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Mortandad Canyon Investigation Report



Prepared by the Environmental Programs Directorate

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EXECUTIVE SUMMARY

This investigation report for Mortandad Canyon presents the results of studies conducted from 1998 to 2005 in Effluent, Mortandad, and Ten Site Canyons and in an unnamed tributary canyon that heads in Technical Area (TA) 05 of the Los Alamos National Laboratory (the Laboratory). Together these drainage systems comprise the Mortandad watershed. These canyons have received inorganic and organic chemicals and radionuclides since the Laboratory was established in 1943. Most of the contamination related to Laboratory releases is associated with effluent discharges, and discharges of contaminants have decreased over time. The investigations reported herein address sediment, surface water, groundwater, and biota potentially impacted by solid waste management units (SWMUs) and areas of concern (AOCs) located within the watershed. Investigations occurred along 18 km (11 mi) of canyon bottom downcanyon of SWMUs or AOCs. The objectives of the investigations included defining the nature and extent of chemicals of potential concern (COPCs) in sediment, surface water, and groundwater and assessing the potential risks to human health and the environment from these COPCs. The investigations also address the sources, fate, and transport of COPCs in the canyons and evaluate the need for additional characterization or remedial actions.

Sediment investigations included geomorphic mapping, associated geomorphic characterization, and sediment sampling in 27 investigation reaches located downcanyon from SWMUs or AOCs. Analytical data collected in this investigation are supplemented by data collected by the Laboratory's Environmental Surveillance Program and other Laboratory studies to aid in determining spatial and temporal trends in sediment contamination.

Surface water investigations included sampling of persistent water at nine locations in Effluent, Mortandad, and Ten Site Canyons, which are locations where water potentially occurs persistently enough to contribute to human health risks or to adverse ecological effects associated with potential chronic exposure. Surface water and groundwater sampling occurred concurrently in two sampling events to assess relations between these media and to characterize potential seasonal effects on hydrology and contaminant concentrations. Analytical data collected in this investigation are supplemented by Environmental Surveillance Program data to provide a longer period of record and a larger data set.

Groundwater investigations included installing nine alluvial wells, eight perched-intermediate groundwater wells and boreholes, and seven regional groundwater wells within the Mortandad watershed. Data from groundwater samples collected from these wells were supplemented with historical data from preexisting wells. Groundwater investigations also included surface and subsurface geophysical surveys, installation of piezometers, water-level measurements, vector probe and flux meter analyses, and analyses of core samples and vadose-zone pore water.

Sediment COPCs in the Mortandad watershed include 38 inorganic chemicals, 74 organic chemicals, and 17 radionuclides. Surface water and groundwater COPCs include 62 inorganic chemicals, 42 organic chemicals, and 16 radionuclides. These COPCs are derived from a variety of sources, including Laboratory SWMUs and AOCs, runoff from developed areas, and naturally occurring soil, sediment, and bedrock. Assessments in this report focus on the subset of these COPCs considered most important for the evaluation of potential ecological or human health risk. The relative importance of the COPCs was determined by comparing COPC concentrations with human health screening action levels and soil screening levels, ecological screening levels, U.S. Environmental Protection Agency Region 6 and Region 9 tap water values, or U.S. Department of Energy-Derived Concentration Guidelines for drinking water. The sources of the COPCs are also considered in these assessments to determine whether they partially or largely represent Laboratory sources.

The spatial distribution of contaminants in the Mortandad watershed, supported by effluent discharge data, indicates that the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) outfall into Effluent Canyon, which has been active since 1963, is the most important source of contamination with respect to potential human health risk and groundwater impacts. Source areas for Laboratory-derived COPCs that are most important in the assessment of potential ecological risk include TA-48 outfalls into the head of Effluent Canyon and into Mortandad Canyon, the TA-50 RLWTF outfall, and additional releases from TA-50 or TA-35 into the head of Ten Site Canyon. The impacts of additional Laboratory sources (e.g., outfalls from the former TA-35 wastewater treatment plant, wastewater lagoons, and filter beds) are indicated by the characterization data, although the concentrations, extent, and inventory of COPCs from these sources are generally minor compared with the sources listed above.

Contaminants in sediment and alluvial groundwater that were originally released from the TA-50 RLWTF outfall are largely or entirely restricted to approximately 4 km (2.5 mi) of canyon bottom downcanyon from the outfall. The infiltration of stormwater into alluvium, particularly upcanyon from the confluence of Mortandad and Ten Site Canyons, results in a complete loss of surface water in most runoff events and deposition of contaminated sediment. The most important sediment deposition area is in the 0.6 km (0.4 mi) of canyon bottom west of the confluence (reach M-3E), and approximately 50% of the inventory of most radionuclides in sediments occurs there. No floods have been recorded crossing the Laboratory-San-Ildefonso Pueblo boundary since RLWTF discharges began in 1963, and only one event before 1963 is recorded as having reached the Laboratory boundary in August 1952.

Contaminant concentrations in sediment, surface water, and alluvial groundwater in the Mortandad watershed have generally decreased over time, indicating that the initial SWMU and AOC sources are no longer major contributors to contamination in canyons media. The canyon bottom sediment deposits contain the largest inventory of adsorbed contaminants that are susceptible to remobilization and transport in floods and are now the primary source for ongoing surface water and alluvial groundwater contamination. Therefore, any future efforts that may be required to address contaminants in canyons media should address the current distribution of contaminants in sediment and associated groundwater rather than the original source areas at Laboratory outfalls.

In contrast, contaminant concentrations in deeper perched-intermediate or regional groundwater have increased over time, indicating the migration of mobile constituents from the alluvial zone into the vadose zone and into deeper zones of saturation. Vadose-zone pore water concentration profiles indicate that these mobile contaminants have percolated in the subsurface. Currently, the majority of the mass of the nonsorbing contaminants nitrate, perchlorate, and tritium is located within the vadose zone, particularly beneath the area near and just east of the confluence of Mortandad and Ten Site Canyons. Chromium is present in the regional aquifer in one characterization well (R-28) above groundwater standards, and chromium, nitrate, perchlorate, and tritium have been measured above groundwater standards in one or more perched-intermediate depth groundwater wells. Iron and manganese have also been measured above drinking water standards in regional groundwater in one well (R-14) and nickel in another well (R-33), although available data indicate that these results represent naturally occurring constituents and not Laboratory-derived contamination.

A baseline ecological risk assessment conducted as part of this investigation evaluates the potential for adverse effects by assessing risks to omnivorous mammals, insect-eating birds, plants, earthworms, aquatic invertebrates, algae, and two threatened and endangered species: the Mexican spotted owl and the southwestern willow flycatcher. Multiple lines of evidence were used to evaluate potential adverse effects on these ecological receptors. Ecological effects data were collected using small-mammal trapping arrays, a cavity-nesting bird monitoring network, seedling germination tests, earthworm mortality tests, and sediment and water toxicity tests. The assessment lines of evidence are augmented by

breeding-bird field surveys, plant surveys, habitat analyses, and spatial modeling of wildlife exposure. The weight of evidence that these investigations provide indicates that no adverse effects to terrestrial and aquatic receptors exist from COPCs in the Mortandad watershed.

The site-specific human health risk assessment uses a trail-user exposure scenario to represent the present-day and reasonably foreseeable future land use in canyons throughout the Mortandad watershed. The assessment results indicate that for the trail-user scenario, no areas in the Mortandad watershed have contaminant concentrations greater than levels acceptable for noncarcinogens (hazard index of 1) or carcinogens (incremental cancer risk criterion of 1×10^{-5}) in sediment or water. However, the radionuclide dose for one area, reach E-1E in Effluent Canyon downcanyon from the TA-50 RLWTF outfall, exceeds the target dose limit of 15 mrem/yr. The calculated dose for reach E-1E, 52 mrem/yr (corresponding to a radiological risk of approximately 2×10^{-4}), is primarily related to external gamma radiation from cesium-137 in sediment. The radionuclide dose limit of 4 mrem/yr in water was not exceeded at any location. Reach E-1E is a short, steep, and rocky area that has no developed trail within the contaminated area, and it is unlikely that recreational users of the Mortandad watershed use this reach as much as is assumed in the trail-user scenario (1 h/d and 200 d/yrr). Other protectively biased assumptions are incorporated into the exposure assessment, also contributing to an overestimate of potential dose. In addition, the area is currently posted as a "soil contamination area," and posting also states that "access is restricted to workers on official business," further discouraging recreational use in reach E-1E. Therefore, no remedial action is proposed to reduce the potential radiation dose to recreational users of Effluent Canyon, although it is recommended that appropriate posting be maintained.

Evaluations of the changes in COPC concentrations over time for sediment, surface water, and alluvial groundwater indicate that concentrations are either relatively stable or are decreasing for contaminants derived from Laboratory SWMUs or AOCs. These decreases are associated with decreased concentrations in TA-50 RLWTF effluent and processes that remobilize, transport, and dilute sediment and waterborne constituents. Radioactive decay also contributes to decreasing concentrations for some radionuclides (e.g., cesium-137, strontium-90, and tritium). Therefore, the potential for impacts to human health or ecosystems from Laboratory-derived contaminants in these media is expected to continue to decrease.

Potential future changes in the vadose-zone contamination and concentrations of contaminants in perched-intermediate and regional groundwater are less well constrained, and a corrective measures evaluation (CME) is necessary to assess the need for remedial actions. The CME will assess the fate of the contaminant mass in the vadose zone and impacts to the regional groundwater where water-supply wells are located. A more detailed evaluation of chromium contamination in groundwater is currently in progress and will be addressed in pending reports to the New Mexico Environment Department. Monitoring in the Mortandad watershed will continue through the proposed CME process and is described in the Interim Facility-Wide Groundwater Monitoring Plan.

In summary, the results of this investigation indicate that human health risks are acceptable for present-day and foreseeable future land uses, assuming that recreational use of Effluent Canyon below the TA-50 RLWTF outfall continues to be discouraged. In addition, no adverse ecological effects were observed within terrestrial and aquatic systems in the Mortandad watershed. Therefore, corrective actions are not needed to mitigate unacceptable risks. However, a CME is proposed to address contamination in groundwater.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE). The Laboratory is located in north-central New Mexico, approximately 90 km (60 mi) northeast of Albuquerque and 30 km (20 mi) northwest of Santa Fe. The Laboratory is currently investigating sites potentially contaminated by past operations to ensure that contaminants do not threaten human health or the environment. The sites under investigation are designated as solid waste management units (SWMUs) or areas of concern (AOCs). Contamination in canyon bottoms and in groundwater is being investigated on a watershed basis between the sources and the Rio Grande, the master drainage in the region, in addition to investigations at individual SWMUs and AOCs.

1.1 Purpose and Scope

This investigation report presents the results of studies conducted from 1998 to 2005 in Mortandad, Effluent, and Ten Site Canyons, and an unnamed tributary to Mortandad Canyon that heads in Technical Area (TA) 05 of the Laboratory. This area is collectively referred to in this report as the Mortandad watershed. The Mortandad watershed above its confluence with the Rio Grande also includes Cañada del Buey and Cedro Canyon, but these canyons are not addressed in this report. Cañada del Buey will be the subject of future investigations under the "Work Plan for Sandia Canyon and Cañada del Buey" (LANL 1999, 64617), and Cedro Canyon is located entirely on San Ildefonso Pueblo land and contains no SWMUs or AOCs. The portion of Mortandad Canyon east of New Mexico State Road (SR) 4 is also not addressed in this report for surface water or sediments because no evidence of contaminant transport past this point has been found (as discussed in Section 7.1.1.6 and in Reneau et al. 2003, 77103). Figure 1.1-1 shows the entire Mortandad watershed and the primary subwatersheds or basins, and Figure 1.1-2 shows more detail within the primary investigation area. The investigations reported herein address sediment, surface water, groundwater, and biota potentially impacted by SWMUs and AOCs located within the Mortandad watershed. These media are collectively referred to as canyons media in this report.

The investigations were conducted to fulfill the requirements of several documents. The "Work Plan for Mortandad Canyon" (hereafter, "the Mortandad Canyon work plan" or "the work plan") (LANL 1997, 56835) describes work scope and regulatory requirements for characterizing the Mortandad watershed for the former Environmental Restoration (ER) Project. It contains a background review of SWMUs and AOCs in the watershed, the history of releases, and a review of contaminant data collected before the work plan was prepared. The New Mexico Environment Department (NMED) approved the work plan in 2002 following the Laboratory's response to a request for supplemental information (RSI) (LANL 1999, 62777; NMED 2002, 73830). The requirement to implement the work plan was also included by reference in Section IV.B.2 ("Mortandad Canyon Watershed") of the Compliance Order on Consent (hereafter, the Consent Order), signed by NMED, DOE, the Regents of the University of California, and the State of New Mexico Attorney General on March 1, 2005.

The investigations conducted for the work plan also followed the technical strategy presented in the "Core Document for Canyons Investigations" (hereafter, "the canyons core document") (LANL 1997, 55622; LANL 1998, 57666). The canyons core document was prepared after a pilot study in Los Alamos and Pueblo Canyons was implemented in 1996, with the goal of standardizing the technical strategy for work in canyons. In 1988, NMED approved the core document following the Laboratory's response to an RSI (LANL 1998, 57666; NMED 1998, 58638).

Two additional documents have been prepared to supplement the work plan. The "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613), approved by NMED in 2004 (NMED 2004,

84463), was prepared to meet requirements in the then-draft Consent Order. This plan replaces the approach and scope of the groundwater and surface water investigations contained in the work plan. The "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308), approved by NMED in 2005 (NMED 2005, 92084), provides a detailed biota sampling and characterization plan for the Mortandad watershed. This plan satisfies the requirement in the work plan to prepare a biological sampling plan for the Mortandad watershed.

Results of investigations of intermediate and regional groundwater beneath the Mortandad watershed described in the Laboratory's "Hydrogeologic Workplan" (LANL 1998, 59599) are also included in this report. Results of an investigation of chromium contamination in groundwater beneath the Mortandad watershed (LANL 2006, 91987) are not included in this report and will instead be reported in an interim measures report scheduled to be completed in November 2006.

Data collected during the investigations included in this report are used to describe the nature and extent of contamination within the canyon bottom and in groundwater beneath the Mortandad watershed; to update the conceptual model for contaminant distribution and transport within the canyons and underlying groundwater; to assess present-day human health and ecological risk from contaminants within the canyons; to determine and recommend potential remedial actions, if needed, that may be appropriate to achieve or maintain site conditions at an acceptable risk level; and to provide support for decisions at SWMUs and AOCs. The assessments in this report are conducted using data collected since 1998 by the former ER Project to evaluate current environmental conditions. Data from prior investigations and from environmental surveillance sampling are used to help identify temporal trends in contamination and therefore help evaluate how potential risk may change in the future relative to present-day conditions.

This report addresses characterization and risk assessment on the spatial scale of an entire canyon system, encompassing approximately 18 km (11 mi) of canyon bottom downstream of SWMUs and AOCs. The characterization and assessment approach used in this investigation provides an integrating perspective on historical and current contaminant releases to the canyon floor and subsequent contaminant redistribution resulting from various transport processes. This approach facilitates the development of conceptual models that describes expected spatial and temporal trends in contaminant concentrations and inventory, thus supporting recommendations for long-term monitoring. The results also support the Laboratory's watershed approach by providing information on the extent of contamination associated with SWMUs and AOCs and SWMU and AOC aggregates in the watershed and by helping identify and prioritize remedial activities within the watershed. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

1.2 Organization of Investigation Report

This investigation report has the following sections. The outline follows a format approved by NMED on June 13, 2006 (Goering 2006, 93028). Section 1 is an introduction to the report and to the Mortandad watershed. Section 2 provides background information on the sources and history of contaminant releases, previous investigations of canyons media, and remediation activities that have occurred in the watershed. Section 3 describes the scope of activities in this investigation. Section 4 introduces the field investigations. Section 5 describes the regulatory context of this investigation. Section 6 presents screening-level assessments that identify chemicals of potential concern (COPCs) and that help focus subsequent sections on the subset of the most important COPCs for evaluating potential human health risk. Section 7 presents a physical system conceptual model, including discussions of the nature, sources, extent, fate, and transport of select COPCs that are most relevant for evaluating potential human health and ecological risk and contaminant transport. Section 8 presents baseline ecological and human

health risk results and assessments. Section 9 presents conclusions and recommendations. Section 10 presents references cited in this report.

This report has the following appendixes. Appendix A provides a list of acronyms and abbreviations and a table showing conversion of metric units to U.S. customary units. Appendix B presents field investigation methods and results. Analytical results from this investigation are contained on a compact disk and are included as Appendix C. Appendix D presents supporting information on contaminant trends and inventory. Appendix E presents supporting information on statistics and risk. Appendix F presents an alluvial water-level study. Appendix G discusses subunit variability within alluvium, colluvium, and in the Cerro Toledo interval as it pertains to subsurface hydrology. Appendix H presents results of a resistivity study. Appendix I presents documentation of techniques used in the earthVision model. Appendix J discusses constraints on saturated thickness and lateral extent of perched-intermediate water beneath the Mortandad watershed. Appendix K presents the screening results of stormwater data collected at gage stations in the Mortandad watershed. Appendix L presents an analysis of temporal variability in water-levels observed at the intermediate-depth boreholes in the Mortandad watershed and its relation to surface flow events and barometric pressure changes. Preliminary infiltration investigation results are discussed in Appendix M. Appendix N presents an analysis of spatial variability of the regional water table and generation of a contour map of the water-table elevation. In Appendix O, variability in the regional water table elevation near the Mortandad Canyon is analyzed. Appendix P presents an analysis of variability in the pumping rate and hydraulic heads at the water-supply wells near the Mortandad Canyon.

1.3 Watershed Description

The portion of the Mortandad watershed addressed in this report includes Mortandad Canyon west of SR 4, Effluent Canyon, Ten Site Canyon, and an unnamed tributary canyon that heads in TA-05 (Figure 1.1-2). The watershed heads on the Pajarito Plateau on Laboratory land in TA-03, at an elevation of approximately 2255 m (7400 ft) above sea level (asl), and extends approximately 11 km (7 mi) to SR 4 on San Ildefonso Pueblo land at an elevation of approximately 1965 m (6450 ft) asl, approximately 5 km (3 mi) upcanyon from the Rio Grande. The watershed upcanyon of SR4 has a drainage area of 8.4 km^2 (3.3 mi^2), of which 60% is on Laboratory land and the remaining 40% is on San Ildefonso Pueblo land. Effluent Canyon heads in TA-48 and has a length of approximately 0.8 km (0.5 mi) and a drainage area of 0.3 km^2 (0.1 mi^2), entirely on Laboratory land. Ten Site Canyon heads in TA-50 and has a length of approximately 2.9 km (1.8 mi) and a drainage area of 0.9 km^2 (0.3 mi^2), entirely on Laboratory land. Ten Site Canyon includes a short tributary, referred to as Pratt Canyon, which heads in TA-35. The unnamed tributary canyon that heads in TA-05 has a length of approximately 2.8 km (1.7 mi) and a drainage area of 1.4 km^2 (0.6 mi^2), of which 41% is on Laboratory land and the remaining 59% is on San Ildefonso Pueblo land.

Bedrock geologic units exposed within Mortandad Canyon and tributary canyons upcanyon from SR 4 consist of Quaternary ignimbrites of the Otowi and Tshirege Members of the Bandelier Tuff. Pliocene basaltic rocks of the Cerros del Rio volcanic field and underlying geologic units are exposed farther downcanyon toward the Rio Grande (Griggs 1964, 8795; Smith et al. 1970, 9752; Dethier 1997, 49843; Gardner et al. 1999, 63492; Lavine et al. 2003, 92527). Geologic units within the watershed are discussed in more detail in Section 7 of this report.

A comprehensive overview of the biological setting of the Mortandad watershed is provided in the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). Details on the hydrology are provided in Section 7 and Appendix B of this report.

1.4 Current Land Use

The portion of the Mortandad watershed addressed in this report is located on DOE and San Ildefonso Pueblo lands. Currently, no active Laboratory operations occur in the canyon, except for environmental work such as sediment and water sampling and the discharge of effluent from five National Pollutant Discharge Elimination System (NPDES)-permitted outfalls (Figure 1.1-2 and Plate 1). NPDES outfall 051 discharges treated radioactive effluent from the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) into Effluent Canyon. NPDES outfall 03A181 discharges treated cooling water from TA-55 into Effluent Canyon upcanyon from the RLWTF outfall. NPDES outfall 03A021 discharges treated cooling water from TA-03 into the head of Mortandad Canyon. NPDES outfall 03A022 discharges treated cooling water from TA-03 into the upper part of Mortandad Canyon. NPDES outfall 03A160 discharges treated cooling water from TA-50 into the upper part of Ten Site Canyon. There is currently no public access to the watershed on Laboratory land, although trails in the canyons are used by Laboratory personnel for recreational activities such as hiking, running, and bike riding. The portion of the Mortandad watershed on San Ildefonso Pueblo land is undeveloped and is used for traditional activities, including hunting and wood gathering.

2.0 BACKGROUND

Inorganic chemicals, organic chemicals, and radionuclides have been released into the Mortandad watershed from a variety of sources, primarily Laboratory operations in several TAs, since the Laboratory was established in 1943. Most of the contamination related to Laboratory releases is associated with effluent discharges, and releases of contaminants and radionuclides have decreased over time due to improvements in wastewater treatment processes and decreased effluent volumes. The contaminants and radionuclides have been dispersed downcanyon from their release sites in sediments, surface water, and alluvial groundwater. Subsequently, waterborne constituents have percolated into the subsurface and are observed in vadose-zone pore water. Some nonsorbing species are present in intermediate-perched water and in regional groundwater as well. The following sections summarize the sources and history of contaminant and radionuclide releases as well as investigations that address constituent distribution and concentration in canyons media. Remediation activities implemented to reduce contamination in the canyon bottom or in source areas are also discussed.

2.1 Sources and History of Contaminant Releases

This section describes known releases of inorganic chemicals, organic chemicals, and radionuclides that have contributed to contamination within the Mortandad watershed.

2.1.1 TA-50

The Laboratory's RLWTF located at TA-50 began operations in July 1963, and water treatment continues today. The RLWTF discharges treated wastewater to Mortandad Canyon through Effluent Canyon through an outfall that is currently permitted as NPDES outfall 051 [SWMU 50-006(d)] (Plate 1). The largest amount of contamination and radionuclides released to the Mortandad watershed has come from this outfall, which is interchangeably referred to in the remainder of this document at the TA-50 outfall, the RLWTF outfall, or the TA-50 RLWTF outfall. Radioactive liquid waste is treated in Building 50-1 at the RLWTF and transferred to one of two 80,000-L holding tanks located in Building 50-2. When one of the tanks is full, the contents are discharged. Before discharge, the treated wastewater is sampled and tested for radiological and nonradiological constituents. The wastewater is recycled through the treatment plant

until the parameters in the NPDES permit are met. The holding tanks discharge in batches, taking about 30 min per batch. Currently, less than one batch per day is released.

Liquid discharge volumes and associated radionuclide and nitrate releases recorded for the RLWTF from 1963 to 2005 are summarized in Table 2.1-1. This information was collected as part of the historical monitoring of the outfall (LANL 2002, 71301; LANL 2005, 91523; LANL 2006, 93925). Discharge volumes have ranged from the recent low value of 6.8×10^6 L/yr in 2005 to a high of 6.03×10^7 L/yr in 1968, as shown in Figure 2.1-1. Generally, the highest volumes were discharged before about 1981, and volumes have declined since then.

Radionuclides released with the TA-50 RLWTF effluent include americium-241, cesium-137, plutonium 238, plutonium-239,240, strontium-89,90, and tritium. From 1963 to 2004, discharge records indicate that a minimum total of approximately 0.156 Ci of americium-241, more than 2 Ci of cesium-137, more than 0.10 Ci of plutonium-238, nearly 0.2 Ci of plutonium-239,240, approximately 1.5 Ci of strontium-89,90, and approximately 823 Ci of tritium were discharged. Most of the radionuclides americium-241, cesium-137, plutonium-238, and plutonium-239,240 apparently were discharged between 1972 and 1983, although records are incomplete before 1973 (Table 2.1-1). Much of the cesium-137, strontium-90, and tritium have been lost since initial discharge by radioactive decay, although essentially all of the other radionuclides with longer half-lives remain in the watershed.

The variability in discharge volume and in contaminant releases over time (Table 2.1-1) reflects contemporaneous Laboratory operations whose wastewater was treated at the RLWTF, new wastewater treatment methods, and evolving regulatory requirements. Historic nitrate concentrations are compared with outfall volumes in Figure 2.1-1. These illustrate that time histories of released contaminant concentrations do not necessarily track those of outfall volumes. Advanced treatment technologies and stricter regulatory requirements have resulted in reduced contaminant concentrations in effluent. For example, a new reverse osmosis and ultrafiltration system began operating at the RLWTF in 1999 to remove additional radionuclides (except tritium) from the effluent and to ensure that the discharges meet DOE public dose guidelines. Also in 1999, the RLWTF instituted a program to restrict the discharge of nitrogenous wastes into the facility's collection system. The combination of these restrictions with the ultrafiltration system has decreased the nitrate (nitrate as nitrogen) effluent concentration to below 10 mg/L. Since 2000, tritium releases have also decreased because of segregation and evaporation of tritium-contaminated waste streams. The effects of these facility enhancements can be seen in the recent information given in Table 2.1-1.

Measurement of perchlorate releases in RLWTF liquid effluent began in 2000. That year, the RLWTF discharged 4.74 kg of perchlorate for an average concentration of 254 μg/L in the effluent. In 2001, 2.29 kg of perchlorate was released, resulting in an average concentration of 169 μg/L. In 2002, ion-exchange resins were installed at the RLWTF, and this addition has successfully reduced perchlorate in effluent to below the detection limit of 4 μg/L. Other inorganic chemicals released with RLWTF wastewater include chromium, fluoride, sodium, and chloride. Historic chromium releases since 1976 are shown in Figure 2.1-2; the estimated mass of chromium released since 1976 is 26 kg.

Fluoride is also released at the TA-50 RLWTF outfall. Highest effluent concentrations occurred between 1982 and 1990, ranging from about 6 mg/L to a maximum of 28 mg/L. Since 1999, enhanced fluoride treatment has kept effluent concentrations below the New Mexico groundwater standard of 1.6 mg/L. In 2005, the average effluent fluoride concentration was 0.24 mg/L (LANL 2006, 93925).

Before 1975, outfalls at TA-50 (other than the RLWTF) discharged into the head of Ten Site Canyon through drain lines originating in Buildings TA-50-1 and TA-50-2 (LANL 1997, 56835, pp. 2-22–2-23). In 1974, two unplanned releases of untreated waste occurred because of overflow of a sump in TA-50-2.

The drain lines were removed in 1982, and cesium-137, plutonium-239, ruthenium-106, strontium-89, strontium-90, and yitrium-90 were encountered during excavation of the lines. The area near the head of Ten Site Canyon was partially decontaminated in 1981. A Resource Conservation and Recovery Act (RCRA) field investigation (RCRA RFI) was performed in 1993 for SWMU 50-006(a). Soil samples were collected near the outfalls of the two former drain lines, on both banks of the drainage channel, and in the canyon drainage channel at a distance of about 1300 ft downstream from the TA-50 boundary. COPCs identified included polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and the radionuclides americium-241, cobalt-60, cesium-137, potassium-40, plutonium-238, plutonium-239,240, Ra-226, strontium-90, and thorium-232 (LANL 1997, 56835, pp. 2-22, 2-23).

2.1.2 TA-35

Historic outfalls located at TA-35 (Figure 1.1-2 and Plate 1), formerly called Ten Site, are sources of radionuclides and other contamination in the watershed. TA-35 is highly developed industrially, and stormwater runoff from paved areas may also contribute to contaminants in the watershed. The following paragraphs summarize source information compiled in the Mortandad Canyon Work Plan (LANL 1997, 56835).

From 1951 to 1963, treated wastewater containing radionuclides was discharged from the Ten Site Laboratory (Building TA-35-2) into Pratt Canyon (SWMU 35-003(d)-00), a small tributary of Ten Site Canyon. This wastewater originated while hot cells were used to prepare kilocurie sources of radioactive lanthanum (lanthanum-140) and barium (barium-140), waste from experimental reactors (Los Alamos power reactor experiment-1 and -2 and Los Alamos molten plutonium reactor experiment), plutonium research laboratories, and a tritium laboratory. During the operation of the TA-35 wastewater treatment plant (WWTP), approximately 2.7 × 106 gal. (10,220 m^3) of water were discharged to Pratt Canyon (LANL 1997, 56835). The total activity discharged was about 20 Ci gross-beta activity and 1.4 Ci of strontium-89 and strontium-90. The gross-beta activity consisted of a combination of barium-140, lanthanum-140, strontium-89, strontium-90, and trace amounts of cesium-137, ruthinium-106, plutonium, technetium-99, and uranium (Emelity 1958, 793; LANL 1997, 5683; Aeby 1952, 741; Aeby 1954, 742). Many of these radionuclides are short lived, and a decay-corrected inventory estimate made in 1996 considering barium-140, lanthanum-140, strontium-89, and strontium-90 calculated that approximately only 0.2 Ci of strontium-90 remained from the historic releases at TA-35 (LANL 1997, 56835). Unknown quantities of tritium were also disposed of from 1953 to 1974 (Rogers 1998, 59169, p. 2). In addition, chemicals such as nitric acid, strontium nitrate, iron sulfate, and ferric chlorate were released to Pratt Canyon either as wastewater constituents or as treatment chemicals. The TA-35 WWTP was closed in 1963, underwent initial decontamination and decommissioning (D&D) in 1984 and 1985 (Elder et al. 1986, 03089), and underwent further D&D in 1995 and 1996 (LANL 1997, 56835).

Sanitary septic systems that previously discharged from TA-35 were also a source of nitrates in the Mortandad watershed. From 1951 to 1975, two septic systems discharged to Mortandad Canyon and two discharged to Ten Site Canyon. These four systems had no documented releases of contaminants other than treated sewage (LANL 1997, 56835). From 1975 to 1992, the TA-35 sanitary septic sewage lagoons released treated effluent to Ten Site Canyon at NPDES-permitted outfall 10S. Records from 1987 to 1992 show that an average of 45,000 gal. was discharged daily (LANL 1997, 56835).

Photographic waste discharge, noncontact cooling water, and treated cooling water were also previously released at now inactive outfalls into Ten Site and Mortandad Canyons. Chromium may have been released with some cooling water, especially from NPDES-permitted outfall 04A-127.

Currently, only NPDES-permitted outfall 03A160 (Plate 1) discharges from TA-35. It discharges cooling tower blowdown associated with a large generator within Building TA-35-124 to Ten Site Canyon above reach TS-1W.

2.1.3 TA-48

Radiochemistry and nuclear medicine research has been conducted at TA-48 (Figure 1.1-2 and Plate 1), the Radiochemistry Site, since 1957. Discharges to Mortandad Canyon and to the head of Effluent Canyon from TA-48 are believed to have begun at about that time (LANL 1997, 56835). Historically, outfalls handling once-through cooling water and treated cooling tower blowdown have discharged to the canyons [SWMUs 48-007(a), 48-007(b), 48-007(d), 48-010)]; additional small wastewater sources such as floor, roof, and sink drains [SWMUs 48-007(c) and 48-007(f)] also existed. Soil samples collected at these sites in 1993, 1995, and/or 1997 showed the presence of radionuclides and inorganic chemicals. Some radionuclides observed were americium-241, cobalt-60, cesium-137, sodium-22, plutonium isotopes, ruthinium-106, and strontium-90 and uranium isotopes; some inorganic chemicals detected above background levels were barium, copper, lead, mercury, manganese, strontium, and zinc. Currently, no NPDES-permitted outfalls are present at TA-48.

In addition to liquid effluent, the air exhaust system at TA-48 vented acidic vapors (such as perchloric, hydrochloric, hydrofluoric, and nitric acids) that may have contributed contaminants to that watershed.

2.1.4 TA-03

A small portion of the southern part of TA-03, mainly near the Chemistry and Metallurgy Research (CMR) Building (Building TA-03-29) and the Materials Science Laboratory (Building TA-03-1698), is located in the upper reaches of the Mortandad watershed. Some unintentional spills to Mortandad Canyon have occurred, as summarized in the Mortandad Canyon Work Plan (LANL 1997, 56835).

- Six releases of cooling water from the new Sigma Building occurred before 1975; no information was reported regarding possible contaminants associated with the cooling water (Purtymun 1964, 11822).
- During summer 1974, two accidental releases from a radioactive liquid-waste line (near the CMR building) resulted in radioactive contamination of soil near the leaks, SWMU 03-054(e). The waste contained predominantly plutonium-238, with lesser concentrations of cesium-137, plutonium-239, strontium-89, and strontium-90. Remediation of soils was conducted in 1974 and 1984.

Treated cooling water and electroplating solutions were released at SWMU 03-049(a) starting in 1960. Trace amounts of metals (including chromium), acids, cyanide, and depleted uranium were likely released with electroplating rinse waters.

Currently, NPDES-permitted outfalls 03A021 (CMR Building seasonal cooling) and 03A022 (Sigma Complex seasonal cooling) discharge treated cooling water to the upper part of Mortandad Canyon at TA-03 (Plate 1).

In addition to the TA-03 sites located around Mortandad Canyon, it is possible that potassium chromate discharged from TA-03 into Sandia Canyon may be a source of chromium contamination observed in the regional aquifer at well R-28 in Mortandad Canyon (LANL 2006, 91987). Potassium chromate was used from approximately 1956 to 1972 as a corrosion inhibitor in the cooling towers that serviced the TA-03 Power Plant. Possible usage averaging 16.3 kg/d (35.9 lb/d) (DOE 1987, 52975) makes this the largest

known usage of chromium at the Laboratory. Cooling tower blowdown was discharged through an outfall to Sandia Canyon (currently NPDES-permitted outfall 01A001) at approximate rates of 128,000 to 288,000 gal./d. Chromium contamination is being further investigated under the "Interim Measures Work Plan for Chromium Contamination in Groundwater" (LANL 2006, 91987).

2.1.5 TA-55

TA-55 was established in 1973 for the plutonium-processing laboratory. Activities include chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms. Waste streams are treated at the TA-50 RLWTF. NPDES-permitted outfall 03A181 (Plate 1) currently discharges to upper Effluent Canyon near reach E-1W and west of outfall 051. This outfall releases small volumes of treated blowdown from a cooling tower.

2.1.6 Other Technical Areas

SWMUs and AOCs at several other Laboratory TAs within the Mortandad watershed could have potentially contributed contamination to the canyon bottoms, including TA-60, former TA-04, TA-05, TA-52, former TA-42, and TA-63. Firing sites and outfalls at TA-05 that were active from approximately 1944 to 1959 are the only sources of potential contamination for an unnamed tributary canyon that joins Mortandad Canyon immediately east of the Laboratory-San Ildefonso Pueblo boundary (LANL 1997, 56835, p. 2-11).

2.1.7 Runoff from Developed Areas

The Laboratory's technical areas that surround Mortandad Canyon are industrially developed, including Laboratory facilities, storage locations, and parking lots. Runoff from developed areas transport various contaminants associated with urban areas into the canyons. Contaminants commonly found below developed areas include constituents in motor oil, gasoline, diesel, and asphalt, road salt, PCBs, heavy metals, and pesticides. PAHs, suspected carcinogens that are frequently associated with vehicle usage and asphalt, are a common class of contaminants associated with developed areas (Edwards 1983, 82302; Lopes and Dionne 1998, 82309; van Metre et al. 2000, 82262). Metals that have been identified as associated with runoff from roads include cadmium, chromium, copper, lead, nickel, and zinc (Walker et al. 1999, 82308; Breault and Granato 2000, 82310). Consistent with studies in other regions, investigations in other canyons in and near the Laboratory have identified various inorganic and organic COPCs as being associated with runoff from developed areas (LANL 2004, 87390, pp. 7-14, 7-16).

2.1.8 Cerro Grande Fire

In May 2000, the Cerro Grande fire burned a large part of the Mortandad watershed west of SR 4. Approximately 5.7 km^2 (1410 acres) of the watershed was within the burn perimeter (BAER 2000, 72659), comprising 68% of the watershed above the highway. Most of this area, 82%, was classified as low burn severity or not burned and the remainder as moderate burn severity. Various naturally occurring inorganic chemicals (e.g., barium, cobalt, and manganese) and anthropogenically created fallout radionuclides (e.g., cesium-137, plutonium-239,240, and strontium-90) were concentrated in Cerro Grande ash at levels exceeding that of background sediments before the fire, and the transport of ash has resulted in elevated levels of these analytes in post-fire sediment deposits in some canyons (Katzman et al. 2001, 72660; Kraig et al. 2002, 85536; LANL 2004, 87390). Elevated levels of inorganic chemicals and radionuclides that can be attributed to the transport of ash have also been found in stormwater samples in some canyons (Gallaher and Koch 2004, 88747). Post-fire changes in sediment or water chemistry may have

occurred in the Mortandad watershed, although these effects are expected to be relatively minor compared with other canyons because of the low burn severity and because no layers of ash-rich sediment have been observed.

2.2 Contamination in Canyons Media

Contamination in sediment, surface water, and groundwater in the Mortandad watershed has been evaluated in many studies before this report, dating back to 1956 (Purtymun et al. 1965, 11847). This previous work documented the presence of elevated levels of inorganic chemicals, organic chemicals, and radionuclides in canyon media and has evaluated the potential effects of contaminants on biota. Some key studies, summarized below, provide background and supplemental data for the investigations presented in this report. Relevant information from these studies is also included in subsequent sections of this report.

2.2.1 U.S. Geological Survey

The U.S. Geological Survey (USGS) performed initial studies of contaminants in the Mortandad watershed, beginning with sampling and analyzing sediment below the TA-35 WWTP outfall into Pratt Canyon in 1956 (Purtymun et al. 1965, 11847) and continuing with studies in Effluent and Mortandad Canyons (Purtymun et al. 1966, 11848; Purtymun 1967, 8987; Purtymun and Kunkler 1967, 8888). This work provides documentation of contamination in the initial years of effluent discharge in the watershed and of downcanyon decreases in radionuclide concentration at that time.

2.2.2 Environmental Surveillance Program

The Laboratory's Environmental Surveillance Program (ESP) has sampled and analyzed sediments, surface water, and groundwater at numerous locations in the Mortandad watershed since 1969. This work, reported in annual Environmental Surveillance reports (e.g., ESP 2001, 71301; ESP 2002, 73876; ESP 2004, 83635; ESP 2004, 88421; ESP 2005, 92222) and in other reports (e.g., Purtymun 1971, 4795; Purtymun 1973, 4971; Purtymun 1974, 5476; Purtymun 1975, 11787; Purtymun et al. 1977, 11846; Purtymun et al. 1983, 6407; Devaurs and Purtymun 1985, 7415; Stoker et al. 1991, 7530; Ferenbaugh and Gladney 1997, 93715; Gallaher et al. 1997, 59165), supports the evaluation of long-term trends in contamination in different media and an understanding of the role of stormwater transport.

2.2.3 Environmental Science Group

The Laboratory's Environmental Science Group conducted a series of detailed studies of radionuclides in sediments within the Mortandad watershed in the 1970s; this group has also conducted ecological investigations in contaminated canyon-bottom areas (Hakonson et al. 1973, 4974; Hakonson and Bostick 1976, 29678; Hakonson et al. 1976, 8920; Nyhan et al. 1976, 11746; Nyhan et al. 1976, 11747; Nyhan et al. 1978, 5726; Hakonson et al. 1980, 8924; Nyhan et al. 1982, 7164). This work included documenting downstream changes in contaminant concentrations and relations between contaminant concentration and sediment particle size in the canyon below the RLWTF outfall into Effluent Canyon.

2.2.4 Ecology Group

The Laboratory's Ecology Group has conducted studies on the uptake of contaminants by biota in Mortandad Canyon. These studies include addressing potential uptake of contaminants by small mammals and plants (Bennett et al. 1996, 56035), peregrine falcons (Podolsky 2000, 73477), and an

initial ecotoxicological risk screen in Effluent and Mortandad Canyons (Gonzales and Newall 1996, 56045). Additional studies by the Ecology Group were conducted as part of this investigation and are summarized in Section 8.1.

2.2.5 Environmental Restoration Project

Since 1998, detailed studies of canyons media in the Mortandad watershed have been conducted by the former ER Project and successor organizations. Summaries of results of sediment investigations through 2003 have been presented previously (Reneau et al. 2003, 77103; LANL 2005, 89308). Supplemental data on contamination in canyons media are available through other ER Project reports (e.g., LANL 1995, 49925; LANL 1996, 54422; LANL 2005, 91699). The work presented in this investigation report builds on these previous studies.

2.2.6 NMED and EPA

NMED and the U.S. Environmental Protection Agency (EPA) and their subcontractors have collected and analyzed samples from canyons media in the Mortandad watershed as part of oversight activities (e.g., Hanlon-Mayer and Jacquez 2000, 82261; EPA 2001, 70669). These data provide supplemental information about contamination in the watershed.

2.3 Remediation Activities

Several remediation activities in the Mortandad watershed have reduced the potential for contaminant transport or reduced the concentrations or inventory of contaminants in canyon media. The activities most relevant to this investigation are summarized below.

2.3.1 Pratt Canyon

After removing structures at the former TA-35 WWTP at the head of Pratt Canyon in the early to mid-1980s [SWMUs 35-003(d,e,l,q)], backfill was placed at the head of the canyon to fill excavations and prevent erosion of potentially contaminated soil. Subsequent runoff events incised the backfill on the slope, leading to concerns about remobilizing contaminants such as strontium-90. In 1996, the ER Project conducted an interim action (IA) in Pratt Canyon to reduce the potential for erosion (LANL 1996, 55809). The IA activities included replacing fill in the incised channel, stabilizing the slope, and installing a berm to divert runoff from the slope.

2.3.2 Ten Site Canyon

Excavation of contaminated sediment from Ten Site Canyon reach TS-1W (Plates 1 and 3) occurred in an IA in 1996 (LANL 1997, 55834). This IA targeted a location in the stream channel where unusually high concentrations of plutonium-238 (5190 pCi/g) had been found in one sample, which is the maximum reported anywhere in the Mortandad watershed. This contamination was derived from accidental releases from TA-50 in 1974, designated SWMU/AOC 50-006(a). The site has been described as a “hummock,” and the geomorphic setting indicates that the location was probably a sandbar next to a scour hole that formed below boulders in the channel. Only a single sample from this area had plutonium concentrations >100 pCi/g, suggesting that the 5190 pCi/g result was anomalous and included a small particle of plutonium. A total of 0.55 m^3 (0.72 yd^3) of sediment was removed in this IA.

2.3.3 Sediment Traps

Sediment deposits were excavated from sediment traps #1 and #3 in Mortandad Canyon reach M-4 (Plates 1 and 4) in June 2000 after the Cerro Grande fire (WGII 2000, 70735). This sediment removal was intended to increase capacity in trap #1 to prepare for possible post-fire floods and to remove some fine-grained sediment in trap #3. Excavation of a fill pile adjacent to trap #1 that resulted from prior trap maintenance activities in 1992 also occurred. An estimated 1680 m^3 (2200 yd^3) of sediment was removed in these activities. The contaminant inventory removed in these activities is probably relatively low, compared with the total inventory in reach M-4 because measured radionuclide concentrations in the traps and the fill piles were relatively low. In addition, much of the excavated volume probably consisted of sediment that predated contaminant releases in the watershed.

2.3.4 Permeable Reactive Barrier

In January and February 2003, the Laboratory installed a permeable reactive barrier (PRB) in Mortandad Canyon reach M-3W to evaluate in situ treatment of a suite of COPCs in shallow alluvial groundwater (Kaszuba et al. 2002, 93891; DBS&A 2006, 93888). The PRB was designed to remove americium-241, plutonium-238, plutonium-239,240, strontium-90, nitrate, and perchlorate. Because of their geochemical variability, no single treatment media was optimal for removing all of these COPCs. Consequently, a multiple-layer PRB was designed with multiple treatment zones arranged in series to sequentially remove each of the COPCs. The PRB employs a funnel-and-gate system with a sequential series of four reactive media cells. The funnel consists of a row of sheet piles driven through the alluvium and into the underlying bedrock that directs the alluvial groundwater so that it will flow through the four cells (the gate). The four reactive media cells, ordered by sequence of contact with the groundwater, consist of (1) gravel-sized scoria for colloidal removal; (2) mineral apatite (calcium phosphate) for removing metals and radionuclides; (3) biobarrier cell composed of 65% pecan shells and 10% cotton seed mixed with 25% pea gravel to deplete dissolved oxygen and break down nitrate, perchlorate, and potential RCRA organic compounds; and (4) gravel-sized limestone for pH buffering and anion adsorption. Performance monitoring of the PRB consisted of collecting several rounds of groundwater samples between 2003 and 2005 from the PRB sampling ports and nearby alluvial monitoring wells that were analyzed for major cations and anions and radionuclides (DBS&A 2006, 93888). These data indicated that successful treatment of COPCs occurred in the apatite and biobarrier cells. However, dissolved concentrations of key COPCs measured in the limestone cell and a downcanyon monitoring well—notably, perchlorate, nitrate, and strontium-90—were essentially equivalent to the untreated water upcanyon of the PRB. This pattern of chemical behavior was observed initially under very low alluvial saturation levels in 2003 that created stagnant groundwater flow conditions in the alluvium but also during higher saturation levels in 2004 and 2005 when normal groundwater flow conditions prevailed. Possible explanations for the apparent impaired performance include hydraulic bypass or errors associated with sampling techniques. The performance of the PRB is the subject of ongoing investigations to evaluate these issues.

3.0 SCOPE OF ACTIVITIES

The scope of activities in this report include investigations of sediment, surface water, groundwater, and biota in the Mortandad watershed, as presented in the Mortandad Canyon work plan and subsequent documents (LANL 1997, 96835; LANL 1999, 62777; LANL 2004, 82613; LANL 2005, 89308). These investigations are discussed below.

3.1 Sediment Investigations

The sediment investigations presented in this report focused on characterizing the nature, extent, concentrations, and inventory of contaminants in post-1942 sediment deposits in a series of reaches in the Mortandad watershed. Data from these reaches are used to evaluate potential human health and ecological risks and to identify spatial trends in contamination at a watershed scale, including variations in contaminant concentration and inventory at increasing distances from source areas and temporal trends in contamination. The investigation methods are discussed in Section 4 and Appendix B, Section B-1, of this report; in the "Mortandad Canyon Work Plan" (LANL 1995, 96835; LANL 1999, 62777); and in the canyons core document (LANL 1997, 55622; LANL 1998, 57666).

The scope of this investigation originally included up to 13 investigation reaches in the Mortandad watershed, as presented in Section 7.2.4 of the work plan (LANL 1997, 55622; pp. 7-12–7-30). The scope of work subsequently increased, as discussed below, and a total of 27 investigation reaches have been characterized. Table 3.1-1 lists the sediment investigation reaches and the years in which samples were collected in each reach. Table 3.1-1 also provides abbreviations for reach names included in this report and the approximate length and distance of each reach from the Rio Grande, as well as additional information on the reaches. Figure 3.1-1 and Plate 1 show the location of the investigation reaches within the Mortandad watershed. Note that Pratt Canyon (reach PCYN), a short tributary to Ten Site Canyon below the former TA-35 WWTP, is included in Table 3.1-1, Figure 3.1-1, Plates 1 and 3, and in the physical system conceptual model in Section 7 for completeness but not in the screening assessment in Section 6 or in the risk assessments in Section 8. An evaluation of COPCs and potential risk in Pratt Canyon was completed as part of investigations at TA-35 (LANL 2005, 91867).

During implementation of the work plan in 1998 to 2004, additional investigation areas were added in the Mortandad watershed, and some reaches were subdivided to better identify contaminant sources and to characterize variations in contamination in these canyons. For example, reach TS-2 was subdivided into reaches TS-2 West, TS-2 Central, and TS-2 East, with reach boundaries placed at outfalls from specific SWMUs. Reaches M-3 and M-4 were subdivided to help evaluate variations in contaminant concentrations and inventory related to geomorphic variations in the canyon bottom, although data from all subdivisions of M-3 are evaluated together for risk assessment and also for all subdivisions of M-4. M-3 West consists of the relatively narrow upcanyon portion of M-3; M-3 East consists of the broader downcanyon portion that extends to the confluence with Ten Site Canyon. M-4 West consists of the part of Mortandad Canyon between the Ten Site Canyon confluence and sediment trap #3, M-4 Central consists of the area east of sediment trap #2 where radionuclide concentrations are relatively high, and M-4 East consists of the area farther east where radionuclide concentrations are relatively low.

In 1998, reach M-1 West was added and investigated upcanyon of reach M-1 as shown in the work plan, and the original M-1 was renamed M-1 East. M-1 West is located at the head of Mortandad Canyon just east of Diamond Drive and was investigated to better determine contaminant levels that would be associated with releases from TA-03. In 2001, reach M-2 East was investigated downcanyon of reach M-2 as shown in the work plan, and the original M-2 was renamed M-2 West. M-2 East is located downstream of the easternmost SWMU at TA-35 and was investigated to better determine if TA-35 SWMUs or AOCs have had a measurable impact on sediments in Mortandad Canyon. Investigation of M-2 East was partially in support of planned work at TA-35 under the "Sampling and Analysis Plan for the Middle Mortandad/Ten Site Aggregate" (LANL 2002, 73092). Other objectives of the M-2 East investigation were to obtain additional data on contaminants released from TA-50 and to reduce the length of the nonsampled area between Effluent Canyon and reach M-3. In 2004, reaches E-1 Far West, M-1 Central, and M-5 West were added to the investigation. E-1 Far West is located at the head of Effluent Canyon, upcanyon of the westernmost TA-55 SWMU and was investigated to better determine

relative contributions from TA-48 and TA-55. M-1 Central is located between M-1 West and M-1 East, upcanyon of the westernmost TA-48 SWMU and was investigated to better determine relative contributions from TA-03 and TA-48. M-5 West is located in the middle of a long previously unsampled part of Mortandad Canyon between M-4 and the San Ildefonso Pueblo boundary and was investigated to better determine the eastern extent of recognizable contamination; the previous reach M-5 was renamed M-5 East.

Sediment characterization was also conducted to support the biota investigations according to the study plan presented in the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). This sampling was conducted to provide additional data to support the assessment of potential ecological effects from contamination found in sediment. This characterization included resampling previously sampled sediment layers in some reaches and collecting samples at new locations in other reaches. Details of the methodology are presented in Section B-3 of Appendix B.

3.2 Surface Water and Groundwater Investigations

The water investigations presented in this report focus on characterizing the nature, extent, and concentrations of contaminants in persistent surface water, alluvial groundwater, and perched-intermediate groundwater in and beneath the Mortandad Canyon watershed. Wells extending into the regional aquifer are also considered. Data from these components of the hydrogeologic system are used to evaluate potential human health and ecological risk as well as to identify spatial trends in contamination at a watershed scale, including variations in contaminant concentration at increasing distances from the source areas and as a function of seasonal and annual hydrologic variations. The data are also used to identify temporal trends in contamination. This work involved sampling persistent surface water; drilling and installing monitoring wells and piezometers; sampling new and preexisting groundwater wells; and measuring water level variations in all groundwater sources. Persistent surface water generally refers to effluent-supported flow, standing water in bedrock pools in the channel, snowmelt runoff, and other surface water not related to short-duration stormwater runoff (Section 7.2 further discusses the hydrology of the watershed). Figure 3.2-1 shows the locations of surface and groundwater sites that were sampled as part of this investigation. The investigation methods are discussed in Section 4.2 and Appendix B of this report. The scope of the investigation is described in the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). The investigation activities described above are discussed in the following sections.

3.2.1 Monitoring Well Installations

Nine alluvial monitoring wells were installed in Mortandad and Ten Site Canyons between 1998 and 2005 to fulfill the requirements of the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Well completion diagrams and geologic logs for these wells are provided in the reports "Alluvial Groundwater Monitoring Well Completions, 1994-2001" (LANL 2001, 73307) and "Final MCA Wells, MCB Boreholes, and MCRES Boreholes Completion Report 2004–05 Mortandad Canyon Drilling Program, Los Alamos National Laboratory, Los Alamos, New Mexico, Project 49436" (Kleinfelder 2006a, Appendix 92486). Downhole gamma and induction logs were collected in several boreholes either before plugging and abandonment or before well installation. Other alluvial monitoring wells installed in Mortandad Canyon from 1960 to 1990 for surveillance monitoring were used in these investigations (Purtymun 1995, 45344). In 1994, 24 additional water balance wells were installed in Mortandad Canyon to investigate spatial and temporal changes in alluvial saturation (McLin 1997, 85422). Well completion diagrams and geologic logs for these early wells are compiled in Purtymun (1995, 45344) and McLin (1997, 85422). Figure 3.2-1 and Plate 1 show the locations of the alluvial monitoring wells in the Mortandad Canyon watershed.

Eight intermediate perched monitoring wells and boreholes were installed in Mortandad Canyon in 2001 to fulfill the requirements of the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and in 2004 and 2005 to fulfill the requirements of the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Well completion diagrams and geologic logs for these wells are provided in the following reports: "Characterization Well MCOBT-4.4 and Borehole MCOBT-8.5 Completion Report" (Broxton et al. 2002, 76006) and "Final I Wells Completion Report 2004-05 Mortandad Canyon Drilling Program, Los Alamos National Laboratory, Los Alamos, New Mexico, Project 49436" (Kleinfelder 2006b, 92494, Appendix B). Downhole gamma and induction logs were collected in the boreholes either before plugging and abandonment or before well installation. Schlumberger, Inc., collected a more comprehensive suite of geophysical logs in three of the wells (Kleinfelder 2005, 90045; MCOBT-4.4, MCOBT-8.5, and MCOI-5). Figure 3.2-1 and Plate 1 show the locations of intermediate-perched monitoring wells and boreholes in the Mortandad Canyon watershed.

Three additional perched intermediate wells were identified in the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613) as contingent wells that could be installed if results from the seven other intermediate wells indicated the need for additional perched zone characterization. These included a well in upper Ten Site Canyon near R-14 (MCOI-2), a well on the bench south of Mortandad Canyon and south of GS-2 (MCOI-7), and a well on the mesa top south of Mortandad Canyon 1500 ft east of supply well PM-5 (MCOI-9). Intermediate well MCOI-2 was designed to investigate the occurrence of perched groundwater near the TA-35 outfall. Because no perched groundwater was encountered when drilling nearby well R-14, and the regional aquifer has not shown the presence of contaminants, including perchlorate, nitrate, and tritium, MCOI-2 was not considered essential for determining the nature and extent of contaminants in this area and was not discussed. Intermediate well MCOI-7 was not drilled after results from well MCOI-1 indicated there was insufficient groundwater to make a useful well in the narrow part of Mortandad Canyon between Effluent Canyon and TW-8. Intermediate well MCOI-9 was not drilled after results from borehole MCOI-10 indicated that perched groundwater does not extend under the mesa south of Mortandad Canyon.

Four regional groundwater characterization and monitoring wells were installed in Mortandad Canyon; two regional wells were installed in Ten Site Canyon; and one regional well was installed in Cedro Canyon from 1998 to 2005 to fulfill the requirements of the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Well completion diagrams and geologic logs for these wells are provided in the following reports: "Revision 1 Well R-1 Completion Report, Los Alamos National Laboratory, Los Alamos, New Mexico" (Kleinfelder 2005a, 90045), "Characterization Well R-13 Completion Report" (LANL 2003a, 76060), "Characterization Well R-14 Completion Report" (LANL 2003b, 76062), "Characterization Well R-15 Completion Report" (Longmire 2001, 70103), "Revision 1 Well R-28 Completion Report, Los Alamos National Laboratory, Los Alamos, New Mexico" (Kleinfelder 2005b, 94042), "Final Completion Report Characterization Well R-33, Los Alamos National Laboratory, Los Alamos, New Mexico" (Kleinfelder 2005c, 94041), "Final Completion Report Characterization Well R-34, Los Alamos National Laboratory, Los Alamos, New Mexico (Kleinfelder 2004, 92199), "Final MCA Wells, MCB Boreholes, and MCRES Boreholes Completion Report 2004-05 Mortandad Canyon Drilling Program" Los Alamos National Laboratory, Los Alamos, New Mexico, Project No. 49436 (Kleinfelder 2006, 92486), and "Final I Wells Completion Report 2004–05 Mortandad Canyon Drilling Program, Los Alamos National Laboratory, Los Alamos, New Mexico, Project No. 49436" (Kleinfelder 2006, 92494). The last two reports listed above are provided in electronic format as part of Appendix B on the attached CD. Schlumberger, Inc., collected a comprehensive suite of geophysical logs in all of the regional well boreholes before well installation Kleinfelder 2005, 90045). TW-8 was installed in Mortandad Canyon in 1960 to determine the hydrologic characteristics of the Mortandad Canyon area and to monitor the regional aquifer for contaminants (Baltz et al.1963, 08402; Purtymun 1995, 45344). The well completion diagram and geologic log for TW-8 are

summarized in Baltz et al. (1963, 08402) and Purtymun (1995, 45344). Historic water-quality data from TW-8 were used with data from the more recent characterization wells to examine spatial and temporal trends in contaminants as part of this investigation report. Figure 3.2-1 and Plate 1 show the locations of the regional groundwater characterization and monitoring wells in the Mortandad Canyon watershed.

3.2.2 Piezometer Installations

Six piezometers were installed in 2004 to fulfill the requirements of the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). The piezometers were installed in Mortandad Canyon to collect information about groundwater flow directions, hydraulic gradients, saturated thicknesses, and extent of saturation in alluvial groundwater west of the confluence with Ten Site Canyon and east of the sediment traps. Well completion diagrams and geologic logs for these piezometers are provided in the report "Final MCA Wells, MCB Boreholes, and MCRES Boreholes Completion Report 2004-05 Mortandad Canyon Drilling Program, Los Alamos National Laboratory, Los Alamos, New Mexico, Project 49436" (Kleinfelder 2006a, 92486). Figure 3.2-1 and Plate 1 show the locations of the piezometers in the Mortandad Canyon watershed.

3.2.3 Surface Water and Groundwater Sampling

Since release of the "Work Plan for Mortandad Canyon" (LANL 1997, 56835), surface water, alluvial groundwater, intermediate-perched groundwater, and regional groundwater samples have been collected in the Mortandad Canyon watershed, supplementing years of data collected by the Laboratory's Environmental Surveillance Program. These investigations were conducted to address characterization requirements presented in the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613) and to fulfill the requirements of the Laboratory's Environmental Surveillance Program. The "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613) updated the sampling approach initially presented in "Work Plan for Mortandad Canyon" (LANL 1997, 56835) by selecting wells and surface water locations for sampling based on bounding of key potential contaminant sources and collecting data useful for assessing human health and ecological risk.

Based on the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613), sampling of surface water and groundwater was coordinated to provide a "snapshot" in time to evaluate the relationship between constituents in surface water and various groundwater bodies. The snapshot sampling efforts were conducted in 2005 and included two sampling events that were scheduled to coincide with periods of relatively dry and wet hydrologic conditions. Surface water locations were selected from areas where persistent surface water was present. Surface water sampling was also conducted to support the biota investigations (LANL, 2005, 89308), discussed in Section 4.3.

The list of surface water sites and groundwater monitoring wells that were sampled as part of the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613) and the rationale for selecting each sample site are presented in Table 3.2-1. Other wells and surface water locations in the watershed were sampled as part of earlier investigations but are not included in Table 3.2-1. Figure 3.2-1 shows the locations of the sample sites listed in Table 3.2-1. Plate 1 shows those same locations as well as additional monitoring wells, surface water sampling locations, and production wells in the Mortandad Canyon watershed.

3.2.4 Water-Level Measurements

Both manual and automated water-level data have been collected from alluvial monitoring wells, piezometers, intermediate-perched monitoring wells, and regional monitoring wells in the Mortandad watershed. A summary of water-level measurements for wells at LANL, including those in the Mortandad Canyon watershed, is given in the report "Groundwater Level Status Report for 2005, Los Alamos National Laboratory" (Allen and Koch 2006, 93652). Table 3.2-2a shows the list of wells and period of record for the manual water-level data for each well; Table 3.2-2b shows the list of wells and period of record for the automated water-level data for each well. Details of the field methodology and results are presented in Section B-2.2 of Appendix B.

3.2.5 Infiltration Investigation

An infiltration investigation is currently being conducted to fulfill requirements of the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). The purpose of the infiltration investigation is to constrain the various terms of the water budget to quantify water movement within the deep percolation contaminant transport pathway. These data will support future assessment of groundwater infiltration under varying conditions and for differing source-reduction scenarios (e.g., elimination of TA-50 discharges). To assess flow dynamics within the alluvial aquifer, system vector probes were installed in selected boreholes. Water content and matric potential sensors were also installed in other selected boreholes to analyze vadose-zone dynamics below alluvium. Instrumentation was also installed at locations in the canyon floor to assess percolation rates. Preliminary results for the infiltration study are discussed in Appendix M.

3.2.6 Surface Geophysics

Two surface-based direct-current (DC-) resistivity surveys were conducted in Mortandad Canyon in 2002 and 2004. The 2004 survey fulfills requirements of the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). The objective of the resistivity surveys was to identify regions of higher conductivity beneath the canyon floor that may be related to perched alluvial groundwater and to zones of infiltration in subcropping bedrock units. The surveys were optimized to characterize variations in electrical conductivity in the upper 150 to 200 ft of the vadose zone. Details of the methodology and results for the resistivity surveys are provided in the reports "Pilot Geophysical Studies in Mortandad Canyon, Los Alamos National Laboratory, Los Alamos, NM, Job No. 1171" (Geophex 2002, 94040, Appendix B) and "DC Resistivity Profiling in Mortandad, Ten Site and DP Canyons, Los Alamos National Laboratory, Los Alamos, NM, Job No. 1247" (Geophex 2004, 84540, Appendix B). Locations of the resistivity survey lines are shown in Plate 1.

3.2.7 Characterization Core Holes

Thirteen of 16 planned characterization core holes were installed in Mortandad Canyon in 2004 and 2005 to fulfill the requirements of the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Two of the planned characterization core holes, MCB-3 and MCB-4, could not be installed because the sites are located in an inaccessible, deeply incised portion of Mortandad Canyon. Access to one site (MCB-13) was denied because it was located in a protected archeological area. Table 3.2-3 describes the characterization boreholes and provides information about their locations, purpose, and depths. Diagrams and geologic logs for these core holes are provided in the report "Final MCA Wells, MCB Boreholes, and MCRES Boreholes Completion Report 2004-05 Mortandad Canyon Drilling Program, Los Alamos National Laboratory, Los Alamos, New Mexico, Project 49436" (Kleinfelder 2006a, 92486, Appendix B). Additional core was collected during installation of intermediate-perched and

regional groundwater monitoring wells, described in Sections 3.2.2 and 3.2.3 above. Figure 3.2-1 and Plate 1 show the locations of the alluvial monitoring wells and piezometers in the Mortandad Canyon watershed.

3.2.8 RES Coreholes

Cores from four boreholes and from one regional aquifer well were collected to compare vertical electrical profiles from the 2002 surface-based DC-resistivity survey with moisture profiles and perched groundwater occurrences detected in boreholes. Table 3.2-3 describes the RES boreholes and provides information about their locations, purpose, and depths. These resistivity boreholes investigations fulfill the requirements of the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Diagrams and geologic logs for these boreholes are provided in the following reports: "Final MCA Wells, MCB Boreholes, and MCRES Boreholes Completion Report 2004-05 Mortandad Canyon Drilling Program, Los Alamos National Laboratory, Los Alamos, New Mexico, Project 49436" (Kleinfelder 2006a, 92486, Appendix B), "Characterization Well MCOBT-4.4 and Borehole MCOBT-8.5 Completion Report" (Broxton et al. 2002, 76006), and "Revision 1 Well R-28 Completion Report, Los Alamos National Laboratory, Los Alamos, New Mexico" (Kleinfelder 2005b, 94042). Figure 3.2-1 and Plate 1 show the locations of the three RES holes, MCOBT-4.4, and R-28.

3.3 Biological Investigations

The biological investigations presented in this report focused on characterizing the potential for adverse effects of contaminants in post-1942 sediment deposits and surface water on terrestrial and aquatic ecological receptors. These investigations fulfill the general objectives identified in the work plan (LANL 1997, 96835; LANL 1999, 62777) and in the canyons core document (LANL 1997, 55622; LANL 1998, 57666). These investigations build upon the results obtained from sediment and surface water characterization, and the basis for the investigation approach is documented in the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). The investigation methods are discussed in Section 4.3 and Section B-3.0 in Appendix B of this report.

3.4 Deviations from Planned Activities

The sediment, surface water, groundwater, and biota investigations discussed in this report deviated in several respects from that proposed in the original plans. Most of the deviations consisted of additions to scope, such as the investigation of additional sediment investigation reaches that was discussed in Section 3.1. Other deviations resulted when the original work plan (LANL 1997, 56835; LANL 1999 62777) was superseded by later documents, such as the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613) or the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). This section focuses on work proposed in the most recent, applicable document that was not accomplished or that was otherwise changed in a manner that has the potential to negatively affect the scope of this investigation.

Plans for drilling 9 alluvial wells, 16 characterization boreholes, 3 resistivity boreholes, and 7 intermediate wells were described in the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Four regional wells (R-1, R-28, R-33, and R-33) were also described in that plan; details of activities and well construction for these holes to the regional aquifer are described in dedicated borehole completion reports for each well (Kleinfelder 2004, 92199; Kleinfelder 2005a, 90045; Kleinfelder 2005b, 94042; Kleinfelder 2005c, 94041). Exceptions and modifications to the other alluvial wells as well as characterization boreholes, resistivity boreholes, and intermediate wells are detailed in Table 3.4-1. Among the alluvial wells installed, MCA-4 provided an adequate sample only for the first round of

sampling. Nearby, alluvial well MCO-2 has been sampled in instances where an adequate sample could not be obtained from MCA-4 (see Table 3.2-1), and data from both wells have been used to represent the alluvial system in Effluent Canyon upstream of the TA-50 outfall.

The biota investigation was completed as planned with several exceptions. It was planned to analyze earthworms used in the earthworm toxicity test for COPECs, but the analytical laboratory instead disposed of these samples, and analyses were not obtained. It was planned to collect aquatic invertebrates using a Hess sampler for taxonomic identification and comparison to NMED's draft "Stream Condition Index for New Mexico Wadeable Streams;" but flow was insufficient to use the Hess sampler. It was also planned to submit aquatic invertebrates obtained with a dip net for radiological analyses, but insufficient invertebrate mass was obtained for these analyses.

4.0 FIELD INVESTIGATIONS

Field investigations in the Mortandad watershed included investigations of sediment, surface water, groundwater, and biota. The approaches and methods of these investigations are briefly discussed in the following subsections. A more detailed discussion of the methods and the results of the field investigations is presented in Appendix B.

4.1 Sediment

Sediment investigations in the Mortandad watershed included detailed geomorphic characterization and sediment sampling in a series of discrete reaches, following the general process described in the NMED-approved work plan and canyons core document (LANL 1997, 55622; LANL 1997, 56835; LANL 1998, 57666; LANL 1999, 62777). The geomorphic characterization in most reaches included preparing a detailed geomorphic map delineating the horizontal extent of geomorphic units with varying physical characteristics, contaminant concentrations, and/or age. Field radiological screening measurements were used to help delineate geomorphic units in reaches where the levels of radionuclide contamination in post-1942 sediment exhibited higher levels of radiation than nearby pre-1943 sediment. The geomorphic characterization also included measuring the thicknesses of potentially contaminated post-1942 sediment deposits to estimate the volume of contaminated sediment and the contaminant inventory in each reach. Several methods were used to identify the bottom of post-1942 sediment deposits, including determining the depth of buried trees and associated buried soils, and noting the presence or absence of materials imported to the watershed after 1942 (e.g., quartzite gravel, plastic).

Field data on the volume and radiation levels in the different geomorphic units in a reach were used to help allocate samples for analysis at off-site laboratories. In most reaches, samples were collected in multiple phases, and analytical results from initial sampling phases were used to help guide subsequent sampling. Section B-1 of Appendix B includes a more detailed discussion of the investigation methods. All analytical results of the sediment sampling incorporated in this investigation report are presented in Appendix C on a CD included with this report.

Plates 2 to 5 present geomorphic maps for reaches in the Mortandad watershed and sample locations, field radiological measurement locations, and stratigraphic description locations within these reaches. The horizontal extent of contaminated or potentially contaminated sediment deposits in each reach is delineated by the extent of the channel ("c") and floodplain ("f") units in these maps. Section B-1 of Appendix B includes field investigation results, including field radiological screening results.

4.2 Surface Water and Groundwater

The surface water and groundwater investigations in the Mortandad Canyon watershed are designed to define the nature and extent of contamination, to identify the physical and chemical processes controlling contaminant distributions, and to identify the transport pathways that could result in potential human health and ecological risk. This work includes sampling persistent surface water; drilling and installing monitoring wells and piezometers; sampling new and preexisting groundwater wells; and measuring water level variations in all groundwater sources. In addition, core was collected to characterize the distribution contaminants and moisture in rock units of the upper vadose zone. The investigation methods are discussed in Appendix B of this report. The scope of the investigation is described in the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613).

4.2.1 Monitoring Well Installations

Nine alluvial wells, eight intermediate wells, and seven regional wells were installed to fulfill the requirements of the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Detailed well completion reports describe the investigation methods, well completion diagrams, geologic logs, and borehole geophysical logs for these wells. These well completion reports are described in Section 3.2.1 of this investigation report. Table 3.2-1 provides information about the location, purpose, and depth of these wells.

4.2.2 Piezometer Installations

Piezometers were installed to evaluate groundwater flow directions, hydraulic gradients, saturated thicknesses, and extent of saturation in the alluvial groundwater system. The piezometers were installed at two locations, each containing three closely spaced piezometers to monitor water levels in the alluvial system. The piezometers consist of 0.8-in. I.D. (1.1-in. O.D.) PVC casings coupled to 1.4-in. O.D. prepacked screens surrounded with 10/20 sand. Slot sizes are 0.01 in., and the screens are 6 in. long. Slug tests were conducted in the completed piezometers.

One group of piezometers consisting of MCA-3a, MCA-3b, and MCA-3c (Figure 3.2-1) was installed in Mortandad Canyon west of the confluence with Ten Site Canyon. MCA-3a and MCA-3c were installed in the same borehole and are screened across the lower and upper parts of the alluvial system, respectively. MCA-3b was installed in an adjacent borehole, and it is screened across the middle portion of the alluvial system. Slug tests were conducted in the three piezometers.

The second group of piezometers consisting of MCA-3d, MCA-3e, and MCA-3f (Figure 3.2-1) was installed east of the sediment traps, near the eastern limit of persistent alluvial saturation. The three piezometers were installed in a single borehole to measure water levels in the upper (MCA-3f), middle (MCA-3e), and lower (MCA-3d) parts of the alluvial system. Slug tests were conducted in MCA-3d.

4.2.3 Surface Water and Groundwater Sampling

As described in Section 3.2, sampling of persistent surface water, alluvial groundwater, perched-intermediate groundwater, and regional groundwater was coordinated to provide a snapshot in time to evaluate the relationship between constituents in surface water and various groundwater bodies. Snapshot sampling was conducted in 2005 and included two sampling events that were scheduled to coincide with periods of relatively dry and wet hydrologic conditions. The first round of samples was collected in late April to mid-June during relatively dry conditions. The second round of samples was

collected in mid-August to mid-September during wet conditions, coinciding with the summer monsoon season. Samples were collected at designated locations described in the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). Under this work plan, alluvial groundwater monitoring wells and surface water locations were sampled concurrently (typically within a period of less than 6 weeks) to obtain a comprehensive and current data set and a synoptic perspective of the hydrology and contaminants present in water within the watershed. A key objective was to characterize potential contaminant variability associated with variations in surface water and alluvial groundwater conditions. Sampling surface water and alluvial groundwater concurrently also allows for evaluating the relation between surface water and alluvial groundwater quality. Sampling was attempted at designated locations in each of the two sampling rounds, and samples were collected if sufficient water was present. Some additional surface water stations and wells, in addition to the designated locations required in the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613), were added to the rounds of snapshot sampling to replace dry sample locations and to provide more comprehensive water quality data for the watershed. Table 4.2-1 summarizes the sampling conducted during the two rounds required under the work plan, as well as other sampling conducted as part of Laboratory facility-wide surveillance sampling and during early RFI sampling in the watershed conducted under the "Work Plan for Mortandad Canyon" (LANL 1997, 56835).

Most of the surface water and groundwater samples were collected in accordance with ER Project standard operating procedures (SOPs), and a few were collected as part of annual surveillance monitoring using Water Quality and Hydrology (WQH) procedures. The procedures for sample collection are described in Appendix B, and the analytical results of the sampling are discussed in Appendix C and provided on a CD included with this report. With the exception of R-33, which had equipment problems, a water-level measurement was collected from each well before purging for a sampling event. The water-level measurements associated with sampling are also presented in Appendix F. Water-quality field parameters including pH, specific conductance, temperature, and turbidity were measured for each surface water and groundwater sample collected. Measurements of field parameters were taken as part of groundwater sampling to evaluate the effectiveness of purging. Field parameters data were also collected for surface water and groundwater samples to provide data potentially useful for evaluating contaminant variability. These field parameters were logged in a water-quality stabilization record form for each sample and are presented in tables in Section B-2 of Appendix B. The methodology for collecting field parameters and results is also described in Section B-2.0.

4.2.4 Water-Level Measurements

Historical and new water-level data were compiled for alluvial, intermediate, and regional wells in Mortandad Canyon. These data, which included both manual and automated measurements, allow interconnections between groundwater bodies to be assessed by comparing water-level responses with storm events and seasonal variations in precipitation. Water-level data are also collected to determine hydraulic gradients within groundwater bodies and to assess hydraulic conductivity. Details of the field methodology and results are presented in Section B-2.2 of Appendix B.

Systematic manual water-level measurements for selected alluvial observation wells (MCO series) began in 1960 to document seasonal water-level fluctuations in the alluvial groundwater system. In 1994, water balance wells were installed in Mortandad Canyon to investigate spatial and temporal changes in alluvial saturation (McLin et al. 1997, 85422). Manual water-level measurements were taken in selected water balance wells in 1995 and 1996 and automated, high-frequency water-level data were collected using pressure transducer probes from 1997 to 2005. Automated pressure transducer probes were also placed in the alluvial wells and piezometers installed in 2004 and 2005.

Automated pressure transducers were also installed for acquisition of water levels in intermediate-perched groundwater. An automated pressure transducer has collected intermittent water-level data for intermediate-perched monitoring well MCOBT-4.4 since 2002. Automated pressure transducer probes were also placed in wells MCOI-4, MCOI-5, MCOI-6, and MCOI-8.

Water-level data for the regional aquifer wells includes both manual and automated water-level measurements. At first, water-level measurements were collected manually from the regional aquifer wells during water sampling events. In late 2004 and early 2005, automated pressure transducer probes were installed in all but one of the regional aquifer wells installed for the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613). R-33 is the only regional well without an automated transducer because there is an equipment problem with the multiport sampling system. TW-8 has the longest period on record of all the regional aquifer wells. An automated pressure transducer was installed in TW-8 in 1992 and it has collected water-level data intermittently since then.

4.2.5 Infiltration Investigation

The "Work Plan for Mortandad Canyon" (LANL 1997, 56835) specifies that field-based work is needed to quantify the movement of water through the vadose zone (including the alluvial aquifer system). The Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613) also contains a requirement to assess subsurface water movement in the canyon. Therefore, the Mortandad Canyon infiltration study was implemented to understand spatial and temporal variability of the rates of water movement above, below, and within the alluvial aquifer system and to determine unsaturated zone fluxes in selected locations where no current alluvial water exists. Multiple approaches were used to address these goals, and these are described from shallowest to deepest below. Preliminary results of the infiltration investigation are discussed in Appendix M.

One potential pathway for contaminant transport and recharge in the canyon is percolation through the bottom of the streambed. To quantify this loss, instrumentation was installed at nine locations in the canyon to collect high-time-resolution temperature profiles down to about 180 cm below the stream channel. This method uses heat as a tracer to determine downward fluxes (Constantz et al. 2003, 94090). From the temperature data, the frequency and duration of streambed infiltration events can be determined and downward fluxes can be estimated.

Borehole data from Mortandad Canyon shows that the extent of perchlorate and nitrate contamination extends laterally well beyond the incised channel. Thus, it is important to quantify percolation in the floodplains and terraces as well as the channel. Twelve fiberglass wicktype flux meters were installed at various canyon locations (away from the channel) to measure downward unsaturated flow rates at a depth of approximately 100 cm below the canyon floor. At two of these locations, paired matric potential and water content sensors were also installed. These sensors are used to quantify downward fluxes that are below the detection level of the flux meters and also to quantify rates and durations of upward flux events.

Vector probes were installed in five boreholes (MCB-5, MCB-6, MCB-9, MCB-14, and MCRES-2) to assess flow dynamics within the alluvial aquifer system (see www.hydrotechnics.com for more information about the probes). The vector probes were emplaced in selected MCB and MCRES holes at depths thought to represent the most transmissive alluvial aquifer flow zones identified during drilling (typically above the alluvium/tuff contact). The vector probes provide quantitative information on flow rates and directions within the alluvial aquifer system and how they might vary with time.

A series of volumetric water content and matric potential sensors were also installed in six boreholes (MCB-2, MCB-7, MCB-8, MCB-11, MCB-16, and MCRES-4) below the alluvium (within the tuff) to quantify fluxes in bedrock units. These sensors provide data on the spatial and temporal variability of deep fluxes within the canyon and help constrain recharge fluxes to the deeper intermediate-perched aquifer zone in the canyon.

4.2.6 Surface Geophysics

A DC-resistivity survey was conducted in Mortandad Canyon in summer 2002 to determine whether this geophysical method was an effective and appropriate means to identify zones of saturation and moisture within the alluvial and upper vadose zone systems (Geophex 2002, 94040, Appendix B). Geophysical survey lines are shown in Figure 4.2-1. Geophex conducted the geophysical surveys and prepared a summary report that was submitted to NMED on March 26, 2003 (Geophex 2002, 94040). Nine DC resistivity profiles were compiled in the middle portion of Mortandad Canyon. One profile was collected continuously along the centerline of the canyon from a point upstream of the PRB to a point near well R-13, a distance of 2830 m (9290 ft) to the east (Figure 4.2-1). The remaining profiles consisted of a series of transects across the canyon at selected locations. Profile depths of penetration varied according to the length of the line and the spacing of electrodes. In the upper reaches of the canyon, the shortest profile penetrated approximately 6 to 9 (20 to 30 ft) below ground surface (bgs). The longest profiles imaged to depths of over 60 m (200 ft) bgs.

A second DC resistivity survey was conducted by Geophex in December 2003 to cover additional parts of upper Mortandad Canyon that were not included by the 2002 survey (Geophex 2003, 84540). Geophysical survey lines are shown in Figure 4.2-1. One DC resistivity profile was completed for a distance of 1800 m (5904 ft) along the centerline of upper Mortandad Canyon from a point upstream of the PRB to the confluence with Effluent Canyon. A second profile was compiled for a distance of 220 m (722 ft) along the centerline of lower Effluent Canyon. A third profile was completed for a distance of 475 m (1558 ft) along the centerline of lower Ten Site Canyon from a point where the canyon becomes broad and flat eastward to the confluence with Mortandad Canyon. A fourth line is a north-south transect that extends 192 m (631 ft) across the mouth of Effluent Canyon into Mortandad Canyon.

4.2.7 Characterization Core Holes

A list of the characterization core holes and information about their locations, purpose, and depths are provided in Table 3.2-3. These core holes were drilled to depths ranging between 25 to 87 m (84 and 284 ft) in Effluent, Mortandad, and Ten Site Canyons. Cores collected from the boreholes were used to determine moisture content, adsorption capacity, and the nature and the extent of contamination in the alluvium and upper portions of the Bandelier Tuff/Cerro Toledo interval. Geologic and hydrologic data from these core holes also provide site-specific data for modeling hydrological and geochemical-contaminant transport mechanisms.

Core was collected using hollow-stem auger methods without the use of drilling fluids. Cores were collected from all major stratigraphic units, including the alluvium at a nominal sample interval of 3 m (10 ft) to determine contaminant distributions in the upper vadose zone. Samples were containerized to prevent moisture loss and were analyzed for moisture content, metals, anions, stable isotopes, and radionuclides. Where feasible, borehole gamma and induction logs were collected in uncased portions of the boreholes. In general, the core holes were plugged and abandoned with bentonite after reaching total depth. However, five of the boreholes were instrumented before being backfilled as part of infiltration investigations as described in Section 4.2.5.

Analytical data for cores are discussed in Section 7.2.2. Appendix D contains plots of contaminated profiles in cores and in pore waters extracted from cores. Appendix B presents moisture profiles for the core holes.

4.2.8 RES Coreholes

The 2002 DC resistivity survey suggested that various moist zones might be mapped by the electrical profiles. The degree of saturation or moisture within these zones is not known and can only be confirmed by measuring the moisture content in the boreholes. The high resistivity areas are inferred to be either "dry" or "dryer" unconsolidated sediments or dry bedrock, for example, in the upper portions of the Bandelier Tuff. The dry bedrock zones vary in elevation across the deeper portions of the profiles. Vertical zones of lower resistivity appear to cut through dry bedrock zones and extend to greater depths in certain areas. These features are interpreted to be either "moist" or clay-rich fracture zones within the dryer bedrock.

Core holes MCRES-2, MCRES-3, MCRES-4 (Figure 3.2-1) targeted areas of low and high resistivity identified in the 2002 resistivity survey to evaluate the relationship between the electrical profiles and in situ moisture and physical property measurements determined from core. Core holes MCRES-3 and MCRES-4 are located near TW-8 in resistive and conductive zones, respectively. Near the confluence of Mortandad and Ten Ste Canyons, core was collected from MCRES-2 for comparison to the moisture profile collected from existing well MCOBT-4.4. The 2002 DC resistivity profile suggests that MCOBT-4.4 was drilled in an area where high conductivity extends to greater depths than at MCRES-2. Core was also collected from the upper 45 m (150 ft) of R-28 to evaluate conductivity data from a spot yet farther downcanyon. At R-28, a sharp electrical boundary at 24-m (80-ft) depth separates a conductive zone above from a resistive zone below. Core samples collected at a nominal interval of 3 m (10 ft) were analyzed for moisture content, grain size, porosity, and clay content.

4.3 Biota

Biological data were collected to evaluate the potential for adverse ecological effects from contaminants in sediment and surface water. Biota investigations in the Mortandad watershed included a range of activities, as presented in the NMED-approved "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). Field investigations included studies of bird nest boxes, plant and bird surveys, collection of sediment samples for earthworm toxicity tests, seedling germination tests, aquatic toxicity tests, and collection of water samples for algae toxicity tests. The nest box study included adding nest boxes to an existing network, collecting data on occupancy, and collecting samples of eggs and insects for laboratory analyses. These activities are discussed in more detail in Section 8.1 and Section B-3.0 of Appendix B.

5.0 REGULATORY CRITERIA

This section provides information on the regulatory context, human health screening levels, ecological screening values, and water standards and screening levels.

5.1 Regulatory Context

Regulatory requirements governing the Laboratory's canyons investigations are discussed in Section 1.4 of NMED-approved canyons core document (LANL 1997, 55622, LANL 1998, 57666). In particular, these investigations address requirements of the Laboratory's Hazardous Waste Facility Permit (Module VIII) under RCRA, including "the existence of contamination and the potential for movement or transport to or

within Canyon watersheds" (EPA 1990, 1585; EPA 1994, 44146). RCRA and the New Mexico Hazardous Waste Act (NMHWA) regulate releases of hazardous wastes and hazardous waste constituents. DOE Order 5400.1, "General Environmental Protection Program," establishes requirements for managing residual radioactivity at DOE facilities.

As a result of the operational history of sites in the Mortandad watershed, this investigation addresses both radioactive and hazardous components. NMED has authority under the NMHWA over the cleanup of hazardous wastes and hazardous constituents, while DOE has authority over the cleanup of radioactive contamination. Radionuclides are regulated under DOE Order 5400.5, "Radiation Protection of the Public and the Environment," and DOE Order 435.1, "Radioactive Waste Management."

The regulatory requirements for conducting investigations in the Mortandad watershed are incorporated into Module VIII through work plans approved by NMED. The approved work plans include the "Work Plan for Mortandad Canyon" (LANL 1997, 56835; LANL 1999, 62777), the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613), and the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). Corrective actions at the Laboratory are subject to the Consent Order, which contains general requirements and those specific to the Mortandad watershed (Section IV.B.2, "Mortandad Canyon Watershed"). The Consent Order was issued pursuant to NMHWA, New Mexico Statutes Annotated (NMSA) 1978 § 74-4-10 and the New Mexico Solid Waste Act (NMSWA), NMSA 1978, § 74-9-36(D). The requirements of the Consent Order now supersede those of Module VIII.

Surface water discharges that are subject to a permit under Section 402 of the federal Clean Water Act, including stormwater discharges, are not regulated under the Consent Order. Requirements for stormwater monitoring are contained in a Federal Facility Compliance Agreement/Administrative Order (FFCA/AO) between EPA and DOE.

The assessments in this report are primarily risk based for all media and contaminants. Surface water and groundwater standards are used to support the assessment of nature and extent of contamination in canyons media. Concentrations of chemicals and radionuclides are compared with various risk-based screening levels, which are described in Sections 5.2 and 5.3. Applicable water standards are discussed in Section 5.4.

5.2 Human Health Screening Levels

In Section 6, soil screening levels (SSLs) for inorganic and organic chemicals and screening action levels (SALs) for radionuclides are media-specific concentrations derived for residential exposures. If environmental concentrations of contaminants are below SALs or SSLs, then the potential for adverse human health effects is considered highly unlikely. For sediment nonradionuclide COPCs with carcinogen or noncarcinogen endpoints, SSLs from revision 4.0 of NMED guidance (NMED 2006, 92513) were used if available. If values were not available from NMED then residential screening values were obtained from EPA Region 6 or EPA Region 9. The SSLs for noncarcinogens are based on a hazard quotient (HQ) of 1.0. The SSLs for carcinogens are based on a cancer risk level of 10^{-5} (10E-5). For nonradionuclide COPCs without NMED SSLs, approved surrogate values were used (NMED 2003, 81172). SALs for radionuclides were obtained from Laboratory guidance (LANL 2005, 88493). The radionuclide SALs for sediment have a target dose limit of 15 millirem per year (mrem/yr), which is consistent with guidance from DOE (DOE/AL 2000, 67153).

Human health screening levels for water are EPA Region 6 Human Health Medium Specific Screening Level (HHMSSL) tap water screening levels for carcinogens and noncarcinogens and DOE-Derived Concentration Guidelines (DCG) for radionuclides. The screening levels for carcinogens and

noncarcinogens in water are based on the same HQ and cancer risk levels as the SSLs. The screening values for radionuclides in groundwater were calculated based on a target dose limit of 4 mrem/yr, which is the radiation dose limit for a public drinking water supply in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." The screening values for radionuclides in surface water were calculated based on a target dose limit of 100 mrem/yr, which is the radiation dose limit for the general public from all sources in DOE Order 5400.5, "Radiation Protection of the Public and the Environment."

Additional information regarding the potential for human health risks from affected media in the Mortandad watershed is provided in Section 8.2.

5.3 Ecological Screening Levels

Ecological screening levels (ESLs) are used to determine chemicals of potential ecological concern (COPECs) for water and sediment data. The document "Screening Level Ecological Risk Assessment Methods, Rev. 2" (LANL 2004, 87630) contains information about how ESLs are derived. ESLs are developed for a suite of receptors designed to represent individual feeding guilds, such as invertivorous mammal or carnivorous bird. Receptors such as robins and kestrels are modeled with multiple diets to represent multiple feeding guilds. The representative concentration of each COPC was compared with ESLs from the ECORISK Database Versions 2.1 (LANL 2004, 87386) or 2.2 (LANL 2005, 90032).

Additional information regarding the potential for ecological risks from affected media in the Mortandad watershed is provided in Section 8.1.

5.4 Water Standards and Screening Levels

COPCs are identified by comparing concentrations in water with applicable water standards and screening values. All surface water sampling locations in the Mortandad watershed are designated ephemeral. Water standards that apply to ephemeral surface waters (not including stormwater runoff) include the following.

- Aquatic Acute Life (New Mexico Water Quality Control Commission [NMWQCC] Acute Aquatic Life criteria, New Mexico Administrative Code [NMAC] 20.6.4.900 (H), (I), and (J), effective July 2005. Hardness-dependent criteria are calculated using 100 mg/L $CaCO_3$.)
- Livestock Watering (NMWQCC Livestock Watering criteria, NMAC 20.6.4.900 (F) and (J), effective July 2005)
- Wildlife Habitat (NMWQCC Wildlife Habitat criteria, NMAC 20.6.4.900 (G) and (J), effective July 2005)
- Human Health Persistent (NMWQCC human health criteria for persistent toxic pollutants, NMAC 20.6.4.900 (J), effective July 2005. Human health criteria for toxic, carcinogenic, and persistent pollutants only)

Concentrations of radionuclides in surface water were compared with the following values to identify COPCs:

- DCG based on 100 mrem/yr

To identify COPCs in groundwater, comparisons to the lowest of the following standards were performed:

- Human Health (NMAC 20.6.2.3103.A: Human health standards)

- Other Standards for Domestic Water (NMAC 20.6.2.3103.B: Other standards for domestic water supply)
- EPA maximum contaminant levels (MCLs)

If none of the above standards exist for an analyte, the following values were compared with concentrations in groundwater to identify COPCs:

- DCG based on 4 mrem/yr
- EPA Region 6 HHMSSLs for tap water (EPA 2005, 91002)

Stormwater discharges are regulated under the federal Clean Water Act, and no applicable standards for stormwater are under the Consent Order. For informational purposes, available stormwater monitoring data for the Mortandad watershed are compared with water screening action levels (wSALs) established under the FFCA/AO. The wSAL for an analyte is designated as the lowest numeric criterion of the applicable NMWQCC water quality criteria (WQC) established in State of New Mexico Standards for Interstate and Intrastate Surface Waters (NMAC 20.6.4), if one exists. The wSALs for each contaminant are determined in stepwise fashion by evaluating, in the following order

- requirements for any FFCA-monitored segment that is included in a classified water of the state in 20.6.4.101 through 20.6.4.899 NMAC;
- requirements for any FFCA-monitored surface water that is not included in a classified water of the state in 20.6.4.101 through 20.6.4.899 NMAC; or
- *Federal Register,* EPA. Multi-Sector General Permit benchmark values for Sector K, Hazardous Waste Treatment, Storage, or Disposal Facilities.

Classified waters of the state that are described in NMAC 20.6.4.101 through 20.6.4.899 have segment-specific designated uses. Nonclassified surface waters are described as ephemeral (NMAC 20.6.4.97), intermittent (NMAC 20.6.4.98), or perennial (NMAC 20.6.4.99), each of which has designated uses. The designated uses for surface water are associated with use-specific WQC, including numeric criteria. Stormwater in the Mortandad watershed is described as nonclassified, ephemeral; the relevant list of wSALs and their bases are provided in Appendix C.

6.0 CANYONS CONTAMINATION

This section describes the methodology and results of analytical data screening assessments for samples collected to identify COPCs in sediment, surface water, groundwater, and core samples. Identifying COPCs forms the basis for evaluating contamination in canyons media. All COPCs identified in this section are evaluated in human health risk assessments in Section 8.2 and have been considered in developing the measures evaluated in the baseline ecological risk assessment in Section 8.1. A subset of these COPCs is discussed in the conceptual model in Section 7. Section 6.1 briefly describes how the data were prepared for the screening processes. Section 6.2 presents the screens for sediment, Section 6.3 presents the screens for surface water and groundwater, and Section 6.4 presents the screens for core samples. The term “sediment” includes all post-1942 sediment deposits in the canyon bottoms, including deposits in abandoned channels and floodplains as well as in active stream channels; therefore, sediment includes alluvial soils as defined in some other studies.

6.1 Data Preparation

The data used in the following assessments were obtained from the Environmental Restoration Database (ERDB) and the Water Quality Database (WQDB) (on DVD as Attachment 1). All data are presented in Appendix C, Analytical Results (on CD).

Certain analytical results are not evaluated in the screens and subsequent risk assessments for the following reasons.

- Semivolatile organic compound (SVOC) results from samples analyzed by a volatile organic compound (VOC), PAH, or high explosives (HE) analytical method. These duplicate results are excluded from the screen because the VOC, PAH, and HE analytical methods provide lower detection limits than the SVOC method.
- Field duplicate results. These results are from samples obtained for quality assurance/quality control (QA/QC) purposes and not as primary characterization data.
- Isotopic thorium results by gamma spectroscopy. For sediment, these results are excluded because gamma spectroscopy analysis yields results that cannot be directly compared with sediment background values (BVs).
- Results from composite sediment samples collected to support ecological risk studies. These composite samples are used to support the ecological risk assessment in Section 8.1, but they cannot be compared with the other samples in this investigation; therefore, they have been excluded from the screens and from the subsequent human health risk assessments.
- Samples collected from material that has since been excavated (indicated by a "Y" in the excav_flag field in the Appendix C analytical results tables). These data are not representative of current site conditions, so they are excluded from the COPC identification process. However, these data are used in the conceptual site model in Section 7.1.
- Results from water samples collected before 2000. These results are not used in the COPC screens because in many instances the data do not have accompanying data packages for validation and are considered screening level. Also, concentrations in older data are not representative of current site conditions. However, pre-2000 data are used in the trend analyses presented in the conceptual site model in Section 7.2.

6.2 Contaminants in Sediment

This section presents the process for screening analytical results obtained from sediment samples collected in the Mortandad watershed. Samples collected and analyses performed by the analytical laboratories are presented in Table C-2.0-1 in Appendix C. Sample locations are presented in Plates 2 through 5. Analytical results were screened to develop a list of COPCs, as presented in Section 6.2.1.

6.2.1 Identification of Sediment COPCs

Sediment COPCs are identified by a screening process that includes comparing the maximum chemical concentrations by reach with Laboratory-specific sediment BVs (presented in LANL 1998, 59730). Analytes are retained as COPCs using rules specific to the class of analyte. This process is discussed below.

For inorganic chemicals, an analyte is retained as a COPC in a reach if

- the analyte has a BV and a detected or nondetected result in the reach exceeds the BV, or
- the analyte does not have a BV, but at least one detected result is in the reach.

For radionuclides, an analyte is retained as a COPC in a reach if

- the analyte has a BV and at least one detected result in the reach exceeds the BV, or
- the analyte does not have a BV but has at least one detected result in the reach.

There are no BVs for organic chemicals, and retaining an organic chemical as a COPC is based solely on detection status. For organic chemicals, an analyte is retained as a COPC in a reach if there is at least one detected result in the reach.

A total of 38 inorganic chemicals, 74 organic chemicals, and 17 radionuclides were retained as COPCs in sediment in the Mortandad watershed. Maximum sample results in each reach for these COPCs are presented in Tables 6.2-1, 6.2-2, and 6.2-3 for inorganic chemicals, organic chemicals, and radionuclides, respectively.

6.2.2 Comparison of Sediment COPC Concentrations to Residential SSLs and SALs

Maximum concentrations (including detection limits for inorganic chemicals) of sediment COPCs in each reach were compared with residential SSLs for inorganic and organic chemicals or residential SALs for radionuclides to identify which are most important for understanding potential human health risk. A total of three inorganic COPCs, two organic COPCs, and nine radionuclide COPCs have maximum concentrations exceeding residential SSLs or SALs in the Mortandad watershed, and these are included in the conceptual model for sediment in Section 7.1. These COPCs are highlighted in gray in Tables 6.2-1, 6.2-2, and 6.2-3.

6.3 Contaminants in Surface Water and Groundwater

This section presents the process for screening surface water and groundwater sample results from the Mortandad watershed. Samples collected and analyses performed by the analytical laboratories are presented in Table C-2.0-2 in Appendix C. Sample locations are presented in Plates 2 through 5. Analytical results from water samples were screened to develop a list of COPCs, as presented in Section 6.3.1.

6.3.1 Identification of Surface Water and Groundwater COPCs

There are no BVs for water data, and COPCs are identified by a screening process that is based only on the detection status. This process is performed for groups of data defined by field preparation (filtered or nonfiltered samples) and analyte type (inorganic chemicals, organic chemicals, and radionuclides). No organic chemical analyses were obtained from filtered water samples. An analyte is retained as a COPC for a location if the chemical has at least one detected result.

A total of 62 inorganic chemicals, 42 organic chemicals, and 16 radionuclides were retained as COPCs in surface water and/or groundwater in the Mortandad watershed. Maximum sample results at each sample location for these COPCs are presented in Tables 6.3-1 through 6.3-5.

6.3.2 Comparison of Water COPC Concentrations to Standards

Maximum detected concentrations of water COPCs by location and field preparation were compared with applicable water standards, as discussed in Section 5, to identify which are most important from a regulatory perspective. A total of six inorganic chemicals and one radionuclide have maximum detected concentrations in intermediate-depth or regional groundwater exceeding groundwater standards and are

discussed in the conceptual model for water in Section 7.2. COPCs exceeding standards are highlighted in gray in Tables 6.3-1 through 6.3-5.

6.4 Contaminants in Core Samples

This section presents the process for screening analytical results obtained from core samples collected in the Mortandad watershed. Samples collected and analyses performed by the analytical laboratories are presented in Table C-2.0-3 in Appendix C. Sample locations are presented in Plates 2 through 5. Analytical results were screened to develop a list of COPCs, as presented in Section 6.4.1.

6.4.1 Identification of Core COPCs

COPCs in core samples are identified by a screening process that includes comparing the maximum inorganic chemical or radionuclide concentrations by location and geologic unit with Laboratory-specific BVs presented in LANL (1998, 59730). Analytes are retained as COPCs using rules specific to the class of analyte. This process is discussed below.

For inorganic chemicals, an analyte is retained as a COPC in a borehole if

- the analyte has a BV and a detected or nondetected result in the geologic unit that exceeds the BV, or
- the analyte does not have a BV, but there is at least one detected result in the geologic unit.

For radionuclides, an analyte is retained as a COPC in a borehole if

- the analyte has a BV and at least one detected result in the geologic unit exceeds the BV, or
- the analyte does not have a BV but has at least one detected result in the geologic unit.

A total of 22 inorganic chemicals and 8 radionuclides were retained as COPCs in core samples in the Mortandad watershed. Maximum sample results at each borehole for these COPCs are presented in Tables 6.4-1 and 6.4-2 for inorganic chemicals and radionuclides, respectively. No organic chemical analyses were obtained from core samples, so there are no organic COPCs identified in the boreholes.

6.4.2 Comparison of Core COPC Concentrations to Residential SSLs and SALs

Maximum concentrations (including detection limits for inorganic chemicals) of COPCs by borehole and geologic unit were compared with residential SSLs for inorganic chemicals or residential SALs for radionuclides for purposes of comparison with results in other media. Only one inorganic COPC, iron, has a maximum result from a borehole exceeding residential SSLs. This result is highlighted gray in Table 6.4-1. No radionuclides exceeded residential SALs.

6.5 Summary

Table 6.5-1 presents a summary of the COPCs in sediment, water, and core samples collected from the Mortandad watershed to allow comparisons between media. Table 6.5-1 also indicates which COPCs have maximum results in the watershed exceeding SSLs, SALs, and standards.

7.0 PHYSICAL SYSTEM CONCEPTUAL MODEL

This section discusses aspects of the physical system conceptual model that are relevant for understanding the nature, sources, extent, fate, and transport of contaminants in the Mortandad watershed. The discussion on contaminants focuses on COPCs that are shown to be most important for evaluating potential present-day human health risk based on the comparisons with SALs, SSLs, and standards in Section 6 and that represent known contaminant releases into the watershed. These COPCs are included in evaluations of potential human health risk in Section 8.2. This section also includes discussion of other COPCs that were identified as study design COPECs and are relevant for evaluating potential present-day ecological risk. Some additional COPCs are discussed to provide insights into sources and trends of contaminants historically or otherwise important in the watershed, including some COPCs that were detected on San Ildefonso Pueblo land and that are relevant for understanding the downcanyon extent of Laboratory-derived contamination. As used in this section, "contaminants" refers to COPCs that are known to represent releases from Laboratory SWMUs or AOCs or other anthropogenic sources, whereas "COPC" is a more general term that also includes analytes identified in Section 6 that may or may not represent such releases.

The following discussion is divided into three sections. Section 7.1 describes spatial and temporal trends for contaminants in sediments and the fluvial processes controlling their distributions. Section 7.2 describes the hydrology of the watershed, including descriptions of surface water, alluvial groundwater, pore water, intermediate-perched groundwater and regional groundwater, and summarizes spatial and temporal trends for contaminants in these media. Together, the data presented in Sections 7.1 and 7.2 are used to identify contaminant sources and to understand contaminant transport away from the source areas. Section 7.3 presents a summary of the physical system conceptual model based on the combined contaminant and pathways data. Key aspects of the physical system conceptual model are shown in Figure 7.0-1. Supporting information about trends in hydrologic conditions and contaminant distributions that support the conceptual model is presented in Appendixes B, D, F, G, H, I, J, K, L, M, N, O and P.

In the following discussion, metric units followed by English units in parentheses are generally employed. However, some data such as transducer data for alluvial wells, precipitation data collected at TA-06, and streamflow gage data were all collected and reported in English units (feet, inches, and cubic feet per second, respectively). Because of the voluminous nature of these data, the original units are maintained in some graphs and tables.

7.1 Contaminants in Sediments

This section discusses general aspects of contaminants associated with sediment in the Mortandad watershed, including how the distribution and concentration of contaminants are affected by fluvial processes acting over decadal time periods after releases. Subsequent sections discuss details of the distribution and concentration of specific COPCs in sediment deposits in the watershed that are important for evaluating potential human health or ecological risk or the downcanyon transport of contaminants in floods. In this section, the term "contaminant" is used to refer to COPCs that are known to represent releases from Laboratory SWMUs or AOCs or other anthropogenic sources, whereas "COPC" is a more general term that also includes analytes identified in Section 6 that may or may not represent such releases. For example, some COPCs identified by comparison with BVs or detection limits may represent naturally elevated concentrations or false positives from analytical laboratories, as discussed below.

Most contaminants in sediment in the Mortandad watershed that were derived from Laboratory sources were originally released in wastewater from outfalls (Purtymun 1967, 11785; Purtymun 1971, 4795; Hakonson and Bostick 1976, 29678; Nyhan et al. 1982, 7164; LANL 1997, 56835). Because streambeds

on the Pajarito Plateau are usually dry, effluent that did not infiltrate into soils between the outfalls and the channel generally infiltrated into the streambeds. The downcanyon extent of effluent flow varied with release volume and prior moisture conditions along the channel. Nyhan et al. (1978, 5726) reported that in the early 1970s, when the discharge volume was relatively high (Figure 2.1-1), effluent extended for 1.5 km (1 mi) or less downcanyon from the TA-50 RLWTF outfall, indicating that infiltration of effluent in Mortandad Canyon during this period generally occurred upcanyon from reach M-3W. Observations from the early to mid-1960s indicate that effluent sometimes reached M-3W when TA-48 and TA-50 were concurrently discharging wastewater (Purtymun 1967, 11785, p. 36). Discharge volume has been progressively decreasing since the early 1980s (Figure 2.1-1), and infiltration of effluent at present occurs over a shorter stretch of channel.

Once in the streambed, dissolved contaminants commonly adsorb to sediment particles or organic matter because of the geochemical behavior of most radionuclides, metals, and organic chemicals that are of concern in this investigation (Watters et al. 1983, 11888; Salomons and Forstner 1984, 82304; Lopes and Dionne 1998, 82309). Exceptions include perchlorate and tritium which are highly soluble, nonsorbing analytes that remain dissolved in water; as discussed in more detail in Section 7.2. Many contaminants preferentially bind to clay minerals or organic particles, but they will also bind to other mineral particles. Contaminants will preferentially bind to smaller particles because of their larger ratio of surface area to mass and greater electrostatic attractions, and Nyhan et al. (1976, 11747) have documented a general inverse relation between contaminant concentration and particle size of streambed sediment on the Pajarito Plateau. Preferential adsorption to finer particles and organic matter also occurs when wastewater infiltrates into soils on hillslopes. Because of the general inverse correlation of contaminant concentrations with sediment particle size, concentrations can be an order of magnitude higher in the finest-grained sediment deposits, which contain up to 80% or more silt and clay than in coarse-grained sediment deposits that contain < 5% silt and clay (Reneau et al. 2004, 93174; LANL 2004, 87390).

Once adsorbed to sediment particles in the streambed, contaminants can subsequently be redistributed by floods that scour the streambed and mobilize the bed sediment. Contaminants in the streambed that originated as solid particles will behave similarly to those originally released as dissolved components in wastewater. Contaminants associated with coarse-size fractions (coarse sand and coarser; >0.5 mm [0.02 in.]) are generally transported as bed load along the streambed, whereas contaminants associated with fine-size fractions (fine sand and finer; <0.25 mm [0.01 in.]) are generally transported in suspension (Malmon 2002, 76038, pp. 108–114; Malmon et al. 2004, 93018). Contaminants associated with medium sand (0.25–0.5 mm [0.01–0.02 in.]) can be either transported as bed load or as suspended load. The coarse sediment fractions typically travel shorter distances during a flood than fine fractions because of their interactions with other sediment particles on the streambed, and they are usually redeposited within the channel during waning stages of a flood. In areas where the channel is aggrading (raising its elevation through sediment deposition) and where there are no stream banks or where banks are low, coarse sediment can be deposited over adjacent floodplains. In floods that overtop stream banks or where there are no stream banks, some of the fine particles and associated contaminants carried in suspension are also deposited on adjacent abandoned channels or floodplains as flow depth, and velocity decreases relative to the main channel. In large flood events, contaminants can be distributed across the entire width of floodplains in canyon bottoms. In reaches where transmission losses into the streambed exceed discharge, all sediment is deposited. Additional fine particles are deposited on or infiltrate into the streambed during waning stages of flow to be potentially scoured and resuspended in subsequent events.

During floods, sediment from a variety of sources is mixed, changing contaminant concentrations longitudinally along a channel. Where runoff from a contaminant source area enters a stream draining noncontaminated or less-contaminated areas, contaminant concentrations in sediment carried by a flood typically decrease relative to the source area while they increase relative to areas upstream from the

contaminant source. Downcanyon, where runoff from tributaries draining noncontaminated or less-contaminated areas joins a stream in flood, concentrations may be further reduced. Some of the sediment transported in floods is eroded from the bed and banks of the channel, and this erosion can also change contaminant concentrations in a flood. As a flood from noncontaminated areas erodes contaminated sediment downcanyon from source areas, contaminant concentrations in transported sediment increase. Similarly, when a flood draining contaminated areas erodes noncontaminated or less-contaminated material along the channel, concentrations in transported sediment decrease. The net result is a general downcanyon decrease in contaminant concentrations in sediment with distance from a contaminant source area (e.g., Marcus 1987, 82301; Graf 1996, 55537; Reneau et al. 2004, 93174) and an increase in contaminant concentrations along main channels where significant amounts of contaminants are provided from tributaries (LANL 2004, 87390).

Contaminant concentrations in sediment carried in floods also change over time in relation to the history of contaminant releases. Concentrations are generally highest during the period of peak contaminant releases and decrease over time as a result of the mixing processes discussed above. Such decreases over time have been documented in the Los Alamos and Pueblo Canyon system (Malmon 2002, 76038, pp. 315–322; LANL 2004, 87390, pp. 7–8; Reneau et al. 2004, 93174, pp. 1216–1217), as well as in other regions (Lewin et al. 1977, 82306, p. 357; Rowan et al., 1995, 82303, p. 61). Removing or stabilizing contaminants in source areas can help accelerate these natural decreases in contaminant concentrations over time.

Multiple floods occurring over decadal time periods result in sediment deposits in each reach that have a range in age and particle size distribution and hence in contaminant concentration. Schematic cross sections illustrating the distribution of coarse and fine sediment in reaches in the Mortandad watershed are shown in Figures 7.1-1, 7.1-2, and 7.1-3. The term “coarse facies” is used to refer to sediment with median particle size in the less than 2-mm (0.08-in.) fraction of medium to very coarse sand, and these deposits commonly have a high gravel content. The term “fine facies” is used to refer to sediment with median particle size of silt to medium sand. The active channel (c1 geomorphic unit) is typically dominated by relatively young coarse facies sediment deposits. In some parts of the Mortandad watershed, cattail wetlands occur along the active channel (c1ct unit; e.g., reach E-1W in Figure 7.1-2), and fine facies sediment is commonly deposited in these areas where floodwaters spread and energy drops. Abandoned channels (c2 and c3 units), which are areas occupied by the channel sometime after 1942 but subsequently abandoned following channel migration and/or channel incision, typically include fine facies sediment overlying older coarse facies sediment. Abandoned channels can also include coarse deposits as the uppermost, youngest layer (e.g., reach M-4C in Figure 7.1-3). Post-1942 floodplains (f1 unit) typically include thinner layers of post-1942 fine facies sediment that bury pre-1943 soils. (See Section B-1 of Appendix B for additional discussion of sediment facies and geomorphic units.)

As shown in Figures 7.1-1 and 7.1-3, the layers with the highest contaminant concentration in a reach are typically at depth, buried by younger sediment layers with lower concentrations, although they can also occur at the surface (e.g., cesium-137 in reach M-3E, Figure 7.1-2). The highest concentrations can also occur in very small sediment deposits in narrow canyons close to the sources, including the watershed maximums for americium-241, cesium-137, and strontium-90 in reach E-1E and chromium in reach E-1FW (Figure 7.1-1). These figures also show how the relation of sediment layers to trees provides one means of estimating the thickness and age of different sediment layers (tree age determined from tree-ring dating [dendrochronology]; see Section B-1 (in Appendix B) for more discussion of field investigation methods). Plates 2 through 5 show the distribution of geomorphic units in the investigation reaches.

Volumes of contaminated post-1942 sediment vary longitudinally along the canyons, resulting in part from variations in channel gradient and the width of post-1942 geomorphic units, as shown in Figure 7.1-4. Mortandad Canyon contains relatively large volumes of post-1942 sediment associated with wide areas of the canyon bottom near the Ten Site Canyon confluence. Width and volume of post-1942 sediment deposits in Mortandad Canyon increase beginning in reach M-3W, where the channel gradient decreases and the canyon bottom widens. Maximum volume is in reaches M-3E and M-4C, and the maximum average width of about 60 m (200 ft) is in M-4C. Other areas of locally high volume and width and lower gradient, relative to nearby reaches, include reaches E-1W, PCYN, TS-1C, and TS-3. In contrast, width and volume are generally lowest in relatively steep reaches, such as E-1FW, E-1E, and TS-2E.

Parts of Mortandad Canyon include discontinuous channels, features that are common in many arid and semiarid areas (Bull 1997, 93908) and that enhance the spreading and infiltration of floodwaters and the deposition of sediment and associated contaminants. Where channels end and runoff becomes unconfined, floodwaters can spread over large areas, such as M-4C and the western part of M-5W (Figure 3.2-1 and Plate 4). Runoff from these areas typically feed into headcuts, below which flow is again generally confined within narrow channels. Examples of the beginning of channels at headcuts occur in reaches M-4E and M-5W (Plate 4).

Most of the contaminants in sediments in Mortandad watershed occur in areas of post-1942 sediment deposition outside the active stream channels, as also seen in the Los Alamos and Pueblo watershed (LANL 2004, 87390; Reneau et al. 2004, 93174) and in Cañon de Valle (LANL 2003, 77965; Reid et al. 2005, 91247). At present, these deposits probably constitute the primary source for contaminants carried by floods, as observed in other regions (e.g., Rowan et al. 1995, 82303, pp. 63–64), with active channels and erosion from hillslopes constituting lesser sources. The concentration and inventory (amount) of contaminants in deposits outside the active channel vary longitudinally within the canyons. Concentrations are typically highest in fine sediment deposits near the sources that date to the period of contaminant releases and decrease in younger deposits, in coarser deposits, and downcanyon. Contaminant inventories display more irregular patterns than contaminant concentrations and are related to longitudinal variations in the volume, grain size, and age of sediment deposits within a canyon. Subsequent sections provide examples of the variations in contaminant concentration and inventory in sediment deposits within the Mortandad watershed.

Variations in background concentrations of some analytes in sediment can complicate the identification and evaluation of contaminants related to Laboratory releases. For example, background concentrations of fallout radionuclides in sediments have been shown to vary between regional rivers and reservoirs (McLin and Lyons 2002, 82305) and between these settings and canyons on the Pajarito Plateau (Ryti et al. 1998, 59730; McDonald et al. 2003, 76084). Background concentrations of some inorganic chemicals in sediments have also been shown to vary between different areas on the Pajarito Plateau as a result of local variations in soils or bedrock (Drakos et al. 2000, 68739). Because soils on the Pajarito Plateau have higher concentrations of many inorganic chemicals than sediments (Ryti et al. 1998, 59730), deposition of sediment derived from locally eroded soils provides a possible source for elevated concentrations of inorganic chemicals in sediments.

Mineralogic variations within naturally occurring sediment can also contribute to background variations, for example, the higher concentrations of many metals in black magnetite-rich sands on the Pajarito Plateau, such as iron, manganese, nickel, thallium, vanadium, and zinc (Reneau et al. 1998, 62050, pp. 12–14). Additional variations in background concentrations are the result of incorporation of ash transported from the Cerro Grande burn area, since ash contains higher concentrations of fallout radionuclides and many inorganic chemicals than pre-fire sediment (Katzman et al. 2001, 72660; Gallaher et al. 2002, 82265; Kraig et al. 2002, 85536; Johansen et al. 2003, 82312; LANL 2004, 87390).

Finally, concentrations of various inorganic and organic chemicals in sediment may be elevated near urbanized or industrial areas as a result of runoff from roads and other developed areas (Edwards 1983, 82302; Lopes and Dionne 1998, 82309; Walker et al. 1999, 82308; Breault and Granato 2000, 82310; van Metre et al. 2000, 82262), further complicating the identification and evaluation of contaminants related to Laboratory releases. The topics of variations in background concentration and contributions from developed areas as they relate to key contaminants in the Mortandad Canyon system are discussed in subsequent sections.

7.1.1 Radionuclides in Sediments

Nine radionuclides detected in sediments in the Mortandad watershed have maximum results greater than residential SALs and are more important for assessing potential human health risk: americium-241, cesium-137, cobalt-60**,** plutonium-238, plutonium-239,240, strontium-90, thorium-228, thorium-230, and thorium-232. This section focuses on spatial and temporal variations in radionuclides in the Mortandad watershed, and supporting information is included in Appendix D.

7.1.1.1 Sources and Spatial Variations in Radionuclide Concentrations

Radionuclides in sediments in the Mortandad watershed have several sources, as indicated by their spatial distribution, and concentrations typically decline downcanyon from the source areas. Subsequent discussions focus on the nine radionuclides that are most important for evaluating potential human health risk, based on comparison to residential SALs in Section 6.2.2: americium-241, cesium-137, cobalt-60**,** plutonium-238, plutonium-239,240, strontium-90, thorium-228, thorium-230, and thorium-232. Figure D-1.1.1 in Appendix D includes additional plots that show all sample results for radionuclide COPCs plotted against distance from the Rio Grande. Figure D-1.1.1 plots help to identify sources, although these data are biased high because fine-grained sediment layers from the most contaminated geomorphic units in a reach were preferentially sampled. In addition, these plots include some relatively high values from earlier sampling events that could not be replicated in later events.

Figures 7.1-5 to 7.1-10 show the estimated average concentrations of radionuclides whose concentrations and spatial trends indicate clear sources at Laboratory SWMUs or AOCs and whose maximum concentrations exceed residential SALs: americium-241, cesium-137, cobalt-60**,** plutonium-238, plutonium-239,240, and strontium-90. These are volume-weighted averages in post-1942 fine facies sediment in investigation reaches, where average radionuclide concentrations in a geomorphic unit in a reach are weighted by the volume of fine facies sediment in that unit, removing most of the bias introduced during sample collection. (Sample collection is biased toward geomorphic units and sediment facies with relatively high contaminant concentrations, as discussed in Section B-1 of Appendix B, and straight averages of all sample results from a reach are overestimates of true averages.) Averages for fine facies sediment are shown because average concentrations in this type of sediment are, with a few exceptions, higher than in coarse facies sediment, and fine facies deposits are therefore more important for evaluating risk. Average concentrations for both fine and coarse facies sediment in each reach are presented in Tables D-1.5-1 to D-1.5-6 (Appendix D). In Figure 7.1-10, the sediment BV for strontium-90 is shown for comparison; BVs are too low for the other radionuclides to show at the scales used in the figures.

The most important sources for radionuclide COPCs in the Mortandad watershed are the TA-50 RLWTF outfall into reach E-1E, the former TA-35 WWTP outfall into Pratt Canyon (reach PCYN), and the accidental releases in 1974 from TA-50 into the head of Ten Site Canyon (reach TS-1W), as shown in Figures 7.1-5 to 7.1-10. Average concentrations of americium-241, cesium-137, cobalt-60**,** and plutonium-239,240 are highest in reach E-1E in Effluent Canyon, and plutonium-238 and strontium-90 are

also present there above background concentrations. Average concentrations of plutonium-238 are highest in Ten Site Canyon between TA-50 and Pratt Canyon; americium-241, cesium-137, cobalt-60, plutonium-239,240, and strontium-90 have also been identified there as COPCs. Average concentrations of strontium-90 are highest in Pratt Canyon; and americium-241, cesium-137, cobalt-60, plutonium-238, and plutonium-239,240 have also been identified there as COPCs. Some of these radionuclide COPCs have been detected above BVs in other areas that suggest the possibility of additional sources, but concentrations are low, and no significant increase in average concentrations is indicated in Figures 7.1-5 to 7.1-10. If releases of radionuclides occurred from other SWMUs or AOCs, they were apparently small.

The pattern of downcanyon decline in radionuclide concentrations is notably different between the different sources, as shown in Figures 7.1-5 to 7.1-10. Downcanyon from the RLWTF outfall into Effluent Canyon, radionuclides generally show decreasing trends for about 3–4 km (1.9–2.5 mi), east of which their average concentrations are similar to background levels. In Ten Site Canyon, the highest concentrations of plutonium-238 are found within 1 km (0.6 mi) of the accidental releases from TA-50, and concentrations are much lower downcanyon—less than in Mortandad Canyon, which is an equal distance downcanyon from the RLWTF (Figure 7.1-8). Similarly, although the average concentration of strontium-90 is much higher in Pratt Canyon than in Effluent Canyon, concentrations are relatively low farther downcanyon in Ten Site Canyon compared with Mortandad Canyon above the Ten Site Canyon confluence (Figure 7.1-10). The occurrence of relatively low-gradient areas near the contaminant sources in Pratt and Ten Site Canyons, where sediment is preferentially deposited (Figure 7.1-4), contributes to the differences seen between canyons. The relatively small drainage areas of Pratt and upper Ten Site Canyons, compared with Mortandad Canyon below the Effluent Canyon confluence, also lead to smaller-magnitude floods and lower transport rates of sediment and associated contaminants from Pratt and upper Ten Site Canyons.

Several deviations from the general downcanyon decline in average radionuclide concentrations are seen in Figures 7.1-5 to 7.1-10 that reflect some of the complexity in the present distribution of contaminants. This complexity probably results at least in part from the combined effects of temporal variations in contaminant releases and spatial and temporal variations in downcanyon sediment erosion and deposition during floods in the subsequent decades, as documented previously in the Los Alamos and Pueblo watershed (LANL 2004, 87390; Reneau et al. 2004, 93174). For example, the higher average concentrations of cesium-137 and other radionuclides in reach M-3E than the concentrations that are immediately upcanyon in M-3W probably records preferential deposition of sediment in M-3E during the period of peak cesium-137 releases from the RLWTF and the general stability of these sediment deposits since that time (as discussed later). In contrast, analytical data from reach M-3W indicate that most of the sediment is younger, postdating the period of peak releases, recording either nondeposition or subsequent erosion of deposits from that time period. The higher average concentrations of cesium-137 and plutonium-238 in M-2E relative to M-2W may similarly record preferential deposition in M-2E during the period of peak releases of these radionuclides, in contrast to americium-241, cobalt-60, plutonium-239,240, and strontium-90, which have higher average concentrations in M-2W.

The general downcanyon decrease in average radionuclide concentrations discussed above applies only to historic sediment deposits that integrate the effects of changing discharge from the sources and downcanyon transport over decadal time frames. Samples collected from the active channel (c1 unit) and associated low surfaces (c1b unit) in 2004 from the TA-50 RLWTF outfall to near the confluence of Mortandad and Ten Site Canyons show a different pattern. This pattern indicates the primary source of radionuclides currently transported by floods is remobilization of sediment previously stored along the channel and in adjacent geomorphic units. Figure 7.1-11 shows that fine facies sediment adjacent to the channel in 2004 (median particle size of coarse silt to fine sand) had the lowest concentrations of cesium-137 in reach E-1E near the RLWTF outfall and that concentrations progressively increased

downcanyon. Cesium-137 concentrations in coarse facies sediment (median particle size of coarse to very coarse sand) were much lower than in the fine facies sediment but also showed relatively low concentrations near the outfall and higher concentrations downcanyon. Concentrations in fine facies sediment increased downcanyon in 2004 because of the erosion of sediment deposits along the channel containing relatively high concentrations of cesium-137. The relatively low concentrations in E-1E, close to the outfall in the reach with the highest concentrations of cesium-137 in older sediment deposits, suggest that most of the sediment in the active channel in this reach is derived from upcanyon of the RLWTF outfall, with relatively small contributions from bank erosion in E-1E. In contrast to the fine facies samples, cesium-137 concentrations in coarse facies samples are similar from M-2W to M-3E, except for a somewhat higher result in M-3W (Figure 7.1-11), suggesting that neither net enhancement nor dilution of cesium-137 is occurring over this 2-km stretch of canyon in coarse sediment associated with mixing of sediment from different sources.

Data from environmental surveillance sampling stations (e.g., ESP 2005, 92222), representing sediment collected from the stream channel, show the same lack of systematic variations in cesium-137 concentration between Effluent Canyon and the Ten Site Canyon confluence (reaches M-2W to M-3E) as seen in coarse facies samples from 2004. Figure 7.1-12 shows average concentrations of cesium-137 in samples collected over the 10-yr period from 1996 to 2005 at surveillance stations in Mortandad Canyon. Concentrations are relatively high and similar at the stations below Effluent Canyon (gaging station E200, reach M-2W), at well MCO-5 (reach M-3W), and above the sediment traps (gaging station E202, confluence of Mortandad and Ten Site Canyons). Concentrations decrease downcanyon from there to well MCO-9.5, west of reach M-5W, and are at background levels farther downcanyon. Cesium-137 concentrations are also at background levels in Mortandad Canyon above Effluent Canyon (Figure 7.1-12).

For several radionuclides that have maximum results above residential SALs, available data do not indicate clear sources at Laboratory SWMUs or AOCs and/or releases that were large enough to noticeably affect average concentrations in a reach. Specifically, thorium-228, thorium-230, and thorium-232 all have maximum values above sediment BVs, but average concentrations calculated for both fine and coarse facies sediment are generally less than background averages, as shown in Table D-1.5-7. Thorium-228 only had one result above the BV, from reach TS-1C in 2004 (sample CAMO-04-53373), and resampling of this sediment layer in 2005 yielded a result below the BV (sample CAMO-05-63743). Thorium-230 had only three results above the BV: two from TS-1C (samples CAMO-04-53373 and CAMO-04-53376) and one from reach MCW-1 (sample CAMO-03-49826). The MCW-1 result was only 7% higher than the BV (2.44 vs. 2.28 pCi/g), and resampling of the TS-1C sample layers in 2005 yielded thorium-230 results below the BV (samples CAMO-05-63743 and CAMO-05-63744). Thorium-232 had three results above BVs: one from M-1C and two from TS-1C. The M-1C result was less than twice the BV (3.48 vs. 2.33 pCi/g), and the TS-1C results were not confirmed upon the resampling discussed for thorium-228 and thorium-230. In summary, available data for these thorium isotopes do not clearly indicate sources at SWMUs or AOCs, and if releases occurred, they were too small to elevate average concentrations in a reach above background averages.

7.1.1.2 Collocation of Radionuclides

The different radionuclide COPCs are generally collocated in sediment deposits in the different reaches in the Mortandad watershed, primarily occurring in post-1942 sediment deposits and preferentially occurring in fine rather than coarse facies sediment. However, the maximum concentrations of each radionuclide may not occur in the same sediment layers in each reach because the relative concentrations of radionuclides in effluent released from outfalls varied over time both as a result of changes in research activities at the Laboratory and changes in wastewater treatment methods. These variations are

discussed further in Section 7.1.1.3. Additional variations result from the mixing of sediment and associated contaminants from different sources and possibly from variable geochemical behavior between radionuclides.

The best correlations between radionuclides downcanyon from the TA-50 RLWTF outfall generally occur between americium-241 and plutonium-239,240 and between cesium-137 and strontium-90, suggesting similar histories of release and transport for these pairs of radionuclides. Good correlations can also exist between other pairs of radionuclides in a reach, although in the complete data set more variability is present that indicates the presence of multiple populations of samples. As examples, Figure 7.1-13 presents scatter plots that show relations between select pairs of radionuclides in M-2E and in the entire data set from the RLWTF outfall through M-4. Both data sets show good correlations between cesium-137 and strontium-90. Correlations are also generally good between americium-241 and plutonium-239,240, although a scattering of samples with high results for plutonium-239,240 deviate from the general trend. Good correlations exist between cesium-137 and plutonium-238 in M-2E, but in the entire data set, distinct populations can be seen that record differences in the ratios between these radionuclides, and the overall correlation is poor. For comparison, relations between plutonium-238 and plutonium-239,240 are poor in both data sets. As discussed in Sections 7.1.1.3 and D-1.6 (Appendix D), populations of samples with different radionuclide ratios are associated with changes in the RLWTF release history and reflect sediment deposits of different age.

Plutonium-238 has maximum concentrations in the Mortandad watershed in Ten Site Canyon upcanyon from Pratt Canyon, and plutonium-239,240 is also elevated in the same reaches. The maximum measured concentrations of both plutonium-238 and plutonium-239,240 in Ten Site Canyon occur in the same sample (CAMO-04-53381), a subsurface layer of fine facies sediment in reach TS-1E. Similar but slightly lower values of both isotopes occur in a subsurface layer of fine facies sediment in reach TS-1C (CAMO-04-53378). These data support simultaneous release and similar behavior of these plutonium isotopes in this part of Ten Site Canyon.

Radionuclide concentrations in Ten Site Canyon show less collocation downcanyon from Pratt Canyon, consistent with mixing of sediment from different sources and variable release histories. The highest concentration of strontium-90 in Ten Site Canyon was measured in a fine facies sediment layer in reach TS-2E, about 420 m (1380 ft) downcanyon from Pratt Canyon. The highest plutonium-239,240 concentration in this part of Ten Site Canyon was measured in a different layer in TS-2E, and the highest plutonium-238 concentration downcanyon from Pratt Canyon was measured in a fine-grained sediment layer in TS-2W.

7.1.1.3 Temporal Variations in Radionuclide Concentration

Data from Mortandad Canyon show that the concentrations of radionuclides in both fine- and coarse-grained sediment generally decreased over time following peak contaminant releases. Some examples of these data are presented below. Additional plots of environmental surveillance data for key radionuclides are presented in Section D-1.2 of Appendix D.

Figure 7.1-14 shows time series of cesium-137 concentrations measured at three environmental surveillance stations in Mortandad Canyon since 1977, supplemented by active channel samples from the reach investigations in 1998 to 2005 and from investigations by the Environmental Science Group in 1972 and 1973 (Nyhan et al. 1978, 5726; results from 0–7.5-cm depth). During this period, concentrations in reach M-2W were highest in the 1970s, decreasing to near present values by 1985. Concentrations in reach M-3W were highest in the early 1970s, decreasing more gradually to near present values by 1995.

Concentrations in reach M-4W were highest from the late 1970s to the early 1980s, also decreasing to near present values by 1995. Cesium-137 concentrations have been relatively constant in the active channel at all three sites since about 1995. These data indicate that the effects of the discharge of cesium-137 from the RLWTF were most pronounced close to the source, but concentrations also decreased most rapidly there. Reductions in cesium-137 concentration over time in channel sediments were slower farther downcanyon, although concentrations have been relatively stable for 10 yr in these areas.

Data collected by the Environmental Science Group in 1972 and 1973 (Nyhan et al. 1978, 5726) document the high variability and high concentrations that existed in radionuclides in the active stream channel close to the RLWTF outfall during the early period of releases. Analyses from the Effluent Canyon channel include the highest reported cesium-137 concentrations from the Mortandad watershed, greater than 3000 pCi/g. Figure 7.1-15 plots the results of this sampling (0–7.5-cm depth) versus distance from the outfall and shows that cesium-137 concentrations varied by a factor of 6 in reach E-1E in a single year and also varied between years. In samples from two locations in reach M-2W, cesium-137 concentrations varied by a factor of 2 between 1972 and 1973. Farther downcanyon, in reaches M-2E and M-3W, cesium-137 concentrations were less variable between years. These data support the conceptual model first proposed by Purtymun et al. (1966, 11848; see also Purtymun 1971, 4795; Nyhan et al. 1978, 5726) that during periods of radioactive effluent release, radionuclides first build up in the stream channel alluvium where the effluent infiltrates into the bed. These radionuclides are subsequently remobilized by higher magnitude stormwater runoff events that scour the bed, being transported with sediment particles farther downstream. The high spatial and temporal variability seen in reaches E-1E and M-2W in Figure 7.1-15 is interpreted to correspond to the area where most of the effluent was infiltrating into the streambed and being periodically scoured, and the lower variability downcanyon is interpreted to largely record the effects of sediment mixing during subsequent downcanyon transport, although some direct contact with effluent was reported at the M-2E site (Nyhan et al. 1982, 7164, p. 532).

Figure 7.1-16 shows reconstructions of the concentrations of five key radionuclides in fine facies sediment in reaches M-3, M-4W, and M-4E near the confluence of Mortandad and Ten Site Canyons between 1960 and 2005. These reconstructions use data from sediment samples collected in this investigation and provide trends consistent with discharge records from the RLWTF. The basis for age estimates for individual sediment layers is discussed in Section D-1.6 in Appendix D. Plots for cesium-137 and strontium-90 have been adjusted for radioactive decay to show both estimated average concentrations at the time of deposition and average concentrations in 2006 when this report was written.

Americium-241 and plutonium-239/240 show very similar trends, with very low concentrations before 1975, well-defined maximum concentrations at ca. 1979–1983, and concentrations near current levels after about 1990 (Figure 7.1-16). Discharge records similarly show maximum releases of these radionuclides in 1981–1983 (LANL 1997, 56835, pp. 2-20, 2-21), which indicates rapid transport over the 3 km from the outfall to the confluence of Mortandad and Ten Site Canyons. Plutonium-238 is present at much lower concentrations, with an earlier peak at ca. 1975–1977 that is consistent with discharge records indicating peak releases in 1974–1975 (LANL 1997, 56835, pp. 2-20, 2-21). Plutonium-238 also has a secondary peak of slightly lower magnitude at ca. 1979–1983. Cesium-137 shows more variability in concentrations, with similar-magnitude peaks in the late 1960s and at ca. 1975–1977; no cesium-137 discharge data from the RLWTF are available from this period for comparison. Strontium-90 shows the highest concentrations in the late 1960s, which is consistent with discharge records that indicate the peak releases in 1964–1965 (LANL 1997, 56835, pp. 2-20, 2-21). Figure 7.1-16 shows that by 2006, concentrations of cesium-137 and strontium-90 in sediment deposits from the late 1960s have been

reduced by about 60% due to radioactive decay. Both cesium-137 and strontium-90 show gradual decreases in concentration since about 1987, which may also be largely caused by radioactive decay.

7.1.1.4 Relations between Particle Size and Radionuclide Concentration

The particle size distribution of sediment deposits can have a strong influence on radionuclide concentrations because of the preferential tendency for radionuclides to adsorb onto small particles, although these relations can be obscured because of temporal variations in radionuclide release history and other factors (Reneau et al. 1998, 59160; Reneau et al. 2004, 93174; LANL 2004, 87390). General inverse relations between contaminant concentration and particle size within streambed sediment in Effluent and Mortandad Canyons were previously documented by Nyhan et al. (1976, 11747) for samples collected in the early 1970s. The data collected in this investigation provide additional insights into relations between particle size and radionuclide concentrations in the Mortandad watershed, as discussed below.

Figure 7.1-17 plots concentrations of select radionuclides in sediment samples from the Mortandad watershed against percent silt and clay content (percent in the <2-mm fraction of the sample). Cesium-137 is shown for plots in Effluent and Mortandad Canyons downcanyon from the TA-50 RLWTF outfall (reaches E-1E, M-2W, M-2E, M-3, and M-4), and strontium-90 is shown for Ten Site Canyon downcanyon from Pratt Canyon (reach TS-2). With one exception, radionuclide concentrations in these reaches are highest in fine facies sediment deposits with relatively high silt and clay content. The exception is reach M-2W, where cesium-137 concentrations are highest in coarse facies sediment collected from the c3 and f1g units, although within these samples there is a good correlation between cesium-137 and silt and clay content (Figure 7.1-17). The coarse facies deposits in c3 and f1g are interpreted to represent the active streambed during the period of highest cesium-137 discharges, with the high concentrations resulting from the direct interaction of effluent with streambed sediment. Lower concentrations in coarse facies sediment in other reaches suggest that sampled deposits did not have direct contact with effluent during this period.

The highest radionuclide concentrations in other reaches generally occur in deposits with relatively high silt and clay contents, although there is generally much scatter between radionuclide concentrations and silt and clay content in each reach (Figure 7.1-17). This variability probably results in part from the large temporal variations in radionuclide concentrations discussed in Section 7.1.1.3, combined with the mixing of sediment from different sources. Subsets of the data in a reach can display much more systematic relations, such as the good correlations between cesium-137 and silt and clay content in sediment from ca. 1990 to 2005 in M-3 and M-4 (Figure 7.1-17). The effect of deposit age can be seen in M-4, where the samples with the highest cesium-137 concentration (148–276 pCi/g) were from silt and clay-rich sediment deposited ca. 1974–1978. The relatively high cesium-137 concentrations in fine facies sediment in c3 and f1 units in E-1E and in c3 and f1g units in M-2E (Figure 7.1-17) probably also record sediment deposited during periods of high cesium-137 releases.

7.1.1.5 Radionuclide Inventory

Data collected in this investigation define the general geographic variations in the amount, or inventory, of radionuclides contained in sediment deposits in different parts of the Mortandad watershed. Table 7.1-1 summarizes the geographic distribution of americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239,240, and strontium-90 in sediment deposits in the watershed, which updates and expands on estimates of cesium-137 inventory in a previous report (Reneau et al. 2003, 77103). Supporting data for Table 7.1-1 are presented in Section D-1 of Appendix D. No inventories are estimated for reaches where these analytes are not COPCs (which would largely or entirely represent inventories associated

with background concentrations). Inventory estimates are also not shown for Mortandad Canyon above Effluent Canyon, Mortandad Canyon east of M-5E, or the unnamed tributary canyon that heads in TA-05 because these areas include less than 0.2% of the estimated inventory for each radionuclide. The inventory estimates in Table 7.1-1 are not adjusted for sediment removed during maintenance of the sediment traps in 2000 (WGII 2000, 70735), although the inventory removed is expected to be minor because of the low concentrations present in the traps and in adjacent fill piles. Estimated inventories are also not adjusted for radioactive decay, which would be more important than the maintenance activities for cesium-137, cobalt-60, and strontium-90 because of their relatively short half-lives (30.1, 5.27, and 28.8 years, respectively; Parrington et al. 1996, 58682). For example, radioactive decay would reduce the concentration of cesium-137 and strontium-90 in a layer sampled in 1998, the first year of this investigation, by about 17% by 2006, the date of this report. Estimates of the amount redistributed by floods since characterization was done are not included, although these will have resulted in some reduction in inventory in upcanyon reaches and increases in downcanyon reaches since this investigation began. Estimates of additions of radionuclides from the RLWTF outfall or from erosion from SWMUs or AOCs are also not included, although these are expected to be minor relative to the total watershed inventory in the canyon bottoms.

Table 7.1-1 shows that reach M-3E in Mortandad Canyon upcanyon from the Ten Site Canyon confluence contains the largest amounts of key radionuclides in the watershed, an estimated 50% to 55% of the americium-241, cesium-137, cobalt-60, and plutonium-239,240. Mortandad Canyon between Effluent Canyon and M-3E contains the second largest amounts of these radionuclides, and reach M-4 contains the third largest amounts. Effluent Canyon contains relatively small amounts of all radionuclides because of the small sediment volumes in the steep and narrow canyon below the TA-50 RLWTF outfall. Ten Site Canyon contains an estimated 33% of the plutonium-238, indicating the importance of the accidental releases in 1974 from TA-50 into the head of the canyon but contains relatively low percentages of the remaining radionuclides. Pratt Canyon is notable for strontium-90, containing an estimated 39% of the watershed inventory, although geomorphically Pratt Canyon is not as well characterized as other reaches and has more uncertainty in the strontium-90 inventory. Because sampling in Pratt Canyon was biased to layers with relatively high field radiation measurements, the total strontium-90 inventory is probably overestimated.

Figure 7.1-18 shows the inventory of cesium-137 in Effluent and Mortandad Canyons plotted against distance from the Rio Grande. The cesium-137 inventory in this figure is plotted both as a normalized inventory in each reach per kilometer of channel ([a] units of mCi/km) and as cumulative amounts from the TA-50 RLWTF outfall to reach M-6 adjacent to SR 4 ([b] units of mCi). The cumulative plot extrapolates between sampled reaches. Figure 7.1-18 shows the estimated inventories in coarse and fine facies sediment deposits as well as the total inventory. Cesium-137 was chosen for these plots because it is the most important radionuclide in the watershed from the perspective of potential human health risk, based on a comparison to residential SALs, and because it illustrates the distribution of a key radionuclide downcanyon from the major source area.

Figure 7.1-18 shows that the radionuclide inventory varies considerably between reaches and that essentially the entire inventory is confined to approximately 4 km (2.5 mi) of canyon between the TA-50 RLWTF outfall and reach M-5W. Most of the inventory is contained within fine facies sediment deposits, and an estimated 79% of the cesium-137 in Effluent and Mortandad Canyons is in deposits of fine facies sediment. The most significant area for cesium-137 inventory in Mortandad Canyon is in reach M-3E, 2.1 to 2.7 km (1.3 to 1.7 mi) downcanyon from the outfall. The inventory is relatively high in this reach because of the deposition of large amounts of sediment where the stream gradient decreases and the canyon bottom widens (Figure 7.1-4). Data from a gross-gamma radiation walkover survey clearly show

the general pattern of cesium-137 deposition in M-3E where floodwaters spread over the canyon bottom (Figure 7.1-19).

7.1.1.6 Flood Attenuation and Downcanyon Extent of Radionuclide Contamination

Gaging station records of stream discharge (e.g., Shaull et al. 2005, 92225; Shaull et al. 2006, 93735), observations made during this investigation, and historical records presented in the work plan (LANL 1997, 56835) indicate that floods generated from upper Mortandad Canyon, Effluent Canyon, and Ten Site Canyon significantly attenuate as they move downcanyon, recording transmission losses into the alluvium. For example, from 1997 to 2004, 16 stormwater events occurred with estimated peak discharges exceeding 10 ft^3/s) recorded at gaging station E200 in Mortandad Canyon, 30 m (100 ft) below the Effluent Canyon confluence, and no events of this size recorded at gaging station E202 2.5 km (1.5 mi) downcanyon, near the confluence of Mortandad and Ten Site Canyons (Shaull et al. 2005, 92225, pp. 49, 125). Field observations indicate that stormwater that reaches the west end of reach M-3E near test well TW-8 generally infiltrates into the alluvium completely before arriving at the Mortandad-Ten Site Canyon confluence 0.6 km (0.4 mi.) downcanyon. These observations are consistent with the occurrence of over 50% of the cesium-137 inventory in M-3E (Section 7.1.1.4), recording deposition of most of the historic sediment load as stormwater infiltrates into the alluvium in this reach. In this area, both the canyon bottom and the active channel widen substantially and the channel gradient decreases (Figure 7.1-4 and Table B-1.0-1 [in Appendix B]), which slows stormwater and enhances its ability to infiltrate.

The distribution of cesium-137 and other radionuclides indicates that stormwater that passed the Mortandad-Ten Site Canyon confluence also generally infiltrated into the alluvium within reach M-4, even before excavation of the current sediment traps in 1986 or the original smaller traps in 1976. The canyon bottom does not have a defined channel in M-4C, east of the sediment traps, and stormwater that reached this area historically spread over an area averaging about 60 m (200 ft) in width, further enhancing infiltration and sediment deposition. The estimated cesium-137 inventory in the first 210 m (690 ft) past the sediment traps, in M-4C, is 4 times as high as the inventory in the next 230 m (755 ft), in M-4E (Table D-1.4-2), documenting this deposition of sediment and associated contaminants. The construction of the sediment traps therefore helped enhance a process of infiltration and sediment deposition that was occurring previously.

Since construction of the current sediment traps in 1986, there are only five known occurrences of overflow: June 7, 1987; July 24, 1991; August 6, 1991; August 24, 2005; and August 25, 2006. The downcanyon extent of the 1987 flood is not known, but in 1997 it was reported to be the “largest runoff event in Mortandad Canyon since hydrologic studies began in the canyon in 1960” (LANL 1997, 56835, p. 3-77). In 1991 flow was reported to have extended 200 m (650 ft) past sediment trap #3 (EPG 1993, 23249; LANL 1997, 56835, pp. 3-80, 3-83), and in 2005 flow extended 85 m (280 ft) past the overflow point of sediment trap #3 before infiltrating into the alluvium (Plate 4). The largest flood since initial releases from the TA-50 RLWTF occurred on August 25, 2006, with flow extending to reach M-5E within 65 m (215 ft) of the Laboratory boundary.

Records of earlier flows are sparse, and only one known event has had possible flow to the Laboratory boundary in reach M-5E, in August 1952, when a record 11.2 in. of precipitation was recorded in Los Alamos in 1 month, and flow in this event may have extended to SR 4 below reach M-6 (LANL 1997, 56835, pp. 3-16, 3-81). This was before initial releases from the TA-50 RLWTF in 1963 but after releases began from the TA-35 WWTP into Pratt Canyon in 1951. An additional large runoff event was noted in November 1978, with flow as far east as well MCO-9, between reaches M-4E and M--5W (Purtymun 1994, 52951, pp. 132–135; LANL 1997, 56835, p. 3-77).

Radionuclides display the clearest evidence of contamination in sediment deposits in the Mortandad watershed from Laboratory releases, possessing the highest concentrations relative to BVs or detection limits and the most systematic downcanyon trends. Therefore, radionuclide data provide insight into the downcanyon extent of Laboratory-derived contaminants that have been transported by floods. Five radionuclides have been detected above BVs in sediment downcanyon of reach M-4E (cesium-137, plutonium-238, plutonium-239,240, strontium-90, and uranium-235), and one additional radionuclide without a BV has been detected east of M-4E (cesium-134). None of these radionuclides were identified as COPCs in reach M-6 near SR 4, indicating the absence of recognizable transport of Laboratory-derived contaminants past SR 4.

The eastern identified extent of strontium-90 above the BV is in reach M-5W, although only one sample had a result above the BV (CAMO-04-53299, 1.68 pCi/g, vs. BV of 1.04 pCi/g). The other five radionuclides are COPCs in reach M-5E at the Laboratory boundary, although with generally low detection frequencies and low values above BVs. Cesium-137 was detected in only 1 out of 23 samples slightly above the BV (sample CAMO-00-0033, 0.93 pCi/g vs. BV of 0.9 pCi/g). Plutonium-238 was detected in 2 out of 23 samples above the BV, with a maximum of 0.09 pCi/g (sample CAMO-04-53326, vs. BV of 0.006 pCi/g). Plutonium-239,240 was detected in 8 out of 23 samples above the BV, with a maximum of 0.13 pCi/g (sample CAMO-04-53326, vs. BV of 0.068 pCi/g). Uranium-235 was detected in 1 out of 10 samples above the BV, with a maximum of 0.27 pCi/g (sample CAMO-04-53325, vs. BV of 0.2 pCi/g). Cesium-134, without a BV, was detected in 4 out of 18 samples, with a maximum of 0.1 pCi/g (sample CAMO-04-53325). In summary, the available analytical data indicate possible transport of several radionuclide COPCs as far as reach M-5E but not as far as M-6. The highest values relative to BVs are for plutonium-238 and plutonium-239,240, and the highest detection frequency above BVs is for plutonium-239,240. However, understanding the source of plutonium isotopes is complicated by the inference from regional soil data that plutonium may also be dispersed at levels above BVs by local Laboratory stack emissions and/or by fugitive dust from Laboratory sites (Fresquez et al. 1998, 76063), and the plutonium results in M-5E may or may not record past flood transport.

7.1.1.7 Future Fate and Transport of Radionuclides in Sediment

The concentrations and distribution of radionuclides present in sediment deposits in the Mortandad watershed will continue to change over time as a result of redistribution by floods and radioactive decay, as well as from any additional effluent discharges. Available data show progressive decreases in radionuclide concentration over time, driven largely by decreasing releases from the RLWTF, combined with the effects of mixing of sediment from different sources during transport and radioactive decay for radionuclides with relatively short half-lives such as cesium-137, cobalt-60, and strontium-90. Barring significant increases in the discharge of radionuclides, concentrations can be expected to generally continue declining over time, with a simultaneous downstream redistribution of inventory toward the confluence of Mortandad and Ten Site Canyons. Therefore, the present state of the watershed represents “worst-case” conditions from the perspective of potential future radionuclide contamination.

7.1.2 Inorganic Chemicals in Sediments

Three inorganic chemicals detected in sediments in the Mortandad watershed have maximum concentrations greater than residential SSLs and are most important for assessing potential human health risk: arsenic, chromium, and iron. Additional inorganic chemicals detected in sediment samples are important for assessing potential ecological risk (e.g., copper, cyanide, lead, mercury, perchlorate, thallium, vanadium, and zinc), for understanding relations between COPCs in water and sediment (e.g., lead, manganese, perchlorate, and selenium), or for understanding potential off-site transport onto San Ildefonso Pueblo land (e.g., copper cyanide, and selenium). The spatial distribution of these

inorganic chemicals (discussed below) indicates that they are derived from a variety of sources, including Laboratory SWMUs or AOCs, roads and other developed areas, and naturally occurring soils and bedrock. Once in the canyon bottoms, most of these inorganic chemicals adsorb to sediment particles and organic matter, and their subsequent fate is expected to be similar to that of radionuclides discussed in Section 7.1.1. However, inorganic chemicals derived from runoff from developed areas or from erosion of natural soils in the watershed differ from radionuclides in that these chemicals will not show the same decreases over time, and the concentrations of constituents derived from runoff from developed areas may actually increase over time.

This section focuses on spatial variations in inorganic chemicals in the Mortandad watershed. Supporting information is included in Appendix D. Table D-1.7-1 presents average concentrations in each reach for inorganic chemicals that are discussed in this section, substituting one-half of the detection limit for nondetected sample results. Averages presented here are weighted by the volume of sediment in each geomorphic unit in each reach, as discussed in Section D-1.3. Table D-1.7-1 presents the upper and lower bounds on these averages using either the detection limit or zero for nondetects, respectively, which indicate uncertainties in the average values. This table shows that on average, concentrations of these inorganic chemicals are generally lower in coarse facies sediment than in fine facies sediment, and Figure 7.1-20 and the discussions in the following sections focus on data from fine facies sediment. Figure 7.1-16 and Table D-1.7-1 also indicate that considerable uncertainty in the average concentration of some inorganic chemicals exists in some reaches because of elevated detection limits and/or detected concentrations close to detection limits, such as selenium and thallium.

The plots in Figure 7.1-20 include both the BV for each inorganic chemical, which is an estimate of the upper level of background concentrations, and the average value from the background sediment data set, where available (averages from McDonald et al. 2004, 76084, Table 10, p. 49–50). The background averages are included to be consistent with the presentation of averages from potentially contaminated samples. The spatial distribution of inorganic chemicals indicates that several TAs have been important Laboratory sources for these constituents in the Mortandad watershed, as discussed below.

Average concentrations of arsenic in fine facies sediment are greater than the sediment BV in two reaches, E-1FW and M-1E, both downgradient from TA-48 SWMUs or AOCs (Figure 7.1-20), indicating a source at this TA. Decreasing concentrations are present downcanyon from these reaches, and arsenic concentrations are similar to background averages east of M-2W in Mortandad Canyon. Average arsenic concentrations in M-1W and TS-2E are also above background averages but below the BV, indicating possible sources in TA-03 and from the TA-35 sand filter-bed outfall (AOC C-35-007).

Chromium data indicate a clear source at TA-48, with maximum concentrations in the Mortandad watershed in reach E-1FW, at the head of Effluent Canyon, and decreasing concentrations downcanyon. These data are consistent with known usage of potassium dichromate as a corrosion inhibitor in cooling towers at TA-48, as discussed in Section 7.2.2.1. Average chromium concentrations in fine facies sediment in E-1FW are roughly 100 times greater than in the next highest reach, E-1E, and average concentrations are the same as background averages by the Mortandad-Ten Site Canyon confluence (reach M-4W), 3.3 km (2.0 mi) downcanyon (Figure 7.1-20). Data from M-1C and M-1E, where average concentrations are greater than the BV, indicate one or more additional sources from TA-03 and possibly TA-48 into Mortandad Canyon. An additional minor source is suggested at the TA-35 sand filter-bed outfall by data from TS-2E where average concentrations of chromium are greater than the background average and close to the BV. Analyses of seven samples from E-1FW and E-1W indicate that the chromium in sediment is dominated by trivalent chromium (chromium[III]), with <0.4% hexavalent chromium (chromium[V1]). This contrasts with data from groundwater that indicate a dominance of

chromium(VI) in that media and is consistent with chemical reduction of chromium associated with the presence of organic carbon in sediments (Section 7.2.2.1).

Chromium is an important contaminant in the regional groundwater system beneath Mortandad Canyon (Section 7.2.2.1; LANL 2006, 91987), and the inventory of chromium present in sediment deposits in the Mortandad watershed as a result of Laboratory operations was estimated to allow comparison with the estimated amount released into the adjacent watershed of Sandia Canyon. The inventory estimates are presented in Table D-1.8-1 of Appendix D and indicate that about 75% of the anthropogenically added chromium in the watershed (subtracting background concentrations) is within Effluent Canyon, almost all above the TA-50 RLWTF outfall, and an additional 12% is within Mortandad Canyon downcanyon of the Effluent Canyon confluence. Most of the chromium associated with sediment has therefore been retained within sediment deposits near the source, with relatively small amounts transported farther downcanyon. The chromium inventory between the main source at TA-48 and SR 4 (reach M-6) is shown graphically in Figure 7-1-21. The inventory estimate indicates that an additional 11% of the watershed inventory is within Mortandad Canyon upcanyon from Effluent Canyon, and only about 1% is in Ten Site Canyon (Table D-1.8-1). About 60% of the estimated inventory is contained within fine facies sediment deposits, and 40% is contained in coarse facies deposits. The total estimated mass of anthropogenically-added chromium in sediment deposits in the Mortandad watershed is about 195 kg (430 lb) (Table D-1.8-1), which is <1% of the amount reported to have been released into Sandia Canyon (an average of 35.9 lb/d from 1950 to the mid-1970s or >100,000 lb; LANL 2006, 91987, p. 3).

A comparison of chromium concentrations with particle-size data indicates that the highest concentrations are in samples with high silt and clay content in reach E-1FW, indicating an affinity for fine-grained sediment particles, as seen with radionuclides (Figure 7.1-22). However, the highest concentration downcanyon in E-1W is in a sample of coarse facies sediment with relatively low silt and clay content. The high concentration in a coarse sediment sample in E-1W is interpreted to represent streambed sediment that was in direct contact with chromium-bearing effluent, as discussed for cesium-137 in M-2W in Section 7.1.1-5.

Chromium analyses obtained from the active channel between the TA-50 RLWTF outfall and the sediment traps in 1979 (Ferenbaugh and Gladney 1997, 93715) provide insights into both temporal and spatial trends in chromium concentration in Effluent and Mortandad Canyons. Figure 7.1-23 plots chromium results from 1979 as a function of distance from the RLWTF outfall and also shows average values from environmental surveillance samples (1992–2005) and active channel samples from the reach investigations (1998–2005). The 1979 data indicate much higher concentrations than at present and a progressive downcanyon decrease in concentrations, attaining present-day concentrations (below the background average) in reach M-3. The data indicate that chromium was being actively released into Effluent Canyon in 1979 or earlier and that by the early 1990s, little chromium was remaining in the active channel of Effluent or Mortandad Canyons downcanyon from the RLWTF outfall.

As with chromium, copper data indicate a clear source at TA-48, with maximum concentrations in the Mortandad watershed in reach E-1FW, and decreasing concentrations downcanyon. Average copper concentrations in fine facies sediment in E-1FW are roughly 5 times greater than in the next highest reach, E-1E, and remain above background averages through M-4 (Figure 7.1-20). Copper is not a COPC farther downcanyon. The spatial distribution of copper indicates additional sources into Ten Site Canyon from TA-35, with a local maximum in reach TS-2C below the outfalls from the TA-35 wastewater lagoons. Copper is not a COPC in TS-1W but is in TS-1C and downcanyon, indicating one or more sources at other TA-35 SWMUs or AOCs. Additional sources of copper into the upper part of Mortandad Canyon from TA-03 and TA-48 are indicated by average concentrations in fine facies sediment that exceed the background average in reaches M-1W and M-1E. The M-1W data may indicate a source from

road runoff, as copper is reported to be a common contaminant associated with vehicles (Breault and Granato 2000, pp. 48–49).

Cyanide has a maximum concentration in sediment samples in reach MCW-2W, on San Ildefonso Pueblo land below TA-05 SWMUs or AOCs. This was the only detected result above the BV (1.37 mg/kg in sample CAMO-03-49844, vs. BV of 0.82 mg/kg), and additional samples were collected in 2005 to see if this result could be confirmed. Resampling of that location and additional samples from two nearby locations in the same geomorphic unit yielded results below the BV (0.14 to 0.19 mg/kg, samples CAMO-05-63588, CAMO-05-63608, and CAMO-05-63609). There is therefore no evidence of cyanide from Laboratory SWMUs or AOCs impacting sediments in the Mortandad watershed.

Iron data suggest releases from the same sources as for arsenic and chromium, although average concentrations are generally within the background range and background variations at least partially affect the results. Only one reach, M-1E, has average concentrations in fine facies sediment slightly greater than the BV, indicating collocation with arsenic and chromium (Figure 7.1-20). Average concentrations in E-1FW and TS-2E are above background averages and suggest additional sources into the head of Effluent Canyon and into Ten Site Canyon, although average concentrations of iron are also greater than background averages in M-5W, downcanyon from significant Laboratory-derived contamination. The M-5W iron results above the BV are interpreted to represent a locally elevated background, as also found in Cañada del Buey, the next canyon to the south (Drakos et al. 2000, 68739).

Lead data indicate multiple sources in the upper parts of Effluent, Mortandad, and Ten Site Canyons. The average concentrations of lead in fine facies sediment are above the sediment BV in reaches E-1FW, M-1C, and M-1E and close to the BV in M-1W and TS-1C (Figure 7.1-20). Lead concentrations decrease downcanyon from these areas, and lead is not identified as a COPC downcanyon from M-4E. Lead is a common contaminant found below roads and other developed areas, and one source is leaded gasoline (Walker et al. 1999, 82308, p. 364; Breault and Granato 2000, 82310, p. 48; Callender and Rice 2000, 82307, p. 232). The distribution of lead in the Mortandad watershed suggests runoff from developed areas is one source, although releases from Laboratory SWMUs or AOCs is also possible, particularly from sites like TA-48 where the sediment data indicate releases of other metals (e.g., arsenic, chromium, copper, mercury, and vanadium).

Manganese data suggest releases from one or more sources in the Mortandad watershed, although background variability appears to be responsible for at least some of the results above the BV. Average manganese concentrations in fine facies sediment are greater than the BV in reaches M-1E and E-1W (Figure 7.1-20), suggesting releases from TA-48 and possibly TA-55. These are also reaches with relatively high concentrations of manganese in surface water (Section 7.2.2.1). Manganese is also elevated relative to background averages in E-1FW, E-1E, and TS-3. Although the elevated concentrations in E-1FW and E-1E suggest releases from one or more outfalls into Effluent Canyon, the TS-3 results apparently record background variations because manganese is not a COPC in the TS-2 reaches, closer to potential contaminant sources.

Mercury data indicate multiple sources in the Mortandad watershed, with the TA-50 RLWTF outfall into Effluent Canyon reach E-1E and the TA-35 sand filter-bed outfall into Ten Site Canyon reach TS-2E being most important (Figure 7.1-20). These two reaches and reaches M-2W and M-2E in Mortandad Canyon downcanyon from Effluent Canyon have average mercury concentrations in fine-grained sediment deposits greater than the BV, and several other reaches have averages greater than the background average, including E-1FW, M-1W, M-1E, and TS-2C. Data from these reaches indicate additional sources of mercury at TA-03, TA-35, and TA-48. Concentrations generally decrease downcanyon, and mercury was not identified as a COPC east of M-4.

Perchlorate data from sediment are relatively sparse but indicate a recognizable source at the TA-50 RLWTF outfall into reach E-1E, consistent with effluent discharge records, and transport downcanyon into M-4 (Figure 7.1-20). Perchlorate was not detected in Effluent Canyon upcanyon from the RLWTF outfall or in Ten Site Canyon but was detected in every reach between the RLWTF outfall and the east end of M-4. The absence of detected perchlorate in sediment in Ten Site Canyon contrasts with its detection in a borehole in Pratt Canyon, as discussed in Section 7.2.2.1, that indicates releases from the former TA-35 WWTP. Perchlorate concentrations in sediment in the Mortandad watershed are low, with a maximum measured concentration of 0.959 mg/kg in reach M-2W (sample CAMO-01-0072). Average concentrations suggest a secondary peak in reach M-4E (Figure 7.1-20), although this is not considered to be reliable because of the low sample numbers and high frequency of nondetects (67% nondetects between the RLWTF outfall and the east end of M-4). The low-detection frequency and low concentrations in sediment samples are consistent with the high solubility of perchlorate and indicate a relatively small inventory in the near-surface sediment deposits in Mortandad Canyon.

Selenium is a COPC that exceeds the wSAL in stormwater in the Mortandad watershed and that NMED has requested be included in biota evaluations (NMED 2005, 92084). Selenium has been identified as a COPC in sediment in all reaches in the watershed except one (M-5W) and has detected results greater than the sediment BV of 0.3 mg/kg in most of the other reaches (except M-6, MCW-2N, and TS-1W, where nondetect values exceed the BV). Understanding the sources and distribution of selenium in the Mortandad watershed is complicated by elevated detection limits in many samples and by local background concentrations that appear to be greater than the BV. Selenium detection limits as high as 11.5 mg/kg have been provided by analytical laboratories for sediment samples from the Mortandad watershed, which results in large uncertainties in estimates of average concentrations, as shown in Figure 7.1-20. Elevated background levels are indicated by data from units with little or no evidence of Laboratory contamination, such as five samples from the area designated as f2?(Qt?) in reach M-4E. Selenium concentrations from this geomorphic unit average 0.37 mg/kg and range from 0.26 to 0.51 mg/kg. Data from the adjacent watershed of Cañada del Buey also indicate an elevated local background for selenium, and sediment from drainages with no upgradient SWMUs or AOCs has yielded selenium results as high as 1.2 mg/kg (Drakos et al. 2000, 68739). These data indicate local background concentrations of selenium significantly above the BV of 0.3 mg/kg and at least as high as 1.2 mg/kg. Review of the maximum detected selenium concentrations shows that they are geographically dispersed and do not indicate a clear Laboratory source, contrasting with the distribution of other inorganic chemicals discussed in this section. For example, the four detected selenium results that exceed 1 mg/kg (range of 1.1 to 1.6 mg/kg) were obtained from four different reaches (E-1E, M-1E, TS-1E, and TS-2C). Therefore, although selenium data indicate the possibility of releases from Laboratory SWMUs or AOCs, if releases occurred, they were apparently small in relation to local background levels; natural background variations may account for much or all of the elevated selenium results.

Thallium is a potentially important COPC for evaluating ecological risk, as discussed in Section 8.1. Thallium data suggest relatively small releases into Effluent Canyon from the TA-50 RLWTF and rapid downcanyon attenuation. Only five detected thallium results are above the BV of 0.73 mg/kg: three in reach E-1E and two in M-2W. In both reaches, the average thallium concentration in fine facies sediment is above the background average but well below the BV (Figure 7.1-20). Thallium is a COPC in only three other reaches (M-5E, TS-1W, and TS-1C) and only because detection limits for some samples are greater than the BV.

Vanadium is a potentially important COPC for evaluating ecological risk, as discussed in Section 8.1, and vanadium data indicate releases from multiple Laboratory sources. The average concentrations of vanadium in fine facies sediment are greater than the BV in reaches M-1E and E-1FW (Figure 7.1-20), both downcanyon from outfalls at TA-48 and indicating releases from this site into Mortandad Canyon and

into the head of Effluent Canyon. Concentrations attenuate rapidly downcanyon from these reaches, and vanadium is not a COPC in either E-1E or M-2W. Vanadium concentrations are also elevated in Ten Site Canyon, with average concentrations being close to the BV in reach TS-2E, downcanyon from the TA-35 sand filter-bed outfall. Elevated concentrations in TS-1W, TS-1C, and TS-2W suggest additional sources into Ten Site Canyon from TA-50 and TA-35.

Zinc is a potentially important COPC for evaluating ecological risk, as discussed in Section 8.1, and zinc data indicate multiple sources in the Mortandad watershed. The highest average zinc concentrations in fine facies sediment are in reach M-1W at the head of Mortandad Canyon, and zinc concentrations progressively decrease downcanyon (Figure 7.1-20). Reach M-1W receives runoff from large areas of paved roads and parking lots, and zinc is commonly found in urban runoff; one important source for zinc is tire-wear particulates (Walker et al. 1999, 82308, p. 364; Breault and Granato 2000, 82310, p. 49; Callender and Rice 2000, 82307, p. 232). Similarly, the highest average concentrations of zinc in the Los Alamos and Pueblo watershed were found in the upper parts of Acid and DP Canyons, which also receive runoff from large paved areas (LANL 2004, 87390, p. 7-14). The average concentration of zinc in M-1W, about 85 mg/kg, is less than that found in reaches in upper Acid and DP Canyons, 100-130 mg/kg. A secondary maximum for zinc occurs in reach E-1FW at the head of Effluent Canyon, indicating a source in runoff from developed areas at TA-48 and/or releases from outfalls. In comparison to upper Mortandad and Effluent Canyons, Ten Site Canyon has lower levels of zinc in relation to background levels, with average concentrations in fine facies sediment being greater than the background average but less than the BV (Figure 7.1-20).

In summary, the sediment data indicate that inorganic chemicals in the Mortandad watershed have multiple sources, including Laboratory SWMUs or AOCs, runoff from developed areas, and naturally occurring soils. TA-48 is apparently the most important source for several metals, including arsenic, chromium, copper, vanadium, and possibly iron, and included releases into Mortandad Canyon and particularly into the head of Effluent Canyon. The TA-50 RLWTF outfall into Effluent Canyon is the most important source for mercury, perchlorate, and possibly thallium. The former sand filter-bed outfall from TA-35 into Ten Site Canyon is apparently a secondary source for several metals, such as arsenic, chromium, mercury, and vanadium. Runoff from developed areas is apparently the most important source of zinc and possibly lead. Some of the variations in concentrations of inorganic chemicals are also attributable to background variations, such as iron in reach M-5W and perhaps elsewhere and selenium in many reaches. Concentrations generally decrease downcanyon from the sources, and in some cases the contaminants are largely contained in sediment deposits near the sources, such as chromium in the upper part of Effluent Canyon. Remobilization of these chemicals by erosion will result in a progressive downcanyon shift of the inventory and accompanying decreases in concentrations, as discussed for radionuclides.

7.1.3 Organic Chemicals in Sediments

Two organic chemicals detected in sediments in the Mortandad watershed have maximum results greater than residential SSLs and are more important for assessing potential human health risk: the PCB Aroclor-1264 and the PAH benzo(a)pyrene. Additional organic chemicals detected in sediment samples are important for assessing potential ecological risk (e.g., bis(2-ethylhexyl)phthalate, di-n-butylphthalate, DDT[4,4-], and endrin aldehyde), for understanding relations between COPCs in water and sediment (e.g., bis(2-ethylhexyl)phthalate), or for understanding potential off-site transport onto San Ildefonso Pueblo land (e.g., acenaphthene, acetone, and bis(2-ethylhexyl)phthalate). These organic chemicals are derived from a variety of sources, including Laboratory SWMUs or AOCs and runoff from roads and other developed areas, as indicated by their spatial distribution (discussed below). Once in the canyon bottoms, most of these organic chemicals will adsorb to sediment particles and organic matter, and their

subsequent fate and transport by fluvial processes are expected to be similar to that for the radionuclides, which were discussed in detail in Section 7.1. Similar to some of the radionuclides, the organic chemicals discussed here have relatively short environmental half-lives associated with biodegradation and/or volatilization in the environment. Therefore, the concentrations will decrease over time unless contaminants are added to the canyon bottoms (such as from road runoff). However, the degradation rates are not well constrained and will vary with local environmental conditions.

This section focuses on spatial variations in organic chemicals in the Mortandad watershed, and supporting information is included in Appendix D. Table D-1.7-2 presents average concentrations in each reach for organic chemicals that are discussed in this section, substituting one-half of the detection limit for nondetected sample results. Table D-1.7-2 also presents the upper and lower bounds on these averages, using either the detection limit or zero for nondetects, respectively. This table indicates that on average, concentrations of these organic chemicals are lower in coarse than in fine facies sediment, and the discussions and figures in the following sections focus on data from fine facies sediment. Table D-1.7-2 also indicates that considerable uncertainty exists in the average concentration of organic chemicals in some reaches because of elevated detection limits.

7.1.3.1 PCBs

PCBs have low solubilities and a strong affinity for organic material and sediment particles (Chou and Griffin 1986, 83419). PCBs were widely used in electric transformers and other industrial applications (e.g., Walker et al. 1999, 82308, pp. 364–365), and their wide use is consistent with their spatial distribution in sediments in the Mortandad watershed. Figure 7.1-24 presents average concentrations of Aroclor-1260 and Aroclor-1254 in fine facies sediment in the Mortandad watershed, substituting one-half of the detection limit for nondetected sample results and showing upper and lower bounds on these averages. These data indicate that PCBs come from multiple sources in the watershed and that concentrations generally decrease downcanyon from these sources, as discussed below.

Aroclor-1260 has been detected in almost every reach in Effluent and Ten Site Canyons and in Mortandad Canyon as far east as M-4 but not farther downcanyon or in the unnamed tributary canyon that heads in TA-05. Aroclor-1260 has the highest average concentrations in reaches TS-1W and TS-1C, indicating one or more sources from TA-50 and possibly TA-35 into the upper part of Ten Site Canyon (Figure 7.1-24). These are also the only reaches with maximum concentrations above residential SSLs (1.37 and 1.3 mg/kg vs. an SSL of 1.12 mg/kg). Average concentrations of Aroclor-1260 decrease rapidly downcanyon in Ten Site Canyon. The data indicate additional sources into Effluent and Mortandad Canyons but at lower levels than in Ten Site Canyon.

Aroclor-1254 has a lower frequency of detection and was detected at lower concentrations and in fewer reaches than Aroclor-1260. The spatial distribution of Aroclor-1254 is somewhat different than for Aroclor-1260. Aroclor-1254 has the highest average concentrations in reach E-1FW (Figure 7.1-24), indicating the most important source for this PCB is TA-48, and concentrations decrease rapidly downcanyon in Effluent Canyon. Additional minor sources are indicated in upper Ten Site Canyon above reach TS-1W.

7.1.3.2 PAHs

PAHs have a range of chemical properties with some being less volatile and less soluble, and these chemicals are more likely to become adsorbed to and persist in sediments (Neff 1979, 83420). Some PAHs, such as naphthalene, are relatively volatile and should have the lowest affinity for sediments, whereas others, such as benzo(a)pyrene, are less volatile and less soluble and have a stronger affinity

for sediments. The different PAHs also have somewhat different spatial distributions in the Mortandad watershed, indicating different sources, as discussed below. Considerable uncertainty exists in the average concentrations of PAHs in some reaches because of elevated detection limits in data obtained from the SVOC analytical suite (method SW-846:8270C), although detection limits and associated uncertainties are lower in reaches with data obtained from the PAH analytical suite (method SW-846:8310).

Benzo(a)pyrene is the only PAH in the Mortandad watershed with concentrations above residential SSLs and has been detected in most reaches in Effluent and Ten Site Canyons and in Mortandad Canyon as far east as M-4 but not farther downcanyon or in the unnamed tributary canyon that heads in TA-05. Benzo(a)pyrene has the highest average concentrations at the head of Mortandad Canyon in reach M-1W, downcanyon from large paved areas and a major road in TA-03 (Diamond Drive) (Figure 7.1-25), consistent with a primary source in runoff from developed areas. Drainage from tar roofs is another possible source of benzo(a)pyrene and other PAHs in runoff from developed areas. A clear association between benzo(a)pyrene and runoff from developed areas was also seen in the Los Alamos and Pueblo watersheds (LANL 2004, 87390, p. 7-16), where average concentrations are up to several times higher than in the Mortandad watershed (the average concentration in fine facies sediment in reach AC-1 at the head of Acid Canyon is approximately 2.3 mg/kg, compared with approximately 0.7 mg/kg in M-1W). Benzo(a)pyrene is also notably elevated in reaches TS-1C and TS-1E in upper Ten Site Canyon (average of approximately 0.5 mg/kg, Figure 7.1-19), indicating a source from developed areas at TA-35 and/or TA-50. Lower concentrations are present in Effluent Canyon (average of approximately 0.2 mg/kg, Figure 7.1-19) and farther downcanyon in Mortandad Canyon.

Acenaphthene is the only PAH detected east of reach M-4, in reach M-5E, and the maximum detected concentration in the Mortandad watershed is also in M-5E (1.8 mg/kg). The apparent spatial distribution of acenaphthene is very irregular (Fig. 7.1-25), and the apparently elevated concentrations in M-5E are not considered reliable because of the absence of other evidence for significant transport of other contaminants this far downcanyon (Section 7.1.1.6). In addition, the elevated concentrations of acenaphthene in M-5E were obtained from the SVOC analytical method in 2000, and subsequent sampling in 2004 using the PAH method, with lower detection limits (0.025 mg/kg), did not provide any detected results. Interpretation of the acenaphthene results in upcanyon reaches is complicated by elevated detection limits and a high frequency of nondetects in many reaches, although the elevated results in M-1C are considered reliable because they were obtained with the PAH method, and the M-1C data had a relatively high-detection frequency (50%). These data therefore indicate a source for acenaphthene in upper Mortandad Canyon, such as runoff from developed areas as inferred for benzo(a)pyrene, and perhaps other less important sources in Effluent and Ten Site Canyons (Figure 7.1-25).

7.1.3.3 Other SVOCs

Besides PAHs, several other SVOCs are important in the Mortandad watershed for assessing potential human health or ecological risk, understanding sources of COPCs in water, or assessing potential transport off-site onto San Ildefonso Pueblo land. Sources and average concentrations of these SVOCs are typically uncertain, as discussed below.

Bis(2-ethylhexyl)phthalate was identified by ECORSK9 modeling as being the most important COPEC for the Mexican spotted owl, a T&E species (Gonzales et al. 2006, 93786). This SVOC also exceeds drinking water standards and has been detected in sediment samples collected on San Ildefonso Pueblo land. As shown in Figure 7.1-26, bis(2-ethylhexyl)phthalate displays no clear spatial trends in fine facies sediment, and the estimated average concentrations have much uncertainty associated with high frequencies of

nondetects (82% in sediment samples in the watershed) and with detection limits that are similar to reported detected values. Anomalies in the data set also indicate many of the detected values are suspect and/or do not represent releases from Laboratory SWMUs or AOCs. For example, five out of nine samples from reach M-6 are reported as detects, and the estimated average concentration here is similar to in upcanyon reaches closer to potential sources (Figure 7.1-26), but there are no detects in the next two upcanyon reaches (M-5W and M-5E) and no evidence for transport of other COPCs as far downcanyon as M-6. EPA has identified bis(2-ethylhexyl)phthalate as a common laboratory contaminant (EPA 1989, 8021, p. 5-16), which may explain some of the results. Therefore, although the available bis(2-ethylhexyl)phthalate data indicate the possibility of releases from SWMUs or AOCs, because of uncertainties in the data set, no sources can be clearly identified, and concentrations in sediment in the watershed are poorly constrained.

Di-n-butylphthalate was identified by ECORSK9 modeling as being the most important COPEC for the western bluebird and southwestern willow flycatcher, a T&E species (Gonzales et al. 2006, 93786). This SVOC has a high frequency of nondetects in sediment samples from the Mortandad watershed (99.5% nondetects) and was detected only in three reaches (MCW-2N, TS-1W, and TS-1C). As with bis(2-ethylhexyl)phthalate, di-n-butylphthalate displays no clear spatial trends in fine facies sediment (Figure 7.1-26), and the estimated average concentrations have much uncertainty associated both with the low detection frequency and detection limits that are similar to reported detected values. EPA has also identified di-n-butylphthalate as a common laboratory contaminant (EPA 1989, 8021, p. 5-16). Therefore, although the available di-n-butylphthalate data indicate the possibility of releases from SWMUs or AOCs, because of uncertainties in the data set no sources can be clearly identified, and concentrations in sediment in the watershed are poorly constrained. It is possible that the detected values at least in part reflect artifacts of the laboratory analyses (e.g., false positives).

7.1.3.4 Pesticides

Several pesticides in sediments have been identified as potentially important in assessing ecological risk in the Mortandad watershed. These organic chemicals have low solubilities and a strong affinity for organic material and sediment particles (Pionke and Chesters 1973, 83423; Nowell et al. 1999, 83422). The spatial distribution of pesticides in sediments in the Mortandad watershed indicates that these analytes have multiple sources at the Laboratory, which is consistent with their expected dispersed use in pest-control efforts. However, understanding their spatial distribution and sources is in part complicated by a high frequency of nondetects and detected concentrations close to detection limits. As two examples, Figure 7.1-27 presents average concentrations of DDT and endrin aldehyde in fine facies sediment in the reaches, substituting one-half of the detection limit for nondetected sample results and showing upper and lower bounds on these averages.

DDT is the pesticide with the highest aquatic HQ in the Mortandad watershed. It was detected at low concentrations in many reaches, although it has a relatively low detection frequency in the watershed (84% nondetects). The data suggest that the highest concentrations are in Mortandad Canyon from Effluent Canyon to reach M-3W, although much uncertainty is present associated with the influence of nondetects (Figure 7.1-27). Ten Site Canyon has detects only in reach TS-3 and not in upcanyon reaches closer to sources, indicating the apparent spatial patterns may not be reliable. Effluent Canyon reach E-1FW also has no detects of DDT, although downcanyon reaches do.

Endrin aldehyde is the pesticide with the highest terrestrial HQ in the Mortandad watershed. Endrin aldehyde has a low frequency of detection in sediment samples in the Mortandad watershed (97% nondetects) and was detected only in reaches E-1E, M-1C, M-2W, and M-3. Sources for endrin aldehyde are uncertain, and its spatial distribution does not display clear trends, showing the highest

concentrations in reaches M-2W and M-3 (Figure 7.1-27). Average concentrations are also uncertain because of detected values that are similar to the detection limits.

7.1.3.5 VOCs

VOCs have been detected in many reaches within the Mortandad watershed at low concentrations, but their spatial distribution is irregular and it is not certain to what degree the reported detects represent releases from SWMUs or AOCs or instead artifacts of the analyses (e.g., false positives). Detects in downcanyon reaches (M-5W and M-5E), at similar or greater concentrations than in upcanyon reaches closer to potential sources, indicate that at least some of these results do not represent releases from the Laboratory. Examples are discussed below for acetone, benzene, and methylene chloride.

Acetone has been detected in most reaches within the Mortandad watershed, with the highest average concentrations in fine facies sediment in M-1E and E-1FW below TA-48, suggesting releases from this TA (Figure 7.1-28). Acetone data also suggest releases from one or more sites into Ten Site Canyon, with estimated highest average concentrations in TS-1C and TS-2E. However, acetone concentrations are also relatively high in M-5W and M-5E, and it seems unlikely that the M-5W and M-5E data represent transport of acetone from Laboratory sites because these reaches are downcanyon of significant transport of radionuclide COPCs (Section 7.1.1.6). EPA has identified acetone as a common laboratory contaminant (EPA 1989, 8021, p. 5-16), and some of the results may represent false positives.

Benzene has also been detected downcanyon in M-5E in a single sample (CAMO-04-53325, 0.0006 mg/kg), at a concentration similar to in upcanyon reaches closer to potential sources. Of the nine detects in sediment samples from the Mortandad watershed (4% detection frequency), six are from Ten Site Canyon, with a maximum from TS-2E (CAMO-04-53394, 0.0008 mg/kg). The benzene data therefore indicate possible releases from Laboratory sites into Ten Site Canyon, although the detect in M-5E indicates that at least some of the data represent artifacts of the laboratory analyses.

Methylene chloride has been detected in five reaches in the Mortandad watershed (M-3, M-4, M-5W, M-5E, and TS-1C), and the maximum concentrations and the highest frequency of detects are in reaches M-5W and M-5E (Figure 7.1-28). Other reaches closer to potential sources have only single detects, at lower concentrations. The apparent spatial distribution of methylene chloride is therefore inconsistent with releases from Laboratory sites and subsequent downcanyon transport by floods. EPA has identified methylene chloride as a common laboratory contaminant (EPA 1989, 8021, p. 5-16), and these data largely or entirely represent artifacts of the laboratory analyses.

7.2 Conceptual Models for Hydrology and Contaminant Transport in Groundwater

The hydrology of the Mortandad watershed is described in Section 7.2.1 and includes surface water, alluvial groundwater, pore water in the upper vadose zone, intermediate-perched water, and regional groundwater. Contaminant distributions and transport processes are described in Sections 7.2.2 and summarized in Section 7.3.

7.2.1 Watershed Hydrology

The Mortandad watershed heads in the central part of the Pajarito Plateau in TA-03 and extends east southeast for 15.8 km (9.8 mi) to the Rio Grande (Plate 1). The watershed has a catchment area of about 15.5 km^2 (6 mi^2), which is relatively small compared with larger watersheds that head in the mountains, such as the Los Alamos and Pueblo Canyons watershed. The Mortandad watershed has no naturally perennial reaches. As a result, the surface water, alluvial groundwater, unsaturated zone and

intermediate-perched zone hydrology of the Mortandad watershed is largely controlled by the location and discharge volumes of anthropogenic water sources and by runoff from developed (e.g., paved) Laboratory technical areas. The subsequent distribution of surface water, sediments, groundwater, and contaminants is strongly influenced by the canyon geology and topography.

The Mortandad drainage heads entirely within the upper units of the Tshirege Member of the Bandelier Tuff. From its headwaters, the stream channel drops about 300 m (1000 ft) over a 13-km (8-mi) passage to the bluffs above White Rock Canyon, with an additional 245-m (800-ft) drop in elevation along the last ~3 km (~1.8 mi) of steep channel to the Rio Grande. Along the 13-km (8-mi) segment of shallower gradient, the stream channel cuts progressively down section through the Tshirege Member of the Bandelier Tuff, Cerro Toledo deposits, the Otowi Member of the Bandelier Tuff, and perhaps some minor amounts of Puye Formation fanglomerate that wedge out eastward on top of Cerros del Rio lava flows. The steep channel near the Rio Grande cuts through resistant Cerros del Rio lavas capping poorly consolidated stream gravels (Totavi Lentil) and Santa Fe Group sediments. These relations are illustrated in the conceptual hydrogeologic cross section in Figure 7.0-1.

For the purposes of the following hydrologic discussion, the Mortandad Canyon watershed on Laboratory property is subdivided into five canyon segments based on their hydrogeologic characteristics. The locations of these hydrologic segments are shown in Figure 7.2-1. These five segments include the

- Upper Mortandad Canyon hydrologic segment extending from the headwaters near Diamond Drive to the confluence with Effluent Canyon,
- Effluent Canyon hydrologic segment extending from the headwaters of Effluent Canyon to the confluence with Mortandad Canyon,
- Middle Mortandad Canyon hydrologic segment extending from the confluence with Effluent Canyon to the confluence with Ten Site Canyon,
- Ten Site Canyon hydrologic segment extending from the headwaters of Ten Site Canyon to the confluence with Mortandad Canyon, and
- Lower Mortandad Canyon hydrologic segment property extending from the confluence of Ten Site Canyon to the eastern Laboratory boundary.

7.2.1.1 Surface Water Hydrology

The conceptual model for surface water hydrology is based on gaging station data, outfall discharge records, and visual observations. Figure 7.2-1 shows the locations and modes of surface water occurrences throughout the watershed and the current locations of Laboratory NPDES outfalls and surface water gages. Canyon reaches defined for sediment sampling and their designations are also shown since they provided the basis for documenting visual observations of surface water occurrence.

The primary sources of surface water in the Mortandad watershed, aside from seasonal runoff and snowmelt, are currently five NPDES outfalls (Figure 7.2-1):

- TA-03-29, CMR Building (NPDES outfall EPA03A-021)
- TA-03-2274, Sigma Building (NPDES outfall EPA03A-022)
- TA-55-6, Plutonium Facility Complex (NPDES outfall EPA03A-181)
- TA-50-1, Radioactive Liquid Waste Treatment Facility (NPDES outfall 051)
- TA-35-124, Large Generator (NPDES outfall EPA03A-160)

The TA-03 outfalls consist of treated water associated with cooling at the CMR and Sigma Buildings and provide seasonal, intermittent discharges (generally April or May through October) to the upper Mortandad Canyon hydrologic segment above reach M-1W. The TA-55 outfall provides intermittent discharge of treated cooling water to upper Effluent Canyon above reach E1-W. Historically, each outfall discharged about 38 L/min ($6.3x10^{-4}$ m^3/s) (LANL1997, 57236), but discharges are discontinuous, variable, and seasonal. The TA-50 outfall consists of treated effluent discharges from the RLWTF into reach E-1E. Since 1997, the RLWTF discharges have averaged approximately 37.4 cubic meters per day (m^3/d). However, these discharges have decreased significantly in recent years from an average 63.7 m^3/d L/d in 1998 to an average 17.3 m^3/d in 2006 (through September 4, 2006). The TA-35 outfall discharges cooling tower blowdown associated with a large generator to Ten Site Canyon above reach TS-1W. These outfalls combined provide a significant component of surface water flow in the watershed beyond that produced by naturally occurring runoff and snowmelt. Annual discharge totals for the Mortandad outfalls from 2004 to 2005 are shown in Table 7.2-1 (LANL 2004, 94068; LANL 2005, 94073).

A total of five streamflow gaging stations are operated within the Mortandad watershed (Figure 7.2-1), from which data are regularly reported (Shaull et al. 2005, 92225; Shaull et al. 2006, 93735). Gage E200 is located in the uppermost portion of the middle Mortandad Canyon hydrologic segment approximately 30 m (100 ft) below the confluence of Effluent Canyon and 230 m (755 ft) below the TA-50 RLWTF outfall. This gage records the sum of natural runoff plus RLWTF effluent and TA-55 outfall discharges. Gage E202 is located at the boundary between the middle and lower Mortandad Canyon hydrologic segments upstream of the sediment traps at the Ten Site confluence. This gage only occasionally measures flow during extreme runoff events and records no flow most of the time. Gage E2015 is located in the Ten Site Canyon hydrologic segment approximately 400 m (1310 ft) upstream from E202. This gage has recorded only occasional minor intermittent flows since October 2000. Gage E203 is located in the lower Mortandad Canyon hydrologic segment at the outlet to sediment trap #3, approximately 260 m (850 ft) downstream from E202, and gage E204 is located in the lower Mortandad Canyon hydrologic segment approximately 15 m (50 ft) upstream from the Laboratory/San Ildefonso Pueblo boundary. Gage E203 has been continuously dry since October 1996 except for two recent sediment trap overflow events on August 24, 2005 (Shaull et al. 2006, 93735, pp. 44-45,) and August 25, 2006. Gage E204 has been continuously dry since October 1993, but there has been no known flow at San Ildefonso boundary since RLWTF discharges began in 1963. Table 7.2-2 shows the number and percentage of days with recorded flow at each streamflow gaging station. These data show the effects of infiltration losses on surface water between the middle and lower Mortandad Canyon hydrologic segments. Whereas gage E200 recorded flow for 75% of the days of record, E202 recorded flow for only 14% of the days of record, while E203 and E204 have been continuously dry during the period of record.

Since gage E200 is the uppermost reported streamflow gage in the watershed, a comparison of outfall discharges to the streamflow measured at gage E200 was made to assess the magnitude of the component of outfall discharges to total flow in the canyon (Figure 7.2-2). These data illustrate a variable relation between the volumes of outfall discharges and recorded flow at E200. The RLWTF is the only outfall whose flow reaches gage E200; flow from the others stops upcanyon, while the TA-35 effluent enters Mortandad Canyon below the gage (actually never making it out of Ten Site Canyon) and does not contribute to streamflow at E200. Data from 2004 and 2005 show streamflow significantly exceeding outfall volumes for the four contributing outfalls; these years had fairly normal natural runoff volumes. The RLWTF outfall percentage of flow at E200 was 4% and 9% during 2004 and 2005, respectively.

Surface water occurrences were determined from a series of field observations made during site visits to the various sediment sampling reaches in the canyon between June 2003 and September 2005 (Reneau, 2005). Canyon reaches with surface water observations are subdivided into ranges of percentage of observations with surface water present. Reaches identified in 100% of the observations are considered

"perennial" where water flow is continuous throughout most of the year. Reaches identified in 50%–99% of the observations are considered "intermittent" where the stream channel is predominantly dry throughout much of the year but have some extended periods of flow from snowmelt runoff, spring discharge, or groundwater discharge associated with high groundwater levels. Reaches identified in 1%-49% of the observations are considered "ephemeral" where the stream channel is predominantly dry throughout most of the year but may experience short periods of flow (i.e., hours to days) in response to storm events, particularly summer thunderstorms.

Approximately 87% of the Mortandad watershed upstream from the boundary with San Ildefonso Pueblo burned in the Cerro Grande fire of 2000 (BAER 2000, 72659). However, the burn was of low intensity and little to no change is surface water flow was recorded in the years immediately following the fire. Gage records indicate similar peak discharges before and after the fire (Shaull et al. 2003, 76042).

Upper Mortandad Canyon Hydrologic Segment

In upper Mortandad Canyon, above the confluence of Effluent Canyon, welded tuffs underlying the stream channel are relatively impermeable and limit the amount of infiltration along the stream channel. Persistent surface water originates primarily at TA-03 from runoff events (snowmelt and rainfall) and from seasonal outfall discharges from noncontact cooling water. Reach M-1W is indicated in Figure 7.2-1 as a perennial reach with surface water present during 100% of the observations made during the 2003-2005 surveillance period. Reach M-1W is downstream from NPDES outfall EPA03A-021 from the CMR Building in TA-03 and also receives runoff from extensive paved areas at the head of the watershed. Water was always observed in bedrock pools in the east part of M-1W and was usually observed in a bedrock area closer to the outfall and in the middle of the reach downstream from a headcut into alluvium where a small cattail wetland is supported. Plunge pools occur where the stream channel becomes steeper as the drainage incises into the upper part of Tshirege unit Qbt 2. Intermittent flow conditions exist below reach M-1W, as indicated by observations in reaches M-1C (below TA-48) and M-1E. A small cattail wetland exists adjacent to the stream channel below TA-48, and cattail wetlands are also present in reach M-1E where the stream has a bedrock channel as the canyon steepens eastward. Relatively deep and persistent bedrock pools are present downstream from reach M-1E. Historically, other outfalls from TA-48 have also contributed to surface water in this canyon segment. No gage is located within this canyon segment, but 79% of the observations made in reach M-1E indicate the intermittent presence of surface water there while 50% of the observations in reach M-1C indicated intermittent water associated with a fluctuating water table in the alluvium.

Effluent Canyon Hydrologic Segment

In Effluent Canyon, welded tuff bedrock underlying the stream channel limits infiltration along the stream channel. Intermittent flow occurs in reach E1F-W with surface water present during 75% of the observations. Here, water is fed by storm runoff that supports willows and cattails. Perennial flow is indicated in reaches E-1W (fed by the TA-55 outfall) and E-1E (fed by the TA-55 and TA-50 outfalls). Surface water was present during 100% of the observations made in these reaches between 2003 and 2005.

The TA-50 RLWTF has discharged to Effluent Canyon since 1963 at NPDES-permitted outfall EPA 051. Annual effluent discharge volumes have ranged from a high of 60.28 million liters (60,280 m^3) in 1968 to 6.93 million liters (6,930 m^3) in 2005 (Table 2.1-1 and Figure 2.1-1). Discharges are released from two 79,000-L (79-m^3) holding tanks. Effluent is released from one tank at a time when full. Timing of releases is variable, ranging from over 2 weeks between releases to daily releases over several consecutive days. Usually only one release occurs during a day, but occasionally two or three releases are made in a single

day. Between 1997 and September 2006, releases occurred an average of 3 d/wk. Historically, seasonal variability in discharge volumes has been significant, but quarterly release volumes have been relatively consistent since 2005 (Figure 7.2-3).

Effluent Canyon also receives stormwater runoff from portions of TA-48, TA-55, and TA-35, which contributes to a small wetland at the head of the canyon between TA-48 and the discharge point for the TA-50 outfall.

Middle Mortandad Canyon Hydrologic Segment

From west to east in the middle Mortandad Canyon hydrologic segment, bedrock becomes progressively less welded and more permeable, and canyon-bottom alluvium thickens. Surface flow generally infiltrates in the eastern part of this segment. Outfall discharges from Effluent Canyon are a major source of surface water to the middle Mortandad Canyon hydrologic segment below the confluence with Effluent Canyon and above the confluence with Ten Site Canyon (Figure 7.2-2). These discharges comprise a significant percentage of the flow at gage E200, which measures surface flow entering the middle Mortandad Canyon hydrologic segment from both the Effluent Canyon and upper Mortandad Canyon hydrologic segments. Based on visual observations between 2003 and 2005, indicating that surface water was present during 100% of the observations in reach M-2W, surface water flow in the middle Mortandad Canyon hydrologic segment is indicated as perennial in reach M-2W for a distance of approximately 570 m (1870 ft) below the Effluent Canyon confluence (fed by the TA-55 and TA-50 outfalls and road runoff) (Figures 7.2-1 and 7.0-1). Surface water in reach M-2W, however, is typically discontinuous, with stretches with no surface water, and water was present partly as bedrock pools and emergence from saturated alluvium rather than as a through-flowing stream. The region of surface water flow coincides with relatively thin alluvium in a channel underlain by the welded portions of Qbt 2. However, gage E200 has recorded flow for 75.4% of the days during its period of record since 1995, indicating that persistent surface flow is not uninterrupted in this canyon segment. Intermittent flow occurs in reach M-2E with surface water present as discontinuous flowing water and pools during 78% of the observations made during 2003–2005 surveillance period. No flow was observed below reach M-2E during the 2003–2005 observations, indicating the point below which water has infiltrated into the thickening canyon bottom alluvium or is lost to evaporation. Beyond reach M-2D, surface water is ephemeral in response to high discharge volumes or to upstream runoff. Only infrequently, generally following severe summer thunderstorms, does surface water exit the middle canyon. This is illustrated in Figure 7.2-4 which depicts the hydrographs for streamflow measured in reported gages during 2005 and 2006. The hydrograph for gage E202 shows that this gage recorded flow on only 11 of the 587 days of record during this period. Except for a larger flood event on August 24, 2005, during which the mean daily discharge was about 48 liters per second (L/s [1.7 cfs]), only minor flow events from about 1 to 6 L/s (0.04 to 0.2 cfs) mean daily discharge were measured at E202 during the 2005–2006 period (through August 14, 20/06).

Gage E200 provides the most consistent record of persistent flow in the watershed. A comparison of cumulative daily TA-50 effluent and gage E200 streamflow discharge volumes since 1997 is shown in Figure 7.2-5. From mid-1997 to 2000, the cumulative TA-50 discharges were roughly half of the total flow recorded at E200. Since 2001, the rate of discharge from TA-50 has declined while total runoff at E200 has increased. Notable flow increases were recorded at E200 in January 2002 and January-March 2004 associated with snowmelt or flood events. By August 2006, cumulative discharges from TA-50 were only about 19% of the cumulative total flow at E200 for the period from 1997 to August 2006.

A comparison of seasonal (quarterly) discharge volumes since 1997 for the TA-50 outfall and the E200 gage is shown in Figure 7.2-6. The streamflow volume for the quarter ending on 3/31/04 is literally off the chart in this figure. The total streamflow volume recorded at E200 during this quarter exceeded

175,000 m^3, which is nearly 5 times greater than the total flow at E200 in any other quarter since 1997. Otherwise, the highest quarterly streamflow totals are generally associated with spring snowmelt runoff and summer-fall monsoon rains while lower streamflow amounts are generally recorded in the winter, though several exceptions to this pattern are present (e.g., occasional high winter flows and low summer-fall flows). After the RLWTF discharges peaked in 1999, a subtle seasonal pattern of higher discharges in the summer and lower discharges in the winter is apparent for the TA-50 outfall, while the declining trend in discharge volume is clearly evident. The seasonal TA-50 percentage of E200 streamflow discharge is shown in Figure 7.2-7. Data from the second quarter of 1998 and the second and third quarters of 2000 were compromised by extended periods of equipment failure at E200 and are thus excluded from this graph. A clear pattern of seasonality for this parameter is not readily apparent from these data. Examining the extreme conditions for this parameter shows that the highest proportions of TA-50 contributions to total flow (exceeding 80%) occurred in the first and fourth quarters of 1997, the third quarter of 2000, the second quarter of 2004, and the first quarter of 2006. These occurrences are related to drought conditions leading to abnormally low inputs of naturally occurring runoff or snowmelt during these periods and not a regular seasonal variation. The lowest proportions of TA-50 contributions to total flow (less than 8%) occurred in the fourth quarter of 2001 and first quarter of 2002, the fourth quarter of 2003 and first quarter of 2004, and the first and third quarters of 2005. A relatively low proportion of TA-50 flow was also recorded in the fourth quarter of 2004 (about 14%). An inconsistent seasonal pattern is thus apparent during the winters of 2001–2002, 2003–2004, and 2004–2005 when higher runoff occurred leading to low relative contributions of outfall discharges to total flow. This analysis indicates that winter runoff is frequently (since 2001) a significant contributor to total surface flow in the upper and middle watershed.

The seasonal TA-50 outfall percentage of E200 flow since 1997 is summarized in Table 7.2-3. The mean and median percentages are nearly equal for the first and second quarters at about 41% and 47%, respectively. The third quarter exhibits the lowest proportion of TA-50 flow with mean and median percentages of about 23% and 25%, respectively, illustrating the effects of monsoonal rains to total flow in the watershed. The fourth quarter proportion of TA-50 flow has a mean percentage of about 34% but a median value of about 28%. These data suggest that overall, surface water flowing from the upper Mortandad Canyon hydrologic segment generated by naturally occurring runoff makes up a large percentage of E200 flow during the summer and fall. In addition, building cooling-water discharges from the CMR and Sigma Buildings at TA-03 may also contribute seasonally. The proportion of TA-50 flow during the summer and fall is only about one-fourth of the total streamflow, whereas during the winter and spring seasons, the TA-50 discharges comprise nearly half of the total flow recorded at gage E200. The annual averages clearly show the declining influence of the TA-50 outfall on surface flow in the watershed. Whereas in 1997 the TA-50 outfall comprised 63% of the flow recorded at E200, by 2005, its contribution was only 21%.

Ten Site Canyon Hydrologic Segment

Pratt Canyon is a small tributary to Ten Site Canyon, which is a tributary to Mortandad Canyon. Before 1963, Pratt Canyon received effluent from the TA-35 Waste Water Treatment Plant (Section 2.1). Purtyman (2002, 11787) reported that historical effluent discharges from Pratt Canyon to Ten Site Canyon were insufficient to reach Mortandad Canyon as surface flow.

Surface flow conditions in the Ten Site Canyon hydrologic segment are currently recorded at gage E2015, which is located near the mouth of canyon (Figure 7.2-1). As seen in Figure 7.2-4, mean daily flows recorded at E2015 seldom exceed 3 L/s (0.1 ft^3/s), and the gage is dry most of the time. As noted in Table 7.2-2, flow was recorded in this gage on only 11% of the days during its period of record (since 2000). Virtually all of this flow is attributed to runoff from paved areas, but the current TA-35 outfall (03A-160) releases into the head of Ten Site Canyon and may also contribute. As depicted in

Figure 7.2-1, surface water conditions range from intermittent in reaches TS-1W, TS-1C, and TS-2E to ephemeral in reaches TS-1E, TS-2W, and TS-2C. During the period of visual surveillance in 2003–2005, reaches TS-1W, TS-1C, and TS-2E contained surface water during 69%, 58%, and 73% of the observations, respectively. Relatively persistent water was found in depressions between boulders or scour holes (TS-1W and TS-1C), and in shallow bedrock depressions (TS-1E). Reaches TS-1E, TS-2W, and TS-2C contained surface water during 41%, 31%, and 17% of the observations, respectively. Although occasional small flows were recorded at gage E2015, no water was ever observed in reach TS-3.

Lower Mortandad Canyon Hydrologic Segment

Surface water is ephemeral and occurs infrequently in the lower Mortandad Canyon hydrologic segment. This canyon segment is characterized by a broad flat canyon floor with an indistinct drainage system. It contains thick alluvial deposits (up to 30 m [100 ft]) that rapidly imbibe the rare surface water flows that reach this part of the canyon.

No visual observations of surface water were ever made below the confluence with Ten Site Canyon during the 2003–2005 surveillance period. However, an exception flood event did occur in August 2006. As noted in Table 7.2-2, gage E202, which records flow entering this section of the canyon, recorded measurable flow during only about 14% of the days during its period of record (since 1997). As illustrated in Figure 7.2-4, flows are infrequent and normally very small, with the exception of occasional major flood events. When flow occurs, the water is routed through three sediment traps dug into the alluvial channel. The sediment traps dam the water into retention basins so that contaminated sediments settle, and the impounded surface water then infiltrates into the permeable alluvium. Gage E203 (Figure 7.2-1), located below the sediment traps, has never recorded flow during its period of record since 1996. Before 2005, the sediment traps were generally continuously dry since December 1997 except for a post-fire event in the upper sediment trap on May 26-29, 2001. Since then, the upper sediment trap has filled with water on August 24, 2005 and August 25, 2006. Gage E204 (Figure 7.2-1) at the Laboratory boundary with San Ildefonso Pueblo has also never recorded flow during its period of record (since 1993). Stream flow extended nearly to the Laboratory boundary for a major flood that occurred on August 25, 2006 (after the streamflow gage data for this report were compiled). Clearly, however, surface water flow in the lower Mortandad Canyon hydrologic segment is a rare event.

In the lower Mortandad Canyon Hydrologic Segment from the San Ildefonso boundary to the Rio Grande, flow is probably derived from local rainfall events and/or flow from tributaries entering Mortandad Canyon below the Laboratory boundary. Although no documented flow measurements in this reach are available, the stream channel shows evidence of at least occasional flow in places, and tributaries like Cedro Canyon have likely fed water locally into lower Mortandad Canyon. Flow is ephemeral only to the confluence of Cañada del Buey. Intermittent or perennial flow occurs from the Cañada del Buey, confluence to the Rio Grande, fed by White Rock WWTP discharges.

7.2.1.2 Alluvial Groundwater

Surface water infiltrates into the canyon bottom alluvial sediments until its downward movement is impeded by zones of lower permeability, usually weathered tuff, forming a perched alluvial aquifer with intermittently varying levels of saturation. The alluvial groundwater conceptual model is based on water-level responses to precipitation and streamflow data, and to effluent discharge. In addition, recent field observations have added to the conceptual understanding of the alluvial groundwater system, indicating that the system is complex and heterogeneous. In much of the watershed, a perched zone of saturation exists at the base of the alluvium where it overlies less permeable bedrock. Otherwise, the

alluvium above and adjacent to the perched zone is unsaturated. Figure 7.2-8 shows the extent of the alluvial groundwater based on average alluvial water levels for the summer of 2005. Figure 7.2-9 is an isopach map showing thickness variations in the alluvium from the confluence of Mortandad and Ten Site Canyons to the eastern Laboratory boundary. Figure 7.2-10 shows the distribution of geologic units beneath the alluvium in the same area.

A series of plots, shown in Appendix F, present time series of water levels at selected alluvial wells. These time series are discussed in the following sections to illustrate the relationship of alluvial water-level fluctuations to precipitation and runoff events. Historically, effluent discharges from the TA-50 RLWTF have represented a large percentage of the watershed water balance. However, they have steadily declined since 1998 to where they comprised only about 10% of the flow recorded at gage E200 in 2005 (Figure 7.2-2). Whereas historically the main volume of the alluvial groundwater body may have been fairly steady, it has gradually become more dependent on recharge from naturally occurring runoff as the influence of outfall discharges throughout the watershed has diminished. This has resulted in highly variable saturation conditions in the alluvium with notable transient responses to recharge from major runoff events.

In addition to temporal variations, the model also addresses spatial variations in the nature of the water-level record and the relation of water-level responses to precipitation and streamflow. A series of plots, shown in Appendix F, also incorporate these data to describe the system. The plots include daily precipitation measured at the TA-06 meteorological station located on Two-Mile Mesa, approximately 970 m (3180 ft) south-southwest of the headwaters of the upper Mortandad Canyon hydrologic segment, as well as mean daily discharge measured at streamflow gaging stations E200 and E202. The TA-06 precipitation record, obtained from the Laboratory meteorological database (http://weather.lanl.gov), was chosen because it is the station closest to the upper part of the watershed, which is the main source area for runoff.

The following discussion describes variations in alluvium thickness and downcanyon changes in suballuvium geology for the Mortandad watershed. Results of the alluvial water-level study are also summarized from Appendix F. The reader is referred to Appendix F for a detailed discussion of spatial and temporal variations in water-level data for the alluvial wells in each of the hydrologic segments in the watershed.

Upper Mortandad Canyon Hydrologic Segment

Alluvium is generally thin in the upper Mortandad Canyon hydrologic segment. The thickness of alluvium is about 1 m (3 ft) at MCO-0.6, located below TA-48 approximately 780 m (2560 ft) above the Effluent Canyon confluence, and 1.8 m (5.9 ft) at MCA-1, located approximately 70 m (230 ft) above the Effluent Canyon confluence (Figure 3.2-1, Plate 1). Alluvium is underlain by poorly welded to nonwelded tuffs of Tshirege unit Qbt 3 in the westernmost part of this hydrologic segment and by strongly welded tuffs of Tshirege unit Qbt 2 in the central and eastern parts of this hydrologic segment (Figure 7.0-1).

Since mid-2005, the alluvial groundwater system has typically been dry or nearly dry in the late winter, spring, and early summer seasons until recharged by summer storm runoff. The thin alluvium results in a limited ability to store groundwater. As a result, alluvial saturation levels in the upper canyon areas respond nearly instantly to recharge from runoff events, and recession of water levels is generally rapid afterwards.

Effluent Canyon Hydrologic Segment

Alluvium in the Effluent Canyon hydrologic segment is generally less than 1 to 2 m (3 to 6 ft) thick, and portions of the stream flow in a bedrock channel. Alluvium is 1.6 m (5.4 ft) thick in the wetlands at MCA-4, but the stream forms a steep-walled channel with little alluvium east of the wetlands. Alluvium is underlain by poorly welded to nonwelded tuffs of Tshirege unit Qbt 3 in the headwaters of this drainage and by strongly welded tuffs of Tshirege unit Qbt 2 in the central and eastern parts of this hydrologic segment.

Hydrograph data (Appendix F) show similar aquifer behavior to that seen in the upper Mortandad Canyon hydrologic segment. Alluvial water levels rise rapidly in response to stormwater runoff events associated with summer and fall precipitation events, and the groundwater responses occur virtually instantaneously, correlating well with the streamflow record at gaging station E200. However, alluvial saturation levels are more persistent in the Effluent Canyon hydrologic segment due to the TA-50 and TA-55 outfalls that contribute to recharge that provides a base flow saturation level of generally 0.3 to 0.6 m (1 to 2 ft).

Middle Mortandad Canyon Hydrologic Segment

Alluvium is generally thin in the western half of the middle Mortandad Canyon hydrologic segment, and it becomes progressively thicker from approximately the center of the segment to the confluence with Ten Site Canyon to the east (Figure 7.2-9). Alluvium is about 1.8 m (6 ft) thick at MCA-5 at the upper end of the segment, 8.8 m (29 ft) thick at MCB-5, and 18 m (60 ft) thick at RES-2 near the confluence with Ten Site Canyon. Because of the inaccessible terrain, there are no boreholes between MCA-5 and MCB-5 (Figure 3.2-1, Plate 1), and there is no information on the thickness of alluvium in that part of the canyon. The thin alluvium in the western half of the middle Mortandad Canyon hydrologic segment overlies strongly welded tuffs of Tshirege unit Qbt 2. The thickening alluvium in the eastern half of the middle Mortandad Canyon hydrologic segment overlies progressively older and more porous bedrock units in a downcanyon direction, including the poorly welded tuffs at the base of Qbt 2, nonwelded tuffs in Qbt 1v and Qbt 1g, and poorly consolidated sediments of the Cerro Toledo interval (Figures 7.0-1 and 7.2-8).

The alluvial groundwater in the middle Mortandad Canyon hydrologic segment is a transitional zone between the dynamically responding behavior of the upper canyon segments and a more stable and slowly responding system in the lower canyon segments. In the upper part of the middle Mortandad Canyon hydrologic segment (about 200 m [655 ft] below the Effluent Canyon confluence), a thin perched aquifer is restricted within a narrow bedrock channel and has little capacity for aquifer storage. This results in highly transient saturation conditions with instant responses to runoff recharge events followed by rapid recessions (generally a few days). Here the alluvial aquifer was dry about half the time (during the winter and spring seasons) since mid-2005.

Farther downcanyon (about 400 m [1310 ft] above the Ten Site confluence), intermittent and variable saturation levels still exist. A time lag of several weeks between a major surface runoff event and a corresponding rise in the water level indicates that alluvial groundwater recharge in this canyon segment is primarily from groundwater underflow that was recharged by infiltration of runoff further upcanyon. Only after persistent levels of alluvial saturation are maintained do flood events result in nearly instantaneous water-level rises showing the influence of rapid recharge from local infiltration.

Near the Ten Site confluence, the delayed recharge effect is more pronounced with time lags of several months between major streamflow events and alluvial groundwater recharge responses. Also, much longer recessional limbs (weeks to months) in the alluvial hydrographs from this area reflect an enlarged aquifer storage capacity attributable to the deepening package of alluvial sediments present beneath the widening canyon floor. Most water movement in the alluvial aquifer near the Ten Site confluence is

probably lateral within the alluvium, but some percolation losses from the base of the alluvium are also possible.

Ten Site Canyon Hydrologic Segment

Alluvium is relatively thin in the western half of the Ten Site Canyon hydrologic segment. This alluvium overlies poorly welded to nonwelded tuffs of Tshirege unit Qbt 3 in the headwaters of the canyon and strongly welded tuffs of Tshirege unit Qbt 2 near well R-14 (Plate 1). In the eastern part of the Ten Site Canyon hydrologic segment, as the canyon exits the hard tuffs of Tshirege unit Qbt 2, the valley floor flattens and broadens eastward, and the alluvium becomes significantly thicker. At well TSCO-6 the alluvium is 6.5 m (21.3 ft) thick, and at R-33 the alluvium is 20 m (66 ft) thick (Figure 7.2-9). Alluvium in the eastern half of the Ten Site Canyon hydrologic segment overlies progressively older bedrock units in a downcanyon direction, including the poorly welded tuffs at the base of Qbt 2, nonwelded tuffs in Qbt 1v and Qbt 1g, and poorly consolidated sediments of the Cerro Toledo interval (Figure 7.2-10).

Alluvial well TSWB-6 has been dry during every measurement event since its installation in 1994. Newly installed well TSCA-6 encountered alluvial water but the period of record is too short to evaluate the hydrograph. Therefore, no water-level data for Ten Site Canyon are summarized here.

Lower Mortandad Canyon Hydrologic Segment

Alluvium reaches its maximum thickness in the lower Mortandad Canyon hydrologic segment (Figure 7.2-9). From west to east, the thickness of alluvium varies from 21.2 m (69.5) ft at MCB-8, 25 m (82 ft) at MCB-10, 34.3 m (112.5 ft) at MCOBT-8.5, and 32.8 m (107.5 ft) at MCA-9 (Figure 3.2-1, Plate 1). From the vicinity of R-15 to the San Ildefonso Pueblo boundary, the alluvium-filled basin is asymmetric, with deeper alluvium occurring beneath the northern part of the canyon floor (Figure 7.2-9). Drill-hole data and cross-canyon resistivity profiling (see Section 7.2.1.3 and Appendix H) support the interpretation of asymmetry in the alluvial-filled basin, with gentler suballuvial slopes to the south and steeper slopes to the north. Mass-wasting apparently contributed to the alluvial fill along the steep north wall of the canyon; colluvial blocks up to 3 m (10 ft) in diameter are intercalated with fluvial sediments at MCOBT-8.5 (Broxton et al., 2002, 76006). Alluvium is underlain by Cerro Toledo fluvial deposits in the western part of the lower Mortandad Canyon hydrologic segment and by Otowi Member ash flow tuffs in the central and eastern parts (Figure 7.2-10).

In the lower Mortandad Canyon hydrologic segment, where alluvial groundwater is most prevalent, time lags of 5 to 6 months between runoff events and recharge responses in the alluvial aquifer are typical. Greater aquifer storage is available because of the thickening alluvial sediments causing long recessional limbs in alluvial hydrographs of up to 2 years. Infiltration losses from the alluvium in this canyon segment limit the extent of saturation. The downgradient extent of alluvial saturation occurs near a point about 700 m (2300 ft) below the Ten Site confluence where infiltration losses from the alluvium have led to less than fully saturated conditions spanning time periods of several years. In the easternmost wells with alluvial saturation, time lags of 8 to 17 months for response to upstream recharge events have been observed.

7.2.1.3 Vadose Zone

The vadose zone is defined as the region between the land surface and the top of the regional aquifer (see Figure 7.0-1). The vadose zone is about 365 m (1200 ft) thick beneath the upper Mortandad Canyon hydrologic segment and 245 m (800 ft) thick beneath the eastern portion of the lower Mortandad Canyon hydrologic segment. The discussion in this section will focus on the unsaturated portions of the vadose

zone. Sections 7.2.1.2 and 7.2.1.4 provide detailed descriptions of the alluvial groundwater and intermediate-perched zones, respectively, which are saturated intervals located within the vadose zone. This subsection initially focuses on the shallow vadose zone (i.e., from the land surface through the Bandelier Tuff), and then concludes by discussing the deep vadose zone (including the Cerros del Rio basalts and the Puye Formation, Figure 7.0-1). In addition, specific discussions of flux meter measurements and VECTOR in situ permeable flow sensor data collected in the Mortandad watershed are presented in Appendix M.

Volumetric Water Content

One of the most important hydrologic characteristics of the vadose zone is water content, and volumetric water content profiles for recent Mortandad boreholes are shown in Appendix B. The borehole profile data show that water contents vary widely with depth as well as up and down and laterally across the canyon. For example, in MCB-7, volumetric water contents range from less than 5% to saturation (e.g., 40%–50%) within the alluvium. Variability such as this plays an important role in the rates of water and contaminant movement in the canyon because fluxes in unsaturated media (both vertical and lateral) are strongly controlled by water content. As a demonstration of this variability, average volumetric water contents are summarized for each borehole by stratigraphic unit (and in one case by depth interval) in Table 7.2-4. Boreholes are also ordered from upcanyon (at the top of the table) to downcanyon so that along-canyon values can be compared. Note that MCB-15 is in Ten Site Canyon, and MCI-1 and MCI-10 were not drilled in the Mortandad Canyon bottom.

A cross section showing the spatial distribution volumetric water content along the axis of Mortandad Canyon is shown in Figure 7.2-11. This figure shows an interpolated representation of all available volumetric water content data collected in the Mortandad watershed as of 2005. The contours indicate that a large fraction of the vadose-zone moisture is located near and below the confluence of Mortandad Canyon and Ten Site canyons. This area is represented in Figure 7.0-1 as the zone of greatest percolation of alluvial groundwater to the deeper vadose zone, as represented by the large vertical arrows. This area coincides with zones containing persistent and intermittent alluvial groundwater and the only occurrences of intermediate-depth perched groundwater that show influences from Mortandad sources. Much of this wetter area is underlain by thick alluvium overlying the Cerro Toledo interval with locally high moisture contents (Figures 7.0-1, 7.2-9, and 7.2-10). Together, these data suggest alluvial groundwater is the source of enhanced percolation to the underlying rocks of the vadose zone. The loosely consolidated sediments of the Cerro Toledo interval may facilitate deep percolation in this area.

Alluvial groundwater is often perched at or near the contact between alluvium and underlying Cerro Toledo deposits. However, high moisture contents (as well as soluble contaminants such as perchlorate) commonly extend downward into the underlying Cerro Toledo deposits (Figure 7.2-11 and 7.2-12). Moisture and contaminant profiles indicate that the base of saturation does not represent a no-flow barrier. Rather, elevated values for moisture and soluble contaminants persist into deeper bedrock units that are not fully saturated.

Table 7.2-4 compares moisture contents for rocks of the upper vadose zone on a unit-by-unit basis. From these data, it is evident that the 0–6-m (0–20-ft) depth interval has the lowest overall water contents. Water contents at this depth are affected greatly by evapotranspiration (evaporation plus transpiration) losses, and the 0–6-m (0–20-ft) depth interval likely has the largest temporal variability, especially close to the ground surface, because of the dynamics between evapotranspiration, infiltration, and percolation. These data suggest that although the RLWTF outfall and runoff provide significant water to the canyon, evapotranspiration still plays a large role in the canyon water balance. Additional evidence for this control is described later in the discussion on stable isotope profiles.

Deep alluvium (>6 m [>20 ft]) shows a great deal of variability in volumetric water content, much of which is related to the presence or absence of alluvial saturation. There is a suggestion that water contents decrease in the deep alluvium in locations near the Laboratory boundary (i.e., MCOBT-8.5 and R-28); however, MCB-16 has a relatively high average water content of 21%.

Tshirege Member unit Qbt 2 (>6 m [>20 ft]) was observed in only two canyon bottom holes (MCB-1 and MCB-2), and average water contents vary between 10% and 24%. MCB-1 is located in Effluent Canyon above the TA-50 RLWTF outfall, and MCB-2 is located at the confluence of Mortandad and Effluent canyons (Plate 1). None of the Qbt 2 samples in these two boreholes had water contents over 25%, and both boreholes were dry when drilled. Thus, the strongly welded nature Qbt 2 and the upper canyon hydrological conditions appear to inhibit the formation of shallow perched saturated zones in this setting.

Tshirege Member unit Qbt 1 has a similar range of average water contents to Tshirege unit Qbt 2; however, Qbt 1 was observed in more boreholes. One interesting note is that a horizon of nearly saturated or saturated tuff was observed in MCB-2 near the contact of Tshirege subunits Qbt 1v and Qbt 1g. Similar occurrences of enhanced moisture at the Qbt 1v/Qbt 1g contact have been observed in other parts of the Laboratory (e.g., borehole 49-2-700-1 at TA-49, Stimac et al., 2002, p.7).

The Cerro Toledo interval has some of the highest average water contents presented in Table 7.2-4. Some of these water contents may be high because of leakage from the alluvial perched horizons during drilling. However, the number of observed high values indicates that the Qct is one of the wetter units within the canyon.

The Otowi Member average water contents tend to center around the high teens to low twenties, indicating that the Otowi is 30%–40% saturated (assuming 45% porosity) from R-1 to near the Laboratory boundary. However, the specific water-content profiles for boreholes MCB-14, MCOI-6, MCOI-8, R-1 and R-15 (Appendix B) show extensive intervals with water contents approaching thirty. These wells are located in an area with persistent alluvial groundwater and are shown in Figure 7.0-1 as being located in the region of enhanced vadose-zone flow.

In contrast to the upper vadose zone described above, there is much less information available about the deeper vadose zone (e.g., the Cerros del Rio basalts and the Puye Formation). Only one hole was cored within the deep zone, and no core data exist for the Puye Formation in Mortandad Canyon. At R-15, volumetric water contents in the basalt are less than 10% from about 150 to 215 m (500 to 700 ft) (Longmire et al. 2001, 70103). Below the intermediate perched zone, water contents increase to about 30% near the contact with the Puye Formation. The basalt units are difficult to characterize because they can have a wide range of porosities and hydraulic conductivities, depending on whether the basalts are massive or fractured, or if interflow/paleosol zones are present. Fracture porosity is a possible route for fast transport through the basalts. The closest proxies for the deep vadose zone in Mortandad Canyon are R-12 and R-9 in Sandia and Los Alamos canyons, respectively. R-12 and R-9 water contents in the Cerros del Rio basalts are generally similar to the 150 to 215 m (500–700 ft) zone at R-15 (i.e., <10%; Broxton et al., 2001a, 2001b). However, R-12 water contents increase to over 20% in interflow zones at basalt subunit contacts. At R-12 and R-9, water contents are also around 10% in the clay-poor sedimentary deposits in the upper part of the Puye Formation. In the lower Puye Formation (near the regional aquifer), water contents increase to 30%–40% in clay-rich sedimentary deposits. The Puye deposits beneath Mortandad Canyon are most similar to the clay-poor deposits in the upper Puye Formation at R-9 and R-12.

The water contents in rocks beneath Mortandad and Ten Site canyons (i.e., MCB-15) are generally higher than is observed beneath mesa locations on the Pajarito Plateau. For example, MCI-10, a mesa borehole adjacent to Mortandad Canyon, has the lowest water contents observed in this investigation for Tshirege

unit Qbt 1 and the Otowi Member (Table 7.2-4). Thus, higher fluxes are expected to be confined to those areas beneath Mortandad Canyon and are not expected to extend beneath the adjacent mesas. These results are consistent with observations made in other areas of the Laboratory, which show that canyons are often wetter than mesa locations (Birdsell et al., 2005, 92048; Newman 1996, 59118)

Oxygen and Hydrogen Stable Isotope Profiles

Pore water oxygen ($\delta^{18}O$) and hydrogen (δD) stable isotopes are another set of data that provide insights on vadose zone processes within Mortandad Canyon. These data were described previously by Longmire et al. (2001, 70103) and Broxton et al. (2002, 76006). They are useful in vadose zone studies because they are sensitive indicators of processes such as evaporation and mixing. Stable isotope profiles were collected from core samples from R-15, MCOBT-4.4, and MCOBT-8.5; $\delta^{18}O$ depth profiles are shown in Figure 7.2-13. The figures show two key features. The first feature is that all three holes show a zone in the shallow alluvium (Qal) where pore waters are isotopically heavy (less negative). For example, R-15 has a $\delta^{18}O$ of –5 ‰ in the shallow alluvium, and the MCOBT holes have values in the –7 to –8 ‰ range. As discussed by Broxton et al. (2002, 76006), such values are characteristic of waters that have undergone evaporation. Mortandad Canyon alluvial well samples collected in 1999 and 2005 range from –6 to -12 ‰. Some of the heavier values may be related to evaporated waters that are generated during water treatment and are subsequently released through outfalls to the canyon. However, the heavier alluvial aquifer values are also consistent with the low water contents observed in the shallow tuffs and alluvium (e.g., <6 m [<20 ft] in Table 7.2-4). Thus, it is likely that evaporative losses within the canyon are an important part of the canyon water budget. Although the stable isotopes are not sensitive to transpiration, the substantial amount of vegetation (including ponderosa pines) in the canyon indicates that there is also large water loss through transpiration. Thus, evapotranspiration (evaporation plus transpiration) must play a significant role in the canyon water budget despite the additions of water from runoff and five operating outfalls.

The second feature in the isotope profiles (Figure 7.2-13) is the shift from isotopically heavy values near the surface to relatively constant but significantly lighter values with depth. The reduction of variation in isotope values (with a few exceptions) occurs within the Qct and Qbo, and values are similar to the average annual precipitation values for the plateau (–10 to –11 ‰). Seasonal- and precipitation event-based variations in the isotopic composition of water inputs to the canyon are substantial based on the Mortandad alluvial data discussed above and on other studies on the plateau (e.g., LANL 1998, 59891; Newman et al. 1998, 76883). Thus, the shallow parts of the Mortandad Canyon profiles likely reflect some of this variation. In addition, isotope values at and below the base of the alluvium may contain alluvial groundwater from an upcanyon effluent source that flowed laterally to the particular location. After about 15 m (50 ft), much of the variation is dampened out. This reduction of variability in the deeper parts of the profiles indicates that substantial mixing occurs as water from different sources (i.e., effluent, runoff and evaporated precipitation, all from different time periods) moves through the upper vadose zone. Mixing is an important aspect of the canyon hydrology because it means that variations in contaminant inputs over time will be substantially smoothed out as well.

Surface DC Resistivity Survey

Surface DC resistivity surveys of the Mortandad watershed were conducted in 2002 and 2003 (Geophex,Ltd., 2003, 84540, Appendix B) and are summarized in Appendix H. This technique allows for noninvasive interrogation of large portions of the subsurface and can potentially identify conductive zones that may be related to moisture distribution (see Section 3.2). Figure 7.2-14 shows the survey results for the line run in the narrow section of the middle Mortandad Canyon hydrologic segment, from the

confluence with Effluent Canyon to just past well MCB-5. The survey results are compared with gravimetric moisture and perchlorate concentration profiles with depth at three wells.

In Effluent Canyon downcanyon of the TA-50 RLWTF outfall, thin alluvium overlies strongly welded tuff that forms an impermeable barrier to infiltration. The surface DC resistivity profile down the axis of the canyon (Geophex Ltd., 2003, 84540) indicated that the rocks beneath the channel are highly resistive (perhaps drier) below depths of a few feet.

In the western portion of the middle Mortandad Canyon hydrologic segment, between MCA-5 and MCB-5, resistivity profiling (Geophex 2003, 84540) indicates deepening of an upper conductive horizon as the stream channel progressively cuts down section through bedrock tuffs that are strongly welded (middle of Tshirege unit Qbt 2) into the poorly welded tuffs at the base of Tshirege unit Qbt 2 and in Tshirege unit Qbt 1v (Figure 7.2-14). The resistivity data suggest that infiltration is restricted to relatively shallow depths in the western portion of the middle Mortandad Canyon hydrologic segment. Nevertheless, core moisture profiles at MCOI-1, drilled along the Qbt 2 bench within the canyon, show that moisture can accumulate along deeper small scale features such as the Tshirege Qbt 1v/Qbt 1g contact, albeit with no evidence of associated contamination (Figure 7.2-14).

In the lower part of the Ten Site Canyon hydrologic segment, the surface DC resistivity profile down the axis of the lower canyon (Geophex 2004, 84540; see Appendix H) indicates that the rocks beneath the channel are moderately conductive at depths of 15 to 30 m (50 to 100 ft).

The eastern part of the middle Mortandad Canyon hydrologic segment and the western part of the lower Mortandad Canyon hydrologic segment from R-1 to approximately the location of MCOBT-8.5 include the most abundant and widespread shallow conductive intervals in electrical profiling (resistivity <100 ohm-m). Much of this conductive structure is beneath alluvium and within the Cerro Toledo deposits (see Appendix H). In this section of the canyon, the axial alluvial deposits thicken from about 10 to 33 m (30 to 110 ft). The contact between base of alluvium and the Cerro Toledo deposits is irregular, indicating branching channels cut into the top of the Cerro Toledo interval. Stratigraphy within the Cerro Toledo interval is complex and may lead to locally variable hydrogeologic properties at the base of alluvium (see Appendix G for discussion of heterogeneity in alluvium/colluvium and the Cerro Toledo interval).

7.2.1.4 Intermediate-Perched Zones in Mortandad Canyon

This section describes the physical setting of intermediate-depth perched groundwater in Mortandad Canyon. These perched groundwater bodies represent local areas of saturation in the deeper parts of the vadose zone and are too small for use as municipal water supplies. Nonetheless, they are of interest because (1) their chemical and isotopic characteristics help constrain groundwater transport rates through the vadose zone; (2) perching horizons may facilitate, divert, slow, or stop vertical migration of groundwater through the vadose zone, or they may indicate the presence of a fast subsurface pathway, depending on their hydraulic characteristics; and (3) they can be used as vadose-zone monitoring points that provide early warning of contaminants approaching the regional aquifer. The following descriptions of intermediate perched zones in Mortandad Canyon are modified from the recent paper by Robinson et al. (2005, 91682). Additional discussion about the constraints on saturated thickness and lateral extent of these perched zones relevant to Mortandad Canyon is provided in Appendix J.

Two groups of wells encounter perched water within the Cerros del Rio basalts beneath Mortandad Canyon. In one set of wells, MCOBT-4.4 and MCOI-4 near the Ten Site Canyon confluence, a thin perched zone occurs at a depth of about 160 m (520 ft), within the clay-rich basaltic rubble at the top of the Cerros del Rio basalts (Figure 7.0-1). The saturated thickness of this zone is approximately 1 m (3 ft). The mean water elevation is 1925.0 m (6315.7 ft) for MCOBT-4.4 and 1925.0 m (6317.1 ft) for MCOI-4.

Appendix J provides a discussion of temporal water-level fluctuations in the two wells. The apparent perching horizon at this location is a massive lava flow with few fractures. The massive lava causes perching because it lacks sufficient permeability at the existing level of saturation to drain the influx of new water. Fractures within the massive perching lava apparently do not conduct substantial groundwater flux. The inability of fractures to drain the perched zone is probably due to a combination of factors including the sealing of fractures by clay minerals and/or the limited number of fractures along the flow paths (flux along the fractures is smaller than the infiltration rate feeding the perched zone). Contaminant concentrations in groundwater in both wells vary over time (see Sections 7.2.2 and 7.2.3.), indicating water in the perched zone is flowing along a hydraulic gradient (i.e., not static).

About 350 m (1150 ft) downcanyon, a second group of wells, including MCOI-5, MCOI-6, and R-15, encountered perched water in the lower part of the Cerros del Rio basalt (Figure 7.0-1). The depth to water is 210 m (689 ft) at MCOI-5 and 202 m (664 ft) at MCOI-6. At R-15, the depth to water is poorly constrained by data collected during the drilling program, but it probably occurs between 197 m (646 ft) and 222 m (729 ft) (see Appendix J for more discussion of R-15 water-level data). The equivalent water elevations are 1869 m (6130.4 ft) at MCOI-5, 1874 m (6147.1 ft) at MCOI-6, and between 1857 and 1882 m (6091 and 6173.6 ft) at R-15. Minimum saturated thicknesses are 16.8 m (55 ft) at MCOI-5 and 21.9 m (72 ft) at MCOI-6; at R-15 estimates of saturated thickness range between 4.9 m (16 ft) and 30 m (99 ft). The perched water occurs in a combination of fractured and porous media. The fractured media consist of dense, massive lava flows cut by high-angle cooling fractures. These fractured lava flows are separated by nearly horizontal beds of porous interflow breccias. The variable static water levels and differences in saturated thicknesses within these closely spaced wells may be caused by the heterogeneous nature of perched groundwater systems located within basaltic rocks. This heterogeneity can reflect poor hydrologic communication among fractures, partial drainage of poorly connected perched zones during drilling, or spatial and temporal variability in the infiltration rate feeding the perched zone at the time of drilling. At R-15, the perching horizon appears to be clay-rich, flow-base rubble or underlying silty basaltic sands. The perched zones at MCOI-5 and MCOI-6 were probably not fully penetrated during drilling, and the perching horizons in these boreholes are uncertain.

Because of their different geologic settings, the perched groundwater occurrences at MCOBT-4.4/MCOI-4 and R-15/MCOI-5/MCOI-6 probably represent two unrelated groundwater bodies of limited lateral extent along the canyon axis (Figures 7.0-1 and 7.2-11). Based on the distribution of water-bearing vs. dry boreholes, the lateral extent of these perched groundwater bodies is probably less than 450 m (1500 ft).

A potential intermediate perched water zone was noted while drilling well MCOI-8, located about 325 m (1100 ft) upcanyon of the Ten Site Canyon confluence. A well was installed in the lower Cerros del Rio basalt where saturation was considered most likely based on borehole water-level measurements, video logs, and induction logs. Water-level measurements made since well installation indicate that water is present in the well sump but not in the screen. At the time of this report it is uncertain whether intermediate-perched groundwater is present at MCOI-8. A continuous-record water-level transducer is installed, and water levels are being monitored.

Other potential intermediate-perched water zones were also noted in the well completion report for boreholes MCRES-4 and MCB-7 (Kleinfelder 2006, 92486; Appendix B). At MCRES-4, possible perched water was noted in the lower Tshirege Member (Qbt 1g) between 21.3 and 22.9 m (70 and 75 ft). At MCB-7, the completion report indicates perched water occurred in the lower Tshirege Member (Qbt 1g) between 21 and 22.6 m (69 and 74 ft) and in the Cerro Toledo interval between 25.6 and 27.1 m (84 and 89 ft). Both boreholes encountered alluvial groundwater systems and there were problems sealing off the alluvial water from the deeper parts of the boreholes. Because of these problems, the intermediate-

perched groundwater at MCRES-4 and MCB-7 are considered possible, but poorly constrained, occurrences.

Figure 7.0-1 shows deep perched water within the lower Cerros del Rio lavas based on evidence from drill holes R-12 and R-10/10A, which are located in lower Sandia Canyon near the Laboratory boundary. There are no wells in this part of Mortandad Canyon, and it is not known whether these perched waters extend beneath the eastern part of the Mortandad watershed. Sources of the deep perched water observed at R-12 and R-10/10A are poorly constrained, but water-quality data indicate that these groundwaters do not contain contaminants associated with the Mortandad hydrologic system.

Water-level fluctuations in some of the perched intermediate zones were observed in 2005 following large rainstorms. These were originally hypothesized as rapid flow from the surface to the intermediate locations. However, the water-level fluctuations are probably not caused by infiltration of surface water during flood events but are a result of barometric pressure effects, as discussed in Appendix L.

7.2.1.5 Regional Aquifer Model

The water table of the regional aquifer, which lies approximately 300 m (1000 ft) below the canyon floor in Mortandad Canyon occurs within Miocene pumiceous sedimentary deposits that underlie the Pliocene Puye Formation. At a larger scale, the regional aquifer comprises several sedimentary and volcanic hydrostratigraphic units of varying thickness, lateral extent, and permeability. The hydraulic conductivity of aquifer rocks is highly heterogeneous and averages approximately 1 m/d (3 ft/d) at a regional scale. The regional aquifer is a complex hydrogeological structure that includes confined and unconfined zones that are characterized by a spatially varying degree of hydraulic communication.

The shallow portion of the regional aquifer near the water table is predominantly under phreatic (unconfined) conditions. The phreatic zone is mainly encountered in the Puye Formation and the underlying pumiceous sedimentary deposits and has limited thickness (approximately 30 to 50 m [100 to 165 ft]). The groundwater flow and transport in this zone are believed to generally follow the shape of the regional water table. The flow directions are then east-southeast, toward the Rio Grande. The hydraulic gradient along the regional water table is relatively steep; on the order of 0.01. The shape of the regional water table (i.e., the flow directions in the phreatic zone) is predominantly controlled by the existing areas of regional recharge (the Jemez Mountains with some contributions on the Pajarito Plateau) and discharge (springs in White Rock Canyon and the Rio Grande). The impact of Pajarito Plateau water-supply pumping on the flow directions in the phreatic zone is negligible (Appendix O).

The deep portion of the regional aquifer is predominantly under confined conditions. Water-supply pumping is performed predominantly in the deep portion of the regional aquifer. The pumping has negligible impact on the flow directions in the phreatic zone above beneath the Mortandad watershed because of poor hydraulic communication (Appendix O). The boundary between the shallow phreatic and the deep confined zones is not well defined. The hydraulic separation is caused by stacking highly stratified, gently dipping sedimentary deposits made up of individual beds characterized by highly variable hydraulic permeabilities and varying spatial extents. These strata are encountered in the Puye Formation and Santa Fe Group (Figure 7.0-1). Therefore, the boundary between the shallow phreatic and the deep confined zones is not a well-defined aquitard but instead represents the net effect of stacked beds with variable hydraulic properties, resulting in a vertical permeability that is at least 3 orders of magnitude lower than the horizontal permeability parallel to the bedding. For all the practical purposes, this causes a dominant hydraulic separation between the shallow phreatic and the deep confined aquifer zones that can be considered to be equivalent to an “aquitard.” However, the poor hydraulic communication does not necessarily preclude the possibility for contaminants to migrate through the “aquitard.”. Because of

pumping in the deep aquifer, there is a substantial vertical component of the hydraulic gradient between the shallow phreatic and the deep confined zones. This creates the possibility for groundwater flow and contaminant migration through the aquitard along hydraulic windows by shortcutting between the layering.

A regional representation of the water-table elevation is shown Figure 7.2-15. Similar spatial analysis of the hydraulic pressures in the deep portion of the regional aquifer is not feasible because of limited data.

Appendix N provides a spatial analysis of water-table variability and discusses the assumptions implemented in the generation of a regional water-table map (Figure 7.2-15). Appendix O provides analysis of temporal variability of water-table elevations measured at the monitoring boreholes near Mortandad Canyon (R-1, R-11, R-13, R-15, and R-28). Appendix P discusses the available information for the pumping-rate variability at the water-supply wells. These appendixes provide more detailed analyses of the potential impact of water-supply pumping on the groundwater flow and transport directions in the shallow phreatic zone of the regional aquifer. More details about this conceptual model of groundwater flow and transport beneath the Pajarito Plateau can be found in (Vesselinov 2005, 89753; Vesselinov 2005, 90040; Vesselinov 2004, 90117).

7.2.2 Contaminant Transport

Contaminant transport in the Mortandad watershed generally occurs along the pathways depicted in Figure 7.0-1. Adsorbing contaminants adhere to sediment to become part of the sediment load, as described in Section 7.1, and either stay relatively close to the release location or are transported down the canyon with surface flow events. Nonadsorbing species travel with water and follow the same flow paths that water takes. Weakly adsorbing constituents may travel with sediments or with water but generally migrate more slowly than nonadsorbing species. Strongly adsorbing species may travel with sediment or adsorb onto immobile rock surfaces. Therefore, adsorptive contaminants tend to exhibit retarded migration in the environment, and the nonadsorbing species are those that are detected in vadose-zone porewater and deeper groundwater zones.

The sections of this report that follow describe the nature and extent of COPCs in water. For each COPC, its current distribution in water is described and time histories are presented to illustrate the evolution of the COPC in the environment. The following format is used to describe these distributions.

- For surface water and alluvial groundwater, box plots showing recent (2000 to 2005) concentration data at different locations are used to define current COPC distributions throughout the watershed. Then time series plots give longer records in these waters to show concentration responses to long-term changes in effluent concentrations from the TA-50 RLWTF. In addition, shorter time series from 2000 to 2005 are presented to describe more recent concentration responses to treatment-plant enhancements and to flood events.
- For the vadose zone, contaminant distributions are described based on vadose-zone pore-water concentrations or contaminant masses as estimated from core samples. Time series concentrations are available for some perched-intermediate zones, and contaminant trends for these groundwaters are discussed.
- For the regional aquifer, time series plots present trends in concentration data for those few mobile contaminants that are observed in that zone.

A full series of plots in Appendix D provides a comprehensive overview of the spatial and temporal trends of COPCs in the Mortandad watershed. The discussion and supporting plots below provides additional information on the spatial and temporal distributions of these contaminants in key areas of the watershed.

- Box plots show concentration data between 2000 and 2005 for surface water and alluvial groundwater at sampling locations from west to east in relation to distance from the Rio Grande. These plots are useful for describing the present-day spatial distribution of COPCs and are also useful for identifying both the historical source(s) of each contaminant and the present-day "secondary" source areas. Three watershed segments are plotted. (1) The Effluent and Mortandad Canyons segment covers locations from the head of Effluent Canyon to the Mortandad Canyon confluence and then follows Mortandad Canyon eastward to the Rio Grande. (2) The Mortandad Canyon segment covers locations from the head of Mortandad Canyon to the confluence with Effluent Canyon and eastward to reach M-2E (Plate 1). (3) The Ten Site Canyon segment covers locations from the head of Ten Site Canyon to the confluence with Mortandad Canyon at well MCA-2. The sampling locations included in the plots were selected to bound known or suspected contaminant sources and generally include locations that have enough data to show variability in contaminant concentrations. The upper and lower ends of the boxes are the 75th and 25th percentiles of the data distribution, and upper and lower lines outside the boxes indicate 90th and 10th percentiles, respectively. Nondetect values are included in the plots. The paired numbers below each box indicate the number of detects (left) and nondetects (right) at each location. Detected values are represented in the plots with filled symbols, and the nondetect values are open symbols.
- Time series plots show available concentration data for surface water station E200 (and its nearby precursor GS-1) and many alluvial wells throughout the watershed for their full periods of record, which covers over a 40-yr period at many locations. Time series plots are also presented for regional wells and perched intermediate wells. Although these records are quite short, some apparent trends can be observed.
- Contaminant depth profiles show concentration as a function of corehole depth for porewater and solid-phase core. Samples for these analyses were collected when the boreholes were drilled and subsequently analyzed.

Overall, the spatial distributions of inorganic chemical and radionuclide concentrations indicate only a few key sources of the COPCs observed in groundwater and vadose-zone pore water, as described in Section 2.1. The most important source is the outfall from the TA-50 RLWTF into Effluent Canyon. Other sources include the former TA-35 WWTP outfall in Ten Site Canyon, possible discharges from cooling towers and radiochemistry laboratories at TA-48 in Effluent Canyon west of the TA-50 outfall (Plate 1) and in Mortandad Canyon west of gage E200, and sources at TA-03 with releases into upper Mortandad Canyon above the Effluent confluence. The cooling towers for the TA-03 power plant in the Sandia watershed may also have been a potential source of contaminants, especially chromium, to the groundwater beneath Mortandad Canyon.

Monitoring wells in the regional aquifer consist of both single- and multi-screen construction. Groundwater chemistry data from the single-screen completions are representative of predrilling conditions. However, two multi-screen wells do not provide fully representative data for the groundwater, especially for certain constituents subject to dissolution and desorption resulting from the affects of reducing conditions (e.g., chromium iron, perchlorate, and nitrate). The two affected wells/screens are R-14, screen 2 and R-33, screen 2.

7.2.2.1 Inorganic Chemicals in Water

Several inorganic chemicals are identified in Section 6 as being COPCs in water. Subsections below present a discussion of the spatial distribution and conceptual model for these COPCs.

Nitrate and perchlorate are the most mobile of the inorganic chemicals historically released in the watershed. Nitrate and perchlorate concentrations have been measured in surface water, and in alluvial, perched-intermediate and regional groundwaters. Their presence has also been observed in vadose-zone pore water collected from core samples from several boreholes drilled in and around Mortandad Canyon (Plate 1) since 1998. These combined results provide a comprehensive picture of subsurface contaminant distributions and migration at various locations in the watershed. In light of these results, this subsection first discusses contaminant nature and extent characteristics specific to nitrate and perchlorate within the watershed. The distributions of these nonadsorbing contaminants yield key information about subsurface pathways. The nitrate and perchlorate results in particular are useful because of the high mobility of these contaminants in the subsurface (i.e., they move at similar rates to subsurface pore water). Thus, their distribution is likely to bound the subsurface extent of other nonadsorbing contaminants that have followed the same migration pathway.

Nitrate

Nitrate is detected in surface water, alluvial and perched-intermediate groundwater, and the regional aquifer beneath Mortandad Canyon. There are both natural and anthropogenic sources of nitrate within the watershed, with Laboratory-derived nitrate produced from the dissociation of nitric acid that is neutralized before discharge. The other Laboratory source of nitrate is from treated sewage effluent in which nitrate concentrations are typically less than 5 mg/L due to denitrification taking place before discharge. Natural nitrate is common on the Pajarito Plateau and in the American Southwest (Walvoord et al., 2003, 93787). Thus, detectible levels of nitrate do not necessarily mean that contamination is present. However, it is clear that for many locations in the Mortandad watershed, the nitrate concentrations are elevated and related to historical Laboratory releases. Under oxidizing conditions, nitrate is mobile as an anion in groundwater and does not significantly adsorb onto clay minerals, ferric (oxy)hydroxide, solid organic matter, and other naturally occurring adsorbents. In the presence of denitrifying bacteria and reactive solid and dissolved organic carbon, nitrate becomes reduced to nitrogen gas. Other types of nitrate-reducing bacteria are capable of reducing nitrate to ammonium under oxygen-depleted conditions. In the discussion that follows, nitrate concentrations are based on different sampling and analysis techniques to obtain the largest data sets. Results for nitrate and nitrate plus nitrite are combined because nitrite is generally a very small part of the measured concentration. Filtered and nonfiltered results are also combined because filtration has little to no effect on nitrate concentration. Nitrate concentrations in the discussions that follows are reported in the units “Nitrate (as N, mg/L),” unless otherwise noted.

Nitrate in Surface Water and Alluvial Groundwater

Nitrate transport within the surface water and alluvial groundwater is controlled by the flow paths in these systems, which spread the contaminant laterally down the canyon, as described in Sections 7.2.1.1 and 7.2.1.2. The spatial trends in recent (2000–2005) nitrate concentrations in surface water and alluvial groundwater are shown in the box plots of Figures 7.2-16(a-c). In upper Mortandad Canyon (Figure 7.2-16[a]), in upper Effluent Canyon (Figure 7.2-16(b) above the TA-50 outfall, and in Ten Site Canyon (Fig. 7.2-16[c]), the nitrate concentrations are low (<1 mg/L), indicating that there are no recent sources contributing to the nitrate mass already in those canyon segments. However, nitrate concentrations increase in Effluent Canyon (Figure 7.2-16[b]) below the TA-50 RLWTF outfall and in

Mortandad Canyon below the confluence with Effluent Canyon (Figure 7.2-16[a]), indicating that the TA-50 RLWTF outfall continues to be the primary source of nitrate to the watershed.

Figure 7.2-17 is a time series plot covering the period 1960 through 2005. It shows the annual nitrate concentration in TA-50 effluent and the resulting concentrations at alluvial wells MCO-3, MCO-5, MCO-6, MCO-7 and MCO-7.5. The outfall nitrate concentrations averaged over 200 mg/L from 1981 to 1995, with maximum concentration approaching 500 mg/L. During this same period, nitrate concentrations in the alluvial wells were elevated with many measurements over 100 mg/L (as N). After 1995, outfall concentrations dropped below 100 mg/L, and from 2000 to 2004, the average outfall concentration was less than 3 mg/L due to improvements in wastewater treatment at the TA-50 RLWTF and concurrent source reduction implemented at Laboratory facilities that have their wastewater treated at the RLWTF. Correspondingly, concentrations in the alluvial wells have declined.

Nitrate concentrations increase spatially from west to east in Mortandad Canyon below the Effluent Canyon confluence from well MCO-5 to approximately well MCO-7.5. The trend is indicative of a dilution lag in the alluvial aquifer from west to east since improved nitrate removal began at the RLWTF in late 1999 (Section 2.1.1). The lag is due, in part, to distance from the outfall, but the increasing alluvial storage from west to east (Section 7.2.1.2) is probably a more important factor. To illustrate this, Figure 7.2-18 is a time series plot analogous to Figure 7.2-17, but it covers the period of low nitrate effluent concentrations, 2000 through 2004–2005. At well pair MCO-3/MCA-5 (Plate 1), which is located in the westernmost portion of the middle Mortandad Canyon hydrologic segment and has little alluvial storage, the concentration decline occurs almost immediately in 2000 following the drop in effluent concentration. At wells MCO-5 and MCO-6, near the eastern end of the middle Mortandad Canyon hydrologic segment, where the canyon is still narrow but the alluvium starts to thicken, the decline is delayed slightly with the greatest change in 2000 and 2001. Finally, nitrate concentrations at wells MCO-7 and MCO-7.5 have declined slowly since 2000. These wells are located in the lower Mortandad Canyon hydrologic segment where the highest amount of alluvial storage occurs. Nitrate concentrations at these distal locations should continue to decline in response to lower treated effluent concentrations and to periodic high runoff events. With few exceptions, the recent surface water and alluvial groundwater nitrate concentrations are less than the EPA Region 6 tap water MCL of 10 mg/L (Figure 7.2-17 and Figures 7.2-16[a–c]). In alluvial groundwater, these exceptions are two values at well MCO-7 (12.5 and 10.9 mg/L in February 2000 and August 2001, respectively) and one value at well MCO-7.5 (18 mg/L in 2000).

Nitrate in Vadose-Zone Pore Water and Perched-Intermediate Groundwater

Nitrate has migrated from the surface water and alluvial groundwater into the deeper vadose-zone, probably since effluent releases began in the watershed at TA-35 in 1951. Depth profiles of pore-water nitrate concentrations reflect the combined releases to the watershed (Appendix D, Figures D-2.3-1 through D-2.3-21). Nitrate was detected in every core hole analyzed in the watershed, and vadose-zone pore-water concentrations sometimes exceed 100 mg/L. The historic concentrations of nitrate in the alluvial groundwater (from 1960, these are shown in Figure 7.2-17) became the nitrate source for the deeper vadose zone in areas where perched-alluvial groundwater was present.

Figure 7.2-19 depicts the vadose-zone nitrate concentration along a longitudinal cross section through Mortandad Canyon. The figure shows nitrate concentrations measured from pore water and groundwater collected from representative characterization boreholes and regional and perched intermediate wells in the watershed. These data are also spatially interpolated using a minimum-tension technique (as implemented in the earthVision software, see Appendix I) to evaluate a generalized distribution of the concentrations between boreholes and wells, which can be used to describe characteristics about nature and extent of nitrate and migration pathways beneath the canyon.

Figure 7.2-20 depicts the distribution of nitrate mass along a longitudinal cross section through Mortandad Canyon. This mass distribution is estimated by multiplying the pore water and groundwater nitrate concentrations (Figure 7.2-19) and volumetric water content (Figure 7.2-11). Approximately 198,000 kg of nitrate has been reported as being released through the TA-50 RLWTF outfall into the Mortandad watershed from 1963 to 2005 (see Table 2.1-1). The distribution of mass, as estimated using the earthVision model (Figure 7.2-20, Appendix I), was used to estimate the current nitrate mass as it now exists distributed within and beneath the canyon, including nitrate in the alluvial groundwater, the unsaturated pore water (including alluvium), and the perched-intermediate zones. The estimated mass is approximately 228,000 kg nitrate (as N). Table 7.2-5 shows the mass distribution by strata. The estimated mass using in situ concentrations is 15% higher than the estimate made from outfall records (which also contains some inherent uncertainty), showing that the model technique provides a reasonable method for estimating in situ mass. Nearly the entire mass (99.7%) is estimated to be in the vadose-zone pore water within and stratigraphically above the Otowi member (Qbo). Only 0.1% and 0.2% of the nitrate mass are estimated to be in the alluvial groundwater and perched intermediate groundwater, respectively.

In terms of vertical extent, there is a region of elevated nitrate concentrations and mass located in approximately the upper 90 m (300 ft) of the vadose zone that extends into the mid- to lower-Otowi Member, as described above. In particular, nitrate has migrated into the Otowi Member at locations between about MCB-5 and MCOBT-8.5 (Figure 7.2-19). This is also the zone where the Otowi Member has elevated water content (Section 7.2.1, Figure 7.2-11 and Appendix B), alluvial groundwater is persistent to intermittent, perched-intermediate groundwater is observed, and apparent greater vadose-zone fluxes (Appendix M) are present. The broad zone of fairly well-defined contaminant extent is consistent with the general conceptual model of transport depicted in Figure 7.0-1.

The vertical migration of nitrate in the vadose zone west of MCB-5 is poorly constrained because of the inaccessibility of drill rigs to this part of Mortandad Canyon. However, the presence of thin alluvium over less permeable bedrock units 500 to 1000 m (1640 to 3280 ft) west of MCB-5 probably limits infiltration in that portion of the canyon. Borehole MCB-1 (Plate 1), located in Effluent Canyon above the TA-50 outfall, has very little nitrate (maximum pore-water concentration less than 1 mg/L, Figure D-2.3-1), reflecting the lack of a nitrate source and/or no migration pathway. At MCB-2, located east of the RLWTF outfall near the Mortandad Canyon confluence, observed pore-water nitrate concentrations remain low (less than 21 mg/L, Figure D-2.3-2) despite the presence of a nitrate source. Transport at this location is considered to be dominated by lateral surface water flow resulting in very little infiltration and vadose-zone transport. There is a marked change near the eastern end of the middle Mortandad Canyon hydrologic segment, where the canyon begins to widen and alluvium thickens around borehole MCB-5. From MCB-5 and further downcanyon to about MCOBT-8.5, elevated concentrations and vadose-zone mass are observed as described above.

The zone of low nitrate concentration and mass between MCOBT-8.5 and R-28 in Figures 7.2-19 and 7.2-20 is of interest. This zone likely contains a greater mass of nitrate than shown in the figures. Nitrate was detected within this zone in core holes MC-1 and MC-2, which were drilled as characterization boreholes for the proposed Advanced Hydrotest Facility (AHF). However, because of sample preservation problems (described in Appendix M), the nitrate pore-water concentrations are not accurate and were not used to generate the visualized nitrate distributions. Thus, the zone of elevated nitrate may extend east of MCOBT-8.5 toward R-28, at least down to the top of the Otowi Member, which was the maximum depth of the MC boreholes.

From R-28 east to MCB-16, near the Laboratory boundary, the frequency of high nitrate concentrations (above 100 mg/L) is substantially lower, especially when compared with the area between R-1 and MCBT-8.5. At R-28, there was only one nitrate detection above 100 mg/L. Pore-water concentrations of

nitrate are also low at MCB-16, except for three detections above 100 mg/L in an approximately 30-ft interval in the unsaturated alluvium (Figure D-2.3-13).

In order to bound the migration rates that have led to the current distribution of the main nitrate mass observed in the Mortandad watershed, several studies have estimated transport velocities based on vadose-zone chemical distributions. Estimates of vertical transport velocities of nitrate, based on a release of unique isotopically light nitrogen from October 1986 to September 1989, range between 2.5 and 2.9 m/yr (8.2 and 9.5 ft/yr) for wells MCOBT-4.4 and MCOBT-8.5, respectively (Broxton et al. 2002, 76006). Estimates of transport rates based on peak tritium releases to the canyon suggest that vertical transport rates have declined substantially from a possible maximum of 11 m/y (36.1 ft/y) in the late 1970s to about 1.36 m/yr (4.46 ft/yr) in 1999 (Kwicklis et al 2005, 90069). Finally, calibration to nitrate profiles in R-15 and MCOBT-8.5 yield approximate transport velocities of 6 m/y (20 ft/yr) in 1968 to 1.2 m/y (4 ft/yr) in 2002 (Birdsell et al. 2005, 92048). These studies apply to nonadsorbing constituents, such as nitrate, perchlorate and tritium, and indicate that vadose-zone transport velocities were greater in the past and over time have declined in response to declining outfall volumes.

Elevated nitrate concentrations are observed in perched-intermediate zones located beneath Mortandad Canyon. The presence of deep contamination indicates that there are some preferential pathways through the vadose zone that have transported comparatively small masses of nitrate to depths below the Otowi Member and beyond the main mass of the nitrate contamination. Nitrate concentrations have increased slightly from 13.2 to 16.2 mg/L in filtered samples within the perched-intermediate zone at well MCOBT-4.4 from 2002 to 2005 (Figure 7.2-21). This may indicate advancing nitrate-contaminated vadose-zone waters. Nitrate is also observed in perched-intermediate groundwaters at wells MCOI-4, MCOI-5, and MCOI-6 where reported nitrate concentrations for filtered samples over two sampling rounds in 2005 were 13 and 14.2 mg/L, 3.07 and 4.22 mg/L, and 13.7 and 16.8 mg/L, respectively (Figures D-2.2-16[f], D-2.2-17[f], D-2.2-18[f]).

In Ten Site Canyon, pore-water nitrate concentrations from the core collected at R-14 (Figure D-2.3-19), at the head of the canyon, and MCB-15 (Figure D-2.3-12), at the lower end of the canyon near the Mortandad Canyon confluence, are consistently low (less than 10 mg/L). However, pore-water concentrations exceed 1000 mg/L in the shallow part of borehole 35-2028 in Pratt Canyon, while concentrations are less than 4 mg/L below 12 m (69 ft) in this borehole. The 35-2028 results are indicative of releases to the Ten Site drainage; however, the vertical extent of nitrate is interpreted to be a function of relatively small mass and/or the lack of a continuous aqueous driver in Pratt and Ten Site Canyons.

Nitrate in the Regional Aquifer

Anthropogenic nitrate has been detected in the regional aquifer beneath Mortandad Canyon. Nitrate concentrations in filtered samples occur at 2 to 2.5 mg/L at R-15 during the 2000 to 2005 period, as shown in Figure 7.2-22. Isotopic analyses of the groundwater at R-15 suggest that nitrate is not significantly fractionated, having δ^{15}N ratios ranging from –0.8 to +1.3‰ (Longmire 2002, 72614). These values are characteristic of nitrate derived from neutralized nitric acid (Broxton et al. 2001, 71252), most likely released from TA-50 RLWTF. Nitrate concentrations varied from 3.10 to 4.89 mg/L at R-28 in 2005, as shown in Figure 7.2-23. These are the highest concentrations of nitrate measured in the regional aquifer beneath Mortandad Canyon. δ^{15}N values for several samples collected from R-28 ranged from 5.51 to +11.88‰, suggesting that nitrate is fractionated and was derived from a sewage source enriched in nitrogen-15 (Clark and Fritz 1997, 59168). Two potential sources of sewage-derived nitrate include the TA-35 lagoons within Ten Site Canyon and sanitary effluent discharges into Sandia Canyon. The Sandia Canyon source is considered most likely caused by the collocation at R-28 of chromium contamination

also thought to have its source in Sandia Canyon. The vadose-zone moisture content and nitrate profiles (Figures 7.2-11 and 7.2-19) at these two wells support the concept of different transport pathways (and hence possible different sources) for the nitrate in the regional aquifer at these locations. Elevated moisture contents and pore-water nitrate concentrations from core obtained during drilling of R-15 extent down into the Otowi Member and into a perched-intermediate zone within the Cerros del Rio basalt, indicating further downward migration of water and nitrate to the regional aquifer from the TA-50 source. Drier conditions and very little nitrate are observed in the vadose zone at R-28, indicating little vertical migration at that location. Nitrate in the regional aquifer at R-28 probably entered the regional aquifer upgradient and arrived at the well by horizontal flow within the regional aquifer.

Several other regional aquifer wells sampled during this investigation had nitrate concentrations of less than 1.0 mg/L including R-1, R-13, R-14, R-33, R-34, and TW-8. Concentrations of nitrate plus nitrite(N) were less than analytical detection (<0.05 mg/L) in four samples collected at R-14. The majority of groundwater samples analyzed from R-14 contained detectable nitrate plus nitrite. The nondetections are most likely due to the presence of residual drilling fluid in screen 2.

The spatial extent of nitrate detected in the regional aquifer correlates with the nitrate mass observed in the vadose zone.

Perchlorate

Perchlorate is detected in surface water, alluvial and perched-intermediate groundwater, and the regional aquifer beneath Mortandad Canyon. Perchlorate has been discharged into Mortandad Canyon from the TA-50 RLWTF outfall probably since 1963. The primary source of perchlorate is from perchloric acid ($HClO_4$), a strong oxidizing acid used in actinide research and processing at the Laboratory. Perchlorate is mobile and stable as an anion in groundwater and does not significantly adsorb onto clay minerals, ferric (oxy)hydroxide, solid organic matter, nor other naturally occurring adsorbents. Filtered and nonfiltered results are combined in the discussions that follow because filtration has little to no effect on measured perchlorate concentration.

Perchlorate in Surface Water and Alluvial Groundwater

Perchlorate travels laterally downcanyon with the surface water and alluvial groundwater in the watershed. The spatial trends in recent (2000–2005) perchlorate concentrations in surface water and alluvial groundwater are shown in the box plots of Figures 7.2-24 (a–c). In upper Mortandad Canyon (Figure 7.2-24(a)), in upper Effluent Canyon (Figure 7.2-24(b)), and in Ten Site Canyon (Figure 7.2-24(c)) the perchlorate concentrations are low (<10 μg/L), indicating that there are no recent perchlorate sources contributing to the perchlorate mass already in these canyon segments. The perchlorate concentration at surface water station E-1E SW in Effluent Canyon (Figure 7.2-24(b)) does not show an increase to indicate a TA-50 RLWTF outfall source; however, these data were all collected in 2005, approximately 3 yr after perchlorate treatment was improved at the TA-50 RLWTF and concentrations were greatly reduced in effluent (see Section 2.1.1). Perchlorate concentrations are higher in Mortandad Canyon beyond the confluence with Effluent Canyon (Figure 7.2-24(a)), indicating that previous perchlorate releases from the TA-50 RLWTF outfall were the primary source of perchlorate to the watershed. Figure 7.2-24(b) shows a trend of increasing concentration spatially from west to east in Mortandad Canyon beyond the Effluent Canyon confluence similar to that observed for nitrate. As for nitrate, this trend is indicative of a dilution lag in the alluvial aquifer from west to east since improved perchlorate removal began at the RLWTF in 2002 (see Section 2.1.1), with the lag being a function of both the distance from the outfall and the volume of alluvial groundwater storage.

Figure 7.2-25 is a time series plot covering the period 2000 through 2005 when perchlorate concentrations were regularly measured and removal of perchlorate from the TA-50 RLWTF effluent occurred. The plot shows annual perchlorate concentration in the effluent and the resulting concentrations at alluvial wells MCO-3, MCO-5, MCO-6, MCO-7, and MCO-7.5. Outfall perchlorate concentrations have dropped from 257 and 305 μg/L in 2000 and 2001, respectively, to nondetect since 2003 (LANL 2005, 91523). Correspondingly, concentrations in the alluvial wells have declined to values ranging from about 10 to 50 μg/L in 2005. Alluvial concentrations should continue to decline in response to the greatly reduced perchlorate concentrations in the effluent, with a lag similar to those seen in the nitrate responses at corresponding alluvial wells (Figure 7.2-18).

Perchlorate in Vadose-Zone Pore Water and Perched-Intermediate Groundwater

Perchlorate has migrated from the surface water and alluvial groundwater into the vadose zone. The vertical extent of perchlorate contamination in the vadose zone is similar to nitrate in most of Mortandad Canyon, as depicted in Figure 7.2-26 and in Appendix D (Figures D-2.3-1 through D-2.3-21). The collocation is likely an indication of the same release site (TA-50 RLWTF) and similar release histories. Within a given borehole, perchlorate and nitrate concentrations are often highly correlated with depth (for example, see Figures D-2.3-16 and D-2.3-20), and within some boreholes, correlation coefficients between perchlorate and nitrate are above 0.9. These correlations suggest a similar long-term release history for the two contaminants and similar transport rates in the vadose zone. Correlations tend to be poorer in the alluvium. However, this is a zone where variable mixing of recharge water and some denitrification is likely occurring (LANL 2005, 91696). In contrast, there is no evidence for natural perchlorate degradation in Mortandad Canyon (e.g., no chlorate and chlorite, byproducts of perchlorate degradation).

Until 1999, no records were kept for perchlorate in the TA-50 RLWTF effluent. The present-day distribution of perchlorate mass is estimated from the interpolated concentration data shown in Figure 7.2-26 in the same manner that is used to estimate the nitrate mass (Appendix I). Table 7.2-5 lists the approximate in situ perchlorate mass as 1248 kg and includes the distribution by stratigraphic interval. As for nitrate, nearly the entire perchlorate mass (95.6%) is estimated to be in the vadose-zone pore water within and stratigraphically above the Otowi Member. Only 2.6% and 1.7% of the mass are estimated to be in the alluvial groundwater and perched-intermediate groundwater, respectively.

The vadose-zone distribution of perchlorate is also quite similar to that of nitrate. Perchlorate concentrations are mostly below analytical detection in Effluent Canyon (MCB-1 and MCB-2, Figures D-2.3-1 and D-2.3-2), but concentrations are significantly higher where the canyon widens near the Ten Site Canyon confluence (from MCB-5 downcanyon), which also supports the conceptual model shown in Figure 7.0-1. There is one notable exception to the similarity in horizontal extent between nitrate and perchlorate. In contrast to nitrate, the zone of little to no perchlorate beyond borehole MCOBT-8.5 depicted in Figure 7.2-26 is probably real. In fact, pore-water perchlorate results suggest that there is not much perchlorate from approximately AHF borehole MC-1 eastward to the Laboratory boundary. Pore-water concentrations for boreholes MC-1, -2, -3, and MCB-16 (Figure D-2.3-13) show no perchlorate detections, and there were only two isolated detections in pore water in R-28 (Figure D-2.3-21). Note that the sample preservation problems with the AHF MC boreholes mentioned in Appendix M would increase estimated concentrations.

It is possible that a continuous area of perchlorate contamination occurs in the vadose zone between MCOBT-8.5 and R-28 in the mid- to lower-Otowi Member because the MC holes were only drilled to the top of the Otowi Member. However, the limited detections and low perchlorate concentrations at R-28

suggest that the zone of contamination becomes discontinuous somewhere between MCOBT-8.5 and R-28.

Perchlorate also occurs in perched-intermediate groundwater beneath Mortandad Canyon. Perchlorate concentrations increased from 32.1 to 256 μg/L at perched-intermediate well MCOBT-4.4 sampled from 2001 to 2005 (Figure 7.2-21). Concentrations of perchlorate collected at MCOI-4 varied from 134 to 159 μg/L during 2005 (Figure D-2.2-16(g)). Perchlorate concentrations at MCOI-4 are lower than those observed at MCOBT-4.4, even though the two wells are close to each other and screened across the same zone in the Puye Formation. At well MCOI-5, perchlorate concentrations generally increased from 81.6 to 104 μg/L during 2005 (Figure D-2.2-17(g)). Concentrations of perchlorate at MCOI-6 varied from 159 to 246 μg/L during 2005 (Figure D-2.2-18(g)).

Occurrence of perchlorate in Ten Site Canyon is different than that observed for nitrate. Although nitrate was observed at low concentrations (<10 mg/L) in core collected for well R-14 in upper Ten Site Canyon, perchlorate concentrations are elevated to a depth of 90 m (300 ft) with maximum pore water concentrations over 200 μg/L (Figure D-2.3-19). Perchlorate was also detected in pore water down to 27 m (90 ft) in borehole 35-2028 in Pratt Canyon, and some concentrations exceeded 500 μg/L. In addition, there were two chlorate detections in the upper 27-m (90-ft) zone, and these are the only chlorate detections observed in the entire Mortandad watershed borehole data set. It is possible that the chlorate is an in situ perchlorate degradation product. It is also possible that it is a remnant of an older radiochemistry process similar to that used at TA-21. This difference in observations for nitrate and perchlorate indicates that there was not a Ten Site Canyon nitrate source that was correlated to the apparent perchlorate source.

The R-14 and 35-2028 results show that there were historical releases of perchlorate into the Ten Site drainage, likely through Pratt Canyon. This is also supported by the results from MCB-15 at the bottom of Ten Site Canyon where perchlorate concentrations up to 37 μg/L in pore water are observed (Figure D-2.3-12). The MCB-15 profile shows that there are two distinct intervals of perchlorate contamination, one extending from 3 to 6 m (11 to 21 ft) (and possibly shallower) and the other extending from 40 to 46 m (131 to 151 ft) (and possibly deeper). The upper zone is within the alluvium and does not extend past the contact with unit Qbt1g tuff. The top of the deeper zone lies roughly 9 m (30 ft) below the top of the Otowi Member. It is not clear why these isolated zones are present, but there are some alternative hypotheses. The shallow zone probably developed from surface water infiltration or episodic alluvial groundwater migration within Ten Site Canyon, similar to that observed in Mortandad Canyon. An explanation for the contamination in the deeper interval is less clear. It could represent a deeper, but separate, flow path within Ten Site Canyon or a lateral southward flow component from Mortandad Canyon, given the proximity between the two canyons.

Perchlorate in the Regional Aquifer

Perchlorate released from TA-50 has migrated to the regional aquifer in Mortandad Canyon. The highest concentrations of perchlorate were measured at R-15. Concentrations of perchlorate at R-15 generally increased from 4.71 to 6.39 μg/L from 2003 to 2005 (Figure 7.2-22). Concentrations of perchlorate at R-28 ranged from 0.99 to 1.13 μg/L during 2005 (Figure 7.2-23). Concentrations of perchlorate are observed at R-1, R-13, R-33, R-34, and TW-8 (see Appendix D, Section D-2.2) were much lower than those observed at R-15 and R-28. Detectable concentrations of perchlorate, analyzed by liquid chromatography-mass spectrometry/mass spectrometry (EPA SW846 modified Method 6850) to obtain a lower detection limit, ranged from 0.12 to 0.48 μg/L at R-1, R-13, R-14, R-33, R-34, and TW-8. Concentrations of perchlorate were less than analytical detection (<0.05 μg/L) in three samples collected at R-14 (screen 2). The nondetects of low-level perchlorate are most likely due to the presence of residual

drilling fluid in screen 2, R-14. The spatial extent of perchlorate detected in the regional aquifer correlates with the perchlorate mass observed in the vadose zone.

Chromium

Chromium is detected in surface water, alluvial and perched-intermediate groundwater, and the regional aquifer beneath Mortandad Canyon. Chromium speciation controls its mobility in groundwater.

- Chromium(VI) is soluble as anions and is subsequently mobile in oxidizing groundwater. Chromium(VI), in the form of potassium dichromate ($K_2Cr_2O_7$), was used in cooling towers at the TA-03 power plant as a corrosion inhibitor from approximately 1956 to 1972 (LANL 2006, 91987), and cooling tower blowdown (effluent) was released into Sandia Canyon. It may have been used in other cooling towers at TA-03, TA-35 and TA-48 with blowdown released directly to the Mortandad watershed as well. Chromic acid may also have been used in electroplating operations at facilities on Sigma Mesa at TA-03 (LANL 2006, 91987). Both potassium dichromate and chromic acid dissociate to the anions CrO_4^{2-} and $HCrO_4^-$, which are hypothesized to be the dominant mobile species in surface water and groundwater. Chromium(VI) is the dominant species when concentrations of chromium in filtered and nonfiltered sample pairs are similar.
- Chromium(VI) can be reduced to chromium(III) in the presence of reducing agents, such as solid organic matter present within wetlands and alluvial sediments and ferrous iron within glass, silicates, and oxides in the alluvium and Cerros del Rio basalt. Once reduced, the chromium(III) is insoluble and precipitates from solution as amorphous or crystalline $Cr(OH)_3$ and co-precipitates with ferric iron as $(Fe_xCr_{1-x})(OH)_3$ (Rajet et al 1987, 91686; Raji and Zachara 1986, 91684) and is subsequently much less mobile in groundwater. Below pH 7, chromium(III) is stable as a cation that adsorbs onto solid organic matter. In any of these phases, chromium(III) is associated with suspended particles present in nonfiltered samples. Chromium(III) is the dominant species when chromium concentrations in nonfiltered samples exceed those in filtered samples.

The role of speciation on chromium mobility will be further evaluated under the “Interim Measures Work Plan for Chromium Contamination in Groundwater” (LANL 2006, 91987) and under subsequent related work plans as appropriate.

Chromium in Surface Water and Alluvial Groundwater

The spatial trends in recent (2000–2005) total (nonspeciated) chromium(III and VI) concentrations in surface water and alluvial groundwater are shown in box plots in Appendix D, Figures D-2.1-7 through D-2.1-9, for different portions of the Mortandad watershed. Box plots for both filtered (dissolved) and nonfiltered (dissolved and suspended fractions) samples are presented separately because filtration tends to remove trivalent chromium from the sample and thus allows speciation information to be gleaned from the total chromium analyses, as discussed above. The spatial distributions of chromium concentrations shown in Figures D-2.1-7 through D-2.1-9 indicate that chromium in surface water and alluvial groundwater in the Mortandad watershed are predominantly, if not entirely, Laboratory derived.

At the heads of Mortandad Canyon (Figure D-2.1-7) and Effluent Canyon (Figure D-2.1-8), and throughout Ten Site Canyon (FigureD-2.1-9), total chromium concentrations in surface water and alluvial groundwater are higher than at downstream locations, indicating that separate chromium sources are discernible in reaches at the heads of these canyons. At each of these locations, chromium(III) dominates over chromium(VI) in the surface water and alluvial groundwater samples because the nonfiltered fraction constitutes the majority of total chromium. In upper Mortandad Canyon, the highest chromium concentrations occur in surface water below TA-03 within reach M-1W where total chromium was

observed at 27.5 μg/L in a nonfiltered water sample. In Effluent Canyon, the highest concentration of total chromium is 100 μg/L in a nonfiltered alluvial groundwater sample collected at MCO-2/MCA-4 west of (above) the TA-50 outfall. In Ten Site Canyon, total chromium is identified in surface water within reaches TS-1C, TS-2C, and TS-2E (Figure D-2.1-9). The maximum detected concentration of total chromium is 20.8 μg/L in surface water in reach TS-1C. The higher apparent presence of chromium(III) in the upper portions of these canyon segments indicates that the chromium(III) is relatively immobile and is probably related to the presence of chromium(III)-contaminated sediments redistributed downcanyon of small historical sources at TA-03, TA-48, and TA-35 (Section 2.1). The predominance of chromium(III) in that area is also likely related to the several small wetlands that exist within the canyon floor in that area. The concentrations and frequency of detection generally decrease east of the TA-50 RLWTF outfall in Effluent Canyon and in Mortandad Canyon past the confluence with Effluent Canyon. From reach E-1W eastward, low-detected concentrations of total chromium occur in surface water and alluvial groundwater. Although chromium(III) dominates in the samples, detection of chromium in both filtered and nonfiltered samples indicates the co-occurrence of chromium(III and VI) in the surface water and groundwater samples. Concentrations in filtered samples of both surface water and alluvial groundwater do not exceed 50 μg/L or 100 μg/L, the NMWQCC groundwater standard and EPA Region 6 drinking water MCL, respectively.

Chromium in Vadose-Zone Pore Water and Perched-Intermediate Groundwater

The hypothesis for chromium transport in the vadose zone is that chromium(VI) migrates from the alluvial groundwater into the vadose zone and travels as the mobile anions CrO_4^{2-} and $HCrO_4$. Chromium(VI) can be reduced to chromium(III) along vadose zone flow paths by naturally occurring minerals and volcanic glass that act as reducing agents. Ferrous iron concentrated within the Cerros del Rio basalt is considered to be another potential reductant for chromium(VI). Once reduced, chromium(III) precipitates from solution or adsorbs onto ferric (oxy)hydroxide and clay minerals.

Analytical results for chromium and iron measured on vadose-zone core samples are plotted in Appendix D, Figures D-2.4-1 through D-2.4-21. Potential anthropogenic chromium was identified in the core samples at concentrations exceeding background for the Bandelier Tuff-Cerro Toledo Interval (2.24 to 7.14 mg/kg) and/or sediments (10.5 mg/kg) (Ryti et al. 1998, 59730) at MCB-2, -7, -8, -9, -10, -11, -12, -14, -15, and -16, R-14, and R-15. Chromium is found concentrated at or near the interfaces of the alluvium with Unit Qbt1g and of Unit Qbt1g with the Cerro Toledo Interval (Figures D-2.4-1 through 2.4-21). The highest concentration of anthropogenic chromium (440 mg/kg) was detected in core collected at R-15 at a depth of 37 m (120 ft) at the contact between the Cerro Toledo Interval and Otowi Member of the Bandelier Tuff (Figures D-2.4-20 and D-2.4-21) (Longmire et al. 2001, 70103). With respect to the MCB boreholes, the highest concentration of anthropogenic chromium (71 mg/kg) was detected at MCB-14 at a depth of 66 m (215 ft) (Figure D-2.4-11) within the Otowi Member of the Bandelier Tuff. In fact, MCB-14 contains the greatest chromium mass of any borehole with five measured chromium concentrations above 15 mg/kg over the depth interval 52 to 82 m (170 to 270 ft). Excluding the sample from core collected at R-15, core samples from the remainder of the boreholes did not have chromium concentrations exceeding 15 mg/kg. Concentrations of chromium are within background at MCB-1, MCB-5, and MCB–6.

Analysis conducted on core samples did not differentiate chromium(III) from chromium(VI). However, because of the ability of iron-bearing minerals to reduce and then adsorb chromium(III), the co-occurrence of chromium and iron is indicative of adsorbed chromium(III). The chromium and iron profiles (Figures D-2.4-1 through D-2.4-21) indicate a strong correlation between chromium and iron, that is, higher chromium concentrations are collocated with higher iron concentrations, meaning that the chromium is likely relatively immobile. Under acidic pH conditions, CrO_4^{2-} and $HCrO_4^-$ adsorb onto ferric

(oxy)hydroxide to a greater extent than under alkaline pH conditions. Therefore, chromium(VI) may partly account for some of the association between iron and chromium in the unsaturated zone.

Elevated chromium(VI) concentrations are observed in perched-intermediate zones located beneath Mortandad Canyon. The presence of deep contamination indicates that there are some preferential pathways through the vadose zone that have transported comparatively small masses of chromium to depths below the Otowi Member. Perched-intermediate wells sampled during 2005 include MCOI-4, MCOI-5, MCOI-6 (Figures D-2.2-16[a], D-2.2-17[a], and D-2.2-18[a]), and MCOI-8, whereas MCOBT-4.4 (Figure 7.2-21) was sampled from 2001 to 2005. The data show spatially variable results with chromium(VI) dominating in some of the perched zones and chromium(III) at others.

Concentrations of total chromium in filtered and nonfiltered samples decreased from 53.3 to 37.4 μg/L and 53.6 to 41.4 μg/L, respectively, at perched-intermediate well MCOBT-4.4 during 2002 and 2003 (Figure D-2.2-15[a]). Concentrations of total chromium in filtered and nonfiltered samples were similar, indicating that chromium(VI) dominants over chromium(III) at MCOBT-4.4.

Concentrations of total chromium in nonfiltered samples collected at MCOI-4 in 2005 have decreased from 135 to 61.3 μg/L (Figure D-2.2-16[a]) and sample turbidity decreased from 31.9 to 18 nephelometric turbidity units (NTUs). Total chromium in filtered samples increased from 25 to 29.4 μg/L in the samples during 2005. Concentrations of total chromium in nonfiltered samples initially exceeded those in filtered samples suggesting that chromium(III) dominates.

Concentrations of total chromium in nonfiltered samples collected at MCOI-5 in 2005 decreased from 770 to 545 μg/L (Figure D-2.2-17[a]) and sample turbidity decreased from 83.6 to 16.6 NTU. This well is located on the south side of Mortandad Canyon near regional aquifer well R-15. Concentrations of total chromium in filtered samples at the well also decreased from 3.5 to 3.1 μg/L. This suggests that chromium(III) dominates and that chromium(VI) represents a small fraction not removed from solution by adsorption and/or precipitation processes.

Concentrations of total chromium in nonfiltered samples at MCOI-6 in 2005 were 52.2 to 58.9 μg/L (Figure D-2.2-18[a]) and sample turbidity was 4.86 and 6.41 NTU. Concentrations of total chromium in filtered samples collected at the well also increased from 48.4 to 58.2 μg/L, suggesting that chromium(VI) dominates. Variation in total chromium in nonfiltered samples is caused by the presence of suspended particles that probably contain natural and anthropogenic chromium(III). Well MCOI-8 was sampled for chromium in 2006, and analytical results will be reported in the "Chromium Interim Measures Report."

Overall, perched-intermediate groundwaters from MCOBT-4.4, MCOI-4, and MCOI-6 have elevated chromium(VI), represented by total chromium concentrations in filtered samples, ranging from 25 to 58 μg/L that is most likely anthropogenic. Suspended particles in these samples probably contain both natural and anthropogenic chromium(III). Chromium(VI) concentrations, represented by total chromium concentrations in filtered samples in intermediate groundwater from MCOI-5 are low at 3.5 μg/L or less. This well may not be impacted by anthropogenic sources.

Chromium in the Regional Aquifer

Regional aquifer wells sampled during this investigation included R-1, R-13, R-14, R-15, R-28, R-33, R-34, and TW-8 (see Appendix D, Section 2.2). Concentrations of total chromium within the regional aquifer in the Puye Formation are the highest beneath the axis of Mortandad Canyon at R-28 (Figure 7.2-23) and decrease to the southeast and southwest at R-13 (Figure D-2.2-20[a]) and R-15. (Figure 7.2-22).

Concentrations of total chromium at R-15 varied from 3.6 to 14.7 μg/L in nonfiltered samples collected from 1999 to 2005 (Figure D-2.2-22[a]). Concentrations of total chromium varied from 2.6 to 7.9 μg/L in filtered samples at the well (Figure 7.2-22 and D-2.2-22[a]). Concentrations of total chromium at R-28 generally increased from 375 to 404 μg/L (Figure 7.2-23) and from 389 to 416 μg/L (Figure D-2.2-23[a]) in filtered samples and nonfiltered samples, respectively, collected during 2005. These are the highest concentrations of total chromium(III, VI) and chromium(VI) measured in the regional aquifer beneath the Laboratory. Detectable concentrations of total chromium in nonfiltered and filtered samples ranged from 2.73 to 12.3 μg/L and from 0.93 to 8.2 μg/L, respectively, at R-1, R-13, R-14, R-33, and R-34 (Appendix D, Section D-2.2). Concentrations of total chromium varied from 3.36 to 7.92 μg/L in nonfiltered samples collected at TW-8 from 2001 to 2005 (Figure D-2.2-26[a]). Concentration of total chromium in three filtered samples were less than analytical detection (<1 μg/L) at R-14 (Figure D-2.2-21[a]) in 2004 and 2005. The majority of water samples from R-14 contained detectable total chromium. The nondetection of total chromium is most likely due to the presence of residual drilling fluid in screen 2, R-14.

Iron

Solid and aqueous species of iron occur within stream sediments, alluvial and perched-intermediate groundwater, the regional aquifer, and unsaturated and saturated rock. Under oxidizing and circumneutral pH conditions, such as in the Mortandad watershed, ferric iron precipitates from solution typically as insoluble ferric (oxy)hydroxide and ferric oxide (hematite) (Langmuir 1997, 56037). Iron is stable in the +II (ferrous) and +III (ferric) oxidation states in aqueous solution and forms complexes with hydroxide, sulfate, chloride, and bicarbonate. These complexes influence the solubility of iron(II, III) solids. Ferric (oxy)hydroxide is an important adsorbent for many trace elements and radionuclides, including americium, arsenic, cadmium, chromate, cobalt, lead, nickel, plutonium, selenium, thorium, uranium, and zinc. The specific surface area of hydrated ferric hydroxide (ferrihydrite) is 600 m^2/g as compared with that of quartz having a value of 0.14 m^2/g (Langmuir 1997, 56037). Iron(III) dominates over iron(II) when concentrations of iron in nonfiltered samples exceed those of filtered samples. Iron and manganese have similar chemical properties, and iron is typically collocated with manganese in sections of the Mortandad watershed. Under reducing conditions enhanced by the presence of residual organic-based drilling fluids, iron(III) solids dissolve and iron(II) aqueous species and solids becomes stable. Desorption of trace elements can take place during reductive dissolution of ferric (oxy)hydroxide, resulting in an increase of these solutes in groundwater.

Iron in Surface Water and Alluvial Groundwater

The spatial trends in total (nonspeciated) iron(II and III) concentrations in surface water and alluvial groundwater from 2000-2005 are shown in box plots in Appendix D, Figures D-2.1-10 through D-2.1-12, for different portions of the Mortandad watershed. Box plots for both filtered (dissolved) and nonfiltered (dissolved and suspended fractions) samples are presented separately to help differentiate speciation. The highest concentrations of total iron in nonfiltered samples are measured within reach M-1W (25.5 mg/L, Figure D-2.1-10) in upper Mortandad Canyon just east of TA-03 (Plate 1) and at well MCO-2/MCA-4 (26 mg/L) in Effluent Canyon (Figure D-2.1-11). Most of the iron at these locations occurs as a precipitate associated with suspended material because concentrations of total iron in nonfiltered samples are greater than total iron in filtered samples. Surface water at reach E-1W is also elevated (approximately 5 mg/L in both nonfiltered and filtered samples). Concentrations of total iron are much lower in surface water and alluvial groundwater within Mortandad Canyon east of the Effluent Canyon confluence (Figure D-2.1-11). These distributions indicate sources at the head of Mortandad Canyon in TA-03 and to Effluent Canyon west of the TA-50 RLWTF outfall.

In Ten Site Canyon, the highest concentration of iron is identified in surface water within reach TS-1C (Figure D-2.1-12). Iron(III) precipitate(s) associated with suspended material dominate within this reach because concentrations of total iron in nonfiltered samples greatly exceed dissolved iron in the surface-water samples. Concentrations of total iron in nonfiltered samples decrease downcanyon to the Mortandad confluence (Figure D-2.1-12). Concentrations of iron detected in surface water in reach TS-1C are possibly related to the presence of iron-contaminated sediments redistributed down canyon of the TA-35 source. Ferric chloride and ferric sulfate were identified as chemicals present in the TA-35 wastewater or used to treat the wastewater before discharge (LANL 1997, 56835).

Iron in Vadose-Zone Pore Water, Perched-Intermediate Groundwater, and the Regional Aquifer

Analytical results for iron measured on vadose-zone core samples are plotted in Figures D-2.4-1 through D-2.4-21. Background concentrations of iron range from 0.37 to 1.45 wt% within the Bandelier Tuff and are 1.38 wt% in sediments (McDonald et al. 2003, 76084; Ryti et al. 1998, 59730). Background concentrations of iron are observed at MCB-1, MCB-2, MCB-5, MCB-6, MCB-14, and MCB-16, R-14, and R-15. Concentrations of iron exceeding background occur at MCB-7, MCB-8, MCB-9, MCB-10, MCB -11, MCB -12, and MCB-15, which could be represented by a combination of anthropogenic and natural iron in the forms of ferric (oxy)hydroxide, Fe_2O_3 (hematite) and Fe_3O_4 (magnetite) The co-occurrence of iron and chromium, as discussed in the chromium section above, suggests that adsorption processes are important in concentrating chromium within the vadose zone.

Anthropogenic forms of iron discharged from the Laboratory most likely have not migrated to perched-intermediate zones and the regional aquifer because of the elements' low solubility under circumneutral pH and oxidizing conditions dominant in the subsurface. Distributions of natural iron in the deeper saturated zones are controlled by specific hydrogeochemical conditions including redox conditions, groundwater composition, and aquifer mineralogy. Biologically induced breakdown of drilling fluids results in reductive dissolution of ferric (oxy)hydroxide and hematite (LANL 2005, 91533). Concentrations of total dissolved and total iron range from 2.33 and 4.50 mg/L and 4.24 and 6.85 mg/L, respectively, at R-14 (screen 2). Elevated concentrations of dissolved iron show the presence of residual drilling fluid at the well.

Fluoride

Fluoride has been detected in surface water, alluvial and perched-intermediate groundwater, and the regional aquifer within the Mortandad watershed. There are both natural and anthropogenic sources of fluoride within the watershed, with Laboratory-derived fluoride produced from the dissociation of hydrofluoric acid that is neutralized before discharge. Fluoride has been released at the TA-50 RLWTF outfall, but since 2000, effluent concentrations have been below the New Mexico WQCC groundwater standard of 1.6 mg/L, and in 2005 the average concentration had dropped to 0.24 mg/L (LANL 2006, 93925). Fluoride is mobile in groundwater as an anion and does not significantly adsorb onto clay minerals, ferric (oxy)hydroxide, solid organic matter, and other naturally occurring adsorbents. In the presence of calcium, fluoride precipitates from solution as CaF_2 (fluorite), and its solubility is independent of pH.

Fluoride in Surface Water and Alluvial Groundwater

Fluoride travels laterally downcanyon with surface water and alluvial groundwater in the watershed. The spatial trends in recent (2000–2005) fluoride concentrations in nonfiltered samples of surface water and alluvial groundwater are shown in box plots in Appendix D, Figures D-2.1-13 through D-2.1-15, for different portions of the Mortandad watershed. Fluoride was detected in all surface water samples

collected within upper Mortandad Canyon west of the Effluent confluence (Figure D-2.1-13). The highest concentration of fluoride was 0.72 mg/L measured in reach M-1W. Concentrations of fluoride decrease in surface water to the Effluent Canyon confluence and then increase downcanyon (Figure D-2.1-14). The maximum concentrations of fluoride are 1.92 mg/L at wells MT-1 and MT-3 in 2005, just slightly over the New Mexico WQCC groundwater standard of 1.6 mg/L. In Ten Site Canyon, detectable concentrations of fluoride are low, ranging between 0.03 and 0.42 mg/L in surface water samples. Effluent from the TA-50 RLTWF has been a source of fluoride to the watershed. However, it appears that fluoride has also entered the watershed at TA-03 and may have come from TA-48 (to both Mortandad and Effluent canyons) as well.

The overall distribution of fluoride concentrations in surface water and alluvial groundwater is very similar to that observed for nitrate. That is, fluoride concentrations increase spatially from west to east in Mortandad Canyon beyond the Effluent Canyon confluence. As for nitrate, the trend is indicative of a dilution lag in the alluvial aquifer from west to east since improved effluent quality in 2000 (Section 2.1.1). The lag is caused by the distance from the outfall and to increasing alluvial storage from west to east (Section 7.2.1.2). Time series plots for surface water at gage E200 (Figure D-2.2-1[b]) and several alluvial wells (e.g., Figures D-2.2-6[b], D-2.2-7[b], D-2.2-9[b]) show a decline in fluoride concentrations since 2000. In 2005, only the most distal alluvial wells, MCOBT-7.5, MT-1, and MT-3 have concentrations slightly over the New Mexico WQCC groundwater standard (1.92 mg/L vs. 1.6 mg/L). None of the surface water or alluvial water concentrations is currently above the EPA Region 6 tap water standard of 4 mg/L. Over time, fluoride concentrations at the alluvial wells will decline even further in response to improved effluent quality at the TA-50 outfall and to dilution by occasional surface water runoff events.

Fluoride in Vadose-Zone Pore Water and Perched-Intermediate Groundwater

Fluoride appears to have mobility similar to nitrate in the vadose zone and is present in vadose-zone pore water into the Otowi Member and at a few locations is present in perched-intermediate groundwater. For instance, at wells MCOBT-4.4 and MCOBT-8.5, pore-water concentrations of fluoride range from approximately 4 to 20 mg/L throughout the Otowi Member (Broxton et al. 2002, 76006). Concentrations of fluoride have varied within the perched-intermediate zones from 2002 to 2005, which may be indicative of natural conditions with a slight impact from the TA-50 outfall. Concentrations of fluoride in filtered and nonfiltered samples slightly varied from 0.4 to 0.42 mg/L at MCOBT-4.4 during 2002 and 2003. At MCOI-4, concentrations of fluoride in nonfiltered samples varied from 0.21 to 0.24 mg/L. At MCOI-5, concentrations of fluoride in filtered and nonfiltered samples increased from 0.24 to 0.33 mg/L. Concentrations of fluoride in filtered and nonfiltered samples at MCOI-6 increased slightly from 0.54 to 0.59 mg/L during 2005.

Fluoride in the Regional Aquifer

Fluoride within the regional aquifer beneath Mortandad Canyon is generally variable within a narrow concentration range. Concentrations ranged from 0.01 to 0.48 mg/L, representing natural conditions within the regional aquifer.

Lead

Lead is a naturally occurring trace metal found in surface water and groundwater environments. It is also a widespread environmental contaminant associated with industrial discharges, bullets, batteries, leaded gasoline, paint, solder, and other waste forms or chemicals. Lead is stable in the +II oxidation state in aqueous solution (Langmuir 1997, 56037) and forms complexes with hydroxide, sulfate, chloride, and bicarbonate. Lead also precipitates from solution in the form of hydroxide, carbonate, sulfate, and

phosphate minerals. Lead strongly adsorbs onto ferric (oxy)hydroxide through surface complexation reactions (Langmuir 1997, 56037) under circumneutral pH conditions. Lead is very immobile in groundwater if it occurs as a cation and is not complexed with organic ligands or anions.

Lead in Surface Water and Alluvial Groundwater

The spatial trends in recent (2000–2005) lead concentrations in nonfiltered samples of surface water and alluvial groundwater are shown in box plots in Appendix D, Figures D-2.1-16 through D-2.1-18. The two highest concentrations of lead measured within the Mortandad watershed, exceeded 30 μg/L and 27 μg/L in nonfiltered surface water samples collected in upper Ten Site Canyon (Figure D-2.1-18) and upper Mortandad Canyon (Figure D-2.1-16), respectively. Concentrations of lead in nonfiltered surface water samples lower substantially downcanyon. In Effluent Canyon, the highest concentration of lead (22 μg/L) was measured in a nonfiltered alluvial groundwater sample collected at well MCO-2/MCA-4 above the TA-50 RLWTF outfall (Figure D-2.1-17). A dissolved concentration of lead of 3.5 μg/L was measured at alluvial well MCO-2/MCA-4, located above the Mortandad Canyon confluence. The sources of lead at these locations, which are all near the head of their respective canyons, are most likely anthropogenic, originating from TA-35, TA-03 and TA-48 discharges, respectively, and/or atmospheric and roadside deposition of leaded gasoline that contains tetraethyl lead. Most of the lead within the watershed is associated with suspended material because concentrations of this metal in nonfiltered samples are greater than that found in filtered samples. Concentrations of dissolved lead in surface water and alluvial groundwater within the watershed are less than the New Mexico WQCC groundwater standard of 50 μg/L and the EPA Region 6 tap water standard of 15 μg/L.

Lead in Vadose-Zone Pore Water, Perched-Intermediate Groundwater, and the Regional Aquifer

Anthropogenic forms of lead discharged from the Laboratory most likely have not migrated substantially into the vadose zone and have not reached perched-intermediate zones and the regional aquifer because of the element's high capacity to adsorb onto surfaces of aquifer material containing smectite and ferric (oxy)hydroxide. At well R-15, lead analyses of vadose-zone core samples showed lead within the Bandelier tuff and the Cerro Toledo interval (Longmire et al. 2001, 70103). However, this was attributed to naturally occurring elements within the tuff samples. Detectable concentrations of lead in nonfiltered samples from perched-intermediate zones ranged from 0.56 to 13.8 μg/L at MCOI-4, MCOI-5, MCOI-6, and MCOI–8 and MCOBT-4.4. Dissolved (filtered) concentrations of lead are generally not detected (upper detection limit of 0.5 μg/L) within perched-intermediate zones and the regional aquifer. When detected, dissolved concentrations of this trace metal are less than 0.3 μg/L. Distributions of natural lead in the deeper saturated zones are controlled by specific hydrogeochemical conditions including groundwater composition and aquifer mineralogy. Elevated concentrations of lead may occur in wells resulting from corrosion of components and solder associated with electrical wiring.

Manganese

Manganese is stable in the +II, +III, and +IV oxidation states in aqueous solution in which a large stability field for dissolved Mn(II) occurs (Langmuir 1997, 56037). Manganese (III, IV) solids are stable under oxidizing conditions typical of aquatic environments with little or no dissolved or solid organic matter. Manganese(IV) solids are considered to be important minerals present within aquifer and vadose material in the watershed based on oxidizing conditions. Manganese(IV) solids are important adsorbents for many trace elements similar to that of ferric (oxy)hydroxide (Langmuir 1997, 56037). Manganese (III, IV) oxides are less abundant than ferric (oxy)hydroxide and hematite in aquifer material and surface sediments at the Laboratory based on much higher concentrations of iron (in the weight percent range) than

manganese (in the parts per million range). Manganese has a spatial distribution that is, in part, similar to that of iron in sections of the watershed.

It is widely accepted that bacterially mediated reduction of manganese depends upon sediment moisture conditions, the availability of labile organic carbon, and the presence of poorly crystalline manganese oxides (Lovley 1991, 85523; Lovley and Chapelle 1995, 85506). In wetlands within upper Mortandad Canyon, dissolved and solid organic matter are concentrated in sections with abundant vegetation including grasses, shrubs, cattails, and coniferous and deciduous trees. Persistent saturated conditions in these reaches ensure environmental stability for microbial communities, and abundant manganese oxides associated with volcanic rocks, especially weathered tuffs, on the Pajarito Plateau provide optimal conditions for manganese reduction in wetland pore water. In addition, the slow oxidation kinetics of manganese and the progressively longer residence time of stagnant water within wetlands result in an accumulation of soluble manganese (Hem 1981, 85505).

Manganese in Surface Water and Alluvial Groundwater

The spatial trends in recent (2000–2005) manganese concentrations in nonfiltered and filtered samples of surface water and alluvial groundwater are shown in box plots in Appendix D, Figures D-2.1-19 through D-2.1-21. Concentrations of manganese in filtered and nonfiltered surface water samples range from 6.3 to 958 μg/L and from 7.4 to 1080 μg/L, respectively, within Effluent Canyon. Concentrations of manganese in filtered and nonfiltered alluvial groundwater samples range from 1510 to 2266 μg/L and from 1670 to 2375 μg/L, respectively, at MCA-4. Concentrations of manganese exceeding 2 mg/L are associated with both nonfiltered and filtered samples in surface water in reach M-1E and in alluvial groundwater at MCO-0.6 (Figure D-2.1-19), both located in or near wetland areas in upper Mortandad Canyon west of the Effluent Canyon, and in alluvial groundwater collected from MCO-2/MCA-4 within Effluent Canyon west of the TA-50 RLWTF outfall (Figures D-2.1-20). The presence of abundant wetlands in upper Effluent Canyon and Mortandad Canyon suggests that the manganese observed in this portion of the watershed is naturally occurring. Concentrations of manganese sharply decrease immediately east of the TA-50 outfall and remain low throughout Mortandad Canyon. Most of the detectable manganese is stable as soluble manganese(II) based on similar concentrations within filtered and nonfiltered samples. Concentrations of manganese in filtered and nonfiltered surface water samples range from 1.67 to 33.7 μg/L and from 2.5 to 108 μg/L, respectively, within Mortandad Canyon. Concentrations of manganese in filtered and nonfiltered alluvial groundwater samples range from 0.296 to 7.6 μg/L and from 0.296 to 45.6 μg/L, respectively, within Mortandad Canyon.

In Ten Site Canyon, manganese is identified in surface water within reaches TS-1C and TS-2E (Figure D-2.1-21). The maximum concentrations of total manganese in filtered and nonfiltered water samples are 449 and 1690 μg/L, respectively, in surface water in reach TS-1C. This distribution suggests that particulates of manganese(III, VI) oxides occur within the reach, and the surface water is moderately oxidizing. The maximum concentrations of total manganese in filtered and nonfiltered samples are 875 and 887 μg/L, respectively, in surface water in reach TS-2E. This distribution suggests that manganese(II) is stable and that reductive dissolution of manganese(III, IV) oxides has taken place within the reach. It is not clear whether the manganese in Ten Site Canyon represents a natural condition or a Laboratory source of manganese.

Manganese within Perched-Intermediate Groundwater and the Regional Aquifer

Any anthropogenic forms of manganese that may have been released by the Laboratory most likely have not migrated to perched intermediate zones and the regional aquifer because of the elements' low solubility under circumneutral pH and oxidizing conditions dominating in the subsurface. Distributions of

natural manganese in the deeper saturated zones are controlled by specific hydrogeochemical conditions including redox conditions, groundwater composition, and aquifer mineralogy. Biologically induced breakdown of drilling fluids results in reductive dissolution of manganese oxide (LANL 2005, 91533).

Nickel

Nickel is stable in the +II oxidation state in aqueous solution as Ni^{2+}, $NiHCO_3^+$, and $NiCO_3^0$ (Langmuir 1997, 56037). Free or noncomplexed Ni^{2+} is stable under acidic pH conditions, whereas the complexes $NiHCO_3^+$ and $NiCO_3^0$ are stable under circumneutral pH conditions in the presence of total carbonate alkalinity. Nickel(II) solids, including $Ni(OH)_2$ and $NiCO_3$, are stable under a wide range of redox conditions. Natural nickel is concentrated within the Cerros del Rio lavas, ranging between 35 and 154 ppm (Vaniman et al. 2002, 72615) and is a trace element associated with olivine, basaltic glass, and weathering products such as ferric (oxy)hydroxide, smectite, and iddingsite. Nickel(II) adsorbs onto ferric (oxy)hydroxide and clay minerals (Langmuir 1997, 56037) through surface complexation and cation exchange reactions, respectively.

Elevated concentrations of nickel in filtered and nonfiltered samples were measured at MCOI-5 and R-33 (screen 1) during one or two sampling rounds conducted in 2005. Well MCOI-5 was sampled on June 9 and September 9, 2005. Concentrations of nickel in filtered and nonfiltered samples were 55.8 and 62.2 μg/L and 414 and 282 μg/L, respectively, at MCOI-5. Concentrations of iron in the same filtered and nonfilter samples were 62.4 and 69.8 μg/L and 6980 and 4360 μg/L, respectively, at MCOI-5. Concentrations of iron in nonfiltered samples suggest the presence of iron-rich solid phases associated with suspended material. Turbidity values were 83.6 and 16.6 NTU in the two samples collected on June 9 and September 9, 2005, respectively. Well MCOI-5 is completed within Puye Formation/Cerros del Rio basalt. One hypothesis for explaining the elevated nickel concentrations at MCOI-5 is that natural adsorbents for nickel and other metals such as ferric (oxy)hydroxide, olivine, smectite, and volcanic glass are present as suspended particles.

Well R-33 was sampled on June 24 and 27 and September 14 and 15, 2005. Concentrations of nickel were 168 and 25.1 μg/L, respectively, in filtered and nonfiltered samples collected on June 24, 2005, at R-33 (screen 1) using EPA Method SW-846-6010B. The analytical result for nickel in the filtered sample is suspect because it is greater than that for the nonfiltered sample. The turbidity measured for the sample was 24.1 NTU. Concentrations of iron in the same filtered and nonfilter samples were 163 and 251 μg/L, respectively, which were also analyzed by using EPA Method SW-846-6010B. Other samples collected at R-33 in September 2005 did not show any discrepancies within metal analyses.

7.2.2.2 Organic Chemicals in Water

Aroclor-1260

Aroclor-1260 generally was not detected in surface water and alluvial groundwater samples collected within the Mortandad watershed (Appendix D, Figures D-2.1-22 through D-2.1-24). The maximum instrument detection limit (IDL) for aroclor-1260 was 1.4 μg/L. Arochlor-1260, however, was detected at a concentration of 1.1 μg/L in one nonfiltered surface water sample collected in Ten Site Canyon within reach TS-1C (Figure D-2.1-24). Aroclor-1260 is not considered to be a widespread COPC in surface water or alluvial groundwater within the watershed.

Bis(2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate was detected between concentrations of 0.5 and 7 μg/L in nonfiltered surface water and alluvial groundwater samples within Mortandad Canyon (Appendix D, Figures D-2.1-25 through D-2.1-27). The highest concentration of bis(2-ethylhexyl)-phthalate was measured at well MT-1. The maximum practical quantitation limit (PQL) for bis(2-ethylhexyl)-phthalate is 22 μg/L. Detects of bis(2-ethylhexyl)-phthalate are typically less than the PQLs but are above the minimum detection limit (MDL) of 0.5 μg/L. Bis(2-ethylhexyl)phthalate was observed in regional well R-15 from 2000 to 2005 and in R-33 in 2005 at ranges of 2 to less than 11 μg/L. Bis(2-ethylhexyl)phthalate is a component of plastics and could be derived from several sources, including bailers used during sample collection, Laboratory discharges and runoff, and analytical laboratories in which water samples come in contact with plastic during analysis.

1,4-Dioxane

Perched-intermediate groundwater has shown detections of 1,4-dioxane at MCOI-4 (53.3 and 50.8 μg/L) and MCOI-6 (52.2 and 56.4 μg/L). Other wells sampled in the Mortandad watershed did not contain detectable concentrations of 1,4-dioxane. The analytical detection limit for recent samples analyzed for 1,4-dioxane is 50 μg/L using gas chromatography-mass spectrometry. 1, 4-dioxane is completely miscible in aqueous solution and does not adsorb onto solid surfaces. 1, 4-dioxane is used as a solvent for cellulosics and a wide range of organic products including lacquers, paints, varnishes, paint and varnish removers, cleaning and detergent preparations, cements, cosmetics, deodorants, and fumigants (Verschueren 1983, 63044). The source(s) of 1,4-dioxane have not been identified.

7.2.2.3 Radionuclides in Water

Several radionuclides are identified in Section 6 as being COPCs in surface water, alluvial and perched-intermediate groundwater and/or the regional aquifer in the Mortandad watershed. These include tritium, strontium-90, plutonium-238, plutonium-239,240, and americium-241. A series of plots in Appendix D provides a high-level overview of the spatial trends of the radionuclide COPCs in the Mortandad watershed. The discussion below provides additional information on the spatial distribution of these contaminants in key areas of the watershed. Overall, the spatial distribution of radionuclide concentrations indicates only a few key sources of contaminants in water. The most important sources include the TA-50 outfall within Effluent Canyon and the former TA-35 WWTP outfall adjacent to reach TS-1C in Ten Site Canyon (Plate 1). Ash from the Cerro Grande fire may be a potential minor source of radionuclide constituents measured in water.

Tritium

Tritium is detected in surface water, alluvial groundwater, perched-intermediate groundwater, and the regional aquifer in Mortandad Canyon. Tritium has been discharged into the Mortandad watershed from approximately 1953 to 1974 at TA-35 and since 1963 at the TA-50 RLWTF (see Section 2.1). Tritium is a radioactive isotope of hydrogen with a relatively short half-life of 12.32 yr, which decays to helium-3 with the emission of a beta particle (Clark and Fritz 1997, 59168). It is extremely mobile because it can replace hydrogen within a water molecule and travel as groundwater.

Tritium in Surface Water and Alluvial Groundwater

Tritium travels laterally down canyon with the surface water and alluvial groundwater in the watershed. The spatial trends in recent (2000–2005) tritium concentrations in surface water and alluvial groundwater

are shown in the box plots of Figures D-2.1-28 through D-2.1-30. Tritium concentrations are low (< 1000 pCi/L) in upper Mortandad Canyon (Fig. D-2.1-28), in upper Effluent Canyon (Fig. D-2.1-29), and in Ten Site Canyon (Fig. D-2.1-30) indicating that there is little, if any, recent tritium disposal contributing to these canyon segments. The highest concentrations of tritium in surface water are observed at gage E200 with two detections greater than the groundwater MCL of 20,000 pCi/L. All other surface water and alluvial groundwater detections, except for one high value at well pair MCO-3/MCA-5, are far below the MCL.

Figure 7.2-27 is a time series plot covering the period 1967 through 2005. It shows the annual tritium concentration in TA-50 RLTWF effluent and the resulting concentrations at alluvial wells MCO-3/MCA-5, MCO-5, MCO-6, MCO-7 and MCO-7.5. From 1976 to 1992, the outfall tritium concentrations averaged over 300,000 pCi/L, with maximum concentration exceeding 3,000,000 pCi/L. During this same period, tritium concentrations in the alluvial wells were elevated with many values over 20,000 pCi/L. Since 2001, outfall concentrations have dropped below 20,000 pCi/L. Correspondingly, concentrations of tritium have decreased in surface water and alluvial groundwater.

Current concentrations of tritium in alluvial groundwater are generally higher in the Mortandad Canyon segment between wells MCO-3/MCA-5 and MCO-7.5 (Figure D-2.1-29) are lower east of MCO-7.5. Previous releases from the TA-50 RLWTF are the likely source of tritium. Similar to nitrate and perchlorate, tritium demonstrates a trend of increasing concentration spatially from west to east in Mortandad Canyon beyond the Effluent Canyon confluence. Again, this trend is indicative of a dilution lag in the alluvial aquifer from west to east since improved tritium removal began in 2000 (see Section 2.1.1), with the lag being a function of both the distance from the outfall and localized alluvial storage. To illustrate this, Figure 7.2-28 is a time series plot analogous to Figure 7.2-27, but it covers the period of low tritium effluent concentrations, 2000 through 2004/2005. The observed decline in tritium concentration over time is completely analogous to that observed for nitrate. That is, at the westernmost well pair MCO-3/MCA-5, the concentration decline occurs almost immediately in 2000 after the drop in effluent concentration. At wells MCO-5 and MCO-6, the decline is delayed slightly with the greatest change in 2000 and 2001. Finally, tritium concentrations at the most distal wells, MCO-7 and MCO-7.5, have declined slowly since 2000. Tritium concentrations at these distal locations should continue to decline in response to lower effluent concentrations

Tritium in Vadose-Zone Pore Water and Perched-intermediate Zones

Tritium has migrated from the surface water and alluvial groundwater into the vadose zone. Figures D-2.3-22 through D-2.3-42 show the distribution of tritium concentrations in core samples collected at the MCB-, MCOI- and R- boreholes or wells in the Mortandad watershed. These values are presented here as pore-water concentrations. Both the vertical and horizontal (downcanyon) extent of tritium in the vadose zone is similar to that of nitrate and perchlorate in most of the canyon. This is demonstrated by comparing vadose-zone concentrations for tritium (Figures D-2.3-22 through D-2.3-42) to analogous profiles for nitrate and perchlorate (Figures D-2.3-1 through D-2.3-21). Tritium was detected in core samples collected at 9 of the 13 MCB- boreholes and at MCOI-6, MCOI-8, and MCOI-10, R-1, R-14, R-15, and R-28. A maximum concentration of 3.75×10^6 pCi/L of tritium was measured at MCB-10 at a depth of 18 m (60 ft) within the alluvium. Samples collected at MCB-9, MCB-10, and MCB-11 also had peak concentrations of detectable tritium within the alluvium. At MCB-5, MCB-6, and MCB-7, and R-1, peak concentrations of detectable tritium occur within the Bandelier Tuff, Unit Qbt1g. Peak concentrations of detectable tritium occur within the Cerro Toledo Interval at MCB-8 and MCB-12. The deepest pore-water measurements were observed in the Otowi Member in MCB-14, MCOI-6, MCOI-8, R-1, and R-15, which coincides with that part of Mortandad Canyon below the confluent with Ten Site Canyon and represented as an area with the enhanced deep percolation (Figure 7.0-1). At some locations

(e.g., MCB-14 in Figure D-2.3-32; R-1 in Figure D-2.3-39), tritium does not extend as deep as nitrate and perchlorate, which might be due to radioactive decay in the deepest (and oldest) vadose-zone porewater within the Bandelier Tuff. Tritium was not detected at MCB-1 and MCB-2, west of the RLTWF outfall within Effluent Canyon, or at MCB-15, MCB-16, MCOI-1, or MCOI-10.

Tritium is observed in perched-intermediate groundwater. Concentrations of tritium within saturated portions of the Puye Formation and Cerros del Rio basalt are the highest beneath the axis of Mortandad Canyon east of the confluence with Ten Site Canyon. Concentrations of tritium at MCOBT-4.4 ranged from 9700 to 14,900 pCi/L from 2001 to 2003, when tritium concentrations generally increased over time (Figure 7.2-21). The concentration of tritium was 21,007 pCi/L in a sample collected from the well during 2005. Concentrations of tritium at MCOI-4 varied from 11,700 to 12,900 pCi/L, whereas lower concentrations of tritium occur at MCOI-5 ranging from 4310 to 5370 pCi/L during 2005 (Figures D-2.2-16[l] and D-2.2-17[l]). Concentrations of tritium at MCOI-6 varied from 12,200 to 13,100 pCi/L (Figure D-2.2-18[l]). The concentration of tritium measured at MCOI-8 was 137 pCi/L, confirming that recharge from surface water or perched alluvial groundwater infiltrates to perched-intermediate zones immediately west of the Ten Site confluence.

Tritium in the Regional Aquifer

Based on available data, concentrations of tritium within the regional aquifer in the Puye Formation are the highest beneath the axis of Mortandad Canyon at R-28 and decrease to the south at R-15. Concentrations of tritium at R-28 increased from 152 to 181 pCi/L during 2005 (Figure 7.2-23). These are the highest concentrations of tritium measured in the regional aquifer within Mortandad Canyon. Concentrations of tritium at R-15 increased from 1.12 to 31 pCi/L from 1999 to 2005 (Figure 7.2-21). Concentrations of tritium at regional aquifer well TW-8 varied from 4.21 to 140 pCi/L from 2003 to 2005 (Figure D-2.2-26[l]). TW-8 was drilled by the cable tool method and was completed in 1960, which may have resulted in leakage of alluvial groundwater down the well casing. R-1, a replacement well for TW-8, was drilled 75 m (246 ft) west of TW-8 does not contain tritium (Figure D-2.2-19[l]). Concentrations of tritium are slightly above the IDL of 0.29 pCi/L, using electrolytic enrichment, at R-1 and R-14 (screen 1) (Figures D-2.2-19[l] and D-2.2-21[l]). Concentrations of tritium are less than analytical detection at wells R-13, R-14 (screen 2), R-33, and R-34 (Figures D-2.2-20[l], D-2.2-21[l], D-2.2-24[l], D-2.2-25[l]).

Strontium-90

Strontium-90 has a half-life of 28.78 y and decays to yttrium-90 through emission of a beta particle. Strontium-90 reversibly adsorbs onto sediments containing clay minerals through cation exchange reactions (Langmuir 1997, 56037). Strontium is stable in the +II oxidation state in aqueous solution. Strontium forms complexes with bicarbonate ($SrHCO_3^+$, $SrCO_3^0$) under near-neutral pH conditions. Cationic forms of strontium are considered to be less mobile than neutral forms under alkaline pH conditions because cation exchange dominates over anion exchange (Langmuir 1997, 56037). Stable or natural strontium and strontium-90 precipitates from solution as $SrCO_3$ (strontianite), which has an aqueous solubility of $10^{-9.27}$ moles/L (6.63×10^6 pCi/L) (Langmuir 1997, 56037). Therefore, precipitation is another potential process for removing strontium-90 from solution. Surface water and groundwater have much higher concentrations of stable strontium than of strontium-90, which enhances precipitation of $SrCO_3$ within the watershed for long periods of time exceeding 30 years.

Strontium-90 in Surface Water and Alluvial Groundwater

The spatial trends of current (2000 through 2005) strontium-90 concentrations in both nonfiltered and filtered surface water and alluvial groundwater samples are shown in box plots in Appendix D, Figures

D-2.1-31 through D-2.1-33. These plots indicate that the TA-50 RLWTF outfall and former discharges from the TA-35 WWTP are important Laboratory sources of strontium-90 within the Mortandad watershed. Dissolved strontium-90 makes up approximately 50% to 90% of total strontium-90 within surface water and alluvial groundwater in the Mortandad watershed, suggesting that this radionuclide reversibly adsorbs onto sediments through cation exchange reactions. In Mortandad Canyon, concentrations of strontium-90 are generally higher in surface water at location E200 east of the confluence with Effluent Canyon and in reach M-2E and in alluvial water in the segment of Mortandad Canyon between wells MCO-3/MCA-5 and MCO-6 (Figure D-2.1-32). In Effluent Canyon, concentrations in surface and alluvial groundwater are elevated east of the RLWTF outfall, which is clearly a source of strontium-90 to the watershed. The maximum concentration of strontium-90 in surface water is approximately 48 pCi/L measured in surface water in Mortandad Canyon at location E200. The highest concentration of strontium-90 was 81.6 pCi/L at MCO-5, the alluvial groundwater monitoring well located east of the PRB and west of the confluence with Ten Site Canyon (Figure D-2.1-32). Concentrations of total strontium-90 sharply decrease downcanyon to less than 4 pCi/L at alluvial well MCO-7 and other wells farther to the east. Groundwater mixing and/or an increase in the adsorptive capacity of the alluvium (silt-sized material) may explain concentration decreases of strontium-90 between alluvial wells MCO-6 and MCO-7. Persistent surface water was uncommon in this portion of the Mortandad watershed during the investigation period; therefore, contamination was generally limited to alluvial groundwater.

The spatial distribution of strontium-90 concentrations in surface water in Ten Site Canyon above the Mortandad Canyon confluence indicate that the bulk of strontium-90 has migrated downcanyon to reach TS-2E (Figure D-2.1.33). The highest concentration of total strontium-90 within this reach is 21.3 pCi/L. A portion of the strontium-90 released from TA-35 WWTP, however, occurs in upper Ten Site Canyon in surface water within reach TS-1C with a maximum concentration of 7 pCi/L.

Figure 7.2-29 is a time series plot for strontium-90 covering the period 1963 through 2005. It shows the annual strontium-90 concentration in RLWTF effluent and the concurrent concentrations at alluvial wells MCO-3/MCA-5, MCO-5, MCO-6, MCO-7, and MCO-7.5. The strontium-90 concentrations in the outfall averaged 380 pCi/L from 1963 to 1989, with a maximum concentration of 1725 pCi/L. During this same period, strontium-90 concentrations in the alluvial wells were elevated with many measurements over the MCL of 8 pCi/L. Concentrations at the alluvial wells that are located closest to the TA-50 outfall, MCO-3 and MCO-5, tend to rise in response to outfall releases. Those wells farther downcanyon, MCO-7 and MCO-7.5, have relatively constant, low concentrations of strontium-90. It is likely that adsorption onto various adsorptive phases within alluvial sediments retards further strontium-90 transport. After 1993, outfall concentrations dropped below 10 pCi/L, and from 2000 to 2004, the average outfall concentration has been less than 4 pCi/L due to source reduction implemented by the waste generators before entering the TA-50 RLWTF and through cation exchange and/or reverse osmosis treatment at the facility. Correspondingly, concentrations in the alluvial wells have declined. The rate of decline of strontium-90 concentrations in alluvial groundwater is controlled by concentration decreases in the TA-50 effluent, by cation exchange and dilution in the environment, and by radioactive decay.

Figure 7.2-30 shows the alluvial aquifer response to strontium-90 source reduction for the period 2000 through 2005, when outfall concentrations dropped to below 4 pCi/L. This response is not similar to that observed for nitrate, perchlorate, or tritium, which showed a lag in dilution at alluvial wells located farther from the source. Here the more distal wells (MCO-7 and MCO-7.5) maintain low concentrations because they were not elevated in the first place. Concentrations at wells MCO-3/MCA-5, MCO-5, and MCO-6 are slowly declining in response to the source reduction. This response may be delayed by desorption of strontium-90 from the sediment and alluvial load.

Strontium-90 in Vadose-Zone Pore Water, Perched-Intermediate Groundwater, and the Regional Aquifer

Plots of concentration versus depth for strontium-90, shown in Figures D-2.4-22 through D-2.4-38, indicate that this radionuclide is concentrated within the alluvium and at the alluvium/bedrock contact. Higher concentrations of strontium-90 are observed in alluvial groundwater indicating that a fraction of this radionuclide adsorbs onto alluvial material, as discussed above. Strontium-90 was detected in core samples collected at MCB-5, MCB -6, MCB-7, and R-1 at depths less than 11 m (35 ft). The maximum concentration of strontium-90 is approximately 1.16 pCi/g measured at borehole MCB-5 at a depth of 6 m (20 ft) within the alluvium. The strontium-90 values shown in these plots are generally below the analytic detection limit, as indicated by the open blue triangles. Concentrations of strontium-90 in core samples were less than analytical detection at MCB-1, MCB-2, MCB-8, MCB-9, MCB-10, MCB-11, MCB-12, MCB-14, MCB-15, MCB-16, R-14, R-15, and R-28. Strontium-90 is not consistently detected within perched-intermediate zones and the regional aquifer within the Mortandad watershed due to its ability to adsorb onto silt- and clay-sized material present within the alluvium and weathered Bandelier Tuff.

Plutonium-238 and Plutonium-239,240

The half-life of plutonium-238 is 87.7 yr, and the isotope decays to uranium-234 by emission of an alpha particle (Parrington et al. 1996, 58682). The half-lives of plutonium-239 and plutonium-240 are 2.410×10^4 and 6.56×10^3 yr, respectively, and they decay to uranium-235 and uranium-236, respectively, by emission of alpha particles (Parrington et al. 1996, 58682). Plutonium strongly adsorbs onto sediments containing clay minerals and ferric (oxy)hydroxides (Langmuir 1997, 56037) through surface complexation reactions. Plutonium is stable in the +III, +IV, +V, and +VI oxidation states in aqueous solution. Plutonium(III, V, and VI) forms complexes with bicarbonate (for example, near pH 7, $PuCO_3^+$, $PuO_2CO_3^-$, $PuO_2(CO_3)_2^{2-}$, and $PuO_2CO_3^0$). Plutonium(IV and V) hydrolyzes to form $Pu(OH)_4^0$ and PuO_2^+. Plutonium(V and VI) complexes are considered to be the most stable in oxidizing surface water and alluvial groundwater within the Mortandad watershed based on the co-occurrence of nitrate, perchlorate, chromium(III, VI), and solid organic matter in the sediments. Cationic forms of complexed plutonium are considered to be less mobile than anionic forms under alkaline pH conditions because most adsorbents tend to have net-negative surface charges (Langmuir 1997, 56037). Plutonium(IV) oxide, consisting of plutonium-239, is characterized by low aqueous solubility of $10^{-35.38}$ moles/L ($6.15 \times 1\ 0^{-23}$ pCi/L) at pH 7, calculated using thermodynamic data cited in Langmuir 1997 (56037); therefore, precipitation from the aqueous phase provides another potential process for removing plutonium from solution.

Plutonium-238 and -239 in Surface Water and Alluvial Groundwater

The spatial trends in plutonium-238 and plutonium-239 concentrations in surface water and alluvial groundwater from 2000–2005 are shown in box plots for different portions of the Mortandad watershed in Appendix D, Figures D-2.1-34 through D-2.1-36 and Figures D-2.1-37 through D-2.1-39, respectively. Detections of plutonium-238 and plutonium-239,240 occur in both filtered and nonfiltered samples throughout the Mortandad watershed, but the highest concentrations are from nonfiltered surface water samples, indicating the preference for plutonium to adsorb to fine-grained sediment and solid organic matter and the presence of plutonium-contaminated suspended solids in the samples.

The distributions of detected values of plutonium-238 and plutonium-239,240 are attributed to two primary sources: the TA-50 RLWTF outfall and the former TA-35 WWTP outfall (Section 2.1). In Mortandad Canyon, the highest frequency of detected plutonium-238 and plutonium-239 concentrations occurs in surface water immediately east of the TA-50 outfall within reach E-1E and below the Mortandad

confluence at gage E200. The concentrations and frequency of detection decrease immediately downcanyon. From monitoring well MCO-3/MCA-5 down Mortandad Canyon, only scattered detected concentrations occur in surface water and alluvial groundwater. Overall, a higher frequency of detection occurs in nonfiltered samples, indicating the presence of plutonium-contaminated suspended solids in the samples.

In Ten Site Canyon, above the confluence with Pratt Canyon, plutonium-238 was detected in filtered and nonfiltered surface water samples within reaches TS-1C and TS-1E with maximum detected concentrations of 0.234 and 1.79 pCi/L, respectively (Figures D-2.1-33 and D-2.1-36). Maximum concentrations of plutonium-239 detected in filtered and nonfiltered surface water samples were 0.0712 and 0.79 pCi/L, respectively, in the same reaches (Figures D-2.1-36 and D-2.1-39). Concentrations of both plutonium-238 and plutonium-239 are less than detection east of reach TS-1C within Ten Site Canyon. The limited concentrations of plutonium detected in surface water in reach TS-1C are probably related to the presence of plutonium-contaminated sediments redistributed downcanyon from the TA-35 sources (Section 7.1).

Appendix D, Section D-2.2, shows a time series plot for plutonium-238 and plutonium-239 covering the period 1963 through 2005 for surface water gage E200 and the entire series of alluvial wells. These plots show the highest concentrations of plutonium occurred just downstream of the TA-50 outfall in surface water at gage E200 and in alluvial groundwater in well MCO-3. Concentrations decline rapidly down canyon because of adsorption of plutonium onto sediments and alluvial deposits. Maximum plutonium concentrations in surface and alluvial groundwater occurred during the 1980s when releases were highest (Table 2.1-1). Surface water and alluvial groundwater concentrations of plutonium-238 and plutonium-239 are currently both less than 7 pCi/L in nonfiltered samples and less than 2.5 pCi/L in filtered samples.

Plutonium-239,240 in Vadose-Zone Pore Water, Perched-Intermediate Groundwater, and the Regional Aquifer

Figures D-2.4-22 through D-2.4-38 show the distribution of plutonium-239 concentrations in core samples collected from Mortandad Canyon and Ten Site Canyon. Both plutonium and americium adsorb onto solid surfaces, and these two actinides are generally collocated in the core samples, although plutonium was detected at a higher frequency in samples at depth. Plutonium-239 was detected in core holes MCB-5, MCB-6, MCB-7, MCB-9, MCB--10, R-1, and R-14. Plutonium-239 was detected at a concentration of 0.03 pCi/g at a maximum depth of 61 m (200 ft) within the Cerro Toledo interval at R-14. This occurrence could be attributed to translocation or downward movement during coring operations at R-14. The maximum concentration of plutonium-239 was 1.16 pCi/g measured at core hole MCB-7 at a depth of 3 m (10 ft) within the alluvium. Several samples from MCB-5, MCB-7, MCB-9, and MCB-10, contained detectable plutonium-239 at depths suggesting that colloid transport under saturated and unsaturated flow conditions has taken place. Plutonium-239 was not detected at core holes MCB-1, MCB-2, MCB-8, MCB-11, MCB-12, MCB-15, MCB-16, R-14, R-15, and R-28.

Plutonium-239,240 is not frequently detected within perched-intermediate zones and the regional aquifer within the Mortandad watershed due to its ability to strongly adsorb onto silt- and clay-sized material present within stream channels, alluvium, and weathered Bandelier Tuff. Possible detections of plutonium-239, 240 within deep saturated zones occur in nonfiltered samples, and transport mechanisms may include adsorption onto colloids migrating through fractured media.

Americium-241

Americium-21 has a half-life of 432.7 yr and decays to neptunium-237 through emission of an alpha particle. Americium is stable in the +III oxidation state in aqueous solution (Langmuir 1997, 56037). Americium-241 very strongly adsorbs onto sediments containing clay minerals and ferric (oxy)hydroxide, through cation exchange and surface complexation reactions (Langmuir 1997, 56037). Americium forms complexes with bicarbonate. At pH 7, it is stable as $AmCO_3^+$ at a partial pressure of CO_2 gas = 10^{-2} bar, typical of groundwater. Under surface water conditions with a partial pressure of CO_2 gas = $10^{-3.5}$ bar, americium is mainly stable as $AmOH^{2+}$ at pH 7 (Langmuir 1997, 56037). Americium-241 precipitates from solution as $AmOHCO_3$, and its solubility minimum is $10^{-8.7}$moles/L (1.64×10^6 pCi/L) at pH 8.3. Adsorption of americium-241 onto clay minerals and ferric (oxy)hydroxide is the dominant process taking place in the watershed for removing this actinide from solution.

Americium-241 in Surface Water and Alluvial Groundwater

The spatial trends in americium-241 concentrations in surface water and alluvial groundwater from 2000 to 2005 are shown in box plots for different portions of the Mortandad watershed in Appendix D, Figures D-2.1-40 through D-2.1-42. The release history of americium-241 from the TA-50 RLWTF is similar to that of plutonium-239,240, even though less americium-241 was released in comparison to plutonium-239,240 (Table 2.1-1 and LANL 1997, 56835). The spatial distribution of americium-241 in water is similar to plutonium-239 in that highest concentrations detected in water are near the TA-50 source, and the concentrations and frequency of detection decrease rapidly downcanyon (Figures D-2.1-40 through D-2.1-41). In Effluent Canyon, the highest frequency of detected americium-241 concentrations occurs in surface water in reach E-1E below the TA-50 outfall and at gage E200 immediately east of the confluence with Mortandad Canyon. From monitoring well MCO-3/MCA-5 down Mortandad Canyon, detected concentrations occur in surface water and alluvial groundwater. Overall, a higher frequency of detection occurs in nonfiltered samples, indicating the presence of americium-contaminated suspended solids in the samples.

A smaller source of americium-241 occurred at the TA-35 WWTP. In Ten Site Canyon, americium-241 is identified in surface water only within reach TS-1C at a maximum total concentration of 0.2 pCi/L (Figure D-2.1-42). The concentrations of americium-241 detected in water in Ten Site Canyon are probably related to the presence of americium-contaminated sediments redistributed down canyon of the TA-35 source.

Appendix D, Section D-2.2, shows time series plot for americium-241 covering the period 1963 through 2005 for surface water gage E200 and the entire series of alluvial wells. The trend shown in these plots is very similar to that for plutonium in that the highest concentrations of americium occurred just downstream of the TA-50 outfall in surface water at gage E200 and in alluvial groundwater in well MCO-3. Concentrations decline rapidly downcanyon because of adsorption onto sediments and alluvial deposits. Recent nonfiltered samples show that surface water concentrations are less than 15 pCi/L, and alluvial groundwater concentrations are less than 5 pCi/L at MCO-3 and decline rapidly downcanyon from there.

Americium-241 in Vadose-Zone Pore Water, Perched-Intermediate Groundwater, and the Regional Aquifer

Figures D-2.4-22 through D-2.4-38 show the distribution of americium-241 concentrations in core samples with depth collected at the MCB holes in Mortandad Canyon. Americium-241 was infrequently detected in core samples collected at MCB-5, -6, -7, -8, and -14. This actinide was detected (0.04 pCi/g) at a maximum depth of 68.6 m (225 ft) within the Bandelier Tuff at MCB-14. This occurrence could be

attributed to translocation or downward movement during coring operations at MCB-14. Detectable concentrations of americium-241 typically occurred at depths less than 9.1 m (30 ft) within the alluvium due to its strong affinity for ferric (oxy)hydroxide and clay minerals. Core hole MCB-8 contained one detect of americium-241 at a depth of 27 m (90 ft), which may have resulted from coring operations. Core hole MCB-14 contained detectable concentrations of americium-241 at 12 and 21 m (40 and 70 ft) within the alluvium and at the contact of the alluvium-Cerro Toledo interval, respectively. The maximum concentration of americium 241 was approximately 1.05 pCi/g measured at core hole MCB-7 at a depth of 3 m (10 ft) within the alluvium. Americium-241 was not detected in samples collected from core holes MCB-1, MCB-2, MCB-9, MCB-10, MCB-11, MCB-12, MCB -13, MCB-15, and MCB-16.

Americium-241 is not consistently detected within perched-intermediate zones and the regional aquifer (see Appendix D, Section D-2.2) within the Mortandad watershed due to its ability to strongly adsorb onto silt- and clay-sized material present within the alluvium and weathered Bandelier Tuff. Possible detections of americium-241 within deep saturated zones occur in nonfiltered samples and transport mechanisms may include adsorption onto colloids migrating through fractured media.

7.3 Summary of Physical System Conceptual Model

This section summarizes the main elements of the physical system conceptual model whose individual elements were discussed in more detail in Sections 7.1 and 7.2. The primary focus of this section is the fate and transport of contaminants released from the TA-50 RLWTF because it is identified as the main source of contaminants in the Mortandad watershed. Other significant sources such as TA-35 and TA-48 are discussed at length in Sections 7.1 and 7.2, and the conceptual model discussed below also applies to the fate and transport of contaminants from these sources. Figure 7.0-1 illustrates key aspects of the physical system conceptual model.

Most contaminants in the Mortandad watershed are derived from Laboratory sources that released wastewater from outfalls into tributary drainages of Mortandad Canyon. Contaminants include radionuclides, inorganic chemicals, and organic chemicals as detailed in Sections 7.1 and 7.2. The mobility of contaminants is controlled by the geochemical characteristics of each contaminant and the geochemical properties of the medium along transport pathways (aqueous solubility, speciation, oxidation/reduction, precipitation/dissolution, adsorption/desorption, microbial and mineralogical characteristics of sediments and aquifer material). The nature and volume of effluent released from outfalls varied over time as a result of changes in research activities at the Laboratory, changes in wastewater treatment methods, and changes in environmental standards. As a result, the present-day distribution of contaminants in the watershed reflects the geochemical properties of individual contaminants, the complex history of releases from multiple Laboratory sites, and hydrological and mineralogical properties of aquifer material. Redistribution of contaminants by surface water, sediment transport, and groundwater is an ongoing process within the Mortandad watershed.

Initially, contaminants are transported from their release sites dissolved in water or adsorbed onto sediment particles and solid organic material. Some contaminants are deposited in soils between outfalls and stream channels, but most are transported down tributary drainages into the main canyon system by surface-water flow and sediment transport. Once adsorbed onto sediment particles in the streambed, contaminants are redistributed by floods that scour the streambed and mobilize the bed sediment. Contaminants associated with coarse-size fractions (coarse sand and coarser) are generally transported as bed load along the streambed, whereas contaminants associated with fine-size fractions (fine sand and finer) are generally transported in suspension. These include cesium-137, americium-241, plutonium-238, plutonium-239,240, chromium(III), lead, mercury, and PCBs. Contaminants are generally collocated in the sediment deposits, primarily occurring in post-1942 sediment deposits and preferentially

occurring in fine rather than coarse facies sediment. During floods, sediment from a variety of sources, much of it not contaminated, is mixed, changing contaminant concentrations longitudinally along the channel. The net result is a general downcanyon decrease in contaminant concentrations in sediment with distance from a contaminant source area (Figure 7.0-1). In general, the inventory of contaminants in sediments increases in downcanyon areas, primarily because post-1942 sediment accumulated in thicker and more extensive deposits where the canyon floor widens eastward. Most of the contaminant inventory in Mortandad Canyon occurs in reach M-3E, upcanyon from the Ten Site Canyon confluence. A notable exception to this trend is the deposition of chromium in Effluent Canyon close to its release site at TA-48.

In Effluent Canyon, the transport of contaminants by surface water is facilitated where thin alluvium overlies relatively impermeable bedrock in the stream channel; this limits the amount of infiltration along the stream channel and results in greater movement of surface water downcanyon. The downcanyon extent of surface water flow varies with effluent discharge rates, runoff from storm events and snowmelt, and prior moisture conditions along the channel. In Mortandad Canyon below the Effluent Canyon confluence, surface water infiltrates the Mortandad Canyon channel where the alluvium thickens and groundwater storage capacity increases (Figure 7.0-1). The maximum extent of persistent surface water occurred in the 1960s to early 1970s when effluent discharge volumes were highest. During this time, surface flow generally extended about 1.5 km (1 mi) or less downcanyon from the TA-50 RLWTF outfall. Discharge volume from the TA-50 RLWTF outfall has progressively decreased since the early 1980s, and today persistent surface water flow generally extends only about 600 m (1970 ft) below the Effluent Canyon confluence (Figure 7.0-1). Runoff from storm events and snowmelt sometimes causes ephemeral flow and episodic infiltration to occur as far east as the sediments traps (and rarely farther downcanyon), but these events are infrequent. Contaminant concentrations in surface water have decreased over time in response to improved treatment technologies employed at the TA-50 RLWTF, especially since 2000.

Infiltration of surface water in the stream channel recharges alluvium within the watershed. Stable isotope data suggest that some surface water and shallow subsurface moisture is lost through evapotranspiration. The remaining water recharges alluvial groundwater that generally accumulates in the lower part of the alluvial deposits, most often perching on weathered bedrock units. Perched alluvial groundwater is a major pathway for the downcanyon transport of soluble contaminants. In Mortandad Canyon, the thickest and most persistent perched alluvial groundwater occurs between MCB-5, where the canyon begins to widen eastward to MCB-11 located east of the sediment traps (Figure 7.0-1). Alluvial groundwater occurs on an intermittent basis as far east as alluvial well MT-4 (Figure 3.2-1). Well hydrographs suggest that the alluvial groundwater levels respond relatively quickly to precipitation events in areas closest to zones of surface water infiltration and that significant lag times may occur at the eastern limit of alluvial saturation. These data support the interpretation that the alluvial groundwater system is recharged by infiltration of persistent and intermittent surface water in gradually thickening alluvium west of MCB-5 and that underflow within the alluvium is the dominant recharge process for alluvial groundwater farther down canyon. Saturation is not uniformly distributed within the alluvium, and in some cases, dry boreholes were drilled next to a location or well where alluvial groundwater was encountered. Similarly, hydrographs for adjacent alluvial wells frequently respond at different times to precipitation events and runoff events. These observations suggest that alluvial groundwater flows along preferential pathways within the highly heterogeneous alluvium and that the aquifer may resemble a network of cross-connected channels rather than a continuous zone of saturation at the base of alluvium. Contaminant concentrations in alluvial groundwater have decreased over time in response to improved treatment of effluent at the TA-50 RLWTF. Concentrations in alluvial groundwater currently account for an estimated 0.1% of the nitrate mass and 2.8% of the perchlorate mass in the watershed. Although overall concentrations are declining, there is a trend of increasing concentration for mobile constituents downcanyon from well MCO-5 to approximately well MCO-7.5 (Figure 3.2-1). This trend is indicative of a lag in the response of alluvial groundwater to the application of improved effluent treatment technologies.

The lag is related in part to distance from the outfall, but increasing alluvial storage from west to east is probably a more important factor. Concentrations at more distal locations will continue to decline in response to lower effluent concentrations and to further dilution by runoff events.

Deeper infiltration of alluvial groundwater into bedrock units results in the vertical transport of contaminants into the suballuvium vadose zone. Transport of contaminants to these deeper zones is generally limited to soluble constituents such as nitrate, perchlorate, fluoride, tritium, sulfate, and chromium(VI). Contaminant profiles from core holes indicate that maximum contaminant concentrations of these mobile constituents and most of the contaminant mass (an estimated 96.6% of the nitrate mass and 94.6% of the perchlorate mass) occurs in bedrock units in the upper half of the vadose zone in the region extending from MCB-5 on the west to MCOBT.8.5 on the east (Figure 7.0-1). The Otowi Member of the Bandelier Tuff accounts for an estimated 55.8% of the nitrate mass and 67.7% of the perchlorate mass in Mortandad Canyon. The western extent of vadose-zone contamination is poorly constrained because Mortandad Canyon is inaccessible to drilling between the Effluent Canyon confluence and MCB-5. Thinning of alluvium over less permeable tuffs 500 to 1000 m (1640 to 3280 ft) west of MCB-5 probably controls the western limit of significant alluvial groundwater infiltration. The eastern extent of vadose-zone contamination is constrained by core hole data from MCOBT-8.5 and R-28. The greatest mass of contamination in the vadose zone occurs beneath the portion of the canyon that contains the thickest and most persistent alluvial groundwater. Bedrock units such as Tshirege unit Qbt 1g, the Cerro Toledo interval, and the Otowi Member underlie the alluvium in this area, and because of their porous nature, alluvial groundwater is able to percolate through these units. Moisture associated with vadose-zone contamination is elevated relative to other parts of the canyon, but the rocks are generally not fully saturated. Movement of moisture and contaminants probably occurs as gravity-driven porous flow. Estimates of vertical transport velocities of nitrate based on a release of unique isotopically light nitrogen from October 1986 to September 1989 range between 2.5 and 2.9 m/y (8.2 and 9.5 ft/y). Estimates of transport rates based on peak tritium releases to the canyon suggest that vertical transport rates have declined substantially from about 11 m/yr (36.1 ft/y) in the late 1970s to about 1.36 m/yr (4.46 ft/y) today. Finally, calibration to nitrate profiles in R-15 and MCOBT-8.5 yield approximate transport velocities of 6 m/yr (20 ft/yr) in 1968 to 1.2 m/yr (4 ft/yr) in 2002. These studies apply to mobile constituents and indicate vadose-zone transport velocities were greater in the past and that over time, transport velocities decreased as discharges to the watershed from outfalls declined. Adsorbing constituents have much slower transport rates and are generally not present within the suballuvium vadose zone.

A thin zone (<1m [<3 ft]) of perched-intermediate groundwater occurs within the clay-rich basaltic rubble at the top of the Cerros del Rio basalt near the Mortandad–Ten Site Canyon confluence (Figure 7.0-1). A thicker zone (up to 21.9 m [72 ft]) of perched saturation occurs near the base of the Cerros del Rio basalt near R-15. These perched-intermediate zones probably represent two unrelated groundwater bodies of limited lateral extent along the canyon axis (Figure 7.0-1). Based on the distribution of boreholes encountering perched-intermediate groundwater, the lateral extent of these groundwater bodies is probably less than 450 m (1500 ft). Contaminant concentrations within these perched zones show increasing trends over time, indicating that limited masses of the most mobile constituents (nitrate, perchlorate, chromium(VI), and tritium) have migrated from upgradient areas through the vadose zone along preferential pathways. Concentrations in perched-intermediate groundwater currently account for only an estimated 0.10% of the nitrate mass and 1.6% of the perchlorate mass in Mortandad Canyon. Perched-intermediate groundwater percolates into the Puye Formation, resulting in further vertical transport of contaminants into the lower vadose zone (Figure 7.0-1). Mobile constituents percolate through the lower vadose zone, reaching the regional water table.

The water table of the regional aquifer lies approximately 300 m (984 ft) below the canyon floor in Mortandad Canyon (Figure 7.0-1). The regional aquifer is a complex, heterogeneous system that includes

confined and unconfined zones. Hydraulic communication between these zones is uncertain and spatially variable. The shallow portion of the regional aquifer (along the water table) is predominantly under phreatic (unconfined) conditions and has limited thickness (approximately 30–50 m [98–164 ft]). The groundwater flow and transport directions in this zone generally follow the gradient of the regional water table; the flow is east/southeast toward White Rock Canyon springs and the Rio Grande. The shape of the regional water table is predominantly controlled by areas of regional recharge (Sierra de los Valles and some Pajarito Plateau canyons) and discharge (White Rock Canyon springs and the Rio Grande). The deep portion of the regional aquifer is predominantly under confined conditions, and it is heavily stressed by Pajarito Plateau water-supply pumping. The pumping likely has a small impact on the flow directions in the phreatic zone because of poor hydraulic communication (cf. Appendix O). Capture of contaminants by supply well PM-3 seems unlikely because of this poor vertical hydraulic communication. However, the poor hydraulic communication does not preclude the possibility that some contaminant migration may occur between the shallow and deep zones. Between the two zones, the hydraulic gradient has a substantial vertical component due to water-supply pumping, creating the possibility that downward contaminant flow may occur along hydraulic windows and possibly along filter packs in water-supply wells. However, upward vertical gradients near PM-3 might provide natural protection against entry of contaminants from the phreatic zone into the well screen. Mobile contaminants, including nitrate, perchlorate, chromium(VI), and tritium, are observed only in the shallow zone of the regional aquifer beneath the Mortandad watershed. Some wells, such as R-15 and R-28, show increasing contaminant concentrations over time, suggesting breakthrough of mobile constituents from the vadose zone is increasing over time. Differences in nitrate isotopic ratios for some wells (e.g., R-28 vs. R-15) indicate that contamination in regional groundwater beneath Mortandad Canyon includes contributions from mixed source areas. The future pathways of contaminant movement from these locations should follow the groundwater flow direction along the regional water table. The contaminant flow should be to the east without substantial temporal changes due to seasonal effects.

8.0 RISK ASSESSMENTS

This section presents the methods used to evaluate the potential for adverse ecological and human health risks from COPCs in sediment and surface water. Risk characterization results, uncertainty analysis, and risk assessment summary are also provided for each assessment.

8.1 Baseline Ecological Risk Assessment

Biological data were collected in the Mortandad watershed to evaluate the potential for adverse ecological effects from contaminants in sediment and persistent surface water. A biological investigation work plan was developed based on the application of the eight-step EPA ecological risk assessment guidance for Superfund (ERAGS) (EPA 1997, 59370) to COPECs in sediment and persistent surface water (LANL 2005, 89308).

Steps 1 and 2 of ERAGS include the screening-level ecological risk assessment (SLERA) (LANL 2004, 87630), which identifies COPECs and ecological receptors potentially at risk. Ecological screening results based on the comparison of ecological screening levels (ESLs) with available sediment and water data are provided in the “Mortandad Canyon Biota Investigation Work Plan” (LANL 2005, 89308) and in Appendix E-1. Also presented in the biota investigation work plan is a comparison of available data with DOE biota concentration guidelines (BCGs) for radionuclides (DOE 2002, 85637; DOE 2004, 85639). These screening-level assessments identified COPECs and formed the basis for proceeding to the baseline ecological risk assessment (ERAGS Steps 3 to 8).

Steps 3 and 4 of ERAGS comprise problem formulation and study design, which include refining the list of COPECs, developing a conceptual exposure model, selecting assessment endpoints, and selecting associated measures of effect and exposure. The study design required for these measures was included in the biota investigation work plan (LANL 2005, 89308). Aspects of study design were modified based on field verification of the design (ERAGS Step 5) and on comments received from NMED (NMED 2005, 92084). Deviations to the original biota work plan are discussed in Section 8.1.2. ERAGS Steps 6 and 7 comprise the implementation of the study design, analysis of ecological exposure and effects, and risk characterization. ERAGS Step 8 is risk management and the conclusions that may lead to risk management activities are documented in Section 9.

8.1.1 Problem Formulation

This section addresses the baseline ecological risk assessment problem formulation, which is Step 3 of ERAGS. A problem formulation was presented in Appendix D of the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308, pp. D-1–D-3). Problem formulation includes refinement of the list of COPECs, a literature search on known ecological effects, the conceptual exposure model, and the selection of assessment endpoints. Additional samples have been collected since the initial problem formulation in the biota investigation work plan, and new COPECs have been identified; therefore the problem formulation elements are updated and presented in the following sections.

8.1.1.1 Refinement of COPEC list

The third step of the ERAGS process involves refinement of the COPEC list from the screening to focus on those COPECs that have the largest impact on the potential ecological risk. As explained in the SLERA methods document (LANL 2004, 87630, p. 31), the criterion for retaining a COPC as a COPEC is a HQ greater than 0.3. The ESL screening excludes only COPCs with an HQ less than or equal to 0.3, which are COPCs for which no potential for ecological risk exists. To determine whether areas of the canyon may pose a risk to ecological receptors, and therefore what areas should be included within the scope of the biota investigation, the criterion of an HQ greater than 3 was used. An HQ greater than 3 represents levels that may impact receptors and is therefore appropriate for determining which COPECs should be included in site-specific biota studies in the Mortandad watershed. This criterion of 3 is based on the geometric mean of the ratio between the no observed adverse effect level (NOAEL) and the lowest observed adverse effect level (LOAEL) (Dourson and Stara 1983, 73474). Concentrations corresponding to LOAELs represent levels where impacts to individuals or populations may occur, and these levels represent a more appropriate criterion for determining which COPECs should be included in site-specific biota analyses to assess if impacts to ecological receptors have actually occurred. The same criterion of an HQ greater than 3 was used to refine the list of COPECs for the baseline studies conducted in Los Alamos and Pueblo Canyons (LANL 2004, 87390, p. 8-2). Receptors representing threatened and endangered (T&E) species are evaluated versus an HQ greater than 1 to ensure protection of each individual within the population.

Selection of study design COPECs for soil was based on comparison of the maximum detected concentrations in all geomorphic units within a reach with the minimum soil ESL. Active channel sediments may be exposed due to the transient nature of water flow in the channels in this watershed; therefore concentrations in the active channel geomorphic unit (c1) were included in the screening for terrestrial receptors. The COPECs for soil identified in the biota investigation work plan are: arsenic, barium, cadmium, chromium, copper, total cyanide, lead, manganese, mercury, selenium, silver, thallium, vanadium, zinc, americium-241, cesium-137, plutonium-238, plutonium-239, strontium-90, Aroclor-1254, Aroclor-1260, acenaphthene, chrysene, naphthalene, di-n-butyl phthalate, and endrin aldehyde (LANL 2005, 89308). Study design COPECs for sediment were chosen based on a comparison of maximum

detected concentrations in geomorphic unit c1 (the active channel sediments) with the ESLs for sediment. The study design COPECs in sediment identified in the biota investigation work plan include: aluminum, arsenic, barium, copper, mercury, silver, vanadium, acenaphthene, acetone, anthracene, Aroclor-1260, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, alpha-chlordane, gamma-chlordane, chrysene, 4,4-DDT, di-n-butylphthalate, dibenz(a,h) anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, 4,4'-methoxychlor, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene. Study design COPECs for water were based on the comparison to ESLs and DOE BCGs. Study design COPECs for water identified in the biota investigation work plan are: aluminum, barium, cadmium, copper, cyanide (total), lead, manganese, silver, zinc, americium-241, and radium-226.

After its review of the biota investigation work plan, NMED requested considering gross alpha and selenium as COPECs in all evaluations (NMED 2005, 92084). There is no ESL for gross alpha, but gross alpha has an NMED surface water standard in 20.6.4 NMAC. Therefore, gross alpha was evaluated through screening of surface water against this standard. Individual alpha-emitting radionuclides were screened against the ESLs and DOE BCGs for each individual radionuclide. In the screening conducted for the biota investigation work plan (LANL 2005, 89308), selenium was designated as a study design COPEC only for plants. In response to NMED's concerns the evaluation of the results of each field study and the modeling of COPEC ingestion through the food chain to avian and mammalian receptors includes selenium.

Subsequent to the screening against minimum ESLs, the study design COPECs were screened against the ESLs for individual receptors to determine which COPECs should be addressed by each of the field measures. Table D-6.0-1 of the biota investigation work plan (LANL 2005, 89308) lists the COPECs for individual receptors; these subsets of COPECs were used to determine the appropriate analytical suites and locations for each measure. The COPECs and analytical suites associated with each measure are described in the discussion of each individual field measure in Section 8.1.2. The receptors potentially at risk from exposure to soil COPECs include plants, soil invertebrates (earthworms), small mammals, mammalian carnivores, omnivorous birds, and carnivorous birds representing a T&E species, the Mexican spotted owl (*Strix occidentalis lucida*). Receptors at potential risk from exposure to sediment include the swallow (which also represents a T&E species, the southwestern willow flycatcher [*Empidonax traillii extimus*]), the bat, and the aquatic community (which represents a number of aquatic species). Receptors at potential risk from exposure to COPCs in water also included representatives of the aquatic community (aquatic invertebrates and algae).

Screening Against ESLs and BCGs for 2005 Sediment and Water Data

Sediment samples were collected in 20 of the investigation reaches in the Mortandad watershed and in the background reach in Los Alamos Canyon in 2005 after preparation of the biota investigation work plan. The concentrations of COPCs in these samples were screened against ESLs and BCGs to determine if any new study design COPECs (COPECs with an HQ >3) were identified by the additional sampling. Screening the data from 2005 samples was conducted with ECORISK Database Version 2.2 (LANL 2005, 90032); the screening documented in the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308) used the version of the ESL database that was current at the time that the report was written, ECORISK Database Version 2.1 (LANL 2004, 87386). The tables for this screening are presented in Section E-1.2 of Appendix E. The section below includes a discussion of the results of the screening and whether new COPECs were identified based on higher detected maximum concentrations or a decrease in the ESL between the versions of the database.

Additional COPECs for Soil

Tables E-1.2-1 to E-1.2-3 in Appendix E show the HQs for soil COPECs based on the screening of the 2005 samples. The maximum detected concentrations of analytes in soil for these samples are available in the data files in Appendix C.

Soil samples from two reaches with the highest concentrations of chromium were analyzed for hexavalent chromium in 2005. n reach E-1FW, the HQ for both the earthworm and the plant for hexavalent chromium was 5.8. Based on other study design COPECs, reach E-1FW was already included in the plant and earthworm toxicity studies that includes metals; therefore, no additional studies are necessary based on the designation of hexavalent chromium as a study design COPEC.

The SVOC bis (2-ethylhexyl) phthalate is also a new COPEC for soil based on the screening of the data from the 2005 samples; bis (2-ethylhexyl) phthalate is a COPEC in soil for reach TS-1C. The ESL for bis (2-ethylhexyl) phthalate in the ECORISK Database Version 2.2 (LANL 2005, 90032) is lower for terrestrial avian receptors than in the previous version of the database (LANL 2004, 87386) due to a revision to the transfer factor EPA recommended for calculating the dose to avian receptors (LANL 2005, 90032). Bis (2-ethylhexyl) phthalate is a COPEC in sediment only for reach TS-1C. Additional nest boxes were added to reach TS-1C in 2005 as part of the field studies. Therefore the existing studies for the Mortandad watershed include the potential effects of this and other COPECs on avian receptors.

Existing study design COPECs for soil, particularly inorganic COPECs, were designated as study design COPECs for additional reaches as a result of the screening of data from the 2005 samples: cadmium and lead in E-1FW, chromium and copper in TS-2E, manganese in TS-1E, vanadium in TS-1W, and Aroclor-1254 in E-1E. Mercury is now a study design COPEC in a number of additional reaches because of an updated transfer factor EPA recommended for calculating the ESL for avian species (LANL 2005, 90032), and the current ESL is one-fourth of the ESL used for the original screening in the biota investigation work plan. The additional reaches for which mercury is a COPEC are M-1E, M-2W, M-2E, and M-3. Some existing study design COPECs were also detected at higher concentrations in reaches in which they were already study design COPECs. These COPECs were already considered in the study designs for other reaches and were not detected at concentrations greatly exceeding the concentrations detected in earlier samples. Therefore, no additional studies are indicated for these COPECs based on the screening of the new data.

Additional COPECs for Sediment

Tables E-1.2-4 to E-1.2-6 in Appendix E show the HQs for sediment COPECs based on the screening of the 2005 samples. The maximum detected concentrations of COPCs in sediment for these samples are available in the data files in Appendix C.

Based on the screening of 2005 samples iron is a study design COPEC in active channel sediments. No iron ESL for sediment was available at the time of the screening against ESLs in the biota investigation work plan; the new ESL is based on exposure to aquatic community organisms (LANL 2005, 90032). Based on the screening of the 2005 sediment data, iron would be a study design COPEC in reaches E-1W, M-1E, and M-4. The HQs for all three reaches are similar, and reach E-1W was already included in the study for ecological risk to the aquatic community (the *Chironomus tentans* laboratory toxicity assay). Therefore the existing field studies for the Mortandad watershed address this additional COPEC.

The SVOC bis (2-ethylhexyl) phthalate is also a new COPEC based on the screening of the 2005 sediment data, combined with revisions to ESLs. The ESL for bis(2-ethylhexyl) phthalate in the ECORISK Database Version 2.2 (LANL 2005, 90032) is lower for the avian receptor (the violet green swallow)

exposed to sediment than the ESL in the previous version of the database due to a revision in the transfer factor EPA recommended for calculating the dose to avian receptors. Bis(2-ethylhexyl)phthalate is a COPEC in sediment only for reach TS-1C. Additional nest boxes were added to reach TS-1C in 2005 as part of the field studies. Therefore, the existing studies for the Mortandad watershed include the potential effects of this and other COPECs on avian receptors.

Several existing study design COPECs for sediment are designated as study design COPECs for additional reaches based on the screening of the 2005 sediment data. Anthracene is now a study design COPEC for aquatic community organisms in sediment in two additional reaches, E-1E and M-2W. Mercury is now a study design COPEC for avian receptors in reach M-1E in addition to the existing reaches for which it was already a study design COPEC. These COPECs were considered in the study designs for aquatic community and avian species in other reaches and were not detected at concentrations greatly exceeding the concentrations in earlier samples. Therefore, no additional studies are indicated for these COPECs based on the screening of data from the 2005 sediment samples.

Additional COPECs in Surface Water

Samples of nonfiltered nonstormwater (nonstormwater includes base flow, snowmelt, and persistent pools), filtered nonstormwater, and filtered stormwater were collected from individual water locations within the Mortandad watershed in 2005. Tables E-1.2-7 to E-1.2-12 in Appendix E show the HQs for surface water COPECs based on the screening of the 2005 samples. The maximum detected concentrations of analytes in surface water for these samples are available in the data files in Appendix C.

In the filtered nonstormwater samples (see Tables E-1.2-7 and E-1.2-8 [Appendix E]), two additional surface water COPECs were designated. Cobalt had an HQ of 4.7 for the maximum detected concentration in reach E-1FW. E-1FW was not included in the aquatic studies, but these surface water screening results are unlikely to indicate a widespread ecological risk within the watershed as the HQ in only one reach exceeded 3. Iron, which did not have an ESL for water at the time of the screening presented in the biota investigation work plan, is designated as a study design COPEC for reaches E-1FW, E-1W, and M-1W. Reaches E-1W and M-1W were already included in studies both for toxicity to aquatic invertebrates and toxicity to algae. (Radium-226 was already a study design COPEC for water based on the screening conducted by subwatershed for the biota investigation work plan.) The screening of the 2005 samples confirmed that radium-226 should be considered as a study design COPEC for reaches E-1E, M-1W, M-1E, and M-2W.

In the nonfiltered nonstormwater (see Tables E-1.2-9, E-1.2-10, and E-1.2-11 [Appendix E]), cobalt is also designated as a new study design COPEC in reaches E-1FW and TS-1W. Iron was designated as a new study design COPEC in reaches E-1FW, E-1W, M-1W, M-1E, TS-1C, and TS-1W. Radium-226 was already a study design COPEC for water based on the screening conducted for the biota investigation work plan. The screening of the 2005 samples confirmed that radium-226 should be considered as a study design COPEC for reaches E-1W, M-1W, and M-2W.

No new COPECs were detected in the filtered stormwater samples from 2005; the HQs for filtered stormwater are shown in Table E-1.2-12.

8.1.1.2 Literature Search in Known Ecological Effects

The following is a synopsis of the screening ecological receptors with the highest HQs (HQ >3) and the feeding guilds they represent. This section reviews both the original COPECs from the biota investigation

work plan and the new COPECs designated based on the screening of the 2005 data. The toxic effects are based on toxicity studies used as the basis for the ESLs as described in the ECORISK Database Version 2.2 (LANL 2005, 90032) and are summarized in Appendix E in Tables E-1.1-2 through E-1.1-7. The section below also reports the count of sediment investigation reaches in which the study design COPECs are located. The names of these reaches and HQs for screening against individual receptors can be found in Tables D-2.2.1 through 2.2.10 of the biota investigation work plan (LANL 2005, 89328, pp. D-31– D-41).

Mammals

Soil Pathway Receptors

The deer mouse as a representative for mammalian omnivores had HQs greater than 3 for four COPECs: arsenic, manganese, thallium and naphthalene. Study design COPECs were found in 6 of the 23 reaches.

The montane shrew as a representative for mammalian invertevores had HQs greater than 3 for seven COPECs: arsenic, cadmium, manganese, thallium, vanadium, chrysene and naphthalene. Study design COPECs were found in 10 of the 23 reaches.

The red fox as a representative for mammalian carnivores had HQs greater than 3 for three COPECs: cesium-137, Aroclor-1254, and Aroclor-1260. Study design COPECs were found in 4 of the 23 reaches.

Sediment Pathway Receptors

The occult little brown myotis bat as a representative for mammalian aerial insectivores had HQs greater than 3 for three COPECs: aluminum, arsenic, and naphthalene. Study design COPECs were found in 4 of the 23 reaches.

Birds

Soil Pathway Receptors

The American robin (with invertevore diet) as a representative for avian invertevores had HQs greater than 3 for 10 COPECs: copper, lead, mercury (inorganic), silver, vanadium, zinc, Aroclor-1254, bis-2-ethylhexylphthalate, di-n-butyl phthalate, and cyanide (total). Study design COPECs were found in 13 of the 23 reaches.

The American kestrel (with flesh diet) as a representative for avian carnivores had HQs greater than 3 for three COPECs: mercury (inorganic), cesium-137, and Aroclor-1254. Study design COPECs were found in 1 of the 23 reaches.

Sediment Pathway Receptors

The violet green swallow as a representative for avian aerial insectivores had HQs greater than 3 for nine COPECs, including aluminum, barium, cadmium, copper, mercury (inorganic), silver, vanadium, zinc, and cyanide (total). Study design COPECs were found in 14 of the 23 reaches.

Terrestrial Plants

The terrestrial plant as a representative of primary producers had HQs greater than 3 for 12 COPECs, including barium, chromium (total), hexavalent chromium, copper, manganese, selenium, silver, thallium, vanadium, zinc, acenaphthene, and endrin aldehyde. Study design COPECs were found in all of the 23 reaches.

Terrestrial Invertebrates

The earthworm as a representative of invertebrate detritivores had HQs greater than 3 for six COPECs: chromium (total), hexavalent chromium, copper, mercury (inorganic), americium-241, and plutonium-239,240. Study design COPECs were found in 15 of the 23 reaches.

Aquatic Community Organisms

Water Pathway Receptors

The aquatic community organism that represents various aquatic functional and feeding guilds had HQs greater than 3 for 13 COPECs: aluminum, barium, cadmium, cobalt, copper, total cyanide, iron, lead, manganese, silver, zinc, americium-241, and radium-226. Most COPECs were identified in samples from station E200, which include COPECs from filtered stormwater.

Sediment Pathway Receptors

The aquatic community organism that represents various aquatic functional and feeding guilds had HQs greater than 3 for 15 COPECs, including barium, copper, iron, mercury (inorganic), silver, acenaphthene, anthracene, dibenz(a,h)anthracene, fluorene, methylnaphthalene, naphthalene, Aroclor-1260, chlordane (alpha), chlordane (gamma), and DDT [4,4'-]. Study design COPECs were found in 9 of the 23 reaches.

8.1.1.3 Conceptual Exposure Model

An ecological scoping checklist was completed for the Mortandad watershed during June and July 2003. A separate Part B checklist was completed for each of several subsets of reaches that were similar in habitat. All the completed ecological scoping checklists appear in Appendix C of the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). In Mortandad Canyon above the confluence with Ten Site Canyon (which includes reaches M-1W, M-1C, M-1E, M-2W, M-2E, M-3W, and M-3E), the terrestrial vegetation cover consists primarily of ponderosa pine, mixed-conifer species, box elder, scrub oak, and various deciduous shrubs. Wetland vegetation (e.g., cattails, rushes, and willows) and aquatic receptors are also found in riparian areas along this part of Mortandad Canyon, particularly in reach M-1W, which contains a cattail wetland. Wildlife noted in this part of the canyon included many species of birds (including bluebirds), burrowing animals, garter snakes, lizards, harvester ants, and evidence of large mammals (deer and bear). Chironomids and stonefly larvae were noted in aquatic areas within reach M-1W. A wide selection of wildlife receptors was noted throughout the reaches within Mortandad Canyon. In Mortandad Canyon east of the Ten Site Canyon confluence (which includes reaches M-4, M-5W, M-5E, and M-6), the vegetation cover consists of piñon-juniper woodland, with scattered ponderosa pine, and numerous shrub species and many of the same wildlife species seen in the Mortandad Canyon reaches farther west. In Effluent Canyon (which includes reaches E-1FW, E-1W, and E-1E), terrestrial plant species include ponderosa pine and wetland species (willows, rushes, and cattails) that were common throughout reach E-1W. In Ten Site Canyon (including reaches TS-1W, TS-1C, TS-1E, TS-2W, TS-2C, TS-2E, and TS-3), the vegetation cover includes ponderosa pine, mixed-conifer

species, and oak, along with deciduous shrubs and forbs and associated terrestrial wildlife species. Some areas of riparian and aquatic vegetation (willows, rushes, and cattails) occur in reaches TS-1C, TS-2W, TS-2C and TS-2E. Reach TS-2E also contained aquatic insects at the time of the site visits. The unnamed tributary canyon that heads in TA-05 (including reaches MCW-1 and MCW-2) contains ponderosa pine mixed with piñon-juniper woodland and some shrub oak with a low level of vegetative cover.

Some of the reaches also represent potential or actual habitat for T&E species (Keller 2004, 87688). All the reaches considered in this study are rated as low potential forage areas for the bald eagle except for reach M-6, which is rated as a moderate potential forage area for the eagle. The Mexican spotted owl, however, is believed to actively use several reaches within the canyon (E-1E, M-2W, M-2E, and M-3W). Additional reaches (TS-1E, all TS-2 reaches, and M-3E) are designated as very high potential foraging area, with a number of other reaches considered high or moderate as potential foraging area for the Mexican spotted owl (Keller 2004, 87688). Reaches M-1W and E-1W both contain habitat in which the southwestern willow flycatcher may be assumed to forage at a moderate frequency (Keller 2004, 87688), although this species has not yet been observed in the watershed. The biota studies therefore include explicit consideration of risk to both the Mexican spotted owl, which nests within Mortandad Canyon, and the southwestern willow flycatcher, for which potential habitat exists within the Mortandad watershed.

Surface water in the Mortandad watershed originates either as effluent releases, stormwater, or snowmelt runoff. Where present, surface water can be discontinuous within a reach, alternately stopping where the flow entirely infiltrates into alluvium and emerging downstream where the alluvium thins. Transitions from alluvial channels to bedrock channels are common locations of surface water as water discharges from the shallow alluvial groundwater. Table D-2.3-1 in the “Mortandad Canyon Biota Investigation Work Plan” (LANL 2005, 89308) presents the results of a survey of surface water occurrence in the Mortandad watershed.

Historical contaminant releases to the soils, sediments, and persistent surface water in the Mortandad watershed have occurred from multiple SWMUs and AOCs, primarily through releases of effluent, as discussed in Section 2.1. For ecological receptors, the primary impacted media in the canyons are sediment deposits in the canyon bottoms, surface water derived from effluent releases or persistent pools, and reaches of water that remain for some time after periods of runoff. Active channel sediments (c1 geomorphic unit), potentially subject to persistent water, are referred to as “sediment” in this section. Sediment in other geomorphic units (abandoned channels and floodplains) is referred to as “soil” in this section. The active channel sediments in the Mortandad watershed were also evaluated as part of the soil because all sediments within any of the reaches may be exposed and dry for at least some period of the year, and therefore terrestrial receptors could also be exposed to these sediments.

Persistent surface water exists only in limited sections of the active channel in the watershed. Even so, all active channel deposits are considered in this assessment to be potentially subject to persistent flow under different climatic conditions and therefore to potentially harbor aquatic receptors, i.e., organisms dependent on water, such as algae or chironomids (LANL 2004, 87630, p.26). Floodplains and abandoned channels generally have well-developed terrestrial plant and animal populations and do not support truly aquatic species. Thus, only active channel sediments and surface water potentially have complete exposure pathways to truly aquatic species, whereas terrestrial animals and plants are exposed to COPECs in surface water, soil, or sediment. It is important to recognize that the aquatic species in the watershed represent a fairly simple food web that does not include aquatic vertebrates because surface water is limited both spatially and temporally.

Exposure pathways to terrestrial receptors can occur through the following:

- Air—through respiration of vapors, inhalation, and deposition of particulates
- Surface soil—through root uptake and rain splash on plants, food web transport to plants and animals, incidental ingestion of soil, dermal contact with contaminated soil, and external irradiation
- Persistent surface water and sediments—through root uptake and rain splash on plants, food web transport to animals, incidental ingestion of water and sediment, dermal contact with contaminated water or sediment, and external irradiation from sediment

The major soil-related exposure pathways are plant uptake, food web transport, incidental ingestion of contaminated soil, and external gamma radiation exposure. Water and sediment pathways are of lesser importance to terrestrial receptors because of the limited temporal and/or spatial extent of persistent surface water in the watershed. Exposure to vapors is unlikely because of the infrequent detection of VOCs in the watershed, the low VOC concentrations measured in sediment and water, and the rapid volatilization of VOCs in sediments near the ground surface. Exposure to airborne particulates is a minor pathway because of the limited amount of contamination at the ground surface and the dense plant cover in some reaches.

The remaining pathways related to exposure to surface soil (dermal contact) and surface water and sediment (food web transport, incidental ingestion of contaminated sediment and water, dermal contact, and external radiation exposure) are also minor because of the limited amount of contamination at the ground surface or in surface water. In addition, soil exposure pathway analysis EPA performed to support the development of its ecological soil screening levels (Eco-SSLs) has shown that inhalation and dermal pathways contribute a small fraction of the dose obtained orally (EPA 2003, 76077). All complete exposure pathways are at least qualitatively evaluated in the assessment in this report because some of the measures proposed in this investigation are field measures of effect or exposure.

8.1.1.4 Assessment Endpoints

Assessment endpoints consist of an entity (a receptor species) and an attribute (survival, growth, or reproduction) of that entity that is being assessed. Seven assessment endpoints for the Mortandad watershed are identified based on the study design COPECs summarized in Section 8.1.1.1 (and the associated tables) and the conceptual exposure model. These endpoints were selected to represent T&E receptors (the Mexican spotted owl and the southwestern willow flycatcher) as well as receptors that are representative of the terrestrial and aquatic food web in the Mortandad watershed (food webs are shown in Figures 3.4-1 and 3.4-2 of LANL 2004, 87630). The conceptual exposure model indicates that ingestion exposure pathways and, in particular, food web transport, are important pathways for these COPECs. Assessment endpoints were developed for the five terrestrial feeding guilds (including aerial insectivores) that represented the receptors with the highest HQs, as well as for the surrogates for the T&E species. Because aquatic environments in the Mortandad watershed are generally not perennial and rely on effluent and persistent water from storm runoff, a single assessment endpoint for the aquatic study design was selected. The seven assessment endpoints (AE1 through AE7) are as follows:

- Survival and reproduction of the Mexican spotted owl (AE1)
- Population abundance or persistence and species diversity of avian ground invertevore feeding guild species (e.g., American robin, bluebird) (AE2)

- Population abundance or persistence and diversity of mammalian invertevore and omnivore feeding guild species (e.g., shrews and deer mice) (AE3)
- Survival and growth of detritivore species (earthworms) (AE4)
- Native plant species presence and diversity (AE5)
- Survival and reproduction of the southwestern willow flycatcher (AE6)
- Abundance and survival of the aquatic community in the reaches of the Mortandad watershed that retain surface water long enough to support aquatic communities (AE7)

Assessment endpoints were used as the basis for developing the measures of exposure and the measures of effects. Those measures evaluate impacts to the attributes of survival, growth, or reproduction in the receptor species and in the feeding guilds that those receptor species represent. The measures included field, laboratory, and model data. For the biota investigation in the Mortandad watershed, the measures are based on extension of the field biota investigation done in the Los Alamos and Pueblo watershed (LANL 2004, 87390).

8.1.2 Study Design, Field Verification, and Site Investigation

This section discusses the ecological risk assessment study design, field verification, and site investigation; this encompasses ERAGS steps 4 and 5 and the first part of step 6. Biological data were collected as measures of exposure and effect (lines of evidence) to evaluate the potential for adverse ecological effects from contaminants in soil, sediment, and persistent surface water. The initial design of each study is documented in the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308). As a result of discussions with NMED during the review of the biota investigation work plan, an additional measure was added. Algal toxicity tests were added to assess potential risk to algae from radionuclides in surface water. These algal toxicity tests are described in Section 8.1.2.11. Figure 8.1-1 shows reaches and the sample locations in the Mortandad watershed and the background site (reach LA-BKG). Shrews were trapped in two of the reaches (E-1W and LA-BKG) designated for the general small mammal trapping. The plant diversity field studies were conducted in the same reaches indicated for the plant and earthworm toxicity studies. Field bird surveys are not indicated on the map because they did not correspond directly to individual locations in reaches, as explained in Section 8.1.2.5. The rapid bioassessment characterization studies were collocated with the chironomid toxicity tests indicated in Figure 8.1-1. Table 8.1-1 shows the reaches included in each type of study, as well as the study design COPECs used as the basis for including that reach for that type of study.

8.1.2.1 Small Mammal Trapping and Analysis of Pelts and Carcasses

Trapping small mammals was conducted in three reaches within the Mortandad watershed and one background reach in Los Alamos Canyon. The results of the trapping determined measures of effect on the small mammal population including relative abundance, species composition, reproductive status, and body weight. The field measures of the small mammals were lines of evidence for the effects to the small mammals themselves (see Table D-4.0-4 in LANL 2005, 89308) in support of AE3.

Small mammals were also collected for laboratory analysis to determine the concentration of COPECs in tissues. The concentrations in the tissues were lines of evidence for the exposure of the Mexican spotted owl (AE1) as well as for the mammalian carnivore (the red fox), which was not designated as an individual assessment endpoint. All the individuals of most species from each reach were separated into pelts and carcasses; the pelts and carcasses were then combined so that one pelt and one carcass sample from each species was sent for analytical analysis for each reach. The exception is for shrews, which were too

small to allow separation into pelt and carcass, and instead whole body samples were submitted. Table B-3.0-2 shows the sample IDs associated with these tissue samples as well as the weights for the composite pelt and tissue samples from each species. Individuals of some species (particularly wood rats) have enough mass that not all animals trapped were included in the composite pelt and carcass samples. Also, animals that tested positive for Hanta virus after collection were not included in the composite samples.The total number of animals trapped of each species is discussed in Section 8.1.3.4. The number of animals collected (excluding released or hanta virus infected animals) for each pelt or carcass sample from each reach is shown in Table 8.1-2.

The analytical suites were prioritized based on study design COPECs for predators, as shown in Table D-6.0-2 (LANL 2005, 89308). Analyses conducted on these carcass and pelt samples included EPA Method SW-846 6010B metals, perchlorate, mercury, PCBs, americium-241, cesium-137, and strontium-90.

As discussed in Section 7.1.2, cyanide is designated as a study design COPEC based on sediment concentrations exceeding the BV only in reach MCW-2W. Resampling done in that location and two adjacent locations in the same area produced values below the BV (see Section 7.1.2 and Tables E-1.2-1 and Table E-1.2-4). Cyanide was therefore not considered further in sediment in this investigation report. Total cyanide was also designated as a study design COPEC for aquatic organisms in the biota work plan based on detected concentrations in water at gage station E200 (Table B-7.1-1 in LANL 2005, 89308). Water from E200 was collected as the reach M-2W sample and included in the algae toxicity studies. Neither this water sample nor any other new water samples from other reaches contained cyanide at concentrations that would make cyanide a study design COPEC (see Table E-1.2-7 and E-1.2-9) at this water station or the others sampled. Cyanide was detected in water for the algae test only in the samples from TS-1C and TS-2C, and the concentrations were less than 3 μg/L. Sediment from reach M-2W was also used for the chironomid toxicity test to assess risk to aquatic organisms. Regression analysis was conducted for each analyte detected (except sodium) in the carcass or pelt samples of each species, even if the analyte was not a study design COPEC. These regression analyses compared the concentration of a COPEC in the composite sediment samples collected at the trapping arrays, discussed in Section 8.1.2.2, against the concentration of the COPEC detected in tissues. Some analytes were detected in some tissue samples but not other samples; plots and regressions for analytes that were detected at least once in tissue include nondetects for that analyte as values at their detection limit

8.1.2.2 Soil Characterization

Samples of sediment were collected from the locations in the Mortandad watershed used for laboratory toxicity tests and also from sediment within the small mammal trapping arrays for additional characterization of exposure to small mammals. Table B-3.0-3 shows the reach, location ID, and geomorphic unit associated with each of these samples. For the earthworm and plant toxicity tests, discrete samples were collected from 0–30 cm (0–1 ft) for the toxicity assays and for the analytical analysis of the same samples. Samples for the earthworm and plant toxicity tests were collected from geomorphic units outside the active channel (generally c2, c3, or f1 units). Sediment samples for the *Chironomus tentans* toxicity tests were collected from 0–15 cm (0-0.5 ft) in the c1 geomorphic unit (the active channel) to represent the sediment to which these aquatic organisms would be exposed. At the four sites for the small mammal trapping, composite samples were collected for Laboratory analysis to estimate COPEC concentrations the mammals would be exposed to. The composite samples consisted of 10 subsamples collected from 0–15 cm (0–0.5 ft) at 10 locations within each trap array.

8.1.2.3 Owl Pellet Analysis

Owls regurgitate pellets containing fur and bones from prey items they have consumed; the contents of these pellets were examined to determine the species of prey consumed as an ancillary line of evidence for AE1. For this study, 46 pellets collected from four owl roosting sites were sent for taxonomic identification of the bone and tooth fragments (Bennett et al. 2006, 93774). Three of the roosting sites are known to be occupied by the Mexican spotted owl. One roosting site lies within Mortandad Canyon near reach M-2W. Two additional Mexican spotted owl roosting sites are in Cañon de Valle. The analysis of species included 17 taxonomic groups of mammals as well as birds. The complete list of number and type of each species found is described in Bennett et al. (2006, 93774). The primary use of this information in this study was to determine which species of small mammals from the tissue COPEC concentration analysis were appropriate to use for modeling the COPEC concentrations ingested during prey consumption by the Mexican spotted owl, as described in Section 8.1.2.1. The results of this comparison are described in Section 8.1.3.1.

8.1.2.4 Nest Box Studies

An avian nest box monitoring network has existed in the vicinity of the Laboratory since 1997; the network includes both potentially contaminated and noncontaminated areas. As part of the baseline ecological risk assessment for the Mortandad watershed, additional nest boxes were placed in the canyon bottoms or canyon bench areas within Mortandad Canyon and its major tributary canyons. Figure 8.1-1 shows the boxes within the Mortandad watershed that were sampled for the biota studies. Both the western bluebird (*Sialia mexicana*) and the ash-throated flycatcher (*Myiarchus cinerascens*) occupy these boxes. Measures collected using the nest box network included field measures of effect on reproductive success of these avian species (including clutch size, fledgling success, growth of fledglings, etc.) and measures of exposure through analysis of COPEC concentrations in unhatched western bluebird eggs and unconsumed prey (insects) collected within the boxes. Table B-3.0-5 shows the egg and insect samples collected for analytical analysis within the Mortandad watershed; the locations of the boxes within the reaches are shown in Figure 8.1-1. Boxes in Cañada del Buey and in the Cañada del Buey watershed (near TA-51) and boxes from two areas outside the Laboratory (the Los Alamos golf course and the Guaje Pines Cemetery; LANL 2004, 87390, Figure 8.1-1) were also included in the study for reference. Eggs from individual boxes within a reach were submitted as samples. In some cases, individual boxes contained sufficient material for analysis, but in other cases insects from more than one box in a reach were combined to obtain sufficient sample size for analysis. Table 8.1-3 shows a summary of the eggs and insects collected per reach.

Because of sample size limitations, egg and insect samples were analyzed only for metals. These measures were collected to evaluate AE2, the endpoint for avian ground invertevores. The COPEC concentrations in nest box insects were used as a measure for AE6, the avian insectivore (southwestern willow flycatcher) and the mammalian insectivore (the occult little brown myotis bat); the bat is being evaluated for possible exposure through prey even though this species does not represent a specific assessment endpoint in the baseline ecological risk assessment studies. Results of the field measures of effect through reproductive success are discussed in Section 8.1.3.3. The measures of exposure through COPEC concentrations measured in insects are discussed in Section 8.1.3.2 and exposure based on COPEC concentrations in eggs is discussed in Section 8.1.3.3.

8.1.2.5 Breeding Bird Survey

An additional study done as a measure for AE2 and AE6 for the avian ground invertevore and the avian insectivore was a survey of the level of use of upper Mortandad Canyon and Ten Site Canyon by avian

species. The survey recorded species, sex, and age of birds within these canyon bottom areas and provides an estimate of the diversity of species in the survey areas. The survey areas were not restricted to the designated reach areas but included birds seen or heard in the majority of the canyon bottoms in these areas during the walkover survey. The complete survey results are presented in Keller (2005, 93690). The results relevant to this investigation are discussed in Section 8.1.3.3.

8.1.2.6 Earthworm Toxicity Tests

Sediment collected from the 0- to 30-cm (0- to 1-ft) depth interval was used for the earthworm toxicity tests (a measure for AE4). The earthworm tests used the standard American Society for Testing and Materials (ASTM) method E1676-97. The toxicity tests compared the growth and mortality of the earthworms from the seven reaches shown in Table 8.1-1 with the reference site in reach LA-BKG. As shown in the table, the reaches were selected to represent a gradient of concentrations for COPECs associated with both the soil invertebrate receptor and the mammalian and avian receptors that feed on the soil invertebrate. The biota investigation work plan (LANL 2005, 89308) originally proposed that this assay would also include a bioaccumulation test to determine concentrations of COPECs in the worm tissues after 28 days' exposure to the sediment samples. Unfortunately, the earthworms were inadvertently discarded at the conclusion of the test before being sent for laboratory analysis for COPEC concentration. Therefore, the dose to avian receptors in Section 8.1.3.3 is calculated based on concentrations detected in earthworms in the Los Alamos and Pueblo Canyon studies (LANL 2004, 87390) from sediments with the same COPEC concentrations or on extrapolated values from those studies. Section 8.1.3.5 discusses the results of the statistical analysis of the growth and mortality between sites.

8.1.2.7 Seedling Germination Tests

Sediment collected from the 0-30-cm (0-1-ft) depth interval was used for the plant toxicity tests (a measure for AE5). The plant toxicity tests used the standard ASTM method E1963-98. The plant toxicity tests compared survival rates, shoot height, root length, and shoot and root mass in plants grown in soil the same seven locations used for the earthworm toxicity tests with plants grown in the soil sample from the background site. The tests used yarrow (*Achillea millefolium* L. var *occidentalis*), which has more variable results than some other available test species of plant but is more relevant to the ecosystems found at the Laboratory. Section 8.1.3.6 discusses the results of the statistical analysis of the growth and mortality between sites.

8.1.2.8 Plant Survey

A field plant survey was conducted in reaches within the Mortandad watershed to provide ancillary information for the small mammal trapping (AE3); significant differences in the amount of plant cover may affect the number or type of small mammals caught. The field plant survey also serves as an ancillary line of evidence for ecological risk to plants (AE5), although the plant toxicity test is the major line of evidence for that assessment endpoint. The plant survey encompassed nine reaches (see Table 8.1-1) including all of the mammal trapping reaches, all reaches for the plant and earthworm toxicity tests, and the background reach.

In these surveys, vegetation was identified as tree, shrub, forb, cacti, or graminoid (with identification to species where possible) and percent canopy cover for each species was categorized (Balice and Sandoval 2006, 93689). Two measures of diversity, the Shannon diversity function and species richness, were used to compare the vegetation between sites. A brief summary of the results and their relevance to other measures is provided in Section 8.1.3.6.

8.1.2.9 *Chironomus tentans* Toxicity Test

Sediment samples from the eight reaches shown in Table 8.1-1 were used in the EPA Method 100.2 (EPA 2000, 73776) 10-day growth and survival test with the larval insect *Chironomus tentans*. Each sediment sample was tested at 100% only; dilution series were not run on the sites. Standard control and reference toxicants were included. The endpoints for this test include both survival and growth (as ash-free dry weight). The results of the test are discussed in Section 8.1.3.7.

8.1.2.10 Rapid Bioassessment Characterization

Rapid bioassessment characterization was conducted at five reaches in the Mortandad watershed that had sufficient flow to potentially support aquatic macroinvertebrate communities (Henne and Buckley 2006, 93687), using the EPA Rapid Bioassessment Protocol (EPA 1999, 73728). Collection of aquatic macroinvertebrates was conducted in association with the bioassessment. Collection and assessment were attempted at all reaches specified in Table 8.1-1 in June and September 2005, but becaue of absence of wate,r neither TS-1C nor TS-2C underwent an assessment or invertebrate collection in June 2005. Similarly, reaches M-2W and TS-1C could not be sampled in September due to lack of water. The biota investigation work plan (LANL 2005, 89308) specified use of a Hess sampler to collect aquatic macroinvertebrates when sufficient water was present to use this sampler. However, none of the sites had sufficient water to use the Hess sampler in either June or September 2005. The Hess sampler is needed to collect data for comparison to the NMED Stream Condition Index (SCI); therefore, no comparisons to the SCI were done for the aquatic macroinvertebrate sampling in the Mortandad watershed. Semiquantitative sampling using a D-frame dip net to determine taxonomic composition of macroinvertebrates was done at the sites. The biota investigation work plan indicated that the collected macroinvertebrates would be submitted for Laboratory analysis if sufficient mass could be collected for analysis. The field team was unable to collect sufficient mass of aquatic macroinvertebrates to submit for analysis.

8.1.2.11 Algal Toxicity Test

Water samples collected from the reaches shown in Table 8.1-1 were used for the EPA Method 1003.0 short (96-hr) chronic toxicity algal growth test. This test uses the green algae *Selenastrum capricornutum*. The test methods, conditions, and results are described in Pacific Ecorisk (2005, 91270). Samples were collected from M-2W, E-1W, E-1E, M-1W, and LA-BKG in July 2005 for the test. Locations in TS-1C, TS-1E, and TS-2C were dry at that time, but water samples were collected from these locations in August 2005 for the toxicity test. Controls and reference toxicants were run with both sets of samples. The results of the test are discussed in Section 8.1.3.7.

8.1.2.12 Spatial Modeling Using ECORSK.9.

The ECORSK.9 model was used to model HQs and hazard indices (HIs) across the Mortandad watershed for the Mexican spotted owl, southwestern willow flycatcher, deer mouse, and western bluebird, as presented in Gonzales et al. (2006, 93786). ECORSK.9 includes both canyon and noncanyon sources as well as measured and interpolated concentrations of COPECs from these sources. The model estimates exposure based on an environmental exposure unit (EEU) that consists of foraging throughout the home range centered on known or potential nest sites input into the model. For the Mexican spotted owl, the model restricted the nest sites to within the buffer area for this T&E species. For the southwestern willow flycatcher, the model restricted the nest sites to within the wetland area designated as potential flycatcher habitat. For the deer mouse and western bluebird, the modeled area included the entire Mortandad watershed west of SR 4. The model produces mean total HIs that provide

an estimate of risk to populations and are most useful for species such as the deer mouse and western bluebird. For evaluating T&E species, risk to individuals and therefore the number of individual grid cells with elevated HIs are a better indicator of locations and COPECs that may need additional investigation. The model calculates both unadjusted HQs and HIs and adjusted HQs and HIs; the adjusted values do not include the contribution of background concentrations of COPECs. For this investigation report, the model was run with two scenarios: In the first scenario all nondetects were included as values at one-half of their detection limit. For many organic chemicals, nondetects constituted 75% to 98% of the data set values, resulting in detection limits heavily influencing the HQ and HI values. To overcome this problem, a second scenario was run in the model in which nondetects for organic chemicals were treated as zeros to focus the results on the actual detected COPECs in the model.

8.1.3 Characterization of Exposure and Effects

This section discusses the baseline ecological risk assessment characterization of exposure and effects, which represents the second part of ERAGS Step 6. This section provides the results from the studies and their interpretation as well as the supporting information in tables and figures. Revised calculations of dose to predators based on concentrations of COPECs in prey are also presented in this section. Although the screening of concentrations of COPCs in sediment and water samples collected in 2005 is also a line of evidence supporting the evaluation of potential ecological risk in the Mortandad watershed, that evaluation is separate from the field studies conducted for the base line ecological risk assessment. Screening the 2005 sediment and water samples against ESLs is presented in Appendix E and summarized in Section 8.1.1.1.

8.1.3.1 Mexican Spotted Owl

ECORSK.9 Model

In the ECORSK.9 model, a number of grid cells within the Mortandad watershed with elevated HIs indicated there may be areas of potential risk to individual Mexican spotted owls (Gonzales et al. 2006, 93786). This was true for both the unadjusted and adjusted mean HI. The adjusted mean HQ and mean HI values calculated in the second scenario (all organic nondetects treated as zeros, as explained in Section 8.1.2.12) are considered the most representative of potential risk from Laboratory sources to the modeled receptors, although the adjustment for background made little difference for the HQ and HI values for the owl. The adjusted total mean HI with nondetects treated as zeros for the owl is 1.6; only bis(2-ethylhexyl)phthalate had an HQ >1.0. Lead was the second most important COPEC (HQ = 0.6). The HI was ≥1 in 49% of the focal points; almost all of these HIs were less than 10. The area with the highest adjusted HI values indicating potential risk to the Mexican spotted owl were in part of Ten Site Canyon, including TA-35 and reaches TS-2E and TS-2C, and in Mortandad Canyon reach M-2E. Although it is difficult to pinpoint the individual source of elevated HIs in the model for a receptor with a home range as large as the owl, the primary sources of high HI values in the model appear to be from samples from noncanyon sources, particularly sources of COPECs associated with TA-35.The adjusted HI for the grid cell in Mortandad Canyon in which a pair of owls has nested was only 0.2. Therefore, the adjusted HI for the grid cell in Mortandad Canyon containing a confirmed owl nest indicates little to no threat of potential adverse effects from Laboratory-related contaminants.

Concentrations of COPECs in Prey

Remains of prey found in the owl pellets from the collection site near reach M-2W in Mortandad Canyon were dominated by wood rats (*Neotoma sp.*), which made up approximately half the identified pellets (Bennett et al. 2006, 93774). Wood rats were collected and analyzed from all trapping sites except the

LA-BKG site. Deer mice, brush mice, and pinyon mice were also found in pellets from this site. All these species were collected during the small mammal trapping done for this study. Two other pellet collection sites lie outside of the Mortandad watershed but within the home range of Mexican spotted owls at the Laboratory. These two other sites are also used for roosting by the Mexican spotted owl. Pellets from both these sites also contained wood rats; in addition, one site contained the remains of brush mice and another site contained pellets with the remains of long-tailed voles. The analysis of the pellets collected from these three sites indicate that the species collected from the small mammal trapping locations are appropriate to use in the refined calculation of the estimated doses to the Mexican spotted owl. The dose was calculated using the maximum detected concentrations in any prey species, although because wood rats may represent the dominant prey species; use of maximum concentrations from other species may overestimate the dose to the Mexican spotted owl.

COPECs for the Mexican spotted owl were identified in the initial screening of the sediment data (LANL 2005, 89308, p. D-37). While only Aroclor-1254 met the criterion for a study design COPEC (HQ >1 for a T&E species), mercury and cesium-137 had HQs just above 0.8. These three COPECs were not detected in the tissues of the small mammals sent for Laboratory analysis in this study. The detection limits for mercury and Aroclor-1254 are conservatively used to represent the tissue concentration in the refined dose calculation for the Mexican spotted owl. Cesium-137 results are not used in the dose calculations, as discussed below. Based on comments by NMED (NMED 2005, 92084), selenium is also a study design COPEC for all avian receptors although the HQ did not indicate that selenium should be included.

Small mammals are also assumed to be the prey of the receptor representing the carnivorous mammal, the red fox. Study design COPECs for the fox identified in the screening conducted for the biota investigation work plan (LANL 2005, 89308, p. D-35) include cesium-137, Aroclor-1254, and Aroclor-1260. Detected concentrations of Aroclor-1260 are used in the refined estimate of the dose to the fox, and the detection limit for Aroclor-1254 is conservatively used as tissue concentrations for this COPEC.

As described in the biota investigation work plan (LANL 2005, 89308 p. D-14), an HQ for the owl can be calculated by dividing the avian toxicity reference value (TRV) for a COPEC from the ECORISK Database, Version 2.2 (LANL 2005, 90032) by the normalized food intake of the owl of 0.102 mg fresh weight (fw) food/kg body weight (bw)/day (LANL 2005, 89308, p. D-14). Because the TRV for cesium-137 is based on a radiation dose to the organism and not on an amount ingested, this COPEC is not amenable to these calculations. Table 8.1-4 shows the calculations to combine the maximum detected concentrations in carcass and pelt into the equivalent concentration in a whole animal. This table also shows the HQ calculated by dividing the concentration in the reconstructed whole animal by the food ESL calculated as described above. The proportions of methylated mercury and inorganic mercury in the tissues were not measured, but the calculations in Table 8.1-4 demonstrate that the HQ is <0.5 for the owl regardless of whether the mercury is in the inorganic or methylated form.

8.1.3.2 Southwestern willow flycatcher

ECORSK.9 Model

In the ECORSK.9 model, a number of grid cells within the Mortandad watershed with elevated HIs indicated there may be areas of potential risk to southwestern willow flycatchers (Gonzales et al. 2006, 93786). This was true for both the unadjusted and adjusted HI. The adjusted mean HI value for the flycatcher was 6.2. The dominant COPECs were mercury (HQ = 1.7), di-n-butyl phthalate (HQ = 1.5), boron (1.4), and bis (2 ethylhexyl) phthalate (HQ = 0.48). HIs were ≥1.0 in 81% of the grids; approximately half of these HIs were less than 10. The flycatcher was modeled only for areas that contain

flycatcher habitat; therefore, the area with elevated HIs are limited to the Effluent Canyon area. The elevated HQs for di-n-butyl phthalate resulted primarily from measured values in the noncanyons portion of the data set used in the ECORSK.9 model. There is no BV for boron, and it is unknown whether the detected boron values represent releases from Laboratory sites or instead background levels.

Concentrations of COPECs in Prey

This section estimates the potential dose to the southwestern willow flycatcher using the concentrations in the insects collected from the nest boxes. As described in the biota investigation work plan (LANL 2005, 89308, p. D-14), an HQ for the flycatcher can be calculated by dividing the avian TRV for a COPEC from the ECORISK Database Version 2.2 (LANL 2005, 90032) by the normalized food intake. For the flycatcher, normalized food intake was calculated from the body weight of 12.7 g (LANL 2005, 89308, p. D-14) and estimating the food ingestion rate using the allometric equation for passerine birds from EPA's Wildlife Exposure Factors Handbook (EPA 1993, 59384, equation 3-4). The calculated food ingestion rate is 0.0034 kg/day. This food ingestion rate is in grams of dry weight per day, and was converted to fresh weight using the dry weight to fresh weight ratio for honeybees (Fresquez and Ferenbaugh 1999, 91269). The final insect ingestion rate used in the calculations for the southwestern willow flycatcher is therefore 0.79 kg fw food/ kg bw/day. Table 8.1-5 shows the calculated HQs for the flycatcher based on ingestion of the concentration measured in nest box insects. In some reaches, more than one insect sample could be analyzed, so the arithmetic mean of the concentrations was used (nondetects treated as one-half of the detection limit) as the sample size was too small for calculation of a UCL of the mean. In reaches with only one insect sample analyzed, the maximum detected concentration was used.

The HQs for food ingestion are shown in Table 8.1-5 and predict a much lower level of potential ecological risk than the screening against ESLs did, even though HQs for five COPECs still exceed one (barium, copper, mercury [assumed to be methyl], vanadium, and zinc). Four of these COPECs also had HQs elevated above one in samples collected outside the Mortandad watershed in the Cañada del Buey, Pueblo, and Rendija watersheds. The concentration of these metals in insects is therefore unlikely to be correlated with the concentration of COPECs in soil. The TRVs for these metals probably result in an overprediction of riskbecause the TRV is likely to be based on a more toxic form of the COPEC than is found in the insects. In addition, the southwestern willow flycatcher has not been observed in this part of the Laboratory, so the risk is hypothetical at this time. However, further evaluation may be warranted if the flycatcher is observed to utilize this area in the future.

Bis(2-ethylhexyl)phthalate could not be evaluated in this study, as the mass of insect tissue collected was sufficient only to run the metals analytical suite. However, potential effects of bis(2-ethylhexyl)phthalate are considered in the nest box study evaluation described in Section 8.1.3.3.

8.1.3.3 Avian Invertevore Feeding Guild

This section provides results for trends of COPEC concentration in sediment versus field measures for the avian invertevore feeding guild in the Mortandad watershed, such as nest success and eggshell thickness. This section also evaluates trends of COPEC concentration in sediment versus concentration in eggs. Field measures are derived from Colestock and Fair (2005, 93691).

Nest Success for Bluebirds

As part of the Laboratory's nest box monitoring program, a large number of field measures are collected from the nest boxes each year (Colestock and Fair 2005, 93691). Two of these measures that relate to

juvenile survival were selected for this study for comparison to concentrations of COPECs in sediment. The measures selected are percent fledged and percent female (the latter may relate to specifically to PCBs as COPECs). Occupied bird boxes were found in five reaches within the Mortandad watershed: M-3, M-4, M-5, TS-2C, and TS-2W. All species occupying the nest boxes (western bluebirds, violet green swallows, ash-throated flycatchers, and mountain bluebirds) are included in the analysis of the measures to provide a larger dataset as the overall number of occupied boxes in the reaches is fairly small. Appendix E provides box plots comparing these two measures between species; no significant differences are seen. Comparisons of the selected nest measures between these reaches are shown in Figure 8.1-2 for percent fledged and Figure 8.1-3 for percent female. Boxes in these figures indicate the interquartile range of the sample results, with the upper and lower ends defined by the 75th and 25th percentiles, respectively. Horizontal lines within the boxes indicate median values, and horizontal lines above and below the boxes represent the 5th and 95th percentiles of the data. Neither measure appears to differ significantly between the reaches, but there are small sample sizes for some measures (e.g., percentage of females in reaches TS-2C and TS-2W). These measures were recorded from 1997 to 2005; bivariate plots of each measure versus year were made and are shown in Appendix E. These measures do not correlate significantly with the year, so data from all years are included on the plots.

In addition to the comparison conducted between reaches, the combined data from all reaches within the Mortandad watershed are compared with other areas within the nest box monitoring network. The groups are Mortandad (Mort), Cañada del Buey (CdB), the cemetery (Cem, unimpacted area), the golf course (GC, unimpacted area), TA-35 (impacted, boxes are near SWMUs or AOCs), Los Alamos and Pueblo Canyons (LA/P, impacted by SWMUs and AOCs), and other (representing the boxes in the nest box network not included in the other groups). Figure 8.1-4 shows a comparison of the percent fledged between the groups and Figure 8.1-5 shows a comparison of the percent female nestlings between the groups. For both measures the results for the Mortandad watershed do not differ from the other areas.

Eggshell Thickness

Another set of parameters collected as part of the nest box network are related to the condition of the eggs. Numerous parameters have been collected; three of these parameters were chosen for inclusion in this study. Eggshell length (in millimeters) and total egg weight correlate well with each other and provide an estimate of egg size. Eggshell thickness was also chosen because previous studies had shown that some thinning of eggshells has occurred in Sandia Canyon (Fair and Meyers 2002, 82655). As with the other nest measures described above, all species are included to provide a larger dataset. Appendix E shows the comparison between species for egg length, egg weight, and eggshell thickness; the comparison shows no significant differences between species for these parameters. Appendix E also compares length, weight, and thickness across years in bivariate plots. None of the three measures vary significantly with year, so data from all years are included in the analysis.

The measures for the eggs are compared between the same five reaches (M-3, M-4, M-5, TS-2C, and TS-2W) as the other nest measures and are also compared among the same areas (Mortandad, cemetery, golf course, Cañada del Buey, TA-35, Los Alamos and Pueblo Canyons, and other). Figures 8.1-6 to 8.1-8 show the comparisons for the egg measures between reaches within the Mortandad watershed. Figures 8.1-9 to 8.1-11 show the comparisons for these measures between the areas. The sample sizes vary between reaches and between groups; however, the three measures do not show any significant differences between reaches or between groups.

COPEC Concentration in Eggs

The concentrations of metals measured in eggs were plotted against the reach average sediment concentration of that COPEC in the reach from which the egg was collected. The concentration in eggs does not correlate significantly with the concentration in sediment for any of the metals. The plots and regression calculations for all metals are presented in Appendix E. For two of the metals that generated higher HQs for the robin—mercury and copper—in the screening conducted for the biota plan and that were detected in the eggs, the graphs are presented in Figures 8.1-12 and 8.1-13. In addition, NMED requested retaining selenium for all evaluations in the report (NMED 2005, 92084), even though the initial screening did not show this as a COPEC; therefore the graph for selenium is presented in this section in Figure 8.1-14.

COPEC Concentration in Worms

As discussed in Section 8.1.2.6, COPEC concentrations in earthworms were not obtained from the Mortandad watershed in this study. Therefore estimates of potential risk to birds in the avian invertevore feeding guild cannot be directly made using measured concentrations in earthworms. In this report, regressions based on data from the Los Alamos and Pueblo watershed (LANL 2004, 87390) are used to estimate potential concentrations in earthworms in the Mortandad watershed for COPECs that had a significant correlation between detected concentrations in soil and worms in the Los Alamos and Pueblo watershed. For COPECs without significant correlations, the transfer factor from the ECORISK Database Version 2.2 (LANL 2005, 90032) is used. For both types of calculations, the concentration of the COPEC in the composite sample used for the earthworm toxicity test in a reach is used to estimate the concentration in earthworms from that reach. This estimated concentration in the worms is then compared with the concentration in food items expected to have no toxic effects (the food ESL) to derive an HQ for each reach reflecting risk from consumption of earthworms exposed to soil from that reach. Table 8.1-6 shows the basis of the calculations of the estimated concentrations in the worms, the food for each COPEC, the concentration in each soil composite sample by reach, and the HQ from worm ingestion. Two of the two organic COPECs (bis(2-ethylhexyl)phthalate, di-n-butyl phthalate) are not included in Table 8.1-6 because neither COPEC was detected in any of the soil composite samples used in the earthworm toxicity tests. An HQ >3 appears in all reaches, including the reference reach, for mercury based on assuming all mercury is in the methylated form. Only reach E-1E shows an HQ >3 for mercury in the non methylated form. Risk from both types of mercury are included in the table to provide bounding estimates. Because mercury speciation was not measured, the actual ratio of methylated to non methylated mercury in soil and worms is not known. No COPECs, except mercury, produced an HQ >3 in the modeling of dose through earthworms.

Field Surveys of Bird Abundance and Diversity

Field surveys of bird species were done in two areas: Mortandad Canyon from reaches M-1 through M-2, and adjacent parts of Effluent Canyon, and Ten Site Canyon from reaches TS-1 through TS-2, and adjacent areas in Pratt Canyon (Keller 2005, 93690). Species diversity was measured by calculating a Shannon-Weaver Index for each site. The index value was 2.7 for Mortandad and Effluent Canyons and 2.5 for Ten Site Canyon, indicating similar diversity of species between the two areas. The composition of species based on diet type was also similar between the two areas: most of the species in both areas were insectivores (including both ground-feeding insectivores and aerial insectivores). This finding supports using COPEC analysis in earthworms for assessing the risk to avian receptors in the Mortandad watershed.

The surveys yielded similar results for both areas even though there are some differences in bird COPECs between Mortandad and Effluent Canyons and Ten Site Canyon. As shown in Tables D-2.2-6 and D-2.2-8 (LANL 2005, 89308; pp. D-36 and D-38), the study design COPECs for the robin in that part of Mortandad Canyon are predominantly copper, lead, mercury, vanadium, and Aroclor-1254. In Ten Site Canyon, Aroclor-1254 and mercury are also study design COPECs, but other metals have HQs less than 3. Di-n-butyl phthalate was also a study design COPEC only in Ten Site Canyon. Study design COPECs for the violet-green swallow in Mortandad and Effluent Canyons included primarily aluminum and zinc. Other metals (cadmium, copper, mercury, and vanadium) were the dominant COPECs for the swallow in Ten Site Canyon. Both areas have a number of study design COPECs for birds, but the field surveys support that a good diversity of avian species are still found in these areas.

ECORSK.9 Model for Western Bluebird

Based on the ECORSK.9 model (Gonzales et al. 2006,93786), the percentage of the western bluebird population in the Mortandad watershed that has potential for adverse effects predicted by elevated HIs is too low to affect population viability. The adjusted mean HI for the bluebird is 1.2. The dominant COPEC for this receptor based on the adjusted HI is mercury (mean HQ = 0.38). Other metals (cyanide, zinc, and vanadium) dominated the unadjusted HI, but the entire contribution of these three COPECs was attributable to background. HIs in 24% of the focal points were greater than 1.0.

8.1.3.4 Mammalian Invertevore Feeding Guild

Field Surveys of Small Mammal Relative Abundance and Reproductive Status

A variety of field measures were collected during the trapping and collection of small mammals for this biota investigation (Bennett et al. 2006, 93701). The mean percent daily capture rate, which is an estimate of relative population density, was highest in reach E-1W at 22% and lowest in reach LA-BKG at 7%. The results are shown in Figure 8.1-15. The trend within the Mortandad watershed reaches of decreasing mean daily capture rates with distance downcanyon is probably related to habitat; the trend is consistent with the total percent vegetation canopy cover discussed in Section 8.1.3.6. Species diversity expressed as a Shannon-Weaver Index (see Figure 8.1-16) follows the same trend. The HQ and HI values for deer mouse COPECs also decrease downcanyon; so increasing COPEC concentrations cannot be responsible for the drop in capture rates.

Species composition (the frequency of capture for each species at a site) was very similar between the three Mortandad watershed reaches; species composition in all the Mortandad reaches differed from the Los Alamos Canyon reference site. Data collected during the trapping study indicated no differences in ratios of males to females, body weights, or reproductive status between reaches, using chi square analysis (Bennett et al. 2006, 93701); however, the size of the sample set in this study is somewhat small for evaluation of effects on these parameters.

Concentrations of COPECs in Small Mammals

As described in Section 8.1.3.4, several species of small mammals were trapped and collected in each reach used in the study. All the individuals of most species from a reach were separated into pelt and carcass; the pelts and carcasses were combined so that one pelt and one carcass sample from each species was sent for analysis for each reach. The exception is for shrews, where whole bodies were sent for analysis because of the small size of these mammals. Distinct differences in tissue concentration versus sediment concentration were not seen between species. Regression analysis of concentrations of study design COPECs in carcasses of all species and concentrations in sediment are presented in

Appendix E and show statistically significant correlations for only three of the detected COPECs: aluminum, iron, and perchlorate, although two of the correlations are negative. As shown in Figures 8.1-17 and 8.1-18, aluminum and iron concentrations in tissue are negatively correlated with sediment concentrations, indicating no significant uptake by small mammals from the soil. Figure 8.1-19 shows perchlorate in body tissue; perchlorate was positively correlated with sediment concentrations, indicating uptake by small mammals from the soil. At NMED's request (NMED 2005, 92084), selenium was retained as a COPEC in this evaluation. Selenium concentrations in small mammal tissue did not have a significant correlation with concentrations in soil, as shown in Figure 8.1-20. Figures presenting concentrations in carcass and concentrations in soil for all other detected analytes are in Appendix E.

Regression analysis of concentrations in pelts of all species and COPEC concentrations in sediment showed statistically significant correlations for only two of the detected analytes: americium-241 and arsenic. Concentrations of both these COPECs in pelts were positively correlated with sediment concentration. Figure 8.1-21 shows the concentration of americium-241 in pelt versus sediment. Figure 8.1-22 shows the concentration of arsenic in pelt versus sediment. Selenium concentrations in pelt versus sediment are shown in Figure 8.1-23, and indicate a positive correlation**.** In contrast, lead concentrations in pelts seem to be negatively correlated with sediment concentrations, although the regression was not statistically significant ($p = 0.07$ for regression). Because analyses of pelts include soil particles adhering to the pelt, these analyses are not as useful as concentrations in carcasses in indicating potential uptake, although they still provide information for possible transfer to higher levels of the food chain. Appendix E presents regression equations and figures showing concentrations in soil versus concentrations in pelts for other detected analytes. The other study design, COPECs detected in pelt and carcass samples were not correlated with sediment concentrations in the study reaches. Graphs of carcass and pelt concentration versus sediment concentration for all other detected COPECs are presented in Appendix E. For some COPECs, this result may indicate that concentrations in tissues are unrelated to environmental exposure. For COPECs that are known bioaccumulators, such as Aroclor-1260, these results indicate that the sediment in the study reaches is not a significant contributor to the total body burden of these small mammals.

Concentrations in the pelts and carcasses were multiplied by the proportional masses of the pelts and carcasses to reconstruct an estimate of the whole animal body tissue concentration. This information was used in Section 8.1.3.1.1 to refine the estimate of dose to the Mexican spotted owl. The same information is used here for comparison to the results of small mammal trapping studies conducted in other canyons; those studies all used concentrations determined from analysis of whole animals. Regression analysis of estimated concentrations in whole bodies of all species and concentrations in sediment show statistically significant correlations for only two of the detected analytes, with positive correlations for americium-241 and perchlorate. Regression equations and figures showing concentrations in soil versus concentrations in whole animals for other detected analytes are presented in Appendix E.

Concentrations of Aroclor-1260 in small mammals from the Mortandad watershed (except for the shrew, which was not included in previous studies) are similar to concentrations detected in small mammals trapped in the Los Alamos and Pueblo watershed. These two watersheds have similar concentrations of Aroclor-1260 in soil from the mammal trapping areas. This indicates a consistent relationship between this COPEC in soil and in small mammal tissue, indicating that this correlation may have some predictive value.

ECORSK.9 Model for Deer Mouse

The percentage of deer mouse population in the Mortandad watershed that has potential for adverse effects predicted by elevated HIs in the ECORSK.9 model is too low to affect population viability

(Gonzales et al. 2006, 93786). Mean HI values exceeded 1.0 in only 8% of the focal points for the deer mouse. Based on the unadjusted HI (the adjusted HI showed no COPECs with an HQ >0.3), the dominant COPEC would be thallium. Nondetects constituted 72.5% of the thallium values used in the data set, and the mammalian TRV for thallium is very low. The model likely overpredicts the potential risk from thallium based on detection limits; thallium was detected in relatively few of the canyon bottom samples (37% detection frequency). In addition, thallium was only detected above the BV in five sediment samples in the Mortandad watershed, three in E-1E and 2 in M-2W. This indicates relatively small releases of thallium from the TA-50 RLWTF and low levels of thallium contamination in a small area, as discussed in Section 7.1.2.

Refinement of COPEC Dose to the Shrew from Earthworms

Some COPECs in the ecological screening in the biota investigation work plan had HQs exceeding three for deer mice and for shrews. All deer mouse COPECs were also shrew COPECs. Therefore, the shrew (which has a higher exposure because the diet is modeled as 100% earthworm versus 50% earthworm for the deer mouse) was evaluated through modeling of the dose through earthworms based on estimated concentrations in earthworms. Regression equations or concentrations based on transfer factors from the ECORISK Database Version 2.2 were used, as explained for the avian receptors in Section 8.1.3.3. The results of the calculations are shown in Table 8.1-7. Only thallium has an HQ >3 for the shrew; this would also be the case for the deer mouse. Thallium has a very low TRV for mammals and uses a default transfer factor of one to estimate the concentration in earthworms. Table 8.1-8 provides some additional information on the comparison of thallium HQs between reaches. Because these factors are so conservative, the thallium HQ shown in the table is likely to overestimate risk. As discussed above and in Section 7.1.2, there is also evidence of only very small releases of thallium into the canyon bottoms.

8.1.3.5 Detritivores

The earthworm toxicity tests measured growth and survival of earthworms at seven locations in the Mortandad watershed in comparison with the background location in reach LA-BKG (EP&T 2005, 91267). The results for this test, including all replicates, are summarized with box plots for survival and growth (as weight change) in Figures 8.1-24 and 8.1-25. Negative and positive control samples from the laboratory are also shown (LAEW-Neg and LAEW-Pos). The boxes on these plots indicate the interquartile range of the sample results, with the upper and lower ends defined by the 75th and 25th percentiles, respectively. Horizontal lines within the boxes indicate median values, and lines above and below the boxes represent the 5th and 95th percentiles of the data. Dunnett's t-Test results are presented in the right-hand section of each figure. The comparison circles indicate statistical differences between the tests and the reference site (LA-BKG). The background sample for the Dunnett's t-Test is displayed as a heavy red circle, and the text for the reference site is printed in bold red text on the x-axis. Thin red circles represent samples that are not statistically different ($p < 0.05$), and the reach names for these reaches are in red on the axis. Heavy gray circles represent samples that are statistically different, and these reach names are printed in black on the x-axis. No significant differences in survival were seen between any of the sites and the reference site; survival was almost 100% in all replicates, except the Laboratory positive controls (LAEW-Pos samples). In all treatments, including the negative Laboratory control (LAEW-Neg sample), worms showed weight loss, which is typical of earthworms in this assay (EP&T 2005, 91267). Only one reach, M-2W, showed a significant decrease in weight compared with the reference site in LA-BKG. The composite sediment samples from each reach were also analyzed for COPECs; the concentrations of all earthworm study design COPECs in M-2W were lower than the concentrations of these COPECs in some other reaches that did not have as high a weight loss (Table 8.1-9). The higher weight loss of worms in

the sample from this reach is therefore unlikely to be related to the presence of earthworm COPECs in the soil.

Organic matter in soil can serve as a food source for earthworms during this type of test. The organic matter was measured in each of these samples, but the organic matter in the sample did not correlate with the percent survival or weight change in the test groups (see figures in Appendix E).

8.1.3.6 Plant (Primary Producers)

Seedling Germination and Growth

A number of measures of plant growth and survival are included in the Laboratory toxicity test on samples collected from the Mortandad watershed; these measures include mass of dry shoots, mass of dry roots, mass of wet shoots, mass of wet roots, percent survival, mean root length, and mean shoot length. The complete results are provided in EP&T (2005, 91268). The results are plotted on box plots with the results of the Dunnett's t-Test comparison printed on the right-hand side of the figure; this type of figure is explained in Section 8.1.3.5. As shown in Figure 8.1-26, the dry mass of roots, dry mass of shoots, and mean root length showed no significant differences between reaches, although the test sites did differ from the negative and positive (boric acid) laboratory control samples. In the analysis of wet root length shown in Figure 8.1-27, the plants grown in soil from reach TS-2C had significantly higher mass of wet roots and wet shoots than the other reaches, which were not significantly different from each other. The dry weight of roots and shoots in TS-2C did not differ from the other reaches.

The soil samples used in the plant toxicity test were also analyzed for study design COPECs. The results of those analyses show that reach TS-2C had lower concentrations of chromium, copper, manganese, thallium, vanadium, and zinc than some of the other reaches, although that soil sample had the maximum detected concentration of silver (Table 8.1-9).

Plant survival by reach is shown in Figure 8.1-28. The Dunnett's test results indicate the reaches can be divided into two groups. Reaches E-1W, E-1E, and M-2W represent a group with the highest survival rate. Reaches E-1FW, M-4, TS-1C, TS-2C, and the reference site (LA-BKG) form a second group with slightly lower survival. Although survival in the two groups differ statistically, it is important to note that survival in all replicates from all reaches (except a single replicate from M-4) exceeded 87%, and the background sample was also in the lower survival group. Differences in survival are therefore unlikely to have population level effects and are not related to the presence of COPECs.

Mean shoot length is shown in Figure 8.1-29. The Dunnett's test for this measure also divided the reaches into two groups; these groups did not contain the same reaches as seen in the results for survival discussed above. For the measure of shoot length, reaches E-1E and TS-2C are statistically the same as the reference site (LA-BKG). Reaches E-1FW, E-1W, M-2W, M-4, and TS-1C form a second group with a slightly decreased mean shoot length.

Nutrients in soil can strongly influence growth in soils during this test. Therefore, nutrient parameters such as phosphate, nitrate, and percent organic matter were measured on the soils used in the plant toxicity test. The laboratory negative control sample, for example, contains 10% organic matter, which is the primary reason the control growth always exceeds the growth in the soils from the Laboratory, which are much lower in organic matter. Each growth measure is compared with phosphate, nitrate, and percent organic matter in the bivariate plots in Appendix E. Based on the bivariate plots, percent organic matter may influence plant growth measures in the test regardless of the presence of COPECs in the soil sample.

Abundance and Diversity of Plants

Data from a field survey of plant abundance and diversity in the Mortandad watershed (Balice and Sandoval 2006, 93689) provide supplemental information on plant communities between reaches and possible effects of COPECs on plants. Table 8.1-10 provides the total species richness, the Shannon diversity index for all species, and the total percent canopy cover for all species. These same reaches were surveyed in 2003 for species richness, and the average species richness of 36 from 2005 is much higher than the 2003 species richness of 25. This increase in species richness occurred for all vegetation categories except cacti and is associated with the lessening of drought conditions between surveys. The increase in plant species richness with higher precipitation from one survey year to the next supports the results of the toxicity assay, indicating that COPECs in the canyon soils are not inhibiting the germination or growth of plants in these areas. Part of the variability in species between reaches is caused by variations in climate, including the general increase in annual precipitation from east to west across the study area. Differences in local topography and hydrology, such as canyon width and depth and presence or absence of wetlands, also affect plant communities. Total species richness, Shannon diversity index, and total percent canopy cover for each reach are plotted versus distance from the Rio Grande as a measure of relative precipitation in Figure 8.1-30. The Shannon diversity index has a significant positive correlation with distance from the Rio Grande (primarily caused by diversity at reach LA-BKG representing an outlier value)*,* suggesting that climate is a primary control on this measure. In contrast, total species richness and total percent canopy cover have much variability with distance, which suggests other factors are important. Total species richness is least in reaches M-2W, E-1W, and E-1E, and total percent canopy cover is also least in E-1E at intermediate distances from the Rio Grande. E-1E and M-2W are the narrowest reaches included in this study, bounded by Bandelier Tuff bedrock, and E-1W is the reach with the largest wetland in this study, suggesting that these factors have negatively affected species richness and canopy cover. The presence of COPECs in canyon soils may also potentially affect these parameters, although the results of the toxicity assay indicate that COPECs in the canyon soils are not inhibiting the germination or growth of plants in these areas.

8.1.3.7 Aquatic Community

Chironomus Tentans Toxicity Bioassay

The *Chironomus tentans* toxicity test measures survival and growth of larval insects in active channel sediment collected from the eight reaches specified in Table 8.1-1. A complete description of the test conditions and results is contained in Pacific Ecorisk (2005, 91271). Figure 8.1-31 shows box plots of the number of live larvae remaining per replicate per reach at the conclusion of the test. This box plot shows no significant differences in larval survival between the selected reaches or between the reaches with COPECs and the reference site in reach LA-BKG. Figure 8.1-32 shows the mean dry weight of surviving larvae in each replicate test for each reach. This box plot also shows no significant difference between reaches for this measure of larval growth. Box plots of two other measures of larval growth, total ash-free dry larvae weight and mean ash-free dry larvae weight, are presented in Appendix E. Neither of those growth measures showed any difference between reaches. These results indicate that sediment COPECs do not have an effect on the growth or survival of *C. tentans*.

Rapid Bioassessment Characterization

Data on collected macroinvertebrates, habitat scores, and dissolved oxygen levels in reaches E-1W, M-1W, and M-2W indicate that these sites are marginal for sustaining a diverse community of aquatic life (Henne and Buckley 2006, 93687). However, the assessment protocols used are based on perennial streams and may be biased toward rating ephemeral streams as degraded. Hess sampling could not be

used because of low flow conditions, so quantitative estimates are not available for comparison to the NMED metric. Macroinvertebrates were collected from each reach by D-frame dip net. During both sampling events (June and September 2005), 25% of the taxa at reach E-1W were chironomids. In June, chironomids constituted 85% of the identified individuals from this site as well. Chironomids represented 25% of the taxa and 92% of the individuals in M-1W in June, and 16% of taxa and 71% of individuals in September. The site in reach M-2W also contained predominantly chironomids; chironomids were 33% of the taxa and 69% of individuals in June, and the site was dry in September. The predominance of chironomids at the sites also supports the use of the *Chironomus tentans* Laboratory toxicity test as the appropriate assay to determine if sediment COPECs are adversely impacting the macroinvertebrate communities in these ephemeral stream systems.

Algal Toxicity Test

Water was collected from areas of intermittent or persistent water in reaches E-1W, E-1E, M-1W, M-2W, and LA-BKG in July 2005 for tests of algal toxicity, and from reaches TS-1C, TS-1E, and TS-2C in August 2005 after summer rainstorms provided enough water in these drier reaches. These two sampling events resulted in two separate tests for toxicity of water to algae. For these short-term tests, the endpoint is growth expressed as number of cells versus the control. The results of the toxicity tests are reported in Pacific Ecorisk (2005, 91270). Different rates of growth were seen in the controls between the two tests, so the results for the two tests are shown separately. Figure 8.1-33 shows a box plot comparing the samples from each reach (this type of plot is explained in Section 8.1.3.5) with the July samples, which include the reference site (LA-BKG). Laboratory controls are labeled ”control” and “0.5 ZN” (0.5 ppm zinc as a positive control) through “20 ZN” (20 ppm zinc as a positive control). Figure 8.1-34 shows a box plot for the laboratory controls and samples from Ten Site Canyon collected in August. The box plots show that for both sets of tests, growth in all reaches except TS-1C exceeded both the negative (Laboratory control water) and positive laboratory controls (the range of zinc growth-inhibiting concentrations) for the test.

Table 8.1-11 shows the concentrations of detected radionuclides in algal test samples that are study design COPECs and the value for the algal HQ based on these concentrations. Radium-226 was detected in the M-1W sample, and americium-241 was detected in the E-1E, M-2W, and TS-1C samples. A comparison between Figures 8.1-33 and 8.1-34 and Table 8.1-11 shows that the differences in growth do not correspond to the detected concentrations of radium-226 and americium-241. The only reach sample in which algal growth was inhibited was in TS-1C; this sample contained the lowest detected concentration of americium-241, and radium-226 was not detected in that sample. The growth rates for all reaches were compared with general water quality parameters, which can strongly influence the results of this type of test. For both tests, the mean algal cell density correlates extremely well with water hardness, as shown in the bivariate plots in Figure 8.1-35. These results indicate that differences in the growth rates of algal cells between reaches (including reach TS-1C) result from the differences in water hardness between samples from the reaches and not from the concentrations of radionuclides in the water samples. Bivariate plots of algal cell density against conductivity and alkalinity are presented in Appendix E. None of these parameters correlated with cell growth as well as the water hardness.

The detected concentration of radium-226 in the M-1W sample has an HQ >3 (equivalent to a study design COPEC), but this sample did not show adverse impacts to the growth of green algae when compared with positive controls in the test. The detected concentrations of americium-241 are below the ESL, and the test results do not indicate adverse impacts to populations of green algae.

Estimate of COPEC Dose through Food to the Bat

Although several COPECs in the Mortandad watershed had HQs >3 for the bat (aluminum, arsenic, and naphthalene), the bat was not identified as an appropriate measure for an assessment endpoint in the biota investigation work plan because its large home range and high food ingestion rate indicate that much of a bat's food would be obtained from outside the watershed. However, because nest box insect tissues were analyzed to evaluate avian receptors, these same analytical results were used to refine the potential COPEC dose through food to the occult little brown myotis bat, as shown in Table 8.1-12. Because of the size of the insect samples, only metals analyses could be run on the insects. Therefore, naphthalene was not included in these calculations. Aluminum was included in the analytical suite for the nest box insects, but the ESL for aluminum has been updated to follow EPA guidance that aluminum is only a potential COPEC in soils with a pH below 5.5 (EPA 2003, 85645); therefore, aluminum no longer fits the ESL model for accumulation through the food chain and is also not included in Table 8.1-12. The HQ for arsenic for bioaccumulation through insects into the bat is 0.6, indicating no potential risk to the bat through ingestion of insects even if all insects come from the canyon bottom areas within the Mortandad watershed.

8.1.3.8 Refinement of COPEC Dose to the Fox through Ingestion of Small Mammals

The red fox was not evaluated as the measure for a specific endpoint in this study, but Aroclor-1254, Aroclor-1260, and cesium-137 had HQs greater than 3 for the red fox in the ecological risk screening (LANL 2005, 89308, p. D-35). For the two PCBs, maximum detected concentrations in whole small mammals were used to refine the dose estimate. These calculations and the resulting HQs are shown in Table 8.1-13. Aroclor-1254 and cesium-137 were not detected in small mammal tissues, so this COPEC is not evaluated further. For Aroclor-1260, the maximum whole body concentration was detected in a montane shrew. The calculated HQ for Aroclor-1260 is 0.003, indicating no potential risk to the red fox from PCBs through ingestion of small mammals

8.1.4 Risk Characterization

ERAGS Step 7 is risk characterization, which includes risk estimation and the uncertainty analysis. Risk estimation includes a summary of the results for the measures used to evaluate potential for ecological effects. A qualitative weight of evidence (WOE) criterion was assigned to each measure in Appendix D of the biota investigation work plan (LANL 2005, 89308). If measures indicate different outcomes, meaning one measure indicates a potential for adverse effects and one does not, then the overall conclusion would be weighted toward the measure with the higher WOE.

8.1.4.1 Risk Estimation

Mexican Spotted Owl

The two main measures for the Mexican spotted owl are the ECORSK.9 modeling and the modeling of estimated dose through the food chain from the study design COPECs detected in small mammals. The WOE assigned to each measure is shown in Table 8.1-14. In the ECORSK.9 model, the total adjusted mean HI (using zero for nondetects) across the core and buffer areas for the owl was 1.6. This value exceeds the HI target of 1.0, indicating a small potential for effects to individual owls, primarily from bis(2-ethylhexyl)phthalate (Section 8.1.3.1 and Gonzales et al. 2006, 93786). This SVOC has a high frequency of nondetects in sediment samples from the Mortandad watershed (99.5% nondetects; Section 7.1.3.3), and the potential risk is largely from analyses of samples collected outside the canyon bottoms. One Mexican spotted owl nest currently exists in the Mortandad watershed, and the adjusted HI for this

nest location is 0.2, which does not indicate potential risk to the Mexican spotted owl. The other measure estimated the dose to the Mexican spotted owl based on detected concentrations in mammal tissue (Section 8.1.3.1). The dose modeling was conducted for the nonradionuclide COPECs for the owl (Aroclor-1254, mercury, and selenium) as determined by the screening against ESLs in the biota investigation work plan. The dose modeling shows no HQs greater than 0.5, indicating no potential risk to the owl. Small mammals were not analyzed for SVOCs. Bis(2-ethylhexyl)phthalate was not a study design COPEC in the original screening because it had a higher ESL in the version of the ECORISK Database (Version 2.1, LANL 2004, 87386), which was current at that time. The owl pellet analysis showed that the small mammal species used in the dose modeling are among the species consumed by the Mexican spotted owl in the Mortandad watershed. Based on the dose modeling and on the ECORSK.9 model results for the portion of the canyon in which Mexican spotted owls currently nest, the WOE indicates no adverse effects of COPECs on survival and reproduction of the Mexican spotted owl (AE1).

Southwestern WillowFlycatcher

The aerial insectivores applicable measures for the southwestern willow flycatcher are the ECORSK.9 model, the results of estimated dose through prey using the concentrations of COPECs detected in nest box insects and the field nest box measures. The WOE assigned to each measure is presented in Table 8.1-15. The ECORSK.9 model had a total mean adjusted HI of 6.2, indicating some potential for risk to the flycatcher through exposure to mercury, di-n-butyl phthalate, boron, and bis (2ethylhexyl) phthalate (Section 8.1.3.2 and Gonzales et al. 2006, 93786). The food chain modeling showed HQ values >1 for six metals when the maximum detected concentration in insects was used for the calculation. When the mean detected concentration in the insects is used in the calculations, the HQs are still elevated for mercury (if all the mercury is considered to be in the methylated form), copper, vanadium, and zinc. These calculations indicate potential for risk to flycatchers from ingestion of the nest box insects. The WOE from these measures indicates some potential for adverse effects to survival and reproduction of the southwestern willow flycatcher (AE6) from COPECs in sediment. However, the field measures (nest box studies) of other avian insectivores do not show impacts to nest success, which indicates that the models used for assessing the flycatcher overestimate the potential for ecological risk to avian insectivores. In addition, the southwestern willow flycatcher has not been observed in this part of the Laboratory, so the risk to this species is hypothetical at this time.

Avian Ground Invertevore Feeding Guild

A number of measures were evaluated for the avian ground invertevore feeding guild. The WOE assigned to each measure is provided in Table 8.1-16. ECORSK.9 modeling using the western bluebird indicated a total mean adjusted HI of 1.2, too low to have effects on populations of avian invertevores (Section 8.1.3.3 and Gonzales et al. 2006,93786). Modeling the estimated dose of COPECs to the robin through earthworms was also done, although this analysis had to employ estimated concentrations of COPECs in the earthworms instead of measured concentrations as initially planned. The dose modeling indicates a potential for risk to avian ground invertevores through ingestion of COPECs in earthworms. The primary COPECs are mercury, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, and Aroclor-1254. A number of field measures of impacts on avian invertevore species were also conducted. The measures of nest success through percent fledged, percent female nestlings, and egg size and thickness show no differences between reaches with and without COPECs. Concentrations of COPECs in eggs do not correlate with sediment concentrations, indicating that uptake into the birds is less than the levels predicted by models, including the dose modeling from earthworms. Field surveys of avian species in Effluent, Mortandad, and Ten Site Canyons did not show any differences in species diversity or avian diet types represented between the canyons, even though di-n-butyl phthalate was a study design COPEC in

Ten Site Canyon and not in Effluent and Mortandad Canyons. Overall, the WOE indicates that COPECs in the Mortandad watershed do not pose a risk to population abundance or persistence and species diversity of avian ground invertevore feeding guild species (AE2).

Mammalian Invertevore and Omnivore Feeding Guild

The mammalian invertevore and omnivore feeding guild includes both the deer mouse (an omnivore) and the shrew (an insectivore). Four lines of evidence were evaluated for these species, and the WOE for these lines is presented in Table 8.1-17. The unadjusted HI had only thallium as a COPEC; this results because thallium has a low TRV and the data set consisted mostly of nondetects that elevated the HQs. ECORSK.9 modeling for the deer mouse showed no COPECs with the adjustment to remove the contribution of thallium (Section 8.1.3.4 and Gonzales et al. 2006, 93786). The tissue and pelt concentrations of COPECs were measured in small mammals as well. This line of evidence was primarily for dose modeling to receptors that eat small mammals, but the results are also relevant to the small mammals themselves. Very few of the COPECs detected in the small mammals correlated with the concentrations in sediment: three COPECs correlated with body tissue, two with pelt, and two with whole animals. These results indicate that the ESL model overestimates the uptake of COPECs into small mammals. Thallium was one of the COPECs that did not correlate with soil concentrations in any of the tissues tested.

The third measure for the small mammals was to estimate the potential dose to them through ingestion of earthworms. As with the avian receptors, estimated COPEC concentrations in earthworms had to be substituted for the planned analytical results. Both the shrew and deer mouse are modeled for the ESL development with invertebrates in their diet, but as explained in Section 8.1.3, the dose modeling was conducted using the shrew. Only thallium had an HQ >3 for the small mammals; this results because thallium has a low TRV and a default transfer factor of 1. Thallium in earthworms did not correlate with soil concentrations of thallium in the study in the Los Alamos and Pueblo watershed; therefore, the thallium result from the modeling is likely to greatly exceed the actual risk and not be a strong line of evidence for small mammals. Overall, the WOE for small animals indicates that COPECs in soil do not have adverse effects on population abundance or persistence and diversity of mammalian invertevore and omnivore feeding guild species (AE3).

Mammalian Carnivore Feeding Guild

Although the fox did not represent a specific assessment endpoint because carnivores were evaluated through AE1, the ecological screening presented in the biota investigation work plan indicated that PCBs may impact this receptor. The mammal tissue concentrations of PCBs were used to calculate a refined estimate of dose through the food chain (Section 8.1.3.8). Only Aroclor-1260 was detected in small mammal tissue and the HQ for Aroclor-1260 was less then 0.01, indicating that there is no risk to this receptor through ingestion of small mammals in the Mortandad watershed.

Detritivores

ALaboratory toxicity test measured both survival and weight change in earthworms from samples in reaches with and without soil COPECs (Section 8.1.3.5). The WOE for this measure and measures of detritivores relevant to other receptors is given in Table 8.1-18. There was no difference in survival between any of the reaches. There were differences in weight loss between the reaches, but the differences in weight loss did not correlate with COPEC concentration. The WOE for detritivores indicates that COPECs in soil in the Mortandad watershed do not adversely impact survival and growth of detritivore species (AE4).

Plants (Primary Producers)

Lines of evidence and their WOE for plants are provided in Table 8.1-19. The main line of evidence is the seedling germination test with supporting information from the field survey of plants in reaches with different concentrations of COPECs. Survival and most measures of growth in roots and shoots showed no difference between reaches (Section 8.1.3.6). Two measures (wet root length and mean shoot length) differed between reaches but did not correlate with COPEC concentration. The field survey of plants showed no differences between reaches that could be directly related to variations in COPEC concentrations, and all reaches that had been previously surveyed had more species diversity than previously, supporting the finding that germination and growth are not inhibited. The overall WOE indicates no adverse effects of COPECs in soil on native plant species presence and diversity (AE5).

Aquatic Community

The measures used as lines of evidence for evaluating impacts to the aquatic community in the Mortandad watershed, and the WOE assigned to each measure are provided in Table 8.1-20. The Laboratory toxicity test using *C. tentans* showed no difference in survival and no difference in growth correlated with COPEC concentration. The field bioassessment characterization indicated that chironomids dominate the aquatic community in sampled reaches and that the toxicity test using chironomids is therefore an appropriate measure of impacts to the aquatic community. The Laboratory algal toxicity test showed differences in cell growth with reaches, but these differences were attributable to water hardness and not to COPECs in water. The WOE for measures of the aquatic community indicates there are no adverse effects from COPECs in sediment and water on abundance and survival of the aquatic community in the reaches of the Mortandad watershed (AE7).

8.1.4.2 Uncertainty Analysis

Exposure Uncertainty

Uncertainties in the ecological risk assessment are potentially associated with the characterization for sediment and surface water. Maximum detected concentrations were used for some comparisons, which would overestimate the exposure concentration in a reach. For comparisons to bird boxes, arithmetic mean concentrations in soil in each reach were used for comparison; because sampling is biased towardlocations where contaminant concentrations are highest, use of straight means generally provide overestimates of actual exposure concentrations, as discussed in Section B-1.0 of Appendix B. Media concentrations for evaluating the results of Laboratory toxicity tests came from the actual water and sediment samples used in those tests and provide a good estimate of the exposure concentration for the assay organisms. These concentrations would overestimate exposure concentrations throughout the sampled reaches because sampling was biased to specific locations with higher concentrations of COPECs in these reaches. For the small mammal trapping, composite soil samples for comparison were obtained from the traps within the array.This provides a good representation of the concentration in the trapping array, but because the arrays were centered in areas with contaminated sediment deposits, the data are expected to overestimate exposure concentrations for mammals that largely forage outside these areas.

Another uncertainty is the adequacy of the toxicity and bioaccumulation data used to develop the assessment endpoints and select the associated measures and develop the study design. In fact, a number of toxicity values and transfer factors in the ECORISK database and the associated food chain and ECORSK.9 modeling were changed between the design of the studies and their evaluation in this investigation report. These changes brought new COPECs into consideration. Gaps also exist for toxicity

for some classes of COPECs on some receptors that hamper evaluating those COPEC-receptor combinations except in the field studies. The study design included field, Laboratory, and model components to provide complementary information and reduce uncertainties related to toxicity and bioaccumulation data.

Field Measures

Empirical ecological effects data are the most relevant data for determining if there are adverse effects on ecological receptors, especially at the population level. However, these data are inherently more variable and difficult to quantify than laboratory measures. Uncertainty associated with a limited number of locations and a limited number of sampling events is mitigated by collecting information across a variety of measures of exposure and effect.Factors unrelated to COPECs, such as drought and other climatic variations, fire, and annual variation in species, can have confounding effects on analysis of field measures.

Field measures can also provide some information on adverse effects that cannot be obtained with other methods. This includes an estimate of impacts from COPECs for which there are not toxicity values. Field measures also provide valuable information on the usefulness of models and transfer factors in predicting ecological effects.

Laboratory Measures

Laboratory toxicity tests provide more standardized results than field data because they are conducted under controlled conditions, but they are still subject to uncertainties associated with sample collection and representativeness. Confounding factors are also possible, as was demonstrated in this investigation by the effect of water hardness on the results of the algal toxicity test (Section 8.1.3.7). Other confounding factors may include variability in the test species selected; for example, the yarrow used in the plant toxicity test for these studies is more variable in growth than standard assay plants, but it is also more relevant to the ecosystems under consideration. Mortandad watershed soils are generally nutrient-poor, which can influence growth in plant, earthworm, algae, and chironomid tests. Sample sites were also selected to represent a gradient of COPEC concentrations to improve the representativeness of the toxicity tests to potential COPEC impacts.

Model Measures

ECORSK.9 represents a modified exposure model with many of the limitations of the simple exposure models used of screening-level ecological risk assessments. ECORSK.9 blends more realistic information on spatial use of the watershed with simple models of contaminant bioaccumulation and toxicity (Gonzales et al. 2006, 93786). In ECORSK.9, conservatism is still present for key parameters like TRVs and bioaccumulation factors. For example, the TRVs are based on NOAELs or the geometric mean of NOAEL values, and risks are assessed assuming additivity of response or summing of exposure across COPECs. ECORSK.9 is also based on conservative estimates of COPEC concentrations in soil; it assumes that the average of the sample data for a model grid cell is representative of the true concentration, although sampling is typically biased toward areas with higher concentrations of contaminants (Section B-1.0 of Appendix B). For this study, nondetected concentrations of organic chemicals were handled as either one-half their detection limits or as zero.The different results demonstrate that assumptions regarding nondetects can obscure sources of problem contaminants and overestimate risks. The simple dose modeling from concentrations in food done for this investigation is subject to many of the same uncertainties arising from toxicity values, transfer factors, and assumptions about concentrations and nondetects as the ECORSK.9 modeling.

8.1.5 Summary

Many COPECs were identified as study design COPECs in the ecological screening of soil, sediment, and surface water in the Mortandad watershed. The WOE demonstrated by the various lines of evidence for the seven assessment endpoints indicates there are no adverse effects of COPECs on terrestrial and aquatic receptors in the Mortandad watershed. The overall WOE from field studies, analysis of COPEC concentrations in tissues, and Laboratory toxicity tests supports this conclusion. Some of the results from modeling (both ECORSK.9 modeling and the dose through food ingestion modeling) indicate a potential for some ecological risk. However, these two models incorporate many of the same conservative factors (TRVs and transfer factors) inherent to the original screening using ESLs, which are designed to overestimate potential effects to provide a conservative screen. Therefore these models are not as strong a line of evidence as the other studies mentioned. Thus, no COPECs are retained for any further assessment or mitigation as a result of this baseline ecological risk assessment.

8.2 Human Health Risk Assessment

This human health risk assessment evaluates the potential for adverse effect on human health in the Mortandad watershed for COPCs identified in Section 6 of this report. The risk assessment approach used in this report follows guidance from EPA (1989, 08021), LANL (2004, 87800), NMED (2006, 92513), and EPA (2005, 91002) and is organized in seven major subsections. The approach utilizes media- and scenario-specific media-based screening levels to evaluate the potential for human health risks from sediment and surface water in the Mortandad watershed. Section 8.2.1 provides the basis for selecting exposure scenarios for the human health risk assessment. In Section 8.2.2, the data collection and evaluation processes described in previous sections of the report are summarized, focusing on aspects of data analysis that are pertinent to the risk assessment. Section 8.2.2 also lays out the logic for selecting COPCs for the human health risk assessment. The exposure assessment (Section 8.2.3) provides information used in quantifying human exposure to COPCs in sediments and water. The toxicity assessment (Section 8.2.4) provides information on potential human health effects from chemicals and radionuclides evaluated in the risk assessment. Section 8.2.4 provides the sources for the media- and scenario-specific screening levels. Risk characterization (Section 8.2.5) is based on the SOF method for evaluating the potential for additive effects with COPCs that are classified as noncarcinogens, carcinogens, or radionuclides. Uncertainty related to the various assumptions and inputs used in the risk assessment is evaluated in Section 8.2.6 to support interpretation of the risk characterization. A summary of the risk assessment is provided in Section 8.2.7.

8.2.1 Problem Formulation

The purpose of this risk assessment is to evaluate potential human health risks related to the COPCs identified in sediments and surface water in the Mortandad watershed. This information can be used to inform a risk management decision. This risk assessment uses information pertaining to current and reasonably foreseeable future land use to assess potential impacts under reasonable maximum exposure (RME) conditions. The canyon bottoms in the Mortandad watershed include a mixture of Laboratory property and San Ildefonso Pueblo lands, potentially supporting a variety of land use alternatives.

The assessment in this report primarily employs the trail user exposure scenario to represent the current and reasonably foreseeable future exposure activities for contaminated sediments and surface waters in the watershed. The trail user scenario describes an adult individual who contacts contaminated sediments and surface water while hiking or jogging in the canyons. This use is considered to be inclusive of realistic present-day potential exposure activities in canyon bottoms in areas of the watershed where contaminants are at levels requiring a human health risk assessment.

One supplemental exposure scenario, residential, is evaluated in the human health risk assessment for comparison purposes only. A description of this supplemental exposure scenario is provided in Section 8.2.3.3. Unlike the trail user scenario, residential use is not currently applicable across the watershed. A residential scenario does not represent current or reasonably foreseeable future land uses in the canyon bottoms, and residential development in particular is not a feasible land use within the parts of the canyons subject to flooding.

Assessment results for the trail user scenario are provided in Section 8.2.5. The results of risk calculations for the residential scenario are provided in Section E-3 of Appendix E.

8.2.2 Data Collection and Evaluation

The approach to sampling design, data collection, and characterization is described in Sections 3 and 4 and Appendix B. Sample locations, sample results, and data quality for data employed in the human health risk assessment are presented in Appendix C. Section 6 describes how sediment data were separated into reaches and status and how sediment data within reaches were combined for the comparison of contaminant data maxima with BVs. Water data were evaluated at each surface water sampling location, as described in Section 6.

Identifying COPCs for the Human Health Risk Assessment

COPCs for the human health risk assessment are identified based on screening level risk calculations using a residential exposure scenario. This process is initially inclusive of all COPCs and evaluates the potential for human health risks under a protective residential scenario. This process includes calculating a ratio, which is the maximum concentration of an analyte in a specific media in a reach or at a water sampling station divided by the media-specific risk-based screening level. This is analogous to the HQ as used in Section 8.1 for assessing potential ecological risk. An SOF is also calculated for a risk type; i.e., carcinogens (SOF_{ca}), noncarcinogens (SOF_{nc}), and radionuclides (SOF_{rad}). These are analogous to HIs calculated in Section 8.1. Ratios for all COPCs within a reach or water location are summed to calculate the SOF for the risk class of those analytes (carcinogen, noncarcinogen, or radionuclide). For all reaches or water locations with an SOF >1.0 for a risk class, all COPCs within that risk class with ratios greater than 0.1 are retained as COPCs for the site-specific risk assessment. COPCs with a ratio ≤0.1 based on maximum sample results are excluded because they are unlikely to significantly contribute to risk.

Sediment COPCs: The human health screening levels for nonradionuclides in sediment used in this screening assessment are the NMED residential SSLs from Revision 4 of NMED guidance (NMED 2006, 92513). For analytes for which NMED does not provide a value, the residential screening value from EPA Region 6 (EPA 2005, 91002) or EPA Region 9 (epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf) was used as the SSL (carcinogens are adjusted to a 10^{-5} risk level to be consistent with the NMED target risk level). NMED-approved surrogate compounds were used for some COPCs that lack NMED or EPA screening levels (NMED 2003, 81172). SALs related to residential land use for radionuclides are based on the soil guidelines for unrestricted release of property (DOE Order 5400.5, “Radiation Protection of the Public and the Environment”); these values are derived using RESRAD version 6.21 as described in “Derivation and Use of Radionuclide Screening Action Levels Revision 1” (LANL 2005, 88493).

Tables 8.2-1 to 8.2-3 contain the set of human health residential SSLs and SALs used to calculate ratios; these tables also provides the SOFs for each reach for each risk class for all sediment COPCs. COPCs and reaches shaded gray are those retained for the risk assessment. Table 8.2-1 provides the results for noncarcinogens, Table 8.2-2 provides the results for carcinogens, and Table 8.2-3 provides the results for radionuclides.

Surface Water COPCs: Screening levels for surface water for organic and inorganic chemicals are the EPA Region 6 risk-based screening levels for tap water (EPA 2005, 91002). The EPA Region 6 values were supplemented by screening values from EPA Region 9 , available at (epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf). Radionuclide screening levels are based on a dose of 4 mrem/yr and are from the DOE DCG (DOE Order 5400.5, "Radiation Protection of the Public and the Environment").

Tables 8.2-4 to 8.2-6 contain the set of human health water screening levels used to calculate ratios; these tables also provide the SOFs for each type of field preparation (filtered or unfiltered) for each water location, and each risk class for all surface water COPCs. COPCs and water locations shaded gray are those retained for the further assessment. Table 8.2-4 provides the results for noncarcinogens; Table 8.2-5 provides the results for carcinogens; Table 8.2-6 provides the results for radionuclides. Surface water data have been obtained from the surveillance station "Mortandad at Rio Grande" (monitoring station A-11), and there is no associated reach for this location. The primary source of surface water at station A-11 is effluent from the Los Alamos County wastewater treatment plant in White Rock. The SOF_{nc} for station A-11 was 1.01, and the primary contributors to the sum were fluoride and vanadium. Because station A-11 has no associated sediment sample results, and surface water is wastewater effluent, this location will not be retained for evaluation in the human health risk assessment.

COPC Summary: Table 8.2-7 presents a summary of endpoints and reaches considered in the human health risk assessment for the Mortandad watershed. For each reach and endpoint combination with both sediment and water COPCs retained, a multimedia assessment is also assessed for this reach. Table 8.2-7 shows that the most downstream reach in the Mortandad watershed requiring further human health risk assessment is reach M-4.

Calculating Representative Concentrations

Sediment: The investigation approach for sediments resulted in samples associated with discrete geomorphic units and sediment facies within each reach. These data are combined to estimate weighted averages and weighted 95% upper confidence limits (UCLs) on the averages for COPCs retained for the human health risk assessment in each reach. The approach to estimating weighted averages and weighted 95% UCLs is well established in the statistical methods for stratified sampling, (e.g., Gilbert 1987, 56179; Cochran 1977, 84462). A description of these methods is provided in Section E-3 of Appendix E. Many of the data sets for combinations of COPCs and reaches or COPCs and water sampling locations include nondetect values. The approach to estimating averages and 95% UCLs with data that include nondetects is also described in Section E-3 (Appendix E).

The trail user exposure scenario uses representative sediment concentrations calculated from surface-area weighted averages and surface-area weighted 95% UCLs for sediment facies that typically occur in the uppermost parts of geomorphic units because trail user exposures predominantly occurs with near-surface sediment. In addition, the uppermost sediment facies is usually finer grained and contains higher contaminant concentrations than deeper sediment, thus providing a more protective assessment. The calculation approach for the averages and 95% UCLs uses the relative areas of the different geomorphic units in a reach to derive the weights. The residential exposure scenario includes activities that penetrate the ground surface, resulting in direct exposure to buried sediments. Therefore, the residential exposure scenario uses the volumes of sediment deposits within geomorphic units to derive weights rather than the surface areas. The area weights and volume weights for each unit in each reach are presented in Table D-1.3-1 in Appendix D. Representative sediment concentrations for the trail user scenario are presented in Section 8.2.5.

Surface Water: Water COPC concentrations are evaluated for each sampling location, unlike sediments where multiple sample locations are combined to generate a representative concentration for a reach. The only exception is for locations that are basically collocated within a few meters of each other. As a result, methods to estimate weighted averages and weighted 95% UCLs are not used to calculate water representative concentration. The approach to calculating averages and 95% UCLs for the water data follows the approach described in Section E-3 (Appendix E). Representative surface water concentrations for the trail user scenario are presented in Section 8.2.5.

8.2.3 Exposure Assessment

The trail user scenario is the exposure scenario that applies to all reaches identified in Table 8.2-3. Additionally, potential risk associated with the residential scenario is provided as a point of comparison. The two exposure scenarios employed in the human health risk assessment have been described in other documents. The trail user scenario is the adult receptor in the recreational scenario document (LANL 2004, 87800) and the recreational scenario in the radionuclide SALs document (LANL 2005, 88493). An adult trail user is evaluated in this assessment because access to these reaches is limited to Laboratory workers or trespassers, and it is unlikely that young children would accompany either workers or trespassers on recreational visits to these reaches. Exposures to surface water ingestion are evaluated based on the trail user scenario described in the "Los Alamos and Pueblo Canyon Investigation Report" (LANL 2004, 87390, p. 8-37), which also provides risk-based concentrations for trail user surface water exposures (LANL 2004, 87390, p. E-317). Residential SSLs are in NMED guidance (NMED 2006, 92513), and residential SALs are in LANL guidance (LANL 2005, 88493).

8.2.3.1 Exposure Scenario Description

The human health risk assessment focuses on potential risks resulting from direct exposure to contaminants in sediments through ingestion, inhalation, external irradiation (radionuclides only), and dermal contact (chemicals only). The water pathways for the trail user consist of ingestion and dermal contact (chemicals only) using persistent surface water data. Exposure to stormwater is not assessed because stormwater is transient and does not occur frequently enough to sustain chronic exposures. Exposure to groundwater is not evaluated because no groundwater in the Mortandad watershed is available for human uses under current conditions or for the reasonably foreseeable future. A summary of potentially complete exposure pathways, by scenario, is provided in Table 8.2-8.

Exposure scenario parameters were selected to provide an RME estimate of potential exposures. As discussed in EPA (1989, 8021), the RME estimate is generally the principal basis for evaluating potential health impacts. In general, an RME estimate of risk is at the high end of a risk distribution, i.e., 90th–99.9th percentiles (EPA 2001, 85534). An RME scenario assesses risk to individuals whose behavioral characteristics may result in much higher potential exposure than seen in the average individual.

The trail user scenario addresses limited site use for outdoor activities such as hiking and jogging. The receptor for this scenario is anticipated to be a Laboratory employee using the canyon over an extended period of time. Therefore, receptors for the trail user scenario are defined as adults. A complete description of the parameter values and associated rationale is provided in Laboratory guidance (LANL 2004, 87390, p. 8-37). Exposure parameters for the trail user are provided in Appendix E-3.

8.2.3.2 Supplemental Exposure Scenario

Risk estimates are provided for a resident as a supplemental exposure scenario. A more detailed discussion of the basis and parameterization of this scenario is provided in NMED guidance (2006,

92513) and Laboratory guidance (LANL 2005, 88493). Exposure parameters for the resident are provided in Appendix E-3.

8.2.3.3 Spatial Scales of Application for the Exposure Scenarios

Each exposure scenario is evaluated at the scale of a reach for sediments and at the scale of individual sampling locations for water. Each of the surface water sampling locations has been associated with a reach for combining results into a multimedia assessment (where appropriate). The investigations evaluated in this report have multiple investigation reaches and water sampling locations. The risk assessment does not attempt to integrate exposure across multiple reaches for sediment or across water sampling locations for surface water. By assessing each reach and associated water sampling locations separately, the impacts of local variability in COPC concentrations upon the risk assessment results are preserved.

8.2.4 Toxicity Assessment

This section of the human health risk assessment provides information related to the basis for distinguishing among the three classes of chemicals that are evaluated in this assessment: systemic toxicants (noncarcinogens), chemical carcinogens, and radionuclides. This information provides a context for interpreting the results of the risk assessment, which employs COPC-specific values of toxicity and radiation dose to evaluate potential health impacts.

Using media-specific risk-based screening levels simplifies aspects of the risk assessment in that exposure and toxicity information has been compiled in available guidance documents and reports. The sources for toxicity data used for this risk assessment include NMED and LANL guidance documents and the "Los Alamos and Pueblo Canyon Investigation Report" (LANL 2004, 87390) and its supplement (LANL 2005, 91918). The "Los Alamos and Pueblo Canyon Investigation Report" is used as a source of surface water screening values because there is no guidance document available with such values, and the exposure information provided therein is germane to trail user exposures in other Laboratory canyons. Toxicity information used to develop surface water screening values is also generally consistent with values used in NMED and LANL guidance documents (as discussed below).

Media-specific risk-based screening levels are from seven sources based on COPC type and exposure medium.

- Recreational scenario (trail user) for carcinogens and noncarcinogens
    - Sediment: used the recreational SSLs developed in Laboratory guidance (LANL 2004, 87800)
    - Surface water: used the risk-based concentrations for trail user surface water ingestion and dermal contact developed in the "Los Alamos and Pueblo Canyon Investigation Report" (LANL 2004, 87390, except lead is from LANL 2005, 91918)
- Recreational scenario (trail user) for radionuclides
    - Sediment: used the recreational SALs developed in Laboratory guidance (LANL 2005, 88493)
    - Surface water: used the risk-based concentrations for trail user surface water ingestion developed in the "Los Alamos and Pueblo Canyon Investigation Report" (LANL 2004, 87390)

- Residential scenario for carcinogens and noncarcinogens
    - Sediment: used the SSLs from NMED guidance (NMED 2006, 92513), except for certain values from EPA Region 6 (EPA 2005, 91002) and EPA Region 9 (epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf)
- Residential scenario for radionuclides
    - Sediment: used the residential SALs developed in Laboratory guidance (LANL 2005, 88493)

Table 8.2-9 provides the compilation of the sediment and surface water media-specific risk-based screening levels and target adverse effect-levels. Comparing the screening values with COPCs for a given risk endpoint provides some information of the relative toxicity of these analytes. Because these risk-based screening values are obtained from references prepared from 2004 to 2006, there is potential for differences in the toxicity values used in the screening level calculations. The slope factors and reference doses were compared with the COPCs listed in Table 8.2-9 among the sources; differences in these toxicity values are summarized in Table 8.2-10. This information will be considered in the uncertainty analysis of this assessment.

8.2.5 Risk Characterization

In this section of the human health risk assessment, information provided in the exposure and toxicity assessments (Sections 8.2.3 and 8.2.4, respectively) is integrated to characterize potential adverse effects. The risk characterization is conducted on the basis of the general principles described in Section 8.0 of the risk assessment guidance for Superfund (EPA 1989, 8021). Potential adverse effects related to noncarcinogens, chemical carcinogens, and radionuclides are discussed in Sections 8.2.5.1, 8.2.5.2, and 8.2.5.3, respectively. The presentation of potential adverse effects focuses on the quantitative expressions of potential impacts. In the uncertainty analysis (Section 8.2.6), the confidence associated with the quantitative risk estimates is discussed through an evaluation of the uncertainties pertaining to each step of the risk assessment process.

This risk assessment employs media-specific risk-based screening levels to evaluate COPCs for potential adverse health effects. COPC intake and toxicity are combined within the screening value calculations; therefore, separate calculations of intake and health effects (cancer risk, hazard, and dose) were not generated. Human health effects were assessed using the ratios of representative concentrations to media-specific risk-based screening levels for each COPC retained in this assessment for each of the exposure scenarios. These ratios were summed for an investigation reach and (when applicable) a water sampling location within the COPC classes of chemical carcinogens, noncarcinogens, and radionuclides (SOFs). A sum of less than 1 indicates that exposure is unlikely to result in an unacceptable cancer risk, hazard, or radiation dose. The SOF values were multiplied by the target effect level (i.e., HI = 1, risk = 1×10^{-5}, or dose = 15 mrem/yr) to provide risk estimates for each COPC class.

For the trail user scenario, exposure to sediment and surface water is evaluated through a multimedia sum. For COPCs with a common target adverse effect level (e.g., all carcinogens are based on 1×10^{-5} incremental cancer risk), the multimedia sum can be converted into an approximate effect level. Carcinogen and noncarcinogen screening levels are based on a common adverse effect level across sediment and surface water, but the radionuclide adverse effect levels are not the same for sediment (15 mrem/yr) and surface water (4 mrem/yr).

The trail user scenario multimedia sums and the risk values for noncarcinogens, carcinogens, and radionuclides based on 95% UCLs are summarized in Table 8.2-11. Most of the carcinogen and

radionuclide multimedia sums are similar to the sediment risk values, which indicate that there is greater potential for effects from the sediment concentrations and exposure pathways than from surface water. For noncarcinogens, this observation is reversed for many reaches: the multimedia sum is similar to the surface water risk values. There is one reach where the multimedia sum and the sediment risk values are greater than the target risk level for the trail user scenario: radionuclide dose in reach E-1E.

Table 8.2-12 presents the COPC and reach-specific recreational risk values for sediment; Table 8.2-13 presents the COPC and reach-specific recreational risk values for surface water. The representative concentrations for sediment are presented in Table 8.2-14; the representative concentrations for surface water are presented in Table 8.2-15. Results for the supplemental exposure scenario (residential) are provided in Tables E-3.5-2 and E-3.5-3.

8.2.5.1 Noncarcinogenic Effects

Chemical hazard for an individual chemical is commonly defined by the HQ, which is calculated as the ratio of the chemical intake to the reference dose (RfD) for that chemical. An HQ greater than 1 is indicative of the potential for adverse effects; therefore, an HQ of 1 was used in the calculation of screening values for noncarcinogenic effects. When the potentially additive effects of two or more chemicals are considered, HQs may be summed to generate an HI. However, summing of chemical HQs to create an HI assumes that the target organs and mechanisms of toxicity are similar. The SOF_{nc} values in this human health risk assessment are functionally equivalent to generating an HI. The protective approach of summing these ratios does not warrant refinement because the HI values are in all cases well below 1.0.

The four largest HI values for the trail user scenario were between 0.4 and 0.7 (Table 8.2-11) and related mostly to the potential for adverse effects from lead in surface water (reaches M-1W and TS-1C; Table 8.2-13) or aluminum and iron in sediment (reaches M-1E and E-1FW; Table 8.2-13). The HI was between 0.1 and 0.4 in four other reaches (E-1W, E-1E, M-2W, and TS-2E) with the key contributors to these noncarcinogenic sums being aluminum, arsenic, iron, and manganese in sediment and lead and perchlorate in surface water.

8.2.5.2 Carcinogenic Effects

Cancer risk for an individual chemical is defined by the incremental cancer risk (ICR), which is calculated as the product of exposure to a single chemical and the cancer slope factor (SF) for that chemical. ICRs for each exposure route and chemical are then summed to calculate the total ICR to an individual. A target risk level of 1×10^{-5} was used in this human health risk assessment to calculate risk-based concentrations for carcinogenic effects (NMED 2006, 92513). Lifetime cancer risk is considered to be additive over time; childhood and adulthood exposures are summed to calculate the ICR.

The potential risk from carcinogens was evaluated in 12 investigation reaches, and the range of sediment or multimedia ICR for the trail user scenario was from 8×10^{-7} to 6×10^{-6} (Table 8.2-7). The maximum ICR (6×10^{-6}) was calculated for reach M-1W. The primary contributors to the ICR in these reaches from sediment were arsenic and PAHs (Table 8.2-12). Carcinogenic COPCs were not significant contributors to the ICR for trail users from surface water exposure.

8.2.5.3 Radiation Dose

The radiation dose associated with the EPA dose conversion factors (DCFs) used in the human health risk assessment is the annual committed effective dose equivalent (internal) or annual effective dose

equivalent (external), expressed in units of millirems per year. The target dose limit used for calculating media-specific risk-based screening levels related to soil pathways is 15 mrem/yr, which is consistent with guidance from DOE (DOE-AL 2000, 67153). For water-based exposure pathways, media-specific risk-based screening levels were calculated using a target dose limit of 4 mrem/yr. Use of this more protective dose limit for water pathways is based on the radiation dose limit for a public drinking water supply in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." Consistent with EPA guidance (EPA 1989, 8021), dose through dermal absorption is not quantified because it is probably negligible compared with the other exposure pathways.

The potential risk from radionuclides in sediment was evaluated in 12 reaches; the potential risk from radionuclides in surface water was evaluated in four reaches, and multimedia sums were also calculated in these four reaches. The range of sediment or multimedia radionuclide dose was from 0.01 to 44 mrem/yr; the range of surface water radionuclide dose was from 0.04 to 0.3 mrem/yr (Table 8.2-11). One reach had a radionuclide dose value for the trail user scenario greater than 15 mrem/yr: reach E-1E had a multimedia dose of 44 mrem/yr. Americium-241, cesium-137, plutonium-238, and plutonium-239,240 contributed more than 99% of the dose from radionuclide sediment COPCs for all reaches except TS-1C (Table 8.2-8). In reach TS-1C, thorium-228, thorium-230, and thorium-232 contributed approximately 59% of the radionuclide dose from sediment. Approximately 80% of the dose in reach E-1E from sediment was from cesium-137.

8.2.6 Uncertainty Analysis

The uncertainty analysis uses qualitative and semiquantitative information to evaluate the uncertainty associated with the risk, hazard, and dose estimates described in Section 8.2.5. This uncertainty analysis pertains to the results of the trail user scenario. The uncertainty analysis is organized according to the major aspects of the human health risk assessment: data collection and evaluation (Section 8.2.6.1), exposure assessment (Section 8.2.6.2), and toxicity assessment (Section 8.2.6.3).

8.2.6.1 Data Collection and Evaluation

All analytes that were identified as COPCs in Section 6 were retained for evaluation in the human health risk assessment. COPCs that were retained for calculation of representative concentrations were those that had ratios greater than 0.1 for endpoints with SOF values greater than 1 for the residential screen. Thus, the analytes retained represent an inclusive list of potential human health risk drivers.

No BVs are available for surface water. The inability to distinguish COPCs in surface water based on comparisons with background concentrations is a substantial source of uncertainty in the results of the human health risk assessment for this media. For example, concentrations of arsenic and iron in surface water, which contribute to HI, could be associated with local background and not with releases from Laboratory SWMUs or AOCs.

Overestimating representative concentrations for investigation reaches is another potential source of uncertainty. Five approaches were used to minimize that possibility. First, the emphasis of the geomorphic characterization and sediment sampling was to identify and sample post-1942 sediment deposits, which focuses sampling on potentially contaminated areas. The process of characterizing reaches and focusing sampling is discussed further in Section 4.1 and Section B-1 of Appendix B. Second, the canyon bottoms include other geomorphic units that are not impacted or are only minimally impacted by Laboratory releases. Samples from these other geomorphic units were not included in the area-weighted and volume-weighted averages to provide more protective estimates of COPC concentrations for use in the human health risk assessment. Third, 95% UCLs on the area-weighted

average sediment concentrations were employed as representative concentrations to minimize the chance of underestimating representative concentrations in a reach. Fourth, it was assumed that exposure in most geomorphic units for the trail user scenario was entirely caused by fine facies sediment deposits where concentrations are generally highest, as discussed in Section 7.1, excluding data from coarse facies sediment deposits where concentrations are generally lower. Fifth, for radionuclides, no correction was made for radioactive decay since the time of sampling, although present-day concentrations are lower than at the time of sampling for some key radionuclides. For example, the maximum concentration of cesium-137 measured in the Mortandad watershed was in a sample collected from reach E-1E in 1998, and concentrations in 2006 when this report was written would be about 17% lower in that sediment layer due to radioactive decay. Accounting for radiological decay would decrease the calculated dose in reach E-1E from 44 mrem/yr to approximately 38 mrem/yr.

A similar uncertainty exists for estimating representative concentrations for water sampling locations. COPC concentrations often change with hydrologic conditions and can either increase or decrease seasonally or related to effluent discharges. The data evaluated in this assessment represent a snapshot of the current hydrological conditions and generally reflects a range of hydrologic conditions at each sampling location. As discussed in Section 7.2.1 and Appendix B, Section B-2, sampling occurred during a range of water-level conditions and field parameters, such as pH and dissolved oxygen. The representative concentrations calculated from these data represent the range of COPC concentrations at the sampling locations. Using the 95% UCL on the average minimizes the chance of underestimating the representative concentrations for a sampling location.

8.2.6.2 Exposure Assessment

Uncertainty pertaining to exposure parameters was addressed in the human health risk assessment by using RME estimates for several exposure parameters (see Appendix E-3). The use of RME assumptions, coupled with upper-bound estimates of the average concentration of COPCs in sediment, is intended to produce a protective bias in the risk calculations. The results of the risk assessment, discussed in Section 8.2.5, include a description of the key COPCs and exposure pathways associated with potential health impacts. This evaluation of uncertainty in exposure is focused on these COPCs and pathways.

Key exposure pathways for contaminated sediments across hazard, ICR, and dose for the trail user exposure scenario include dermal absorption, incidental soil ingestion, and external irradiation. A common source of protective bias in the exposure assessment for these pathways is that the entire 1-h daily exposure time defined for the trail user scenario is spent on contaminated sediment deposits within a reach. To the extent that time may be spent in other canyon areas such as uncontaminated stream terraces, colluvial slopes, or bedrock areas during recreational activities, exposure to contaminated sediment deposits is overestimated.

The assessment also includes no consideration of the current signage in the canyon, which reads “No Trespassing: Access to Mortandad Canyon is Restricted to Workers on Official Business.” In addition, the area at the head of reach E-1E at the TA-50 RLWTF outfall is posted as “Caution: Soil Contamination Area.” Because each reach is treated equally from an exposure perspective, no consideration is made regarding ease of access or land area available for recreation. For example, reach E-1E has the highest estimated radionuclide dose (44 mrem/yr for the trail user scenario), but it is one of the shortest, narrowest, and roughest reaches in the Mortandad watershed and has no developed trails or other features that attract trail users. Reach E-1E is also in a part of the Laboratory with access controls and access requirements and has signs that discourage the specific recreational activity being assessed. In addition, the estimated dose of 44 mrem/yr is below the 100 mrem/yr dose limit established by DOE for

radiation workers, indicating that trained workers conducting environmental or other work in this area would not be expected to exceed dose limits for these specific and occasional activities. As a further point of comparison, dose to the trail user would be less than 15 mrem/yr if 50 h/yr was spent in reach E-1E (instead of the 200 h//yr assumed for the trail user).

For both carcinogens and radionuclides, the exposure assessment should be evaluating incremental exposures that are greater than background. Representative concentrations are calculated that include background concentrations. For the most part, background exposures are likely negligible with the exception of some metals in sediment and surface water (e.g., arsenic) and do not lead to overestimating risk or dose.

Dermal contact with sediments and incidental soil ingestion exposure pathways each have a second exposure characteristic in addition to time spent on-site that was biased in a protective manner. The soil adherence factors that were used to define soil loading on skin for children and adults are both protectively biased. The adult adherence factor is based on a high-exposure activity (gardening) that probably would result in greater exposure than would be the case during trail use. Adult soil ingestion was assumed to be 100 mg/d, which is twice the EPA-recommended value for adults (EPA 1997, 66596).

Radionuclides in reach E-1E represent the greatest potential for risk for adult trail users, and the largest fraction of dose is related to external gamma radiation from cesium-137. Because external gamma radiation is the main contributor to radionuclide dose, the assessment should also be protective of child exposures because behaviors that increase child exposure through some pathways (incidental soil ingestion and dermal contact) play basically no role in external gamma dose.

Exposure related to external irradiation from soil is primarily a function of time spent on-site. However, the external DCFs used in the calculation of external dose protectively assume an effectively infinite area and depth of contamination. The contaminated sediments in reach E-1E, where external irradiation was an important contributor to trail user dose, are approximately 200 m long and average 3 m in width and less than 1 m in depth. The calculated dose through external irradiation from cesium-137, assuming an infinite source, would likely be twice as large as would actually be the case given the described source geometry of reach E-1E. Actual external irradiation received during recreational activities would probably be lower, assuming that receptors are not consistently in the center of the contaminated area.

An important aspect of uncertainty in exposure to COPCs in surface water relates to exposure intensity. Dermal contact and surface water ingestion were assumed to occur 20 times per year for 30 years (trail user). There is no empirical basis for this assumption, which was developed to bound a high-end exposure condition. Potential contact by adults with surface water in the Mortandad watershed would be highly intermittent at some locations based on the limited availability of water. It is also unlikely that a Laboratory employee would be drinking surface water, which is in some cases nonpotable effluent.

8.2.6.3 Toxicity Assessment

The evaluation of uncertainty pertaining to the toxicity assessment focuses primarily on the toxicology of cesium-137 because this COPC was primarily responsible for the calculated radionuclide dose to be greater than 15 mrem/yr in one reach. Nearly all of the dose for cesium-137 for the trail user scenario is associated with external gamma radiation (LANL 2005, 88493, Table A-2, p. A-2). The main uncertainties associated with the external radiation DCF relate to the geometry of the source and the receptor. Uncertainties associated with the source term were discussed in Section 8.2.6.2.

Table 8.2-10 provides a summary of the COPCs where the reference dose or SF values differ between various sources used in this assessment. The toxicity values used by NMED or EPA Region 6 are

basically the same, but these values differ from the sources used in Laboratory guidance or reports. For barium, copper, and manganese, the Laboratory toxicity values were more protective. There are three cases where the values used by NMED are more protective and the impact on the assessment for these analytes is considered.

- *Aroclor-1254*: The inhalation cancer risk slope factor used by NMED is 6 times more protective than the Laboratory value. However, the inhalation pathway is orders of magnitude less important than soil ingestion from an exposure perspective, so this difference in the inhalation cancer slope would not change the estimated risks from Aroclor-1254.
- *Thallium*: The oral reference dose used by NMED is about 20% lower (more protective) than the Laboratory value. This level of difference in thallium toxicity would not change any of the noncarcinogen assessments because the largest ratio for thallium was 0.003.
- *Vanadium*: The oral reference dose used by NMED is 7 times lower (more protective) than the Laboratory value. This level of difference in vanadium toxicity would not change any of the noncarcinogen assessments because the largest ratio for vanadium was 0.004.

8.2.7 Summary of the Human Health Risk Assessment

The health effects associated with COPCs in the Mortandad watershed were assessed relative to a radiological dose criterion of 15 mrem/yr for sediment and 4 mrem/yr for water, a chemical cancer risk criterion of 1×10^{-5}, and a chemical hazard criterion of 1.0. The risk assessment results are below these thresholds for the trail user with one exception. The calculated radionuclide dose for reach E-1E was 44 mrem/yr, and this was almost entirely related to sediment COPCs and primarily related to external gamma radiation from cesium-137.

The sediment radionuclide dose corresponds to a radiological risk of approximately 2×10^{-4} based on risk-based recreational radionuclide SALs. Radiological risks from surface water in reach E-1E will be negligible as sediment contributed about 99.4% of the dose. Radiological risks from sediments for reaches M-2W, M-2E, and M-3 were 2×10^{-5} to 3×10^{-5}, and radiological risks in other reaches ranged from 2×10^{-8} to 9×10^{-6}.

The nonsuitability of E-1E for traditional trail use and access restrictions in this part of the Laboratory, combined with conservatism included in the risk assessment, indicates that it is unlikely that actual recreational users of the Mortandad watershed would receive a dose exceeding 15 mrem/yr. Surface water risk results are below all adverse effect levels.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Investigations of sediment, surface water, and groundwater in the Mortandad watershed indicate that inorganic, organic, and radionuclide COPCs are present in these media at concentrations above screening levels and federal and/or state groundwater standards. These COPCs are derived from several sources, including Laboratory SWMUs and AOCs, runoff from developed areas, and natural sources such as noncontaminated soils, sediments, and bedrock.

The spatial distribution of contaminants in the Mortandad watershed, supported by effluent discharge data, indicates that the TA-50 RLWTF outfall into Effluent Canyon, which has been active since 1963, is the most important source of contamination with respect to potential human health risk and groundwater impacts. Source areas for Laboratory-derived COPECs that are most important in the assessment of potential ecological risk include TA-48 outfalls into the head of Effluent Canyon and into Mortandad

Canyon, the TA-50 RLWTF outfall, and additional releases from TA-50 or TA-35 into the head of Ten Site Canyon. The impacts of additional Laboratory sources (e.g., outfalls from the former TA-35 WWTP, wastewater lagoons, and filter beds) are indicated by the characterization data, although the concentrations, extent, and inventory of COPCs from these sources are generally minor compared with the sources listed above.

Contaminants in sediment that were originally released from the TA-50 RLWTF outfall are largely or entirely restricted to approximately 4 km (2.5 mi) of canyon bottom downcanyon from the outfall. The COPCs in alluvial groundwater derived from the RLWTF outfall are also restricted to this area. The infiltration of stormwater into alluvium, particularly upcanyon from the Mortandad–Ten Site Canyon confluence, results in a complete loss of surface water in most runoff events and deposition of contaminated sediment. The most important sediment deposition area is in the 0.6 km (0.4 mi) of canyon bottom west of the confluence (reach M-3E), and approximately 50% of the inventory of most radionuclides in sediments occurs there. No floods have been recorded crossing the Laboratory-San Ildefonso Pueblo boundary since RLWTF discharges began in 1963, and only one event before 1963 is recorded as having reached the Laboratory boundary in August 1952. Construction of the current sediment traps in Mortandad Canyon east of the Ten Site Canyon confluence in 1986 enhanced a process of infiltration and sediment deposition that was occurring previously.

Contaminant concentrations in sediment, surface water, and alluvial groundwater in the Mortandad watershed have generally decreased over time, indicating that the initial SWMU and AOC sources are no longer major contributors to contamination in canyons media. The canyon bottom sediment deposits contain the largest inventory of adsorbed contaminants that are susceptible to remobilization and transport in floods and are now the primary source for ongoing surface water and alluvial groundwater contamination. Therefore, any future efforts that may be required to address contaminants in canyons media should address the current distribution of contaminants in sediment and associated groundwater rather than in the original source areas.

In contrast, contaminant concentrations in deeper perched-intermediate or regional groundwater have increased over time, indicating the migration of mobile constituents through the vadose zone and into deeper zones of saturation. Vadose-zone pore-water concentration profiles indicate that these mobile contaminants have percolated in the subsurface. Currently, the majority of the mass of the nonsorbing contaminants—nitrate, perchlorate, and tritium—is located within the vadose zone, particularly beneath the area near and east of the confluence of Mortandad and Ten Site Canyons. Chromium is present in the regional aquifer in one characterization well (R-28) above groundwater standards; chromium, nitrate, perchlorate, and tritium have been measured above groundwater standards in perched intermediate-depth groundwater in one or more wells. Iron and manganese have also been measured above drinking water standards in regional groundwater in one well (R-14) and nickel in another well (R-33), although available data indicate that these results represent naturally occurring constituents and not Laboratory-derived contamination. Additional evaluations will be necessary to further understand contamination in intermediate-depth and regional groundwater and to consider potential remedial actions. A more detailed evaluation of chromium contamination in groundwater is currently in progress (LANL 2006, 91987) and will be available in an interim measures report scheduled for completion in November 2006.

Many organic, inorganic, and radionuclide COPECs have been identified in the ecological screening assessments; subsequently, a plan for a base line ecological risk assessment was developed. This process is based upon the eight-step EPA ecological risk assessment guidance for Superfund (EPA 1997, 59370). The base line ecological risk assessment evaluated evidence of ecological risks from COPECs to omnivorous mammals, insect-eating birds, plants, earthworms, aquatic invertebrates, algae, and two T&E species: the Mexican spotted owl and the southwestern willow flycatcher. The multiple lines

of evidence did not identify adverse effects to terrestrial or aquatic receptors that currently inhabit the watershed. Therefore, no mitigation is necessary.

The site-specific human health risk assessment uses a trail user exposure scenario to represent the present-day and reasonably foreseeable future land use in canyons throughout the Mortandad watershed. The assessment results indicate that for the trail user scenario, no areas in the Mortandad watershed have contaminant concentrations greater than levels acceptable for noncarcinogens (HI of 1) or carcinogens (incremental cancer risk criterion of 1×10^{-5}) in sediment or water. However, the radionuclide dose for one area, reach E-1E in Effluent Canyon downcanyon from the TA-50 RLWTF outfall, exceeds the target dose limit of 15 mrem/yr. The calculated dose for reach E-1E, 52 mrem/yr (corresponding to a radiological risk of approximately 2×10^{-4}), is primarily related to external gamma radiation from cesium-137 in sediment. The radionuclide dose limit of 4 mrem/yr in water was not exceeded at any location.

As discussed in Section 8.2.6, reach E-1E is a short, steep, and rocky area that has no developed trail within the contaminated area, and it is unlikely that recreational users of the Mortandad watershed use this reach as much as assumed in the trail user scenario (1 h/d and 200 d/yr). Other protectively biased assumptions are incorporated into the exposure assessment, also contributing to an overestimate of potential dose. In addition, the area is currently posted as a "soil contamination area," and posting also states that "access is restricted to workers on official business," further discouraging recreational use in reach E-1E. Therefore, no remedial action is proposed to reduce the potential radiation dose to recreational users of Effluent Canyon, although it is recommended that appropriate posting be maintained.

Evaluations of the changes in COPC concentrations over time for sediment, surface water, and alluvial groundwater indicate that concentrations are either relatively stable or are decreasing for contaminants derived from Laboratory SWMUs or AOCs. These decreases are associated with processes that remobilize, transport, and dilute sediment- and waterborne constituents. Radioactive decay also contributes to decreasing concentrations for some radionuclides (e.g., cesium-137, strontium-90, and tritium). Therefore, the potential for impacts to human health or ecosystems from Laboratory-derived contaminants in these media is expected to continue to decrease in the absence of new sources.

Potential future changes in the vadose-zone contamination and concentrations of contaminants in perched-intermediate and regional groundwater are less well constrained, and a corrective measures evaluation (CME) is necessary to assess the need for remedial actions. The CME will assess the fate of the contaminant mass in the vadose zone and impacts to the regional groundwater where water-supply wells are located. A more detailed evaluation of chromium contamination in groundwater is currently in progress and will be addressed in pending reports to the NMED. Monitoring in the Mortandad watershed will continue through the proposed CME process and is described in the Interim Facility-Wide Groundwater Monitoring Plan.

In summary, the results of this investigation indicate that human health risks are acceptable for present-day and foreseeable future land uses, assuming that recreational use of Effluent Canyon below the TA-50 RLWTF outfall continues to be discouraged. In addition, no adverse ecological effects were observed within terrestrial and aquatic systems in the Mortandad watershed. Therefore, corrective actions are not needed to mitigate unacceptable risks. However, a CME is proposed to address contamination in groundwater.

10.0 REFERENCES

The following list includes all documents cited in this report. 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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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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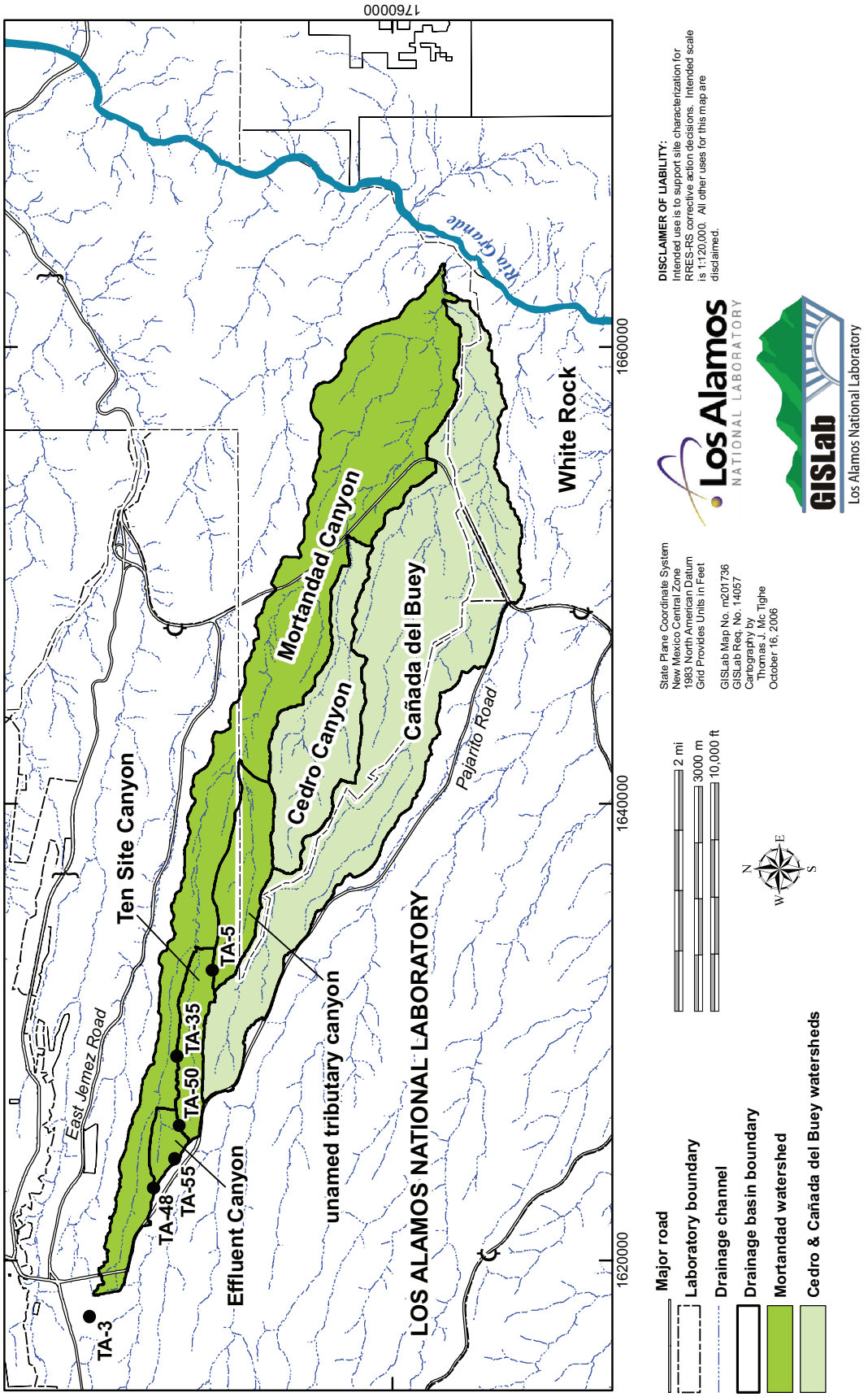


Figure 1.1-1. Map of the Mortandad Canyon watershed, showing major subbasins

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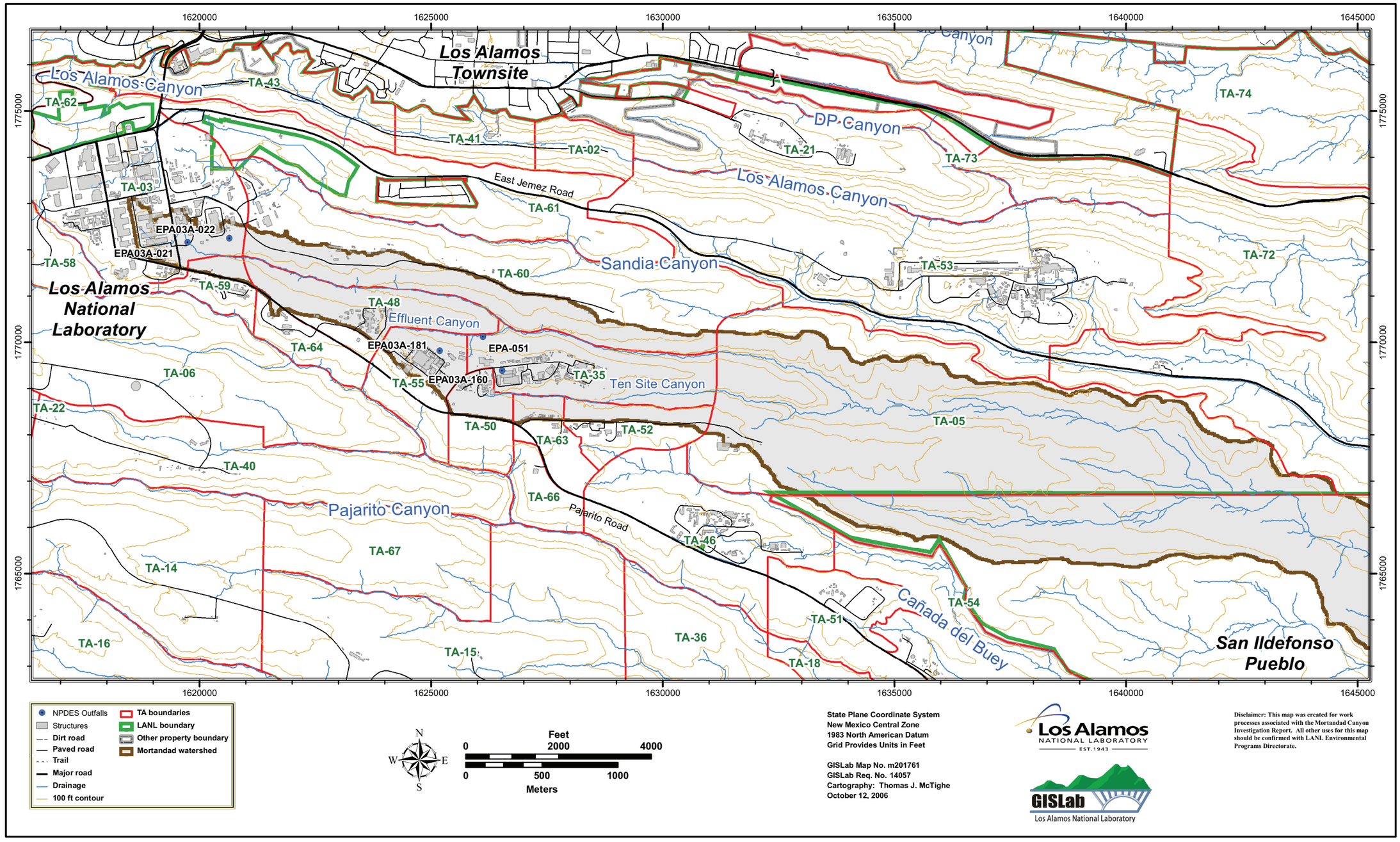


Figure 1.1-2. Mortandad watershed, showing TA boundaries and active NPDES outfalls

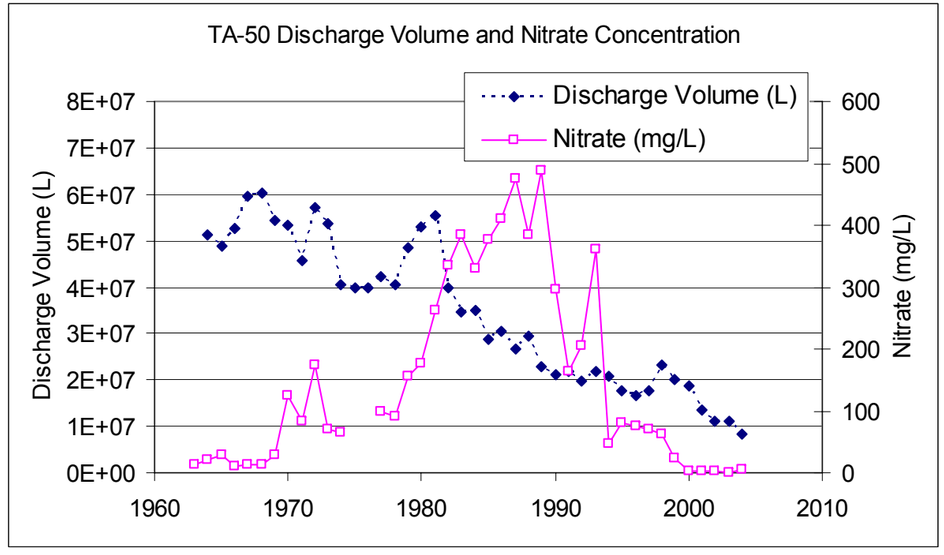


Figure 2.1-1. Historical discharge volumes (L/yr) and outfall nitrate concentrations (mg/L as N) for the TA-50 RLTWF, NPDES EPA-051

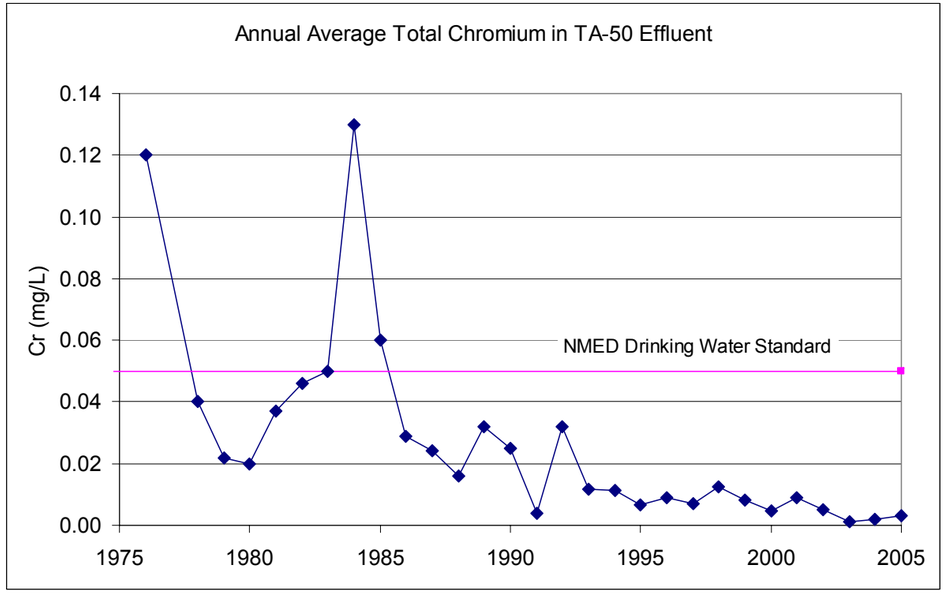


Figure 2.1-2. Historical outfall total chromium concentrations for the TA-50 RLTWF, NPDES EPA-051

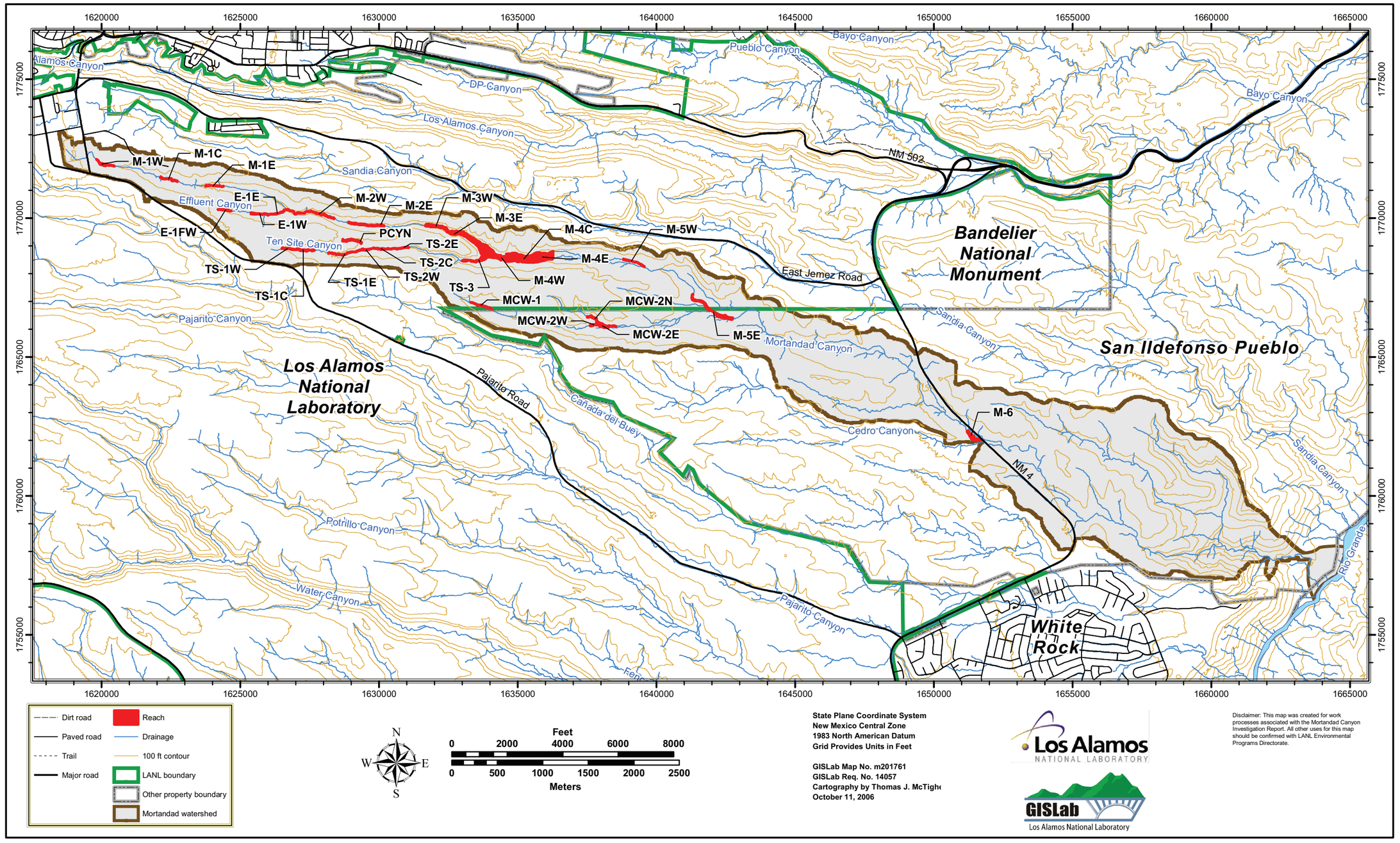
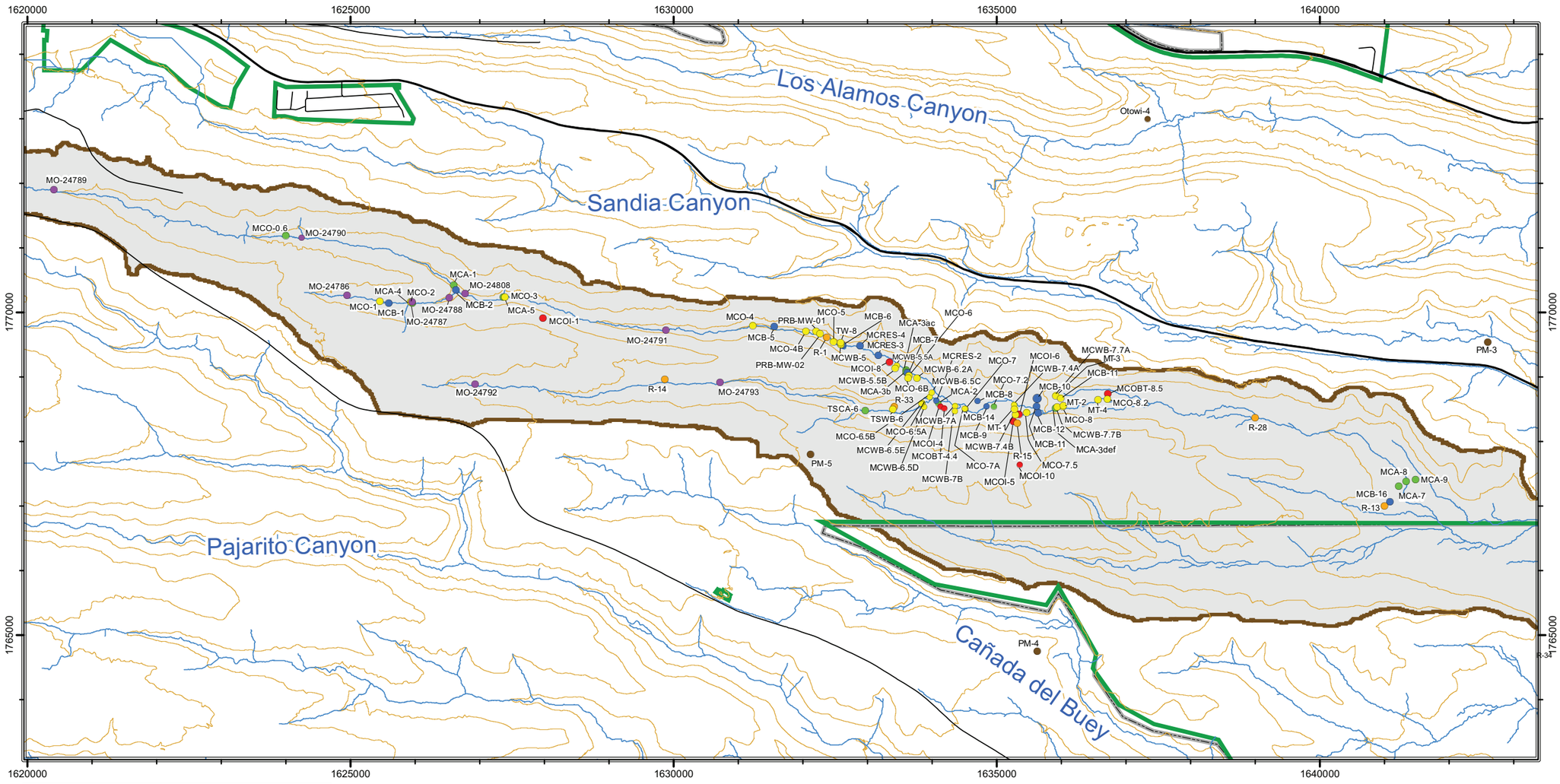
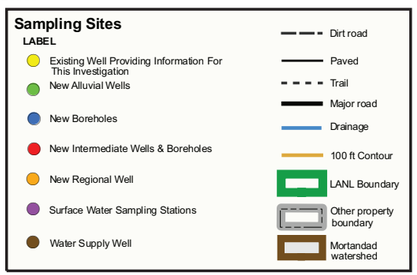
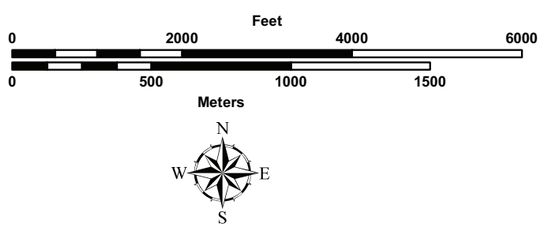


Figure 3.1-1. Reaches in the Mortandad watershed







State Plane Coordinate System
New Mexico Central Zone
1983 North American Datum
Grid Provides Units in Feet

GISLab Map No. m201752
GISLab Req. No. 14025
Cartography: Thomas J. McTighe
September 14, 2006

Los Alamos NATIONAL LABORATORY EST.1943

GISLab Los Alamos National Laboratory

DISCLAIMER:

This map was created for work processes associated with the Mortandad Canyon Investivation Report. All other uses for this map should be confirmed with LANL Environmental Programs Directorate.

DATA SOURCES:

Canyon Annotation; Los Alamos National Laboratory
LANL Boundary; Los Alamos National Laboratory
Other property boundary; Los Alamos National Laboratory
Road centerlines for the County of Los Alamos; County of Los Alamos, Information Services; 07 September 2004
Hypsography, 100 Foot Contour Interval; Los Alamos National Laboratory, RRES Remediation Services Project; 1991
Mortandad Watershed; Los Alamos National Laboratory
Mortandad Reaches; Los Alamos National Laboratory
Rio Grande; Los Alamos National Laboratory
Watercourse; Los Alamos National Laboratory; ENV Water Quality & Hydrology; 05 January 2005

Figure 3.2-1. Water-sampling locations in the Mortandad watershed

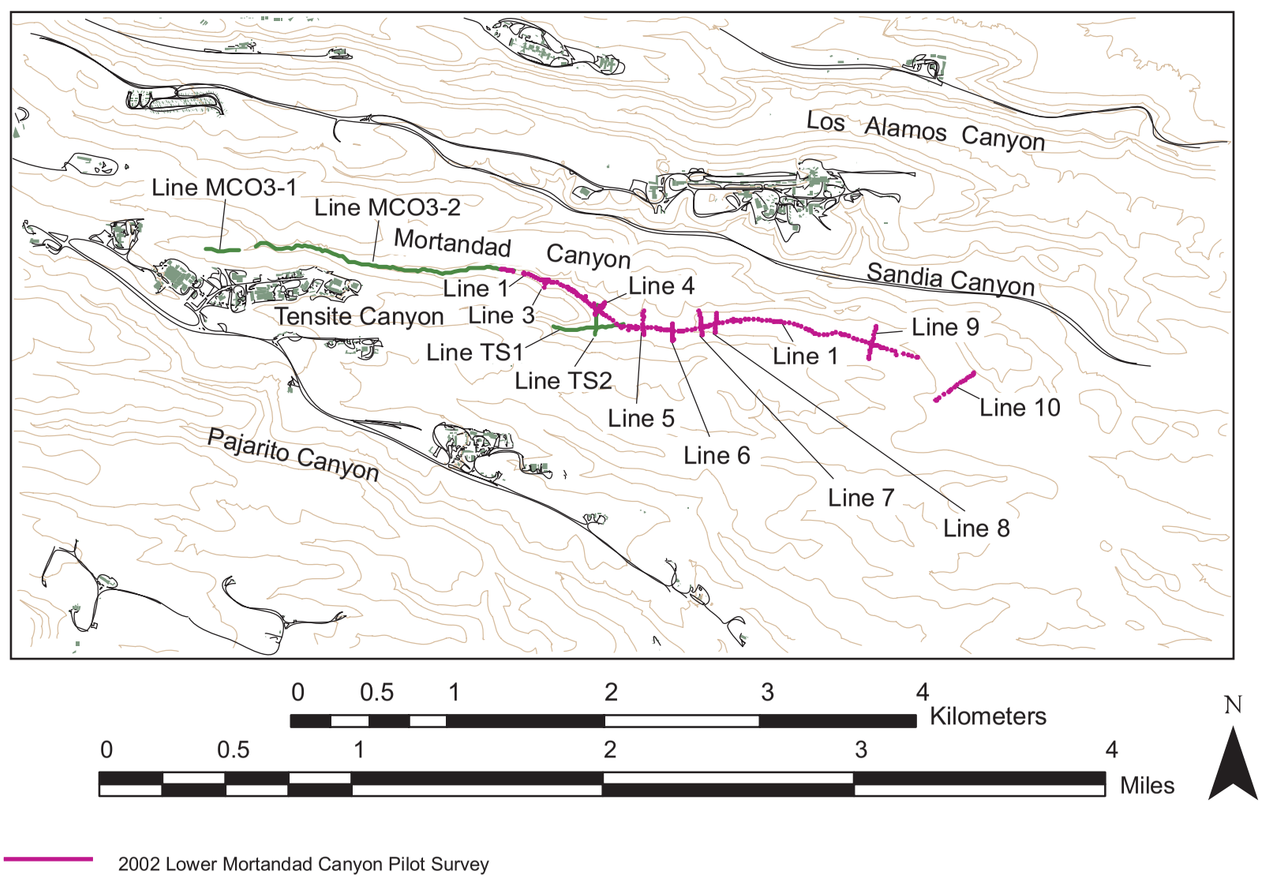
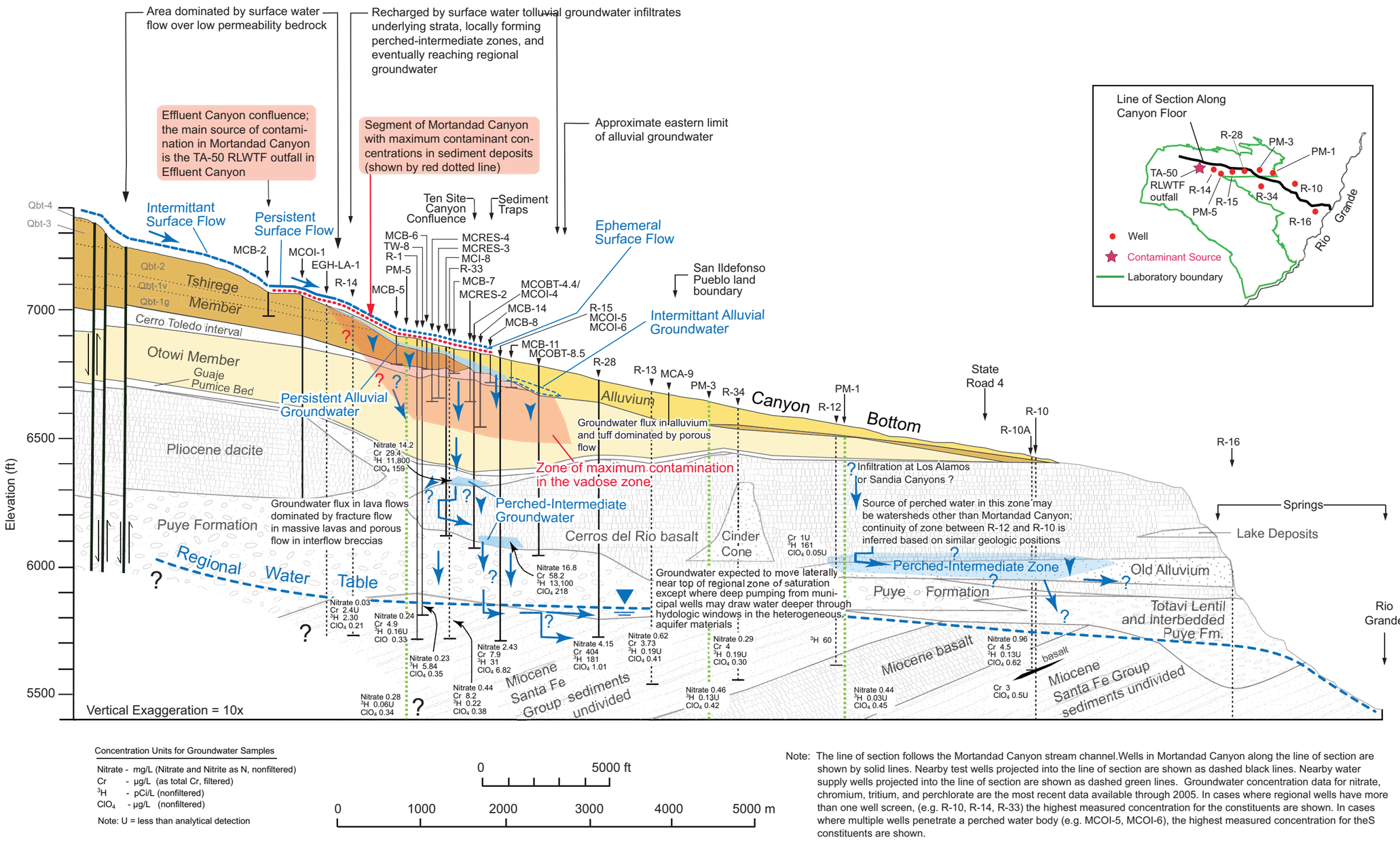


Figure 4.2-1. Locations of Surface-Based Direct-Current Resistivity Lines Collected by Geophex, Inc. in Mortandad Canyon



Note: The line of section follows the Mortandad Canyon stream channel.Wells in Mortandad Canyon along the line of section are shown by solid lines. Nearby test wells projected into the line of section are shown as dashed black lines. Nearby water supply wells projected into the line of section are shown as dashed green lines. Groundwater concentration data for nitrate, chromium, tritium, and perchlorate are the most recent data available through 2005. In cases where regional wells have more than one well screen, (e.g. R-10, R-14, R-33) the highest measured concentration for the constituents are shown. In cases where multiple wells penetrate a perched water body (e.g. MCOI-5, MCOI-6), the highest measured concentration for theS constituents are shown.

Figure 7.0-1. Conceptual hydrogeologic cross section showing potential contaminant transport pathways and the most recent concentration data through 2005 for selected contaminants in groundwater

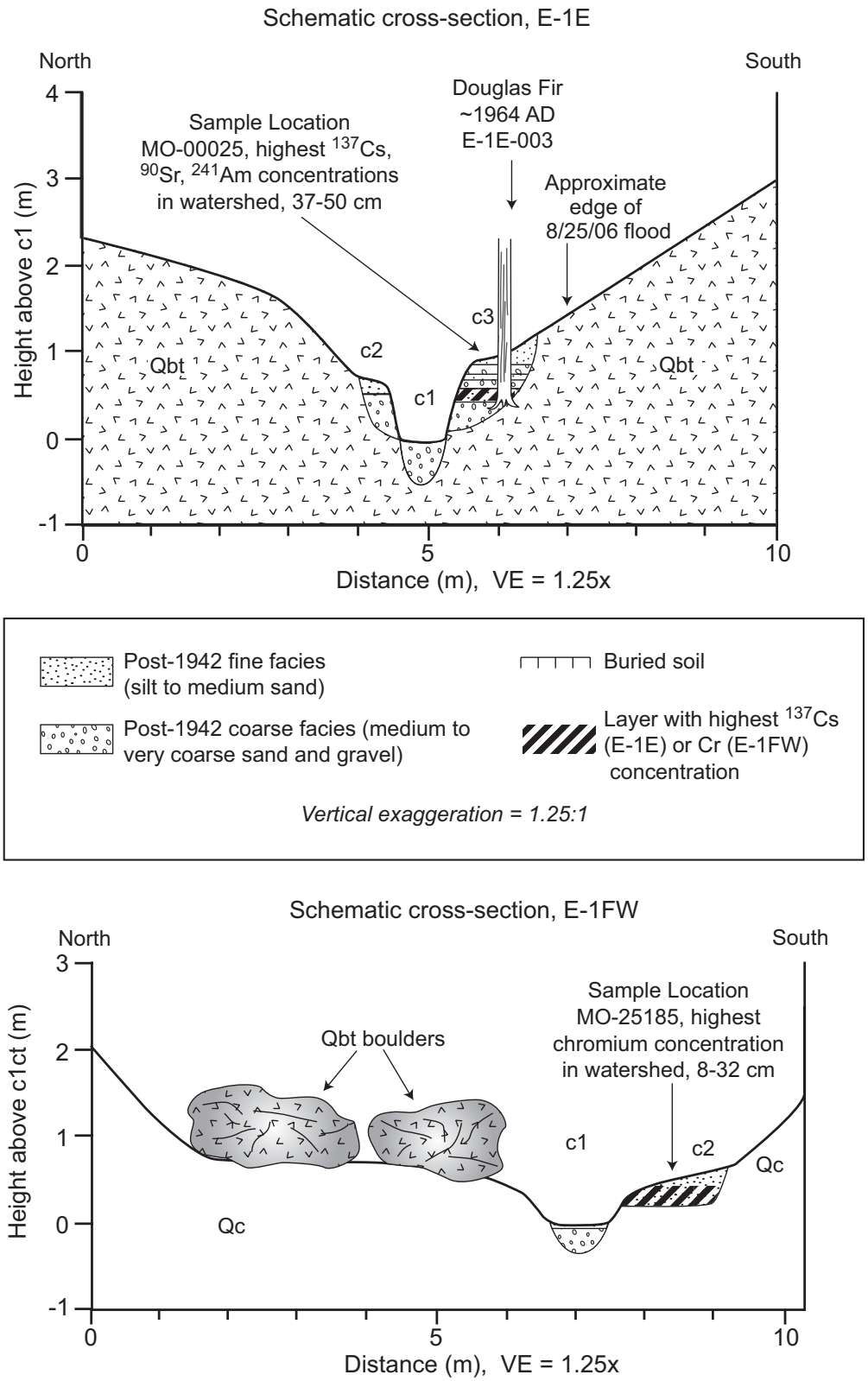


Figure 7.1-1. Schematic cross sections showing post-1942 coarse facies and fine facies sediment deposits in reaches E-1FW and E-1E

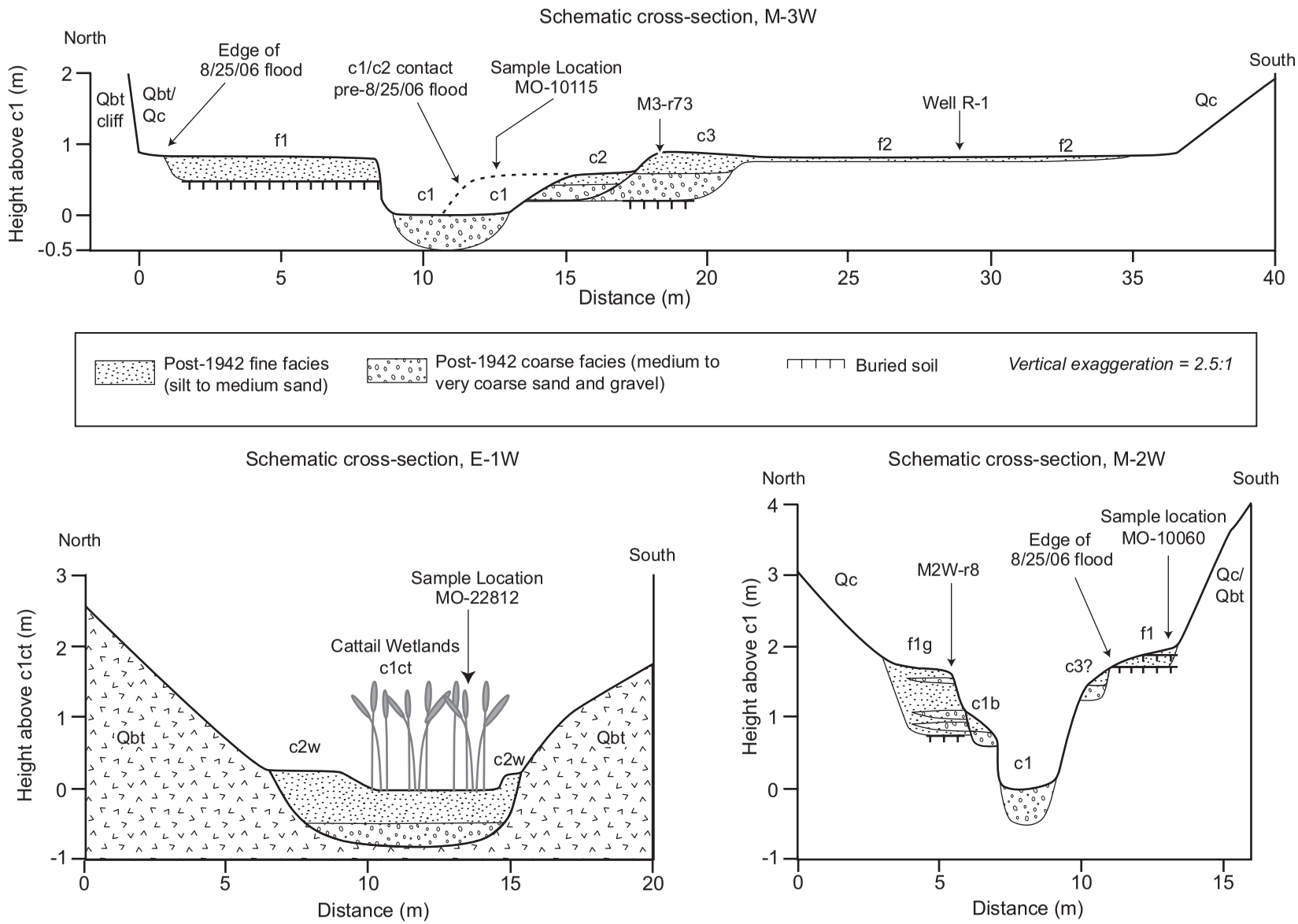


Figure 7.1-2. Schematic cross sections showing post-1942 coarse facies and fine facies sediment deposits in reaches E-1W, M-2W, and M-3W

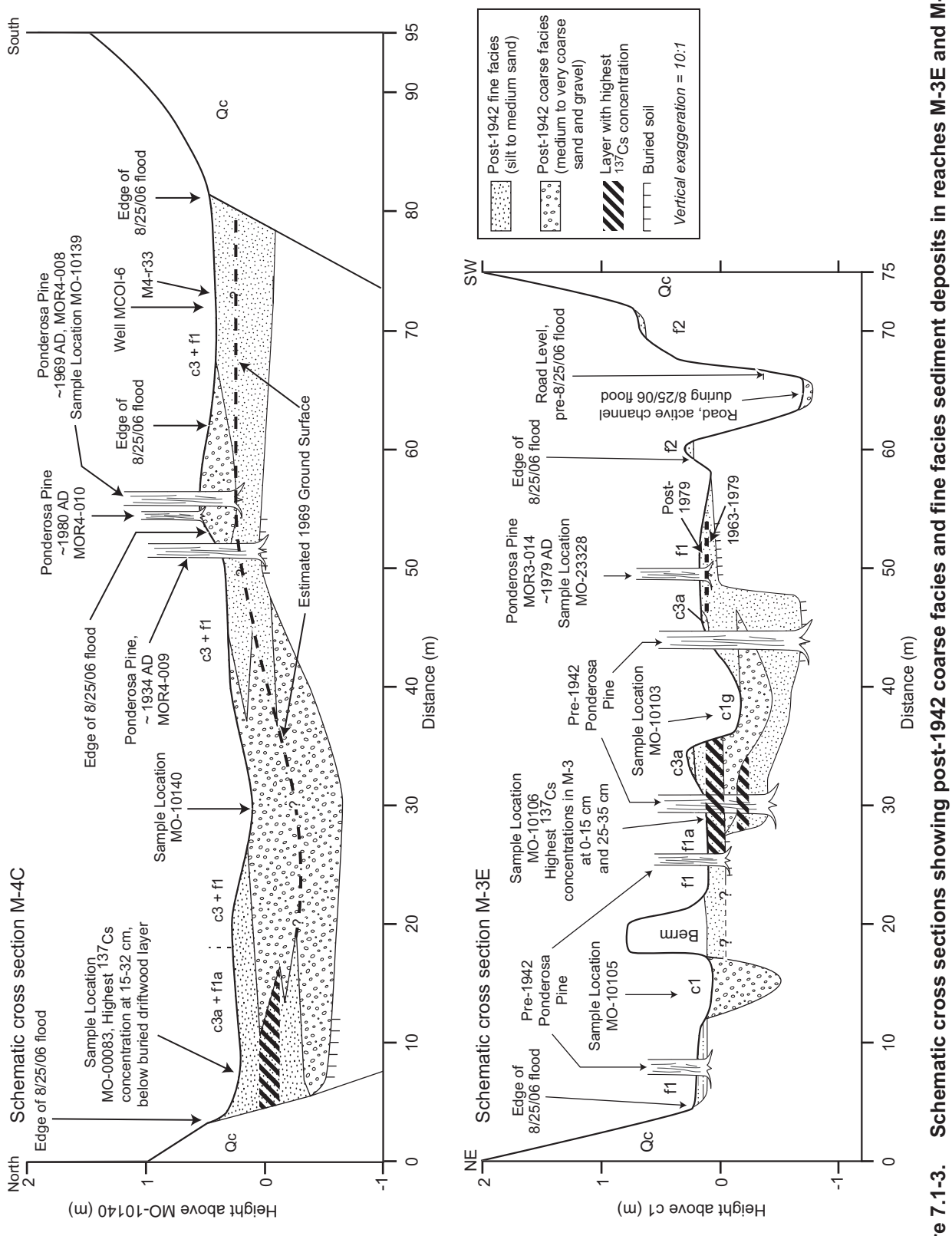


Figure 7.1-3. Schematic cross sections showing post-1942 coarse facies and fine facies sediment deposits in reaches M-3E and M-4C

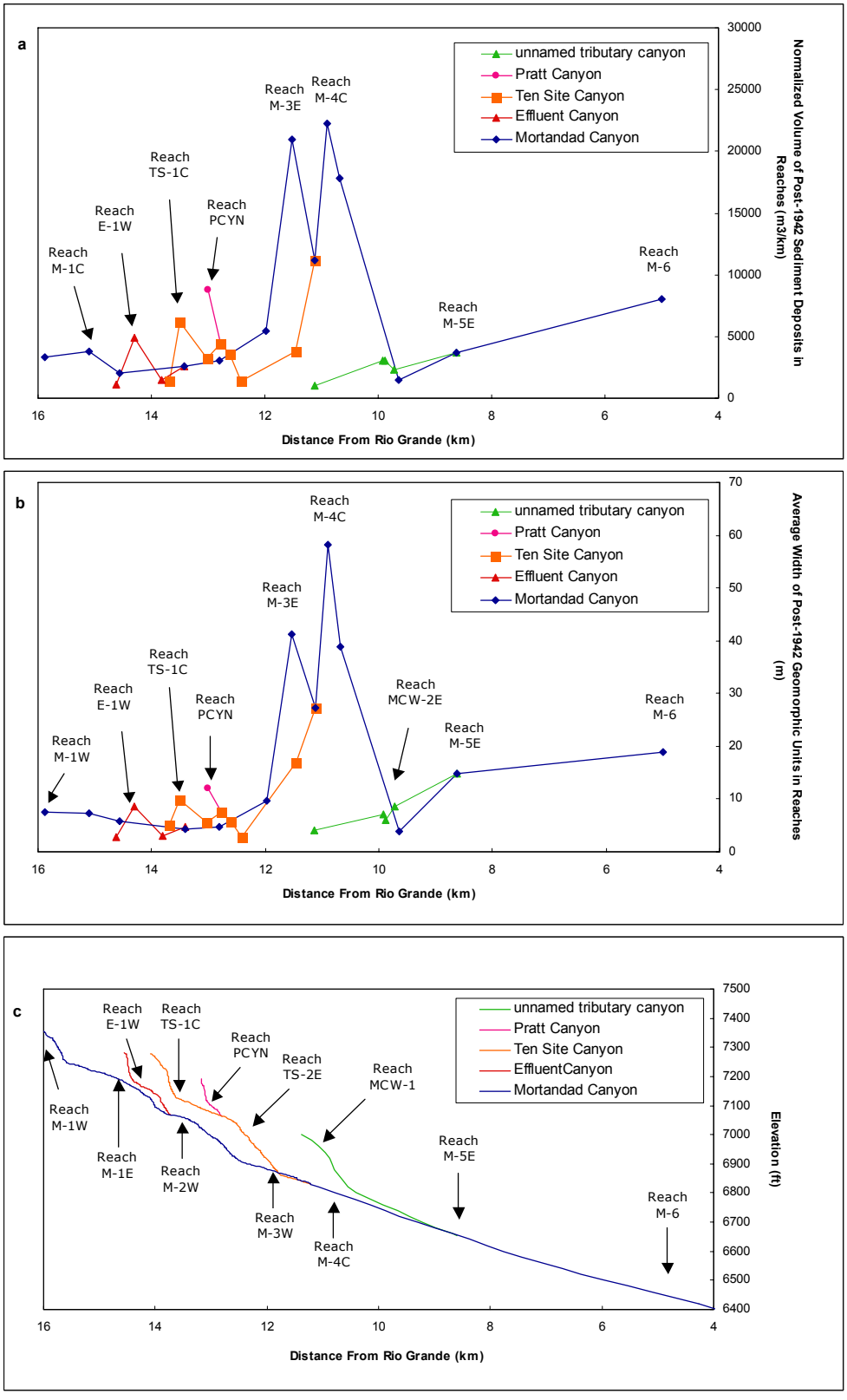


Figure 7.1-4. Longitudinal variations in normalized volume (a in units of m^3/km) and width, (b) of post-1942 sediment and geomorphic units, and stream profiles, and (c) in the Mortandad watershed

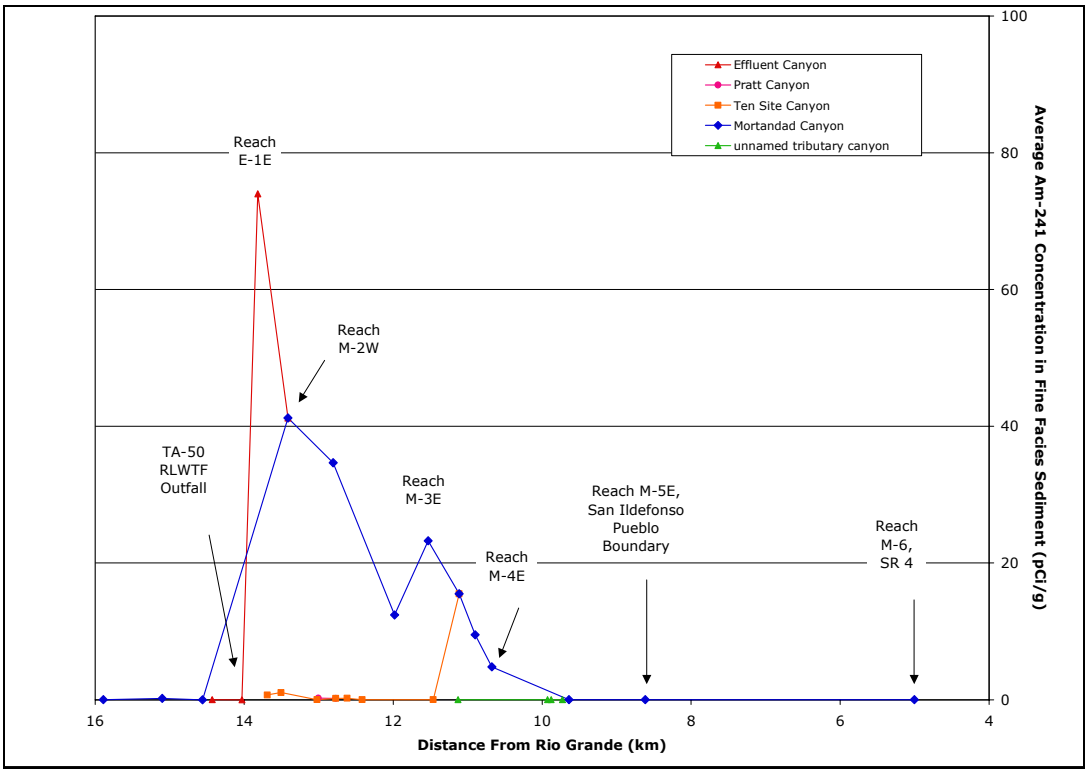


Figure 7.1-5. Estimated average concentrations of americium-241 in fine facies sediment in the Mortandad watershed

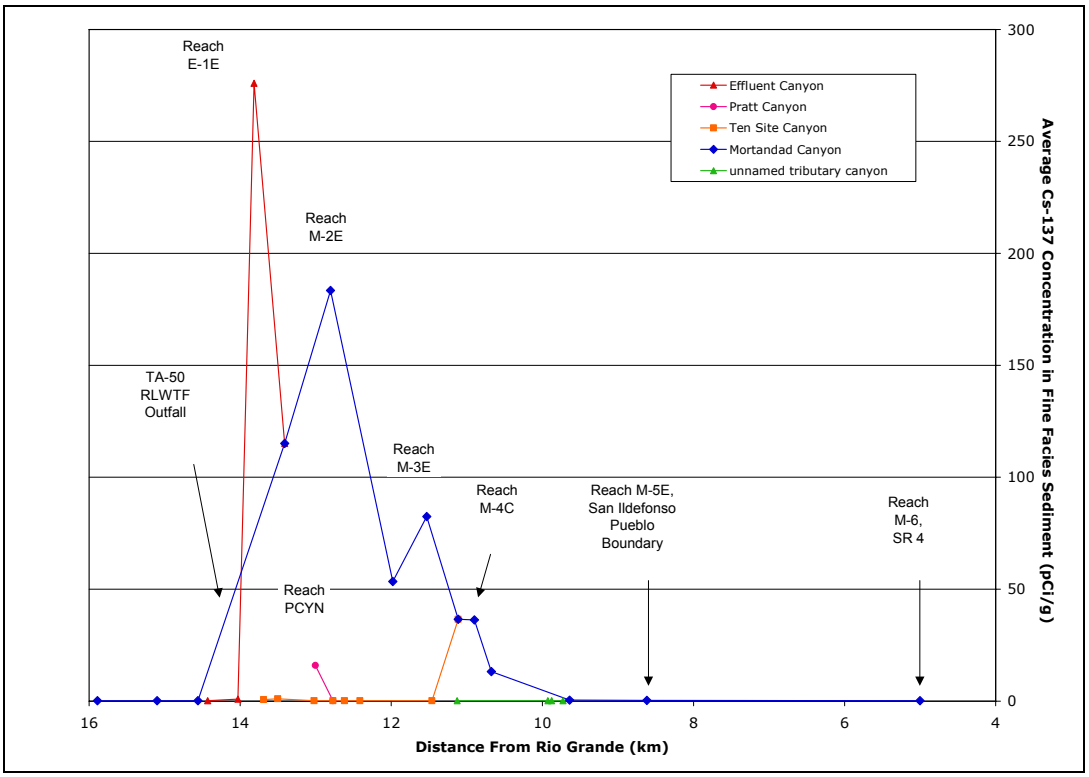


Figure 7.1-6. Estimated average concentrations of cesium-137 in fine facies sediment in the Mortandad watershed

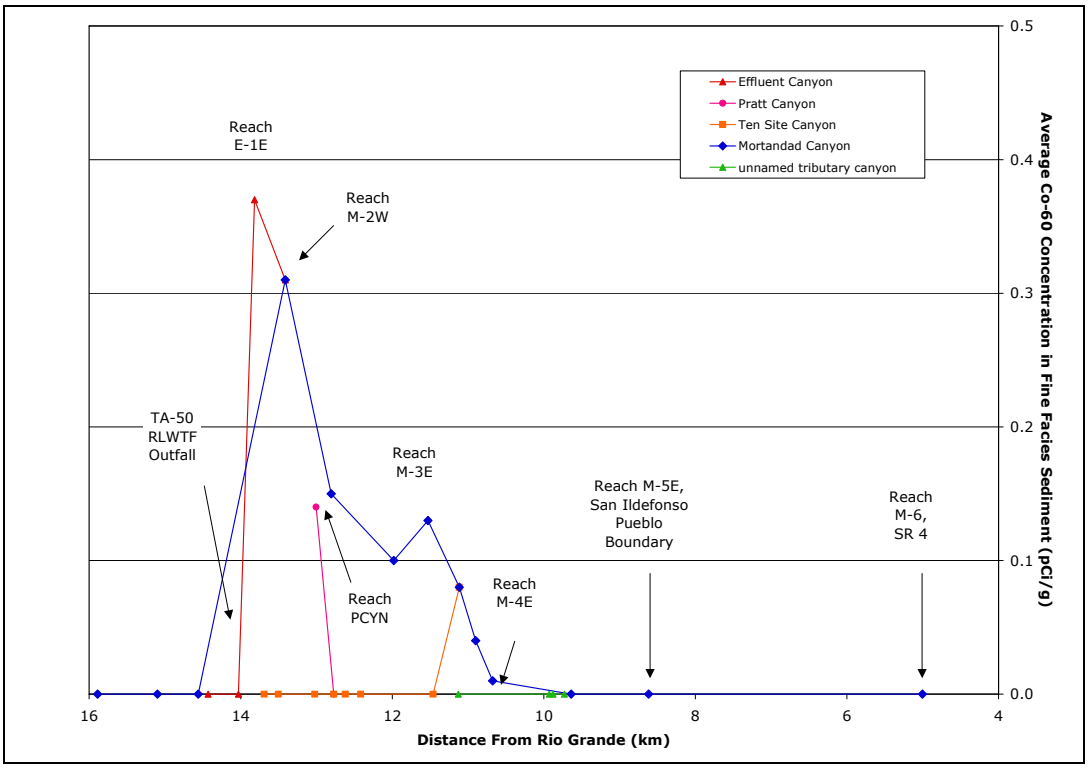


Figure 7.1-7. Estimated average concentrations of cobalt-60 in fine facies sediment in the Mortandad watershed

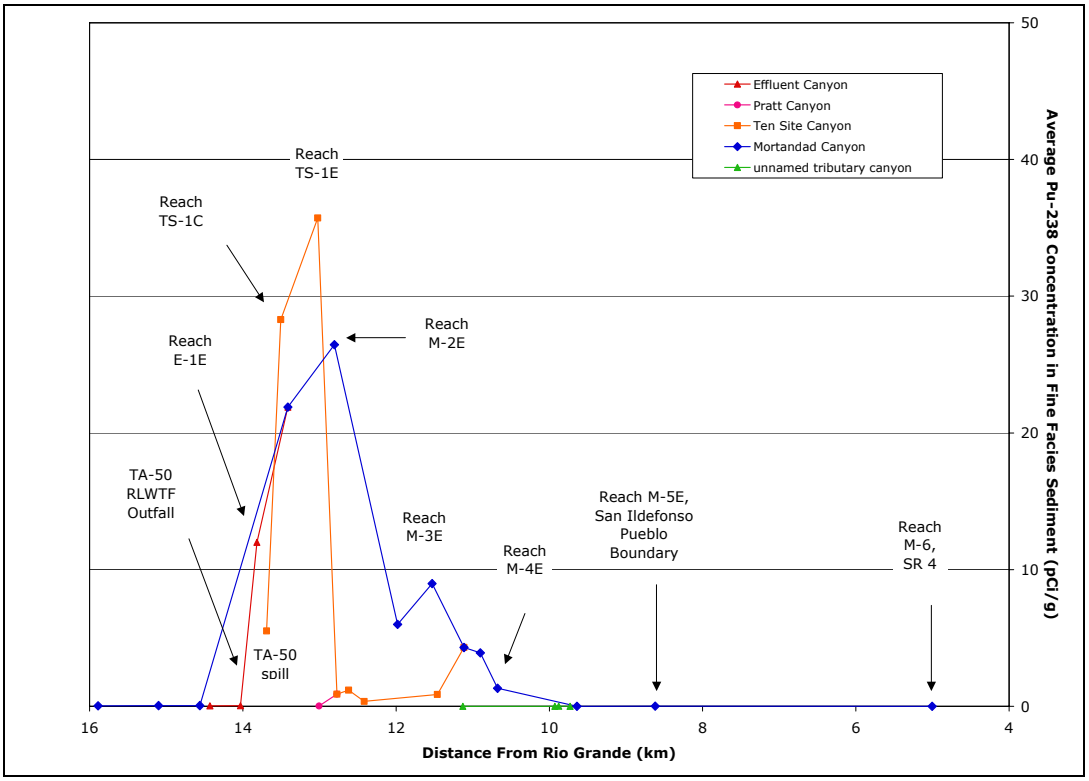


Figure 7.1-8. Estimated average concentrations of plutonium-238 in fine facies sediment in the Mortandad watershed

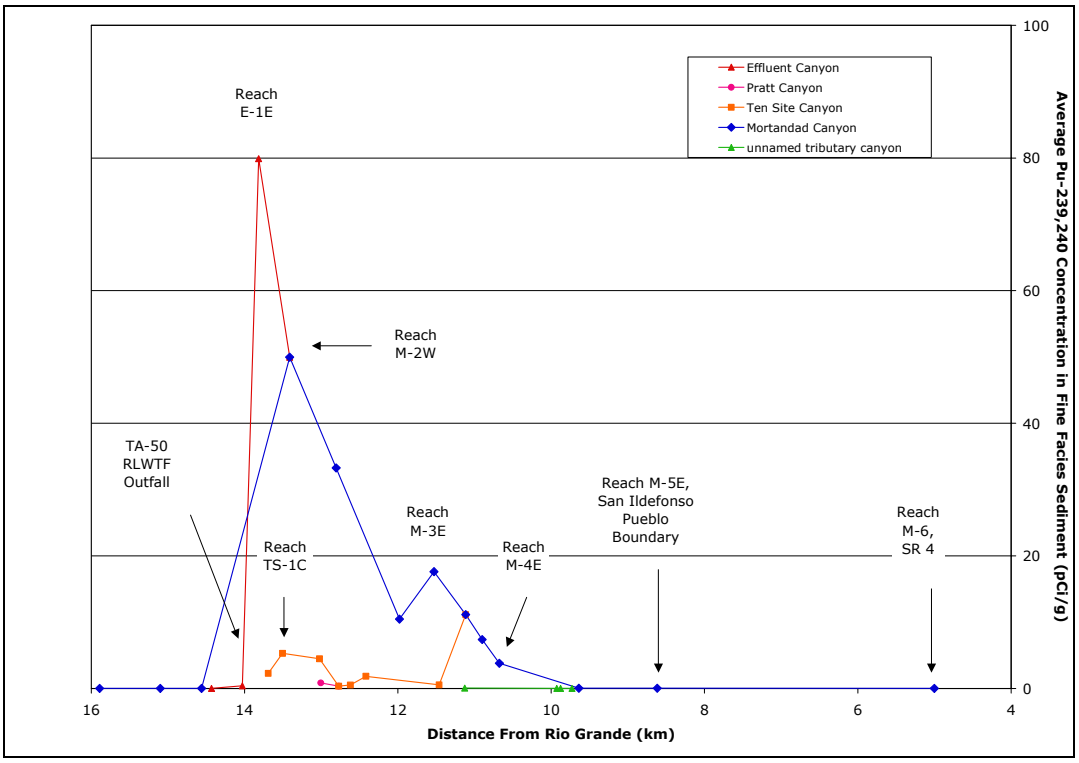


Figure 7.1-9. Estimated average concentrations of plutonium-239,240 in fine facies sediment in the Mortandad watershed

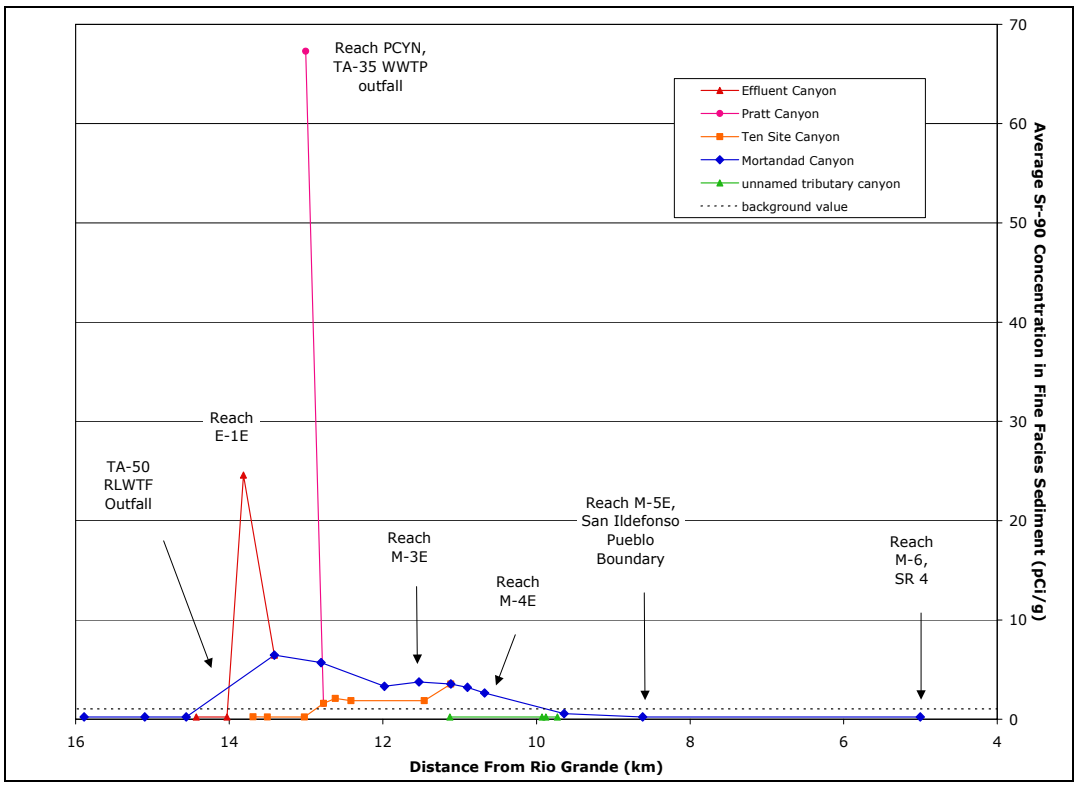


Figure 7.1-10. Estimated average concentrations of strontium-90 in fine facies sediment in the Mortandad watershed

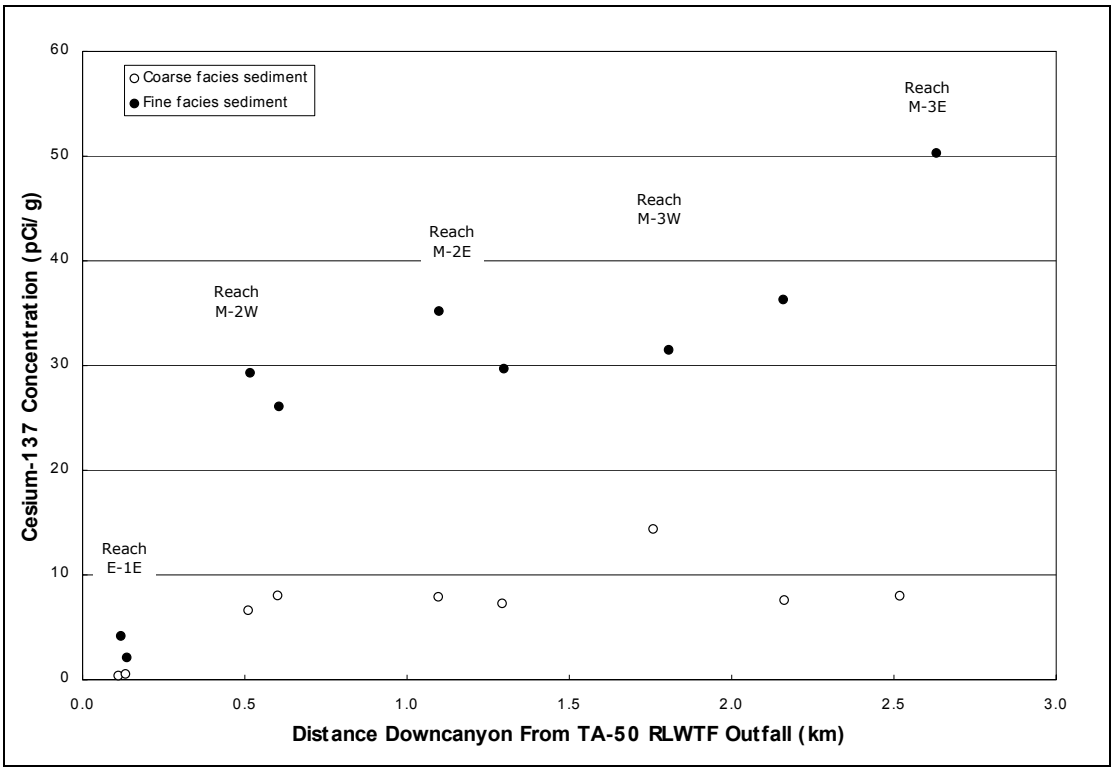
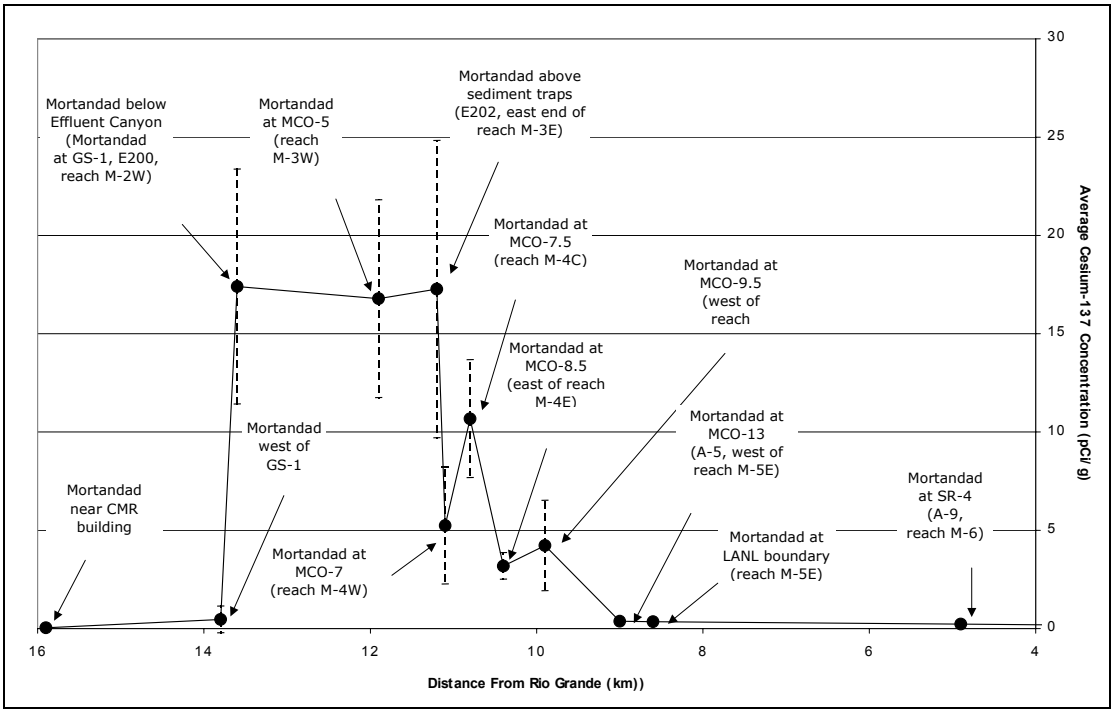


Figure 7.1-11. Cesium-137 concentrations in active channel sediment collected in Effluent and Mortandad Canyons in 2004



Notes: Error bars indicate 1 standard deviation of measurements. Previously used station names shown in parentheses, along with associated reaches.

Figure 7.1-12. Average cesium-137 concentrations at environmental surveillance stations in Mortandad Canyon, 1996–2005

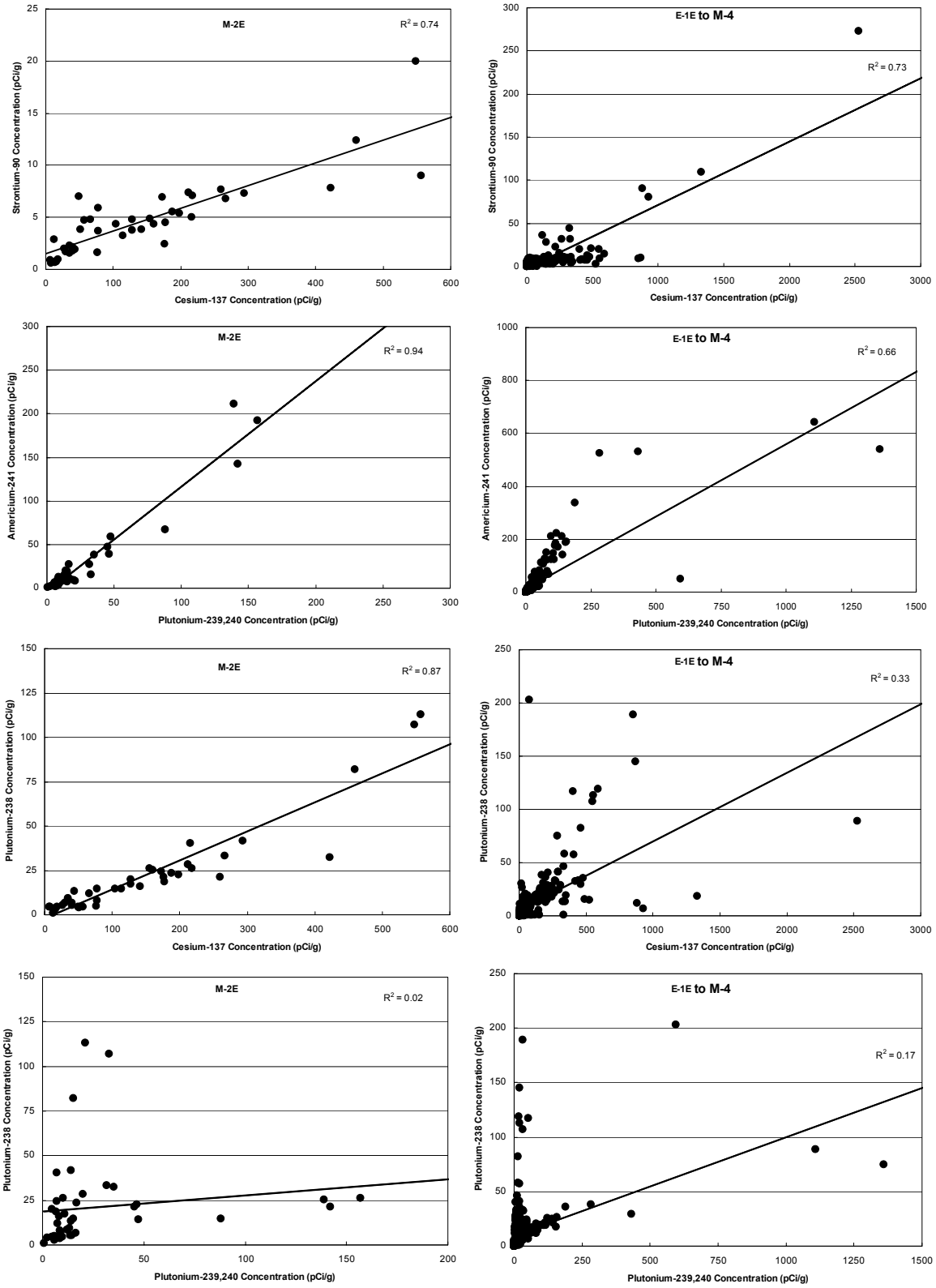


Figure 7.1-13. Scatter plots showing relations between pairs of radionuclides in sediment samples from reach M-2E and in entire data set from the TA-50 RLWTF outfall through reach M-4

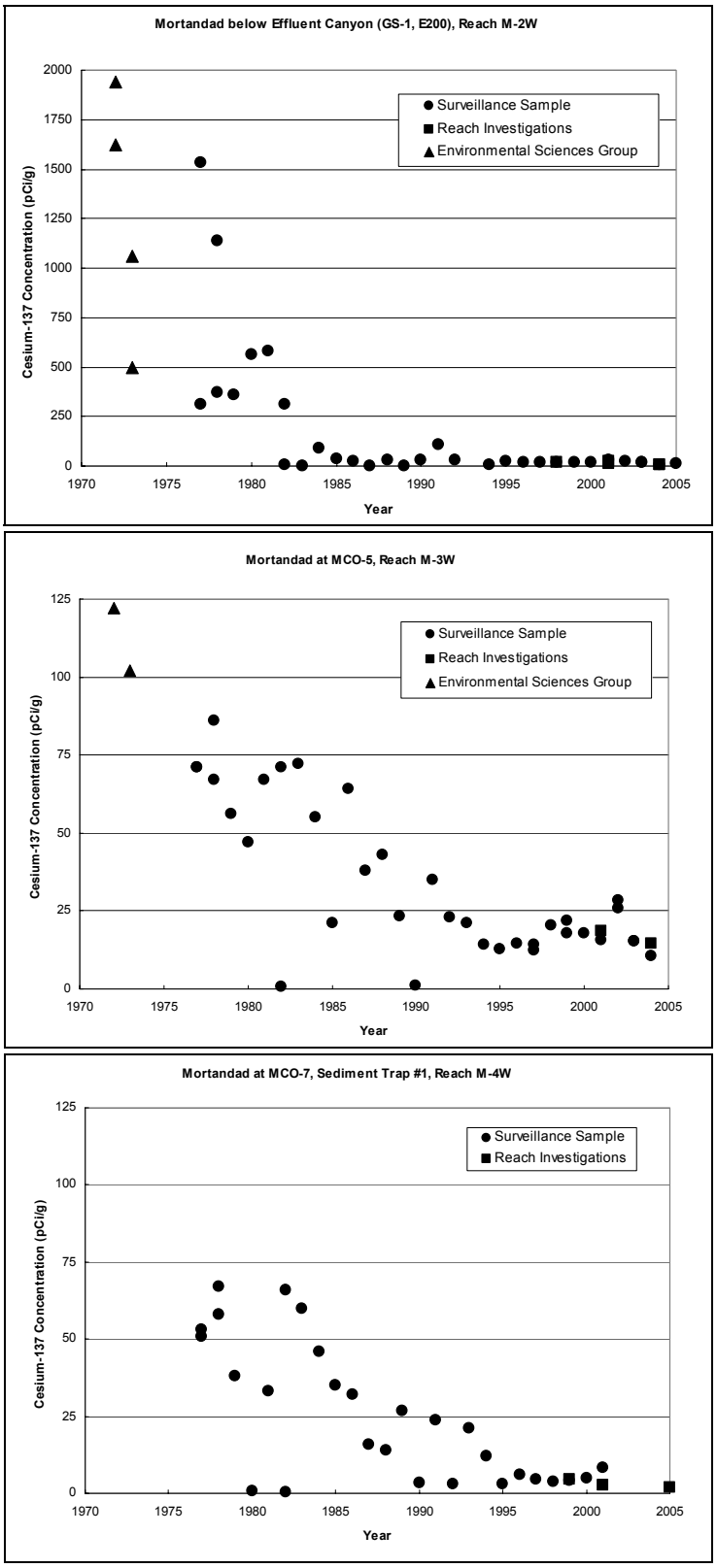


Figure 7.1-14. Time series of cesium-137 concentrations from active channel samples at environmental surveillance stations and from reach investigations

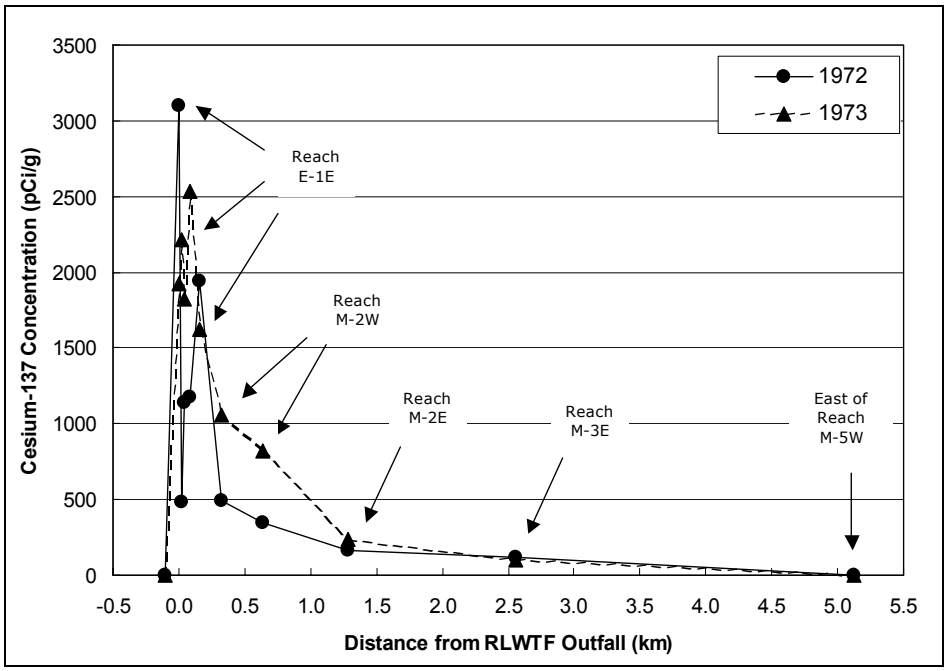


Figure 7.1-15. Cesium-137 concentrations from active channel samples collected in 1972 and 1973 plotted versus distance from TA-50 RLWTF outfall (data from Nyhan et al. 1978, 05726)

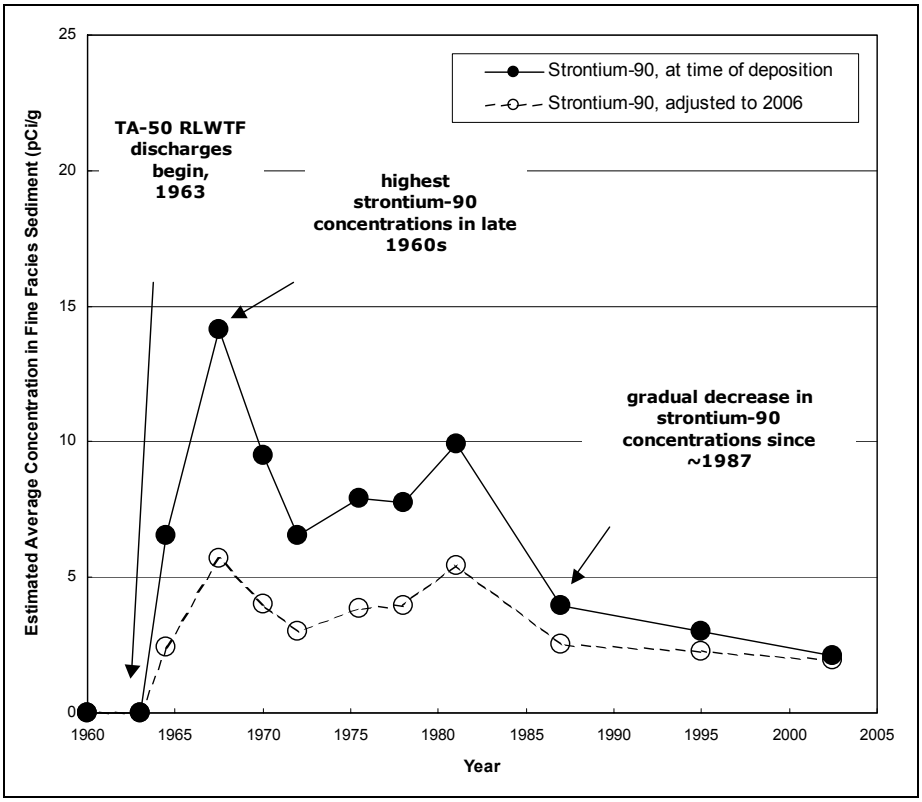


Figure 7.1-16. Reconstructed concentrations of americium-241, cesium-137, plutonium-238, plutonium-239,240, and strontium-90 in fine facies sediment in reaches M-3, M-4W, and M-4E, plotted against year

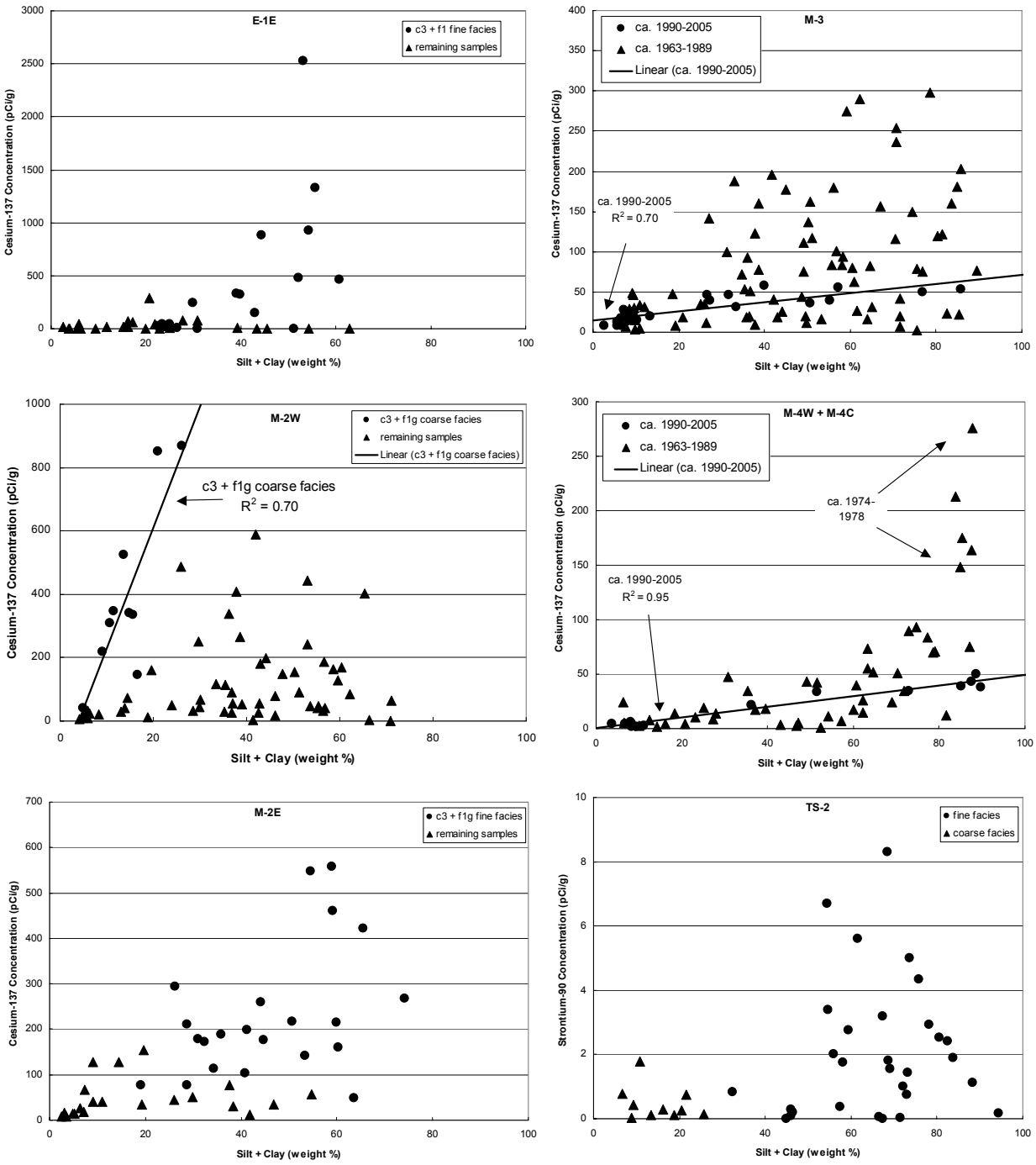


Figure 7.1-17. Scatter plots showing relations between radionuclide concentration and silt and clay content in reaches E-1E, M-2W, M-2E, M-3, M-4, and TS-2

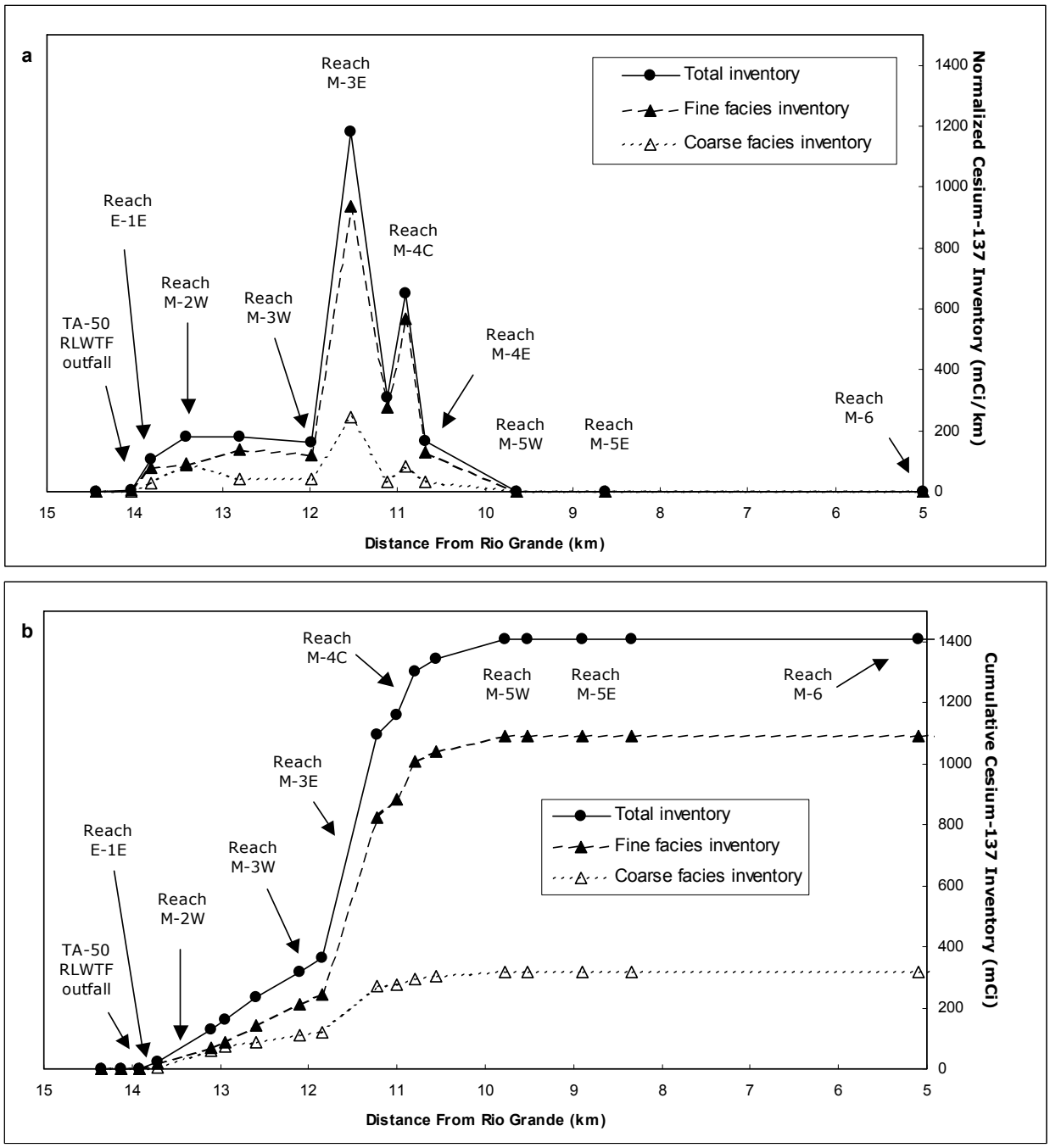


Figure 7.1-18. Estimated cesium-137 inventory in Effluent and Mortandad Canyons downstream from the TA-50 RLWTF outfall: (a) normalized inventory [mCi/km]; (b) cumulative inventory [mCi]

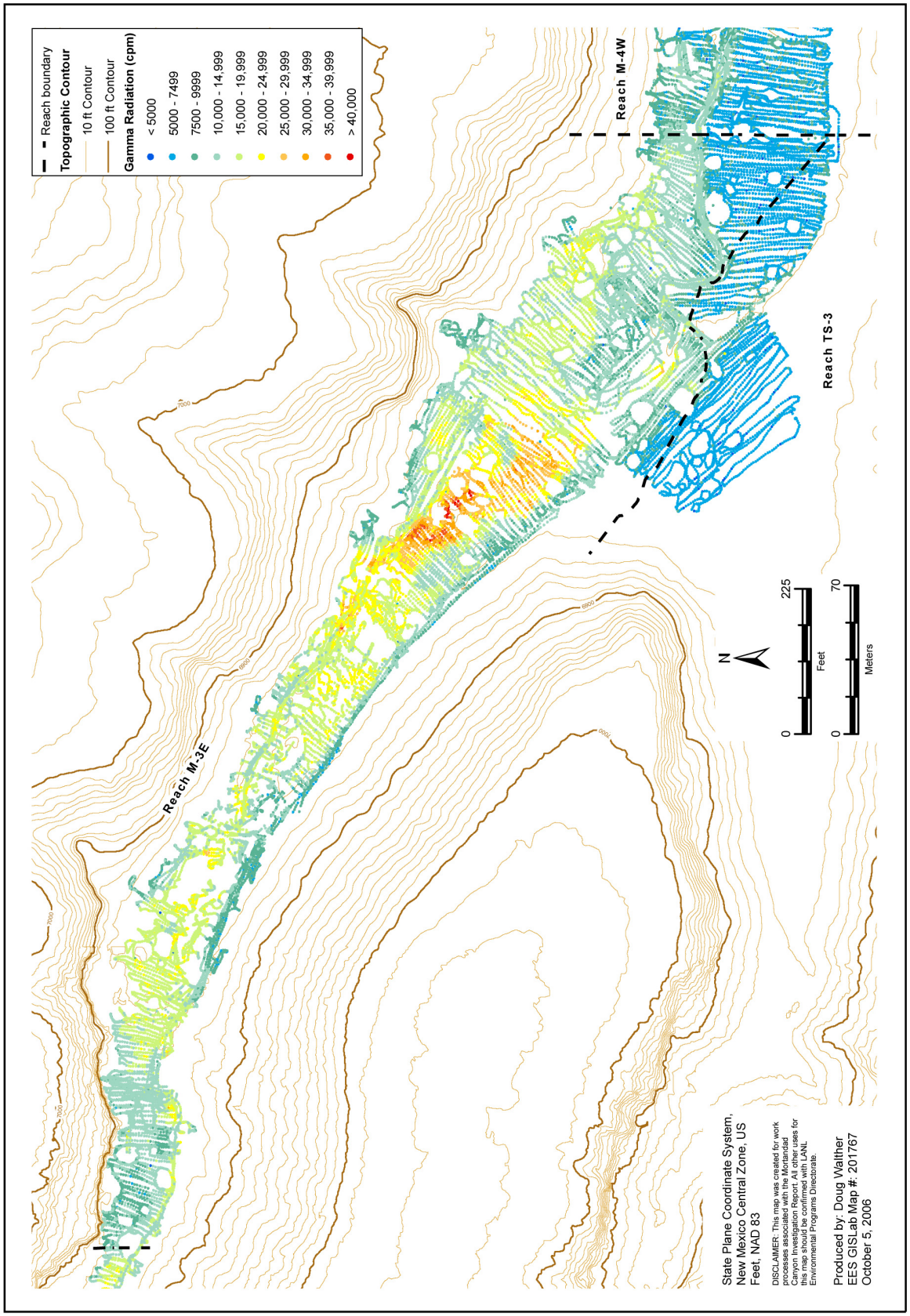
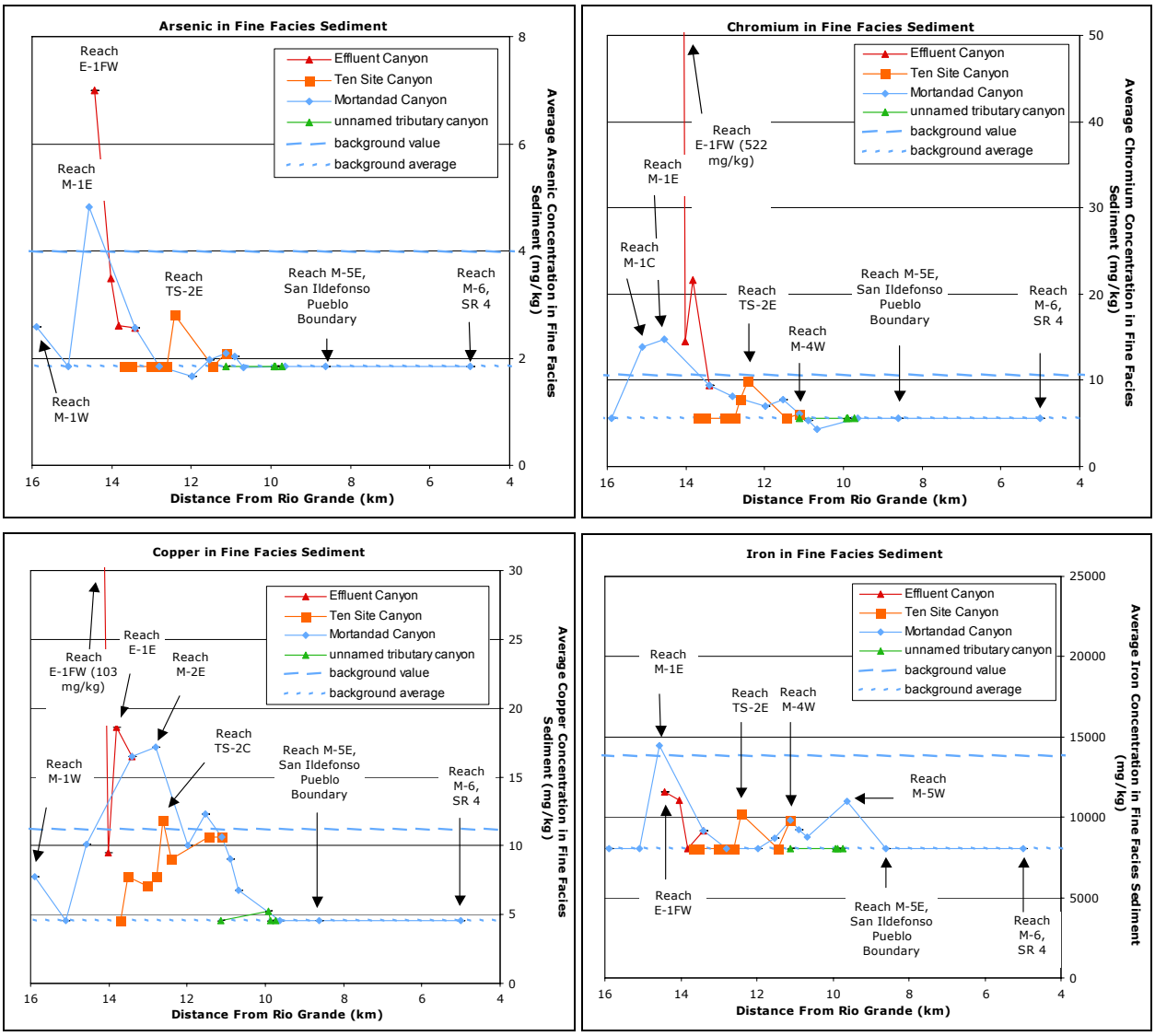
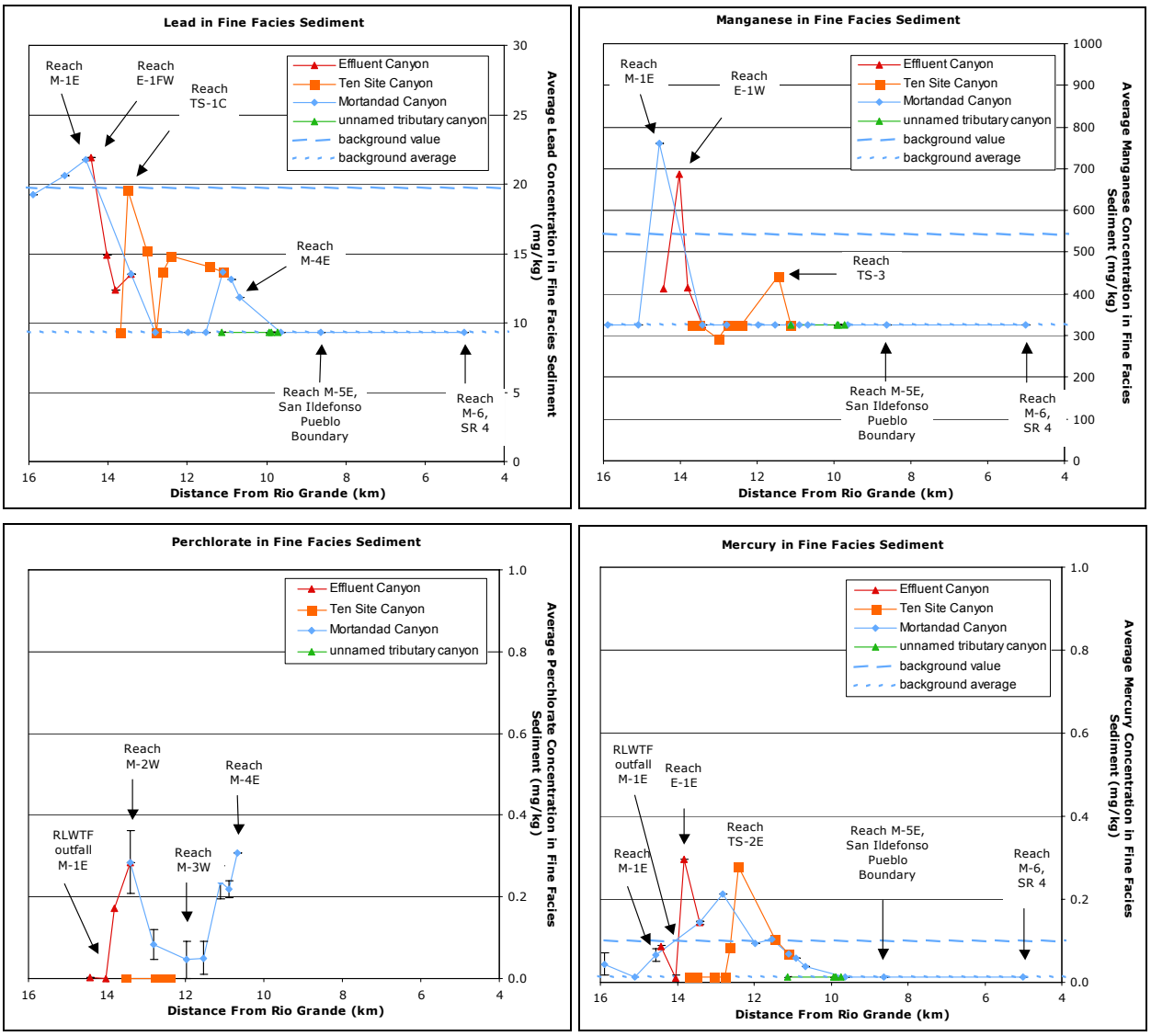


Figure 7.1-19. Results of gross-gamma radiation walkover survey in reach M-3E, in area of highest cesium-137 inventory in the Mortandad watershed, showing area of sediment deposition where floodwaters spread over canyon bottom



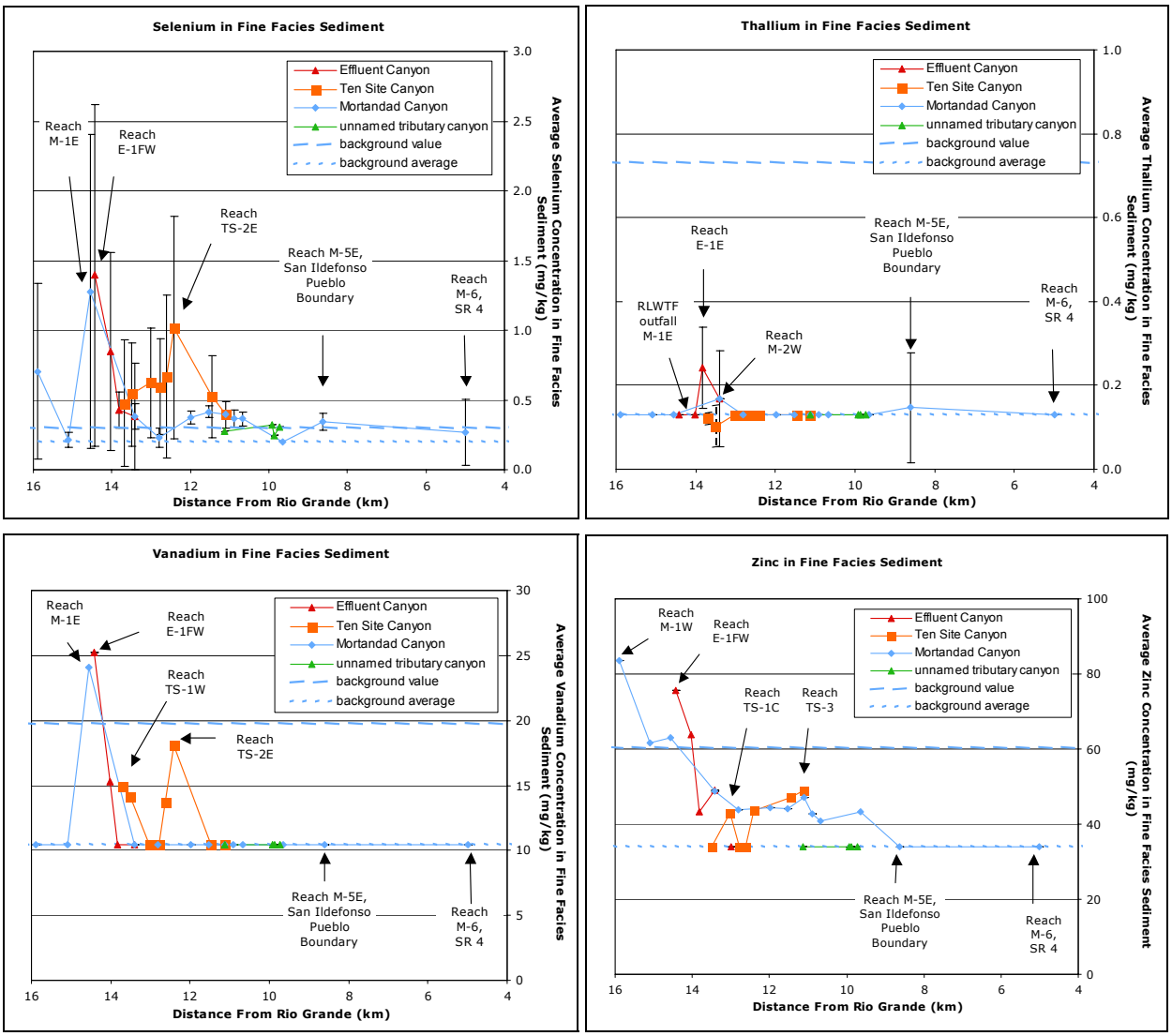
Note: Error bars indicate upper and lower bounds based on replacing nondetect values with either the detection limit or zero.

Figure 7.1-20. Estimated average concentrations of inorganic chemicals in fine facies sediment in the Mortandad watershed



Note: Error bars indicate upper and lower bounds based on replacing nondetect values with either the detection limit or zero.

Figure 7.1-20 (continued). Estimated average concentrations of inorganic chemicals in fine facies sediment in the Mortandad watershed



Note: Error bars indicate upper and lower bounds based on replacing nondetect values with either the detection limit or zero.

Figure 7.1-20 (continued). Estimated average concentrations of inorganic chemicals in fine facies sediment in the Mortandad watershed

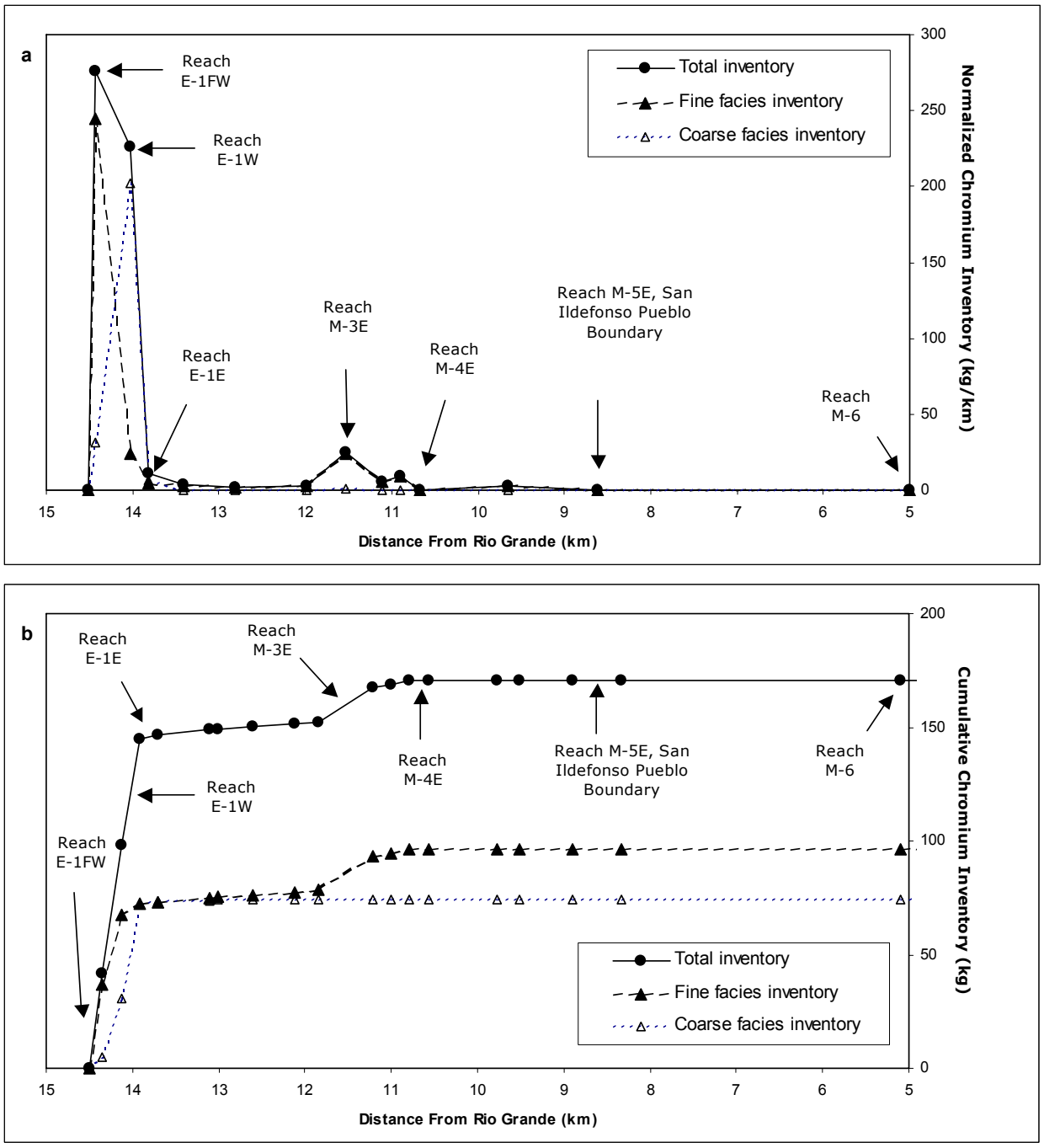


Figure 7.1-21. Estimated anthropogenic chromium inventory in Effluent and Mortandad Canyons downstream from the head of reach E-1FW: (a) normalized inventory [kg/km]; (b) cumulative inventory [kg]

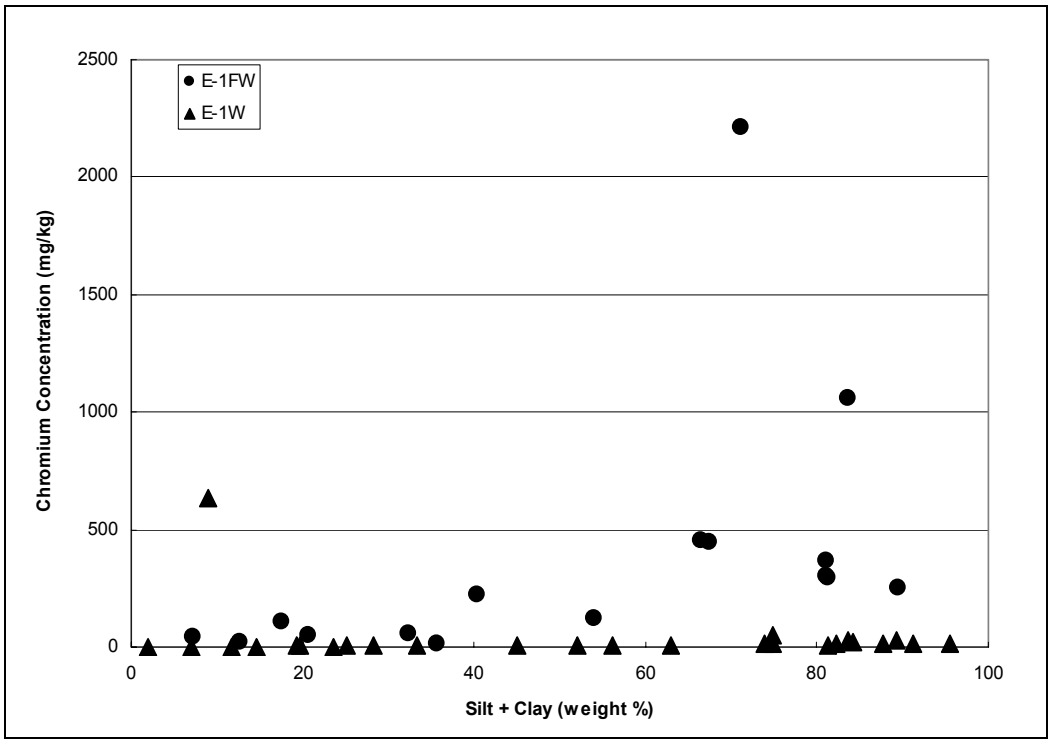


Figure 7.1-22. Scatter plot showing relations between chromium concentration and silt and clay content in reaches E-1FW and E-1W

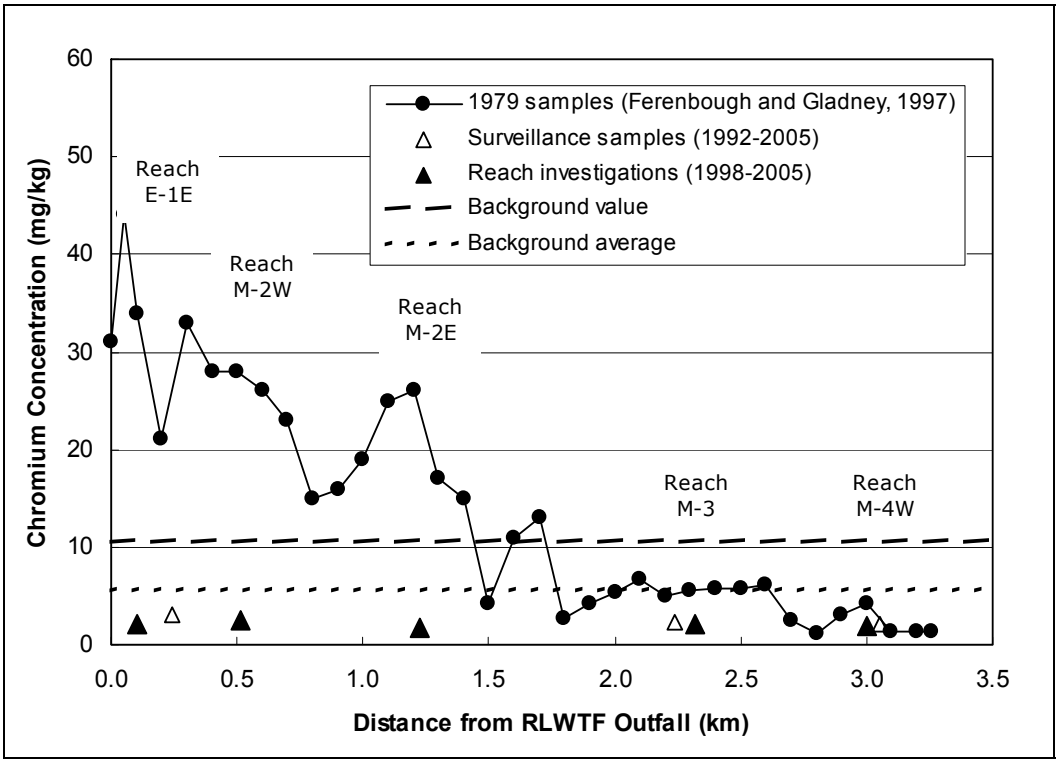
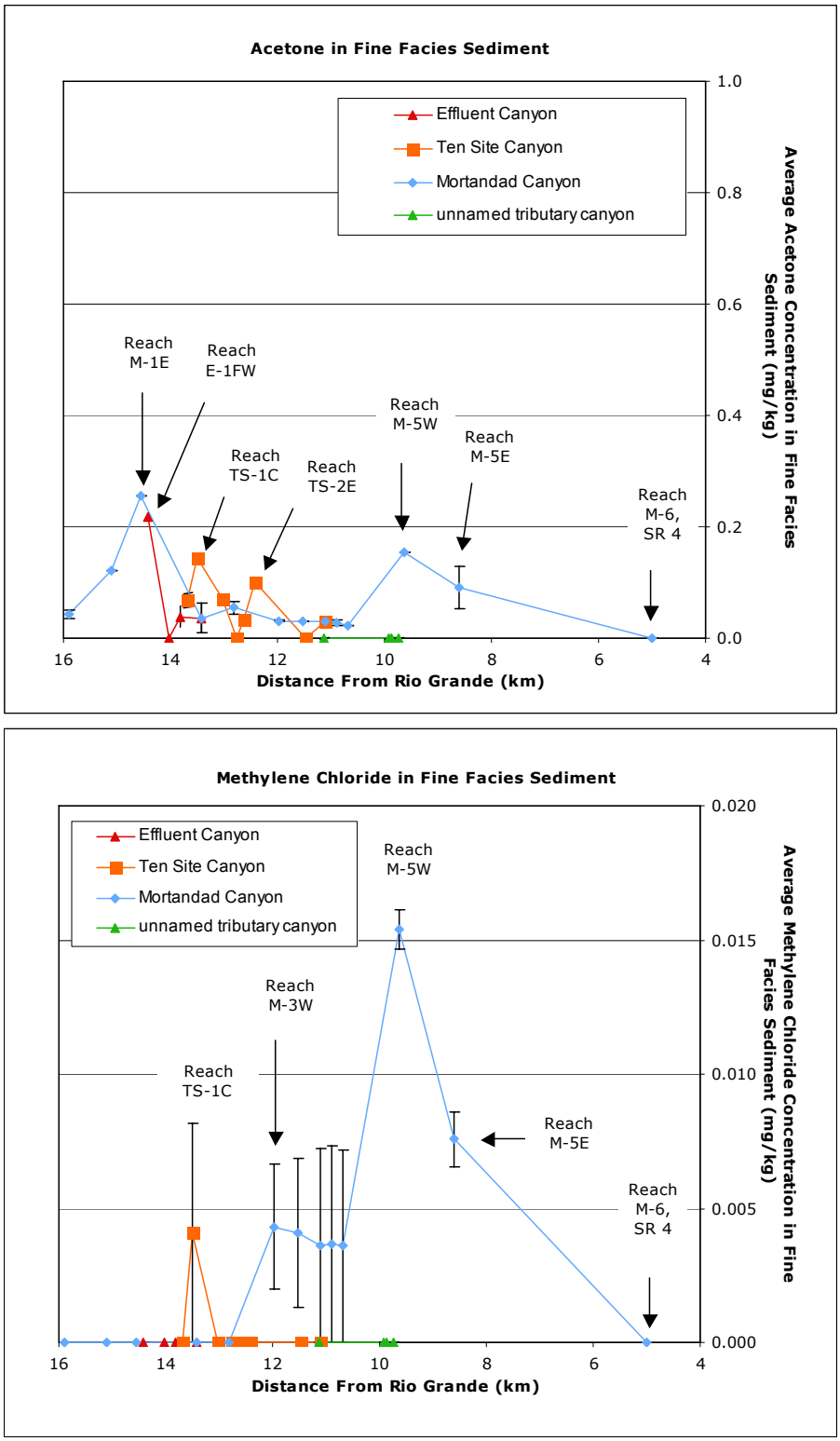
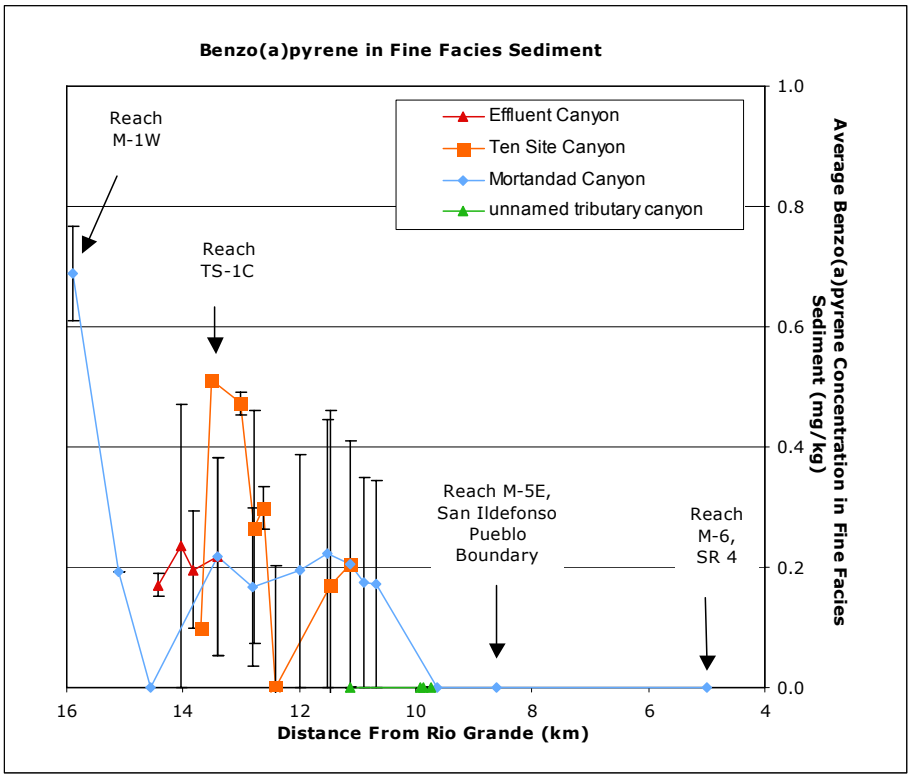


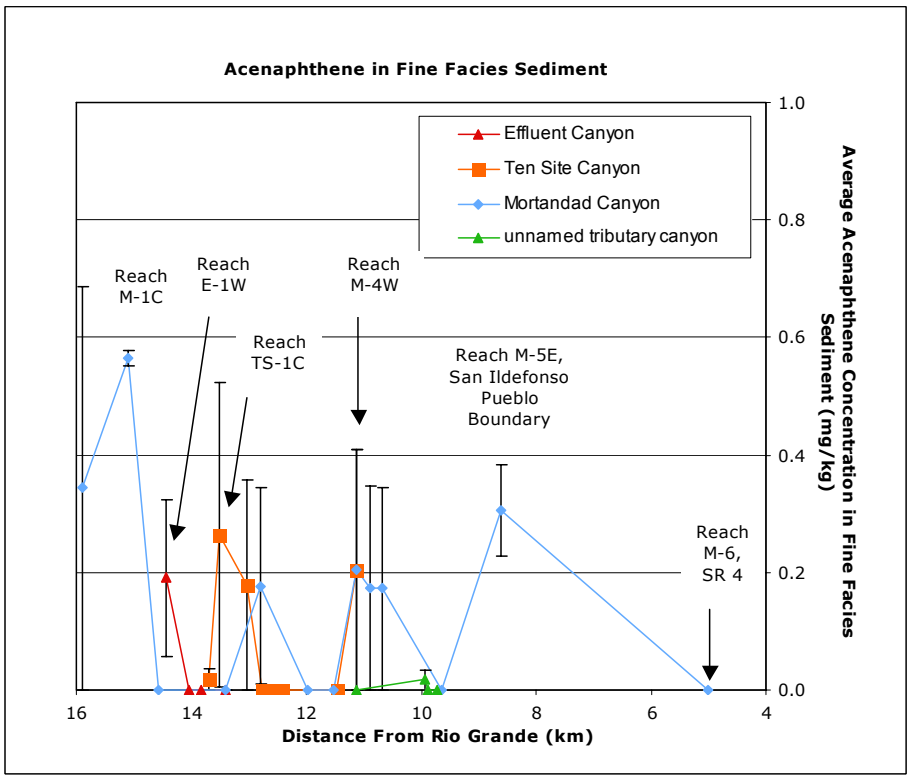
Figure 7.1-23. Chromium concentrations from active channel samples collected in 1979 (Ferenbaugh and Gladney 1997, 93715) and from later investigations plotted versus distance from TA-50 RLWTF outfall



Notes: Error bars indicate upper and lower bounds based on replacing nondetect values with either the detection limit or zero. A value of zero is shown where there are no detected results.

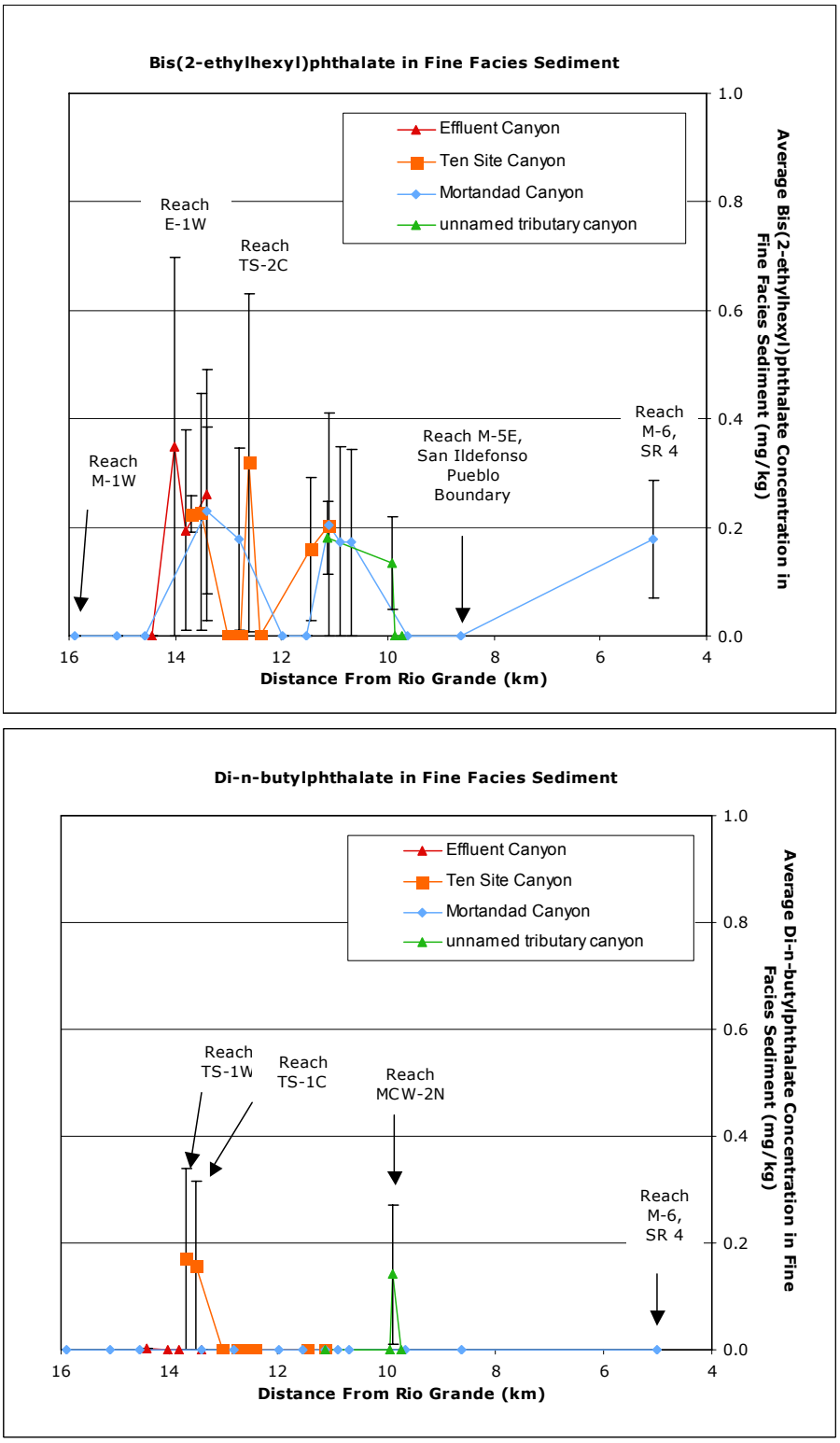
Figure 7.1-24. Estimated average concentrations of the PCBs Aroclor-1260 and Aroclor-1254 in fine facies sediment in the Mortandad watershed





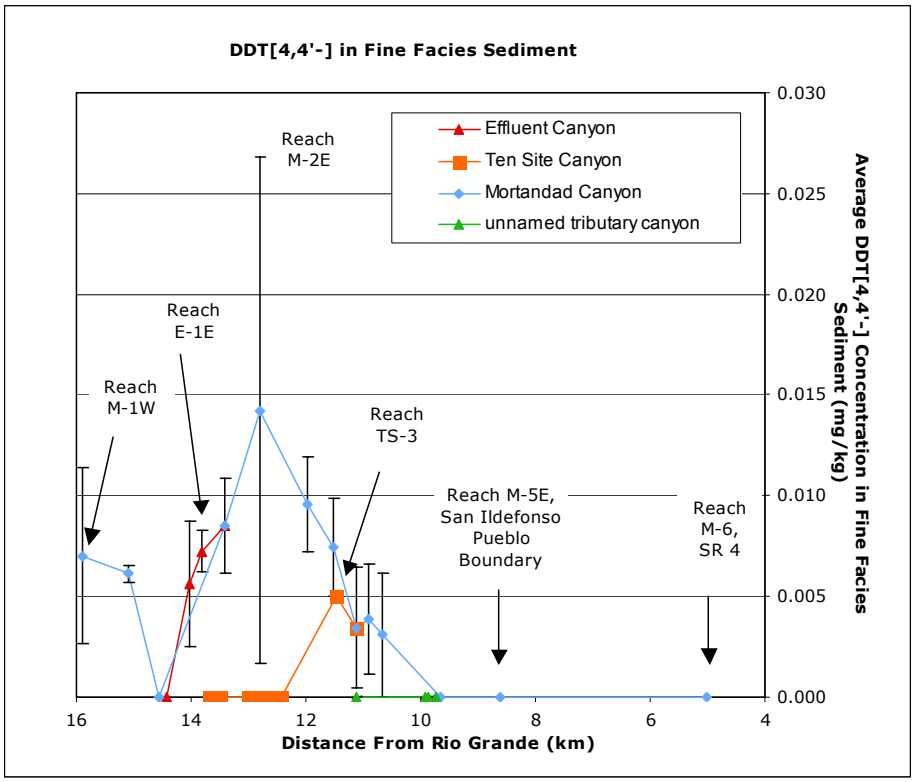
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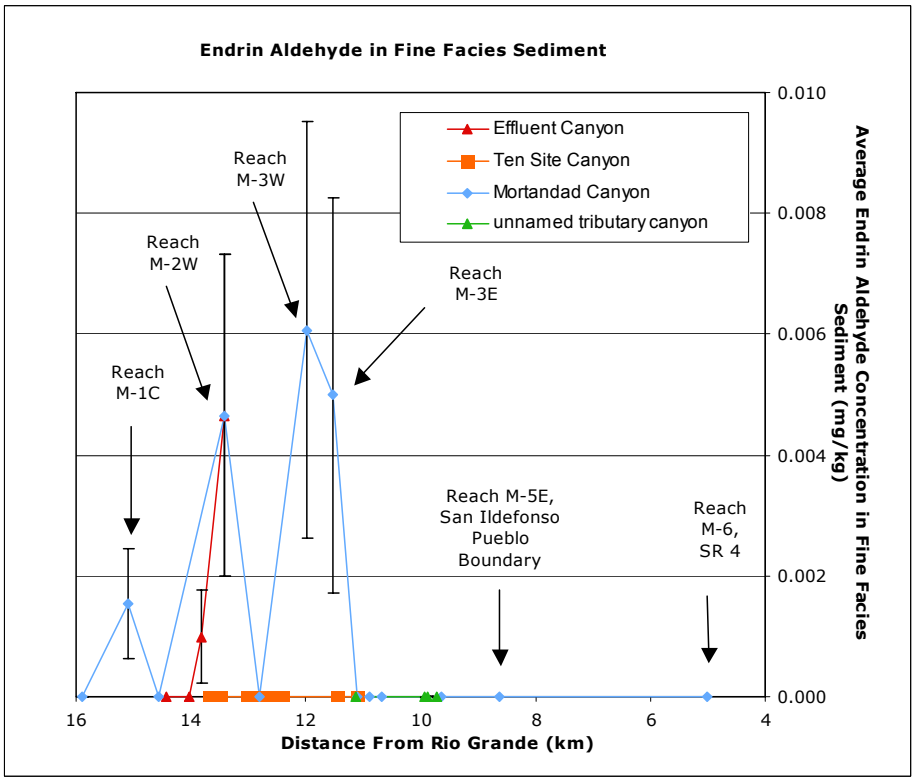
Figure 7.1-25. Estimated average concentrations of the PAHs benzo(a)pyrene and acenaphthene in fine facies sediment in the Mortandad watershed



Notes: Error bars indicate upper and lower bounds based on replacing nondetect values with either the detection limit or zero. A value of zero is shown where there are no detected results.

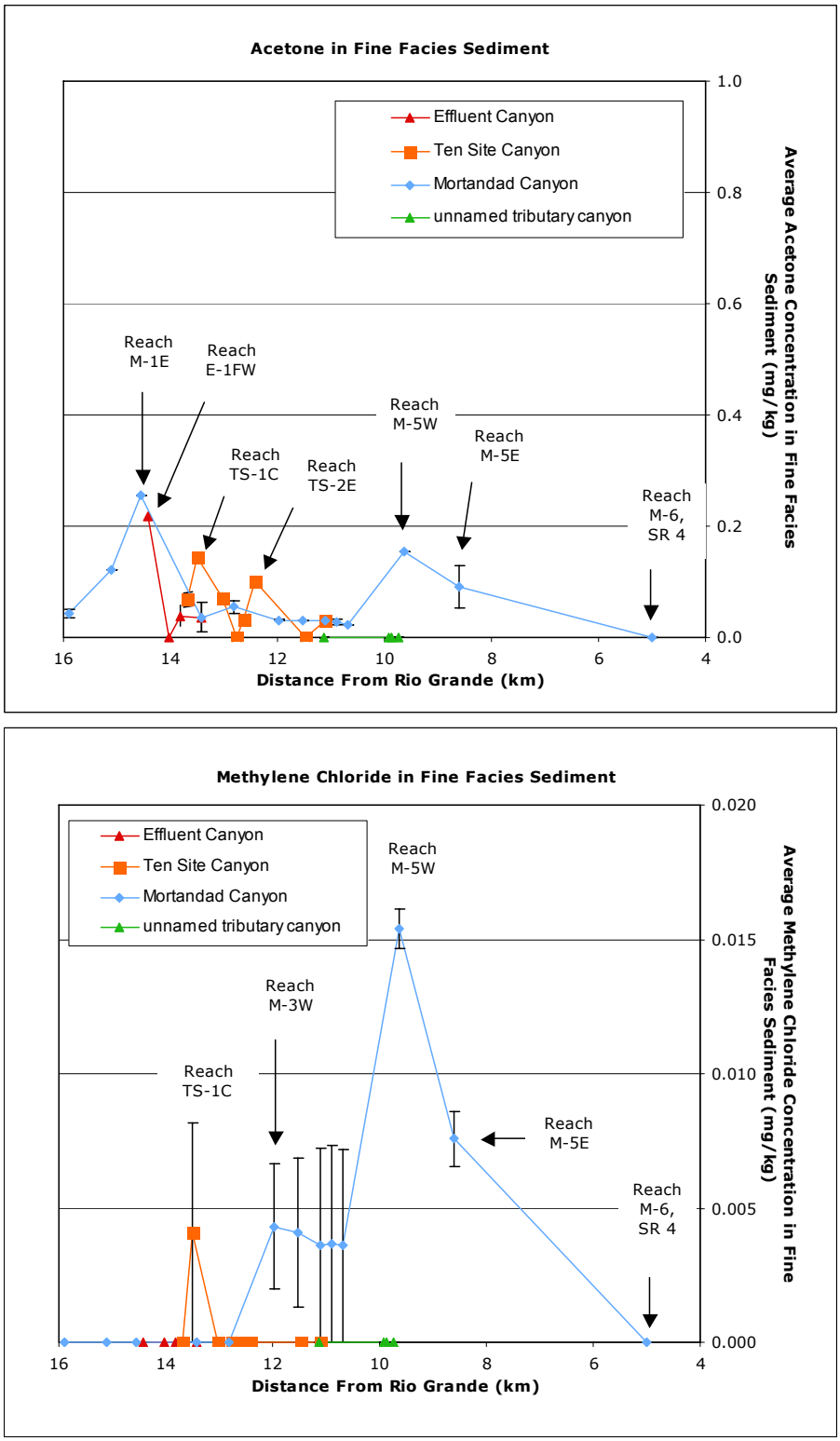
Figure 7.1-26. Estimated average concentrations of the SVOCs bis(2-ethylhexyl)phthalate and di-n-butylphthalate in fine facies sediment in the Mortandad watershed





Notes: Error bars indicate upper and lower bounds based on replacing nondetect values with either the detection limit or zero. A value of zero is shown where there are no detected results.

Figure 7.1-27. Estimated average concentrations of the pesticides DDT and endrin aldehyde in fine facies sediment in the Mortandad watershed



Notes: Error bars indicate upper and lower bounds based on replacing nondetect values with either the detection limit or zero. A value of zero is shown where there are no detected results.

Figure 7.1-28. Estimated average concentrations of the VOCs acetone and methylene chloride in fine facies sediment in the Mortandad watershed

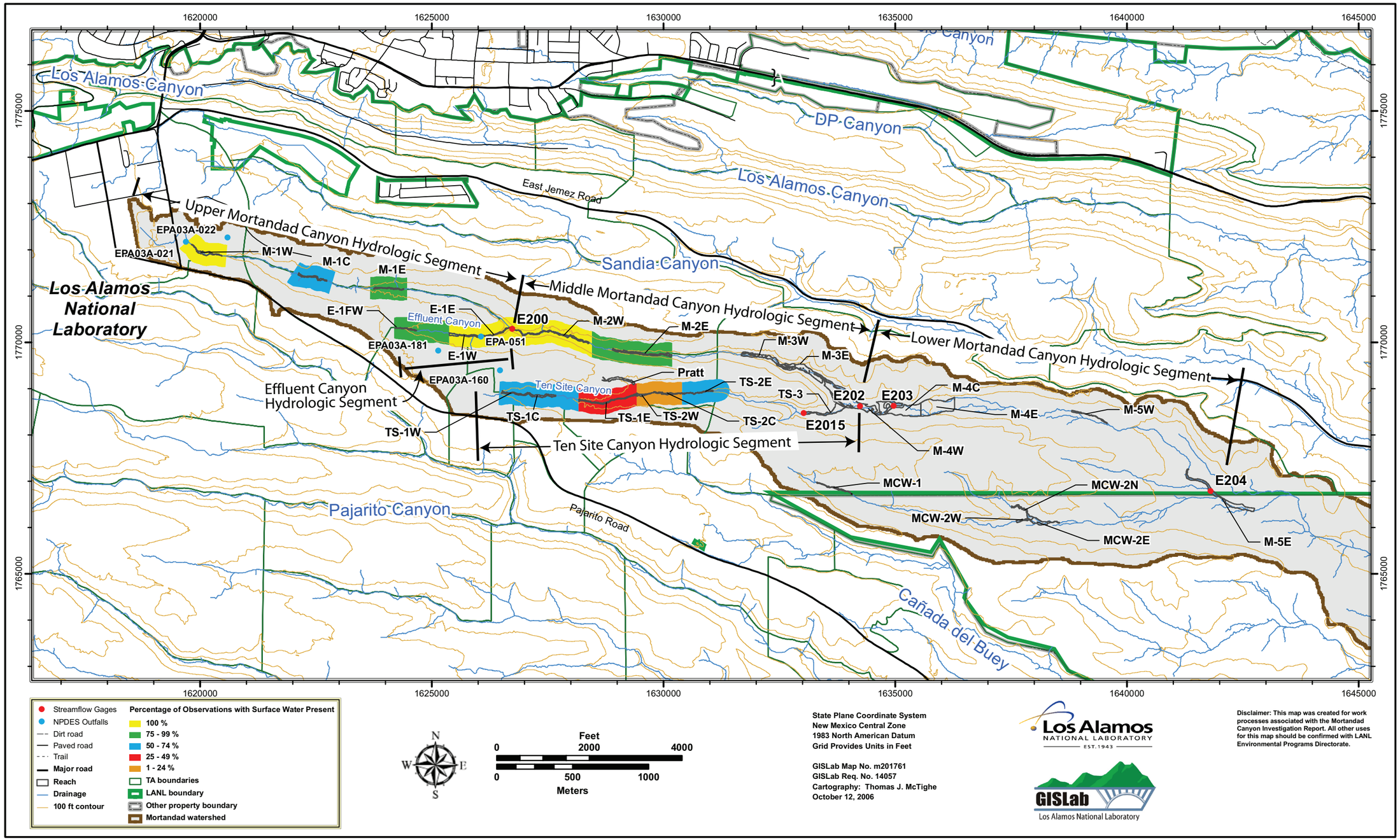


Figure 7.2-1. Mortandad watershed depicting different surface water occurrences, NPDES outfalls, and gaging stations

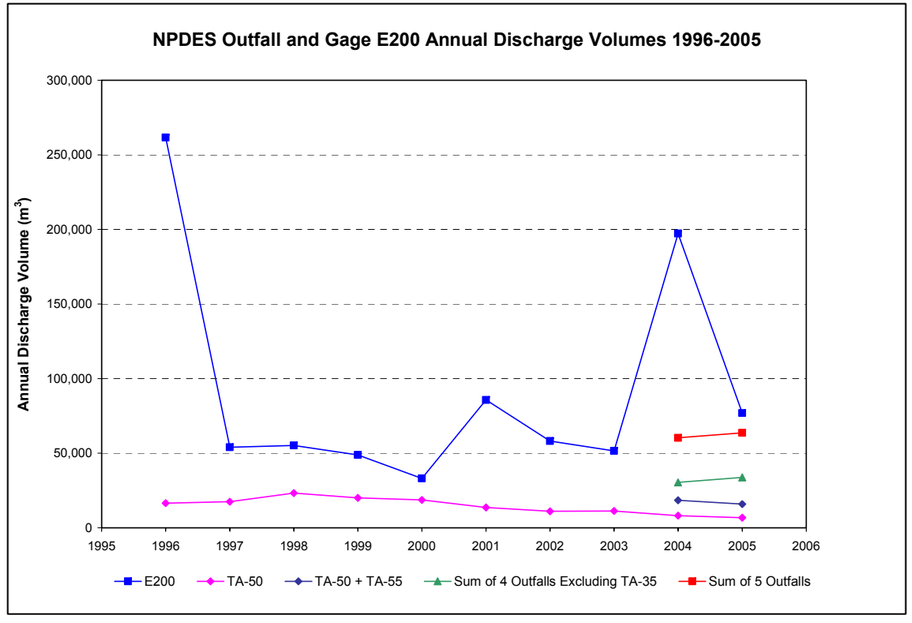


Figure 7.2-2. Comparison of NPDES outfall and gage E200 discharge volumes

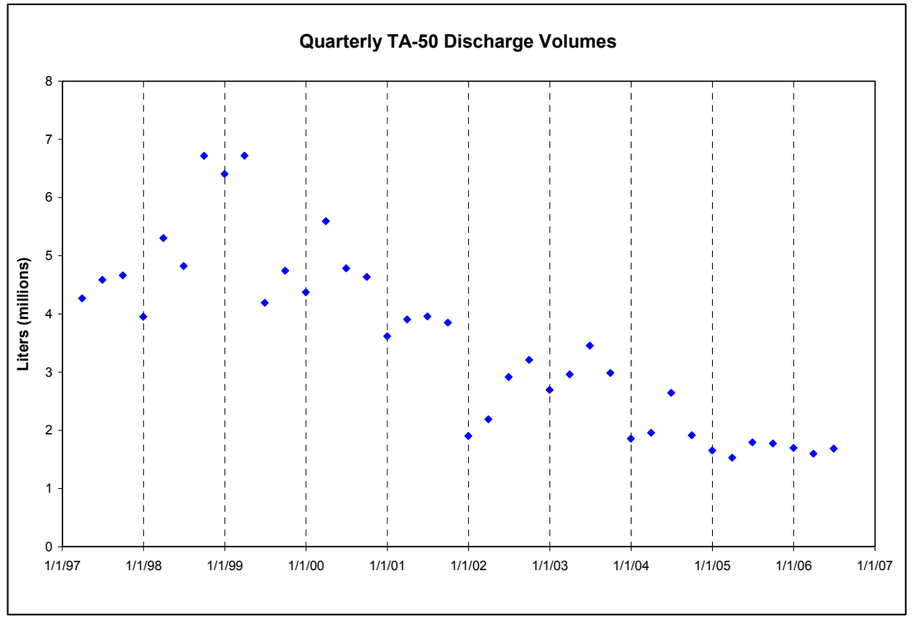


Figure 7.2-3. Seasonal variability in TA-50 RLWTF outfall discharges

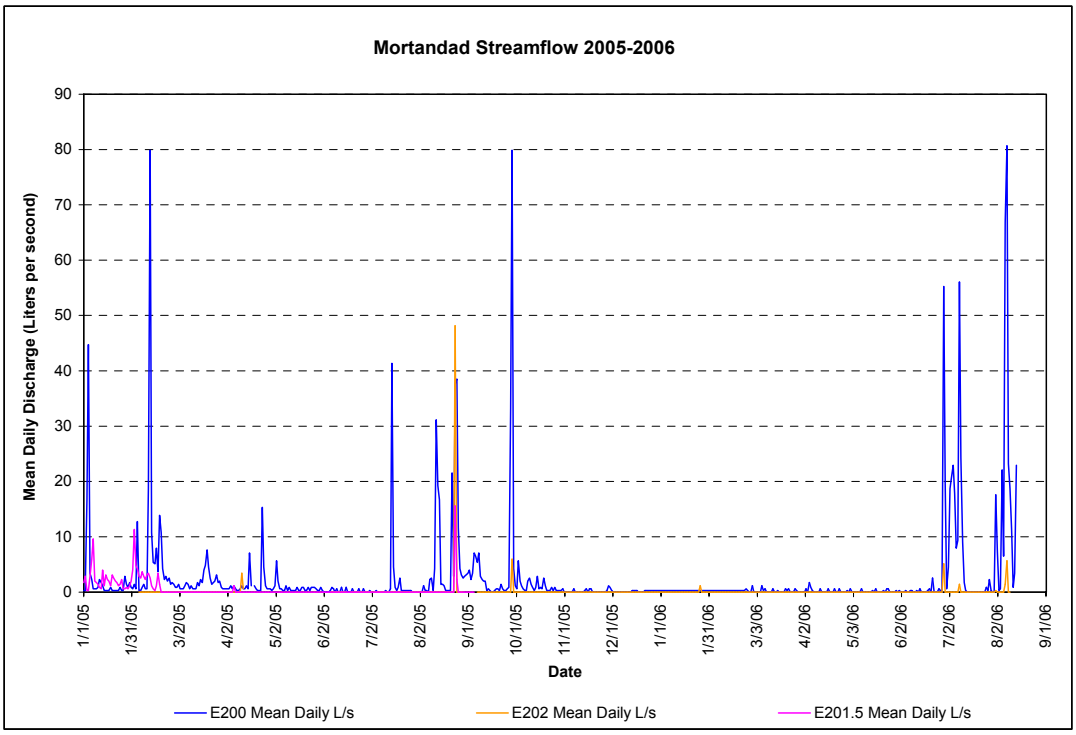


Figure 7.2-4. Mortandad Canyon streamflow during 2005–2006

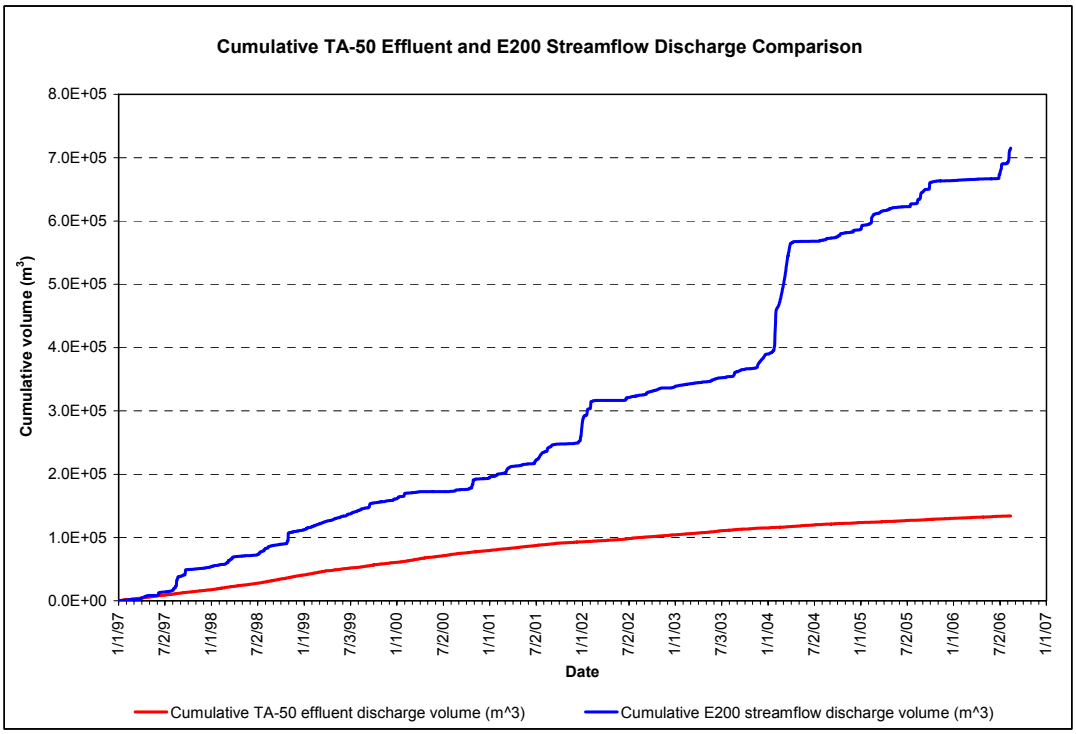
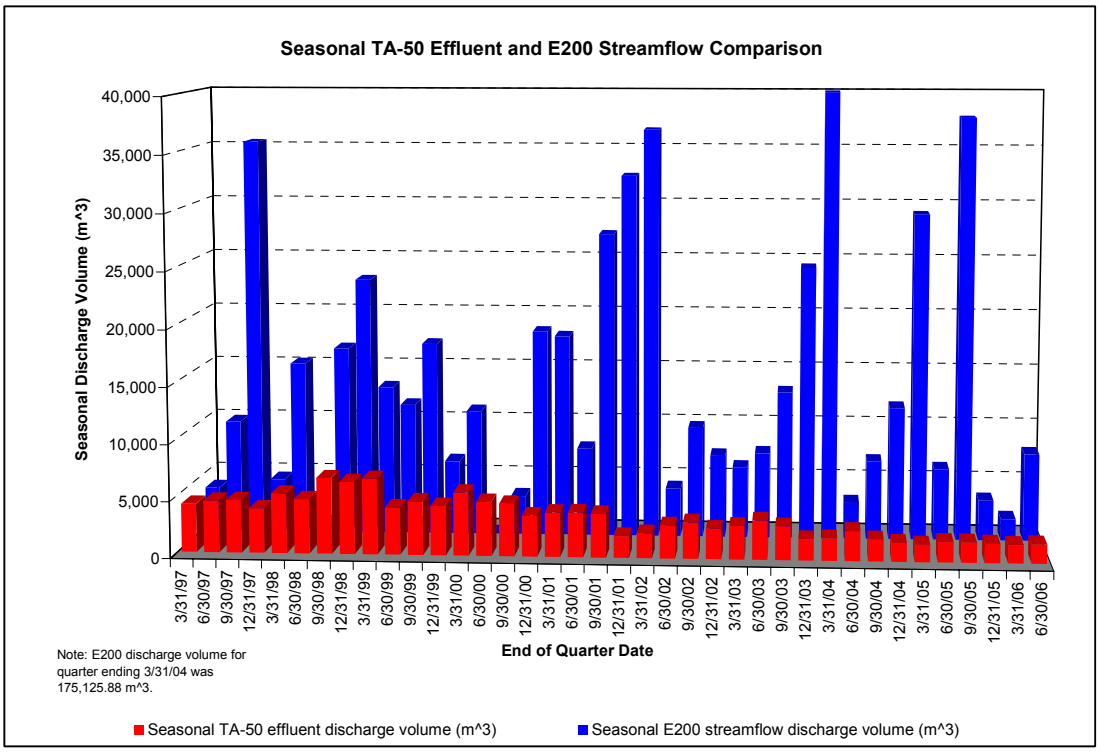


Figure 7.2-5. Comparison of cumulative TA-50 RLWTF outfall discharge and gage E200 streamflow volumes since 1997 using daily records



Note: Discharge volume for quarter ending 3/31/04 is off the chart at a volume exceeding 175,000 m^3.

Figure 7.2-6. Comparison of seasonal TA-50 RLWTF outfall discharge and gage E200 streamflow volumes since 1997

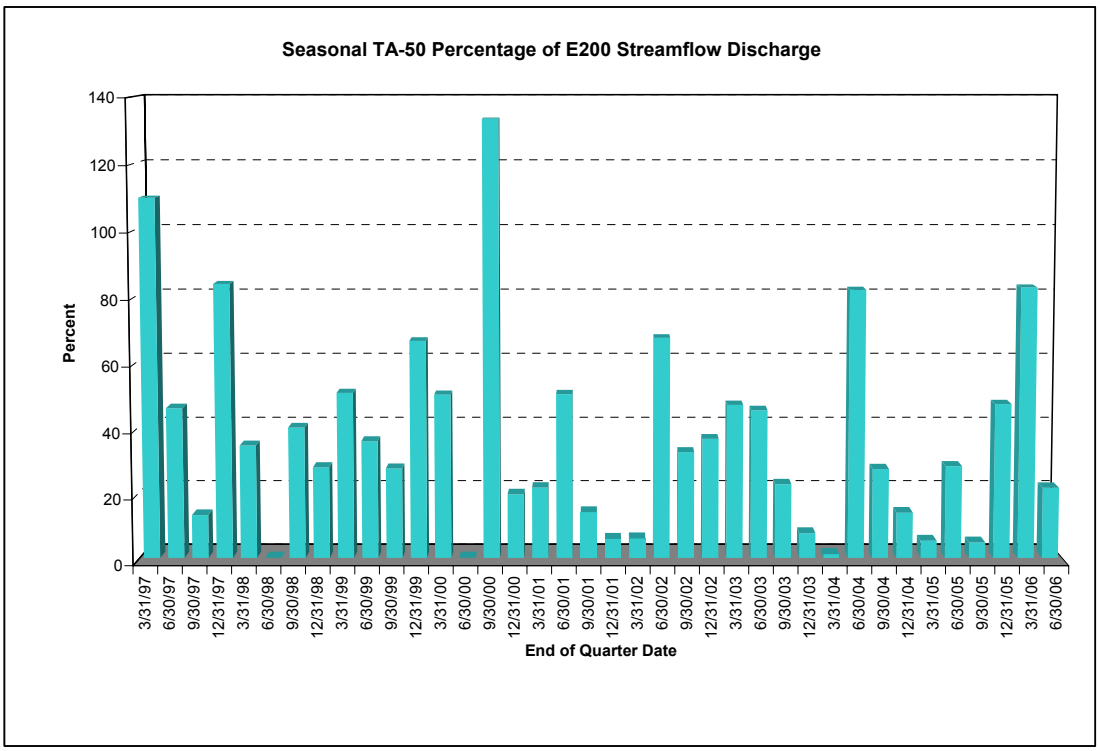


Figure 7.2-7. Seasonal TA-50 RLWTF outfall percentage of gage E200 total streamflow discharge

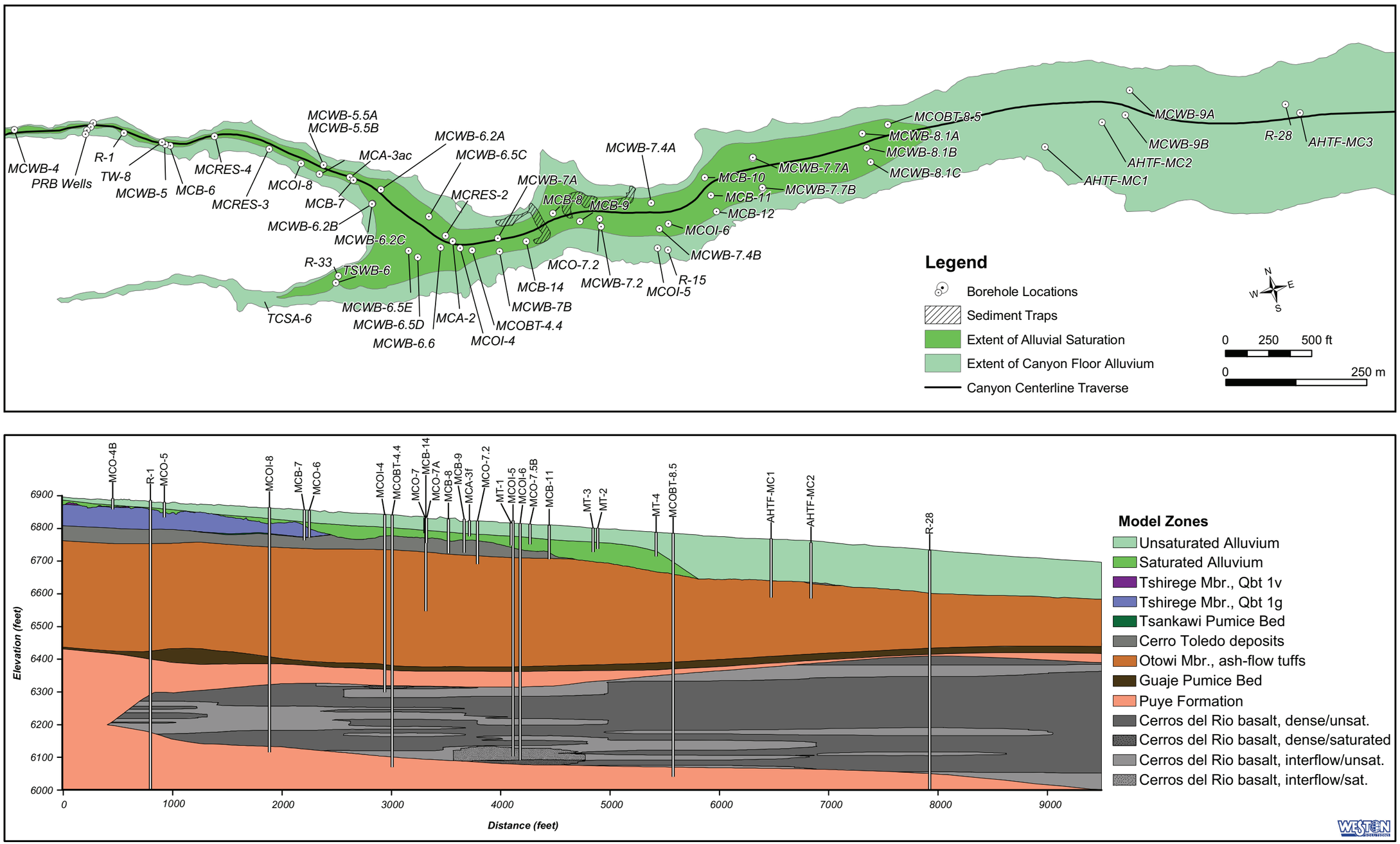


Figure 7.2-8. Map and cross section showing extent of alluvial groundwater in Mortandad Canyon

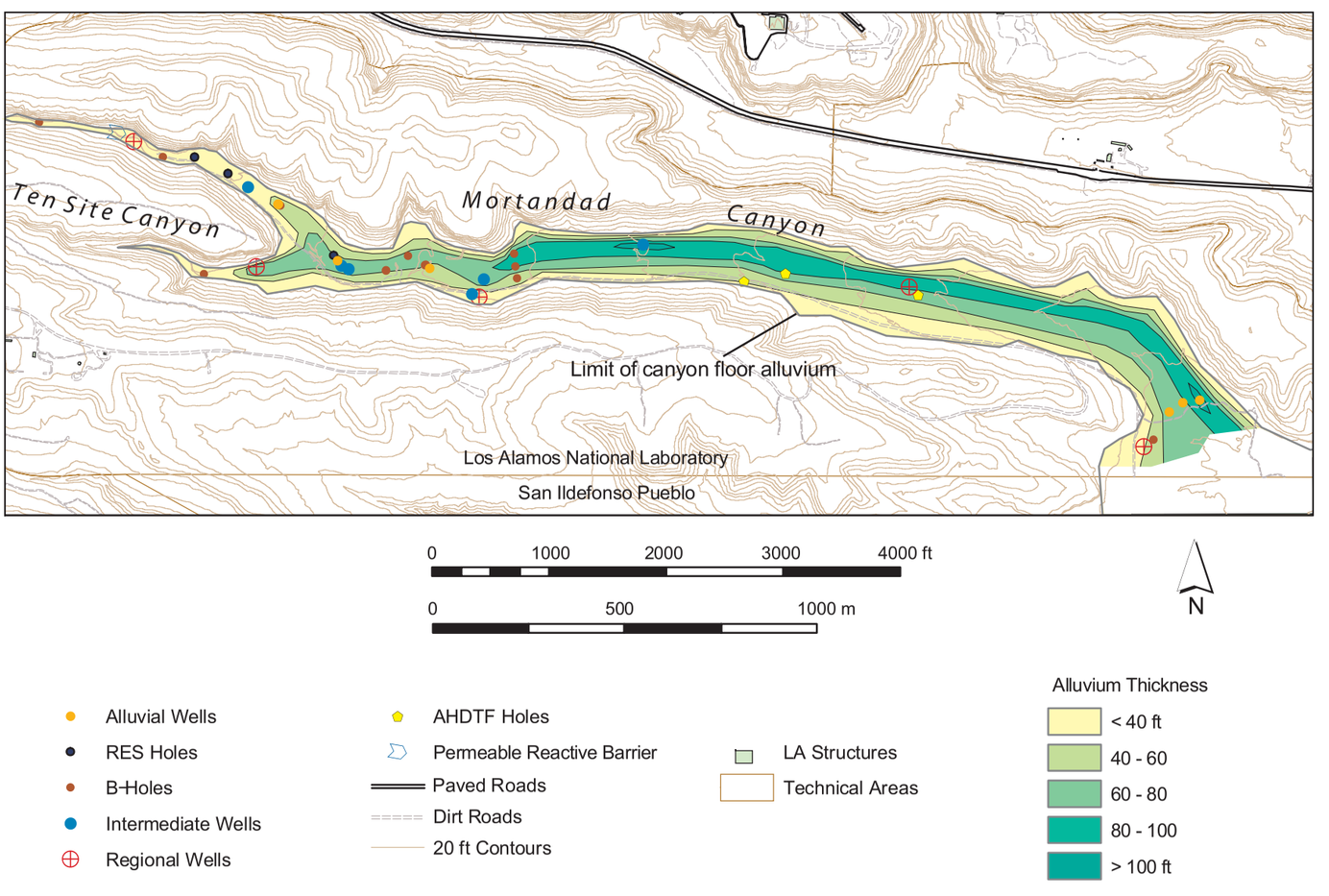


Figure 7.2-9. Map showing thickness of alluvium in Mortandad Canyon

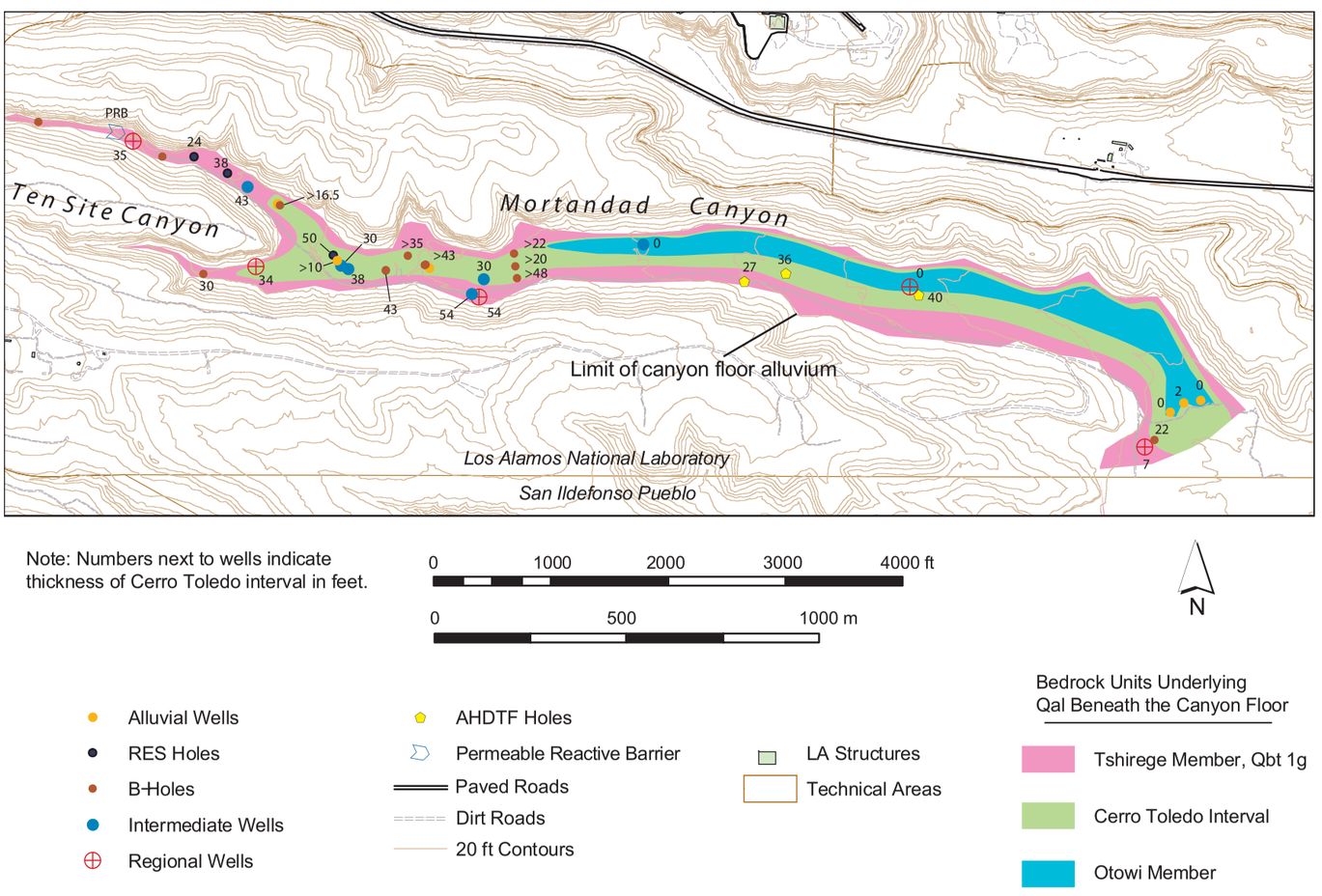


Figure 7.2-10. Distribution of geologic bedrock units beneath alluvium in Mortandad Canyon

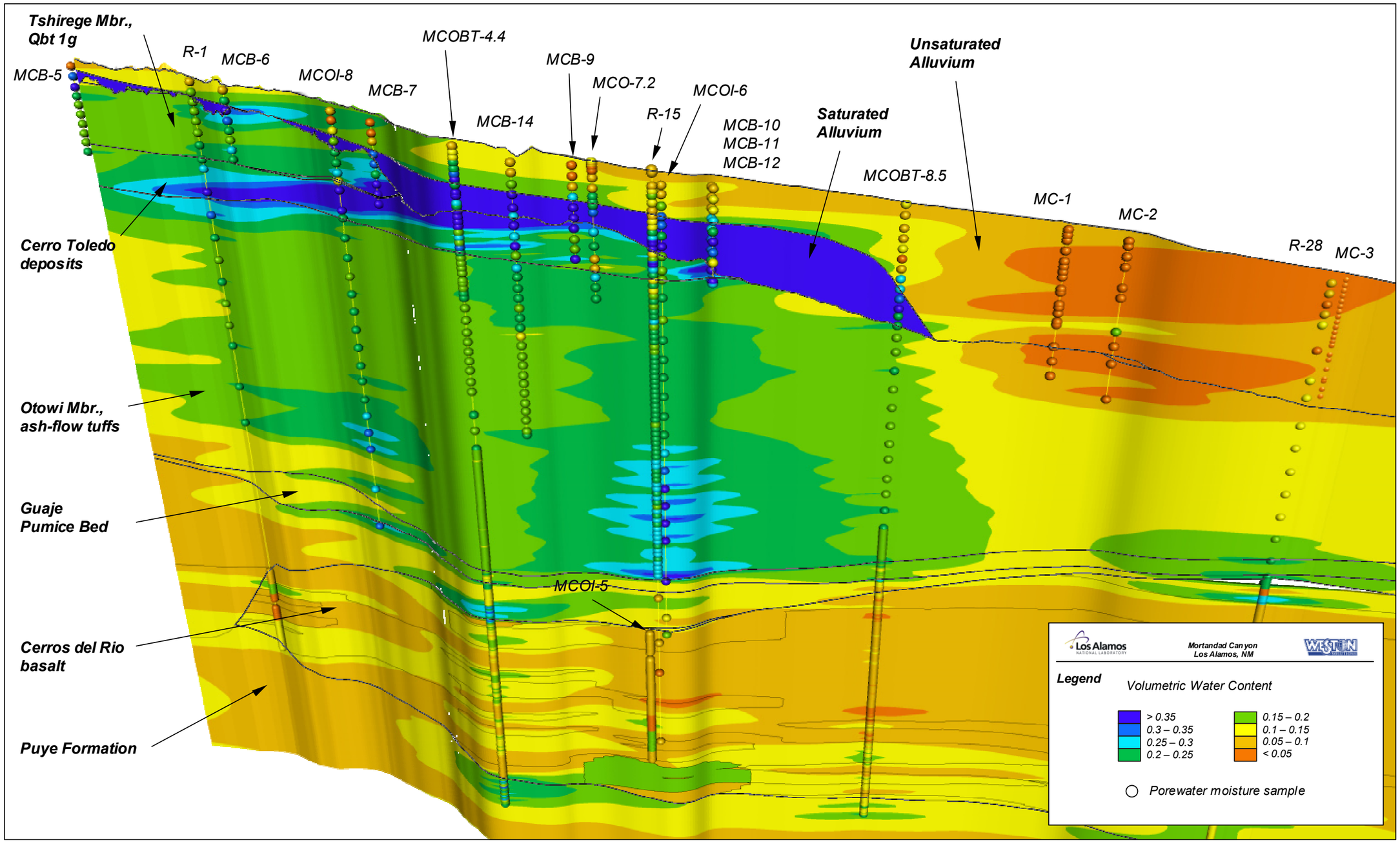


Figure 7.2-11. Cross section showing estimated volumetric moisture content based on borehole porewater measurements and saturated conditions occurring in alluvium and perched-intermediated groundwater

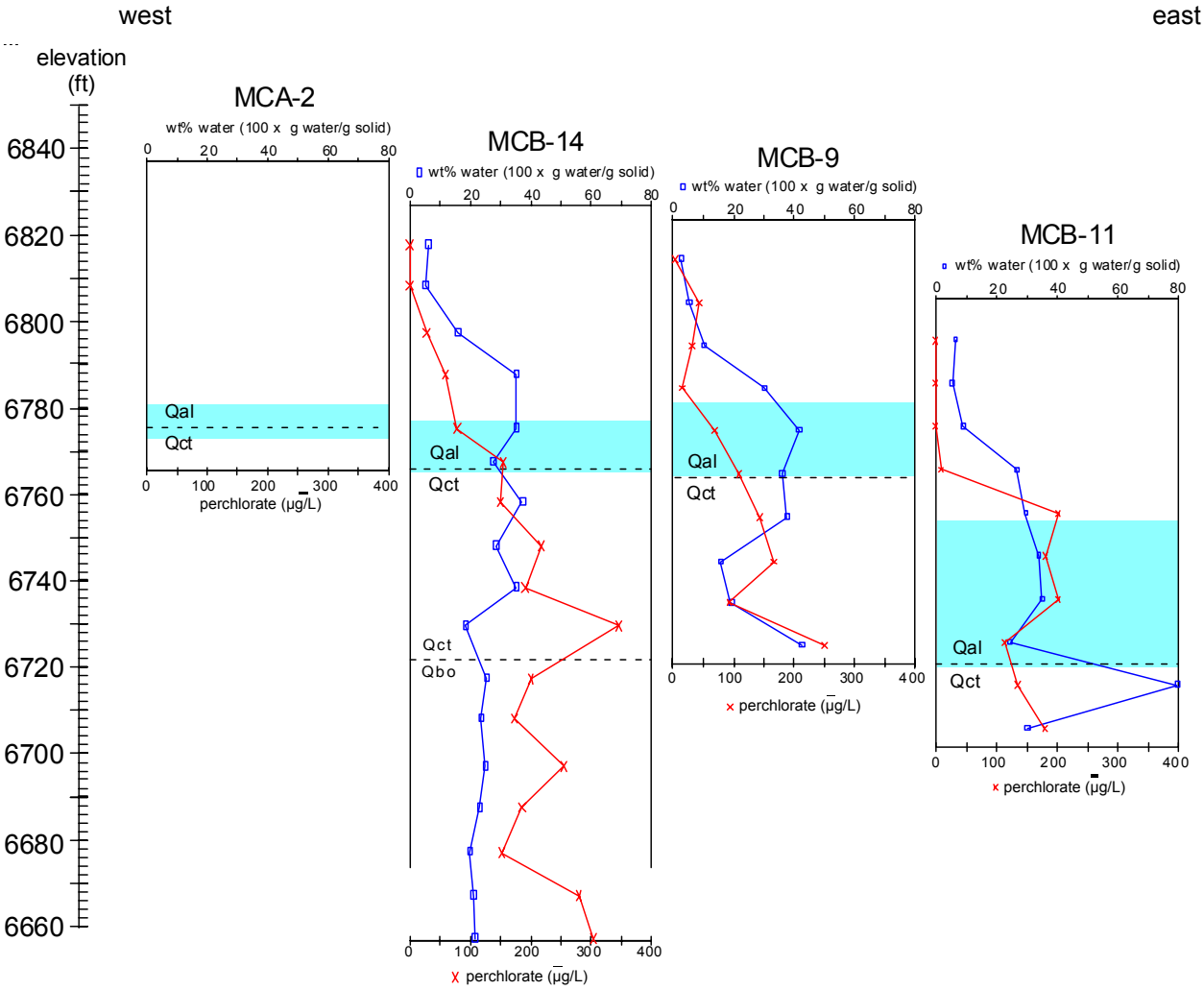


Figure 7.2-12. Comparison of alluvial groundwater occurrences (blue-shaded areas) with moisture and perchlorate profiles in wells MCA-2, MCB-9, MCB-11 and MCB-14

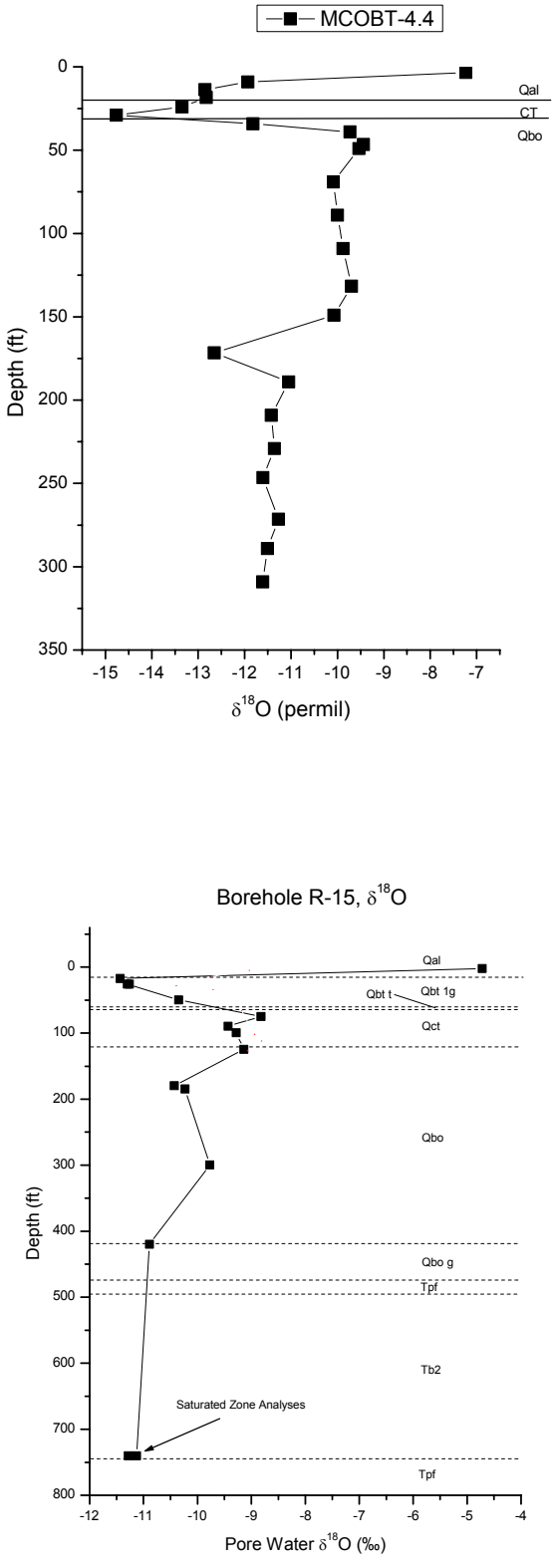


Figure 7.2-13. Oxygen isotope profiles for boreholes MCOBT-4.4, R-15 and MCOBT-8.5

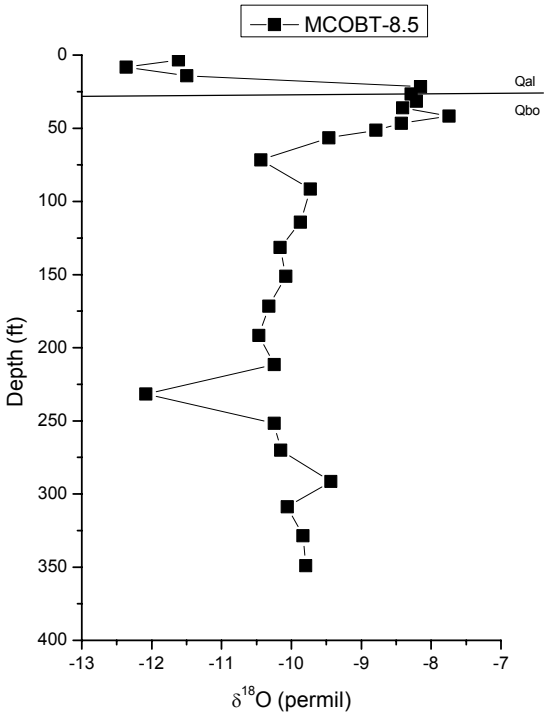


Figure 7.2-13 (continued). Oxygen isotope profiles for boreholes MCOBT-4.4, R-15 and MCOBT-8.5

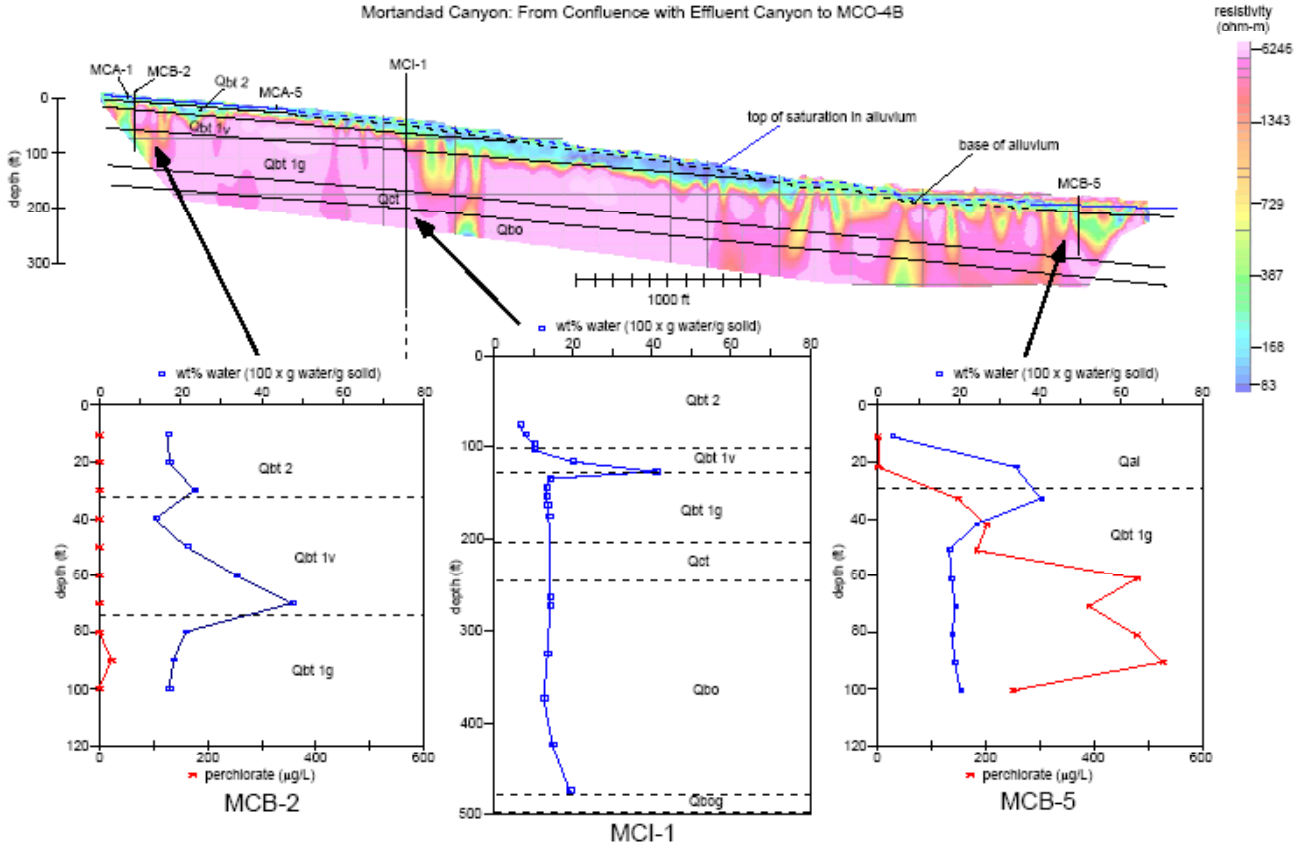


Figure 7.2-14. DC Resistivity profiles results compared to vadose-zone gravimetric moisture and porewater perchlorate concentrations for boreholes MCB-2, MCIO-I and MCB-5

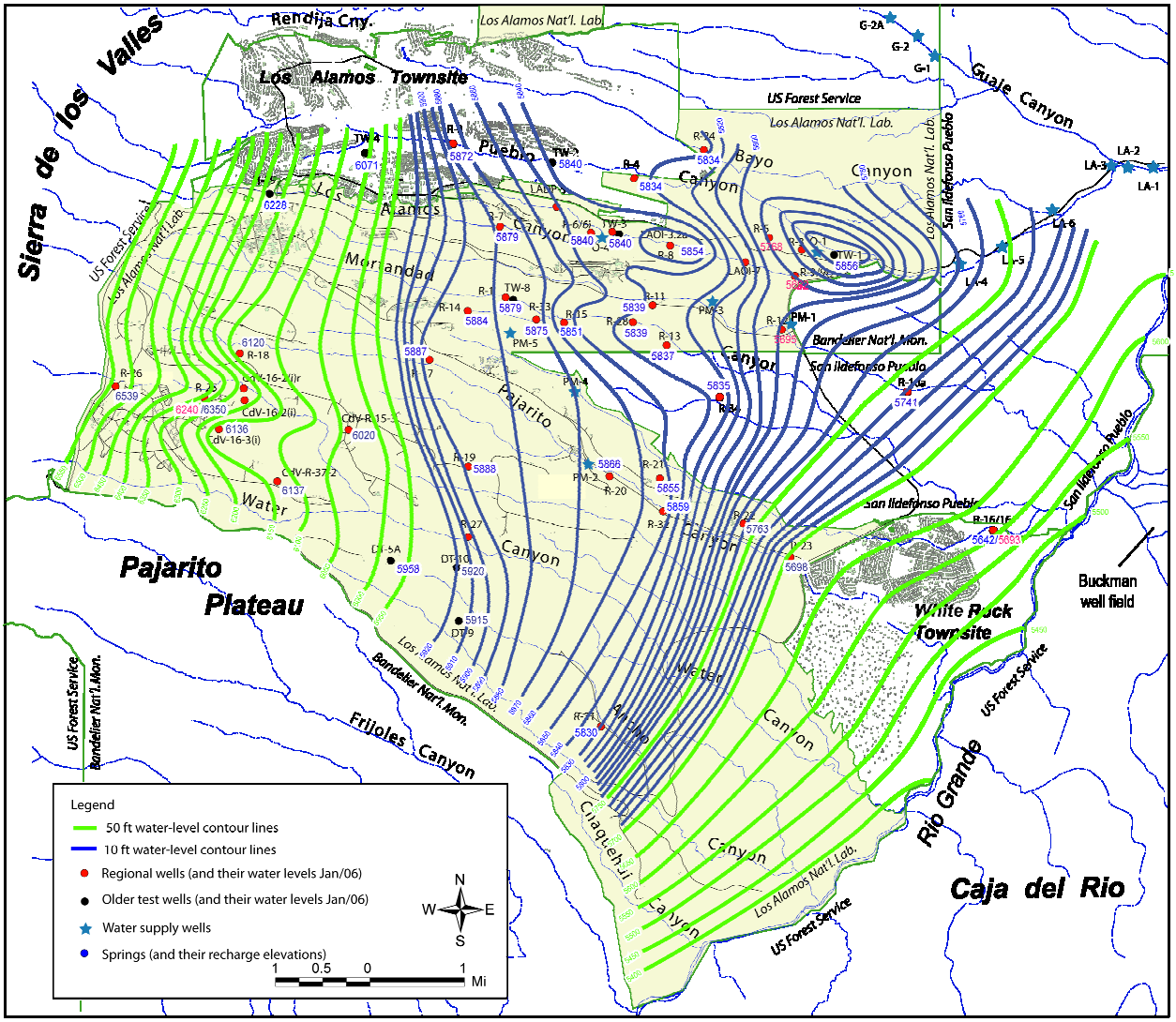
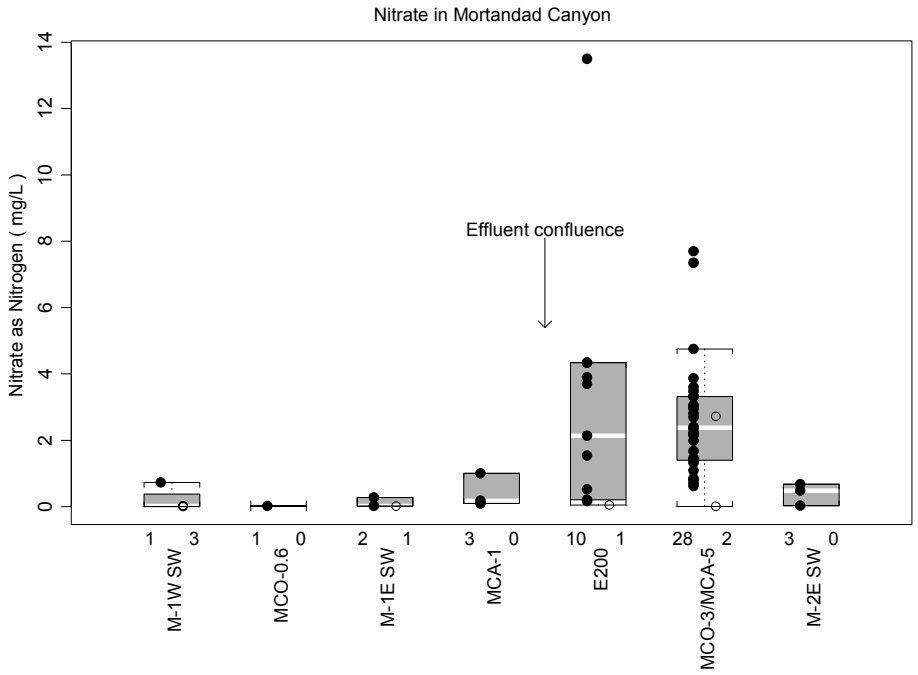
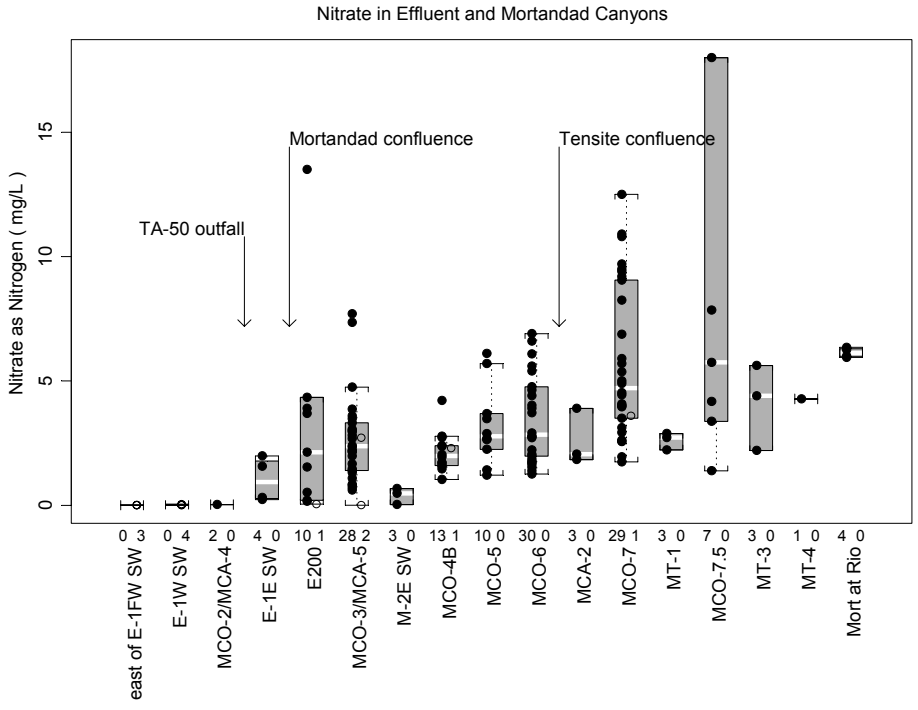


Figure 7.2-15. Water-table map based on January 2006 water-level data

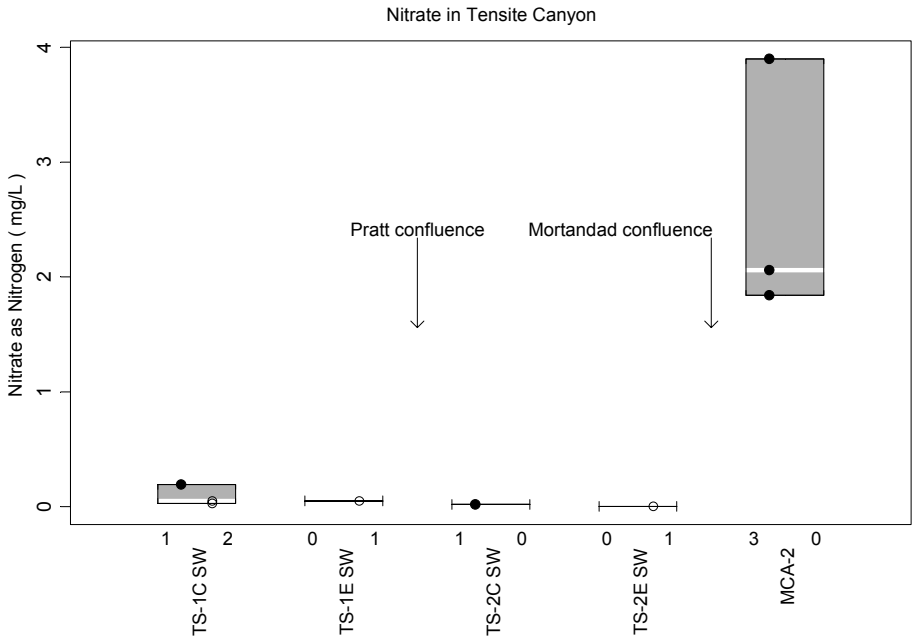


(a)



(b)

Figure 7.2-16. Box plots showing the spatial distribution of nitrate (as N) at surface water and alluvial groundwater locations in both filtered and non-filtered samples (a) the upper Mortandad Canyon hydrologic segment, (b) in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande, (c) in Ten Site Canyon to just past the Mortandad Canyon confluence



(c)

Figure 7.2-16 (continued). Box plots showing the spatial distribution of nitrate (as N) at surface water and alluvial groundwater locations in both filtered and non-filtered samples (a) the upper Mortandad Canyon hydrologic segment, (b) in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande, (c) in Ten Site Canyon to just past the Mortandad Canyon confluence

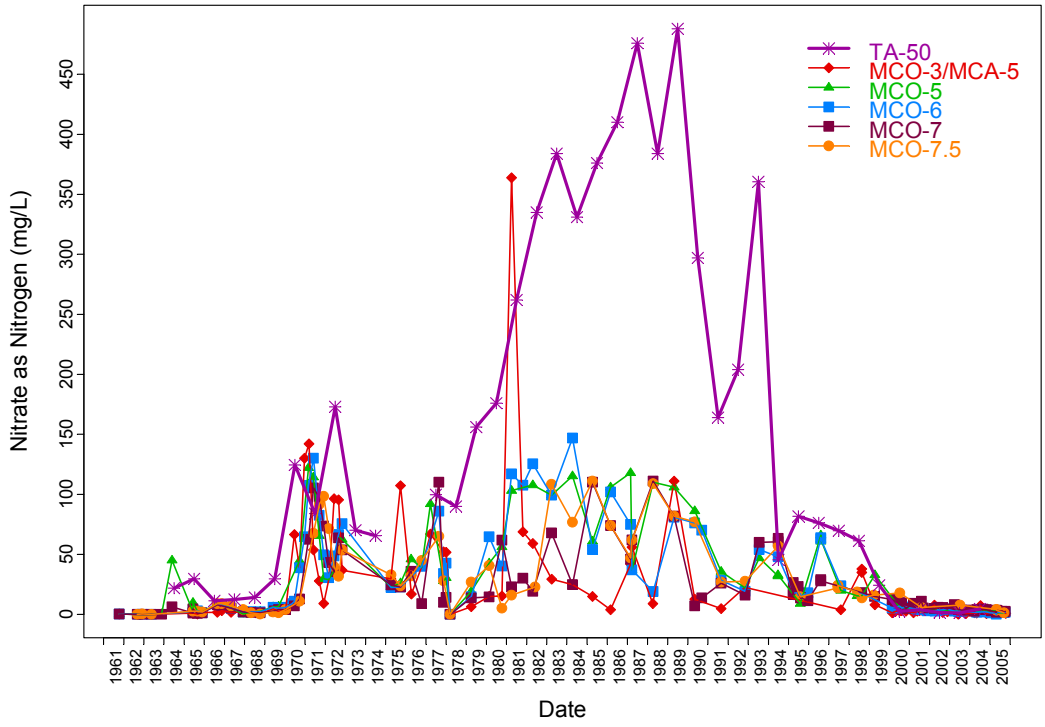


Figure 7.2-17. Comparison of nitrate concentrations (as N, mg/L) in TA-50 RLWTF effluent to those in down-gradient alluvial wells - history since 1960s

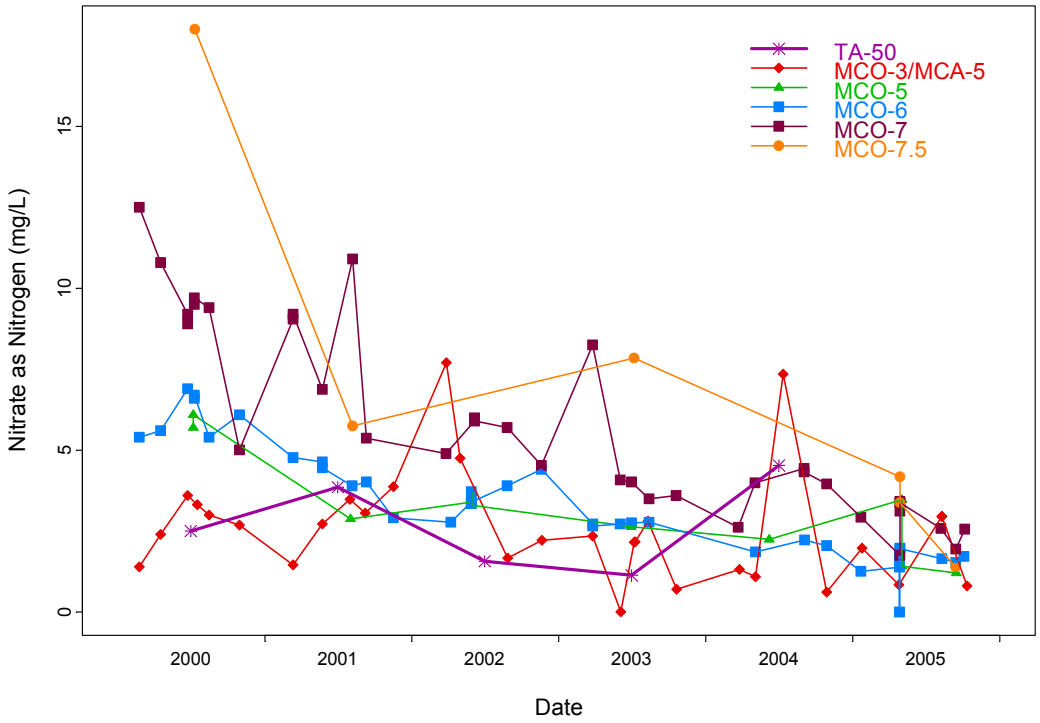


Figure 7.2-18. Comparison of nitrate concentrations (as N, mg/L) in TA-50 RLWTF effluent to those in down-gradient alluvial wells - history since 2000

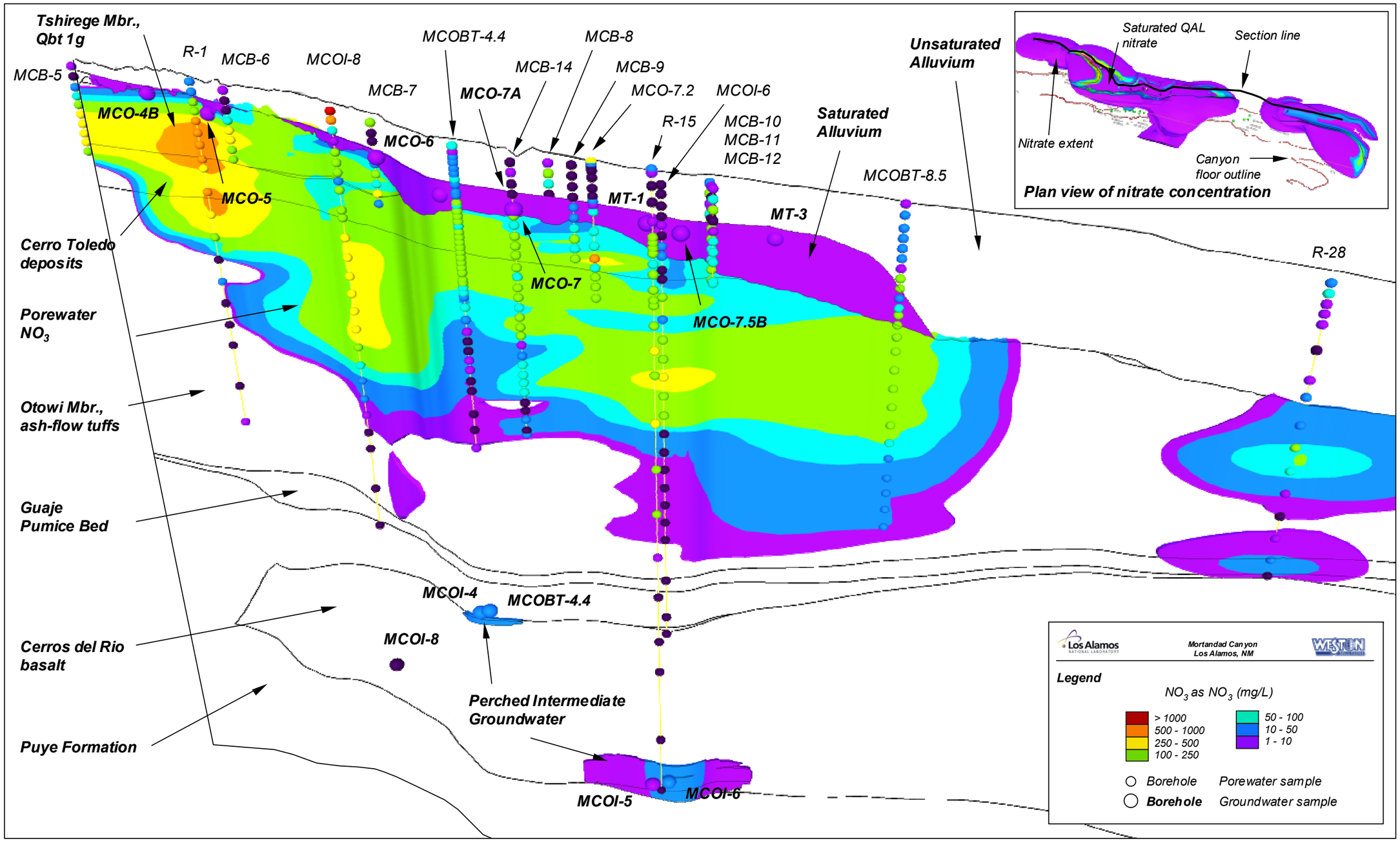


Figure 7.2-19. Cross section showing estimated nitrate concentrations (NO_3 as NO_3, mg/L) in Mortandad Canyon vadose-zone pore water and perched-intermediate groundwater

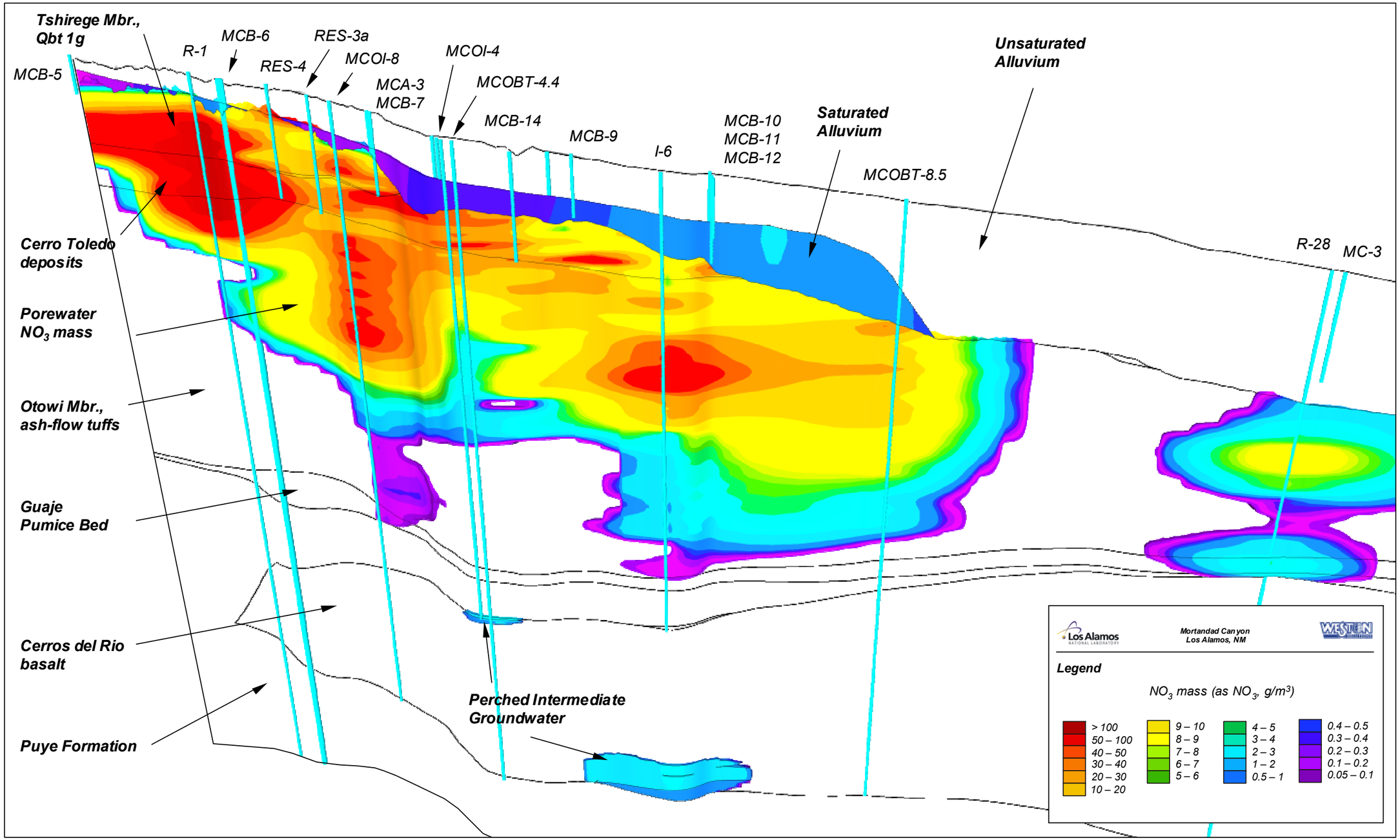


Figure 7.2-20. Cross section showing estimated nitrate mass (g NO_3 as NO_3/m^3 rock) distribution located within Mortandad Canyon vadose-zone pore water and perched-intermediate groundwater

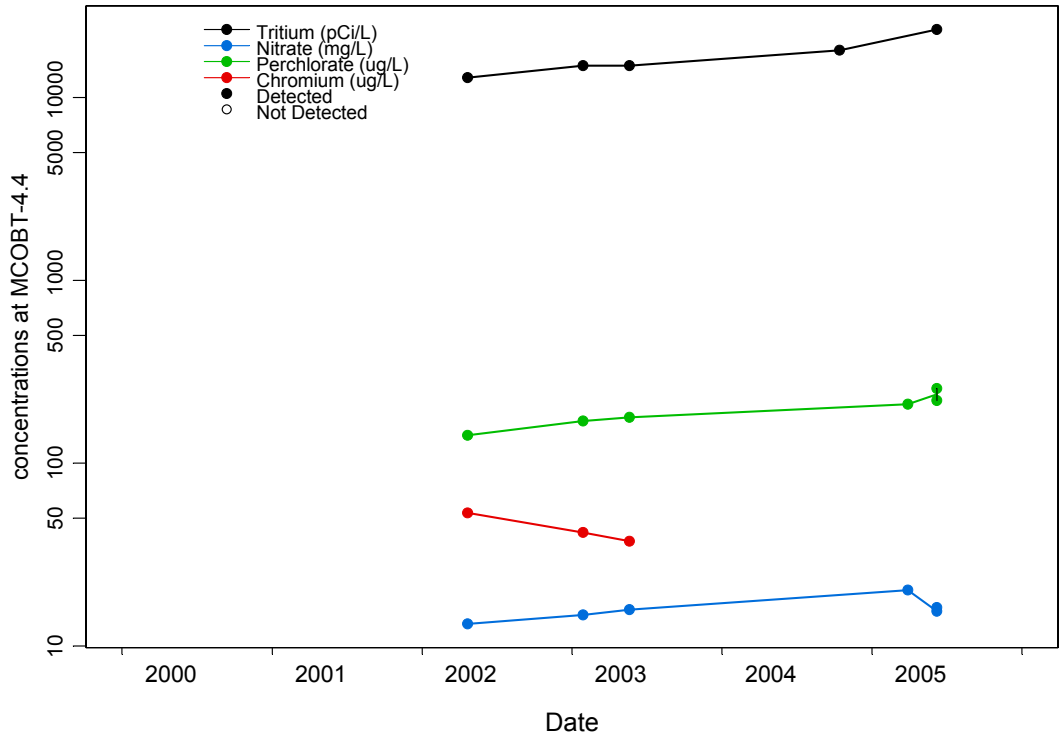


Figure 7.2-21. Concentrations of nitrate (as N), perchlorate, filtered chromium and tritium in perched-intermediate groundwater for period of record in well MCOBT-4.4

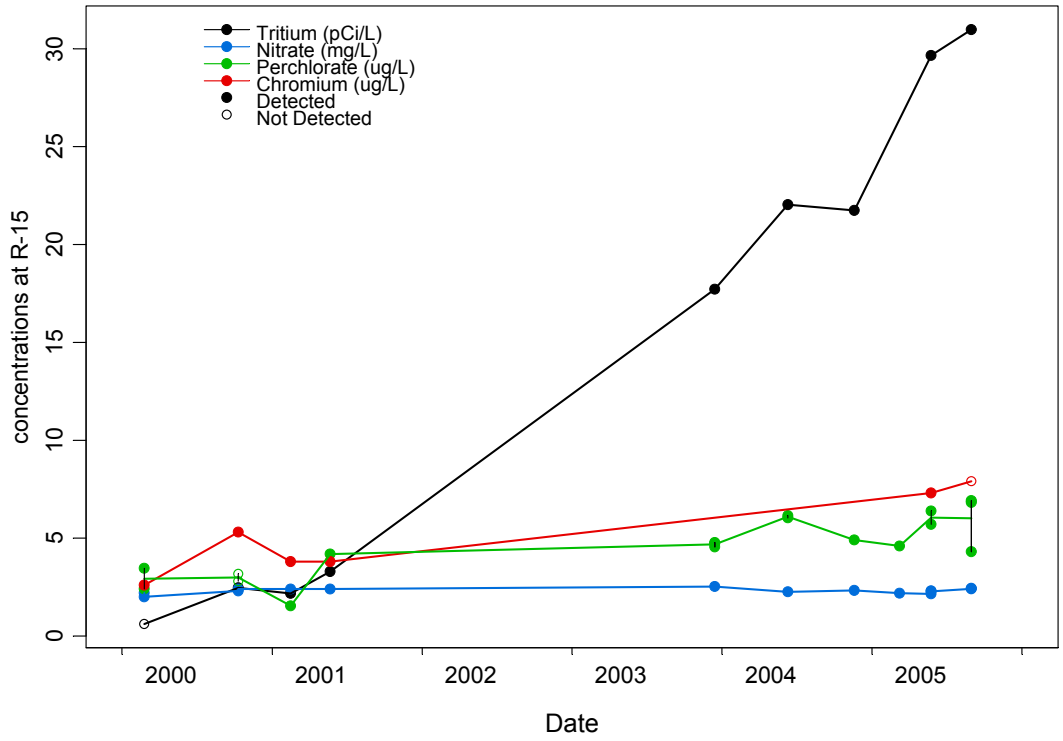


Figure 7.2-22. Concentrations of nitrate (as N), perchlorate, filtered chromium and tritium in regional groundwater for period of record in well R-15

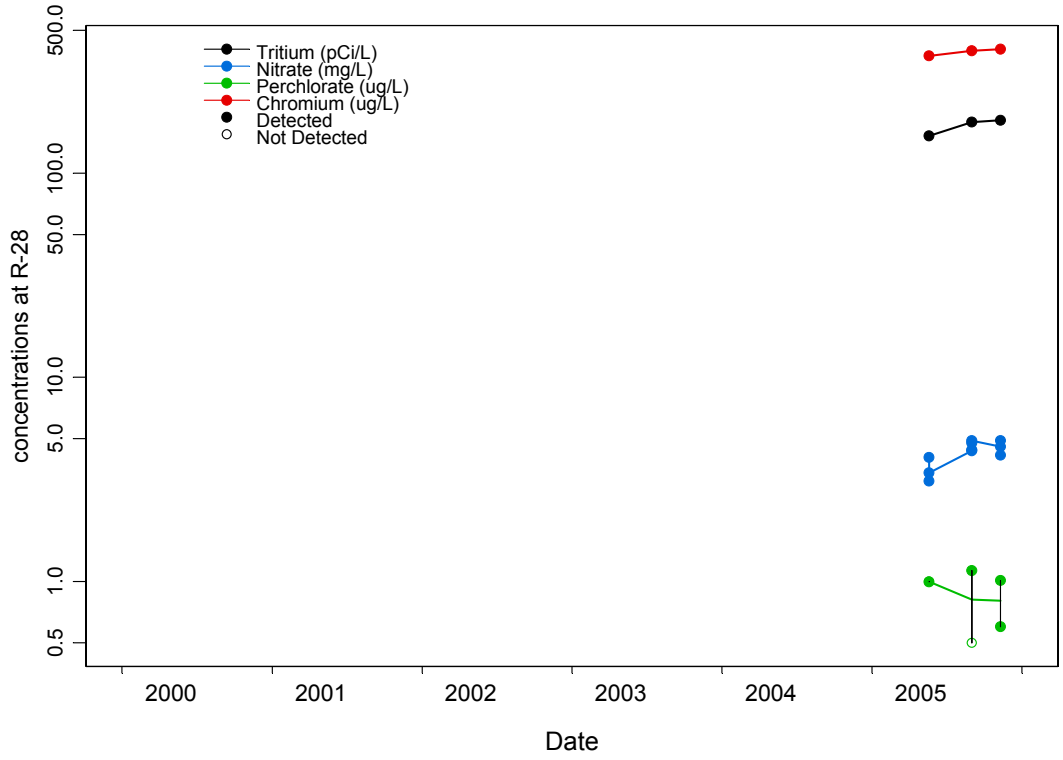
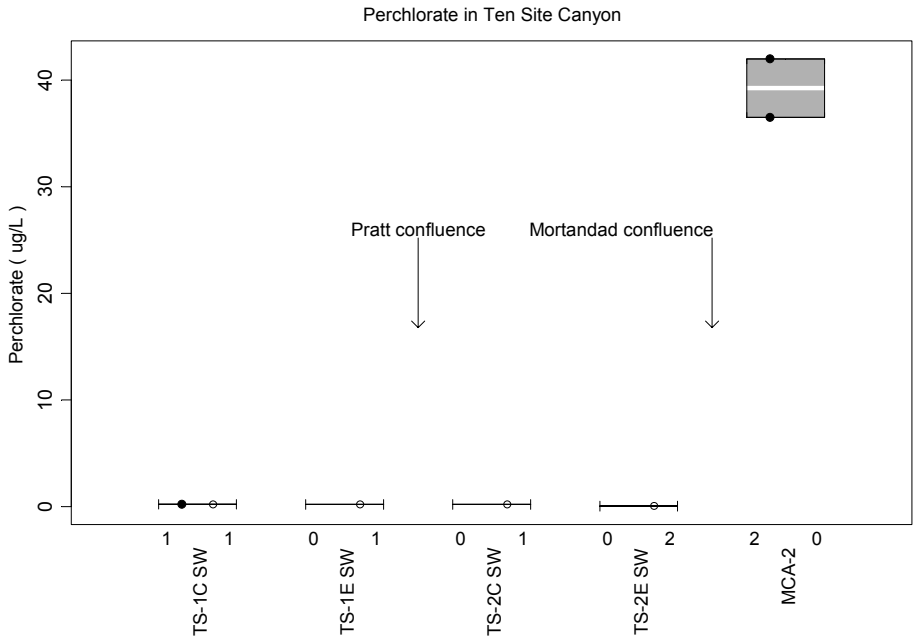
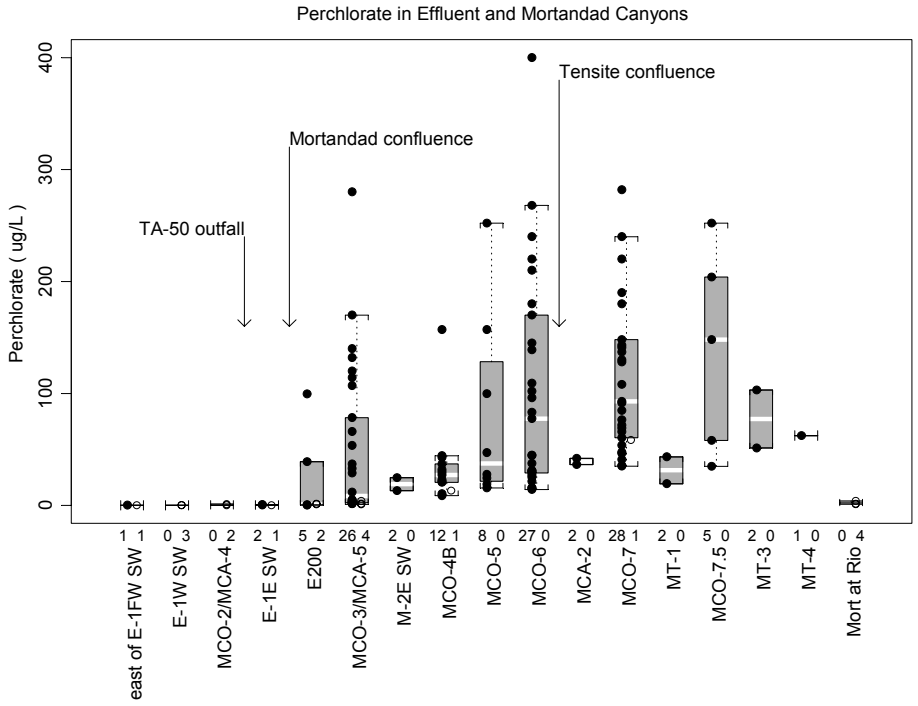


Figure 7.2-23. Concentrations of nitrate (as N), perchlorate, filtered chromium and tritium in regional groundwater for period of record in well R-28

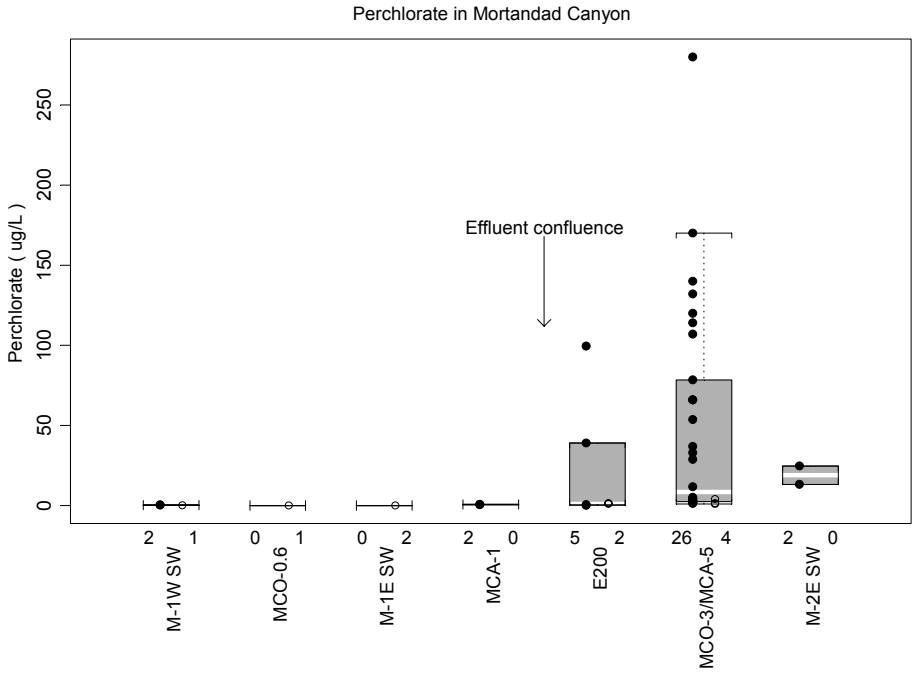


(a)



(b)

Figure 7.2-24. Box plots showing the spatial distribution of perchlorate (μg/L) at surface water and alluvial groundwater locations in both filtered and non-filtered samples (a) the upper Mortandad Canyon hydrologic segment, (b) in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande, (c) in Ten Site Canyon to just past the Mortandad Canyon confluence



(c)

Figure 7.2-24 (continued). Box plots showing the spatial distribution of perchlorate (µg/L) at surface water and alluvial groundwater locations in both filtered and non-filtered samples (a) the upper Mortandad Canyon hydrologic segment, (b) in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande, (c) in Ten Site Canyon to just past the Mortandad Canyon confluence

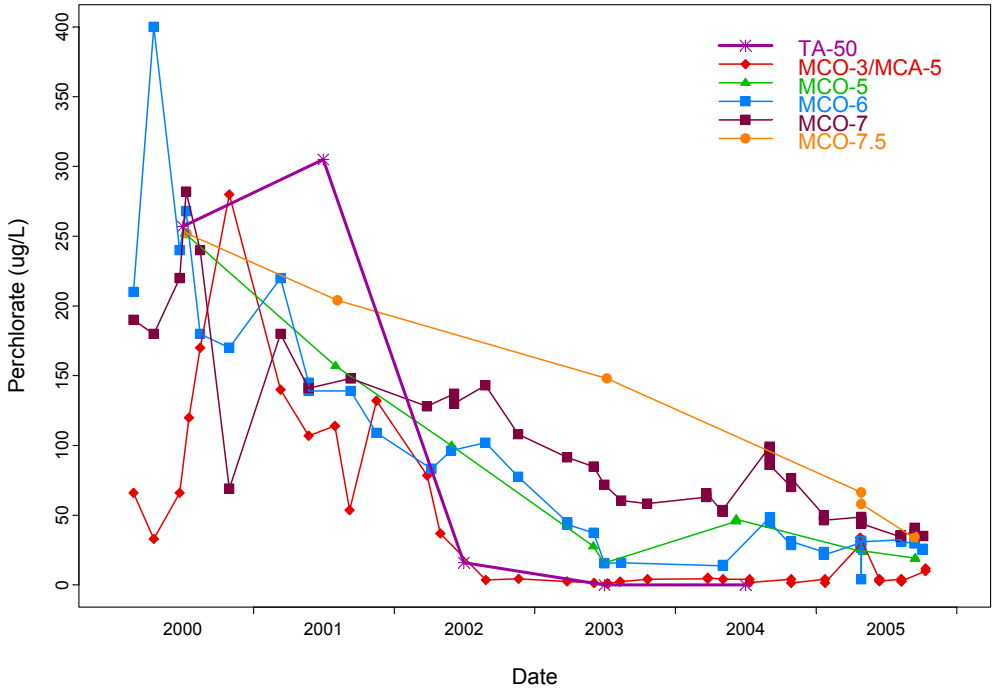


Figure 7.2-25. Comparison of perchlorate concentrations (µg/L) in TA-50 RLWTF effluent to those in down-gradient alluvial wells - history since 2000

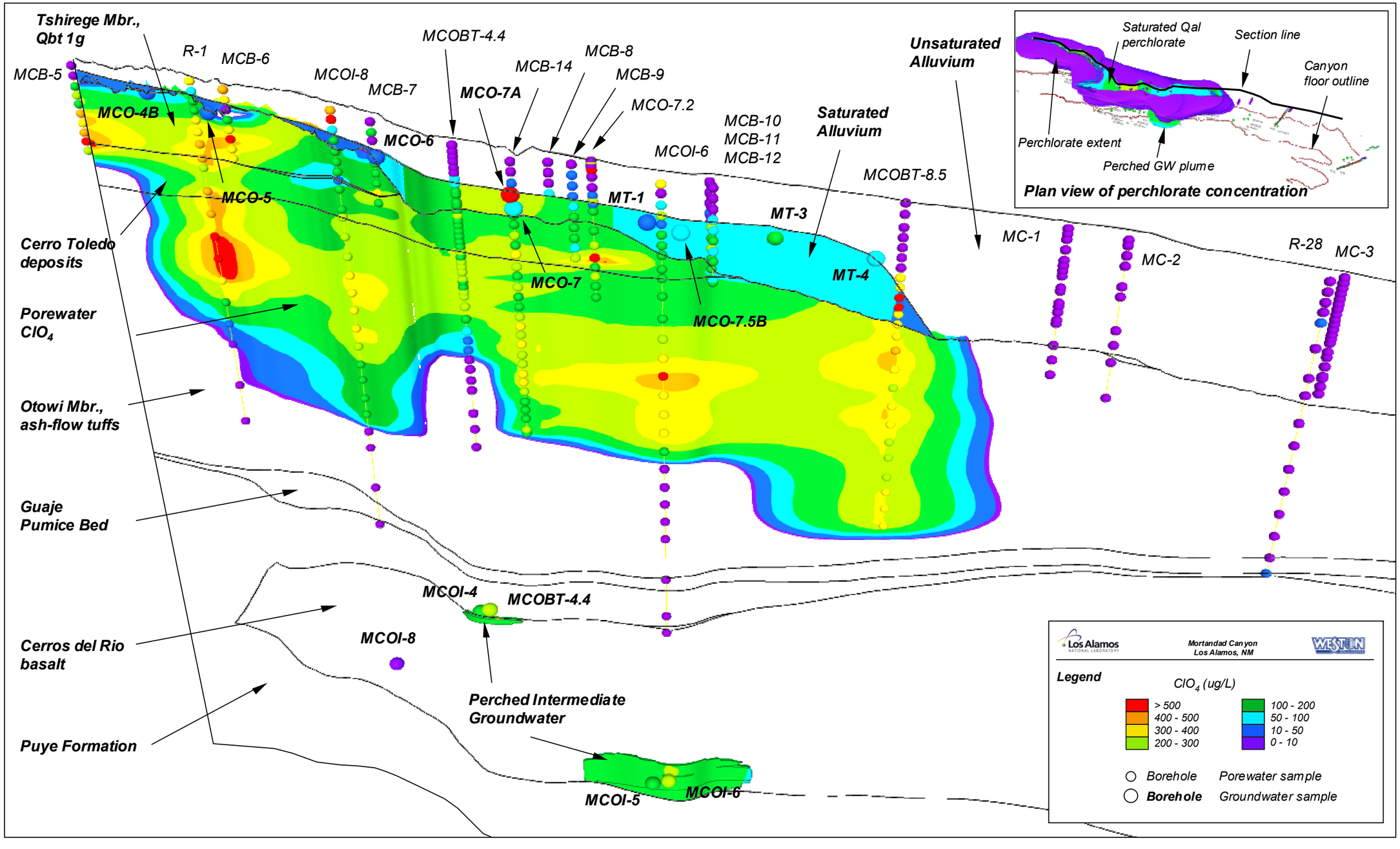


Figure 7.2-26. Cross section showing estimated perchlorate concentration (μg/L) in Mortandad Canyon vadose-zone pore water and perched-intermediate groundwater

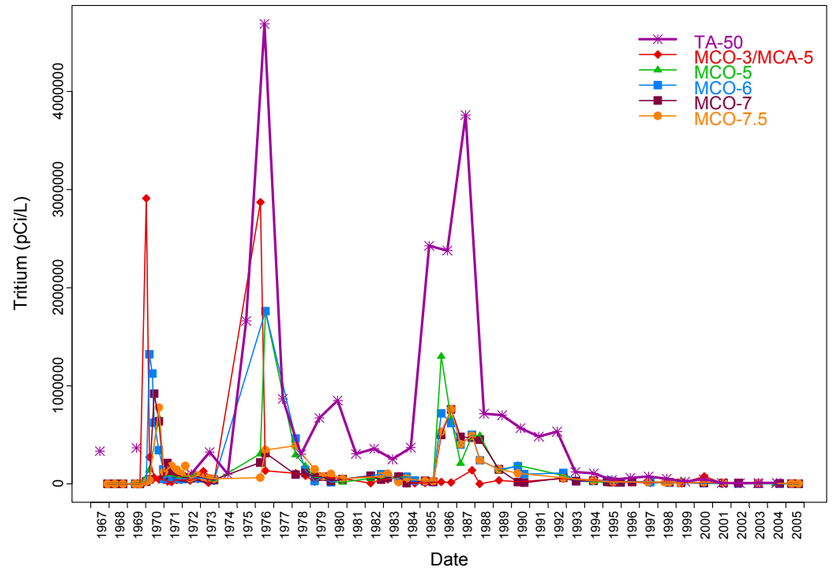


Figure 7.2-27. Comparison of tritium concentrations (pCi/L) in TA-50 RLWTF effluent to those in down-gradient alluvial wells - history since 1960s

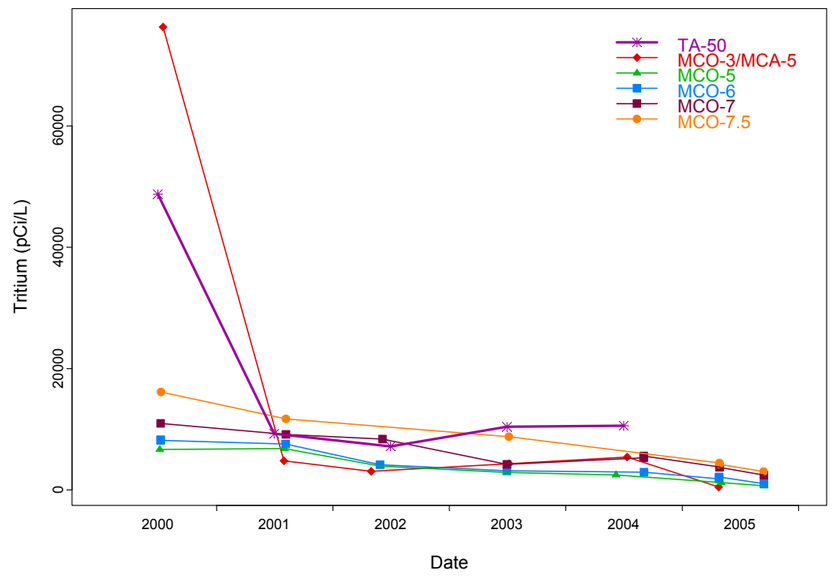


Figure 7.2-28. Comparison of tritium concentrations (pCi/L) in TA-50 RLWTF effluent to those in down-gradient alluvial wells - history since 2000

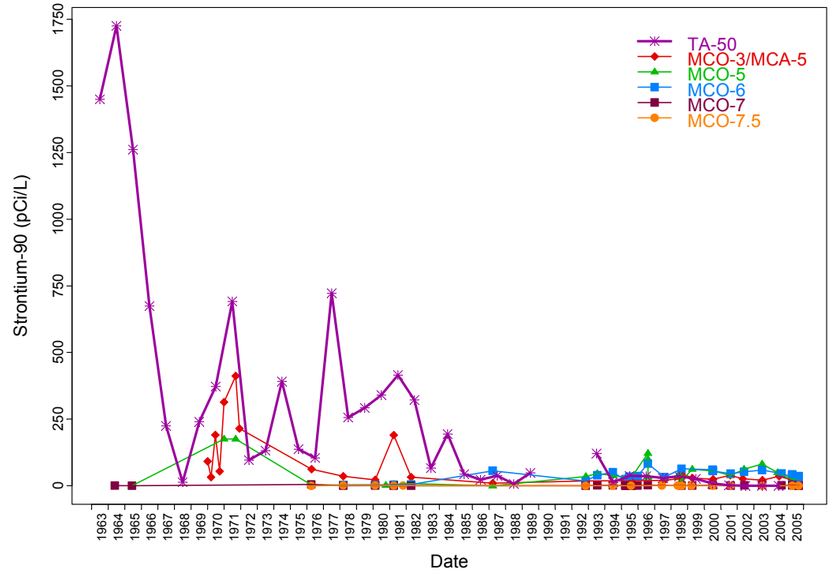


Figure 7.2-29. Comparison of strontium-90 concentrations (pCi/L) in TA-50 RLWTF effluent to those in down-gradient alluvial wells - history since 1960s

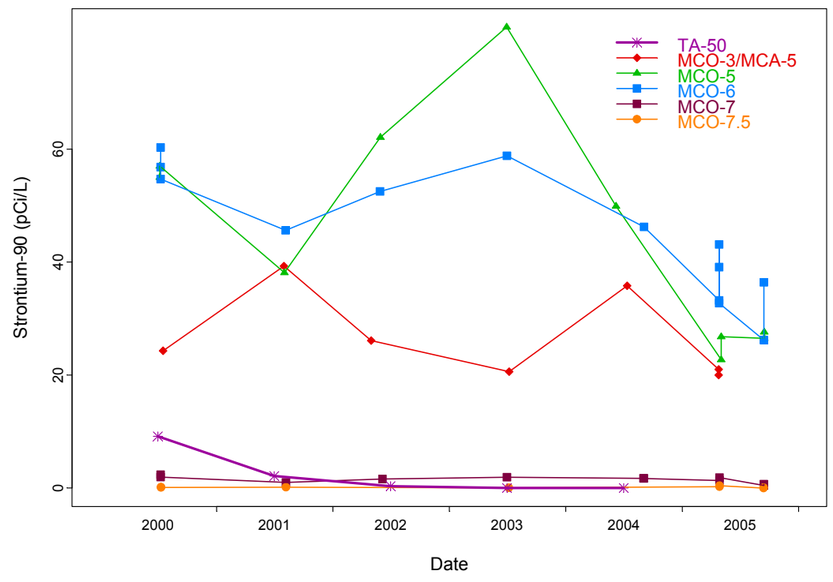


Figure 7.2-30. Comparison of strontium-90 concentrations (pCi/L) in TA-50 RLWTF effluent to those in down-gradient alluvial wells - history since 2000

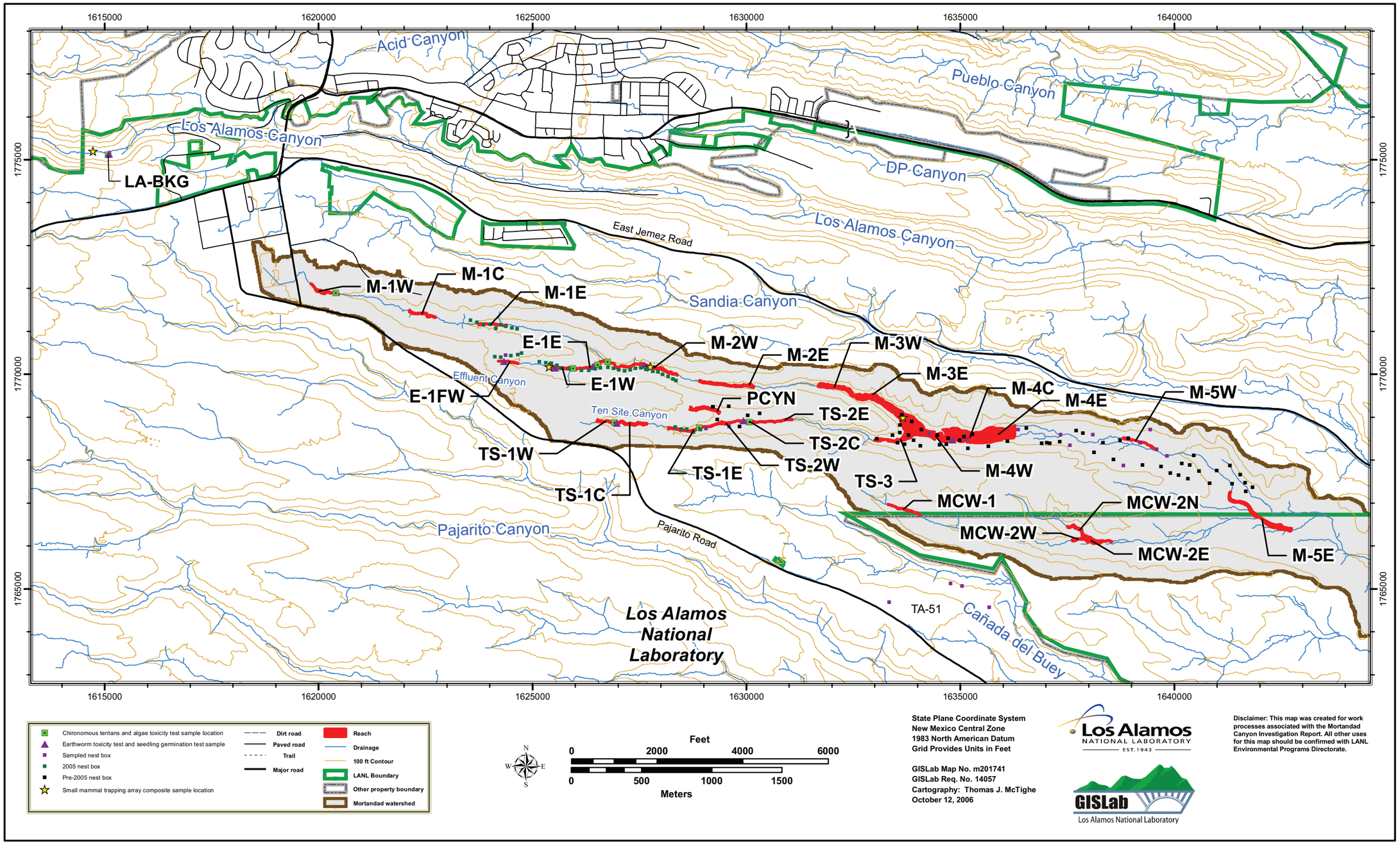


Figure 8.1-1. Map of reaches and sample locations

Key to Bird Species in Figures 8.1-2 to 8.1-11: ATFL = ash-throated flycatcher, HOFI = House Finch, HOWR = House wren, JUTI = juniper titmouse, MOBL = mountain bluebird, MOCH = mountain chickadee, PYNU = pygmy nuthatch, VGSW = violet-green swallow, WBNH = white-breasted nuthatch, WEBL = western bluebird

Key to Group Codes in Figures 8.1-2 to 8.1-11: M-# = reach # in Mortandad Canyon, TS-# = reach # in Ten Site Canyon, Mort = all of Mortandad Canyon, Cem = Cemetery, GC = Golf Course, CdB = Cañada del Buey, LA/P = Los Alamos and Pueblo Canyons, TA-35 = Technical Area 35, Other = boxes within nest box network but outside of areas listed above

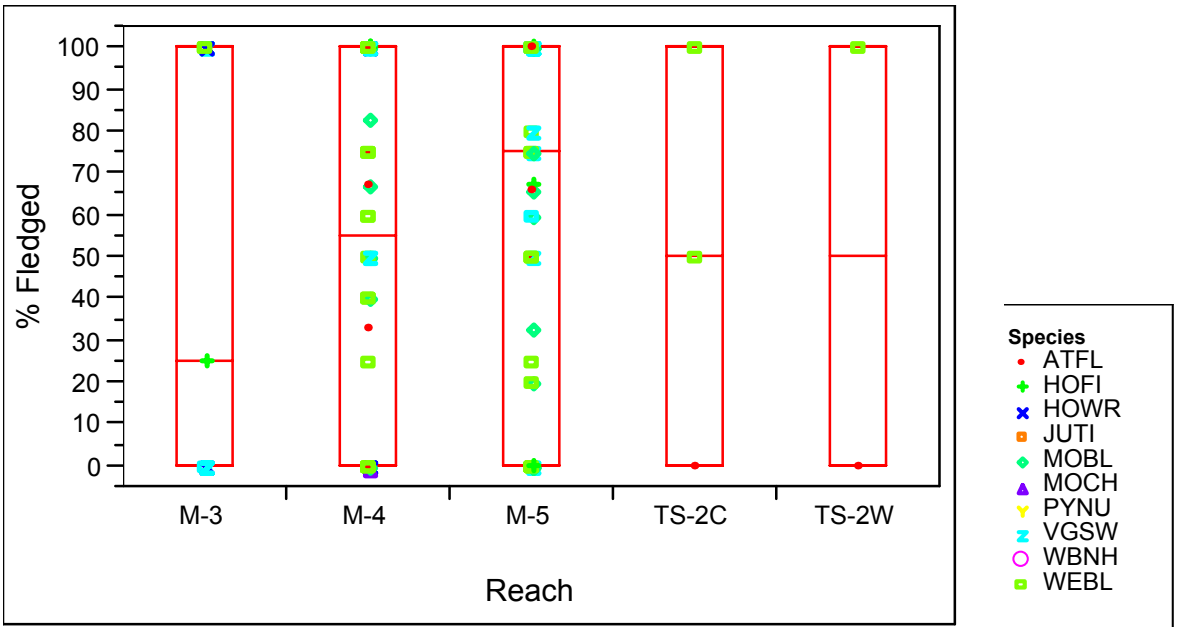


Figure 8.1-2. Box plots showing percent fledged by reach

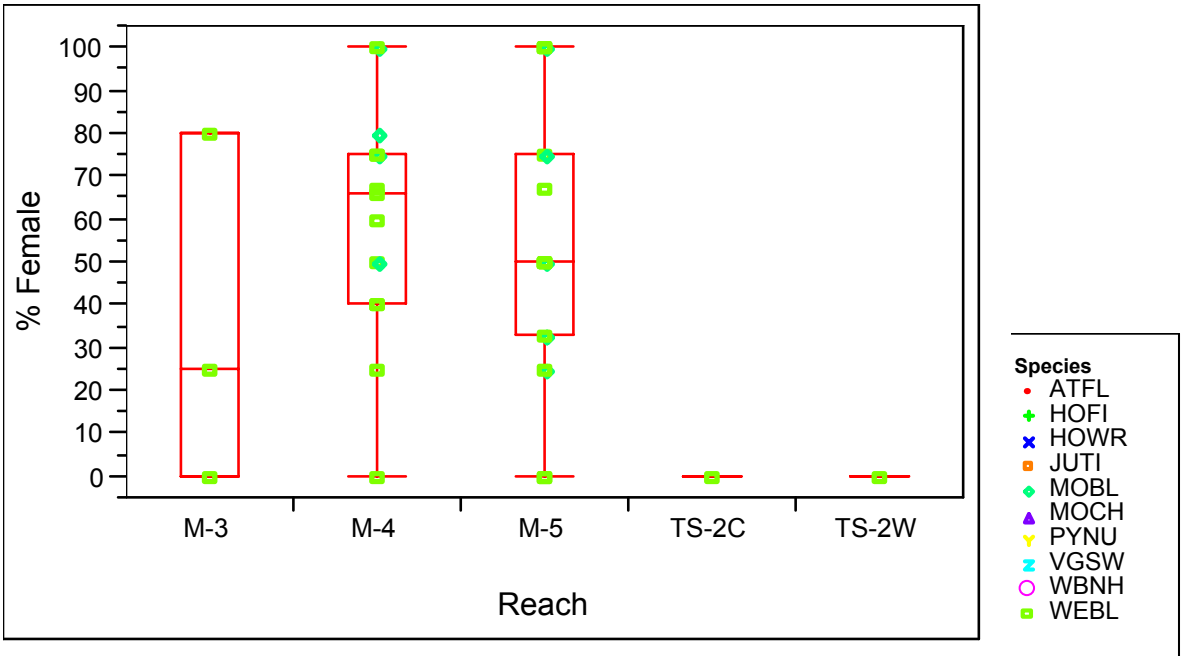


Figure 8.1-3. Box plots showing percent female by reach

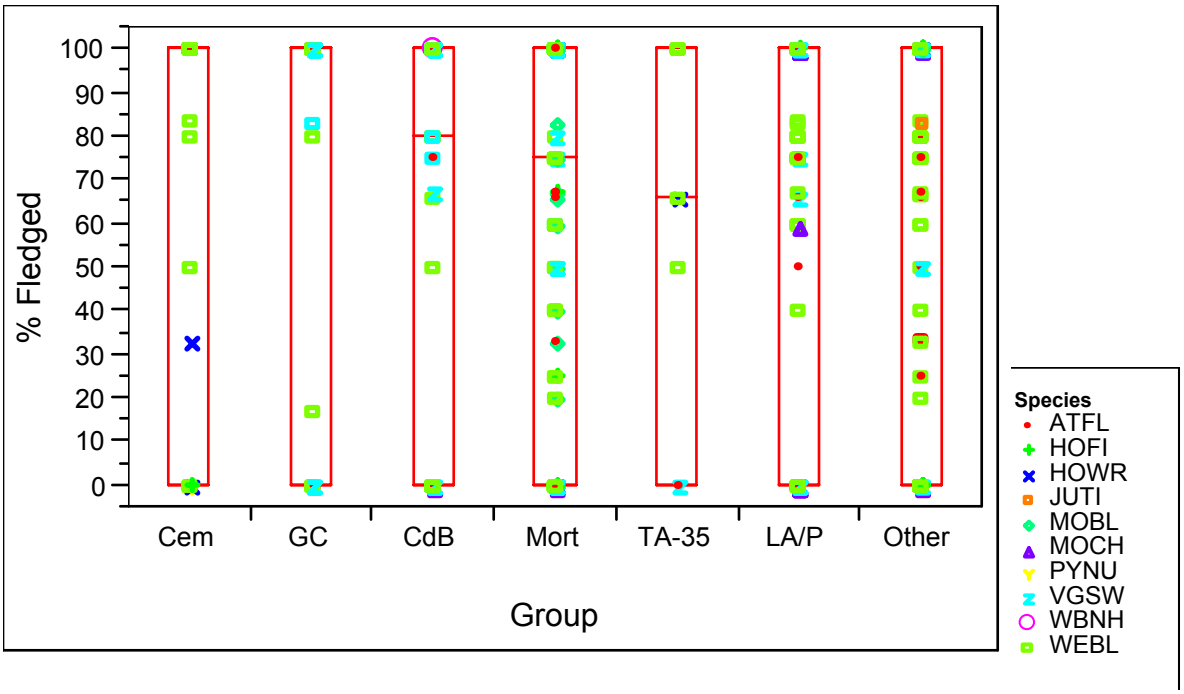


Figure 8.1-4. Box plots showing percent fledged by area (group)

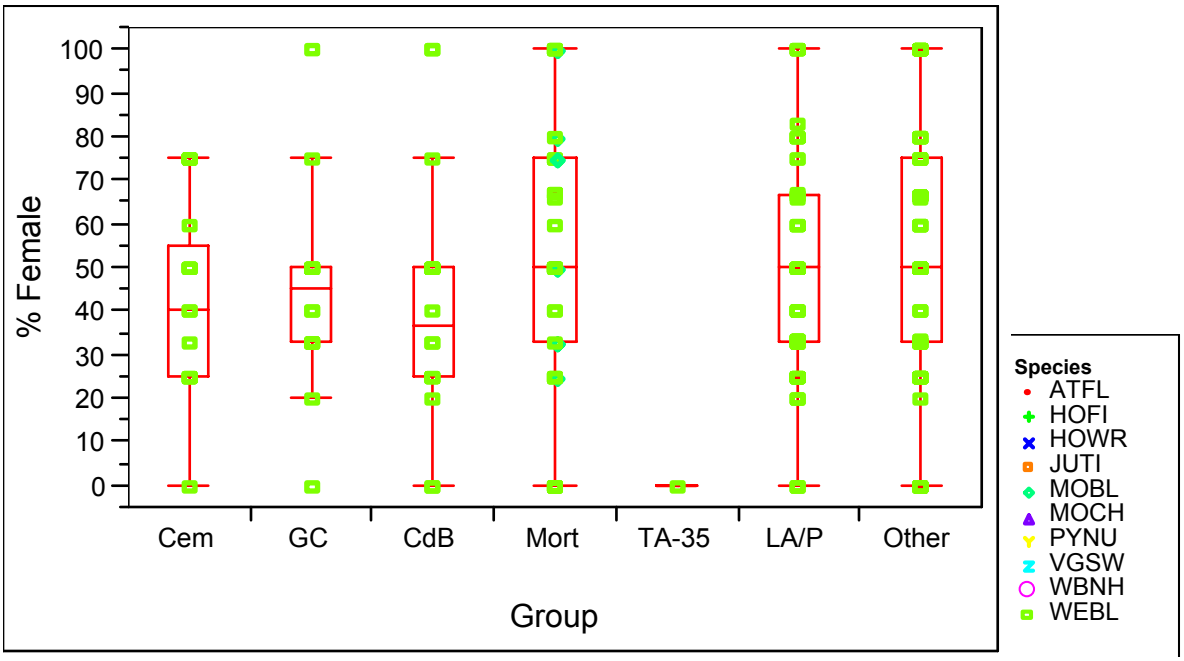


Figure 8.1-5. Box plots showing percent female by area (group)

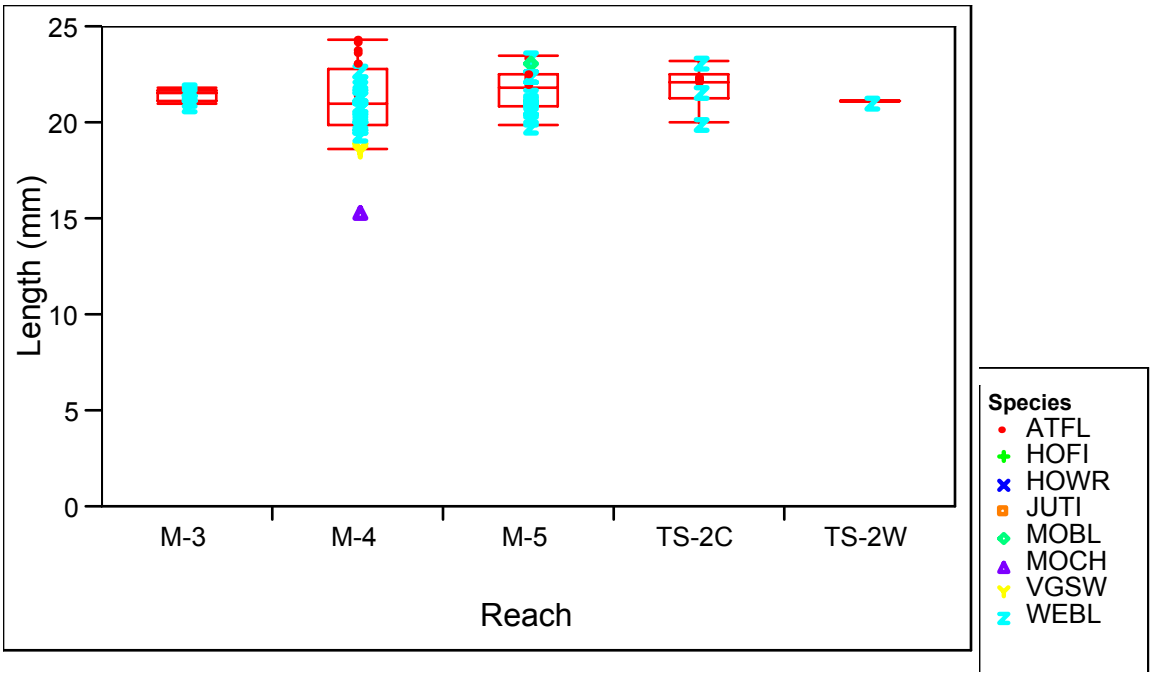


Figure 8.1-6. Box plots showing egg length by reach

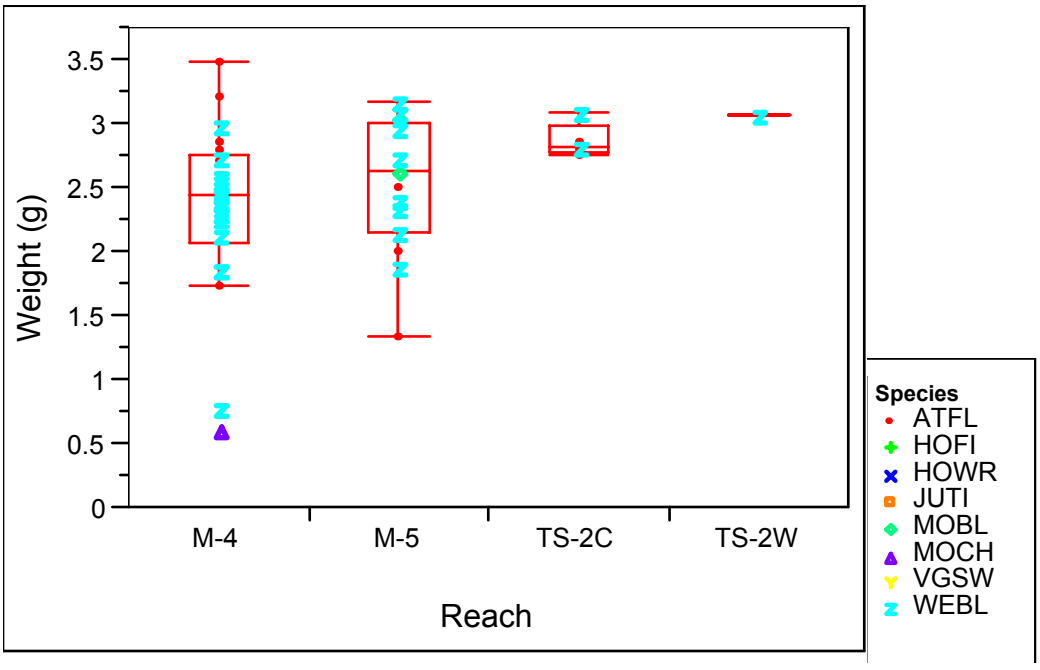


Figure 8.1-7. Box plots showing egg weight by reach

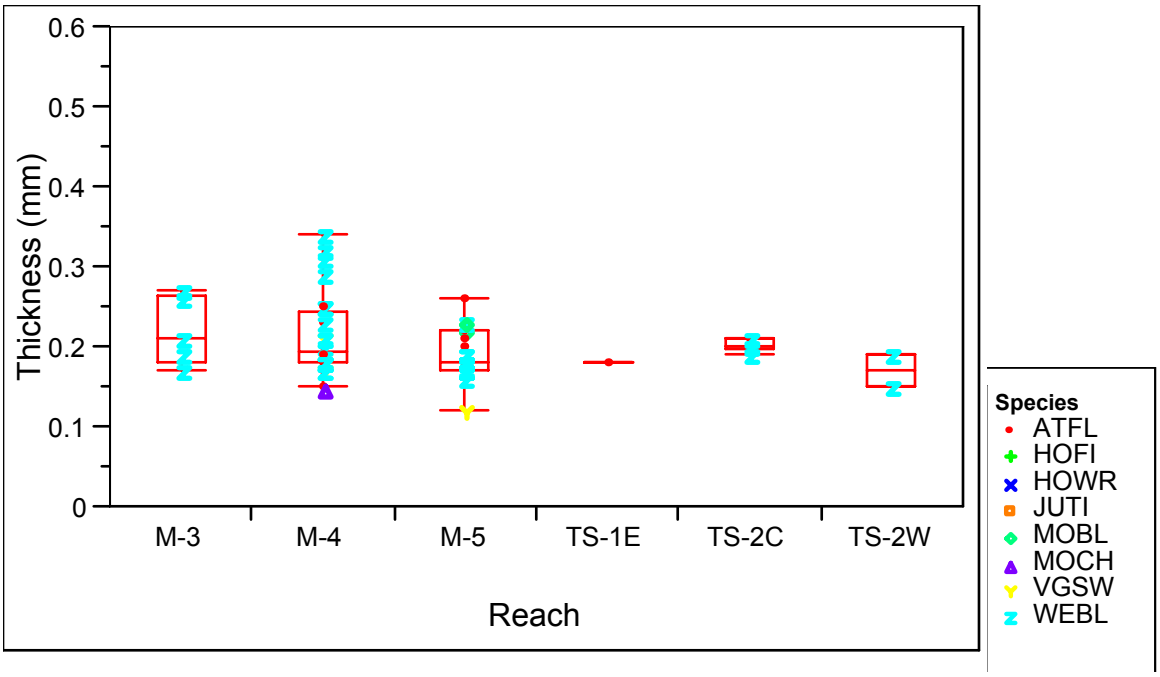


Figure 8.1-8. Box plots showing eggshell thickness by reach

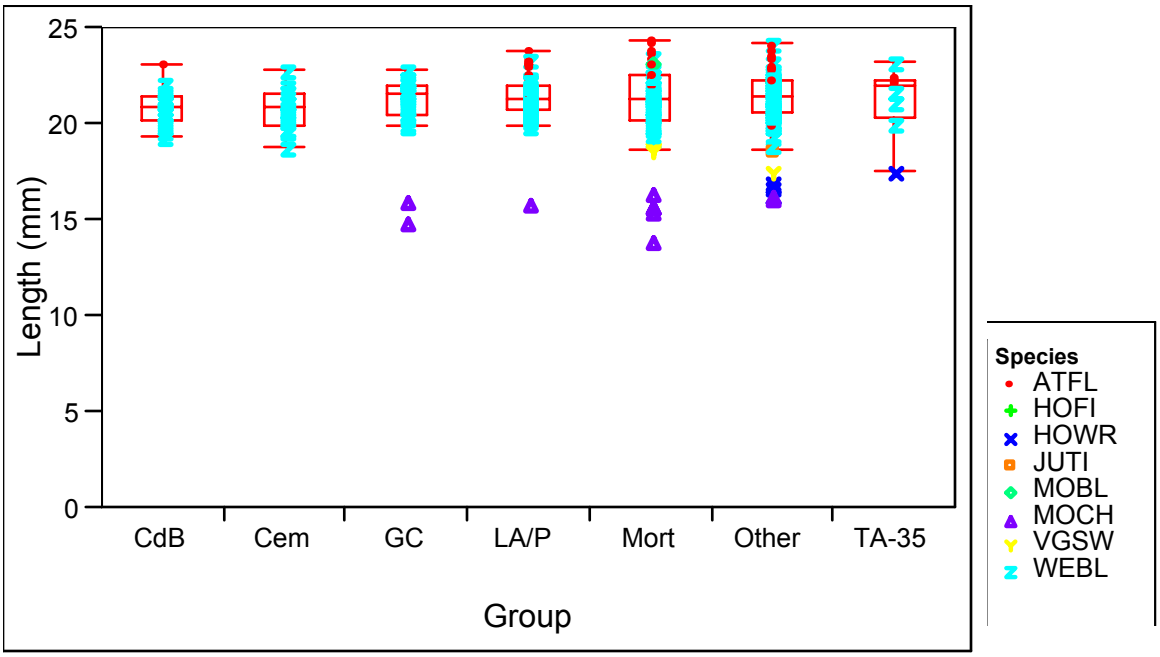


Figure 8.1-9. Box plots showing egg length by group

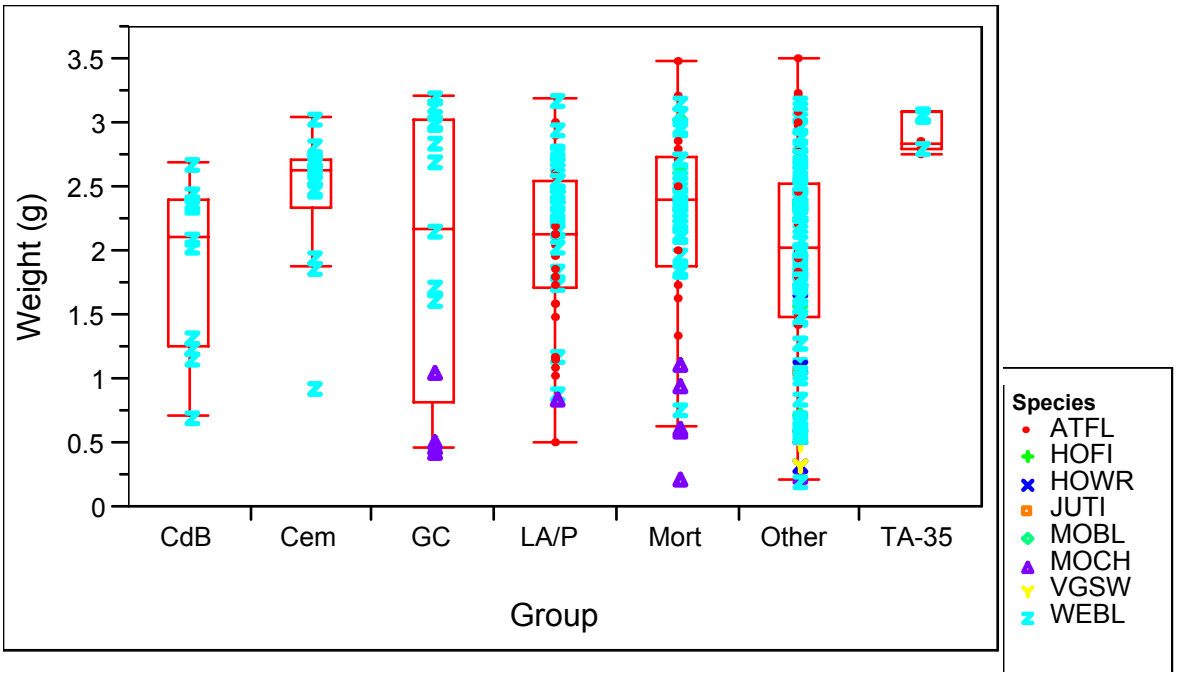


Figure 8.1-10. Box plots showing egg weight by group

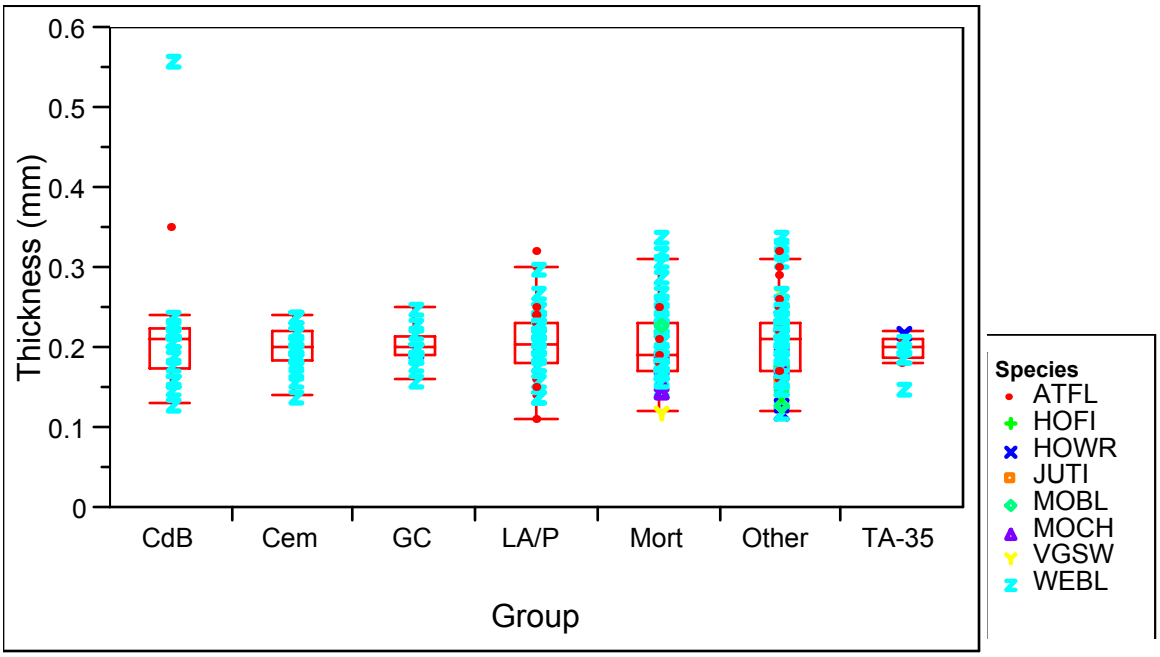


Figure 8.1-11. Box plots showing eggshell thickness by group.

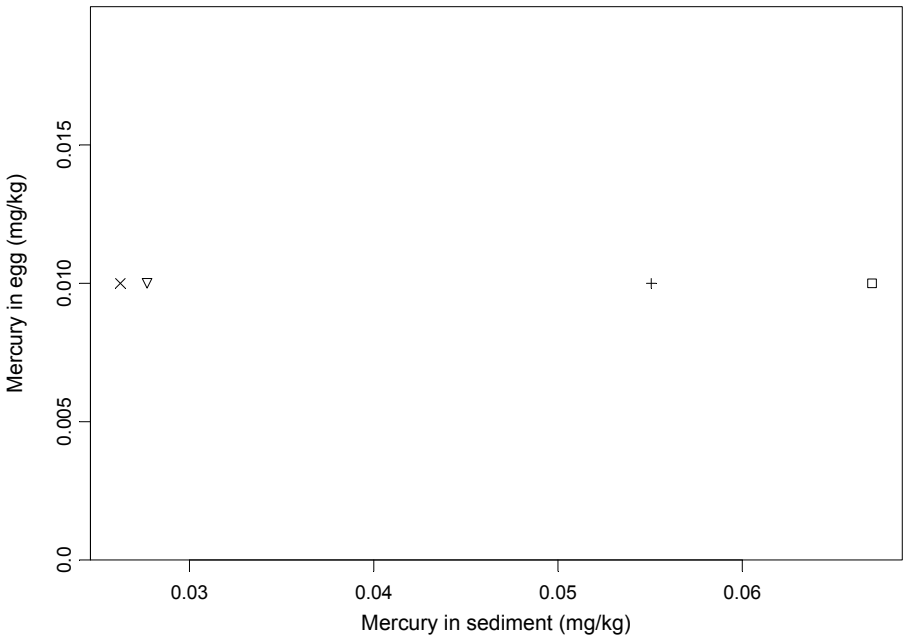


Figure 8.1-12. Concentration of mercury in egg contents

□ = E-1FW, + = M-4, × = M-5W,
△ = TS-1E, ▽ = TS-2W,

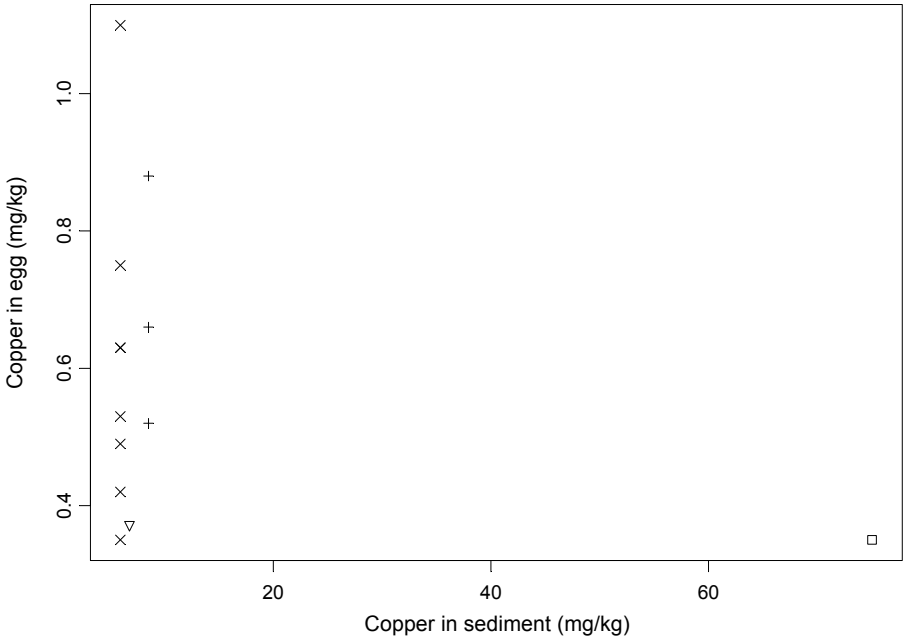


Figure 8.1-13. Concentration of copper in egg contents

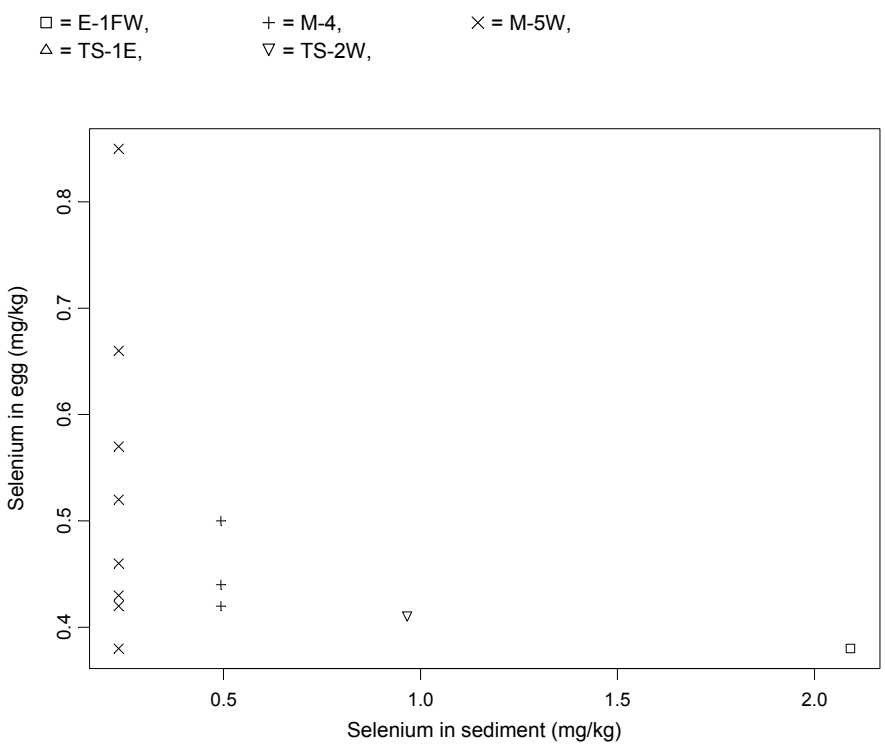


Figure 8.1-14. Concentration of selenium in egg contents

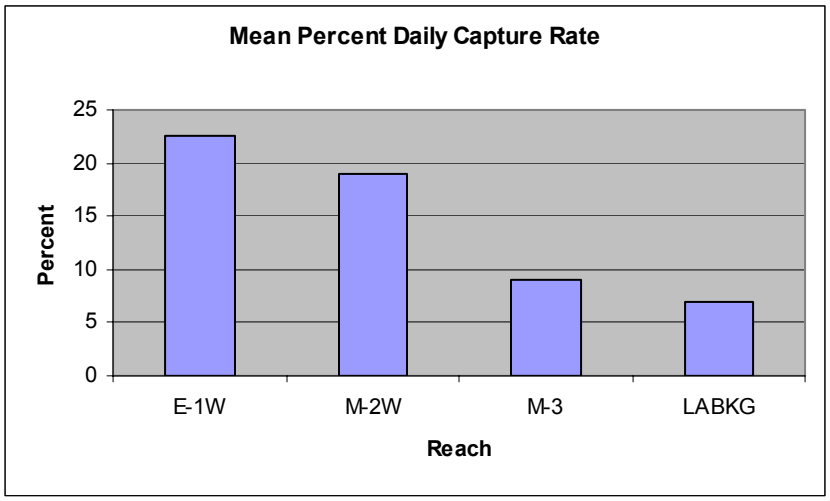


Figure 8.1-15. Mean percent daily capture rate for small mammals

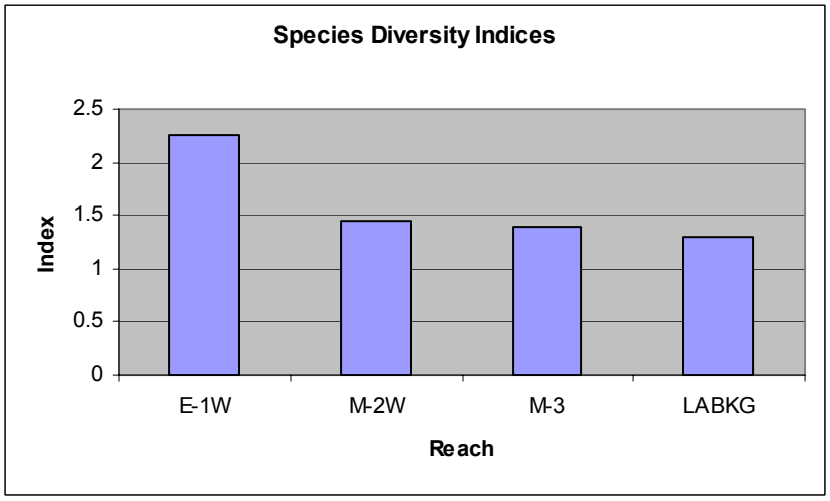


Figure 8.1-16. Small mammal species diversity

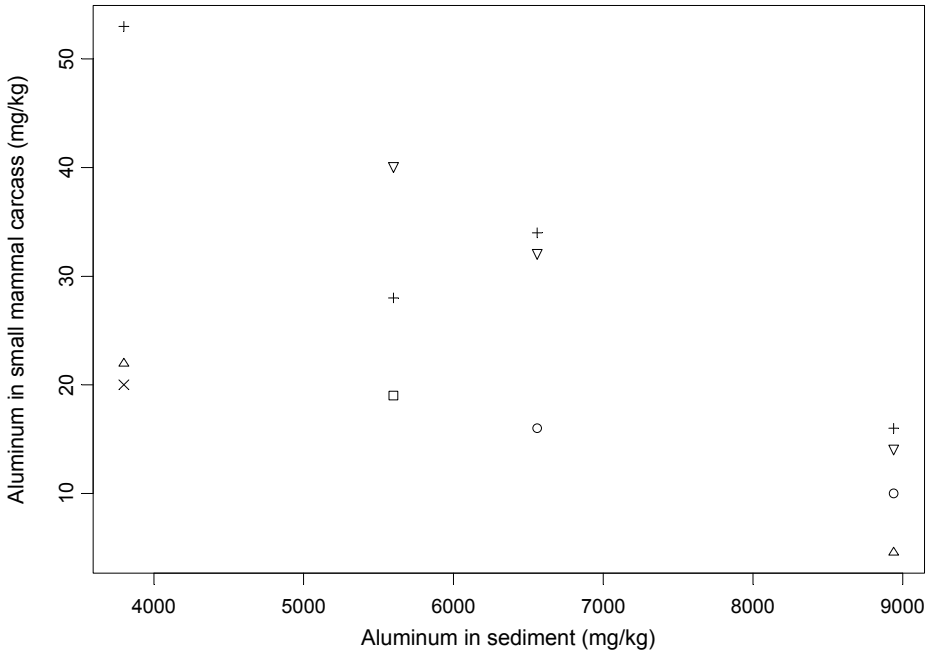


Figure 8.1-17. Aluminum in small mammal carcass versus sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, △ = long tailed vole, □ = western harvest mouse.

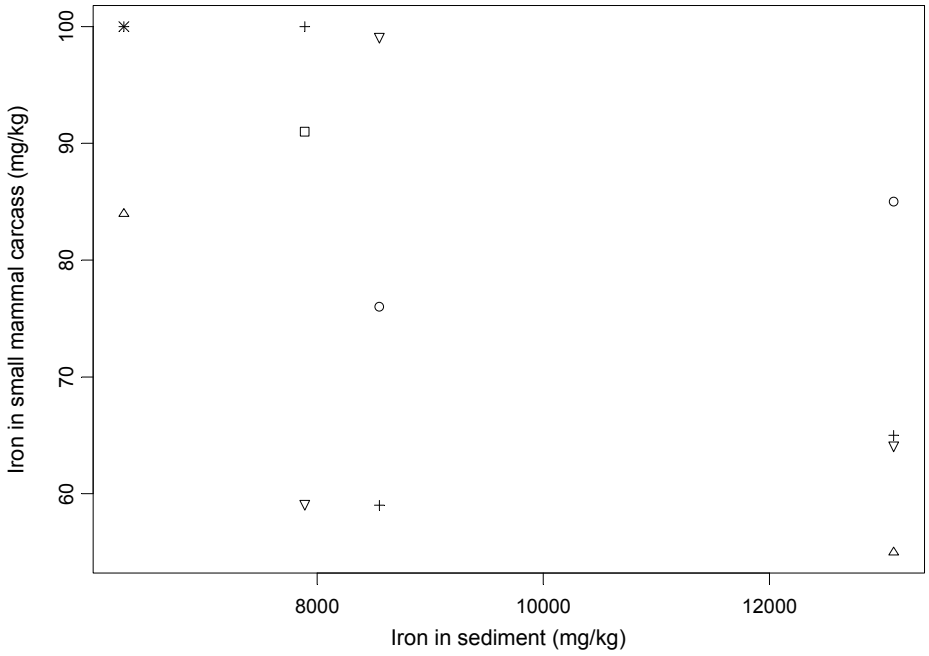


Figure 8.1-18. Iron in small mammal carcass versus sediment

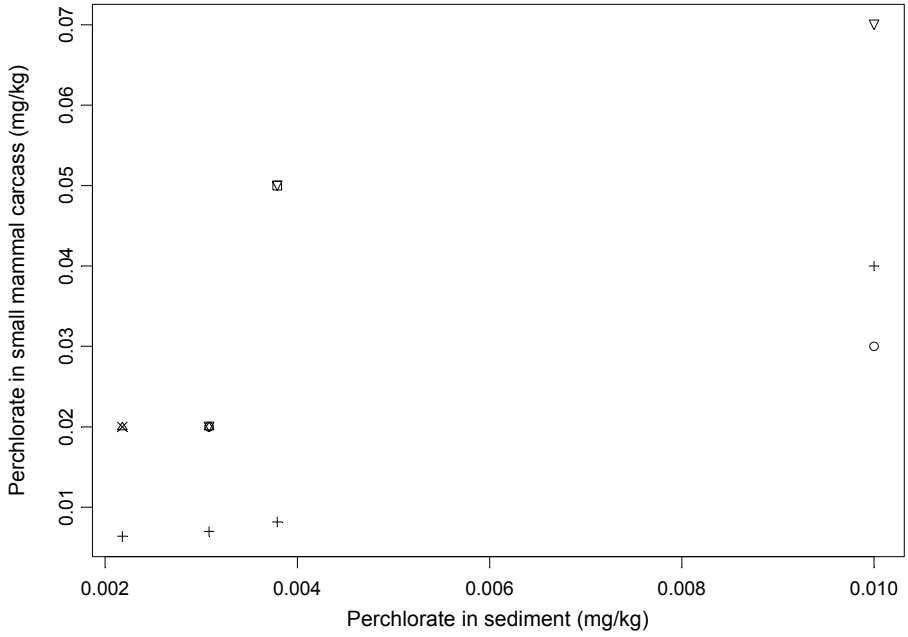
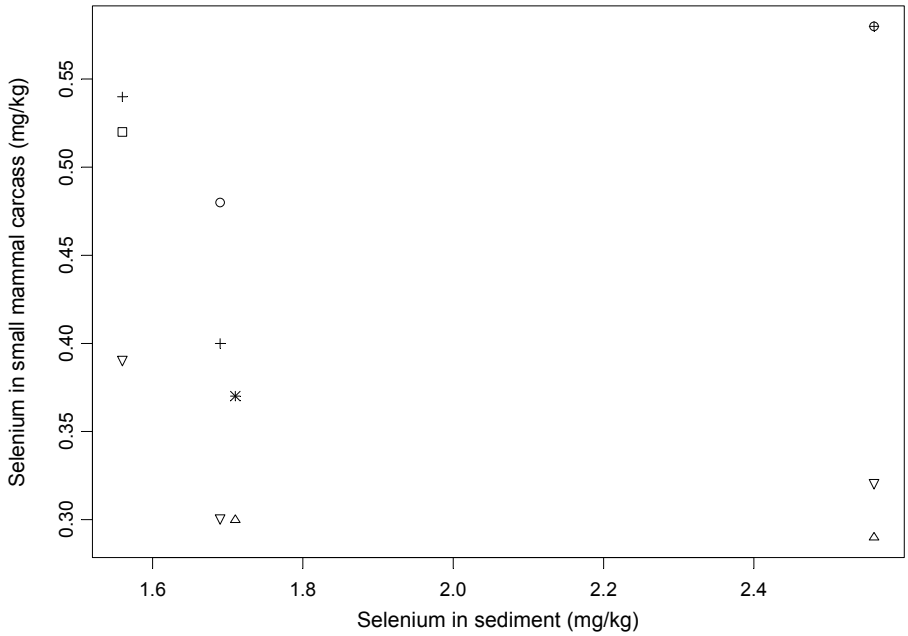


Figure 8.1-19. Perchlorate in small mammal carcass versus sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, △ = long tailed vole, □ = western harvest mouse.



○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, △ = long tailed vole, □ = western harvest mouse.

Figure 8.1-20. Selenium in small mammal carcass versus sediment

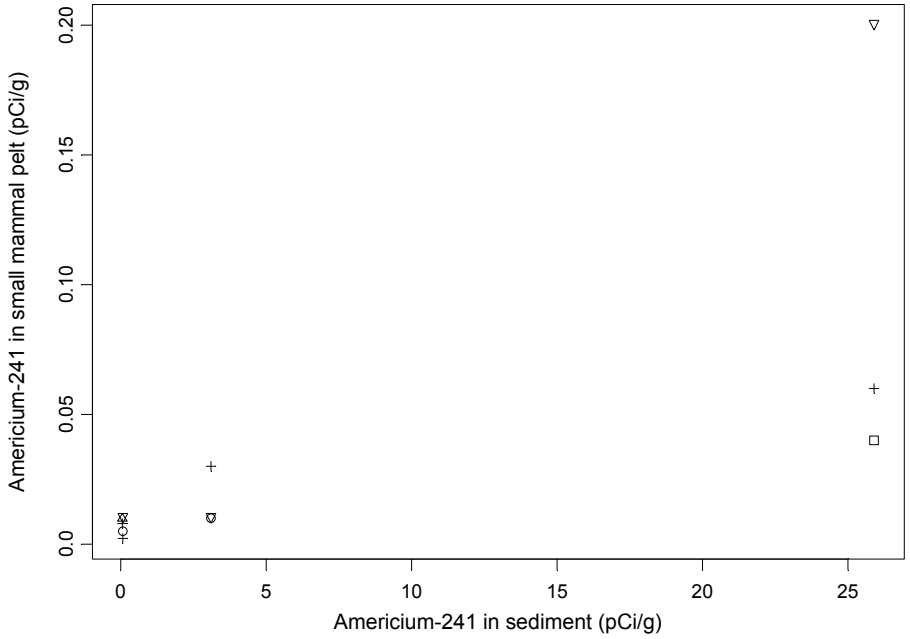
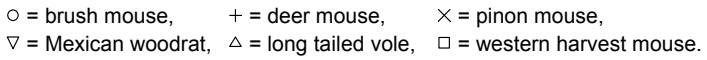


Figure 8.1-21. Concentration of americium-241 in small mammal pelt versus sediment concentration



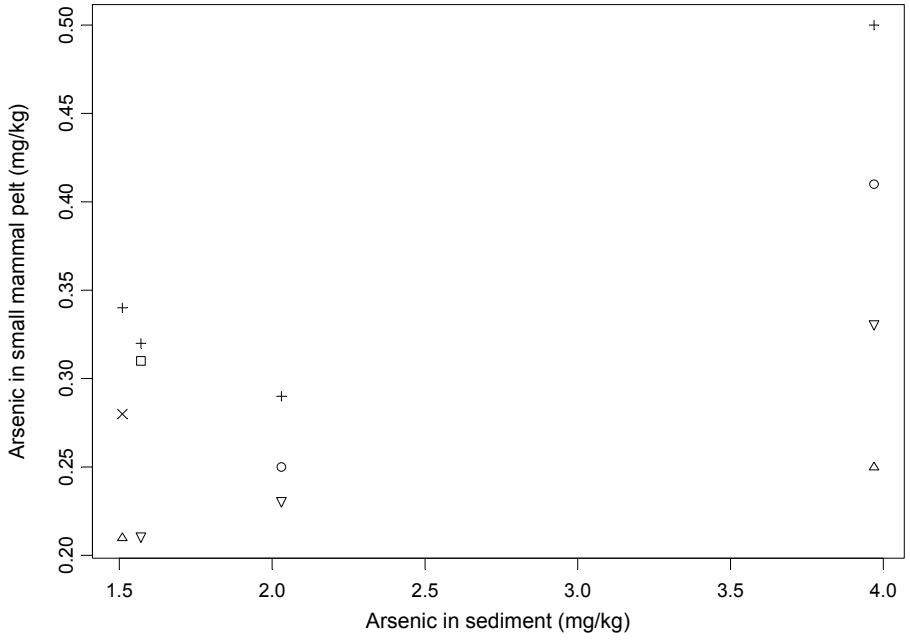


Figure 8.1-22. Concentration of arsenic in small mammal pelt versus sediment concentration

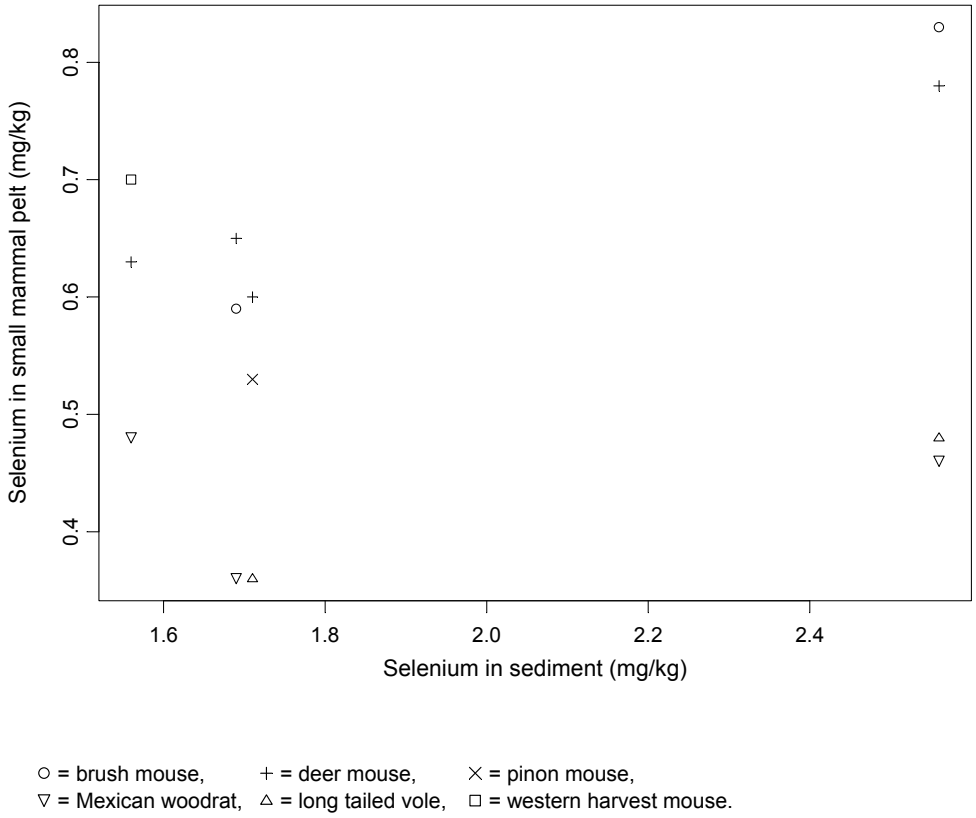


Figure 8.1-23. Concentration of selenium in small mammal pelt versus sediment concentration

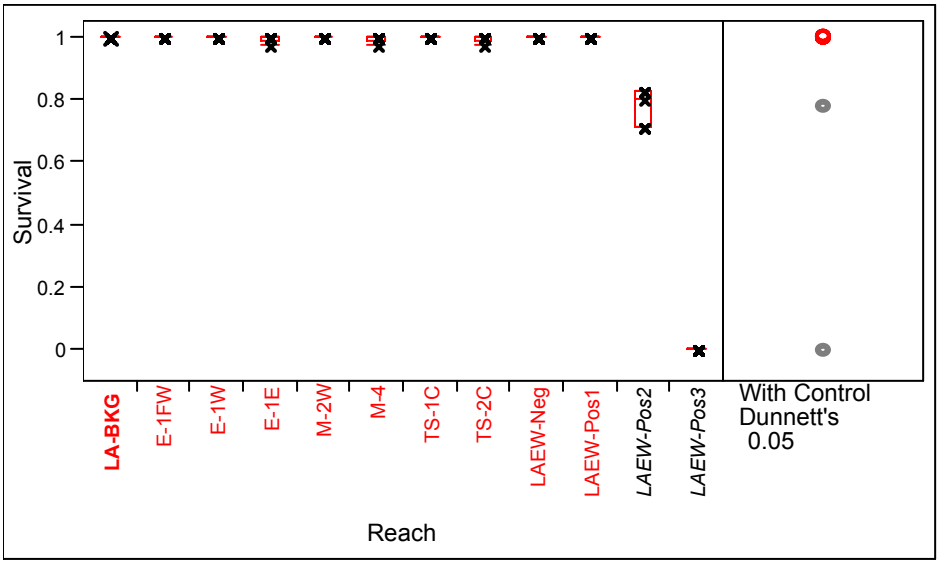


Figure 8.1-24. Survival of earthworms in toxicity test by reach

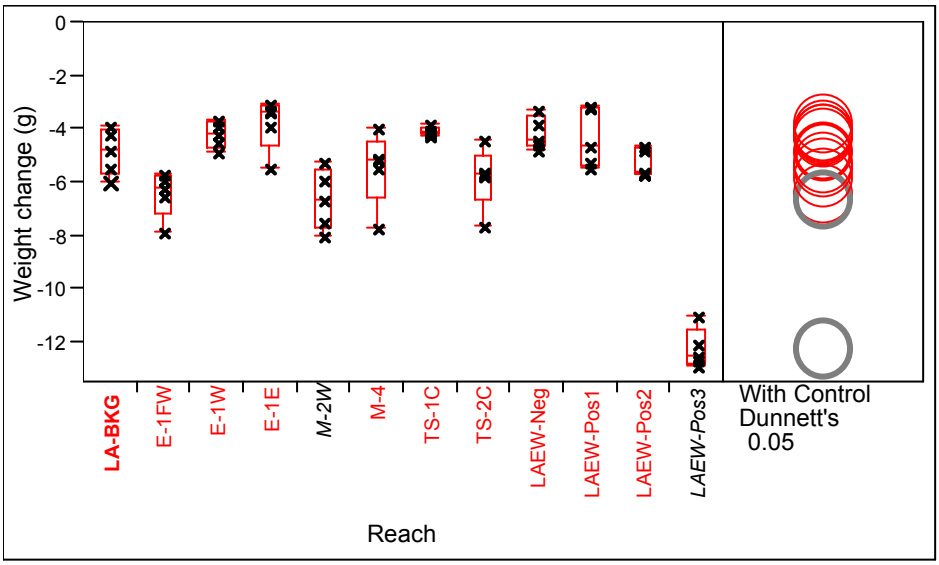
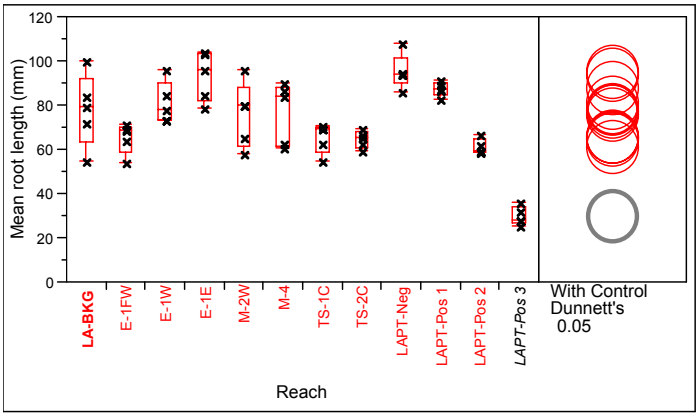
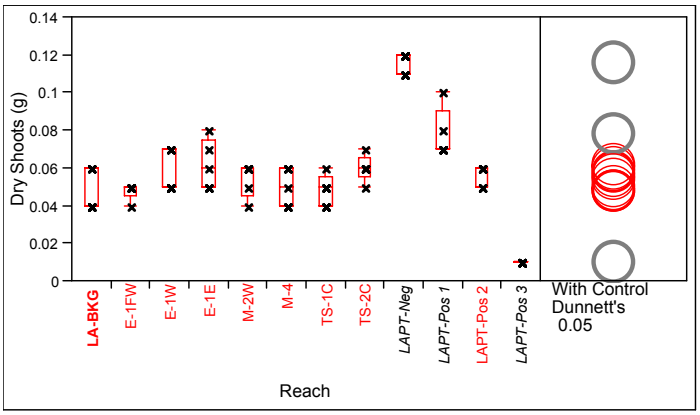


Figure 8.1-25. Weight change in earthworms during toxicity test by reach





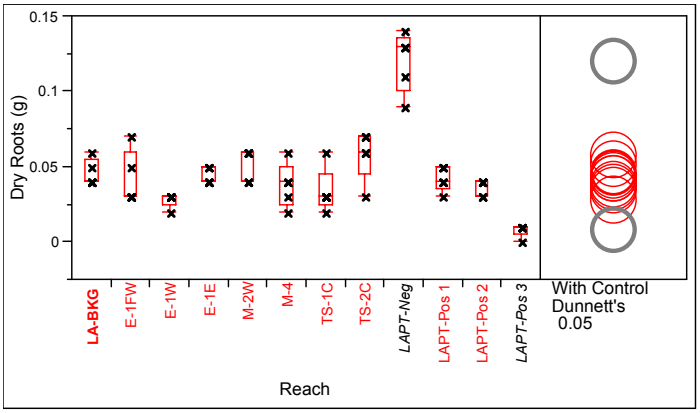


Figure 8.1-26. Plant Growth Parameters in toxicity test by reach

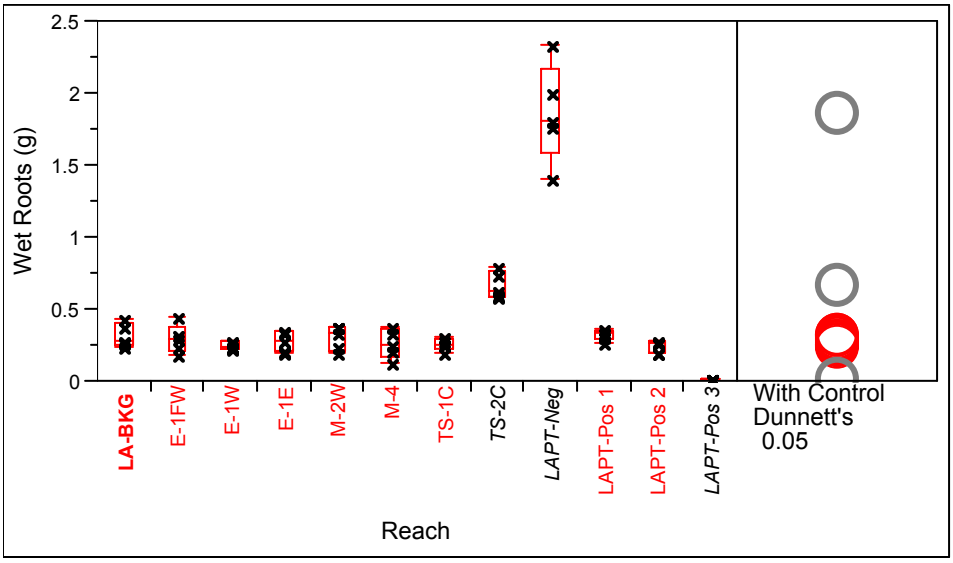


Figure 8.1-27. Wet root length by reach in plant toxicity test

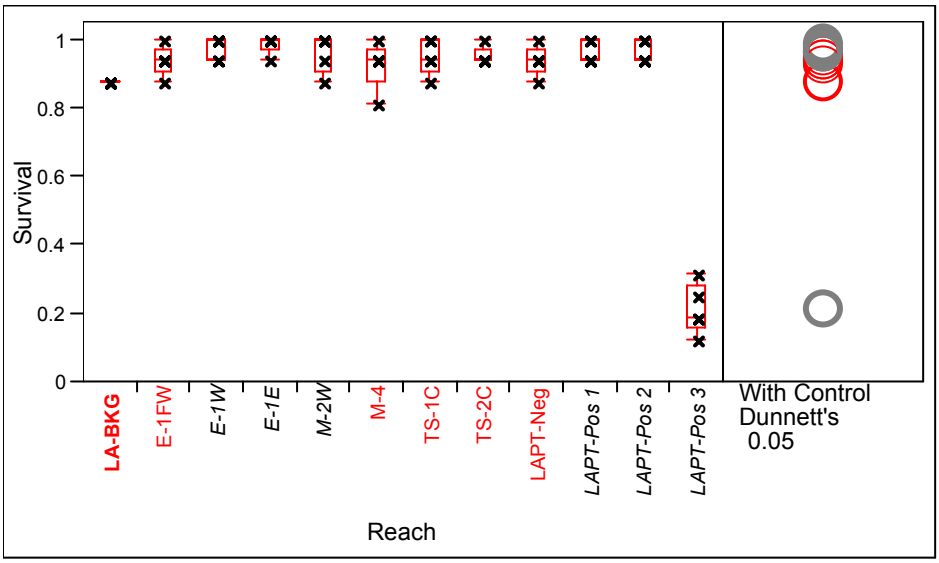


Figure 8.1-28. Fraction of Plants Surviving at end of Toxicity Test by reach

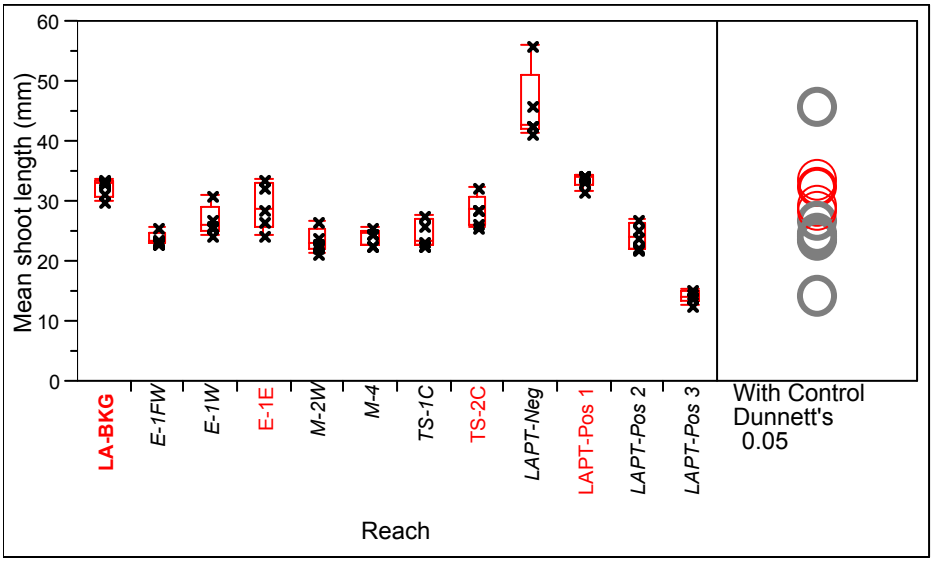


Figure 8.1-29. Mean shoot length of plants surviving at end of toxicity test by reach

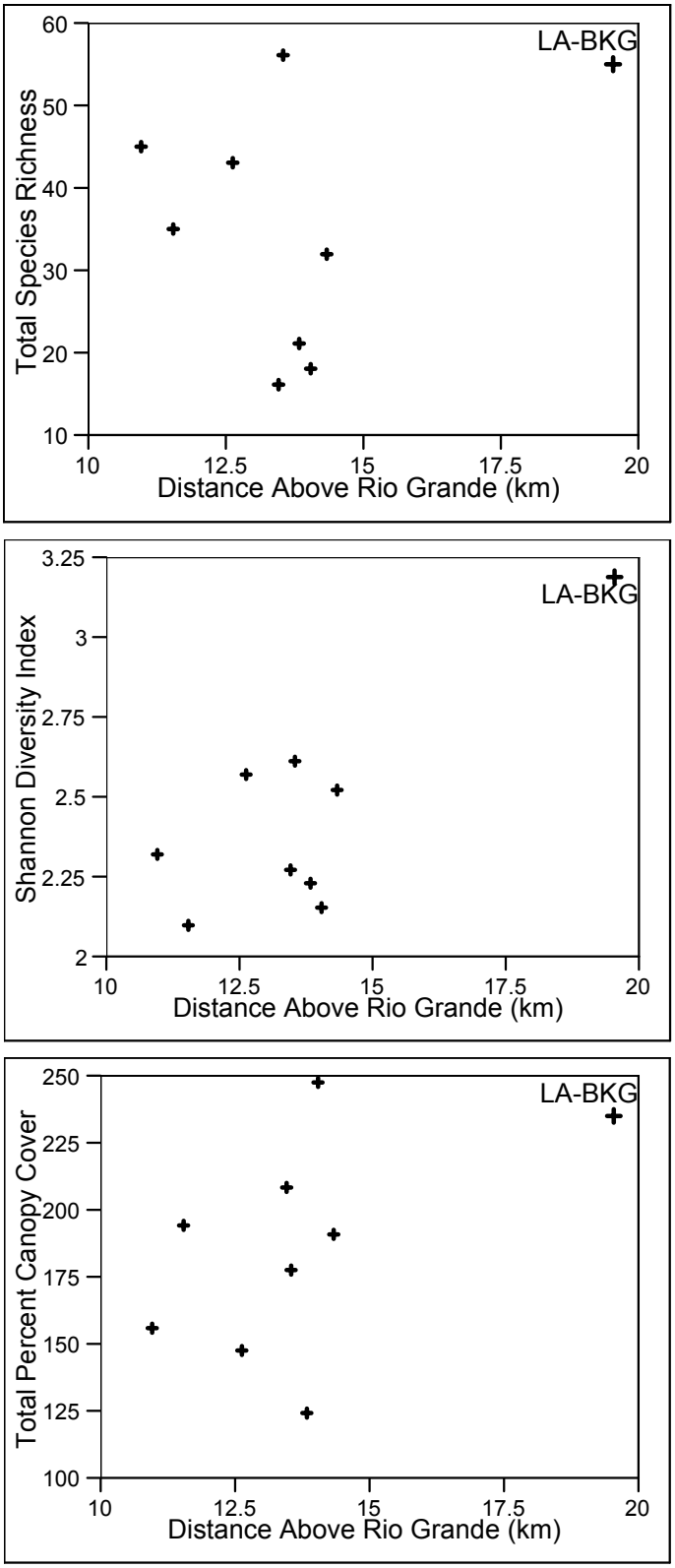


Figure 8.1-30. Scatter plots of plant field measures of diversity and cover versus distance from Rio Grande

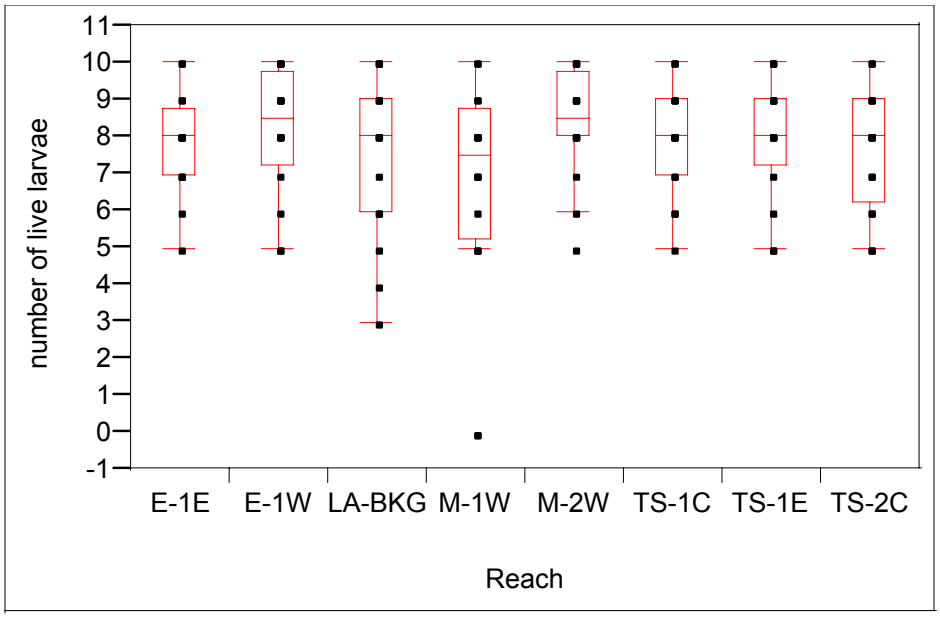


Figure 8.1-31. Number of live larvae at Conclusion of Chironomid Toxicity Test

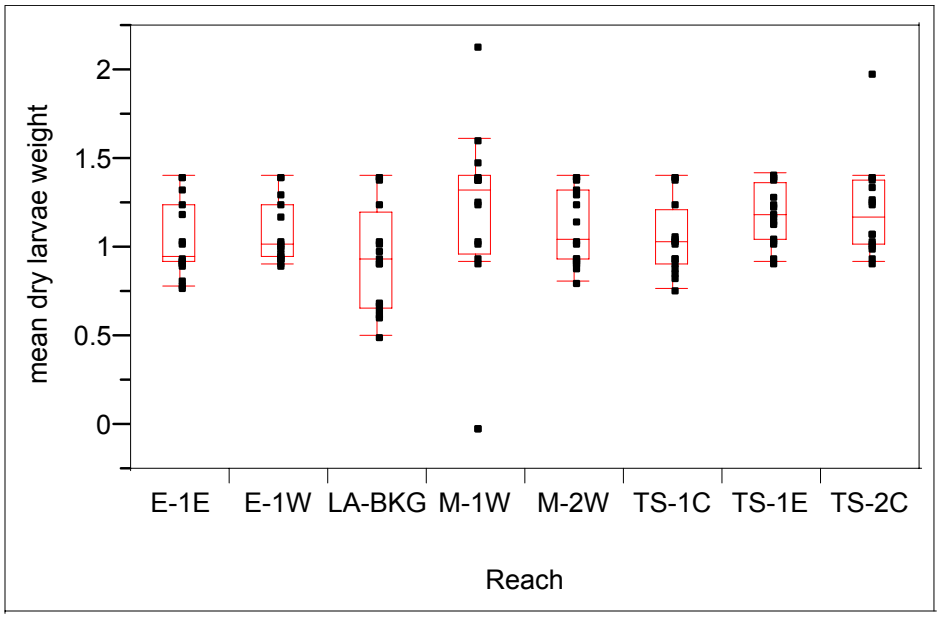


Figure 8.1-32. Box plot of mean dry larval weight (in mg) per Replicate after chironomid toxicity test

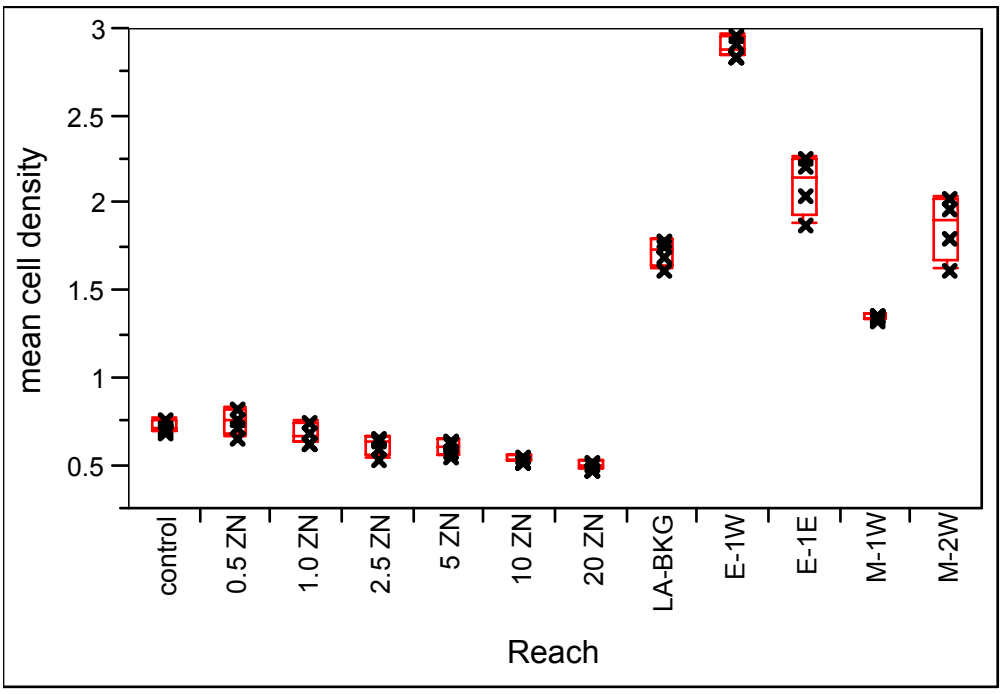


Figure 8.1-33. Box plot for mean algal cell density (in millions of cells/mL) at conclusion of July toxicity test

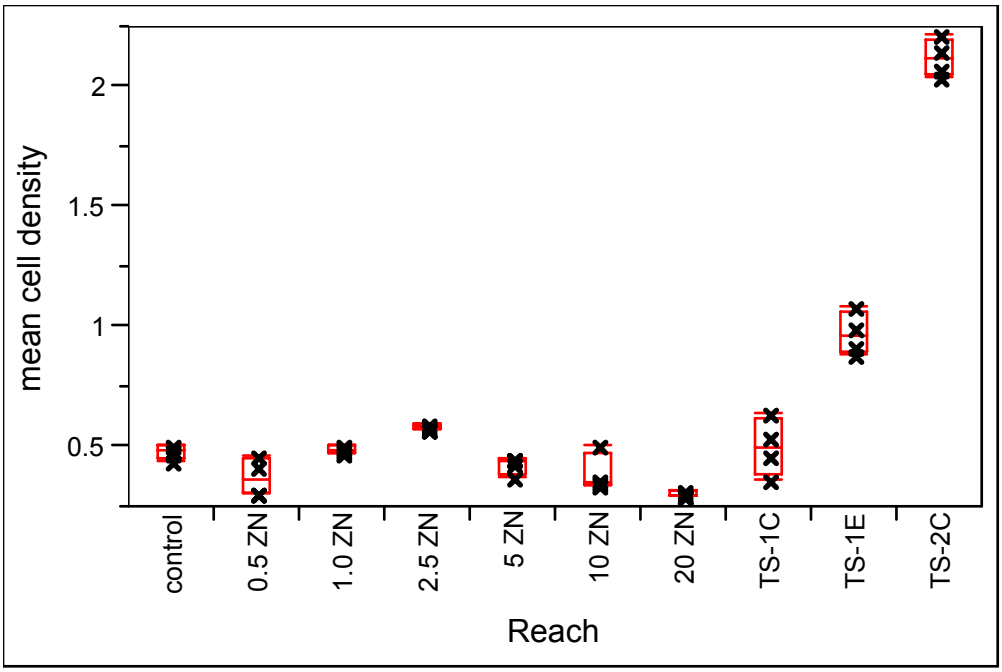


Figure 8.1-34. Box plot for mean algal cell density (in millions of cells/mL) at conclusion of August toxicity test

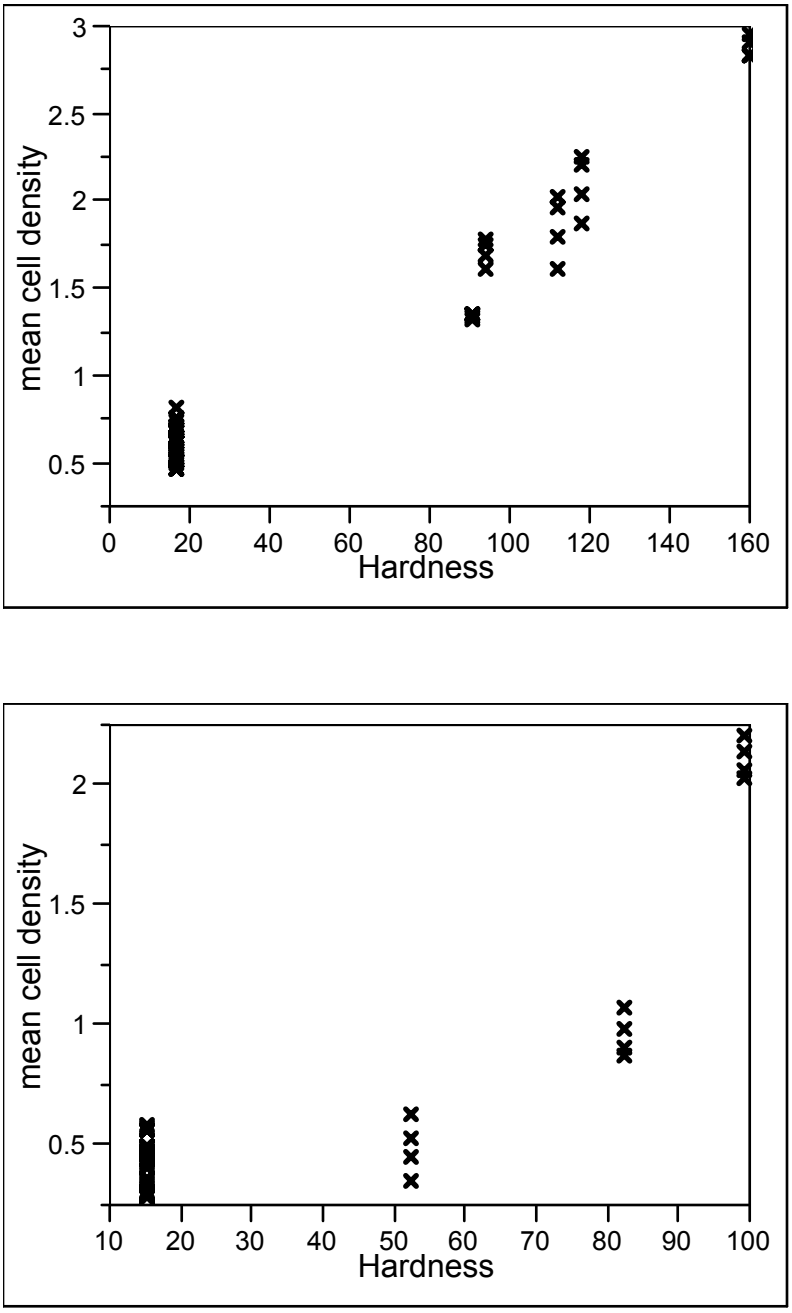


Figure 8.1-35. Bivariate fit of mean cell density (in millions of cells/mL) by hardness for July test (top panel) and August test (bottom panel)

Table 2.1-1
Annual Discharges Recorded for TA-50 RLWTF

Year	Discharge Volume (L)	^{241}Am (Ci)	^{137}Cs (Ci)	Gross Alpha (Ci)	Gross Beta/Gamma (Ci)	^{238}Pu (Ci)	^{239,240}Pu (Ci)	^{89}Sr (Ci)	^{90}Sr (Ci)	Total Tritium (Ci)	Total NO_3 as N (kg)
1963	2.74E+07	b	b	0.00371	0.1594	b	0.0016	0.1486	0.0397	b	b
1964	5.14E+07	b	b	0.0012	2.525	b	0.00194	0.06074	0.08865	b	1,126
1965	4.90E+07	b	b	0.00189	0.7084	b	0.00349	0.04229	0.06177	b	1,450
1966	5.28E+07	b	b	0.00209	0.3382	b	0.00162	0.02436	0.03558	b	596
1967	5.97E+07	b	b	0.00342	0.3091	b	0.00422	0.0535	0.0134	20	741
1968	6.03E+07	b	b	0.00257	0.2858	b	0.00259	0.0326	0.00082	b	858
1969	5.45E+07	b	b	0.0066	0.2893	b	0.00678	0.0546	0.0131	20	1,612
1970	5.32E+07	b	b	0.0033	0.1614	b	0.00498	0.0136	0.0198	b	6,618
1971	4.57E+07	b	b	0.00394	1.849	b	0.00691	0.01253	0.03159	b)	3,838
1972	5.71E+07	b	b	0.00513	0.3747	0.00769	0.00102	0.00352	0.0055	5.97	9,875
1973	5.37E+07	0.00136	0.2927	0.00424	0.9586	0.00839	0.00058	0.00455	0.0071	17.47	3,762
1974	4.06E+07	0.00166	0.156	b	0.181	0.0114	0.00039	0.00287	0.0159	4.05	2,660
1975	3.97E+07	0.00113	0.174	b	0.12	0.0148	0.00067	0.0017	0.00544	66.00	b
1976	3.99E+07	0.00114	0.193	b	0.0155	0.00748	0.00105	0.00092	0.00417	187.00	b
1977	4.21E+07	0.00193	0.142	b	0.0763	0.00257	0.00147	0.00226	0.0304	36.50	4,199
1978	4.05E+07	0.00173	0.317	b	0.0963	0.00405	0.00183	0.00264	0.0104	12.30	3,649
1979	4.86E+07	0.00468	0.17	b	0.0707	0.00055	0.00171	0.00607	0.0142	32.70	7,578
1980	5.28E+07	0.0057	0.132	b	b	0.0013	0.0082	0.0409	0.018	44.90	9,298
1981	5.53E+07	0.023	0.12	b	b	0.0029	0.055	0.042	0.023	17.00	14,496
1982	3.98E+07	0.0178	0.209	b	b	0.003	0.0166	0.0118	0.0128	14.20	13,320
1983	3.45E+07	0.038	b	b	b	0.011	0.042	0.057	0.0023	8.70	13,248
1984	3.50E+07	0.0082	b	b	b	0.0061	0.0081	0.26	0.0068	13.00	11,595
1985	2.86E+07	0.00542	b	b	b	0.00393	0.00575	0.00904	0.00125	69.40	10,754
1986	3.05E+07	0.00324	0.018	b	b	0.0015	0.00355	0.0092	0.00069	72.50	12,505

Table 2.1-1 (continued)

Year	Discharge Volume (L)	^{241}Am (Ci)	^{137}Cs (Ci)	Gross Alpha (Ci)	Gross Beta/Gamma (Ci)	^{238}Pu (Ci)	^{239,240}Pu (Ci)	^{89}Sr (Ci)	^{90}Sr (Ci)	Total Tritium (Ci)	Total NO_3 as N (kg)
1987	2.66E+07	0.0036	0.0081	b	b	0.0014	0.0032	0.064	0.001	100.00	12,662
1988	2.93E+07	0.0037	0.031	b	b	0.0011	0.0032	0.081	0.0002	21.00	11,251
1989	2.28E+07	0.0041	0.039	b	b	0.00051	0.002	0.018	0.0011	16.00	11,126
1990	2.11E+07	0.0027	0.0125	b	b	0.0002	0.0006	b	b	12.00	6,267
1991	2.19E+07	0.0011	0.067	b	b	0.0003	0.001	b	b	10.60	3,592
1992	1.99E+07	0.00027	0.0005	b	b	0.00032	0.00039	b	b	10.63	4,060
1993	2.17E+07	0.0112	0.00817	0.0124	0.0231	0.00058	0.00049	0.00263	0.00263	2.66	7,821
1994	2.08E+07	0.00306	0.00851	0.00523	0.0851	0.00281	0.00046	0.00196	0.000285	2.23	948
1995	1.76E+07	0.0034	0.00662	0.00531	0.02348	0.0034	0.0006	0.00012	0.000651	0.73	1,440
1996	1.65E+07	0.00199	0.0022	0.005036	0.010988	0.00225	0.00039	0.00066	0.0006	1.02	1,260
1997	1.75E+07	0.00256	0.00248	0.005713	0.009524	0.00134	0.0008	0.00083	0.0005	1.33	1,220
1998	2.32E+07	0.002	0.001	0.006272	0.018301	0.002	0.00091	0.002	0.00082	1.23	1,420
1999	2.00E+07	0.0011	0.0015	0.004977	0.011468	0.0024	0.0014	0.00036	0.00052	0.49	486
2000	1.86E+07	0.000041	0.0031	0.000219	0.002712	0.000063	0.000035	0.000332	0.00017	0.91	47
2001	1.36E+07	0.000056	0.000213	0.000248	0.006944	0.000074	0.000024	0.000039	0.000029	0.13	53
2002	1.10E+07	0.000114	0.000582	b	b	0.000073	0.000024	0.000004	0.000003	0.07898	17.31
2003	1.12E+07	0.000055	0.000614	b	b	0.000109	0.000043	0.0	0.0	0.1171	12.8
2004	8.17E+06	0.000013	0.000085	b	b	0.000018	0.000011	0.0	0.0	0.0865	36.7
2005	6.8E+06	0.00003	0.000039	b	b	0.000003	0.000002	0.0	0.0	0.0215	25.1
MinTotal	1.43E+09	0.156	2.12	0.0835	8.71	0.1056	0.1977	1.069	0.4709	823	197,498

Table 3.1-1
Sediment Investigation Reaches in the Mortandad Watershed

Subwatershed	Investigation Reach	Reach Abbreviation	Approximate Distance from Rio Grande to Midpoint of Reach (km)	Reach Length (km)	Year(s) of Sample Collection (Canyons Investigations)	Notes
Effluent Canyon	E-1 Far West	E-1FW	14.43	0.15	2004, 2005	Upcanyon of TA-55
	E-1 West	E-1W	14.03	0.21	1998, 2001, 2004, 2005	Downcanyon of TA-55
	E-1 East	E-1E	13.82	0.21	1998, 2001, 2004, 2005	Downcanyon of TA-50 outfall
Mortandad Canyon	M-1 West	M-1W	15.89	0.23	1998, 2004, 2005	Downcanyon of Diamond Drive
	M-1 Central	M-1C	15.10	0.20	2004	Upcanyon of TA-48
	M-1 East	M-1E	14.56	0.20	1998, 2004, 2005	Downcanyon of TA-48
	M-2 West	M-2W	13.41	0.60	1998, 2001, 2004, 2005	Downcanyon of Effluent Canyon
	M-2 East	M-2E	12.81	0.41	2001, 2004	Downcanyon of TA-35
	M-3 West[a]	M-3W	11.98	0.29	1999, 2001, 2004	Vicinity of permeable reactive barrier
	M-3 East[a]	M-3E	11.53	0.62	1999, 2001, 2004, 2005	Upcanyon of Ten Site Canyon; canyon floor widens
	M-4 West[b]	M-4W	11.12	0.21	1999, 2001, 2004, 2005	Downcanyon of Ten Site Canyon; includes sediment traps #1 and #2
	M-4 Central[b]	M-4C	10.90	0.22	1999, 2001, 2004, 2005	Downcanyon of sediment trap #2
	M-4 East[b]	M-4E	10.68	0.23	1999, 2001, 2004	Area where radionuclide concentrations are decreasing
	M-5 West	M-5W	9.64	0.25	2004	Midway between M-4 and M-5E
	M-5 East	M-5E	8.62	0.56	2000, 2001, 2004	Spans LANL-San Ildefonso Pueblo boundary
	M-6	M-6	5.00	0.20	2003, 2004, 2005	Upcanyon of SR 4

Table 3.1-1 (continued)

Subwatershed	Investigation Reach	Reach Abbreviation	Approximate Distance from Rio Grande to Midpoint of Reach (km)	Reach Length (km)	Year(s) of Sample Collection (Canyons Investigations)	Notes
Ten Site Canyon	TS-1 West	TS-1W	13.69	0.13	2004, 2005	Downcanyon of TA-50 and MDA C; steep and rocky
	TS-1 Central	TS-1C	13.50	0.24	1999, 2004, 2005	Canyon bottom widening and flattening
	TS-1 East	TS-1E	13.02	0.39	1999, 2004, 2005	Upcanyon of Pratt Canyon
	Pratt Canyon	PCYN	13.01	0.23	none	Sampled as part of TA-35 investigations in 1994, 1997, 1998, and 2005
	TS-2 West	TS-2W	12.77	0.11	1999, 2004, 2005	Downcanyon of Pratt Canyon
	TS-2 Central	TS-2C	12.62	0.20	1999, 2004, 2005	Downcanyon of TA-35 sewage lagoon outfall
	TS-2 East	TS-2E	12.42	0.21	1999, 2004, 2005	Downcanyon of TA-35 sand filter bed outfall
	TS-3	TS-3	11.46	0.31	2001, 2005	Upcanyon of Mortandad Canyon
Unnamed tributary canyon	MCW-1	MCW-1	11.13	0.25	2003, 2005	Upper part of unnamed tributary below TA-5
	MCW-2 North	MCW-2N	9.93	0.20	2003, 2005	Tributary below Far Point firing site (SWMU 05-001[c])
	MCW-2 West	MCW-2W	9.88	0.10	2003, 2005	Upcanyon of Far Point firing site tributary
	MCW-2 East	MCW-2E	9.73	0.20	2003, 2005	Downcanyon of Far Point firing site tributary

[a] In Section 6 and Appendix C tables, these 2 reaches are combined and reported as "M-3."

[b] In Section 6 and Appendix C tables, these 3 reaches are combined and reported as "M-4."

Table 3.2-1
Mortandad Canyon Surface and Groundwater Sampling Locations and Rationale

Location Name	Location and Rationale
Alluvial Groundwater Wells (West to East)	
MCO-0.6	Mortandad Canyon north of TA-48. Westernmost alluvial groundwater monitoring point in Mortandad Canyon. Provides samples of base line alluvial water upstream of the Mortandad and Effluent Canyons confluence and downstream of all potential contaminant sources in upper Mortandad Canyon.
MCA-1	Mortandad Canyon above confluence with Effluent Canyon. New well that provides samples of alluvial groundwater from the upper part of the Mortandad Canyon watershed above the influence of the TA-50 RLWTF outfall (NPDES outfall EPA03A-051).
MCA-4	Effluent Canyon. New well located downcanyon of release sites in Effluent Canyon and upcanyon of TA-50 RLWTF outfall. Provides continuity with historical groundwater quality data. Replacement for well MCO-2.
MCO-2	Effluent Canyon. Location is downcanyon of release sites in Effluent Canyon and upcanyon of TA-50 RLWTF outfall. Sampled when insufficient water was obtained from MCA-4.
MCA-5	Mortandad Canyon below confluence with Effluent Canyon. New well that provides samples of alluvial groundwater representing contributions from both Effluent Canyon and the upper part of the Mortandad Canyon watershed. First groundwater monitoring point below the TA-50 RLWTF outfall. Provides continuity with historical groundwater quality data. Replacement for well MCO-3.
MCO-4B	Mortandad Canyon near the east end of the narrow, deeply incised portion of the canyon. Provides samples of alluvial water upcanyon of the permeable reactive barrier and the major zone of infiltration where the canyon widens to the east. Provides continuity with historical groundwater quality data.
MCO-5	Mortandad Canyon near TW-8. Provides samples of alluvial water where the canyon widens eastward and alluvium thickens. First groundwater monitoring point downcanyon of the permeable reactive barrier. Provides continuity with historical groundwater quality data.
MCO-6	Mortandad Canyon above confluence with Ten Site Canyon. Location provides samples of alluvial groundwater from the upper part of the Mortandad Canyon watershed above the influence of release sites in the Ten Site Canyon watershed. Provides continuity with historical groundwater quality data.
MCA-2	Confluence of Mortandad and Ten Site canyons. New well that provides samples of alluvial groundwater that may a source of intermediate-perched groundwater encountered at MCI-4 and MCOBT-4.4. Equivalent to well MCO-6.8 in the “Work Plan for Mortandad Canyon” (LANL 1997, 56835).
MCO-7	Mortandad Canyon below confluence with Ten Site Canyon. Location provides samples of alluvial groundwater representing contributions from both Ten Site Canyon and the upper and middle parts of the Mortandad Canyon watershed. Located west of sediment traps. Provides continuity with historical groundwater quality data.
TSCA-6	Ten Site Canyon. New well located downcanyon of historic release sites at TA-35. Formerly called MCA-6. The TSCA-6 alluvial well was installed in the MCB-15 core hole after backfilling the deep borehole to the level of alluvial saturation.
MCO-7.2	Mortandad Canyon east of sediment traps. New well installed to determine if suballuvium groundwater occurs within Cerro Toledo deposits in this part of Mortandad Canyon. This well is dry although alluvial groundwater was present in overlying alluvium during drilling.

Table 3.2-1 (continued)

Location Name	Location and Rationale
MT-1	Mortandad Canyon downcanyon of sediment traps. Provides continuity with historical groundwater quality data. Alternative water sampling well for alluvial groundwater near MCO-7.2.
MCO-7.5	Mortandad Canyon downcanyon of sediment traps. Located near the eastern extent of persistent alluvial groundwater saturation. Provides continuity with historical groundwater quality data.
MT-2	Mortandad Canyon in area of intermittent alluvial saturation.
MT-3	Mortandad Canyon in area of intermittent alluvial saturation.
MT-4	Mortandad Canyon in area of intermittent alluvial saturation.
MCA-7,-8,-9	Mortandad Canyon near eastern Laboratory boundary. Transect of new wells installed to determine if saturation occurs near the Laboratory boundary. MCA-7 (dry) was plugged and abandoned. Alluvial wells (dry) were installed in MCA-8 and MCA-9. Meets the requirement to install wells MC-13A and -13B in the "Work Plan for Mortandad Canyon" (LANL 1997, 56835).
Surface Water (West to East)	
Reach M-1W Surface Water (MO-24789)	Mortandad Canyon east of Diamond Drive. Provides base line information for surface water in uppermost part of Mortandad Canyon watershed.
Reach M-1E Surface Water (MO-24790)	Mortandad Canyon north of TA-48. Provides samples of surface water upstream of the Mortandad and Effluent Canyons confluence and downstream of all potential contaminant sources in upper Mortandad Canyon.
Reach E-1FW Surface Water (MO-24786)	Uppermost Effluent Canyon. Provides samples surface water downstream of outfalls on the east end of TA-48.
Reach E-1W Surface Water (MO-24787)	Middle Effluent Canyon. Provides samples surface water upstream of TA-50 RLWTF outfall (NPDES outfall EPA03A-051).
Reach E-1E Surface Water (MO-24788)	Effluent Canyon about 130 m (425 ft) downstream of the TA-50 RLWTF outfall. Provides samples of surface water downstream of all Effluent Canyon contaminant sources.
Reach M-2W Surface Water (MO-24808)	Below confluence of Mortandad and Effluent Canyons at the E200 gaging station. Provides samples combined Mortandad and Effluent Canyons surface water.
Reach M-2E Surface Water (MO-24791)	Mortandad Canyon about 970 m (3180 ft) downcanyon of the Effluent Canyon confluence. Provides samples of surface water near the terminus of surface water flow supported by the TA-50 RLWTF outfall.

Table 3.2-1 (continued)

Location Name	Location and Rationale
Reach TS-1W Surface Water (MO-24792)	Ten Site Canyon headwaters above TA-35.
Reach TS-2E Surface Water (MO-24793)	Ten Site Canyon downcanyon of TA-35 where surface water occurs in persistent bedrock pools.
Perched Intermediate Groundwater (West to East)	
MCOI-1	Bench south of Mortandad Canyon about 425 m (1400 ft) east of the confluence with Effluent Canyon. New borehole to investigate western extent of intermediate-perched groundwater. Borehole was moist but did not produce flowing water. Well installed but does not produce water.
MCOI-8	Mortandad Canyon between TW-8 and MCOBT-4.4. New well to investigate possible saturation was encountered in the lower part of Cerros del Rio basalts. Water level in well generally coincides with top of sump.
MCOI-4	Confluence of Mortandad and Ten Site canyons. New well completed in a thin zone of intermediate-perched groundwater that occurs in Puye Formation sedimentary deposits on top of Cerros del Rio basalts.
MCOBT-4.4	Confluence of Mortandad and Ten Site canyons. Well completed in 2001 within a thin zone of perched groundwater occurs in Puye Formation sedimentary deposits on top of Cerros del Rio basalt.
MCOI-5	Mortandad Canyon on the R-15 well pad on the south side of the canyon. New well completed in an intermediate perched groundwater that occurs in the lower part of Cerros del Rio basalts.
MCOI-6	Mortandad Canyon north of R-15 near the canyon axis. New well completed in an intermediate-perched groundwater occurs in the lower part of Cerros del Rio basalt.
MCOI-10	Mesa top south of Mortandad Canyon, south of well R-15. New borehole to investigate southern extent of intermediate perched groundwater in the Cerros del Rio basalt. Borehole was dry and backfilled.
MCOBT-8.5	Mortandad Canyon about 440 m (1450 ft) downcanyon of R-15; located near the stream channel. New borehole to investigate eastern extent of intermediate-perched groundwater in the Cerros del Rio basalt. Borehole was dry and backfilled.
Regional Groundwater (West to East)	
R-1	Mortandad Canyon in area transitioning from narrow slot canyon to the west and a broad open canyon to the east. Westernmost well for monitoring regional groundwater in Mortandad Canyon. Completed as a single screen well. R-1 is a replacement well for TW-8.
TW-8	Mortandad Canyon in area transitioning from narrow slot canyon to the west and a broad open canyon to the east.
R-14	Upper Ten Site Canyon. Location provides samples of regional groundwater downstream of historic release sites at TA-35. Well has two screens in the regional aquifer.
R-33	Lower Ten Site Canyon near confluence with Mortandad Canyon. Location provides samples of regional groundwater near confluence. Well has two screens in the regional aquifer.

Table 3.2-1 (continued)

Location Name	Location and Rationale
R-15	Mortandad Canyon. Location provides samples of regional groundwater in part of canyon where infiltration of contaminated alluvial water is expected to affect deep groundwater systems. Completed as a single screen well.
R-28	Mortandad Canyon. Location provides samples of regional groundwater downgradient of where infiltration of contaminated alluvial water is expected to affect deep groundwater systems. Completed as a single screen well.
R-13	Mortandad Canyon near the eastern Laboratory boundary. Location provides samples of regional groundwater moving off-site. Completed as a single screen well.
R-34	Cedro Canyon. Well installed at the request of San Ildefonso Pueblo to monitor groundwater on San Ildefonso lands downgradient of Mortandad Canyon. Completed as a single screen well.

Note: Gray shading indicates new wells required by the "Work Plan for Mortandad Canyon" (LANL 1997, 56835) and "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613).

Table 3.2-2a
Period of Record for Manual Water-Level Data in Mortandad Canyon Wells

Saturated Zone	Well	Period of Record
Alluvial	MCA-1	5/05–07/06
	MCA-2	5/05–07/06
	MCA-3ac[a]	11/04–07/06
	MCA-3b	11/04–07/06
	MCA-3def[b]	03/05–07/06
	MCA-4	04/05–07/06
	MCA-5	04/05–07/06
	TSCA-6	04/05–07/06
	TSWB-6	01/95–07/97; 02/00–07/06 (dry)
	MCA-8	09/04–07/06 (dry)
	MCA-9	01/04–07/06 (dry)
	MCO-0.6	03/99–09/02; 05/05–07/06
	MCO-4B	8/90; 8/97; 5/98 – 7/06
	MCO-5	10/60-12/69; 07/71-09/71; 2/74–11/74; 8/76–11/79; 10/80; 4/81; 4/82; 10/83; 2/91 9/91; 8/92–10/92; 12/93; 6/94; 8/95; 8/96–11/96; 8/97; 5/98; 3/99–11/99; 03/00–07/06
	MCO-6	08/61–09/71; 02/74–11/74; 08/76–1/79; 10/80; 04/81; 04/82; 02/91–09/91; 08/92; 12/93; 03/95– 08/95; 11/96; 08/97; 10/98–07/06
	MCO-7	10/60–12/69; 07/71–09/71; 02/74–11/74; 08/76–11/79; 10/80; 04/81; 04/82; 10/83; 02/91 –10/91; 07/92; 12/93; 06/94; 06/95–11/96; 03/99–07/06
	MCO-7.5	10/61–12/69; 07/7–09/71; 02/74–11/74; 08/76–11/79; 10/80; 04/81; 10/83; 02/91–09/91; 07/92; 06/94; 06/95–08/95; 08/96–11/96; 05/98–07/03; 04/05–07/06
	MCWB-5	01/95–09/95; 01/96; 08/98; 01/00; 12/05 –07/06
	MCWB-5.5A	01/95–09/95; 07/97; 01/00; 12/05–07/06
	MCWB-5.5B	01/95– 09/95; 07/97; 01/00; 12/05–07/06
	MCWB-6.2A	01/95–09/95; 11/96; 07/97; 01/00; 12/05–07/06
	MCWB-6.5C	01/95–09/95; 11/96; 07/97; 01/00; 12/05–07/06
	MCWB-6.5D	01/95–09-95; 11/96; 06/97; 08/98; 06/99–06/03; 12/05– 0706 (mostly dry)
	MCWB-6.5E	01/95–09/95; 11/96; 06/97–07/97; 08/98; 01/00; 12/05– 0706
	MCWB-7A	01/95–09/95; 11/96; 06/97–07/97; 01/00; 12/05-0306
	MCWB-7B	01/95–09/95; 11/96; 06/97–07/97; 07/01; 12/05
	MCWB-7.4A	01/95–09/95; 11/96; 06/97–07/97; 01/00; 12/05-0306
	MCWB-7.4B	01/95 09/95; 11/96; 06/97–07/97; 01/00; 07/01; 12/05– – 03/06
	MCWB-7.7A	01/95–09/95; 06/97; 08/98; 01/00; 12/05– 3/06
	MCWB-7.7B	01/95–9/95; 07/97; 08/98; 03/99–06-03; 10/05–03/06
	MT-1	11/88; 02/91; 05/98–08/98; 03/99–06/03; 04/05–07/06
	MT-2	11/88; 02/91; 05/98–08/98; 03/99–06/03; 04/05–07/06 (dry)
	MT-3	11/88; 02/91; 05/98–08/98; 03/99–06/03; 04/05–07/06
	MT-4	11/88; 02/91; 05/98–08/98; 03/99–06/03; 05/05–07/06

Table 3.2-2 (continued)

Saturated Zone	Well	Period of Record
Intermediate	MCOBT-4.4	04/02–05/03; 11/04; 03/05–07/06
	MCOI-1	01/05–06/06 (dry)
	MCOI-4	11/04–07/06
	MCOI-5	10/04–03/06
	MCOI-6	01/05–02/06
	MCOI-8	01/05 –06/06
Regional	R-1	12/03; 01/05– 2/06
	R-13	02/02–12/03; 06/04; 01/05–02/06
	R-14	None, Westbay well
	R-15	09/99 02/00; 02/01–05/01; 07/02; 12/03; 06/04–02/06
	R-28	12/03 –01/04; 01/05–02/06
	Test Well 8	10/92–01/94; 01/00; 06/01; 06/04–02/06
	R-33	None; manual measurements are not possible with well completion.
	R-34	08/04– 05/06

[a] Denotes a nest of two piezometers with two transducers.

[b] Denotes a nest of three piezometers with three transducers.

Table 3.2-2b
Period of Record for
Automated Water-Level Data in Mortandad Canyon Alluvial Wells

Saturated Zone	Well	Period of Record
Alluvial	MCA-1	05/05–07/06
	MCA-2	05/05 07/06
	MCA-3ac[a]	04/05–07/06
	MCA-3b	04/05–07/06
	MCA-3def[b]	MCA-3d 04/05–07/06; MCA-3e and MCA-3f 10/05-0706
	MCA-4	05/05 07/06
	MCA-5	05/05–07/06
	TSCA-6	10/05–07/06
	TSWB-6	02/00–12/05; 07/06 (dry)
	MCA-8	10/05–07/06
	MCA-9	08/05 –07/06
	MCO-0.6	05/05– 07/06
	MCO-4B	05/05–07/06
	MCO-5	10/92–12/93; 05/05– 07/06
	MCO-6	05/05–07/06
	MCO-7	05/05–07/06
	MCO-7.5	05/05–07/06
	MCWB-5	01/96–10/99; 01/00–05/01; 07/02–07/06
	MCWB-5.5A	07/97–07/06
	MCWB-5.5B	07/97–07/06
	MCWB-6.2A	07/97–07/06
	MCWB-6.5C	07/97–03/06
	MCWB-6.5D	12/05–03/06
	MCWB-6.5E	07/97–10/99; 01/00–07/06
	MCWB-7A	07/97–07/06
	MCWB-7B	07/97–12/00; 07/01–01/03
	MCWB-7.4A	07/97– 04/99; 01/00 03/06
	MCWB-7.4B	07/97–07/99; 07/01–03/06
	MCWB-7.7A	01/00– 03/06
	MCWB-7.7B	07/97–03/06
	MT-1	05/05–07/06
	MT-2	05/05–07/06 (dry)
	MT-3	05/05–07/06
	MT-4	05/05–07/06

Table 3.2-2 (continued)

Saturated Zone	Well	Period of Record
Intermediate	MCOBT-4.4	07/02–07/06
	MCOI-1	None
	MCOI-4	10/05–07/06
	MCOI-5	08/05–07/06
	MCOI-6	08/05–07/06
	MCOI-8	10/05–07/06
Regional	R-1	01/05–03/06
	R-13	01/05–05/06
	R-14	12/04–09/05; 11/05–06/06
	R-15	12/04–05/06
	R-28	01/05–05/06
	Test Well 8	06/93–11/93; 01/94–03/97; 01/00–08/03; 12/04-05/06
	R-33	No valid data
	R-34	01/05–02/05; 05/05–06/06

[a] Denotes a nest of two piezometers with two transducers.
[b] Denotes a nest of three piezometers with three transducers.

Table 3.2-3
Characterization and RES Boreholes Installed in Mortandad Canyon

Borehole	Depth	Purpose and Location
Characterization Boreholes		
MCB-1	32 m (105 ft)	Determine distribution of contaminants in the vadose zone above the TA-50 outfall in Effluent Canyon. Borehole plugged and abandoned.
MCB-2	31.9 (104.5 ft)	Determine distribution of contaminants and moisture flux in the vadose zone below the TA-50 outfall near the Mortandad and Effluent Canyons confluence. Borehole is instrumented with water content and matric potential sensors.
MCB-3	NA	Determine distribution of contaminants in the vadose zone beneath the narrow slot portion of Mortandad Canyon between the confluence with Effluent Canyon and TW-8. Could not be drilled because there is no access to this portion of Mortandad Canyon.
MCB-4	NA	Determine distribution of contaminants in the vadose zone beneath the narrow slot portion of Mortandad Canyon between the confluence with Effluent Canyon and TW-8. Could not be drilled because there is no access to this portion of Mortandad Canyon.
MCB-5	31.7 m (104 ft)	Determine distribution of contaminants and moisture flux in the vadose zone beneath the narrow slot portion of Mortandad Canyon between the confluence with Effluent Canyon and TW-8. Borehole is about 205 m (670 ft) west of the permeable reactive barrier and represents westernmost access to slot portion of Mortandad Canyon. Borehole is instrumented with a vector probe.
MCB-6	27 m (89 ft)	Determine distribution of contaminants and moisture flux in the vadose zone in area where Mortandad Canyon begins to widen eastward. The borehole is about 140 m (460 ft) east of the permeable reactive barrier. Borehole is instrumented with a vector probe.
MCB-7	30.8 m (101 ft)	Determine distribution of contaminants and moisture flux in the vadose zone in Mortandad Canyon about 200 m (650 ft) upcanyon of the confluence with Ten Site Canyon. Borehole is instrumented with water content and matric potential sensors.
MCB-8	31.9 m (104.5 ft)	Determine distribution of contaminants and moisture flux in the vadose zone in the Mortandad Canyon sediment traps. Borehole is instrumented with water content and matric potential sensors.
MCB-9	31.2 m (102.5 ft)	Determine distribution of contaminants and moisture flux in the vadose zone adjacent to easternmost sediment trap in Mortandad Canyon. Borehole is instrumented with a vector probe.
MCB-10	31.7 m (104 ft)	Determine distribution of contaminants in the vadose zone near eastern limit of alluvial saturation in Mortandad Canyon. Northern borehole in north-south transect across canyon that includes MCB-11 and MCB-12. Borehole plugged and abandoned.
MCB-11	31.7 m (104 ft)	Determine distribution of contaminants and moisture flux in the vadose zone near eastern limit of alluvial saturation in Mortandad Canyon. Middle borehole in north-south transect across canyon that includes MCB-10 and MCB-12. Borehole is instrumented with water content and matric potential sensors.
MCB-12	31.9 m (104.5 ft)	Determine distribution of contaminants in the vadose zone near eastern limit of alluvial saturation in Mortandad Canyon. Southern borehole in north-south transect across canyon that includes MCB-10 and MCB-11. Borehole plugged and abandoned.
MCB-13	NA	Determine distribution of contaminants in the vadose zone in Mortandad Canyon east of persistent alluvial groundwater. Could not be drilled because this portion of Mortandad Canyon is a protected archeological zone.
MCB-14	86.6 m (284 ft)	Determine distribution of contaminants and moisture flux in the vadose zone adjacent to the westernmost Mortandad Canyon sediment trap. Borehole is instrumented with a vector probe.

Table 3.2-3 (continued)

Borehole	Depth	Purpose and Location
MCB-15	47.1 m (154.5 ft)	Determine distribution of contaminants in the vadose zone in lower Ten Site Canyon. Borehole was drilled to total depth and partially backfilled before installing alluvial well TSCO-6.
MCB-16	30.5 m (100 ft)	Determine distribution of contaminants and moisture flux in the vadose zone near the eastern Laboratory. The borehole was drilled about 32 m (105 ft) northeast of R-13. Borehole is instrumented with water content and matric potential sensors.
RES Boreholes		
MCRES-2	61 m (200.2 ft)	Borehole drilled to collect moisture data, soil properties, and borehole geophysics at the confluence of Mortandad Ten Site canyons where surface-based resistivity survey indicates electrically resistive bedrock at depth. Borehole is instrumented with a vector probe. Paired with data collected from MCOBT-4.4 to evaluate lateral changes in resistivity structure in bedrock units beneath Mortandad Canyon.
MCRES-3	61 m (200 ft)	Borehole drilled to collect moisture data, soil properties, and borehole geophysics in Mortandad Canyon east of TW-8 where surface-based resistivity survey indicates resistive bedrock at depth. MCRES-3 is paired with MCRES-4 to evaluate lateral changes in resistivity structure in bedrock units beneath Mortandad Canyon. Borehole plugged and abandoned.
MCRES-4	68.6 m (225 ft)	Borehole drilled to collect moisture data, soil properties, and borehole geophysics in Mortandad Canyon east of TW-8 where surface-based resistivity survey indicates conductive bedrock at depth. MCRES-4 is paired with MCRES-3 to evaluate lateral changes in resistivity structure in bedrock units beneath Mortandad Canyon. Borehole is instrumented with water content and matric potential sensors.
R-28	45.6 (150 ft)	Core collected from the upper 45.6 m (150 ft) of the corehole drilled at the R-28 regional well site were analyzed for moisture data and soil properties. The data were collected to determine if data from a surface-based resistivity survey can be used to predict changes in moisture content with depth. The corehole was plugged and abandoned.

Table 3.4-1
Deviations from Plans for Alluvial Wells,
Characterization Boreholes, Resistivity Boreholes, and Intermediate Wells

Planned	Actual Disposition
Alluvial wells A-3a to A-3f to be drilled along the canyon axis between MCO-8 and MCW-8.1A,B,C	Archeological site restrictions required moving the drilling location . MCA-3 actually installed as two sets of three nested piezometers each. The set MCA-3a,b,c was installed in Mortandad Canyon upcanyon of the confluence with Ten Site Canyon, ~25 ft upcanyon of MCB-7. The set MCA-3d,e,f was installed south of sediment trap #3 and near MCB-9.
Alluvial well MCA-6 to be installed singly in lower Ten Site Canyon	Hole was extended to 154.5-ft depth to accomplish the goals of MCB-15 before the lower interval was plugged to 21.3-ft depth to allow construction of alluvial well MCA-6.
Transect of alluvial wells MCA-7, MCA-8, and MCA-9 proposed across Mortandad Canyon near R-13	All three alluvial explorations were dry to total depth. MCA-8 and MCA-9 were completed as alluvial wells; MCA-7 was plugged and abandoned.
Characterization borehole MCB-3 to be drilled in Mortandad Canyon between MCA-5 and MCO-4	MCB-3 was not drilled because this stretch of Mortandad Canyon is too narrow and heavily vegetated for drilling activity.
Characterization borehole MCB-4 to be drilled in Mortandad Canyon between MCA-5 and MCO-4, immediately north of R-14	MCB-4 was not drilled because this stretch of Mortandad Canyon is too narrow and heavily vegetated for drilling activity.
Characterization borehole MCB-8 to be drilled in Mortandad Canyon between sediment traps #1 and #2	MCB-8 was moved to a location south of sediment trap #1.
Characterization borehole MCB-9 to be drilled in Mortandad Canyon within sediment trap #1	MCB-9 was moved to a location south of sediment trap #3.
Characterization boreholes MCB-10, MCB-11, and MCB-12 to be drilled in Mortandad Canyon in a cluster downcanyon of the sediment traps	Characterization boreholes MCB-10, MCB-11, and MCB-12 were drilled in a north-to-south transect across Mortandad Canyon downcanyon of sediment trap #3.
Characterization borehole MCB-13 to be drilled between MCO-8 and MCW-8.1A,B,C	MCB-13 was not drilled because of archeological site restrictions.
Characterization borehole MCB-14 to be drilled in accessible portion of lower Ten Site Canyon west of MCOI-3	MCB-14 was moved to a location next to sediment trap #1.
Characterization borehole MCB-15 to be installed singly in lower Mortandad Canyon.	MCB-15 was backfilled to 21.3-ft depth and completed as alluvial well MCA-6.
Intermediate well MCOI -3 to be installed in lower Ten Site Canyon with one screen in Cerros del Rio basalt. Projected depth 770 ft. Core to be collected to refusal (~560 ft).	MCOI-3 was not drilled; the objectives set out for MCOI -3 were obtained by drilling R-33 in this locality.
Intermediate well MCOI -5 to be installed near R-15, with one screen in Cerros del Rio basalt. Projected depth 760 ft. Core to be collected to refusal (~500 ft).	Intermediate well MCOI-5 located and completed as planned. Total depth drilled 717 ft. No core was collected because of available core (0–420 ft and 740–751.5 ft) from adjacent R-15 borehole.
Intermediate well MCOI -10 to be installed on the north flank of the mesa south of R-15, on the Qbt 2 bench above the canyon bottom, with one screen in the Cerros del Rio basalt. Projected depth 1000 ft. Core to be collected from 300 to 800 ft depth.	MCOI-10 was moved farther south to the mesa top because of limited space on the Qbt 2 bench. No well was installed at MCOI-10 because the borehole was dry throughout; the hole was plugged and abandoned. Total depth drilled 1050 ft. Core was collected from 300 to 727.3-ft depth.

Table 4.2-1
Summary of Water Samples Taken, 2000–2005, Mortandad Canyon

Location Name	Sampling Performed for the Work Plan for Mortandad Canyon and the Mortandad Canyon Groundwater Work Plan, Revision 1					
	2000	2001	2002	2003	2004	2005
Alluvial Wells (West to East)						
MCO-0.6						Dry √
MCA-1	n/a*	n/a	n/a	n/a	n/a	√ √
MCA-4	n/a	n/a	n/a	n/a	n/a	Dry √
MCO-2	√					Dry Dry
MCA-5	n/a	n/a	n/a	n/a	n/a	√ Dry
MCO-4B		√		√	√ √	√ √ √ √
MCO-5	√	√	√	√	√	√ √
MCO-6	√√√√√	√√√√√	√√√√	√√√√	√√√	√ √ √ √
MCA-2	n/a	n/a	n/a	n/a	n/a	√ √
MCO-7	√√√√√	√√√√	√√√√	√√√√√	√√√√	√ √ √ √ √
TSCA-6	n/a	n/a	n/a	n/a	n/a	Dry Dry
MT-1						√ √
MCO-7.5	√	√		√		√ √
MT-2						Dry Dry
MT-3			√			√ √
MT-4						Dry √
Surface Water (West to East)						
Reach M-1W Surface Water (MO-24789)	n/a	n/a	n/a	n/a	n/a	√ √ √
Reach M-1E Surface Water (MO-24790)	n/a	n/a	n/a	n/a	n/a	√ √
Reach E-1FW Surface Water (MO-24786)	n/a	n/a	n/a	n/a	n/a	√ √
Reach E-1W Surface Water (MO-24787)	n/a	n/a	n/a	n/a	n/a	√ √ √
Reach E-1E Surface Water (MO-24788)	n/a	n/a	n/a	n/a	n/a	√ √ √
Reach M-2W Surface Water (MO-24808)	n/a	n/a	n/a	n/a	n/a	√ √
Reach M-2E Surface Water (MO-24791)	n/a	n/a	n/a	n/a	n/a	√ √
Reach TS-1W Surface Water (MO-24792)	n/a	n/a	n/a	n/a	n/a	√ √ √ √
Reach TS-2E Surface Water (MO-24793)	n/a	n/a	n/a	n/a	n/a	√ √

Table 4.2-1 (continued)

Location Name	Sampling Performed for the Work Plan for Mortandad Canyon and the Mortandad Canyon Groundwater Work Plan, Revision 1					
	2000	2001	2002	2003	2004	2005
Perched-Intermediate Groundwater (West to East)[smr1]						
MCOI-1	n/a	n/a	n/a	n/a	n/a	Dry
MCOI-8	n/a	n/a	n/a	n/a	n/a	√ Dry
MCOI-4	n/a	n/a	n/a	n/a	n/a	√ √
MCOBT-4.4	n/a			√ √	√	√ √
MCOI-5	n/a	n/a	n/a	n/a	n/a	√ √
MCOI-6	n/a	n/a	n/a	n/a	n/a	√ √
Regional Groundwater (west to east)						
R-1	n/a	n/a	n/a	√		√ √ √
TW-8	√ √ √	√ √ √ √ √	√ √ √	√	√	√ √
R-14	n/a	n/a	n/a		√ √ √	√ √
R-33	n/a	n/a	n/a	n/a	n/a	√ √
R-15	√ √	√ √		√	√ √	√ √ √
R-28	n/a	n/a	n/a	n/a	n/a	√ √ √
R-13	n/a	n/a	√ √ √	√ √ √	√	√ √ √
R-34	n/a	n/a	n/a	n/a		√ √
PM-5	√ √ √ √ √	√√√√√√√√√	√√√√√√√√√	√√√√√√√	√√√√√	√ √ √ √ √

Notes: Gray shading highlights sample locations required under the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613).
Multiple checks (√) represent number of sampling events in a year. Underlined checks (√) represent samples collected as part of two rounds of snapshot sampling. Underlined Dry (Dry) indicates sample location was dry during the snapshot sampling. Checks without underlining (√) represent samples collected as part of routine surveillance monitoring.

*n/a = Not applicable, well not installed or surface water station not established.

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Table 6.4-2
Mortandad Core Radionuclide COPCs

Borehole	Media Code[a]	Americium-241	Cesium-134	Plutonium-238	Plutonium-239	Tritium	Uranium-234	Uranium-235	Uranium-238
QAL (ALLH) LANL BV[b]		**0.013**	**#N/A**	**0.023**	**0.054**	**#N/A**	**2.59**	**0.2**	**2.29**
QBT2 LANL BV		**#N/A**	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**1.98**	**0.09**	**1.93**
QBT1V LANL BV		**#N/A**	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**3.12**	**0.14**	**3.05**
QBT 1G, QCT, QBO, QBOF LANL BV		**#N/A**	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**4**	**0.18**	**3.9**
Residential SSL[c]		**30**	**2.4**	**37**	**33**	**750**	**170**	**17**	**86**
B-1	QBT2	-[d]	-	-	-	-	2.24	0.1	2.26
B-2	QBT1V	-	-	-	-	-	-	0.19	3.22
B-2	QBT2	-	-	-	-	-	-	0.13	1.94
B-5	QAL	0.79	-	0.19	0.78	-	3.08	-	3.16
B-5	QBT1G	-	-	-	0.07	13.39	-	-	-
B-6	QAL	0.06	-	-	-	-	-	-	-
B-6	QBT1G	-	-	-	-	9.28	-	-	-
B-7	QAL	1.07	-	0.18	1.11	0.84	-	-	-
B-7	QBT1G	-	-	-	-	8.72	-	0.2	-
B-7	QCT	-	-	-	-	3.31	-	-	-
B-8	QCT	-	-	-	-	1.06	-	-	-
B-9	QAL	-	-	0.07	-	1.02	-	-	-
B-9	QCT	-	-	-	-	7.5	-	-	-
B-10	QAL	-	-	-	-	29.44	-	-	2.65
B-10	QCT	-	-	-	-	4.16	-	-	-
B-11	QAL	-	-	-	-	5.9	-	-	-
B-11	QCT	-	-	-	-	3.64	-	-	-
B-12	QAL	-	-	-	-	1.75	-	-	-
B-12	QCT	-	-	-	-	6.81	-	-	-
B-14	QAL	0.03	-	-	0.06	7.92	-	-	-
B-14	QBOF	-	-	-	-	5.66	-	-	-
B-14	QCT	-	0.13	0.12	-	5.71	-	-	-
B-15	QBT1G	-	-	-	-	-	-	-	3.94
B-16	QAL	-	-	-	-	-	-	-	2.42
I-6	QAL	-	-	-	-	1.85	-	-	-
I-6	QBO	-	-	-	-	8.33	-	-	-
I-6	QCT	-	-	-	-	0.97	-	-	-
I-8	QAL	-	-	-	-	1.23	-	-	-
I-8	QBO	-	-	-	-	9.18	-	-	-

Table 6.4-2 (continued)

Borehole	Media Code[a]	Americium-241	Cesium-134	Plutonium-238	Plutonium-239	Tritium	Uranium-234	Uranium-235	Uranium-238
QAL (ALLH) LANL BV[b]		**0.013**	**#N/A**	**0.023**	**0.054**	**#N/A**	**2.59**	**0.2**	**2.29**
QBT2 LANL BV		**#N/A**	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**1.98**	**0.09**	**1.93**
QBT1V LANL BV		**#N/A**	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**3.12**	**0.14**	**3.05**
QBT 1G, QCT, QBO, QBOF LANL BV		**#N/A**	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**4**	**0.18**	**3.9**
Residential SSL[c]		**30**	**2.4**	**37**	**33**	**750**	**170**	**17**	**86**
I-8	QBT1G	-	-	-	-	3.33	-	-	-
I-8	QCT	-	-	-	-	5.65	-	-	-
R-1	QAL	0.486	-	0.0812	0.503	0.604	-	-	-
R-1	QBO	-	-	-	-	10.3	-	0.233	-
R-1	QBT1G	-	-	-	-	29.6	-	0.242	-
R-1	QCT	-	-	-	-	10.8	-	-	-
R-14	QBT1V	-	-	-	-	-	-	0.157	-
R-15	QAL	-	-	-	-	0.12	-	-	-
R-15	QBO	-	-	-	-	26.5	-	-	-
R-15	QBT1G	-	-	-	-	14.6	-	-	-
R-15	QCT	-	-	-	-	12.5	-	-	-
R-28	QAL	-	-	-	-	0.0591	-	-	-
R-28	QBO	-	-	-	-	-	-	0.424	-
R-28	QBOG[e]	-	-	-	-	-	3.58	0.184	3.77
R-28	QCT	-	-	-	-	-	-	0.268	-

Notes: All values in pCi/g. Values are maximum detected values > BV; if no BV, value is maximum detected value. No values exceed the residential SSL.

[a] Media code definitions are provided in Table C-2-4.

[b] LANL 1998, 59730.

[c] LANL 2005, 88493.

[d] — = Not detected (if no BV), not detected > BV, or not analyzed.

[e] No background values have been developed for QBOG.

Table 6.5-1
Mortandad COPC Summary

Analyte	Sediment	Water	Core
Aluminum	x[a]	**x**[b]	x
Ammonia	x	x	—[c]
Ammonia as Nitrogen	—	**x**	—
Antimony	x	**x**	x
Arsenic	**x**	**x**	x
Barium	x	x	x
Beryllium	x	x	x
Boron	x	x	—
Bromide	x	x	—
Cadmium	x	x	x
Calcium	x	x	x
Cerium	—	x	—
Chloride	x	**x**	—
Chromium	**x**	**x**	x
Chromium hexavalent ion	x	x	—
Cobalt	x	x	x
Copper	x	**x**	x
Cyanide (Total)	x	x	—
Dysprosium	—	x	—
Erbium	—	x	—
Europium	—	x	—
Fluoride	x	**x**	—
Gadolinium	—	x	—
Holmium	—	x	—
Iron	**x**	**x**	**x**
Iron (ferrous)	—	x	—
Lanthanum	—	x	—
Lead	x	**x**	x
Lithium	—	x	—
Lutetium	—	x	—
Magnesium	x	x	x
Manganese	x	**x**	x
Mercury	x	x	x
Molybdenum	—	**x**	x
Neodymium	—	x	—
Nickel	x	**x**	x
Nitrate	x	**x**	—
Nitrate as Nitrogen	—	**x**	—
Nitrate-Nitrite as N	x	**x**	—

Table 6.5-1 (continued)

Analyte	Sediment	Water	Core
Nitrite	x	**x**	—
Oxalate	x	—	—
Perchlorate	x	**x**	—
Phosphorus, Orthophosphate (Expressed as PO_4)	x	x	—
Potassium	—	x	—
Praseodymium	—	x	—
Samarium	—	x	—
Selenium	x	x	x
Silver	x	x	x
Sodium	x	x	—
Strontium	—	x	—
Sulfate	x	x	—
Sulfide, Total	—	x	—
Terbium	—	x	—
Thallium	x	x	x
Thulium	—	x	—
Tin	—	x	—
Titanium	—	x	—
Total Phosphate as Phosphorus	—	x	—
Total Phosphorus	x	x	—
Uranium	x	**x**	—
Vanadium	x	x	x
Ytterbium	—	x	—
Zinc	x	**x**	x
Acenaphthene	x	x	—
Acenaphthylene	—	x	—
Acetone	x	x	—
Anthracene	x	x	—
Aroclor-1254	x	—	—
Aroclor-1260	**x**	**x**	—
Aroclors (Mixed)	x	—	—
Benzene	x	x	—
Benzo(a)anthracene	x	x	—
Benzo(a)pyrene	**x**	—	—
Benzo(b)fluoranthene	x	x	—
Benzo(g,h,i)perylene	x	—	—
Benzo(k)fluoranthene	x	x	—
Benzoic Acid	x	x	—
BHC[alpha-]	x	—	—
BHC[beta-]	x	—	—

Table 6.5-1 (continued)

Analyte	Sediment	Water	Core
BHC[delta-]	x	—	—
BHC[gamma-]	x	—	—
Bis(2-ethylhexyl)phthalate	x	**x**	—
Bromodichloromethane	x	—	—
Bromomethane	x	—	—
Butanone[2-]	x	x	—
Butylbenzylphthalate	x	—	—
Carbazole	x	x	—
Carbon Disulfide	—	x	—
Carbon Tetrachloride	x	—	—
Chlordane[alpha-]	x	—	—
Chlordane[gamma-]	x	—	—
Chloroform	x	—	—
Chloromethane	x	x	—
Chloronaphthalene[2-]	—	x	—
Chlorophenol[2-]	x	—	—
Chlorophenyl-phenyl[4-] Ether	x	—	—
Chrysene	x	x	—
DDD[4,4'-]	x	x	—
DDE[4,4'-]	x	x	—
DDT[4,4'-]	x	x	—
Dibenz(a,h)anthracene	x	—	—
Dibenzofuran	x	—	—
Dichlorobenzene[1,2-]	x	x	—
Dichlorobenzene[1,3-]	—	x	—
Dichlorobenzene[1,4-]	—	x	—
Dichlorobenzidine[3,3'-]	x	**x**	—
Dichloroethene[1,1-]	x	—	—
Dichloroethene[cis-1,2-]	x	—	—
Dieldrin	x	—	—
Diethylphthalate	x	x	—
Dioxane[1,4-]	—	x	—
Di-n-butylphthalate	x	—	—
Endosulfan Sulfate	x	—	—
Endrin	—	x	—
Endrin Aldehyde	x	—	—
Fluoranthene	x	x	—
Fluorene	x	x	—
Heptachlor Epoxide	x	—	—
Hexachlorobutadiene	x	—	—

Table 6.5-1 (continued)

Analyte	Sediment	Water	Core
Hexanone[2-]	x	—	—
Indeno(1,2,3-cd)pyrene	x	—	—
Isopropylbenzene	x	x	—
Isopropyltoluene[4-]	x	—	—
Methoxychlor[4,4'-]	x	—	—
Methyl-2-pentanone[4-]	x	x	—
Methylene Chloride	x	x	—
Methylnaphthalene[2-]	x	x	—
Naphthalene	x	x	—
Nitroaniline[2-]	x	—	—
Nitroaniline[4-]	x	x	—
Nitrophenol[2-]	x	—	—
Nitrosodiphenylamine[N-]	x	—	—
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	—	x	—
Phenanthrene	x	x	—
Pyrene	x	x	—
Tetrachloroethene	x	—	—
Toluene	x	x	—
Trichloroethane[1,1,1-]	x	—	—
Trichloroethene	x	—	—
Trichlorofluoromethane	x	—	—
Trichlorophenol[2,4,6-]	x	—	—
Trimethylbenzene[1,2,4-]	x	—	—
Xylene (Total)	x	x	—
Xylene[1,2-]	x	x	—
Xylene[1,3-]	x	—	—
Xylene[1,3-]+Xylene[1,4-]	—	x	—
Americium-241	**x**	**x**	x
Cesium-134	x	—	x
Cesium-137	**x**	x	—
Cobalt-60	**x**	—	—
Europium-152	x	—	—
Plutonium-238	**x**	**x**	x
Plutonium-239/240	**x**	**x**	x
Potassium-40	—	**x**	—
Radium-226	—	x	—
Ruthenium-106	x	—	—
Sodium-22	x	x	—
Strontium-90	**x**	**x**	—
Technetium-99	—	x	—

Table 6.5-1 (continued)

Analyte	Sediment	Water	Core
Thorium-228	**x**	x	—
Thorium-230	**x**	x	—
Thorium-232	**x**	x	—
Tritium	x	**x**	x
Uranium-234	x	x	x
Uranium-235/236	x	x	x
Uranium-238	x	x	x

[a] x = Analyte is a COPC for given medium.

[b] Bold x = Analyte exceeded residential SSL, SAL, or standard.

[c] — = Analyte is not a COPC for given medium.

Table 7.1.1
Summary of Estimated Inventory of Radionuclides in Post-1942 Sediments in the Mortandad Watershed

Area	Distance From Rio Grande (km)	Americium-241		Cesium-137		Cobalt-60		Plutonium-238		Plutonium-239,240		Strontium-90	
		Inventory (mCi)	Percent of Total Inventory	Inventory (mCi)	Percent of Total Inventory	Inventory (mCi)	Percent of Total Inventory	Inventory (mCi)	Percent of Total Inventory	Inventory (mCi)	Percent of Total Inventory	Inventory (mCi)	Percent of Total Inventory
Effluent Canyon	13.71–14.70	11	3%	23	2%	0.1	3%	3	1%	17	4%	1.7	1%
Mortandad Canyon between Effluent Canyon and Reach M-3E	11.84–13.71	81	19%	340	24%	0.8	29%	55	21%	87	22%	16	10%
Mortandad Canyon Reach M-3E	11.22–11.84	230	55%	732	52%	1.5	52%	85	32%	192	50%	36	23%
Pratt Canyon	12.83–13.12	0.2	0%	10	1%	0	3%	0.0	0%	0.5	0%	62	39%
Ten Site Canyon	11.22–13.75	2.3	1%	2.0	0%	0.0	0%	87	33%	16	4%	5	3%
Mortandad Canyon Reach M-4	10.56–11.22	75	18%	246	17%	0.4	12%	27	10%	57	15%	24	15%
Mortandad Canyon between Reach M-4 and East End of Reach M-5E	8.90–10.56	21	5%	66	5%	0.1	2%	7	3%	18	5%	13	8%
Total	n/a*	420	100%	1420	100%	3	100%	263	100%	387	100%	157	100%

Note: Inventory does not include estimates in reaches where these analytes are not COPCs or for parts of Mortandad Canyon upcanyon of Effluent Canyon or downcanyon of M-5E, or for the unnamed tributary canyon that heads in TA-5

*n/a = Not applicable.

Table 7.2-1
Recent Annual Discharge Volumes for NPDES Outfalls in the Mortandad Watershed

Outfall	Key Facility	Annual Total Discharge (m^3)	
		2004	2005
051	WMO: RLWTF (TA-50, 21)	8170	6796
03A-021	CMR Building (TA-03)	4490	3483
03A-022	Sigma Complex (TA-03)	7461	14,403
03A-160	Nonkey (TA-35)	29,844	29,844
03A-181	Plutonium Facility Complex (TA-55)	10,306	9087
	Sum of Mortandad Outfall Discharges	60,271	63,613

Sources: LANL 2004, 94068; LANL 2005, 94073.

Table 7.2-2
Days with Recorded Flow for Streamflow Gaging Stations in the Mortandad Watershed

Gage	E200	E202	E2015	E203	E204
Period of Record[a]	10/1/1995 8/14/2005	10/1/1996 8/19/2006	11/17/1999 9/30/2005	10/1/1996 9/30/2005	10/1/1993 9/30/2005
Days with Recorded Flow	2798	436	212	0	0
Total Days of Record[b]	3710	3069	1919	3288	4383
% of Days with Recorded Flow	75.4%	14.2%	11.1%	0.0%	0.0%

Source: WQH database.

[a] Water year data are provisional.

[b] Excludes days when equipment malfunction resulted in no record.

Table 7.2-3
Seasonal TA-50 RLWTF Outfall Percentage of E200 Flow

Year	Jan–Mar	Apr–Jun	Jul–Sep	Oct–Dec	Annual Average
1997	109.7%	45.9%	13.2%	83.7%	63.1%
1998	34.5%	Not available[a]	40.0%	27.8%	34.1%
1999	50.6%	35.8%	27.5%	66.4%	45.1%
2000	50.0%	Not available[b]	na[b]	19.6%	34.8%
2001	21.6%	50.2%	14.1%	5.9%	22.9%
2002	6.0%	67.4%	32.5%	36.6%	35.6%
2003	46.9%	45.3%	22.6%	7.6%	30.6%
2004	1.1%	81.9%	27.4%	13.9%	31.1%
2005	5.2%	28.2%	4.7%	47.2%	21.3%
2006	82.6%	21.5%			
Mean	40.8%	47.0%	22.7%	34.3%	35.4%
Median	40.7%	45.6%	25.0%	27.8%	34.1%

[a] E200 gage malfunctioned from 5/23/1998 to 6/3/2000; summary data not valid.

[b] E200 gage malfunctioned from 4/5/2000 to 7/24/2000; summary data not valid.

Table 7.2-4
Average Volumetric Water Content for Mortandad Boreholes by Unit

Borehole	Average 0–6 m (0–20 ft)	Alluvium >6m (>20 ft)	Qbt 2 >6 m (>20 ft)	Qbt 1	Qct	Qbo
MCB-1	16		10	10		
MCB-2	17		24	25		
MCB-5	4	37		19		
R-1	12			21	48	22
MCB-6	10	30		23		
MCI-8	6	12		22	32	24
MCB-7	1	31				
MCOBT-4.4	14	30			36	19
MCB-14	6	28			30	20
MCB-8	14	12			19	
MCB-9	3	29			28	
MCI-6	7	28			16	29
R-15	8			16	36	19
MCB-10	15	24			39	
MCB-11	6	26			55	
MCB-12	10	22			31	
MCOBT-8.5	10	15				21
R-28	6	8				16
MCB-16	7	21				12
MCB-15	5	30		20	17	16
MCI-1			8	17		15
MCI-10				9		9

Notes: Blank cells indicate unit is not present; 0–20 ft average is independent of stratigraphic unit. Qbt 2 is Tshirege Member unit Qbt 2. Qbt 1 is Tshirege Member unit Qbt 1 (includes subunits 1v and 1g). Qct is the Cerro Toledo interval, and Qbo is the Otowi Member of the Bandelier Tuff.

Table 7.2-5
Estimated Nitrate and Perchlorate Masses by Strata Based on earthVision Models

Model Zone	NO_3 (as N, kg)	% NO_3	CLO_4 (kg)	% CLO_4
Unsaturated Alluvium	6379	2.9	10	0.8
Saturated Alluvium	230	0.1	35	2.8
QBT3	0	0.0	0	0.0
QBT2	12	0.0	0	0.0
QBT1V	7986	3.6	8	0.7
QBT1G	41609	18.8	150	12.1
QBTT	1087	0.5	4	0.3
QCT	39667	17.9	171	13.8
QBOF	123370	55.8	839	67.7
QBOG	131	0.1	0	0.0
TPF	41	0.0	0	0.0
TPF2	2	0.0	0	0.0
TPF3	0	0.0	0	0.0
TT	0	0.0	0	0.0
Saturated TB4 (Dense)	57	0.0	1	0.1
Saturated TB4 (Interflow)	325	0.1	20	1.6
Unsaturated TB4 (Dense)	91	0.0	0	0.0
Unsaturated TB4 (Interflow)	2	0.0	0	0.0
Total Porewater	220377	99.7	1,183	95.5
Perched Intermediate	382	0.2	22	1.8
Alluvial Saturation	230	0.1	35	2.8
Grand Total	**220,989**	**100.0**	**1,239**	**100.0**

Table 8.1-1
Field Studies in Mortandad Canyon Watershed As Implemented

Assay Type	Reach	Rationale for Reach Selection Based on HQ
Soil COPECs		
Earthworm toxicity, plant toxicity, sediment characterization	E-1FW	Plant: high chromium, vanadium (+ other inorganic chemicals) Worm: high chromium, high copper
	E-1W	Plant: high chromium, vanadium Worm: high chromium
	E-1E	Plant: high chromium, high silver Worm: high chromium, high mercury, high Am-241, high Pu-239
	TS-1C	Plant: high selenium, vanadium Worm: di-n-butyl phthalate
	TS-2C	Plant: high silver, high vanadium Worm: moderate chromium, moderate mercury
	M-2W	Plant: lower inorganic chemicals Worm: moderate chromium, moderate mercury, high Am-241, Pu-238, and Pu-239 High perchlorate
	M-4	Plant: high silver, lower other inorganic chemicals Worm: lower chromium, lower mercury Moderate perchlorate
	LA-BKG	Background location
General small mammal trapping, sediment characterization	E-1W	Moderate arsenic and manganese
	M-2W	High thallium, Aroclor-1260 for potential risk to Mexican spotted owl High perchlorate
	M-3	Low arsenic, no other small mammal COPECs Low perchlorate
	LA-BKG	Background location
Shrew trapping, sediment characterization	E-1W	100% wet, high arsenic, high thallium
	LA-BKG	Background location
Plant diversity	E-1FW	Correlate to plant toxicity
	E-1W	Correlate to mammal trapping and plant toxicity
	E-1E	Correlate to plant toxicity
	TS-1C	Correlate to plant toxicity
	TS-2C	Correlate to plant toxicity
	M-2W	Correlate to mammal trapping and plant toxicity High perchlorate
	M-3	Correlate to mammal trapping and plant toxicity
	M-4	Correlate to plant toxicity
	LA-BKG	Background location
Additional nest boxes	E-1FW	Robin: moderate copper, vanadium, PCBs Swallow: no COPECs
	E-1W	Robin: high vanadium, lower zinc Swallow: High aluminum, moderate vanadium, lower copper and zinc Kestrel: no COPECs

Table 8.1-1 (continued)

Assay Type	Reach	Rationale for Reach Selection Based on HQ
	E-1E (bench above reach)	Robin: high mercury, moderate copper, lead Swallow: low zinc Kestrel: no COPECs but total hazard index (HI)=2 and Cs-137 HQ=0.8
	TS-1C	Swallow: high vanadium, zinc Kestrel: no COPECs but total HI=1.2 Robin: highest organic HQ (di-n-butyl phthalate)
	M-1E	Robin: high vanadium Swallow: high aluminum and vanadium, lower zinc Kestrel: no COPECs
	M-2W (bench above reach)	Robin: lower lead, mercury, zinc, PCBs Swallow: low zinc Kestrel: no COPECs but total HI=1.2 High perchlorate
	M-2E (bench above reach)	Robin: moderate mercury Swallow: low zinc Kestrel: no COPECs Moderate perchlorate
	TS-1E	Add to existing network in area of higher contamination
Sediment/Water COPECs		
Aquatic Toxicity and rapid bioassessment protocol	E-1W	High barium, PCBs, DDT for aquatic community
	E-1E	No aquatic community COPECs
	M-1W	Chlordane and DDT COPECs for aquatic community
	M-2W	No aquatic community COPECs Low perchlorate
	TS-1C	High PCBs and anthracene for aquatic community
	TS-1E	High PCBs, anthracene, and copper for aquatic community
	TS-2C	High silver for aquatic community Moderate PCBs and dibenz(a,h)anthracene for aquatic community
	LA-BKG	Background location. Collect sediment and water for toxicity testing, not used for rapid bioassessment protocol
Algal toxicity tests	M-1W	Included to collocate with aquatic toxicity tests
	M-2W	sampled at gaging station E200; location with high HQs for algae for radium-226 and americium-241
	E-1W	Just downcanyon from gaging station E196, location with high HQs for algae for radium-226
	E-1E	Upcanyon of high HQ at gaging station E200 for algae for radium-226 and americium-241
	TS-1C	Included to collocate with aquatic toxicity tests
	TS-1E	Included to collocate with aquatic toxicity tests
	TS-2C	Included to collocate with aquatic toxicity tests
	LA-BKG	Background location

Table 8.1-2
Number of Each Species Collected for Analysis in Each Reach in the Mortandad Watershed

Reach	M-3E	M-2W	E-1W	LA-BKG
Deer Mouse (*Peromyscus maniculatus*)	23	10	8	18
Mexican Wood rat (*Neotoma mexicana*)	4	4	2	0
Brush Mouse (*Peromyscus boylii*)	0	17	7	0
Long-tailed Vole (*Microtus longicaudus*)	0	0	1	5
Pinyon Mouse (*Peromyscus truei*)	0	0	0	2
Western Harvest Mouse (*Reithrodontomys megalotis*)	10	0	0	0
Montane Shrew (*Sorex spp*)	0	0	4	6

Table 8.1-3
Samples Collected from Nest Boxes

Reach/Location	Number of Egg Samples	Number of Insect Samples
E-1FW	1	1
TS-1E	0	1
TS-2W	1	1
M-4	2	2
M-4E	1	1
M-4W	1	1
M-5W	9	3
TA-51	1	0
Cañada del Buey	3	1
Guaje Pines Cemetery	7	2
Los Alamos golf course	6	1

Table 8.1-4
Estimate of Risk to Mexican Spotted Owl Through Ingestion of Small Mammals

COPEC	Maximum Detected Concentration in Carcass (mg/kg)	Carcass wt (kg)	Max Concentration in Pelt (mg/kg)	Pelt wt (kg)	Calculated Whole Animal Concentration (mg/kg)	Avian Soil TRV (mg/kg/d)	Owl Food Ingestion Rate (kg/d)	ESL for Food (in mg/kg)	HQ
Mercury (inorganic)	0.02	0.1025	0.07	0.0193	0.03	0.019	0.102	0.186	0.15
Mercury (methyl)*	0.02	0.1025	0.07	0.0193	0.03	0.0064	0.102	0.063	0.45
Selenium	0.58	0.1025	0.83	0.0193	0.62	0.44	0.102	4.31	0.14

*Not analyzed; bounding case of 100% methyl mercury

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Table 8.1-5
Estimate of Risk to Southwestern Willow Flycatcher Through Ingestion of Nest Box Insects by Reach

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Table 8.1-6
Estimate of Risk to the Insectivorous Robin Using Estimated Concentrations of COPECs in Earthworms

Table 8.1-7
Estimate of Risk to Small Mammals (shrew) from Estimated COPEC Concentrations in Earthworms

COPEC	Basis of Concentration	Maximum Detected Concentration Detected in Earthworm Toxicity Test Soil	Estimated Concentration in Earthworm Tissue (mg/kg fresh wt)	Mammalian Soil TRV (mg COPEC/kg bird/day)	Shrew Food Ingestion Rate (kg fresh food/kg bw/d) or if ESL TF Used (kg dry food/kg bw/d)	Food ESL (in mg/kg or pCi/g)	HQ
Arsenic	ESL TF	5.6	1.32	1.04	0.198	5.3	0.25
Cadmium	Regression	0.66	2.25	0.77	0.508	1.5	1.48
Manganese	Regression	614	30.95	44	0.508	86.6	0.36
Thallium	ESL TF	0.87	0.87	0.0071	0.198	0.036	24
Vanadium	ESL TF	29.7	1.25	4.16	0.198	21.0	0.06
Chrysene	ESL TF	0.62	0.15	0.17	0.198	0.86	0.17

Table 8.1-8
Estimate of Risk to Shrews from Estimated Thallium Concentrations in Earthworms by Reach

Reach	Concentration in Earthworm Tox Test Composite Soil	Estimated Concentration in Earthworm Tissue (mg/kg fresh wt)	Mammalian Soil TRV (mg COPEC/kg bird/day)	Shrew Food Ingestion Rate (kgfresh food/kg bw/d) or if ESL TF Used (kg dry food/kg bw/d)	Food ESL (in mg/kg or pCi/g)	HQ
TS-1C	0.16	0.16	0.0071	0.198	0.036	4
E-1E	0.87	0.87	0.0071	0.198	0.036	24
M-4	0.52	0.52	0.0071	0.198	0.036	15
E-1FW	0.15	0.15	0.0071	0.198	0.036	4
E-1W	0.2	0.20	0.0071	0.198	0.036	6
M-2W	0.14	0.14	0.0071	0.198	0.036	4
TS-2C	0.13	0.13	0.0071	0.198	0.036	4
LA-BKG	0.1	0.10	0.0071	0.198	0.036	3

Table 8.1-9
Plant and Earthworm HQs for Study Design COPECs in Soil from Laboratory Toxicity Tests

		HQ of Soil Sample from Toxicity Test for Receptor at Left							
Plant COPEC	**Plant ESL**	**LA-BKG**	**E-1FW**	**E-1W**	**E-1E**	**M-2W**	**M-4**	**TS-1C**	**TS-2C**
Barium	110	0.39	0.93	1.1	0.81	0.52	1.1	0.26	0.70
Chromium	2.4	2.2	218	8.4	20	3.24	5.7	1.7	2.8
Copper	10	0.42	9.1	1.2	0.03	1.2	2.0	0.37	0.69
Manganese	50	3.1	5.9	11	12	7.5	9.4	5.1	5.5
Selenium	0.1	ND[a]	ND	ND	7.50	ND	ND	ND	ND
Silver	0.05	ND	3.0	2.2	2.0	2.2	6.0	0.80	15.60
Thallium	0.1	1.0	1.5	2.0	8.7	1.4	5.2	1.6	1.3
Vanadium	0.025	440	1200	820	452	476	764	476	532
Zinc	10	3.0	7.5	7.5	3.0	8.0	5.6	4.6	4.7
Acenapthene	0.25	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	0.0034	ND	ND	ND	ND	ND	ND	ND	ND
Plant HI		450	1446	853	507	500	799	490	563
Worm COPEC	**Worm ESL**	**LA-BKG**	**E-1FW**	**E-1W**	**E-1E**	**M-2W**	**M-4**	**TS-1C**	**TS-2C**
Chromium	2.3	2.3	228	8.78	21	3.4	6.0	1.8	2.9
Copper	13	0.32	7.0	0.94	0.021	0.95	1.5	0.28	0.53
Mercury	0.05	0.20	1.8	0.80	0.20	0.80	4.2	0.16	0.40
Amercium-241	44	NA[b]	ND	0.01	0.73	NA	0.23	0.00	0.01
Plutonium-238	44	ND	ND	ND	0.48	0.14	0.43	0.13	0.03
Plutonium-239	47	ND	0.0011	0.01	1.8	0.20	0.29	0.02	0.01
Worm HI		2.8	237	11	25	5.5	13	2.4	3.9

[a] ND = Not detected.

[b] NA = Not analyzed.

Table 8.1-10
Summary of Field Plant Survey Results

Reach	Approximate Distance Above Rio Grande (km)	Total Species Richness	Shannon Diversity Index (All Species)	Total Percent Canopy Cover
LA-BKG	19.5	55	3.19	235.25
E-1E	13.8	21	2.23	124.25
E-1FW	14.3	32	2.52	190.75
E-1W	14.0	18	2.15	247.25
M-2W	13.4	16	2.27	208.25
M-3	11.5	35	2.10	194.25
M-4	10.9	45	2.32	155.50
TS-1C	13.5	56	2.61	177.75
TS-2C	12.6	43	2.57	147.75

Table 8.1-11
Detected Radionuclide Concentrations in Algal Toxicity Test Samples

Reach	Sample ID	Radionuclide	Result (pCi/L)	HQ Based on Algae ESL
TS-1C	CAMO-05-61178	Americium-241	0.2	0.03
M-2W	CAMO-05-61170	Americium-241	1.88	0.32
E-1E	CAMO-05-61174	Americium-241	5.29	0.91
M-1W	CAMO-05-61176	Radium-226	0.43	4.3

Table 8.1-12
Estimate Risk to the Occult Myotis Little Brown Bat
from Ingestion of COPECs in the Tissues of Insects Collected from Nest Boxes

COPEC	Maximum Detected Concentration in Insect Tissue in Nest Box (mg/kg fresh insect)	Mammalian Sediment TRV (mg COPEC/kg bw/day)	Bat Food Ingestion Rate (kgfresh food/kg bird/d)	Food ESL (in mg/kg or pCi/g)	HQ
Aluminum	250	pH dependent	0.410	n/a*	n/a
Arsenic	1.4	1.04	0.410	3	0.55

*n/a = Not applicable.

Table 8.1-13
Estimate of Risk to the Red Fox from Ingestion of COPECs in the Tissues of Small Mammals

COPEC	Measured Whole Animal Concentration	Mammalian TRV (mg/kg/d)	Fox Food Ingestion Rate (kg food fresh weight/kg bird/d)	ESL (in mg/kg)	HQ
Aroclor-1260	0.32	13.8	0.14	98	0.003

Table 8.1-14
Lines of Evidence and Rationale for the Mexican Spotted Owl (AE1)

Line of Evidence	Weight of Evidence Criteria	Result
(1) Modeled exposure and literature toxicity information to calculate spatially weighted HQ values using ECORSK.9 (includes consideration of nesting and foraging habitat based on vegetation class coverage)	Medium	Total mean adjusted HI across watershed for owl equals 1.6, indicating a slight potential fro risk (mostly associated with non-canyons contaminants). Mean adjusted HI for reach with known owl nest is 0.2, indicating no potential for risk to owl.
(2) Modeled and measured concentrations in prey species (small mammals)—compare prey COPEC concentrations across gradient and determine division of contaminants between carcass and pelt	Medium	Dose of COPEC ingested had HQ<1.0 for all COPECs when compared to TRV, indicating that the risk through food ingestion was much lower than that predicted by the ESL screening.
(3) Analysis of owl pellets	Low	Results of pellet analysis confirmed that the small mammal prey species captured and used for tissue analysis are the species consumed by the owl, supporting the use of these species in the food chain modeling
(4) Comparison of concentrations in 2005 sediment samples to ESLs	Low	Screening of 2005 sediment data against ESLs resulted in addtion of bis (2ethylhexyl) phthalate as a new COPEC for this receptor

Table 8.1-15
Lines of Evidence and Rationale for Avian and Mammalian Aerial Insectivores (AE6)

Line of Evidence	Weight of Evidence Criteria	Result	Aerial Insectivore Receptors
(1) Nest box study—determine nest success rate by bluebirds along a gradient of COPEC concentrations in the Mortandad Canyon watershed; need to account for other factors known to influence nest success (food, predators, etc.)	Medium (new boxes) High (established boxes)	Percent fledged and percent female nestlings were not different between Mortandad watershed reaches or between Mortandad watershed and other canyons, indicating no effect on population (measured as nest success)	Southwestern willow flycatcher/Violet-green swallow
(2) Nest box study—determine eggshell thickness for bluebirds along a gradient of COPEC concentrations in Mortandad, Effluent, and Ten Site Canyons; need to account for other factors known to influence eggshell thickness (amount of calcium in diet, etc.)	Medium	Egg size (length and weight), and eggshell thickness were not different between Mortandad reaches or between Mortandad and other canyons, indicating no effect on nest success	Southwestern willow flycatcher/Violet-green swallow
(3) Nest box study—compare COPEC concentrations in eggs within Mortandad Canyon watershed and also compare concentrations with “reference” locations	Medium-low	Concentrations of metals in eggs did not correlate with concentrations of metals in soil, indicating soil is not a source of bioaccumulation into eggs	Southwestern willow flycatcher/Violet-green swallow
(4) Compare the measured concentrations of COPECs in insects with the TRV	Medium	Potential dose through food to Southwestern willow flycatcher and little myotis bat modeled based on measured COPEC concentrations in nest box insects. Copper, mercury, vanadium, and zinc had 1.0<HQ<10 for flycatcher using mean concentrations. Bat had no COPECs with HQ>1.0 using maximum detected concentrations.	Southwestern willow flycatcher/Violet-green swallow Occult little myotis bat
(5) Comparison of concentrations in 2005 sediment and water samples to ESLs	Low	Only new COPEC to swallow or flycatcher from screening of 2005 sediment samples is bis (2 ethylhexyl) phthalate. No new COPECs for bat. Some existing study design COPECs are now COPECs in additional reaches	Southwestern willow flycatcher/Violet-green swallow Occult little myotis bat
(6) Modeled exposure and literature toxicity information to calculate spatially weighted HQ values using ECORSK.9 (includes consideration of nesting and foraging habitat based on vegetation class coverage)—could be based on a frequency of HQ values greater than 1 for the watershed	Medium	The mean adjusted total HI for the SWF was 6.2, based on mercury, di-n-butyl phthalate, boron, and bis (2ethylhexyl) phthtalate. These values indicate a potential for risk to the flycatcher.	Southwestern willow flycatcher

Table 8.1-16
Lines of Evidence and Rationale for Avian Ground Invertevores (AE2)

Line of Evidence	Weight of Evidence Criteria	Result
(1) Nest box Study-Compare the measured concentrations of COPECs in insects with the TRV for the robin with the invertevore diet	Medium	Substituted calculations with earthworms for this measure
(2) Nest box study—determine nest success rate by bluebirds along a gradient of COPEC concentrations in the Mortandad Canyon watershed; need to account for other factors known to influence nest success (food, predators, etc.)	Medium (new boxes) High (established boxes)	Percent fledged and percent female nestlings were not different between Mortandad watershed reaches or between Mortandad watershed and other canyons, indicating no effect on population (measured as nest success)
(3) Nest box study—determine eggshell thickness for bluebirds along a gradient of COPEC concentrations in Mortandad, Effluent, and Ten Site Canyons; need to account for other factors known to influence eggshell thickness (amount of calcium in diet, etc.)	Medium	Egg size (length and weight), and eggshell thickness were not different between Mortandad watershed reaches or between Mortandad watershed and other canyons, indicating no effect on nest success
(4) Nest box study—compare COPEC concentrations in eggs within Mortandad Canyon watershed and also compare concentrations with "reference" locations	Medium-low	Concentrations of metals in eggs did not correlate with concentrations of metals in soil, indicating soil is not a source of bioaccumulation into eggs
(5) Modeled and measured concentrations in food (earthworm bioaccumulation test)—determine if exposure concentrations differ within the watershed in relation to sediment concentrations; design used a gradient in COPEC concentrations with the Mortandad Canyon watershed and also compared concentrations with "reference" locations	Medium	HQs based on modeled doses from estimated concentrations in earthworms indicated that some COPECs (mercury, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, and Aroclor-1254) may have potential for ecological risk to avian ground invertevores
(6) Modeled exposure and literature toxicity information to calculate spatially weighted HQ values using ECORSK.9 (includes consideration of nesting and foraging habitat based on vegetation class coverage) for bluebird populations in the watershed; will be based on a frequency of HQ values greater than 1 for the watershed (or assessment population area)	Medium	Western bluebird served as a surrogate for the robin representing avian invertevores in the model. The mean adjusted total HI for the bluebird is 1.2, too low for population level effects.
(7) Field surveys of avian ground invertevore abundance and diversity in the Mortandad Canyon watershed; and also compare abundance/diversity with "reference" locations	Low	Field surveys of Upper Mortandad and Ten Site Canyon had similar diversity indices and most species in both areas were invertevores, no population level effects seen
(8) Comparison of concentrations in 2005 sediment samples to ESLs	Low	Only new COPEC from screening of 2005 sediment samples is bis(2-ethylhexyl)phthalate. Some existing study design COPECs are now COPECs in additional reaches.

Table 8.1-17
Lines of Evidence and Rationale for Mammalian Invertevores and Omnivores (AE3)

Line of Evidence	Weight of Evidence Criteria	Result
(1) Field surveys to determine small mammal reproduction status along gradient of COPEC concentrations in the Mortandad Canyon watershed and also compare reproduction rates with "reference" locations	Medium high	No differences seen in relative population abundance, gender, or body weight between reaches
(2) Modeled and measured concentrations in food (earthworms)—could determine if exposure concentrations differ within the watershed in relation to sediment concentrations; design could use a gradient in COPEC concentrations with the Mortandad Canyon watershed and also compare concentrations with "reference" location	Medium	Modeling of potential risk through food to the shrew or mouse using estimated concentrations in earthworms showed only thallium with an HQ elevated enough to indicate potential for population-level effects. Thallium has a very low TRV and high default TF in model
(3) Modeled exposure and literature toxicity information to calculate spatially weighted HQ values using ECORSK.9 (includes consideration of nesting and foraging habitat based on vegetation class coverage) for deer mouse and shrew populations in the watershed—could be based on a frequency of HQ values greater than 1 for the watershed	Medium	Mean HI exceeded 1 in only 8% of sites across watershed. Dominant COPEC in this model is also thallium
(4) Comparison of concentrations in 2005 sediment samples to ESLs	Low	Screening of 2005 sediment sample data did not show any new COPECs for these receptors

Table 8.1-18
Lines of Evidence and Rationale for Detritivores (AE4)

Line of Evidence	Weight of Evidence Criteria	Result
(1) Toxicity test (earthworm mortality) along gradient of COPEC concentrations in the Los Alamos and Pueblo watershed—compare mortality rates with "reference" locations	High	No differences in earthworm mortality seen between reaches, indicating no effect along COPEC gradient. Weight loss differed between reaches, but did not correlate with COPEC concentration.
(2) The concentration of COPECs in earthworms	Contributor to other AEs	Not measured due to laboratory error
(3) Comparison of concentrations in 2005 sediment samples to ESLs	Low	Screening of 2005 sediment data indicates that hexavalent chromium would be a study design COPEC for this receptor. Existing studies included reaches with this COPEC.

Table 8.1-19
Lines of Evidence and Rationale for Plants (AE5)

Line of Evidence	Weight of Evidence Criteria	Result
1) Toxicity test (seedling germination) along gradient of COPEC concentrations in the Los Alamos and Pueblo watershed and also compare germination rates with "reference" locations	High	No differences in mortality, dry root mass, dry shoot mass, or mean root length. Some differences in wet root length and mean shoot length between reaches, but effect did not match with COPEC concentration
2) Abundance and diversity of plants along gradient of COPEC concentrations in the Mortandad watershed and also compare plant abundance/diversity with "reference" locations	Medium	Plant survey showed differences between reaches, but not attributable to COPEC gradient. Differences attributable to climate factors, and species in all reaches increased since previous survey during dry year.
(3) Comparison of concentrations in 2005 sediment samples to ESLs	Low	Screening of 2005 sediment data indicates that hexavalent chromium would be a study design COPEC for this receptor. Existing studies included reaches with this COPEC.

Table 8.1-20
Lines of Evidence and Rationale for the Aquatic Community (AE7)

Line of Evidence	Weight of Evidence Criteria	Result
(1) Estimates of growth and mortality of aquatic invertebrates based on toxicity tests using *Chironomus tentans* compared with the reference location	High	No significant differences in larval survival or mean dry weight of larvae between reaches, indicating no effect of COPECs on larval survival and growth.
(2) A rapid bioassessment characterization to evaluate habitat ratings at selected locations based on watershed features, riparian vegetation, in-stream features, aquatic vegetation, and benthic substrate; assessment will also include measures of abundance and diversity of aquatic invertebrates through Hess sampling and dip net capture	Medium	Physical aspects of habitat similar between reaches; all rated as marginal using index scores. Chironomids made up majority of biomass in all reaches, supporting their use as toxicity indicator organism.
(3) Comparison of concentrations in 2005 sediment and water samples to ESLs	Low	Screening of 2005 sediment data indicated iron should be a new COPEC for this receptor. Screening of water data also indicated iron should be a new COPEC, and cobalt would be a COPEC at one water location
(4) Algae toxicity test	High	Differences seen between water samples from different reaches attributable to differences in water hardness. Algal cell growth in all samples except TS-1C exceeded negative and positive laboratory control sample growth. Results indicate no impairment of algal cell growth due to COPECs in water.

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Table 8.2-8
Site-Specific Exposure Scenarios and Complete Exposure Pathways

	Exposure Scenarios	
Exposure Pathways	**Trail User**	**Residential**
Incidental ingestion of soil	**X**	**X**
Inhalation of dust	**X**	**X**
Dermal contact with soil	**X**	**X**
Ingestion of fruits and vegetables	—*	**X**
Ingestion of meat	—	—
Ingestion of groundwater	—	—
Dermal contact with groundwater	—	—
Ingestion of surface water	**X**	—
Dermal contact with surface water	**X**	—
External irradiation	**X**	**X**

* — = Incomplete pathway.

Table 8.2-9
Media-Specific Risk-Based Screening Levels (MSSL) for the Trail User Scenario

Medium	COPC	CAS ID	Units	Endpoint	Target Adverse-Effect Level	Recreational MSSL	Reference
Sediment	Aluminum	7429-90-5	mg/kg	nc	HQ=1	100000	LANL (2004, 87800)
Sediment	Antimony	7440-36-0	mg/kg	nc	HQ=1	317	LANL (2004, 87800)
Sediment	Aroclor-1254	11097-69-1	mg/kg	ca	1E-5 risk	10.5	LANL (2004, 87800)
Sediment	Aroclor-1254-nc	11097-69-1	mg/kg	nc	HQ=1	6.65	LANL (2004, 87800)
Sediment	Aroclor-1260	11096-82-5	mg/kg	ca	1E-5 risk	10.5	LANL (2004, 87800)
Sediment	Aroclors (Mixed)	1336-36-3	mg/kg	ca	1E-5 risk	10.5	LANL (2004, 87800)
Sediment	Arsenic	7440-38-2	mg/kg	ca	1E-5 risk	27.7	LANL (2004, 87800)
Sediment	Arsenic-nc	7440-38-2	mg/kg	nc	HQ=1	183	LANL (2004, 87800)
Sediment	Benzo(a)anthracene	56-55-3	mg/kg	ca	1E-5 risk	30.1	LANL (2004, 87800)
Sediment	Benzo(a)pyrene	50-32-8	mg/kg	ca	1E-5 risk	3.01	LANL (2004, 87800)
Sediment	Benzo(b)fluoranthene	205-99-2	mg/kg	ca	1E-5 risk	30.1	LANL (2004, 87800)
Sediment	Chromium	7440-47-3	mg/kg	ca	1E-5 risk	100000	LANL (2004, 87800)
Sediment	Chromium-nc	7440-47-3	mg/kg	nc	HQ=1	14300	LANL (2004, 87800)
Sediment	Copper	7440-50-8	mg/kg	nc	HQ=1	31700	LANL (2004, 87800)
Sediment	Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	ca	1E-5 risk	30.1	LANL (2004, 87800)
Sediment	Iron	7439-89-6	mg/kg	nc	HQ=1	100000	LANL (2004, 87800)
Sediment	Lead	7439-92-1	mg/kg	nc	HQ=1	560	LANL (2004, 87800)
Sediment	Manganese	7439-96-5	mg/kg	nc	HQ=1	15800	LANL (2004, 87800)
Sediment	Mercury	7487-94-7	mg/kg	nc	HQ=1	238	LANL (2004, 87800)
Sediment	Thallium	7440-28-0	mg/kg	nc	HQ=1	52.3	LANL (2004, 87800)
Sediment	Uranium	7440-61-1	mg/kg	nc	HQ=1	2380	LANL (2004, 87800)
Sediment	Vanadium	7440-62-2	mg/kg	nc	HQ=1	5550	LANL (2004, 87800)
Sediment	Americium-241	86954-36-1	pCi/g	rad	15 mrem/yr	280	LANL (2005, 88493)
Sediment	Cesium-137	10045-97-3	pCi/g	rad	15 mrem/yr	210	LANL (2005, 88493)
Sediment	Cobalt-60	10198-40-0	pCi/g	rad	15 mrem/yr	46	LANL (2005, 88493)
Sediment	Europium-152	14683-23-9	pCi/g	rad	15 mrem/yr	100	LANL (2005, 88493)
Sediment	Plutonium-238	13981-16-3	pCi/g	rad	15 mrem/yr	330	LANL (2005, 88493)
Sediment	Plutonium-239	15117-48-3	pCi/g	rad	15 mrem/yr	300	LANL (2005, 88493)
Sediment	Sodium-22	13966-32-0	pCi/g	rad	15 mrem/yr	58	LANL (2005, 88493)
Sediment	Strontium-90	10098-97-2	pCi/g	rad	15 mrem/yr	5600	LANL (2005, 88493)
Sediment	Thorium-228	14274-82-9	pCi/g	rad	15 mrem/yr	77	LANL (2005, 88493)
Sediment	Thorium-230	14269-63-7	pCi/g	rad	15 mrem/yr	150	LANL (2005, 88493)
Sediment	Thorium-232	7440-29-1	pCi/g	rad	15 mrem/yr	40	LANL (2005, 88493)
Sediment	Tritium	10028-17-8	pCi/g	rad	15 mrem/yr	5100000	LANL (2005, 88493)
Sediment	Uranium-238	7440-61-1	pCi/g	rad	15 mrem/yr	2100	LANL (2005, 88493)

Table 8.2-9 (continued)

Medium	COPC	CAS ID	Units	Endpoint	Target Adverse-Effect Level	Recreational MSSL	Reference
Surface water	Arsenic	7440-38-2	ug/L	ca	1E-5 risk	98.3	LANL (2004, 87390)
Surface water	Arsenic-nc	7440-38-2	ug/L	nc	HQ=1	1900	LANL (2004, 87390)
Surface water	Aroclor-1260	11096-82-5	ug/L	ca	1E-5 risk	74.5	LANL (2004, 87390)*
Surface water	Lead	7439-92-1	ug/L	nc	HQ=1	65	LANL (2005, 88493)
Surface water	Mercury	7439-97-6	ug/L	nc	HQ=1	1660	LANL (2004, 87390)*
Surface water	Aluminum	7429-90-5	ug/L	nc	HQ=1	6320000	LANL (2004, 87390)*
Surface water	Barium	7440-39-3	ug/L	nc	HQ=1	388000	LANL (2004, 87390)
Surface water	Fluoride	7782-41-4	ug/L	nc	HQ=1	379000	LANL (2004, 87390)
Surface water	Iron	7439-89-6	ug/L	nc	HQ=1	1900000	LANL (2004, 87390)
Surface water	Manganese	7439-96-5	ug/L	nc	HQ=1	706000	LANL (2004, 87390)
Surface water	Molybdenum	7439-98-7	ug/L	nc	HQ=1	31600	LANL (2004, 87390)
Surface water	Thallium	7440-28-0	ug/L	nc	HQ=1	506	LANL (2004, 87390)
Surface water	Vanadium	7440-62-2	ug/L	nc	HQ=1	32000	LANL (2005, 88493)
Surface water	Perchlorate	14797-73-0	ug/L	nc	HQ=1	632	LANL (2004, 87390)
Surface water	Uranium	7440-61-1	ug/L	nc	HQ=1	19000	LANL (2004, 87390)
Surface water	Americium-241	86954-36-1	pCi/L	rad	4 mrem/yr	275	LANL (2004, 87390)
Surface water	Cesium-137	10045-97-3	pCi/L	rad	4 mrem/yr	20000	LANL (2004, 87390)*
Surface water	Plutonium-238	13981-16-3	pCi/L	rad	4 mrem/yr	313	LANL (2004, 87390)*
Surface water	Plutonium-239	15117-48-3	pCi/L	rad	4 mrem/yr	282	LANL (2004, 87390)
Surface water	Plutonium-239/240	15117-48-3	pCi/L	rad	4 mrem/yr	282	LANL (2004, 87390)
Surface water	Potassium-40	13966-00-2	pCi/L	rad	4 mrem/yr	53800	LANL (2004, 87390)*
Surface water	Radium-226	13982-63-3	pCi/L	rad	4 mrem/yr	758	LANL (2004, 87390)*
Surface water	Strontium-90	10098-97-2	pCi/L	rad	4 mrem/yr	6540	LANL (2004, 87390)
Surface water	Tritium	10028-17-8	pCi/L	rad	4 mrem/yr	15600000	LANL (2004, 87390)*
Surface water	Uranium-234	13966-29-5	pCi/L	rad	4 mrem/yr	3530	LANL (2004, 87390)

*Additional documentation of this MSSL is provided in Appendix E.

Table 8.2-10
Toxicity Values that Differed Between Sources

Chemical	Chemical Abstract System ID	Parameter	Value	Source
Aroclor-1254	11097-69-1	SFi	3.50E-01	LANL (2004, 87800)
			No value	LANL (2004, 87390)
			2.00E+00	NMED (2006, 92513)
			2.00E+00	EPA (2005, 91002)
Barium	7440-39-3	RfDo	**7.00E-02**	LANL (2004, 87800)
			7.00E-02	LANL (2004, 87390)
			2.00E-01	NMED (2006, 92513)
			2.00E-01	EPA (2005, 91002)
		RfDi	**1.43E-04**	LANL (2004, 87800)
			7.00E-02	LANL (2004, 87390)
			2.00E-01	NMED (2006, 92513)
			2.00E-01	EPA (2005, 91002)
Copper	7440-50-8	RfDo	4.00E-02	LANL (2004, 87800)
			3.70E-02	LANL (2004, 87390)
			4.00E-02	NMED (2006, 92513)
			3.70E-02	EPA (2005, 91002)
Manganese	7439-96-5	RfDo	**2.00E-02**	LANL (2004, 87800)
			1.40E-01	LANL (2004, 87390)
			4.70E-02	NMED (2006, 92513)
			4.70E-02	EPA (2005, 91002)
Thallium	7440-28-0	RfDo	**6.60E-05**	LANL (2004, 87800)
			8.00E-05	LANL (2004, 87390)
			6.60E-05	NMED (2006, 92513)
			7.00E-05	EPA (2005, 91002)
Vanadium	7440-62-2	RfDo	7.00E-03	LANL (2004, 87800)
			7.00E-03	LANL (2004, 87390)
			1.00E-03	NMED (2006, 92513)
			1.00E-03	EPA (2005, 91002)

Notes: More protective values are in bold type. CSFi = inhalation cancer slope factor, RFDo = oral reference dose, RFDi = inhalation reference dose.

Table 8.2-11
Summary of Trail User Risk Assessment Results

Endpoint	Reach	Sediment	Surface Water	Multimedia Sum
Non-carcinogen HI	M-1W	0.016	0.446	0.46
	M-1E	0.397	0.055	0.45
	E-1FW	0.429	0.060	0.49
	E-1W	0.304	0.042	0.35
	E-1E	0.063	0.040	0.10
	M-2W	0.116	0.206	0.32
	M-2E		0.003	
	M-3	0.011		
	TS-1W	0.091		
	TS-1C	0.113	0.549	0.66
	TS-2E	0.184	0.030	0.21
	M-4	0.012		
Carcinogen risk	M-1W	5.5E-06	6.6E-07	6.2E-06
	M-1E	1.9E-06		
	E-1FW	3.5E-06	7.7E-07	4.3E-06
	E-1W	2.4E-06	6.7E-07	3.0E-06
	E-1E	1.6E-06		
	M-2W	2.0E-06	7.6E-07	2.8E-06
	M-3	8.6E-07		
	TS-1W	1.4E-06		
	TS-1C	2.7E-06	9.1E-07	3.6E-06
	TS-1E	2.3E-06		
	TS-2E	1.2E-06		
	M-4	7.8E-07		
Radionuclide dose (mrem/yr)	E-1W	1.60		
	E-1E	**43.7**	0.25	**44.0**
	M-2W	10.4	0.33	10.7
	M-2E	10.2	0.05	10.3
	M-3	9.08		
	TS-1W	0.43		
	TS-1C	3.39	0.04	3.43
	TS-1E	3.98		
	TS-2W	0.05		
	TS-2C	0.01		
	TS-2E	0.30		
	M-4	2.75		

Table 8.2-12
Risk Ratios based on Representative Concentrations for Sediment, Trail User Scenario

Non-carcinogen COPCs - Ratios															
Reach	Aluminum	Antimony	Aroclor-1254	Arsenic	Chromium	Copper	Iron	Lead	Manganese	Mercury	Thallium	Uranium	Vanadium	SOFnc	HI
MSSL	1E+05	317	6.65	183	14300	31700	1E+05	560	15800	238	52.3	2380	5550		
M-1W	-	-	-	0.014	-	-	-	-	-	-	-	-	-	0.01	0.01
M-1E	0.12	-	-	0.022	-	-	0.12	-	0.045	-	-	-	0.004	0.31	0.31
E-1FW	0.091	-	0.021	0.035	0.048	0.003	0.1	0.045	0.029	-	-	-	0.004	0.38	0.38
E-1W	0.059	-	-	0.018	0.003	-	0.087	-	0.041	-	-	0.001	0.002	0.21	0.21
E-1E	-	-	-	0.011	-	-	-	0.017	0.021	0.001	0.003	0.002	-	0.06	0.06
M-2W	-	9E-04	-	0.011	-	-	0.08	0.015	-	-	0.002	-	-	0.11	0.11
M-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-3	-	-	-	0.011	-	-	-	-	-	-	-	-	-	0.01	0.01
TS-1W	-	-	-	-	-	-	-	-	-	-	0.002	-	0.002	0.00	0.005
TS-1C	-	0.002	-	-	-	-	0.11	-	-	-	0.002	-	0.003	0.12	0.12
TS-1E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2E	0.066	-	-	0.012	-	-	0.087	-	-	-	-	-	0.003	0.17	0.17
M-4	-	-	-	0.011	-	-	-	-	-	-	-	-	-	0.01	0.01

Table 8.2-12 (continued)

Carcinogen COPCs - Ratios										
Reach	Aroclor-1254	Aroclor-1260	Arsenic	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Chromium	Indeno(1,2,3-cd)pyrene	SOFca	Carcinogenic risk
MSSL	10.5	10.5	27.7	30.1	3.01	30.1	1E+05	30.1		
M-1W	-	-	0.092	0.033	0.286	0.035	-	0.012	0.46	4.6E-06
M-1E	-	-	0.147	-	-	-	-	-	0.15	1.5E-06
E-1FW	0.013	-	0.23	-	0.05	-	0.007	-	0.30	3.0E-06
E-1W	-	-	0.117	-	0.086	-	4E-04	-	0.20	2.0E-06
E-1E	0.007	-	0.074	-	0.083	-	-	-	0.16	1.6E-06
M-2W	0.014	0.004	0.073	-	0.123	-	-	-	0.21	2.1E-06
M-2E	-	-	-	-	-	-	-	-	-	-
M-3	-	0.014	0.072	-	-	-	-	-	0.09	8.6E-07
TS-1W	0.054	-	-	-	0.034	-	-	-	0.09	8.8E-07
TS-1C	-	0.034	-	0.017	0.136	0.019	-	0.011	0.22	2.2E-06
TS-1E	-	-	-	0.016	0.137	0.023	-	-	0.18	1.8E-06
TS-2W	-	-	-	-	-	-	-	-	-	-
TS-2C	-	-	-	-	-	-	-	-	-	-
TS-2E	-	0.03	0.081	-	-	-	-	-	0.11	1.1E-06
M-4	-	-	0.073	-	-	-	-	-	0.07	7.3E-07

Table 8.2-12 (continued)

Radionuclide COPCs - Ratios														
Reach	**Americium-241**	**Cesium-137**	**Cobalt-60**	**Plutonium-238**	**Plutonium-239**	**Sodium-22**	**Strontium-90**	**Thorium-228**	**Thorium-230**	**Thorium-232**	**Tritium**	**Uranium-238**	**SOFrad**	**Radionuclide dose (mrem/yr)**
MSSL	280	210	46	330	300	58	5600	77	150	40	5E+06	2100		
M-1W	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-1E	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E-1FW	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E-1W	-	0.005	-	-	0.1	-	-	-	-	-	-	-	0.11	1.58
E-1E	**0.38**	**2.58**	0.022	0.057	**0.37**	0.001	0.002	-	-	-	2E-07	-	**3.42**	**51.2**
M-2W	0.169	0.305	0.007	0.107	0.151	-	1E-03	-	-	-	-	7E-04	0.74	11.1
M-2E	0.086	0.467	0.004	0.049	0.076	-	6E-04	-	-	-	-	-	0.68	10.2
M-3	0.099	0.388	0.004	0.028	0.091	-	7E-04	-	-	-	-	-	0.61	9.16
TS-1W	0.003	0.003	-	0.014	0.006	-	1E-04	-	-	-	-	-	0.03	0.39
TS-1C	-	0.009	-	0.058	0.029	-	-	0.033	0.025	0.079	-	-	0.23	3.50
TS-1E	-	-	-	0.235	0.031	-	-	-	-	-	-	-	0.27	3.98
TS-2W	-	-	-	-	-	-	4E-04	-	-	-	-	-	0.00	0.007
TS-2C	-	-	-	-	-	-	4E-04	-	-	-	-	-	0.00	0.006
TS-2E	-	-	-	-	0.017	-	0.001	-	-	-	-	-	0.02	0.28
M-4	0.034	0.138	0.001	0.01	-	-	6E-04	-	-	-	-	-	0.18	2.76

Table 8.2-13
Risk Ratios based on Representative Concentrations for Surface Water, Trail User Scenario

Non-carcinogen COPCs – Ratios															
Reach	Aluminum	Arsenic-nc	Barium	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Perchlorate	Thallium	Uranium	Vanadium	SOFnc	HI
MSSL	6E+06	1900	4E+05	4E+05	2E+06	65	7E+05	1660	31600	632	506	19000	31700		
M-1W	0.007	0.003		0.002	0.014	0.415		4E-05	0.004				0.002	0.45	0.45
M-1E	0.001			0.001	0.002	0.048	0.003						2E-04	0.06	0.06
east of E-1FW		0.004		9E-04	0.002	0.048	0.001		0.003		4E-04		3E-04	0.06	0.06
E-1W		0.003		0.002	0.003	0.029	0.001		0.002				2E-04	0.04	0.04
E-1E				0.002	0.001	0.035			0.001		1E-03			0.04	0.04
M-2W	7E-04	0.004			0.001	0.042		5E-05	2E-04	0.157	1E-03		7E-05	0.21	0.21
M-2E				0.002					1E-03					0.00	0.00
TS-2E				8E-04	6E-04	0.026	0.001		0.001			4E-05	1E-04	0.03	0.03
TS-1C	0.006		9E-04	6E-04	0.02	0.517	0.002				0.001	2E-04	0.001	0.55	0.55

Table 8.2-13 (continued)

Reach	Carcinogen COPCs - Ratios				Radionuclide COPCs - Ratios										
	Aroclor-1260	Arsenic	SOFca	Carcinogenic risk	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Potassium-40	Radium-226	Strontium-90	Tritium	Uranium-234	SOFrad	Radionuclide dose (mrem/yr)
MSSL	74.5	98.3			275	20000	313	282	53800	758	6540	15600000	3530		
M-1W		0.066	0.07	6.6E-07											
M-1E															
east of E-1FW		0.077	0.08	7.7E-07											
E-1W		0.067	0.07	6.7E-07											
E-1E					0.0314	0.0018	0.0101	0.0172	0.0012	0.0003	0.0006			0.063	0.25
M-2W		0.076	0.08	7.6E-07	0.0463	0.0016	0.016	0.0147		0.0007	0.0017	0.002272	0.0004	0.084	0.33
M-2E					0.0036		0.0009	0.0018			0.0067			0.013	0.05
TS-2E															
TS-1C	0.015	0.076	0.09	9.1E-07			0.0057	0.0028			0.001			0.01	0.04

Table 8.2-14
Representative Concentrations for Sediment COPCs, Trail User Scenario (Surface Area Weighted)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
E-1E	Americium-241	107.45	36.05	31	30	642
E-1E	Arsenic	2.0481	1.6772	32	31	6.1
E-1E	Cesium-137	542.15	186.79	31	31	2530
E-1E	Cobalt-60	0.9935	0.43307	31	16	4.35
E-1E	Lead	9.6317	8.3673	32	32	50
E-1E	Manganese	331.94	271.84	32	32	1700
E-1E	Mercury	0.259	0.1205	32	29	0.39
E-1E	Plutonium-238	18.892	9.4569	31	30	88.7
E-1E	Plutonium-239	110.5	34.177	31	30	1110
E-1E	Sodium-22	0.08	0.05088	31	3	0.49
E-1E	Strontium-90	13.809	8.2762	31	19	273
E-1E	Thallium	0.1497	0.09421	32	6	1.6
E-1E	Tritium	1.0007	0.5814	15	8	2.4
E-1E	Uranium	4.14	2.632	5	5	4.14
E-1FW	Aluminum	9126.9	8004	16	16	21300
E-1FW	Aroclor-1254	0.1398	0.11108	8	5	0.16
E-1FW	Arsenic	6.3618	5.6298	16	16	16.6
E-1FW	Benzo(a)pyrene	0.1519	0.12288	16	11	0.5
E-1FW	Chromium	690.81	452.91	16	16	2210
E-1FW	Copper	108.83	79.415	16	16	383
E-1FW	Iron	9955.6	9876.6	16	16	18300
E-1FW	Lead	24.925	24.078	16	16	56.8
E-1FW	Manganese	462.3	379.86	16	16	1040
E-1FW	Vanadium	21.66	19.888	16	16	53.1
E-1W	Aluminum	5897.9	7891.9	22	22	19000
E-1W	Arsenic	3.2493	3.3112	22	21	11
E-1W	Cesium-137	1.0536	0.81755	11	7	2.14
E-1W	Chromium	40.773	13.894	22	22	50
E-1W	Iron	8727.6	10751	22	22	25000
E-1W	Manganese	642.34	642.5	22	22	2500
E-1W	Plutonium-239	30.1	2.19368	8	7	30.1
E-1W	Uranium	3.3943	2.084	5	5	4.32
E-1W	Vanadium	12.018	14.894	22	22	30
M-1E	Aluminum	11961	12972	21	21	26000
M-1E	Arsenic	4.065	4.509	21	21	8.4
M-1E	Iron	11962	13660	21	21	21000
M-1E	Manganese	704.27	714.48	21	21	1640

Table 8.2-14 (continued)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
M-1E	Vanadium	20.13	22.561	21	21	37
M-1W	Arsenic	2.5527	2.3785	16	14	4.4
M-1W	Benzo(a)anthracene	0.9801	0.62494	16	10	2.71
M-1W	Benzo(a)pyrene	0.8623	0.54029	16	8	2.11
M-1W	Benzo(b)fluoranthene	1.0678	0.56874	16	7	2.51
M-1W	Indeno(1,2,3-cd)pyrene	0.3636	0.19041	16	5	1.23
M-2E	Americium-241	23.982	17.323	36	34	211
M-2E	Cesium-137	98.113	81.947	36	36	557
M-2E	Cobalt-60	0.194	0.16677	36	20	0.47
M-2E	Plutonium-238	16.073	12.864	36	36	113
M-2E	Plutonium-239	22.737	17.567	36	36	157
M-2E	Strontium-90	3.1602	2.7663	36	35	20
M-2W	Americium-241	47.189	24.688	53	47	524
M-2W	Antimony	0.2853	0.25509	48	25	0.65
M-2W	Aroclor-1260	0.0432	0.02508	21	9	0.21
M-2W	Arsenic	2.0119	1.5455	54	51	4.3
M-2W	Cesium-137	64.061	54.577	53	53	850
M-2W	Cobalt-60	0.3364	0.26596	53	33	2.45
M-2W	Iron	7967.3	6170.9	54	54	14000
M-2W	Lead	8.5311	8.0198	54	54	18
M-2W	Plutonium-238	35.185	15.216	53	51	203
M-2W	Plutonium-239	45.28	24.119	53	53	596
M-2W	Strontium-90	5.38	3.0123	53	51	35.9
M-2W	Thallium	0.1009	0.08676	54	12	0.8
M-2W	Uranium-238	2.4555	1.3226	16	16	10.7
M-3	Americium-241	27.795	20.917	76	70	223
M-3	Aroclor-1260	0.148	0.0698	15	13	0.39
M-3	Arsenic	1.9829	1.8303	65	65	4
M-3	Cesium-137	81.557	72.188	76	76	298
M-3	Cobalt-60	0.1684	0.1276	74	43	1.47
M-3	Plutonium-238	9.3315	7.9833	76	74	40.9
M-3	Plutonium-239	27.153	18.154	76	76	123
M-3	Strontium-90	3.9094	3.5116	76	71	8.6
M-4	Americium-241	9.5695	7.723	65	59	112
M-4	Arsenic	2.0265	1.9372	63	62	4.6
M-4	Cesium-137	28.951	23.989	65	65	276
M-4	Cobalt-60	0.0586	0.0457	64	14	0.44
M-4	Plutonium-238	3.2719	2.6901	65	64	32.2
M-4	Strontium-90	3.443	2.8102	65	60	9.64

Table 8.2-14 (continued)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
TS-1C	Antimony	0.4931	0.46543	19	3	0.63
TS-1C	Aroclor-1260	0.359	0.28663	19	18	1.3
TS-1C	Benzo(a)anthracene	0.5231	0.28428	19	11	1.86
TS-1C	Benzo(a)pyrene	0.4095	0.2689	19	13	2.04
TS-1C	Benzo(b)fluoranthene	0.5792	0.33632	19	8	2.53
TS-1C	Cesium-137	1.9247	0.83	4	3	2.19
TS-1C	Indeno(1,2,3-cd)pyrene	0.3339	0.16673	19	10	1.45
TS-1C	Iron	11007	9093.1	19	19	28800
TS-1C	Plutonium-238	19.058	12.1	18	18	314.07
TS-1C	Plutonium-239	8.6642	4.679	18	18	35.19
TS-1C	Thallium	0.1104	0.10289	19	8	0.18
TS-1C	Thorium-228	2.5368	1.6239	14	14	15.2
TS-1C	Thorium-230	3.7975	1.9887	14	14	28.51
TS-1C	Thorium-232	3.1583	1.5906	14	14	13.55
TS-1C	Vanadium	14.873	13.752	19	19	25.9
TS-1E	Benzo(a)anthracene	0.4958	0.32692	17	11	0.72
TS-1E	Benzo(a)pyrene	0.4122	0.38296	17	14	0.85
TS-1E	Benzo(b)fluoranthene	0.7002	0.46484	17	8	1.6
TS-1E	Plutonium-238	77.436	29.308	16	16	338.33
TS-1E	Plutonium-239	9.1811	3.8059	16	16	37.91
TS-1W	Americium-241	0.7702	0.495	8	5	1.53
TS-1W	Aroclor-1260	0.4671	0.29443	8	5	1.37
TS-1W	Benzo(a)pyrene	0.1028	0.07544	14	12	0.32
TS-1W	Benzo(b)fluoranthene	0.1073	0.0737	14	12	0.87
TS-1W	Cesium-137	0.6484	0.4896	8	8	1.15
TS-1W	Plutonium-238	4.6989	3.7253	14	14	14.3
TS-1W	Plutonium-239	1.6674	1.5374	14	14	4.06
TS-1W	Thallium	0.1206	0.10237	14	7	0.24
TS-1W	Vanadium	12.456	12.086	14	14	23
TS-2C	Strontium-90	2.2671	1.9972	28	24	5.61
TS-2E	Aluminum	6584.2	6043.1	14	14	16100
TS-2E	Aroclor-1260	0.31	0.06962	8	5	0.31
TS-2E	Arsenic	2.2453	2.1303	14	14	4.43
TS-2E	Iron	8703.9	8130.9	14	14	13900
TS-2E	Plutonium-239	5.23	2.59261	8	7	5.23
TS-2E	Strontium-90	14.533	5.0773	14	9	8.3 *
TS-2E	Vanadium	15.038	14.187	14	14	27.1
TS-2W	Strontium-90	2.4796	1.5442	26	10	6.7

*Used maximum detect as representative concentration; calculated UCL > maximum.

Table 8.2-15
Representative Concentrations for Surface Water COPCs, Trail User Scenario

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
E-1E	Americium-241	8.64	6.71333	3	3	8.64
E-1E	Cesium-137	35.6	27.7	2	2	35.6 *
E-1E	Fluoride	607.091	444	4	4	620
E-1E	Iron	2080	1246.33	3	3	2080
E-1E	Lead	2.3	1.49333	3	3	2.3
E-1E	Molybdenum	34.8	28.75	2	2	34.8 *
E-1E	Plutonium-238	3.15	2.53333	3	3	3.15
E-1E	Plutonium-239/240	4.85	3.89333	3	3	4.85
E-1E	Potassium-40	63.6	35.255	2	1	63.6 *
E-1E	Strontium-90	3.97	3.13	2	2	3.97 *
E-1W	Arsenic	6.6	3.9	4	1	6.6
E-1W	Fluoride	760	610.8	5	5	760
E-1W	Iron	6250	4262.5	4	4	6250
E-1W	Lead	1.9	1.69636	4	3	1.9
E-1W	Manganese	1035.14	589.5	4	4	1080
E-1W	Molybdenum	64.5	52.6667	3	3	64.5
E-1W	Vanadium	6.2	4.92673	4	3	6.2
east of E-1FW	Arsenic	7.6	5.3	2	1	7.6 *
east of E-1FW	Fluoride	349	211.667	3	3	349
east of E-1FW	Iron	4200	3965	2	2	4200 *
east of E-1FW	Lead	3.1	1.675	2	1	3.1 *
east of E-1FW	Manganese	873	634.5	2	2	873 *
east of E-1FW	Molybdenum	93.5	55.95	2	2	93.5 *
east of E-1FW	Vanadium	8.3	4.4	2	1	8.3 *
M-1E	Aluminum	7400	4655	2	2	7400 *
M-1E	Fluoride	500	291.667	3	3	500
M-1E	Iron	4230	3095	2	2	4230 *
M-1E	Lead	3.1	1.945	2	2	3.1 *
M-1E	Manganese	2010	1080.5	2	2	2010 *
M-1E	Vanadium	7.6	6.1	2	2	7.6 *
M-1W	Aluminum	43700	31033.3	3	3	43700
M-1W	Arsenic	6.5	4.16667	3	1	6.5
M-1W	Fluoride	672.121	399.5	4	4	720
M-1W	Iron	25700	17336.7	3	3	25700
M-1W	Lead	27	19.0333	3	3	27
M-1W	Mercury	0.07	0.04833	3	2	0.07
M-1W	Molybdenum	121	83.55	2	2	121 *

Table 8.2-15 (continued)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
M-1W	Vanadium	48.3	35.0667	3	3	48.3
M-2E	Americium-241	0.985	0.89	2	2	0.985 *
M-2E	Fluoride	628	502	3	3	628
M-2E	Molybdenum	30.9	29.7	2	2	30.9 *
M-2E	Plutonium-238	0.287	0.2765	2	2	0.287 *
M-2E	Plutonium-239/240	0.508	0.482	2	2	0.508 *
M-2E	Strontium-90	43.9	41.65	2	2	43.9 *
M-2W	Aluminum	4410	1970.67	3	3	4410
M-2W	Americium-241	12.7148	6.35501	10	10	15.1
M-2W	Cesium-137	32.925	25.775	8	8	42.6
M-2W	Iron	2460	1118	3	3	2460
M-2W	Lead	2.7	1.26333	3	3	2.7
M-2W	Mercury	0.08	0.04513	10	1	0.08
M-2W	Perchlorate	99.5	14.1489	10	5	99.5
M-2W	Plutonium-238	5.00321	3.55384	10	10	7.57
M-2W	Plutonium-239/240	4.14226	2.98443	10	10	6.7543
M-2W	Radium-226	0.51154	0.373	8	2	0.709
M-2W	Strontium-90	11.2143	7.60309	8	7	14.5
M-2W	Tritium	35500	9888.1	8	8	35500
M-2W	Uranium-234	1.36323	0.73914	10	10	2.93
M-2W	Vanadium	2.1	2.28333	3	2	2.1
TS-1C	Aluminum	37700	20920	3	3	37700
TS-1C	Aroclor-1260	1.1	0.5725	2	1	1.1 *
TS-1C	Arsenic	7.5	6	3	1	7.5
TS-1C	Barium	349	191.967	3	3	349
TS-1C	Fluoride	226.522	151.5	4	4	228
TS-1C	Iron	37800	16486.7	3	3	37800
TS-1C	Lead	33.6	13.9333	3	3	33.6
TS-1C	Manganese	1690	598.167	3	3	1690
TS-1C	Plutonium-238	1.79	1.106	3	3	1.79
TS-1C	Plutonium-239/240	0.79	0.45333	3	3	0.79
TS-1C	Strontium-90	6.63	5.57	2	2	6.63 *
TS-1C	Thallium	0.73	0.47667	3	1	0.73
TS-1C	Vanadium	36.4	17.7667	3	2	36.4
TS-1C	Uranium	2.9	2.9	1	1	2.9 *
TS-1E	Fluoride	322	322	1	1	322 *
TS-2C	Fluoride	430	430	1	1	430 *
TS-2C	Lead	1.6	1.6	1	1	1.6 *

Table 8.2-15 (continued)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
TS-2E	Fluoride	316	269.333	3	3	316
TS-2E	Iron	1120	908.5	2	2	1120 *
TS-2E	Lead	1.7	1.21	2	2	1.7 *
TS-2E	Manganese	887	462.75	2	2	887 *
TS-2E	Molybdenum	36.6	21.2	2	2	36.6 *
TS-2E	Uranium	0.77	0.77	1	1	0.77 *
TS-2E	Vanadium	4.4	4.05	2	2	4.4 *

*Maximum detect used as the representative concentration.

Table 6.2-1
Mortandad Sediment Inorganic COPCs

Reach	Aluminum	Ammonia	Antimony	Arsenic	Barium	Beryllium	Boron	Bromide	Cadmium	Calcium	Chloride	Chromium[a]	Chromium hexavalent ion	Cobalt	Copper	Cyanide (Total)	Fluoride	Iron	Lead
LANL sediment BV[b]	**15400**	**#N/A**	**0.83**	**3.98**	**127**	**1.31**	**#N/A**	**#N/A**	**0.4**	**4420**	**17.1**	**10.5**	**#N/A**	**4.73**	**11.2**	**0.82**	**#N/A**	**13800**	19.7
Residential SSL[c]	**77800**	**#N/A**	**31.3**	**3.9**	**15600**	**156**	**15600**	**#N/A**	**39**	**#N/A**	**#N/A**	**2100**	**234**	**1520**	**3130**	**1220**	**3670**	**23500**	400
M-1W	—[d]	4.67	11 (U)	**4.4**	—	—	—	—	0.93 (U)	—	—	—	—	—	13.3	0.93 (U)	—	—	25.8
M-1C	—	—	—	—	132	—	—	—	—	—	—	16.8	—	—	—	—	—	—	24
M-1E	26000	—	—	**8.4**	270	1.4	29	—	0.79 (U)	—	—	18.8	—	7.7	14	—	—	21000	30
E-1FW	21300 (J+)	—	—	**16.6**	233	—	—	—	0.85	4820	—	**2210**	1.99	4.78	383	—	3.73	18300	56.8 (J)
E-1W	19000	3.22	1.41 (U)	**11**	350	2.4	—	8.31	1.75 (U)	5800	185	636	—	12	20	1.2 (U)	7.59	**25000**	34.6 (J-)
E-1E	—	—	—	**6.1**	130	—	—	12.4	2.2 (J+)	51000	88.7	140	—	6	120	—	3.9	—	50
M-2W	—	3.05	13 (U)	**4.3**	130	—	—	3.83	0.8	22000	39.2	22	—	—	47	—	70.6	14000	58
M-2E	—	—	—	—	—	—	—	1.12	0.508 (U)	12000	52.7	14	—	—	35	—	13.3	—	—
M-3	—	—	—	**4**	—	—	—	0.944	0.53 (U)	5460	35.8	17.5	—	—	29	—	3.62	13900	—
TS-1W	—	—	11.2 (UJ)	—	131	—	—	—	1	—	—	—	—	4.84	—	—	—	—	—
TS-1C	—	3.84	11.2 (UJ)	—	153	—	—	—	1.7	—	—	—	—	5.9 (J)	14.5	—	—	**28800 (J+)**	39.1
TS-1E	—	4.65	—	—	—	—	—	—	0.59 (U)	—	—	—	—	6.77	119	—	—	—	24.7
TS-2W	—	—	—	—	—	—	—	—	0.67 (U)	—	—	—	—	—	18.8	—	6.2	—	—
TS-2C	—	4.45	—	—	—	—	—	—	0.59 (U)	—	—	22.3	—	—	48.1	—	2.23	—	29.2
TS-2E	16100	—	—	**4.43**	—	—	—	—	0.75	—	126	26.8	—	5.5 (J)	67	—	1.8	13900 (J+)	26.3
TS-3	—	—	—	—	—	—	—	—	0.51 (U)	—	—	—	—	—	19	—	—	—	20
M-4	—	—	1.9 (J-)	**4.6**	146	—	—	—	0.75 (U)	5180	—	14.5 (J)	—	5.1	37.2	—	1.48	15100	22.6
MCW-1	—	—	—	—	—	—	—	—	0.582 (U)	—	—	—	—	—	—	—	—	—	21.4
MCW-2N	—	—	—	—	—	—	—	—	0.532 (U)	—	—	—	—	—	—	—	—	—	—
MCW-2W	—	—	—	—	—	—	—	—	0.5 (U)	—	—	—	—	—	11.5	1.37	—	—	—
MCW-2E	—	—	—	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	—	—	—	—
M-5W	—	—	—	—	143	—	—	—	—	—	—	—	—	—	—	—	—	14100	—
M-5E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-6	—	—	—	—	—	—	—	—	0.51 (U)	—	—	—	—	—	—	—	—	—	—

Table 6.2-1 (continued)

Reach	Magnesium	Manganese	Mercury	Nickel	Nitrate	Nitrate-Nitrite as N	Nitrite	Oxalate	Perchlorate[c]	Phosphorus, Orthophosphate (Expressed as PO4)	Selenium	Silver	Sodium	Sulfate	Thallium	Total Phosphorus	Uranium[e]	Vanadium	Zinc
LANL sediment BV[b]	2370	543	0.1	9.38	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.3	1	1470	58.2	0.73	#N/A	2.22	19.7	60.2
Residential SSL[a]	#N/A	3590	100000	1560	100000	#N/A	7820	#N/A	55	#N/A	391	391	#N/A	#N/A	5.16	#N/A	16	78.2	23500
M-1W	—	—	0.19 (U)	28.8	—	—	—	—	—	—	2.22 (U)	3.7 (U)	—	—	—	—	—	—	137
M-1C	—	—	—	—	—	—	—	—	—	—	0.35	—	—	—	—	—	—	—	71.8
M-1E	3400	1640	0.16 (U)	11	—	—	—	—	—	—	10.7 (U)	3.2 (U)	—	—	—	—	—	37	94
E-1FW	3310	1040	0.22	10.9	—	—	—	—	0.00323	—	11.5 (U)	—	—	—	—	101	—	53.1	169
E-1W	2700	2500 (J-)	0.24 (U)	11	—	—	—	46.5	—	—	5.25 (U)	4.8 (U)	—	232	—	293	4.32	30	110
E-1E	—	1700	2.7	46	—	0.21 (J)	—	25.8	0.0011 (J)	—	2.28 (U)	3.3	—	204	1.6	154	4.14 (J+)	—	78 (J-)
M-2W	—	—	0.69	—	—	0.7	—	19.3	0.959	—	1.6 (U)	2.8 (U)	1700	181	0.8 (J)	101	—	—	100
M-2E	—	—	1.1	—	—	—	—	15.8	0.141 (J)	—	0.59	2.7	—	99.9	—	—	—	—	60.6
M-3	—	—	0.43	—	—	—	—	12.8	0.162 (J+)	—	1.6 (U)	—	—	96.2	—	—	—	—	88.8
TS-1W	—	—	—	—	—	—	—	—	—	—	1.63 (U)	1.4 (U)	—	—	1 (U)	—	—	23	—
TS-1C	—	—	—	58.9	—	—	—	—	—	—	3 (U)	1.4 (U)	—	—	1 (U)	93.3	—	25.9	94
TS-1E	—	661	—	—	—	—	—	—	—	—	1.8 (U)	—	—	—	—	—	—	—	—
TS-2W	—	—	—	—	1.9	—	0.26	—	—	3.8 (J)	2.02 (U)	—	—	—	—	—	—	—	—
TS-2C	—	—	0.86	—	1.5	—	0.32	—	—	2.4 (J)	1.8 (U)	42.8	—	—	—	99.4	—	22	61
TS-2E	—	—	1.36	—	0.7	—	0.11 (J)	—	—	3.4 (J)	9.94 (U)	33.9	—	827	—	—	—	27.1	90.4
TS-3	—	570	0.19	—	—	—	—	—	—	—	1.76 (U)	4.4	—	—	—	—	—	—	63
M-4	—	—	0.32	—	—	0.3 (J)	—	—	0.627 (J-)	—	2.26 (U)	7	—	—	—	127	—	—	73.6
MCW-1	—	—	—	—	—	—	—	—	—	—	0.582 (U)	—	—	—	—	—	—	—	—
MCW-2N	—	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	—	—
MCW-2W	—	—	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—	—	—	—	—
MCW-2E	—	—	—	—	—	—	—	—	—	—	0.52 (U)	—	—	—	—	—	—	—	—
M-5W	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	72.9
M-5E	—	—	—	—	—	—	—	—	—	—	0.56 (J-)	—	—	—	1 (U)	—	—	—	—
M-6	—	—	—	—	—	—	—	—	—	—	0.603 (U)	—	—	—	—	—	—	—	—

Notes: Values are in mg/kg. Values are maximum values > BV; if no BV, value is maximum detected value. Values in bold exceed the residential SSL. Grey shading indicates a screening value was exceeded for that chemical.

[a] EPA region 6 residential HHMSSL (Human Health Medium-Specific Screening Levels), EPA 2005, 91002.

[b] LANL (1998, 59730).

[c] Residential SSLs are NMED values (NMED 2006, 92513) unless otherwise noted.

[d] — = Not detected, not detected > BV, or not analyzed.

[e] EPA region 9 residential PRG (Preliminary Remediation Goals), EPA 2004, 93663.

Table 6.2-2
Mortandad Sediment Organic COPCs

Reach	Acenaphthene	Acetone	Anthracene	Aroclor-1254	Aroclor-1260	Aroclors (Mixed)[a]	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene[b]	Benzo(k)fluoranthene	Benzoic Acid[a]	BHC[alpha-]	BHC[beta-]	BHC[delta-]	BHC[gamma-]	Bis(2-ethylhexyl)phthalate	Bromodichloromethane	Bromomethane	Butanone[2-]	Butylbenzylphthalate[a,c]	Carbazole[a]	Carbon Tetrachloride
Residential SSL[d]	**3730**	**28100**	**22000**	**1.12**	**1.12**	**2.22**	**10.3**	**6.21**	**0.621**	**6.21**	**2290**	**62.1**	**100000**	**0.902**	**3.16**	**#N/A**	**4.37**	**347**	**14.4**	**8.51**	**31800**	**240**	**240**	**3.47**
M-1W	0.42	0.087 (J)	0.74	—[e]	0.063	—	—	2.71	**2.11**	2.51	1.18	0.2	—	0.018	0.003	—	0.0075	—	—	—	—	—	—	—
M-1C	1.7	0.19 (J)	0.32	—	0.14	—	—	0.38	0.45	0.3	0.18	0.19	—	0.021 (J+)	0.0048 (J-)	—	0.0091 (J+)	—	—	—	0.021 (J)	—	—	—
M-1E	—	0.44 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.036 (J)	—	—	—
E-1FW	0.33	0.47 (J)	0.3 (J+)	0.16	0.03	—	—	0.44 (J+)	0.5 (J+)	0.49 (J+)	0.29 (J+)	0.27 (J+)	—	—	—	—	—	—	—	0.002 (J)	0.025 (J)	—	—	—
E-1W	—	—	—	—	0.02	—	—	0.23	0.26	0.48	0.25	—	—	—	—	—	—	0.04 (J)	—	—	—	—	—	—
E-1E	—	0.1	0.04 (J)	0.13 (J-)	0.11	0.053	—	0.1	0.25	0.42 (J)	0.12	0.13	5.7 (J)	0.0073 (J)	—	—	—	0.16 (J-)	—	—	0.027	—	—	—
M-2W	—	0.034 (J)	0.01 (J)	0.15 (J)	0.21 (J)	—	—	0.37 (J-)	0.37 (J-)	0.37 (J-)	0.07	0.37 (J-)	0.13 (J)	—	—	—	—	0.4 (J)	—	—	0.02 (J+)	—	—	—
M-2E	0.088 (J-)	0.085 (J)	0.15 (J-)	0.053	0.054	—	—	0.22 (J-)	0.16 (J-)	0.11 (J)	—	0.069 (J)	—	—	0.0023 (J)	—	—	0.091 (J)	—	—	—	—	—	—	—
M-3	—	0.046	—	—	0.39	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TS-1W	0.041 (J)	0.13 (J)	0.04 (J)	0.57	**1.37**	1.52	—	0.44 (J)	**0.67 (J)**	0.87 (J)	0.25 (J)	0.27 (J)	0.13 (J)	—	—	—	—	0.55	—	—	—	—	—	0.002 (J)
TS-1C	0.51 (J)	0.21 (J)	0.9 (J)	0.01 (J)	**1.3**	—	0.00069 (J)	1.86 (J)	**2.04**	2.53 (J)	1.35 (J)	1.13 (J)	0.14 (J)	—	—	—	—	0.16 (J)	—	—	0.038 (J)	0.51 (J)	—	—
TS-1E	0.06	0.13 (J)	0.11 (J)	0.03 (J)	0.19 (J)	—	—	0.72 (J-)	**0.85 (J)**	1.6 (J)	0.58	0.25 (J-)	—	—	—	—	—	—	—	—	0.02 (J)	—	—	—
TS-2W	—	—	0.045	—	0.1	—	—	0.33	0.38	0.36	0.26	0.16	—	—	—	—	—	—	—	—	0.019 (J)	—	—	—
TS-2C	—	0.16 (J)	0.01 (J)	0.069 (J)	0.16	—	—	0.11 (J+)	0.17 (J-)	0.37 (J)	0.12 (J-)	—	—	—	—	—	—	0.15 (J)	—	—	0.026 (J)	—	—	—
TS-2E	—	0.14	—	—	0.31	—	0.0008 (J)	—	—	—	0.082	—	—	—	—	—	—	—	—	—	0.014 (J)	—	—	—
TS-3	—	—	—	—	0.076	—	—	0.059 (J)	0.084 (J)	0.09 (J)	—	0.079 (J)	0.14 (J)	0.007	—	—	—	0.094 (J)	—	—	—	—	—	—
M-4	0.29 (J)	0.087 (J+)	0.38 (J)	0.01	0.12	—	—	0.58 (J-)	0.59 (J)	0.6 (J)	0.73 (J-)	0.2 (J)	0.18 (J)	—	—	—	—	0.41 (J)	0.004 (J)	—	0.014 (J)	—	0.23 (J)	—
MCW-1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.191 (J)	—	—	—	—	—	—
MCW-2N	0.0108 (J)	—	—	—	—	—	—	—	—	—	—	—	0.402 (J)	—	—	—	—	0.17 (J)	—	—	—	—	—	—
MCW-2E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-5W	—	0.23 (J)	—	—	—	—	—	—	—	—	—	—	—	0.049	0.0076	0.0034	0.017	—	—	—	0.03 (J)	—	—	—
M-5E	1.8 (J+)	0.16 (J)	—	—	—	—	0.00057 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	0.024 (J)	—	—	—
M-6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.207 (J)	—	—	—	—	—	—

Table 6.2-2 (continued)

Reach	Chlordane[alpha-][f]	Chlordane[gamma-][f]	Chloroform	Chloromethane	Chlorophenol[2-]	Chlorophenyl-phenyl[4-] Ether	Chrysene	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dibenz(a,h)anthracene	Dibenzofuran	Dichlorobenzene[1,2-][b]	Dichlorobenzidine[3,3'-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dieldrin	Diethylphthalate	Di-n-butylphthalate	Endosulfan Sulfate	Endrin Aldehyde	Fluoranthene	Fluorene	Heptachlor Epoxide[a]	Hexachlorobutadiene
Residential SSL[d]	**16.2**	**16.2**	**4**	**21.8**	**166**	**#N/A**	**615**	**24.4**	**17.2**	**17.2**	**0.621**	**142**	**37.4**	**10.8**	**206**	**76.5**	**0.304**	**48900**	**6110**	**18.3**	**18.3**	**2290**	**2660**	**0.53**	**12.2**
M-1W	0.002 (J)	0.0024	—	—	—	—	2.22	0.0038	—	0.013 (J)	—	—	—	—	—	—	0.0033 (J)	—	—	—	—	7.78	0.031	—	—
M-1C	—	—	—	—	—	—	0.56	0.0031 (J+)	0.0036 (J+)	0.016 (J+)	—	—	—	—	—	—	—	—	—	—	0.0032 (J+)	1.5	0.23	—	—
M-1E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
E-1FW	—	—	—	—	—	—	0.59 (J+)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.5 (J+)	0.22 (J+)	—	—
E-1W	—	—	—	—	—	—	0.23	—	—	0.0096 (J-)	—	—	—	—	—	—	—	—	—	—	—	0.7 (J)	—	—	—
E-1E	0.0095	0.014	0.0013 (J-)	—	—	—	0.25	—	0.0062 (J)	0.078 (J)	—	—	—	—	—	—	—	—	—	—	0.0035 (J)	0.63	—	0.0027 (J)	—
M-2W	—	—	—	—	—	—	0.37 (J-)	—	—	0.035 (J)	—	—	—	—	—	—	—	—	—	—	0.014 (J)	0.37 (J-)	—	—	—
M-2E	—	—	—	—	—	—	0.21 (J-)	—	—	0.01 (J)	—	—	—	—	—	—	0.0045 (J)	—	—	0.0034 (J)	—	0.59 (J-)	0.089 (J-)	—	—
M-3	—	—	—	—	—	—	—	—	—	0.028	—	—	—	—	—	—	—	—	—	—	0.011 (J+)	0.15 (J)	—	—	—
TS-1W	—	—	—	—	—	—	0.72 (J)	—	—	—	—	—	—	—	—	—	—	—	2.6 (J)	—	—	1 (J)	—	—	—
TS-1C	—	—	—	—	—	—	1.64 (J)	—	—	—	0.18 (J)	0.26 (J)	—	—	—	—	—	0.1 (J)	3 (J)	—	—	3.18 (J)	0.47 (J)	—	—
TS-1E	—	—	—	—	—	—	0.91 (J)	—	—	—	—	0.14 (J)	—	—	—	—	—	—	—	—	—	1.7 (J+)	—	—	—
TS-2W	—	—	—	—	—	—	0.53	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.88 (J)	—	—	—
TS-2C	—	—	—	—	—	—	0.18 (J+)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.36 (J-)	—	—	—
TS-2E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TS-3	—	—	—	—	—	—	0.087 (J)	—	—	0.0095 (J)	—	—	—	—	—	—	—	—	—	—	—	0.35 (J)	—	—	—
M-4	—	—	—	0.002 (J)	—	—	0.59 (J)	—	—	0.015 (J-)	—	—	—	0.7	—	0.001 (J)	—	—	—	—	—	1.5	0.24 (J)	—	—
MCW-1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCW-2N	—	—	—	—	0.024 (J)	0.0904 (J)	—	—	—	—	—	0.0251 (J)	—	—	—	—	—	—	0.0406 (J)	—	—	—	0.0195 (J)	—	0.02 (J)
MCW-2E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
M-5W	—	—	—	—	—	—	—	0.0067	0.0022	0.019 (J)	—	—	—	—	0.0012 (J)	—	—	—	—	—	—	—	—	—	—
M-5E	—	—	—	—	—	—	—	—	—	—	—	—	0.0013 (J)	—	0.0016 (J)	—	—	—	—	—	—	—	—	—	—
M-6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 6.2-2 (continued)

Reach	Hexanone[2-]	Indeno(1,2,3-cd)pyrene	Isopropylbenzene	Isopropyltoluene[4-][g]	Methoxychlor[4,4'-][a]	Methyl-2-pentanone[4-]	Methylene Chloride	Methylnaphthalene[2-][h]	Naphthalene	Nitroaniline[2-][a]	Nitroaniline[4-][a]	Nitrophenol[2-]	Nitrosodiphenylamine[N-]	Phenanthrene	Pyrene	Tetrachloroethene	Toluene[b]	Trichloroethane[1,1,1-][b]	Trichloroethene	Trichlorofluoromethane	Trichlorophenol[2,4,6-]	Trimethylbenzene[1,2,4-]	Xylene (Total)[b]	Xylene[1,2-][b]	Xylene[1,3-][b]
Residential SSL[d]	**31800**	**6.21**	**271**	**271**	**305.515**	**5510**	**182**	**79.5**	**79.5**	**180**	**180**	**166**	**993**	**1830**	**2290**	**12.5**	**252**	**563**	**0.638**	**588**	**6.11**	**58**	**82**	**99.5**	**82**
M-1W	—	1.23	—	—	0.1	—	—	—	—	—	—	—	—	3.38 (J)	5.2	0.00067 (J)	—	—	—	—	—	—	—	—	—
M-1C	—	0.22	—	0.0065 (J)	0.14	—	—	—	1	—	—	—	—	1.1	0.86	0.00086 (J)	—	—	—	—	—	—	—	—	—
M-1E	—	—	—	0.039 (J)	—	—	—	—	—	—	—	—	—	—	—	0.0011 (J-)	0.028	—	0.00023 (J)	—	—	—	—	—	—
E-1FW	—	0.34 (J+)	0.024	0.57 (J-)	—	0.014 (J)	—	0.0082 (J)	1.2 (J+)	—	—	—	—	0.94 (J-)	1 (J+)	0.0011 (J-)	0.075 (J-)	—	—	—	—	—	0.0014 (J)	—	—
E-1W	—	—	—	—	—	—	—	—	—	—	—	—	—	0.4 (J)	0.57	—	—	—	—	—	—	—	—	—	—
E-1E	—	0.13	—	0.016 (J)	—	—	—	—	—	—	—	—	—	0.34	0.65	—	—	—	—	0.002 (J)	—	—	—	—	—
M-2W	—	0.06	—	0.032	—	—	—	—	—	—	—	—	—	0.37 (J-)	0.37 (J-)	—	—	—	—	0.0034 (J)	—	—	—	—	—
M-2E	—	—	—	—	0.034 (J)	—	—	—	0.08 (J-)	—	—	—	—	0.56 (J-)	0.55 (J-)	—	—	0.03 (J+)	—	0.0027 (J)	—	—	—	—	—
M-3	—	—	—	0.026 (J)	—	—	0.0083	—	—	—	—	—	—	0.11 (J)	—	—	0.023 (J)	—	—	—	—	—	—	—	—
TS-1W	0.014	0.23 (J)	—	0.014	—	—	0.002 (J)	—	—	0.25 (J)	0.24 (J)	—	—	0.35 (J)	1.2 (J)	—	0.022 (J)	—	—	—	—	—	—	—	—
TS-1C	0.0033 (J)	1.45 (J)	0.00074 (J)	0.026 (J)	—	0.008 (J)	—	0.081 (J)	0.18 (J)	—	—	—	—	3.1 (J)	3.52 (J)	—	0.016 (J-)	—	0.00035 (J)	—	—	—	—	—	—
TS-1E	—	0.52 (J+)	—	0.0082 (J)	—	—	—	0.13 (J)	—	—	—	—	—	0.81 (J)	2.2 (J-)	0.02 (J)	0.018 (J)	0.01	0.0003 (J)	—	—	0.00078 (J)	—	—	—
TS-2W	—	0.28	—	—	—	—	—	—	—	—	—	—	—	0.29	0.63 (J)	0.02	—	0.01	0.0011 (J)	—	—	0.00086 (J)	—	—	—
TS-2C	—	0.12 (J-)	—	0.0038 (J)	—	—	—	—	—	—	—	—	—	0.097 (J+)	0.66 (J)	0.01	0.0073 (J)	0.0055 (J-)	0.00028 (J)	—	—	0.001 (J)	—	—	—
TS-2E	—	—	—	—	—	0.0043 (J+)	—	—	—	—	—	—	—	—	—	—	0.00096 (J)	—	—	0.00037 (J)	—	—	—	—	—
TS-3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.38 (J)	—	—	—	—	—	—	—	—	—	—
M-4	—	0.29 (J)	—	—	—	—	0.0067	—	0.002 (J)	—	—	—	—	1.5	1.4	0.006 (J)	0.014	—	—	0.0088 (J)	—	0.003 (J)	—	0.002 (J)	0.005 (J)
MCW-1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCW-2N	—	—	—	0.0025 (J)	—	—	—	0.0274 (J)	—	—	—	0.0818 (J)	0.0801 (J)	—	—	—	—	—	—	—	0.052 (J)	—	—	—	—
MCW-2E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.0028 (J)	—	—	—	—	—	—	—	—
M-5W	—	—	—	—	0.23	—	0.034 (J)	—	—	—	—	—	—	—	—	0.0017 (J)	—	0.00072 (J)	0.0048 (J)	—	—	—	—	—	—
M-5E	—	—	—	0.0019 (J)	—	—	0.01 (J)	—	—	—	—	—	—	—	—	0.024 (J)	—	0.0014 (J)	0.013 (J)	—	—	0.00074 (J)	—	—	—
M-6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Notes: All values are in mg/kg. All values are maximum detected values. Values in bold exceed the residential SSL. Grey shading indicates a screening value was exceeded for that chemical.

[a] EPA region 6 residential HHMSSL (EPA 2005, 91002).

[b] Pyrene residential SSL is used as a surrogate

[c] SSL based on the soil saturation concentration; not a risk-based value.

[d] Residential SSLs are NMED values (NMED 2006, 92513) unless otherwise noted.

[e] — = Not detected or not analyzed.

[f] Chlordane residential SSL is used as a surrogate.

[g] Isopropylbenzene residential SSL is used as a surrogate.

[h] Naphthalene residential SSL is used as a surrogate.

Table 6.2-3
Mortandad Sediment Radionuclide COPCs

Reach	Americium-241	Cesium-134	Cesium-137	Cobalt-60	Europium-152	Plutonium-238	Plutonium-239	Ruthenium-106	Sodium-22	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Tritium	Uranium-234	Uranium-235	Uranium-238
LANL sediment BV[a]	**0.04**	**#N/A**	**0.9**	**#N/A**	**#N/A**	**0.006**	**0.068**	**#N/A**	**#N/A**	**1.04**	**2.28**	**2.29**	**2.33**	**0.093**	**2.59**	**0.2**	**2.29**
Residential SAL[b]	**30**	**2.4**	**5.6**	**1.3**	**2.9**	**37**	**33**	**20**	**1.6**	**5.7**	**2.3**	**5**	**5**	**750**	**170**	**17**	**86**
M-1W	—[c]	—	—	—	—	0.04	—	—	—	—	—	—	—	0.13	—	—	—
M-1C	1	0.07	—	—	—	0.1	—	—	—	—	—	—	3.48	—	—	—	—
M-1E	—	—	—	—	—	0.048	—	—	—	—	—	—	—	—	—	—	—
E-1FW	—	0.083	—	—	—	0.102	—	—	—	—	—	—	—	—	—	—	—
E-1W	0.28	—	2.14	—	—	0.417	30.1	—	—	—	—	—	—	—	—	—	2.65
E-1E	**642**	0.196	**2530**	**5.22**	—	**88.7 (J-)**	**1360 (J-)**	—	0.49	**273 (J-)**	—	—	—	105.0239	16.04	0.683	7.125
M-2W	**524**	0.24	**870**	**2.45**	—	**203**	**596**	—	0.151	**35.9 (J-)**	—	—	—	7.153747	14.7	0.8	10.7
M-2E	**211**	0.114	**557**	0.5	—	**113**	**157**	—	—	**20**	—	—	—	0.518	—	—	—
M-3	**223**	0.177	**298**	**1.47**	—	**40.9 (J+)**	**123 (J+)**	0.8	—	**8.6 (J-)**	—	—	—	0.3211111	—	0.45	—
TS-1W	4.172 (J-)	0.072	3.585	1.2991	—	**67.817 (J-)**	19.51	—	—	3.11 (J-)	—	—	—	1.264033 (J)	2.735	—	3.049
TS-1C	2.3	—	3.1869	—	—	**314.079**	**35.198 (J-)**	—	—	—	**15.2**	**28.511**	**13.557**	0.3034217 (J)	—	0.255	3.006
TS-1E	—	—	—	—	—	**338.335 (J-)**	**37.916**	—	—	—	—	—	—	—	—	—	—
TS-2W	0.493	0.086	—	—	—	2.087	0.665	—	—	**6.7**	—	—	—	0.143	—	—	—
TS-2C	0.302	0.099	—	—	—	1.98	0.896	—	—	5.61	—	—	—	0.134	—	0.22	—
TS-2E	—	0.082	—	—	—	1.351	5.237	—	—	**8.3**	—	—	—	—	—	—	2.37
TS-3	—	—	1.22	—	—	1.55	0.77	—	—	3.1	—	—	—	0.297	—	—	—
M-4	**112**	0.194	**276**	0.445	0.338	32.2 (J+)	**64.5 (J+)**	—	—	**9.64**	—	—	—	0.2781174	—	0.285	—
MCW-1	—	—	—	—	—	—	0.0741	—	—	—	—	2.44	—	—	—	—	—
MCW-2N	—	—	—	—	—	0.0229	—	—	—	—	—	—	—	—	—	—	—
M-5W	—	—	0.92	—	—	—	0.11	—	—	1.68	—	—	—	—	—	0.24	—
M-5E	—	0.1	0.93	—	—	0.09	0.13	—	—	—	—	—	—	—	—	0.27	—

Notes: Values are in pCi/g. Values are maximum detected values > BV; if no BV, value is maximum detected value. Values in bold exceed the residential SSL. Grey shading indicates a screening value was exceeded for that chemical.

[a] LANL 1998, 59730

[b] LANL 2005, 88493.

[c] — = Not detected, not detected > BV, or not analyzed.

Table 6.3-1
Mortandad Filtered Water Inorganic COPCs

Location ID	Media Code[a]	Aluminum	Ammonia	Ammonia as Nitrogen	Antimony	Arsenic	Barium	Beryllium	Boron	Bromide	Cadmium	Calcium	Cerium	Chloride	Chromium	Chromium hexavalent ion	Cobalt	Copper	Cyanide (Total)	Dysprosium	Erbium
Acute Aquatic Life[b]		**750**	**—[c]**	**—**	**—**	**340**	**—**	**—**	**—**	**—**	**2**	**—**	**—**	**—**	**570**	**—**	**—**	**13.4**	**—**	**—**	**—**
Human Health Persistent[b]		**—**	**—**	**—**	**640**	**9**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Livestock Watering[b]		**5000**	**—**	**—**	**—**	**200**	**—**	**—**	**5000**	**—**	**50**	**—**	**—**	**—**	**1000**	**—**	**1000**	**500**	**—**	**—**	**—**
MO-24786	WS	263	—	—	—	7.8	210 (J)	—	25.5	—	0.1	29300 (J)	10.3	130000	36.4	—	14.2 (J)	**29.2**	2.86	0.4	0.3
MO-24787	WS	**1400**	—	—	—	—	114	—	44.4	—	—	24000	4.2	39100	7.4	—	1.6	—	—	0.3	—
MO-24788	WS	**924 (J)**	—	—	0.82	—	32.1	—	107	—	—	18000	2.6	39000	2.5	—	2	12.2	—	0.2	—
MO-24789	WS	**12500**	—	—	1.2	—	98.8	—	32.8	—	0.26	12900	19.6	224000 (J)	7.8	—	4.1	12.4	8.64	1.2	0.6
MO-24790	WS	**4230 (J)**	—	—	—	—	132	—	26.7	—	—	21300	10.7	47400	4	—	7.4	3.5	—	0.6	0.3
MO-24791	WS	230	—	—	0.61	—	44.8	—	59	—	—	33400	—	109000	2.3	—	—	3.9	—	—	—
MO-24792	WS	**1620**	—	—	—	—	95.3	—	46	—	—	25100 (J)	0.8	48800	1.3	—	1.9	3.1	10	—	—
MO-24793	WS	389	—	—	—	—	146	—	30	—	—	40400	3.8	14200	1.7	—	2.4	8.3	—	0.2	—
Mortandad at GS-1	WS	**1021**	—	—	1	2.4	38.5	0.11	65.99	—	1.02	46800	—	20600	7.19	—	0.87	**30.3**	—	—	—
Mortandad at Rio Grande (A-11)	WS	142 (J-)	—	—	—	—	61.1	—	572	—	0.07	31200	—	63400	—	—	12.8	**22.1 (J+)**	—	—	—
Mortandad below Effluent Canyon	WS	**2790 (J)**	—	—	0.56	—	39	—	104	—	0.11	32600	—	34600	2.39 (J-)	—	—	12.9	—	—	—
NM Groundwater Standards[d]		—	—	—	—	**100**	**1000**	—	—	—	**10**	—	—	**250000**	**50**	—	—	**1000**	**200**	—	—
EPA MCLs[e]		—	—	—	**6**	**10**	**2000**	**4**	—	—	**5**	—	—	—	**100**	**100**	—	**1300**	**200[f]**	—	—
EPA region 6 tap water screening levels[g]		**36500**	**208.6**	**208.6**	—	—	—	—	**7300**	—	—	—	—	—	—	—	**730**	—	—	—	—
MCA-1	WGA	5770	—	—	—	—	84.6	0.37	33.7	—	0.1	19500	10.4	38000	4.6	—	—	3.1	—	0.6	0.3
MCA-2	WGA	895 (J+)	—	—	—	—	185	—	82.7	40	—	25400 (J)	1.4	58700	1.1	—	—	—	—	0.2	0.4
MCA-4	WGA	1410 (J+)	—	—	—	**16.6**	121	—	32.1	—	0.28	21100 (J)	—	**—**	43	—	10.6	5.4	—	—	—
MCA-5	WGA	1400	—	—	0.64	—	25.5	0.13	38.8	—	—	25900	3.1	46900	3.7	—	1.4	5.9	—	0.3	—
MCO-0.6	WGA	1040 (J+)	—	—	—	—	214	—	20.9	200	—	22800 (J)	30.3	**303000**	6	—	14.3	4.1	—	1.4	0.8
MCO-2	WGA	111	—	—	—	**17**	155	2	37.99	—	—	28660	—	4590	13	—	—	—	—	—	—
MCO-3	WGA	951	—	100 (J+)	0.69	—	35.9	—	90	—	0.24	45200	—	22600	3.98	—	2.2	33	—	—	—
MCO-4B	WGA	1490 (J-)	—	**310**	—	—	113	—	79.8	—	—	53800	1.6	64400	2.1	—	—	2.21	—	0.2	0.2
MCO-5	WGA	323	—	—	—	2.43	135	—	110	—	0.28	56100	0.4	59400	1.8	—	—	2.13	—	—	0.2
MCO-6	WGA	113	—	—	0.75 (J)	2.6 (JN-)	117	0.04 (J)	137	—	0.15	47500	—	53100	1.79 (J)	—	4.9	2.9	—	—	0.2
MCO-7	WGA	385	—	—	—	1.29	224	0.03 (J)	96.3	100	0.2	33800	0.3	51300	1.89 (J)	—	0.34 (J)	3.2	2.85 (J)	0.2	0.5
MCO-7.5	WGA	2270	—	—	—	0.75	174	0.02	87.9	120	0.16	30400	2.9	31000	4	—	2.3	0.92	3.79	0.4	0.9
MT-1	WGA	1920	—	—	—	—	198	—	49.5	40	—	23300	2.5	**40000 (J)**	2.4	—	—	—	—	0.4	0.8
MT-3	WGA	156	—	—	—	—	150	1.3	83.1	100	—	20600	—	39600	5.2	—	1.2	9.8	—	0.4	1.2
MT-4	WGA	110	—	—	—	—	97.1	—	52.7	120	—	16000	—	34000	1.6	—	—	—	—	0.2	0.6
MCOBT-4.4	WGI	—	—	—	—	—	13.6	—	47.4	—	0.18	32400	—	17300	**53.5**	—	0.92	2.28	—	—	—
MCOI-4	WGI	—	—	—	—	—	19.4	—	31.7	400	0.14	36500	—	20700	29.4	—	—	30.5	4.04	—	—
MCOI-5	WGI	—	—	—	2.7	—	26.9	—	23.7	150	—	20100 (J)	—	6700	3.5	—	4	4.3	—	—	—
MCOI-6	WGI	—	—	—	—	—	33.1	—	32.5	290	—	48100	—	24000	**57.2**	—	—	7.6	3.89	—	—
PM-5	WGR	—	—	—	—	—	—	—	—	—	—	—	—	**—**	**—**	5.3	—	—	—	—	—
R-1	WGR	—	—	—	—	—	17.9	—	13.9	170	0.11	12200	—	1970	5.6	—	1.6	—	—	—	—
R-13	WGR	40.5	40 (J)	—	—	—	29.3	—	21.5	—	—	14700	—	5950	3.76	—	1.6	—	—	—	—
R-14	WGR	29.3 (J-)	—	80 (J-)	—	8.24 (JN-)	48.6	—	21.1	40	—	12300	—	2050	3.02	—	—	2.79	—	—	—
R-15	WGR	—	160	—	0.16 (J)	7.2	30.2	0.02 (J)	19 (J)	110	—	14200	—	4900	7.3	—	—	—	—	—	—
R-28	WGR	—	—	—	—	—	56.2	—	25.5	180	—	35700	—	24400	**404**	—	—	—	—	—	—
R-33	WGR	—	—	—	—	—	34.8	—	13.5	—	0.1	12000	—	2190	8.2	—	1.7	—	—	—	—
Test Well 8	WGR	—	—	—	—	—	—	—	—	—	—	—	—	**—**	**—**	2.3	—	—	—	—	—

Table 6.3-1 (continued)

Location ID	Media Code[a]	Europium	Fluoride	Gadolinium	Holmium	Iron	Lanthanum	Lead	Lutetium	Magnesium	Manganese	Molybdenum	Neodymium	Nickel	Nitrate as Nitrogen	Nitrate-Nitrite as N	Nitrite	Perchlorate	Phosphorus, Orthophosphate (Expressed as PO4)	Potassium
Acute Aquatic Life[b]		—	—	—	—	—	—	**64.6**	—	—	—	—	—	**467**	—	—	—	—	—	—
Human Health Persistent[b]		—	—	—	—	—	—	—	—	—	—	—	—	**4600**	—	—	—	—	—	—
Livestock Watering[b]		—	—	—	—	—	—	**100**	—	—	—	—	—	—	**132000**	**132000**	**132000**	—	—	—
MO-24786	WS	—	90	0.7	—	5730 (J)	3.1	1.1	—	5140 (J)	816	87	3.2	13 (J)	—	—	—	0.15 (J-)	—	3590 (J)
MO-24787	WS	—	750	0.4	—	4510	2.1	0.78	—	5920	958	45.1	1.8	1.7	—	—	—	—	—	13200
MO-24788	WS	—	530	0.3	—	560 (J)	1.7	0.63	—	3660	13.4	34.3	1.4	14	—	1570	—	0.38 (J)	—	12300
MO-24789	WS	—	270 (J+)	1.8	0.2	7280	8.2	8.1	—	2310	42.3	117	8.3	5.6	—	—	—	0.42	—	7040
MO-24790	WS	—	180 (J+)	0.9	—	2280 (J)	4.5	1.6	—	4490	1850	4.8	4.3	7.6	—	10 (J-, JN-)	—	—	—	6400
MO-24791	WS	—	590	—	—	103	0.3	—	—	2040	—	32.1	0.4	2.8	—	670	—	24.7	—	7310
MO-24792	WS	—	60	—	—	852	0.4	—	—	3150	449	12.6	0.4	1.7	—	—	—	0.22 (J)	—	7310
MO-24793	WS	—	300 (J+)	0.3	—	548	1	0.58	—	5610	875	36.7	1.1	8.4	—	—	—	—	—	4800
Mortandad at GS-1	WS	—	890	—	—	584	—	1.47	—	3660	7	97	—	13	—	4340	—	—	—	8610
Mortandad at Rio Grande (A-11)	WS	—	1120	—	—	75.9	—	0.54	—	7370	33.7	2.09	—	3.31	—	6350	—	—	—	15900
Mortandad below Effluent Canyon	WS	—	540	—	—	1540 (J)	—	1.5	—	4620 (J-)	16.9	37.5	—	6.45	—	13500 (J-)	—	0.48 (J)	—	8100
NM Groundwater Standards[d]		—	**1600**	—	—	**1000**	—	**50**	—	—	**200**	—	—	—	—	—	—	—	—	—
EPA MCLs[e]		—	**4000**	—	—	—	—	**15**	—	—	—	—	—	**100**	**10000**	**10000**	**1000**	—	—	—
EPA region 6 tap water screening levels[g]		—	—	—	—	—	—	—	—	—	—	**183**	—	—	—	—	—	**25.55**[h]	—	—
MCA-1	WGA	—	160	0.9	—	**3270**	5.1	1.1	—	4970	62.4	1.2	4.7	2.8	—	170	—	0.75 (J)	—	4430
MCA-2	WGA	—	1450	0.2	—	409	0.7	—	—	4520	3.8 (J)	93.3	0.7	3.9 (JN-)	—	3900	—	**44.3**	—	20700
MCA-4	WGA	—	—	—	—	**9060**	—	3.4	—	4530	**1510 (J)**	**611**	—	10.7	—	—	—	—	—	8340
MCA-5	WGA	—	440	0.3	—	726	1.8	—	—	2320	6.2	27.8	1.7	—	—	**595000**	—	**34**	—	6520
MCO-0.6	WGA	0.2	210	2.2	0.3	**8820**	8.4	1.9	—	4990	**2040 (J)**	—	9.2	16.7	—	20	—	—	—	12100
MCO-2	WGA	—	870	—	—	**15328**	—	—	—	6800	**2266**	**400.99**	—	—	—	20	—	—	—	3870
MCO-3	WGA	—	900	—	—	499 (J)	—	0.15 (JN-)	—	2960	1.07 (JN-)	77	—	7.04	—	**530000**	—	**170**	—	8170
MCO-4B	WGA	—	1070	0.2	—	611	1.1	0.08	—	4020	3.8	72.9	1	7.17	—	**73100**	—	**44.3 (J+)**	—	13600
MCO-5	WGA	—	1180	—	—	136	0.5	0.13	—	4680	0.3	81.3	0.5	9.19 (J)	—	6100	—	24.4 (J)	—	16000
MCO-6	WGA	—	1440	—	—	32.8	0.2	0.2 (J)	—	4410	7.3	89.7	0.2	12.5	—	6900	—	**400**	—	17700
MCO-7	WGA	—	**2130**	—	—	173	—	0.82	—	7410	1.6	92.1	—	10.6	—	**12500**	—	**240**	—	19300
MCO-7.5	WGA	—	**1770**	0.3	—	**1020**	1.3	1.1	0.3	7210	7.6	108	1.2	8.08	—	**18000**	—	**66.3**	—	16600
MT-1	WGA	—	**1960**	0.3	—	1000	1.1	0.76	0.3	5680	7.5	99.8	1	2.8	—	2730	—	**49.2**	—	17700
MT-3	WGA	—	1560	—	0.2	92.5	—	—	0.5	5190	—	81.4	—	3.9	—	4400 (J)	—	**106**	—	9570
MT-4	WGA	—	1330	—	—	—	—	—	0.3	4040	—	56.6	—	4.6	—	4280	—	**62.9**	—	5740
MCOBT-4.4	WGI	—	420	—	—	—	—	—	—	5590	—	0.96	—	2.25	—	**15800**	—	**256**	—	690
MCOI-4	WGI	—	230	—	—	28.5	—	—	—	5720	15.9	1.4	—	5.1	—	**14200**	—	**159**	—	840
MCOI-5	WGI	—	370	—	—	69.8	—	—	—	3780	157 (J)	8.1	—	62.2 (J)	2930	4220	360	**104**	—	740
MCOI-6	WGI	—	560	—	—	—	—	—	—	9650	25.1	2.5	—	5.9 (J+)	—	**16400**	—	**246 (J)**	—	740
PM-5	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-1	WGR	—	260 (J+)	—	—	78.8	—	—	—	4220	4.2	2.4	—	1.1	—	250	—	0.33	40 (J)	1790
R-13	WGR	—	480	—	—	147	—	—	—	3710	7.55	1.12	—	—	—	810	—	0.41 (J)	—	1440
R-14	WGR	—	390	—	—	**4500**	—	0.08	—	3520	**588 (J)**	5.53	—	2 (JN-)	50 (J)	90 (J-)	—	0.18	370 (J)	2290
R-15	WGR	—	220	—	—	210	—	0.22 (J)	—	3880	18	—	—	1.89 (J)	—	2430	—	6.92	—	1900
R-28	WGR	—	350	—	—	—	—	—	—	9010	3.5	0.87	—	7.4	—	4760	—	1.13 (J)	—	1660
R-33	WGR	—	240	—	—	263	—	—	—	4080	6	10.9	—	**168**	—	430	—	0.38 (J+)	—	2280
Test Well 8	WGR	—	160	0.9	—	**3270**	5.1	1.1	—	4970	62.4	1.2	4.7	2.8	—	170	—	0.75 (J)	—	4430

Table 6.3-1 (continued)

Location ID	Media Code[a]	Praseodymium	Samarium	Selenium	Silver	Sodium	Strontium	Sulfate	Terbium	Thallium	Thulium	Tin	Titanium	Total Phosphate as Phosphorus	Total Phosphorus	Uranium	Vanadium	Ytterbium	Zinc
Acute Aquatic Life[b]		—	—	—	**3.2**	—	—	—	—	—	—	—	—	—	—	—	—	—	**117.2**
Human Health Persistent[b]		—	—	**4200**	—	—	—	—	—	**6.3**	—	—	—	—	—	—	—	—	**26000**
Livestock Watering[b]		—	—	**50**	—	—	—	—	—	—	—	—	—	—	—	—	**100**	—	**25000**
MO-24786	WS	0.8	0.7	—	—	64100 (J)	158 (J)	11100 (J+)	—	0.6	—	3.7 (J)	—	—	—	0.37	4.1	0.2	12.4
MO-24787	WS	0.5	0.4	9.7 (JN-)	—	47700	121	14000	—	—	—	—	—	730	450	0.27	3.5	—	11.7
MO-24788	WS	0.4	0.3	—	—	82700	67.6	13700	—	0.42	—	—	—	220	—	0.53	2.3	—	9
MO-24789	WS	2.1	1.6	—	—	178000	58.9	6870	0.2	—	—	—	—	—	—	0.44	20.4	0.5	76.1
MO-24790	WS	1.1	0.8	—	—	37100	125	3590	—	—	—	—	—	—	—	0.28	3.6	0.3	13.8
MO-24791	WS	—	—	—	—	60000	80.8	15000	—	—	—	—	—	—	—	0.66	1.2	—	2.6
MO-24792	WS	—	—	—	—	41800	125	6360	—	0.88	—	—	—	—	—	0.24	—	—	15.4
MO-24793	WS	0.3	0.3	—	0.26	12000	183	6540	—	—	—	—	—	—	—	0.77	3.9	—	4.6
Mortandad at GS-1	WS	—	—	1.6	0.05 (J)	77310	74.3	40700	—	0.26	—	39.99	0.17	210	—	3.78	4.5 (J+)	—	**265**
Mortandad at Rio Grande (A-11)	WS	—	—	—	—	92700	123	34900	—	—	—	—	6.36 (J)	4080	4850	0.5	7.89	—	39.7
Mortandad below Effluent Canyon	WS	—	—	—	—	96400	95	70800	—	0.19	—	—	—	—	150	—	4.73	—	14.8
NM Groundwater Standards[d]		—	—	**50**	**50**	—	—	**600000**	—	—	—	—	—	—	—	—	—	—	**10000**
EPA MCLs[e]		—	—	**50**	—	—	—	—	—	**2**	—	—	—	—	—	—	—	—	—
EPA region 6 tap water screening levels[g]		—	—	—	—	—	**21900**	—	—	—	—	**21900**	—	—	—	**7.3**[i]	**36.5**	—	—
MCA-1	WGA	1.3	0.9	—	—	33600	116	27900	—	—	—	—	—	60	—	0.21	—	0.3	11.3
MCA-2	WGA	0.2	0.2	—	—	70000 (J)	143	23200	—	—	—	—	—	280	—	1.7	2.8	0.7	—
MCA-4	WGA	—	—	—	—	102000 (J)	128	—	—	0.97	—	—	—	—	—	1.2	14.8	—	—
MCA-5	WGA	0.4	0.3	—	—	58300	57.8	24000	—	0.46	—	—	—	—	120	—	—	—	5.5
MCO-0.6	WGA	2.3	1.9	—	—	273000 (J)	163	12700	0.3	—	—	—	—	80	—	4.1	12.5	0.7	25.1
MCO-2	WGA	—	—	—	8.99	36050	152.99	—	—	—	—	—	—	430	—	—	—	—	—
MCO-3	WGA	—	—	—	—	92090	97.6	89100	—	0.39	—	—	0.25	200	100	0.69	1.41	—	7.96 (J+)
MCO-4B	WGA	0.3	0.2	—	—	80700	173	45600	—	0.3	—	—	—	120	60	0.66	2.3	0.3	7.66 (J-)
MCO-5	WGA	—	—	5.24	—	77400	202	76000	—	0.24	—	—	—	180	90	1.21	1.6	0.3	9.92 (J+)
MCO-6	WGA	—	—	6.1	0.02 (J)	71300	189	83000	—	1.01	—	—	—	150	100 (J+)	1.62	1.1	0.4	14.7 (J+)
MCO-7	WGA	—	—	7.3	0.01	79300	161	77000	—	0.44	—	—	—	410	280	**28.5**	3.3	0.8	8.8
MCO-7.5	WGA	0.3	0.3	1.2	—	84900	140	36000	—	—	—	—	—	140	290 (J-)	1.6	4	1.7	19.6
MT-1	WGA	0.3	0.2	—	—	67900	154	30600	—	—	—	—	—	210	—	0.56	3.6	1.3	10.6
MT-3	WGA	—	—	—	—	90900	136	36600	—	—	0.3	4.5	—	160	110	1.2	3.1	2.4	34.8
MT-4	WGA	—	—	—	—	86700	105	27200	—	0.8	—	—	—	200	—	1.5	2.5	1.3	—
MCOBT-4.4	WGI	—	—	—	—	21700	157	27500	—	0.08	—	—	—	—	60	0.28	0.98	—	2.01
MCOI-4	WGI	—	—	—	—	24300	177	31800	—	—	—	—	—	100	—	0.23	1.5	—	141
MCOI-5	WGI	—	—	—	—	13900	92.4	14100	—	0.48	—	—	—	—	—	0.15	1.4	—	145
MCOI-6	WGI	—	—	—	—	21600	218	39500	—	0.6	—	—	—	180 (J+)	—	0.5	1.4	—	74.2
PM-5	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-1	WGR	—	—	—	—	12900	55.4	3650	—	0.64	—	—	—	—	—	0.84	8.4	—	7.6
R-13	WGR	—	—	—	—	11100	55.1	3140	—	0.03	—	—	—	90 (J+)	40 (J+)	0.5	4.81	—	5.78
R-14	WGR	—	—	—	—	15000	98.4	1920	—	0.45	—	—	—	—	790	0.63	6.75	—	6.4
R-15	WGR	—	—	0.95 (J)	—	11300	63.7	6640	—	0.96	—	—	—	140	60	0.45	6.4 (J)	—	7.09 (J)
R-28	WGR	—	—	6.8	—	14200	140	39400	—	0.52	—	—	—	60	—	1.1	5.4	—	11

Table 6.3-1 (continued)

Location ID	Media Code[a]	Praseodymium	Samarium	Selenium	Silver	Sodium	Strontium	Sulfate	Terbium	Thallium	Thulium	Tin	Titanium	Total Phosphate as Phosphorus	Total Phosphorus	Uranium	Vanadium	Ytterbium	Zinc
R-33	WGR	—	—	—	1.8 (NJ)	12000	52.6	2790	—	0.78	—	—	—	—	—	0.96	6.1	—	38.6
Test Well 8	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Notes: All values in ug/L. All surface waters associated with these locations are ephemeral. Bolded concentrations exceed a standard and/or screening level. Grey shading indicates a standard and/or screening value was exceeded for that chemical.

[a] Media code definitions are provided in Table C-2-4.

[b] 20.6.4 NMAC.

[c] — = Not detected or not analyzed.

[d] 20.6.2 NMAC.

[e] EPA 2005, 91002.

[f] EPA MCL for free cyanide.

[g] EPA 2005, 91002 only listed for chemicals without a standard or MCL.

[h] Perchlorate-revised value.

[i] EPA region 9 PRG (EPA 2004, 93663).

Table 6.3-2
Mortandad Unfiltered Water Inorganic COPCs

Location ID	Media Code[a]	Aluminum	Ammonia	Ammonia as Nitrogen	Antimony	Arsenic	Barium	Beryllium	Boron	Bromide	Cadmium	Calcium	Cerium	Chloride	Chromium	Chromium hexavalent ion	Cobalt	Copper	Cyanide (Total)	Dysprosium	Erbium	Europium
Acute Aquatic Life[b]		—[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Livestock Watering[b]		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Wildlife Habitat[b]		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24786	WS	1090	—	—	—	7.6	201	—	26.3	190	0.16	28600	13.9	135000	46.3	—	11.1	45.3	—	0.6	0.3	—
MO-24787	WS	3350	131	—	—	6.6 (J)	148	0.41 (J)	26.6	120	0.13	27300	9.8	53300	7.5	—	1	3.5 (J)	—	0.6	0.3	—
MO-24788	WS	3310	66	—	0.67	—	46.4	0.19 (J)	94.4	130	0.12 (J)	23700	4.4	66100	4.6 (J)	—	—	23.5	—	0.3	—	—
MO-24789	WS	43700	99	—	1 (J)	6.5 (J)	198	2.1	37.3	40	0.49 (J)	13500	33.6	226000 (J)	27.5	—	2.7	55.4	—	2	1	0.3
MO-24790	WS	7400	—	—	—	—	138	—	27.2	120	0.12	21500	11.5	47700 (J)	6.8	—	5.6	4.4	—	0.6	0.3	—
MO-24791	WS	941	—	—	0.56	—	42.9	—	58.1	20	—	32600	2.1	58900	2.4	—	—	4.2	—	0.2	—	—
MO-24792	WS	37700	—	—	—	7.5	349	3.5	57.7	—	1.2	34400 (J)	8.4	48400	20.8	—	11.4	25	2.72 (J)	0.5	0.2	—
MO-24793	WS	2360	—	—	—	—	149	—	30.5	100	0.15	40700	4.6	242000	2.1	—	2.1	10.2	—	0.3	—	—
MO-24794	WS	1170	—	—	—	—	114	0.12 (J)	—	—	—	26000	—	11500	—	—	—	4.7 (J)	—	—	—	—
MO-24795	WS	590	—	—	—	—	172	0.18 (J)	—	—	0.56 (J)	27600	—	9920	1.4 (J)	—	1.4 (J)	32.5	2.79 (J)	—	—	—
MO-24808	WS	809	80	—	—	—	48.8	0.14 (J)	—	—	0.11 (J)	25200	—	23900	1.4 (J)	—	—	9.2 (J)	—	—	—	—
Mortandad at GS-1	WS	1010	—	160	—	2.59	42.29	0.13	—	—	0.25	47400	—	—	8.69	—	1.39	18.79	10.00	—	—	—
Mortandad below Effluent Canyon	WS	4410	—	—	—	—	44.9	—	30.4	—	—	15000	—	34000	—	—	—	4.7	—	—	—	—
NM Groundwater Standards[d]		—	—	—	—	**100**	**1000**	—	—	—	**10**	—	—	**250000**	**50**	—	—	**1000**	**200**	—	—	—
EPA MCLs[f]		—	—	—	**6**	**10**	**2000**	**4**	—	—	**5**	—	—	—	**100**	**100**	—	**1300**	**200**[e]	—	—	—
EPA region 6 tap water screening levels[g]		**36500**	**208.6**	**208.6**	—	—	—	—	**7300**	—	—	—	—	—	—	—	**730**	—	—	—	—	—
MCA-1	WGA	8740	—	—	—	—	89.3	0.56	34.2	60	0.11	19600	13.6	37700	6.5	—	—	—	—	0.8	0.4	—
MCA-2	WGA	3120 (J+)	—	—	—	—	196	0.1	75.5	50	—	25600 (J)	5	53700	2.2	—	—	—	—	0.4	0.4	—
MCA-4	WGA	24700 (J+)	—	—	0.84	**19.4**	216	2.2	37	—	0.75	22800 (J)	—	**—**	**101**	—	10.5	26.1	—	—	—	—
MCA-5	WGA	4370	—	—	0.53	—	31	0.18	41.2	40	—	26200	4.4	53600	5.6	—	—	7.1	—	0.4	0.2	—
MCO-0.6	WGA	3880 (J+)	—	—	—	—	234	—	21.1	200	0.13	23600 (J)	36.2	**299000**	12.9	—	14.5	10.9	—	1.6	0.9	0.3
MCO-2	WGA	128.99	—	—	—	**15**	155	—	35.99	—	—	—	—	**—**	17	—	—	—	10	—	—	—
MCO-3	WGA	1570	—	—	0.6	2.73 (JN-)	36.2	—	90.99	—	0.59	46400	—	**—**	4.77	—	—	32.8	2	—	—	—
MCO-4B	WGA	1810	—	—	—	4.31	117	—	82	30	—	36200	1.9	66800	2.5	—	—	2.12	—	0.3	0.2	—
MCO-5	WGA	521	—	—	—	2.31	135	0.03	110	80	0.31	44300	1.6	50700	1.6	—	2.46	2.93	—	0.2	0.2	—
MCO-6	WGA	103 (J+)	—	—	—	1.5	115	0.04 (J)	103	30	0.39	42600	—	60700	3.9 (J)	—	3.15	4.9	—	—	0.2	—
MCO-7	WGA	2300	—	—	—	2.94	208	0.04 (J)	152	110	0.28 (J+)	24200	0.5	52000	1.89 (J)	—	0.4 (J)	4.3	—	0.2	0.5	—
MCO-7.5	WGA	3230	—	—	—	0.92	172	0.15 (J)	81.7	100	—	29200	3.6	38300	2.9	—	0.51	2.4	—	0.5	0.9	—
MT-1	WGA	2100	—	—	—	—	223	0.24	49.5	70	0.13	24200	12.4	44800	2.8	—	—	—	—	1	0.8	—
MT-3	WGA	602	—	—	—	—	148	—	78.5	100	—	20400	0.8	39800	2.1	—	—	5	—	0.5	1.3	—
MT-4	WGA	173	—	—	—	—	98	—	52.2	130	—	16100	0.2	34400	1.9	—	—	—	—	0.2	0.6	—

Table 6.3-2 (continued)

Location ID	Media Code[a]	Aluminum	Ammonia	Ammonia as Nitrogen	Antimony	Arsenic	Barium	Beryllium	Boron	Bromide	Cadmium	Calcium	Cerium	Chloride	Chromium	Chromium hexavalent ion	Cobalt	Copper	Cyanide (Total)	Dysprosium	Erbium	Europium
MCOBT-4.4	WGI	23.6	—	—	—	0.4	15	—	50.9	130	—	38000	—	17300	**53.6**	—	4.82	2.8	2.27 (J)	—	—	—
MCOI-4	WGI	499 (J)	—	—	—	0.9	21.7	—	30	380	—	35600	0.7	20300	**135 (J)**	—	1.3	97.1	—	—	—	—
MCOI-5	WGI	3410	—	—	**7.1**	—	51.2	0.15	23.5	130	—	20800 (J)	5.9	6690	**770**	—	9	211	—	0.3	—	—
MCOI-6	WGI	7	—	—	—	1.2	33.2	—	31.5	290	—	47600	—	24100	**59**	—	—	14.5	—	—	—	—
MCOI-8	WGI	9.3	—	—	—	0.6	63	—	66	200	—	25300	—	13200	**—**	—	—	1.7	—	—	—	—
PM-5	WGR	44.7	—	—	—	1	32.5	—	67 (J)	—	—	12300	—	2850	5.9	5.5	—	—	50	—	—	—
R-1	WGR	23	—	—	—	1	17.3	—	14	170	0.14	11700	—	2250	5.9	—	—	4.8	—	—	—	—
R-13	WGR	7	—	—	—	3.56 (JN-)	310	—	63	20	—	14200	—	2520	5.9	—	—	2.34	2.36	—	—	—
R-14	WGR	37	—	80	—	7.3	75	—	27	100	—	13800	0.3	1970	7.7	—	5.2	7.56 (J)	—	—	—	—
R-15	WGR	56.5 (JN-)	110	—	—	4.91 (JN-)	34	0.05 (J)	20 (J)	21000	—	14700	0.2	5220	9.2	—	—	1.91	6.56	—	—	—
R-28	WGR	10	—	—	—	1	370	—	77	160	—	36500	—	29200	**416**	—	8.6	4.3	3.95	—	—	—
R-33	WGR	14	—	—	—	0.9	35.6	—	14.3	30	—	12000	0.3	2240	12.3	—	—	3.5	—	—	—	—
Test Well 8	WGR	88.3	—	—	0.45	0.4	8.51	—	28.4	20	—	11800	—	2060	7.92	2.3	—	1.7	6	—	—	—

Table 6.3-2 (continued)

Location ID	Media Code[a]	Fluoride	Gadolinium	Holmium	Iron	Iron (ferrous)	Lanthanum	Lead	Lithium	Lutetium	Magnesium	Manganese	Mercury	Molybdenum	Neodymium	Nickel	Nitrate	Nitrate as Nitrogen	Nitrate-Nitrite as N	Nitrite	Perchlorate
Acute Aquatic Life[b]		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Livestock Watering[b]		—	—	—	—	—	—	—	—	—	—	—	**10**	—	—	—	**132000**	**132000**	**132000**	**132000**	—
Wildlife Habitat[b]		—	—	—	—	—	—	—	—	—	—	—	**0.77**	—	—	—	—	—	—	—	—
MO-24786	WS	340	0.9	—	4200	—	4.2	3.1	—	—	5060	873	—	93.5	4.3	11.2	—	—	—	—	—
MO-24787	WS	760 (J)	0.8	—	6250	—	4	1.8	—	—	6860	1080	—	63.9	3.6	2.5	—	—	—	—	—
MO-24788	WS	620	0.5	—	2080	—	2.8	2.3	—	—	4070	74	—	34.8	2.4	13	—	720	1990	—	0.68
MO-24789	WS	720	3.1	0.4	25700	—	14.6	27	—	—	6060	115	0.07 (J)	121	14.8	13.6	—	—	730	—	—
MO-24790	WS	500	0.9	—	4230	—	4.9	3.1	—	—	4670	2010	—	4.8	4.8	7.7	—	270	—	—	—
MO-24791	WS	620	0.3	—	467	—	1.4	—	—	—	2050	5.9	—	30.9	1.3	3	—	30	—	—	—
MO-24792	WS	220	0.7	—	37800	—	3.7	33.6	—	—	8200	1690	—	15.5	3.4	17.1	—	190	—	—	—
MO-24793	WS	310	0.4	—	1120	—	1.9	1.7	—	—	5670	887	—	36.6	1.8	8.3	—	—	—	—	—
MO-24794	WS	322	—	—	679	—	—	1.2 (J)	—	—	4490	88.4	—	—	—	3 (J)	—	—	—	—	—
MO-24795	WS	430	—	—	493	—	—	1.6 (J)	—	—	4380	426	—	—	—	8.8	—	—	19.6 (J)	—	—
MO-24808	WS	—	—	—	472	—	—	0.55 (J)	—	—	3870	108	—	—	—	5.8	—	—	—	—	0.14 (J)
Mortandad at GS-1	WS	—	—	—	644	—	—	0.52	—	—	2660	16	0.07	—	—	14.39	—	4340	3900	—	99.5
Mortandad below Effluent Canyon	WS	310 (J+)	—	—	2460	—	—	2.7	—	—	3290	29.1	—	—	—	—	—	—	160 (J-)	—	0.5
NM Groundwater Standards[d]		**1600**	—	—	**1000**	—	—	**50**	—	—	—	**200**	**2**	—	—	—	—	—	—	—	—
EPA MCLs[f]		**4000**	—	—	—	—	—	**15**	—	—	—	—	**2**	—	—	**100**	**10000**	**10000**	**10000**	**1000**	—
EPA region 6 tap water screening levels[g]		—	—	—	—	—	—	—	**730**	—	—	—	—	**183**	—	—	—	—	—	—	**25.55**[h]
MCA-1	WGA	170	1.2	—	**5070**	—	6.5	2.9	—	—	5170	50.1	—	1.3	6.1	3.1	—	1000	—	**3960**	—
MCA-2	WGA	1430	0.5	—	**1490**	—	2.2	1.6	—	—	4750	21.7 (J)	—	94.2	2.1	3.4	—	1840	—	—	—
MCA-4	WGA	—	—	—	**26500**	—	—	**20.8**	—	—	7210	**1670 (J)**	—	**600**	—	20.4	—	—	—	—	—
MCA-5	WGA	410	0.5	—	**2370**	—	2.6	—	—	—	2650	10.7 (J)	0.05	27	2.3	—	—	840	—	—	—
MCO-0.6	WGA	220	2.6	0.3	**11900**	—	10.4	4.3	—	—	5520	**2140 (J)**	—	—	11.1	19.1	—	—	—	—	—
MCO-2	WGA	—	—	—	**16041**	—	—	—	—	—	—	**2375**	—	**354.99**	—	—	—	30	—	—	—
MCO-3	WGA	—	—	—	815 (J)	—	—	0.58	—	—	2750	6.19	0.03	74.5	—	7.03	—	3320	—	—	**280**
MCO-4B	WGA	980	0.3	—	735	—	1.2	0.13	—	—	2850	4.8	—	76.9	1.2	7.31	—	1710	—	—	**157**
MCO-5	WGA	**1680**	0.3	—	242	—	1.3	0.51	—	—	3830	8.1	—	83.1	1.1	8.9	—	3470	5700	—	**252**
MCO-6	WGA	1310	—	—	38.7	—	0.2	0.29 (J)	—	—	3910	2.32	—	89.9 (J)	0.3	22.79	—	1380	6600	—	**268**
MCO-7	WGA	1400	—	—	**1140**	—	0.3	1.32	—	—	5660	17.6	0.24	83.3	0.2	10	—	1750	9500	—	**282**
MCO-7.5	WGA	**1780**	0.4	0.2	**1460**	—	1.5	1.01	—	0.3	7180	26.4	—	93.9	1.4	8.6	—	4170	**18000**	20	**252**
MT-1	WGA	**1960**	1.2	0.2	**1180**	—	5	1.7	—	0.3	6060	45.6	—	100	4.8	5.3	—	2890	—	—	—
MT-3	WGA	**1960**	—	0.2	351	—	0.3	—	—	0.5	5120	6.5	—	79.7	0.3	3.9	—	5620	—	—	—
MT-4	WGA	1350	—	—	—	—	—	—	—	0.3	4030	—	—	57.3	—	4.9	—	—	—	—	—

Table 6.3-2 (continued)

Location ID	Media Code[a]	Fluoride	Gadolinium	Holmium	Iron	Iron (ferrous)	Lanthanum	Lead	Lithium	Lutetium	Magnesium	Manganese	Mercury	Molybdenum	Neodymium	Nickel	Nitrate	Nitrate as Nitrogen	Nitrate-Nitrite as N	Nitrite	Perchlorate
MCOBT-4.4	WGI	350	—	—	**—**	—	—	—	39	—	6030	1.6	—	0.98	—	3.73	**89500**	**20200**	**16200**	—	**210**
MCOI-4	WGI	220	—	—	**1150 (J)**	—	0.3	4.8	27	—	5620	23.3	—	4.3	0.3	35.8 (J)	**—**	**11220**	**13200**	—	**140**
MCOI-5	WGI	310	0.3	—	**6980**	—	2.6	13.8	—	—	4560	**231 (J)**	—	20.8	2.4	**414**	**—**	**—**	3070	—	—
MCOI-6	WGI	580	—	—	107	—	—	1.3	34	—	9560	29	—	2	—	7.3	**—**	**16710**	**15000**	580	**160**
MCOI-8	WGI	**1730**	—	—	30	—	—	—	49	—	5950	**940**	—	150	—	27	**—**	**—**	**—**	—	—
PM-5	WGR	330	—	—	**—**	—	—	0.35	—	—	4870	1.81	—	2.31	—	0.23	**—**	350	340	—	1.29
R-1	WGR	180	—	—	74.5	—	—	0.3	37	—	4060	**—**	—	2.8	—	1	1460	330	240	—	0.34
R-13	WGR	450	—	—	140	—	—	0.1	24	—	3520	7.66	—	1.11	—	—	3320	750	790	—	0.4
R-14	WGR	340	—	—	**6850**	910	—	0.4	27	—	3480	**586**	0.08	5.6	—	2.2 (JN-)	760	170	70 (J-)	190	0.19
R-15	WGR	270	—	—	520	—	—	0.65 (J)	25	—	4250	24	—	**—**	—	2.79 (J)	**10700**	2410	2530	—	6.15
R-28	WGR	330	—	—	24.8	—	—	—	48	—	9220	17	—	0.9	—	8.1	**20200**	4570	4890	—	1.13 (J)
R-33	WGR	250	—	—	402	—	—	—	21	—	4090	4.9	—	1.5	—	32	**—**	350	310	—	—
Test Well 8	WGR	870	—	—	**1210**	—	—	7	21	—	4310	9.52	—	2.01	—	1.8 (JN-)	670	350	340	—	3.26

Table 6.3-2 (continued)

Location ID	Media Code[a]	Phosphorus, Orthophosphate (Expressed as PO4)	Potassium	Praseodymium	Samarium	Selenium	Silver	Sodium	Strontium	Sulfate	Sulfide, Total	Terbium	Thallium	Thulium	Tin	Titanium	Total Phosphate as Phosphorus	Total Phosphorus	Uranium	Vanadium	Ytterbium	Zinc
Acute Aquatic Life[b]		—	—	—	—	**20**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Livestock Watering[b]		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Wildlife Habitat[b]		—	—	—	—	**5**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24786	WS	—	3710	1.1	0.8	—	—	61100	152	10900	—	—	—	—	—	—	—	—	0.46	8.3	0.3	16.8
MO-24787	WS	20	14100	1	0.7	—	—	48300	117	14000	—	—	—	—	—	—	—	941	0.51	6.2	0.3	18.3
MO-24788	WS	160	13500	0.7	0.5	—	—	76200	72.2	23300	—	—	—	—	—	—	—	270	0.67	3.2	—	29.1
MO-24789	WS	400	10100	3.8	2.9	—	—	173000	64.3	32200	—	0.4	—	—	—	—	—	401	0.72	48.3	0.8	271
MO-24790	WS	560	6630	1.2	0.9	—	—	38800	126	14600	—	—	—	—	—	—	—	—	0.34	7.6	0.3	21.3
MO-24791	WS	200	7020	0.3	0.3	—	—	61100	79	17700	—	—	—	—	—	—	—	—	0.73	1.4	—	4.1
MO-24792	WS	10	14500	0.9	0.7	—	0.39	43800 (J)	185	11300	—	—	0.73	—	4.5	—	—	174	2.9	36.4	0.2	213
MO-24793	WS	50	4840	0.5	0.4	—	0.32	12000	184	6940	—	—	—	—	—	—	—	—	0.77	4.4	—	8.6
MO-24794	WS	—	4760	—	—	—	—	20100	—	8400	—	—	—	—	—	—	—	—	—	3.3 (J)	—	10.4
MO-24795	WS	—	2760	—	—	—	5.4	16700	—	5320	—	—	—	—	—	—	—	—	—	2.5 (J)	—	22.1
MO-24808	WS	—	9590	—	—	—	—	39900	—	10000	—	—	—	—	—	—	—	149	—	2.1 (J)	—	17.1
Mortandad at GS-1	WS	220	9160	—	—	2	0.11	79100	—	—	—	—	0.21	—	—	—	220	—	3.8	5.8	—	—
Mortandad below Effluent Canyon	WS	—	7630	—	—	2.55	—	38000	63.1	10600	—	—	—	—	—	—	—	170	—	—	—	14.9
NM Groundwater Standards[d]		—	—	—	—	**50**	**50**	—	—	**600000**	—	—	—	—	—	—	—	—	—	—	—	**10000**
EPA MCLs[f]		—	—	—	—	**50**	—	—	—	—	—	—	**2**	—	—	—	—	—	—	—	—	—
EPA region 6 tap water screening levels[g]		—	—	—	—	—	—	—	**21900**	—	—	—	—	—	—	—	—	—	**7.3**[i]	**36.5**	—	—
MCA-1	WGA	—	4640	1.6	1.2	—	—	33600	117	28700	—	—	—	—	—	—	—	—	0.26	8.7	0.4	18.2
MCA-2	WGA	310	21000	0.6	0.5	7.7	—	69600 (J)	145	23200	—	—	—	—	—	—	—	—	1.8	4	0.7	—
MCA-4	WGA	—	11100	—	—	—	0.31	97400 (J)	143	—	—	—	—	—	—	—	—	—	3	34.7	—	64.9
MCA-5	WGA	250	6910	0.6	0.5	—	—	58500	58.7	25800	—	—	—	—	—	—	—	—	—	—	0.2	10.6
MCO-0.6	WGA	—	12700	2.8	2.3	—	—	277000 (J)	169	12800	—	0.3	—	—	—	—	—	—	4.3	15.5	0.8	32.4
MCO-2	WGA	430	—	—	—	2	8	—	153.99	1300	—	—	—	—	—	—	—	—	—	—	—	—
MCO-3	WGA	210	6980	—	—	—	—	68100	97.7	18700	—	—	0.24	—	—	—	—	—	0.71	2.01	—	15.1
MCO-4B	WGA	150	12700	0.3	0.3	—	—	67800	179	19800	—	—	—	—	—	—	—	—	0.66	2.2	0.3	5.8
MCO-5	WGA	220	16000	0.3	0.3	—	—	65400	203	33800	—	—	0.14	—	—	—	90	—	1.82 (J)	1.4	0.3	9.13 (J+)
MCO-6	WGA	200	16700	—	—	2.79	0.01 (J)	75000	184	19800	—	—	0.73	—	—	—	—	—	1.7 (J)	1.89 (J)	0.4	3.9
MCO-7	WGA	280	19100	—	—	0.95 (J)	0.1	75500	158	25900	—	—	—	—	—	—	270	—	2.18	3.1	0.9	12
MCO-7.5	WGA	600	13300	0.4	0.3	1.29	0.02	83900	138	33400	—	—	—	—	—	—	—	—	1.69	4.2	1.7	12.7
MT-1	WGA	340	18800	1.5	1.1	—	—	70200	165	32200	—	0.2	—	—	—	—	—	—	0.52	3.9	1.3	13.8
MT-3	WGA	240	9560	—	—	—	—	89300	134	37400	—	—	—	0.3	—	—	—	—	1.2	1.5	2.5	6
MT-4	WGA	—	5780	—	—	—	—	86700	105	27100	—	—	—	—	—	—	—	—	1.5	2.8	1.3	—

Table 6.3-2 (continued)

Location ID	Media Code[a]	Phosphorus, Orthophosphate (Expressed as PO4)	Potassium	Praseodymium	Samarium	Selenium	Silver	Sodium	Strontium	Sulfate	Sulfide, Total	Terbium	Thallium	Thulium	Tin	Titanium	Total Phosphate as Phosphorus	Total Phosphorus	Uranium	Vanadium	Ytterbium	Zinc
MCOBT-4.4	WGI	100	710	—	—	—	—	23200	170	27300	—	—	—	—	—	1	—	—	0.28	1	—	9
MCOI-4	WGI	90	830	—	—	—	—	22600	173	31700	—	—	—	—	—	—	—	—	0.12	1.9	—	137
MCOI-5	WGI	—	1240	0.6	0.5	—	—	14100	108	14200	—	—	—	—	—	—	210	—	0.26	8.6	—	382
MCOI-6	WGI	200	740	—	—	—	—	21600	215	39500	—	—	—	—	—	2	—	—	0.47	1.3	—	90.8
MCOI-8	WGI	140	4790	—	—	—	—	45400	170	23500	—	—	—	—	—	—	—	—	1.6	—	—	50
PM-5	WGR	—	2310	—	—	—	—	13500	59.3	2760	—	—	—	—	—	—	30	40	0.55	11	—	12.2
R-1	WGR	120	1840	—	—	—	—	12800	53	3700	2	—	—	—	—	—	—	—	0.83	8.7	—	11
R-13	WGR	50	1400	—	—	2.98	—	11700	53.8	3360	—	—	0.27	—	—	—	—	—	0.49	6	—	38
R-14	WGR	580	2300 (J)	—	—	10.1 (J+)	—	15700	102	1890	30	—	0.03 (JN-)	—	1	—	—	1020	0.63	6.45 (J)	—	13
R-15	WGR	70	2000	—	—	2.9	—	12100	65	7590	—	—	1.51	—	—	—	—	70	0.46	7.34	—	3.59 (J)
R-28	WGR	20	1740 (J)	—	—	6.3 (J)	0.61	15600	143	43200	5	—	—	—	—	2	90	—	1.1 (J)	7	—	52
R-33	WGR	70	2170	—	—	6.2	—	12100	53.2	2800	—	—	—	—	—	—	—	—	1	6.1	—	63.2
Test Well 8	WGR	90	2060	—	—	—	—	10800	54.3	2150	—	—	0.45	—	—	—	—	60	0.84	5.3	—	460

All values in ug/L. Bolded concentrations exceed a standard and/or screening level. Grey shading indicates a standard and/or screening value was exceeded for that chemical. All surface waters associated with these locations are ephemeral.

[a] Media code definitions are provided in Table C-2-4.
[b] 20.6.4 NMAC.
[c] — = Not detected or not analyzed.
[d] 20.6.2 NMAC.
[e] EPA MCL for free cyanide.
[f] EPA 2005, 91002.
[g] EPA 2005, 91002 only listed for chemicals without a standard or MCL.
[h] Perchlorate-revised value.
[i] EPA region 9 PRG (EPA 2004, 93663).

Table 6.3-3
Mortandad Unfiltered Water Organic COPCs

Location ID	Media Code[a]	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1260	Benzene	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Butanone[2-]	Carbazole	Carbon Disulfide	Chloromethane	Chloronaphthalene [2-]	Chrysene	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dichlorobenzene [1,2-]
Acute Aquatic Life[b]		—[c]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	**1.1**	**1.1**	**1.1**	—
Human Health Persistent[b]		—	—	—	—	**0.00064**	—	—	—	—	—	—	—	—	—	—	—	—	**0.0022**	**0.0022**	**0.0022**	—
Wildlife Habitat[b]		—	—	—	—	**0.014**	—	—	—	—	—	—	—	—	—	—	—	—	**0.001**	**0.001**	**0.001**	—
MO-24786	WS	—	—	2.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24787	WS	—	—	2.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24788	WS	—	—	2	—	—	—	—	—	—	14.2	—	—	—	—	—	—	—	—	—	—	—
MO-24790	WS	—	—	3.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24792	WS	—	—	2.4	—	**1.1 (J-)**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24793	WS	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24808	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mortandad below Effluent Canyon	WS	—	—	75.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
NM Groundwater Standards[d]		—	—	—	—	**1**	**10**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
EPA MCLs[e]		—	—	—	—	—	**5**	—	—	—	—	**6**	—	—	—	—	—	—	—	—	—	**600**
EPA region 6 tap water screening levels[f]		**365**	—	**5475**	**1825**	—	—	**0.92**	**0.92**	**9.2**	**146000**	—	**7065**	**33.62**	**1043**	**21.3**	**487**	**92**	**2.77**	**1.95**	**1.95**	—
MCA-1	WGA	—	—	—	—	—	—	—	—	—	—	—	1.4	—	—	—	—	—	—	—	—	—
MCA-2	WGA	—	—	—	—	—	—	—	—	—	—	3.2	—	—	—	—	—	—	—	—	—	—
MCA-5	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCO-0.6	WGA	—	—	5.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.26
MCO-3	WGA	—	—	—	—	—	—	—	—	—	—	0.25	—	—	—	—	—	—	—	—	—	—
MCO-4B	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.3	—	—	—	—	—	—
MCO-5	WGA	—	—	—	—	—	0.45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCO-6	WGA	—	—	—	—	—	—	—	—	—	—	3.1	—	—	—	—	—	—	—	—	—	—
MCO-7	WGA	—	—	—	—	—	—	—	—	—	—	3.2	—	—	—	—	—	—	—	—	—	—
MT-1	WGA	—	—	2.4	—	—	—	—	—	—	—	**7**	—	—	—	—	—	—	—	—	—	—
MT-3	WGA	0.71	0.6	3.4	0.64	—	—	—	0.44	0.66	—	0.59	—	0.68	—	—	0.68	0.8	—	—	—	—
MCOBT-4.4	WGI	—	—	5.3	—	—	—	—	—	—	—	1.6 (J)	—	—	—	—	—	—	—	—	0.03 (J)	—
MCOI-4	WGI	—	—	3.5	—	—	—	—	—	—	—	—	—	—	4.2 (J)	3.4 (J)	—	—	—	—	—	—
MCOI-5	WGI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCOI-6	WGI	—	—	—	—	—	—	—	—	—	—	4.6	3.7	—	—	—	—	—	—	—	—	—
PM-5	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00792	—	—	—
R-1	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-13	WGR	—	—	71.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01	—	—
R-14	WGR	—	0.25 (J)	4.2	0.3 (J)	—	—	0.42 (J)	—	—	—	—	—	—	—	—	—	0.38 (J)	—	—	—	—
R-15	WGR	—	—	19 (J)	—	—	—	—	—	—	—	**9.3 (J)**	—	—	—	—	—	—	—	—	—	—
R-28	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.1	—	—	—	—	—	—
R-33	WGR	—	—	—	—	—	—	—	—	—	—	**8.2**	—	—	—	—	—	—	—	—	—	—
Test Well 8	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 6.3-3 (continued)

Location ID	Media Code[a]	Dichlorobenzene[1,3-]	Dichlorobenzene[1,4-]	Dichlorobenzidine[3,3'-]	Diethylphthalate	Dioxane[1,4-]	Endrin	Fluoranthene	Fluorene	Isopropylbenzene	Methyl-2-pentanone[4-]	Methylene Chloride	Methylnaphthalene[2-]	Naphthalene	Nitroaniline[4-]	Octachlorodibenzofuran [1,2,3,4,6,7,8,9-]	Phenanthrene	Pyrene	Toluene	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
Acute Aquatic Life[b]		—	—	—	—	—	**0.086**	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Human Health Persistent[b]		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Wildlife Habitat[b]		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24786	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24787	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24788	WS	—	—	—	—	—	—	—	—	—	1.9	—	—	—	—	—	—	—	—	—	—	—
MO-24790	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24792	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24793	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MO-24808	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mortandad below Effluent Canyon	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.85	—	—	—	—
NM Groundwater Standards[d]		—	—	—	—	—	—	—	—	—	—	**100**	**30**	**30**	—	—	—	—	**750**	**620**	—	—
EPA MCLs[e]		—	**75**	—	—	—	**2**	—	—	—	—	—	—	—	—	—	—	—	**1000**	—	—	—
EPA region 6 tap water screening levels[f]		**14.5**	—	**1.49**	**29200**	**61.12**	—	**1460**	**243**	**658**	—	—	—	—	—	—	—	**183**	—	—	**1431**	—
MCA-1	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCA-2	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCA-5	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.38	—	—	—
MCO-0.6	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCO-3	WGA	0.65	0.39	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCO-4B	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCO-5	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.84E-05	—	—	0.83	0.64	0.19	0.45
MCO-6	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCO-7	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MT-1	WGA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MT-3	WGA	—	—	**14.1 (J+)**	—	—	—	0.73	0.74	—	—	—	0.6	0.64	—	—	0.75	0.66	0.34	—	—	—
MCOBT-4.4	WGI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCOI-4	WGI	—	—	—	—	53.3 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MCOI-5	WGI	—	—	—	—	—	—	—	—	—	—	—	—	—	17.6 (J+)	—	—	—	8.5	—	—	—
MCOI-6	WGI	—	—	—	—	52.2 (J)	—	—	—	—	5.8 (J)	—	—	—	—	—	—	—	31.2	—	—	—
PM-5	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-1	WGR	—	—	—	7.44 (J+)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-13	WGR	—	0.32 (J)	—	—	—	0.0084	—	—	—	—	—	—	—	—	—	—	—	2.8	—	—	—
R-14	WGR	—	—	—	—	—	—	0.33 (J)	0.3 (J)	0.3	—	—	—	—	—	—	0.43 (J)	0.36 (J+)	—	—	—	—
R-15	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.69 (J)	—	—	—
R-28	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29.1	—	—	—

Table 6.3-3 (continued)

Location ID	Media Code[a]	Dichlorobenzene[1,3-]	Dichlorobenzene[1,4-]	Dichlorobenzidine[3,3'-]	Diethylphthalate	Dioxane[1,4-]	Endrin	Fluoranthene	Fluorene	Isopropylbenzene	Methyl-2-pentanone[4-]	Methylene Chloride	Methylnaphthalene[2-]	Naphthalene	Nitroaniline[4-]	Octachlorodibenzofuran [1,2,3,4,6,7,8,9-]	Phenanthrene	Pyrene	Toluene	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
R-33	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Test Well 8	WGR	—	—	—	—	—	—	—	—	—	—	1.1	—	0.37	—	—	—	—	0.3	—	—	—

Notes: All values in ug/L. Bolded concentrations exceed a standard and/or screening level. Grey shading indicates a standard and/or screening value was exceeded for that chemical. All surface waters associated with these locations are ephemeral.

[a] Media code definitions are provided in Table C-2-4.

[b] 20.6.4 NMAC

[c] — = Not detected or not analyzed.

[d] 20.6.2 NMAC

[e] EPA 2005, 91002.

[f] EPA 2005, 91002 only listed for chemicals without a standard or MCL.

Table 6.3-4
Mortandad Filtered Water Radionuclide COPCs

Location ID	Media Code[a]	Americium-241	Cesium-137	Gross Alpha	Gross Beta	Gross Gamma	Plutonium-238	Plutonium-239/240[b]	Potassium-40	Radium-226	Sodium-22	Strontium-90	Uranium-234	Uranium-235/236[c]	Uranium-238
Derived Concentration Guide (DCG) 100 mrem/yr[d]		**30**	**3000**	—[e]	—	—	**40**	**30**	**7000**	**100**	**10000**	**1000**	**500**	**600**	**600**
MO-24786	WS	—	—	—	5.5 (J)	—	—	—	—	—	—	—	0.14 (J)	—	0.12 (J)
MO-24787	WS	—	—	—	16 (J)	—	—	—	—	—	—	0.44	0.09 (J)	—	0.07 (J)
MO-24788	WS	4.07	22.8	7.98	48.1	—	1.5	2.56	—	0.41 (J)	—	4.37	0.42	—	0.36
MO-24789	WS	—	—	—	6.22 (J)	—	—	—	—	1.45 (J)	—	—	0.16 (J)	—	0.14 (J)
MO-24790	WS	—	—	1.94 (J)	8.42	—	—	—	—	0.37 (J)	—	0.6 (J)	0.13 (J)	—	0.08 (J)
MO-24791	WS	0.64	—	4.24 (J)	109	—	0.2	0.39	—	—	—	41.4	0.58	—	0.19
MO-24792	WS	0.04 (J)	—	—	25.7	—	0.23	0.07 (J)	—	—	—	9.1	0.13 (J)	—	0.1 (J)
MO-24793	WS	—	—	—	44.9	—	—	—	—	—	—	19.1	0.24 (J)	—	0.26
Mortandad at GS-1	WS	0.6	—	—	—	—	1.51	0.82	—	—	—	45.29	3.51	0.07	1.08
Mortandad below Effluent Canyon	WS	1.62	9.67 (J)	4.68 (J)	28.8	—	0.44	0.75	—	0.61 (J)	—	3.2	0.17 (J)	—	0.07 (J)
EPA MCLs[f]		—	—	**15**	—	—	—	—	—	—	—	—	—	—	—
Derived Concentration Guide (DCG) 4 mrem/yr		**1.2**	**120**	—	—	—	**1.6**	**1.2**	**280**	**4**	**400**	**40**	**20**	**24**	**24**
MCA-1	WGA	—	—	2.35	6.03 (J)	—	—	—	—	1.94	—	0.42 (J)	0.11 (J)	—	0.09 (J)
MCA-2	WGA	0.1 (J)	—	3.67 (J)	47.4	—	—	—	70.8 (J)	1.66	—	10.4	0.99	0.06 (J)	0.66
MCA-5	WGA	1.19	—	3.11 (J)	59.6	—	0.78	0.76	—	1.41	—	21	0.47	0.03 (J)	0.17
MCO-0.6	WGA	—	—	5.16 (J, J-)	14.5 (J)	—	—	—	—	—	—	0.45 (J)	1.2	—	1.38
MCO-4B	WGA	0.17	—	3.73 (J)	112	—	0.11 (J)	0.2	—	—	—	39.6 (J)	0.54	—	0.17 (J)
MCO-5	WGA	0.11	—	1.89 (J)	95.9	—	0.05	—	—	—	—	**57**	0.42 (J)	0.04	0.41
MCO-6	WGA	0.08 (J)	—	3.06 (J)	112	—	0.02	—	—	1.42	5.84	**56.79**	1.4	0.06 (J)	0.5
MCO-7	WGA	0.12	—	—	31.5	—	0.03	—	—	2.19 (J)	—	1.92	0.77	0.08 (J)	0.65
MCO-7.5	WGA	0.21	—	2.53 (J)	25	—	—	0.07 (J)	—	0.72 (J)	—	—	0.5	0.06 (J)	0.45
MT-1	WGA	0.12	—	1.25 (J)	30.4	—	—	0.04 (J)	—	1.37 (J)	—	0.41 (J)	0.65	—	0.48
MT-3	WGA	0.23	—	2.89 (J)	28.8	—	—	—	—	—	—	—	0.57	0.08 (J)	0.47
MT-4	WGA	0.08 (J)	—	2.46 (J)	15.5	—	—	—	—	—	—	—	0.69	0.06 (J)	0.62
MCOBT-4.4	WGI	—	—	—	—	—	—	—	44.4	—	—	—	0.25	—	0.15
MCOI-4	WGI	—	—	—	3.35 (J)	—	—	—	—	—	—	—	0.11 (J)	—	—
MCOI-5	WGI	—	—	—	—	—	—	—	—	—	—	—	0.11 (J)	—	0.06 (J)
MCOI-6	WGI	—	—	2.11 (J)	14.7 (J)	—	—	—	—	3.04	—	—	0.4	0.06 (J)	0.19
R-1	WGR	—	—	—	3.63 (J)	—	—	—	—	—	—	—	0.63	—	0.23
R-13	WGR	—	—	—	—	—	—	—	—	—	—	—	0.33	—	0.14
R-15	WGR	—	—	—	3.42 (J)	137	—	—	—	—	—	1.51	0.34	0.04	0.18 (J)
R-28	WGR	—	—	—	9.29 (J)	—	—	—	—	—	—	—	0.89	0.07 (J)	0.39
R-33	WGR	—	—	—	4.96 (J)	—	—	—	—	—	—	—	0.65	—	0.32

Note: All values in pCi/L. Bolded concentrations exceed a standard and/or screening level. Grey shading indicates a standard and/or screening value was exceeded for that chemical.
[a] Media code definitions are provided in Table C-2-4.
[b] Plutonium-239 DCG.
[c] Uranium-235 DCG.
[d] No applicable NM standards; all surface waters are ephemeral.
[e] — = Not detected or not analyzed.
[f] EPA 2005, 91002.

Table 6.3-5
Mortandad Unfiltered Water Radionuclide COPCs

Location ID	Media Code[a]	Americium-241	Cesium-137	Gross Alpha	Gross Alpha/Beta	Gross Beta	Gross Gamma	Plutonium-238	Plutonium-239/240[b]	Potassium-40	Radium-226	Sodium-22	Strontium-90	Technetium-99	Thorium-228	Thorium-230	Thorium-232	Tritium	Uranium-234	Uranium-235/236[c]	Uranium-238
Livestock Watering[d]		**—[e]**	**—**	**15**	**—**	**—**	**—**	**—**	**—**	**—**	**30**	**—**	**—**	**—**	**—**	**—**	**—**	**20000**	**—**	**—**	**—**
Derived Concentration Guide (DCG) 100 mrem/yr[f]		**30**	**3000**	**—**	**—**	**—**	**—**	**40**	**30**	**7000**	**—**	**10000**	**1000**	**100000**	**400**	**300**	**50**	**—**	**500**	**600**	**600**
MO-24786	WS	—	—	**—**	—	5 (J)	—	—	—	—	—	—	0.36 (J)	—	—	—	—	117.18	0.19 (J)	—	0.16 (J)
MO-24787	WS	—	—	**—**	—	16.1	—	—	—	—	0.76	—	0.58 (J)	—	—	—	—	365 (J)	0.19 (J)	—	0.16 (J)
MO-24788	WS	8.64 (J)	35.6	**18.4 (J)**	12.3	52.7 (J)	—	3.15 (J)	4.85 (J)	63.6 (J)	—	—	3.97 (J)	—	—	—	—	1090	0.56 (J+)	—	0.24 (J+)
MO-24789	WS	—	—	4.87 (J)	7.44	13.1	—	0.13 (J)	0.08	**—**	0.43	—	0.44 (J)	—	—	—	—	87.8	0.42	—	0.4
MO-24790	WS	—	—	2.2 (J)	—	9.26	—	—	**—**	**—**	—	—	0.5 (J)	—	—	—	—	86.84	0.12 (J)	—	0.12 (J)
MO-24791	WS	0.98 (J)	6.15 (J)	7.22	—	119	—	0.28 (J)	0.5	**—**	—	—	43.9 (J)	9.87	—	—	—	590.7	0.52	—	0.18
MO-24792	WS	0.2	—	7.41 (J,J-)	7.73	43.9	—	1.79	0.79	**—**	—	—	6.63	—	—	—	—	72.8	0.24	—	0.22
MO-24793	WS	—	—	**81.2**	—	59.2	—	0.07 (J)	**—**	**—**	—	—	21.3	—	—	—	—	167.31	0.22 (J)	—	0.26
MO-24794	WS	—	—	**—**	3.1	—	—	0.12	**—**	**—**	—	—	—	—	—	—	—	—	0.26	—	0.29
MO-24795	WS	—	—	**—**	6.15	—	—	0.06	**—**	**—**	—	—	—	—	—	—	—	—	0.15	—	0.13
MO-24808	WS	1.88	—	**—**	4.59	—	—	0.75	0.81	**—**	—	—	—	—	—	—	—	—	0.36	—	0.19
Mortandad at GS-1	WS	6.54 (J+)	31.39	**39.9**	—	92.9 (J)	262	5	6.75	**—**	—	8.96	47.7	—	—	—	—	**52633.41**	3.43	0.07	1.12
Mortandad at Rio Grande (A-11)	WS	0.03	—	**—**	—	15.3	—	—	**—**	**—**	1.36	—	0.3 (J)	—	—	—	—	5.97	0.35	—	0.17
Mortandad below Effluent Canyon	WS	15	42.6	**49.3**	—	80.3	—	6.75	4.73	**—**	0.7 (J)	12.8	11.5	—	0.12 (J)	0.07	0.1 (J)	12900	2.93	0.17	0.25
EPA MCLs[g]		**—**	**—**	**15**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Derived Concentration Guide (DCG) 4 mrem/yr[g]		**1.2**	**120**	**—**	**—**	**—**	**—**	**1.6**	**1.2**	**280**	**4**	**400**	**40**	**4000**	**16**	**12**	**2**	**80000**	**20**	**24**	**24**
MCA-1	WGA	**—**	**—**	3.66 (J)	—	10.5	—	**—**	**—**	**—**	—	**—**	**—**	**—**	**—**	—	**—**	109.83	0.17 (J)	**—**	0.2 (J)
MCA-2	WGA	0.07 (J)	**—**	3.63 (J)	—	51.4	—	**—**	**—**	**—**	1.63	**—**	9.53	12.6 (J)	**—**	—	**—**	3649.59	0.94	0.06 (J)	0.66
MCA-5	WGA	**2.44 (J)**	7.53 (J)	8.91 (J)	—	80.2 (J)	—	**1.75 (J)**	**1.96 (J)**	**—**	1.35 (J)	**—**	20 (J)	15.6 (J)	**—**	—	**—**	491 (J)	0.49 (J)	—	0.26 (J)
MCO-0.6	WGA	**—**	—	7.86 (J,J-)	—	19.7 (J)	—	**—**	**—**	**—**	—	**—**	0.38 (J)	—	**—**	—	**—**	222 (J)	1.43	0.09 (J)	1.53
MCO-2	WGA	**—**	—	—	—	—	—	**—**	**—**	**—**	—	**—**	0.67	—	**—**	—	**—**	—	0.14	—	0.15
MCO-3	WGA	**3.98**	8.08	12.4	—	161 (J)	—	**2.19**	**1.78**	**649**	0.52 (JN+)	24.6	39.3	—	**—**	—	0.05 (J)	76300	4.27	0.17 (J)	1.17
MCO-4B	WGA	0.7	—	7.11 (J-)	—	262 (J)	—	0.14	0.27	**—**	1.28 (J)	**—**	**79.1**	6.25 (J)	**—**	—	—	2790	3.24	0.21	0.91
MCO-5	WGA	1.06	—	11.9 (J-)	—	251 (J)	—	0.17	0.29	63.1 (J)	0.99 (J)	26.2	**81.6**	7.43 (J)	**—**	0.05 (J)	—	6820	2.66	0.14 (J)	0.8
MCO-6	WGA	0.97	—	6.28 (J-)	—	152 (J)	—	0.01	0.03 (J)	**—**	1.55 (J)	18.5	**60.29**	10.7 (J)	**—**	0.03 (J)	—	8260.29	2.48	0.16	0.88
MCO-7	WGA	0.98	16.5	3.39 (J-)	—	54.2	—	—	0.02	**—**	1.59 (J)	12.4	2.32	18 (J)	**—**	0.04 (J)	—	10971.14	0.85	0.04 (J)	0.69
MCO-7.5	WGA	0.32	**—**	2.8 (J)	—	43.3 (J)	—	0.23	0.32	**—**	2.27	8.34 (J)	0.42 (J)	23.1	0.12 (J)	0.16 (JN+)	0.05 (J)	16137.42	0.51	0.05 (J)	0.55
Mort PRB Apatite Cell 10	WGA	0.12 (J)	**—**	—	—	—	—	—	—	**—**	—	**—**	1.48	—	**—**	—	—	—	—	—	—
Mort PRB Apatite Cell 4	WGA	—	**—**	—	—	—	—	0.05 (J)	—	**—**	—	**—**	14.4	—	**—**	—	—	—	—	—	—
Mort PRB Apatite Cell 8	WGA	0.4	**—**	—	—	—	—	0.21	0.22	**—**	—	**—**	36.9	—	**—**	—	—	—	—	—	—
Mort PRB Bio Cell 3	WGA	0.66	**—**	—	—	—	—	0.08 (J)	0.06 (J)	**—**	—	**—**	**45.9**	—	**—**	—	—	—	—	—	—
Mort PRB Bio Cell 7	WGA	0.21	**—**	—	—	—	—	0.1 (J)	0.05 (J)	**—**	—	**—**	34.6	—	**—**	—	—	—	—	—	—

Table 6.3-5 (continued)

Location ID	Media Code[a]	Americium-241	Cesium-137	Gross Alpha	Gross Alpha/Beta	Gross Beta	Gross Gamma	Plutonium-238	Plutonium-239/240[b]	Potassium-40	Radium-226	Sodium-22	Strontium-90	Technetium-99	Thorium-228	Thorium-230	Thorium-232	Tritium	Uranium-234	Uranium-235/236[c]	Uranium-238
Mort PRB Bio Cell 9	WGA	0.34	—	—	—	—	—	0.23	0.13	—	—	—	**48.5**	—	—	—	—	—	—	—	—
Mort PRB Gravel Cell 11	WGA	0.34	—	—	—	—	—	0.27	0.23	—	—	—	**60.9**	—	—	—	—	—	—	—	—
Mort PRB Gravel Cell 12	WGA	0.12 (J)	—	—	—	—	—	0.1	0.05 (J)	—	—	—	**67.7**	—	—	—	—	—	—	—	—
Mort PRB Gravel Cell 6	WGA	0.24	—	—	—	—	—	0.13	0.08 (J)	—	—	—	**62**	—	—	—	—	—	—	—	—
Mort PRB Limestone Cell 13	WGA	0.35	—	—	—	—	—	0.1	0.24	—	—	—	**53.4**	—	—	—	—	—	—	—	—
Mort PRB Limestone Cell 14	WGA	0.19	—	—	—	—	—	0.07 (J)	—	—	—	—	**49.3**	—	—	—	—	—	—	—	—
Mort PRB Limestone Cell 5	WGA	0.67	—	—	—	—	—	0.19	0.43	—	—	—	**47**	—	—	—	—	—	—	—	—
MT-1	WGA	0.11 (J)	—	6.38	—	33.1 (J)	—	0.07 (J)	0.1 (J)	—	1.54 (J)	—	0.58 (J)	16	—	—	—	3610	0.94 (J)	0.05 (J)	0.81 (J)
MT-3	WGA	0.2 (J)	—	2.06 (J)	—	29.8 (J)	—	—	—	—	—	—	—	17.4	—	—	—	6287.01	0.45	—	0.39
MT-4	WGA	0.08 (J)	—	—	—	17	—	—	—	—	—	—	—	20.2	—	—	—	4720	0.7	0.04 (J)	0.62
PRB-MW-01	WGA	**3.09**	—	—	—	—	—	1.41	**1.57**	—	—	—	**90.5**	—	—	—	—	—	—	—	—
PRB-MW-02	WGA	0.74	—	—	—	—	—	0.33	0.88	—	—	—	**78.9**	—	—	—	—	—	—	—	—
MCOBT-4.4	WGI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	23500	0.4	0.06	0.36
MCOI-4	WGI	—	—	—	—	2.03 (J)	—	—	—	—	3.28	—	—	5.76 (J)	—	—	—	12900	0.13 (J)	—	—
MCOI-5	WGI	—	—	—	—	—	—	—	—	—	—	—	—	4.72 (J)	—	—	—	4480	0.19 (J)	—	0.13 (J)
MCOI-6	WGI	—	—	—	—	10.2 (J)	—	—	—	—	0.73 (J)	—	—	7.86 (J)	—	—	—	13100	0.41	—	0.21
MCOI-8	WGI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	136.37	—	—	—
PM-5	WGR	0.15	—	—	—	4.01 (J)	—	—	—	—	0.56 (J)	—	—	—	—	0.2 (J)	—	2.36	0.39	0.04 (J)	0.21
R-1	WGR	—	—	14.5	—	3.75 (J)	—	—	—	—	—	—	—	—	—	—	—	—	0.67	0.06 (J)	0.28
R-13	WGR	—	—	0.64 (J)	—	2.58	—	—	—	—	0.44 (J)	—	—	—	—	—	—	—	0.31	0.06 (J)	0.15
R-14	WGR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.55	0.33	0.08 (J)	0.2
R-15	WGR	—	—	—	—	3.1	240	—	—	195	0.92 (J)	—	—	—	—	—	—	30.97	0.31	0.07	0.18
R-28	WGR	—	—	—	—	12.4 (J)	—	—	—	—	—	—	—	—	—	—	—	181.36	0.85	0.08 (J)	0.39
R-33	WGR	—	—	—	—	4.51 (J)	—	—	—	—	0.7 (J)	—	—	—	—	—	—	137.29	0.62	0.05 (J)	0.33
Test Well 8	WGR	—	—	—	—	3.01	—	—	—	—	3.99	—	—	—	—	—	—	6.06	0.41	—	0.22

Notes: All values in pCi/L. Bolded concentrations exceed a standard and/or screening level. Grey shading indicates a standard and/or screening value was exceeded for that chemical.

[a] Media code definitions are provided in Table C-2-4.

[b] Plutonium-239 DCG.

[c] Uranium-235 DCG.

[d] 20.6.4 NMAC.

[e] — = Not detected or not analyzed.

[f] Only listed for chemicals without a NM standard.

[g] EPA 2005, 91002.

Table 6.4-1
Mortandad Core Inorganic COPCs

Borehole	Media Code[a]	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium[b]	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
QAL (ALLH) LANL BV[c]		**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**21500**	**22.3**	**4610**	**671**	**0.1**	**#N/A**	**15.4**	**1.52**	**1**	**0.73**	**39.6**	**48.8**
QBT2 LANL BV		**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**	**11.2**	**1690**	**482**	**0.1**	**#N/A**	**6.58**	**0.3**	**1**	**1.1**	**17**	**63.5**
QBT1V LANL BV		**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**	**18.4**	**780**	**408**	**0.1**	**#N/A**	**2**	**0.3**	**1**	**1.24**	**4.48**	**84.6**
QBT 1G, QCT, QBO, QBOF LANL BV		**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**	**13.5**	**739**	**189**	**0.1**	**#N/A**	**2**	**0.3**	**1**	**1.22**	**4.59**	**40**
Residential SSL		**77800**	**31.3**	**3.9**	**15600**	**156**	**39**	**#N/A**	**2100**	**1520**	**3130**	**23500**	**400**	**#N/A**	**3590**	**100000**	**391**	**1560**	**391**	**391**	**5.16**	**78.2**	**23500**
B-1	QBT1V	—[d]	—	—	—	—	0.53 (U)	—	—	—	—	—	—	—	—	—	—	—	0.67	—	—	—	—
B-1	QBT2	—	—	—	—	1.76	—	—	—	—	—	—	—	—	—	—	—	—	1.08	—	—	—	64.4
B-2	QBT1G	9440	—	0.88	—	1.71	—	—	14	—	—	5040	—	—	264 (J)	—	—	—	—	—	—	—	—
B-2	QBT1V	25500	—	3.82	338	5.51	—	—	—	—	4.36 (J+)	11000	60	—	670 (J)	—	—	—	0.69 (U)	—	1.63	—	98.2
B-2	QBT2	—	—	—	—	—	—	—	—	—	—	—	11.4	—	497 (J)	—	—	—	—	—	—	—	65.5
B-5	QAL	—	—	—	—	—	0.61 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
B-5	QBT1G	—	—	0.57 (U)	—	—	0.58 (U)	—	—	—	—	4090 (J)	—	—	—	—	—	—	0.58 (U)	—	—	—	—
B-6	QAL	—	—	—	—	—	0.6 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	70.6
B-6	QBT1G	—	—	0.8 (U)	—	—	0.62 (U)	—	—	—	—	—	—	—	—	—	—	—	0.62 (U)	—	—	—	—
B-7	QAL	—	—	—	—	—	0.58 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
B-7	QBT1G	42000	0.53 (U)	2.7 (U)	634	3.89	0.66 (U)	—	6.6	—	9.41	13200	29.6	1310	—	—	—	13.5	0.66 (U)	—	—	8.65	101
B-7	QCT	14600	—	1.39	70	4.41	0.63 (U)	—	5.23	—	4.41	6880	17.8	1630	—	—	—	3.91	0.56 (J)	—	—	7.3	120
B-8	QAL	—	—	—	—	—	0.56 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
B-8	QCT	37200	—	1.9	166	3.59	0.77 (U)	—	7.15	—	7.67	10700	26.3	1710 (J+)	364	—	—	18.2	1.03	—	—	9.66	65.4
B-9	QAL	36000	—	—	—	3.18	0.61 (U)	—	—	—	—	—	37.9	—	—	—	—	—	—	—	0.82	—	86.2
B-9	QCT	14900	—	0.95	56.6	1.76	0.62 (U)	—	3.47	—	—	12500	—	905 (J)	216 (J)	—	—	3.43	1.13	—	—	9.81	44
B-10	QAL	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	57.9
B-10	QCT	17300	—	2.42 (J)	73	2.49	—	—	5.74	—	5.19	12500	14.2	1540 (J+)	474	—	—	4.43	1.2	—	—	9.12	62.5
B-11	QAL	—	—	—	—	—	0.63 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	65.6
B-11	QCT	23300	0.52 (UJ)	1.23	81.8	1.5	0.65 (U)	—	4.27	—	—	10600	—	1000	246	—	—	4.21	0.65 (U)	—	—	7.19	—
B-12	QCT	28000 (J+)	—	3.52	178	6.66	—	2420	11.2 (J)	—	5.9	14100 (J+)	114	4270	918 (J-)	—	—	6 (J)	0.74	—	—	21.7	245 (J)
B-14	QAL	62600	—	—	365	4.18	0.72 (U)	—	—	—	17	—	31.9	—	—	—	—	25.4	—	—	—	—	94.8
B-14	QBOF	7850 (J)	—	1.35 (J)	85.1 (J-)	—	0.58 (U)	—	71.7 (J-)	—	8.19 (J)	10900	—	1390 (J-)	217 (J-)	—	—	3.56	1.19	—	—	6.83	—
B-14	QCT	11400	—	0.84 (U)	43.4	—	0.62 (U)	—	4.09 (J)	—	4.33	5860	—	1230 (J)	—	—	—	2.8	0.62	—	—	9.63 (J)	—
B-15	QAL	—	—	—	—	—	0.53 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
B-15	QBO	—	—	—	30.5	—	0.55 (U)	—	3.07	—	—	6690 (J+)	—	—	198	—	—	—	0.55 (U)	—	—	5.25	49.7
B-15	QBT1G	—	—	0.6 (U)	—	—	0.6 (U)	—	—	—	—	—	—	—	—	—	—	—	0.57 (U)	—	—	—	—
B-15	QCT	17300 (J+)	—	1.36 (U)	66.9	5.71	0.58 (U)	—	9.98	—	5.95	10100 (J+)	—	2470 (J+)	237	—	—	5.4	0.84 (U)	—	—	13	63.8
B-16	QBO	—	—	—	49	—	—	—	6.48	—	—	4000	—	—	230	—	—	—	0.66	—	—	—	—

Table 6.4-1 (continued)

Borehole	Media Code[a]	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium[b]	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
R-14	QBO	—	—	—	—	—	0.528 (U)	—	—	—	—	3830	—	—	—	—	—	—	0.528 (U)	—	—	—	—
R-14	QBT1G	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.531 (U)	—	—	—	—
R-14	QBT1V	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.499 (U)	—	—	—	—
R-14	QBT2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.523 (U)	—	—	—	—
R-14	QCT	3660	—	—	—	—	0.489 (U)	—	2.76	—	—	—	—	—	—	—	—	—	0.489 (U)	—	—	—	—
R-15	QBO	8820	1.3 (J-)	1.4 (J)	156	—	0.6 (U)	10200	9.6	21.2	35.1	**28000**	—	16700	545 (J+)	0.12 (U)	0.83 (J)	75.6	1.3	2.4 (U)	—	28.1	46.2
R-15	QBT1G	27500	0.68 (UJ)	2.8	192	4.8	—	2040	6.4	—	15.4	9390	31.2	1300	479 (J-)	—	—	9.1 (J)	0.79 (U)	—	—	11.8	80.2
R-15	QCT	23800	0.72 (UJ)	2.1 (J)	72.5	2.9	—	2190	442	—	46.1	8110	16.6	1840	348 (J-)	—	—	218	0.83 (U)	—	—	10 (J)	46.4

Notes: All values in mg/kg. Values are maximum values > BV. Values in bold exceed the residential SSL. Grey shading indicates a screening value was exceeded for that chemical.

[a] Media code definitions are provided in Table C-2-4.

[b] EPA region 6 residential HHMSSL (EPA 2005, 91002).

[c] LANL (1998, 59730).

[d] — = Not detected > BV or not analyzed.

Table 8.1-5
Estimate of Risk to Southwestern Willow Flycatcher Through Ingestion of Nest Box Insects by Reach

COPEC	Avian sediment TRV (mg COPEC/kg bird/day)	SWF food ingestion rate (kgfresh food/kg bird/d)	Food ESL (in mg/kg or pCi/g)	Detected Concentration in Insect Tissue in E-1FW Nest Boxes (mg/kg fresh insect)	HQ for E-1FW	Detected Concentration in Insect Tissue in TS-1E Nest Boxes (mg/kg fresh insect)	HQ for TS-1E	Mean Detected Concentration in Insect Tissue in M-4 Nest Boxes (mg/kg fresh insect)	HQ for M-4	Mean Detected Concentration in Insect Tissue in M-5W nest boxes (mg/kg fresh insect)	HQ for M-5W	Detected Concentration in Insect Tissue in Cañada del Buey Nest Boxes (mg/kg fresh insect)	HQ for Canada del Buey	Detected Concentration in Insect Tissue in Pueblo Nest Boxes (mg/kg fresh insect)	HQ for Pueblo	Mean Detected Concentration in Insect Tissue in Rendija Nest Boxes (mg/kg fresh insect)	HQ for Rendija
Aluminum	pH dependent	0.79	n/a	51	n/a	250	n/a	118	n/a	141	n/a	130	n/a	70	n/a	145	n/a
Barium	73.5	0.79	93	5.3	0.057	120	1.29	6.4	0.07	6.3	0.07	5.6	0.060	4.3	0.046	17.5	0.188
Cadmium	1.47	0.79	1.9	0.33	0.1774	0.63	0.34	0.11	0.06	0.13	0.07	0.72	0.3871	0.13	0.0699	0.205	0.1102
Copper	2.98	0.79	3.8	41	10.87	70	18.56	35	9.28	12.6	3.34	28	7.42	28	7.42	48	12.73
Mercury (inorganic)	0.019	0.79	0.024	ND*	0.000	ND	0.00	ND	0.00	0.02	0.83	0.02	0.83	0.02	0.83	ND	0.000
Mercury (methyl)	0.0064	0.79	0.01	ND	0.000	ND	0.00	ND	0.00	0.02	2.47	0.02	2.47	0.02	2.47	ND	0.000
Selenium	0.44	0.79	0.6	0.19	0.341	0.31	0.56	0.425	0.76	0.29	0.52	0.13	0.23	0.13	0.233	0.165	0.296
Silver	5.44	0.79	6.9	0.02	0.00291	0.17	0.02	0.071	0.01	0.014	0.0020	0.19	0.02760	0.02	0.00291	0.055	0.00799
Vanadium	0.344	0.79	0.44	ND	0.000	ND	0.00	ND	0.00	0.36	0.83	0.31	0.712	ND	0.000	0.615	1.413
Zinc	37.7	0.79	48	100	2.096	210	4.40	99.65	2.09	73.7	1.54	100	2.096	120	2.515	125	2.620

*ND = Analyte not detected.

Table 8.1-6
Estimate of Risk to the Insectivorous Robin Using Estimated Concentrations of COPECs in Earthworms

COPEC	Basis of Estimated Worm Tissue Concentration	Avian Soil TRV (mg COPEC/ kg bw/day)	Robin Food Ingestion Rate for Regression (kgfresh food/kg bird/d)	Robin Food Ingestion Rate for ESL TF (kg dry food/kg bw/d)	Food ESL (in mg/kg)	Concentration in Soil LA-BKG	HQ for LA-BKG	Concentration in Earthworm Toxicity Test Soil - Reach E-1FW	HQ for E-1FW	Concentration in Earthworm Toxicity Test Soil - Reach E-1W	HQ for E-1W	Concentration in Toxicity Test Soil - Reach E-1E	HQ for E-1E	Concentration in Earthworm Toxicity Test Soil - Reach M-2W	HQ for M-2W	Concentration in Earthworm Toxicity Test Soil - Reach M-4	HQ for M-4	Concentration in Earthworm Toxicity Test Soil - Reach TS-1C	HQ for TS-1C	Concentration in Earthworm Toxicity Test Soil - Reach TS-2C	HQ for TS-2C
Copper	regression	2.98	0.897	na[a]	3.322185	4.2	0.65	90.9	2.80	12.2	0.85	4.2	0.27	12.4	0.86	20	1.05	3.69	0.64	6.94	0.72
Lead	regression	1.63	0.897	na	1.817168	9.6	0.15	27.3	0.97	17.8	0.531	9.56	0.49	11.1	0.22	19	0.59	5.76	-0.028	10.7	0.20
Mercury (inorganic)	regression	0.019	0.897	na	0.021182	0.01	1.200	0.09	2.9	0.04	1.826	0.01	42	0.04	1.8	0.21	5.4	0.008	1.2	0.02	1.4
Mercury (methyl)	regression	0.0064	0.897	na	0.007135	0.01	3.6	0.09	8.5	0.04	5.4	0.01	126	0.04	5.4	0.21	16	0.008	3.4	0.02	4.2
Selenium	ESL TF	0.44	na	0.35	1.257143	ND[b]	0	ND	0	ND	0	0.75	0.28	ND	0	ND	0	ND	0	ND	0
Silver	regression	5.44	0.897	na	6.06466	ND	0	0.15	0.014	0.11	0.013	0.1	0.15	0.11	0.013	0.3	0.019	0.04	0.01	0.78	0.036
Vanadium	ESL TF	0.344	na	0.35	0.982857	11	0.48	30	1.3	20.5	0.88	11.3	0.36	11.9	0.51	19.1	0.82	11.9	0.51	13.3	0.57
Zinc	ESL TF	37.7	na	0.35	107.7143	30	1.1	75	2.6	75	2.6	30	0.003	79.5	2.8	55.9	2.0	45.9	1.6	46.5	1.6
Aroclor-1254	ESL TF	0.1	na	0.35	0.285714	ND	0	0.04	0.95	ND	0	0.0017	1.23	0.0059	0.140	0.01	0.24	0.01	0.24	0.01	0.24

[a] na = Not applicable to model used for this COPEC.

[b] ND = Analyte not detected.

Table 8.2-1
Identifying Sediment COPCs, Non-carcinogens

Reach	Aluminum	Antimony	Barium	Beryllium	Boron	Cadmium	Chromium hexavalent ion	Cobalt	Copper	Cyanide (Total)	Fluoride	Iron	Lead	Manganese	Mercury[a]	Nickel	Nitrate	Nitrite	Perchlorate[a]	Selenium	Silver	Thallium	Uranium[b]	Vanadium	Zinc	Acenaphthene	Acetone	Anthracene	Aroclor-1254	Aroclor-1260	Benzo(g,h,i)perylene[c]	Benzoic Acid[a]	Bromomethane	Butanone[2-]
Residential SSL	**77800**	**31.3**	**15600**	**156**	**15600**	**39**	**234**	**1520**	**3130**	**1220**	**3670**	**23500**	**400**	**3590**	**23**	**1560**	**100000**	**7820**	**55**	**391**	**391**	**5.16**	**16**	**78.2**	**23500**	**3730**	**28100**	**22000**	**1.12**	**1.12**	**2290**	**100000**	**8.51**	**31800**
M-1W	-	0.35	-	-	-	0.02	-	-	<0.01	<0.01	-	-	0.06	-	<0.01	0.02	-	-	-	<0.01	<0.01	-	-	-	<0.01	<0.01	<0.01	<0.01	-	0.05	<0.01	-	-	-
M-1C	-	-	<0.01	-	-	-	-	-	-	-	-	-	0.06	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	0.13	<0.01	-	-	<0.01
M-1E	**0.33**	-	0.02	<0.01	<0.01	0.02	-	<0.01	<0.01	-	-	**0.89**	0.08	**0.46**	<0.01	<0.01	-	-	-	0.03	<0.01	-	-	**0.47**	<0.01	-	<0.01	-	-	-	-	-	-	<0.01
E-1FW	**0.27**	-	0.01	-	-	0.02	<0.01	<0.01	**0.12**	-	<0.01	**0.78**	**0.14**	**0.29**	<0.01	<0.01	-	-	<0.01	0.03	-	-	-	**0.68**	<0.01	<0.01	<0.01	<0.01	**0.14**	0.03	<0.01	-	<0.01	<0.01
E-1W	**0.24**	0.05	0.02	0.02	-	0.04	-	<0.01	<0.01	<0.01	<0.01	**1.06**	0.09	**0.70**	0.01	<0.01	-	-	-	0.01	0.01	-	**0.27**	**0.38**	<0.01	-	-	-	-	0.02	<0.01	-	-	-
E-1E	-	-	<0.01	-	-	0.06	-	<0.01	0.04	-	<0.01	-	**0.13**	**0.47**	**0.12**	0.03	-	-	<0.01	<0.01	<0.01	**0.31**	**0.26**	-	<0.01	-	<0.01	<0.01	**0.12**	0.10	<0.01	<0.01	-	<0.01
M-2W	-	**0.42**	<0.01	-	-	0.02	-	-	0.02	-	0.02	**0.60**	**0.15**	-	0.03	-	-	-	0.02	<0.01	<0.01	**0.16**	-	-	<0.01	-	<0.01	<0.01	**0.13**	**0.19**	<0.01	<0.01	-	<0.01
M-2E	-	-	-	-	-	0.01	-	-	0.01	-	<0.01	-	-	-	0.05	-	-	-	<0.01	<0.01	<0.01	-	-	-	<0.01	<0.01	<0.01	<0.01	0.04	0.04	-	-	-	-
M-3	-	-	-	-	-	0.01	-	-	<0.01	-	<0.01	0.59	-	-	0.02	-	-	-	<0.01	<0.01	-	-	-	-	<0.01	-	<0.01	-	-	0.35	-	-	-	-
TS-1W	-	**0.36**	<0.01	-	-	0.03	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	**0.19**	-	**0.29**	-	<0.01	<0.01	<0.01	**0.51**	**1.22**	<0.01	<0.01	-	-
TS-1C	-	**0.36**	<0.01	-	-	0.04	-	<0.01	<0.01	-	-	**1.23**	0.10	-	-	0.04	-	-	-	<0.01	<0.01	**0.19**	-	**0.33**	<0.01	<0.01	<0.01	<0.01	<0.01	**1.16**	<0.01	<0.01	-	<0.01
TS-1E	-	-	-	-	-	0.02	-	<0.01	0.04	-	-	-	0.06	0.18	-	-	-	-	-	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	0.03	0.17	<0.01	-	-	<0.01
TS-2W	-	-	-	-	-	0.02	-	-	<0.01	-	<0.01	-	-	-	-	-	<0.01	<0.01	-	<0.01	-	-	-	-	-	-	-	<0.01	-	0.09	<0.01	-	-	<0.01
TS-2C	-	-	-	-	-	0.02	-	-	0.02	-	<0.01	-	0.07	-	0.04	-	<0.01	<0.01	-	<0.01	0.11	-	-	0.28	<0.01	-	<0.01	<0.01	0.05	0.14	<0.01	-	-	<0.01
TS-2E	**0.21**	-	-	-	-	0.02	-	<0.01	0.02	-	<0.01	**0.59**	0.07	-	0.06	-	<0.01	<0.01	-	0.03	0.09	-	-	**0.35**	<0.01	-	<0.01	-	-	**0.28**	<0.01	-	-	<0.01
TS-3	**-**	-	-	-	-	0.01	-	-	<0.01	-	-	-	0.05	0.16	<0.01	-	-	-	-	<0.01	0.01	-	-	-	<0.01	-	-	-	-	0.06	-	<0.01	-	-
M-4	-	0.06	<0.01	-	-	0.02	-	<0.01	0.01	-	<0.01	0.64	0.06	-	0.01	-	-	-	0.01	<0.01	0.02	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	<0.01	-	<0.01
MCW-1	-	-	-	-	-	0.01	-	-	-	-	-	-	0.05	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2N	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-
MCW-2W	-	-	-	-	-	0.01	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MCW-2E	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-5W	-	-	<0.01	-	-	-	-	-	-	-	-	0.60	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	<0.01	-	-	-	-	-	-	<0.01
M-5E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	0.19	-	-	-	<0.01	<0.01	-	-	-	-	-	-	<0.01
M-6	-	-	-	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8.2-1 (continued)

Reach	Butylbenzylphthalate[a,d]	Chlorophenol[2-]	Dibenzofuran	Dichlorobenzene[1,2-][d]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Diethylphthalate	Di-n-butylphthalate	Endosulfan Sulfate	Endrin Aldehyde	Fluoranthene	Fluorene	Hexachlorobutadiene	Hexanone[2-]	Isopropylbenzene	Isopropyltoluene[4-][c]	Methoxychlor[4,4'-][a]	Methyl-2-pentanone[4-]	Methylnaphthalene[2-][c]	Naphthalene[a]	Nitroaniline[2-][a]	Nitroaniline[4-][a]	Nitrophenol[2-]	Phenanthrene	Pyrene	Toluene[d]	Trichloroethane[1,1,1-][d]	Trichlorofluoromethane	Trichlorophenol[2,4,6-]	Trimethylbenzene[1,2,4-]	Xylene (Total)[d]	Xylene[1,2-][d]	Xylene[1,3-][d]	SOFnc
Residential SSL	**240**	**166**	**142**	**37.4**	**206**	**76.5**	**48900**	**6110**	**18.3**	**18.3**	**2290**	**2660**	**12.2**	**31800**	**271**	**271**	**306**	**5510**	**79.5**	**79.5**	**180**	**180**	**166**	**1830**	**2290**	**252**	**563**	**588**	**6.11**	**58**	**82**	**99.5**	**82**	
M-1W	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	<0.01	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	0.55
M-1C	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	<0.01	<0.01	-	-	0.01	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	0.21
M-1E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	**2.34**
E-1FW	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	0.02	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	<0.01	-	-	**2.58**
E-1W	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	**2.96**
E-1E	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	<0.01	-	-	<0.01	-	-	-	-	-	**1.66**
M-2W	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	<0.01	-	-	<0.01	-	-	-	-	-	**1.76**
M-2E	-	-	-	-	-	-	-	-	<0.01	-	<0.01	<0.01	-	-	-	-	<0.01	-	-	<0.01	-	-	-	<0.01	<0.01	-	<0.01	<0.01	-	-	-	-	-	0.18
M-3	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	-	<0.01	-	-	-	-	-	-	-	0.99
TS-1W	-	-	-	-	-	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	<0.01	-	-	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	**2.63**
TS-1C	<0.01	-	<0.01	-	-	-	<0.01	<0.01	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	**3.50**
TS-1E	-	-	<0.01	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	<0.01	-	-	-	0.51
TS-2W	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	-	<0.01	-	-	<0.01	-	-	-	0.12
TS-2C	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	<0.01	-	-	-	0.74
TS-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	-	<0.01	-	-	-	-	-	**1.71**
TS-3	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	0.32
M-4	-	-	-	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	<0.01	-	-	-	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	-	<0.01	<0.01	0.97
MCW-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.07
MCW-2N	-	<0.01	<0.01	-	-	-	-	<0.01	-	-	-	<0.01	<0.01	-	-	<0.01	-	-	<0.01	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-	-	-	0.03
MCW-2W	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
MCW-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	0.01
M-5W	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	0.61
M-5E	-	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	0.20
M-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01

Notes: Residential SSL values are in mg/kg. Ratios in bold and gray shading show where the SOFnc>1 and the ratio is >0.1.

[a] EPA Region 6 residential SSL (EPA 2005, 91002).

[b] EPA Region 9 residential SSL (epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf).

[c] Pyrene used as surrogate for benzo(g,h,i)perylene. Isopropyltoluene uses isopropylbenzene SSL as surrogate and 2-methylnaphthalene uses naphthalene as surrogate.

[d] Screening value is based on saturation, not risk based.

Table 8.2-2
Identifying Sediment COPCs, Carcinogens

Reach	Arsenic	Chromium*	Aroclor-1254	Aroclor-1260	Aroclors (Mixed)*	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	BHC[alpha-]	BHC[beta-]	BHC[gamma-]	Bis(2-ethylhexyl)phthalate	Bromodichloromethane	Carbazole*	Carbon Tetrachloride	Chloroform	Chloromethane	Chrysene	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dibenz(a,h)anthracene	Dichlorobenzene[1,4-]	Dichlorobenzidine[3,3'-]	Dieldrin	Heptachlor Epoxide*	Hexachlorobenzene	Indeno(1,2,3-cd)pyrene	Methylene Chloride	Nitrosodiphenylamine[N-]	Tetrachloroethene	Trichloroethene	SOFca
Residential SSL	**3.9**	**2100**	**2.22**	**2.22**	**2.22**	**10.3**	**6.21**	**0.62**	**6.21**	**62.1**	**0.9**	**3.16**	**4.37**	**347**	**14.4**	**240**	**0.97**	**4**	**21.8**	**615**	**24.4**	**17.2**	**17.2**	**0.62**	**39.5**	**10.8**	**0.3**	**0.53**	**3.04**	**6.21**	**182**	**993**	**12.5**	**0.64**	
M-1W	**1.13**	-	-	0.03	-	-	**0.44**	**3.40**	**0.40**	<0.01	0.01	<0.01	<0.01	-	-	-	-	-	-	<0.01	<0.01	-	<0.01	-	-	-	0.01	-	-	**0.20**	-	-	<0.01	-	**5.62**
M-1C	-	<0.01	-	0.06	-	-	0.06	0.72	0.05	<0.01	0.02	<0.01	<0.01	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	0.04	-	-	<0.01	-	0.97
M-1E	**2.15**	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	**2.16**
E-1FW	**4.26**	**1.05**	0.07	0.01	-	-	0.07	**0.81**	0.08	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	0.05	-	-	<0.01	-	**6.41**
E-1W	**2.82**	**0.30**	-	<0.01	-	-	0.04	**0.42**	0.08	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	**3.67**
E-1E	**1.56**	0.07	0.06	0.05	0.02	-	0.02	**0.40**	0.07	<0.01	<0.01	-	-	<0.01	-	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	-	-	-	<0.01	-	0.02	-	-	-	-	**2.29**
M-2W	**1.10**	0.01	0.07	0.09	-	-	0.06	**0.60**	0.06	<0.01	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-	-	<0.01	-	-	-	-	**2.01**
M-2E	-	<0.01	0.02	0.02	-	-	0.04	0.26	0.02	<0.01	-	<0.01	-	<0.01	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	0.01	-	-	-	-	-	-	-	0.38
M-3	**1.03**	<0.01	-	**0.18**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	-	-	-	**1.21**
TS-1W	-	-	**0.26**	**0.62**	**0.68**	-	0.07	**1.08**	**0.14**	<0.01	-	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-	0.04	<0.01	-	-	-	**2.89**
TS-1C	-	-	<0.01	**0.59**	-	<0.01	**0.30**	**3.29**	**0.41**	0.02	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-	-	**0.29**	-	-	-	-	-	**0.23**	-	-	-	<0.01	**5.13**
TS-1E	-	-	0.01	0.09	-	-	**0.12**	**1.37**	**0.26**	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	0.08	-	-	<0.01	<0.01	**1.93**
TS-2W	-	-	-	0.05	-	-	0.05	0.61	0.06	<0.01	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	0.05	-	-	<0.01	<0.01	0.82
TS-2C	-	0.01	0.03	0.07	-	-	0.02	0.27	0.06	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	0.02	-	-	<0.01	<0.01	0.48
TS-2E	**1.14**	0.01	-	**0.14**	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1.29**
TS-3	-	-	-	0.03	-	-	<0.01	0.13	0.01	<0.01	<0.01	-	-	<0.01	-	-	-	-	-	<0.01	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	0.19
M-4	**1.18**	<0.01	<0.01	0.05	-	-	0.09	**0.95**	0.10	<0.01	-	-	-	<0.01	<0.01	<0.01	-	-	<0.01	<0.01	-	-	<0.01	-	-	0.06	-	-	-	0.05	<0.01	-	<0.01	-	**2.50**
MCW-1	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00
MCW-2N	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	0.00
MCW-2W	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.00
MCW-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00
M-5W	-	-	-	-	-	-	-	-	-	-	0.04	<0.01	<0.01	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.01	-	<0.01	<0.01	0.06
M-5E	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	<0.01	0.02	0.02
M-6	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00

Notes: Residential SSL values are in mg/kg. Ratios in bold and gray shading show where the SOFnc>1 and the ratio is >0.1.
*EPA Region 6 residential SSL (EPA 2005, 91002), multiplied by 10 to account for target risk level of 1E-5.

Table 8.2-3
Identifying Sediment COPCs, Radionuclides

Reach	Americium-241	Cesium-134	Cesium-137	Cobalt-60	Europium-152	Plutonium-238	Plutonium-239	Ruthenium-106	Sodium-22	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Tritium	Uranium-234	Uranium-235	Uranium-238	SOFrad
Residential SAL*	**30**	**2.4**	**5.6**	**1.3**	**2.9**	**37**	**33**	**20**	**1.6**	**5.7**	**2.3**	**5**	**5**	**750**	**170**	**17**	**86**	
M-1W	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	<0.01	-	-	-	<0.01
M-1C	0.03	0.03	-	-	-	<0.01	-	-	-	-	-	-	0.7	-	-	-	-	0.76
M-1E	<0.01	-	-	-	-	<0.01	0.16	-	-	-	-	-	-	-	-	-	-	0.17
E-1FW	-	0.03	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	0.04
E-1W	0.01	-	**0.38**	-	-	0.01	**0.91**	-	-	-	-	-	-	-	-	-	0.03	**1.35**
E-1E	**21.4**	0.08	**452**	**4.02**	-	**2.4**	**41.2**	-	**0.31**	**47.9**	-	-	-	**0.14**	0.09	0.04	0.08	**569**
M-2W	**17.5**	0.1	**155**	**1.88**	-	**5.49**	**18.1**	-	0.09	**6.3**	-	-	-	0.01	0.09	0.05	**0.12**	**205**
M-2E	**7.03**	0.05	**99.5**	**0.38**	-	**3.05**	**4.76**	-	-	**3.51**	-	-	-	<0.01	-	-	-	**118**
M-3	**7.43**	0.07	**53.2**	**1.13**	-	**1.11**	**3.73**	0.04	-	**1.51**	-	-	-	<0.01	-	0.03	-	**68.3**
TS-1W	**0.14**	0.03	**0.64**	**0.99**	-	**1.83**	**0.59**	-	-	**0.55**	-	-	-	<0.01	0.02	-	0.04	**4.82**
TS-1C	0.08	-	**0.57**	-	-	**8.49**	**1.07**	-	-	-	**6.61**	**5.7**	**2.71**	<0.01	-	0.01	0.03	**25.3**
TS-1E	-	-	-	-	-	**9.14**	**1.15**	-	-	-	-	-	-	-	-	-	-	**10.3**
TS-2W	0.02	0.03	-	-	-	0.06	0.02	-	-	**1.18**	-	-	-	<0.01	-	-	-	**1.30**
TS-2C	0.01	0.04	-	-	-	0.05	0.03	-	-	**0.98**	-	-	-	<0.01	-	0.01	-	**1.13**
TS-2E	-	0.03	-	-	-	0.04	**0.16**	-	-	**1.46**	-	-	-	-	-	-	0.03	**1.71**
TS-3	-	-	0.22	-	-	0.04	0.02	-	-	0.54	-	-	-	<0.01	-	-	-	0.83
M-4	**3.73**	0.08	**49.3**	**0.34**	**0.12**	**0.87**	**1.95**	-	-	**1.69**	-	-	-	<0.01	-	0.02	-	**58.1**
MCW-1	-	-	-	-	-	-	<0.01	-	-	-	-	0.49	-	-	-	-	-	<0.01
MCW-2N	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	<0.01
M-5W	-	-	0.16	-	-	-	<0.01	-	-	0.29	-	-	-	-	-	0.01	-	0.48
M-5E	-	0.04	0.17	-	-	<0.01	<0.01	-	-	-	-	-	-	-	-	0.02	-	0.23

Note: Ratios in bold and gray shading show where the SOFrad>1 and the ratio is >0.1.
*LANL (2005, 88493).

Table 8.2-4
Identifying Surface Water COPCs, Non-carcinogens

Location ID	Reach	Media Code	Field Preparation	Aluminum	Antimony	Barium	Beryllium	Boron	Cadmium	Cobalt	Copper	Cyanide (Total)	Fluoride	Iron	Lead[a]	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thallium	Vanadium	Zinc	Perchlorate	Uranium[b]	Acetone	Butanone[2-]	Methyl-2-pentanone[4-]	Pyrene	Benzoic Acid	SOFnc
Tap Water Screening Level				**36500**	**14.6**	**7300**	**73**	**7300**	**18.3**	**730**	**1460**	**730**	**2190**	**11000**	**15**	**5110**	**11**	**183**	**730**	**183**	**183**	**21900**	**2.41**	**36.5**	**11000**	**25.6**	**7.3**	**5480**	**7060**	**1990**	**183**	**146000**	
MO-24786	east of E-1FW	WS	Filtered	<0.01	-	0.03	-	<0.01	<0.01	0.02	0.02	<0.01	0.04	**0.52**	0.07	**0.16**	<0.01	**0.48**	0.02	<0.01	-	-	<0.01	**0.25**	0.05	**0.11**	<0.01	-	-	-	-	-	**1.80**
MO-24786	east of E-1FW	WS	Unfiltered	0.03	-	0.03	-	<0.01	<0.01	0.02	0.03	-	**0.16**	**0.38**	**0.21**	**0.17**	-	**0.51**	0.02	-	-	-	<0.01	-	0.06	**0.23**	<0.01	<0.01	-	-	-	-	**1.86**
MO-24787	E-1W	WS	Filtered	0.04	-	0.02	-	<0.01	-	<0.01	-	-	**0.34**	**0.41**	0.05	**0.19**	<0.01	**0.25**	<0.01	-	0.05	-	<0.01	-	0.04	0.10	<0.01	-	-	-	-	-	**1.50**
MO-24787	E-1W	WS	Unfiltered	0.09	-	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	-	**0.35**	**0.57**	**0.12**	**0.21**	-	**0.35**	<0.01	-	-	-	<0.01	-	0.07	**0.17**	<0.01	<0.01	-	-	-	-	**1.98**
MO-24788	E-1E	WS	Filtered	0.03	0.06	<0.01	-	0.01	-	<0.01	<0.01	-	0.24	0.05	0.04	<0.01	<0.01	0.19	0.02	0.01	-	-	<0.01	0.17	0.07	0.06	<0.01	-	-	-	-	-	0.98
MO-24788	E-1E	WS	Unfiltered	0.09	0.05	<0.01	<0.01	0.01	<0.01	-	0.02	-	**0.28**	**0.19**	**0.15**	0.01	-	**0.19**	0.02	0.03	-	-	<0.01	-	0.09	0.09	<0.01	<0.01	<0.01	-	<0.01	-	**1.24**
MO-24789	M-1W	WS	Filtered	**0.34**	0.08	0.01	-	<0.01	0.01	<0.01	<0.01	0.01	**0.12**	**0.66**	**0.54**	<0.01	<0.01	**0.64**	<0.01	0.02	-	-	<0.01	-	0.06	**0.56**	<0.01	-	-	-	-	-	**3.11**
MO-24789	M-1W	WS	Unfiltered	**1.20**	0.07	0.03	0.03	<0.01	0.03	<0.01	0.04	-	**0.33**	**2.34**	**1.80**	0.02	<0.01	**0.66**	0.02	-	-	-	<0.01	-	0.10	**1.32**	0.02	-	-	-	-	-	**8.02**
MO-24790	M-1E	WS	Filtered	**0.12**	-	0.02	-	<0.01	-	0.01	<0.01	-	0.08	**0.21**	**0.11**	**0.36**	<0.01	0.03	0.01	-	-	-	<0.01	-	0.04	0.10	<0.01	-	-	-	-	-	**1.09**
MO-24790	M-1E	WS	Unfiltered	**0.20**	-	0.02	-	<0.01	<0.01	<0.01	<0.01	-	**0.23**	**0.38**	**0.21**	**0.39**	-	0.03	0.01	-	-	-	<0.01	-	0.05	**0.21**	<0.01	<0.01	-	-	-	-	**1.76**
MO-24808	M-2W	WS	Unfiltered	0.02	-	<0.01	<0.01	-	<0.01	-	<0.01	-	-	0.04	0.04	0.02	-	-	<0.01	<0.01	-	-	-	-	-	0.06	<0.01	-	-	-	-	-	0.22
Mortandad at GS-1	M-2W	WS	Filtered	0.03	0.07	<0.01	<0.01	<0.01	0.06	<0.01	0.02	-	**0.41**	0.05	0.10	<0.01	<0.01	**0.53**	0.02	-	<0.01	<0.01	<0.01	**0.11**	**0.52**	**0.12**	0.02	-	-	-	-	-	**2.08**
Mortandad at GS-1	M-2W	WS	Unfiltered	0.03	-	<0.01	<0.01	-	0.01	<0.01	0.01	0.01	-	0.06	0.03	<0.01	<0.01	-	0.02	**3.89**	0.01	<0.01	-	0.09	**0.52**	**0.16**	-	-	-	-	-	-	**4.87**
Mortandad below Effluent Canyon	M-2W	WS	Filtered	0.08	0.04	<0.01	-	0.01	<0.01	-	<0.01	-	**0.25**	**0.14**	0.10	<0.01	<0.01	**0.20**	<0.01	0.02	-	-	<0.01	0.08	-	**0.13**	<0.01	-	-	-	-	-	**1.09**
Mortandad below Effluent Canyon	M-2W	WS	Unfiltered	0.12	-	<0.01	-	<0.01	-	-	<0.01	-	0.14	0.22	0.18	<0.01	-	-	-	0.02	0.01	-	<0.01	-	-	-	<0.01	0.01	-	-	-	<0.01	0.74
MO-24791	M-2E	WS	Filtered	<0.01	0.04	<0.01	-	<0.01	-	-	<0.01	-	**0.27**	<0.01	-	-	<0.01	**0.18**	<0.01	**0.97**	-	-	<0.01	-	0.09	0.03	<0.01	-	-	-	-	-	**1.62**
MO-24791	M-2E	WS	Unfiltered	0.03	0.04	<0.01	-	<0.01	-	-	<0.01	-	0.28	0.04	-	<0.01	-	0.17	<0.01	-	-	-	<0.01	-	0.10	0.04	<0.01	-	-	-	-	-	0.72
MO-24792	TS-1C	WS	Filtered	0.04	-	0.01	-	<0.01	-	<0.01	<0.01	0.01	0.03	0.08	-	0.09	<0.01	0.07	<0.01	<0.01	-	-	<0.01	0.37	0.03	-	<0.01	-	-	-	-	-	0.76
MO-24792	TS-1C	WS	Unfiltered	**1.03**	-	0.05	0.05	<0.01	0.07	0.02	0.02	<0.01	**0.10**	**3.44**	**2.24**	**0.33**	-	0.08	0.02	-	-	<0.01	<0.01	**0.30**	**0.40**	**1.00**	0.02	<0.01	-	-	-	-	**9.18**
MO-24793	TS-2E	WS	Filtered	0.01	-	0.02	-	<0.01	-	<0.01	<0.01	-	0.14	0.05	0.04	0.17	<0.01	0.20	0.01	-	-	-	<0.01	<0.01	-	0.11	0.11	<0.01	-	-	-	-	-	0.88
MO-24793	TS-2E	WS	Unfiltered	0.06	-	0.02	-	<0.01	<0.01	<0.01	<0.01	-	**0.14**	**0.10**	**0.11**	**0.17**	-	**0.20**	0.01	-	-	-	<0.01	<0.01	-	**0.11**	**0.12**	<0.01	<0.01	-	-	-	-	**1.09**
MO-24794	TS-1E	WS	Unfiltered	0.03	-	0.02	<0.01	-	-	-	<0.01	-	0.15	0.06	0.08	0.02	-	-	<0.01	-	-	-	-	-	-	0.09	<0.01	-	-	-	-	-	0.45
MO-24795	TS-2C	WS	Unfiltered	0.02	-	0.02	<0.01	-	0.03	<0.01	0.02	<0.01	0.20	0.04	0.11	0.08	-	-	0.01	-	-	0.03	-	-	-	0.07	<0.01	-	-	-	-	-	0.64
Mortandad at Rio Grande (A-11)	none	WS	Filtered	<0.01	-	<0.01	-	0.08	<0.01	0.02	0.02	-	**0.51**	<0.01	0.04	<0.01	<0.01	0.01	<0.01	-	-	-	<0.01	-	0.07	**0.22**	<0.01	-	-	-	-	-	1.00

Notes: All values in ug/L. Ratios in bold and gray shading show where the SOFnc>1 and the ratio is >0.1.

[a] EPA Region 6 screening value (EPA 2005, 91002).

[b] EPA Region 9 screening value (epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf).

Table 8.2-5
Identifying Surface Water COPCs, Carcinogens

Location ID	Reach	Media Code	Field Preparation	Arsenic	Chromium[a]	Aroclor-1260	SOFca
Tap Water Screening Level[b]				**0.44**	**1100**	**0.33**	
MO-24786	east of E-1FW	WS	Filtered	**17.6**	0.03	-	**17.7**
MO-24786	east of E-1FW	WS	Unfiltered	**17.2**	0.04	-	**17.2**
MO-24787	E-1W	WS	Filtered	-	<0.01	-	-
MO-24787	E-1W	WS	Unfiltered	**14.9**	<0.01	-	**14.9**
MO-24788	E-1E	WS	Filtered	-	<0.01	-	-
MO-24788	E-1E	WS	Unfiltered	-	<0.01	-	-
MO-24789	M-1W	WS	Filtered	-	<0.01	-	-
MO-24789	M-1W	WS	Unfiltered	**14.7**	0.03	-	**14.7**
MO-24790	M-1E	WS	Filtered	-	<0.01	-	-
MO-24790	M-1E	WS	Unfiltered	-	<0.01	-	-
Mortandad at GS-1	M-2W	WS	Filtered	**5.43**	<0.01	-	**5.4**
Mortandad at GS-1	M-2W	WS	Unfiltered	**5.86**	<0.01	-	**5.9**
Mortandad below Effluent Canyon	M-2W	WS	Filtered	-	<0.01	-	-
Mortandad below Effluent Canyon	M-2W	WS	Unfiltered	-	<0.01	-	-
MO-24791	M-2E	WS	Filtered	-	-	-	-
MO-24791	M-2E	WS	Unfiltered	-	<0.01	-	-
MO-24792	TS-1C	WS	Filtered	-	<0.01	-	-
MO-24792	TS-1C	WS	Unfiltered	**17.0**	<0.01	**3.31**	**20.3**
MO-24793	TS-2E	WS	Filtered	-	0.02	-	0.0
MO-24793	TS-2E	WS	Unfiltered	-	<0.01	-	-
MO-24794	TS-1E	WS	Unfiltered	-	<0.01	-	-
MO-24795	TS-2C	WS	Unfiltered	-	-	-	-
MO-24808	M-2W	WS	Unfiltered	-	<0.01	-	-
Mortandad at Rio Grande (A-11)	none	WS	Filtered	-	-	-	-

Notes: All values in ug/L. Ratios in bold and gray shading show where the SOFca>1 and the ratio is >0.1.

[a] Used hexavalent chromium screening value.

[b] EPA Region 6 screening value (EPA 2005, 91002).

Table 8.2-6
Identifying Surface Water COPCs, Radionuclides

Location ID	Reach	Media code	Field Preparation	Americium-241	Cesium-137	Plutonium-238	Plutonium-239	Plutonium-239/240[a]	Potassium-40	Radium-226	Sodium-22	Strontium-90	Technetium-99	Thorium-228	Thorium-230	Thorium-232	Tritium	Uranium-234	Uranium-235	Uranium-235/236[b]	Uranium-238	SOFrad
Tap Water Screening Level [c]				**1.2**	**120**	**1.6**	**1.2**	**1.2**	**280**	**4**	**400**	**40**	**4000**	**16**	**12**	**2**	**80000**	**20**	**24**	**24**	**24**	
MO-24786	east of E-1FW	WS	Unfiltered	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01	<0.01	-	-	<0.01	0.03
MO-24786	east of E-1FW	WS	Filtered	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	<0.01	0.01
MO-24787	E-1W	WS	Unfiltered	-	-	-	-	-	-	0.19	-	0.01	-	-	-	-	<0.01	<0.01	-	-	<0.01	0.23
MO-24787	E-1W	WS	Filtered	-	-	-	<0.01	-	-	-	-	0.01	-	-	-	-	-	<0.01	-	-	<0.01	0.02
MO-24788	E-1E	WS	Unfiltered	**7.2**	**0.30**	**1.97**	**1.78**	**4.04**	**0.23**	-	-	0.10	-	-	-	-	0.014	0.03	-	-	<0.01	**15.7**
MO-24788	E-1E	WS	Filtered	**3.39**	**0.19**	**0.94**	<0.01	**2.13**	-	**0.10**	-	**0.11**	-	-	-	-	-	0.02	-	-	0.02	**6.90**
MO-24789	M-1W	WS	Unfiltered	-	-	0.08	0.07	-	-	0.11	-	0.01	-	-	-	-	<0.01	0.02	-	-	0.02	0.31
MO-24789	M-1W	WS	Filtered	-	-	-	<0.01	-	-	0.36	-	-	-	-	-	-	-	<0.01	-	-	<0.01	0.38
MO-24790	M-1E	WS	Unfiltered	-	-	-	-	-	-	-	-	0.01	-	-	-	-	<0.01	<0.01	-	-	<0.01	0.02
MO-24790	M-1E	WS	Filtered	-	-	-	<0.01	-	-	0.09	-	0.02	-	-	-	-	-	<0.01	-	-	<0.01	0.12
MO-24808	M-2W	WS	Unfiltered	**1.57**	-	**0.47**	**0.68**	-	-	-	-	-	-	-	-	-	-	0.02	-	-	<0.01	**2.74**
Mortandad at GS-1	M-2W	WS	Unfiltered	**5.45**	**0.26**	**3.13**	-	**5.63**	-	-	0.02	**1.19**	-	-	-	-	**0.658**	**0.17**	-	<0.01	0.05	**16.6**
Mortandad at GS-1	M-2W	WS	Filtered	**0.5**	-	**0.94**	-	**0.68**	-	-	-	**1.13**	-	-	-	-	-	**0.18**	-	<0.01	0.05	**3.48**
Mortandad below Effluent Canyon	M-2W	WS	Unfiltered	**12.5**	**0.36**	**4.22**	-	**3.94**	-	**0.18**	0.03	**0.29**	-	<0.01	<0.01	0.05	**0.161**	**0.15**	-	<0.01	0.01	**21.9**
Mortandad below Effluent Canyon	M-2W	WS	Filtered	**1.35**	0.08	**0.28**	-	**0.63**	-	**0.15**	-	0.08	-	-	-	-	-	<0.01	-	-	<0.01	**2.57**
MO-24791	M-2E	WS	Unfiltered	**0.82**	0.05	**0.18**	-	**0.42**	-	-	-	**1.10**	<0.01	-	-	-	<0.01	0.03	-	-	<0.01	**2.60**
MO-24791	M-2E	WS	Filtered	**0.53**	-	**0.13**	<0.01	**0.33**	-	-	-	**1.04**	-	-	-	-	-	0.03	-	-	<0.01	**2.06**
MO-24792	TS-1C	WS	Unfiltered	**0.17**	-	**1.12**	**0.66**	**0.32**	-	-	-	**0.17**	-	-	-	-	<0.01	0.01	-	-	<0.01	**2.45**
MO-24792	TS-1C	WS	Filtered	0.03	-	0.14	-	0.06	-	-	-	0.23	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	-	<0.01	0.47
MO-24793	TS-2E	WS	Unfiltered	-	-	0.04	-	-	-	-	-	0.53	-	-	-	-	<0.01	0.01	-	-	0.01	0.60
MO-24793	TS-2E	WS	Filtered	-	-	-	<0.01	-	-	-	-	0.48	-	-	-	-	-	0.01	-	-	0.01	0.50
MO-24794	TS-1E	WS	Unfiltered	-	-	0.08	-	-	-	-	-	-	-	-	-	-	-	0.01	-	-	0.01	0.10
MO-24795	TS-2C	WS	Unfiltered	-	-	0.04	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	<0.01	0.05
Mortandad at Rio Grande (A-11)	none	WS	Unfiltered	0.03	-	-	-	-	-	0.34	-	<0.01	-	-	-	-	<0.01	0.02	-	-	<0.01	0.40
Rio Grande at Mortandad	none	WS	Unfiltered	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	<0.01
Rio Grande at Mortandad	none	WS	Filtered	-	-	-	-	-	-	-	-	<0.01	-	-	<0.01	-	-	0.03	-	-	0.01	0.06

Note: Ratios in bold and gray shading show where the SOFrad>1 and the ratio is >0.1.

[a] Plutonium-239 DCG.

[b] Uranium-235 DCG.

[c] DCG (Derived Concentration Guide) based on committed effective dose equivalent of 4 mrem/yr, all values in pCi/L.

Table 8.2-7
Reaches Evaluated for Water, Sedment, and Multimedia Exposure

Endpoint	Reach	Water	Sediment	Multimedia
Carcinogen	M-1W	x	x	yes
	M-1E		x	
	E-1FW	x	x	yes
	E-1W	x	x	yes
	E-1E		x	
	M-2W	x	x	
	M-3		x	
	TS-1W		x	
	TS-1C	x	x	yes
	TS-1E		x	
	TS-2E		x	
	M-4		x	
Non-carcinogen	M-1W	x		
	M-1E	x	x	yes
	E-1FW	x	x	yes
	E-1W	x	x	yes
	E-1E	x	x	yes
	M-2W	x	x	yes
	M-2E	x		
	TS-1W		x	
	TS-1C	x	x	yes
	TS-2E	x	x	yes
Radionuclide	E-1W		x	
	E-1E	x	x	yes
	M-2W	x	x	yes
	M-2E	x	x	yes
	M-3		x	
	TS-1W		x	
	TS-1C	x	x	yes
	TS-1E		x	
	TS-2W		x	
	TS-2C		x	
	TS-2E		x	
	M-4		x	

Appendix A

Acronyms and Abbreviations,
Glossary, and Metric Conversion Table

A-1.0 ABBREVIATIONS AND ACRONYMS

AHF	Advanced Hydrotest Facility
AOC	area of concern
asl	above sea level
bgs	below ground surface
BV	background value
bw	body weight
CME	corrective measures evaluation
CMR	Chemistry and Metallurgy Research
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CRDL	contract-required detection limit
DC	direct current
DCF	dose conversion factor
DCG	Derived Concentration Guidelines
DEM	digital elevation model
DDT	dichlorodiphenyltrichloroethane
DOE	U.S. Department of Energy
EEU	environmental exposure unit
EQL	estimated quantitation limit
ER	Environmental Restoration Project
ERDB	Environmental Restoration Database
ESL	ecological screening level
ESP	Environmental Surveillance Program
FFCA/AO	Federal Facility Compliance Agreement/Administrative Order
fw	food weight
HFM	hydrostratigraphic framework model
HHMSSL	Human Health Medium Specific Screening Level [EPA Region 6]
HI	hazard index
HQ	hazard quotient
IA	interim action
ICPES	inductively coupled plasma emission spectroscopy
ICR	incremental cancer risk
I.D.	inside diameter
IDL	instrument detection limit
LANL	Los Alamos National Laboratory
LCS	laboratory control samples
LOAEL	lowest observed adverse effect level

Ma	million years ago
MCL	maximum contaminant level
MDC	minimum detectable concentration
MDL	method detection level
mrem/yr	millirem per year
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMHWA	New Mexico Hazardous Waste Act
NMSA	New Mexico Statutes Annotated
NMSWA	New Mexico Solid Waste Act
NMWQCC	New Mexico Water Quality Control Commission
NOAEL	no observed adverse effect level
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
O.D.	outside diameter
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRB	permeable reactive barrier
PQL	practical quantitation limit
PVC	polyvinyl chloride
RCRA	Resource and Conservation Recovery Act
RfD	reference dose
RFI	RCRA facility investigation
RLWTF	Radioactive Liquid Waste Treatment Facility
RME	reasonable maximum exposure
RPD	relative percent difference
RRES	Risk Reduction and Environmental Stewardship
RSI	request for supplemental information
SAL	screening action level
SCI	Stream Condition Index
SF	slope factor
SOF	sum of fractions
SOP	standard operating procedure
SOW	statement of work
SSL	soil screening level
SR	State Road
SVOC	semivolatile organic compound
SWMU	solid waste management unit

TA	technical area
T&E	threatened and endangered
TPU	total propagated uncertainty
TRV	toxicity reference value
UCL	upper confidence level
USGS	U.S. Geological Survey
VOC	volatile organic compound
WOE	weight of evidence
WQC	water quality criteria
WQDD	Water Quality Database
wSAL	water screening action level
WWTP	wastewater treatment plant

A-2.0 GLOSSARY

administrative authority—For Los Alamos National Laboratory, one or more regulatory agencies, such as the New Mexico Environment Department, the U.S. Environmental Protection Agency, or the U.S. Department of Energy, as appropriate.

adsorption—The surface retention of solid, liquid, or gas molecules, atoms, or ions by a solid.

aggregate—At the Los Alamos National Laboratory, an area within a *watershed* containing solid waste management units (SWMUs) and/or areas of concern (AOCs), and the media affected or potentially affected by releases from those SWMUs and/or AOCs. Aggregates are designated to promote efficient and effective corrective action activities.

alkalinity—In water analysis, the presence of carbonates, bicarbonates, and/or hydroxides, and occasionally borates, chlorates, silicates, or phosphates.

alluvial—Pertaining to geologic deposits or features formed by running water.

alluvial fan—A fan-shaped piedmont accumulation of alluvium.

alluvium—Soil deposited by a river or other running water.

aquifer—An underground geological formation (or group of formations) containing water that is the source of groundwater for wells and springs.

aquitard—Geological formation that may contain groundwater but is not capable of transmitting significant quantities of it under normal hydraulic gradients.

area of concern—(1) A release that may warrant investigation or remediation and is not a solid waste management unit (SWMU). (2) An area at Los Alamos National Laboratory that may have had a release of a hazardous waste or a hazardous constituent but is not a SWMU.

artificial fill—A material that has been imported and typically consists of disturbed *soils* mixed with crushed Bandelier Tuff or other rock types.

ash-flow tuff—A tuff deposited by a hot, dense volcanic current. Ash-flow tuff can be either welded tuff or nonwelded tuff.

assessment—(1) The act of reviewing, inspecting, testing, checking, conducting surveillance, auditing, or otherwise determining and documenting whether items, processes, or services meet specified

requirements. (2) An evaluation process used to measure the performance or effectiveness of a system and its elements. In this glossary, assessment is an all-inclusive term used to denote any one of the following: audit, performance evaluation, management system review, peer review, inspection, or surveillance.

assessment endpoint—In an ecological risk assessment, the expression of an environmental value to be protected (e.g., fish biomass or reproduction of avian populations).

background concentration—Naturally occurring concentrations of an inorganic chemical or radionuclide in soil, sediment, or tuff.

background data—Data that represent naturally occurring concentrations of inorganic and radionuclide constituents in a geologic medium. Los Alamos National Laboratory's (the Laboratory's) background data are derived from samples collected at locations that are either within, or adjacent to, the Laboratory. These locations (1) are representative of geological media found within Laboratory boundaries, and (2) have not been affected by Laboratory operations.

background level—(1) The concentration of a substance in an environmental medium (air, water, or soil) that occurs naturally or is not the result of human activities. (2) In exposure assessment, the concentration of a substance in a defined control area over a fixed period of time before, during, or after a data-gathering operation.

background sample—A sample collected from an area or site that is similar to the one being studied but known, or thought, to be free from constituents of concern.

background value (BV)—A statistically derived concentration (i.e., the upper tolerance limit [UTL]) of a chemical used to represent the background data set. If a UTL cannot be derived, either the detection limit or maximum reported value in the background data set is used.

barrier—Any material or structure that prevents, or substantially delays, the movement of solid-, liquid-, or gaseous-phase chemicals in environmental media.

basalt—A fine-grained, dark volcanic rock composed chiefly of plagioclase, augite, olivine, and magnetite.

baseline risk assessment—A site-specific analysis of the potential adverse effects of hazardous constituents that have been released from a site in the absence of any controls or mitigating actions. A baseline risk assessment consists of the following four steps: data collection and analysis, exposure assessment, toxicity assessment, and risk characterization.

beta radiation—High-energy electrons emitted by certain types of radioactive nuclei, such as potassium-40. The beta particles emitted are a form of ionizing radiation also known as beta rays.

borehole—(1) A hole drilled or bored into the ground, usually for exploratory or economic purposes. (2) A hole into which casing, screen, and other materials may be installed to construct a well.

borehole logging—The process of making remote measurements of physical, chemical, or other parameters at multiple depths in a borehole.

canyon—A stream-cut chasm or gorge, the sides of which are composed of cliffs or a series of cliffs rising from the chasm's bed. Canyons are characteristic of arid or semiarid regions where downcutting by streams greatly exceeds weathering.

chain of custody—An unbroken, documented trail of accountability that is designed to ensure the uncompromised physical integrity of samples, data, and records.

chemical—Any naturally occurring or human-made substance characterized by a definite molecular composition.

chemical analysis—A process used to measure one or more attributes of a sample in a clearly defined, controlled, and systematic manner. Chemical analysis often requires treating a sample chemically or physically before measurement.

chemical of potential concern (COPC)—A detected chemical compound or element that has the potential to adversely affect human receptors as a result of its concentration, distribution, and toxicity.

chemical of potential ecological concern (COPEC)—A detected chemical compound or element that has the potential to adversely affect ecological receptors as a result of its concentration, distribution, and toxicity.

collocated sample—One of two or more samples collected within close proximity of each other and meant to represent the same immediate area.

colluvium—A loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope.

community—In ecology, an assemblage of populations of different species within a specified location in space and time. Sometimes, a particular subgrouping may be specified, such as the fish community in a lake or the soil arthropod community in a forest.

Compliance Order on Consent (Consent Order)—For the Environmental Remediation and Surveillance Program, an enforcement document signed by the New Mexico Environment Department, the U.S. Department of Energy, and the Regents of the University of California on March 1, 2005, which prescribes the requirements for corrective action at Los Alamos National Laboratory. The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, the facility; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, the facility; and (3) to implement such corrective measures. The Consent Order supersedes the corrective action requirements previously specified in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

confined—Pertaining to groundwater in an artesian aquifer.

confluence—A place where two or more streams or canyons meet; the point where a tributary meets the main stream.

Consent Order—See Compliance Order on Consent.

contaminant—(1) Chemicals and radionuclides present in environmental media or on debris above background levels. (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any hazardous waste listed or identified as characteristic in 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]); any hazardous constituent listed in 40 CFR 261 Appendix VIII (incorporated by 20.4.1.200 NMAC) or 40 CFR 264 Appendix IX (incorporated by 20.4.1.500 NMAC); any groundwater contaminant listed in the Water Quality Control Commission (WQCC) Regulations at 20.6.3.3103 NMAC; any toxic pollutant listed in the WQCC Regulations at 20.6.2.7 NMAC; explosive compounds; nitrate; and perchlorate. (Note: Under the Consent Order, the term "contaminant" does not include radionuclides or the radioactive portion of mixed waste.)

corrective measure evaluation—An evaluation of potential remedial alternatives undertaken to identify a preferred remedy that will be protective of human health and the environment and that will attain appropriate cleanup goals.

curie—A unit of radioactivity defined as the quantity of any radioactive nuclide that has an activity of 3.7×10^{10} disintegrations per second (dps).

data package—The hard copy deliverable for each sample delivery group produced by a contract analytical laboratory in accordance with the statement of work for analytical services.

data-quality objectives—Qualitative and quantitative statements of the overall level of uncertainty that a decision maker will accept regarding results or decisions based on environmental data. The objectives provide the statistical framework for planning and managing environmental data operations that will meet user needs.

data validation—A systematic process that applies a defined set of performance-based criteria to a body of data and that may result in the qualification of the data. The data-validation process is performed independently of the analytical laboratory that generates the data set and occurs before conclusions are drawn from the data. The process may include a standardized data review (routine data validation) and/or a problem-specific data review (focused data validation).

detect (detection)—An analytical result, as reported by an analytical laboratory, that denotes a chemical or radionuclide to be present in a sample at a given concentration.

detection limit—The minimum concentration that can be determined by a single measurement of an instrument. A detection limit implies a specified statistical confidence that the analytical concentration is greater than zero.

discharge—The accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of hazardous waste into, or on, any land or water.

disposal—The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into, or on, any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

dissolved oxygen—The amount of oxygen dissolved in water, in parts per million (ppm) by weight or in milligrams per liter (mg/L) by volume.

dose (dosage)—(1) The actual quantity of a chemical that is administered to an organism or to which it is exposed. (2) The amount of a substance that reaches a specific tissue (e.g., the liver). (3) The amount of a substance that is available for interaction with metabolic processes after it has crossed an organism's outer boundary.

drill bit—The cutting tool attached to the bottom of a drill stem.

drilling fluid—The fluid used to lubricate a bit and to convey drill cuttings to the surface with rotary drilling equipment. Usually composed of bentonite slurry or muddy water. The fluid can become contaminated, lead to cross-contamination, and may require special disposal.

drilling string—The string of pipe (extending from the bit to the driving mechanism) that serves to carry mud down a borehole and to rotate a bit.

drill rod (drill pipe)—Special pipe used to transmit rotation and energy from the drill rig to the bit. This conduit conveys circulation fluids such as air, water, or other mixtures to cool the bit and evacuate the borehole cuttings.

ecological screening levels—Soil, sediment, or water concentrations that are used to screen for potential ecological effects. The concentrations are based on a chemical's no-observed-adverse-effect level for a receptor, below which no risk is indicated.

effluent—Wastewater (treated or untreated) that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters

estimated quantitation limit (EQL)—The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine analytical-laboratory operating conditions.

The low point on a calibration curve should reflect this quantitation limit. The EQL is not used to establish detection status. Sample EQLs are highly matrix dependent, and the specified EQLs might not always be achievable.

evapotranspiration—(1) The discharge of water from the earth's surface to the atmosphere by evaporation from lakes, streams, and soil surfaces and by transpiration from plants. (2) The loss of water from the soil by evaporation and/or by transpiration from the plants growing in the soil.

exposure pathway—Any path from the sources of contaminants to humans and other species or settings through air, soil, water, or food.

facility—All contiguous land (and structures, other appurtenances, and improvements on the land) used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units. For the purpose of implementing a corrective action, a facility is all the contiguous property that is under the control of the owner or operator seeking a permit under Subtitle C of the Resource Conservation and Recovery Act.

fallout radionuclides—Radionuclides that are present at globally elevated levels in the environment as a result of fallout from world-wide atomic weapons tests. The Los Alamos National Laboratory (the Laboratory) background data sets consist of environmental surveillance samples taken from marginal and regional locations for the following radionuclides associated with fallout: tritium, cesium-137, americium-241, plutonium-238, plutonium-239/240, and strontium-90. Samples were collected from regional and marginal locations in the Laboratory's vicinity that were (1) representative of geological media found within Laboratory boundaries, and (2) were not impacted by Laboratory operations.

fallout value—The concentration of fallout radionuclides in surface soil (0-6 in.) that represent deposition from atmospheric fallout (resulting from world-wide atomic weapons tests) and are unrelated to Laboratory activities.

fault—A fracture, or zone of fractures, in rock along which vertical or horizontal movement has taken place and adjacent rock layers or bodies have been displaced.

field duplicate (replicate) samples—Two separate, independent samples taken from the same source, which are collected as collocated samples (i.e., equally representative of a sample matrix at a given location and time).

field matrix spike—A known amount of a field sample to which a known amount of a target analyte has been added and used to compute the proportion of the added analyte that is recovered upon analysis.

filter pack—Sand, gravel, or glass beads that are uniform, clean, and well rounded and are placed in the annulus of a well, between the borehole wall and the well intake, to stabilize the formation and to prevent foreign material from entering through the well intake.

floodplain—The flat, or nearly flat, land along a river or stream, or in a tidal area, that is covered by water during a flood.

gamma radiation—A form of electromagnetic, high-energy ionizing radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays (though at higher energy) and require heavy shielding, such as concrete or steel, to be blocked.

gravimetric moisture content—See water content.

groundwater—Interstitial water that occurs in saturated earth material and is capable of entering a well in sufficient amounts to be used as a water supply.

grout—Cement or bentonite mixtures used for sealing boreholes and wells and for zone isolation. Only Portland Type I or II cement is approved for use at investigative sites.

half-life—(1) The time required for a pollutant to lose one-half of its original concentration (for example, the biochemical half-life of DDT [dichlorodiphenyltrichloroethane] in the environment is 15 yr). (2) The time required for one half of the atoms in a radioactive element to undergo self-transmutation or decay (the half-life of radium is 1620 yr). (3) The time required for the elimination of one half of a total dose from the body.

hazard index—The sum of hazard quotients for multiple contaminants to which a receptor may have been exposed.

hazard quotient (HQ)—The ratio of the estimated site-specific exposure concentration of a single chemical from a site to the estimated daily exposure level at which no adverse health effects are likely to occur.

hydraulic conductivity—(1) A coefficient of proportionality that describes the rate at which a fluid can move through a permeable medium. The rate is a function of both the medium and the fluid flowing through it. (2) The quantity of water that will flow through a unit of cross-sectional area of a porous material per unit time under a hydraulic gradient of 1.00 (measured at right angles to the direction of flow) at a specified temperature.

hydraulic gradient—The rate of change in hydraulic head per unit of distance in the direction of groundwater flow.

hydrogen-ion activity (pH)—The effective concentration (activity) of dissociated hydrogen ions (H+); a measure of the acidity or alkalinity of a solution that is numerically equal to 7 for neutral solutions, increases with alkalinity, and decreases as acidity increases.

hydrogeology—The science dealing with the occurrence of surface water and groundwater, their uses, and their functions in modifying the earth, primarily by erosion and deposition.

infiltration—(1) The penetration of water through the ground surface into subsurface soil. (2) The technique of applying large volumes of wastewater to land to penetrate the surface and percolate through the underlying soil.

instrument detection limit (IDL)—A measure of instrument sensitivity without any consideration for contributions to the signal from reagents. The IDL is calculated as follows: Three times the average of the standard deviations obtained on three nonconsecutive days from the analysis of a standard solution, with seven consecutive measurements of that solution per day. The standard solution must be prepared at a concentration of three to five times the instrument manufacturer's estimated IDL.

interim measure—An action that can be implemented to minimize or prevent the migration of contaminants and to minimize or prevent actual or potential human or ecological exposure to contaminants, while long-term final corrective action remedies are evaluated and, if necessary, implemented.

intermittent stream—A stream that flows only in certain reaches as a result of the channel bed's losing and gaining characteristics.

Investigation-derived waste—Solid waste or hazardous waste that was generated as a result of corrective action investigation or remediation field activities. investigation-derived waste may include drilling muds, cuttings, and purge water from the installation of test pits or wells; purge water, soil, and other materials from the collection of samples; residues from the testing of treatment technologies and pump-and-treat systems; contaminated personal protective equipment; and solutions (aqueous or otherwise) used to decontaminate nondisposable protective clothing and equipment.

matrix—Relatively fine material in which coarser fragments or crystals are embedded; also called "ground mass" in the case of igneous rocks.

migration—The movement of inorganic and organic chemical species through unsaturated or saturated materials.

migration pathway—A route (e.g., a stream or subsurface flow path) for the potential movement of contaminants to environmental receptors (plants, humans, or other animals).

monitoring well—(1) A well used to obtain water-quality samples or to measure groundwater levels, (2) A well drilled at a hazardous waste management facility or Superfund site to collect groundwater samples for the purpose of physical, chemical, or biological analysis and to determine the amounts, types, and distribution of contaminants in the groundwater beneath the site.

National Pollutant Discharge Elimination System—The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits to discharge wastewater or storm water, and for imposing and enforcing pretreatment requirements under the Clean Water Act.

nondetect—A result that is less than the method detection limit.

operable units (OUs)—At Los Alamos National Laboratory, 24 areas originally established for administering the Environmental Remediation and Surveillance Program. Set up as groups of potential release sites, the OUs were aggregated according to geographic proximity for the purposes of planning and conducting Resource Conservation and Recovery Act (RCRA) facility assessments and RCRA facility investigations. As the project matured, it became apparent that there were too many areas to allow efficient communication and to ensure consistency in approach. In 1994, the 24 OUs were reduced to 6 administrative field units.

outfall—A place where effluent is discharged into receiving waters.

perched water—A zone of unpressurized water held above the water table by impermeable rock or sediment.

percolation—Gravity flow of soil water through the pore spaces in soil or rock below the ground surface.

perennial stream—Water in a channel or bed that flows continuously throughout the year.

piezometer—A nonpumping well (generally of small diameter) for measuring the elevation of a water table.

piezometric surface (potentiometric surface)—The surface that represents the static head in an aquifer; applies to both confined and unconfined aquifers.

polychlorinated biphenyls (PCBs)—Any chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees, or any combination that contains such substances. PCBs are colorless, odorless compounds that are chemically, electrically, and thermally stable and have proven to be toxic to both humans and other animals.

porosity—The degree to which soil, gravel, sediment, or rock is permeated with pores or cavities through which water or air can move.

quality procedure—A document that describes the process, method, and responsibilities for performing, controlling, and documenting any quality-affecting activity governed by a quality management plan.

Quaternary—The second period of the Cenozoic Era, following the Tertiary, and including the last two to three million years of earth history.

radiation—A stream of particles or electromagnetic waves emitted by atoms and molecules of a radioactive substance as a result of nuclear decay. The particles or waves emitted can consist of neutrons, positrons, alpha particles, beta particles, or gamma radiation.

radioactive material—For purposes of complying with U.S. Department of Transportation regulations, any material having a specific activity (activity per unit mass of the material) greater than 2 nanocuries per gram (nCi/g) and in which the radioactivity is evenly distributed.

radioactivity (radioactive decay; radioactive disintegration)—The spontaneous change in an atom by the emission of charged particles and/or gamma rays.

radionuclide—Radioactive particle (human-made or natural) with a distinct atomic weight number.

reach—A specific length of a canyon that is treated as a single unit for sampling and analysis. Reaches tend to be internally uniform with respect to geomorphic setting and land use.

recreational scenario—A land-use condition under which individuals may be exposed to contaminants for a limited amount of time as a result of outdoor activities such as hiking, camping, hunting, or fishing.

regional aquifer—Geologic material(s) or unit(s) of regional extent whose saturated portion yields significant quantities of water to wells, contains the regional zone of saturation, and is characterized by the regional water table or potentiometric surface.

residential scenario—The land use condition under which individuals may be exposed to contaminants as a result of living on or near contaminated sites.

Resource Conservation and Recovery Act—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Public Law [PL] 94-580, as amended by PL 95-609 and PL 96-482, United States Code 6901 et seq.).

retardation—An act or process that reduces the rate of movement of a chemical substance in water relative to the average velocity of the water. The movement of chemical substances in water can be retarded by adsorption and precipitation reactions, and by diffusion into pore water in a given sedimentary or rock matrix.

risk—A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

risk assessment—See baseline risk assessment.

runoff—The portion of the precipitation on a drainage area that is discharged from the area.

screening action level (SAL)—A radionuclide's medium-specific concentration level; it is calculated by using conservative criteria below which it is generally assumed that no potential exists for a dose that is unacceptable to human health. The derivation of a SAL is based on conservative exposure and on land-use assumptions. However, if an applicable regulatory standard exists that is less than the value derived, it is used in place of the SAL.

sediment—(1) A mass of fragmented inorganic solid that comes from the weathering of rock and is carried or dropped by air, water, gravity, or ice. (2) A mass that is accumulated by any other natural agent and that forms in layers on the earth's surface (e.g., sand, gravel, silt, mud, fill, or loess). (3) A solid material that is not in solution and is either distributed through the liquid or has settled out of the liquid.

site conceptual model—A qualitative or quantitative description of sources of contamination, environmental transport pathways for contamination, and receptors that may be impacted by contamination and whose relationships describe qualitatively or quantitatively the release of contamination from the sources, the movement of contamination along the pathways to the exposure points, and the uptake of contaminants by the receptors.

soil—(1) A material that overlies bedrock and has been subject to soil-forming processes. (2) A sample media group that includes naturally occurring and artificial fill materials.

soil moisture—The water contained in the pore space of the unsaturated zone.

soil screening level (SSL)—The concentration of a chemical (inorganic or organic) below which no potential for unacceptable risk to human health exists. The derivation of an SSL is based on conservative exposure and land-use assumptions, and on target levels of either a hazard quotient of 1.0 for a noncarcinogenic chemical or a cancer risk of 10^{-5} for a carcinogenic chemical.

solid waste management unit (SWMU)—(1) Any discernible site at which solid wastes have been placed at any time, whether or not the site use was intended to be the management of solid or hazardous waste. SWMUs include any site at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated sites (i.e., landfills, surface impoundments, waste piles, and land treatment sites), but does not include passive leakage or one-time spills from production areas and sites in which wastes have not been managed (e.g., product storage areas). (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any discernible site at which solid waste has been placed at any time, and from which the New Mexico Environment Department determines there may be a risk of a release of hazardous waste or hazardous waste constituents (hazardous constituents), whether or not the site use was intended to be the management of solid or hazardous waste. Such sites include any area in Los Alamos National Laboratory at which solid wastes have been routinely and systematically released; they do not include one-time spills.

spring—Groundwater seeping out of the earth where the water table intersects the ground surface.

stratigraphy—The study of the formation, composition, and sequence of sediments, whether consolidated or not.

technical area (TA)—At Los Alamos National Laboratory, an administrative unit of operational organization (e.g., TA-21).

topography—The physical or natural features of an object or entity and their structural relationships.

tuff—Consolidated volcanic ash, composed largely of fragments produced by volcanic eruptions.

turbidity (nephelometric)—A measure of the intensity of light scattered by sample particulates relative to a standard reference suspension. The range of water turbidity is measured between 0 and 40 nephelometric turbidity units (NTU).

unconfined aquifer—An aquifer containing water that is not under pressure; the water level in a well is the same as the water table outside the well.

unsaturated zone—The area above the water table where soil pores are not fully saturated, although some water may be present.

vadose zone—The zone between the land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. Soil pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone.

water balance—The relationship between water input (precipitation) and water output (runoff, evapotranspiration, and recharge) in a hydrological system.

water content—The amount of water in an unsaturated medium, expressed as the ratio of the weight of water in a sample to the weight of the oven-dried sample (often expressed as a percentage).

watershed—A region or basin drained by, or contributing waters to, a river, stream, lake, or other body of water and separated from adjacent drainage areas by a divide, such as a mesa, ridge, or other geologic feature.

water table—The top of the regional saturated zone; the piezometric surface associated with an unconfined aquifer.

welded tuff—A volcanic deposit hardened by the action of heat, pressures from overlying material, and hot gases.

well casing—A solid piece of pipe, typically steel or polyvinyl chloride (PVC) plastic, used to keep a well open in either unconsolidated materials or unstable rock and as a means to contain zone-isolation materials such as cement grout or bentonite.

well screen—A perforated wire-wrapped casing that allows fluids, but not solid material, to enter a well.

A-3.0 METRIC UNITS TO U.S. CUSTOMARY CONVERSIONS

Multiply SI (Metric) Unit	by	To Obtain US Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

Appendix B

Field Investigation Methods and Results

B-1.0 SEDIMENT INVESTIGATIONS IN REACHES

This appendix summarizes results from field investigations of potentially contaminated sediment deposits in reaches within the Mortandad watershed that were conducted from 1998 to 2005 as part of implementation of the "Work Plan for Mortandad Canyon" (LANL 1997, 56835; LANL 1999, 62777).

Geomorphic mapping at a scale of 1:200 occurred in each reach and focused on delineating geomorphic units with differences in physical characteristics and/or contaminant levels. These maps are presented in Plates 2 to 4. Unit designations followed those used in previous reports on canyons in and near the Los Alamos National Laboratory (LANL) (e.g., LANL 2004, 87390), with "c" designating post-1942 channel units and "f" designating post-1942 floodplain units. Summaries of the physical characteristics of post-1942 geomorphic units in the Mortandad investigation reaches are presented in Table B-1.0-1.

Sediment-thickness measurements distinguished between fine facies sediment, with typical median particle size of silt to fine sand (0.015 to 0.25 mm) in the less than 2-mm fraction, and coarse facies sediment, with typical median particle size of coarse to very coarse sand (0.5 to 2 mm) in the less than 2-mm fraction. Samples with median particle size of medium sand (0.25 to 0.5 mm) were classified either as fine or coarse facies, depending on the stratigraphic context and the particle size of adjacent layers. Coarse facies sediment is characteristic of material transported along the streambeds as bed load, and fine facies sediment is characteristic of material transported in suspension (Malmon 2002, 76038, pp . 94–97; Malmon et al. 2004, 93018). Several methods were used to identify the bottom of post-1942 sediment deposits, including determining the depth of buried trees and associated buried soils and noting the presence or absence of materials imported to the watershed after 1942 (e.g., quartzite gravel, plastic). Analytical data from sediment samples were also used to help identify the bottom of post-1942 sediment deposits, as discussed below. Sediment-thickness measurements from the Mortandad investigation reaches are shown in Table B-1.0-2.

Average facies thickness in each unit was combined with unit area, as determined from digitized geomorphic maps, to obtain an estimated unit volume. The estimates of unit volume were combined with estimates of contaminant levels, where available, to allocate samples using a stratified sample allocation process (Gilbert 1987, 56179, pp. 45–57) designed to reduce uncertainties in the contaminant inventory in each reach. In this process, samples were preferentially allocated to units and sediment facies with a large portion of the total inventory (e.g., Ryti et al. 2005, 93019). One result of this sample allocation process is a high bias in sample results because a disproportionately large number of samples were collected from the more contaminated geomorphic units and sediment facies. Weighted averages are generally used in this investigation to remove the bias introduced during sample collection.

Additional samples were collected from specific locations or layers in the reaches to help define the horizontal and vertical extent of contaminated sediments. For example, samples may be collected from surface or subsurface layers on floodplains or terraces where field evidence was inconclusive as to whether the layer pre- or postdated contaminant releases. The presence of analytes at concentrations significantly above background values was used to infer that the sampled sediments were younger than 1942. Concentrations slightly above background values and lower than overlying layers are sometimes interpreted to record the downward translocation of trace levels of contaminants into pre-1942 sediment. Concentrations slightly above background levels in surface layers are interpreted to indicate minimal thicknesses of post-1942 overbank sediment, wind deposition of trace amounts of contaminated sediments, or minimal levels of contamination in a reach.

Field radiological screening data were obtained in reaches where the levels of radionuclide contaminants were high enough that post-1942 sediment exhibited higher levels of radiation, as measured with field instruments, than nearby pre-1943 sediment. In these cases, field radiological measurements were useful

in delineating areas with varying contaminant levels. Screening data were not routinely obtained in reaches with low levels of radionuclides because previous studies in other canyons had indicated these data were not useful in characterizing variations in contaminant concentrations. Investigations in relatively wide, open reaches downcanyon of the Technical Area (TA) 50 Radioactive Liquid Waste Treatment Facility (RLWTF) outfall (reaches M-3, M-4, and M-5E) included gross-gamma radiation walkover surveys by CHEMRAD (Oak Ridge, Tennessee) using Ludlum Model 44-2 detectors (1-in. × 1-in. sodium iodide [NaI] probes) with Ludlum Model 3 scaler/rate meters (single-channel analyzers). The CHEMRAD surveys obtained gamma radiation measurements every 1 s, which were located with the ultrasonic ranging and data system (USRADS). USRADS relies on a local triangulation network of receivers that records ultrasonic signals emitted from the location of the NaI probe. The gross-gamma radiation maps for reaches M-3, M-4, and M-5E are shown in Plates 6 to 8. Gross-gamma radiation walkover surveys were not conducted in other reaches downcanyon of the RLWTF outfall (reaches E-1E, M-2W, and M-2E) because the terrain was not suitable for these surveys (too narrow, rocky, and/or densely vegetated).

Investigations also included fixed-point measurements of gamma radiation at various depths in reaches where levels of cesium-137 (a gamma emitter) resulted in detectable increases above background radiation levels (reaches E-1E, M-2W, M-2E, M-3, and M-4). Fixed-point gamma radiation measurements utilized a Ludlum Model 44-10 detector encased in a lead- and copper-lined polyethylene shield with a Ludlum Model 2221 scaler/rate meter. Before and after each day's use, each instrument's response was checked by collecting a 1-min measurement of a cesium-137 source (for gamma-radiation response) of known activity and compared with the acceptable range (average ± 20%). At the same time, each instrument was used to collect five 1-min instrument calibration measurements at a local field site. Scaler/rate meter battery voltage, operating high voltage, threshold setting, and window configuration were also checked twice daily. The measurement locations were chosen to include all geomorphic units identified in each reach and specific sites of relatively high gross-gamma radiation as identified in the gamma walkover surveys, where applicable. In addition, measurements of different stratigraphic layers exposed in stream banks and hand-dug holes were made to evaluate depth variations. Gamma measurements were conducted by placing the probe face on the soil surface (horizontal for surface measurements, vertical for depth measurements) and collecting 1-min timed measurements (counts per minute) at 10-cm intervals. Fixed-point gamma radiation measurements from the Mortandad investigation reaches are shown in Table B-1.0-3, and measurement locations are shown in Plates 2, 3, and 4. Field radiation measurements vary with soil moisture content because the attenuation of particles emitted by radioactive decay varies with soil density. Wet soils are denser than dry soils; therefore, a wet soil will provide a lower number of counts than a dry soil with the same concentration of radionuclides. Thus, field measurements made at different locations with different moisture content or at the same location during different time periods may not be exactly comparable, although the relative levels of radiation between different locations can still be determined.

Particle-size analyses of sediment samples were obtained at an off-site laboratory at the Desert Research Institute (DRI) following the procedures described in Janitzky (1986, 57674) to examine the effect of particle-size distribution on contaminant concentrations. Organic-matter content was determined for some of the samples at DRI using the loss-on-ignition method to provide additional information about the physical characteristics of potentially contaminated sediment deposits, and pH data were obtained from some samples because ecological screening levels can be pH-dependent for some analytes. Particle size, organic matter, and pH from the Mortandad investigation reaches are shown in Table B.1.0-4.

Dendrochronological analyses (tree-ring dating) were obtained in some reaches to provide supplemental information on the age of sampled sediment deposits in the Mortandad watershed. Sediments burying trees of known age are constrained to be younger than the trees; sediments beneath the base of trees are constrained to be older. In some cases, nearby trees of different ages can provide more precise

determination of the ages of sediment deposits. For example, two adjacent trees of different ages can be buried by different thicknesses of sediment, thereby recording a variable number of floods since the germination of each tree and approximate ages for such floods. As another example, trees of different ages can be buried by the same thickness of sediment, thereby recording the absence of deposition during specific time periods. Cores were collected from 71 individual trees by means of a 5-mm-diameter increment borer (Table B-1.0-5). Each tree was assigned a unique three-letter three-number identifier following the convention used by the Laboratory of Tree-Ring Research at the University of Arizona, with the designation "MOR" chosen to indicate trees cored in Mortandad Canyon. These trees are located at or near sediment sample sites, and data on the tree diameter and the thickness of sediment burying each tree were recorded. These analyses followed the methodology described in Stokes and Smiley (1968, 57644) and Phipps (1985, 58477), and the process is discussed further in Reneau et al. (1998, 65407, Appendix B, Section B-1.0).

B-2.0 WATER INVESTIGATIONS

This section provides additional information concerning the distribution of vadose-zone moisture as a function of depth in core collected from MCB-, MCOI-, and R-wells located throughout the Mortandad watershed. Core and cuttings samples from vadose-zone boreholes were collected at the time the holes were drilled and, therefore, represent a snapshot in time. See Figures B-2.0-1 to B-2.0-21.

The completion reports for the alluvial wells, characterization boreholes, and intermediate and regional wells installed under the "Mortandad Canyon Groundwater Work Plan, Revision 1" (LANL 2004, 82613) are provided as Attachment B-1, which is included on CD.

B-3.0 BIOTA INVESTIGATIONS

This appendix contains supplemental information on biota investigations conducted to support the evaluation of potential adverse ecological impacts presented in Section 8.1. Sample locations are presented in Figure 8.1-1.

Following the biota investigation work plan (LANL 2005, 89308, p. 6), sediment characterization in support of the small mammal study involved collecting one composite sample from each trapping array to obtain representative concentrations of chemicals of potential ecological concern constituents within the foraging area. Each composite sample consisted of equal portions of sediment from a subset of trapping locations within that area. All the sediment samples were collected from depths of 0 to 15 cm (0 to 6 in.). The specific trapping locations were selected randomly using a random number generator and included 10 trapping locations per array. For the typical array of 100 trapping locations, 10% of the locations were sampled. For reach E-1W where only 30 traps were placed because of the small area of the reach, 33% of the locations were sampled. At each location, field notes were taken on the geomorphic unit, sediment facies, and on the percent of the sample, if any, that consisted of ash-bearing sediment or soil related to the Cerro Grande fire. Table B-3.0-1 presents information on the trap number, geomorphic unit, sediment thickness for each portion of each composite sample, and average sediment-thickness values in each composite sample.

Tables B-3.0-2 to B-3.0-4 present additional details of samples submitted for analysis associated with the biota investigation. Table B-3.0-2 presents specific information on the small mammals submitted for laboratory analyses, including reach, sample ID, species, type of sample (carcass, pelt, or whole body), number of individuals composited in sample, and weight. Table B-3.0-3 lists each sediment sample submitted for laboratory analyses, including reach, location ID, geomorphic unit, depth, date collected,

and type of biota test. Table B-3.0-4 lists surface water samples for algae toxicity tests, including field water-quality parameters for each samples (pH, specific conductance, temperature, and dissolved oxygen) and notes on the nature of the surface water. Table B-3.0-5 lists egg and insect samples from western bluebird nest boxes that were submitted for laboratory analysis, including location ID, the reach or general sample location, the nest box number (or numbers for insect samples that were composited from multiple boxes), the collection date, and the sample weight.

B-4.0 WASTE MANAGEMENT DOCUMENTATION

This appendix section provides the best available waste characterization strategy forms (WCSFs) and relevant notices of intent (NOIs) to discharge purge and development water associated with the groundwater investigations in Mortandad Canyon. These documents are found in Attachment B-2 and Attachment B-3, respectively, on CD.

B-5.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author, publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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 as needed. Documents previously submitted to the administrative authority are not included.

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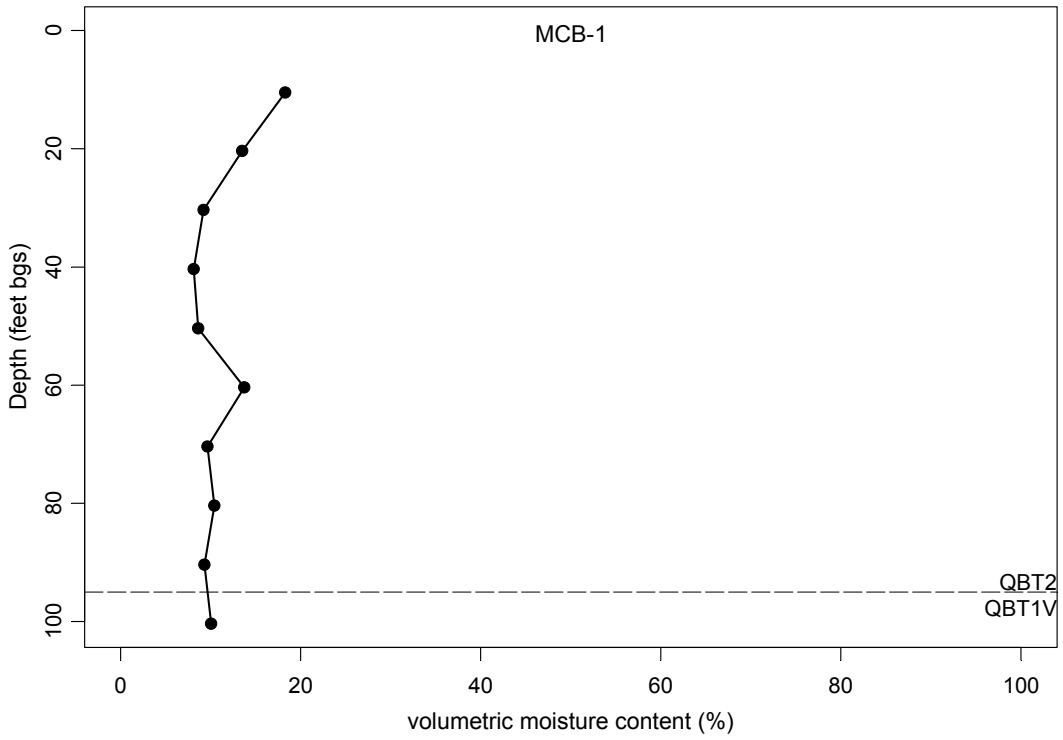


Figure B-2.0-1. Vadose-zone moisture profile in borehole MCB-1

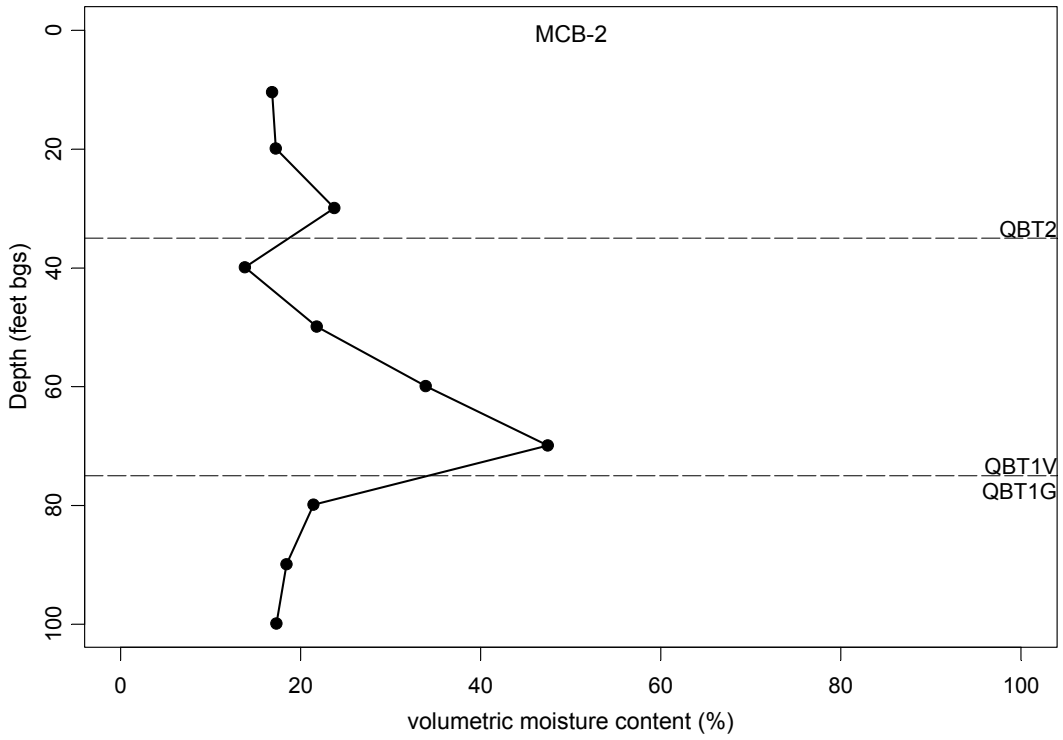


Figure B-2.0-2. Vadose-zone moisture profile in borehole MCB-2

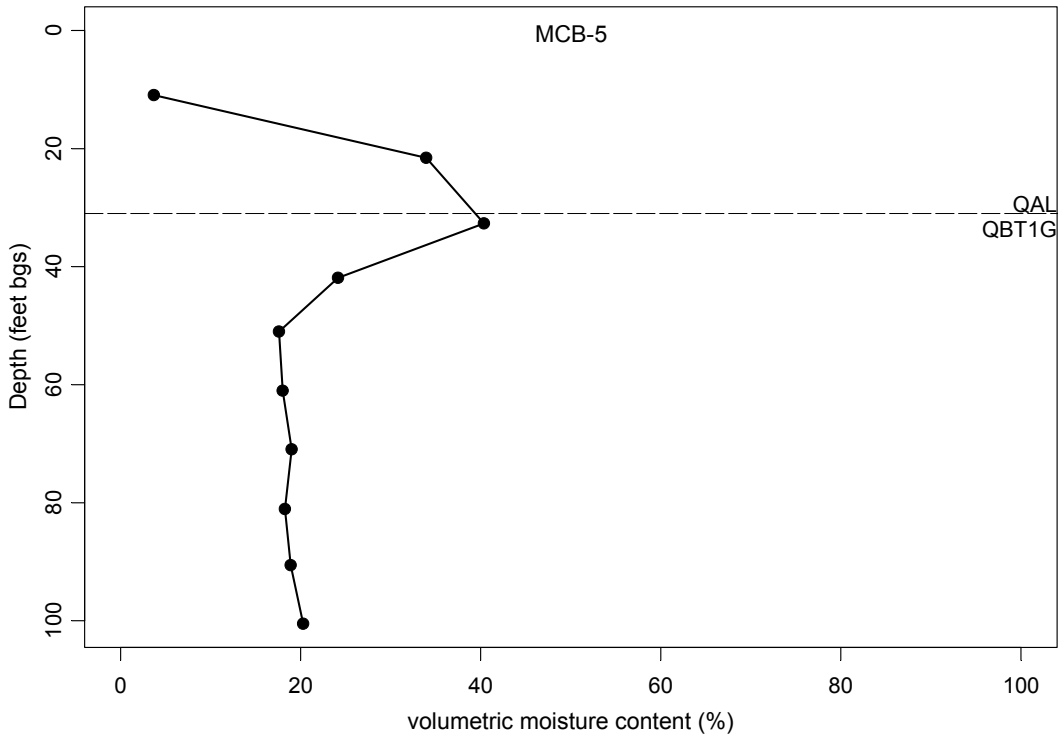


Figure B-2.0-3. Vadose-zone moisture profile in borehole MCB-5

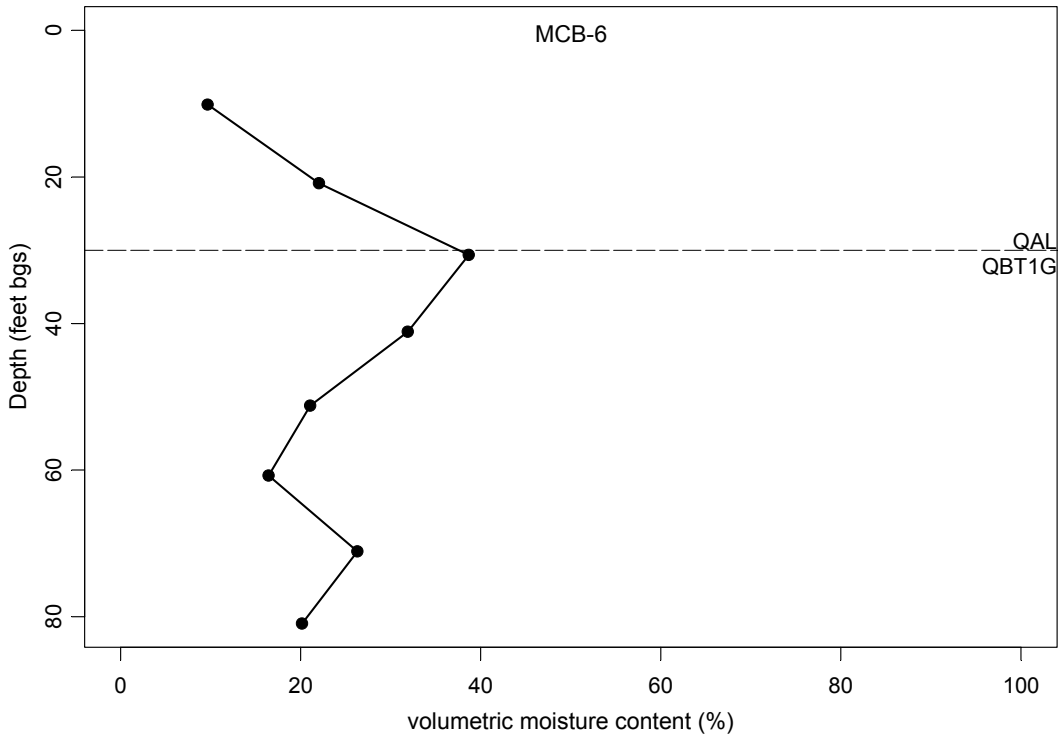


Figure B-2.0-4. Vadose-zone moisture profile in borehole MCB-6

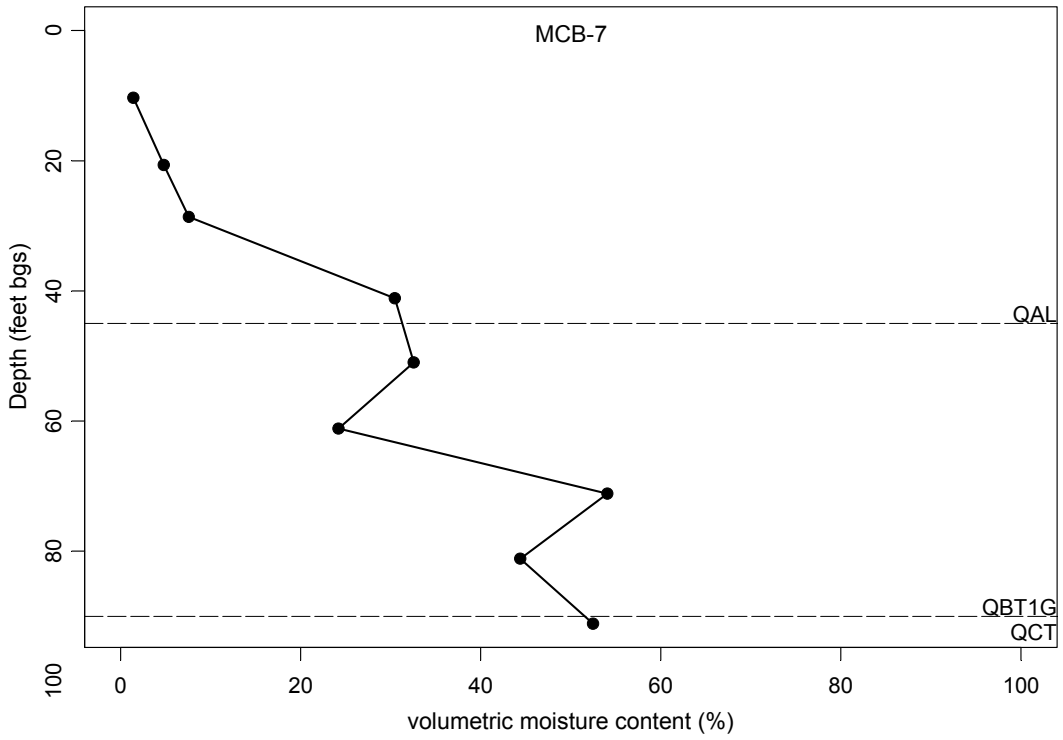


Figure B-2.0-5. Vadose-zone moisture profile in borehole MCB-7

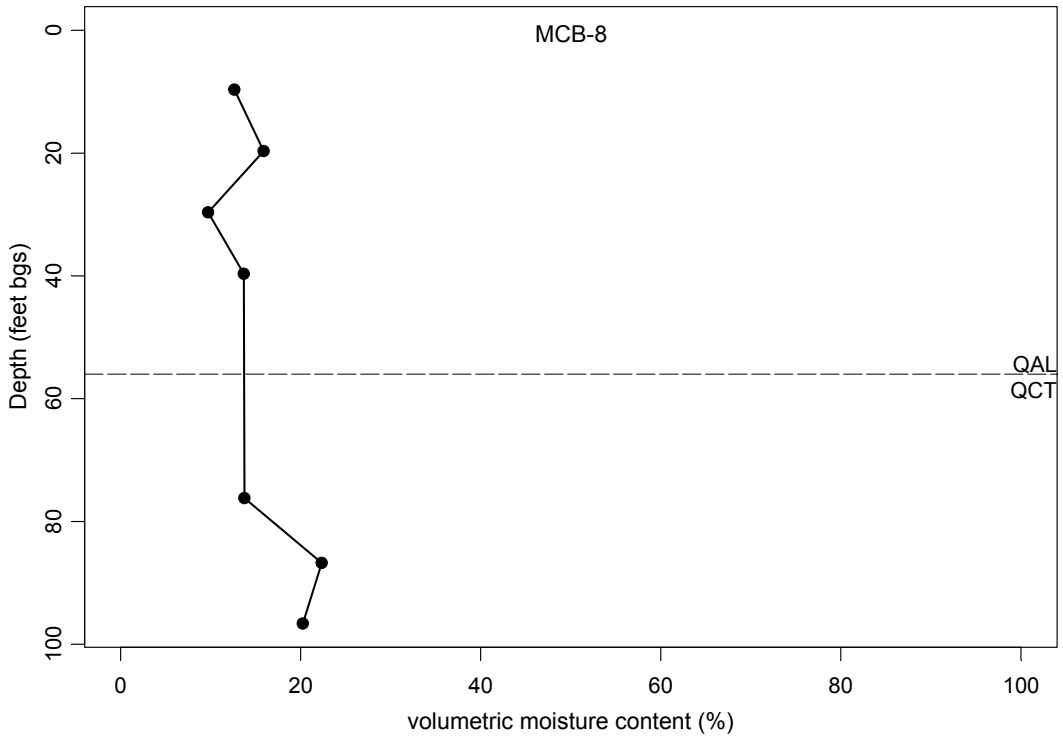


Figure B-2.0-6. Vadose-zone moisture profile in borehole MCB-8

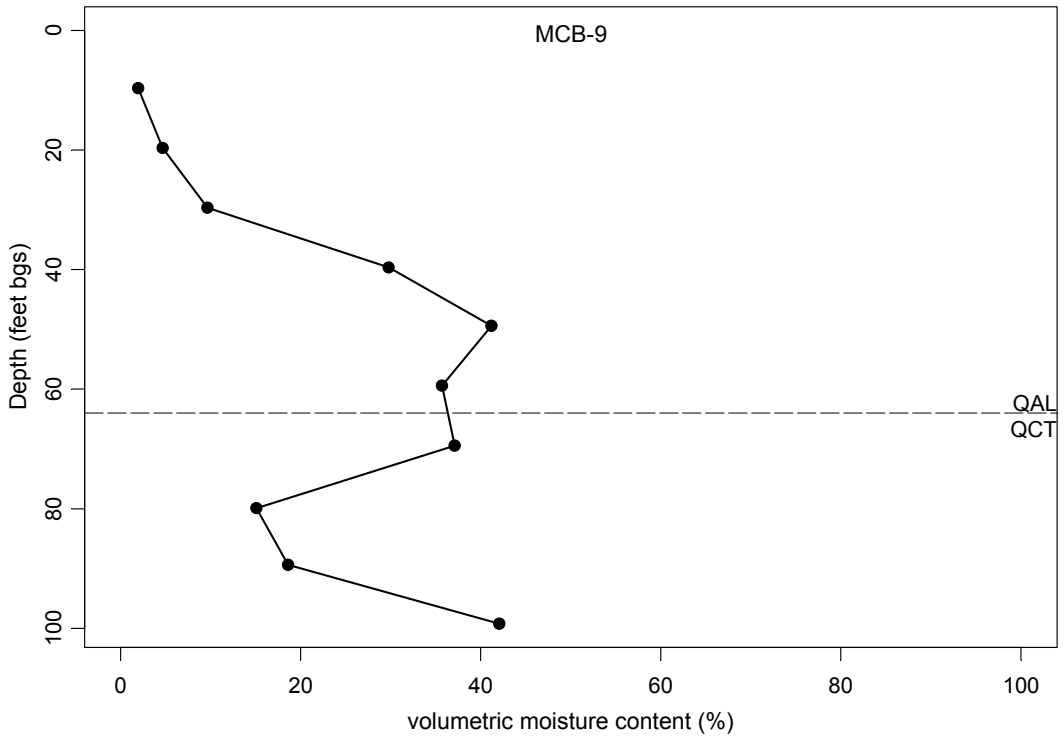


Figure B-2.0-7. Vadose-zone moisture profile in borehole MCB-9

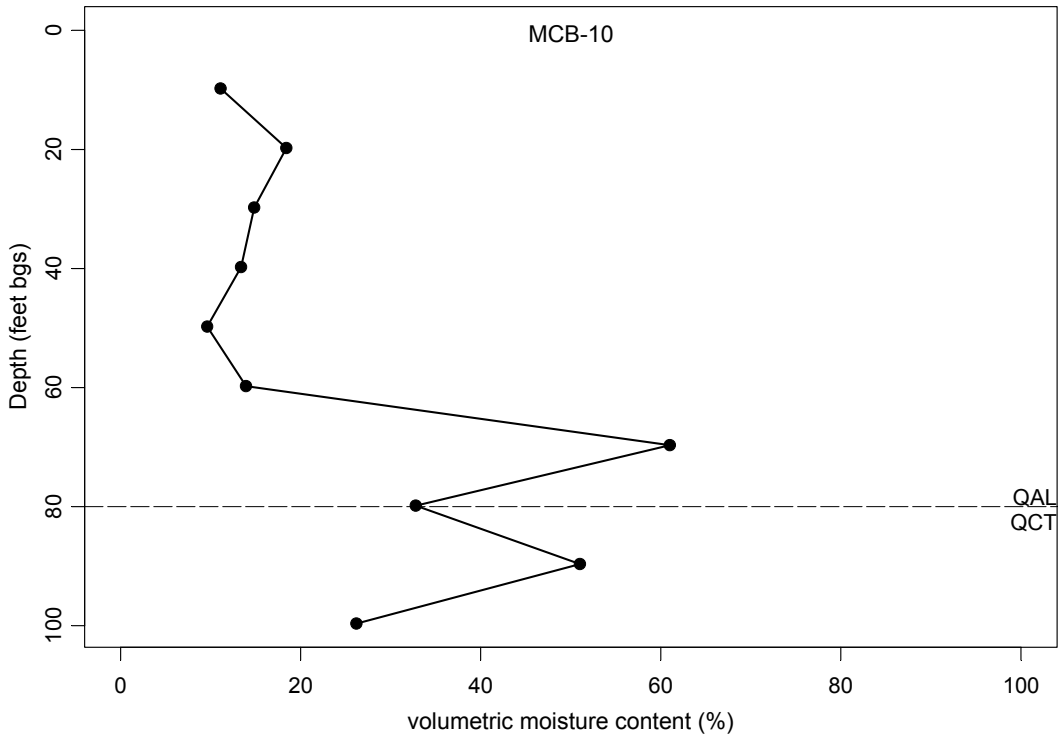


Figure B-2.0-8. Vadose-zone moisture profile in borehole MCB-10

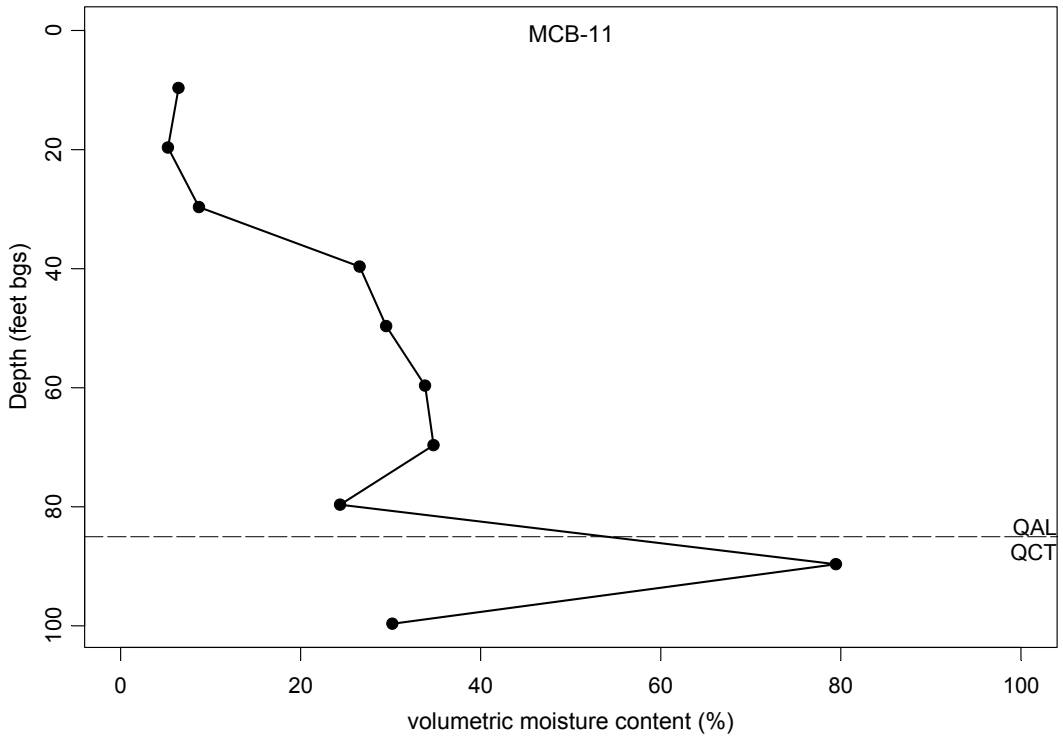


Figure B-2.0-9. Vadose-zone moisture profile in borehole MCB-11

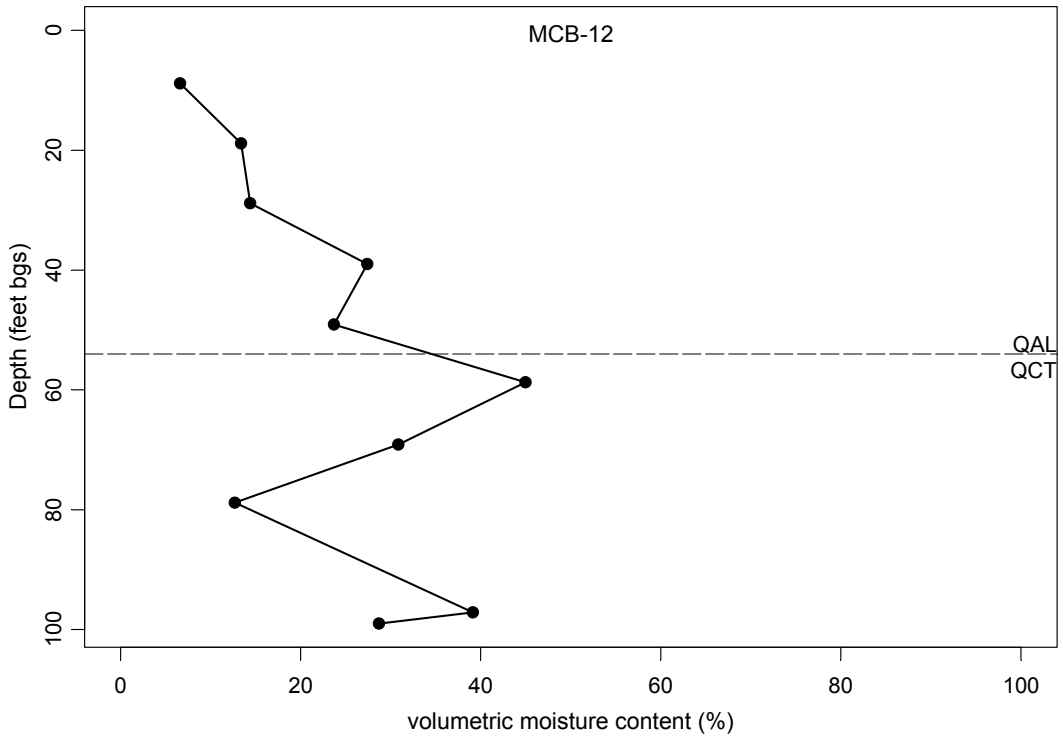


Figure B-2.0-10. Vadose-zone moisture profile in borehole MCB-12

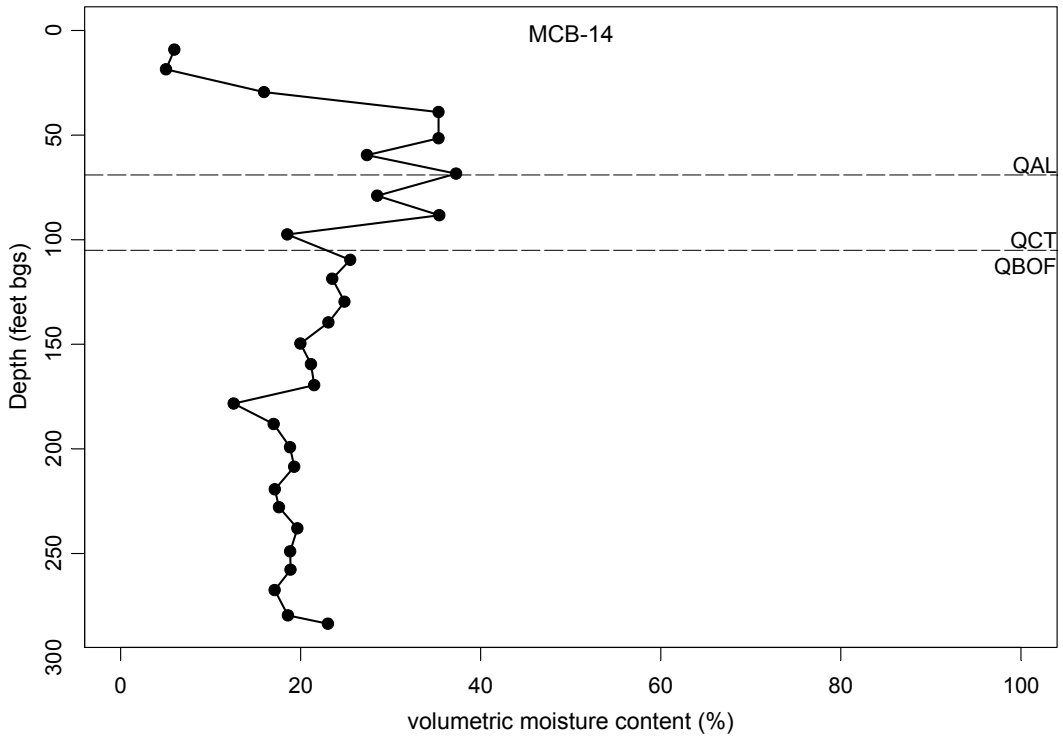


Figure B-2.0-11. Vadose-zone moisture profile in borehole MCB-14

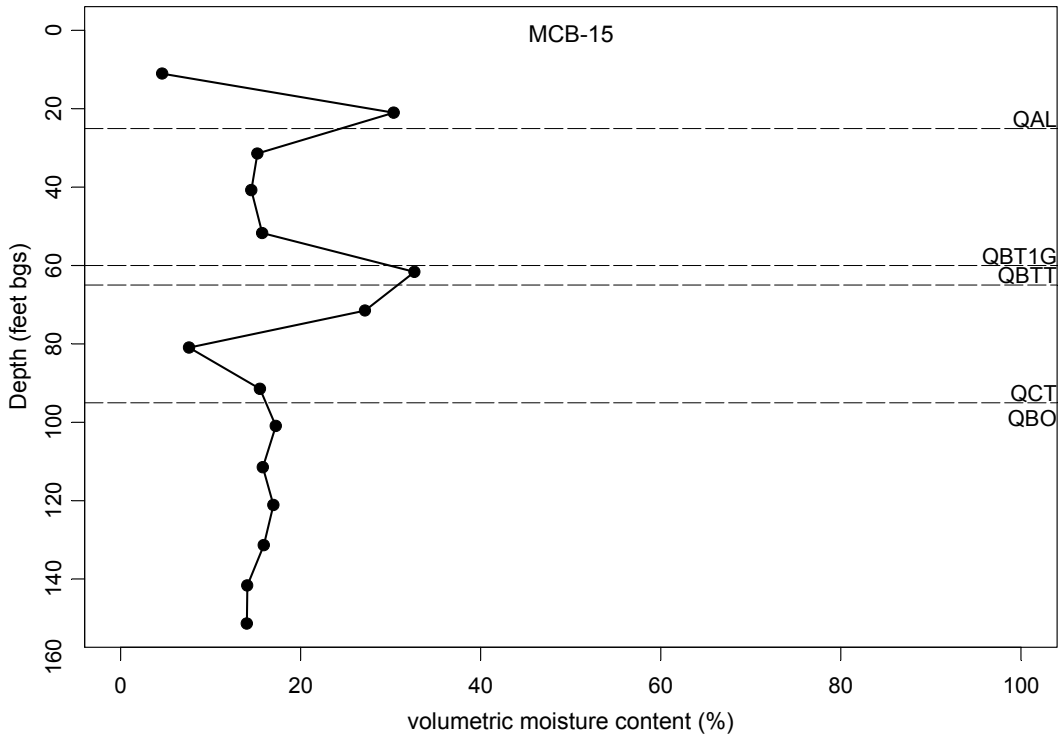


Figure B-2.0-12. Vadose-zone moisture profile in borehole MCB-15

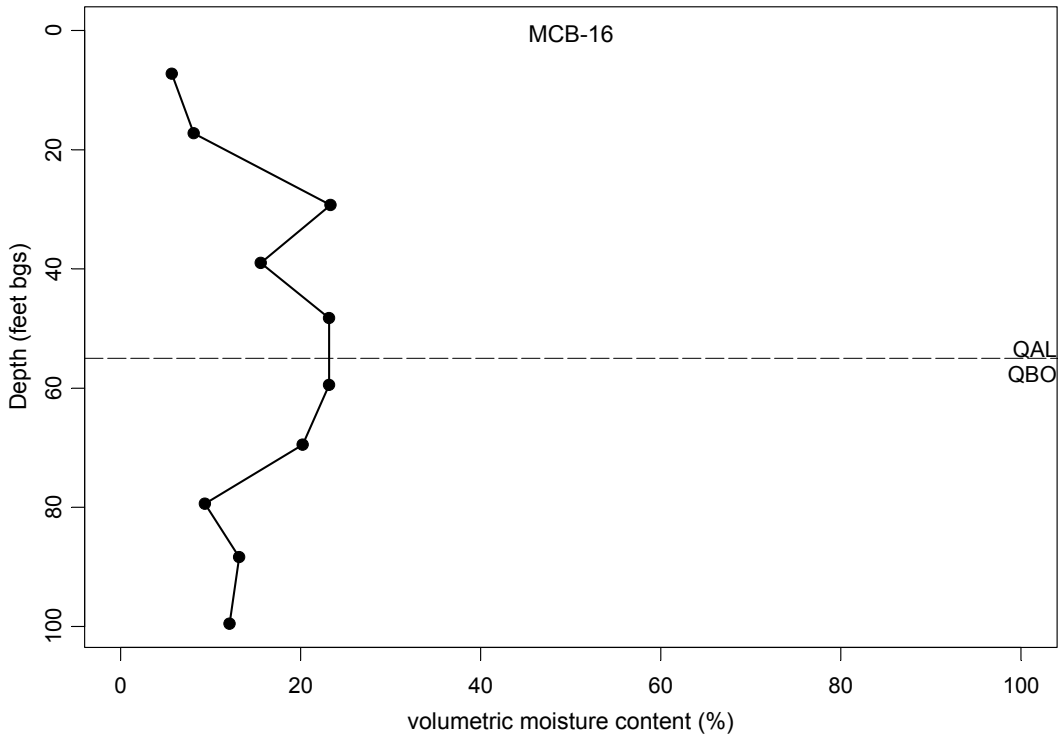


Figure B-2.0-13. Vadose-zone moisture profile in borehole MCB-16

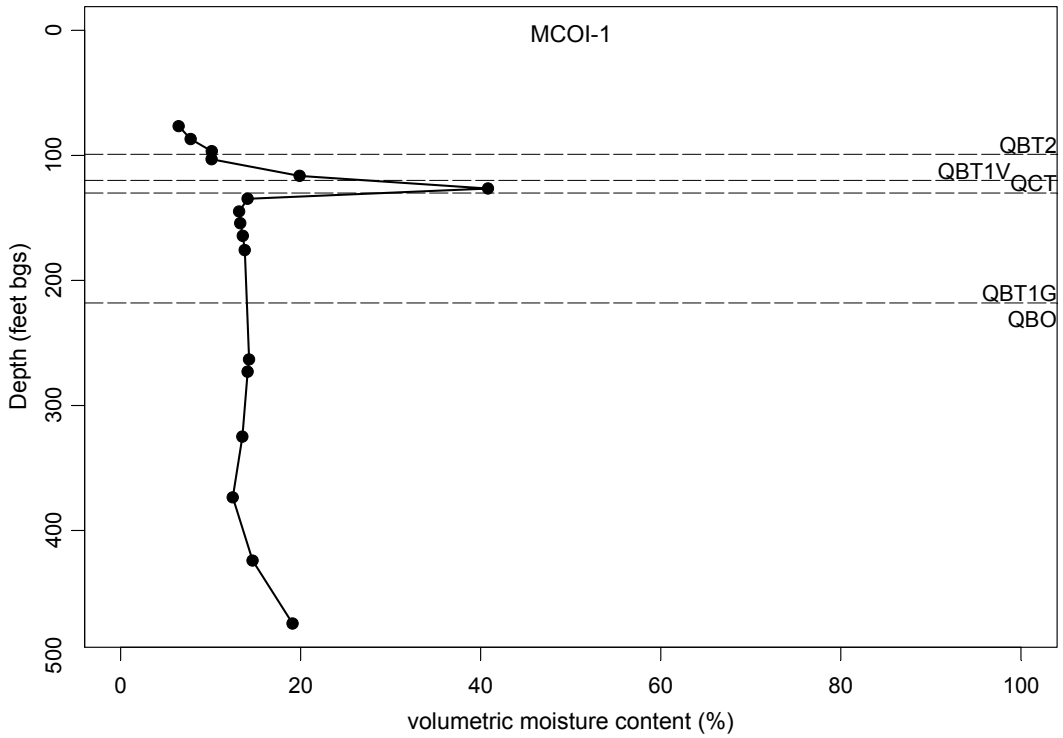


Figure B-2.0-14. Vadose-zone moisture profile in borehole MCOI-1

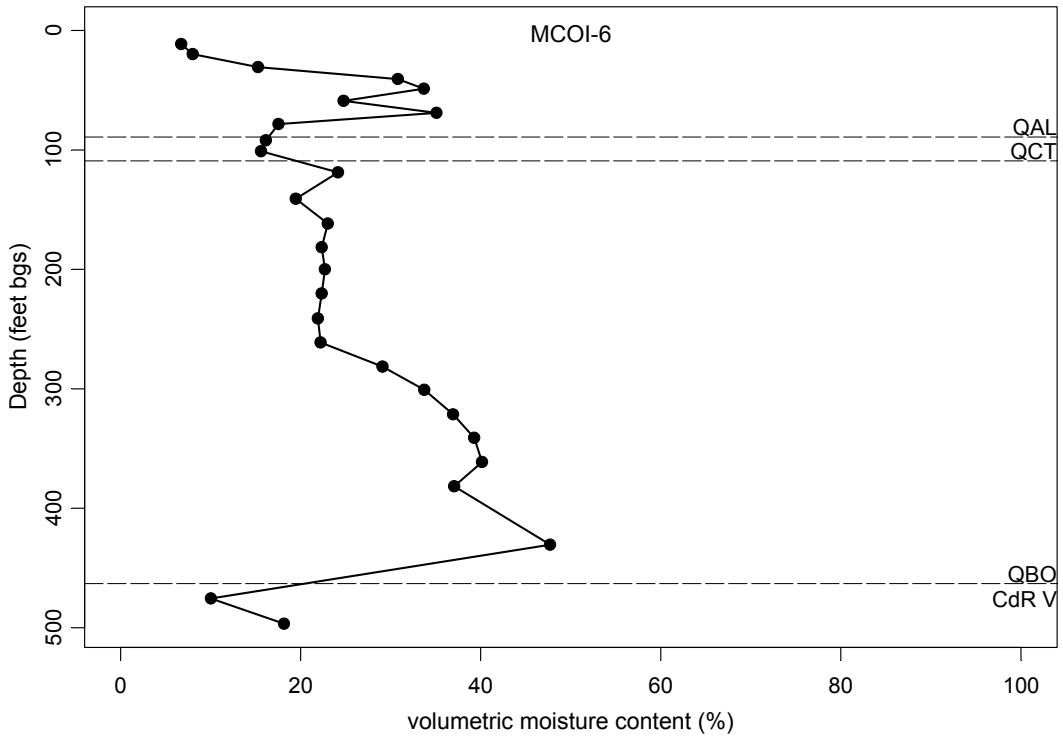


Figure B-2.0-15. Vadose-zone moisture profile in borehole MCOI-6

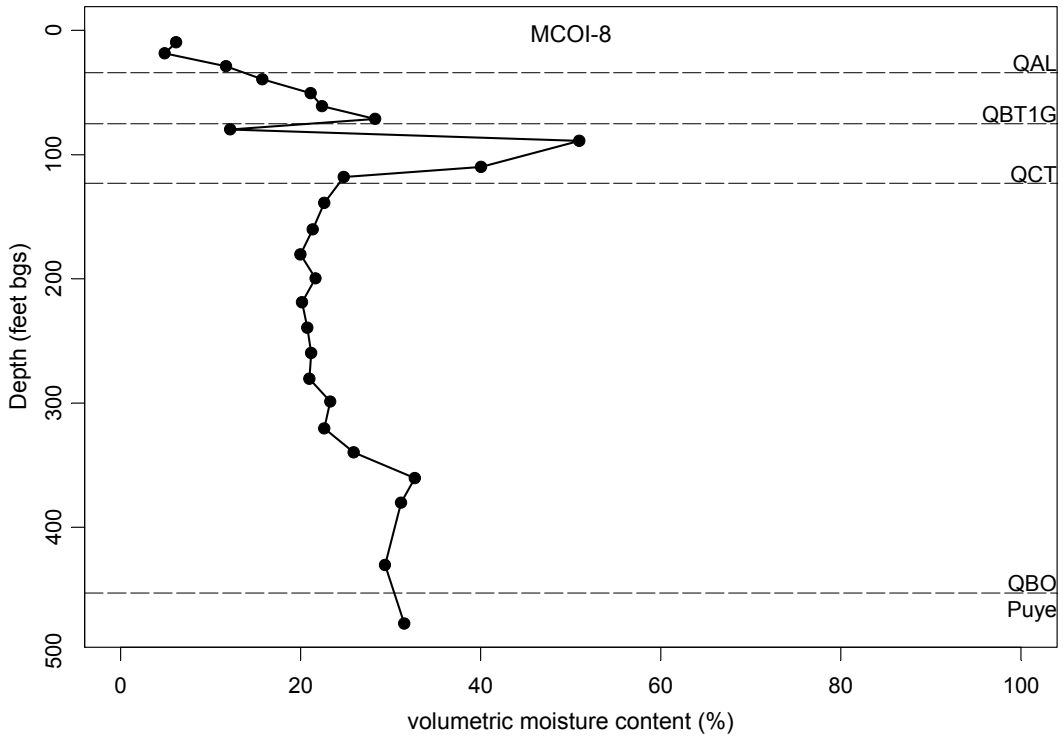


Figure B-2.0-16. Vadose-zone moisture profile in borehole MCOI-8

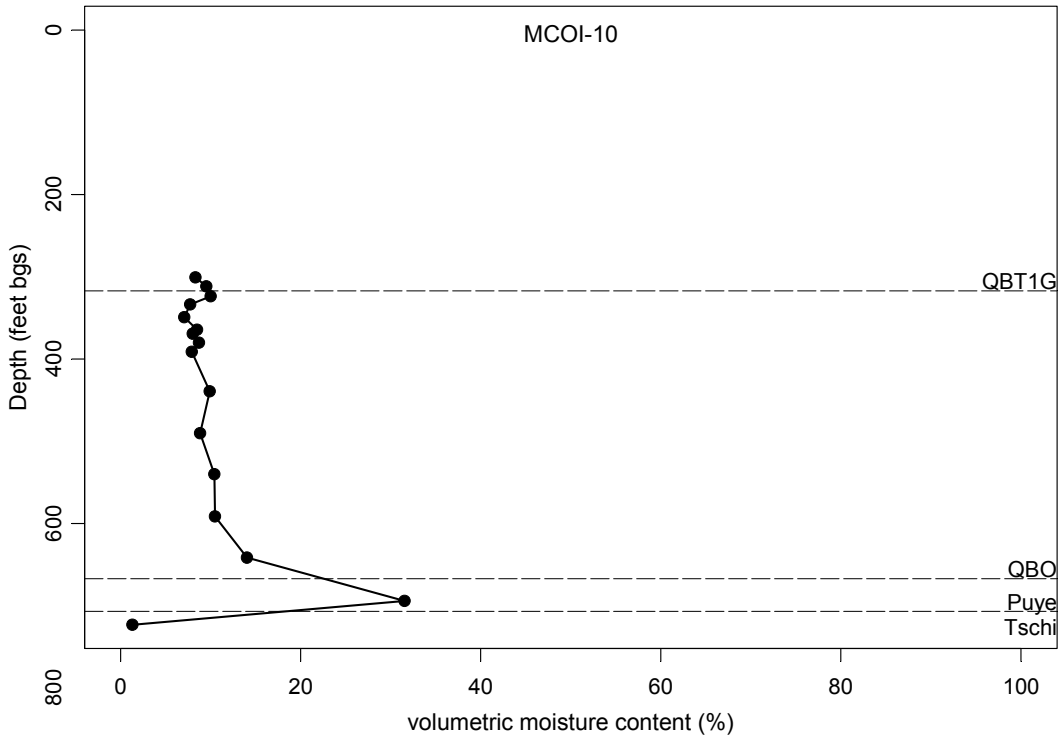


Figure B-2.0-17. Vadose-zone moisture profile in borehole MCOI-10

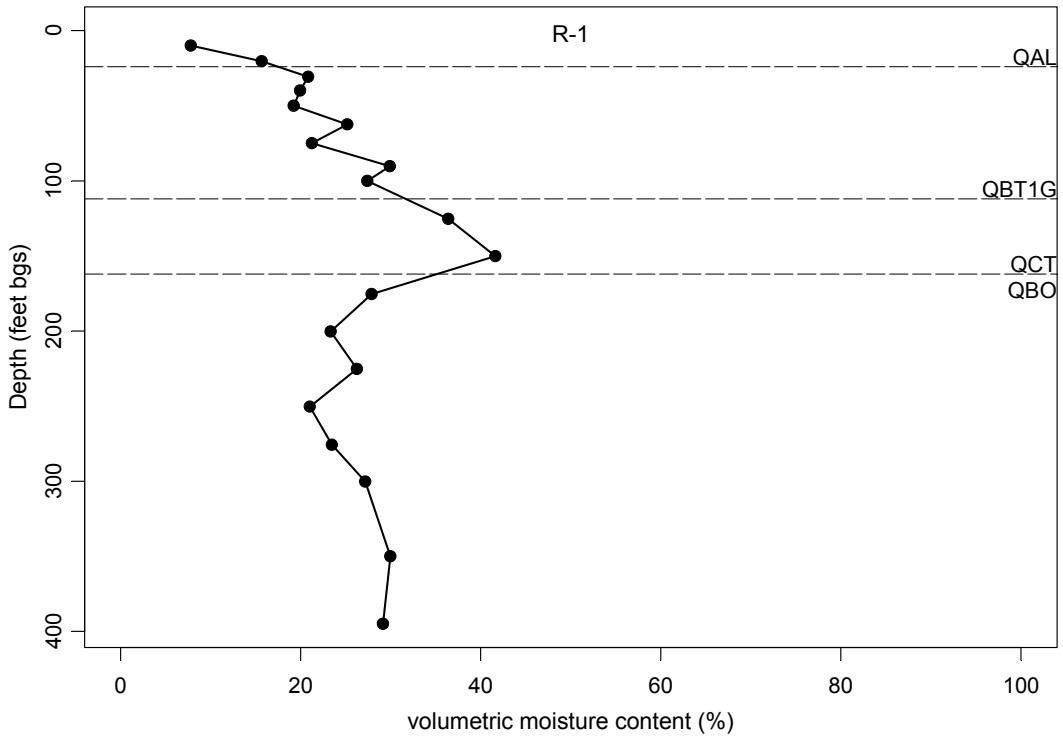


Figure B-2.0-18. Vadose-zone moisture profile in borehole R-1

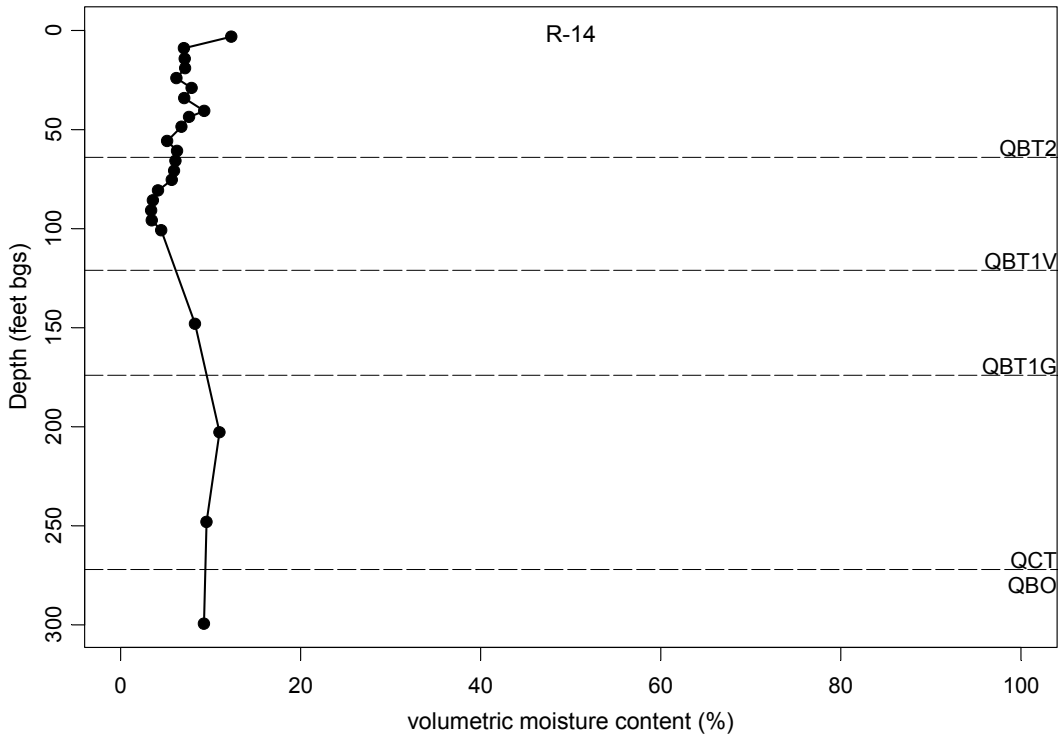


Figure B-2.0-19. Vadose-zone moisture profile in borehole R-14

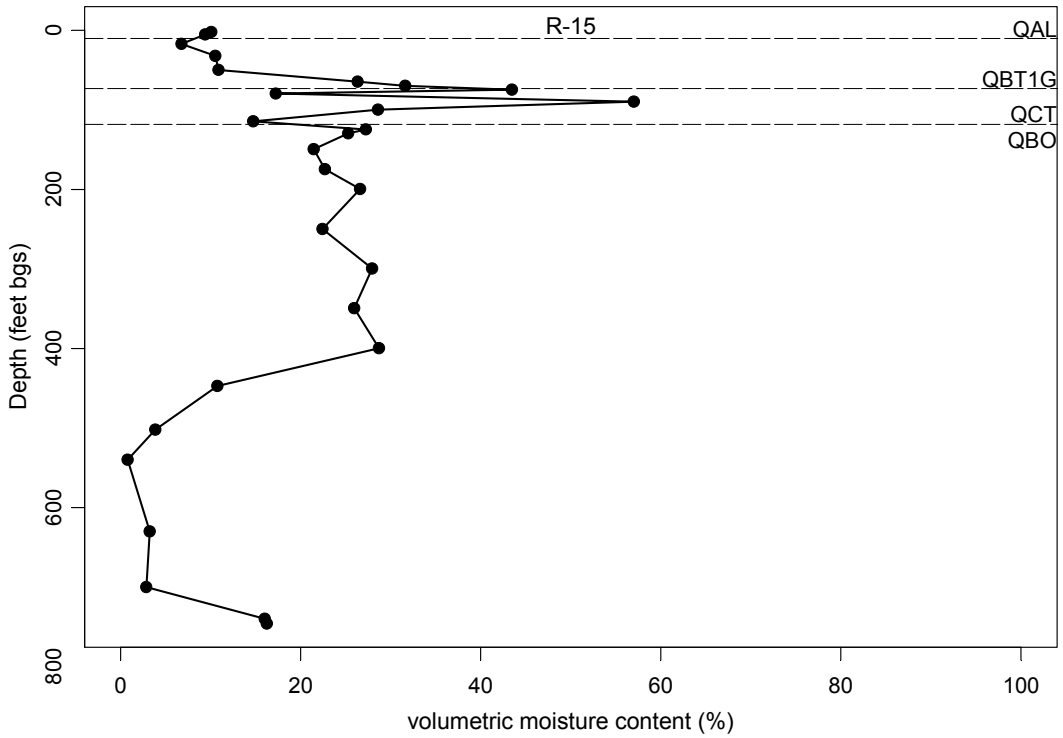


Figure B-2.0-20. Vadose-zone moisture profile in borehole R-15

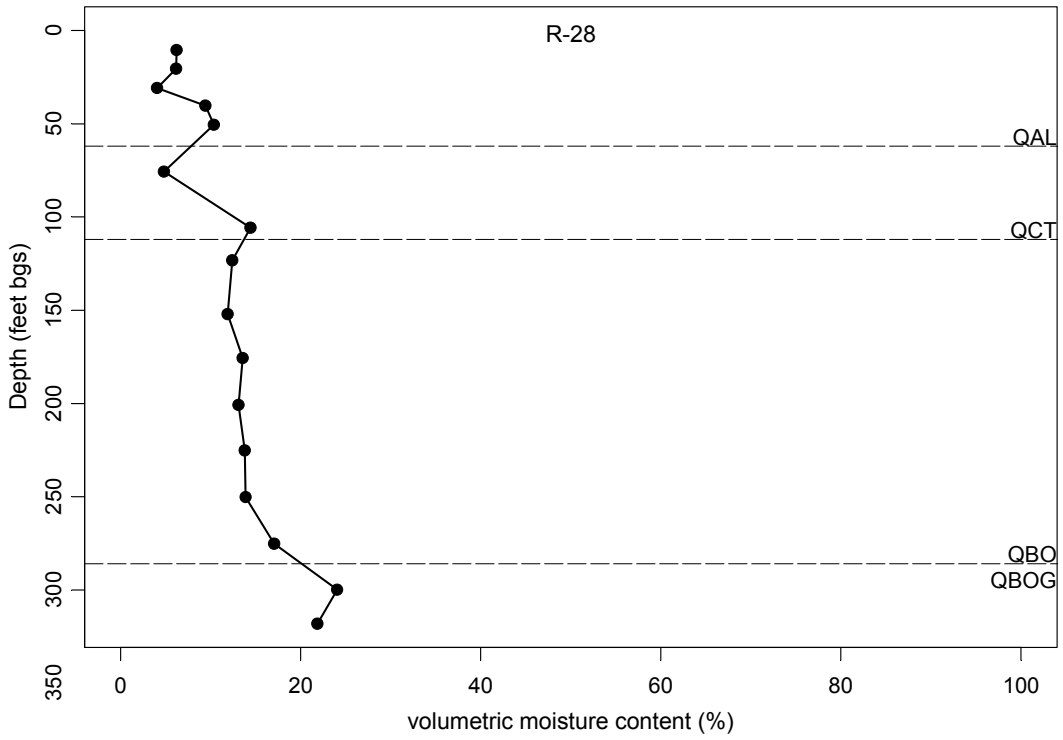


Figure B-2.0-21. Vadose-zone moisture profile in borehole R-28

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Table B-1.0-1
Physical Characteristics of Post-1942 Geomorphic Units in Mortandad Reaches

Reach	Geomorphic Unit	Average Unit Width (m)[a]	Sediment Facies	Estimated Average Sediment Thickness (m)	Typical Median Particle Size Class (<2 mm fraction)	Notes
E-1FW	c1	0.8	Fine	0.04	Fine sand [b]	Active channel
			Coarse	0.33	Coarse sand	
	c1b	0.04	Fine	0.16	Fine sand	Area of fine-grained sediment deposition along active channel
			Coarse	0.24	Coarse sand [b]	
	c2	1.5	Fine	0.23	Coarse silt	Abandoned post-1942 channel
			Coarse	0.20	Coarse sand	
	f1	0.3	Fine	0.20	Very fine sand	Post-1942 floodplain
			Coarse	0.08	Coarse sand [b]	
	Total	2.7				
E-1W	c1	0.3	Fine	0.04	Coarse silt [b]	Active channel
			Coarse	0.5	Coarse sand	
	c1b	0.1	Fine	0.37	Coarse silt [b]	Area of fine-grained sediment deposition along active channel
			Coarse	0.39	Coarse sand [b]	
	c1ct	4.8	Fine	0.28	Coarse silt	Cattail wetland along active channel
			Coarse	0.27	Coarse sand	
	c2	1.3	Fine	0.30	Very fine sand	Abandoned post-1942 channel
			Coarse	0.19	Medium sand	
	c2w	1.6	Fine	0.47	Coarse silt	Abandoned post-1942 channel with willows
			Coarse	0.37	Coarse sand	
	f1	0.3	Fine	0.15	Coarse silt [b]	Post-1942 floodplain
			Coarse	0.14	Coarse sand [b]	
	Total	8.5				
E-1E	c1	1.7	Fine	0.02	Very fine sand	Active channel
			Coarse	0.4	Coarse sand	
	c1b	0.3	Fine	0.09	Medium sand	Area of fine-grained sediment deposition along active channel
			Coarse	0.4	Coarse sand	
	c2	0.2	Fine	0.24	Medium sand	Abandoned post-1942 channel
			Coarse	0.4	Coarse sand	
	c3	0.5	Fine	0.27	Fine sand	Abandoned post-1942 channel with relatively high cesium-137
			Coarse	0.4	Coarse sand	
	f1	0.1	Fine	0.53	Very fine sand	Post-1942 floodplain
			Coarse	0.15	Coarse sand	
	f2	0.2	Fine	0.18	Coarse silt	Possible post-1942 floodplain
			Coarse	0.04	Coarse sand [b]	
	Total	3.0				
M-1W	c1	1.3	Fine	0.03	Fine sand [b]	Active channel
			Coarse	0.29	Coarse sand	
	c1b	0.8	Fine	0.06	Medium sand	Area of fine-grained sediment deposition along active channel
			Coarse	0.5	Coarse sand	
	c1br	0.3	n/a[c]	0	n/a	Active channel on bedrock
	c1ct	1.3	Fine	0.15	Coarse silt	Cattail wetland along active channel
			Coarse	0.25	Coarse sand	
	c2	2.8	Fine	0.12	Very fine sand	Relatively low abandoned post-1942 channel
			Coarse	0.40	Coarse sand	
	c2w	1.1	Fine	0.03	Fine sand	Abandoned post-1942 channel with willows
			Coarse	0.5	Coarse sand [b]	
	f1	0.1	Fine	0.12	Fine sand [b]	Post-1942 floodplain
			Coarse	0.03	Coarse sand [b]	
	Total	7.6				
M-1C	c1	0.3	Coarse	0.4	Coarse sand	Active channel
	c2	3.7	Fine	0.21	Coarse silt	Relatively low abandoned post-1942 channel
			Coarse	0.20	Coarse sand	
	c2w	3.3	Fine	0.20	Coarse silt	Abandoned post-1942 channel with willows
			Coarse	0.44	Coarse sand	
	Total	7.4				

Table B-1.0-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m)[a]	Sediment Facies	Estimated Average Sediment Thickness (m)	Typical Median Particle Size Class (<2 mm fraction)	Notes
M-1E	c1	0.6	Fine	0.03	Coarse silt [b]	Active channel
			Coarse	0.29	Coarse sand	
	c1b	0.1	Fine	0.09	Coarse silt [b]	Area of fine-grained sediment deposition along active channel
			Coarse	0.5	Coarse sand [b]	
	c1ct	0.9	Fine	0.18	Fine silt	Cattail wetland along active channel
			Coarse	0.25	Coarse sand	
	c2	2.8	Fine	0.25	Coarse silt	Relatively low abandoned post-1942 channel
			Coarse	0.2	Coarse sand	
	c2w	0.3	Fine	0.24	Fine silt	Abandoned post-1942 channel with willows
			Coarse	0.34	Medium sand	
	c3	0.03	Fine	0.50	Coarse silt [b]	Relatively high abandoned post-1942 channel
			Coarse	0.5	Coarse sand [b]	
	f1	1.0	Fine	0.29	Coarse silt	Post-1942 floodplain
			Coarse	0.02	Coarse sand [b]	
	f2	0.03	Fine	0.01	Coarse silt [b]	Possible post-1942 floodplain
	Total	5.8				
M-2W	c1	2.4	Coarse	0.5	Coarse sand	Active channel
	c1b	0.2	Fine	0.14	Fine sand	Area of fine-grained sediment deposition along active channel
			Coarse	0.5	Coarse sand	
	c2	0.4	Fine	0.32	Very fine sand	Abandoned post-1942 channel with relatively low cesium-137
			Coarse	0.4	Coarse sand	
	c3	0.2	Fine	0.40	Very fine sand	Abandoned post-1942 channel with relatively high cesium-137
			Coarse	0.4	Coarse sand	
	f1	0.6	Fine	0.47	Coarse silt	Post-1942 floodplain with relatively low cesium-137
			Coarse	0.13	Coarse sand [b]	
	f1g	0.3	Fine	0.64	Coarse silt	Post-1942 floodplain with relatively high cesium-137
			Coarse	0.24	Coarse sand	
	f2	0.6	Fine	0.32	Very fine sand	Possible post-1942 floodplain
	Total	4.8				
M-2E	c1	2.6	Fine	0.01	Very fine sand	Active channel
			Coarse	0.5	Coarse sand	
	c1b	0.2	Fine	0.20	Fine sand	Area of fine-grained sediment deposition along active channel
			Coarse	0.5	Very coarse sand	
	c2	0.3	Fine	0.15	Medium sand	Abandoned post-1942 channel with relatively low cesium-137
			Coarse	0.5	Coarse sand	
	c3	0.3	Fine	0.39	Very fine sand	Abandoned post-1942 channel with relatively high cesium-137
			Coarse	0.5	Coarse sand	
	f1	0.4	Fine	0.29	Very fine sand	Post-1942 floodplain with relatively low cesium-137
	f1g	1.0	Fine	0.44	Coarse silt	Post-1942 floodplain with relatively high cesium-137
			Coarse	0.05	Coarse sand	
	f2	2.6	Fine	0.24	Very fine sand [b]	Possible post-1942 floodplain
	Total	7.3				
M-3W	c1	1.7	Fine	0.03	Coarse silt	Active channel
			Coarse	0.6	Coarse sand	
	c2	1.1	Fine	0.29	Medium sand	Abandoned inset post-1942 channel with relatively low cesium-137
			Coarse	0.4	Coarse sand	
	c3	1.1	Fine	0.23	Coarse silt	High abandoned post-1942 channel with relatively low cesium-137
			Coarse	0.3	Coarse sand	
	f1	5.7	Fine	0.28	Coarse silt	Post-1942 floodplain with relatively low cesium-137
			Coarse	0.04	Coarse sand	
	f2	7.1	Fine	0.13	Coarse silt	Possible post-1942 floodplain
			Coarse	0.04	Coarse sand [b]	
	Total	16.8				
M-3E	c1	1.5	Fine	0.03	Coarse silt	Active channel
			Coarse	0.6	Coarse sand	

Table B-1.0-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m)[a]	Sediment Facies	Estimated Average Sediment Thickness (m)	Typical Median Particle Size Class (<2 mm fraction)	Notes
	c1b	3.5	Fine	0.45	Coarse silt	Area of fine-grained sediment deposition along active channel; in part overlies c3 or f1 units
			Coarse	0.4	Coarse sand	
	c1g	0.6	Fine	0.36	Medium sand	Active channel in gully; in part overlies c3 unit
			Coarse	0.45	Coarse sand	
	c2	1.3	Fine	0.29	Medium sand	Abandoned inset post-1942 channel with relatively low cesium-137
			Coarse	0.4	Coarse sand	
	c2a	0.3	Fine	0.33	Fine sand	Abandoned inset post-1942 channel with relatively high cesium-137
			Coarse	0.3	Coarse sand	
	c3	11.2	Fine	0.23	Coarse silt	High abandoned post-1942 channel with relatively low cesium-137
			Coarse	0.3	Coarse sand	
	c3a	2.3	Fine	0.36	Coarse silt	High abandoned post-1942 channel with relatively high cesium-137
			Coarse	0.5	Coarse sand	
	f1	19.5	Fine	0.28	Coarse silt	Post-1942 floodplain with relatively low cesium-137
			Coarse	0.04	Coarse sand	
	f1a	1.0	Fine	0.44	Coarse silt	Post-1942 floodplain with relatively high cesium-137
			Coarse	0.16	Coarse sand	
	f2	4.6	Fine	0.13	Coarse silt	Possible post-1942 floodplain
			Coarse	0.04	Coarse sand [b]	
	Total	45.8				
M-4W	c1	1.3	Fine	0.08	Fine sand	Active channel
			Coarse	0.34	Very coarse sand	
	c1t	8.1	Fine	0.06	Coarse silt	Active sediment trap
			Coarse	0.15	Coarse sand	
	c1/c2t	0.5	Fine	0.57	Coarse silt [b]	Active channel over former sediment trap
			Coarse	0.40	Coarse sand [b]	
	c2/c2t	0.5	Fine	0.57	Coarse silt	Abandoned channel over former sediment trap
			Coarse	0.40	Coarse sand	
	c2	2.2	Fine	0.34	Coarse silt	Abandoned inset post-1942 channel
			Coarse	0.11	Coarse sand	
	c3a + f1a	2.6	Fine	0.27	Coarse silt	High abandoned post-1942 channel and floodplain with relatively high cesium-137
			Coarse	0.12	Coarse sand	
	c3 + f1	12.1	Fine	0.21	Coarse silt	High abandoned post-1942 channel and floodplain with relatively low cesium-137
			Coarse	0.04	Coarse sand	
	f2	11.9	Fine	0.21	Medium sand	Possible post-1942 floodplain
			Coarse	0.04	Coarse sand [b]	
	fill(t)	n/a	n/a	n/a	n/a	Fill associated with sediment traps
	Total	39.1				
M-4C	c1t	2.3	Fine	0.06	Coarse silt	Active sediment trap
			Coarse	0.15	Coarse sand	
	c3a + f1a	19.4	Fine	0.27	Coarse silt	High abandoned post-1942 channel and floodplain with relatively high cesium-137
			Coarse	0.12	Coarse sand	
	c3 + f1	35.3	Fine	0.21	Coarse silt	High abandoned post-1942 channel and floodplain with relatively low cesium-137
			Coarse	0.04	Coarse sand	
	f1	1.2	Fine	0.21	Coarse silt	Post-1942 floodplain with relatively low cesium-137
	f2	7.9	Fine	0.21	Medium sand	Possible post-1942 floodplain
			Coarse	0.04	Coarse sand [b]	
	fill(t)	n/a	n/a	n/a	n/a	Fill associated with sediment traps
	Total	66.1				
M-4E	c1g	1.4	Fine	0.16	Very fine sand	Active chennel within gully
			Coarse	0.12	Coarse sand	
	c2a	0.1	Fine	0.13	Coarse silt	Abandoned headcut gully
			Coarse	0.04	Coarse sand [b]	
	c3 + f1	26.8	Fine	0.21	Coarse silt	High abandoned post-1942 channel and floodplain with relatively low cesium-137
			Coarse	0.04	Coarse sand	

Table B-1.0-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m)[a]	Sediment Facies	Estimated Average Sediment Thickness (m)	Typical Median Particle Size Class (<2 mm fraction)	Notes
	f1	10.7	Fine	0.21	Coarse silt	Post-1942 floodplain with relatively low cesium-137
	f2	44.3	Fine	0.21	Medium sand	Possible post-1942 floodplain
			Coarse	0.04	Coarse sand [b]	
	Total	83.2				
M-5W	c1	1.4	Fine	0.17	Very fine sand	Active channel
			Coarse	0.34	Coarse sand	
	c2	0.3	Coarse	0.6	Coarse sand	Abandoned post-1942 channel
	f1	2.2	Fine	0.29	Coarse silt	Post-1942 floodplain
	Total	3.8				
M-5E	c1	1.0	Fine	0.12	Coarse silt	Active channel
			Coarse	0.12	Coarse sand	
	c2	10.3	Fine	0.18	Coarse silt	Abandoned post-1942 channel
			Coarse	0.12	Coarse sand	
	f1	3.6	Fine	0.10	Coarse silt	Post-1942 floodplain
	f2	0.3	Fine	0.05	Very fine sand	Possible post-1942 floodplain
	Total	15.2				
M-6	c1	1.3	Fine	0.01	Very fine sand[b]	Active channel
			Coarse	0.49	Coarse sand	
	c2	2.9	Fine	0.32	Very fine sand	Abandoned post-1942 channel
			Coarse	0.29	Coarse sand	
	f1	14.8	Fine	0.37	Very fine sand	Post-1942 floodplain
			Coarse	0.01	Coarse sand[b]	
	f2	0.1	Fine	0.05	Very fine sand[b]	Possible post-1942 floodplain
	Total	19.0				
MCW-1	c1	1.1	Fine	0.06	Coarse silt [b]	Active channel
			Coarse	0.12	Coarse sand	
	c1b	0.6	Fine	0.13	Coarse silt	Area of fine-grained sediment deposition along active channel
			Coarse	0.13	Coarse sand [b]	
	c1br	0.2	n/a	0	n/a	Active channel on bedrock
	c2	2.1	Fine	0.23	Very fine sand	Low abandoned post-1942 channel
			Coarse	0.07	Coarse sand	
	c3	0.0	Fine	0.13	Very fine sand [b]	High abandoned post-1942 channel
			Coarse	0.16	Coarse sand [b]	
	Total	4.0				
MCW-2N	c1	1.7	Fine	0.11	Fine sand	Active channel
			Coarse	0.5	Coarse sand	
	c1b	0.3	Fine	0.25	Fine sand [b]	Area of fine-grained sediment deposition along active channel
			Coarse	0.15	Coarse sand [b]	
	c2	3.5	Fine	0.25	Very fine sand	Abandoned post-1942 channel
			Coarse	0.21	Coarse sand	
	f1	1.6	Fine	0.29	Very fine sand	Post-1942 floodplain
	f2	2.4	Fine	0.15	Coarse silt [b]	Possible post-1942 floodplain
	Total	7.1				
MCW-2W	c1	2.1	Fine	0.04	Very fine sand	Active channel
			Coarse	0.42	Very coarse sand	
	c1b	0.1	Fine	0.07	Very fine sand [b]	Area of fine-grained sediment deposition along active channel
			Coarse	0.4	Very coarse sand [b]	
	c2	2.7	Fine	0.07	Very fine sand	Abandoned post-1942 channel
			Coarse	0.39	Very coarse sand	
	f1	1.2	Fine	0.46	Coarse silt	Post-1942 floodplain
			Coarse	0.04	Coarse sand [b]	
	f2	2.4	Fine	0.15	Coarse silt [b]	Possible post-1942 floodplain
	Total	8.5				
MCW-2E	c1	0.6	Fine	0.11	Medium sand [b]	Active channel
			Coarse	0.29	Coarse sand	

Table B-1.0-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m)[a]	Sediment Facies	Estimated Average Sediment Thickness (m)	Typical Median Particle Size Class (<2 mm fraction)	Notes
	c2	0.6	Fine	0.18	Medium sand	Abandoned post-1942 channel
			Coarse	0.33	Coarse sand [b]	
	f1	7.3	Fine	0.21	Coarse silt	Post-1942 floodplain
			Coarse	0.14	Coarse sand	
	f2	7.4	Fine	0.06	Coarse silt [b]	Possible post-1942 floodplain
	Total	15.9				
TS-1W	c1	1.9	Coarse	0.31	Coarse sand	Active channel
	f1	3.3	Fine	0.23	Coarse silt	Post-1942 floodplain
			Coarse	0.02	Coarse sand [b]	
	Total	5.2				
TS-1C	c1	1.3	Fine	0.3	Coarse silt	Active channel
			Coarse	0.29	Coarse sand	
	c1b	0.3	Fine	0.29	Coarse silt [b]	Area of fine-grained sediment deposition along active channel
			Coarse	0.25	Coarse sand [b]	
	c2	1.6	Fine	0.34	Coarse silt	Abandoned post-1942 channel
			Coarse	0.48	Coarse sand	
	f1	6.6	Fine	0.50	Coarse silt	Post-1942 floodplain
			Coarse	0.09	Coarse sand	
	Total	9.8				
TS-1E	c1	0.9	Fine	0.06	Very fine sand [b]	Active channel
			Coarse	0.38	Coarse sand	
	c1b	0.1	Fine	0.16	Very fine sand [b]	Area of fine-grained sediment deposition along active channel
			Coarse	0.43	Coarse sand [b]	
	c1br	0.1	n/a	0	n/a	Active channel on bedrock
	c1w	0.8	Fine	0.13	Very fine sand	Active channel with willows
			Coarse	0.86	Coarse sand	
	c2	2.4	Fine	0.37	Coarse silt	Abandoned post-1942 channel
			Coarse	0.22	Coarse sand	
	f1	1.2	Fine	0.29	Coarse silt	Post-1942 floodplain
			Coarse	0.09	Coarse sand [b]	
	Total	5.6				
TS-2W	c1	0.3	Fine	0.08	Coarse silt [b]	Active channel
			Coarse	0.55	Coarse sand	
	c1br	0.3	n/a	0	n/a	Active channel on bedrock
	c1w	3.7	Fine	0.34	Coarse silt	Active channel with willows
			Coarse	0.5	Coarse sand	
	c2	3.3	Fine	0.30	Coarse silt	Abandoned post-1942 channel
			Coarse	0.20	Coarse sand	
	Total	7.6				
TS-2C	c1	0.7	Fine	0.07	Coarse silt [b]	Active channel
			Coarse	0.31	Coarse sand	
	c1b	2.6	Fine	0.46	Coarse silt	Broad unincised area along active channel
			Coarse	0.43	Coarse sand	
	c2	1.4	Fine	0.38	Coarse silt	Abandoned post-1942 channel
			Coarse	0.20	Medium sand	
	f1	1.1	Fine	0.35	Coarse silt	Post-1942 floodplain
			Coarse	0.04	Medium sand [b]	
	Total	5.7				
TS-2E	c1	1.1	Fine	0.01	Coarse silt [b]	Active channel
			Coarse	0.42	Coarse sand	
	c1br	0.04	n/a	0	n/a	Active channel on bedrock
	c2	1.1	Fine	0.29	Coarse silt	Abandoned post-1942 channel
			Coarse	0.27	Coarse sand	
	f1	0.7	Fine	0.40	Coarse silt	Post-1942 floodplain
			Coarse	0.05	Coarse sand [b]	

Table B-1.0-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m)[a]	Sediment Facies	Estimated Average Sediment Thickness (m)	Typical Median Particle Size Class (<2 mm fraction)	Notes
	f2	0.03	Fine	0.27	Coarse silt [b]	Possible post-1942 floodplain
	Total	2.9				
TS-3	c1	0.8	Fine	0.06	Coarse silt [b]	Active channel
			Coarse	0.3	Very coarse sand	
	c2	5.8	Fine	0.29	Coarse silt	Abandoned post-1942 channel
			Coarse	0.20	Coarse sand	
	f1	1.1	Fine	0.14	Very fine sand	Post-1942 floodplain
			Coarse	0.05	Coarse sand [b]	
	f2	9.3	Fine + coarse	0.06	Medium sand	Possible post-1942 floodplain
	Total	15.9				

[a] Average unit width is total area of unit in reach divided by reach length

[b] No particle size data from unit; median particle size inferred based on data from other units and field descriptions

[c] n/a = Not applicable.

Table B-1.0-2
Sediment-Thickness Measurements from Mortandad Reaches

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
E-1E	13	S	c3	20	50	E1E-r1	MO-10070
E-1E	13	N	c3	0	50	E1E-r2	-*
E-1E	22	S	f2	31	0	E1E-r3	MO-10071
E-1E	25	N	c3	15	50	E1E-r4	MO-10072
E-1E	37	S	c3	31	50	E1E-r5	MO-10073
E-1E	48	N	c2	28	50	E1E-r6	MO-10074
E-1E	73	S	c1b	20	50	-	-
E-1E	75	N	c2	36	30	-	-
E-1E	86	S	f1	60	0	E1E-r7	MO-00023
E-1E	94	S	c2	14	66	E1E-r8	-
E-1E	95	S	c1b	0	50	E1E-r9	-
E-1E	110	S	f2	9	11	E1E-r10	MO-10076
E-1E	118	N	c3	36	50	E1E-r11	-
E-1E	119	N	c1b	4	50	E1E-r12	MO-10077
E-1E	126	N	c3	25	50	E1E-r13	MO-10078
E-1E	140	S	c1b	10	50	E1E-r14	MO-10079
E-1E	148	N	c3	45	40	E1E-r15	MO-00024
E-1E	156	S	f2	15	0	E1E-r16	MO-10080
E-1E	160	N	c1b	16	50	E1E-r17	-
E-1E	161	N	c3	30	50	E1E-r18	-
E-1E	163	N	f1	46	30	E1E-r19	-
E-1E	180	N	c1b	0	50	E1E-r21	-
E-1E	180	S	c3	32	50	E1E-r20	MO-00025
E-1E	188	N	c2	16	5	E1E-r22	-
E-1E	191	S	c3	33	50	E1E-r23	MO-10082
E-1E	196	-	c1b	11	50	-	-
E-1FW	668	-	c2	22	48	E1FW-s21	MO-22811
E-1FW	679	N	c2	32	30	E1FW-s20	MO-22809
E-1FW	683	-	c1	0	50	E1FW-s19	MO-22808
E-1FW	687	S	c1b	16	24	E1FW-s18	MO-22807
E-1FW	688	N	c2	17	0	E1FW-s16	-
E-1FW	688	S	f1	7	0	E1FW-s17	-
E-1FW	695	-	c1	11	32	E1FW-s15	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
E-1FW	701	S	c2	32	0	E1FW-s14	-
E-1FW	712	S	f1? (c2?)	9	9	E1FW-s13	-
E-1FW	715	-	c1	0	24	E1FW-s12	-
E-1FW	717	S	f1	17	0	E1FW-s11	MO-22806
E-1FW	720	N	f1? (c2?)	26	30	E1FW-s10	-
E-1FW	735	S	c2	14	19	E1FW-s9	-
E-1FW	742	-	c1	0	45	E1FW-s8	-
E-1FW	745	N	c2	28	16	E1FW-s7	MO-22805
E-1FW	752	-	c1	0	27	E1FW-s5	-
E-1FW	753	S	f1	27	11	E1FW-s6	-
E-1FW	758	N	c2	46	9	E1FW-s4	MO-22804
E-1FW	768	N	c2	22	18	E1FW-s3	-
E-1FW	778	N	c2	0	21	E1FW-s2	-
E-1FW	783	-	c1	11	17	E1FW-s1	-
E-1W	222	N	c2w	53	50	E1W-s42	-
E-1W	225	S	c2w	26	60	E1W-s41	MO-22816
E-1W	227	N	c1b	75	60	E1W-s40	-
E-1W	231	N	c1b	11	8	E1W-s39	-
E-1W	235	S	c2	30	50	E1W-s38	-
E-1W	240	N	c2	35	0	E1W-s37	-
E-1W	249	N	c2	104	4	E1W-s34	-
E-1W	249	island	c2	44	50	E1W-s35	-
E-1W	251	S	c1b	26	50	E1W-s33	-
E-1W	258	-	c1	4	50	E1W-s32	-
E-1W	259	N	c2w	90	18	E1W-s31	MO-22814
E-1W	269	-	c1ct	49	26	E1W-s30	MO-22812
E-1W	277	-	c1ct	49	50	E1W-s29	-
E-1W	286	-	c2w	53	32	E1W-s28	-
E-1W	292	-	c1ct	40	50	E1W-s27	-
E-1W	300	-	c1ct	5	50	-	-
E-1W	305	-	c1ct	20	13	-	MO-00029
E-1W	325	-	c1ct	7	12	-	-
E-1W	341	-	c2w	35	12	-	-
E-1W	354	N	c2w	20	50	-	-
E-1W	354	S	c2w	50	0?	-	MO-00028
E-1W	375	N	c1ct	20	0	-	MO-00027
E-1W	375	N	c2	8	22	-	MO-00026
E-1W	380	N	c2	15	4	-	-
E-1W	395	S	c1ct	28	0	-	-
E-1W	396	N	c2	0	5	-	-
E-1W	400	N	c1ct	35	0	-	-
E-1W	400	N	c2	4	17	-	-
E-1W	404	-	c1ct	30	50	E1W-s24	-
E-1W	407	S	f1	13	4	E1W-s26	-
E-1W	410	-	c1ct	40	0	E1W-s23	-
E-1W	412	S	f1	16	24	E1W-s25	-
E-1W	418	-	c1ct	20	50	E1W-s22	-
E-1W	433	-	c1ct	15	50	E1W-s21	-
M-1C	6	N	c2	50	0	M1C-s1	-
M-1C	11	N	c2	13	50	M1C-s2	-
M-1C	19	N	c2	44	0	M1C-s3	MO-22752
M-1C	25	S	c2	14	0	M1C-s4	-
M-1C	35	N	c2	33	50	M1C-s5	-
M-1C	40	S	c2	29	0	M1C-s6	-
M-1C	46	S	c2	32	50	M1C-s7	MO-22753
M-1C	62	S	c2	9	50	M1C-s8	-
M-1C	75	N	c2	19	50	M1C-s9	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-1C	81	N	c2	16	50	M1C-s10	-
M-1C	94	S	c2	0	6	M1C-s11	-
M-1C	108	N	c2w	36	9	M1C-s12	MO-22754
M-1C	118	-	c2w	15	50	M1C-s13	-
M-1C	130	-	c2w	35	50	M1C-s14	MO-22755
M-1C	140	N	c2	18	27	M1C-s15	-
M-1C	141	S	c2	0	> 35	M1C-s16	MO-22756
M-1C	148	-	c1	5	> 22	M1C-s22	MO-22757
M-1C	159	-	c2w	6	> 24	M1C-s17	MO-22758
M-1C	166	-	c2w	23	> 23	M1C-s19	-
M-1C	174	-	c2w	13	> 29	M1C-s18	-
M-1C	183	-	c2	15	50	M1C-s20	MO-22759
M-1C	195	-	c2w	11	> 22	M1C-s21	-
M-1E	-19	-	c1ct	17	50	M1E-s31	-
M-1E	-14	N	c2ct	15	50	M1E-s32	MO-22768
M-1E	-11	-	c1ct	19	> 9	M1E-s33	MO-22769
M-1E	-7	-	c2ct	22	50	M1E-s34	-
M-1E	-1	S	c2	40	0	M1E-s35	-
M-1E	10	N	c2	44	0	M1E-s36	MO-22771
M-1E	14	S	c2	30	0	M1E-s37	-
M-1E	18	N	c2	40	0	M1E-s38	-
M-1E	24	-	c1ct	14	0	M1E-s39	-
M-1E	25	S	c2	35	> 2	-	-
M-1E	30	S	c2	26	> 20	-	-
M-1E	31	-	c1ct	16	0	-	-
M-1E	37	S	c1ct	16	> 5	-	-
M-1E	49	S	c1ct	27	0	-	MO-00004
M-1E	55	N	c2	28	0	-	-
M-1E	56	-	c1	6	24	-	-
M-1E	60	N	c2	15	5	-	-
M-1E	68	-	c1	0	> 33	-	-
M-1E	75	S	c2	30	0	-	MO-00003
M-1E	79	N	c2	19	11	-	-
M-1E	92	N	c1b	9	>10	-	-
M-1E	94	-	c1	0	>6	-	-
M-1E	100	N	c2	17	> 8	-	MO-22772
M-1E	101	-	c1	0	6	-	MO-00002
M-1E	107	S	c2	15	26	-	-
M-1E	115	N	f1	36	0	-	-
M-1E	125	N	f1	41	0	-	MO-00001
M-1E	125	N	f1	28	0	-	-
M-1E	133	S	c2	42	32	-	MO-22773
M-1E	133	N	f1	12	0	-	-
M-1E	145	S	c2	0	> 30	-	-
M-1E	145	S	c3	50	50	-	-
M-1E	150	N	c2	6	39	-	-
M-1E	158	N	c2	11	37	-	-
M-1E	164	S	f1	34	0	-	-
M-1E	171	S	f1	28	12	-	-
M-1E	171	N	f1	27	0	-	MO-22775
M-1W	-12	N	c1b	9	22	M1W-s37	-
M-1W	-9	N	c1b	15	7	M1W-s36	MO-22748
M-1W	27	N	c2	6	31	-	-
M-1W	32	S	c2	19	43	-	-
M-1W	38	S	c2	9	27	-	-
M-1W	43	S	c2	13	> 30	-	-
M-1W	44	-	c1	0	> 10	-	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-1W	47	S	c1b	22	39	-	-
M-1W	50	S	c2	0	33	-	MO-00011
M-1W	55	N	c2	10	27	-	-
M-1W	56	-	c1	6	50	-	-
M-1W	57	S	c1b	0	> 35	-	-
M-1W	65	N	c1b	0	> 26	-	-
M-1W	68	-	c1	0	> 33	-	-
M-1W	68	S	c2	10	> 18	-	MO-00014
M-1W	68	S	c2	0	> 22	-	-
M-1W	75	S	c1b	0	> 35	-	MO-00013
M-1W	83	S	c2	19	> 12	-	-
M-1W	93	S	c1ct	26	0	-	MO-00015
M-1W	94	-	c1	0	> 6	-	-
M-1W	94	N	c1ct	17	68	M1W-s39	-
M-1W	96	N	c1ct	29	31	M1W-s38	MO-22749
M-1W	100	S	c2	0	> 17	-	-
M-1W	121	S	c2	12	> 25	M1W-s21	-
M-1W	123	N	c2	13	> 13	M1W-s22	-
M-1W	125	S	c1b	6	> 31	M1W-s23	-
M-1W	130	S	c2	15	> 16	M1W-s24	-
M-1W	133	N	c2	23	47	M1W-s25	-
M-1W	143	N	c2	12	> 30	M1W-s26	-
M-1W	143	N	f1	11	0	M1W-s27	-
M-1W	147	N	Qc	0	35	M1W-s28	-
M-1W	151	N	c2	10	49	M1W-s29	-
M-1W	155	S	f1	10	0	M1W-s30	-
M-1W	160	S	c2	7	13	M1W-s31	-
M-1W	166	S	c2	0	40	M1W-s32	MO-22750
M-1W	168	N	c2	13	22	M1W-s33	MO-22751
M-1W	169	S	c2	29	26	M1W-s34	-
M-1W	179	N	f1	14	9	M1W-s35	-
M-2E	5	-	c1	0	> 10	-	MO-10048
M-2E	6	N	c2	19	> 27	M2E-r2	MO-10047
M-2E	6	S	f2? (Qt?)	23	0	M2E-r1	-
M-2E	9	N	c3	99	> 31	M2E-r3	-
M-2E	18.5	S	f1g	19	6	M2E-r4	-
M-2E	21	S	c3	47	28	M2E-r5	-
M-2E	32.7	S	c2	14	> 42	M2E-r6	-
M-2E	36	N	c2	20	> 60	M2E-r7	-
M-2E	51.5	S	c3	7	> 61	M2E-r8	-
M-2E	52	N	c2	30	> 20	M2E-r9	-
M-2E	58.5	S	f1g	15	0	M2E-r10	MO-10046
M-2E	68	N	c3	36	> 74	M2E-r11	-
M-2E	77	S	f1g	49	0	M2E-r12	MO-10045
M-2E	85	N	c3	78	> 36	M2E-r13	MO-10044
M-2E	87	S	f1g	11	0	M2E-r15	MO-10043
M-2E	89	S	c3	69	> 26	M2E-r14	-
M-2E	96	S	c1b	20	14	M2E-r16	MO-10042
M-2E	105	N	f1	23	0	M2E-r17	-
M-2E	110	S	f1	47	0	M2E-r18	-
M-2E	118	S	c3	17	> 50	M2E-r19	-
M-2E	131	S	f1g	51	> 29	M2E-r20	MO-10041
M-2E	133	N	f1g	123	6	M2E-r21	MO-10040
M-2E	145	S	c3	5	> 95	M2E-r23	-
M-2E	145	N	f1g	26	0	M2E-r22	-
M-2E	154	S	c1b	31	> 32	M2E-r24	-
M-2E	158	S	f2? (Qt?)	9	0	M2E-r25	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-2E	175	S	f1g	76	0	M2E-r26	-
M-2E	179	N	f1g	50	16	M2E-r27	MO-10039
M-2E	185	S	c2	13	50	M2E-r52	-
M-2E	188	N	c2	4	> 58	M2E-r28	-
M-2E	191	N	f2? (Qt?)	31	0	M2E-r29	-
M-2E	200	-	c1	0	> 10	-	MO-10038
M-2E	200	N	f1g	48	8	M2E-r30	-
M-2E	209	N	f1	43	0	M2E-r31	MO-10037
M-2E	210	N	f1g	65	0	M2E-r32	-
M-2E	227	S	c2	15	> 30	M2E-r33	-
M-2E	239	S	c1b	0	> 40	M2E-r34	MO-10036
M-2E	242	N	c3	15	28	M2E-r35	-
M-2E	272	N	c1b	7	> 49	M2E-r36	-
M-2E	281	S	f1g	10	0	M2E-r37	MO-10035
M-2E	302	S	c2	8	> 44	M2E-r38	MO-10034
M-2E	310	N	f2? (Qt?)	33	0	M2E-r39	-
M-2E	320	N	f1	12	0	M2E-r40	-
M-2E	322	N	c1b	40	> 0	M2E-r41	-
M-2E	334	N	c3	40	> 38	M2E-r42	MO-10033
M-2E	342	N	c2	8	28	M2E-r43	-
M-2E	353	S	f1	30	0	M2E-r44	MO-10032
M-2E	357	N	c2	14	> 86	M2E-r45	-
M-2E	376	N	f1g	23	0	M2E-r46	MO-10031
M-2E	385	S	c3	20	24	M2E-r47	MO-10030
M-2E	386	N	f1	26	0	M2E-r48	MO-10029
M-2E	390	-	c1	0	> 10	-	MO-10028
M-2E	396	N	f1	23	0	M2E-r49	MO-10027
M-2E	398	S	f1g	29	0	M2E-r50	-
M-2E	401	N	f1g	60	0	M2E-r51	-
M-2W	12	N	c3	28	> 37	M2W-r59	-
M-2W	19	S	c2	73	> 10	M2W-r58	-
M-2W	55	N	Qt	0	0	M2W-r57	-
M-2W	72	N	c2	10	> 8	M2W-r56	MO-10068
M-2W	75	S	c2	58	> 42	M2W-r55	-
M-2W	84	S	f2	40	0	M2W-r60	-
M-2W	97	S	c3	50	> 17	M2W-r54	MO-00021
M-2W	119	-	c1	0	> 14	-	MO-00020
M-2W	136	S	c3	40	> 20	M2W-r53	MO-10067
M-2W	137	-	c1	0	37	M2W-r52	-
M-2W	138	N	c3	32	> 28	M2W-r51	MO-00019
M-2W	155	S	f1	37	0	M2W-r49	-
M-2W	155	-	c1	0	40	M2W-r50	-
M-2W	160	S	f1	88	0	M2W-r48	MO-10066
M-2W	171	S	c1b	13	> 37	M2W-r47	-
M-2W	171	S	Qt	0	0	M2W-r46	-
M-2W	183	-	c1	0	65	M2W-r44	-
M-2W	183	N	f2	35	0	M2W-r45	-
M-2W	188	S	c1b	10	> 26	M2W-r43	MO-10065
M-2W	217	N	f2	37	0	M2W-r42	MO-10064
M-2W	223	N	f1	56	> 42	M2W-r41	-
M-2W	250	-	c1	0	50	M2W-r40	-
M-2W	250	N	c1b	39	22	M2W-r39	-
M-2W	275	S	c3	10	> 22	M2W-r37	MO-00018
M-2W	276	-	c1	0	50	M2W-r36	-
M-2W	276	N	c3	20	> 42	M2W-r35	-
M-2W	280	S	Qt	0	0	M2W-r38	-
M-2W	295	S	c2	9	> 63	M2W-r34	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-2W	300	N	c3	74	> 42	M2W-r33	MO-00017
M-2W	312	S	Qt	0	0	M2W-r1	-
M-2W	326	S	f1	52	23	M2W-r2	-
M-2W	334	S	c2	40	> 40	M2W-r3	MO-10063
M-2W	357	S	c3	60	> 27	M2W-r4	MO-10062
M-2W	362	S	c2	28	> 28	M2W-r5	-
M-2W	370	N	f1g	42	18	M2W-r6	MO-10061
M-2W	377	N	f1g	61	30	M2W-r8	-
M-2W	378	S	f1	24	0	M2W-r7	MO-10060
M-2W	383	N	c2	15	45	M2W-r9	-
M-2W	401	S	f1g	55	10	M2W-r10	MO-10059
M-2W	413	N	f1g	77	33	M2W-r11	MO-10058
M-2W	423	S	f1	69	34	M2W-r12	-
M-2W	447	N	c1b	7	> 18	M2W-r13	-
M-2W	454	N	f1	40	22	M2W-r16	-
M-2W	455	S	f1	49	17	M2W-r14	MO-10057
M-2W	456	N	c2	24	> 46	M2W-r15	-
M-2W	475	S	c2	17	26	M2W-r17	-
M-2W	475	N	f1	18	0	M2W-r18	MO-10056
M-2W	491	S	f1	38	0	M2W-r19	MO-10055
M-2W	496	N	c3	34	> 80	M2W-r20	MO-10054
M-2W	500	N	c3	37	14	M2W-r21	-
M-2W	502	S	f1	48	0	M2W-r22	-
M-2W	507	S	c2	21	12	M2W-r23	-
M-2W	527	N	f1	85	0	M2W-r24	-
M-2W	530	S	c2	62	50	M2W-r25	MO-10051
M-2W	540	N	c2	41	> 9	M2W-r26	MO-10053
M-2W	544	N	c1b	0	> 53	M2W-r27	MO-10052
M-2W	560	N	c2	34	> 49	M2W-r28	-
M-2W	560	N	f1	10	> 10	M2W-r29	-
M-2W	581	S	c2	21	37	M2W-r30	-
M-2W	586	S	f2	17	0	M2W-r31	-
M-2W	591	N	c1b	17	> 28	M2W-r32	MO-10050
M-3	148	N	f2	17	44	M3-r154	-
M-3	148	N	c2	16	>44	M3-r155	-
M-3	153	S	f2	34	7	M3-r153	-
M-3	166	N	f1	12	0	M3-r157	-
M-3	177	S	f1	21	0	M3-r156	-
M-3	200	N	f1	75	0	M3-r84	MO-10120
M-3	200	N	f1	20	0	M3-r85	MO-10121
M-3	202	S	f1	22	0	M3-r82	-
M-3	203	S	c2	30	16	M3-r83	-
M-3	217	N	f1	34	19	M3-r81	-
M-3	250	S	c3	50	19	M3-r80	-
M-3	257	N	f2	29	0	M3-r79	-
M-3	272	N	c3	17	27	M3-r78	-
M-3	280	N	f1	9	0	M3-r77	-
M-3	281	N	c2	11	>69	M3-r76	MO-10118
M-3	302	N	f1	26	15	M3-r75	MO-10117
M-3	306	N	c2	15	>40	M3-r74	MO-10116
M-3	315	S	c3? (f1?)	30	40	M3-r73	-
M-3	320	S	c2	0	>55	M3-r72	MO-10115
M-3	343	N	f1	31	0	M3-r71	-
M-3	345	S	c2	18	38	M3-r69	-
M-3	348	S	c3? (f1?)	14	17	M3-r68	-
M-3	353	N	c2	0	>50	M3-r70	-
M-3	375	S	f2	25+	0	M3-r67	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-3	381	S	f1	15	0	M3-r66	-
M-3	420	N	c3? (c2?)	13	19	M3-r65	-
M-3	422	N	c2	9	71	M3-r64	-
M-3	425	S	c2	6	38	M3-r62	-
M-3	425	S	f1	44	0	M3-r63	MO-10114
M-3	443	N	c2	8	>82	M3-r60	-
M-3	452	S	c2	11	>59	M3-r58	-
M-3	454	N	c3? (f1?)	15	26	M3-r8	MO-00067
M-3	454	S	f1	22	0	M3-r59	-
M-3	457	N	f1	66	0	M3-r61	-
M-3	471	N	c3	46	16	M3-r107	-
M-3	502	S	c2	15	>55	M3-r55	-
M-3	504	N	c2	31	19	M3-r56	-
M-3	505	N	f1	48	22	M3-r57	-
M-3	522	N	c3	24	34	M3-r151	-
M-3	523	N	c3a	43	21	M3-r152	-
M-3	534	N	c3	46	14	M3-r11	-
M-3	538	N	c3	44	31	M3-r9	MO-00068
M-3	540	S	c2a	36	36	M3-r52	-
M-3	543	N	c2a	36	14	M3-r54	-
M-3	544	S	c3	39	11	M3-r51	-
M-3	550	N	f1	45	0	M3-r53	MO-10113
M-3	555	N	f1	82	0	M3-r10	-
M-3	573	N	c3	0	37	M3-r150	-
M-3	575	S	c3	12	33	M3-r149	-
M-3	595	N	c3a	27	50	M3-r148	-
M-3	596	S	f1	12	0	M3-r147	-
M-3	600	N	f1	18	0	M3-r50	-
M-3	602	S	c3a	40	60	M3-r47	MO-10112
M-3	604	-	c1	0	>45	M3-r49	-
M-3	611	S	f1	28	10	M3-r48	-
M-3	618	S	c3a	35	35	M3-r146	-
M-3	627	S	c2	17	26	M3-r144	-
M-3	635	S	f1	21	0	M3-r143	-
M-3	646	S	c3	12	15	M3-r145	-
M-3	650	N	c2a	28	13	M3-r45	MO-10111
M-3	650	N	f1	15	0	M3-r46	-
M-3	653	S	c1g	8	14	M3-r44	-
M-3	653	S	c3	40	50	M3-r142	-
M-3	665	S	c3	17	26	M3-r43	MO-10110
M-3	675	S	c1g	12	>42	M3-r38	-
M-3	675	S	f1a	43	7	M3-r140	-
M-3	676	S	c2	24	3	M3-r141	-
M-3	688	S	c3	0	17	M3-r37	-
M-3	695	S	c3	58	21	M3-r1	MO-00069
M-3	695	N	c3	33	28	M3-r42	-
M-3	698	N	c2	12	13	M3-r41	-
M-3	700	-	c1	13	>37	M3-r40	-
M-3	703	S	c2	0	20	M3-r39	-
M-3	725	S	c3a	33	61	M3-r105	-
M-3	727	S	c1g	36	57	M3-r106	-
M-3	731	S	f1	25	0	M3-r136	-
M-3	739	S	f1	16	0	M3-r138	-
M-3	740	N	c3	8	11	M3-r33	-
M-3	741	S	f1	9	9	M3-r137	-
M-3	750	N	c2	16	0	M3-r32	MO-10109
M-3	750	S	c3a	34	50	M3-r35	MO-10108

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-3	752	S	c2	40	>33	M3-r34	-
M-3	752	S	f1	6	0	M3-r36	MO-10107
M-3	763	S	f1a	75	47	M3-r3	MO-00070
M-3	767	S	c3a	32	62	M3-r135	-
M-3	770	S	f1	11	0	M3-r134	-
M-3	775	S	f1	9	0	M3-r133	-
M-3	783	S	f1	8	0	M3-r104	-
M-3	783	S	f1a	50	10	M3-r2	MO-10106
M-3	785	S	f1	7	0	M3-r103	-
M-3	786	S	c3a	35	38	M3-r139	-
M-3	786	S	f1	4	0	M3-r132	-
M-3	793	S	c3	35	35	M3-r102	-
M-3	800	S	f1	16	0	M3-r28	-
M-3	800	S	f1a	14	0	M3-r27	-
M-3	801	-	c1	0	>55	M3-r29	MO-10105
M-3	802	N	f1	8	0	M3-r30	MO-10104
M-3	805	S	c1g	56	>27	M3-r31	MO-10103
M-3	805	S	c3	0	20	M3-r98	-
M-3	813	S	f1	27	13	M3-r97	-
M-3	814	S	c3	0	16	M3-r131	-
M-3	815	S	f1	15	7	M3-r127	-
M-3	818	S	f1	28	0	M3-r129	-
M-3	819	S	f2? (Qt?)	35	>15	M3-r130	-
M-3	824	S	f1	0	24	M3-r126	-
M-3	840	S	c3	10	27	M3-r13	MO-00072
M-3	840	S	c3	17	12	M3-r26	-
M-3	843	S	c3	28	28	M3-r128	-
M-3	843	S	f1	15	0	M3-r93	MO-10102
M-3	845	S	c3	9	10	M3-r25	-
M-3	848	-	c1b over c3	47	33	M3-r24	MO-10101
M-3	848	S	f1	20	0	M3-r94	-
M-3	850	S	c3	14	7	M3-r12	-
M-3	856	-	c1b over c3	25	32	M3-r101	-
M-3	856	S	f1	46	16	M3-r95	-
M-3	858	S	c3	24	23	M3-r123	-
M-3	860	S	f1	8	0	M3-r92	-
M-3	865	S	f2? (Qt?)	26	>24	M3-r110	-
M-3	870	S	f1	34	12	M3-r22	MO-10100
M-3	870	S	f1	25	6	M3-r96	-
M-3	871	S	Qt (TS-3 fan)	10	7	M3-r109	-
M-3	873	S	f1	19	0	M3-r108	-
M-3	875	S	c3	6	77	M3-r6	MO-00073
M-3	881	S	c3 swale	15	17	M3-r122	-
M-3	887	S	c3	0	37	M3-r114	-
M-3	887	S	c3	19	12	M3-r115	-
M-3	895	S	c3	27	58	M3-r5	-
M-3	896	S	c3	25	33	M3-r7	MO-00074
M-3	900	-	c1b over c3	5	65	M3-r21	-
M-3	900	S	f1	22	0	M3-r23	-
M-3	906	S	c3 swale	23	30	M3-r124	MO-23336
M-3	912	S	f1	36	0	M3-r100	-
M-3	918	S	c3	5	25	M3-r120	-
M-3	920	S	f1	19	0	M3-r91	MO-10099
M-3	922	S	c3	12	27	M3-r119	-
M-3	925	-	c1b over c3	68	>16	M3-r4	MO-00075
M-3	925	S	f1	8	0	M3-r90	-
M-3	930	S	f1	46	0	M3-r121	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-3	935	S	c3?(f2?)	40	45	M3-r125	-
M-3	938	S	f1	26	0	M3-r99	-
M-3	945	S	c3	0	100	M3-r19	-
M-3	948	S	c1b over c3(?)	79	0	M3-r20	-
M-3	950	S	f1	38	0	M3-r113	-
M-3	950	S	f2? (Qt?)	7	0	M3-r89	-
M-3	951	N	c3	11	9	M3-r111	-
M-3	958	S	Qt	18	0	M3-r86	-
M-3	960	S	f1	52	12	M3-r18	MO-10098
M-3	965	S	c2	7	>47	M3-r118	-
M-3	966	S	f2? (Qt?)	7	>53	M3-r117	-
M-3	967	S	c2	28	>52	M3-r87	-
M-3	970	S	f2? (Qt?)	38	0	M3-r88	-
M-3	974	S	f1	9	0	M3-r17	-
M-3	985	S	f2? (Qt?)	22+	0	M3-r116	-
M-3	987	N	c3	15	18	M3-r112	-
M-3	993	-	c1 (TS channel)	0	>65	M3-r16	-
M-3	995	S	c2	46	56	M3-r14	-
M-3	996	S	c2	58	>22	M3-r15	-
M-4	13	-	c1	8	34	M4-r89	MO-10157
M-4	14	N	c3 + f1	30	0	M4-r88	-
M-4	15	N	c3 + f1	11	0	M4-r87	MO-10158
M-4	20	S	c3 + f1	33	0	M4-r82	MO-10156
M-4	30	N	c3a	18	44	M4-r14	MO-00076
M-4	35	S	c3 + f1	22	11	M4-r83	-
M-4	46	N	c3 + f1	20	0	M4-r15	-
M-4	54	S	c3a	33	0	M4-r16	-
M-4	57	S	c3 + f1	23	0	M4-r84	-
M-4	67	S	c3 + f1	28	5	M4-r86	MO-10155
M-4	68	S	c3 + f1	24	19	M4-r85	-
M-4	80	-	c1t	0	35	M4-r12	MO-00077
M-4	80	-	c1t	3	27	M4-r90	MO-10154
M-4	85	-	c1t	13	0	M4-r91	MO-10153
M-4	95	-	c1t	8	0	M4-r13	MO-00078
M-4	100	S	c3a	17	17	M4-r92	-
M-4	133	N	c2	41	21	M4-r93	MO-10152
M-4	133	N	c2/c2t?	38	0	M4-r94	-
M-4	155	N	c2	26	0	M4-r81	MO-10151
M-4	165	N	c3 + f1	0	5	M4-r76	-
M-4	165	S	c3a + f1a	36	6	M4-r80	MO-10150
M-4	167	S	c2/c2t	>53	47	M4-r10	-
M-4	174	N	c2/c2t	19	28	M4-r77	-
M-4	175	S	c2/c2t	7	83	M4-r78	MO-10149
M-4	176	N	f2? (Qt?)	0	0	M4-r75	-
M-4	182	S	c3a + f1a	59	41	M4-r79	-
M-4	186	N	c3 + f1	7	6	M4-r74	MO-10148
M-4	188	S	c1/c2t	>150	0	M4-r11	MO-00079
M-4	200	N	c3a + f1a	14	0	M4-r73	-
M-4	201	S	c3a + f1a	50	55	M4-r1	MO-00080
M-4	205	S	c3a + f1a	15	47	M4-r2	-
M-4	217	N	c1t	0	29	M4-r72	MO-10147
M-4	220	N	c1t	13	0	M4-r71	MO-10146
M-4	270	S	c3a + f1a	23	27	M4-r3	MO-10143
M-4	274	N	c3 + f1	63	0	M4-r68	-
M-4	275	S	c3a + f1a	20	0	M4-r9	-
M-4	280	N	c1t	0	0	M4-r67	MO-10145
M-4	280	S	c3a + f1a	17	0	M4-r4	MO-10142

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-4	291	N	c3a + f1a	26	34	M4-r17	MO-00081
M-4	298	N	c3 + f1	9	0	M4-r69	-
M-4	298	N	c3a + f1a	48	0	M4-r70	MO-10144
M-4	300	S	c3 + f1	30	0	M4-r20	MO-10141
M-4	300	S	c3 + f1	57	13	M4-r24	-
M-4	305	-	c3 + f1	0	0	M4-r22	-
M-4	305	S	c3a + f1a	10	40	M4-r23	-
M-4	310	S	c3 + f1	18	49	M4-r25	-
M-4	310	S	Qc	0	0	M4-r26	-
M-4	316	S	c3 + f1	30	15	M4-r21	-
M-4	324	S	c3 + f1	45	24	M4-r18	MO-00082
M-4	333	S	c3 + f1	28	10	M4-r8	-
M-4	348	N	c3 + f1	36	14	M4-r27	-
M-4	352	S	c3 + f1	0	24	M4-r29	MO-10140
M-4	353	S	c3 + f1	37	38	M4-r30	-
M-4	354	N	c3 + f1	40	6	M4-r28	-
M-4	360	S	c3 + f1	37	0	M4-r31	-
M-4	366	S	c3 + f1	4	30	M4-r32	MO-10139
M-4	367	S	c3 + f1	50	0	M4-r33	-
M-4	371	N	c3a + f1a	54	0	M4-r6	MO-00083
M-4	398	N	c3a + f1a	20	0	M4-r36	-
M-4	400	S	c3 + f1	15	0	M4-r66	MO-10138
M-4	400	S	f2? (Qt?)	8	7	M4-r34	-
M-4	402	S	c3a + f1a	15	0	M4-r35	-
M-4	406	N	c3a + f1a	31	0	M4-r5	MO-00084
M-4	440	N	f1	21	0	M4-r37	MO-10137
M-4	446	S	f2? (Qt?)	0	22	M4-r64	-
M-4	447	S	c3 + f1	19	4	M4-r65	-
M-4	450	N	f2? (Qt?)	0	0	M4-r62	MO-10136
M-4	450	S	f2? (Qt?)	0	19	M4-r63	MO-10134
M-4	451	S	c3 + f1	18	0	M4-r38	MO-10135
M-4	455	S	c1g	0	32	M4-r39	-
M-4	500	S	c1g	10	0	M4-r61	-
M-4	500	S	c2a	13	4	M4-r59	MO-10132
M-4	500	N	c3 + f1	15	0	M4-r56	MO-10133
M-4	500	N	f1	37	0	M4-r58	-
M-4	500	N	f2? (Qt?)	0	0	M4-r57	-
M-4	500	S	f2? (Qt?)	35	0	M4-r60	-
M-4	506	N	c3 + f1	24	0	M4-r7	MO-00085
M-4	550	-	c1g	41	0	M4-r54	MO-10129
M-4	550	N	c3 + f1	36	0	M4-r51	MO-10130
M-4	550	N	f1	30	0	M4-r53	MO-10131
M-4	550	N	f2? (Qt?)	7	0	M4-r52	-
M-4	550	S	f2? (Qt?)	0	0	M4-r55	MO-10128
M-4	585	N	c3 + f1	33	0	M4-r19	MO-00086
M-4	600	-	c1g	0	13	M4-r50	-
M-4	600	N	c3 + f1	8	0	M4-r47	-
M-4	600	N	f1	21	0	M4-r49	-
M-4	600	N	f2? (Qt?)	10	0	M4-r48	-
M-4	650	N	c1g	33	0	M4-r40	MO-10124
M-4	650	-	c1g	13	>27	M4-r46	MO-10122
M-4	650	N	c3 + f1	0	14	M4-r41	MO-10125
M-4	650	N	f1	20	0	M4-r44	MO-10127
M-4	650	N	f2? (Qt?)	20	0	M4-r42	MO-10126
M-4	650	N	f2? (Qt?)	10	0	M4-r43	-
M-4	650	N	f2? (Qt?)	0	0	M4-r45	MO-10123
M-5E	265	-	c1	8	29	-	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-5E	265	E	c2	29	21	-	MO-10013
M-5E	277	-	c1	>4	>5	-	MO-22791
M-5E	295	N	c2	6	33	-	-
M-5E	295	S	c2	7	13	-	-
M-5E	306	N	c2	25	?	-	MO-22792
M-5E	345	-	c1	0	50	-	MO-10012
M-5E	345	S	c2	15	32	-	-
M-5E	393	N	c2	0	18	-	MO-22795
M-5E	395	-	c1	11	41	-	MO-10011
M-5E	395	N	c2	10	16	-	-
M-5E	422	N	c2	0	13	-	MO-22787
M-5E	447	S	c2	10	0	-	MO-10010
M-5E	447	-	Qal	23	0	-	-
M-5E	451	-	c1	4	48	-	-
M-5E	475	N	c2	60	50	-	MO-10009
M-5E	487	S	f2? (Qt?)	76	50	-	MO-22796
M-5E	503	-	c1	14	50	-	MO-00087
M-5E	517	N	c2	23	50	-	MO-00088
M-5E	525	-	c1	10	50	-	-
M-5E	525	N	c2? f1?	67	0	-	-
M-5E	544	-	c1	44	24	-	-
M-5E	588	N	c2	77	0	-	MO-22790
M-5E	600	N	f1? (f2?)	59	6	-	MO-22794
M-5E	625	S	c2	25	0	-	MO-00089
M-5E	648	S	c2	26	0	-	-
M-5E	650	N	f1? (f2?)	29	0	-	MO-22789
M-5E	673	S	c2	28	0	-	-
M-5E	674	S	c2	37	0	-	MO-00090
M-5E	704	S	c2	12	70	-	-
M-5E	705	-	c1	25	50	-	-
M-5E	705	N	f2? (f1?)	38	0	-	-
M-5E	723	S	c2	31	50	-	-
M-5E	725	-	c1	26	50	-	MO-00091
M-5E	739	-	c1	24	50	-	MO-22793
M-5E	739	S	c2	35	50	-	-
M-5E	742	N	c2	0	24	-	MO-22788
M-5E	775	S	c2	12	50	-	MO-00092
M-5W	13	S	f1	25	0	M5W-s1	MO-22760
M-5W	16	N	f1	26	0	M5W-s2	MO-22761
M-5W	26	N	f1	29	0	M5W-s3	MO-22762
M-5W	30	S	f1	37	0	M5W-s4	MO-22763
M-5W	73	-	c1	33	23	M5W-s5	-
M-5W	83	-	c1	32	15	M5W-s6	MO-22764
M-5W	120	-	c1	13	26	M5W-s7	-
M-5W	139	-	c1	22	50	M5W-s8	-
M-5W	162	-	c1	39	12	M5W-s9	MO-22765
M-5W	179	-	c1	11	50	M5W-s10	-
M-5W	201	-	c1	0	43	M5W-s11	-
M-5W	211	S	c2	0	55	M5W-s12	MO-22766
M-5W	217	S	c2	0	68	M5W-s13	-
M-5W	228	-	c1	0	45	M5W-s14	MO-22767
M-5W	247	-	c1	8	41	M5W-s15	-
M-5W	249	-	c1g	13	34	M5W-s16	-
M-6	3	-	c1	0	50	M6-s3	-
M-6	7	NE	f1	51	0	M6-s2	MO-03-21422
M-6	11	NE	c2	39	50	M6-s1	MO-03-21420
M-6	46	SW	f1	37	0	M6-s4	MO-22786

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
M-6	57	NE	f1	19	0	M6-s6	-
M-6	62	SW	c2	29	21	M6-s5	-
M-6	67	-	c1	0	46	M6-s8	MO-03-21419
M-6	70	SW	f1	58	0	M6-s7	-
M-6	90	NE	c2	24	0	M6-s9	MO-03-21418
M-6	91	SW	f1	23	0	M6-s12	MO-03-21417
M-6	93	NE	f1	21	0	M6-s10	MO-22785
M-6	98	SW	f1	18	0	M6-s11	MO-22784
M-6	115	SW	f1	34	0	M6-s15	-
M-6	115	SW	f1	40	11	M6-s16	-
M-6	121	NE	c2	38	0	M6-s13	-
M-6	122	-	c1	0	46	M6-s14	-
M-6	146	SW	f1	46	0	M6-s18	MO-03-21415
M-6	150	NE	c2	48	50	M6-s17	-
M-6	175	SW	f1	49	0	M6-s21	-
M-6	176	-	c1	4	45	M6-s20	MO-22783
M-6	192	SW	c2	11	51	M6-s19	-
MCW-1	5	N	c2	17	0	MCW1-s1	-
MCW-1	12	S	c2	23	5	MCW1-s2	MO-03-21425
MCW-1	25	-	c1	0	30	MCW1-s3	-
MCW-1	39	S	c2	28	0	MCW1-s4	-
MCW-1	50	S	c2	15	7	MCW1-s5	-
MCW-1	66	S	c2	31	10	MCW1-s6	-
MCW-1	75	N	c3	10	25	MCW1-s7	-
MCW-1	84	N	c2	28	20	MCW1-s8	MO-03-21427
MCW-1	90	S	c1b	18	30	MCW1-s9	-
MCW-1	108	-	c1	3	14	MCW1-s10	-
MCW-1	115	S	c2	20	14	MCW1-s11	MO-03-21429
MCW-1	127	N	c2	17	18	MCW1-s12	-
MCW-1	154	N	c2	24	0	MCW1-s13	-
MCW-1	168	S	c2	18	0	MCW1-s14	-
MCW-1	173	-	c1	21	21	MCW1-s16	-
MCW-1	183	N	c1b	13	4	MCW1-s15	MO-03-21430
MCW-1	216	-	c1	1	19	MCW1-s17	-
MCW-1	235	-	c1	0	16	MCW1-s18	MO-03-21432
MCW-1	239	N	c1b	9	5	MCW1-s19	-
MCW-2E	3	N	c2	19	15	MCW2-s22	-
MCW-2E	5	-	c1	13	15	MCW2-s23	-
MCW-2E	37	S	f1	12	0	MCW2-s24	-
MCW-2E	63	N	f2	6	0	MCW2-s25	-
MCW-2E	69	N	f1	30	0	MCW2-s26	MO-03-21454
MCW-2E	90	-	f1 swale	20	50	MCW2-s27	MO-03-21456
MCW-2E	95	N	f1	20	0	MCW2-s28	MO-03-21457
MCW-2E	114	N	f1	21	19	MCW2-s29	MO-03-21458
MCW-2E	140	S	c2	16	50	MCW2-s30	MO-03-21459
MCW-2E	143	-	c1	19	50	MCW2-s31	-
MCW-2E	183	S	c2	19	13	MCW2-s32	-
MCW-2E	185	-	c1	0	21	MCW2-s33	MO-03-21460
MCW-2E	195	N	c2	27	9	MCW2-s34	-
MCW-2N	5	S	c2	16	0	MCW2-s7	-
MCW-2N	25	N	c2	8	50	MCW2-s8	MO-03-21442
MCW-2N	40	-	c1	0	50	MCW2-s9	MO-03-21441
MCW-2N	45	S	c2	15	16	MCW2-s13	-
MCW-2N	60	N	c1b	25	15	MCW2-s10	-
MCW-2N	69	S	f1	18	0	MCW2-s11	-
MCW-2N	79	S	c2	27	10	MCW2-s12	-
MCW-2N	90	N	c2	33	50	MCW2-s14	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
MCW-2N	95	S	f1	25	0	MCW2-s15	MO-03-21440
MCW-2N	100	-	c1	0	50	MCW2-s16	-
MCW-2N	117	N	f1? (c2?)	33	0	MCW2-s17	-
MCW-2N	135	S	c2	44	0	MCW2-s18	MO-03-21438
MCW-2N	155	N	f1 swale	41	0	MCW2-s19	MO-03-21436
MCW-2N	155	N	f1? (f2?)	28	0	MCW2-s35	-
MCW-2N	160	-	c1	25	50	MCW2-s20	MO-03-21435
MCW-2N	171	N	c2	30	21	MCW2-s21	-
MCW-2W	11	N	c2	15	50	MCW2-s1	MO-03-21445
MCW-2W	19	-	c1	0	34	MCW2-s2	-
MCW-2W	36	S	c2	1	17	MCW2-s3	MO-03-21447
MCW-2W	44	S	c2? (f1?)	6	50	MCW2-s4	MO-03-21448
MCW-2W	64	N	f1? (f2?)	46	4	MCW2-s5	MO-03-21449
MCW-2W	70	-	c1	7	50	MCW2-s6	MO-03-21451
TS-1C	201	S	c2	38	34	TS1C-s15	MO-22826
TS-1C	212	N	c2	8	23	-	50-6520
TS-1C	212	S	f1 + c2	34	6	-	50-6522
TS-1C	225	N	c2	41	54	TS1C-s14	MO-25218
TS-1C	228	N	c2	58	30	-	-
TS-1C	243	-	c1	22	36	TS1C-s13	50-6524
TS-1C	243	N	f1 + c2	26	0	-	50-6523
TS-1C	248	S	c2	20	85	TS1C-s12	-
TS-1C	254	N	c1b	24	46	TS1C-s11	-
TS-1C	263	N	c2	37	63	TS1C-s10	-
TS-1C	276	N	c2	40	10	-	-
TS-1C	278	S	f1 + c2	54	21	-	50-6528
TS-1C	281	N	f1 + c2	118	9	TS1C-s9	-
TS-1C	287	-	c1	0	27	TS1C-s8	-
TS-1C	310	N	c1b	16	8	TS1C-s7	-
TS-1C	310	N	f1 + c2	21	9	-	-
TS-1C	310	S	f1 + c2	12	10	-	50-6531
TS-1C	310	N	f1 + c2	0	0	-	50-6529
TS-1C	316	N	f1 + c2	107	21	TS1C-s6	MO-25222
TS-1C	323	N	f1 + c2	51	0	-	-
TS-1C	326	N	f1 + c2	49	0	-	-
TS-1C	330	N	f1 + c2	86	14	-	MO-00065
TS-1C	340	-	c1	57	13	TS1C-s5	MO-22828
TS-1C	340	S	f1 + c2	24	6	-	-
TS-1C	340	S	f1 + c2	14	0	-	50-6534
TS-1C	340	N	f1 + c2	110	20	-	-
TS-1C	340	N	f1 + c2	75	25	-	50-6532
TS-1C	348	S	c1b	27	19	TS1C-s4	-
TS-1C	361	N	f1 + c2	81	7	TS1C-s3	MO-22829
TS-1C	370	N	f1 + c2	40	0	-	50-6535
TS-1C	370	S	f1 + c2	4	0	-	50-6537
TS-1C	380	N	c1b	48	27	TS1C-s2	-
TS-1C	383	-	c1	39	41	TS1C-s1	MO-00066
TS-1C	395	N	f1 + c2	35	24	-	-
TS-1C	401	N	f1 + c2	15	0	-	50-6538
TS-1C	401	S	f1 + c2	63	11	-	50-6540
TS-1C	411	N	f1	>56	>6	-	-
TS-1C	429	N	f1 + c2	46	0	-	-
TS-1C	436	N	f1 + Qf	34	7	-	50-6541
TS-1E	603	N	c2	28	>40	-	-
TS-1E	636	N	f1	5	0	-	-
TS-1E	639	S	c2	11	>84	-	-
TS-1E	650	-	c1	0	30	TS1E-s7	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
TS-1E	650	S	c2	66	>18	-	MO-00053
TS-1E	655	N	f1	57	19	-	MO-22835
TS-1E	672	S	c2	33	34	-	-
TS-1E	674	N	c2	39	8	-	-
TS-1E	697		c1b	34	>53	-	-
TS-1E	700	N	c2	36	31	-	MO-22833
TS-1E	701	S	f1	45	5	-	-
TS-1E	716	S	f1	26	5	-	-
TS-1E	716	N	f1	50	10	-	-
TS-1E	725	-	c1	22	36	TS1E-s6	MO-25212
TS-1E	725	N	c2	56	42	-	-
TS-1E	726	N	c1b	11	13	-	-
TS-1E	728	S	f1	6	4	-	-
TS-1E	738	S	c2	36	9	-	-
TS-1E	740	S	c1b	17	>68	-	-
TS-1E	761	N	f1	21	20	-	MO-00054
TS-1E	767	S	f1	19	17	-	-
TS-1E	773	S	f1	26	8	-	-
TS-1E	776	N	c2	58	20	-	-
TS-1E	790	S	f1	63	9	-	-
TS-1E	797	N	f1	49	17	-	-
TS-1E	800	-	c1	0	7	TS1E-s5	-
TS-1E	800	N	f1	55	15	-	-
TS-1E	813	N	c2	12	13	-	-
TS-1E	821	S	c2	32	10	-	-
TS-1E	825	N	c2	26	3	-	-
TS-1E	840	S	c2 (f1?)	17	6	-	-
TS-1E	849	N	c2	15	8	-	-
TS-1E	850	S	f1	5	0	-	-
TS-1E	852	N	c1b	2	37	-	-
TS-1E	875	-	c1	0	77	TS1E-s4	-
TS-1E	875	N	c2	29	13	-	-
TS-1E	902	S	c2	52	36	-	-
TS-1E	907	N	f1	3	0	-	-
TS-1E	910	N	c2	67	23	-	-
TS-1E	925	N	c2	46	0	-	-
TS-1E	925	S	c2	53	>17	-	-
TS-1E	925	S	f1	6	0	-	-
TS-1E	943	-	c1w	2	48	-	-
TS-1E	950	-	c1w	2	108	TS1E-s3	MO-00055
TS-1E	962	-	c1w	34	86	TS1E-s2	MO-25216
TS-1E	975	-	c1w	15	100	TS1E-s1	MO-22832
TS-1W	67	N	f1	19	0	TS1W-s1	-
TS-1W	67	S	f1	14	15	TS1W-s2	-
TS-1W	75	-	c1	0	25	TS1W-s3	-
TS-1W	76	N	f1	32	0	TS1W-s4	MO-22818
TS-1W	84	S	f1	29	0	TS1W-s5	-
TS-1W	91	N	f1	34	0	TS1W-s6	-
TS-1W	94	-	c1	0	10	TS1W-s7	-
TS-1W	98	S	f1	17	0	TS1W-s8	MO-22819
TS-1W	106	N	f1	16	0	TS1W-s9	-
TS-1W	110	S	f1	18	0	TS1W-s10	-
TS-1W	114	-	c1	0	25	TS1W-s11	MO-22820
TS-1W	130	N	f1	16	4	TS1W-s12	MO-22821
TS-1W	133	-	c1	0	20	TS1W-s13	-
TS-1W	134	N	f1	23	5	TS1W-s14	-
TS-1W	150	-	c1	0	55	TS1W-s16	MO-22823

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
TS-1W	150	N	f1	24	0	TS1W-s15	MO-22822
TS-1W	152	S	f1	18	0	TS1W-s17	-
TS-1W	155	-	c1	0	50	TS1W-s18	-
TS-1W	160	N	f1	17	0	TS1W-s19	-
TS-1W	165	S	f1	40	0	TS1W-s20	MO-22825
TS-2C	111	S	f1	50	5	-	-
TS-2C	120	N	f1	12	0	TS2C-s1	-
TS-2C	122		c1b	23	>34	-	-
TS-2C	122	S	f1	40	0	-	-
TS-2C	125	-	c1	8	31	TS2C-s2	-
TS-2C	145	S	c2	13	11	-	-
TS-2C	145	N	c2	46	6	-	MO-22840
TS-2C	151	-	c1	7	43	TS2C-s3	MO-00059
TS-2C	155	S	c2	21	9	-	-
TS-2C	167	N	c2	63	41	-	MO-00060
TS-2C	185		c1b	64	21	-	-
TS-2C	194	N	c1b	34	0	-	35-2236
TS-2C	200	S	f1	27	12	-	-
TS-2C	203		c1b	38	>74	-	-
TS-2C	210		c1b	48	>32	TS2C-s6	MO-22841
TS-2C	227		c1b	69	60	-	-
TS-2C	227	S	f1	46	4	-	MO-00061
TS-2C	259		c1b	45	70	-	-
TS-2C	276	-	c1	5	20	TS2C-s4	-
TS-2C	277	N	c2	49	33	TS2C-s5	-
TS-2E	300	N	c2	14	15	-	-
TS-2E	300	S	c2	23	29	-	-
TS-2E	312	-	c1	5	5	TS2E-s1	-
TS-2E	320	S	c2	20	>36	-	-
TS-2E	353	N	c2	27	>27	-	-
TS-2E	356	N	c2	42	65	-	MO-22845
TS-2E	359	N	f1	16	0	-	-
TS-2E	373	-	c1	0	50	TS2E-s2	-
TS-2E	383	S	c2	46	0	-	-
TS-2E	398	N	c2	15	30	TS2E-s3	-
TS-2E	403	N	c2	38	50	-	MO-00062
TS-2E	403	N	f1	43	11	-	-
TS-2E	420	S	c2	53	>20	-	MO-22846
TS-2E	423	S	f1	43	0	-	MO-00063
TS-2E	449	-	c1	0	75	TS2E-s4	-
TS-2E	450	N	c2	18	23	-	-
TS-2E	451	S	f1	77	10	-	-
TS-2E	460	N	f2? (f1?)	27	0	TS2E-s5	-
TS-2E	463	S	f1	99	16	-	MO-22847
TS-2E	480	N	c2	23	37	-	-
TS-2E	483	-	c1	0	38	TS2E-s6	-
TS-2E	483	S	c2	49	16	TS2E-s7	-
TS-2E	491	S	f1	0	0	-	-
TS-2E	491	N	f1	5	0	-	-
TS-2E	495	S	c2	12	0	TS2E-s8	-
TS-2W	-11	-	c1w	4	34	TS2W-s7	-
TS-2W	-2	-	c1w	44	48	TS2W-s6	MO-25228
TS-2W	10	-	c1w	39	12	TS2W-s4	MO-00056
TS-2W	12	-	c1w	52	90	TS2W-s5	MO-22838
TS-2W	17	-	c1w	32	68	TS2W-s3	-
TS-2W	17	S	c2	7	22	TS2W-s2	-
TS-2W	23	S	c2	15	11	TS2W-s1	-

Table B-1.0-2 (continued)

Reach	Reach Distance (m)	Side of Channel	Geomorphic Unit	Fine Facies Thickness (cm)	Coarse Facies Thickness (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID
TS-2W	35	-	c1	5	77	TS2W-s10	-
TS-2W	36	S	c2	58	8	TS2W-s9	MO-22836
TS-2W	42	-	c1	15	77	TS2W-s11	MO-00058
TS-2W	42	N	c2	62	0	TS2W-s8	MO-00057
TS-2W	52	-	c2	30	59	TS2W-s12	MO-25229
TS-2W	64	-	c1	4	10	TS2W-s13	-
TS-2W	73	N	c2	8	22	TS2W-s14	-
TS-3	600	-	c1	14	>43	-	-
TS-3	601	S	c2	27	66	-	-
TS-3	620	S	f1? (f2?)	13	5	-	-
TS-3	621	S	c2	49	11	-	MO-10014
TS-3	625	-	c1	0	25	-	MO-10015
TS-3	625	N	c2	48	14	-	-
TS-3	637	N	c2	28	38	-	-
TS-3	637	S	f1? (f2?)	13	9	-	MO-10016
TS-3	650	N	c2	25	46	-	-
TS-3	650	S	c2	28	32	-	-
TS-3	674	S	c2	31	0	-	-
TS-3	675	N	c2	5	0	-	-
TS-3	680	N	c2	5	0	-	-
TS-3	700	-	c2	17	0	-	-
TS-3	710	S	f2? (f1?)	< 8?	0	-	-
TS-3	725	-	c1	11	12	-	-
TS-3	725	S	c2	17	0	-	-
TS-3	750	-	c1	0	45	-	-
TS-3	750	N	c2	32	11	-	-
TS-3	754	N	f1? (f2?)	16	0	-	MO-24237
TS-3	769	N	c2	39	11	-	MO-10017
TS-3	774	N	c2	28	9	-	-
TS-3	777	N	f2? (Qt?)	0	0	-	-
TS-3	800	-	c1	6	14	-	-
TS-3	800	N	c2	20	0	-	-
TS-3	800	S	c2	44	11	-	-
TS-3	805	N	f2? (Qt?)	13	0	-	-
TS-3	807	N	f2? (Qt?)	13	0	-	MO-10018
TS-3	823	N	c2	30	0	-	-
TS-3	825	N	c2	41	29	-	MO-10020
TS-3	825	S	c2	54	9	-	MO-10019
TS-3	825	N	f2? (Qt?)	2	0	-	-
TS-3	825	N	f2? (Qt?)	2	0	-	-
TS-3	850	-	c2	20	0	-	-
TS-3	875	-	c2	29	0	-	MO-10021

*Dash indicates not applicable (no relation to channel, no fixed point or stratigraphic location, or no Location ID)

Table B-1.0-3
Field Gross-Gamma Radiation Data
Obtained from Mortandad Reaches

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
E1E-r1	MO-10070	c3	13	0	17209
				10	25,499
				20	33,016
				30	45066
				40	53297
				50	64811
				60	68330
E1E-r2	-[b]	c3	13	0	22,109
				10	39,231
				20	57,518
E1E-r3	MO-10071	f2	22	0	12,089
				10	10,620
				20	10,218
				30	10,671
				40	11,582
				50	13,069
				60	14,315
E1E-r4	MO-10072	c3	25	0	26,344
				10	36,212
				20	47,348
				30	63,132
				40	87,980
				50	118,073
				60	144,912
E1E-r5	MO-10073	c3	37	0	40,424
				10	59,168
				20	62,890
				30	55,856
				40	52,623
				50	51,049
E1E-r6	MO-10074	c2	48	0	14,502
				10	15,054
				20	16,656
				30	19,364
				40	22,398
				50	33,357
				60	40,849
				70	44,827
E1E-r7	MO-00023	f1	86	0	123,535
				10	220,136
				20	215,037
				30	163,727
				40	130,559
				50	91,445
				60	87,300
E1E-r8	-	c2	94	0	34,018
				10	44,795
				20	31,512
				30	25,859
				40	22,865
				50	22,174
				60	21,208
				70	20,875

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
E1E-r9	-	c1b	95	0	22,213
				10	20,116
				20	19,028
				30	19,018
E1E-r10	MO-10076	f2	110	0	11,981
				10	9,146
				20	9,442
				30	10,046
				40	10,967
				50	11,255
				60	11,936
				70	12,427
E1E-r11	-	c3? (c2?)	118	0	31,579
				10	43,708
				20	42,003
				30	33,698
				40	26,937
				50	25,322
				60	26,915
E1E-r12	MO-10077	c1b	119	0	24,405
				10	27,182
				20	27,531
				30	30,262
E1E-r13	MO-10078	c3	126	0	22,813
				10	34,056
				20	40,266
				30	38,326
				40	32,696
				50	31,252
				60	29,170
				70	27,921
E1E-r14	MO-10079	c1b	140	0	11,968
				10	14,238
				20	14,754
				30	15,421
E1E-r15	MO-00024	c3	148	0	73,301
				10	121,017
				20	143,401
				30	104,209
				40	83,508
				50	56,620
				60	47,719
				70	39,634
				80	36,861
E1E-r16	MO-10080	f2	156	0	8,313
				10	7,994
				20	8,620
				30	9,610
				40	9,100
				50	9,600
				60	10,250
				70	10,200
				80	10,080
				90	10,180
				100	9,810
				110	9,470

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
E1E-r17	-	c1b	160	0	34,936
				10	22,425
				20	20,594
				30	20,018
E1E-r18	-	c3	161	0	56,206
				10	74,604
				20	96,428
				30	100,932
				40	86,314
				50	76,007
				60	63,844
E1E-r19	-	f1	163	0	39,264
				10	38,309
				20	25,114
				30	29,943
				40	29,921
				50	29,036
				60	26,792
				70	29,690
E1E-r20	MO-00025	c3	180	0	33,137
				10	96,573
				20	157,408
				30	230,705
				40	299,355
				50	292,872
E1E-r21	-	c1b	180	0	17,078
				10	18,160
				20	17,430
				30	14,990
E1E-r22	-	c2? (c1b?)	188	0	11,300
				10	12,720
				20	13,800
				30	13,410
E1E-r23	MO-10082	c3	191	0	23,595
				10	42,904
				20	75,603
				30	113,777
				40	112,536
M2W-r1	-	Qt	312	0	9771
				10	9,673
				20	9,847
				30	9716
M2W-r2	-	f1	326	0	15,865
				10	34,665
				20	26,003
				30	25,387
				40	21,379
				50	20,814
				60	20,701
				70	21,816
M2W-r3	MO-10063	c2	334	0	22,897
				10	27,567
				20	29,605
				30	39,860
				40	38,644

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
M2W-r4	MO-10062	c3	357	0	24,733
				10	28,408
				20	33,794
				30	39,515
				40	47,995
				50	50,083
				60	42,453
				70	36,214
M2W-r5	-	c2	362	0	26,979
				10	29,869
				20	32,420
				30	34,303
				40	35,748
M2W-r6	MO-10061	f1g	370	0	38,529
				10	51,196
				20	62,791
				30	65,759
				40	68,286
				50	62,183
				60	59,305
				70	57,973
M2W-r7	MO-10060	f1	378	0	15,475
				10	15,080
				20	14,521
				30	13,285
				40	12,994
M2W-r8	-	f1g? (c3?)	377	0	34,903
				10	43,524
				20	56,588
				30	67,952
				40	75,333
				50	79,380
				60	77,337
				70	74,393
				80	71,824
M2W-r9	-	c2	383	0	24,863
				10	28,240
				20	30,607
				30	32,257
				40	33,618
				50	32,242
M2W-r10	MO-10059	f1g	401	0	65,000
				10	91,815
				20	90,836
				30	77,932
				40	62,220
				50	50,409
				60	42,529
				70	34,355
				80	28,114
				90	24,301
				100	24,803
M2W-r11	MO-10058	f1g	413	0	81,465
				10	103,934
				20	104,113
				30	103,676

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				40	97,197
				50	91,311
				60	79,672
				70	70,280
				80	62,317
				90	55,171
				100	49,719
				110	45,770
M2W-r12	-	f1	423	0	24,755
				10	27,596
				20	30,279
				30	29,855
				40	29,017
				50	27,525
				60	23,322
				70	20,632
				80	17,491
				90	16,119
M2W-r13	-	c1b	447	0	18,376
				10	17,424
M2W-r14	MO-10057	f1	455	0	20,127
				10	23,927
				20	23,279
				30	17,574
				40	15,548
				50	14,889
				60	12,505
M2W-r15	-	c2	456	0	29,683
				10	26,150
				20	23,676
				30	21,056
				40	17,946
				50	16,051
				60	15,307
M2W-r16	-	f1	454	0	18,759
				10	23,319
				20	28,314
				30	34,135
				40	35,232
				50	31,091
				60	26,191
				70	20,684
M2W-r17	-	c2	475	0	27,794
				10	29,562
				20	30,197
				30	34,199
M2W-r18	MO-10056	f1	475	0	14,078
				10	12,457
				20	12,701
				30	9,808
M2W-r19	MO-10055	f1	491	0	32,405
				10	33,538
				20	23,655
				30	23,050
				40	18,454
				50	16,599

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				60	15,987
				70	16,264
				80	16,942
M2W-r20	MO-10054	c3	496	0	169,976
				10	251,345
				20	309,179
				30	380,929
				40	421,092
				50	382,626
				60	339,798
				70	305,444
				80	250,249
				90	198,209
				100	176,865
M2W-r21	-	c3	500	0	29,925
				10	36,143
				20	46,315
				30	60,557
				40	72,546
M2W-r22	-	f1	502	0	16,469
				10	15,590
				20	15,546
				30	17,866
				40	21,082
				50	19,734
				60	27,143
M2W-r23	-	c2	507	0	19,590
				10	21,730
				20	24,482
				30	26,033
				40	21,140
M2W-r24	-	f1	527	0	13,342
				10	12,980
				20	13,088
				30	13,319
				40	13,945
				50	19,825
				60	25,115
				70	31,125
M2W-r25	MO-10051	c2	530	0	15,237
				10	15,773
				20	17,283
				30	16,551
M2W-r26	MO-10053	c2	540	0	23,598
				10	27,870
				20	30,576
				30	31,018
				40	30,131
M2W-r27	MO-10052	c1b	544	0	17,927
				10	18,609
				20	20,315
				30	21,398
				40	22,829
M2W-r28	-	c2	560	0	22,056
				10	22,187
				20	19,003

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				30	17,928
				40	17,878
				50	20,239
				60	22,682
				70	22,422
M2W-r29	-	f1	560	0	25,660
				10	25,283
M2W-r30	-	c2	581	0	24,122
				10	24,275
				20	23,673
				30	18,967
				40	16,338
				50	13,597
				60	11,423
M2W-r31	-	f2	586	0	9,936
				10	9,250
				20	9,258
				30	8,991
				40	8,886
				50	9,051
M2W-r32	MO-10050	c1b	591	0	22,300
				10	25,302
				20	26,859
				30	27,535
M2W-r33	MO-00017	c3	300	0	35,342
				10	41,600
				20	49,200
				30	56,700
				40	63,200
				50	74,050
				60	88,400
				70	108,000
				80	116,000
				90	123,000
				100	108,645
				110	104,501
MSW-r34	-	c2	295	0	17,881
				10	19,225
				20	21,219
				30	21,585
				40	21,359
				50	19,837
				60	17,422
M2W-r35	-	c3	276	0	60,511
				10	111,934
				20	130,121
M2W-r36	-	c1	276	0	55,321
M2W-r37	MO-00018	c3	275	0	32,686
				10	46,520
				20	55,258
				30	60,372
M2W-r38	-	Qt	280	0	7,947
				10	8, 097
				20	8,166
M2W-r39	-	c1b	250	0	19,683
				10	28,185

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				20	31,936
				30	37,030
				40	45,647
				50	50,893
M2W-r40	-	c1	250	0	18,594
M2W-r41	-	f1	223	0	13,032
				10	11,706
				20	12,010
				30	12,310
				40	11,852
				50	13,837
				60	16,621
				70	22,601
				80	30,845
				90	34,323
M2W-r42	MO-10064	f2	217	0	9,078
				10	9,281
				20	9,746
				30	10,003
				40	10,626
				50	10,410
				60	11,406
				70	12,180
				80	14,856
				90	17,261
				110	16,247
M2W-r43	MO-10065	c1b	188	0	17,923
				10	19,421
				20	21,178
				30	23,769
M2W-r44	-	c1	183	0	19,610
M2W-r45	-	f2? (f1?)	183	0	11,161
				10	9,975
				20	10,223
				30	9,840
				40	10,396
				50	11,083
				60	12,228
				70	13,813
				80	14,920
				90	15,271
				100	15,314
				110	16,247
M2W-r46	-	Qt	171	0	7,633
				10	7,826
				20	8,247
				30	8,400
M2W-r47	-	c1b	171	0	36,644
				10	27,900
				20	29,295
				30	31,017
				40	30,830
M2W-r48	MO-10066	f1	160	0	40,030
				10	31,831
				20	32,768
				30	29,280

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				40	24,881
				50	20,925
				60	18,101
				70	17,545
				80	16,654
				90	15,200
				100	14,086
M2W-r49	-	f1	154	0	43,991
				10	49,631
				20	48,168
				30	45,105
				40	45,150
				50	43,032
				60	42,171
				70	38,034
				80	37,970
M2W-r50	-	c1	155	0	31,820
M2W-r51	MO-00019	c3	138	0	39,218
				10	56,938
				20	60,287
				30	58,292
				40	56,276
				50	56,792
				60	54,395
				70	37,951
M2W-r52	-	c1	137	0	30,888
M2W-r53	MO-10067	c3	136	0	55,779
				10	75,983
				20	93,204
				30	90,512
				40	85,298
				50	70,440
				60	60,050
M2W-r54	MO-00021	c3	97	0	43,213
				10	61,757
				20	75,155
				30	103,800
				40	117,600
				50	123,943
				60	112,526
				70	95,577
				80	84,793
				90	80,271
M2W-r55	-	c2	75	0	11,687
				10	11,241
				20	11,503
				30	12,213
				40	13,407
				50	15,294
				60	19,473
				70	24,166
				80	32,936
				90	42,339
				100	43,048
M2W-r56	MO-10068	c2	72	0	18,667
				10	18,935

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				20	22,193
M2W-r57	-	Qt	55	0	7,499
				10	7,378
				20	7,675
				30	8,009
				40	7,979
				50	8,617
M2W-r58	-	c2	19	0	11,985
				10	11,203
				20	11,243
				30	11,995
				40	12,617
				50	14,236
				60	16,446
				70	17,673
M2W-r59	-	c3	12	0	18,238
				10	26,007
				20	31,003
				30	40,901
				40	56,793
				50	81,949
				60	137,762
M2W-r60	-	f2	84	0	10,163
				10	9,354
				20	10,071
				30	10,562
				40	11,304
				50	10,967
				60	11,329
				70	12,513
				80	13,365
				90	14,766
				100	17,150
M2E-r1	-	f2? (Qt?)	6	0	9287
				10	9,295
				20	9,167
				30	9648
				40	9807
				50	9885
				60	9199
				70	8956
				80	9225
M2E-r2	MO-10048	c2	6	0	22,358
				10	24,073
				20	25,661
				30	27,410
M2E-r3	-	c3	9	0	16,721
				10	15,133
				20	17,034
				30	19,907
				40	24,641
				50	34,886
				60	47,653
				70	53,887
				80	51,306
				90	41,802

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				100	37,315
				110	36,098
				120	35,579
M2E-r4	-	f1? (c3?)	19	0	23,207
				10	30,419
				20	29,642
				30	29,816
M2E-r5	-	c3	21	0	25,941
				10	31,450
				20	36,161
				30	40,598
				40	44,193
				50	50,309
				60	50,840
M2E-r6	-	c2	33	0	18,263
				10	21,795
				20	25,137
				30	27,192
				40	27,711
M2E-r7	-	c2	36	0	22,836
				10	20,208
				20	18,146
				30	19,180
				40	22,267
				50	23,048
				60	23,400
				70	23,276
M2E-r8	-	c3	52	0	51,258
				10	59,941
				20	78,075
				30	75,245
				40	64,470
				50	57,451
M2E-r9	-	c2	52	0	19,074
				10	20,432
				20	22,926
				30	26,506
				40	29,672
M2E-r10	MO-10046	f1g	59	0	68,940
				10	50,390
				20	39,513
				30	32,324
				40	27,624
M2E-r11	-	c3	68	0	56,293
				10	67,173
				20	75,219
				30	84,132
				40	94,479
				50	95,554
				60	96,689
				70	106,152
				80	115,814
				90	116,888
				100	113,612
M2E-r12	MO-10045	f1g	77	0	45,828
				10	61,464

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				20	69,272
				30	74,338
				40	77,210
				50	72,119
				60	61,484
				70	53,651
				80	51,177
M2E-r13	MO-10044	c3	85	0	53,759
				10	73,942
				20	94,892
				30	120,342
				40	148,152
				50	159,809
				60	144,153
				70	122,930
				80	95,976
				90	99,949
				100	79,701
				110	78,563
M2E-r14	-	c3	89	0	48,395
				10	61,629
				20	83,893
				30	96,747
				40	115,185
				50	131,336
				60	138,688
				70	162,271
				80	153,904
M2E-r15	MO-10043	f1g	87	0	26,952
				10	23,513
				20	21,008
M2E-r16	MO-10042	c1b	96	0	27,152
				10	29,558
				20	33,994
				30	38,647
				40	49,895
M2E-r17	-	f1	105	0	23,671
				10	22,059
				20	19,542
				30	16,863
				40	15,896
				50	15,254
M2E-r18	-	f1	110	0	15,181
				10	15,081
				20	15,397
				30	16,809
				40	17,112
				50	17,112
				60	17,699
				70	20,033
M2E-r19	-	c3? (c2?)	118	0	59,681
				10	69,759
				20	76,667
				30	74,639
				40	67,220
				50	63,603

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				60	65,670
M2E-r20	MO-10041	f1g	131	0	57,803
				10	75,881
				20	89,241
				30	93,057
				40	84,611
				50	73,713
				60	71,562
				70	67,559
M2E-r21	MO-10040	f1g	133	0	58,430
				10	66,757
				20	77,789
				30	78,668
				40	77,790
				50	74,078
				60	70,444
				70	59,335
				80	52,572
				90	45,005
				100	43,727
				110	47,433
				120	47,572
				130	48,356
				140	47,622
M2E-r22	-	f1g	145	0	76,511
				10	79,765
				20	81,174
				30	71,174
M2E-r23	-	c3	145	0	24,392
				10	28,051
				20	29,978
				30	29,567
				40	31,502
				50	32,278
				60	38,071
				70	40,472
				80	32,248
M2E-r24	-	c1b	154	0	21,804
				10	23,604
				20	26,457
				30	30,331
				40	33,063
				50	34,114
				60	33,692
M2E-r25	-	f2? (Qt?)	158	0	11,718
				10	11,603
				20	11,466
				30	11,476
M2E-r26	-	f1g	175	0	26,079
				10	22,496
				20	22,022
				30	20,351
				40	19,692
				50	20,346
M2E-r27	MO-10039	f1g? (c3?)	179	0	45,515
				10	49,895

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				20	47,999
				30	42,428
				40	36,531
				50	34,007
M2E-r28	-	c2	188	0	20,436
				10	22,435
				20	24,328
				30	26,646
				40	28,023
				50	28,831
M2E-r29	-	f2? (Qt?)	191	0	12,119
				10	11,099
				20	10,639
				30	10,067
				40	9,553
				50	9,421
M2E-r30	-	f1g	200	0	49,783
				10	55,097
				20	54,749
				30	54,036
				40	53,174
				50	50,801
				60	44,653
M2E-r31	MO-10037	f1	209	0	16,396
				10	14,396
				20	12,884
				30	12,175
				40	11,850
M2E-r32	-	f1g	210	0	36,215
				10	37,986
				20	36,508
				30	34,268
				40	30,169
				50	26,962
				60	24,707
				70	24,164
M2E-r33	-	c2	227	0	23,816
				10	23,721
				20	20,188
				30	16,754
				40	15,054
MSE-r34	MO-10036	c1b	239	0	18,926
				10	21,697
				20	22,024
				30	25,067
M2E-r35	-	c3	242	0	27,683
				10	32,916
				20	35,272
				30	35,409
M2E-r36	-	c1b	272	0	21,033
				10	22,660
				20	24,478
				30	25,495
				40	26,537
M2E-r37	MO-10035	f1g	281	0	48,332
MSE-r38	MO-10034	c2	302	0	25,935

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				10	24019
				20	24,877
				30	25,152
				40	24,573
M2E-r39	-	f2? (Qt?)	310	0	9,010
				10	8,966
				20	9,106
M2E-r40	-	f1	320	0	13,309
				10	13,287
				20	12,179
				30	13,589
M2E-r41	-	c1b	322	0	22,600
				10	25,578
				20	29,497
				30	32,418
M2E-r42	MO-10033	c3	334	0	43,823
				10	55,140
				20	61,481
				30	62,776
				40	56,526
				50	50,615
				60	43,322
M2E-r43	-	c2	342	0	17,596
				10	17,455
				20	15,653
				30	14,856
				40	14,371
M2E-r44	MO-10032	f1	353	0	15,540
				10	14,335
				20	13,206
M2E-r45	-	c2	357	0	21,193
				10	23,545
				20	24,897
				30	26,962
				40	28,041
				50	29,423
				60	29,037
				70	29,157
				80	28,239
				90	29,917
M2E-r46	MO-10031	f1g	376	0	37,121
				10	35,590
				20	30,366
				30	25,715
				40	23,104
				50	22,443
				60	22,007
				70	22,252
M2E-r47	MO-10030	c3	385	0	44,014
				10	47,779
				20	47,898
				30	39,945
M2E-r48	MO-10029	f1	386	0	24,132
				10	22,215
				20	20,144
				30	18,338

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				40	17,933
M2E-r49	MO-10027	f1	396	0	20,423
				10	18,503
				20	17,092
				30	15,350
				40	13,881
				50	13,014
M2E-r50	-	f1g	398	0	32,108
				10	29,843
				20	27,089
				30	22,852
				40	20,308
M2E-r51	-	f1g	401	0	42,201
				10	43,817
				20	42,410
				30	39,660
				40	38,332
				50	36,787
				60	34,955
				70	33,709
M2E-r52	-	c2	185	0	18,775
				10	21,045
				20	23,596
				30	25,528
				40	24,252
M3-r1	MO-00069	c3? (f1?)	695	0	28,097
				10	29,467
				20	35,505
				30	39,098
				40	42,524
				50	35,502
				60	30,375
				70	23,038
M3-r2	-	f1a	783	0	61,945
				10	56,233
				20	62,987
				30	60,787
				40	54,070
				50	42,126
				60	39,139
M3-r3	MO-00070	f1a	763	0	46,871
				10	51,807
				20	62,777
				30	69,463
				40	65,568
				50	56,402
				60	47,247
				70	37,661
				80	30,814
				90	63,742
				100	20,434
M3-r4	MO-00075	c1b	925	0	26,043
				10	25,635
				20	25,587
				30	22,921
				40	17,279

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				50	13,586
				60	11,668
				70	10,860
M3-r5	-	c3	895	0	22,833
				10	15,642
				20	13,627
				30	11,736
				40	10,425
				50	9,506
				60	8,773
M3-r6	MO-00073	c3	875	0	17,193
				10	15,302
				20	12,647
				30	16,322
				40	8,584
				50	8,560
				60	8,222
				70	8,109
M3-r7	MO-00074	c3? (f1?)	896	0	24,807
				10	20,194
				20	18,689
				30	16,302
				40	15,438
M3-r8	-	c3? (f1?)	454	0	28,784
				10	21,195
				20	29,600
				30	29,075
				40	25,243
				50	22,676
M3-r9	-	c3? (f1?)	538	0	24,034
				10	21,611
				20	21,330
				30	18,914
				40	15,991
				50	13,405
				60	11,864
				70	11,133
				80	9,732
				90	9,006
M3-r10	-	f1? (c3?)	555	0	26,039
				10	20,385
				20	18,970
				30	15,830
				40	13,957
				50	11,920
				60	10,438
				70	10,317
				80	10,513
				90	11,213
				100	11,577
M3-r11	-	c3? (f1?)	534	0	24,879
				10	23,190
				20	23,766
				30	22,793
				40	18,502
				50	15,191

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				60	13,886
				70	13,364
M3-r12	-	c3	850	0	26,579
				10	23,048
				20	17,947
				30	13,980
				40	11,603
M3-r13	MO-00072	c3	840	0	32,083
				10	19,240
				20	15,758
				30	14,436
				40	13,004
M3-r14	-	c2	995	0	13,674
				10	14,935
				20	15,119
				30	15,298
				40	13,722
				50	12,975
				60	11,930
				70	12,054
				80	11,919
				90	12,040
M3-r15	-	c2	996	0	17,740
				10	19,006
				20	17,754
				30	16,498
				40	14,374
				50	13,090
				60	12,946
				70	12,384
M3-r16	-	c1 (Ten Site canyon channel)	993	0	14,984
				10	14,214
				20	15,916
				30	15,900
				40	15,354
				50	13,670
M3-r17	-	f2	974	0	10,620
				10	9,980
				20	9,634
				30	9,138
				40	8,784
				50	8,786
				60	8,634
				70	8,478
				80	8,190
M3-r18	-	f1? (f2?)	960	0	14,220
				10	12,906
				20	12,554
				30	11,576
				40	10,896
				50	10,406
				60	9,804
				70	9,426
M3-r19	-	c3	945	0	19,714
				10	24,138
				20	17,578

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				30	30,247
				40	31,418
				50	28,980
				60	26,776
				70	24,010
				80	20,060
M3-r20	-	c1b over c3	948	0	20,132
				10	19,556
				20	18,950
				30	17,158
				40	15,096
				50	13,416
				60	11,520
				70	10,534
				80	9,982
M3-r21	-	c1b over c3	900	0	21,516
				10	24,794
				20	26,416
				30	27,932
				40	27,900
				50	32,054
				60	38,142
				70	37,160
M3-r22	-	f1? (c3?)	870	0	17,696
				10	16,514
				20	15,662
				30	14,462
				40	12,482
M3-r23	-	f2	900	0	11,158
				10	11,365
				20	11,779
				30	11,549
				40	11,173
M3-r24	-	c1b over c3	848	0	24,002
				10	28,646
				20	32,542
				30	34,862
				40	36,110
				50	39,238
				60	40,890
				70	43,814
M3-r25	-	c3	845	0	20,676
				10	19,520
				20	18,000
				30	15,412
M3-r26	-	c3? (f1?)	840	0	20,720
				10	19,154
				20	17,436
				30	16,368
M3-r27	-	f1a	800	0	31,200
				10	29,300
				20	26,100
				30	21,300
M3-r28	-	f1	800	0	25,500
				10	24,600
				20	21,800

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				30	17,380
				40	15,670
				50	14,600
M3-r29	-	c1	801	0	11,740
				10	13,260
				20	13,260
				30	13,630
				40	13,940
M3-r30	-	f1	802	0	12,070
				10	9,910
				20	7,920
M3-r31	-	c1g	805	0	20,000
				10	24,400
				20	28,300
				30	29,200
				40	26,100
				50	21,800
				60	17,950
				70	15,730
M3-r32	-	c2	750	0	13,900
				10	13,250
				20	12,330
				30	10,650
				40	8,670
M3-r33	-	c3	740	0	26,400
				10	31,900
				20	34,500
				30	28,200
				40	23,500
				50	20,100
M3-r34	-	c2	752	0	18,450
				10	19,780
				20	20,700
				30	19,510
				40	13,550
				50	13,050
				60	10,310
M3-r35	-	c3a? (f1a?)	750	0	35,100
				10	49,000
				20	57,900
				30	63,800
				40	66,000
				50	62,500
				60	48,300
				70	44,600
M3-r36	-	f2? (Qt?)	752	0	8,800
				10	7,600
				20	7,250
				30	6,850
				40	6,880
				50	6,990
M3-r37	-	c3	688	0	20,200
				10	20,400
				20	16,520
				30	13,340
M3-r38	-	c1g	675	0	19,770

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				10	23790
				20	25,600
				30	27,300
				40	24,300
M3-r39	-	c2	703	0	17,700
				10	18,700
				20	17,980
				30	15,430
				40	13,050
				50	11,260
M3-r40	-	c1	700	0	11,500
				10	9,950
				20	8,260
				30	7,330
				40	6,920
M3-r41	-	c2	698	0	19,170
				10	21,700
				20	20,100
				30	16,190
				40	13,420
M3-r42	-	c3	695	0	25,700
				10	28,800
				20	32,400
				30	35,200
				40	35,900
				50	33,700
				60	26,700
				70	21,000
M3-r43	-	c3	665	0	17,740
				10	20,300
				20	21,000
				30	21,300
				40	17,740
				50	15,130
M3-r44	-	c1g	653	0	12,650
				10	13,690
				20	12,110
				30	10,830
				40	9,760
M3-r45	-	c2a	650	0	23,800
				10	30,400
				20	37,200
				30	40,000
				40	38,300
				50	34,800
M3-r46	-	f1	650	0	17,470
				10	18,100
				20	17,180
				30	14,700
				40	13,100
M3-r47	-	c3a	602	0	22,900
				10	25,000
				20	32,000
				30	40,400
				40	50,100
				50	57,600

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				60	57,500
				70	51,060
				80	48,800
				90	39,560
M3-r48	-	f2? (Qt?)	611	0	8,230
				10	7,550
				20	7,310
				30	7,460
				40	7,400
				50	7,290
				60	7,300
				70	7,260
M3-r49	-	c1	604	0	15,840
				10	16,970
				20	18,660
				30	19,800
M3-r50	-	f1	600	0	15,150
				10	13,310
				20	11,440
				30	9,630
				40	8,500
M3-r51	-	c3? (f1?)	544	0	19,360
				10	22,100
				20	21,800
				30	18,890
				40	15,130
				50	13,280
				60	12,000
M3-r52	-	c2a? (c2?)	540	0	21,800
				10	28,400
				20	32,200
				30	34,500
				40	36,000
				50	30,600
				60	29,200
M3-r53	-	f1	550	0	19560
				10	19,000
				20	17,430
				30	14510
				40	13060
				50	11970
M3-r54	-	c2a? (c2?)	543	0	26,300
				10	35,600
				20	41,700
				30	46,000
				40	44,100
M3-r55	-	c2	502	0	14,080
				10	15,740
				20	15,490
				30	15,370
				40	15,340
				50	14,660
				60	15,210
M3-r56	-	c2	504	0	15,130
				10	13,260
				20	11,190

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				30	10,120
				40	9,340
M3-r57	-	f1? (c3?)	505	0	16,880
				10	19,330
				20	19,810
				30	20,100
				40	17,340
				50	16,180
				60	13,350
				70	11,850
M3-r58	-	c2	452	0	14,060
				10	14,690
				20	15,540
				30	16,340
				40	16,660
				50	17,390
				60	16,360
M3-r59	-	f1	454	0	17,050
				10	18,330
				20	17,470
				30	14,720
M3-r60	-	c2	443	0	13,850
				10	14,880
				20	15,340
				30	15,290
				40	15,610
				50	15,570
				60	15,840
				70	15,830
M3-r61	-	f1? (c3?)	457	0	12,100
				10	12,780
				20	12,740
				30	12,220
				40	11,550
				50	10,860
				60	10,900
M3-r62	-	c2	425	0	13,130
				10	12,830
				20	12,990
				30	13,080
				40	13,250
				50	13,140
				60	13,350
M3-r63	-	f1	425	0	22,700
				10	23,200
				20	23,000
				30	21,600
				40	17,990
				50	15,600
				60	13,330
M3-r64	-	c2	422	0	13,310
				10	13,890
				20	14,000
				30	14,340
				40	15,300
				50	15,990

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				60	16,150
				70	17,990
M3-r65	-	c3? (c2?)	420	0	18,900
				10	19,700
				20	19,850
				30	18,000
				40	16,400
				50	14,300
M3-r66	-	f1	381	0	15,730
				10	14,410
				20	12,880
				30	12,160
M3-r67	-	Qt	375	0	8,540
				10	8,070
M3-r68	-	c3? (f1?)	348	0	11,910
				10	12,430
				20	11,270
				30	9,530
				40	8,900
				50	8,520
M3-r69	-	c2	345	0	16,950
				10	18,310
				20	20,000
				30	20,800
				40	22,700
				50	23,200
M3-r70	-	c2	353	0	13,220
				10	14,780
				20	16,380
				30	17,360
				40	17,760
M3-r71	-	f1	343	0	13,210
				10	12,960
				20	11,890
				30	10,870
				40	10,380
				50	10,150
				60	9,330
				70	9,380
M3-r72	-	c2	320	0	14,060
				10	15,920
				20	18,310
				30	20,300
				40	21,700
M3-r73	-	c3? (f1?)	315	0	13,300
				10	11,750
				20	10,640
				30	9,550
				40	8,710
				50	8,050
				60	8,060
				70	7,780
M3-r74	-	c2	306	0	17,080
				10	18,630
				20	19,150
				30	19,360

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				40	19,650
M3-r75	-	f1? (c3?)	302	0	28,100
				10	31,100
				20	31,500
				30	30,800
				40	28,400
				50	24,900
				60	20,100
				70	16,600
				80	14,400
M3-r76	-	c2	281	0	13,100
				10	14,310
				20	14,850
				30	13,200
				40	11,920
				50	11,780
				60	10,600
M3-r77	-	f1	280	0	16,060
				10	14,050
				20	11,780
				30	10,600
				40	9,230
				50	8,430
				60	8,370
				70	7,880
M3-r78	-	c3	272	0	29,900
				10	31,800
				20	28,600
				30	22,000
				40	17,360
				50	14,660
				60	12,040
				70	10,660
				80	9,920
M3-r79	-	Qt	257	0	7,690
				10	7,810
				20	7,910
				30	7,580
M3-r80	-	c3? (f1?)	250	0	23,500
				10	26,100
				20	28,600
				30	29,000
				40	30,600
				50	30,600
				60	29,000
				70	21,800
M3-r81	-	f1	217	0	23,000
				10	25,700
				20	27,800
				30	28,400
				40	29,100
				50	29,600
				60	26,900
				70	21,800
				80	17,620
				90	14,930

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
M3-r82	-	f1? (c3?)	202	0	15,410
				10	14,270
				20	12,650
				30	12,440
				40	11,040
				50	9,100
				60	8,600
M3-r83	-	c2	203	0	26,600
				10	31,300
				20	30,800
				30	30,500
				40	26,100
				50	21,800
M3-r84	-	f1	200	0	21,300
				10	23,600
				20	25,700
				30	25,000
				40	21,600
				50	18,810
				60	17,350
				70	15,610
				80	14,980
M3-r85	-	f2	200	0	11,840
				10	11,580
				20	11,700
				30	11,400
M3-r86	-	Qt	958	0	6,510
				10	6,100
				20	6,180
				30	6,200
				40	5,890
				50	6,100
M3-r87	-	c2	967	0	14,260
				10	16,040
				20	15,880
				30	13,740
				40	11,820
				50	11,220
				60	10,000
				70	9,220
M3-r88	-	Qt	970	0	7,220
				10	7,820
				20	7,990
				30	7,800
				40	7,970
M3-r89	-	Qt	950	0	5,570
				10	5,650
M3-r90	-	f2	925	0	9,400
				10	8900
				20	8,900
M3-r91	-	f2	920	0	10,800
				10	10,700
				20	10,000
M3-r92	-	f1	860	0	21,400
				10	19,850
				20	17,440

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
M3-r93	-	f1	843	0	18,800
				10	19,500
				20	17,990
M3-r94	-	f1	848	0	16,870
				10	17,960
				20	16,210
M3-r95	-	f1	856	0	18,640
				10	18,520
				20	17,530
				30	15,560
				40	13,000
				50	11,220
				60	9,660
				70	8,970
M3-r96	-	f1	870	0	12,220
				10	13,350
				20	12,980
				30	12,270
M3-r97	-	f1? c3?)	813	0	31,400
				10	33,600
				20	27,900
				30	22,800
M3-r98	-	c3	805	0	24,600
				10	24,300
				20	20,800
M3-r99	-	f2? (f1?)	938	0	10,010
				10	9,540
				20	9,310
				30	9,000
				40	8,900
				50	8,240
				60	7,770
M3-r100	-	f1	912	0	13,250
				10	11,830
				20	10,520
				30	9,810
				40	9,230
				50	9,240
M3-r101	-	c1b over c3	856	0	20,300
				10	25,200
				20	30,200
				30	33,100
				40	38,000
				50	38,700
				60	33,800
M3-r102	-	c3	793	0	36,600
				10	40,400
				20	40,400
				30	36,500
				40	28,000
				50	21,300
				60	17,540
M3-r103	-	f1	785	0	15,776
				10	13,830
M3-r104	-	f1	783	0	18,850
M3-r105	-	c3a	725	0	25900

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				10	31,300
				20	35,600
				30	40000
				40	45400
				50	47300
				60	44000
				70	44000
				80	44700
				90	42700
M3-r106	-	c1g	727	0	27,700
				10	31,300
				20	37,500
				30	47,000
				40	48,400
				50	44,700
				60	42,800
				70	42,300
				80	42,200
M3-r107	-	c3	471	0	17,540
				10	19,320
				20	20,300
				30	21,100
				40	20,800
				50	17,730
				60	15,450
				70	14,920
M3-r108	-	f2? (f1?)	873	0	10,500
				10	11,000
				20	10,870
M3-r109	-	reach TS-3 fan? (Qt?)	871	0	6,580
				10	6,980
				20	7,010
M3-r110	-	Qt	865	0	8,180
				10	8,060
				20	7,790
				30	7,400
				40	7,180
M3-r111	-	c3	951	0	18,410
				10	19,550
				20	17,650
				30	14,830
				40	13,200
M3-r112	-	c3? (f1?)	987	0	11,770
				10	11,500
				20	11,700
				30	10,900
				40	10,700
				50	10,600
M3-r113	-	f1	950	0	12,350
				10	12,500
				20	12,300
				30	11,000
				40	10,200
M3-r114	-	c3	887	0	17,100
				10	19,600
				20	18,600

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				30	17,250
				40	15,500
M3-r115	-	c3	887	0	17,000
				10	17,200
				20	15,150
				30	13,900
M3-r116	-	Qt	985	0	5,250
				10	5,500
M3-r117	-	Qt	966	0	6,930
				10	6,700
				20	7,130
M3-r118	-	c2	965	0	7,700
				10	21,000
				20	24,500
				30	24,300
				40	25,700
M3-r119	-	c3	922	0	10,820
				10	10,520
				20	10,250
				30	11,210
				40	11,480
				50	12,220
M3-r120	-	c3	918	0	11,700
				10	12,500
				20	13,600
				30	13,500
				40	13,000
M3-r121	-	f1	930	0	13,900
				10	14,100
				20	14,800
				30	14,900
				40	14,000
				50	12,700
M3-r122	-	c3 swale	881	0	15,130
				10	12,320
				20	13,240
				30	10,000
M3-r123	-	c3	858	0	17,220
				10	19,740
				20	20,700
				30	19,220
				40	17,430
				50	14,600
M3-r124	-	c3 swale	906	0	15,160
				10	13,360
				20	12,370
				30	11,490
				40	10,910
				50	10,150
M3-r125	-	c3? (f2?)	935	0	9,500
				10	9,500
				20	9,800
				30	9,900
				40	9,400
				50	8,500
				60	7,700

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
M3-r126	-	f2? (c3?)	824	0	9,700
				10	8,840
				20	7,990
				30	7,500
				40	7,300
M3-r127	-	f1? (c3?)	815	0	27,800
				10	28,700
				20	24,600
				30	20,700
				40	16,300
				50	14,800
				60	12,900
M3-r128	-	c3	843	0	27,700
				10	23,600
				20	20,100
				30	17,370
				40	14,690
				50	12,110
				60	11,730
M3-r129	-	f1	818	0	29,300
				10	30,700
				20	28,600
				30	25,300
M3-r130	-	f2? (Qt?)	819	0	7,260
				10	6,900
				20	7,200
M3-r131	-	c3	814	0	19,000
				10	19,500
				20	19,200
				30	15,500
				40	13,000
				50	11,300
M3-r132	-	f2? (f1?)	786	0	9,620
				10	8,820
				20	8,440
				30	7,470
M3-r133	-	f1? (f2?)	775	0	11,240
				10	9,640
				20	9,690
				30	8,100
				40	8,200
M3-r134	-	f2? (f1?)	770	0	10,670
				10	9,640
				20	9,100
				30	8,750
M3-r135	-	c3a? (f1a?)	767	0	42,000
				10	49,200
				20	57,300
				30	62,700
				40	66,600
				50	63,800
				60	61,800
				70	65,600
				80	61,500
				90	53,600
M3-r136	-	f1	731	0	22,500

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				10	26,300
				20	27,000
				30	24,800
				40	21,000
M3-r137	-	f1	741	0	15,960
				10	17,280
				20	15,530
				30	13,350
				40	11,530
				50	11,180
M3-r138	-	f1? (c3?)	739	0	16,700
				10	16,600
				20	15,900
				30	15,600
				40	14,300
M3-r139	-	c3a	786	0	37,200
				10	40,700
				20	45,200
				30	48,500
				40	43,700
				50	38,200
				60	30,000
				70	25,900
M3-r140	-	f1a?	675	0	28,800
				10	33,400
				20	39,000
				30	48,200
				40	50,500
				50	44,700
M3-r141	-	c2	676	0	17,000
				10	14,900
				20	12,800
				30	11,000
				40	9,800
M3-r142	-	c3	653	0	24,600
				10	30600
				20	35,600
				30	38,000
				40	41,000
				50	43,000
				60	41,800
				70	39,700
				80	39,500
M3-r143	-	f2? (f1?)	635	0	9,240
				10	8,370
				20	8,220
				30	7,980
M3-r144	-	c2	627	0	11,800
				10	11,000
				20	9,800
				30	9,700
				40	9,500
M3-r145	-	c3	646	0	22,300
				10	22,900
				20	22,100
				30	20,000

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				40	17,510
M3-r146	-	c3a	618	0	26,000
				10	31,000
				20	37,500
				30	43,200
				40	55,000
				50	65,000
				60	70,500
M3-r147	-	f2	596	0	12,900
				10	11,500
				20	10,770
				30	10,160
				40	9,190
				50	8,980
M3-r148	-	c3a	595	0	28,400
				10	37,100
				20	45,200
				30	53,000
				40	61,100
				50	63,700
				60	64,200
				70	59,300
M3-r149	-	c3	575	0	10,000
				10	9,700
				20	10,000
				30	8,600
				40	9,300
				50	9,800
M3-r150	-	c3	573	0	10,400
				10	12,000
				20	11,600
				30	10,700
				40	10,400
				50	10,200
M3-r151	-	c3	522	0	20,500
				10	21,900
				20	23,700
				30	23,600
				40	21,400
				50	19,000
M3-r152	-	c3a	523	0	23,500
				10	29,000
				20	36,100
				30	42,900
				40	51,400
				50	53,100
M3-r153	-	Qt? (f2?)	153	0	8,600
				10	8,600
				20	8,700
				30	9,300
				40	9,400
				50	9,800
M3-r154	-	Qt? (f2?)	148	0	8,600
				10	8,300
				20	7,550
				30	7,500

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				40	6,600
				50	6,600
M3-r155	-	c2	148	0	13,300
				10	15,000
				20	15,500
				30	14,500
				40	13,900
				50	13,000
M3-r156	-	f1	177	0	13,000
				10	13,190
				20	12,650
M3-r157	-	f1	166	0	15,200
				10	14,300
				20	13,600
				30	12,200
M4-r1	MO-00080	c3a+f1a	201	0	52,632
				10	45,471
				20	50,005
				30	44,753
				40	30,912
				50	24,030
				60	18,347
				70	15,502
				80	12,749
M4-r2	-	c3a+f1a	205	0	24,083
				10	21,615
				20	23,161
				30	24,081
				40	20,213
				50	18,547
M4-r3	MO-10143	c3a+f1a	270	0	18,256
				10	16,825
				20	16,775
				30	16,529
				40	14,529
				50	12,482
				60	10,900
				70	9,336
				80	7,317
				90	6,446
				100	6,809
M4-r4	MO-10142	c3a+f1a	280	0	21,539
				10	19,483
				20	24,780
				30	17,975
				40	16,935
M4-r5	MO-00084	c3a+f1a	406	0	18,017
				10	15,494
				20	16,018
				30	15,814
				40	15,603
M4-r6	MO-00083	c3a+f1a	371	0	27,267
				10	30,656
				20	35,544
				30	34,274
				40	29,918

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				50	22,415
M4-r7	MO-00085	c3+f1	506	0	7,989
				10	7,116
				20	7,189
				30	7,170
				40	5,321
M4-r8	-	c3+f1	333	0	11,836
				10	10,898
				20	11,085
				30	10,166
				40	9,845
				50	9,125
M4-r9	-	c3a+f1a	275	0	15,746
				10	15,656
				20	16,884
				30	15,480
M4-r10	-	c2/c2t	167	0	16,788
				10	17,231
				20	18,224
				30	19,958
				40	23,162
				50	25,851
				60	29,570
				70	33,142
				80	37,585
				90	37,497
M4-r11	MO-00079	c1/c2t	188	0	22,007
				10	23,570
				20	25,338
				30	26,918
				40	29,500
				50	32,591
				60	38,743
				70	46,280
				80	57,128
				90	71,893
				100	83,035
				110	96,862
				120	103,524
				130	111,805
				140	118,522
				150	119,164
M4-r12	MO-00077	c1t #1	80	0	7,517
				10	5,949
				20	6,445
				30	8,440
				40	8,902
M4-r13	MO-00078	c1t #1	95	0	14,433
				10	11,694
				20	12,118
				30	12,342
M4-r14	MO-00076	c3a	30	0	15,011
				10	16,996
				20	17,086
				30	16,893
				40	17,840

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				50	18,587
				60	19,066
				70	19,008
				80	18,755
M4-r15	-	c3+f1	46	0	7,701
				10	6,588
				20	7,163
M4-r16	-	c3a	54	0	12,703
				10	9,683
				20	9,142
				30	8,507
				40	8,012
				50	7,250
				60	6,673
				70	6,805
				80	6,750
				90	6,920
				100	6,705
M4-r17	MO-00081	c3a+f1a	291	0	28,167
				10	30,614
				20	35,323
				30	30,600
				40	22,423
				50	15,571
M4-r18	MO-00082	c3+f1	324	0	10,898
				10	10,355
				20	11,193
				30	11,429
				40	11,443
				50	10,377
				60	9,886
				70	9,574
				80	9,792
M4-r19	MO-00086	c3+f1	585	0	9,756
				10	8,677
				20	8,686
				30	8,579
				40	8,550
				50	8,335
M4-r20	MO-10141	c3+f1	300	0–10	10,590
				10–20	10,720
				20–30	11,230
M4-r21	-	c3+f1	316	0–10	8,840
				10–20	8,250
				20–30	7,690
				30–40	7,200
M4-r22	-	c3+f1	305	0–10	7,150
				10–20	6,990
M4-r23	-	c3a+f1a	305	0–10	18,320
				10–20	17,690
				20–30	14,510
				30–40	11,740
				40–50	10,660
M4-r24	-	c3+f1	300	0–10	7,880
				10–20	7,690
				20–30	7,800

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				30–40	8,170
				40–50	8,280
				50–60	8,330
				60–70	8,130
M4-r25	-	c3+f1	310	0–10	11,760
				10–20	11,930
				20–30	11,200
				30–40	9,770
				40–50	8,710
				50–60	8,060
M4-r26	-	Qc	314	0–10	6,190
				10–20	6,760
				20–30	6,780
M4-r27	-	c3+f1	348	0–10	7,650
				10–20	7,260
				20–30	7,300
				30–40	6,850
				40–50	6,800
M4-r28	-	c3+f1	354	0–10	11,570
				10–20	10,110
				20–30	9,410
				30–40	8,800
				40–50	8,450
M4-r29	MO-10140	c3+f1	352	0–10	8,610
				10–20	8,270
M4-r30	-	c3+f1	353	0–10	7,100
				10–20	7,500
				20–30	8,000
				30–40	7,890
M4-r31	-	c3+f1	360	0–10	8,850
				10–20	8,630
				20–30	8,730
M4-r32	MO-10139	c3+f1	366	0–10	9,350
				10–20	9,130
				20–30	9,410
M4-r33	-	c3+f1	367	0–10	10,000
				10–20	10,300
				20–30	10,200
M4-r34	-	f2? (Qt?)	400	0–10	5,260
				10–20	5,350
				20–30	5,640
M4-r35	-	c3a+f1a	402	0–10	13,380
				10–20	13,380
				20–30	13,120
				30–40	12,250
M4-r36	-	c3a+f1a	398	0–10	16,360
				10–20	18,250
				20–30	16,830
				30–40	13,790
M4-r37	MO-10137	f1	440	0–10	9,700
				10–20	9,700
				20–30	9,900
				30–40	9,500
M4-r38	MO-10135	c3+f1	451	0–10	11,030
				10–20	11,440
				20–30	11,700

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				30–40	10,990
				40–50	11,010
M4-r39	-	c1g	455	0–10	7,350
				10–20	7,930
				20–30	8,700
				30–40	8,440
				40–50	8,420
M4-r40	MO-10124	c1g	650	0–10	6,630
				10–20	7,170
				20–30	7,720
				30–40	7,560
M4-r41	MO-10125	c3+f1	650	0–10	5,810
				10–20	5,650
M4-r42	MO-10126	f2? (Qt?)	650	0–10	5,770
				10–20	6,080
				20–30	6,520
M4-r43	-	f2? (Qt?)	650	0–10	6,550
				10–20	6,580
				20–30	7,000
M4-r44	MO-10127	f1	650	0–10	6,530
				10–20	6,630
M4-r45	MO-10123	f2? (Qt?)	650	0–10	5,900
				10–20	6,000
				20–30	6,600
M4-r46	MO-10122	c1g	650	0–10	9,100
				10–20	9,770
				20–30	10,620
				30–40	10,250
M4-r47	-	c3+f1	600	0–10	7,000
				10–20	7,170
				20–30	7,490
M4-r48	-	f2? (Qt?)	600	0–10	6,850
				10–20	7,140
				20–30	7,100
M4-r49	-	f1	600	0–10	6,250
				10–20	7,000
				20–30	6,560
M4-r50	-	c1g	600	0–10	8,180
				10–20	8,520
				20–30	9,740
M4-r51	MO-10130	c3+f1	550	0–10	7,480
				10–20	8,210
				20–30	8,040
M4-r52	-	f2? (Qt?)	550	0–10	6,150
				10–20	6,500
				20–30	7,150
M4-r53	MO-10131	f1	550	0–10	6,910
				10–20	6,780
				20–30	7,650
				30–40	7,540
M4-r54	MO-10129	c1g	550	0–10	11,490
				10–20	13,630
				20–30	14,560
				30–40	14,880
M4-r55	MO-10128	f2? (Qt?)	550	0–10	6,250
				10–20	6,450

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				20–30	6,700
M4-r56	MO-10133	c3+f1	500	0–10	8,800
				10–20	9,550
				20–30	9,760
				30–40	9,140
M4-r57	-	f2? (Qt?)	500	0–10	6,020
				10–20	6,360
M4-r58	-	f1	500	0–10	7,200
				10–20	7,310
M4-r59	MO-10132	c2a	500	0–10	10,090
				10–20	9,700
				20–30	9,480
M4-r60	-	f2? (Qt?)	500	0–10	5,940
				10–20	6,720
				20–30	7,260
M4-r61	-	c1g	500	0–10	8,520
				10–20	8,760
				20–30	8,810
M4-r62	MO-10136	f2? (Qt?)	450	0–10	5,600
				10–20	5,680
				20–30	6,370
M4-r63	MO-10134	f2? (Qt?)	450	0–10	5,420
				10–20	5,720
M4-r64	-	f2? (Qt?)	446	0–10	5,980
				10–20	6,410
M4-r65	-	c3+f1	447	0–10	8,520
				10–20	8,760
				20–30	8,750
M4-r66	MO-10138	c3+f1	400	0–10	8,660
				10–20	9,110
				20–30	9,100
M4-r67	MO-10145	c1t #3	280	0–10	5,500
				10–20	5,200
M4-r68	-	c3+f1	274	0–10	11,500
				10–20	11,990
				20–30	11,390
M4-r69	-	c3+f1	298	0–10	9,860
M4-r70	MO-10144	c3a+f1a	298	0–10	12,460
				10–20	11,550
				20–30	10,180
M4-r71	MO-10146	c1t #2	220	0–10	10,610
				10–20	9,800
				20–30	9,260
M4-r72	MO-10147	c1t #2	217	0–10	6,150
				10–20	6,430
				20–30	7,120
M4-r73	-	c3a+f1a	200	0–10	12,840
				10–20	11,720
M4-r74	MO-10148	c3+f1	186	0–10	7,002
				10–20	7,170
M4-r75	-	f2? (Qt?)	176	0–10	6,030
				10–20	6,270
M4-r76	-	c3+f1	165	0–10	6,250
				10–20	6,580
M4-r77	-	c2/c2t	174	0–10	11,560
				10–20	12,160

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				20–30	12,190
				30–40	12,700
M4-r78	MO-10149	c2/c2t	175	0–10	13,190
				10–20	16,450
				20–30	17,300
				30–40	18,800
				40–50	19,990
				80–90	31,800
M4-r79	-	c3a+f1a	182	0–10	9,630
				10–20	10,240
				20–30	10,660
				30–40	10,980
				40–50	12,240
				50–60	12,600
				60–70	13,380
				70–80	14,860
				80–90	15,680
				90–100	15,850
M4-r80	MO-10150	c3a+f1a	165	0–10	15,170
				10–20	16,310
				20–30	16,940
				30–40	14,940
				40–50	13,530
M4-r81	MO-10151	c2	155	0–10	12,680
				10–20	12,990
				20–30	12,250
				30–40	11,080
				40–50	9,740
M4-r82	MO-10156	c3+f1	20	0–10	5,470
				10–20	5,810
				20–30	5,870
M4-r83	-	c3+f1	35	0–10	6,280
				10–20	6,190
				20–30	6,190
M4-r84	-	c3+f1	57	0–10	6,100
				10–20	5,890
M4-r85	-	c3+f1	68	0–10	5,460
				10–20	5,420
				20–30	5,230
M4-r86	MO-10155	c3+f1	67	0–10	6,740
				10–20	6,400
				20–30	6,110
M4-r87	MO-10158	c3+f1	15	0–10	7,400
				10–20	7,410
M4-r88	-	c3+f1	14	0–10	6,650
				10–20	6,250
				20–30	6,300
M4-r89	MO-10157	c1	13	0–10	9,690
				10–20	9,690
				20–30	9,170
				30–40	8,880
M4-r90	MO-10154	c1t #1	80	0–10	6,550
				10–20	7,450
				20–30	7,880
M4-r91	MO-10153	c1t #1	85	0–10	10,860
M4-r92	-	c3a	100	0–10	14,110

Table B-1.0-3 (continued)

Fixed Point Site	Location ID	Geomorphic Unit	Distance from End of Reach (m)	Depth (cm)	Shielded Gamma Radiation (cpm[a])
				10–20	16,130
				20–30	15,460
				30–40	13,060
M4-r93	MO-10152	c2	133	0–10	16,920
				10–20	19,820
				20–30	20,100
				30–40	18,410
				40–50	16,290
				50–60	15,250
M4-r94	-	c2/c2t?	133	0–10	7,110
				10–20	7,160
				20–30	6,910
				30–40	7,003
				40–50	7,180

[a] cpm = Counts per minute.

[b] Dash indicates no location ID.

Table B-1.0-4
Particle Size, Organic Matter, and pH Data from Mortandad Reaches

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
E-1E	CAMO-98-0027	c1	coarse	19.5	57.7	30.8	7.5	0.9	0.5	0.1	1.2	1.2	vcs	2.6	0.6	-[b]
E-1E	CAMO-98-0028	f1	fine	12.5	4.3	10.0	10.4	9.2	9.9	28.1	16.6	10.9	csi	55.6	5.5	-
E-1E	CAMO-98-0029	c3	fine	2.3	5.1	11.7	13.0	13.2	12.4	24.5	10.4	9.4	vfs	44.3	6.0	-
E-1E	CAMO-98-0030	c3	fine	9.1	10.7	17.2	17.3	14.0	9.8	18.3	7.5	5.1	fs	30.8	3.4	-
E-1E	CAMO-98-0031	c3	fine	3.3	6.6	10.7	10.9	8.0	10.2	25.6	18.2	9.2	csi	53.0	6.8	-
E-1E	CAMO-01-0077	c3	fine	6.3	10.2	18.8	23.3	16.2	9.1	10.3	6.5	5.7	ms	22.5	1.6	-
E-1E	CAMO-01-0078	c3	fine	3.3	2.0	1.6	2.2	9.3	24.2	40.2	11.9	8.7	csi	60.8	3.2	-
E-1E	CAMO-01-0079	c3	fine	8.5	12.0	17.3	15.5	12.3	13.0	17.6	8.1	4.1	fs	29.8	2.0	-
E-1E	CAMO-01-0080	c3	fine	2.8	7.1	14.8	15.4	11.4	11.5	20.7	12.3	6.8	vfs	39.8	3.1	-
E-1E	CAMO-01-0081	c2	fine	9.0	21.8	24.7	15.8	8.9	6.1	9.8	8.8	4.2	ms	22.8	1.4	-
E-1E	CAMO-01-0082	c1	coarse	33.5	47.7	33.6	9.7	2.2	1.1	2.5	0.6	2.4	cs	5.5	0.4	-
E-1E	CAMO-01-0083	c1b	coarse	54.8	35.4	25.9	13.7	5.7	3.1	5.3	6.7	4.1	cs	16.1	1.2	-
E-1E	CAMO-01-0084	c3	coarse	10.5	33.0	25.9	10.2	4.6	4.2	9.3	6.6	6.1	cs	21.9	1.8	-
E-1E	CAMO-01-0085	c3	fine	9.3	21.0	21.9	15.2	9.4	6.0	11.3	10.4	5.0	ms	26.6	2.1	-
E-1E	CAMO-01-0086	c3	fine	0.8	4.2	8.2	9.5	10.8	14.9	29.8	14.0	8.4	csi	52.2	4.8	-
E-1E	CAMO-01-0093	f2	fine	14.6	10.4	9.6	7.2	7.9	10.3	27.0	14.8	12.4	csi	54.2	3.3	-
E-1E	CAMO-01-0094	c1	coarse	12.2	35.3	40.8	13.5	2.8	1.3	2.2	2.5	1.6	cs	6.3	0.4	-
E-1E	CAMO-01-0095	c3	fine	5.4	13.5	20.5	17.7	13.9	10.9	14.1	4.2	4.9	ms	23.1	1.8	-
E-1E	CAMO-01-0096	c3	coarse	29.9	20.3	18.8	13.6	8.9	6.8	14.7	7.8	8.4	ms	30.9	3.4	-
E-1E	CAMO-01-0138	c3	fine	36.1	25.8	19.3	13.8	10.3	5.9	9.4	8.9	6.7	ms	25.0	1.4	-
E-1E	CAMO-01-0139	c3	coarse	1.3	16.0	31.3	16.5	8.0	7.3	8.4	7.6	4.6	ms	20.7	1.4	-
E-1E	CAMO-01-0140	f2	fine	2.5	4.7	7.0	10.7	15.2	16.8	24.8	11.2	9.6	vfs	45.6	3.7	-
E-1E	CAMO-01-0141	c3	fine	2.0	7.2	20.8	23.8	14.0	10.6	10.3	8.1	5.0	ms	23.4	2.0	-
E-1E	CAMO-01-0142	c3	coarse	45.7	50.3	17.2	6.9	5.6	3.6	6.7	5.6	3.9	vcs	16.1	1.0	-
E-1E	CAMO-01-0143	c3	fine	5.1	7.1	17.3	21.5	16.1	10.2	14.2	5.9	7.6	fs	27.7	3.3	-
E-1E	CAMO-01-0144	c3	coarse	16.8	20.4	32.2	19.9	6.8	3.2	5.4	6.0	5.9	cs	17.2	1.7	-
E-1E	CAMO-01-0145	c2	fine	5.4	12.5	19.2	13.5	7.8	7.6	19.9	11.3	8.2	fs	39.3	3.3	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
E-1E	CAMO-01-0146	c2	coarse	9.6	46.6	34.3	9.6	2.5	1.0	0.8	2.7	2.3	cs	5.9	0.4	-
E-1E	CAMO-01-0147	f1	fine	0.3	1.7	8.0	16.2	15.5	15.4	23.0	9.8	10.2	vfs	42.9	2.9	-
E-1E	CAMO-01-0148	f1	coarse	26.2	35.6	29.5	15.8	5.2	2.1	3.4	5.0	3.4	cs	11.8	0.8	-
E-1E	CAMO-01-0149	f2	fine	1.8	4.2	7.2	5.6	6.8	13.3	37.4	14.6	10.9	csi	62.9	3.8	-
E-1E	CAMO-01-0150	c1b	coarse	17.7	41.3	33.7	10.2	3.4	1.9	2.5	3.2	3.6	cs	9.4	0.6	-
E-1E	CAMO-01-0151	c3	fine	0.7	5.6	8.8	9.5	9.5	11.8	25.7	18.6	10.0	csi	54.4	4.3	-
E-1E	CAMO-01-0152	c1b	coarse	14.7	30.6	33.0	13.6	4.7	2.8	4.2	6.1	4.8	cs	15.2	1.5	-
E-1E	CAMO-01-0153	c1b	fine	4.8	13.3	26.2	18.6	10.4	7.5	10.7	7.6	5.7	ms	24.1	4.1	-
E-1E	CAMO-01-0154	c3	fine	5.3	16.9	21.6	12.2	4.9	5.1	16.3	13.0	9.7	ms	39.0	3.6	-
E-1E	CAMO-01-0155	c3	fine	1.2	2.2	7.9	11.6	12.9	14.2	30.4	13.2	7.7	csi	51.2	2.2	-
E-1E	CAMO-01-0156	c3	coarse	22.5	29.2	21.6	11.7	6.9	5.5	10.3	9.0	5.7	cs	25.0	1.7	-
E-1E	CAMO-04-55060	c3	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.83
E-1E	CAMO-04-55061	c3	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.93
E-1E	CAMO-04-55062	f2	fine	-	-	-	-	-	-	-	-	-	-	-	-	4.76
E-1E	CAMO-04-55063	c1	coarse	14.5	43.7	38.1	11.4	2.4	0.8	0.3	1.6	1.8	cs	3.7	0.39	5.58
E-1E	CAMO-04-55064	c1	fine	0.3	2.7	9.3	13.2	13.5	17.9	28.3	8.0	7.1	vfs	43.4	3.06	6.27
E-1E	CAMO-04-55065	c1	coarse	9.7	62.1	24.8	6.3	2.0	0.9	0.3	1.0	2.6	vcs	3.9	0.36	6.25
E-1E	CAMO-04-55066	c1b	fine	0.6	7.2	16.8	22.6	20.8	12.7	10.3	4.8	4.8	fs	19.9	1.72	6.31
E-1E	CAMO-04-55067	c2	fine	-	-	-	-	-	-	-	-	-	-	-	-	5.99
E-1E	CAMO-05-61173	c1	coarse	0.5	22.1	40.2	19.7	6.4	3.8	0.8	3.1	3.9	cs	7.9	0.29	6.41
E-1FW	CAMO-04-53351	c2	fine	0.6	2.5	7.3	5.8	5.8	11.3	36.2	17.2	13.9	csi	67.4	5.1	5.84
E-1FW	CAMO-04-53352	c2	fine	0.2	1.6	3.0	2.4	3.0	8.6	43.0	20.1	18.1	csi	81.2	5.5	5.48
E-1FW	CAMO-04-53353	f1	fine	0.4	4.1	14.4	16.0	12.2	12.9	21.1	9.0	10.2	vfs	40.3	5.0	5.91
E-1FW	CAMO-04-53354	c1b	fine	3.4	16.4	19.3	11.9	7.9	8.8	20.3	8.1	7.4	fs	35.7	2.7	5.55
E-1FW	CAMO-04-53355	c1	coarse	12.0	23.4	24.2	16.0	9.3	6.6	9.9	5.0	5.7	ms	20.6	1.8	5.86
E-1FW	CAMO-04-53356	c2	coarse	29.1	51.1	18.8	6.9	3.1	2.6	6.4	5.8	5.2	vcs	17.5	1.7	6.26
E-1FW	CAMO-04-53357	c2	fine	0.4	0.3	1.3	2.2	4.9	10.3	39.7	22.2	19.1	csi	81.1	8.6	5.81
E-1FW	CAMO-04-53358	c2	fine	0.2	0.2	0.8	1.2	2.1	6.4	46.8	22.5	20.1	csi	89.4	6.7	5.45
E-1FW	CAMO-05-63626	c2	coarse	13.7	20.4	22.5	11.4	6.4	6.9	15.8	10.5	6.1	ms	32.4	1.40	5.75
E-1FW	CAMO-05-63627	c2	fine	0.0	0.3	1.7	3.5	4.4	8.7	48.3	18.1	14.8	csi	81.2	2.67	5.85
E-1FW	CAMO-05-63628	c1	coarse	19.8	42.6	25.0	11.5	5.0	3.2	4.6	4.1	4.1	cs	12.7	0.50	5.91
E-1FW	CAMO-05-63629	c2	fine	0.1	2.4	8.6	7.9	6.6	7.8	31.4	18.9	16.2	csi	66.5	3.08	5.58
E-1FW	CAMO-05-63630	c2	fine	0.2	0.5	3.0	3.6	3.3	5.8	29.0	29.8	24.8	csi	83.6	4.80	5.42
E-1FW	CAMO-05-63631	c2	fine	2.4	8.1	8.0	5.1	3.6	4.1	27.5	22.4	21.2	csi	71.1	6.04	5.38
E-1FW	CAMO-05-63632	c2	fine	0.6	5.3	8.5	6.8	10.0	15.4	31.7	10.7	11.6	csi	53.9	3.35	5.45
E-1FW	CAMO-05-63633	c1	coarse	11.3	64.1	22.5	3.9	1.2	1.0	2.3	2.7	2.2	vcs	7.2	0.37	5.85
E-1W	CAMO-98-0032	c2	coarse?	8.9	26.7	22.5	14.0	6.6	4.9	12.4	8.7	4.1	ms	25.2	3.9	-
E-1W	CAMO-98-0033	c2	fine	1.8	4.0	6.1	5.1	3.7	5.5	39.5	26.0	9.4	csi	74.9	9.1	-
E-1W	CAMO-98-0034	c1ct	fine	1.4	1.1	1.9	1.4	1.4	4.4	44.0	32.1	13.3	csi	89.3	7.0	-
E-1W	CAMO-98-0035	c2w	fine	3.1	0.4	1.1	1.4	2.3	6.8	45.0	29.5	13.2	csi	87.7	4.3	-
E-1W	CAMO-98-0036	c1ct	fine	0.8	4.5	8.1	5.1	7.6	18.4	38.9	11.8	5.5	csi	56.2	2.0	-
E-1W	CAMO-01-0087	c1ct	coarse	11.5	36.1	29.2	10.7	5.1	4.0	7.4	4.0	3.2	cs	14.6	0.7	-
E-1W	CAMO-01-0088	c1ct	coarse	14.1	40.5	29.2	11.0	4.4	3.3	6.6	2.6	2.4	cs	11.6	0.8	-
E-1W	CAMO-01-0089	c1ct	fine	0.9	1.8	3.3	3.2	5.6	11.8	41.4	20.6	11.9	csi	73.9	4.8	-
E-1W	CAMO-01-0090	c2	fine	0.0	1.7	4.6	4.8	4.6	9.0	39.8	22.5	12.6	csi	74.9	11.8	-
E-1W	CAMO-01-0091	c2	coarse	13.6	24.8	19.8	13.4	10.1	8.0	11.5	6.3	5.8	ms	23.6	1.7	-
E-1W	CAMO-01-0092	c1ct	fine	0.0	0.2	1.0	1.7	3.2	9.4	42.5	26.5	15.2	csi	84.2	6.6	-
E-1W	CAMO-04-53359	c1ct	fine	0.0	0.0	0.1	0.3	1.1	7.4	51.8	26.7	12.7	csi	91.2	4.3	6.41
E-1W	CAMO-04-53360	c1ct	fine	0.0	0.0	0.3	0.3	0.5	3.5	47.3	27.7	20.4	csi	95.5	6.9	5.95
E-1W	CAMO-04-53361	c2w	fine	0.3	0.9	3.3	6.3	10.5	15.9	35.5	14.4	13.2	csi	63.0	4.4	6.36
E-1W	CAMO-04-53362	c2w	fine	0.7	7.7	11.5	8.0	8.1	12.7	30.8	10.0	11.3	csi	52.1	3.1	6.41
E-1W	CAMO-04-53363	c2w	fine	0.2	0.9	3.9	9.2	17.7	23.3	28.9	5.4	10.7	vfs	45.0	2.9	5.77

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
E-1W	CAMO-04-53364	c2w	coarse	29.8	32.3	25.5	19.7	10.5	3.2	3.3	1.9	3.8	cs	8.9	0.7	5.96
E-1W	CAMO-05-61171	c1	coarse	0.5	12.8	32.4	32.1	12.3	3.4	1.2	2.0	3.8	ms	7.0	0.25	6.32
E-1W	CAMO-05-63637	c1ct	fine	0.0	0.1	0.2	2.3	5.8	7.8	36.2	28.0	19.3	csi	83.6	7.14	5.68
E-1W	CAMO-05-63638	c1ct	fine	0.1	0.1	0.7	2.0	3.8	11.0	51.0	20.2	11.1	csi	82.3	2.41	5.54
E-1W	CAMO-05-63639	c2w	coarse	11.1	33.3	24.2	11.1	6.4	5.7	8.6	6.7	3.9	cs	19.2	0.76	5.80
E-1W	CAMO-05-63640	c1ct	fine	0.4	1.8	3.4	1.6	2.5	9.5	49.1	21.5	10.7	csi	81.2	2.73	6.31
E-1W	CAMO-05-63641	c2	fine	1.6	4.7	11.5	18.5	18.0	14.1	8.1	18.2	7.0	fs	33.3	1.96	6.44
E-1W	CAMO-05-63642	c2	fine	2.4	10.5	14.9	18.9	16.4	11.2	6.2	14.0	8.0	fs	28.3	2.01	6.41
E-1W	CAMO-05-63643	c1	coarse	27.0	67.9	21.0	6.9	1.9	0.5	0.0	-0.1	2.1	vcs	2.0	0.11	6.46
E-1W	CAMO-05-63644	c2	fine	10.4	24.7	22.0	16.5	10.9	6.4	4.8	8.8	6.0	ms	19.6	1.18	6.38
M-1C	CAMO-04-53287	c2	fine	0.3	0.9	2.9	5.7	11.2	17.1	33.7	12.4	16.1	csi	62.3	-	6.08
M-1C	CAMO-04-53288	c2	fine	0.5	1.5	5.1	6.3	8.4	11.9	31.8	21.1	14.1	csi	67.0	-	6.27
M-1C	CAMO-04-53289	c2w	fine	0.2	1.2	2.9	3.0	2.9	4.4	40.4	25.2	19.9	csi	85.5	-	6.17
M-1C	CAMO-04-53290	c2w	fine	1.3	5.4	11.3	13.3	15.9	15.0	21.3	6.9	10.6	vfs	38.8	-	6.13
M-1C	CAMO-04-53291	c2	coarse	47.0	37.1	19.5	7.5	3.5	3.5	11.6	9.3	8.1	cs	29.0	-	6.25
M-1C	CAMO-04-53292	c1	coarse	45.1	46.5	23.8	5.6	1.8	1.2	1.7	8.6	10.8	cs	21.1	-	6.11
M-1C	CAMO-04-53293	c2w	coarse	23.2	30.7	34.7	14.6	4.3	2.6	3.4	3.1	6.5	cs	12.9	-	4.54
M-1C	CAMO-04-53294	c2	fine	10.7	4.3	10.7	9.6	6.1	5.5	22.8	24.6	16.2	csi	63.5	-	5.72
M-1E	CAMO-98-0001	f1	fine	0.1	1.6	4.7	6.2	5.1	5.1	26.8	31.2	19.2	fsi	77.2	5.9	-
M-1E	CAMO-98-0002	c1	coarse?	16.5	18.9	23.4	15.3	6.5	4.1	12.8	8.9	10.0	ms	31.7	2.2	-
M-1E	CAMO-98-0003	c2	fine	0.2	1.1	1.7	2.3	2.3	2.6	25.0	42.8	22.2	fsi	89.9	5.8	-
M-1E	CAMO-98-0005	c2	fine	15.4	11.1	14.8	19.2	10.7	7.5	18.8	8.4	9.2	fs	36.5	2.2	-
M-1E	CAMO-98-0006	c1ct	fine	0.2	2.0	2.4	2.5	2.4	3.0	22.7	37.2	27.8	fsi	87.6	5.9	-
M-1E	CAMO-04-53303	c2w	fine	1.4	0.3	2.0	2.4	2.0	3.9	34.8	31.8	22.7	fsi	89.3	-	5.99
M-1E	CAMO-04-53304	c1ct	fine	6.2	0.3	2.3	2.5	1.6	3.2	34.3	28.9	27.0	fsi	90.1	-	5.84
M-1E	CAMO-04-53305	c1ct	coarse	13.2	50.4	37.3	4.1	0.7	0.7	1.0	1.6	4.2	vcs	6.8	-	5.61
M-1E	CAMO-04-53306	c2	fine	0.0	0.3	1.1	2.7	3.9	8.9	41.8	22.9	18.4	csi	83.1	-	5.79
M-1E	CAMO-04-53307	c2	fine	0.9	2.4	6.7	7.1	5.1	5.7	28.6	24.7	19.5	csi	72.8	-	6.18
M-1E	CAMO-04-53308	c2	fine	9.3	13.2	9.7	5.4	8.4	11.6	26.2	13.0	12.3	csi	51.5	-	6.19
M-1E	CAMO-04-53309	c2	coarse	9.0	27.4	40.3	19.5	4.5	1.3	-0.8	2.2	5.2	cs	6.6	-	6.09
M-1E	CAMO-04-53310	f1	fine	0.0	1.4	6.5	9.1	8.1	9.4	31.9	17.8	15.7	csi	65.4	-	6.85
M-1E	CAMO-05-63648	c1ct	fine	0.0	0.5	2.2	1.6	1.7	5.1	27.8	36.0	25.2	fsi	89.1	3.62	5.07
M-1E	CAMO-05-63649	c2w	coarse	13.5	21.8	26.8	16.7	5.9	3.9	5.6	10.8	8.5	ms	24.9	1.15	5.26
M-1E	CAMO-05-63650	c2	fine	0.1	1.9	3.8	3.1	3.6	7.4	26.1	33.9	20.2	fsi	80.2	4.07	5.71
M-1E	CAMO-05-63651	c2	fine	0.0	0.3	3.3	5.3	4.7	5.5	30.6	27.4	22.8	fsi	80.8	4.09	5.49
M-1E	CAMO-05-63652	c2	fine	0.0	0.3	5.2	9.2	5.8	5.5	27.3	27.9	18.8	csi	74.0	4.58	6.03
M-1E	CAMO-05-63653	c2	coarse	4.8	23.9	25.8	12.6	6.3	4.1	7.9	11.0	8.4	ms	27.3	1.24	5.70
M-1E	CAMO-05-63654	c1	coarse	19.3	53.4	32.4	7.7	1.1	0.6	1.3	0.9	2.6	vcs	4.9	0.18	6.04
M-1E	CAMO-05-63655	f1	fine	0.3	6.2	14.4	13.0	6.5	5.1	19.2	19.9	15.5	csi	54.6	3.98	5.58
M-1W	CAMO-98-0011	c2	coarse	25.2	32.0	28.9	15.2	4.4	2.3	7.9	6.3	3.0	cs	17.2	0.6	-
M-1W	CAMO-98-0012	c1	coarse	30.9	25.8	37.1	21.6	4.8	1.9	4.1	2.5	2.3	cs	8.9	1.0	-
M-1W	CAMO-98-0013	c1b	coarse	31.4	26.5	29.6	17.6	7.6	3.9	7.7	3.6	3.4	cs	14.8	0.9	-
M-1W	CAMO-98-0015	c2w	fine	12.4	17.8	16.6	11.0	11.3	13.9	19.3	5.9	4.0	fs	29.3	1.1	-
M-1W	CAMO-98-0016	c1ct	fine	15.9	9.6	12.4	12.8	12.8	14.1	23.5	8.2	6.5	vfs	38.3	2.1	-
M-1W	CAMO-04-53283	c1b	fine	7.2	14.7	24.2	24.5	11.2	6.3	7.9	4.7	6.7	ms	19.2	-	6.2
M-1W	CAMO-04-53284	c1ct	coarse	20.5	23.2	32.0	23.6	11.2	4.1	0.6	1.6	3.5	cs	5.7	-	6.23
M-1W	CAMO-04-53285	c2	coarse	68.4	32.8	31.1	14.6	5.5	3.0	3.3	4.4	5.2	cs	12.9	-	6.2
M-1W	CAMO-04-53286	c2	fine	2.9	5.1	10.6	13.2	13.7	11.1	22.8	12.1	11.0	vfs	45.9	-	6.13
M-1W	CAMO-05-61175	c1	coarse	60.1	47.4	27.6	8.4	3.3	2.4	5.3	2.5	3.2	cs	10.9	0.43	6.53
M-1W	CAMO-05-63622	c2	fine	0.8	0.8	5.6	11.3	16.0	16.7	12.3	26.1	11.2	vfs	49.6	2.90	5.75
M-1W	CAMO-05-63623	c2	fine	0.2	1.8	5.4	12.3	21.6	18.1	10.2	22.1	8.3	vfs	40.6	1.86	5.98
M-1W	CAMO-05-63624	c2	coarse	42.0	20.6	25.5	25.0	12.2	4.3	3.2	5.4	3.8	ms	12.4	0.45	6.08

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-1W	CAMO-05-63625	c1ct	fine	0.0	0.2	1.0	1.9	6.4	12.5	19.2	46.4	12.3	fsi	78.0	2.98	5.04
M-1W	CAMO-05-63646	c1	coarse	29.7	49.8	36.9	9.7	0.8	0.3	1.0	-0.2	1.8	cs	2.6	0.27	6.41
M-1W	CAMO-05-63647	c2w	coarse	29.7	20.1	24.7	22.5	10.1	5.0	3.5	8.6	5.6	ms	17.7	0.44	6.31
M-2E	CAMO-01-0025	f1g	fine	1.7	3.7	9.6	14.8	13.5	13.4	25.3	10.7	8.7	vfs	44.7	4.5	-
M-2E	CAMO-01-0026	c1	coarse	5.3	28.6	43.2	20.9	3.5	0.6	1.3	0.5	1.2	cs	3.0	0.6	-
M-2E	CAMO-01-0027	f1g? (c3?)	fine	4.7	2.0	7.8	17.2	16.0	15.6	24.7	10.1	6.5	vfs	41.2	2.6	-
M-2E	CAMO-01-0028	f1g	fine	6.5	19.3	14.4	9.5	12.4	13.1	19.0	8.2	3.7	fs	31.0	1.5	-
M-2E	CAMO-01-0029	f1g	fine	0.3	0.1	0.9	3.2	11.8	23.2	42.0	11.0	7.3	csi	60.3	3.5	-
M-2E	CAMO-01-0030	f1g	fine	0.1	0.4	0.6	2.6	10.8	19.8	40.7	17.0	7.7	csi	65.5	3.5	-
M-2E	CAMO-01-0031	c1b	fine	0.9	2.0	12.2	28.3	20.6	10.8	14.6	7.4	4.0	fs	25.9	2.9	-
M-2E	CAMO-01-0032	f1g	fine	0.2	0.3	3.8	22.4	22.8	14.8	16.4	11.5	8.0	vfs	35.8	4.7	-
M-2E	CAMO-01-0033	c3	fine	3.6	2.3	14.8	27.5	17.4	11.5	15.6	9.1	1.6	fs	26.2	3.2	-
M-2E	CAMO-01-0034	c2	fine	0.0	0.3	4.3	26.8	32.0	17.0	12.3	5.3	1.8	fs	19.4	1.7	-
M-2E	CAMO-01-0035	f1	fine	1.2	5.7	18.1	22.7	13.6	9.9	13.1	8.6	8.1	fs	29.8	2.4	-
M-2E	CAMO-01-0036	c1	coarse	36.1	45.3	28.0	15.7	4.8	1.0	0.8	3.7	0.8	cs	5.3	0.4	-
M-2E	CAMO-01-0037	f1	fine	2.9	6.4	13.7	18.0	13.2	11.2	17.5	10.9	9.1	fs	37.6	2.7	-
M-2E	CAMO-01-0038	c3	coarse	4.4	15.1	29.1	27.2	10.1	4.1	3.7	6.8	4.0	ms	14.4	1.2	-
M-2E	CAMO-01-0039	c3	fine	0.3	2.2	4.0	9.9	11.2	13.4	36.1	15.1	7.9	csi	59.1	3.2	-
M-2E	CAMO-01-0040	c3	fine	4.3	13.5	20.1	26.3	14.1	7.0	7.0	5.7	6.4	ms	19.0	1.3	-
M-2E	CAMO-01-0041	f1	fine	0.7	2.0	6.7	18.0	16.5	15.0	22.4	10.9	8.5	vfs	41.9	2.7	-
M-2E	CAMO-01-0042	c3	fine	3.7	8.1	15.4	18.1	13.7	10.5	15.4	10.0	8.9	fs	34.2	3.0	-
M-2E	CAMO-01-0043	c3	fine	5.5	8.1	16.7	18.6	13.0	11.3	15.8	9.7	6.9	fs	32.3	2.0	-
M-2E	CAMO-01-0044	c3	coarse	36.2	44.4	32.9	11.4	2.8	1.1	1.0	2.1	4.3	cs	7.4	0.6	-
M-2E	CAMO-01-0045	c2	fine	1.0	7.8	27.2	35.2	14.1	4.7	3.5	2.8	4.6	ms	10.9	1.1	-
M-2E	CAMO-01-0046	c2	coarse	54.6	52.4	25.1	10.8	3.8	1.4	1.2	2.4	2.8	vcs	6.4	0.4	-
M-2E	CAMO-01-0047	f1g	fine	0.2	0.9	2.5	10.8	18.8	22.8	26.3	8.1	9.7	vfs	44.1	2.7	-
M-2E	CAMO-01-0048	c1b	coarse	33.0	62.3	24.3	5.9	1.8	0.8	0.8	0.3	3.7	vcs	4.9	0.5	-
M-2E	CAMO-01-0049	f1	fine	0.4	3.4	7.5	11.2	11.0	12.0	25.0	13.9	15.9	csi	54.7	5.2	-
M-2E	CAMO-01-0050	f1g? (c3?)	fine	2.1	3.3	6.3	8.8	9.5	8.5	26.0	24.1	13.5	csi	63.6	3.9	-
M-2E	CAMO-01-0051	f1g	fine	0.9	3.1	5.0	5.5	13.4	22.1	32.4	8.7	9.7	csi	50.7	2.7	-
M-2E	CAMO-01-0052	f1g	fine	1.0	2.7	3.4	4.5	11.9	17.4	37.7	10.7	11.6	csi	60.0	2.5	-
M-2E	CAMO-01-0053	f1g	fine	0.7	3.1	7.5	11.6	11.1	13.3	26.6	14.1	12.6	csi	53.3	2.6	-
M-2E	CAMO-01-0054	f1g	coarse	22.7	48.2	30.5	8.2	2.3	1.8	0.9	3.6	4.5	cs	9.0	0.6	-
M-2E	CAMO-01-0055	c1b	tuff	4.3	21.0	24.3	13.4	8.8	5.8	7.3	12.5	6.9	ms	26.7	0.3	-
M-2E	CAMO-01-0056	c3	fine	1.3	0.2	3.6	21.8	27.6	17.8	13.1	6.9	8.7	fs	28.7	2.5	-
M-2E	CAMO-01-0057	c3	fine	54.0	21.4	12.5	14.5	12.8	9.4	12.9	8.2	7.7	fs	28.7	2.0	-
M-2E	CAMO-01-0058	c3	fine	0.2	3.0	5.7	6.3	9.7	16.4	36.4	11.3	11.2	csi	58.9	2.7	-
M-2E	CAMO-01-0059	c3	fine	0.0	0.0	1.4	7.8	22.6	27.1	22.2	7.9	10.6	vfs	40.8	3.0	-
M-2E	CAMO-01-0060	c3	fine	0.2	0.8	2.4	2.4	4.9	15.3	48.1	14.6	11.5	csi	74.2	2.9	-
M-2E	CAMO-01-0061	c3	coarse	31.4	48.2	22.7	4.9	2.1	2.3	7.4	6.6	5.6	cs	19.6	1.1	-
M-2E	CAMO-01-0062	f1g	fine	0.1	1.3	3.4	6.2	13.6	20.7	34.6	10.9	9.0	csi	54.5	3.2	-
M-2E	CAMO-01-0063	c2	coarse	30.1	25.2	37.3	21.2	5.6	1.8	0.7	2.9	5.4	cs	9.0	0.6	-
M-2E	CAMO-01-0064	c1	coarse	17.0	40.5	32.8	14.1	4.0	1.5	0.6	1.7	4.9	cs	7.2	0.5	-
M-2E	CAMO-04-55076	c3	fine	-	-	-	-	-	-	-	-	-	-	-	-	7.14
M-2E	CAMO-04-55077	f1g	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.93
M-2E	CAMO-04-55078	f1g	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.86
M-2E	CAMO-04-55079	c1	coarse	17.5	64.3	25.3	4.8	1.3	0.8	-0.7	0.8	3.5	vcs	3.5	0.47	6.83
M-2E	CAMO-04-55080	c1	fine	0.0	0.8	3.3	7.7	19.4	22.2	26.4	9.2	11.2	vfs	46.8	3.26	6.76
M-2E	CAMO-04-55081	f1	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.72
M-2E	CAMO-04-55082	c1	coarse	4.8	34.6	48.8	12.0	1.5	0.4	-0.5	0.7	2.4	cs	2.6	0.22	6.86
M-2E	CAMO-04-55083	c1	fine	0.3	1.2	3.6	12.1	22.9	21.4	22.3	5.6	10.5	vfs	38.4	3.37	6.71
M-2W	CAMO-98-0017	c3	fine	3.9	4.0	9.8	22.9	21.3	11.9	16.6	6.4	7.2	fs	30.1	2.3	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-2W	CAMO-98-0018	c3	fine	0.7	0.3	3.0	14.5	28.2	20.2	21.9	5.1	6.5	vfs	33.5	2.9	-
M-2W	CAMO-98-0019	c3	fine	5.9	2.3	4.0	12.6	20.5	21.8	28.5	6.9	3.1	vfs	38.5	2.5	-
M-2W	CAMO-98-0020	c3	coarse	32.1	35.7	31.9	15.7	4.5	1.4	3.0	3.3	4.3	cs	10.6	0.7	-
M-2W	CAMO-98-0021	c3	fine	3.5	7.4	13.6	17.8	13.0	9.0	21.4	9.5	8.1	fs	39.1	2.0	-
M-2W	CAMO-98-0022	c3	coarse	18.3	23.5	31.4	16.9	8.0	3.4	6.7	4.9	5.2	cs	16.7	1.0	-
M-2W	CAMO-98-0023	c1	coarse	15.8	25.7	35.6	27.3	5.2	1.1	1.1	1.6	2.2	cs	4.9	0.5	-
M-2W	CAMO-98-0024	c3	fine	1.1	2.6	5.4	14.6	16.8	17.6	27.1	8.0	8.0	vfs	43.1	3.5	-
M-2W	CAMO-98-0025	c3	fine	3.5	6.1	23.8	27.8	11.3	5.3	11.7	7.6	6.6	ms	26.0	2.6	-
M-2W	CAMO-98-0026	c3	coarse	37.5	52.8	21.6	7.4	2.2	1.0	3.8	5.4	5.7	vcs	14.9	1.1	-
M-2W	CAMO-01-0067	c1	coarse	13.6	46.8	32.6	11.7	3.3	0.9	0.6	2.2	1.9	cs	4.7	0.3	-
M-2W	CAMO-01-0068	c1b	fine	3.2	6.1	19.7	33.2	19.7	7.4	5.1	3.4	5.3	ms	13.8	1.3	-
M-2W	CAMO-01-0069	c3	coarse	26.8	33.6	27.1	8.7	2.5	1.9	10.1	9.7	6.3	cs	26.1	1.6	-
M-2W	CAMO-01-0070	f1	fine	0.0	0.3	1.8	8.2	13.4	19.2	34.4	13.4	9.1	csi	56.9	2.2	-
M-2W	CAMO-01-0071	f1	fine	0.7	2.4	8.1	14.3	12.6	11.1	23.0	13.8	14.5	csi	51.3	2.8	-
M-2W	CAMO-01-0072	f1g	fine	4.3	5.8	12.9	21.7	16.0	13.7	15.0	7.9	6.8	fs	29.7	2.0	-
M-2W	CAMO-01-0073	f1g	fine	0.1	1.9	3.8	8.4	15.6	19.8	32.8	7.1	10.3	csi	50.3	2.9	-
M-2W	CAMO-01-0074	c2	fine	1.0	3.7	6.3	11.5	14.7	17.7	21.7	11.2	13.2	vfs	46.1	4.2	-
M-2W	CAMO-01-0075	c1b	fine	2.0	5.3	9.6	11.6	17.4	19.2	21.0	7.4	8.4	vfs	36.9	2.2	-
M-2W	CAMO-01-0076	f1	fine	0.2	1.5	8.1	23.7	18.9	12.2	16.5	8.8	10.1	fs	35.4	2.5	-
M-2W	CAMO-01-0097	c1b	coarse	32.2	32.3	37.4	18.2	4.7	1.3	3.4	0.0	2.5	cs	5.9	0.8	-
M-2W	CAMO-01-0098	c2	fine	0.8	5.6	15.2	20.1	16.7	13.7	13.8	7.5	7.2	fs	28.5	3.1	-
M-2W	CAMO-01-0099	c2	fine	1.2	3.7	7.9	9.1	9.0	13.5	27.8	14.7	14.0	csi	56.5	3.5	-
M-2W	CAMO-01-0100	c1b	coarse	23.2	26.6	38.0	19.4	5.6	2.2	2.4	3.8	2.2	cs	8.3	0.6	-
M-2W	CAMO-01-0101	c2	fine	2.0	4.4	9.4	14.6	18.0	16.5	20.2	8.0	8.7	vfs	36.9	3.1	-
M-2W	CAMO-01-0102	c3	fine	3.7	8.9	13.2	16.2	14.0	11.0	18.6	8.3	9.5	fs	36.3	3.3	-
M-2W	CAMO-01-0103	c3	fine	10.9	16.5	15.3	10.7	7.5	7.6	20.0	13.3	8.6	fs	41.9	2.9	-
M-2W	CAMO-01-0104	c3	coarse	32.4	37.1	31.1	8.4	1.3	1.0	5.2	8.6	7.3	cs	21.0	1.2	-
M-2W	CAMO-01-0105	c3	coarse	39.5	48.7	26.8	6.3	1.4	0.8	1.7	7.3	6.6	cs	15.7	1.0	-
M-2W	CAMO-01-0106	f1	fine	0.3	0.1	1.3	5.2	12.0	21.5	35.6	11.2	12.7	csi	59.5	3.7	-
M-2W	CAMO-01-0107	f1	fine	0.1	0.0	0.8	3.5	8.4	16.0	38.6	19.8	12.6	csi	71.0	3.7	-
M-2W	CAMO-01-0108	f1	fine	0.0	0.1	1.5	2.7	7.5	16.8	38.9	17.6	14.5	csi	71.0	5.4	-
M-2W	CAMO-01-0109	f1	fine	0.0	0.3	1.5	4.2	9.3	18.2	41.1	15.0	10.2	csi	66.3	3.1	-
M-2W	CAMO-01-0110	f1g	fine	0.1	2.8	3.6	5.4	11.7	19.7	32.7	10.1	13.8	csi	56.6	3.0	-
M-2W	CAMO-01-0111	f1g	coarse	13.0	20.9	31.6	24.9	7.7	3.1	4.0	1.9	5.7	cs	11.6	1.0	-
M-2W	CAMO-01-0112	f1g	fine	0.5	3.3	3.5	3.2	12.9	23.7	31.1	10.1	11.9	csi	53.1	3.3	-
M-2W	CAMO-01-0113	f1g	fine	0.1	0.5	5.0	10.7	9.7	11.5	35.1	13.1	14.0	csi	62.2	2.9	-
M-2W	CAMO-01-0114	f1g	coarse	7.3	16.9	28.2	21.9	12.5	6.6	4.5	3.3	5.9	ms	13.7	1.2	-
M-2W	CAMO-01-0115	f1g	fine	0.0	0.2	1.9	6.1	16.6	21.9	29.8	8.8	14.5	csi	53.1	3.5	-
M-2W	CAMO-01-0116	f1g	fine	1.9	10.5	23.5	26.9	12.7	6.8	8.2	5.1	6.4	ms	19.6	1.8	-
M-2W	CAMO-01-0117	f1g	fine	0.0	1.3	5.5	12.1	16.3	16.7	27.1	8.3	12.4	vfs	47.8	3.1	-
M-2W	CAMO-01-0118	f1	fine	0.0	1.1	7.8	15.2	21.7	17.0	17.3	9.0	10.7	vfs	37.0	4.3	-
M-2W	CAMO-01-0119	f1g	fine	0.0	0.0	0.9	4.2	16.0	22.9	33.1	8.4	14.1	csi	55.5	3.7	-
M-2W	CAMO-01-0120	f1g	fine	0.1	0.3	1.0	3.2	9.4	20.5	39.7	14.2	11.6	csi	65.4	3.2	-
M-2W	CAMO-01-0121	f1g	coarse	15.7	60.8	30.0	3.1	0.3	0.3	-0.2	2.8	2.3	vcs	5.0	0.6	-
M-2W	CAMO-01-0122	f1g	fine	0.1	2.0	4.2	8.5	10.9	15.9	30.7	15.2	12.6	csi	58.5	3.7	-
M-2W	CAMO-01-0123	c3	fine	0.0	1.3	7.1	26.9	27.6	13.1	9.5	4.6	9.8	fs	23.9	3.3	-
M-2W	CAMO-01-0124	c3	fine	0.0	0.4	2.3	16.6	28.1	22.8	19.0	4.7	6.1	vfs	29.8	1.7	-
M-2W	CAMO-01-0125	c3	fine	0.6	5.5	4.8	6.0	9.6	20.5	38.7	6.0	9.0	csi	53.7	2.0	-
M-2W	CAMO-01-0126	c3	fine	0.0	1.0	2.0	3.2	9.2	24.3	44.4	8.9	7.1	csi	60.4	2.9	-
M-2W	CAMO-01-0127	c2	fine	0.5	1.1	2.9	8.2	14.6	17.8	31.0	11.8	12.5	csi	55.3	3.8	-
M-2W	CAMO-01-0128	c2	fine	0.4	3.2	7.2	19.9	15.6	11.3	18.0	12.4	12.2	vfs	42.7	3.7	-
M-2W	CAMO-01-0129	c2	coarse	15.2	35.0	31.3	12.9	4.4	1.9	2.2	6.0	6.3	cs	14.5	1.1	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-2W	CAMO-01-0130	f2	fine	1.3	6.7	11.1	14.8	13.4	12.5	19.1	9.3	13.0	vfs	41.4	4.1	-
M-2W	CAMO-01-0131	f1	fine	0.0	1.5	6.7	12.6	15.2	17.8	27.9	7.9	10.2	vfs	46.1	2.2	-
M-2W	CAMO-01-0132	c3	fine	0.6	0.4	1.9	10.2	19.2	24.1	29.8	5.0	9.5	vfs	44.2	2.9	-
M-2W	CAMO-01-0133	c3	fine	21.1	14.3	17.4	13.1	9.2	8.1	20.0	9.8	8.1	fs	37.9	2.6	-
M-2W	CAMO-01-0134	c3	coarse	33.1	57.3	23.9	7.2	1.8	0.7	0.1	5.5	3.4	vcs	9.0	0.7	-
M-2W	CAMO-01-0135	c2	fine	1.7	2.0	12.6	32.2	21.9	12.3	9.3	5.2	4.3	fs	18.8	1.4	-
M-2W	CAMO-01-0136	c2	coarse	55.6	27.7	30.5	19.0	6.7	3.0	5.3	3.5	4.3	cs	13.1	0.7	-
M-2W	CAMO-01-0137	c1	coarse	21.1	41.7	33.5	14.7	2.8	1.0	1.1	3.0	2.2	cs	6.3	0.4	-
M-2W	CAMO-04-55068	c3	fine	-	-	-	-	-	-	-	-	-	-	-	-	7.45
M-2W	CAMO-04-55069	c3	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.81
M-2W	CAMO-04-55070	c1	coarse	12.2	48.0	38.9	7.1	1.0	0.7	0.1	0.9	3.2	cs	4.2	0.32	6.90
M-2W	CAMO-04-55071	c3	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.84
M-2W	CAMO-04-55072	c1b	fine	0.1	0.6	5.4	18.3	25.9	14.6	21.5	6.5	7.2	fs	35.2	3.05	7.05
M-2W	CAMO-04-55073	c2	fine	-	-	-	-	-	-	-	-	-	-	-	-	7.00
M-2W	CAMO-04-55074	c1	coarse	37.6	52.4	27.3	10.4	2.8	1.2	1.6	2.2	2.2	vcs	6.0	0.53	6.74
M-2W	CAMO-04-55075	c1b	fine	0.0	0.1	2.3	13.3	21.3	20.3	25.3	8.0	9.4	vfs	42.6	4.61	6.74
M-2W	CAMO-05-61169	c1	coarse	6.7	52.6	29.7	8.5	2.2	1.2	0.7	1.6	3.5	vcs	5.8	0.24	6.23
M-3	CAMO-99-0050	c3	fine	5.1	2.1	3.6	2.1	2.6	7.7	41.5	27.7	12.1	csi	81.3	4.3	-
M-3	CAMO-99-0051	f1a	fine	4.3	3.3	5.5	3.4	5.8	11.2	38.1	20.0	12.6	csi	70.7	2.4	-
M-3	CAMO-99-0052	c1	coarse	10.8	42.4	27.7	13.6	6.0	2.1	3.0	2.3	2.9	cs	8.2	0.3	-
M-3	CAMO-99-0053	c3	coarse	8.5	38.4	36.4	11.3	2.2	0.8	2.1	3.8	4.9	cs	10.8	0.4	-
M-3	CAMO-99-0054	c1b/c3?	fine	6.6	10.0	11.0	8.2	5.8	7.6	25.9	19.3	11.9	csi	57.1	2.6	-
M-3	CAMO-99-0060	c3? (f1?)	fine	9.2	14.2	13.9	13.1	10.8	9.8	23.7	8.1	6.0	fs	37.8	1.9	-
M-3	CAMO-99-0061	c3? (f1?)	fine	1.1	0.5	3.2	9.7	16.3	19.8	34.6	8.7	7.0	csi	50.3	2.0	-
M-3	CAMO-99-0062	c3	fine	28.2	7.3	4.6	5.8	10.6	13.6	37.5	15.0	5.5	csi	58.0	3.5	-
M-3	CAMO-99-0063	c3	fine	0.3	0.6	1.6	1.2	3.1	12.8	56.2	15.9	8.2	csi	80.3	2.6	-
M-3	CAMO-99-0064	c3	coarse	7.9	40.1	35.9	12.3	2.5	1.4	3.8	1.7	2.1	cs	7.6	0.3	-
M-3	CAMO-99-0065	c3	fine	1.5	0.4	1.2	1.4	5.6	15.7	50.6	15.8	9.1	csi	75.5	2.2	-
M-3	CAMO-99-0066	c3	fine	3.6	10.0	19.3	15.0	8.8	11.3	20.9	8.1	6.4	fs	35.5	2.5	-
M-3	CAMO-99-0067	c3	fine	0.5	3.0	5.3	4.5	5.9	10.3	41.6	18.4	10.4	csi	70.4	3.4	-
M-3	CAMO-99-0068	f1a	fine	0.2	0.6	1.9	1.9	2.4	8.1	49.7	24.5	10.7	csi	84.9	3.7	-
M-3	CAMO-99-0069	f1a	fine	0.1	0.3	1.0	2.4	7.9	17.5	47.2	11.7	11.9	csi	70.8	3.1	-
M-3	CAMO-99-0070	c3	fine	4.7	16.4	12.1	4.6	2.7	3.2	24.0	21.9	15.1	csi	60.9	3.8	-
M-3	CAMO-99-0071	c3	coarse	16.7	48.0	32.4	7.2	1.8	0.7	0.8	4.6	4.3	cs	9.7	0.5	-
M-3	CAMO-99-0072	c3	fine	8.7	21.9	20.0	9.5	5.7	6.7	18.5	9.7	7.8	ms	36.0	1.6	-
M-3	CAMO-01-0161	f1	fine	9.2	12.7	11.4	4.3	2.8	4.9	27.2	19.8	17.0	csi	64.0	3.9	-
M-3	CAMO-01-0162	f1a	fine	2.3	2.1	2.5	1.7	4.3	10.9	41.3	24.1	13.2	csi	78.6	4.0	-
M-3	CAMO-01-0163	c2	fine	7.8	18.9	20.1	16.8	9.4	7.4	14.6	5.8	7.0	ms	27.4	1.9	-
M-3	CAMO-01-0164	c3	fine	0.9	7.6	14.9	6.9	4.9	7.5	31.5	16.6	10.1	csi	58.2	3.9	-
M-3	CAMO-01-0165	c2a?	fine	10.9	14.4	21.6	15.8	9.0	7.3	16.4	8.0	7.3	ms	31.8	2.4	-
M-3	CAMO-01-0166	c3a	fine	4.8	14.7	13.7	9.9	6.1	4.7	21.1	18.3	11.3	csi	50.7	3.3	-
M-3	CAMO-01-0167	f1	fine	10.2	5.3	7.4	3.6	1.9	4.9	36.4	23.6	16.9	csi	76.9	3.0	-
M-3	CAMO-01-0168	c2	fine	2.2	5.2	8.8	12.5	18.0	15.5	22.8	7.4	9.7	vfs	39.9	3.3	-
M-3	CAMO-01-0169	c1	coarse	13.6	35.6	31.3	15.6	6.1	1.7	2.5	3.1	4.0	cs	9.6	0.6	-
M-3	CAMO-01-0170	f1	fine	0.6	1.3	3.9	6.6	12.6	19.8	37.2	10.8	7.8	csi	55.8	2.4	-
M-3	CAMO-01-0171	c1	coarse	5.9	37.0	38.8	13.4	3.6	1.5	1.9	0.3	3.5	cs	5.7	0.5	-
M-3	CAMO-01-0172	c1	coarse	10.7	38.4	35.1	12.1	2.3	1.8	4.1	3.4	2.9	cs	10.4	0.6	-
M-3	CAMO-01-0173	f1	fine	9.6	8.9	7.5	3.3	3.1	5.4	26.9	26.2	18.6	csi	71.7	5.4	-
M-3	CAMO-01-0174	f1	fine	7.2	14.8	18.4	7.2	4.6	5.0	19.5	16.1	14.2	vfs	49.9	2.6	-
M-3	CAMO-01-0175	f1	fine	13.2	15.8	16.8	7.5	4.9	5.5	19.6	18.3	11.6	vfs	49.5	3.6	-
M-3	CAMO-01-0176	f1	fine	13.9	19.1	16.9	7.7	5.6	6.5	19.4	13.7	11.1	vfs	44.2	2.6	-
M-3	CAMO-01-0177	f1	fine	11.9	14.5	12.5	5.5	7.6	11.0	24.4	12.4	12.0	vfs	48.8	2.4	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-3	CAMO-01-0178	f1	coarse	7.3	28.2	29.3	10.9	3.2	2.0	7.2	3.1	15.7	cs	26.0	1.7	-
M-3	CAMO-01-0179	f1	fine	2.8	1.3	2.0	1.2	2.0	7.9	39.5	28.2	17.6	csi	85.4	2.8	-
M-3	CAMO-01-0180	c1b/c3	coarse	25.7	29.8	20.4	10.5	6.4	6.0	10.8	9.0	6.9	cs	26.7	1.3	-
M-3	CAMO-01-0181	c1b/c3	coarse	26.2	30.6	22.5	8.6	6.1	7.0	13.0	7.7	4.4	cs	25.1	1.1	-
M-3	CAMO-01-0182	c1b/c3	fine	6.9	3.7	4.2	2.1	1.9	4.2	32.4	30.9	20.4	fsi	83.7	4.0	-
M-3	CAMO-01-0183	c1b/c3	fine	2.8	0.8	1.0	0.7	1.3	10.2	42.9	21.9	21.1	csi	85.9	3.5	-
M-3	CAMO-01-0184	f1	fine	8.5	12.8	12.2	6.9	6.7	10.2	24.9	14.0	12.1	csi	51.0	3.0	-
M-3	CAMO-01-0185	c1g/c3	coarse?	1.2	11.2	38.6	31.1	9.1	3.1	1.9	0.0	5.0	ms	6.9	0.5	-
M-3	CAMO-01-0186	c1g/c3	coarse	27.6	29.9	29.5	16.3	8.1	4.0	2.6	3.4	6.0	cs	12.1	0.7	-
M-3	CAMO-01-0187	c1g/c3	fine	7.6	21.4	24.1	10.7	4.4	4.4	11.8	11.3	11.6	ms	34.7	1.7	-
M-3	CAMO-01-0188	c1g/c3	coarse	4.9	42.3	32.4	12.5	3.1	1.0	0.1	5.6	2.9	cs	8.6	0.5	-
M-3	CAMO-01-0189	f1	fine	5.8	15.6	14.5	6.9	3.9	5.5	22.4	20.6	10.3	csi	53.3	4.5	-
M-3	CAMO-01-0190	f1a	coarse	11.2	28.2	21.9	9.2	4.0	3.5	11.5	11.6	9.8	cs	32.9	1.7	-
M-3	CAMO-01-0191	f1a	fine	3.4	8.9	6.6	5.0	6.7	10.3	26.7	22.9	12.6	csi	62.3	3.2	-
M-3	CAMO-01-0192	f1a	fine	2.6	5.7	9.0	9.7	4.5	6.0	32.4	19.1	13.3	csi	64.7	4.2	-
M-3	CAMO-01-0193	f1	fine	4.8	15.7	19.7	11.4	8.1	8.4	21.5	8.1	6.9	fs	36.6	2.3	-
M-3	CAMO-01-0194	c3a? (f1a?)	fine	6.3	6.6	6.4	4.7	8.6	12.9	37.0	15.2	8.4	csi	60.6	2.6	-
M-3	CAMO-01-0195	c3a? (f1a?)	fine?	12.2	26.5	17.8	6.3	4.1	6.3	20.8	9.4	8.5	ms	38.7	1.6	-
M-3	CAMO-01-0196	c3a? (f1a?)	fine	2.1	4.5	8.8	6.5	8.2	12.3	33.1	13.0	13.1	csi	59.2	2.5	-
M-3	CAMO-01-0197	c3a? (f1a?)	coarse	7.0	39.3	31.1	13.8	4.2	2.2	2.7	3.0	3.6	cs	9.3	0.5	-
M-3	CAMO-01-0198	c3	coarse	14.1	25.1	26.5	15.8	8.5	5.4	9.5	4.7	4.3	cs	18.5	1.1	-
M-3	CAMO-01-0199	c2a?	fine	9.1	12.8	14.2	13.8	7.7	6.5	22.9	12.9	9.1	vfs	44.9	1.8	-
M-3	CAMO-01-0200	c2a?	fine	8.6	19.0	19.8	15.0	10.7	8.0	12.8	7.4	6.9	ms	27.1	1.4	-
M-3	CAMO-01-0201	c2a?	coarse	26.3	42.8	32.8	10.8	2.9	1.4	1.5	3.3	4.3	cs	9.2	0.5	-
M-3	CAMO-01-0202	c3a	coarse	13.2	35.4	37.6	10.6	2.8	2.4	4.7	3.0	3.3	cs	10.9	0.9	-
M-3	CAMO-01-0203	c3a	coarse	13.4	53.0	29.7	4.4	1.7	1.7	2.9	3.1	3.5	vcs	9.5	0.6	-
M-3	CAMO-01-0204	c3a	fine	2.2	15.6	22.8	9.7	4.3	5.8	21.3	11.5	9.0	fs	41.7	2.0	-
M-3	CAMO-01-0205	c3a	coarse	10.3	37.9	36.9	12.9	3.4	1.6	1.4	2.4	3.4	cs	7.2	0.3	-
M-3	CAMO-01-0206	f1	fine	13.1	21.8	14.8	7.6	6.1	6.7	20.0	12.5	10.5	fs	42.9	1.8	-
M-3	CAMO-01-0207	f1	fine	0.3	0.0	0.8	4.1	8.1	15.1	43.8	16.4	11.4	csi	71.6	2.9	-
M-3	CAMO-01-0208	f1	fine	1.6	0.1	1.0	2.0	5.6	16.5	44.2	16.0	14.2	csi	74.4	2.6	-
M-3	CAMO-01-0209	c2	coarse	23.8	51.6	19.6	8.3	4.5	2.6	5.2	3.6	4.6	vcs	13.3	0.9	-
M-3	CAMO-01-0210	c2	coarse	9.7	33.4	32.2	17.5	5.3	2.0	3.3	2.6	3.7	cs	9.6	0.7	-
M-3	CAMO-01-0211	c2	coarse	8.6	30.9	37.5	18.1	4.6	1.6	1.1	2.7	3.4	cs	7.2	0.5	-
M-3	CAMO-01-0212	f1	fine	10.4	8.0	8.5	7.4	11.9	14.9	27.6	11.6	10.0	vfs	49.1	3.3	-
M-3	CAMO-01-0213	f1	fine	3.4	7.2	10.8	13.0	14.8	15.1	22.1	9.3	7.3	vfs	38.7	2.9	-
M-3	CAMO-01-0214	f1	fine	4.7	1.1	3.0	11.3	18.4	16.9	28.2	11.6	9.2	vfs	49.1	2.9	-
M-3	CAMO-01-0215	f1	fine	0.5	1.1	2.0	4.7	12.3	23.0	36.3	10.5	10.0	csi	56.8	3.1	-
M-3	CAMO-01-0216	c2	fine	1.6	10.6	35.7	32.1	9.8	3.0	3.0	1.9	3.8	ms	8.7	0.8	-
M-3	CAMO-01-0217	c2	coarse	6.3	33.5	40.7	13.5	4.2	1.6	0.8	2.5	3.2	cs	6.5	0.4	-
M-3	CAMO-01-0218	f1	fine	5.2	10.3	14.3	13.6	12.5	12.3	20.1	8.2	8.5	fs	36.8	2.4	-
M-3	CAMO-01-0219	f1	fine	5.1	11.7	16.7	15.9	9.5	8.4	20.1	8.9	8.8	fs	37.8	1.7	-
M-3	CAMO-01-0220	f1	fine	0.0	1.3	2.7	4.2	7.2	12.9	40.1	17.1	14.4	csi	71.6	4.3	-
M-3	CAMO-04-55018	c3? (f1?)	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.84
M-3	CAMO-04-55019	f1a	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.81
M-3	CAMO-04-55020	f1a	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.78
M-3	CAMO-04-55021	c1b/c3?	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.34
M-3	CAMO-04-55022	c1	fine	1.9	8.5	12.9	9.9	7.3	10.5	26.8	14.1	9.9	csi	50.8	4.57	6.74
M-3	CAMO-04-55023	c1	coarse	35.4	66.0	25.4	4.8	0.8	0.3	-0.8	0.7	2.8	vcs	2.7	0.25	6.38
M-3	CAMO-04-55024	c1	coarse	21.5	47.3	34.5	9.0	2.0	0.8	0.8	2.2	3.1	cs	6.2	0.63	6.31
M-3	CAMO-04-55025	c1	fine	0.3	8.5	23.2	16.8	9.6	8.5	17.3	8.5	7.6	fs	33.4	3.38	6.53
M-3	CAMO-04-55027	f1	fine	5.5	3.5	6.3	5.3	7.2	12.7	33.3	18.1	13.6	csi	65.0	-	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-3	CAMO-04-55028	c3	coarse	17.3	36.4	24.4	10.0	4.9	3.4	6.8	6.6	7.5	cs	20.9	-	-
M-3	CAMO-04-55029	f1a	fine	1.0	9.7	10.1	5.6	4.1	8.9	33.8	15.4	12.5	csi	61.7	-	-
M-3	CAMO-04-55030	f1a	coarse	9.5	40.7	26.9	13.8	6.0	2.8	2.7	3.2	4.0	cs	9.9	-	-
M-3	CAMO-04-55031	f1a	coarse	5.3	42.8	31.7	12.1	4.1	1.7	1.9	2.3	3.5	cs	7.7	-	-
M-3	CAMO-04-55032	f1a	coarse	10.8	44.3	34.2	13.0	2.8	1.0	0.7	0.9	3.2	cs	4.8	-	-
M-3	CAMO-04-55033	f1	fine	0.7	3.1	6.2	4.0	3.1	8.1	50.7	11.5	13.3	csi	75.5	-	-
M-3	CAMO-04-55034	f1	fine	5.0	23.3	17.5	8.8	6.7	7.5	17.3	9.4	9.0	fs	35.8	-	-
M-3	CAMO-04-55035	c3	fine	2.4	19.4	19.6	13.2	8.6	7.8	17.7	6.0	7.5	ms	31.2	-	-
M-3	CAMO-04-55036	c3	fine	0.2	2.5	5.3	4.9	7.2	12.8	40.6	14.8	11.6	csi	67.0	-	-
M-3	CAMO-04-55037	c3	fine	0.4	1.9	4.1	7.1	14.6	15.9	31.0	12.7	12.6	csi	56.2	-	-
M-3	CAMO-04-55038	c3	fine	0.6	6.8	9.9	16.3	13.4	11.3	22.0	9.4	10.7	vfs	42.1	-	-
M-3	CAMO-04-55039	c3	coarse	16.5	40.4	30.7	15.6	4.0	1.6	1.3	2.8	3.5	cs	7.6	-	-
M-3	CAMO-04-55040	c3	fine	5.2	11.8	11.3	6.8	5.7	8.9	30.9	14.1	10.2	csi	55.2	-	-
M-3	CAMO-04-55041	c3	coarse	4.0	33.6	24.2	8.3	3.7	3.7	11.0	8.0	7.5	cs	26.5	-	-
M-3	CAMO-04-55042	c3 swale	fine	0.1	3.1	4.1	1.4	0.8	0.9	26.5	40.8	22.1	fsi	89.5	-	-
M-3	CAMO-04-55043	c3 swale	coarse	14.6	45.4	24.5	7.6	2.2	1.1	2.3	8.3	8.7	cs	19.3	-	-
M-3	CAMO-04-55044	c3 swale	fine	0.1	2.3	2.5	2.6	3.8	6.4	29.6	30.3	22.7	fsi	82.6	-	-
M-3	CAMO-04-55045	c3 swale	coarse	4.7	41.3	31.5	11.8	3.8	1.8	1.9	3.1	4.7	cs	9.8	-	-
M-3	CAMO-04-55047	c1	coarse	5.0	35.4	42.4	11.1	2.9	1.5	1.6	1.4	3.5	cs	6.5	0.48	6.83
M-3	CAMO-04-55048	c1	fine	0.6	2.3	5.4	3.5	3.6	8.3	43.0	20.8	12.9	csi	76.8	6.46	6.50
M-3	CAMO-05-63824	c1	coarse	5.7	23.5	36.4	22.5	8.8	3.2	2.1	0.9	2.8	cs	5.7	0.22	6.89
M-3	CAMO-05-63825	c1b	fine	0.5	0.3	1.2	1.0	1.3	10.3	56.1	16.3	13.5	csi	85.9	3.65	6.58
M-4C	CAMO-99-0058	c3a + f1a	fine	7.3	0.0	1.0	1.7	2.8	6.6	45.5	29.2	12.9	csi	87.7	3.8	-
M-4C	CAMO-99-0078	c3a + f1a	fine	0.1	1.6	2.4	1.5	1.6	5.6	43.7	27.4	16.4	csi	87.5	3.3	-
M-4C	CAMO-99-0079	c3 + f1	coarse	16.4	42.9	30.5	9.6	3.0	1.8	3.5	4.0	4.9	cs	12.4	0.5	-
M-4C	CAMO-99-0080	c3 + f1	fine	4.8	12.2	11.0	5.5	6.0	11.3	29.7	12.6	11.9	csi	54.1	1.9	-
M-4C	CAMO-99-0081	c3a + f1a	fine	2.8	4.5	4.8	3.5	4.0	10.0	39.2	21.1	12.7	csi	73.0	3.6	-
M-4C	CAMO-99-0082	c3a + f1a	fine	1.6	3.3	3.3	1.9	1.8	4.6	35.0	33.8	16.1	csi	84.9	4.4	-
M-4C	CAMO-99-0083	c3a + f1a	fine	0.9	6.8	6.5	3.4	2.0	3.8	39.3	22.7	15.3	csi	77.3	4.4	-
M-4C	CAMO-01-0228	c3 + f1	coarse	12.3	29.6	24.0	9.4	3.9	5.0	15.0	7.8	5.2	cs	27.9	1.7	-
M-4C	CAMO-01-0229	c3 + f1	coarse	8.2	26.5	24.5	11.7	5.4	4.5	12.0	9.0	6.3	cs	27.3	1.6	-
M-4C	CAMO-01-0230	c3a + f1a	fine	2.0	2.7	3.3	2.2	3.2	13.8	42.0	19.2	13.4	csi	74.6	3.7	-
M-4C	CAMO-01-0255	c3a + f1a	fine	9.6	17.4	20.5	12.0	5.8	4.8	14.0	13.0	12.4	fs	39.4	2.1	-
M-4C	CAMO-01-0256	c3 + f1	fine	7.1	8.8	11.0	7.0	5.1	5.9	29.7	20.4	12.1	csi	62.2	2.7	-
M-4C	CAMO-01-0257	c3 + f1	coarse	12.2	41.4	24.8	7.6	2.1	1.2	4.2	10.7	8.2	cs	23.1	1.2	-
M-4C	CAMO-01-0258	c3a + f1a	fine	14.2	22.0	23.3	11.0	4.5	3.8	13.1	12.8	9.4	ms	35.4	1.9	-
M-4C	CAMO-01-0259	c3 + f1	fine	2.7	4.0	4.4	8.5	13.9	16.6	30.8	10.3	11.3	csi	52.4	2.2	-
M-4C	CAMO-01-0260	c3 + f1	fine	9.1	20.8	19.4	9.4	6.3	6.9	15.6	10.7	10.7	fs	37.1	2.6	-
M-4C	CAMO-01-0261	c3a + f1a	coarse	7.3	30.9	36.7	15.4	4.8	2.0	4.0	1.3	4.9	cs	10.1	0.7	-
M-4C	CAMO-01-0262	c3a + f1a	coarse	11.1	22.5	24.2	15.8	7.5	4.8	10.2	7.4	7.5	ms	25.0	2.5	-
M-4C	CAMO-01-0263	c3a + f1a	fine	4.7	10.7	11.5	8.2	8.7	14.0	27.5	9.8	9.5	vfs	46.7	2.2	-
M-4C	CAMO-01-0264	c3a + f1a	coarse	13.0	27.9	23.8	12.8	5.9	4.9	12.1	6.6	6.0	cs	24.7	1.4	-
M-4C	CAMO-01-0265	c3a + f1a	coarse	19.9	62.4	25.8	4.0	0.7	0.5	1.3	2.5	2.8	vcs	6.6	0.5	-
M-4C	CAMO-01-0266	c3a + f1a	fine	1.2	1.8	3.9	2.4	1.8	2.8	34.9	38.4	13.7	fsi	87.1	3.6	-
M-4C	CAMO-01-0267	c1t	coarse	14.9	50.3	34.2	6.9	1.7	0.9	1.9	1.2	2.8	vcs	5.9	0.3	-
M-4C	CAMO-01-0277	c3a + f1a	fine	2.7	2.9	4.8	6.2	10.4	12.2	27.8	20.1	15.4	csi	63.2	3.5	-
M-4C	CAMO-04-55052	c3 + f1	coarse	4.9	38.9	28.6	10.7	3.3	2.4	7.0	4.1	5.0	cs	16.1	-	-
M-4C	CAMO-04-55053	c3 + f1	coarse	10.0	53.0	26.2	6.5	2.4	1.5	2.4	3.0	5.1	vcs	10.5	-	-
M-4C	CAMO-04-55054	c3a + f1a	coarse	10.4	36.2	35.1	13.4	4.3	2.1	3.6	1.9	3.4	cs	8.9	-	-
M-4C	CAMO-04-55055	c3a + f1a	fine	10.0	25.0	19.8	11.9	7.9	7.7	15.1	5.3	7.3	ms	27.6	-	-
M-4C	CAMO-04-55056	c3a + f1a	coarse	4.9	22.1	29.1	17.1	6.1	4.8	9.0	5.1	6.6	cs	20.7	-	-
M-4C	CAMO-04-55057	c3a + f1a	fine	7.4	18.6	17.7	9.6	4.9	6.3	21.4	11.7	9.9	fs	42.9	-	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-4E	CAMO-99-0059	c3 + f1	fine	6.4	10.2	11.3	7.7	5.0	7.3	34.3	14.6	9.4	csi	58.2	2.5	-
M-4E	CAMO-99-0077	c3a + f1a	fine	0.5	1.7	3.4	5.9	6.9	12.9	42.0	13.3	13.6	csi	69.0	2.2	-
M-4E	CAMO-99-0084	c3 + f1	fine	4.8	9.2	8.4	4.3	2.5	3.3	28.6	27.1	16.6	csi	72.3	3.3	-
M-4E	CAMO-01-0226	c1g	fine	6.6	14.1	17.7	11.5	5.7	4.6	15.5	17.3	13.2	vfs	46.1	3.1	-
M-4E	CAMO-01-0227	c3 + f1	fine	2.7	5.2	6.9	3.8	3.1	5.7	33.1	24.6	17.4	csi	75.2	3.8	-
M-4E	CAMO-01-0236	c1g	fine	4.5	10.2	12.3	7.0	3.6	3.7	24.9	22.1	16.0	csi	63.1	6.5	-
M-4E	CAMO-01-0237	c1g	coarse	12.0	42.9	24.0	6.1	1.9	1.2	6.9	10.8	6.1	cs	23.8	1.8	-
M-4E	CAMO-01-0238	f2? (Qt?)	fine	5.2	18.0	21.7	14.0	7.6	7.1	17.6	8.4	5.4	ms	31.4	1.4	-
M-4E	CAMO-01-0239	c1g	fine	9.0	21.5	23.7	13.9	6.7	5.9	13.4	8.8	5.8	ms	28.0	1.3	-
M-4E	CAMO-01-0240	c3 + f1	coarse	8.7	27.9	24.1	11.8	6.3	5.3	12.3	6.9	5.3	cs	24.4	1.6	-
M-4E	CAMO-01-0241	f2? (Qt?)	fine	7.6	23.0	26.0	15.4	7.5	6.0	11.5	6.5	4.0	ms	22.0	1.5	-
M-4E	CAMO-01-0242	f1	fine	4.7	10.7	12.3	6.7	5.2	9.3	30.7	12.1	12.9	csi	55.7	3.2	-
M-4E	CAMO-01-0243	c3 + f1	fine	8.0	21.1	20.8	11.0	5.5	5.8	16.0	11.4	8.3	ms	35.7	1.7	-
M-4E	CAMO-01-0244	f2? (Qt?)	fine	7.0	14.8	14.7	8.5	6.6	8.4	25.6	11.8	9.5	vfs	46.8	2.7	-
M-4E	CAMO-01-0245	c1g	fine	10.7	17.0	18.3	13.3	6.6	4.9	14.9	13.9	11.1	fs	39.8	3.0	-
M-4E	CAMO-01-0246	c1g	fine	1.3	5.2	8.6	8.4	5.3	5.1	20.7	28.5	18.2	csi	67.3	3.9	-
M-4E	CAMO-01-0247	c3 + f1	fine	6.2	15.0	16.6	8.5	4.9	5.9	23.8	14.6	10.5	vfs	48.8	2.7	-
M-4E	CAMO-01-0248	f1	fine	4.4	13.5	16.0	8.2	5.6	7.6	25.3	13.7	10.0	vfs	49.0	2.6	-
M-4E	CAMO-01-0249	c3 + f1	coarse	4.8	26.5	27.2	14.2	5.8	3.9	10.5	6.6	5.1	cs	22.2	1.0	-
M-4E	CAMO-01-0250	c2a	fine	2.5	5.0	8.7	5.6	3.6	4.4	23.1	30.3	19.0	csi	72.4	5.1	-
M-4E	CAMO-01-0251	c3 + f1	fine	5.9	8.9	11.2	7.3	5.0	7.3	28.3	18.5	13.2	csi	60.1	2.9	-
M-4E	CAMO-01-0252	f2? (Qt?)	coarse	9.5	33.2	25.7	11.0	5.1	3.8	9.7	11.7	-0.4	cs	21.1	1.3	-
M-4E	CAMO-01-0253	f2? (Qt?)	fine	12.8	28.5	20.7	8.6	5.5	6.7	15.7	8.6	5.6	ms	29.8	2.0	-
M-4E	CAMO-01-0254	c3 + f1	fine	8.3	12.6	12.4	7.1	6.5	8.2	24.8	17.7	10.5	csi	53.0	2.8	-
M-4E	CAMO-04-55058	c1g	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.38
M-4E	CAMO-04-55058	c1g	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.38
M-4W	CAMO-99-0055	c1t	coarse	11.0	48.9	31.7	9.4	2.2	0.9	2.7	1.8	2.3	cs	6.8	0.8	-
M-4W	CAMO-99-0056	c1t	fine	1.1	0.8	1.6	1.1	1.8	7.0	48.1	26.0	13.5	csi	87.6	3.6	-
M-4W	CAMO-99-0057	c1/c2t	fine	7.5	0.1	0.4	0.8	3.1	10.4	52.1	21.4	11.9	csi	85.4	3.5	-
M-4W	CAMO-99-0073	c3a + f1a	fine	0.4	3.3	8.4	8.6	6.8	9.1	34.1	17.4	11.8	csi	63.4	2.9	-
M-4W	CAMO-99-0074	c1/c2t	fine	0.8	1.1	2.0	2.0	4.0	12.0	48.0	19.2	11.4	csi	78.5	2.9	-
M-4W	CAMO-99-0075	c1/c2t	fine	3.3	0.7	1.7	5.9	15.0	24.5	32.4	8.3	10.7	csi	51.4	2.0	-
M-4W	CAMO-99-0076	c1/c2t	fine	0.2	0.1	1.1	4.0	6.2	6.4	40.0	25.8	15.9	csi	81.6	2.9	-
M-4W	CAMO-01-0231	c3a + f1a	fine	0.5	2.6	2.9	3.3	6.6	12.7	35.5	19.1	17.2	csi	71.8	3.9	-
M-4W	CAMO-01-0232	c2	fine	1.7	5.0	7.3	4.8	4.5	7.8	32.1	23.7	14.6	csi	70.3	4.0	-
M-4W	CAMO-01-0233	c2	fine	0.8	2.8	5.8	7.5	9.2	10.0	31.7	20.2	12.6	csi	64.5	3.5	-
M-4W	CAMO-01-0234	c1t	fine	2.0	0.3	0.6	1.2	2.8	9.8	45.8	23.5	15.8	csi	85.1	4.9	-
M-4W	CAMO-01-0235	c1t	coarse	2.4	28.8	37.4	16.4	3.6	2.6	5.0	1.5	4.7	cs	11.2	0.8	-
M-4W	CAMO-01-0268	c1t	fine	4.0	5.5	10.8	14.5	9.5	7.8	20.3	18.0	13.3	csi	51.6	2.1	-
M-4W	CAMO-01-0269	c1t	fine	9.7	16.6	16.7	10.2	7.8	10.3	21.3	9.4	7.4	fs	38.1	1.2	-
M-4W	CAMO-01-0270	c1t	coarse	7.0	38.0	34.1	12.1	4.1	2.2	3.5	2.4	3.5	cs	9.4	0.5	-
M-4W	CAMO-01-0271	c3 + f1	fine	0.4	2.8	4.2	4.8	11.7	14.0	31.4	17.4	13.4	csi	62.2	3.7	-
M-4W	CAMO-01-0272	c1/c2t	fine	1.5	0.1	1.1	4.6	12.9	20.3	36.8	10.6	13.4	csi	60.7	3.4	-
M-4W	CAMO-01-0273	c1/c2t	fine	3.1	0.0	0.3	1.7	5.5	13.1	42.1	19.9	17.2	csi	79.1	4.2	-
M-4W	CAMO-01-0274	c1/c2t	fine	1.2	0.0	0.3	2.2	5.3	7.8	34.0	31.3	18.6	csi	83.9	3.7	-
M-4W	CAMO-01-0275	c2/c2t	coarse	6.2	36.0	33.5	8.3	2.2	1.6	4.8	7.2	6.4	cs	18.4	1.3	-
M-4W	CAMO-01-0276	c2/c2t	coarse	19.6	44.1	37.8	9.6	1.5	0.7	1.3	2.4	2.6	cs	6.3	0.5	-
M-4W	CAMO-01-0278	c2	fine	4.1	8.6	12.7	12.2	9.0	8.4	22.6	13.5	13.0	vfs	49.0	2.1	-
M-4W	CAMO-01-0279	c2	coarse	15.5	35.7	35.5	10.2	2.7	1.6	4.7	4.0	5.4	cs	14.2	0.9	-
M-4W	CAMO-01-0280	c3 + f1	fine	1.3	4.0	7.6	9.9	8.1	10.3	32.5	15.3	12.2	csi	60.0	4.2	-
M-4W	CAMO-01-0281	c3 + f1	fine	9.1	14.0	14.5	9.4	6.3	8.6	26.9	9.8	10.5	vfs	47.2	2.7	-
M-4W	CAMO-01-0282	c1	fine	12.6	15.9	14.8	9.2	10.2	13.4	19.7	8.7	8.0	fs	36.3	1.9	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-4W	CAMO-01-0283	c1	coarse	23.7	61.1	24.4	4.5	1.1	0.7	2.3	2.3	3.5	vcs	8.1	0.5	-
M-4W	CAMO-01-0284	c3 + f1	fine	5.3	9.7	11.8	7.6	5.7	7.6	28.8	15.4	13.1	csi	57.3	3.7	-
M-4W	CAMO-01-0285	c3a + f1a	coarse?	25.3	28.1	20.4	9.2	5.6	5.7	13.4	9.3	8.0	ms	30.7	1.6	-
M-4W	CAMO-04-55049	c3a + f1a	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.58
M-4W	CAMO-04-55049	c3a + f1a	fine	0.9	3.7	7.1	11.7	10.5	12.2	34.4	7.8	12.4	csi	54.7	-	6.58
M-4W	CAMO-04-55050	c1/c2t	fine	-	-	-	-	-	-	-	-	-	-	-	-	6.50
M-4W	CAMO-04-55050	c1/c2t	fine	0.2	0.2	0.9	3.6	13.0	20.2	38.0	10.0	14.1	csi	62.0	-	6.50
M-4W	CAMO-04-55051	c1/c2t	fine	-	-	-	-	-	-	-	-	-	-	-	-	5.94
M-4W	CAMO-04-55051	c1/c2t	fine	0.0	0.0	0.2	2.0	4.7	6.1	41.3	27.7	17.8	csi	86.8	-	5.94
M-4W	CAMO-05-63826	c1t	coarse	29.9	47.8	28.4	11.5	2.9	1.0	1.9	2.2	4.2	cs	8.3	0.33	6.61
M-4W	CAMO-05-63827	c1t	fine	0.0	0.0	0.1	0.5	3.4	7.4	39.4	31.0	18.2	csi	88.6	3.61	6.66
M-4W	CAMO-05-63828	c1t	coarse	6.7	42.1	41.8	11.0	1.1	0.4	0.0	1.1	2.7	cs	3.8	0.19	6.75
M-4W	CAMO-05-63829	c1t	fine	0.0	0.0	0.2	1.7	7.1	17.9	44.0	15.5	13.4	csi	72.9	2.52	7.13
M-4W	CAMO-05-63830	c1t	fine	0.1	0.6	1.9	1.3	1.0	5.5	34.2	38.0	17.5	fsi	89.8	3.03	6.72
M-5E	CAMO-01-0001	c2	fine	6.4	7.5	5.7	5.4	6.8	10.1	30.2	19.8	14.6	csi	64.5	3.17	-
M-5E	CAMO-01-0002	c2	fine	4.7	4.5	3.0	2.8	6.3	11.6	36.5	21.2	13.8	csi	71.5	3.20	-
M-5E	CAMO-01-0003	c2	fine	2.1	3.7	3.4	2.5	3.9	12.2	42.7	17.5	14.1	csi	74.3	3.68	-
M-5E	CAMO-01-0004	c1	fine	0.5	1.5	1.7	1.0	1.7	9.6	47.1	21.5	15.9	csi	84.5	3.66	-
M-5E	CAMO-01-0005	c1	coarse	5.9	39.2	39.0	13.4	2.6	0.8	1.8	1.3	2.0	cs	5.1	0.52	-
M-5E	CAMO-01-0006	c2	fine	7.3	12.7	14.8	13.3	9.3	8.0	19.0	12.4	10.5	fs	41.9	2.02	-
M-5E	CAMO-01-0017	c1	fine	12.9	12.0	6.6	5.5	7.4	11.2	28.1	18.7	10.3	csi	57.1	2.83	-
M-5E	CAMO-01-0018	c2	fine	9.3	11.8	9.7	8.2	8.2	10.5	26.2	15.4	10.0	csi	51.6	2.28	-
M-5E	CAMO-01-0019	c2	fine	0.4	1.0	1.1	3.4	7.7	19.0	44.6	11.8	11.3	csi	67.7	8.09	-
M-5E	CAMO-01-0021	c2	fine	0.2	0.3	0.3	0.8	1.7	9.8	49.0	22.4	15.7	csi	87.1	3.53	-
M-5E	CAMO-01-0022	c2	fine	0.2	0.6	0.8	1.7	3.3	18.5	49.7	13.3	12.2	csi	75.2	2.93	-
M-5E	CAMO-01-0023	c1	fine	4.7	17.9	21.7	10.6	4.2	4.4	21.6	9.6	9.9	ms	41.0	1.99	-
M-5E	CAMO-01-0024	c2	fine	1.4	6.9	4.1	5.6	7.0	9.9	32.1	19.0	15.4	csi	66.5	3.46	-
M-5E	CAMO-04-53322	c2	coarse	27.8	42.7	21.2	7.8	4.0	3.2	8.7	6.7	5.9	cs	21.2	-	6.59
M-5E	CAMO-04-53323	c2	coarse	14.1	39.4	19.0	7.3	4.4	4.9	13.3	5.7	6.0	cs	25.1	-	5.85
M-5E	CAMO-04-53324	f1? (f2?)	fine	2.9	3.1	4.8	3.1	4.2	12.9	44.1	13.9	14.1	csi	72.1	-	6.86
M-5E	CAMO-04-53325	c2	fine	7.1	6.4	8.3	5.6	5.3	9.8	36.7	15.2	12.6	csi	64.6	-	-
M-5E	CAMO-04-53326	c1	coarse	3.7	23.4	39.2	18.4	4.4	1.8	3.4	3.9	5.5	cs	12.7	-	-
M-5E	CAMO-04-53327	c2	fine	12.3	11.2	18.9	16.6	11.1	8.1	15.8	9.1	8.9	fs	33.9	-	-
M-5E	CAMO-04-53328	c1	coarse	17.0	44.3	28.3	9.5	2.5	1.1	3.1	4.4	6.7	cs	14.2	-	5.82
M-5E	CAMO-04-53329	f1? (f2?)	fine	10.2	15.9	9.9	3.6	3.2	9.0	35.2	12.4	11.1	csi	58.7	-	6.43
M-5E	CAMO-04-53330	c2	coarse	11.2	52.5	22.0	6.4	2.3	1.5	4.2	5.5	5.5	vcs	15.2	-	-
M-5E	CAMO-04-53331	f2? (Qt?)	fine	1.9	9.0	12.4	11.3	9.9	10.2	30.1	7.9	9.1	vfs	47.2	-	-
M-5W	CAMO-04-53295	f1	fine	0.0	0.0	0.1	0.1	0.9	8.1	53.0	22.8	15.0	csi	90.7	-	6.82
M-5W	CAMO-04-53296	f1	fine	1.3	2.3	5.0	3.3	3.3	8.7	37.2	24.4	15.9	csi	77.4	-	6.28
M-5W	CAMO-04-53297	f1	fine	0.8	4.2	5.5	3.2	3.0	6.4	36.1	21.6	19.8	csi	77.5	-	6.28
M-5W	CAMO-04-53298	f1	fine	0.3	5.2	6.6	4.4	5.2	9.0	31.3	21.4	16.7	csi	69.3	-	6.02
M-5W	CAMO-04-53299	c1	fine	3.6	13.3	17.4	9.7	5.6	6.6	19.9	15.6	11.9	vfs	47.4	-	5.15
M-5W	CAMO-04-53300	c1	coarse	5.8	31.6	30.1	11.1	4.0	2.8	7.6	5.9	7.4	cs	20.9	-	6
M-5W	CAMO-04-53301	c2	coarse	9.2	32.7	35.2	14.1	4.2	2.2	3.4	3.9	4.5	cs	11.8	-	5.71
M-5W	CAMO-04-53302	c1	coarse	7.8	34.8	33.2	13.9	3.9	1.2	2.3	5.2	5.7	cs	13.2	-	5.6
M-6	CAMO-03-49810	f1	fine	1.0	1.4	2.5	3.7	9.7	20.7	39.1	12.4	10.4	csi	61.9	-	-
M-6	CAMO-03-49811	f1	fine	1.5	0.9	1.5	4.4	10.7	17.4	44.5	14.0	6.5	csi	65.0	-	-
M-6	CAMO-03-49812	f1	fine	5.4	3.6	8.9	14.9	15.2	17.7	23.9	5.4	10.0	vfs	39.3	-	-
M-6	CAMO-03-49813	c2	fine	1.9	2.5	5.1	5.7	11.6	18.6	37.1	9.9	9.3	csi	56.3	-	-
M-6	CAMO-03-49814	c1	coarse	5.0	30.0	34.1	14.1	4.9	2.5	5.6	3.9	4.8	cs	14.3	-	-
M-6	CAMO-03-49815	c2	fine	3.1	6.3	10.1	12.1	13.5	17.1	24.0	7.4	9.4	vfs	40.8	-	-
M-6	CAMO-03-49816	c2	coarse	4.7	25.8	29.0	19.5	9.2	4.7	4.9	2.5	4.3	cs	11.7	-	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
M-6	CAMO-03-49817	f1	fine	1.9	2.8	5.1	6.7	13.2	22.4	34.6	7.1	8.1	vfs	49.9	-	-
M-6	CAMO-03-49818	f1	fine	1.7	2.1	6.1	10.3	19.2	24.5	24.9	5.6	7.2	vfs	37.7	-	-
M-6	CAMO-04-53318	c1	coarse	3.3	14.7	35.4	28.3	9.0	3.0	3.3	2.1	4.3	cs	9.7	6.3	-
M-6	CAMO-04-53319	f1	fine	2.9	4.0	9.4	11.9	11.6	21.1	31.2	4.0	7.2	vfs	42.4	6.59	-
M-6	CAMO-04-53320	f1	fine	3.8	3.6	6.7	10.7	19.4	23.2	23.7	5.1	7.4	vfs	36.1	6.52	-
M-6	CAMO-04-53321	f1	fine	1.8	2.5	9.1	21.3	19.2	14.9	21.1	3.8	8.0	fs	32.8	6.57	-
MCW-1	CAMO-03-49820	c2	fine	3.3	3.3	4.7	5.0	6.2	12.7	37.6	15.5	14.8	csi	67.9	-	-
MCW-1	CAMO-03-49821	c2	fine	1.2	1.3	4.4	4.8	5.9	16.0	39.0	13.0	15.4	csi	67.3	-	-
MCW-1	CAMO-03-49822	c2	fine	8.6	16.2	16.8	12.7	13.5	12.6	13.7	6.5	8.0	fs	28.2	-	-
MCW-1	CAMO-03-49823	c2	coarse	15.6	24.2	24.9	19.5	14.0	6.1	4.4	1.7	5.1	ms	11.2	-	-
MCW-1	CAMO-03-49824	c2	fine	6.8	17.2	18.5	12.1	7.4	9.1	20.5	6.0	9.2	fs	35.6	-	-
MCW-1	CAMO-03-49825	c1b	fine	3.9	7.9	10.6	6.8	5.9	13.2	34.3	8.0	13.2	csi	55.5	-	-
MCW-1	CAMO-03-49826	c1b	fine	0.9	0.8	0.8	0.5	0.6	3.5	38.9	50.5	4.4	fsi	93.7	-	-
MCW-1	CAMO-03-49827	c1	coarse	14.0	54.3	26.2	7.7	2.6	1.0	2.8	2.3	3.1	vcs	8.1	-	-
MCW-2E	CAMO-03-49849	f1	fine	0.1	0.3	1.3	2.4	4.0	11.9	42.8	19.7	17.4	csi	79.9	-	-
MCW-2E	CAMO-03-49850	f1	fine	0.6	4.2	14.9	17.9	14.3	14.8	8.4	12.2	13.1	fs	33.7	-	-
MCW-2E	CAMO-03-49851	f1	coarse	10.3	32.4	25.7	14.1	6.2	4.2	6.7	3.8	6.9	cs	17.4	-	-
MCW-2E	CAMO-03-49852	f1	fine	0.1	1.3	2.1	1.4	3.0	12.2	46.6	16.6	16.6	csi	79.9	-	-
MCW-2E	CAMO-03-49853	f1	fine	0.4	2.5	5.2	3.1	2.0	11.1	44.0	15.8	16.3	csi	76.0	-	-
MCW-2E	CAMO-03-49854	c2	fine	7.3	21.6	17.3	11.9	7.8	8.0	17.9	5.8	9.6	ms	33.4	-	-
MCW-2E	CAMO-03-49855	c1	coarse	15.7	42.6	28.9	9.2	3.3	2.2	5.1	3.1	5.7	cs	13.8	-	-
MCW-2N	CAMO-03-49830	c1	fine	5.9	20.2	18.8	7.2	4.7	8.0	24.0	8.0	9.0	fs	41.0	-	-
MCW-2N	CAMO-03-49831	f1	fine	2.3	9.8	13.6	10.2	9.2	13.0	25.9	8.7	9.6	vfs	44.1	-	-
MCW-2N	CAMO-03-49832	f1	fine	5.5	21.5	20.5	12.1	7.7	7.9	16.0	6.7	7.3	ms	30.1	-	-
MCW-2N	CAMO-03-49833	c2	fine	3.0	6.7	9.0	6.8	7.8	15.0	31.7	11.1	11.9	csi	54.7	-	-
MCW-2N	CAMO-03-49834	c2	fine	5.3	8.3	9.8	9.4	11.5	15.0	27.8	6.4	11.5	vfs	45.7	-	-
MCW-2N	CAMO-03-49835	f1	fine	2.2	4.7	6.3	9.7	16.3	14.5	27.9	8.9	11.8	vfs	48.5	-	-
MCW-2N	CAMO-03-49836	c1	coarse	3.7	42.2	26.7	11.8	4.4	2.7	3.9	3.1	5.2	cs	12.3	-	-
MCW-2N	CAMO-03-49837	c2	coarse	19.0	13.9	21.3	21.8	10.9	8.3	11.3	5.3	7.1	ms	23.7	-	-
MCW-2N	CAMO-03-49838	c2	fine	6.5	11.9	15.2	8.9	6.9	12.0	26.6	8.5	9.8	vfs	44.9	-	-
MCW-2W	CAMO-03-49840	c2	fine	2.7	12.5	17.3	17.1	10.6	9.2	19.6	6.0	7.7	fs	33.3	-	-
MCW-2W	CAMO-03-49841	c2	coarse	4.4	31.3	33.2	13.5	5.3	3.4	5.0	4.2	4.1	cs	13.3	-	-
MCW-2W	CAMO-03-49842	c2	coarse	20.8	68.9	18.8	3.3	1.1	0.5	1.6	2.2	3.4	vcs	7.3	-	-
MCW-2W	CAMO-03-49843	c2? (f1?)	fine	1.4	6.1	7.2	5.1	7.4	14.8	38.6	10.1	10.4	csi	59.1	-	-
MCW-2W	CAMO-03-49844	f1	fine	3.3	6.7	6.0	5.9	5.7	11.1	39.3	13.4	11.8	csi	64.4	-	-
MCW-2W	CAMO-03-49845	f1	fine	1.9	6.0	7.7	10.8	11.5	12.2	29.7	10.9	11.0	csi	51.6	-	-
MCW-2W	CAMO-03-49846	c1	coarse	6.8	58.1	34.1	3.9	0.7	0.3	0.7	1.3	0.9	vcs	2.9	-	-
MCW-2W	CAMO-03-49847	c1	fine	0.6	4.0	10.1	9.9	11.0	15.8	29.4	9.4	10.2	vfs	49.0	-	-
MCW-2W	CAMO-05-63608	f1	fine	3.5	15.2	13.7	4.8	3.0	6.8	38.1	8.3	10.0	csi	56.5	1.86	5.92
MCW-2W	CAMO-05-63609	f1	fine	3.2	15.5	11.3	10.1	8.2	7.6	17.9	15.8	13.7	vfs	47.3	2.72	6.06
Pratt Cyn	CAMO-98-0037	c1ct	fine	0.0	0.2	0.3	0.4	1.5	7.5	57.0	19.6	13.3	csi	89.9	-	-
Pratt Cyn	CAMO-98-0038	c1b	fine	14.9	11.4	11.8	8.2	7.8	9.5	28.5	11.7	10.4	csi	50.6	-	-
Pratt Cyn	CAMO-98-0039	c1b	fine	10.4	17.9	15.6	11.4	8.0	7.4	18.6	11.0	10.0	fs	39.7	-	-
Pratt Cyn	CAMO-98-0040	c3	coarse	39.2	31.3	24.4	12.3	6.0	4.5	10.3	6.2	4.9	cs	21.4	-	-
Pratt Cyn	CAMO-98-0041	c3	fine	10.5	3.3	3.8	2.8	4.2	12.9	46.5	11.4	14.9	csi	72.8	-	-
Pratt Cyn	CAMO-98-0042	c3	fine	14.5	17.6	16.9	9.9	7.4	8.0	20.0	10.6	9.0	fs	39.6	-	-
Pratt Cyn	CAMO-98-0043	c3	coarse	33.6	35.2	26.1	15.2	6.1	3.3	5.6	4.1	4.5	cs	14.1	-	-
Pratt Cyn	CAMO-98-0044	c3	fine	16.8	6.7	5.8	3.8	4.9	14.5	38.8	11.2	14.2	csi	64.2	-	-
Pratt Cyn	CAMO-98-0045	c3	fine	25.3	12.7	10.3	4.6	4.3	10.0	35.2	11.0	11.6	csi	57.8	-	-
TS-1C	CAMO-99-0046	f1	fine	5.0	3.7	5.5	8.7	14.0	19.3	32.1	8.3	8.2	vfs	48.5	2.0	-
TS-1C	CAMO-99-0047	f1	fine	0.2	0.3	1.2	1.3	5.3	20.1	52.8	9.1	9.6	csi	71.4	2.0	-
TS-1C	CAMO-99-0048	f1	fine	10.6	1.6	2.1	2.0	3.8	11.4	44.7	18.1	15.9	csi	78.8	2.8	-

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
TS-1C	CAMO-99-0049	c1	coarse	15.7	35.3	38.8	14.0	3.8	1.0	1.4	2.4	3.0	cs	6.9	0.4	-
TS-1C	CAMO-04-53373	c2	coarse	40.4	29.6	32.3	18.8	7.0	2.6	4.2	2.7	3.0	cs	9.9	0.8	6.22
TS-1C	CAMO-04-53374	c2	fine	0.3	2.8	4.2	4.5	9.3	19.0	41.5	7.8	10.9	csi	60.2	4.6	5.55
TS-1C	CAMO-04-53375	c1	fine	0.0	0.2	0.4	0.8	3.2	11.6	50.5	16.5	16.7	csi	83.7	3.8	6.34
TS-1C	CAMO-04-53376	f1	fine	0.9	3.3	8.4	10.3	13.1	17.0	32.6	6.9	8.5	vfs	48.0	2.7	6.53
TS-1C	CAMO-04-53377	f1	fine	1.9	0.3	1.2	1.4	2.3	10.2	49.7	19.0	15.9	csi	84.6	4.8	6.52
TS-1C	CAMO-04-53378	f1	fine	1.6	0.6	0.9	0.6	0.9	4.5	42.0	27.8	22.8	fsi	92.5	5.6	6.19
TS-1C	CAMO-05-61177	c1	coarse	19.9	45.4	30.3	10.2	3.2	1.8	2.9	1.1	5.2	cs	9.2	0.32	6.43
TS-1C	CAMO-05-63733	c2	coarse	8.2	33.1	28.7	17.0	6.7	3.7	4.8	2.4	3.6	cs	10.9	0.32	6.02
TS-1C	CAMO-05-63734	f1	fine	1.7	7.8	8.2	13.1	16.8	15.7	24.0	7.7	6.7	vfs	38.4	1.54	6.44
TS-1C	CAMO-05-63735	f1	fine	17.2	9.8	9.3	8.6	10.3	14.2	30.5	8.4	8.8	vfs	47.7	1.37	6.14
TS-1C	CAMO-05-63736	f1	coarse	6.7	33.3	28.2	13.0	6.0	3.1	6.7	4.5	5.2	cs	16.3	0.34	6.23
TS-1C	CAMO-05-63737	f1	fine	0.0	1.5	2.6	4.6	10.1	17.3	41.3	11.7	11.0	csi	64.0	1.24	6.56
TS-1C	CAMO-05-63738	f1	fine	0.8	1.0	2.3	3.3	6.3	13.4	46.0	16.4	11.6	csi	73.9	1.58	6.68
TS-1C	CAMO-05-63739	c1	coarse	12.4	65.8	24.7	3.6	1.3	0.6	0.9	0.7	2.3	vcs	4.0	0.15	6.23
TS-1C	CAMO-05-63740	f1	fine	2.8	6.4	13.2	19.2	17.6	14.0	18.0	5.8	5.9	fs	29.7	0.98	6.08
TS-1E	CAMO-99-0030	c2	fine	6.6	4.5	11.3	19.4	19.6	14.7	18.1	5.0	7.3	fs	30.4	1.4	-
TS-1E	CAMO-99-0031	c2	fine	1.9	0.6	1.2	1.6	3.6	11.1	54.6	15.3	11.9	csi	81.7	2.6	-
TS-1E	CAMO-99-0032	f1	fine	0.8	1.1	4.2	10.7	15.9	18.4	30.6	9.3	9.5	vfs	49.5	2.6	-
TS-1E	CAMO-99-0033	c1w	coarse	9.9	31.4	40.6	17.3	3.7	1.0	0.9	1.9	3.2	cs	6.0	0.4	-
TS-1E	CAMO-04-53379	c1w	fine	6.2	15.0	15.7	9.2	7.1	7.2	26.2	10.7	8.8	vfs	45.7	4.5	6.14
TS-1E	CAMO-04-53380	c2	coarse	25.5	38.7	24.8	10.7	4.1	3.1	9.0	4.9	4.8	cs	18.7	1.0	6.31
TS-1E	CAMO-04-53381	c2	fine	0.4	0.8	2.2	5.4	8.1	15.8	46.6	11.2	9.9	csi	67.7	3.2	5.96
TS-1E	CAMO-04-53382	f1	fine	0.2	0.5	0.7	1.3	2.8	8.0	50.1	21.7	14.9	csi	86.6	3.9	6.59
TS-1E	CAMO-05-61179	c1	coarse	6.5	36.7	29.1	10.9	3.8	2.1	5.1	4.7	7.7	cs	17.5	0.90	6.48
TS-1E	CAMO-05-63725	c1	coarse	21.2	46.9	26.5	12.8	3.7	1.5	2.2	2.4	4.2	cs	8.8	0.38	6.14
TS-1E	CAMO-05-63726	c2	fine	1.1	3.9	12.1	26.4	19.6	11.2	15.9	5.2	5.6	fs	26.7	1.06	6.13
TS-1E	CAMO-05-63727	c2	fine	2.3	11.5	16.4	13.1	9.7	12.5	24.5	6.0	6.1	fs	36.6	1.20	6.23
TS-1E	CAMO-05-63728	c2	fine	0.2	3.1	3.2	2.1	3.7	9.5	40.4	21.6	16.6	csi	78.5	1.96	6.19
TS-1E	CAMO-05-63729	c1w	coarse	28.3	46.3	27.5	7.6	3.2	2.7	5.1	4.4	3.1	cs	12.6	0.36	6.07
TS-1E	CAMO-05-63730	c1w	coarse	23.3	55.8	25.9	9.5	2.3	0.9	1.6	1.2	2.7	vcs	5.5	0.22	5.93
TS-1E	CAMO-05-63745	c2	fine	0.0	0.3	2.7	9.7	14.4	16.2	38.0	9.4	9.0	csi	56.3	1.56	6.28
TS-1E	CAMO-05-63746	c1	coarse	12.9	52.4	35.4	7.1	1.0	0.3	0.0	1.7	2.0	vcs	3.7	0.15	6.18
TS-1W	CAMO-04-53365	f1	fine	1.0	3.5	8.2	8.6	7.8	12.9	34.0	11.3	13.8	csi	59.0	3.7	6.33
TS-1W	CAMO-04-53366	f1	fine	0.0	0.6	2.3	2.9	3.4	9.4	48.6	19.9	13.1	csi	81.6	5.9	5.72
TS-1W	CAMO-04-53367	c1	coarse	11.1	31.7	33.8	15.9	5.4	2.4	4.3	2.8	3.7	cs	10.8	1.1	5.67
TS-1W	CAMO-04-53368	f1	fine	0.5	3.9	5.5	4.0	4.7	11.3	44.0	14.6	12.1	csi	70.7	4.1	5.76
TS-1W	CAMO-04-53369	f1	fine	0.0	0.2	2.8	12.3	20.8	21.6	28.2	6.0	8.2	vfs	42.5	2.5	5.69
TS-1W	CAMO-04-53370	c1	coarse	25.1	45.0	30.6	10.5	2.4	2.1	3.3	3.4	3.7	cs	10.3	0.9	5.98
TS-1W	CAMO-04-53371	c1	coarse	25.7	68.6	20.7	3.4	0.9	0.6	1.3	1.8	2.6	vcs	5.7	0.5	5.93
TS-1W	CAMO-04-53372	f1	fine	0.0	0.2	0.3	0.3	4.0	24.2	52.5	7.5	11.0	csi	71.0	2.8	6.1
TS-1W	CAMO-05-63719	f1	fine	0.1	3.6	10.4	8.9	7.7	11.2	33.8	13.1	11.3	csi	58.3	2.64	5.80
TS-1W	CAMO-05-63720	f1	fine	0.0	0.4	2.7	5.3	7.1	15.7	42.1	14.2	12.7	csi	69.0	1.95	5.88
TS-1W	CAMO-05-63721	f1	fine	0.4	6.0	9.8	7.7	6.3	12.9	35.5	11.6	10.1	csi	57.2	1.96	5.21
TS-1W	CAMO-05-63722	f1	fine	0.0	0.2	1.8	4.3	11.3	18.6	40.6	12.8	10.5	csi	63.8	2.07	5.59
TS-1W	CAMO-05-63723	f1	fine	0.0	0.4	1.9	3.0	6.0	22.6	43.7	11.3	11.0	csi	66.1	2.26	5.45
TS-1W	CAMO-05-63724	c1	coarse	12.7	46.2	29.4	7.5	1.6	1.3	5.7	4.5	3.8	cs	14.0	0.30	6.33
TS-2C	CAMO-99-0038	c1	coarse	13.5	42.9	41.1	7.6	0.9	0.7	1.0	2.1	3.7	cs	6.8	0.3	-
TS-2C	CAMO-99-0039	c2	fine	4.6	7.1	6.7	5.2	4.5	7.8	30.9	22.0	15.9	csi	68.8	2.8	-
TS-2C	CAMO-99-0040	c2	coarse	26.0	25.9	23.2	15.2	8.1	6.0	8.7	5.3	7.6	ms	21.6	0.7	-
TS-2C	CAMO-99-0041	f1	fine	0.0	0.4	1.7	2.0	3.3	11.7	51.3	16.5	12.8	csi	80.6	2.9	-
TS-2C	CAMO-04-53387	c2	fine	0.4	0.5	2.6	6.2	7.5	10.3	37.0	20.2	15.7	csi	72.9	4.4	5.99

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
TS-2C	CAMO-04-53388	c1b	fine	0.8	2.3	3.7	2.2	2.3	7.0	45.1	22.7	14.7	csi	82.5	4.9	5.97
TS-2C	CAMO-04-53389	c1b	fine	0.4	2.6	6.5	5.4	6.2	10.0	37.3	17.5	14.3	csi	69.2	3.7	5.61
TS-2C	CAMO-04-53390	c1b	fine	0.3	0.4	1.6	1.9	2.0	5.8	37.5	27.9	22.9	fsi	88.2	5.9	5.07
TS-2C	CAMO-05-61165	c1b	coarse	7.5	43.0	29.6	8.2	2.5	1.7	2.8	4.6	7.6	cs	15.0	0.77	6.23
TS-2C	CAMO-05-63749	f1	fine	0.0	3.5	4.9	4.3	6.1	13.6	37.5	15.1	14.9	csi	67.5	2.18	6.21
TS-2C	CAMO-05-63750	c1b	coarse	17.2	48.5	25.2	6.9	1.8	1.4	4.8	5.7	5.6	cs	16.1	0.62	6.13
TS-2C	CAMO-05-63765	f1	fine	0.7	5.1	7.8	6.9	7.7	11.0	33.5	14.3	13.7	csi	61.5	1.94	6.07
TS-2C	CAMO-05-63766	c2	fine	2.0	3.6	7.0	10.2	8.6	11.3	32.9	14.5	12.1	csi	59.4	2.60	5.81
TS-2C	CAMO-05-63767	f1	fine	0.1	1.2	3.0	3.4	5.0	11.6	42.8	17.8	15.1	csi	75.8	2.87	5.36
TS-2C	CAMO-05-63768	f1	fine	6.7	17.3	11.9	6.7	4.4	5.0	24.9	17.2	12.5	csi	54.7	2.34	5.73
TS-2E	CAMO-04-53391	c2	coarse	56.1	40.7	25.0	15.9	6.0	1.7	3.6	3.3	3.9	cs	10.8	1.4	5.95
TS-2E	CAMO-04-53392	c2	fine	0.3	0.3	1.7	2.6	6.1	15.9	44.8	13.5	14.9	csi	73.2	4.4	4.83
TS-2E	CAMO-04-53393	c2	fine	1.5	2.5	5.2	6.3	8.4	19.4	41.3	6.5	10.3	csi	58.1	3.5	6.14
TS-2E	CAMO-04-53394	f1	fine	0.1	0.1	1.0	4.8	9.6	18.0	44.7	8.7	13.1	csi	66.5	4.2	6.58
TS-2E	CAMO-05-63751	c1	coarse	41.2	45.1	33.1	14.3	2.5	0.4	0.3	1.7	2.7	cs	4.7	0.31	5.92
TS-2E	CAMO-05-63752	c2	coarse	58.8	32.6	23.6	17.2	5.8	1.9	5.3	7.5	6.0	cs	18.8	0.96	6.06
TS-2E	CAMO-05-63769	c2	fine	0.9	1.7	5.0	7.1	8.3	10.4	28.6	20.5	18.4	csi	67.4	3.44	5.21
TS-2E	CAMO-05-63770	c2	fine	2.1	5.3	13.1	25.3	15.9	7.9	16.5	8.7	7.3	fs	32.5	1.98	6.39
TS-2E	CAMO-05-63771	c2	fine	0.0	0.3	2.0	4.4	7.0	8.3	29.4	25.8	22.9	csi	78.1	4.37	5.71
TS-2E	CAMO-05-63772	f1	fine	0.1	3.9	8.1	9.3	8.5	12.9	35.6	10.5	11.3	csi	57.4	1.93	6.04
TS-2E	CAMO-99-0042	c2	fine	11.0	7.1	12.6	10.6	6.3	7.0	25.7	16.5	13.8	csi	56.0	3.5	-
TS-2E	CAMO-99-0043	f1	fine	4.4	1.8	4.3	6.4	7.1	11.4	42.2	13.6	12.7	csi	68.5	3.9	-
TS-2E	CAMO-99-0044	f1	fine	3.2	0.7	1.6	2.7	5.5	17.3	51.2	9.7	11.2	csi	72.1	2.4	-
TS-2E	CAMO-99-0045	c1	coarse	46.5	42.9	28.9	12.8	5.0	1.5	2.6	3.3	3.1	cs	8.9	0.5	-
TS-2W	CAMO-04-53383	c2	fine	6.0	8.2	9.1	11.0	13.0	13.5	27.4	8.5	9.1	vfs	45.0	2.2	5.77
TS-2W	CAMO-04-53384	c2	fine	0.0	17.3	15.0	8.3	5.7	7.3	22.7	12.4	11.2	vfs	46.4	2.2	-
TS-2W	CAMO-04-53385	c1w	coarse	27.7	34.8	29.0	13.8	5.5	3.3	5.8	3.3	4.4	cs	13.4	1.0	6.05
TS-2W	CAMO-04-53386	c1w	fine	0.1	0.2	0.4	0.4	0.5	3.8	53.2	25.6	15.7	csi	94.5	3.5	5.74
TS-2W	CAMO-05-63747	c1w	fine	3.4	12.8	14.7	11.0	6.6	8.7	24.9	12.0	9.1	vfs	46.1	1.64	5.88
TS-2W	CAMO-05-63748	c2	coarse	13.2	32.6	28.9	12.5	3.4	2.2	7.1	7.8	5.6	cs	20.4	0.83	6.09
TS-2W	CAMO-05-63762	c1w	fine	0.0	1.3	4.2	4.9	6.0	12.2	43.2	16.4	11.9	csi	71.5	2.54	5.40
TS-2W	CAMO-05-63763	c1w	coarse	18.9	26.5	24.1	11.1	6.5	6.1	12.7	6.3	6.6	cs	25.7	0.83	5.78
TS-2W	CAMO-05-63764	c1w	fine	1.8	12.2	11.7	6.0	8.2	15.6	30.8	6.7	8.6	vfs	46.1	1.03	5.66
TS-2W	CAMO-99-0034	c1w	fine	1.1	4.4	4.0	2.5	2.9	12.5	45.8	14.4	13.4	csi	73.6	2.2	-
TS-2W	CAMO-99-0035	c1w	fine	8.5	11.3	12.2	7.6	5.5	9.0	28.3	12.5	13.6	csi	54.4	1.9	-
TS-2W	CAMO-99-0036	c2	fine	0.0	0.7	1.1	0.9	2.3	11.1	53.8	17.2	12.8	csi	83.7	2.0	-
TS-2W	CAMO-99-0037	c1	coarse	9.3	38.4	35.9	13.6	2.1	0.6	1.8	3.4	4.0	cs	9.2	0.4	-
TS-3	CAMO-01-0007	c2	fine	0.5	2.3	9.0	17.8	16.4	11.6	20.1	10.6	11.9	vfs	42.6	3.02	-
TS-3	CAMO-01-0008	c2	fine	0.9	3.1	7.1	12.5	14.1	13.3	26.5	10.5	12.8	vfs	49.8	2.91	-
TS-3	CAMO-01-0009	c1	coarse	25.7	50.9	25.1	9.3	3.6	1.3	1.7	3.1	5.0	vcs	9.8	0.68	-
TS-3	CAMO-01-0010	f1? (f2?)	fine	9.5	17.3	10.6	5.6	5.2	9.9	29.5	10.0	11.7	csi	51.3	4.09	-
TS-3	CAMO-01-0011	c2	fine	3.3	2.1	2.1	2.2	5.3	14.9	40.7	17.8	14.9	csi	73.4	4.00	-
TS-3	CAMO-01-0012	f2? (Qt?)	fine	5.4	19.3	21.2	12.2	6.8	6.8	15.6	8.5	9.5	ms	33.6	1.99	-
TS-3	CAMO-01-0013	c2	fine	1.7	2.7	2.9	2.5	3.5	7.9	36.1	27.7	16.6	csi	80.4	4.28	-
TS-3	CAMO-01-0014	c2	coarse	6.0	23.1	29.0	16.0	5.3	2.7	6.2	8.6	9.1	cs	23.9	1.47	-
TS-3	CAMO-01-0015	c2	fine	6.5	2.6	3.9	5.7	6.8	9.8	28.1	22.9	20.2	csi	71.2	3.98	-
TS-3	CAMO-01-0016	c2	fine	4.5	11.5	11.1	6.6	5.5	8.8	26.4	17.0	12.8	csi	56.3	3.00	-
TS-3	CAMO-05-63753	c2	fine	0.1	1.5	4.6	12.3	15.3	11.9	27.8	15.9	10.9	csi	54.6	1.98	6.23
TS-3	CAMO-05-63754	c2	fine	4.6	8.3	9.9	11.4	11.6	11.3	25.8	9.9	11.7	vfs	47.4	1.85	6.21
TS-3	CAMO-05-63755	c2	coarse	4.9	50.1	27.5	8.0	2.6	1.3	2.8	2.8	4.8	vcs	10.4	0.31	6.19
TS-3	CAMO-05-63756	f1? (f2?)	fine	7.0	17.1	16.1	10.2	6.6	8.8	22.9	9.1	9.0	fs	41.0	1.97	5.74

Table B-1.0-4 (continued)

Reach	Sample ID	Unit	Facies	Gravel (> 2 mm) (wt %)	Very Coarse Sand (2-1 mm) (wt %)	Coarse Sand (1-0.5 mm) (wt %)	Medium Sand (0.5-0.25 mm) (wt%)	Fine Sand (0.25-0.125 mm) (wt %)	Very Fine Sand (0.125-0.0625 mm) (wt %)	Coarse Silt (62.5-15 µm) (wt%)	Fine Silt (15-2 µm) (wt%)	Clay (<2 µm) (wt%)	Median Particle Size Class[a]	Total Silt + Clay (wt%)	Organic Matter (wt %)	pH
TS-3	CAMO-05-63757	f2? (Qt?)	coarse	7.9	23.9	27.0	16.7	8.3	5.3	8.2	4.6	6.0	cs	18.8	1.36	5.85
TS-3	CAMO-05-63758	c2	fine	0.6	6.2	8.3	4.8	6.6	10.5	32.7	17.2	13.6	csi	63.5	2.79	5.83

[a] Median particle size class in < 2 mm fraction; cs = coarse sand; csi = coarse silt; fs = fine sand; fsi = fine silt; ms = medium sand; vcs = very coarse sand; vfs = very fine sand

[b] Dash indicates data not obtained.

Table B-1.0-5
Dendrochronological Analyses from Mortandad Reaches

Reach	Core ID	Channel Distance (m)	Geomorphic Unit	Depth of Burial (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID	Species	Date of Pith Ring
E-1W	EFF-001A	400	c2	12	-[a]	-	Ponderosa pine	1980
	EFF-001B							1980 or 1981
	EFF-002C	375	c2	14	-	MO-00026	Ponderosa pine	1935[b]
	EFF-002D							1935[b]
	EFF-003B	380	c2	15	-	-	Ponderosa pine	1935
E-1E	E1E-001 A	132	c3? (c2?)	20	-	-	Douglas fir or white fir	1949[b]
	E1E-001 B							1949[b]
	E1E-002 A	175	Qc	0	-	-	Douglas fir	1955[b]
	E1E-002 B							1955[b]
	E1E-002 C							1954[b]
	E1E-002 D							1954[b]
	E1E-003 A	179	c3	33	-	-	Douglas fir	1964
	E1E-003 B							1964
	E1E-004 D	183	c3	45	-	-	Douglas fir	1690[b]
M-1W	MOR1W-002C	38	c2	26	-	-	Ponderosa pine	1985
	MOR1W-002D							1985
	MOR1W-003E	50	c2	33	-	MO-00011	Ponderosa pine	1963[b]
	MOR1W-003F							1963[b]
	MOR1W-004A	65	c1b	>44	-	-	Ponderosa pine	1964[b]
	MOR1W-004C							1964[b]
	MOR1W-006A	68	c2	52	-	MO-00014	Ponderosa pine	1972
	MOR1W-006B							1972 or 1973
	MOR1W-006C							1972 or 1973
	MOR1W-007A	100	c2	25	-	-	Ponderosa pine	1985
	MOR1W-014	70	c2	46	-	-	Ponderosa pine	1984–1981
	MOR1W-015a	169	c2	13	M1W-s34	-	Douglas fir	
	MOR1W-015b							
M-1C	MOR1C-016	141	c2 bar	0	M1C-s16	-	Ponderosa pine	
M-1E	MOR1E-005C	171	f1	20	-	-	Ponderosa pine	1936
	MOR1E-005D							1936
	MOR1E-008A	164	f1	34	-	-	Ponderosa pine	1934[b]
	MOR1E-008B							1935
	MOR1E-009A	150	c2	26	-	-	Ponderosa pine	1979
	MOR1E-009B							1979
	MOR1E-010A	133	f1	12	-	-	Ponderosa pine	1920
	MOR1E-010B							1924[b]
	MOR1E-011C	125	f1	12	-	-	Ponderosa pine	1965
	MOR1E-011D							1965
	MOR1E-012C	115	f1	36	-	-	Ponderosa pine	1960[b]
	MOR1E-012D							1960[b]

Table B-1.0-5 (continued)

Reach	Core ID	Channel Distance (m)	Geomorphic Unit	Depth of Burial (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID	Species	Date of Pith Ring
M-2W	MOR-001C	87	Qt	0	-	-	Douglas fir	1902[b]
	MOR1-001D							1902[b]
	MOR-013D	244	Qt	0	-	-	Douglas fir	1922[b]
M-3	MOR3-001 C	925	f1	8	M3-r90	-	Ponderosa pine	1972
	MOR3-001 D							1970
	MOR3-002C	920	f1	19	M3-r91	MO-10099	Ponderosa pine	1970[b]
	MOR3-002D							1970[b]
	MOR3-003A	912	f1	47	M3-r100	-	Ponderosa pine	1928
	MOR3-003B							1932
	MOR3-004C	870	f1	46	M3-r22	MO-10100	Ponderosa pine	1935[b]
	MOR3-004D							1935[b]
	MOR3-005A	875	c3	80	M3-r6	MO-00073	Ponderosa pine	1922[b]
	MOR3-005B							1922[b]
	MOR3-006A	848	c1b/c3	68	M3-r24	MO-10101	Ponderosa pine	1916[b]
	MOR3-006B							1916[b]
	MOR3-007C	856	c1b/c3	57	M3-r101	-	Ponderosa pine	1932[b]
	MOR3-008A	813	f1	40	M3-r97	-	Ponderosa pine	1914[b]
	MOR3-008B							1912[b]
	MOR3-009 A/B	843	f1	15	M3-r93	MO-10102	Ponderosa pine	1937
	MOR3-009 A/B							1937
	MOR3-010A	860	f1	8	M3-r92	-	Ponderosa pine	1926[b]
	MOR3-010C							1926[b]
	MOR3-011C	800	f1a	14	M3-r27	-	Ponderosa pine	1932[b]
	MOR3-011D							1932[b]
	MOR3-012 A/B	793	c3	62	M3-r102	MO-13329	Ponderosa pine	1954
	MOR3-012 A/B							1954
	MOR3-013A	785	f1	7	M3-r103	-	Ponderosa pine	1975[b]
	MOR3-013D							1975[b]
	MOR3-014A	783	f1	8	M3-r104	MO-13328	Ponderosa pine	1979[b]
	MOR3-014B							1979[b]
	MOR3-015A	725	c3a	>105	M3-r105	-	Ponderosa pine	1929
	MOR3-015B							1929
	MOR3-016A	727	c1g/c3a	93	M3-r106	-	Ponderosa pine	1942
	MOR3-016B							1942
	MOR3-017B	505	f1	73	M3-r57	-	Ponderosa pine	1933[b]
	MOR3-018A	504	c2	50	M3-r56	-	Ponderosa pine	1953[b]
	MOR3-018B							1953[b]
	MOR3-019B	454	f1	22	M3-r59	-	Douglas fir	1907
	MOR3-020C	471	c3	62	M3-r107	-	Ponderosa pine	1938[b]
	MOR3-020D							1938[b]
	MOR3-021A	381	f1	15	M3-r66	-	Ponderosa pine	1957[b]
	MOR3-021C							1957
	MOR3-022A	900	f1	0	M3-r23	-	Ponderosa pine	1989
	MOR3-022B							1989
	MOR3-023A	870	f1	6	M3-r96	-	Ponderosa pine	1989
	MOR3-023B							1989
	MOR3-024A	871	f2? (Qt?)	7	M3-r109	-	Ponderosa pine	1989
	MOR3-024B							1989
	MOR3-025A	858	c3	47	M3-r123	-	Ponderosa pine	1927[b]
	MOR3-025B							1925[b]
	MOR3-026 A/B	843	c3	56	M3-r128	-	Ponderosa pine	1956
	MOR3-026 A/B							1957
	MOR3-026 C/D							1956
	MOR3-026 C/D							1958

Table B-1.0-5 (continued)

Reach	Core ID	Channel Distance (m)	Geomorphic Unit	Depth of Burial (cm)	Fixed-Point Radiological Measurement or Stratigraphic Description Location	Location ID	Species	Date of Pith Ring
	MOR3-027C	177	f1	21	M3-r156	-	Ponderosa pine	1927
	MOR3-027D							1927
M-4	MOR-4-001C	15	c3 + f1	11	M4-r87	MO-10158	Ponderosa pine	1944
	MOR-4-001D							1944
	MOR-4-002C	57	c3 + f1	22	M4-r84	-	Ponderosa pine	1928[b]
	MOR-4-002D							1927[b]
	MOR-4-003A	165	c3 + f1	13	M4-r76	-	Ponderosa pine	1920
	MOR-4-004A	176	f2? (Qt?)	0	M4-r75	-	Ponderosa pine	1966[b]
	MOR-4-004 B							1966[b]
	MOR-4-005C	186	c3 + f1	22	M4-r74	MO-10148	Ponderosa pine	1920[b]
	MOR-4-006C	200	c3a + f1a	15	M4-r73	-	Ponderosa pine	1946[b]
	MOR -4-006D							1946[b]
	MOR-4-007A	310	Qc	17	M4-r26	-	Ponderosa pine	1923[b]
	MOR-4-008C	366	c3 + f1	30	M4-r32	MO-10139	Ponderosa pine	1969
	MOR-4-008D							1969
	MOR-4-009A	360	c3 + f1	31	M4-r31	-	Ponderosa pine	1934
	MOR-4-010A	373	c3 + f1	0	-	-	Ponderosa pine	1980[b]
	MOR-4-010B							1980[b]
	MOR-4-011A	650	c3 + f1	0	M4-r41	MO-10125	Ponderosa pine	1984
	MOR-4-011B							1984
	MOR-4-012C	644	c3 + f1	0	-	-	Ponderosa pine	1976
	MOR-4-012D							1976
Pratt Canyon	PRA-001A	-	c2	56	PR-T4	-	Ponderosa pine	1980
	PRA-001B							1980
	PRA-002A	-	c3	22	PR-T3	-	Ponderosa pine	1962[b]
	PRA-002B							1962[b]
	PRA-003A	-	c2? c3?	?	PR-T1	-	Ponderosa pine	1951
	PRA-003B							1951
	PRA-004C	-	c3	95	PRA-004	MO-00034	Ponderosa pine	1965
	PRA-004D							1965
	PRA-005A	-	c2? c3?	26	PR-T6	-	Ponderosa pine	1980
	PRA-005B							1980
	small tree	-	c2? c3?	29	PR-T5	-	Ponderosa pine	1989[c]
TS-3	TS3-001A	762	c2	50	-	MO-10017	Ponderosa pine	1946[b]
	TS3-001D							1944[b]
	TS3-002A	775	c2	37	-	-	Ponderosa pine	1935
	TS3-002B					-		1935
	TS3-003A	825	c2	56	-	MO-10119	Ponderosa pine	1985
	TS3-003B							1985
	TS3-003C							1985
	TS3-003D							1985
	TS3-004A	823	c2	30	-	-	Ponderosa pine	1972
	TS3-004 B							1972
	TS3-005A	807	f2? (Qt?)	14	-	-	Ponderosa pine	1914[b]
	TS3-005B							1914[b]
	TS3-006A	673	c2	28	-	-	Rocky Mountain juniper	1976
	TS3-006B							1977
	TS3-007A	637	f1? (f2?)	22	-	MO-10016	Ponderosa pine	1916[b]
	TS3-007D							1918[b]
	TS3-008C	621	c2	35	-	MO-10014	Ponderosa pine	1972
	TS3-008D							1976
	TS3-009C	622	f1? (f2?)	15	-	-	Ponderosa pine	1934

[a] Dash indicates not applicable.

[b] Age estimated; pith not encountered and/or poor match with chronology.

[c] Age estimate based on whorl count only.

Table B-3.0-1
Characteristics of Sediment in Composite Samples from Small Mammal Trapping Arrays

Trap Number	Geomorphic Unit	Thickness Fine Facies Sediment, Post-1942 (cm)	Thickness Coarse Facies Sediment, Post-1942 (cm)	Thickness Pre-1942 Sediment, Colluvium, or Young Fans (cm)	Thickness Post-Fire Ash-Bearing Layer (burnt soil or fine ash-bearing sediment) (cm)
Sample CAMO-05-63552, Location ID MO-25169, Reach M-3E					
1	f1	8	0	7	0
10	f1	7	0	8	0
25	c3	15	0	0	0
29	f1	8	0	7	0
35	disturbed + c3	0	14	0	1
57	c3	12	3	0	0
59	f1a	15	0	0	0
69	c3a	12	3	0	0
73	berm	15	0	0	0
95	c3	10	5	0	0
Average		**10.2**	**2.5**	**2.2**	**0.1**
Percent of Total		**68%**	**17%**	**15%**	**1%**
Sample CAMO-05-63553, Location ID MO-25170, Reach M-2W					
12	Qc	0	0	15	0
17	Qt	0	0	15	0
28	Qc	0	0	15	0
43	f2?	5	0	10	0
45	c1b	3	12	0	0
54	f2? (Qt?)	15	0	0	0
63	Qt	0	0	15	0
84	f1	15	0	0	0
87	Qc	0	0	15	0
91	c2	15	0	0	0
Average		**5.3**	**1.2**	**8.5**	**0**
Percent of Total		**35%**	**8%**	**57%**	**0%**

Table B-3.0-1 (continued)

Trap Number	Geomorphic Unit	Thickness Fine Facies Sediment, Post-1942 (cm)	Thickness Coarse Facies Sediment, Post-1942 (cm)	Thickness Pre-1942 Sediment, Colluvium, or Young Fans (cm)	Thickness Post-Fire Ash-Bearing Layer (burnt soil or fine ash-bearing sediment) (cm)
Sample CAMO-05-63554, Location ID MO-25171, Reach E-1W					
8	Qf	0	0	14	1
12	c1ct	15	0	0	0
14	c1ct	15	0	0	0
17	c1ct	9	6	0	0
19	c1ct	7	8	0	0
20	c1ct	15	0	0	0
21	Qf	0	0	15	0
24	Qf	0	0	14	1
25	Qf	0	0	4	11
29	Qc	0	0	15	0
Average		**6.1**	**1.4**	**6.2**	**1.3**
Percent of Total		**41%**	**9%**	**41%**	**9%**
Sample CALA-05-63718, Location ID LA-25251, Reach LA-BKG					
2	Qc	0	0	15	0
17	f1	9	6	0	0
20	f1	0	8	0	7
29	c2	0	3	0	12
35	berm near channel	11	4	0	0
44	c2	5	10	0	0
47	f1	15	0	0	0
68	Qt? (f1?)	0	0	15	0
78	Qt	0	0	15	0
91	road edge	0	0	15	0
Average		**4.0**	**3.1**	**6.0**	**1.9**
Percent of Total		**27%**	**21%**	**40%**	**13%**

Table B-3.0-2
Small Mammals Submitted for Laboratory Analysis

Reach	Sample ID	Species	Type of Sample	Number of Individuals in Sample	Weight (g)
M-3E	CAMO-06-64256	deer mouse (PEMA)	carcass	23	322.5
M-3E	CAMO-06-64257	deer mouse (PEMA)	pelt	23	62.5
M-3E	CAMO-06-64258	western harvest mouse (REME)	carcass	10	96.1
M-3E	CAMO-06-64259	western harvest mouse (REME)	pelt	10	15.2
M-3E	CAMO-06-64260	Mexican woodrat (NEME)	carcass	4	414.5
M-3E	CAMO-06-64261	Mexican woodrat (NEME)	pelt	4	73.6
M-2W	CAMO-06-64262	brush mouse (PEBO)	carcass	17	287.7
M-2W	CAMO-06-64263	brush mouse (PEBO)	pelt	17	50.6
M-2W	CAMO-06-64264	Mexican woodrat (NEME)	carcass	4	388.5
M-2W	CAMO-06-64265	Mexican woodrat (NEME)	pelt	4	57.5
M-2W	CAMO-06-64266	deer mouse (PEMA)	carcass	10	118.9
M-2W	CAMO-06-64267	deer mouse (PEMA)	pelt	10	20.3
E-1W	CAMO-06-64268	deer mouse (PEMA)	carcass	8	102.5
E-1W	CAMO-06-64269	deer mouse (PEMA)	pelt	8	19.3
E-1W	CAMO-06-64270	brush mouse (PEBO)	carcass	7	107.6
E-1W	CAMO-06-64271	brush mouse (PEBO)	pelt	7	22.3
E-1W	CAMO-06-64272	long tailed vole (MILO)	carcass	1	25.6
E-1W	CAMO-06-64273	long tailed vole (MILO)	pelt	1	3.0
E-1W	CAMO-06-64274	Mexican woodrat (NEME)	carcass	2	208.9
E-1W	CAMO-06-64275	Mexican woodrat (NEME)	pelt	2	32.0
E-1W	CAMO-06-64276	shrew (SOVA)	whole body	4	19.4
LA-BKG	CALA-06-24277	deer mouse (PEMA)	carcass	18	224.2
LA-BKG	CALA-06-24278	deer mouse (PEMA)	pelt	18	42.0
LA-BKG	CALA-06-24279	long tailed vole (MILO)	carcass	5	116.4
LA-BKG	CALA-06-24280	long tailed vole (MILO)	pelt	5	22.1
LA-BKG	CALA-06-24281	pinyon mouse (PETR)	carcass	2	35.4
LA-BKG	CALA-06-24282	pinyon mouse (PETR)	pelt	2	6.5
LA-BKG	CALA-06-24283	shrew (SOVA)	whole body	6	29.2

Table B-3.0-3
Sediment Submitted for Laboratory Analysis

Reach	Sample ID	Location ID	Geomorphic Unit	Depth (cm)	Date Collected	Notes
TS-1C	CAMO-05-61156	50-06520	c2	0–30	6/30/05	Earthworm toxicity test and seedling germination test
E-1E	CAMO-05-61157	MO-00023	f1	0–30	6/30/05	Earthworm toxicity test and seedling germination test
E-1W	CAMO-05-61158	MO-00027	c1ct	0–30	6/30/05	Earthworm toxicity test and seedling germination test
M-4C	CAMO-05-61159	MO-00080	c3a + f1a	0–30	6/30/05	Earthworm toxicity test and seedling germination test
M-2W	CAMO-05-61160	MO-10063	c2	0–30	6/30/05	Earthworm toxicity test and seedling germination test
E-1FW	CAMO-05-61161	MO-22804	c2	0–30	6/30/05	Earthworm toxicity test and seedling germination test
TS-2C	CAMO-05-61162	MO-22840	c2	0–30	6/30/05	Earthworm toxicity test and seedling germination test
E-1FW	CAMO-05-61163	MO-22804	c2	0–30	6/30/05	QA duplicate from earthworm and seedling test location
TS-2C	CAMO-05-61165	MO-24795	c1b	0–15	6/30/05	*Chironomous tentans* test
M-2W	CAMO-05-61167	MO-24808	c1	0–15	6/30/05	QA duplicate from *Chironomous tentans* test location
M-2W	CAMO-05-61169	MO-24808	c1	0–15	6/30/05	*Chironomous tentans* test
E-1W	CAMO-05-61171	MO-24787	c1	0–15	6/30/05	*Chironomous tentans* test
E-1E	CAMO-05-61173	MO-24788	c1	0–15	6/30/05	*Chironomous tentans* test
M-1W	CAMO-05-61175	MO-24789	c1	0–15	6/30/05	*Chironomous tentans* test
TS-1C	CAMO-05-61177	MO-24792	c1	0–15	6/30/05	*Chironomous tentans* test
TS-1E	CAMO-05-61179	MO-24794	c1	0–15	6/30/05	*Chironomous tentans* test
M-3E	CAMO-05-63552	MO-25169	composite	0–15	9/16/05	Small mammal trapping array
M-2W	CAMO-05-63553	MO-25170	composite	0–15	9/16/05	Small mammal trapping array
E-1W	CAMO-05-63554	MO-25171	composite	0–15	9/16/05	Small mammal trapping array
M-3E	CAMO-05-63555	MO-25169	composite	0–15	9/16/05	QA duplicate from small mammal trapping array
LA-BKG	CALA-05-61181	LA-24809	c1	0–15	6/30/05	*Chironomous tentans* test
LA-BKG	CALA-05-61183	LA-24798	f1	0–30	6/30/05	Earthworm toxicity test and seedling germination test
LA-BKG	CALA-05-63718	LA-25251	composite	0–15	9/16/05	Small mammal trapping array

Table B-3.0-4
Surface Water Submitted for Laboratory Analysis

Reach	Sample ID	Location ID	Collection Date	pH	Specific Conductance (µS/cm)	Temperature (°C)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Notes
TS-2C	CAMO-05-61166	MO-24795	8/18/2005	6.68	245	22.3	3.07	1.95	clear pool, with water seeping over rock upstream
M-2W	CAMO-05-61168	MO-24808	7/26/2005	-	-	-	-	-	QA duplicate
M-2W	CAMO-05-61170	MO-24808	7/26/2005	7.8	325	15.6	6.49	4.08	pool, with water seeping through weir at gage
E-1W	CAMO-05-61172	MO-24787	7/26/2005	6.8	372	17.3	1.88	0.44	stream with low flow
E-1E	CAMO-05-61174	MO-24788	7/26/2005	6.8	379	16.5	5.12	0.78	isolated pool
M-1W	CAMO-05-61176	MO-24789	7/26/2005	7.6	427	20.0	158	5.14	slightly turbid pool, with water seeping over rock upstream
TS-1C	CAMO-05-61178	MO-24792	8/18/2005	6.90	259	15.4	86.3	2.40	slightly turbid pool
TS-1E	CAMO-05-61180	MO-24794	8/18/2005	7.43	255	15.0	4.51	5.80	clear pool, with water seeping over rock upstream
LA-BKG	CALA-05-61185	LA-24809	7/26/2005	8.0	181	15.9	2.36	9.56	flowing water near LAO-B well

Table B-3.0-5
Egg and Insect Samples Submitted for Laboratory Analysis

Sample ID	Location ID	Watershed	Reach or General Location	Nest Box Number(s)	Date Collected	Type of Sample	Weight (g)
CAMO-05-62799	MO-25040	Mortandad	M-4	524	5/12/2005	Egg	2.23
CAMO-05-62800	MO-25041	Mortandad	M-4E	522	6/29/2005	Egg	1.99
CAMO-05-62801	MO-25042	Mortandad	M-5W	512	5/18/2005	Egg	2.07
CAMO-05-62802	MO-25043	Mortandad	M-5W	517	5/24/2005	Egg	1.53
CAMO-05-62803	MO-25044	Mortandad	M-5W	520	6/2/2004	Egg	2.20
CAMO-05-62804	MO-25040	Mortandad	M-4	524	6/2/2004	Egg	2.10
CAMO-05-62805	MO-25046	Mortandad	M-5W	551	5/20/2005	Egg	2.24
CAMO-05-62806	MO-25047	Mortandad	M-5W	513	5/17/2005	Egg	1.99
CAMO-05-62807	MO-25048	Mortandad	M-5W	510	6/30/2005	Egg	2.62
CAMO-05-62808	MO-25049	Mortandad	M-5W	511	6/30/2005	Egg	2.48
CAMO-05-62809	MO-25047	Mortandad	M-5W	513	6/30/2005	Egg	2.43
CAMO-05-62810	MO-25051	Mortandad	TS-2W	30	5/27/2005	Egg	2.69
CAMO-05-62811	MO-25052	Mortandad	E-1FW	736	5/27/2005	Egg	2.87

Table B-3.0-5 (continued)

Sample ID	Location ID	Watershed	Reach or General Location	Nest Box Number(s)	Date Collected	Type of Sample	Weight (g)
CAMO-05-62812	MO-25053	Mortandad	TS-1E	742	6/23/2005	Insect	0.32
CAMO-05-62813	MO-25040	Mortandad	M-4	524	6/30/2004	Insect	0.27
CAMO-05-62814	MO-25040	Mortandad	M-4	524	6/9/2005	Insect	0.54
CAMO-05-62815	MO-25041	Mortandad	M-4E	522	July 2005	Insect	0.12
CAMO-05-62816	MO-25047	Mortandad	M-5W	510, 511, 512, 513, 517, 551	June–July 2005	Insect	2.70
CAMO-05-62817	MO-25047	Mortandad	M-5W	513, 520	June–July 2004	Insect	0.25
CAMO-05-62818	MO-25051	Mortandad	TS-2W	30	6/20/2005	Insect	0.27
CAMO-05-62819	MO-25052	Mortandad	E-1FW	736	6/23/2005	Insect	0.49
CAMO-05-63116	MO-25054	Mortandad	M-4W	527	6/18/2003	Egg	2.00
CAMO-05-63117	MO-25054	Mortandad	M-4W	527	7/1/2003	Insect	0.35
CAMO-05-63118	MO-25055	Mortandad	M-5W	548	6/27/2003	Egg	1.90
CAMO-05-63119	MO-25055	Mortandad	M-5W	548	7/16/2003	Insect	0.42
CACB-05-62827	CB-25068	del Buey	TA-51	326B	5/25/2005	Egg	2.10
CACB-05-62828	CB-25069	del Buey	Cañada del Buey	581	5/20/2005	Egg	1.83
CACB-05-62829	CB-25070	del Buey	Cañada del Buey	582	5/18/2005	Egg	1.71
CACB-05-62830	CB-25071	del Buey	Cañada del Buey	587	5/24/2005	Egg	2.43
CACB-05-62831	CB-25070	del Buey	Cañada del Buey	581, 582, 587	June 2005	Insect	1.57
CAPU-05-62820	PU-25061	Pueblo	Golf Course	6	5/25/2004	Egg	2.50
CAPU-05-62821	PU-25061	Pueblo	Golf Course	6	5/18/2005	Egg	1.37
CAPU-05-62822	PU-25063	Pueblo	Golf Course	5A	6/30/2005	Egg	2.40
CAPU-05-62823	PU-25063	Pueblo	Golf Course	5A	6/1/2005	Egg	2.55
CAPU-05-62824	PU-25065	Pueblo	Golf Course	5	6/30/2005	Egg	1.91
CAPU-05-62825	PU-25066	Pueblo	Golf Course	8	5/18/2005	Egg	1.10
CAPU-05-62826	PU-25061	Pueblo	Golf Course	5, 5A, 6, 8A, 8	June–July 2005	Insect	2.49
CARE-05-62832	RE-25073	Rendija	Cemetery	168	5/21/2005	Egg	1.49
CARE-05-62833	RE-25074	Rendija	Cemetery	171	6/3/2005	Egg	1.85
CARE-05-62834	RE-25075	Rendija	Cemetery	172	5/26/2005	Egg	2.49
CARE-05-62835	RE-25076	Rendija	Cemetery	174	6/25/2005	Egg	2.38
CARE-05-62836	RE-25077	Rendija	Cemetery	175	5/25/2004	Egg	2.30
CARE-05-62837	RE-25077	Rendija	Cemetery	175	6/3/2005	Egg	2.34
CARE-05-62838	RE-25079	Rendija	Cemetery	178	5/17/2005	Egg	2.31
CARE-05-62839	RE-25077	Rendija	Cemetery	175	June–July 2004	Insect	0.34
CARE-05-62840	RE-25077	Rendija	Cemetery	168, 171, 172, 174, 175, 178	June–July 2005	Insect	1.25

Appendix C

Analytical Data

C-1.0 ANALYTICAL RESULTS

Analytical data collected in the Mortandad watershed are presented on a compact disc (CD) as Attachment C-1. Separate tables are provided for solid media, which includes sediment, core, and biota, and for water. Solid media and water data are further subdivided into analytical data (those data used in analyses presented in this report), field quality control (QC) data and rejected data. These are the tables included on CD:

- Table C-1.0-1 Mortandad Solid Media Analytical Data
- Table C-1.0-2 Mortandad Solid Media Field QC Data
- Table C-1.0-3 Mortandad Solid Media Rejected Data
- Table C-1.0-4 Mortandad Water Analytical Data
- Table C-1.0-5 Mortandad Water Field QC Data
- Table C-1.0-6 Mortandad Water Rejected Data

C-2.0 SUMMARY OF SAMPLES COLLECTED

Samples collected in the Mortandad watershed and analyses performed by analytical laboratories are summarized in Tables C-2.0-1 (sediment), C-2.0-2 (water), and C-2.0-3 (core). Media code definitions are provided in Table C-2.0-4. Geomorphic unit definitions are provided in Table B-1.0-1 in Appendix B.

C-3.0 SAMPLE COLLECTION METHODS

Historical groundwater samples have been collected using a variety of sampling methods: automated pump sampler, bailer, bladder pump, direct container grab sampling, discharge pipe/faucet, gear-driven submersible pump, peristaltic pump, transfer device for grab samples, weighted bottle, or West Bay sampler. Historical surface water samples have been collected using automated pump samplers, bailers, direct container grab sampling, peristaltic pumps, single-stage samplers, or transfer devices for grab samples. Historical stormwater samples have been collected using an automated pump sampler, direct container grab sampling, or single-stage samplers.

Current Los Alamos National Laboratory (LANL or the Laboratory) standard operating procedures (SOPs) for water sampling methods are

- SOP-06.01, Rev. 3 Purging and Sampling Methods for Single Completion Wells,
- SOP-06.13, Rev. 2 Surface Water Sampling,
- SOP-06.29, Rev. 2 Single-Stage Sampling for Surface Water Run-Off, and
- SOP-06.32, Rev. 2 Multi-Level Groundwater Sampling of Monitoring Wells, Westbay MP System.

Historical sediment samples have been collected using a spade and scoop or a hand auger and thin-wall tube sampler.

Current Laboratory SOPs for sediment sampling methods are

- SOP-06.09, Rev. 2 Spade and Scoop Method for Collection of Soil Samples, and
- SOP-06.10, Rev. 3 Hand Auger and Thin-Wall Tube Sampler.

Historical core samples have been collected using a core barrel samples, a hollow-stem auger, or split-spoon samplers and Shelby tube samplers.

Current Laboratory SOPs for core sampling methods are

- SOP-06.24, Rev. 2 Sample Collection from Split Spoon Sampler and Shelby Tube Samplers,
- SOP-06.26, Rev. 2 Core Barrel Sampling for Subsurface Earth Materials

C-4.0 ANALYTICAL PROGRAM

The data contained in this report were obtained from the Environmental Restoration Database (ERDB), the Water Quality Database (WQDB), and EES-6 (the Hydrology, Geochemistry, and Geology group at the Laboratory).

EES-6 analyses were performed on pore water extracted from core samples. These data are considered screening-level data and are not used for decision-making purposes. These data are used to help develop the conceptual site model presented in Section 7 of this report.

Data validation for data from the WQDB is performed by an outside contractor that validates the analytical data according to U.S. Environmental Protection Agency (EPA) protocols. All of the data from analytical laboratories that provide level 4 data packages are validated. Level 4 data packages are defined as those containing chain -of-custody forms, quality assurance (QA) and QC documentation, the analytical laboratory Form 1 (a summary of the analytical results) and the raw analytical data. Some data collected before 2000 do not have level 4 data packages and are considered preliminary or screening-level data (indicated by a “Y” [yes] in the “prelim_flag” field in the Appendix C tables; “N” [no] in this field indicates the record is validated even if no validation codes were applied).

For data obtained from the ERDB, QA, QC, and data validation procedures were implemented in accordance with the requirements of the Los Alamos National Laboratory Quality Assurance Project Plan Requirements for Sampling and Analysis (LANL 1996, 54609) and the Laboratory’s analytical services statements of work (SOWs) for contract laboratories (LANL 1995, 49738; LANL 2000, 71233). All data obtained from the ERDB that are included in this report have accompanying level 4 data packages and have undergone routine validation according to SOPs specific to the analyte type (inorganic chemicals, organic chemicals, or radionuclides). These SOPs include the following:

- SOP-15.01, Rev. 1, Routine Validation of Volatile Organic Data
- SOP-15.02, Rev. 1, Routine Validation of Semivolatile Organic Data
- SOP-15.03, Rev. 1, Routine Validation of Organochlorine Pesticides and Polychlorinated Biphenyls Data
- SOP-15.04, Rev. 1, Routine Validation of High Explosives Data
- SOP-15.05, Rev. 1, Interim Change Notice 1, Routine Validation of Inorganic Data
- SOP-15.06, Rev. 1, Interim Change Notice 1, Routine Validation of Gamma Spectroscopy Data
- SOP-15.07, Rev. 1, Interim Change Notice 1, Routine Validation of Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Data

Some analytical results were rejected for various reasons and are not usable for the purposes of this report. In some of these instances, the analysis was rerun and a valid result exists. However, some rejected data represent data issues; there is no valid result for the analyte for the given sample. Rejected results that represent data issues are provided on the data CD and discussed in Section C-4. Field

duplicates are used for QC purposes and are not included in the summary tables in Section 6 of the report. When there were duplicate analytical results for an analyte in the same sample resulting from two methods, the result obtained from the more sensitive method (i.e., lower detection limit) was presented in the summary tables in Section 6 of the report. Laboratory data qualifiers are presented in parentheses next to the results in the summary tables. Laboratory qualifier definitions are listed in Table C-4.0-1, and analytical laboratory qualifiers are listed in Table C-4.0-2.

C-5.0 INORGANIC CHEMICAL ANALYSIS METHODS

The analytical methods used for inorganic chemicals are listed in Table C-5.0-1.

Laboratory control samples (LCSs), method blanks, matrix spike samples, and field duplicate samples were analyzed to assess accuracy and precision of inorganic chemical analyses. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 49738; LANL 2000, 71233) and is described briefly in the sections below.

The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. The analytical results for the samples were qualified according to National Functional Guidelines (EPA 1994, 48639) if the individual LCS recovery indicated an unacceptable bias in the measurement of individual analytes. LCS recoveries should fall into the control limits of 75%–125% (LANL 1995, 49738; LANL 2000, 71233).

Method blanks are used as a measurement of bias and potential cross-contamination. All target analytes should be below the contract-required detection limit (CRDL) in the preparation blank (LANL 1995, 49738; LANL 2000, 71233).

The accuracy of inorganic chemical analyses is also assessed using matrix spike samples. A matrix spike sample is designed to provide information about the effect of each sample matrix on the sample preparation procedures and analytical technique. The spike sample recoveries should be within the acceptance range of 75%–125% (LANL 1995, 49738; LANL 2000, 71233).

Analyzing field duplicate samples assesses the precision of analyses. All relative percent differences between the sample and field duplicate should be ±35% (LANL 1995, 49738; LANL 2000, 71233).

The validation of inorganic chemical data using QA/QC samples and other methods can result in the rejection of the data or the assignment of various qualifiers to individual sample results. LANL qualifier definitions are listed in Table C-4.0-1.

Inorganic Chemical Background Values

It is important to note that the previously used analytical services SOW (LANL 1995, 49738) was issued before the widespread use of axial view inductively coupled plasma emission spectroscopy (ICPES) (also known as trace ICPES). With the advent of axial view ICPES, detection limits for inorganic chemicals have greatly improved. For example, antimony soil detection limits for the older radial view ICPES are typically on the order of 12 mg/kg, whereas axial view ICPES detection limits are as low as 0.5 mg/kg.

“Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory” (LANL 1998, 59730) was developed after axial view ICPES was widely used. However, since some of the samples were collected and analyzed before widespread axial view ICPES use, not all detection limits are below the background values (BVs). Sample results with detection limits above the BVs are presented in the data summary tables.

C-6.0 ORGANIC CHEMICAL ANALYSIS METHODS

The analytical methods used for organic chemicals are listed in Table C-6.0-1.

QCs are designed to produce a quantitative measure of the reliability of a specific part of an analytical procedure. The results of the QCs performed on a sample provide confidence about whether the analyte is present and whether the concentration reported is correct. The validation of organic chemical data using QA/QC samples and other methods can result in rejecting the data or in assigning various qualifiers to individual sample results. LANL qualifier definitions are listed in Table C-4.0-1.

Calibration verifications, instrument-performance checks, LCSs, method blanks, matrix spike samples, surrogates, and internal standards were analyzed to assess the accuracy and precision of the organic chemical analyses. Each of these QA/QC sample types is defined in the analytical services SOWs (LANL 1995, 49738; LANL 2000, 71233) and is described briefly below.

Calibration verification, which consists of initial and continuing verification, is the establishment of a quantitative relationship between the response of the analytical procedure and the concentration of the target analyte. The initial calibration verifies the accuracy of the calibration curve and the individual calibration standards used to perform the calibration. The continuing calibration ensures that the initial calibration is still holding and correct as the instrument is used to process samples. The continuing calibration also serves to determine whether analyte identification criteria, such as retention times and spectral matching, are being met.

The LCS is a sample of a known matrix that has been spiked with compounds that are representative of the target analytes, and it serves as a monitor of the overall performance of a “controlled” sample. Daily, the LCS is the primary demonstration of the ability to analyze samples with good qualitative and quantitative accuracy. The analytical results for the samples were qualified according to National Functional Guidelines (EPA1999, 66649) if the individual LCS recoveries were not within method-specific acceptance criteria. The LCS recoveries should fall within the control limits of 75%–125% (LANL 1995, 49738; LANL 2000, 71233).

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing and which is extracted and analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during extraction and analysis. All target analytes should be below the CRDL limit in the method blank (LANL 1995, 49738; LANL 2000, 71233).

The accuracy of organic chemical analyses is also assessed by using matrix spike samples that are aliquots of the submitted samples spiked with a known concentration of the target analyte(s). Matrix spike samples are used to measure the ability to recover prescribed analytes from a native sample matrix. Spiking typically occurs before sample preparation and analysis. The spike sample recoveries should be within the acceptance range of 75%–125% (LANL 1995, 49738; LANL 2000, 71233).

A surrogate compound (surrogate) is an organic chemical compound used in the analyses of organic target analytes that is similar in composition and behavior to the target analytes but not normally found in environmental samples. Surrogates are added to every blank, sample, and spike to evaluate the efficiency with which analytes are recovered during extraction and analysis. The recovery percentage of the surrogates must be within specified ranges or the sample may be rejected or assigned a qualifier (LANL 1995, 49738; LANL 2000, 71233).

Internal standards are chemical compounds added to every blank, sample, and standard extract at a known concentration. They are used to compensate for (1) analyte concentration changes that might occur during storage of the extract and (2) quantitation variations that can occur during analysis. Internal standards are used as the basis for quantitation of target analytes. The percent recovery for internal standards should range between 50% and 200% (LANL 1995, 49738; LANL 2000, 71233).

C-7.0 RADIOCHEMICAL ANALYSIS METHODS

Radionuclides were analyzed by the methods listed in Table C-7.0-1. Radionuclides with reported values less than the minimum detectable activity were qualified as nondetected (U). Each radionuclide result was also compared with the corresponding one sigma total propagated uncertainty (TPU). If the result was not greater than three times the TPU, the radionuclide was qualified as nondetected (U).

The precision and bias of radiochemical analyses performed at off-site fixed laboratories were assessed using matrix spike samples, LCSs, method blanks, and duplicates. The analytical services SOWs (LANL 1995, 49738; LANL 2000, 71233) specify that spike sample recoveries should be within ±25% of the certified value. LCSs were analyzed to assess the accuracy of radionuclide analyses. The LCSs serve as a monitor of the overall performance of each step during the analysis, including the radiochemical separation preparation. The analytical services SOWs (LANL 1995, 49738; LANL 2000, 71233) specify that LCS recoveries should be within ±25% of the certified value. Method blanks are also used to assess bias. The analytical services SOWs (LANL 1995, 49738; LANL 2000, 71233) specify that the method blank concentration should not exceed the required estimated quantitation limit (EQL).

C-8.0 DATA QUALITY

Data quality issues, including rejected analytical results, are summarized by media and canyon. Because of the large number of records that were qualified, the following sections provide a summary of the reasons for qualification, and the qualification is not addressed by individual records.

C-8.1 Water Data

Water samples were collected in Cedro, Effluent, Los Alamos, Mortandad, Sandia, and Ten Site Canyons. A total of 72, 955 results were reported from water samples from these canyons. Fewer than 1% (692 results) were rejected during data validation.

C-8.1.1 Cedro Canyon

Eight inorganic chemical sample results (analytes include ammonia, total phosphate, and zinc) were rejected based on holding time exceeded or negative blank sample results greater than the method detection limit (MDL). Two radionuclide results and five volatile organic compound (VOC) results were rejected based on QC failures. Two semivolatile organic compound (SVOC) results were rejected because of the relative response factor.

Twenty-seven inorganic results were reported as estimated, either detected or not detected, based on holding time exceeded, negative blank sample results greater than the MDL, matrix spike/matrix spike duplicate issues, or other QC failures.

C-8.1.2 Effluent Canyon

One nitrate-nitrite as nitrogen result was rejected in Effluent Canyon due to negative blank sample results greater than the MDL. One potassium-40 result was rejected based on QC failures. Five VOC results were rejected because of issues related to sample preservation or relative response factors. Multiple SVOC results were rejected based on issues related to either LCS recoveries, surrogates, or matrix spike/matrix spike duplicate samples.

C-8.1.3 Los Alamos Canyon

No sample results were rejected for Los Alamos Canyon samples.

C-8.1.4 Mortandad Canyon

Fifty-three results were rejected for inorganic chemicals because of issues related to at least one of the following: preparation blanks, negative blank results greater than the MDL, spike recoveries, continuing calibration verification not reported, duplicate analysis not performed for the associated request number, holding time exceeded, or other QC failures. Sixty-six radionuclide results were rejected because of differences between the sample and duplicate, minimum detectable concentration, spectral interference, and other QC failures. Eight pesticide records were rejected because the method blank or instrumentation blank documentation is missing. Forty-four high explosive records are rejected either because of holding time issues or other QC failures. Two hundred and thirty-seven VOC records were rejected for one of the following reasons: holding time exceeded, low relative response factor, matrix spike and/or matrix spike duplicate was not performed on a sample related to a Laboratory request number, or other QC failures. One hundred and seven SVOC results were rejected based on issues with surrogates, matrix spike/matrix spike duplicate acceptance criteria, LCS recoveries, or matrix spike recoveries.

C-8.1.5 Sandia Canyon

Seven inorganic chemical results were rejected because of negative blank sample results greater than the MDL, holding time exceeded, or other QC failures. Seven organic chemical results were rejected because of matrix spike recoveries or acceptance criteria for the relative percent difference between the matrix spike and matrix spike duplicate, LCS recoveries, or associated relative response factors.

C-8.1.6 Ten Site Canyon

Twenty-five inorganic chemical results were rejected because negative blank sample results were greater than the MDL, holding time was exceeded, preparation blank issues, or other QC failures. Twenty-one radionuclide results were rejected either because the duplicate error ratio was high or other QC failures. Four pesticide results and twenty VOC results were rejected because of QC failures. Twenty-six SVOC results were rejected because of issues related to surrogates, the LCS recoveries, the spike recoveries, or the matrix spike/matrix spike duplicate.

C-8.2 Sediment and Core Data

Sediment samples were collected in Effluent, Los Alamos, Mortandad, Ten Site Canyons, and an unnamed tributary to Mortandad Canyon. A total of 82,284 results from sediment samples in these canyons were reported. Approximately 6% of these records were rejected during data validation. Core samples were collected in Effluent, Mortandad, and Ten Site Canyons. A total of 9,525 results were

reported for core samples collected in these canyons. The 255 results that were rejected during data validation represent about 2.6% of all the core results.

C-8.2.1 Effluent Canyon

Sediment Samples

Twenty-nine inorganic chemical results were rejected for antimony, calcium, and nickel due to a low spike sample recovery. One-hundred and forty-three radionuclide results were rejected because the minimum detectable concentration (MDC) documentation was missing, spectral interference, or the quality deficiencies were identified by the validator. Seventy-six SVOC results were rejected due to low internal standard counts or holding time. Two Aroclor results were rejected because the documentation for the confirmation column analysis was missing.

Five hundred and forty inorganic chemical results were reported as estimated, either detected or not detected, for one of the following reasons. The results were between the EQL and MDL, the analytical laboratory reported the result as estimated, recovery of the associated sample spike, sample, and duplicate results and relative percent difference (RPD), or the serial dilution sample relative percent difference. Thirty-two radionuclide results were either estimated and biased low or reported with estimated detection limits due to extraction holding time issues. One thousand three hundred and thirty organic chemical results were reported as estimated, either detected or not detected, based on at least one of the following issues: LCS recovery, surrogate recovery, continuing calibration standard, holding time, matrix spike/matrix spike duplicate RPD, calibration verification, method blanks, mass spectrum did not meet method specifications, or other quality deficiencies.

Core Samples

Seventeen radionuclide results from core samples were rejected because of spectral interference.

One hundred forty-six inorganic chemical results were reported as estimated, either detected or not detected, because the results were between the EQL and MDL, sample and duplicate results and RPD difference, recoveries of the associated spike samples, or LCS recoveries.

C-8.2.2 Los Alamos Canyon

Background Samples

Two radionuclide results from background sediment samples were rejected because of spectral interference.

Twenty-nine inorganic chemical results were reported as estimated, detected or not detected, because the results were between the EQL and MDL, spike sample recoveries, sample and duplicate results and RPD difference, or other quality deficiencies. Thirty-four organic chemical results were reported as estimated detection limits due to the LCS recoveries or criteria associated with the initial or continuing calibration standards.

Sediment Samples

There were no rejected sample results for sediment in Los Alamos Canyon. Six inorganic chemicals from one sample were reported as estimated, either detected or not detected, because the results were between the EQL and MDL or the recovery of the associated spike sample. One Aroclor result and three

SVOC results were reported with estimated detection limits based on criteria associated with the initial or continuing calibration standards.

C-8.2.3 Mortandad Canyon

Sediment Samples

One hundred and sixty-nine inorganic chemical results (for antimony, chromium, and lead) were rejected because of low spike sample recovery. One result for cyanide was rejected based on QC failures. Five hundred and seventy radionuclide results were rejected because the MDC documentation was missing, spectral interference, or quality deficiencies were identified. Of 227 organic chemical results that were rejected, one Aroclor result had quality deficiencies, 14 VOCs had issues related to the internal standard area counts, and 212 SVOCs either had low sample surrogate recoveries, holding time issues, invalid 5-point calibration, or LCS recovery issues.

Two thousand two hundred and thirty-three inorganic chemical results were reported as estimated, either detected or not detected, based on one or more of the following: the results were between the EQL and MDL, issues related to duplicate samples, serial dilution sample RPD, matrix spike sample issues, LCS recoveries, holding time issues, or negative blank sample results greater than the MDL. Two hundred and ninety-nine radionuclide results were reported as estimated, detected or not detected, based on one or more of the following issues: holding time, method blank documentation missing, high duplicate error ratio, high tracer recovery, matrix spike recoveries, or other QC failures. Four thousand two hundred and eighty-three organic chemical records were reported as estimated, either detected or not detected, based on at least one of the following issues: LCS recovery, surrogate recovery, continuing calibration standard, holding time, matrix spike/matrix spike duplicate RPD, calibration verification, method blanks, mass spectrum did not meet method specifications, or other quality deficiencies.

Core Samples

Eighty-six inorganic chemical results (for antimony, calcium, and manganese) were rejected because of low spike sample recovery. One hundred and twenty-nine radionuclide results (mostly cesium-134) were rejected because of spectral interference.

One thousand and eighty-two inorganic chemical results were reported as estimated, either detected or not detected, because the results were between the EQL and MDL, sample and duplicate results and RPD difference, serial dilution sample RPD, recoveries of the associated spike samples, LCS recoveries, or other quality deficiencies. Eleven radionuclide results (mostly uranium-238) were reported as estimated and potentially biased high due to a high LCS recovery.

C-8.2.4 Unnamed Tributary

Sediment Samples

Thirty-two inorganic chemical results for antimony were rejected because of low spike sample recovery.

One hundred and fifty-seven inorganic chemical results were reported as estimated, either detected or not detected, because the results were between the EQL and MDL, recoveries of the associated spike samples, LCS recoveries, or serial dilution sample RPDs. Three isotopic thorium results were reported as estimated and potentially biased low because of low tracer recovery. One hundred and seventeen organic chemical results were reported as estimated, either detected or not detected, either by the analytical

laboratory or based on issues with the LCS recovery, the method blank, or criteria associated with the initial or continuing calibration standards.

C-8.2.5 Ten Site Canyon

Sediment Samples

Forty-four inorganic chemical results (for manganese, nickel, and lead) were rejected because of low spike sample recovery. Three hundred and thirty-five radionuclide results were rejected because of missing MDC documentation, spectral interference, high duplicate error ratio, or other quality deficiencies. One thousand five hundred and seventy-one SVOC results (25 samples) were rejected because the instrument performance sample did not pass method acceptance criteria. Two thousand two hundred and three VOC results (39 samples) were rejected either because of internal standard area count issues or because the method or instrument blank documentation was missing.

One thousand one hundred and twenty-six inorganic chemical results were reported as estimated, either detected or not detected, because the results were between the EQL and MDL, recoveries of the associated spike samples, LCS recoveries, sample and duplicate results and RPD difference, or serial dilution sample RPDs. One hundred and eighty-seven radionuclide results were reported as estimated, either detected or not detected, because of one of the following issues: tracer recoveries, duplicate samples, extraction holding times, or other quality deficiencies. Two thousand three hundred and fifty-two organic chemical records were reported as estimated, either detected or not detected, based on at least one of the following issues: LCS recovery, surrogate recovery, continuing calibration standard, holding time, matrix spike/matrix spike duplicate RPD, calibration verification, method blanks, mass spectrum did not meet method specifications, or other quality deficiencies.

Core Samples

Fifteen inorganic chemical results for antimony were rejected based on low spike sample recovery. Eight radionuclide results for cesium-134 were rejected because of spectral interference.

Two hundred and fourteen inorganic chemical results were reported as estimated, either detected or not detected, based on results that were between the EQL and MDL, recoveries of the associated spike samples, or LCS recoveries.

C-8.3 Biota Data

Biota samples were collected from Cañada del Buey, Effluent Canyon, Los Alamos Canyon, Mortandad Canyon, Pueblo Canyon, Rendija Canyon, and Ten Site Canyon. Samples were collected from at least one of the following: eggs, insects, and mammals (carcass, pelt, and whole body). A total of 1964 results were reported from the biota samples. Only one result was rejected.

C-8.3.1 Cañada del Buey

Insects and eggs were collected in the Cañada del Buey watershed. No results were rejected. Fifteen inorganic chemical results from egg samples were reported as estimated based on the serial dilution sample RPD and the sample concentration in comparison to the MDL. Twenty-three inorganic chemical results from insect samples were reported as estimated, either detected or not detected, based on quality deficiencies identified by the validator.

C-8.3.2 Effluent Canyon

Biota samples from Effluent Canyon were collected from eggs, insects, and mammals (carcass, pelt and whole body). No results were rejected. A total of 13 perchlorate and aluminum results from the mammal samples were reported as estimated, either detected or not detected, because results were between the EQL and MDL, the analyte and spike recoveries were outside of acceptance criteria, or quality deficiencies were identified by the validator.

C-8.3.3 Los Alamos Canyon

Biota samples from mammals (carcass, pelt, and whole body) were collected in Los Alamos Canyon. No results were rejected. Four inorganic chemical results from the mammal samples were reported as estimated based on the serial dilution sample RPD or the sample results between the EQL and MDL.

C-8.3.4 Mortandad Canyon

Biota samples from Mortandad Canyon were collected from eggs, insects, and mammals (carcass and pelt). No results were rejected. Four polychlorinated biphenyl (PCB) results were estimated by the analytical laboratory. The inorganic chemical results were reported as estimated, either detected or not detected, because of insufficient sample volume to analyze an associated matrix spike; results were between the EQL and MDL, the analyte and spike recoveries were outside of acceptance criteria, or serial dilution sample RPD.

C-8.3.6 Pueblo Canyon

Insects and eggs were collected in the Pueblo Canyon watershed. No results were rejected. Twenty-six inorganic chemical results were reported as estimated, either detected or not detected, based on holding time issues or quality deficiencies identified by the validator.

C-8.3.7 Rendija Canyon

Insects and eggs were collected in the Rendija Canyon watershed. One result from an egg sample was rejected because of holding time issues. Fourteen inorganic chemical results were estimated based on the serial dilution sample RPD or holding time issues.

C-8.3.8 Ten Site Canyon

Insects and eggs were collected in Ten Site Canyon. No results were rejected or estimated.

C-9.0 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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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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Table C-2.0-1
Mortandad Canyon Watershed Sediment Samples Collected

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
E-1E	50-06000	0	15	AAA2492	SED	-	6/9/1993	N	c2	-	–[a]	–	–	–	x[b]	–	x	–	–	x	–	x	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06001	0	15	AAA2493	SED	-	6/9/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06002	0	15	AAA2494	SED	-	6/9/1993	N	c3	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
E-1E	50-06002	46	76	AAA2750	SED	-	6/9/1993	N	c3	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06002	91	122	AAA2752	SED	-	6/9/1993	N	c3	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06003	0	15	AAA2495	ALLH	-	6/9/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06004	0	15	AAA2496	SED	-	6/9/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06005	0	15	AAA2497	SED	-	6/9/1993	N	f2	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06005	91	122	AAA2753	SED	-	6/9/1993	N	f2	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06006	0	15	AAA2498	SED	-	6/9/1993	N	c3	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–	–	–	–
E-1E	50-06007	0	15	AAA2499	SED	-	6/9/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06007	46	76	AAA2749	SED	-	6/9/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06008	0	15	AAA2500	SED	-	6/9/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06008	46	76	AAA2748	ALLH	-	6/9/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06008	91	122	AAA2751	ALLH	-	6/9/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	–	x	–	–	–
E-1E	50-06009	0	15	AAA2501	ALLH	-	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06009	91	122	AAA2739	ALLH	-	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06010	0	15	AAA2502	SED	-	6/7/1993	N	c1b	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06011	0	15	AAA2503	ALLH	-	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06011	0	15	AAA2742	ALLH	FD[c]	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06012	0	15	AAA2504	ALLH	-	6/7/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06012	46	76	AAA2743	ALLH	-	6/7/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06012	46	76	AAA2745	ALLH	FD	6/7/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06013	0	15	AAA2505	SED	-	6/7/1993	N	c1b	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06014	0	15	AAA2506	SED	-	6/7/1993	N	c2	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06014	46	76	AAA2725	SED	-	6/7/1993	N	c2	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06015	0	15	AAA2507	ALLH	-	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06015	91	122	AAA2747	ALLH	-	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06016	0	15	AAA2508	SED	-	6/7/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06016	46	76	AAA2744	SED	-	6/7/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06017	0	15	AAA2509	ALLH	-	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06017	91	122	AAA2735	ALLH	-	6/7/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
E-1E	50-06017	91	122	AAA2746	ALLH	FD	6/7/1993	N	Qc	-	–	–	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06018	0	15	AAA2510	SED	-	6/3/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06018	46	76	AAA2728	SED	-	6/3/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06018	91	122	AAA2736	SED	-	6/3/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
E-1E	50-06019	0	15	AAA2511	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06019	46	76	AAA2726	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06019	91	122	AAA2733	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06020	0	15	AAA2512	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06020	46	76	AAA2732	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	50-06020	91	122	AAA2740	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
E-1E	MO-00022	0	5	CAMO-98-0027	SED	-	8/31/1998	N	c1	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1E	MO-00023	0	22	CAMO-98-0028	SED	-	8/31/1998	N	f1	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1E	MO-00023	0	30	CAMO-05-61157	SED	-	6/30/2005	N	f1	-	–	–	x	–	x	–	–	–	–	x	–	–	x	x	x	x	x	–	x	x	x	x	–	–	x
E-1E	MO-00023	22	45	CAMO-01-0147	SED	-	7/31/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00023	45	70	CAMO-01-0148	SED	-	7/31/2001	N	f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00024	0	22	CAMO-98-0029	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1E	MO-00024	22	31	CAMO-04-55060	SED	-	9/8/2004	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
E-1E	MO-00024	22	31	CAMO-01-0154	SED	-	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00024	31	43	CAMO-04-55061	SED	-	9/8/2004	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
E-1E	MO-00024	31	43	CAMO-01-0155	SED	-	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00024	50	75	CAMO-01-0156	SED	-	7/31/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00025	0	9	CAMO-98-0030	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1E	MO-00025	9	23	CAMO-01-0095	SED	-	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00025	9	23	CAMO-01-0160	SED	FD	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00025	23	37	CAMO-01-0096	SED	-	7/31/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-00025	37	50	CAMO-98-0031	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1E	MO-10070	0	18	CAMO-01-0077	SED	-	7/31/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10070	0	18	CAMO-01-0297	SED	-	9/7/2001	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10070	36	50	CAMO-01-0298	SED	-	9/7/2001	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10070	18	36	CAMO-01-0138	SED	-	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10070	36	50	CAMO-01-0078	SED	-	7/31/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10070	50	63	CAMO-01-0139	SED	-	7/31/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10071	0	14	CAMO-01-0140	SED	-	7/31/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10072	0	16	CAMO-01-0141	SED	-	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
E-1E	MO-10072	28	42	CAMO-01-0142	SED	-	7/31/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10072	42	61	CAMO-01-0079	SED	-	7/31/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10072	42	61	CAMO-01-0299	SED	-	9/7/2001	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10073	0	16	CAMO-01-0143	SED	-	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10073	0	16	CAMO-01-0159	SED	FD	7/31/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10073	16	35	CAMO-01-0080	SED	-	7/31/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
E-1E	MO-10073	16	35	CAMO-01-0300	SED	-	9/7/2001	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10073	35	52	CAMO-01-0144	SED	-	7/31/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10074	0	11	CAMO-01-0145	SED	-	7/31/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10074	0	11	CAMO-04-55067	SED	-	9/8/2004	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
E-1E	MO-10074	11	33	CAMO-01-0081	SED	-	7/31/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10074	11	33	CAMO-01-0301	SED	-	9/7/2001	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10074	48	75	CAMO-01-0146	SED	-	7/31/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10075	0	15	CAMO-01-0082	SED	-	7/31/2001	N	c1	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10075	0	15	CAMO-01-0302	SED	-	9/7/2001	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10076	0	10	CAMO-01-0149	SED	-	7/31/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10076	0	10	CAMO-04-55062	SED	-	9/8/2004	N	f2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
E-1E	MO-10077	0	25	CAMO-01-0150	SED	-	7/31/2001	N	c1b	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10077	0	26	CAMO-01-0083	SED	-	7/31/2001	N	c1b	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10078	0	22	CAMO-01-0084	SED	-	7/31/2001	N	c3	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10078	0	26	CAMO-01-0303	SED	-	9/7/2001	N	c1b	coarse	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10078	0	22	CAMO-01-0304	SED	-	9/7/2001	N	c3	coarse	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10078	22	37	CAMO-01-0151	SED	-	7/31/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10079	5	19	CAMO-01-0152	SED	-	7/31/2001	N	c1b	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10079	19	27	CAMO-01-0153	SED	-	7/31/2001	N	c1b	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10080	0	17	CAMO-01-0093	SED	-	7/31/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10081	0	10	CAMO-01-0094	SED	-	7/31/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
E-1E	MO-10082	0	17	CAMO-01-0085	SED	-	7/31/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10082	0	17	CAMO-01-0305	SED	-	9/7/2001	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-10082	17	38	CAMO-01-0086	SED	-	7/31/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1E	MO-10082	17	38	CAMO-01-0306	SED	-	9/7/2001	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
E-1E	MO-23344	0	10	CAMO-04-55063	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
E-1E	MO-23345	0	12	CAMO-04-55064	SED	-	9/8/2004	N	c1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
E-1E	MO-23346	0	10	CAMO-04-55065	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
E-1E	MO-23347	0	10	CAMO-04-55066	SED	-	9/8/2004	N	c1b	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
E-1E	MO-23347	0	10	CAMO-04-55084	SED	FD	9/8/2004	N	c1b	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
E-1E	MO-24788	0	15	CAMO-05-61173	SED	-	6/30/2005	N	c1	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	–	x	x	x	–	–	–	–	x	–	–	–
E-1FW	MO-22804	0	26	CAMO-04-53351	SED	-	6/24/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22804	0	26	CAMO-04-53395	SED	FD	6/24/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	–	x	x	–	–	–	x	x	–	x	–
E-1FW	MO-22804	0	26	CAMO-05-63558	SED	FD	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1FW	MO-22804	0	26	CAMO-05-63559	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1FW	MO-22804	0	30	CAMO-05-61161	SED	-	6/30/2005	N	c2	-	–	–	x	–	x	–	–	–	–	x	–	–	x	x	x	x	x	–	x	x	x	x	–	–	x
E-1FW	MO-22804	0	30	CAMO-05-61163	SED	FD	6/30/2005	N	c2	-	–	–	x	–	x	–	–	–	–	x	–	–	x	x	–	x	x	–	–	–	x	x	–	–	–
E-1FW	MO-22805	16	44	CAMO-04-53352	SED	-	6/24/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22805	16	44	CAMO-05-63560	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1FW	MO-22806	0	17	CAMO-04-53353	SED	-	6/24/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22806	0	17	CAMO-05-63561	SED	-	9/22/2005	N	f1	fine	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1FW	MO-22807	17	28	CAMO-04-53354	SED	-	6/24/2004	N	c1b	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22808	0	32	CAMO-04-53355	SED	-	6/24/2004	N	c1	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22809	15	35	CAMO-04-53356	SED	-	6/24/2004	N	c2	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22809	15	35	CAMO-05-63562	SED	-	9/22/2005	N	c2	coarse	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1FW	MO-22809	35	47	CAMO-04-53357	SED	-	6/24/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22809	35	47	CAMO-05-63565	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1FW	MO-22811	48	70	CAMO-04-53358	SED	-	6/24/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
E-1FW	MO-22811	48	70	CAMO-05-63563	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1FW	MO-25180	2	21	CAMO-05-63626	SED	-	9/22/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25180	25	37	CAMO-05-63627	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25182	0	15	CAMO-05-63628	SED	-	9/22/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25183	0	11	CAMO-05-63629	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25183	11	22	CAMO-05-63630	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25185	8	32	CAMO-05-63631	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25186	0	15	CAMO-05-63632	SED	-	9/22/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25187	0	10	CAMO-05-63633	SED	-	9/22/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
E-1FW	MO-25187	0	10	CAMO-05-63635	SED	FD	9/22/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
E-1W	MO-00026	0	15	CAMO-98-0032	SED	-	9/1/1998	N	c2	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1W	MO-00026	15	23	CAMO-98-0033	SED	-	9/1/1998	N	c2	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1W	MO-00027	0	20	CAMO-98-0034	SED	-	9/1/1998	N	c1ct	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1W	MO-00027	0	30	CAMO-05-61158	SED	-	6/30/2005	N	c1ct	-	–	–	x	–	x	–	–	–	–	x	–	–	x	x	x	x	x	–	x	x	x	x	–	–	x

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
E-1W	MO-00028	0	33	CAMO-98-0035	SED	-	9/1/1998	N	c2w	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1W	MO-00029	0	13	CAMO-98-0036	SED	-	9/1/1998	N	c1ct	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
E-1W	MO-10083	0	24	CAMO-01-0087	SED	-	7/31/2001	N	c1ct	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1W	MO-10083	24	34	CAMO-01-0088	SED	-	7/31/2001	N	c1ct	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
E-1W	MO-10084	0	22	CAMO-01-0089	SED	-	7/31/2001	N	c2w	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
E-1W	MO-10085	0	7	CAMO-01-0090	SED	-	7/31/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
E-1W	MO-10085	7	20	CAMO-01-0091	SED	-	7/31/2001	N	c2	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
E-1W	MO-10086	0	20	CAMO-01-0092	SED	-	7/31/2001	N	c1ct	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
E-1W	MO-10086	0	20	CAMO-05-63636	SED	-	9/22/2005	N	c1ct	fine	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1W	MO-22812	0	29	CAMO-04-53359	SED	-	6/24/2004	N	c1ct	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
E-1W	MO-22812	29	49	CAMO-04-53360	SED	-	6/24/2004	N	c1ct	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
E-1W	MO-22814	0	20	CAMO-04-53361	SED	-	6/24/2004	N	c2w	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
E-1W	MO-22814	27	41	CAMO-04-53362	SED	-	6/24/2004	N	c2w	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
E-1W	MO-22816	27	47	CAMO-04-53363	SED	-	6/24/2004	N	c2w	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
E-1W	MO-22816	47	80	CAMO-04-53364	SED	-	6/24/2004	N	c2w	coarse	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
E-1W	MO-22816	47	80	CAMO-05-63564	SED	-	9/22/2005	N	c2w	coarse	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E-1W	MO-24787	0	15	CAMO-05-61171	SED	-	6/30/2005	N	c1	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	x	x	x	x	–	–	–	–	x	–	–	–
E-1W	MO-25188	0	15	CAMO-05-63637	SED	-	9/22/2005	N	c1ct	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25189	0	30	CAMO-05-63638	SED	-	9/22/2005	N	c1ct	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25190	27	47	CAMO-05-63639	SED	-	9/22/2005	N	c2w	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25191	0	10	CAMO-05-63640	SED	-	9/22/2005	N	c1ct	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25192	0	24	CAMO-05-63641	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25193	0	30	CAMO-05-63642	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25194	0	10	CAMO-05-63643	SED	-	9/21/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25195	0	21	CAMO-05-63644	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
E-1W	MO-25195	0	21	CAMO-05-63645	SED	FD	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
LA-BKG	LA-24798	0	30	CALA-05-61183	SED	-	6/30/2005	N	f1	-	–	–	x	–	x	–	–	–	–	x	–	–	x	x	x	x	x	–	–	x	x	x	–	–	x
LA-BKG	LA-24809	0	15	CALA-05-61181	SED	-	6/30/2005	N	c1	-	–	x	x	–	–	–	–	–	–	–	–	–	x	x	x	x	x	–	–	–	–	x	–	–	–
M-1C	MO-22752	5	44	CAMO-04-53287	SED	-	5/17/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1C	MO-22752	5	44	CAMO-04-53332	SED	FD	5/17/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	–	x	x	–	–	–	x	–	–	x	–
M-1C	MO-22753	0	32	CAMO-04-53288	SED	-	5/17/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1C	MO-22754	7	30	CAMO-04-53289	SED	-	5/17/2004	N	c2w	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1C	MO-22755	9	35	CAMO-04-53290	SED	-	5/17/2004	N	c2w	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1C	MO-22756	0	25	CAMO-04-53291	SED	-	5/17/2004	N	c2	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-1C	MO-22757	5	27	CAMO-04-53292	SED	-	5/17/2004	N	c1	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1C	MO-22758	6	32	CAMO-04-53293	SED	-	5/17/2004	N	c2w	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1C	MO-22759	3	15	CAMO-04-53294	SED	-	5/17/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1E	MO-00001	0	34	CAMO-98-0001	SED	-	9/2/1998	N	f1	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1E	MO-00002	0	6	CAMO-98-0002	SED	-	9/2/1998	N	c1	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1E	MO-00003	0	15	CAMO-98-0003	SED	-	9/2/1998	N	c2	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	–	x	–	–
M-1E	MO-00003	0	15	CAMO-98-0004	SED	-	9/2/1998	N	c2	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1E	MO-00003	15	28	CAMO-98-0005	SED	-	9/2/1998	N	c2	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1E	MO-00004	3	20	CAMO-98-0006	SED	-	9/2/1998	N	c1ct	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1E	MO-22768	0	15	CAMO-04-53303	SED	-	5/17/2004	N	c2w	fine	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22768	15	38	CAMO-05-63649	SED	-	9/21/2005	N	c2w	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1E	MO-22769	0	19	CAMO-04-53304	SED	-	5/17/2004	N	c1ct	fine	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22769	19	59	CAMO-04-53305	SED	-	5/17/2004	N	c1ct	coarse	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22771	4	32	CAMO-04-53306	SED	-	5/17/2004	N	c2	fine	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22772	0	15	CAMO-04-53307	SED	-	5/17/2004	N	c2	fine	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22773	0	16	CAMO-04-53308	SED	-	5/17/2004	N	c2	fine	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22773	47	64	CAMO-04-53309	SED	-	5/17/2004	N	c2	coarse	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22775	5	25	CAMO-04-53310	SED	-	5/17/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-1E	MO-22775	5	25	CAMO-04-53335	SED	FD	5/17/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-1E	MO-25198	9	21	CAMO-05-63648	SED	-	9/21/2005	N	c1ct	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1E	MO-25198	9	21	CAMO-05-63656	SED	FD	9/21/2005	N	c1ct	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
M-1E	MO-25200	0	21	CAMO-05-63650	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1E	MO-25201	0	24	CAMO-05-63651	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1E	MO-25202	0	27	CAMO-05-63652	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1E	MO-25203	8	30	CAMO-05-63653	SED	-	9/21/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1E	MO-25204	0	15	CAMO-05-63654	SED	-	9/21/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1E	MO-25205	0	26	CAMO-05-63655	SED	-	9/21/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-1W	MO-00011	0	33	CAMO-98-0011	SED	-	9/1/1998	N	c2	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1W	MO-00012	0	10	CAMO-98-0012	SED	-	9/1/1998	N	c1	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1W	MO-00013	0	35	CAMO-98-0013	SED	-	9/2/1998	N	c1b	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1W	MO-00013	0	35	CAMO-98-0014	SED	FD	9/2/1998	N	c1b	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1W	MO-00014	17	36	CAMO-98-0015	SED	-	9/2/1998	N	c2w	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1W	MO-00015	0	26	CAMO-98-0016	SED	-	9/2/1998	N	c1ct	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-1W	MO-22748	7	22	CAMO-04-53283	SED	-	5/17/2004	N	c1b	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-1W	MO-22749	17	38	CAMO-04-53284	SED	-	5/17/2004	N	c1ct	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1W	MO-22750	0	40	CAMO-04-53285	SED	-	5/17/2004	N	c2	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1W	MO-22751	0	13	CAMO-04-53286	SED	-	5/17/2004	N	c2	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	–	–	x	–
M-1W	MO-24789	0	15	CAMO-05-61175	SED	-	6/30/2005	N	c1	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	x	x	x	x	–	–	–	–	x	–	–	–
M-1W	MO-25176	7	17	CAMO-05-63622	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
M-1W	MO-25177	0	9	CAMO-05-63623	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
M-1W	MO-25177	9	36	CAMO-05-63624	SED	-	9/21/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
M-1W	MO-25177	9	36	CAMO-05-63634	SED	FD	9/21/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	x	–	–	–	–	–	–	–	–	–	–	–
M-1W	MO-25179	22	38	CAMO-05-63625	SED	-	9/21/2005	N	c1ct	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	–	–
M-1W	MO-25196	0	10	CAMO-05-63646	SED	-	9/21/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	x	–
M-1W	MO-25197	8	48	CAMO-05-63647	SED	-	9/21/2005	N	c2w	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	x	x	–	–	–	x	–	–	–	–	x	–
M-2E	MO-00031	0	23	CAMO-01-0025	SED	-	7/26/2001	N	f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-2E	MO-10027	0	23	CAMO-01-0035	SED	-	7/26/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10028	0	10	CAMO-01-0036	SED	-	7/26/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10029	0	26	CAMO-01-0037	SED	-	7/26/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10030	0	17	CAMO-01-0038	SED	-	7/26/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10030	17	23	CAMO-01-0039	SED	-	7/26/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10030	23	37	CAMO-01-0040	SED	-	7/26/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10032	0	30	CAMO-04-55081	SED	-	9/8/2004	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2E	MO-10032	0	30	CAMO-01-0041	SED	-	7/26/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10033	0	10	CAMO-01-0042	SED	-	7/26/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10033	10	40	CAMO-01-0043	SED	-	7/26/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10033	10	40	CAMO-01-0066	SED	FD	7/26/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10033	40	75	CAMO-01-0044	SED	-	7/26/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10034	0	12	CAMO-01-0045	SED	-	7/26/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10034	12	52	CAMO-01-0046	SED	-	7/26/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10035	0	10	CAMO-01-0047	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10035	0	10	CAMO-01-0065	SED	FD	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10036	0	20	CAMO-01-0048	SED	-	7/26/2001	N	c1b	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10037	0	10	CAMO-01-0049	SED	-	7/26/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10038	0	10	CAMO-01-0026	SED	-	7/26/2001	N	c1	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-2E	MO-10038	0	10	CAMO-01-0313	SED	-	9/7/2001	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2E	MO-10039	0	16	CAMO-01-0027	SED	-	7/26/2001	N	f1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2E	MO-10039	26	50	CAMO-01-0050	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-2E	MO-10040	0	20	CAMO-01-0051	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10040	26	47	CAMO-01-0028	SED	-	7/26/2001	N	f1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2E	MO-10040	47	61	CAMO-04-55077	SED	-	9/8/2004	N	f1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2E	MO-10040	47	61	CAMO-01-0052	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10040	67	100	CAMO-04-55078	SED	-	9/8/2004	N	f1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2E	MO-10040	67	100	CAMO-01-0053	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10041	0	22	CAMO-01-0029	SED	-	7/26/2001	N	f1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2E	MO-10041	0	22	CAMO-01-0311	SED	-	9/7/2001	N	f1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2E	MO-10041	22	44	CAMO-01-0030	SED	-	7/26/2001	N	f1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2E	MO-10041	22	44	CAMO-01-0312	SED	-	9/7/2001	N	f1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2E	MO-10041	44	56	CAMO-01-0054	SED	-	7/26/2001	N	f1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10042	0	20	CAMO-01-0031	SED	-	7/26/2001	N	c1b	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-2E	MO-10042	0	20	CAMO-01-0310	SED	-	9/7/2001	N	c1b	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2E	MO-10042	35	55	CAMO-01-0055	SED	-	7/26/2001	N	c1b	-	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10043	0	11	CAMO-01-0032	SED	-	7/26/2001	N	f1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2E	MO-10043	0	11	CAMO-01-0309	SED	-	9/7/2001	N	f1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2E	MO-10044	0	15	CAMO-01-0056	SED	-	7/26/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10044	26	46	CAMO-01-0057	SED	-	7/26/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10044	46	68	CAMO-01-0033	SED	-	7/26/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2E	MO-10044	46	68	CAMO-01-0308	SED	-	9/7/2001	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2E	MO-10044	68	109	CAMO-01-0058	SED	-	7/26/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10045	8	19	CAMO-01-0059	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10045	19	41	CAMO-04-55076	SED	-	9/8/2004	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2E	MO-10045	19	41	CAMO-01-0060	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10045	41	49	CAMO-01-0061	SED	-	7/26/2001	N	f1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10046	0	15	CAMO-01-0062	SED	-	7/26/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10047	0	18	CAMO-01-0034	SED	-	7/26/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-2E	MO-10047	0	18	CAMO-01-0307	SED	-	9/7/2001	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2E	MO-10047	18	48	CAMO-01-0063	SED	-	7/26/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-10048	0	10	CAMO-01-0064	SED	-	7/26/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2E	MO-23352	0	10	CAMO-04-55079	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-2E	MO-23353	0	10	CAMO-04-55080	SED	-	9/8/2004	N	c1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-2E	MO-23354	0	10	CAMO-04-55082	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-2E	MO-23355	0	8	CAMO-04-55083	SED	-	9/8/2004	N	c1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-2W	50-06021	0	15	AAA2513	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06021	46	76	AAA2727	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06021	91	122	AAA2738	ALLH	-	6/3/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06022	0	15	AAA2514	SED	-	6/3/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06022	46	76	AAA2731	SED	-	6/3/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06022	91	122	AAA2741	SED	-	6/3/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06023	0	15	AAA2515	ALLH	-	6/3/1993	N	fill	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
M-2W	50-06023	46	76	AAA2729	ALLH	-	6/3/1993	N	fill	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06023	91	122	AAA2734	ALLH	-	6/3/1993	N	fill	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06024	0	15	AAA2516	ALLH	-	6/3/1993	N	Qt	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06024	46	76	AAA2724	ALLH	-	6/3/1993	N	Qt	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
M-2W	50-06025	0	15	AAA2517	SED	-	6/3/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
M-2W	MO-00017	0	14	CAMO-98-0017	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00017	33	50	CAMO-04-55071	SED	-	9/8/2004	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2W	MO-00017	33	50	CAMO-98-0018	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00017	64	85	CAMO-98-0019	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00017	85	105	CAMO-98-0020	SED	-	8/31/1998	N	c3	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00018	0	10	CAMO-04-55069	SED	-	9/8/2004	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2W	MO-00018	0	10	CAMO-98-0021	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00018	10	23	CAMO-98-0022	SED	-	8/31/1998	N	c3	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00020	0	14	CAMO-98-0023	SED	-	8/31/1998	N	c1	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00021	0	18	CAMO-04-55068	SED	-	9/8/2004	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2W	MO-00021	0	18	CAMO-98-0024	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00021	32	50	CAMO-98-0025	SED	-	8/31/1998	N	c3	fine	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-00021	50	67	CAMO-98-0026	SED	-	8/31/1998	N	c3	coarse	x	–	–	x	x	–	x	–	–	x	–	x	x	–	x	x	x	–	x	–	x	x	x	–	–
M-2W	MO-10049	0	10	CAMO-01-0067	SED	-	7/30/2001	N	c1	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-2W	MO-10049	0	10	CAMO-01-0289	SED	-	9/7/2001	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10050	0	17	CAMO-01-0068	SED	-	7/30/2001	N	c1b	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-2W	MO-10050	0	17	CAMO-01-0225	SED	FD	9/7/2001	N	c1b	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10050	0	17	CAMO-01-0290	SED	-	9/7/2001	N	c1b	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10050	17	45	CAMO-01-0097	SED	-	7/30/2001	N	c1b	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10051	0	22	CAMO-01-0098	SED	-	7/30/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10051	22	52	CAMO-01-0099	SED	-	7/30/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10052	0	28	CAMO-01-0100	SED	-	7/30/2001	N	c1b	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-2W	MO-10053	0	41	CAMO-01-0101	SED	-	7/30/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10054	0	25	CAMO-01-0102	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10054	25	39	CAMO-01-0103	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10054	39	53	CAMO-01-0069	SED	-	7/30/2001	N	c3	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10054	64	76	CAMO-01-0104	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10054	76	114	CAMO-01-0105	SED	-	7/30/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10055	0	11	CAMO-01-0106	SED	-	7/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10055	11	38	CAMO-01-0070	SED	-	7/30/2001	N	f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10055	11	38	CAMO-01-0291	SED	-	9/7/2001	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10055	47	78	CAMO-01-0107	SED	-	7/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10056	0	10	CAMO-01-0108	SED	-	7/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10057	0	16	CAMO-01-0071	SED	-	7/30/2001	N	f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10057	0	16	CAMO-01-0292	SED	-	9/7/2001	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10057	25	48	CAMO-01-0109	SED	-	7/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10058	0	10	CAMO-01-0110	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10058	10	18	CAMO-01-0111	SED	-	7/30/2001	N	f1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10058	27	37	CAMO-01-0112	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10058	37	59	CAMO-01-0072	SED	-	7/30/2001	N	f1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10058	37	59	CAMO-01-0293	SED	-	9/7/2001	N	f1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10058	77	97	CAMO-01-0113	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10058	77	97	CAMO-01-0157	SED	FD	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10059	0	13	CAMO-01-0073	SED	-	7/30/2001	N	f1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10059	0	13	CAMO-01-0294	SED	-	9/7/2001	N	f1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10059	13	23	CAMO-01-0114	SED	-	7/30/2001	N	f1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10059	23	32	CAMO-01-0115	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10059	32	48	CAMO-01-0116	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10059	48	65	CAMO-01-0117	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10059	48	65	CAMO-01-0158	SED	FD	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10060	0	9	CAMO-01-0118	SED	-	7/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10061	0	26	CAMO-01-0119	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10061	33	42	CAMO-01-0120	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10061	42	60	CAMO-01-0121	SED	-	7/30/2001	N	f1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10061	60	75	CAMO-01-0122	SED	-	7/30/2001	N	f1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10062	0	13	CAMO-01-0123	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-2W	MO-10062	13	28	CAMO-01-0124	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10062	28	43	CAMO-01-0125	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10062	43	60	CAMO-01-0126	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10063	0	30	CAMO-05-61160	SED	-	6/30/2005	N	c2	-	–	–	x	–	x	–	–	–	–	x	–	–	x	–	x	x	x	–	x	x	x	x	–	–	x
M-2W	MO-10063	3	16	CAMO-04-55073	SED	-	9/8/2004	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-2W	MO-10063	3	16	CAMO-01-0127	SED	-	7/30/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10063	16	25	CAMO-01-0128	SED	-	7/30/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10063	25	40	CAMO-01-0074	SED	-	7/30/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10063	40	53	CAMO-01-0129	SED	-	7/30/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10064	0	9	CAMO-01-0130	SED	-	7/30/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10065	0	14	CAMO-01-0075	SED	-	7/30/2001	N	c1b	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10065	0	14	CAMO-01-0295	SED	-	9/7/2001	N	c1b	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10066	0	25	CAMO-01-0076	SED	-	7/30/2001	N	f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	–	x	–	–	x	x	–	–	–
M-2W	MO-10066	0	25	CAMO-01-0296	SED	-	9/7/2001	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–
M-2W	MO-10066	25	36	CAMO-01-0131	SED	-	7/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10067	0	21	CAMO-01-0132	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10067	21	44	CAMO-01-0133	SED	-	7/30/2001	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10067	44	63	CAMO-01-0134	SED	-	7/30/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10068	0	9	CAMO-01-0135	SED	-	7/30/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10068	9	29	CAMO-01-0136	SED	-	7/30/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-10069	0	5	CAMO-01-0137	SED	-	7/20/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-2W	MO-23348	0	10	CAMO-04-55070	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-2W	MO-23350	0	10	CAMO-04-55074	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-2W	MO-23351	0	9	CAMO-04-55075	SED	-	9/8/2004	N	c1b	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-2W	MO-23357	0	12	CAMO-04-55072	SED	-	9/8/2004	N	c1b	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-2W	MO-24808	0	15	CAMO-05-61167	SED	FD	6/29/2005	N	c1	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	x	–	x	x	–	–	–	–	x	–	–	–
M-2W	MO-24808	0	15	CAMO-05-61169	SED	-	6/29/2005	N	c1	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	x	x	x	x	–	–	–	–	x	–	–	–
M-3	MO-00067	0	26	CAMO-99-0060	SED	-	5/18/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00067	26	41	CAMO-99-0061	SED	-	5/18/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00068	0	12	CAMO-99-0062	SED	-	5/18/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00068	0	12	CAMO-99-0092	SED	FD	5/18/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-00068	12	33	CAMO-04-55018	SED	-	9/8/2004	N	c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–
M-3	MO-00068	12	33	CAMO-99-0063	SED	-	5/18/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00068	33	52	CAMO-99-0064	SED	-	5/18/1999	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-3	MO-00068	52	63	CAMO-99-0065	SED	-	5/18/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00069	0	16	CAMO-99-0066	SED	-	5/19/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00069	16	31	CAMO-99-0067	SED	-	5/19/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00069	31	47	CAMO-99-0050	SED	-	5/19/1999	N	c3	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-3	MO-00069	50	75	CAMO-04-55028	SED	-	9/8/2004	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00070	0	16	CAMO-99-0068	SED	-	5/19/1999	N	f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00070	24	43	CAMO-99-0051	SED	-	5/19/1999	N	f1a	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-3	MO-00070	49	64	CAMO-99-0069	SED	-	5/19/1999	N	f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00070	64	72	CAMO-04-55029	SED	-	9/8/2004	N	f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00070	72	98	CAMO-04-55030	SED	-	9/8/2004	N	f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00070	104	119	CAMO-04-55031	SED	-	9/8/2004	N	f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00070	130	160	CAMO-04-55032	SED	-	9/8/2004	N	f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00071	0	15	CAMO-99-0052	SED	-	5/19/1999	N	c1	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-3	MO-00072	0	10	CAMO-99-0070	SED	-	5/19/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00072	10	37	CAMO-99-0071	SED	-	5/19/1999	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00073	0	11	CAMO-04-55040	SED	-	9/8/2004	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-00073	0	11	CAMO-04-55046	SED	FD	9/8/2004	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-00073	15	25	CAMO-04-55041	SED	-	9/8/2004	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00073	25	68	CAMO-99-0053	SED	-	5/19/1999	N	c3	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-3	MO-00074	0	25	CAMO-99-0072	SED	-	5/19/1999	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-00075	0	34	CAMO-99-0054	SED	-	5/19/1999	N	c1b/c3	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-3	MO-10098	2	11	CAMO-01-0173	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10098	11	30	CAMO-01-0161	SED	-	8/29/2001	N	f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	–	x	–	–	x	x	–	x	–
M-3	MO-10098	30	52	CAMO-01-0174	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10099	0	9	CAMO-01-0175	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10099	9	19	CAMO-01-0176	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10100	3	12	CAMO-01-0177	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10100	12	24	CAMO-01-0178	SED	-	8/29/2001	N	f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10100	24	39	CAMO-01-0179	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10101	0	40	CAMO-01-0180	SED	-	8/29/2001	N	c1b/c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10101	40	60	CAMO-01-0181	SED	-	8/29/2001	N	c1b/c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10101	60	68	CAMO-01-0182	SED	-	8/29/2001	N	c1b/c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10101	68	80	CAMO-04-55021	SED	-	9/8/2004	N	c1b/c3	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–
M-3	MO-10101	68	80	CAMO-01-0183	SED	-	8/29/2001	N	c1b/c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-3	MO-10102	0	15	CAMO-01-0184	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10103	0	11	CAMO-01-0185	SED	-	8/29/2001	N	c1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10103	11	24	CAMO-01-0186	SED	-	8/29/2001	N	c1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10103	24	41	CAMO-01-0187	SED	-	8/29/2001	N	c1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10103	41	73	CAMO-01-0188	SED	-	8/29/2001	N	c1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10104	2	8	CAMO-01-0189	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10105	0	19	CAMO-01-0171	SED	-	8/29/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10105	0	19	CAMO-01-0221	SED	FD	8/29/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10105	26	45	CAMO-01-0172	SED	-	8/29/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10106	0	15	CAMO-01-0162	SED	-	8/29/2001	N	f1a	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	–	x	–	–	x	x	–	x	–
M-3	MO-10106	15	25	CAMO-04-55019	SED	-	9/8/2004	N	f1a	coarse	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–
M-3	MO-10106	15	25	CAMO-01-0190	SED	-	8/29/2001	N	f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10106	25	35	CAMO-04-55020	SED	-	9/8/2004	N	f1a	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–
M-3	MO-10106	25	35	CAMO-01-0191	SED	-	8/29/2001	N	f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10106	35	51	CAMO-01-0192	SED	-	8/29/2001	N	f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10107	0	6	CAMO-01-0193	SED	-	8/29/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10108	0	25	CAMO-01-0194	SED	-	8/29/2001	N	c3a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10108	0	25	CAMO-01-0222	SED	FD	8/29/2001	N	c3a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10108	25	48	CAMO-01-0195	SED	-	8/29/2001	N	c3a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10108	48	57	CAMO-01-0196	SED	-	8/29/2001	N	c3a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10108	57	82	CAMO-01-0197	SED	-	8/29/2001	N	c3a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10109	0	16	CAMO-01-0163	SED	-	8/29/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	x	x	–	–	x	x	–	x	–
M-3	MO-10110	0	26	CAMO-01-0198	SED	-	8/29/2001	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10110	26	43	CAMO-01-0164	SED	-	8/29/2001	N	c3	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	–	x	–	–	x	x	–	x	–
M-3	MO-10111	0	19	CAMO-01-0165	SED	-	8/30/2001	N	c2a	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	x	x	–	–	x	x	–	x	–
M-3	MO-10111	19	29	CAMO-01-0199	SED	-	8/30/2001	N	c2a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10111	29	46	CAMO-01-0200	SED	-	8/30/2001	N	c2a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10111	46	69	CAMO-01-0201	SED	-	8/30/2001	N	c2a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10112	0	29	CAMO-01-0202	SED	-	8/30/2001	N	c3a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10112	0	29	CAMO-01-0223	SED	FD	8/30/2001	N	c3a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10112	32	43	CAMO-01-0203	SED	-	8/30/2001	N	c3a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10112	43	62	CAMO-01-0166	SED	-	8/30/2001	N	c3a	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	x	x	–	–	x	x	–	x	–
M-3	MO-10112	67	85	CAMO-01-0204	SED	-	8/30/2001	N	c3a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10112	85	110	CAMO-01-0205	SED	-	8/30/2001	N	c3a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-3	MO-10113	0	19	CAMO-01-0167	SED	-	8/30/2001	N	f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	x	x	–	x	x	–	x	–
M-3	MO-10113	19	31	CAMO-01-0206	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10113	31	45	CAMO-01-0207	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10114	0	14	CAMO-01-0208	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10114	24	45	CAMO-04-55027	SED	-	9/8/2004	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-10115	0	17	CAMO-01-0209	SED	-	8/30/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10115	17	42	CAMO-01-0210	SED	-	8/30/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10116	0	15	CAMO-01-0168	SED	-	8/30/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	x	x	–	–	x	x	–	x	–
M-3	MO-10116	15	65	CAMO-01-0211	SED	-	8/30/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10117	0	17	CAMO-01-0212	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10117	17	32	CAMO-01-0213	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10117	32	41	CAMO-01-0214	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10117	41	60	CAMO-01-0215	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10118	0	11	CAMO-01-0216	SED	-	8/30/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10118	11	60	CAMO-01-0217	SED	-	8/30/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10119	0	25	CAMO-01-0169	SED	-	8/30/2001	N	c1	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	x	x	–	–	x	x	–	x	–
M-3	MO-10120	0	21	CAMO-01-0218	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10120	21	45	CAMO-01-0170	SED	-	8/30/2001	N	f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	–	–	x	x	–	–	x	x	–	x	–
M-3	MO-10120	45	75	CAMO-01-0219	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-10121	0	20	CAMO-01-0220	SED	-	8/30/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-23322	0	5	CAMO-04-55022	SED	-	9/8/2004	N	c1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-3	MO-23322	0	5	CAMO-04-55026	SED	FD	9/8/2004	N	c1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-23323	0	10	CAMO-04-55023	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-3	MO-23324	0	10	CAMO-04-55024	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-3	MO-23325	0	7	CAMO-04-55025	SED	-	9/8/2004	N	c1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
M-3	MO-23328	0	9	CAMO-04-55033	SED	-	9/8/2004	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-23328	9	19	CAMO-04-55034	SED	-	9/8/2004	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-23329	5	15	CAMO-04-55035	SED	-	9/8/2004	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-23329	15	22	CAMO-04-55036	SED	-	9/8/2004	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-23329	29	37	CAMO-04-55037	SED	-	9/8/2004	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-23329	37	45	CAMO-04-55038	SED	-	9/8/2004	N	c3	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-23329	65	90	CAMO-04-55039	SED	-	9/8/2004	N	c3	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-3	MO-23336	0	13	CAMO-04-55042	SED	-	9/8/2004	N	c3 swale	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-3	MO-23336	0	13	CAMO-04-55059	SED	FD	9/8/2004	N	c3 swale	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	–	x	–	–	–	–
M-3	MO-23336	13	32	CAMO-04-55043	SED	-	9/8/2004	N	c3 swale	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–
M-3	MO-23336	32	42	CAMO-04-55044	SED	-	9/8/2004	N	c3 swale	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–
M-3	MO-23336	42	53	CAMO-04-55045	SED	-	9/8/2004	N	c3 swale	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–
M-3	MO-23341	0	9	CAMO-04-55047	SED	-	9/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	x	–	–	–	–
M-3	MO-23342	0	4	CAMO-04-55048	SED	-	9/8/2004	N	c1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	x	–	–	–	–
M-3	MO-25252	0	14	CAMO-05-63824	SED	-	9/28/2005	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	x	–	–	x	–
M-3	MO-25253	0	3	CAMO-05-63825	SED	-	9/28/2005	N	c1b	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	x	–	–	x	–
M-4	05-02075	0	15	0405-95-0303	SED	-	11/15/1995	Y	c1t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02075	60	90	0405-95-0304	SED	-	11/15/1995	Y	c1t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02076	0	15	0405-95-0305	SED	-	11/15/1995	N	c1t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02076	61	91	0405-95-0306	SED	-	11/15/1995	N	c1t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02077	0	15	0405-95-0308	SED	-	11/15/1995	Y	c1t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02077	60	90	0405-95-0309	SED	-	11/15/1995	Y	c1t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02078	0	15	0405-95-0311	SED	-	11/15/1995	N	fill	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02078	61	91	0405-95-0312	SED	-	11/15/1995	N	fill	-	–	–	–	–	x	x	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02079	0	15	0405-95-0315	SED	-	11/15/1995	N	c1/c2t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02079	61	91	0405-95-0317	SED	-	11/15/1995	N	c1/c2t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02080	0	15	0405-95-0318	SED	-	11/15/1995	N	c1/c2t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02080	61	91	0405-95-0319	SED	-	11/15/1995	N	c1/c2t	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02081	0	15	0405-95-0320	SED	-	11/15/1995	N	c3b	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02081	61	91	0405-95-0321	SED	-	11/15/1995	N	c3b	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02082	0	15	0405-95-0322	SED	-	11/15/1995	Y	fill [t]	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02082	60	90	0405-95-0323	SED	-	11/15/1995	Y	fill [t]	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02083	0	15	0405-95-0324	SED	-	11/15/1995	N	c3b	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02083	61	91	0405-95-0325	SED	-	11/15/1995	N	c3b	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02084	0	15	0405-95-0326	SED	-	11/15/1995	N	c3b	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02084	61	91	0405-95-0327	SED	-	11/15/1995	N	c3b	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	05-02084	61	91	0405-95-0328	SED	FD	11/15/1995	N	c3b	-	–	–	–	–	–	–	–	–	–	x	–	x	x	–	–	–	–	–	–	–	x	–	x	–
M-4	MO-00076	0	18	CAMO-99-0073	SED	-	5/19/1999	N	c3a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00076	32	62	CAMO-01-0285	SED	-	9/7/2001	N	c3a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00077	0	35	CAMO-99-0055	SED	-	5/19/1999	Y	c1t	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-4	MO-00077	0	35	CAMO-99-0090	SED	FD	5/19/1999	Y	c1t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-4	MO-00078	0	8	CAMO-99-0056	SED	-	5/19/1999	Y	c1t	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-4	MO-00079	3	28	CAMO-99-0074	SED	-	5/19/1999	N	c1/c2t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00079	31	42	CAMO-04-55050	SED	-	9/8/2004	N	c1/c2t	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–
M-4	MO-00079	31	42	CAMO-01-0272	SED	-	9/7/2001	N	c1/c2t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00079	48	63	CAMO-99-0075	SED	-	5/19/1999	N	c1/c2t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00079	64	75	CAMO-01-0273	SED	-	9/7/2001	N	c1/c2t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00079	75	89	CAMO-04-55051	SED	-	9/8/2004	N	c1/c2t	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–
M-4	MO-00079	75	89	CAMO-99-0076	SED	-	5/19/1999	N	c1/c2t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00079	93	125	CAMO-01-0274	SED	-	9/7/2001	N	c1/c2t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00079	125	150	CAMO-99-0057	SED	-	5/19/1999	N	c1/c2t	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-4	MO-00080	0	25	CAMO-99-0058	SED	-	5/24/1999	N	c3a + f1a	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-4	MO-00080	0	30	CAMO-05-61159	SED	-	6/30/2005	N	c3a + f1a	-	–	–	x	–	x	–	–	–	–	x	–	–	x	x	x	x	x	–	x	x	x	x	–	–	x
M-4	MO-00080	33	50	CAMO-99-0077	SED	-	5/24/1999	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00080	65	105	CAMO-01-0265	SED	-	9/7/2001	N	c3a + f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00081	6	26	CAMO-99-0078	SED	-	5/24/1999	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00081	30	60	CAMO-01-0261	SED	-	9/6/2001	N	c3a + f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00082	10	29	CAMO-99-0079	SED	-	5/24/1999	N	c3 + f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00082	29	54	CAMO-99-0080	SED	-	5/24/1999	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00082	59	69	CAMO-01-0259	SED	-	9/6/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00082	70	90	CAMO-04-55052	SED	-	9/8/2004	N	c3 + f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00083	0	15	CAMO-99-0081	SED	-	5/24/1999	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00083	15	32	CAMO-99-0082	SED	-	5/24/1999	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00083	32	54	CAMO-01-0258	SED	-	9/6/2001	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00083	54	74	CAMO-04-55054	SED	-	9/8/2004	N	c3a + f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00083	74	93	CAMO-04-55055	SED	-	9/8/2004	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00084	0	11	CAMO-99-0083	SED	-	5/24/1999	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00084	11	31	CAMO-01-0255	SED	-	9/6/2001	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00084	31	41	CAMO-04-55056	SED	-	9/8/2004	N	c3a + f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00084	41	53	CAMO-04-55057	SED	-	9/8/2004	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00085	0	24	CAMO-99-0059	SED	-	5/24/1999	N	c3 + f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
M-4	MO-00085	24	45	CAMO-01-0249	SED	-	9/6/2001	N	c3 + f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00086	0	10	CAMO-99-0084	SED	-	5/24/1999	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-00086	15	30	CAMO-01-0243	SED	-	9/6/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10122	0	7	CAMO-01-0236	SED	-	9/6/2001	N	c1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10122	13	35	CAMO-01-0237	SED	-	9/6/2001	N	c1g	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-4	MO-10123	0	14	CAMO-01-0238	SED	-	9/6/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10124	0	33	CAMO-01-0239	SED	-	9/6/2001	N	c1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10124	0	33	CAMO-01-0286	SED	FD	9/6/2001	N	c1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-4	MO-10125	0	14	CAMO-01-0240	SED	-	9/6/2001	N	c3 + f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10126	0	20	CAMO-01-0241	SED	-	9/6/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10127	0	7	CAMO-01-0242	SED	-	9/6/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10128	0	8	CAMO-01-0244	SED	-	9/6/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10129	0	10	CAMO-01-0245	SED	-	9/6/2001	N	c1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10129	10	26	CAMO-01-0226	SED	-	9/6/2001	N	c1g	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	x	–
M-4	MO-10129	26	41	CAMO-04-55058	SED	-	9/8/2004	N	c1g	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
M-4	MO-10129	26	41	CAMO-01-0246	SED	-	9/6/2001	N	c1g	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10130	0	7	CAMO-01-0247	SED	-	9/6/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10131	0	14	CAMO-01-0248	SED	-	9/6/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10132	0	13	CAMO-01-0250	SED	-	9/6/2001	N	c2a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10133	0	15	CAMO-01-0251	SED	-	9/6/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10134	0	19	CAMO-01-0252	SED	-	9/6/2001	N	f2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10135	0	18	CAMO-01-0227	SED	-	9/6/2001	N	c3 + f1	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	x	–
M-4	MO-10136	0	10	CAMO-01-0253	SED	-	9/6/2001	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10137	0	9	CAMO-01-0254	SED	-	9/6/2001	N	f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10138	0	15	CAMO-01-0256	SED	-	9/6/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10138	0	15	CAMO-01-0287	SED	FD	9/6/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-4	MO-10139	0	21	CAMO-01-0228	SED	-	9/6/2001	N	c3 + f1	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	x	–
M-4	MO-10139	25	34	CAMO-01-0257	SED	-	9/6/2001	N	c3 + f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10139	40	70	CAMO-04-55053	SED	-	9/8/2004	N	c3 + f1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10140	0	24	CAMO-01-0229	SED	-	9/6/2001	N	c3 + f1	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	x	–
M-4	MO-10141	0	15	CAMO-01-0260	SED	-	9/6/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10142	0	17	CAMO-01-0230	SED	-	9/7/2001	N	c3a + f1a	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	x	x	–	–	–	x	x	–	x	–
M-4	MO-10143	0	27	CAMO-01-0262	SED	-	9/7/2001	N	c3a + f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10143	27	50	CAMO-01-0263	SED	-	9/7/2001	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10143	50	75	CAMO-01-0264	SED	-	9/7/2001	N	c3a + f1a	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10144	0	7	CAMO-01-0266	SED	-	9/7/2001	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10145	15	40	CAMO-01-0267	SED	-	9/7/2001	N	c1t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10146	3	10	CAMO-01-0268	SED	-	9/7/2001	N	c1t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10146	15	35	CAMO-01-0269	SED	-	9/7/2001	N	c1t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-4	MO-10147	0	29	CAMO-01-0270	SED	-	9/7/2001	N	c1t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10148	0	7	CAMO-01-0271	SED	-	9/7/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10149	3	14	CAMO-01-0275	SED	-	9/7/2001	N	c2/c2t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10149	30	90	CAMO-01-0276	SED	-	9/7/2001	N	c2/c2t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10150	0	15	CAMO-01-0277	SED	-	9/7/2001	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10150	0	15	CAMO-01-0288	SED	FD	9/7/2001	N	c3a + f1a	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
M-4	MO-10150	21	42	CAMO-04-55049	SED	-	9/8/2004	N	c3a + f1a	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–
M-4	MO-10150	21	42	CAMO-01-0231	SED	-	9/7/2001	N	c3a + f1a	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	x	x	–	–	–	x	x	–	x	–
M-4	MO-10151	0	26	CAMO-01-0232	SED	-	9/7/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	x	x	–	–	–	x	x	–	x	–
M-4	MO-10152	0	22	CAMO-01-0233	SED	-	9/7/2001	N	c2	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	x	x	–	–	–	x	x	–	x	–
M-4	MO-10152	32	41	CAMO-01-0278	SED	-	9/7/2001	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10152	47	77	CAMO-01-0279	SED	-	9/7/2001	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10153	0	13	CAMO-01-0234	SED	-	9/7/2001	N	c1t	fine	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	x	x	–	–	–	x	x	–	x	–
M-4	MO-10154	0	22	CAMO-01-0235	SED	-	9/7/2001	N	c1t	coarse	–	–	x	–	x	–	x	–	–	x	x	x	x	–	x	x	x	–	–	–	x	x	–	x	–
M-4	MO-10155	0	12	CAMO-01-0280	SED	-	9/7/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10156	0	11	CAMO-01-0281	SED	-	9/7/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10157	4	11	CAMO-01-0282	SED	-	9/7/2001	N	c1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10157	12	42	CAMO-01-0283	SED	-	9/7/2001	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-10158	0	11	CAMO-01-0284	SED	-	9/7/2001	N	c3 + f1	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	x	–	–	–	–
M-4	MO-22710	0	105	CAMO-04-53202	SED	-	4/19/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22711	0	260	CAMO-04-53203	SED	-	4/19/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22712	0	360	CAMO-04-53204	SED	-	4/19/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22713	0	280	CAMO-04-53205	SED	-	4/19/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22714	0	325	CAMO-04-53206	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22715	0	110	CAMO-04-53207	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22715	0	110	CAMO-04-53231	SED	FD	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22716	0	135	CAMO-04-53208	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22717	0	195	CAMO-04-53209	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22718	0	190	CAMO-04-53210	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22719	0	170	CAMO-04-53211	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22720	0	180	CAMO-04-53212	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22721	0	170	CAMO-04-53213	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22722	0	180	CAMO-04-53214	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22722	0	180	CAMO-04-53232	SED	FD	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-4	MO-22723	0	105	CAMO-04-53215	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22724	0	95	CAMO-04-53216	SED	-	4/22/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22725	0	100	CAMO-04-53217	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22726	0	170	CAMO-04-53218	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22727	0	215	CAMO-04-53219	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22728	0	230	CAMO-04-53220	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22728	0	230	CAMO-04-53233	SED	FD	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22729	0	255	CAMO-04-53221	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22730	0	240	CAMO-04-53222	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22731	0	185	CAMO-04-53223	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22732	0	135	CAMO-04-53224	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22733	0	190	CAMO-04-53225	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22734	0	225	CAMO-04-53226	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-22735	0	250	CAMO-04-53227	SED	-	4/26/2004	N	fill	-	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
M-4	MO-25254	1	14	CAMO-05-63826	SED	-	9/28/2005	N	c1t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
M-4	MO-25254	1	14	CAMO-05-63834	SED	FD	9/28/2005	N	c1t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	x	–	–	x	–
M-4	MO-25255	0	6	CAMO-05-63827	SED	-	9/28/2005	N	c1t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
M-4	MO-25256	0	5	CAMO-05-63828	SED	-	9/28/2005	N	c1t	coarse	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
M-4	MO-25257	0	14	CAMO-05-63829	SED	-	9/28/2005	N	c1t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
M-4	MO-25258	0	10	CAMO-05-63830	SED	-	9/28/2005	N	c1t	fine	–	–	–	–	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
M-5E	MO-00087	0	11	CAMO-00-0030	SED	-	7/7/2000	N	c1	fine	x	–	–	x	x	–	–	–	–	x	–	x	x	–	–	x	x	–	–	–	–	x	–	–	–
M-5E	MO-00087	0	11	CAMO-01-0017	SED	-	5/29/2001	N	c1	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-5E	MO-00088	5	18	CAMO-00-0031	SED	-	7/7/2000	N	c2	fine	x	–	–	x	x	–	–	–	–	x	–	x	x	–	–	x	x	–	–	–	–	x	–	–	–
M-5E	MO-00088	5	18	CAMO-01-0018	SED	-	5/29/2001	N	c2	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-5E	MO-00089	0	25	CAMO-00-0032	SED	-	7/7/2000	N	c2	fine	x	–	–	x	x	–	–	–	–	x	–	x	x	–	–	x	x	–	–	–	–	x	–	–	–
M-5E	MO-00089	0	25	CAMO-01-0019	SED	-	5/29/2001	N	c2	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-5E	MO-00089	0	25	CAMO-01-0020	SED	FD	5/29/2001	N	c2	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	–	–	–	–	–	–	x	–	–	–	–
M-5E	MO-00090	0	12	CAMO-00-0033	SED	-	7/7/2000	N	c2	fine	x	–	–	x	x	–	–	–	–	x	–	x	x	–	–	x	x	–	–	–	–	x	–	–	–
M-5E	MO-00090	0	12	CAMO-01-0021	SED	-	5/29/2001	N	c2	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-5E	MO-00090	12	37	CAMO-00-0034	SED	-	7/7/2000	N	c2	fine	x	–	–	x	x	–	–	–	–	x	–	x	x	–	–	x	x	–	–	–	–	x	–	–	–
M-5E	MO-00090	12	37	CAMO-01-0022	SED	-	5/29/2001	N	c2	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-5E	MO-00091	12	26	CAMO-00-0035	SED	-	7/7/2000	N	c1	fine	x	–	–	x	x	–	–	–	–	x	–	x	x	–	–	x	x	–	–	–	–	x	–	–	–
M-5E	MO-00091	12	26	CAMO-01-0023	SED	-	5/29/2001	N	c1	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-5E	MO-00092	0	12	CAMO-00-0036	SED	-	7/7/2000	N	c2	fine	x	–	–	x	x	–	–	–	–	x	–	x	x	–	–	x	x	–	–	–	–	x	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-5E	MO-00092	0	12	CAMO-01-0024	SED	-	5/29/2001	N	c2	fine	–	–	–	–	–	–	x	–	–	–	x	–	–	–	x	–	–	–	–	–	x	–	–	–	–
M-5E	MO-10009	0	18	CAMO-01-0001	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-5E	MO-10009	0	18	CAMO-04-53315	SED	-	5/18/2004	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-10009	0	18	CAMO-04-53317	SED	FD	5/18/2004	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-10009	18	31	CAMO-01-0002	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-5E	MO-10009	18	31	CAMO-04-53316	SED	-	5/18/2004	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-10010	0	10	CAMO-01-0003	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-5E	MO-10010	0	10	CAMO-04-53314	SED	-	5/18/2004	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-10011	1	11	CAMO-01-0004	SED	-	5/29/2001	N	c1	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-5E	MO-10011	1	11	CAMO-04-53313	SED	-	5/18/2004	N	c1	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-10012	0	12	CAMO-04-53312	SED	-	5/18/2004	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-10012	0	12	CAMO-01-0005	SED	-	5/29/2001	N	c1	coarse	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
M-5E	MO-10013	0	29	CAMO-04-53311	SED	-	5/18/2004	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-10013	0	29	CAMO-01-0006	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	x	x	x	–	–	x	x	–	–	–
M-5E	MO-22787	0	13	CAMO-04-53322	SED	-	5/18/2004	N	c2	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-5E	MO-22787	0	13	CAMO-04-53334	SED	FD	5/18/2004	N	c2	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
M-5E	MO-22788	0	24	CAMO-04-53323	SED	-	6/8/2004	N	c2	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-5E	MO-22789	0	29	CAMO-04-53324	SED	-	6/8/2004	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-5E	MO-22790	0	30	CAMO-04-53325	SED	-	6/8/2004	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	x	–
M-5E	MO-22791	0	11	CAMO-04-53326	SED	-	5/18/2004	N	c1	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	x	–
M-5E	MO-22792	0	25	CAMO-04-53327	SED	-	5/18/2004	N	c2	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	x	–
M-5E	MO-22793	5	25	CAMO-04-53328	SED	-	6/8/2004	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-5E	MO-22794	0	14	CAMO-04-53329	SED	-	6/8/2004	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	–
M-5E	MO-22795	0	18	CAMO-04-53330	SED	-	5/18/2004	N	c2	coarse	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–
M-5E	MO-22796	3	31	CAMO-04-53331	SED	-	5/18/2004	N	f2	fine	–	–	–	–	x	–	–	–	–	x	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–
M-5W	MO-22760	6	25	CAMO-04-53295	SED	-	5/18/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	x	–	–
M-5W	MO-22761	11	26	CAMO-04-53296	SED	-	5/18/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	x	–	–
M-5W	MO-22762	3	29	CAMO-04-53297	SED	-	5/18/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	x	–	–
M-5W	MO-22763	6	37	CAMO-04-53298	SED	-	5/18/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	x	–	–
M-5W	MO-22763	6	37	CAMO-04-53333	SED	FD	5/18/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	–	–	x	x	–	x	x	–	–	–	x	–	–	x	–
M-5W	MO-22764	3	12	CAMO-04-53299	SED	-	5/18/2004	N	c1	fine	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	–	x	–
M-5W	MO-22765	5	22	CAMO-04-53300	SED	-	5/18/2004	N	c1	fine	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	–	x	–
M-5W	MO-22766	0	35	CAMO-04-53301	SED	-	5/18/2004	N	c2	coarse	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	–	x	–
M-5W	MO-22767	2	45	CAMO-04-53302	SED	-	5/18/2004	N	c1	coarse	–	–	–	x	x	–	x	–	–	x	–	–	x	x	x	x	x	–	x	–	x	–	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
M-6	MO-03-21415	0	25	CAMO-03-49810	SED	-	12/4/2002	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21415	0	25	CAMO-03-49858	SED	FD	12/4/2002	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21415	0	25	CAMO-05-63567	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21415	0	25	CAMO-05-63610	SED	FD	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21415	25	46	CAMO-03-49811	SED	-	12/4/2002	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21415	25	46	CAMO-05-63568	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21417	0	23	CAMO-03-49812	SED	-	12/4/2002	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21417	0	23	CAMO-05-63569	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21418	0	24	CAMO-03-49813	SED	-	12/4/2002	N	c2	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21418	0	24	CAMO-05-63570	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21419	0	15	CAMO-03-49814	SED	-	12/4/2002	N	c1	coarse	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21419	0	15	CAMO-05-63571	SED	-	9/20/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21420	5	32	CAMO-03-49815	SED	-	12/4/2002	N	c2	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21420	5	32	CAMO-05-63572	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21420	44	60	CAMO-03-49816	SED	-	12/4/2002	N	c2	coarse	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21420	44	60	CAMO-05-63573	SED	-	9/20/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21422	0	32	CAMO-03-49817	SED	-	12/4/2002	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21422	0	32	CAMO-05-63574	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-03-21422	32	51	CAMO-03-49818	SED	-	12/4/2002	N	f1	fine	–	–	–	x	x	–	–	–	–	x	–	x	x	–	x	–	–	–	–	–	x	x	–	–	–
M-6	MO-03-21422	32	51	CAMO-05-63575	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
M-6	MO-22783	8	46	CAMO-04-53318	SED	-	6/8/2004	N	c1	coarse	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-6	MO-22784	0	18	CAMO-04-53319	SED	-	6/8/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-6	MO-22785	0	21	CAMO-04-53320	SED	-	6/8/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
M-6	MO-22786	0	23	CAMO-04-53321	SED	-	6/8/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	–	–	–	–	–
MCW-1	MO-03-21425	0	13	CAMO-03-49820	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21425	0	13	CAMO-05-63576	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-1	MO-03-21425	18	28	CAMO-03-49821	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21425	18	28	CAMO-05-63577	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-1	MO-03-21427	6	24	CAMO-03-49822	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21427	6	24	CAMO-05-63578	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-1	MO-03-21427	24	44	CAMO-03-49823	SED	-	12/4/2002	N	c2	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21427	24	44	CAMO-05-63579	SED	-	9/20/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-1	MO-03-21429	3	20	CAMO-03-49824	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21429	3	20	CAMO-05-63580	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
MCW-1	MO-03-21430	0	9	CAMO-03-49825	SED	-	12/4/2002	N	c1b	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21430	0	9	CAMO-05-63581	SED	-	9/20/2005	N	c1b	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-1	MO-03-21430	0	9	CAMO-05-63611	SED	FD	9/20/2005	N	c1b	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-1	MO-03-21430	13	17	CAMO-03-49826	SED	-	12/4/2002	N	c1b	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21430	13	17	CAMO-05-63582	SED	-	9/20/2005	N	c1b	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-1	MO-03-21432	0	15	CAMO-03-49827	SED	-	12/4/2002	N	c1	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-1	MO-03-21432	0	15	CAMO-05-63583	SED	-	9/20/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2E	MO-03-21454	0	8	CAMO-03-49849	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2E	MO-03-21454	0	8	CAMO-05-63601	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2E	MO-03-21454	8	30	CAMO-03-49850	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2E	MO-03-21454	8	30	CAMO-05-63602	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2E	MO-03-21456	6	18	CAMO-03-49851	SED	-	12/4/2002	N	f1	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2E	MO-03-21456	6	18	CAMO-05-63603	SED	-	9/20/2005	N	f1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2E	MO-03-21457	3	13	CAMO-03-49852	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2E	MO-03-21457	3	13	CAMO-05-63604	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2E	MO-03-21458	1	15	CAMO-03-49853	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2E	MO-03-21458	1	15	CAMO-05-63605	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2E	MO-03-21459	2	16	CAMO-03-49854	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2E	MO-03-21459	2	16	CAMO-05-63606	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2E	MO-03-21460	2	21	CAMO-03-49855	SED	-	12/4/2002	N	c1	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2E	MO-03-21460	2	21	CAMO-05-63607	SED	-	9/20/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21435	7	16	CAMO-03-49830	SED	-	12/4/2002	N	c1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21435	7	16	CAMO-05-63592	SED	-	9/20/2005	N	c1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21436	0	16	CAMO-03-49831	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21436	0	16	CAMO-05-63593	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21436	16	41	CAMO-03-49832	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21436	16	41	CAMO-05-63594	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21436	0	16	CAMO-05-63613	SED	FD	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21438	0	20	CAMO-03-49833	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21438	0	20	CAMO-05-63595	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21438	20	38	CAMO-03-49834	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21438	20	38	CAMO-05-63596	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21440	3	25	CAMO-03-49835	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21440	3	25	CAMO-05-63597	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
MCW-2N	MO-03-21441	0	23	CAMO-03-49836	SED	-	12/4/2002	N	c1	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21441	0	23	CAMO-05-63598	SED	-	9/20/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21442	0	12	CAMO-03-49837	SED	-	12/4/2002	N	c2	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21442	0	12	CAMO-05-63599	SED	-	9/20/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2N	MO-03-21442	12	26	CAMO-03-49838	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2N	MO-03-21442	12	26	CAMO-05-63600	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21445	0	15	CAMO-03-49840	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21445	0	15	CAMO-05-63584	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21445	15	40	CAMO-03-49841	SED	-	12/4/2002	N	c2	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21445	15	40	CAMO-05-63585	SED	-	9/20/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21447	1	18	CAMO-03-49842	SED	-	12/4/2002	N	c2	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21447	1	18	CAMO-05-63586	SED	-	9/20/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21448	1	6	CAMO-03-49843	SED	-	12/4/2002	N	c2	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21448	1	6	CAMO-05-63587	SED	-	9/20/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21449	1	6	CAMO-03-49844	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21449	1	6	CAMO-05-63588	SED	-	9/20/2005	N	f1	fine	–	–	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21449	10	20	CAMO-03-49845	SED	-	12/4/2002	N	f1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21449	10	20	CAMO-05-63589	SED	-	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21449	10	20	CAMO-05-63612	SED	FD	9/20/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21451	0	9	CAMO-03-49846	SED	-	12/4/2002	N	c1	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21451	0	9	CAMO-03-49859	SED	FD	12/4/2002	N	c1	coarse	–	–	–	x	–	–	–	–	x	x	x	x	x	–	–	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21451	0	9	CAMO-05-63590	SED	-	9/20/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-03-21451	10	16	CAMO-03-49847	SED	-	12/4/2002	N	c1	fine	–	–	–	x	–	–	–	–	x	x	x	x	x	–	x	–	–	–	–	–	–	x	–	–	–
MCW-2W	MO-03-21451	10	16	CAMO-05-63591	SED	-	9/20/2005	N	c1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
MCW-2W	MO-25174	2	8	CAMO-05-63608	SED	-	9/20/2005	N	f1	fine	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
MCW-2W	MO-25175	6	15	CAMO-05-63609	SED	-	9/20/2005	N	f1	fine	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-1C	50-06520	0	15	AAA2539	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06520	0	30	CAMO-05-61156	SED	-	6/30/2005	N	c2	-	–	–	x	–	x	–	–	–	–	x	–	–	x	x	x	x	x	–	x	x	x	x	–	–	x
TS-1C	50-06520	46	76	AAA2710	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06520	91	122	AAA2713	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06521	0	15	AAA2540	SED	-	5/27/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06522	0	15	AAA2637	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06522	46	76	AAA2707	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06522	91	122	AAA2712	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-1C	50-06523	0	15	AAA2638	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06523	0	15	AAA2680	SED	FD	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06524	0	15	AAA2639	SED	-	5/26/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06525	0	15	AAA2640	ALLH	-	5/26/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06526	0	15	AAA2641	ALLH	-	5/26/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06527	0	15	AAA2642	SED	-	5/26/1993	N	c1b	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06528	0	15	AAA2643	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06528	46	76	AAA2682	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06528	91	122	AAA2685	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06529	0	15	AAA2644	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06529	46	76	AAA2683	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06529	91	122	AAA2684	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06530	0	15	AAA2645	SED	-	5/26/1993	N	c1b	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06531	0	15	AAA2646	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06531	46	76	AAA2705	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06531	91	122	AAA2706	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06532	0	15	AAA2647	SED	-	5/26/1993	N	c2?	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06533	0	15	AAA2648	SED	-	5/26/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06533	46	76	AAA2681	SED	-	5/26/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06533	91	122	AAA2686	SED	-	5/26/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06534	0	15	AAA2649	SED	-	5/26/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06535	0	15	AAA2650	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06535	46	76	AAA2659	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06535	91	122	AAA2660	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06536	0	15	AAA2651	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06536	46	76	AAA2661	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06536	91	122	AAA2662	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06537	0	15	AAA2652	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06537	46	76	AAA2663	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06537	91	122	AAA2664	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06538	0	15	AAA2653	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06538	46	76	AAA2665	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06538	91	122	AAA2666	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06539	0	15	AAA2654	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-1C	50-06539	46	76	AAA2667	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06539	91	122	AAA2668	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06540	0	15	AAA2655	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06540	0	15	AAA2677	SED	FD	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06540	46	76	AAA2669	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06540	46	76	AAA2678	SED	FD	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06540	91	122	AAA2670	SED	-	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06540	91	122	AAA2679	SED	FD	5/24/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06541	0	15	AAA2656	SED	-	5/24/1993	N	f1 + Qf	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06541	46	76	AAA2671	SED	-	5/24/1993	N	f1 + Qf	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06541	91	122	AAA2672	SED	-	5/24/1993	N	f1 + Qf	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06542	0	15	AAA2657	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06542	46	76	AAA2673	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1C	50-06542	91	122	AAA2674	SED	-	5/24/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06543	0	15	AAA2658	ALLH	-	5/24/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06543	46	76	AAA2675	ALLH	-	5/24/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06543	91	122	AAA2676	ALLH	-	5/24/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	–	–
TS-1C	50-06564	0	15	AAA3204	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1C	MO-00065	0	23	CAMO-99-0046	SED	-	5/18/1999	N	f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1C	MO-00065	38	49	CAMO-99-0047	SED	-	5/18/1999	N	f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1C	MO-00065	64	95	CAMO-99-0048	SED	-	5/18/1999	N	f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1C	MO-00066	0	10	CAMO-99-0049	SED	-	5/18/1999	N	c1	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1C	MO-22826	0	34	CAMO-04-53373	SED	-	6/22/2004	N	c2	coarse	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1C	MO-22826	0	34	CAMO-05-63743	SED	-	9/19/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-1C	MO-22826	53	72	CAMO-04-53374	SED	-	6/22/2004	N	c2	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	–	x	x	x	–	x	–	–	x	–	x	–
TS-1C	MO-22828	13	37	CAMO-04-53375	SED	-	6/22/2004	N	c1	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1C	MO-22829	0	18	CAMO-05-63740	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1C	MO-22829	0	18	CAMO-05-63741	SED	FD	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	x	–	x	x	–	x	–	–	–	–	–	–	–	–	–
TS-1C	MO-22829	18	30	CAMO-04-53376	SED	-	6/22/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1C	MO-22829	18	30	CAMO-05-63744	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-1C	MO-22829	37	60	CAMO-04-53377	SED	-	6/22/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1C	MO-22829	37	60	CAMO-04-53397	SED	FD	6/22/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	–	x	x	–	–	–	–	x	–	x	–
TS-1C	MO-22829	60	72	CAMO-04-53378	SED	-	6/22/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1C	MO-24792	0	15	CAMO-05-61177	SED	-	6/30/2005	N	c1	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	x	x	x	x	–	–	–	–	x	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-1C	MO-25218	0	22	CAMO-05-63733	SED	-	9/19/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1C	MO-25219	0	22	CAMO-05-63734	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1C	MO-25220	0	16	CAMO-05-63735	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1C	MO-25220	22	36	CAMO-05-63736	SED	-	9/19/2005	N	f1	coarse	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1C	MO-25222	22	42	CAMO-05-63737	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1C	MO-25222	42	61	CAMO-05-63738	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1C	MO-25224	0	15	CAMO-05-63739	SED	-	9/19/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	x	x	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1E	MO-00053	0	15	CAMO-99-0030	SED	-	5/17/1999	N	c2	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1E	MO-00053	15	31	CAMO-99-0031	SED	-	5/17/1999	N	c2	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1E	MO-00054	0	13	CAMO-99-0032	SED	-	5/17/1999	N	f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1E	MO-00055	0	25	CAMO-99-0033	SED	-	5/17/1999	N	c1w	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-1E	MO-22832	0	15	CAMO-04-53379	SED	-	6/22/2004	N	c1w	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1E	MO-22832	22	67	CAMO-05-63730	SED	-	9/19/2005	N	c1w	coarse	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1E	MO-22833	0	22	CAMO-04-53380	SED	-	6/22/2004	N	c2	coarse	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1E	MO-22833	22	42	CAMO-04-53381	SED	-	6/22/2004	N	c2	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1E	MO-22835	6	16	CAMO-04-53382	SED	-	6/22/2004	N	f1	fine	–	–	–	x	–	–	–	–	–	x	x	–	x	x	x	x	x	–	x	–	–	x	–	x	–
TS-1E	MO-24794	0	15	CAMO-05-61179	SED	-	6/30/2005	N	c1	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	x	x	x	x	–	–	–	–	x	–	–	–
TS-1E	MO-25212	0	20	CAMO-05-63725	SED	-	9/19/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1E	MO-25213	3	15	CAMO-05-63726	SED	-	9/19/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1E	MO-25214	0	15	CAMO-05-63727	SED	-	9/19/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1E	MO-25214	15	36	CAMO-05-63728	SED	-	9/19/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1E	MO-25216	20	60	CAMO-05-63729	SED	-	9/19/2005	N	c1w	coarse	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1E	MO-25216	20	60	CAMO-05-63731	SED	FD	9/19/2005	N	c1w	coarse	–	–	–	–	–	–	–	–	–	x	–	–	x	x	–	x	–	–	–	–	–	–	–	–	–
TS-1E	MO-25226	0	16	CAMO-05-63745	SED	-	9/19/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	x	–
TS-1E	MO-25227	0	15	CAMO-05-63746	SED	-	9/19/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	x	–
TS-1W	50-06505	0	15	AAA2524	ALLH	-	6/1/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06506	0	15	AAA2525	ALLH	-	6/1/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06506	46	76	AAA2716	ALLH	-	6/1/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06506	91	122	AAA2722	ALLH	-	6/1/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06507	0	15	AAA2526	ALLH	-	6/1/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06507	0	15	AAA2687	ALLH	FD	6/1/1993	N	f1	-	–	–	–	–	–	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06507	46	76	AAA2717	ALLH	-	6/1/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06507	46	76	AAA2718	ALLH	FD	6/1/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	–	–
TS-1W	50-06508	0	15	AAA2527	SED	-	6/1/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-1W	50-06508	46	76	AAA2688	SED	-	6/1/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
TS-1W	50-06508	91	122	AAA2723	SED	-	6/1/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
TS-1W	50-06509	0	15	AAA2528	SED	-	6/1/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
TS-1W	50-06510	0	15	AAA2529	SED	-	6/1/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	x	–	–	–
TS-1W	50-06511	0	15	AAA2530	SED	-	5/27/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06511	46	76	AAA2709	ALLH	-	5/27/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06512	46	76	AAA3227	SED	-	7/15/1993	Y	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06512	91	122	AAA3222	SED	-	7/15/1993	Y	c1	-	x	–	–	–	–	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06513	0	15	AAA2532	ALLH	-	5/27/1993	N	Qc	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06514	46	76	AAA3240	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06514	91	122	AAA3241	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06515	0	15	AAA2534	SED	-	5/27/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06516	0	15	AAA2535	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06517	0	15	AAA2536	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06517	91	122	AAA2711	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06518	0	15	AAA2537	SED	-	5/27/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06518	46	76	AAA2708	SED	-	5/27/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06518	91	122	AAA2714	SED	-	5/27/1993	N	c1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06519	0	15	AAA2538	SED	-	5/27/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	x	–	–	–	–	–	–	–	x	x	–	x	–
TS-1W	50-06550	0	15	AAA3229	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06551	0	15	AAA3228	SED	-	6/30/1993	N	c2	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06551	46	76	AAA3218	SED	-	6/30/1993	N	c2	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06551	91	122	AAA3212	SED	-	6/30/1993	N	c2	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06552	0	15	AAA3219	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06552	91	122	AAA3216	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06553	0	15	AAA3215	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06554	0	15	AAA3205	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06554	46	76	AAA3210	SED	-	6/30/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06554	91	122	AAA3209	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06555	0	15	AAA3203	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06556	0	15	AAA3213	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06556	46	76	AAA3217	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06557	0	15	AAA3223	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06557	46	76	AAA3224	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-1W	50-06557	91	122	AAA3208	SED	-	6/30/1993	N	f1	-	–	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06558	0	15	AAA3225	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06558	46	76	AAA3201	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06558	91	122	AAA3202	SED	-	6/30/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	–	x	–	x	–
TS-1W	50-06559	0	15	AAA3211	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06560	0	15	AAA3206	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06561	0	15	AAA3207	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06562	0	15	AAA3214	ALLH	-	6/30/1993	N	Qc	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06563	0	15	AAA3200	SED	-	6/30/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	x	–	–	–	–	x	x	–	x	–
TS-1W	50-06565	0	15	AAA3221	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06565	46	76	AAA3220	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06565	91	122	AAA3226	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06566	0	15	AAA3230	SED	-	7/15/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06566	46	76	AAA3231	SED	-	7/15/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06566	91	122	AAA3232	SED	-	7/15/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06567	0	15	AAA3233	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06567	46	76	AAA3234	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06567	91	122	AAA3235	SED	-	7/15/1993	N	f1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06568	0	15	AAA3236	SED	-	7/15/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06568	46	76	AAA3237	SED	-	7/15/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	50-06568	91	122	AAA3238	SED	-	7/15/1993	N	c1	-	x	–	–	–	x	–	x	–	–	x	–	x	–	–	–	–	–	–	–	–	x	–	–	–	–
TS-1W	MO-22818	0	32	CAMO-04-53365	SED	-	6/22/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22819	4	17	CAMO-04-53366	SED	-	6/22/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22820	0	25	CAMO-04-53367	SED	-	6/22/2004	N	c1	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22821	4	20	CAMO-04-53368	SED	-	6/22/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22822	0	11	CAMO-04-53369	SED	-	6/22/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22822	11	24	CAMO-05-63720	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1W	MO-22823	0	25	CAMO-04-53370	SED	-	6/22/2004	N	c1	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22823	25	55	CAMO-04-53371	SED	-	6/22/2004	N	c1	coarse	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22825	0	8	CAMO-05-63723	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1W	MO-22825	8	40	CAMO-04-53372	SED	-	6/22/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-1W	MO-22825	8	40	CAMO-04-53396	SED	FD	6/22/2004	N	f1	fine	–	–	–	x	x	–	x	–	–	x	x	x	x	x	–	x	x	–	–	–	x	x	–	x	–
TS-1W	MO-25206	0	16	CAMO-05-63719	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1W	MO-25208	0	18	CAMO-05-63721	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-1W	MO-25209	0	12	CAMO-05-63722	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-1W	MO-25211	0	10	CAMO-05-63724	SED	-	9/19/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	x	–	–	x	x	x	x	–	–	x	–	–	–	–	–	–
TS-2C	35-02236	0	15	0435-95-0108	SED	-	4/24/1995	N	c1b	-	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-2C	MO-00059	0	5	CAMO-99-0038	SED	-	5/18/1999	N	c1	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2C	MO-00060	0	35	CAMO-99-0039	SED	-	5/18/1999	N	c2	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2C	MO-00060	66	85	CAMO-99-0040	SED	-	5/18/1999	N	c2	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2C	MO-00061	0	13	CAMO-99-0041	SED	-	5/18/1999	N	f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2C	MO-22840	0	30	CAMO-05-61162	SED	-	6/30/2005	N	c2	-	–	–	x	–	x	–	–	–	–	x	–	–	x	–	x	x	x	–	x	x	x	x	–	–	x
TS-2C	MO-22840	8	40	CAMO-04-53387	SED	-	6/22/2004	N	c2	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2C	MO-22841	0	23	CAMO-04-53388	SED	-	6/22/2004	N	c1b	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2C	MO-22841	0	23	CAMO-04-53398	SED	FD	6/22/2004	N	c1b	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	–	x	x	–	–	–	x	x	–	x	–
TS-2C	MO-22841	31	40	CAMO-04-53389	SED	-	6/22/2004	N	c1b	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2C	MO-22841	46	62	CAMO-04-53390	SED	-	6/22/2004	N	c1b	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2C	MO-24795	0	15	CAMO-05-61165	SED	-	6/30/2005	N	c1b	coarse	–	x	x	–	–	–	–	–	–	–	–	–	x	x	x	x	x	–	–	–	–	x	–	–	–
TS-2C	MO-25230	0	17	CAMO-05-63765	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2C	MO-25230	17	38	CAMO-05-63749	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-2C	MO-25231	3	17	CAMO-05-63750	SED	-	9/19/2005	N	c1b	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-2C	MO-25244	0	12	CAMO-05-63766	SED	-	9/19/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2C	MO-25245	0	17	CAMO-05-63767	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2C	MO-25246	1	10	CAMO-05-63768	SED	-	9/19/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2E	35-02196	0	15	0435-95-0124	SED	-	4/24/1995	N	fill	-	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-2E	35-02197	0	30	0435-95-0127	SED	-	4/24/1995	N	fill	-	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-2E	35-02197	30	61	0435-95-0128	SED	-	4/24/1995	N	fill	-	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-2E	35-02197	61	91	0435-95-0129	SED	-	4/24/1995	N	fill	-	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-2E	35-02235	0	15	0435-95-0106	SED	-	4/24/1995	N	c1	-	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-2E	35-02235	0	15	0435-95-0107	SED	FD	4/24/1995	N	c1	-	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
TS-2E	MO-00062	0	21	CAMO-99-0042	SED	-	5/18/1999	N	c2	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2E	MO-00063	7	23	CAMO-99-0043	SED	-	5/18/1999	N	f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2E	MO-00063	23	43	CAMO-99-0044	SED	-	5/18/1999	N	f1	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2E	MO-00064	0	20	CAMO-99-0045	SED	-	5/18/1999	N	c1	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2E	MO-22845	0	50	CAMO-04-53391	SED	-	6/22/2004	N	c2	coarse	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2E	MO-22845	72	102	CAMO-04-53392	SED	-	6/22/2004	N	c2	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2E	MO-22846	8	38	CAMO-04-53393	SED	-	6/22/2004	N	c2	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2E	MO-22847	20	75	CAMO-04-53394	SED	-	6/22/2004	N	f1	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-2E	MO-25232	0	30	CAMO-05-63751	SED	-	9/21/2005	N	c1	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-2E	MO-25233	12	36	CAMO-05-63752	SED	-	9/21/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-2E	MO-25247	8	18	CAMO-05-63769	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2E	MO-25248	0	19	CAMO-05-63770	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2E	MO-25248	19	35	CAMO-05-63771	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2E	MO-25250	10	31	CAMO-05-63772	SED	-	9/21/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2W	MO-00056	10	29	CAMO-99-0034	SED	-	5/17/1999	N	c1w	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2W	MO-00056	29	39	CAMO-99-0035	SED	-	5/17/1999	N	c1w	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2W	MO-00057	27	58	CAMO-99-0036	SED	-	5/17/1999	N	c2	fine	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2W	MO-00058	0	5	CAMO-99-0037	SED	-	5/17/1999	N	c1	coarse	–	–	–	–	x	–	x	–	–	x	–	x	x	–	x	x	x	–	–	–	x	x	–	–	–
TS-2W	MO-22836	13	33	CAMO-04-53383	SED	-	6/22/2004	N	c2	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2W	MO-22836	42	66	CAMO-04-53384	SED	-	6/22/2004	N	c2	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2W	MO-22838	7	44	CAMO-04-53385	SED	-	6/22/2004	N	c1w	coarse	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2W	MO-22838	82	97	CAMO-04-53386	SED	-	6/22/2004	N	c1w	fine	–	–	x	x	x	–	x	–	–	x	x	–	x	x	x	x	x	–	x	–	x	x	–	x	–
TS-2W	MO-25228	0	18	CAMO-05-63747	SED	-	9/19/2005	N	c1w	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-2W	MO-25228	23	37	CAMO-05-63762	SED	-	9/19/2005	N	c1w	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2W	MO-25228	23	37	CAMO-05-63773	SED	FD	9/19/2005	N	c1w	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	x	–	–	–	–
TS-2W	MO-25229	0	24	CAMO-05-63748	SED	-	9/19/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-2W	MO-25241	10	22	CAMO-05-63763	SED	-	9/19/2005	N	c1w	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-2W	MO-25241	22	33	CAMO-05-63764	SED	-	9/19/2005	N	c1w	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	–	–
TS-3	MO-10014	7	22	CAMO-01-0007	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10014	22	34	CAMO-01-0008	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10015	0	25	CAMO-01-0009	SED	-	5/29/2001	N	c1	coarse	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10016	3	13	CAMO-01-0010	SED	-	5/29/2001	N	f1	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10017	10	28	CAMO-01-0011	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10018	2	11	CAMO-01-0012	SED	-	5/29/2001	N	f2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10019	7	37	CAMO-01-0013	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10020	31	52	CAMO-01-0014	SED	-	5/29/2001	N	c2	coarse	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10020	52	70	CAMO-01-0015	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-10021	1	13	CAMO-01-0016	SED	-	5/29/2001	N	c2	fine	–	–	–	–	x	–	x	–	–	x	x	x	x	–	x	–	x	x	–	–	x	x	–	–	–
TS-3	MO-25234	6	20	CAMO-05-63753	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-3	MO-25234	6	20	CAMO-05-63759	SED	FD	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	x	–	–	x	–
TS-3	MO-25234	25	43	CAMO-05-63754	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-3	MO-25234	43	100	CAMO-05-63755	SED	-	9/21/2005	N	c2	coarse	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–

Table C-2.0-1 (continued)

Reach	Location ID	Begin Depth (cm)	End Depth (cm)	Sample ID	Media Code	Field Code	Collection Date	Excav Flag	Geomorphic Unit	Facies	Am-241	Ammonia	Anion	CN	Gamma Spec	Gross AB	H3	HEX CR	HEXP	Iso Pu	Iso Th	Iso U	Metals	PAH	Part SZ	PCB	PEST	PESTPCB	PH	Phosphorus	Sr-90	SVOC	TOC	VOC	Wet Chem
TS-3	MO-25237	3	14	CAMO-05-63756	SED	-	9/21/2005	N	f1	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-3	MO-25238	11	28	CAMO-05-63757	SED	-	9/21/2005	N	f2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–
TS-3	MO-25239	2	27	CAMO-05-63758	SED	-	9/21/2005	N	c2	fine	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	x	–	x	–	–	x	–

[a] – = Analysis was not performed.

[b] x = Analysis was performed.

[c] FD = Field duplicate.

Table C-2.0-2
Mortandad Canyon Watershed Water Samples Collected

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCA-1	2.4	WGA	EF05040GMA101	-	4/26/2005	–[a]	–	–	–	–	–	–	–	–	–	–	–	–	–	x[b]	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-1	2.4	WGA	EF05080GMA101	-	8/31/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-1	2.4	WGA	GF05040GMA101	-	4/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCA-1	2.4	WGA	GF05080GMA101	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCA-2	45	WGA	EF05040GMA201	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-2	45	WGA	EF05090GMA201	-	9/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-2	45	WGA	EF05090GMA290	FD[c]	9/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-2	45	WGA	GF05040GMA201	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCA-2	45	WGA	GF05090GMA201	-	9/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCA-2	45	WGA	GF05090GMA290	FD	9/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCA-4	1.75	WGA	GF05090GMA401	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-5	3.4	WGA	EF05040GMA501	-	4/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-5	3.4	WGA	GF05040GMA501	-	4/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCA-5	3.4	WGA	GF05050GMA501	-	5/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCA-5	3.4	WGA	GF05100GMA501	-	10/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-0.6	1.05	WGA	EF05090GM0601	-	9/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-0.6	1.05	WGA	GF05090GM0601	-	9/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-1	8	WGA	WG6110127021	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-13	87	WGA	9702WG3711	-	2/11/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-2	2	WGA	6110WGG2CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-2	2	WGA	9808WGG2CM	-	8/19/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-2	2	WGA	CF00071G2CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-2	2	WGA	CM00071G2CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6110WGG3CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6209WGG3CM	-	9/5/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6212WGG3CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6305WGG3CM	-	5/22/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6506WGG3CM	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6509WGG3CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6511WGG3CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6608WGG3CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6611WGG3CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6705WGG3CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-3	2	WGA	6712WGG3CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6804WGG3CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6810WGG3CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	6906WGG3CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7006WGG3CM	-	6/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7009WGG3CM	-	9/24/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7012WGG3CM	-	12/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7103WGG3CM	-	3/15/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7106WGG3CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7109WGG3CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7112WGG3CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7203WGG3CM	-	3/10/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7206WGG3CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7208WGG3CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7504WGG3CM	-	4/7/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7509WGG3CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7604WGG3CM	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7703WGG3CM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7711WGG3CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7801WGG3CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7803WGG3CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	7904WGG3CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8002WGG3CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8104WGG3CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8110WGG3CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8204WGG3CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8303WGG3CM	-	3/30/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8404WGG3CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8504WGG3CM	-	4/10/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8603WGG3CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8804WGG3CM	-	4/7/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	8904WGG3CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	9005WGG3CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	9108WGG3CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-3	2	WGA	9210WGG3CM	-	10/29/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	9808WGG3CM	-	8/20/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-3	2	WGA	BB00101G3CM	-	10/30/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	CF00071G3CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	CM00071G3CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GB01031G3CM	-	3/12/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF01051G3CM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF01081G3CM	-	9/7/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF01091G3CM	-	7/31/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF01111G3CM	-	11/16/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF02031G3CM	-	3/28/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF02051G3CM	-	5/1/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF02080G3CM01	-	8/27/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF02110G3CM01	-	11/20/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF03060G3CM01	-	6/4/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF03060G3CM02	-	7/8/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF03070G3CM01	-	7/10/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF03080G3CM01	-	8/11/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF03100G3CM01	-	10/21/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF04030G3CM01	-	3/25/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF04040G3CM01	-	5/4/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF04070G3CM01	-	7/12/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF04100G3CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF05010G3CM01	-	1/24/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF05060G3CM01	-	6/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF05060G3CM90	FD	6/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF05080G3CM01	-	8/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GF05080G3CM02	-	8/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	GFO3110G3CM01	-	3/26/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MC03.022400	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MC03.041700	-	4/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MC03.062300	-	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MC03.081500	-	8/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MF98081G3CM	-	8/20/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-3	2	WGA	MF99041G3CM	-	4/16/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MM97071G3CM	-	8/7/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MM98081G3CM	-	8/20/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	MM99041G3CM	-	4/16/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	WG6909052011	-	9/5/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	WG7001122011	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	WG7211022011	-	11/2/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	WG7610212011	-	10/21/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	WG8010092011	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	WG8703012011	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-3	2	WGA	WG8703242011	-	3/24/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6110WGG4CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6209WGG4CM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6212WGG4CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6305WGG4CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6506WGG4CM	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6509WGG4CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6511WGG4CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6608WGG4CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6611WGG4CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6705WGG4CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6712WGG4CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6804WGG4CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6810WGG4CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6906WGG4CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	6909WGG4CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7005WGG4CM	-	5/14/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7006WGG4CM	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7009WGG4CM	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7012WGG4CM	-	12/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7103WGG4CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7106WGG4CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7109WGG4CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7112WGG4CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-4	14	WGA	7203WGG4CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7206WGG4CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7208WGG4CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7211WGG4CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7504WGG4CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7509WGG4CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7601WGG4CM	-	1/1/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-4	14	WGA	7604WGG4CM	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7610WGG4CM	-	10/22/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7703WGG4CM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7711WGG4CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7801WGG4CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7803WGG4CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	7904WGG4CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8002WGG4CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8104WGG4CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8110WGG4CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8204WGG4CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8206WGG4CM	-	6/2/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8303WGG4CM	-	3/24/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8404WGG4CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8504WGG4CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8603WGG4CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8804WGG4CM	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	8904WGG4CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	9005WGG4CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	9009WGG4CM	-	9/13/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	9108WGG4CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	9211WGG4CM	-	11/6/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	9307WGG4CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	9406WGG4CM	-	6/23/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	WG7001122021	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	WG8703012021	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4	14	WGA	WG8703232021	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-4B	8.9	WGA	0700-95-0018	-	6/27/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	0700-95-0054	-	8/9/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	0700-95-0055	-	8/9/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	0700-95-0086	-	12/18/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	0700-95-0087	-	12/18/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	9009WGG4BM	-	9/11/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	9602WGG4BM	-	2/22/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	9603WGG4BM	-	3/5/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	9708WGG4BM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	9808WGG4BM	-	8/20/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	AAC3644	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	AAC3645	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	EF05040G4BM01	-	4/21/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	EF05090G4BM01	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF01051G4BM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF03060G4BM01	-	6/2/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF03060G4BM02	-	6/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF03080G4BM01	-	8/13/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF03100G4BM01	-	10/20/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF04030G4BM01	-	3/22/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF04040G4BM01	-	5/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF04070G4BM01	-	7/8/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF04100G4BM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF05040G4BM01	-	4/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF05040G4BM02	-	5/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF05080G4BM01	-	8/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF05080G4BM90	FD	8/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF05090G4BM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF05100G4BM01	-	10/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	GF05100G4BM90	FD	10/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	MF98051G4BM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	MM97071G4BM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	MM98051G4BM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-4B	8.9	WGA	MNM9603B4	-	3/5/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-5	21	WGA	6110WGG5CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6209WGG5CM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6212WGG5CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6305WGG5CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6311WGG5CM	-	11/19/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6405WGG5CM	-	5/27/1964	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6509WGG5CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6511WGG5CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6608WGG5CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6611WGG5CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6705WGG5CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6712WGG5CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6804WGG5CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6810WGG5CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6906WGG5CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	6909WGG5CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7009WGG5CM	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7103WGG5CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7106WGG5CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7109WGG5CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7112WGG5CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7203WGG5CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7206WGG5CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7208WGG5CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7211WGG5CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7504WGG5CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7509WGG5CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7601WGG5CM	-	1/1/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-5	21	WGA	7604WGG5CM	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7610WGG5CM	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7703WGG5CM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7711WGG5CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7801WGG5CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	7803WGG5CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-5	21	WGA	7904WGG5CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8002WGG5CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8104WGG5CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8204WGG5CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8303WGG5CM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8404WGG5CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8504WGG5CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8603WGG5CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8804WGG5CM	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	8904WGG5CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	9005WGG5CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	9108WGG5CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	9211WGG5CM	-	11/6/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	9307WGG5CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	9406WGG5CM	-	6/23/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	9608WGG5CM	-	8/9/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-5	21	WGA	9708WGG5CM	-	8/8/1997	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-5	21	WGA	9808WGG5CM	-	8/20/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-5	21	WGA	CAMO-00-0021	-	7/7/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-5	21	WGA	EF05050G5CM01	-	5/3/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	EF05090G5CM01	-	9/15/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF01091G5CM	-	8/2/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF02050G5CM.5	SS	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF02050G5CM01	-	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF02050G5CM1.0	SS	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF02050G5CM2.0	SS	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF03060G5CM01	-	6/2/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF03060G5CM01-1	-	6/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF04060G5CM01	-	6/7/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF05050G5CM01	-	5/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-5	21	WGA	GF05090G5CM01	-	9/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-5	21	WGA	MF98051G5CM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MF98052G5CM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MF99041G5CM	-	4/15/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-5	21	WGA	MM96081G5CM	-	8/9/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MM96082G5CM	-	8/9/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MM97071G5CM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MM98051G5CM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MM98052G5CM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MM99041G5CM	-	4/14/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	MNM95060078	-	8/1/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	WG6506082041	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	WG6506092041	-	6/9/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	WG8010092041	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	WG8703012041	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	WG8703232041	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-5	21	WGA	WG9808207031	-	8/20/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	0700-95-0021	-	6/27/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	0700-95-0022	-	6/27/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	0700-95-0056	-	8/9/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	0700-95-0057	-	8/9/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	0700-95-0088	-	12/19/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	0700-95-0089	-	12/19/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	6110WGG6CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6209WGG6CM	-	9/7/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6212WGG6CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6305WGG6CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6506WGG6CM	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6509WGG6CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6511WGG6CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6608WGG6CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6611WGG6CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6705WGG6CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6712WGG6CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6804WGG6CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6810WGG6CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6906WGG6CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	6909WGG6CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-6	27	WGA	7005WGG6CM	-	5/14/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7006WGG6CM	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7009WGG6CM	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7012WGG6CM	-	12/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7103WGG6CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7106WGG6CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7109WGG6CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7112WGG6CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7203WGG6CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7206WGG6CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7208WGG6CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7211WGG6CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7504WGG6CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7509WGG6CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7610WGG6CM	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	7708WGG6CM	-	8/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7711WGG6CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7801WGG6CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7803WGG6CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	7904WGG6CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8002WGG6CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8010WGG6CM	-	10/8/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8104WGG6CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8110WGG6CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8204WGG6CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8303WGG6CM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8404WGG6CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8504WGG6CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8603WGG6CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8804WGG6CM	-	4/12/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	8904WGG6CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	9005WGG6CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	9009WGG6CM	-	9/13/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	9108WGG6CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-6	27	WGA	9211WGG6CM	-	11/5/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	9307WGG6CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	9406WGG6CM	-	6/27/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	9608WGG6CM	-	8/6/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	9708WGG6CM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	9808WGG6CM	-	8/21/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	AAC3640	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	AAC3641	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	AAC3642	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	AAC3643	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	BB00101G6CM	-	10/30/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	CAMO-00-0023	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	CAMO-00-0029	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	EF05040G6CM01	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	EF05040G6CM90	FD	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	EF05090G6CM01	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GB01031G6CM	-	3/12/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF01051G6CM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF01052G6CM	FD	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF01081G6CM	-	9/10/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF01091G6CM	-	8/6/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF01111G6CM	-	11/16/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF02050G6CM.5	SS	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF02050G6CM01	-	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF02050G6CM1.0	SS	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF02050G6CM2.0	SS	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF02080G6CM01	-	8/26/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF02110G6CM01	-	11/19/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF03060G6CM01	-	6/3/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF03060G6CM02	-	7/1/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF03080G6CM01	-	8/14/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF04040G6CM01	-	5/4/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF04080G6CM01	-	9/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF04100G6CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-6	27	WGA	GF05010G6CM01	-	1/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF05040G6CM01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF05040G6CM02	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF05040G6CM90	FD	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF05040G6CM91	FD	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF05080G6CM01	-	8/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF05090G6CM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6	27	WGA	GF05100G6CM01	-	10/4/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GFO3110G6CM01	-	3/27/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	GFO3110G6CM02	FD	3/27/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	MC06.022400	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	MC06.041700	-	4/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	MC06.062300	-	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	MC06.081500	-	8/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	MM96081G6CM	-	8/6/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	MM97071G6CM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	WG7001122051	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	WG8703012051	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6	27	WGA	WG8703232051	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6.5A	45	WGA	WG6212047041	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6.5A	45	WGA	WG6305217041	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6.5B	42	WGA	WG6212047051	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6.5B	42	WGA	WG6305217051	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6B	22	WGA	9009WGG6BM	-	9/11/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6B	22	WGA	AAC3646	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6B	22	WGA	AAC3647	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-6B	22	WGA	MF98051G6BM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6B	22	WGA	MF99041G6BM	-	4/14/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6B	22	WGA	MM98051G6BM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-6B	22	WGA	MM99041G6BM	-	4/14/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	0700-95-0029	-	6/28/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	0700-95-0061	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	0700-95-0062	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	0700-95-0092	-	12/20/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-7	39	WGA	0700-95-0094	-	12/20/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6110WGG7CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6209WGG7CM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6212WGG7CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6305WGG7CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6311WGG7CM	-	11/19/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6405WGG7CM	-	5/27/1964	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6509WGG7CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6511WGG7CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6608WGG7CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6611WGG7CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6705WGG7CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6712WGG7CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6804WGG7CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6810WGG7CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6906WGG7CM	-	6/24/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	6909WGG7CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7006WGG7CM	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7103WGG7CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7106WGG7CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7109WGG7CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7112WGG7CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7203WGG7CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7206WGG7CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7208WGG7CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7211WGG7CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7504WGG7CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7509WGG7CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7601WGG7CM	-	1/1/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	7604WGG7CM	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7610WGG7CM	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7708WGG7CM	-	8/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7711WGG7CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	7803WGG7CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-7	39	WGA	7904WGG7CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8002WGG7CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8010WGG7CM	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8104WGG7CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8110WGG7CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8204WGG7CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8303WGG7CM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8404WGG7CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8504WGG7CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8603WGG7CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8804WGG7CM	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	8904WGG7CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9005WGG7CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9009WGG7CM	-	9/13/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9108WGG7CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9211WGG7CM	-	11/4/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9307WGG7CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9406WGG7CM	-	6/27/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9608WGG7CM	-	8/6/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	9808WGG7CM	-	8/21/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	AAC3633	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	AAC3634	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	AAC3635	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	AAC3636	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	BB00101G7CM	-	10/30/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	CAMO-00-0025	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	EF05040G7CM01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	EF05090G7CM01	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GB01031G7CM	-	3/12/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GB01032G7CM	FD	3/12/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF01051G7CM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF01081G7CM	-	9/10/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF01091G7CM	-	8/7/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF02031G7CM	-	3/27/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-7	39	WGA	GF02050G7CM01	-	6/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF02052G7CM.5	SS	6/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF02052G7CM1	SS	6/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF02052G7CM2	SS	6/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF02080G7CM01	-	8/26/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF02110G7CM01	-	11/19/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF03060G7CM01	-	6/3/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF03060G7CM02	-	7/1/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF03080G7CM01	-	8/14/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF03100G7CM01	-	10/20/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF04030G7CM01	-	3/22/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF04040G7CM01	-	5/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF04080G7CM01	-	9/2/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF04080G7CM90	FD	9/2/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF04100G7CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF05010G7CM01	-	1/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF05040G7CM01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF05040G7CM02	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF05040G7CM91	FD	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF05080G7CM01	-	8/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF05090G7CM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7	39	WGA	GF05100G7CM01	-	10/6/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	GFO3110G7CM01	-	3/26/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MC07.022400	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MC07.041700	-	4/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MC07.062300	-	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MC07.062300X	FD	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MC07.081500	-	8/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MF99041G7CM	-	4/13/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MM96081G7CM	-	8/6/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	MM99041G7CM	-	4/13/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	WG6506082081	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	WG6506092081	-	6/9/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	WG7001122081	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-7	39	WGA	WG7009242081	-	9/24/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	WG7801022081	-	1/2/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	WG8703012081	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7	39	WGA	WG8703232081	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6209WGG57M	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6212WGG57M	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6305WGG57M	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6506WGG57M	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6509WGG57M	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6511WGG57M	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6608WGG57M	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6611WGG57M	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6705WGG57M	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6712WGG57M	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6804WGG57M	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6810WGG57M	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6906WGG57M	-	6/4/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	6909WGG57M	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7009WGG57M	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7106WGG57M	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7109WGG57M	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7112WGG57M	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7203WGG57M	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7206WGG57M	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7208WGG57M	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7211WGG57M	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7504WGG57M	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7509WGG57M	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7601WGG57M	-	1/1/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7604WGG57M	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7610WGG57M	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7708WGG57M	-	8/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7711WGG57M	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	7803WGG57M	-	3/13/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-7.5	35	WGA	7904WGG57M	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8002WGG57M	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8010WGG57M	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8104WGG57M	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8206WGG57M	-	6/2/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8303WGG57M	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8404WGG57M	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8504WGG57M	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8603WGG57M	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8804WGG57M	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	8904WGG57M	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	9005WGG57M	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	9108WGG57M	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	9211WGG57M	-	11/4/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	9406WGG57M	-	6/27/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	CAMO-00-0027	-	7/11/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	EF05040G57M01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	EF05090G57M01	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	GF01091G57M	-	8/7/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	GF03060G57M01	-	7/7/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	GF05040G57M01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	GF05090G57M01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	MF98051G57M	-	5/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	MF99031G57M	-	3/26/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	MM97061G57M	-	6/13/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	MM98051G57M	-	5/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	MM99031G57M	-	3/26/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	MNM95060079	-	8/1/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	WG7001122091	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	WG8703012091	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	WG8703232091	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	WG9706137061	-	6/13/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7.5	35	WGA	WG9808257061	-	8/25/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	0700-95-0032	-	6/28/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-7A	34.8	WGA	0700-95-0063	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	0700-95-0064	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	0700-95-0095	-	12/20/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	9009WGG7AM	-	9/11/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	AAC3638	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	AAC3639	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	MF98051G7AM	-	5/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	MM97061G7AM	-	6/13/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-7A	34.8	WGA	MM98051G7AM	-	5/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6110127071	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6209067071	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6212047071	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6305217071	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6506087071	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6509017071	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6511227071	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6608247071	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6611167071	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6705027071	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6712067071	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6804307071	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6810077071	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6906047071	-	6/4/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG6909087071	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7001127071	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7006237071	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7009237071	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7012227071	-	12/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7206097071	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7208317071	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7211067071	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7504117071	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7509307071	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8	84	WGA	WG7604097071	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCO-8.2	70	WGA	WG6209067081	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8.2	70	WGA	WG6212047081	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCO-8.2	70	WGA	WG6305217081	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOBT-4.4	485.4	WGI	EF05050G44M01	-	6/8/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOBT-4.4	485.4	WGI	GF05050G44M01	-	6/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOBT-4.4	485.4	WGI	GW05-03-51697	-	5/21/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOBT-4.4	485.4	WGI	GWM4-02-45566	-	4/22/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOBT-4.4	485.4	WGI	GWM4-03-50311	-	1/28/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-4	499	WGI	EF05050GMC401	-	6/23/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-4	499	WGI	EF05090GMC401	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOI-4	499	WGI	GF05050GMC401	-	6/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-4	499	WGI	GF05090GMC401	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-5	689	WGI	EF05050GMC501	-	6/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-5	689	WGI	EF05090GMC501	-	9/9/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOI-5	689	WGI	GF05050GMC501	-	6/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-5	689	WGI	GF05090GMC501	-	9/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-6	686	WGI	EF05050GMC601	-	6/15/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOI-6	686	WGI	EF05050GMC690	FD	6/15/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOI-6	686	WGI	EF05090GMC601	-	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOI-6	686	WGI	EF05090GMC690	FD	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCOI-6	686	WGI	GF05050GMC601	-	6/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-6	686	WGI	GF05050GMC690	FD	6/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-6	686	WGI	GF05090GMC601	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCOI-6	686	WGI	GF05090GMC690	FD	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCS-3.2	0	WS	WS6605247091	-	5/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.8	0	WS	WS6509017101	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.8	0	WS	WS6605247101	-	5/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.8	0	WS	WS6611167101	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.8	0	WS	WS6705027101	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS6509017111	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS6601167111	-	1/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS6608247111	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS6705027111	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS6712067111	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MCS-3.9	0	WS	WS6804307111	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7009237111	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7103087111	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7109137111	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7112067111	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7203037111	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7206097111	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7208317111	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7211067111	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7604127111	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7703237111	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS7803167111	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCS-3.9	0	WS	WS8002197111	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MCWB-6.5E	35	WGA	9808WG3451	-	8/24/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MCWB-7.7B	55	WGA	9808WG3531	-	8/26/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24786	0	WS	EF0504PWF1E01	-	4/20/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24786	0	WS	EF0509PWF1E01	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24786	0	WS	GF0504PWF1E01	-	4/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24786	0	WS	GF0509PWF1E01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24787	0	WS	EF05040PW1E01	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24787	0	WS	EF05090PW1E01	-	9/7/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24787	0	WS	EF05090PW1E90	FD	9/7/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24787	0	WS	GF05040PW1E01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24787	0	WS	GF05090PW1E01	-	9/7/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24787	0	WS	GF05090PW1E90	FD	9/7/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24788	0	WS	EF05040PE1E01	-	4/29/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24788	0	WS	EF05090PE1E01	-	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24788	0	WS	GF05040PE1E01	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24788	0	WS	GF05090PE1E01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24789	0	WS	EF05040PW1M01	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24789	0	WS	EF05090PW1M01	-	9/8/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24789	0	WS	GF05040PW1M01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24789	0	WS	GF05090PW1M01	-	9/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24790	0	WS	EF05040PE1M01	-	4/29/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	MO-24790	0	WS	EF05090PE1M01	-	9/9/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24790	0	WS	GF05040PE1M01	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24790	0	WS	GF05090PE1M01	-	9/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24791	0	WS	EF05040PE2M01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24791	0	WS	EF05090PE2M01	-	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24791	0	WS	GF05040PE2M01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24791	0	WS	GF05090PE2M01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24792	0	WS	EF0504PW1ST01	-	4/26/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24792	0	WS	GF0504PW1ST01	-	4/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24792	0	WS	GF0509PW1ST01	-	9/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24793	0	WS	EF0504PE2ST01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24793	0	WS	EF0509PE2ST01	-	9/8/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MO-24793	0	WS	GF0504PE2ST01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MO-24793	0	WS	GF0509PE2ST01	-	9/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7604WGS1GM	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7610WGS1GM	-	10/21/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	9706WGS1GM	-	6/3/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	9808WGS1GM	-	8/28/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WG9808287321	-	8/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6209WSS1GM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6212WSS1GM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6509WSS1GM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6511WSS1GM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6712WSS1GM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6804WSS1GM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6810WSS1GM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	6909WSS1GM	-	9/5/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7006WSS1GM	-	6/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7007WSS1GM	-	7/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7009WSS1GM	-	9/24/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7011WSS1GM	-	11/17/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7102WSS1GM	-	2/12/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7109WSS1GM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7112WSS1GM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	Mortandad at GS-1	0	WS	7203WSS1GM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7206WSS1GM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7208WSS1GM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7211WSS1GM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7703WSS1GM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7711WSS1GM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7803WSS1GM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7809WSS1GM	-	9/25/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	7904WSS1GM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8002WSS1GM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8010WSS1GM	-	10/8/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8104WSS1GM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8110WSS1GM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8204WSS1GM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8303WSS1GM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8404WSS1GM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8504WSS1GM	-	4/10/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8603WSS1GM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8703WSS1GM	-	3/24/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8711WSS1GM	-	11/6/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8804WSS1GM	-	4/7/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	8904WSS1GM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	9005WSS1GM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	9108WSS1GM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	9210WSS1GM	-	10/29/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	9307WSS1GM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	9406WSS1GM	-	6/23/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	CAMO-00-0017	-	7/11/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	CC00081W1SG	-	8/16/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	CM99051W1SG	-	5/27/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	GF01041W1SG	-	4/18/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	MM96081W1SG	-	8/5/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	MM97061W1SG	-	6/3/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	MM97062W1SG	-	6/3/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	Mortandad at GS-1	0	WS	MM98081W1SG	-	8/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	MNM95070076	-	7/28/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WS6608247131	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WS6611167131	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WS6705027131	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WS7001122121	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WS7012012121	-	12/1/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WS7012212121	-	12/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at GS-1	0	WS	WS7106022121	-	6/2/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande	0	WS	WS6706277341	-	6/27/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	7410WSS11M	-	10/1/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	7709WSS11M	-	9/13/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	7809WSS11M	-	9/19/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	7911WSS11M	-	11/1/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8010WSS11M	-	10/7/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8209WSS11M	-	9/27/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8309WSS11M	-	9/20/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8409WSS11M	-	9/24/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8509WSS11M	-	9/24/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8610WSS11M	-	10/29/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8710WSS11M	-	10/6/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8801WSS11M	-	1/1/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	8910WSS11M	-	10/6/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	9110WSS11M	-	10/7/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	Mortandad at Rio Grande (A-11)	0	WS	9209WSS11M	-	9/8/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	9310WSS11M	-	10/12/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GC00091WGRM	-	9/25/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF02100WGRM01	-	11/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03020WGRM01	-	2/25/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03020WGRM01-R1	-	2/25/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03020WGRM01-R2	-	2/25/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03020WGRM01-R3	-	2/25/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03020WGRM01-R4	-	2/25/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03020WGRM01-R5	-	2/25/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03020WGRM01-R6	-	2/25/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	GF03080WGRM01	-	10/6/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	MM96101WGRM	-	10/7/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	MM97091WGRM	-	9/11/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	MM98091WGRM	-	9/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad at Rio Grande (A-11)	0	WS	MNM95090120	-	9/11/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad below Effluent Canyon	0	WS	GF02050W20001	-	5/28/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad below Effluent Canyon	0	WS	GF02050W20090	FD	5/28/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad below Effluent Canyon	0	WS	GF03070W20001	-	7/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad below Effluent Canyon	0	WS	GF03070W20090	FD	7/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	Mortandad below Effluent Canyon	0	WS	GF04060W20001	-	6/9/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Mortandad below Effluent Canyon	0	WS	GF05040P20001	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-1	39	WGA	EF05040G1TM01	-	4/22/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-1	39	WGA	EF05090G1TM01	-	9/16/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-1	39	WGA	GF05040G1TM01	-	4/22/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-1	39	WGA	GF05090G1TM01	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-3	44	WGA	9702WGG3TM	-	2/11/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-3	44	WGA	9808WGG3TM	-	8/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-3	44	WGA	EF05040G3TM01	-	4/20/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-3	44	WGA	EF05090G3TM01	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-3	44	WGA	GF05040G3TM01	-	4/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-3	44	WGA	GF05090G3TM01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-3	44	WGA	MF98081G3TM	-	9/4/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-3	44	WGA	MF99111G3TM	-	11/9/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-3	44	WGA	MM98081G3TM	-	9/4/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-3	44	WGA	MM99111G3TM	-	11/9/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-4	54	WGA	9401WGG4TM	-	1/1/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-4	54	WGA	9702WGG4TM	-	2/11/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-4	54	WGA	9808WGG4TM	-	8/26/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-4	54	WGA	AAC3609	-	3/27/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-4	54	WGA	AAC3610	-	3/27/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-4	54	WGA	EF05090G4TM01	-	9/16/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-4	54	WGA	GF05090G4TM01	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	MT-4	54	WGA	MF98051G4TM	-	5/14/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	MT-4	54	WGA	MM98051G4TM	-	5/14/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	8208WGG5MP	-	8/4/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	8602WGG5MP	-	2/4/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	8702WGG5MP	-	2/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	8801WGG5MP	-	1/1/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	8903WGG5MP	-	3/14/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	9004WGG5MP	-	4/12/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	9105WGG5MP	-	5/9/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	9208WGG5MP	-	8/18/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	PM-5	1440	WGR	9308WGG5MP	-	8/18/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	9405WGG5MP	-	5/24/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	9604WGG5MP	-	4/25/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	9706WGG5MP	-	6/25/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	CM00081G5MP	-	8/14/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	MM96041G5MP	-	4/25/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	MM97061G5MP	-	6/25/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	MM98061G5MP	-	6/8/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	MM99031G5MP	-	3/9/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	MNM95060026	-	6/12/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	PM-5	1440	WGR	SF06010G5MP01	-	1/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-1	1031.1	WGR	EF05050G01R01	-	5/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-1	1031.1	WGR	EF05080G01R01	-	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-1	1031.1	WGR	EF05080G01R90	FD	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-1	1031.1	WGR	GF05050G01R01	-	5/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-1	1031.1	WGR	GF05080G01R01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-1	1031.1	WGR	GF05080G01R90	FD	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-1	1031.1	WGR	GF05110G01R01	-	11/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-13	958.3	WGR	EF05050G13R01	-	5/26/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-13	958.3	WGR	EF05080G13R01	-	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-13	958.3	WGR	EF05080G13R90	FD	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-13	958.3	WGR	GF05050G13R01	-	5/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-13	958.3	WGR	GF05080G13R01	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-13	958.3	WGR	GF05080G13R90	FD	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-13	958.3	WGR	GW05-03-51694	-	5/22/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-13	958.3	WGR	GW13-02-45568	-	4/18/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-13	958.3	WGR	GW13-02-46375	-	7/3/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-13	958.3	WGR	GW13-02-49493	-	10/28/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-13	958.3	WGR	GW13-03-50450	-	1/27/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-14	1204.5	WGR	EF0505G14R101	-	5/10/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1204.5	WGR	GF0402G14R101	-	2/9/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1204.5	WGR	GF0407G14R101	-	7/12/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1204.5	WGR	GF0410G14R101	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1204.5	WGR	GF0505G14R101	-	5/11/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	R-14	1204.5	WGR	SF0601G14R101	-	1/24/2006	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1288.5	WGR	EF0505G14R201	-	5/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1288.5	WGR	GF0402G14R201	-	2/17/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1288.5	WGR	GF0407G14R201	-	7/14/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1288.5	WGR	GF0411G14R201	-	11/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1288.5	WGR	GF0505G14R201	-	5/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-14	1288.5	WGR	HF0411G14R201	-	11/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-15	958.6	WGR	CAMO-00-0002	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-15	958.6	WGR	EF05050G15R01	-	5/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-15	958.6	WGR	EF05050G15R90	FD	5/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-15	958.6	WGR	EF05080G15R01	-	8/31/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-15	958.6	WGR	GF05050G15R01	-	5/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-15	958.6	WGR	GF05050G15R90	FD	5/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-15	958.6	WGR	GF05080G15R01	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-15	958.6	WGR	GWMO-00-0001	-	10/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-15	958.6	WGR	RW15-01-0002	-	2/15/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-15	958.6	WGR	RW15-01-0004	-	5/22/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-28	946.2	WGR	EF05050G28R01	-	5/20/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-28	946.2	WGR	EF05080G28R01	-	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-28	946.2	WGR	GF05050G28R01	-	5/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-28	946.2	WGR	GF05080G28R01	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-28	946.2	WGR	GF05110G28R01	-	11/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-33	995.5	WGR	EF0506G33R101	-	6/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-33	995.5	WGR	EF0509G33R101	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-33	995.5	WGR	GF0506G33R101	-	6/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-33	995.5	WGR	GF0509G33R101	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-33	1112.4	WGR	EF0506G33R201	-	6/24/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-33	1112.4	WGR	EF0509G33R201	-	9/15/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	R-33	1112.4	WGR	GF0506G33R201	-	6/24/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	R-33	1112.4	WGR	GF0509G33R201	-	9/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	TA-50	0	WS	WS9808199261	-	8/19/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	TA-50 OUTFALL	0	WS	WS9808289271	-	8/28/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Ten Site Canyon	0	WS	WS7903139461	-	3/13/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	6012WGG8WT	-	12/16/1960	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	Test Well 8	953	WGR	6111WGG8WT	-	11/30/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	6311WGG8WT	-	11/15/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	6509WGG8WT	-	9/24/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	6702WGG8WT	-	2/14/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7503WGG8WT	-	3/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7510WGG8WT	-	10/16/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7604WGG8WT	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7610WGG8WT	-	10/13/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7703WGG8WT	-	3/11/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7711WGG8WT	-	11/16/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7803WGG8WT	-	3/22/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	7904WGG8WT	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8003WGG8WT	-	3/5/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8101WGG8WT	-	1/1/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8204WGG8WT	-	4/8/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8305WGG8WT	-	5/26/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8403WGG8WT	-	3/20/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8504WGG8WT	-	4/3/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8602WGG8WT	-	2/27/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8703WGG8WT	-	3/16/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8801WGG8WT	-	1/1/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	8903WGG8WT	-	3/29/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9005WGG8WT	-	5/2/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9109WGG8WT	-	9/23/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9312WGG8WT	-	12/5/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9410WGG8WT	-	10/21/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9411WGG8WT	-	11/3/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9602WGG8WT	-	2/13/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9607WGG8WT	-	7/23/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9609WGG8WT	-	9/30/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9611WGG8WT	-	11/15/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	9809WGG8WT	-	9/2/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Filtered	Test Well 8	953	WGR	CM00051G8WT	-	5/2/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	MM96071G8WT	-	7/23/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Filtered	Test Well 8	953	WGR	MM96072G8WT	-	7/23/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	MM96111G8WT	-	11/15/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	MM98081G8WT	-	9/2/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	MM98082G8WT	-	9/2/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	MM99081G8WT	-	8/3/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	MM99082G8WT	-	8/3/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	MNM95060070	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	SF06010G8WT01	-	1/24/2006	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Filtered	Test Well 8	953	WGR	WG6901193101	-	1/19/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	LA-24809	0	WS	CALA-05-61185	-	7/26/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x
Unfiltered	MCA-1	2.4	WGA	EU05040GMA101	-	4/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCA-1	2.4	WGA	EU05080GMA101	-	8/31/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-1	2.4	WGA	FU05040GMA101	-	4/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-1	2.4	WGA	FU05080GMA101	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-1	2.4	WGA	GU05040GMA101	-	4/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCA-1	2.4	WGA	GU05050GMA101	-	5/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–
Unfiltered	MCA-1	2.4	WGA	GU05080GMA101	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCA-1	2.4	WGA	UU05040GMA101	-	4/26/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCA-2	45	WGA	EU05040GMA201	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCA-2	45	WGA	EU05090GMA201	-	9/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-2	45	WGA	EU05090GMA290	FD	9/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-2	45	WGA	FU05040GMA201	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-2	45	WGA	FU05090GMA201	-	9/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-2	45	WGA	GU05040GMA201	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCA-2	45	WGA	GU05090GMA201	-	9/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCA-2	45	WGA	GU05090GMA290	FD	9/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCA-2	45	WGA	UU05040GMA201	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCA-4	1.75	WGA	FU05090GMA401	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-4	1.75	WGA	GU05090GMA401	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-5	3.4	WGA	EU05040GMA501	-	4/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCA-5	3.4	WGA	FU05040GMA501	-	4/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCA-5	3.4	WGA	GU05040GMA501	-	4/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCA-5	3.4	WGA	GU05050GMA501	-	5/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–
Unfiltered	MCA-5	3.4	WGA	UU05040GMA501	-	4/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-0.6	1.05	WGA	EU05090GM0601	-	9/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-0.6	1.05	WGA	GU05090GM0601	-	9/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCO-1	8	WGA	WG6103277021	-	3/27/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-1	8	WGA	WG6105227021	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-1	8	WGA	WG6110127021	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-2	2	WGA	6103WGG2CM	-	3/27/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-2	2	WGA	6105WGG2CM	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-2	2	WGA	6110WGG2CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-2	2	WGA	9808WGG2CM	-	8/19/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MCO-2	2	WGA	BM00071G2CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-2	2	WGA	CM00071G2CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-2	2	WGA	FU04120G2CM01	-	11/9/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6103WGG3CM	-	3/27/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6105WGG3CM	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6110WGG3CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6209WGG3CM	-	9/5/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6212WGG3CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6305WGG3CM	-	5/22/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6506WGG3CM	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6509WGG3CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6511WGG3CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6608WGG3CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6611WGG3CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6705WGG3CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6712WGG3CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6804WGG3CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6810WGG3CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	6906WGG3CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7003WGG3CM	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7006WGG3CM	-	6/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7009WGG3CM	-	9/24/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7012WGG3CM	-	12/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7101WGG3CM	-	1/1/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7103WGG3CM	-	3/15/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-3	2	WGA	7106WGG3CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7109WGG3CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7112WGG3CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7201WGG3CM	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7203WGG3CM	-	3/10/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7206WGG3CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7208WGG3CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7302WGG3CM	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7306WGG3CM	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7309WGG3CM	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7404WGG3CM	-	4/17/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7404WSG3CM	-	4/17/1974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7407WGG3CM	-	7/31/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7407WSG3CM	-	7/31/1974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7410WGG3CM	-	10/24/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7410WSG3CM	-	10/24/1974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7504WGG3CM	-	4/7/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7509WGG3CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7604WGG3CM	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7607WGG3CM	-	7/16/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7703WGG3CM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7711WGG3CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7801WGG3CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7803WGG3CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7809WGG3CM	-	9/27/1978	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7904WGG3CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	7910WGG3CM	-	10/17/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8002WGG3CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8104WGG3CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8110WGG3CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8204WGG3CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8211WGG3CM	-	11/15/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8303WGG3CM	-	3/30/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8310WGG3CM	-	10/31/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-3	2	WGA	8404WGG3CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8409WGG3CM	-	9/19/1984	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8504WGG3CM	-	4/10/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8509WGG3CM	-	9/23/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8603WGG3CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8609WGG3CM	-	9/15/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8711WGG3CM	-	11/6/1987	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8804WGG3CM	-	4/7/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	8904WGG3CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	9005WGG3CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	9108WGG3CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	9210WGG3CM	-	10/29/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	9808WGG3CM	-	8/20/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–
Unfiltered	MCO-3	2	WGA	BB00101G3CM	-	10/30/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	BB01031G3CM	-	3/12/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	BM00071G3CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	CM00071G3CM	-	7/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FN04030G3CM01	-	3/25/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FN04040G3CM01	-	5/4/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FN04100G3CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FN05010G3CM01	-	1/24/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FU02080G3CM01	-	8/27/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FU05060G3CM01	-	6/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FU05080G3CM01	-	8/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	FU05080G3CM02	-	8/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU01051G3CM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU01091G3CM	-	7/31/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-3	2	WGA	GU02051G3CM	-	5/1/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-3	2	WGA	GU03060G3CM01	-	6/4/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU03060G3CM02	-	7/8/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-3	2	WGA	GU03070G3CM01	-	7/10/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU03080G3CM01	-	8/11/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU03100G3CM01	-	10/21/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU04030G3CM01	-	3/25/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-3	2	WGA	GU04040G3CM01	-	5/4/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU04070G3CM01	-	7/12/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-3	2	WGA	GU04100G3CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	GU05010G3CM01	-	1/24/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	MC03.022400	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	MC03.041700	-	4/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	MC03.062300	-	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	MC03.081500	-	8/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	MM97071G3CM	-	8/7/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-3	2	WGA	MM98081G3CM	-	8/20/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	–	–
Unfiltered	MCO-3	2	WGA	MM99041G3CM	-	4/16/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG6909052011	-	9/5/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG6909082011	-	9/8/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG7001012011	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG7001122011	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG7211022011	-	11/2/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG7211062011	-	11/6/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG7610212011	-	10/21/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG7610222011	-	10/22/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG8010082011	-	10/8/1980	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG8010092011	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG8703012011	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-3	2	WGA	WG8703242011	-	3/24/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6103WGG4CM	-	3/27/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6105WGG4CM	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6110WGG4CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6209WGG4CM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6212WGG4CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6305WGG4CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6506WGG4CM	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6509WGG4CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6511WGG4CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6608WGG4CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6611WGG4CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-4	14	WGA	6705WGG4CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6712WGG4CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6804WGG4CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6810WGG4CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6906WGG4CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6909WGG4CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	6911WGG4CM	-	11/6/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7003WGG4CM	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7005WGG4CM	-	5/14/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7006WGG4CM	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7009WGG4CM	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7012WGG4CM	-	12/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7101WGG4CM	-	1/1/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7103WGG4CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7106WGG4CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7109WGG4CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7112WGG4CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7201WGG4CM	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7203WGG4CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7206WGG4CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7208WGG4CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7211WGG4CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7301WGG4CM	-	1/1/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7302WGG4CM	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7309WGG4CM	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7404WGG4CM	-	4/17/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7407WGG4CM	-	7/31/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7410WGG4CM	-	10/24/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7504WGG4CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7509WGG4CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7604WGG4CM	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7607WGG4CM	-	7/16/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7610WGG4CM	-	10/22/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7703WGG4CM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-4	14	WGA	7711WGG4CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7801WGG4CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7803WGG4CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7809WGG4CM	-	9/25/1978	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7904WGG4CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	7910WGG4CM	-	10/17/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8002WGG4CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8010WGG4CM	-	10/8/1980	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8104WGG4CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8110WGG4CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8204WGG4CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8206WGG4CM	-	6/2/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8211WGG4CM	-	11/15/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8301WGG4CM	-	1/1/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8303WGG4CM	-	3/24/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8310WGG4CM	-	10/31/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8404WGG4CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8409WGG4CM	-	9/19/1984	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8504WGG4CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8509WGG4CM	-	9/24/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8603WGG4CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8609WGG4CM	-	9/15/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8711WGG4CM	-	11/6/1987	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8804WGG4CM	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	8904WGG4CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	9005WGG4CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	9009WGG4CM	-	9/13/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	9108WGG4CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	9211WGG4CM	-	11/6/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	9307WGG4CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	9406WGG4CM	-	6/23/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	WG7001012021	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	WG7001122021	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	WG7306072021	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-4	14	WGA	WG7306262021	-	6/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	WG8703012021	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4	14	WGA	WG8703232021	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	0700-95-0017	-	6/27/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCO-4B	8.9	WGA	0700-95-0054	-	8/9/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	0700-95-0086	-	12/18/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-4B	8.9	WGA	0700-95-0087	-	12/18/1995	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	x	–
Unfiltered	MCO-4B	8.9	WGA	9009WGG4BM	-	9/11/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	9011WGG4BM	-	11/2/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	9708WGG4BM	-	8/5/1997	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	9808WGG4BM	-	8/20/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MCO-4B	8.9	WGA	AAC3644	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-4B	8.9	WGA	AAC3645	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	EU05040G4BM01	-	4/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	EU05090G4BM01	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FN04030G4BM01	-	3/22/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FN04040G4BM01	-	5/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FN04100G4BM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FU04070G4BM01	-	7/8/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FU05040G4BM01	-	4/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FU05040G4BM02	-	5/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FU05090G4BM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	FU05100G4BM01	-	10/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU01051G4BM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU03060G4BM01	-	6/2/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU03060G4BM02	-	6/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-4B	8.9	WGA	GU03080G4BM01	-	8/13/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU03100G4BM01	-	10/20/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU04030G4BM01	-	3/22/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU04040G4BM01	-	5/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU04070G4BM01	-	7/8/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-4B	8.9	WGA	GU04100G4BM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	GU05040G4BM01	-	4/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCO-4B	8.9	WGA	GU05090G4BM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-4B	8.9	WGA	MM97071G4BM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	MM98051G4BM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-4B	8.9	WGA	MNM9603B4	-	3/5/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-4B	8.9	WGA	UU05040G4BM01	-	4/21/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6103WGG5CM	-	3/23/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6105WGG5CM	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6110WGG5CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6209WGG5CM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6212WGG5CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6305WGG5CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6311WGG5CM	-	11/19/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6405WGG5CM	-	5/27/1964	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6509WGG5CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6511WGG5CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6608WGG5CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6611WGG5CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6705WGG5CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6712WGG5CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6804WGG5CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6810WGG5CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6906WGG5CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	6909WGG5CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7001WGG5CM	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7003WGG5CM	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7009WGG5CM	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7101WGG5CM	-	1/1/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7103WGG5CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7106WGG5CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7109WGG5CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7112WGG5CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7201WGG5CM	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7203WGG5CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7206WGG5CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7208WGG5CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-5	21	WGA	7211WGG5CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7302WGG5CM	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7306WGG5CM	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7309WGG5CM	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7404WGG5CM	-	4/17/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7407WGG5CM	-	7/29/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7410WGG5CM	-	10/24/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7504WGG5CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7509WGG5CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7604WGG5CM	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7607WGG5CM	-	7/22/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7610WGG5CM	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7703WGG5CM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7711WGG5CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7801WGG5CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7803WGG5CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7809WGG5CM	-	9/25/1978	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7904WGG5CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	7910WGG5CM	-	10/17/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8002WGG5CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8104WGG5CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8110WGG5CM	-	10/26/1981	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8204WGG5CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8211WGG5CM	-	11/15/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8303WGG5CM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8310WGG5CM	-	10/31/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8404WGG5CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8409WGG5CM	-	9/19/1984	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8504WGG5CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8509WGG5CM	-	9/24/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8603WGG5CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8609WGG5CM	-	9/15/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8711WGG5CM	-	11/6/1987	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	8804WGG5CM	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-5	21	WGA	8904WGG5CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	9005WGG5CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	9108WGG5CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	9211WGG5CM	-	11/6/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	9307WGG5CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	9406WGG5CM	-	6/23/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	9608WGG5CM	-	8/9/1996	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	9808WGG5CM	-	8/20/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MCO-5	21	WGA	CAMO-00-0020	-	7/7/2000	–	–	–	–	–	x	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	CAMO-00-0021	-	7/7/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	EU05050G5CM01	-	5/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	EU05090G5CM01	-	9/15/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	FU02050G5CM01	-	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	FU03060G5CM01	-	6/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	FU04060G5CM01	-	6/7/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	FU05050G5CM01	-	5/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	FU05090G5CM01	-	9/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	GU01091G5CM	-	8/2/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	GU02050G5CM.5	SS	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	GU02050G5CM01	-	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	GU02050G5CM1.0	SS	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	GU02050G5CM2.0	SS	5/30/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	GU03060G5CM01	-	6/2/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	GU03060G5CM01-1	-	6/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	GU04060G5CM01	-	6/7/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	GU05050G5CM01	-	5/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	GU05090G5CM01	-	9/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	MM96081G5CM	-	8/9/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	MM96082G5CM	-	8/9/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	MM97071G5CM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	MM98051G5CM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	MM98052G5CM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-5	21	WGA	MM99041G5CM	-	4/14/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	MNM95060078	-	8/1/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-5	21	WGA	UU05050G5CM01	-	5/3/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	WG6506082041	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	WG6506092041	-	6/9/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	WG8010082041	-	10/8/1980	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	WG8010092041	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	WG8703012041	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	WG8703232041	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-5	21	WGA	WG9808207031	-	8/20/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MCO-6	27	WGA	0700-95-0019	-	6/27/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	0700-95-0020	-	6/27/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	0700-95-0056	-	8/9/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	0700-95-0088	-	12/19/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	0700-95-0089	-	12/19/1995	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	6103WGG6CM	-	3/23/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6105WGG6CM	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6110WGG6CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6209WGG6CM	-	9/7/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6212WGG6CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6305WGG6CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6506WGG6CM	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6509WGG6CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6511WGG6CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6608WGG6CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6611WGG6CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6705WGG6CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6712WGG6CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6804WGG6CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6810WGG6CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6906WGG6CM	-	6/2/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	6909WGG6CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7003WGG6CM	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7005WGG6CM	-	5/14/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7006WGG6CM	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7009WGG6CM	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-6	27	WGA	7012WGG6CM	-	12/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7101WGG6CM	-	1/1/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7103WGG6CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7106WGG6CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7109WGG6CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7112WGG6CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7201WGG6CM	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7203WGG6CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7206WGG6CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7208WGG6CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7211WGG6CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7302WGG6CM	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7306WGG6CM	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7309WGG6CM	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7404WGG6CM	-	4/17/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7407WGG6CM	-	7/29/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7410WGG6CM	-	10/24/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7504WGG6CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7509WGG6CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7607WGG6CM	-	7/22/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7610WGG6CM	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7708WGG6CM	-	8/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7711WGG6CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7801WGG6CM	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7803WGG6CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7809WGG6CM	-	9/25/1978	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7904WGG6CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	7909WGG6CM	-	9/11/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8002WGG6CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8010WGG6CM	-	10/8/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8104WGG6CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8110WGG6CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8204WGG6CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8211WGG6CM	-	11/15/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-6	27	WGA	8303WGG6CM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8310WGG6CM	-	10/31/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8404WGG6CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8409WGG6CM	-	9/19/1984	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8504WGG6CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8509WGG6CM	-	9/24/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8603WGG6CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8609WGG6CM	-	9/15/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8711WGG6CM	-	11/6/1987	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8804WGG6CM	-	4/12/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	8904WGG6CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	9005WGG6CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	9009WGG6CM	-	9/13/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	9108WGG6CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	9211WGG6CM	-	11/5/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	9307WGG6CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	9406WGG6CM	-	6/27/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	9808WGG6CM	-	8/21/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–
Unfiltered	MCO-6	27	WGA	AAC3640	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	AAC3641	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	AAC3642	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	AAC3643	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	BB00101G6CM	-	10/30/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	BB01031G6CM	-	3/12/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	CAMO-00-0022	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	CAMO-00-0023	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	CAMO-00-0028	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	CAMO-00-0029	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	EU05040G6CM01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	EU05040G6CM90	FD	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	EU05090G6CM01	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FN04040G6CM01	-	5/4/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FN04100G6CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FN05010G6CM01	-	1/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-6	27	WGA	FU02050G6CM01	-	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FU02080G6CM01	-	8/26/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FU04080G6CM01	-	9/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FU05040G6CM01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FU05080G6CM01	-	8/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FU05090G6CM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	FU05100G6CM01	-	10/4/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GF02041G6CM	-	4/8/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU01051G6CM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU01052G6CM	FD	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU01091G6CM	-	8/6/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	x	–	–	–
Unfiltered	MCO-6	27	WGA	GU02050G6CM.5	SS	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU02050G6CM01	-	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	–
Unfiltered	MCO-6	27	WGA	GU02050G6CM1.0	SS	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU02050G6CM2.0	SS	5/29/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU03060G6CM01	-	6/3/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU03060G6CM02	-	7/1/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU03080G6CM01	-	8/14/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU04040G6CM01	-	5/4/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU04080G6CM01	-	9/3/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	GU04100G6CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU05010G6CM01	-	1/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	GU05040G6CM01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	GU05040G6CM90	FD	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	GU05090G6CM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-6	27	WGA	MC06.022400	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	MC06.041700	-	4/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	MC06.062300	-	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	MC06.081500	-	8/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	MM96081G6CM	-	8/6/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	MM97071G6CM	-	8/5/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	UU05040G6CM01	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	UU05040G6CM90	FD	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	WG7001012051	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-6	27	WGA	WG7001122051	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	WG8703012051	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6	27	WGA	WG8703232051	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6.5A	45	WGA	WG6212047041	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6.5A	45	WGA	WG6305217041	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6.5B	42	WGA	WG6212047051	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6.5B	42	WGA	WG6305217051	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6B	22	WGA	9009WGG6BM	-	9/11/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-6B	22	WGA	9011WGG6BM	-	11/1/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6B	22	WGA	AAC3646	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-6B	22	WGA	AAC3647	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-6B	22	WGA	MM98051G6BM	-	5/27/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-6B	22	WGA	MM99041G6BM	-	4/14/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	0700-95-0028	-	6/28/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-7	39	WGA	0700-95-0061	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	0700-95-0062	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	0700-95-0092	-	12/20/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-7	39	WGA	0700-95-0094	-	12/20/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-7	39	WGA	6103WGG7CM	-	3/23/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6105WGG7CM	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6110WGG7CM	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6209WGG7CM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6212WGG7CM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6305WGG7CM	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6311WGG7CM	-	11/19/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6405WGG7CM	-	5/27/1964	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6509WGG7CM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6511WGG7CM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6608WGG7CM	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6611WGG7CM	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6705WGG7CM	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6712WGG7CM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6804WGG7CM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6810WGG7CM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-7	39	WGA	6906WGG7CM	-	6/24/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	6909WGG7CM	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7003WGG7CM	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7006WGG7CM	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7101WGG7CM	-	1/1/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7103WGG7CM	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7106WGG7CM	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7109WGG7CM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7112WGG7CM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7201WGG7CM	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7203WGG7CM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7206WGG7CM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7208WGG7CM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7211WGG7CM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7302WGG7CM	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7304WGG7CM	-	4/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7306WGG7CM	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7309WGG7CM	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7404WGG7CM	-	4/17/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7407WGG7CM	-	7/29/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7410WGG7CM	-	10/24/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7504WGG7CM	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7509WGG7CM	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7604WGG7CM	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7607WGG7CM	-	7/22/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7610WGG7CM	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7708WGG7CM	-	8/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7711WGG7CM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7803WGG7CM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7809WGG7CM	-	9/29/1978	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7904WGG7CM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	7909WGG7CM	-	9/11/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8002WGG7CM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8010WGG7CM	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-7	39	WGA	8104WGG7CM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8110WGG7CM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8204WGG7CM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8211WGG7CM	-	11/15/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8303WGG7CM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8310WGG7CM	-	10/31/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8404WGG7CM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8409WGG7CM	-	9/19/1984	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8504WGG7CM	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8509WGG7CM	-	9/23/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8603WGG7CM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8609WGG7CM	-	9/15/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8711WGG7CM	-	11/6/1987	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8804WGG7CM	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	8904WGG7CM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	9005WGG7CM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	9009WGG7CM	-	9/13/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	9108WGG7CM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	9211WGG7CM	-	11/4/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	9307WGG7CM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	9406WGG7CM	-	6/27/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	9808WGG7CM	-	8/21/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–
Unfiltered	MCO-7	39	WGA	AAC3633	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–	–
Unfiltered	MCO-7	39	WGA	AAC3634	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	AAC3635	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–	–
Unfiltered	MCO-7	39	WGA	AAC3636	-	3/30/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	BB00101G7CM	-	10/30/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	BB01031G7CM	-	3/12/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	CAMO-00-0024	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	CAMO-00-0025	-	7/10/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	EU05040G7CM01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	EU05090G7CM01	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FN04030G7CM01	-	3/22/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FN04040G7CM01	-	5/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-7	39	WGA	FN04100G7CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FN05010G7CM01	-	1/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FU02050G7CM01	-	6/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FU02080G7CM01	-	8/26/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FU04080G7CM01	-	9/2/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FU05040G7CM01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FU05090G7CM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	FU05100G7CM01	-	10/6/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU01051G7CM	-	5/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU01091G7CM	-	8/7/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	x	–	–	–
Unfiltered	MCO-7	39	WGA	GU02050G7CM01	-	6/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x
Unfiltered	MCO-7	39	WGA	GU02052G7CM.5	SS	6/6/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU02052G7CM1	SS	6/6/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU02052G7CM2	SS	6/6/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU03060G7CM01	-	6/3/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU03060G7CM02	-	7/1/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU03080G7CM01	-	8/14/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU03100G7CM01	-	10/20/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU04030G7CM01	-	3/22/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU04040G7CM01	-	5/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU04080G7CM01	-	9/2/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-7	39	WGA	GU04080G7CM90	FD	9/2/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-7	39	WGA	GU04100G7CM01	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU05010G7CM01	-	1/21/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	GU05040G7CM01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCO-7	39	WGA	GU05090G7CM01	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCO-7	39	WGA	MC07.022400	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	MC07.041700	-	4/17/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	MC07.062300	-	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	MC07.062300X	FD	6/23/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	MC07.081500	-	8/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	MCO7.022400	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	MM96081G7CM	-	8/6/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	MM99041G7CM	-	4/13/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-7	39	WGA	UU05040G7CM01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG6506082081	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG6506092081	-	6/9/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG7001012081	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG7001122081	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG7009232081	-	9/23/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG7009242081	-	9/24/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG7801012081	-	1/1/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG7801022081	-	1/2/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG8703012081	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7	39	WGA	WG8703232081	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6209WGG57M	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6212WGG57M	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6305WGG57M	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6506WGG57M	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6509WGG57M	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6511WGG57M	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6608WGG57M	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6611WGG57M	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6705WGG57M	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6712WGG57M	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6804WGG57M	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6810WGG57M	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6906WGG57M	-	6/4/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	6909WGG57M	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7003WGG57M	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7009WGG57M	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7101WGG57M	-	1/1/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7106WGG57M	-	6/3/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7109WGG57M	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7112WGG57M	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7201WGG57M	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7203WGG57M	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7206WGG57M	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-7.5	35	WGA	7208WGG57M	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7211WGG57M	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7302WGG57M	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7306WGG57M	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7309WGG57M	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7404WGG57M	-	4/17/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7407WGG57M	-	7/29/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7410WGG57M	-	10/24/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7504WGG57M	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7509WGG57M	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7604WGG57M	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7607WGG57M	-	7/22/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7610WGG57M	-	10/18/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7708WGG57M	-	8/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7711WGG57M	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7803WGG57M	-	3/13/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7904WGG57M	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	7909WGG57M	-	9/11/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8002WGG57M	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8010WGG57M	-	10/9/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8104WGG57M	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8110WGG57M	-	10/26/1981	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8206WGG57M	-	6/2/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8211WGG57M	-	11/15/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8301WGG57M	-	1/1/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8303WGG57M	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8310WGG57M	-	10/31/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8404WGG57M	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8504WGG57M	-	4/11/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8509WGG57M	-	9/23/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8603WGG57M	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8609WGG57M	-	9/15/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8711WGG57M	-	11/6/1987	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	8804WGG57M	-	4/11/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-7.5	35	WGA	8904WGG57M	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	9005WGG57M	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	9108WGG57M	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	9211WGG57M	-	11/4/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	9406WGG57M	-	6/27/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	9706WGG57M	-	6/13/1997	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	CAMO-00-0026	-	7/11/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	EU05040G57M01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	EU05090G57M01	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	FU03060G57M01	-	7/7/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	FU05040G57M01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	FU05090G57M01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	GU01091G57M	-	8/7/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	GU03060G57M01	-	7/7/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-7.5	35	WGA	GU05040G57M01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-7.5	35	WGA	GU05090G57M01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-7.5	35	WGA	MM97061G57M	-	6/13/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	MM98051G57M	-	5/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-7.5	35	WGA	MM99031G57M	-	3/26/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	MNM95060079	-	8/1/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	UU05040G57M01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	WG7001012091	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	WG7001122091	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	WG8703012091	-	3/1/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	WG8703232091	-	3/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7.5	35	WGA	WG9808257061	-	8/25/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MCO-7A	34.8	WGA	0700-95-0031	-	6/28/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCO-7A	34.8	WGA	0700-95-0063	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7A	34.8	WGA	0700-95-0064	-	8/10/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7A	34.8	WGA	0700-95-0095	-	12/20/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-7A	34.8	WGA	9009WGG7AM	-	9/11/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCO-7A	34.8	WGA	9011WGG7AM	-	11/1/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-7A	34.8	WGA	AAC3638	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MCO-7A	34.8	WGA	AAC3639	-	3/31/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-7A	34.8	WGA	MM97061G7AM	-	6/13/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-7A	34.8	WGA	MM98051G7AM	-	5/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCO-8	84	WGA	WG6103237071	-	3/23/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6105227071	-	5/22/1961	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6110127071	-	10/12/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6209067071	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6212047071	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6305217071	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6506087071	-	6/8/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6509017071	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6511227071	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6608247071	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6611167071	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6705027071	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6712067071	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6804307071	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6810077071	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6906027071	-	6/2/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6906047071	-	6/4/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG6909087071	-	9/8/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7001017071	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7001127071	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7003177071	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7006237071	-	6/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7009237071	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7012227071	-	12/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7201017071	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7206097071	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7208317071	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7211067071	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7302267071	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7306077071	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7309277071	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7504117071	-	4/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCO-8	84	WGA	WG7509307071	-	9/30/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCO-8	84	WGA	WG7604097071	-	4/9/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8.2	70	WGA	WG6209067081	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8.2	70	WGA	WG6212047081	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCO-8.2	70	WGA	WG6305217081	-	5/21/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOBT-4.4	485.4	WGI	EU05030G44M01	-	3/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOBT-4.4	485.4	WGI	EU05050G44M01	-	6/8/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOBT-4.4	485.4	WGI	FU05030G44M01	-	3/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOBT-4.4	485.4	WGI	FU05050G44M01	-	6/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOBT-4.4	485.4	WGI	GU05050G44M01	-	6/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOBT-4.4	485.4	WGI	GW05-03-51696	-	5/21/2003	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCOBT-4.4	485.4	WGI	GWM4-02-45565	-	4/22/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	x	–
Unfiltered	MCOBT-4.4	485.4	WGI	GWM4-02-45565-1	-	4/22/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOBT-4.4	485.4	WGI	GWM4-03-50310	-	1/28/2003	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MCOBT-4.4	485.4	WGI	GWM4-05-56041	-	10/14/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCOBT-4.4	485.4	WGI	GWM4-05-56042	FD	10/14/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOI-4	499	WGI	EU05050GMC401	-	6/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-4	499	WGI	EU05090GMC401	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-4	499	WGI	FU05050GMC401	-	6/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-4	499	WGI	FU05090GMC401	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-4	499	WGI	GU05050GMC401	-	6/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCOI-4	499	WGI	GU05090GMC401	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCOI-5	689	WGI	EU05050GMC501	-	6/9/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOI-5	689	WGI	EU05090GMC501	-	9/9/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-5	689	WGI	FU05050GMC501	-	6/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-5	689	WGI	FU05090GMC501	-	9/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-5	689	WGI	GU05050GMC501	-	6/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCOI-5	689	WGI	GU05090GMC501	-	9/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MCOI-6	686	WGI	EU05050GMC601	-	6/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOI-6	686	WGI	EU05050GMC690	FD	6/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOI-6	686	WGI	EU05090GMC601	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MCOI-6	686	WGI	EU05090GMC690	FD	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-6	686	WGI	FU05050GMC601	-	6/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-6	686	WGI	FU05090GMC601	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCOI-6	686	WGI	GU05050GMC601	-	6/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCOI-6	686	WGI	GU05050GMC690	FD	6/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCOI-6	686	WGI	GU05090GMC601	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCOI-6	686	WGI	GU05090GMC690	FD	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MCOI-8	686	WGI	EU05060GMC801	-	6/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-8	686	WGI	FU05060GMC801	-	6/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-8	686	WGI	GU05060GMC801	-	6/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCOI-8	686	WGI	UU05060GMC801	-	6/16/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.2	0	WS	WS6605247091	-	5/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.8	0	WS	WS6509017101	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.8	0	WS	WS6605247101	-	5/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.8	0	WS	WS6608247101	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCS-3.8	0	WS	WS6611167101	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.8	0	WS	WS6705027101	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.8	0	WS	WS6810077101	-	10/7/1968	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6509017111	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6601167111	-	1/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6608247111	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6611167111	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6705027111	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6710067111	-	10/6/1967	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6712067111	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6804307111	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6810077111	-	10/7/1968	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS6909087111	-	9/8/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7003177111	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7009237111	-	9/23/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7103087111	-	3/8/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7106037111	-	6/3/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7109137111	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7112067111	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7203037111	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7206097111	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7208067111	-	8/6/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MCS-3.9	0	WS	WS7208317111	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7211067111	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7302267111	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7306077111	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7309277111	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7604127111	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7607167111	-	7/16/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7703237111	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7803167111	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS7809257111	-	9/25/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCS-3.9	0	WS	WS8002197111	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MCWB-6.5E	35	WGA	9808WG3451	-	8/24/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MCWB-7.7B	55	WGA	9808WG3531	-	8/26/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MO-24786	0	WS	EU0504PWF1E01	-	4/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24786	0	WS	EU0509PWF1E01	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24786	0	WS	FU0509PWF1E01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24786	0	WS	GU0504PWF1E01	-	4/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MO-24786	0	WS	GU0509PWF1E01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MO-24786	0	WS	UU0504PWF1E01	-	4/20/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24787	0	WS	CAMO-05-61172	-	7/26/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x
Unfiltered	MO-24787	0	WS	EU05040PW1E01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24787	0	WS	EU05090PW1E01	-	9/7/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24787	0	WS	EU05090PW1E90	FD	9/7/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24787	0	WS	FU05090PW1E01	-	9/7/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24787	0	WS	GU05040PW1E01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MO-24787	0	WS	GU05090PW1E01	-	9/7/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MO-24787	0	WS	GU05090PW1E90	FD	9/7/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MO-24787	0	WS	UU05040PW1E01	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24788	0	WS	CAMO-05-61174	-	7/26/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x
Unfiltered	MO-24788	0	WS	EU05040PE1E01	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24788	0	WS	EU05090PE1E01	-	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24788	0	WS	FU05090PE1E01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24788	0	WS	GU05040PE1E01	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MO-24788	0	WS	GU05090PE1E01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MO-24788	0	WS	UU05040PE1E01	-	4/29/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24789	0	WS	CAMO-05-61176	-	7/26/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x
Unfiltered	MO-24789	0	WS	EU05040PW1M01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24789	0	WS	EU05090PW1M01	-	9/8/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24789	0	WS	FU05090PW1M01	-	9/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24789	0	WS	GU05040PW1M01	-	4/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MO-24789	0	WS	GU05090PW1M01	-	9/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MO-24789	0	WS	UU05040PW1M01	-	4/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24790	0	WS	EU05040PE1M01	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24790	0	WS	EU05090PE1M01	-	9/9/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24790	0	WS	FU05090PE1M01	-	9/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24790	0	WS	GU05040PE1M01	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MO-24790	0	WS	GU05090PE1M01	-	9/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MO-24790	0	WS	UU05040PE1M01	-	4/29/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24791	0	WS	EU05040PE2M01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24791	0	WS	EU05090PE2M01	-	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24791	0	WS	FU05090PE2M01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24791	0	WS	GU05040PE2M01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MO-24791	0	WS	GU05090PE2M01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MO-24791	0	WS	UU05040PE2M01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24792	0	WS	CAMO-05-61178	-	8/18/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x
Unfiltered	MO-24792	0	WS	EU0504PW1ST01	-	4/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24792	0	WS	FU0509PW1ST01	-	9/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24792	0	WS	GU0504PW1ST01	-	4/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–
Unfiltered	MO-24792	0	WS	GU0505PW1ST01	-	5/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–
Unfiltered	MO-24792	0	WS	GU0509PW1ST01	-	9/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	–	–
Unfiltered	MO-24792	0	WS	UU0504PW1ST01	-	4/26/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24793	0	WS	EU0504PE2ST01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24793	0	WS	EU0509PE2ST01	-	9/8/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24793	0	WS	FU0509PE2ST01	-	9/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MO-24793	0	WS	GU0504PE2ST01	-	4/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	MO-24793	0	WS	GU0509PE2ST01	-	9/8/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	MO-24793	0	WS	UU0504PE2ST01	-	4/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	MO-24794	0	WS	CAMO-05-61180	-	8/18/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MO-24795	0	WS	CAMO-05-61166	-	8/18/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x
Unfiltered	MO-24808	0	WS	CAMO-05-61168	FD	7/26/2005	–	x	–	–	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	–	–	–	–	x	–	–	–
Unfiltered	MO-24808	0	WS	CAMO-05-61170	-	7/26/2005	x	x	x	x	x	–	–	–	x	–	–	x	x	x	x	x	x	x	x	–	x	–	–	–	x	x	–	x
Unfiltered	Mort PRB Apatite Cell 10	0	WGA	GU0406PBA1001	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Apatite Cell 4	0	WGA	GU04060PBA401	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Apatite Cell 8	0	WGA	FN04030PRBA01	-	3/30/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mort PRB Apatite Cell 8	0	WGA	GU04030PRBA01	-	3/30/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Apatite Cell 8	0	WGA	GU04060PBA801	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Bio Cell 3	0	WGA	GU04060PBB301	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Bio Cell 7	0	WGA	GU04060PBB701	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Bio Cell 9	0	WGA	FN04030PRBB01	-	3/30/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mort PRB Bio Cell 9	0	WGA	GU04030PRBB01	-	3/30/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Bio Cell 9	0	WGA	GU04060PBB901	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Gravel Cell 11	0	WGA	FN04030PRBG01	-	3/30/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mort PRB Gravel Cell 11	0	WGA	GU04030PRBG01	-	3/30/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Gravel Cell 11	0	WGA	GU0406PBG1101	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Gravel Cell 12	0	WGA	GU0406PBG1201	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Gravel Cell 6	0	WGA	GU04060PBG601	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Limestone Cell 13	0	WGA	GU0406PBL1301	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Limestone Cell 14	0	WGA	GU0406PBL1401	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mort PRB Limestone Cell 5	0	WGA	GU04060PBL501	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7404WGS1GM	-	4/17/1974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7407WGS1GM	-	7/31/1974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7604WGS1GM	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7610WGS1GM	-	10/21/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	9706WGS1GM	-	6/3/1997	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Mortandad at GS-1	0	WS	6209WSS1GM	-	9/6/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6212WSS1GM	-	12/4/1962	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6509WSS1GM	-	9/1/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6511WSS1GM	-	11/22/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6608WSS1GM	-	8/24/1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6611WSS1GM	-	11/16/1966	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6705WSS1GM	-	5/2/1967	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6712WSS1GM	-	12/6/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6804WSS1GM	-	4/30/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6810WSS1GM	-	10/7/1968	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6906WSS1GM	-	6/2/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	6909WSS1GM	-	9/5/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7003WSS1GM	-	3/17/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7004WSS1GM	-	4/24/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7006WSS1GM	-	6/22/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7007WSS1GM	-	7/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7009WSS1GM	-	9/24/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7011WSS1GM	-	11/17/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7101WSS1GM	-	1/1/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7102WSS1GM	-	2/12/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7103WSS1GM	-	3/15/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7109WSS1GM	-	9/13/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7112WSS1GM	-	12/6/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7201WSS1GM	-	1/1/1972	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7203WSS1GM	-	3/3/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7206WSS1GM	-	6/9/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7208WSS1GM	-	8/31/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7211WSS1GM	-	11/6/1972	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7302WSS1GM	-	2/26/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7304WSS1GM	-	4/19/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7305WSS1GM	-	5/14/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7306WSS1GM	-	6/7/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7309WSS1GM	-	9/27/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7404WSS1GM	-	4/17/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Mortandad at GS-1	0	WS	7407WSS1GM	-	7/31/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7410WSS1GM	-	10/24/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7604WSS1GM	-	4/12/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7607WSS1GM	-	7/16/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7610WSS1GM	-	10/22/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7703WSS1GM	-	3/23/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7711WSS1GM	-	11/17/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7803WSS1GM	-	3/16/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7809WSS1GM	-	9/25/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7904WSS1GM	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	7910WSS1GM	-	10/17/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8002WSS1GM	-	2/19/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8010WSS1GM	-	10/8/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8104WSS1GM	-	4/2/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8110WSS1GM	-	10/26/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8204WSS1GM	-	4/21/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8211WSS1GM	-	11/15/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8301WSS1GM	-	1/1/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8303WSS1GM	-	3/29/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8310WSS1GM	-	10/31/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8404WSS1GM	-	4/10/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8409WSS1GM	-	9/19/1984	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8504WSS1GM	-	4/10/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8509WSS1GM	-	9/23/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8603WSS1GM	-	3/3/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8609WSS1GM	-	9/15/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8703WSS1GM	-	3/24/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8711WSS1GM	-	11/6/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8804WSS1GM	-	4/7/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	8904WSS1GM	-	4/26/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	9005WSS1GM	-	5/8/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	9108WSS1GM	-	8/28/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	9210WSS1GM	-	10/29/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	9307WSS1GM	-	7/19/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Mortandad at GS-1	0	WS	9406WSS1GM	-	6/23/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	BC00081W1SG	-	8/16/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	CAMO-00-0016	-	7/11/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	CC00051W1SG	-	5/3/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	CC00081W1SG	-	8/16/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	CM99051W1SG	-	5/27/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	GU01041W1SG	-	4/18/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	MM96081W1SG	-	8/5/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	MM97061W1SG	-	6/3/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	Mortandad at GS-1	0	WS	MM97062W1SG	-	6/3/1997	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	Mortandad at GS-1	0	WS	MM98081W1SG	-	8/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	MNM95060076	-	7/28/1995	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	MNM95070076	-	7/28/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	PC00081W1SG	-	8/16/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS6608247131	-	8/24/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS6611167131	-	11/16/1966	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS6705027131	-	5/2/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS7001012121	-	1/1/1970	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS7001122121	-	1/12/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS7012012121	-	12/1/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS7012212121	-	12/21/1970	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS7106022121	-	6/2/1971	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at GS-1	0	WS	WS7106032121	-	6/3/1971	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande	0	WS	WS6706277341	-	6/27/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	7303WSS11M	-	3/18/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	7309WSS11M	-	9/11/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	7311WSS11M	-	11/15/1973	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	7410WSS11M	-	10/1/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	7709WSS11M	-	9/13/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	7809WSS11M	-	9/19/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	7911WSS11M	-	11/1/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8010WSS11M	-	10/7/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8209WSS11M	-	9/27/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8309WSS11M	-	9/20/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8409WSS11M	-	9/24/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8509WSS11M	-	9/24/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8610WSS11M	-	10/29/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8710WSS11M	-	10/6/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8801WSS11M	-	1/1/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	8910WSS11M	-	10/6/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	9010WSS11M	-	10/1/1990	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	9110WSS11M	-	10/7/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	9209WSS11M	-	9/8/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	9310WSS11M	-	10/12/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	FU02100WGRM01	-	11/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	FU03080WGRM01	-	10/6/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	GC00091WGRM	-	9/25/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	GU02100WGRM01	-	11/6/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	GU03020WGRM01	-	2/25/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	GU03080WGRM01	-	10/6/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	MM96101WGRM	-	10/7/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	MM97091WGRM	-	9/11/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	MM98091WGRM	-	9/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	MNM95090120	-	9/11/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	Mortandad at Rio Grande (A-11)	0	WS	UU03020WGRM01	-	2/25/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	FU02050W20001	-	5/28/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	FU03070W20001	-	7/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	FU04060W20001	-	6/9/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	GU02050W20001	-	5/28/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	GU02050W20090	FD	5/28/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	GU03070W20001	-	7/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	GU03070W20090	FD	7/30/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	GU04060W20001	-	6/9/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	Mortandad below Effluent Canyon	0	WS	GU05040P20001	-	4/29/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MT-1	39	WGA	EU05040G1TM01	-	4/22/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MT-1	39	WGA	EU05090G1TM01	-	9/16/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-1	39	WGA	FU05040G1TM01	-	4/22/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-1	39	WGA	FU05090G1TM01	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-1	39	WGA	GU05040G1TM01	-	4/22/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MT-1	39	WGA	GU05090G1TM01	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MT-1	39	WGA	UU05040G1TM01	-	4/22/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MT-3	44	WGA	9808WGG3TM	-	8/27/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MT-3	44	WGA	EU05040G3TM01	-	4/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	MT-3	44	WGA	EU05090G3TM01	-	9/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-3	44	WGA	FU05040G3TM01	-	4/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-3	44	WGA	FU05090G3TM01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-3	44	WGA	GU02031G3TM-EQB	-	3/25/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–
Unfiltered	MT-3	44	WGA	GU05040G3TM01	-	4/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	–
Unfiltered	MT-3	44	WGA	GU05090G3TM01	-	9/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	–
Unfiltered	MT-3	44	WGA	MM98081G3TM	-	9/4/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	–
Unfiltered	MT-3	44	WGA	MM99111G3TM	-	11/9/1999	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MT-3	44	WGA	UU05040G3TM01	-	4/20/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MT-4	54	WGA	9401WGG4TM	-	1/1/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	MT-4	54	WGA	9808WGG4TM	-	8/26/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–
Unfiltered	MT-4	54	WGA	AAC3609	-	3/27/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-4	54	WGA	AAC3610	-	3/27/1995	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	MT-4	54	WGA	EU05090G4TM01	-	9/16/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-4	54	WGA	FU05090G4TM01	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	MT-4	54	WGA	GU05090G4TM01	-	9/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	MT-4	54	WGA	MM98051G4TM	-	5/14/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	2312705	-	9/27/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	2312715	-	9/27/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	2312725	-	9/27/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	2312735	-	9/27/2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	8208WGG5MP	-	8/4/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	8602WGG5MP	-	2/4/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	8702WGG5MP	-	2/23/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	8801WGG5MP	-	1/1/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	8903WGG5MP	-	3/14/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	9004WGG5MP	-	4/12/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	9105WGG5MP	-	5/9/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	9208WGG5MP	-	8/18/1992	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	9308WGG5MP	-	8/18/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	9405WGG5MP	-	5/24/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	9706WGG5MP	-	6/25/1997	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	AU01101G5MP	-	10/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	AU01111G5MP	-	11/28/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	PM-5	1440	WGR	AU01121G5MP	-	12/15/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	AU01122G5MP	FD	12/15/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	AU02011G5MP	-	1/16/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BB01021G5MP	-	2/14/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BB99111G5MP	-	11/5/1999	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BB99121G5MP	-	12/13/1999	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BM00021G5MP	-	2/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BM0111G5MP	-	11/15/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01041G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01042G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01043G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01044G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01051G5MP	-	5/9/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01061G5MP	-	6/13/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01071G5MP	-	7/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01091G5MP	-	9/5/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01092G5MP	FD	9/5/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01101G5MP	-	10/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01111G5MP	-	11/28/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU01121G5MP	-	12/15/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU02011G5MP	-	1/16/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	BU02021G5MP	-	2/23/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	CM00061G5MP	-	6/20/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	CM00081G5MP	-	8/14/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	EM00021G5MP	-	2/14/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FN04030G5MP01	-	3/24/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU02050G5MP01	-	5/18/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU02060G5MP01	-	6/26/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU02080G5MP01	-	8/24/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU02090G5MP01	-	9/25/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU02100G5MP01	-	10/9/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU02110G5MP01	-	11/16/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU03080G5MP01	-	8/21/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU03090G5MP01	-	9/24/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	PM-5	1440	WGR	FU03100G5MP01	-	10/29/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU03120G5MP01	-	12/17/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU04010G5MP01	-	1/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU04020G5MP01	-	2/9/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU04050G5MP01	-	5/20/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU04080G5MP01	-	8/31/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU04110G5MP01	-	11/16/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU05030G5MP01	-	3/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU05050G5MP01	-	5/18/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU05080G5MP01	-	8/17/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	FU05110G5MP01	-	11/16/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GB01021G5MP	-	2/14/2001	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GM00081G5MP	-	8/14/2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GM0111G5MP	-	11/15/2000	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01041G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01042G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01043G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01044G5MP	-	4/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01051G5MP	-	5/9/2001	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01061G5MP	-	6/13/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01071G5MP	-	7/11/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01081G5MP	-	8/8/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01091G5MP	-	9/5/2001	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01092G5MP	FD	9/5/2001	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01101G5MP	-	10/24/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01111G5MP	-	11/28/2001	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU01121G5MP	-	12/15/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02011G5MP	-	1/16/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02021G5MP	-	2/23/2002	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02031G5MP	-	3/14/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02041G5MP	-	4/18/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02050G5MP01	-	5/18/2002	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02050G5MP02	-	5/18/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02060G5MP01	-	6/26/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	PM-5	1440	WGR	GU02070G5MP01	-	7/16/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02080G5MP01	-	8/24/2002	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02090G5MP01	-	9/25/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02100G5MP01	-	10/9/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU02110G5MP01	-	11/16/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03040G5MP01	-	4/9/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03050G5MP01	-	5/14/2003	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03060G5MP01	-	6/18/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03070G5MP01	-	7/23/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03080G5MP01	-	8/21/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03080G5MP02	-	8/21/2003	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03090G5MP01	-	9/24/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03100G5MP01	-	10/29/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03100G5MP02	-	10/29/2003	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03110G5MP01	-	11/24/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU03110G5MP02	-	11/24/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	x	–
Unfiltered	PM-5	1440	WGR	GU03120G5MP01	-	12/17/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU04010G5MP01	-	1/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU04020G5MP01	-	2/9/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU04030G5MP01	-	3/24/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU04050G5MP01	-	5/20/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	PM-5	1440	WGR	GU04080G5MP01	-	8/31/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU04110G5MP01	-	11/16/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU05030G5MP01	-	3/23/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU05050G5MP01	-	5/18/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	PM-5	1440	WGR	GU05080G5MP01	-	8/17/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	GU05110G5MP01	-	11/16/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MB01021G5MP	-	2/14/2001	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM00021G5MP	-	2/14/2000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM96041G5MP	-	4/25/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM97061G5MP	-	6/25/1997	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM98061G5MP	-	6/8/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM98111G5MP	-	11/2/1998	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM98112G5MP	-	11/2/1998	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	PM-5	1440	WGR	MM98113G5MP	-	11/2/1998	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM99031G5MP	-	3/9/1999	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MM99061G5MP	-	6/9/1999	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	MNM95060026	-	6/12/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	NSPM5.02.1009	-	10/9/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	PM00021G5MP	-	2/14/2000	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	PM00061G5MP	-	6/20/2000	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	PM00081G5MP	-	8/14/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	SU06010G5MP01	-	1/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU02021G5MP	-	2/23/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU02050G5MP01	-	5/18/2002	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU03050G5MP01	-	5/14/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU03100G5MP01	-	10/29/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU04050G5MP01	-	5/20/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU04110G5MP01	-	11/16/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU05050G5MP01	-	5/18/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PM-5	1440	WGR	UU05110G5MP01	-	11/16/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PRB-MW-01	0	WGA	GU0403MO-2201	-	3/30/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PRB-MW-01	0	WGA	GU0406PRBW101	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PRB-MW-01	0	WGA	CAMO-03-52189	-	8/13/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PRB-MW-01	0	WGA	CAMO-03-52519	-	9/17/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PRB-MW-02	0	WGA	FN0403PRBW201	-	3/30/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	PRB-MW-02	0	WGA	GU0403PRBW201	-	3/30/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PRB-MW-02	0	WGA	GU0406PRBW201	-	6/8/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	PRB-MW-02	0	WGA	CAMO-03-52185	-	8/13/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	EU05050G01R01	-	5/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	EU05080G01R01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	EU05080G01R02	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	EU05080G01R90	FD	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	EU05110G01R01	-	11/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	FU05050G01R01	-	5/19/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	FU05080G01R02	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	FU05110G01R01	-	11/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	GU05050G01R01	-	5/19/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	R-1	1031.1	WGR	GU05080G01R01	-	9/12/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-1	1031.1	WGR	GU05080G01R90	FD	9/12/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-1	1031.1	WGR	GU05110G01R01	-	11/28/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-1	1031.1	WGR	UU05050G01R01	-	5/19/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	UU05080G01R02	-	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	UU05080G01R90	FD	9/12/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-1	1031.1	WGR	UU05110G01R01	-	11/28/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	EU05030G31R01	-	3/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	EU05030G31R90	FD	3/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	EU05050G13R01	-	5/26/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	EU05080G13R01	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	EU05080G13R02	-	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	EU05080G13R90	FD	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	FU04060G31R01	-	6/11/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	FU05030G31R01	-	3/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	FU05050G13R01	-	5/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	FU05080G13R02	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	GU03120G31R01	-	12/9/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	GU04060G31R01	-	6/11/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-13	958.3	WGR	GU05050G13R01	-	5/26/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	GU05080G13R01	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	GU05080G13R90	FD	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	GW05-03-51693	-	5/22/2003	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-13	958.3	WGR	GW13-02-45567	-	4/18/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–
Unfiltered	R-13	958.3	WGR	GW13-02-45568	-	4/18/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	GW13-02-46374	-	7/3/2002	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-13	958.3	WGR	GW13-02-49492	-	10/28/2002	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-13	958.3	WGR	GW13-03-50449	-	1/27/2003	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-13	958.3	WGR	UU03120G31R01	-	12/9/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	UU04060G31R01	-	6/11/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	UU05050G13R01	-	5/26/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	UU05080G13R02	-	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-13	958.3	WGR	UU05080G13R90	FD	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	EU0402G14R101	-	2/10/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	R-14	1204.5	WGR	EU0407G14R101	-	7/14/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	EU0410G14R101	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	EU0505G14R101	-	5/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	FU0505G14R101	-	5/11/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	GU0402G14R101	-	2/9/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-14	1204.5	WGR	GU0407G14R101	-	7/12/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-14	1204.5	WGR	GU0410G14R101	-	10/28/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-14	1204.5	WGR	GU0505G14R101	-	5/11/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-14	1204.5	WGR	SU0601G14R101	-	1/24/2006	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	UU0402G14R101	-	2/9/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	UU0407G14R101	-	7/12/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	UU0410G14R101	-	10/28/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1204.5	WGR	UU0505G14R101	-	5/10/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	EU0402G14R201	-	2/11/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	EU0407G14R201	-	7/12/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	EU0411G14R201	-	11/3/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	EU0505G14R201	-	5/13/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	FU0505G14R201	-	5/12/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	GU0402G14R201	-	2/11/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–
Unfiltered	R-14	1288.5	WGR	GU0402G14R202	-	2/18/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	x	–	–	–	x	–	–	x	–
Unfiltered	R-14	1288.5	WGR	GU0407G14R201	-	7/14/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-14	1288.5	WGR	GU0411G14R201	-	11/3/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-14	1288.5	WGR	GU0505G14R201	-	5/12/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-14	1288.5	WGR	UU0402G14R201	-	2/11/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	UU0407G14R201	-	7/14/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-14	1288.5	WGR	UU0505G14R201	-	5/13/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	CAMO-00-0003	-	2/24/2000	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-15	958.6	WGR	EU04110G15R01	-	11/19/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	EU05030G15R01	-	3/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	EU05050G15R01	-	5/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	EU05050G15R02	-	5/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	EU05050G15R90	FD	5/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	EU05050G15R91	FD	5/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	EU05080G15R01	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	R-15	958.6	WGR	EU05080G15R02	-	8/31/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	EU05080G15R90	FD	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	FU04050G15R01	-	6/10/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	FU05030G15R01	-	3/9/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	FU05050G15R01	-	5/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	FU05080G15R01	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	FU05080G15R02	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	GU03120G15R01	-	12/15/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	GU03120G15R90	FD	12/15/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	GU04050G15R01	-	6/10/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	R-15	958.6	WGR	GU04050G15R90	FD	6/10/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	R-15	958.6	WGR	GU05050G15R01	-	5/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	R-15	958.6	WGR	GU05050G15R90	FD	5/25/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	R-15	958.6	WGR	GU05080G15R01	-	8/31/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	x	–
Unfiltered	R-15	958.6	WGR	GWMO-00-0002	-	10/10/2000	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	R-15	958.6	WGR	RW15-01-0001	-	2/15/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	x	–
Unfiltered	R-15	958.6	WGR	RW15-01-0003	-	5/22/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	x	–
Unfiltered	R-15	958.6	WGR	UU03120G15R01	-	12/15/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	UU03120G15R90	FD	12/15/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	UU04050G15R01	-	6/10/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	UU04050G15R90	FD	6/10/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	UU04110G15R01	-	11/19/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	UU05050G15R01	-	5/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	UU05050G15R90	FD	5/25/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-15	958.6	WGR	UU05080G15R02	-	8/31/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	EU05050G28R01	-	5/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	EU05080G28R01	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	EU05080G28R02	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	EU05110G28R01	-	11/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	FU05050G28R01	-	5/20/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	FU05080G28R02	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	FU05110G28R01	-	11/10/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	GU05050G28R01	-	5/20/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–
Unfiltered	R-28	946.2	WGR	GU05080G28R01	-	9/1/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	x	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	R-28	946.2	WGR	GU05110G28R01	-	11/10/2005	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	R-28	946.2	WGR	UU05050G28R01	-	5/20/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	UU05080G28R02	-	9/1/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-28	946.2	WGR	UU05110G28R01	-	11/10/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-33	995.5	WGR	EU0506G33R101	-	6/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-33	995.5	WGR	EU0509G33R101	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-33	995.5	WGR	FU0506G33R101	-	6/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-33	995.5	WGR	FU0509G33R101	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-33	995.5	WGR	GU0506G33R101	-	6/27/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	R-33	995.5	WGR	GU0509G33R101	-	9/14/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	R-33	995.5	WGR	UU0506G33R101	-	6/27/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-33	995.5	WGR	UU0509G33R101	-	9/14/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-33	1112.4	WGR	EU0506G33R201	-	6/24/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-33	1112.4	WGR	EU0509G33R201	-	9/15/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-33	1112.4	WGR	FU0506G33R201	-	6/24/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-33	1112.4	WGR	FU0509G33R201	-	9/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	R-33	1112.4	WGR	GU0506G33R201	-	6/24/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	R-33	1112.4	WGR	GU0509G33R201	-	9/15/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	x	–	–	x	–
Unfiltered	R-33	1112.4	WGR	UU0506G33R201	-	6/24/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	R-33	1112.4	WGR	UU0509G33R201	-	9/15/2005	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	TA-50	0	WS	WS9808199261	-	8/19/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–
Unfiltered	TA-50 OUTFALL	0	WS	WS9710299271	-	10/29/1997	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	TA-50 OUTFALL	0	WS	WS9808289271	-	8/28/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Ten Site Canyon	0	WS	WS7903139461	-	3/13/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	6012WGG8WT	-	12/16/1960	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	6111WGG8WT	-	11/30/1961	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	6311WGG8WT	-	11/15/1963	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	6509WGG8WT	-	9/24/1965	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	6702WGG8WT	-	2/14/1967	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	6902WGG8WT	-	2/14/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	6911WGG8WT	-	11/6/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7401WGG8WT	-	1/1/1974	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7404WGG8WT	-	4/23/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7408WGG8WT	-	8/2/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Test Well 8	953	WGR	7410WGG8WT	-	10/22/1974	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7503WGG8WT	-	3/11/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7506WGG8WT	-	6/24/1975	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7510WGG8WT	-	10/16/1975	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7604WGG8WT	-	4/12/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7607WGG8WT	-	7/14/1976	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7610WGG8WT	-	10/13/1976	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7703WGG8WT	-	3/11/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7711WGG8WT	-	11/16/1977	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7803WGG8WT	-	3/22/1978	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7809WGG8WT	-	9/27/1978	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7904WGG8WT	-	4/2/1979	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	7909WGG8WT	-	9/13/1979	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8003WGG8WT	-	3/5/1980	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8010WGG8WT	-	10/3/1980	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8101WGG8WT	-	1/1/1981	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8104WGG8WT	-	4/6/1981	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8109WGG8WT	-	9/21/1981	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8204WGG8WT	-	4/8/1982	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8211WGG8WT	-	11/1/1982	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8305WGG8WT	-	5/26/1983	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8310WGG8WT	-	10/13/1983	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8403WGG8WT	-	3/20/1984	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8409WGG8WT	-	9/18/1984	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8504WGG8WT	-	4/3/1985	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8509WGG8WT	-	9/16/1985	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8602WGG8WT	-	2/27/1986	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8609WGG8WT	-	9/8/1986	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8703WGG8WT	-	3/16/1987	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8711WGG8WT	-	11/3/1987	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8801WGG8WT	-	1/1/1988	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	8903WGG8WT	-	3/29/1989	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9005WGG8WT	-	5/2/1990	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9109WGG8WT	-	9/23/1991	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Test Well 8	953	WGR	9312WGG8WT	-	12/5/1993	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9410WGG8WT	-	10/21/1994	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9411WGG8WT	-	11/3/1994	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9602WGG8WT	-	2/13/1996	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9609WGG8WT	-	9/30/1996	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9611WGG8WT	-	11/15/1996	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	9809WGG8WT	-	9/2/1998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	AU01111G8WT	-	11/6/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	AU01112G8WT	FD	11/6/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	BM00051G8WT	-	5/2/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	CM00051G8WT	-	5/2/2000	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	EU05030G8WT01	-	3/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	EU05080G8WT01	-	10/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	FU02050G8WT01	-	5/17/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	FU02080G8WT01	-	8/21/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	FU03070G8WT01	-	7/31/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	FU04060G8WT01	-	6/16/2004	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	FU05030G8WT01	-	3/28/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	FU05080G8WT01	-	10/3/2005	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GM00091G8WT	-	9/13/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GM00121G8WT	-	12/11/2000	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU01031G8WT	-	3/22/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU01061G8WT	-	6/4/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–
Unfiltered	Test Well 8	953	WGR	GU01091G8WT	-	7/30/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU01101G8WT	-	10/5/2001	–	–	–	–	–	–	–	x	–	–	x	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU01111G8WT	-	11/6/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU01112G8WT	-	11/6/2001	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU02050G8WT01	-	5/17/2002	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU02050G8WT90	FD	5/17/2002	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU02080G8WT01	-	8/21/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU02110G8WT01	-	11/18/2002	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU03070G8WT01	-	7/31/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU03070G8WT90	FD	7/31/2003	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	GU04060G8WT01	-	6/16/2004	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	x	–

Table C-2.0-2 (continued)

Field Prep	Location ID	Port Depth (ft)	Media Code	Sample ID	Field QC Type Code	Collection Date	ALK	Am-241	Ammonia	Anion	CN	Diox/Fur	Gamma Spec	GENINORG	Gross AB	HERB	HEXP	Iso Pu	Iso Ra	Iso U	Metals	NVC	PAH	PCB	PEST	PEST/PCB	Phosphorus	Rad	Sr-90	SVOA	SVOC	TOC	VOA	Wet Chem
Unfiltered	Test Well 8	953	WGR	MM96071G8WT	-	7/23/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MM96072G8WT	-	7/23/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MM96101G8WT	-	9/30/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MM96111G8WT	-	11/15/1996	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MM98081G8WT	-	9/2/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MM98082G8WT	-	9/2/1998	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–	x	–	x	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MM99081G8WT	-	8/3/1999	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–
Unfiltered	Test Well 8	953	WGR	MM99082G8WT	-	8/3/1999	–	–	–	–	–	–	–	x	–	–	x	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	x	–
Unfiltered	Test Well 8	953	WGR	MNM95060070	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070001	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070002	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070003	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070004	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070005	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070006	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070007	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070008	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070009	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070010	-	7/17/1995	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM95070031	-	7/17/1995	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	MNM9601006U	-	1/29/1996	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	SU06010G8WT01	-	1/24/2006	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	UU03070G8WT01	-	7/31/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	UU03070G8WT90	FD	7/31/2003	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	UU04060G8WT01	-	6/16/2004	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	WG6901103101	-	1/10/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	WG6901143101	-	1/14/1969	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	x	–	–	–	–	–	–
Unfiltered	Test Well 8	953	WGR	WG6901193101	-	1/19/1969	–	–	–	–	–	–	–	x	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

[a] – = Analysis was not performed.

[b] x = Analysis was performed.

[c] FD = Field duplicate.

Table C-2.0-3
Mortandad Canyon Watershed Core Samples Collected

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
B-1	10	10.6	CAMO-05-58394	QBT2	-	2/14/2005	x[a]	x	–[b]	–	–	x	x	x	–	x	–	–
B-1	10	10.95	CAMO-04-55348	QBT2	-	12/6/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	20	20.75	CAMO-04-55349	QBT2	-	12/6/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	20.75	21.4	CAMO-05-58395	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	27.5	28.1	CAMO-05-58396	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	30	30.75	CAMO-04-55350	QBT2	-	12/6/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	40	40.75	CAMO-04-55351	QBT2	-	12/6/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	40.75	41.4	CAMO-05-58397	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	50	50.75	CAMO-04-55352	QBT2	-	12/6/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	50.75	51.4	CAMO-05-58398	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	60	60.75	CAMO-04-55353	QBT2	-	12/6/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	60.75	61.4	CAMO-05-58399	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	70	70.75	CAMO-04-55354	QBT2	-	12/6/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	70.75	71.4	CAMO-05-58400	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	80	80.75	CAMO-04-55355	QBT2	-	12/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	80.85	82.2	CAMO-05-58401	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	80.85	82.2	CAMO-05-58417	QBT2	FD[c]	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	90	90.75	CAMO-04-55356	QBT2	-	12/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	90.75	91.4	CAMO-05-58402	QBT2	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-1	100	100.75	CAMO-04-55357	QBT1V	-	12/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-1	100.75	101.3	CAMO-05-58403	QBT1V	-	2/14/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	10	10.8	CAMO-04-55362	QBT2	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	12	12.6	CAMO-05-58404	QBT2	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	19.5	20.3	CAMO-04-55363	QBT2	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	20.3	20.9	CAMO-05-58405	QBT2	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	29.5	30.3	CAMO-04-55364	QBT2	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	30.3	30.9	CAMO-05-58406	QBT2	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	39.5	40.3	CAMO-04-55365	QBT1V	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	40.3	40.9	CAMO-05-58407	QBT1V	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	49.5	50.3	CAMO-04-55366	QBT1V	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	50.3	50.9	CAMO-05-58408	QBT1V	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	59.5	60.3	CAMO-04-55367	QBT1V	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	60.3	61.5	CAMO-05-58409	QBT1V	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	60.3	61.5	CAMO-05-58414	QBT1V	FD	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	69.5	70.3	CAMO-04-55368	QBT1V	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	70.3	70.9	CAMO-05-58410	QBT1V	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	79.5	80.3	CAMO-04-55369	QBT1G	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	80.3	80.9	CAMO-05-58411	QBT1G	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	89.5	90.3	CAMO-04-55370	QBT1G	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	90.3	90.9	CAMO-05-58412	QBT1G	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-2	99.5	100.3	CAMO-04-55371	QBT1G	-	12/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-2	100.3	100.9	CAMO-05-58413	QBT1G	-	2/15/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	9.8	10.5	CAMO-05-58249	QAL	-	2/3/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-5	10.6	11.3	CAMO-04-55334	QAL	-	11/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	19.5	20.2	CAMO-05-58250	QAL	-	2/3/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-5	21.2	21.9	CAMO-04-55335	QAL	-	11/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	30	30.7	CAMO-05-58251	QAL	-	2/3/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-5	32.3	33	CAMO-04-55336	QBT1G	-	11/5/2004	–	–	–	–	x	–	–	–	–	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
B-5	40.5	41.1	CAMO-05-58252	QBT1G	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	41.5	42.3	CAMO-04-55337	QBT1G	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	49.9	50.5	CAMO-05-58253	QBT1G	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	50.6	51.4	CAMO-04-55338	QBT1G	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	59.4	60.6	CAMO-05-58254	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	59.4	60.6	CAMO-05-58259	QBT1G	FD	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	60.6	61.4	CAMO-04-55339	QBT1G	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	69.9	70.5	CAMO-05-58255	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	70.6	71.3	CAMO-04-55340	QBT1G	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	80	80.6	CAMO-05-58256	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	80.7	81.4	CAMO-04-55341	QBT1G	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	89.5	90.1	CAMO-05-58257	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	90.2	90.9	CAMO-04-55342	QBT1G	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-5	99.5	100	CAMO-05-58258	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-5	100.1	100.9	CAMO-04-55343	QBT1G	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	9.5	10.25	CAMO-04-55320	QAL	-	10/27/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	11.5	12.3	CAMO-05-58261	QAL	-	2/4/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-6	19.7	20.4	CAMO-05-58262	QAL	-	2/4/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-6	20.5	21.2	CAMO-04-55321	QAL	-	10/27/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	29.5	30.1	CAMO-05-58263	QAL	-	2/4/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-6	29.5	30.1	CAMO-05-58269	QAL	FD	2/4/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-6	30.25	31	CAMO-04-55322	QBT1G	-	10/27/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	40.1	40.7	CAMO-05-58264	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-6	40.8	41.4	CAMO-04-55323	QBT1G	-	11/2/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	50.1	50.7	CAMO-05-58265	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-6	50.8	51.6	CAMO-04-55324	QBT1G	-	11/2/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	59.7	60.3	CAMO-05-58266	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-6	60.4	61.1	CAMO-04-55325	QBT1G	-	11/2/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	70	70.6	CAMO-05-58267	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-6	70.7	71.5	CAMO-04-55326	QBT1G	-	11/2/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-6	79.9	80.5	CAMO-05-58268	QBT1G	-	2/4/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-6	80.6	81.3	CAMO-04-55327	QBT1G	-	11/2/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	9.3	10	CAMO-05-58271	QAL	-	2/7/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-7	10	10.7	CAMO-04-55307	QAL	-	11/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	19.5	20.2	CAMO-05-58272	QAL	-	2/7/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-7	20.3	21	CAMO-04-55308	QAL	-	11/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	28.3	29	CAMO-04-55309	QAL	-	11/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	30.2	30.9	CAMO-05-58273	QAL	-	2/7/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-7	40	40.7	CAMO-05-58274	QAL	-	2/7/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-7	40.8	41.5	CAMO-04-55310	QAL	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	49	50.4	CAMO-05-58275	QBT1G	-	2/7/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-7	49	50.4	CAMO-05-58281	QBT1G	FD	2/7/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-7	50.6	51.4	CAMO-04-55311	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	60	60.6	CAMO-05-58276	QBT1G	-	2/7/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-7	60.8	61.5	CAMO-04-55312	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	70	70.6	CAMO-05-58277	QBT1G	-	2/7/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-7	70.8	71.5	CAMO-04-55313	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	80	80.6	CAMO-05-58278	QBT1G	-	2/7/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-7	80.8	81.5	CAMO-04-55314	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
B-7	90	90.6	CAMO-05-58279	QBT1G	-	2/7/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-7	90.8	91.5	CAMO-04-55315	QCT	-	11/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-7	94.9	95.6	CAMO-05-58280	QCT	-	2/7/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	9.3	10	CAMO-04-55280	QAL	-	10/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-8	10	10.7	CAMO-05-57322	QAL	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	19.3	20	CAMO-04-55281	QAL	-	10/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-8	20	20.7	CAMO-05-57323	QAL	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	29.3	30	CAMO-04-55282	QAL	-	10/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-8	30	30.7	CAMO-05-57324	QAL	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	39.3	40	CAMO-04-55283	QAL	-	10/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-8	40	40.7	CAMO-05-57325	QAL	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	71.2	71.9	CAMO-05-57326	QCT	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	75.8	76.6	CAMO-04-55284	QCT	-	10/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-8	79.6	81	CAMO-05-57327	QCT	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	79.6	81	CAMO-05-57333	QCT	FD	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	86.5	87	CAMO-04-55285	QCT	-	10/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-8	89.5	90.3	CAMO-05-57328	QCT	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-8	96.3	97	CAMO-04-55286	QCT	-	10/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-8	100.2	101	CAMO-05-57329	QCT	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	9.3	10	CAMO-04-55264	QAL	-	10/10/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	10	10.7	CAMO-05-57310	QAL	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	19.3	20	CAMO-04-55265	QAL	-	10/10/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	20	20.7	CAMO-05-57311	QAL	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	29.3	30	CAMO-04-55266	QAL	-	10/10/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	30	30.7	CAMO-05-57312	QAL	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	39.3	40	CAMO-04-55267	QAL	-	10/10/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	40	40.7	CAMO-05-57313	QAL	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	40.8	41.5	CAMO-05-57320	QAL	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	49	49.8	CAMO-04-55268	QAL	-	10/10/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	49.5	50.2	CAMO-05-57314	QAL	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	59	59.8	CAMO-04-55269	QAL	-	10/11/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	59.8	60.5	CAMO-05-57315	QAL	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	69.2	69.7	CAMO-04-55270	QCT	-	10/11/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	69.7	70.4	CAMO-05-57316	QCT	-	1/31/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	79.5	80.25	CAMO-04-55271	QCT	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	80.25	81	CAMO-05-57317	QCT	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	89	89.75	CAMO-04-55272	QCT	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	89.75	90.4	CAMO-05-57318	QCT	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-9	99	99.5	CAMO-04-55273	QCT	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-9	99.75	100.4	CAMO-05-57319	QCT	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	9.5	10	CAMO-04-55222	QAL	-	10/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	10	10.8	CAMO-05-57274	QAL	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	19.5	20	CAMO-04-55223	QAL	-	10/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	20	20.8	CAMO-05-57275	QAL	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	29.4	30	CAMO-04-55224	QAL	-	10/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	30	30.8	CAMO-05-57276	QAL	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	39.5	40	CAMO-04-55225	QAL	-	10/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	40	40.8	CAMO-05-57277	QAL	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	49.5	50	CAMO-04-55226	QAL	-	10/4/2004	–	–	–	–	x	–	–	–	–	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
B-10	50	50.8	CAMO-05-57278	QAL	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	59.5	60	CAMO-04-55227	QAL	-	10/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	60	60.8	CAMO-05-57279	QAL	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	69.4	70	CAMO-04-55228	QAL	-	10/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	70	70.8	CAMO-05-57280	QAL	-	1/25/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-10	79.5	80.2	CAMO-04-55229	QAL	-	10/5/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	80.2	81	CAMO-05-57281	QCT	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	89.3	90	CAMO-04-55230	QCT	-	10/5/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	90	90.8	CAMO-05-57282	QCT	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-10	99.3	100	CAMO-04-55231	QCT	-	10/5/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-10	100	100.8	CAMO-05-57283	QCT	-	1/25/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	9.3	10	CAMO-04-55236	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	10	10.7	CAMO-05-57295	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	19.3	20	CAMO-04-55237	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	20	20.7	CAMO-05-57294	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	29.3	30	CAMO-04-55238	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	30	30.7	CAMO-05-57293	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	31.5	32.2	CAMO-05-57296	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	39.3	40	CAMO-04-55239	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	40	40.7	CAMO-05-57292	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	49.3	50	CAMO-04-55240	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	50	50.7	CAMO-05-57291	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	59.3	60	CAMO-04-55241	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	60	60.7	CAMO-05-57290	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	69.3	70	CAMO-04-55242	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	70	70.7	CAMO-05-57289	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	79.3	80	CAMO-04-55243	QAL	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	80	80.6	CAMO-05-57288	QAL	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	89.3	90	CAMO-04-55244	QCT	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	90	90.7	CAMO-05-57287	QCT	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-11	99.3	100	CAMO-04-55245	QCT	-	10/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-11	100	100.6	CAMO-05-57286	QCT	-	1/28/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	8.5	9.2	CAMO-04-55250	QAL	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	9.5	10.2	CAMO-05-57298	QAL	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	18.5	19.2	CAMO-04-55251	QAL	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	19.5	20.2	CAMO-05-57299	QAL	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	28.5	29.2	CAMO-04-55252	QAL	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	30	30.7	CAMO-05-57300	QAL	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	38.7	39.3	CAMO-04-55253	QAL	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	39.5	40.2	CAMO-05-57301	QAL	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	48.8	49.4	CAMO-04-55254	QAL	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	49.5	50.2	CAMO-05-57302	QAL	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	58.75	59.5	CAMO-04-55255	QCT	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	59.5	60.2	CAMO-05-57303	QCT	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	68.8	69.4	CAMO-04-55256	QCT	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	69.5	70.9	CAMO-05-57304	QCT	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	69.5	70.9	CAMO-05-57309	QCT	FD	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	78.5	79.1	CAMO-04-55257	QCT	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	79.5	80.2	CAMO-05-57305	QCT	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
B-12	87.2	87.75	CAMO-04-55258	QCT	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	89.5	90.2	CAMO-05-57306	QCT	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-12	98.7	99.3	CAMO-04-55259	QCT	-	10/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-12	99.5	100.2	CAMO-05-57307	QCT	-	2/10/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	8.8	9.4	CAMO-04-55460	QAL	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	9.4	10.3	CAMO-05-57351	QAL	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	18.1	18.9	CAMO-04-55461	QAL	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	20	20.7	CAMO-05-57352	QAL	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	29.1	29.8	CAMO-04-55462	QAL	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	30	30.7	CAMO-05-57353	QAL	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	38.6	39.3	CAMO-04-55463	QAL	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	40.6	41.3	CAMO-05-57354	QAL	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	51.2	51.9	CAMO-04-55464	QAL	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	51.9	52.6	CAMO-05-57355	QAL	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	59.1	59.9	CAMO-04-55465	QAL	-	10/12/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	60	60.7	CAMO-05-57356	QAL	-	2/1/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	68.1	68.8	CAMO-04-55466	QAL	-	10/14/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	70	70.7	CAMO-05-57357	QCT	-	2/2/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	78.6	79.3	CAMO-04-55467	QCT	-	10/14/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	81	82.4	CAMO-05-57358	QCT	-	2/2/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	81	82.4	CAMO-05-58393	QCT	FD	2/2/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	88	88.7	CAMO-04-55468	QCT	-	10/14/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	90	90.7	CAMO-05-57359	QCT	-	2/2/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	97.1	97.8	CAMO-04-55469	QCT	-	10/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	100	100.7	CAMO-05-57360	QCT	-	2/2/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-14	109.3	110	CAMO-04-55470	QBOF	-	10/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	110	110.6	CAMO-05-57361	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	118.3	119	CAMO-04-55471	QBOF	-	10/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	120	120.6	CAMO-05-57362	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	129.3	130	CAMO-04-55472	QBOF	-	10/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	130	130.6	CAMO-05-57363	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	139.2	139.9	CAMO-04-55473	QBOF	-	10/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	140	140.6	CAMO-05-57364	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	149.3	150	CAMO-04-55474	QBOF	-	10/15/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	150	150.6	CAMO-05-57365	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	159.1	160	CAMO-04-55446	QBOF	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	160	160.6	CAMO-05-57366	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	169.2	170	CAMO-04-55447	QBOF	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	170	170.6	CAMO-05-57367	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	177.9	178.8	CAMO-04-55448	QBOF	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	180	180.6	CAMO-05-58380	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	187.7	188.5	CAMO-04-55449	QBOF	-	11/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	190	190.6	CAMO-05-58381	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	198.9	199.6	CAMO-04-55450	QBOF	-	11/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	200	200.6	CAMO-05-58382	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	208.2	208.9	CAMO-04-55451	QBOF	-	11/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	210.4	211	CAMO-05-58383	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	218.9	219.7	CAMO-04-55452	QBOF	-	11/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	220	220.6	CAMO-05-58384	QBOF	-	2/2/2005	x	x	–	–	–	x	x	x	–	x	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
B-14	227.6	228.3	CAMO-04-55453	QBOF	-	11/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	230	230.6	CAMO-05-58385	QBOF	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	237.7	238.4	CAMO-04-55454	QBOF	-	11/23/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	240	240.6	CAMO-05-58386	QBOF	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	248.7	249.4	CAMO-04-55455	QBOF	-	11/23/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	250	250.6	CAMO-05-58387	QBOF	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	257.5	258.2	CAMO-04-55456	QBOF	-	11/23/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	260	260.6	CAMO-05-58388	QBOF	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	267.2	267.9	CAMO-04-55457	QBOF	-	11/23/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	270	270.6	CAMO-05-58389	QBOF	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	279.3	280	CAMO-04-55458	QBOF	-	11/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-14	280.8	281.4	CAMO-05-58390	QBOF	-	2/3/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-14	283.3	284	CAMO-04-55459	QBOF	-	11/29/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	9.9	10.6	CAMO-05-57334	QAL	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-15	10.75	11.25	CAMO-04-55292	QAL	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	19.5	20.2	CAMO-05-57335	QAL	-	2/8/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-15	20.5	21.5	CAMO-04-55293	QAL	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	29.5	30.1	CAMO-05-57336	QBT1G	-	2/8/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	31.1	31.75	CAMO-04-55294	QBT1G	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	39.5	40.1	CAMO-05-57337	QBT1G	-	2/8/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	40.5	41	CAMO-04-55295	QBT1G	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	49.5	50.1	CAMO-05-57338	QBT1G	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	51.4	52	CAMO-04-55296	QBT1G	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	59.5	60.1	CAMO-05-57339	QBT1G	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	61.25	62	CAMO-04-55297	QBTT	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	69.5	70.2	CAMO-05-57340	QCT	-	2/9/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-15	71.25	71.7	CAMO-04-55298	QCT	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	79.5	80.2	CAMO-05-57341	QCT	-	2/9/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-15	80.5	81.3	CAMO-04-55299	QCT	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	89.5	90.9	CAMO-05-57342	QCT	-	2/9/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-15	89.5	90.9	CAMO-05-57350	QCT	FD	2/9/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-15	91	92	CAMO-04-55300	QCT	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	99.5	100.1	CAMO-05-57343	QBO	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	100.6	101.3	CAMO-04-55301	QBO	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	109.5	110.1	CAMO-05-57344	QBO	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	111.2	111.8	CAMO-04-55302	QBO	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	119.5	120.1	CAMO-05-57345	QBO	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	120.75	121.5	CAMO-04-55303	QBO	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	129.5	130.1	CAMO-05-57346	QBO	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	131	131.75	CAMO-04-55304	QBO	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	139.5	140.1	CAMO-05-57347	QBO	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	141.75	142	CAMO-04-55305	QBO	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-15	149.5	150.1	CAMO-05-57348	QBO	-	2/9/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-15	151	151.75	CAMO-04-55306	QBO	-	10/25/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	7	7.5	CAMO-04-55208	QAL	-	9/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	10	10.8	CAMO-05-56949	QAL	-	1/26/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-16	17	17.5	CAMO-04-55209	QAL	-	9/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	20	20.8	CAMO-05-56950	QAL	-	1/26/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-16	29	29.5	CAMO-04-55210	QAL	-	9/21/2004	–	–	–	–	x	–	–	–	–	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
B-16	30	30.8	CAMO-05-56951	QAL	-	1/26/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-16	38.7	39.3	CAMO-04-55211	QAL	-	9/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	40	40.8	CAMO-05-56952	QAL	-	1/26/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-16	48	48.5	CAMO-04-55212	QAL	-	9/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	50	51.3	CAMO-05-56953	QAL	-	1/26/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-16	50	51.3	CAMO-05-57272	QAL	FD	1/26/2005	x	x	–	–	–	x	x	x	x	x	–	–
B-16	59.2	59.7	CAMO-04-55213	QBO	-	9/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	60	60.8	CAMO-05-56954	QBO	-	1/26/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-16	69.2	69.8	CAMO-04-55214	QBO	-	9/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	70	70.8	CAMO-05-56955	QBO	-	1/26/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-16	79.1	79.7	CAMO-04-55215	QBO	-	9/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	80	80.8	CAMO-05-56956	QBO	-	1/26/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-16	88.1	88.6	CAMO-04-55216	QBO	-	9/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
B-16	90	90.8	CAMO-05-56957	QBO	-	1/26/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-16	98.4	99.2	CAMO-05-56958	QBO	-	1/26/2005	x	x	–	–	–	x	x	x	–	x	–	–
B-16	99.2	99.9	CAMO-04-55217	QBO	-	9/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	75.8	77.5	CAMO-05-56912	QBT2	-	11/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	86.1	87.8	CAMO-05-56913	QBT2	-	11/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	95.8	97.4	CAMO-05-56914	QBT2	-	11/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	102.5	103.8	CAMO-05-56915	QBT1V	-	11/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	115.5	117.1	CAMO-05-56916	QBT1V	-	11/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	125.3	127.5	CAMO-05-56917	QCT	-	11/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	134	135.5	CAMO-05-56918	QBT1G	-	11/29/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	144	145.5	CAMO-05-56919	QBT1G	-	11/29/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	153.5	155	CAMO-05-56920	QBT1G	-	11/30/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	163.5	165	CAMO-05-56921	QBT1G	-	11/30/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	174.5	176.5	CAMO-05-56922	QBT1G	-	11/30/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	262.5	263.7	CAMO-05-56923	QBO	-	12/3/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	324	326	CAMO-05-56925	QBO	-	12/3/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	372.5	374.5	CAMO-05-56926	QBO	-	12/3/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	423	425	CAMO-05-56927	QBO	-	12/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-1	473.4	475.4	CAMO-05-56928	QBO	-	12/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	9.1	13.5	CAMO-05-56746	QAL	-	10/21/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	18.9	20.5	CAMO-05-56747	QAL	-	10/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	30	31.2	CAMO-05-56748	QAL	-	10/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	40	41.2	CAMO-05-56749	QAL	-	10/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	47.5	49.2	CAMO-05-56750	QAL	-	10/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	58.2	59.4	CAMO-05-56751	QAL	-	10/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	68.2	69.6	CAMO-05-56752	QAL	-	10/22/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	77.6	78.8	CAMO-05-56753	QAL	-	10/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	99.6	102.2	CAMO-05-56755	QCT	-	10/23/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	118	119.3	CAMO-05-56756	QBO	-	10/23/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	140	141.9	CAMO-05-56757	QBO	-	10/23/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	160.8	162.3	CAMO-05-56759	QBO	-	10/23/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	180.7	182.2	CAMO-05-56760	QBO	-	10/23/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	199	200.8	CAMO-05-56761	QBO	-	10/23/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	219.2	221.2	CAMO-05-56762	QBO	-	10/23/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	240.4	241.9	CAMO-05-56763	QBO	-	10/24/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-6	260.4	261.9	CAMO-05-56765	QBO	-	10/24/2004	–	–	–	–	x	–	–	–	–	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
I-6	280.6	282.1	CAMO-05-56766	QBO	-	10/24/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	299.8	301.8	CAMO-05-56767	QBO	-	10/26/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	320.7	322.2	CAMO-05-56768	QBO	-	10/26/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	340.3	341.8	CAMO-05-56769	QBO	-	10/26/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	360.4	361.9	CAMO-05-56771	QBO	-	10/26/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	380.9	382.4	CAMO-05-56772	QBO	-	10/26/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	429.7	431.2	CAMO-05-56774	QBO	-	10/27/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-6	496	497.5	CAMO-05-56777	TCB	-	10/28/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	8	11	CAMO-05-56851	QAL	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	17.8	19.2	CAMO-05-56852	QAL	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	28.4	29.4	CAMO-05-56853	QAL	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	38.8	40	CAMO-05-56854	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	49.5	51.6	CAMO-05-56855	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	60.3	61.9	CAMO-05-56856	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	70.3	71.9	CAMO-05-56857	QBT1G	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	78.9	80.5	CAMO-05-56858	QCT	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	88.2	89.8	CAMO-05-56859	QCT	-	11/16/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	108.8	110.9	CAMO-05-56860	QCT	-	11/17/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	138.1	139.7	CAMO-05-56862	QBO	-	11/17/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	159.3	160.9	CAMO-05-56864	QBO	-	11/17/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	179.6	181.2	CAMO-05-56865	QBO	-	11/17/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	198.9	200.2	CAMO-05-56883	QBO	-	11/22/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	218.1	219.7	CAMO-05-56867	QBO	-	11/17/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	238.5	240.1	CAMO-05-56868	QBO	-	11/17/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	259	260.6	CAMO-05-56870	QBO	-	11/17/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	279.8	281.3	CAMO-05-56871	QBO	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	298.1	299.3	CAMO-05-56884	QBO	-	11/22/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	319.6	321.2	CAMO-05-56873	QBO	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	x	–
I-8	338.9	340.5	CAMO-05-56874	QBO	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	359.6	361.2	CAMO-05-56876	QBO	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	379.4	381.1	CAMO-05-56877	QBO	-	11/18/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	429.5	431.1	CAMO-05-56879	QBO	-	11/19/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-8	477	478.1	CAMO-05-56881	TP	-	11/20/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	300	301.7	CAMO-05-56885	QBT1G	-	11/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	311.3	312.5	CAMO-05-56886	QBT1G	-	11/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	323	324.5	CAMO-05-56887	QBO	-	11/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	333	334.5	CAMO-05-56888	QBO	-	11/4/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	348.5	350	CAMO-05-56889	QBO	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	368.5	370	CAMO-05-56891	QBO	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	379.5	381	CAMO-05-56892	QBO	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	390.5	392	CAMO-05-56893	QBO	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	438.5	440	CAMO-05-56896	QBO	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	489.5	491	CAMO-05-56898	QBO	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	539.3	540.8	CAMO-05-56900	QBO	-	11/7/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	590.7	592.2	CAMO-05-56902	QBO	-	11/8/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	640.7	641.2	CAMO-05-56904	QBO	-	11/8/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	693.5	695	CAMO-05-56906	TP	-	11/9/2004	–	–	–	–	x	–	–	–	–	–	–	–
I-10	721.1	723.4	CAMO-05-56911	TT	-	11/10/2004	–	–	–	–	x	–	–	–	–	–	–	–
R-1	9	10.8	GW01-04-52716	QAL	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
R-1	19	21.5	GW01-04-52717	QAL	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	29	32.3	GW01-04-52718	QBT1G	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	39	40.9	GW01-04-52719	QBT1G	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	49	51.1	GW01-04-52720	QBT1G	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	61	63.7	GW01-04-52731	QBT1G	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	74	76	GW01-04-52721	QBT1G	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	89	91.5	GW01-04-52732	QBT1G	-	12/2/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	99	101.1	GW01-04-52722	QBT1G	-	12/3/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	124	126.6	GW01-04-52723	QCT	-	12/4/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	149	151.2	GW01-04-52724	QCT	-	12/4/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	174	176.5	GW01-04-52725	QBO	-	12/4/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	199	201.5	GW01-04-52726	QBO	-	12/5/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	224	226.5	GW01-04-52727	QBO	-	12/5/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	249	251.5	GW01-04-52728	QBO	-	12/8/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	275	276.5	GW01-04-52729	QBO	-	12/10/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	299	301.2	GW01-04-52730	QBO	-	12/11/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	349	350.8	GW01-04-52733	QBO	-	12/12/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-1	394	395.8	GW01-04-52734	QBO	-	12/17/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-14	0	3.9	GW14-02-46102	QBT2	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	6.2	9.2	GW14-02-46103	QBT2	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	9.2	14.2	GW14-02-46104	QBT2	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	14.2	19.2	GW14-02-46105	QBT2	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	19.2	24.2	GW14-02-46106	QBT2	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	24.2	29.2	GW14-02-46107	QBT2	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	31	35.8	GW14-02-46108	QBT2	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	35.8	40.8	GW14-02-46109	QBT2	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	40.8	44.3	GW14-02-46110	QBT2	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	44.3	49.3	GW14-02-46111	QBT2	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	54.3	56	GW14-02-46112	QBT2	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	56	61	GW14-02-46113	QBT2	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	61	66	GW14-02-46114	QBT2	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	66	71	GW14-02-46115	QBT1V	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	71	76	GW14-02-46116	QBT1V	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	76	81	GW14-02-46117	QBT1V	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	81	86	GW14-02-46118	QBT1V	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	86	91	GW14-02-46119	QBT1V	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	91	96	GW14-02-46120	QBT1V	-	6/2/2002	–	–	–	–	x	–	–	–	–	–	–	–
R-14	96	101	GW14-02-46121	QBT1V	-	6/2/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	146	151	GW14-02-46122	QBT1G	-	6/3/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	201	206	GW14-02-46123	QCT	-	6/3/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	246	251	GW14-02-46124	QCT	-	6/4/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-14	297.3	306	GW14-02-46125	QBO	-	6/4/2002	–	x	–	–	x	x	x	x	–	x	–	–
R-15	2.6	17	CAMO-98-0211	QAL	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	17.5	20	CAMO-98-0212	QBT1G	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	22	22.5	CAMO-98-0253	QBT1G	-	9/11/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	25	25.3	CAMO-98-0213	QBT1G	-	9/17/1998	x	x	–	–	–	x	x	x	–	x	–	–
R-15	39.5	40	CAMO-98-0254	QBT1G	-	9/11/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	40	41.5	CAMO-98-0214	QBT1G	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	59.5	60	CAMO-98-0255	QBT1G	-	9/11/1998	–	–	–	–	x	–	–	–	–	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
R-15	63.3	64.3	CAMO-98-0215	QBT1G	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	65	65.8	CAMO-98-0216	QBT1G	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	68.3	69.3	CAMO-98-0217	QBT1G	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	69.5	70	CAMO-98-0256	QBT1G	-	9/11/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	75.8	76.6	CAMO-98-0218	QCT	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	84.5	85	CAMO-98-0257	QCT	-	9/11/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	87	87.4	CAMO-98-0219	QCT	-	9/17/1998	x	x	–	–	–	x	x	x	–	x	–	–
R-15	90.8	91.6	CAMO-98-0220	QCT	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	100	101.3	CAMO-98-0221	QCT	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	104.5	105	CAMO-98-0258	QCT	-	9/11/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	105	105.8	CAMO-98-0222	QCT	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	112.5	114.3	CAMO-98-0223	QCT	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	114.5	115	CAMO-98-0259	QCT	-	9/14/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	115	115.8	CAMO-98-0224	QCT	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	120	120.8	CAMO-98-0225	QBO	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	144.5	145	CAMO-98-0260	QBO	-	9/14/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	148.3	149.3	CAMO-98-0226	QBO	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	150	150.8	CAMO-98-0227	QBO	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	169.5	170	CAMO-98-0261	QBO	-	9/14/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	170	170.8	CAMO-98-0228	QBO	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	229.5	230	CAMO-98-0262	QBO	-	9/15/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	230	231.3	CAMO-98-0229	QBO	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	269.5	270	CAMO-98-0263	QBO	-	9/15/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	270	272.5	CAMO-98-0230	QBO	-	9/17/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	324.5	325	CAMO-98-0264	QBO	-	9/16/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	325	327.5	CAMO-98-0231	QBO	-	9/23/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	379.5	380	CAMO-98-0265	QBO	-	9/17/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	380	384	CAMO-98-0232	QBO	-	9/23/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	380	384	CAMO-98-0233	QBO	FD	9/23/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	414.6	415	CAMO-98-0266	QBO	-	9/18/1998	–	–	–	–	x	–	–	–	–	–	–	–
R-15	415	418	CAMO-98-0234	QBO	-	9/23/1998	x	x	–	x	x	x	x	x	–	x	–	–
R-15	742	742.4	CAMO-99-0121	QBO	-	8/3/1999	x	x	–	x	x	x	x	–	–	–	–	–
R-15	744	744.5	CAMO-99-0122	QBO	-	8/4/1999	–	–	–	–	–	–	–	x	–	–	–	–
R-28	9.7	11.2	GW28-04-52742	QAL	-	11/10/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	19.4	21.5	GW28-04-52743	QAL	-	11/10/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	30.1	31.4	GW28-04-52744	QAL	-	11/10/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	39.5	41.1	GW28-04-52745	QAL	-	11/10/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	49.5	51.5	GW28-04-52746	QAL	-	11/10/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	75	76.3	GW28-04-52747	QCT	-	11/11/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	105	106.5	GW28-04-52748	QCT	-	11/12/2003	x	x	–	–	–	x	x	–	–	x	–	–
R-28	120	126.5	GW28-04-52749	QBO	-	11/12/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	149	155.2	GW28-04-52750	QBO	-	11/13/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	175	176.2	GW28-04-52751	QBO	-	11/14/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	200	201.5	GW28-04-52752	QBO	-	11/14/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	224	226.3	GW28-04-52753	QBO	-	11/17/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	249	251.5	GW28-04-52754	QBO	-	11/17/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	274	276.5	GW28-04-52755	QBO	-	11/18/2003	x	x	–	–	x	x	x	–	–	x	–	x
R-28	299	300.8	GW28-04-52756	QBOG	-	11/18/2003	x	x	–	–	x	x	x	–	–	x	–	x
RES-2	10	10.5	CAMO-04-55178	QAL	-	10/19/2004	–	–	x	–	–	–	–	–	x	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
RES-2	19.2	19.7	CAMO-04-55179	QAL	-	10/19/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-2	28.8	29.3	CAMO-04-55180	QAL	-	10/19/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-2	39.1	39.6	CAMO-04-55181	QAL	-	10/19/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-2	47	47.5	CAMO-04-55182	QAL	-	10/19/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-2	59.5	60	CAMO-04-55183	QAL	-	10/19/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-2	80.3	80.8	CAMO-04-55185	QCT	-	11/9/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	89.5	90	CAMO-04-55186	QCT	-	11/9/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	97.4	98.1	CAMO-04-55187	QCT	-	11/10/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	109.4	110	CAMO-04-55188	QCT	-	11/10/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	117.8	118.5	CAMO-04-55189	QBO	-	11/10/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	127.6	128.3	CAMO-04-55190	QBO	-	11/10/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	139.7	140.4	CAMO-04-55191	QBO	-	11/10/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	149.4	150	CAMO-04-55192	QBO	-	11/10/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	159.3	160	CAMO-04-55193	QBO	-	11/11/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	168.6	169.3	CAMO-04-55194	QBO	-	11/11/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	178.3	179	CAMO-04-55195	QBO	-	11/11/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	187.5	188.2	CAMO-04-55196	QBO	-	11/11/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-2	199.5	200.2	CAMO-04-55197	QBO	-	11/11/2004	–	–	–	–	–	–	–	–	x	–	–	–
RES-3	9.3	9.8	CAMO-04-55148	QAL	-	10/1/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	18.6	19.1	CAMO-04-55149	QAL	-	10/1/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	29.2	29.7	CAMO-04-55150	QBT1G	-	10/1/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	39.5	40	CAMO-04-55151	QBT1G	-	10/1/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	49.5	50	CAMO-04-55152	QBT1G	-	10/1/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	59.5	60	CAMO-04-55153	QBT1G	-	10/4/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	68.9	69.4	CAMO-04-55154	QBT1G	-	10/4/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	78.5	79	CAMO-04-55155	QBT1G	-	10/4/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	87.9	88.4	CAMO-04-55156	QCT	-	10/4/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	98	98.5	CAMO-04-55157	QCT	-	10/5/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	110	110.5	CAMO-04-55158	QCT	-	10/5/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	119.5	120	CAMO-04-55159	QCT	-	10/5/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	129.5	130	CAMO-04-55160	QBO	-	10/5/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	138.8	139.3	CAMO-04-55161	QBO	-	10/6/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	149.3	149.8	CAMO-04-55162	QBO	-	10/6/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	159.5	160	CAMO-04-55163	QBO	-	10/6/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	169.5	170	CAMO-04-55164	QBO	-	10/6/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	179.5	180	CAMO-04-55165	QBO	-	10/6/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	189.5	190	CAMO-04-55166	QBO	-	10/6/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-3	198.8	199.3	CAMO-04-55167	QBO	-	10/6/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	9.5	10	CAMO-04-55118	QAL	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	19.5	20	CAMO-04-55119	QAL	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	29.5	30	CAMO-04-55120	QAL	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	39.5	40	CAMO-04-55121	QBT1G	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	49.5	50	CAMO-04-55122	QBT1G	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	59.5	60	CAMO-04-55123	QBT1G	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	69.5	70	CAMO-04-55124	QBT1G	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	79.5	80	CAMO-04-55125	QBT1G	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	89.5	90	CAMO-04-55126	QBT1G	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	99.5	100	CAMO-04-55127	QCT	-	9/21/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	109.3	109.8	CAMO-04-55128	QBO	-	9/22/2004	–	–	x	–	–	–	–	–	x	–	–	–

Table C-2.0-3 (continued)

Borehole	Begin Depth (ft)	End Depth (ft)	Sample ID	Media Code	Field QC Type Code	Collection Date	Am-241	Gamma Spec	Geo Tech	Gross AB	H3	Iso PU	Iso U	Metals	Part SZ	Sr-90	Stable Isotopes	Tc-99
RES-4	119.5	120	CAMO-04-55129	QBO	-	9/22/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	129.5	130	CAMO-04-55130	QBO	-	9/22/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	139.5	140	CAMO-04-55131	QBO	-	9/22/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	149.5	150	CAMO-04-55132	QBO	-	9/22/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	159.5	160	CAMO-04-55133	QBO	-	9/22/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	170	170.5	CAMO-04-55134	QBO	-	9/23/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	179.5	180	CAMO-04-55135	QBO	-	9/23/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	189.5	190	CAMO-04-55136	QBO	-	9/23/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	199.4	199.9	CAMO-04-55137	QBO	-	9/23/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	210	210.5	CAMO-04-55138	QBO	-	9/24/2004	–	–	x	–	–	–	–	–	x	–	–	–
RES-4	219.5	220	CAMO-04-55139	QBO	-	9/24/2004	–	–	x	–	–	–	–	–	x	–	–	–

[a] x = Analysis was performed.

[b] – = Analysis was not performed.

[c] FD = Field duplicate.

Table C-2.0-4
Media Code Definitions

Media Code	Definition
ALLH	Soil All Horizons
QAL	Quaternary Alluvium
QBO	Quaternary Otowi Member of the Bandelier Tuff, Ignimbrite
QBOF	Quaternary Otowi Member, Ash flow
QBOG	Quaternary Otowi Member of the Bandelier Tuff, Guaje Pumice Bed
QBT1G	Quaternary Tshirege Member of the Bandelier Tuff 1G
QBT1V	Quaternary Tshirege Member of the Bandelier Tuff 1V
QBT2	Quaternary Tshirege Member of the Bandelier Tuff 2
QBTT	Quaternary Tshirege Member of the Bandelier Tuff, Tsankawi Pumice Bed
QCT	Quaternary Cerro Toledo Interval
SED	Alluvial Sediment
WGA	Groundwater, alluvial
WGI	Groundwater, intermediate depth perched
WGR	Groundwater, regional
WS	Surface Water
WT	Storm water

Table C-4.0-1
LANL Qualifier Definitions

LANL Qualifier	Definition
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 estimated quantity with a suspected positive bias.
JN-	Presumptive evidence of the presence of the material at an estimated quantity with a suspected negative bias.
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	Not qualified
R	The sample results were rejected because of serious deficiencies in the ability to analyze the sample and meet quality control criteria; the presence or absence cannot be verified.
U	The analyte was analyzed for but not detected; the reported value is the sample-specific EQL (estimated quantitation limit) or detection limit.
UJ	The analyte was analyzed for but not detected; the reported value is an estimate of the sample-specific quantitation limit or detection limit.

Table C-4.0-2
Analytical Laboratory Qualifiers

Analytical Laboratory Qualifier	Definition
*	(Inorganic)- Duplicate analysis not within control limits. (Organic) - Spike recovery is equal to or outside the control criteria used.
B	(Organic) - Analyte present in the blank and the sample. (Inorganic) - reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).
B*	(Inorganic) - reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). (Organic) - Analyte present in the blank and the sample.
BE	Low surrogate recovery; analyzed twice
BJ	(Inorganic)- The associated numeric value is an estimated quantity. The reported value was obtained from a reading that was less the Contract Required Detection Limit.
BN	(Organic) - Analyte was detected in the associated method blank as well as in the sample. Presumptive evidence based on a mass spectral library search to make a tentative identification of the analyte.
BN*	(inorganics) - reported value <CRDL and >IDL. Duplicate Analysis not within control limits. Spiked sample recovery not within control limits.
BNE	(Inorganic)-The value is between the instrument detection limit and the contract required detection limit., The qualifier that is used when the percent difference between the parent sample and its serial dilution?s concentrations exceeds 10%., Spiked sample recovery not within control limits.
D	(Organic) - Analytes analyzed at a secondary dilution.
E	(Inorganic) Paragon- Reported value is estimated because of the presence of interference. GEL- Percent difference between the parent sample and its serial dilution's concentration exceeds 10%. (Organic) - Analyte concentration exceeded the upper level of
E*	(Inorganic) Paragon- Reported value is estimated because of the presence of interference. GEL- Percent difference between the parent sample and its serial dilution's concentration exceeds 10%. (Organic) - Analyte concentration exceeded the upper level of
EJ	(Inorganic) - Paragon- Reported value is estimated because of the presence of interference. GEL- Percent difference between the parent sample and its serial dilution's concentration exceeds 10%. Having concentrations between the MDL and the PQL (or reporting limit).
EN	(Organic) - Identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument for that specific analysis. Presumptive evidence based on a mass spectral library search to make a tentative identification of the analyte. (Inorganic) - The qualifier that is used when the percent difference between the parent sample and its serial dilution's concentration exceeds 10%. The sample's concentration must be greater than 50 times the IDL/MDL for ICP or 100 times
H	Holding time exceeded
HJ	(Inorganic) - This qualifier is used to indicate the holding time expired for a particular parameter., J
J	(Inorganic) -The associated numerical value is an estimated quantity. (Organic) - The associated numerical value is an estimated quantity.
J*	(Inorganic) -The associated numerical value is an estimated quantity. - Duplicate Analysis not within control limits.
JN	(Inorganic) - Having concentrations between the MDL and the PQL (or reporting limit). Analytical results associated with a spike analysis that was outside control limits.

Table C-4.0-2 (continued)

Analytical Laboratory Qualifier	Definition
JN*	(J) (Organic/Inorganic/General Inorganics) - The result for this analyte was greater than the Method Detection Limit (MDL) but less than the Practical Quantitation Limit (PQL). (N) (Organic) - The reported analyte is a tentatively identified compound (TIC). (N) (Inorganic) - The result for this analyte in the matrix spike sample was outside acceptance criteria. * (Inorganic) - The result for this analyte in the Laboratory Replicate analysis was outside acceptance criteria.
JP	(Organic) - The associated numerical value is an estimated quantity. > 25% difference for detected concentrations between two columns.
LT	Spectral interference problems for RAD D
N	(Inorganic) - Spiked sample recovery not within control limits. (Organic) -Presumptive evidence based on a mass spectral library search to make a tentative identification of the analyte.
N*	(Inorganic) - Spiked sample recovery not within control limits. Duplicate analysis not within control limits.
P	(Organic) - > 40% difference for detected concentrations between two columns
PJ	GC/HPLC methods the difference between the hits are > 40%. Analyte is detected and between the MDL/PQL.
SI	Spectral interference problems for RAD
SQ	Spectral interference problems for RAD A
TI	Spectral interference problems for RAD B
U	(Inorganic) -The material was analyzed for, but was not detected above the level of the associated numeric value. The associated numerical value is either the sample quantitation limit or the sample detection limit. (Organic) -The material was analyzed
U*	(Inorganic) - Compound was analyzed for, but was not detected. Duplicate analysis not within control limits.
UE	(Inorganic) - Compound was analyzed for, but was not detected. Reported value is estimated because of the presence of interference.
UH	(Inorganic) - The value of the analyte was below the instrument detection limit., This qualifier is used to indicate the holding time expired for a particular parameter.
UI	denotes uncertain identification for gamma spectroscopy
UJ	(Inorganic) - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise. (Organic) -The material was analyzed for, but was not detected. Quantitation limit is an estimated quantity.
UL	UL (all suites) Not detected legacy - This lab qual code is applied by Water Quality 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	(Inorganic) - Compound was analyzed for,but was not detected. - Spiked sample recovery not within control limits.
UN*	(Inorganic) - Compound was analyzed for,but was not detected. - Spiked sample recovery not within control limits. - Duplicate Analysis not within control limits.
UUI	compound analyzed for, but not detected above detection limit; uncertain identification for gamma spectroscopy
X	Reported concentration is a false positive
XB	There is presumptive evidence that the analyte really is not there. (organics) - blank contamination.

Table C-5.0-1
Inorganic Chemical Analytical Methods

Analytical Suite	Analytical Methods
Alkalinity	EPA:310.1
Alkalinity	EPA:310.2
Alkalinity	SM:A2320B
Ammonia	EPA:350.1
Ammonia	EPA:350.3
Ammonia	SM:4500NH3
ANION	DI Leach
ANION	EPA:300
ANION	EPA:314.0
ANION	EPA:320.1
ANION	EPA:325.1
ANION	EPA:325.3
ANION	EPA:340.1
ANION	EPA:340.2
ANION	EPA:340.3
ANION	EPA:353.1
ANION	EPA:353.2
ANION	EPA:353.3
ANION	EPA:375.4
ANION	SW-846:8321A
ANION	SW-846:9056
Chemical Oxygen Demand	EPA:410.1
Chemical Oxygen Demand	EPA:410.4
Cyanide	SW-846:9010
Cyanide	SW-846:9010A
Cyanide	EPA:335.1
Cyanide	EPA:335.2
Cyanide	EPA:335.3
Cyanide	SW-846:9012A
Dissolved Organic Carbon	SM:5310C
GENINORG	ACOLR
GENINORG	CALC
GENINORG	FIA
GENINORG	TITR
GENINORG	ACOLR CN
GENINORG	ACOLR PO4-P
GENINORG	CONDUCTIVITY
GENINORG	EPA 6850 Modified

Table C-5.0-1 (continued)

Analytical Suite	Analytical Methods
GENINORG	EPA:160.4
GENINORG	EPA:200.7
GENINORG	EPA:300.0
GENINORG	EPA:330.0
GENINORG	EPA:335.4
GENINORG	FIA F
GENINORG	FIA NO3-N
GENINORG	FIA SIO2
GENINORG	FIELD CONDUCTIVITY
GENINORG	FIELD Flow
GENINORG	Field Measurement
GENINORG	FIELD PH
GENINORG	FIELD TEMP
GENINORG	FIELD TURB
GENINORG	GRAV TDS
GENINORG	HARDNESS
GENINORG	IC
GENINORG	ICPES
GENINORG	Ion Chromatography
GENINORG	Percent Moisture
GENINORG	PH
GENINORG	SM:4500-N&NH3B,C
GENINORG	SM:4500-NH3B,C
GENINORG	Specific Gravity
GENINORG	SW846 6850 Modified
GENINORG	SW-846:6850
GENINORG	SW-846:8321(M)
GENINORG	SW-846:8321A(M)
Hardness, Total	SM:A2340B
Hexavalent Chromium	SW-846:7199
Hexavalent Chromium	SW-846:7196A
Humic Substances	USGS-WRI-79-4
Mercury	EPA:245.1
Mercury	EPA:245.2
Mercury	EPA:245.5
Mercury	SW-846:7470
Mercury	SW-846:7470A
Mercury	SW-846:7471
Mercury	SW-846:7471A

Table C-5.0-1 (continued)

Analytical Suite	Analytical Methods
METALS	200 series AA-FL
METALS	ASTM:D3972-90
METALS	CVAA
METALS	EPA:200.8
METALS	EPA:200.9
METALS	EPA:370.1
METALS	ETVAA
METALS	ICPES
METALS	ICPMS
METALS	SW-846:6010
METALS	SW-846:6010B
METALS	SW-846:6020
METALS	SW-846:7060
METALS	SW-846:7740
METALS	SW-846:7841
pH	EPA:150.1
pH	SW-846:9040B
PHOSPHORUS	EPA:365.1
PHOSPHORUS	EPA:365.2
PHOSPHORUS	EPA:365.4
Specific Conductance	EPA:120.1
Specific Conductance	SW-846:9050A
Specific gravity	ASTM:D5057
Specific Gravity	SM:A2710F
Total Dissolved Solids	EPA:160.1
Total Kjeldahl Nitrogen	EPA:351.2
Total Kjeldahl Nitrogen	EPA:351.4
Total Organic Carbon	SW-846:9060
Total Suspended Solids	EPA:160.2
Geotechnical	ASTM:D2216V
Geotechnical	ASTM:D2937
Geotechnical	ASTM:D854
Geotechnical	MOSA:18-1986
Particle Size	PMM:383
pH	SW-846:9045C
Wet Chemistry	ASTM:E1676-97

Table C-6.0-1
Organic Chemical Analytical Methods

Analytical Suite	Analytical Methods
Dioxins/Furans	EPA:1613B
Dioxins/Furans	SW-846:8290
Herbicides	SW-846:8151A
High Explosives	HE
High Explosives	HEXP
High Explosives	HEXP CL
High Explosives	HPLC
High Explosives	SW-846:8321A_MOD
High Explosives	SW-846:8330
Polycyclic Aromatic Hydrocarbons	SW-846:8310
Pesticides/Polychlorinated Biphenyls	LA-10300-M, Vol. 2:EO430
Pesticides/Polychlorinated Biphenyls	SW-846:8082
Pesticides/Polychlorinated Biphenyls	SW-846:8081
Pesticides/Polychlorinated Biphenyls	SW-846:8081A
Pesticides/Polychlorinated Biphenyls	PCB
Pesticides/Polychlorinated Biphenyls	EPA:608
Pesticides/Polychlorinated Biphenyls	SW-846:8080
Semivolatile Organic Chemicals	SVOA
Semivolatile Organic Chemicals	EPA:625
Semivolatile Organic Chemicals	SW-846:8270C
Semivolatile Organic Chemicals	SW-846:8270
Total Organic Carbons	EPA:415.1
Volatile Organic Chemicals	VOA
Volatile Organic Chemicals	EPA:524.2
Volatile Organic Chemicals	EPA:624
Volatile Organic Chemicals	GCMS
Volatile Organic Chemicals	VOA CL
Volatile Organic Chemicals	SW-846:8260
Volatile Organic Chemicals	SW-846:8260B

Table C-7.0-1
Radionuclide Analytical Methods

Analytical Suite	Analytical Methods
Americium-241	HASL-300:AM-241
Isotopic Plutonium	HASL-300:ISOPU
Isotopic Radium	EPA:903.0
Isotopic Thorium	HASL-300:ISOTH
Isotopic Uranium	HASL-300:ISOU
Radionuclides	GRAV
Radionuclides	Alpha-Spec
Radionuclides	ASTM:D5811-95M
Radionuclides	Beta Counting
Radionuclides	CST:GLL
Radionuclides	EH-ALPHA
Radionuclides	EPA:900
Radionuclides	EPA:901.1
Radionuclides	EPA:903.1
Radionuclides	EPA:904
Radionuclides	EPA:905
Radionuclides	EPA:905.0
Radionuclides	EPA:906.0
Radionuclides	Gas Flow Proportional Counting
Radionuclides	Gas Proportional Counting
Radionuclides	Gross Alpha Beta Radiation
Radionuclides	Gross Gamma
Radionuclides	HASL-300:I-129
Radionuclides	ICPMS
Radionuclides	KPA
Radionuclides	LEGACY
Radionuclides	Liquid Scintillation Counting
Radionuclides	LL
Radionuclides	LLEE
Radionuclides	TIMS
Stable Isotopes	Deuterium Ratio
Stable Isotopes	Nitrogen Isotope Ratio
Stable Isotopes	Oxygen Isotope Ratio
Strontium-90	Gamma Spec.
Tc-99	HASL-300:TC99
Tritium	LA-10300-M, Vol. 1:R230
Tritium	LA-10300-M, Vol. 2:ER210
Tritium	Low_Level_Tritium
Tritium	Low_Level_Tritium
Tritium	Tritium

Appendix D

Contaminant Trends and Inventory

D-1.0 SEDIMENT

This section presents information on contaminants in sediments in the Mortandad watershed that supports the physical system conceptual model in Section 7 and the risk assessments in Section 8. It includes information on spatial and temporal variations in the concentrations of chemicals of potential concern (COPCs) that helps identify contaminant sources and provide an understanding of the effects of sediment redistribution by floods on contaminant concentrations and potential exposure to receptors. Calculations of the inventory (amount) of some key COPCs are included that support a conceptual understanding of the current distribution of contaminants. This section also presents specific information on how sample results from different geomorphic units were grouped or binned to calculate weighted-average concentrations in a reach. This binning is used in the human health risk assessment process discussed in Section 8.2 and Appendix E and in the conceptual model in Section 7.1.

D-1.1 Spatial Variations in Sample Results for COPCs

Figure D-1.1-1 consists of plots showing sample results for all COPCs identified in sediment in the watershed plotted versus distance from the Rio Grande. These plots help to identify sources for the COPCs and show how concentrations change with distance from sources. Different colors on these plots are used for each subwatershed: Effluent, Mortandad, Ten Site, and the unnamed tributary canyon that heads in Technical Area (TA) 05. Each sample is plotted at a location represented by the distance from the Rio Grande to the approximate midpoint of the reach. For inorganic and organic chemicals, nondetected sample results are shown by an open circle, and the detected sample results are represented by a filled circle. For radionuclides, detect status is not indicated because radionuclide sample results are not censored. Only sediment data from the Environmental Restoration Database that have complete data packages and are validated are included in these plots.

Results from sample locations removed during remediation activities are included in Figure D-1.1-1 to help indicate sources and support the conceptual model described in Section 7, although these results are excluded from evaluations of potential present-day human health or ecological risk described in Sections 8 and E-5.

The sample results in Figure D-1.1-1 are biased high as a result of biases accompanying sample collection, as discussed in Section B-1 of Appendix B. Specifically, samples were typically biased toward geomorphic units and sediment facies with higher concentrations of contaminants, and units and facies with low concentrations (e.g., coarse facies sediment in the active channels) are underrepresented. In addition, some of these results could not be reproduced by resampling in this investigation or were from samples collected from previous investigations whose context is not certain.

Some COPCs in these plots have clearly defined source areas, with concentrations decreasing downstream from these sources. For example, americium-241, cesium-137, cobalt-60, and plutonium-239,240 originate primarily from the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) outfall into Effluent Canyon and decrease downstream in Mortandad Canyon. Other COPCs have no clearly defined source areas or spatial trends, which suggests that the sample results primarily represent variations in background concentrations and/or variability in detection limits. Examples include potassium, selenium, cesium-134, and europium-152.

D-1.2 Temporal Variations in Radionuclide COPCs at Surveillance Stations

Figures D-1.2-1 to D-1.2-4 consist of plots showing temporal variations in the concentrations of americium-241, plutonium-238, plutonium-239,240, and strontium-90 in sediment in the Mortandad watershed as measured in annual environmental surveillance samples from a series of active channel stations downloaded from the Water Quality Database . These data are originally from the annual environmental surveillance reports (e.g., ESP 2002, 73876), and include all analyses for these radionuclides from select stations through 2005. The current station name is shown first, followed by prior station names and the associated sediment investigation reach shown in parentheses. Data for cesium-137 are presented and discussed in Section 7.1.1-3. Data for these five radionuclides are included in this report because these COPCs are important in assessing potential human health risk and have a relatively long period of record, extending back to 1982 for americium-241, to 1977 for cesium-137 and strontium-90, and to 1976 for plutonium-238 and plutonium-239,240. Other key COPCs have much shorter periods of record (e.g., back to 1992 for chromium and 1997 for cobalt-60). Stations shown are Mortandad below Effluent Canyon (formerly called Mortandad at GS-1; this is gaging station E200 in reach M-2W), Mortandad at MCO-5 (in reach M-3W), Mortandad at MCO-7 (at sediment trap #1, in reach M-4W), and Mortandad at MCO-7.5 (in reach M-4C). In reach M-4, the annual sampling station was moved from MCO-7 to MCO-7.5 in 2002, from sediment trap #1 to the abandoned channel downstream from the traps, in an area that rarely receives flow. Data from other stations are not shown because they are either upcanyon of the main contaminant source or downcanyon of the sediment traps in areas that rarely receive flow.

These plots indicate that concentrations of these COPCs are generally highest at the upcanyon station in M-2Wand lowest at the downcanyon stations in reach M-4. The plots of these COPCs also indicate possible temporal trends downstream from the most important contaminant source in the watershed, specifically the TA-50 RLWTF outfall into Effluent Canyon. The plots in Figures D-1.2-1 to D-1.2-4 help to show how contaminant concentrations have changed over time because of the redistribution of sediment by floods and help provide insight into likely future changes in contaminant concentrations. Concentrations of the key radionuclide COPCs are generally highest in the late 1970s or early to mid-1980s, which is consistent with evidence from RLWTF discharge records and sediment samples collected in this investigation, as discussed in Section 7.1.1-3. A few results are inconsistent with these trends, such as relatively high results for americium-241 and plutonium-239,240 at MCO-5 in 1999, and may be caused by sampling fine-grained sediment in the active channel, perhaps derived from collapse of banks in older more-contaminated sediment, instead of the typical coarse to very coarse sand that dominates the channel.

D-1.3 Binning of COPC Results

The analytical data used in this investigation were examined to determine what grouping of samples in each reach was optimal for the combined purposes of defining geomorphic variations and statistically describing the variability in COPC concentrations. These grouped or binned data are used in the geomorphic assessments and the calculation of weighted averages used in the human health risk assessment in this report; therefore, the specific binning process is an important part of the data evaluation. The binning process generally follows the process used in prior reports (e.g., LANL 2004, 87390) and is discussed here to document the specific rationale used in this investigation for combining samples in different reaches into bins. Only data collected in this investigation (CAMO sample IDs, 1998 to 2005) are included here because the geomorphic unit and sediment facies is uncertain for samples collected in other investigations.

In reaches where individual analytes were identified as key COPCs (COPCs that are widely distributed, have a confirmed or inferred Los Alamos National Laboratory (the Laboratory) source, and are important in risk assessments), the data for key COPCs in each reach were first examined after being binned by individual geomorphic units and sediment facies to evaluate if concentrations varied or were similar between units. In many cases, these subsets of data were combined into larger bins because of similarities in COPC concentrations, increasing the sample size and allowing better statistical evaluation. Cesium-137 was used as a key COPC in reaches downstream from the RLWTF outfall (reaches E-1E, M 2W, M-2E, M-3, M-4, M-5W, and M-5E) because it is widely distributed and has the largest contribution to potential human health risk in sediments in the watershed. Plutonium-238 was used as a key COPC in reaches downcanyon from the accidental releases from TA-50 into upper Ten Site Canyon (reaches TS 1W, TS-1C, and TS-1E) because it has the largest contribution to potential human health risk in sediments in these reaches. Strontium-90 was used as a key COPC in reaches farther east in Ten Site Canyon, downcanyon from Pratt Canyon (reaches TS-2W, TS-2C, TS-2E, and TS-3), because it has the largest contribution to potential human health risk in sediments in these reaches. Chromium was used as a key COPC in upper Effluent Canyon (reaches E-1FW and E-1W) because it has a clear source at TA-48 and is important in evaluating human health risk, particularly in groundwater. In the remaining reaches, no key COPCs were identified and were therefore not used in binning.

Coarse facies and fine facies samples were kept in separate bins in all reaches because maximum and average COPC concentrations are generally higher in the fine-grained sediments than in related coarse-grained sediments. Samples within the same sediment facies (coarse or fine facies) in different geomorphic units were kept in separate bins if the variations in COPC concentration provided information on time-dependent trends in a reach (e.g., where c1 sediment in active channels had lower COPC concentrations than texturally similar c2 sediment in older, abandoned channel units). However, these subsets were combined when no such trends were apparent in the data. Combining results from different geomorphic units, when no differences in contaminant concentrations between units are evident, improves the estimates of summary statistics because the estimates are based on a larger data set.

One exception to the separation of samples in different sediment facies is where fewer than three samples were available from coarse facies sediment in a reach for an analyte. In this case, data were combined with fine facies for the calculation of 95% upper confidence limits (UCLs) because valid statistical calculations cannot be done with fewer samples. In addition, data from different geomorphic units were sometimes combined to calculate 95% UCLs for risk assessments to achieve a minimum of three samples in a bin but kept separate for use in the conceptual model in Section 7.1. An additional exception to the separation of facies in different bins is for f2 units where COPC concentrations are generally at or near background levels and no separation of facies was done for the conceptual model (these data are not included in the risk assessments). Additional adjustments were made as needed where fewer than three results were available for an analyte in a bin in a reach.

In two cases, data from adjacent reaches are combined to calculate average COPC concentrations for the conceptual model and 95% UCLs for the risk assessments, although the reaches are treated separately in the conceptual model and risk assessments because of major differences in geomorphic characteristics and/or COPC concentrations. Data from M-3W and M-3E are combined as reach M-3 for statistical analyses, although these reaches are treated separately for other purposes because of the much greater width of post-1942 sediment deposits and overall higher contaminant concentrations in M-3E. For similar reasons, data from M-4W, M-4C, and M-4E are combined as reach M-4 for statistical analyses although treated separately for other purposes.

The binning used in this report is presented in Table D-1.3-1. This table includes notes on the rationale for the specific binning and other summary information on the size of sediment deposits in each

geomorphic unit and present the fractions of reach area and sediment volume represented by each geomorphic unit in each reach. These fractions are the area-weighting and volume-weighting used in the human health risk assessment in Section 8.2. The f2 unit is excluded from these fractions because contaminant concentrations are at or near background concentrations in this geomorphic unit, and including f2 would introduce a low bias in estimates of average contaminant concentrations in a reach.

D-1.4 Radionuclide Inventory

This section presents inventory estimates for key radionuclide COPCs in the Mortandad watershed. The inventory estimates for cesium-137 have been updated from estimates presented in a previous report (Reneau et al. 2003, 77103). The COPCs included here are six radionuclides that have maximum concentrations above residential human health screening action levels (SALs) and also have clearly defined sources at solid waste management units (SWMUs) or areas of concern (AOCs) (americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239,240, and strontium-90). The term “inventory” refers to the total amount of a COPC in a geomorphic unit, in a reach, or in a canyon. Inventory estimates provide basic information for understanding how contaminants have been redistributed in the environment and hence for understanding the processes of contaminant transport. Inventory estimates are also useful when considering corrective action alternatives and as input into fate and transport models that predict future contaminant redistribution (e.g., Malmon 2002, 76038; Malmon et al. 2002, 82604; Malmon et al. 2003, 82603; Malmon et al. 2005, 93540).

Inventory estimates in this report are focused on radionuclides because these are the primary COPCs in the Mortandad watershed with both well-documented sources and pervasive results above background values (BVs) or detection limits. In general, nonradionuclide COPCs released from the same SWMUs or AOCs and associated with sediment particles are expected to share the same trends in inventory as the radionuclides discussed here. In Section D-1.8 inventory estimates for chromium are presented, which provides an example of trends in inventory for an inorganic chemical with a different source than the radionuclides considered here.

Inventory estimates presented here use the same process that was used in previous reports (Reneau et al. 1998, 59159; Reneau et al. 1998, 59160; Reneau et al. 1998, 59667; Katzman et al. 1999, 63915; LANL 2004, 87390). In these calculations, estimates of the average concentration of radionuclides in each sediment facies and each geomorphic unit in each reach are combined with estimates of sediment volume, sediment density, and gravel content. Sediment volume is calculated as unit area, as determined from digitized geomorphic maps, multiplied by average sediment thickness as determined from field measurements (as discussed in Section B-1.0 of Appendix B). Sediment density utilizes measurements made previously in Los Alamos and Pueblo Canyons (Reneau et al. 1998, 59159, Appendix B-4.0). Gravel content, as determined from particle size analyses (Section B-1.0), is used to adjust the effective volume of each unit because of the predominant association of contaminants with fine-grained particles (clay, silt, and sand). Because particles larger than 2 mm that are excluded from this inventory contain some effluent-derived radionuclides, the total watershed inventory may be somewhat underestimated. Data from different particle-size fractions indicate that about 16% of the channel-bed inventory in Mortandad Canyon in 1973 was in the >2-mm fraction (Nyhan et al. 1976, 11747), and assuming that the coarse facies inventory is underestimated by this amount indicates an underestimation of the total watershed inventory of less than 5%, which is well within the uncertainties in these calculations. In reaches M-4W and M-4E, average concentrations of cesium-137 in the fill piles adjacent to the sediment traps were used to estimate the concentrations of the other key radionuclides, assuming the ratios between radionuclides is the same in the fill piles as in the rest of M-4. Similarly, the inventory in the fill piles was divided into coarse and fine facies assuming the same percentages as elsewhere in M-4.

Table D-1.4-1 presents detailed estimates of the inventory of americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239,240, and strontium-90 in reaches where these radionuclides have been identified as COPCs, along with the underlying data used in these calculations. Table D-1.4-1 includes inventory estimates for one nonsampled reach, "TS-1C unsampled," which is the part of Ten Site Canyon between reaches TS-1C and TS-1E where there is a wide canyon bottom and a relatively large volume of post-1942 sediment. Unit areas here are based on geomorphic mapping; thicknesses are assumed to be the same as in TS-1C, and radionuclide concentrations are assumed to be the average of values from TS-1C and TS-1E. Table D-1.4-1 also includes inventory estimates for two parts of Pratt Canyon, areas which are otherwise out of the scope of this investigation but which are considered important for understanding radionuclides in the Mortandad watershed. Reach PCYN was mapped and characterized in 1998, although data are relatively sparse here in comparison to other reaches. Because sampling in PCYN was biased to layers with relatively high field radiation measurements, the total inventory is probably overestimated. The area between PCYN and Ten Site Canyon has not been mapped, but analytical data are available from sampling in 2005 (LANL 2005, 91699). Field observations are used to estimate sediment volume in this short (70-m long), narrow reach where a thin layer of sediment overlies bedrock.

Table D-1.4-2 uses the estimates in Table D-1.4-1 to provide an estimated inventory of key radionuclides in the entire Mortandad watershed. No adjustment for radioactive decay was made for cesium-137, cobalt-60, strontium-90, with relatively short half-lives (30.1, 5.27, and 28.8 years, respectively; Parrington et al. 1996, 58682), providing overestimates of present-day inventory. In addition, no adjustments were made for sediment removed during maintenance of the sediment traps in 2000 (WGII 2000, 70735) because the low concentrations present in the traps and in adjacent fill piles indicate a minor reduction in inventory. These estimates are applicable to the period when geomorphic mapping and characterization and sediment sampling was conducted in each reach and do not include changes in inventory that have occurred because of flooding after characterization work was completed.

D-1.5 Summary of Key Radionuclides

Tables D-1.5-1 through D-1.5-6 summarize the variations in concentrations and inventory of key radionuclide COPCs in the Mortandad watershed. Estimated average concentrations and normalized inventories (units of mCi/km) are presented for americium-241, cesium-137, cobalt-60, plutonium-238, plutonium-239,240, and strontium-90 for coarse and fine facies in each reach in which they have been identified as COPCs. The average concentrations are volume-weighted values, where the estimated average concentration in a geomorphic unit is weighted by the volume of that unit. The calculation of averages only used data from samples collected during this investigation and not results from other studies because the geomorphic context was uncertain for the latter samples. Normalized inventories are calculated by dividing the total estimated inventory in a reach by the reach length. These concentrations and inventories are not corrected for radioactive decay and therefore provide overestimates for radionuclides with relatively short half-lives (e.g., radioactive decay would reduce the concentration of cesium-137 in a layer sampled in 1998, the first year of this investigation, by about 17% by 2006; half-life = 30.1 yr, Parrington et al. 1996, 58682).

Table D-1.5-7 summarizes average concentrations for thorium-228, thorium-230, and thorium-232 in reaches where one or more of these radionuclides were identified as COPCs. For reach TS-1C, the two sample layers that provided results above BVs (samples CAMO-04-53373 and CAMO-04-53376) were resampled in 2005 (samples CAMO-05-63743 and CAMO-05-63744), indicating concentrations below BVs, and the 2005 results were used in the calculation of averages in this table.

D-1.6 Radionuclide Chronology

A chronology has been developed of variations in radionuclide ratios and radionuclide concentrations in fine facies sediment in reaches M-3 and M-4 using analytical data from samples collected from well-constrained geomorphic contexts, supplemented by analyses of suspended sediment samples in one flood in 1974 (Hakonson et al. 1976, 8920). Variations in the ratios between different radionuclides in sediment occur because of variations in release history from the RLWTF, in turn reflecting changes in either research activities at the Laboratory and/or treatment processes, modified by additions of radionuclides remobilized from the channel and adjacent banks downcanyon from the outfall during floods. Temporal variations in radionuclide ratios in sediment deposits in upper Los Alamos and DP Canyons have been previously used to reconstruct a time series of radionuclide concentration in these canyons (Reneau et al. 1998, 59160; Katzman et al. 1999, 63915; Malmon 2002, 76038), and the data from Mortandad Canyon allows a similar time series to be constructed here. Four radionuclides that are commonly detected in sediment deposits in M-3 and M-4 and that tend to strongly adsorb to sediment particles are used to evaluate radionuclide ratios: americium-241, cesium-137, plutonium-238, and plutonium-239,240. Ratios including cesium-137 calculated from sediment deposits are different than those from at the time of transport because of radioactive decay of cesium-137 but they still provide a means to differentiate deposits. Data from the sediment samples used to calculate radionuclides ratios for this chronology are presented in Table D-1.6-1, showing estimated ages for each sample.

Excellent constraints on sediment age and variations in radionuclide isotope ratios are provided at sample location MO-00079 in reach M-4W, where seven sediment samples were analyzed through a 1.5-m thick section of fine-grained sediment that filled one of the original sediment traps (c1/c2t unit). This trap was excavated in 1976 and largely filled by September 1983 (LANL 1997, 56835, p. 2-8). This sample location provides a record of variations in radionuclide concentrations and ratios through this period. This period includes one of the largest documented runoff events in Mortandad Canyon in November 1978 (Purtymun 1994, 52951, pp. 132–135; LANL 1997, 56835, p. 3-77), and some of the sediment in the traps and farther east in M-4C and M-4E was deposited during this event. Sediment sampled at a depth of 93-125 cm at MO-00079 has similar radionuclide ratios as the uppermost layer at many locations east of the traps and is interpreted to have been deposited during the 1978 flood. The upper five samples (3-89 cm) have distinctly different radionuclide ratios and are interpreted as having been deposited from 1979 to 1983. The lowest sample (125–150 cm) has radionuclide ratios distinct from the upper six samples, with a minimum value for the ratio of plutonium-239,240 to plutonium-238 (Pu239/Pu238) (0.4) in the sediment data set used hereand is interpreted as having been deposited in 1976 or 1977.

Information on radionuclide concentrations and ratios between 1963, when effluent discharges began from the RLWTF, and 1976 is provided from sediment deposits east of the original sediment traps. Location MO-00080 is in reach M-4C immediately east of berms constructed east of the first traps and is where gross-gamma radiation walkover surveys identified the highest levels of cesium-137 east of the traps. The uppermost layers here represent the youngest sediment deposited before construction of the first traps in 1976 and record similar radionuclide ratios as the lowest sampled layer in the 1976 trap, with a low Pu239/Pu238) ratio (0.7). Additional age constraints are provided farther east in M-4C at location MO-10139 where a tree dated at 1969 by dendrochronology (tree MOR4-008; see Figure 7.1-3) is buried by 34 cm of sediment with higher Pu239/Pu238 ratios (2.1 to 7.6). The lowest layer above the base of the tree has the highest Cs137/Pu238 ratio in M-4 (122), much higher than ratios at MO-00079 and MO-00080 or the uppermost later at MO-10139 (<30). This sediment deposit is inferred to date to ca. 1969-1971 and the overlying sediment to ca. 1971–1973 based on differences from sediment deposited in 1974 or later (discussed in the next paragraph). Higher Cs137/Pu238 ratios are present in samples at MO-00068 and MO-10117 in M-3E (235-311) and are interpreted to represent sediment deposited after initial RLWTF releases in 1963 but before the 1969 or younger sediment at MO-10139.

Supplemental data on radionuclide ratios in fine facies sediment before construction of the original sediment traps are provided by analyses of cesium-137, plutonium-238, and plutonium-239,240 concentrations in suspended sediment samples collected during a runoff event on September 15, 1974, at a location upcanyon from reach M-3W (Hakonson et al. 1976, 8920). These samples record somewhat lower Pu239/Pu238 ratios than in the ca. 1976 sediment deposits discussed above at locations MO-00079 and MO-00080 (0.14 to 0.18) and are consistent with TA-50 RLWTF discharge records that indicate the peak releases of plutonium-238 in 1974–1975 (LANL 1997, 56835, pp. 2-20–2-21). The September 1974 samples also have relatively high Cs137/Pu239 ratios (21-62, with cesium-137 concentrations adjusted for radioactive decay to 2001), generally higher than in the ca. 1976 deposits (12–25) and indicating much variability during this time period. Cs137/Pu238 ratios (3–11) are similar in sediment deposits dating to the mid-1970s or younger and lower than in deposits deposited ca. 1971 or earlier (>50).

Information on radionuclide concentrations and ratios in fine facies sediment after the original sediment traps filled in 1983 is provided from sediment deposits within and west of the current sediment traps. Sediment was excavated from the traps in 1992 (LANL 1992, 45363; LANL 1997, 56835, p. 2-5), and fine-grained sediment sampled from the traps in 1999 provides data for the 1990s. Fine-grained sediment sampled from along the channel in M-3 in 1999 provides additional information for this time period. Sediment traps #1 and #3 were also excavated in 2000 (WGII 2000, 70735), and data for the period 2000 to 2005 are provided by samples from 2001 and 2005, the latter deposited during the August 24, 2005, flood. Samples collected from the active channel in 2004 provide additional data for recent transport. Finally, some sampled sediment deposits in M-3 are inferred to have been deposited in June 1987 when a large flood damaged the road and filled the traps (LANL 1997, 56835, pp. 2-8, 3-77), and some additional sampled sediment is known to postdate subsequent engineering of the channel in 1987.

Temporal variations in the ratios of key radionuclides are shown in Figure D-1.6-1 and are used to estimate ages for sampled sediment layers in M-3 and M-4. These age estimates allow calculation of average concentrations of radionuclides in different time periods in M-3 and M-4, as support for time trends presented in Section 7.1.1.3.

D-1.7 Spatial Variations in Average Concentrations for Select Inorganic and Organic COPCs

This section presents information on the average concentrations of inorganic and organic COPCs in sediment in the Mortandad watershed that are important for assessing potential human health risk, based on a comparison with residential soil screening levels (SSLs), as identified in Section 6. Some COPCs are also included that are important for evaluating potential ecological risk or relations between COPCs in water and in sediment or for understanding the downcanyon extent of contamination. This information supports the identification of sources for the COPCs and the examination of how concentrations change with distance from sources and how they vary with sediment facies. Averages were calculated separately for fine facies sediment samples and coarse facies samples to highlight differences between concentrations in these facies. The averages were calculated using the same bins discussed in Section D-1.3. Upper and lower bounds on average concentrations in this section are calculated by replacing the sample result for nondetects with either the detection limit or zero, respectively; the midpoint or median of this range is also calculated by substituting one-half of the detection limit for nondetects. For some COPCs and some reaches, considerable uncertainty exists in average concentrations because of elevated detection limits, although for most COPCs and most reaches uncertainties related to nondetects do not obscure the general spatial trends in COPC concentration. If improved estimates of average concentrations were warranted, these estimates could be refined using the more robust nondetect replacement methods employed in Appendix E. Tables D-1.7-1 and D-1.7-2 present average concentrations for inorganic and organic COPCs discussed in Sections 7.1.2 and 7.1.3.

D-1.8 Chromium Inventory

This section presents inventory estimates for chromium in sediments in the Mortandad watershed, which is an important contaminant in groundwater and also has maximum sediment concentrations exceeding residential SSLs. The chromium inventory is estimated the same way as inventories for radionuclides discussed in Section D-1.4, with the exception that the average chromium value from the background sediment data set (5.6 mg/kg; McDonald et al. 2004, 76084, Table 10, p. 47) is subtracted from the average concentration in each unit. Background levels of chromium are subtracted because many of the unit averages are close to the background average, and background therefore dominates the inventory in some reaches. The inventory is considered to be zero for units and facies where the average concentration is less than the background average. The summary inventory of anthropogenic (Laboratory-added) chromium in the Mortandad watershed is presented in Table D-1.8-1 and discussed in Section 7.1.2.

D-2.0 WATER

This section presents plots showing sample results for all COPCs identified in surface water, springs, and alluvial groundwater in the Mortandad watershed versus distance from the Rio Grande. These plots help to identify sources for the COPCs, show how concentrations change with distance from sources and in time, and support the physical system conceptual model in Section 7 and the risk assessments in Section 8.

D-2.1 Spatial Distribution of COPCs in Surface Water and Alluvial Groundwater

This section provides additional information concerning the spatial distribution of COPCs in the watershed using box plots that show the data for surface water and alluvial groundwater sampling locations in relation to distance from the Rio Grande. The box plots are depicted in Figures D-2-1 to D.2-1. Data collected from 2000 to 2005 under the investigations described in Section 3 are used in the box plots. The upper and lower ends of the boxes are the 75th and 25th percentiles of the data distribution and upper and lower lines outside the boxes indicate 90th and 10th percentiles, respectively. The sampling locations included in the plots were selected to bound known or suspected contaminant sources and generally include locations that have enough data to show variability in contaminant concentrations. Nondetect values are included in the plots. The paired numbers below each box indicate the number of detects (left) and nondetects (right) at each location. Detected values are represented in the plots with filled symbols, and the nondetect values are open symbols.

D-2.2 Temporal Distribution of COPCs in Surface Water and in Alluvial, Perched-Intermediate, and Regional Groundwater

This section provides additional information concerning the time-varying concentrations of COPCs in water using time series plots. Concentrations as a function of time are presented for surface water at gaging station E200 (and its predecessor GS-1), for perched-alluvial groundwater at 13 alluvial wells, for perched-intermediate groundwater at 4 intermediate wells, and for regional groundwater at 8 regional wells. At each location, the full period of record for a given constituent is presented.

D-2.3 Nitrate, Perchlorate and Tritium Concentrations in Vadose-Zone Pore Water

This section provides additional information concerning the vertical distribution of nitrate, perchlorate, and tritium pore water in the vadose zone by presenting a series of plots showing concentration as a function

of depth (Figures D-2.3-1 through D-2.3-40). Core and cuttings samples from vadose-zone boreholes were collected at the time the holes were drilled. Therefore, each vertical distribution represents a snapshot in time. Anion concentrations for nitrate and perchlorate were analyzed using a pore-water leach method, as described by Broxton et al. (2001, 71250 p. 46). Tritium concentrations were analyzed using liquid scintillation. The following equation was used to convert the activity of tritium present in the pore water from picocuries per gram of rock to picocuries per liter of pore water.

pCi/L = pCi/g(dry sample) × (1/gravimetric moisture content) × 1000

D-2.4 Metal and Radionuclide Distributions in Vadose-Zone Core and Cutting Samples

This section provides additional information concerning the vertical distribution of radionuclides and of the metals chromium and iron in the vadose zone by presenting a series of plots showing activity or concentration within the solid sample as a function of depth (Figures D-2.4-1 through D-2.4-38). Core and cuttings samples from vadose-zone boreholes were collected at the time the holes were drilled and, therefore, represent a snapshot in time. The samples were partially digested using hot HNO_3, as described by Longmire et al. (2001, 70103 p. 39).

D-3.0 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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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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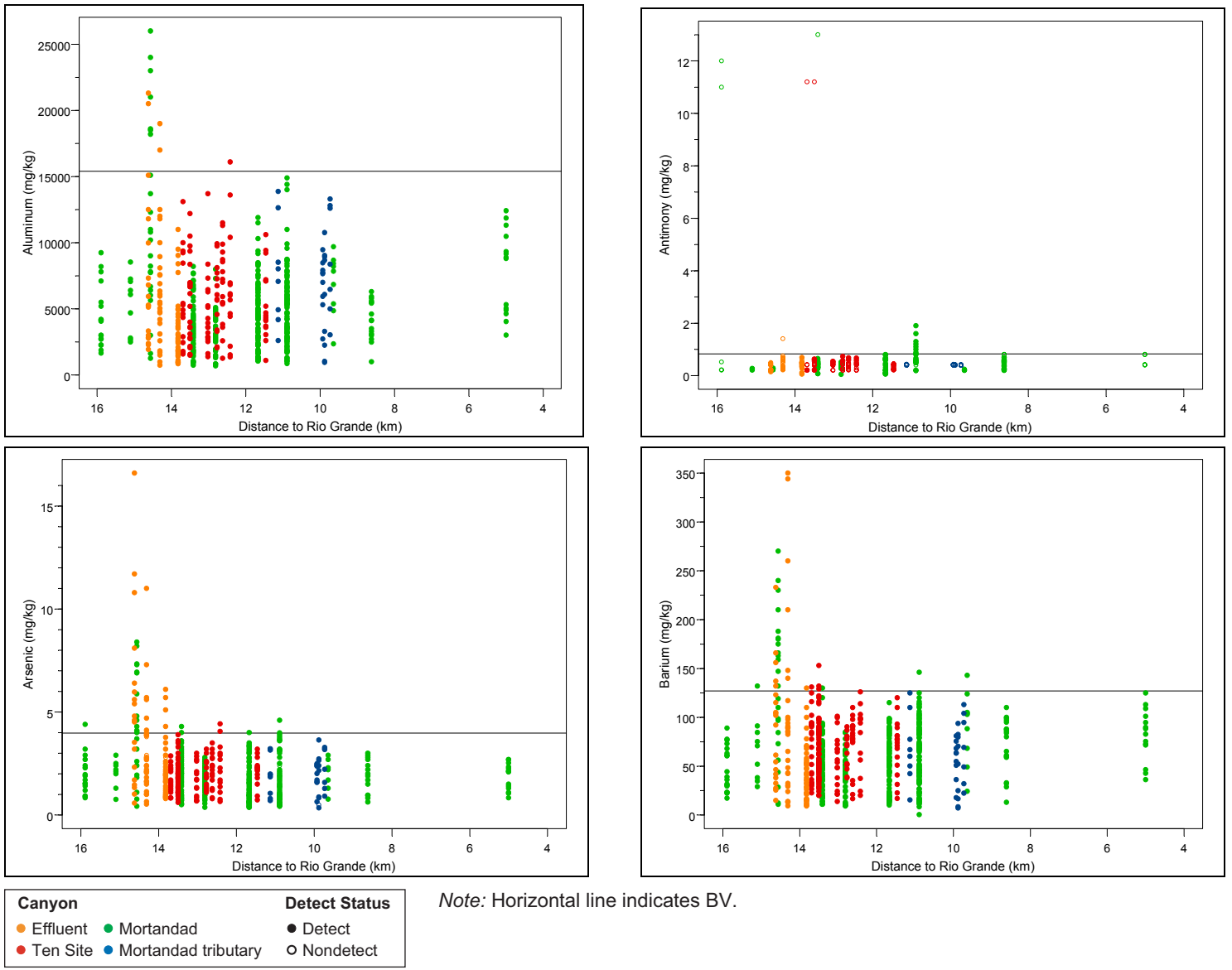
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Note: Horizontal line indicates BV.

Figure D-1.1-1. Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

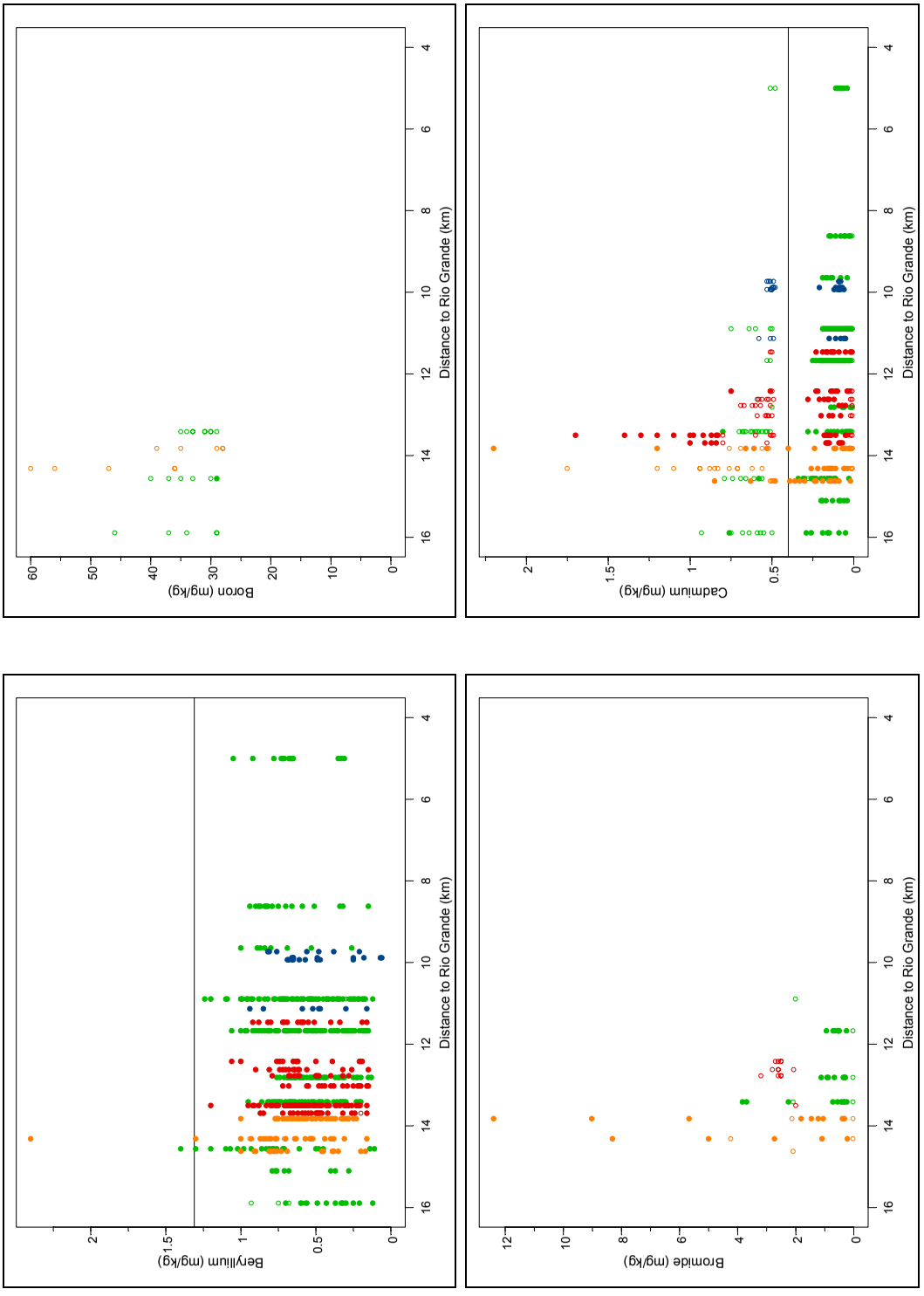
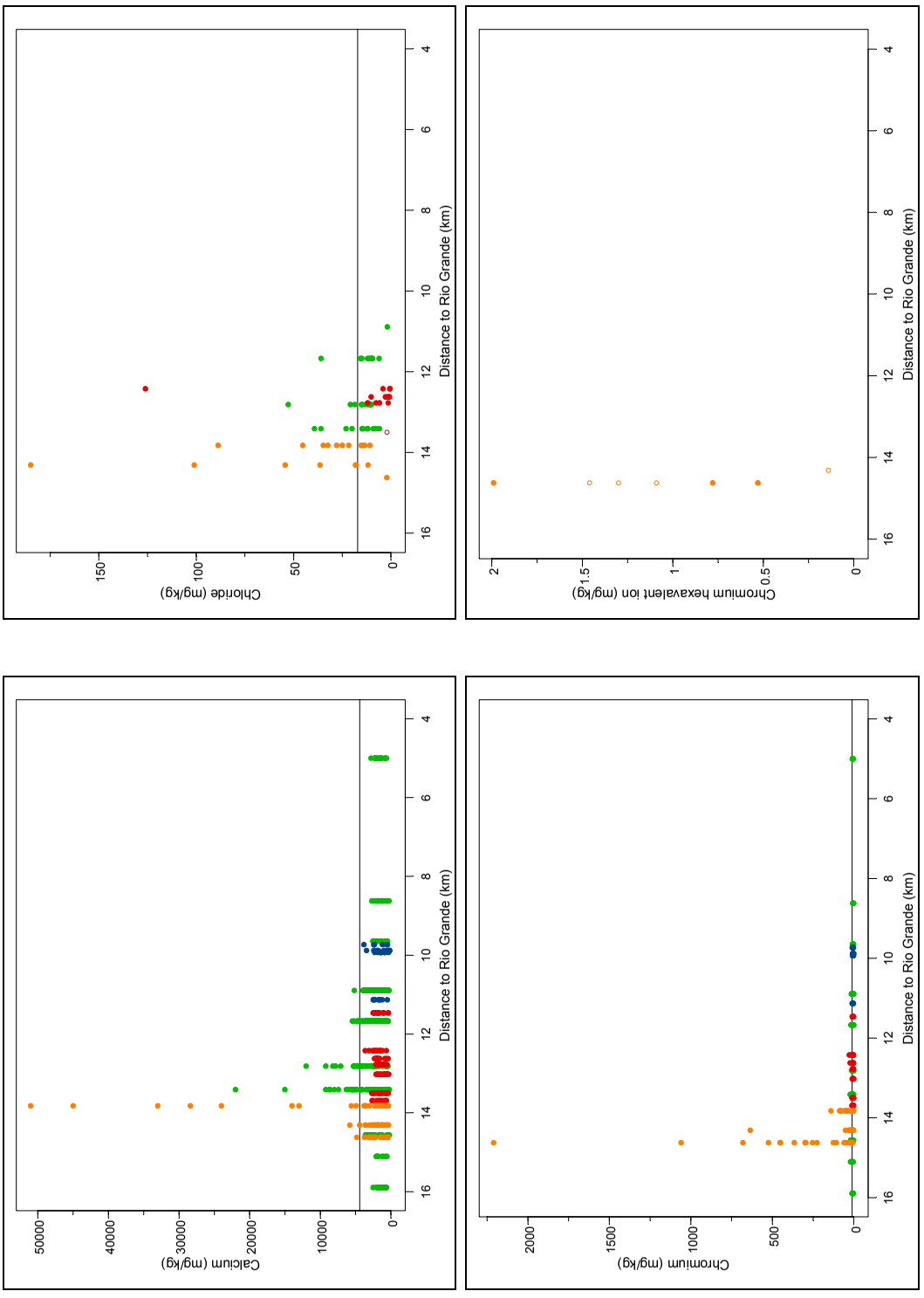


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed



Note: Horizontal line indicates BV.

Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

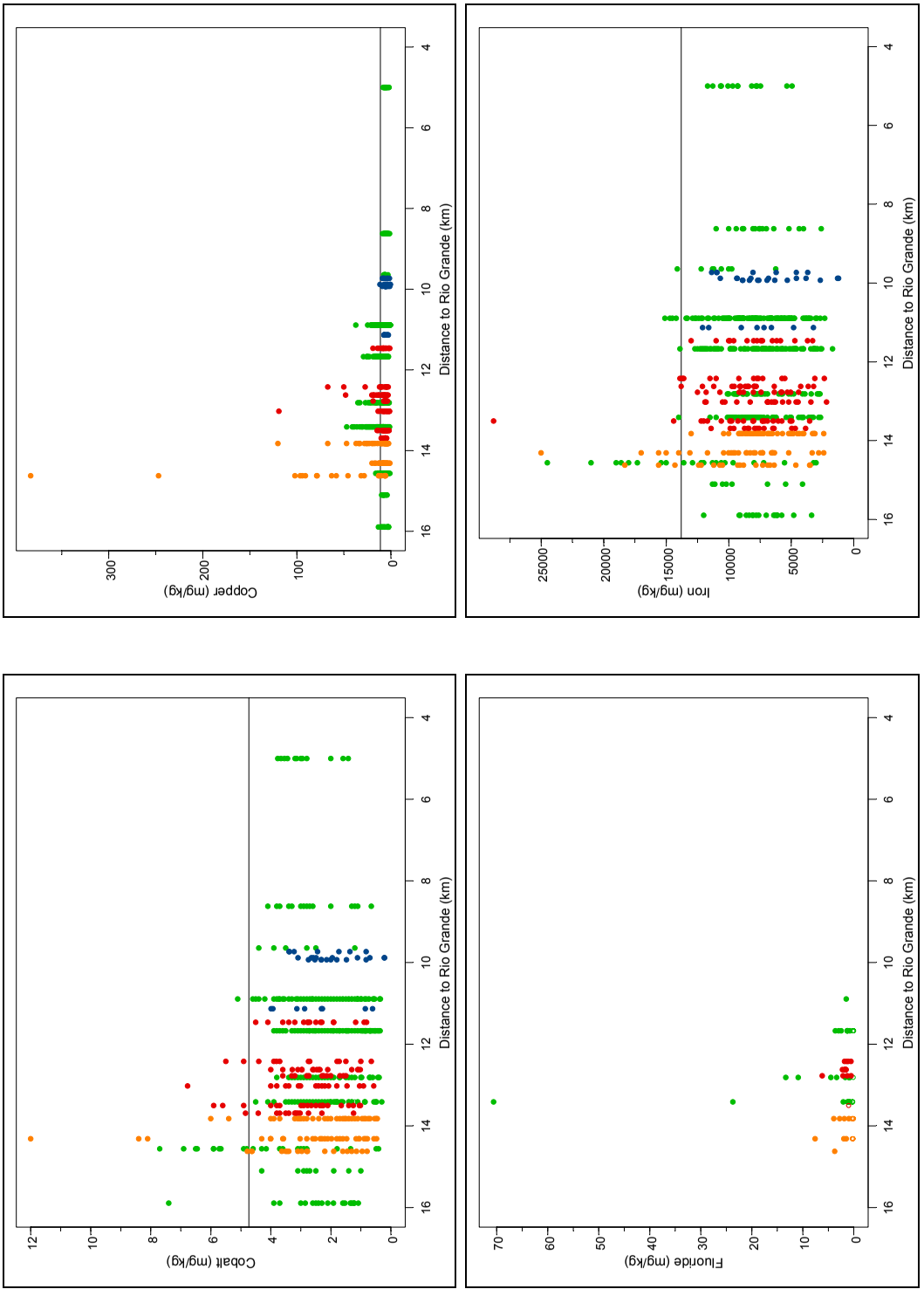
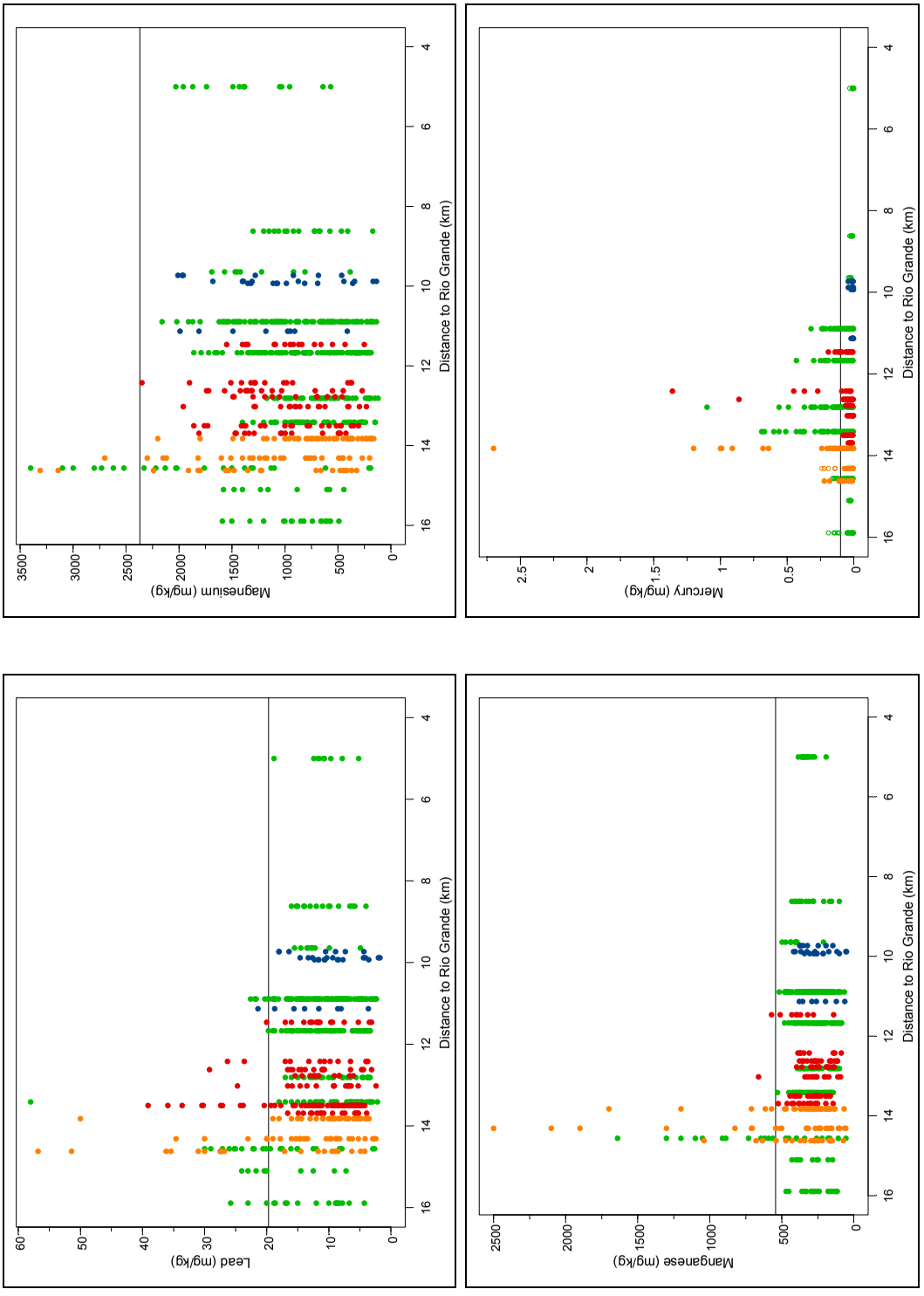
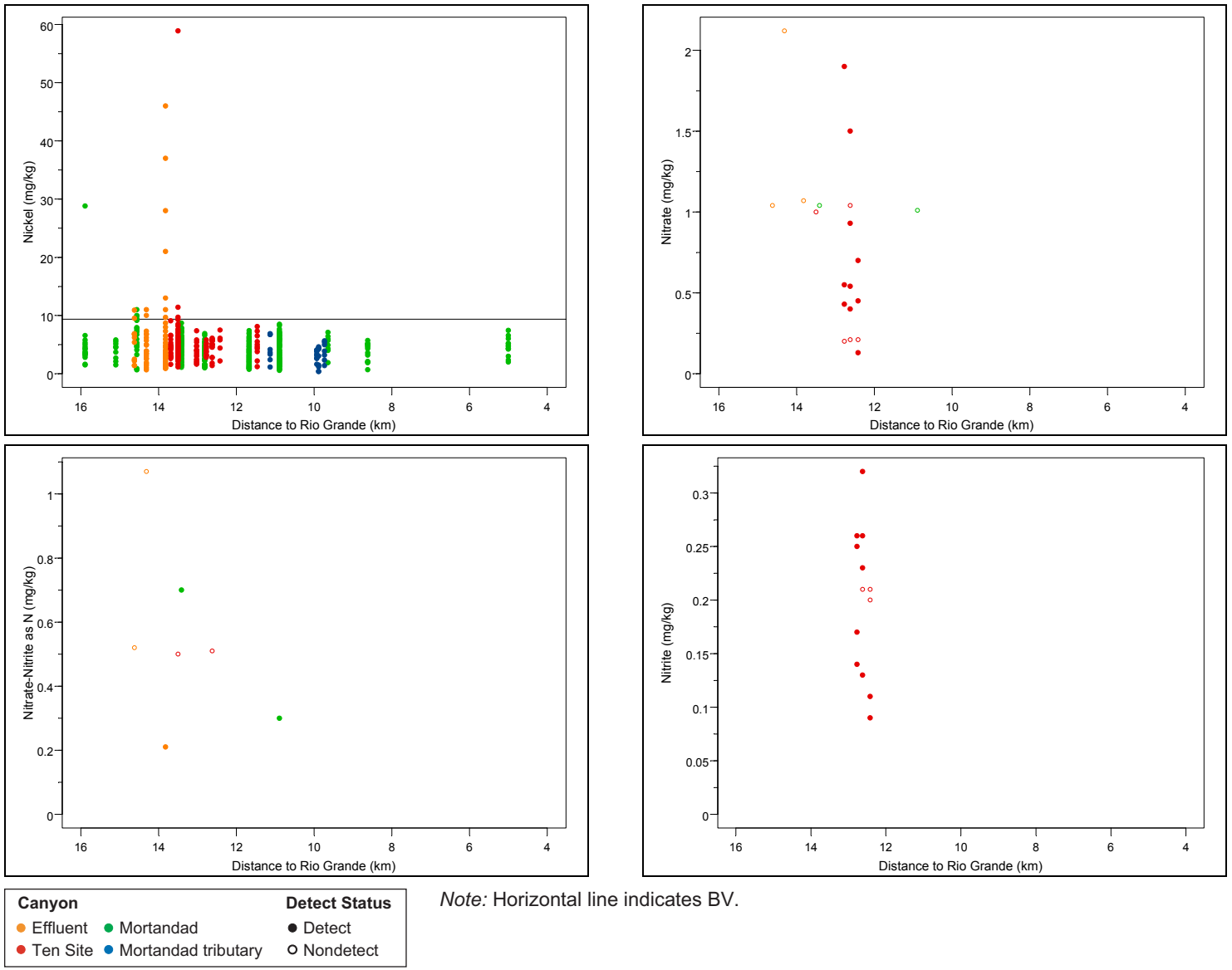


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed



Note: Horizontal line indicates BV.

Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed



Note: Horizontal line indicates BV.

Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

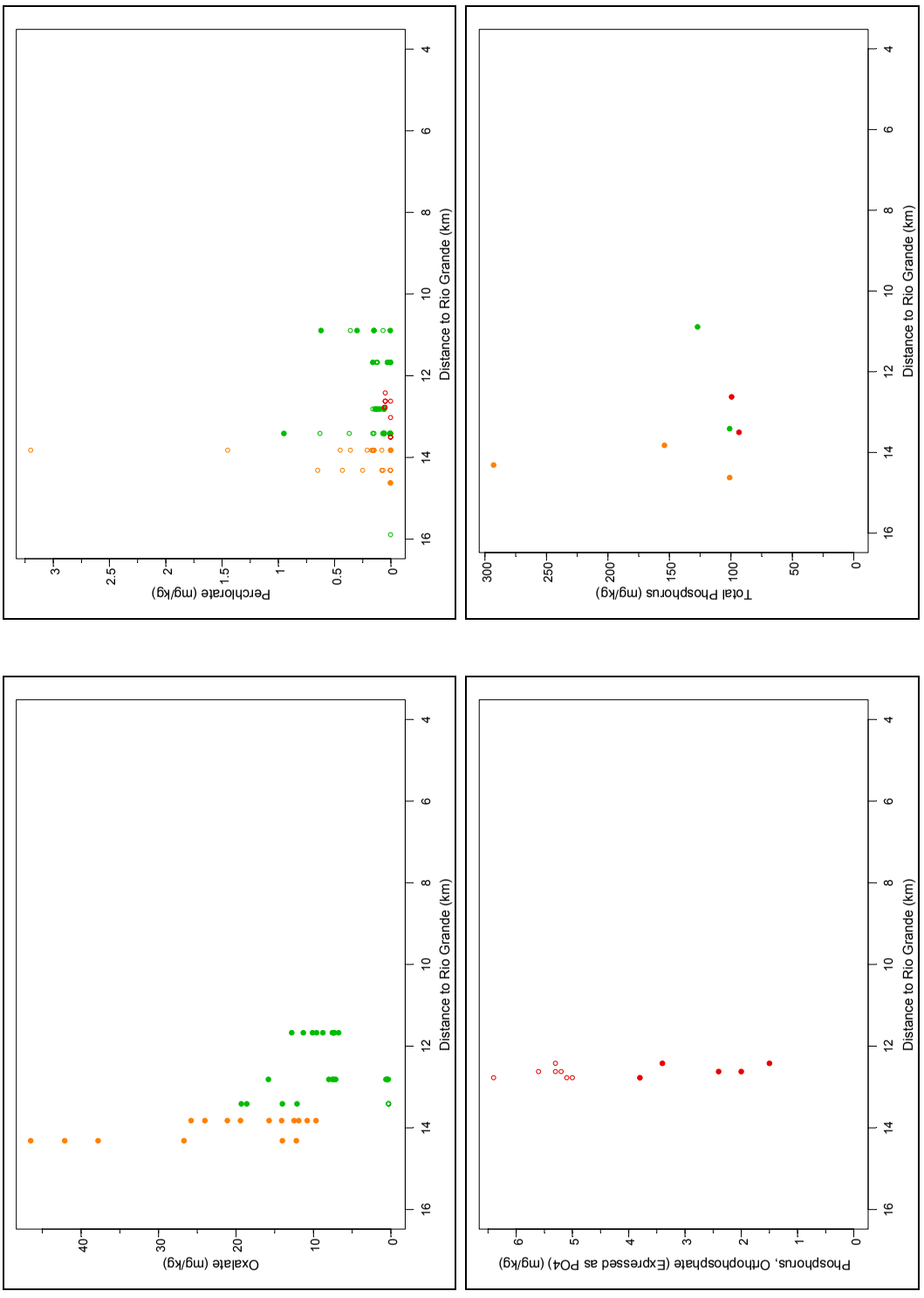


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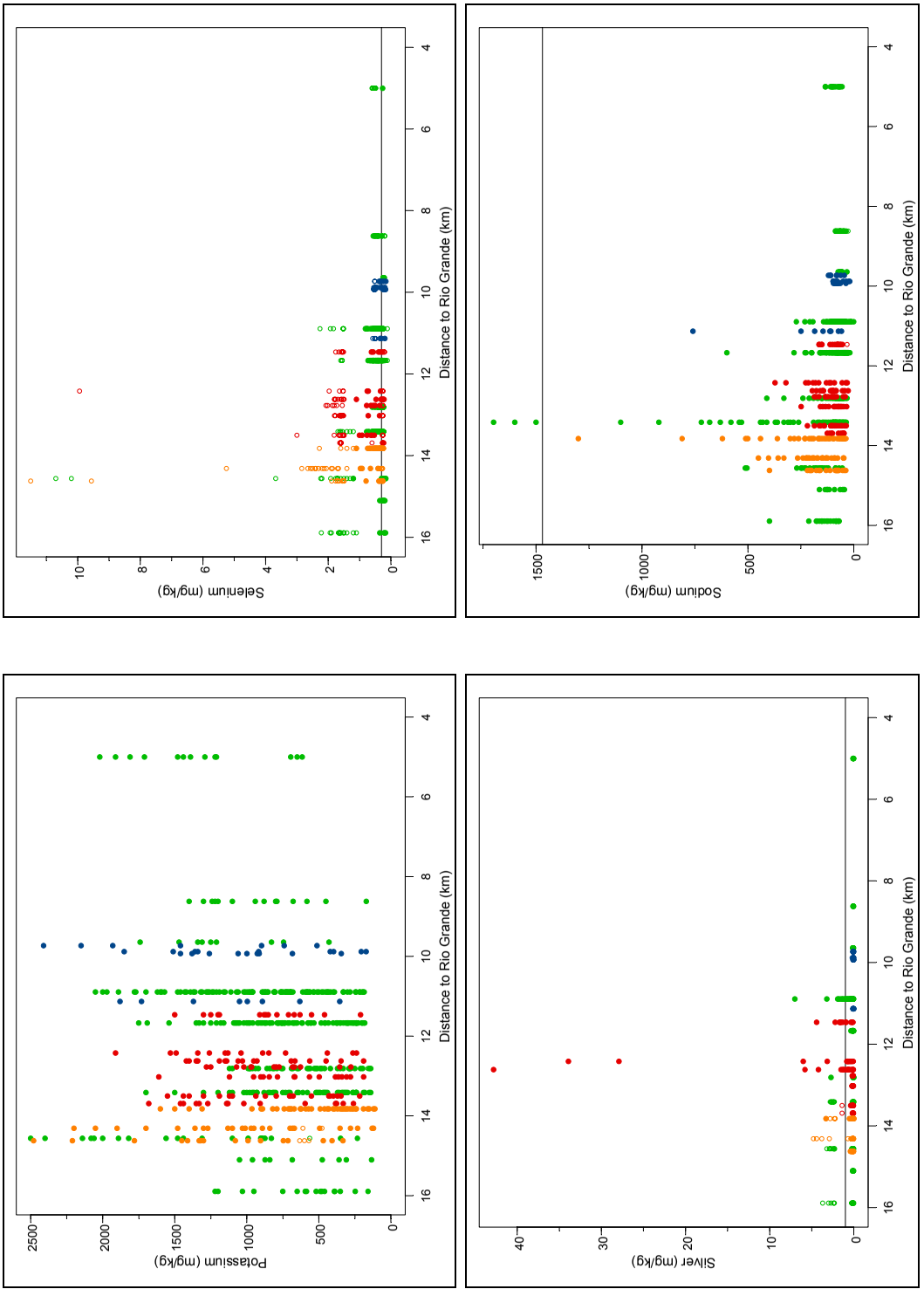


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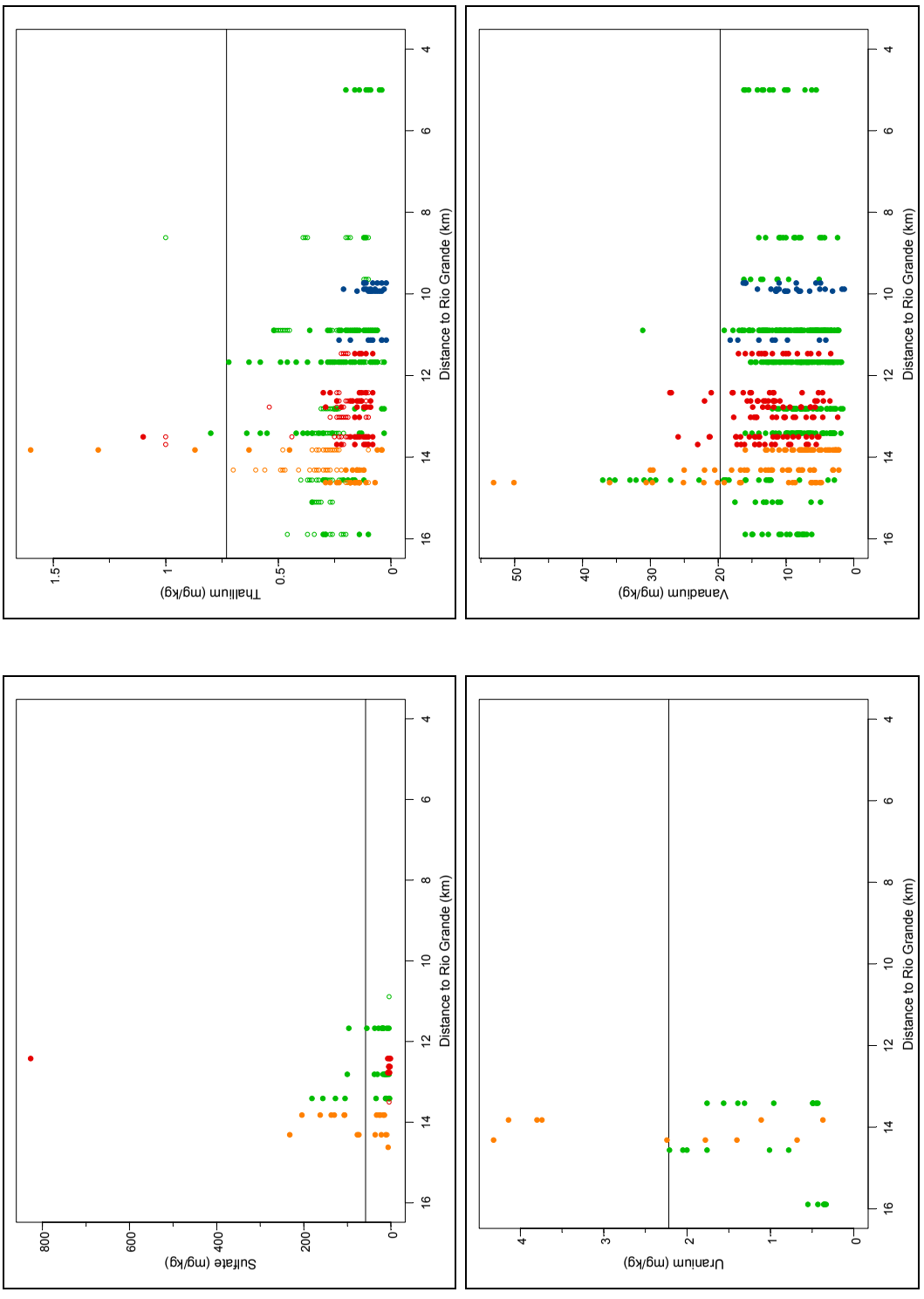


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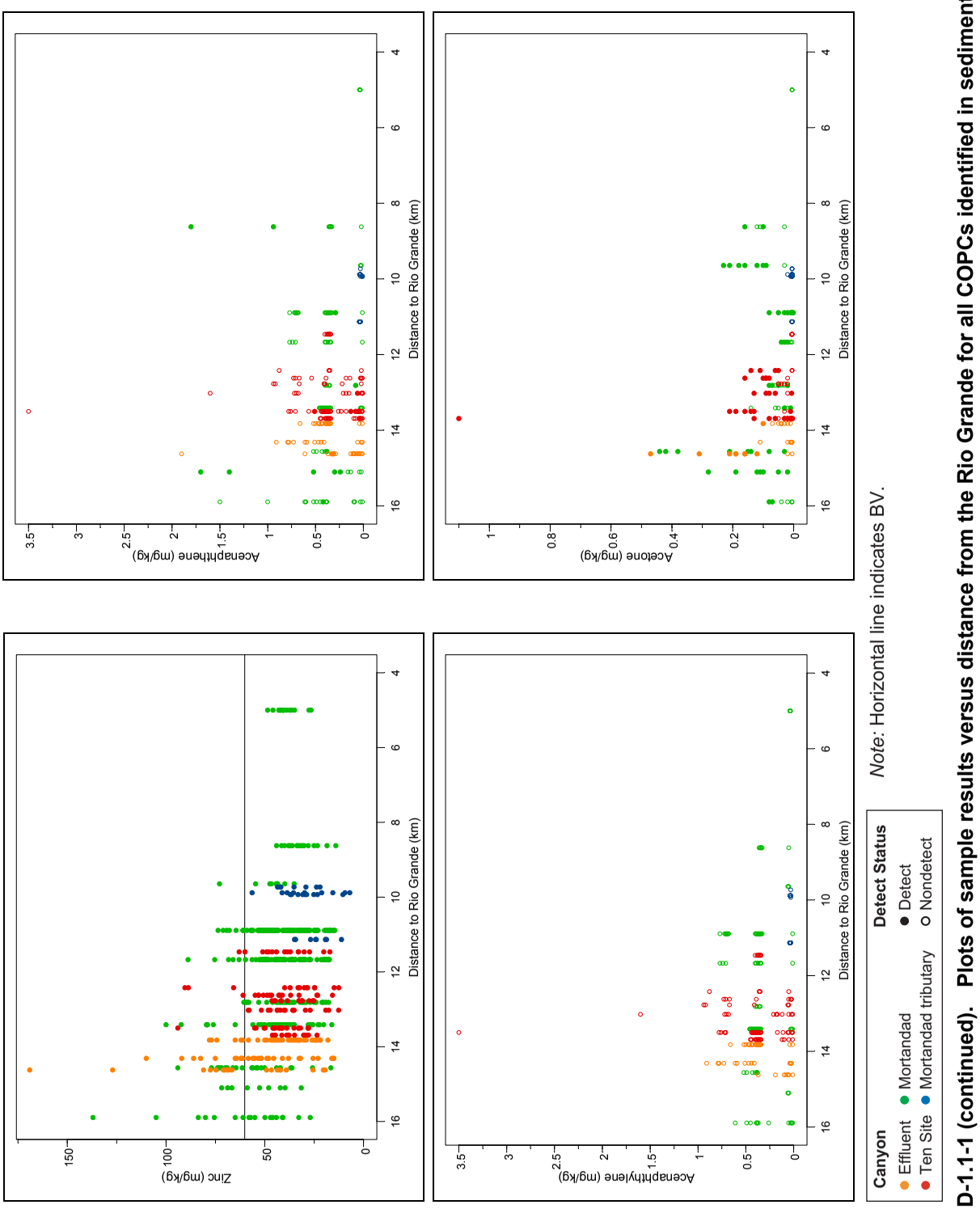


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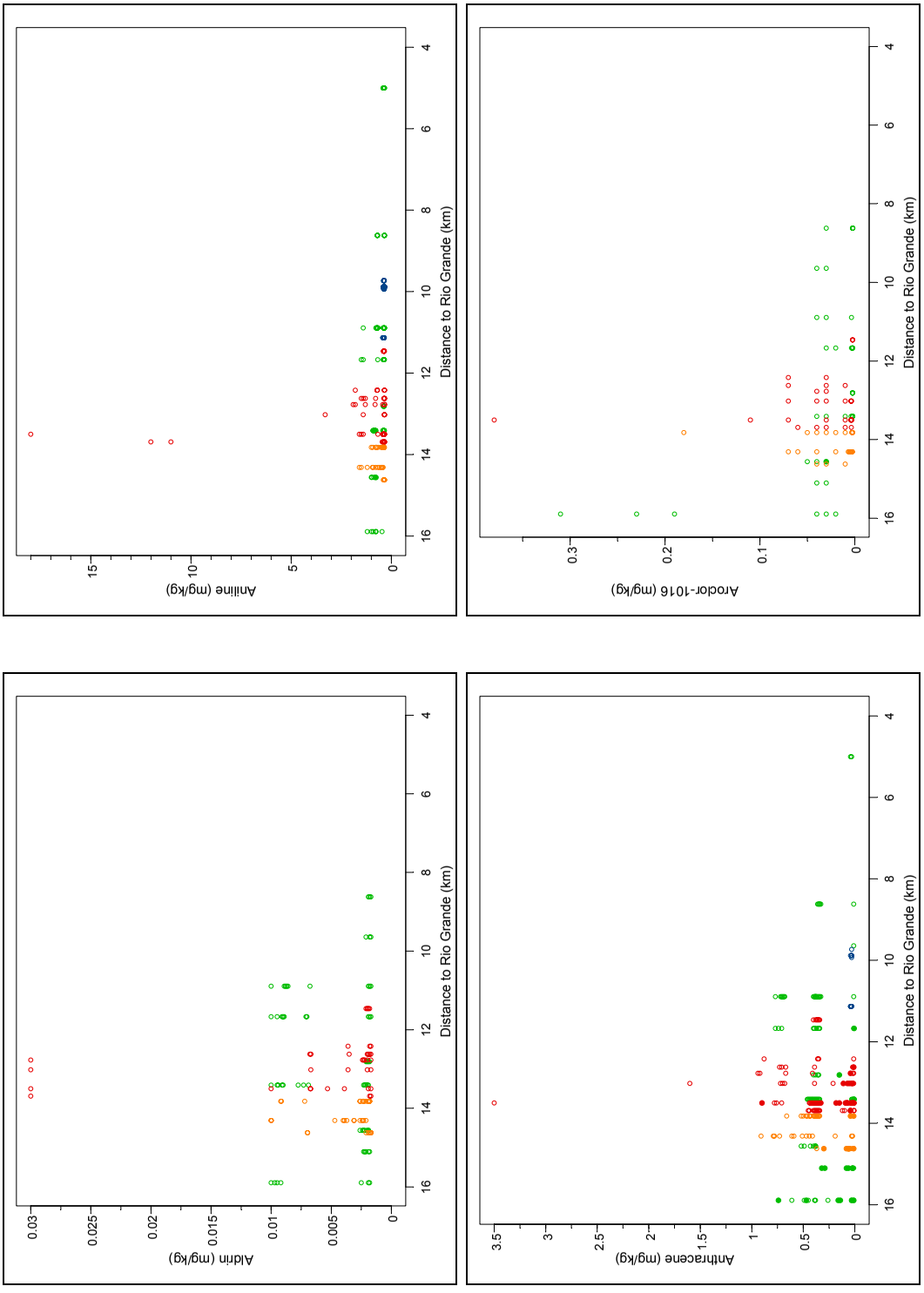


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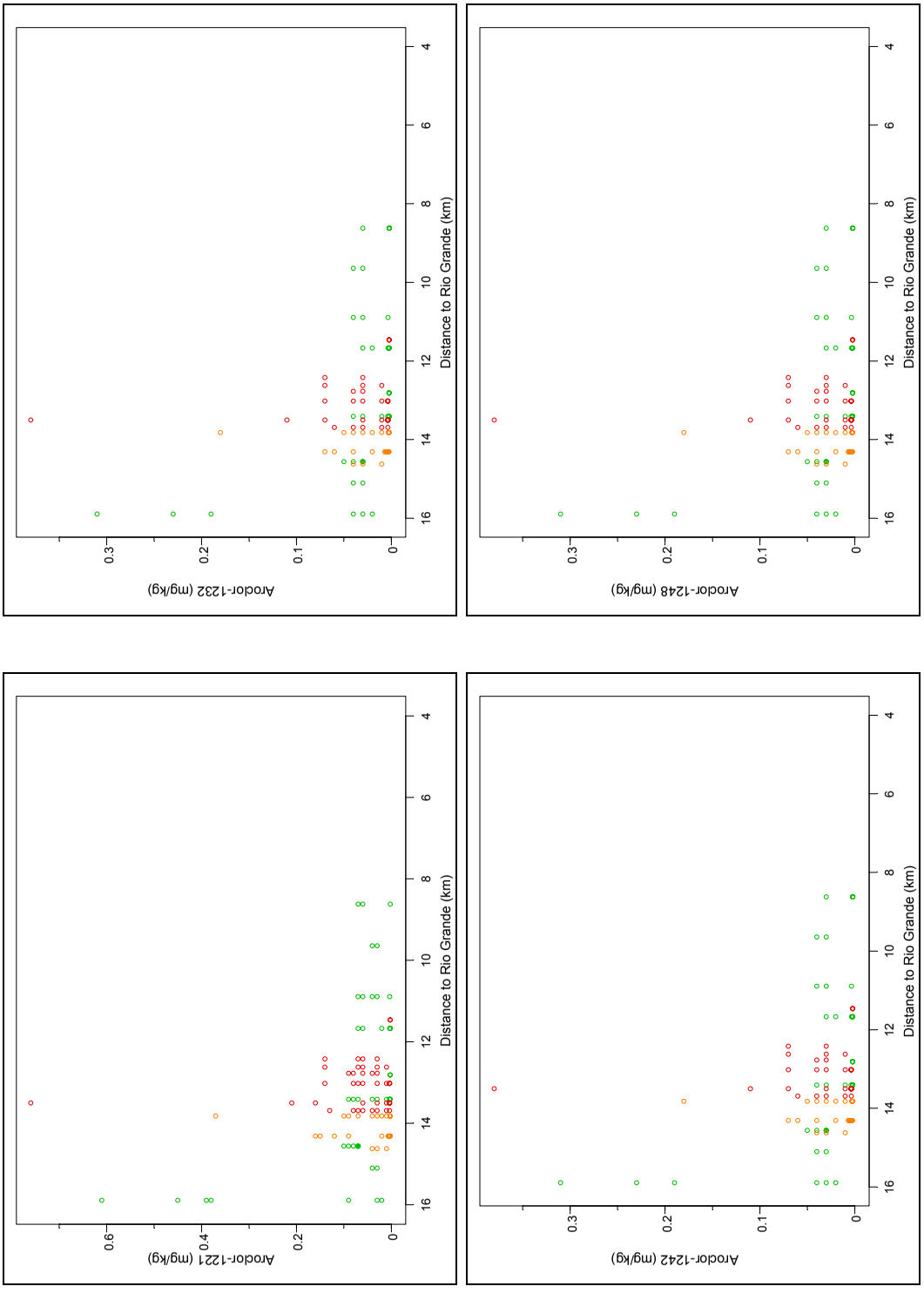


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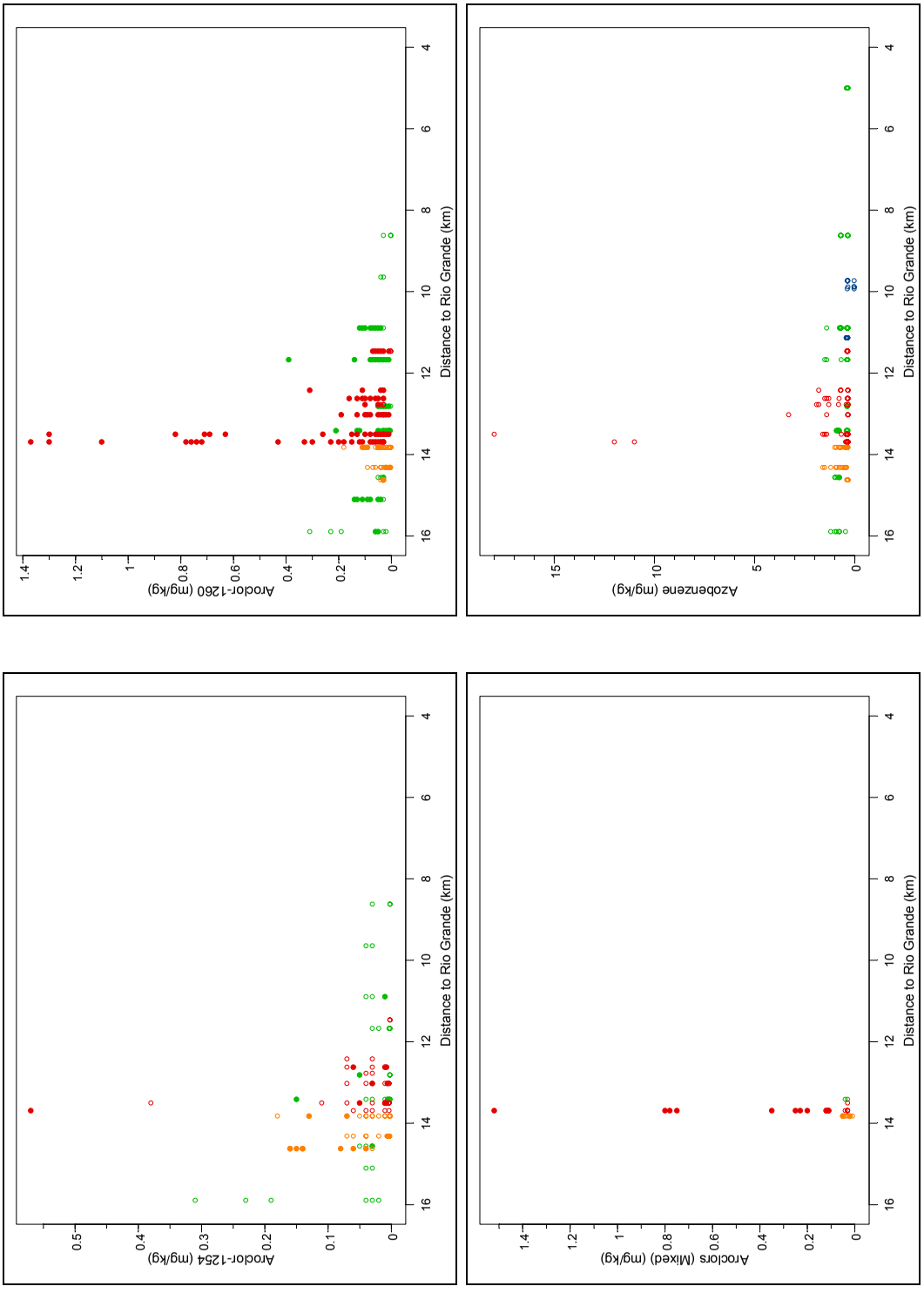


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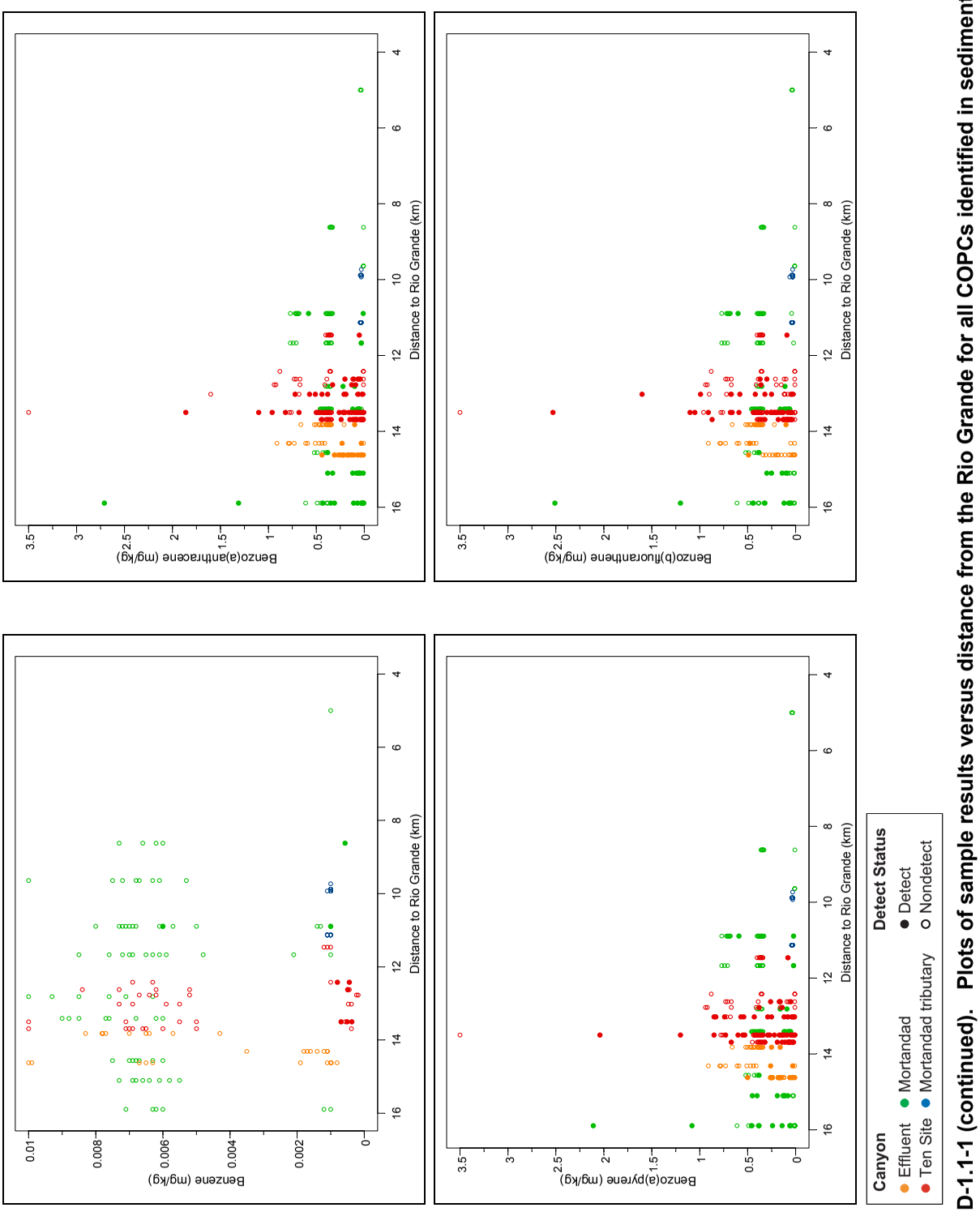


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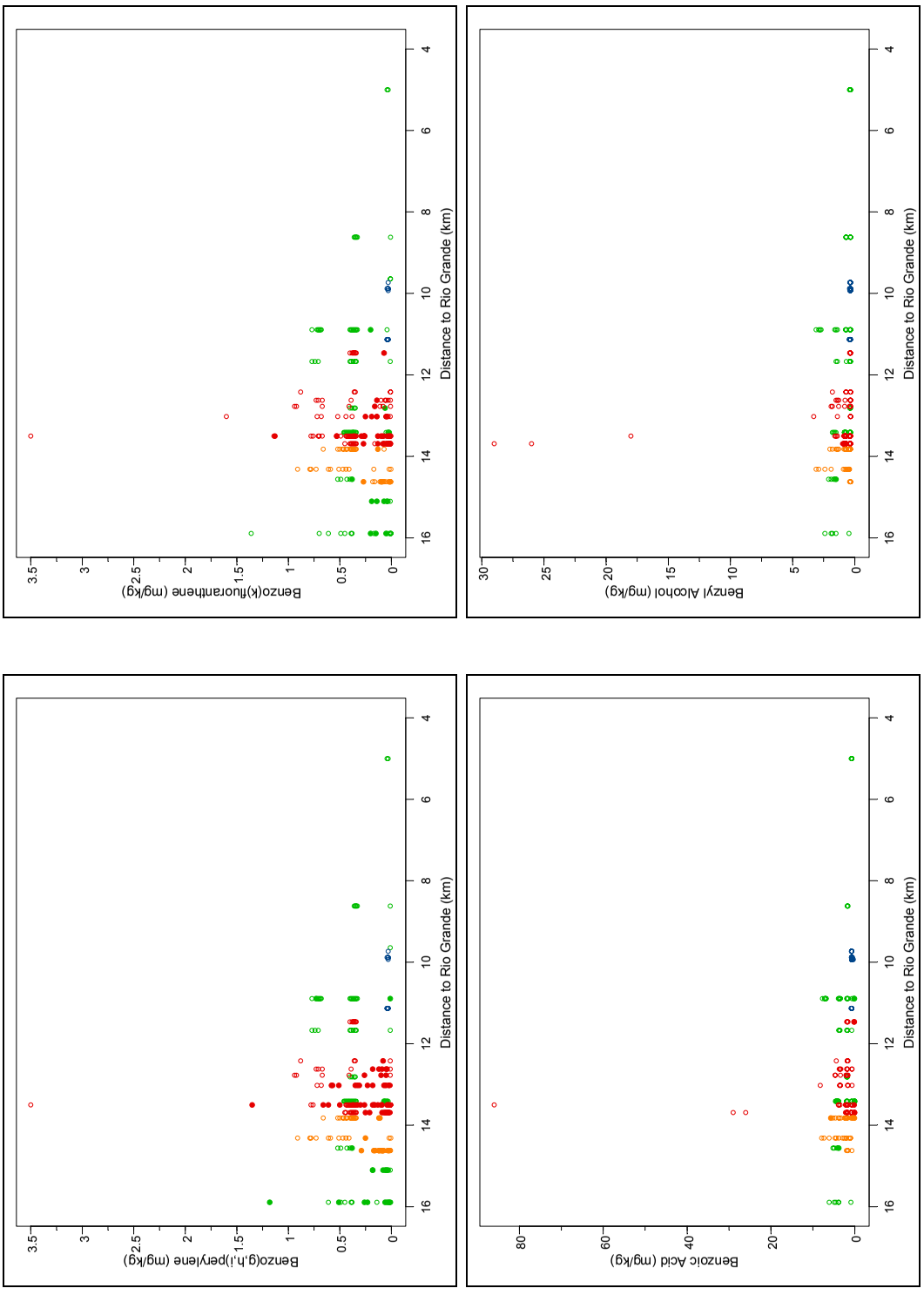


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

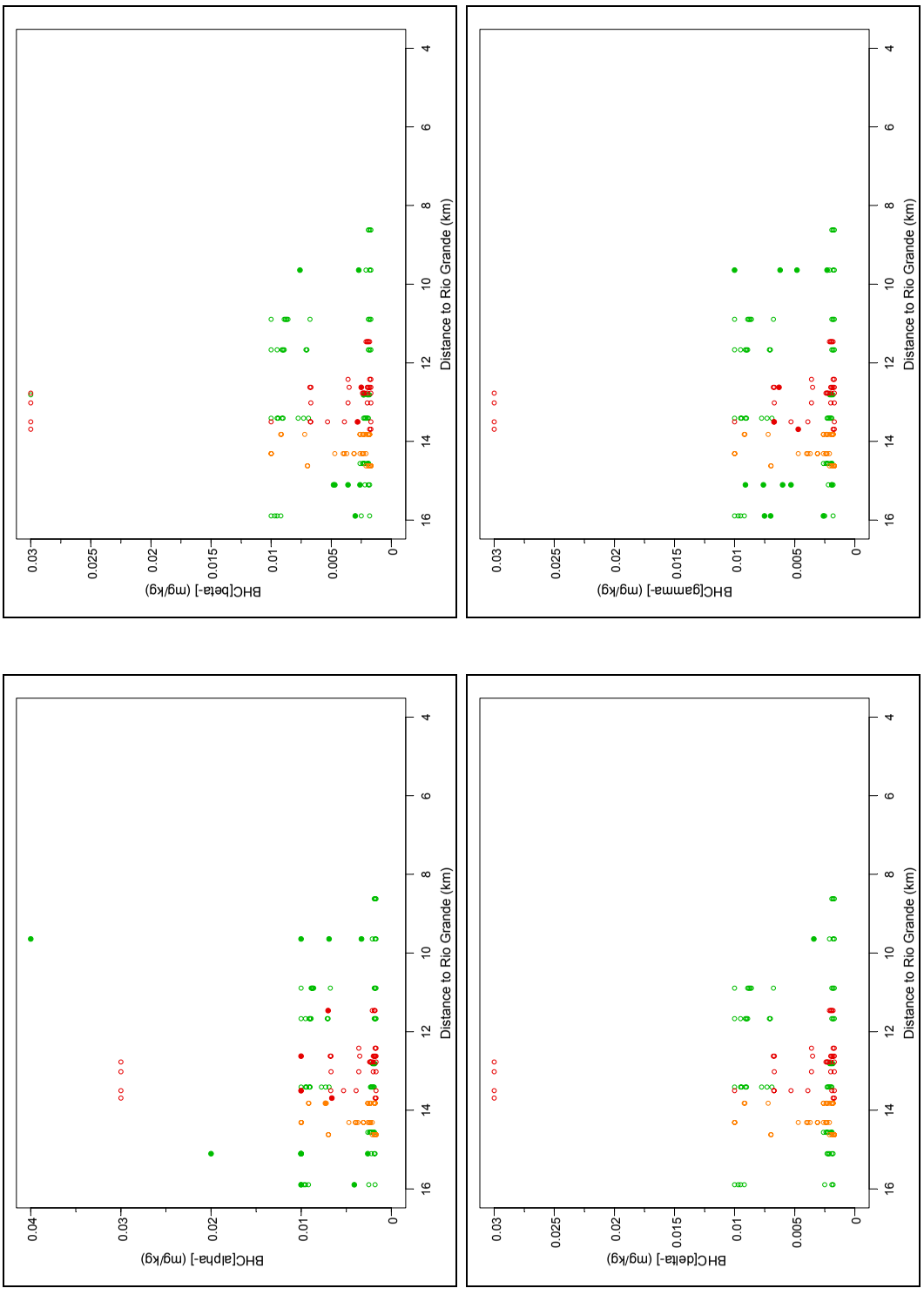


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

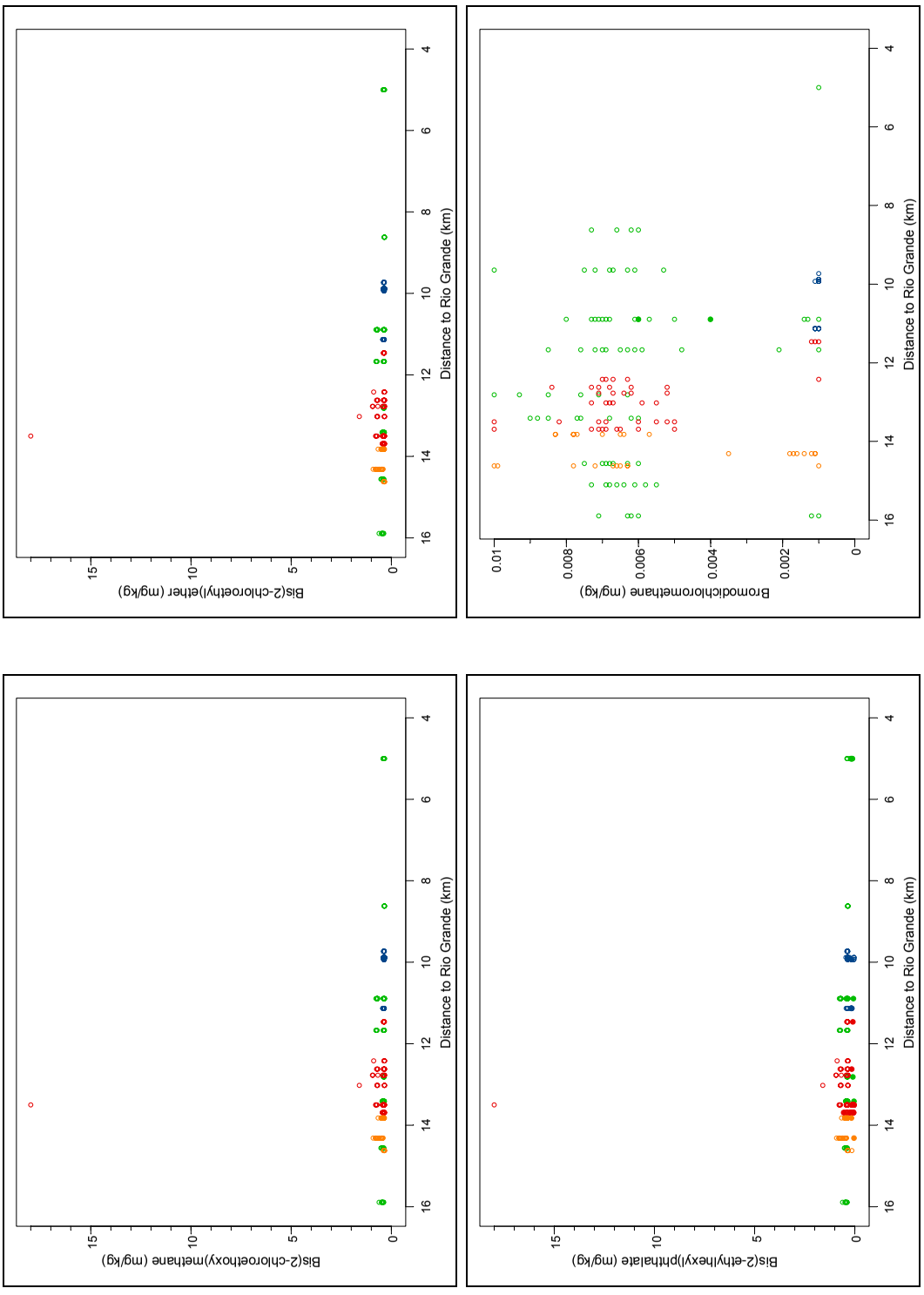


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

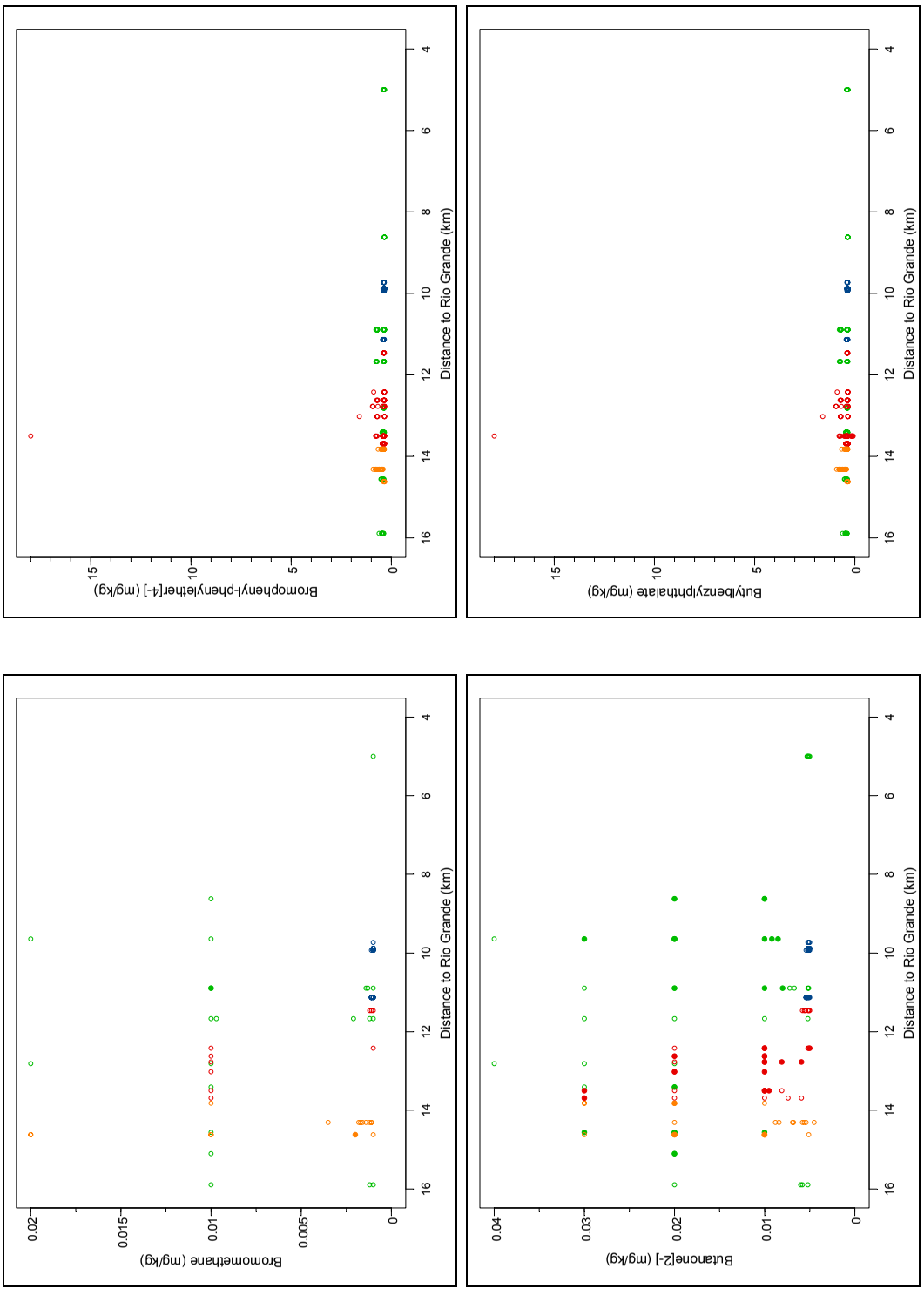


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

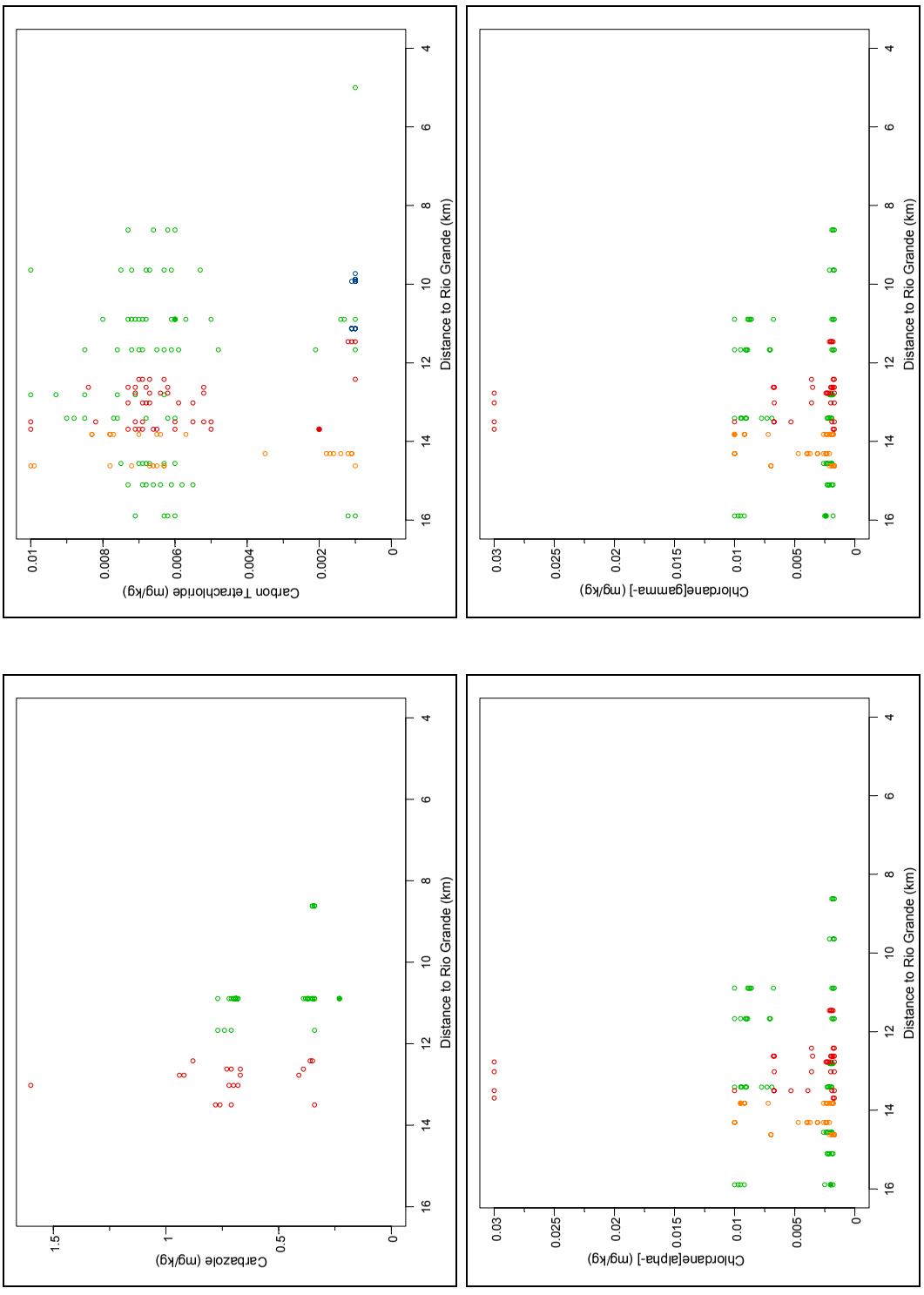


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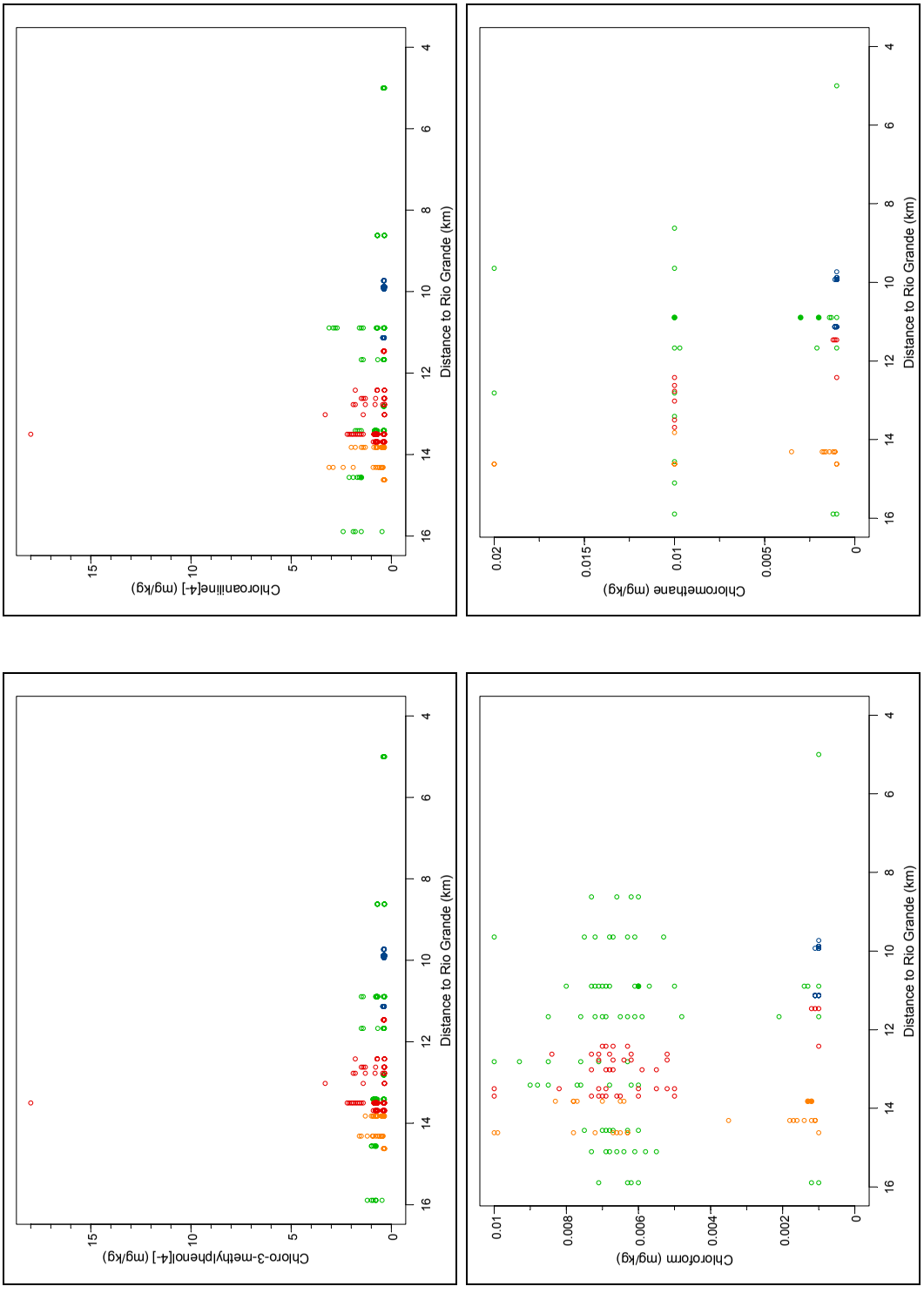


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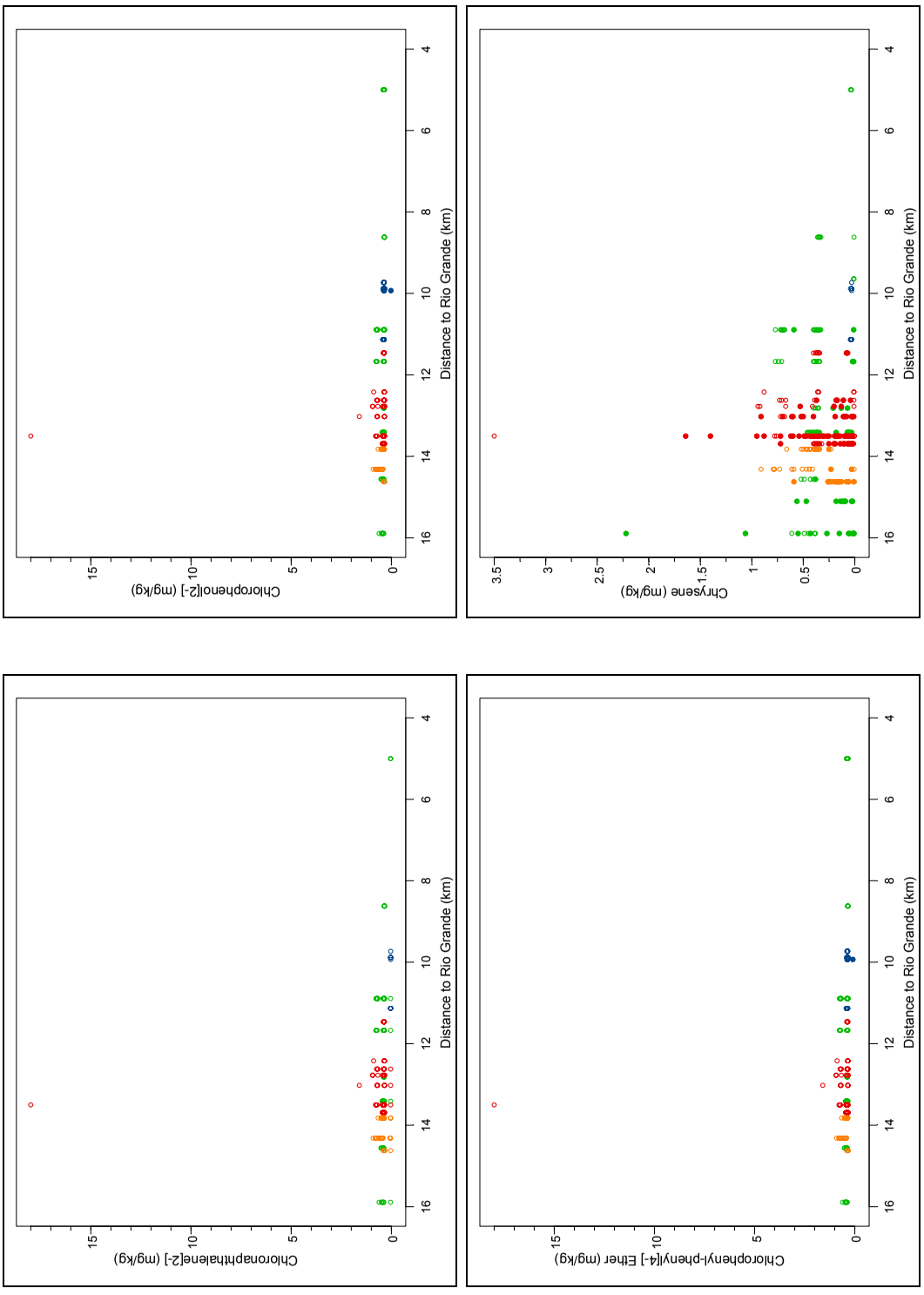


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

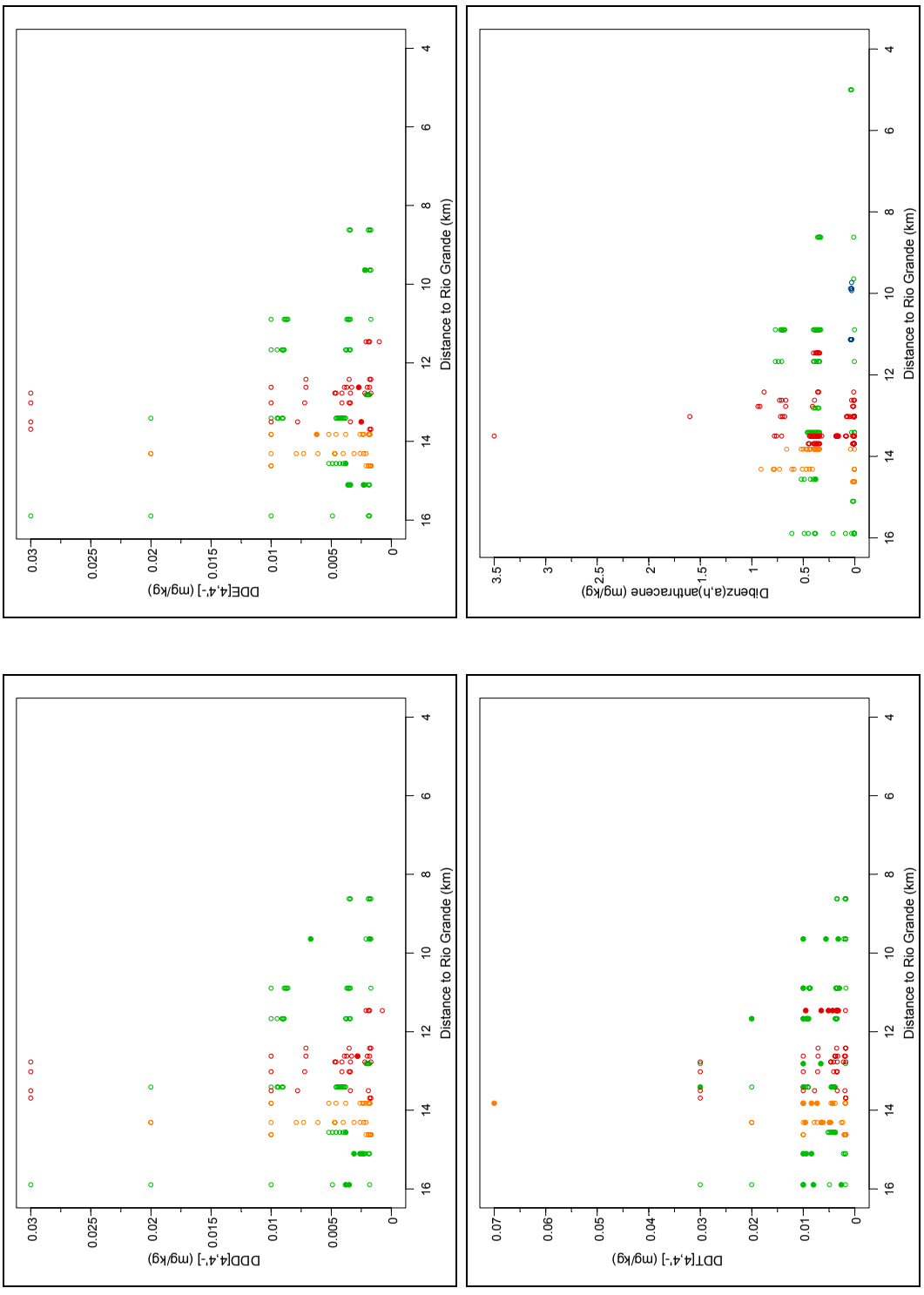


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

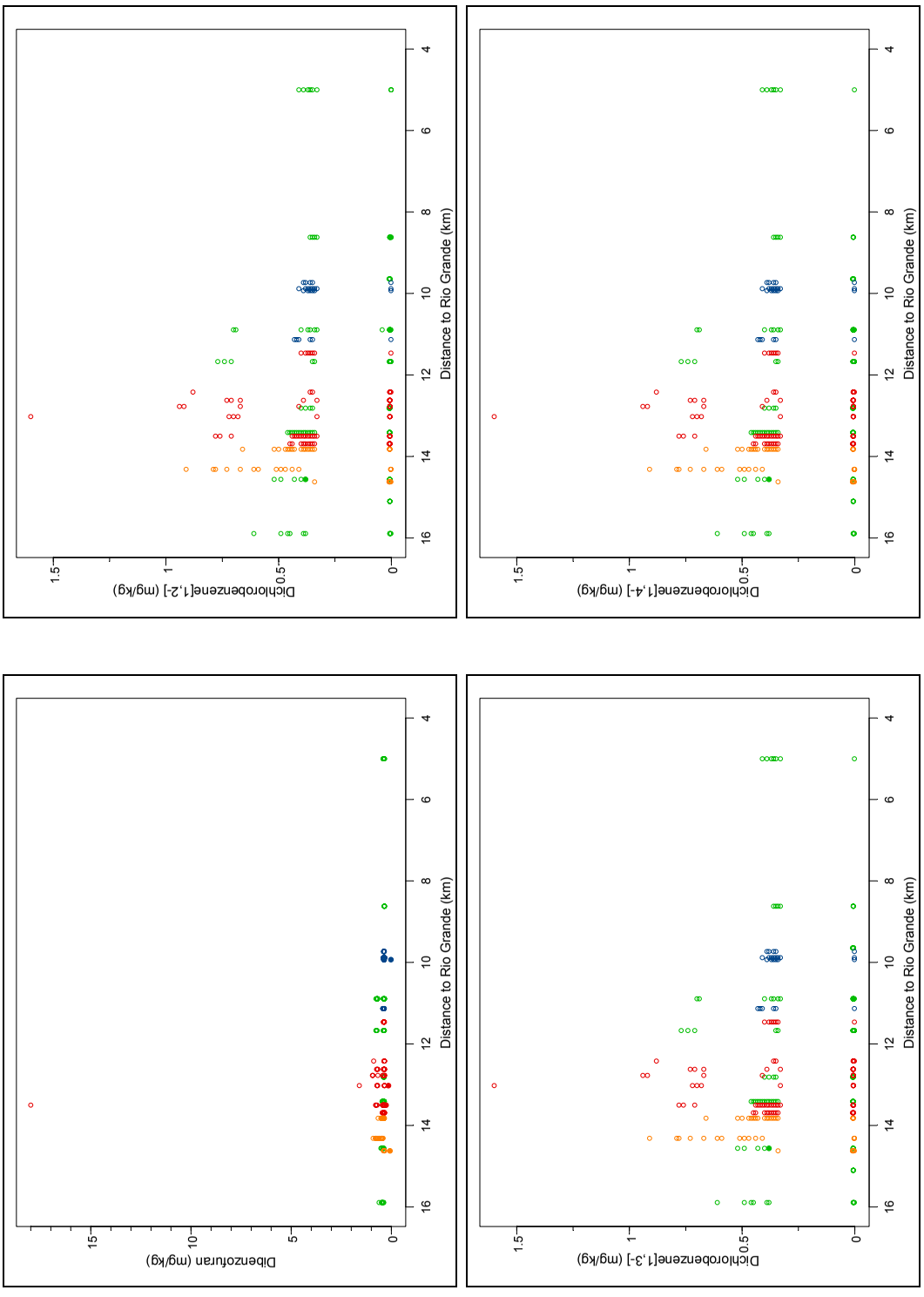


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

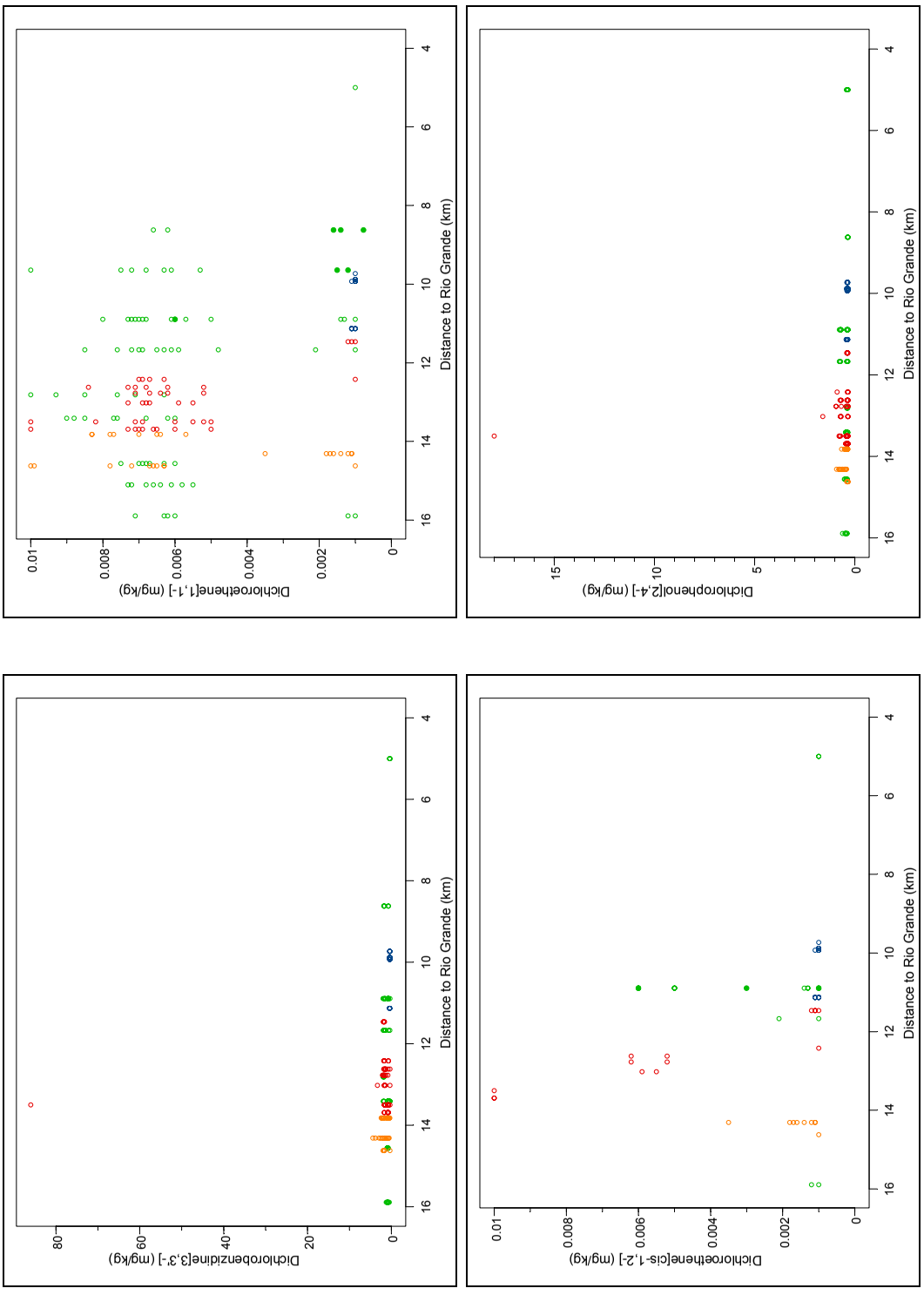


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

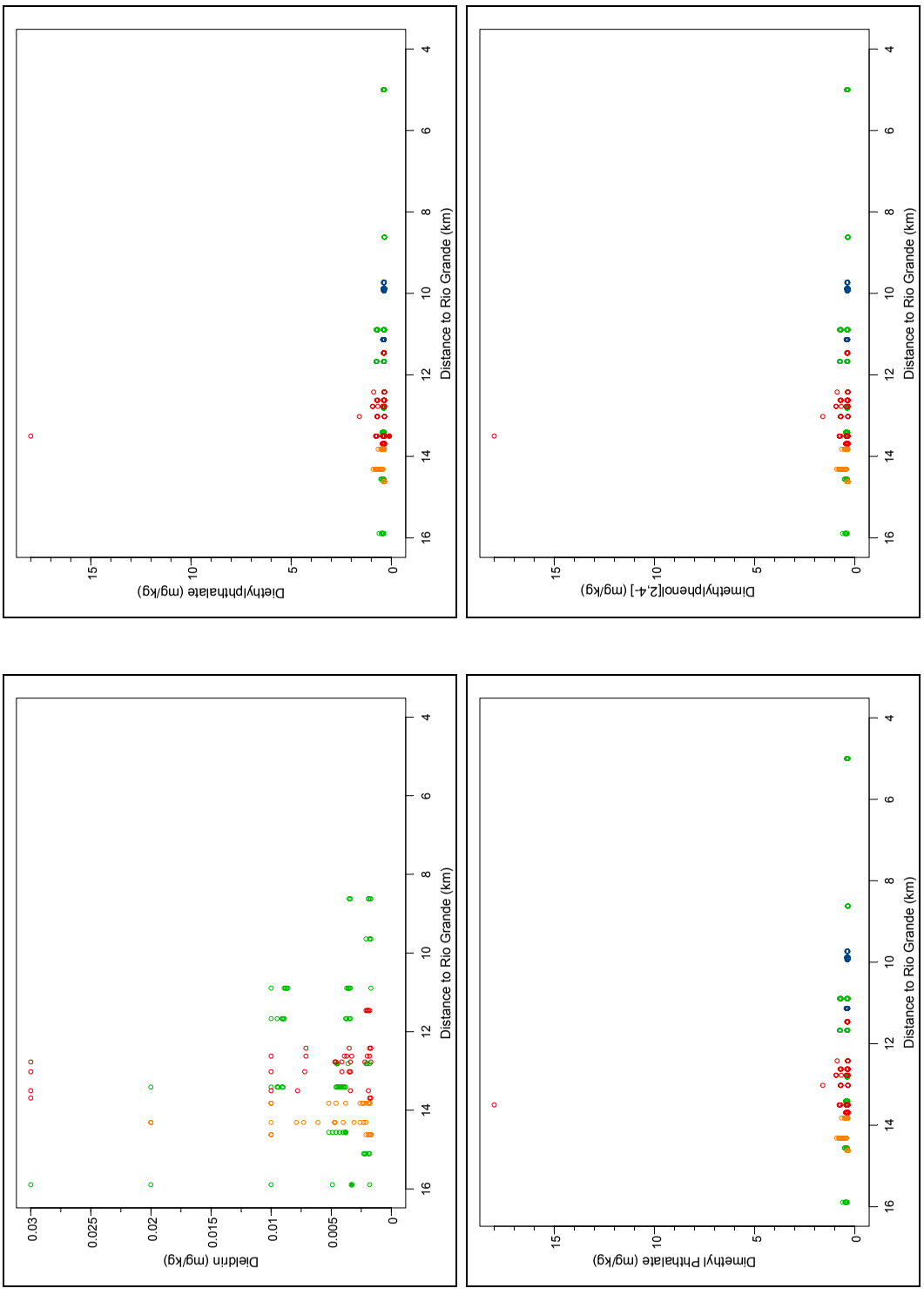


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

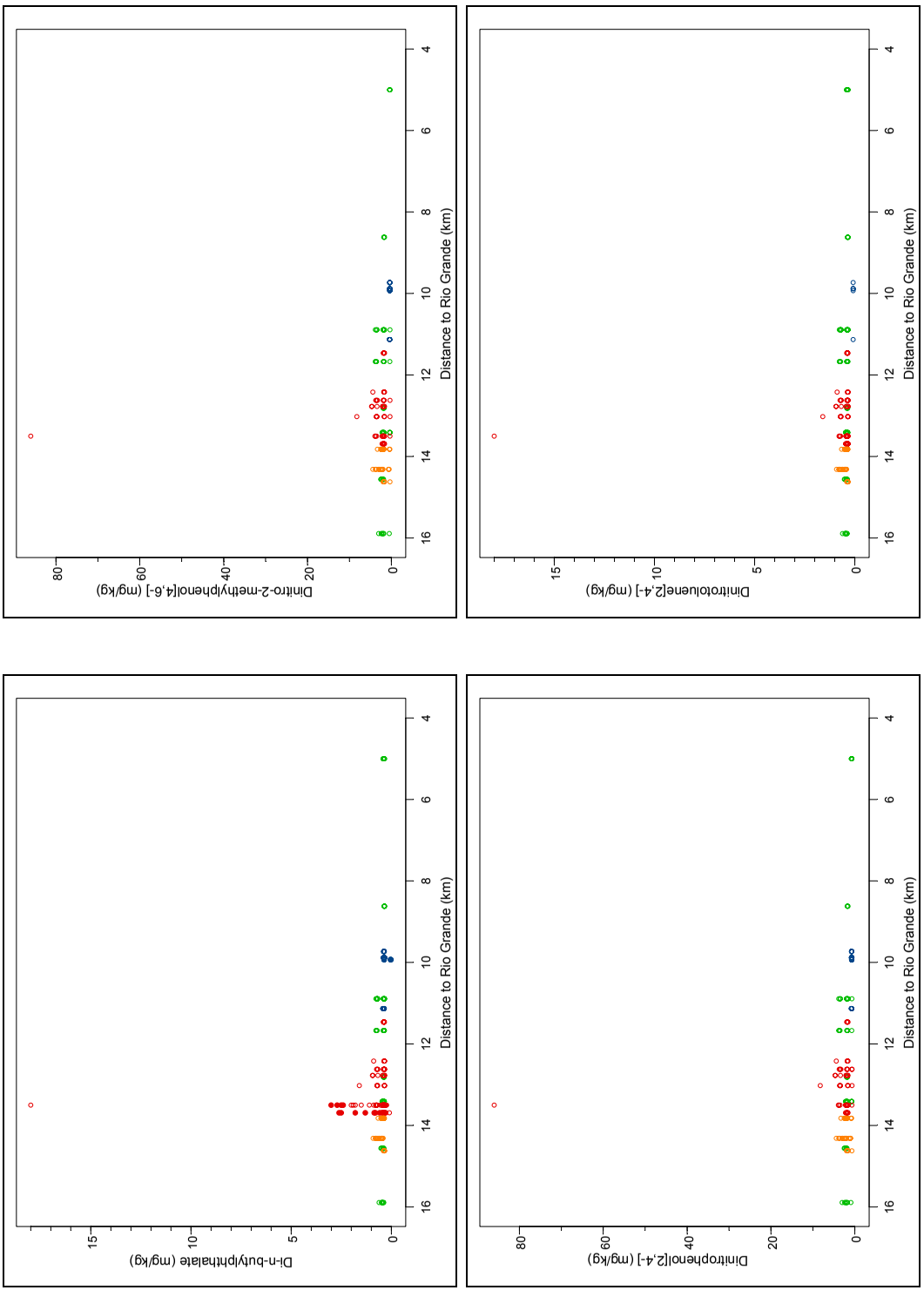


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

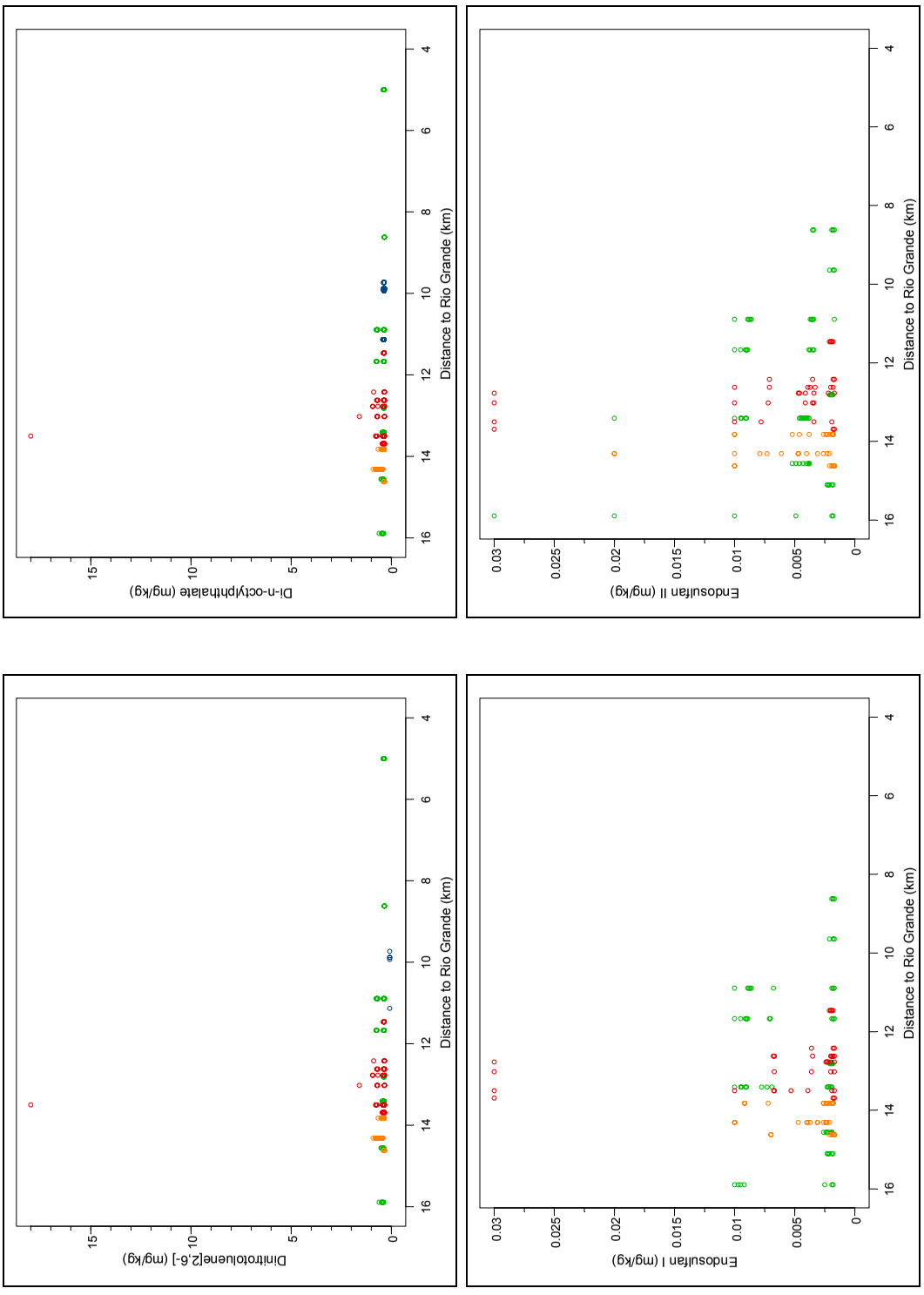


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

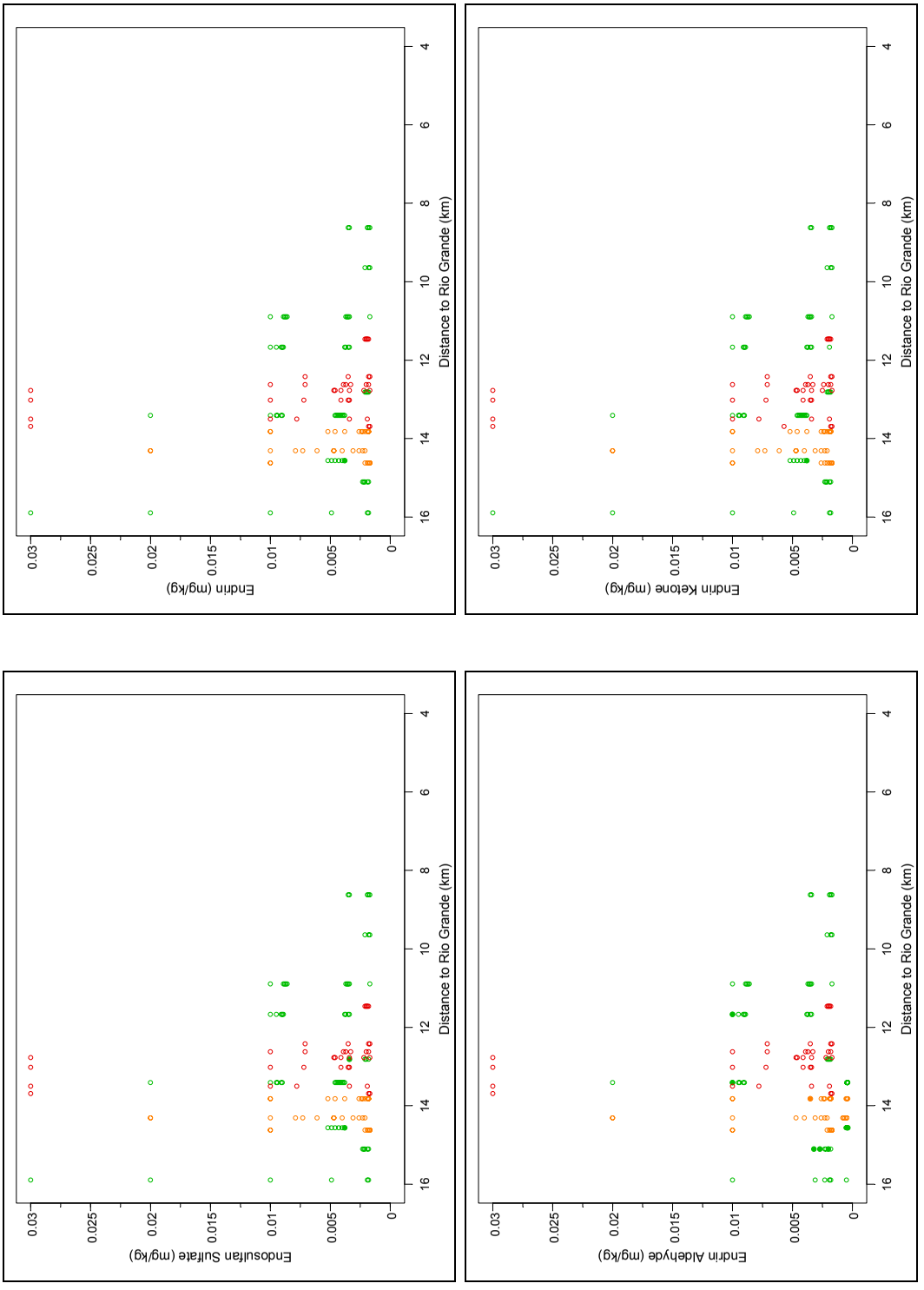


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

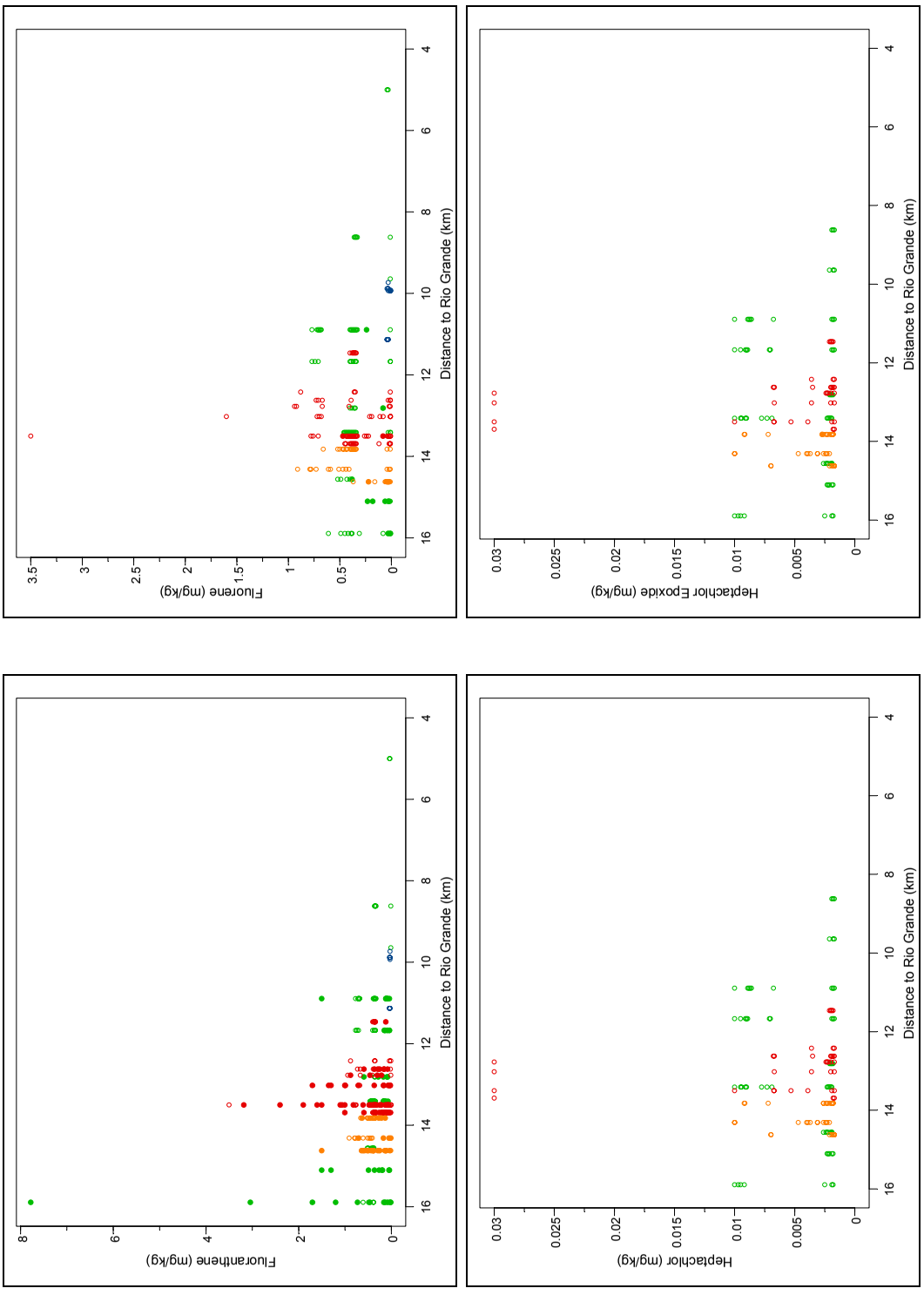


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

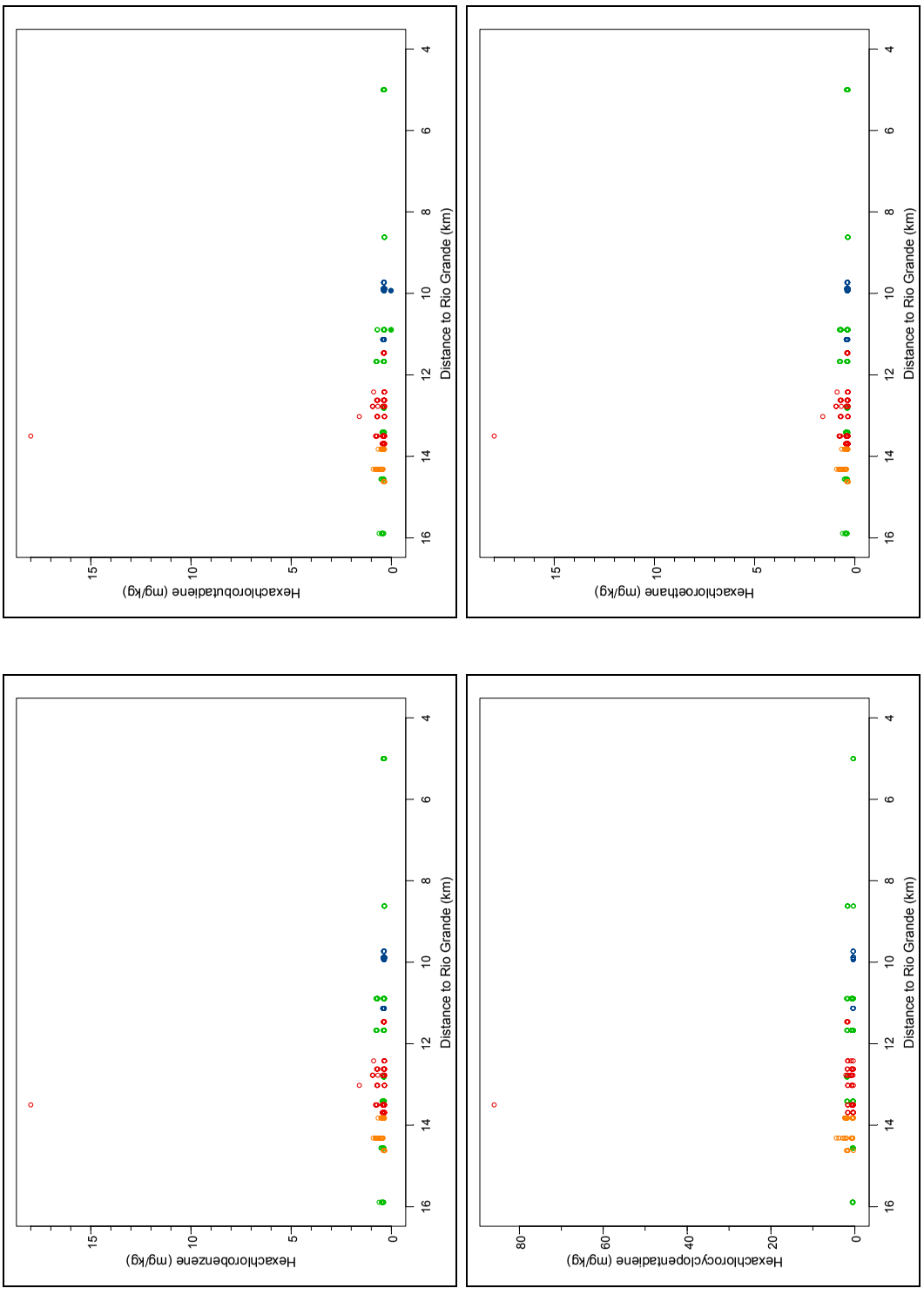


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

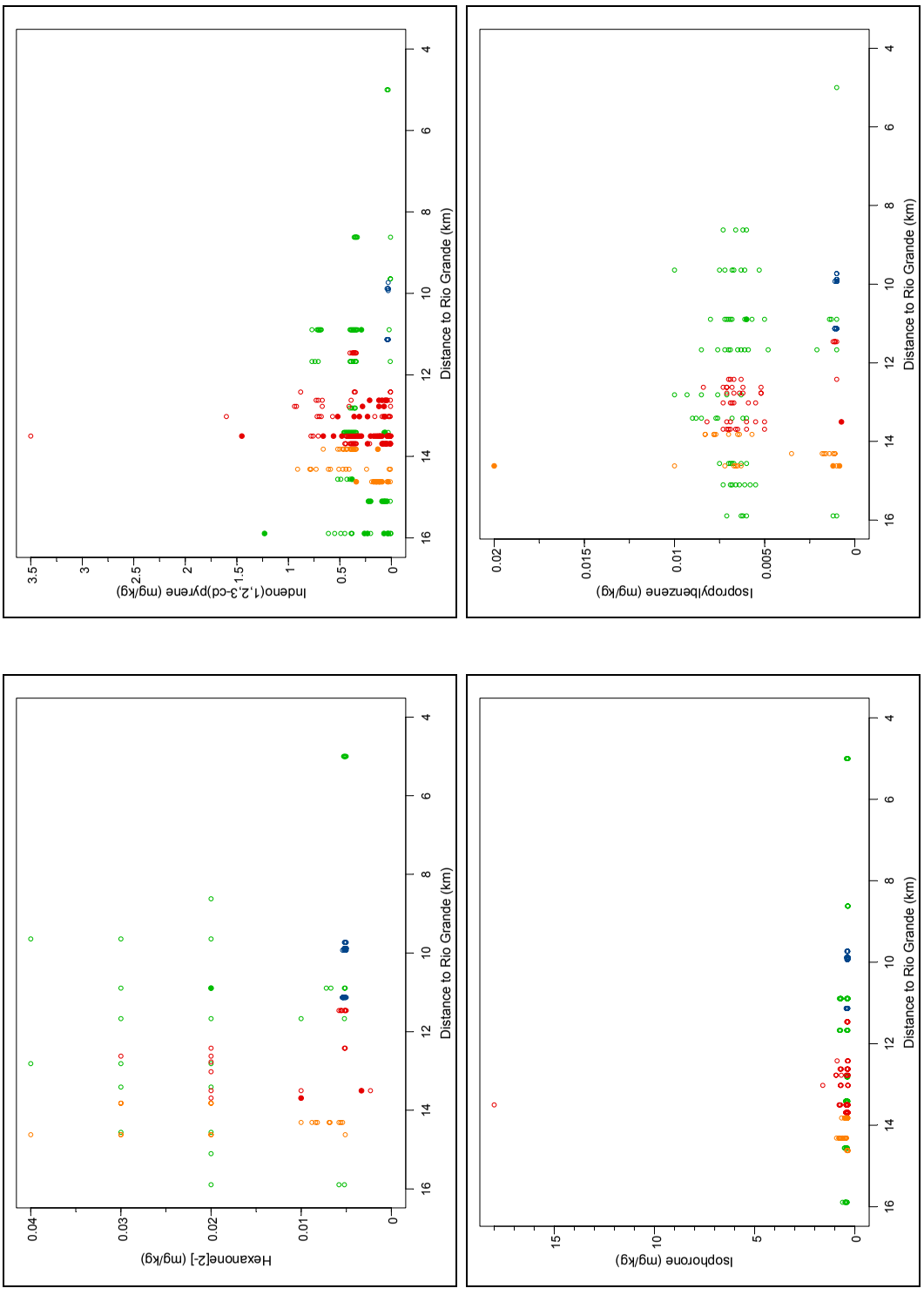


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

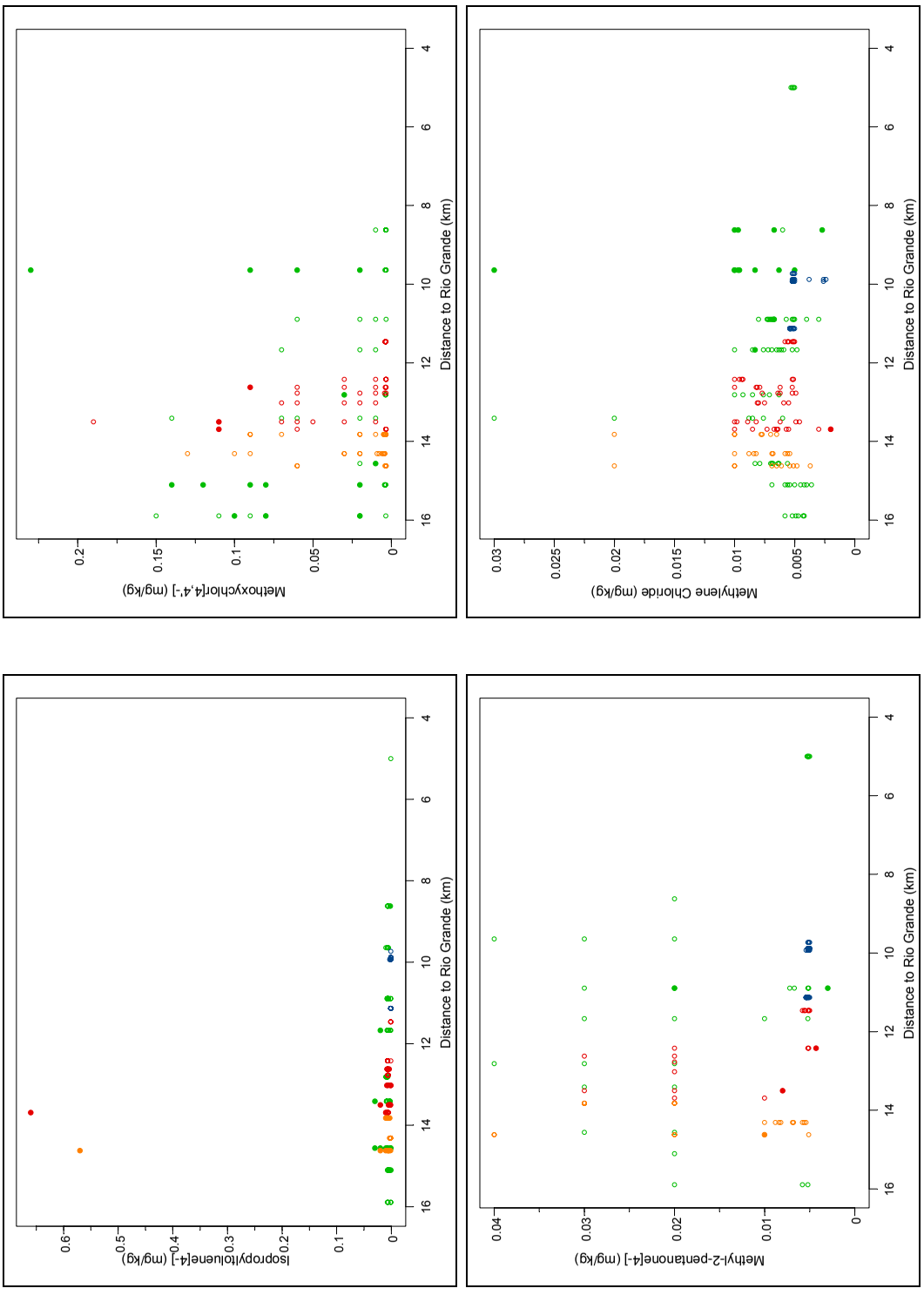


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

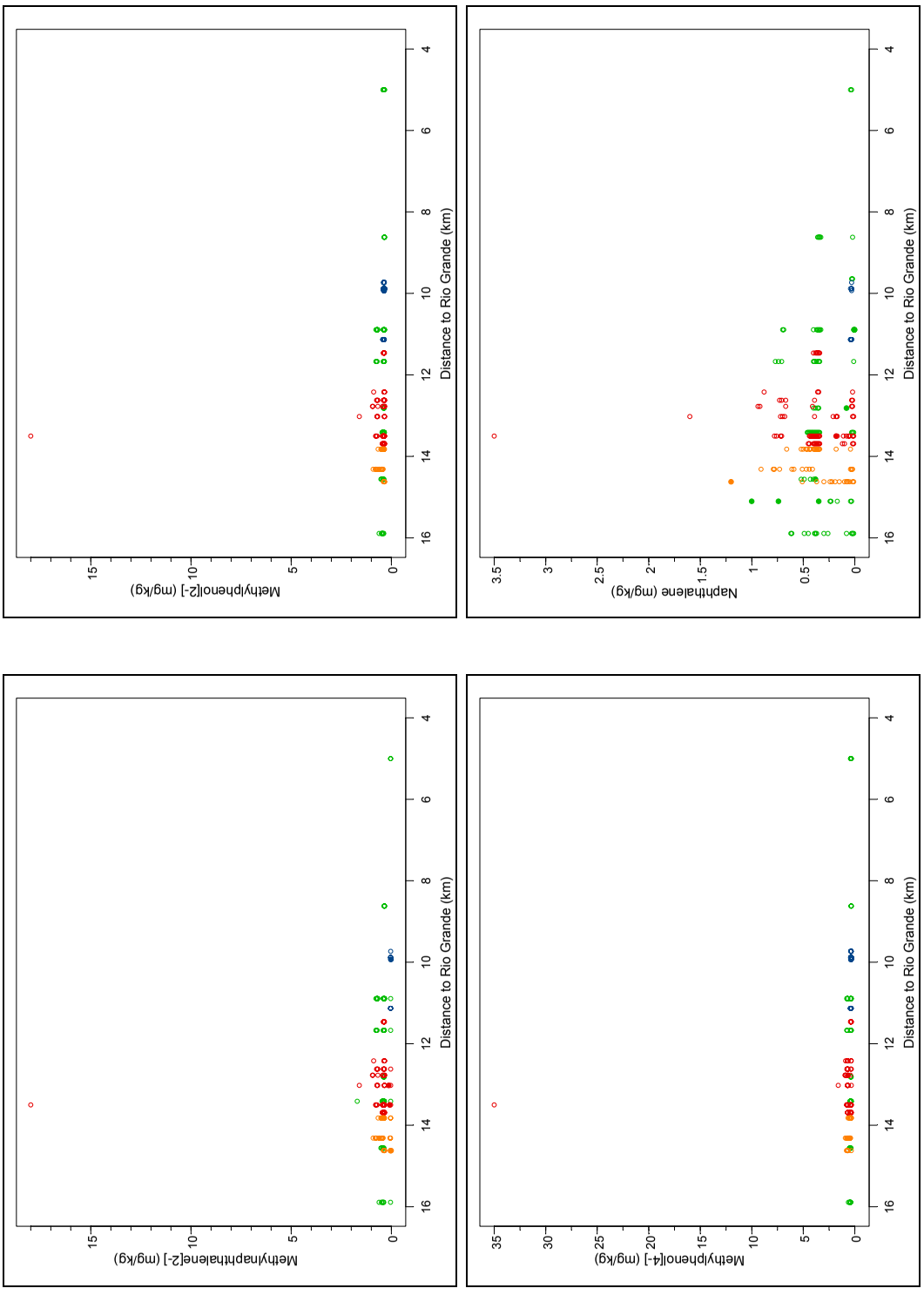


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

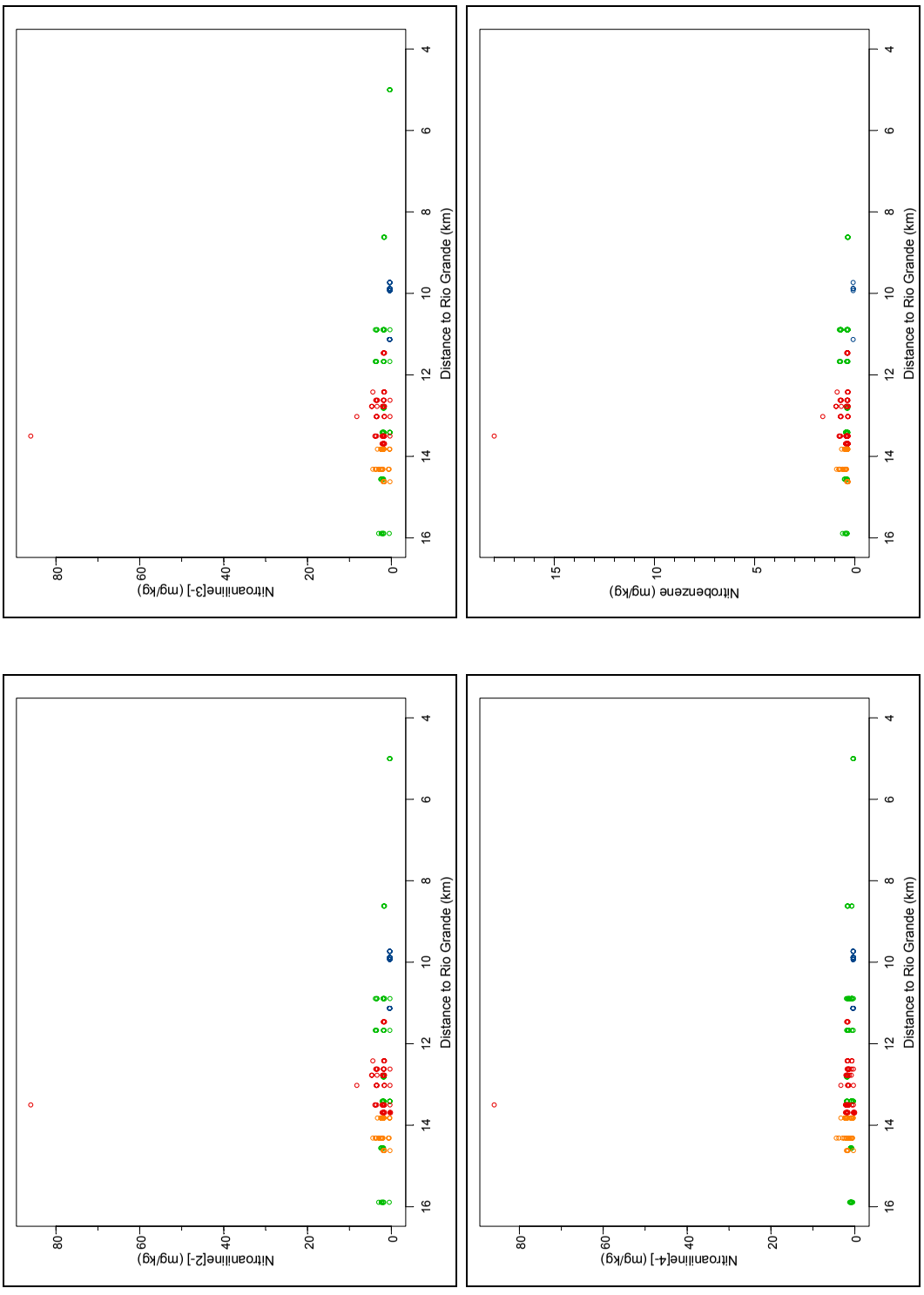


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

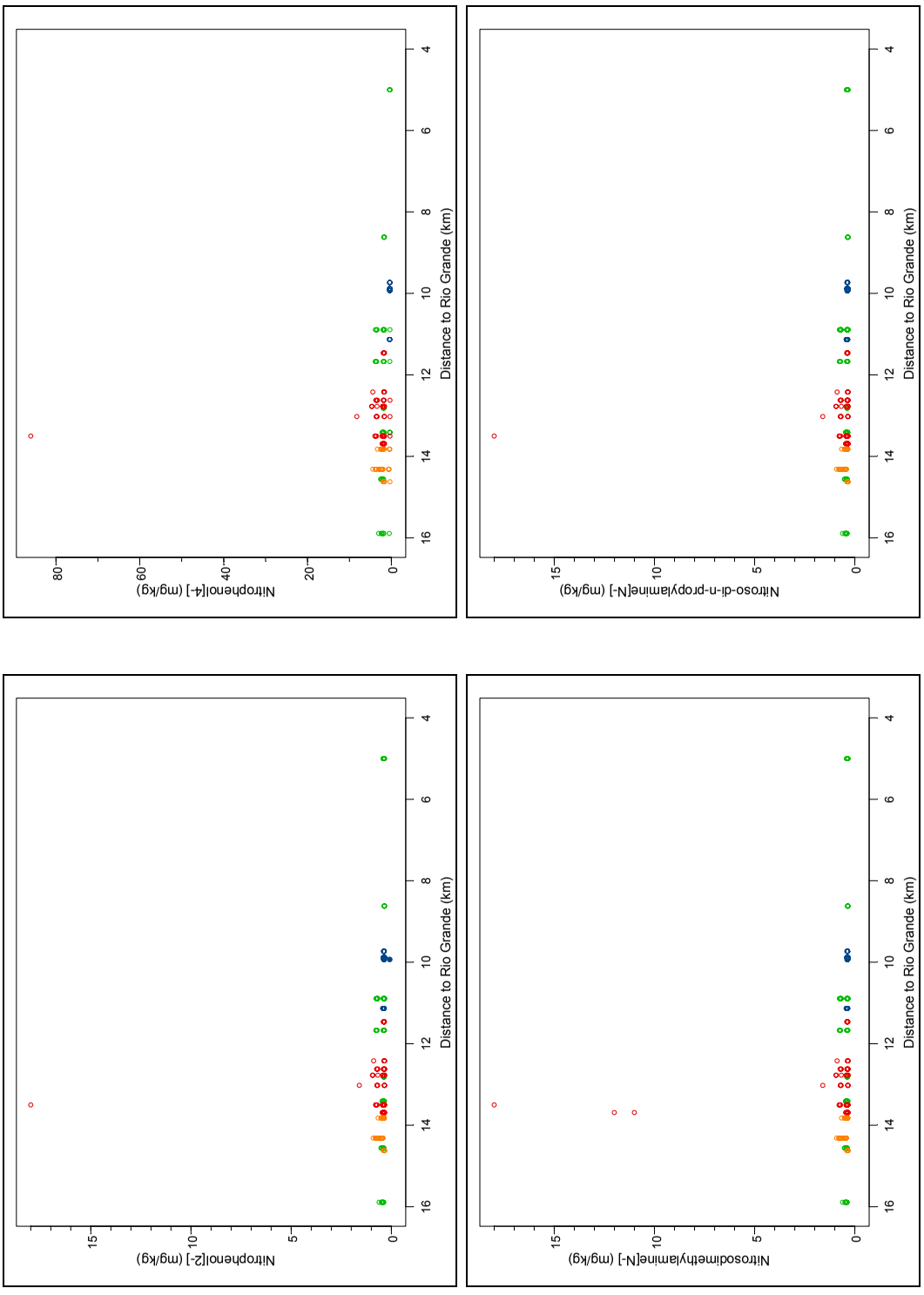


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

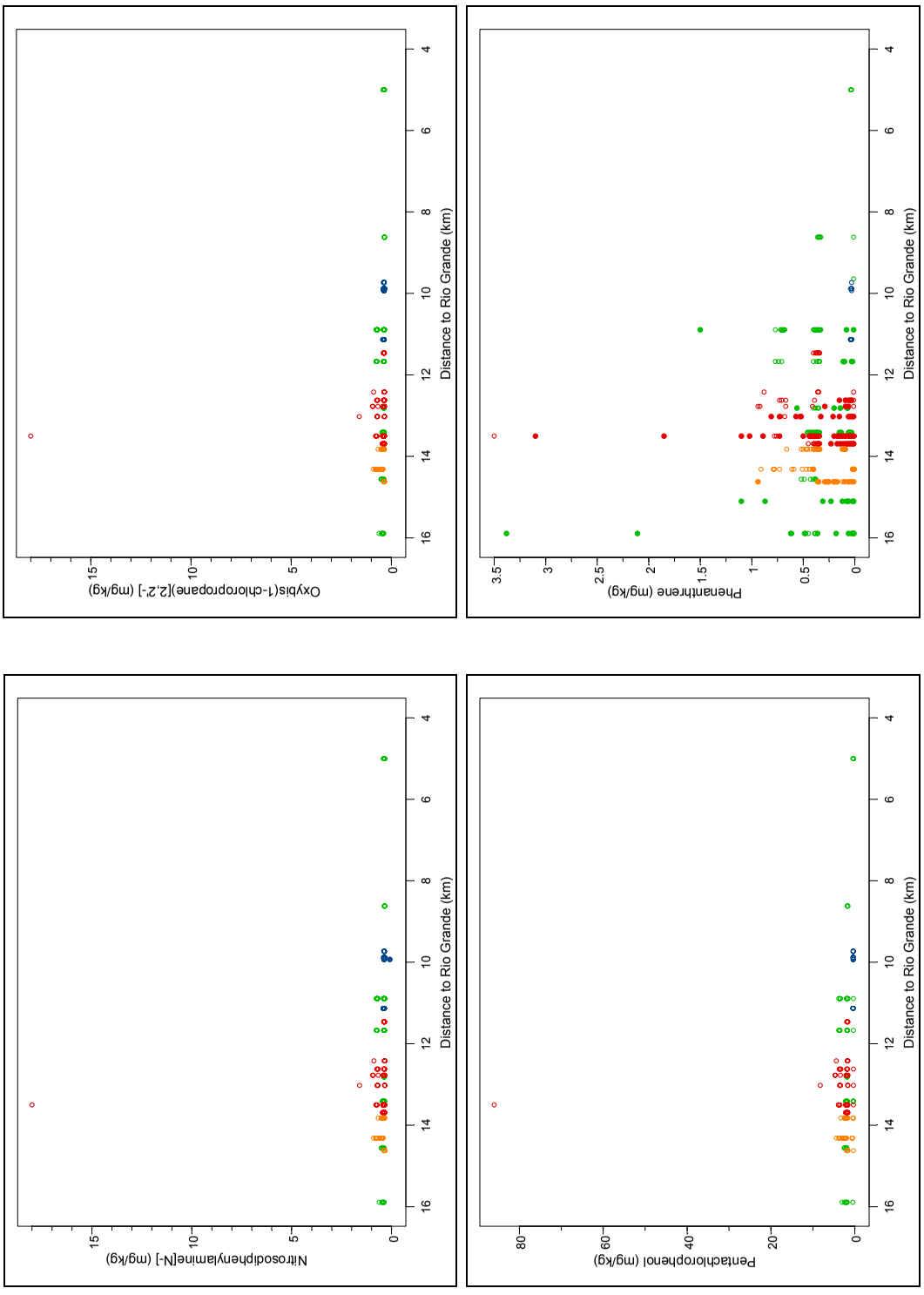


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

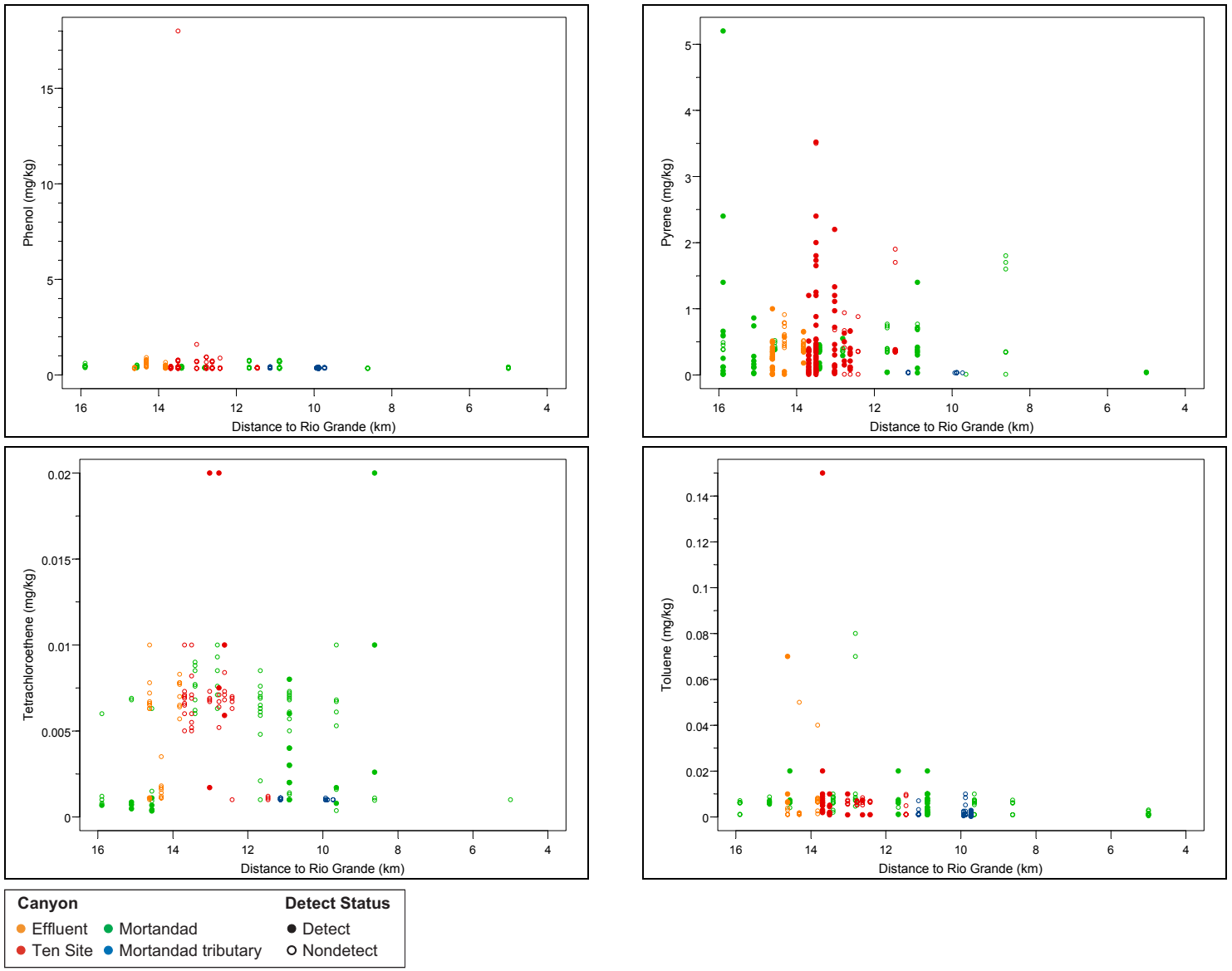


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

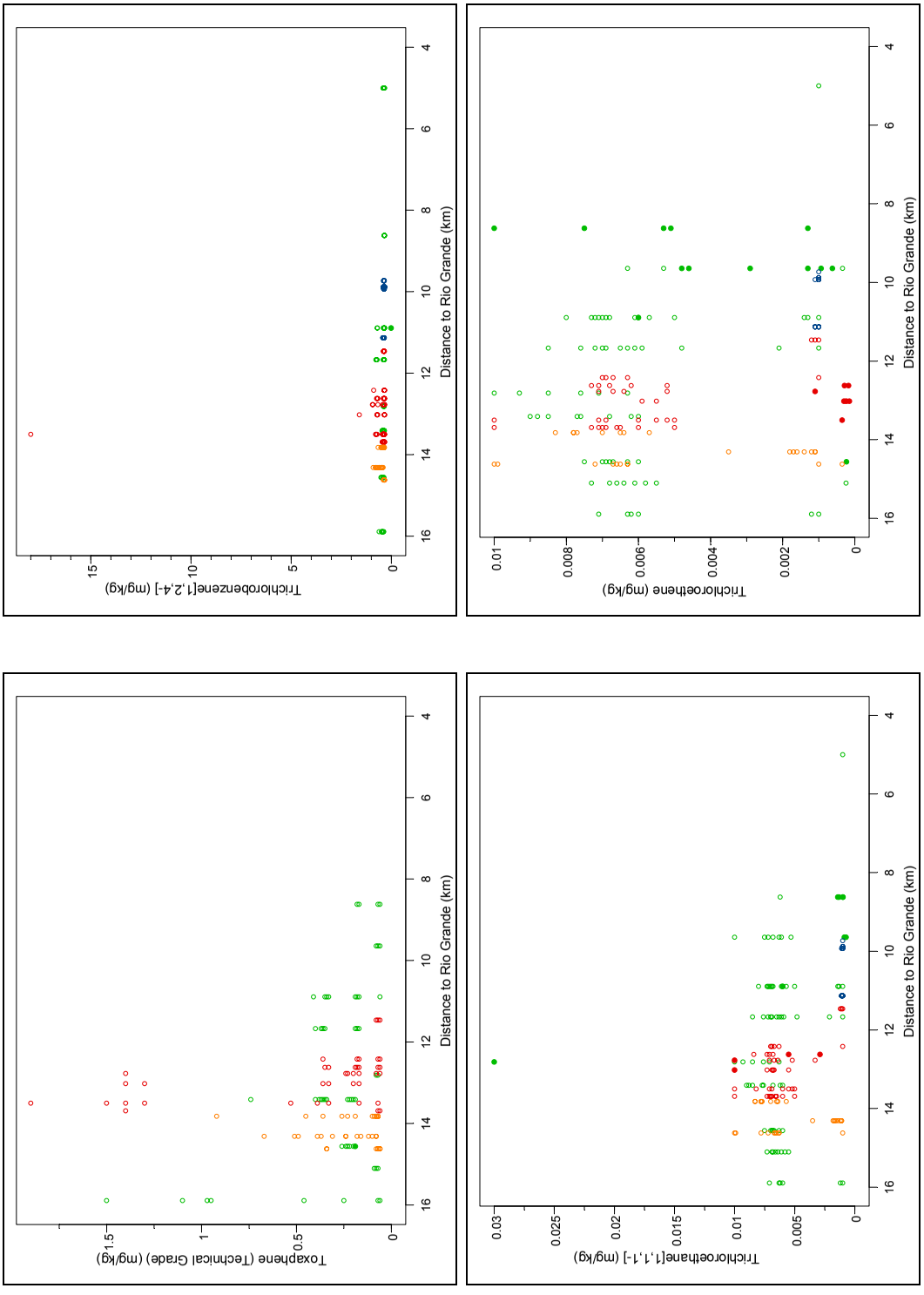


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

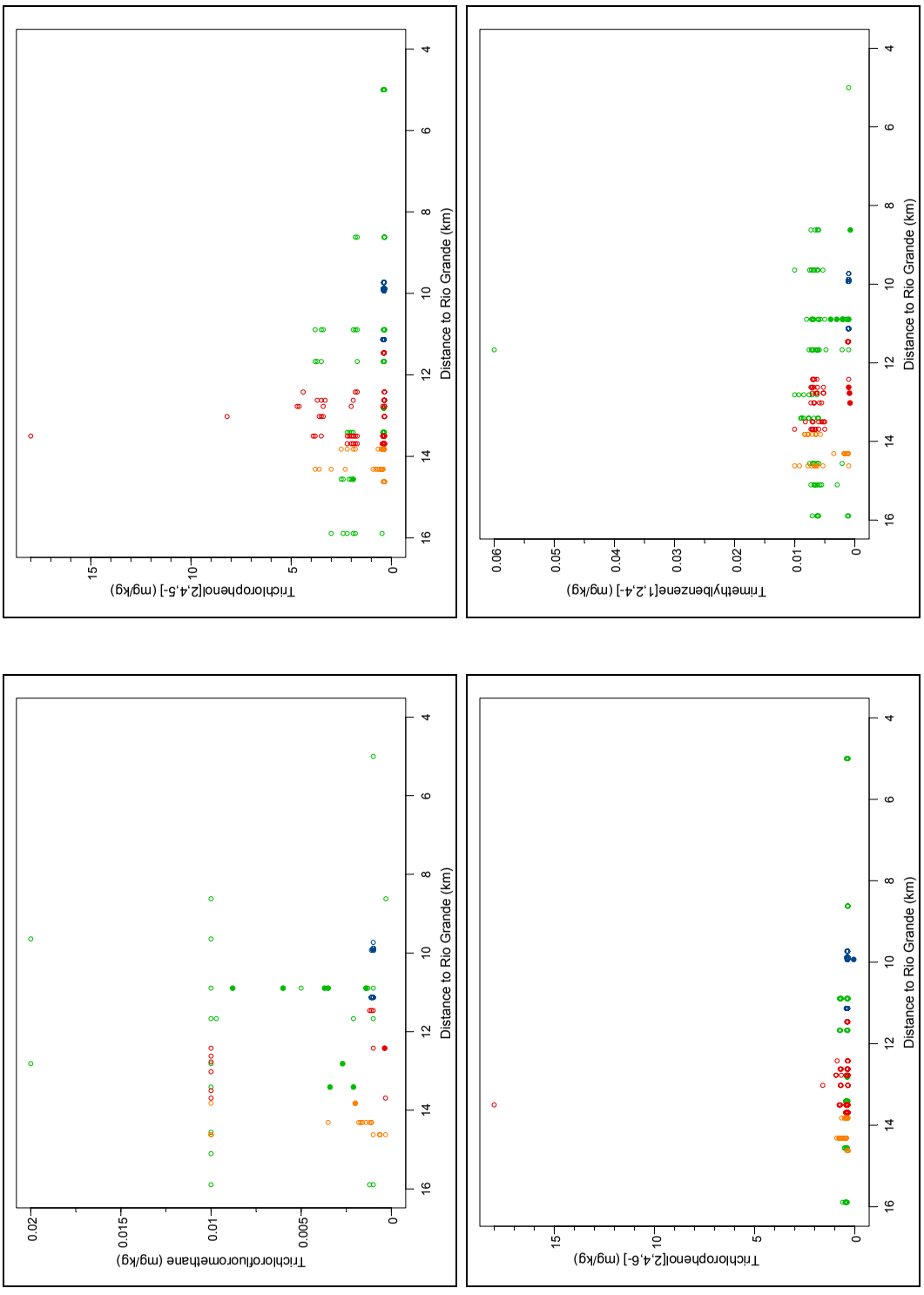


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

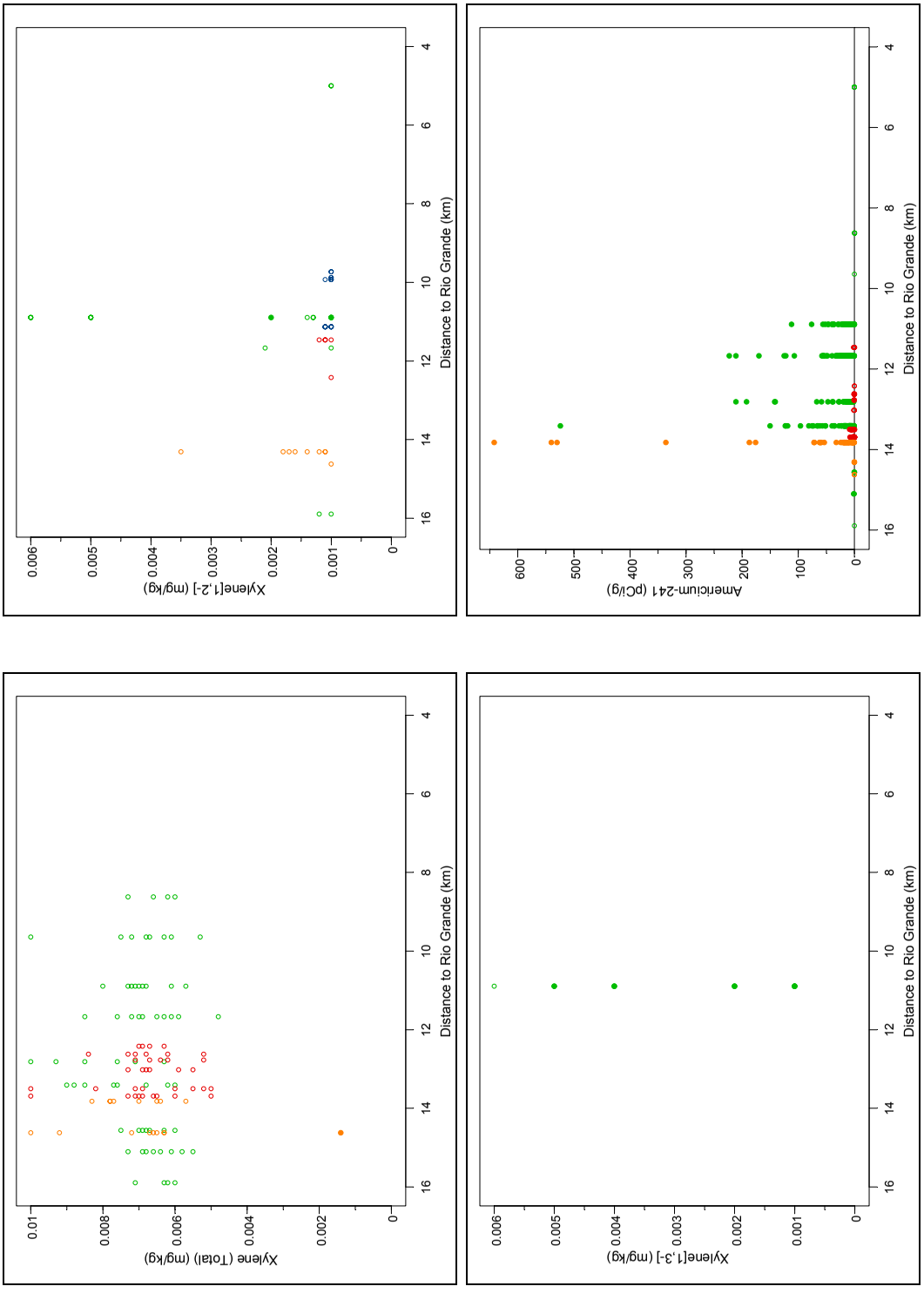


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

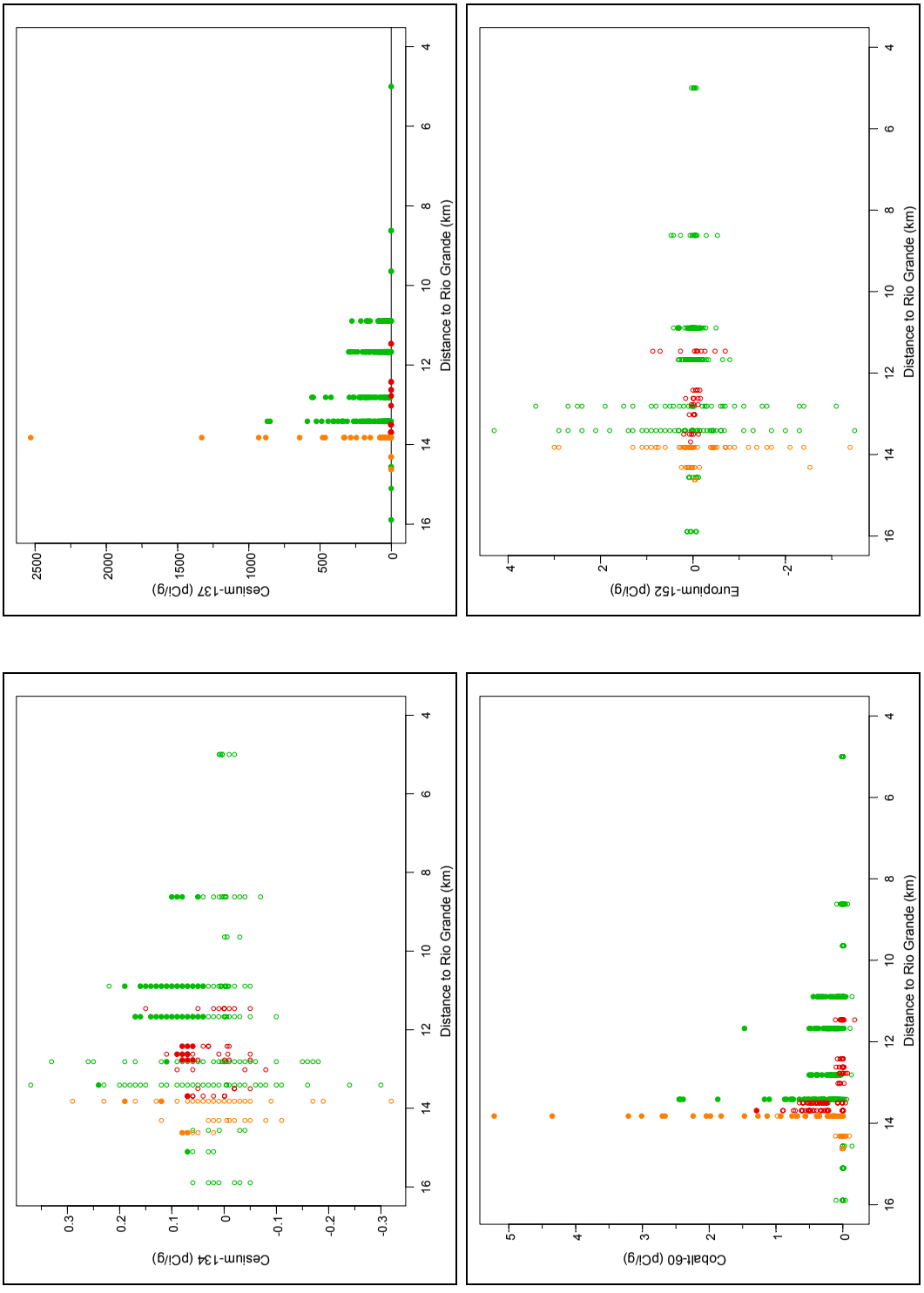
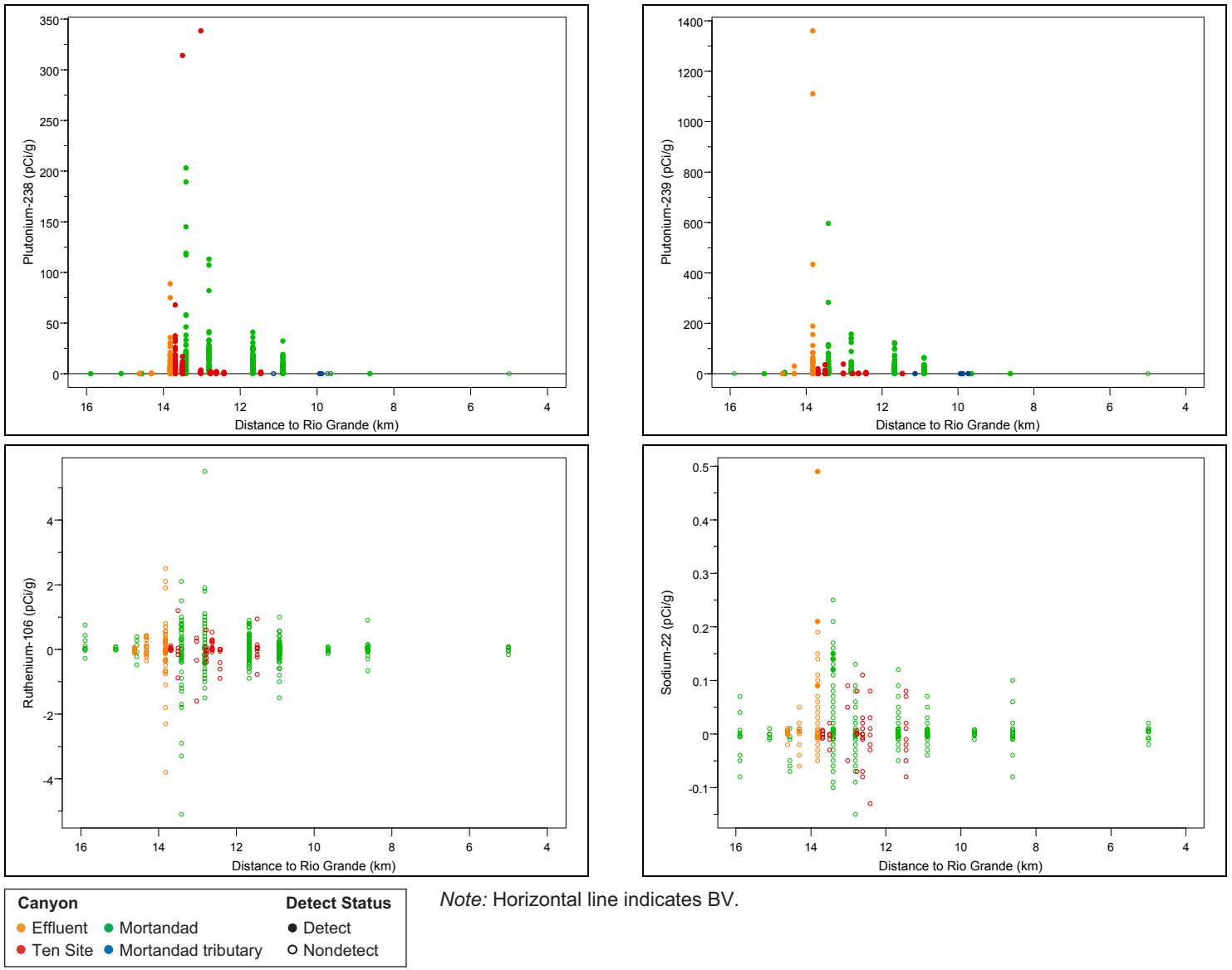
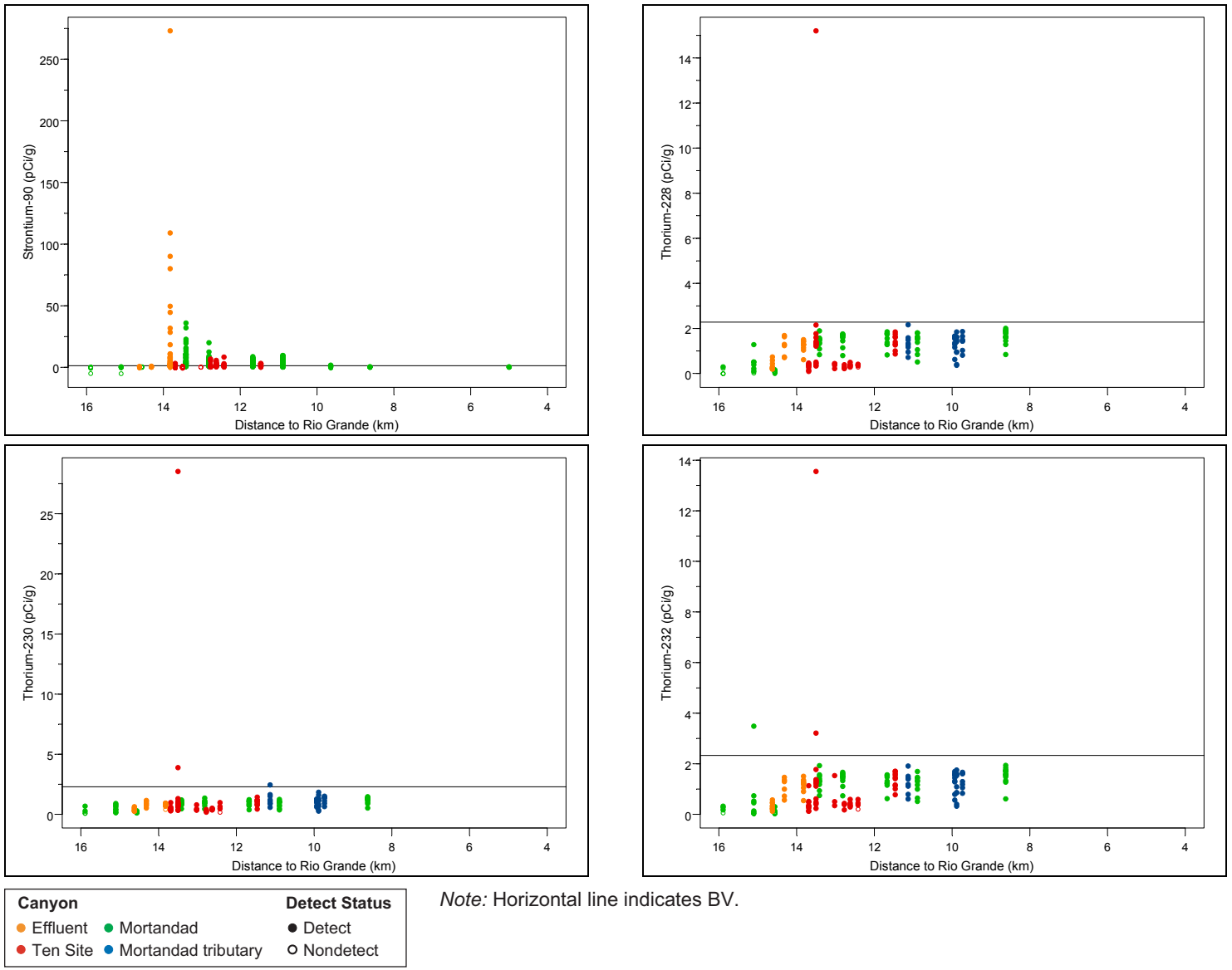


Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed



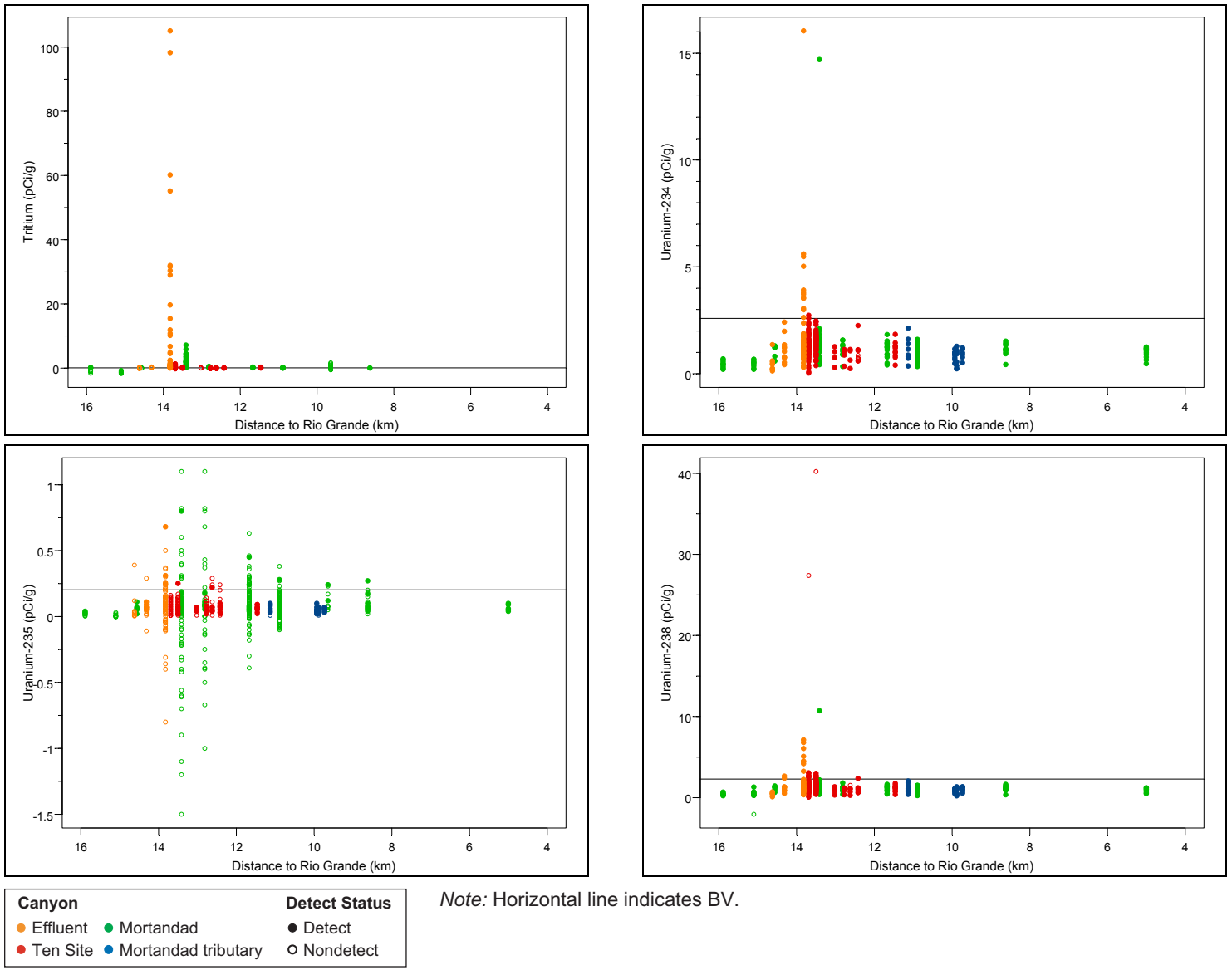
Note: Horizontal line indicates BV.

Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed



Note: Horizontal line indicates BV.

Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed



Note: Horizontal line indicates BV.

Figure D-1.1-1 (continued). Plots of sample results versus distance from the Rio Grande for all COPCs identified in sediment in the Mortandad watershed

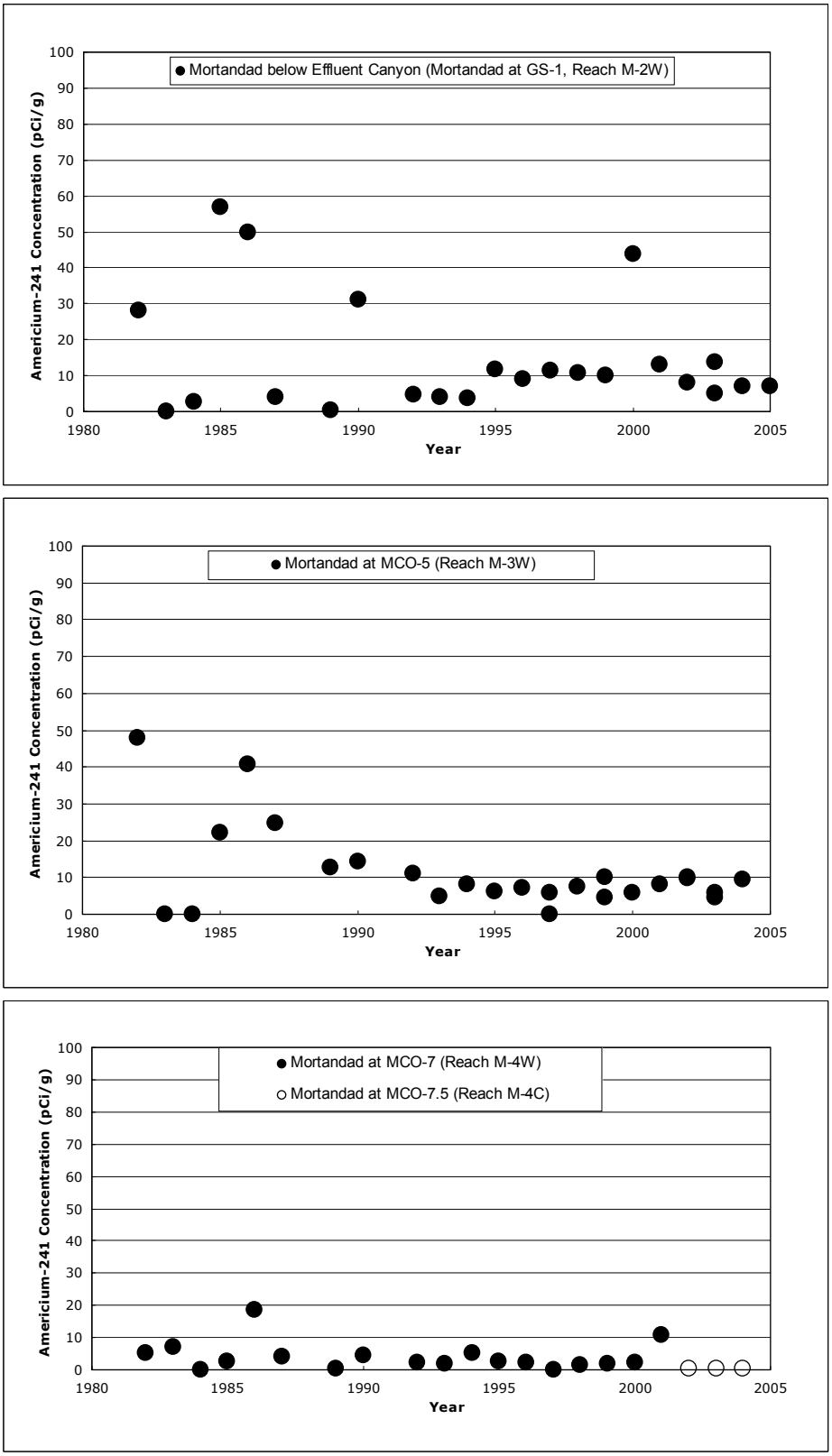


Figure D-1.2-1. Plots of sample results for americium-241 in active channel samples from environmental surveillance sampling stations in Mortandad Canyon

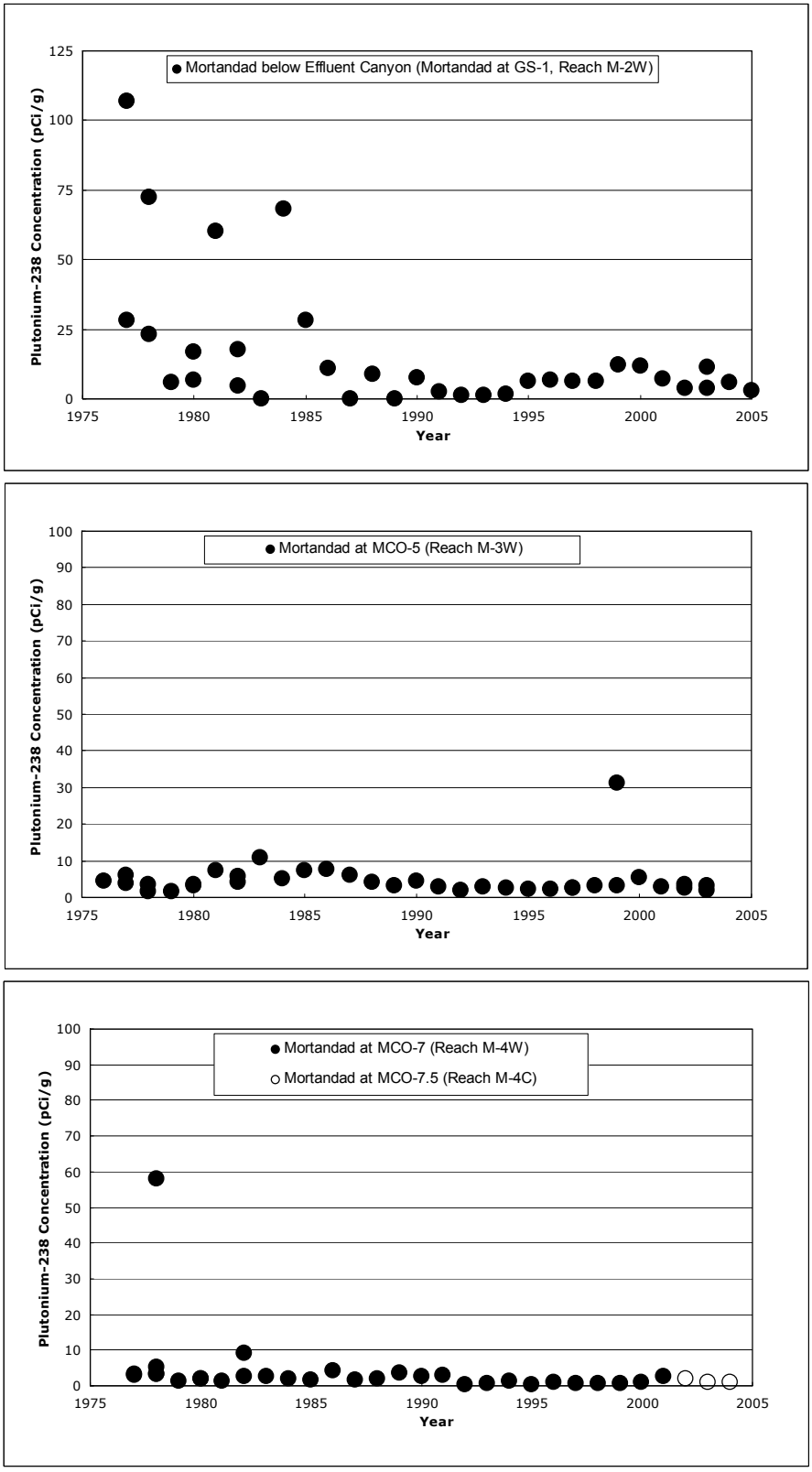


Figure D-1.2-2. Plots of sample results for plutonium-238 in active channel samples from environmental surveillance sampling stations in Mortandad Canyon.

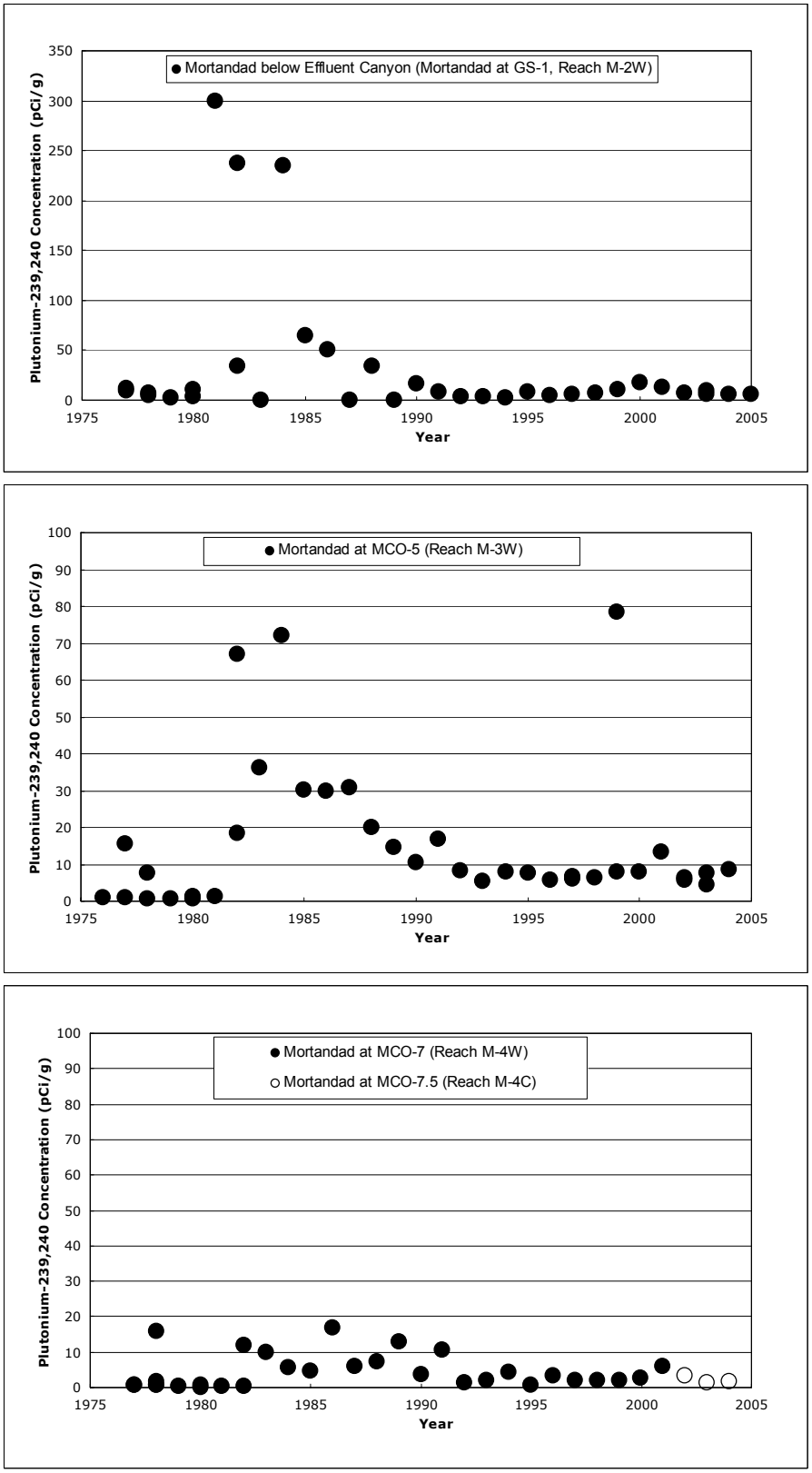
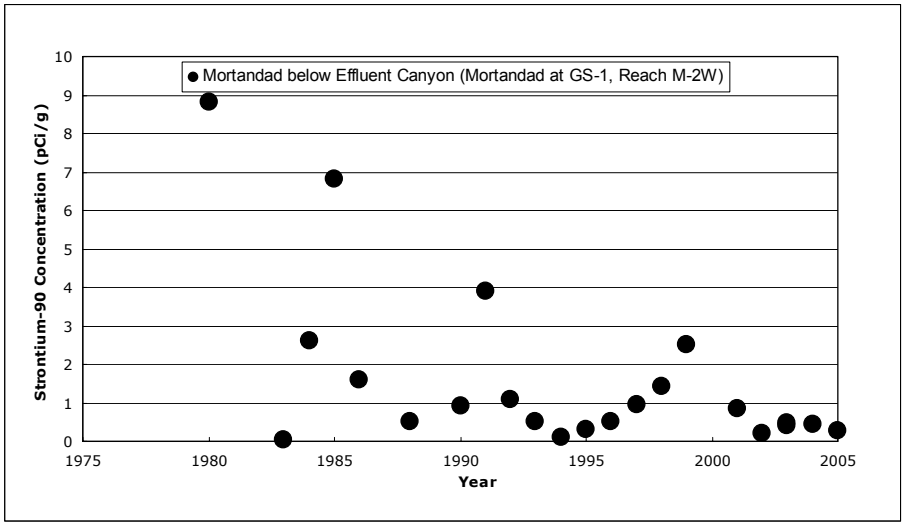
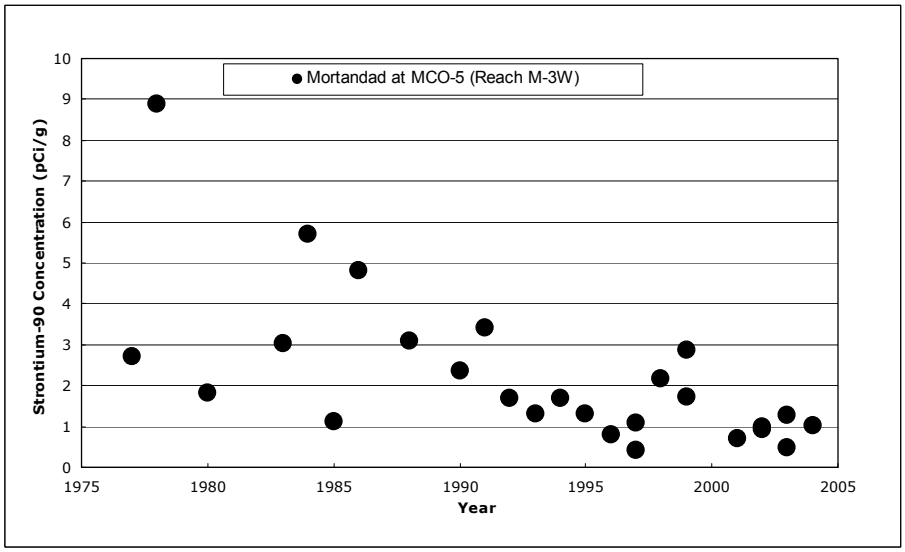


Figure D-1.2-3. Plots of sample results for plutonium-239,240 in active channel samples from environmental surveillance sampling stations in Mortandad Canyon





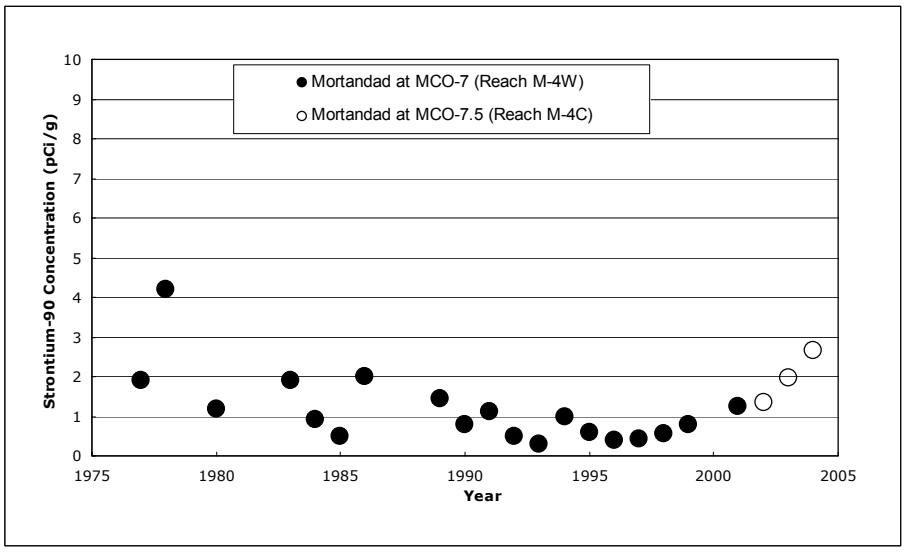


Figure D-1.2-4. Plots of sample results for strontium-90 in active channel samples from environmental surveillance sampling stations in Mortandad Canyon

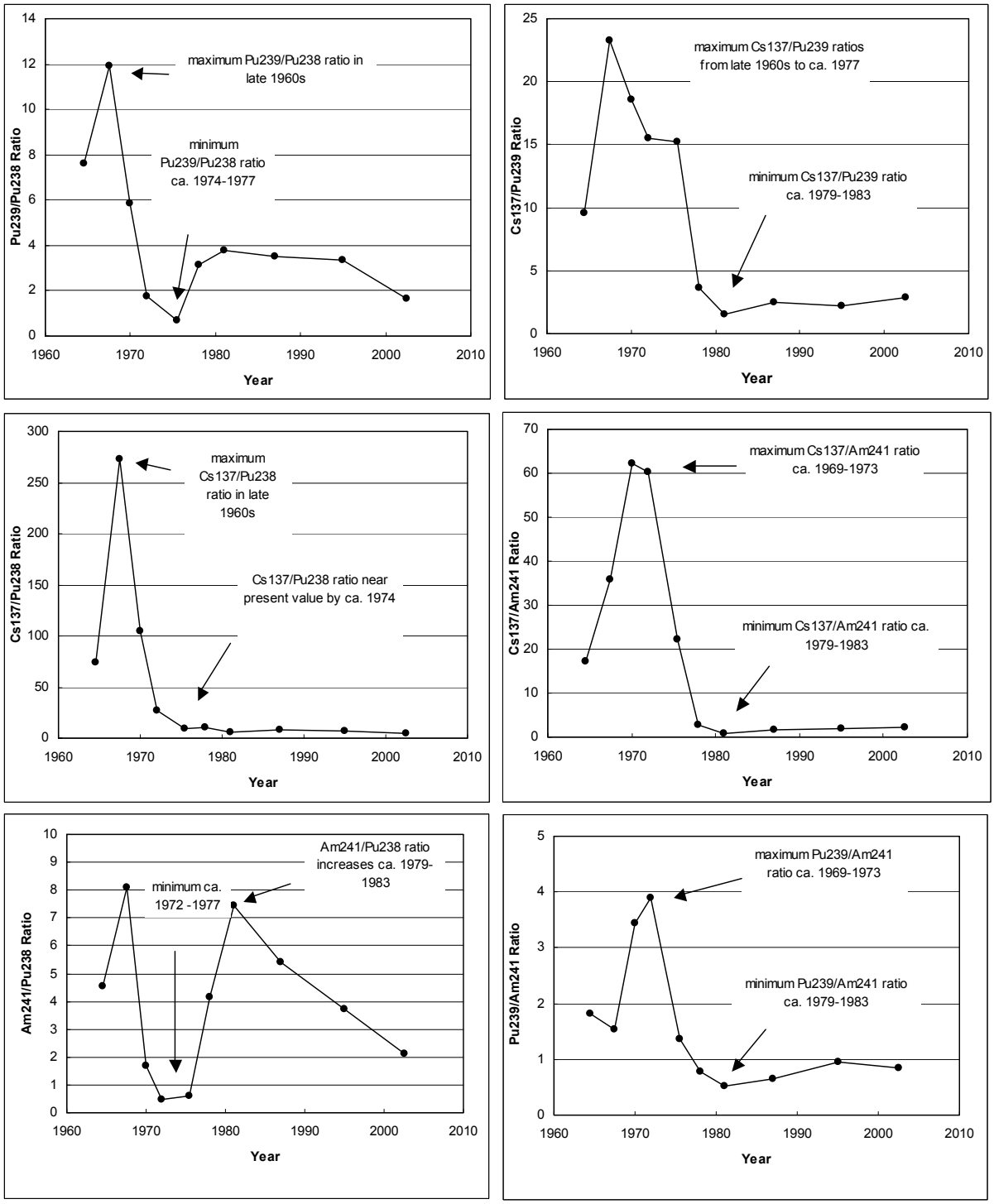
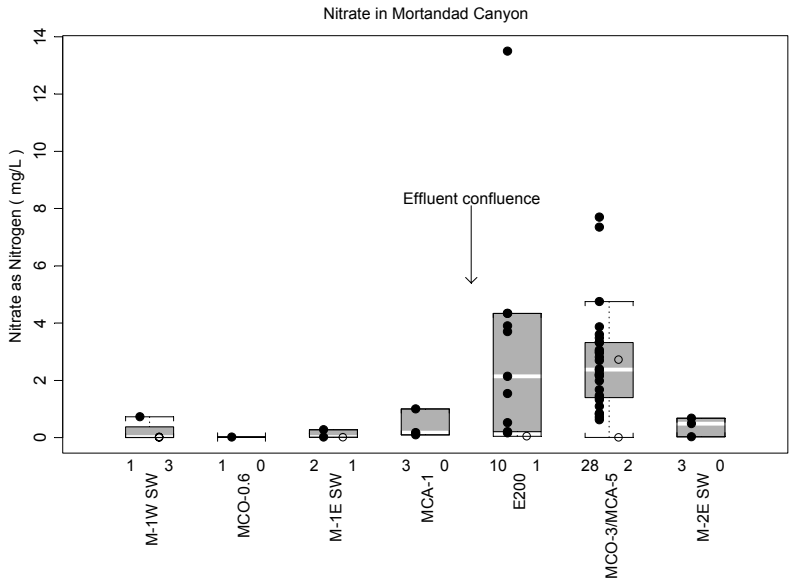
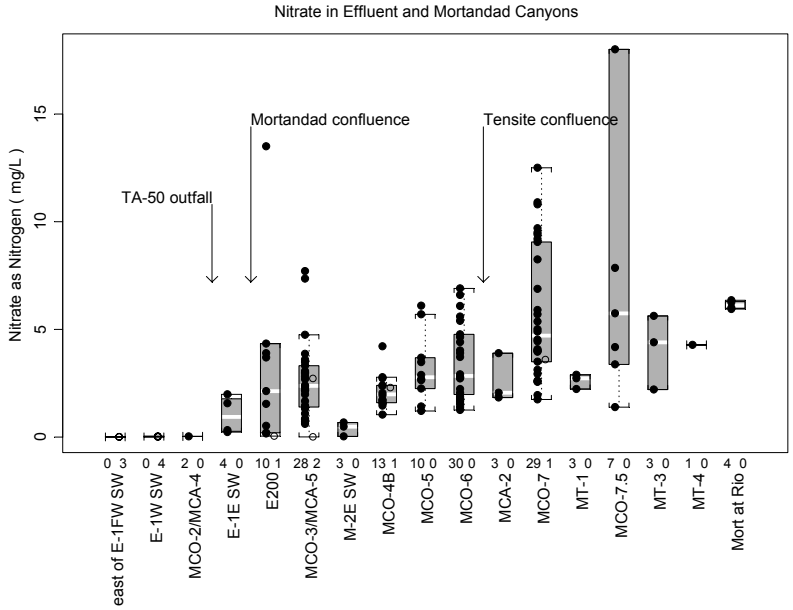


Figure D-1.6-1. Temporal variations in radionuclide ratios in sediment deposits in reaches M-3 and M-4



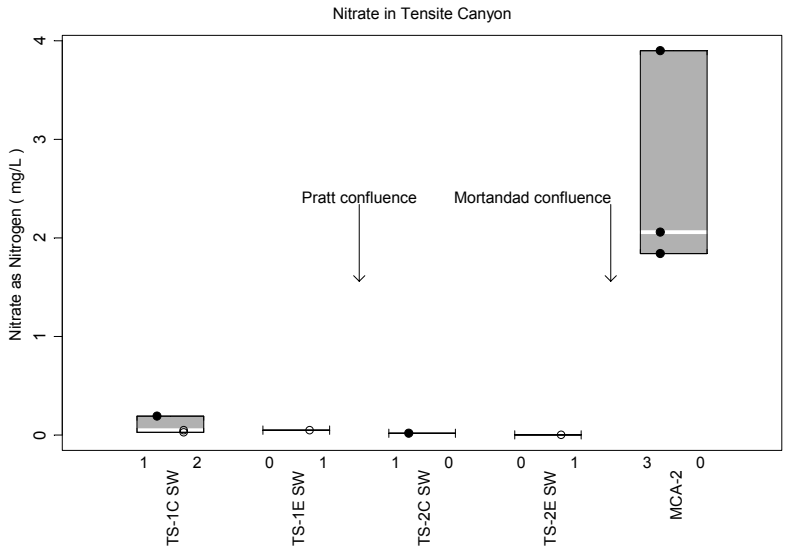
Notes: Filtered and non-filtered samples are included. Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-1. Box plots showing the spatial distribution of nitrate (as N) at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



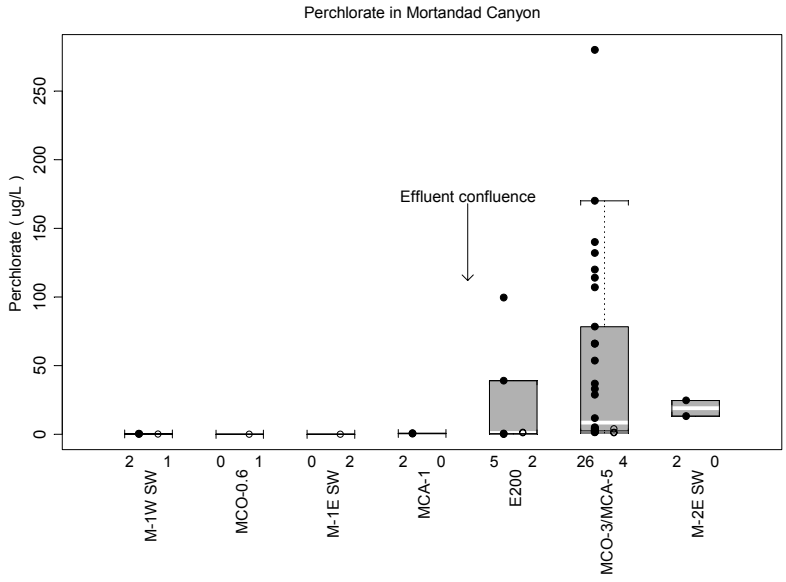
Notes: Filtered and non-filtered samples are included. Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-2. Box plots showing the spatial distribution of nitrate (as N) at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande



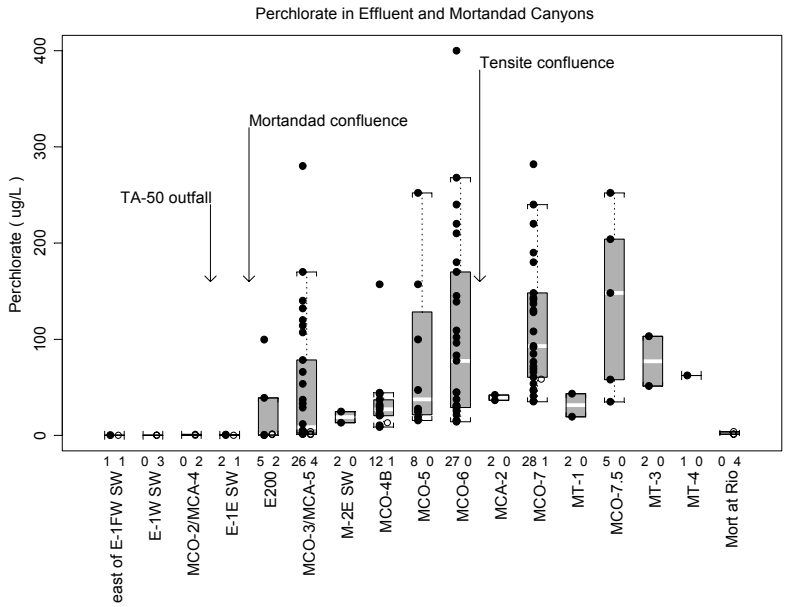
Notes: Filtered and non-filtered samples are included. Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-3. Box plots showing the spatial distribution of nitrate (as N) at surface water and alluvial groundwater locations in Ten Site Canyon



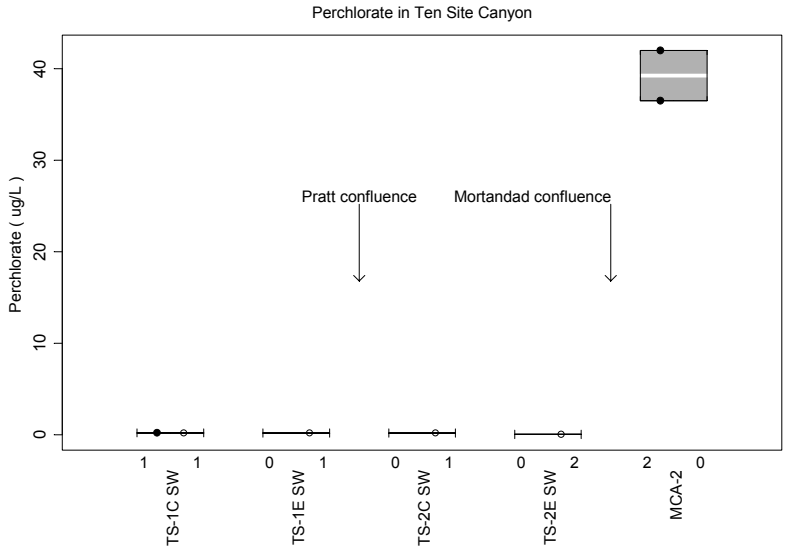
Notes: Filtered and non-filtered samples are included. Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-4. Box plots showing the spatial distribution of perchlorate at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



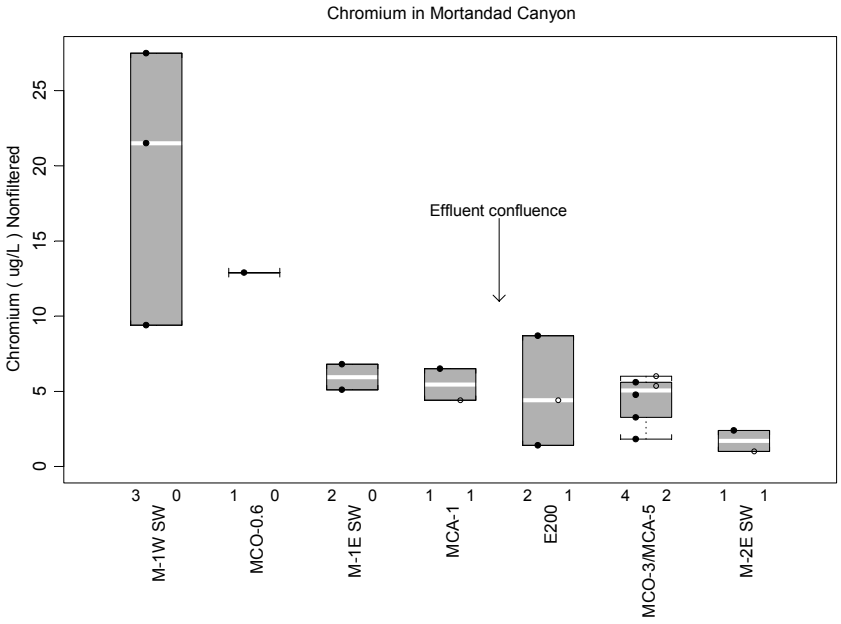
Notes: Filtered and non-filtered samples are included. Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-5. Box plots showing the spatial distribution of perchlorate at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande

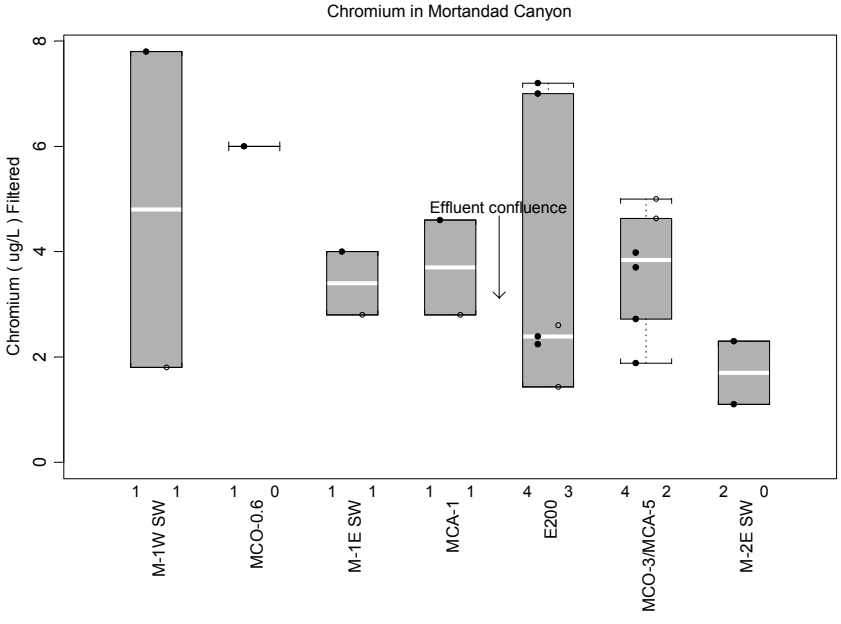


Notes: Filtered and non-filtered samples are included. Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-6. Box plots showing the spatial distribution of perchlorate at surface water and alluvial groundwater locations in Ten Site Canyon



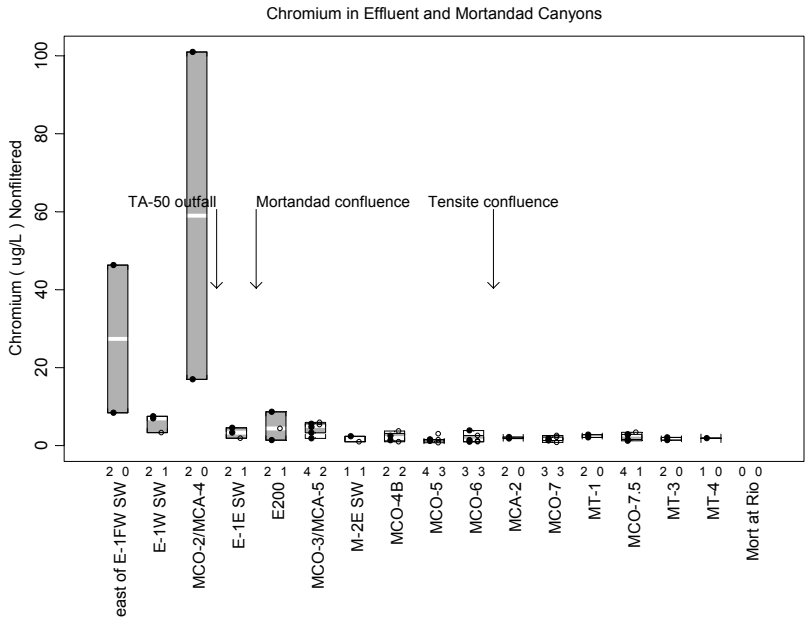
(a)



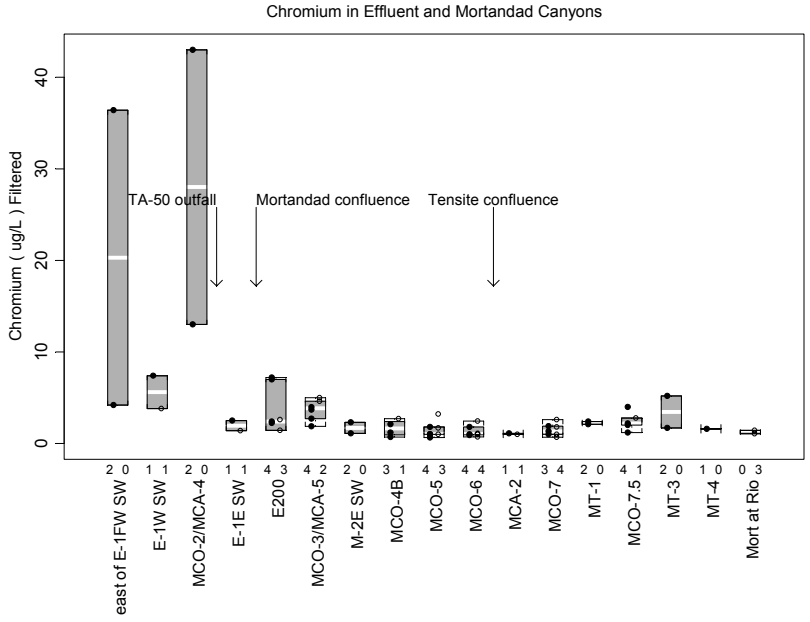
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-7. Box plots showing the spatial distribution of chromium at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment; (a) non-filtered and (b) filtered



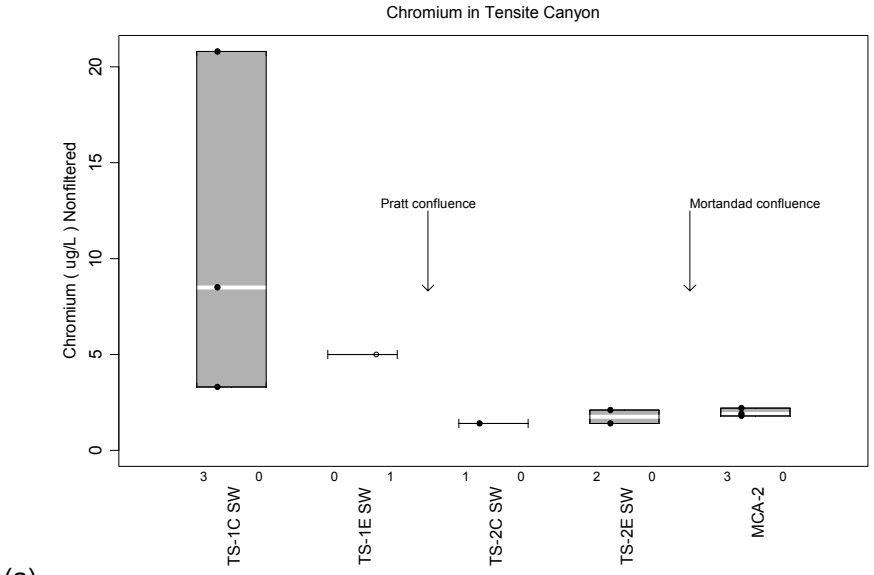
(a)



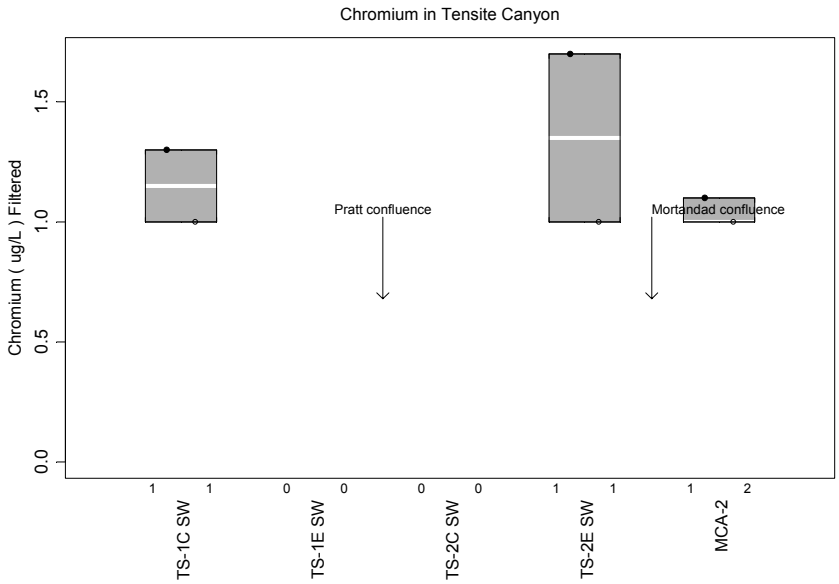
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-8. Box plots showing the spatial distribution of chromium at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande; (a) non-filtered and (b) filtered



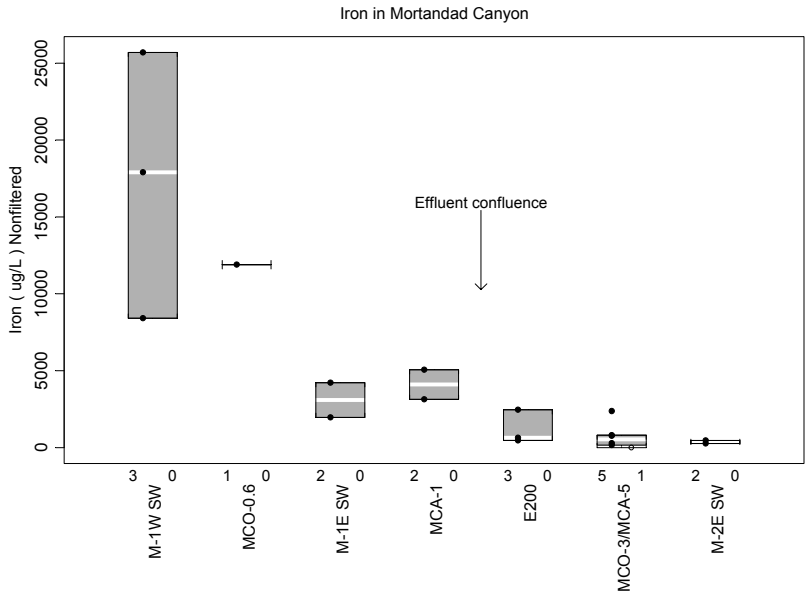
(a)



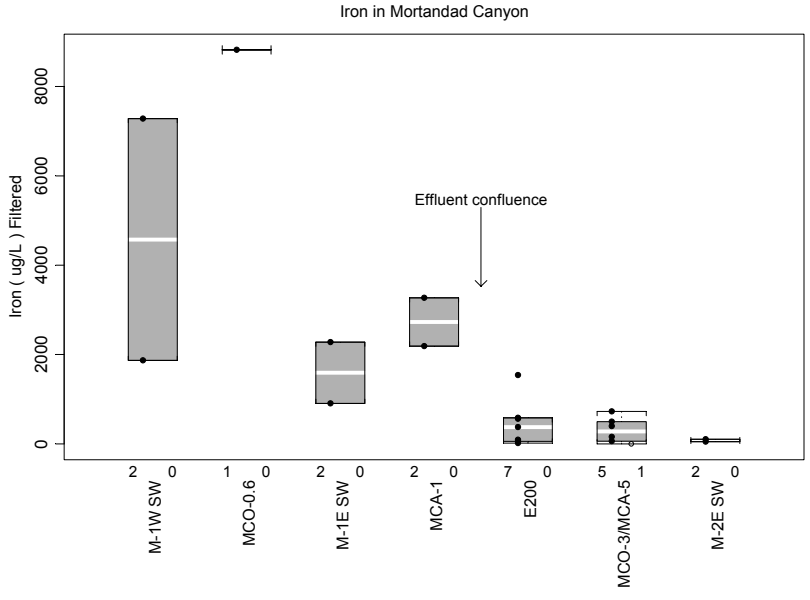
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-9. Box plots showing the spatial distribution of chromium at surface water and alluvial groundwater locations in Ten Site Canyon; (a) non-filtered and (b) filtered



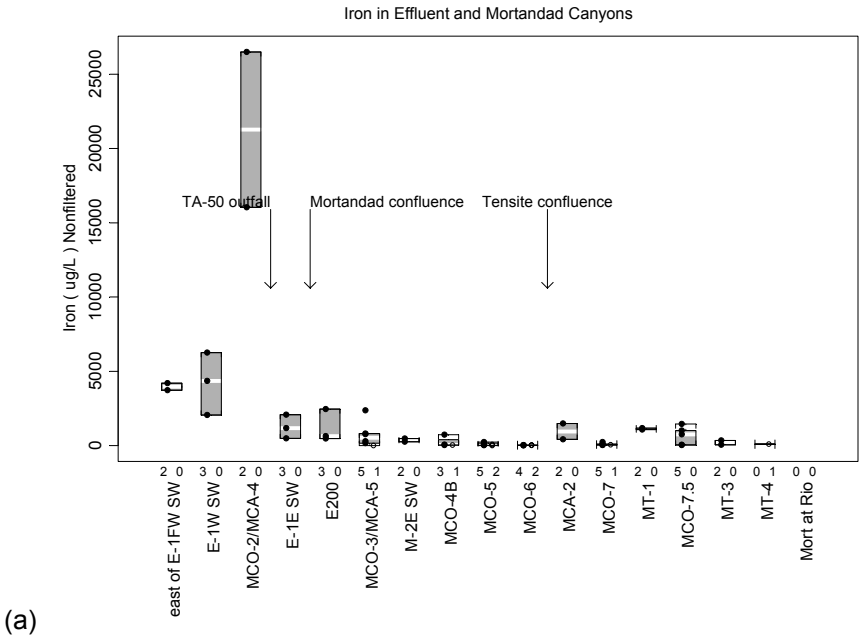
(a)



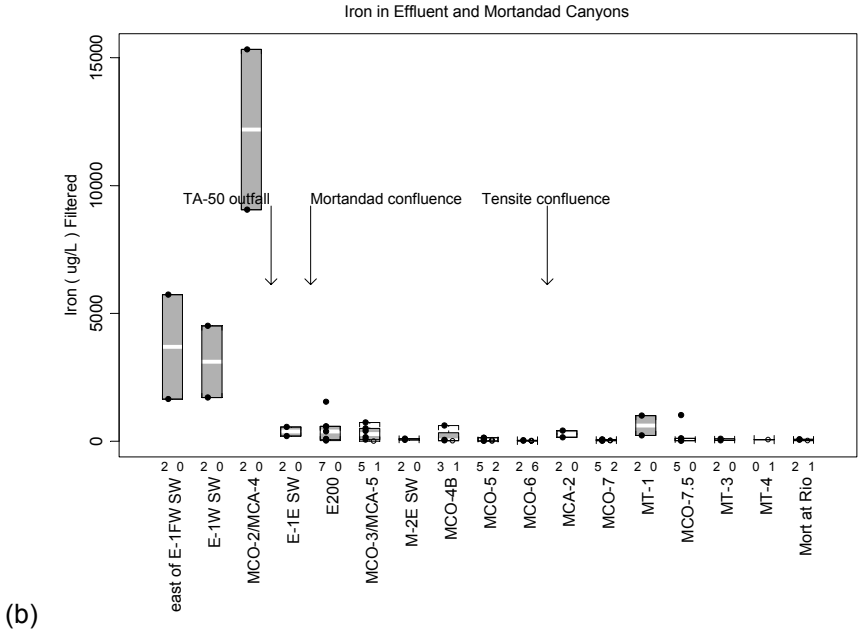
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-10. Box plots showing the spatial distribution of iron at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment; (a) non-filtered and (b) filtered



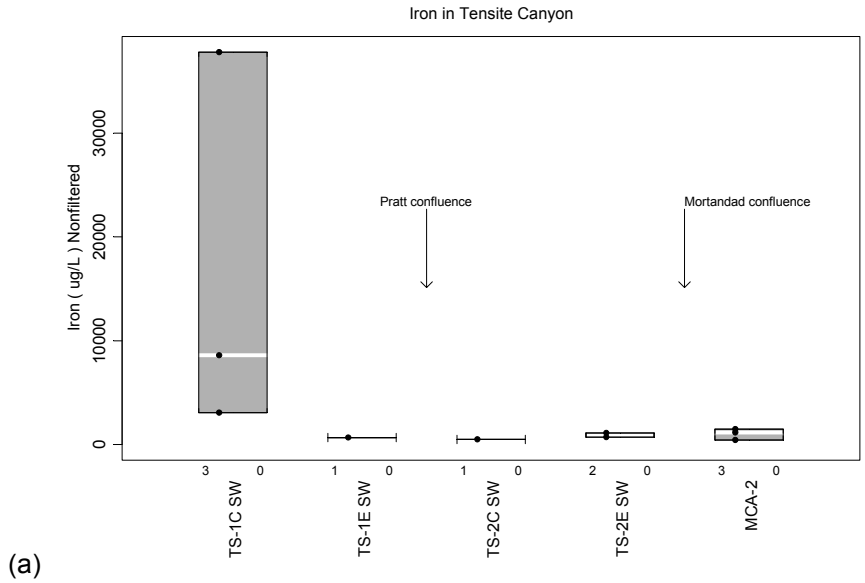
(a)



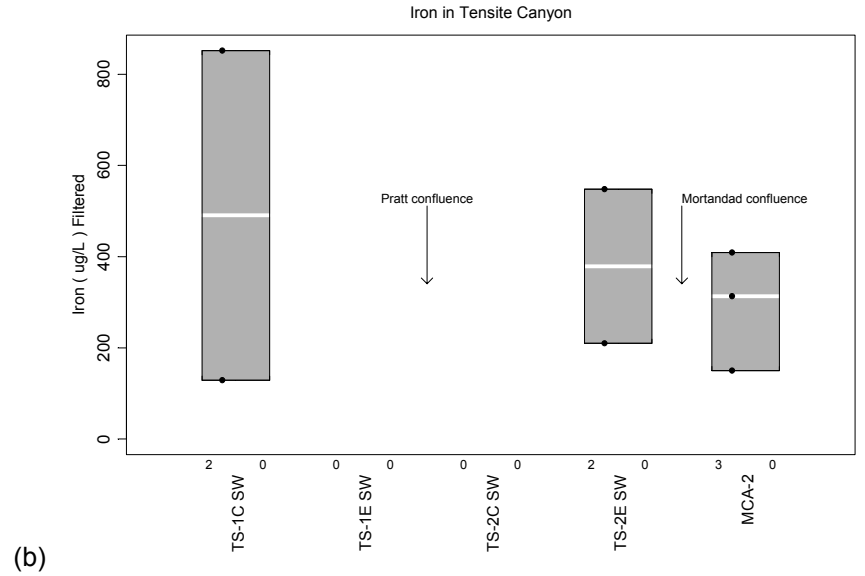
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-11. Box plots showing the spatial distribution of iron at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande; (a) non-filtered and (b) filtered



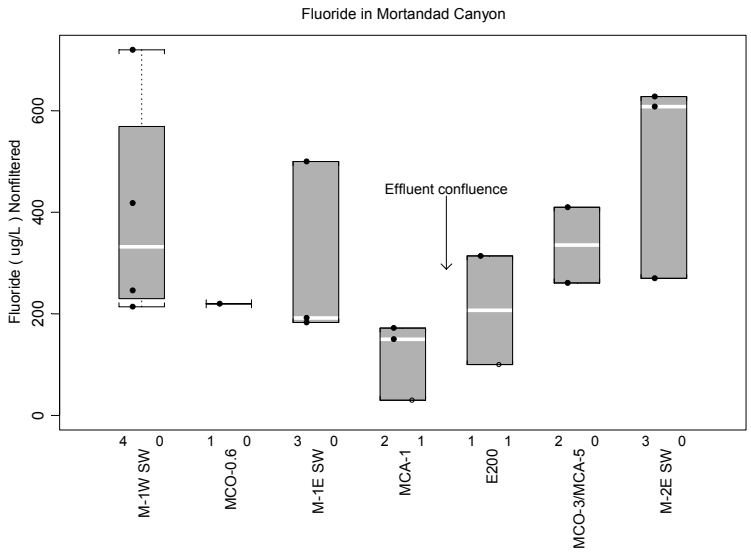
(a)



(b)

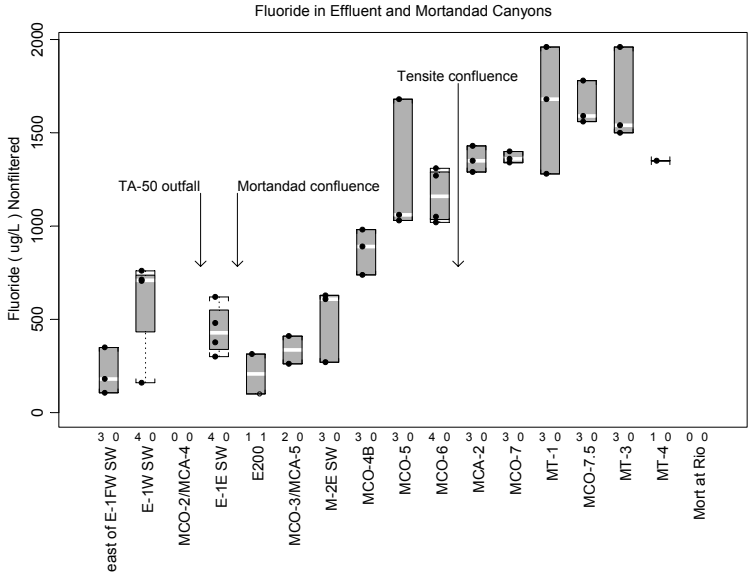
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-12. Box plots showing the spatial distribution of iron at surface water and alluvial groundwater locations in Ten Site Canyon; (a) non-filtered and (b) filtered



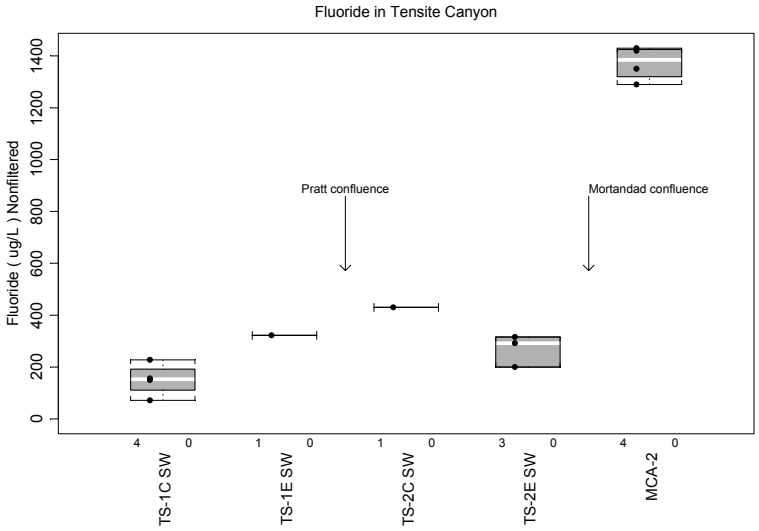
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-13. Box plots showing the spatial distribution of fluoride in non-filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



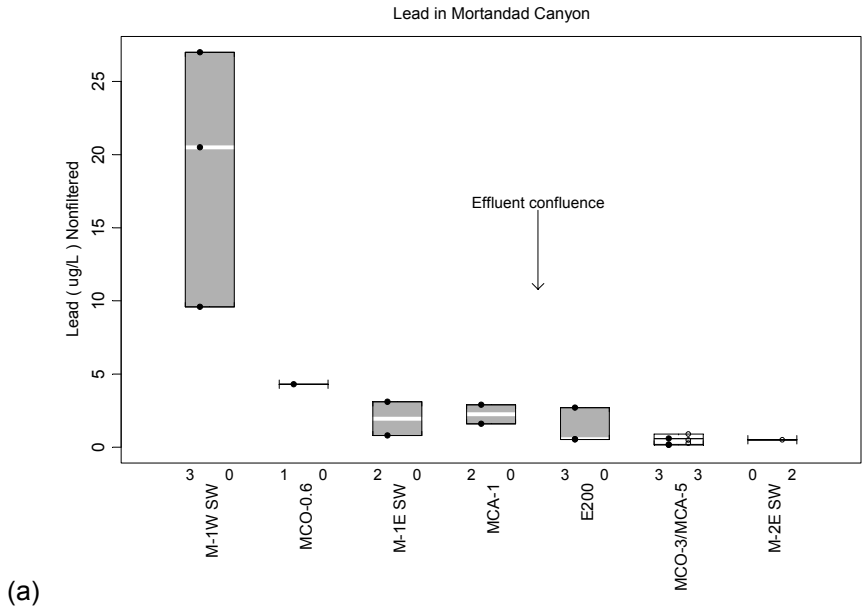
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-14. Box plots showing the spatial distribution of fluoride in non-filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande

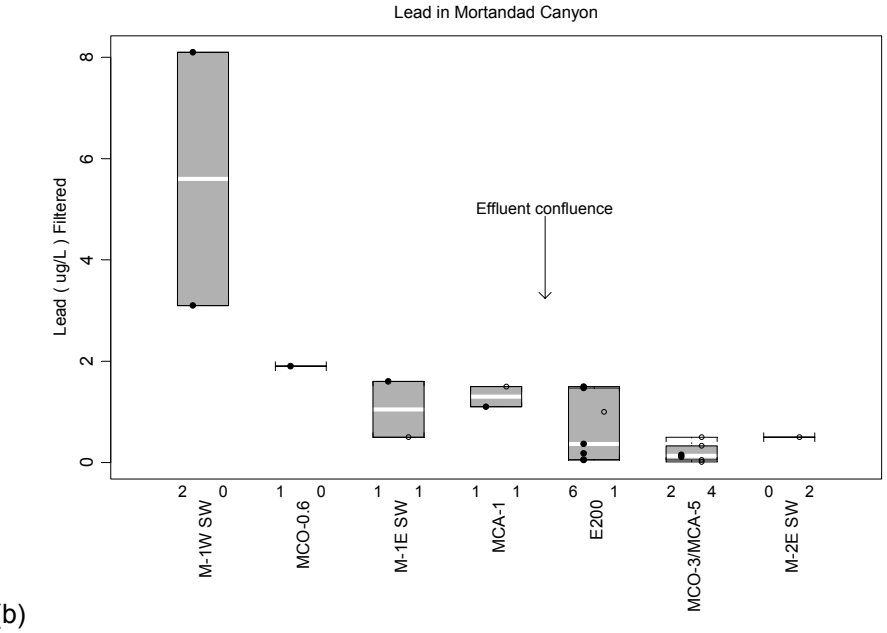


Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-15. Box plots showing the spatial distribution of fluoride in non-filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



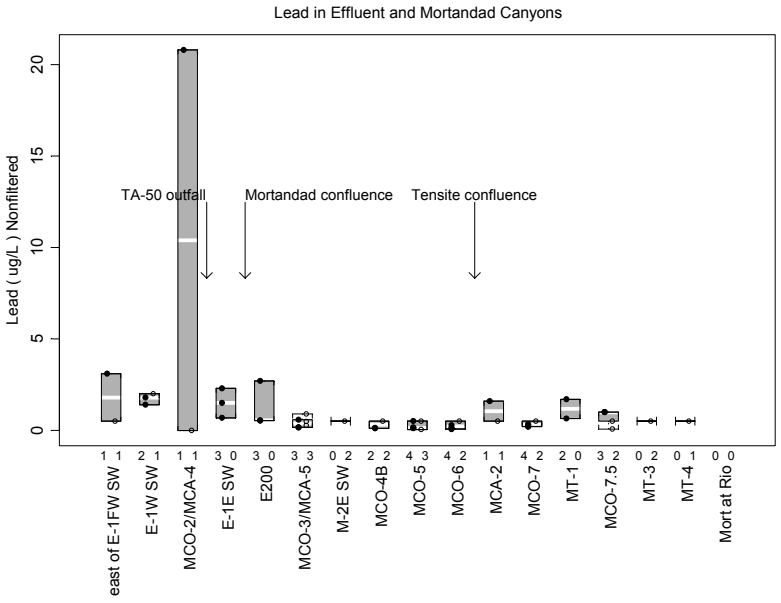
(a)



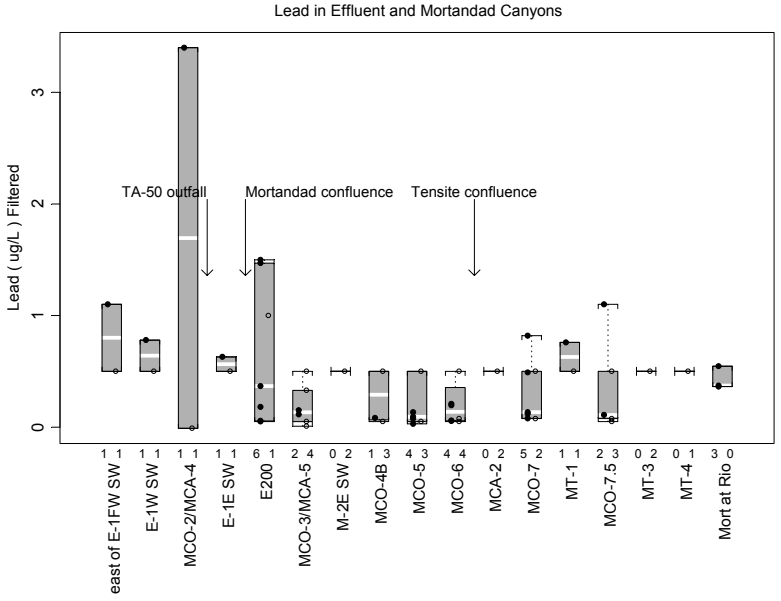
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-16. Box plots showing the spatial distribution of lead at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment, (a) non-filtered and (b) filtered samples



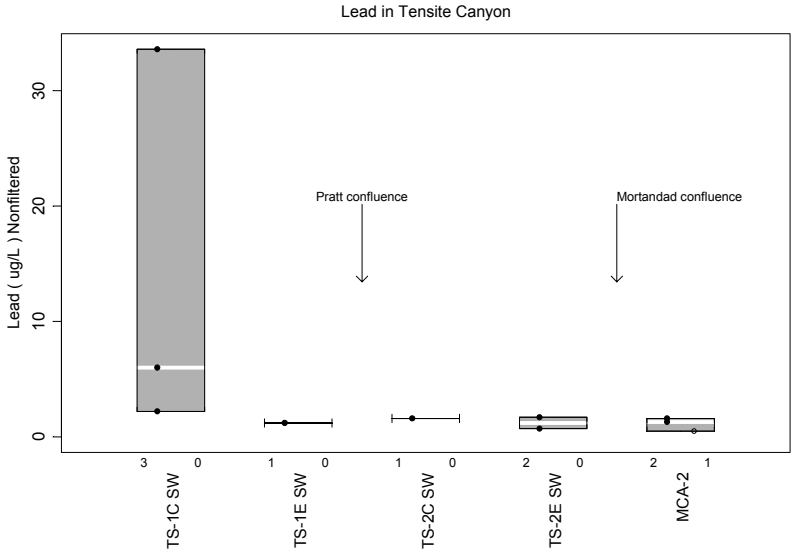
(a)



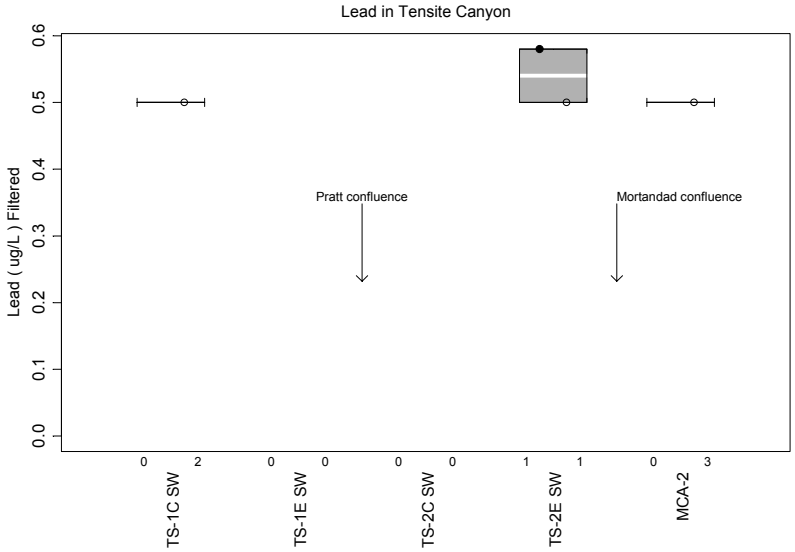
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-17. Box plots showing the spatial distribution of lead at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande, in (a) non-filtered and (b) samples



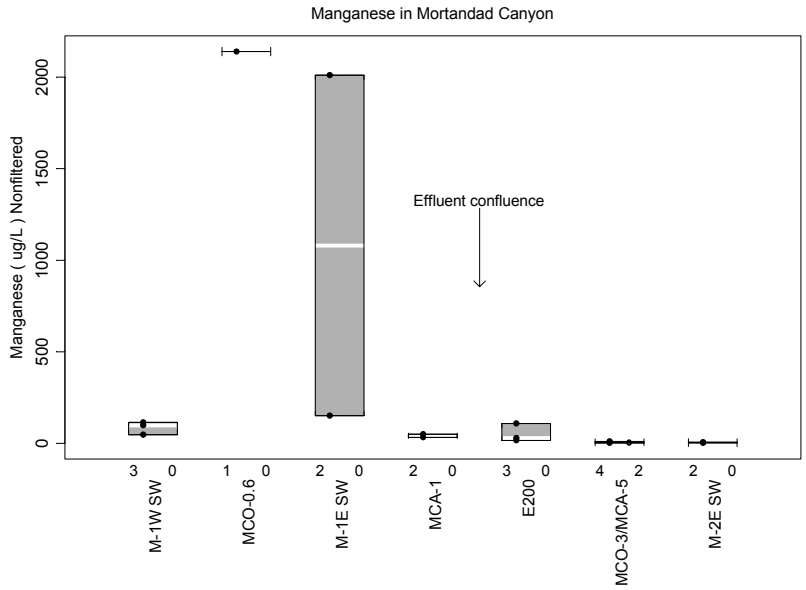
(a)



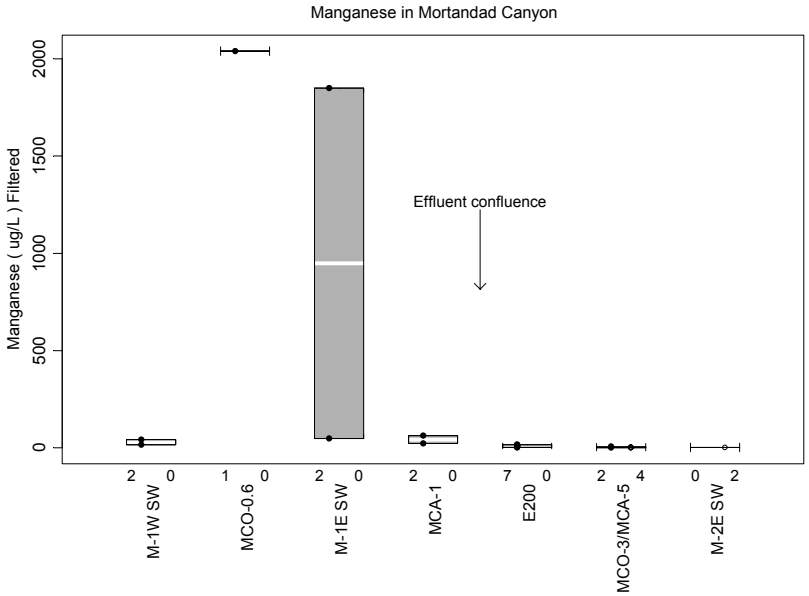
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-18. Box plots showing the spatial distribution of lead in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



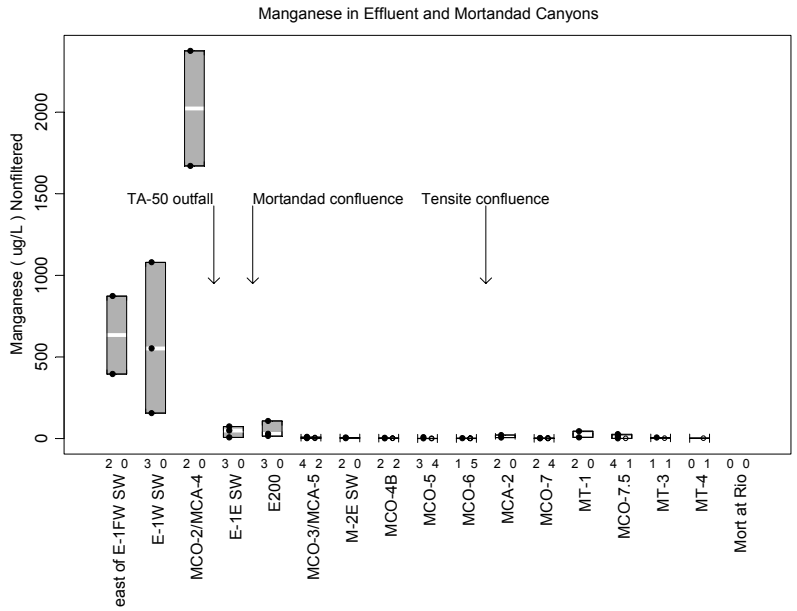
(a)



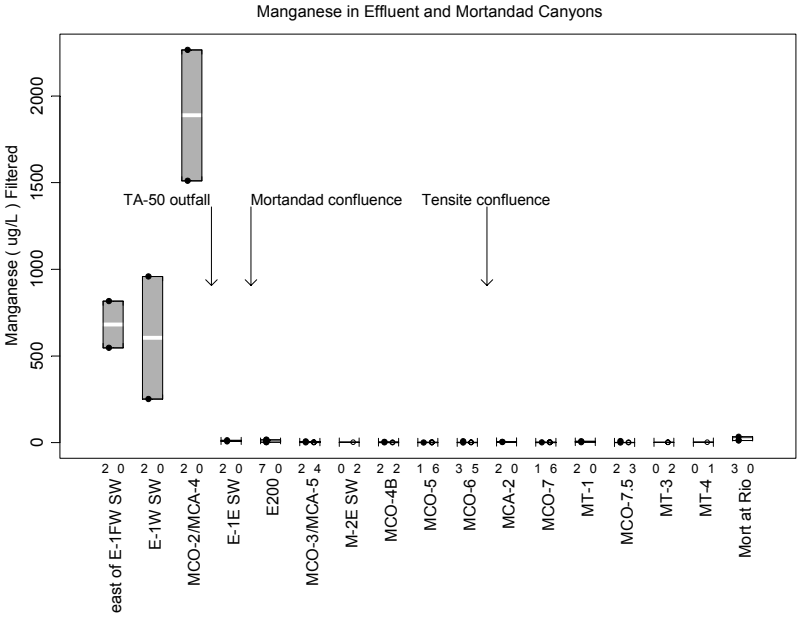
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-19. Box plots showing the spatial distribution of manganese at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment, (a) non-filtered and (b) filtered samples



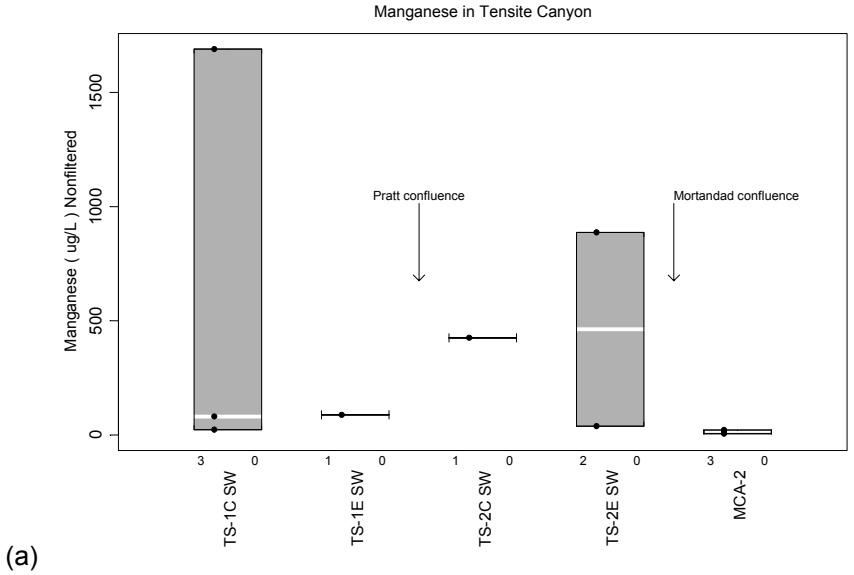
(a)



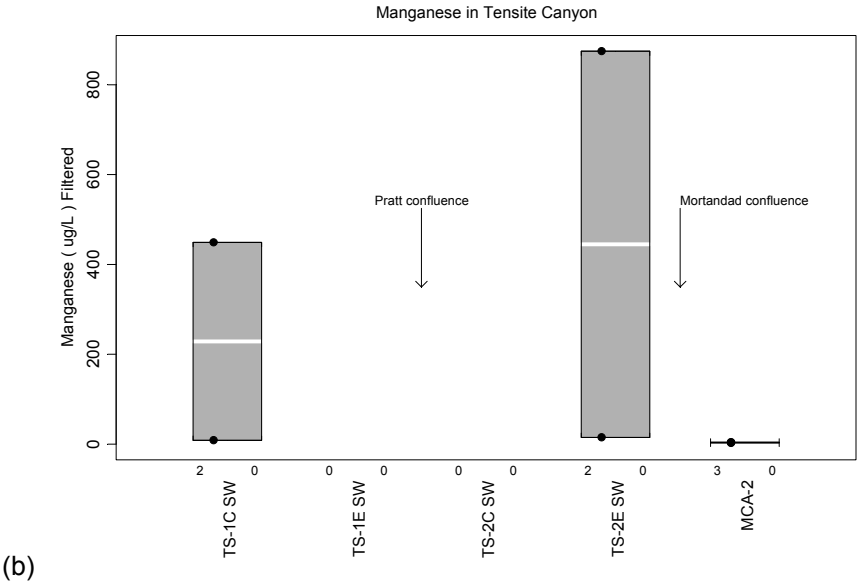
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-20. Box plots showing the spatial distribution of manganese at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande; in (a) non-filtered and (b) filtered samples



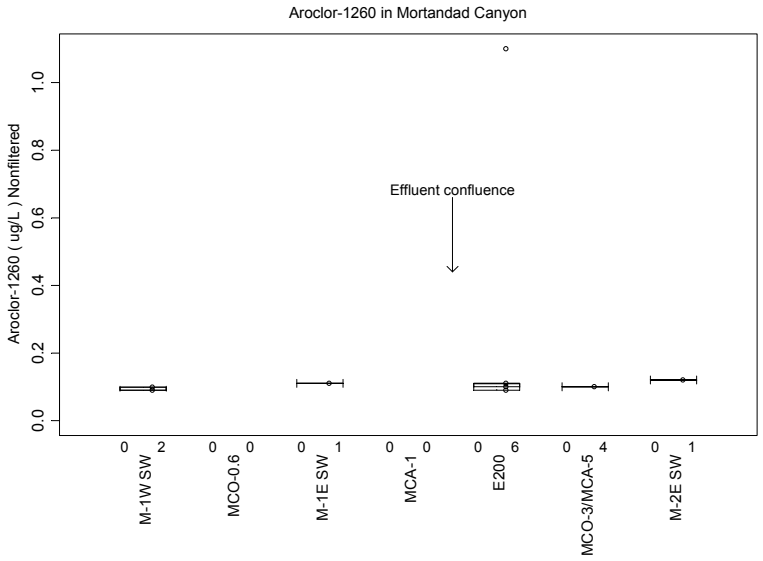
(a)



(b)

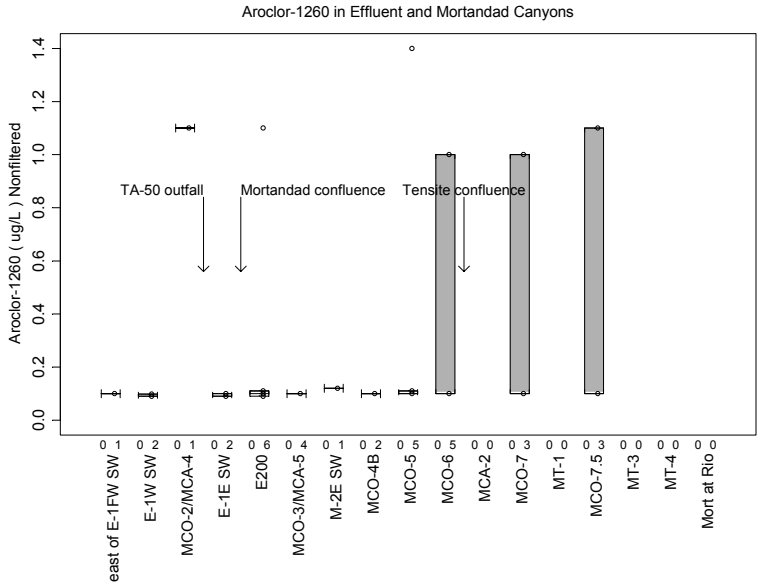
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-21. Box plots showing the spatial distribution of manganese at surface water and alluvial groundwater locations in Ten Site Canyon, (a) in non-filtered and (b) filtered samples.



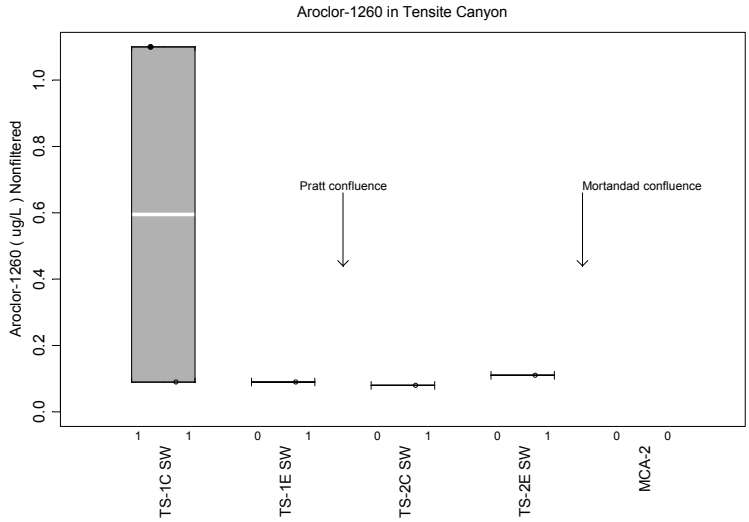
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-22. Box plots showing the spatial distribution of aroclor-1260 in non-filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



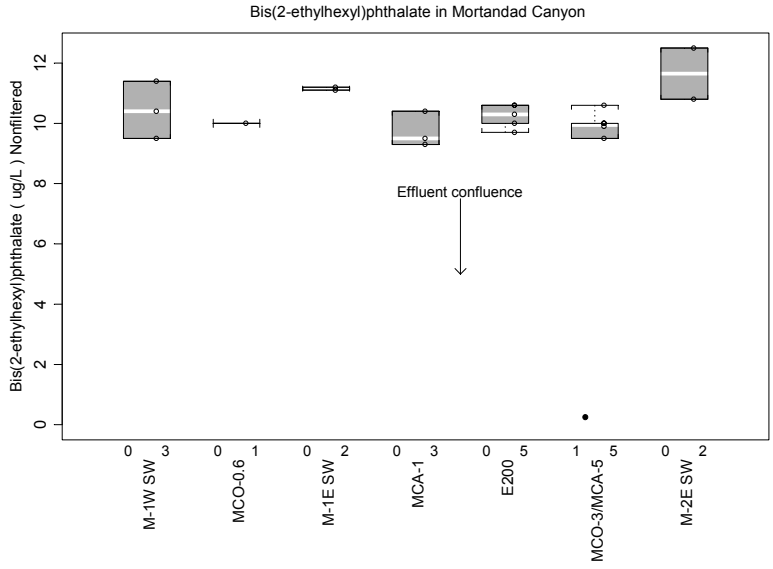
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-23. Box plots showing the spatial distribution of aroclor-1260 in non-filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande



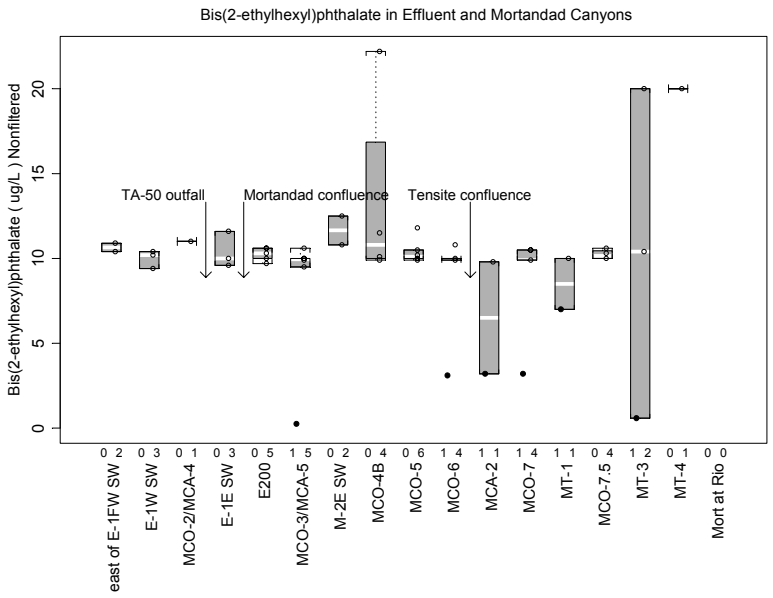
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-24. Box plots showing the spatial distribution of aroclor-1260 in non-filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



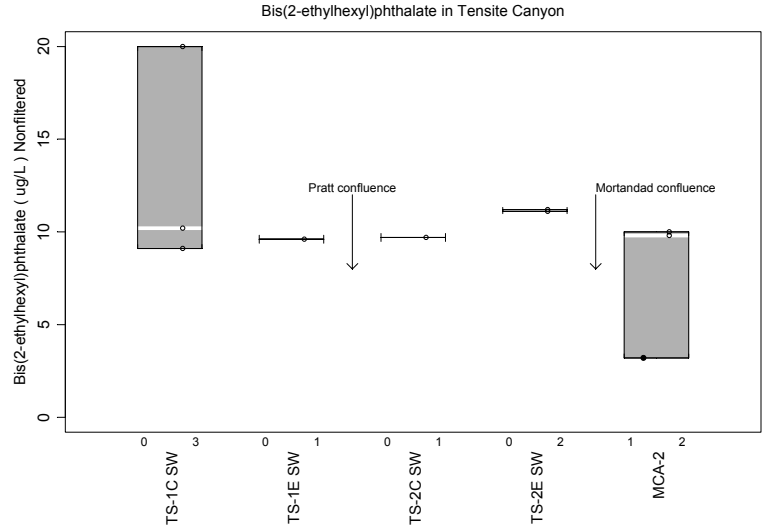
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-25. Box plots showing the spatial distribution of bis(2-ethylhexyl)phthalate in non-filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



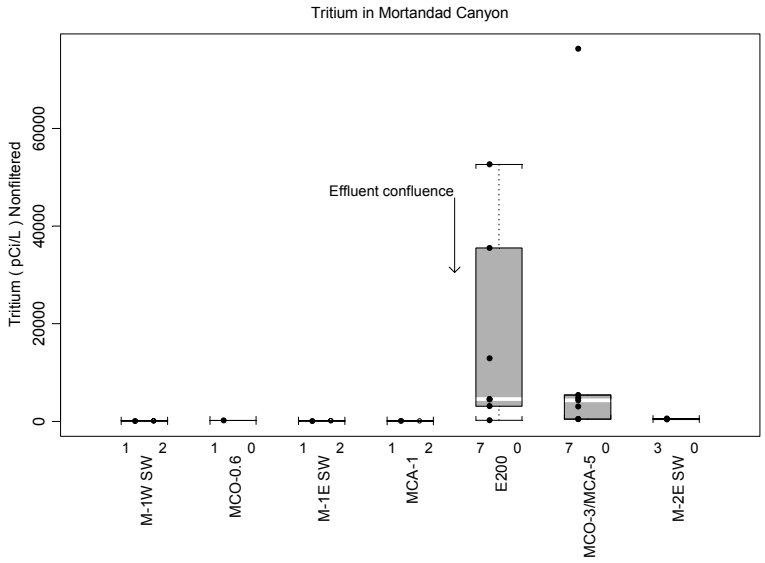
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-26. Box plots showing the spatial distribution of bis(2-ethylhexyl)phthalate in non-filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande



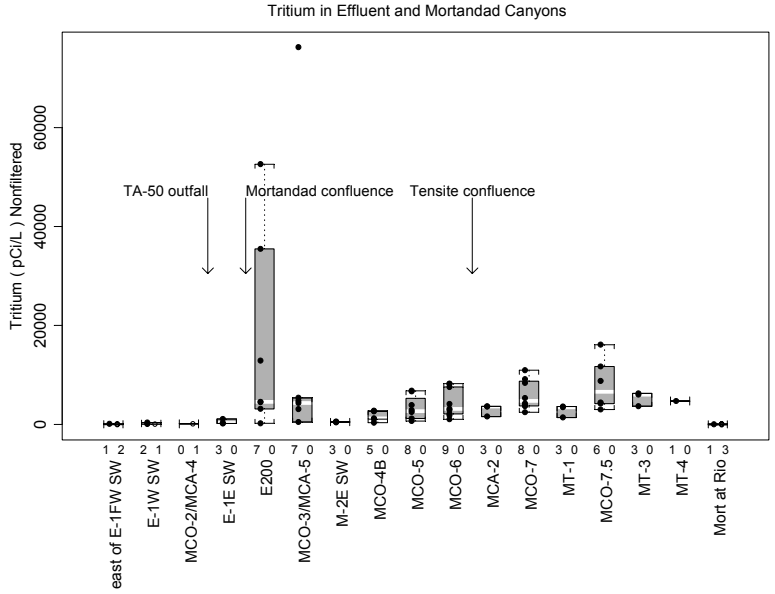
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-27. Box plots showing the spatial distribution of bis(2-ethylhexyl)phthalate in non-filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



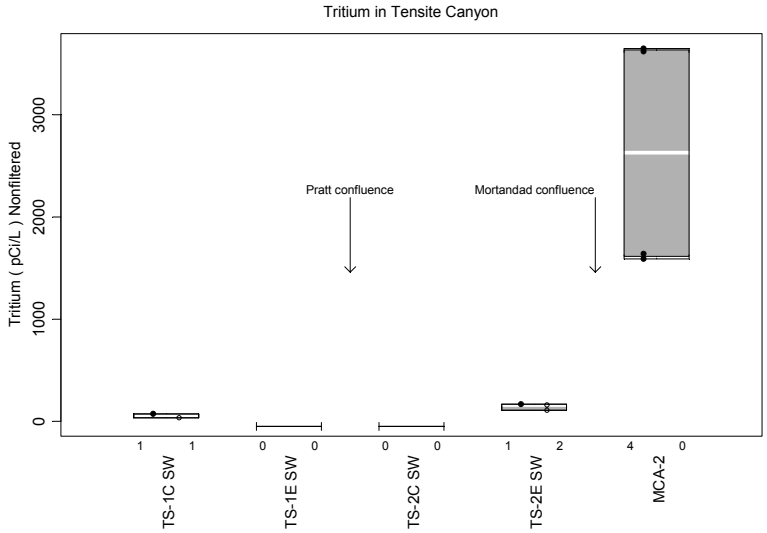
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-28. Box plots showing the spatial distribution of tritium in non-filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



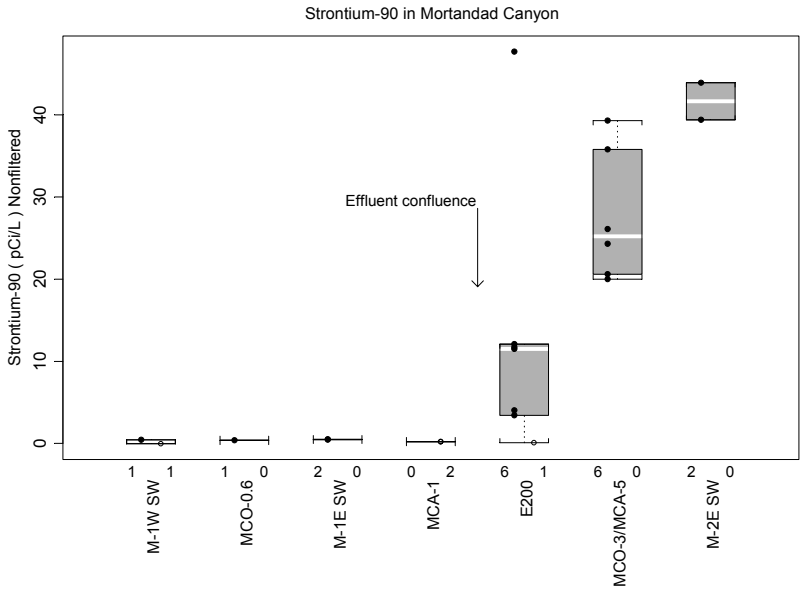
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-29. Box plots showing the spatial distribution of tritium in non-filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande

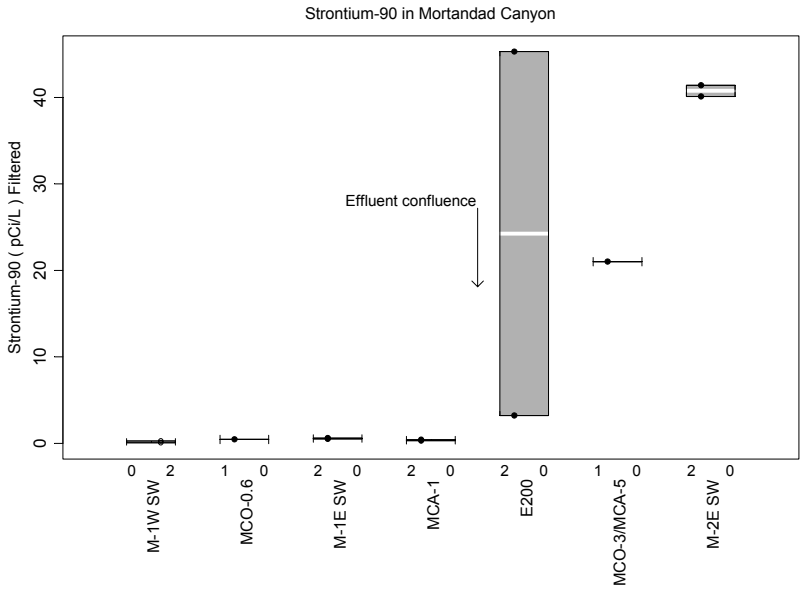


Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-30. Box plots showing the spatial distribution of tritium in non-filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



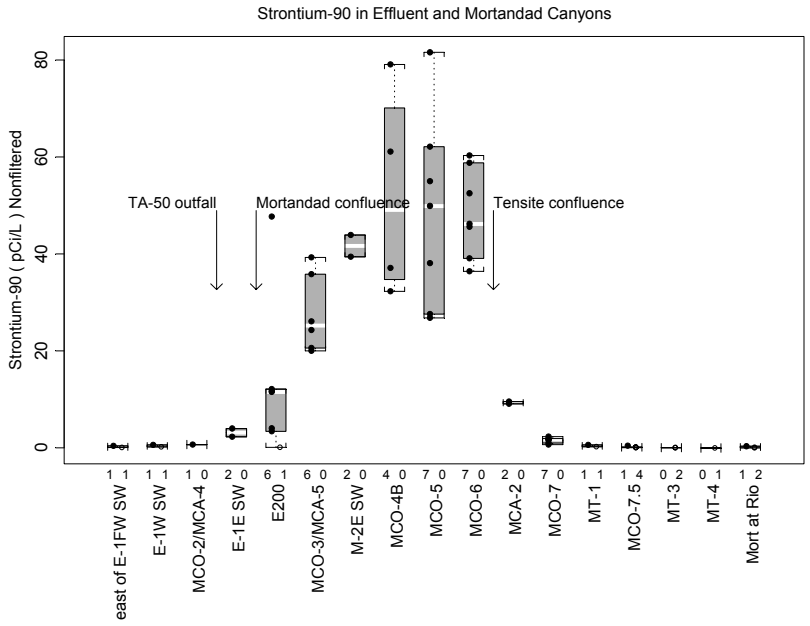
(a)



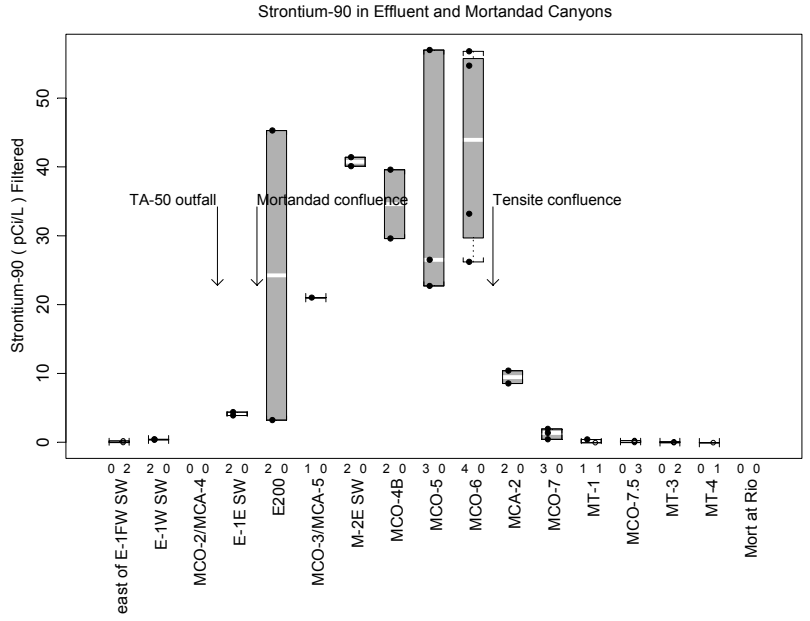
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-31. Box plots showing the spatial distribution of strontium-90 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



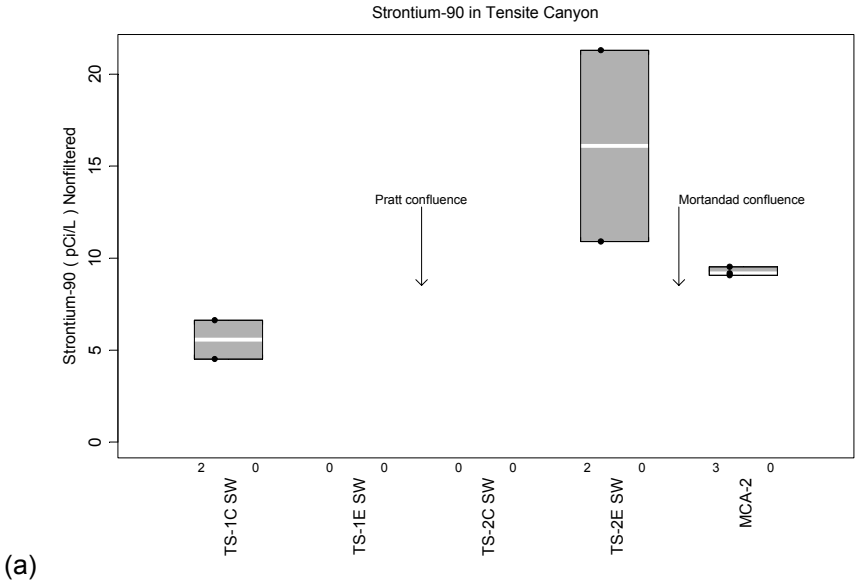
(a)



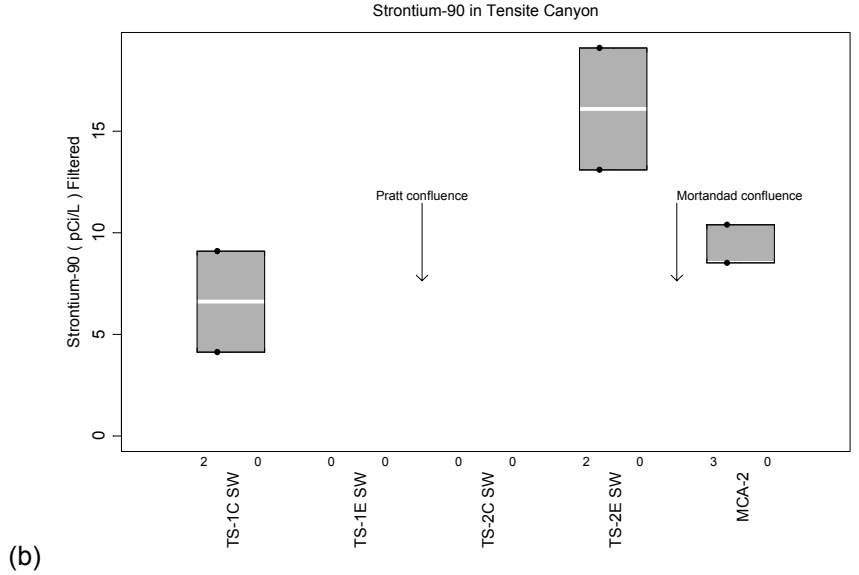
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-32. Box plots showing the spatial distribution of strontium-90 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande



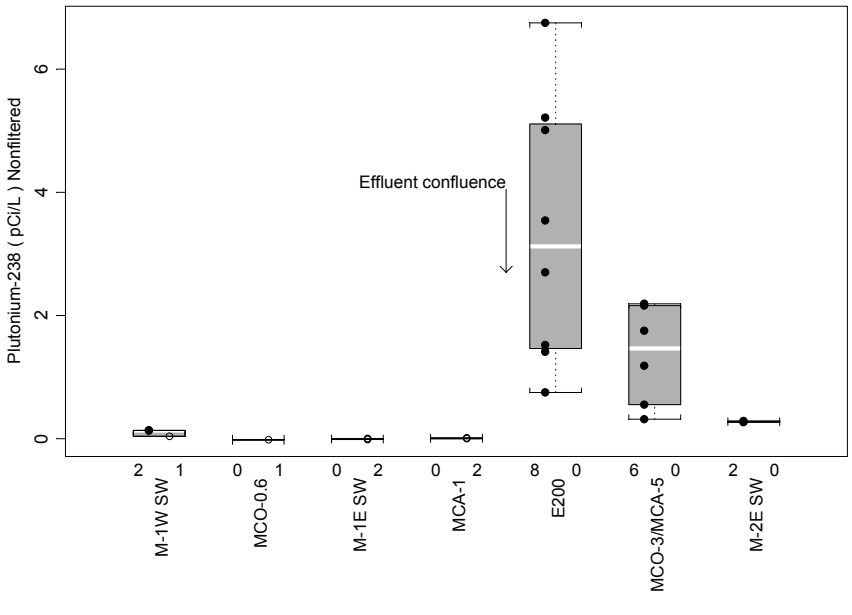
(a)



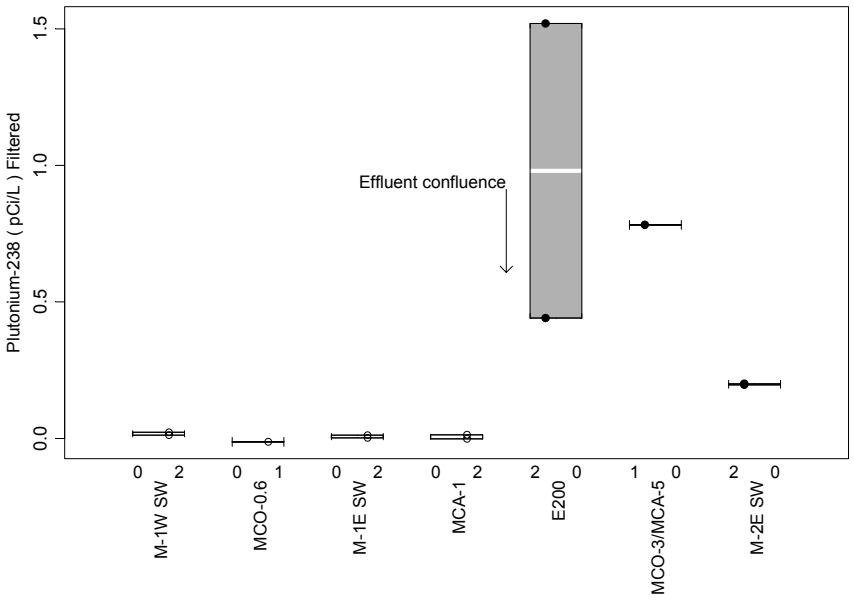
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-33. Box plots showing the spatial distribution of strontium-90 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



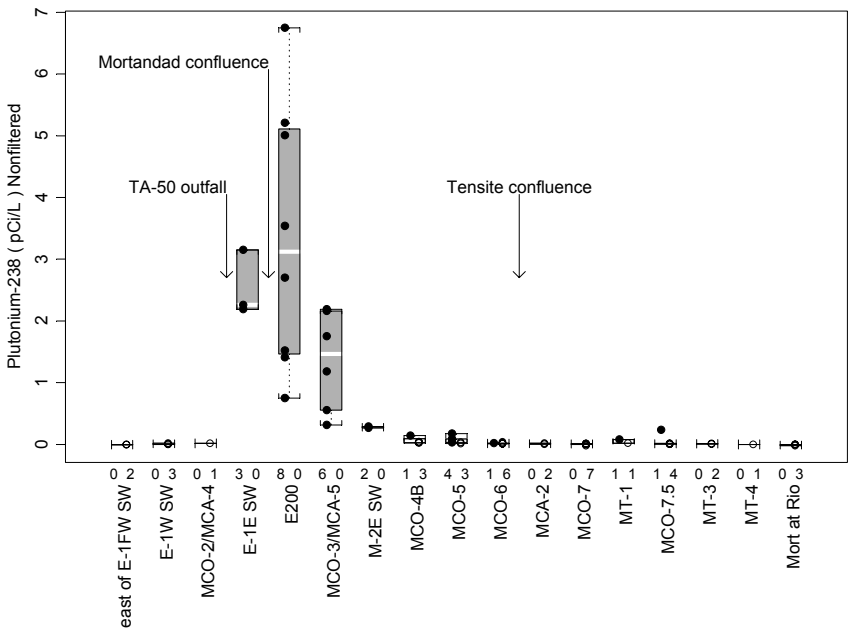
(a)



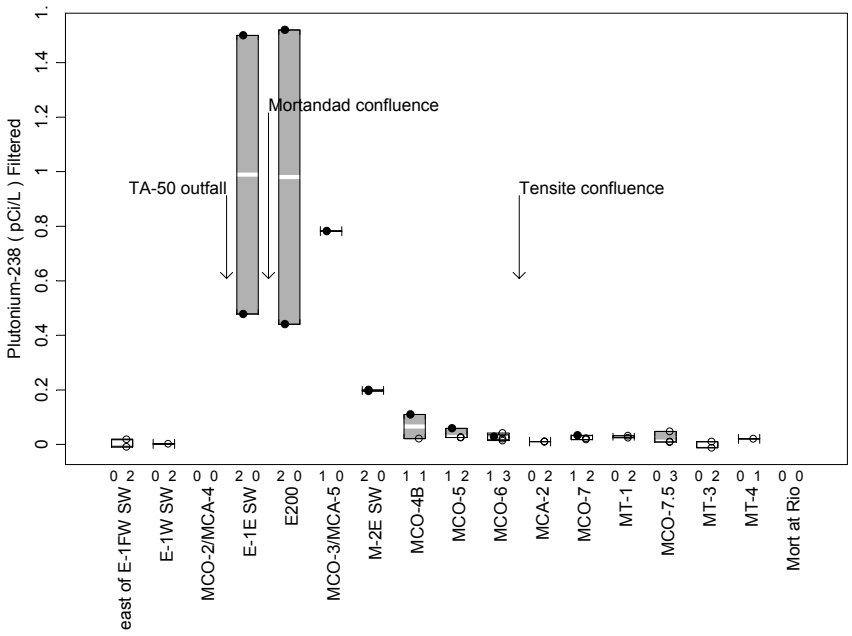
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-34. Box plots showing the spatial distribution of plutonium-238 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



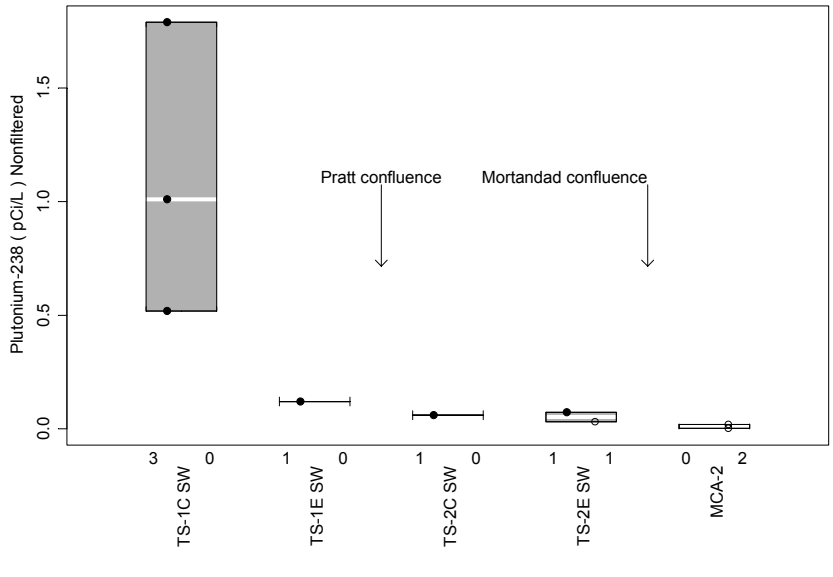
(a)



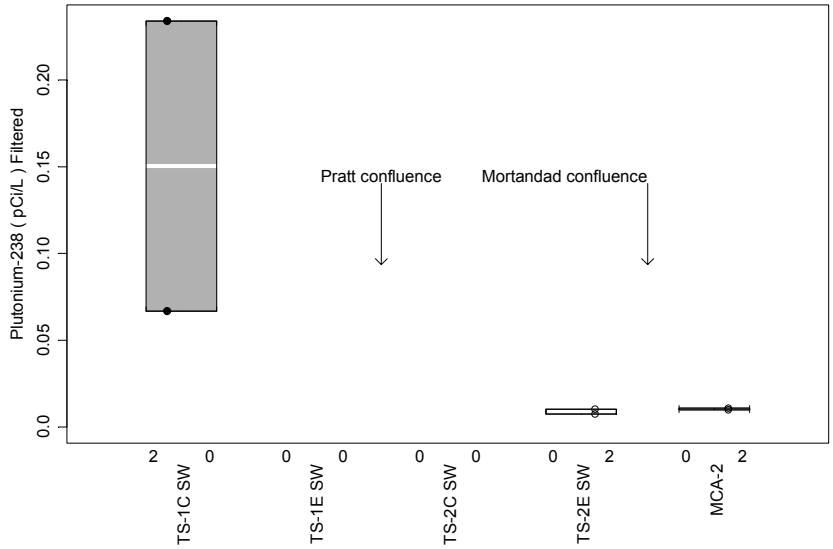
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-35. Box plots showing the spatial distribution of plutonium-238 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande



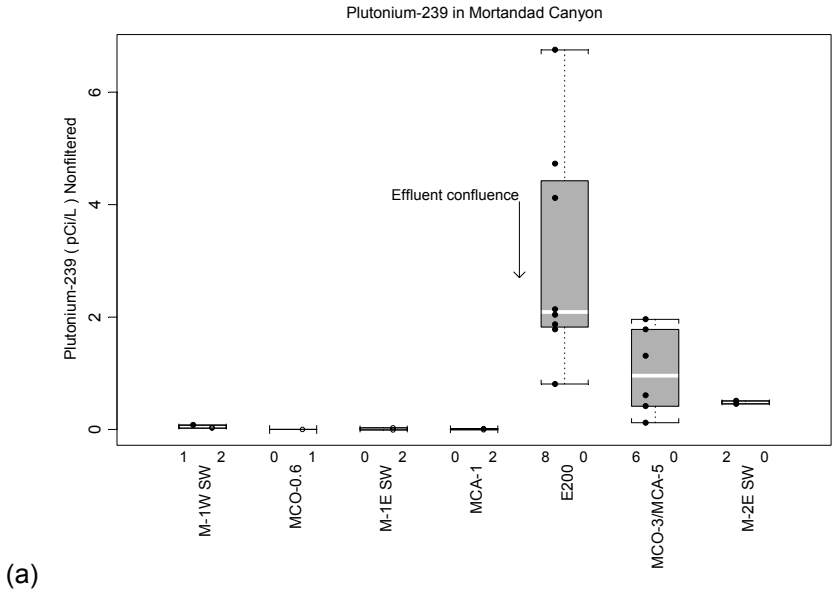
(a)



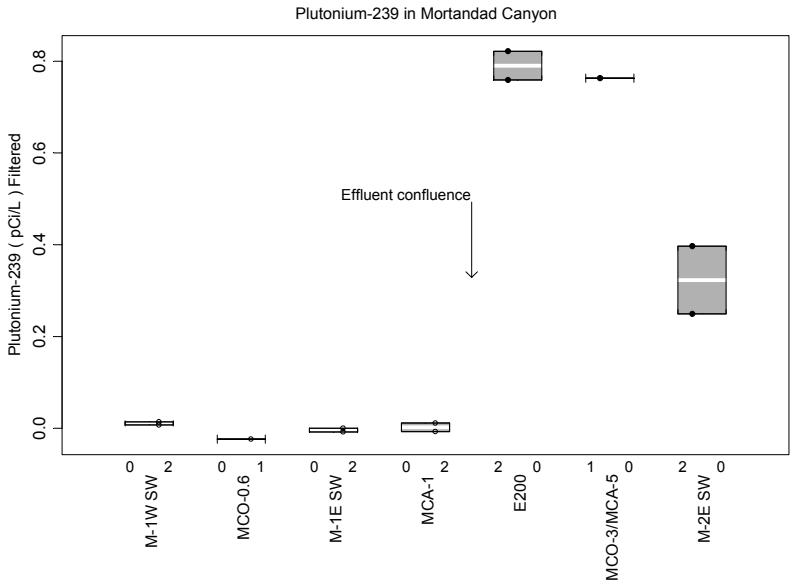
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-36. Box plots showing the spatial distribution of plutonium-238 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



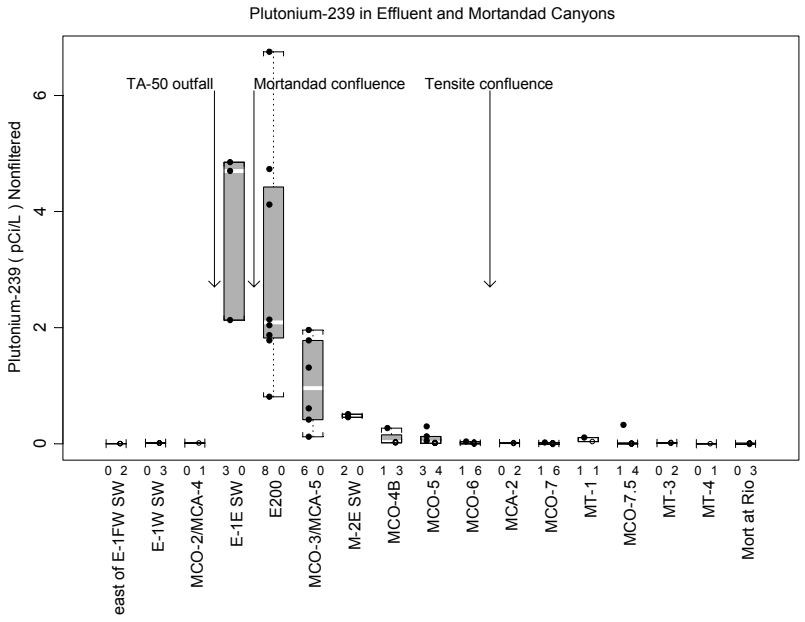
(a)



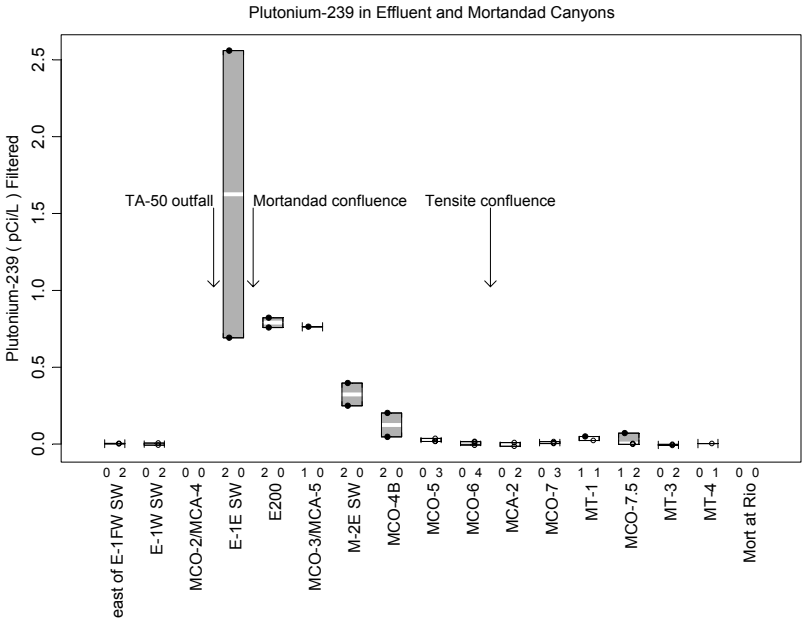
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-37. Box plots showing the spatial distribution of plutonium-239 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



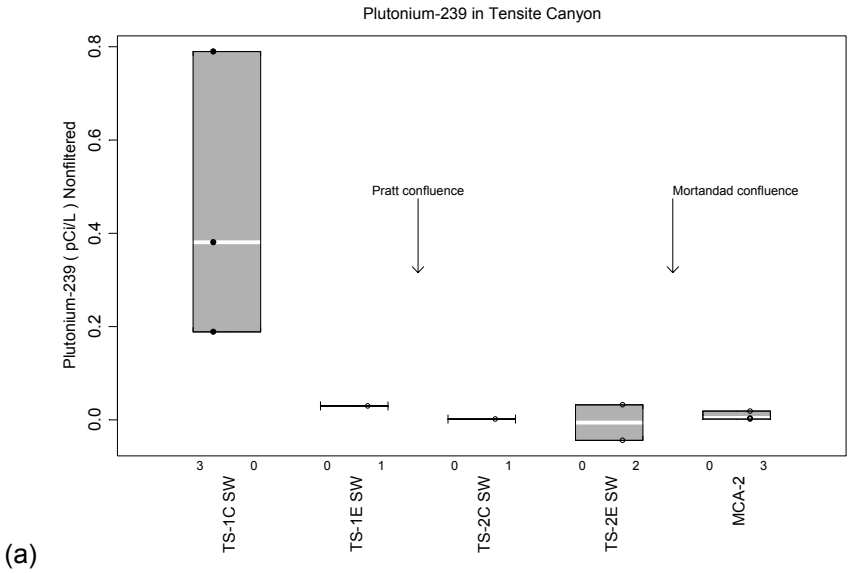
(a)



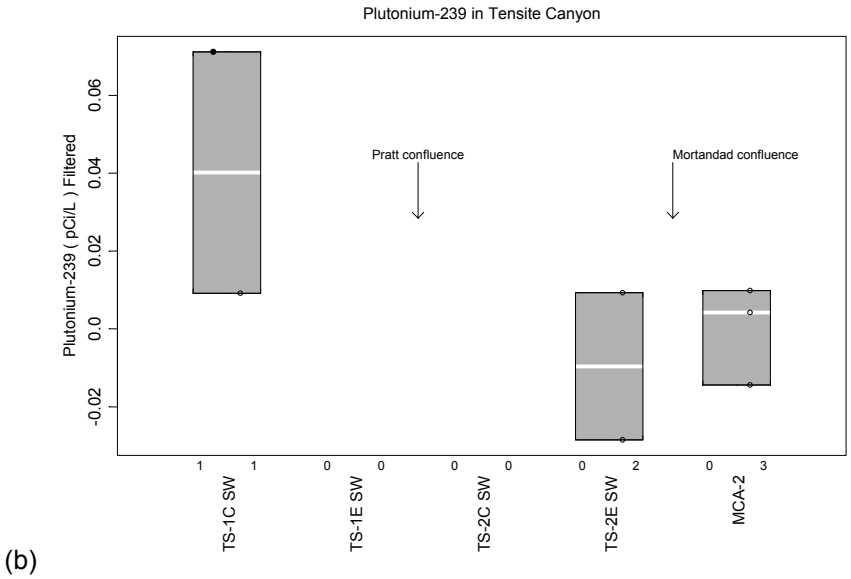
(b)

Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-38. Box plots showing the spatial distribution of plutonium-239 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande



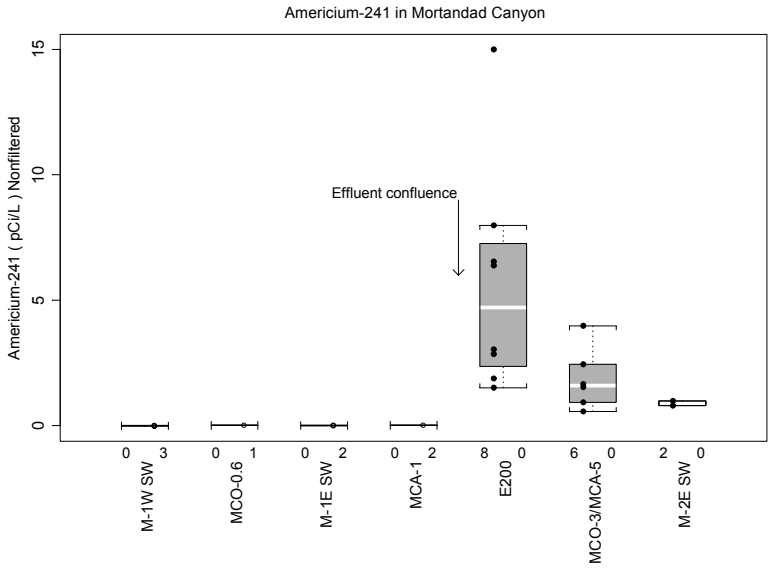
(a)



(b)

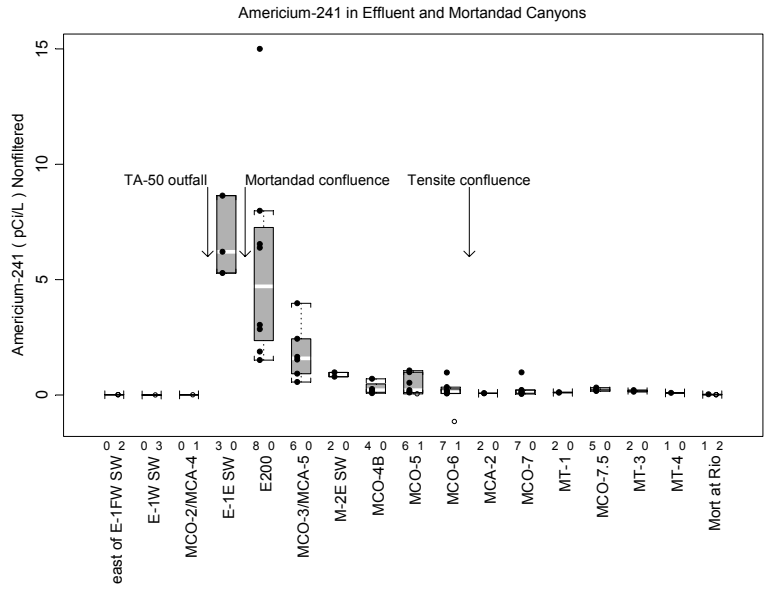
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-39. Box plots showing the spatial distribution of plutonium-239 in (a) non-filtered and (b) filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon



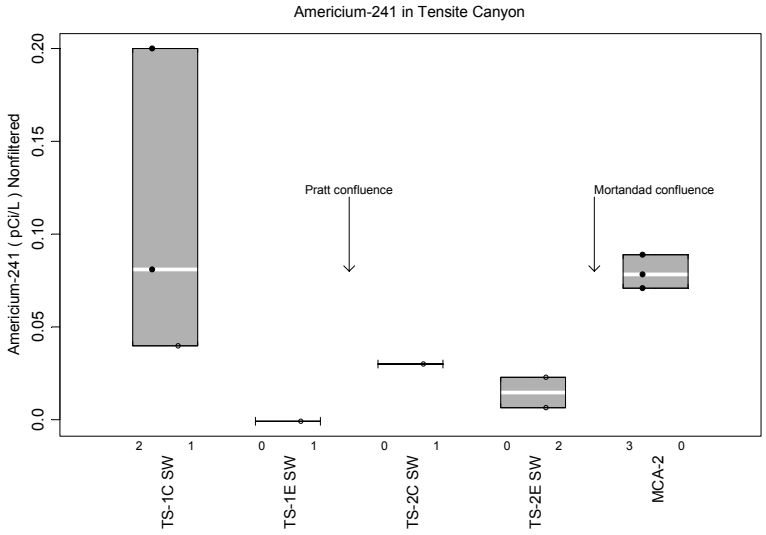
Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-40. Box plots showing the spatial distribution of americium-241 in non-filtered samples at surface water and alluvial groundwater locations in the upper Mortandad Canyon watershed segment



Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-41. Box plots showing the spatial distribution of americium-241 in non-filtered samples at surface water and alluvial groundwater locations in Effluent Canyon and in Mortandad Canyon between the Effluent Canyon confluence and the Rio Grande



Note: Annotation shows the relative locations of key contaminant sources and other geographic features.

Figure D-2.1-42. Box plots showing the spatial distribution of americium-241 in non-filtered samples at surface water and alluvial groundwater locations in Ten Site Canyon

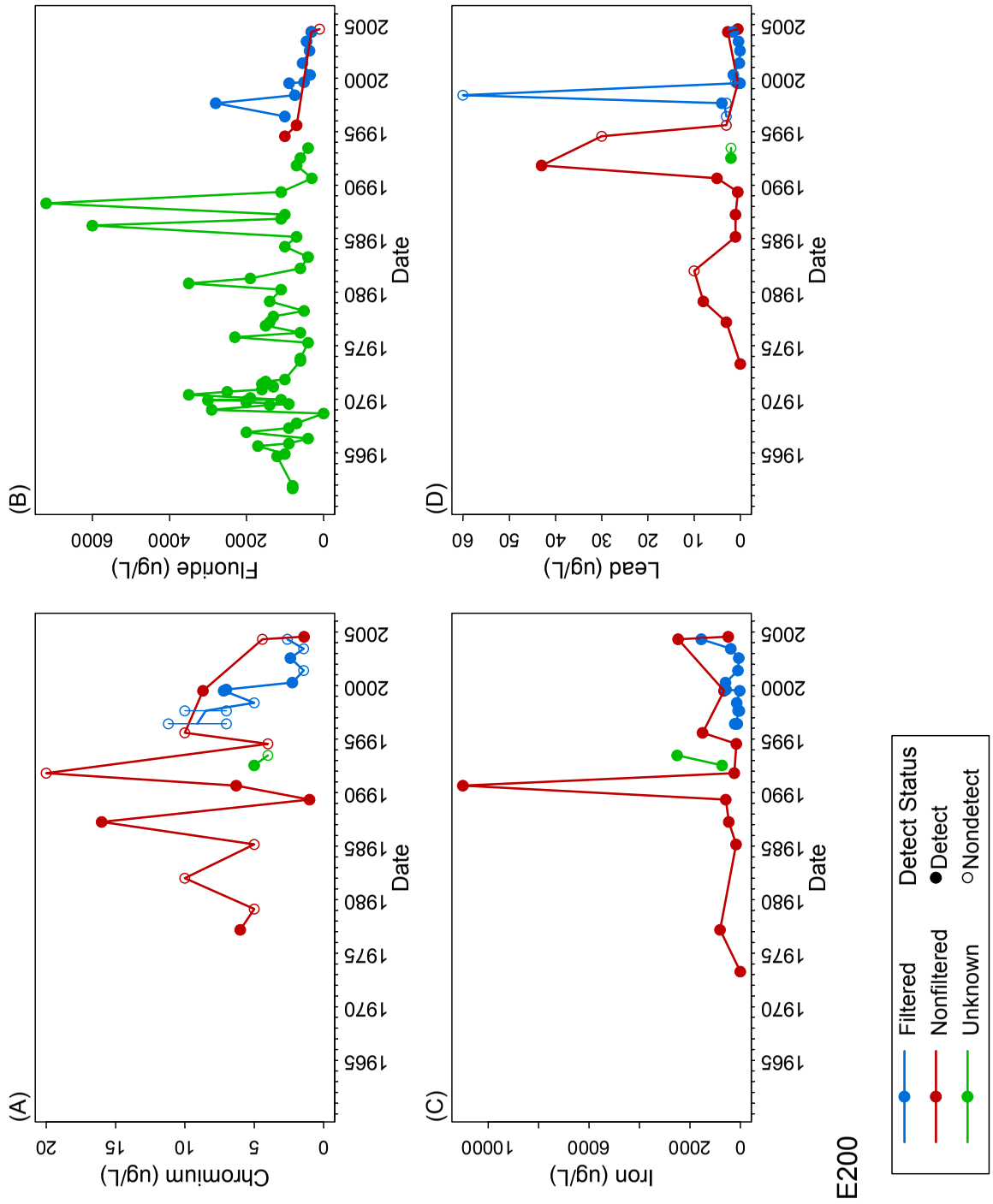


Figure D-2.2-1. Concentrations over time at Gage E200/GS-1 for (A) chromium, (B) fluoride, (C) iron, (D) lead

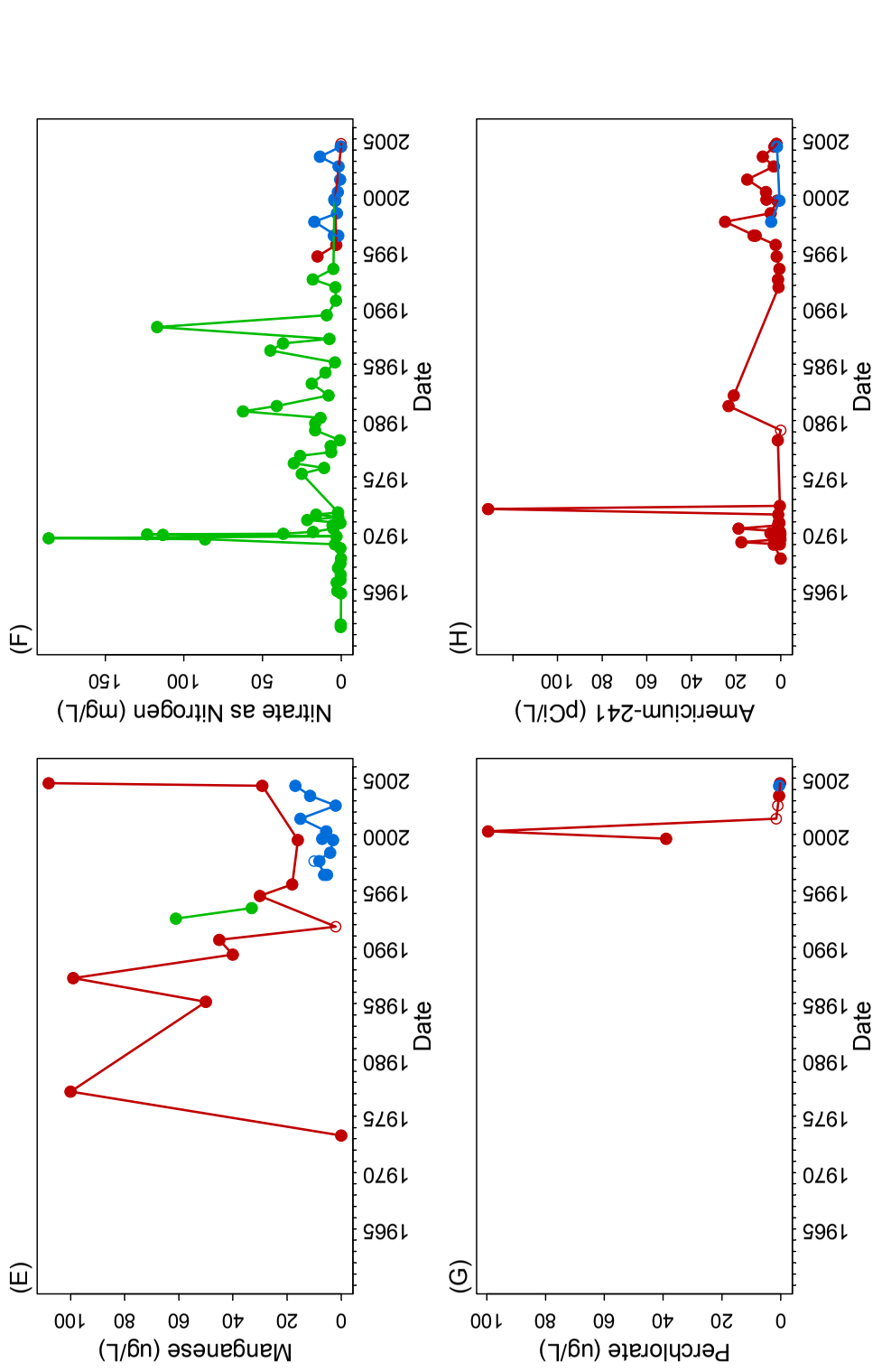


Figure D-2.2-1 (continued). Concentrations over time at Gage E200/GS-1 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

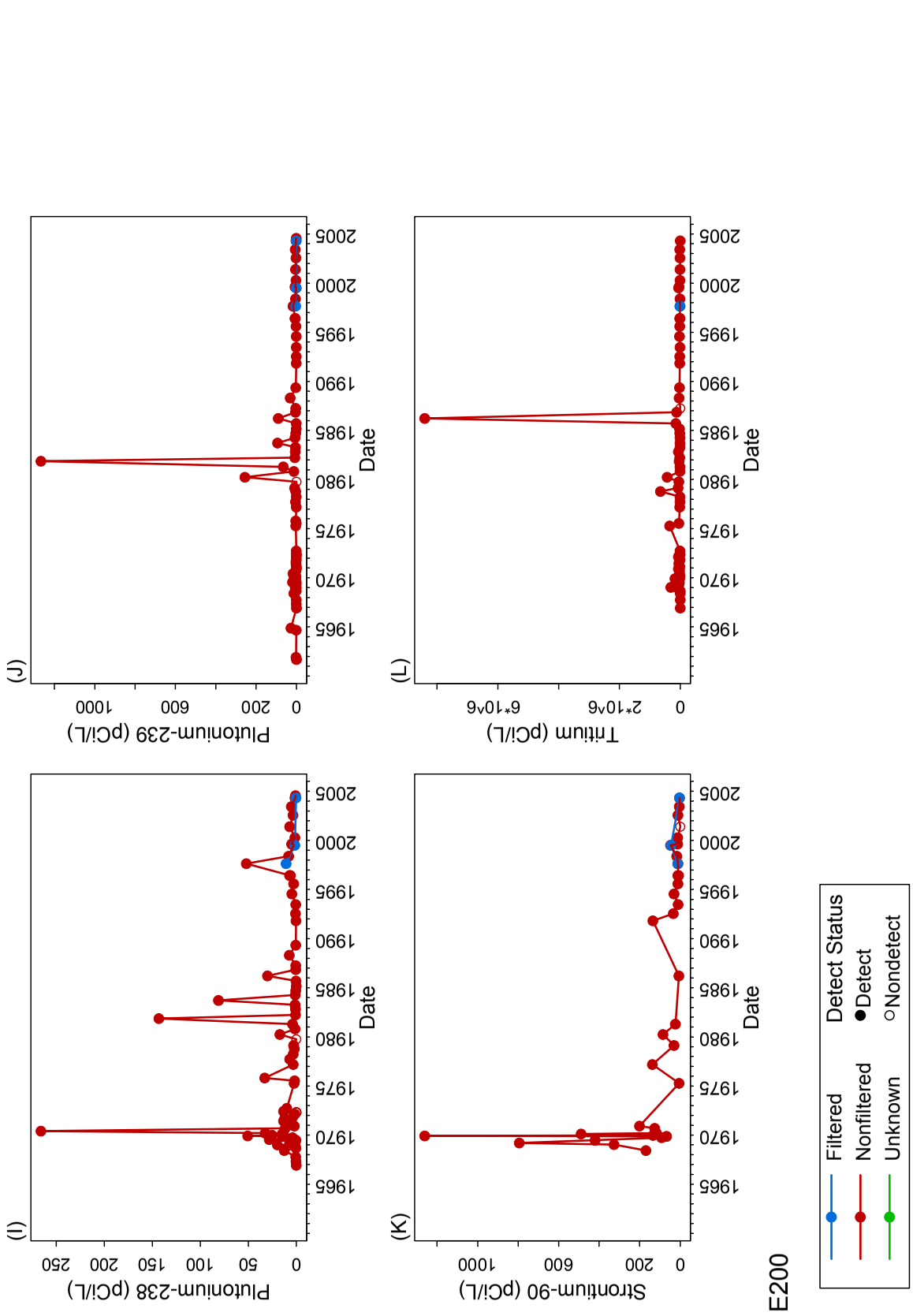


Figure D-2.2-1 (continued). Concentrations over time at Gage E200/GS-1 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

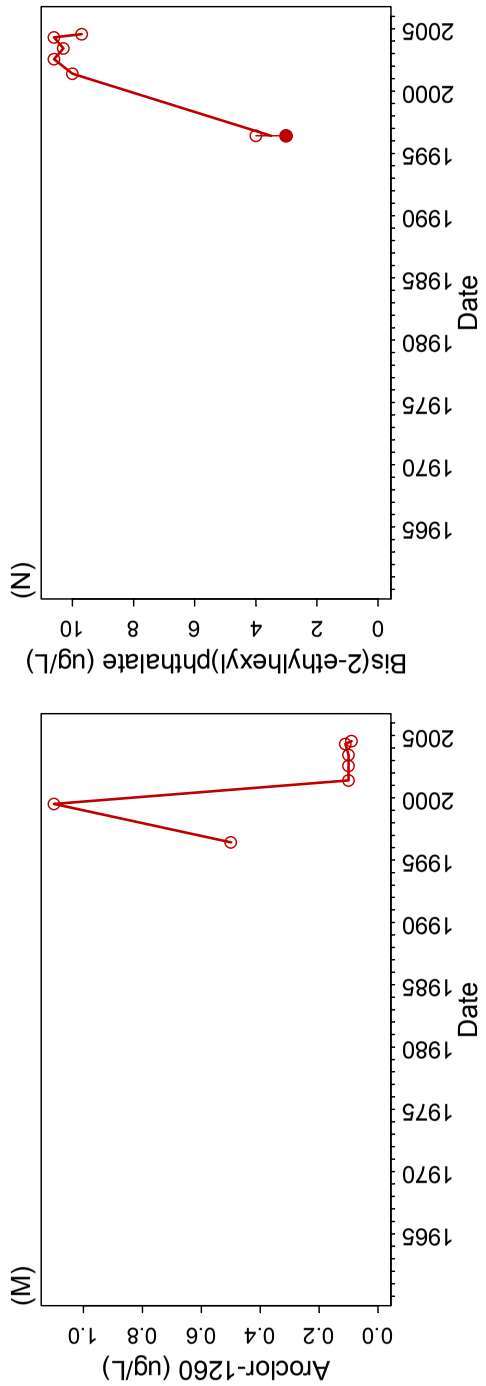


Figure D-2.2-1 (continued). Concentrations over time at Gage E200/GS-1 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

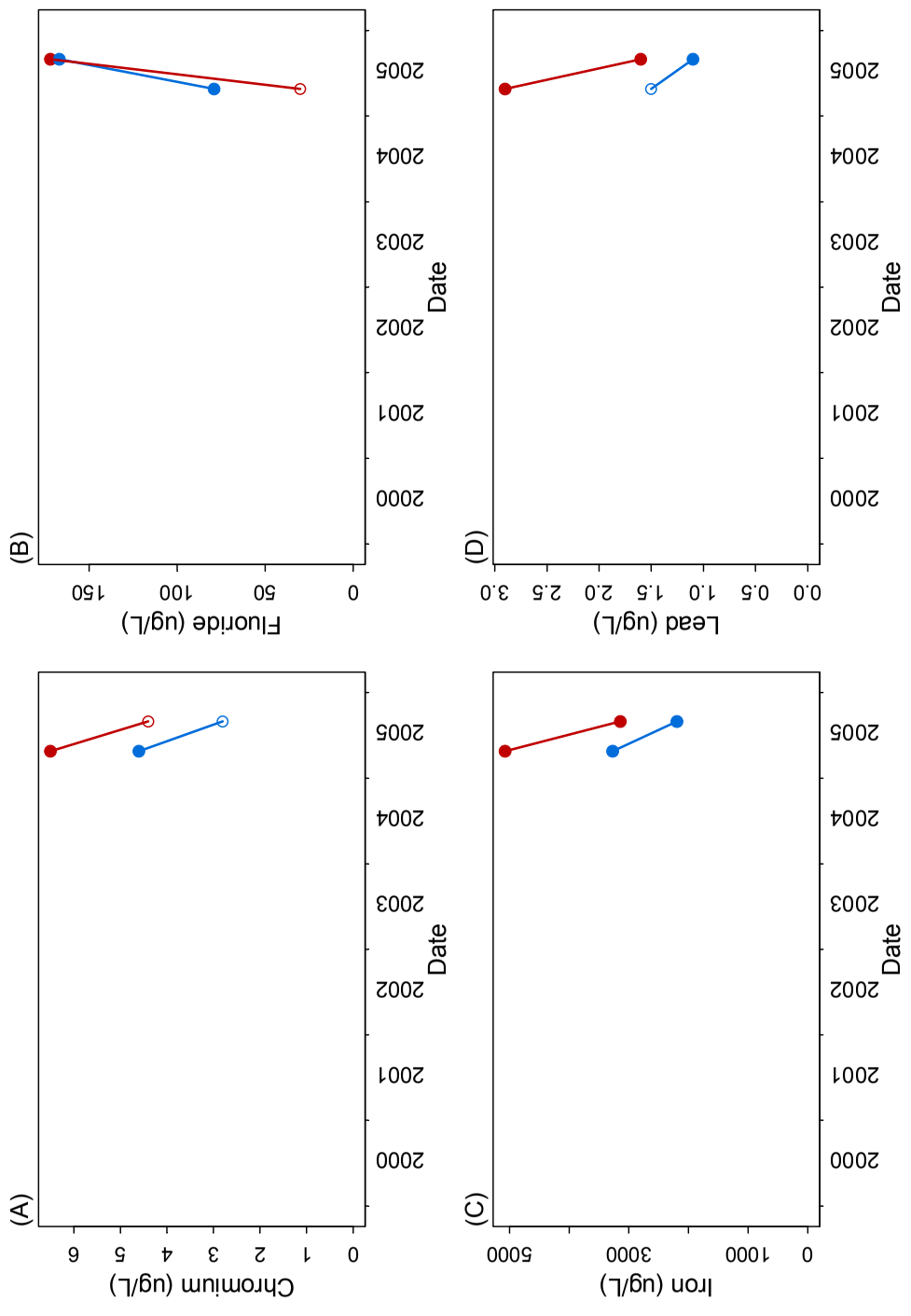


Figure D-2.2-2. Concentrations over time at MCA-1 for (A) chromium, (B) fluoride, (C) iron, (D) lead

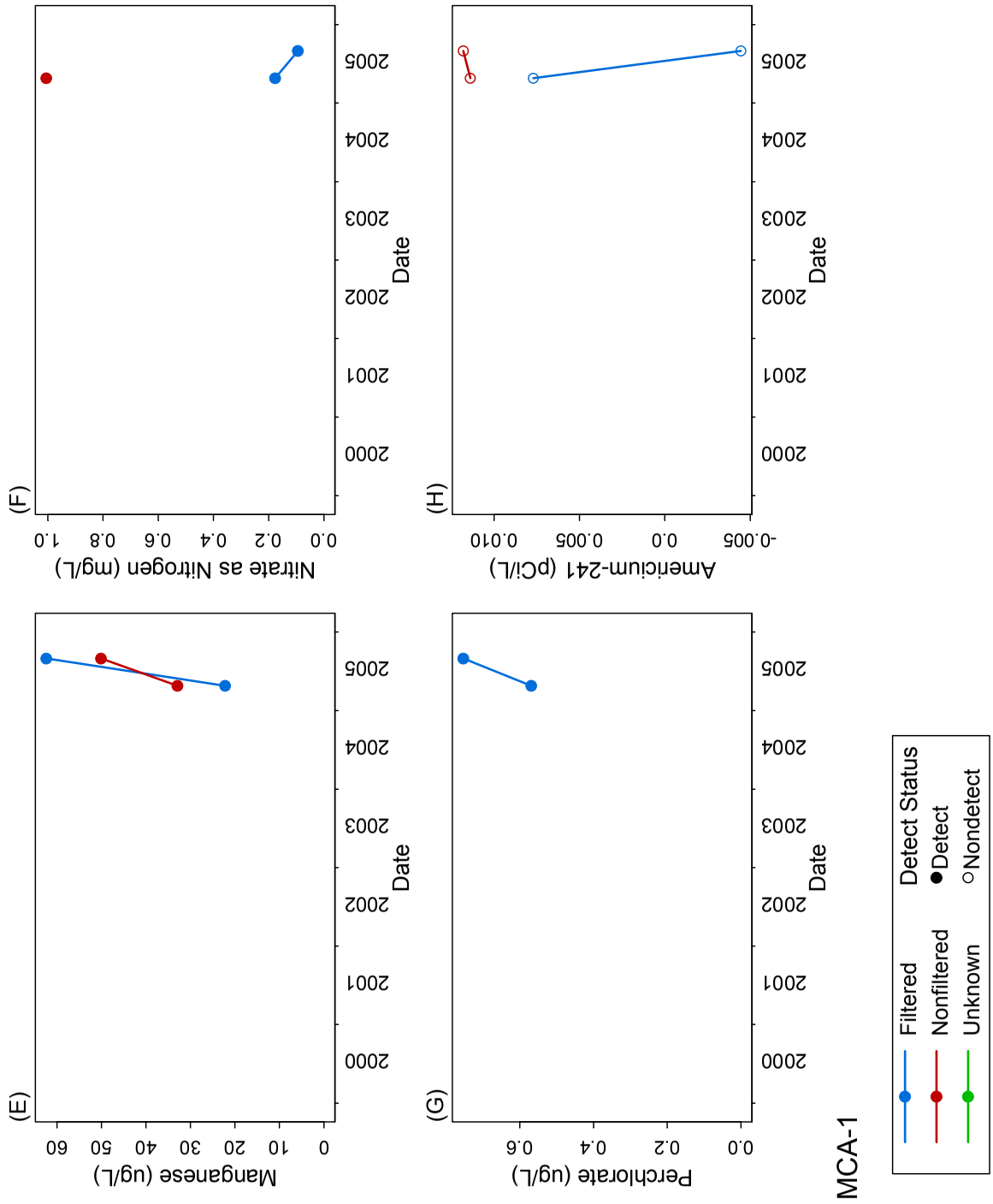


Figure D-2.2-2 (continued). Concentrations over time at MCA-1 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

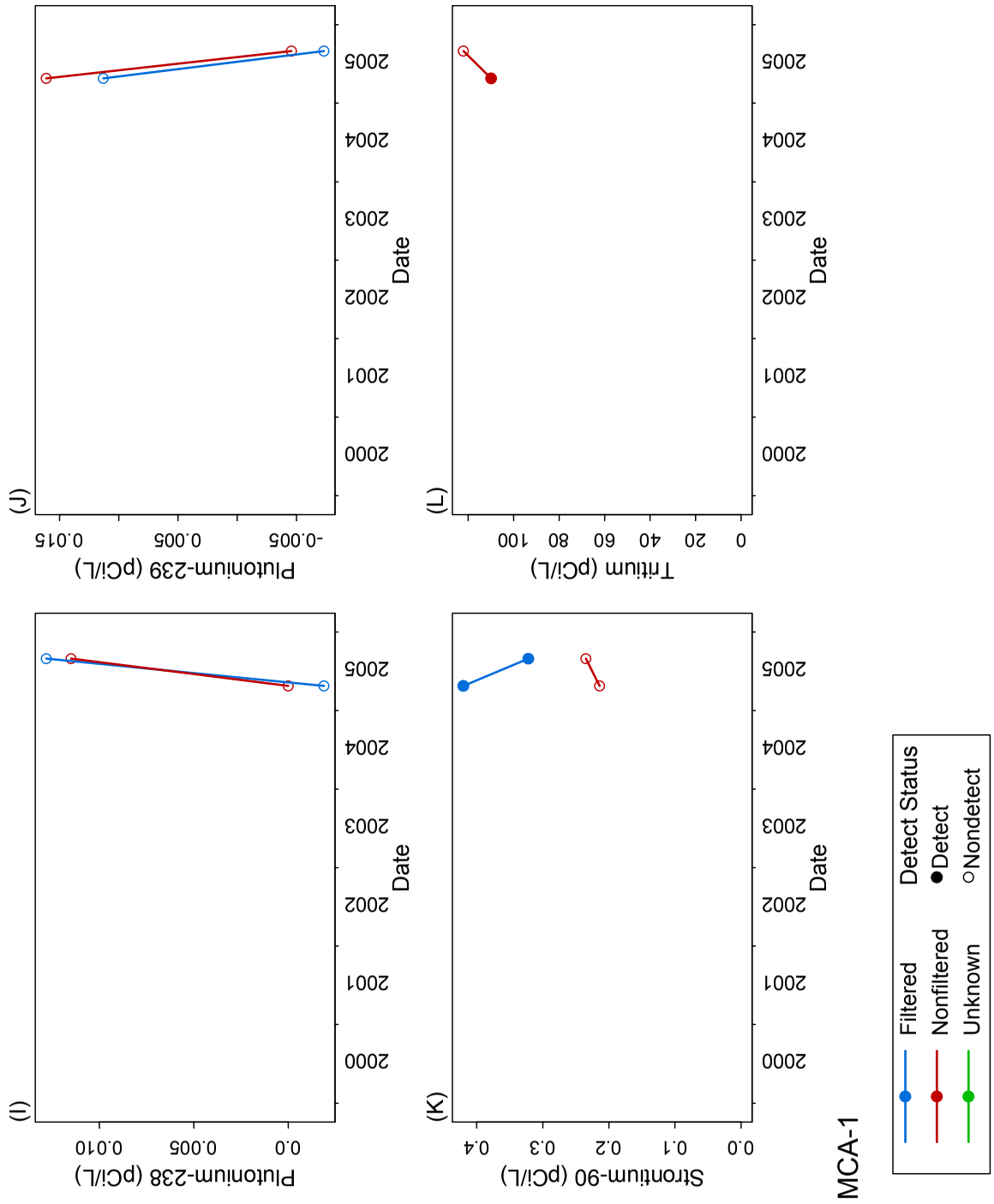


Figure D-2.2-2 (continued). Concentrations over time at MCA-1 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

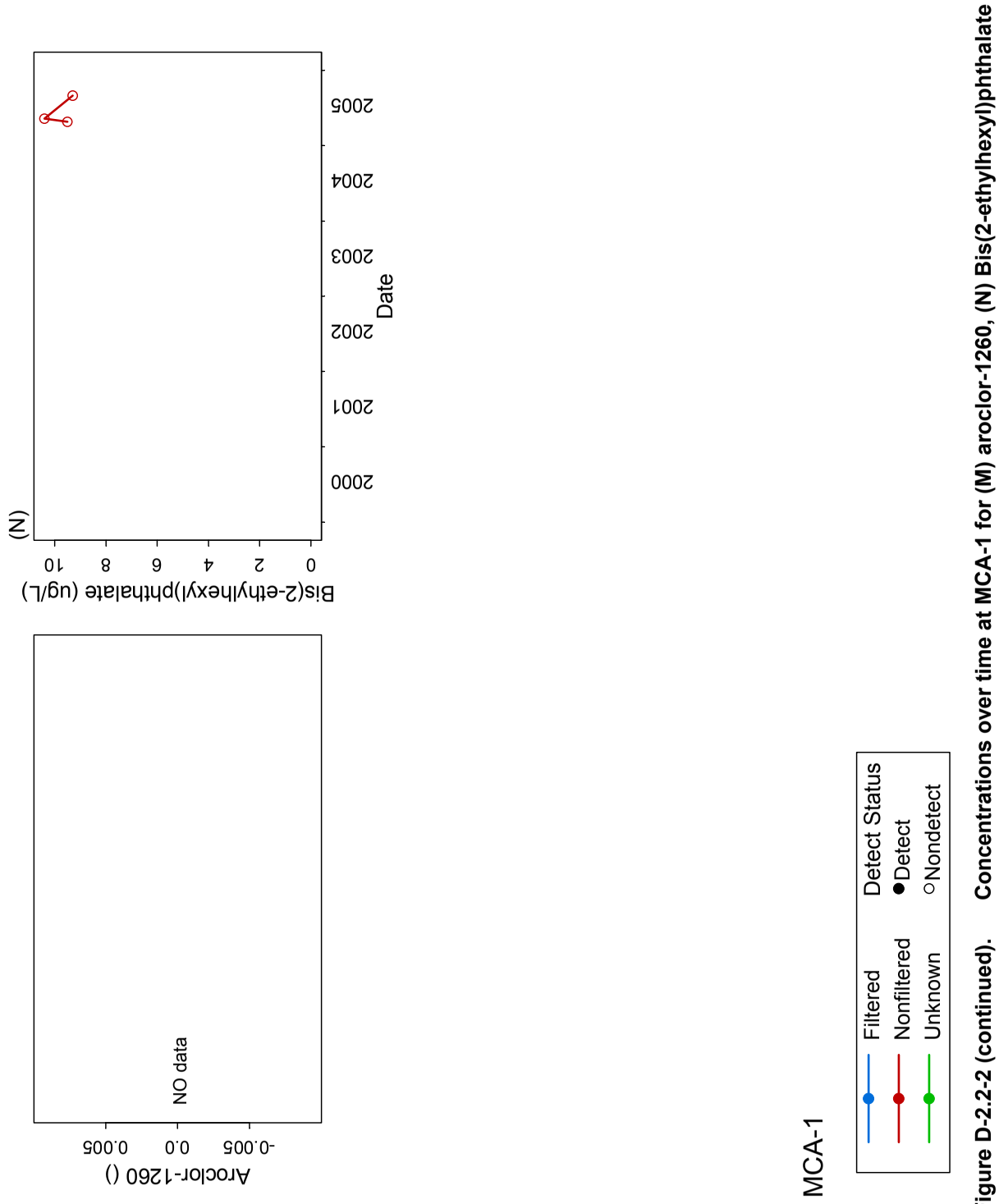


Figure D-2.2-2 (continued). Concentrations over time at MCA-1 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

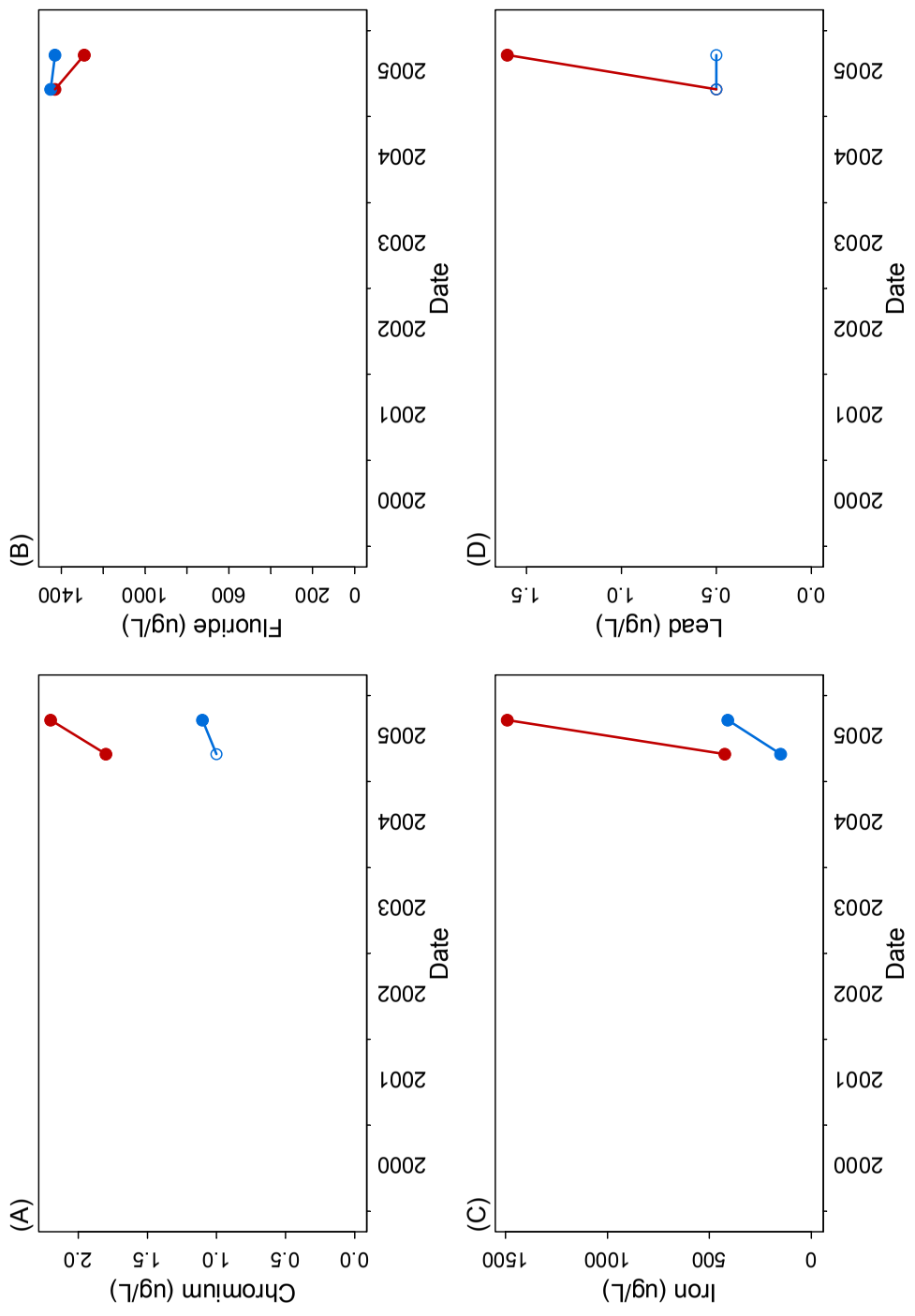


Figure D-2.2-3. Concentrations over time at MCA-2 for (A) chromium, (B) fluoride, (C) iron, (D) lead

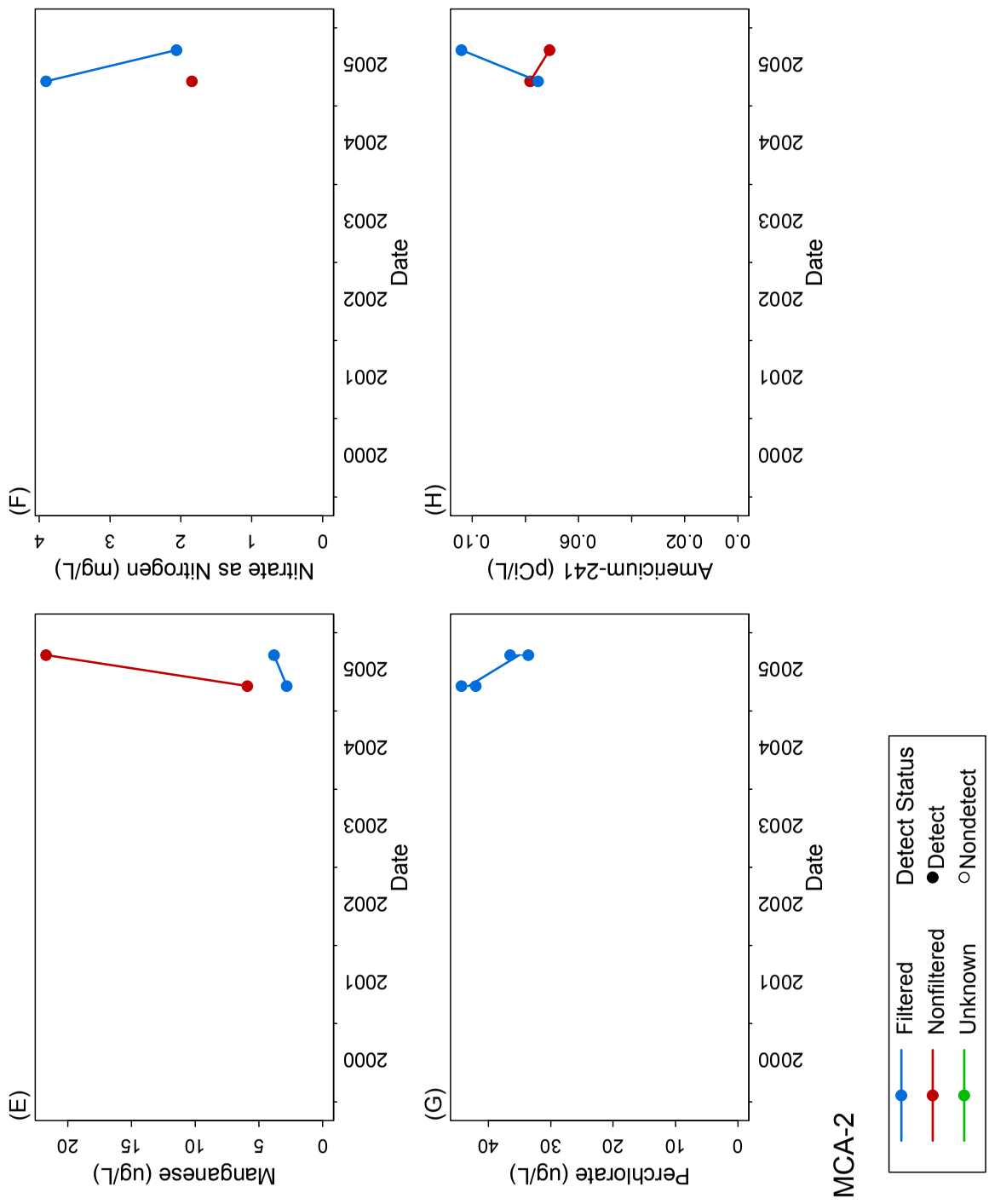


Figure D-2.2-3 (continued). Concentrations over time at MCA-2 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

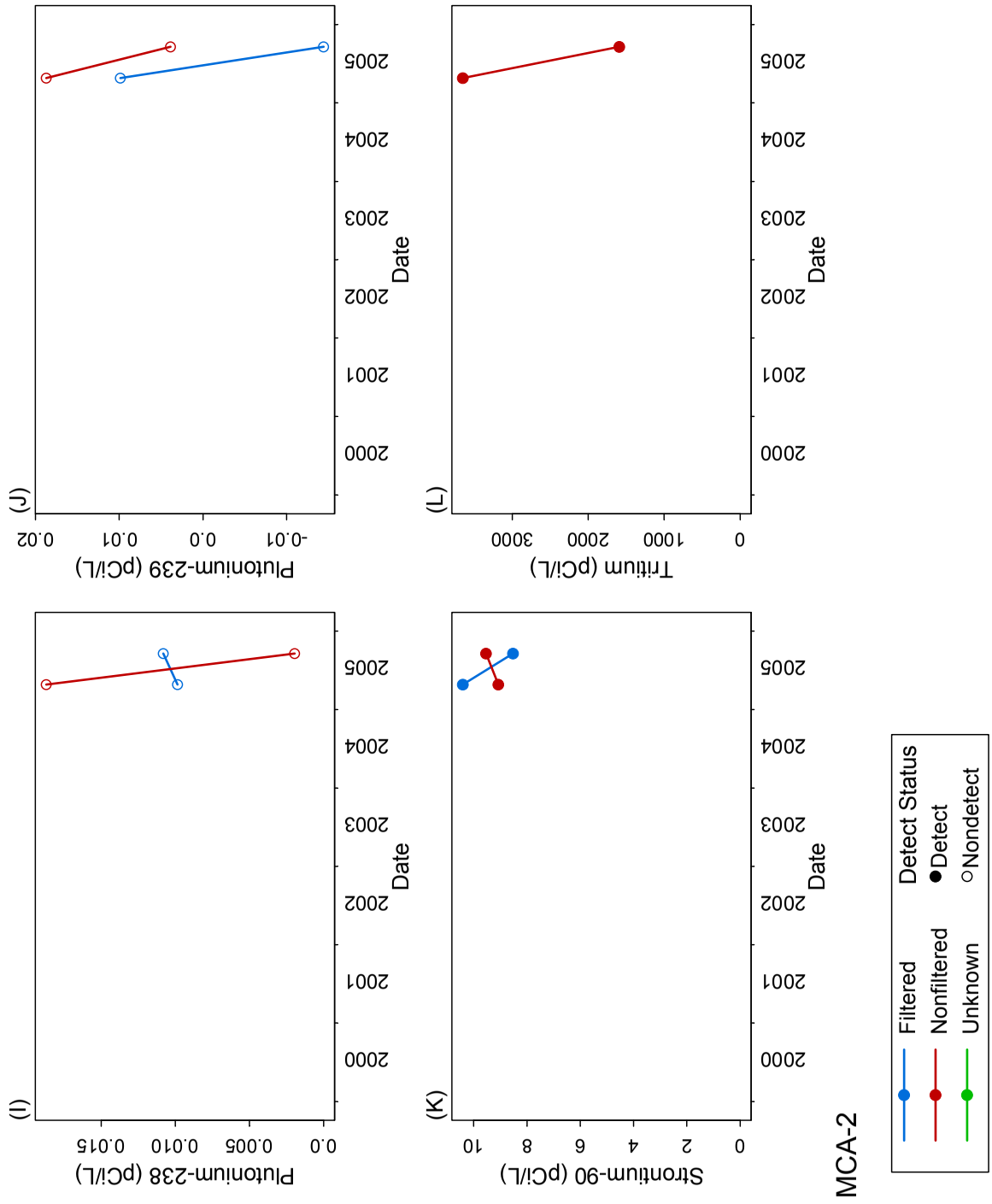


Figure D-2.2-3 (continued). Concentrations over time at MCA-2 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

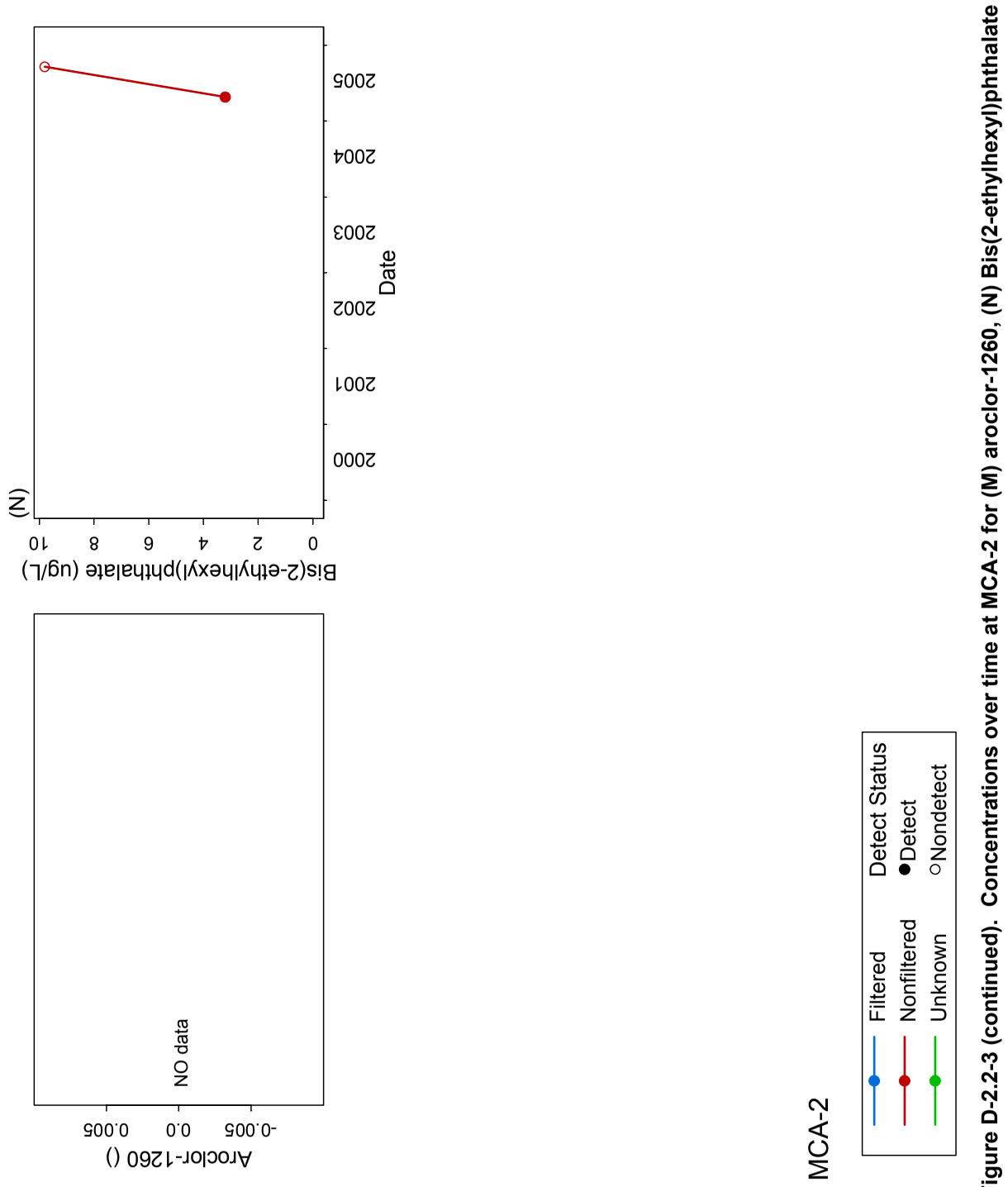


Figure D-2.2-3 (continued). Concentrations over time at MCA-2 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

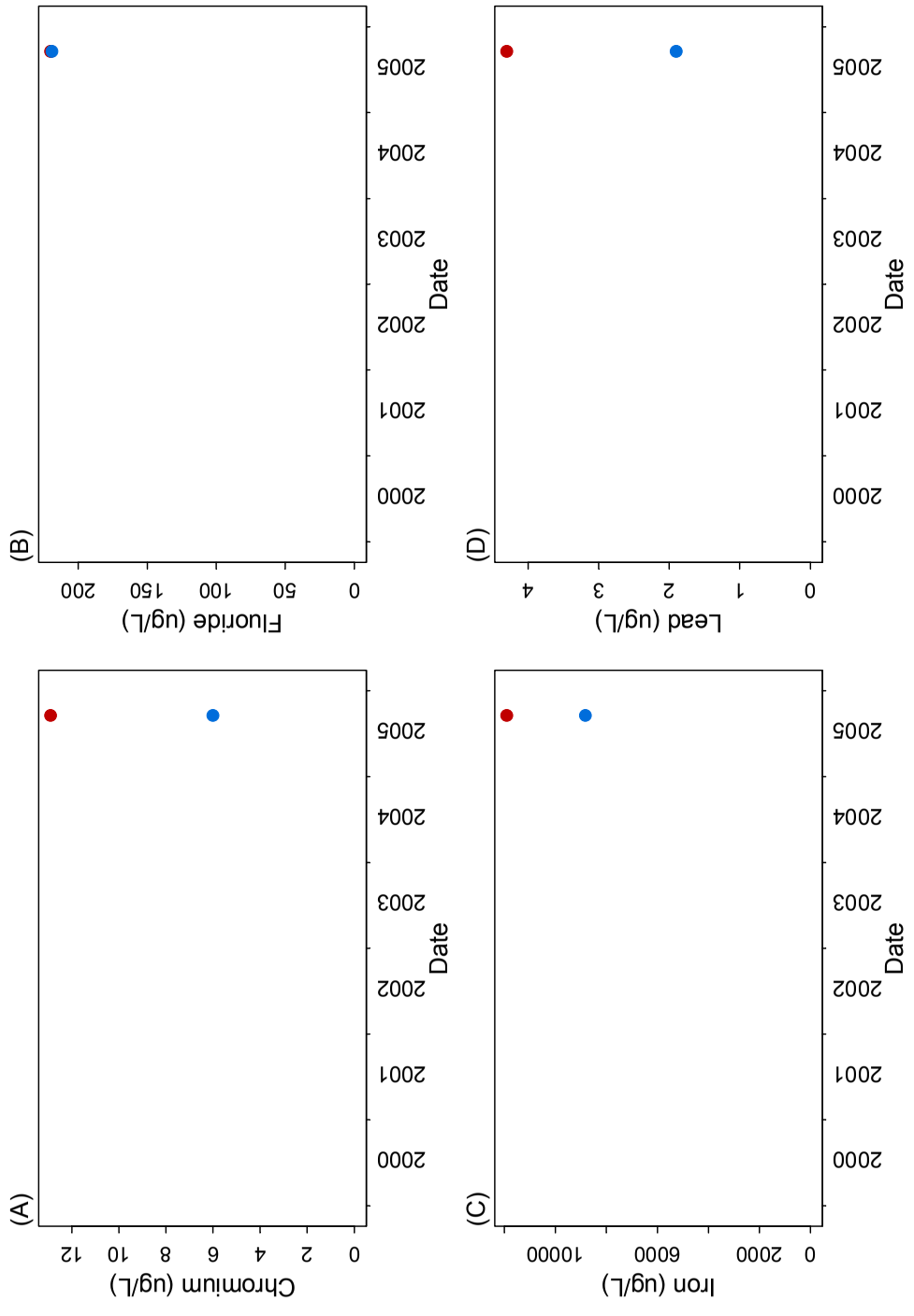


Figure D-2.2-4. Concentrations over time at MCO-0.6 for (A) chromium, (B) fluoride, (C) iron, (D) lead

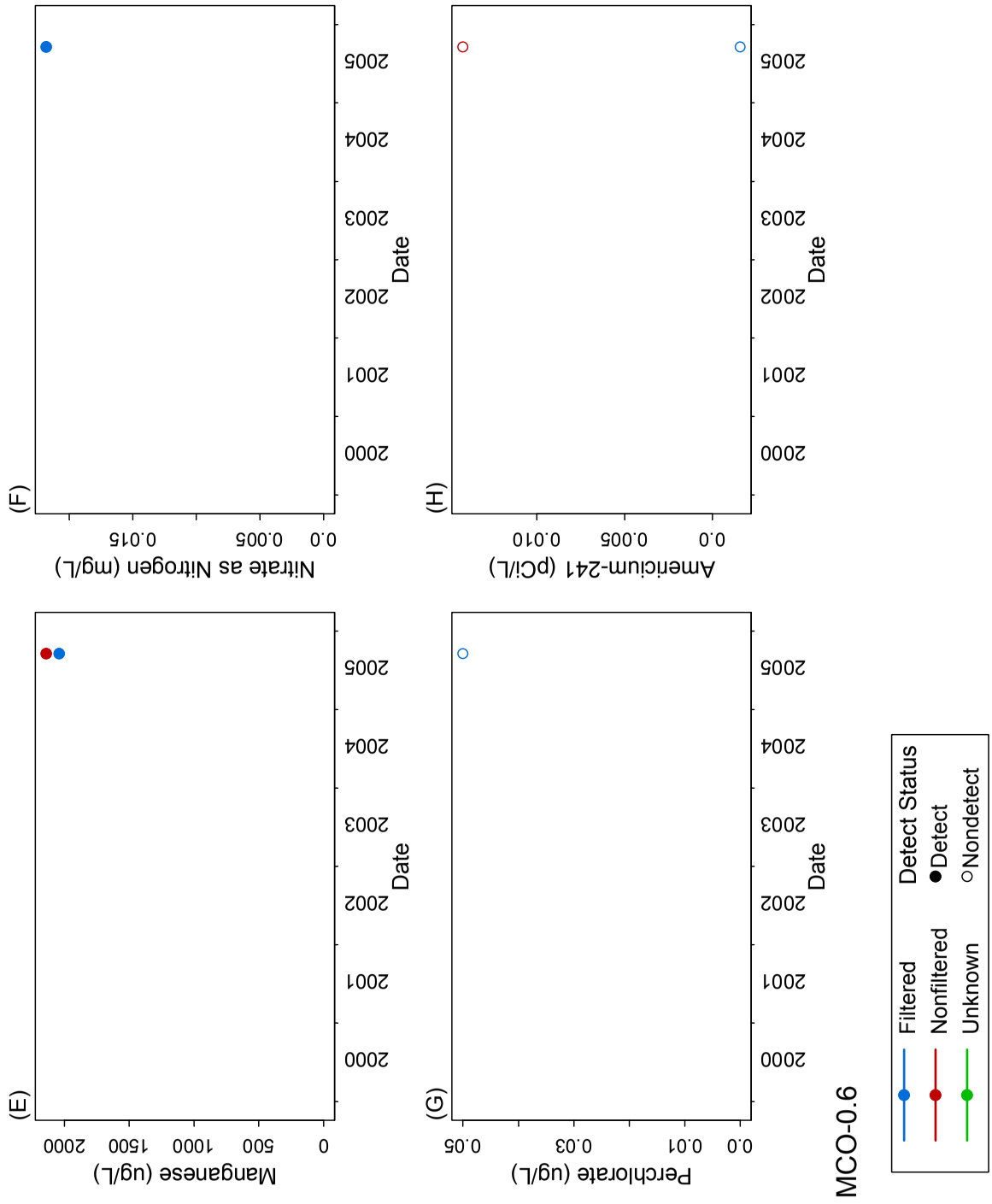


Figure D-2.2-4 (continued). Concentrations over time at MCO-0.6 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241.

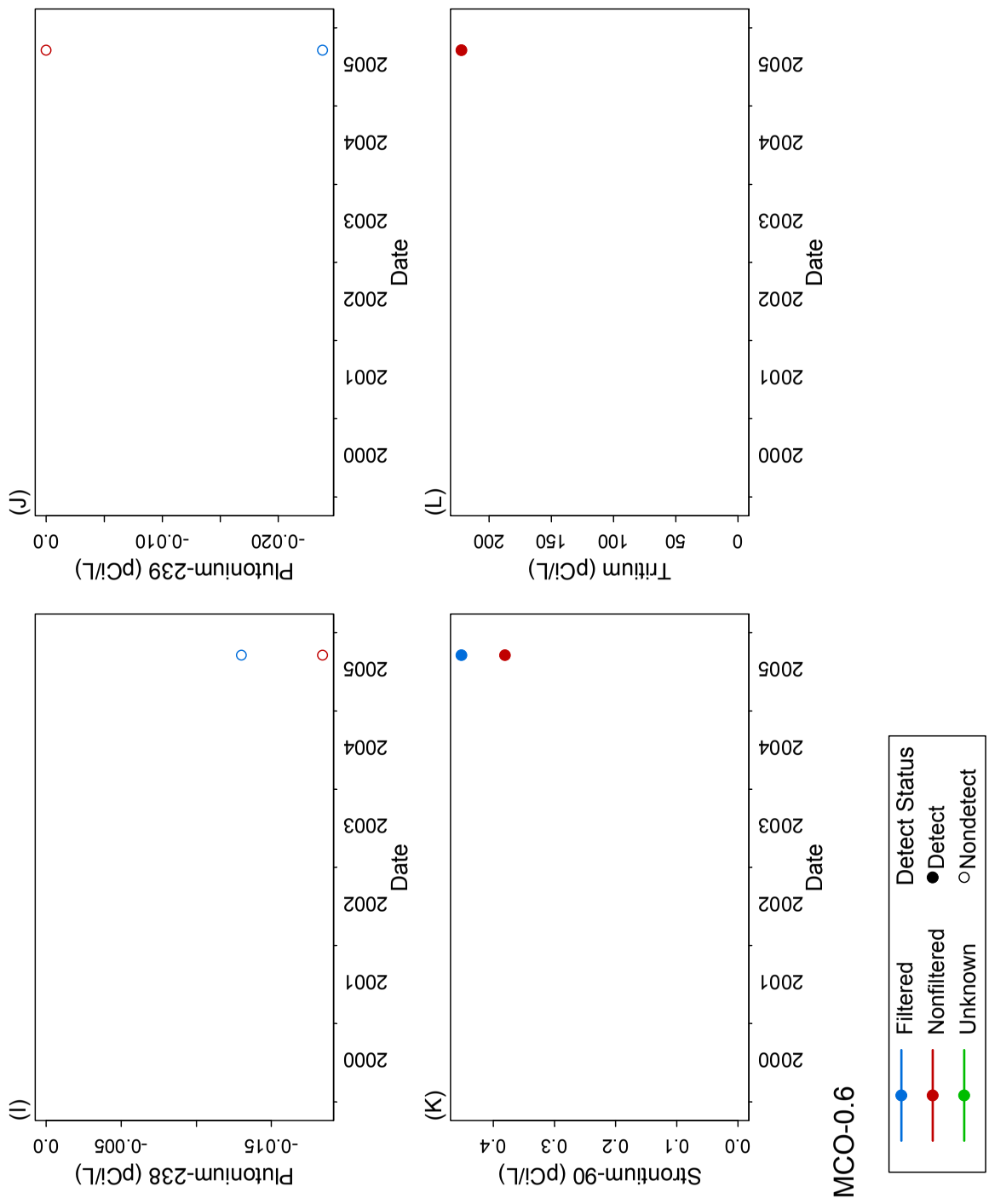


Figure D-2.2-4 (continued). Concentrations over time at MCO-0.6 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

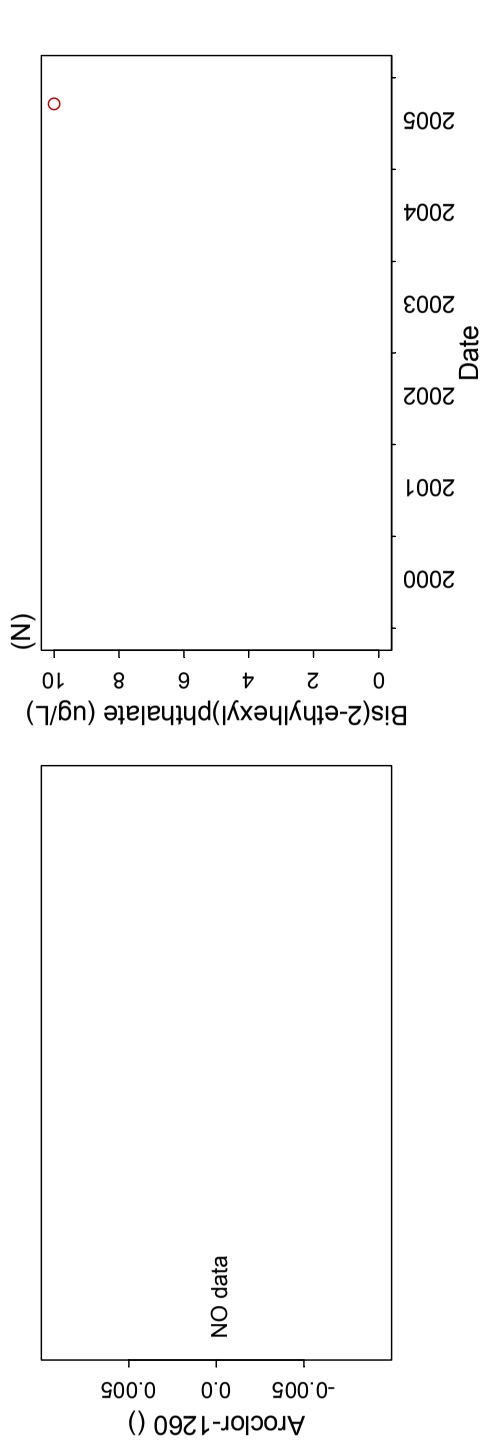


Figure D-2.2-4 (continued). Concentrations over time at MCO-0.6 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

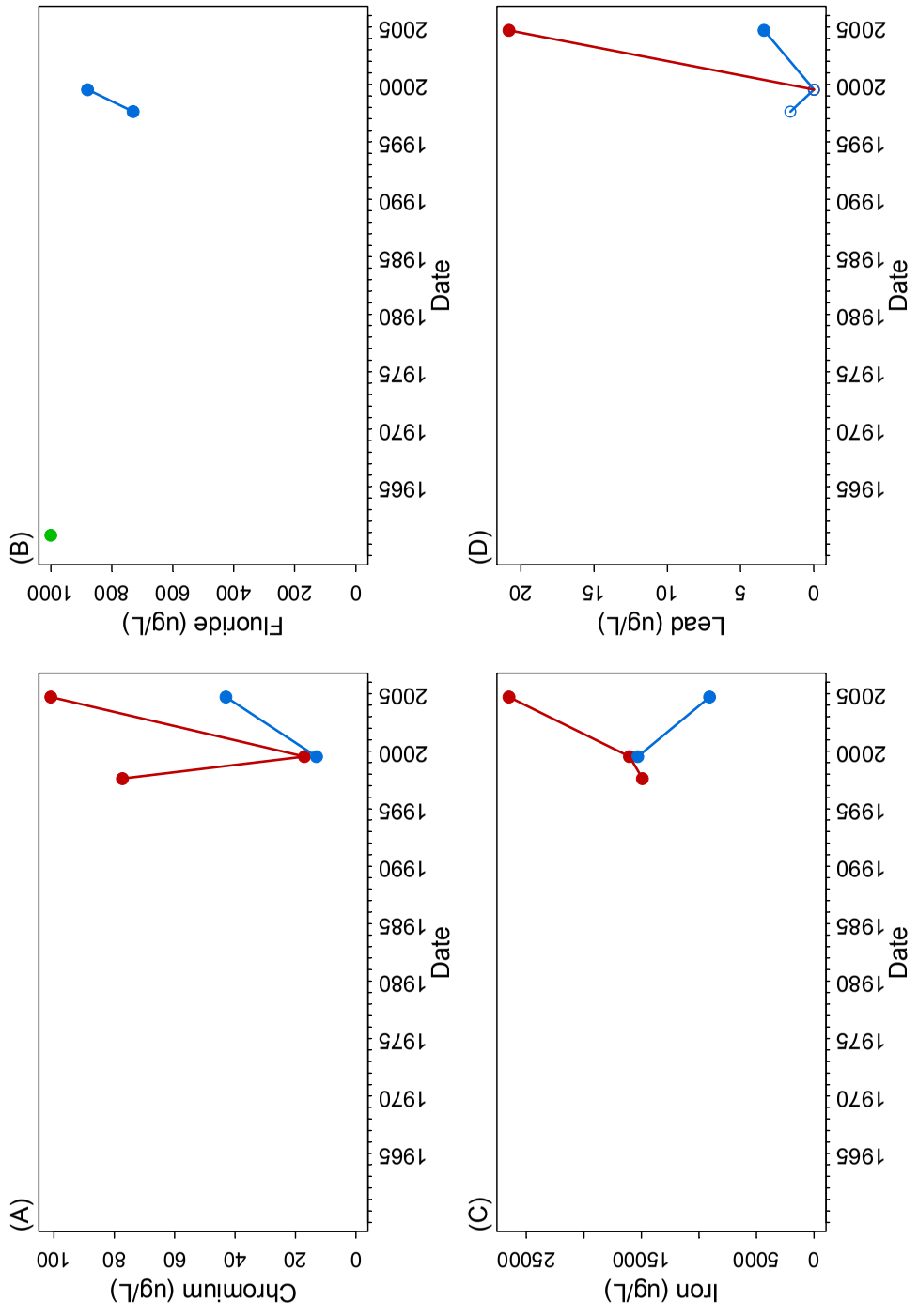


Figure D-2.2-5. Concentrations over time at MCO-2/MCA-4 for (A) chromium, (B) fluoride, (C) iron, (D) lead

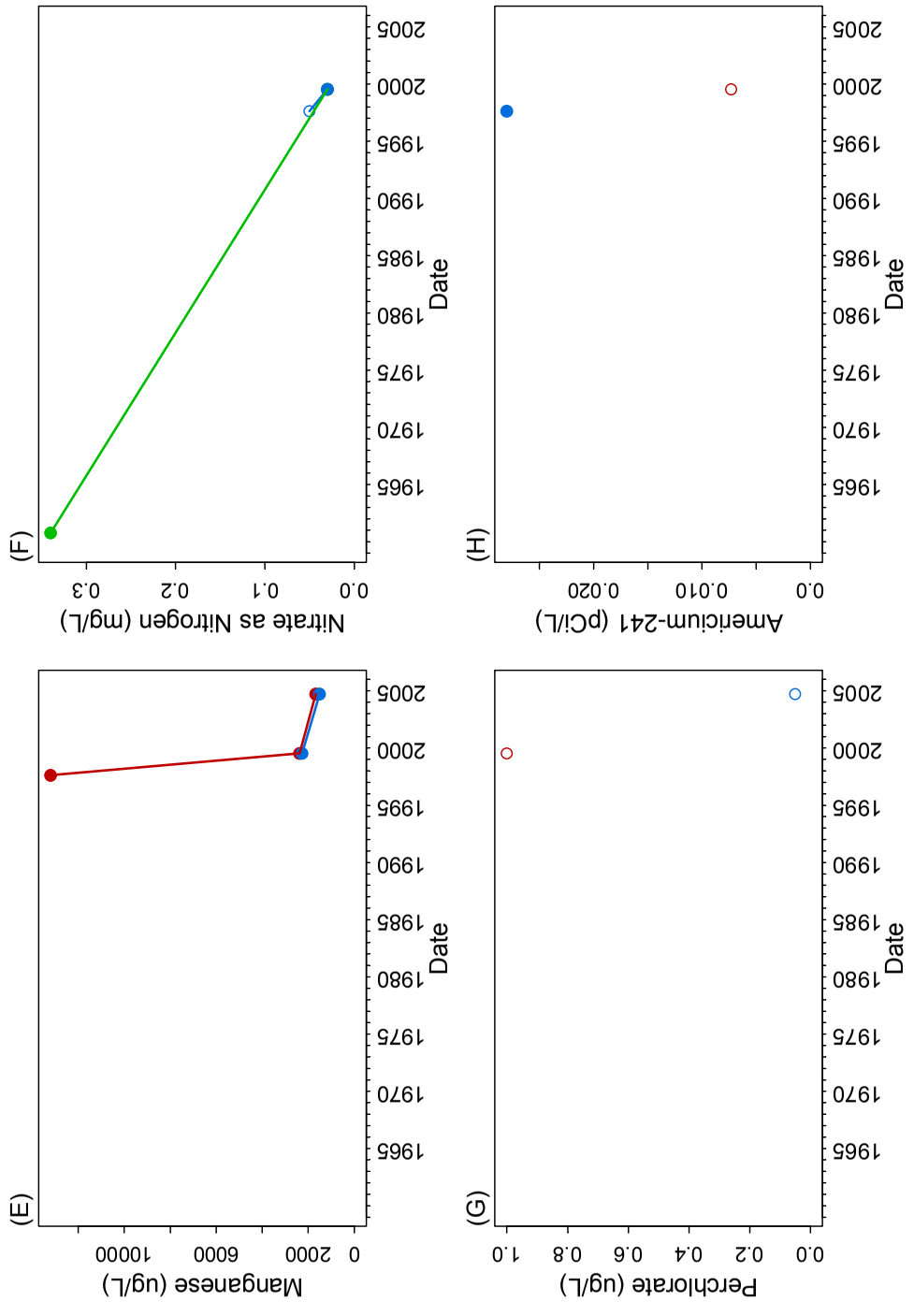


Figure D-2.2-5 (continued). Concentrations over time at MCO-2/MCA-4 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

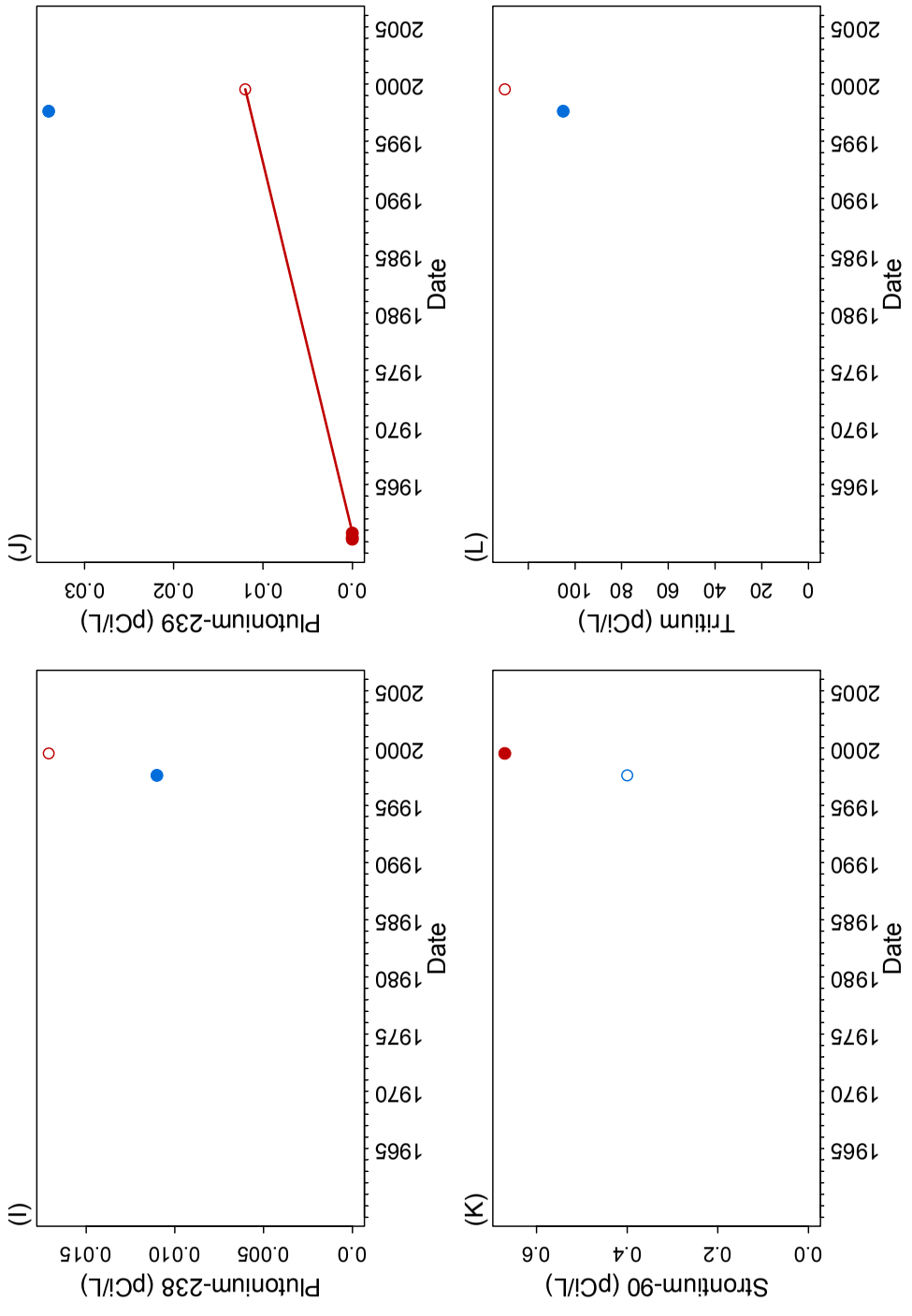


Figure D-2.2-5 (continued). Concentrations over time at MCO-2/MCA-4 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

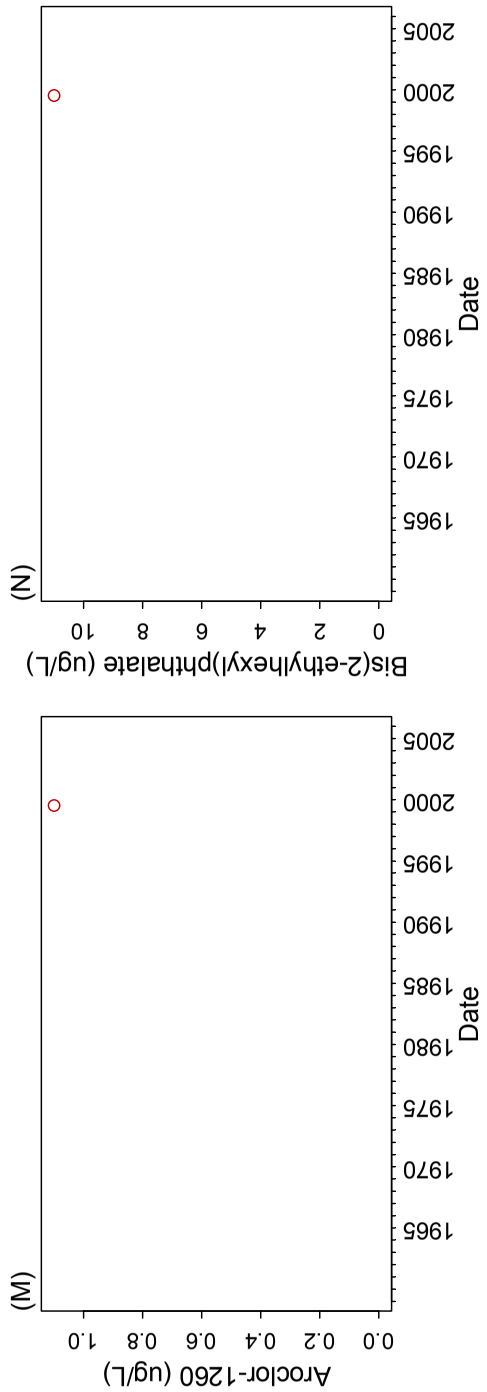


Figure D-2.2-5 (continued). Concentrations over time at MCO-2/MCA-4 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

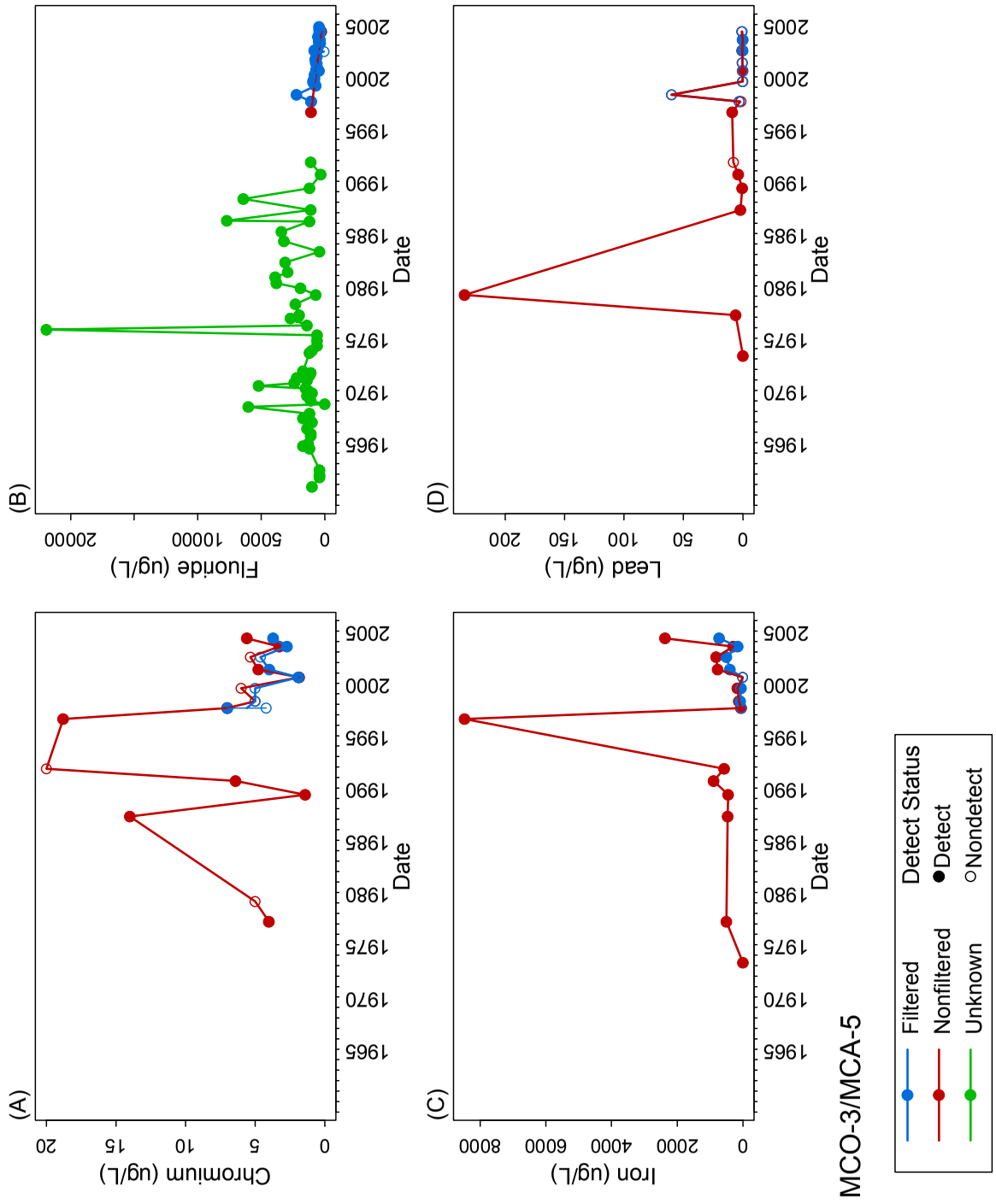


Figure D-2.2-6. Concentrations over time at MCO-3/MCA-5 for (A) chromium, (B) fluoride, (C) iron, (D) lead

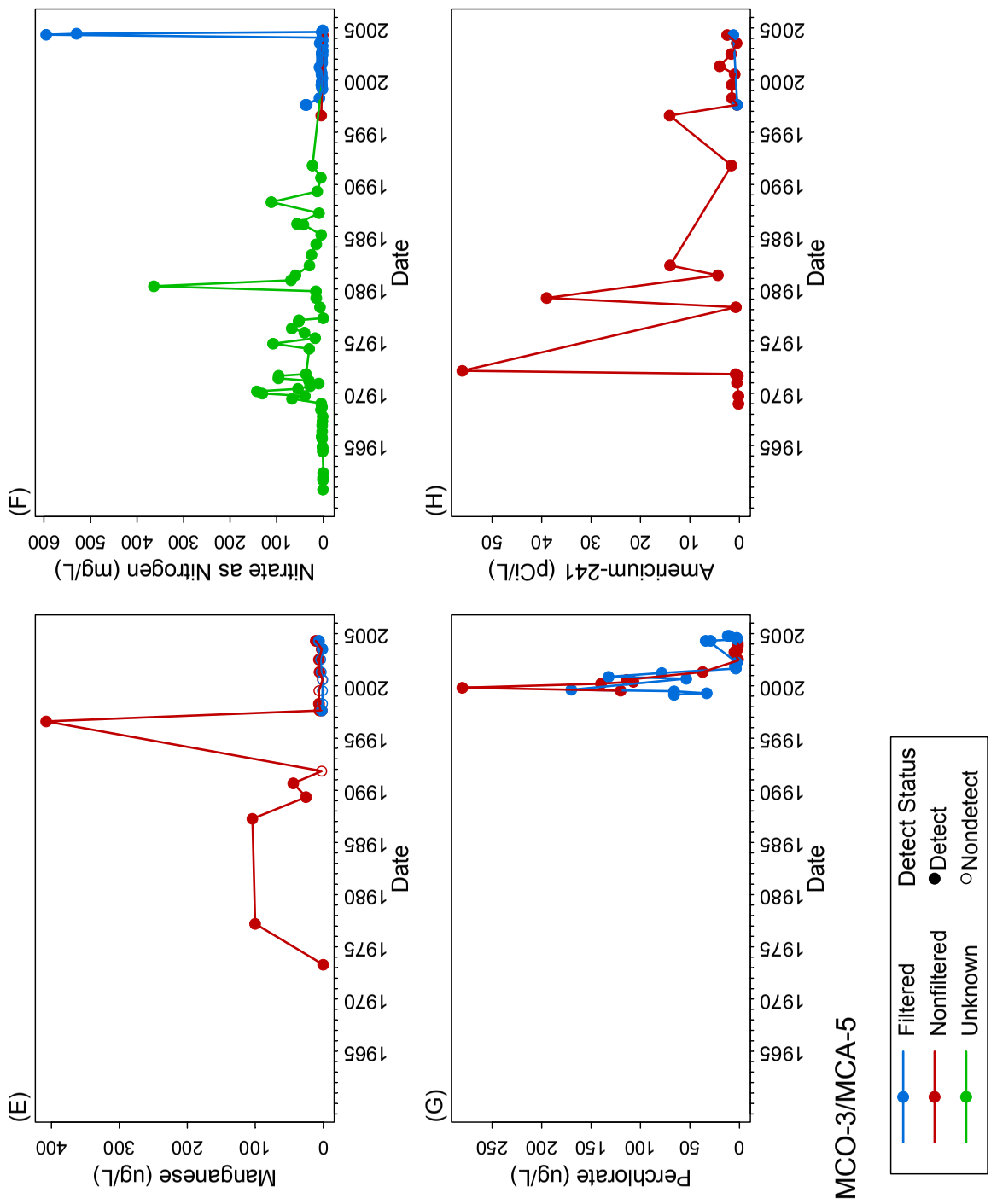


Figure D-2.2-6 (continued). Concentrations over time at MCO-3/MCA-5 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

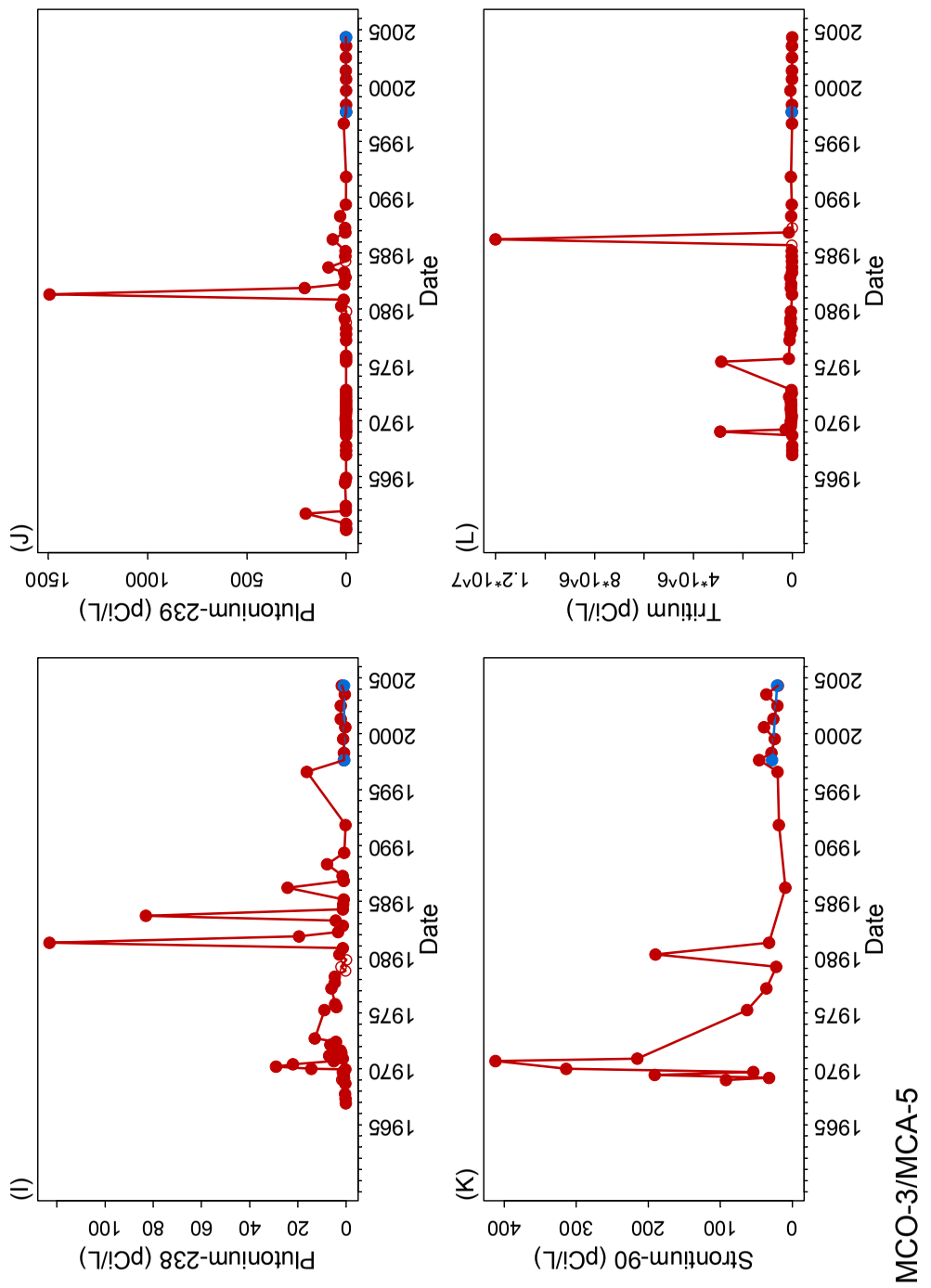


Figure D-2.2-6 (continued). Concentrations over time at MCO-3/MCA-5 for (I) plutonium-238, (J plutonium-239, (K) strontium-90, (L) tritium.

MCO-3/MCA-5

Figure D-2.2-6 (continued). Concentrations over time at MCO-3/MCA-5 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

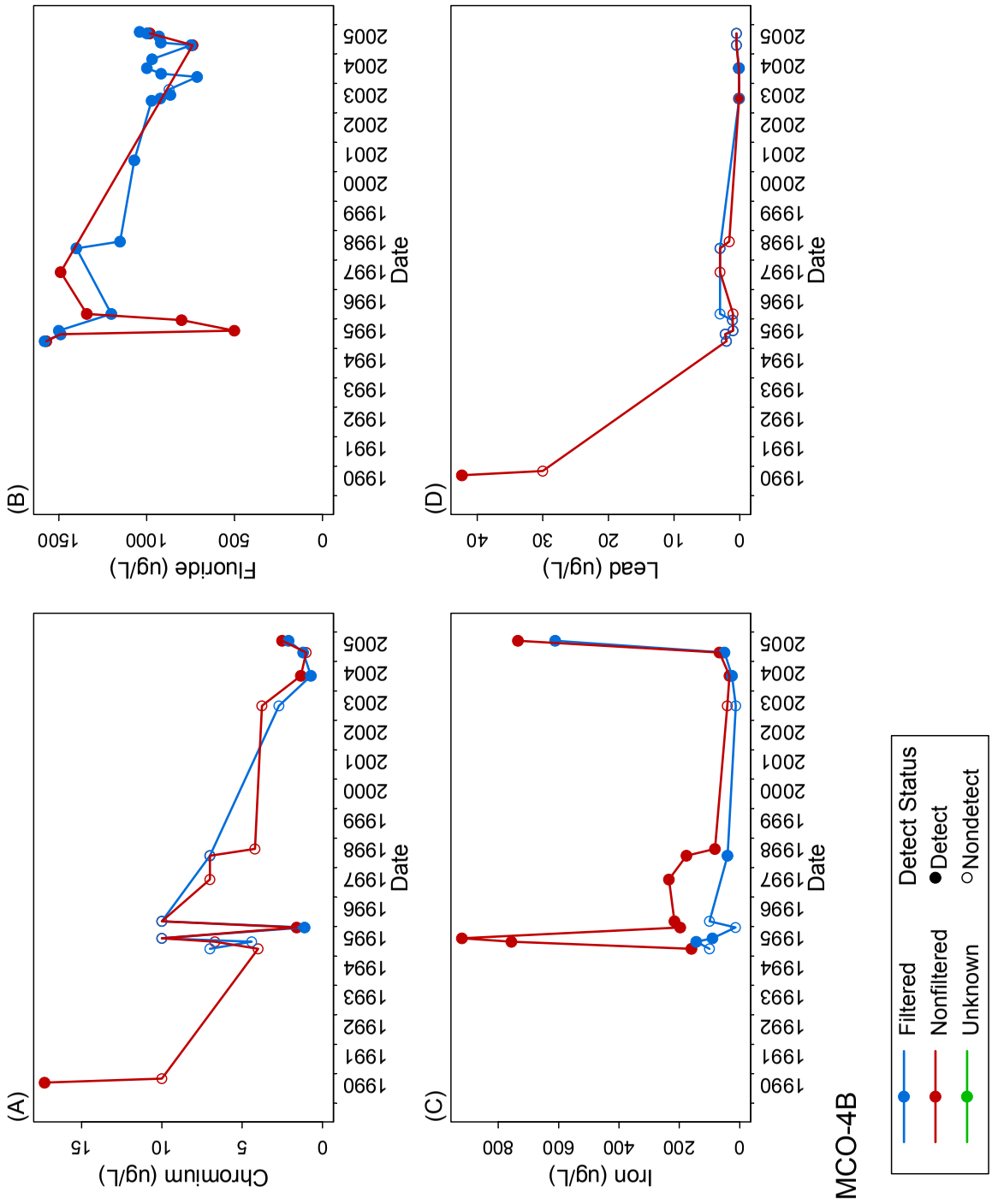


Figure D-2.2-7. Concentrations over time at MCO-4B for (A) chromium, (B) fluoride, (C) iron, (D) lead

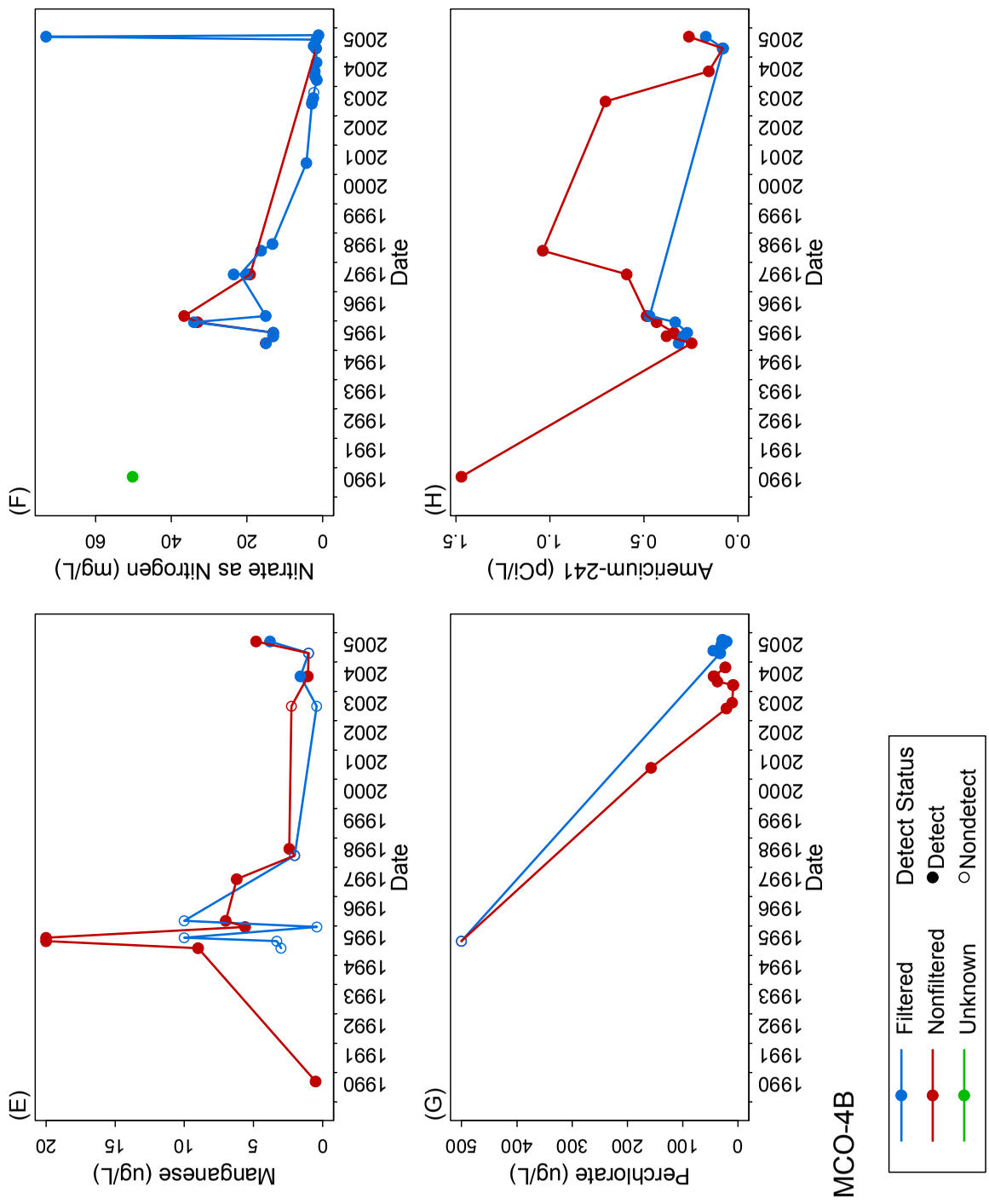


Figure D-2.2-7 (continued). Concentrations over time at MCO-4B for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

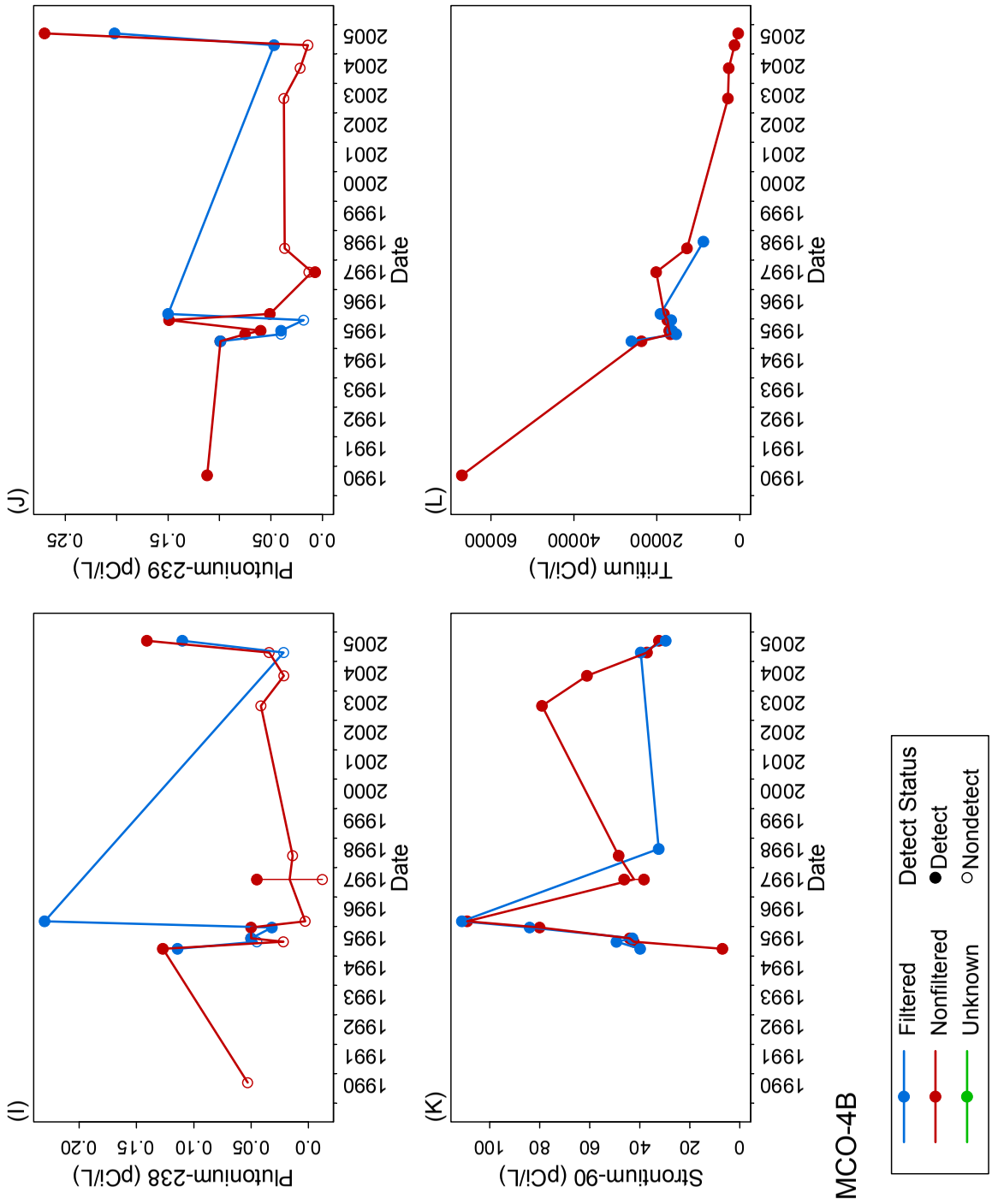


Figure D-2.2-7 (continued). Concentrations over time at MCO-4B for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

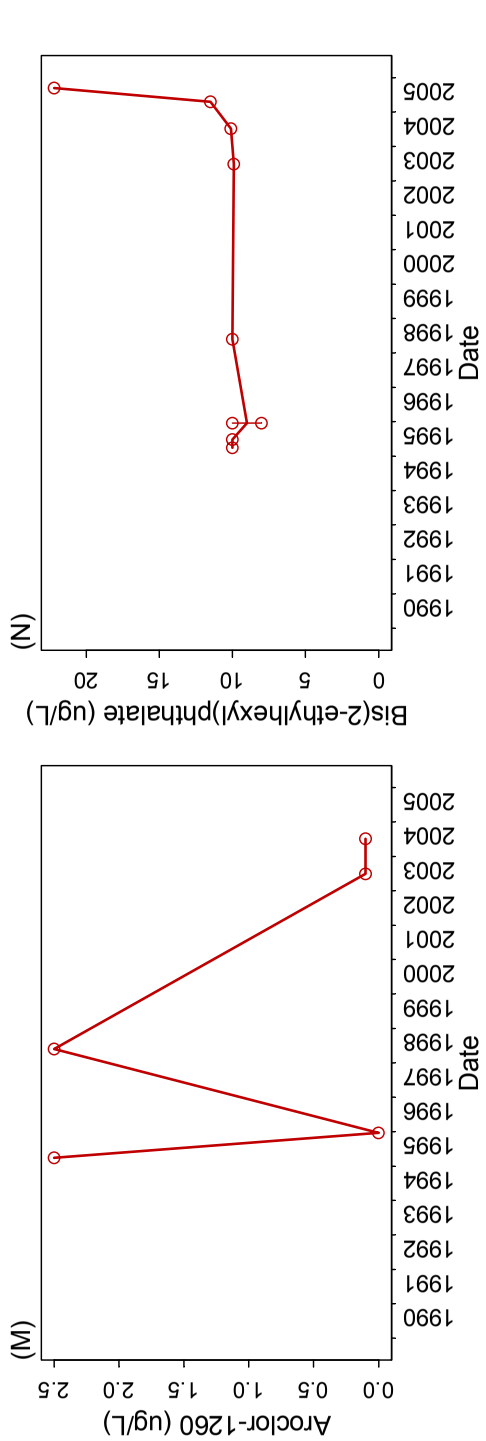


Figure D-2.2-7 (continued). Concentrations over time at MCO-4B for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

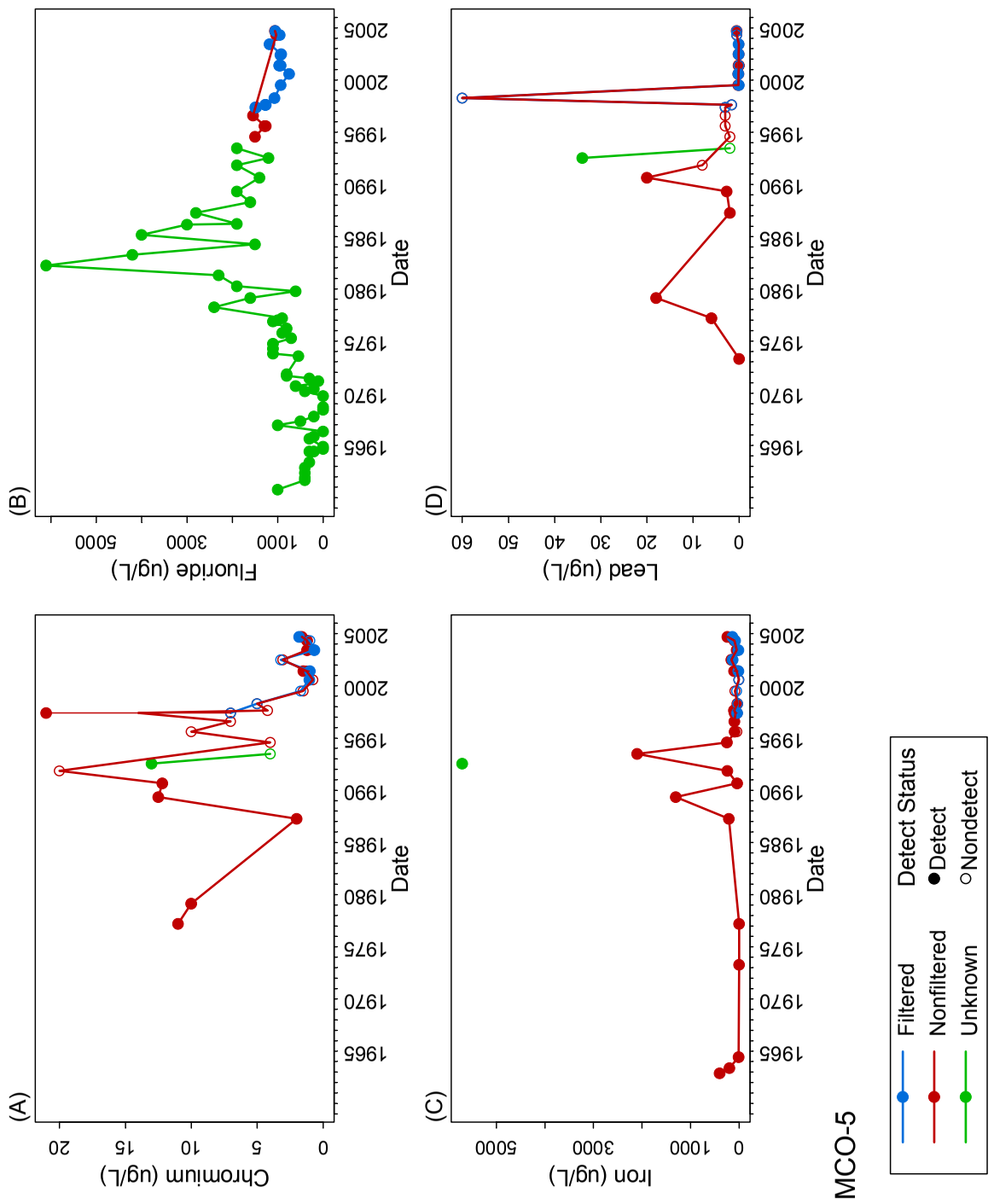


Figure D-2.2-8. Concentrations over time at MCO-5 for (A) chromium, (B) fluoride, (C) iron, (D) lead

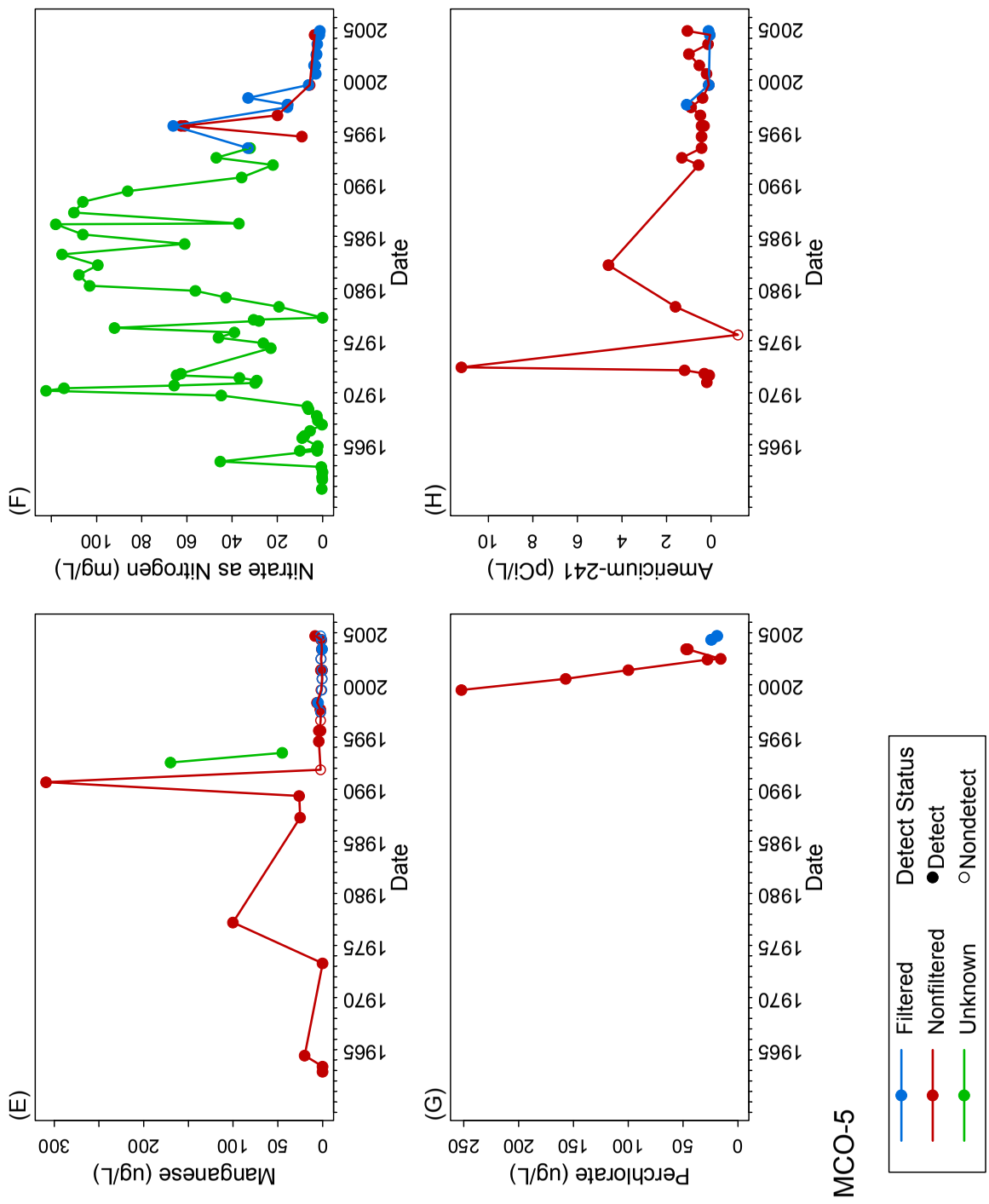


Figure D-2.2-8 (continued). Concentrations over time at MCO-5 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

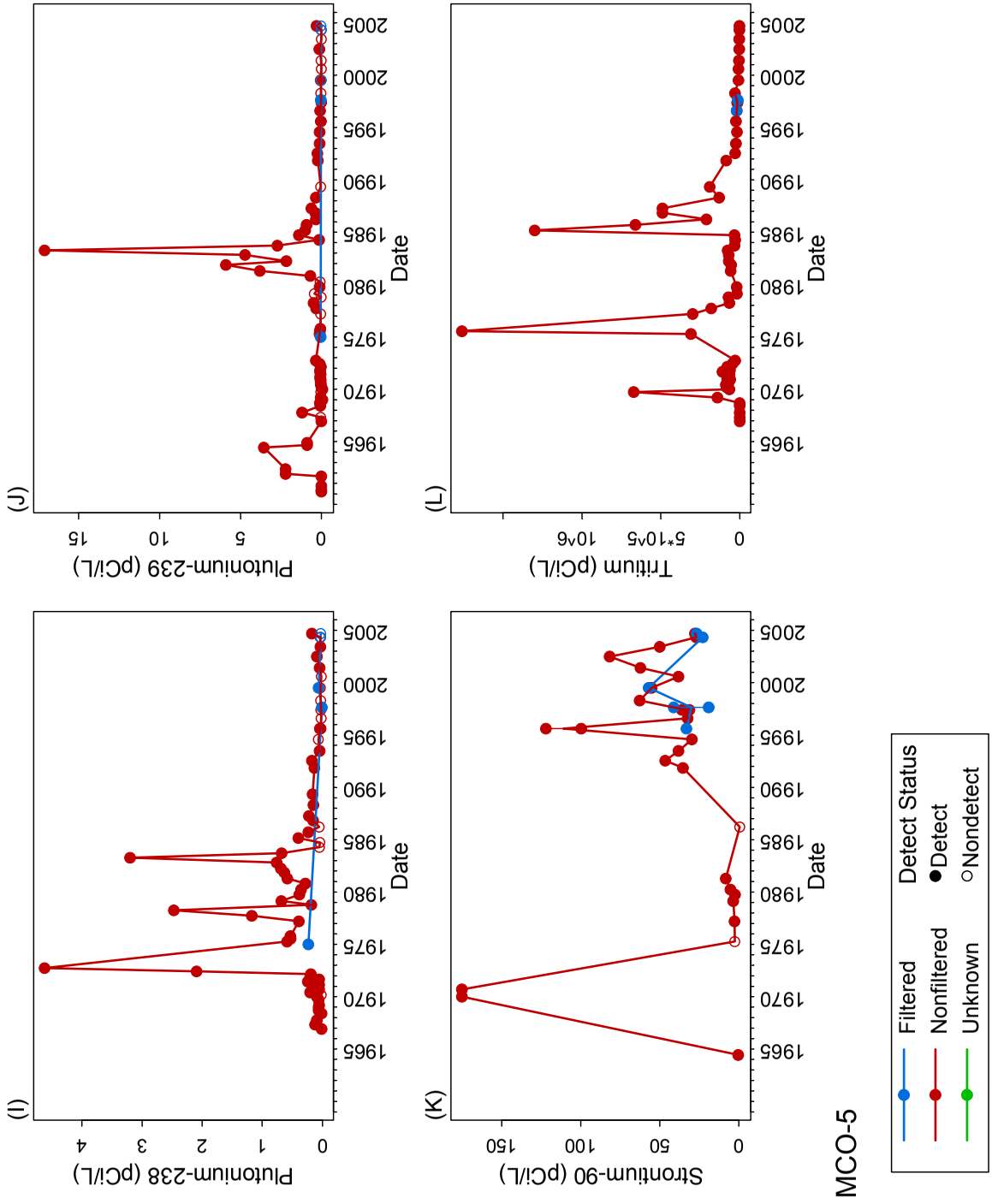


Figure D-2.2-8 (continued). Concentrations over time at MCO-5 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

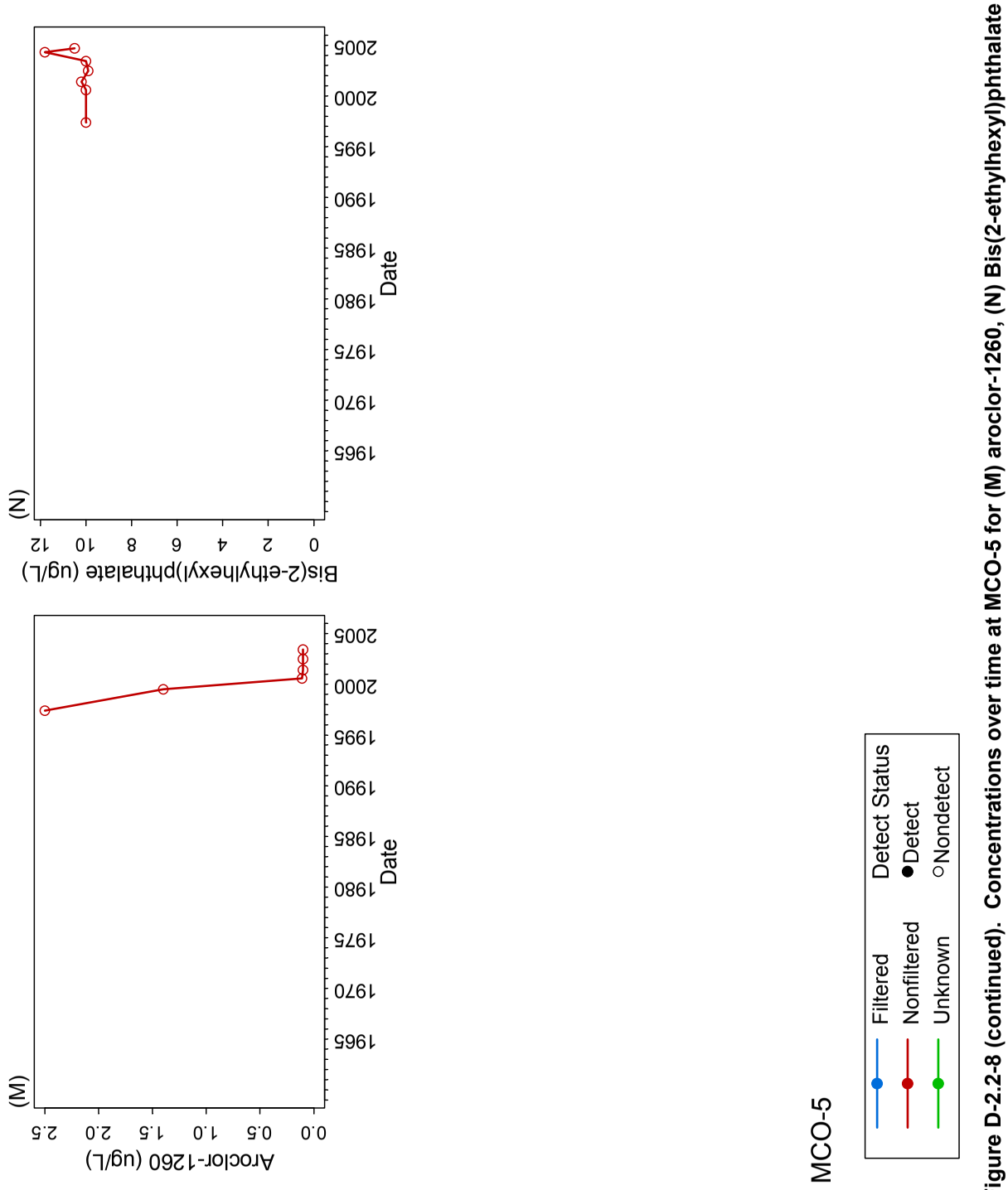


Figure D-2.2-8 (continued). Concentrations over time at MCO-5 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

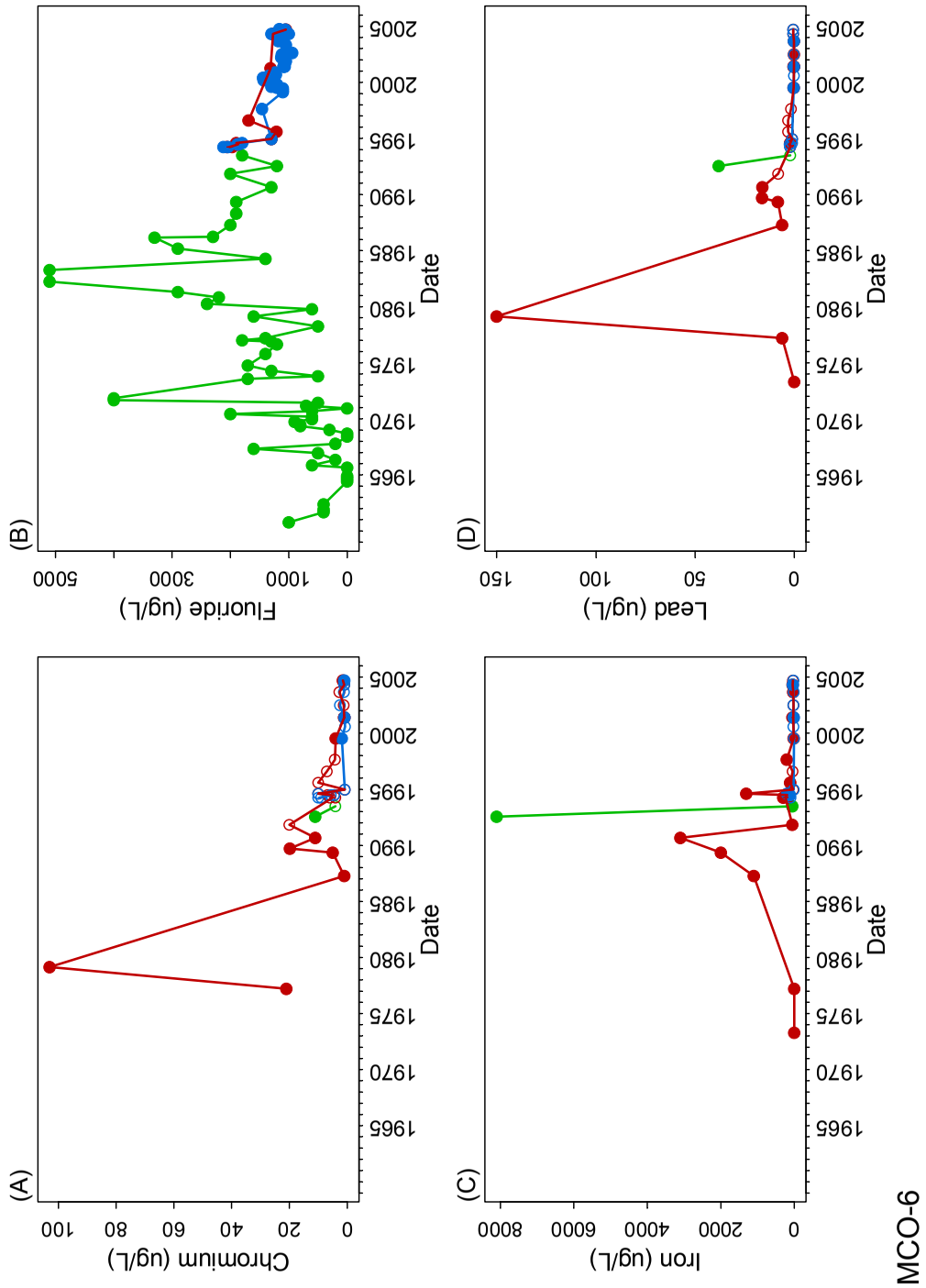


Figure D-2.2-9. Concentrations over time at MCO-6 for (A) chromium, (B) fluoride, (C) iron, (D) lead

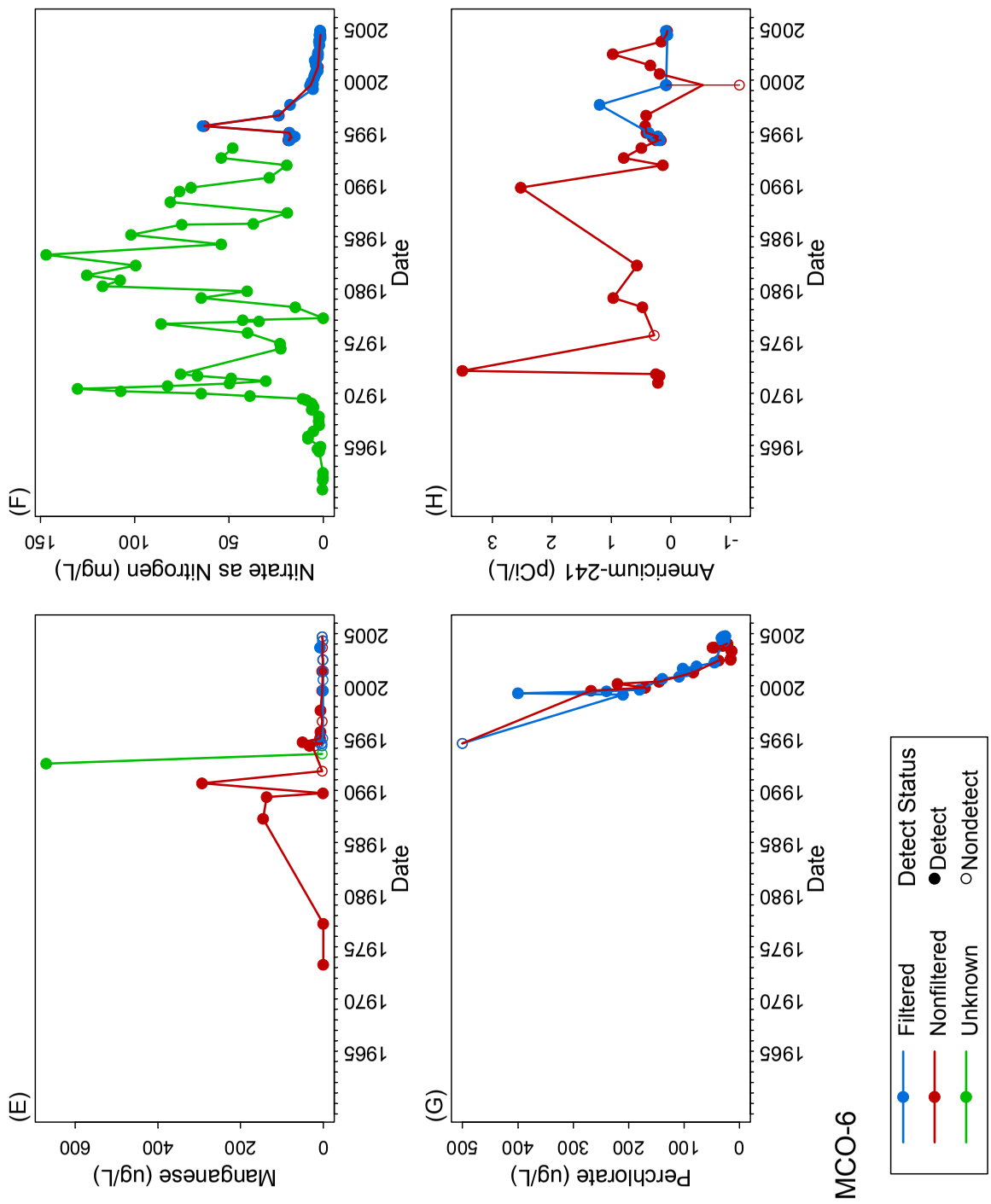


Figure D-2.2-9 (continued). Concentrations over time at MCO-6 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

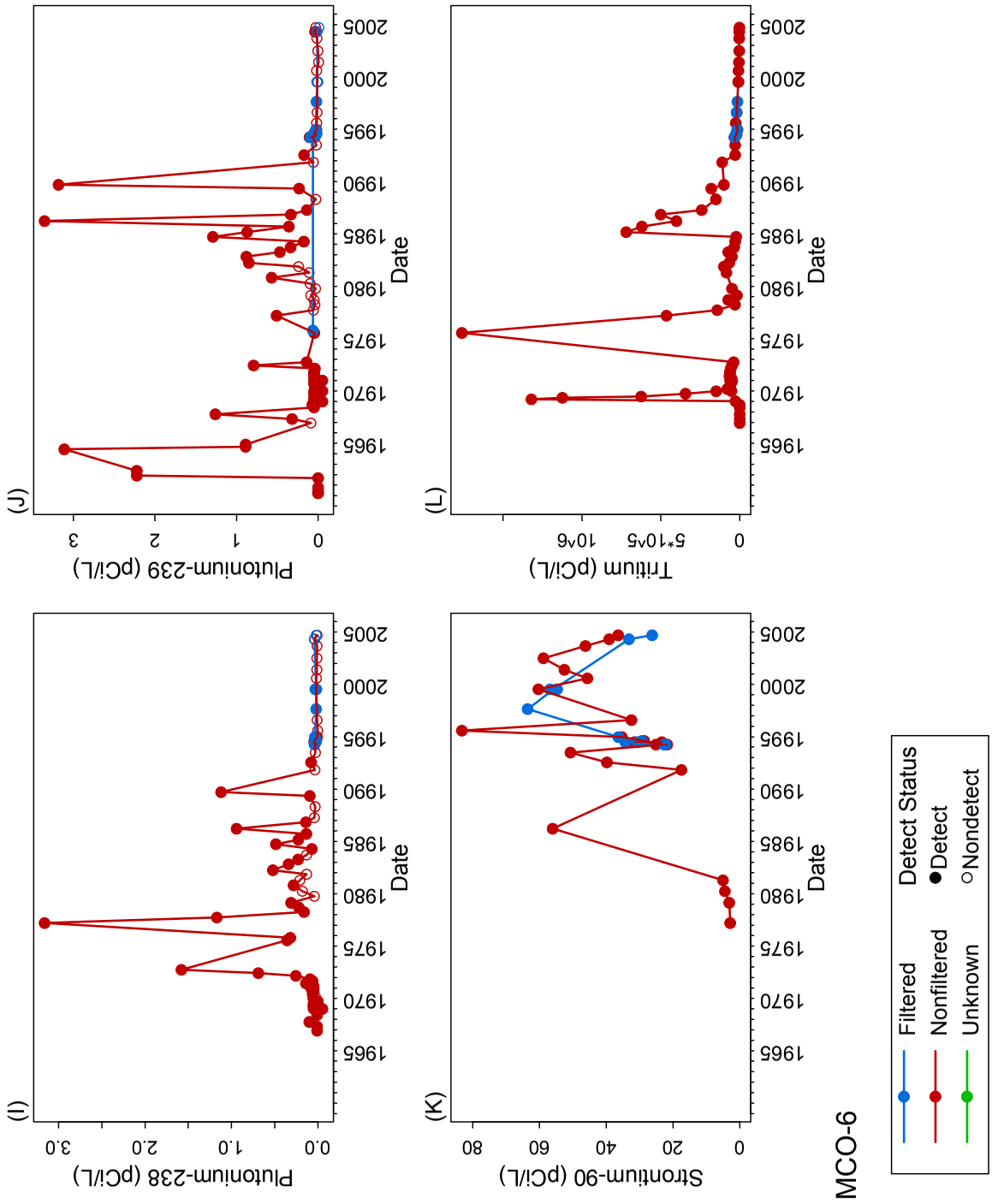


Figure D-2.2-9 (continued). Concentrations over time at MCO-6 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

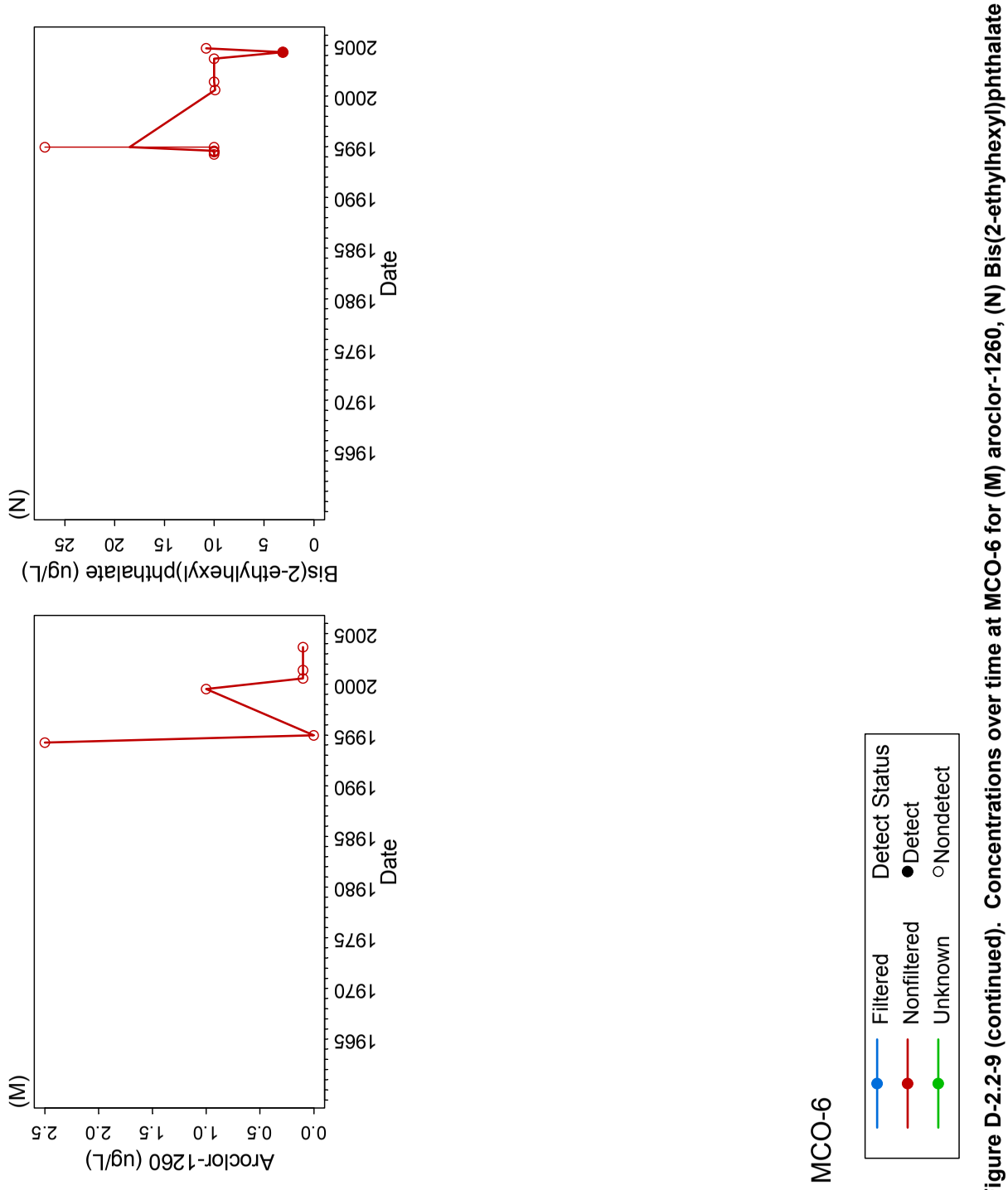


Figure D-2.2-9 (continued). Concentrations over time at MCO-6 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

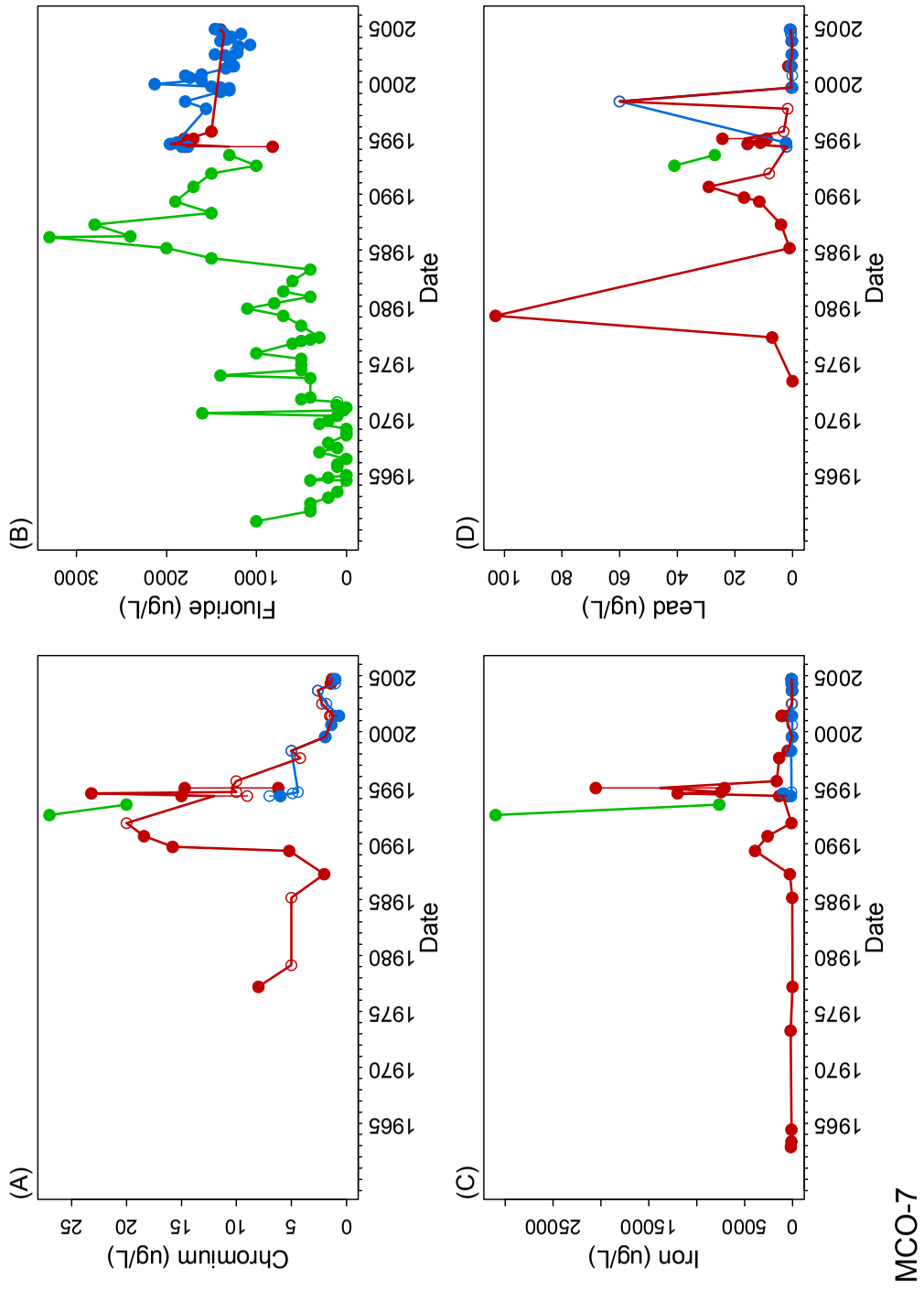


Figure D-2.2-10. Concentrations over time at MCO-7 for (A) chromium, (B) fluoride, (C) iron, (D) lead

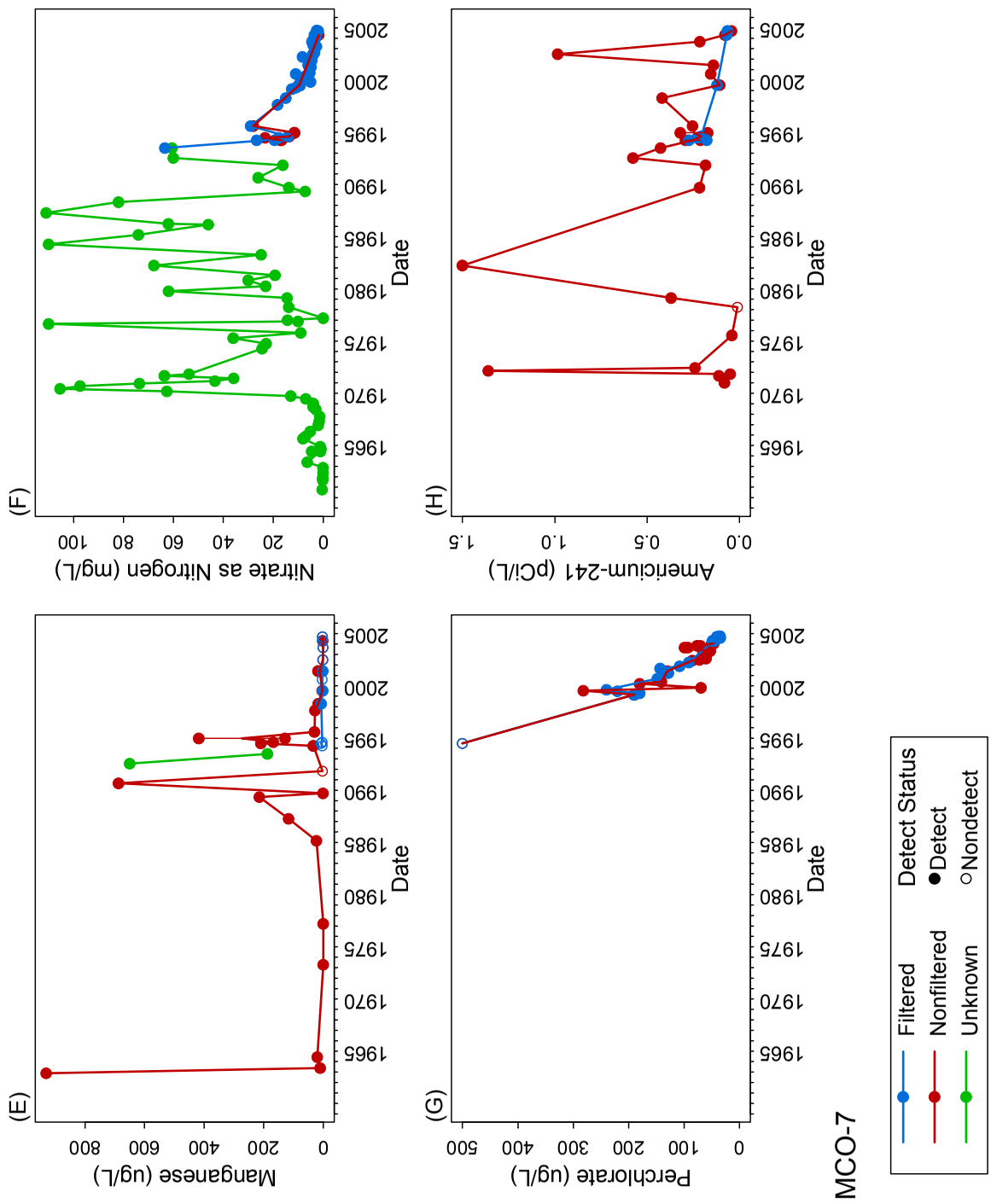


Figure D-2.2-10 (continued). Concentrations over time at MCO-7 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

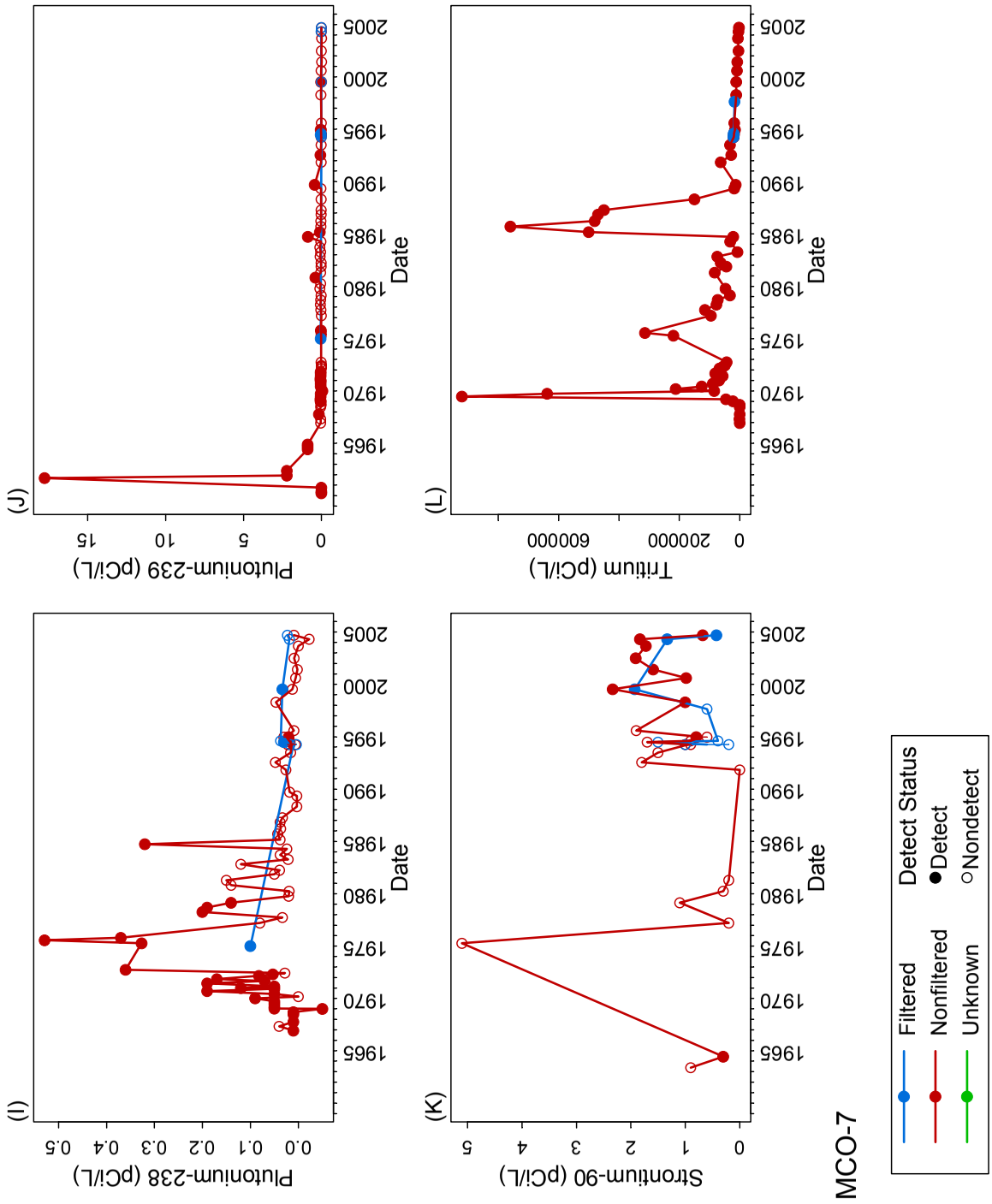


Figure D-2.2-10 (continued). Concentrations over time at MCO-7 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

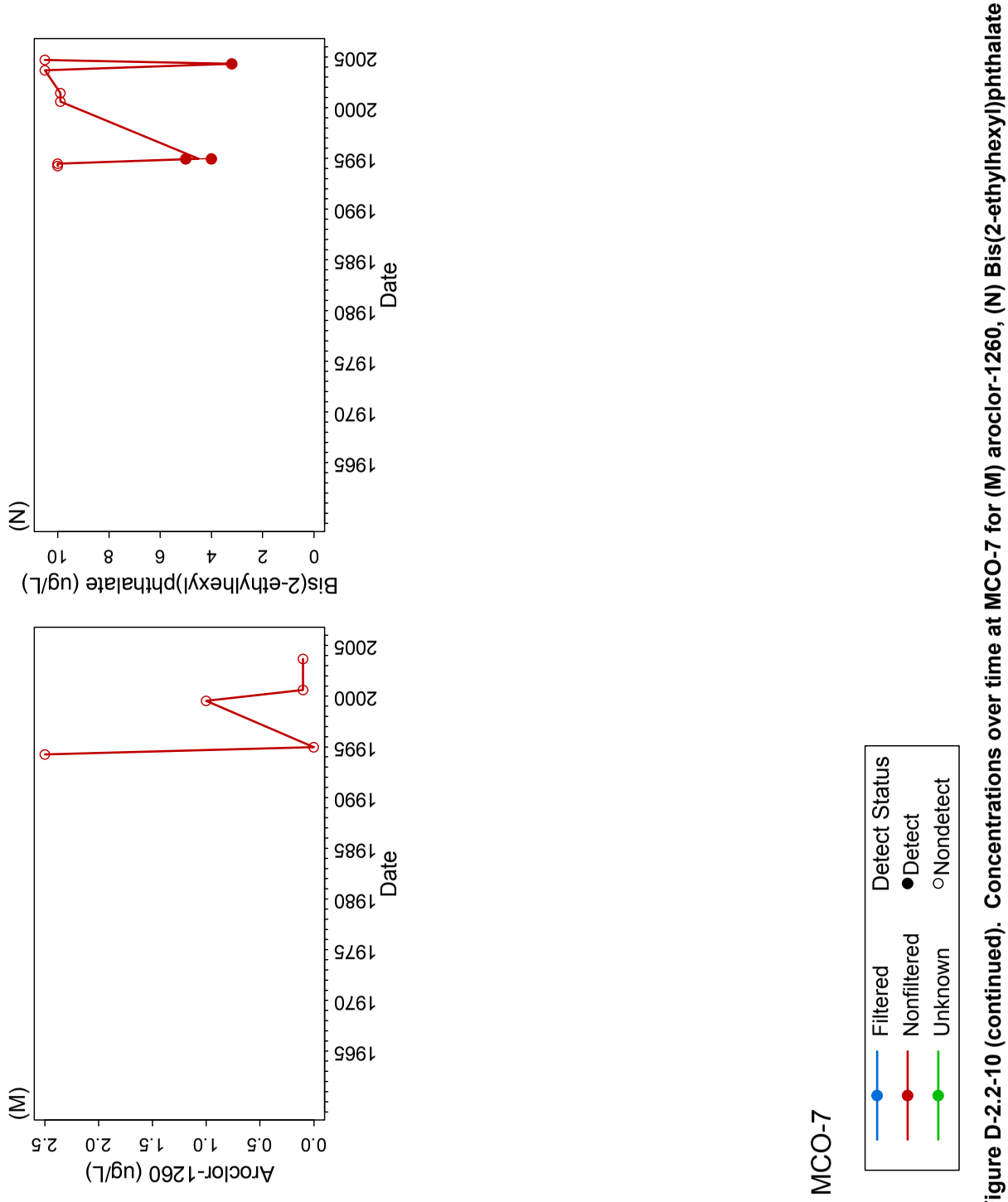


Figure D-2.2-10 (continued). Concentrations over time at MCO-7 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

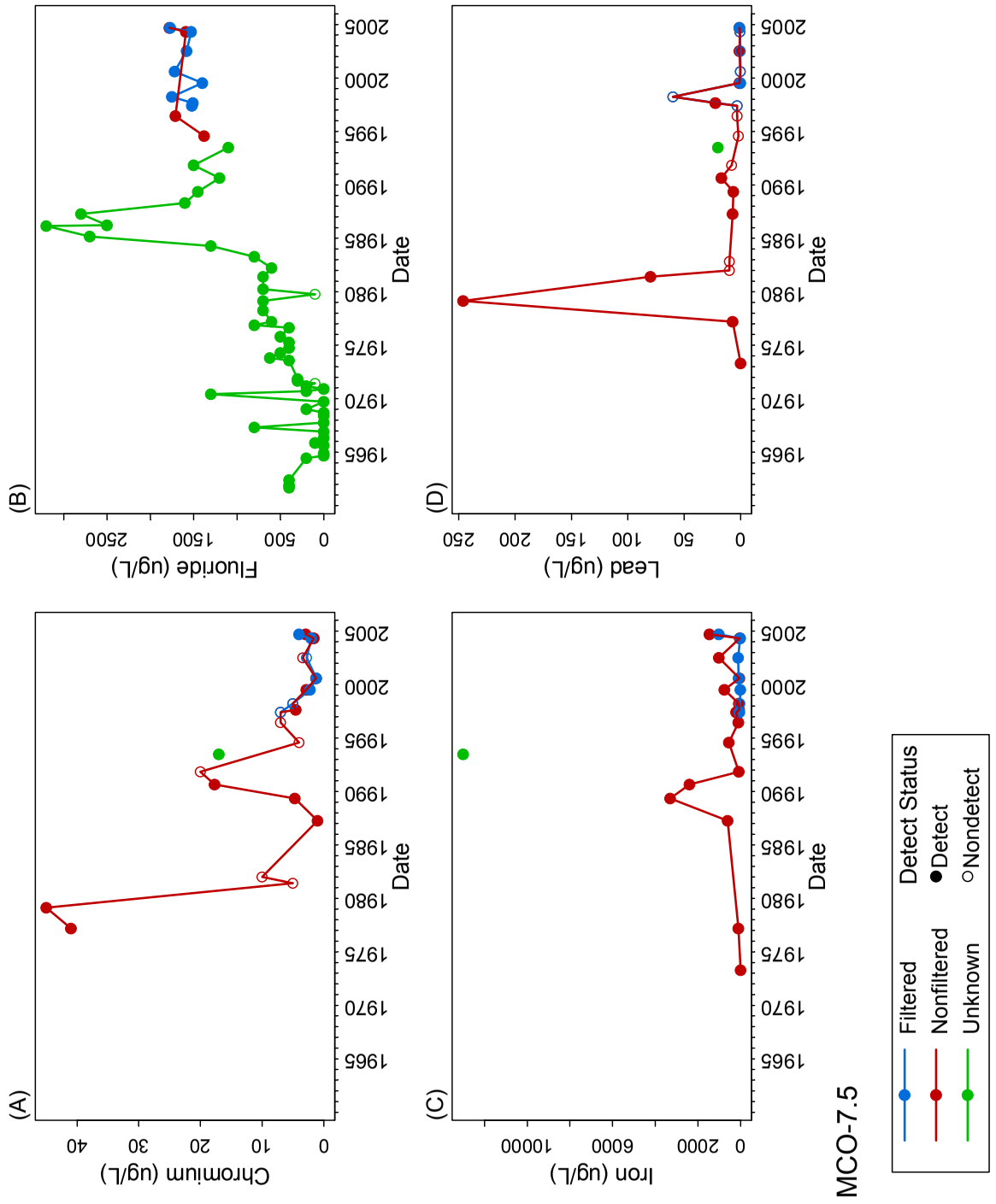


Figure D-2.2-11. Concentrations over time at MCO-7.5 for (A) chromium, (B) fluoride, (C) iron, (D) lead

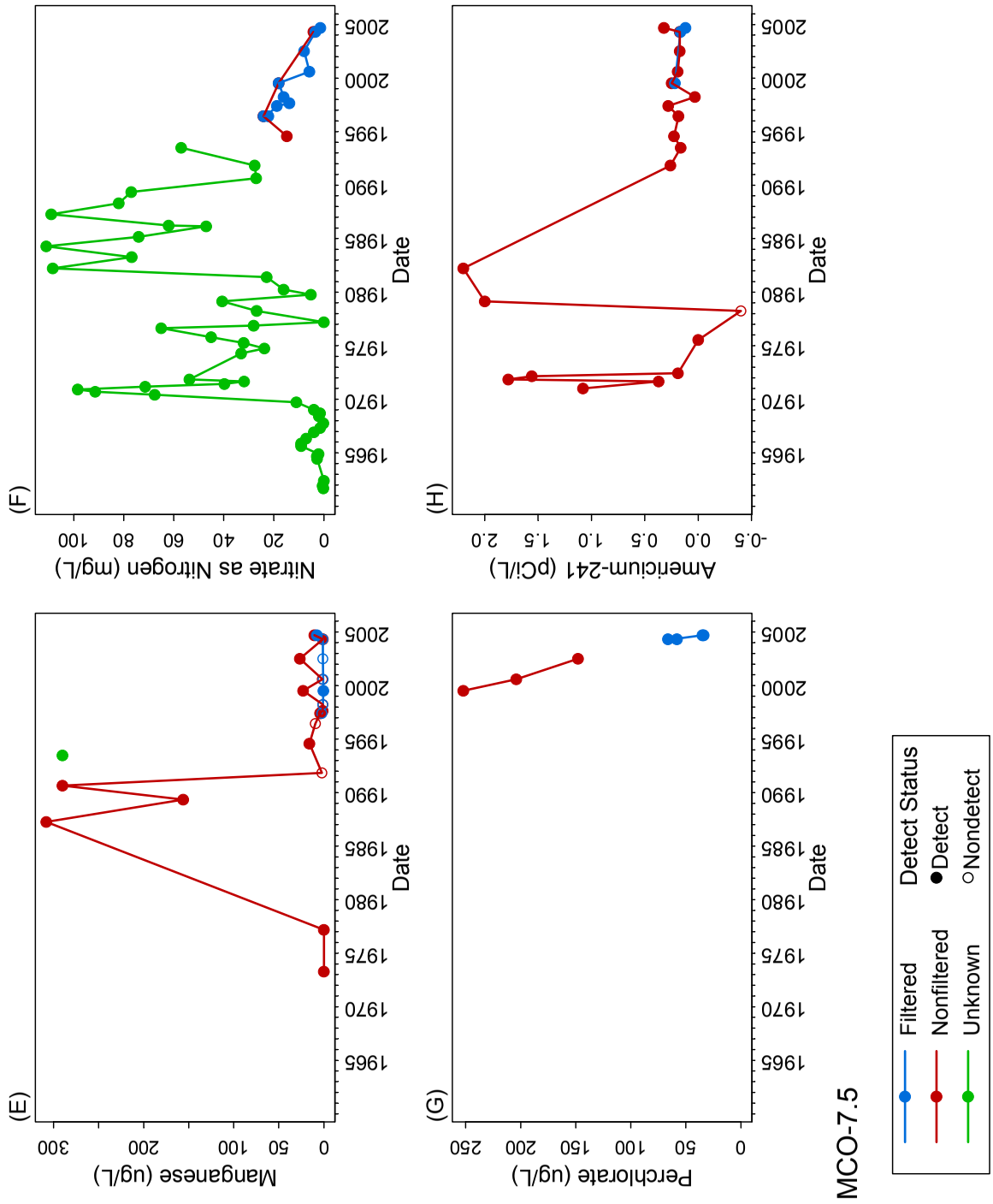


Figure D-2.2-11 (continued). Concentrations over time at MCO-7.5 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

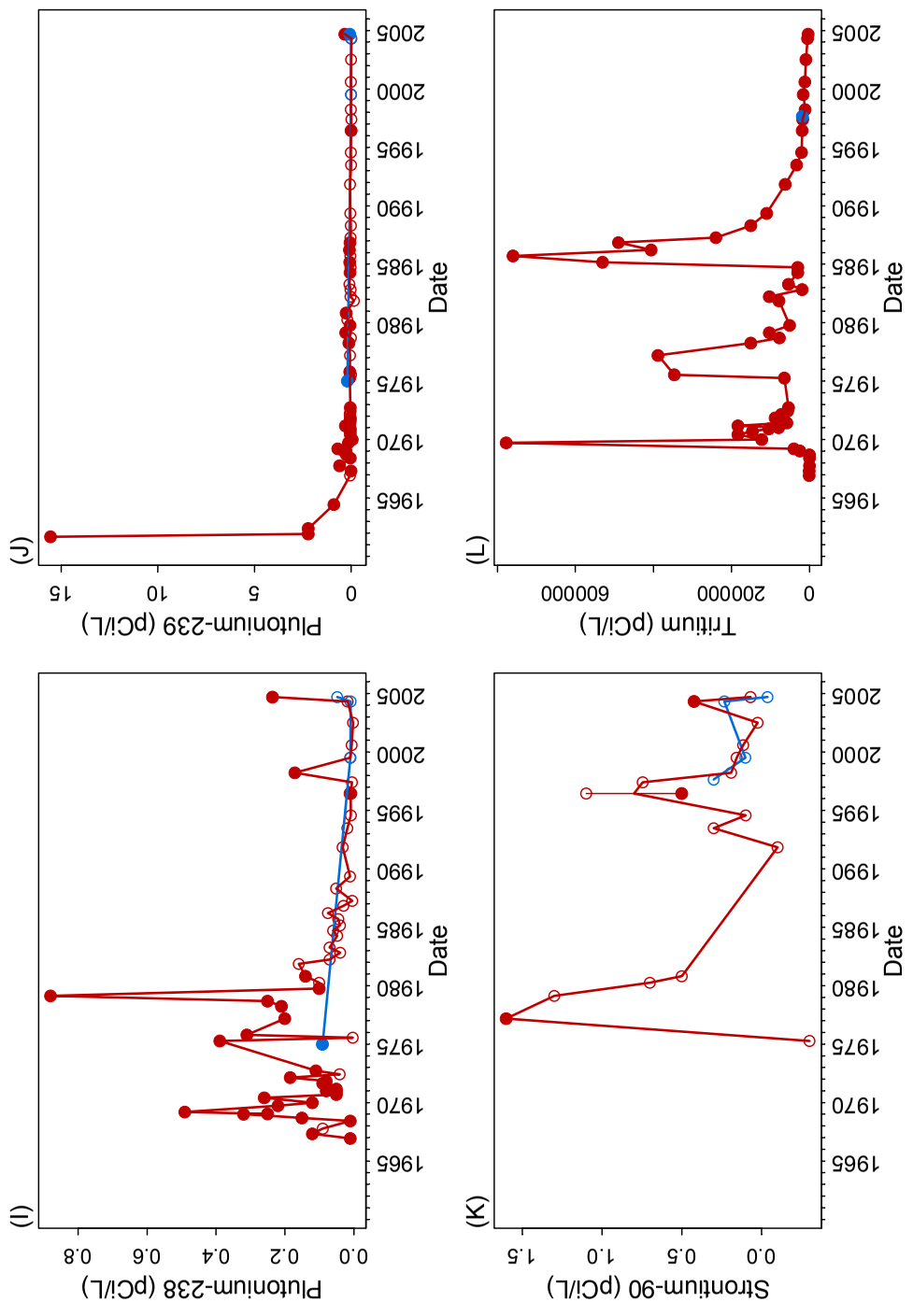


Figure D-2.2-11 (continued). Concentrations over time at MCO-7.5 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

MCO-7.5

Figure D-2.2-11 (continued). Concentrations over time at MCO-7.5 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

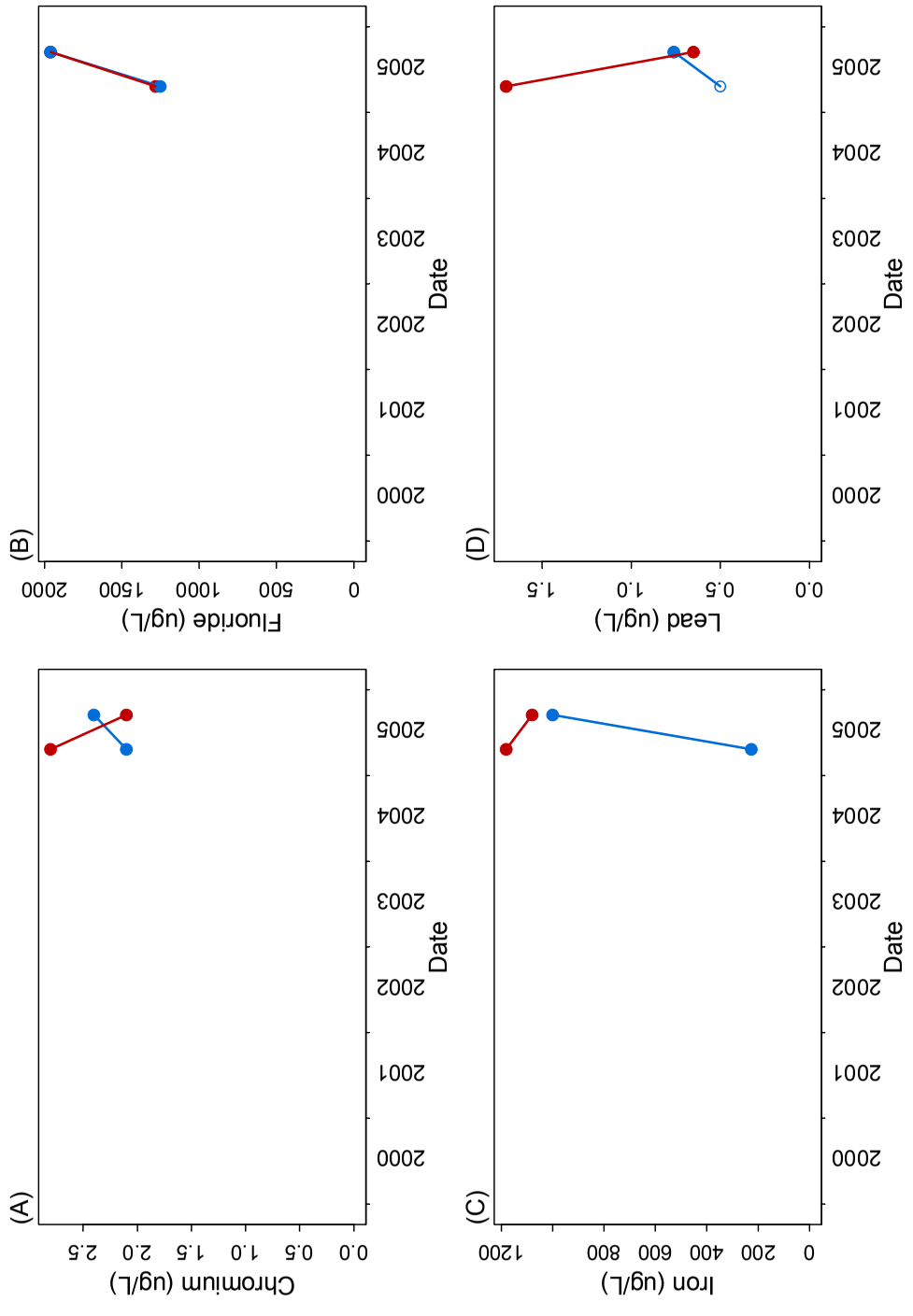


Figure D-2.2-12. Concentrations over time at MT-1 for (A) chromium, (B) fluoride, (C) iron, (D) lead

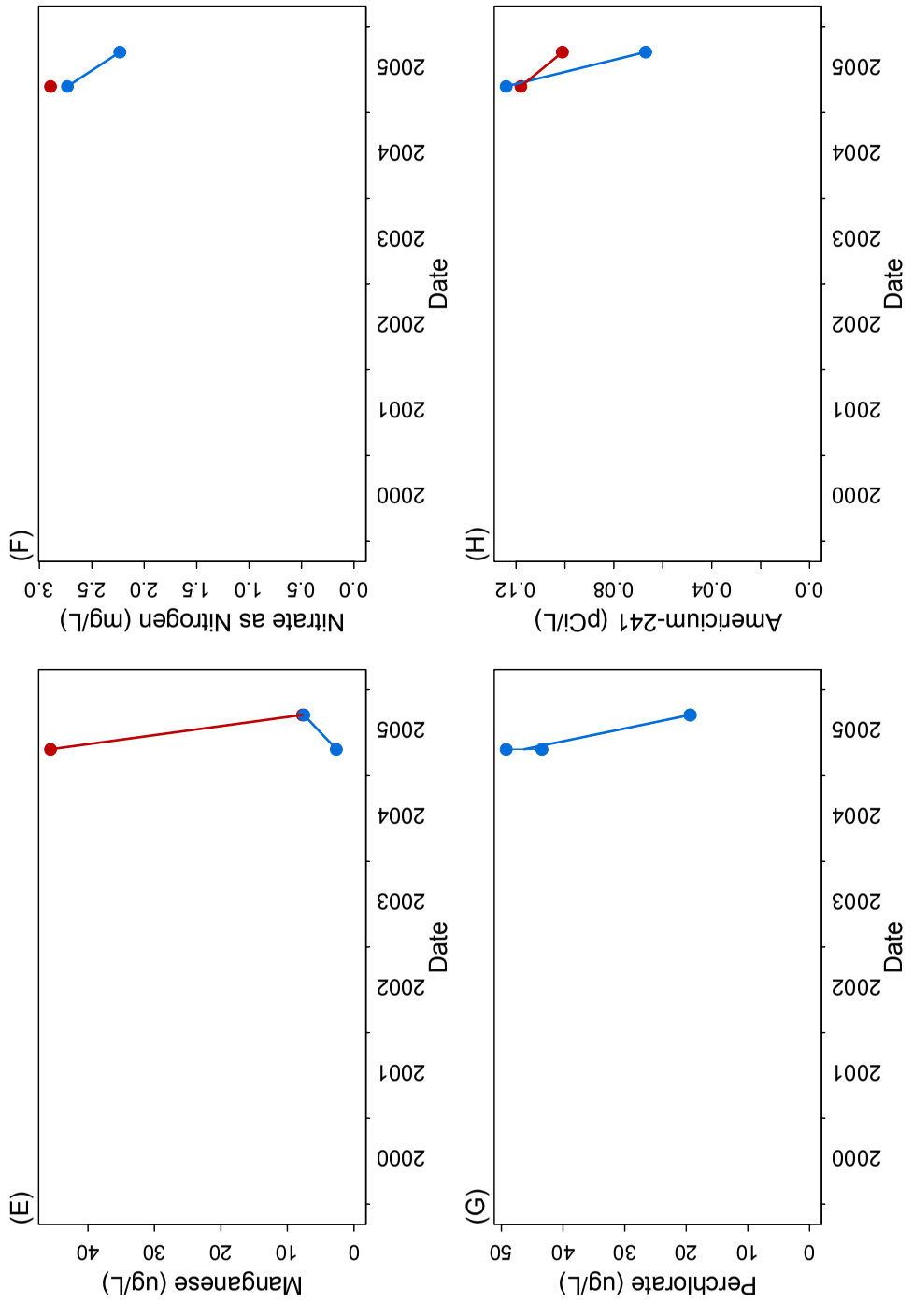


Figure D-2.2-12 (continued). Concentrations over time at MT-1 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

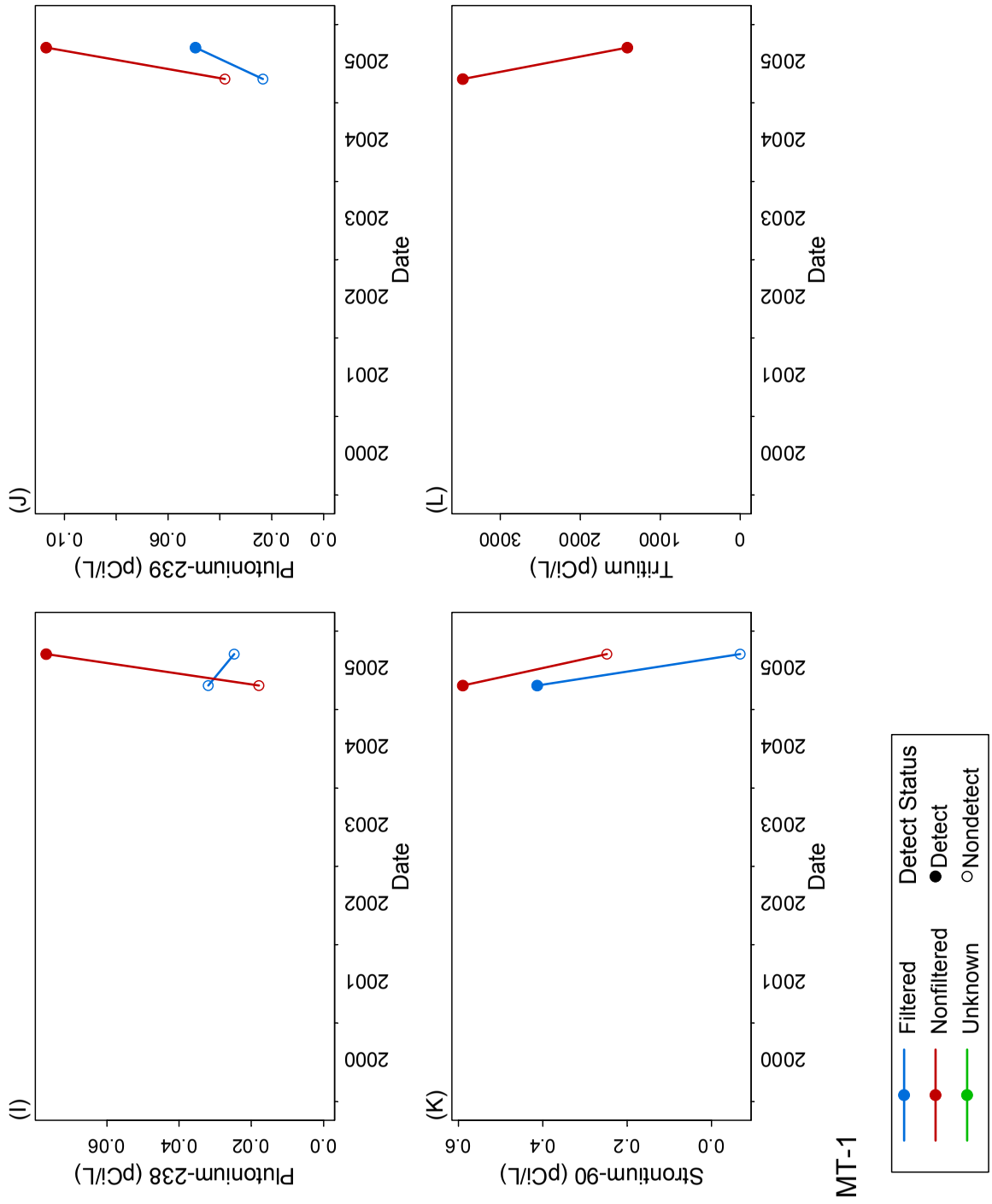


Figure D-2.2-12 (continued). Concentrations over time at MT-1 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

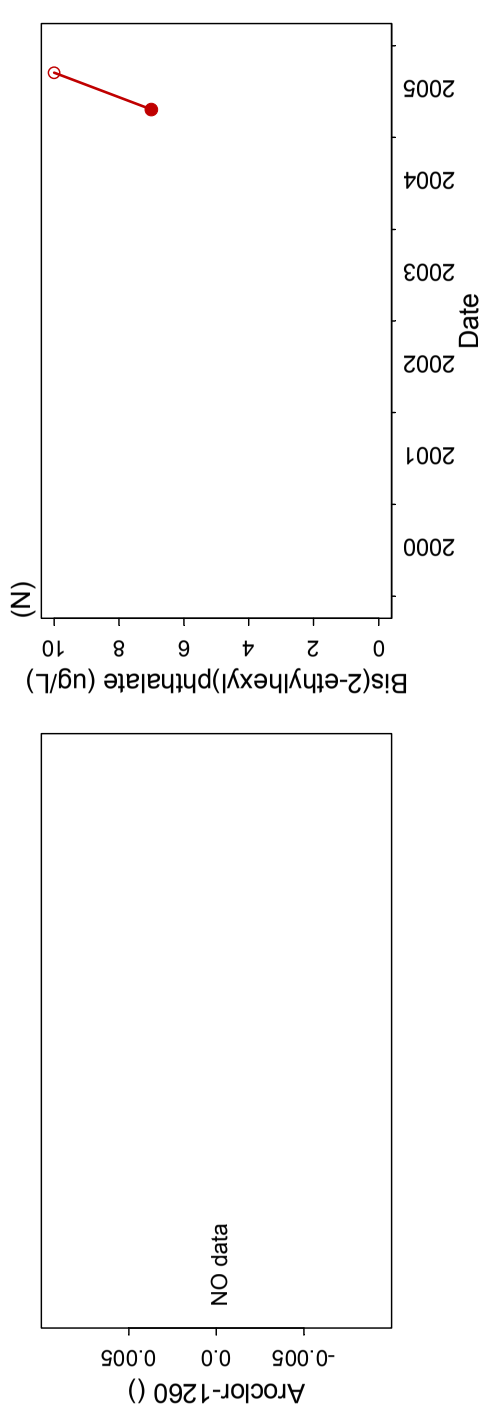


Figure D-2.2-12 (continued). Concentrations over time at MT-1 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

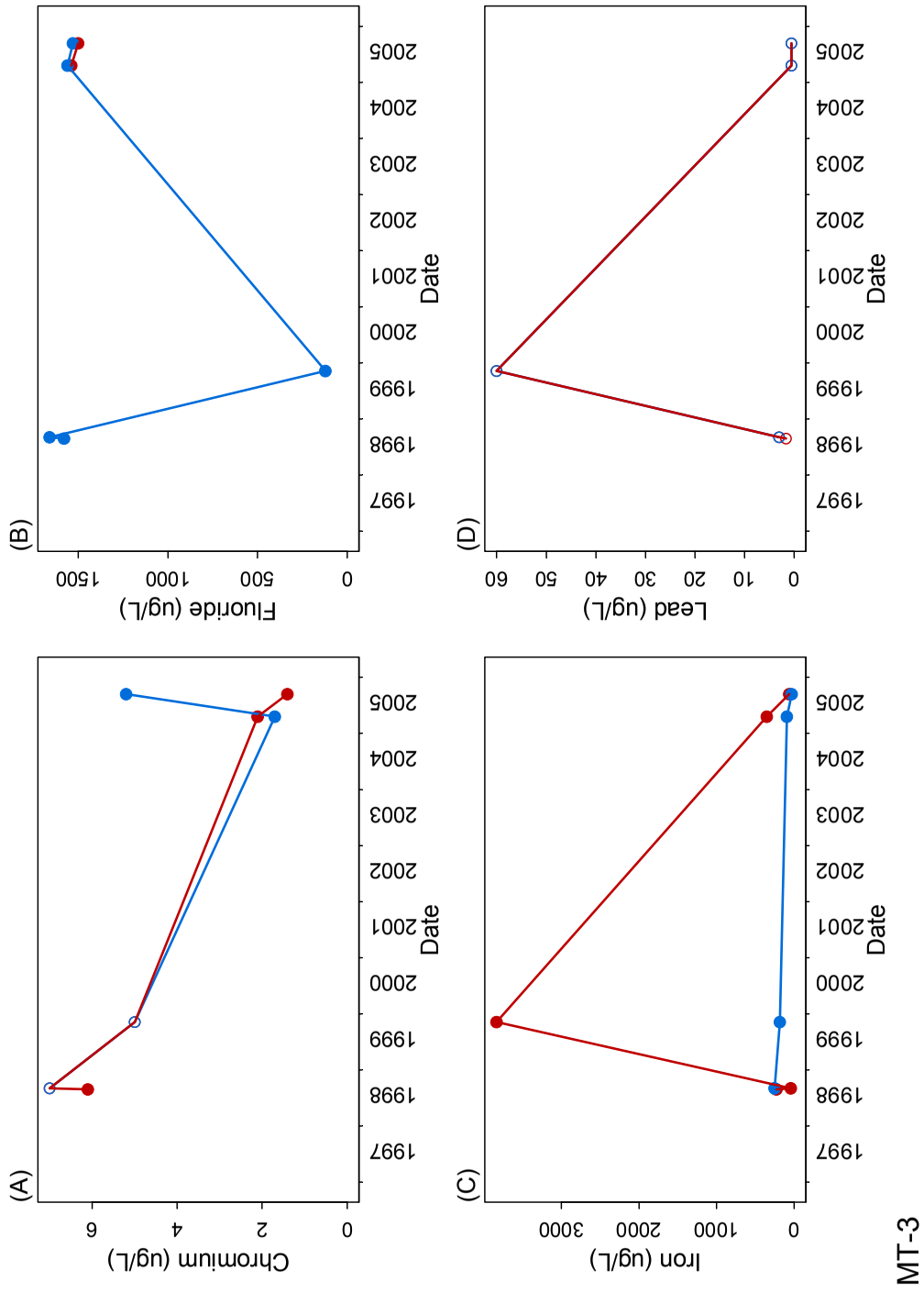


Figure D-2.2-13. Concentrations over time at MT-3 for (A) chromium, (B) fluoride, (C) iron, (D) lead

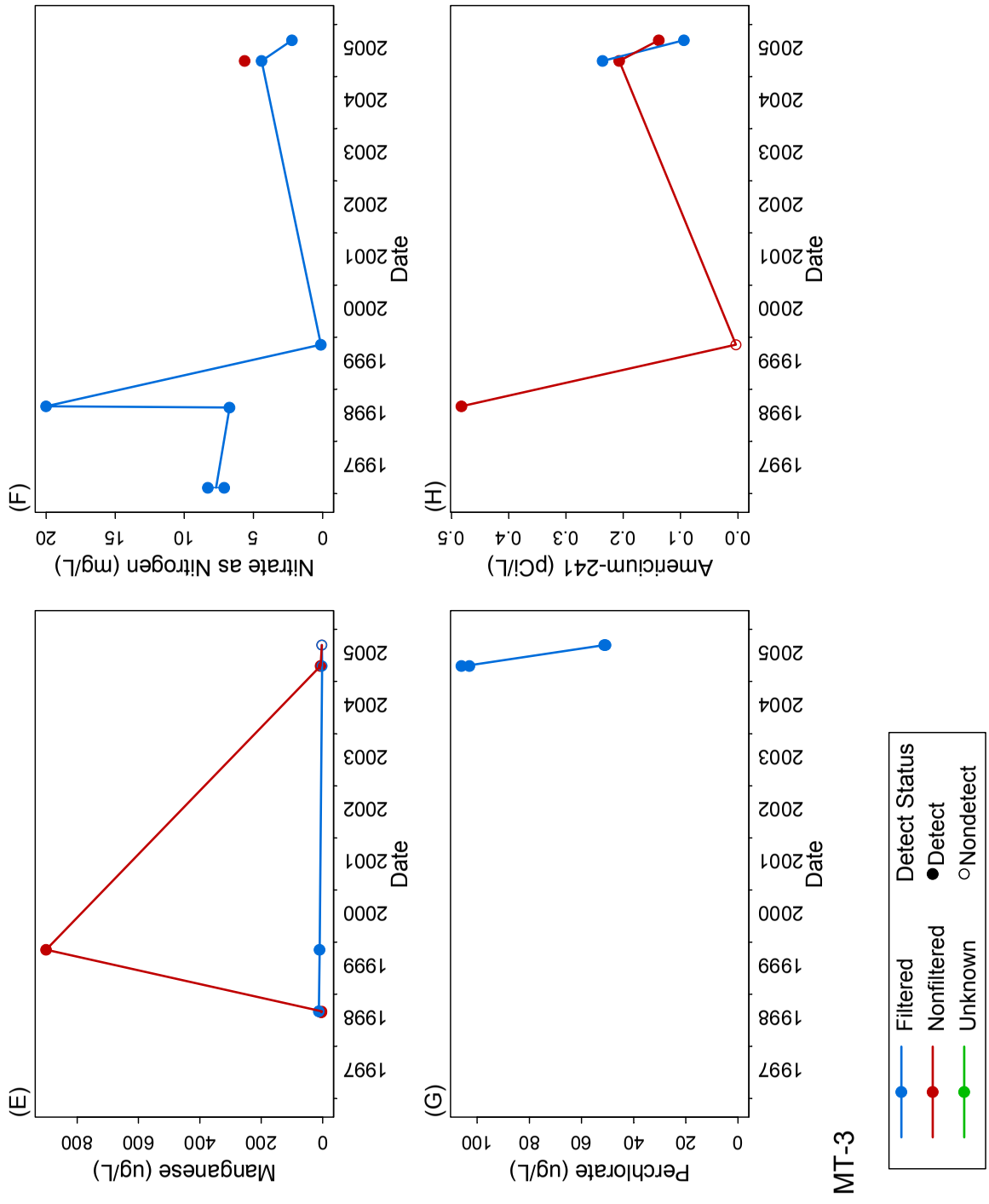


Figure D-2.2-13 (continued). Concentrations over time at MT-3 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

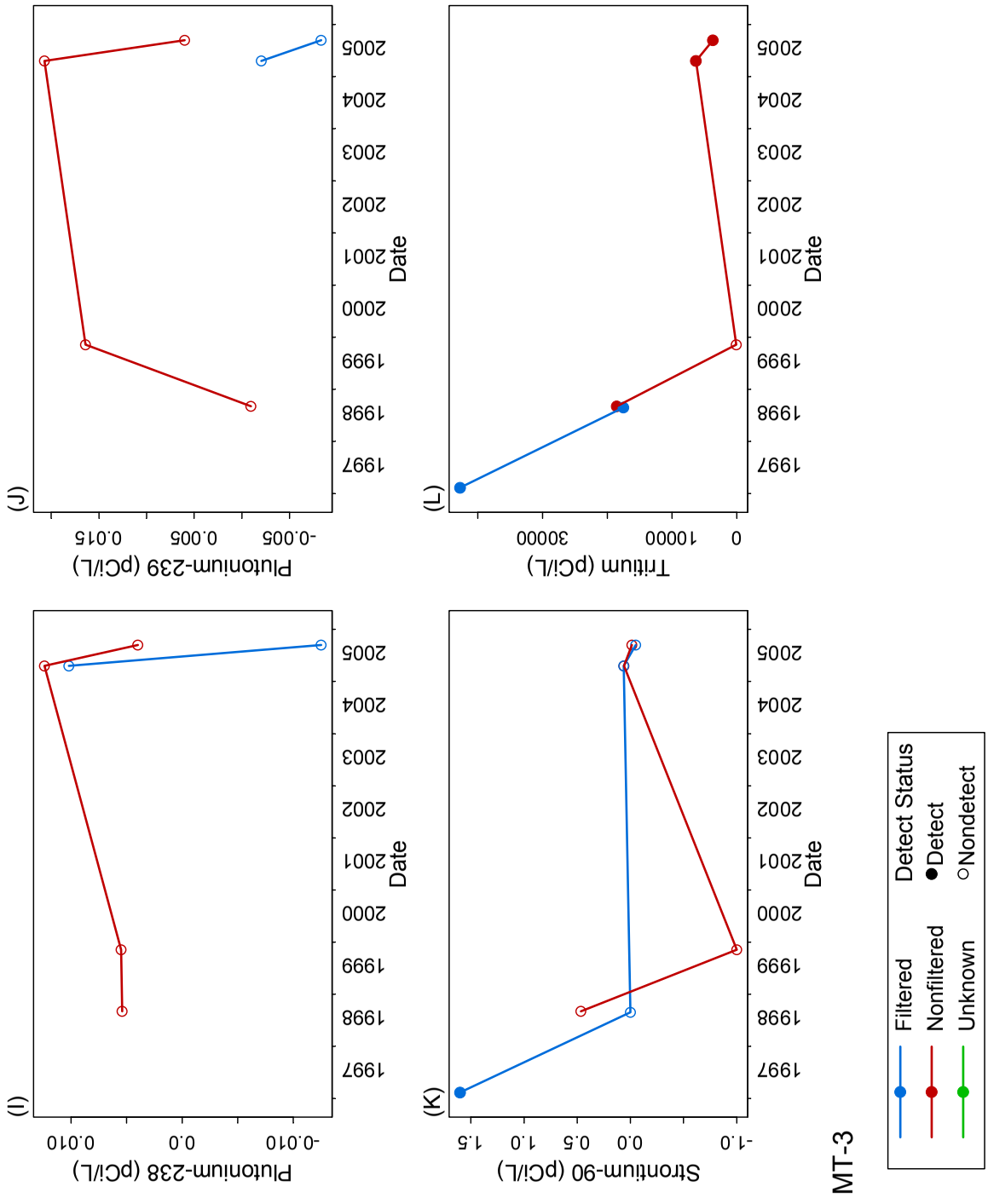


Figure D-2.2-13 (continued). Concentrations over time at MT-3 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

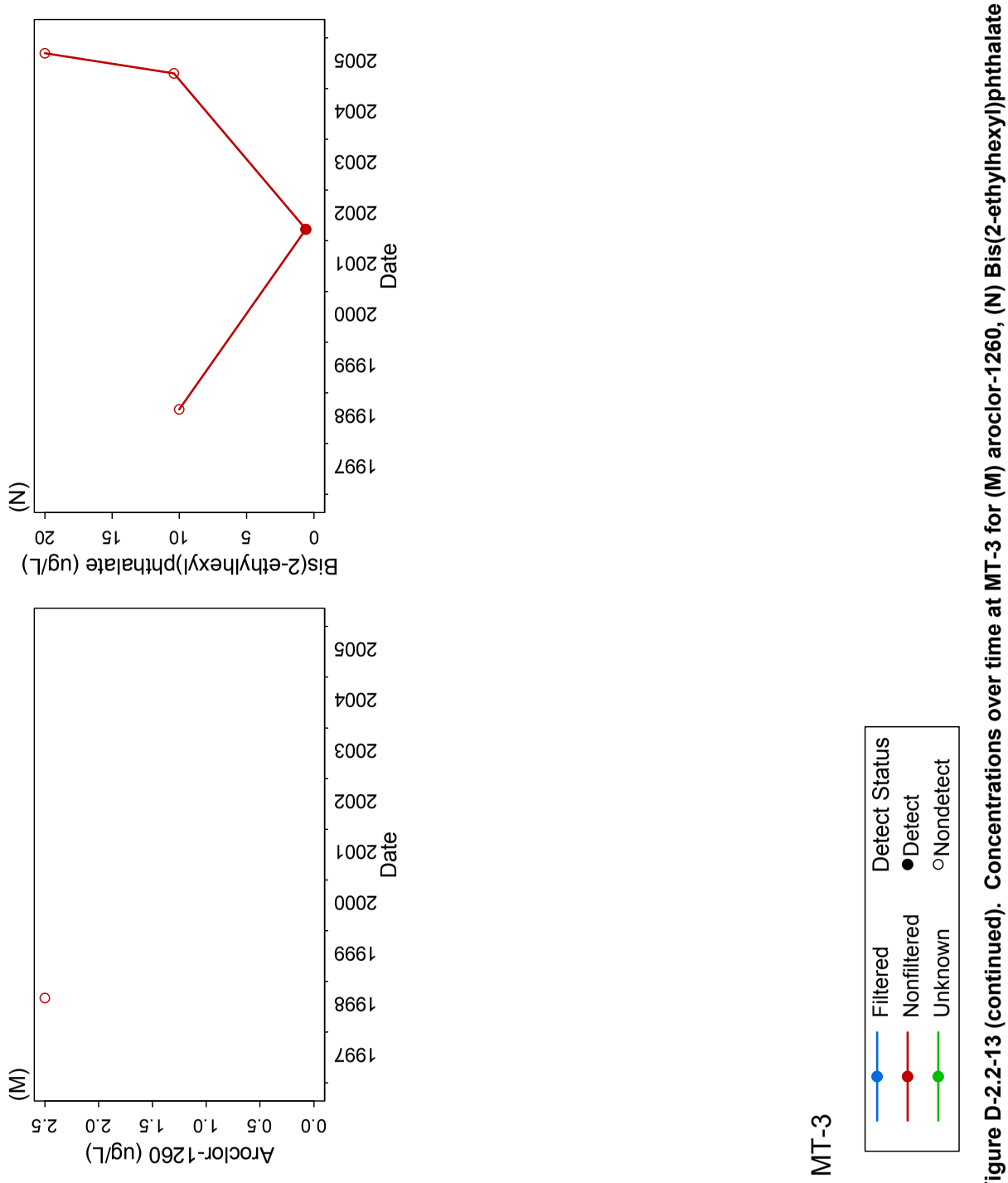


Figure D-2.2-13 (continued). Concentrations over time at MT-3 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

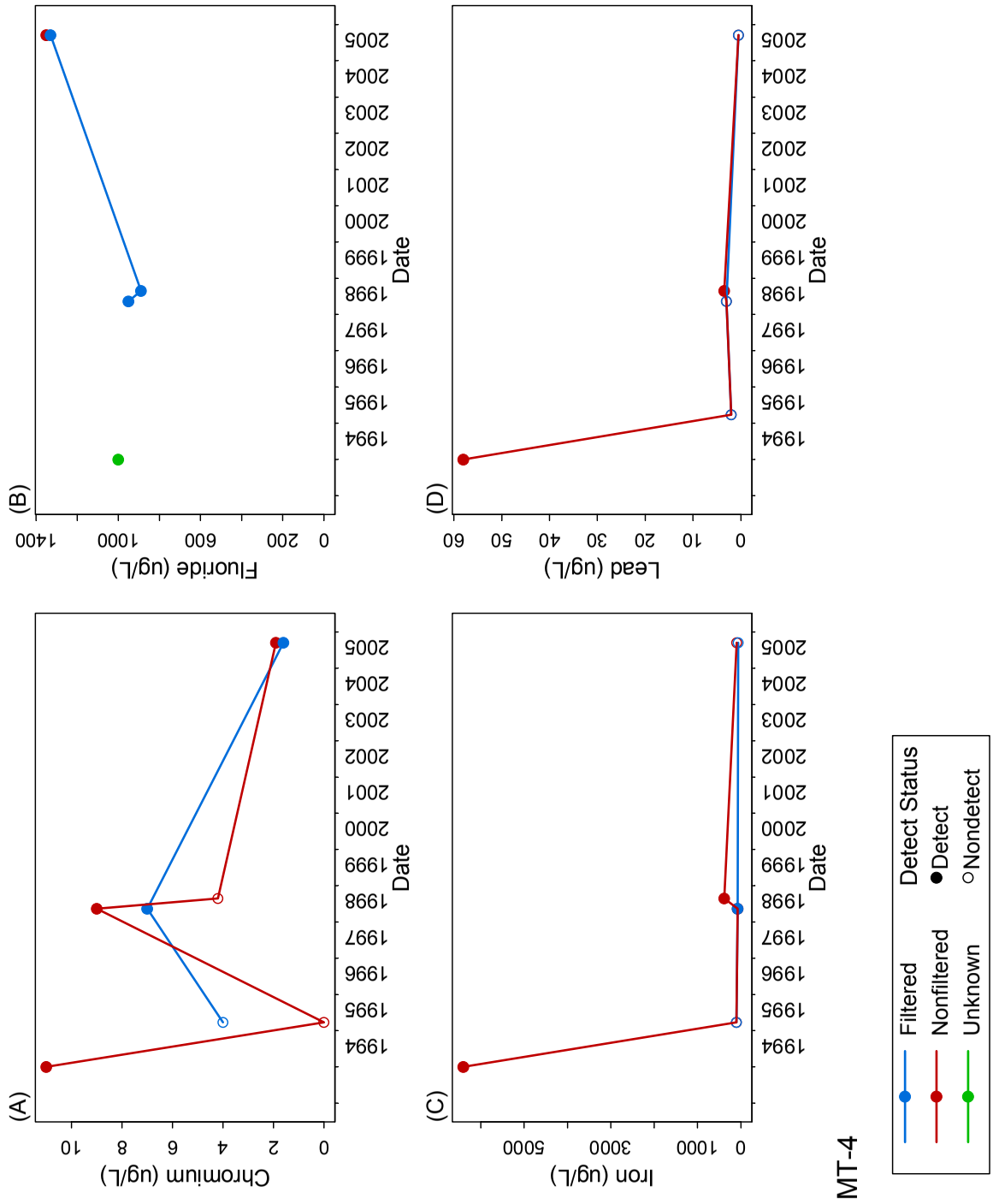


Figure D-2.2-14. Concentrations over time at MT-4 for (A) chromium, (B) fluoride, (C) iron, (D) lead

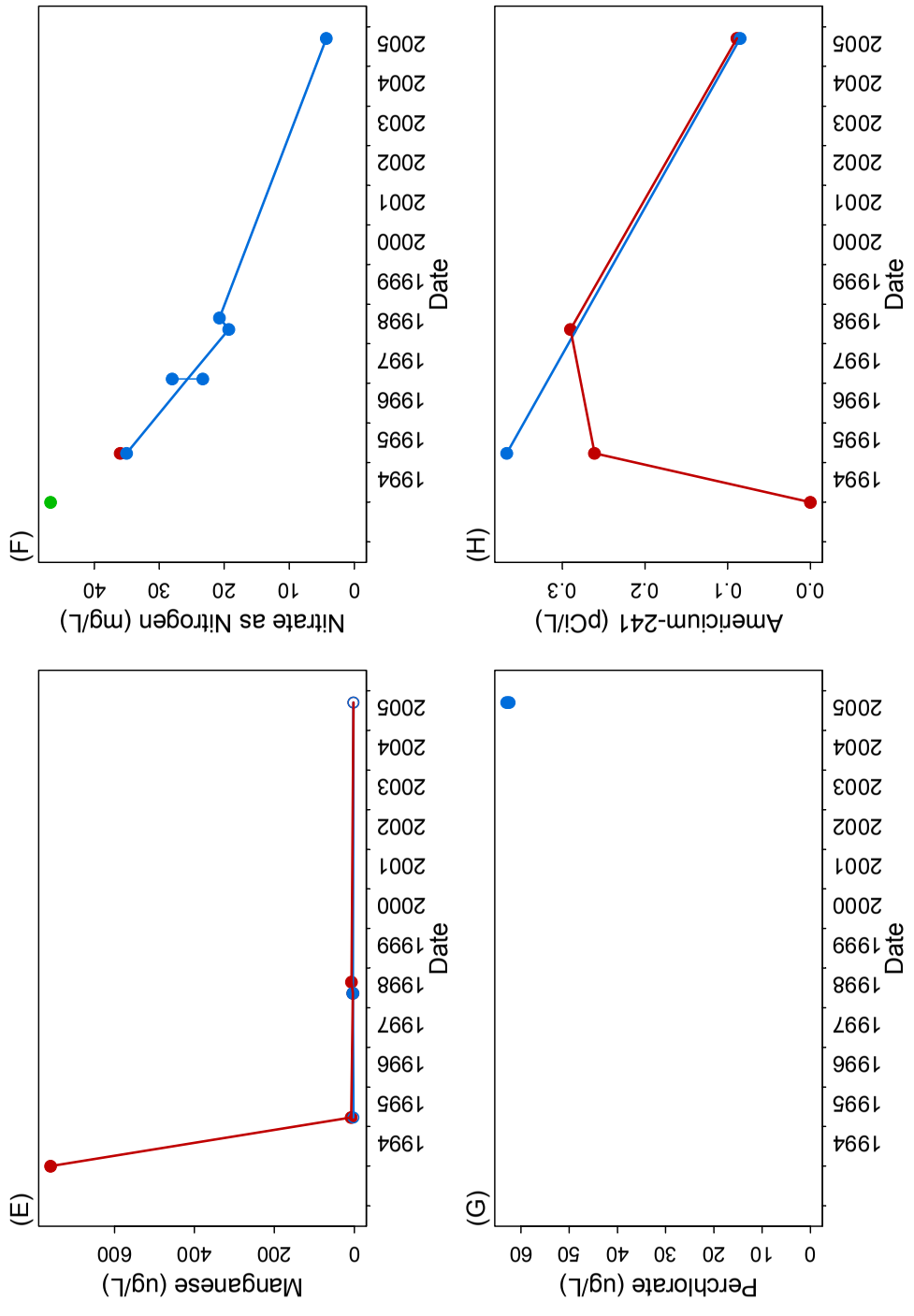


Figure D-2.2-14 (continued). Concentrations over time at MT-4 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

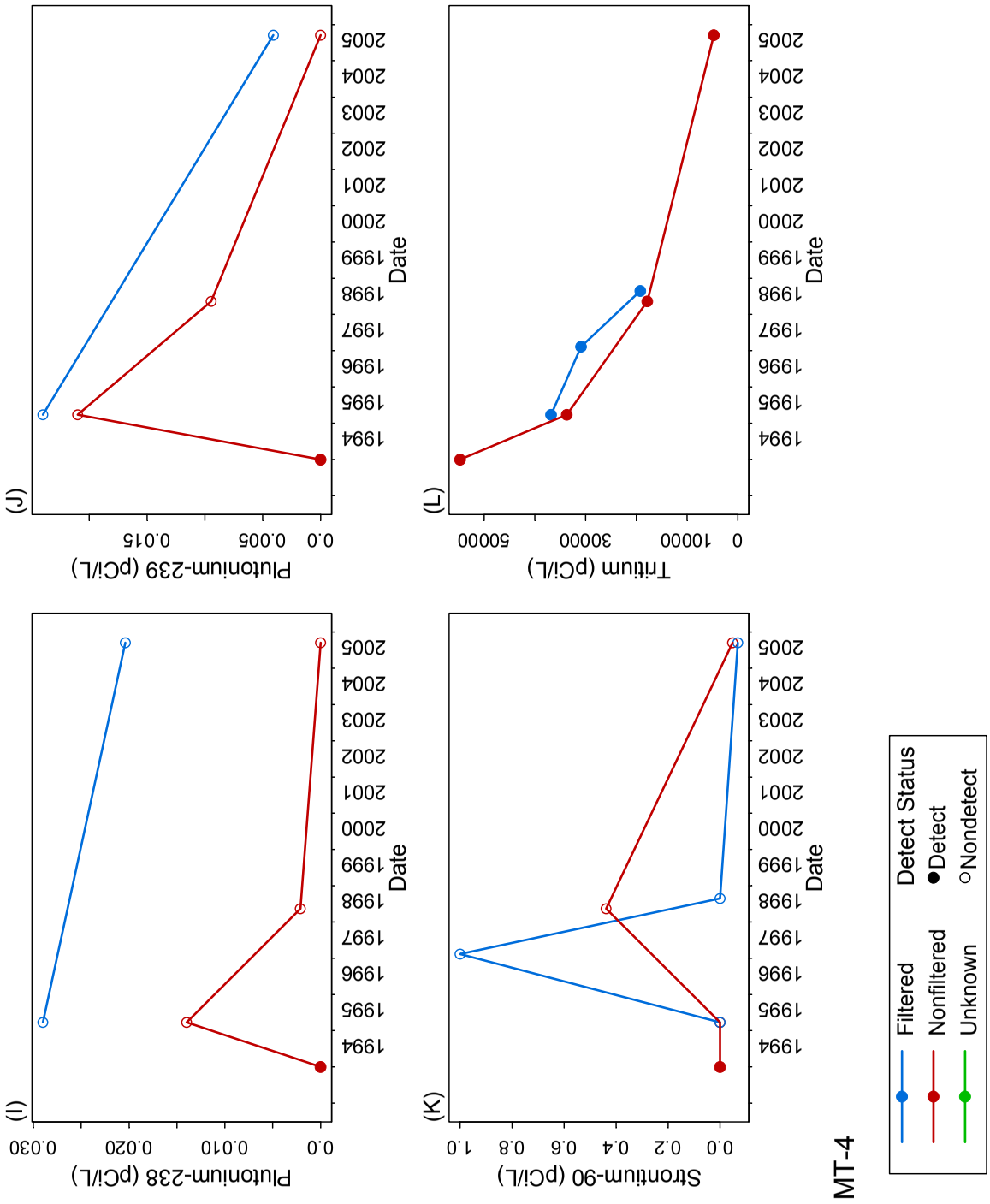


Figure D-2.2-14 (continued). Concentrations over time at MT-4 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

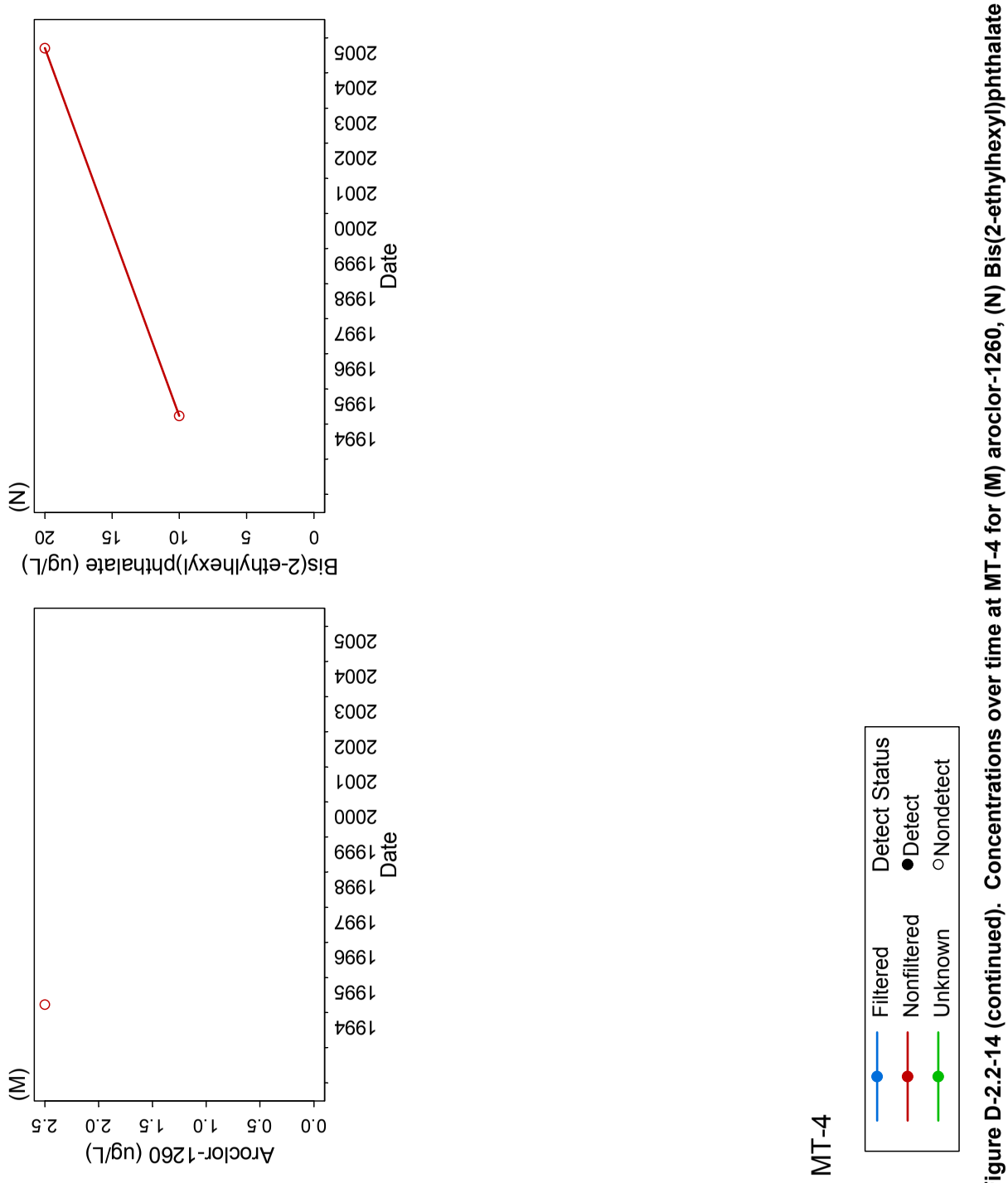


Figure D-2.2-14 (continued). Concentrations over time at MT-4 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

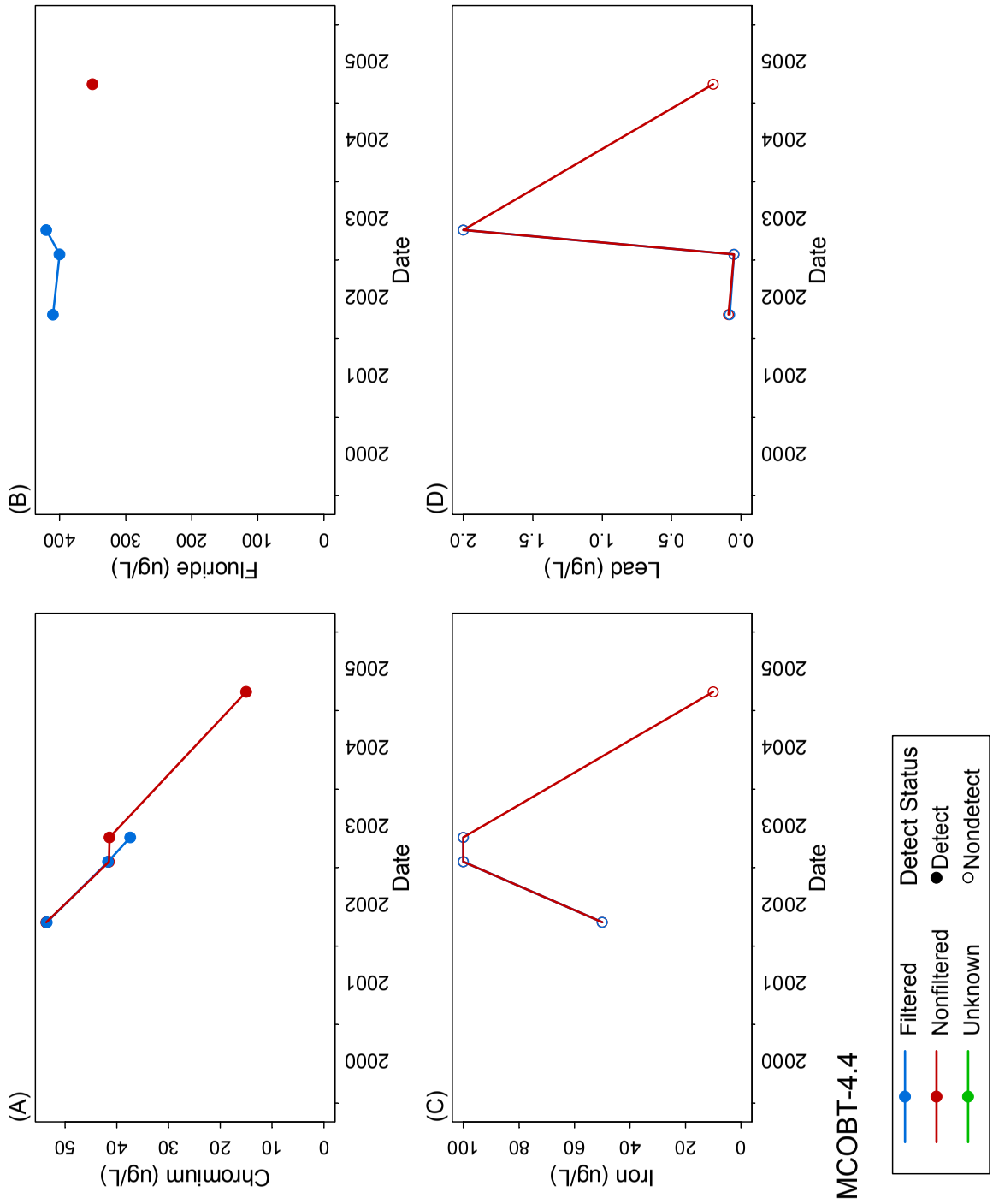


Figure D-2.2-15. Concentrations over time at MCOBT-4.4 for (A) chromium, (B) fluoride, (C) iron, (D) lead

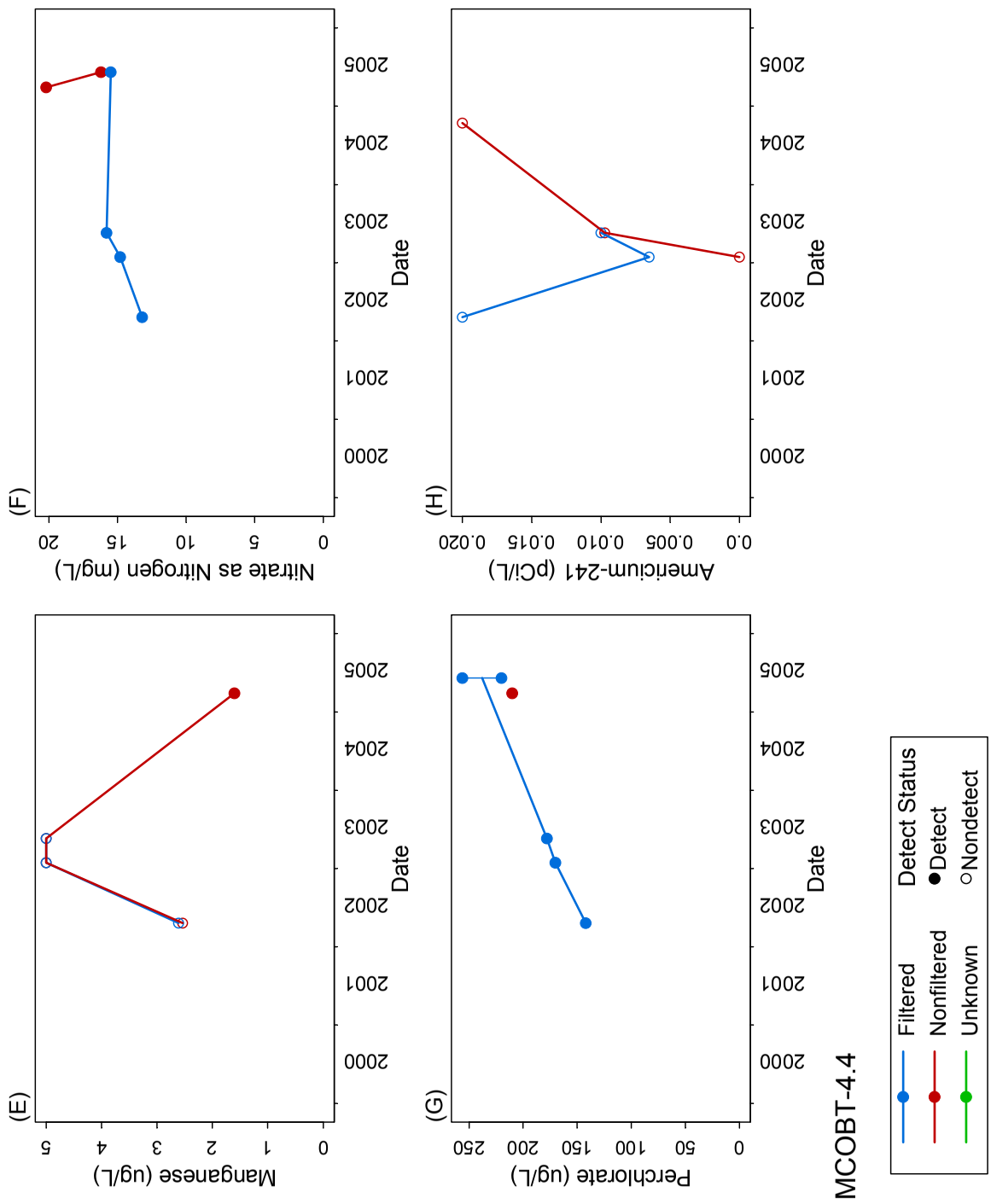


Figure D-2.2-15 (continued). Concentrations over time at MCOBT-4.4 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

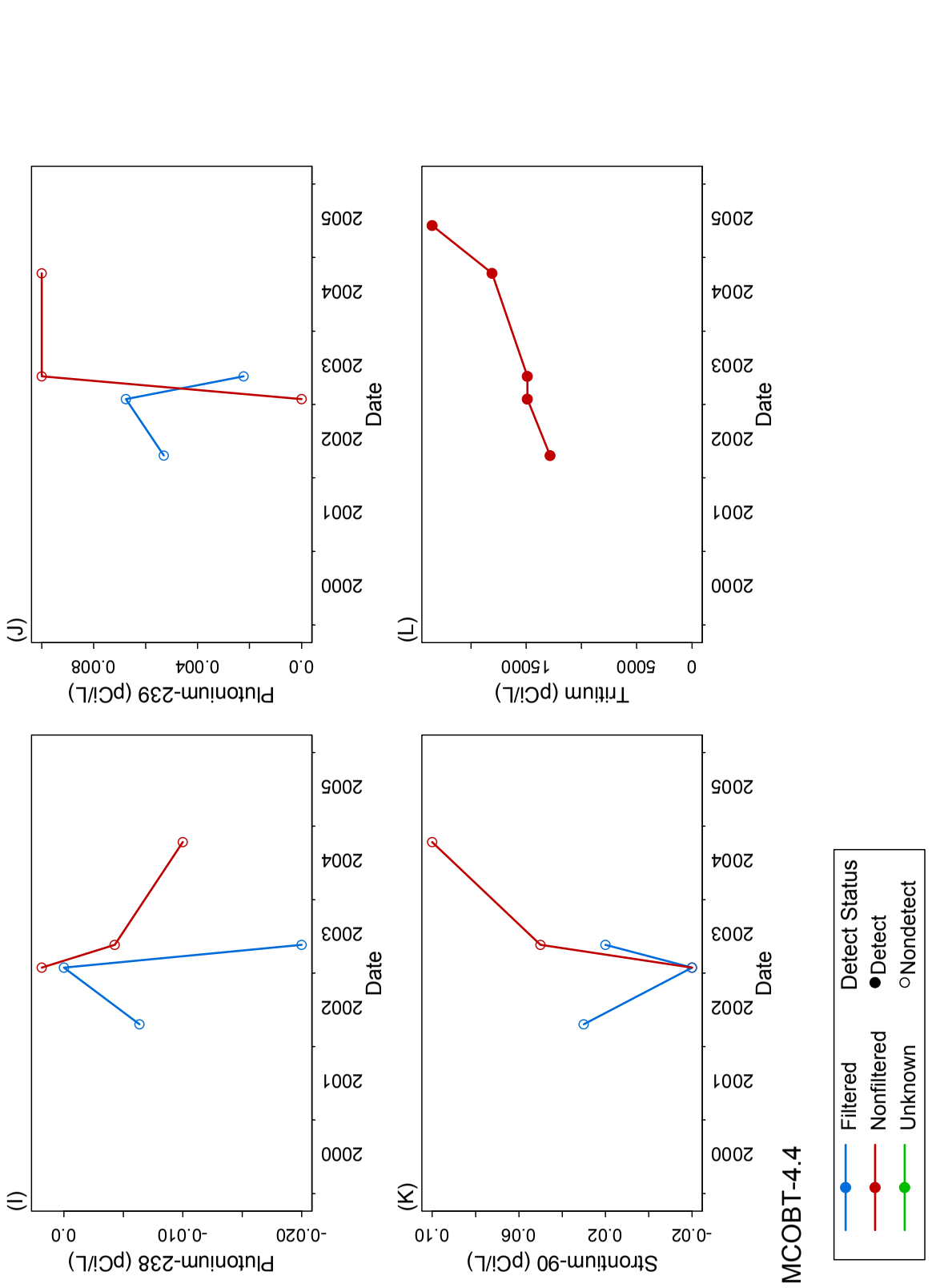


Figure D-2.2-15 (continued). Concentrations over time at MCOBT-4.4 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

MCOBT-4.4

Figure D-2.2-15 (continued). Concentrations over time at MCOBT-4.4 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

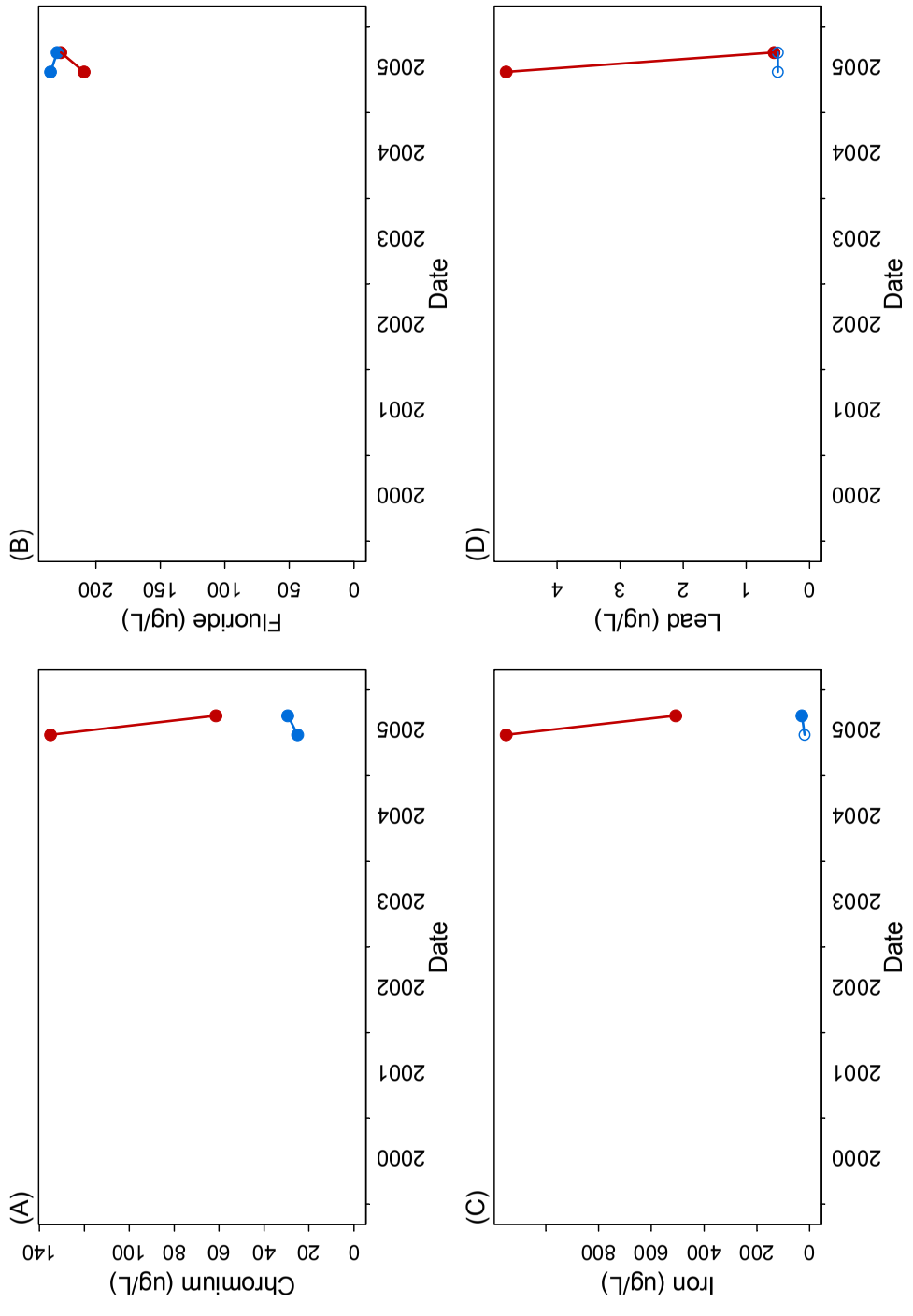


Figure D-2.2-16. Concentrations over time at MCOI-4 for (A) chromium, (B) fluoride, (C) iron, (D) lead

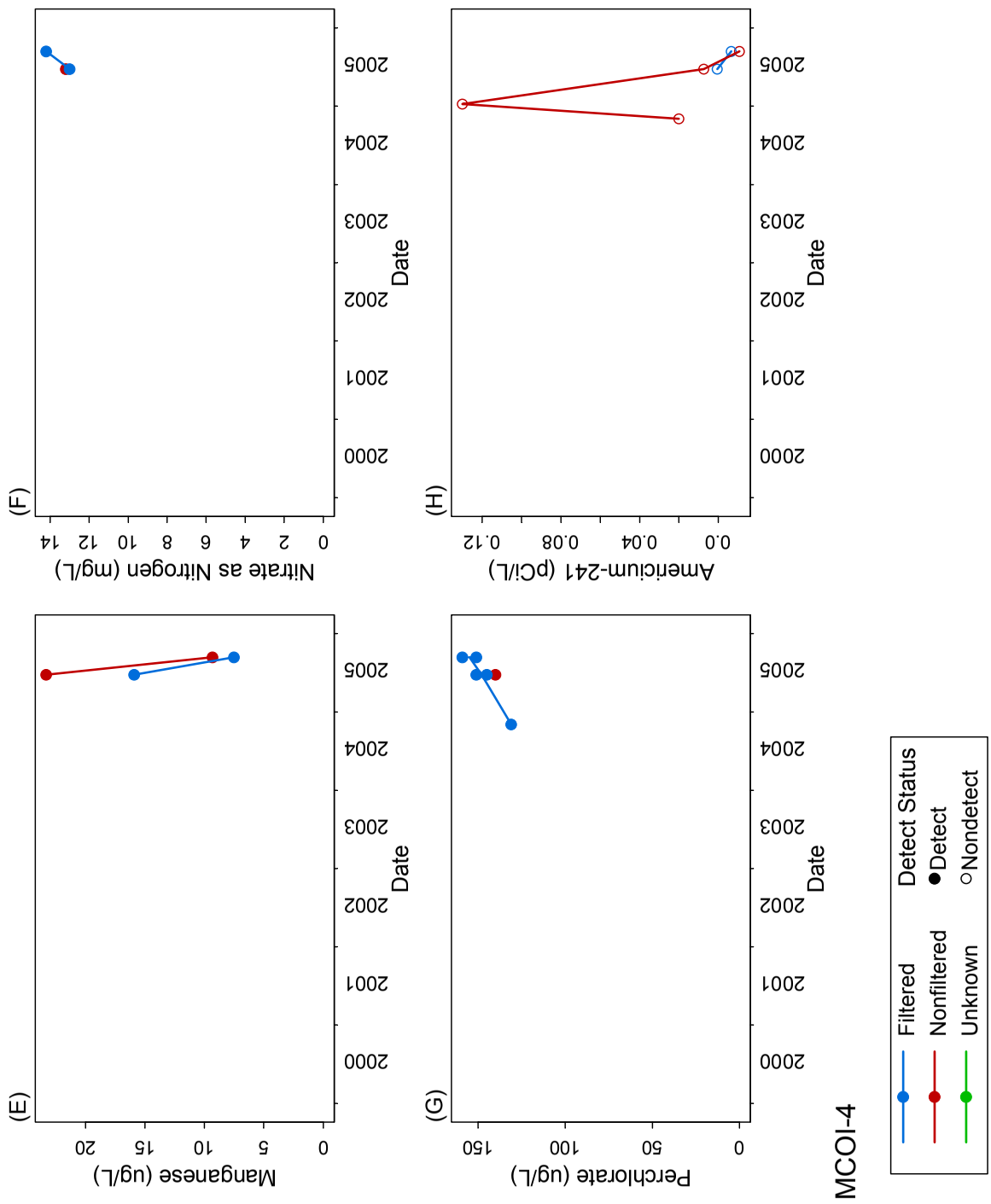


Figure D-2.2-16 (continued). Concentrations over time at MCOI-4 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

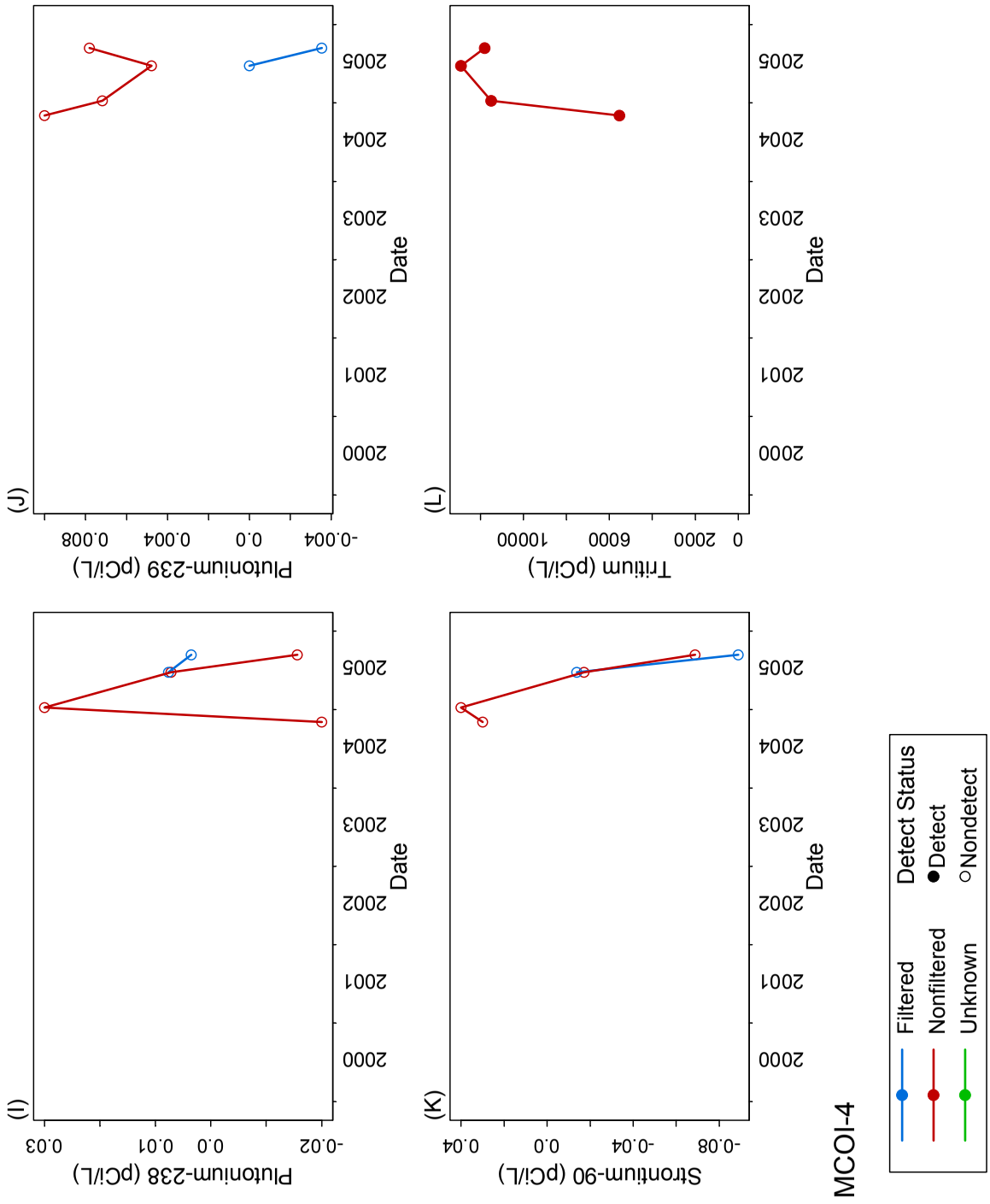


Figure D-2.2-16 (continued). Concentrations over time at MCOI-4 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

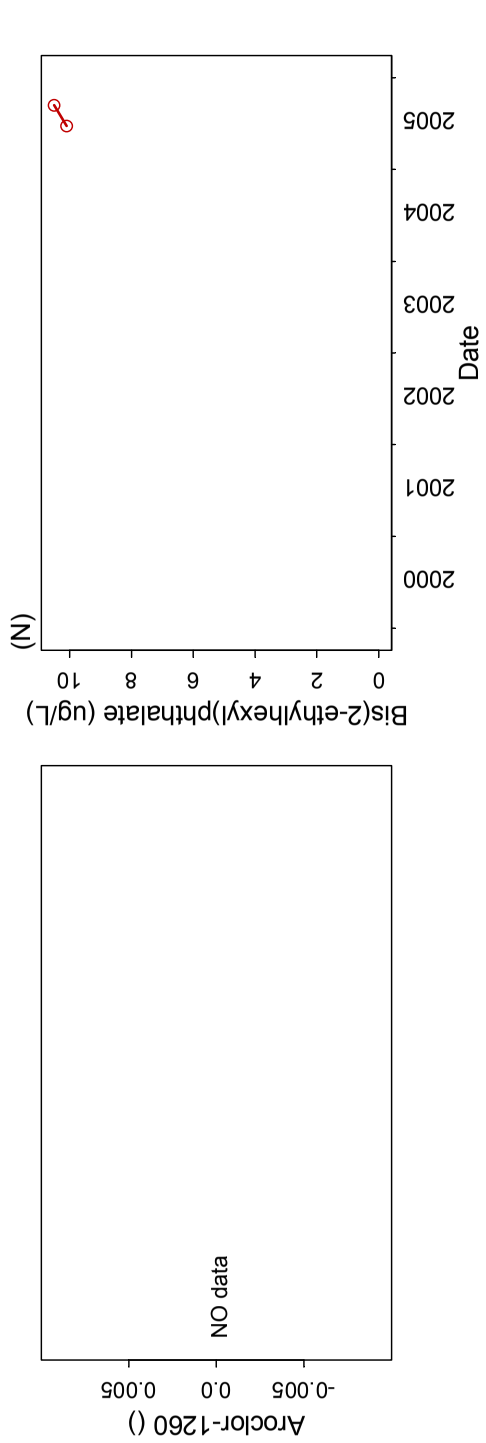


Figure D-2.2-16 (continued). Concentrations over time at MCOI-4 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

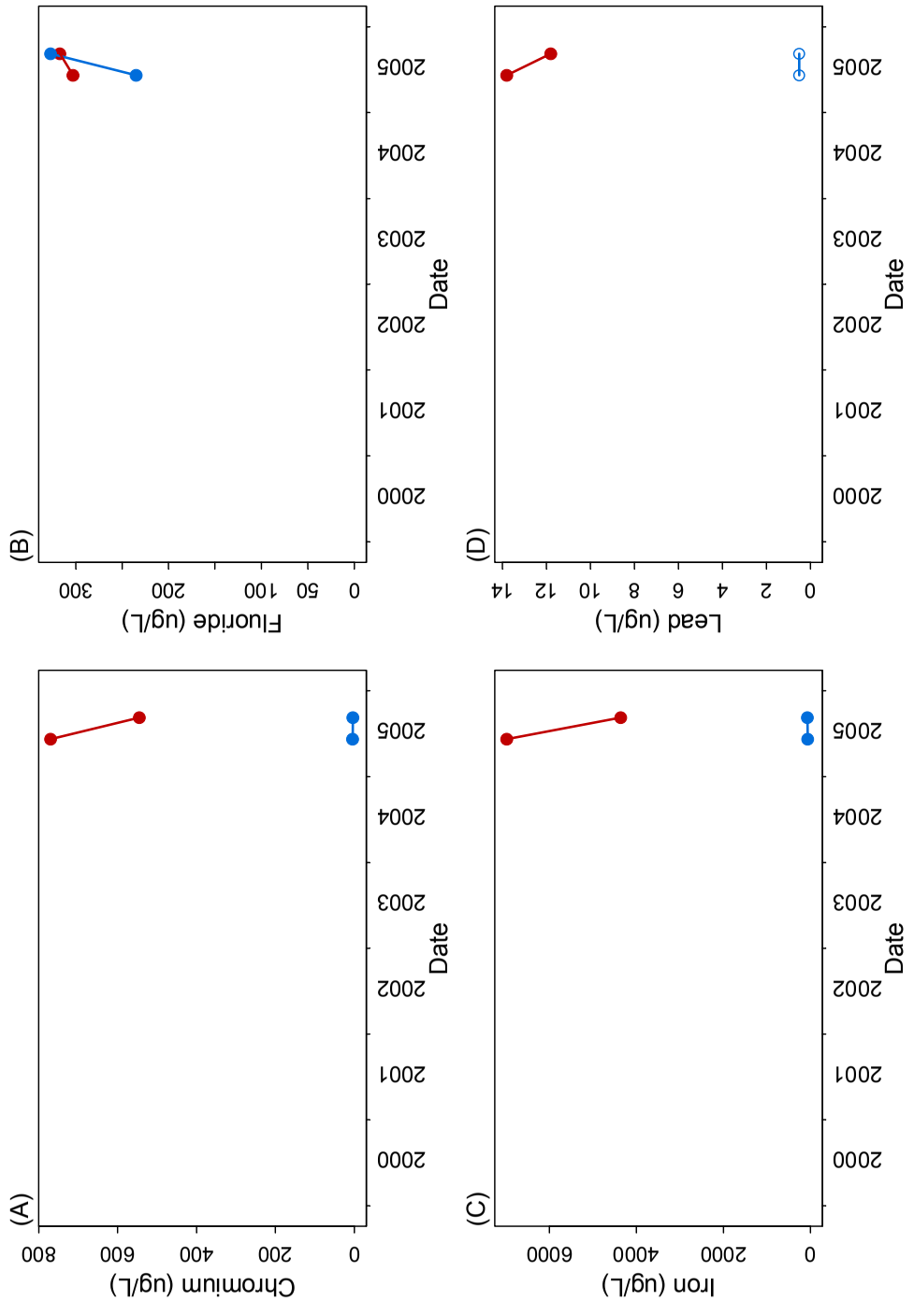


Figure D-2.2-17. Concentrations over time at MCOI-5 for (A) chromium, (B) fluoride, (C) iron, (D) lead

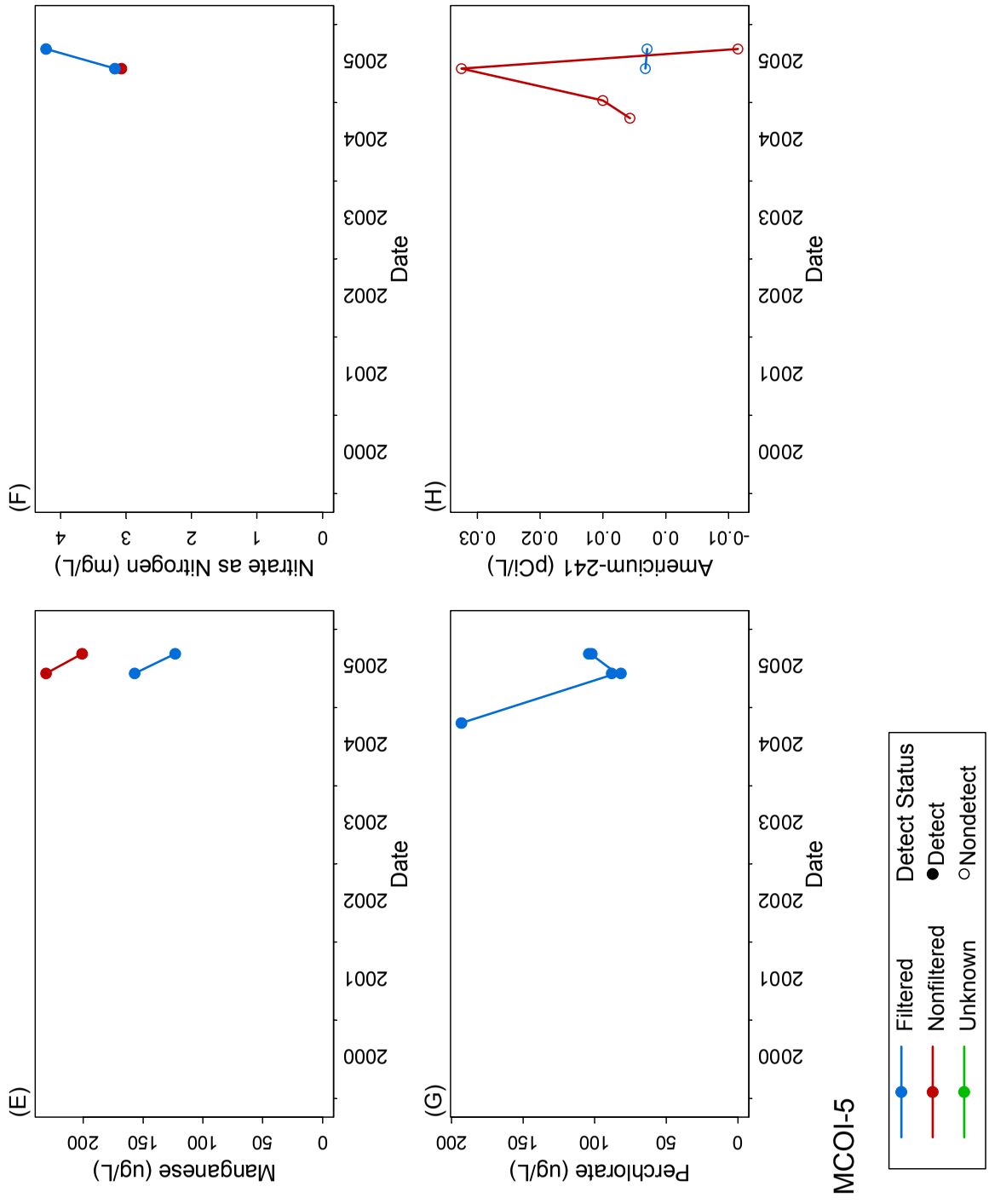


Figure D-2.2-17 (continued). Concentrations over time at MCOI-5 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

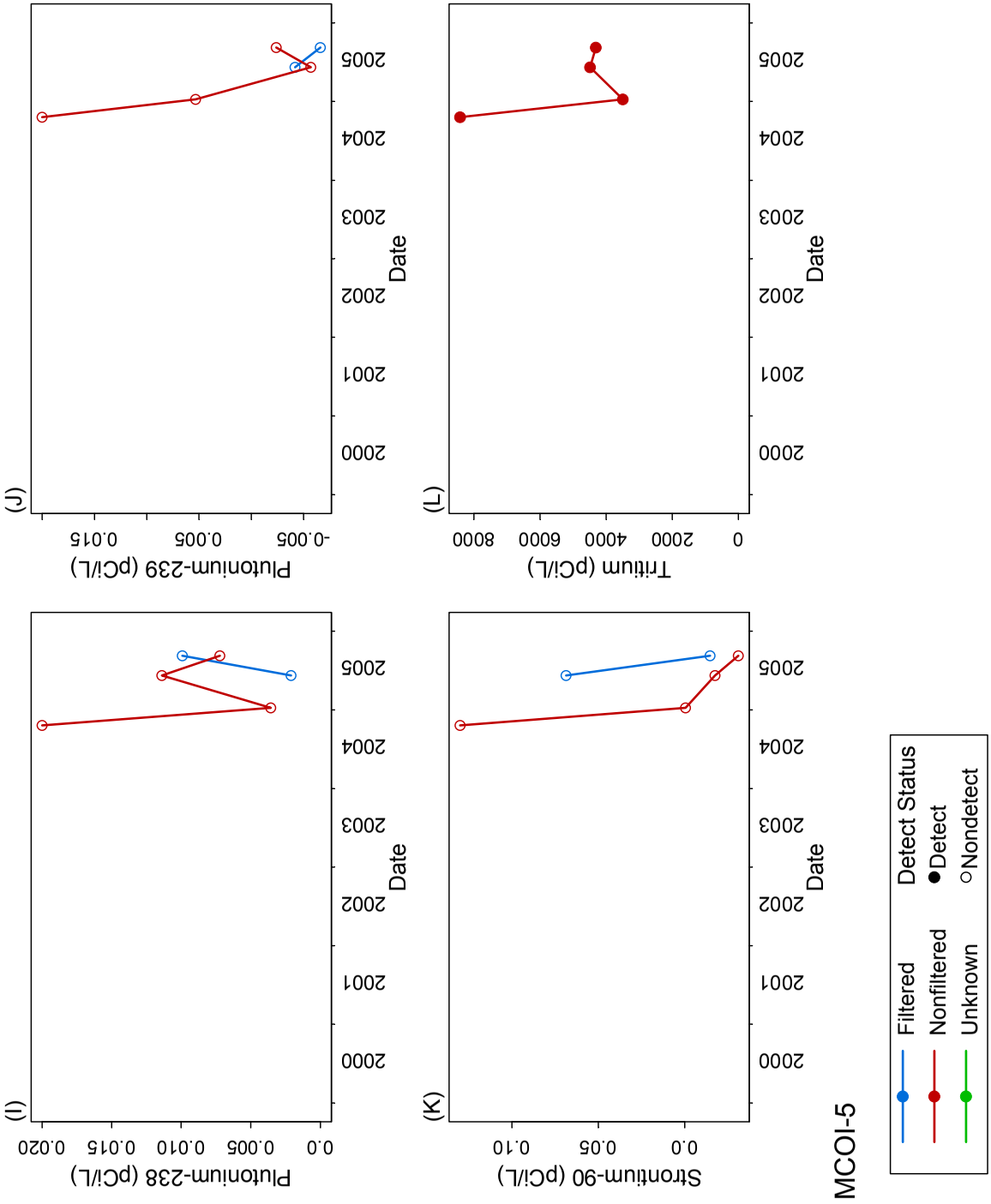


Figure D-2.2-17 (continued). Concentrations over time at MCOI-5 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

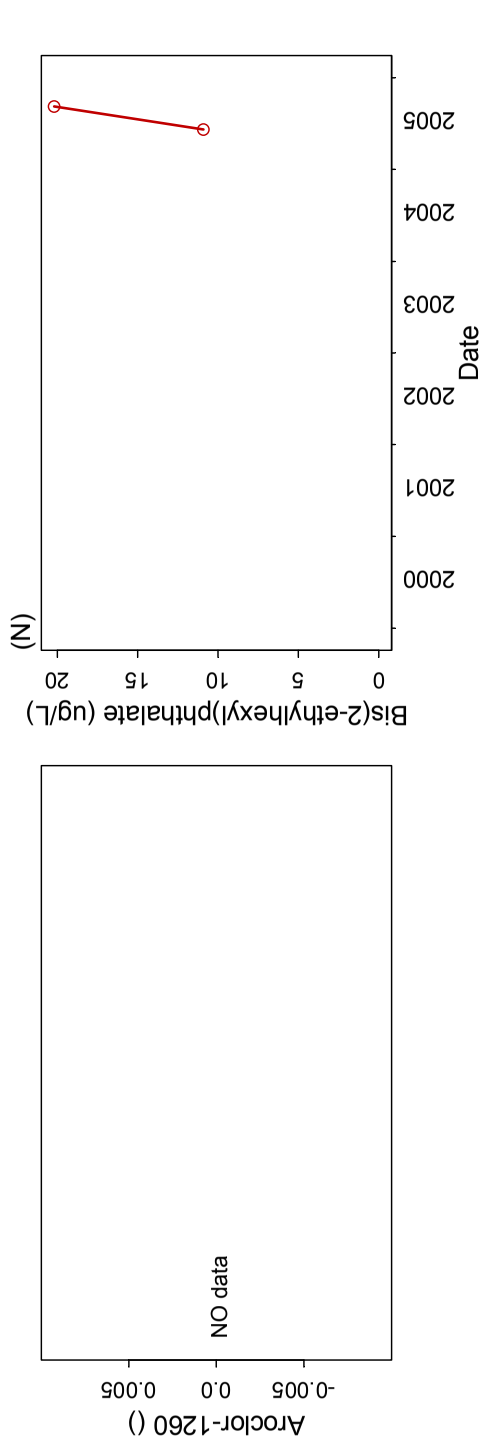


Figure D-2.2-17 (continued). Concentrations over time at MCOI-5 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

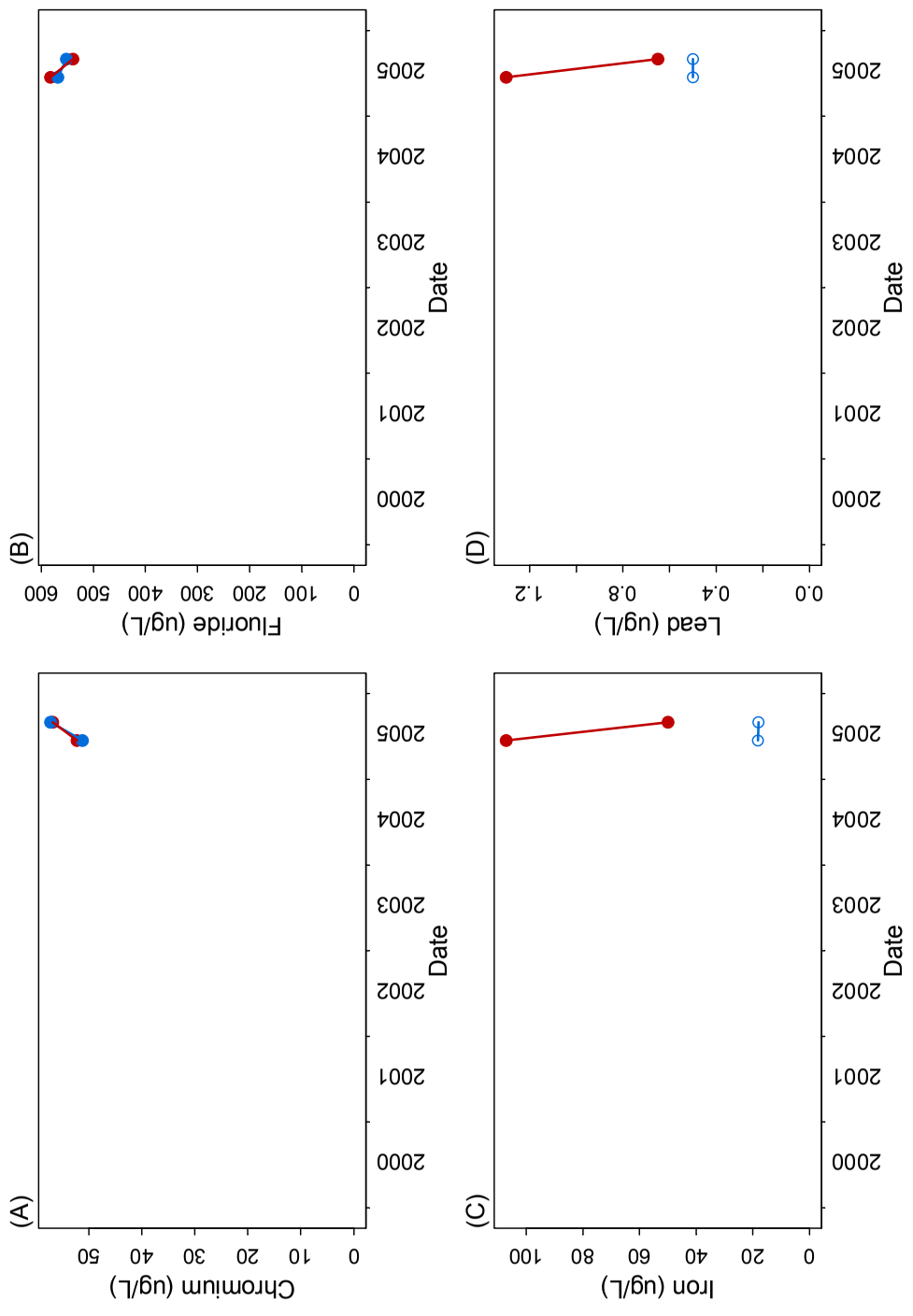


Figure D-2.2-18. Concentrations over time at MCOI-6 for (A) chromium, (B) fluoride, (C) iron, (D) lead

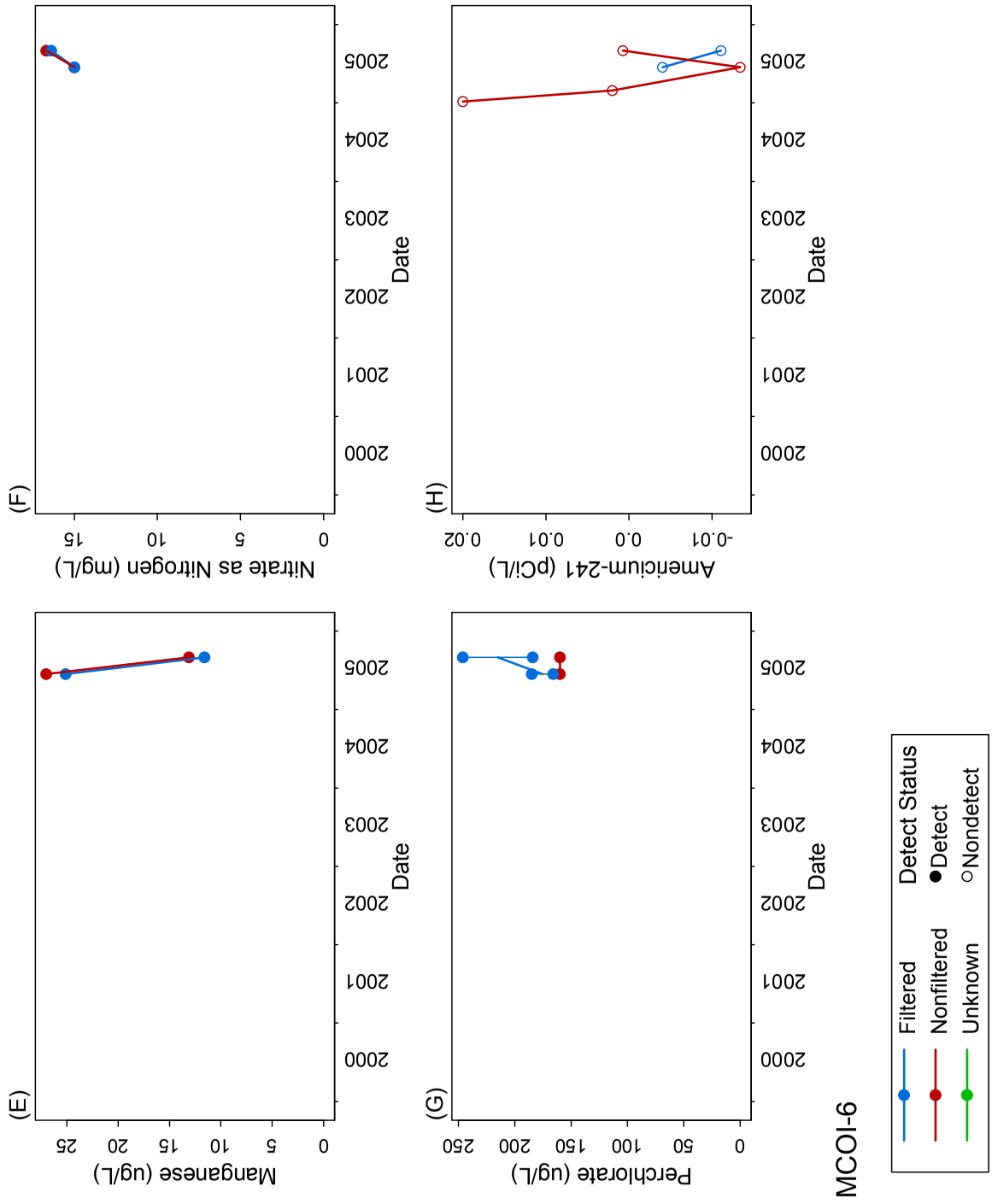


Figure D-2.2-18 (continued). Concentrations over time at MCOI-6 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

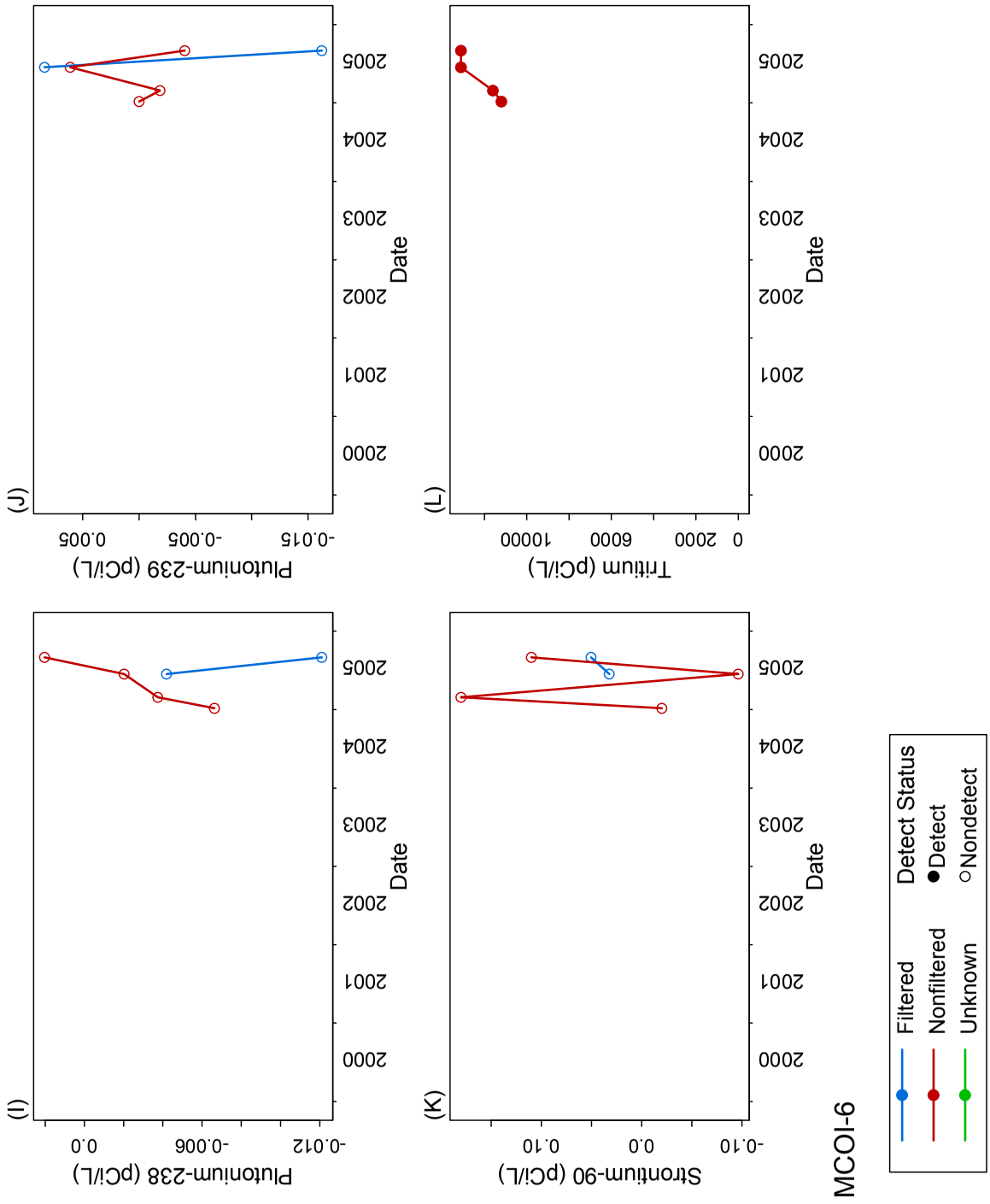


Figure D-2.2-18 (continued). Concentrations over time at MCOI-6 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

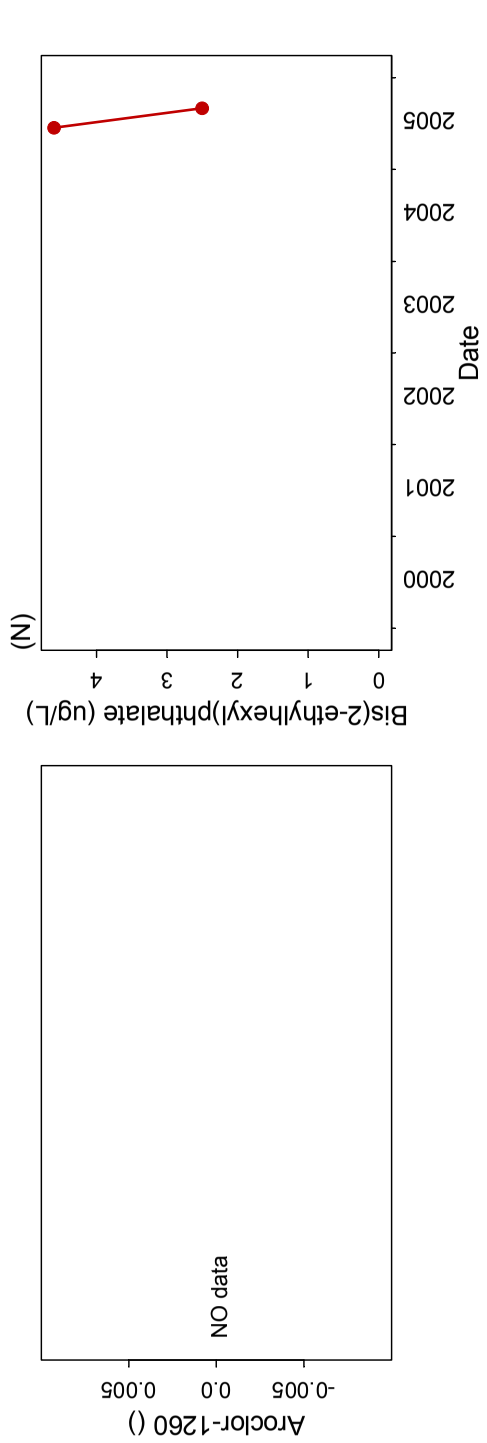


Figure D-2.2-18 (continued). Concentrations over time at MCOI-6 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

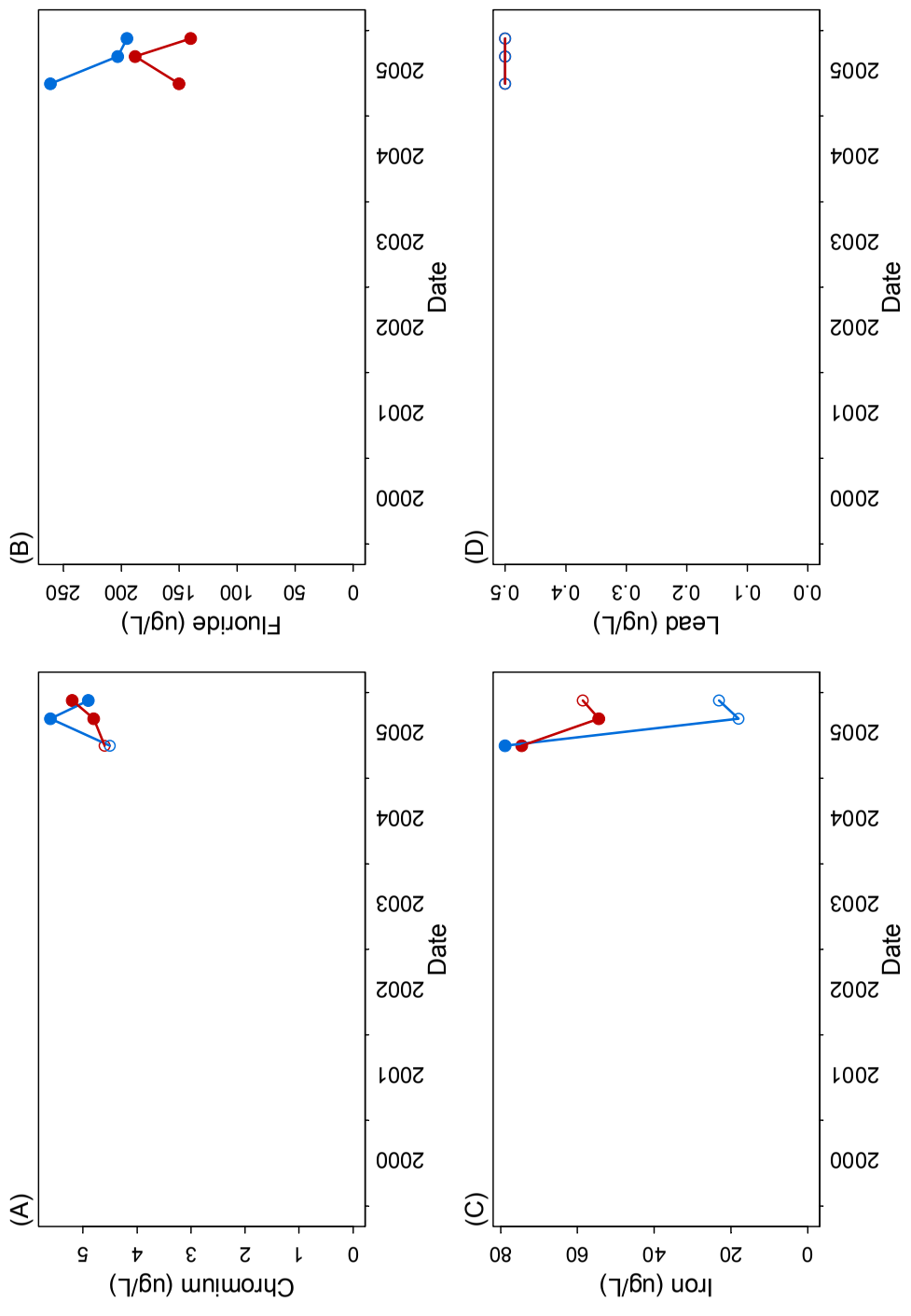


Figure D-2.2-19. Concentrations over time at R-1 for (A) chromium, (B) fluoride, (C) iron, (D) lead

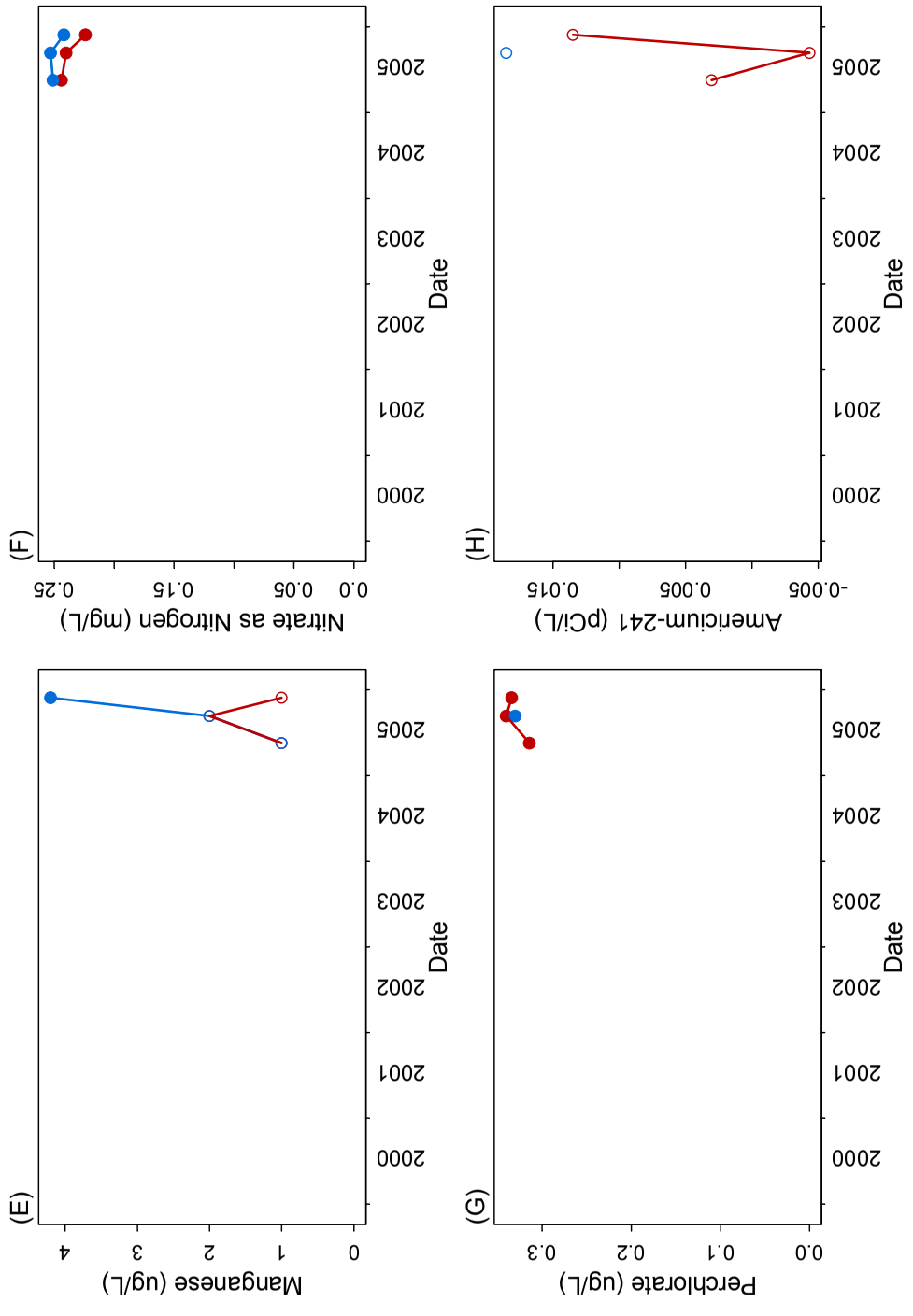


Figure D-2.2-19 (continued). Concentrations over time at R-1 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

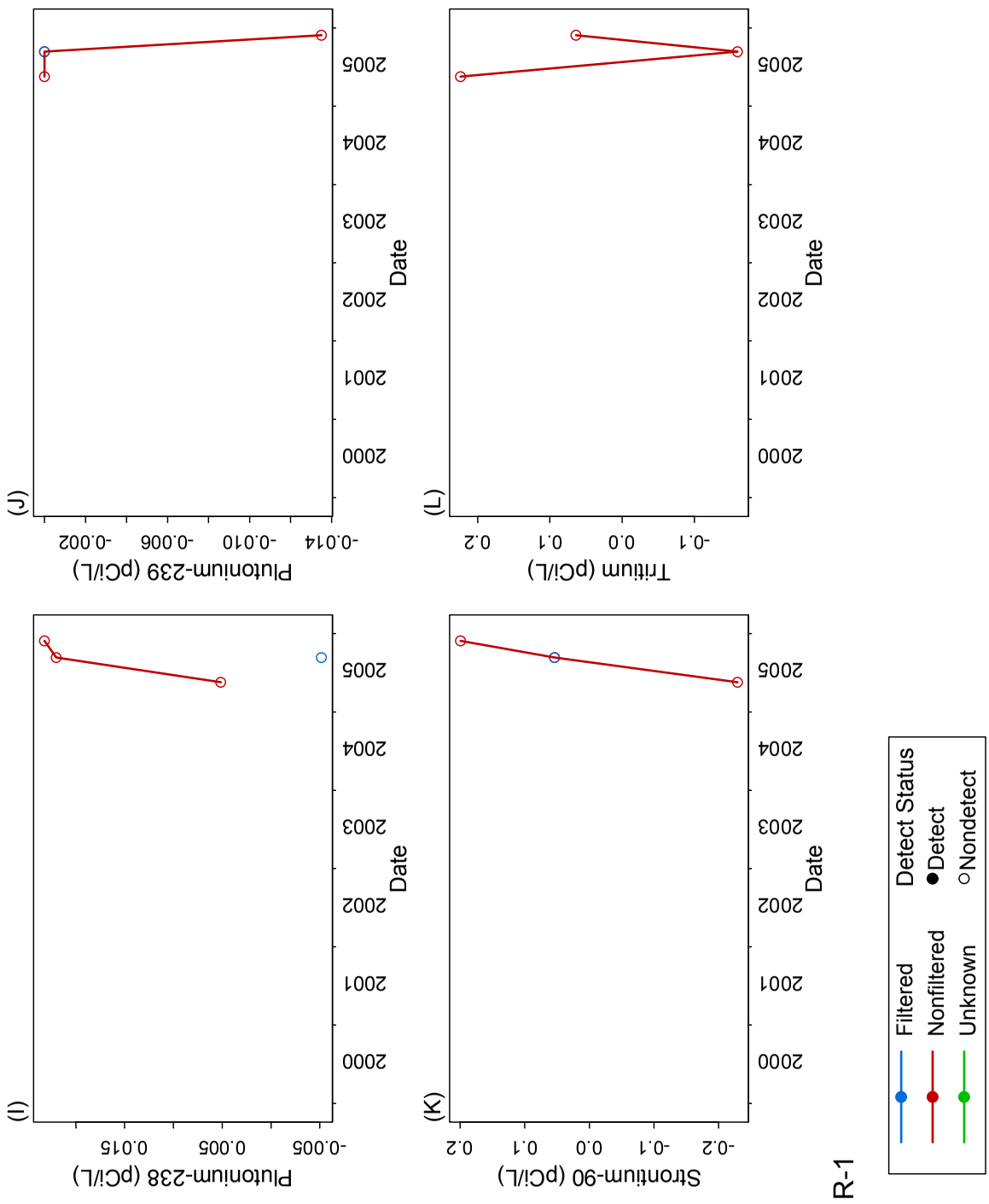


Figure D-2.2-19 (continued). Concentrations over time at R-1 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

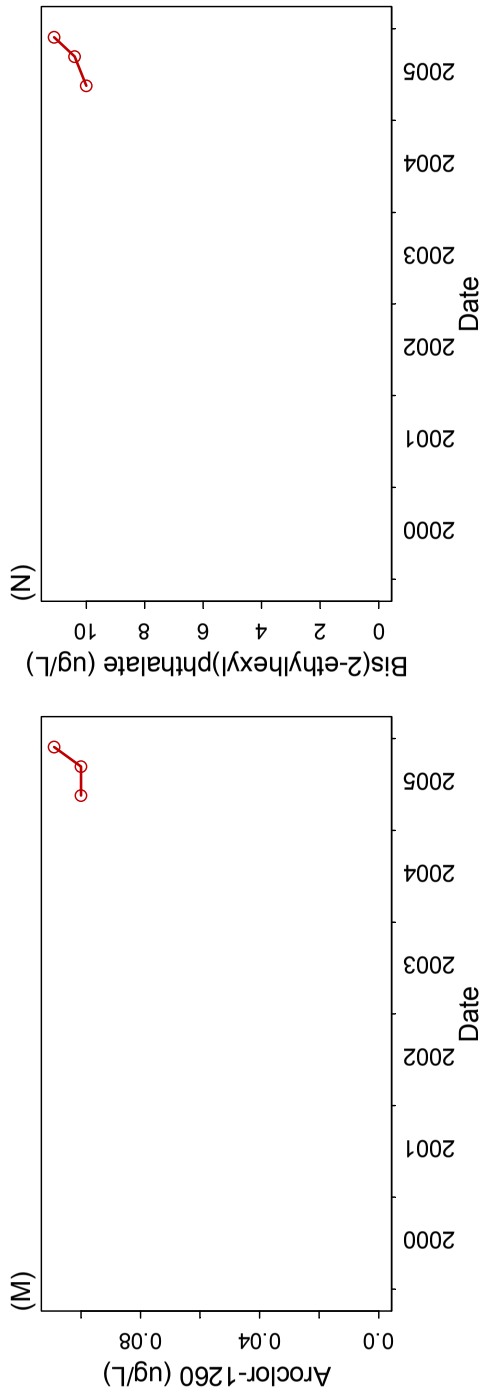


Figure D-2.2-19 (continued). Concentrations over time at R-1 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

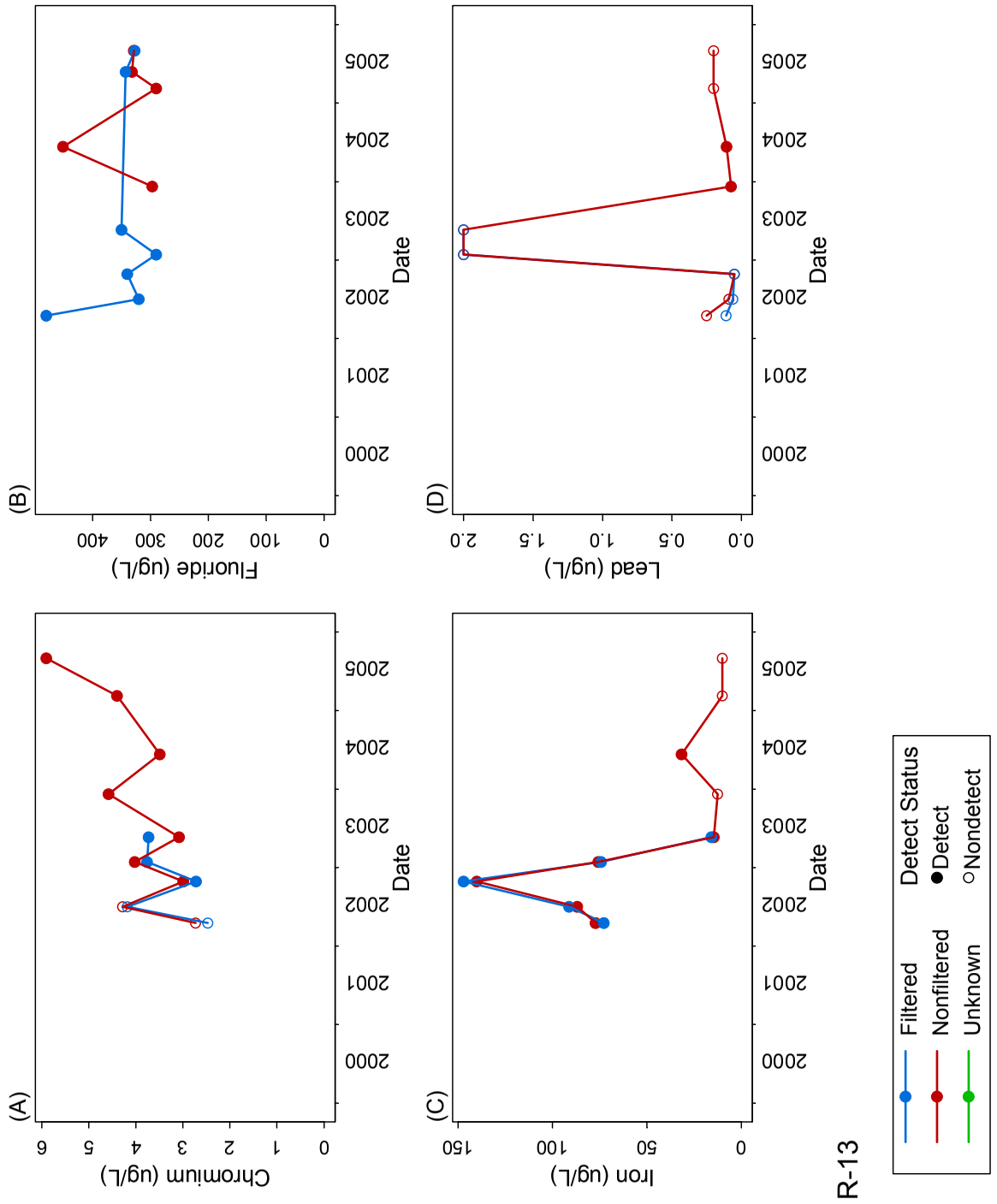


Figure D-2.2-20. Concentrations over time at R-13 for (A) chromium, (B) fluoride, (C) iron, (D) lead

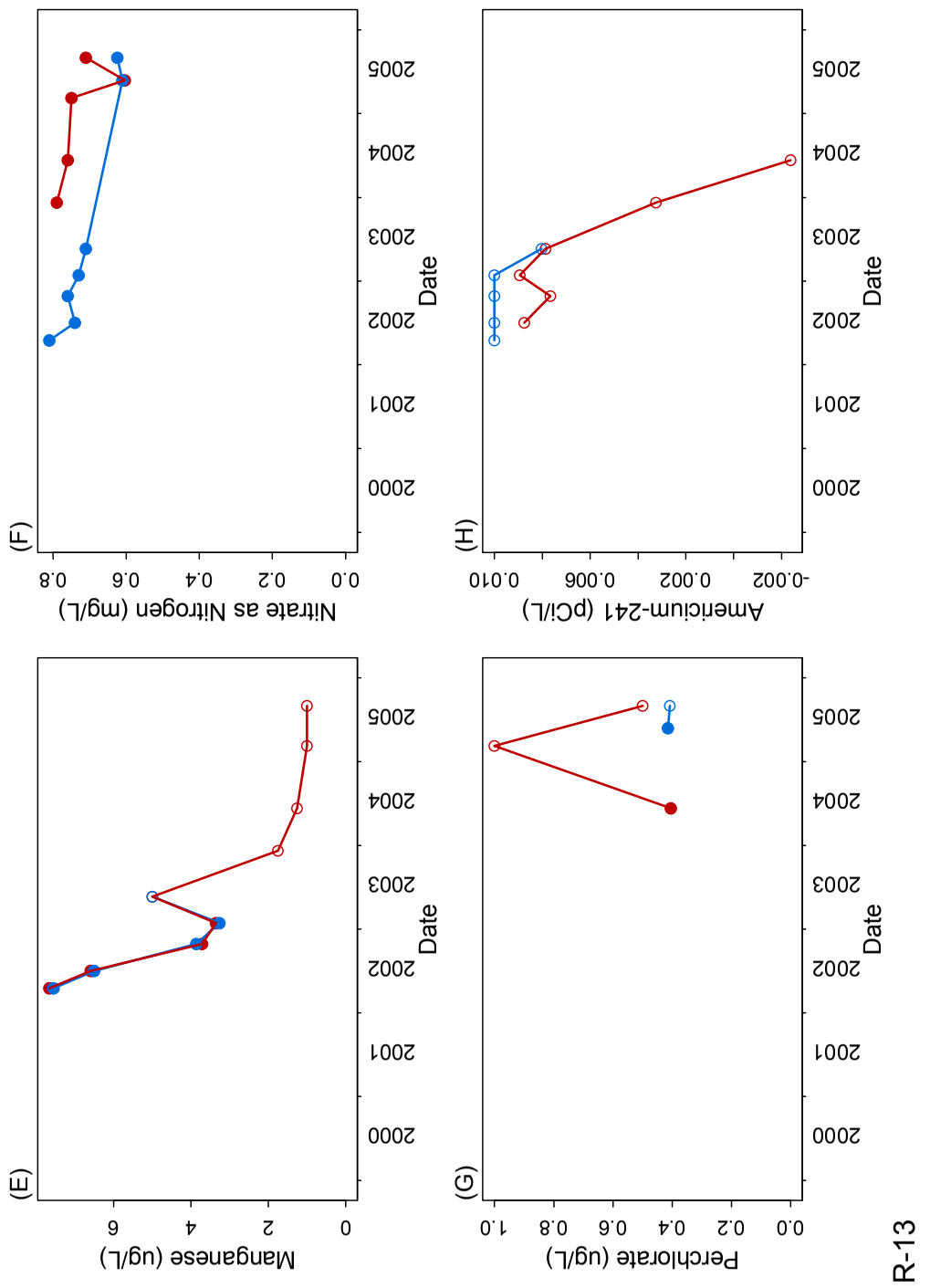


Figure D-2.2-20 (continued). Concentrations over time at R-13 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

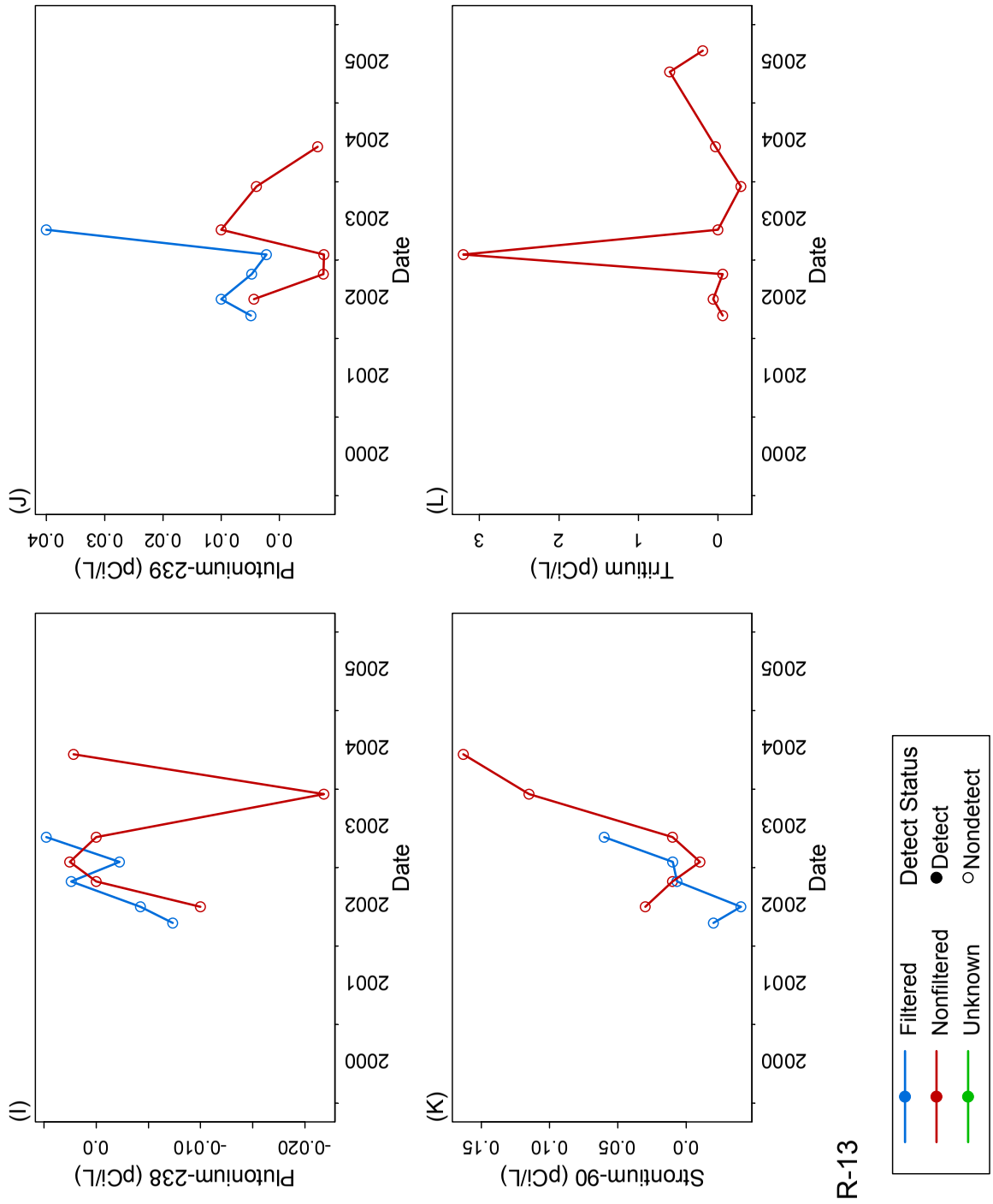


Figure D-2.2-20 (continued). Concentrations over time at R-13 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

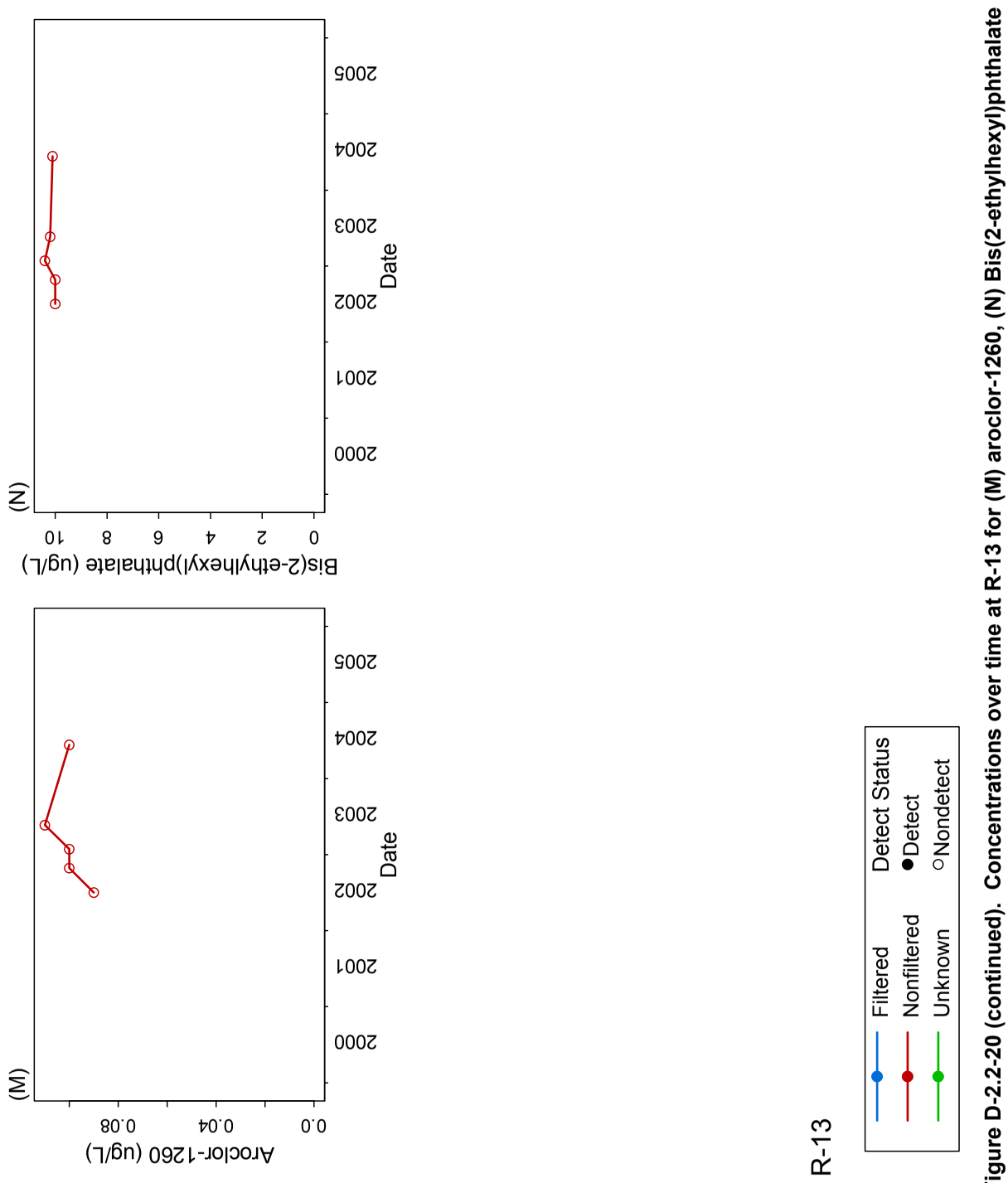


Figure D-2.2-20 (continued). Concentrations over time at R-13 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

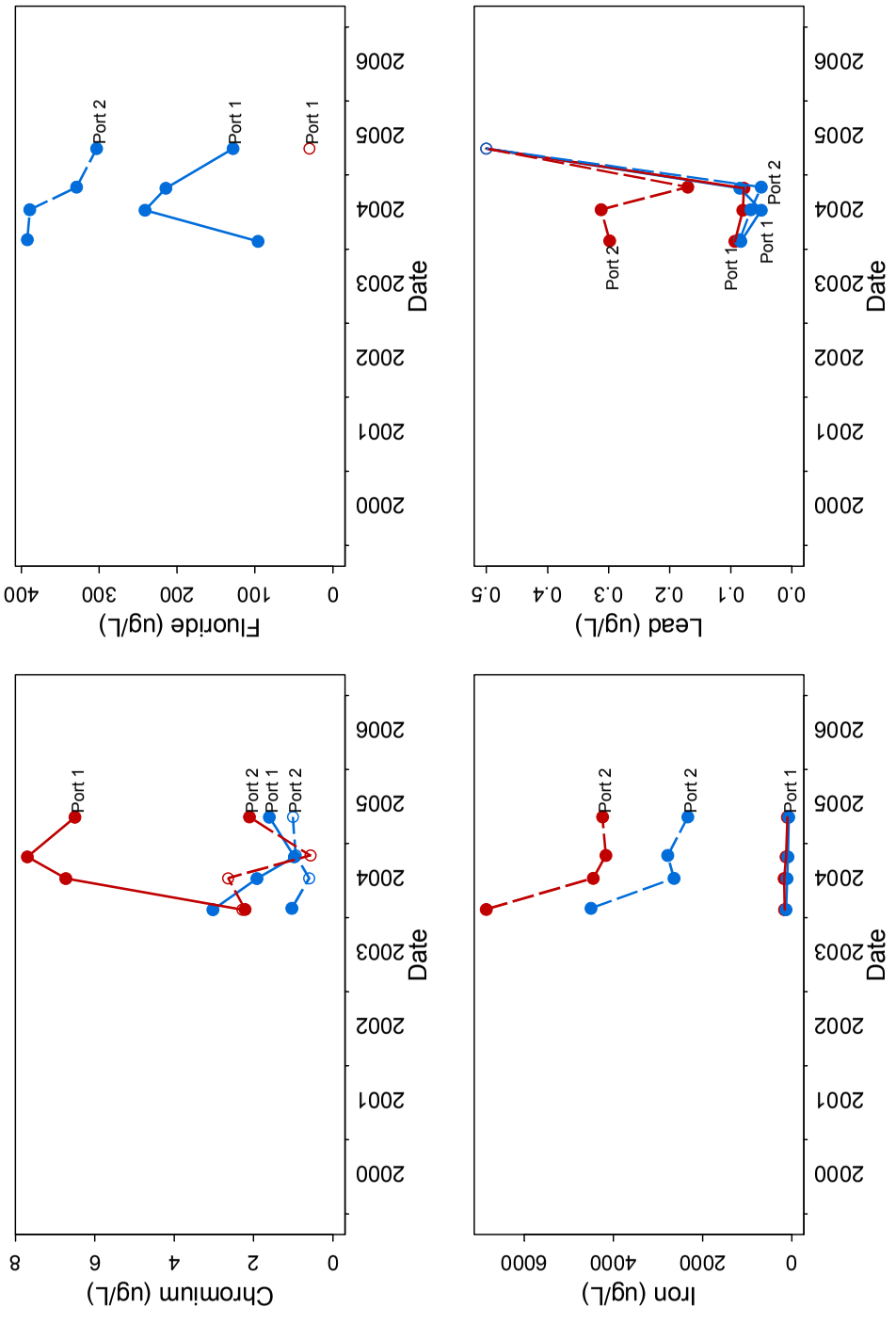


Figure D-2.2-21. Concentrations over time at R-14 for (A) chromium, (B) fluoride, (C) iron, (D) lead

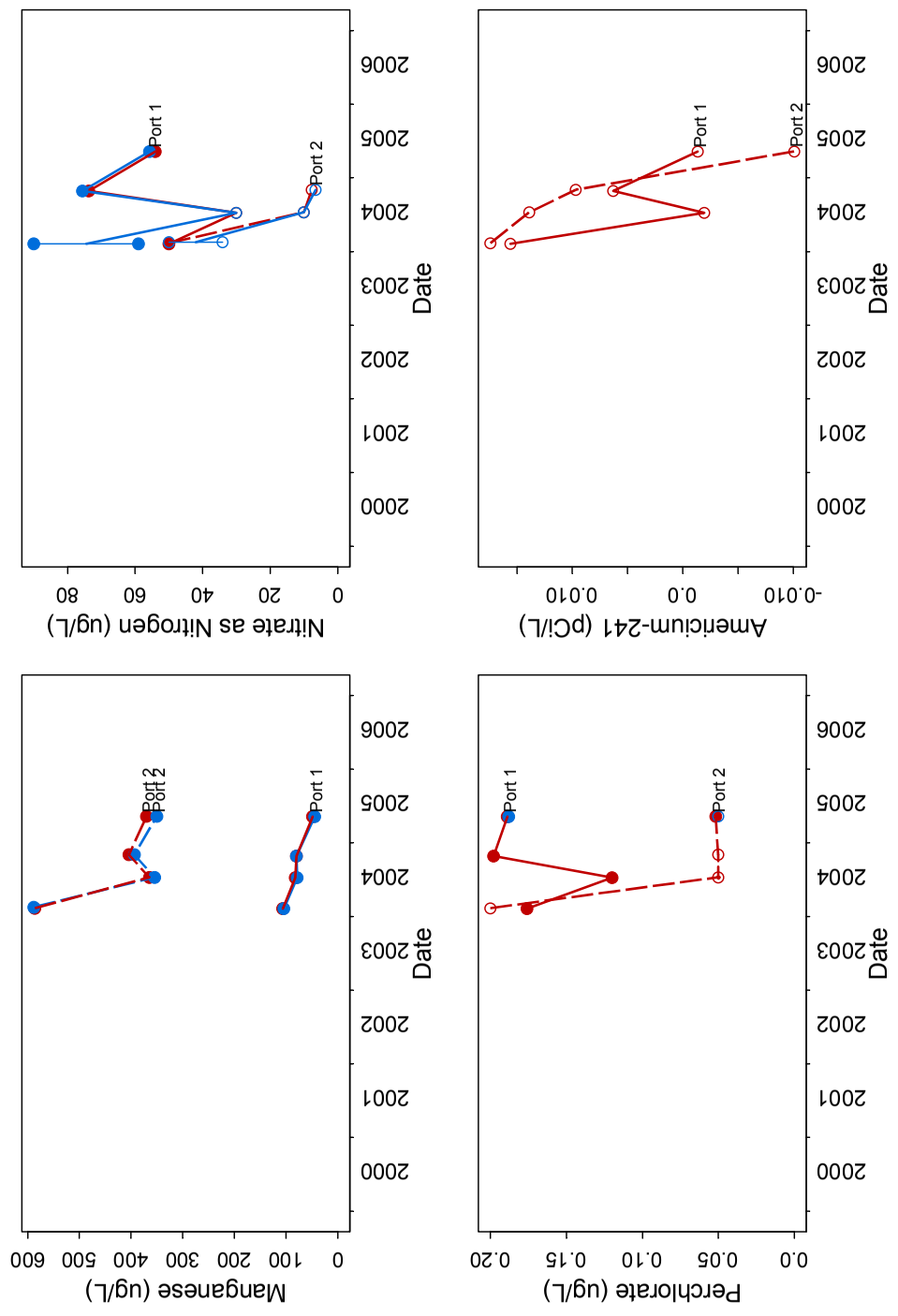


Figure D-2.2-21 (continued). Concentrations over time at R-14 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

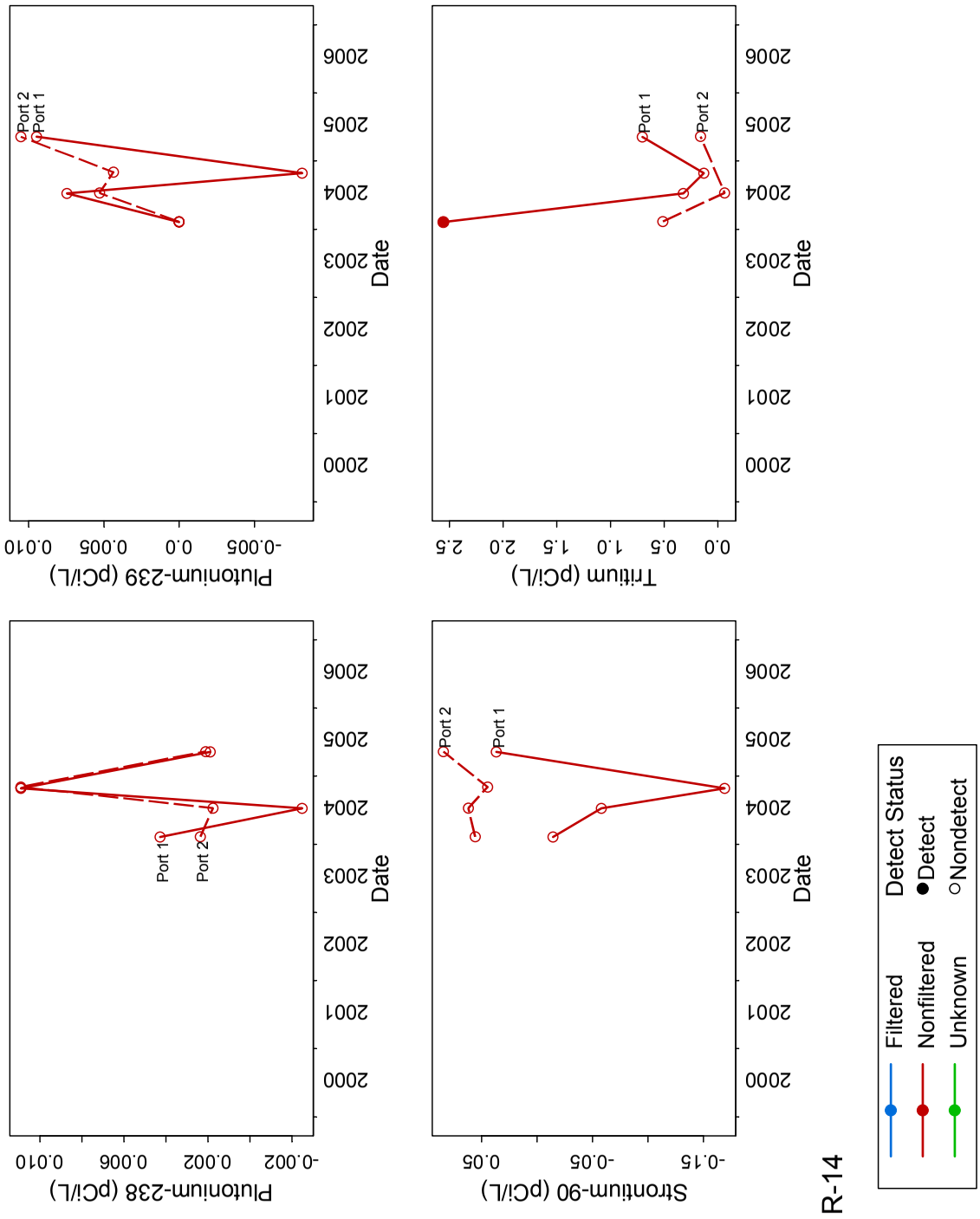
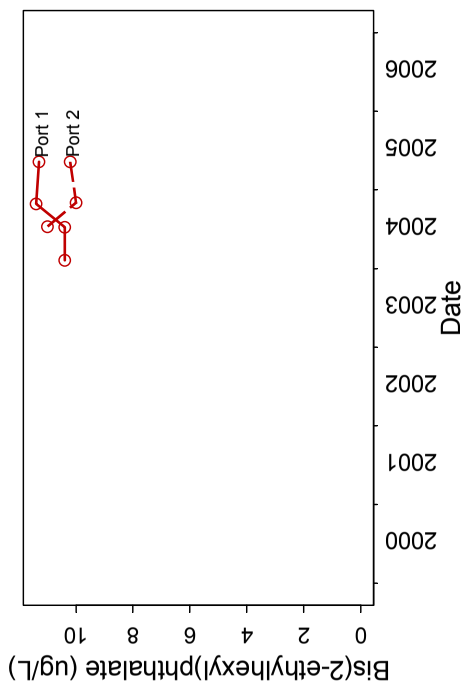
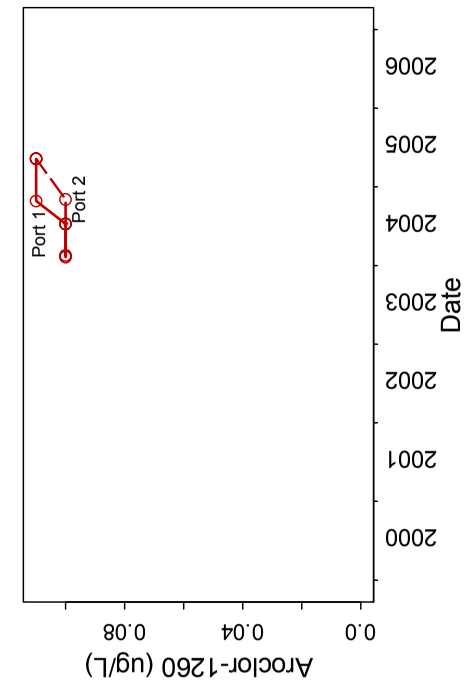
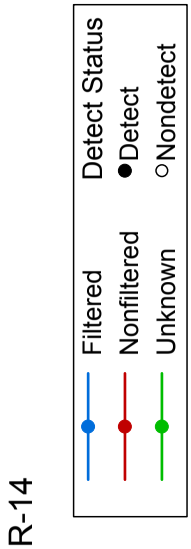


Figure D-2.2-21 (continued). Concentrations over time at R-14 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium







R-14

Figure D-2.2-21 (continued). Concentrations over time at R-14 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

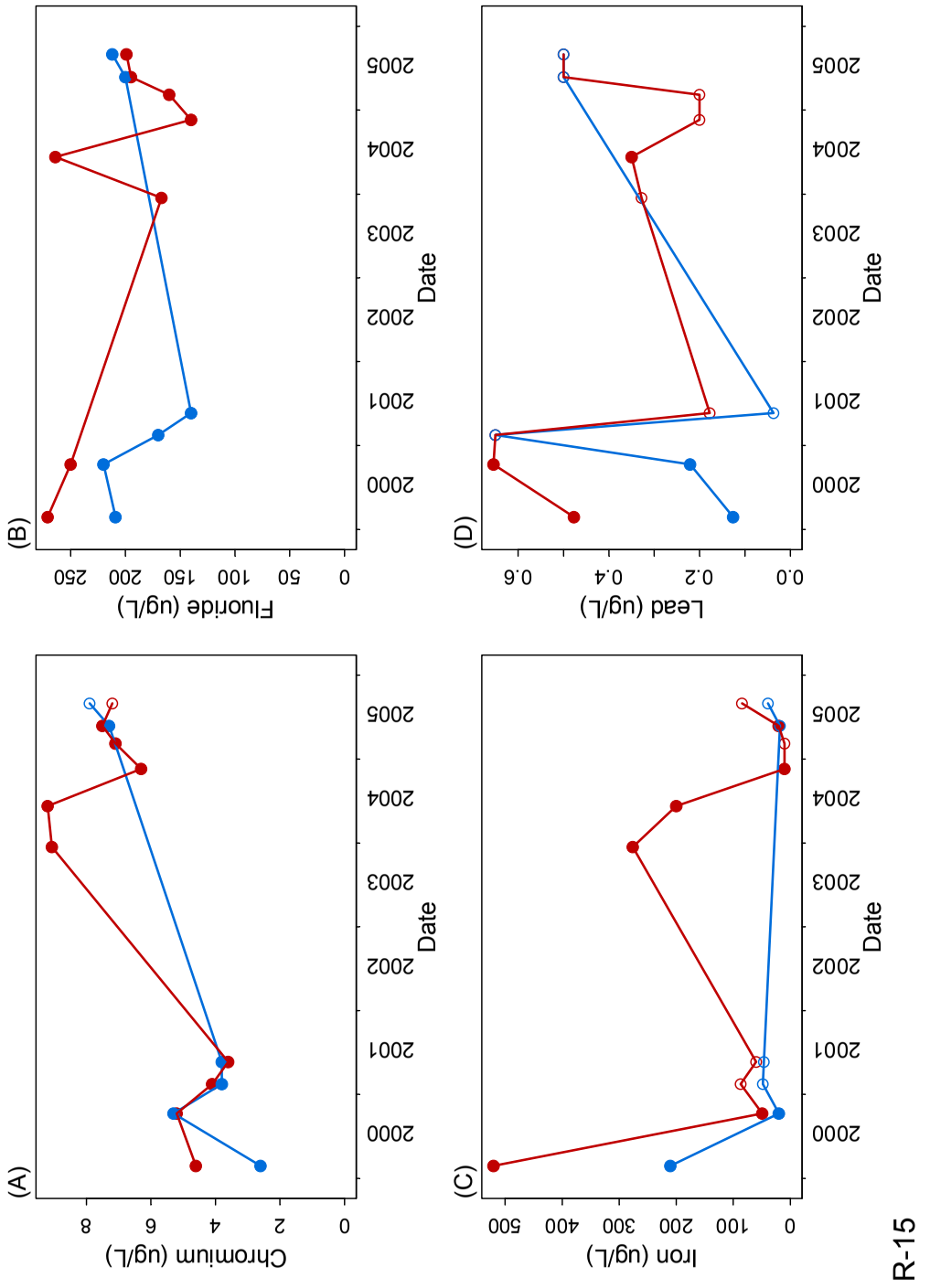


Figure D-2.2-22. Concentrations over time at R-15 for (A) chromium, (B) fluoride, (C) iron, (D) lead

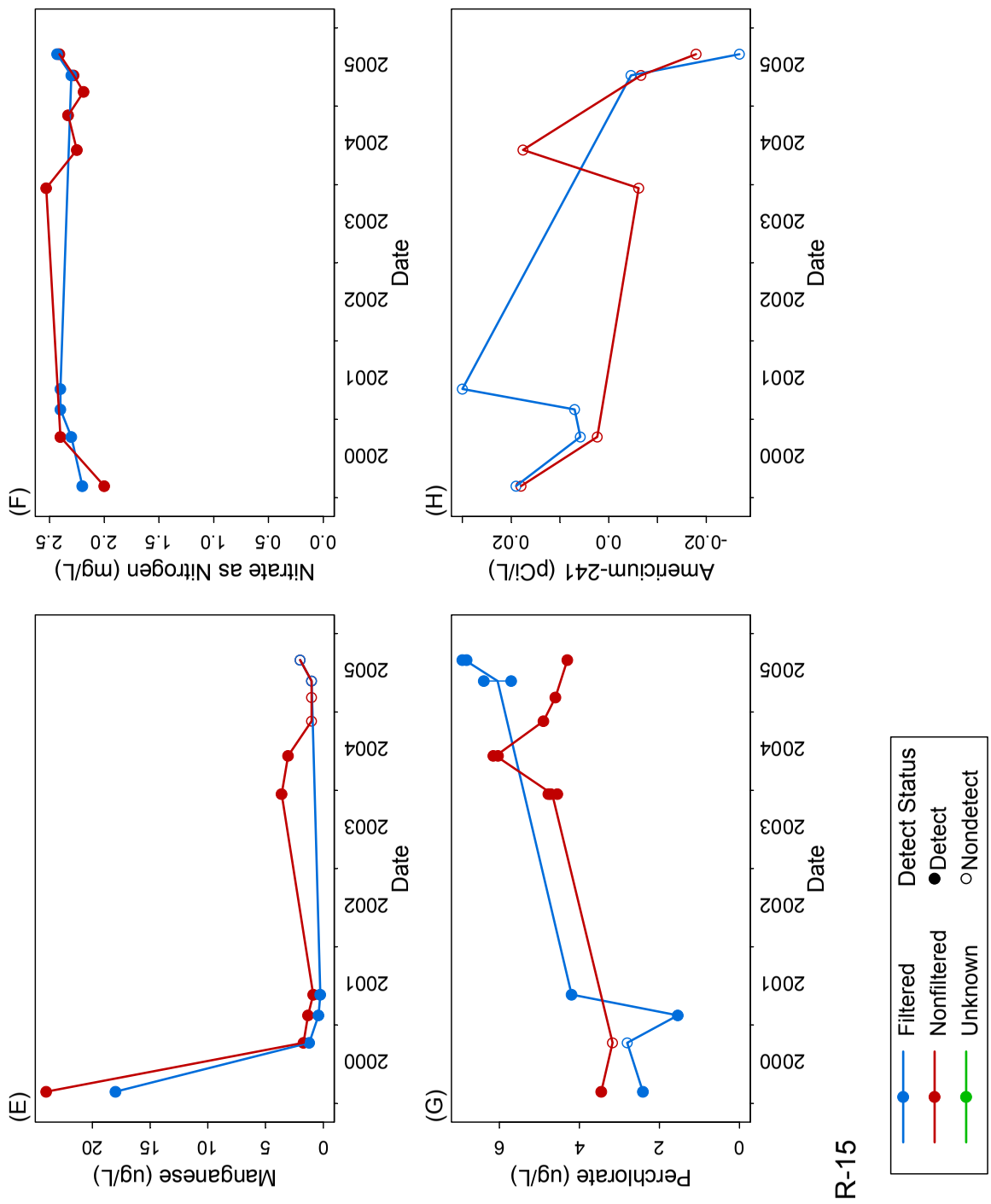


Figure D-2.2-22 (continued). Concentrations over time at R-15 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

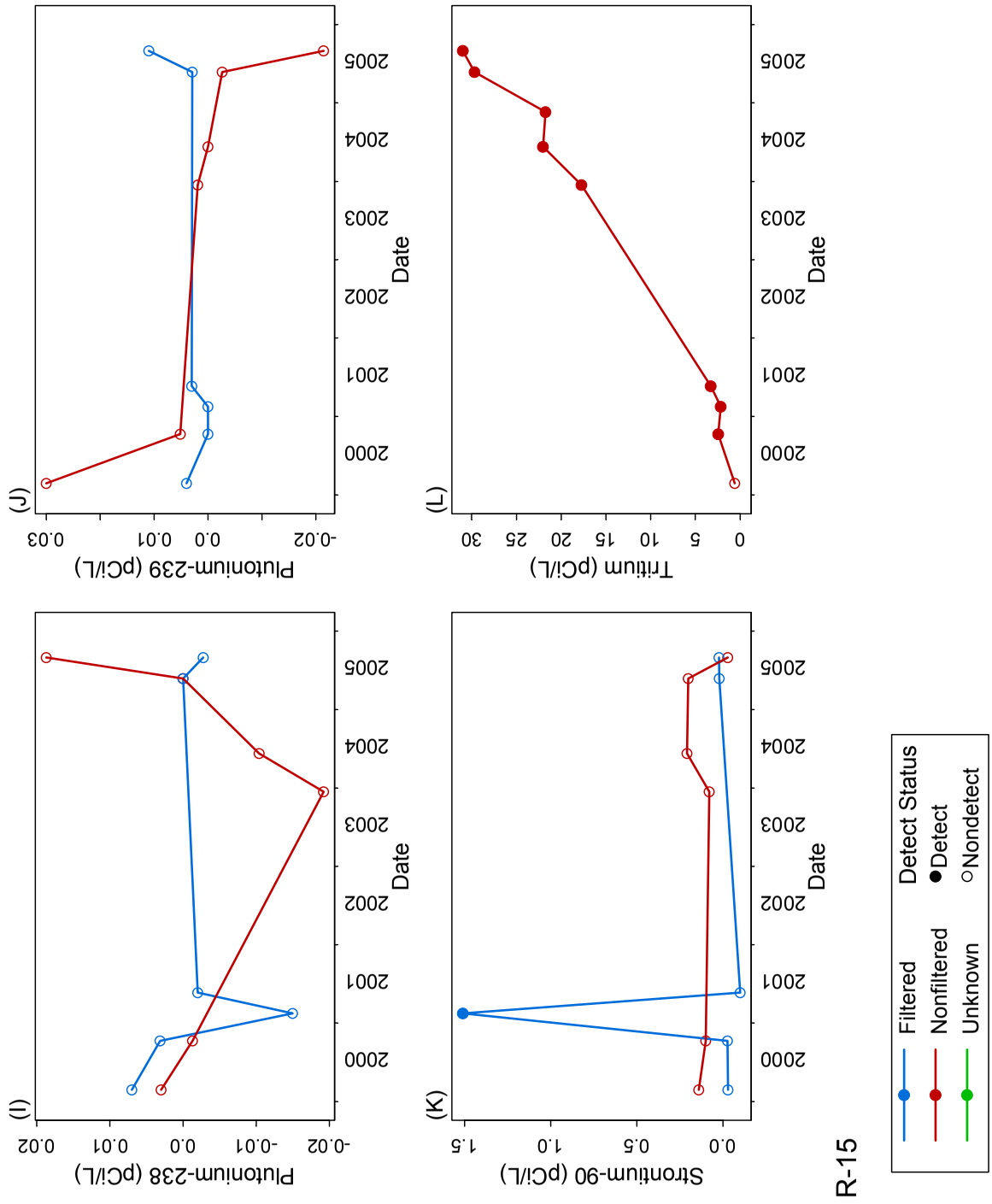


Figure D-2.2-22 (continued). Concentrations over time at R-15 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

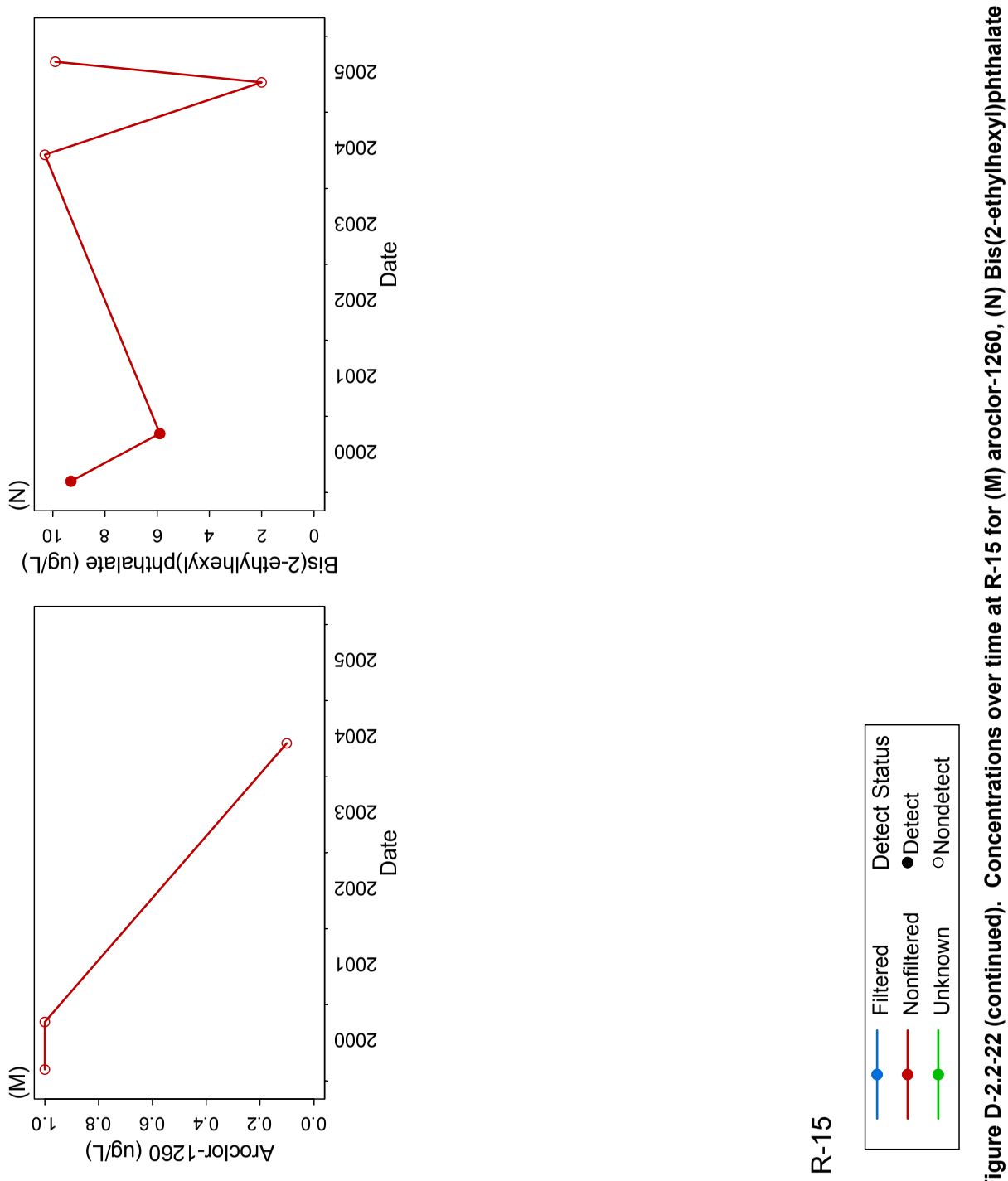


Figure D-2.2-22 (continued). Concentrations over time at R-15 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

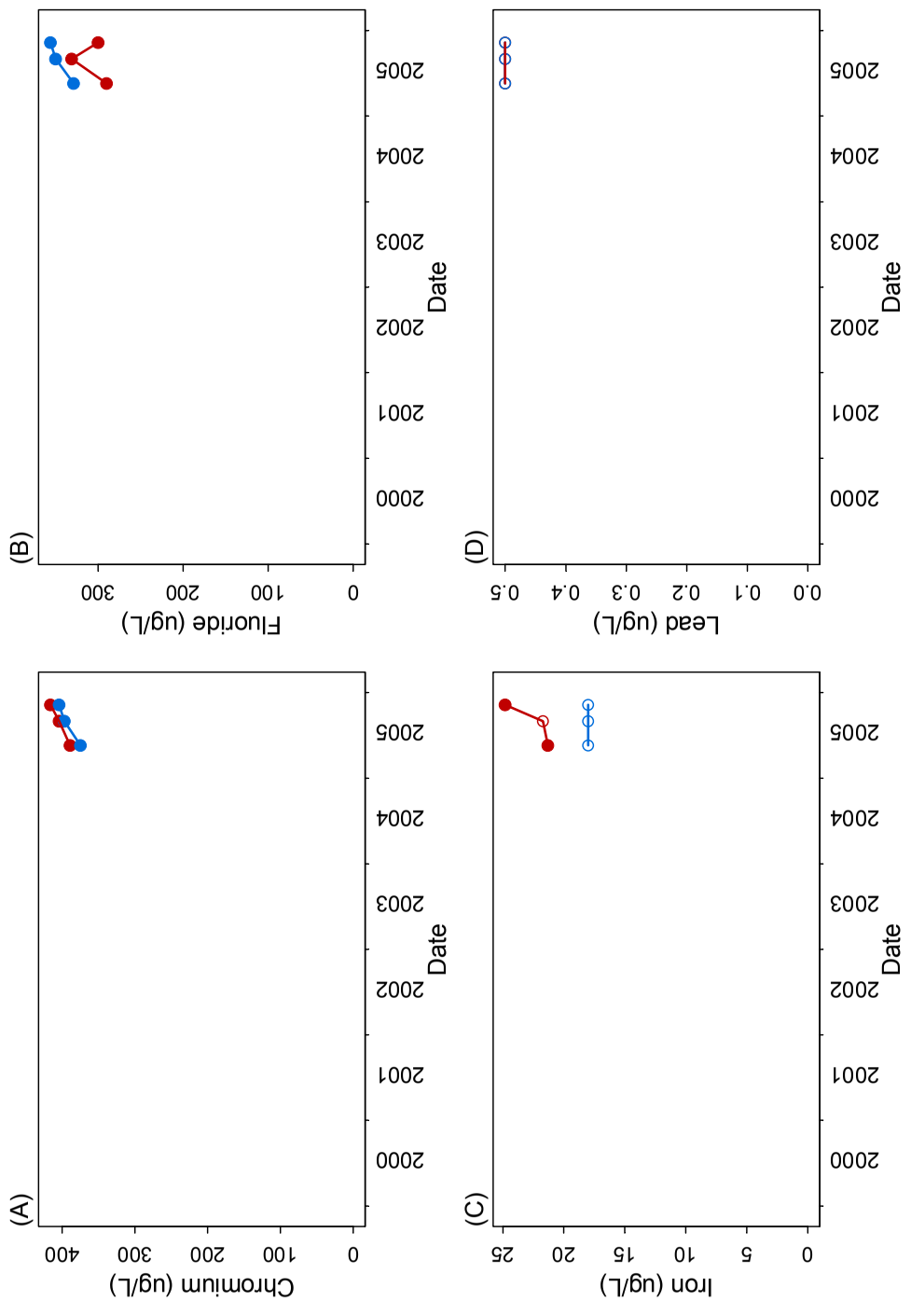


Figure D-2.2-23. Concentrations over time at R-28 for (A) chromium, (B) fluoride, (C) iron, (D) lead

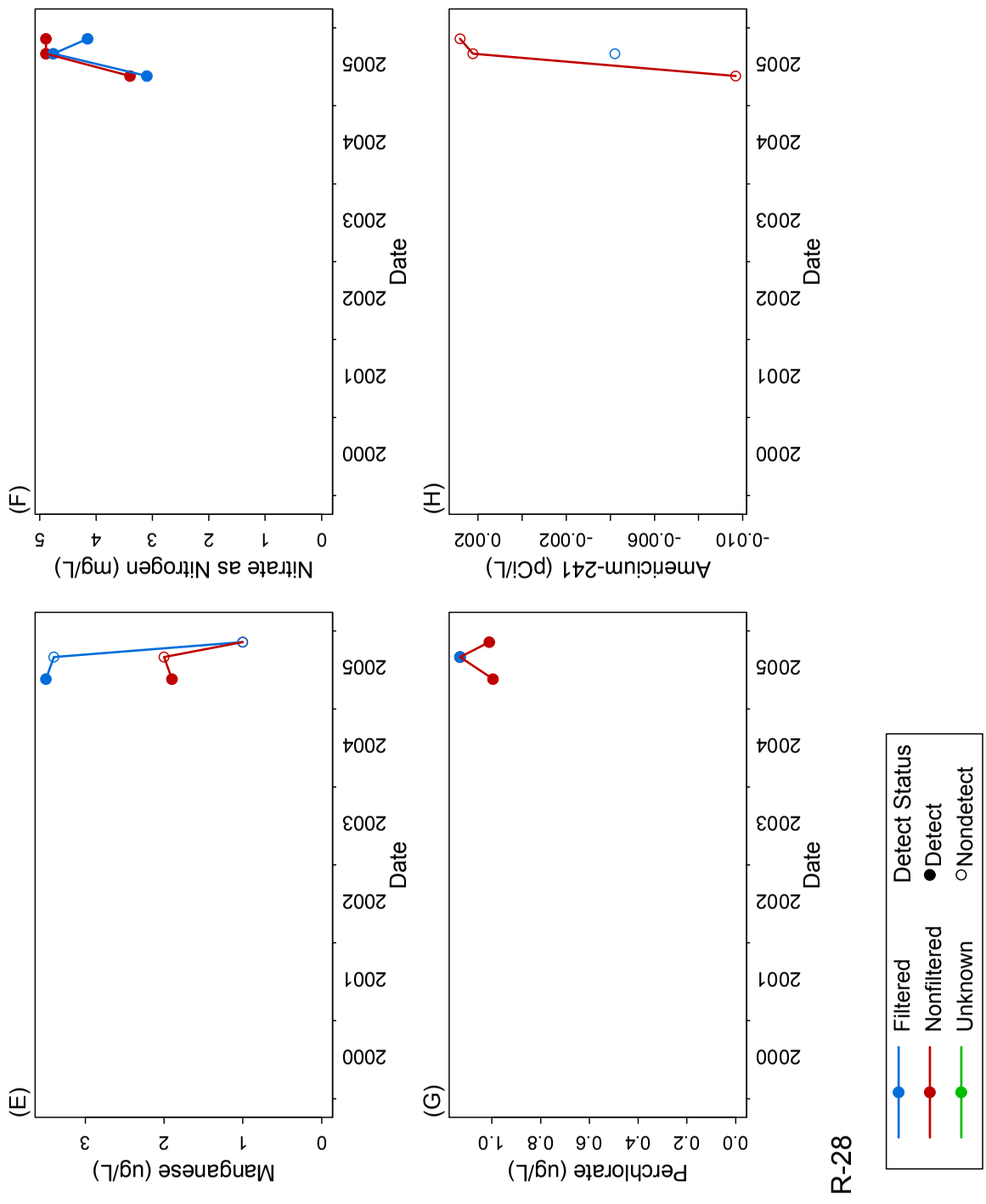


Figure D-2.2-23 (continued). Concentrations over time at R-28 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

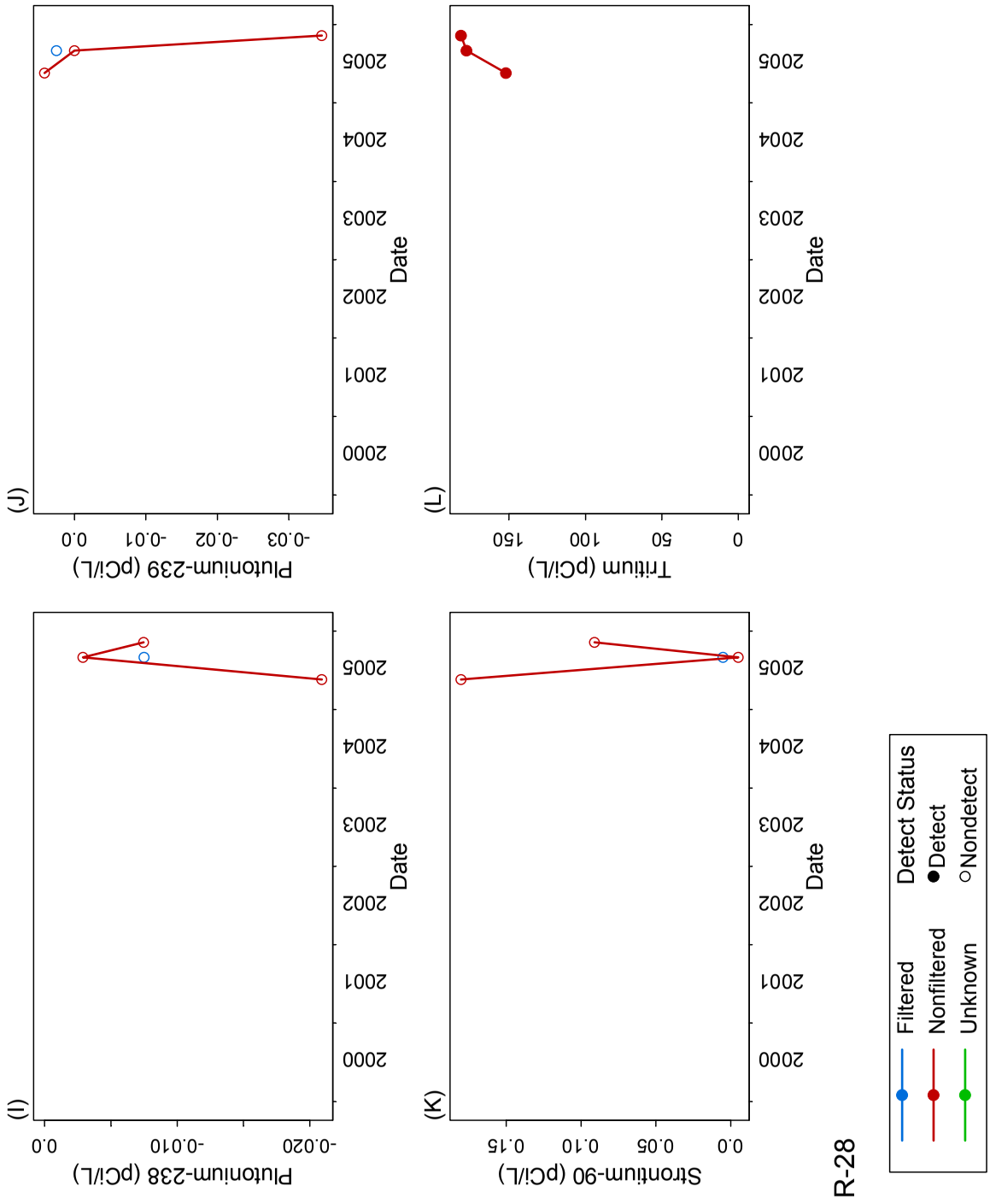


Figure D-2.2-23 (continued). Concentrations over time at R-28 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

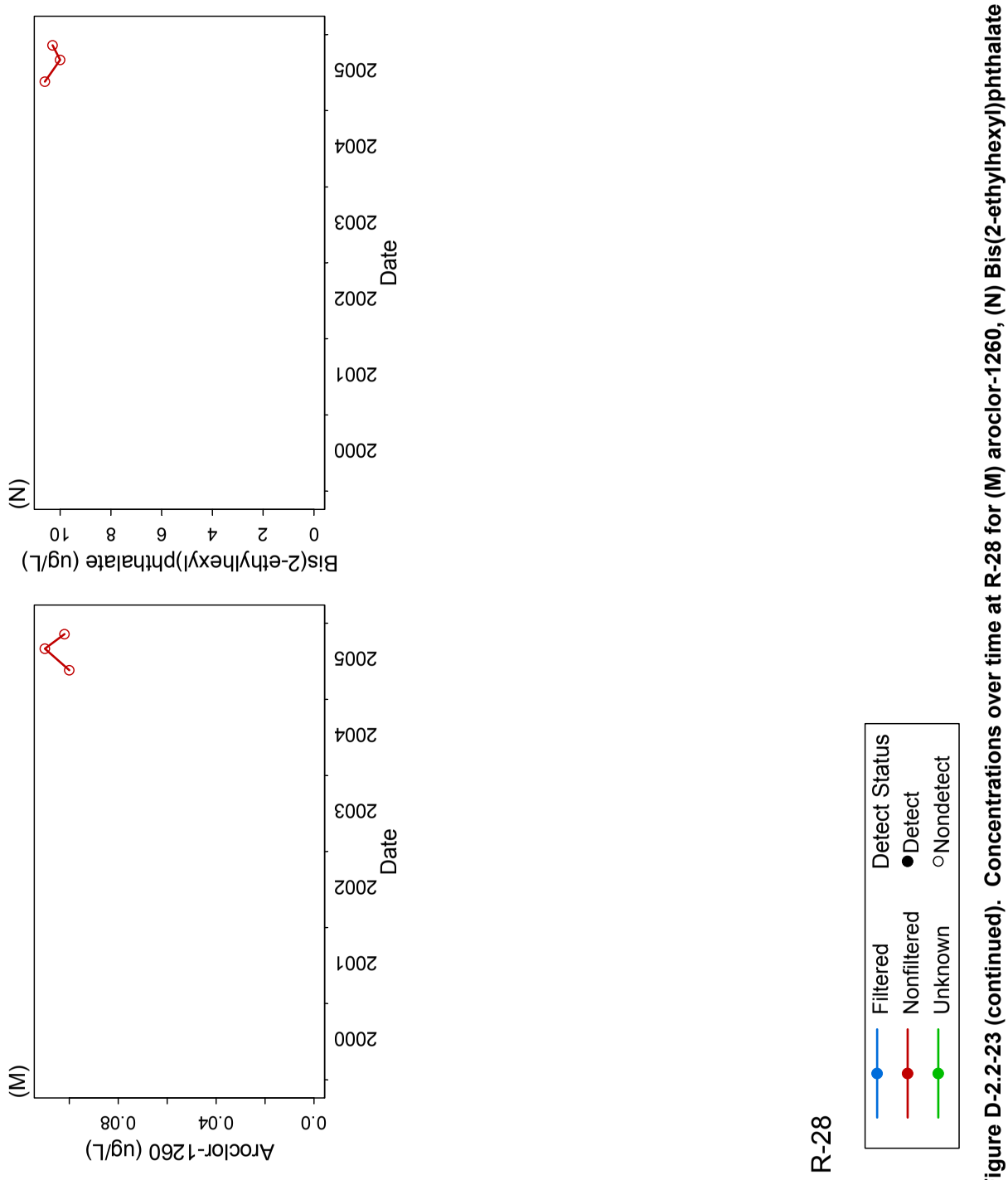


Figure D-2.2-23 (continued). Concentrations over time at R-28 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

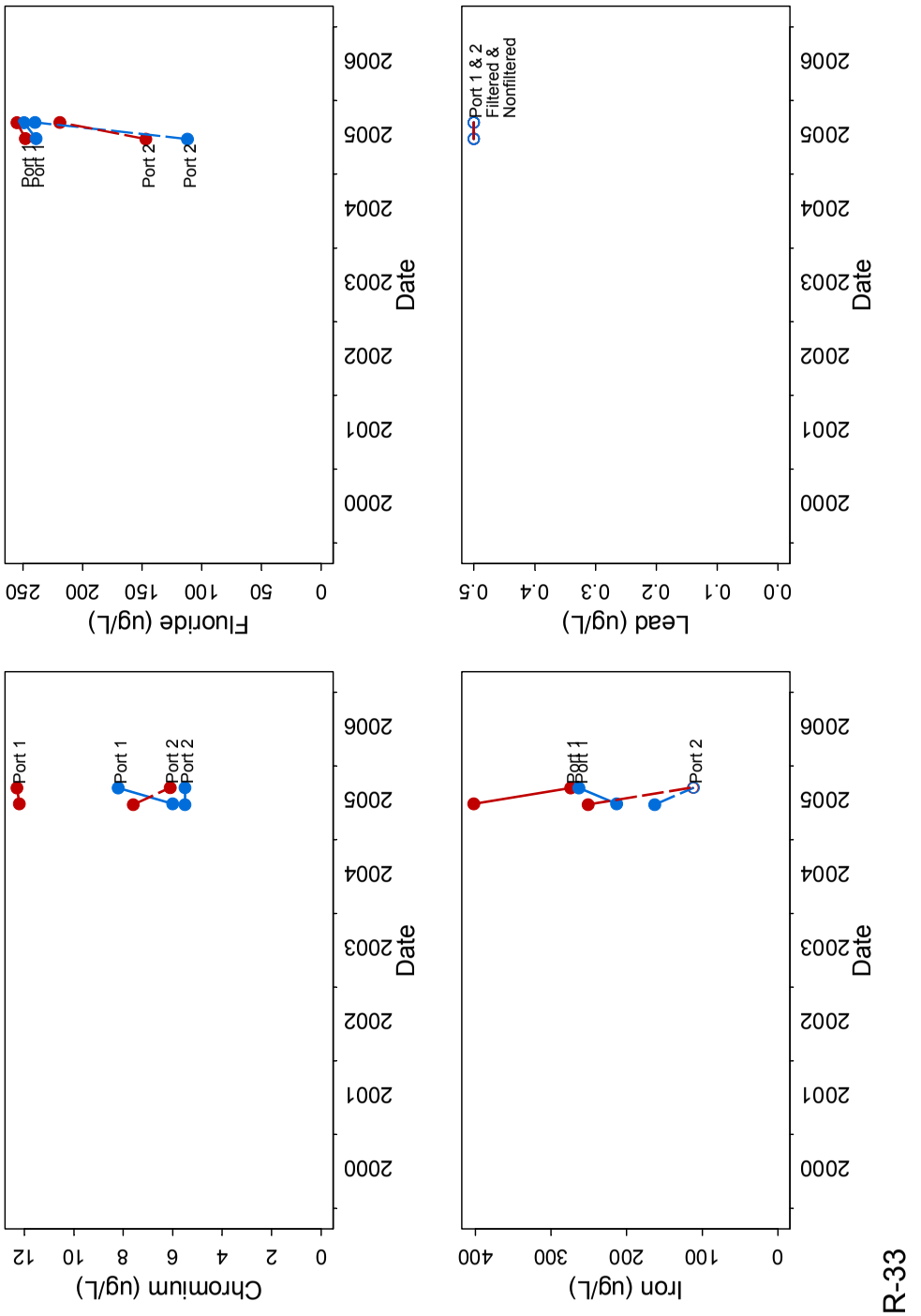


Figure D-2.2-24. Concentrations over time at R-33 for (A) chromium, (B) fluoride, (C) iron, (D) lead

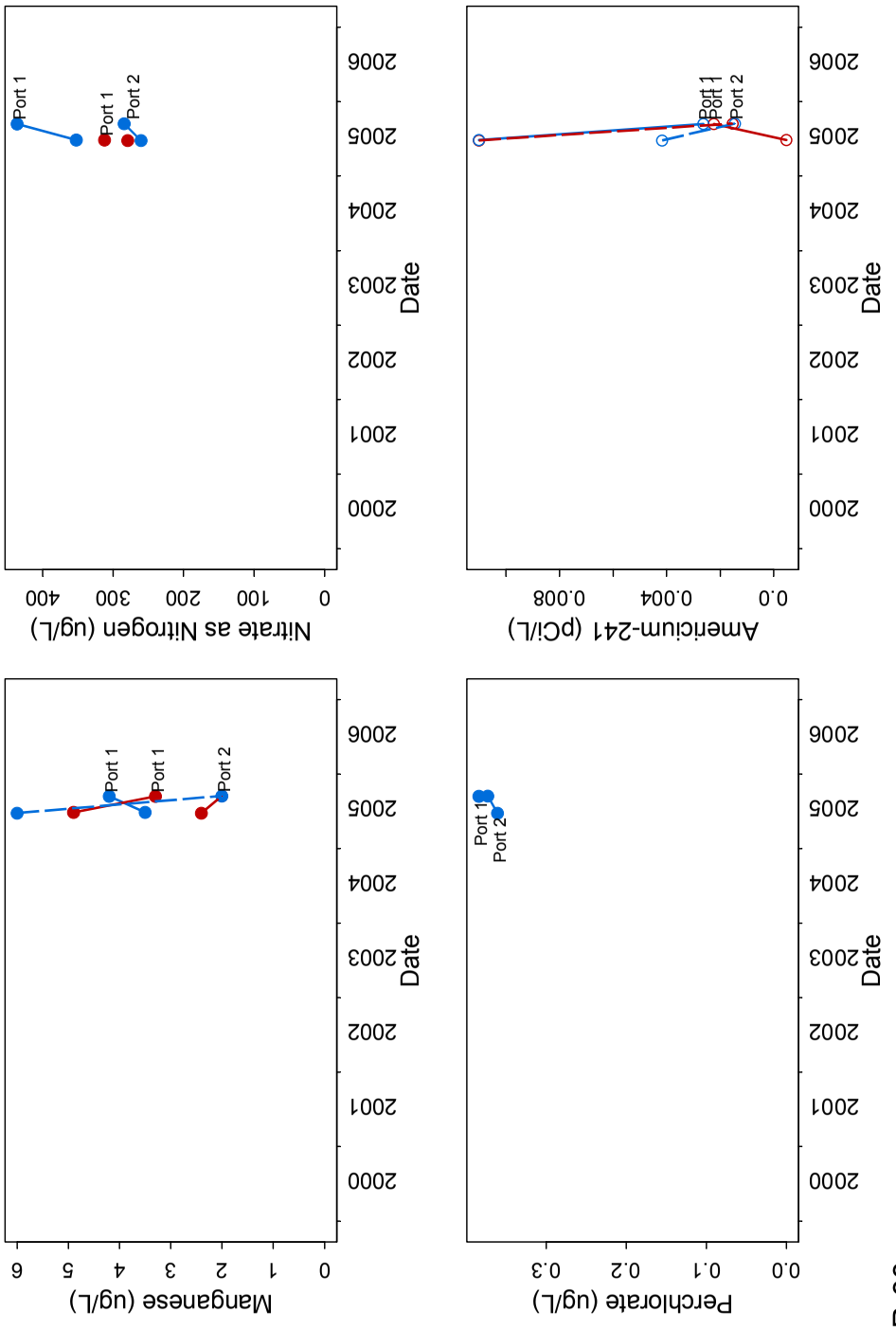


Figure D-2.2-24 (continued). Concentrations over time at R-33 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

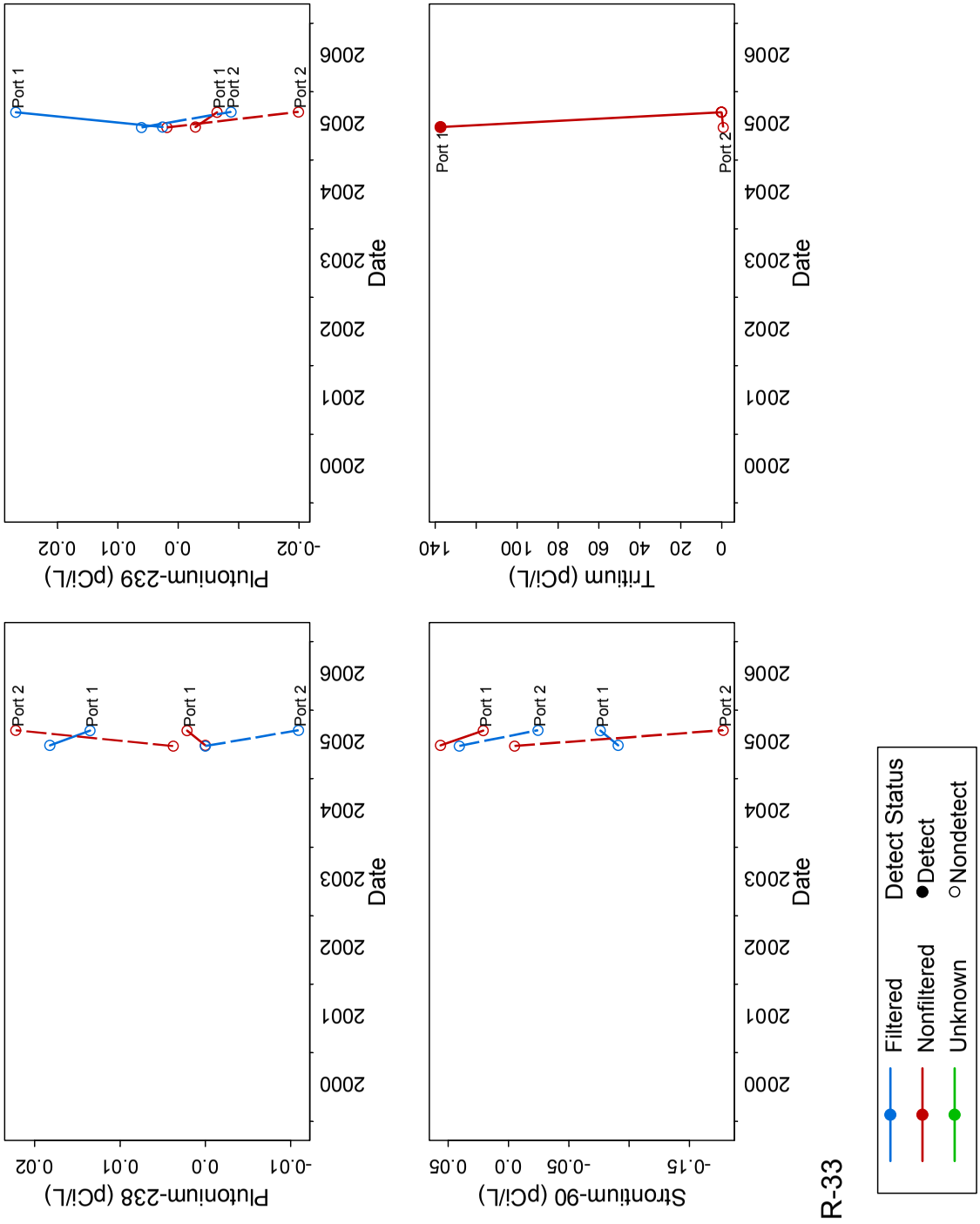


Figure D-2.2-24 (continued). Concentrations over time at R-33 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

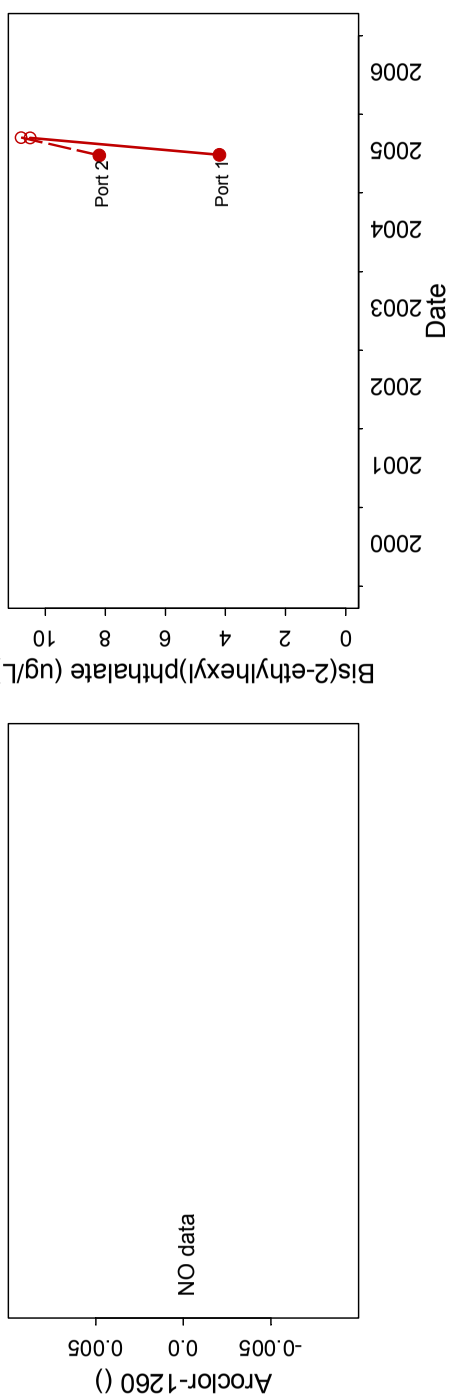


Figure D-2.2-24 (continued). Concentrations over time at R-33 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

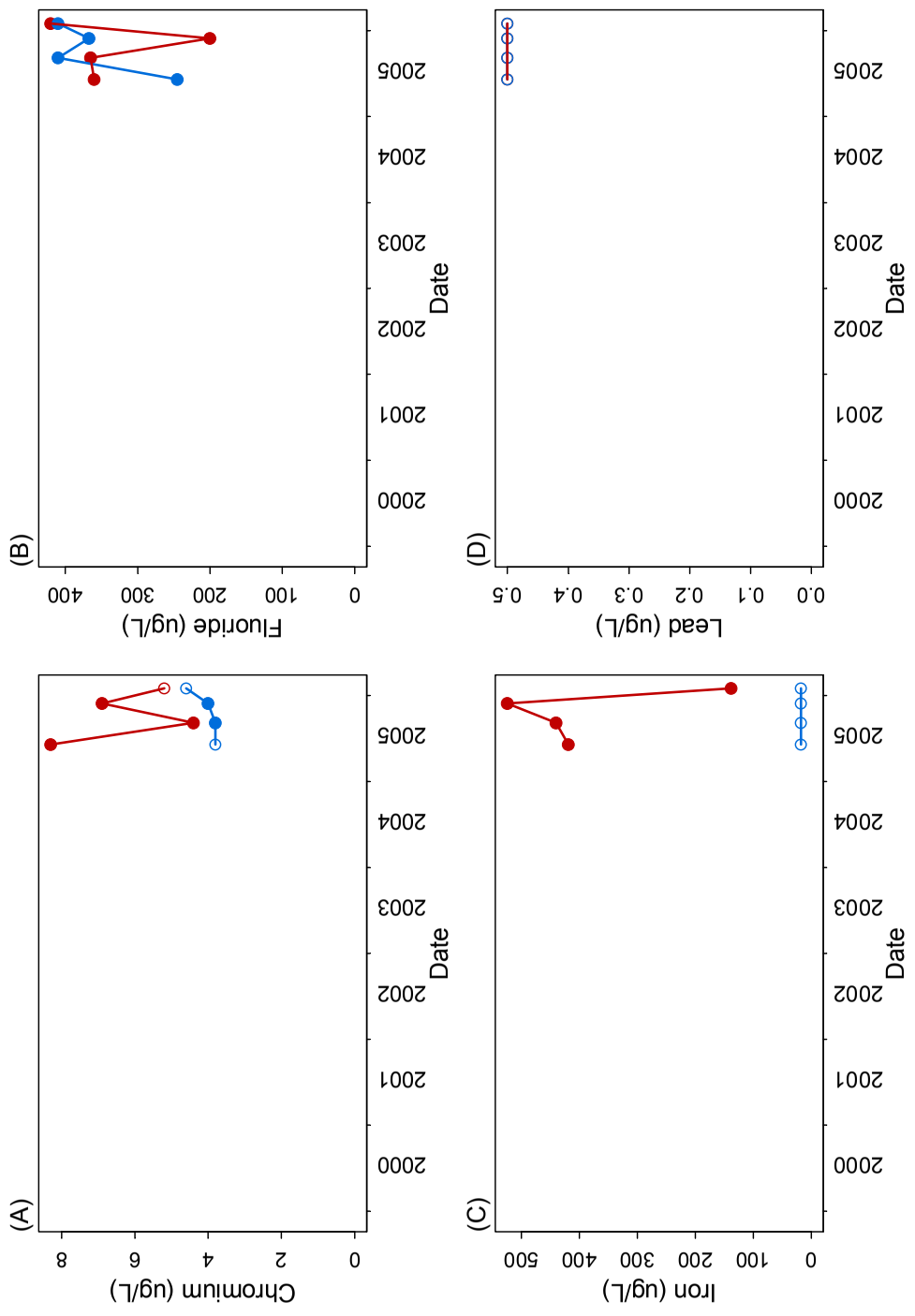


Figure D-2.2-25. Concentrations over time at R-34 for (A) chromium, (B) fluoride, (C) iron, (D) lead

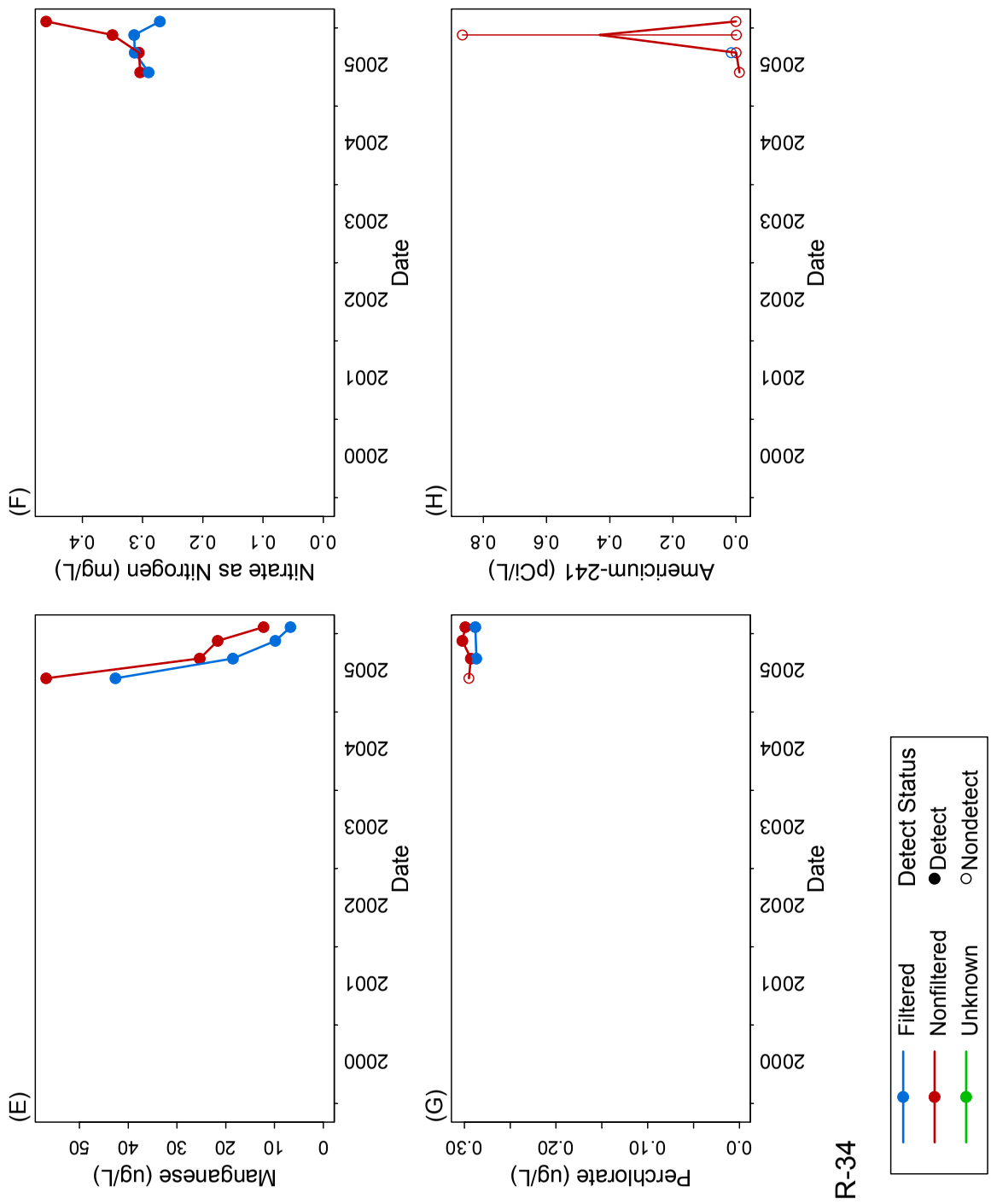


Figure D-2.2-25 (continued). Concentrations over time at R-34 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

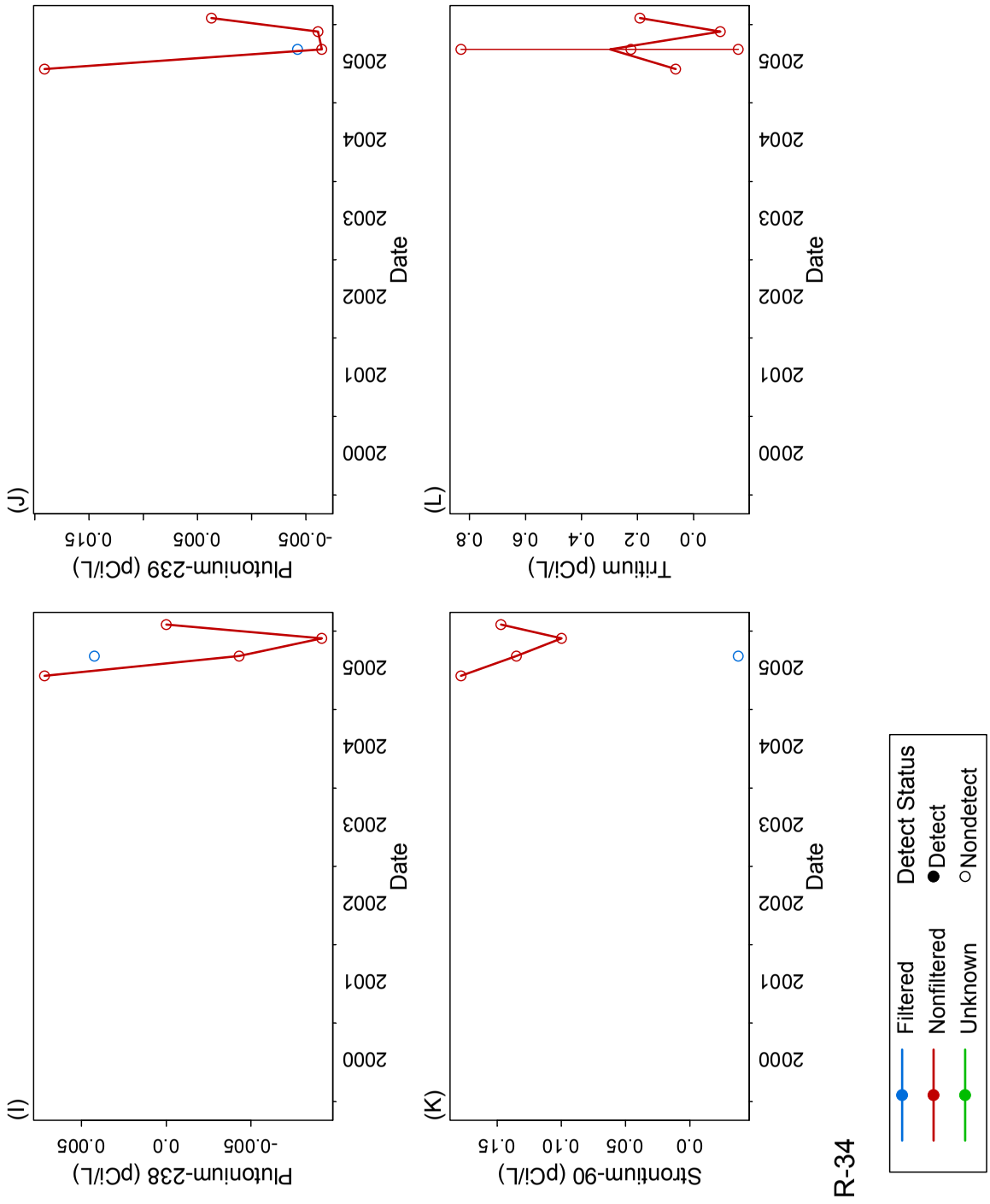


Figure D-2.2-25 (continued). Concentrations over time at R-34 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

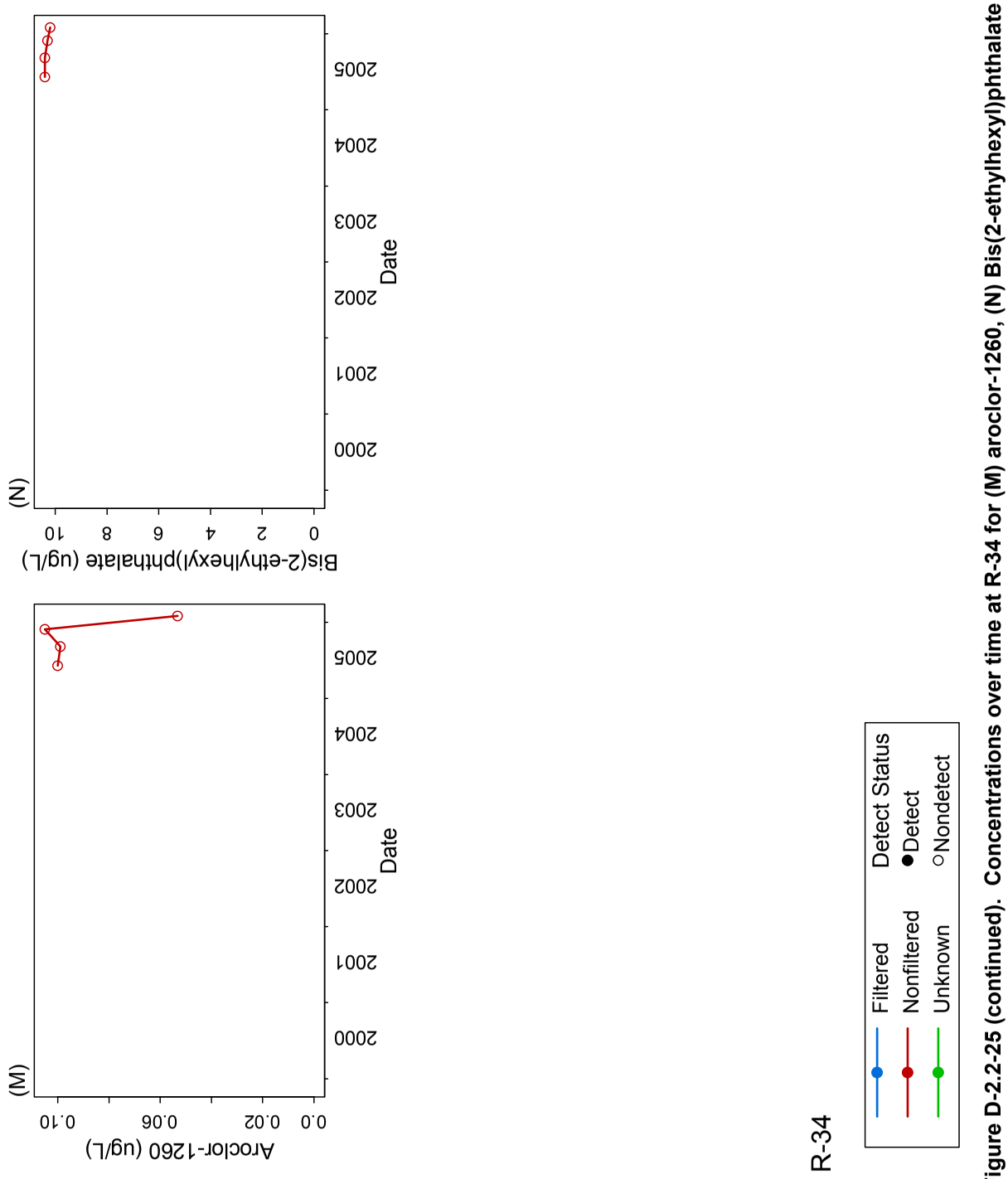


Figure D-2.2-25 (continued). Concentrations over time at R-34 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

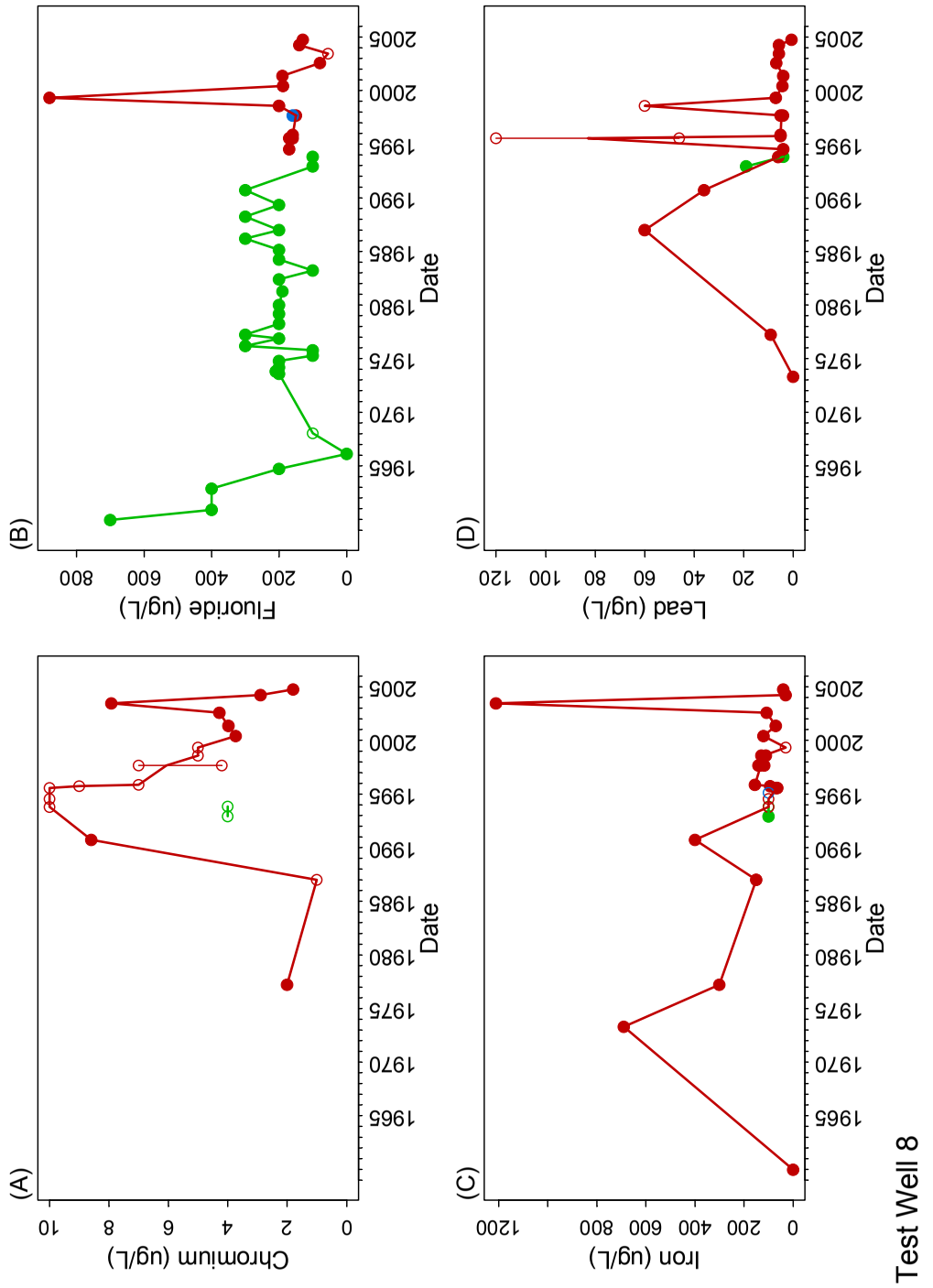


Figure D-2.2-26. Concentrations over time at Test Well 8 for (A) chromium, (B) fluoride, (C) iron, (D) lead

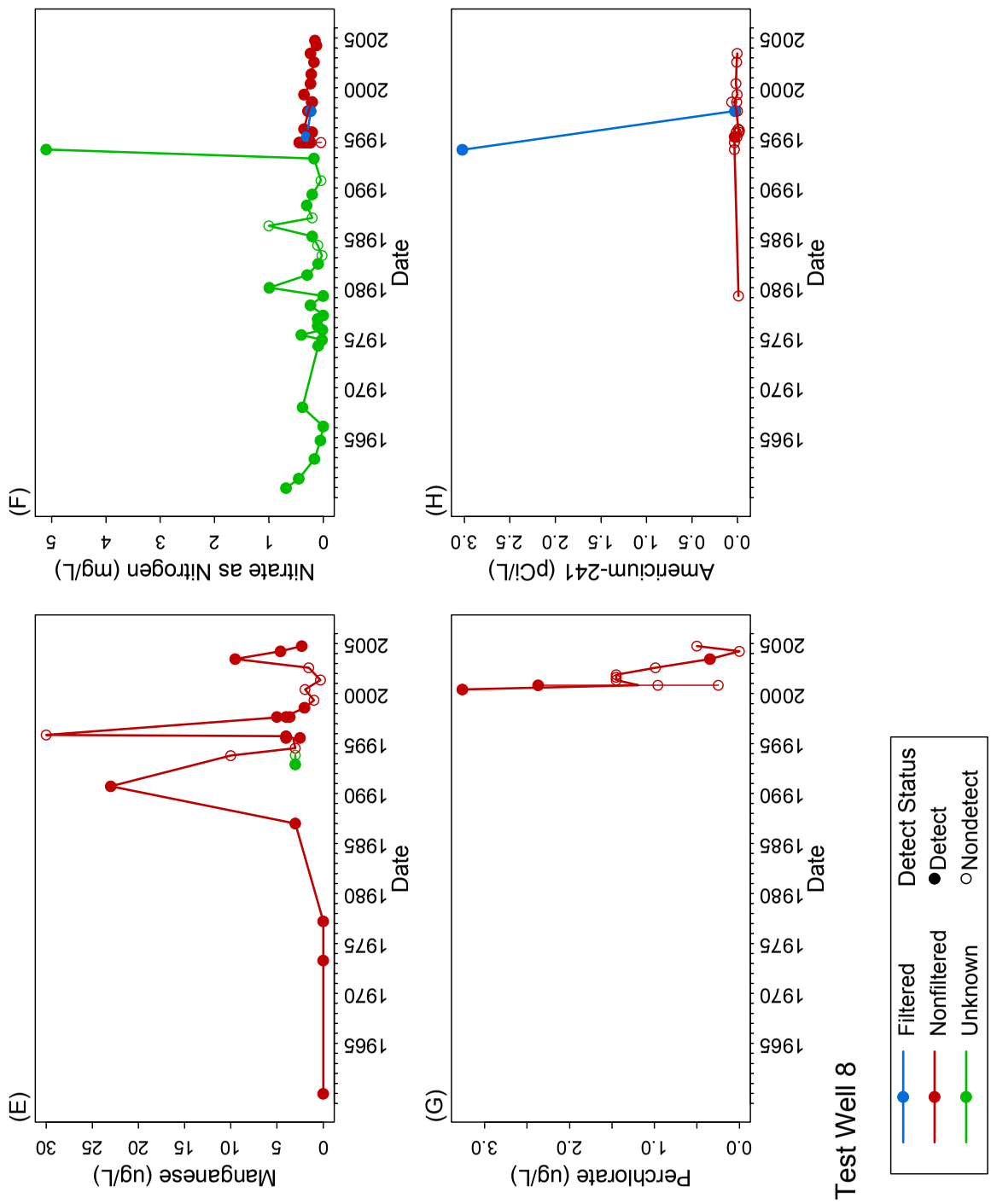


Figure D-2.2-26 (continued). Concentrations over time at Test Well 8 for (E) manganese, (F) nitrate, (G) perchlorate, (H) americium-241

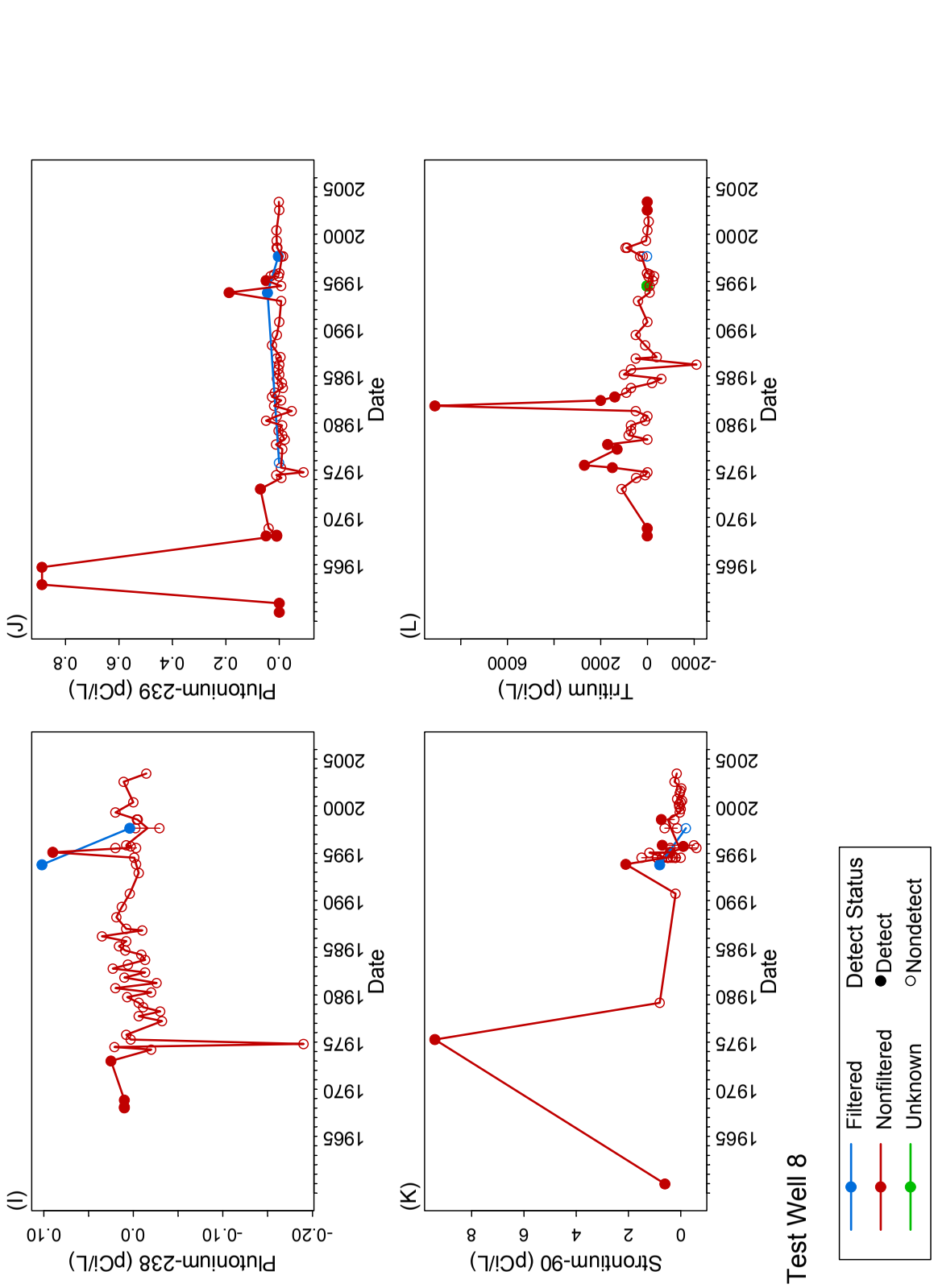


Figure D-2.2-26 (continued). Concentrations over time at Test Well 8 for (I) plutonium-238, (J) plutonium-239, (K) strontium-90, (L) tritium

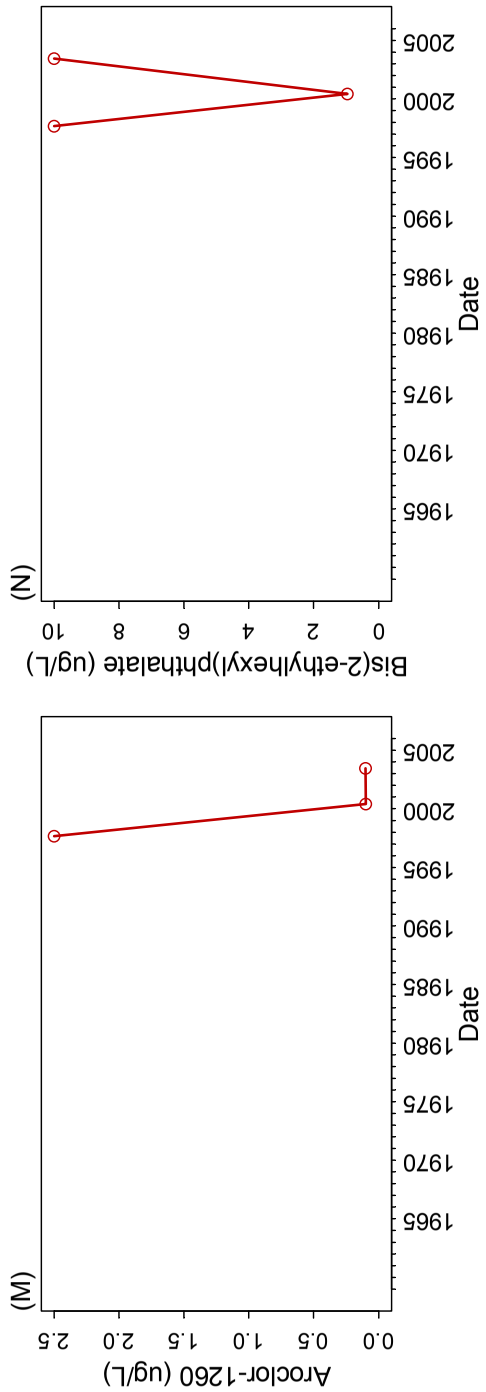


Figure D-2.2-26 (continued). Concentrations over time at Test Well 8 for (M) aroclor-1260, (N) Bis(2-ethylhexyl)phthalate

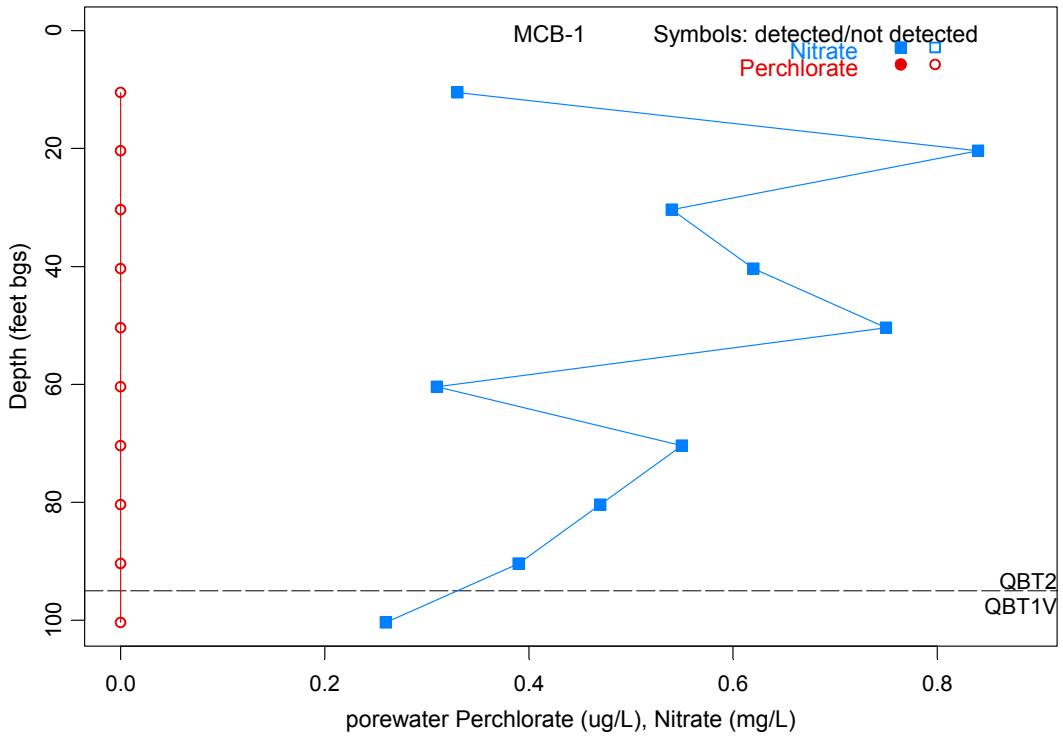


Figure D-2.3-1. Pore water nitrate (mg/L as N) and perchlorate (µg/L) concentrations in MCB-1.

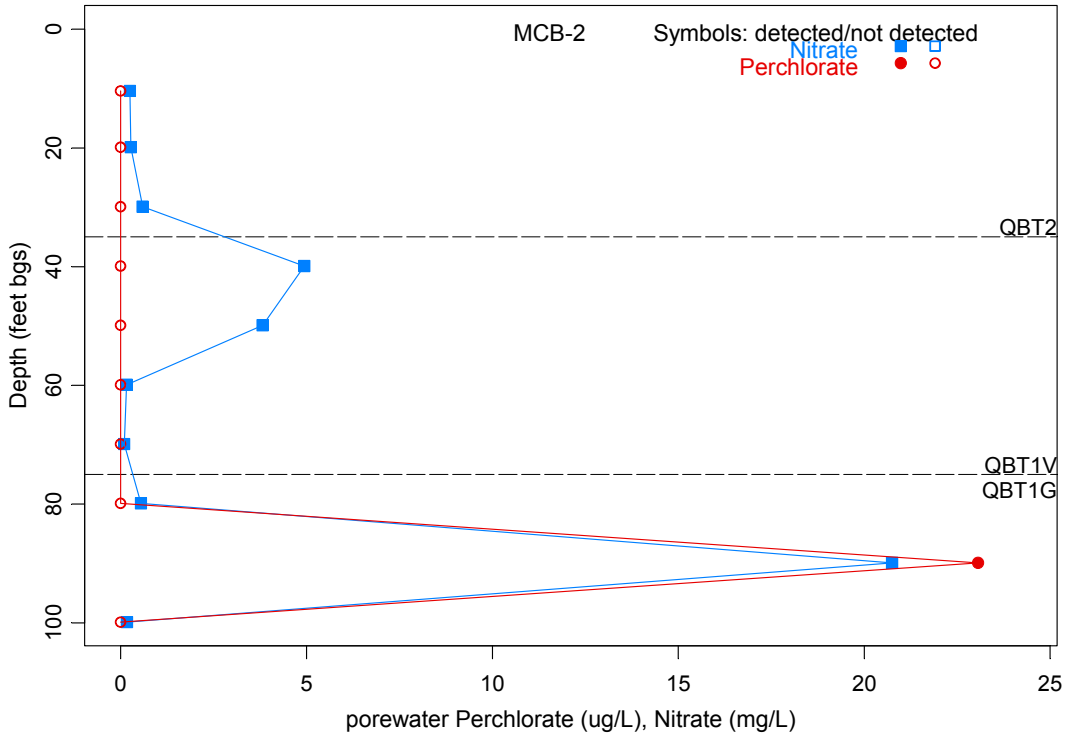


Figure D-2.3-2. Pore water nitrate (mg/L as N) and perchlorate (µg/L) concentrations in MCB-2.

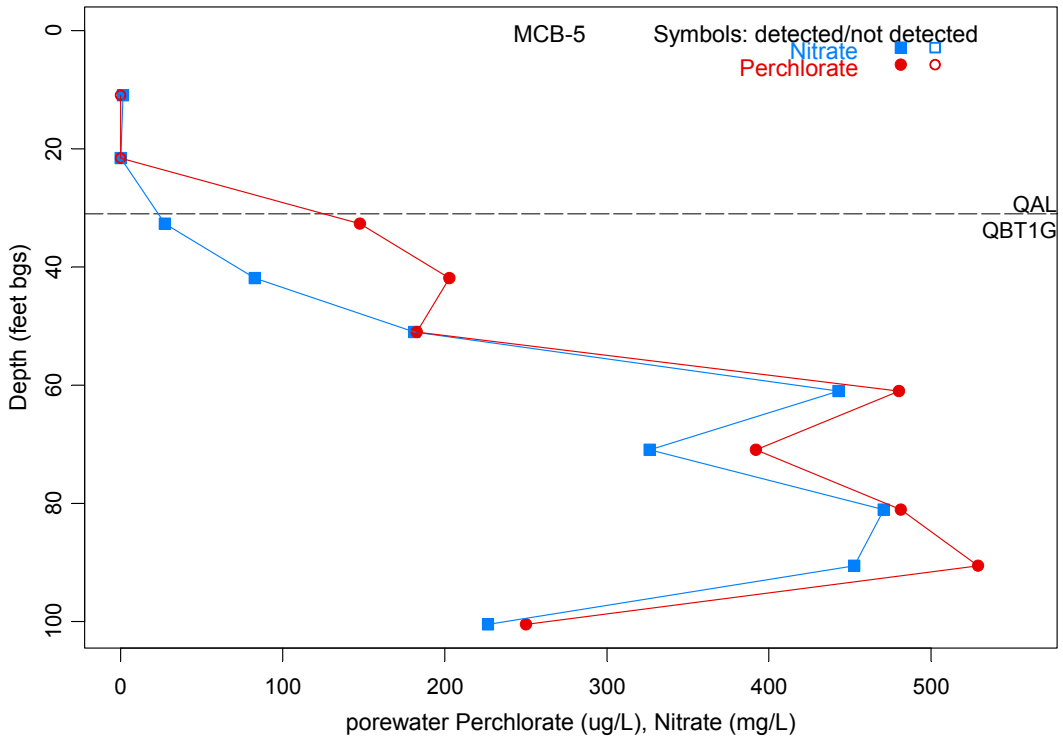


Figure D-2.3-3. Pore water nitrate (mg/L as N) and perchlorate (µg/L) concentrations in MCB-5.

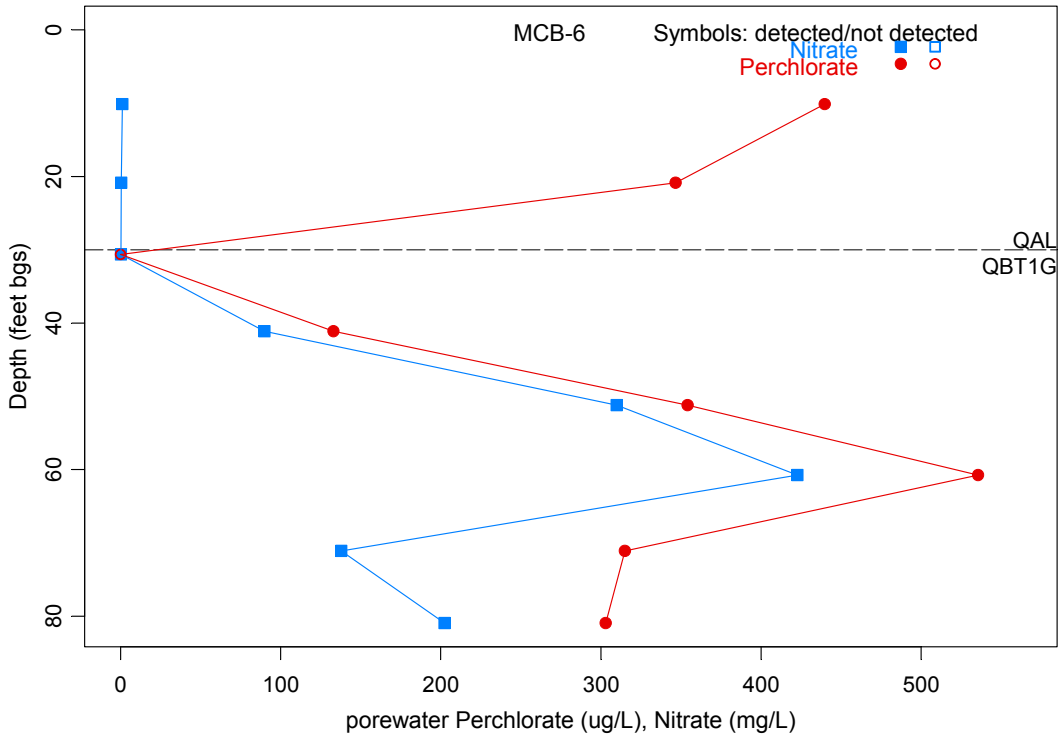


Figure D-2.3-4. Pore water nitrate (mg/L as N) and perchlorate (µg/L) concentrations in MCB-6.

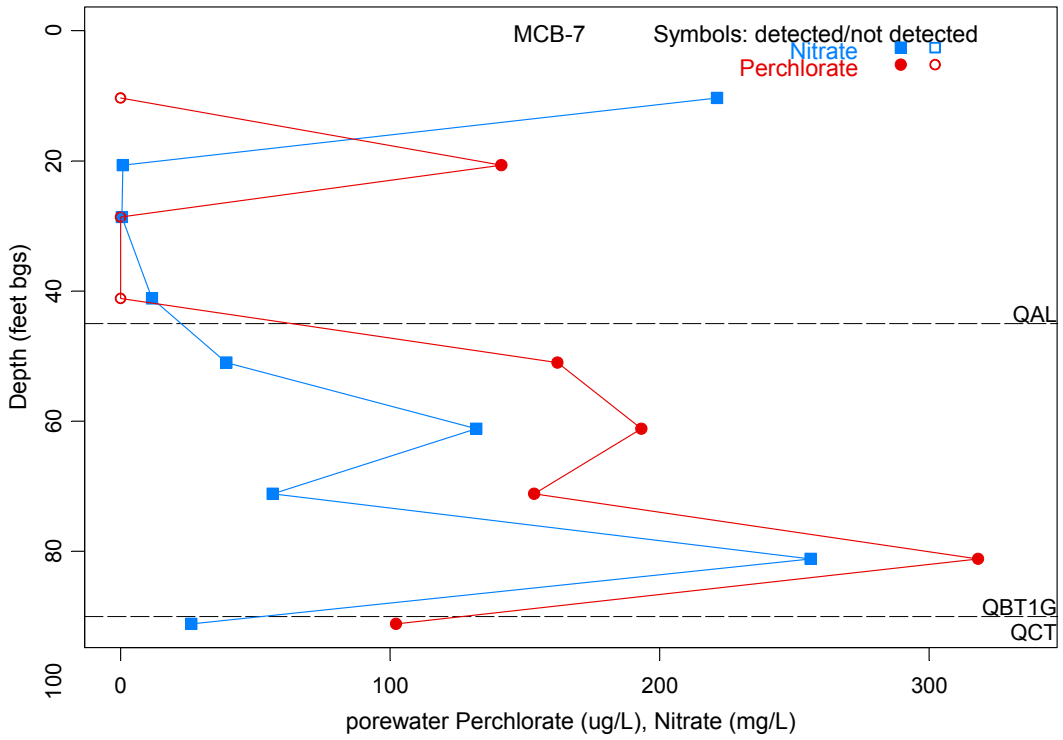


Figure D-2.3-5. Pore water nitrate (mg/L as N) and perchlorate (µg/L) concentrations in MCB-7.

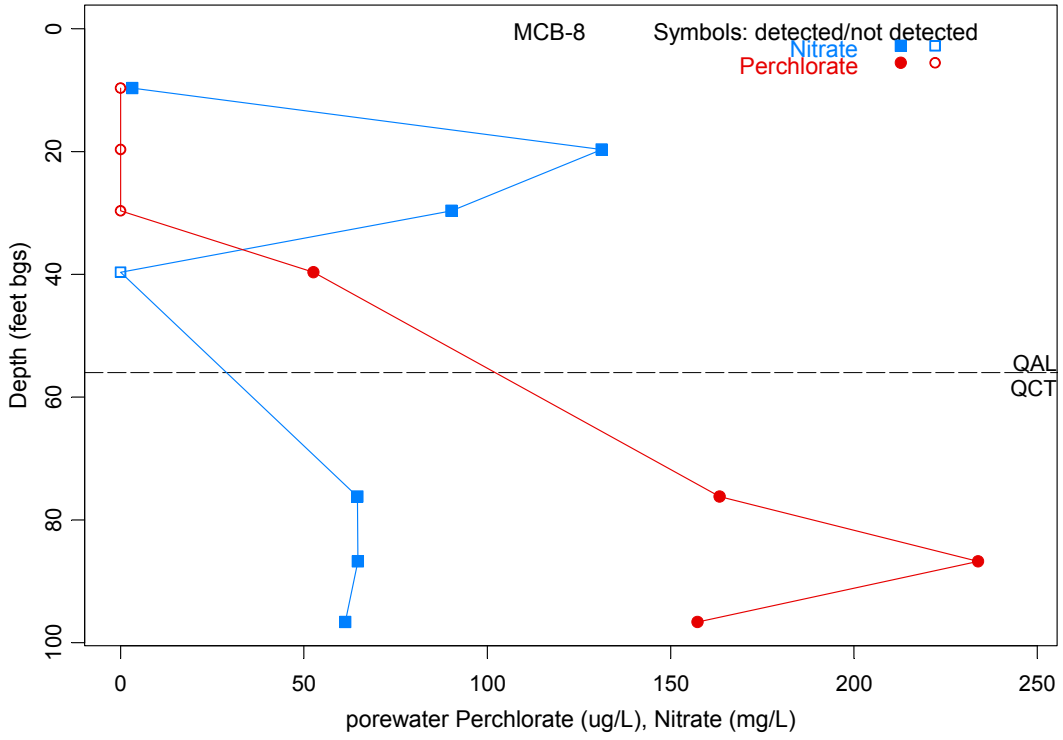


Figure D-2.3-6. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-8.

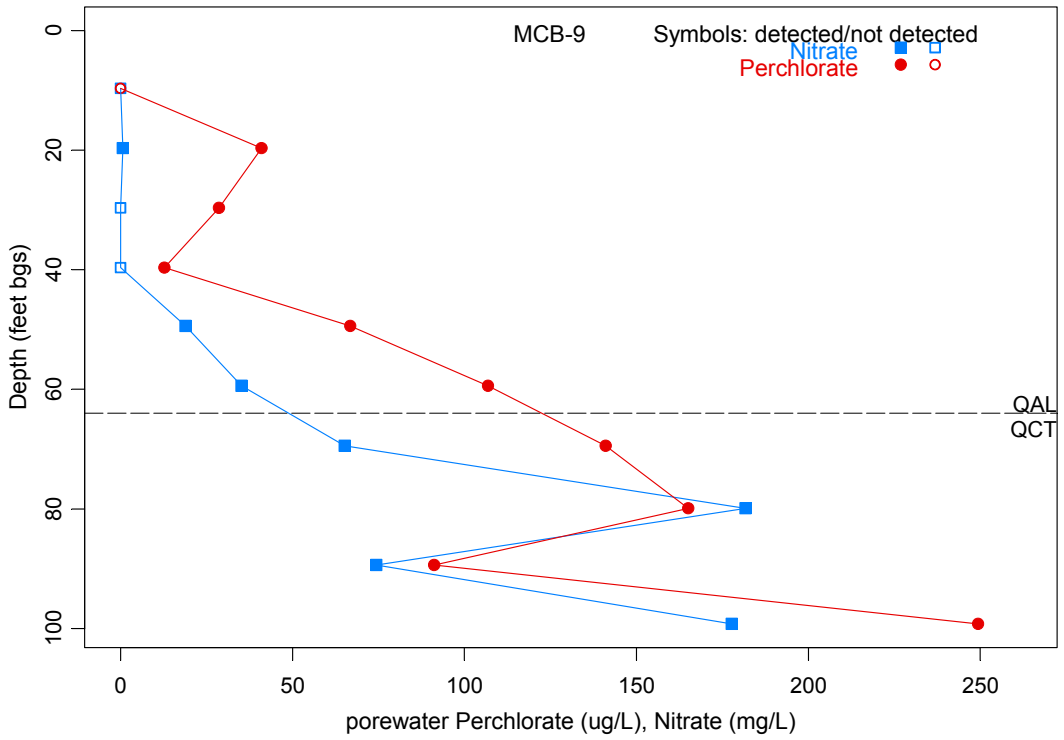


Figure D-2.3-7. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-9.

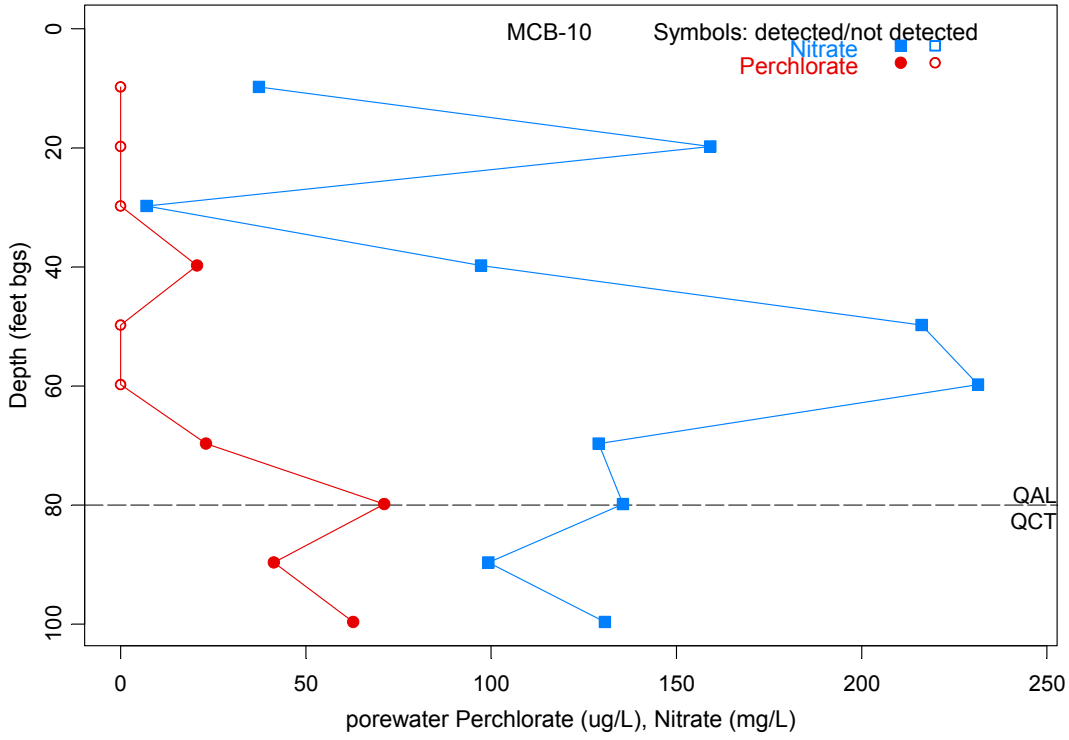


Figure D-2.3-8. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-10.

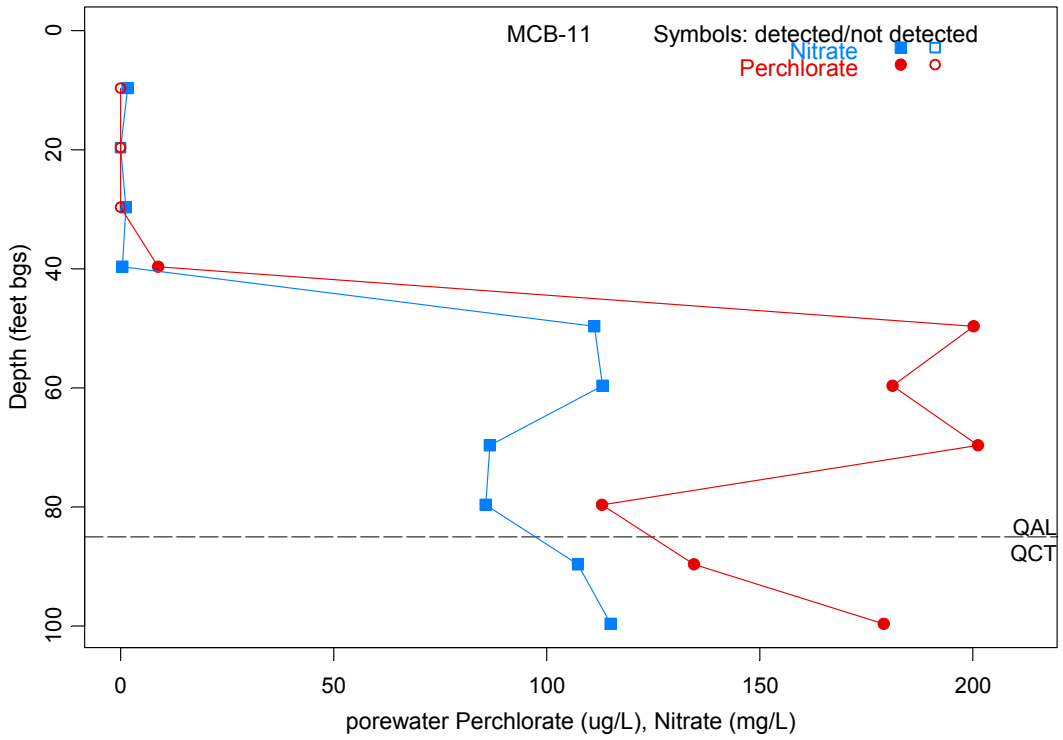


Figure D-2.3-9. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-11.

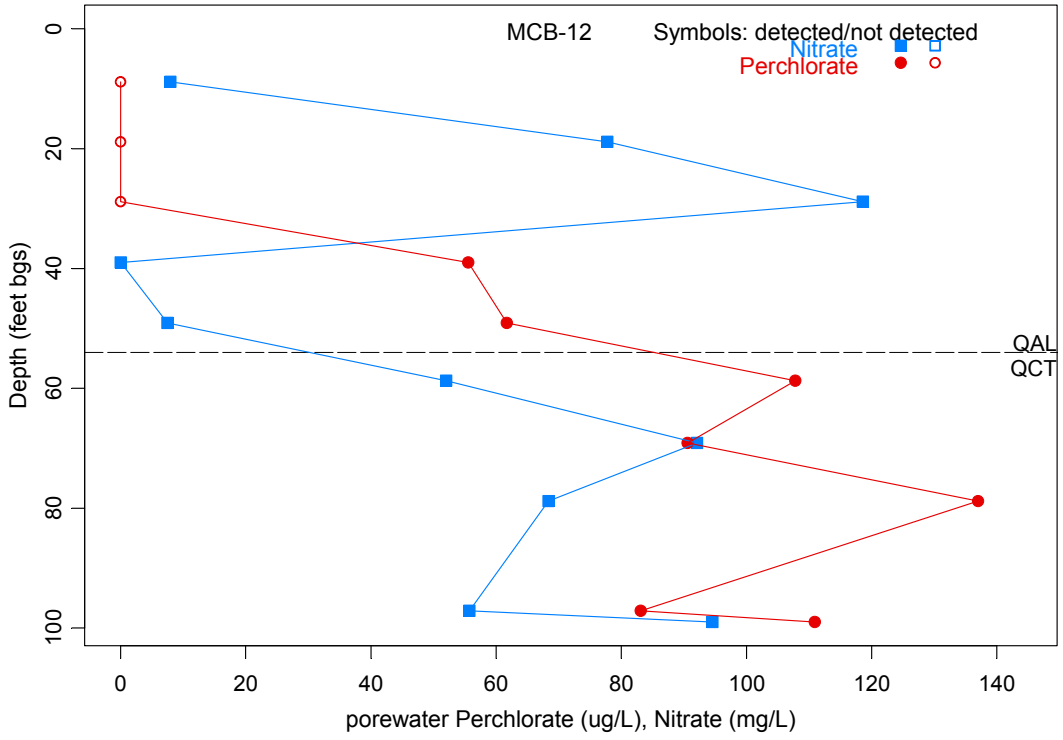


Figure D-2.3-10. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-12.

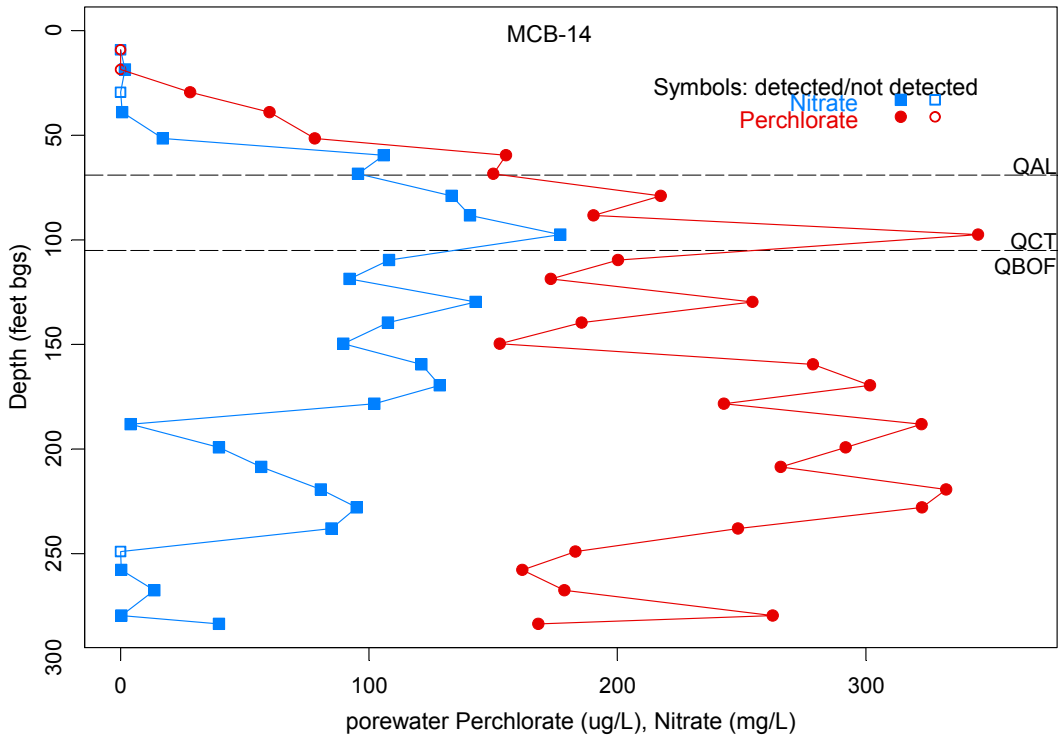


Figure D-2.3-11. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-14.

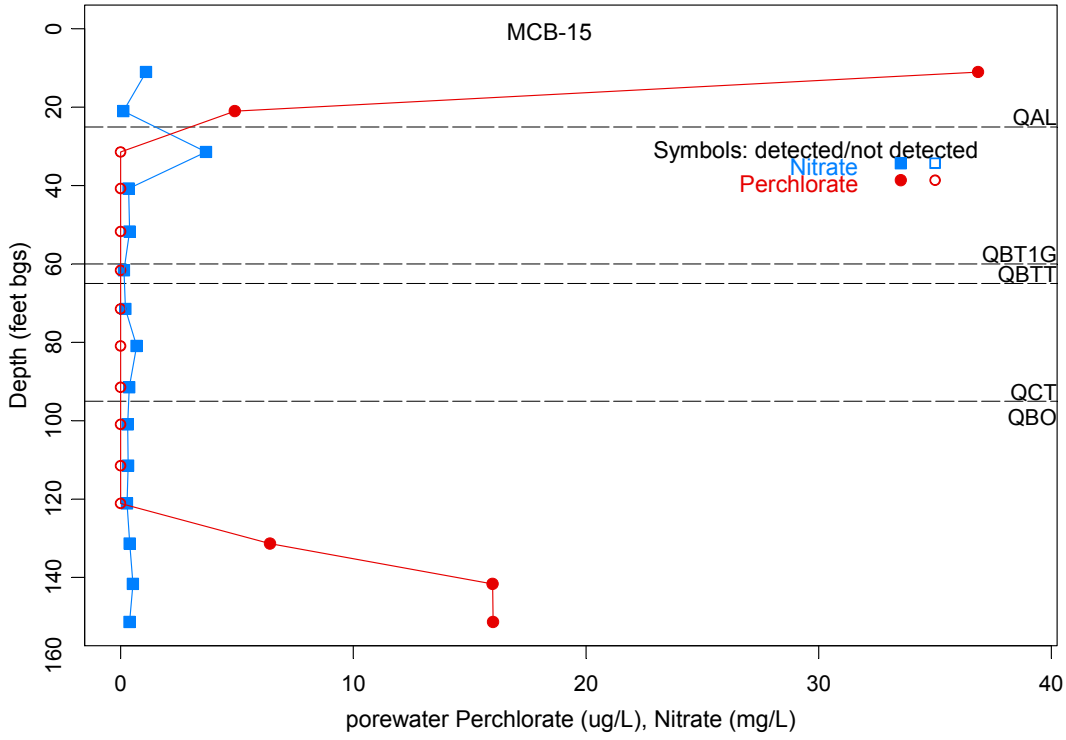


Figure D-2.3-12. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-15.

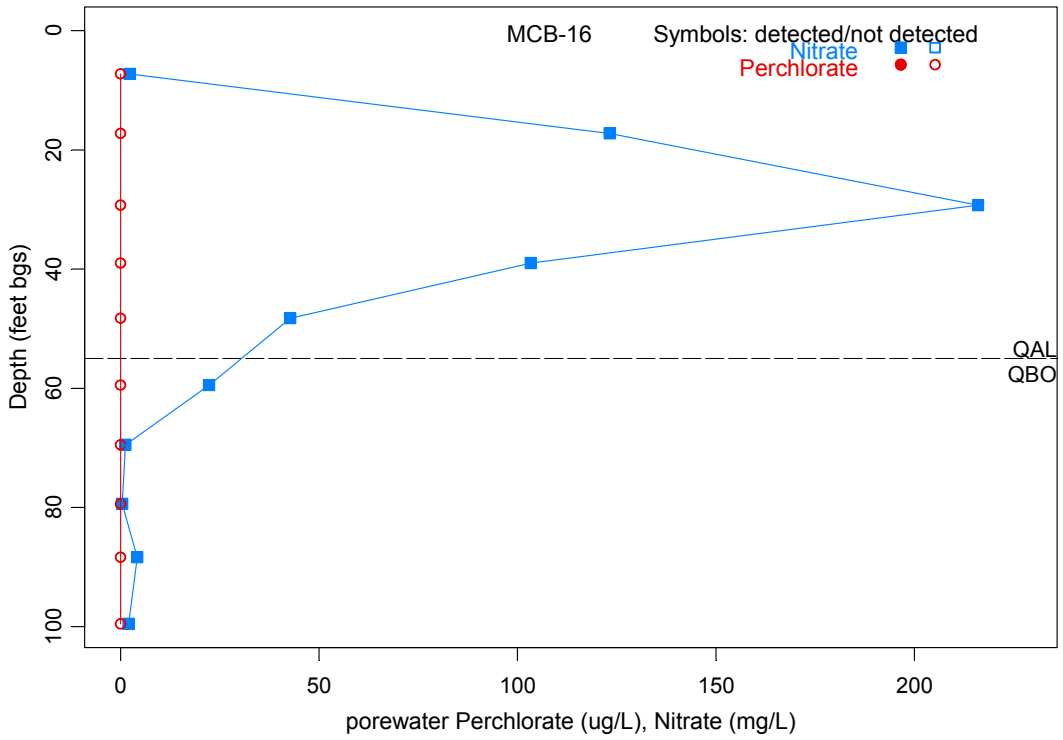


Figure D-2.3-13. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCB-16.

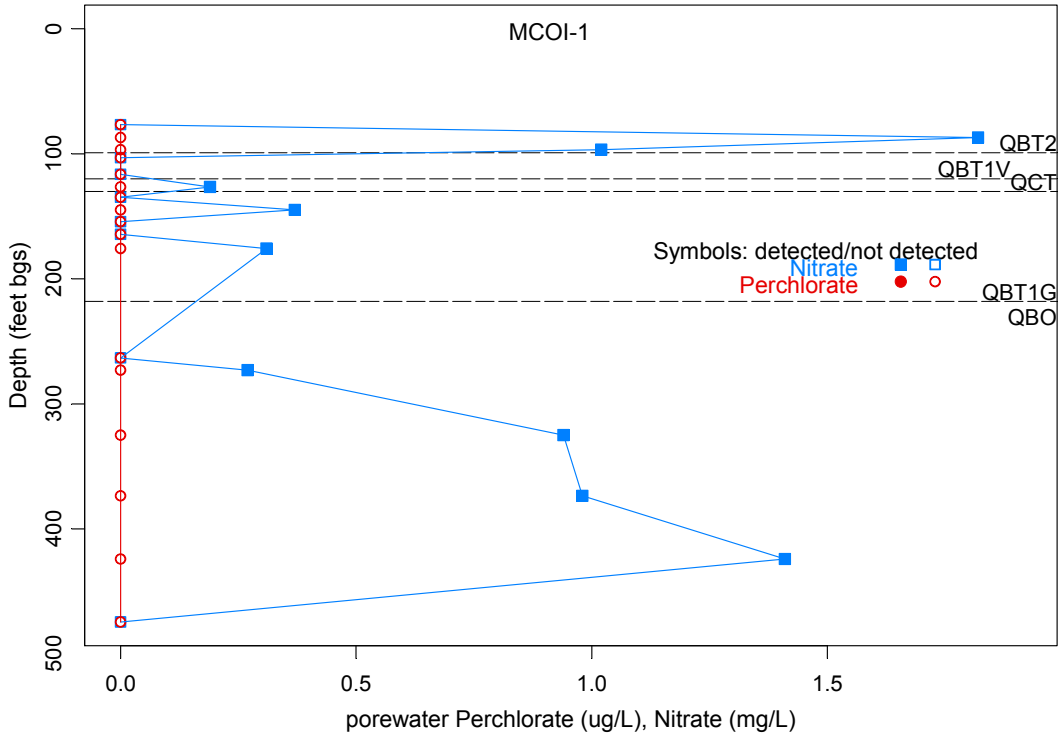


Figure D-2.3-14. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCOI-1.

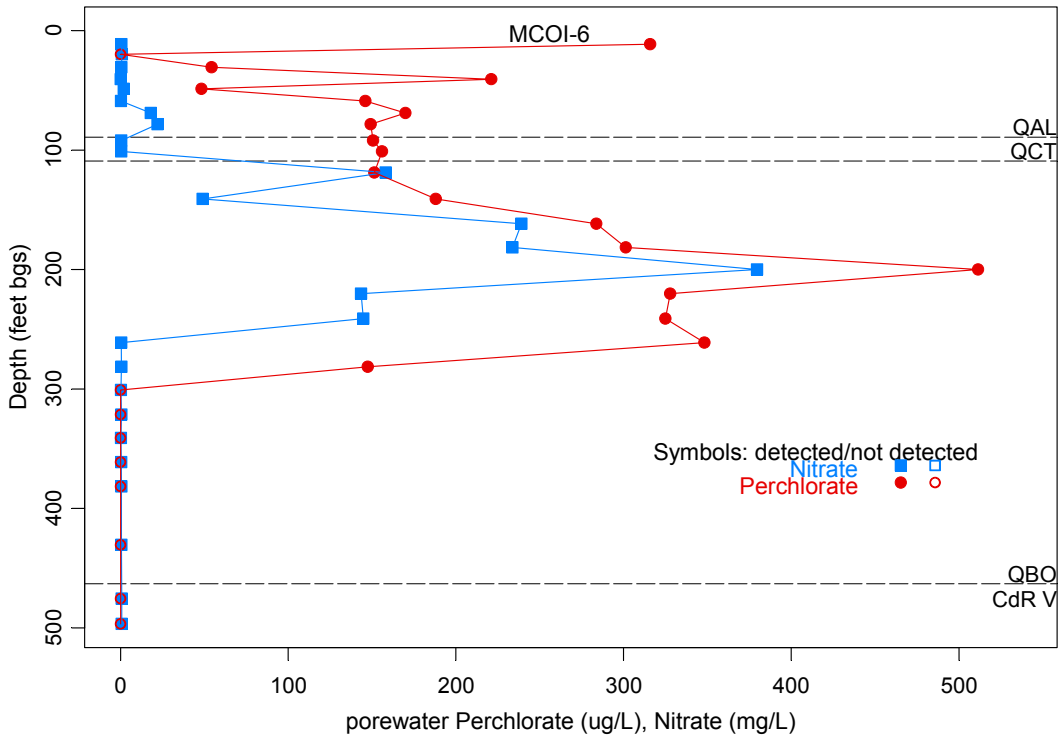


Figure D-2.3-15. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCOI-6.

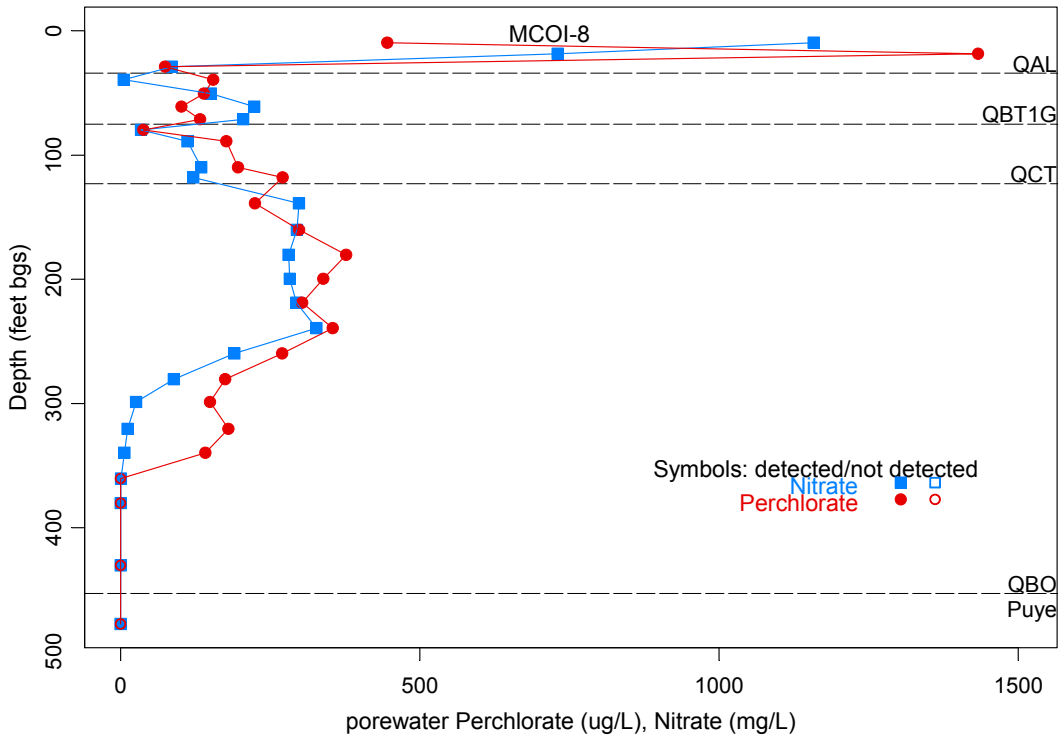


Figure D-2.3-16. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in MCOI-8.

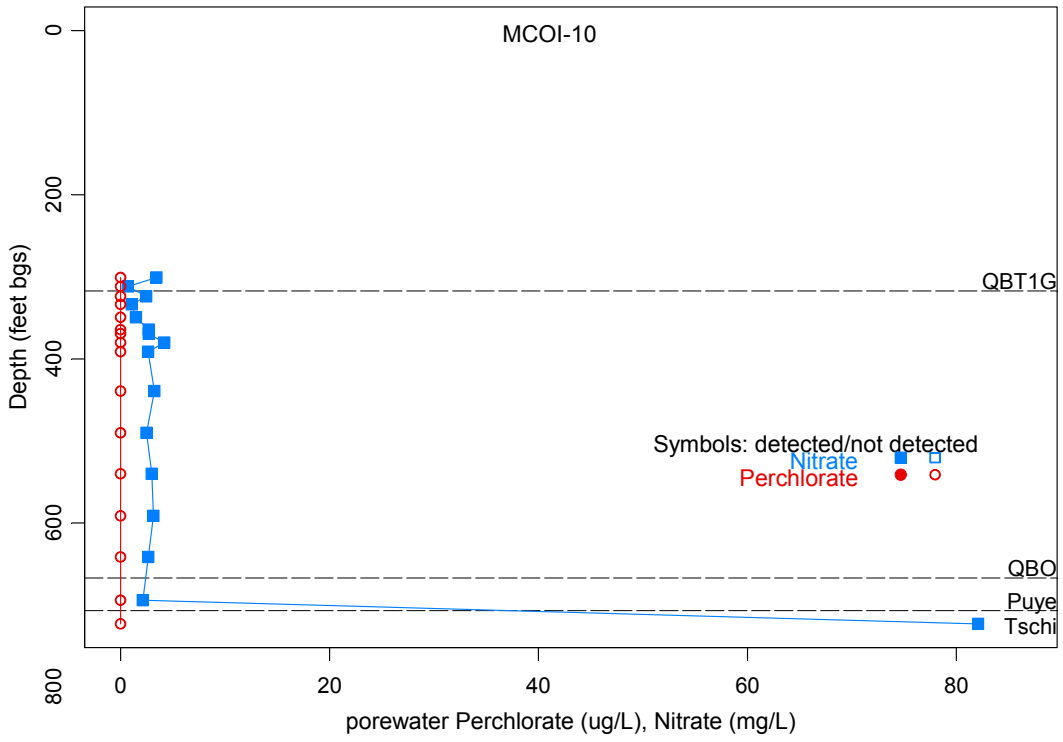


Figure D-2.3-17. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L)) Concentrations in MCOI-10.

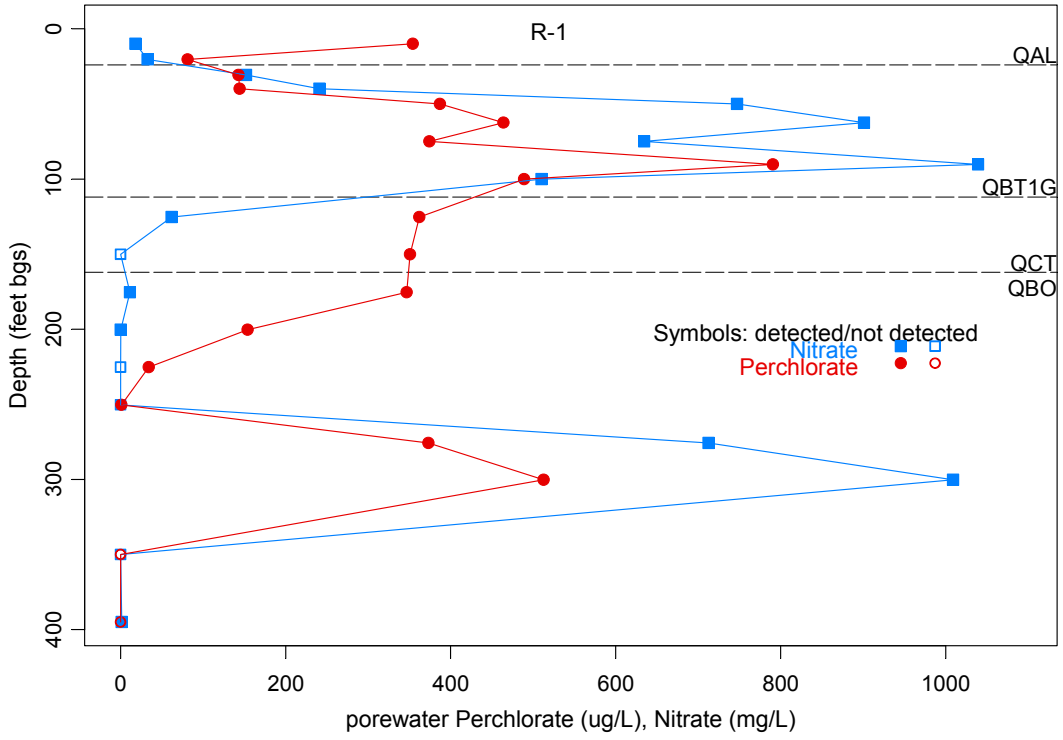


Figure D-2.3-18. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in R-1.

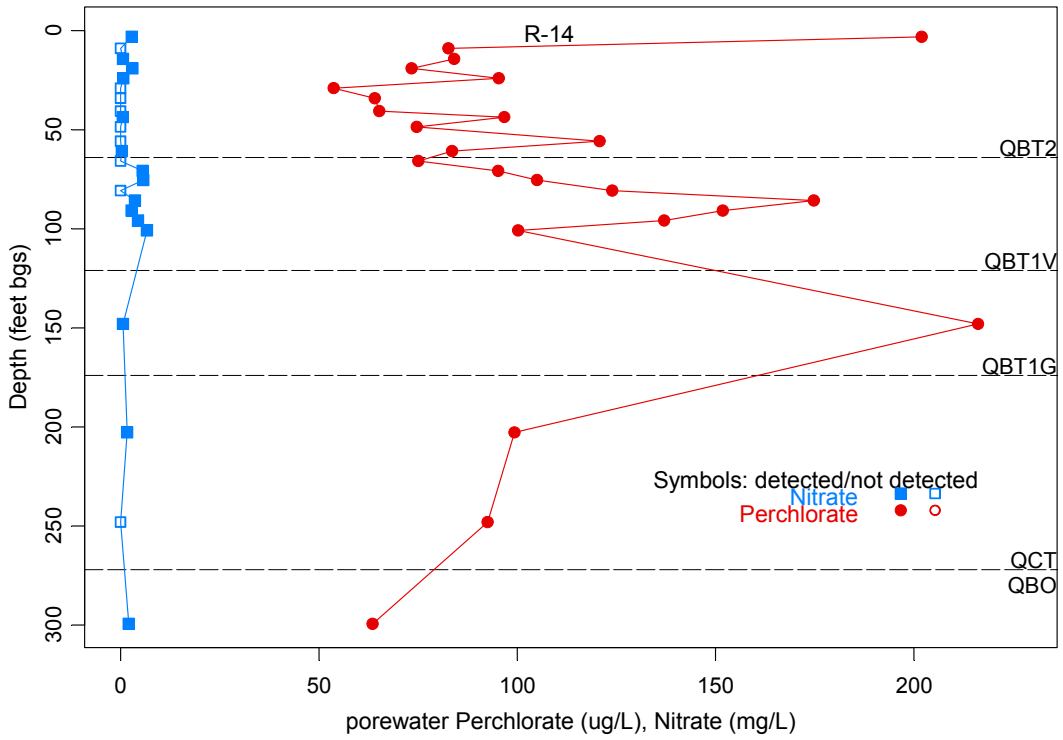


Figure D-2.3-19. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in R-14.

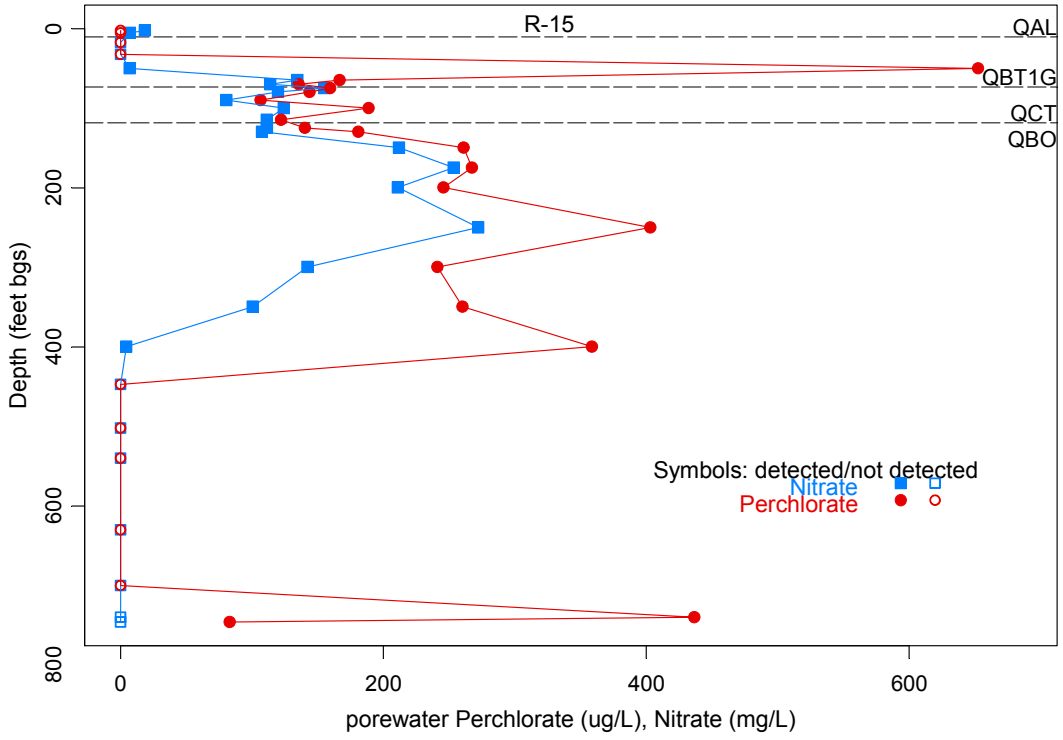


Figure D-2.3-20. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in R-15.

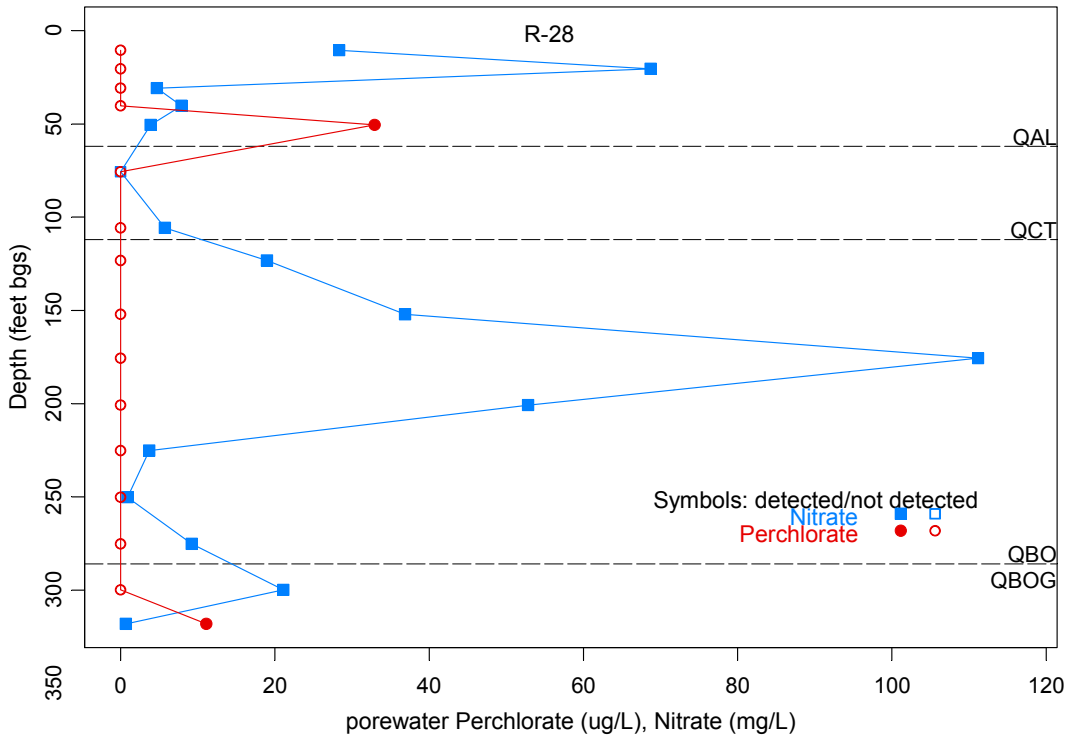


Figure D-2.3-21. Porewater Nitrate (mg/L as N) and Perchlorate (µg/L) Concentrations in R-28.

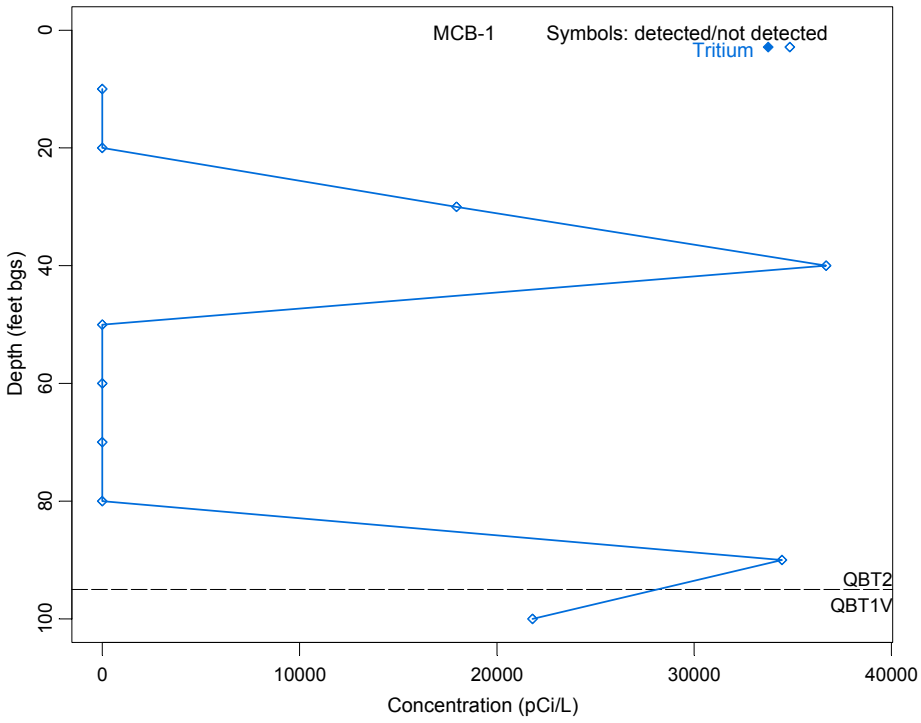


Figure D-2.3-22. Porewater Tritium Concentrations (pCi/L) at MCB-1.

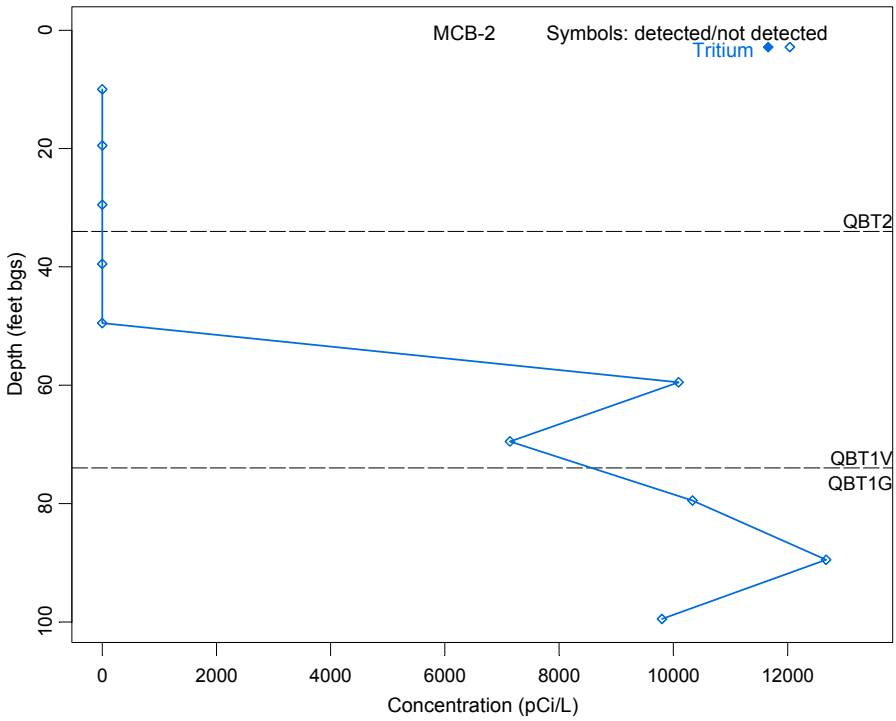


Figure D-2.3-23. Porewater Tritium Concentrations (pCi/L) at MCB-2.

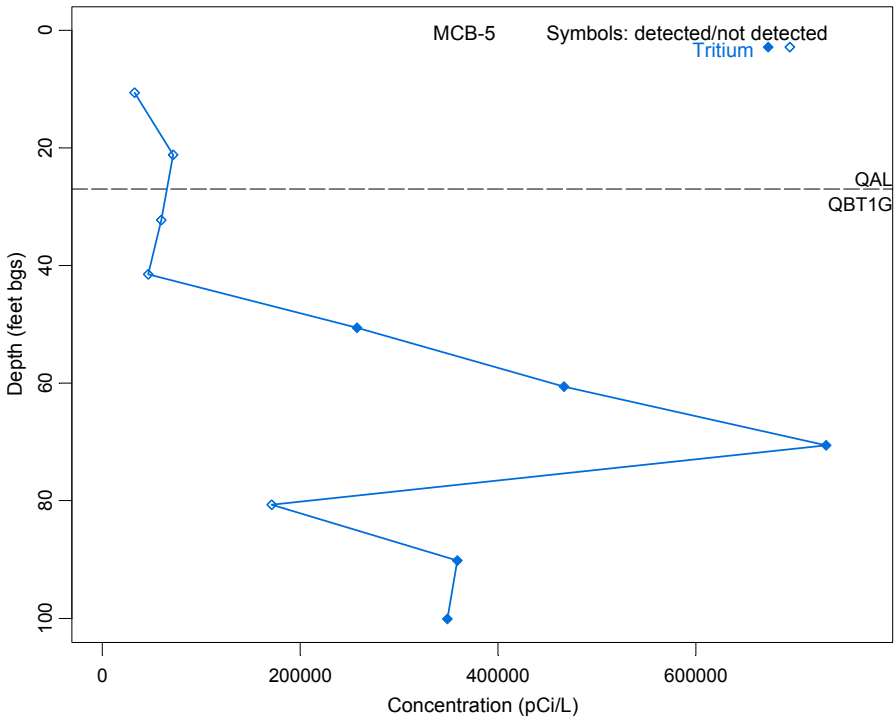


Figure D-2.3-24. Porewater Tritium Concentrations (pCi/L) at MCB-5.

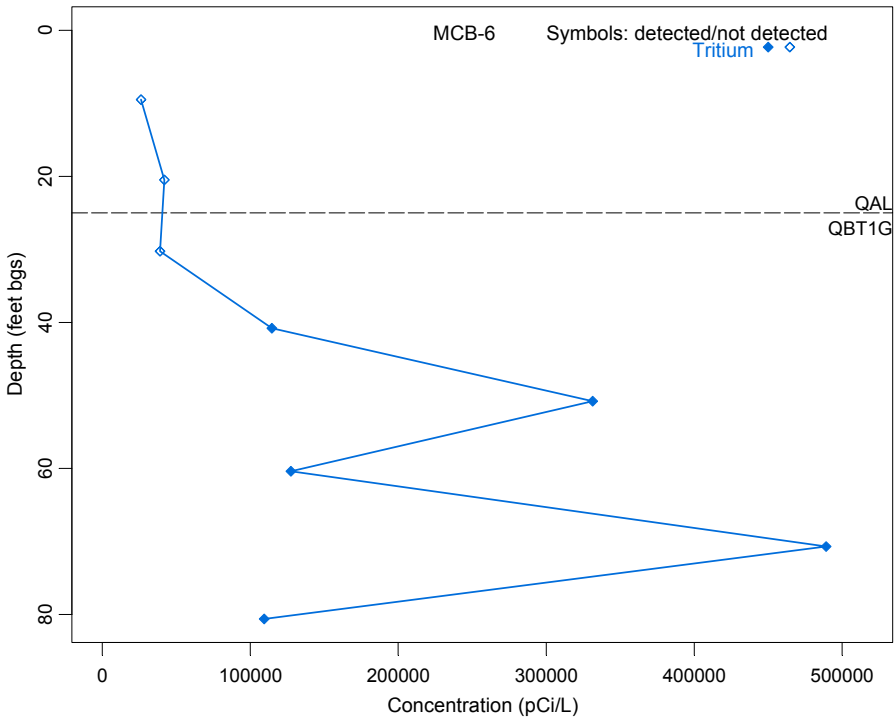


Figure D-2.3-25. Porewater Tritium Concentrations (pCi/L) at MCB-6.

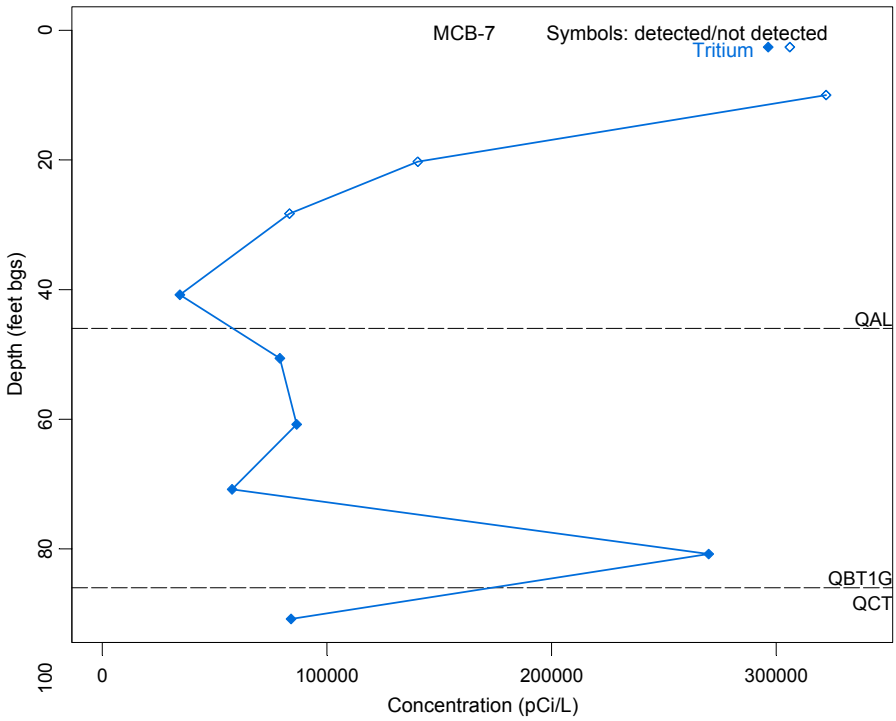


Figure D-2.3-26. Porewater Tritium Concentrations (pCi/L) at MCB-7.

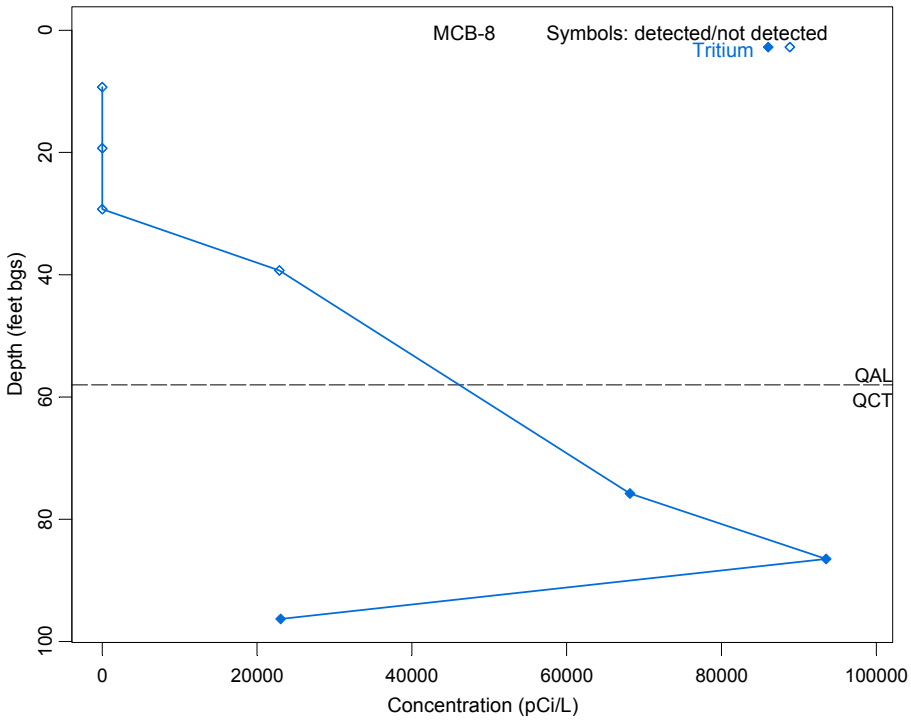


Figure D-2.3-27. Porewater Tritium Concentrations (pCi/L) at MCB-8.

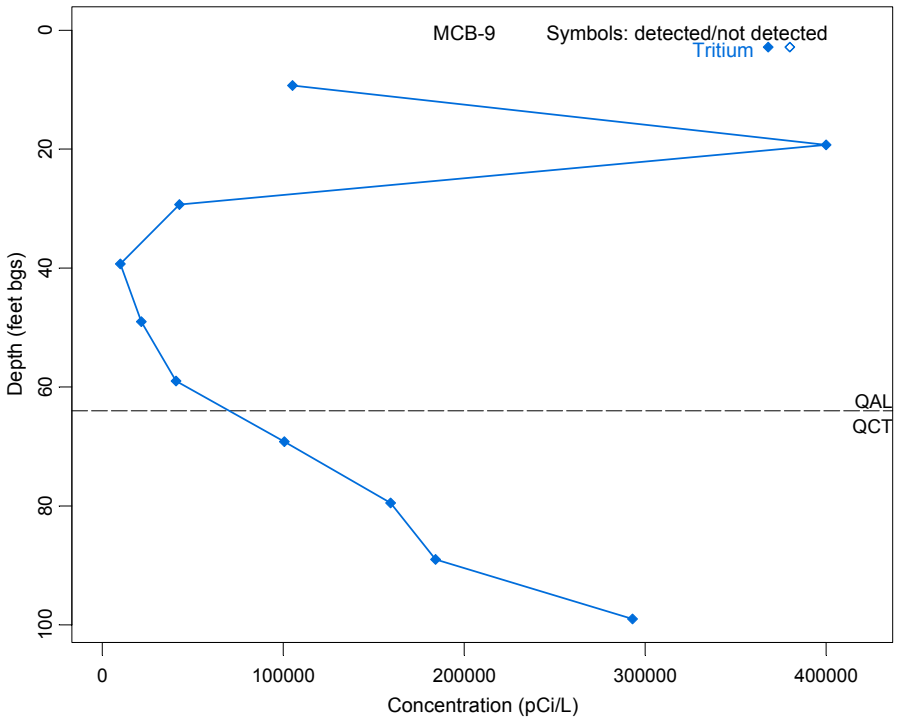


Figure D-2.3-28. Porewater Tritium Concentrations (pCi/L) at MCB-9.

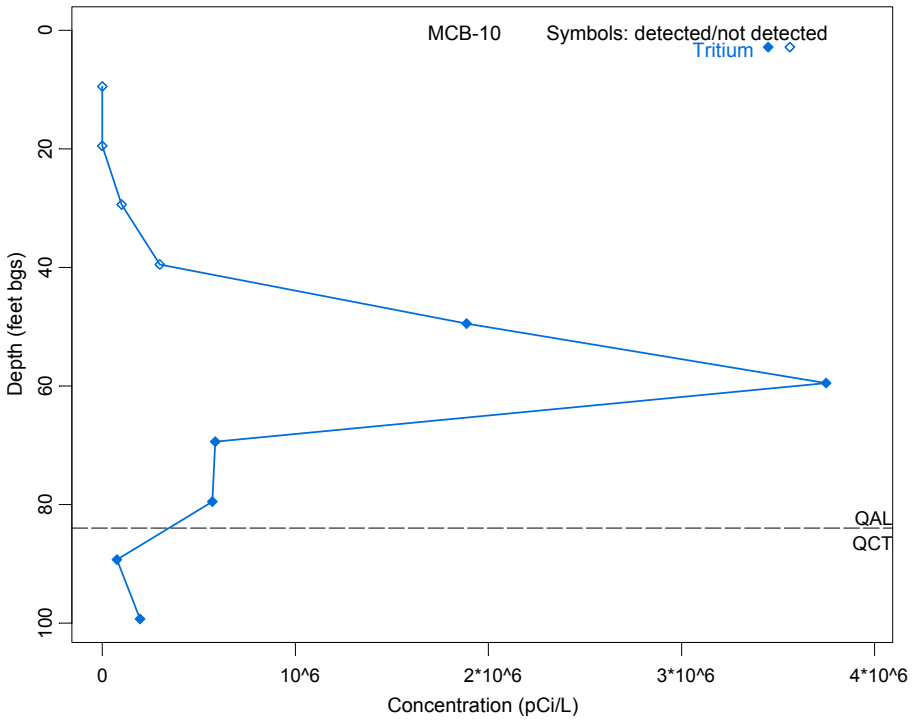


Figure D-2.3-29. Porewater Tritium Concentrations (pCi/L) at MCB-10.

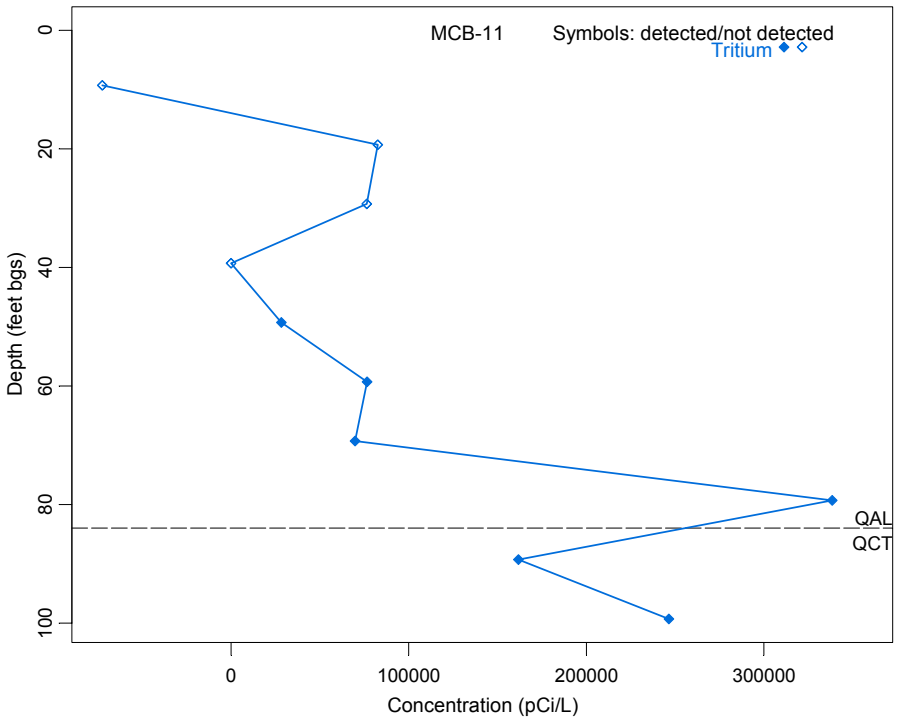


Figure D-2.3-30. Porewater Tritium Concentrations (pCi/L) at MCB-11.

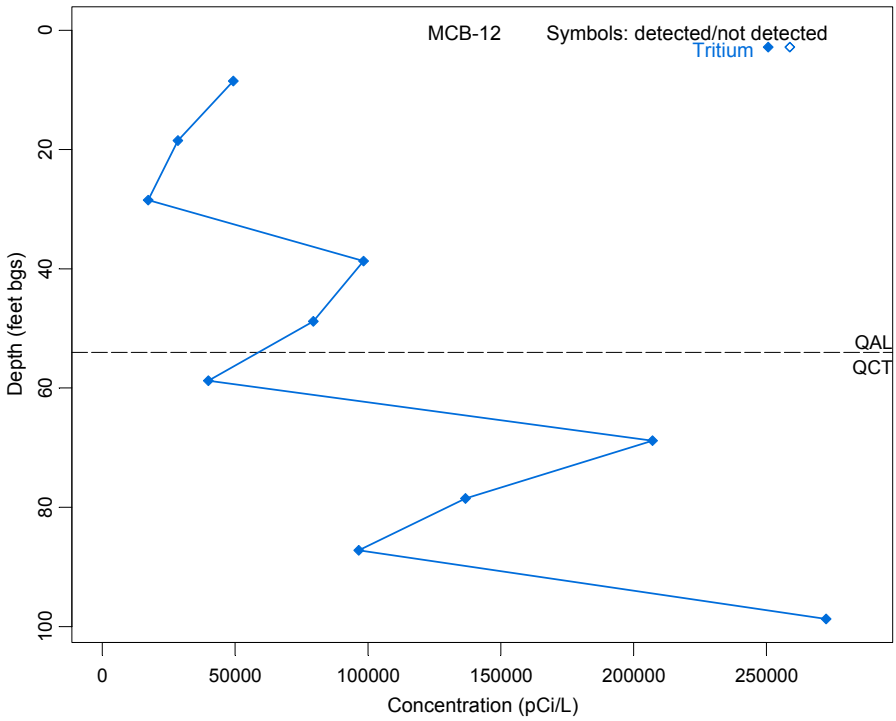


Figure D-2.3-31. Porewater Tritium Concentrations (pCi/L) at MCB-12.

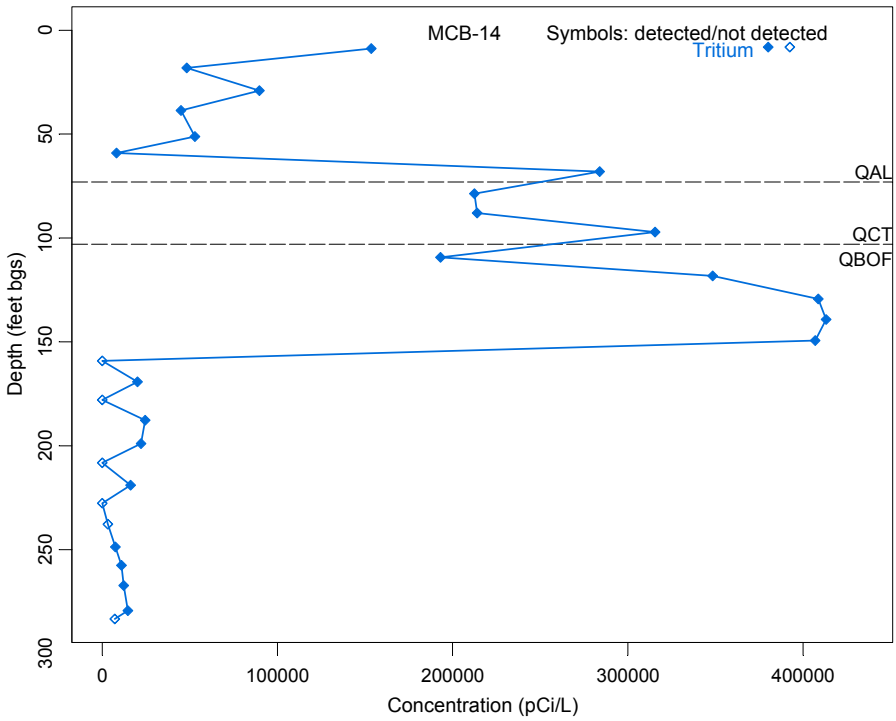


Figure D-2.3-32. Porewater Tritium Concentrations (pCi/L) at MCB-14.

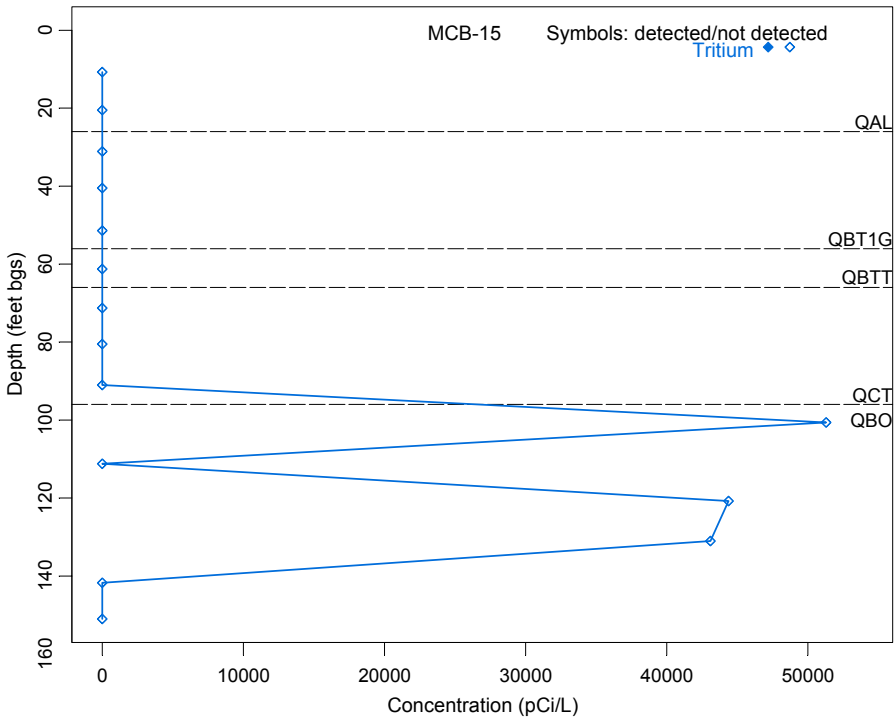


Figure D-2.3-33. Porewater Tritium Concentrations (pCi/L) at MCB-15.

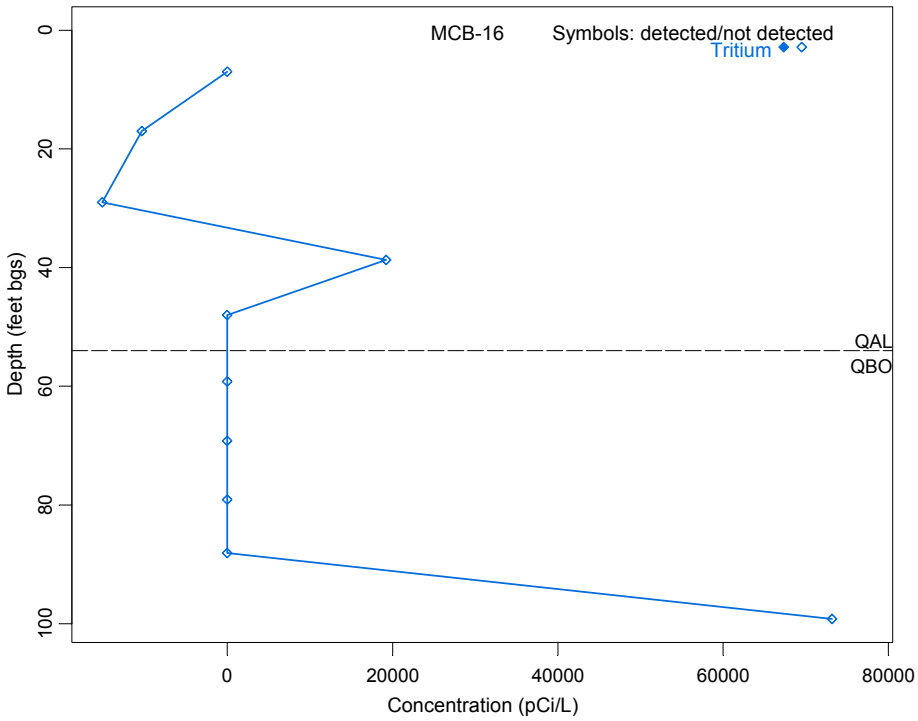


Figure D-2.3-34. Porewater Tritium Concentrations (pCi/L) at MCB-16.

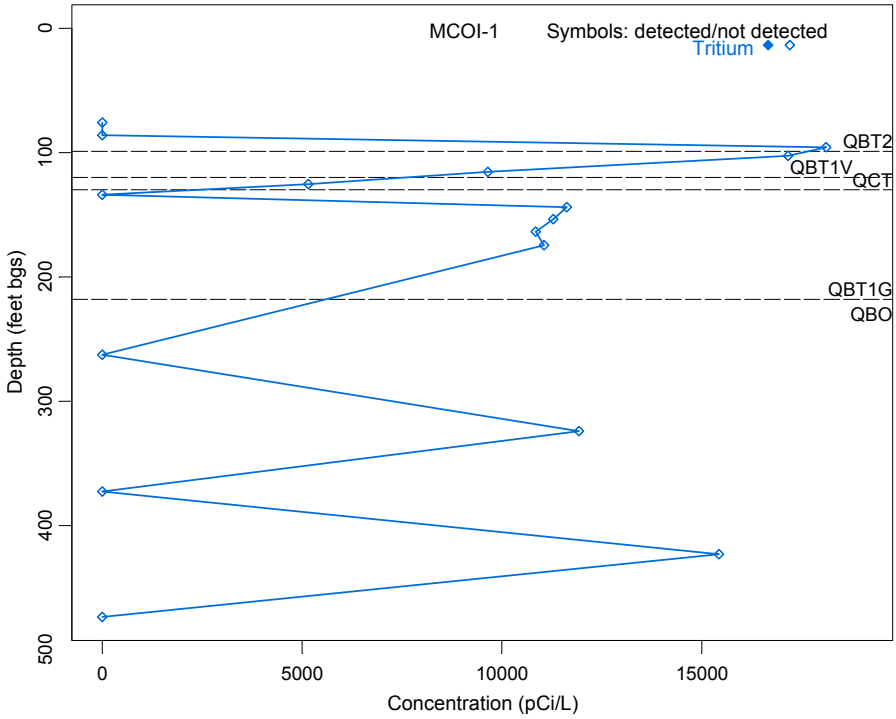


Figure D-2.3-35. Porewater Tritium Concentrations (pCi/L) at MCOI-1.

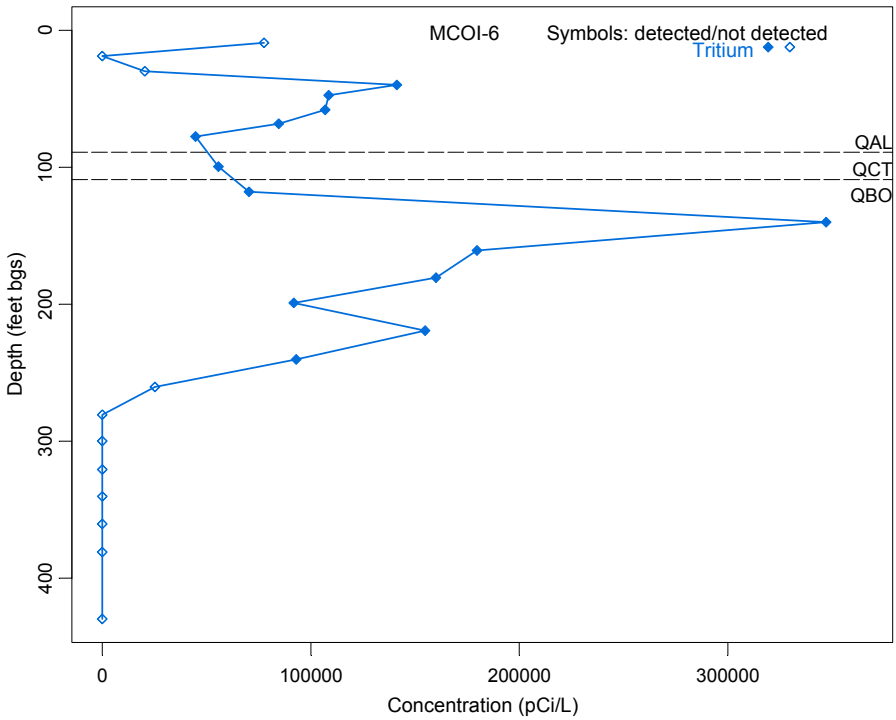


Figure D-2.3-36. Porewater Tritium Concentrations (pCi/L) at MCOI-6.

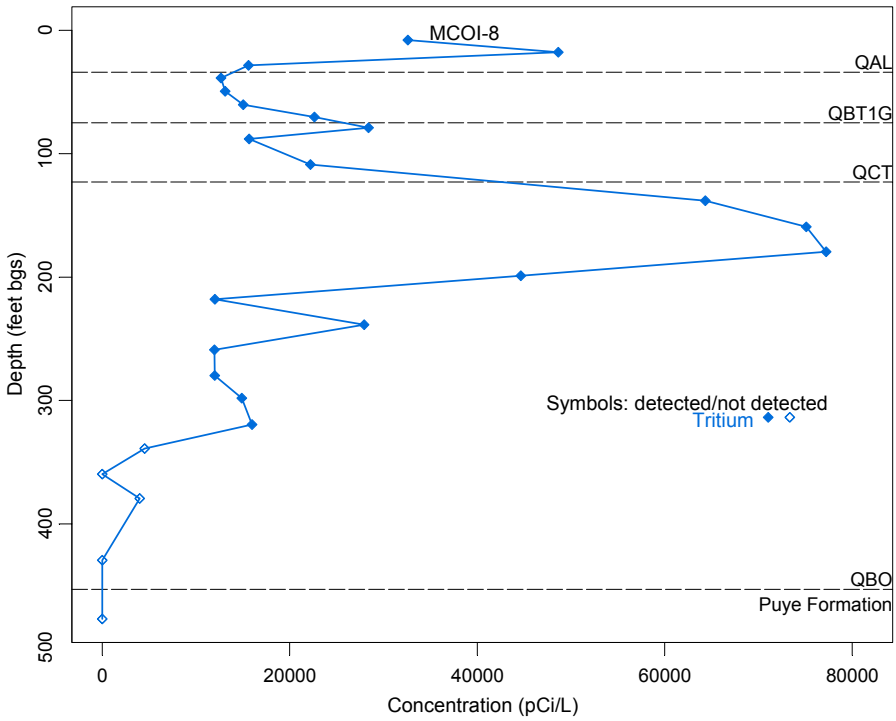


Figure D-2.3-37. Porewater Tritium Concentrations (pCi/L) at MCOI-8.

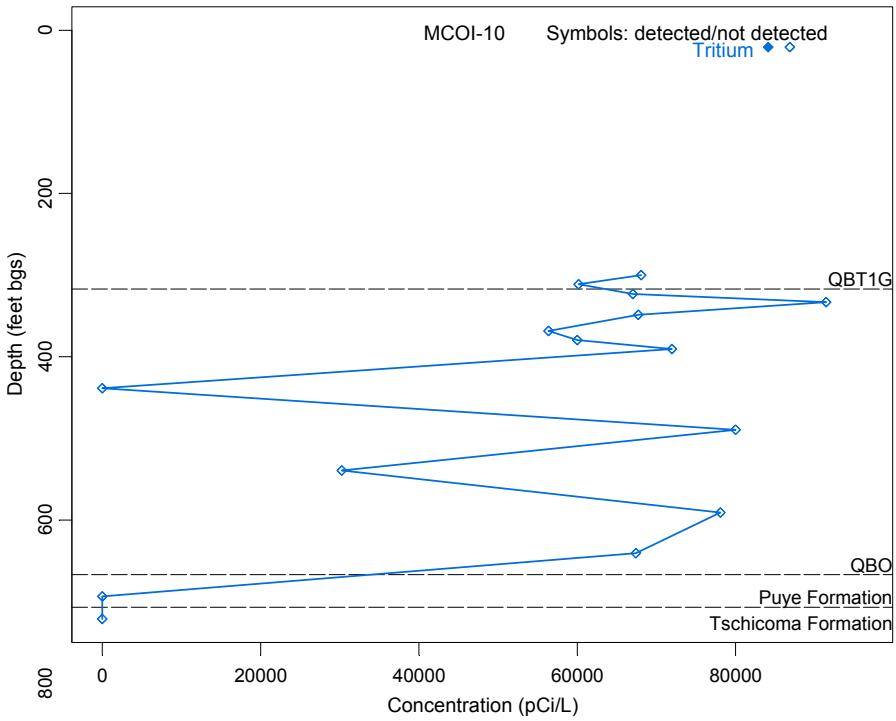


Figure D-2.3-38. Porewater Tritium Concentrations (pCi/L) at MCOI-10.

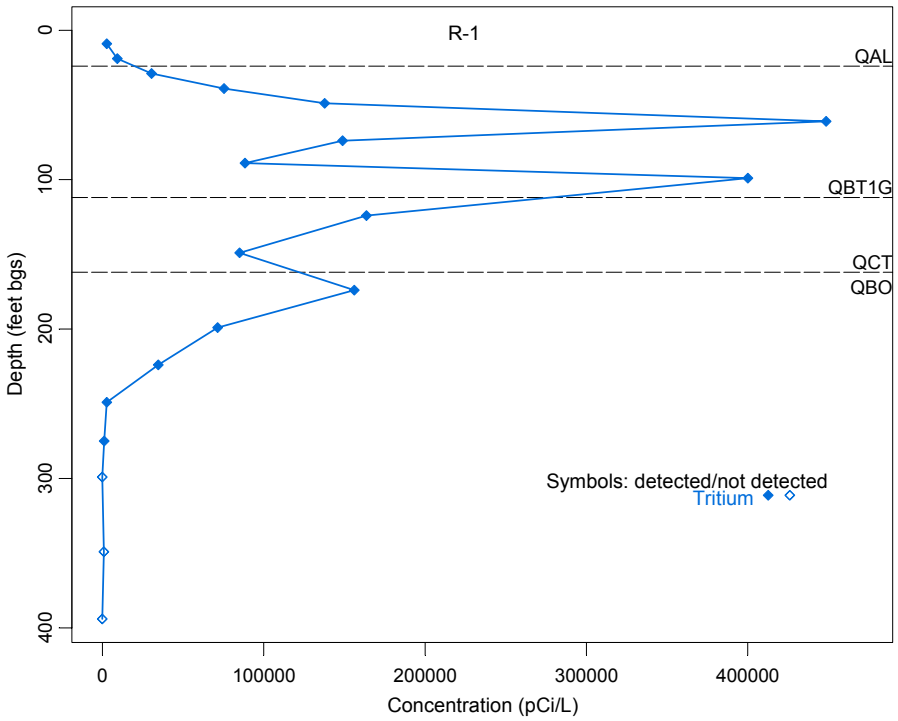


Figure D-2.3-39. Porewater Tritium Concentrations (pCi/L) at R-1.

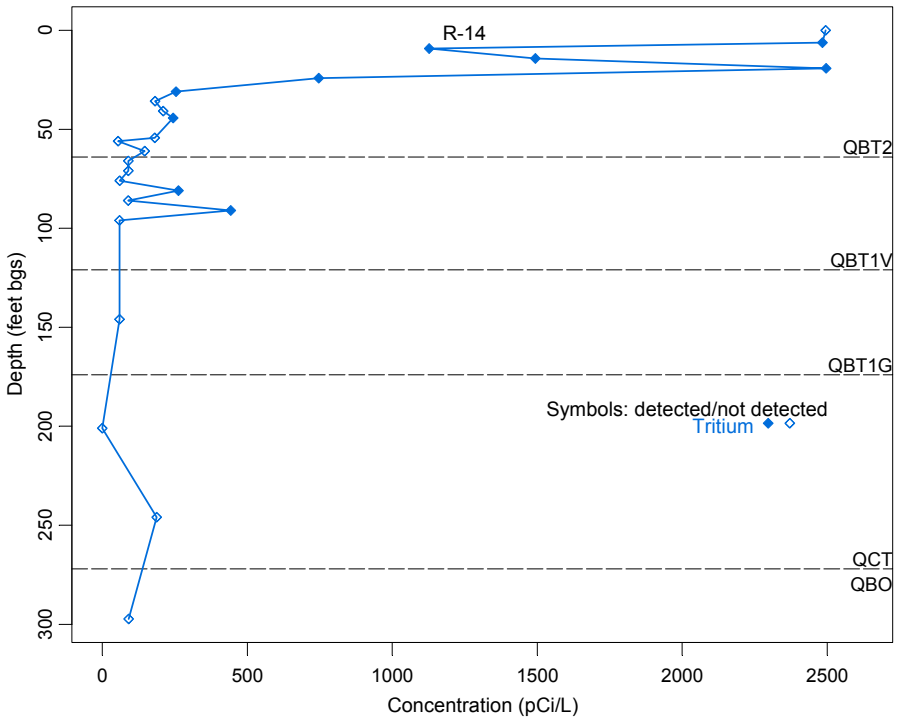


Figure D-2.3-40. Porewater Tritium Concentrations (pCi/L) at R-14.

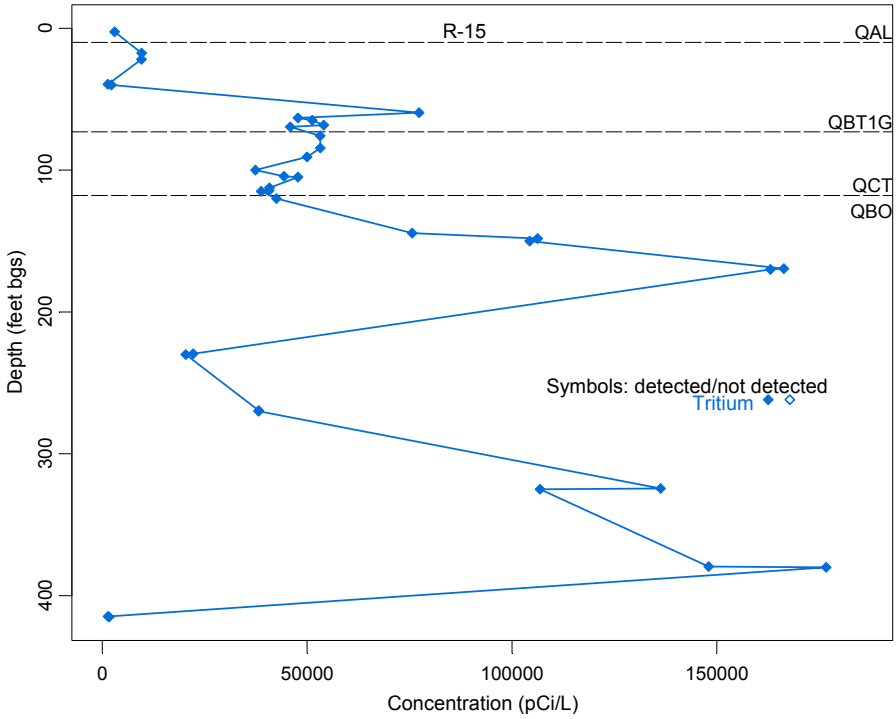


Figure D-2.3-41. Porewater Tritium Concentrations (pCi/L) at R-15.

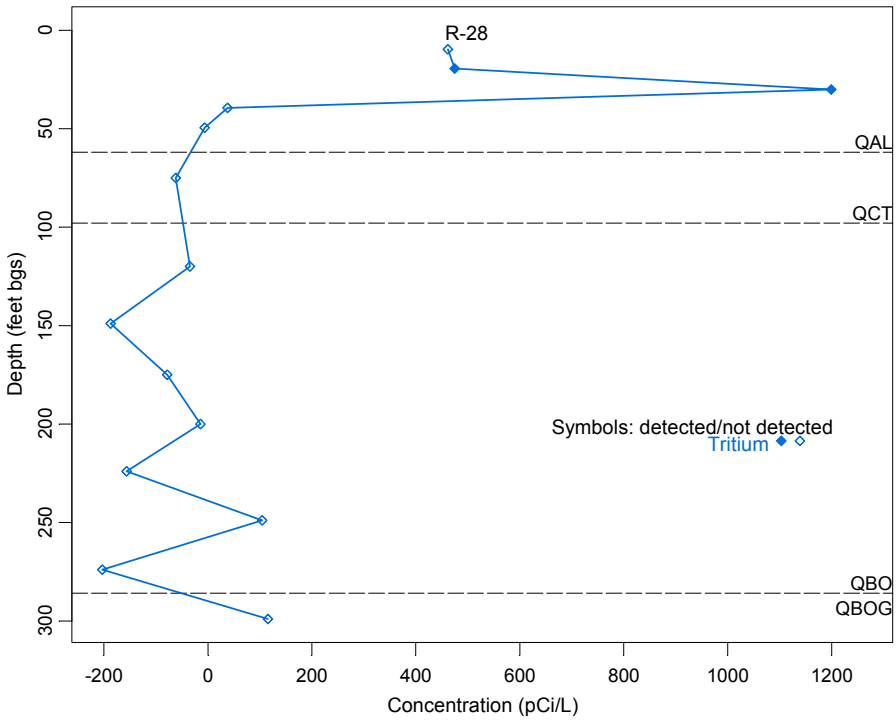


Figure D-2.3-42. Porewater Tritium Concentrations (pCi/L) at R-28.

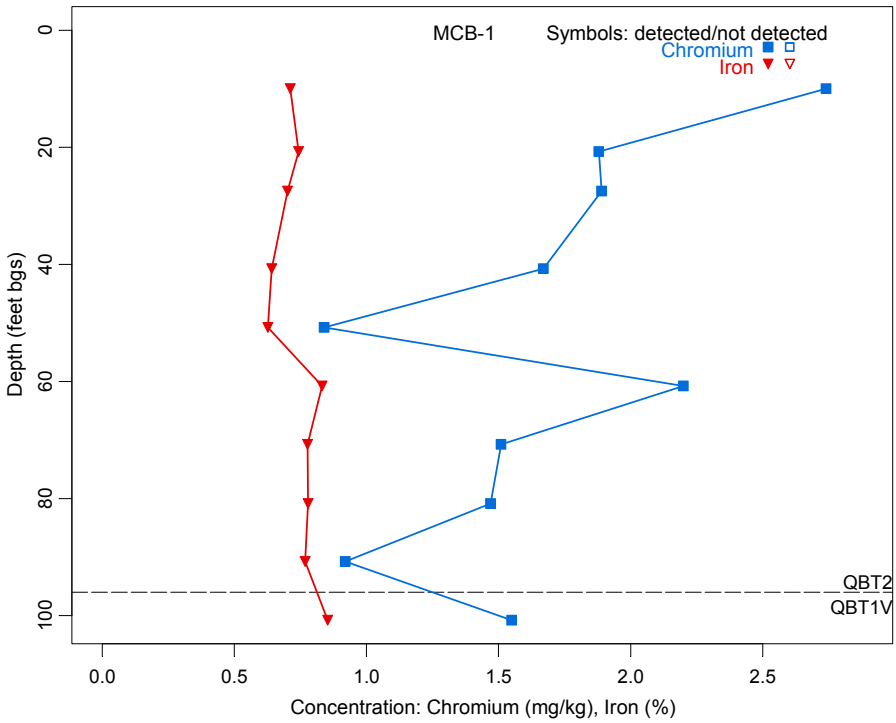


Figure D-2.4-1. Chromium and iron distribution in cores at MCB-1

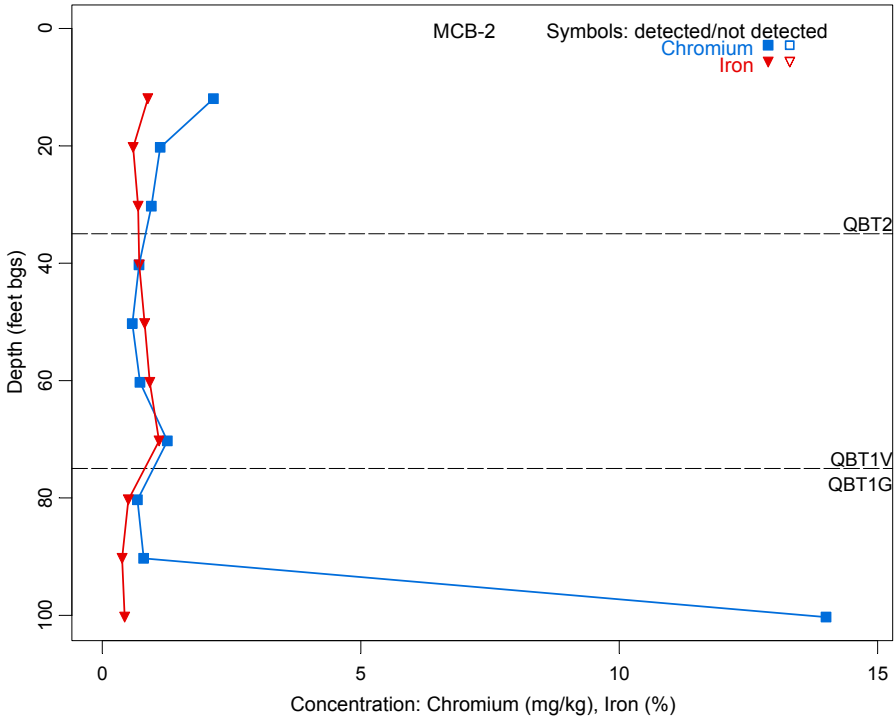


Figure D-2.4-2. Chromium and iron distribution in cores at MCB-2

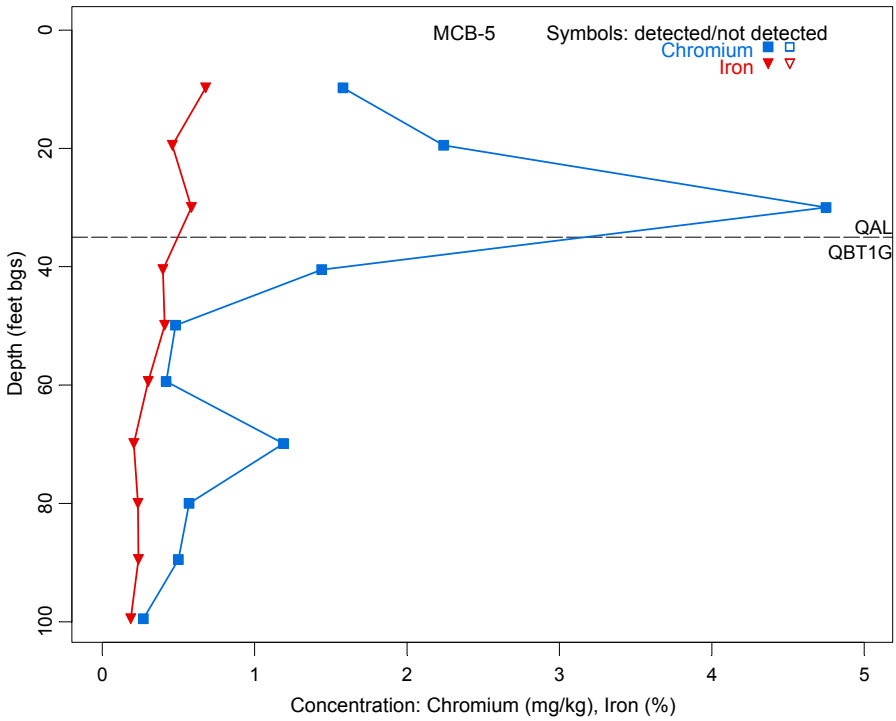


Figure D-2.4-3. Chromium and iron distribution in cores at MCB-5

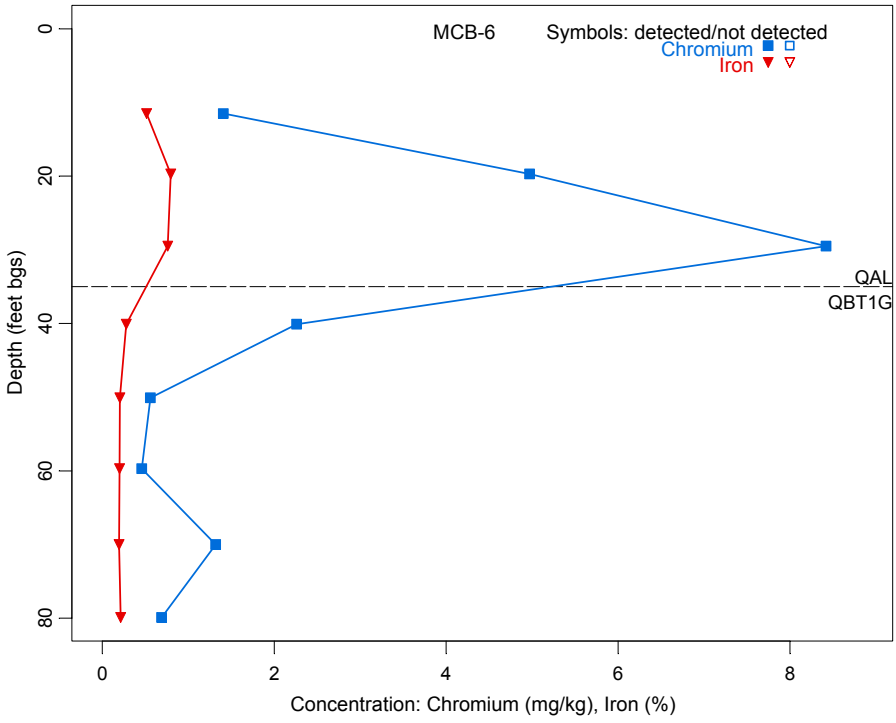


Figure D-2.4-4. Chromium and iron distribution in cores at MCB-6

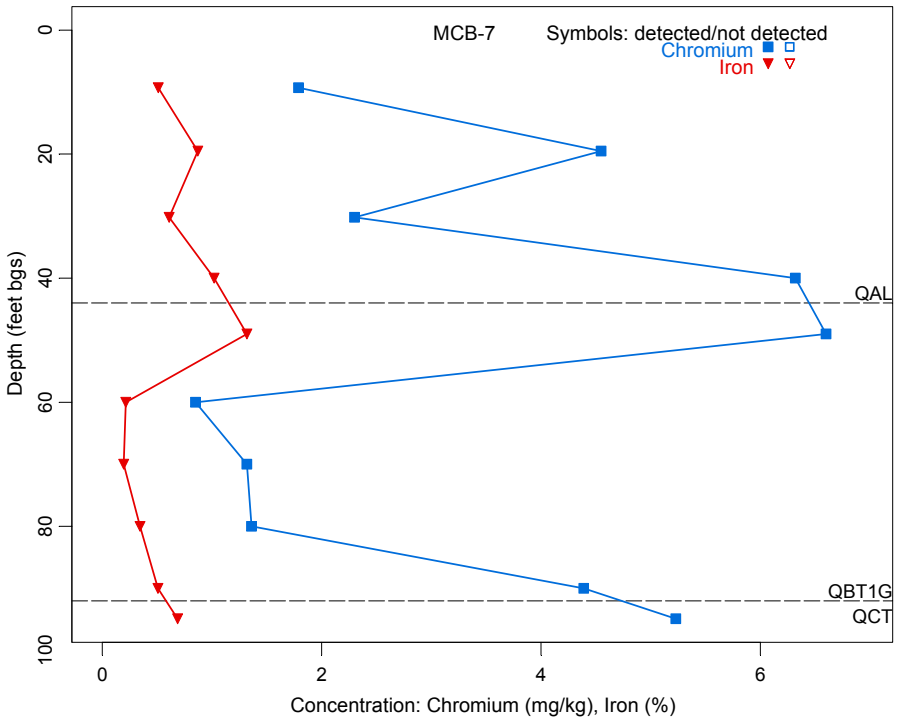


Figure D-2.4-5. Chromium and iron distribution in cores at MCB-7

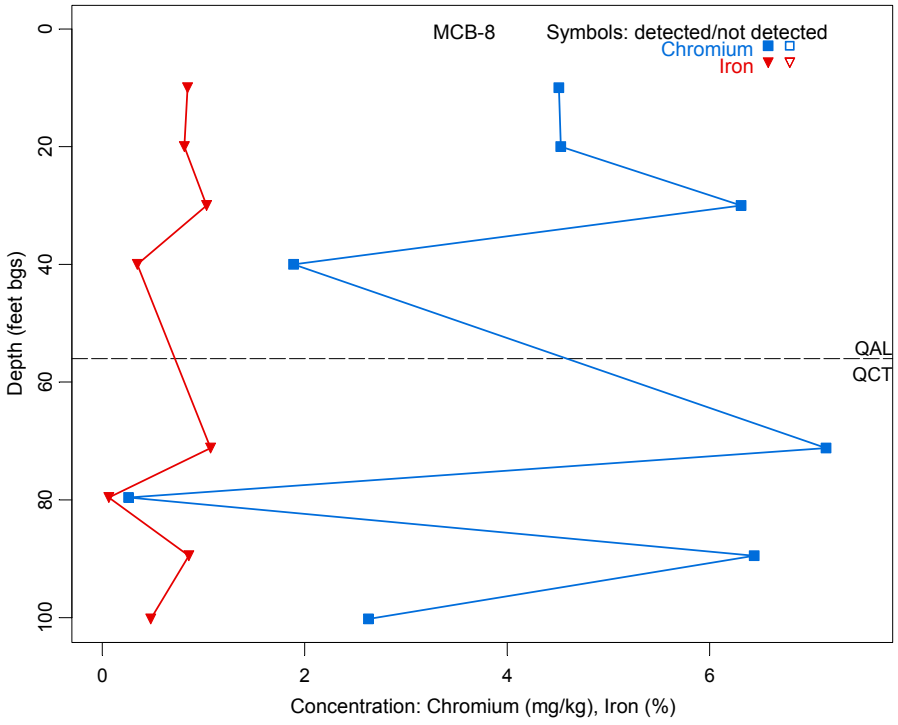


Figure D-2.4-6. Chromium and iron distribution in cores at MCB-8

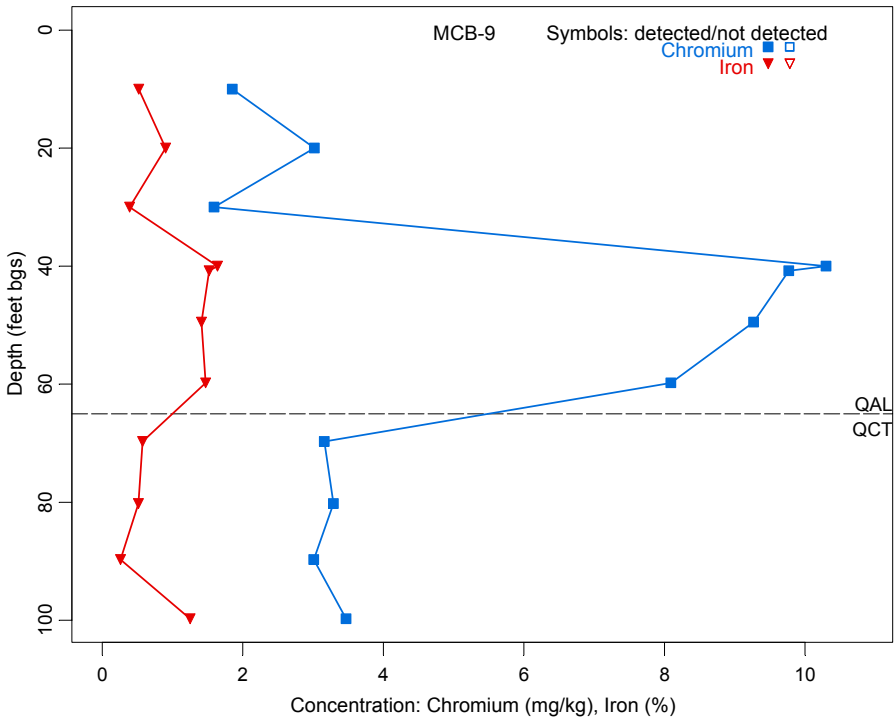


Figure D-2.4-7. Chromium and iron distribution in cores at MCB-9

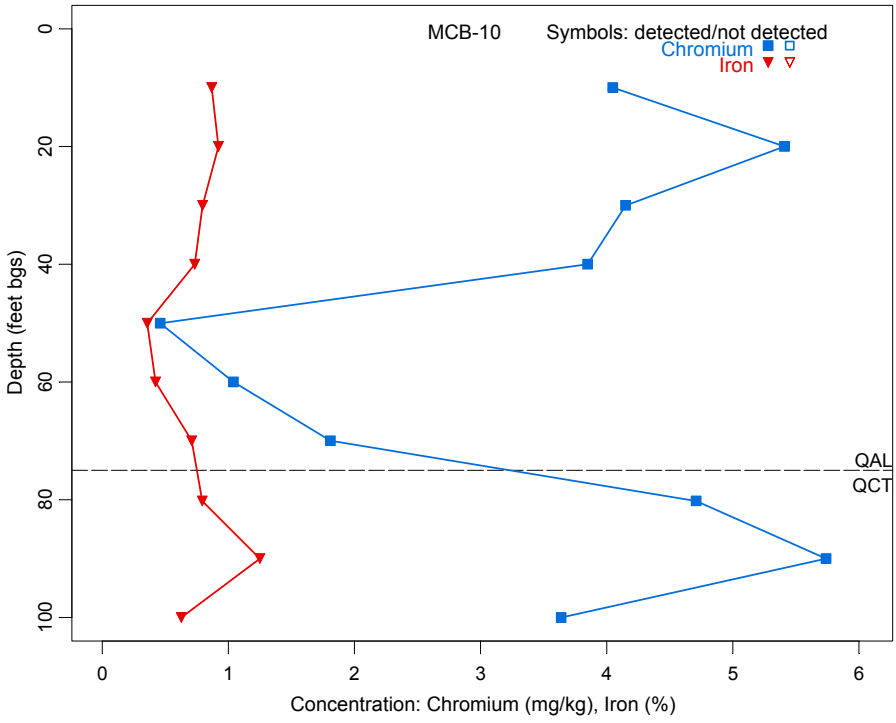


Figure D-2.4-8. Chromium and iron distribution in cores at MCB-10

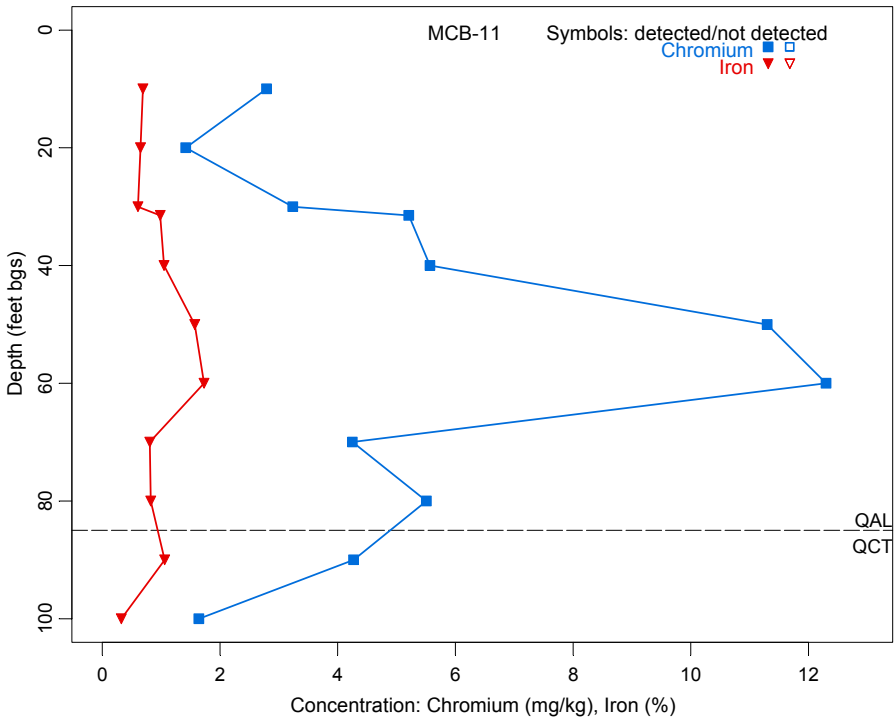


Figure D-2.4-9. Chromium and iron distribution in cores at MCB-11

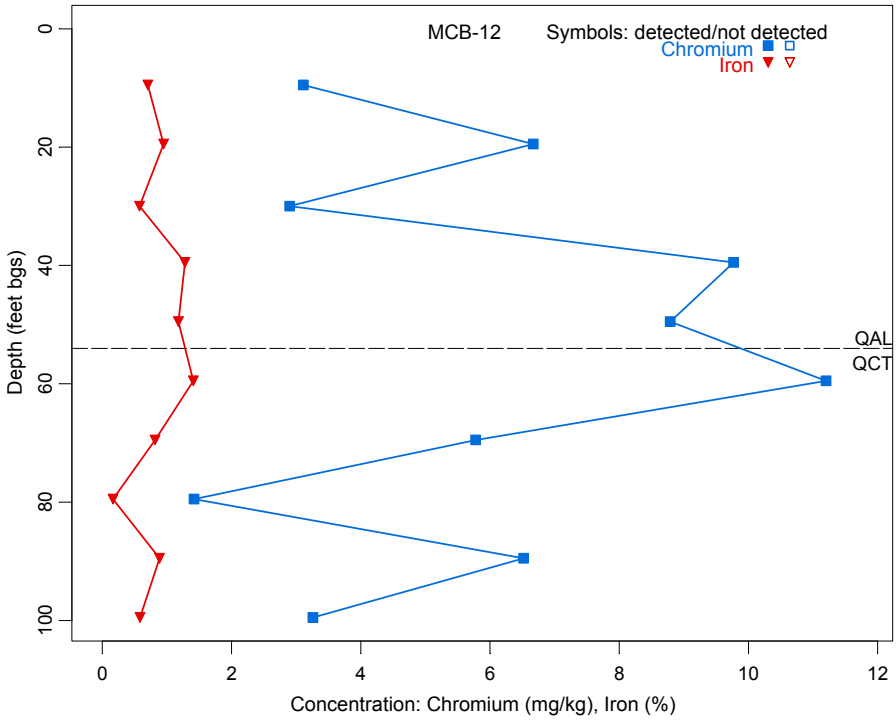


Figure D-2.4-10. Chromium and iron distribution in cores at MCB-12

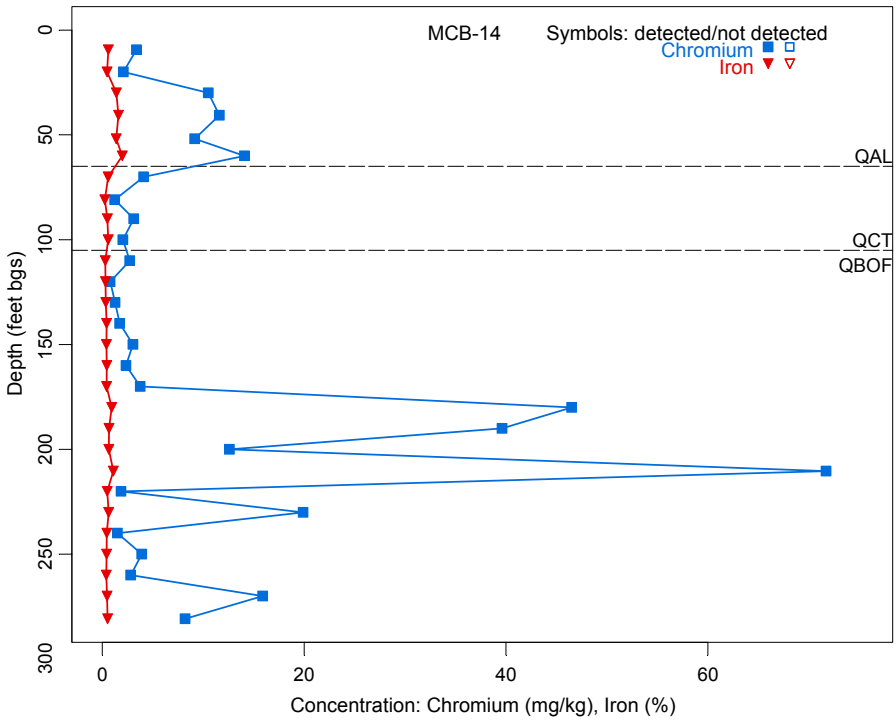


Figure D-2.4-11. Chromium and iron distribution in cores at MCB-14

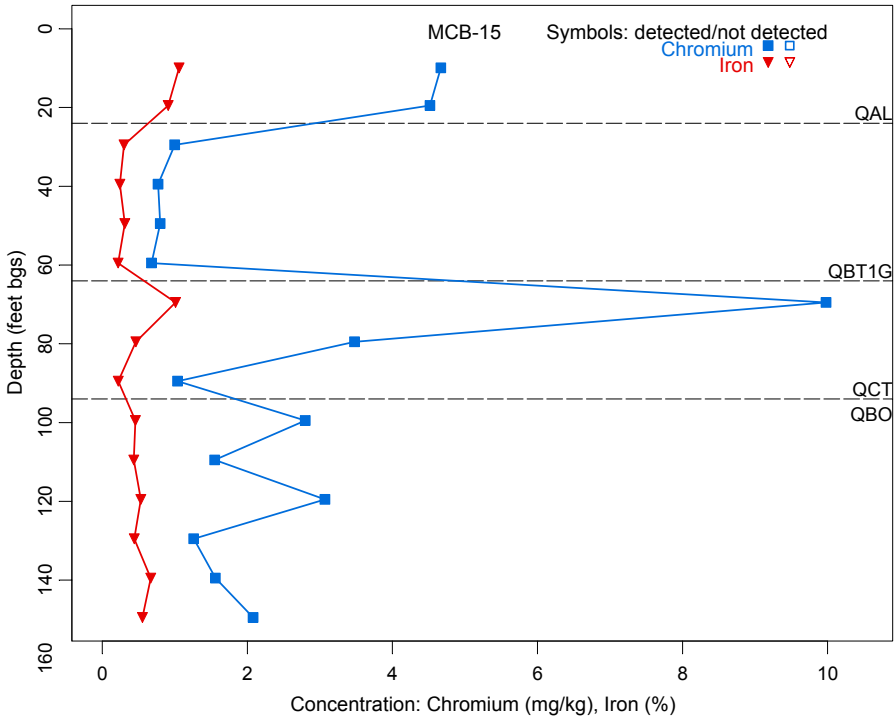


Figure D-2.4-12. Chromium and iron distribution in cores at MCB-15

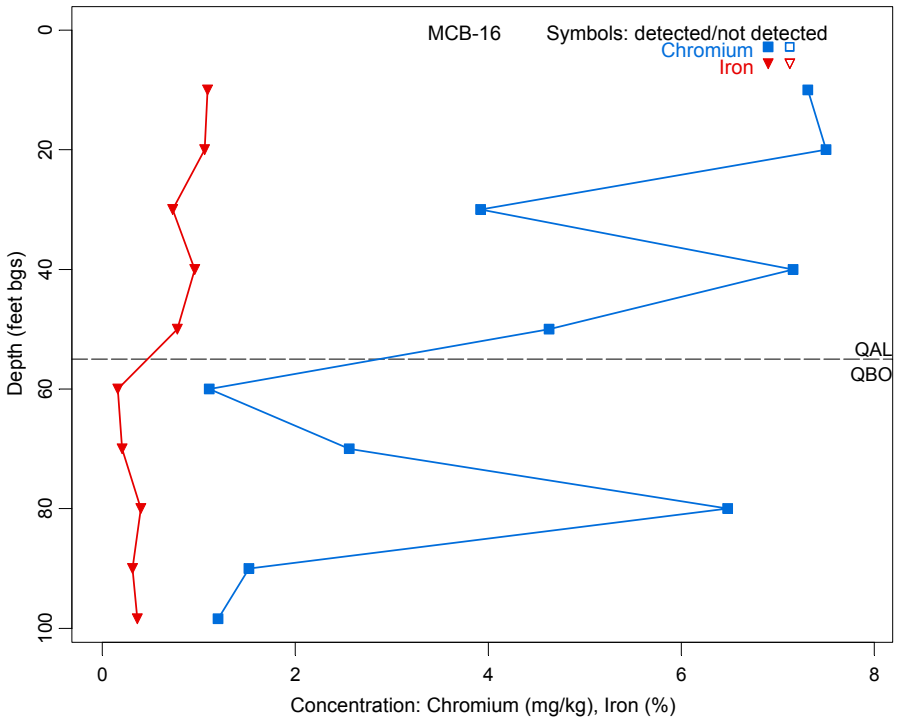


Figure D-2.4-13. Chromium and iron distribution in cores at MCB-16

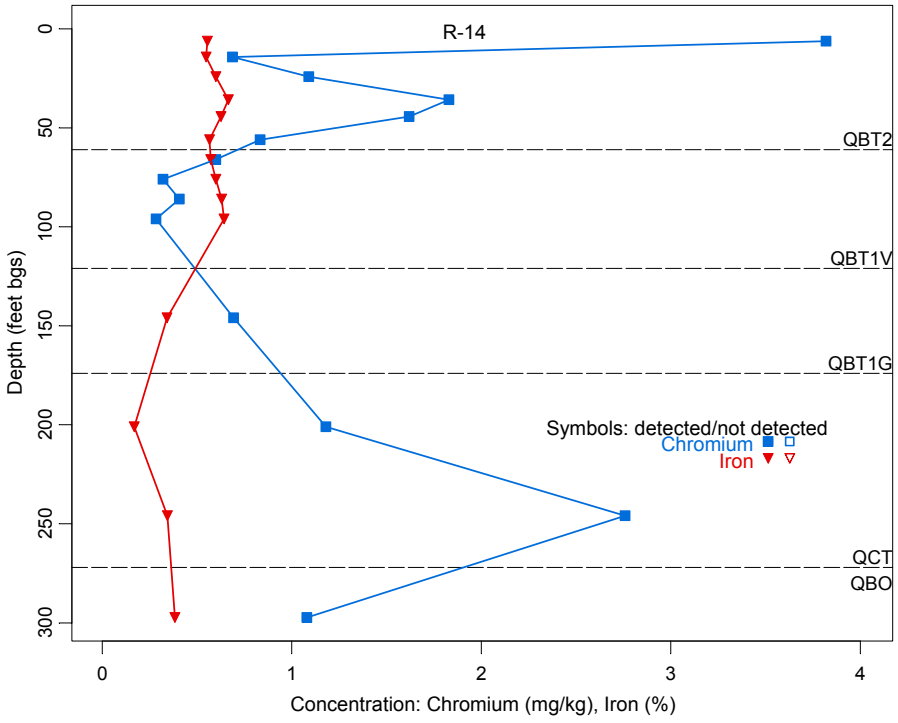


Figure D-2.4-19. Chromium and iron distribution in cores at R-14

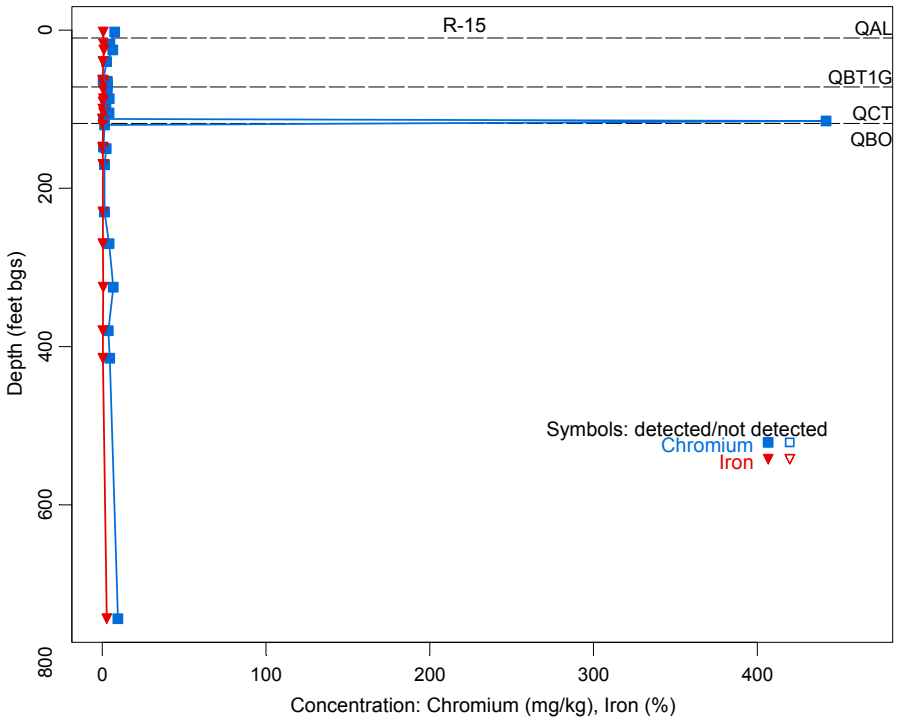


Figure D-2.4-20. Chromium and iron distribution in cores at R-15

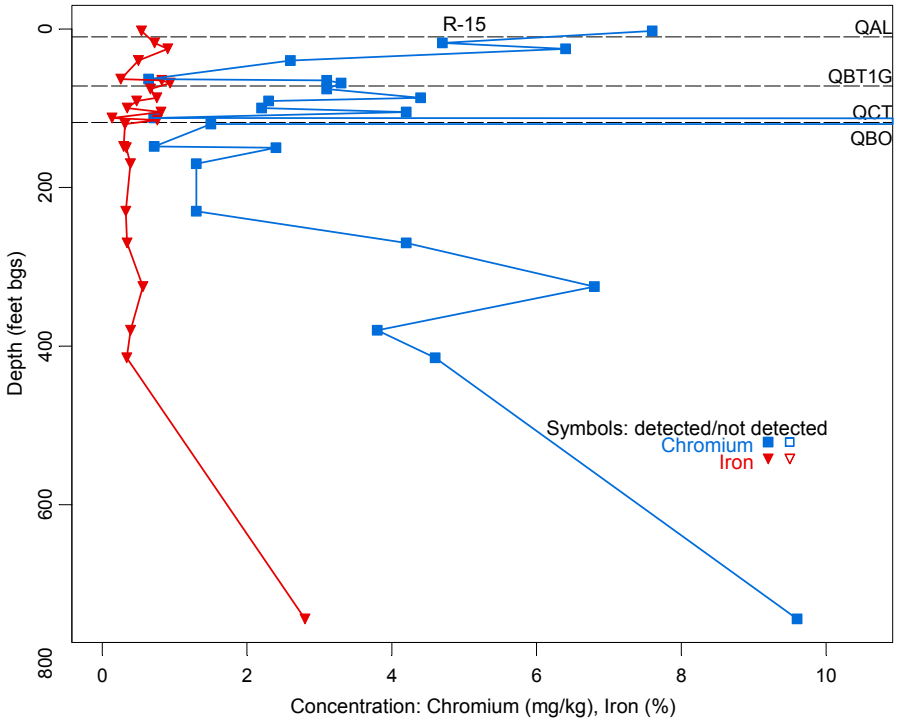


Figure D-2.4-21. Chromium and iron distribution in cores at R-15 without 442-mg/kg sample

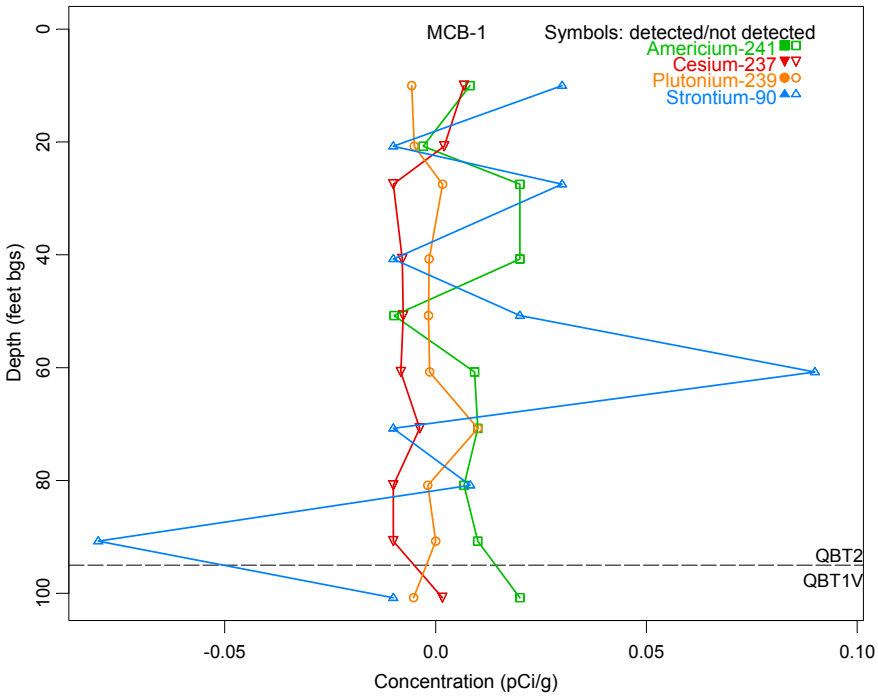


Figure D-2.4-22. Radionuclide distribution in cores at MCB-1

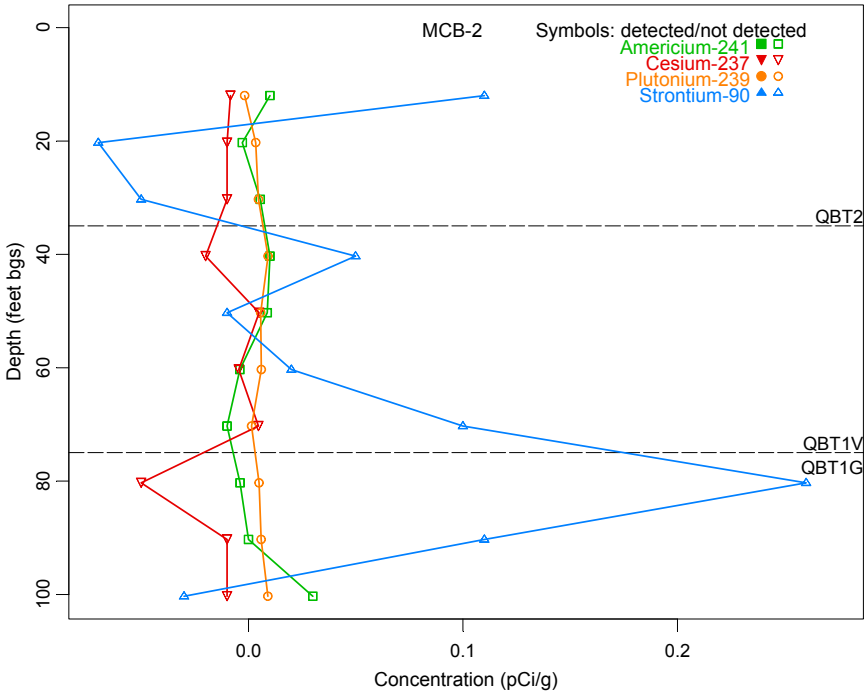


Figure D-2.4-23. Radionuclide distribution in cores at MCB-2

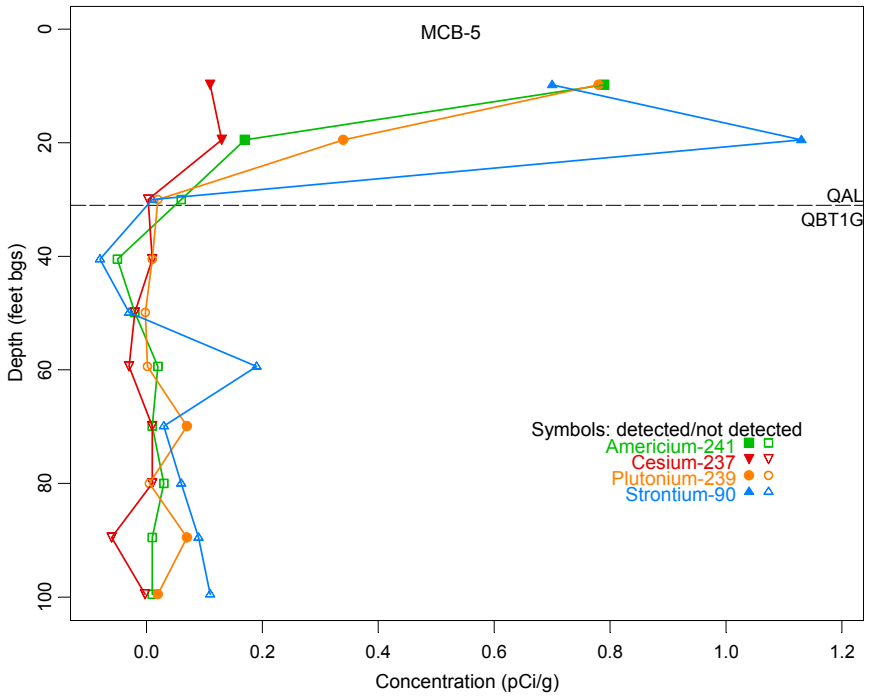


Figure D-2.4-24. Radionuclide distribution in cores at MCB-5

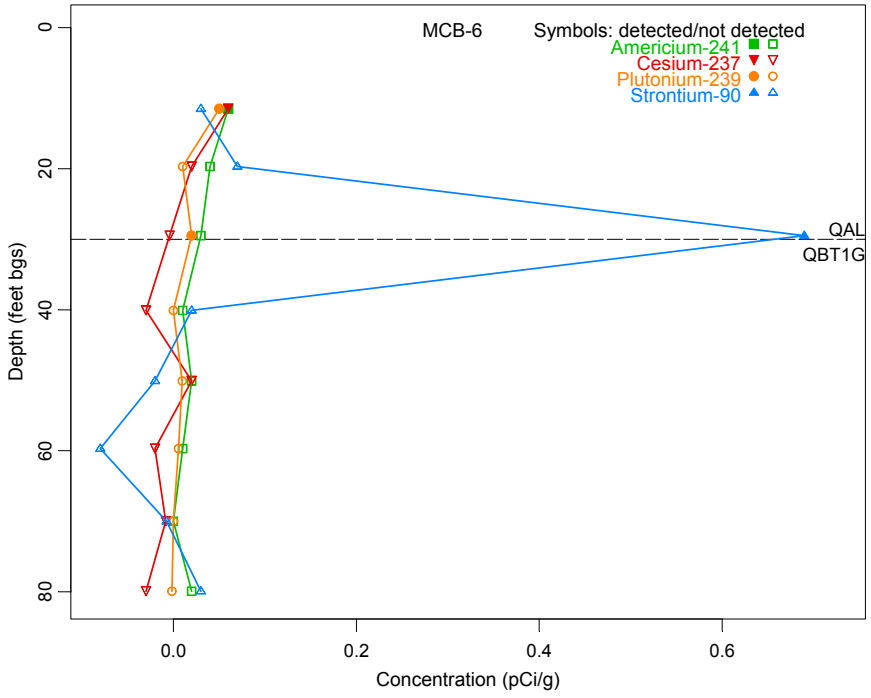


Figure D-2.4-25. Radionuclide distribution in cores at MCB-6

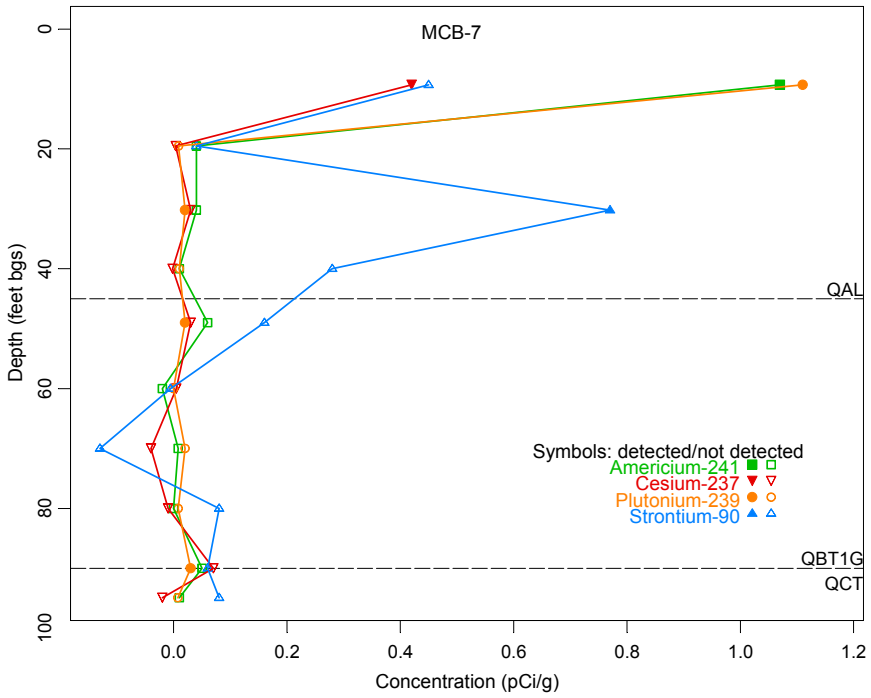


Figure D-2.4-26. Radionuclide distribution in cores at MCB-7

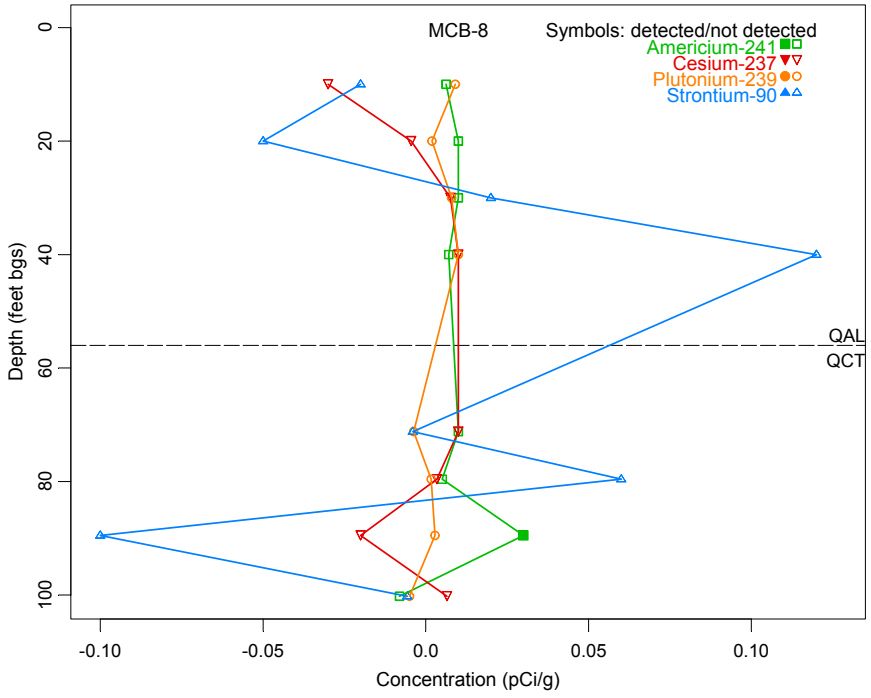


Figure D-2.4-27. Radionuclide distribution in cores at MCB-8

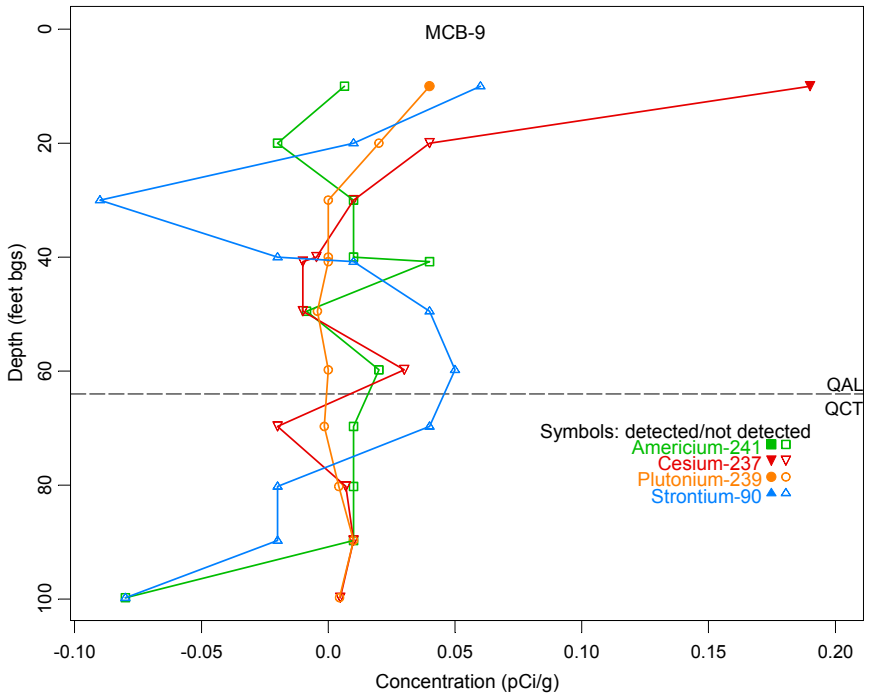


Figure D-2.4-28. Radionuclide distribution in cores at MCB-9

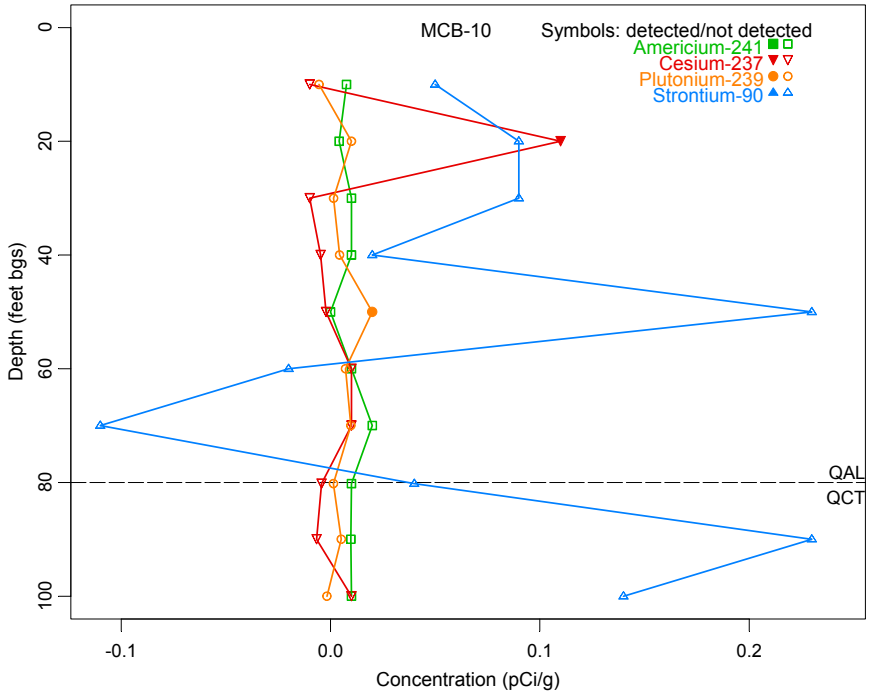


Figure D-2.4-29. Radionuclide distribution in cores at MCB-10

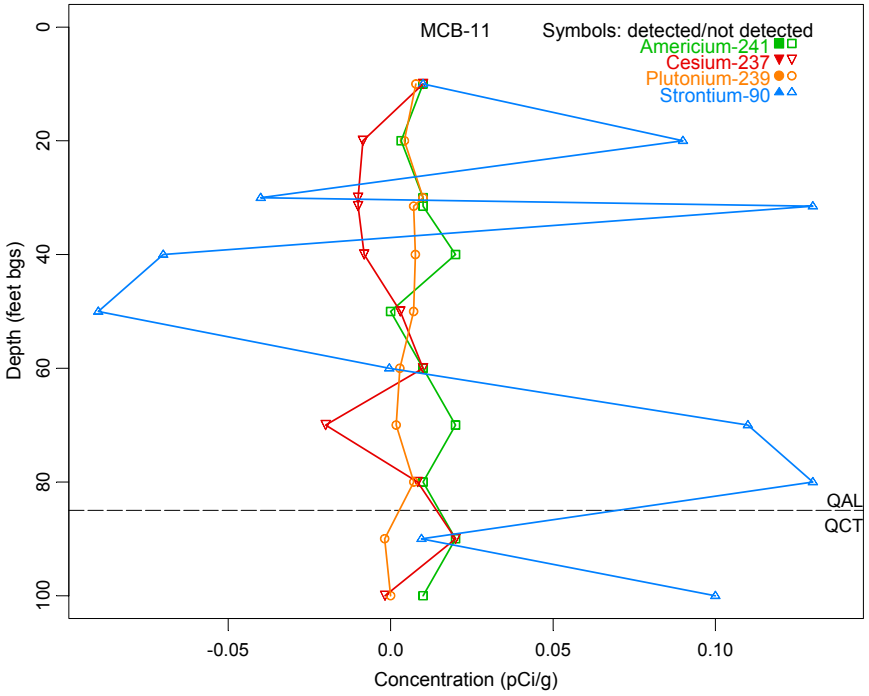


Figure D-2.4-30. Radionuclide distribution in cores at MCB-11

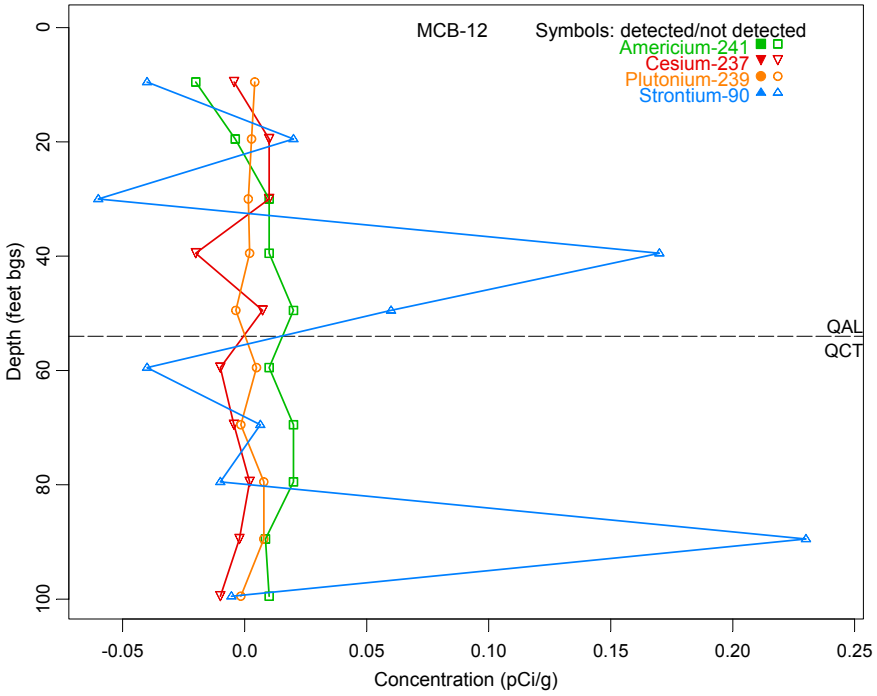


Figure D-2.4-31. Radionuclide distribution in cores at MCB-12

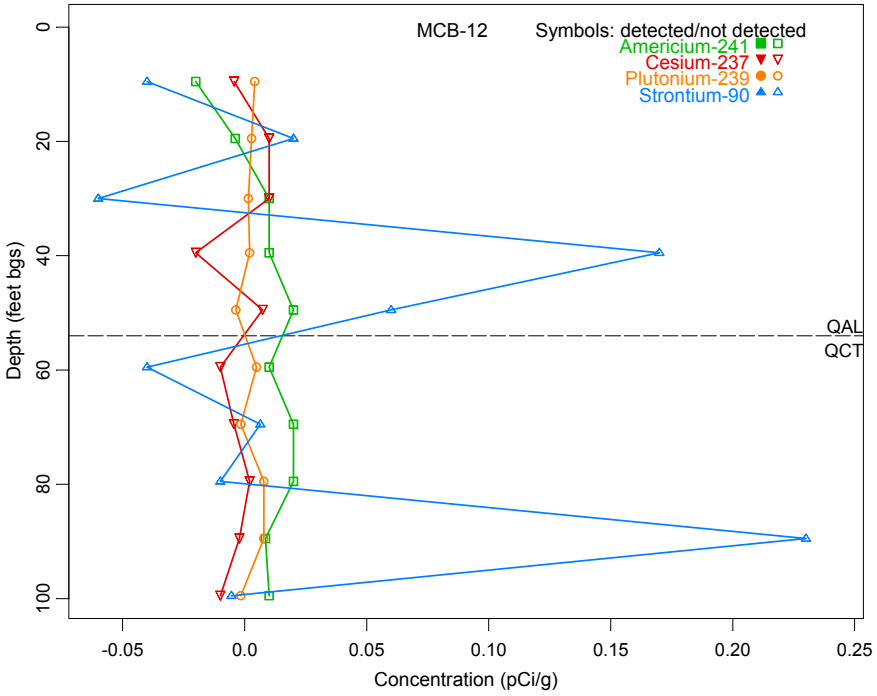


Figure D-2.4-32. Radionuclide distribution in cores at MCB-14

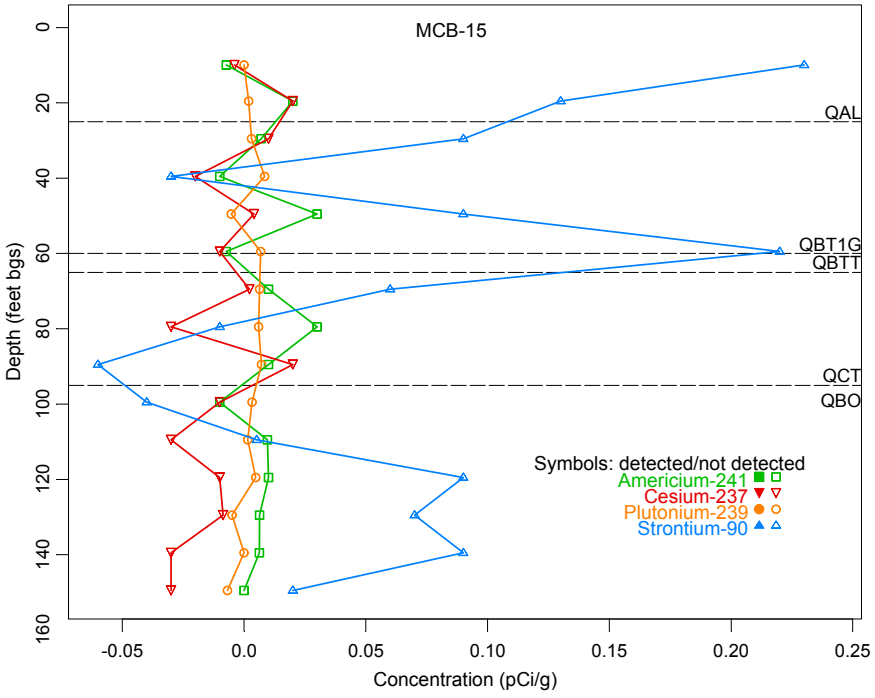


Figure D-2.4-33. Radionuclide distribution in cores at MCB-15

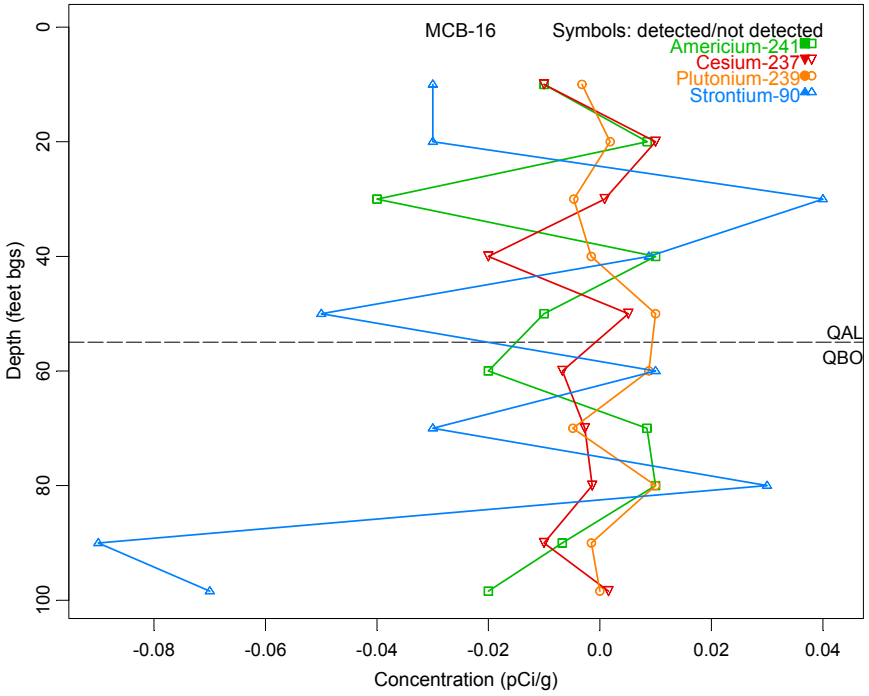


Figure D-2.4-34. Radionuclide distribution in cores at MCB-16

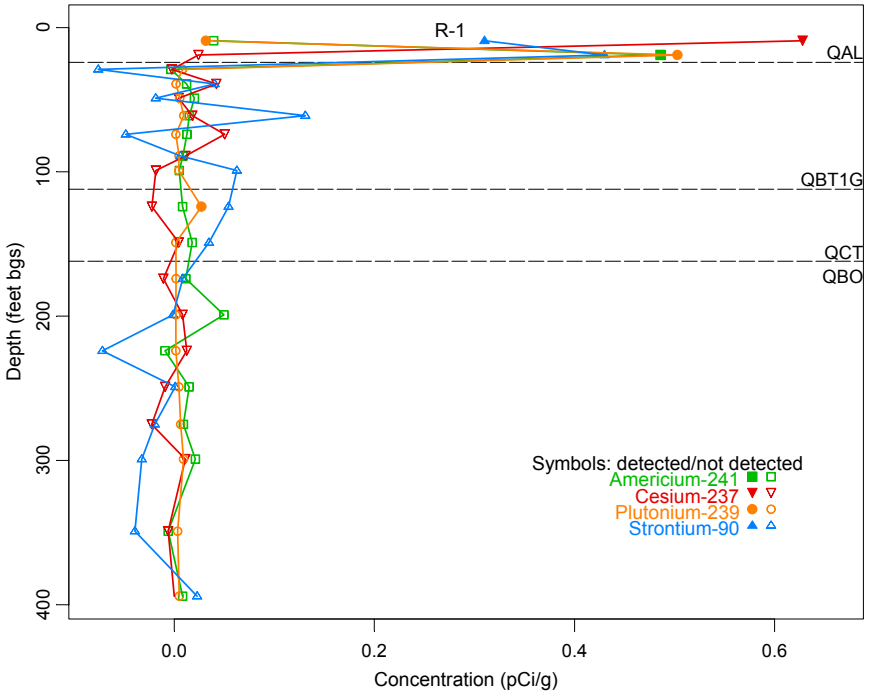


Figure D-2.4-35. Radionuclide distribution in cores at R-1

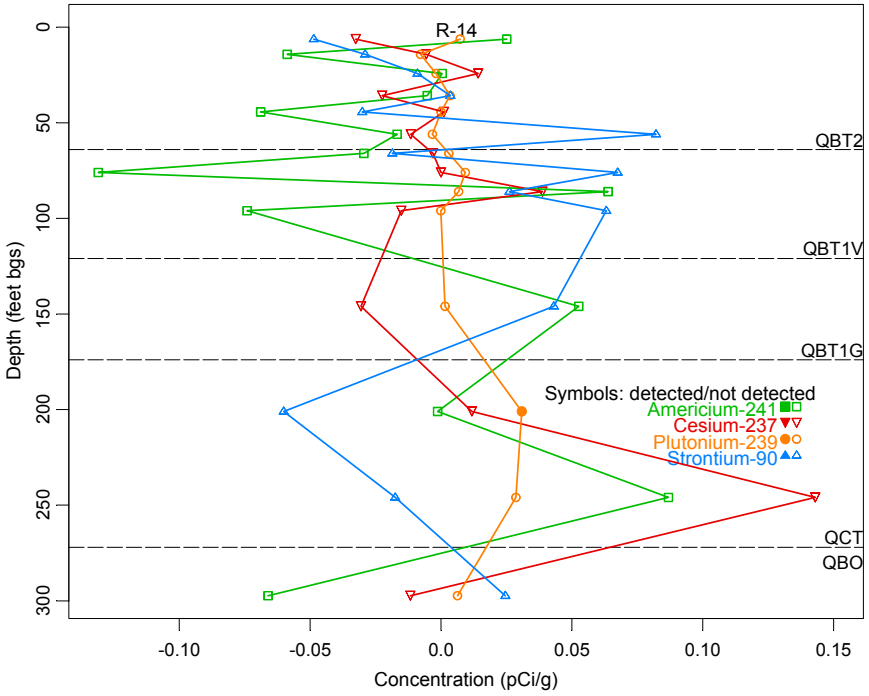


Figure D-2.4-36. Radionuclide distribution in cores at R-14

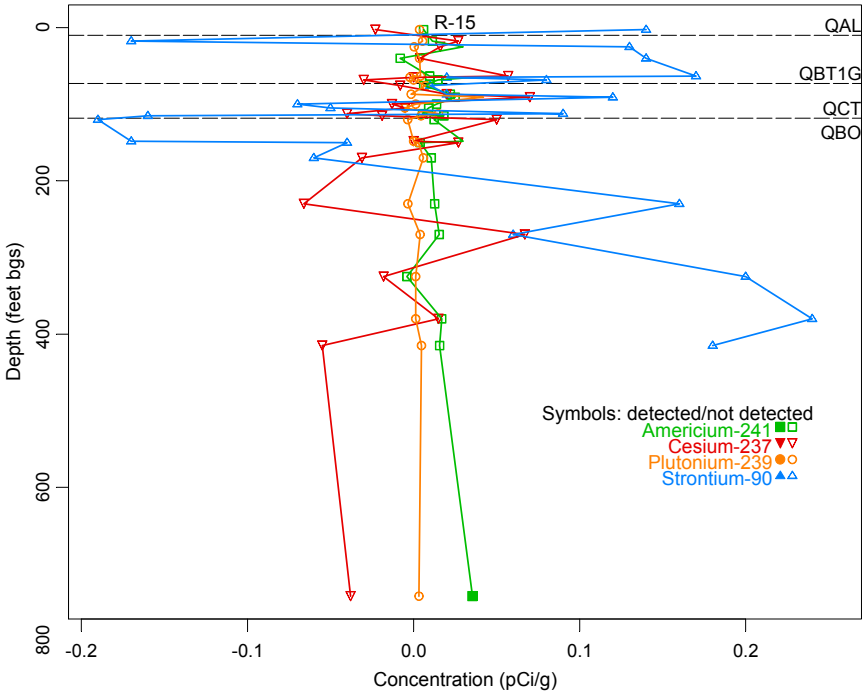


Figure D-2.4-37. Radionuclide distribution in cores at R-15

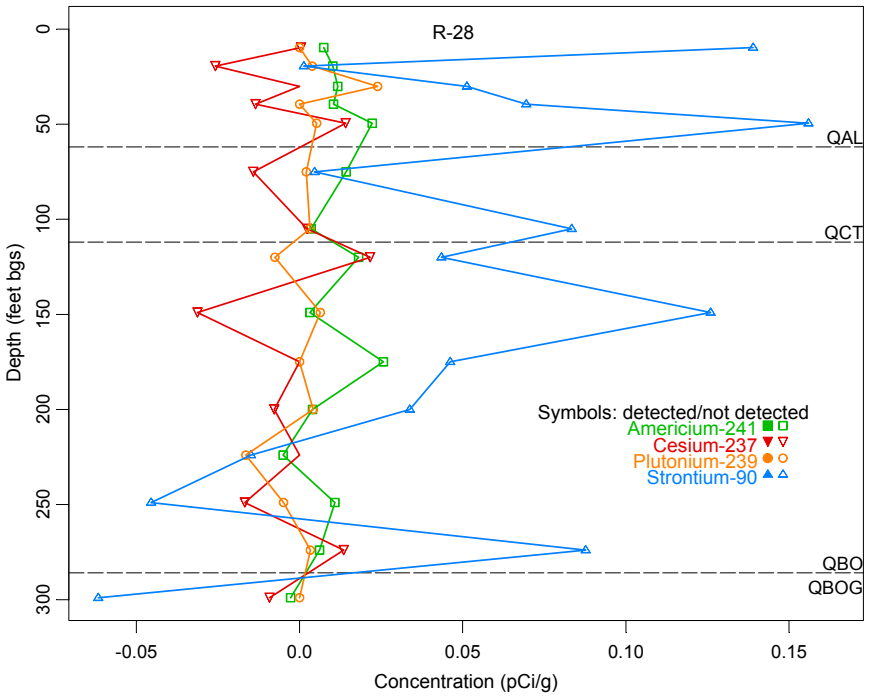


Figure D-2.4-38. Radionuclide distribution in cores at R-28

Table D-1.3-1
Binning and Summary of Geomorphic Units in
Sediment Investigation Reaches in the Mortandad Watershed

Reach	Geomorphic Unit	Average Unit Width (m) [a]	Fraction of Reach Area Excluding c1br and f2	Sediment Facies	Bin Number	Notes on Bin [b]	Estimated Average Sediment Thickness (m)	Estimated Volume Excluding f2 (m^3/m)	Fraction of Sediment Volume Excluding f2	Notes
E-1FW	c1	0.8	0.28	Fine	1	1	0.04	0.03	0.03	Active channel
				Coarse	2	2, 4	0.33	0.25	0.24	
	c1b	0.04	0.01	Fine	1	3, 4	0.16	0.01	0.01	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.24	0.01	0.01	
	c2	1.5	0.57	Fine	1	3	0.23	0.35	0.34	Abandoned post-1942 channel
				Coarse	2	2, 4	0.20	0.31	0.29	
	f1	0.3	0.13	Fine	1	3	0.20	0.07	0.07	Post-1942 floodplain
				Coarse	2	1	0.08	0.03	0.03	
	Total	**2.7**	**1.00**	**n/a** [c]	**n/a**	**n/a**	**n/a**	**1.05**	**1.00**	**n/a**
E-1W	c1	0.3	0.04	Fine	1	1	0.04	0.01	0.00	Active channel
				Coarse	2	5	0.5	0.16	0.03	
	c1b	0.1	0.01	Fine	1	1	0.37	0.03	0.01	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.39	0.03	0.01	
	c1ct	4.8	0.56	Fine	1	3	0.28	1.34	0.27	Cattail wetland along active channel
				Coarse	2	5	0.27	1.29	0.26	
	c2	1.3	0.16	Fine	1	3	0.30	0.40	0.08	Abandoned post-1942 channel
				Coarse	3	4, 5	0.19	0.26	0.05	
	c2w	1.6	0.19	Fine	1	3	0.47	0.77	0.15	Abandoned post-1942 channel with willows
				Coarse	3	4, 5	0.37	0.61	0.12	
	f1	0.3	0.04	Fine	1	1	0.15	0.05	0.01	Post-1942 floodplain
				Coarse	2	1	0.14	0.04	0.01	
	Total	**8.5**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**4.99**	**1.00**	**n/a**
E-1E	c1	1.7	0.60	Fine	1	5	0.02	0.03	0.02	Active channel
				Coarse	2	5	0.4	0.68	0.49	
	c1b	0.3	0.12	Fine	1	5	0.09	0.03	0.02	Area of fine-grained sediment deposition along active channel
				Coarse	2	5	0.4	0.14	0.10	
	c2	0.2	0.07	Fine	1	5	0.24	0.04	0.03	Abandoned post-1942 channel
				Coarse	3	5	0.4	0.07	0.05	
	c3	0.5	0.17	Fine	4	5	0.27	0.13	0.09	Abandoned post-1942 channel with relatively high cesium-137
				Coarse	3	5	0.4	0.19	0.14	
	f1	0.1	0.04	Fine	4	5	0.53	0.06	0.04	Post-1942 floodplain
				Coarse	3	5	0.15	0.02	0.01	
	f2	0.2	n/a	Fine	5	6	0.18	n/a	n/a	Possible post-1942 floodplain
				Coarse	5	1	0.04	n/a	n/a	
	Total	**3.0**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**1.39**	**1.00**	**n/a**
M-1W	c1	1.3	0.17	Fine	1	1	0.03	0.04	0.01	Active channel
				Coarse	2	2	0.29	0.37	0.11	
	c1b	0.8	0.11	Fine	1	3	0.06	0.05	0.01	Area of fine-grained sediment deposition along active channel
				Coarse	2	2	0.5	0.39	0.12	
	c1br	0.3	n/a	n/a	n/a	n/a	0	n/a	n/a	Active channel on bedrock
	c1ct	1.3	0.18	Fine	1	3	0.15	0.20	0.06	Cattail wetland along active channel
				Coarse	2	2	0.25	0.34	0.10	
	c2	2.8	0.38	Fine	1	3	0.12	0.33	0.10	Relatively low abandoned post-1942 channel
				Coarse	2	2	0.40	1.11	0.33	
	c2w	1.1	0.15	Fine	1	3	0.03	0.03	0.01	Abandoned post-1942 channel with willows
				Coarse	2	2	0.5	0.54	0.16	

Table D-1.3-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m) [a]	Fraction of Reach Area Excluding c1br and f2	Sediment Facies	Bin Number	Notes on Bin [b]	Estimated Average Sediment Thickness (m)	Estimated Volume Excluding f2 (m^3/m)	Fraction of Sediment Volume Excluding f2	Notes
	f1	0.1	0.01	Fine	1	1	0.12	0.01	0.00	Post-1942 floodplain
				Coarse	2	1	0.03	0.00	0.00	
	Total	**7.6**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**3.40**	**1.00**	**n/a**
M-1C	c1	0.3	0.04	Coarse	2	2	0.4	0.13	0.03	Active channel
	c2	3.7	0.51	Fine	1	3	0.21	0.78	0.21	Relatively low abandoned post-1942 channel
				Coarse	2	2	0.20	0.75	0.20	
	c2w	3.3	0.45	Fine	1	3	0.20	0.66	0.18	Abandoned post-1942 channel with willows
				Coarse	2	2	0.44	1.46	0.39	
	Total	**7.4**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**3.78**	**1.00**	**n/a**
M-1E	c1	0.6	0.10	Fine	1	3	0.03	0.02	0.01	Active channel
				Coarse	2	2	0.29	0.18	0.07	
	c1b	0.1	0.01	Fine	1	1	0.09	0.01	0.00	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.5	0.03	0.01	
	c1ct	0.9	0.16	Fine	1	3	0.18	0.17	0.07	Cattail wetland along active channel
				Coarse	2	2	0.25	0.24	0.10	
	c2	2.8	0.49	Fine	1	3	0.25	0.71	0.29	Relatively low abandoned post-1942 channel
				Coarse	2	2	0.2	0.57	0.23	
	c2w	0.3	0.06	Fine	1	3	0.24	0.08	0.03	Abandoned post-1942 channel with willows
				Coarse	2	2	0.34	0.11	0.05	
	c3	0.03	0.01	Fine	1	1	0.50	0.02	0.01	Relatively high abandoned post-1942 channel
				Coarse	2	1	0.5	0.02	0.01	
	f1	1.0	0.17	Fine	1	3	0.29	0.29	0.12	Post-1942 floodplain
				Coarse	2	1	0.02	0.02	0.01	
	f2	0.03	n/a	Fine	3	1, 7	0.01	n/a	n/a	Possible post-1942 floodplain
	Total	**5.8**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**2.45**	**1.00**	**n/a**
M-2W	c1	2.4	0.58	Coarse	1	5	0.5	1.21	0.50	Active channel
	c1b	0.2	0.05	Fine	2	5	0.14	0.03	0.01	Area of fine-grained sediment deposition along active channel
				Coarse	1	5	0.5	0.10	0.04	
	c2	0.4	0.09	Fine	3	5	0.32	0.12	0.05	Abandoned post-1942 channel with relatively low cesium-137
				Coarse	4	4, 5	0.4	0.15	0.06	
	c3	0.2	0.05	Fine	5	5	0.40	0.09	0.04	Abandoned post-1942 channel with relatively high cesium-137
				Coarse	4	5	0.4	0.09	0.04	
	f1	0.6	0.15	Fine	3	5	0.47	0.30	0.12	Post-1942 floodplain with relatively low cesium-137
				Coarse	4	1	0.13	0.08	0.03	
	f1g	0.3	0.08	Fine	5	5	0.64	0.20	0.08	Post-1942 floodplain with relatively high cesium-137
				Coarse	4	5	0.24	0.08	0.03	
	f2	0.6	n/a	Fine	6	6	0.32	n/a	n/a	Possible post-1942 floodplain
	Total	**4.8**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**2.43**	**1.00**	**n/a**
M-2E	c1	2.6	0.54	Fine	1	5	0.01	0.03	0.01	Active channel
				Coarse	2	5	0.5	1.29	0.51	
	c1b	0.2	0.04	Fine	1	5	0.20	0.04	0.02	Area of fine-grained sediment deposition along active channel
				Coarse	2	5	0.5	0.11	0.04	
	c2	0.3	0.06	Fine	3	5	0.15	0.04	0.02	Abandoned post-1942 channel with relatively low cesium-137
				Coarse	4	4, 5	0.5	0.14	0.05	
	c3	0.3	0.06	Fine	5	5	0.39	0.11	0.04	Abandoned post-1942 channel with relatively high cesium-137
				Coarse	6	5	0.5	0.14	0.06	
	f1	0.4	0.08	Fine	3	5	0.29	0.11	0.05	Post-1942 floodplain with relatively low cesium-137
	f1g	1.0	0.21	Fine	5	5	0.44	0.44	0.18	Post-1942 floodplain with relatively high cesium-137
				Coarse	6	5	0.05	0.05	0.02	

Table D-1.3-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m) [a]	Fraction of Reach Area Excluding c1br and f2	Sediment Facies	Bin Number	Notes on Bin [b]	Estimated Average Sediment Thickness (m)	Estimated Volume Excluding f2 (m^3/m)	Fraction of Sediment Volume Excluding f2	Notes
	f2	2.6	n/a	Fine	7	1, 7	0.24	n/a	n/a	Possible post-1942 floodplain
	Total	**7.3**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**2.51**	**1.00**	**n/a**
M-3W	c1	1.7	0.18	Fine	1	5	0.03	0.05	0.01	Active channel
				Coarse	2	5	0.6	1.04	0.24	
	c2	1.1	0.11	Fine	1	5	0.29	0.32	0.07	Abandoned inset post-1942 channel with relatively low cesium-137
				Coarse	3	5	0.4	0.44	0.10	
	c3	1.1	0.12	Fine	4	5	0.23	0.26	0.06	High abandoned post-1942 channel with relatively low cesium-137
				Coarse	3	5	0.3	0.34	0.08	
	f1	5.7	0.59	Fine	5	5	0.28	1.60	0.38	Post-1942 floodplain with relatively low cesium-137
				Coarse	3	5	0.04	0.23	0.05	
	f2	7.1	n/a	Fine	7	1, 7	0.13	n/a	n/a	Possible post-1942 floodplain
				Coarse	7	1, 7	0.04	n/a	n/a	
	Total	**16.8**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**4.27**	**1.00**	**n/a**
M-3E	c1	1.5	0.04	Fine	1	5	0.03	0.04	0.00	Active channel
				Coarse	2	5	0.6	0.90	0.04	
	c1b	3.5	0.09	Fine	4	5	0.45	1.58	0.08	Area of fine-grained sediment deposition along active channel; in part overlies c3 or f1 units
				Coarse	3	5	0.4	1.40	0.07	
	c1g	0.6	0.01	Fine	4	5	0.36	0.21	0.01	Active channel in gully; in part overlies c3 unit
				Coarse	3	5	0.45	0.27	0.01	
	c2	1.3	0.03	Fine	1	5	0.29	0.39	0.02	Abandoned inset post-1942 channel with relatively low cesium-137
				Coarse	3	5	0.4	0.53	0.03	
	c2a	0.3	0.01	Fine	4	5	0.33	0.10	0.01	Abandoned inset post-1942 channel with relatively high cesium-137
				Coarse	3	5	0.3	0.09	0.00	
	c3	11.2	0.27	Fine	4	5	0.23	2.58	0.13	High abandoned post-1942 channel with relatively low cesium-137
				Coarse	3	5	0.3	3.37	0.17	
	c3a	2.3	0.06	Fine	6	5	0.36	0.82	0.04	High abandoned post-1942 channel with relatively high cesium-137
				Coarse	3	5	0.5	1.14	0.06	
	f1	19.4	0.47	Fine	5	5	0.28	5.43	0.27	Post-1942 floodplain with relatively low cesium-137
				Coarse	3	5	0.04	0.78	0.04	
	f1a	1.0	0.02	Fine	6	5	0.44	0.44	0.02	Post-1942 floodplain with relatively high cesium-137
				Coarse	3	4, 5	0.16	0.16	0.01	
	f2	4.6	n/a	Fine	7	1, 7	0.13	n/a	n/a	Possible post-1942 floodplain
				Coarse	7	1, 7	0.04	n/a	n/a	
	Total	**45.6**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**20.21**	**1.00**	**n/a**
M-4W	c1	1.3	0.05	Fine	1	5	0.08	0.10	0.01	Active channel
				Coarse	2	5	0.34	0.43	0.05	
	c1t	8.1	0.30	Fine	1	5	0.06	0.48	0.06	Active sediment trap
				Coarse	2	5	0.15	1.21	0.15	
	c1/c2t	0.5	0.02	Fine	3	5	0.57	0.30	0.04	Active channel over former sediment trap
				Coarse	4	1	0.40	0.21	0.03	
	c2/c2t	0.5	0.02	Fine	3	1	0.57	0.28	0.03	Abandoned channel over former sediment trap
				Coarse	4	5	0.40	0.20	0.02	
	c2	2.2	0.08	Fine	5	5	0.34	0.74	0.09	Abandoned inset post-1942 channel
				Coarse	2	5	0.11	0.24	0.03	
	c3a + f1a	2.6	0.10	Fine	6	5	0.27	0.70	0.09	High abandoned post-1942 channel and floodplain with relatively high cesium-137
				Coarse	4	5	0.12	0.31	0.04	
	c3 + f1	12.1	0.44	Fine	7	5	0.21	2.54	0.31	High abandoned post-1942 channel and floodplain with relatively low cesium-137
				Coarse	4	5	0.04	0.48	0.06	

Table D-1.3-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m) [a]	Fraction of Reach Area Excluding c1br and f2	Sediment Facies	Bin Number	Notes on Bin [b]	Estimated Average Sediment Thickness (m)	Estimated Volume Excluding f2 (m^3/m)	Fraction of Sediment Volume Excluding f2	Notes
	f2	11.9	n/a	Fine	8	6	0.21	n/a	n/a	Possible post-1942 floodplain
				Coarse	8	6	0.04	n/a	n/a	
	fill(t)	n/a	n/a	n/a	9	5	n/a	n/a	n/a	Fill associated with sediment traps
	Total	**39.1**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**8.24**	**1.00**	**n/a**
M-4C	c1t	2.3	0.04	Fine	1	5	0.06	0.14	0.01	Active sediment trap
				Coarse	2	5	0.15	0.35	0.02	
	c3a + f1a	19.4	0.33	Fine	6	5	0.27	5.24	0.31	High abandoned post-1942 channel and floodplain with relatively high cesium-137
				Coarse	4	5	0.12	2.33	0.14	
	c3 + f1	35.3	0.61	Fine	7	5	0.21	7.41	0.43	High abandoned post-1942 channel and floodplain with relatively low cesium-137
				Coarse	4	5	0.04	1.41	0.08	
	f1	1.2	0.02	Fine	7	5	0.21	0.24	0.01	Post-1942 floodplain with relatively low cesium-137
	f2	7.9	n/a	Fine	8	6	0.21	n/a	n/a	Possible post-1942 floodplain
				Coarse	8	6	0.04	n/a	n/a	
	fill(t)	n/a	n/a	n/a	9	5	n/a	n/a	n/a	Fill associated with sediment traps
	Total	**66.1**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**17.12**	**1.00**	**n/a**
M-4E	c1g	1.4	0.04	Fine	10	5	0.16	0.22	0.02	Active chennel within gully
				Coarse	4	5	0.12	0.16	0.02	
	c2a	0.1	0.00	Fine	5	5	0.13	0.01	0.00	Abandoned headcut gully
				Coarse	4	1	0.04	0.00	0.00	
	c3 + f1	26.8	0.69	Fine	7	5	0.21	5.62	0.60	High abandoned post-1942 channel and floodplain with relatively low cesium-137
				Coarse	4	5	0.04	1.07	0.11	
	f1	10.7	0.27	Fine	7	5	0.21	2.24	0.24	Post-1942 floodplain with relatively low cesium-137
	f2	44.3	n/a	Fine	8	6	0.21	n/a	n/a	Possible post-1942 floodplain
				Coarse	8	6	0.04	n/a	n/a	
	Total	**83.2**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**9.33**	**1.00**	**n/a**
M-5W	c1	1.4	0.36	Fine	1	5	0.17	0.23	0.15	Active channel
				Coarse	2	5	0.34	0.46	0.31	
	c2	0.3	0.08	Coarse	2	5	0.6	0.18	0.12	Abandoned post-1942 channel
	f1	2.2	0.57	Fine	3	5	0.29	0.63	0.42	Post-1942 floodplain
	Total	**3.8**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**1.50**	**1.00**	**n/a**
M-5E	c1	1.0	0.07	Fine	1	3	0.12	0.27	0.32	Active channel
				Coarse	2	2	0.12	0.12	0.14	
	c2	10.3	0.69	Fine	1	3	0.18	0.21	0.25	Abandoned post-1942 channel
				Coarse	2	2	0.12	0.04	0.05	
	f1	3.6	0.24	Fine	1	3	0.10	0.21	0.25	Post-1942 floodplain
	f2	0.3	n/a	Fine	3	6	0.05	n/a	n/a	Possible post-1942 floodplain
	Total	**15.2**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**0.85**	**1.00**	**n/a**
M-6	c1	1.3	0.07	Fine	1	1	0.01	0.01	0.00	Active channel
				Coarse	2	2	0.49	0.64	0.08	
	c2	2.9	0.15	Fine	1	3	0.32	0.92	0.11	Abandoned post-1942 channel
				Coarse	2	2	0.29	0.84	0.10	
	f1	14.8	0.78	Fine	1	3	0.37	5.47	0.68	Post-1942 floodplain
				Coarse	2	1	0.01	0.15	0.02	
	f2	0.1	n/a	Fine	3	1, 7	0.05	n/a	n/a	Possible post-1942 floodplain
	Total	**19.0**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**8.02**	**1.00**	**n/a**

Table D-1.3-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m) [a]	Fraction of Reach Area Excluding c1br and f2	Sediment Facies	Bin Number	Notes on Bin [b]	Estimated Average Sediment Thickness (m)	Estimated Volume Excluding f2 (m^3/m)	Fraction of Sediment Volume Excluding f2	Notes
MCW-1	c1	1.1	0.28	Fine	1	1	0.06	0.06	0.07	Active channel
				Coarse	2	2	0.12	0.13	0.13	
	c1b	0.6	0.15	Fine	1	3	0.13	0.07	0.08	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.13	0.07	0.08	
	c1br	0.2	n/a	n/a	n/a	n/a	0	n/a	n/a	Active channel on bedrock
	c2	2.1	0.55	Fine	1	3	0.23	0.47	0.49	Low abandoned post-1942 channel
				Coarse	2	2	0.07	0.14	0.15	
	c3	0.0	0.01	Fine	1	1	0.13	0.00	0.00	High abandoned post-1942 channel
				Coarse	2	1	0.16	0.01	0.01	
	Total	**4.0**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**0.96**	**1.00**	**n/a**
MCW-2N	c1	1.7	0.24	Fine	1	3	0.11	0.19	0.06	Active channel
				Coarse	2	2	0.5	0.87	0.27	
	c1b	0.3	0.05	Fine	1	1	0.25	0.08	0.03	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.15	0.05	0.02	
	c2	3.5	0.48	Fine	1	3	0.25	0.87	0.27	Abandoned post-1942 channel
				Coarse	2	2	0.21	0.73	0.22	
	f1	1.6	0.22	Fine	1	3	0.29	0.46	0.14	Post-1942 floodplain
	f2	2.4	n/a	Fine	3	1, 7	0.15	n/a	n/a	Possible post-1942 floodplain
	Total	**9.5**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**3.26**	**1.00**	**n/a**
MCW-2W	c1	2.1	0.34	Fine	1	3	0.04	0.08	0.03	Active channel
				Coarse	2	2	0.42	0.89	0.31	
	c1b	0.1	0.01	Fine	1	1	0.07	0.00	0.00	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.4	0.02	0.01	
	c2	2.7	0.45	Fine	1	3	0.07	0.19	0.07	Abandoned post-1942 channel
				Coarse	2	2	0.39	1.06	0.37	
	f1	1.2	0.20	Fine	1	3	0.46	0.57	0.20	Post-1942 floodplain
				Coarse	2	1	0.04	0.05	0.02	
	f2	2.4	n/a	Fine	3	1, 7	0.15	n/a	n/a	Possible post-1942 floodplain
	Total	**8.5**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**2.87**	**1.00**	**n/a**
MCW-2E	c1	0.6	0.07	Fine	1	1	0.11	0.06	0.02	Active channel
				Coarse	2	2	0.29	0.16	0.05	
	c2	0.6	0.07	Fine	1	3	0.18	0.10	0.03	Abandoned post-1942 channel
				Coarse	2	1	0.33	0.19	0.06	
	f1	7.3	0.87	Fine	1	3	0.21	1.54	0.50	Post-1942 floodplain
				Coarse	2	2	0.14	1.03	0.33	
	f2	7.4	n/a	Fine	3	1, 7	0.06	n/a	n/a	Possible post-1942 floodplain
	Total	**15.9**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**3.08**	**1.00**	**n/a**
TS-1W	c1	1.9	0.37	Coarse	2	2	0.31	0.60	0.42	Active channel
	f1	3.3	0.63	Fine	1	3	0.23	0.76	0.53	Post-1942 floodplain
				Coarse	2	1	0.02	0.07	0.05	
	Total	**5.2**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**1.42**	**1.00**	**n/a**
TS-1C	c1	1.3	0.13	Fine	1	3	0.3	0.38	0.06	Active channel
				Coarse	2	2	0.29	0.37	0.06	
	c1b	0.3	0.03	Fine	1	1	0.29	0.09	0.02	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.25	0.08	0.01	
	c2	1.6	0.17	Fine	1	3	0.34	0.56	0.09	Abandoned post-1942 channel
				Coarse	2	2	0.48	0.79	0.13	

Table D-1.3-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m) [a]	Fraction of Reach Area Excluding c1br and f2	Sediment Facies	Bin Number	Notes on Bin [b]	Estimated Average Sediment Thickness (m)	Estimated Volume Excluding f2 (m^3/m)	Fraction of Sediment Volume Excluding f2	Notes
	f1	6.6	0.67	Fine	1	3	0.50	3.30	0.54	Post-1942 floodplain
				Coarse	2	2	0.09	0.59	0.10	
	Total	**9.8**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**6.17**	**1.00**	**n/a**
TS-1E	c1	0.9	0.17	Fine	1	3	0.06	0.06	0.02	Active channel
				Coarse	2	2	0.38	0.36	0.11	
	c1b	0.1	0.02	Fine	1	1	0.16	0.02	0.01	Area of fine-grained sediment deposition along active channel
				Coarse	2	1	0.43	0.06	0.02	
	c1br	0.1	n/a	n/a	n/a	n/a	0	n/a	n/a	Active channel on bedrock
	c1w	0.8	0.15	Fine	1	3	0.13	0.11	0.03	Active channel with willows
				Coarse	2	2	0.86	0.73	0.23	
	c2	2.4	0.43	Fine	1	3	0.37	0.89	0.28	Abandoned post-1942 channel
				Coarse	2	2	0.22	0.53	0.16	
	f1	1.2	0.22	Fine	1	3	0.29	0.36	0.11	Post-1942 floodplain
				Coarse	2	1	0.09	0.11	0.03	
	Total	**5.6**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**3.23**	**1.00**	**n/a**
TS-2W	c1	0.3	0.04	Fine	1	1	0.08	0.02	0.00	Active channel
				Coarse	2	2	0.55	0.16	0.03	
	c1br	0.3	n/a	n/a	n/a	n/a	0	n/a	n/a	Active channel on bedrock
	c1w	3.7	0.51	Fine	1	3	0.34	1.25	0.26	Active channel with willows
				Coarse	2	2	0.5	1.84	0.38	
	c2	3.3	0.45	Fine	1	3	0.30	0.98	0.20	Abandoned post-1942 channel
				Coarse	2	2	0.20	0.65	0.13	
	Total	**7.6**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**4.89**	**1.00**	**n/a**
TS-2C	c1	0.7	0.12	Fine	1	1	0.07	0.05	0.01	Active channel
				Coarse	2	2	0.31	0.21	0.06	
	c1b	2.6	0.45	Fine	1	5	0.46	1.18	0.31	Broad unincised area along active channel
				Coarse	2	2	0.43	1.11	0.29	
	c2	1.4	0.24	Fine	1	5	0.38	0.52	0.14	Abandoned post-1942 channel
				Coarse	2	2	0.20	0.27	0.07	
	f1	1.1	0.19	Fine	3	5	0.35	0.38	0.10	Post-1942 floodplain
				Coarse	2	3	0.04	0.04	0.01	
	Total	**5.7**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**3.77**	**1.00**	**n/a**
TS-2E	c1	1.1	0.37	Fine	1	1	0.01	0.01	0.01	Active channel
				Coarse	2	4	0.42	0.44	0.32	
	c1br	0.04	n/a	n/a	n/a	n/a	0	n/a	n/a	Active channel on bedrock
	c2	1.1	0.38	Fine	1	3	0.29	0.31	0.23	Abandoned post-1942 channel
				Coarse	2	4	0.27	0.29	0.21	
	f1	0.7	0.25	Fine	1	3	0.40	0.29	0.21	Post-1942 floodplain
				Coarse	2	1	0.05	0.04	0.03	
	f2	0.03	n/a	Fine	3	1, 7	0.27	n/a	n/a	Possible post-1942 floodplain
	Total	**2.9**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**1.39**	**1.00**	**n/a**

Table D-1.3-1 (continued)

Reach	Geomorphic Unit	Average Unit Width (m) [a]	Fraction of Reach Area Excluding c1br and f2	Sediment Facies	Bin Number	Notes on Bin [b]	Estimated Average Sediment Thickness (m)	Estimated Volume Excluding f2 (m^3/m)	Fraction of Sediment Volume Excluding f2	Notes
TS-3	c1	0.8	0.10	Fine	1	1	0.06	0.05	0.01	Active channel
				Coarse	2	2	0.3	0.24	0.07	
	c2	5.8	0.76	Fine	1	8	0.29	1.69	0.50	Abandoned post-1942 channel
				Coarse	2	2	0.20	1.16	0.35	
	f1	1.1	0.14	Fine	3	I	0.14	0.15	0.05	Post-1942 floodplain
				Coarse	2	1	0.05	0.05	0.02	
	f2	9.3	n/a	Fine	4	6	0.04	n/a	n/a	Possible post-1942 floodplain
				Coarse	4	6	0.02	n/a	n/a	
	Total	**17.0**	**1.00**	**n/a**	**n/a**	**n/a**	**n/a**	**3.34**	**1.00**	**n/a**

[a] Average unit width is total area of unit in reach divided by reach length

[b] Notes on bin:

1. No data available; number indicates bin that is inferred to be most applicable based on geomorphic context
2. All data from coarse facies samples in reach, except for f2 samples, combined into one bin for UCL calculations and/or conceptual model
3. All data from fine facies samples in reach, except for f2 samples, combined into one bin for UCL calculations and/or conceptual model
4. Data retained in separate bin for conceptual model, but combined with other units for UCL calculations to achieve a minimum of three analyses
5. Coarse and/or fine facies samples subdivided in reach for UCL calculations based on differences in key COPC concentration
6. f2 data combined into single bin
7. For conceptual model, concentrations assumed same as nearest reach with analyses of f2 samples
8. Coarse and/or fine facies samples subdivided in reach for conceptual model based on differences in key COPC concentration; UCL calculations not performed

[c] n/a = Not applicable.

Table D-1.4-1
Estimated Radionuclide Inventory in Sediment Investigation Reaches in the Mortandad Watershed

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
Reach E-1FW																								
c1	coarse	115	0.33	38	0.83	1.23	0.00	0.000	0%	0.30	0.01	18%	-[a]	-	-	0.05	0.00	26%	0.05	0.00	24%	0.01	0.00	6%
c1b	coarse	6	0.24	1	0.83	1.23	0.00	0.000	0%	0.30	0.00	1%	-	-	-	0.05	0.00	1%	0.05	0.00	1%	0.01	0.00	0%
c2	coarse	233	0.20	47	0.83	1.23	0.00	0.000	0%	0.30	0.01	22%	-	-	-	0.05	0.00	32%	0.05	0.00	30%	0.01	0.00	7%
f1	coarse	52	0.08	4	0.83	1.23	0.00	0.000	0%	0.30	0.00	2%	-	-	-	0.05	0.00	3%	0.05	0.00	3%	0.01	0.00	1%
Coarse Facies Subtotal			m^3	90			mCi	0.000	0%	mCi	0.03	43%	mCi	-	-	mCi	0.00	63%	mCi	0.00	57%	mCi	0.00	14%
			m^3/km	601			mCi/km	0.000		mCi/km	0.18		mCi/km	-	-	mCi/km	0.03		mCi/km	0.03		mCi/km	0.01	
c1	fine	115	0.04	5	0.99	1.04	0.01	0.000	7%	0.51	0.00	4%	-	-	-	0.04	0.00	2%	0.04	0.00	3%	0.08	0.00	6%
c1b	fine	6	0.16	1	0.99	1.04	0.01	0.000	1%	0.51	0.00	1%	-	-	-	0.04	0.00	1%	0.04	0.00	1%	0.08	0.00	1%
c2	fine	233	0.23	54	0.99	1.04	0.01	0.000	77%	0.51	0.03	44%	-	-	-	0.04	0.00	29%	0.04	0.00	33%	0.08	0.00	66%
f1	fine	52	0.20	10	0.99	1.04	0.01	0.000	15%	0.51	0.01	9%	-	-	-	0.04	0.00	6%	0.04	0.00	6%	0.08	0.00	13%
Fine Facies Subtotal			m^3	70			mCi	0.001	100%	mCi	0.04	57%	mCi	-	-	mCi	0.00	37%	mCi	0.00	43%	mCi	0.01	86%
			m^3/km	464			mCi/km	0.004		mCi/km	0.24		mCi/km	-	-	mCi/km	0.02		mCi/km	0.02		mCi/km	0.04	
Total			m^3	160			mCi	0.001	100%	mCi	0.06	100%	mCi	-	-	mCi	0.01	100%	mCi	0.01	100%	mCi	0.01	100%
			m^3/km	1065			mCi/km	0.004		mCi/km	0.43		mCi/km	-	-	mCi/km	0.04		mCi/km	0.05		mCi/km	0.04	
Reach E-1W																								
c1	coarse	65	0.5	33	0.85	1.23	0.18	0.01	9%	0.13	0.00	1%	-	-	-	0.005	0.00	1%	0.02	0.00	0%	-	-	-
c1b	coarse	17	0.39	7	0.85	1.23	0.18	0.00	2%	0.13	0.00	0%	-	-	-	0.005	0.00	0%	0.02	0.00	0%	-	-	-
c1ct	coarse	990	0.27	267	0.85	1.23	0.18	0.05	73%	0.13	0.04	6%	-	-	-	0.005	0.00	6%	0.02	0.01	2%	-	-	-
c2	coarse	279	0.19	53	0.85	1.23	0.05	0.00	4%	0.20	0.01	2%	-	-	-	0.000	0.00	0%	0.04	0.00	1%	-	-	-
c2w	coarse	340	0.37	126	0.85	1.23	0.05	0.01	10%	0.20	0.03	5%	-	-	-	0.000	0.00	0%	0.04	0.01	2%	-	-	-
f1	coarse	63	0.14	9	0.85	1.23	0.18	0.00	2%	0.13	0.00	0%	-	-	-	0.005	0.00	0%	0.02	0.00	0%	-	-	-
Coarse Facies Subtotal			m^3	494			mCi	0.07	100%	mCi	0.08	14%	mCi	-	-	mCi	0.00	7%	mCi	0.01	6%	mCi	-	-
			m^3/km	2353			mCi/km	0.33		mCi/km	0.38		mCi/km	-		mCi/km	0.01		mCi/km	0.07		mCi/km	-	
c1	fine	65	0.04	3	0.99	1.04	0	0.00	0%	0.94	0.00	0%	-	-	-	0.040	0.00	0%	0.41	0.00	0%	-	-	-
c1b	fine	17	0.37	6	0.99	1.04	0	0.00	0%	0.94	0.01	1%	-	-	-	0.040	0.00	1%	0.41	0.00	1%	-	-	-
c1ct	fine	990	0.28	277	0.99	1.04	0	0.00	0%	0.27	0.08	13%	-	-	-	0.040	0.01	48%	0.38	0.11	45%	-	-	-
c2	fine	279	0.3	84	0.99	1.04	0	0.00	0%	1.61	0.14	24%	-	-	-	0.040	0.00	14%	0.44	0.04	16%	-	-	-
c2w	fine	340	0.47	160	0.99	1.04	0	0.00	0%	1.61	0.26	46%	-	-	-	0.040	0.01	28%	0.44	0.07	30%	-	-	-
f1	fine	63	0.15	9	0.99	1.04	0	0.00	0%	0.94	0.01	2%	-	-	-	0.040	0.00	2%	0.41	0.00	2%	-	-	-

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
Fine Facies Subtotal			m^3	539			mCi	0.00	0%	mCi	0.50	86%	mCi	-	-	mCi	0.02	93%	mCi	0.23	94%	mCi	-	-
			m^3/km	2567			mCi/km	0.00		mCi/km	2.37		mCi/km	-	-	mCi/km	0.11		mCi/km	1.08		mCi/km	-	-
Total			m^3	1033			mCi	0.07	100%	mCi	0.58	100%	mCi	-	-	mCi	0.02	100%	mCi	0.24	100%	mCi	-	-
			m^3/km	4920			mCi/km	0.33		mCi/km	2.76		mCi/km	-	-	mCi/km	0.11		mCi/km	1.15		mCi/km	-	-
Reach E-1E																								
c1	coarse	356	0.4	142	0.80	1.23	5.2	0.73	7%	8.01	1.12	5%	0.26	0.04	46%	6.24	0.87	32%	3.66	0.51	3%	0.20	0.03	2%
c1b	coarse	73	0.4	29	0.80	1.23	5.2	0.15	1%	8.01	0.23	1%	0.26	0.01	9%	6.24	0.18	7%	3.66	0.11	1%	0.20	0.01	0%
c2	coarse	39	0.4	16	0.80	1.23	100.69	1.55	14%	76.06	1.17	5%	0.21	0.00	4%	16.42	0.25	9%	195.49	3.00	18%	3.81	0.06	3%
c3	coarse	99	0.4	40	0.80	1.23	100.69	3.92	35%	76.06	2.96	13%	0.21	0.01	10%	16.42	0.64	23%	195.49	7.62	46%	3.81	0.15	9%
f1	coarse	22	0.15	3	0.80	1.23	100.69	0.33	3%	76.06	0.25	1%	0.21	0.00	1%	16.42	0.05	2%	195.49	0.63	4%	3.81	0.01	1%
f2	coarse	44	0.04	2	0.80	1.23	1.14	0.00	0%	1.45	0.00	0%	0.05	0.00	0%	0.28	0.00	0%	1.00	0.00	0%	0.51	0.00	0%
Coarse Facies Subtotal			m^3	232			mCi	6.68	60%	mCi	5.73	26%	mCi	0.06	71%	mCi	2.00	73%	mCi	11.87	71%	mCi	0.25	15%
			m^3/km	1104			mCi/km	31.79		mCi/km	27.30		mCi/km	0.27		mCi/km	9.52		mCi/km	56.54		mCi/km	1.21	
c1	fine	356	0.02	7	0.96	1.04	6.11	0.04	0%	6.93	0.05	0%	0.09	0.00	1%	8.05	0.06	2%	3.11	0.02	0%	0.30	0.00	0%
c1b	fine	73	0.09	7	0.96	1.04	6.11	0.04	0%	6.93	0.05	0%	0.09	0.00	1%	8.05	0.05	2%	3.11	0.02	0%	0.30	0.00	0%
c2	fine	39	0.24	9	0.96	1.04	6.11	0.06	1%	6.93	0.06	0%	0.09	0.00	1%	8.05	0.08	3%	3.11	0.03	0%	0.30	0.00	0%
c3	fine	99	0.27	27	0.94	1.04	114.75	3.00	27%	437.48	11.43	51%	0.54	0.01	18%	14.44	0.38	14%	126.02	3.29	20%	39.18	1.02	59%
f1	fine	22	0.53	12	0.94	1.04	114.75	1.31	12%	437.48	4.99	22%	0.54	0.01	8%	14.44	0.16	6%	126.02	1.44	9%	39.18	0.45	26%
f2	fine	44	0.18	8	0.94	1.04	1.14	0.01	0%	1.45	0.01	0%	0.05	0.00	0%	0.28	0.00	0%	1.00	0.01	0%	0.51	0.00	0%
Fine Facies Subtotal			m^3	69			mCi	4.46	40%	mCi	16.59	74%	mCi	0.02	29%	mCi	0.73	27%	mCi	4.81	29%	mCi	1.48	85%
			m^3/km	330			mCi/km	21.22		mCi/km	79.00		mCi/km	0.11		mCi/km	3.47		mCi/km	22.90		mCi/km	7.05	
Total			m^3	301			mCi	11.13	100%	mCi	22.32	100%	mCi	0.08	100%	mCi	2.73	100%	mCi	16.68	100%	mCi	1.74	100%
			m^3/km	1434			mCi/km	53.01		mCi/km	106.30		mCi/km	0.38		mCi/km	12.99		mCi/km	79.44		mCi/km	8.26	
Reach M-2W																								
c1	coarse	1455	0.5	728	0.8	1.23	7.04	5.04	19%	17.24	12.34	12%	0.16	0.11	48%	5.45	3.90	20%	7.71	5.52	18%	1.02	0.73	16%
c1b	coarse	122	0.5	61	0.8	1.23	7.04	0.42	2%	17.24	1.03	1%	0.16	0.01	4%	5.45	0.33	2%	7.71	0.46	1%	1.02	0.06	1%
c2	coarse	218	0.4	87	0.6	1.23	11.05	0.71	3%	50.95	3.28	3%	0.36	0.02	10%	9.97	0.64	3%	10.30	0.66	2%	0.50	0.03	1%
c3	coarse	131	0.4	52	0.65	1.23	14.38	0.60	2%	398.56	16.70	16%	0.07	0.00	1%	50.07	2.10	11%	16.46	0.69	2%	7.43	0.31	7%
f1	coarse	378	0.12	45	0.88	1.23	11.05	0.54	2%	50.95	2.50	2%	0.36	0.02	7%	9.97	0.49	2%	10.30	0.51	2%	0.50	0.02	1%
f1g	coarse	188	0.24	45	0.88	1.23	14.38	0.70	3%	398.56	19.46	18%	0.07	0.00	1%	50.07	2.45	12%	16.46	0.80	3%	7.43	0.36	8%
Coarse Facies Subtotal			m^3	1019			mCi	8.02	30%	mCi	55.32	52%	mCi	0.17	72%	mCi	9.90	50%	mCi	8.64	28%	mCi	1.52	34%
			m^3/km	1698			mCi/km	13.37		mCi/km	92.20		mCi/km	0.29		mCi/km	16.50		mCi/km	14.41		mCi/km	2.54	

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
c1b	fine	122	0.14	17	0.99	1.04	17.05	0.30	1%	30.48	0.54	1%	0.24	0.00	2%	11.67	0.21	1%	11.63	0.20	1%	1.31	0.02	1%
c2	fine	218	0.32	70	0.99	1.04	22.18	1.59	6%	53.75	3.86	4%	0.14	0.01	4%	18.45	1.33	7%	51.50	3.70	12%	3.88	0.28	6%
c3	fine	131	0.39	51	0.96	1.04	71.10	3.63	14%	212.04	10.82	10%	0.16	0.01	3%	27.84	1.42	7%	51.55	2.63	8%	10.71	0.55	12%
f1	fine	378	0.47	178	0.99	1.04	22.18	4.06	15%	53.75	9.83	9%	0.14	0.03	11%	18.45	3.37	17%	51.50	9.42	30%	3.88	0.71	16%
f1g	fine	188	0.64	120	0.99	1.04	71.10	8.81	33%	212.04	26.27	25%	0.16	0.02	8%	27.84	3.45	18%	51.55	6.39	21%	10.71	1.33	29%
f2	fine	385	0.32	123	0.99	1.04	0.52	0.07	0%	2.63	0.33	0%	0.00	0.00	0%	0.18	0.02	0%	0.52	0.07	0%	0.78	0.10	2%
Fine Facies Subtotal			m^3	559			mCi	18.45	70%	mCi	51.65	48%	mCi	0.07	28%	mCi	9.80	50%	mCi	22.41	72%	mCi	2.98	66%
			m^3/km	932			mCi/km	30.75		mCi/km	86.08		mCi/km	0.11		mCi/km	16.33		mCi/km	37.34		mCi/km	4.97	
Total			m^3	1578			mCi	26.47	100%	mCi	106.96	100%	mCi	0.24	100%	mCi	19.70	100%	mCi	31.05	100%	mCi	4.51	100%
			m^3/km	2629			mCi/km	44.12		mCi/km	178.27		mCi/km	0.40		mCi/km	32.83		mCi/km	51.75		mCi/km	7.51	
Reach M-2E																								
c1	coarse	1044	0.5	522	0.75	1.23	4.73	2.28	16%	12.98	6.25	9%	0.16	0.08	50%	3.81	1.83	16%	6.74	3.25	22%	0.77	0.37	14%
c1b	coarse	86	0.5	43	0.75	1.23	4.73	0.19	1%	12.98	0.51	1%	0.16	0.01	4%	3.81	0.15	1%	6.74	0.27	2%	0.77	0.03	1%
c2	coarse	110	0.5	55	0.5	1.23	14.35	0.49	3%	33.85	1.14	2%	0.36	0.01	8%	5.35	0.18	2%	14.05	0.48	3%	1.89	0.06	2%
c3	coarse	117	0.5	59	0.7	1.23	5.07	0.26	2%	119.25	6.01	8%	0.07	0.00	2%	18.83	0.95	8%	8.32	0.42	3%	4.56	0.23	8%
f1	coarse	160	0	0	0.75	1.23	14.35	0.00	0%	33.85	0.00	0%	0.36	0.00	0%	5.35	0.00	0%	14.05	0.00	0%	1.89	0.00	0%
f1g	coarse	408	0.05	20	0.75	1.23	5.07	0.10	1%	119.25	2.24	3%	0.07	0.00	1%	18.83	0.35	3%	8.32	0.16	1%	4.56	0.09	3%
Coarse Facies Subtotal			m^3	699			5.53	3.30	23%	mCi	16.16	22%	mCi	0.10	66%	mCi	3.47	30%	mCi	4.56	31%	mCi	0.78	28%
			m^3/km	1705			mCi/km	8.05		mCi/km	39.42		mCi/km	0.24		mCi/km	8.46		mCi/km	11.13		mCi/km	1.90	
c1	fine	1044	0.01	10	0.99	1.04	15.03	0.16	1%	36.20	0.39	1%	0.24	0.00	2%	9.52	0.10	1%	11.76	0.13	1%	1.72	0.02	1%
c1b	fine	86	0.2	17	0.99	1.04	15.03	0.27	2%	36.20	0.64	1%	0.24	0.00	3%	9.52	0.17	1%	11.76	0.21	1%	1.72	0.03	1%
c2	fine	110	0.15	17	0.99	1.04	10.44	0.18	1%	45.53	0.77	1%	0.14	0.00	2%	4.98	0.08	1%	8.12	0.14	1%	2.91	0.05	2%
c3	fine	117	0.39	46	0.93	1.04	42.24	1.86	13%	231.49	10.22	14%	0.16	0.01	5%	33.30	1.47	13%	41.40	1.83	12%	6.71	0.30	11%
f1	fine	160	0.29	46	0.99	1.04	10.44	0.50	4%	45.53	2.18	3%	0.14	0.01	4%	4.98	0.24	2%	8.12	0.39	3%	2.91	0.14	5%
f1g	fine	408	0.44	180	0.98	1.04	42.24	7.73	55%	231.49	42.35	58%	0.16	0.03	19%	33.30	6.09	52%	41.40	7.57	51%	6.71	1.23	45%
f2	fine	1043	0.24	250	0.99	1.04	0.52	0.13	1%	2.63	0.68	1%	0.00	0.00	0%	0.18	0.05	0%	0.52	0.13	1%	0.78	0.20	7%
Fine Facies Subtotal			m^3	556			34.67	10.83	77%	mCi	57.23	78%	mCi	0.05	34%	mCi	8.20	70%	mCi	10.40	69%	mCi	1.96	72%
			m^3/km	1355			mCi/km	26.42		mCi/km	139.58		mCi/km	0.13		mCi/km	20.00		mCi/km	25.36		mCi/km	4.79	
Total			m^3	2260			mCi	14.13	100%	mCi	73.39	100%	mCi	0.15	100%	mCi	11.67	100%	mCi	14.96	100%	mCi	2.74	100%
			m^3/km	3060			mCi/km	34.47		mCi/km	179.00		mCi/km	0.37		mCi/km	28.47		mCi/km	36.49		mCi/km	6.69	
Reach M-3W																								
c1	coarse	499	0.60	299	0.86	1.23	4.90	1.55	12%	12.36	3.91	9%	0.13	0.04	30%	3.18	1.01	17%	8.12	2.57	20%	0.94	0.30	10%

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
c2	coarse	318	0.40	127	0.87	1.23	12.44	1.69	13%	25.35	3.45	8%	0.10	0.01	10%	3.57	0.49	8%	12.18	1.66	13%	1.65	0.22	8%
c3	coarse	323	0.30	97	0.87	1.23	12.44	1.29	10%	25.35	2.63	6%	0.10	0.01	8%	3.57	0.37	6%	12.18	1.26	10%	1.65	0.17	6%
f1	coarse	1654	0.04	66	0.87	1.23	12.44	0.88	7%	25.35	1.79	4%	0.10	0.01	5%	3.57	0.25	4%	12.18	0.86	7%	1.65	0.12	4%
f2	coarse	2051	0.04	82	0.87	1.23	0.09	0.01	0%	0.29	0.03	0%	0.00	0.00	0%	0.02	0.00	0%	0.07	0.01	0%	0.22	0.02	1%
Coarse Facies Subtotal			m^3	672			mCi	5.42	41%	mCi	11.81	26%	mCi	0.07	52%	mCi	2.12	36%	mCi	6.36	49%	mCi	0.83	28%
			m^3/km	2316			mCi/km	18.70		mCi/km	40.74		mCi/km	0.25		mCi/km	7.30		mCi/km	21.93		mCi/km	2.86	
c1	fine	499	0.03	15	0.99	1.04	20.03	0.31	2%	39.57	0.61	1%	0.22	0.00	2%	9.55	0.15	2%	17.10	0.26	2%	2.51	0.04	1%
c2	fine	318	0.29	92	0.96	1.04	20.03	1.84	14%	39.57	3.64	8%	0.22	0.02	15%	9.55	0.88	15%	17.10	1.57	12%	2.51	0.23	8%
c3	fine	323	0.23	74	0.96	1.04	34.93	2.59	19%	97.30	7.22	16%	0.20	0.01	11%	11.11	0.82	14%	24.76	1.84	14%	3.70	0.27	9%
f1	fine	1654	0.28	463	0.94	1.04	7.02	3.18	24%	49.63	22.47	49%	0.06	0.03	20%	4.35	1.97	33%	6.64	3.01	23%	3.45	1.56	52%
f2	fine	2051	0.13	267	0.94	1.04	0.09	0.02	0%	0.29	0.08	0%	0.00	0.00	0%	0.02	0.01	0%	0.07	0.02	0%	0.22	0.06	2%
Fine Facies Subtotal			m^3	911			mCi	7.95	59%	mCi	34.02	74%	mCi	0.07	48%	mCi	3.83	64%	mCi	6.70	51%	mCi	2.16	72%
			m^3/km	3142			mCi/km	27.40		mCi/km	117.29		mCi/km	0.23		mCi/km	13.19		mCi/km	23.10		mCi/km	7.46	
Total			m^3	1583			mCi	13.37	100%	mCi	45.83	100%	mCi	0.14	100%	mCi	5.94	100%	mCi	13.06	100%	mCi	2.99	100%
			m^3/km	5458			mCi/km	46.10		mCi/km	158.03		mCi/km	0.48		mCi/km	20.49		mCi/km	45.03		mCi/km	10.32	
Reach M-3E																								
c1	coarse	923	0.60	554	0.86	1.23	4.90	2.87	1%	12.36	7.24	1%	0.13	0.08	5%	3.18	1.86	2%	8.12	4.76	2%	0.94	0.55	2%
c1b/c3	coarse	2161	0.40	864	0.85	1.23	12.44	11.24	5%	25.35	22.91	3%	0.10	0.09	6%	3.57	3.23	4%	12.18	11.01	6%	1.65	1.49	4%
c1g/c3	coarse	367	0.45	165	0.85	1.23	12.44	2.15	1%	25.35	4.38	1%	0.10	0.02	1%	3.57	0.62	1%	12.18	2.10	1%	1.65	0.28	1%
c2	coarse	820	0.40	328	0.85	1.23	12.44	4.27	2%	25.35	8.69	1%	0.10	0.03	2%	3.57	1.22	1%	12.18	4.18	2%	1.65	0.57	2%
c2a	coarse	189	0.30	57	0.85	1.23	12.44	0.74	0%	25.35	1.50	0%	0.10	0.01	0%	3.57	0.21	0%	12.18	0.72	0%	1.65	0.10	0%
c3	coarse	6921	0.30	2076	0.85	1.23	12.44	27.00	12%	25.35	55.03	8%	0.10	0.22	15%	3.57	7.75	9%	12.18	26.44	14%	1.65	3.58	10%
c3a	coarse	1402	0.50	701	0.85	1.23	12.44	9.12	4%	25.35	18.58	3%	0.10	0.07	5%	3.57	2.62	3%	12.18	8.93	5%	1.65	1.21	3%
f1	coarse	12020	0.04	481	0.85	1.23	12.44	6.25	3%	25.35	12.74	2%	0.10	0.05	3%	3.57	1.79	2%	12.18	6.12	3%	1.65	0.83	2%
f1a	coarse	611	0.16	98	0.85	1.23	16.20	1.66	1%	188.00	19.22	3%	0.09	0.01	1%	24.00	2.45	3%	28.70	2.93	2%	6.35	0.65	2%
f2	coarse	2837	0.04	113	0.85	1.23	0.09	0.01	0%	0.29	0.03	0%	0.00	0.00	0%	0.02	0.00	0%	0.07	0.01	0%	0.22	0.03	0%
Coarse Facies Subtotal			m^3	5437			mCi	65.31	28%	mCi	150.32	21%	mCi	0.57	39%	mCi	21.76	26%	mCi	67.20	35%	mCi	9.29	26%
			m^3/km	8770			mCi/km	105.33		mCi/km	242.46		mCi/km	0.93		mCi/km	35.09		mCi/km	108.38		mCi/km	14.98	
c1	fine	923	0.03	28	0.99	1.04	20.03	0.57	0%	39.57	1.13	0%	0.22	0.01	0%	9.55	0.27	0%	17.10	0.49	0%	2.51	0.07	0%
c1b/c3	fine	2161	0.45	972	0.95	1.04	34.93	33.56	15%	97.30	93.48	13%	0.20	0.19	13%	11.11	10.67	13%	24.76	23.79	12%	3.70	3.55	10%
c1g/c3	fine	367	0.36	132	0.94	1.04	34.93	4.51	2%	97.30	12.57	2%	0.20	0.03	2%	11.11	1.43	2%	24.76	3.20	2%	3.70	0.48	1%
c2	fine	820	0.29	238	0.96	1.04	20.03	4.76	2%	39.57	9.39	1%	0.22	0.05	4%	9.55	2.27	3%	17.10	4.06	2%	2.51	0.60	2%

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
c2a	fine	189	0.33	62	0.90	1.04	34.93	2.04	1%	97.30	5.68	1%	0.20	0.01	1%	11.11	0.65	1%	24.76	1.45	1%	3.70	0.22	1%
c3	fine	6921	0.23	1592	0.96	1.04	34.93	55.51	24%	97.30	154.64	21%	0.20	0.32	22%	11.11	17.66	21%	24.76	39.35	21%	3.70	5.88	16%
c3a	fine	1402	0.36	505	0.94	1.04	53.28	26.29	11%	186.80	92.17	13%	0.12	0.06	4%	21.20	10.46	12%	40.15	19.81	10%	5.76	2.84	8%
f1	fine	12020	0.28	3366	0.94	1.04	7.02	23.10	10%	49.63	163.29	22%	0.06	0.20	13%	4.35	14.31	17%	6.64	21.85	11%	3.45	11.35	32%
f1a	fine	611	0.44	269	0.94	1.04	53.28	14.00	6%	186.80	49.09	7%	0.12	0.03	2%	21.20	5.57	7%	40.15	10.55	6%	5.76	1.51	4%
f2	fine	2837	0.13	369	0.93	1.04	0.09	0.03	0%	0.29	0.10	0%	0.00	0.00	0%	0.02	0.01	0%	0.07	0.02	0%	0.22	0.08	0%
Fine Facies Subtotal			m^3	7532			mCi	164.37	72%	mCi	581.55	79%	mCi	0.89	61%	mCi	63.31	74%	mCi	124.56	65%	mCi	26.58	74%
			m^3/km	12149			mCi/km	265.12		mCi/km	937.99		mCi/km	1.44		mCi/km	102.11		mCi/km	200.91		mCi/km	42.87	
Total			m^3	12970			mCi	229.68	100%	mCi	731.88	100%	mCi	1.47	100%	mCi	85.06	100%	mCi	191.76	100%	mCi	35.87	100%
			m^3/km	20919			mCi/km	370.45		mCi/km	1180.44		mCi/km	2.37		mCi/km	137.20		mCi/km	309.29		mCi/km	57.85	
Reach M-4W																								
c1	coarse	265	0.34	90	0.87	1.23	1.33	0.13	0%	3.37	0.32	1%	0.01	0.00	1%	0.65	0.06	1%	1.65	0.16	1%	0.46	0.04	1%
c1t	coarse	1696	0.15	254	0.87	1.23	1.33	0.36	1%	3.37	0.92	1%	0.01	0.00	2%	0.65	0.18	2%	1.65	0.45	3%	0.46	0.13	3%
c1/c2t	coarse	112	0.32	36	0.87	1.23	1.62	0.06	0%	11.25	0.43	1%	0.01	0.00	0%	1.29	0.05	1%	2.29	0.09	0%	1.23	0.05	1%
c2/c2t	coarse	104	0.32	33	0.87	1.23	1.62	0.06	0%	11.25	0.40	1%	0.01	0.00	0%	1.29	0.05	1%	2.29	0.08	0%	1.23	0.04	1%
c2	coarse	457	0.11	50	0.87	1.23	1.62	0.09	0%	11.25	0.61	1%	0.01	0.00	0%	1.29	0.07	1%	2.29	0.12	1%	1.23	0.07	1%
c3a + f1a	coarse	546	0.12	66	0.87	1.23	1.62	0.11	0%	11.25	0.79	1%	0.01	0.00	0%	1.29	0.09	1%	2.29	0.16	1%	1.23	0.09	2%
c3 + f1	coarse	2536	0.04	101	0.87	1.23	1.62	0.18	1%	11.25	1.22	2%	0.01	0.00	1%	1.29	0.14	2%	2.29	0.25	1%	1.23	0.13	3%
f2	coarse	2499	0.04	100	0.87	1.23	0.09	0.01	0%	0.29	0.03	0%	0.00	0.00	0%	0.02	0.00	0%	0.07	0.01	0%	0.22	0.02	1%
Coarse Facies Subtotal			m^3	731			mCi	1.00	4%	mCi	4.72	7%	mCi	0.01	4%	mCi	0.64	9%	mCi	1.32	7%	mCi	0.57	13%
			m^3/km	3480			mCi/km	4.74		mCi/km	22.48		mCi/km	0.03		mCi/km	3.03		mCi/km	6.27		mCi/km	2.71	
c1	fine	265	0.08	21	0.94	1.04	17.35	0.36	1%	37.04	0.77	1%	0.20	0.00	3%	6.29	0.13	2%	13.64	0.28	2%	1.79	0.04	1%
c1t	fine	1696	0.06	102	0.98	1.04	17.35	1.80	7%	37.04	3.84	6%	0.20	0.02	13%	6.29	0.65	9%	13.64	1.41	8%	1.79	0.19	4%
c1/c2t	fine	112	0.60	67	0.94	1.04	50.80	3.34	13%	88.97	5.84	9%	0.10	0.01	4%	9.85	0.65	9%	32.39	2.13	12%	7.71	0.51	11%
c2/c2t	fine	104	0.60	62	0.97	1.04	33.75	2.12	8%	51.33	3.23	5%	0.17	0.01	7%	5.91	0.37	5%	21.43	1.35	8%	4.61	0.29	6%
c2	fine	457	0.34	155	0.97	1.04	25.90	4.06	15%	48.63	7.62	12%	0.14	0.02	14%	5.91	0.93	13%	18.58	2.91	16%	5.13	0.80	18%
c3a + f1a	fine	546	0.27	147	0.97	1.04	17.79	2.65	10%	78.35	11.65	18%	0.10	0.01	9%	8.55	1.27	17%	13.75	2.04	12%	4.32	0.64	14%
c3 + f1	fine	2536	0.21	533	0.94	1.04	4.82	2.51	9%	13.03	6.78	10%	0.01	0.01	3%	1.31	0.68	9%	3.79	1.97	11%	2.63	1.37	30%
f2	fine	2499	0.21	525	0.94	1.04	0.09	0.04	0%	0.29	0.15	0%	0.00	0.00	0%	0.02	0.01	0%	0.07	0.03	0%	0.22	0.11	2%
Fine Facies Subtotal			m^3	1613			mCi	16.88	63%	mCi	39.89	61%	mCi	0.08	52%	mCi	4.69	64%	mCi	12.14	68%	mCi	3.95	87%
			m^3/km	7680			mCi/km	80.38		mCi/km	189.96		mCi/km	0.40		mCi/km	22.34		mCi/km	57.80		mCi/km	18.80	

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
fill, traps	n/a[b]	4599	1.50	6899	0.90	1.14	1.24	8.78	33%	2.87	20.31	31%	0.01	0.07	44%	0.28	1.98	27%	0.61	4.32	24%		0.00	0%
Total[c]			m^3	2344			mCi	26.65	100%	mCi	64.93	100%	mCi	0.16	100%	mCi	7.31	100%	mCi	17.77	100%	mCi	4.52	100%
			m^3/km	11160			mCi/km	126.91		mCi/km	309.17		mCi/km	0.77		mCi/km	34.81		mCi/km	84.64		mCi/km	21.52	
Reach M-4C																								
c3a + f1a	coarse	4267	0.17	725	0.87	1.23	1.62	1.26	3%	11.25	8.73	6%	0.01	0.01	5%	1.29	1.00	6%	2.29	1.78	6%	1.23	0.95	8%
c3 + f1	coarse	7764	0.09	699	0.90	1.23	1.62	1.25	3%	11.25	8.70	6%	0.01	0.01	5%	1.29	1.00	6%	2.29	1.77	6%	1.23	0.95	8%
f2	coarse	1745	0.04	70	0.87	1.23	0.09	0.01	0%	0.29	0.02	0%	0.00	0.00	0%	0.02	0.00	0%	0.07	0.01	0%	0.22	0.02	0%
Coarse Facies Subtotal			m^3	1494			mCi	2.52	7%	mCi	17.46	12%	mCi	0.02	10%	mCi	2.00	13%	mCi	3.55	12%	mCi	1.92	16%
			m^3/km	6791			mCi/km	11.44		mCi/km	79.35		mCi/km	0.07		mCi/km	9.09		mCi/km	16.15		mCi/km	8.74	
c1t	fine	516	0.05	26	0.96	1.04	17.35	0.45	1%	37.04	0.95	1%	0.20	0.01	3%	6.29	0.16	1%	13.64	0.35	1%	1.79	0.05	0%
c3a + f1a	fine	4267	0.27	1152	0.96	1.04	17.79	20.46	56%	78.35	90.12	63%	0.10	0.12	74%	8.55	9.83	64%	13.75	15.82	54%	4.32	4.97	40%
c3 + f1	fine	7764	0.26	2019	0.95	1.04	4.82	9.61	26%	13.03	25.99	18%	0.01	0.02	13%	1.31	2.61	17%	3.79	7.56	26%	2.63	5.25	42%
f1	fine	256	0.26	67	0.95	1.04	4.82	0.32	1%	13.03	0.86	1%	0.01	0.00	0%	1.31	0.09	1%	3.79	0.25	1%	2.63	0.17	1%
f2	fine	1745	0.08	140	0.95	1.04	0.09	0.01	0%	0.29	0.04	0%	0.00	0.00	0%	0.02	0.00	0%	0.07	0.01	0%	0.22	0.03	0%
Fine Facies Subtotal			m^3	3403			mCi	30.85	84%	mCi	117.96	82%	mCi	0.14	90%	mCi	12.70	82%	mCi	23.98	82%	mCi	10.46	84%
			m^3/km	15467			mCi/km	140.24		mCi/km	536.18		mCi/km	0.64		mCi/km	57.72		mCi/km	109.02		mCi/km	47.56	
fill, traps	n/a[b]	1772	1.50	2658	0.90	1.14	1.24	3.38	9%	2.87	7.83	5%	0.00	0.00	0%	0.28	0.76	5%	0.61	1.66	6%		0.00	0%
Total[c]			m^3	4897			mCi	36.75	100%	mCi	143.24	100%	mCi	0.16	100%	mCi	15.46	100%	mCi	29.20	100%	mCi	12.39	100%
			m^3/km	22257			mCi/km	167.05		mCi/km	651.11		mCi/km	0.71		mCi/km	70.28		mCi/km	132.74		mCi/km	56.30	
Reach M-4E																								
c1g	coarse	316	0.12	38	0.89	1.23	1.62	0.07	1%	11.25	0.47	1%	0.01	0.00	1%	1.29	0.05	1%	2.29	0.10	1%	1.23	0.05	1%
c2a	coarse	24	0.04	1	0.87	1.23	1.62	0.00	0%	11.25	0.01	0%	0.01	0.00	0%	1.29	0.00	0%	2.29	0.00	0%	1.23	0.00	0%
c3 + f1	coarse	6153	0.09	554	0.90	1.23	1.62	0.99	8%	11.25	6.90	18%	0.01	0.01	21%	1.29	0.79	21%	2.29	1.40	14%	1.23	0.75	11%
f2	coarse	10193	0.04	408	0.87	1.23	0.09	0.04	0%	0.29	0.13	0%	0.00	0.00	0%	0.02	0.01	0%	0.07	0.03	0%	0.22	0.10	1%
Coarse Facies Subtotal			m^3	1000			mCi	1.10	9%	mCi	7.50	20%	mCi	0.01	22%	mCi	0.85	22%	mCi	1.53	15%	mCi	0.90	13%
			m^3/km	4349			mCi/km	4.79		mCi/km	32.62		mCi/km	0.03		mCi/km	3.71		mCi/km	6.66		mCi/km	3.92	
c1g	fine	316	0.16	51	0.94	1.04	2.96	0.15	1%	20.25	1.00	3%	0.01	0.00	2%	1.34	0.07	2%	3.16	0.16	2%	2.98	0.15	2%
c2a	fine	24	0.13	3	0.97	1.04	25.90	0.08	1%	48.63	0.15	0%	0.14	0.00	1%	5.91	0.02	0%	18.58	0.06	1%	5.13	0.02	0%
c3 + f1	fine	6153	0.26	1600	0.95	1.04	4.82	7.62	63%	13.03	20.59	55%	0.01	0.02	53%	1.31	2.07	54%	3.79	5.99	59%	2.63	4.16	59%

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
f1	fine	2452	0.26	638	0.95	1.04	4.82	3.04	25%	13.03	8.21	22%	0.01	0.01	21%	1.31	0.83	21%	3.79	2.39	23%	2.63	1.66	23%
f2	fine	10193	0.08	815	0.95	1.04	0.09	0.07	1%	0.29	0.23	1%	0.00	0.00	0%	0.02	0.02	0%	0.07	0.05	1%	0.22	0.18	3%
Fine Facies Subtotal			m^3	3106			mCi	10.95	91%	mCi	30.19	80%	mCi	0.02	78%	mCi	3.00	78%	mCi	8.65	85%	mCi	6.15	87%
			m^3/km	13506			mCi/km	47.63		mCi/km	131.26		mCi/km	0.10		mCi/km	13.03		mCi/km	37.60		mCi/km	26.76	
Total			m^3	4107			mCi	12.05	100%	mCi	37.69	100%	mCi	0.03	100%	mCi	3.85	100%	mCi	10.18	100%	mCi	7.06	100%
			m^3/km	17856			mCi/km	52.41		mCi/km	163.88		mCi/km	0.13		mCi/km	16.74		mCi/km	44.25		mCi/km	30.68	
Reach M-5W																								
c1	coarse	338	0.34	115	0.94	1.23	0.00	0.00	0%	0.21	0.03	20%	-	-	-	0.07	0.01	56%	0.05	0.01	30%	0.16	0.02	14%
c2	coarse	72	0.62	45	0.94	1.23	0.00	0.00	0%	0.21	0.01	8%	-	-	-	0.07	0.00	22%	0.05	0.00	12%	0.16	0.01	6%
f1	coarse	542	0.00	0	0.94	1.23	0.00	0.00	0%	0.21	0.00	0%	-	-	-	0.07	0.00	0%	0.05	0.00	0%	0.16	0.00	0%
Coarse Facies Subtotal			m^3	160			mCi	0.00	0%	mCi	0.04	28%	mCi	-	-	mCi	0.01	78%	mCi	0.01	42%	mCi	0.03	20%
			m^3/km	638			mCi/km	0.00		mCi/km	0.15		mCi/km	-	-	mCi/km	0.05		mCi/km	0.04		mCi/km	0.12	
c1	fine	338	0.17	57	0.99	1.04	0.03	0.00	52%	0.92	0.05	39%	-	-	-	0.06	0.00	22%	0.11	0.01	29%	1.68	0.10	66%
c2	fine	72	0.00	0	0.99	1.04	0.03	0.00	0%	0.92	0.00	0%	-	-	-	0.06	0.00	0%	0.11	0.00	0%	1.68	0.00	0%
f1	fine	542	0.29	157	0.99	1.04	0.01	0.00	48%	0.28	0.05	33%	-	-	-	0.00	0.00	0%	0.04	0.01	29%	0.13	0.02	14%
Fine Facies Subtotal			m^3	215			mCi	0.00	100%	mCi	0.10	72%	mCi	-	-	mCi	0.00	22%	mCi	0.01	58%	mCi	0.12	80%
			m^3/km	859			mCi/km	0.01		mCi/km	0.40		mCi/km	-	-	mCi/km	0.01		mCi/km	0.05		mCi/km	0.48	
Total			m^3	374			mCi	0.00	100%	mCi	0.14	100%	mCi	-	-	mCi	0.02	100%	mCi	0.02	100%	mCi	0.15	100%
			m^3/km	1497			mCi/km	0.01		mCi/km	0.55		mCi/km	-	-	mCi/km	0.07		mCi/km	0.09		mCi/km	0.60	
Reach M-5E																								
c1	coarse	590	0.12	71	0.87	1.23	-	-	-	0.29	0.02	3%	-	-	-	0.02	0.00	6%	0.07	0.01	5%	0.00	0.00	0%
c2	coarse	5791	0.12	695	0.87	1.25	-	-	-	0.29	0.22	32%	-	-	-	0.02	0.02	59%	0.07	0.05	47%	0.00	0.00	0%
Coarse Facies Subtotal			m^3	766			mCi	-	-	mCi	0.24	35%	mCi	-	-	mCi	0.02	65%	mCi	0.05	51%	mCi	0.00	0%
			m^3/km	1367			mCi/km	-	-	mCi/km	0.43		mCi/km	-	-	mCi/km	0.03		mCi/km	0.10		mCi/km	0.00	
c1	fine	590	0.12	71	0.94	1.04	-	-	-	0.34	0.02	3%	-	-	-	0.01	0.00	2%	0.04	0.00	3%	0.15	0.01	5%
c2	fine	5791	0.18	1042	0.95	1.04	-	-	-	0.34	0.35	51%	-	-	-	0.01	0.01	28%	0.04	0.04	39%	0.15	0.15	79%
f1	fine	2036	0.10	204	0.95	1.04	-	-	-	0.34	0.07	10%	-	-	-	0.01	0.00	5%	0.04	0.01	8%	0.15	0.03	15%
f2	fine	147	0.05	7	0.95	1.04	-	-	-	0.01	0.00	0%	-	-	-	0.00	0.00	0%	0.01	0.00	0%	0.14	0.00	1%
Fine Facies Subtotal			m^3	1324			mCi	-	-	mCi	0.44	65%	mCi	-	-	mCi	0.01	35%	mCi	0.05	49%	mCi	0.20	100%
			m^3/km	2365			mCi/km	-	-	mCi/km	0.79		mCi/km	-	-	mCi/km	0.02		mCi/km	0.09		mCi/km	0.35	
Total			m^3	2090			mCi	-	-	mCi	0.68	100%	mCi	-	-	mCi	0.03	100%	mCi	0.11	100%	mCi	0.20	100%
			m^3/km	3732			mCi/km	-	-	mCi/km	1.22		mCi/km	-	-	mCi/km	0.05		mCi/km	0.19		mCi/km	0.35	

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
Reach MCW-1																								
c1	coarse	264	0.21	55	0.85	1.23	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	1%	-	-	-
c1b	coarse	141	0.13	18	0.85	1.23	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0%	-	-	-
c2	coarse	504	0.07	35	0.85	1.23	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	1%	-	-	-
c3	coarse	20	0.16	3	0.85	1.23	-	-	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0%	-	-	-
Coarse Facies Subtotal			m^3	112			mCi	-	-	mCi	-	-	mCi	-	-	mCi	-	-	mCi	0.00	3%	mCi	-	-
			m^3/km	449			mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	0.00		mCi/km	-	-
c1	fine	264	0.06	16	0.98	1.04	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.00	10%	-	-	-
c1b	fine	141	0.13	18	0.98	1.04	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.00	12%	-	-	-
c2	fine	504	0.23	116	0.95	1.04	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.01	73%	-	-	-
c3	fine	20	0.13	3	0.95	1.04	-	-	-	-	-	-	-	-	-	-	-	-	0.07	0.00	2%	-	-	-
Fine Facies Subtotal			m^3	153			mCi	-	-	mCi	-	-	mCi	-	-	mCi	-	-	mCi	0.01	97%	mCi	-	-
			m^3/km	611			mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	0.04		mCi/km	-	-
Total			m^3	265			mCi	-	-	mCi	-	-	mCi	-	-	mCi	-	-	mCi	0.01	100%	mCi	-	-
			m^3/km	1060			mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	0.05		mCi/km	-	-
Reach MCW-2N																								
c1	coarse	345	0.50	173	0.89	1.23	-	-	-	-	-	-	-	-	-	0.00	0.00	0%	-	-	-	-	-	-
c1b	coarse	67	0.15	10	0.89	1.23	-	-	-	-	-	-	-	-	-	0.00	0.00	0%	-	-	-	-	-	-
c2	coarse	678	0.21	142	0.89	1.23	-	-	-	-	-	-	-	-	-	0.00	0.00	0%	-	-	-	-	-	-
Coarse Facies Subtotal			m^3	325			mCi	-	-	mCi	-	-	mCi	-	-	mCi	0.00	0%	mCi	-	-	mCi	-	-
			m^3/km	1625			mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	0.00		mCi/km	-	-	mCi/km	-	-
c1	fine	345	0.11	38	0.94	1.04	-	-	-	-	-	-	-	-	-	0.01	0.00	13%	-	-	-	-	-	-
c1b	fine	67	0.25	17	0.95	1.04	-	-	-	-	-	-	-	-	-	0.01	0.00	6%	-	-	-	-	-	-
c2	fine	678	0.25	170	0.95	1.04	-	-	-	-	-	-	-	-	-	0.01	0.00	59%	-	-	-	-	-	-
f1	fine	224	0.29	65	0.95	1.04	-	-	-	-	-	-	-	-	-	0.01	0.00	22%	-	-	-	-	-	-
Fine Facies Subtotal			m^3	289			mCi	-	-	mCi	-	-	mCi	-	-	mCi	0.00	100%	mCi	-	-	mCi	-	-
			m^3/km	1446			mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	0.02		mCi/km	-	-	mCi/km	-	-
Total			m^3	614			mCi	-	-	mCi	-	-	mCi	-	-	mCi	0.00	100%	mCi	-	-	mCi	-	-
			m^3/km	3070			mCi/km	-	-	mCi/km	-	-	mCi/km	-	-	mCi/km	0.02		mCi/km	-	-	mCi/km	-	-
Reach PCYN																								
c1	coarse	205	0.42	86	0.64	1.23	0.04	0.00	1%	0.57	0.04	0%	0%	0%	0%	0.00	0.00	0%	0.01	0.00	0%	28.30	1.92	3%
c1b	coarse	628	0.42	264	0.64	1.23	0.04	0.01	4%	0.57	0.12	1%	0%	0%	0%	0.00	0.00	0%	0.01	0.00	0%	28.30	5.88	10%

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
c1ct	coarse	103	0.42	43	0.64	1.23	0.04	0.00	1%	0.57	0.02	0%	0%	0%	0%	0.00	0.00	0%	0.01	0.00	0%	28.30	0.96	2%
c2	coarse	557	0.42	234	0.64	1.23	0.04	0.01	4%	0.57	0.10	1%	0%	0%	0%	0.00	0.00	0%	0.01	0.00	0%	28.30	5.21	9%
c3	coarse	675	0.42	284	0.64	1.23	0.04	0.01	5%	0.57	0.13	1%	0%	0%	0%	0.00	0.00	0%	0.01	0.00	0%	28.30	6.32	10%
Coarse Facies Subtotal			m^3	911			0.038	0.03	15%	0.57	0.41	4%	0	0%	0%	0	0.00	0%	0.011	0.01	2%	28.3	20.29	33%
			m^3/km	5059			mCi/km	0.15		mCi/km	2.27		mCi/km	0%		mCi/km	0.00		mCi/km	0.04		mCi/km	112.70	
c1	fine	205	0.31	64	0.87	1.04	0.25	0.01	8%	16.00	0.92	9%	14%	1%	9%	0.02	0.00	9%	0.85	0.05	9%	67.30	3.87	6%
c1b	fine	628	0.31	195	0.87	1.04	0.25	0.04	25%	16.00	2.82	28%	14%	2%	29%	0.02	0.00	29%	0.85	0.15	29%	67.30	11.85	19%
c1ct	fine	103	0.31	32	0.87	1.04	0.25	0.01	4%	16.00	0.46	5%	14%	0%	5%	0.02	0.00	5%	0.85	0.02	5%	67.30	1.94	3%
c2	fine	557	0.31	173	0.87	1.04	0.25	0.04	22%	16.00	2.50	25%	14%	2%	26%	0.02	0.00	26%	0.85	0.13	25%	67.30	10.51	17%
c3	fine	675	0.31	209	0.87	1.04	0.25	0.05	26%	16.00	3.03	30%	14%	3%	31%	0.02	0.00	31%	0.85	0.16	31%	67.30	12.74	21%
Fine Facies Subtotal			m^3	672			mCi	0.15	85%	mCi	9.73	96%	mCi	8%	100%	mCi	0.01	100%	mCi	0.52	98%	mCi	40.92	67%
			m^3/km	3734			mCi/km	0.86		mCi/km	54.05		mCi/km	46%		mCi/km	0.07		mCi/km	2.87		mCi/km	227.36	
Total			m^3	1583			mCi	0.18	100%	mCi	10.14	100%	mCi	8%	100%	mCi	0.01	100%	mCi	0.53	100%	mCi	61.21	100%
			m^3/km	8792			mCi/km	1.01		mCi/km	56.32		mCi/km	46%		mCi/km	0.07		mCi/km	2.92		mCi/km	340.06	
PCYN (not mapped)																								
all	all	210	0.20	42	0.80	1.10	0.02	0.00	n/a	0.75	0.03	n/a	-	-	n/a	0.10	0.00	n/a	0.11	0.00	n/a	14.60	0.54	n/a
Reach TS-1W																								
c1	coarse	248	0.31	77	0.81	1.23	0.13	0.01	12%	0.14	0.01	13%	-	-	-	0.65	0.05	8%	0.26	0.02	8%	0.06	0.00	15%
f1	coarse	426	0.02	9	0.81	1.23	0.13	0.00	1%	0.14	0.00	1%	-	-	-	0.65	0.01	1%	0.26	0.00	1%	0.06	0.00	2%
Coarse Facies Subtotal			m^3	85			mCi	0.01	13%	mCi	0.01	14%	mCi	-	-	mCi	0.06	9%	mCi	0.02	9%	mCi	0.01	17%
			m^3/km	657			mCi/km	0.09		mCi/km	0.09		mCi/km	-	-	mCi/km	0.43		mCi/km	0.17		mCi/km	0.04	
c1	fine	248	0.00	0	1.00	1.04	0.72	0.00	0%	0.70	0.00	0%	-	-	-	5.52	0.00	0%	2.29	0.00	0%	0.25	0.00	0%
f1	fine	426	0.23	98	1.00	1.04	0.72	0.07	87%	0.70	0.07	86%	-	-	-	5.52	0.56	91%	2.29	0.23	91%	0.25	0.03	83%
Fine Facies Subtotal			m^3	98			mCi	0.07	87%	mCi	0.07	86%	mCi	-	-	mCi	0.56	91%	mCi	0.23	91%	mCi	0.03	83%
			m^3/km	754			mCi/km	0.56		mCi/km	0.55		mCi/km	-	-	mCi/km	4.33		mCi/km	1.79		mCi/km	0.20	
Total			m^3	183			mCi	0.08	100%	mCi	0.08	100%	mCi	-	-	mCi	0.62	100%	mCi	0.26	100%	mCi	0.03	100%
			m^3/km	1411			mCi/km	0.65		mCi/km	0.64		mCi/km	-	-	mCi/km	4.75		mCi/km	1.97		mCi/km	0.24	
Reach TS-1C																								
c1	coarse	306	0.29	89	0.84	1.23	0.00	0.00	0%	0.13	0.01	1%	-	-	-	2.44	0.22	1%	0.59	0.05	1%	0.18	0.02	3%
c1b	coarse	77	0.25	19	0.84	1.23	0.00	0.00	0%	0.13	0.00	0%	-	-	-	2.44	0.05	0%	0.59	0.01	0%	0.18	0.00	1%
c2	coarse	394	0.48	189	0.82	1.23	0.00	0.00	0%	0.13	0.02	2%	-	-	-	2.44	0.47	2%	0.59	0.11	2%	0.18	0.03	6%
f1	coarse	1584	0.09	143	0.82	1.23	0.00	0.00	0%	0.13	0.02	2%	-	-	-	2.44	0.35	1%	0.59	0.08	1%	0.18	0.03	5%

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
Coarse Facies Subtotal			m^3	440			mCi	0.00	0%	mCi	0.06	5%	mCi	-	-	mCi	1.09	4%	mCi	0.26	5%	mCi	0.08	15%
			m^3/km	1832			mCi/km	0.00		mCi/km	0.24		mCi/km	-	-	mCi/km	4.54		mCi/km	1.10		mCi/km	0.33	
c1	fine	306	0.30	92	0.97	1.04	1.07	0.10	9%	1.06	0.10	8%	-	-	-	28.29	2.62	9%	5.31	0.49	8%	0.45	0.04	8%
c1b	fine	77	0.29	22	0.97	1.04	1.07	0.02	2%	1.06	0.02	2%	-	-	-	28.29	0.64	2%	5.31	0.12	2%	0.45	0.01	2%
c2	fine	394	0.34	134	0.97	1.04	1.07	0.14	13%	1.06	0.14	12%	-	-	-	28.29	3.82	12%	5.31	0.72	12%	0.45	0.06	11%
f1	fine	1584	0.50	792	0.97	1.04	1.07	0.85	76%	1.06	0.85	72%	-	-	-	28.29	22.60	73%	5.31	4.24	73%	0.45	0.36	65%
Fine Facies Subtotal			m^3	1040			mCi	1.12	100%	mCi	1.11	95%	mCi	-	-	mCi	29.68	96%	mCi	5.57	95%	mCi	0.47	85%
			m^3/km	4334			mCi/km	4.68		mCi/km	4.63		mCi/km	-	-	mCi/km	123.68		mCi/km	23.21		mCi/km	1.97	
Total			m^3	1480			mCi	1.12	100%	mCi	1.17	100%	mCi	-	-	mCi	30.77	100%	mCi	5.83	100%	mCi	0.55	100%
			m^3/km	6166			mCi/km	4.68		mCi/km	4.88		mCi/km	-	-	mCi/km	128.21		mCi/km	24.31		mCi/km	2.30	
Reach TS-1C, unsampled																								
c1	coarse	254	0.29	74	0.84	1.23	0.00	0.00	0%	0.08	0.01	1%				1.45	0.11	0%	0.48	0.04	1%	0.09	0.01	2%
c1b	coarse	13	0.25	3	0.84	1.23	0.00	0.00	0%	0.08	0.00	0%				1.45	0.00	0%	0.48	0.00	0%	0.09	0.00	0%
c2	coarse	1263	0.48	606	0.82	1.23	0.00	0.00	0%	0.08	0.05	6%				1.45	0.89	3%	0.48	0.29	6%	0.09	0.06	15%
f1	coarse	943	0.09	85	0.82	1.23	0.00	0.00	0%	0.08	0.01	1%				1.45	0.12	0%	0.48	0.04	1%	0.09	0.01	2%
Coarse Facies Subtotal			m3	768			0	0.00	0%	0.08	0.06	8%				1.45	1.13	3%	0.48	0.37	7%	0.09	0.07	19%
			m3/km	3200			mCi/km	0.00		mCi/km	0.26					mCi/km	4.69		mCi/km	1.55		mCi/km	0.29	
c1	fine	254	0.30	76	0.97	1.04	0.85	0.07	8%	0.72	0.06	7%				32.01	2.46	8%	4.90	0.38	7%	0.30	0.02	6%
c1b	fine	13	0.29	4	0.97	1.04	0.85	0.00	0%	0.72	0.00	0%				32.01	0.12	0%	4.90	0.02	0%	0.30	0.00	0%
c2	fine	1263	0.34	429	0.97	1.04	0.85	0.37	44%	0.72	0.31	40%				32.01	13.87	42%	4.90	2.12	41%	0.30	0.13	35%
f1	fine	943	0.50	472	0.97	1.04	0.85	0.40	48%	0.72	0.34	44%				32.01	15.23	46%	4.90	2.33	45%	0.30	0.14	39%
Fine Facies Subtotal			m3	981			0.85	0.84	100%	0.72	0.71	92%				32.01	31.67	97%	4.9	4.85	93%	0.3	0.30	81%
			m3/km	4087			mCi/km	3.50		mCi/km	2.97					mCi/km	131.98		mCi/km	20.20		mCi/km	1.24	
Total			m3	1749			mCi	0.84	100%	mCi	0.77	100%				mCi	32.80	100%	mCi	5.22	100%	mCi	0.37	100%
			m3/km	7287			mCi/km	3.50		mCi/km	3.23					mCi/km	136.67		mCi/km	21.76		mCi/km	1.53	
Reach TS-1E																								
c1	coarse	369	0.38	140	0.92	1.23	0.00	0.00	0%	0.03	0.00	2%	-	-	-	0.87	0.14	1%	0.36	0.06	2%	0.00	0.00	0%
c1b	coarse	52	0.43	22	0.92	1.23	0.00	0.00	0%	0.03	0.00	0%	-	-	-	0.87	0.02	0%	0.36	0.01	0%	0.00	0.00	0%
c1br	coarse	20	0.00	0	0.92	1.23	0.00	0.00	0%	0.03	0.00	0%	-	-	-	0.87	0.00	0%	0.36	0.00	0%	0.00	0.00	0%
c1w	coarse	331	0.86	285	0.92	1.23	0.00	0.00	0%	0.03	0.01	4%	-	-	-	0.87	0.28	1%	0.36	0.12	4%	0.00	0.00	0%
c2	coarse	941	0.22	207	0.92	1.23	0.00	0.00	0%	0.03	0.01	3%	-	-	-	0.87	0.20	1%	0.36	0.08	3%	0.00	0.00	0%
f1	coarse	486	0.09	44	0.92	1.23	0.00	0.00	0%	0.03	0.00	1%	-	-	-	0.87	0.04	0%	0.36	0.02	1%	0.00	0.00	0%

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
Coarse Facies Subtotal			m^3	698			mCi	0.00	0%	mCi	0.02	10%	mCi	-	-	mCi	0.69	3%	mCi	0.28	10%	mCi	0.00	0%
			m^3/km	1790			mCi/km	0.00		mCi/km	0.06		mCi/km	-	-	mCi/km	1.76		mCi/km	0.73		mCi/km	0.00	
c1	fine	369	0.06	22	0.98	1.04	0.64	0.01	4%	0.37	0.01	4%	-	-	-	35.72	0.81	4%	4.49	0.10	4%	0.15	0.00	4%
c1b	fine	52	0.16	8	0.98	1.04	0.64	0.01	1%	0.37	0.00	1%	-	-	-	35.72	0.30	1%	4.49	0.04	1%	0.15	0.00	1%
c1br	fine	20	0.00	0	0.98	1.04	0.64	0.00	0%	0.37	0.00	0%	-	-	-	35.72	0.00	0%	4.49	0.00	0%	0.15	0.00	0%
c1w	fine	331	0.13	43	0.98	1.04	0.64	0.03	8%	0.37	0.02	7%	-	-	-	35.72	1.57	7%	4.49	0.20	7%	0.15	0.01	8%
c2	fine	941	0.37	348	0.98	1.04	0.64	0.23	62%	0.37	0.13	56%	-	-	-	35.72	12.68	60%	4.49	1.59	56%	0.15	0.05	62%
f1	fine	486	0.29	141	0.98	1.04	0.64	0.09	25%	0.37	0.05	23%	-	-	-	35.72	5.13	24%	4.49	0.64	23%	0.15	0.02	25%
Fine Facies Subtotal			m^3	563			mCi	0.37	100%	mCi	0.21	90%	mCi	-	-	mCi	20.48	97%	mCi	2.57	90%	mCi	0.09	100%
			m^3/km	1443			mCi/km	0.94		mCi/km	0.54		mCi/km	-	-	mCi/km	52.52		mCi/km	6.60		mCi/km	0.22	
Total			m^3	1261			mCi	0.37	100%	mCi	0.24	100%	mCi	-	-	mCi	21.17	100%	mCi	2.86	100%	mCi	0.09	100%
			m^3/km	3232			mCi/km	0.94		mCi/km	0.60		mCi/km	-	-	mCi/km	54.28		mCi/km	7.33		mCi/km	0.22	
Reach TS-2W																								
c1	coarse	28	0.55	15	0.83	1.23	0.12	0.00	2%	0.07	0.00	1%	-	-	-	0.53	0.01	2%	0.34	0.01	3%	0.23	0.00	1%
c1w	coarse	364	0.50	182	0.83	1.23	0.12	0.02	28%	0.07	0.01	14%	-	-	-	0.53	0.10	29%	0.34	0.06	36%	0.23	0.04	10%
c2	coarse	322	0.20	64	0.83	1.23	0.12	0.01	10%	0.07	0.00	5%	-	-	-	0.53	0.03	10%	0.34	0.02	13%	0.23	0.02	4%
Coarse Facies Subtotal			m^3	262			mCi	0.03	40%	mCi	0.02	20%	mCi	-	-	mCi	0.14	41%	mCi	0.09	52%	mCi	0.06	15%
			m^3/km	2380			mCi/km	0.29		mCi/km	0.17		mCi/km	-	-	mCi/km	1.29		mCi/km	0.83		mCi/km	0.56	
c1	fine	28	0.08	2	0.97	1.04	0.21	0.00	1%	0.33	0.00	1%	-	-	-	0.89	0.00	1%	0.37	0.00	0%	1.60	0.00	1%
c1w	fine	364	0.34	124	0.97	1.04	0.21	0.03	33%	0.33	0.04	44%	-	-	-	0.89	0.11	33%	0.37	0.05	27%	1.60	0.20	47%
c2	fine	322	0.30	97	0.97	1.04	0.21	0.02	26%	0.33	0.03	35%	-	-	-	0.89	0.09	25%	0.37	0.04	21%	1.60	0.16	37%
Fine Facies Subtotal			m^3	223			mCi	0.05	60%	mCi	0.07	80%	mCi	-	-	mCi	0.20	59%	mCi	0.08	48%	mCi	0.36	85%
			m^3/km	2024			mCi/km	0.43		mCi/km	0.67		mCi/km	-	-	mCi/km	1.82		mCi/km	0.76		mCi/km	3.27	
Total			m^3	484			mCi	0.08	100%	mCi	0.09	100%	mCi	-	-	mCi	0.34	100%	mCi	0.17	100%	mCi	0.42	100%
			m^3/km	4404			mCi/km	0.72		mCi/km	0.84		mCi/km	-	-	mCi/km	3.10		mCi/km	1.58		mCi/km	3.83	
Reach TS-2C																								
c1	coarse	130	0.31	40	0.84	1.23	0.12	0.00	4%	0.07	0.00	1%	-	-	-	0.12	0.00	1%	0.05	0.00	1%	0.60	0.02	2%
c1b	coarse	497	0.43	214	0.84	1.23	0.12	0.03	20%	0.07	0.02	6%	-	-	-	0.12	0.03	5%	0.05	0.01	5%	0.60	0.13	12%
c2	coarse	265	0.20	53	0.84	1.23	0.12	0.01	5%	0.07	0.00	2%	-	-	-	0.12	0.01	1%	0.05	0.00	1%	0.60	0.03	3%
f1	coarse	212	0.04	8	0.84	1.23	0.12	0.00	1%	0.07	0.00	0%	-	-	-	0.12	0.00	0%	0.05	0.00	0%	0.60	0.01	0%
Coarse Facies Subtotal			m^3	315			mCi	0.04	30%	mCi	0.02	9%	mCi	-	-	mCi	0.04	7%	mCi	0.02	7%	mCi	0.20	18%
			m^3/km	1577			mCi/km	0.20		mCi/km	0.11		mCi/km	-	-	mCi/km	0.20		mCi/km	0.08		mCi/km	0.98	

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
c1	fine	130	0.07	9	0.98	1.04	0.17	0.00	1%	0.54	0.01	2%	-	-	-	1.03	0.01	2%	0.47	0.00	2%	1.73	0.02	1%
c1b	fine	497	0.46	229	0.98	1.04	0.17	0.04	30%	0.54	0.13	52%	-	-	-	1.03	0.24	44%	0.47	0.11	46%	1.73	0.40	37%
c2	fine	265	0.38	101	0.98	1.04	0.17	0.02	13%	0.54	0.06	23%	-	-	-	1.03	0.11	19%	0.47	0.05	20%	1.73	0.18	16%
f1	fine	212	0.35	74	0.98	1.04	0.45	0.03	26%	0.43	0.03	13%	-	-	-	1.98	0.15	28%	0.76	0.06	24%	3.81	0.29	27%
Fine Facies Subtotal			m^3	413			mCi	0.09	70%	mCi	0.22	91%	mCi	-	-	mCi	0.51	93%	mCi	0.22	93%	mCi	0.88	82%
			m^3/km	2063			mCi/km	0.46		mCi/km	1.09		mCi/km	-	-	mCi/km	2.53		mCi/km	1.10		mCi/km	4.42	
Total			m^3	728			mCi	0.13	100%	mCi	0.24	100%	mCi	-	-	mCi	0.54	100%	mCi	0.24	100%	mCi	1.08	100%
			m^3/km	3641			mCi/km	0.66		mCi/km	1.21		mCi/km	-	-	mCi/km	2.72		mCi/km	1.18		mCi/km	5.40	
Reach TS-2E																								
c1	coarse	222	0.42	93	0.50	1.23	0.04	0.00	57%	0.17	0.01	14%	-	-	-	0.18	0.01	16%	0.17	0.01	4%	0.48	0.03	9%
c1br	coarse	9	0.00	0	0.50	1.23	0.04	0.00	0%	0.17	0.00	0%	-	-	-	0.18	0.00	0%	0.17	0.00	0%	0.48	0.00	0%
c2	coarse	228	0.27	62	0.50	1.23	0.04	0.00	38%	0.17	0.01	9%	-	-	-	0.18	0.01	10%	0.17	0.01	2%	0.48	0.02	6%
f1	coarse	153	0.05	8	0.50	1.23	0.04	0.00	5%	0.17	0.00	1%	-	-	-	0.18	0.00	1%	0.17	0.00	0%	0.48	0.00	1%
f2	coarse	7	0.00	0	0.50	1.23	0.04	0.00	0%	0.17	0.00	0%	-	-	-	0.18	0.00	0%	0.17	0.00	0%	0.48	0.00	0%
Coarse Facies Subtotal			m^3	162			mCi	0.00	100%	mCi	0.02	24%	mCi	-	-	mCi	0.02	27%	mCi	0.02	6%	mCi	0.05	16%
			m^3/km	774			mCi/km	0.02		mCi/km	0.08		mCi/km	-	-	mCi/km	0.09		mCi/km	0.08		mCi/km	0.23	
c1	fine	222	0.01	2	0.98	1.04	0.00	0.00	0%	0.41	0.00	1%	-	-	-	0.36	0.00	1%	1.84	0.00	2%	1.87	0.00	1%
c1br	fine	9	0.00	0	0.98	1.04	0.00	0.00	0%	0.41	0.00	0%	-	-	-	0.36	0.00	0%	1.84	0.00	0%	1.87	0.00	0%
c2	fine	228	0.29	66	0.98	1.04	0.00	0.00	0%	0.41	0.03	38%	-	-	-	0.36	0.02	37%	1.84	0.12	47%	1.87	0.13	42%
f1	fine	153	0.40	61	0.98	1.04	0.00	0.00	0%	0.41	0.03	36%	-	-	-	0.36	0.02	34%	1.84	0.11	44%	1.87	0.12	39%
f2	fine	7	0.27	2	0.98	1.04	0.00	0.00	0%	0.41	0.00	1%	-	-	-	0.36	0.00	1%	1.84	0.00	1%	1.87	0.00	1%
Fine Facies Subtotal			m^3	131			mCi	0.00	0%	mCi	0.05	76%	mCi	-	-	mCi	0.05	73%	mCi	0.25	94%	mCi	0.25	84%
			m^3/km	626			mCi/km	0.00		mCi/km	0.26		mCi/km	-	-	mCi/km	0.23		mCi/km	1.17		mCi/km	1.19	
Total			m^3	294			mCi	0.00	100%	mCi	0.07	100%	mCi	-	-	mCi	0.07	100%	mCi	0.26	100%	mCi	0.30	100%
			m^3/km	1399			mCi/km	0.02		mCi/km	0.34		mCi/km	-	-	mCi/km	0.32		mCi/km	1.25		mCi/km	1.42	
Reach TS-3																								
c1	coarse	236	0.30	71	0.74	1.23	0.09	0.01	3%	0.11	0.01	2%	-	-	-	0.32	0.02	3%	0.17	0.01	3%	0.23	0.01	1%
c2	coarse	1826	0.20	365	0.95	1.23	0.09	0.04	18%	0.11	0.05	10%	-	-	-	0.32	0.14	21%	0.17	0.07	18%	0.23	0.10	8%
f1	coarse	153	0.05	8	0.95	1.23	0.09	0.00	0%	0.11	0.00	0%	-	-	-	0.32	0.00	0%	0.17	0.00	0%	0.23	0.00	0%
Coarse Facies Subtotal			m^3	444			mCi	0.05	21%	mCi	0.06	12%	mCi	-	-	mCi	0.16	25%	mCi	0.09	21%	mCi	0.12	10%
			m^3/km	1431			mCi/km	0.15		mCi/km	0.18		mCi/km	-	-	mCi/km	0.52		mCi/km	0.27		mCi/km	0.37	
c1	fine	236	0.06	14	0.97	1.04	0.29	0.00	2%	0.72	0.01	2%	-	-	-	0.89	0.01	2%	0.56	0.01	2%	1.93	0.03	2%

Table D-1.4-1 (continued)

Geomorphic Unit	Facies	Area (m^2)	Average Thick- ness (m)	Volume (m^3)	Portion Non-gravel	Density (g/cm^3)	Americium-241			Cesium-137			Cobalt-60			Plutonium-238			Plutonium-239,240			Strontium-90		
							Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach	Average Concentration (pCi/g)	Inventory (mCi)	% of Total in Reach
c2	fine	1826	0.29	530	0.97	1.04	0.29	0.15	72%	0.72	0.38	83%	-	-	-	0.89	0.48	73%	0.56	0.30	75%	1.93	1.03	86%
f1	fine	153	0.14	21	0.92	1.04	0.08	0.00	1%	0.37	0.01	2%	-	-	-	0.01	0.00	0%	0.03	0.00	0%	0.47	0.01	1%
f2	fine	2778	0.06	167	0.93	1.04	0.05	0.01	4%	0.03	0.00	1%	-	-	-	0.00	0.00	0%	0.02	0.00	1%	0.08	0.01	1%
Fine Facies Subtotal			m^3	732			mCi	0.17	79%	mCi	0.41	88%	mCi	-	-	mCi	0.49	75%	mCi	0.31	79%	mCi	1.08	90%
			m^3/km	2361			mCi/km	0.54		mCi/km	1.31		mCi/km	-	-	mCi/km	1.58		mCi/km	1.00		mCi/km	3.49	
Total			m^3	1175			mCi	0.21	100%	mCi	0.46	100%	mCi	-	-	mCi	0.65	100%	mCi	0.40	100%	mCi	1.20	100%
			m^3/km	3792			mCi/km	0.69		mCi/km	1.49		mCi/km	-	-	mCi/km	2.09		mCi/km	1.28		mCi/km	3.86	

[a] Dash indicates no inventory estimated because not a COPC in reach.

[b] n/a = Not applicable.

[c] Volume and normalized volume in total excludes fill piles.

Table D-1.4-2
Radionuclide Inventory Estimates For the Mortandad Watershed

Reach	Distance Above Rio Grande, Upstream End (km)	Length (km)	Sampling Status	Americium-241				Cesium-137				Cobalt-60			
				Coarse Facies Inventory (mCi)	Fine Facies Inventory (mCi)	Total Inventory (mCi)	Percent of Total Inventory	Coarse Facies Inventory (mCi)	Fine Facies Inventory (mCi)	Total Inventory (mCi)	Percent of Total Inventory	Coarse Facies Inventory (mCi)	Fine Facies Inventory (mCi)	Total Inventory (mCi)	Percent of Total Inventory
M-1W	16.00	0.22	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1W to M-1C	15.78	0.58	Not sampled	0.00	0.09	0.09	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1C	15.20	0.20	Sampled	0.00	0.06	0.06	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1C to M-1E	15.00	0.34	Not sampled	0.00	0.05	0.05	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1E	14.66	0.20	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1E to M-2W	14.46	0.75	Not sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
E-1FW	14.51	0.15	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
E-1FW to E-1W	14.36	0.23	Not sampled	0.04	0.00	0.04	0%	0.04	0.27	0.31	0%	0.00	0.00	0.00	0%
E-1W	14.13	0.21	Sampled	0.07	0.00	0.07	0%	0.08	0.50	0.58	0%	0.00	0.00	0.00	0%
E-1E	13.92	0.21	Sampled	6.68	4.46	11.14	3%	5.73	16.59	22.32	2%	0.06	0.02	0.08	3%
M-2W	13.71	0.60	Sampled	8.00	18.50	26.50	6%	55.30	51.60	106.90	8%	0.17	0.07	0.24	8%
M-2W to M-2E	13.11	0.17	Not sampled	1.76	4.72	6.48	2%	10.86	18.60	29.47	2%	0.04	0.02	0.06	2%
M-2E	13.01	0.41	Sampled	3.30	10.80	14.10	3%	16.20	57.20	73.40	5%	0.10	0.05	0.15	5%
M-2E to M-3W	12.60	0.50	Not sampled	6.78	13.55	20.33	5%	20.22	64.60	84.82	6%	0.12	0.09	0.21	8%
M-3W	12.12	0.28	Sampled	5.42	7.95	13.37	3%	11.81	34.02	45.83	3%	0.07	0.07	0.14	5%
M-3E	11.84	0.62	Sampled	65.31	164.37	229.68	55%	150.32	581.55	731.87	51%	0.57	0.89	1.46	52%
TS-1W	13.75	0.12	Sampled	0.01	0.07	0.08	0%	0.01	0.07	0.08	0%	0.00	0.00	0.00	0%
TS-1C	13.63	0.25	Sampled	0.00	1.12	1.12	0%	0.06	1.12	1.18	0%	0.00	0.00	0.00	0%
TS-1C (unsampled)	13.38	0.16	Not sampled	0.00	0.84	0.84	0%	0.06	0.71	0.77	0%	0.00	0.00	0.00	0%
TS-1E	13.22	0.39	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
PCYN	13.12	0.23	Sampled	0.03	0.15	0.18	0%	0.41	9.73	10.14	1%	0.00	0.08	0.08	3%
PCYN (not mapped)	12.90	0.07	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
TS-2W	12.83	0.11	Sampled	0.03	0.05	0.08	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
TS-2C	12.72	0.20	Sampled	0.04	0.09	0.13	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
TS-2E	12.52	0.21	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
TS-2E to TS-3	12.31	0.69	Not sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
TS-3	11.62	0.31	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-4W	11.22	0.21	Sampled	1.48	25.17	26.65	6%	6.87	58.06	64.93	5%	0.01	0.15	0.16	6%
M-4C	11.01	0.22	Sampled	2.77	33.98	36.75	9%	18.47	124.78	143.24	10%	0.02	0.14	0.16	6%
M-4E	10.79	0.23	Sampled	1.10	10.95	12.05	3%	7.50	30.19	37.69	3%	0.01	0.02	0.03	1%
M-4E to M-5W	10.56	0.79	Not sampled	1.89	18.81	20.69	5%	12.94	52.01	64.95	5%	0.02	0.03	0.05	2%
M-5W	9.77	0.25	Sampled	0.00	0.00	0.00	0%	0.04	0.10	0.14	0%	0.00	0.00	0.00	0%
M-5W to M-5E	9.52	0.62	Not sampled	0.00	0.00	0.00	0%	0.18	0.37	0.55	0%	0.00	0.00	0.00	0%
M-5E	8.90	0.56	Sampled	0.00	0.00	0.00	0%	0.24	0.44	0.68	0%	0.00	0.00	0.00	0%
MCW-1	11.25	0.25	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-1 to MCW-2W	11.00	0.97	Not sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-2N	10.03	0.10	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-2W	9.93	0.10	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-2E	9.83	0.20	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-2E to M-5E	9.63	1.29	Not sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-5E to M-6	8.34	3.24	Not sampled	0.00	0.00	0.00	0%	0.69	1.27	1.97	0%	0.00	0.00	0.00	0%
M-6	5.10	0.20	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
Total		**17.63**		**104.71**	**315.77**	**420.48**	**100%**	**318.05**	**1103.78**	**1421.81**	**100%**	**1.19**	**1.64**	**2.83**	**100%**

Table D-1.4-2 (continued)

Reach	Distance Above Rio Grande, Upstream End (km)	Length (km)	Sampling Status	Plutonium-238				Plutonium-239,240				Strontium-90			
				Coarse Facies Inventory (mCi)	Fine Facies Inventory (mCi)	Total Inventory (mCi)	Percent of Total Inventory	Coarse Facies Inventory (mCi)	Fine Facies Inventory (mCi)	Total Inventory (mCi)	Percent of Total Inventory	Coarse Facies Inventory (mCi)	Fine Facies Inventory (mCi)	Total Inventory (mCi)	Percent of Total Inventory
M-1W	16.00	0.22	Sampled	0.01	0.00	0.01	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1W to M-1C	15.78	0.58	Not sampled	0.03	0.01	0.04	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1C	15.20	0.20	Sampled	0.01	0.01	0.02	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-1C to M-1E	15.00	0.34	Not sampled	0.01	0.02	0.03	0%	0.00	0.01	0.01	0%	0.00	0.00	0.00	0%
M-1E	14.66	0.20	Sampled	0.00	0.01	0.01	0%	0.00	0.01	0.01	0%	0.00	0.00	0.00	0%
M-1E to M-2W	14.46	0.75	Not sampled	0.00	0.04	0.04	0%	0.00	0.04	0.04	0%	0.00	0.00	0.00	0%
E-1FW	14.51	0.15	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
E-1FW to E-1W	14.36	0.23	Not sampled	0.00	0.01	0.01	0%	0.01	0.12	0.13	0%	0.00	0.00	0.00	0%
E-1W	14.13	0.21	Sampled	0.00	0.02	0.02	0%	0.01	0.23	0.24	0%	0.00	0.00	0.00	0%
E-1E	13.92	0.21	Sampled	2.00	0.73	2.73	1%	11.87	4.81	16.68	4%	0.25	1.48	1.73	1%
M-2W	13.71	0.60	Sampled	9.90	9.80	19.70	7%	8.60	22.40	31.00	8%	1.50	3.00	4.50	3%
M-2W to M-2E	13.11	0.17	Not sampled	2.07	3.00	5.06	2%	2.11	5.17	7.28	2%	0.37	0.81	1.18	1%
M-2E	13.01	0.41	Sampled	3.50	8.20	11.70	4%	4.60	10.40	15.00	4%	0.80	2.00	2.80	2%
M-2E to M-3W	12.60	0.50	Not sampled	3.99	8.34	12.32	5%	8.40	12.20	20.60	5%	1.22	3.12	4.33	3%
M-3W	12.12	0.28	Sampled	2.12	3.83	5.95	2%	6.36	6.70	13.06	3%	0.83	2.16	2.99	2%
M-3E	11.84	0.62	Sampled	21.76	63.31	85.07	32%	67.20	124.56	191.76	49%	9.29	26.58	35.87	23%
TS-1W	13.75	0.12	Sampled	0.06	0.56	0.62	0%	0.02	0.23	0.25	0%	0.01	0.03	0.04	0%
TS-1C	13.63	0.25	Sampled	1.09	29.68	30.77	12%	0.26	5.57	5.83	2%	0.00	0.00	0.00	0%
TS-1C (unsampled)	13.38	0.16	Not sampled	1.13	31.67	32.80	12%	0.37	4.85	5.22	1%	0.00	0.00	0.00	0%
TS-1E	13.22	0.39	Sampled	0.69	20.48	21.17	8%	0.28	2.57	2.85	1%	0.00	0.00	0.00	0%
PCYN	13.12	0.23	Sampled	0.00	0.01	0.01	0%	0.01	0.52	0.53	0%	20.29	40.92	61.21	39%
PCYN (not mapped)	12.90	0.07	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.18	0.36	0.54	0%
TS-2W	12.83	0.11	Sampled	0.14	0.20	0.34	0%	0.09	0.08	0.17	0%	0.06	0.36	0.42	0%
TS-2C	12.72	0.20	Sampled	0.04	0.51	0.55	0%	0.02	0.22	0.24	0%	0.20	0.88	1.08	1%
TS-2E	12.52	0.21	Sampled	0.02	0.05	0.07	0%	0.02	0.25	0.27	0%	0.05	0.25	0.30	0%
TS-2E to TS-3	12.31	0.69	Not sampled	0.09	0.27	0.36	0%	0.13	0.76	0.89	0%	0.22	1.61	1.83	1%
TS-3	11.62	0.31	Sampled	0.05	0.17	0.22	0%	0.09	0.31	0.40	0%	0.12	1.08	1.20	1%
M-4W	11.22	0.21	Sampled	0.87	6.44	7.31	3%	1.74	16.03	17.77	5%	0.57	3.95	4.52	3%
M-4C	11.01	0.22	Sampled	2.10	13.36	15.46	6%	3.77	25.43	29.20	8%	1.92	10.46	12.38	8%
M-4E	10.79	0.23	Sampled	0.85	3.00	3.85	1%	1.53	8.65	10.18	3%	0.90	6.15	7.05	5%
M-4E to M-5W	10.56	0.79	Not sampled	1.48	5.15	6.63	3%	2.64	14.87	17.51	5%	1.59	10.75	12.34	8%
M-5W	9.77	0.25	Sampled	0.01	0.00	0.01	0%	0.01	0.01	0.02	0%	0.03	0.12	0.15	0%
M-5W to M-5E	9.52	0.62	Not sampled	0.02	0.01	0.03	0%	0.04	0.04	0.08	0%	0.04	0.15	0.19	0%
M-5E	8.90	0.56	Sampled	0.02	0.01	0.03	0%	0.05	0.05	0.10	0%	0.00	0.00	0.00	0%
MCW-1	11.25	0.25	Sampled	0.00	0.00	0.00	0%	0.00	0.01	0.01	0%	0.00	0.00	0.00	0%
MCW-1 to MCW-2W	11.00	0.97	Not sampled	0.00	0.00	0.00	0%	0.00	0.02	0.02	0%	0.00	0.00	0.00	0%
MCW-2N	10.03	0.10	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-2W	9.93	0.10	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-2E	9.83	0.20	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
MCW-2E to M-5E	9.63	1.29	Not sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
M-5E to M-6	8.34	3.24	Not sampled	0.06	0.03	0.09	0%	0.14	0.14	0.29	0%	0.00	0.00	0.00	0%
M-6	5.10	0.20	Sampled	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%	0.00	0.00	0.00	0%
Total		**17.63**		**54.10**	**208.92**	**263.02**	**100%**	**120.37**	**267.26**	**387.64**	**100%**	**40.43**	**116.23**	**156.65**	**100%**

Table D-1.5-1
Summary of Americium-241 Concentration and Inventory in the Mortandad Watershed

Reach	Approx. Distance Above Rio Grande, Midpoint of Reach (km)	Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)	Estimated Coarse Facies Inventory, (mCi/km)	Estimated Fine Facies Inventory, (mCi/km)	Estimated Total Inventory (mCi/km)
E-1FW	14.43	- *	-	-	-	-
E-1W	14.03	0.1	0.0	0.3	0.0	0.3
E-1E	13.82	30	74	32	21	53
M-1W	15.89	-	-	-	-	-
M-1C	15.10	0.0	0.2	0.0	0.3	0.3
M-1E	14.56	0.01	0.01	0.01	0.01	0.02
M-2W	13.41	8.3	41	13	31	44
M-2E	12.81	5.5	35	8.1	26	34
M-3W	11.98	8.6	12	19	27	46
M-3E	11.53	12	23	105	265	370
M-4W	11.12	1.5	16	7.1	120	127
M-4C	10.90	1.6	9.5	12.6	154	167
M-4E	10.68	1.6	4.8	4.8	48	52
M-5W	9.64	-	-	-	-	-
M-5E	8.62	-	-	-	-	-
M-6	5.00	-	-	-	-	-
TS-1W	13.69	0.1	0.7	0.1	0.6	0.7
TS-1C	13.50	0.0	1.1	0.0	4.7	4.7
TS-1E	13.02	-	-	-	-	-
TS-2W	12.77	0.1	0.2	0.3	0.4	0.7
TS-2C	12.62	0.1	0.2	0.2	0.5	0.7
TS-2E	12.42	-	-	-	-	-
TS-3	11.46	-	-	-	-	-
PCYN	13.01	0.04	0.3	0.2	0.9	1.0
MCW-1	11.13	-	-	-	-	-
MCW-2W	9.88	-	-	-	-	-
MCW-2N	9.93	-	-	-	-	-
MCW-2E	9.73	-	-	-	-	-

Note: Average concentrations are for <2 mm fraction, and are not adjusted for gravel content.
*Dash indicates not a COPC in that reach.

Table D-1.5-2
Summary of Cesium-137 Concentration and Inventory in the Mortandad Watershed

Reach	Approx. Distance Above Rio Grande, Midpoint of Reach (km)	Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)	Estimated Coarse Facies Inventory, (mCi/km)	Estimated Fine Facies Inventory, (mCi/km)	Estimated Total Inventory (mCi/km)
E-1FW	14.43	- *	-	-	-	-
E-1W	14.03	0.2	0.9	0.4	2.4	2.8
E-1E	13.82	25	276	27	79	106
M-1W	15.89	-	-	-	-	-
M-1C	15.10	-	-	-	-	-
M-1E	14.56	-	-	-	-	-
M-2W	13.41	58	115	92	86	178
M-2E	12.81	27	183	39	140	179
M-3W	11.98	19	53	41	117	158
M-3E	11.53	27	82	242	938	1180
M-4W	11.12	7.0	37	33	276	309
M-4C	10.90	11	36	84	567	651
M-4E	10.68	11	13	33	131	164
M-5W	9.64	0.2	0.5	0.2	0.4	0.6
M-5E	8.62	0.3	0.3	0.4	0.8	1.2
M-6	5.00	-	-	-	-	-
MCW-1	11.13	-	-	-	-	-
MCW-2N	9.93	-	-	-	-	-
MCW-2W	9.88	-	-	-	-	-
MCW-2E	9.73	-	-	-	-	-
PCYN	13.01	0.6	16	2.3	54	56
TS-1W	13.69	0.1	0.7	0.1	0.6	0.6
TS-1C	13.50	0.1	1.1	0.2	4.6	4.9
TS-1E	13.02	-	-	-	-	-
TS-2W	12.77	-	-	-	-	-
TS-2C	12.62	-	-	-	-	-
TS-2E	12.42	-	-	-	-	-
TS-3	11.46	-	-	-	-	-

Note: Average concentrations and inventory apply to time of sampling, and are not adjusted for radioactive decay; average concentrations are for <2 mm fraction, and are not adjusted for gravel content.

*Dash indicates not a COPC in that reach.

Table D-1.5-3
Summary of Cobalt-60 Concentration and Inventory in the Mortandad Watershed

Reach	Approx. Distance Above Rio Grande, Midpoint of Reach (km)	Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)	Estimated Coarse Facies Inventory, (mCi/km)	Estimated Fine Facies Inventory, (mCi/km)	Estimated Total Inventory (mCi/km)
E-1FW	14.43	- *	-	-	-	-
E-1W	14.03	-	-	-	-	-
E-1E	13.82	0.25	0.37	0.27	0.11	0.38
M-1W	15.89	-	-	-	-	-
M-1C	15.10	-	-	-	-	-
M-1E	14.56	-	-	-	-	-
M-2W	13.41	0.26	0.31	0.41	0.23	0.64
M-2E	12.81	0.18	0.15	0.29	0.11	0.40
M-3W	11.98	0.12	0.10	0.25	0.23	0.48
M-3E	11.53	0.10	0.13	0.93	1.44	2.37
M-4W	11.12	0.01	0.08	0.06	0.71	0.77
M-4C	10.90	0.01	0.04	0.07	0.64	0.71
M-4E	10.68	0.01	0.01	0.03	0.10	0.13
M-5W	9.64	-	-	-	-	-
M-5E	8.62	-	-	-	-	-
M-6	5.00	-	-	-	-	-
MCW-1	11.13	-	-	-	-	-
MCW-2N	9.93	-	-	-	-	-
MCW-2W	9.88	-	-	-	-	-
MCW-2E	9.73	-	-	-	-	-
PCYN	13.01	0.00	0.14	0.00	0.46	0.46
TS-1W	13.69	0.00	0.00	0.00	0.00	0.00
TS-1C	13.50	-	-	-	-	-
TS-1E	13.02	-	-	-	-	-
TS-2W	12.77	-	-	-	-	-
TS-2C	12.62	-	-	-	-	-
TS-2E	12.42	-	-	-	-	-
TS-3	11.46	-	-	-	-	-

Note: Average concentrations and inventory apply to time of sampling, and are not adjusted for radioactive decay; average concentrations are for <2 mm fraction, and are not adjusted for gravel content.

*Dash indicates not a COPC in that reach.

Table D-1.5-4
Summary of Plutonium-238 Concentration and Inventory in the Mortandad Watershed

Reach	Approx. Distance Above Rio Grande, Midpoint of Reach (km)	Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)	Estimated Coarse Facies Inventory, (mCi/km)	Estimated Fine Facies Inventory, (mCi/km)	Estimated Total Inventory (mCi/km)
E-1FW	14.43	0.05	0.04	0.03	0.02	0.05
E-1W	14.03	0.00	0.04	0.01	0.1	0.1
E-1E	13.82	8.8	12	9.5	3.5	13
M-1W	15.89	0.03	0.03	0.05	0.02	0.07
M-1C	15.10	0.04	0.05	0.07	0.07	0.14
M-1E	14.56	0.01	0.05	0.01	0.05	0.06
M-2W	13.41	10	22	17	16	33
M-2E	12.81	5.6	26	8.5	20	28
M-3W	11.98	3.4	6.0	7.3	13	20
M-3E	11.53	3.9	9.0	35	102	137
M-4W	11.12	0.9	4.3	4.2	31	35
M-4C	10.90	1.3	3.9	9.6	61	70
M-4E	10.68	1.3	1.3	3.7	13	17
M-5W	9.64	- *	-	-	-	-
M-5E	8.62	0.02	0.01	0.03	0.02	0.05
M-6	5.00	-	-	-	-	-
TS-1W	13.69	0.7	5.5	0.43	4.33	4.8
TS-1C	13.50	2.0	28.3	3.8	123.7	127.5
TS-1E	13.02	0.9	35.7	1.8	52.5	54.3
TS-2W	12.77	0.5	0.9	1.3	1.8	3.1
TS-2C	12.62	0.1	1.2	0.2	2.5	2.7
TS-2E	12.42	0.2	0.4	0.1	0.2	0.3
TS-3	11.46	0.3	0.9	0.5	1.6	2.1
PCYN	13.01	0.00	0.02	0.00	0.07	0.07
MCW-1	11.13	-	-	-	-	-
MCW-2N	9.93	-	-	0.00	0.02	0.02
MCW-2W	9.88	0.00	0.01	-	-	-
MCW-2E	9.73	-	-	-	-	-

Note: Average concentrations are for <2 mm fraction, and are not adjusted for gravel content.
*Dash indicates not a COPC in that reach.

Table D-1.5-5
Summary of Plutonium-239,240 Concentration and Inventory in the Mortandad Watershed

Reach	Approx. Distance Above Rio Grande, Midpoint of Reach (km)	Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)	Estimated Coarse Facies Inventory, (mCi/km)	Estimated Fine Facies Inventory, (mCi/km)	Estimated Total Inventory (mCi/km)
E-1FW	14.43	- *	-	-	-	-
E-1W	14.03	0.03	0.4	0.1	1.1	1.2
E-1E	13.82	52	80	57	23	79
M-1W	15.89	-	-	-	-	-
M-1C	15.10	-	-	-	-	-
M-1E	14.56	0.02	0.03	0.02	0.03	0.05
M-2W	13.41	8.9	50	14	37	52
M-2E	12.81	7.5	33	11	25	36
M-3W	11.98	10	10	22	23	45
M-3E	11.53	12	18	108	201	309
M-4W	11.12	1.9	11	8.3	76	85
M-4C	10.90	2.3	7.4	17	116	133
M-4E	10.68	2.3	3.8	6.7	38	44
M-5W	9.64	0.05	0.06	0.04	0.05	0.09
M-5E	8.62	0.07	0.04	0.10	0.09	0.19
M-6	5.00	-	-	-	-	-
TS-1W	13.69	0.3	2.3	0.2	1.8	2.0
TS-1C	13.50	0.6	5.3	1.1	23	24
TS-1E	13.02	0.4	4.5	0.7	6.6	7.3
TS-2W	12.77	0.3	0.4	0.8	0.8	1.6
TS-2C	12.62	0.1	0.5	0.1	1.1	1.2
TS-2E	12.42	0.2	1.8	0.1	1.2	1.3
TS-3	11.46	0.2	0.5	0.3	1.0	1.3
PCYN	13.01	0.01	0.9	0.04	2.9	2.9
MCW-1	11.13	0.00	0.07	0.00	0.04	0.05
MCW-2N	9.93	-	-	-	-	-
MCW-2W	9.88	-	-	-	-	-
MCW-2E	9.73	-	-	-	-	-

Note: Average concentrations are for <2 mm fraction, and are not adjusted for gravel content.
*Dash indicates not a COPC in that reach.

Table D-1.5-6
Summary of Strontium-90 Concentration and Inventory in the Mortandad Watershed

Reach	Approx. Distance Above Rio Grande, Midpoint of Reach (km)	Estimated Average Sr-90 Concentration, Coarse Facies (pCi/g)	Estimated Average Sr-90 Concentration, Fine Facies (pCi/g)	Estimated Coarse Facies Inventory, Sr-90 (mCi/km)	Estimated Fine Facies Inventory, Sr-90 (mCi/km)	Estimated Total Sr-90 Inventory (mCi/km)
E-1FW	14.43	- *	-	-	-	-
E-1W	14.03	-	-	-	-	-
E-1E	13.82	1.1	25	1.2	7.1	8.3
M-1W	15.89	-	-	-	-	-
M-1C	15.10	-	-	-	-	-
M-1E	14.56	-	-	-	-	-
M-2W	13.41	1.6	6.5	2.5	5.0	7.5
M-2E	12.81	1.3	5.7	1.9	4.8	6.7
M-3W	11.98	1.3	3.3	2.9	7.5	10
M-3E	11.53	1.7	3.8	15	43	58
M-4W	11.12	0.8	3.6	2.7	19	22
M-4C	10.90	1.2	3.2	8.7	48	56
M-4E	10.68	1.2	2.6	3.9	27	31
M-5W	9.64	0.2	0.5	0.1	0.5	0.6
M-5E	8.62	-	-	-	-	-
M-6	5.00	-	-	-	-	-
TS-1W	13.69	0.1	0.3	0.04	0.2	0.2
TS-1C	13.50	-	-	-	-	-
TS-1E	13.02	-	-	-	-	-
TS-2W	12.77	0.2	1.6	0.6	3.3	3.8
TS-2C	12.62	0.6	2.1	1.0	4.4	5.4
TS-2E	12.42	0.5	1.9	0.2	1.2	1.4
TS-3	11.46	0.2	1.9	0.4	3.5	3.9
PCYN	13.01	28	67	113	227	340
MCW-1	11.13	-	-	-	-	-
MCW-2W	9.88	-	-	-	-	-
MCW-2N	9.93	-	-	-	-	-
MCW-2E	9.73	-	-	-	-	-

Note: Average concentrations and inventory apply to time of sampling, and are not adjusted for radioactive decay; average concentrations are for <2 mm fraction, and are not adjusted for gravel content.

*Dash indicates not a COPC in that reach.

Table D-1.5-7
Summary of Thorium-228, Thorium--230, and Thorium--232 Concentrations in the Mortandad Watershed

Reach	Approx. Distance Above Rio Grande, Midpoint of Reach (km)	Thorium-228		Thorium-230		Thorium-232	
		Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)	Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)	Estimated Average Concentration, Coarse Facies (pCi/g)	Estimated Average Concentration, Fine Facies (pCi/g)
Background [b]		**1.44**		**1.37**		**1.43**	
M-1C	15.10	-	-	-	-	0.57	0.75
TS-1C	13.50	1.06	1.12	0.65	0.84	1.01	1.10
MCW-1	11.13	-	-	0.75	1.45	-	-

Note: Average concentrations and inventory apply to time of sampling, and are not adjusted for radioactive decay; average concentrations are for <2 mm fraction, and are not adjusted for gravel content; only shown for reaches where thorium isotopes are COPCs.

*Background average from McDonald et al. (2003, 76084, Table 11, p. 50).

Table D-1.6-1
Sediment Samples used to Construct Chronology of Radionuclide Ratios

Location ID	Depth (cm)	Sample ID	Reach	Geomorphic Unit	Sediment Facies	Am-241 (pCi/g)	Cs-137 (pCi/g)	Pu-238 (pCi/g)	Pu-239,240 (pCi/g)	Pu-239/ Pu-238 ratio	Cs-137/ Pu-239 ratio	Cs-137/ Pu-238 ratio	Cs-137/ Am-241 ratio	Am-241/ Pu-238 ratio	Pu-239/ Am-241 ratio	Estimated Age Based on Geomorphic Context, Supplemented by Isotope Ratios
MO-00068	12–33	CAMO-99-00063	M-3E	c3	fine	4.1	119	0.38	5.51	14.4	21.6	310.7	29.0	10.7	1.3	ca. 1966–1969
MO-00068	52–63	CAMO-99-00065	M-3E	c3	fine	0.24	2.57	0.05	0.326	6.3	7.9	49.4	10.7	4.6	1.4	ca. 1963–1966
MO-00069	0–16	CAMO-99-00066	M-3E	c3	fine	33.7	53	6.7	23.8	3.6	2.2	7.9	1.6	5.0	0.7	late 1980s (1987?)
MO-00078	0–8	CAMO-99-00056	M-4W	c1t	fine	20.7	43.5	6.87	25.6	3.7	1.7	6.3	2.1	3.0	1.2	1992–1998
MO-00079	3–28	CAMO-99-00074	M-4W	c1/c2t	fine	76	70	9.22	35.2	3.8	2.0	7.6	0.9	8.2	0.5	ca. 1979–1983
MO-00079	31–42	CAMO-01-0272	M-4W	c1/c2t	fine	55.8	39.9	6.49	25	3.9	1.6	6.1	0.7	8.6	0.4	ca. 1979–1983
MO-00079	48–63	CAMO-99-00075	M-4W	c1/c2t	fine	47.1	41.9	6.38	25.9	4.1	1.6	6.6	0.9	7.4	0.5	ca. 1979–1983
MO-00079	64–75	CAMO-01-0273	M-4W	c1/c2t	fine	112	70.7	11.4	60.4	5.3	1.2	6.2	0.6	9.8	0.5	ca. 1979–1983
MO-00079	75–89	CAMO-99-00076	M-4W	c1/c2t	fine	14.6	12.3	4.59	8.62	1.9	1.4	2.7	0.8	3.2	0.6	ca. 1979–1983
MO-00079	93–125	CAMO-01-0274	M-4W	c1/c2t	fine	45.9	213	14.9	64.5	4.3	3.3	14.3	4.6	3.1	1.4	1978
MO-00079	125–150	CAMO-99-00057	M-4W	c1/c2t	fine	4.2	175	16	7.08	0.4	24.7	10.9	41.7	0.3	1.7	ca. 1974–1977
MO-00080	0–25	CAMO-99-00058	M-4C	c3a + f1a	fine	16.3	276	32.2	22.4	0.7	12.3	8.6	16.9	0.5	1.4	ca. 1974–1977
MO-00083	0–15	CAMO-99-00081	M-4C	c3a + f1a	fine	39.9	90	9.05	28.7	3.2	3.1	9.9	2.3	4.4	0.7	1978
MO-00083	15–32	CAMO-99-00082	M-4C	c3a + f1a	fine	19.1	148	15.5	15.24	1.0	9.7	9.6	7.7	1.2	0.8	ca. 1974–1977
MO-00083	32–54	CAMO-01-0258	M-4C	c3a + f1a	fine	1.54	34.6	3.59	2.46	0.7	14.1	9.6	22.5	0.4	1.6	ca. 1974–1977
MO-00084	0–11	CAMO-99-00083	M-4C	c3a + f1a	fine	27.6	84	9.12	17.4	1.9	4.8	9.2	3.0	3.0	0.6	1978
MO-00086	0–10	CAMO-99-00084	M-4E	c3 + f1	fine	7.7	24.6	1.61	5.86	3.6	4.2	15.3	3.2	4.8	0.8	1978
MO-10100	3–12	CAMO-01-0177	M-3E	f1	fine	0.62	44.4	1.93	2.41	1.2	18.4	23.0	72.1	0.3	3.9	ca. 1971–1973
MO-10100	24–39	CAMO-01-0179	M-3E	f1	fine	0.37	21.9	0.16	1.2	7.4	18.3	134.4	60.0	2.2	3.3	ca. 1969–1971
MO-10113	0–19	CAMO-01-0167	M-3E	f1	fine	3.07	75.3	1.59	8.18	5.1	9.2	47.4	24.5	1.9	2.7	ca. 1963–1966
MO-10113	19–31	CAMO-01-0206	M-3E	f1	fine	1.07	18	0.24	1.67	7.0	10.8	75.9	16.8	4.5	1.6	ca. 1963–1966
MO-10113	31–45	CAMO-01-0207	M-3E	f1	fine	0.37	6.39	0.05	0.619	12.0	10.3	124.3	17.3	7.2	1.7	ca. 1963–1966
MO-10117	32–41	CAMO-01-0214	M-3W	f1	fine	1.62	75.8	2.66	5.24	2.0	14.5	28.5	46.8	0.6	3.2	ca. 1971–1973
MO-10117	41–60	CAMO-01-0215	M-3W	f1	fine	2.36	101	0.43	4.04	9.4	25.0	235.4	42.8	5.5	1.7	ca. 1966–1969

Table D-1.6-1 (continued)

Location ID	Depth (cm)	Sample ID	Reach	Geomorphic Unit	Sediment Facies	Am-241 (pCi/g)	Cs-137 (pCi/g)	Pu-238 (pCi/g)	Pu-239,240 (pCi/g)	Pu-239/ Pu-238 ratio	Cs-137/ Pu-239 ratio	Cs-137/ Pu-238 ratio	Cs-137/ Am-241 ratio	Am-241/ Pu-238 ratio	Pu-239/ Am-241 ratio	Estimated Age Based on Geomorphic Context, Supplemented by Isotope Ratios
MO-10120	21–45	CAMO-01-0170	M-3W	f1	fine	1.7	82.9	1.09	5.58	5.1	14.9	76.1	48.8	1.6	3.3	ca. 1969–1971
MO-10120	45–75	CAMO-01-0219	M-3W	f1	fine	0.13	9.05	0.11	0.361	3.4	25.1	84.6	70.7	1.2	2.8	ca. 1969–1971
MO-10127	0–7	CAMO-01-0242	M-4E	f1	fine	1.53	2.66	0.231	0.972	4.2	2.7	11.5	1.7	6.6	0.6	1978
MO-10130	0–7	CAMO-01-0247	M-4E	c3 + f1	fine	4.03	9.49	0.93	2.81	3.0	3.4	10.2	2.4	4.3	0.7	1978
MO-10132	0–13	CAMO-01-0250	M-4E	c2a	fine	16.9	48.7	5.15	11	2.1	4.4	9.5	2.9	3.3	0.7	1978
MO-10133	0–15	CAMO-01-0251	M-4E	c3 + f1	fine	7.14	14.4	1.46	5.25	3.6	2.7	9.9	2.0	4.9	0.7	1978
MO-10135	0–18	CAMO-01-0227	M-4E	c3 + f1	fine	8.99	32.2	3.06	7.45	2.4	4.3	10.5	3.6	2.9	0.8	1978
MO-10139	0–21	CAMO-01-0228	M-4C	c3 + f1	coarse	0.22	13.4	0.48	0.983	2.1	13.6	28.0	62.3	0.4	4.6	ca. 1971–1973
MO-10139	25–34	CAMO-01-0257	M-4C	c3 + f1	coarse	0.15	10.1	0.08	0.631	7.6	16.0	121.7	69.7	1.7	4.4	ca. 1969–1971
MO-10144	0–7	CAMO-01-0266	M-4C	c3a + f1a	fine	29.1	74.9	7.26	22.5	3.1	3.3	10.3	2.6	4.0	0.8	1978
MO-10146	3–10	CAMO-01-0268	M-4W	c1t	fine	18.8	33.8	4.25	12.7	3.0	2.7	8.0	1.8	4.4	0.7	1992–1998
MO-10153	0–13	CAMO-01-0234	M-4W	c1t	fine	21.3	38.7	10.4	16.2	1.6	2.4	3.7	1.8	2.0	0.8	2000–2001
MO-10157	4–11	CAMO-01-0282	M-4W	c1	fine	5.83	21.7	3.96	8.87	2.2	2.4	5.5	3.7	1.5	1.5	2000–2001
MO-23322	0–5	CAMO-04-55022	M-3E	c1	fine	14.2	36.3	8.27	12.2	1.5	3.0	4.4	2.6	1.7	0.9	2000–2004
MO-23325	0–7	CAMO-04-55025	M-3W	c1	fine	12.6	31.5	8.46	12.4	1.5	2.5	3.7	2.5	1.5	1.0	2000–2004
MO-23328	0–9	CAMO-04-55033	M-3E	f1	fine	49.7	79.1	8.58	29.7	3.5	2.7	9.2	1.6	5.8	0.6	late 1980s (1987?)
MO-23342	0–4	CAMO-04-55048	M-3E	c1	fine	29.1	50.3	17.2	25.4	1.5	2.0	2.9	1.7	1.7	0.9	2000–2004
MO-25253	0–3	CAMO-05-63825	M-3E	c1b	fine	25.9	53.4	9.01	14.9	1.7	3.6	5.9	2.1	2.9	0.6	2005
MO-25255	0–6	CAMO-05-63827	M-4W	c1t	fine	23.2	49.6	7.89	14.1	1.8	3.5	6.3	2.1	2.9	0.6	2005
MO-25257	0–14	CAMO-05-63829	M-4W	c1t	fine	17.5	34.4	6.02	9.29	1.5	3.7	5.7	2.0	2.9	0.5	2005

Table D-1.7-1
Summary of Average Concentrations of Select Inorganic Chemicals in the Mortandad Watershed

Reach	Arsenic						Chromium		Copper				Iron		Lead		Manganese		Mercury					
	Fine Facies			Coarse Facies			Fine Facies	Coarse Facies	Fine Facies	Coarse Facies			Fine Facies	Coarse Facies	Fine Facies	Coarse Facies	Fine Facies	Coarse Facies	Fine Facies			Coarse Facies		
	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Average (mg/kg)	Average (mg/kg)	Average (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Average (mg/kg)	Average (mg/kg)	Average (mg/kg)	Average (mg/kg)	Average (mg/kg)	Average (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)
BV	3.98						10.5		11.2				13800		19.7		543		0.1					
E-1FW	7.00	7.00	7.00	2.20	2.20	2.20	522.2	56.7	103.4	9.5	9.5	9.5	11563	5610	21.9	26.7	413	305	0.09	0.09	0.09	0.02	0.02	0.00
E-1W	3.59	3.48	3.38	1.86	1.78	1.70	14.6	83.5	9.5	4.1	4.1	4.1	11086	5007	14.9	8.2	687	156	0.02	0.01	0.00	0.07	0.05	0.02
E-1E	2.61	2.61	2.61	1.30	1.18	1.07	21.7	11.4	18.6	8.7	8.7	8.7	-[a]	-	12.3	6.3	415	191	0.30	0.30	0.29	0.05	0.04	0.03
M-1W	2.59	2.59	2.59	1.59	1.31	1.03	-	-	7.8	4.6	4.6	4.6	-	-	19.3	9.6	-	-	0.07	0.04	0.02	0.06	0.03	0.01
M-1C	-	-	-	-	-	-	13.9	5.4	-	-	-	-	-	-	20.6	9.6	-	-	-	-	-	-	-	-
M-1E	4.83	4.83	4.83	1.81	1.81	1.81	14.8	8.0	10.1	2.6	2.6	2.6	14496	6490	21.8	7.7	760	311	0.08	0.07	0.06	0.05	0.03	0.02
M-2W	2.59	2.57	2.54	1.15	0.88	0.61	9.4	3.5	16.5	8.8	8.8	8.8	9157	4545	13.5	6.0	-	-	0.15	0.14	0.14	0.07	0.06	0.05
M-2E	-	-	-	-	-	-	8.2	2.0	17.2	5.2	5.2	5.2	-	-	-	-	-	-	0.21	0.21	0.21	0.02	0.02	0.02
M-3W	1.69	1.69	1.69	0.80	0.80	0.80	7.1	2.3	10.0	5.4	5.4	5.4	8050	4976	-	-	-	-	0.09	0.09	0.09	0.02	0.02	0.01
M-3E	1.96	1.96	1.96	0.77	0.77	0.77	7.7	2.6	12.3	6.4	6.4	6.4	8716	4927	-	-	-	-	0.10	0.10	0.10	0.03	0.03	0.02
M-4W	2.10	2.09	2.08	0.87	0.86	0.84	6.1	2.0	10.6	4.5	4.5	4.4	9812	4931	13.7	5.1	-	-	0.07	0.07	0.07	0.02	0.01	0.01
M-4C	2.05	2.02	1.99	1.01	0.97	0.93	5.4	2.7	9.1	5.9	5.8	5.8	9217	5598	13.1	7.2	-	-	0.06	0.06	0.06	0.03	0.02	0.02
M-4E	1.83	1.83	1.83	1.01	0.97	0.93	4.3	2.7	6.7	5.9	5.8	5.8	8767	5598	11.8	7.2	-	-	0.04	0.04	0.04	0.03	0.02	0.02
M-5W	-	-	-	-	-	-	-	-	-	-	-	-	10970	10033	-	-	-	-	-	-	-	-	-	-
M-5E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-1W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-
TS-1C	-	-	-	-	-	-	-	-	7.8	4.6	4.6	4.6	-	-	19.5	12.3	-	-	-	-	-	-	-	-
TS-1E	-	-	-	-	-	-	-	-	7.1	20.9	20.9	20.9	-	-	15.2	6.3	293	241	-	-	-	-	-	-
TS-2W	-	-	-	-	-	-	-	-	7.7	4.6	4.6	4.6	-	-	-	-	-	-	-	-	-	-	-	-
TS-2C	-	-	-	-	-	-	7.7	2.2	11.8	6.9	6.9	6.9	-	-	13.7	4.7	-	-	0.08	0.08	0.08	0.01	0.01	0.01
TS-2E	2.81	2.81	2.81	0.97	0.97	0.97	10.0	3.2	9.1	20.6	20.6	20.6	10178	4618	14.8	4.5	-	-	0.28	0.28	0.28	0.03	0.03	0.03
TS-3	-	-	-	-	-	-	-		10.6	2.9	2.9	2.9	-	-	14.0	5.3	442	230	0.10	0.10	0.10	0.02	0.02	0.02
MCW-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2W	-	-	-	-	-	-	-	-	5.2	5.0	5.0	5.0	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table D-1.7-1 (continued)

Reach	Perchlorate						Selenium						Thallium						Vanadium		Zinc			
	Fine Facies			Coarse Facies			Fine Facies			Coarse Facies			Fine Facies			Coarse Facies			Fine Facies	Coarse Facies	Fine Facies			Coarse Facies
	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Average (mg/kg)	Average (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Average (mg/kg)
BV	no BV						0.3						0.73						19.7		60.2			
E-1FW	0.003	0.003	0.003	n.d. [b]			2.62	1.39	0.17	1.04	0.57	0.10	-	-	-	-	-	-	25.2	6.4	78.7	75.7	72.7	33.9
E-1W	-	-	-	-	-	-	1.56	0.85	0.14	1.24	0.64	0.05	-	-	-	-	-	-	15.3	6.3	63.9	63.9	63.9	24.5
E-1E	0.34	0.17	0.00	0.88	0.44	0.00	0.56	0.43	0.29	0.58	0.38	0.17	0.34	0.24	0.15	0.23	0.12	0.00	-	-	43.4	43.4	43.4	30.6
M-1W	n.d.			-	-	-	1.34	0.71	0.07	1.21	0.62	0.02	-	-	-	-	-	-	-	-	83.5	83.5	83.5	46.0
M-1C	n.d.			n.d.			0.27	0.22	0.16	0.21	0.14	0.06	-	-	-	-	-	-	-	-	61.6	61.6	61.6	37.8
M-1E	n.d.			n.d.			2.40	1.28	0.15	1.13	0.58	0.03	-	-	-	-	-	-	24.1	9.5	63.1	63.1	63.1	42.2
M-2W	0.36	0.28	0.21	0.04	0.03	0.01	0.47	0.38	0.29	0.58	0.31	0.05	0.28	0.17	0.05	0.24	0.15	0.05	-	-	48.9	48.9	48.9	32.0
M-2E	0.12	0.08	0.05	0.06	0.03	0.00	0.30	0.23	0.16	0.28	0.16	0.04	-	-	-	-	-	-	-	-	43.9	43.9	43.9	25.4
M-3W	0.09	0.05	0.00	0.12	0.06	0.00	0.42	0.37	0.33	0.40	0.30	0.19	-	-	-	-	-	-	-	-	44.3	44.3	44.3	31.8
M-3E	0.09	0.05	0.01	0.12	0.06	0.00	0.46	0.42	0.38	0.32	0.26	0.20	-	-	-	-	-	-	-	-	44.2	44.2	44.2	28.7
M-4W	0.28	0.24	0.20	0.15	0.12	0.10	0.49	0.39	0.30	0.48	0.29	0.09	-	-	-	-	-	-	-	-	47.0	47.0	47.0	25.7
M-4C	0.24	0.22	0.20	0.15	0.08	0.00	0.43	0.37	0.30	0.31	0.28	0.25	-	-	-	-	-	-	-	-	42.8	42.8	42.8	29.1
M-4E	0.31	0.31	0.31	0.15	0.08	0.00	0.41	0.36	0.31	0.31	0.28	0.25	-	-	-	-	-	-	-	-	40.7	40.7	40.7	29.1
M-5W	n.d.			n.d.			-	-	-	-	-	-	-	-	-	-	-	-	-	-	43.4	43.4	43.4	54.2
M-5E	n.d.			n.d.			0.41	0.35	0.28	0.35	0.17	0.00	0.28	0.15	0.02	0.57	0.29	0.00	-	-	-	-	-	-
M-6	n.d.			n.d.			0.50	0.27	0.03	0.50	0.25	0.00	-	-	-	-	-	-	-	-	-	-	-	-
TS-1W	n.d.			n.d.			0.93	0.48	0.02	0.59	0.30	0.00	0.14	0.12	0.11	0.13	0.06	0.00	15.0	7.1	-	-	-	-
TS-1C	-	-	-	-	-	-	0.91	0.54	0.17	1.22	0.69	0.17	0.15	0.10	0.05	0.19	0.11	0.03	14.1	11.3	43.1	43.1	43.1	45.4
TS-1E	n.d.			-	-	-	1.02	0.62	0.23	1.20	0.63	0.05	-	-	-	-	-	-	-	-	-	-	-	-
TS-2W	-	-	-	-	-	-	0.94	0.60	0.25	1.02	0.58	0.14	-	-	-	-	-	-	-	-	-	-	-	-
TS-2C	-	-	-	-	-	-	1.25	0.67	0.08	0.91	0.52	0.14	-	-	-	-	-	-	13.7	4.8	43.6	43.6	43.6	24.9
TS-2E	-	-	-	-	-	-	1.82	1.02	0.22	0.91	0.50	0.08	-	-	-	-	-	-	18.1	7.5	47.0	47.0	47.0	20.2
TS-3	n.d.			n.d.			0.82	0.53	0.23	0.65	0.33	0.00	-	-	-	-	-	-	-	-	49.1	49.1	49.1	24.7
MCW-1	n.d.			n.d.			0.41	0.27	0.14	0.50	0.25	0.00	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2W	n.d.			n.d.			0.43	0.32	0.21	0.39	0.23	0.07	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2N	n.d.			n.d.			0.39	0.24	0.09	0.51	0.25	0.00	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2E	n.d.			n.d.			0.36	0.31	0.26	0.34	0.21	0.08	-	-	-	-	-	-	-	-	-	-	-	-

[a] Dash indicates not a COPC in reach.
[b] n.d. = No data.

Table D-1.7-2
Summary of Average Concentrations of Select Organic Chemicals in the Mortandad Watershed

Reach	Acenaphthene						Acetone						Aroclor-1254						Aroclor-1260					
	Fine Facies			Coarse Facies			Fine Facies			Coarse Facies			Fine Facies			Coarse Facies			Fine Facies			Coarse Facies		
	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)
E-1FW	0.32	0.19	0.06	0.04	0.02	0.00	0.22	0.22	0.22	0.16	0.16	0.16	0.12	0.12	0.11	0.03	0.02	0.00	0.04	0.02	0.00	0.03	0.02	0.00
E-1W	-*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	0.03	0.00	0.02	0.01	0.00
E-1E	-	-	-	-	-	-	0.06	0.04	0.02	0.03	0.01	0.00	0.03	0.02	0.01	0.01	0.01	0.00	0.04	0.03	0.02	0.02	0.01	0.00
M-1W	0.69	0.34	0.00	0.20	0.12	0.05	0.05	0.04	0.04	0.04	0.03	0.02	-	-	-	-	-	-	0.11	0.07	0.03	0.12	0.07	0.01
M-1C	0.58	0.57	0.55	0.08	0.04	0.00	0.12	0.12	0.12	0.08	0.08	0.08	-	-	-	-	-	-	0.10	0.10	0.10	0.05	0.05	0.04
M-1E	-	-	-	-	-	-	0.26	0.26	0.26	0.06	0.06	0.06	-	-	-	-	-	-	-	-	-	-	-	-
M-2W	-	-	-	-	-	-	0.06	0.04	0.01	0.02	0.01	0.00	0.02	0.01	0.00	0.03	0.02	0.01	0.08	0.07	0.07	0.02	0.01	0.00
M-2E	0.35	0.18	0.01	0.35	0.18	0.00	0.07	0.05	0.04	0.02	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.03	0.03	0.03	0.02	0.01	0.01
M-3W	-	-	-	-	-	-	0.03	0.03	0.03	0.01	0.01	0.01	-	-	-	-	-	-	0.16	0.16	0.16	0.03	0.02	0.02
M-3E	-	-	-	-	-	-	0.03	0.03	0.03	0.01	0.01	0.01	-	-	-	-	-	-	0.13	0.13	0.13	0.03	0.03	0.03
M-4W	0.41	0.20	0.00	0.34	0.17	0.00	0.04	0.03	0.03	0.02	0.02	0.01	0.03	0.02	0.00	0.03	0.02	0.00	0.08	0.07	0.07	0.03	0.02	0.00
M-4C	0.35	0.17	0.00	0.33	0.17	0.00	0.03	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.00	0.03	0.02	0.00	0.08	0.07	0.07	0.03	0.02	0.00
M-4E	0.34	0.17	0.00	0.33	0.17	0.00	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.00	0.03	0.02	0.00	0.07	0.06	0.05	0.03	0.02	0.00
M-5W	-	-	-	-	-	-	0.15	0.15	0.15	0.12	0.12	0.12	-	-	-	-	-	-	-	-	-	-	-	-
M-5E	0.38	0.31	0.23	0.03	0.01	0.00	0.13	0.09	0.05	0.07	0.06	0.05	-	-	-	-	-	-	-	-	-	-	-	-
M-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-1W	0.04	0.02	0.00	0.02	0.01	0.00	0.08	0.07	0.06	0.04	0.02	0.00	0.08	0.07	0.06	0.03	0.02	0.00	0.39	0.39	0.39	0.14	0.14	0.14
TS-1C	0.52	0.26	0.00	0.07	0.04	0.00	0.15	0.14	0.14	0.04	0.02	0.00	0.06	0.03	0.00	0.01	0.01	0.00	0.34	0.34	0.34	0.03	0.03	0.03
TS-1E	0.36	0.18	0.00	0.14	0.08	0.01	0.07	0.07	0.07	0.06	0.05	0.05	0.03	0.02	0.00	0.02	0.01	0.00	0.08	0.08	0.08	0.02	0.02	0.02
TS-2W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	0.05	0.03	0.04	0.03	0.03
TS-2C	-	-	-	-	-	-	0.04	0.03	0.03	0.02	0.01	0.00	0.06	0.03	0.00	0.03	0.01	0.00	0.09	0.09	0.09	0.03	0.02	0.01
TS-2E	-	-	-	-	-	-	0.10	0.10	0.10	0.02	0.02	0.02	-	-	-	-	-	-	0.09	0.09	0.08	0.04	0.03	0.02
TS-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	0.05	0.05	0.02	0.02	0.02
MCW-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2N	0.03	0.02	0.00	0.03	0.02	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table D-1.7-2 (continued)

Reach	Benzo(a)pyrene						Bis(2-ethylhexyl)phthalate						DDT[4,4'-]					
	Fine Facies			Coarse Facies			Fine Facies			Coarse Facies			Fine Facies			Coarse Facies		
	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)
E-1FW	0.19	0.17	0.15	0.03	0.03	0.03	-	-	-	-	-	-	-	-	-	-	-	-
E-1W	0.47	0.24	0.00	0.41	0.23	0.06	0.70	0.35	0.00	0.37	0.19	0.01	0.0087	0.0056	0.0025	0.0036	0.0026	0.0016
E-1E	0.39	0.20	0.10	0.35	0.20	0.12	0.38	0.19	0.01	0.39	0.19	0.00	0.0083	0.0073	0.0062	0.0039	0.0019	0.0000
M-1W	0.77	0.69	0.61	0.17	0.10	0.03	-	-	-	-	-	-	0.0114	0.0070	0.0027	0.0103	0.0060	0.0017
M-1C	0.19	0.19	0.19	0.06	0.05	0.04	-	-	-	-	-	-	0.0066	0.0061	0.0057	0.0018	0.0009	0.0000
M-1E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-2W	0.38	0.22	0.05	0.29	0.16	0.02	0.38	0.23	0.08	0.38	0.19	0.00	0.0109	0.0085	0.0062	0.0073	0.0039	0.0006
M-2E	0.30	0.17	0.04	0.35	0.18	0.00	0.35	0.18	0.01	0.35	0.18	0.00	0.0268	0.0142	0.0017	0.0018	0.0009	0.0000
M-3W	0.39	0.19	0.00	0.30	0.15	0.00	-	-	-	-	-	-	0.0119	0.0096	0.0072	0.0048	0.0024	0.0000
M-3E	0.45	0.22	0.00	0.33	0.17	0.00	-	-	-	-	-	-	0.0099	0.0074	0.0050	0.0036	0.0018	0.0000
M-4W	0.41	0.20	0.00	0.34	0.17	0.00	0.41	0.20	0.00	0.34	0.17	0.00	0.0064	0.0034	0.0005	0.0047	0.0026	0.0006
M-4C	0.35	0.17	0.00	0.33	0.17	0.00	0.35	0.17	0.00	0.33	0.17	0.00	0.0066	0.0039	0.0012	0.0024	0.0019	0.0015
M-4E	0.34	0.17	0.00	0.33	0.17	0.00	0.34	0.17	0.00	0.33	0.17	0.00	0.0062	0.0031	0.0000	0.0024	0.0019	0.0015
M-5W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-5E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-6	-	-	-	-	-	-	0.29	0.18	0.07	0.13	0.13	0.13	-	-	-	-	-	-
TS-1W	0.12	0.10	0.08	0.06	0.06	0.06	0.26	0.22	0.19	0.14	0.14	0.14	-	-	-	-	-	-
TS-1C	0.71	0.51	0.32	0.09	0.07	0.04	0.45	0.23	0.01	0.25	0.14	0.03	-	-	-	-	-	-
TS-1E	0.51	0.47	0.44	0.17	0.12	0.06	-	-	-	-	-	-	-	-	-	-	-	-
TS-2W	0.47	0.27	0.06	0.41	0.24	0.07	-	-	-	-	-	-	-	-	-	-	-	-
TS-2C	0.59	0.30	0.01	0.37	0.19	0.02	0.63	0.32	0.01	0.46	0.23	0.00	-	-	-	-	-	-
TS-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-3	0.32	0.17	0.01	0.35	0.17	0.00	0.29	0.16	0.03	0.35	0.17	0.00	0.0051	0.0050	0.0050	0.0027	0.0022	0.0018
MCW-1	-	-	-	-	-	-	0.25	0.18	0.11	0.26	0.17	0.08	-	-	-	-	-	-
MCW-2N	-	-	-	-	-	-	0.22	0.13	0.05	0.35	0.17	0.00	-	-	-	-	-	-
MCW-2W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table D-1.7-2 (continued)

Reach	Di-n-butylphthalate						Endrin Aldehyde						Methylene Chloride					
	Fine Facies			Coarse Facies			Fine Facies			Coarse Facies			Fine Facies			Coarse Facies		
	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)	Upper Bound on Mean (mg/kg)	Mid-Point of Range (mg/kg)	Lower Bound on Mean (mg/kg)
E-1FW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E-1W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E-1E	-	-	-	-	-	-	0.0018	0.0010	0.0002	0.0031	0.0015	0.0000	-	-	-	-	-	-
M-1W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-1C	-	-	-	-	-	-	0.0024	0.0015	0.0006	0.0019	0.0013	0.0007	-	-	-	-	-	-
M-1E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-2W	-	-	-	-	-	-	0.0073	0.0046	0.0020	0.0056	0.0028	0.0000	-	-	-	-	-	-
M-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M-3W	-	-	-	-	-	-	0.0095	0.0061	0.0026	0.0048	0.0024	0.0000	0.0066	0.0043	0.0020	0.0072	0.0036	0.0000
M-3E	-	-	-	-	-	-	0.0083	0.0050	0.0017	0.0036	0.0018	0.0000	0.0069	0.0041	0.0013	0.0070	0.0035	0.0000
M-4W	-	-	-	-	-	-	-	-	-	-	-	-	0.0072	0.0036	0.0000	0.0059	0.0036	0.0013
M-4C	-	-	-	-	-	-	-	-	-	-	-	-	0.0073	0.0037	0.0000	0.0069	0.0051	0.0034
M-4E	-	-	-	-	-	-	-	-	-	-	-	-	0.0072	0.0036	0.0000	0.0069	0.0051	0.0034
M-5W	-	-	-	-	-	-	-	-	-	-	-	-	0.0161	0.0154	0.0146	0.0082	0.0082	0.0082
M-5E	-	-	-	-	-	-	-	-	-	-	-	-	0.0086	0.0076	0.0066	0.0047	0.0047	0.0047
M-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-1W	0.34	0.17	0.00	0.33	0.17	0.00	-	-	-	-	-	-	-	-	-	-	-	-
TS-1C	0.32	0.16	0.00	0.33	0.17	0.00	-	-	-	-	-	-	0.0082	0.0041	0.0000	0.0049	0.0025	0.0000
TS-1E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2N	0.27	0.14	0.01	0.19	0.10	0.01	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCW-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Dash indicates not a COPC in reach.

Table D-1.8-1
Estimated Chromium Inventory in the Mortandad Watershed

Reach	Sampling Status	Approximate Distance Above Rio Grande (km)		Reach Length (km)	Chromium Inventory in Excess of Background (kg)			Normalized Chromium Inventory, Sampled Reach (kg/km)			% of Total Cr Inventory
		Upstream End	Downstream End		Fine Facies	Coarse Facies	Total	Fine Facies	Coarse Facies	Total	
M-1W	Sampled	16.00	15.78	0.23	0.0	0.0	0.0	0.0	0.0	0.0	0%
M-1W to M-1C	Not sampled	15.78	15.20	0.58	3.5	0.0	3.5				2%
M-1C	Sampled	15.20	15.00	0.20	2.4	0.0	2.4	12.1	0.0	12.1	1%
M-1C to M-1E	Not sampled	15.00	14.66	0.34	3.7	0.4	4.2				2%
M-1E	Sampled	14.66	14.46	0.20	2.0	0.5	2.5	9.9	2.6	12.5	1%
M-1E to M-2W	Not sampled	14.46	13.71	0.75	7.4	1.9	9.3				5%
E-1FW	Sampled	14.51	14.36	0.15	37.0	4.7	41.7	245.0	31.1	276.1	21%
E-1FW to E-1W	Not sampled	14.36	14.13	0.23	30.3	26.2	56.5				29%
E-1W	Sampled	14.13	13.93	0.21	5.0	41.4	46.4	24.2	201.9	226.2	24%
E-1E	Sampled	13.92	13.71	0.21	1.0	1.3	2.3	4.8	6.3	11.0	1%
M-2W	Sampled	13.71	13.11	0.60	1.7	0.3	2.0	2.8	0.5	3.3	1%
M-2W to M-2E	Not sampled	13.11	13.01	0.10	0.3	0.0	0.3				0%
M-2E	Sampled	13.01	12.60	0.41	0.9	0.0	0.9	2.1	0.0	2.1	0%
M-2E to M-3W	Not sampled	12.60	12.12	0.48	1.3	0.0	1.3				1%
M-3W	Sampled	12.12	11.84	0.29	0.9	0.0	0.9	3.2	0.0	3.2	0%
M-3E	Sampled	11.84	11.22	0.62	14.9	0.3	15.2	24.2	0.5	24.6	8%
M-4W	Sampled	11.22	11.01	0.21	1.2	0.0	1.2	5.9	0.0	5.9	1%
M-4C	Sampled	11.01	10.79	0.22	2.0	0.0	2.0	9.0	0.0	9.0	1%
M-4E	Sampled	10.79	10.56	0.23	0.0	0.0	0.0	0.0	0.0	0.0	0%
TS-2C	Sampled	12.72	12.52	0.20	1.4	0.0	1.4	6.9	0.0	6.9	1%
TS-2E	Sampled	12.52	12.31	0.21	0.6	0.0	0.6	2.8	0.0	2.8	0%
TS-2E to TS-3	Not sampled	12.31	11.62	0.69	1.0	0.0	1.0				0%
TS-3	Sampled	11.62	11.31	0.31	0.0	0.0	0.0	0.0	0.0	0.0	0%
			Total	**7.60**	**118.3**	**77.1**	**195.4**				**100%**

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Appendix E

Statistics and Risk Information

E-1.0 SCREENING ASSESSMENT INFORMATION SUPPORTING THE BASELINE ECOLOGICAL RISK ASSESSMENT

This section provides information on the ecological screening levels and results that support the baseline ecological risk assessment.

E-1.1 Ecological Screening Levels

Table E-1.1-1 provides the minimum ecological screening levels (ESLs) for chemicals of potential concern (COPCs) in sediment and surface water at Los Alamos National Laboratory (LANL or the Laboratory). These values are from ECORISK Database Version 2.2 (LANL 2005, 90032) and are the values used to screen the 2005 data described in Section E-1.2. The toxicological endpoints considered in the development of the ESLs for each receptor are summarized in Tables E-1.1-2 through E-1.1-7.

E-1.2 Ecological Screening Assessment Results

Tables E-1.2-1 through E-1.2-12 present hazard quotients (HQs) calculated using minimum ESLs for COPCs in sediment and surface water from 2005 sampling of these media. In each reach, the maximum detected concentration of each COPC in all sediment samples was screened using the minimum soil ESL. In each reach the maximum detected concentration of each COPC from the sediment samples collected from the c1 geomorphic unit (the active channel) was screened using the minimum sediment ESL. In surface water, the maximum detected concentration of each COPC at each water station was screened using the minimum water ESL. Cells shaded black with white lettering indicate an HQ >3.0, which defines a study design chemical of potential ecological concern (COPEC). Cells shaded gray in these tables represent HQs >0.3 and ≤3.0, which are other COPECs that are not considered as study design COPECs. The values for the maximum detected concentration of each COPC are presented in tables in Section 6.0.

Screening data from samples collected in 2005 was conducted with ECORISK Database Version 2.2 (LANL 2005, 90032); the screening documented in the "Mortandad Canyon Biota Investigation Work Plan" (LANL 2005, 89308) used the version of the ESL database that was current when the report was written, ECORISK Database Version 2.1 (LANL 2004, 87386). Values within the database can change, based on a review of new data on the toxicity of the chemical or on new recommendations for parameters such as transfer factors in the model used to develop the ESLs. An explanation of all the changes to ESLs between ECORISK Database Versions 2.1 and 2.2 is provided within ECORISK Database Version 2.2 (LANL 2005, 90032). COPCs designated as new study design COPECs based on screening of the 2005 data include iron, bis (2-ethylhexyl) phthalate, hexavalent chromium, mercury, cesium-137, and cobalt. ESLs for iron were developed using newly obtained toxicity data. ESLs existed for hexavalent chromium, but analytical results for this form of chromium were only obtained in 2005. Both mercury and bis (2-ethylhexyl) phthalate are now COPECs because their ESLs were revised to lower values based on U.S. Environmental Protection Agency (EPA) recommendations to modify the transfer factors used in the calculation of ESLs for these chemicals (LANL 2005, 90032). The ESL for cobalt was revised to a lower value based on revisions to both the toxicity value and the transfer factors used in the calculations. Cesium-137 had an HQ >3 because higher concentrations of these chemicals were detected in the 2005 sampling.

Some COPCs for the Mortandad watershed do not have ESLs because no appropriate toxicity values exist. These COPCs are listed in the tables in this section. As described in the biota work plan (LANL 2005, 89308; p. B-5), these COPCs are not used to determine the study design COPECs or the locations for field studies and sampling. Without ESLs, the potential effects of the detected concentrations on

wildlife receptors cannot be determined to select appropriate reaches for study. Also, without ESLs, the appropriate receptor cannot be determined to determine which types of studies should include consideration of those COPCs that have no ESLs.

E-2.0 INFORMATION SUPPORTING THE BASE LINE ECOLOGICAL RISK ASSESSMENT

This section provides plots of various ecological measures to evaluate trends with COPECs or associations with other relevant factors.

E-2.1 Plots Supporting Lines of Evidence for Birds

To increase the data set size for each reach for the nest box studies of measures of reproductive success, results from all species occupying the nest boxes (not just results from the western bluebird, the primary receptor) were included in the analyses presented in Section 8.1. The nest boxes used in the comparisons in the graphs in this section include the occupied boxes in all the areas considered in the comparisons in Section 8.1.

E-2.1.1 Box Plots Comparing Bird Nest Success Measures by Species

Figures E-2.1-1 and E-2.1-2 provide a comparison of the measures (percent of nestlings fledged and percent of nestlings that are female) across species. These plots demonstrate that there are not significant differences for these measures between species and that it is therefore appropriate to include all species in the comparisons between reaches.

E-2.1.2 Bivariate Plots of Bird Measures by Year

Measures of nestlings can also potentially be affected by factors such as climate and food supply that vary across years. Figures E-2.1-3 and E-2.1-4 show the bivariate fit of the two nestling measures across year. No trend across years is discernable for either measure, indicating that potential confounding factors did not exert an effect across the time period for the dataset.

E-2.1.3 Box Plots Comparing Egg Measures between Species

As with the measures of the nestlings, egg length may vary between species. Figure E-2.1-5 compares egg length across species, and Figure E-2.1-6 compares egg weight across species. As expected, there are differences between these measures for some species. Ash-throated flycatchers, western bluebirds, and mountain bluebirds have very similar ranges of values for these measures. Egg weight and length for the violet green swallow overlaps with the western bluebird as well, although the values cluster at the lower end of the range. Egg lengths for the house finch and the mountain chickadee are lower than the other species, although the egg weights are closer to those of the other species. These species were therefore included in the comparisons of the field measures of egg size by reach in Section 8.1. Values for the mountain chickadee, in particular, make up many of the outliers below the box for these measures in the comparison between reaches in Section 8.1.

E-2.1.4 Bivariate Plots Comparing Egg Measures across Years

Measures of egg size can also potentially be affected by factors such as climate and food supply that vary across years. Figure E-2.1-8 compares egg length for all species across years. Figure E-2.1-9 compares egg weight across years for all species. The same comparison for eggshell thickness is shown in

Figure E-2.1-10. None of the three egg measures displays a discernable trend across years, indicating that the potential confounding factors did not exert an effect across the time period for the dataset.

E-2.1.5 Regressions of COPEC Concentrations in Eggs against COPEC Concentrations in Sediment

Eggs collected from western bluebird nests were sent for laboratory analysis for metals. Figures E-2.1-11 through E-2.1-21 show the concentration of each metal in eggs versus the average (arithmetic mean) concentration detected in sediment from the reach in which the eggs were collected. A graph is presented for each metal for which there was at least one detected concentration in egg samples. Detected concentrations and detection limits for nondetects are both included on each graph. Aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, nickel, silver, thallium, and vanadium were analyzed for but were not detected in eggs. None of the metal concentrations in eggs correlated significantly with the concentration of the metal in soil at the $p < 0.05$ level. The regression equations are shown in Table E-2.1-1.

E-2.1.6 Regressions of COPEC Concentrations in Insects against COPEC Concentrations in Sediment

Insects collected from western bluebird nests were sent for laboratory analysis for metals. Figures E-2.1-22 through E-2.1-43 show the concentration of each metal in eggs versus the average (arithmetic mean) concentration detected in sediment from the reach in which the eggs were collected. A graph is presented for each metal for which there was at least one detected concentration in egg samples. Detected concentrations and detection limits for nondetects are both included on each graph. Although a graph is presented in this section for mercury, no regression analysis was done for lead or mercury because only one sample was analyzed for mercury due to sample size limitations. Only cadmium concentrations in insects correlated significantly with the concentration in soil at the $p < 0.05$ level. The regression for cadmium indicates that cadmium concentrations in insects increase with increasing cadmium concentrations in soil. The calculated dose of cadmium from these insects is shown in Table 8.1-5 and does not show a risk to the flycatcher through ingestion of the measured concentrations in these insects. The regression equations for all metals except mercury are shown in Table E-2.1-2.

E-2.2 Regressions between COPEC Concentrations in Small Mammal Tissues and Sediment

Several species of small mammals were trapped in three reaches within the Mortandad watershed (E-1W, M-2W, M-3) and in the background reach (LA-BKG). Each small mammal was divided into a pelt sample and a carcass sample; these samples were combined into one pelt and one carcass sample per species per reach. One species, the montane shrew, was too small to be separated into pelt and carcass. The results for this species are shown only in the graphs for the whole animal. Some species were not captured in all reaches during the trapping efforts, so the number of data points varies between reaches. Graphs and regression analyses were done to compare the concentration of each detected analyte in each type of sample for each reach with the concentration of the same analyte in the composite sediment sample taken within the trapping array in that reach. Graphs and regressions were done for the carcass, for the pelt, and for whole animals. Large and definable differences were not seen between species in the ratios between various tissues and soil, so values from all species were combined for the regression analyses.

E-2.2.1 Carcass Tissues

Figures E-2.2-1 through E-2.2-17 plot the concentrations of detected analytes in carcasses of small mammals against the concentrations in the composite soil samples from the array. The detected analytes include 12 metals, perchlorate, one radionuclide (americium-241), and one organic chemical (Aroclor-1260). Graphs are also included for magnesium, potassium, and sodium, even though these are not COPECs, to show the relationship between physiologically regulated chemicals in tissues and sediment.

In the carcass samples, only three of the analytes demonstrated a significant correlation between tissue and soil at the $p < 0.05$ level: aluminum, iron, and perchlorate. The slopes for the regressions for both aluminum and iron are slightly negative; the ratio of the concentration of these analytes in tissues to the concentration in soil decreases as the concentrations in soil increase. Only perchlorate exhibited a positive correlation between tissues and soil. The regressions between body tissue and soil for all the analytes are shown in Table E-2.2-1.

E-2.2.2 Pelt Tissues

The pelt samples (fur plus skin) were analyzed separately and are compared with concentrations in the soil samples in Figures E-2.2-18 through E-2.2-34. For the pelt samples, only two analytes showed significant positive correlation with concentrations in soil at the $p < 0.05$ level, americium-241 and barium. Pelt samples include the soil adhering to the pelt, so the small percentage of analytes that are significantly correlated between pelt and soil indicates that soil adhered to the pelt is not a major source of soil ingestion to predators on these small mammal species. The regression equations for all the analytes are shown in Table E-2.2-2.

E-2.2.3 Whole Animal

The concentrations in whole animals were calculated from combining the concentrations in the carcass and pelt based on their proportion of the total body weight. All results for the shrew are based on measured whole body concentrations and not the reconstructed values. Figures E-2.2-35 through E-2.2-51 show the concentrations representing the reconstructed whole animals (measured whole animals for shrews) versus the concentrations in soil for all the detected analytes. For the whole body comparisons, only two analytes had significant correlations with concentrations in soil: americium-241 and perchlorate. The analytes significantly correlated for the whole body comparisons match one of the significantly correlated analytes for the carcass (perchlorate) and one of the significantly correlated analytes for the pelt (americium-241). The regression equations for all analytes for the whole body to soil comparisons are shown in Table E-2.2-3.

E-2.3 Bivariate Plots of Plant Nutrients against Plant Growth

Levels of nutrients in soil exert a strong influence on germination and growth of plants. The pH of soil affects the availability of many nutrients to plants. Soil nutrient parameters and pH values were therefore measured in the soil samples from the Mortandad watershed used in the plant laboratory toxicity test. Figure E-2.3-1 provides the mean pH measured in each soil sample used in the laboratory toxicity test. There are differences in pH between the reaches, but these differences do not appear to correlate with the differences in plant growth between the reaches seen in Figures 8.1-27 and 8.1-29. Each plant growth parameter was also compared in bivariate plots with the percent organic matter in the soil in Figures E-2.3-2 through E-2.3-8. None of the plant growth parameters correlate strongly with the percent organic matter in soil, which indicates that the percent organic matter in all soil samples was adequate to support plant germination and growth. As shown in Figure E-2.3-9, there is a relationship between soil

organic matter and soil pH. Bivariate plots were also used to compare the plant growth parameters with the concentration of nitrate-plus nitrite in the soil. Figures E-2.3-10 through E-2.3-17 show these bivariate plots. None of the plant growth parameters show a strong correlation with the concentration of nitrate plus nitrite in the soil; this indicates the levels of nitrogen in the soil in all samples were adequate to support plant germination and growth. One additional soil nutrient, phosphorus, was compared with the plant growth parameters in bivariate plots. Figures E-2.3-18 through E-2.3-24 show these plots. As with the other soil nutrients, phosphorus did not strongly affect plant growth. Figure E-2.3-25 shows that phosphorus content of soil also did not correlate strongly with soil pH. The plots presented in this section indicate that plant soil pH and nutrients were not confounding factors in the laboratory plant toxicity tests.

E-2.4 Plots of Additional Growth Measures forChironomid

Larvae

Figures 8.1-31 and 8.1-32 showed the measure of survival and one of the measures of growth (mean larval dry weight) for the chironomid toxicity test. Two additional measures of larval growth are reported for this study: total ash-free dry larval weight (shown in Figure E-2.4-1) and mean ash-free dry larval weight (shown in Figure E-2.4-2). These measures also showed no significant differences between reaches tested in the chironomid toxicity test.

E-2.5 Bivariate Plots of Algal Growth versus Water-Quality Parameters

Water-quality parameters can influence the growth of algal cells in the algal toxicity tests; bivariate plots were done comparing water quality parameters with algal growth rates. Samples from July and August were plotted separately because of differences in growth between the two sets of tests. Figure E-2.5-1 shows that conductivity shows a positive relationship with mean cell density for the July samples but no relationship with the August samples. Figure E-2.5-2 shows that alkalinity also had a positive relationship with the July samples but not the August ones. Both these water-quality parameters included values up to 50% higher in the July samples, which may explain the differences between the correlations between the sets of samples tested. The strongest relationship for either set of samples was with water hardness, as presented in Figure 8.1-35.

E-3.0 SUPPORTING INFORMATION FOR THE HUMAN HEALTH RISK ASSESSMENT

This section provides human health exposure parameters and toxicity information, representative concentrations, and results for the supplemental human health risk scenario.

E-3.1 Exposure Parameters and Toxicity Information

Exposure parameters used to calculate soil screening levels (SSLs) and screening action levels (SALs) are provided in Table E-3.1-1 (SSLs for chemicals), Table E-3.1-2 (recreational [trail user] SALs for radionuclides), Table E-3.1-3 (surface water ingestion for radionuclides), and Table E-3.1-4 (residential SALs for radionuclides). Toxicity information for COPCs that had screening levels calculated is provided in Table E-3.1-5 (chemicals) and Table E-3.1-6 (radionuclides).

E-3.2 Methods Used to Calculate Representative Concentrations

This section provides information on the statistical methods used to calculate representative concentrations of COPCs for the human health risk assessment.

The sample results for COPCs fall into three general categories. The first consists of COPCs detected in all of the investigation samples for a data subset or COPCs (radionuclides) that are not censored at the detection limit and that are reported as the actual measurement value from the instrument with a nondetect qualifier. The second includes inorganic or organic COPCs for which the data are a mixture of detected and nondetected values for a data subset. These data are censored at the detection limits for the nondetect values and are reported as the detection limit with a nondetect qualifier. For inorganic and organic chemicals, an approach to representing the censored nondetect values in the calculation of 95% upper confidence limits (UCLs) is needed. The third category is either an extreme case of the second category where the number of nondetects (the rate of censorship) is so high that methods for the second category are unreliable, or the data set is too small to calculate a 95% UCL. Section E-3.2.1 describes the methods used to analyze data that fall into the above three categories.

E-3.2.1 Calculating UCLs

The statistical methods used to calculate 95% UCLs are generally consistent with U.S. Environmental Protection Agency (EPA) guidance (EPA 1989, 08021) and ProUCL (EPA 2003, 84461), the EPA public domain software provided for estimating UCLs to use as representative concentrations in risk assessments. Many of the data sets for sediment investigation reaches and water sampling locations are censored at the detection limits, but the ProUCL software does not include methods for censored data. Consequently, methods for calculating 95% UCLs deviated from ProUCL when professional judgment indicated that the ProUCL methods were inadequate for the data.

The first step in calculating a 95% UCL is to determine whether the data fit a probability distribution. The ProUCL software assesses normal and lognormal distributions. The probability plot Shapiro Wilk W-test is used to compare the data for an analyte from a sediment investigation reach or a water-sampling location with normal and log normal distributions. The possible outcomes and UCL calculation approaches are as follows:

- The data show a normal distribution; normal distribution methods are used.
- The data show a lognormal distribution; lognormal distribution methods are used.
- The data are not different from either distribution; normal distribution methods are used.
- The data are different from both distributions; the Chebyshev method is used.
- Insufficient data are available to evaluate the distribution; nonparametric methods are used.
- Two or fewer results are available; the maximum detected concentration is used.

When the calculated UCLs exceed the maximum value for the data, the maximum value is used instead of the 95% UCL. This approach is consistent with EPA guidance (EPA 1989, 08021).

The normal distribution method is a 95% UCL calculated using the arithmetic average, the standard error of the mean, and the Student's t-value for n–1 degrees of freedom (e.g., Gilbert 1987, 56179).

The lognormal 95% UCL method is calculated using the Land *H*-statistic (Gilbert 1987, 56179, pp. 169–170). This method has been criticized for providing large values for UCLs when the data are from a mixture of distributions or the data set has numerous outlier values (EPA 2003, 84461). However, in this report this method was used because it tends to generate larger UCLs when the data do not fit a lognormal distribution very well. Therefore, the outcome overestimates risk. The lognormal mean and variance are calculated using lognormal equations (minimum variance unbiased estimators) described in Gilbert (1987, 56179, pp. 165–167).

The Chebyshev method is recommended in the ProUCL manual for data that do not fit a normal or lognormal distribution. The standard error of the mean is multiplied by a value that is related to the confidence level for the interval. The methodology is documented in the ProUCL user's guide (EPA 2003, 84461).

Nonparametric methods to estimate the 95% UCL on the median are used when the data set consists of less than four values, or the data set is larger but there are fewer than three detected values. This method employs ranks of the data and probabilities associated with the binomial distribution (Gilbert 1987, 56179, pp. 141–142). If the 95% UCL on the median is a nondetect value, the next highest detected value is used for the 95% UCL. Often the next highest detected value is also the maximum detected value.

E-3.2.2 Calculating UCLs with Uncensored Data

Calculating UCLs when all data are detected or when nondetects are not censored requires using the Shapiro Wilk test to determine whether the data fit a normal or lognormal probability distribution and then calculating the appropriate UCL. The radionuclides are not censored and nondetects are reported as positive or negative values as calculated by the laboratory instrument. The negative values are adjusted to values between zero and the smallest reported positive value. The application of methods for calculating a UCL in this report has been constrained to data sets with at least three values. In cases where only one or two values exist, the maximum value is used as the representative concentration.

E.3.2-3 Calculating UCLs with Censored Data

A variety of methods can be used to address nondetect values in a data set. Some of the most widely used are substitutions of the nondetects with the detection limit, half the detection limit, or zero. While these substitution methods are simple, they do not have a statistical basis and can provide erroneous results, over- or underestimating the UCL. The most serious errors with substitution methods are in biasing the estimate of the variance, which can result in a low-biased UCL. Helsel and Cohn (1988, 82912) conducted simulation studies to compare the results of substitution methods against probability plotting methods and maximum likelihood methods for estimating values to replace the nondetects. Their results indicate that probability plotting methods provide the most accurate data summaries for typical environmental data with characteristics such as outliers and skewed distributions.

In this report, the probability plotting method of Helsel and Cohn (1988, 82912) was selected for working with censored data. It provides the best overall performance in estimating fill-in values for nondetects in simulation studies, especially when there is information on the data distribution. It also performs well when the parent distributions of the simulation data sets are very different from the lognormal distribution used to estimate the values for the nondetect values. Another important attribute of the method is that it accommodates data with multiple detection limits. Finally, even when the detected data are highly variable, including outliers, and are not associated with any particular distribution, the estimated nondetect values are constrained to fall between the detection limit and zero. The estimated nondetect values may not always be optimal, but they are also not likely to cause large biases in the estimates of the average and variance for the data set.

The conceptual approach for the probability plotting method starts by assigning exceedence probabilities to each of the detected values based upon its relative magnitude, after which the nondetect values are assigned exceedence probabilities between zero and the detection limit. If each detection limit has a single value, then the assigned probability is half of the detection limit probability. For example, if there are three detection limits with the same value, then the x-axis from zero to the detection limit probability is divided into four segments, and each detection limit is assigned a value at one of the three break points

(1/4, 1/2, and 3/4 of the detection limit probability). The spreading of nondetects over a probability range is how the probability plotting method differs from simple substitution methods, where the detection limit, half the detection limit, or zero would be used for all three values. The exceedence probabilities for the data and nondetect values are converted to proportions of the normal distribution, or z-scores. A regression analysis is performed on the log transformed detected data versus their z-scores. The regression line fit is used to estimate log-concentration values for the nondetect z-scores. These values are back-transformed to original units and combined with the detected values in original units for estimating summary statistics and 95% UCLs.

The extrapolated nondetect values distribute estimates for the detection limits over a range of exceedence probabilities. The values are not intended to be specific estimates for what the sample concentration should have been. The assigned values can be used for summary statistics, such as averages and 95% UCLs but not as individual replacement values for sample results. The method is considered to be semi-nonparametric because the detected values are used without making an assumption about the data distribution. The nondetect values are assumed to come from a lognormal distribution.

Once the nondetect data are replaced with estimated values from the probability plotting method, the combined data set of original detected values and estimates for the nondetects are evaluated with the Shapiro Wilk test for their fit to a normal or lognormal distribution. Normal distribution methods are used to estimate the average and UCL for data that fit a normal distribution. The Land method described by Gilbert (1987, 56179) is used for data that are distributed lognormally. When the data fit neither of these distributions, the method based upon the Chebyshev theorem is used to estimate a 95% UCL (EPA 2003, 84461). An example is provided in Appendix E of the “Los Alamos and Pueblo Canyon Investigation Report” (LANL 2004, 87390, pp. E-5– E-6).

E-3.3 Calculating Weighted Averages and Weighted UCLs for COPCs in Sediments

The geomorphic approach to sampling in the investigation reaches provides data that are derived from specific geomorphic units and sediment facies. The geomorphic methodology and rationale are described in Section B-1.0 of Appendix B and physical characteristics summarized by reach in Table B-1.0-1. In this report, statistical methods are employed to estimate averages and 95% UCLs that are consistent with this investigation approach.

Each sediment facies within each geomorphic unit also contains a population of COPC concentrations. The averages and variances of these populations of COPC concentrations are combined to estimate an overall average COPC concentration and a 95% UCL on that average for the reach. The COPC averages and the 95% UCLs at the reach scale are necessary for the human health risk assessment in Section 8.2 because the exposure scenarios are intended to integrate exposure to COPCs over the whole reach. The statistical methods for estimating the averages and 95% UCLs across more than one population are associated with stratified random sampling methods. This section describes how concentration weighting was performed and identifies the statistical methods used to calculate weighted averages and their 95% UCLs.

E-3.3.1 Weighted Averages

The average of a group of measurements is calculated by adding the values together and dividing the sum by n, the number of measurements. This is equivalent to multiplying each measurement by a weight of 1/n and summing those products. An example is provided in Appendix E of the “Los Alamos and Pueblo Canyon Investigation Report” (LANL 2004, 87390, p. E-7).

Geomorphic mapping and measurements of sediment thickness in each investigation reach provide data on the area of each geomorphic unit and the volume of sediment for each facies in each geomorphic unit, as discussed in Section B-1.0 of Appendix B. The areas of each geomorphic unit and the total area of each investigation reach were used to calculate weights for area-weighted averages of the COPCs, which are presented in Section D-1.3 of Appendix D. The thicknesses of each sediment facies in each geomorphic unit were used to obtain the volumes and the volume weights. The calculation of volume-weighted averages proceeds in the same manner as for area-weighted averages, using volumes for geomorphic units and sediment facies and the total volume in a reach to calculate fractional volume weights. The binning of COPC results by geomorphic unit and sediment facies to support calculations of weighted averages, 95% UCLs, and COPC inventory is presented in Section D-1.3 of Appendix D and bins are summarized in Table D-1.3-1.

Both area-weighted and volume-weighted COPC averages were calculated in this study. The trail user exposure scenario uses representative concentrations based on area-weighted averages because exposures are from the upper parts of the sediment deposits. The thickness of the sediment represented by the area-weighted average and area-weighted 95% UCL depends upon the thickness of the uppermost sediment facies in each geomorphic unit. The residential exposure scenario uses volume-weighted averages to integrate concentrations with depth because this exposure scenario includes direct and indirect exposures to subsurface sediments.

Most geomorphic units have sample results for both coarse and fine facies sediment. The average concentration is calculated for each sediment facies in each geomorphic unit or each set of binned units, after which the area or volume weights are used to estimate the weighted averages for a reach. Where both coarse and fine facies sediment occur in a geomorphic unit, the fine facies, which typically has the highest COPC concentrations, is used in the area-weighted calculations because it generally overlies coarse facies sediment. Results from both coarse and fine facies in a geomorphic unit are used in the volume-weighted calculations.

E-3.3.2 Weighted UCLs

The calculation of a 95% UCL on the weighted average requires deriving a standard error of the weighted average and estimating the degrees of freedom to be used in selecting the t-value from a Student's t-table. Once these quantities are estimated, the 95% UCL is the weighted average plus the standard error of the mean times the t-value. The weighted standard error of the mean is calculated using the variances, the squared area or volume weights, and the number of samples in each bin. Gilbert (1987, 56179, pp. 45–50) provides the equations for this calculation. The degrees of freedom for the estimate of the 95% UCL on the average is approximated according to the method developed by Satterthwaite and described in Cochran , (1977, 84462, pp. 89–96). The calculation uses the variances and the actual areas or volumes of the geomorphic units and sediment facies in a bin. The estimated degrees of freedom fall between the smallest number of degrees of freedom for a single bin and sum of all the degrees of freedom for all the bins.

E-3.3.3 Applying Weighting Methods to Sediment Data

Sediment data collected for the reach investigations were used to estimate representative concentrations. Results from other investigations (collected before 1998) were excluded. These samples were not used in calculations because in many instances they did not have the associated geomorphic information or that information was less certain. Also excluded were field duplicates (indicated by "FD" in the field qc type code column in Appendix C tables), resamples and composite sediment samples collected to support ecological risk studies (used in Section 8.1 only), samples from f2 geomorphic unit, and samples that

have been excavated (indicated by a "Y" in the excavation column in Appendix C tables). See Section 6.1 for details and rationale.

Reach investigations were conducted in multiple phases, and the sampling design was modified before each subsequent phase. Sampling was generally biased toward geomorphic units and sediment facies with higher concentrations of COPCs because these sediments are important for estimating potential risk. For this reason, some geomorphic units and sediment facies, such as coarse sediment in the active channel (coarse facies of c1 unit), have fewer samples because the active channel typically has lower concentrations of COPCs. Additionally, the analytical suites were biased toward COPCs expected to be present in the reach or identified as potential risk contributors in the initial phases of sampling. Consequently, a geomorphic unit or sediment facies may have more samples that characterize the major COPCs in the reach and fewer samples that characterize COPCs not identified as risk drivers or as COPCs related to Los Alamos National Laboratory operations. For those analytes having fewer than three results per bin, geomorphic units were combined into coarse and fine facies bins before estimating UCLs.

The averages and variances for each bin in a reach are calculated according to the rules and methods outlined in Section E-3.2.1, with one exception. When the data fit neither a normal nor lognormal distribution, the approach in Section E-3.2.1 estimates the 95% UCL using the Chebyshev method, which calculates the UCL directly without providing interim results for the average and variance. Since the average and variance for each bin are needed to estimate weighted averages and weighted UCLs, the Chebyshev method must be replaced with another method that provides estimates of these statistics. Bootstrapping is used to estimate the average and variance in this situation. This is a Monte Carlo technique that samples the data set many times and estimates the average and variance each time. The average of the averages and the average of variances from the Monte Carlo results are used for the calculating weighted averages and weighted UCLs

Table E-3.3-1 presents the area-weighted average results for sediment COPCs retained for the human health risk assessment; Table E-3.3-2 presents the volume-weighted average results.

E-3.4 Calculating Representative Concentrations for COPCs in Surface Water

Results from water samples collected before 2000 were excluded. These results are not used in calculations because in many instances the data do not have accompanying Level 4 data packages, and concentrations in older data are not representative of current site conditions. Field duplicates (indicated by "FD" in the field QC type code column in Appendix C tables) were excluded. These results are from samples obtained for quality assurance/quality control (QA/QC) [smr1]purposes and not as primary characterization data. Filtered surface water samples were excluded and unfiltered surface water concentrations were used to represent surface water that would be encountered by a trail user in the canyon. Unfiltered samples provide a conservative estimate in that concentrations in unfiltered samples are typically larger than in filtered samples.

Surface water data were evaluated for each sampling location; surface water sample locations were associated with a sediment investigation reach. Methods for calculating representative concentrations for surface water follows the protocols outlined in Section E-3.2. Table E-3.4-1 presents the representative concentrations for surface water COPCs retained for the human health risk assessment.

E-3.5 Supplemental Human Health Risk Scenario

The SSLs and SALs used for the supplemental scenario are provided in Table E-3.5-1. The risk assessment results for the residential scenario are provided in Table E-3.5-2. The ratios and sum of fraction (SOF) values for the residential scenario are provided in Table E-3.5-3. Representative sediment concentrations (volume weighted) are provided in Table E-3.5-4.

E-4.0 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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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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LANL (Los Alamos National Laboratory), May 2005. "Mortandad Canyon Biota Investigation Work Plan," Los Alamos National Laboratory document LA-UR-05-2231, Los Alamos, New Mexico. (LANL 2005, 89308)

LANL (Los Alamos National Laboratory), September 2005. "ECORISK Database (Release 2.2)," Los Alamos National Laboratory document LA-UR-05-7424, Los Alamos National Laboratory, Los Alamos, New Mexico (LANL 2005, 90032)

Key to Codes for Bird Species in Figures E-2.1-1 to E-2.1-10: ATFL = Ash-throated flycatcher, HOFI = House Finch, HOWR = House wren, JUTI = Juniper titmouse, MOBL = Mountain bluebird, MOCH = Mountain chickadee, PYNU = Pygmy nuthatch, VGSW = Violet green swallow, WBNH = White-breasted nuthatch, WEBL = Western bluebird.

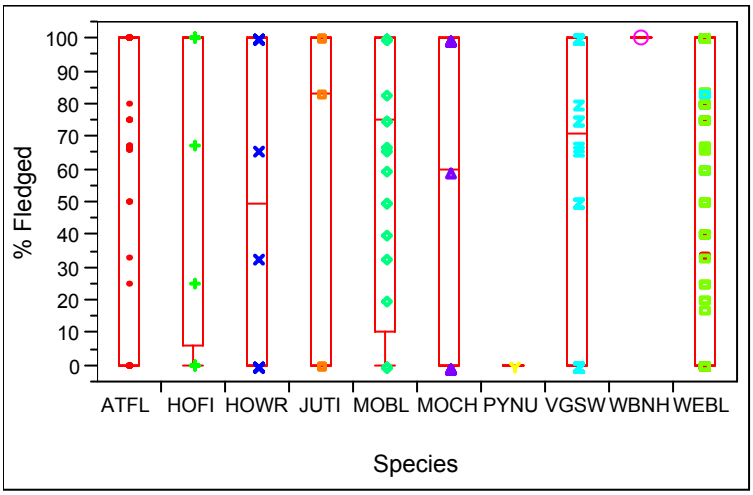


Figure E-2.1-1. Box plot comparing the percent fledged across avian species

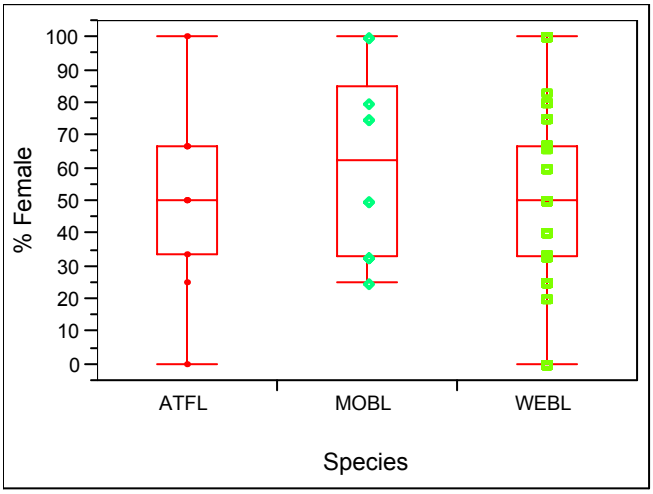


Figure E-2.1-2. Box plot comparing the percent female nestlings across avian species

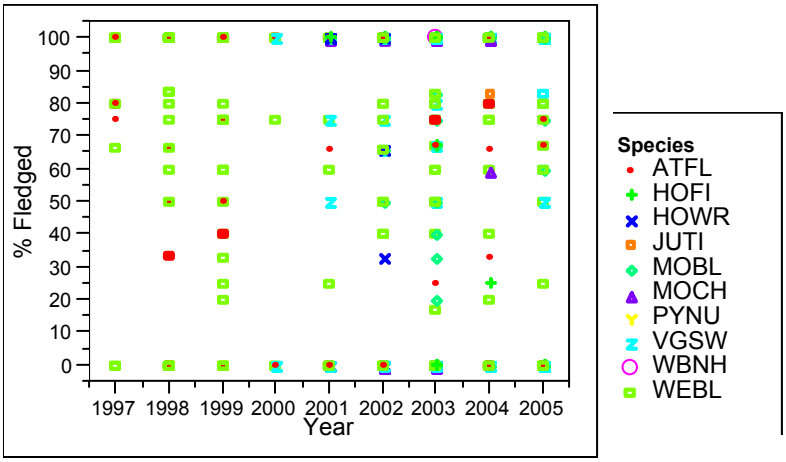


Figure E-2.1-3. Bivariate fit of percent of nestlings versus year

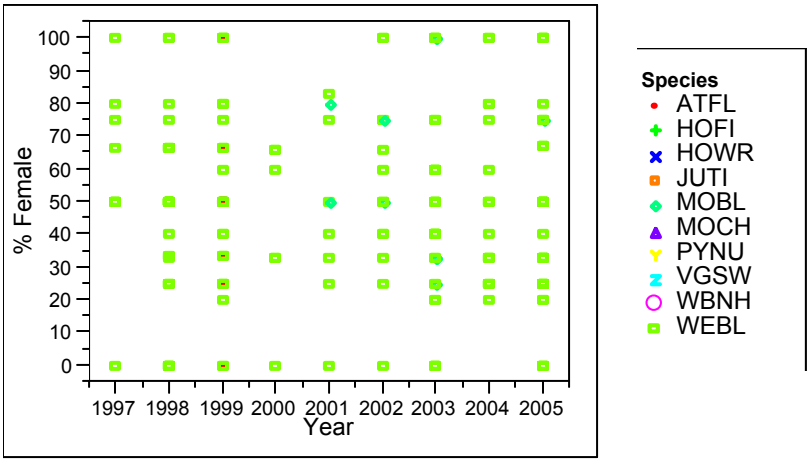


Figure E-2.1-4. Bivariate fit of percent nestlings that are female versus year

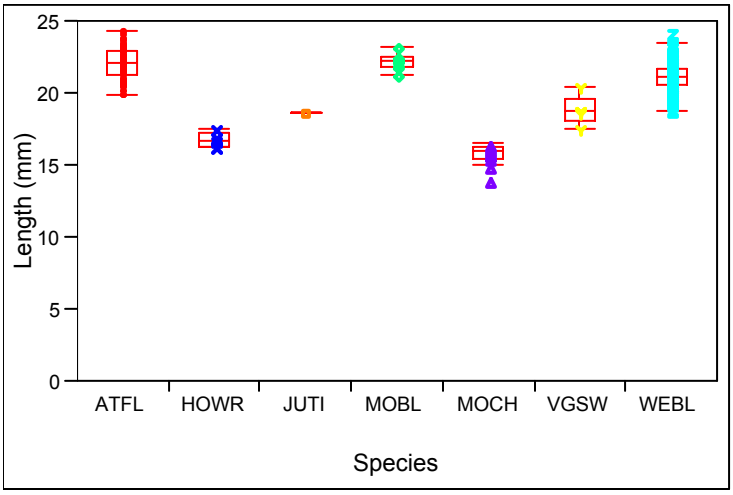


Figure E-2.1-5. Box plot comparing egg length across species

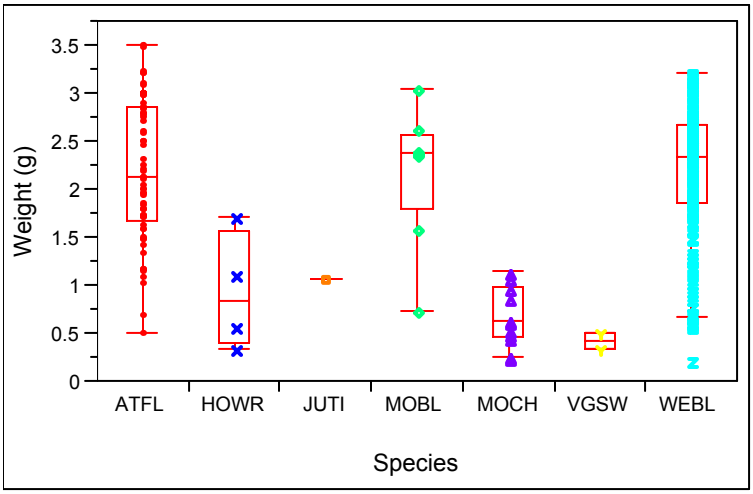


Figure E-2.1-6. Box plot comparing egg weight across species

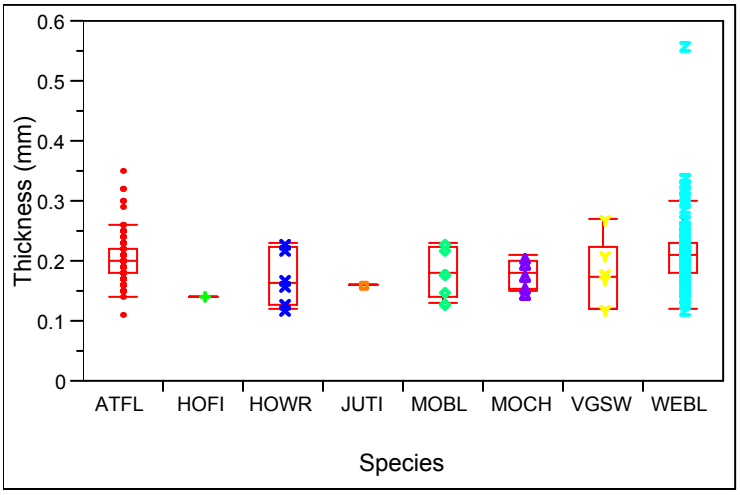


Figure E-2.1-7. Box plot comparing eggshell thickness across species

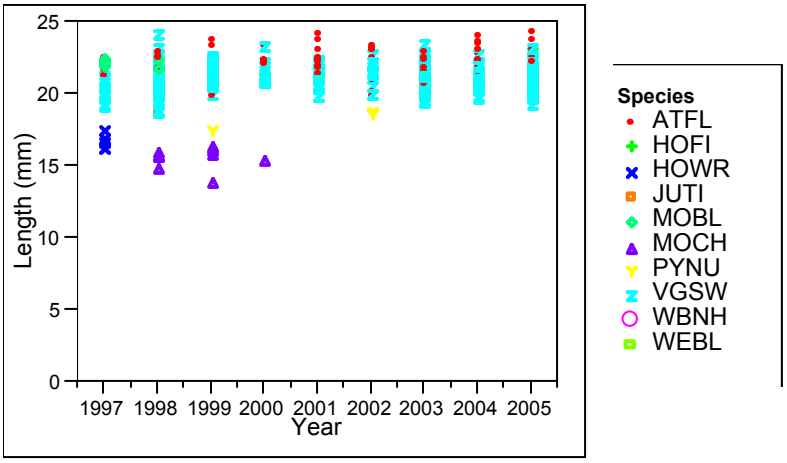


Figure E-2.1-8. Bivariate plot of egg length by year

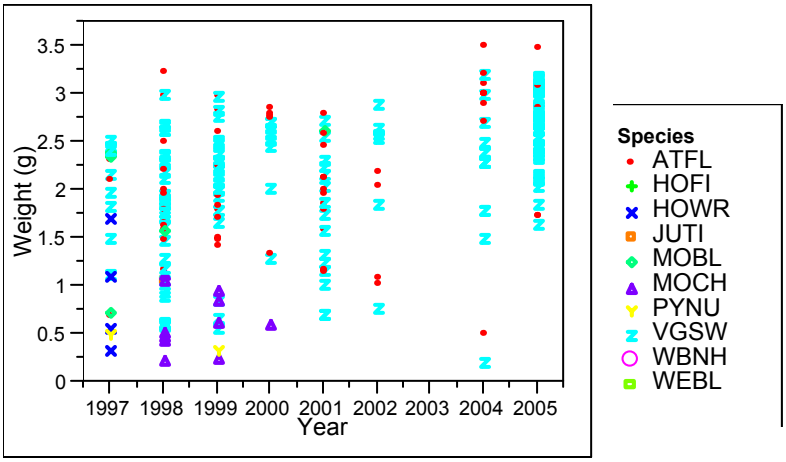


Figure E-2.1-9. Bivariate plot of egg weight versus year

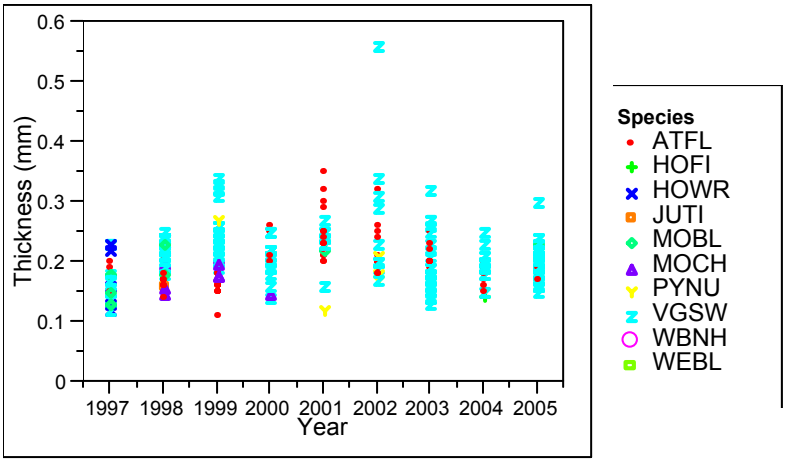


Figure E-2.1-10. Bivariate plot of eggshell thickness versus year

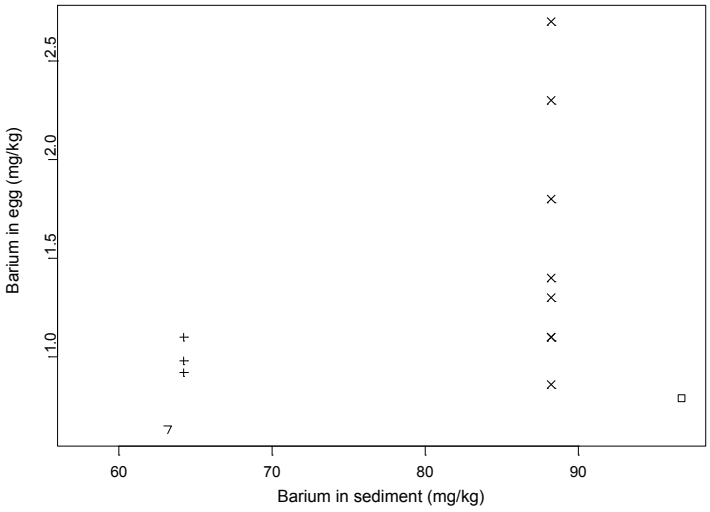


Figure E-2.1-11. Barium in sediment versus eggs (all egg results are detects)

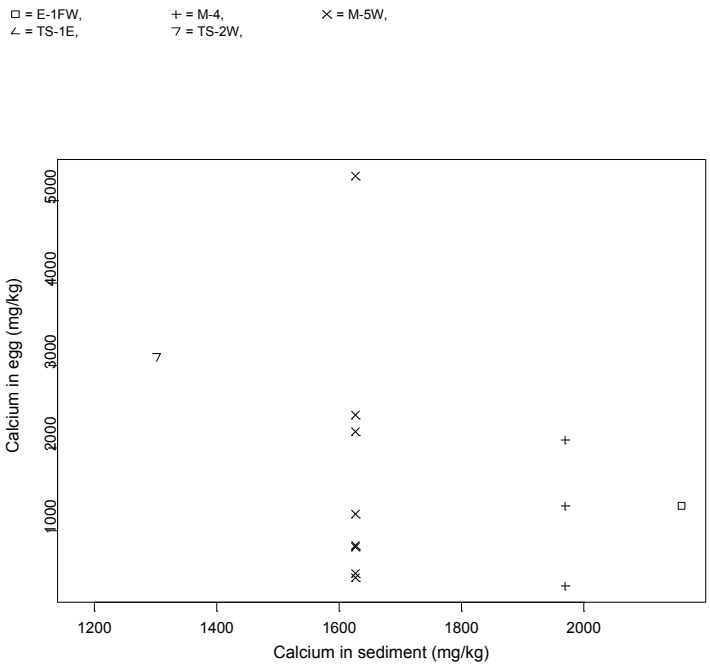


Figure E-2.1-12. Calcium in sediment versus calcium in eggs (all egg results are detects)

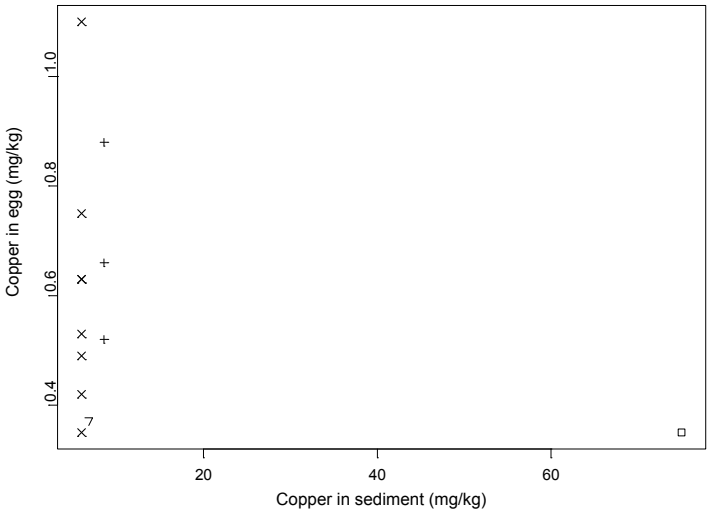


Figure E-2.1-13. Copper in sediment versus eggs (all egg results are detects)

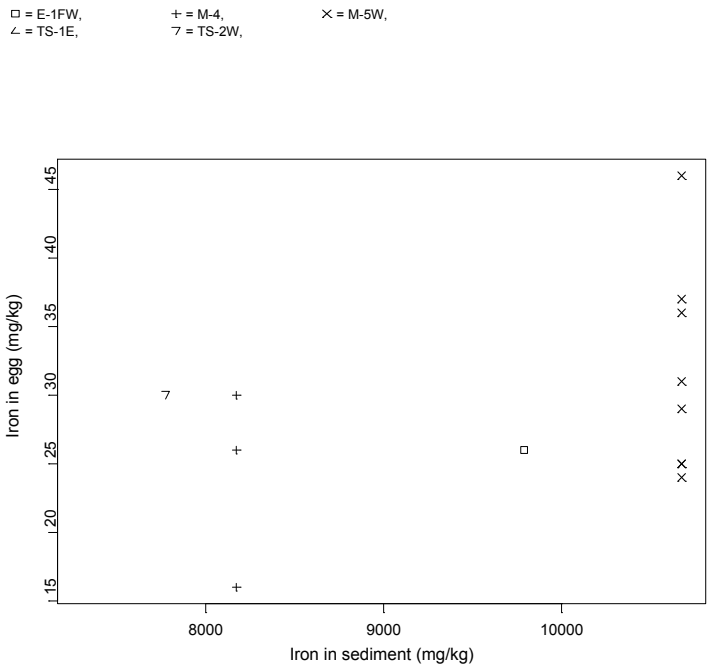


Figure E-2.1-14. Iron in sediment versus eggs (all egg results are detects).

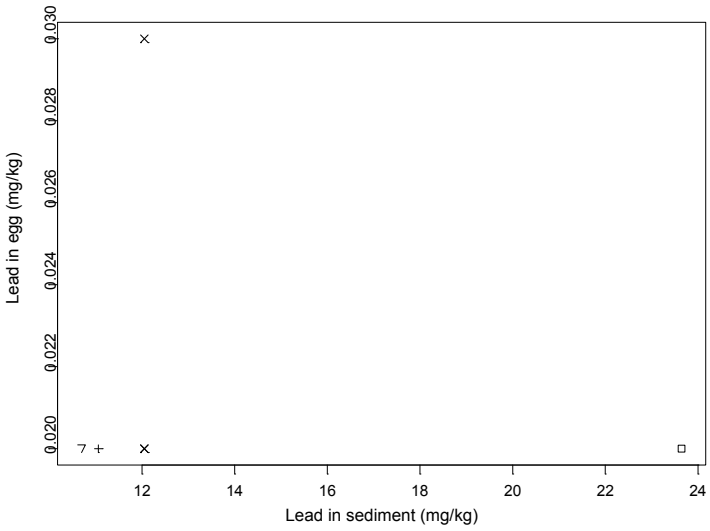


Figure E-2.1-15. Lead in sediment versus eggs (one detect in eggs)

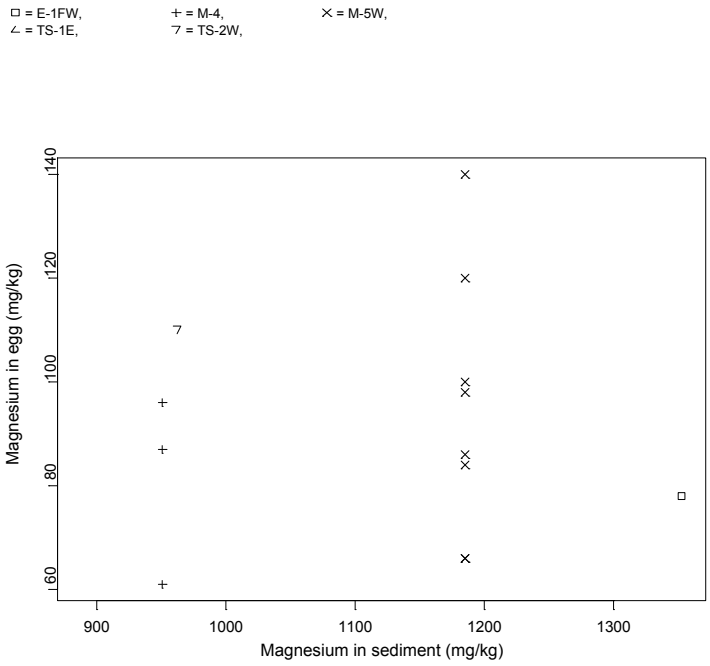


Figure E-2.1-16. Magnesium in sediment versus eggs (egg results are all detects).

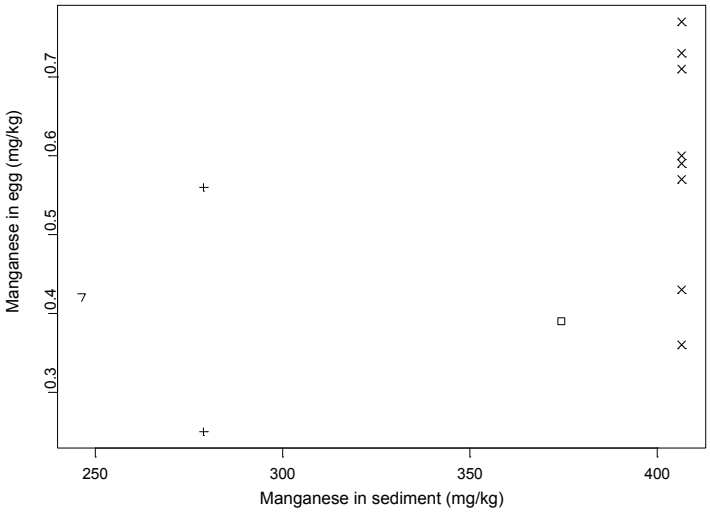


Figure E-2.1-17. Manganese sediment versus eggs (egg results are all detects)

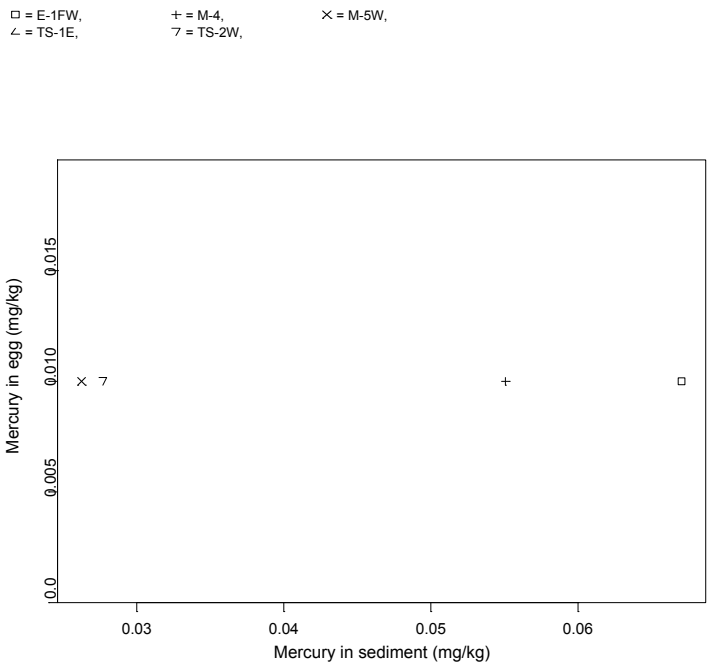


Figure E-2.1-18. Mercury in sediment versus eggs (egg results are same value but 3=nondetects, 7=detects at the DL)

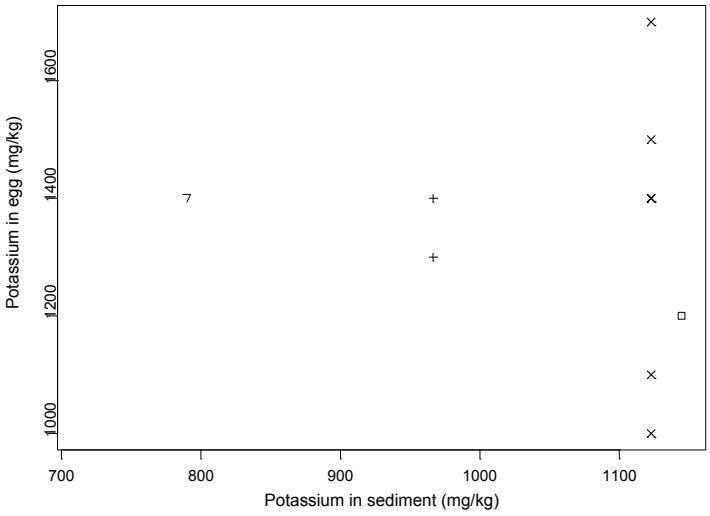


Figure E-2.1-19. Potassium in sediment versus eggs (egg results are all detects)

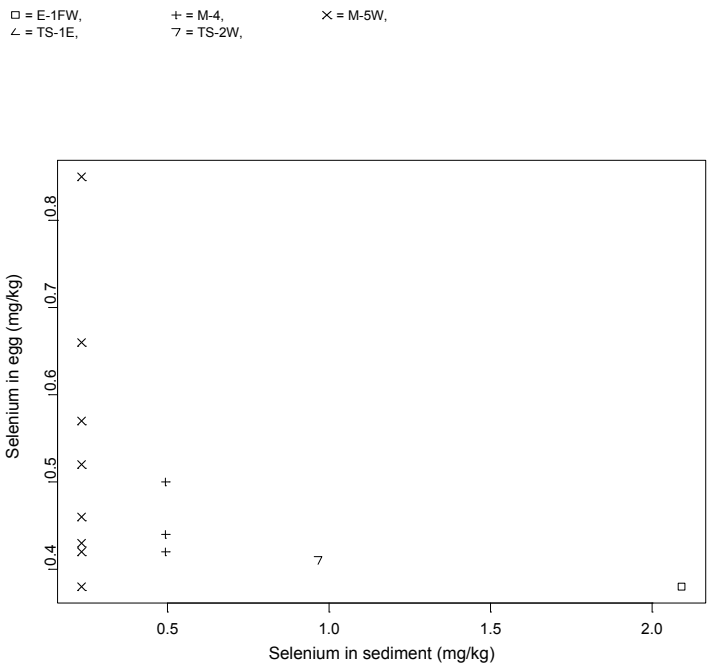


Figure E-2.1-20. Selenium in sediment versus eggs (egg results are all detects)

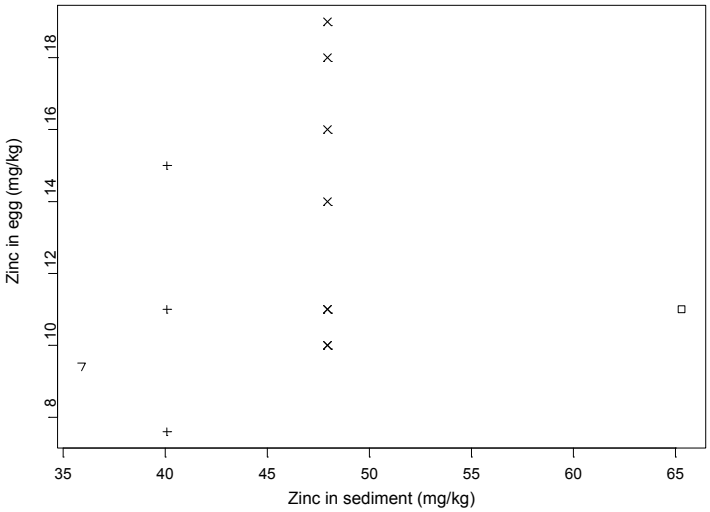


Figure E-2.1-21. Zinc in sediment versus eggs (egg results are all detects)

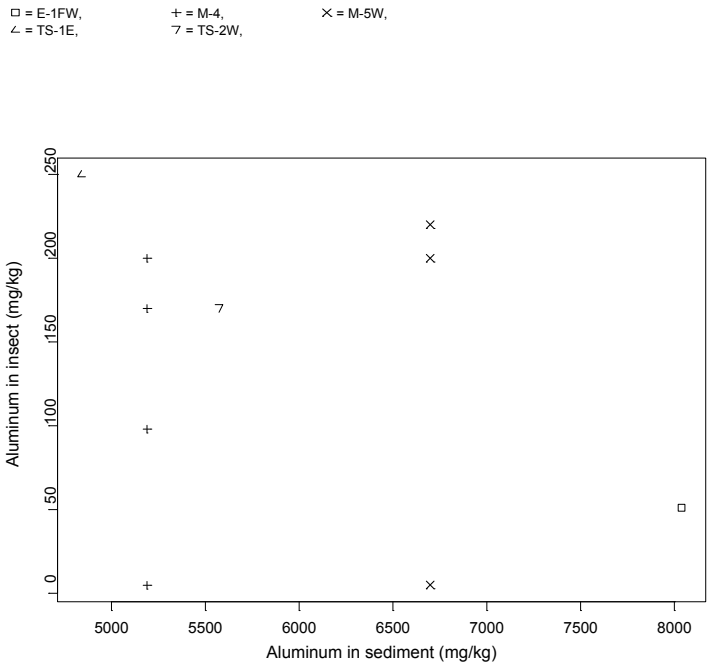


Figure E-2.1-22. Aluminum concentrations in insects versus sediment

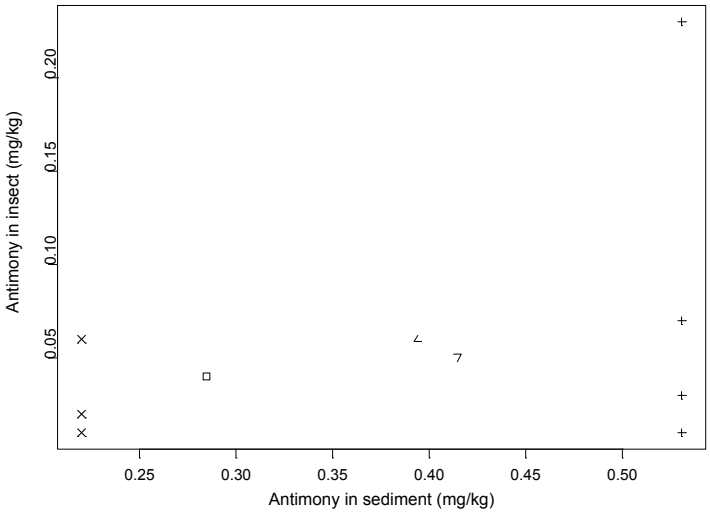


Figure E-2.1-23. Antimony concentration in insects versus sediment

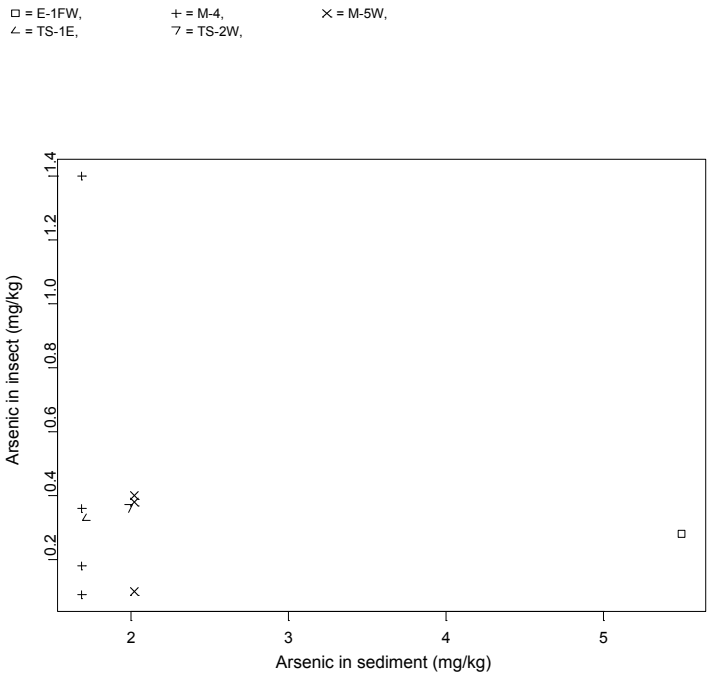


Figure E-2.1-24. Arsenic concentration in insects versus sediment

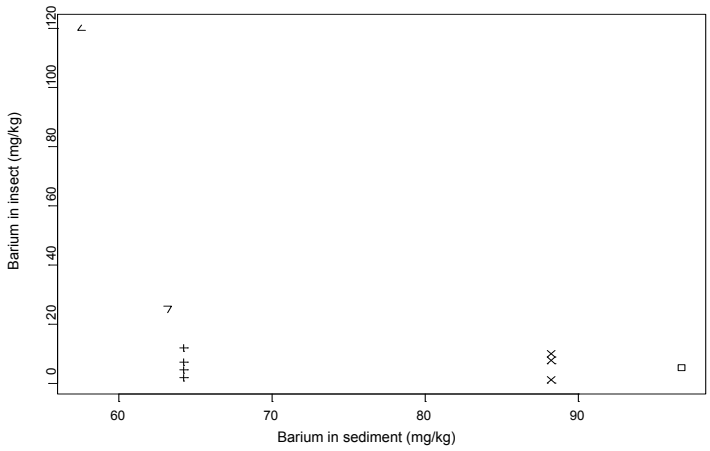


Figure E-2.1-25. Barium concentrations in whole insects versus sediment

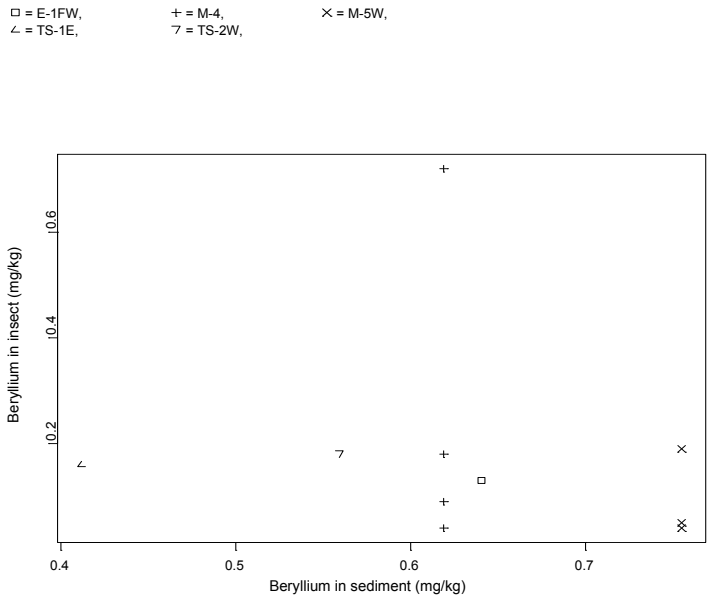


Figure E-2.1-26. Beryllium concentrations in whole insects versus sediment

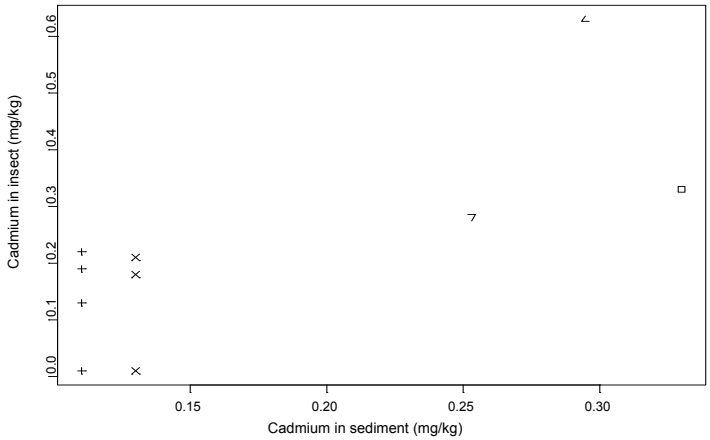


Figure E-2.1-27. Cadmium concentrations in whole insects versus sediment concentrations

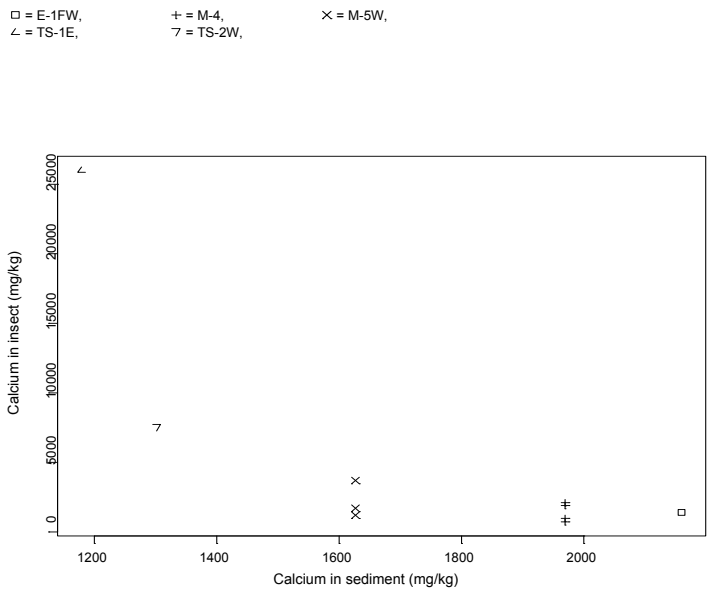


Figure E-2.1-28. Calcium concentrations in whole insects versus sediment concentrations

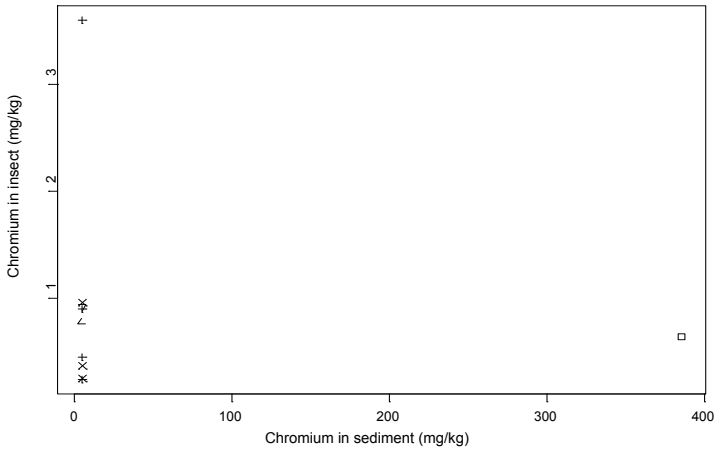


Figure E-2.1-29. Chromium concentrations in whole insects versus sediment concentrations

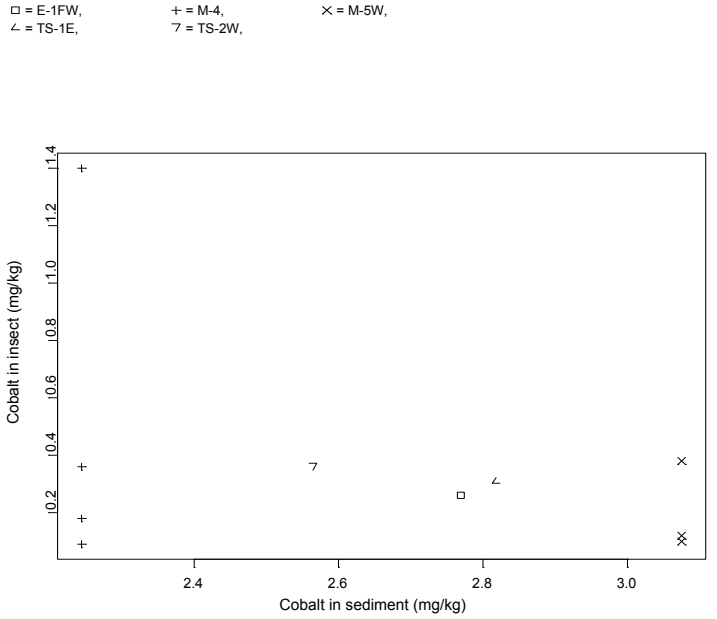


Figure E-2.1-30. Cobalt concentrations in whole insects versus sediment concentrations

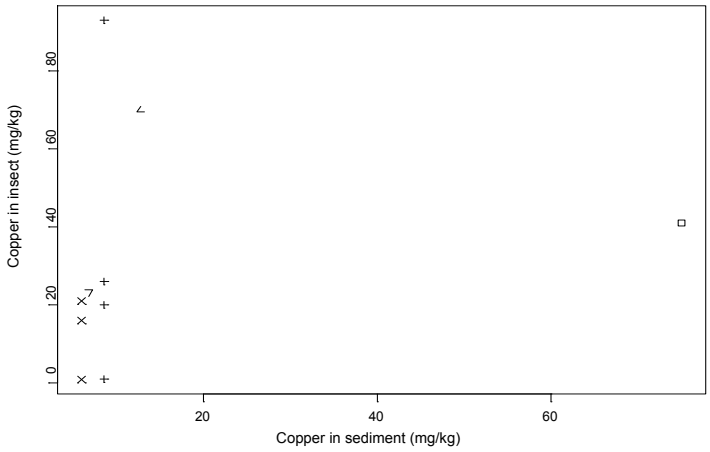


Figure E-2.1-31. Copper concentrations in whole insects versus sediment concentrations

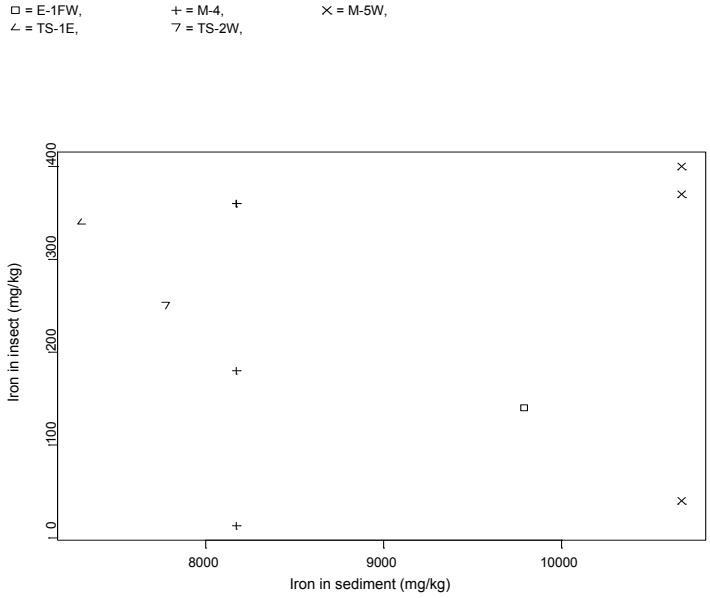


Figure E-2.1-32. Iron concentrations in whole insects versus sediment concentrations

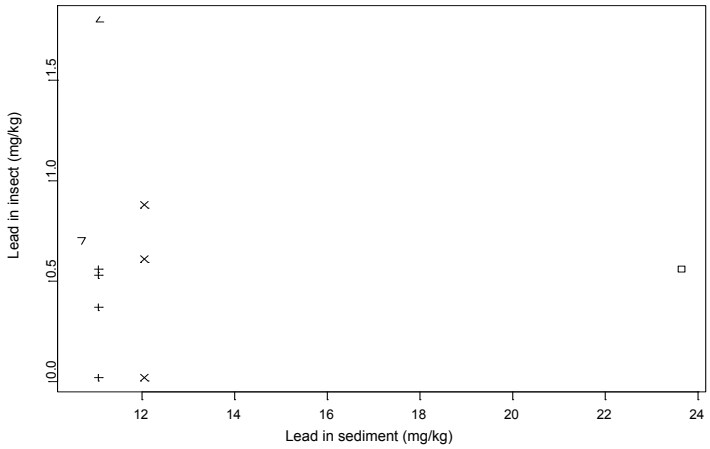


Figure E-2.1-33. Lead concentrations in whole insects versus sediment concentrations

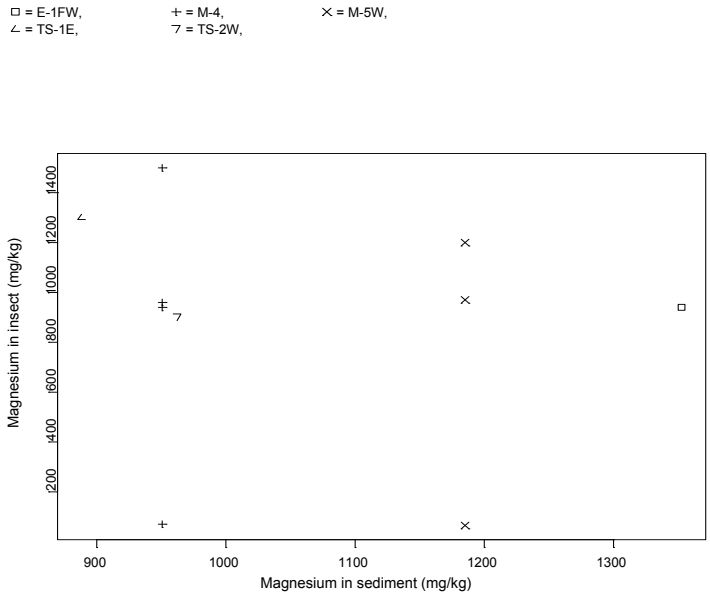


Figure E-2.1-34. Magnesium concentrations in whole insects versus sediment concentrations

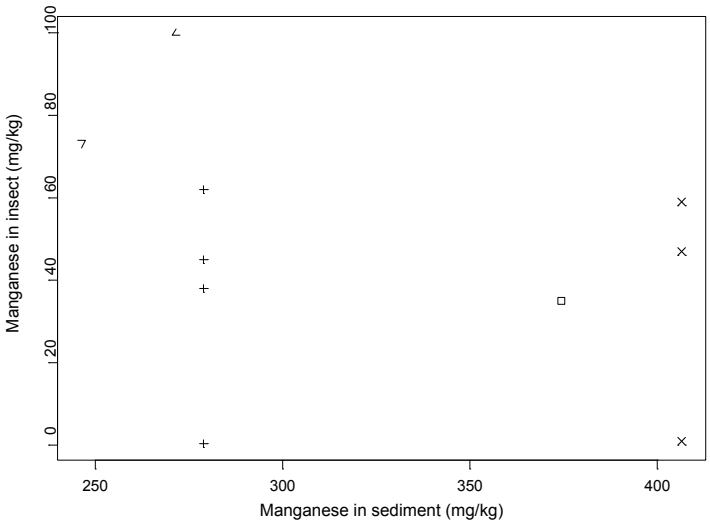


Figure E-2.1-35. Manganese concentrations in whole insects versus sediment concentrations

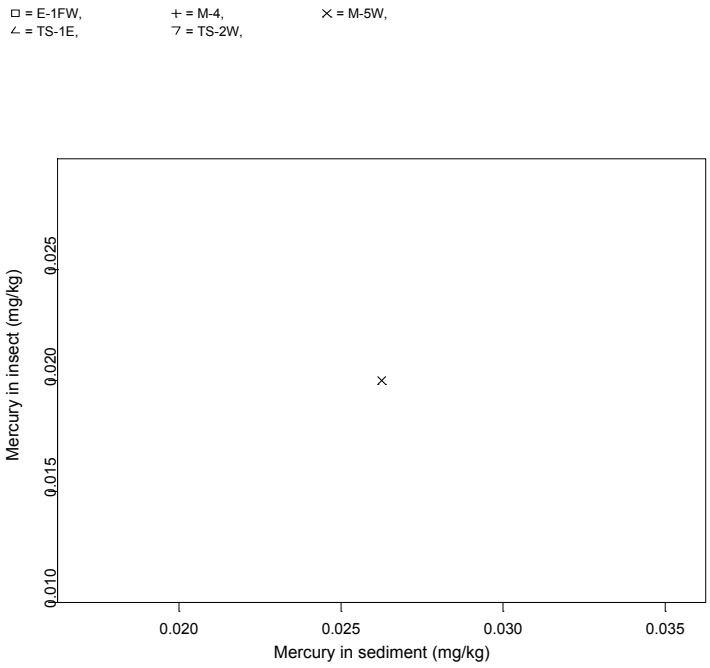


Figure E-2.1-36. Mercury concentrations in whole insects versus sediment concentrations

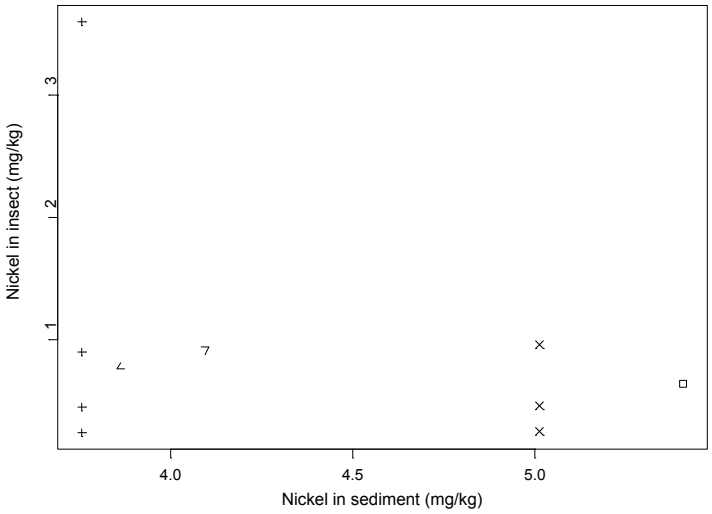


Figure E-2.1-37. Nickel concentrations in whole insects versus sediment concentrations

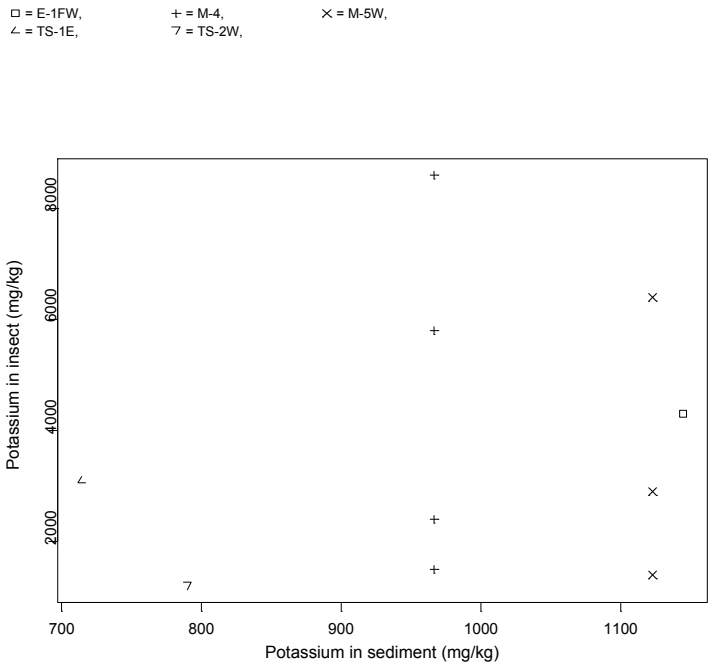


Figure E-2.1-38. Potassium concentrations in whole insects versus sediment concentrations

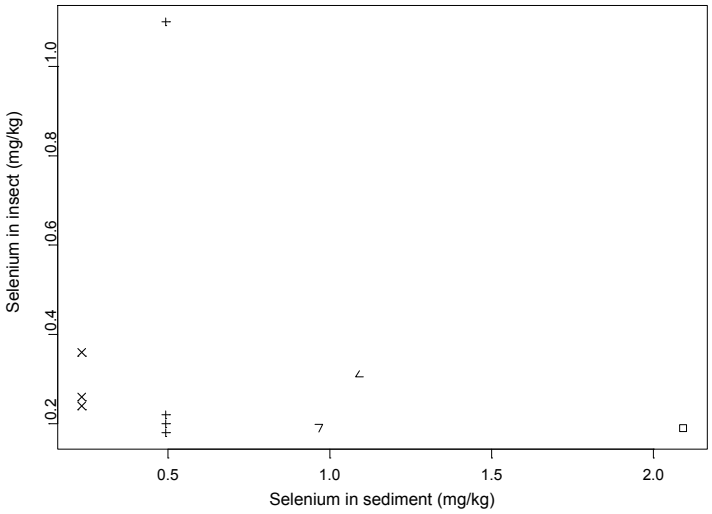


Figure E-2.1-39. Selenium concentrations in whole insects versus sediment concentrations

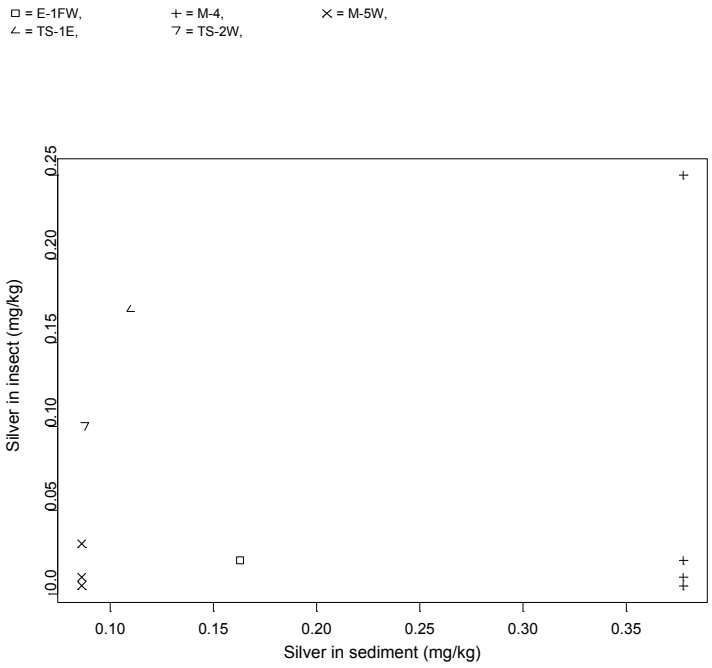


Figure E-2.1-40. Silver concentrations in whole insects versus sediment concentrations

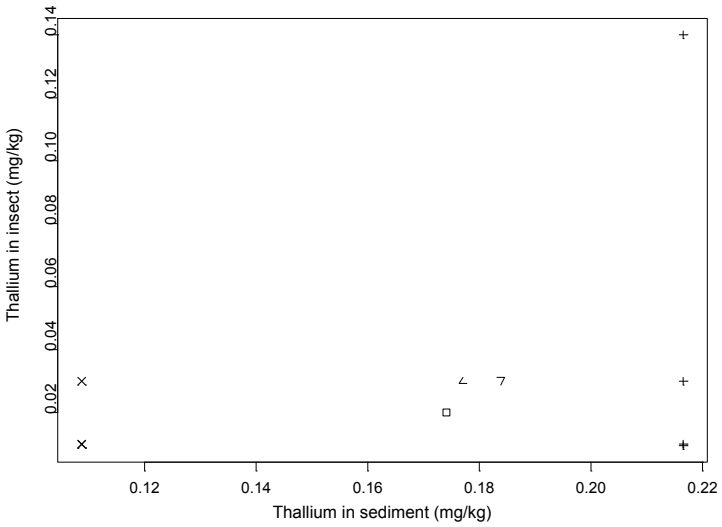


Figure E-2.1-41. Thallium concentrations in whole insects versus sediment concentrations

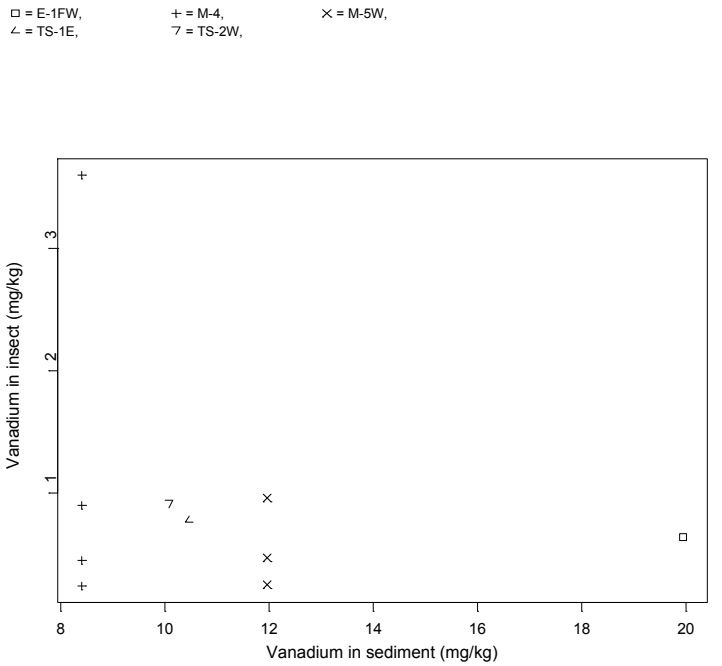


Figure E-2.1-42. Vanadium concentrations in whole insects versus sediment concentrations

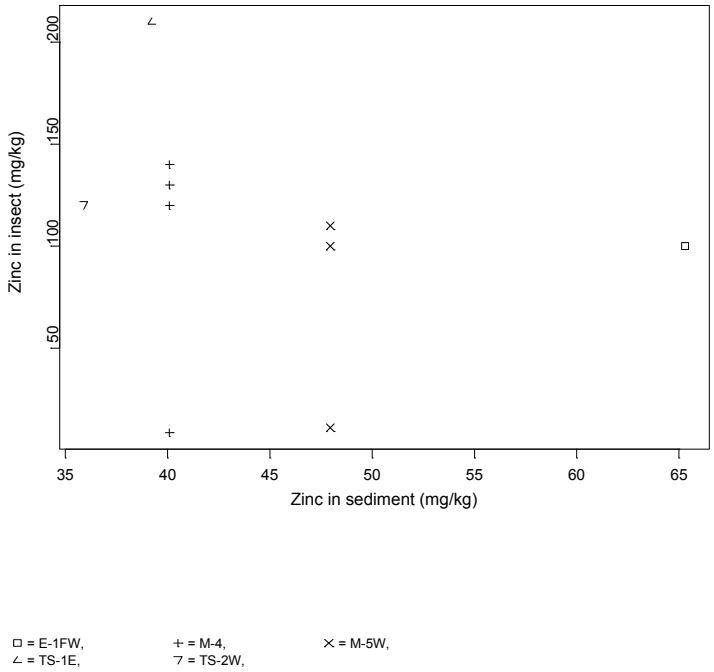


Figure E-2.1-43. Zinc concentrations in whole insects versus sediment concentrations

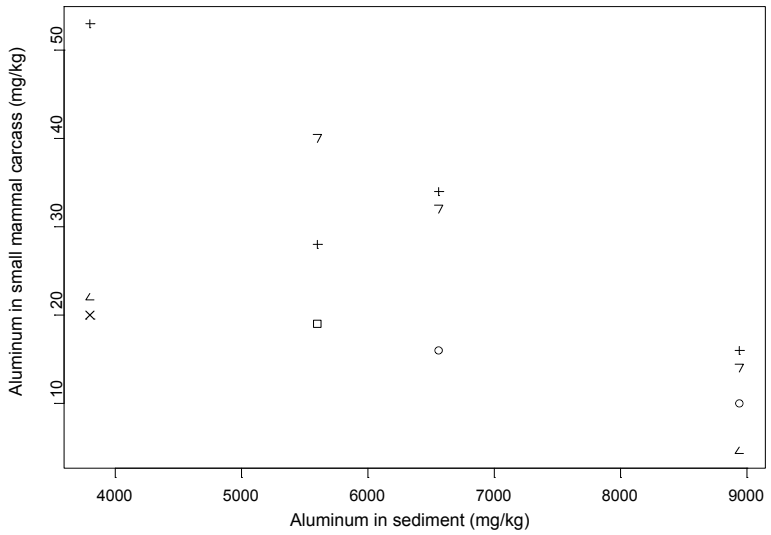


Figure E-2.2-1. Aluminum in small mammal carcass (no pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

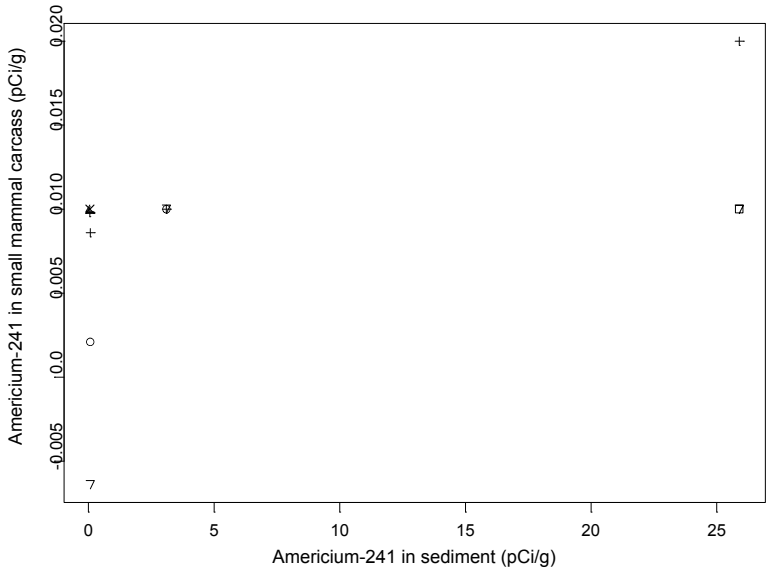


Figure E-2.2-2. Americium-241 in small mammal carcass (no pelt) versus concentration in sediment

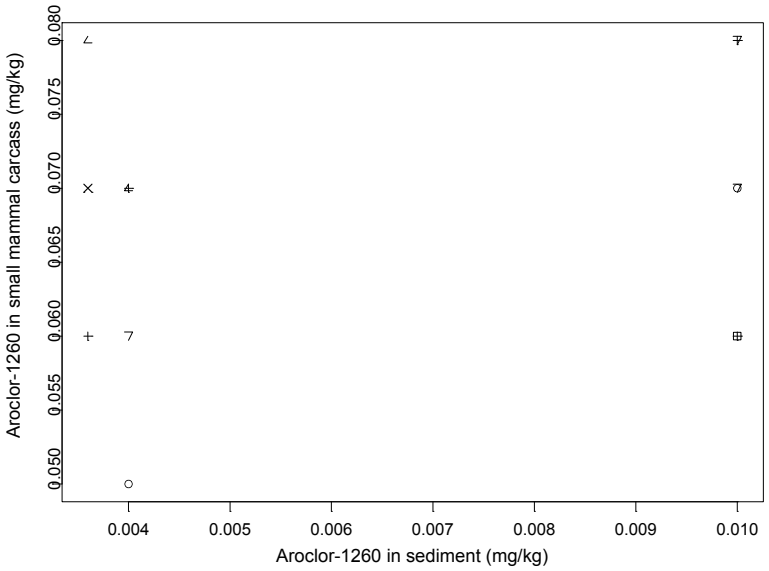
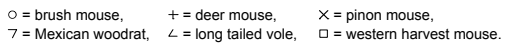


Figure E-2.2-3. Aroclor-1260 in small mammal carcass (no pelt) versus concentration in sediment



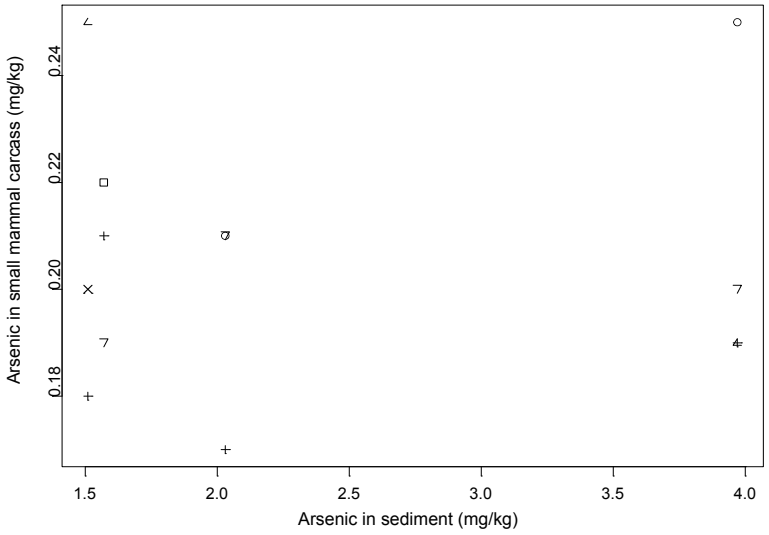


Figure E-2.2-4. Arsenic in small mammal carcass (no pelt) versus concentration in sediment

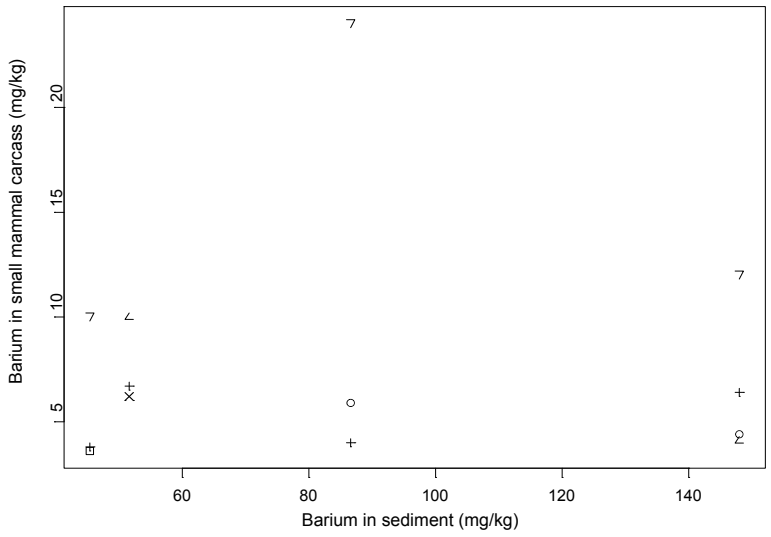


Figure E-2.2-5. Barium in small mammal carcass (no pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

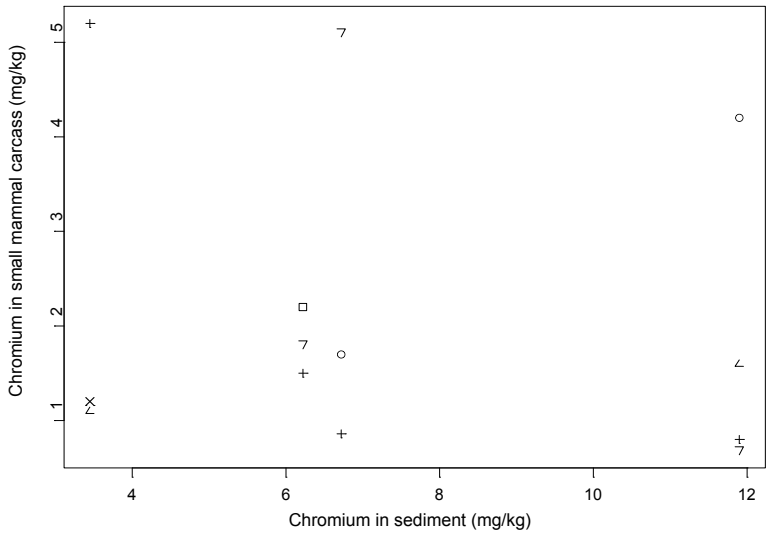


Figure E-2.2-6. Chromium in small mammal carcass (no pelt) versus concentration in sediment

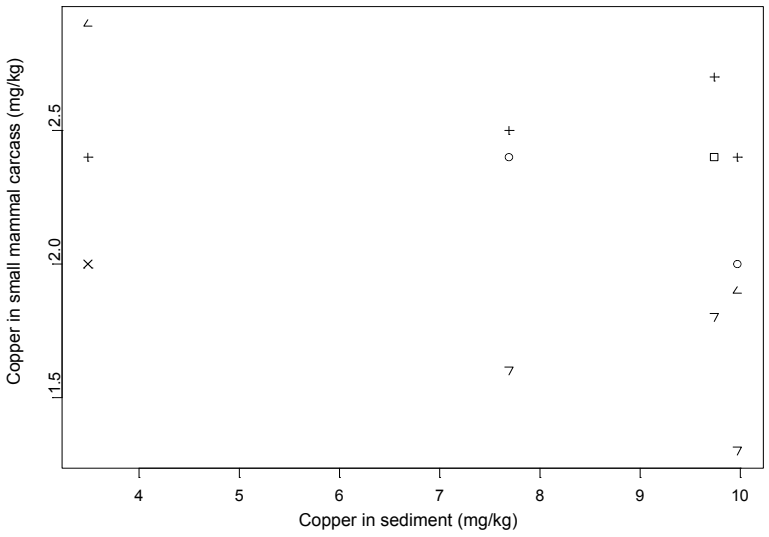


Figure E-2.2-7. Copper in small mammal carcass (no pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

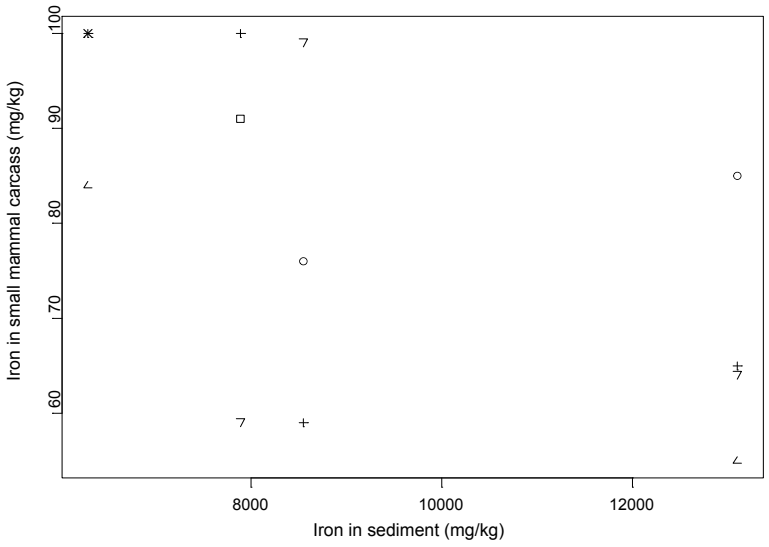


Figure E-2.2-8. Iron in small mammal carcass (no pelt) versus concentration in sediment

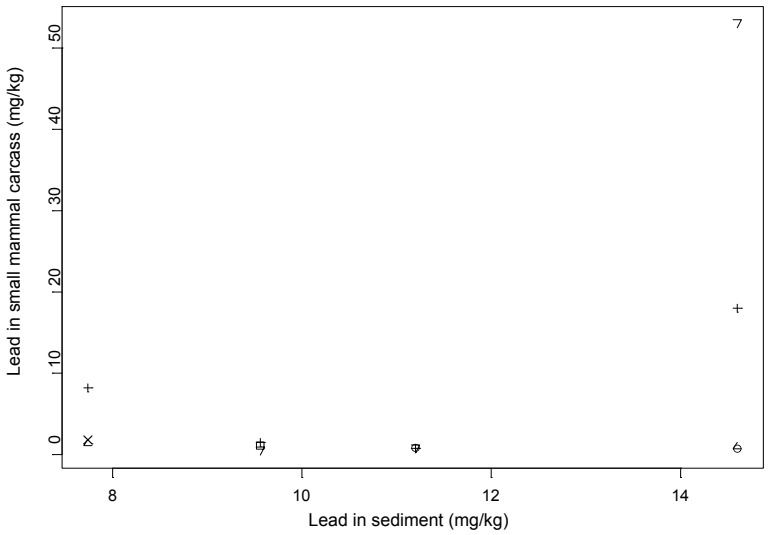


Figure E-2.2-9. Lead in small mammal carcass (no pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ◿ = long tailed vole, □ = western harvest mouse.

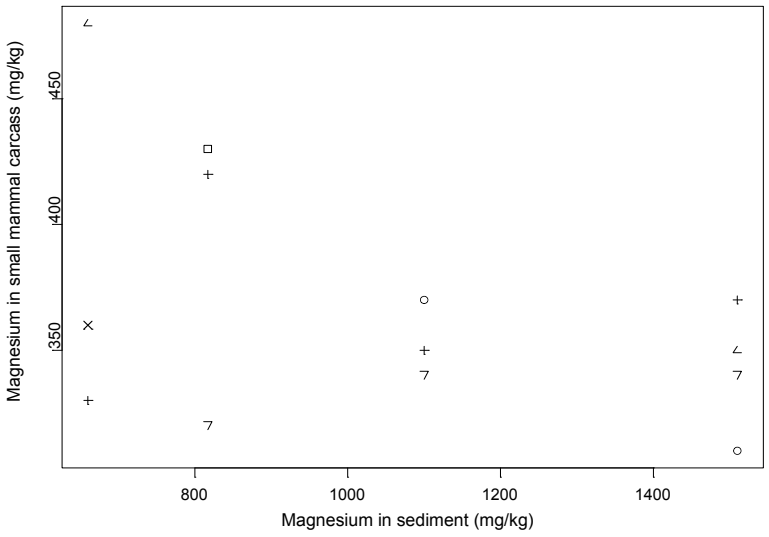


Figure E-2.2-10. Magnesium in small mammal carcass (no pelt) versus concentration in sediment

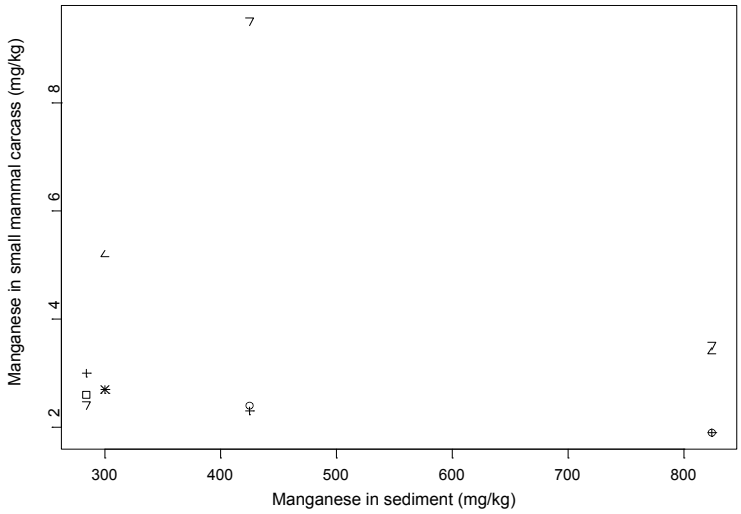


Figure E-2.2-11. Manganese in small mammal carcass (no pelt) versus concentration in sediment Manganese

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

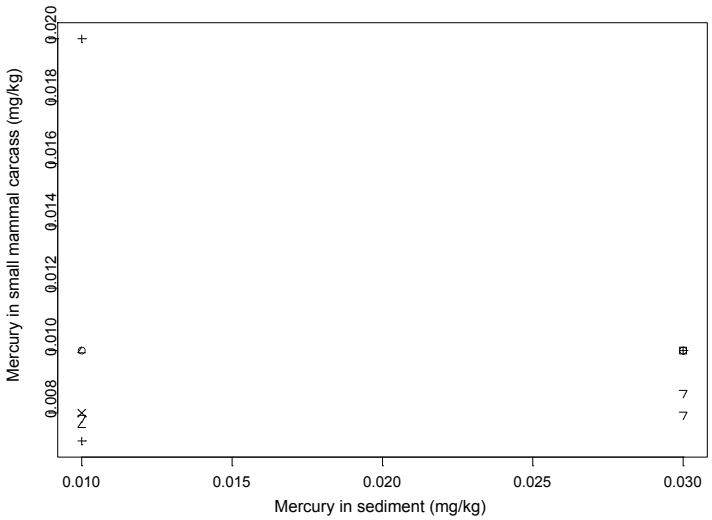


Figure E-2.2-12. Mercury in small mammal carcass (no pelt) versus concentration in sediment

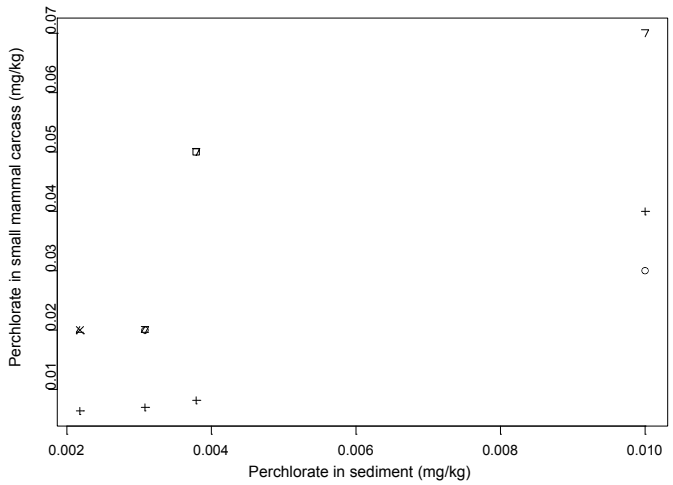


Figure E-2.2-13. Perchlorate in small mammal carcass (no pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
ᒣ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

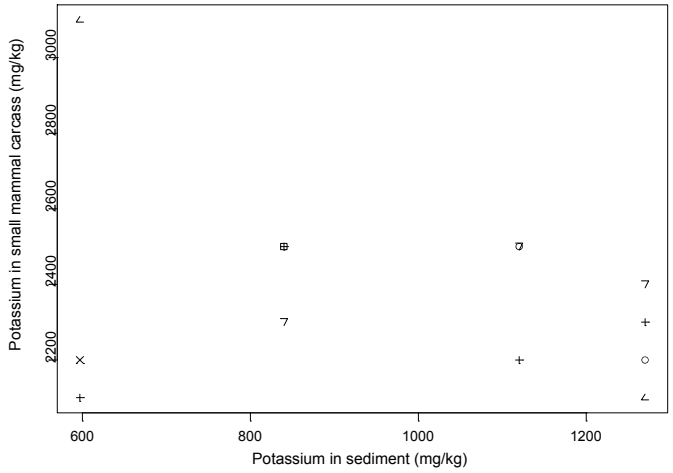


Figure E-2.2-14. Potassium in small mammal carcass (no pelt) versus concentration in sediment

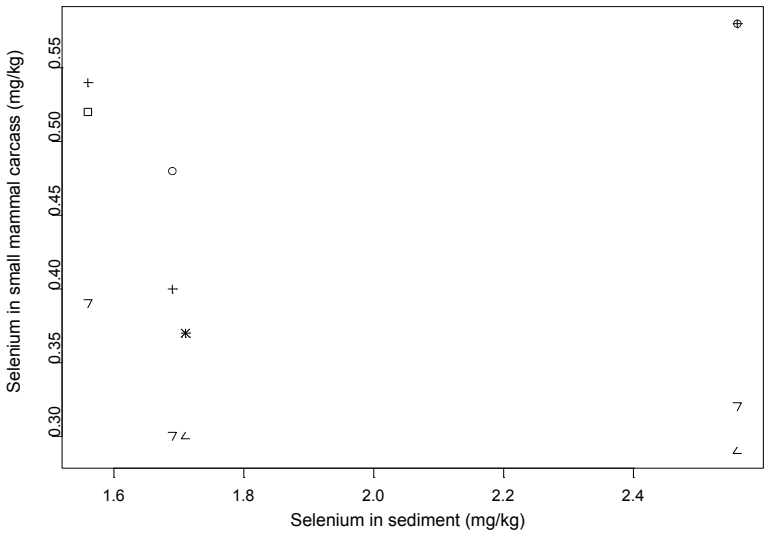


Figure E-2.2-15. Selenium in small mammal carcass (no pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
ᒣ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

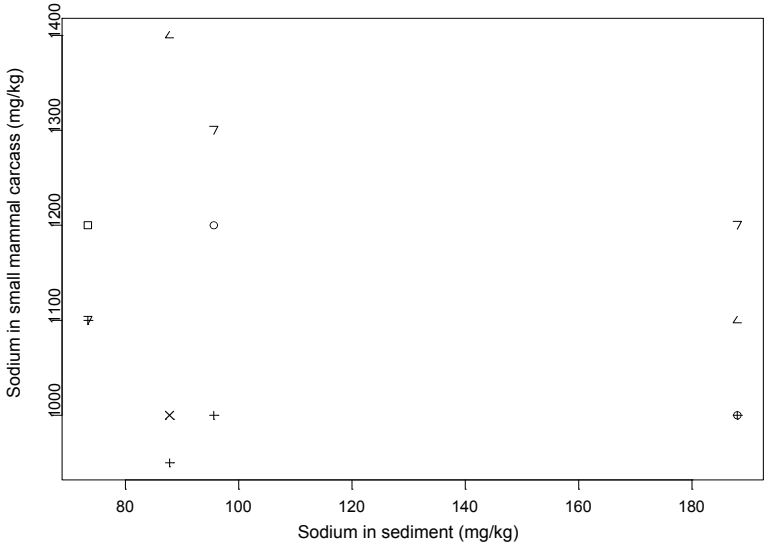


Figure E-2.2-16. Sodium in small mammal carcass (no pelt) versus concentration in sediment

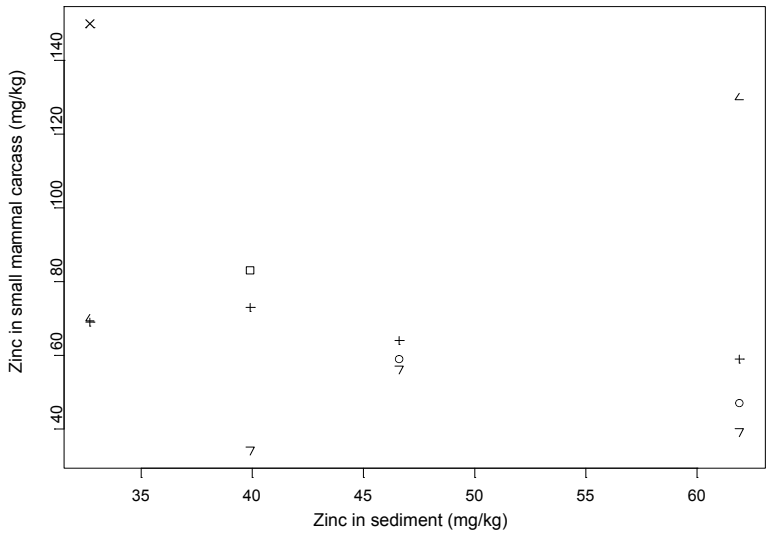


Figure E-2.2-17. Zinc in small mammal carcass (no pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
7 = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

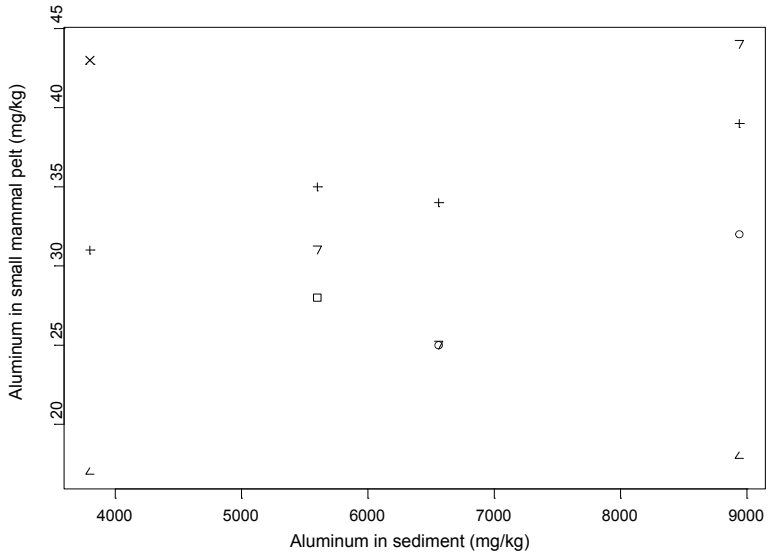


Figure E-2.2-18. Aluminum in small mammal pelt versus concentration in sediment Aluminum

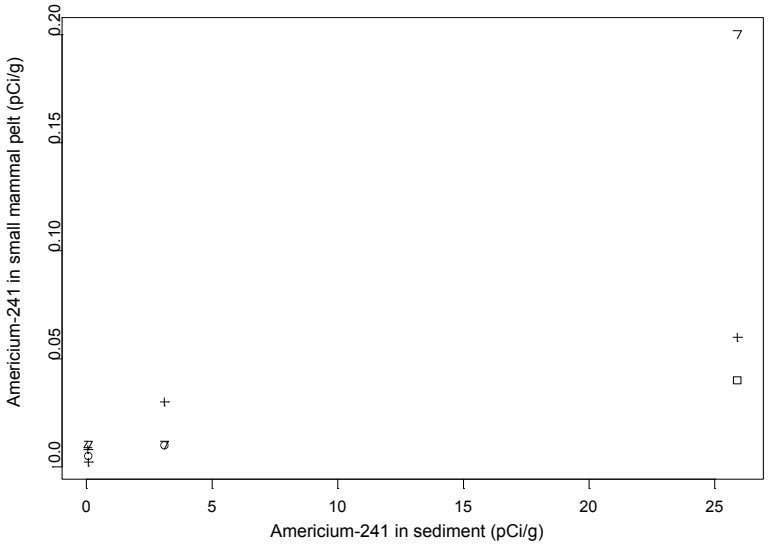


Figure E-2.2-19. Americium-241 in small mammal pelt versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
7 = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

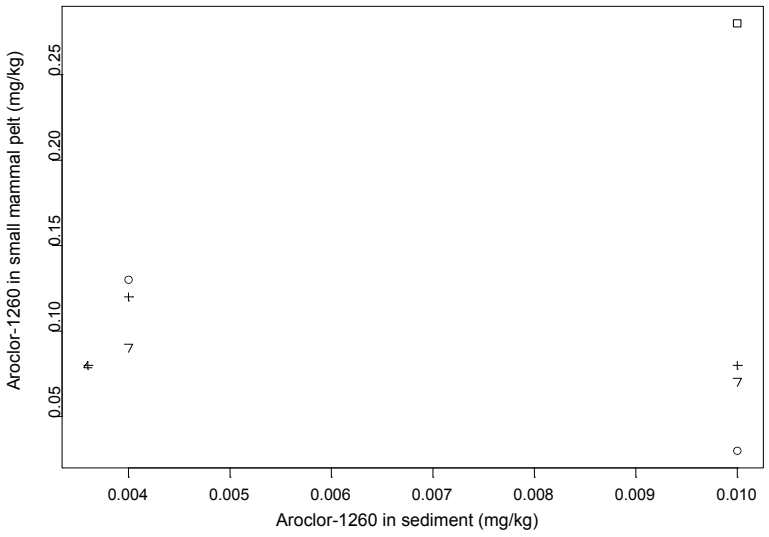


Figure E-2.2-20. Aroclor-1260 in small mammal pelt versus concentration in sediment

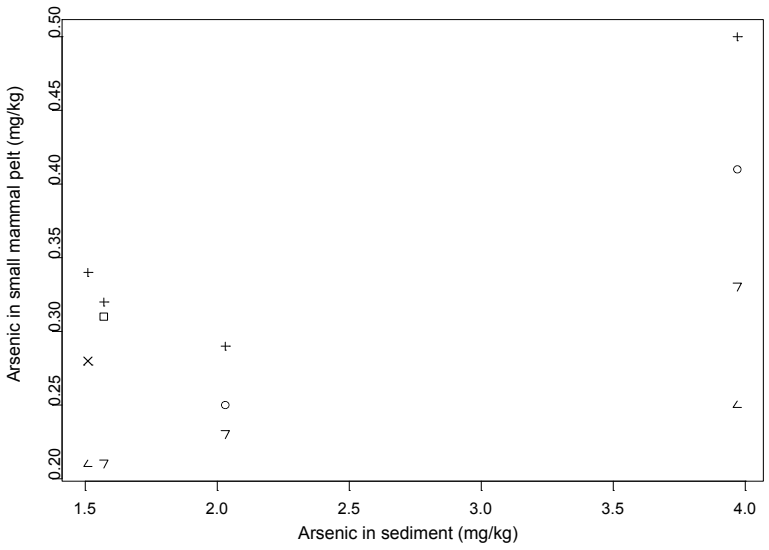


Figure E-2.2-21. Arsenic in small mammal pelt versus concentration in sediment Arsenic

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

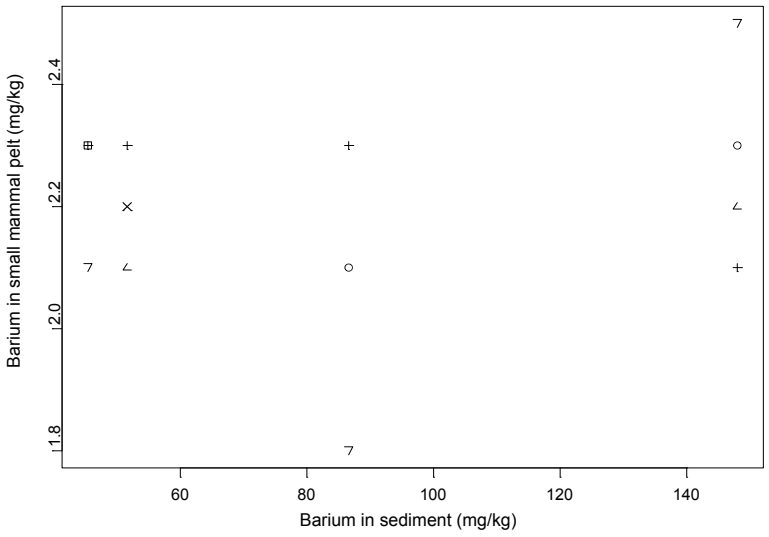


Figure E-2.2-22. Barium in small mammal pelt versus concentration in sediment

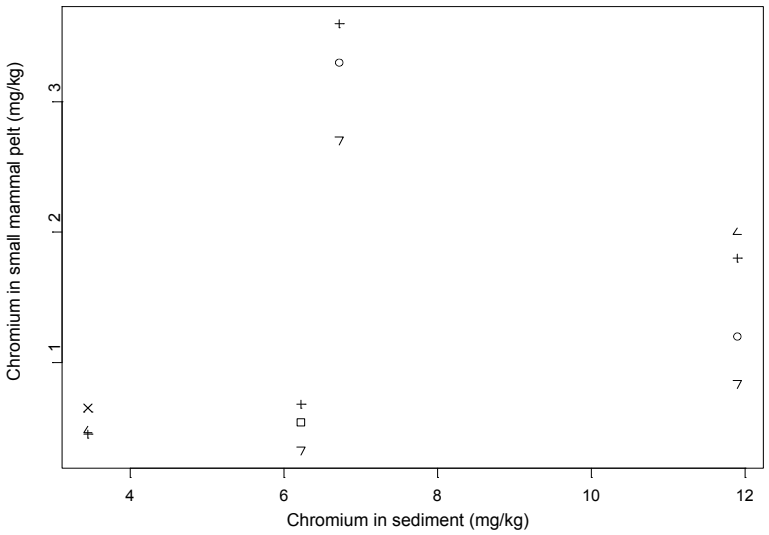


Figure E-2.2-23. Chromium in small mammal pelt versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

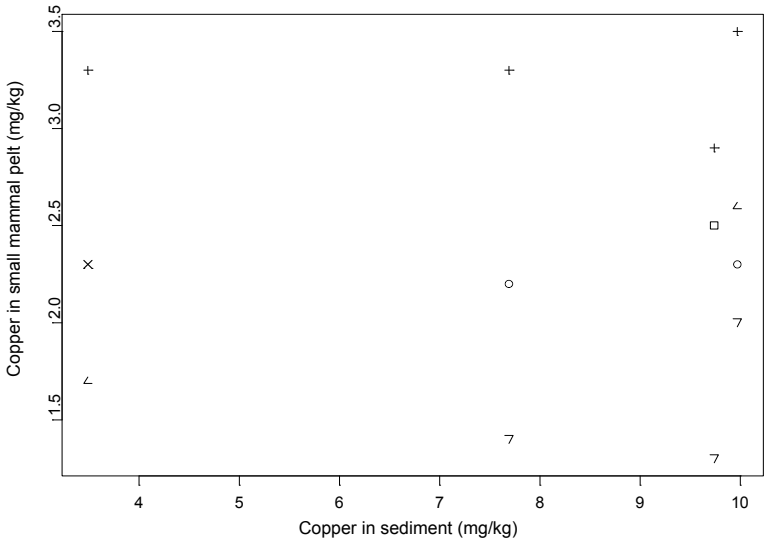


Figure E-2.2-24. Copper in small mammal pelt versus concentration in sediment

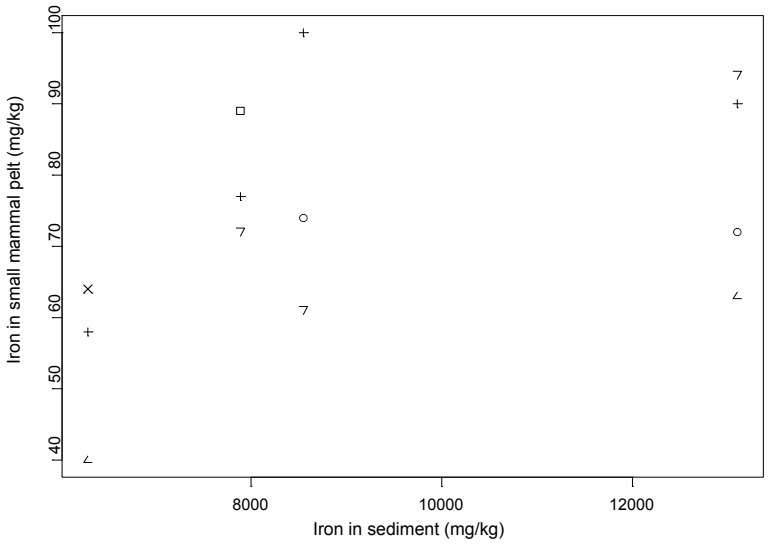


Figure E-2.2-25. Iron in small mammal pelt versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ◁ = long tailed vole, □ = western harvest mouse.

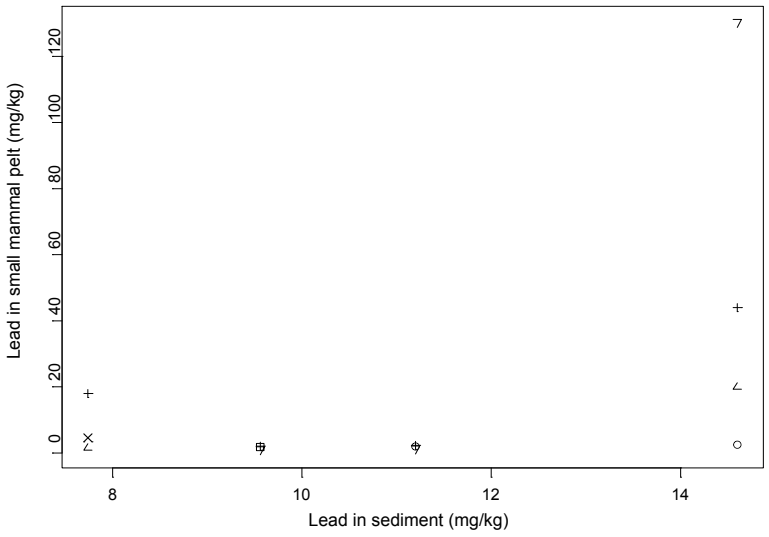


Figure E-2.2-26. Lead in small mammal pelt versus concentration in sediment

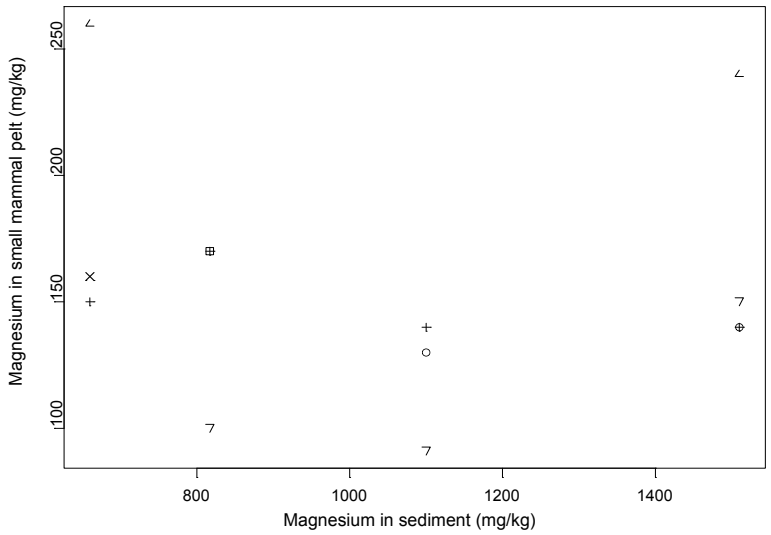


Figure E-2.2-27. Magnesium in small mammal pelt versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

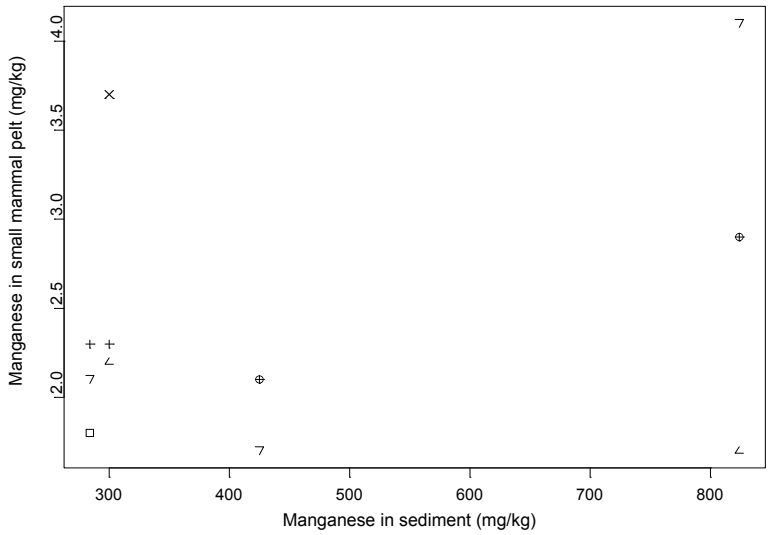


Figure E-2.2-28. Manganese in small mammal pelt versus concentration in sediment

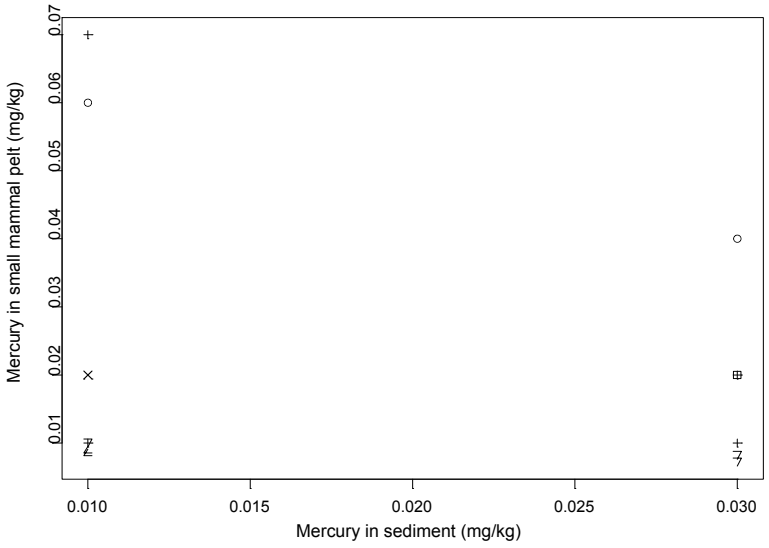


Figure E-2.2-29. Mercury in small mammal pelt versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

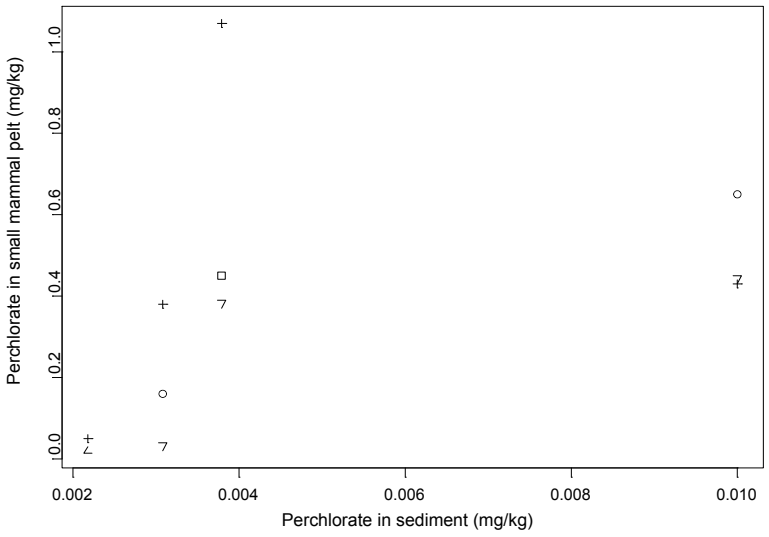


Figure E-2.2-30. Perchlorate in small mammal pelt versus concentration in sediment

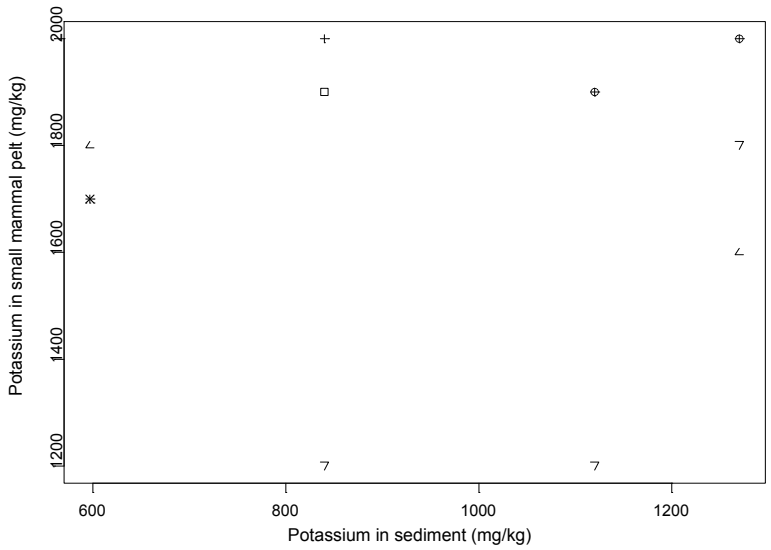
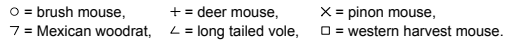


Figure E-2.2-31. Potassium in small mammal pelt versus concentration in sediment



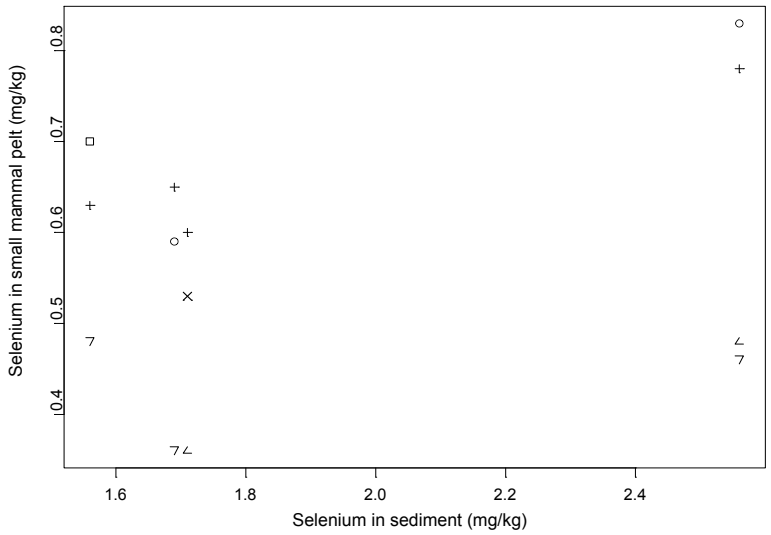


Figure E-2.2-32. Selenium in small mammal pelt versus concentration in sediment

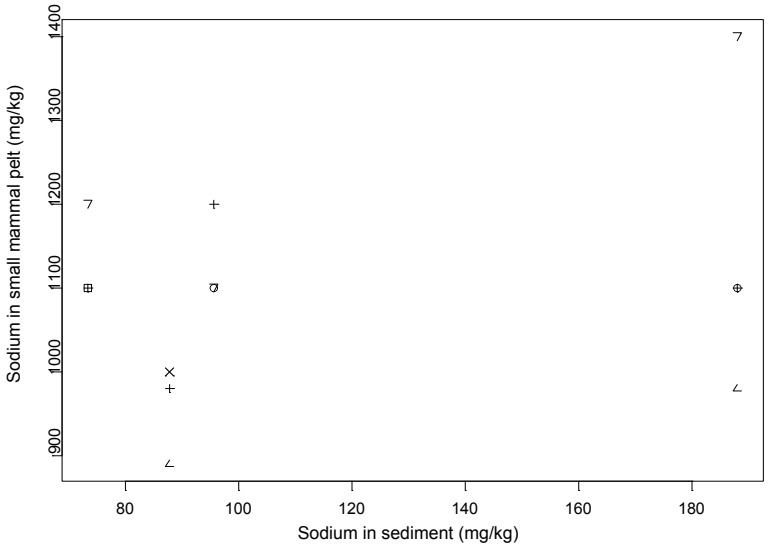


Figure E-2.2-33. Sodium in small mammal pelt versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse.

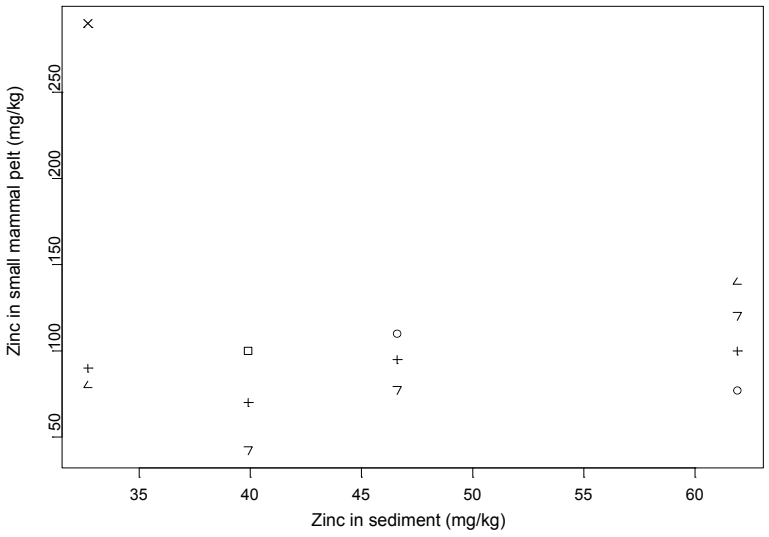


Figure E-2.2-34. Zinc in small mammal pelt versus concentration in sediment

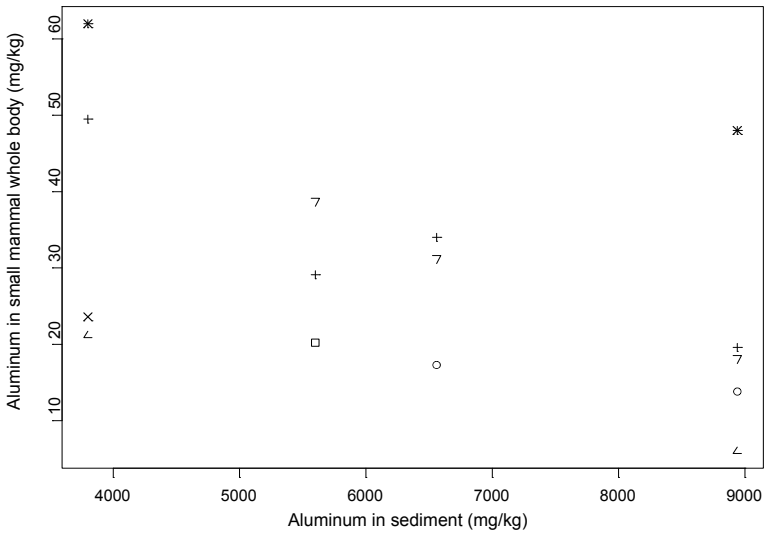


Figure E-2.2-35. Aluminum in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

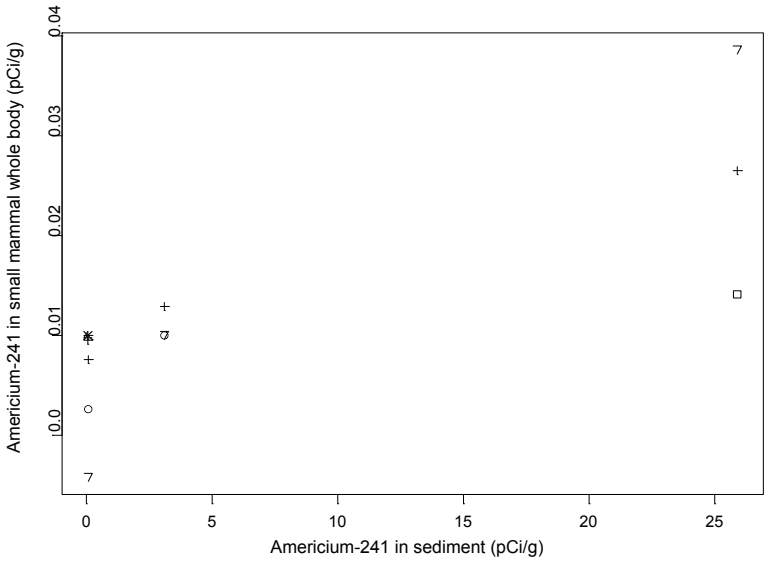


Figure E-2.2-36. Americium-241 in small mammal whole body (as carcass + pelt) versus concentration in sediment

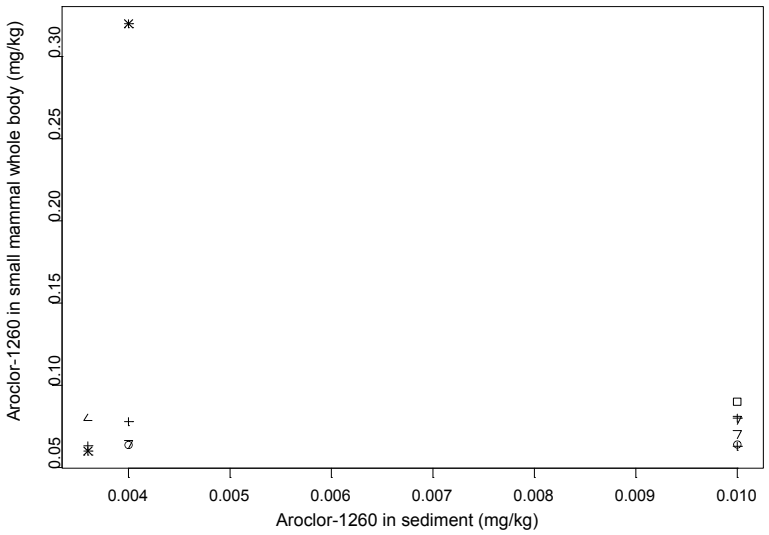


Figure E-2.2-37. Aroclor-1260 in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

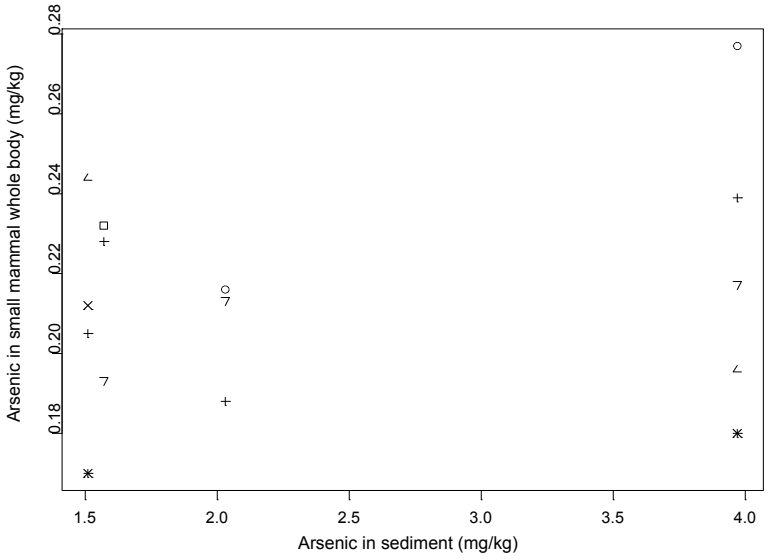


Figure E-2.2-38. Arsenic in small mammal whole body (as carcass + pelt) versus concentration in sediment

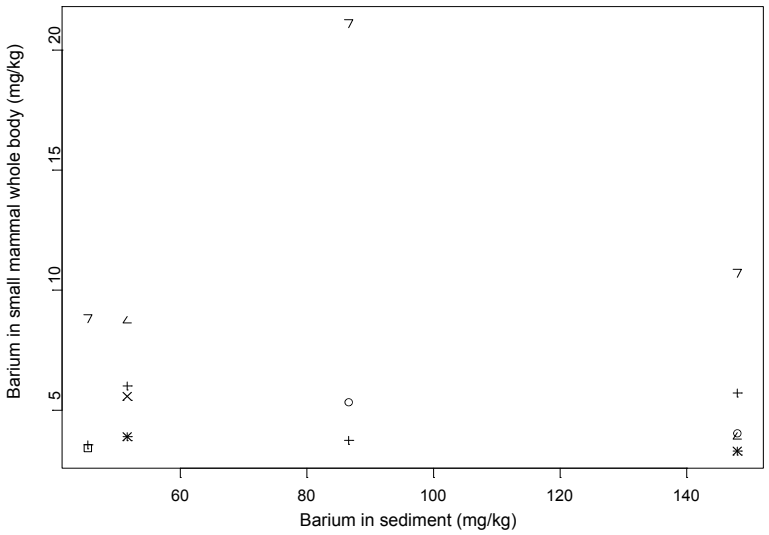


Figure E-2.2-39. Barium in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
7 = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

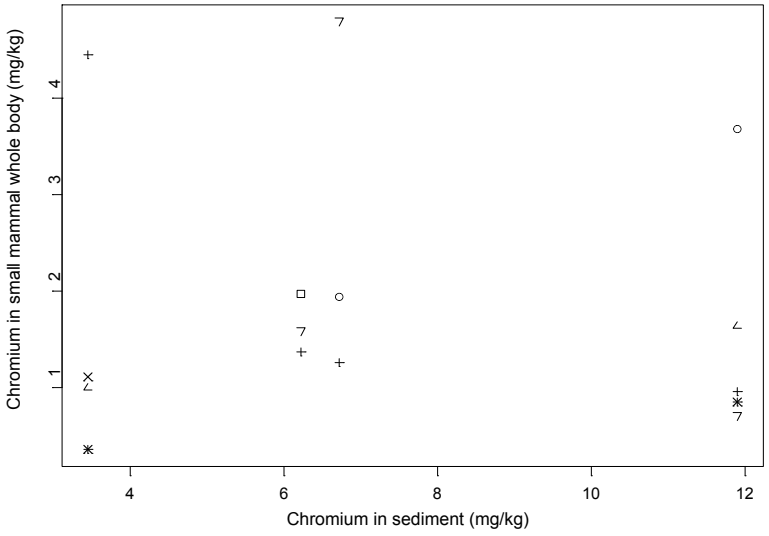


Figure E-2.2-40. Chromium in small mammal whole body (as carcass + pelt) versus concentration in sediment

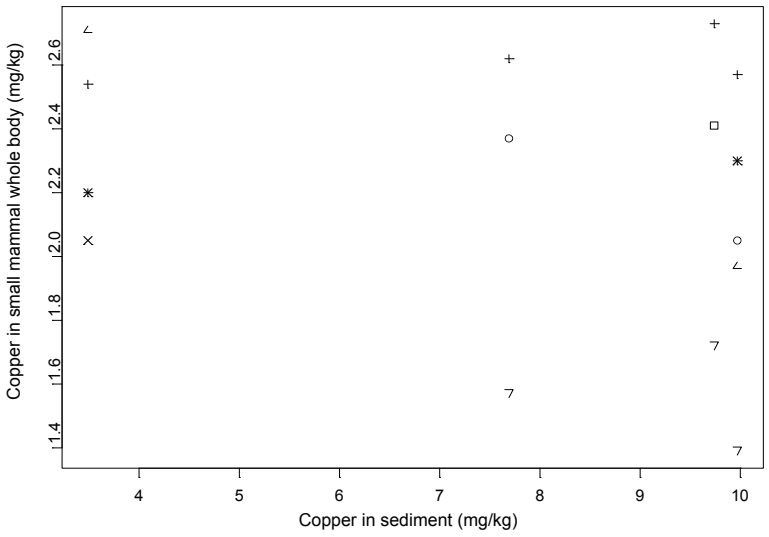


Figure E-2.2-41. Copper in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
7 = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

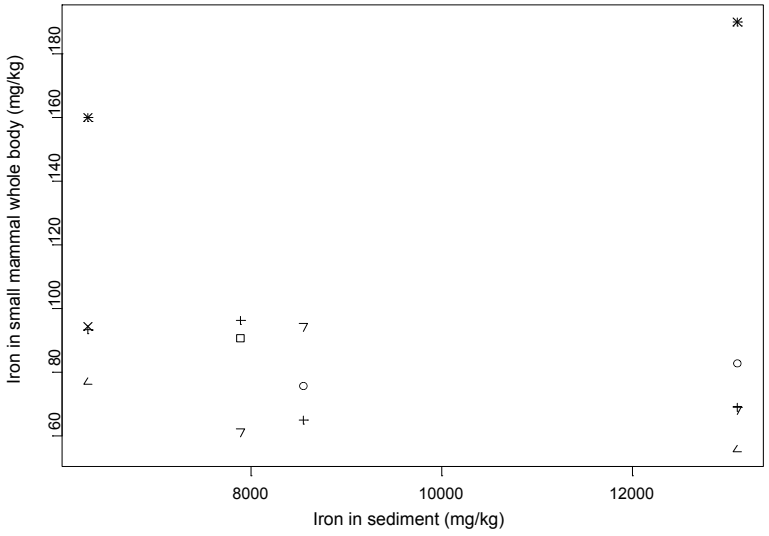


Figure E-2.2-42. Iron in small mammal whole body (as carcass + pelt) versus concentration in sediment

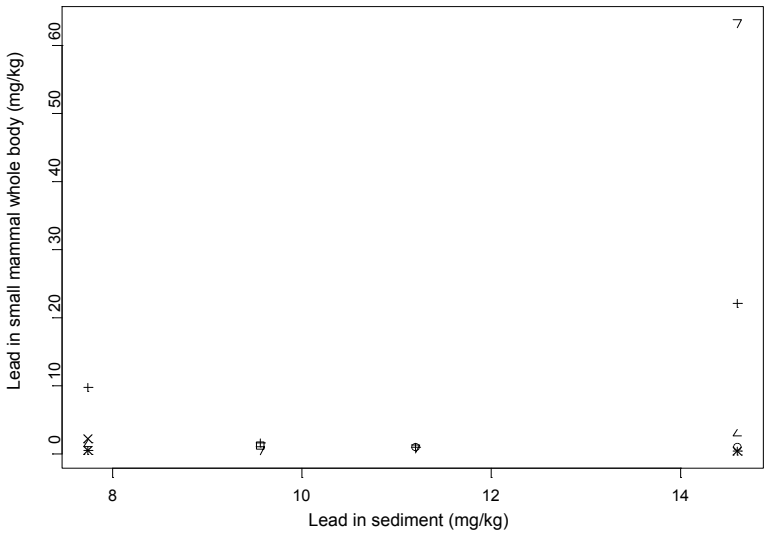


Figure E-2.2-43. Lead in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
7 = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

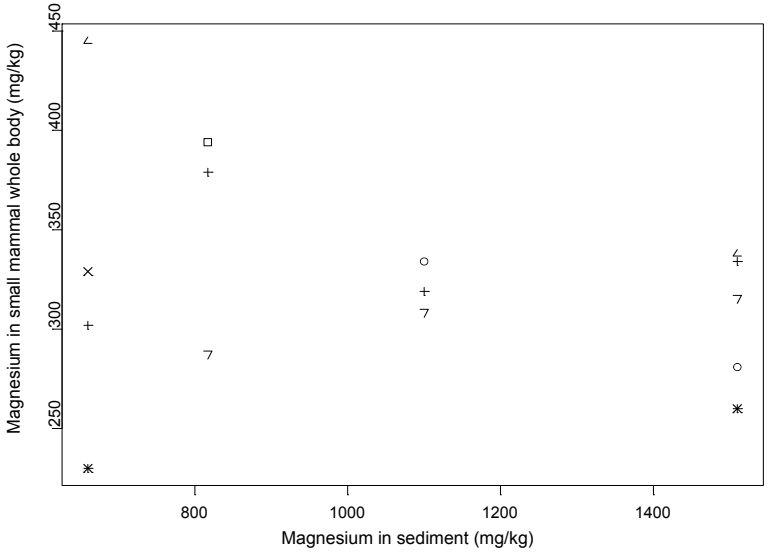


Figure E-2.2-44. Magnesium in small mammal whole body (as carcass + pelt) versus concentration in sediment

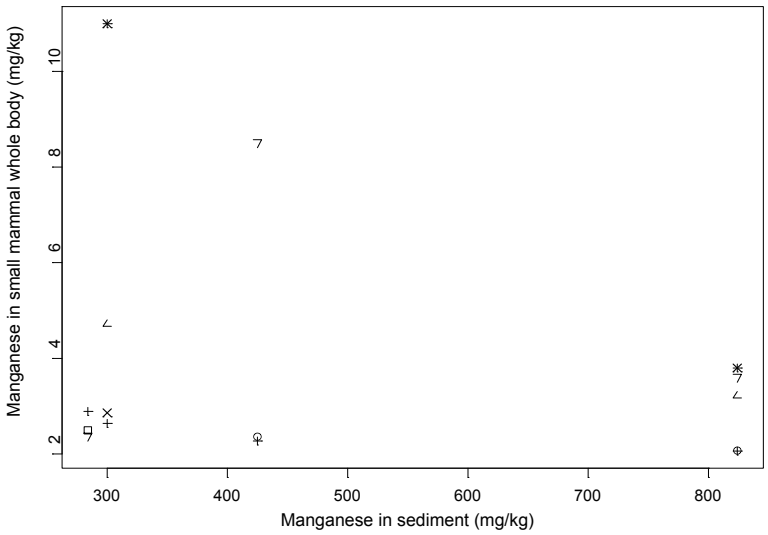


Figure E-2.2-45. Manganese in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

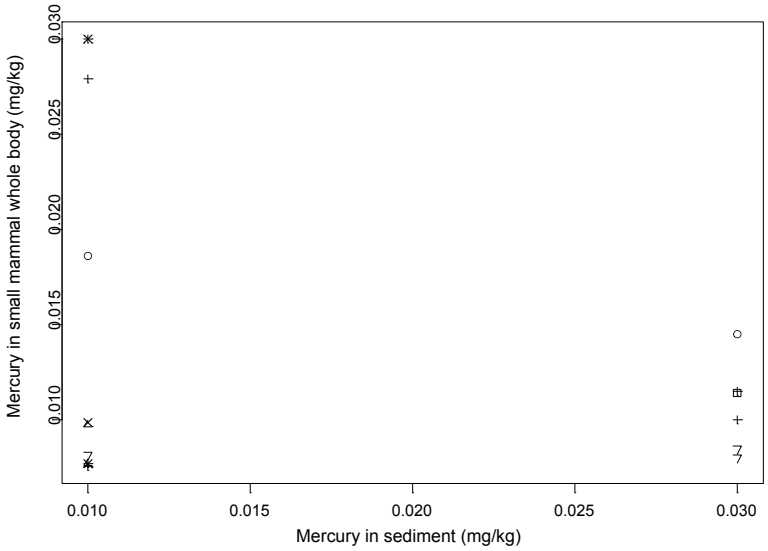


Figure E-2.2-46. Mercury in small mammal whole body (as carcass + pelt) versus concentration in sediment

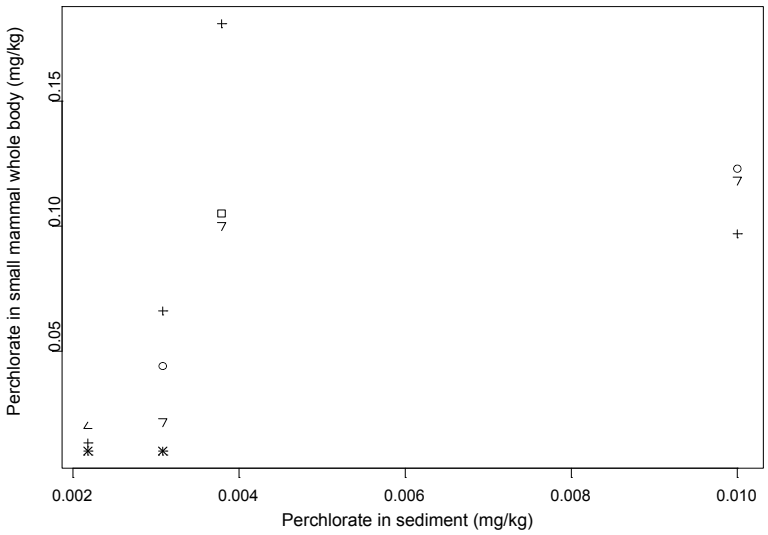


Figure E-2.2-47. Perchlorate in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
7 = Mexican woodrat, ∠ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

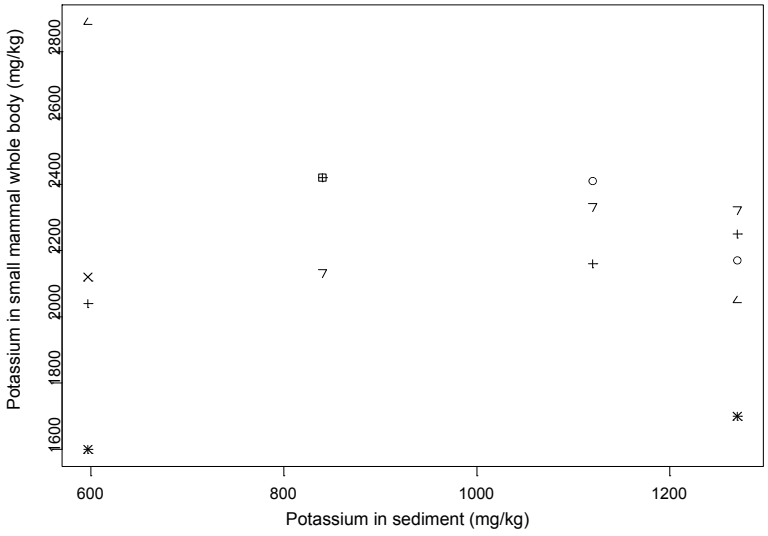


Figure E-2.2-48. Potassium in small mammal whole body (as carcass + pelt) versus concentration in sediment

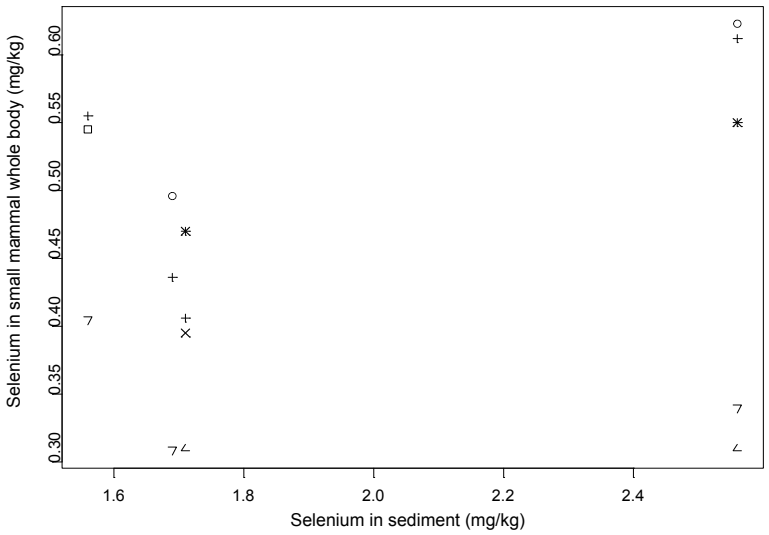


Figure E-2.2-49. Selenium in small mammal whole body (as carcass + pelt) versus concentration in sediment

○ = brush mouse, + = deer mouse, × = pinon mouse,
▽ = Mexican woodrat, ◺ = long tailed vole, □ = western harvest mouse,
✳ = shrew.

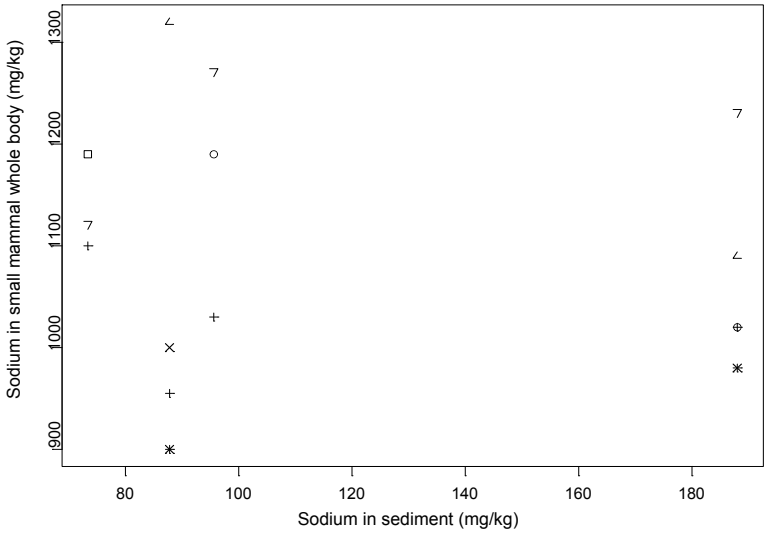


Figure E-2.2-50. Sodium in small mammal whole body (as carcass + pelt) versus concentration in sediment

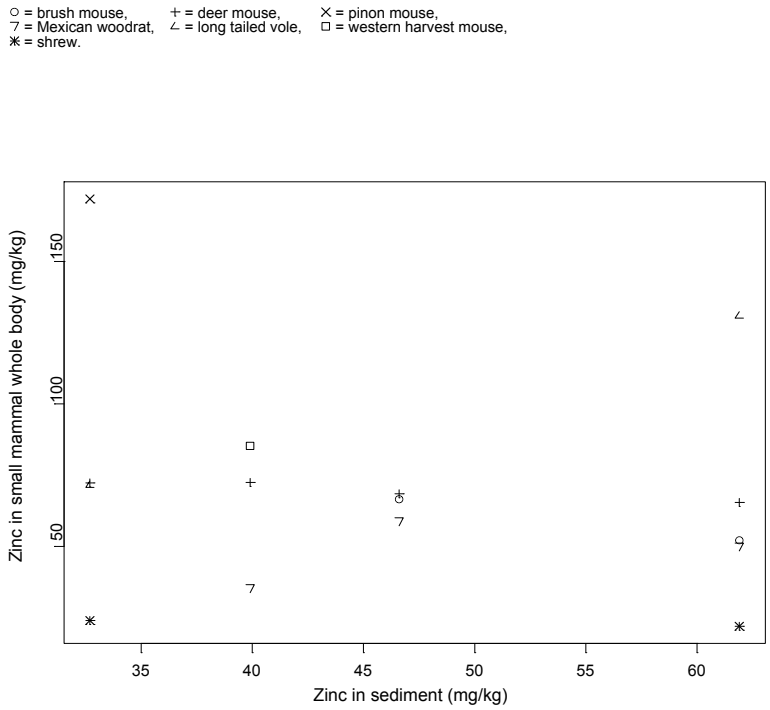


Figure E-2.2-51. Zinc in small mammal whole body (as carcass + pelt) versus concentration in sediment

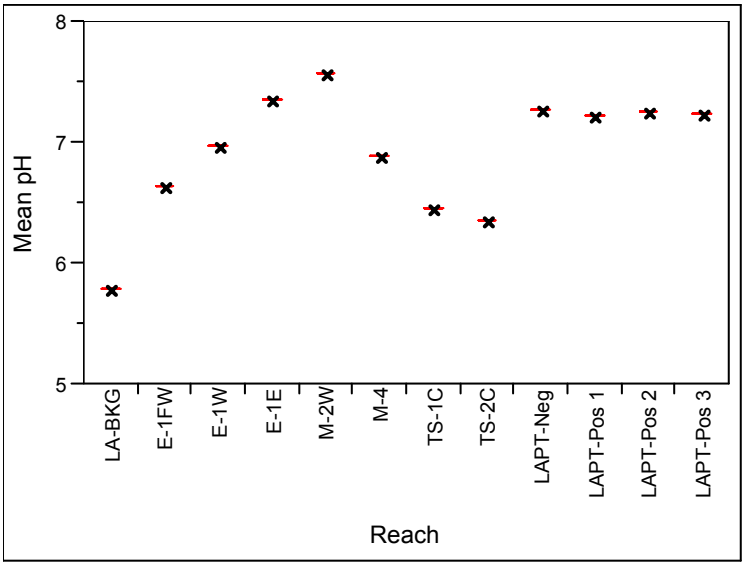


Figure E-2.3-1. Mean pH value by reach for soil samples used in laboratory toxicity tests

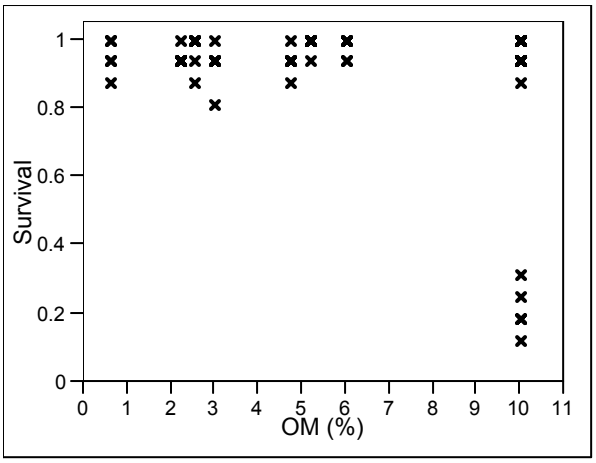


Figure E-2.3-2. Bivariate plot of plant survival in toxicity test versus percent organic matter in soil sample used in test

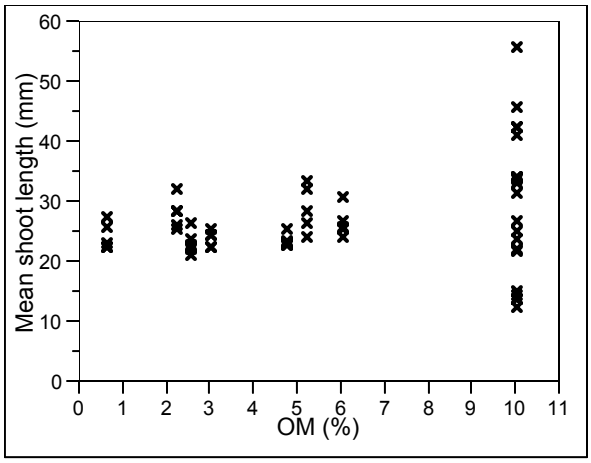


Figure E-2.3-3. Bivariate plot of plant mean shoot length in toxicity test versus percent organic matter in soil sample used in test

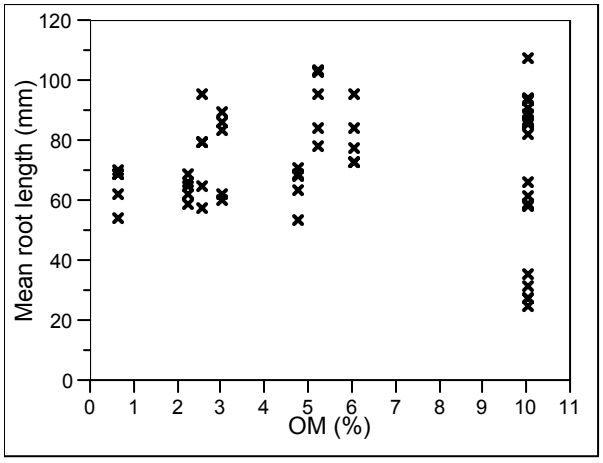


Figure E-2.3-4. Bivariate plot of plant mean root length in toxicity test versus percent organic matter in soil sample used in test

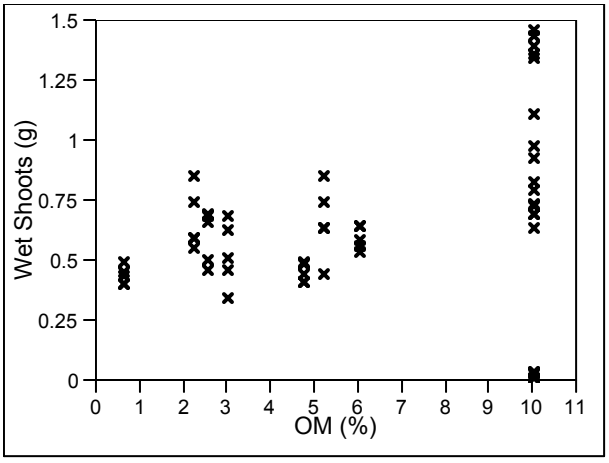


Figure E-2.3-5. Bivariate plot of plant shoot wet weight in toxicity test versus percent organic matter in soil sample used in test

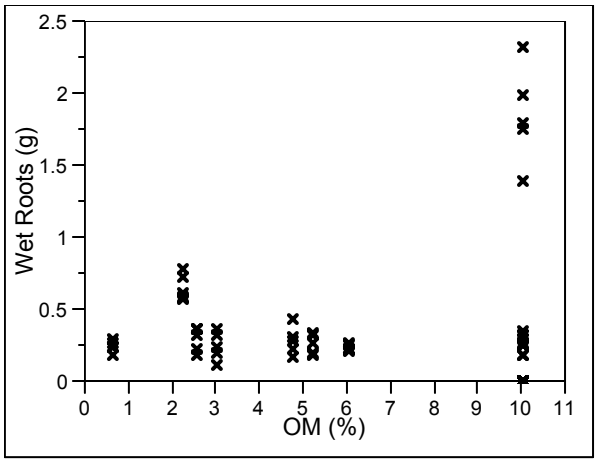


Figure E-2.3-6. Bivariate plot of plant root wet weight in toxicity test versus percent organic matter in soil sample used in test

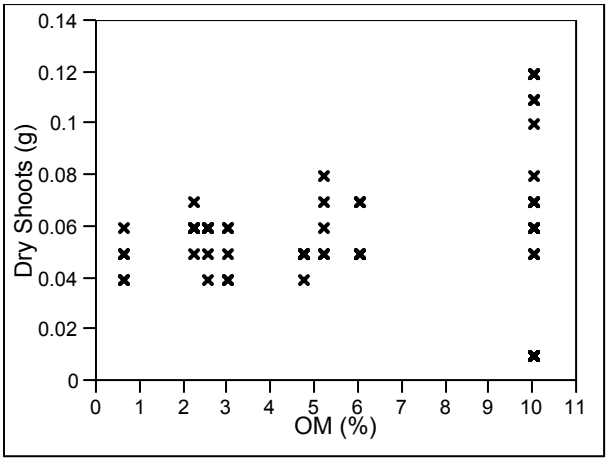


Figure E-2.3-7. Bivariate plot of plant shoot dry weight in toxicity test versus percent organic matter in soil sample used in test

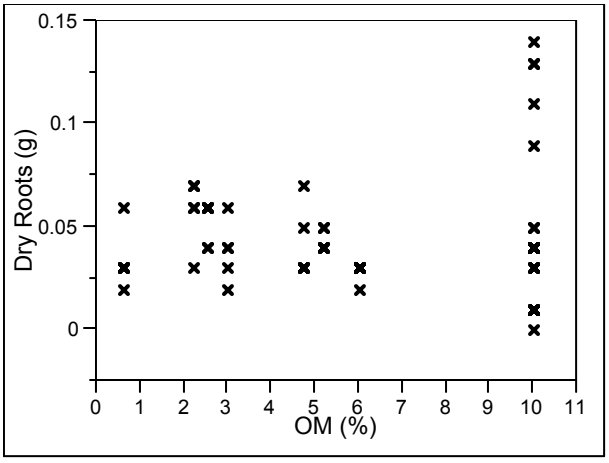


Figure E-2.3-8. Bivariate plot of plant root dry weight in toxicity test versus percent organic matter in soil sample used in test

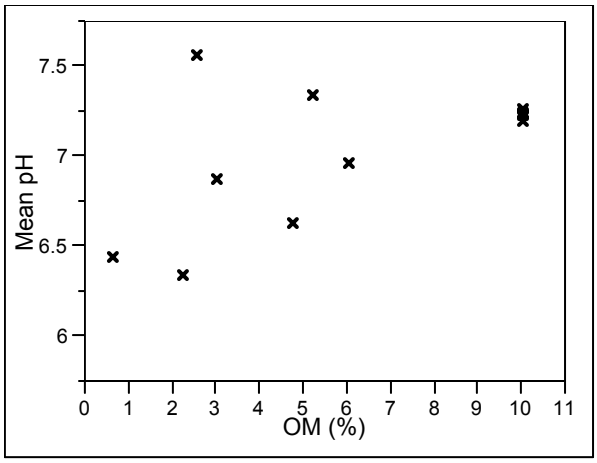


Figure E-2.3-9. Bivariate plot of mean pH of soil sample used in toxicity test versus percent organic matter in soil sample used in test

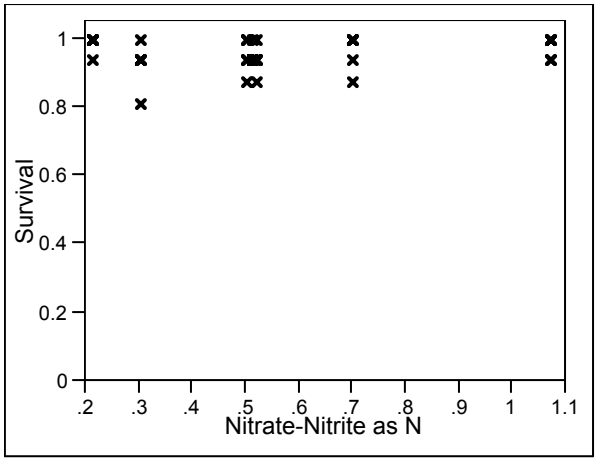


Figure E-2.3-10. Bivariate plot of plant survival in toxicity test versus concentration of nitrate+nitrite in soil sample used in test

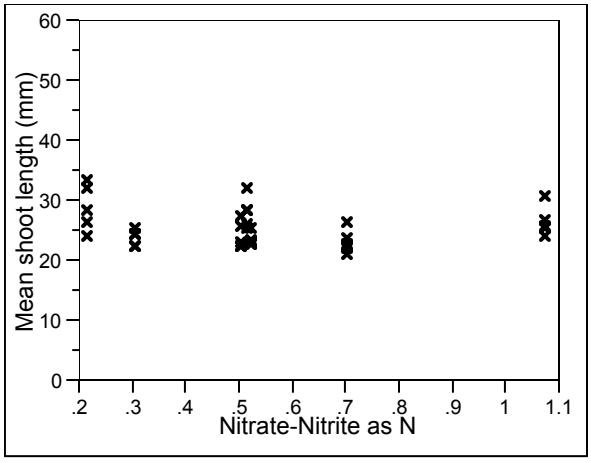


Figure E-2.3-11. Bivariate plot of plant mean shot length in toxicity test versus concentration of nitrate+nitrite in soil sample used in test

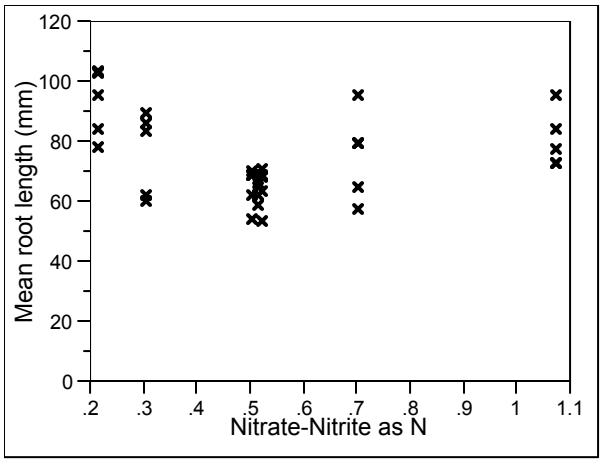


Figure E-2.3-12. Bivariate plot of plant mean root length in toxicity test versus concentration of nitrate+nitrite in soil sample used in test

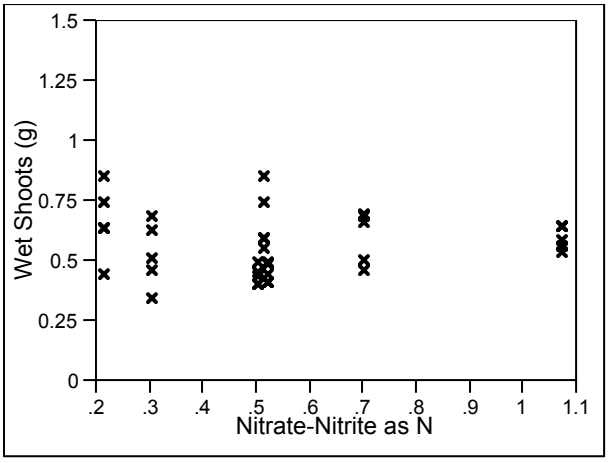


Figure E-2.3-13. Bivariate plot of plant shoot wet weight in toxicity test versus concentration of nitrate+nitrite in soil sample used in test

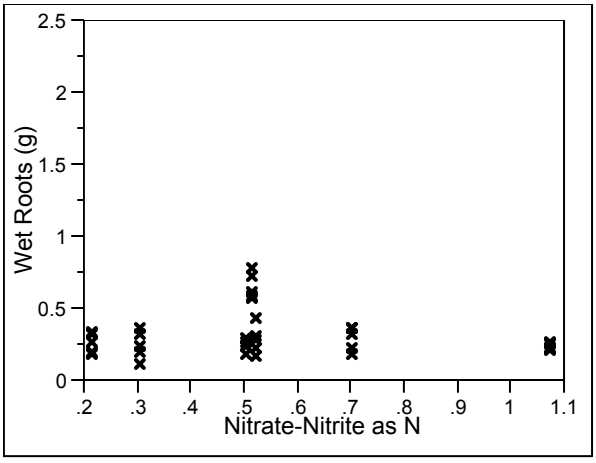


Figure E-2.3-14. Bivariate plot of plant root wet weight in toxicity test versus concentration of nitrate+nitrite in soil sample used in test

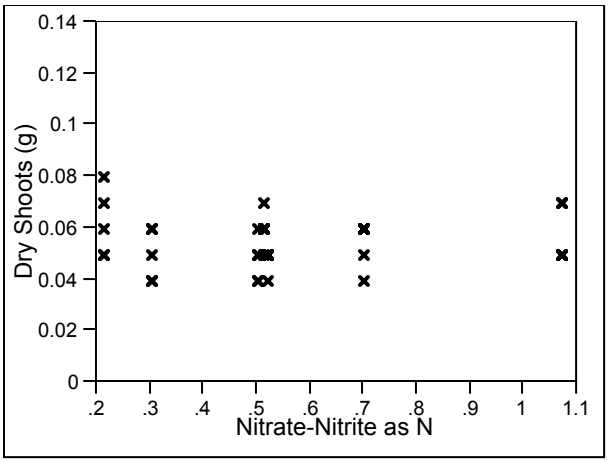


Figure E-2.3-15. Bivariate plot of plant shoot dry weight in toxicity test versus concentration of nitrate+nitrite in soil sample used in test

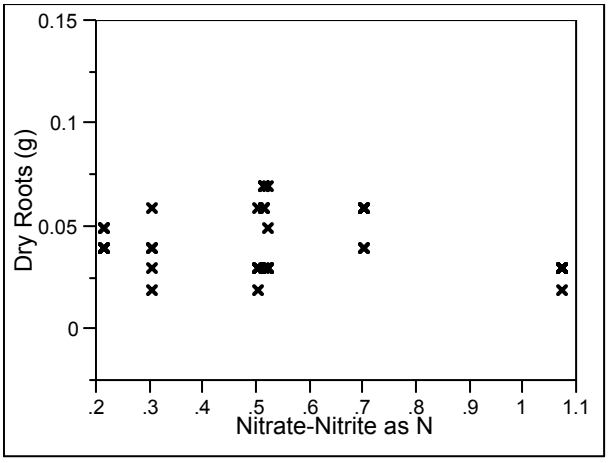


Figure E-2.3-16. Bivariate plot of plant root dry weight in toxicity test versus concentration of nitrate+nitrite in soil sample used in test

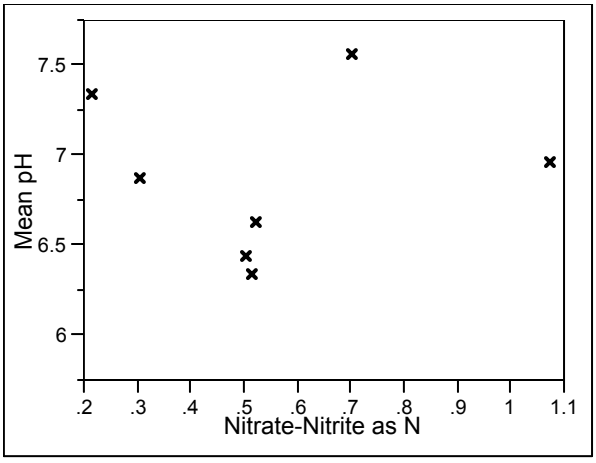


Figure E-2.3-17. Bivariate plot of mean pH in soil used in the toxicity test versus concentration of nitrate+nitrite in soil sample used in test

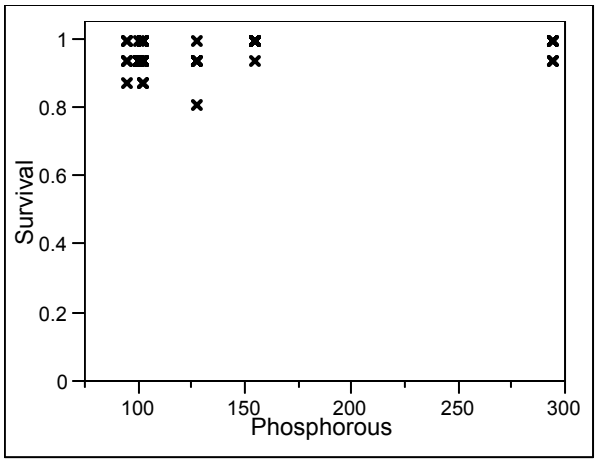


Figure E-2.3-18. Bivariate plot of plant survival in the toxicity test versus concentration of phosphorus in the soil samples used in test

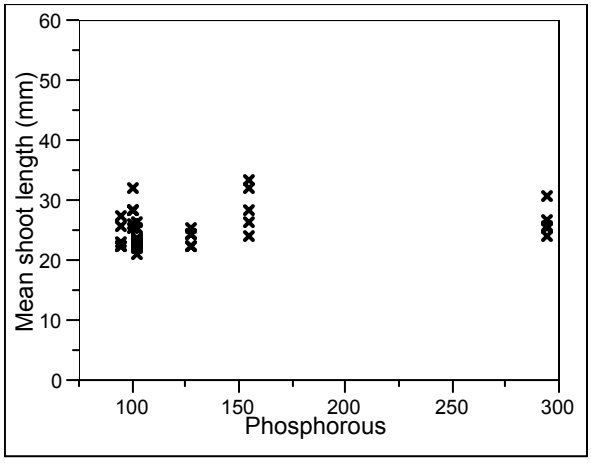


Figure E-2.3-19. Bivariate plot of plant mean shoot length in the toxicity test versus concentration of phosphorus in the soil samples used in test

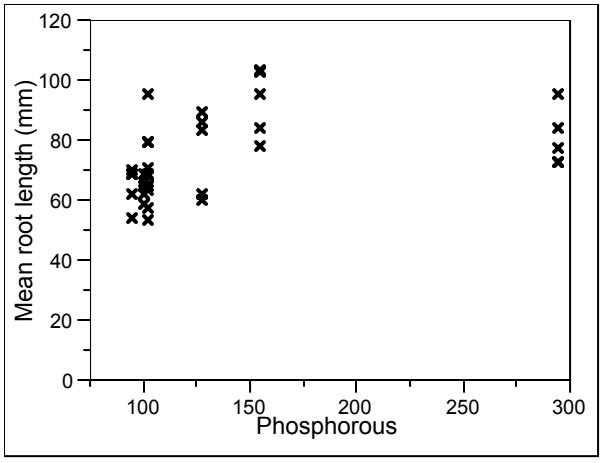


Figure E-2.3-20. Bivariate plot of plant mean root length in the toxicity test versus concentration of phosphorus in the soil samples used in test

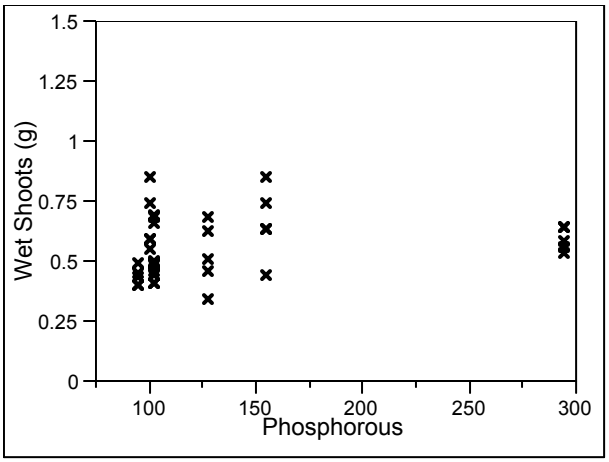


Figure E-2.3-21. Bivariate plot of plant shoot wet weight in the toxicity test versus concentration of phosphorus in the soil samples used in test

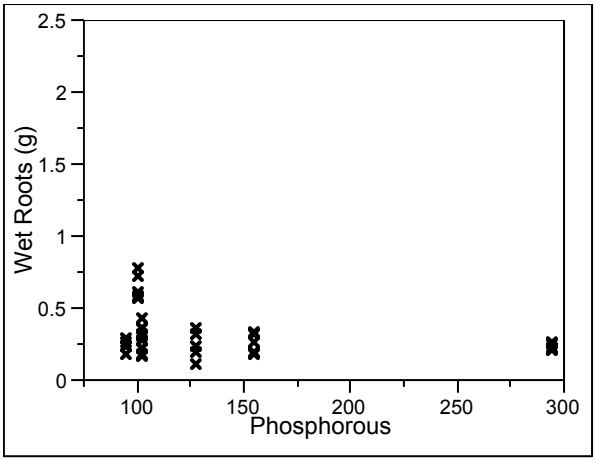


Figure E-2.3-22. Bivariate plot of plant root wet weight in the toxicity test versus concentration of phosphorus in the soil samples used in test

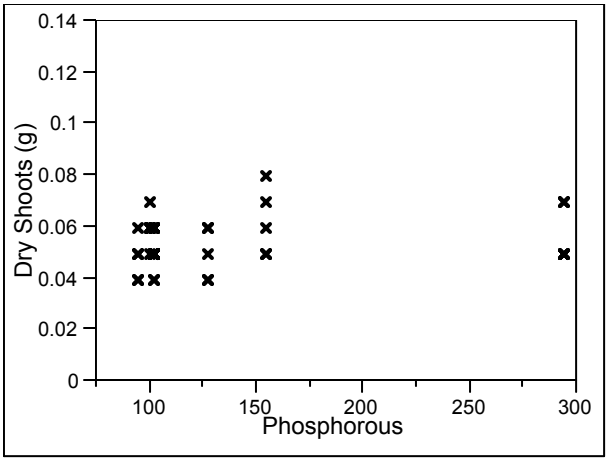


Figure E-2.3-23. Bivariate plot of plant shoot dry weight in the toxicity test versus concentration of phosphorus in the soil samples used in test

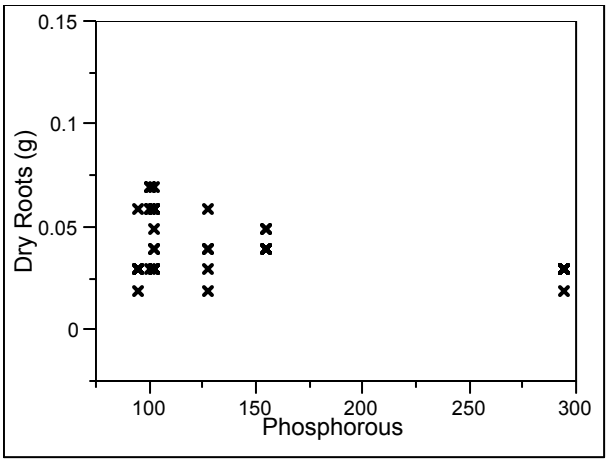


Figure E-2.3-24. Bivariate plot of plant root dry weight in the toxicity test versus concentration of phosphorus in the soil samples used in test

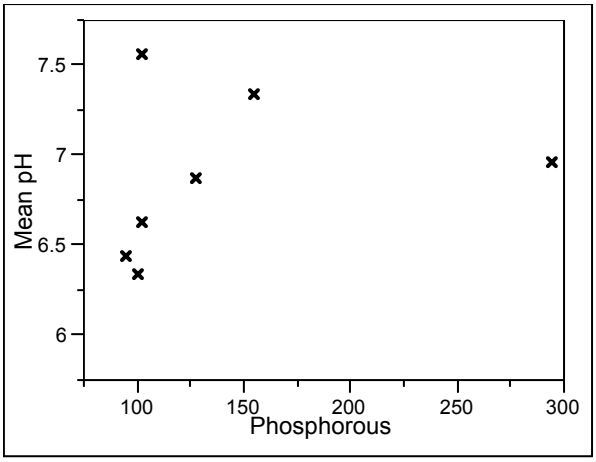


Figure E-2.3-25. Bivariate plot of mean pH of soil samples in the toxicity test versus concentration of phosphorus in the soil samples used in test

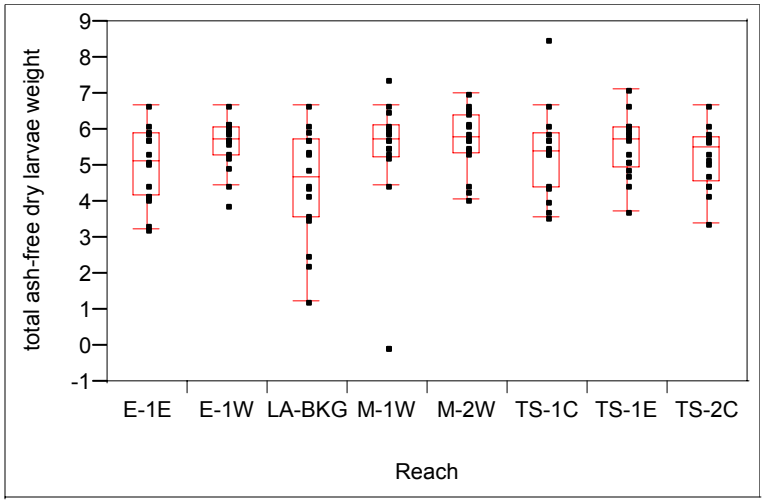


Figure E-2.4-1. Box plot of total ash-free dry larvae weight (in mg) by reach

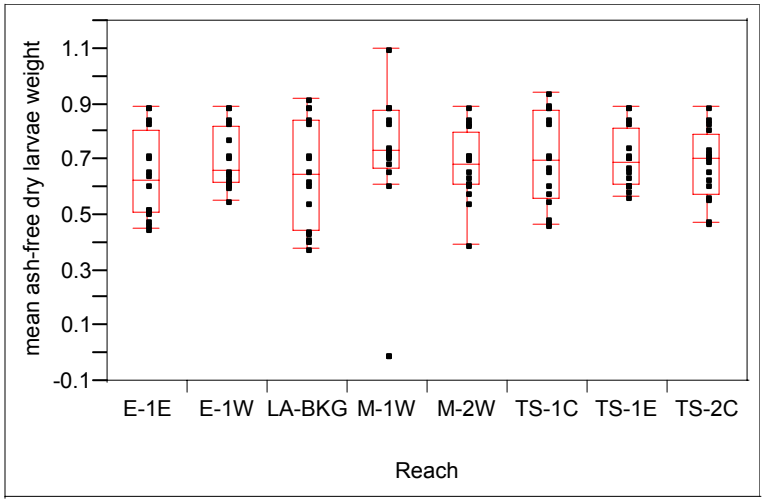


Figure E-2.4-2. Box plot of mean ash-free dry larvae weight (in mg) by reach

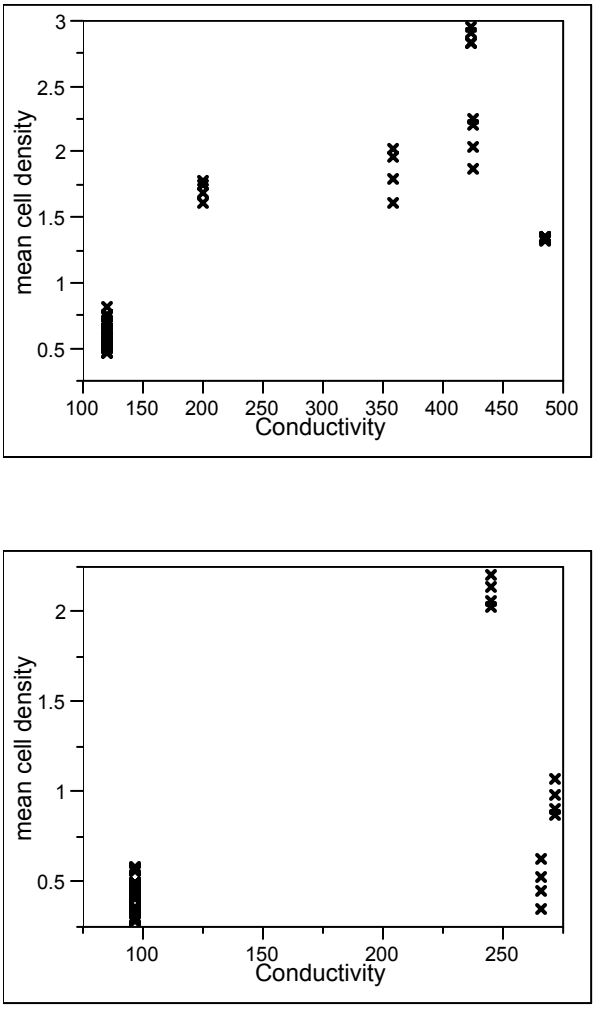


Figure E-2.5-1. Bivariate fit of mean cell density (in millions of cells/mL) by conductivity in July (top panel) and August (bottom panel)

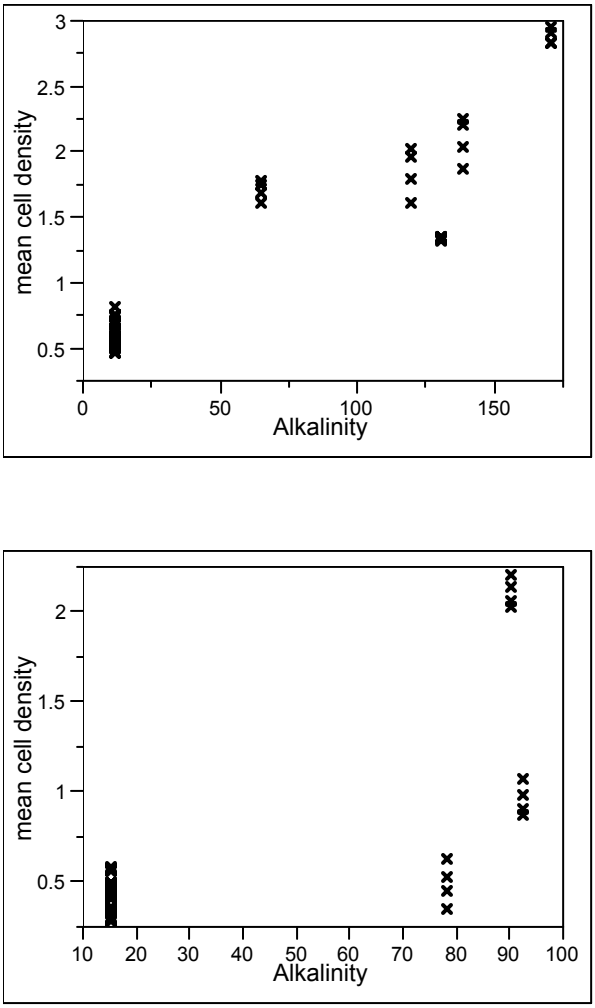


Figure E-2.5-2. Bivariate plot of algal mean cell density (in millions of cells/mL) versus alkalinity for July (top panel) and August (bottom panel)

Table E-1.1-1
Summary of Ecological Screening Levels for COPCs in Sediment or Water

Group	Analyte Code	Analyte Name	Sediment (mg/kg or pCi/g)	Soil (mg/kg or pCi/g)	Water (µg/L or pCi/L)
Inorganic	AL	Aluminum	280	NA	87
Inorganic	SB	Antimony	0.36	0.05	100
Inorganic	AS	Arsenic	12	6.8	150
Inorganic	BA	Barium	48	110	3.8
Inorganic	BE	Beryllium	73	2.5	5.3
Inorganic	B	Boron	10	2	540
Inorganic	CD	Cadmium	0.33	0.27	0.15
Inorganic	CL(-1)	Chloride	-	-	230000
Inorganic	CR	Chromium	56	2.3	77
Inorganic	CR(+6)	Chromium hexavalent ion	8	0.34	11
Inorganic	CO	Cobalt	230	13	3
Inorganic	CU	Copper	17	10	5
Inorganic	CN(-1)	Cyanide (Total)	0.1	0.1	5.2
Inorganic	F(-1)	Fluoride	45	31	1600
Inorganic	FE	Iron	20	-	1000
Inorganic	PB	Lead	27	14	1.2
Inorganic	MN	Manganese	720	50	80
Inorganic	HGI	Mercury	0.018	0.013	0.77
Inorganic	NI	Nickel	39	20	28
Inorganic	ClO4(-1)	Perchlorate	-	-	35000
Inorganic	SE	Selenium	1	0.1	5
Inorganic	AG	Silver	1	0.05	0.36
Inorganic	SR	Strontium	1700	96	620
Inorganic	TL	Thallium	0.044	0.032	18
Inorganic	U	Uranium	1100	25	1.8
Inorganic	V	Vanadium	30	0.025	19
Inorganic	ZN	Zinc	37	10	66
Organic	83-32-9	Acenaphthene	0.62	0.25	23
Organic	67-64-1	Acetone	0.065	1.2	11000
Organic	120-12-7	Anthracene	0.00039	210	0.0013
Organic	11097-69-1	Aroclor-1254	0.031	0.041	0.02
Organic	11096-82-5	Aroclor-1260	0.031	0.14	10
Organic	56-55-3	Benzo(a)anthracene	0.11	3	0.027
Organic	50-32-8	Benzo(a)pyrene	0.35	9.6	0.014
Organic	205-99-2	Benzo(b)fluoranthene	0.24	18	30
Organic	191-24-2	Benzo(g,h,i)perylene	0.29	24	30
Organic	207-08-9	Benzo(k)fluoranthene	0.24	62	30

Table E-1.1-1 (continued)

Group	Analyte Code	Analyte Name	Sediment (mg/kg or pCi/g)	Soil (mg/kg or pCi/g)	Water (µg/L or pCi/L)
Organic	65-85-0	Benzoic Acid	0.065	1	41
Organic	117-81-7	Bis(2-ethylhexyl)phthalate	0.026	0.02	32
Organic	218-01-9	Chrysene	0.5	2.4	30
Organic	206-44-0	Fluoranthene	2.9	22	6.1
Organic	193-39-5	Indeno(1,2,3-cd)pyrene	0.078	62	30
Organic	85-01-8	Phenanthrene	0.85	10	6.3
Organic	129-00-0	Pyrene	0.57	18	30
Organic	127-18-4	Tetrachloroethene	0.23	0.18	120
Organic	108-88-3	Toluene	0.67	23	130
Organic	71-55-6	Trichloroethane[1,1,1-]	0.17	260	62
Organic	79-01-6	Trichloroethene	1.6	42	350
Radionuclide	AM-241	Americium-241	220	44	5.8
Radionuclide	CS-137/ BA-137	Cesium-137	720	680	1100
Inorganic	CO-60	Cobalt-60	210	550	380
Radionuclide	PU-238	Plutonium-238	110	44	19
Radionuclide	PU-239/240	Plutonium-239/240	110	47	20
Radionuclide	RA-226	Radium-226	0.21	8.1	0.1
Radionuclide	SR-90/ Y-90	Strontium-90	150	560	570
Radionuclide	TH-228	Thorium-228	290	43	5.9
Radionuclide	TH-230	Thorium-230	120	52	6.8
Radionuclide	TH-232	Thorium-232	15	6.2	0.81
Radionuclide	H-3	Tritium	660000	36000	160000000
Radionuclide	U-234	Uranium-234	620	51	22
Radionuclide	U-238	Uranium-238	690	55	24

Table E-1.1-2
Key Ecological Effects for Mammals

COPEC	Ecological Effect Type			
	Reproduction/ Development	Survival	Growth	Other
Aluminum (soil)				Soil pH
Aluminum (sediment)	X			
Arsenic	X	X	X	
Cadmium	X	X	X	
Copper	X			
Manganese	X			
Thallium	X			
Vanadium	X	X	X	
Aroclor-1254 (non-carnivore)	X	X	X	
Aroclor-1254 (carnivore)	X			
Aroclor-1260 (non-carnivore)	X	X	X	
Aroclor-1260 (carnivore)	X			
Chrysene				Tumor growth
Naphthalene			X	
Cesium-137				0.1 rad/d

Table E-1.1-3
Key Ecological Effects for Birds

COPEC	Ecological Effect Type			
	Reproduction/ Development	Survival	Growth	Other
Aluminum (soil)				Soil pH
Aluminum (sediment)	X			
Barium	X	X		
Cadmium	X		X	
Copper	X	X		
Lead	X	X	X	
Mercury (inorganic)	X			
Silver	X			
Vanadium	X	X	X	
Zinc	X	X	X	
Cyanide (total)		X		
Aroclor-1254	X			
Bis-2-ethylhexylphthalate	X			
Di-n-butyl-phthalate	X			
Cesium-137				0.1 rad/d

Table E-1.1-4
Key Ecological Effects for Terrestrial Plants

COPEC	Ecological Effect Type			
	Reproduction/ Development	Survival	Growth	Other
Barium	X	X	X	
Chromium (total)	X*			
Hexavalent Chromium (Cr[VI])	X			
Copper	X			
Manganese			X	
Selenium	X			
Silver	X			
Thallium	X			
Vanadium				Unspecified phytotoxicity
Zinc	X			
Acenaphthene	X			
Endrin Aldehyde				Post harvest fruit character

*Based on Cr (VI) toxicity and assumed 1/6 ratio of Cr (VI) to Cr (III).

Table E-1.1-5
Key Ecological Effects for Terrestrial Invertebrates

COPEC	Ecological Effect Type			
	Reproduction/ Development	Survival	Growth	Other
Chromium (total)	X[a]	X*		
Hexavalent Chromium	X	X		
Copper	X			
Mercury (inorganic)	X			
Americium-241				0.1 rad/d
Plutonium-239				0.1 rad/d

*Based on Cr (VI) toxicity and assumed 1/6 ratio of Cr (VI) to Cr (III).

Table E-1.1-6
Key Ecological Effects for Aquatic Community Organisms in Water

COPEC	Ecological Effect Type
Aluminum	NRWQC CCC[a]
Barium	Tier II SCV[b]
Cadmium	NRWQC CCC
Cobalt	Tier II SCV
Copper	NRWQC CCC
Cyanide (total)	NRWQC CCC
Iron	NRWQC CCC
Lead	NRWQC CCC
Manganese	Tier II SCV
Silver	Tier II SCV
Zinc	NRWQC CCC
Americium-241	0.1 rad/d
Radium-226	0.1 rad/d

[a] EPA National Recommended Water Quality Criteria (NRWQC) Criterion Continuous Concentration (CCC).

[b] Tier II Secondary Chronic Value.

Table E-1.1-7
Key Ecological Effects for Aquatic Community Organisms in Sediment

COPEC	Ecological Effect Type
Barium	Apparent Effects Threshold (AET)
Copper	Sediment Effects Threshold minus the Threshold Effects Level (SEC-TEL)
Mercury (inorganic)	EPA Region 6 Sediment Screening Value (Region 6 SSV)
Silver	Effects Range Low (ERL)
Acenaphthene	Sediment Quality Criterion (SQC)
Anthracene	Sediment Quality Benchmark (SQB)
Aroclor-1260	Sediment Effect Concentration (SEC)
Chlordane (alpha)	Effects Range Low (ERL)
Chlordane (gamma)	Effects Range Low (ERL)
Dibenz(a,h)anthracene	Sediment Effect Concentration-Effects Range Medium (SEC-ERM)
DDT	Effects Range Low (ERL)
Fluorene	Sediment Quality Benchmark (SQB)
Iron	Lowest freshwater Effects Level (EL)
Methylnaphthalene [2-]	Sediment Quality Benchmark (SQB)
Naphthalene	Sediment Quality Benchmark (SQB)

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Table E-2.1-1
Regression between Concentrations in Eggs Collected from Western Bluebird Boxes and Concentrations in Soil

Analyte	Regression Equation	Intercept	Slope	n	r^2	p-value
Barium	Egg = -0.236 + 0.0189 * Soil	-0.236	0.0189	13	0.146	0.198
Calcium	Egg = 4720 + -1.77 * Soil	4720	-1.77	13	0.0853	0.333
Copper	Egg = 0.635 + -0.00371 * Soil	0.635	-0.00371	13	0.101	0.289
Iron	Egg = 7.31 + 0.00224 * Soil	7.31	0.00224	13	0.14	0.207
Magnesium	Egg = 86.5 + 0.00459 * Soil	86.5	0.00459	13	0.000677	0.933
Manganese	Egg = 0.155 + 0.00105 * Soil	0.155	0.00105	13	0.189	0.138
Potassium	Egg = 1460 + -0.11 * Soil	1460	-0.11	13	0.00444	0.829
Selenium	Egg = 0.541 + -0.0933 * Soil	0.541	-0.0933	13	0.136	0.215
Sodium	Egg = 1510 + 1.52 * Soil	1510	1.52	13	0.0347	0.542
Zinc	Egg = 9.26 + 0.0705 * Soil	9.26	0.0705	13	0.0203	0.642

Table E-2.1-2
Regression Equations between Metals in Insects Collected from Bird Boxes and Metals in Soil

Analyte	Regression Equation	Intercept	Slope	n	D	r^2	p-value
Aluminum	Insect = 289 + -0.0257 * Soil	289	-0.0257	10	8	0.0871	0.408
Antimony	Insect = -0.0101 + 0.176 * Soil	-0.0101	0.176	10	8	0.148	0.272
Arsenic	Insect = 0.48 + -0.042 * Soil	0.48	-0.042	10	3	0.0173	0.717
Barium	Insect = 101 + -1.1 * Soil	101	-1.1	10	10	0.197	0.198
Beryllium	Insect = 0.382 + -0.321 * Soil	0.382	-0.321	10	0	0.0286	0.64
Cadmium	Insect = -0.0453 + 1.55 * Soil	-0.0453	1.55	10	8	0.568	0.0118
Calcium	Insect = 35900 + -17.9 * Soil	35900	-17.9	10	10	0.556	0.0133
Chromium	Insect = 0.944 + -0.000792 * Soil	0.944	-0.00079	10	1	0.00937	0.79
Cobalt	Insect = 1.34 + -0.372 * Soil	1.34	-0.372	10	1	0.13	0.305
Copper	Insect = 27.7 + 0.238 * Soil	27.7	0.238	10	10	0.0297	0.634
Iron	Insect = 284 + -0.00429 * Soil	284	-0.00429	10	10	0.00159	0.913
Lead	Insect = 0.684 + -0.00626 * Soil	0.684	-0.00626	10	8	0.0024	0.893
Magnesium	Insect = 1370 + -0.463 * Soil	1370	-0.463	10	10	0.0234	0.673
Manganese	Insect = 97 + -0.158 * Soil	97	-0.158	10	10	0.119	0.329
Nickel	Insect = 2.85 + -0.445 * Soil	2.85	-0.445	10	1	0.0951	0.386
Potassium	Insect = 600 + 3.2 * Soil	600	3.2	10	10	0.0362	0.599
Selenium	Insect = 0.384 + -0.0868 * Soil	0.384	-0.0868	10	10	0.0322	0.62
Silver	Insect = 0.0503 + 0.0547 * Soil	0.0503	0.0547	10	8	0.00855	0.799
Sodium	Insect = 1820 + -7.03 * Soil	1820	-7.03	10	10	0.136	0.295
Thallium	Insect = -0.0162 + 0.278 * Soil	-0.0162	0.278	10	0	0.113	0.342
Vanadium	Insect = 1.65 + -0.0666 * Soil	1.65	-0.0666	10	1	0.057	0.507
Zinc	Insect = 175 + -1.57 * Soil	175	-1.57	10	10	0.0505	0.533

Note: Shaded p values indicate a significant correlation between tissue and soil.

Table E-2.2-1
Regressions between Analytes Detected in
Small Mammal Carcasses and Analytes Detected in Soil

Analyte	Regression Equation	Intercept	Slope	N	R2	p-value
Aluminum	Mammal carcass = 50.6 + -0.00417 * Soil	50.6	-0.00417	13	0.395	0.0215
Americium-241	Mammal carcass = 0.00708 + 0.000251 * Soil	0.00708	0.000251	13	0.221	0.105
Aroclor-1260	Mammal carcass = 0.0633 + 0.651 * Soil	0.0633	0.651	13	0.0507	0.459
Arsenic	Mammal carcass = 0.204 + 0.000506 * Soil	0.204	0.000506	13	0.000544	0.94
Barium	Mammal carcass = 7.77 + 4.5e-005 * Soil	7.77	4.50E-05	13	1.30E-07	0.999
Chromium	Mammal carcass = 2.7 + -0.0734 * Soil	2.7	-0.0734	13	0.0232	0.619
Copper	Mammal carcass = 2.64 + -0.0583 * Soil	2.64	-0.0583	13	0.117	0.252
Iron	Mammal carcass = 113 + -0.00363 * Soil	113	-0.00363	13	0.327	0.0411
Lead	Mammal carcass = -19.5 + 2.38 * Soil	-19.5	2.38	13	0.197	0.129
Magnesium	Mammal carcass = 432 + -0.0612 * Soil	432	-0.0612	13	0.194	0.132
Manganese	Mammal carcass = 3.94 + -0.00123 * Soil	3.94	-0.00123	13	0.021	0.636
Mercury	Mammal carcass = 0.0104 + -0.0327 * Soil	0.0104	-0.0327	13	0.0108	0.736
Perchlorate	Mammal carcass = 0.0102 + 3.81 * Soil	0.0102	3.81	13	0.374	0.0264
Potassium	Mammal carcass = 2670 + -0.296 * Soil	2670	-0.296	13	0.0927	0.312
Selenium	Mammal carcass = 0.373 + 0.0233 * Soil	0.373	0.0233	13	0.00893	0.759
Sodium	Mammal carcass = 1190 + -0.578 * Soil	1190	-0.578	13	0.0457	0.483
Zinc	Mammal carcass = 101 + -0.63 * Soil	101	-0.63	13	0.0489	0.468

Note: Shaded p values indicate a significant correlation between tissue and soil.

Table E-2.2-2
Regressions between Analytes Detected in Small Mammal Pelts and Analytes Detected in Soil

Analyte	Regression Equation	Intercept	Slope	N	R2	p-value
Aluminum	Mammal pelt = 27.5 + 0.000538 * Soil	27.5	0.000538	13	0.0164	0.677
Americium-241	Mammal pelt = 0.00634 + 0.00361 * Soil	0.00634	0.00361	11	0.531	0.0109
Aroclor-1260	Mammal pelt = 0.0979 + 0.424 * Soil	0.0979	0.424	11	0.000444	0.951
Arsenic	Mammal pelt = 0.202 + 0.0418 * Soil	0.202	0.0418	13	0.315	0.0458
Barium	Mammal pelt = 2.15 + 0.0006 * Soil	2.15	0.0006	13	0.0252	0.604
Chromium	Mammal pelt = 0.822 + 0.0813 * Soil	0.822	0.0813	13	0.0559	0.437
Copper	Mammal pelt = 2.37 + 0.00418 * Soil	2.37	0.00418	13	0.000248	0.959
Iron	Mammal pelt = 49.8 + 0.00254 * Soil	49.8	0.00254	13	0.178	0.151
Lead	Mammal pelt = -56.9 + 6.74 * Soil	-56.9	6.74	13	0.264	0.0726
Magnesium	Mammal pelt = 170 + -0.0119 * Soil	170	-0.0119	13	0.00772	0.775
Manganese	Mammal pelt = 1.91 + 0.00111 * Soil	1.91	0.00111	13	0.128	0.231
Mercury	Mammal pelt = 0.0314 + -0.46 * Soil	0.0314	-0.46	13	0.0519	0.454
Perchlorate	Mammal pelt = 0.18 + 37.8 * Soil	0.18	37.8	11	0.157	0.228
Potassium	Mammal pelt = 1610 + 0.136 * Soil	1610	0.136	13	0.0184	0.659
Selenium	Mammal pelt = 0.4 + 0.0897 * Soil	0.4	0.0897	13	0.0723	0.374
Sodium	Mammal pelt = 1020 + 0.632 * Soil	1020	0.632	13	0.0618	0.413
Zinc	Mammal pelt = 137 + -0.645 * Soil	137	-0.645	13	0.0158	0.682

Note: Shaded p values indicate a significant correlation between tissue and soil.

Table E-2.2-3
Regressions Between Analytes Detected in
Small Mammal Whole Bodies and Analytes Detected in Soil

Analyte	Regression Equation	Intercept	Slope	N	R2	p-value
Aluminum	Mammal whole body = 50.5 + -0.00337 * Soil	50.5	-0.00337	15	0.214	0.0828
Americium-241	Mammal whole body = 0.0067 + 0.000769 * Soil	0.0067	0.000769	12	0.632	0.002
Aroclor-1260	Mammal whole body = 0.12 + -4.47 * Soil	0.12	-4.47	13	0.0424	0.5
Arsenic	Mammal whole body = 0.203 + 0.00466 * Soil	0.203	0.00466	15	0.0366	0.495
Barium	Mammal whole body = 6.78 + -0.0029 * Soil	6.78	-0.0029	15	0.000808	0.92
Chromium	Mammal whole body = 2.08 + -0.032 * Soil	2.08	-0.032	15	0.00664	0.773
Copper	Mammal whole body = 2.5 + -0.0372 * Soil	2.5	-0.0372	15	0.0621	0.371
Iron	Mammal whole body = 97.9 + -0.000681 * Soil	97.9	-0.00068	15	0.00285	0.85
Lead	Mammal whole body = -18.5 + 2.33 * Soil	-18.5	2.33	15	0.162	0.137
Magnesium	Mammal whole body = 363 + -0.0366 * Soil	363	-0.0366	15	0.0616	0.372
Manganese	Mammal whole body = 4.92 + -0.00229 * Soil	4.92	-0.00229	15	0.0476	0.434
Mercury	Mammal whole body = 0.0159 + -0.175 * Soil	0.0159	-0.175	15	0.0603	0.378
Perchlorate	Mammal whole body = 0.0235 + 10 * Soil	0.0235	10	13	0.321	0.0436
Potassium	Mammal whole body = 2290 + -0.0891 * Soil	2290	-0.0891	15	0.00675	0.771
Selenium	Mammal whole body = 0.356 + 0.0485 * Soil	0.356	0.0485	15	0.0385	0.483
Sodium	Mammal whole body = 1140 + -0.377 * Soil	1140	-0.377	15	0.0237	0.584
Zinc	Mammal whole body = 96.1 + -0.563 * Soil	96.1	-0.563	15	0.0315	0.527

Note: Shaded p values indicate a significant correlation between tissue and soil.

Table E-3.1-1
Parameters Used to Calculate Chemical Soil-Screening Levels

Parameters	Residential Values[a]	Recreational Values[b] (Adult Trail User)
Target HQ	1	1
Target cancer risk	10-5	10-5
Averaging time (carcinogen)	70 yr x 365 days	70 yr x 365 days
Averaging time (noncarcinogen)	ED[c] x 365 days	ED x 365 days
Skin absorption factor	SVOC = 0.1	SVOC = 0.1
	Chemical-specific	Chemical-specific
Adherence factor–child	0.2 mg/cm^2	n/a[d]
Body weight–child	15 kg (0–6 years of age)	n/a
Cancer slope factor–oral (chemical-specific)	mg/kg-day^{-1}	mg/kg-day^{-1}
Cancer slope factor–inhalation (chemical-specific)	mg/kg-day^{-1}	mg/kg-day^{-1}
Exposure frequency	350 day/yr	200 event/yr
Exposure duration–child	6 yr (0–6 years of age)	n/a
Age-adjusted ingestion factor	114 mg-yr/kg-day	n/a
Age-adjusted inhalation factor	11 m^3-yr/kg-day	n/a
Inhalation rate–child	10 m^3/day	n/a
Soil ingestion rate–child	200 mg/day	n/a
Particulate emission factor	6.61 x 10^9 m^3/kg	6.61 x 10^9 m^3/kg
Reference dose–oral (chemical-specific)	mg/kg-day	mg/kg-day
Reference dose–inhalation (chemical-specific)	mg/kg-day	mg/kg-day
Exposed surface area–child	2800 cm^2/day (head, hands, forearms, lower legs, feet)	n/a
Age-adjusted skin contact factor for carcinogens	361 mg-yr/kg-day	n/a
Volatilization factor for soil (chemical-specific)	m^3/kg	m^3/kg
Body weight–adult	70 kg	70 kg
Exposure duration	30 yr[e]	30 yr
Adherence factor–adult	0.07 mg/cm^2	0.2 mg/cm^2
Soil ingestion rate–adult	100 mg/day	25.6 mg/event
Exposed surface area–adult	5700 cm^2/day (head, hands, forearms, lower legs)	3525 cm^2 (head, hands, forearms, lower legs)
Inhalation rate–adult	20 m^3/day	1.6 m^3/hr
Event time	n/a	1 hr

[a] Parameter values from NMED 2005, 90802.

[b] Parameter values from LANL 2004, 87800.

[c] ED = Exposure duration.

[d] n/a = Not applicable.

[e] Exposure duration for lifetime resident is 30 yr. For carcinogens, the exposures are combined for child (6 yr) and adult (24 yr).

Table E-3.1-2
Parameters Used in the
Screening-Level Calculations for Radionuclides, Recreational (Adult Trail User)

Parameters	Construction Worker, Adult
Inhalation rate (m^3/yr)	14,035[a]
Mass loading (g/m^3)	1.5x10-7[b]
Outdoor time fraction	0.0228[c]
Indoor time fraction	0
Soil ingestion (g/yr)	225[d]
Surface water ingestion	0.2 l/event
Surface water exposure frequency	20 event/yr

[a] Calculated as [1.6 $m^{3/}$h × 200 h/yr] / [indoor + outdoor time fractions], where 1.6 m^3/h is the adult inhalation rate for moderate activity (EPA 1997, 66596, Table 5-23).

[b] Calculated as (1 / 6.6 × 10+9 m^3/kg) × 1000 g/kg, where 6.6 × 10+9 m^3/kg is the particulate emission factor used for residential and industrial scenarios (NMED 2004, 85615).

[c] Calculated as (1 h/d × 200 d/yr) / 8766 h/yr, where 1 hr/day is the exposure time for a recreational adult or child (LANL 2005, 88494).

[d] Calculated as [(0.1 g/d / 3.9 h/d) × 200 h/yr)] / [indoor + outdoor time fractions], where 3.9 h/d is the time-weighted average for "doers" across ages 12–44 (EPA 1997, 66598, Table 15-10, data are from a key activity pattern study for adults), and where 0.1 g/y is the adult soil ingestion rate (NMED 2004, 85615).

Table E-3.1-3
Parameters Used to Calculate Chemical Surface-Water Screening Levels

Parameters	Recreational (Adult Trail User) Values[a]
Target HQ	1
Target cancer risk	10-5
Averaging time (carcinogen)	70 yr x 365 days
Averaging time (noncarcinogen)	ED x 365 days
Skin absorption factor	SVOC = 0.1
	Chemical-specific
Cancer slope factor–oral (chemical-specific)	mg/kg-day^{-1}
Cancer slope factor–inhalation (chemical-specific)	mg/kg-day^{-1}
Reference dose–oral (chemical-specific)	mg/kg-day
Reference dose–inhalation (chemical-specific)	mg/kg-day
Body weight–adult	70 kg
Surface Water Ingestion	0.2 l/event
Exposure frequency	20 event/yr
Exposure duration	30 yr
Averaging Time	30 yr
Exposed surface area	2130 cm2
Exposure Time	1 hr/d
Exposure Frequency	20 d/yr

[a] Parameter values from LANL 2004, 87390.

[b] ED = Exposure duration.

Table E-3.1-4
Parameters Used in the Screening Level Calculations for Radionuclides, Residential

Parameters	Residential, Child	Residential, Adult
Inhalation rate (m^3/yr)	3652.5[a]	7305[b]
Mass loading (g/m^3)	1.5 x 10^{-7}[c]	1.5 x 10^{-7}[c]
Outdoor time fraction	0.2236[d]	0.0599[e]
Indoor time fraction	0.7347[f]	0.8984[g]
Soil ingestion (g/yr)	73[h]	36.5[i]

[a] Calculated as [10 m^3/day x 350 day/yr] / [indoor + outdoor time fractions], where 10 m^3/day is the daily inhalation rate of a child (NMED 2005, 90802).

[b] Calculated as [20 m^3/day x 350 day/yr] / [indoor + outdoor time fractions], where 20 m^3/day is the daily inhalation rate of an adult (NMED 2005, 90802).

[c] Calculated as [1/ 6.6 x 10^{+9} m^3/kg) x 1000 g/kg, where 6.6 x 10^{+9} m^3/kg is the particulate emission factor (NMED 2005, 90802).

[d] Calculated as [5.6 hr/day x 350 day/yr] / 8766 hr/yr, where 5.6 hr/day is an estimate of time spent outdoors for a 3-11 yr old child (EPA 1997, 66598, Section 15.4-1).

[e] Calculated as [1.5 hr/day x 350 day/yr] / 8766 hr/yr, where 1.5 hr/day is an estimate of time spent outdoors for an adult 12 yr and older (EPA 1997, 66598, Section 15.4-1).

[f] Calculated as [(24-5.6 hr/day x 350 day/yr] / 8766 hr/yr.

[g] Calculated as [(24-1.5 hr/day x 350 day/yr] / 8766 hr/yr.

[h] Calculated as [0.2 g/day x 350 day/yr] / [indoor + outdoor time fractions], where 0.2 g/day is the child soil ingestion rate (NMED 2005, 90802).

[i] Calculated as [0.1 g/day x 350 day/yr] / [indoor + outdoor time fractions], where 0.1 g/day is the adult soil ingestion rate (NMED 2005, 90802).

Table E-3.1-5
Toxicity Values for COPCs for which Chemical Screening Values Were Calculated

Chemical	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Reference	Reference Dose Oral (mg/kg-day)	Reference	Reference Dose Inhalation (mg/kg-day)	Reference	Reference Dose Dermal (mg/kg-day)
Aluminum	na[a]	n/a	1.00E+00	PPRTV[b]	1.40E-03	PPRTV	1.00E+00
Mercury	na	n/a	3.00E-04	IRIS[c]	8.60E-05	IRIS	2.10E-05
Aroclor-1260	2	IRIS	na	n/a[d]	na	n/a	na

[a] na = Not available.

[b] PPRTV = Provisional peer-reviewed toxicity value.

[c] IRIS = Integrated Risk Information System.

[d] n/a = Not applicable.

Table E-3.1-6
Toxicity Values for Radionuclide COPCs
for which Screening Levels Were Calculated

Radionuclide	Ingestion Dose Conversion Factor (mrem/pCi)	Reference
Cesium-137	0.00005	RESRAD 6.3
Plutonium-238	0.0032	RESRAD 6.3
Potassium-40	1.86E-05	RESRAD 6.3
Radium-226	0.00132	RESRAD 6.3
Tritium	0.000000064	RESRAD 6.3

Table E-3.3-1
Area weighted UCLs for Sediment

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
E-1E	Americium-241	78.634	36.05	3	1	5	0.19	LogNormal	17.7	6.2323	60.875	31	30	642
					2	8	0.604			6.0344	123.67			
					4	18	0.205			151.96	254150			
E-1E	Arsenic	1.8486	1.6772	3	1	5	0.19	Normal	27.59	2.01	0.1837	32	31	6.1
					2	9	0.604			1.1305	0.0937			
					4	18	0.205			2.9778	2.1324			
E-1E	Cesium-137	487.36	186.79	3	1	5	0.19	LogNormal	17.14	6.4144	49.732	31	31	2530
					2	8	0.604			9.1423	253.53			
					4	18	0.205			876.43	12740000			
E-1E	Cobalt-60	0.7261	0.3323	3	1	5	0.19	LogNormal	11.23	0.084981	0.015104	31	16	4.35
					2	8	0.604			0.35713	1.0203			
					4	18	0.205			0.48838	0.65775			
E-1E	Lead	9.6317	8.3673	3	1	5	0.1902	nonparametric	19.63	8.5998	3.2366	32	32	50
					2	9	0.6044			6.1967	7.6771			
					4	18	0.2054			14.538	85.929			
E-1E	Mercury	0.21669	0.1205	3	1	5	0.19	LogNormal	17.59	0.0190	0.0002	32	29	2.7
					2	9	0.604			0.0148	0.0006			
					4	18	0.205			0.52547	1.2978			
E-1E	Manganese	309.09	271.84	3	1	5	0.19	Normal	26.3	319.4	4866.8	32	32	1700
					2	9	0.604			188.78	2155.2			
					4	18	0.205			472.22	151230			
E-1E	Plutonium-238	15.818	9.4569	3	1	5	0.19	LogNormal	13.08	7.7651	163.85	31	30	88.7
					2	8	0.604			6.3678	127.22			
					4	18	0.205			20.111	2523.9			
E-1E	Plutonium-239	73.445	34.177	3	1	5	0.19	LogNormal	17.16	3.116	11.631	31	30	1110
					2	8	0.604			4.4473	68.567			
					4	18	0.205			150.39	216190			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
E-1E	Sodium-22	0.1362	0.0656	3	1	5	0.1902	nonparametric	10.55	0.0343	0.0020	31	3	0.49
					2	8	0.6044			0.0705	0.0311			
					4	18	0.2054			0.0799	0.0420			
E-1E	Strontium-90	13.809	8.2762	3	1	5	0.1902	nonparametric	17.01	0.3357	0.0395	31	19	273
					2	8	0.6044			0.2217	0.0456			
					4	18	0.2054			39.324	4313			
E-1E	Thallium	0.1361	0.0942	3	1	5	0.19	LogNormal	22.58	0.0403	0.0003	32	6	1.6
					2	9	0.604			0.0633	0.0042			
					4	18	0.205			0.2350	0.1814			
E-1E	Uranium	4.14	2.632	1	all data	5	1	Normal	4	2.6320	3.07477	5	5	4.14
E-1E	Tritium	0.9634	0.5814	2	C	4	0.604	LogNormal	10.26	0.4397	0.2606	15	8	2.4
					F	11	0.396			0.7979	1.4647			
E-1FW	Aluminum	10611	8004	2	1	11	0.717	Normal	10.24	9943.6	43977000	16	16	21300
					2	5	0.283			3096	1572200			
E-1FW	Aroclor-1254	0.1398	0.1111	1	all data	8	1	Normal	7	0.1111	0.0018	8	5	0.16
E-1FW	Arsenic	7.3929	5.6298	2	1	11	0.717	Normal	10.67	6.9773	19.838	16	16	16.6
					2	5	0.283			2.22	1.9906			
E-1FW	Benzo(a)pyrene	0.1796	0.1229	2	1	11	0.717	Normal	10.18	0.15907	0.0208	16	11	0.5
					2	5	0.283			0.0313	0.0006			
E-1FW	Chromium	810.5	452.91	2	1	11	0.717	LogNormal	10.02	609.33	833410	16	16	2210
					2	5	0.283			57.108	1153.4			
E-1FW	Copper	129.97	79.415	2	1	11	0.717	LogNormal	10.01	107.04	16655	16	16	383
					2	5	0.283			9.5161	13.167			
E-1FW	Iron	11246	9876.6	2	1	11	0.717	Normal	11.22	11563	11731000	16	16	18300
					2	5	0.283			5610	2212700			
E-1FW	Lead	29.812	24.078	2	1	11	0.717	Normal	10.22	30.464	212.83	16	16	56.8
					2	5	0.283			7.92	6.9498			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
E-1FW	Manganese	486.19	379.86	2	1	11	0.717	LogNormal	12.8	411.07	68675	16	16	1040
					2	5	0.283			300.88	24222			
E-1FW	Vanadium	25.753	19.888	2	1	11	0.717	Normal	10.06	25.236	223.82	16	16	53.1
					2	5	0.283			6.354	1.8976			
E-1W	Aluminum	9331.7	7819.9	2	1	18	0.963	LogNormal	17.01	8061.8	14657000	22	22	19000
					2	4	0.0371			1532.4	721660			
E-1W	Arsenic	4.169	3.3112	2	1	18	0.963	LogNormal	17	3.4066	4.7197	22	21	11
					2	4	0.0371			0.8306	0.0871			
E-1W	Cesium-137	1.3698	0.81755	2	C	4	0.0371	Normal	6.001	0.16	0.0205	11	7	2.14
					F	7	0.963			0.8429	0.6097			
E-1W	Chromium	17.992	13.894	2	1	18	0.963	LogNormal	17	14.345	107.73	22	22	50
					2	4	0.0371			2.1786	0.6670			
E-1W	Iron	12314	10751	2	1	18	0.963	LogNormal	17.05	11014	15671000	22	22	25000
					2	4	0.0371			3911.9	3608600			
E-1W	Manganese	932.85	642.5	2	1	18	0.963	LogNormal	17	663.63	540770	22	22	2500
					2	4	0.0371			93.413	1871			
E-1W	Plutonium-239	30.1	2.1937	1	all data	8	1	LogNormal	7	2.1937	33.4801	8	7	30.1
E-1W	Uranium	3.3943	2.084	1	all data	5	1	Normal	4	2.0840	1.88888	5	5	4.32
E-1W	Vanadium	17.358	14.82	2	1	18	0.963	LogNormal	17.02	15.221	41.296	22	22	30
					2	4	0.0371			4.4077	4.9296			
M-1E	Aluminum	15579	12972	2	1	15	0.896	Normal	14.25	13927	40702000	21	21	26000
					2	6	0.104			4781.7	10809000			
M-1E	Arsenic	5.2648	4.509	2	1	15	0.896	LogNormal	14.7	4.8257	3.3895	21	21	8.4
					2	6	0.104			1.7928	2.2725			
M-1E	Iron	15129	13660	2	1	15	0.896	Normal	14.82	14496	12726000	21	21	21000
					2	6	0.104			6490	11352000			
M-1E	Manganese	893.6	714.48	2	1	15	0.896	LogNormal	14.89	764.46	192240	21	21	1640
					2	6	0.104			285.86	82365			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-1E	Vanadium	25.91	22.561	2	1	15	0.896	Normal	14.42	24.087	66.868	21	21	37
					2	6	0.104			9.4767	29.723			
M-1W	Arsenic	2.9559	2.3785	2	1	7	0.826	Normal	6.106	2.5929	0.90256	16	14	4.4
					2	9	0.174			1.3577	0.23227			
M-1W	Benzo(a)anthracene	1.2095	0.6249	2	1	7	0.826	Normal	6	0.74692	0.92757	16	10	2.71
					2	9	0.174			0.0440	0.0011			
M-1W	Benzo(a)pyrene	1.0553	0.5403	2	1	7	0.826	LogNormal	6.001	0.64285	0.71974	16	8	2.11
					2	9	0.174			0.0518	0.0019			
M-1W	Benzo(b)fluoranthene	1.2739	0.5687	2	1	7	0.826	LogNormal	6.001	0.67832	1.3498	16	7	2.51
					2	9	0.174			0.0469	0.0021			
M-1W	Indeno(1,2,3-cd)pyrene	0.4299	0.1904	2	1	7	0.826	LogNormal	6.001	0.2257	0.1557	16	5	1.23
					2	9	0.174			0.0225	0.0004			
M-2E	Americium-241	23.982	17.323	4	1	3	0.04468	nonparametric	21.18	15.044	10.652	36	34	211
					2	6	0.5423			4.7342	3.3328			
					3	7	0.1403			15.732	240.56			
					5	20	0.2727			43.55	3802.1			
M-2E	Cesium-137	98.113	81.947	4	1	3	0.04468	nonparametric	22.31	36.203	32.978	36	36	557
					2	6	0.5423			12.98	17.479			
					3	7	0.1403			64.418	2462.5			
					5	20	0.2727			235.6	21765			
M-2E	Cobalt-60	0.194	0.1668	4	1	3	0.04468	nonparametric	17.36	0.23927	0.01127	36	20	0.47
					2	6	0.5423			0.16156	0.0023			
					3	7	0.1403			0.15033	0.0249			
					5	20	0.2727			0.1737	0.0154			
M-2E	Plutonium-238	16.073	12.864	4	1	3	0.04468	nonparametric	20.48	9.4886	7.194	36	36	113
					2	6	0.5423			3.8072	0.44716			
					3	7	0.1403			7.3024	37.982			
					5	20	0.2727			34.289	896.97			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-2E	Plutonium-239	22.737	17.567	4	1	3	0.04468	nonparametric	21.56	11.749	4.174	36	36	157
					2	6	0.5423			6.7443	1.0734			
					3	7	0.1403			13.534	198.88			
					5	20	0.2727			42.115	2268.4			
M-2E	Strontium-90	3.1602	2.7663	4	1	3	0.04468	nonparametric	21.68	1.7147	0.0298	36	35	20
					2	6	0.5423			0.7648	0.0151			
					3	7	0.1403			2.8573	1.0261			
					5	20	0.2727			6.8718	13.154			
M-2W	Americium-241	41.502	24.688	4	1	7	0.584	LogNormal	41.34	7.1366	14.946	53	47	524
					2	4	0.049			17.05	2.0376			
					3	16	0.239			44.756	23511			
					5	26	0.128			70.171	23932			
M-2W	Antimony	0.2853	0.2551	4	1	7	0.5839	nonparametric	15.1	0.2135	0.0036	48	25	0.65
					2	4	0.04896			0.1824	0.0231			
					3	16	0.2392			0.3619	0.0245			
					5	21	0.128			0.2730	0.0227			
M-2W	Aroclor-1260	0.040373	0.025077	2	C	7	0.584	LogNormal	15.52	0.0111	0.0001	21	9	0.21
					F	14	0.416			0.0448	0.0059			
M-2W	Arsenic	1.6971	1.5455	4	1	8	0.584	Normal	13.12	0.8390	0.1225	54	51	4.3
					2	4	0.049			2.115	0.1167			
					3	16	0.239			2.6875	0.5052			
					5	26	0.128			2.4165	0.3963			
M-2W	Cesium-137	64.061	54.577	4	1	7	0.5839	nonparametric	39.88	17.167	76.369	53	53	850
					2	4	0.04896			30.489	31.341			
					3	16	0.2392			53.735	1367.3			
					5	26	0.128			235.99	36644			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-2W	Cobalt-60	0.4799	0.31505	4	1	7	0.5839	nonparametric	11.74	0.2385	0.0257	53	33	2.45
					2	4	0.04896			0.3091	0.0168			
					3	16	0.2392			0.4837	1.9576			
					5	26	0.128			0.35161	0.30977			
M-2W	Iron	6626.1	6164.3	4	1	8	0.584	LogNormal	8.305	4049.6	1313800	54	54	14000
					2	4	0.049			8879.9	885760			
					3	16	0.239			9369.4	1302600			
					5	26	0.128			8783.1	1715100			
M-2W	Lead	8.5311	8.0198	4	1	8	0.5839	nonparametric	13.15	4.2298	1.3891	54	54	18
					2	4	0.04896			11.249	1.4431			
					3	16	0.2392			13.737	5.851			
					5	26	0.128			13.389	4.0223			
M-2W	Plutonium-238	28.113	15.216	4	1	7	0.584	LogNormal	19.44	5.4566	1.4597	53	51	203
					2	4	0.049			11.727	31.019			
					3	16	0.239			27.247	14835			
					5	26	0.128			38.589	4179.1			
M-2W	Plutonium-239	41.92	24.119	4	1	7	0.584	LogNormal	15.98	7.7192	7.2918	53	53	596
					2	4	0.049			11.635	4.1461			
					3	16	0.239			51.309	28088			
					5	26	0.128			52.899	5023.4			
M-2W	Strontium-90	3.5971	3.0123	4	1	7	0.584	LogNormal	45.62	1.0175	0.2968	53	51	35.9
					2	4	0.049			1.3085	0.3990			
					3	16	0.239			3.945	9.8843			
					5	26	0.128			11.02	113.1			
M-2W	Thallium	0.1009	0.0868	4	1	8	0.5839	nonparametric	32.52	0.0551	0.0006	54	12	0.8
					2	4	0.04896			0.0977	0.0017			
					3	16	0.2392			0.0972	0.0024			
					5	26	0.128			0.2077	0.0537			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-2W	Uranium-238	1.5645	1.0699	2	C	6	0.58	nonparametric	13.31	0.5317	0.0167	20	20	10.7
					F	14	0.42			1.8132	6.1367			
M-3	Americium-241	27.795	20.917	5	1	7	0.04356	nonparametric	31.59	17.449	97.271	76	70	223
					2	8	0.05603			4.8822	3.8117			
					4	24	0.3427			37.361	2826.6			
					5	25	0.4895			7.0657	106.64			
					6	12	0.06823			53.065	4108.5			
M-3	Aroclor-1260	0.1483	0.0698	1	all data	15	1	LogNormal	14	0.0698	0.0059	15	13	0.39
M-3	Arsenic	1.9829	1.8303	5	1	7	0.04356	nonparametric	25.2	1.8768	0.8678	65	65	4
					2	8	0.05603			0.8527	0.1488			
					4	17	0.3427			2.406	0.9069			
					5	22	0.4895			1.5257	0.1003			
					6	11	0.06823			1.8969	0.7915			
M-3	Cesium-137	81.557	72.188	5	1	7	0.04356	nonparametric	54.97	48.311	557.89	76	76	298
					2	8	0.05603			12.301	14.102			
					4	24	0.3427			94.412	2764.6			
					5	25	0.4895			49.686	1551.5			
					6	12	0.06823			186.41	7219			
M-3	Cobalt-60	0.16838	0.1276	5	1	7	0.04356	nonparametric	29.67	0.18918	0.0114	74	43	1.47
					2	8	0.05603			0.12159	0.0023			
					4	23	0.3427			0.21229	0.0962			
					5	24	0.4895			0.06317	0.0073			
					6	12	0.06823			0.1301	0.0227			
M-3	Plutonium-238	9.3315	7.9833	5	1	7	0.04356	nonparametric	53.93	8.4417	24.184	76	74	40.9
					2	8	0.05603			3.18	0.3653			
					4	24	0.3427			11.291	56.287			
					5	25	0.4895			4.3309	33.601			
					6	12	0.06823			21.223	115.32			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-3	Plutonium-239	25.558	18.154	5	1	7	0.0436	LogNormal	31.48	15.58	94.256	76	76	123
					2	8	0.056			8.119	3.4127			
					4	24	0.343			31.385	3617.1			
					5	25	0.489			7.2338	83.355			
					6	12	0.0682			39.925	1441.9			
M-3	Strontium-90	3.9094	3.5116	5	1	7	0.04356	nonparametric	35.74	2.8065	1.3425	76	71	8.6
					2	8	0.05603			0.93856	0.30114			
					4	24	0.3427			3.651	1.9093			
					5	25	0.4895			3.4558	4.6366			
					6	12	0.06823			5.774	3.2364			
M-4	Americium-241	9.5533	7.703	7	1	8	0.07573	nonparametric	29.51	14.44	62.145	63	57	112
					2	8	0.009624			0.9503	0.5485			
					3	7	0.007844			50.7	1132.3			
					5	4	0.01778			16.489	164.18			
					6	16	0.1368			16.736	264.04			
					7	17	0.7366			4.8518	25.229			
					10	5	0.0156			2.9684	0.9752			
M-4	Arsenic	2.1703	1.9217	7	1	8	0.0757	LogNormal	19.81	2.5411	2.3717	63	62	4.6
					2	8	0.00962			0.74645	0.1000			
					3	7	0.00784			2.7478	1.0151			
					5	4	0.0178			1.6749	0.0612			
					6	14	0.137			2.3487	1.0318			
					7	17	0.737			1.8208	0.4746			
					10	5	0.0156			1.5203	0.2432			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-4	Cesium-137	28.739	23.794	7	1	8	0.07573	nonparametric	27.4	30.92	212.7	63	63	276
					2	8	0.009624			2.5159	3.0927			
					3	7	0.007844			88.357	4837.6			
					5	4	0.01778			48.618	12.489			
					6	16	0.1368			72.918	4897.6			
					7	17	0.7366			13.005	77.86			
					10	5	0.0156			20.354	273.18			
M-4	Cobalt-60	0.0796	0.0532	7	1	7	0.07573	nonparametric	36.75	0.1724	0.0482	62	14	0.44
					2	8	0.009624			0.0126	0.0002			
					3	7	0.007844			0.1030	0.0194			
					5	4	0.01778			0.1457	0.0434			
					6	16	0.1368			0.1200	0.0949			
					7	17	0.7366			0.0271	0.0026			
					10	5	0.0156			0.0158	0.0002			
M-4	Plutonium-238	3.2901	2.6886	7	1	8	0.07573	nonparametric	28.89	5.5087	9.44	65	64	32.2
					2	8	0.009624			0.57	0.1967			
					3	7	0.007844			9.8543	19.52			
					5	4	0.01778			5.91	1.3517			
					6	16	0.1368			8.0375	70.73			
					7	17	0.7366			1.3076	1.1142			
					10	5	0.0156			1.342	0.7532			
M-4	Strontium-90	3.5221	2.8795	7	1	8	0.07573	nonparametric	18.08	1.3705	0.5579	63	59	9.64
					2	8	0.009624			0.42687	0.1630			
					3	7	0.007844			7.716	3.2147			
					5	4	0.01778			5.1498	3.3238			
					6	16	0.1368			4.8765	36.521			
					7	17	0.7366			2.5866	2.9345			
					10	5	0.0156			3.023	4.4364			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
TS-1C	Antimony	0.4931	0.4654	2	1	13	0.8704	nonparametric	13.48	0.4662	0.0040	19	3	0.63
					2	6	0.1296			0.4606	0.0054			
TS-1C	Aroclor-1260	0.4694	0.2866	2	1	13	0.87	LogNormal	12	0.3253	0.1805	19	18	1.3
					2	6	0.13			0.0271	0.0003			
TS-1C	Benzo(a)anthracene	0.6304	0.2843	2	1	13	0.87	LogNormal	12	0.3218	0.6471	19	11	1.86
					2	6	0.13			0.0321	0.0017			
TS-1C	Benzo(a)pyrene	0.50253	0.2689	2	1	13	0.87	LogNormal	12.01	0.3015	0.2947	19	13	2.04
					2	6	0.13			0.0503	0.0045			
TS-1C	Benzo(b)fluoranthene	0.7012	0.3363	2	1	13	0.87	LogNormal	12.01	0.37902	0.71929	19	8	2.53
					2	6	0.13			0.0495	0.0027			
TS-1C	Cesium-137	1.9247	0.83	1	all data	4	1	Normal	3	0.8300	0.8655	4	3	2.19
TS-1C	Indeno(1,2,3-cd)pyrene	0.3339	0.1667	2	1	13	0.8704	nonparametric	12.01	0.18688	0.15086	19	10	1.45
					2	6	0.1296			0.0314	0.0009			
TS-1C	Iron	10627	9093.1	2	1	13	0.87	Normal	16.98	8960	9183100	19	19	28800
					2	6	0.13			9986.7	86474000			
TS-1C	Plutonium-238	23.529	12.1	2	1	13	0.87	LogNormal	12	13.664	705.35	18	18	314.07
					2	5	0.13			1.593	6.1448			
TS-1C	Plutonium-239	8.6642	4.679	2	1	13	0.8704	nonparametric	12.01	5.2876	85.777	18	18	35.19
					2	5	0.1296			0.59188	0.41094			
TS-1C	Thallium	0.1139	0.1029	2	1	13	0.87	LogNormal	12.36	0.1041	0.0006	19	8	0.18
					2	6	0.13			0.0945	0.0003			
TS-1C	Thorium-228	2.5368	1.6239	2	1	10	0.8704	nonparametric	4.043	1.192	0.34717	14	14	15.2
					2	4	0.1296			4.524	37.674			
TS-1C	Thorium-230	3.7975	1.9887	2	1	10	0.8704	nonparametric	3.683	1.1442	0.8982	14	14	28.51
					2	4	0.1296			7.6598	146.9			
TS-1C	Thorium-232	2.3452	1.5906	2	1	10	0.87	LogNormal	4.89	1.3061	0.72135	14	14	13.55
					2	4	0.13			3.5012	20.055			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
TS-1C	Vanadium	15.914	13.752	2	1	13	0.87	Normal	14.71	14.116	23.049	19	19	25.9
					2	6	0.13			11.307	61.895			
TS-1E	Benzo(a)anthracene	0.603	0.3269	2	1	10	0.831	LogNormal	9.068	0.38183	0.32911	17	11	0.72
					2	7	0.169			0.0576	0.0034			
TS-1E	Benzo(a)pyrene	0.5336	0.3830	2	1	10	0.831	Normal	9.082	0.4451	0.0976	17	14	0.85
					2	7	0.169			0.0780	0.0075			
TS-1E	Benzo(b)fluoranthene	0.8558	0.4648	2	1	10	0.831	LogNormal	9.027	0.5445	0.6595	17	8	1.6
					2	7	0.169			0.0739	0.0031			
TS-1E	Plutonium-238	77.436	29.308	2	1	10	0.8307	nonparametric	9	35.105	9990.5	16	16	338.33
					2	6	0.1693			0.87191	0.38981			
TS-1E	Plutonium-239	9.1811	3.8059	2	1	10	0.8307	nonparametric	9	4.5092	124.62	16	16	37.91
					2	6	0.1693			0.35607	0.021126			
TS-1W	Americium-241	0.7702	0.495	2	1	5	0.632	nonparametric	4.038	0.7114	0.2087	8	5	1.53
					2	3	0.368			0.1233	0.0018			
TS-1W	Aroclor-1260	0.4671	0.2944	2	1	10	0.632	nonparametric	10.74	0.38516	0.20689	8	5	1.53
					2	4	0.368			0.13859	0.02766			
TS-1W	Benzo(a)pyrene	0.1055	0.0754	2	1	10	0.632	LogNormal	9.158	0.0830	0.0067	14	12	0.32
					2	4	0.368			0.0625	0.0001			
TS-1W	Benzo(b)fluoranthene	0.1073	0.0737	2	1	10	0.632	nonparametric	9.758	0.0766	0.0082	14	12	0.32
					2	4	0.368			0.0687	0.0004			
TS-1W	Cesium-137	0.6484	0.4896	2	1	5	0.632	nonparametric	4.155	0.6949	0.0696	8	8	1.15
					2	3	0.368			0.1369	0.0024			
TS-1W	Plutonium-238	5.343	3.7253	2	1	10	0.632	Normal	9.175	5.52	19.388	14	14	14.3
					2	4	0.368			0.6425	0.2246			
TS-1W	Plutonium-239	1.9353	1.5374	2	1	10	0.632	Normal	9.183	2.284	1.1725	14	14	4.06
					2	4	0.368			0.255	0.0142			
TS-1W	Thallium	0.12741	0.10237	2	1	10	0.632	Normal	9.532	0.12142	0.0046	14	7	0.24
					2	4	0.368			0.0697	0.0002			

Table E-3.3-1 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Area) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
TS-1W	Vanadium	13.49	12.086	2	1	10	0.632	Normal	11.24	14.97	13.256	14	14	23
					2	4	0.368			7.1325	2.4902			
TS-2C	Strontium-90	2.4067	1.9933	3	1	12	0.6902	nonparametric	15.58	1.7255	0.4909	14	12	5.61
					2	6	0.1178			0.5972	0.0530			
					3	10	0.192			3.8122	1.1579			
TS-2E	Aroclor-1260	0.31	0.0696	1	all data	8	1	LogNormal	7	0.0696	0.0164	8	5	0.31
TS-2E	Plutonium-239	5.23	2.5926	1	all data	8	1	LogNormal	7	2.5926	42.1880	8	7	5.23
TS-2E	Aluminum	7346.3	6043.1	2	1	10	0.632	LogNormal	10.96	8171.2	11756000	14	14	16100
					2	4	0.368			2390.7	1679100			
TS-2E	Arsenic	2.4869	2.1303	2	1	10	0.632	Normal	10.58	2.805	0.8903	14	14	4.43
					2	4	0.368			0.9725	0.1057			
TS-2E	Iron	9437	8130.9	2	1	10	0.632	Normal	11.57	10178	8916300	14	14	13900
					2	4	0.368			4617.5	5246900			
TS-2E	Strontium-90	15.441	5.0773	2	1	10	0.632	LogNormal	10.69	7.6151	827.4	14	9	8.3
					2	4	0.368			0.7219	2.7834			
TS-2E	Vanadium	16.443	14.187	2	1	10	0.632	Normal	11.98	18.11	29.465	14	14	27.1
					2	4	0.368			7.455	12.54			
TS-2W	Strontium-90	7.022	2.371	2	1	18	0.9608	nonparametric	17	2.4583	60.992	13	5	6.7
					2	8	0.03922			0.2308	0.0203			

[a] Area Weighted UCL is reported when number of bins > 1.

[b] Area Weighted Mean is reported when number of bins > 1.

[c] Bin IDs with bin descriptions by geomorphic unit and sediment facies are listed in Table D-1.3-1. C; F=coarse ; fine [combined bins to achieve the needed bin size].

[d] Number of sediment samples per bin.

[e] Fraction of overall reach Area represented by bin.

[f] Simultaneous distribution test (Shapiro Wilks goodness of fit for multiple groups) is applied to determine if all bins are Normal, LogNormal or neither (nonparametric). If bin data sets test significantly different from Normal and LogNormal at the 0.05 simultaneous significance level, then the bootstrap method is used for bin means and variances.

[g] The pooled degrees of freedom from multiple bins is approximated by the method attributed to Satterthwaite (Cochran 1977, 84462).

[h] The bin means are estimated using methods for to the common distribution (Gilbert 1987, 56179).

[i] The bin variances are estimated using methods for to the common distribution (Gilbert 1987, 56179).

Table E-3.3-2
Volume Weighted UCLs for Sediment

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
E-1E	Americium-241	84.994	43.166	4	1	5	0.0791	LogNormal	10.07	6.2323	60.875	39	37	642
					2	8	0.589			6.0344	123.67			
					3	8	0.201			95.243	56239			
					4	18	0.132			151.96	254150			
E-1E	Aroclor-1254	0.07	0.0160	1	all data	16	1	nonparametric	na	0.0160	na	16	1	0.07
E-1E	Arsenic	1.6372	1.4951	4	1	5	0.0791	Normal	23.35	2.01	0.1837	40	39	6.1
					2	9	0.589			1.1305	0.09374			
					3	8	0.201			1.3887	0.19701			
					4	18	0.132			2.9778	2.1324			
E-1E	Benzo(a)pyrene	0.25	0.2047	1	all data	16	1	nonparametric	na	0.2047	na	16	1	0.25
E-1E	Cesium-137	327.47	136.21	4	1	5	0.0791	LogNormal	20.28	6.4144	49.732	39	39	2530
					2	8	0.589			9.1423	253.53			
					3	8	0.201			74.33	6070.1			
					4	18	0.132			876.43	12740000			
E-1E	Cobalt-60	0.70805	0.31996	4	1	5	0.0791	LogNormal	9.083	0.084981	0.015104	39	18	4.35
					2	8	0.589			0.35713	1.0203			
					3	8	0.201			0.19302	0.015652			
					4	18	0.132			0.48838	0.65775			
E-1E	Lead	8.6992	7.5722	4	1	5	0.07906	nonparametric	15.17	8.5942	3.2212	40	40	50
					2	9	0.5886			6.1846	7.6068			
					3	8	0.2007			6.6255	6.4889			
					4	18	0.1317			14.604	87.607			
E-1E	Manganese	265.89	238.35	4	1	5	0.0791	Normal	31.07	319.4	4866.8	40	40	1700
					2	9	0.589			188.78	2155.2			
					3	8	0.201			198.38	5752.6			
					4	18	0.132			472.22	151230			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
E-1E	Mercury	0.15994	0.097891	4	1	5	0.0791	LogNormal	19.25	0.019007	0.00020966	40	37	2.7
					2	9	0.589			0.014791	0.00060858			
					3	8	0.201			0.092136	0.0031224			
					4	18	0.132			0.52547	1.2978			
E-1E	Plutonium-238	15.983	10.197	4	1	5	0.0791	LogNormal	15.74	7.7651	163.85	39	38	88.7
					2	8	0.589			6.3678	127.22			
					3	8	0.201			15.881	559.58			
					4	18	0.132			20.111	2523.9			
E-1E	Plutonium-239	100.05	48.147	4	1	5	0.0791	logNormal	7.879	3.116	11.631	39	38	1360
					2	8	0.589			4.4473	68.567			
					3	8	0.201			126.98	112190			
					4	18	0.132			150.39	216190			
E-1E	Sodium-22	0.082256	0.054495	4	1	5	0.07906	nonparametric	9.437	0.03999	0.0030556	39	3	0.49
					2	8	0.5886			0.051452	0.0045826			
					3	8	0.2007			0.062994	0.0035456			
					4	18	0.1317			0.063854	0.012229			
E-1E	Strontium-90	14.025	7.1793	4	1	5	0.07906	LogNormal	17.49	1.6349	18.003	39	26	273
					2	8	0.5886			0.53405	1.8432			
					3	8	0.2007			4.008	23.384			
					4	18	0.1317			45.044	15907			
E-1E	Thallium	0.12231	0.090001	4	1	5	0.0791	LogNormal	27.52	0.040252	0.00025298	40	6	1.6
					2	9	0.589			0.063328	0.0041535			
					3	8	0.201			0.092669	0.0050337			
					4	18	0.132			0.23503	0.18142			
E-1E	Tritium	0.96586	0.5152	2	C	4	0.789	LogNormal	4.299	0.43973	0.2606	15	8	2.4
					F	11	0.211			0.79785	1.4647			
E-1E	Uranium	4.14	2.632	1	all data	5	1	Normal	4	2.6320	3.07477	5	5	4.14

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
E-1FW	Aluminum	7726.4	6078.2	2	1	11	0.436	Normal	12.28	9943.6	43977000	16	16	21300
					2	5	0.564			3096	1572200			
E-1FW	Aroclor-1254	0.139779869	0.111076027	1	all data	8	1	Normal	7	0.1111	0.001836305	8	5	0.16
E-1FW	Arsenic	5.498	4.2918	2	1	11	0.436	Normal	13.98	6.9773	19.838	16	16	16.6
					2	5	0.564			2.22	1.9906			
E-1FW	Benzo(a)pyrene	0.12244	0.08696	2	1	11	0.436	Normal	11.79	0.15907	0.020845	16	11	0.5
					2	5	0.564			0.031331	0.000559			
E-1FW	Chromium	515.01	297.6	2	1	11	0.436	LogNormal	10.19	609.33	833410	16	16	2210
					2	5	0.564			57.108	1153.4			
E-1FW	Copper	82.726	51.987	2	1	11	0.436	LogNormal	10.07	107.04	16655	16	16	383
					2	5	0.564			9.5161	13.167			
E-1FW	Iron	9240	8202.4	2	1	11	0.436	Normal	13	11563	11731000	16	16	18300
					2	5	0.564			5610	2212700			
E-1FW	Lead	21.349	17.738	2	1	11	0.436	Normal	12.12	30.464	212.83	16	16	56.8
					2	5	0.564			7.92	6.9498			
E-1FW	Manganese	445.28	348.87	2	1	11	0.436	LogNormal	8.482	411.07	68675	16	16	1040
					2	5	0.564			300.88	24222			
E-1FW	Vanadium	18.172	14.577	2	1	11	0.436	Normal	10.61	25.236	223.82	16	16	53.1
					2	5	0.564			6.354	1.8976			
E-1W	Aluminum	6193.4	5218.5	3	1	18	0.522	Normal	20.95	8136.7	18567000	26	26	19000
					2	4	0.305			1532.5	700760			
					3	4	0.173			2920	3171800			
E-1W	Arsenic	3.0672	2.5393	3	1	18	0.522	LogNormal	20.59	3.4066	4.7197	26	24	11
					2	4	0.305			0.8306	0.087055			
					3	4	0.173			2.9371	2.7428			
E-1W	Benzo(a)pyrene	0.26	0.3013	1	all data	12	1	nonparametric	na	0.3013	na	12	1	0.26
E-1W	Cesium-137	0.8181	0.5163	2	C	4	0.478	Normal	6.575	0.16	0.020467	11	7	2.14
					F	7	0.522			0.84286	0.60966			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
E-1W	Chromium	60.973	24.333	3	1	18	0.522	LogNormal	3.016	14.345	107.73	26	26	636
					2	4	0.305			2.1786	0.66702			
					3	4	0.173			93.502	32288			
E-1W	Iron	9072	8076.7	3	1	18	0.522	LogNormal	18.77	11014	15671000	26	26	25000
					2	4	0.305			3911.9	3608600			
					3	4	0.173			6565.5	1322900			
E-1W	Manganese	587.14	426.51	3	1	18	0.522	LogNormal	19.1	663.63	540770	26	26	2500
					2	4	0.305			93.413	1871			
					3	4	0.173			298.94	55082			
E-1W	Plutonium-239	30.1	2.1937	1	all data	8	1	LogNormal	7	2.1937	33.48006467	8	7	30.1
E-1W	Uranium	3.3943	2.084	1	all data	5	1	Normal	4	2.0840	1.88888	5	5	4.32
E-1W	Vanadium	12.491	10.733	3	1	18	0.522	Normal	21.64	15.298	48.082	26	26	30
					2	4	0.305			4.3925	4.2454			
					3	4	0.173			8.1475	29.538			
M-1E	Aluminum	11453	9590.3	2	1	15	0.526	Normal	18.28	13927	40702000	21	21	26000
					2	6	0.474			4781.7	10809000			
M-1E	Arsenic	4.0731	3.3876	2	1	15	0.526	LogNormal	11.85	4.8257	3.3895	21	21	8.4
					2	6	0.474			1.7928	2.2725			
M-1E	Iron	12160	10700	2	1	15	0.526	Normal	10.86	14496	12726000	21	21	21000
					2	6	0.474			6490	11352000			
M-1E	Manganese	684.46	537.52	2	1	15	0.526	LogNormal	10.44	764.46	192240	21	21	1640
					2	6	0.474			285.86	82365			
M-1E	Vanadium	19.839	17.159	2	1	15	0.526	Normal	15.44	24.087	66.868	21	21	37
					2	6	0.474			9.4767	29.723			
M-1W	Arsenic	1.8592	1.5971	2	1	7	0.194	Normal	11.96	2.5929	0.90256	16	14	4.4
					2	9	0.806			1.3577	0.23227			
M-1W	Benzo(a)anthracene	0.31768	0.18026	2	1	7	0.194	Normal	6.197	0.74692	0.92757	16	10	2.71
					2	9	0.806			0.044044	0.0011265			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-1W	Benzo(a)pyrene	0.28771	0.16638	2	1	7	0.194	LogNormal	6.452	0.64285	0.71974	16	8	2.11
					2	9	0.806			0.051848	0.0018776			
M-1W	Benzo(b)fluoranthene	0.33521	0.16928	2	1	7	0.194	LogNormal	6.243	0.67832	1.3498	16	7	2.51
					2	9	0.806			0.046916	0.0021063			
M-1W	Indeno(1,2,3-cd)pyrene	0.11851	0.061897	2	1	7	0.194	LogNormal	6.34	0.22566	0.15571	16	5	1.23
					2	9	0.806			0.022531	0.00041054			
M-2E	Americium-241	20.365	14.982	2	C	13	0.689	nonparametric	20.25	6.6987	19.734	43	41	211
					F	30	0.311			34.497	4405.4			
M-2E	Cesium-137	90.132	77.039	2	C	13	0.689	nonparametric	22.4	65.291	7858.2	43	43	557
					F	30	0.311			184.31	44200			
M-2E	Cobalt-60	0.1943	0.16876	2	C	13	0.689	nonparametric	11.12	0.16009	0.024197	43	23	0.5
					F	30	0.311			0.18618	0.038154			
M-2E	Plutonium-238	14.914	12.312	2	C	13	0.689	nonparametric	20.5	10.349	88.683	43	43	113
					F	30	0.311			26.916	1267.9			
M-2E	Plutonium-239	20.131	15.954	2	C	13	0.689	nonparametric	20.31	9.3182	16.337	43	43	157
					F	30	0.311			32.649	2502.8			
M-2E	Strontium-90	3.0055	2.6801	2	C	13	0.689	nonparametric	22.45	2.6301	7.0009	43	42	20
					F	30	0.311			5.4112	13.004			
M-2W	Americium-241	34.585	21.99	5	1	7	0.54	LogNormal	39.68	7.1366	14.946	64	58	524
					2	4	0.0117			17.05	2.0376			
					3	16	0.17			44.756	23511			
					4	11	0.16			12.759	80.775			
					5	26	0.118			70.171	23932			
M-2W	Antimony	0.2719	0.24472	5	1	7	0.5402	nonparametric	14.12	0.21323	0.0036114	56	28	0.65
					2	4	0.0117			0.18275	0.023098			
					3	16	0.1695			0.36201	0.024716			
					4	8	0.1602			0.20981	0.0085931			
					5	21	0.1183			0.27385	0.022793			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-2W	Aroclor-1254	0.15	0.0175	1	all data	21	1	nonparametric	na	0.0175	na	21	1	0.15
M-2W	Aroclor-1260	0.0326	0.0211	2	C	7	0.7	LogNormal	18.33	0.011052	0.000083776	21	9	0.21
					F	14	0.3			0.044754	0.0058525			
M-2W	Arsenic	1.5553	1.4187	5	1	8	0.54	Normal	11.76	0.83895	0.12246	65	59	4.3
					2	4	0.0117			2.115	0.1167			
					3	16	0.17			2.6875	0.50517			
					4	11	0.16			1.2434	0.11295			
					5	26	0.118			2.4165	0.39625			
M-2W	Benzo(a)pyrene	0.37	0.1988	1	all data	21	1	nonparametric	na	0.1988	na	21	2	0.37
M-2W	Cesium-137	115.44	93.728	5	1	7	0.5402	nonparametric	14.23	17.254	77.396	64	64	870
					2	4	0.0117			30.504	31.037			
					3	16	0.1695			53.584	1368.1			
					4	11	0.1602			293.58	54435			
					5	26	0.1183			236.01	36454			
M-2W	Cobalt-60	0.41758	0.292	5	1	7	0.5402	LogNormal	11.18	0.23847	0.025663	64	38	2.45
					2	4	0.0117			0.30905	0.01679			
					3	16	0.1695			0.48367	1.9576			
					4	11	0.1602			0.22443	0.045991			
					5	26	0.1183			0.35161	0.30977			
M-2W	Iron	6405.6	5915.8	5	1	8	0.54	Normal	10.28	4060	1643900	65	65	14000
					2	4	0.0117			8880	896270			
					3	16	0.17			9368.8	1258300			
					4	11	0.16			6181.8	4303600			
					5	26	0.118			8788.5	2057100			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-2W	Lead	9.6544	8.3103	5	1	8	0.5402	nonparametric	12.49	4.2284	1.4018	65	65	58
					2	4	0.0117			11.251	1.4436			
					3	16	0.1695			13.717	5.937			
					4	11	0.1602			12.387	217.88			
					5	26	0.1183			13.388	4.0285			
M-2W	Plutonium-238	26.29	16.824	5	1	7	0.54	LogNormal	31.18	5.4566	1.4597	64	62	203
					2	4	0.0117			11.727	31.019			
					3	16	0.17			27.247	14835			
					4	11	0.16			28.422	952.6			
					5	26	0.118			38.589	4179.1			
M-2W	Plutonium-239	34.223	21.48	5	1	7	0.54	LogNormal	16.77	7.7192	7.2918	64	64	596
					2	4	0.0117			11.635	4.1461			
					3	16	0.17			51.309	28088			
					4	11	0.16			13.834	49.301			
					5	26	0.118			52.899	5023.4			
M-2W	Strontium-90	4.5075	3.6089	5	1	7	0.54	LogNormal	25.69	1.0175	0.29684	64	61	35.9
					2	4	0.0117			1.3085	0.39903			
					3	16	0.17			3.945	9.8843			
					4	11	0.16			6.6852	79.81			
					5	26	0.118			11.02	113.1			
M-2W	Thallium	0.12379	0.10333	5	1	8	0.5402	nonparametric	23.36	0.055232	0.00060178	65	16	0.8
					2	4	0.0117			0.09815	0.0017196			
					3	16	0.1695			0.096952	0.0023436			
					4	11	0.1602			0.19586	0.037547			
					5	26	0.1183			0.20729	0.053443			
M-2W	Uranium-238	1.2722	0.91616	2	C	6	0.7	nonparametric	13.87	0.53172	0.016697	20	20	10.7
					F	14	0.3			1.8132	6.1367			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-3	Americium-241	20.987	16.747	6	1	7	0.0327	nonparametric	44.48	17.362	95.919	105	96	223
					2	8	0.07893			4.901	3.8376			
					3	29	0.3564			10.77	177.53			
					4	24	0.1929			37.383	2785.6			
					5	25	0.288			6.9942	105.22			
					6	12	0.05114			53.368	4171.7			
M-3	Aroclor-1260	0.1483	0.0698	1	all data	15	1	LogNormal	14	0.069830977	0.005896196	15	13	0.39
M-3	Arsenic	1.5446	1.4376	6	1	7	0.0327	nonparametric	48.39	1.8821	0.86163	86	86	4
					2	8	0.07893			0.85651	0.14989			
					3	21	0.3564			0.8643	0.21094			
					4	17	0.1929			2.4021	0.90827			
					5	22	0.288			1.5278	0.099885			
					6	11	0.05114			1.8993	0.79261			
M-3	Cesium-137	62.621	55.664	6	1	7	0.0327	nonparametric	85.38	48.373	568.9	105	105	298
					2	8	0.07893			12.355	14.221			
					3	29	0.3564			30.971	1452.3			
					4	24	0.1929			94.431	2774.7			
					5	25	0.288			49.643	1556.4			
					6	12	0.05114			186.93	7245.7			
M-3	Cobalt-60	0.1398	0.1141	6	1	7	0.0327	nonparametric	46.06	0.18946	0.011129	103	55	1.47
					2	8	0.07893			0.12134	0.0022474			
					3	29	0.3564			0.092086	0.010531			
					4	23	0.1929			0.21131	0.09471			
					5	24	0.288			0.063291	0.007302			
					6	12	0.05114			0.12845	0.022308			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-3	Plutonium-238	7.5297	6.5628	6	1	7	0.0327	nonparametric	85.16	8.4404	24.085	105	101	40.9
					2	8	0.07893			3.1789	0.36297			
					3	29	0.3564			4.2749	25.191			
					4	24	0.1929			11.279	56.128			
					5	25	0.288			4.353	33.612			
					6	12	0.05114			21.183	116.13			
M-3	Plutonium-239	23.311	17.122	6	1	7	0.0327	LogNormal	54.9	15.58	94.256	105	105	123
					2	8	0.0789			8.119	3.4127			
					3	29	0.356			16.255	1705.3			
					4	24	0.193			31.385	3617.1			
					5	25	0.288			7.2338	83.355			
					6	12	0.0511			39.925	1441.9			
M-3	Strontium-90	3.0517	2.7815	6	1	7	0.0327	nonparametric	58.02	2.8051	1.3133	105	94	8.6
					2	8	0.07893			0.93342	0.29424			
					3	29	0.3564			1.7577	1.5549			
					4	24	0.1929			3.6392	1.9005			
					5	25	0.288			3.4507	4.5922			
					6	12	0.05114			5.7504	3.2266			
M-4	Americium-241	8.9047	7.2462	8	1	8	0.02094	nonparametric	35.44	14.44	62.145	81	69	112
					2	8	0.06433			0.95032	0.54852			
					3	7	0.0169			50.7	1132.3			
					4	18	0.1783			1.4552	5.213			
					5	4	0.02172			16.489	164.18			
					6	16	0.1712			16.736	264.04			
					7	17	0.5203			4.8518	25.229			
					10	5	0.006337			2.9684	0.97516			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-4	Arsenic	1.8787	1.7058	8	1	8	0.0209	LogNormal	23.57	2.3398	1.984	75	73	4.6
					2	8	0.0643			0.71669	0.097433			
					3	7	0.0169			2.7478	1.0151			
					4	14	0.178			0.94677	0.11041			
					5	4	0.0217			1.6749	0.061195			
					6	14	0.171			2.3487	1.0318			
					7	17	0.52			1.8208	0.47455			
					10	5	0.00634			1.5203	0.24324			
M-4	Cesium-137	30.138	24.52	8	1	8	0.02094	nonparametric	20.61	30.92	212.7	81	80	276
					2	8	0.06433			2.5159	3.0927			
					3	7	0.0169			88.357	4837.6			
					4	18	0.1783			10.001	123.75			
					5	4	0.02172			48.618	12.489			
					6	16	0.1712			72.918	4897.6			
					7	17	0.5203			13.005	77.86			
					10	5	0.006337			20.354	273.18			
M-4	Cobalt-60	0.0712	0.0458	8	1	7	0.02094	LogNormal	31.71	0.17236	0.048236	80	15	0.44
					2	8	0.06433			0.012577	0.00023848			
					3	7	0.0169			0.10296	0.019426			
					4	18	0.1783			0.0098158	0.0002039			
					5	4	0.02172			0.14574	0.043399			
					6	16	0.1712			0.11996	0.094937			
					7	17	0.5203			0.027092	0.0025887			
					10	5	0.006337			0.015771	0.00018271			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
M-4	Plutonium-238	3.367	2.7148	8	1	8	0.02094	nonparametric	20.3	5.3221	9.0394	81	78	32.2
					2	8	0.06433			0.55903	0.19705			
					3	7	0.0169			9.8191	16.624			
					4	18	0.1783			1.1428	1.7565			
					5	4	0.02172			5.9027	1.0082			
					6	16	0.1712			8.0671	66.55			
					7	17	0.5203			1.3068	1.0488			
					10	5	0.006337			1.3413	0.59935			
M-4	Strontium-90	3.0408	2.5715	8	1	8	0.02094	nonparametric	22.16	1.3606	0.3863	81	74	9.64
					2	8	0.06433			0.41005	0.086394			
					3	7	0.0169			7.713	2.3804			
					4	18	0.1783			1.0932	0.32688			
					5	4	0.02172			5.1288	1.7463			
					6	16	0.1712			4.0786	6.2555			
					7	17	0.5203			2.6195	3.9147			
					10	5	0.006337			2.966	2.7144			
TS-1C	Antimony	0.4913	0.4648	2	1	13	0.7029	nonparametric	16.82	0.46639	0.0040317	19	3	0.63
					2	6	0.2971			0.46096	0.0053789			
TS-1C	Aroclor-1260	0.3843	0.2367	2	1	13	0.703	LogNormal	12.02	0.32528	0.18045	19	18	1.3
					2	6	0.297			0.027089	0.00032286			
TS-1C	Benzo(a)anthracene	0.5153	0.2358	2	1	13	0.703	LogNormal	12.03	0.32183	0.64707	19	11	1.86
					2	6	0.297			0.032111	0.0016633			
TS-1C	Benzo(a)pyrene	0.4159	0.2268	2	1	13	0.703	LogNormal	12.05	0.30145	0.29467	19	13	2.04
					2	6	0.297			0.050261	0.0045302			
TS-1C	Benzo(b)fluoranthene	0.5758	0.2811	2	1	13	0.703	LogNormal	12.12	0.37902	0.71929	19	8	2.53
					2	6	0.297			0.049513	0.0026828			
TS-1C	Cesium-137	1.9247	0.83	1	all data	4	1	Normal	3	0.8300	0.865533333	4	3	2.19

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
TS-1C	Indeno(1,2,3-cd)pyrene	0.27922	0.14304	2	1	13	0.7029	nonparametric	12.05	0.1901	0.1534	19	10	1.45
					2	6	0.2971			0.031723	0.00087869			
TS-1C	Iron	11638	9265	2	1	13	0.703	Normal	7.872	8960	9183100	19	19	28800
					2	6	0.297			9986.7	86474000			
TS-1C	Plutonium-238	19.322	10.077	2	1	13	0.703	LogNormal	12.02	13.664	705.35	18	18	314.07
					2	5	0.297			1.593	6.1448			
TS-1C	Plutonium-239	7.1666	3.9179	2	1	13	0.7029	nonparametric	12.05	5.3224	87.299	18	18	35.19
					2	5	0.2971			0.59523	0.41518			
TS-1C	Thallium	0.11069	0.10128	2	1	13	0.703	LogNormal	14.57	0.10413	0.0006495	19	8	0.18
					2	6	0.297			0.094527	0.00027396			
TS-1C	Thorium-228	4.3623	2.2119	2	1	10	0.7029	nonparametric	3.124	1.2005	0.3514	14	14	15.2
					2	4	0.2971			4.6044	38.284			
TS-1C	Thorium-230	7.2033	3.0253	2	1	10	0.7029	nonparametric	3.084	1.1439	0.89915	14	14	28.51
					2	4	0.2971			7.476	144			
TS-1C	Thorium-232	3.5411	1.9583	2	1	10	0.703	LogNormal	3.222	1.3061	0.72135	14	14	13.55
					2	4	0.297			3.5012	20.055			
TS-1C	Vanadium	15.637	13.281	2	1	13	0.703	Normal	13.89	14.116	23.049	19	19	25.9
					2	6	0.297			11.307	61.895			
TS-1E	Benzo(a)anthracene	0.34889	0.20229	2	1	10	0.446	LogNormal	11.37	0.38183	0.32911	17	11	0.72
					2	7	0.554			0.057573	0.0033986			
TS-1E	Benzo(a)pyrene	0.32693	0.24186	2	1	10	0.446	Normal	11.78	0.44512	0.097641	17	14	0.85
					2	7	0.554			0.078023	0.0074553			
TS-1E	Benzo(b)fluoranthene	0.49282	0.28395	2	1	10	0.446	LogNormal	9.974	0.54454	0.6595	17	8	1.6
					2	7	0.554			0.073909	0.0031431			
TS-1E	Plutonium-238	42.515	16.427	2	1	10	0.4463	nonparametric	9.002	35.728	10168	16	16	338.33
					2	6	0.5537			0.86912	0.38796			
TS-1E	Plutonium-239	5.0788	2.1996	2	1	10	0.4463	nonparametric	9.008	4.4861	123.83	16	16	37.91
					2	6	0.5537			0.35654	0.021071			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
TS-1W	Americium-241	0.6701	0.4375	2	1	5	0.5343	nonparametric	4.085	0.7114	0.2087	8	5	1.53
					2	3	0.4657			0.12327	0.0017508			
TS-1W	Aroclor-1254	0.57	0.0511	1	all data	14	1	nonparametric	na	0.0511	na	14	1	0.57
TS-1W	Aroclor-1260	0.42431	0.2709	2	1	10	0.5343	nonparametric	11.88	0.38468	0.20566	14	14	1.3
					2	4	0.4657			0.14027	0.028206			
TS-1W	Benzo(a)pyrene	0.0990	0.0734	2	1	10	0.534	LogNormal	9.351	0.082969	0.0066857	14	12	0.32
					2	4	0.466			0.062516	0.000099666			
TS-1W	Benzo(b)fluoranthene	0.1016	0.0727	2	1	10	0.5343	nonparametric	10.59	0.07618	0.0081368	14	6	0.32
					2	4	0.4657			0.068787	0.00043333			
TS-1W	Cesium-137	0.5693	0.4351	2	1	5	0.5343	nonparametric	4.341	0.69492	0.069587	8	8	1.15
					2	3	0.4657			0.1369	0.0024077			
TS-1W	Plutonium-238	4.6208	3.2486	2	1	10	0.534	Normal	9.387	5.52	19.388	14	14	14.3
					2	4	0.466			0.6425	0.22463			
TS-1W	Plutonium-239	1.6767	1.3391	2	1	10	0.534	Normal	9.405	2.284	1.1725	14	14	4.06
					2	4	0.466			0.255	0.014233			
TS-1W	Strontium-90	0.62	0.1925	1	all data	8	1	nonparametric	na	0.1925	na	8	1	0.62
TS-1W	Thallium	0.1187	0.0973	2	1	10	0.534	Normal	10.13	0.12142	0.0045888	14	7	0.24
					2	4	0.466			0.069656	0.00016573			
TS-1W	Vanadium	12.597	11.32	2	1	10	0.534	Normal	11.99	14.97	13.256	14	14	23
					2	4	0.466			7.1325	2.4902			
TS-2C	Strontium-90	1.7342	1.4492	3	1	12	0.4648	nonparametric	17.49	1.7255	0.4909	14	12	5.61
					2	6	0.4333			0.59716	0.053031			
					3	10	0.1019			3.8122	1.1579			
TS-2E	Aluminum	6034.5	4955.2	2	1	10	0.444	LogNormal	11.02	8171.2	11756000	14	14	16100
					2	4	0.556			2390.7	1679100			
TS-2E	Aroclor-1260	0.31	0.0696	1	all data	8	1	LogNormal	7	0.0696	0.016380809	8	5	0.31
TS-2E	Arsenic	2.0718	1.7855	2	1	10	0.444	Normal	11.71	2.805	0.89034	14	14	4.43
					2	4	0.556			0.9725	0.10569			

Table E-3.3-2 (continued)

Reach	Analyte Name	95% UCL[a]	Mean[b]	Number of Bins	Bin ID[c]	n per Bin[d]	Fractional (Volume) Weights[e]	Common Distribution[f]	Pooled Degrees of Freedom[g]	Bin Means[h]	Bin Variances[i]	Total n	Total Detect	Max Detect
TS-2E	Iron	8575.7	7084.4	2	1	10	0.444	Normal	5.793	10178	8916300	14	14	13900
					2	4	0.556			4617.5	5246900			
TS-2E	Plutonium-239	5.23	2.5926	1	all data	8	1	LogNormal	7	2.5926	42.1880	8	7	5.23
TS-2E	Strontium-90	3.4793	1.5919	2	1	10	0.444	LogNormal	11.55	3.1004	54.608	14	9	8.3
					2	4	0.556			0.38891	0.5113			
TS-2E	Vanadium	14.549	12.182	2	1	10	0.444	Normal	6.843	18.11	29.465	14	14	27.1
					2	4	0.556			7.455	12.54			
TS-2W	Strontium-90	3.4739	1.2544	2	1	18	0.4595	LogNormal	17.32	2.4583	60.992	13	5	6.7
					2	8	0.5405			0.2308	0.0203			

[a] Volume Weighted UCL is reported when number of bins > 1.

[b] Volume Weighted Mean is reported when number of bins > 1.

[c] Bin IDs with bin descriptions by geomorphic unit and sediment facies are listed in Table D-1.3-1. C; F=coarse ; fine [combined bins to achieve the needed bin size]

[d] Number of sediment samples per bin

[e] Fraction of overall reach volume represented by bin

[f] Simultaneous distribution test (Shapiro Wilks goodness of fit for multiple groups) is applied to determine if all bins are Normal, LogNormal or neither. If bin data sets test significantly different from Normal and LogNormal at the 0.05 simultaneous significance level, then the bootstrap method is used for bin means and variances.

[g] The pooled degrees of freedom from multiple bins is approximated by the method attributed to Satterthwaite (Cochran 1977, 84462).

[h] The bin means are estimated using methods for to the common distribution (Gilbert 1987, 56179).

[i] The bin variances are estimated using methods for to the common distribution (Gilbert 1987, 56179).

Table E-3.4-1
UCLs for Unfiltered Surface Water

Name	Canyon	Analyte Name	95% UCL	Mean	n[a]	Detects[b]	Max Detect[c]	Data Distribution[d]	Significance Level for the UCL[e]	Data Source for UCL Calculation[f]
E-1E SW	Effluent	Americium-241	8.64	6.713	3	3	8.64	n/a		Max Detect
E-1E SW	Effluent	Cesium-137	35.6	27.700	2	2	35.6	n/a		Max Detect
E-1E SW	Effluent	Fluoride	607.09109	444.000	4	4	620	Normal	0.05	All Data
E-1E SW	Effluent	Iron	2080	1246.333	3	3	2080	n/a		Max Detect
E-1E SW	Effluent	Lead	2.3	1.493	3	3	2.3	n/a		Max Detect
E-1E SW	Effluent	Molybdenum	34.8	28.750	2	2	34.8	n/a		Max Detect
E-1E SW	Effluent	Plutonium-238	3.15	2.533	3	3	3.15	n/a		Max Detect
E-1E SW	Effluent	Plutonium-239	4.85	3.893	3	3	4.85	n/a		Max Detect
E-1E SW	Effluent	Potassium-40	63.6	35.255	2	1	63.6	n/a		Max Detect
E-1E SW	Effluent	Strontium-90	3.97	3.130	2	2	3.97	n/a		Max Detect
E-1W SW	Effluent	Arsenic	6.6	3.900	4	1	6.6	nonparametric		All Data
E-1W SW	Effluent	Fluoride	760	610.800	5	5	760	nonparametric	0.01	All Data
E-1W SW	Effluent	Iron	6250	4262.500	4	4	6250	Normal	0.05	All Data
E-1W SW	Effluent	Lead	1.9	1.696	4	3	1.9	Normal	0.05	Helsel
E-1W SW	Effluent	Manganese	1035.1394	589.500	4	4	1080	Normal	0.05	All Data
E-1W SW	Effluent	Molybdenum	64.5	52.667	3	3	64.5	n/a		Max Detect
E-1W SW	Effluent	Vanadium	6.2	4.927	4	3	6.2	Normal	0.05	Helsel
east of E-1FW SW	Effluent	Arsenic	7.6	5.300	2	1	7.6	n/a		Max Detect
east of E-1FW SW	Effluent	Fluoride	349	211.667	3	3	349	n/a		Max Detect
east of E-1FW SW	Effluent	Iron	4200	3965.000	2	2	4200	n/a		Max Detect
east of E-1FW SW	Effluent	Lead	3.1	1.675	2	1	3.1	n/a		Max Detect
east of E-1FW SW	Effluent	Manganese	873	634.500	2	2	873	n/a		Max Detect
east of E-1FW SW	Effluent	Molybdenum	93.5	55.950	2	2	93.5	n/a		Max Detect
east of E-1FW SW	Effluent	Vanadium	8.3	4.400	2	1	8.3	n/a		Max Detect
M-1E SW	Mortandad	Aluminum	7400	4655.000	2	2	7400	n/a		Max Detect

Table E-3.4-1 (continued)

Name	Canyon	Analyte Name	95% UCL	Mean	n[a]	Detects[b]	Max Detect[c]	Data Distribution[d]	Significance Level for the UCL[e]	Data Source for UCL Calculation[f]
M-1E SW	Mortandad	Fluoride	500	291.667	3	3	500	n/a		Max Detect
M-1E SW	Mortandad	Iron	4230	3095.000	2	2	4230	n/a		Max Detect
M-1E SW	Mortandad	Lead	3.1	1.945	2	2	3.1	n/a		Max Detect
M-1E SW	Mortandad	Manganese	2010	1080.500	2	2	2010	n/a		Max Detect
M-1E SW	Mortandad	Vanadium	7.6	6.100	2	2	7.6	n/a		Max Detect
M-1W SW	Mortandad	Aluminum	43700	31033.333	3	3	43700	n/a		Max Detect
M-1W SW	Mortandad	Arsenic	6.5	4.167	3	1	6.5	n/a		Max Detect
M-1W SW	Mortandad	Fluoride	672.1205	399.500	4	4	720	Normal	0.05	All Data
M-1W SW	Mortandad	Iron	25700	17336.667	3	3	25700	n/a		Max Detect
M-1W SW	Mortandad	Lead	27	19.033	3	3	27	n/a		Max Detect
M-1W SW	Mortandad	Mercury	0.07	0.048	3	2	0.07	n/a		Max Detect
M-1W SW	Mortandad	Molybdenum	121	83.550	2	2	121	n/a		Max Detect
M-1W SW	Mortandad	Vanadium	48.3	35.067	3	3	48.3	n/a		Max Detect
M-2E SW	Mortandad	Americium-241	0.985	0.890	2	2	0.985	n/a		Max Detect
M-2E SW	Mortandad	Fluoride	628	502.000	3	3	628	n/a		Max Detect
M-2E SW	Mortandad	Molybdenum	30.9	29.700	2	2	30.9	n/a		Max Detect
M-2E SW	Mortandad	Plutonium-238	0.287	0.277	2	2	0.287	n/a		Max Detect
M-2E SW	Mortandad	Plutonium-239	0.508	0.482	2	2	0.508	n/a		Max Detect
M-2E SW	Mortandad	Strontium-90	43.9	41.650	2	2	43.9	n/a		Max Detect
M-2W SW (E200)	Mortandad	Aluminum	4410	1970.667	3	3	4410	n/a		Max Detect
M-2W SW (E200)	Mortandad	Americium-241	12.714826	6.355	10	10	15.1	logNormal	0.05	All Data
M-2W SW (E200)	Mortandad	Cesium-137	32.924973	25.775	8	8	42.6	Normal	0.05	All Data
M-2W SW (E200)	Mortandad	Iron	2460	1118.000	3	3	2460	n/a		Max Detect
M-2W SW (E200)	Mortandad	Lead	2.7	1.263	3	3	2.7	n/a		Max Detect
M-2W SW (E200)	Mortandad	Mercury	0.08	0.045	10	1	0.08	nonparametric		All Data
M-2W SW (E200)	Mortandad	Perchlorate	99.5	14.149	10	5	99.5	nonparametric	0.05	All Data

Table E-3.4-1 (continued)

Name	Canyon	Analyte Name	95% UCL	Mean	n[a]	Detects[b]	Max Detect[c]	Data Distribution[d]	Significance Level for the UCL[e]	Data Source for UCL Calculation[f]
M-2W SW (E200)	Mortandad	Plutonium-238	5.0032077	3.554	10	10	7.57	Normal	0.05	All Data
M-2W SW (E200)	Mortandad	Plutonium-239	4.1422624	2.984	10	10	6.75	Normal	0.05	All Data
M-2W SW (E200)	Mortandad	Radium-226	0.5115413	0.373	8	2	0.709	Normal	0.05	All Data
M-2W SW (E200)	Mortandad	Strontium-90	11.214329	7.603	8	7	14.5	Normal	0.05	All Data
M-2W SW (E200)	Mortandad	Tritium	35500	9888.105	8	8	35500	logNormal	0.05	All Data
M-2W SW (E200)	Mortandad	Uranium-234	1.3632292	0.739	10	10	2.93	logNormal	0.05	All Data
M-2W SW (E200)	Mortandad	Vanadium	2.1	2.283	3	2	2.1	n/a		Max Detect
TS-1C SW	Ten Site	Aluminum	37700	20920	3	3	37700	n/a		Max Detect
TS-1C SW	Ten Site	Aroclor-1260	1.1	0.5725	2	1	1.1	n/a		Max Detect
TS-1C SW	Ten Site	Arsenic	7.5	6	3	1	7.5	n/a		Max Detect
TS-1C SW	Ten Site	Barium	349	191.96667	3	3	349	n/a		Max Detect
TS-1C SW	Ten Site	Fluoride	226.5	151.5	4	4	228	Normal	0.05	All Data
TS-1C SW	Ten Site	Iron	37800	16486.667	3	3	37800	n/a		Max Detect
TS-1C SW	Ten Site	Lead	33.6	13.933333	3	3	33.6	n/a		Max Detect
TS-1C SW	Ten Site	Manganese	1690	598.16667	3	3	1690	n/a		Max Detect
TS-1C SW	Ten Site	Plutonium-238	1.79	1.106	3	3	1.79	n/a		Max Detect
TS-1C SW	Ten Site	Plutonium-239	0.79	0.4533333	3	3	0.79	n/a		Max Detect
TS-1C SW	Ten Site	Strontium-90	6.63	5.57	2	2	6.63	n/a		Max Detect
TS-1C SW	Ten Site	Thallium	0.73	0.4766667	3	1	0.73	n/a		Max Detect
TS-1C SW	Ten Site	Vanadium	36.4	17.766667	3	2	36.4	n/a		Max Detect
TS-1C SW	Ten Site	Uranium	2.9	2.9	1	1	2.9	n/a		Max Detect
TS-1E SW	Ten Site	Fluoride	322	322.000	1	1	322	n/a		Max Detect
TS-2C SW	Ten Site	Fluoride	430	430.000	1	1	430	n/a		Max Detect
TS-2C SW	Ten Site	Lead	1.6	1.600	1	1	1.6	n/a		Max Detect
TS-2E SW	Ten Site	Fluoride	316	269.333	3	3	316	n/a		Max Detect
TS-2E SW	Ten Site	Iron	1120	908.500	2	2	1120	n/a		Max Detect

Table E-3.4-1 (continued)

Name	Canyon	Analyte Name	95% UCL	Mean	n[a]	Detects[b]	Max Detect[c]	Data Distribution[d]	Significance Level for the UCL[e]	Data Source for UCL Calculation[f]
TS-2E SW	Ten Site	Lead	1.7	1.210	2	2	1.7	n/a		Max Detect
TS-2E SW	Ten Site	Manganese	887	462.750	2	2	887	n/a		Max Detect
TS-2E SW	Ten Site	Molybdenum	36.6	21.200	2	2	36.6	n/a		Max Detect
TS-2E SW	Ten Site	Uranium	0.77	0.770	1	1	0.77	n/a		Max Detect
TS-2E SW	Ten Site	Vanadium	4.4	4.050	2	2	4.4	n/a		Max Detect

[a] n = Number of samples.

[b] Detects = Number of samples with detected concentrations.

[c] Max Detect = Maximum detected concentration.

[d] Data Distribution = Based on results of the distribution test, the data are classified as Normal, LogNormal, nonparametric (neither) or n/a (<4 samples, insufficient data to test for distribution). The UCL calculations are determined by distribution: Normal uses *t*-statistic; LogNormal uses Land Method (Gilbert, 1987); nonparametric uses Chebyshev equation (EPA 2003, 84461) unless <3 detects then UCL on median (Gilbert, 1987) ; n/a uses maximum detected concentration.

[e] Significance = Significance level for the UCL. Nominally, this is the 0.05 level, but for Chebyshev method the level depends on an estimate of the skew of data following EPA guidance (2003, 84461) and can be 0.05, 0.025 or 0.01.

[f] Data Source for UCL calculation, as follows:
All Data = Data used as reported, including radionuclide nondetects (not censored, see Appendix E-3.1.2)
Helsel = Used replacement method for nondetects described by Helsel and Cohn (1988, 82912)
Max Detect = Used the maximum detect rather than a calculation based on all data.

Table E-3.5-1
Screening Levels for the Residential Scenario

Medium	COPC	CAS ID	Units	Endpoint	Target Adverse-Effect Level	Residential MSSL	Reference
Sediment	Aluminum	7429-90-5	mg/kg	nc[a]	HQ=1	77800	NMED (2006, 92513)
Sediment	Antimony	7440-36-0	mg/kg	nc	HQ=1	31.3	NMED (2006, 92513)
Sediment	Aroclor-1254	11097-69-1	mg/kg	ca[b]	1E-5 risk	2.2	EPA 2005, 91002
Sediment	Aroclor-1254-nc	11097-69-1	mg/kg	nc	HQ=1	1.12	NMED (2006, 92513)
Sediment	Aroclor-1260	11096-82-5	mg/kg	ca	1E-5 risk	2.2	EPA 2005, 91002
Sediment	Aroclor-1260-nc	11096-82-5	mg/kg	nc	HQ=1	1.12	NMED (2006, 92513)
Sediment	Aroclors (Mixed)	1336-36-3	mg/kg	ca	1E-5 risk	2.22	EPA 2005, 91002
Sediment	Arsenic	7440-38-2	mg/kg	ca	1E-5 risk	3.9	NMED (2006, 92513)
Sediment	Arsenic-nc	7440-38-2	mg/kg	nc	HQ=1	21.6	NMED (2006, 92513)
Sediment	Benzo(a)anthracene	56-55-3	mg/kg	ca	1E-5 risk	6.21	NMED (2006, 92513)
Sediment	Benzo(a)pyrene	50-32-8	mg/kg	ca	1E-5 risk	0.621	NMED (2006, 92513)
Sediment	Benzo(b)fluoranthene	205-99-2	mg/kg	ca	1E-5 risk	6.21	NMED (2006, 92513)
Sediment	Chromium	7440-47-3	mg/kg	ca	1E-5 risk	2100	NMED (2006, 92513)
Sediment	Copper	7440-50-8	mg/kg	nc	HQ=1	3130	NMED (2006, 92513)
Sediment	Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	ca	1E-5 risk	6.21	NMED (2006, 92513)
Sediment	Iron	7439-89-6	mg/kg	nc	HQ=1	23500	NMED (2006, 92513)
Sediment	Lead	7439-92-1	mg/kg	nc	HQ=1	400	NMED (2006, 92513)
Sediment	Manganese	7439-96-5	mg/kg	nc	HQ=1	3590	NMED (2006, 92513)
Sediment	Mercury	7487-94-7	mg/kg	nc	HQ=1	23	EPA 2005, 91002
Sediment	Thallium	7440-28-0	mg/kg	nc	HQ=1	5.16	NMED (2006, 92513)
Sediment	Uranium	7440-61-1	mg/kg	nc	HQ=1	16	EPA 2004, 93663
Sediment	Vanadium	7440-62-2	mg/kg	nc	HQ=1	78.2	NMED (2006, 92513)
Sediment	Americium-241	86954-36-1	pCi/g	rad[c]	15 mrem/yr	30	LANL (2005, 88493)
Sediment	Cesium-137	10045-97-3	pCi/g	rad	15 mrem/yr	5.6	LANL (2005, 88493)
Sediment	Cobalt-60	10198-40-0	pCi/g	rad	15 mrem/yr	1.3	LANL (2005, 88493)

Table E-3.5-1 (continued)

Medium	COPC	CAS ID	Units	Endpoint	Target Adverse-Effect Level	Residential MSSL	Reference
Sediment	Europium-152	14683-23-9	pCi/g	rad	15 mrem/yr	2.9	LANL (2005, 88493)
Sediment	Plutonium-238	13981-16-3	pCi/g	rad	15 mrem/yr	37	LANL (2005, 88493)
Sediment	Plutonium-239	15117-48-3	pCi/g	rad	15 mrem/yr	33	LANL (2005, 88493)
Sediment	Sodium-22	13966-32-0	pCi/g	rad	15 mrem/yr	1.6	LANL (2005, 88493)
Sediment	Strontium-90	10098-97-2	pCi/g	rad	15 mrem/yr	5.7	LANL (2005, 88493)
Sediment	Thorium-228	14274-82-9	pCi/g	rad	15 mrem/yr	2.3	LANL (2005, 88493)
Sediment	Thorium-230	14269-63-7	pCi/g	rad	15 mrem/yr	5	LANL (2005, 88493)
Sediment	Thorium-232	7440-29-1	pCi/g	rad	15 mrem/yr	5	LANL (2005, 88493)
Sediment	Tritium	10028-17-8	pCi/g	rad	15 mrem/yr	750	LANL (2005, 88493)
Sediment	Uranium-238	7440-61-1	pCi/g	rad	15 mrem/yr	86	LANL (2005, 88493)

[a] nc = Non-carcinogen.

[b] ca = Carcinogen.

[c] rad = Radionuclide dose.

Table E-3.5-2
Summary of Residential Risk Assessment Results

Reach	Carcinogen Risk	Non-carcinogen HI	Radionuclide dose (mrem/yr)
M-1W	**1.1E-05**	0.09	
M-1E	**1.0E-05**	**1.30**	
E-1FW	**1.9E-05**	**1.31**	
E-1W	**1.2E-05**	**1.14**	**16**
E-1E	8.5E-06	0.52	**1017**
M-2W	**1.1E-05**	0.56	**370**
M-2E			**277**
M-3	4.6E-06	0.20	**202**
TS-1W	6.3E-06	**1.07**	6.1
TS-1C	**1.1E-05**	**1.08**	**77**
TS-1E	6.6E-06		**20**
TS-2W			9.1
TS-2C			4.6
TS-2E	6.7E-06	**1.00**	12
M-4	4.8E-06	0.09	**95**

Table E-3.5-3
Risk Ratios Based on Representative Concentrations for Sediment, Residential Scenario

Carcinogen COPCs - Ratios											
Reach	**Aroclor-1254**	**Aroclor-1260**	**Arsenic**	**Benzo(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b)fluoranthene**	**Chromium**	**Indeno(1,2,3-cd)pyrene**	**SOFca**	**Carcinogen risk**	**Aluminum**
SSL/SAL	2.2	2.2	3.9	6.21	0.621	6.21	2100	6.21			77800
M-1W	-	-	0.477	0.051	0.463	0.054	-	0.019	**1.06**	**1.1E-05**	-
M-1E	-	-	**1.044**	-	-	-	-	-	**1.04**	**1.0E-05**	0.147
E-1FW	0.064	-	**1.410**	-	0.197	-	0.245	-	**1.92**	**1.9E-05**	0.099
E-1W	-	-	0.786	-	0.419	-	0.029	-	**1.23**	**1.2E-05**	0.080
E-1E	0.032	-	0.420	-	0.403	-	-	-	0.85	8.5E-06	-
M-2W	0.068	0.015	0.399	-	0.596	-	-	-	**1.08**	**1.1E-05**	-
M-2E	-	-	-	-	-	-	-	-			-
M-3	-	0.067	0.396	-	-	-	-	-	0.46	4.6E-06	-
TS-1W	0.259	0.193	-	-	0.159	0.016	-	-	0.63	6.3E-06	-
TS-1C	-	0.175	-	0.083	0.670	0.093	-	0.045	**1.07**	**1.1E-05**	-
TS-1E	-	-	-	0.056	0.526	0.079	-	-	0.66	6.6E-06	-
TS-2W	-	-	-	-	-	-	-	-			-
TS-2C	-	-	-	-	-	-	-	-			-
TS-2E	-	0.141	0.531	-	-	-	-	-	0.67	6.7E-06	0.078
M-4	-	-	0.482	-	-	-	-	-	0.48	4.8E-06	-

Table E-3.5-3 (continued)

Non-carcinogen COPCs - Ratios															
Reach	**Antimony**	**Aroclor-1254**	**Aroclor-1260**	**Arsenic**	**Copper**	**Iron**	**Lead**	**Manganese**	**Mercury**	**Thallium**	**Uranium**	**Vanadium**	**SOFnc**	**Noncarcinogen HI**	**Americium-241**
SSL/SAL	31.3	1.12	1.12	21.6	3130	23500	400	3590	23	5.16	16	78.2			30
M-1W	-	-	-	0.086	-	-	-	-	-	-	-	-	0.09	0.09	-
M-1E	-	-	-	0.189	-	0.517	-	0.191	-	-	-	0.254	**1.30**	**1.30**	-
E-1FW	-	0.125	-	0.255	0.026	0.393	0.053	0.124	-	-	-	0.232	**1.31**	**1.31**	-
E-1W	-	-	-	0.142	-	0.386	-	0.164	-	-	0.212	0.160	**1.14**	**1.14**	-
E-1E	-	0.063	-	0.076	-	-	0.022	0.074	0.007	0.024	0.259	-	0.52	0.50	**2.83**
M-2W	0.009	0.134	0.029	0.072	-	0.273	0.024	-	-	0.024	-	-	0.56	0.56	**1.15**
M-2E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.679
M-3	-	-	0.132	0.072	-	-	-	-	-	-	-	-	0.20	0.20	0.700
TS-1W	-	0.509	0.379	-	-	-	-	-	-	0.023	-	0.161	**1.07**	**1.07**	0.022
TS-1C	0.016	-	0.343	-	-	0.495	-	-	-	0.021	-	0.200	**1.08**	**1.08**	-
TS-1E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TS-2E	-	-	0.277	0.096	-	0.365	-	-	-	-	-	0.186	**1.00**	**1.00**	-
M-4	-	-	-	0.087	-	-	-	-	-	-	-	-	0.09	0.09	0.297

Table E-3.5-3 (continued)

Radionuclide COPCs – Ratios													
Reach	Cesium-137	Cobalt-60	Plutonium-238	Plutonium-239	Sodium-22	Strontium-90	Thorium-228	Thorium-230	Thorium-232	Tritium	Uranium-238	SOFrad	Radionuclide dose (mrem/yr)
SSL/SAL	5.6	1.3	37	33	1.6	5.7	2.3	5	5	750	86		
M-1W	-	-	-	-	-	-	-	-	-	-	-	-	-
M-1E	-	-	-	-	-	-	-	-	-	-	-	-	-
E-1FW	-	-	-	-	-	-	-	-	-	-	-	-	-
E-1W	0.146	-	-	0.912	-	-	-	-	-	-	-	**1.1**	**16**
E-1E	**58.5**	0.545	0.432	**3.03**	0.051	**2.46**	-	-	-	0.001	-	**67.8**	**1017**
M-2W	**20.6**	0.321	0.711	**1.04**	-	0.791	-	-	-	-	0.015	**24.6**	**370**
M-2E	**16.1**	0.149	0.403	0.610	-	0.527	-	-	-	-	-	**18.5**	**277**
M-3	**11.2**	0.108	0.204	0.706	-	0.535	-	-	-	-	-	**13.4**	**202**
TS-1W	0.102	-	0.125	0.051	-	0.109	-	-	-	-	-	0.41	6.1
TS-1C	0.344	-	0.522	0.217	-	-	**1.90**	**1.44**	0.708	-	-	**5.1**	**77**
TS-1E	-	-	**1.15**	0.154	-	-	-	-	-	-	-	**1.3**	**20**
TS-2W	-	-	-	-	-	0.609	-	-	-	-	-	0.61	9.1
TS-2C	-	-	-	-	-	0.304	-	-	-	-	-	0.30	4.6
TS-2E	-	-	-	0.158	-	0.610	-	-	-	-	-	0.77	12
M-4	**5.38**	0.055	0.091	-	-	0.533	-	-	-	-	-	**6.4**	**95**

Table E-3.5-4
Representative Concentrations for Sediment COPCs

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
E-1E	Cesium-137	327.5	136.2	39	39	2530
E-1E	Cobalt-60	0.708	0.32	39	18	4.35
E-1E	Lead	8.699	7.572	40	40	50
E-1E	Manganese	265.9	238.4	40	40	1700
E-1E	Mercury	0.16	0.098	40	37	2.7
E-1E	Plutonium-238	15.98	10.2	39	38	88.7
E-1E	Plutonium-239	100.1	48.15	39	38	1360
E-1E	Sodium-22	0.082	0.054	39	3	0.49
E-1E	Strontium-90	14.03	7.179	39	26	273
E-1E	Thallium	0.122	0.09	40	6	1.6
E-1E	Tritium	0.966	0.515	15	8	2.4
E-1E	Uranium	4.14	2.632	5	5	4.14
E-1FW	Chromium	515	297.6	16	16	2210
E-1FW	Copper	82.73	51.99	16	16	383
E-1FW	Iron	9240	8202	16	16	18300
E-1FW	Lead	21.35	17.74	16	16	56.8
E-1FW	Manganese	445.3	348.9	16	16	1040
E-1FW	Vanadium	18.17	14.58	16	16	53.1
E-1W	Cesium-137	0.818	0.516	11	7	2.14
E-1W	Chromium	60.97	24.33	26	26	636
E-1W	Iron	9072	8077	26	26	25000
E-1W	Manganese	587.1	426.5	26	26	2500
E-1W	Plutonium-239	30.1	2.194	8	7	30.1
E-1W	Uranium	3.394	2.084	5	5	4.32
E-1W	Vanadium	12.49	10.73	26	26	30
M-1E	Iron	12160	10700	21	21	21000
M-1E	Manganese	684.5	537.5	21	21	1640
M-1E	Vanadium	19.84	17.16	21	21	37
M-1W	Benzo(b)fluoranthene	0.335	0.169	16	7	2.51
M-1W	Indeno(1,2,3-cd)pyrene	0.119	0.062	16	5	1.23
M-2E	Cesium-137	90.13	77.04	43	43	557
M-2E	Cobalt-60	0.194	0.169	43	23	0.5
M-2E	Plutonium-238	14.91	12.31	43	43	113
M-2E	Plutonium-239	20.13	15.95	43	43	157
M-2E	Strontium-90	3.006	2.68	43	42	20
M-2W	Cesium-137	115.4	93.73	64	64	870

Table E-3.5-4 (continued)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
M-2W	Cobalt-60	0.418	0.292	64	38	2.45
M-2W	Iron	6406	5916	65	65	14000
M-2W	Lead	9.654	8.31	65	65	58
M-2W	Plutonium-238	26.29	16.82	64	62	203
M-2W	Plutonium-239	34.22	21.48	64	64	596
M-2W	Strontium-90	4.508	3.609	64	61	35.9
M-2W	Thallium	0.124	0.103	65	16	0.8
M-2W	Uranium-238	1.272	0.916	20	20	10.7
M-3	Cesium-137	62.62	55.66	105	105	298
M-3	Cobalt-60	0.14	0.114	103	55	1.47
M-3	Plutonium-238	7.53	6.563	105	101	40.9
M-3	Plutonium-239	23.31	17.12	105	105	123
M-3	Strontium-90	3.052	2.782	105	94	8.6
M-4	Arsenic-nc	1.966	1.712	77	75	4.6
M-4	Cesium-137	30.14	24.52	81	80	276
M-4	Cesium-137	30.46	24.79	83	82	276
M-4	Cobalt-60	0.071	0.046	80	15	0.44
M-4	Cobalt-60	0.05	0.038	82	15	0.44
M-4	Europium-152	0.42	0.026	83	0	NA
M-4	Plutonium-238	3.367	2.715	81	78	32.2
M-4	Plutonium-238	3.367	2.716	83	80	32.2
M-4	Strontium-90	3.041	2.572	81	74	9.64
M-4	Strontium-90	3.047	2.576	83	75	9.64
TS-1C	Antimony	0.491	0.465	19	3	0.63
TS-1C	Aroclor-1260	0.324	0.237	19	18	1.3
TS-1C	Benzo(a)anthracene	0.457	0.236	19	11	1.86
TS-1C	Benzo(a)pyrene	0.365	0.227	19	13	2.04
TS-1C	Benzo(b)fluoranthene	0.576	0.281	19	8	2.53
TS-1C	Benzo(b)fluoranthene	0.509	0.281	19	8	2.53
TS-1C	Cesium-137	1.925	0.83	4	3	2.19
TS-1C	Cesium-137	1.925	0.83	4	3	2.19
TS-1C	Dibenz(a,h)anthracene	1.75	0.17	19	0	NA
TS-1C	Indeno(1,2,3-cd)pyrene	0.279	0.143	19	10	1.45
TS-1C	Indeno(1,2,3-cd)pyrene	0.279	0.143	19	10	1.45
TS-1C	Iron	11638	9265	19	19	28800
TS-1C	Iron	11846	9265	19	19	28800
TS-1C	Plutonium-238	19.32	10.08	18	18	314.07
TS-1C	Plutonium-238	16.87	10.08	18	18	314.07

Table E-3.5-4 (continued)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
TS-1C	Plutonium-239	7.167	3.918	18	18	35.19
TS-1C	Plutonium-239	7.167	3.918	18	18	35.19
TS-1C	Thallium	0.111	0.101	19	8	0.18
TS-1C	Thallium	0.109	0.101	19	8	0.18
TS-1C	Thorium-228	4.362	2.212	14	14	15.2
TS-1C	Thorium-228	4.362	2.212	14	14	15.2
TS-1C	Thorium-230	7.203	3.025	14	14	28.51
TS-1C	Thorium-230	7.203	3.025	14	14	28.51
TS-1C	Thorium-232	3.541	1.958	14	14	13.55
TS-1C	Thorium-232	3.986	1.958	14	14	13.55
TS-1C	Vanadium	15.64	13.28	19	19	25.9
TS-1C	Vanadium	15.07	13.28	19	19	25.9
TS-1E	Benzo(a)anthracene	0.366	0.202	17	11	0.72
TS-1E	Benzo(a)pyrene	0.327	0.242	17	14	0.85
TS-1E	Benzo(a)pyrene	0.347	0.242	17	14	0.85
TS-1E	Benzo(b)fluoranthene	0.493	0.284	17	8	1.6
TS-1E	Benzo(b)fluoranthene	0.518	0.284	17	8	1.6
TS-1E	Plutonium-238	42.52	16.43	16	16	338.33
TS-1E	Plutonium-238	42.52	16.43	16	16	338.33
TS-1E	Plutonium-239	5.079	2.2	16	16	37.91
TS-1E	Plutonium-239	5.079	2.2	16	16	37.91
TS-1W	Americium-241	0.67	0.438	8	5	1.53
TS-1W	Antimony	0.21	0.148	14	0	NA
TS-1W	Aroclor-1254	0.57	0.051	14	1	0.57
TS-1W	Aroclor-1260	0.424	0.271	14	14	1.3
TS-1W	Benzo(a)pyrene	0.099	0.073	14	12	0.32
TS-1W	Benzo(a)pyrene	0.098	0.073	14	12	0.32
TS-1W	Benzo(b)fluoranthene	0.102	0.073	14	6	0.32
TS-1W	Benzo(b)fluoranthene	0.102	0.073	14	6	0.32
TS-1W	Cesium-137	0.569	0.435	8	8	1.15
TS-1W	Cesium-137	0.569	0.435	8	8	1.15
TS-1W	Cobalt-60	0.01	0.002	8	0	NA
TS-1W	Plutonium-238	4.621	3.249	14	14	14.3
TS-1W	Plutonium-238	4.454	3.249	14	14	14.3
TS-1W	Plutonium-239	1.677	1.339	14	14	4.06
TS-1W	Plutonium-239	1.607	1.339	14	14	4.06
TS-1W	Strontium-90	0.62	0.193	8	1	0.62
TS-1W	Strontium-90	0.62	0.193	8	1	0.62

Table E-3.5-4 (continued)

Reach	COPC	UCL	Mean	Number of Samples	Number of Detects	Maximum Detect
TS-1W	Thallium	0.119	0.097	14	7	0.24
TS-1W	Thallium	0.117	0.097	14	7	0.24
TS-1W	Vanadium	12.6	11.32	14	14	23
TS-1W	Vanadium	12.33	11.32	14	14	23
TS-2C	Strontium-90	1.734	1.449	14	12	5.61
TS-2C	Strontium-90	1.637	1.449	28	24	5.61
TS-2E	Aluminum	6360	4955	14	14	16100
TS-2E	Aroclor-1260	0.31	0.07	8	5	0.31
TS-2E	Arsenic	2.175	1.786	14	14	4.43
TS-2E	Arsenic-nc	2.175	1.786	14	14	4.43
TS-2E	Iron	8576	7084	14	14	13900
TS-2E	Iron	8889	7084	14	14	13900
TS-2E	Plutonium-239	5.23	2.593	8	7	5.23
TS-2E	Plutonium-239	5.23	2.593	8	7	5.23
TS-2E	Strontium-90	3.479	1.592	14	9	8.3
TS-2E	Strontium-90	8.3	3.78	14	9	8.3
TS-2E	Vanadium	14.55	12.18	14	14	27.1
TS-2E	Vanadium	15.15	12.18	14	14	27.1
TS-2W	Strontium-90	3.474	1.254	13	5	6.7
TS-2W	Strontium-90	1.305	0.857	26	10	6.7

Table E-1.2-1
HQs for Inorganic Soil COPCs from 2005 Sample Results

Reach	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Chromium Hexavalent Ion	Cobalt	Copper	Cyanide (Total)	Fluoride	Lead	Manganese	Mercury	Nickel	Silver	Thallium	Vanadium	Zinc
Soil ESL	0.05	6.8	110	2.5	0.27	2.3	0.34	13	10	0.1	31	14	50	0.013	20	0.05	0.032	0.025	10
M-1W	no detects	max<BV	max<BV	max<BV	2.8	max<BV	no data	max<BV	1.3	no data	no data	1.8	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	14
M-1E	no data	1.0	1.6	max<BV	max<BV	8.2	no data	0.45	1.2	no data	no data	1.8	33	9.2	max<BV	max<BV	max<BV	1284	9.4
E-1FW	max<BV	2.4	2.1	max<BV	3.1	961	5.9	0.37	38	no data	0.12	4.1	21	8.5	0.55	max<BV	max<BV	2124	17
E-1W	no detects	0.61	3.1	max<BV	max<BV	12	no detects	max<BV	1.7	no data	0.24	max<BV	14	max<BV	max<BV	max<BV	max<BV	1184	9.2
E-1E	no detects	max<BV	max<BV	max<BV	2.4	21	no data	max<BV	4.7	no data	0.060	max<BV	12	92	0.4835	max<BV	27	max<BV	max<BV
M-2W	no detects	max<BV	max<BV	max<BV	no detects	max<BV	no data	max<BV	1.2	no data	0.026	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	8.0
M-3	max<BV	max<BV	max<BV	max<BV	no detects	5.6	no data	max<BV	1.7	no data	no data	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	6.6
TS-1W	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	no data	0.37	max<BV	no data	no data	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	920	max<BV
TS-1C	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	no data	max<BV	1.5	no data	no detects	2.4	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV
TS-1E	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	no data	0.52	1.2	no data	no data	1.8	13	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV
TS-2W	no detects	max<BV	max<BV	max<BV	no detects	max<BV	no data	max<BV	max<BV	no data	no data	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV
TS-2C	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	no data	max<BV	max<BV	no data	0.072	max<BV	max<BV	max<BV	max<BV	30	max<BV	max<BV	max<BV
TS-2E	no detects	0.65	max<BV	max<BV	2.8	12	no data	max<BV	6.7	no data	no data	1.9	no data	105	no data	678	max<BV	1084	9.0
TS-3	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	no data	max<BV	max<BV	no data	no data	max<BV	no data	11	no data	33	max<BV	max<BV	max<BV
M-4	no detects	0.59	max<BV	max<BV	max<BV	6.3	no data	max<BV	2.0	no data	0.048	max<BV	max<BV	16	max<BV	max<BV	max<BV	max<BV	7.4
MCW-1	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
MCW-2N	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
MCW-2W	no detects	no data	no data	no data	no data	no data	no data	no data	no data	max<BV	no data	no data	no data	no data	no data	no data	no data	no data	no data
MCW-2E	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
M-6	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
LA-BKG	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	no data	max<BV	max<BV	no data	no detects	max<BV	max<BV	max<BV	max<BV	no detects	max<BV	max<BV	max<BV

Notes: Values are HQs (unitless). Gray shading indicates 0.3 HQ<3 (COPEC). Black shading indicates HQ >3 (field study design COPEC).

Table E-1.2-2
HQs for Radionuclide Soil COPCs from 2005 sample results

Reach	Americium-241	Cesium-137	Cobalt-60	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232
Soil ESL	44	20.8*	550	44	47	22.5*	43	52	6.2
E-1FW	no detects	max<BV	no detects	no detects	max<BV	no detects	no data	no data	no data
E-1W	0.0064	max<BV	no detects	0.00068	0.015	no detects	no data	no data	no data
E-1E	0.73	31	0.00027	0.48	1.8	2.2	no data	no data	no data
M-2W	no data	1.1	0.00060	0.14	0.20	max<BV	no data	no data	no data
M-3	0.59	2.6	0.00020	0.20	0.32	0.068	no data	no data	no data
TS-1W	no data	no data	no data	0.33	0.086	no data	no data	no data	no data
TS-1C	0.0020	max<BV	no detects	0.19	0.040	no detects	max<BV	max<BV	max<BV
TS-1E	no data	no data	no data	0.067	0.029	no data	no data	no data	no data
TS-2W	no data	no data	no data	no data	no data	max<BV	no data	no data	no data
TS-2C	0.0050	max<BV	no detects	0.027	0.0089	0.25	no data	no data	no data
TS-2E	no data	no data	no data	no data	no data	0.13	no data	no data	no data
TS-3	no data	no data	no data	no data	no data	max<BV	no data	no data	no data
M-4	0.53	8.0	no detects	0.43	0.30	0.085	no data	no data	no data
LA-BKG	no data	max<BV	no detects	no detects	no detects	max<BV	no data	no data	no data

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).
*DOE BCG used because lower than LANL ESL.

Table E-1.2-3
HQs for Organic Soil COPCs from 2005 sample results

Reach	Acenaphthene	Acetone	Anthracene	Aroclor-1254	Aroclor-1260	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Chrysene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene	Tetrachloroethene	Toluene	Trichloroethane[1,1,1-]	Trichloroethene
Soil ESL	0.25	1.2	210	0.041	0.14	3	9.6	18	24	62	1	0.02	2.4	22	62	10	18	0.18	23	260	42
M-1W	no detects	no detects	0.0035	no detects	no detects	0.90	0.22	0.14	0.049	no detects	no detects	no detects	0.93	0.35	0.020	0.34	0.29	no detects	no detects	no detects	no detects
E-1FW	no detects	no data	0.00038	0.98	0.21	0.10	0.027	no detects	0.0050	no detects	no detects	no detects	0.10	0.026	no detects	0.035	0.028	no data	no data	no data	no data
E-1W	no detects	no detects	no detects	no detects	0.14	0.077	0.027	0.027	0.010	no detects	no detects	2.0	0.096	0.032	no detects	0.04	0.032	no detects	no detects	no detects	no detects
E-1E	no detects	no data	0.00019	3.2	0.79	0.033	0.026	0.023	0.0050	0.002096774	0.59	no detects	0.10	0.029	0.0021	0.034	0.036	no data	no data	no data	no data
M-2W	no detects	no data	0.000048	0.14	0.071	0.020	0.0083	0.007	0.0029	0.000483871	no detects	no detects	0.025	0.0073	0.00097	0.0060	0.0078	no data	no data	no data	no data
M-3	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects	no detects
TS-1W	no detects	no data	0.0001905	no detects	5.1	0.080	0.033	0.018	0.0088	no detects	no data	no data	0.10	0.027	0.0013	0.023	0.028	no data	no data	no data	no data
TS-1C	no detects	no data	0.0015714	0.24	0.71	0.62	0.21	0.14	0.056	no detects	no detects	4.5	0.68	0.14	0.023	0.19	0.20	no data	no data	no data	no data
TS-1E	0.060	0.0054	0.0005238	0.73	0.71	0.24	0.086	0.055	0.024	no detects	no detects	no detects	0.29	0.061	0.0084	0.073	0.074	0.11	no detects	0.000038	no detects
TS-2W	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	0.11	no detects	0.000038	0.000026
TS-2C	no detects	no detects	4.762E-05	0.24	0.36	0.013	0.018	0.021	0.0038	no detects	no detects	no detects	0.075	0.011	0.0015	0.0090	0.019	0.056	no detects	0.000021	no detects
TS-2E	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects	no detects
TS-3	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects	no detects
M-4	no detects	no detects	no detects	0.24	0.43	0.0033	0.0021	no detects	0.00042	no detects	no detects	no detects	0.0042	0.0018	no detects	0.0010	0.0017	no detects	no detects	no detects	no detects
MCW-1	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects	no detects
MCW-2N	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects	no detects
MCW-2W	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects	no detects
MCW-2E	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	0.00012	no detects	no detects
M-6	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects	no detects
LA-BKG	no detects	no data	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	[0.36]	no detects	no detects	no detects	no detects	no detects	no data	no data	no data	no data

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

Table E-1.2-4
HQs for Inorganic Sediment COPCs from 2005 Sample Results

Reach	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Manganese	Mercury	Nickel	Silver	Thallium	Vanadium	Zinc
Sed ESL	280	0.36	12	48	73	0.33	56	230	17	45	20	27	720	0.018	39	1	0.044	30	37
M-1W	max<BV	no detects	max<BV	max<BV	max<BV	2.3	max<BV	max<BV	max<BV	no data	max<BV	0.96	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	2.0
M-1E	66	no data	0.36	3.4	max<BV	max<BV	0.28	0.025	0.72	no data	770	max<BV	0.78	6.7	max<BV	max<BV	max<BV	1.0	1.9
E-1FW	max<BV	no detects	max<BV	max<BV	max<BV	no detects	0.81	max<BV	max<BV	no data	max<BV	max<BV	max<BV	no detects	max<BV	no detects	no detects	max<BV	max<BV
E-1W	max<BV	no detects	0.34	7.2	max<BV	max<BV	0.49	max<BV	1.0	0.169	780	max<BV	0.98	max<BV	max<BV	max<BV	max<BV	0.99	2.5
E-1E	max<BV	no detects	max<BV	max<BV	max<BV	no detects	max<BV	max<BV	max<BV	no data	max<BV	max<BV	max<BV	max<BV	max<BV	no detects	no detects	max<BV	max<BV
M-2W	max<BV	no detects	no detects	max<BV	max<BV	no detects	max<BV	max<BV	max<BV	no data	max<BV	max<BV	max<BV	max<BV	max<BV	no detects	no detects	max<BV	max<BV
M-3	max<BV	max<BV	max<BV	max<BV	max<BV	no detects	0.23	max<BV	0.98	no data	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	1.8
TS-1W	max<BV	no detects	max<BV	max<BV	max<BV	no detects	max<BV	max<BV	max<BV	no data	max<BV	max<BV	max<BV	no detects	max<BV	no detects	no detects	max<BV	max<BV
TS-1C	max<BV	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	no data	max<BV	1.2	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV
TS-1E	max<BV	no detects	max<BV	max<BV	max<BV	no detects	max<BV	0.029	0.69	no data	max<BV	max<BV	0.92	max<BV	max<BV	max<BV	no detects	max<BV	max<BV
TS-2W	max<BV	no detects	max<BV	max<BV	max<BV	no detects	max<BV	max<BV	max<BV	no data	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV
TS-2C	max<BV	no detects	max<BV	max<BV	max<BV	no detects	max<BV	max<BV	max<BV	no data	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	no detects	max<BV	max<BV
TS-2E	max<BV	no detects	max<BV	max<BV	max<BV	no detects	max<BV	max<BV	max<BV	no data	max<BV	max<BV	no data	max<BV	no data	max<BV	max<BV	max<BV	max<BV
M-4	max<BV	no detects	0.33	max<BV	max<BV	no detects	0.26	max<BV	1.1	no data	755	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	2.0
MCW-1	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
MCW-2N	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
MCW-2W	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
MCW-2E	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
M-6	no data	no detects	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
LA-BKG	max<BV	no detects	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	max<BV	no data	max<BV	max<BV	max<BV	max<BV	max<BV	no detects	no detects	max<BV	max<BV

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

Table E-1.2-5
HQs for Radionuclide Sediment COPCs from 2005 Sample Results

Reach	Americium-241	Cesium-137	Cobalt-60	Plutonium-238	Plutonium-239	Strontium-90	Thorium-228	Thorium-230	Thorium-232
Sed ESL	220	720	210	110	110	150	290	120	15
E-1W	0.0013	max<BV	no detects	0.00027	0.0065	no detects	no data	no data	no data
M-3	0.12	0.074	0.00052	0.082	0.14	0.010	no data	no data	no data
M-4	0.11	0.069	no detects	0.072	0.13	0.008	no data	no data	no data
TS-1W	no data	no data	no data	0.012	0.0039	no data	no data	no data	no data
TS-1E	no data	no data	no data	0.019	0.0047	no data	no data	no data	no data
TS-1C	no data	no data	no data	0.0015	0.0034	no data	max<BV	max<BV	max<BV
TS-2W	no data	no data	no data	no data	no data	max<BV	no data	no data	no data
TS-2C	no data	no data	no data	no data	no data	max<BV	no data	no data	no data
TS-2E	no data	no data	no data	no data	no data	no detects	no data	no data	no data

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

Table E-1.2-6
HQs for Organic Sediment COPCs from 2005 Sample Results

Reach	Acenaphthene	Anthracene	Aroclor-1254	Aroclor-1260	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Chrysene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Phenanthrene	Pyrene	Tetrachloroethene	Toluene	Trichloroethane[1,1,1-]
Sed ESL	0.62	0.00039	0.031	0.031	0.11	0.35	0.24	0.29	0.24	0.026	0.5	2.9	0.078	0.85	0.57	0.23	0.67	0.17
M-1W	no detects	no detects	no detects	no detects	3.2	0.69	no detects	no detects	no detects	no detects	0.54	0.25	no detects	0.42	1.0	no detects	no detects	no detects
E-1FW	no detects	no detects	no data	no data	0.091	0.029	no detects	no detects	no detects	no data	0.02	0.010	no detects	0.012	0.035	no data	no data	no data
E-1W	no detects	no detects	no detects	0.65	2.1	0.74	2.0	0.86	no detects	1.5	0.46	0.24	[0.24]	0.47	1.0	no detects	no detects	no detects
E-1E	no detects	103	no detects	no detects	no detects	0.71	1.8	0.41	0.54	no detects	0.50	0.22	1.7	0.40	1.1	no data	no data	no data
M-2W	no detects	17	no detects	no detects	0.55	0.23	0.50	0.24	no detects	no detects	0.12	0.055	no detects	0.059	0.25	no data	no data	no data
M-3	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects
TS-1W	no detects	no detects	no detects	14	0.36	0.20	0.33	0.21	no detects	no data	0.12	0.041	0.64	0.047	0.19	no data	no data	no data
TS-1C	no detects	24	no detects	1.3	0.73	0.34	0.92	0.34	no detects	3.5	0.20	0.079	1.2	0.12	0.40	no data	no data	no data
TS-1E	0.097	77	no detects	0.97	1.7	0.71	1.0	0.62	no detects	no detects	0.38	0.13	[0.16]	0.18	0.67	0.0074	no detects	no detects
TS-2W	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	0.087	no detects	0.059
TS-2C	no detects	no detects	0.245	0.97	0.36	0.143	no detects	0.14	no detects	no detects	0.08	0.028	0.51	0.035	0.14	0.026	no detects	0.017
TS-2E	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects
M-4	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects
MCW-1	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects
MCW-2N	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects
MCW-2W	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects
MCW-2E	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	0.00076	no detects
M-6	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no detects	no detects	no detects
LA-BKG	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no detects	no data	no data	no data

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

Table E-1.2-7
HQs for Filtered Nonstormwater Inorganic COPCs from 2005 Sample Results

Location Synonym	Location ID	Reach	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Fluoride	Iron	Lead	Manganese	Nickel	Perchlorate	Selenium	Silver	Strontium	Thallium	Uranium	Vanadium	Zinc
		Water ESL	87	100	150	3.8	5.3	540	0.15	230000	77	3	5	5.2	1600	1000	1.2	80	28	3.500E+04	5	0.36	620	18	1.8	19	66
PWF1E	MO-24786	E-1FW	3.0	no detects	0.052	55	no detects	0.047	0.67	0.57	0.473	4.7	5.8	0.55	0.062	5.7	0.92	10	0.46	0.0000043	no detects	no detects	0.25	0.033	0.21	0.22	0.19
PW1ST	MO-24792	TS-1W	19	no detects	no detects	25	no detects	0.085	no detects	0.21	0.017	0.63	0.62	2.2	0.038	0.85	no detects	5.6	0.061	0.0000065	no detects	no detects	0.20	0.049	0.13	no detects	0.23
PW1E	MO-24787	E-1W	16	no detects	no detects	30	no detects	0.082	no detects	0.17	0.096	0.53	no detects	no detects	0.47	4.5	0.65	12	0.061	no detects	1.9	no detects	0.20	no detects	0.15	0.18	0.18
PW1M	MO-24789	M-1W	144	0.012	no detects	26	no detects	0.061	1.7	0.97	0.101	1.4	2.5	1.7	0.17	7.3	6.8	0.53	0.20	0.000012	no detects	no detects	0.095	no detects	0.24	1.1	1.2
PE2M	MO-24791	M-2E	2.6	0.0061	no detects	12	no detects	0.11	no detects	0.47	0.030	no detects	0.78	no detects	0.37	0.103	no detects	no detects	0.10	0.00071	no detects	no detects	0.13	no detects	0.37	0.063	0.039
PE2ST	MO-24793	TS-2E	4.5	no detects	no detects	38	no detects	0.056	no detects	0.062	0.022	0.80	1.7	no detects	0.19	0.55	0.48	11	0.30	no detects	no detects	0.72	0.30	no detects	0.43	0.21	0.070
PE1E	MO-24788	E-1E	11	0.008	no detects	8.4	no detects	0.20	no detects	0.17	0.032	0.67	2.4	no detects	0.33	0.56	0.53	0.168	0.50	0.000011	no detects	no detects	0.11	0.023	0.29	0.12	0.14
PE1M	MO-24790	M-1E	49	no detects	no detects	35	no detects	0.049	no detects	0.21	0.052	2.5	0.70	no detects	0.12	2.3	1.3	23	0.27	no detects	no detects	no detects	0.20	no detects	0.16	0.19	0.21
E200	Mortandad below Effluent Canyon	M-2W	32	no detects	no detects	10	no detects	0.053	no detects	0.15	no detects	no detects	0.70	no detects	0.19	1.5	1.3	0.21	no detects	1.394E-05	no detects	no detects	0.098	no detects	no data	no detects	0.16

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

Table E-1.2-8
HQs for Filtered Nonstormwater Radionuclide COPCs from 2005 Sample Results

Location Synonym	Location ID	Reach	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240	Radium-226	Strontium-90	Uranium-234	Uranium-238
		Water ESL	5.8	42.6*	19	20	0.1	278*	22	24
PE1E	MO-24788	E-1E	0.70	0.54	0.079	0.13	4.2	0.016	0.019	0.015
PWF1E	MO-24786	E-1FW	no detects	no detects	no detects	no detects	no detects	no detects	0.0064	0.0053
PW1E	MO-24787	E-1W	no detects	no detects	no detects	no detects	no detects	0.0016	0.0045	0.0033
PE1M	MO-24790	M-1E	no detects	no detects	no detects	no detects	3.7	0.0022	0.0060	0.0037
PW1M	MO-24789	M-1W	no detects	no detects	no detects	no detects	15	no detects	0.0075	0.0062
PE2M	MO-24791	M-2E	0.11	no detects	0.011	0.020	no detects	0.149	0.027	0.0081
E200	Mortandad below Effluent Canyon	NULL	0.28	0.23	0.023	0.038	6.1	0.012	0.0080	0.0032
PW1ST	MO-24792	TS-1W	0.0080	no detects	0.012	0.0036	no detects	0.033	0.0059	0.0043
PE2ST	MO-24793	TS-2E	no detects	no detects	no detects	no detects	no detects	0.069	0.011	0.011

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).
*DOE BCG used because lower than LANL ESL.

Table E-1.2-9
HQs for Unfiltered Nonstormwater Inorganic COPCs from 2005 Sample Results

Location ID	Reach	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chloride	Chromium	Cobalt	Copper	Cyanide (Total)	Fluoride	Iron	Lead	Manganese	Mercury	Nickel	Silver	Strontium	Thallium	Uranium	Vanadium	Zinc
Water ESL		87	100	150	3.8	5.3	540	0.15	230000	77	3	5	5.2	1600	1000	1.2	80	0.77	28	0.36	620	18	1.8	19	66
MO-24786	E-1FW	13	no detects	0.051	53	no detects	0.049	1.1	0.59	0.60	3.7	9	no data	0.22	4.2	2.6	11	no detects	0.40	no detects	0.25	no detects	0.26	0.44	0.25
MO-24792	TS-1W	433	no detects	0.050	92	0.66	0.11	8	0.21	0.27	3.8	5	no data	0.14	38	28	21	no detects	0.61	1.1	0.30	0.041	1.6	1.9	3.2
MO-24787	E-1W	39	no detects	0.044	39	0.077	0.049	0.87	0.23	0.097	0.33	0.70	no detects	0.48	6.3	1.5	14	no detects	0.09	no detects	0.19	no detects	0.28	0.33	0.28
MO-24789	M-1W	502	0.010	0.043	52	0.40	0.069	3	0.98	0.36	0.90	11	no detects	0.45	26	23	1.4	0.091	0.49	no detects	0.10	no detects	0.40	2.5	4.1
MO-24791	M-2E	11	0.006	no detects	11	no detects	0.11	no detects	0.26	0.031	no detects	0.84	no data	0.39	0.47	no detects	0.074	no detects	0.11	no detects	0.13	no detects	0.41	0.074	0.062
MO-24793	TS-2E	27	no detects	no detects	39	no detects	0.056	1.0	1.1	0.027	0.70	2.0	no data	0.20	1.1	1.4	11	no detects	0.30	0.89	0.30	no detects	0.43	0.23	0.13
MO-24788	E-1E	38	0.007	no detects	12	0.036	0.17	0.80	0.29	0.060	no detects	4.7	no detects	0.39	2.1	1.9	0.93	no detects	0.46	no detects	0.12	no detects	0.37	0.17	0.44
MO-24790	M-1E	85	no detects	no detects	36	no detects	0.050	0.80	0.21	0.088	1.9	0.88	no data	0.31	4.2	2.6	25	no detects	0.28	no detects	0.20	no detects	0.19	0.40	0.32
Mortandad below Effluent Canyon	NULL	51	no detects	no detects	12	no detects	0.056	no detects	0.15	no detects	no detects	0.94	no data	0.20	2.5	2.3	0.36	no detects	no detects	no detects	0.10	no detects	no data	no detects	0.23
MO-24808	M-2W	9	no detects	no detects	13	0.026	no data	0.73	0.10	0.018	no detects	1.8	no detects	no detects	0.47	0.46	1.4	no detects	0.21	no detects	no data	no detects	no data	0.11	0.26
LA-24809	LA-BKG	2.9	no detects	no detects	13	no detects	no data	no detects	0.061	no detects	no detects	2.4	no detects	no detects	0.14	no detects	0.066	no detects	0.51	no detects	no data	no detects	no data	0.089	no detects
MO-24792	TS-1C	222	no detects	no detects	38	0.14	no data	1.2	0.10	0.11	0.43	2.3	0.52	0.10	8.6	5.0	1.0	no detects	0.18	no detects	no data	no detects	no data	0.74	0.78
MO-24794	TS-1E	13	no detects	no detects	30	0.023	no data	no detects	0.050	no detects	no detects	0.94	no detects	0.20	0.68	1.0	1.1	no detects	0.11	no detects	no data	no detects	no data	0.17	0.16
MO-24795	TS-2C	7	no detects	no detects	45	0.034	no data	4	0.043	0.018	0.47	6.5	0.54	0.27	0.49	1.3	5.3	no detects	0.31	15	no data	no detects	no data	0.13	0.33

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

Table E-1.2-10
HQs for Unfiltered Nonstormwater Radionuclide COPCs from 2005 Sample Results

Location ID	Reach	Americium-241	Cesium-137	Plutonium-238	Plutonium-239	Radium-226	Strontium-90	Tritium	Uranium-234	Uranium-238
	Water ESL	5.8	42.6*	19	20	0.1	278*	1.60E+08	22	24
MO-24786	E-1FW	no detects	no detects	no detects	no detects	no detects	0.0013	0.00000073	0.0089	0.0067
MO-24792	TS-1W	0.014	no detects	0.053	0.019	no detects	0.024	0.00000046	0.010	0.0090
MO-24787	E-1W	no detects	no detects	no detects	no detects	7.7	0.0021	0.0000023	0.0087	0.0068
MO-24789	M-1W	no detects	no detects	0.0070	0.0040	4.3	0.0016	0.00000055	0.019	0.017
MO-24791	M-2E	0.17	0.14	0.015	0.025	no detects	0.16	0.0000037	0.024	0.0076
MO-24793	TS-2E	no detects	no detects	0.0038	no detects	no detects	0.077	0.0000010	0.010	0.011
MO-24788	E-1E	1.5	0.84	0.17	0.24	no detects	0.014	0.0000068	0.026	0.010
MO-24790	M-1E	no detects	no detects	no detects	no detects	no detects	0.0016	0.00000054	0.0059	0.0054
Mortandad below Effluent Canyon	M-2W	0.49	0.40	0.074	0.107	4.7	0.012	0.0000014	0.012	0.0057
MO-24808	M-2W	0.32	no data	0.039	0.041	no detects	no data	no data	0.016	0.0079
LA-24809	LA-BKG	no detects	no data	no detects	no detects	no detects	no data	no data	0.0027	no detects
MO-24792	TS-1C	0.034	no data	0.094	0.040	no detects	no data	no data	0.011	0.0092
MO-24794	TS-1E	no detects	no data	0.0063	no detects	no detects	no data	no data	0.012	0.012
MO-24795	TS-2C	no detects	no data	0.0032	no detects	no detects	no data	no data	0.0068	0.0054

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).
*DOE BCG used because lower than LANL ESL.

Table E-1.2-11
HQs for Unfiltered Nonstormwater Organic COPCs from 2005 Sample Results

Location ID	Reach	Acetone	Aroclor-1260	Benzoic Acid	Perchlorate
	Water ESL	11000	10	41	35000
Mortandad below Effluent Canyon	NULL	0.00027	no detects	no data	no data
MO-24786	E-1FW	0.00025	no detects	no detects	no data
MO-24787	E-1W	0.00026	no detects	no detects	no detects
MO-24789	M-1W	no detects	no detects	no detects	no detects
MO-24791	M-2E	no detects	no detects	no detects	no data
MO-24793	TS-2E	0.00018	no detects	no detects	no data
MO-24788	E-1E	0.00018	no detects	0.35	0.000019
MO-24790	M-1E	0.00031	no detects	no detects	no data
MO-24792	TS-1W	0.00022	0.11	no detects	no data
MO-24808	M-2W	no data	no detects	no detects	0.0000040
LA-24809	LA-BKG	no data	no detects	no detects	no detects
MO-24795	TS-2C	no data	no detects	no detects	no detects
MO-24792	TS-1C	no data	no detects	no detects	no detects
MO-24794	TS-1E	no data	no detects	no detects	no detects

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

Table E-1.2-12
HQs for Filtered Stormwater Inorganic COPCs from 2005 Sample Results

Canyon	Location Synonym	Location ID	Aluminum	Antimony	Arsenic	Barium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Nickel	Perchlorate	Silver	Thallium	Vanadium	Zinc
		Water ESL	87	100	150	3.8	0.15	77	3	5	1000	1.2	80	28	35000	0.36	18	19	66
Mortandad	E200	Mortandad below Effluent Canyon	15	0.029	no detects	9.7	no detects	0.045	no detects	1.8	0.68	0.63	1.3	0.093	0.000	no detects	no detects	0.179	0.47
Ten Site	E201.3	Ten Site below MDA C	16	0.010	0.051	7.0	0.73	0.048	1.6	3.0	0.65	0.57	0.36	0.100	no data	no detects	no detects	0.184	0.98
Ten Site	E201.5	Ten Site above Mortandad	38	no detects	no detects	9.0	no detects	0.044	2.1	1.3	1.6	1.3	0.260	0.093	no data	1.3	0.028	0.258	0.282
Mortandad	E201	Mortandad above Ten Site	30	no detects	no detects	5.4	1.0	0.049	0.43	1.4	1.4	1.1	0.180	0.125	0.000	no detects	no detects	0.158	0.182
Mortandad	E202	Mortandad above Sediment Traps	37	no detects	no detects	5.7	no detects	0.045	1.0	1.2	1.7	1.3	0.286	0.100	no data	no detects	no detects	0.189	0.170

Notes: Values are HQs (unitless). Gray shading indicates 0.3<HQ<3 (COPEC). Black shading indicates HQ>3 (field study design COPEC).

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Appendix F

Mortandad Canyon Alluvial Water-Level Study

F-1.0 UPPER MORTANDAD CANYON HYDROLOGIC SEGMENT

Continuous-record water-level data from MCO-0.6 and MCA-1 provide the basis for examining the nature and causes of water-level variations in the upper Mortandad Canyon hydrologic segment. Figures F-1.0-1 (a and b) show the water-level records plotted for comparison to precipitation data and the streamflow record at gaging stations E200 and E202. Both plots illustrate similar aquifer behavior: the groundwater level rises rapidly in response to summer and fall precipitation events and associated stormwater runoff. Rises in groundwater level correlate well with the streamflow record at gaging station E200, indicating that recharge from the streambed occurs quickly during floods. The shapes of the two hydrographs are generally similar with similar magnitudes of water-level response and rates of recession following recharge events through the fall of 2005. However, after the September 29, 2005, flood event, the recessional limb of the hydrograph at MCA-1 is considerably steeper and shorter lived than that seen in the hydrograph for MCO-0.6. MCA-1 dried up within 3 months while the alluvium at MCO-0.6 maintained saturated conditions for approximately 8 months. These data indicate that the upper part of the canyon near MCO-0.6 experiences longer periods of sustained runoff that infiltrates before reaching MCA-1. The thin alluvium at MCO-0.6 (1 m [3 ft]) at the wetland provides limited storage capacity for alluvial groundwater. However, the stream has limited alluvium and areas of bedrock channel as the canyon steepens eastward toward the confluence with Effluent Canyon, and the ability to store groundwater is generally small. This difference in storage is supported by the observation that the alluvium near MCO-0.6 experienced recharge during February and March 2006 from snowmelt runoff that was not observed at MCA-1.

F-2.0 EFFLUENT CANYON HYDROLOGIC SEGMENT

Figure F-2.0-1 shows continuous-record water-level data for MCA-4 compared with precipitation data and the streamflow record for gaging stations E200 and E202. The MCA-4 hydrograph shows similar aquifer behavior to that seen in the upper Mortandad Canyon hydrologic segment in that the groundwater level rises rapidly in response to stormwater runoff events associated with summer and fall precipitation events, and the groundwater responses occur virtually instantaneously, correlating well with the streamflow record at gaging station E200. However, unlike wells in the upper Mortandad Canyon hydrologic segment, the hydrograph recession after the September 29, 2005, flood leveled off to an equilibrium base-flow condition. This is caused by consistent recharge to the alluvial system supplied by the Technical Area (TA) 55 outfall resulting in base-flow conditions apparent from November 2005 to February 2006. Recharge from snowmelt during the period from March to mid-May 2006 caused an additional water-level rise of nearly 0.3 m (1 ft). The following hydrograph recession is uninterrupted until responding to the June 2006 runoff recharge, but the well never dried up completely. These data show the significance of outfall discharges on maintaining saturation in the alluvium in the Effluent Canyon hydrologic segment.

F-3.0 MIDDLE MORTANDAD CANYON HYDROLOGIC SEGMENT

Several alluvial wells with water-level records are located in the middle Mortandad Canyon hydrologic segment below the confluence with Effluent Canyon and above the confluence with Ten Site Canyon. Figure F-3.0-1 (a–c) depicts continuous-record water-level data compared with precipitation and streamflow data for a few wells selected to illustrate representative alluvial aquifer behavior in this canyon segment. Alluvial monitoring well MCA-5 is located in the uppermost portion of the middle Mortandad Canyon hydrologic segment approximately 200 m (655 ft) downstream from the confluence with Effluent Canyon. Wells MCO-4B, MCO-5 and MCWB-5 are located near each other about 1600 m (5250 ft)

downstream from the Effluent Canyon confluence and about 650 m (2130 ft) upstream from the Ten Site confluence. Wells MCWB-5.5A and MCWB-5.5B are located about 100 m (328 ft) upstream of the Ten Site confluence (Figure 3.2-1, Plate 1).

The MCA-5 hydrograph shows similar aquifer behavior to that seen in the upper Mortandad Canyon and Effluent Canyon hydrologic segments with rapid groundwater-level responses to stormwater runoff events associated with summer and fall precipitation events, again occurring rapidly and correlating well with the streamflow record at gaging station E200. However, the MCA-5 hydrograph recessional limbs are steep and abrupt, suggesting little capacity for storage in the aquifer at this location. The alluvial aquifer in this part of the canyon is relatively thin (approximately 1.8 m [6 ft]) and restricted within a narrow bedrock channel. The lateral extent of saturation is thus likely restricted to a narrow zone immediately adjacent to the channel with little volume available for aquifer storage. As a result, this well was dry approximately half the time of its period of record even though it was located within a reach with perennial surface water (Section 7.2.1.1).

Farther downcanyon in the MCO-4B/ MCO-5/MCWB-5 vicinity, differing aquifer behaviors are apparent from those observed in the upper canyon segments. The early part of the MCWB-5 hydrograph when the well was dry shows a considerable time lag between the stream flow recorded during January–March 2004 and the water level response in early May. After drying up again, the late November 2004 water–level rise is an apparent response to streamflow that occurred from mid-September to mid-October. The rapid water level rise recorded in all three hydrographs in mid-August 2005 is an apparent response to streamflows recorded in mid-July. After these events and after persistent saturated conditions were maintained in the alluvium, nearly instantaneous responses to flood events on August 24 and September 29 are recorded in all three hydrographs. These data suggest that initial recharge to the alluvium in this canyon segment when the aquifer is dry occurs by means of underflow from the downcanyon migration of groundwater that had been previously recharged farther upcanyon, resulting in a time lag of several weeks. After the system achieved a significant level of saturation, vertical infiltration from the overlying stream channel resulted in rapid recharge from flood events. A noteworthy observation made from these data is that the recessional limbs of these wells' hydrographs are much longer than those observed in the upper canyon wells with extended periods of gradual decline lasting up to 4 months. This behavior reflects a significantly greater aquifer storage capacity due to a larger volume of alluvial deposits present in this portion of the middle Mortandad Canyon hydrologic segment (the canyon floor in this area is approximately 30 to 40 m [100 to 130 ft] in width and the thickness of the alluvial deposits is typically about 7 to 10 m [23 to 33 ft]).

The hydrographs for alluvial wells MCWB-5.5A and MCWB-5.5B also show significant time lags between streamflow events and water-level responses in the early record when persistent dry conditions existed in the alluvium between 2002 and mid-2004. Time lags of several months between recorded streamflow events and well hydrograph responses are apparent. These early record responses represent water measured below the well screens in the well sumps, which are apparently leaky as they appear to drain readily. The transient events observed where water rose in the sump but then dropped again before reaching the screen bottom suggest that the leading edge of the underflow recharge front advancing downcanyon may be a very thin zone of water perched at the base of the alluvium, perhaps only a few centimeters or so in thickness. The thin underflow zone resulted in a slow trickle into the well sumps maintaining a depth of a couple of feet for a few months when the slow water input was in approximate equilibrium with the leak rate, but then it dried up before saturation above the bottom of the well screens was established. There is also a few weeks' difference in the arrival times of this thin recharge front between the two wells even though they are located only 19 m (62 ft) apart on either side of the stream channel. This likely reflects the heterogeneous nature of the interface between the alluvium and the underlying Cerro Toledo deposits in this canyon segment, causing a variable level of persistence of water

perched above the contact and generating only ephemeral and discontinuous recharge to the wells. The snowmelt runoff recorded from mid-January through mid-April 2004 did not generate recharge to the alluvium in this canyon segment until early May 2004, after which water-level responses are nearly simultaneous in each well. This again supports the conceptual model of initial recharge following dry conditions in the alluvium by means of an underflow recharge front generated by infiltration farther upcanyon. An idea of the velocity of this recharge front may be obtained by comparing the arrival times at different points in the canyon. For example, the water-level response initiated on May 3, 2004, at MCWB-5 was observed in MCWB-5.5A on May 7, 2004. Likewise, a water-level response initiated on February 12, 2005, at MCWB-5 was observed in MCWB-5.5A on February 16, 2005. Finally, the water-level response initiated on August 12, 2005, at MCWB-5 was observed in MCWB-5.5A on August 26, 2005. These data indicate a travel time of 4 days for the first two events and 14 days for the last event. MCWB-5.5 is located 321 m (1055 ft) downstream from MCO-5; thus, the velocity of the recharge fronts moving downcanyon is on the order of 23 to 80 m/d (75 to 262 ft/d).

Figure F-3.0-2 depicts the continuous-record water levels from the MCA-3abc piezometer nest located about 52 m (170 ft) downstream from well MCWB-5.5A and about 125 m (410 ft) upstream from the Ten Site confluence (Figure 3.2, Plate 1) compared with precipitation and streamflow data. The piezometer nest consists of three nominal 2.5-cm (1-in.) diameter polyvinyl chloride pipes with 15.2-cm (0.5-ft) screens. The lowest screen is designated as the “a” piezometer, the middle screen as the “b” piezometer, and the upper screen as the “c” piezometer. For the purpose of this discussion, they are referred to as 3a, 3b, and 3c. A vertical distance of 0.76 m (2.5 ft) separates the screen bottom elevations of 3a and 3b, and 0.6 m (2 ft) separates the screen bottom elevations of 3b and 3c. Piezometers 3a and 3c were installed in a single borehole with a bentonite seal placed between the screens, while 3b was installed in a second borehole located about 1 m (3 ft) distance from the first. The piezometer nest was installed for the purpose of investigating vertical gradients in the alluvial aquifer. Significant downward gradients may be indicative of downward groundwater movement induced by infiltration losses from the base of the alluvium. Since the alluvium overlies the Cerro Toledo interval in this area, it was deemed a likely target for investigating possible infiltration losses from the alluvium. The piezometer hydrographs show no response to streamflow events recorded in April and July 2005. However, rapid water-level rises are observed in response to runoff events associated with summer and fall rainstorms in August and September 2005. A notable observation made from these data is that the early data show an upward gradient between the 3b and 3c piezometers, which was then reversed to a downward gradient after the flood of September 29, 2005. As shown in Figure F-3.0-2, the gradient between 3a and 3b varied between about +1 and +4 (downward), while the gradient between 3b and 3c varied from about –0.4 (upward) to +0.4 (downward).

Another observation from these data is that the water level measured in 3a is consistently 2.1 to 2.4 m (7 to 8 ft) lower than the 3b and 3c water levels, which generally differ by 0.15 to 0.3 m (0.5 to 1 ft). Also, the water-level changes observed in 3a are more muted and produce an erratic hydrograph compared with the smooth curves generated in 3b and 3c. This type of behavior is consistent with that observed in some piezometer nests previously installed in Los Alamos Canyon for a zone of lower conductivity with substantial silt content at the base of the alluvium. In those piezometer nests, the apparent large vertical gradient between the lower and middle piezometers did not translate to a significant seepage velocity since the hydraulic conductivity of the bottom screened interval was significantly lower than the upper screened zones. For example, in the LAP-1 piezometer nest, the conductivity differential between the lower and upper screens was an order of magnitude ($4.7 \times 1\ 0^{-4}$ cm/s vs. 1.3×0^{-3} cm/s to 2.7×10^{-3} cm/s, respectively) (LANL 2004, 87386). Slug tests were performed on each piezometer in the MCA-3abc nest, and those results are shown in Table F-3.0-1.

The lithologic logs for the MCA-3abc boreholes show that the material adjacent to the 3a and 3b screens is silty sand with trace clay, and material adjacent to the 3c screen is tuff boulders. A representative hydraulic conductivity for a silty sand is about 10^{-5} to 10^{-3} cm/s, while a conductivity of 10^{-7} cm/s is typical of pure silt or clay (Freeze and Cherry 1979, 64057). Although the slug test results bear out the conceptual model of a low-conductivity zone at the base of the alluvium, the slug test results reported for this piezometer appear to be unreliable. In addition, repeatability between tests for the 3a and 3b piezometers was poor, and the 3a and 3b piezometers were never developed and in fact were dry when tested (the tests were performed by pouring water into the dry well and recording the rate of water-level decline). Because of sidewall smearing effects during drilling, slug tests performed in undeveloped wells are not reliable, and the poor repeatability of the tests is indicative of this fact. It is thus possible that the apparent gradient reversal observed after the major flood of September 29, 2005, is not real but is merely an artifact of erratic well behavior due to a lack of development. Considering the potential problems caused by these data, it is not possible to compute reliable seepage velocities for this piezometer nest.

F-4.0 TEN SITE CANYON HYDROLOGIC SEGMENT

The alluvium in the Ten Site Canyon Hydrologic Segment is thin, generally less than 1 to 2 m thick for most of its length, and discontinuous with areas where bedrock is exposed in the stream bed. Water-level data are available from only two alluvial wells in this segment. Alluvial well TSWB-6 has been dry during every measurement event since its installation in 1994. Alluvial well TSCA-6 has a short period of record (since October 3, 2005), showing an initial saturated thickness of about 0.45 m (1.5 ft) that quickly dropped below the screen by November 28, 2005, after which it was continuously dry. The brief record suggests similar aquifer behavior to that observed in the upper Mortandad Canyon hydrologic segment with rapid water-level rises and recessions following runoff recharge events.

F-5.0 LOWER MORTANDAD CANYON HYDROLOGIC SEGMENT

A number of alluvial wells with water-level records are located in the lower Mortandad Canyon hydrologic segment. Figure F-5.0-1 (a–d) depicts continuous-record water-level data compared with precipitation and streamflow data for a few wells selected to illustrate representative alluvial aquifer behavior in this canyon segment. Wells MCWB-6.5C, MCWB-6.5E, and MCA-2 are located near each other, forming a transect approximately 60 m (620 ft) below Ten Site confluence. Well MCWB-7A is located above the sediment traps approximately 190 m (720 ft) downstream from the Ten Site confluence. Wells MCWB-7.4A and MCWB-7.4B along with well MT-1 form a transect across the canyon just below the sediment traps and approximately 460 m (1520 ft) below the Ten Site confluence. Wells MCWB-7.7A and MCWB-7.7B form a transect across the canyon below the sediment traps and approximately 660 m (2165 ft) below the Ten Site confluence (Figure 3.2-1, Plate 1). No wells with continuous-record water-level data show saturated conditions in the alluvium located downstream from MCWB-7.7A and MCWB-7.7B. Alluvial wells MCA-8 and MCA-9 were installed in the lower part of this canyon segment about 190 m (625 ft) upstream from the Laboratory/San Ildefonso Pueblo boundary as part of this investigation. Those wells have been continuously dry during their entire period of record (since October and December 2004, respectively).

Well MCWB-6.5E is located 72 m (235 ft) from MCWB-6.5C, forming a north-northeast-trending transect across the broad section of the canyon just below the Ten Site confluence. The proximity to the mouth of Ten Site Canyon makes this a transition area where alluvial groundwater could be influenced by recharge in both canyons. Well MCA-2 is located approximately 25 m (80 ft) east of this transect line and about midway between the other two wells, thus forming a three-well transect across the canyon with

MCWB-6.5E at the northern end and MCWB-6.5C at the southern end. Well MCWB-6.5C is located south of and closer to (about 20 m [65 ft]) the stream channel, while the other wells are located north of the channel (Figure 3.2-1, Plate 1).

The hydrographs for these wells (Figure F-5.0-1a) show that well MCWB-6.5C was dry throughout the period from 2002 to mid-2004, while MCWB-6.5E experienced slowly fluctuating water levels with no clear correlation to specific recharge events. In response to the extensive snowmelt runoff measured at gage E200 between January 23, 2004, and April 11, 2004, water-level rise was first recorded at MCWB-6.5E on June 11, 2004, and then not until July 6, 2004, at MCWB-6.5C, indicating a lag time of about 5 to 6 months for underflow recharge to migrate downcanyon to this area. MCWB-6.5E is closer to the mouth of the middle Mortandad hydrologic segment and thus saw recharge first. It then took 25 d for the advancing underflow recharge front to reach MCWB-6.5C, yielding an apparent southward groundwater flow velocity of 2.9 m/d (9.5 ft/d), considerably slower than that observed in the MCO-5 to MCWB-5.5A vicinity. This may be explained by the fact that the volume of alluvial sediments enlarges dramatically within the zone of the Ten Site confluence, thus causing a spreading of the previously focused recharge front emanating from the middle Mortandad Canyon hydrologic segment. All three wells responded quickly to the flood event of September 29–30 2005; MCA-2 and MCWB-6.5C on September 29, 2005; and MCWB-6.5E on September 30, 2005. In this instance, with alluvial saturation already established, vertical infiltration from the stream channel was able to rapidly recharge the aquifer. The two wells closest to the channel, MCA-2 and MCWB-6.5C, exhibited water-level responses a day earlier than the MCWB-6.5E, the most distal well in the transect, further indicating that channel infiltration was the source of this recharge event.

Well MCWB-7A (Figure F-5.0-1b) has similar responses to MCWB-6.5E. Although it is located 160 m (525 ft) downstream from MCWB-6.5E, the water level in well MCWB-7A responded to the January–April 2004 snowmelt runoff measured at gage E200 on May 29, 2004, 12 days earlier than the response at MCWB-6.5E. This could indicate that the preferential path for movement of the underflow recharge front is eastward along the north edge of the canyon, essentially bypassing MCWB-6.5E to get to MCWB-7A first before spreading more slowly southward to MCWB-6.5E. It certainly suggests that preferential flow paths are important controls on water movement in the alluvial aquifer. MCWB-7A responded similarly to the September 2005 flood on September 29, 2005. Wells MCWB-7.4A and MCWB-7.4B (Figure F-5.0-1c) show similar but dramatically differing behavior: MCWB-7.4A dried up completely for extended periods in 2002–2003 and 2004 while MCWB-7.4B maintained saturated conditions throughout the depicted period. It is not clear to what event(s) the dramatic water-level rise in MCWB-7.4A in May 2003 may be attributed; the most notable preceding streamflow events occurred in July and September 2002. The water-level response in MCWB-7.4A to the January–April 2004 snowmelt runoff measured at gage E200 occurred on September 7, 2004, 12 days later than it occurred at MCWB-7A. The intervening distance between these wells is 279 m (915 ft), resulting in a groundwater flow velocity of 23 m/d (75 ft/d) for the advancing underflow recharge front to move through this canyon segment. The pattern of water-level fluctuation in MCWB-7.4B is similar, but responses are slower and muted in comparison.

Well MCWB-7.4B is located 50 m (165 ft) south of MCWB-7.4A, closer to the stream channel, but its location downstream from the sediment traps negates the likelihood of seeing significant streambed infiltration at this location. Wells MCWB-7.7A and MCWB-7.7B (Figure F-5.0-1d) are located near the downstream extent of alluvial saturation in the canyon, 197 m (645 ft) downstream from wells MCWB-7.4A and MCWB-7.4B. The hydrograph for well MCWB-7.7A dramatically shows the alluvium drying out along the north portion of the canyon with no water at all between June 2000 and August 2005. Located only 56 m (185 ft) south of MCWB-7.7A, well MCWB-7.7B was dry between June 2003 and December 2004. Responses to the underflow recharge front generated by the January–April 2004 snowmelt runoff event occurred on December 21, 2004, at MCWB-7.7B and not until August 13, 2005, at MCWB-7.7A. Here, preferential flow appears to have shifted toward the southern portion of the canyon.

Using the arrival time at MCWB-7.7B, the recharge front advanced 197 m (645 ft) over a period of 105 d, resulting in a groundwater-flow velocity of approximately 1.9 m/d (6.2 ft/d) in this canyon segment. However, it took nearly 9 additional months for water to be seen at MCWB-7.7A.

F-6.0 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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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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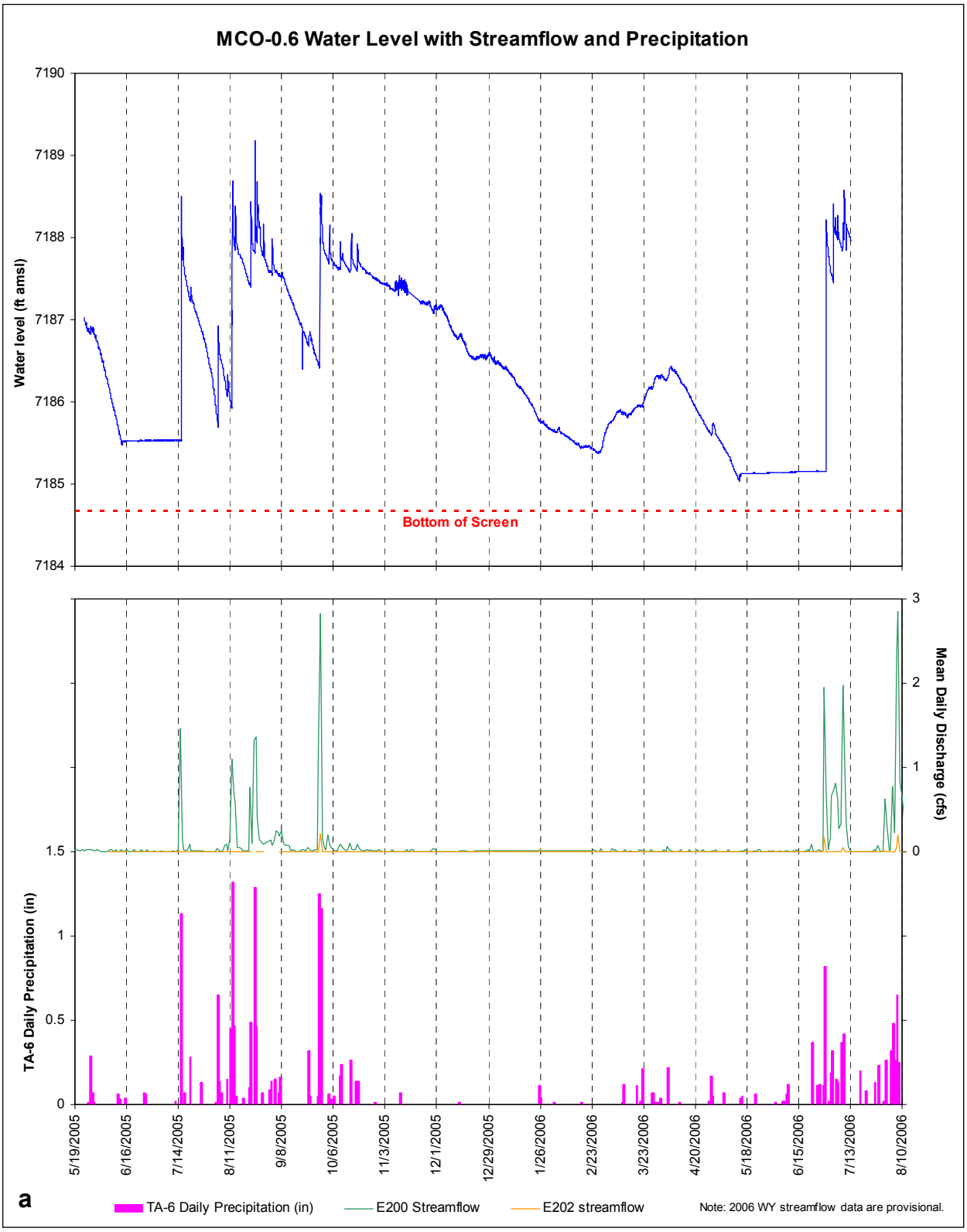


Figure F-1.0-1. Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in upper Mortandad Canyon

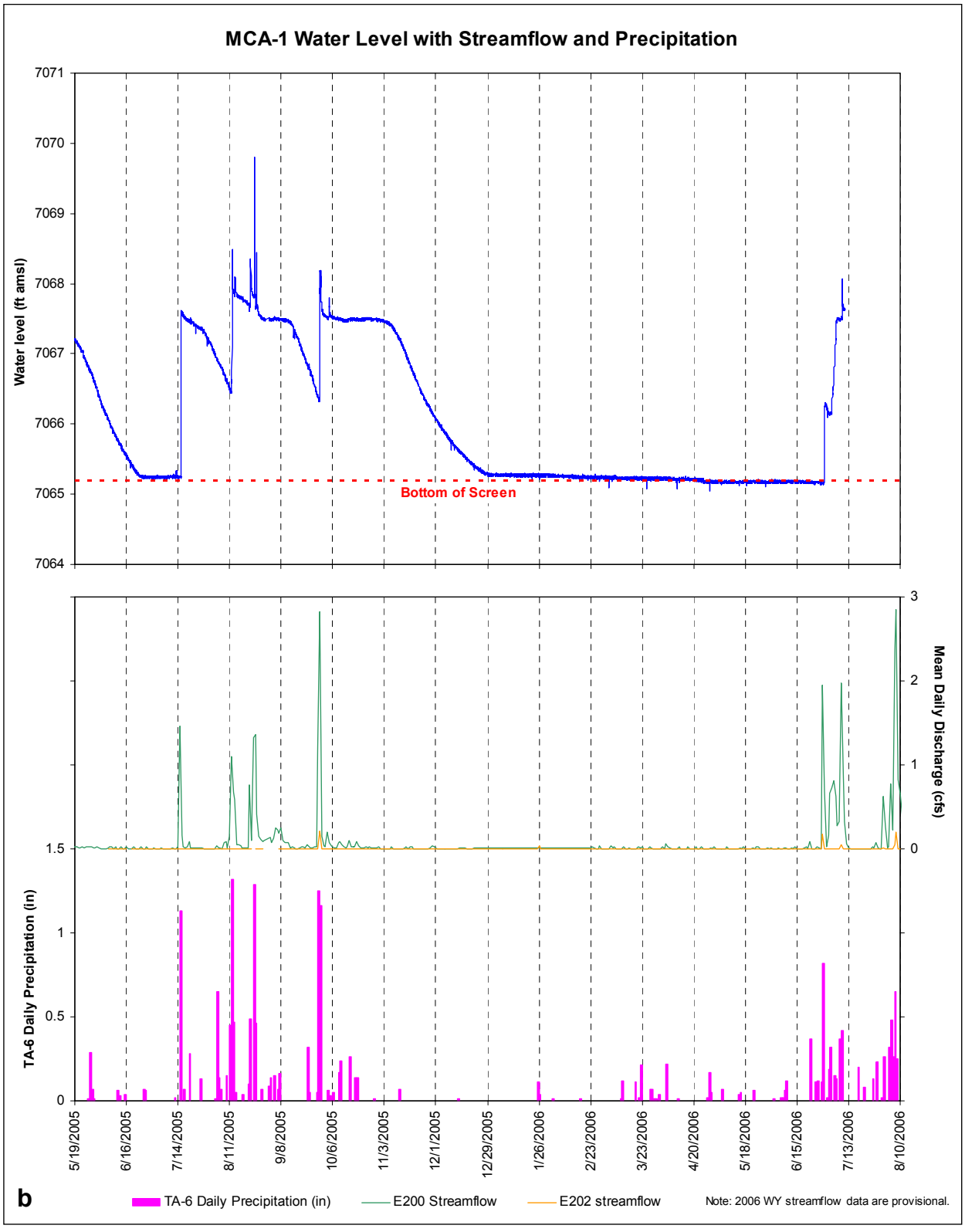


Figure F-1.0-1 (continued). Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in upper Mortandad Canyon

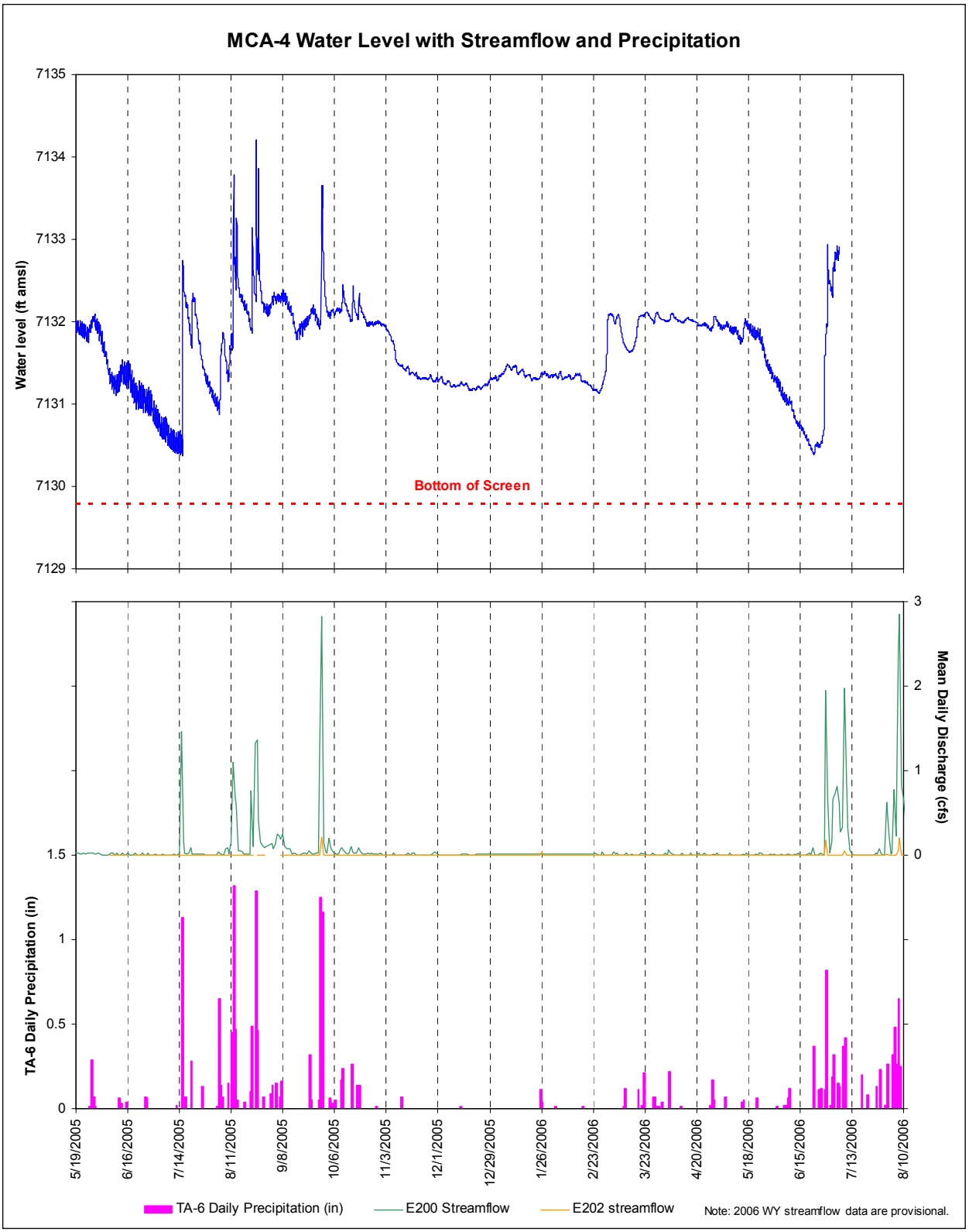


Figure F-2.0-1. Precipitation and streamflow data related to the groundwater-level data for alluvial groundwater monitoring well MCA-4 in Effluent Canyon

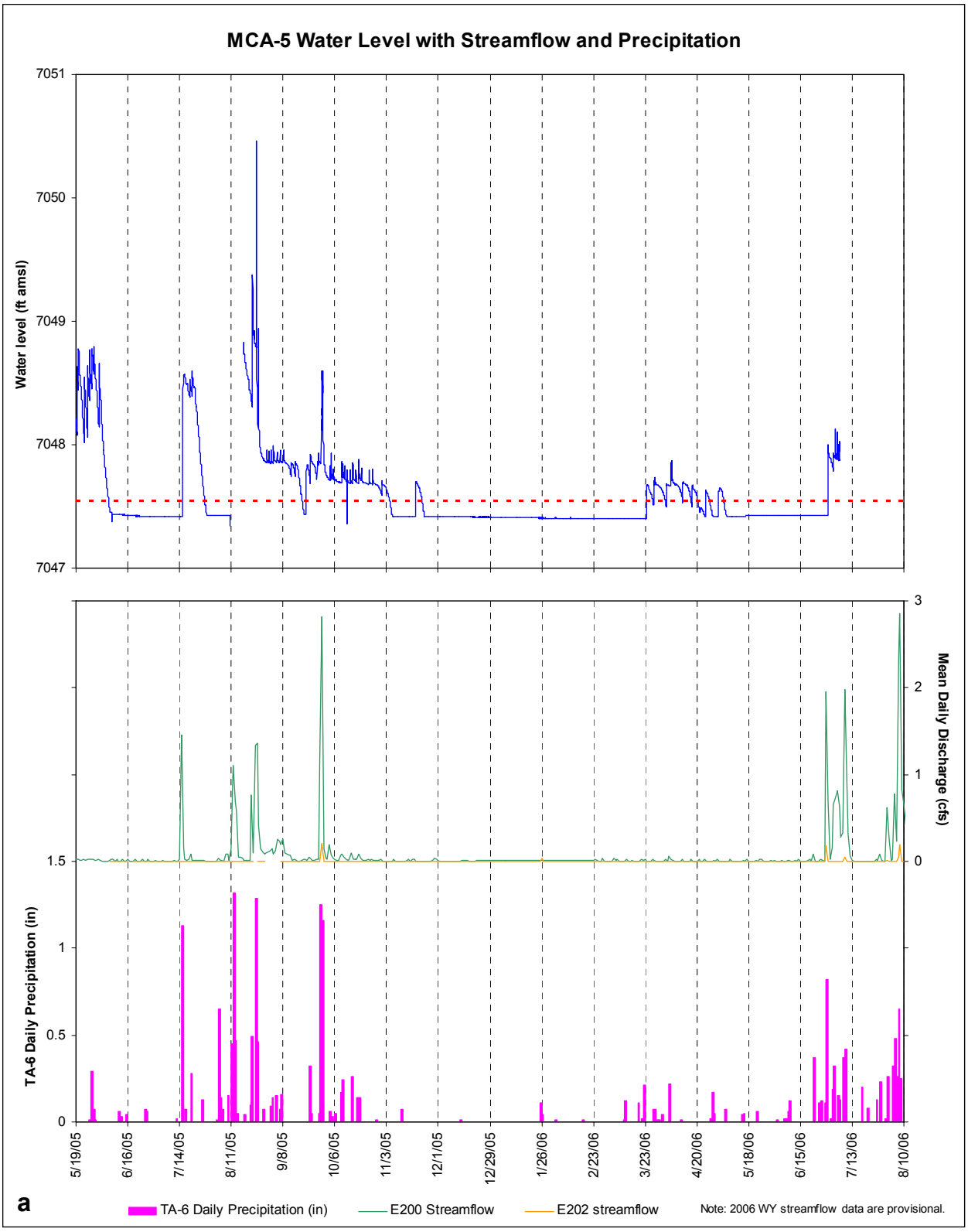


Figure F-3.0-1. Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in middle Mortandad Canyon

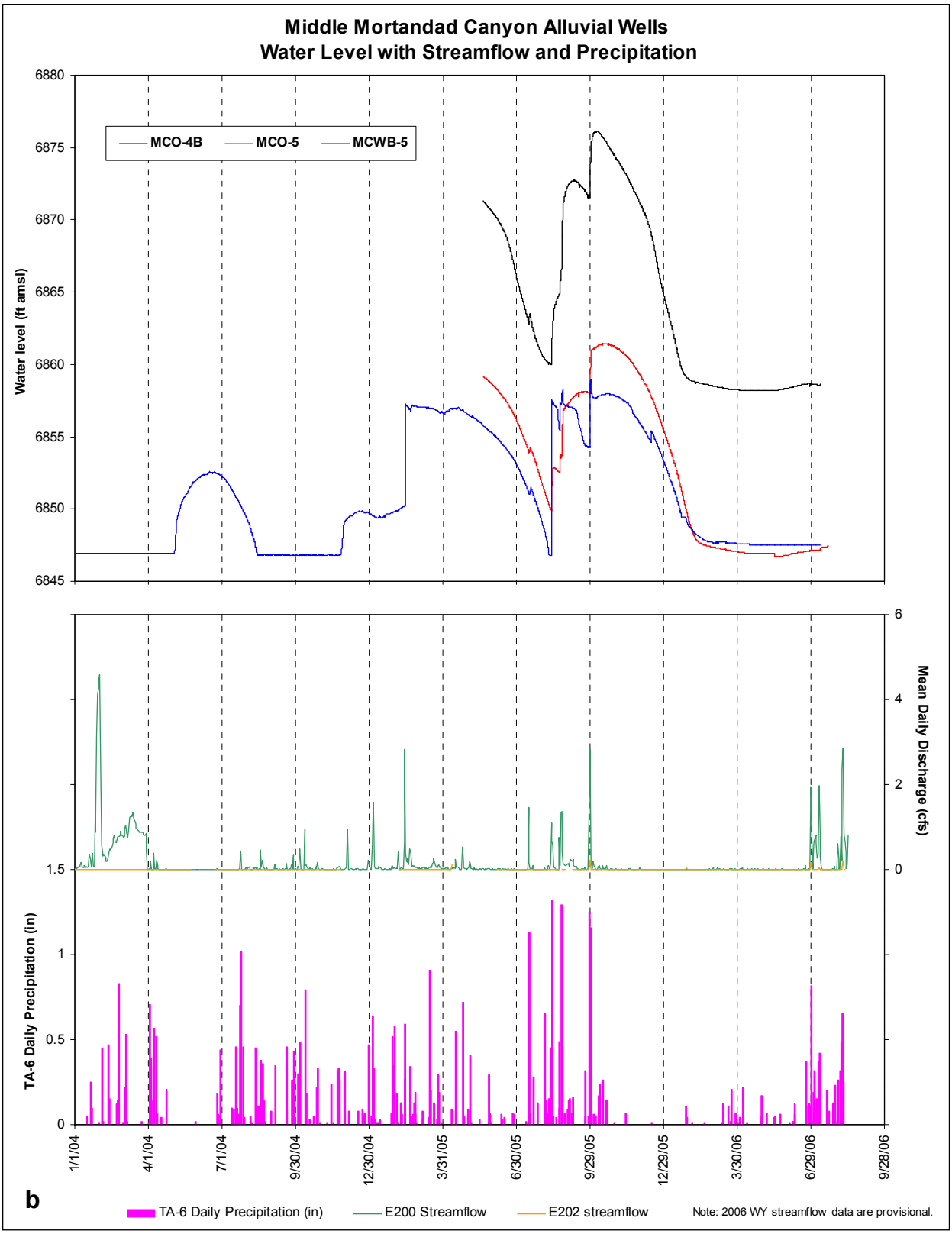


Figure F-3.0-1 (continued). Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in middle Mortandad Canyon

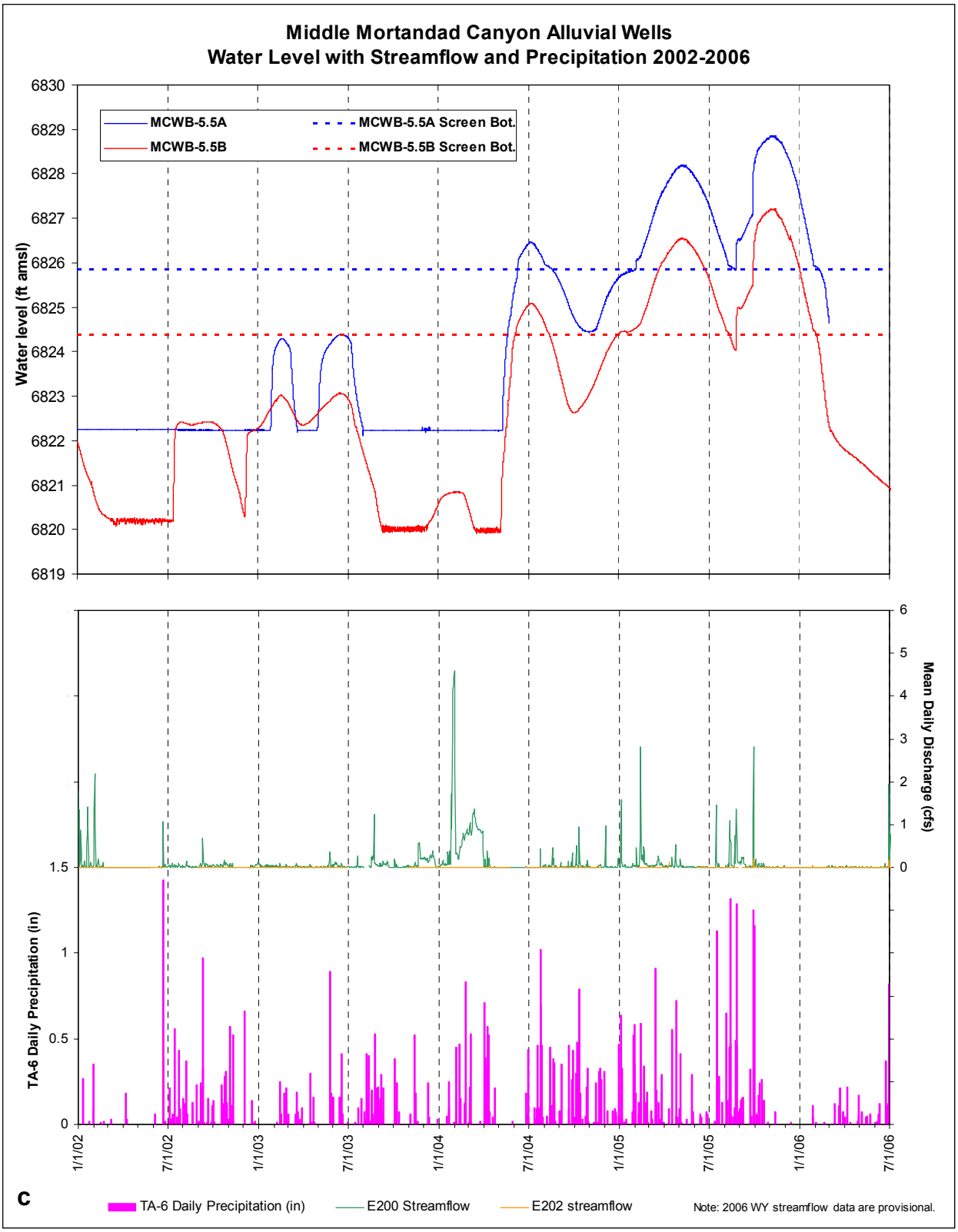


Figure F-3.0-1 (continued). Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in middle Mortandad Canyon

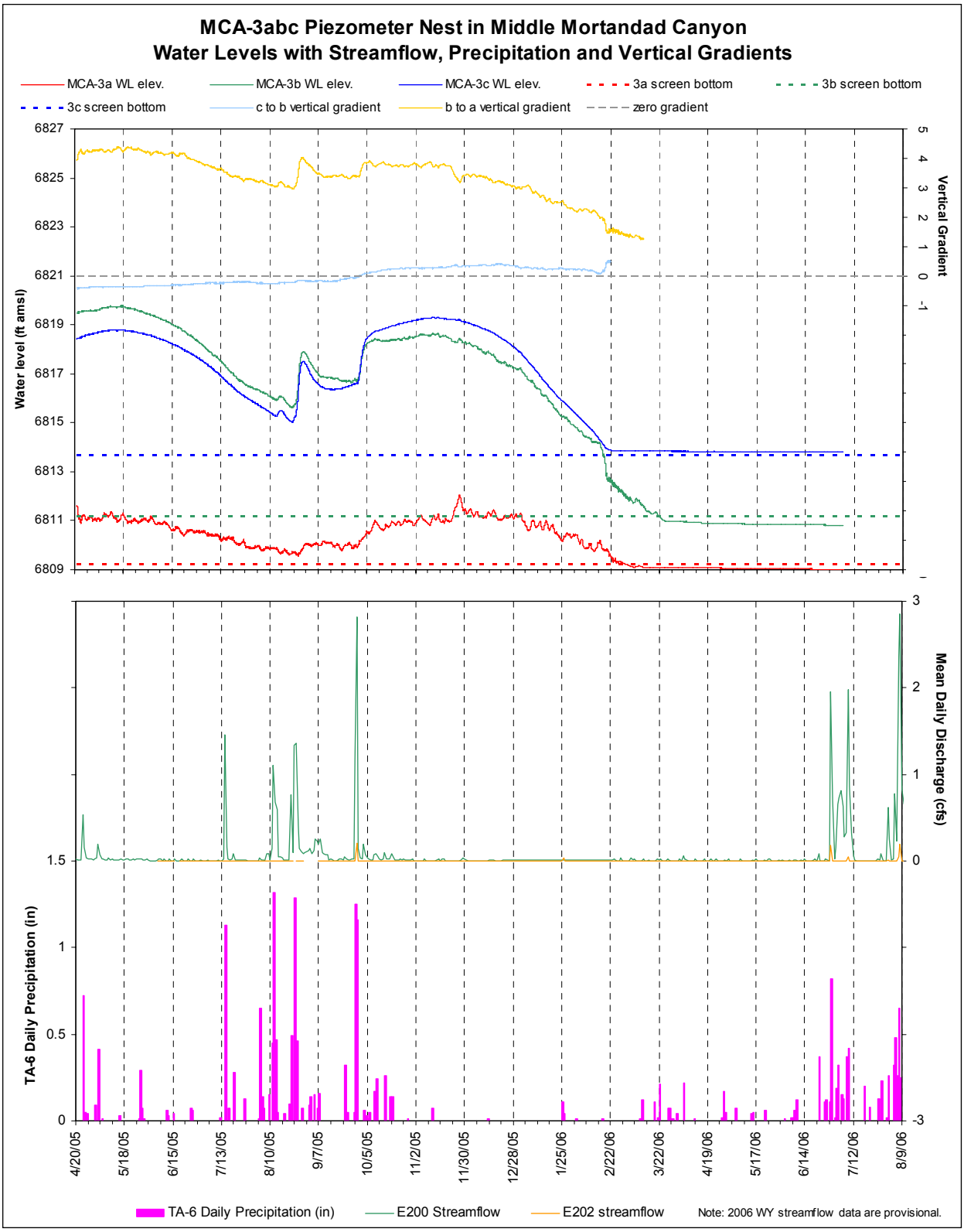


Figure F-3.0-2. Precipitation and streamflow data related to the groundwater-level data for piezometer nest MCA-3abc in middle Mortandad Canyon

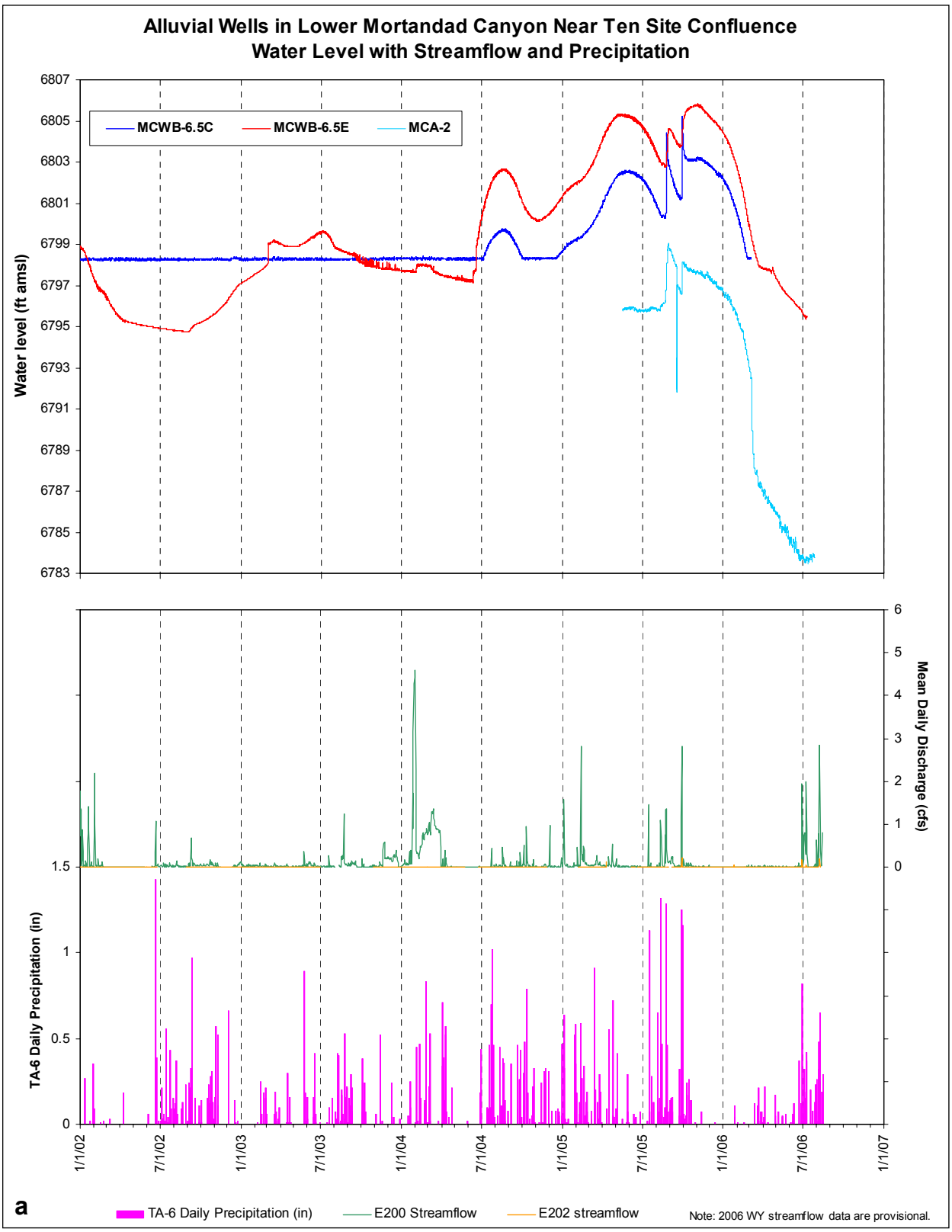


Figure F-5.0-1. Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in lower Mortandad Canyon

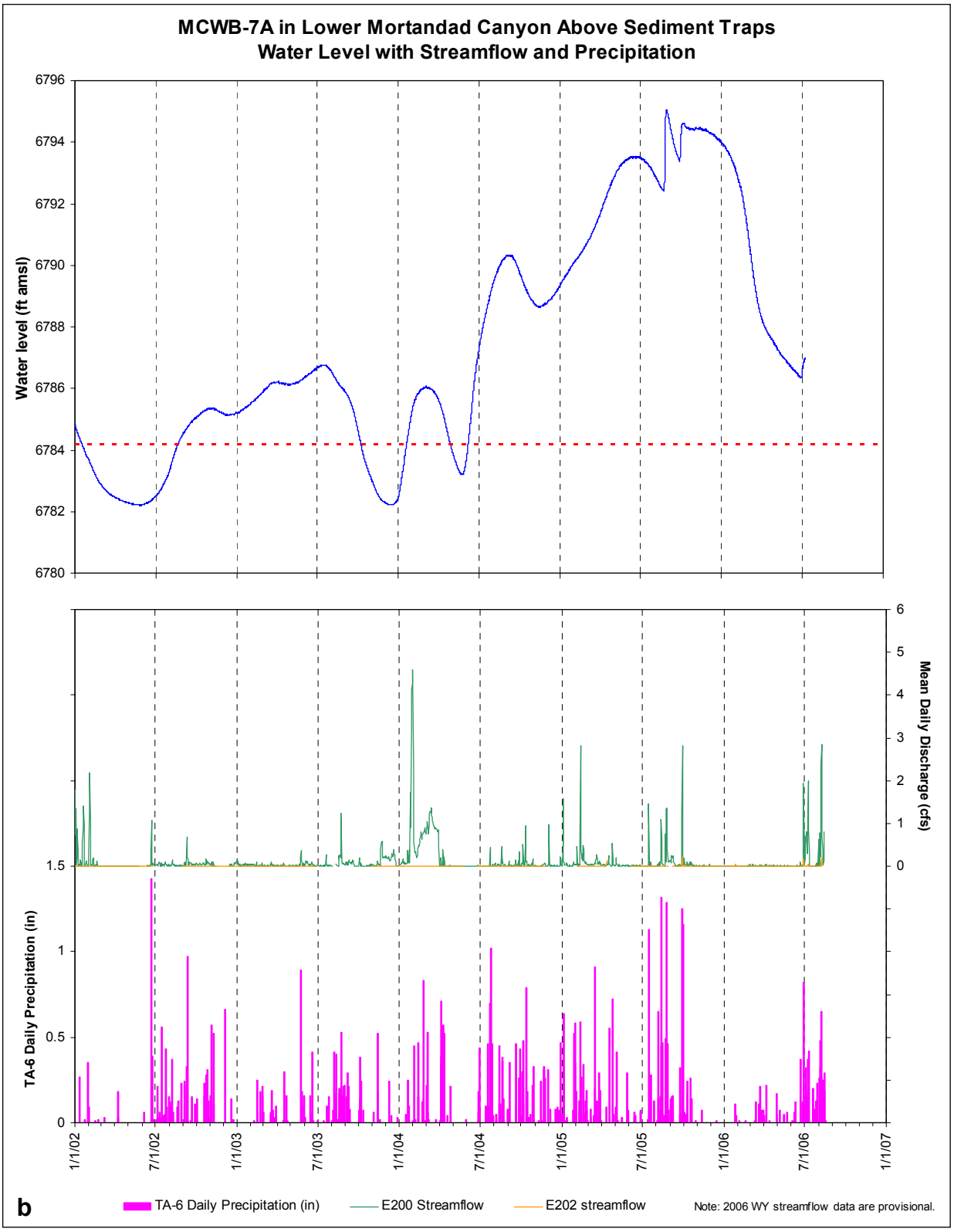


Figure F-5.0-1 (continued). Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in lower Mortandad Canyon

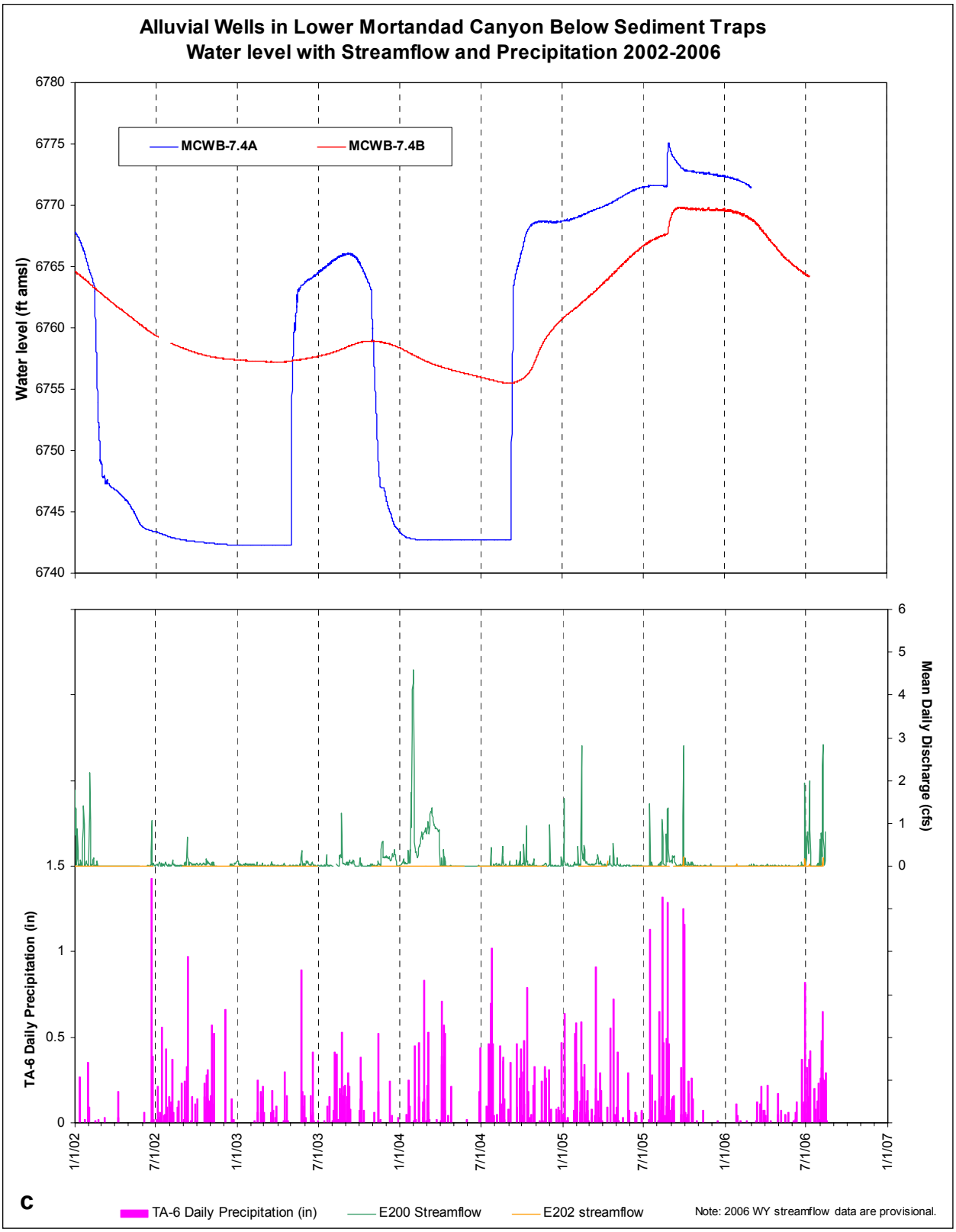


Figure F-5.0-1 (continued). Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in lower Mortandad Canyon

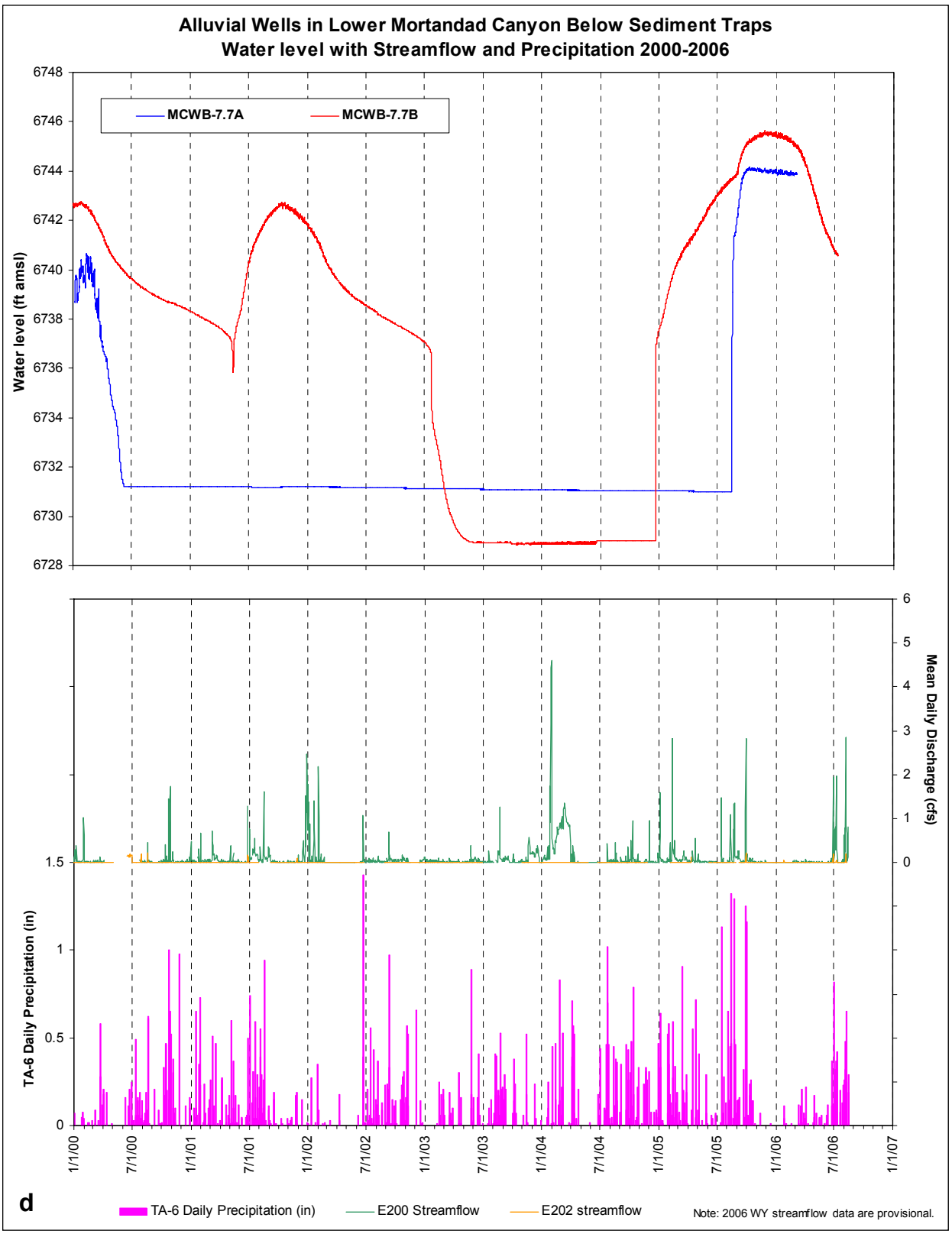


Figure F-5.0-1 (continued). Precipitation and streamflow data related to the groundwater-level data for a series of alluvial groundwater monitoring wells in lower Mortandad Canyon

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Table F-3.0-1
Hydraulic Conductivity Values Determined from Slug Tests at Piezometer Nest MCA-3abc

Piezometer	Hydraulic Conductivity (cm/s)		% Difference	Comments
	Test 1	Test2		
3a	2.89E-07	1.59E-07	-45.0	Dry when tested; not developed
3b	8.47E-06	1.98E-05	133.8	Dry when tested; not developed
3c	1.39E-02	1.10E-02	-20.9	

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Appendix G

Subunit Variability within
Alluvium/Colluvium and the Cerro Toledo Interval

Significant short-range variability in anion and moisture profiles of Mortandad Canyon can be seen where sufficient core data are available (Section 7.2.1.3). This variability is most pronounced within the alluvium and colluvium accumulated along the stream channel and within the Cerro Toledo interval. These units are heterogeneous; although stratified, their internal layering is of limited lateral extend and disrupted by channeling, unlike the thick, homogeneous to coarsely stratified units within the Bandelier Tuff. Thus, where the Cerro Toledo interval occurs as suballuvial bedrock, two units of locally variable hydrogeologic fabric are juxtaposed.

Alluvial fill varies in thickness and depositional fabric along Mortandad Canyon. Because the headwaters of the canyon are within the upper Bandelier Tuff, debris consisting of intermediate-composition Tschicoma lavas is largely absent, although lithic clasts of intermediate-composition lava eroded from within the Bandelier units occur within the alluvium. Above the facilities at Technical Area (TA) 48, the canyon width is as much as ~230 m (~750 ft), and marginal slopes are subdued, with the exception of the upper welded portion of unit Qbt 3. Some colluvial blocks are derived from the Qbt 3 cliffs, but the most abundant alluvial fill is sand and gravel derived from the tuff. Fines accumulate in the wetlands developed within the nonwelded base of Qbt 3 above the resistant, welded top of Qbt 2. North of the facilities at TA-48 where the canyon cuts into Qbt 2, it narrows and channeled flow scours much of the alluvium in this zone, leaving pockets of accumulation in plunge pools; here the channel contains a jumble of resistant colluvial blocks of welded Qbt 2.

As the canyon cuts into the more poorly welded base of Qbt 2 above the confluence with Effluent Canyon, alluvium is more consistently present, and exposed bedrock in the canyon bottom is lacking. Where the canyon remains narrow, down approximately to the location of borehole MCB-5, the thickness of alluvial fill is poorly known, but the available data on thickness range from >1.8 m (>6 ft) near Effluent Canyon (MCA-1) to 8.8 m (29 ft) at MCB-5. Along this stretch, the channel is confined, and lateral diversion of flow and deposition is limited. This stretch of canyon contains stretches of accumulated alluvial sands and gravels that are commonly disrupted by buried colluvial blocks.

Between MCB-5 and MCI-8, the channel of Mortandad Canyon cuts down through the vitric base of the Tshirege Member of the Bandelier Tuff (Qbt 1g) and gradually broadens from <15 m (<50 ft) to ~75 m (~250 ft). Between MCI-8 and MCB-7 the channel cuts through the base of the Tshirege Member and into the Cerro Toledo interval. From this point eastward the underlying bedrock contains no further densely lithified units until the stream cuts into outcrops of Cerros del Rio basaltic lavas near White Rock Canyon. Along this stretch the nature of alluvial fill differs significantly from that to the west; along the channel axis it thickens from ~9 m (~30 ft) near MCRES-4 and MCRES-3 to ~26 m (~85 ft) at MCB-11 and ~40 m (~130) ft at R-28. Beyond R-28 the thickness of alluvium is poorly known, but available data indicate that it diminishes (alluvium is only ~33 m (~108 ft) at MCA-9); the thinning of alluvial fill is caused by both broadening of the canyon and loss of transport energy as the Mortandad fluvial system reaches the limit of typical flood-stage flow. Broadening of the canyon greatly affects the depositional fabric within the alluvium, as braiding stream channel sands and developing overbank deposits lead to a complex series of intercalated fines and sands. Colluvial blocks are rarer but can occur in significant accumulation (e.g., lower alluvial section of MCOBT-8.5; Broxton et al. 2002, 76006). Thus, the heterogeneity of canyon fill east of MCB-7 reflects the interaction of channel migration, variable loss of transport energy depending on flood-stage extent, and mass wasting form cliffs along the channel margin.

Although heterogeneity in the Cerro Toledo interval is also a significant hydrogeologic factor, the origin of heterogeneity in this unit is different. The Cerro Toledo interval occupies the depositional and erosional period from eruption of the Otowi Member of the Bandelier Tuff (1.608 million years ago [Ma]) to eruption of the Tshirege Member (1.225 Ma). Within this period of ~380,000 yr, large-scale eruptions occurred in

the post-Otowi caldera at ~1.54, 1.48, and ~1.37 Ma, with most activity concentrated at 1.38-1.34 Ma (Spell et al.1996, 94044). This activity produced thin (meter-scale or less) deposits of distinctive crystal-poor rhyolitic tephra across the western two-thirds of the Pajarito Plateau. Intercalated with the crystal-poor Cerro Toledo pumice falls are crystal-rich sands derived by erosion of the soft underlying Otowi ash flows and local dacitic detritus derived from the Sierra de los Valles to the west. This combination of volcanic aggradation and active fluvial erosion under a Pleistocene climate produced a very complex deposit that thickens locally to a few hundred meters (several hundred feet) but is typically ~9–15 m (~30–50 ft) thick near Mortandad Canyon where the current channel has not cut into it.

Figure G-1a is an interpretive map of structure contours on top of the Cerro Toledo interval in that portion of Mortandad Canyon where recharge through the base of alluvium into underlying units is most active. This interpretive map suggests that incision of the current channel into the Cerro Toledo creates an irregular upper surface of ≤3 m (≤10 ft) relief, superimposed on a broad E-W ridge of Cerro Toledo deposits. This ridge form is speculative to the north, where drill hole data are lacking, but it honors data to the south at MCI-10 and PM-5 where Cerro Toledo deposits are lacking. The lack of Cerro Toledo deposits at MCI-10 and PM-5 suggests deep erosion of the Cerro Toledo south of Mortandad Canyon, although the extent and azimuth of a possible paleocanyon are unknown.

Figure G-1b suggests structure contours for the base of the Cerro Toledo interval beneath Mortandad Canyon. Generally, NW-trending contours can be projected near MCI-10 without significant deviations; the paleocanyon suggested in Figure G-1a would be shallow and contained largely within the Cerro Toledo deposits. Curvature of these contours is indicated to honor the low elevation of the contact between the two members of the Bandelier Tuff at PM-5. Both Figures G-1a and G-1b are nonunique interpretations of the borehole data, largely driven by the requirement to reconcile the absence of Cerro Toledo deposits in MCI-10 (fairly well confirmed) and in PM-5 (less well confirmed). Further data to the north and south in this vicinity would be required to test these interpretations.

This suggested irregularity in the Cerro Toledo deposits fits with the conflicting processes of aggradation by tephra deposition versus fluvial mobilization. The heterogeneity of the Cerro Toledo can be illustrated in the exceptionally complete core sequence with corresponding gamma and induction logs collected at borehole MCB-15/MCA-6 in Ten Site Canyon (Figure G-2a). The Cerro Toledo deposits in this borehole can be divided into at least eight subunits within a 9.3-m (30.4-ft) thickness. Most of this interval consists of silty sands or clay/sand horizons, with some reworked pumice-rich sediments and thin pumice beds with little evidence of reworking. The abundance of pumice increases upsection, in accord with the observation of increased volcanic activity later in Cerro Toledo time (Spell et al. 1996, 94044), assuming that the sequence in MCB-15/MCA-6 is largely undisturbed. The gamma log is highly variable through the Cerro Toledo deposits and generally lower than in the overlying Tshirege and underlying Otowi tuffs. This drop in gamma signal within the Cerro Toledo is a common and useful characteristic of the unit that can provide accurate identification within many boreholes; however, the variability of the gamma signal means that this distinction is not always present. For example, below ~28 m (~91 ft) depth in this borehole the gamma signal rises to a high Otowi-like value before the clay-altered top of the Otowi ash flows is encountered. This rise is associated with reworked Otowi detritus in the lowest portion of the Cerro Toledo, a feature seen in some boreholes. The induction log indicates specific conductive horizons within the Cerro Toledo deposits, although simple correlation with either pumiceous or other horizons is not evident. Figure G-2b shows that the core moisture data can be both higher and lower within the Cerro Toledo than the background of ~18% that is common in subcanyon deposits of both Qbt 1g and Qbo tuffs (Section 7.2.1.3). The limited number of samples in MCB-15/MCA-6 does not permit direct comparison with the induction curves. A more detailed study of texture, mineralogy, and water content would be required to define the causes of variable conductivity, but the induction log clearly shows intervals of

conductivity greater than in the overlying and underlying tuffs, probably accounted for by a set of properties including but not limited to moisture (see Appendix H).

The heterogeneity of alluvium/colluvium and the Cerro Toledo deposits provides intercalated, variable hydrogeologic units on scales as small as a few feet, both laterally and vertically. The gross structure of alluvium is confined to a channel fill, but the gross structure of the Cerro Toledo deposits extends beyond the confines of Mortandad Canyon (although the model presented in Figures G-1a and 1b suggests truncation to the south). The most invasive water movement from alluvium into subcropping units occurs where these two units are in contact. This results in a situation where it is likely that ribbons or pods of saturation in the alluvial system communicate with similarly irregular bodies of saturation in the Cerro Toledo, with morphology and connectivity of saturation dependent on episodic variation in groundwater inventory (see discussion of localized alluvial flow in Appendix F). In this situation, adjacent pods or ribbons of groundwater may have separate sources and sinks. This can account for the common observation that adjacent wells in alluvium or the Cerro Toledo do not necessarily see similar saturation, head values, or contaminant contents.

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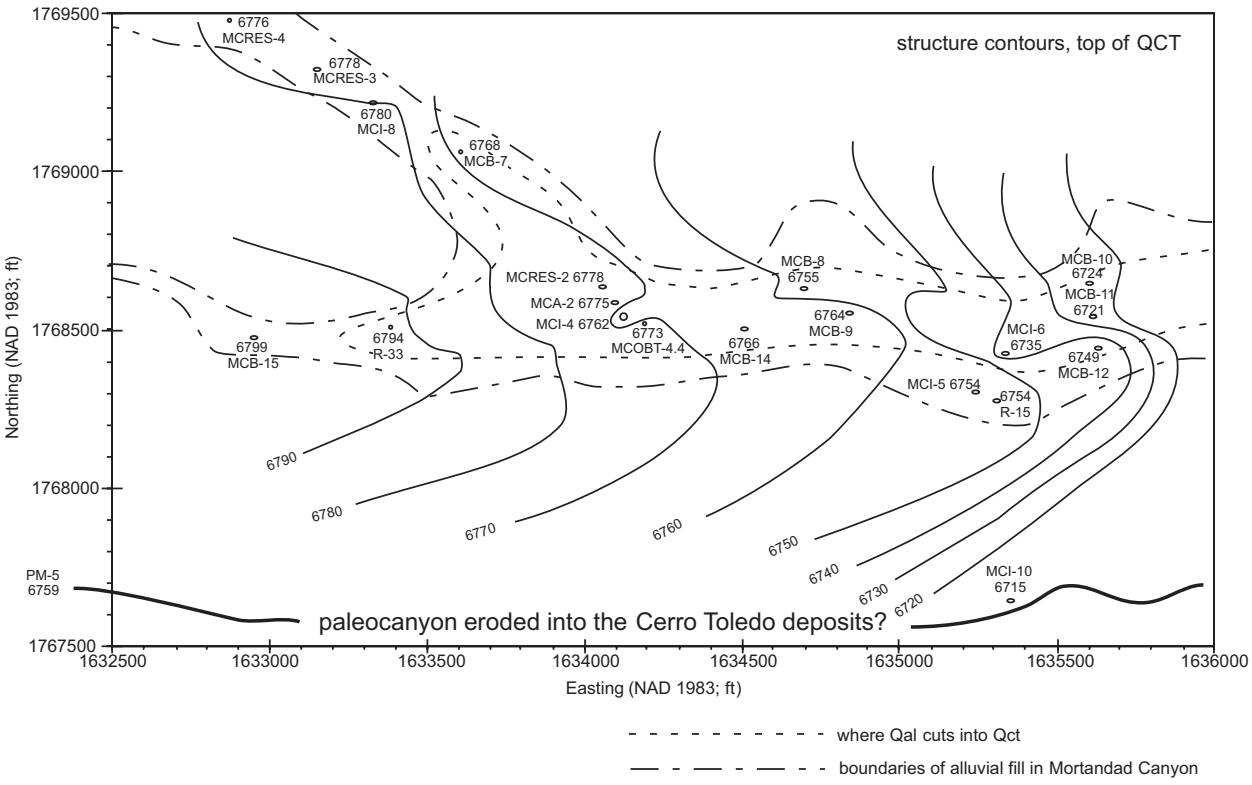
The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's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

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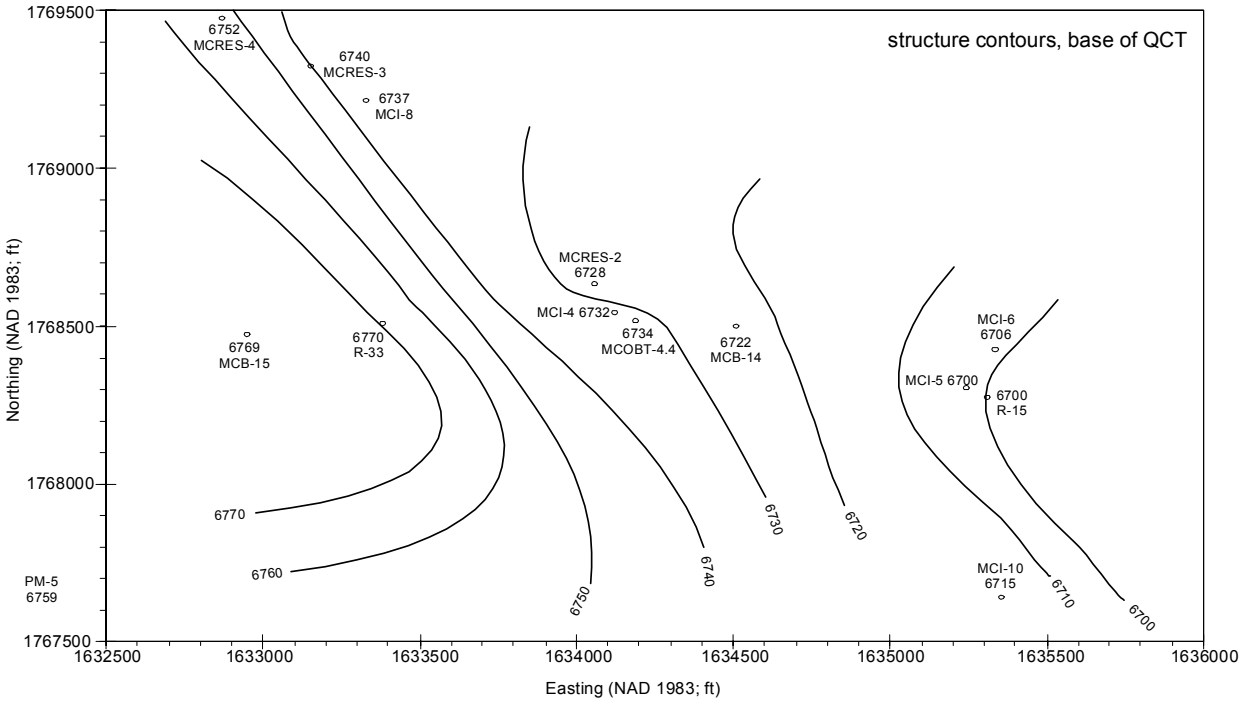
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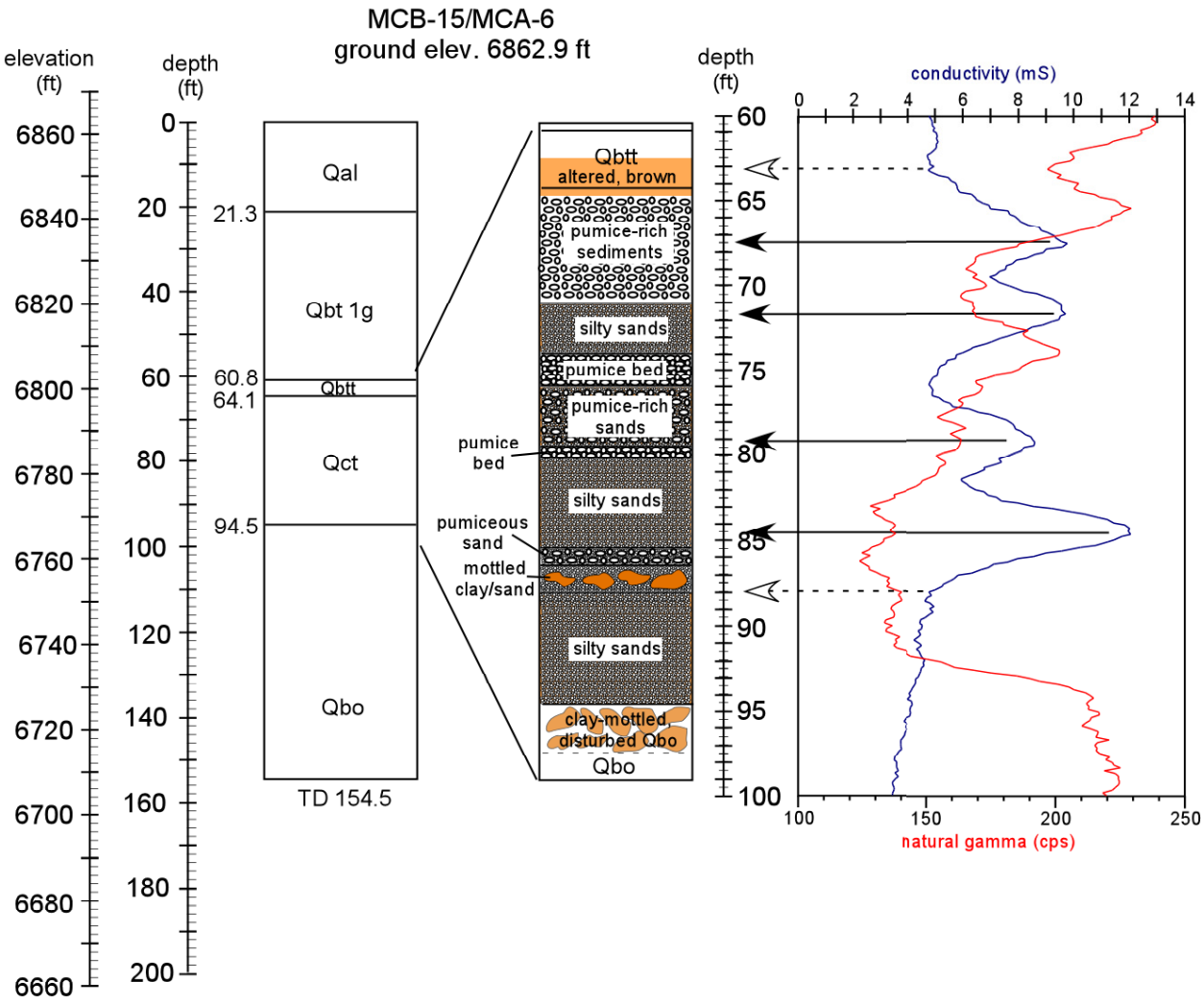
Note: All elevations are in feet.

Figure G-1a. Structure contours at the top of the Cerro Toledo interval (Qct)



Note: All elevations are in feet.

Figure G-1b. Structure contours at the base of the Cerro Toledo interval (Qct)



Note: Natural gamma signal and induction conductivity are also shown for the interval of detail.

Figure G-2a. Detailed stratigraphy of the Cerro Toledo interval in borehole MCB-15 (completed as alluvial well MCA-6)

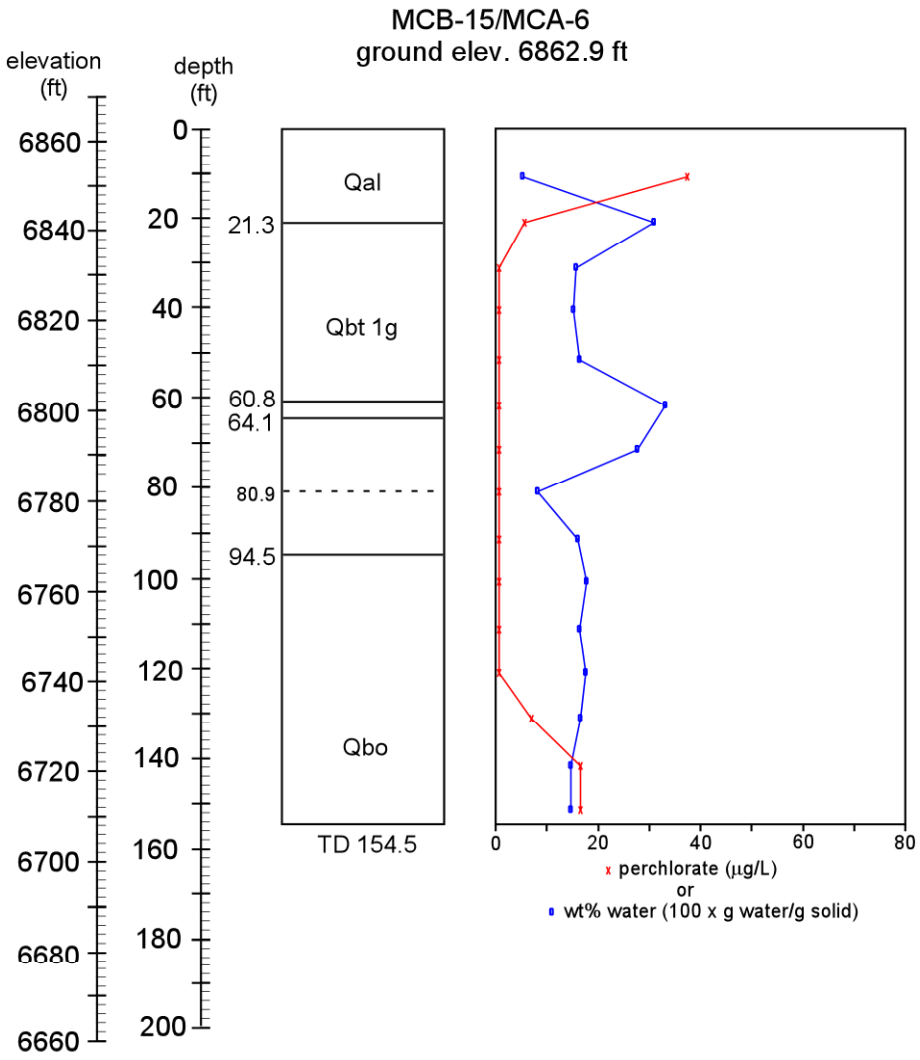


Figure G-2b. Moisture and perchlorate profiles compared with stratigraphy in borehole MCB-15/MCA-6

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Appendix H

Mortandad Canyon DC-Resistivity Surveys: Results, Interpretations, and Implications for Infiltration Pathways and Contaminant Transport

H-1.0 INTRODUCTION

Numerous boreholes and monitoring wells in Mortandad Canyon provide important information on vadose zone water. However, even closely spaced boreholes are limited in regard to lateral variation in perched groundwater, infiltration pathways, and contaminant inventories in the subsurface. As part of a Laboratory-wide effort to provide a more synoptic understanding of subsurface hydrogeologic conditions while minimizing the need for further expensive drilling, a series of seismic and direct current- (DC-) (or "electrical-") resistivity surveys were conducted in selected canyons, including Mortandad Canyon, on and near the Los Alamos National Laboratory during the period 2002–2005.

Use of DC resistivity in hydrogeologic investigations assumes that an important or dominant control on subsurface electrical resistivity is the presence and composition of groundwater, but other important factors are the lithologic properties of subsurface rock units and the presence of clay. A previous study on the Pajarito Plateau (Baldridge et al. 2006, submitted, 94048) established that with the exception of specific clay-rich units, groundwater is the chief control on electrical resistivity. This relationship is investigated further in the present work.

Surveys were conducted by Geophex of Raleigh, North Carolina, as follows. In May and June 2002, seismic and DC-resistivity pilot surveys were carried out in Mortandad Canyon (Geophex 2002, 94040; included on a CD for Appendix H). In December 2003, follow-up surveys were conducted in Mortandad, Ten Site, and DP Canyons (see Geophex 2004, 84540; included on a CD for Appendix H). Finally, in December 2006, additional electrical resistivity surveys were carried out in Pajarito, Sandia, DP, Los Alamos, and Pueblo Canyons (Geophex 2006, 94047). This report summarizes the results and presents interpretations of the surveys conducted in Mortandad and intersecting Ten Site Canyons in 2002 and 2003. See Appendix B (Geophex report) for locations of surveys). Because the seismic surveys carried out in Mortandad Canyon in 2002 (Geophex 2002, 94040; included on CD as Attachment H-1) were not useful for defining moisture or fracture pathways, in part because seismic techniques are generally controlled by lithologic (density) rather than fluid properties of rocks and soil, they are not discussed further in this report.

H-2.0 METHODOLOGY

The DC-resistivity method measures the resistivity of the earth by introducing a near-DC signal into the ground and measuring the resulting voltages created in the earth. From these data the electrical properties of the earth can be derived and thereby the geologic and hydrologic properties inferred. The depth of investigation is a function of the length of the survey line, and the resolution is a function of the electrode spacing. The greater the spacing between the outer (current) electrodes, the deeper the electrical currents will flow in the earth, hence the greater the depth of exploration. The depth of investigation is generally 20% to 40% of the outer electrode spacing, depending on the earth resistivity structure.

The resistivity data are used to create a hypothetical model of the resistivity structure of the earth (geoelectric sections). Resistivity models are generally not unique; i.e., a large number of earth models can produce the same observed data. In general, resistivity methods determine the conductance of a given stratigraphic layer or unit. The conductance is the product of the resistivity and the thickness of a unit. Hence, that layer could be thinner and more conductive or thicker and less conductive and produce essentially the same results. Therefore, constraints on the model such as borehole data or assumed unit resistivities can greatly enhance the interpretation.

The end product from a DC resistivity survey is generally a "geoelectric" cross section (model) showing thicknesses and resistivities of all the geoelectric units or layers. If borehole data or a conceptual geologic model is available, then a geologic identity can be assigned to the geoelectric units.

Electrical resistivity is a fundamental property of rocks and soil that is controlled by rock type, clay content, porosity, and the quantity and quality of the water contained in the rock or soil. Within a given rock or soil type, the resistivity of the rock is primarily dependent on the quality and quantity of water and the amount of clay. Generally, higher clay content and/or poorer quality (higher total dissolved solids [TDS] and/or chlorides) groundwater lowers the resistivity. All electrical resistivity surveys conducted by Geophex on the Pajarito Plateau were of the dipole-dipole configuration. Electrode spacing and line length varied, depending primarily on the length of level ground available.

Numerous boreholes have been drilled in Mortandad Canyon over a period of years, mostly before the DC-resistivity surveys. They are cased either with steel or polyvinylchloride (PVC). A variety of logs and downhole hydrogeologic data were collected, depending on the purposes of each borehole. Boreholes RES-2, -3, and -4 were drilled after the DC-resistivity surveys, specifically to investigate electrical, moisture, and lithologic properties.

Induction logs were acquired in boreholes with a Mount Sopris 2PIA-1000 wire line induction probe. Data were recorded as the probe was pulled up the hole. Details regarding this instrument are provided in Vaniman et al. (2005, 94046).

In boreholes RES-2, -3, and -4, core samples were collected for analysis of water content. Samples were sealed in preweighed containers at the drill site to prevent moisture loss. Gravimetric water analyses were performed at the Los Alamos National Laboratory using techniques described in Vaniman et al. (2005, 94046). Gravimetric water contents obtained from perched zones are estimates only. Reported values are commonly higher than expected from the porosities of the rock matrix. This water “gain” probably results as water flows from the formation into the core barrel during sampling. Values of around 30%, which is approximately the porosity of the enclosing units, are considered very acceptable. Lithologic properties were obtained by Daniel B. Stephens & Associates, Inc., Albuquerque, New Mexico (DBS&A 2006, 93888).

In the text, linear dimensions are presented in meters (converted to feet [ft] in parentheses) except where referring to depth or range on figures, for which the original measurement unit was feet.

H-3.0 RESULTS

Geoelectric Sections

Electrical resistivity in the shallow subsurface (uppermost 69 m [225 ft]) of Mortandad Canyon ranges significantly, from <83 Ω-m to >6000 Ω-m (Figures H-4 through H-6). The resistivity roughly defines two separate regimes. The upper, narrow reach of the canyon (from 0 to 8100 ft range, Figure H-1), where alluvium is thin or absent, is generally resistive. Where local low-resistivity (ranging from <80 to 250 Ω-m) regions occur, such as between 1850 and 4900 ft along the traverse, they are mainly in the upper (6-15 m [20–50 ft]). The resistivity at greater depths typically exceeds 4000 Ω-m. In contrast, the lower reach of Mortandad Canyon (range 8100-16,000 ft), which is wider and characterized by thick alluvium, is overall more conductive and possesses a different resistivity structure. Generally, this reach is resistive near the surface (except between 8100 and 8250 ft) and in the deepest part of the section (lowermost 30 m [100 ft]; >1500 Ω-m) and conductive in the middle (≤83 to 212 Ω-m). The remainder of this report will focus on the lower part of Mortandad Canyon, because borehole data and groundwater sampling indicate that contaminant-bearing infiltration is concentrated here.

Between RES-4 and RES-3, a significant low resistivity (<83 Ω-m) zone, defined informally as resistivity less than 212 Ω-m, is apparent at the surface (Figure H-2A). It is approximately correlated with an increasingly greater thickness of Quaternary alluvium downstream of the upper, narrow part of the canyon and is apparently bounded by the underlying Tshirege Member of the Bandelier Tuff. The low-resistivity

zone decreases smoothly in elevation downcanyon (eastward), following the contact between the alluvium and the Tshirege.

Eastward of MCO-6 the low-resistivity region no longer occurs at the surface. Instead, the top of the low-resistivity zone occurs 15–21 m (50–70 ft) below the surface, continuing eastward some 6000 ft to the end of the resistivity profile. The low-resistivity unit is generally 18–24 m (60–80 ft) thick. Generally in the range 9000–11,500 ft, this zone correlates with the Cerro Toledo interval, although the exact points at which (1) the Tshirege Member pinches out and alluvium comes directly into contact with the Cerro Toledo (constrained between boreholes I-8 and I-4) and (2) the Cerro Toledo pinches out and the alluvium comes into contact with the Otowi Member of the Bandelier tuff (constrained between boreholes R-15 and MCOBT-8.5) cannot be precisely determined. The low-resistivity units continue smoothly across the inferred pinch outs of the units. In this whole interval, the lower contact of the low-resistivity zone is approximately bounded downward by the Otowi Member.

Overall, the electrical resistivity of Mortandad Canyon, and especially the lower part of the canyon (Figure H-2), is characterized prominently by narrow, vertical-oriented regions ("streaks") of alternately high and low resistivity. The streaks are diminished by eliminating the vertical exaggeration in the section (Figure H-2B) but do not disappear. Possibly, boreholes located close to the survey line (we arbitrarily consider the critical distance to be 9 m [30 ft]), particularly those cased with steel, may adversely affect the electrical survey. The expected effect would be to create vertical, low-resistivity regions in the proximity of the well that are not representative of the surrounding formation. For TW-8, located 7 m (23 ft) from the survey line, a narrow, vertically elongate, low-resistivity (≤83 Ω-m) zone corresponds closely with the projected location of the borehole (Figure H-2). TW-8 is cased with steel. However, no particular correspondence exists between other boreholes located <9 m (30 ft) from the resistivity line and zones of low resistivity (e.g., MCO-4.9, projected 2.4 m [8 ft]; MCO-5, 3.7 m [12 ft]; and MCM-5C, 4.0 m [13 ft]). Boreholes RES-2, -3, and -4 were drilled subsequent to the survey; hence, they cannot be used to test this relationship. Therefore, except for TW-8, we do not think that boreholes near the electrical survey adversely affect the resistivity results. Further discussion of these streaks is reserved for the Interpretations and Conclusions section below.

A three-dimensional perspective of the resistivity structure of Mortandad Canyon is provided by several cross lines and an intersecting line in Ten Site Canyon (Figure H-3). Unfortunately, the line spacing is not close enough to allow the resistivity data to be processed or displayed as a data volume. The cross lines generally show the same range of resistivity values as the main line, but they also show that considerable variation in resistivity occurs away from the main Mortandad Canyon line. For example, in cross section Ten Site/Mortandad Canyon Line 2, a conductive region is present at depths of 11–17 m (35–55 ft) where it is intersected by the main Mortandad Canyon line, yet the entire section from the surface to a depth of 64 m (210 ft) is resistive only 15 m (50 ft) to the north (Figure H-3).

Correlation with Perched Groundwater Zones

The fact that most boreholes were not located directly on the survey line may create errors in locations of lithologic boundaries or hydrologic features, such as perched groundwater zones. Despite these uncertainties, depths and thicknesses of perched groundwater zones correspond reasonably well with many regions of low electrical resistivity where they could be sampled (Figures H-4 through H-6). For example, RES-4 encountered two perched bedrock aquifers at depths of 8.9 m (29.3 ft) and 21.3 m (70.0 ft), and both are ≤1.5 m (5 ft) thick. The uppermost aquifer approximately corresponds (in projection) to a small low-conductivity (≤128 Ω-m) region 6–9 m (20–30 ft) to the west, the lower to a narrow low-resistivity (≤148 Ω-m) zone approximately 18 m (60 ft) in vertical extent collocated with the borehole. Correspondence of these low-resistivity regions with the electrical profile might have been

better if the borehole were closer to the line. Similarly good correspondence occurs in MCWB5.5B, MCO-6, MCO-6.5A, and RES-2. Shallow perched zones in boreholes MCO-5 and MCWB7A, projected 3.7 m (12 ft) and 2.1 m (7 ft), respectively, are associated with resistivities of 500–600 Ω-m. These higher values of resistivity may result from the fact that intersected perched aquifers (if present) are very thin or discontinuous, ephemeral, or located off-line and thus not imaged by the resistivity survey. Altogether, values of ≤83 Ω-m are compatible with resistivity of surface and groundwater of 7-130 Ω-m (Baldridge et al. 2006, submitted, 94048).

However, not all regions of low resistivity are apparently associated with the presence of free water (i.e., saturated zones). A very prominent low-resistivity zone (≤83 Ω-m) occurs in lower Mortandad Canyon in Quaternary alluvium at depths of 9–21 m (30–70 ft) (Figure H- 2). Yet borehole R-28, drilled only 4.9 m (16 ft) south of the resistivity line, encountered no perched water. Thus, the correlation of low resistivity with the free water is not simple.

Induction Resistivity and Moisture Content

From boreholes RES-2 and RES-3 drilled specifically to examine the relationship between resistivity, lithologic properties, and water content, we can evaluate the correlation between induction resistivity and perched groundwater. RES-2 encountered a saturated zone between 13.1 m (43.1 ft) and 18.3 m (60.0 ft), perched on the top of the Cerro Toledo interval. A gravimetric water measurement (33.4%) on a silt-rich unit from within the perched zone at 14.4 m (47.3 ft) (Figure H-4) correlates with induction resistivity of 25–30 Ω-m. This resistivity value is in agreement with values inferred from the geoelectric section and within the range of surface and groundwater measured for the Pajarito Plateau (7–130 Ω-m; Baldridge et al. 2006, submitted, 94048). The induction log was not run below 18 m (58 ft).

In RES-3, regions of low induction-resistivity (40–50 Ω-m) were measured at depths of ~ 8, 26–27, and 37 m (26, 86–90, and 120 ft). No perched zones were detected in this borehole, and gravimetric moisture values from 27 m (88 ft) to 37 m (120 ft) (respectively, 19% to 26 %) were not near saturation. We suspect that (1) if these low-resistivity regions represent saturated zones, then they are very thin and thus the gravimetric moisture samples did not adequately represent them, or (2) more likely, the induction resistivity log, although relatively correct in indicating high and low values, is too low. Thus, a positive correlation exists between low-induction resistivity and gravimetric water content where saturated zones are known to be present. However, the inverse that low (40–50 Ω-m) induction resistivity indicates perched water is not true, possibly because of the uncertainty in the induction logs.

Lithologic Controls on Moisture

The extensive suite of grain-size measurements obtained for cores from boreholes RES-2, -3, and -4, specifically drilled into regions with different geoelectric properties (Figure H-2), provide detailed correlations between water content, induction resistivity, and grain size. RES-2 and -4 were drilled into regions that were conductive (≤128 Ω-m) in the middle to lower part of the section. In contrast, RES-3 was drilled into a more resistive (>3500 Ω-m) region. No consistent relationship exists between water content (or electrical resistivity) and grain size of alluvium or bedrock for RES-2 or RES-3. However, in RES-4, a weak correlation of moisture with sand fraction is apparent (Figure H-5). Except for a short interval in borehole RES-2, clay is not a major constituent in this suite of boreholes. For example, in RES-3 and -4, the clay content is less than 6.2% and generally less than 5% and therefore is not shown in Figure H-4. In RES-2, clay comprises <7% of the rock, except between depths of 12 m (39 ft) and 18 m (60 ft) where it ranges between 10% and 18%. The highest values (18%) occur within the vadose zone (Figure H-4). In this interval, clay may contribute to the lower-induction resistivity.

Thus, lithologic properties do not appear to be a major control on amount of vadose-zone water present in the rock matrix, nor do they exert the major control on the presence of perched zones.

H-4.0 INTERPRETATIONS AND CONCLUSIONS

- The dominant control on low DC-resistivity (high electrical conductivity) is water content. Low electrical resistivity (≤148 Ω-m) indicates high moisture, but we cannot confidently assign specific values of resistivity to full saturation. Uncertainties regarding exact resistivity also results from the fact that thicknesses of some perched zones are significantly thinner than the electrode spacing (5.0 m [16.4 ft]) of the main Mortandad Canyon survey (Line 1, Figures H-4 and H-5). Because resolution decreases downward, deeper aquifers are more poorly resolved.
- Similarly, a positive correlation exists between low-induction-resistivity (i.e., measured in boreholes) and gravimetric water content where saturated zones are known to be present. However, the inverse that low (40–50 Ω-m) induction resistivity indicates perched water is not true, possibly because of the uncertainty in the induction logs. The exact relationship between resistivity value and percent moisture cannot be robustly determined by this study.
- Clay can also result in low electrical resistivity, but with the exception of RES-2, it is not a major constituent of the rocks or alluvium from Mortandad. In RES-2, high (10%–18%) clay content characterizes a 6.4-m (21-ft) interval in a perched zone, but its effect in augmenting the low resistivity cannot be evaluated. The presence of clay may result from longer or multiple periods of saturation, or it may be caused by particularly susceptible lithologies. Overall, clay appears not to have a major effect on the resistivity structure of Mortandad.
- In lower Mortandad Canyon, the resistivity structure of the upper 30 m (100 ft) of lower Mortandad Canyon appears to show that stream and/or shallow alluvial water drains downward between RES-4 and RES-3 following the alluvium/Tshirege contact. Moisture does not appear to significantly invade the Tshirege. At the point at which the alluvium comes into contact with the Cerro Toledo interval (i.e., the point at which the Tshirege is stratigraphically terminated), water infiltrates into the Cerro Toledo interval. From this point downstream, the Cerro Toledo interval seems to be the main moisture-bearing unit, indicated by the fact that both the overlying alluvium and the underlying Otowi Member are considerably more resistive. This geoelectric structure persists downstream to R-28.
- Below approximately 30 m (100 ft), the resistivity structure of Mortandad is characterized by alternating, dominantly vertically oriented regions of high and low electrical resistivity. At least two mutually exclusive interpretations (conceptual models) may apply to this region. First, regions of low resistivity may indicate fault zones or regions of closely spaced fractures intersecting the geoelectric section at a perpendicular or oblique angle and which together control movement of water. Regions of high resistivity presumably contain fewer fractures or faults and are relatively dry. If this explanation is correct, then these fault/fracture zones provide potential transport pathways oblique to the orientation of Mortandad Canyon. Because many of the vertical zones extend downward at least as deep as the maximum depth imaged by the resistivity survey, they may conduct water to even deeper levels of the vadose zone. If correct, this conceptual model could imply that water, and potentially contaminants, are carried perpendicularly away from Mortandad Canyon. This explanation is not supported by the borehole induction logs of RES-2 and -3, which indicate similar values of resistivity despite the fact that these boreholes were drilled in regions of low and high resistivity, respectively (Figure H-5). A second hypothesis is that water in the subsurface occurs as pods, “ribbons,” and channels of wetter or possibly saturated sediments and/or rock, which are interconnected laterally and vertically to form a three-

dimensional network. The electrical-resistivity line thus alternately crossed regions of high and low resistivity. In addition, conductive regions lying close to but not beneath the line may "short circuit" electrical currents, the effect of which is to artificially map these low-conductivity regions into the plane of the section. That is, conductive volumes are mapped from the 3rd dimension into the geoelectric section. Thus, the streaks may be real but not necessarily correctly positioned with respect to the section. We do not think that the proximity of boreholes to the DC-resistivity line has any significant effect on the electrical structure, with the exception of TW-8.

- Water is not fundamentally controlled by specific grain size fractions, i.e., with the exception of RES-4, no correlation of moisture content and any grain-size fraction exists. In RES-4, a weak correlation of moisture content with sand-size fraction may be present (Figure H-5). Rather, Mortandad is a water-limited system, where saturation is controlled by (1) availability of water, (2) permeability of alluvium and bedrock units, and (3) the presence of perching units.

H-5.0 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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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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DBS&A (Daniel B. Stephens & Associates), September 2006. "Mortandad Canyon PRB Investigation Phase 1 Data Evaluation and Work Plan for Investigation Activities," Albuquerque, New Mexico. (DBS&A 2006, 93888)

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Vaniman, D., D. Broxton, and S. Chipera, June 2005. "Vadose Zone Clays and Water Content beneath Wet and Dry Canyons of the Pajarito Plateau, New Mexico," *Vadose Zone Journal*, Vol. 4, pp. 453–465. (Vaninaman et al. 2005, 94046)

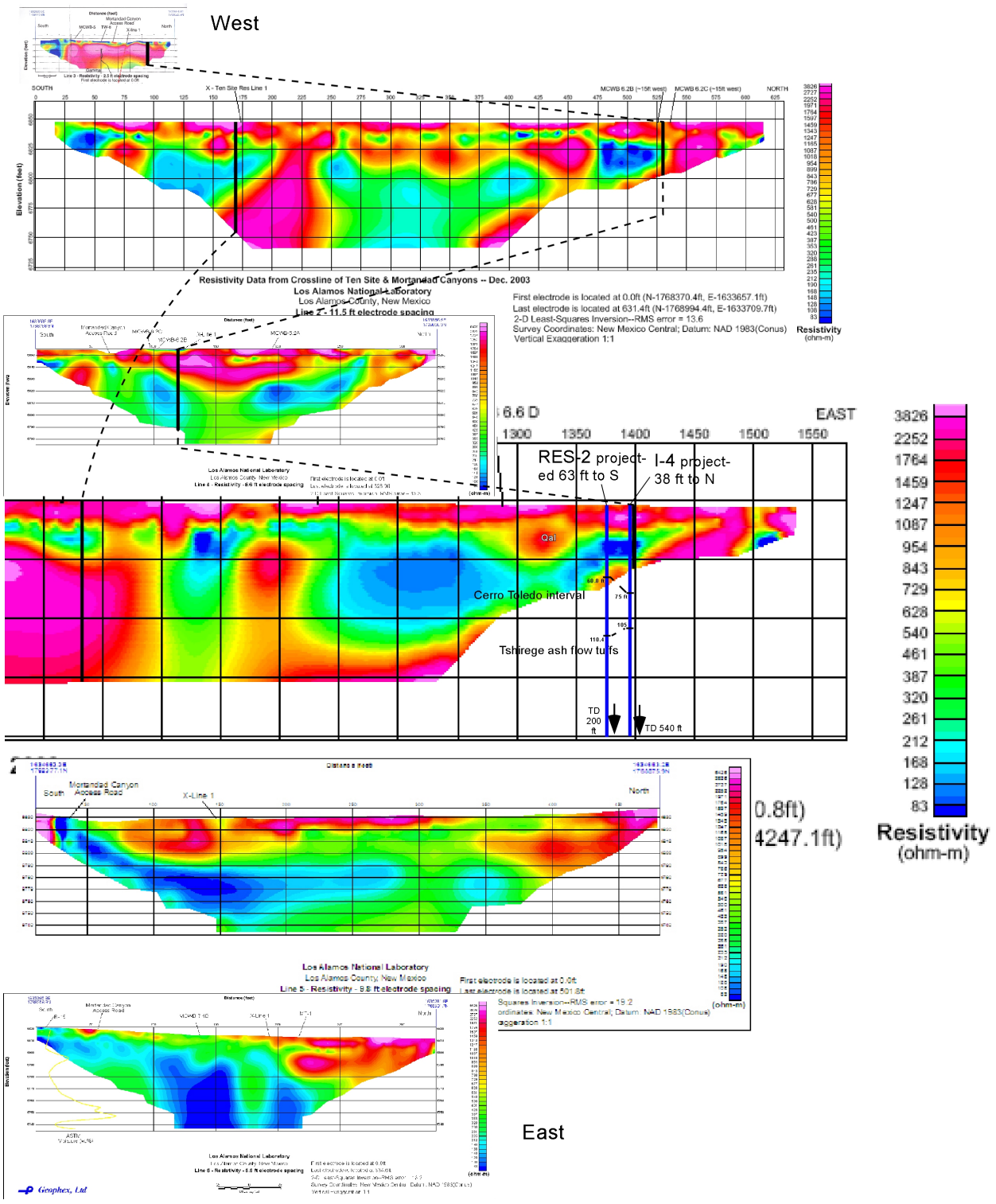
11x17

Figure H-1. DC-resistivity profile of Mortandad Canyon, combined from 2002 and 2003 surveys

11x17

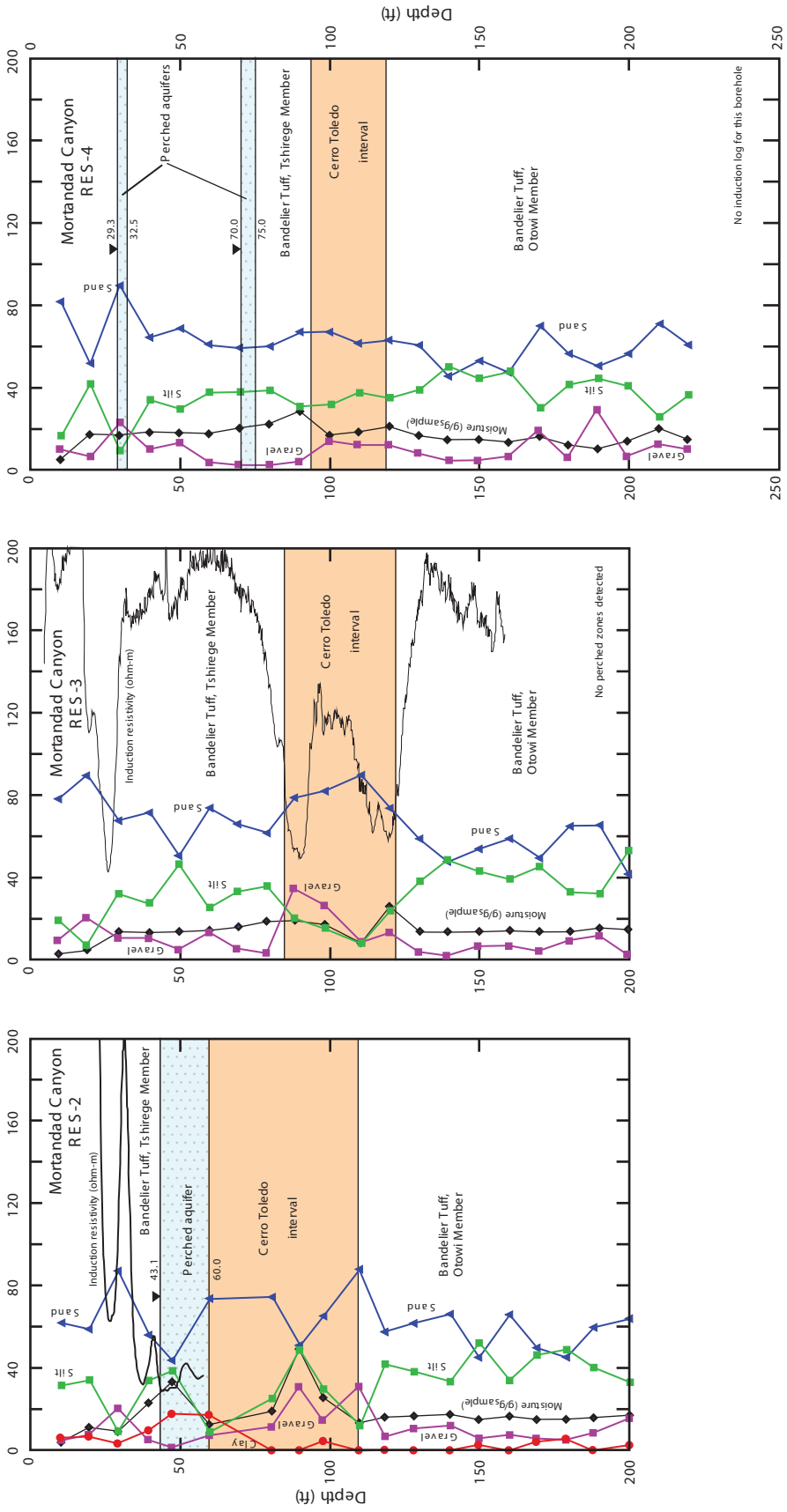
Notes: Major lithologic units are shown as white dashed lines, queried where significantly uncertain. Lithologic control at wells is indicated by short horizontal white lines, with depths (in feet) indicated. Inverted triangles with short horizontal lines indicate the tops of perched groundwater zones, with depths in feet indicated. Where thickness could be determined, the bottom depth is also provided. No control on lithologic boundaries or zones of perched water exists between wells. Arrows pointing to rectangular boxes indicate locations of intersecting profiles. Boreholes located on or adjacent to the electrical profile are indicated by vertical blue or red lines if projected < 30 ft or >30 ft, respectively. Green dots and red square are, respectively, representative analyses of perchlorate and nitrate. They represent the locations and depth ranges over which these contaminants are distributed. B. Same resistivity profile as above, with vertical exaggeration eliminated.

Figure H-2A. DC-resistivity profile of Mortandad Canyon in the lower (wider) reach of the canyon



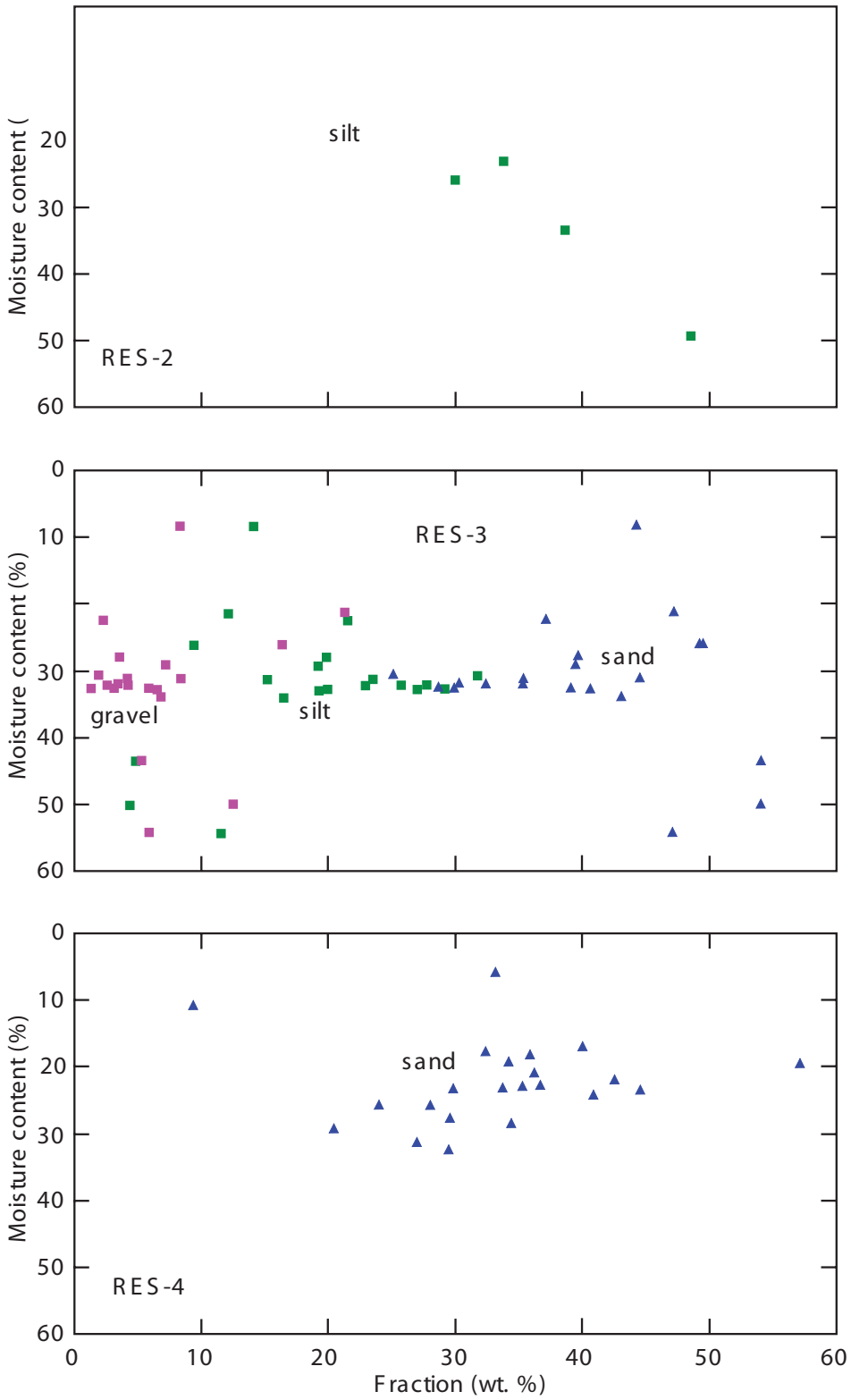
Notes: To emphasize continuity, these are connected between sections by dashed lines. For Ten Site Canyon Line 1, only the eastern portion of the line is shown. Where boreholes are close enough, they are projected onto the appropriate cross sections. All sections are to the same scale, with no vertical exaggeration.

Figure H-3. Cross sections in Mortandad Canyon. Vertical black lines indicate intersection of main longitudinal geoelectric section



Notes: No induction logs were run for RES-4. These boreholes were drilled after the resistivity surveys were conducted. Grain size fractions are in percent. Clay is not a major constituent (<6%) and is therefore not indicated, except for RES-2 where clay is present up to 18%.

Figure H-4. Lithologic, induction, and gravimetric moisture measurements from boreholes RES-2 (located on the resistivity line), RES-3 [projected 4.9 m (16 ft) to the southwest], and RES-4



Note: A weak correlation of moisture with sand fraction is present in RES-4.

Figure H-5. Correlation of gravimetric moisture content with selected grain-size fractions in RES-2, -3, and -4

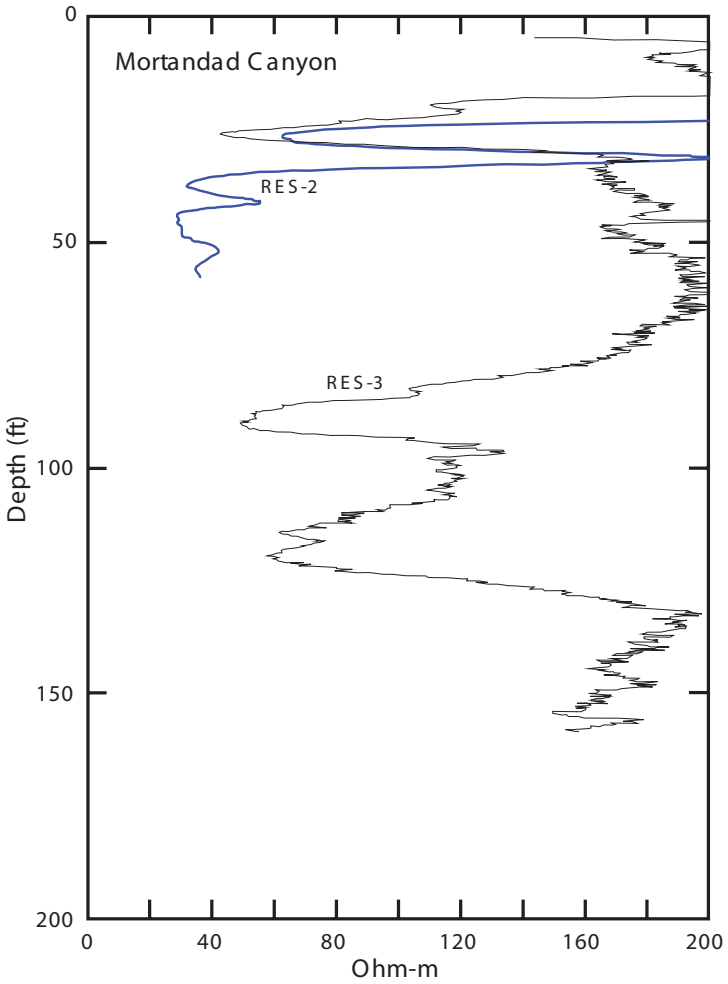


Figure H-6. Comparison of induction logs in RES-2 and RES-3. RES-2 and -3 were drilled respectively in relatively conductive and resistive areas as indicated by DC-resistivity (see Figure H-2)

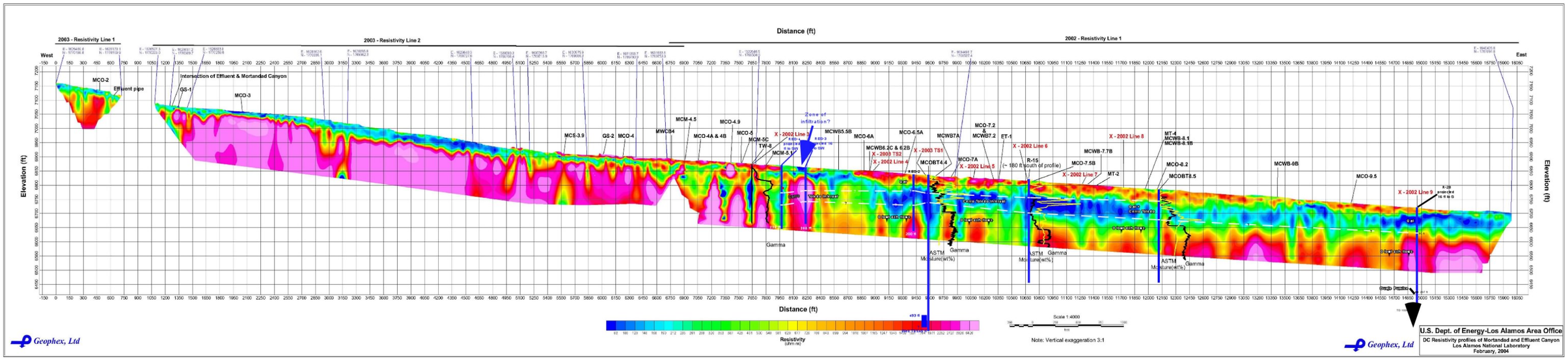
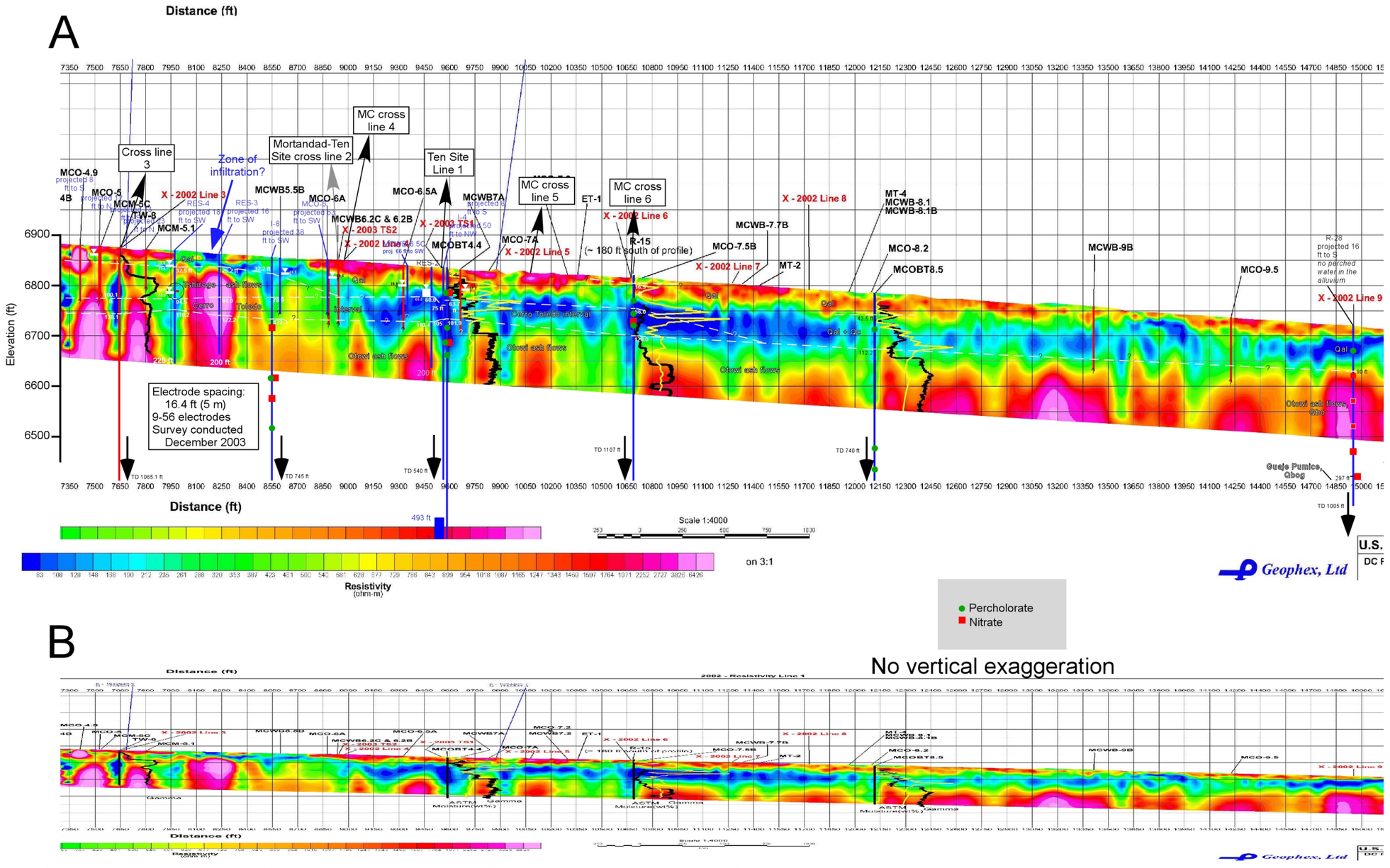


Figure H-1. DC-resistivity profile of Mortandad Canyon, combined from 2002 and 2003 surveys



Notes: Major lithologic units are shown as white dashed lines, queried where significantly uncertain. Lithologic control at wells is indicated by short horizontal white lines, with depths (in feet) indicated. Inverted triangles with short horizontal lines indicate the tops of perched groundwater zones, with depths in feet indicated. Where thickness could be determined, the bottom depth is also provided. No control on lithologic boundaries or zones of perched water exists between wells. Arrows pointing to rectangular boxes indicate locations of intersecting profiles. Boreholes located on or adjacent to the electrical profile are indicated by vertical blue or red lines if projected < 30 ft or >30 ft, respectively. Green dots and red square are, respectively, representative analyses of perchlorate and nitrate. They represent the locations and depth ranges over which these contaminants are distributed. B. Same resistivity profile as above, with vertical exaggeration eliminated.

Figure H-2A. DC-resistivity profile of Mortandad Canyon in the lower (wider) reach of the canyon

Appendix I

Summary of 3D Geospatial Modeling

I-1.0 PURPOSE

A detailed 3D hydrostratigraphic framework model (HFM) was developed for Mortandad Canyon to examine the complex subsurface conditions influencing the nature and extent of groundwater and contaminants. The 3D model was constructed using ArcGiS 9.2 and earthVision 7.5.4 and is based on the comprehensive integration of subsurface data that include lithologic logs, borehole geophysics, surface mapping, pore and groundwater samples, and hydrologic testing. The model evaluates spatial relationships between geologic units, distribution of subsurface moisture and groundwater, and extent of contamination; it enables users to visualize the distribution of these subsurface features in relation with the suspected source area, the regional aquifer system, and specific geologic units.

I-2.0 GEOLOGIC FRAMEWORK

Bedrock

The Mortandad Canyon HFM is illustrated in Figure I-1. The bedrock framework was constructed using a combined minimum tension and horizon gridding technique that maps the top of each geologic unit as a 2D surface and is consistent with the surfaces in the Laboratory's sitewide geologic model (LANL 2006, 93196). One exception is the mapping of the Cerros del Rio basalt that was subdivided into dense lava interiors and interflow zones based on interpretations from lithologic logs and the borehole geophysical logs for this investigation. The distribution of the Cerros del Rio basalt subunits was mapped using a 3D indicator gridding technique, which is illustrated in Figure I-1. The geologic database is provided as Table I-1.

Alluvium

The alluvium zone is based on a refined database containing both current and historic lithologic logs (Table I-2). The base of alluvium is mapped using a 2D minimum tension grid based on estimations of the alluvium and bedrock contacts improved by reexamination of historic lithologic logs. The lateral boundaries of the alluvium are truncated by the canyon bedrock walls and were estimated by analyzing the break in slope on the canyon floor using a high-resolution digital elevation model (DEM). The slope of the canyon walls was projected downward below the alluvium, forming a pseudotrapezoidal shape for the alluvium zone. The top of the alluvium is defined the DEM for the canyon floor. The data analysis shows a thickening of the alluvium near the center of the canyon, suggesting there may be channel(s) that create a nonuniform surface at the alluvium base. A basal channel was incorporated into the alluvium zone by digitizing the series of thicker segments into a continuous reach that replicates the form of a paleochannel.

I-3.0 GROUNDWATER HYDROLOGY

Alluvium

The extent of saturation within the alluvium zone was estimated based on water-level monitoring data. The water table that forms the top of the saturated alluvium was developed by utilizing a trend gridding technique to best replicate the observed slope of the water table. The saturated alluvium zone does not extend over the entire range of the model because leaky aquifer conditions cause the thin zone of saturation to eventually dewater to the east as shown in Figure 7.2-11.

Bedrock

The lateral and vertical extent of moisture in bedrock units was estimated by gridding measured borehole moisture data using a 3D indicator approach. The resulting distribution of soil water is shown in Figure 7.2-11. The mapped extent of moisture is limited by an irregular data distribution that is partly a function of the elongated shape of the canyon and of areas with limited data. Initially, the estimated 3D distribution of moisture was influenced by distant data points that resulted in unrealistic interpretations of soil water extents, particularly to the north where there were fewer data points. As a result, data controls were introduced at the model boundaries to restrict the estimated moisture extents. The boundaries coincide with the surface water divides (mesas) and thus assume that groundwater does not extend across these boundaries. This interpretation is supported by limited data that show low moisture contents and a lack of perched-intermediate groundwater beneath mesas adjacent to Mortandad Canyon (e.g., borehole MCOI-10).

I-4.0 CONTAMINANT DISTRIBUTIONS

Alluvium

The 3D distribution of nitrate and perchlorate concentrations (Figures 7.2-19 and 7.2-26) and mass (Figure 7.2-20) were estimated for the saturated alluvium zone based on site monitoring data. The estimates were generated utilizing a 3D minimum tension method and illustrate the extent of contamination within saturated alluvium.

Bedrock

Nitrate and perchlorate concentrations (Figures 7.2-19 and 7.2-26) and mass (Figure 7.2-20) were estimated for bedrock using the same methods as those described above for alluvium. Extrapolation problems similar to those encountered for moisture estimates were encountered when estimating the extent of nitrate and perchlorate. To limit these effects, the extents of nitrate and perchlorate were restricted to regions where there was some level of measurable saturation in bedrock. This was accomplished by the addition of control points that were assigned attributes consistent with nondetectable concentrations. The control points were located along the outer boundaries of the canyon outside the range of the alluvium. This is consistent with the conceptual model in which alluvial groundwater containing mobile contaminants infiltrates the bedrock units (see Sections 7.2 and 7.3).

Contaminant Mass Inventory

The modeling results that produce the 3D distribution of moisture and contaminant concentrations provide the framework for estimating the contaminant mass that resides within each geologic unit. The contaminant concentration data were normalized using moisture data for each grid and integrated over the model domain to develop a cumulative contaminant mass inventory for Mortandad Canyon. The estimates of mass inventory are provided in Table 7.2-7.

I-5.0 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 Programs Directorate's Records

Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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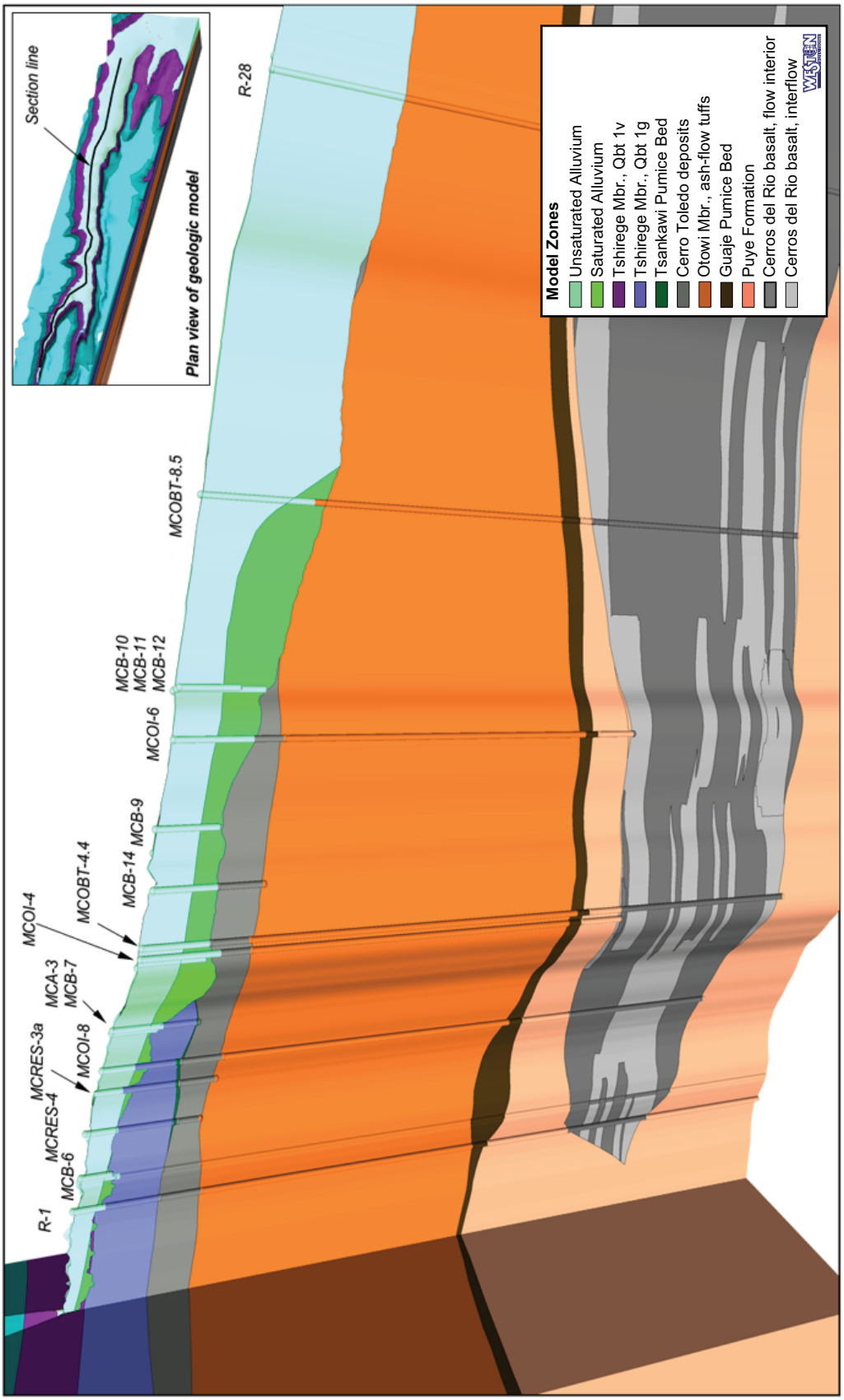


Figure I-1. Geologic cross section illustrating the 3D hydrostratigraphic framework model

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Table I-1
Geologic Database Supporting the Mortandad Canyon HFM for Bedrock Units

#Well ID	X	Y	GS	Unit	Depth	Thickness
I1	1628044.66	1769956.54	7106.00	QBT2	0	100.5
I1	1628044.66	1769956.54	7106.00	QBT1V	100.5	27
I1	1628044.66	1769956.54	7106.00	QBT1G	127.5	73.3
I1	1628044.66	1769956.54	7106.00	QBTT	200.8	3.2
I1	1628044.66	1769956.54	7106.00	QCT	204	40
I1	1628044.66	1769956.54	7106.00	QBOF	244	233.5
I1	1628044.66	1769956.54	7106.00	QBOG	477.5	21.5
I1	1628044.66	1769956.54	7106.00	TPF	499	11
I1	1628044.66	1769956.54	7106.00	TT	510	307.3
I1	1628044.66	1769956.54	7106.00	TPF2	NONE	-5
#I1	#N/A	#N/A	#N/A	TB	NONE	-5
I1	1628044.66	1769956.54	7106.00	TPF3	817.3	BOTTOM
I4	1634129.99	1768539.96	6836.90	QAL	0	75
I4	1634129.99	1768539.96	6836.90	QCT	75	30
I4	1634129.99	1768539.96	6836.90	QBOF	105	350
I4	1634129.99	1768539.96	6836.90	QBOG	455	15
I4	1634129.99	1768539.96	6836.90	TPF	470	50
#I4	#N/A	#N/A	#N/A	TT	NONE	-5
I4	1634129.99	1768539.96	6836.90	TPF2	NONE	-5
I4	1634129.99	1768539.96	6836.90	TB	520	BOTTOM
I5	1635249.28	1768299.13	6819.10	QAL	0	16.5
I5	1635249.28	1768299.13	6819.10	QBT1G	16.5	46.5
I5	1635249.28	1768299.13	6819.10	QBTT	63	3
I5	1635249.28	1768299.13	6819.10	QCT	66	54
I5	1635249.28	1768299.13	6819.10	QBOF	120	323
I5	1635249.28	1768299.13	6819.10	QBOG	443	18
I5	1635249.28	1768299.13	6819.10	TPF	461	31
#I5	#N/A	#N/A	#N/A	TT	NONE	-5
I5	1635249.28	1768299.13	6819.10	TPF2	NONE	-5
I5	1635249.28	1768299.13	6819.10	TB	492	BOTTOM
I6	1635347.01	1768426.02	6810.80	QAL	0	75.3
I6	1635347.01	1768426.02	6810.80	QCT	75.3	29.7
I6	1635347.01	1768426.02	6810.80	QBOF	105	331
I6	1635347.01	1768426.02	6810.80	QBOG	436	15
I6	1635347.01	1768426.02	6810.80	TPF	451	44
#I6	#N/A	#N/A	#N/A	TT	NONE	-5
I6	1635347.01	1768426.02	6810.80	TPF2	NONE	-5
I6	1635347.01	1768426.02	6810.80	TB	495	BOTTOM

Table I-1 (continued)

#Well ID	X	Y	GS	Unit	Depth	Thickness
I8	1633330.12	1769211.87	6859.10	QAL	0	32.2
I8	1633330.12	1769211.87	6859.10	QBT1G	32.2	42.7
I8	1633330.12	1769211.87	6859.10	QBTT	74.9	4
I8	1633330.12	1769211.87	6859.10	QCT	78.9	43.4
I8	1633330.12	1769211.87	6859.10	QBOF	122.3	333.7
I8	1633330.12	1769211.87	6859.10	QBOG	456	17
I8	1633330.12	1769211.87	6859.10	TPF	473	62
#I8	#N/A	#N/A	#N/A	TT	NONE	-5
I8	1633330.12	1769211.87	6859.10	TPF2	NONE	-5
I8	1633330.12	1769211.87	6859.10	TB	535	190
I8	1633330.12	1769211.87	6859.10	TPF3	725	BOTTOM
I10	1635357.99	1767639.27	7033.90	QBT3	0	71
I10	1635357.99	1767639.27	7033.90	QBT2	71	59
I10	1635357.99	1767639.27	7033.90	QBT1V	130	91
I10	1635357.99	1767639.27	7033.90	QBT1G	221	95.4
I10	1635357.99	1767639.27	7033.90	QBTT	316.4	3.6
I10	1635357.99	1767639.27	7033.90	QCT	NONE	-5
I10	1635357.99	1767639.27	7033.90	QBOF	320	353.6
I10	1635357.99	1767639.27	7033.90	QBOG	673.6	11.5
I10	1635357.99	1767639.27	7033.90	TPF	685.1	24.9
#I10	#N/A	#N/A	#N/A	TT	NONE	-5
I10	1635357.99	1767639.27	7033.90	TPF2	NONE	-5
I10	1635357.99	1767639.27	7033.90	TB	710	264
I10	1635357.99	1767639.27	7033.90	TPF3	974	BOTTOM
A1	1626587.39	1770410.53	7070.30	QAL	0	BOTTOM
A2	1634097.23	1768585.88	6837.20	QAL	0	62
A2	1634097.23	1768585.88	6837.20	QCT	62	BOTTOM
A3ac	1633588.23	1769071.06	6852.60	QAL	0	44
A3ac	1633588.23	1769071.06	6852.60	QBT1G	44	BOTTOM
A4	1625945.49	1770130.30	7134.40	QAL	0	BOTTOM
A4	1625945.49	1770130.30	7134.40	QAL	0	BOTTOM
RES3a	1633161.40	1769329.85	6862.60	QAL	0	26.2
RES3a	1633161.40	1769329.85	6862.60	QBT1G	26.2	54.8
RES3a	1633161.40	1769329.85	6862.60	QBTT	81	3
RES3a	1633161.40	1769329.85	6862.60	QCT	84	38.2
RES3a	1633161.40	1769329.85	6862.60	QBOF	122.2	BOTTOM
RES2	1634063.45	1768631.82	6837.80	QAL	0	60
RES2	1634063.45	1768631.82	6837.80	QCT	60	50.4
RES2	1634063.45	1768631.82	6837.80	QBOF	110.4	BOTTOM

Table I-1 (continued)

#Well ID	X	Y	GS	Unit	Depth	Thickness
B9	1634845.37	1768548.74	6823.80	QAL	0	60
B9	1634845.37	1768548.74	6823.80	QCT	60	BOTTOM
B8	1634702.30	1768627.25	6823.90	QAL	0	69.5
B8	1634702.30	1768627.25	6823.90	QCT	69.5	BOTTOM
B7	1633607.54	1769056.40	6852.10	QAL	0	49.2
B7	1633607.54	1769056.40	6852.10	QBT1G	49.2	34.8
B7	1633607.54	1769056.40	6852.10	QBTT	84	0.5
B7	1633607.54	1769056.40	6852.10	QCT	84.5	BOTTOM
B6	1632604.44	1769470.80	6875.20	QAL	0	30.8
B6	1632604.44	1769470.80	6875.20	QBT1G	30.8	BOTTOM
B5	1631546.34	1769769.41	6895.20	QAL	0	40
B5	1631546.34	1769769.41	6895.20	QBT1G	40	BOTTOM
B2	1626624.16	1770334.42	7075.80	QBT2	0	32.5
B2	1626624.16	1770334.42	7075.80	QBT1V	32.5	42
B2	1626624.16	1770334.42	7075.80	QBT1G	74.5	BOTTOM
B16	1641076.52	1767054.67	6670.60	QAL	0	52
B16	1641076.52	1767054.67	6670.60	QCT	52	22.5
B16	1641076.52	1767054.67	6670.60	QBOF	74.5	BOTTOM
B14	1634514.24	1768498.83	6826.90	QAL	0	61.2
B14	1634514.24	1768498.83	6826.90	QCT	61.2	43.8
B14	1634514.24	1768498.83	6826.90	QBOF	105	BOTTOM
B12	1635632.70	1768435.81	6805.20	QAL	0	56.5
B12	1635632.70	1768435.81	6805.20	QCT	56.5	BOTTOM
B11	1635621.15	1768535.39	6805.20	QAL	0	84.5
B11	1635621.15	1768535.39	6805.20	QCT	84.5	BOTTOM
B10	1635606.73	1768644.12	6805.70	QAL	0	82
B10	1635606.73	1768644.12	6805.70	QCT	82	BOTTOM
B1	1625585.57	1770129.73	7150.20	QAL	0	1.1
B1	1625585.57	1770129.73	7150.20	QBT2	1.1	89.4
B1	1625585.57	1770129.73	7150.20	QBT1V	90.5	BOTTOM
A9	1641471.83	1767392.67	6671.40	QAL	0	107.5
A9	1641471.83	1767392.67	6671.40	QBOF	107.5	BOTTOM
A8	1641326.76	1767371.84	6668.70	QAL	0	79.5
A8	1641326.76	1767371.84	6668.70	QCT	79.5	1.7
A8	1641326.76	1767371.84	6668.70	QBOF	81.2	BOTTOM
A7	1641211.83	1767292.61	6669.00	QAL	0	66.5
A7	1641211.83	1767292.61	6669.00	QBOF	66.5	BOTTOM
B15_A6	1632955.35	1768470.04	6862.90	QAL	0	21.5
B15_A6	1632955.35	1768470.04	6862.90	QBT1G	21.5	39.3

Table I-1 (continued)

#Well ID	X	Y	GS	Unit	Depth	Thickness
B15_A6	1632955.35	1768470.04	6862.90	QBTT	60.8	3.3
B15_A6	1632955.35	1768470.04	6862.90	QCT	64.1	30.1
B15_A6	1632955.35	1768470.04	6862.90	QBOF	94.2	BOTTOM
RES4	1632873.59	1769472.29	6870.70	QAL	0	32.5
RES4	1632873.59	1769472.29	6870.70	QBT1G	32.5	58.5
RES4	1632873.59	1769472.29	6870.70	QBTT	91	3.5
RES4	1632873.59	1769472.29	6870.70	QCT	94.5	23.7
RES4	1632873.59	1769472.29	6870.70	QBOF	118.2	BOTTOM
R-1	1632355.14	1769598.84	6881.21	QAL	0	33
R-1	1632355.14	1769598.84	6881.21	QBT1G	33	57
R-1	1632355.14	1769598.84	6881.21	QBTT	NONE	-5
R-1	1632355.14	1769598.84	6881.21	QCT	90	45
R-1	1632355.14	1769598.84	6881.21	QBOF	135	325
R-1	1632355.14	1769598.84	6881.21	QBOG	460	20
R-1	1632355.14	1769598.84	6881.21	TPF	480	110
R-1	1632355.14	1769598.84	6881.21	TT	NONE	-5
R-1	1632355.14	1769598.84	6881.21	TPF2	NONE	-5
R-1	1632355.14	1769598.84	6881.21	TB	590	115
R-1	1632355.14	1769598.84	6881.21	TPF3	705	285
R-1	1632355.14	1769598.84	6881.21	TPP	990	BOTTOM
R-9	1648241.40	1770843.90	6382.80	QAL	0	10
R-9	1648241.40	1770843.90	6382.80	TB	10	279.8
R-9	1648241.40	1770843.90	6382.80	TPF3	289.8	249.2
R-9	1648241.40	1770843.90	6382.80	TPP	539	147.4
R-9	1648241.40	1770843.90	6382.80	TPT	NONE	-5
R-9	1648241.40	1770843.90	6382.80	TB2	686.4	BOTTOM
R-9i	1648208.80	1770834.70	6383.20	QAL	0	10
R-9i	1648208.80	1770834.70	6383.20	TB	10	280
R-9i	1648208.80	1770834.70	6383.20	TPF3	290	BOTTOM
R-12	1647429.30	1767908.90	6499.60	QAL	0	12.5
R-12	1647429.30	1767908.90	6499.60	QCT	12.5	18.8
R-12	1647429.30	1767908.90	6499.60	QBOF	31.3	80.7
R-12	1647429.30	1767908.90	6499.60	QBOG	112	19
R-12	1647429.30	1767908.90	6499.60	TPF	131	1.5
#R-12	#N/A	#N/A	#N/A	TT	NONE	-5
R-12	1647429.30	1767908.90	6499.60	TPF2	NONE	-5
R-12	1647429.30	1767908.90	6499.60	TB	132.5	359.1
R-12	1647429.30	1767908.90	6499.60	TPF3	491.6	174.4
R-12	1647429.30	1767908.90	6499.60	TPP	666	118

Table I-1 (continued)

#Well ID	X	Y	GS	Unit	Depth	Thickness
R-12	1647429.30	1767908.90	6499.60	TPT	NONE	-5
R-12	1647429.30	1767908.90	6499.60	TB2	784	BOTTOM
R-13	1640988.36	1766988.39	6673.05	QAL	0	38
R-13	1640988.36	1766988.39	6673.05	QBT1G	38	35
R-13	1640988.36	1766988.39	6673.05	QCT	73	7
R-13	1640988.36	1766988.39	6673.05	QBOF	80	168
R-13	1640988.36	1766988.39	6673.05	QBOG	248	20
R-13	1640988.36	1766988.39	6673.05	TPF	268	35
#R-13	#N/A	#N/A	#N/A	TT	NONE	-5
R-13	1640988.36	1766988.39	6673.05	TPF2	NONE	-5
R-13	1640988.36	1766988.39	6673.05	TB	303	427
R-13	1640988.36	1766988.39	6673.05	TPF3	730	268
R-13	1640988.36	1766988.39	6673.05	TPP	998	70
R-13	1640988.36	1766988.39	6673.05	TPT	1068	BOTTOM
R-14	1629856.58	1768951.62	7062.08	QAL	0	3
R-14	1629856.58	1768951.62	7062.08	QBT2	3	77
R-14	1629856.58	1768951.62	7062.08	QBT1V	80	49
R-14	1629856.58	1768951.62	7062.08	QBT1G	129	88
R-14	1629856.58	1768951.62	7062.08	QBTT	217	3
R-14	1629856.58	1768951.62	7062.08	QCT	220	24
R-14	1629856.58	1768951.62	7062.08	QBOF	244	278
R-14	1629856.58	1768951.62	7062.08	QBOG	522	12
R-14	1629856.58	1768951.62	7062.08	TPF	534	86
R-14	1629856.58	1768951.62	7062.08	TT	620	148
#R-14	#N/A	#N/A	#N/A	TB	NONE	-5
R-14	1629856.58	1768951.62	7062.08	TPF3	768	442
R-14	1629856.58	1768951.62	7062.08	TPP	1210	BOTTOM
R-15	1635308.60	1768272.50	6820.00	QAL	0	16.5
R-15	1635308.60	1768272.50	6820.00	QBT1G	16.5	48.5
R-15	1635308.60	1768272.50	6820.00	QBTT	65	1
R-15	1635308.60	1768272.50	6820.00	QCT	66	54
R-15	1635308.60	1768272.50	6820.00	QBOF	120	322
R-15	1635308.60	1768272.50	6820.00	QBOG	442	19
R-15	1635308.60	1768272.50	6820.00	TPF	461	31
#R-15	#N/A	#N/A	#N/A	TT	NONE	-5
R-15	1635308.60	1768272.50	6820.00	TPF2	NONE	-5
R-15	1635308.60	1768272.50	6820.00	TB	492	254.7
R-15	1635308.60	1768272.50	6820.00	TPF3	746.7	226.3
R-15	1635308.60	1768272.50	6820.00	TPP	973	127

Table I-1 (continued)

#Well ID	X	Y	GS	Unit	Depth	Thickness
R-15	1635308.60	1768272.50	6820.00	TPT	1100	BOTTOM
R-28	1638989.89	1768356.76	6728.81	QAL	0	130
R-28	1638989.89	1768356.76	6728.81	QBOF	130	167
R-28	1638989.89	1768356.76	6728.81	QBOG	297	18
R-28	1638989.89	1768356.76	6728.81	TPF	315	3
#R-28	#N/A	#N/A	#N/A	TT	NONE	-5
R-28	1638989.89	1768356.76	6728.81	TPF2	NONE	-5
R-28	1638989.89	1768356.76	6728.81	TB	318	357
R-28	1638989.89	1768356.76	6728.81	TPF3	675	265
R-28	1638989.89	1768356.76	6728.81	TPP	940	BOTTOM
R-33	1633403.64	1768531.32	6853.33	QAL	0	66
R-33	1633403.64	1768531.32	6853.33	QCT	66	24
R-33	1633403.64	1768531.32	6853.33	QBOF	90	375
R-33	1633403.64	1768531.32	6853.33	QBOG	465	20
R-33	1633403.64	1768531.32	6853.33	TPF	485	44
#R-33	#N/A	#N/A	#N/A	TT	NONE	-5
R-33	1633403.64	1768531.32	6853.33	TPF2	NONE	-5
R-33	1633403.64	1768531.32	6853.33	TB	529	202
R-33	1633403.64	1768531.32	6853.33	TPF3	731	233
R-33	1633403.64	1768531.32	6853.33	TPP	964	158
R-33	1633403.64	1768531.32	6853.33	TPT	1122	BOTTOM
R-34	1643597.44	1764027.86	6629.99	QAL	0	18
R-34	1643597.44	1764027.86	6629.99	QBT1G	18	78
R-34	1643597.44	1764027.86	6629.99	QBOF	96	41
R-34	1643597.44	1764027.86	6629.99	QBOG	137	11
R-34	1643597.44	1764027.86	6629.99	TPF	NONE	-5
#R-34	#N/A	#N/A	#N/A	TT	NONE	-5
R-34	1643597.44	1764027.86	6629.99	TPF2	NONE	-5
R-34	1643597.44	1764027.86	6629.99	TB	148	552
R-34	1643597.44	1764027.86	6629.99	TPF3	700	25
R-34	1643597.44	1764027.86	6629.99	TPP	725	325
R-34	1643597.44	1764027.86	6629.99	TPT	1050	BOTTOM
MCOBT-4.4	1634196.33	1768512.96	6836.18	QAL	0	63.7
MCOBT-4.4	1634196.33	1768512.96	6836.18	QCT	63.7	38.2
MCOBT-4.4	1634196.33	1768512.96	6836.18	QBOF	101.9	360.1
MCOBT-4.4	1634196.33	1768512.96	6836.18	QBOG	462	15
MCOBT-4.4	1634196.33	1768512.96	6836.18	TPF	477	40
#MCOBT-4.4	#N/A	#N/A	#N/A	TT	NONE	-5
MCOBT-4.4	1634196.33	1768512.96	6836.18	TPF2	NONE	-5

Table I-1 (continued)

#Well ID	X	Y	GS	Unit	Depth	Thickness
MCOBT-4.4	1634196.33	1768512.96	6836.18	TB	517	220
MCOBT-4.4	1634196.33	1768512.96	6836.18	TPF3	737	BOTTOM
MCOBT-8.5	1636710.21	1768725.67	6780.53	QAL	0	112.2
MCOBT-8.5	1636710.21	1768725.67	6780.53	QBOF	112.2	279.8
MCOBT-8.5	1636710.21	1768725.67	6780.53	QBOG	392	22
MCOBT-8.5	1636710.21	1768725.67	6780.53	TPF	414	15
#MCOBT-8.5	#N/A	#N/A	#N/A	TT	NONE	-5
MCOBT-8.5	1636710.21	1768725.67	6780.53	TPF2	NONE	-5
MCOBT-8.5	1636710.21	1768725.67	6780.53	TB	429	281
MCOBT-8.5	1636710.21	1768725.67	6780.53	TPF3	710	BOTTOM
TW-8	1632573.95	1769504.85	6875.46	QAL	0	40
TW-8	1632573.95	1769504.85	6875.46	QBT1G	40	45
TW-8	1632573.95	1769504.85	6875.46	QCT	85	40
TW-8	1632573.95	1769504.85	6875.46	QBOF	125	320
TW-8	1632573.95	1769504.85	6875.46	QBOG	445	45
TW-8	1632573.95	1769504.85	6875.46	TPF	490	90
#TW-8	#N/A	#N/A	#N/A	TT	NONE	-5
TW-8	1632573.95	1769504.85	6875.46	TPF2	NONE	-5
TW-8	1632573.95	1769504.85	6875.46	TB	580	145
TW-8	1632573.95	1769504.85	6875.46	TPF3	725	244
TW-8	1632573.95	1769504.85	6875.46	TPP	969	BOTTOM
AHTF-MC1	1637573.00	1768409.00	6764.60	QAL	0	40
AHTF-MC1	1637573.00	1768409.00	6764.60	QBT1G	40	17
AHTF-MC1	1637573.00	1768409.00	6764.60	QCT	57	24
AHTF-MC1	1637573.00	1768409.00	6764.60	QBOF	81	BOTTOM
AHTF-MC2	1637929.00	1768477.00	6751.90	QAL	0	76
AHTF-MC2	1637929.00	1768477.00	6751.90	QCT	76	44
AHTF-MC2	1637929.00	1768477.00	6751.90	QBOF	120	BOTTOM
AHTF-MC3	1639063.00	1768294.00	6726.60	QAL	0	62
AHTF-MC3	1639063.00	1768294.00	6726.60	QCT	62	45
AHTF-MC3	1639063.00	1768294.00	6726.60	QBOF	107	BOTTOM
SHB-1	1624052.20	1769848.70	7314.60	QAL	0	1
SHB-1	1624052.20	1769848.70	7314.60	QBT3	1	119
SHB-1	1624052.20	1769848.70	7314.60	QBT2	120	95
SHB-1	1624052.20	1769848.70	7314.60	QBT1V	215	55
SHB-1	1624052.20	1769848.70	7314.60	QBT1G	270	32
SHB-1	1624052.20	1769848.70	7314.60	QBTT	302	8
SHB-1	1624052.20	1769848.70	7314.60	QCT	310	137
SHB-1	1624052.20	1769848.70	7314.60	QBOF	447	143

Table I-1 (continued)

#Well ID	X	Y	GS	Unit	Depth	Thickness
SHB-1	1624052.20	1769848.70	7314.60	QBOG	590	41
SHB-1	1624052.20	1769848.70	7314.60	TPF	631	13
SHB-1	1624052.20	1769848.70	7314.60	TT	644	BOTTOM
Sigma_Mesa	1628827.80	1770620.30	7209.50	QAL	0	364
Sigma_Mesa	1628827.80	1770620.30	7209.50	QBTT	364	1
Sigma_Mesa	1628827.80	1770620.30	7209.50	QCT	365	54.6
Sigma_Mesa	1628827.80	1770620.30	7209.50	QBOF	419.6	315.4
Sigma_Mesa	1628827.80	1770620.30	7209.50	QBOG	735	8
Sigma_Mesa	1628827.80	1770620.30	7209.50	TPF	743	57
Sigma_Mesa	1628827.80	1770620.30	7209.50	TT	800	130
Sigma_Mesa	1628827.80	1770620.30	7209.50	TPF2	NONE	-5
#Sigma_Mesa	#N/A	#N/A	#N/A	TB	NONE	-5
Sigma_Mesa	1628827.80	1770620.30	7209.50	TPF3	930	405
Sigma_Mesa	1628827.80	1770620.30	7209.50	TPP	1335	BOTTOM
R-11	1639960.91	1769351.77	6673.72	QAL	0	98
R-11	1639960.91	1769351.77	6673.72	QBOF	98	122
R-11	1639960.91	1769351.77	6673.72	QBOG	220	25
R-11	1639960.91	1769351.77	6673.72	TPF	245	29
#R-11	#N/A	#N/A	#N/A	TT	NONE	-5
R-11	1639960.91	1769351.77	6673.72	TPF2	NONE	-5
R-11	1639960.91	1769351.77	6673.72	TB	274	349
R-11	1639960.91	1769351.77	6673.72	TPF3	623	211
R-11	1639960.91	1769351.77	6673.72	TPP	834	BOTTOM
PM-3	1642593.00	1769527.00	6610.90	QAL	0	30
PM-3	1642593.00	1769527.00	6610.90	QBOF	30	140
PM-3	1642593.00	1769527.00	6610.90	QBOG	170	20
PM-3	1642593.00	1769527.00	6610.90	TPF	190	25
PM-3	1642593.00	1769527.00	6610.90	TT	NONE	-5
PM-3	1642593.00	1769527.00	6610.90	TPF2	NONE	-5
PM-3	1642593.00	1769527.00	6610.90	TB	215	325
PM-3	1642593.00	1769527.00	6610.90	TPF3	540	200
PM-3	1642593.00	1769527.00	6610.90	TPP	740	5
PM-3	1642593.00	1769527.00	6610.90	TPT	745	60
PM-3	1642593.00	1769527.00	6610.90	TF	805	300
PM-3	1642593.00	1769527.00	6610.90	TB2	1105	435
PM-3	1642593.00	1769527.00	6610.90	TS	1540	BOTTOM

Table I-2
Geologic Database Supporting the Mortandad Canyon HFM for Alluvium Unit

X	Y	GS	Thickness	ID	Alluvium Base Elevation
1623987.80	1771179.50	7187.92	3.1	MCO-0.6	7184.82
1625585.57	1770129.73	7150.20	1.1	B1	7149.1
1625620.28	1770156.61	7150.00	0	MCM-1A	7150
1625620.28	1770156.61	7150.00	0	MCM-1B	7150
1625917.97	1770114.04	7140.63	0	MCM-2A	7140.63
1625927.60	1770156.66	7136.25	0	MCM-2B	7136.25
1625945.49	1770130.30	7134.40	5.4	A4	7129
1626587.39	1770410.53	7070.30	5.9	A1	7064.4
1627357.73	1770205.78	7055.53	10	MCM-3A	7045.53
1627362.77	1770234.95	7052.60	7	MCO-3	7045.6
1627367.02	1770241.41	7052.42	20	MCM-3B	7032.42
1629856.58	1768951.62	7062.08	3	R-14	7059.08
1630730	1769690	NA	NA	Mid1_Control	6905
1630935	1769725	NA	NA	Mid1_Control	6895
1631045	1769760	NA	NA	Mid1_Control	6890
1631125	1769775	NA	NA	Mid1_Control	6885
1631215.12	1769786.45	6897.54	18	MCO-4	6879.54
1631420.13	1769756.61	6890.00	9	MCM-4A	6881
1631420.13	1769756.61	6890.00	18	MCM-4B	6872
1631546.34	1769769.41	6895.20	29	B5	6866.2
1631740.56	1769745.66	6893.42	8.8	MCWB-4	6884.62
1631890.10	1769695.91	6888.55	26	MCM-4.5	6862.55
1632036.18	1769694.61	6886.75	18	MCO-4B	6868.75
1632065.32	1769692.90	6889.10	30	MCM-4.8	6859.1
1632156.34	1769660.53	6883.80	6	PRB8	6877.8
1632169.89	1769674.49	6883.09	17	PRB7	6866.091
1632185.64	1769680.48	6881.47	23	PRB6	6858.471
1632193.69	1769695.82	6880.61	25.5	PRB3	6855.114
1632195.49	1769692.99	6880.29	24	PRB4	6856.285
1632203.69	1769703.98	6881.77	27	PRB2	6854.768
1632213.88	1769716.39	6882.90	24	PRB1	6858.902
1632355.14	1769598.84	6881.21	33	R-1	6848.21
1632371.65	1769606.00	6879.95	27	MCO-4.9	6852.95
1632427.92	1769506.84	6880.84	22	MCM-5A	6858.84
1632443.00	1769521.10	6879.00	25	MCM-5B	6854
1632466.32	1769537.46	6875.66	35	MCO-5	6840.66
1632485.49	1769553.61	6877.31	30	MCM-5C	6847.31

Table I-2 (continued)

X	Y	GS	Thickness	ID	Alluvium Base Elevation
1632573.95	1769504.85	6875.46	40	TW-8	6835.46
1632578.31	1769484.60	6876.22	29	MCWB-5	6847.22
1632604.44	1769470.80	6875.20	30.8	B6	6844.4
1632873.41	1769480.75	6870.87	31	MCM-5.1	6839.87
1632873.59	1769472.29	6870.70	32.5	RES4	6838.2
1632955.35	1768470.04	6862.90	21.5	B15_A6	6841.4
1633142.99	1768502.62	6857.83	30	TSCM-1	6827.83
1633270	1768500	NA	NA	Mid1_Control	6810
1633161.40	1769329.85	6862.60	26.2	RES3a	6836.4
1633185	1769335	NA	NA	Mid1_Control	6820
1633330.12	1769211.87	6859.10	32.2	I8	6826.9
1633383.09	1768490.75	6853.21	31.3	TSWB-6	6821.91
1633403.64	1768531.32	6853.33	66	R-33	6787.33
1633420.54	1769125.78	6856.89	37	MCWB-5.5B	6819.89
1633435	1769150	NA	NA	Mid1_Control	6810
1633455.53	1769176.95	6858.36	35.1	MCWB-5.5A	6823.26
1633520.11	1768456.57	6857.00	50	TSCO-1	6807
1633565	1768535	NA	NA	Mid1_Control	6755
1633549.63	1768962.43	6851.79	10	MCM-6A	6841.79
1633588.23	1769071.06	6852.60	44	A3ac	6808.6
1633603.26	1769028.17	6851.83	38	MCM-5.9A	6813.83
1633603.26	1769028.17	6851.83	33	MCM-5.9	6818.83
1633607.54	1769056.40	6852.10	49.2	B7	6802.9
1633618.00	1769007.80	6851.00	47	MCM-6C	6804
1633626.00	1769001.50	6851.00	37	MCM-6B	6814
1633633.54	1769011.79	6849.48	36	MCO-6	6813.48
1633644.00	1769012.10	6850.00	35	MCM-6D	6815
1633682.27	1768893.49	6847.98	-	MCWB-6.2C	NA
1633685.09	1768897.84	6848.01	40.2	MCWB-6.2B	6807.81
1633694.43	1769066.55	6850.17	12	MCM-6E	6838.17
1633754.49	1768968.15	6848.29	41.3	MCWB-6.2A	6806.99
1633833.36	1768583.81	6843.80	47.5	MCWB-6.5E	6796.3
1633847.90	1768595.40	6842.19	47	MCO-6.5A	6795.19
1633878.05	1768536.19	6843.20	-	MCWB-6.5D	NA
1633962.36	1768688.11	6838.84	42	MCO-6.5B	6796.84
1633993.33	1768759.41	6841.02	46.5	MCWB-6.5C	6794.52
1634010.44	1768556.74	6838.74	23	MCM-6.5A	6815.74
1634020.98	1768565.73	6839.35	41.8	MCWB-6.6	6797.55
1634034.59	1768745.86	6839.64	46	MCM-6.5	6793.64

Table I-2 (continued)

X	Y	GS	Thickness	ID	Alluvium Base Elevation
1634063.45	1768631.82	6837.80	60	RES2	6777.8
1634097.23	1768585.88	6837.20	62	A2	6775.2
1634097.23	1768585.88	6837.20	62	A2	6775.2
1634097.23	1768585.88	6837.20	62	A2	6775.2
1634129.99	1768539.96	6836.90	75	I4	6761.9
1634196.33	1768512.96	6836.18	63.7	MCOBT-4.4	6772.48
1634350.16	1768469.73	6832.45	44	MCWB-7B	6788.45
1634356.62	1768551.02	6831.17	47	MCWB-7A	6784.17
1634514.24	1768498.83	6826.90	61.2	B14	6765.7
1634516.11	1768507.85	6827.31	55	MCO-7	6772.31
1634702.30	1768627.25	6823.90	69.5	B8	6754.4
1634845.37	1768548.74	6823.80	60	B9	6763.8
1634956.96	1768491.86	6818.86	65.5	MCWB-7.2	6753.36
1634957.03	1768538.54	6818.34	60.6	MCO-7.2	6757.74
1635249.28	1768299.13	6819.10	16.5	I5	6802.6
1635262.86	1768493.96	6811.63	30	MT-1	6781.63
1635270.33	1768569.46	6812.40	69.3	MCWB-7.4A	6743.1
1635287.73	1768407.84	6813.07	66	MCWB-7.4B	6747.07
1635308.60	1768272.50	6820.00	16.5	R-15	6803.5
1635347.01	1768426.02	6810.80	75.3	I6	6735.5
1635453.22	1768439.56	6808.88	60	MCO-7.5B	6748.88
1635463.03	1768496.21	6809.26	61	MCM-7.5	6748.26
1635606.73	1768644.12	6805.70	82	B10	6723.7
1635621.15	1768535.39	6805.20	84.5	B11	6720.7
1635632.70	1768435.81	6805.20	56.5	B12	6748.7
1635902.25	1768700.71	6798.31	67	MCWB-7.7A	6731.31
1635921.84	1768517.26	6798.97	69	MCWB-7.7B	6729.97
1635923.65	1768834.59	6799.19	4	MCM-8F	6795.19
1635937.41	1768647.61	6797.47	52	MCO-8A	6745.47
1635948.92	1768764.61	6796.25	32	MCM-8E	6764.25
1635969.03	1768692.13	6795.80	59	MCM-8D	6736.8
1635980.95	1768657.83	6796.65	31	MT-3	6765.65
1635996.84	1768606.85	6798.46	57	MCM-8C	6741.46
1636019.79	1768544.59	6796.20	35	MT-2	6761.2
1636021.00	1768529.00	6796.70	61	MCO-8	6735.7
1636031.10	1768479.54	6797.25	30	MCM-8B	6767.25
1636220.04	1768556.57	6800.00	3	MCM-8A	6797
1636552.36	1768704.12	6785.95	69.5	MCWB-8.1A	6716.45
1636557.31	1768634.21	6783.59	44	MT-4	6739.59

Table I-2 (continued)

X	Y	GS	Thickness	ID	Alluvium Base Elevation
1636559.97	1768618.31	6783.80	69.3	MCWB-8.1B	6714.5
1636565.71	1768531.74	6785.63	62.5	MCWB-8.1C	6723.13
1636704.41	1768645.96	6781.60	72	MCO-8.2	6709.6
1636710.21	1768725.67	6780.53	112.2	MCOBT-8.5	6668.33
1636727.09	1768664.51	6781.26	76	MCC-8.2	6705.26
1636865	1768670	NA	NA	Mid2_Control	6605
1637573.00	1768409.00	6764.60	40	AHTF-MC1	6724.6
1637929.00	1768477.00	6751.90	76	AHTF-MC2	6675.9
1637960	1768565	NA	NA	Mid2_Control	6605
1638056.24	1768370.63	6749.67	57	MCO-9	6692.67
1638069.00	1768490.99	6753.60	68.3	MCWB-9B	6685.3
1638123.04	1768627.67	6752.11	70	MCWB-9A	6682.11
1638348.52	1768505.85	6743.27	57	MCO-9.5	6686.27
1638782.025	1768271.379	NA	NA	East_Control	6605
1638880.73	1768393.05	6730.58	62	MCM-10	6668.58
1638989.89	1768356.76	6728.81	130	R-28	6598.81
1639063.00	1768294.00	6726.60	62	AHTF-MC3	6664.6
1639133.18	1768085.36	6729.70	4	MCM-10-1	6725.7
1639769.97	1768056.30	6709.34	3	MCM-10-2	6706.34
1639897.00	1768331.00	6720.00	23	MCO-11	6697
1639960.91	1769351.77	6673.72	98	R-11	6575.72
1640291.18	1767991.25	6704.49	93	MCM-12A	6611.49
1640326.32	1768206.21	6697.15	71	MCO-12	6626.15
1640328.77	1768305.42	6701.62	90	MCM-12B	6611.62
1640816.604	1767870.044	NA	NA	East_Control	6575
1640612.49	1767868.80	6695.95	3	MCM-10-3	6692.95
1640988.36	1766988.39	6673.05	38	R-13	6635.05
1641076.52	1767054.67	6670.60	52	B16	6618.6
1641174.29	1767501.88	6674.48	65	MCO-13	6609.48
1641211.83	1767292.61	6669.00	66.5	A7	6602.5
1641326.76	1767371.84	6668.70	79.5	A8	6589.2
1641471.83	1767392.67	6671.40	107.5	A9	6563.9
1642593.00	1769527.00	6610.90	30	PM-3	6580.9
1643597.44	1764027.86	6629.99	18	R-34	6611.99
1647429.30	1767908.90	6499.60	12.5	R-12	6487.1
1648208.80	1770834.70	6383.20	10	R-9i	6373.2
1648241.40	1770843.90	6382.80	10	R-9	6372.8

Appendix J

Constraints on Saturated Thickness and Lateral Extent of Intermediate-Perched Water beneath Mortandad Canyon

J-1.0 INTRODUCTION

The software package earthVision was used to calculate mass distributions of mobile contaminants in pore water and groundwater beneath Mortandad Canyon. One component of this mass balance is an estimate of contamination that occurs in intermediate-perched groundwater. The saturated thickness and lateral extent of the perched zones are important constraints on the amount of water present when calculating the mass of contaminants in the perched zones.

To determine saturated thickness, water-level data recorded for intermediate wells in Mortandad Canyon are summarized. Mean water level over the period of record is selected as the average top of saturation. Next, the base of saturation in each well is defined. This is less well constrained; the perching layer is not always evident during drilling because it is often difficult to prevent groundwater from flowing down the borehole wall once perched water is penetrated. Summary Table J-1 presents the tops and bottoms of intermediate-perched groundwater in each of the wells.

J-2.0 SUMMARY OF WATER-LEVEL DATA

Figures J-1 and J-2 show variations in water level with time and summary statistics for the water-level data. The period of record for water-level data to date is as follows:

- MCOBT-4.4 Apr 19, 2002–Feb 13, 2006
- MCOI-4 Jan 23, 2005– Apr 7, 2006 (three records in Nov 2004 probably represent disturbed values soon after development and they were ignored)
- MCOI-5 Oct 20, 2004–Mar 22, 2006
- MCOI-6 Jan 10, 2005–May 16, 2006

Gaps in the water-level records correspond to times when transducers were removed from the wells for sampling or maintenance. In some cases, the transducers were not reinstalled until quite a bit of time had passed. In addition to periods of continuous transducer data, manual measurements of water level were made periodically; these usually stand out as single isolated points between the periods of continuous transducer measurements. Several manual measurements also were taken during the periods of transducer measurement and the agreement between these independent water-level measurements is generally very good.

Manual measurements are included in the plotted data and in the statistical compilations, and they are given the same symbols as the transducer data on the plots. The report by Allen and Koch 2006 (93652, pp. 66–70) plots the manual data separately.

MCOBT-4.4 has the longest period of record for intermediate wells in Mortandad Canyon. Water levels generally declined over time in MCOBT-4.4 except for short periods of rebound such as in October and November 2004 (Figure J-1). The mean water elevation in MCOBT-4.4 is 1925 m (6315.7 ft). MCOI-4, located 19.8 m (65 ft) to the northwest, is completed in the same perched zone as MCOBT-4.4. The mean water elevation at MCOI-4 is 1925.45 m (6317.1 ft). When compared with overlapping periods of record, water levels for MCOI-4 are typically 0.9 m (3 ft) higher than those for MCOBT-4.4 (Figure J-1). Both wells are located in the center of the Mortandad Canyon near the stream channel, and there is no reason to expect the water levels to be different, especially given their proximity. Given the lack of any other constraints, the higher water elevation of MCOI-4 (1925.45 m [6317.1 ft]) was selected to represent the water level at this location. This provides some conservatism by producing higher calculated perchlorate and nitrate masses for this perched zone.

Groundwater in MCOI-5 and MCOI-6 is probably hydraulically connected through fractures and interflow zones in the lower part of the Cerros del Rio basalts. The two wells are separated by a lateral distance of 46 m (150 ft), with MCOI-5 located near the south canyon wall and MCOI-6 located near the canyon center. The period of record for both wells is similar, and during this time the mean water level in MCOI-5 and MCOI-6 was 1868.5 and 1873.6 m (6130.4 and 6147.1-ft), respectively (Figure J-2). Thus, the mean water level is 5 m (16.5 ft) higher near the canyon center versus the area near the south canyon wall. One explanation for this difference is that MCOI-6 is completed near the axis of a recharge mound beneath the central part of the canyon. MCOI-5 may be off the axis of the recharge mound and tap into groundwater that is spreading laterally from the mound. However, the substantial water depth from the ground surface (210 m [669 ft]) when compared with the lateral distance between the wells (46 m [150 ft]) should be sufficient for infiltrating flow paths to laterally diffuse at a distance larger than 46 m (150 ft).

Another possibility is that the basalt units hosting the perched water have a significant component of dip to the south. Regional structural contours show that Cerros del Rio basalts in this part of Mortandad Canyon flowed over a land surface that dipped to the south. The flow units hosting perched water near the base of this thick sequence of basalts probably contain south-dipping interflow zones, although lateral stacking of flows probably results in considerable local variations in dips. A third possibility is that heterogeneity in the basalt units can result in poor hydrologic communication among fractures, resulting in partial drainage of poorly connected perched zones during drilling or spatial and temporal variability in the infiltration rate feeding the perched zone at the time of drilling. In this case, the hydraulic gradient between the two wells might not be representing the active flow path but instead is a partial sampling of discontinuous water bodies.

Regardless of origin, the water-level differences between MCOI-5 and MCOI-6 were honored when modeling the top of this perched zone with earthVision. For the model, an elongate recharge mound was placed along the canyon axis. The top of the perched zone dips north and south away from the crest of the mound near MCOI-6. The southern extent of perched water is partly constrained by the absence of intermediate groundwater in borehole MCOI-10, located on the mesa to the south. A reasonable interpretation is that perched water is confined to the area defined by the canyon floor in Mortandad Canyon.

The hydraulic gradient along the perching zone between MCOI-5 and MCOI-6 is in the order of 0.1. Regardless of the explanations discussed above (recharge mound/dipping units), this substantial hydraulic gradient will cause substantial groundwater flux. Even if the permeability is very low (0.1 m/d) and assuming a saturated thickness of 10 m (33 ft) (based on the data presented below), this slope will cause groundwater flux in order of 100 kg/d per unit length.

In 1999, perched water was encountered in the lower Cerros del Rio basalts while drilling regional well R-15, located 19.8 m (65 ft) to the east-southeast of MCOI-5. A well was not installed in this perched zone, but a water elevation of 1881.7 m (6173.6 ft) was obtained after resting the open borehole (bottom elevation was 1853.2 m [6080 ft]) for 14.75 h. The water encountered at R-15 is probably a mixture of native groundwater and drilling fluids. A water sample collected from the perched zone contained elevated perchlorate (12 ppb) and tritium (3770 pCi/L), indicating that a component of contaminated native groundwater was present. Elevated sodium and sulfate in this sample suggest drilling fluids were also present in the sampled water. The perched water occurs in a portion of the borehole that was drilled dry, but fluids were used to advance casing above the perched zone and these fluids probably flowed down the borehole wall or through fractures and contributed to the measured water level and chemistry.

Several factors complicate the comparison of perched water levels at R-15 to those measured at MCOI-5 and MCOI-6. The initial open-hole water level at R-15 (1881.7 m [6173.6 ft] after resting the borehole for 14.75 h) is 13.2 m (43.2 ft) higher than at MCOI-5 (1868.5 m [6130.4 ft]) and 8 m (26.5 ft) higher than at

MCOI-6 (1873.6 m [6147.1 ft]). However, the R-15 water levels dropped to between 1856.5 and 1858.4 m (6091 and 6097 ft) when drill casing was advanced (dry) to better isolate the perched zone; these water levels are lower than MCOI-5 or MCOI-6. It is not possible to determine which of the R-15 water levels is more reliable. Also, the R-15 water-level measurements were made more than 5 yr earlier than those MCOI-5 or MCOI-6.

During the intervening time interval (1999–2004), the volume of effluent released to Mortandad Canyon decreased by about one-half, so comparisons among these wells are complicated by significant temporal fluctuations in water levels. To summarize, it is uncertain how to compare R-15 and MCOI-5/MCOI-6 water-level data because of (1) the unknown effects of drilling fluids on R-15 water-level measurements, (2) inconsistent water levels measured during the drilling of R-15, and (3) the problems of comparing non overlapping water-level records collected during a period of decreasing effluent releases. Based on these limitations, the R-15 water-level data were not used other than to note that the perched water extent in this area includes R-15.

J-3.0 IDENTIFICATION OF PERCHING LAYERS

The perching zone for perched groundwater at MCOBT-4.4 and MCOI-4 was constrained by the use of an open hole packer system to isolate groundwater zones during drilling at MCOBT-4.4. The likely perching layer is the uppermost dense lava interior at the top of the Cerros del Rio basalt sequence. The elevation of the top of the perching interval is 1924.4 m (6313.7 ft), based on the elevation of the top of the massive basalt at MCOBT-4.4. The elevation of the perching interval in MCOI-5 is selected as 1862.3 m (6110 ft), which is within a dense lava-flow interior that Schlumberger, Inc., identified as a possible tight zone that inhibits vertical water movement (see Kleinfelder 2005, 90045 [geophysics report] for MCOI-5). There is some uncertainty about whether additional groundwater occurs in interflow zones and fractured basalts below this horizon, but these possibilities cannot be evaluated because MCOI-5 did not fully penetrate the Cerros del Rio basalts. Based on nearby R-15, the base of basalt in this area is at an elevation of 1851.6 m (6075 ft).

The perching horizon at MCOI-6 cannot be identified with certainty because the geophysics suite available for interpreting the geology and vertical extent of saturation is limited (only gamma and induction). Alternating zones of low and high conductivity within the lower part of the borehole may correspond to dense lavas and interflow breccias, respectively. At MCOI-5, interpretation of groundwater saturation is aided by combinable magnetic resonance and neutron logs. From the available data, the elevation of the perching interval at MCOI-6 is placed at 1862.6 m (6111 ft), the top of a prominent 4.3-m (14-ft)-thick conductivity low that probably represents the dense interior of a lava flow. This closely matches the elevation of the dense lava picked as the perching bed in MCOI-5 (1862.3 m [6110 ft]). Because the elevations of the perching beds in MCOI-5 and MCOI-6 are so similar, a single value of 1862.3 m (6110 ft) is selected to represent the base of the perched zone in this area.

J-4.0 SUMMARY

Table J.1 summarizes the tops and bottoms of the perched zones discussed above. The values in this table represent best estimates of the vertical extent of these zones; however, the data and their interpretation are limited by the low density of boreholes and the difficulty in characterizing fundamental characteristics of the perched zones such as their perching layers. Despite their limitations, these data are the best available basis for estimating saturated thicknesses of these perched zones.

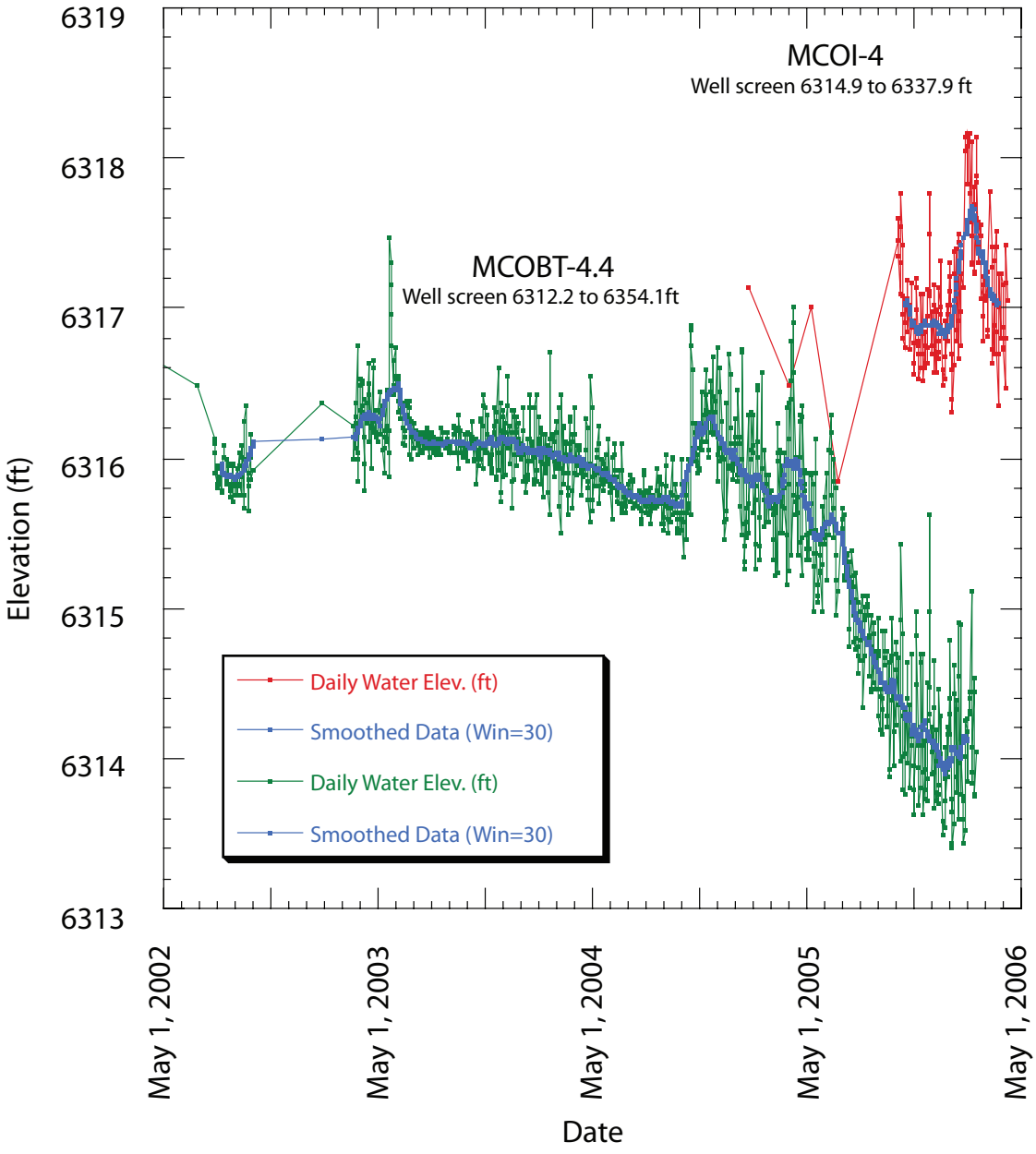
J-5.0 REFERENCES

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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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.

Allen, S.P., and R. Koch, May 2006. "Groundwater Level Status Report for 2005," Los Alamos National Laboratory report LA-14292-PR," Los Alamos, New Mexico. (Allen and Koch 2006, 93652)

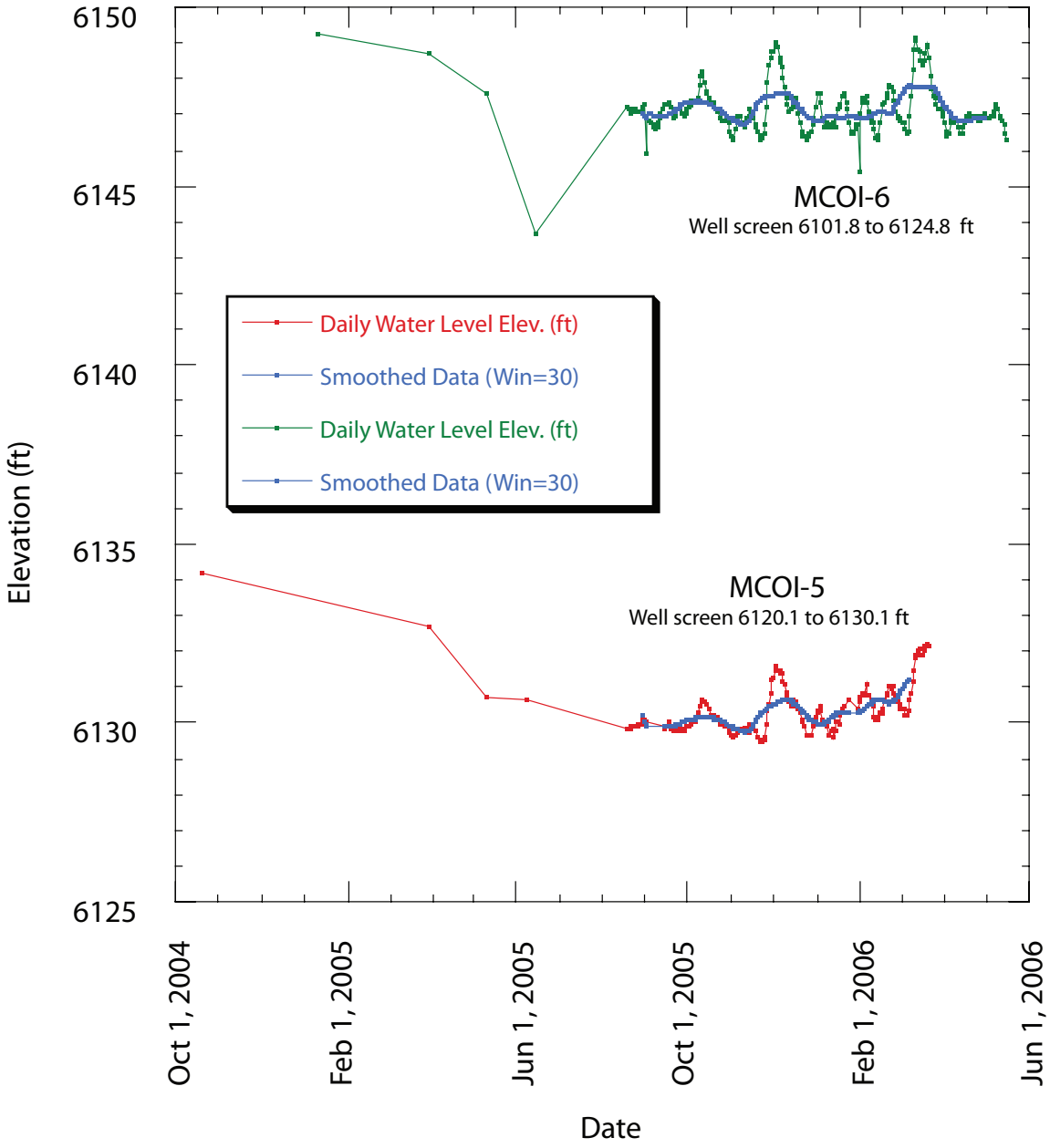
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MCOBT-4.4 Water Levels	
Minimum	6313.40
Maximum	6317.47
Sum	7105113.6
Points	1125
Mean	6315.66
Median	6315.89
Std Deviation	0.733

MCOI-4 Water Levels	
Minimum	6315.8398
Maximum	6318.1665
Sum	1181294
Points	187
Mean	6317.08
Median	6317.03
Std Deviation	0.421

Figure J-1. MCOI-4 and MCOBT-4.4 daily water levels



MCOI-5 Water Levels	
Minimum	6129.45
Maximum	6134.17
Sum	1232201.7
Points	201
Mean	6130.36
Median	6130.14
Std Deviation	0.694

MCOI-6 Water Levels	
Minimum	6143.68
Maximum	6149.25
Sum	1690464.4
Points	275
Mean	6147.14
Median	6147.01
Std Deviation	0.663

Figure J-2. MCOI-5 and MCOI-6 daily water levels

Table J-1
Estimates for Tops, Bottoms, and Saturated Thicknesses of Perched Zones in Mortandad Canyon. Elevations Are Rounded to the Nearest Foot

Well	Top of Perched Zone Elevation	Bottom of Perched Zone Elevation	Saturated Thickness	Comment
MCOBT-4.4 and MCOI-4	1925.4 m (6317 ft)	1924.5 m (6314 ft)	0.9 m (3 ft)	Thin zone of saturation at top of Cerros del Rio basalts. Probably restricted to the area near the confluence between Mortandad and Ten Site Canyons.
MCOI-5 and MCOI-6	1973.6 m (6147 ft) near the canyon axis and 1868.4 m (6130 ft) near the margins of canyon floor	1851.7 m (6075 ft)	21.9 m (72 ft) near the canyon axis and 16.8 m (55 ft) near the canyon margins	Thickest perched zone found in Mortandad Canyon. Does not extend downcanyon as far as MCOBT-8.5 or upcanyon as far as MCOBT-4.4. Base of zone is poorly constrained at MCOI-5 and MCOI-6

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Appendix K

E200, E201, E201.5, and E202 Analytical Results Greater than wSAL, Summary for Potential Laboratory-Derived Pollutants

Station ID	Station Name	Year	Quarter	F/UF*	Analytical Suite	Analyte	Number of Analyses	Number of Detects	Number > wSAL	Summary of Detected Results			wSAL		
										Average	Minimum	Maximum	Stream Type	Value	Units
E200	Mortandad below Effluent Canyon	2003	Q3	UF	METALS	Arsenic	1	1	1	12.5	12.5	12.5	Ephemeral	9	µg/L
E200	Mortandad below Effluent Canyon	2003	Q3	UF	METALS	Copper	1	1	1	51.3	51.3	51.3	Ephemeral	14	µg/L
E200	Mortandad below Effluent Canyon	2003	Q3	UF	METALS	Selenium	1	1	1	7.9	7.9	7.9	Ephemeral	5	µg/L
E200	Mortandad below Effluent Canyon	2003	Q3	UF	METALS	Zinc	1	1	1	401	401	401	Ephemeral	120	µg/L
E200	Mortandad below Effluent Canyon	2004	Q3	UF	METALS	Copper	4	4	4	33.0	15.2	56.4	Ephemeral	14	µg/L
E200	Mortandad below Effluent Canyon	2004	Q3	UF	METALS	Zinc	4	4	3	265	95	468	Ephemeral	120	µg/L
E200	Mortandad below Effluent Canyon	2005	Q2	UF	METALS	Arsenic	2	2	2	12.0	9.5	14.4	Ephemeral	9	µg/L
E200	Mortandad below Effluent Canyon	2005	Q2	UF	METALS	Copper	2	2	2	34.6	31.3	37.9	Ephemeral	14	µg/L
E200	Mortandad below Effluent Canyon	2005	Q2	UF	METALS	Zinc	2	2	2	342	323	361	Ephemeral	120	µg/L
E200	Mortandad below Effluent Canyon	2005	Q2	UF	PEST/PCB	Aroclor-1254	2	1	1	0.22	0.22	0.22	Ephemeral	0.0006	µg/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	METALS	Arsenic	2	2	1	9.6	8.7	10.5	Ephemeral	9	µg/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	METALS	Cadmium	2	2	1	1.6	1	2.2	Ephemeral	2.1	µg/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	METALS	Copper	2	2	2	96	60	133	Ephemeral	14	µg/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	METALS	Lead	2	2	1	90	57	122	Ephemeral	81.7	µg/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	METALS	Zinc	2	2	2	450	390	510	Ephemeral	120	µg/L
E200	Mortandad below Effluent Canyon	2002	Q2	UF	GENINORG	Chemical Oxygen Demand	1	1	1	196	196	196	Ephemeral	120	mg/L
E200	Mortandad below Effluent Canyon	2002	Q2	UF	GENINORG	Magnesium	1	1	1	3.2	3.2	3.2	Ephemeral	0.0064	mg/L
E200	Mortandad below Effluent Canyon	2002	Q3	UF	GENINORG	Magnesium	2	2	2	2.9	2.4	3.4	Ephemeral	0.0064	mg/L
E200	Mortandad below Effluent Canyon	2002	Q3	UF	METALS	Aluminum	1	1	1	7880	7880	7880	Ephemeral	750	µg/L
E200	Mortandad below Effluent Canyon	2003	Q3	UF	METALS	Aluminum	1	1	1	43900	43900	43900	Ephemeral	750	µg/L
E200	Mortandad below Effluent Canyon	2004	Q3	UF	GENINORG	Chemical Oxygen Demand	4	4	2	144	22	245	Ephemeral	120	mg/L
E200	Mortandad below Effluent Canyon	2004	Q3	UF	GENINORG	Magnesium	4	4	4	4.8	2.8	7.1	Ephemeral	0.0064	mg/L
E200	Mortandad below Effluent Canyon	2004	Q3	UF	METALS	Aluminum	4	4	4	25300	13300	42300	Ephemeral	750	µg/L
E200	Mortandad below Effluent Canyon	2005	Q2	UF	GENINORG	Magnesium	2	2	2	5.9	5.2	6.7	Ephemeral	0.0064	mg/L

Station ID	Station Name	Year	Quarter	F/UF*	Analytical Suite	Analyte	Number of Analyses	Number of Detects	Number > wSAL	Summary of Detected Results			wSAL		
										Average	Minimum	Maximum	Stream Type	Value	Units
E200	Mortandad below Effluent Canyon	2005	Q2	UF	METALS	Aluminum	2	2	2	40800	36400	45200	Ephemeral	750	µg/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	GENINORG	Magnesium	2	2	2	7.7	7.6	7.8	Ephemeral	0.0064	mg/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	METALS	Aluminum	2	2	2	32950	19500	46400	Ephemeral	750	µg/L
E200	Mortandad below Effluent Canyon	2003	Q2	UF	RAD	Gross alpha	1	1	1	835	835	835	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2003	Q3	UF	RAD	Gross alpha	2	2	2	441	382	500	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2003	Q3	UF	RAD	Gross alpha, adjusted	2	1	1	39	39	39	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2004	Q3	UF	RAD	Gross alpha	4	4	4	223	27	751	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2004	Q3	UF	RAD	Gross alpha, adjusted	4	4	2	180	5	655	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2005	Q2	UF	RAD	Gross alpha	2	2	2	63	30	97	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2005	Q2	UF	RAD	Gross alpha, adjusted	2	2	1	42	2	82	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	RAD	Gross alpha	2	2	2	145	58	232	Ephemeral	15	pCi/L
E200	Mortandad below Effluent Canyon	2005	Q3	UF	RAD	Gross alpha, adjusted	2	2	2	78	27	130	Ephemeral	15	pCi/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Arsenic	2	2	2	32	20	44	Ephemeral	9	µg/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Cadmium	2	2	2	5	5	5	Ephemeral	2.1	µg/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Copper	1	1	1	261	261	261	Ephemeral	14	µg/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Lead	2	2	2	214	165	262	Ephemeral	81.7	µg/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Mercury	1	1	1	1.6	1.6	1.6	Ephemeral	0.77	µg/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Vanadium	1	1	1	183	183	183	Ephemeral	100	µg/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Zinc	1	1	1	1180	1180	1180	Ephemeral	120	µg/L
E201	Mortandad above Ten Site	2005	Q3	UF	METALS	Copper	2	2	2	36.2	33.5	38.9	Ephemeral	14	µg/L
E201	Mortandad above Ten Site	2005	Q3	UF	METALS	Zinc	2	2	2	147	143	151	Ephemeral	120	µg/L
E201	Mortandad above Ten Site	2003	Q3	UF	GENINORG	Chemical Oxygen Demand	1	1	1	148	148	148	Ephemeral	120	mg/L

Station ID	Station Name	Year	Quarter	F/UF*	Analytical Suite	Analyte	Number of Analyses	Number of Detects	Number > wSAL	Summary of Detected Results			wSAL		
										Average	Minimum	Maximum	Stream Type	Value	Units
E201	Mortandad above Ten Site	2003	Q3	UF	GENINORG	Magnesium	1	1	1	21.4	21.4	21.4	Ephemeral	0.0064	mg/L
E201	Mortandad above Ten Site	2003	Q3	UF	METALS	Aluminum	1	1	1	153000	153000	153000	Ephemeral	750	µg/L
E201	Mortandad above Ten Site	2005	Q3	UF	GENINORG	Magnesium	2	2	2	4.5	4.5	4.6	Ephemeral	0.0064	mg/L
E201	Mortandad above Ten Site	2005	Q3	UF	METALS	Aluminum	2	2	2	28950	27700	30200	Ephemeral	750	µg/L
E201	Mortandad above Ten Site	2005	Q3	UF	RAD	Gross alpha	2	2	2	120	112	127	Ephemeral	15	pCi/L
E201	Mortandad above Ten Site	2005	Q3	UF	RAD	Gross alpha, adjusted	2	2	2	33	19	47	Ephemeral	15	pCi/L
E201.5	Ten Site above Mortandad	2004	Q3	UF	METALS	Copper	1	1	1	18.7	18.7	18.7	Ephemeral	14	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	METALS	Arsenic	4	3	2	14.3	8.2	17.5	Ephemeral	9	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	METALS	Cadmium	4	3	1	1.0	0.4	2.2	Ephemeral	2.1	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	METALS	Copper	4	4	3	51.0	12.5	84.3	Ephemeral	14	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	METALS	Lead	4	4	2	63	10	128	Ephemeral	81.7	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	METALS	Silver	4	4	2	4.0	1.2	8.1	Ephemeral	3.8	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	METALS	Zinc	4	4	2	189	32	323	Ephemeral	120	µg/L
E201.5	Ten Site above Mortandad	2002	Q2	UF	GENINORG	Chemical Oxygen Demand	1	1	1	337	337	337	Ephemeral	120	mg/L
E201.5	Ten Site above Mortandad	2004	Q3	UF	GENINORG	Chemical Oxygen Demand	1	1	1	242	242	242	Ephemeral	120	mg/L
E201.5	Ten Site above Mortandad	2004	Q3	UF	GENINORG	Magnesium	1	1	1	4.4	4.4	4.4	Ephemeral	0.0064	mg/L
E201.5	Ten Site above Mortandad	2004	Q3	UF	METALS	Aluminum	1	1	1	22200	22200	22200	Ephemeral	750	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	GENINORG	Magnesium	4	4	4	7.3	2.5	11.7	Ephemeral	0.0064	mg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	METALS	Aluminum	4	4	4	43075	10600	73100	Ephemeral	750	µg/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	RAD	Gross alpha	3	3	2	30	6	54	Ephemeral	15	pCi/L
E201.5	Ten Site above Mortandad	2005	Q3	UF	RAD	Gross alpha, adjusted	3	3	2	25	5	43	Ephemeral	15	pCi/L
E202	Mortandad above Sediment Traps	2005	Q3	UF	METALS	Copper	2	2	1	22.8	13.8	31.7	Ephemeral	14	µg/L
E202	Mortandad above Sediment Traps	2005	Q3	UF	METALS	Zinc	2	2	2	132	126	137	Ephemeral	120	µg/L

Station ID	Station Name	Year	Quarter	F/UF*	Analytical Suite	Analyte	Number of Analyses	Number of Detects	Number > wSAL	Summary of Detected Results			wSAL		
										Average	Minimum	Maximum	Stream Type	Value	Units
E202	Mortandad above Sediment Traps	2005	Q3	UF	GENINORG	Magnesium	2	2	2	3.4	2.6	4.1	Ephemeral	0.0064	mg/L
E202	Mortandad above Sediment Traps	2005	Q3	UF	METALS	Aluminum	2	2	2	22100	16700	27500	Ephemeral	750	µg/L
E202	Mortandad above Sediment Traps	2005	Q3	UF	RAD	Gross alpha	1	1	1	96	96	96	Ephemeral	15	pCi/L
E202	Mortandad above Sediment Traps	2005	Q3	UF	RAD	Gross alpha, adjusted	1	1	1	25	25	25	Ephemeral	15	pCi/L

*F = Filtered, UF = unfiltered.

Appendix L

Analysis of Temporal Variability in Water Levels Observed at the Intermediate Boreholes in Mortandad Canyon and Its Relation to Surface-Flow Events and Barometric Pressure Changes

It has been hypothesized that temporal variability of water levels observed at intermediate boreholes MCOBT-4.4, MCOI-4, MCOI-5, and MCOI-6 is potentially revealing fast infiltration of water related to large surface-flow events in Mortandad Canyon during summer storms. Figure L-1 shows the water-level data at these intermediate boreholes. It also shows the timing of flood events: July 15, August 12, August 24, and September 28. The water-level changes that are evaluated here in relation to the flood events August 24 and September 28 are marked with red arrows. It should be noted that there are four flood events that could potentially have caused infiltration into the subsurface, and the August 24 event is strongest.

The analysis conducted from the relationships of water level at these intermediate wells and barometric pressure as illustrated in Figures L-2 and L-3 shows good very strong correlation. Typically, boreholes tapping unconfined saturated zones are not expected to exhibit barometric pressure effects. However, when the unconfined zone is pneumatically separated from the atmosphere, water level in boreholes can be influenced by barometric pressure changes (Weeks 1979, 94020). The barometric pressure changes might produce delayed and subdued response in the water levels. The response depends on (1) borehole properties (skin/storage effects), (2) size and hydraulic properties of the saturated zone, and (3) thickness and pneumatic and hydraulic properties of overlying unsaturated zone (Rasmussen and Crawford 1997, 94014; Martinez and Nilson, 1999, 94013).

Figure L-2a compares MCOBT-4.4 and MCOI-4 water levels with barometric pressure data. It appears that water-level fluctuations are well correlated with the barometric pressure changes. At the times of sharp increase in the water levels (marked with red arrows on Figures L-2b and L-2c), there are sharp drops in the barometric pressure.

However, the water-level variability exceeds the barometric pressure changes (as presented in terms of equivalent height of water column). This might be considered theoretically impossible if only barometric pressure effects on the water-level pressures are considered. However, barometric pressure changes also affect the capillary pressures in the unsaturated zone near the borehole. In this case, the barometric pressures changes are transmitted along the boreholes and through dry portions of borehole screens. The water table (respectively, the water level in the well) is a representation of the surface at which the hydraulic pressure is equal to the atmospheric pressure, i.e., capillary pressure is equal to zero. Above the water table, typically there is a layer that is fully saturated but under negative capillary pressure. Layer thickness depends on the hydraulic properties of the medium. Decline in the barometric pressure will allow a portion of this layer to become part of the “saturated” zone and drain into the well. This could be an explanation for the observed water-level variability at MCOBT-4.4 and MCOI-4.

Figure L-3 compares MCOI-5 and MCOI-6 water levels with the barometric pressure data. Again it appears that water-level fluctuations are well correlated with the barometric pressure changes. Sharp increases in the water levels seem to be associated with sharp drops in the barometric pressure. MCOI-5 and MCOI-6 water-level variations also exceed the barometric pressure changes (Figure L-3). In addition, the sharp drops of barometric pressure cause water-level increases that last much longer than theoretically expected if barometric pressure effects are the only cause. As discussed above, the barometric pressure drop also affects hydraulic conditions in the vadose zone. The sudden decline of the barometric pressure should be impacting the water-entry pressure of pores and fractures near the boreholes. As a result, barometric-pressure declines might trigger wetting and draining of fractures and pores close to the borehole, inducing local-scale groundwater flow.

The barometric pressure variability also impacted water levels at the regional aquifer that are not expected to be impacted by the flood events. The data for R-15 (within Mortandad Canyon) and R-21 (far from Mortandad Canyon) are presented in Figure L-4. Again, water levels are influenced by the barometric pressure variability.

Therefore, the water-level fluctuations are probably not caused by infiltration of surface water during flooding events but are a result of barometric pressure effects. Barometric-pressure declines may impact the capillary pressures near the boreholes, triggering wetting and draining of pores and fractures and inducing local-scale groundwater flow. This phenomenon might also be considered to be alocal-scale increase of water movement above the water table (i.e. infiltration) due to barometric pressure impacts on the capillary pressures. The spatial extent of the unsaturated zone impacted by barometric-pressure declines depends on the magnitude and frequencies of pressure changes as well as on the pneumatic and hydraulic properties of the unsaturated zone (this includes spatial characteristics of the existing fractures).

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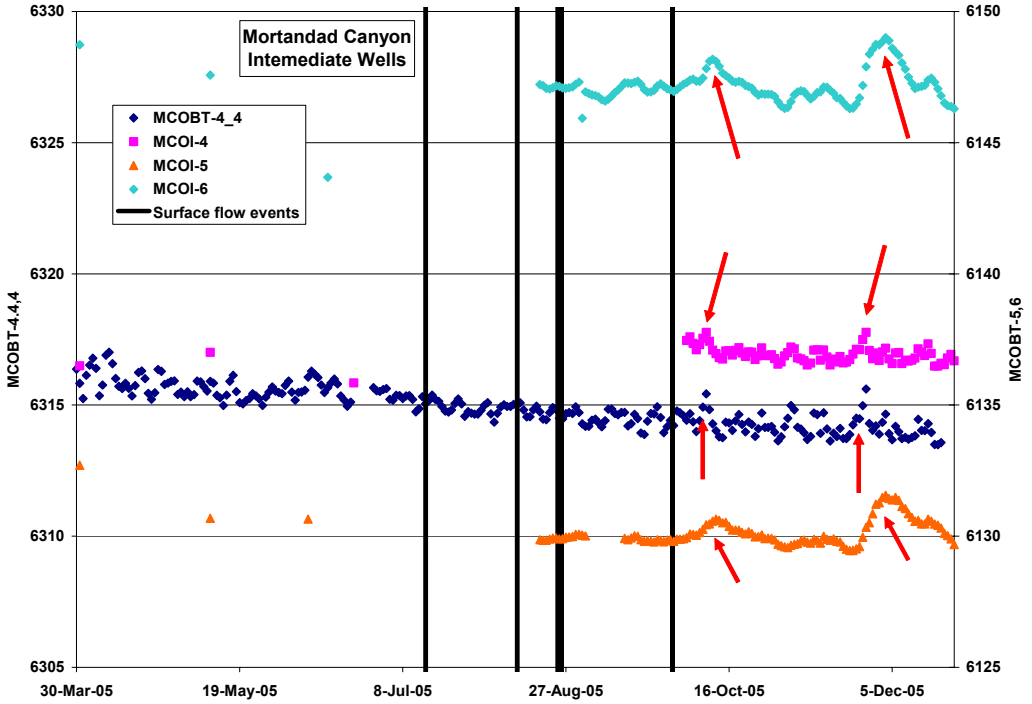
The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the 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 Directorate. 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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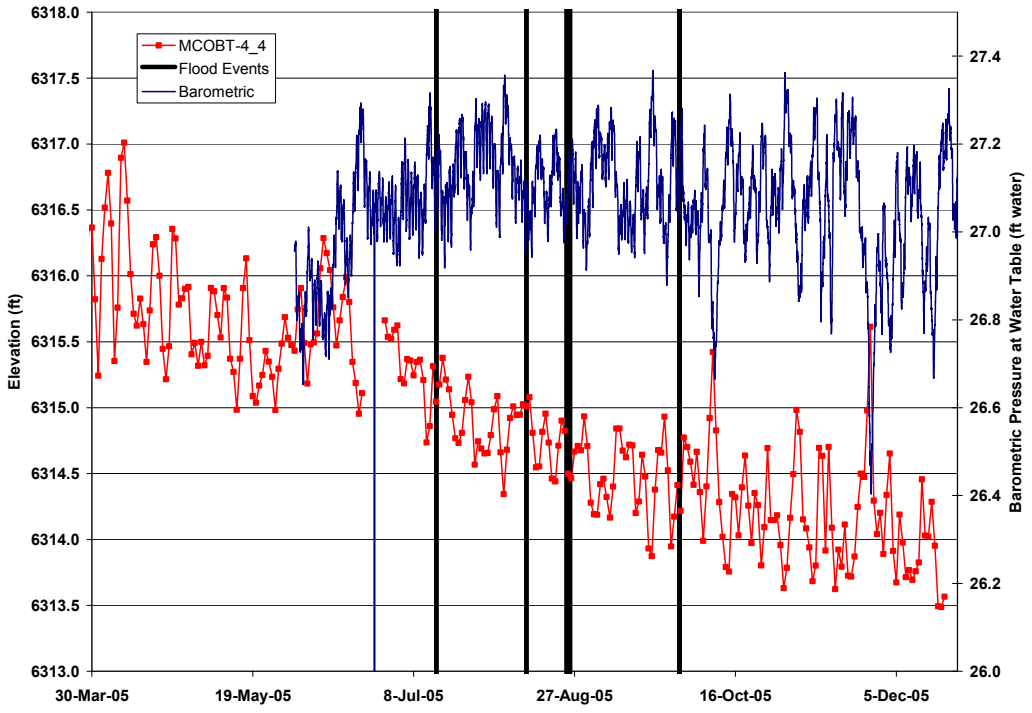
Rasmussen T.C., and L.A. Crawford, 1997. "Identifying and Removing Barometric Pressure Effects in Confined and Unconfined Aquifers, *Ground Water,* Vol. 35, No. 3. pp. 502–511. (Rasmussen and Crawford 1997, 94014)

Weeks, E.P., 1979. "Barometric Fluctuations in Wells Tapping Deep Unconfined Aquifers," *Water Resources Research*, Vol.15, pp. 1167–1176. (Weeks 197, 94020)

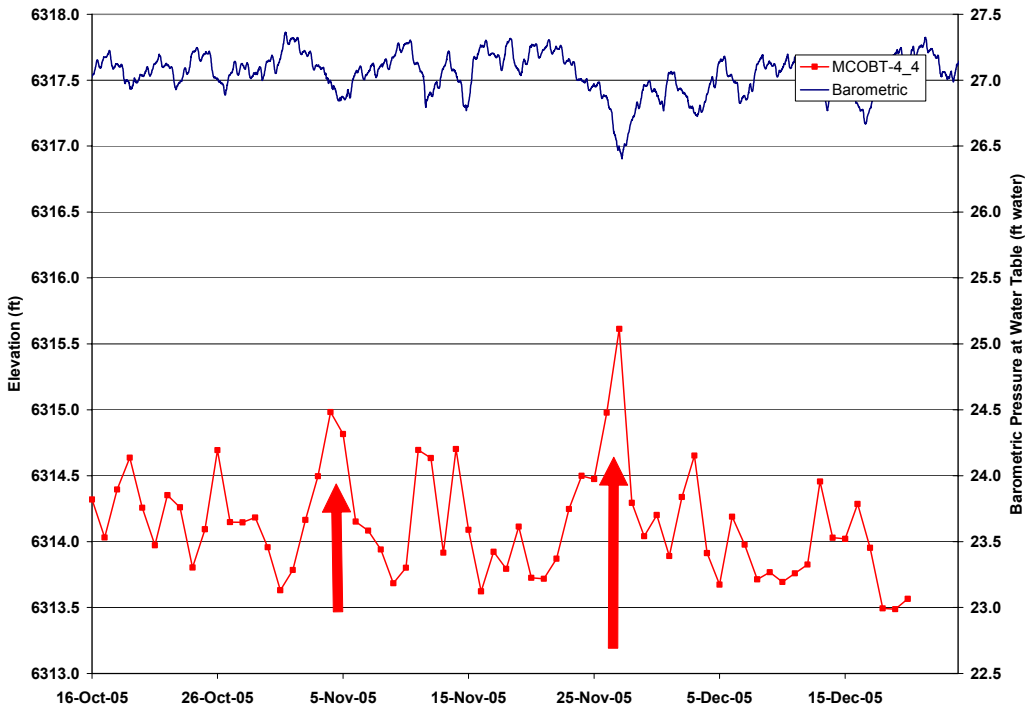


Notes: Black lines indicate timing of surface-flow events observed by gage stations. Red arrows mark sharp water-level changes at the intermediate wells.

Figure L-1. Temporal variability of water levels (ft) observed at boreholes MCOBT-4.4, MCOI-4 (left axis), MCOI-5, and MCOI-6 (right axis)



(a)



(b)

Figure L-2. Comparison of water levels at MCOBT-4.4 ([ft]; left axis) and barometric pressures (represented in terms of water-column height [ft]; right axis)

(c)

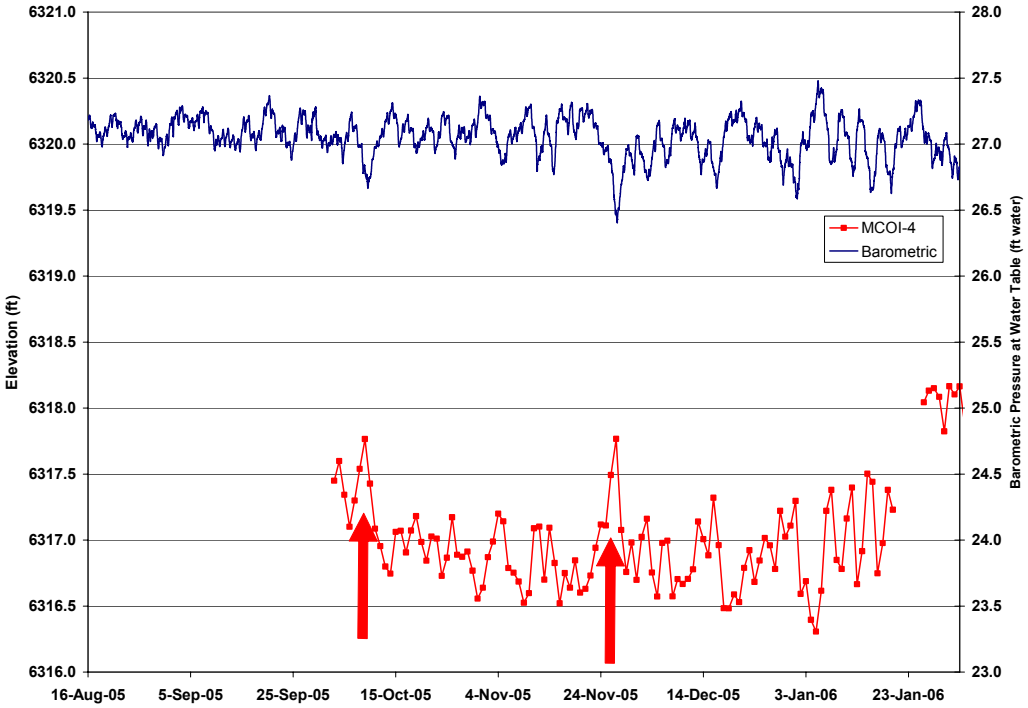
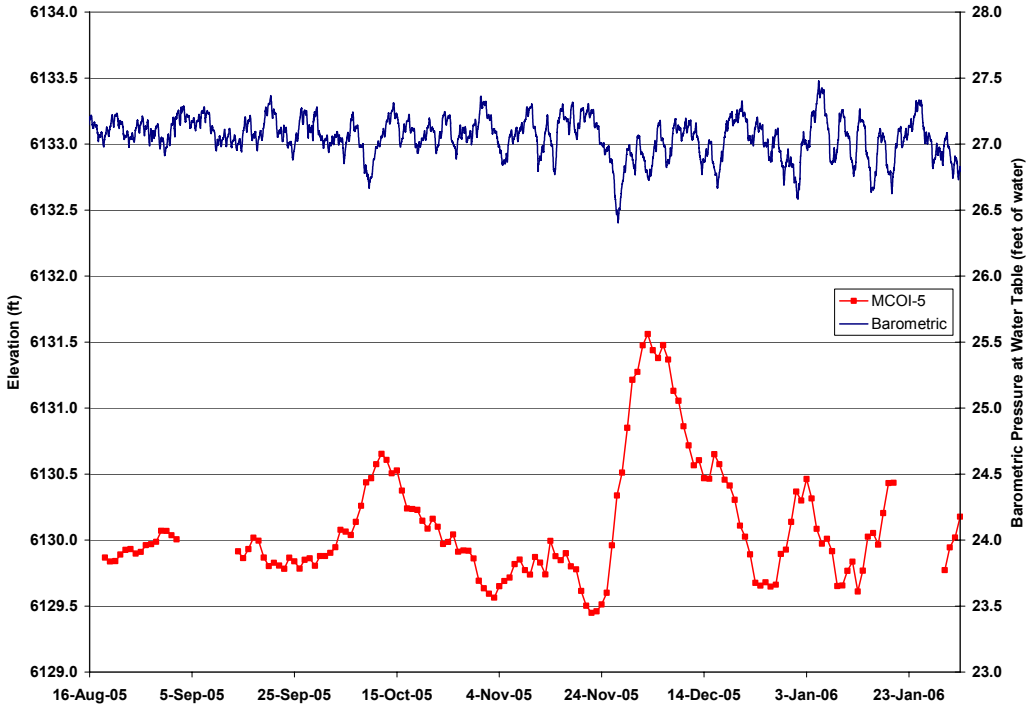
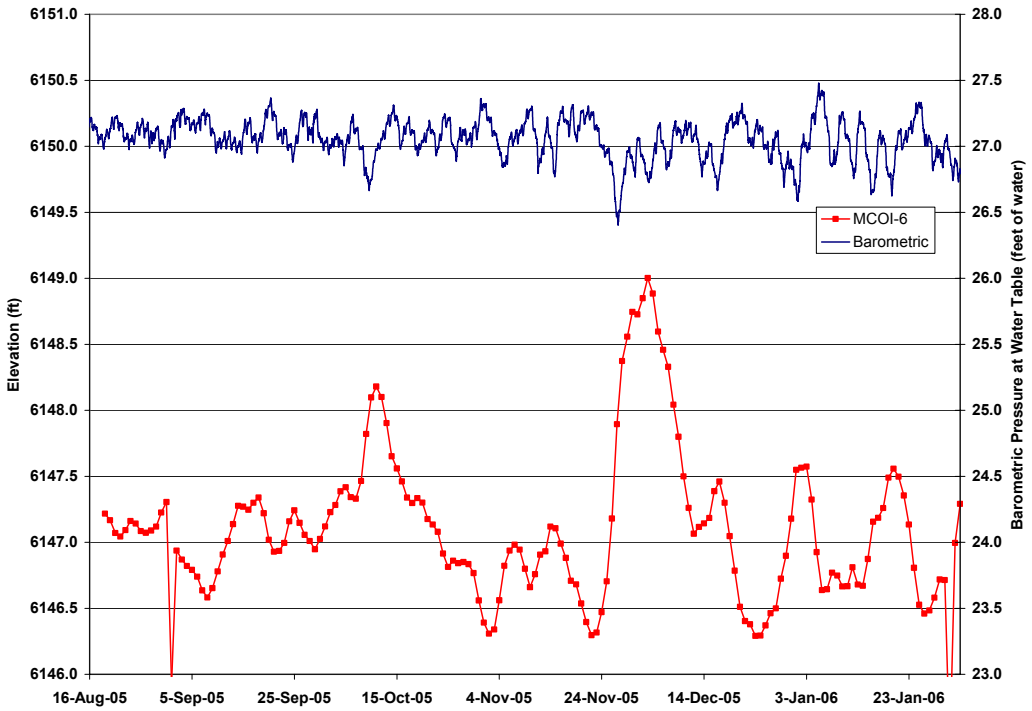


Figure L-2 (continued). Comparison of water levels at MCOBT-4.4 ([ft]; left axis) and barometric pressures (represented in terms of water-column height [ft]; right axis)

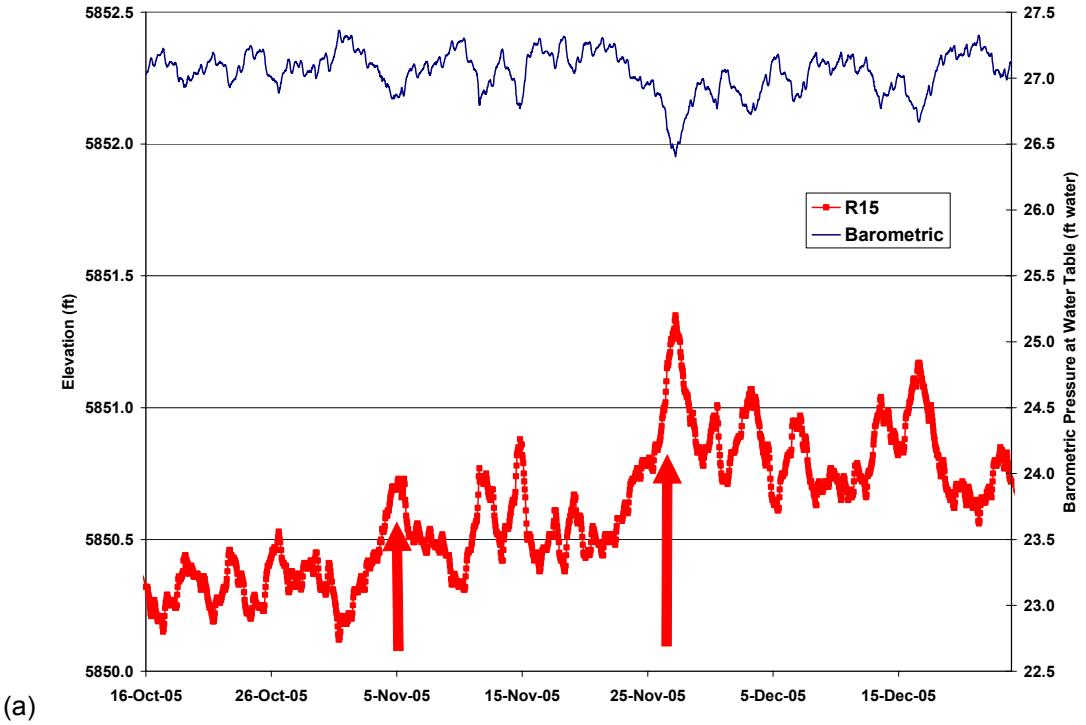


(a)

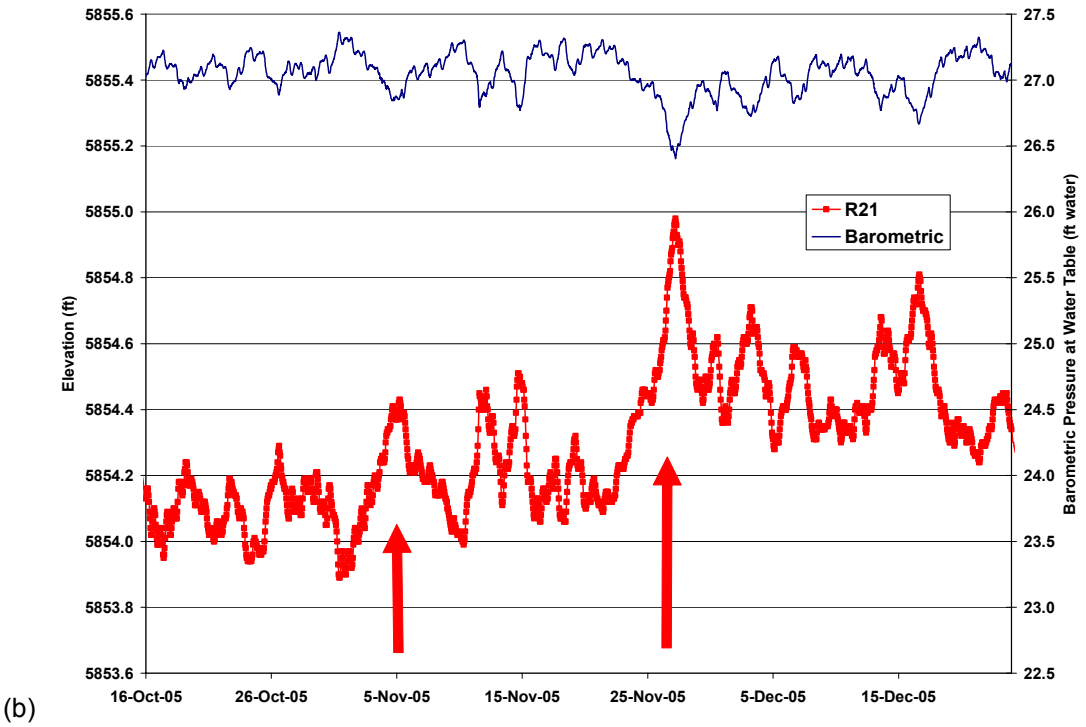


(b)

Figure L-3. Comparison of water levels at MCOI-5/MCOI-6 ([ft]; left axis) and barometric pressures (represented in terms of water-column height [ft]; right axis)



(a)



(b)

Figure L-4. Comparison of water levels at R-15 (a) and R-21 (b) ([ft]; left axis) and barometric pressures (represented in terms of water-column height [ft]; right axis)

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Appendix M

Discussion of Preliminary Infiltration Investigation Results

M-1.0 CUMULATIVE WATER/CUMULATIVE CHLORIDE

Chloride has been used as an effective tracer to evaluate vadose-zone processes on the Pajarito Plateau and elsewhere in the southwest (see discussion in Newman 1996, 59372and Newman et al. 1997, 76885) If the chloride source is from precipitation (i.e., rain and snow), the chloride mass-balance tracer approach can be used to quantify downward water fluxes as well as identify zones where downward fluxes change with depth (e.g., changes in flux related to changes in stratigraphy/hydraulic properties). Unfortunately, in the case of the Mortandad watershed, it is difficult to use the chloride mass-balance method to quantitatively estimate downward vadose-zone fluxes because the addition of anthropogenic sources of water and chloride. For example, outfall water and parking lot runoff will cause the method to severely underestimate the actual fluxes. However, the chloride mass-balance method still has value in identifying zones where fluxes are relatively constant with depth and where changes in fluxes occur.

Understanding where fluxes change or are constant with depth is important in understanding how contaminants are transported and for relating stratigraphy to hydrologic behavior. Such an evaluation is accomplished by examining plots of cumulative water (moisture) versus cumulative pore water chloride, which are developed using borehole profile data (see Appendix B). Unlike chloride-based flux estimates, these evaluations should be relatively insensitive to the nonprecipitation water and chloride inputs to the canyon because they do not use calculations that require knowledge of the water and chloride quantities added to the canyon. In other words, the cumulative water/cumulative chloride plots reflect the actual (natural plus anthropogenic) water and chloride additions to the canyon, and they can be used to identify zones where fluxes are approximately the same, or where they may change. Evaluation of the cumulative plots is fairly straightforward. Regions of the plots that can be described by approximately linear trends indicate zones of relatively constant flux. Significant inflection points indicate depths where fluxes change. The slopes of these segments are related to downward fluxes. Because the data points on the cumulative plots can be related back to actual depths and stratigraphic units, we can also determine how stratigraphy influences the vadose-zone hydrology of the canyon and how hydrologic changes may influence contaminant transport.

Cumulative plots for several Mortandad Canyon boreholes are plotted in Figure M-1.0-1 for shallow boreholes (i.e., MCB holes and MC holes) and in Figure M-1.0-2 for the deeper holes (e.g., MCOI and R holes). For each figure, the plots are ordered from the most upcanyon hole to the most downcanyon hole so that changes along the canyon can be identified. What is interesting about the cumulative plots for the shallow holes is that nearly all of them have approximately linear slopes, suggesting that fluxes are relatively constant with depth. Although there are some small changes in trends with depth, statistical regression R^2 values demonstrate the linearity of the profiles. All of the MCB hole profiles have R^2 values of 0.98 or higher except for MCB-1 and MCB-2 that have regression values of 0.86 and 0.83, respectively (linear data will have a value of 1). Stratigraphic units encountered include alluvium, the Tshirege Member, the Cerro Toledo interval, the Tsankawi Pumice Bed, and the upper part of the Otowi Member (note that these units are not present in all boreholes). Thus, the linear cumulative plots suggest that stratigraphic changes do not play a large role in affecting downward fluxes and that contaminant transport rates (of nonsorbing species) should be similar through roughly the upper 100–200 ft of the vadose zone for a given canyon location. Note that this does not imply that fluxes are similar up and down the canyon. As can be seen from Figure M-1.0-1; there are differences in slopes for the different holes, which implies differences in fluxes. Slopes determined from linear regressions of the data range from 10 to 36, suggesting a broad range in fluxes; there does not appear to be any clear trend in slopes from up- to downcanyon locations. This variability is likely a function of changes in water inputs along and across the canyon. It should be noted that the cumulative plots for the MC holes (MC-1, MC-2, and MC-3 (which were not drilled as part of the “Mortandad Investigation Workplan or Addendum”) vary from the plots for the MCB holes. The MC core samples were quite old when they were analyzed, and water had likely

evaporated during the extended storage period. They have much lower water contents and lower cumulative water values than nearby MCB holes, and thus probably do not represent in situ conditions.

For the deeper holes (MCOI, MCOBT and R holes, Figure M-1.0-2), the shallow parts of the cumulative plots are similar to the MCB hole plots, again suggesting zones of approximately constant flux. In fact, boreholes MCOI-1, MCOI-10, MCOBT-8.5 (with the exception of the shallowest sample), R-1, R-15, and R-28 have approximately linear profiles throughout their entire lengths (R^2 values are all over 0.97). The interpretation for these holes is that fluxes are relatively constant well into the Otowi Member (at least to a 120 m [400 ft] depth) and, in the case of R-15, down to the Puye Formation. However, while boreholes MCOI-6, MCOI-8, and MCOBT-4.4 show approximately linear regions in the shallow parts of their profiles (with R^2 values over 0.98), they also have inflection points where the slopes decrease and other linear regions occur at depth (with R^2 values over 0.98). Because the slopes of the deeper segments are lower, they indicate apparent increases in flux of four to six times over the respective shallow segments. All three holes show a drop in chloride in the deeper parts of the profiles, and MCOI-6 and MCOI-8 show increases in water content. These conditions may be interpreted as remnant moisture and higher fluxes resulting from past higher effluent discharges from the Radioactive Liquid Waste Treatment Facility (RLWTF) (see Section 2.1). However, these results should be considered as apparent increases in downward flux because the changes in water contents and chloride in the deeper parts of the profiles could also be related to lateral subsurface flows. In any case, it is clear that there is a hydrologic shift in the mid- to lower-Otowi Member in the region where the canyon widens and alluvial thickness increases (near the Ten Site confluence). This coincides with the wetter region illustrated in Figure 7.2-11 and the zone of high vadose-zone percolation illustrated in Figure 7.0-1. This hydrological shift coincides with an increase in gamma measurements for borehole geophysical logs through the Otowi (Figure M-1.0-3). The reason for the gamma shift in the Otowi Member is unclear, but a reasonable interpretation is that it represents the contact between sequences of ash-flow tuffs with slightly different compositions. The gamma shift also coincides with abrupt changes in moisture and/or contaminant contents in some boreholes (Figure M-1.0-3). MCOI-6, MCOI-8, and MCOBT-4.4 show the most evidence for a hydrologic shift in the Otowi Member. R-15 is within this same area of the canyon and also shows the gamma shift (Longmire et al. 2001, 70103). However, the cumulative plot does not suggest as pronounced a hydrological shift within the Otowi Member, possibly because R-15 is further from the stream channel than the other holes.

M-2.0 VECTOR PROBE RESULTS

Preliminary results from the vector probes, which are collecting data for the Mortandad Canyon infiltration study, help to illustrate some of the characteristics of the alluvial aquifer system in the easternmost portion of the middle Mortandad Canyon hydrologic segment and the western portion of the lower Mortandad Canyon hydrologic segment. The vector probes use an applied heat source to collect high resolution time series data within the alluvial aquifer that can be used to constrain aquifer flow directions (azimuth and deviation from horizontal), flow magnitudes, and how these characteristics change with time. Results from May to June 2005 for borehole MCRES-2, located just above the Ten Site confluence, are shown in Figure M-2.0-1. The data show that flow magnitude was relatively steady at about 2.5 cm/d (0.98 in./d) (Figure M-2.0-1a most likely in the eastward (90°) direction (Figure M-2.0-1b; however, note the range of the error bars). Deviation-from-horizontal results (Figure M-2.0-1c) show that flow has a downward aspect of approximately –70°. For reference, 0° means horizontal flow, positive values mean upward flow, and negative values mean downward flow. The downward flow result for MCRES-2 is important because it supports the Mortandad conceptual model that the area around MCRES-2 is an area

of enhanced deep percolation. In contrast, alluvial aquifer behavior further downcanyon differs from that observed in MCRES-2.

Results from 2005 from borehole MCB-9 (below the sediment traps) are shown in Figure M-2.0-2. Flow magnitudes for MCB-9 (Figure M-2.0-2a) are similar to those at MCRES-2 at about 3 to 4 cm/d (1.2 to 1.6 in./d). However, the flow direction (azimuth) is northward at about 350° (Figure M-2.0-2b). In addition, deviation-from-horizontal results show an upward aspect to flow (Figure M-2.0-2c). The vector probe in MCB-9 was installed between two clay-rich units that may be affecting the flow direction and deviation from horizontal results. In any case, these results reflect local conditions around the borehole, and it is likely that alluvial aquifer flow conditions may shift significantly both laterally and up- and downcanyon over relatively short distances. This conclusion is not only supported by the vector probe data but also by water level variations, the spatial variability of alluvial saturation, and other factors such as the location and type of recharge pathways and on local variations in sediment type/hydraulic properties. Conceptually, the alluvial aquifer is a heterogeneous zone of saturation where variations in alluvial stratigraphy and lithology result in complex preferential flow paths and in variable flow rates and directions across and along the canyon.

An additional aspect to the alluvial aquifer flow dynamics that can be illustrated by the vector probe data is temporal variability. The flow results shown in Figures M-2.0-1 and M-2.0-2 indicate that relatively stable flow regimes can exist over a few months. However, transient events driven by canyon floods also occasionally impact the alluvial aquifer system as demonstrated in the water-level plots (See Figures F-1.0-1 through F-5.0-1 in Appendix F). The effect of such transients can be readily seen in Figure M-2.0-2c which shows the impacts of a large flood event in late August 2005. Deviation-from-horizontal data indicate a short reversal from an upward aspect to downward over a few days following the flood. Unfortunately, data from MCRES-2 during this flood were unavailable because the power supply for the vector probe was on another borehole when the flood occurred.

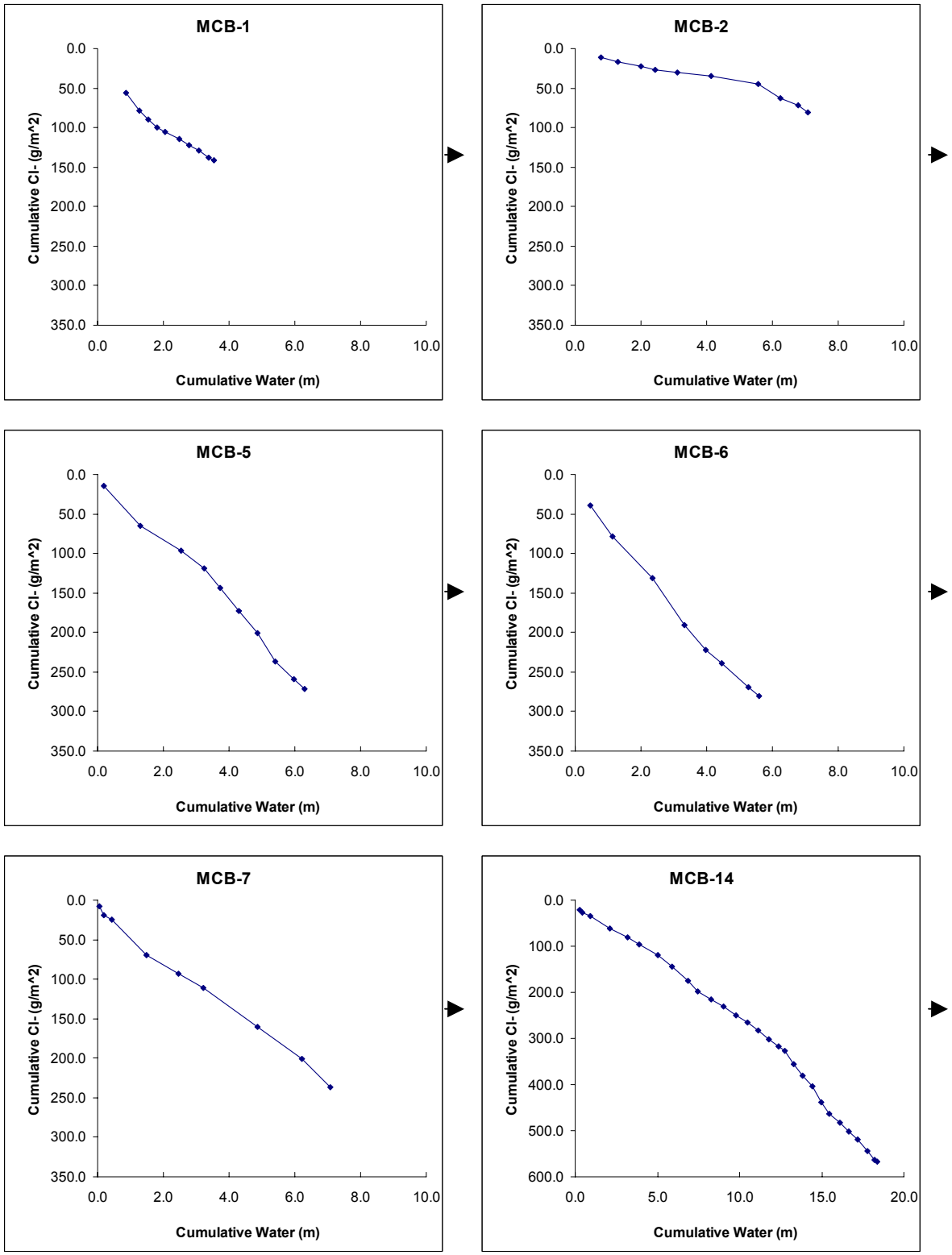
M-3.0 FLUX METER RESULTS

Preliminary results from vadose-zone flux meter instrumentation used in the ongoing monitoring in Mortandad Canyon help illustrate the frequency and spatial variability of percolation in the shallow vadose zone. As mentioned in Section 4.2.5, fiberglass wicktype flux meters were installed at various canyon locations. The flux meters were installed at a depth of 1 m (3 ft) and are used to continuously monitor downward, primarily unsaturated, percolation into the canyon-bottom alluvium.

Four examples of available results from the 2005–2006 flux meter data are shown in Figure M-3.0-1(a–d). The flux meter examples span much of the alluvium-dominated middle and lower Mortandad Canyon hydrologic segments. Flux meter MCF-10 is located out of the stream channel next to borehole MCB-5 (the area in the middle Mortandad Canyon hydrologic segment where the canyon begins to widen). Nearby well locations can be found in Figure 3.2-1 and Plate 1. MCF-9 is located further downcanyon but still in the middle Mortandad Canyon hydrologic segment east of MCRES-4 at a floodplain location north of the stream channel. MCF-7 is located near MCB-7, directly within the stream channel and just west of the Ten Site Canyon confluence. Finally, MCF-3 is located in the lower Mortandad Canyon hydrologic segment in a depression near the Los Alamos National Laboratory (Laboratory) boundary (between R-28 and MCB-16). The results show that percolation events occurred multiple times at all four locations. Thus, transient downward unsaturated flow events occur over much, if not all, of the canyon, including areas that are outside of the stream channel. The downward fluxes should not be confused with deeper percolation rates (e.g., to the alluvial groundwater) because they only represent fluxes at a 1-m-(3-ft) depth. Upward fluxes, which might occur between the downward flow events, could remove water that has passed below 1 m (3 ft), thus preventing actual recharge. However, some of the larger events (e.g.,

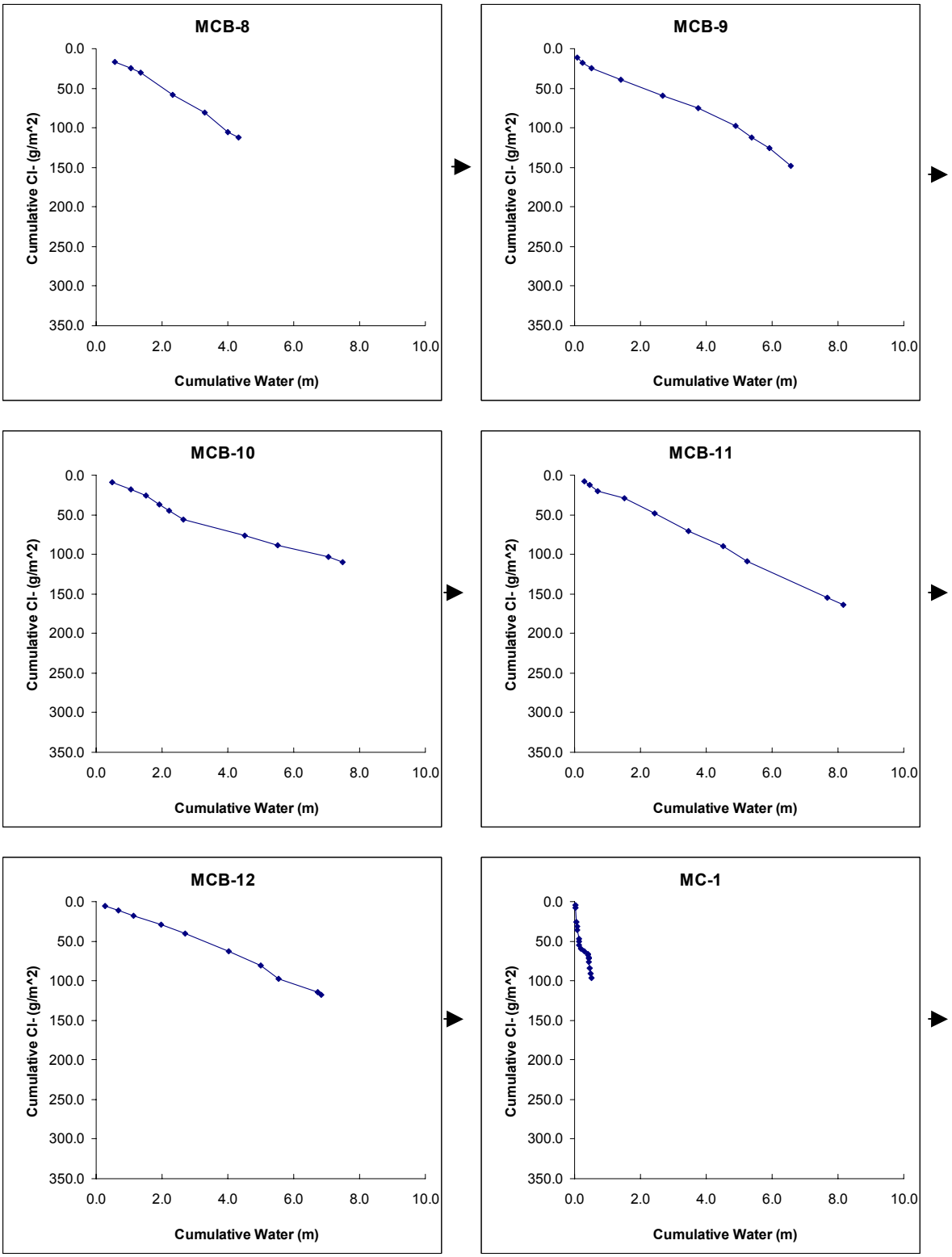
in August 2005 and 2006) correlate with increases in alluvial aquifer water levels and could be related to transient recharge. Another important observation about the occurrences of shallow downward flux events is that contaminants that are stored in the near-surface alluvium could be mobilized by the percolating waters. Nonsorbing contaminants in particular would be gradually pushed to deeper depths. MCF-3 measured fewer and smaller events than the other flux meter locations suggesting that the area near the Laboratory boundary is less prone to transient percolation events. Other flux meters are currently collecting data near the Laboratory boundary, which when analyzed may help support this interpretation.

A final observation from the flux meter results is the difference between fluxes observed within the stream channel (i.e., MCF-7, Figure M-3.0-1b) and outside of the channel (i.e., MCF-3, MCF-9, and MCF-10, Figures M-3.0-1a, c, d). While the in-channel events at MCF-7 are more frequent than at the other locations, their magnitudes are generally the same as locations outside the channel (with the exception of MCF-3). For example, for the large event of late August 2006, the downward flux was about 12 cm/day (4.7 in/day) for MCF-7, while the fluxes were over 20 cm/day (7.9 in./d) in both MCF-9 and 10. MCF-9 has a similar flux profile in both magnitude and frequency as MCF-7, suggesting that at least some of the floodplain area near MCRES-4 has similar downward flux characteristics as the adjacent channel. This area is just upcanyon from the sediment traps and is prone to flooding. It is also within the canyon area where much of the deep percolation is thought to occur (see the conceptual model Figure 7.0-1). These results suggest that the deep percolation area may receive some of its moisture from contributions from floodplain areas outside the stream channel and sediment traps. They also suggest that contaminant movement in such flood prone areas may be somewhat similar to areas directly below the stream channel.



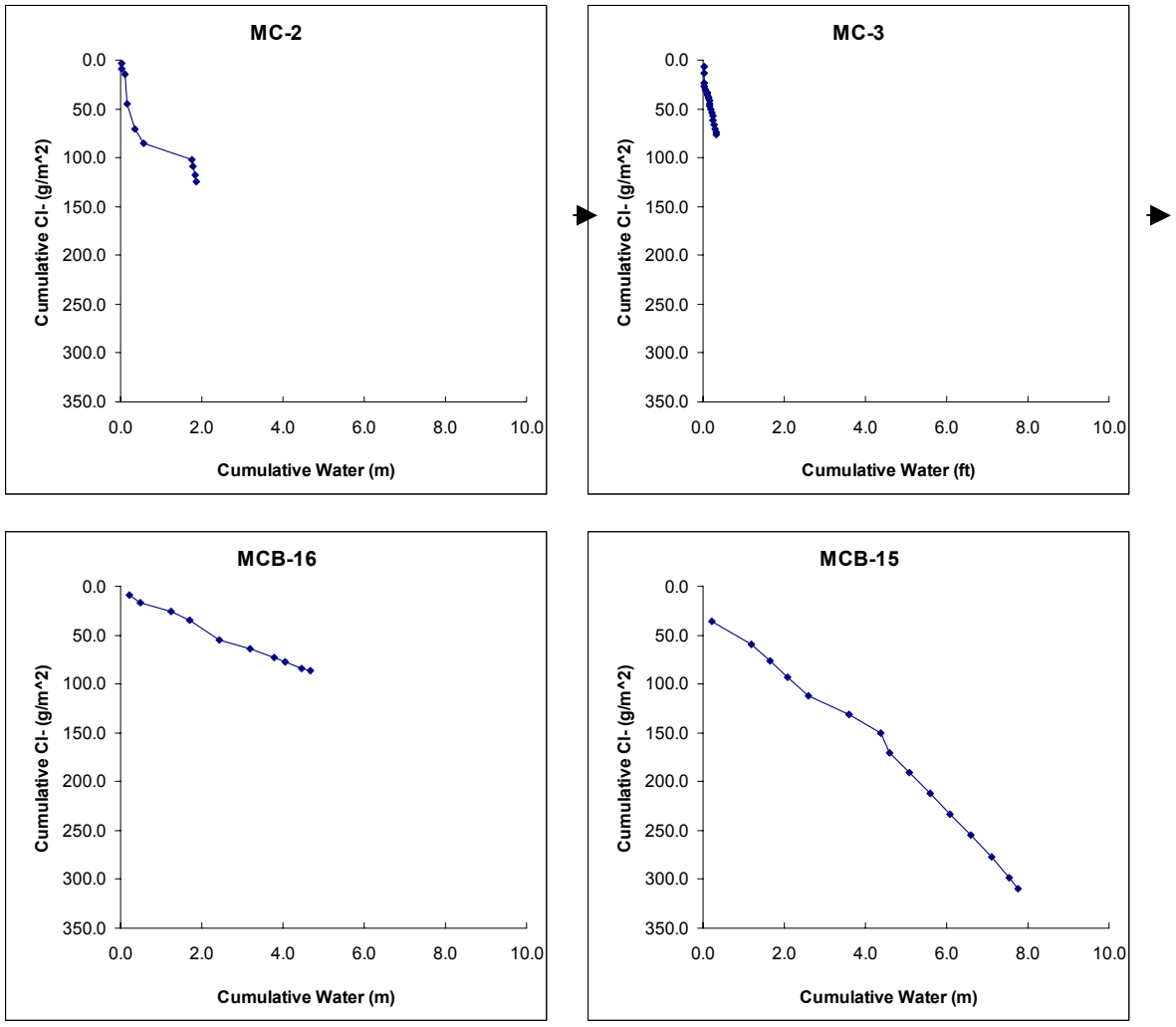
Notes: Plots are shown from up-canyon to down-canyon. Approximately linear plots suggest approximately constant fluxes with depth. Note scale change for MCB-14.

Figure M-1.0-1. Cumulative water/cumulative chloride plots of Mortandad Canyon B- and MC-holes



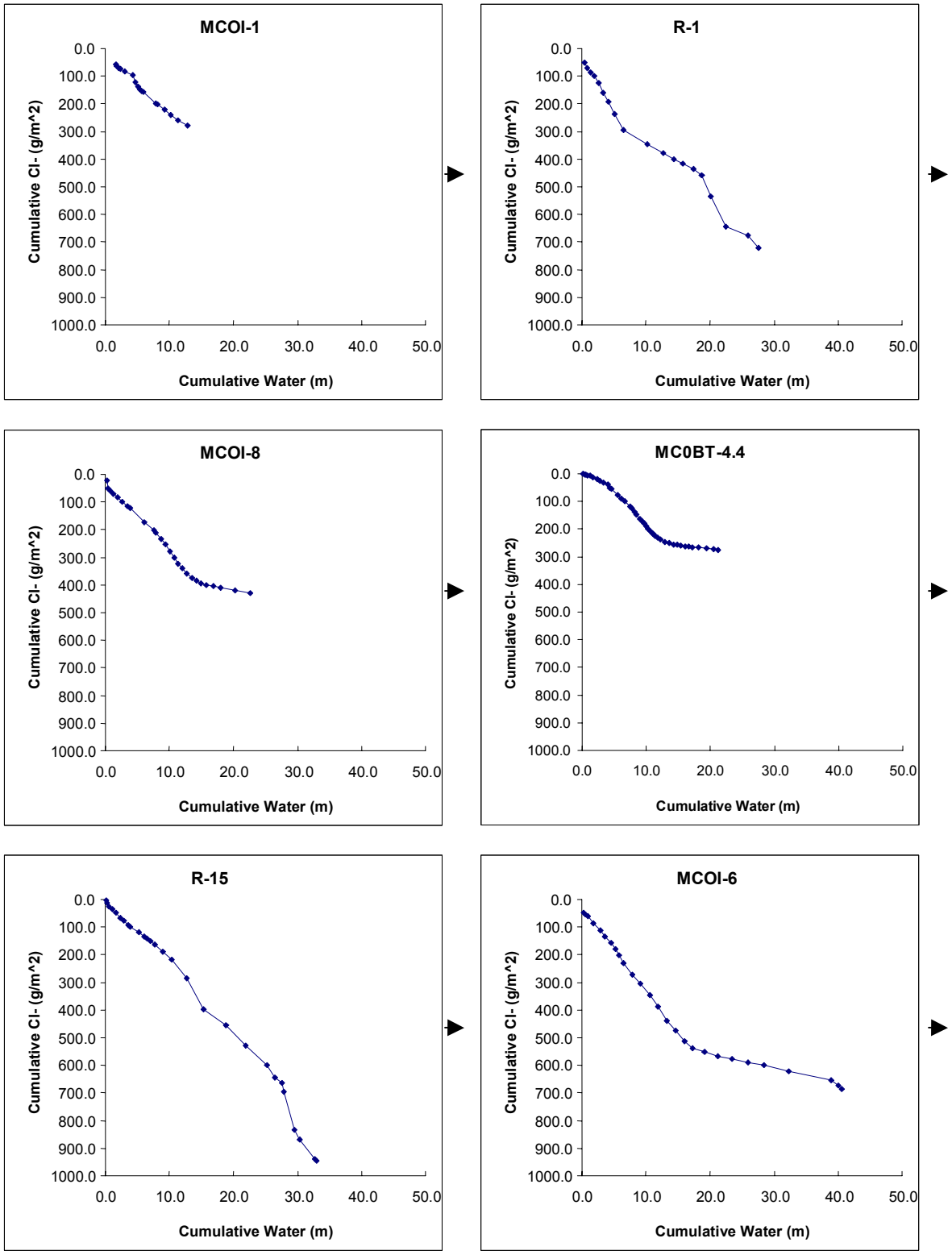
Notes: Plots are shown from up-canyon to down-canyon. Approximately linear plots suggest approximately constant fluxes with depth. Note scale change for MCB-14.

Figure M-1.0-1 (continued). Cumulative water/cumulative chloride plots of Mortandad Canyon B- and MC-holes



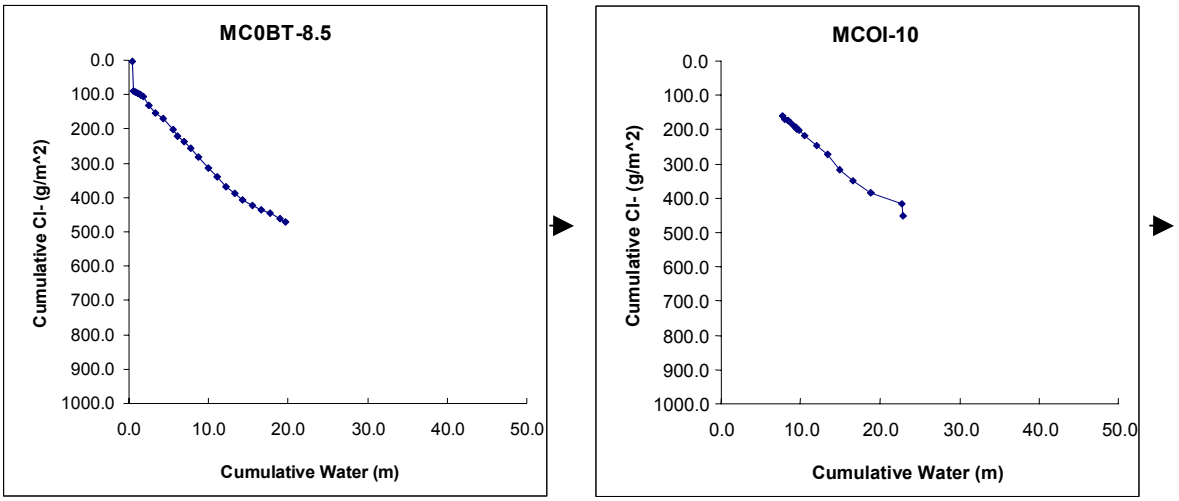
Notes: Plots are shown from up-canyon to down-canyon. Approximately linear plots suggest approximately constant fluxes with depth. Note scale change for MCB-14.

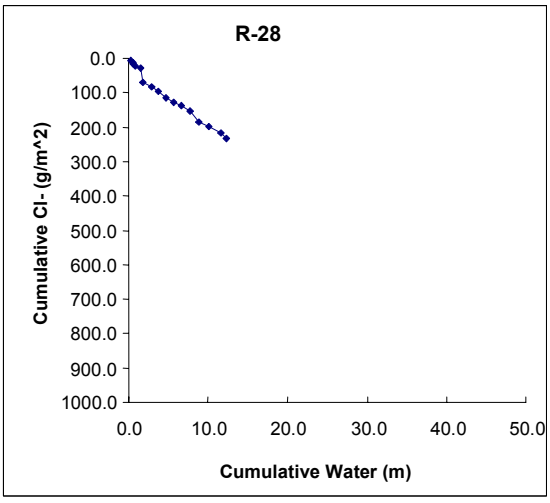
Figure M-1.0-1 (continued). Cumulative water/cumulative chloride plots of Mortandad Canyon B- and MC-holes



Notes: Plots are shown from up-canyon to down-canyon. Approximately linear plots suggest approximately constant fluxes with depth.

Figure M-1.0-2. Cumulative water/cumulative chloride plots of Mortandad Canyon I-, BT-, and R-holes





Notes: Plots are shown from up-canyon to down-canyon. Approximately linear plots suggest approximately constant fluxes with depth.

Figure M-1.0-2 (continued). Cumulative water/cumulative chloride plots of Mortandad Canyon I-, BT-, and R-holes

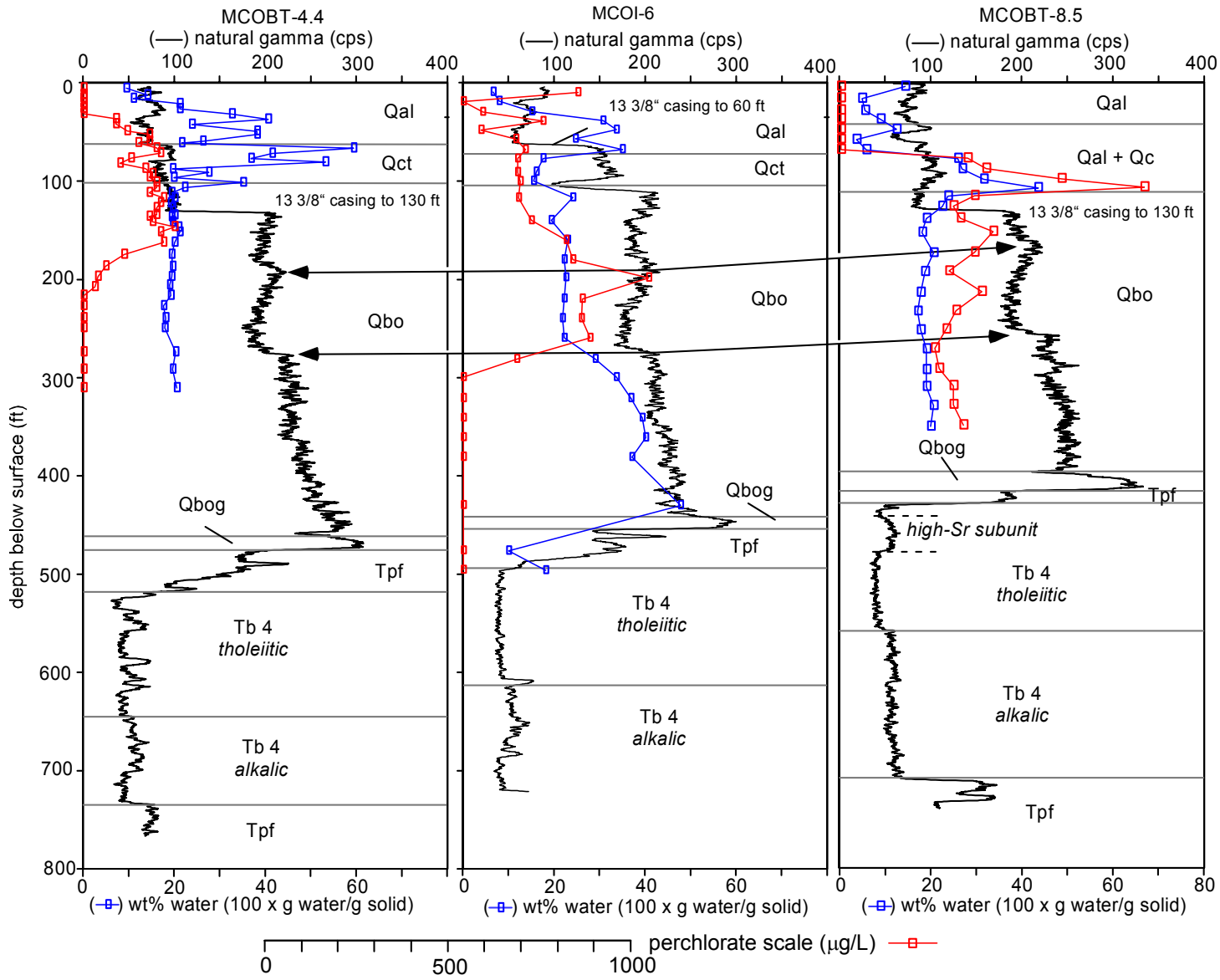


Figure M-1.0-3. Natural gamma, moisture, and perchlorate profiles for MCOBT-4.4, MCOI-6 and MCOBT-8.5

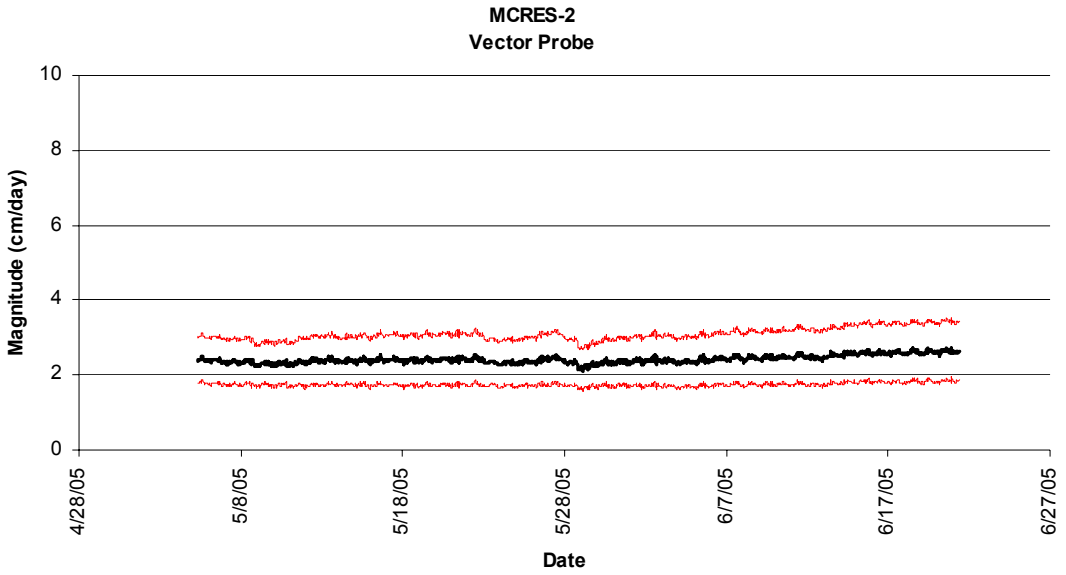


Figure M-2.0-1a. Alluvial aquifer flow rate results from the vector probe installed in borehole MCRES-2

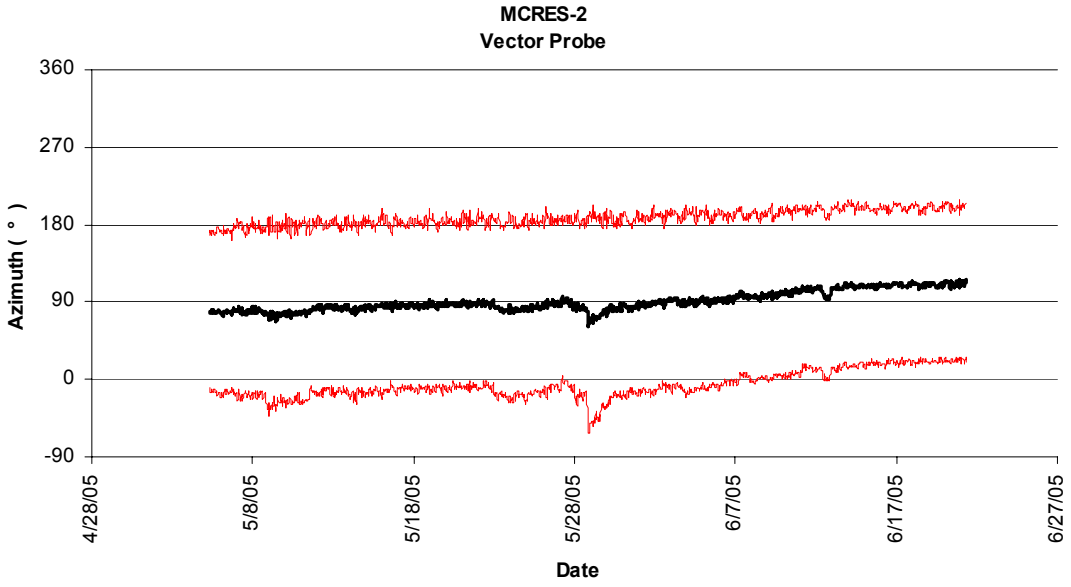


Figure M-2.0-1b. Alluvial aquifer flow direction results from the vector probe installed in borehole MCRES-2. Zero is north, ninety degrees is east, and 180 degrees is south

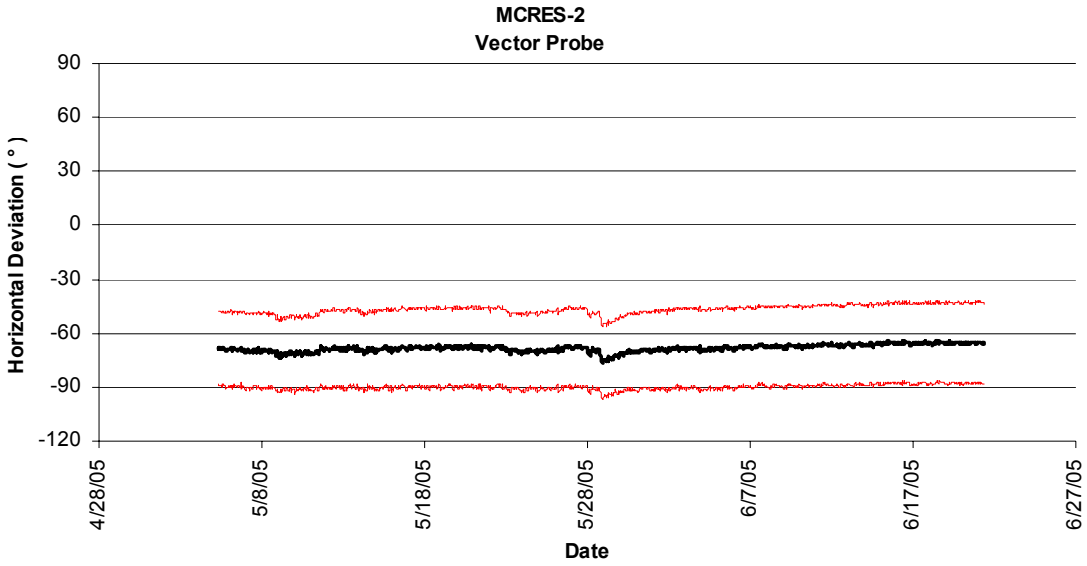


Figure M-2.0-1c. Alluvial aquifer flow deviation from horizontal results from the vector probe installed in borehole MCRES-2. Zero is horizontal, positive values mean upward flow, negative values mean downward flow.

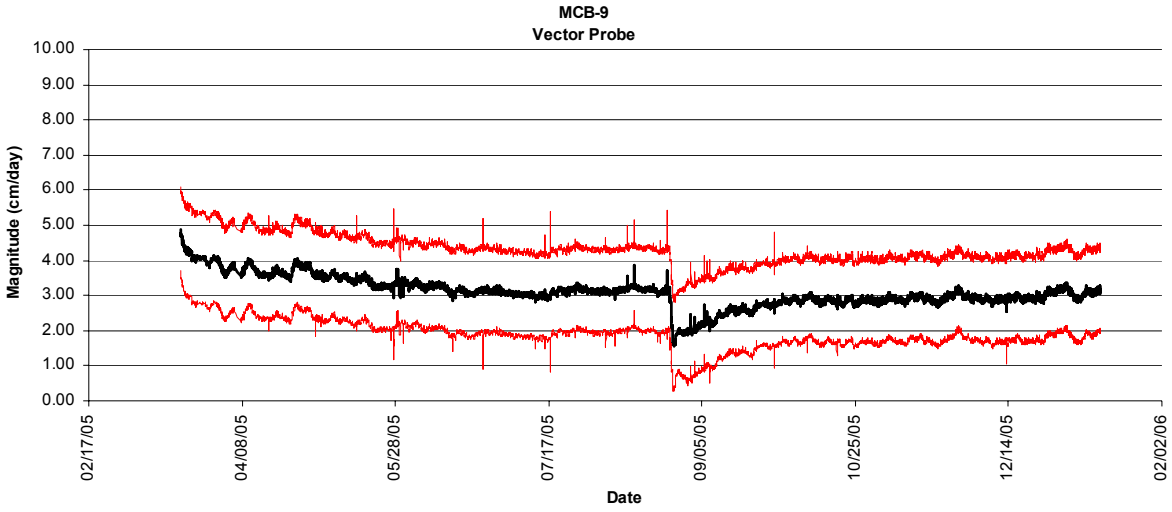


Figure M-2.0-2a. Alluvial aquifer flow rate results from the vector probe installed in borehole MCB-9

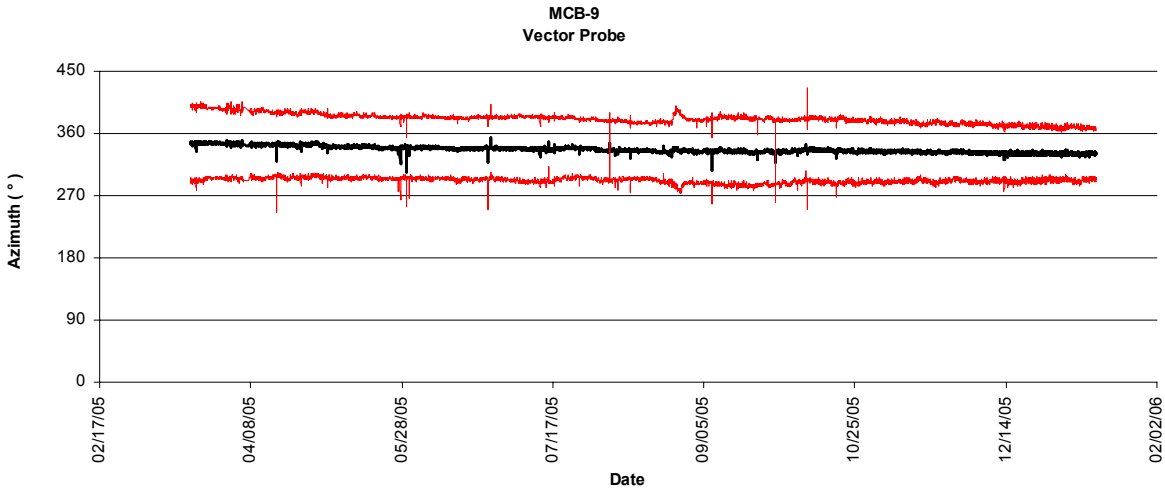


Figure M-2.0-2b. Alluvial aquifer flow direction results from the vector probe installed in borehole MCB-9. Zero is north, ninety degrees is east, and 180 degrees is south

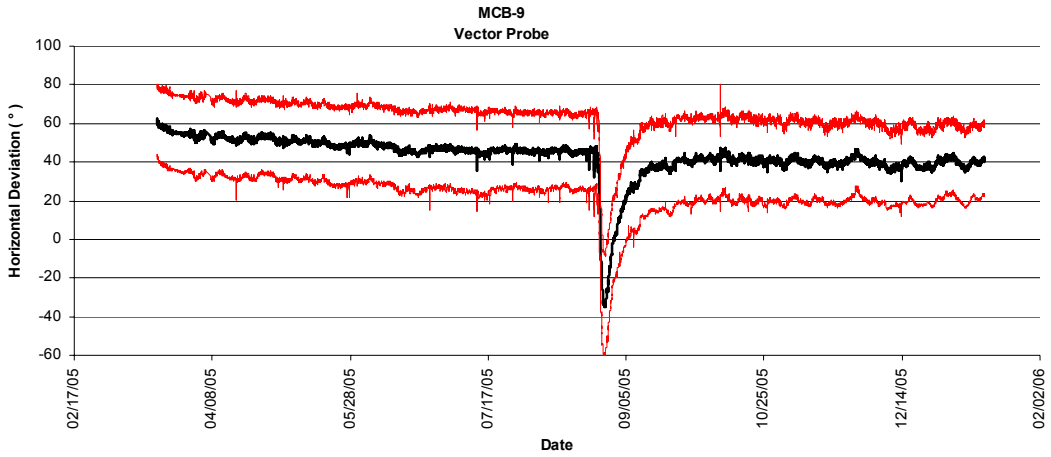
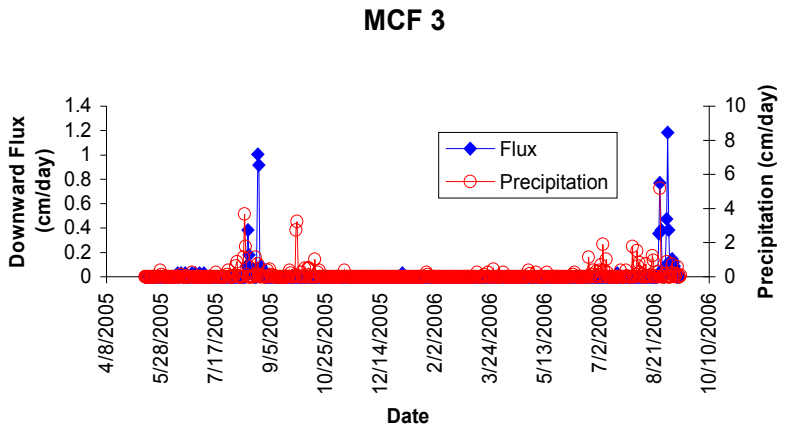
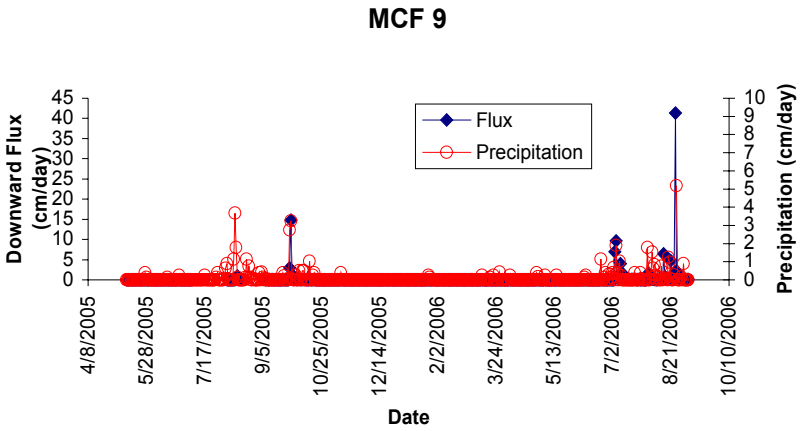


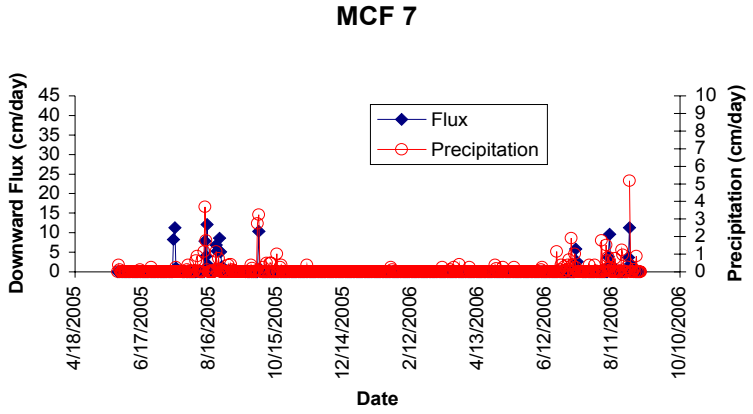
Figure M-2.0-2c. Alluvial aquifer flow deviation from horizontal results from the vector probe installed in borehole MCB-9. Zero is horizontal, positive values mean upward flow, negative values mean downward flow. Note the effects of the flood event in late August, 2005.



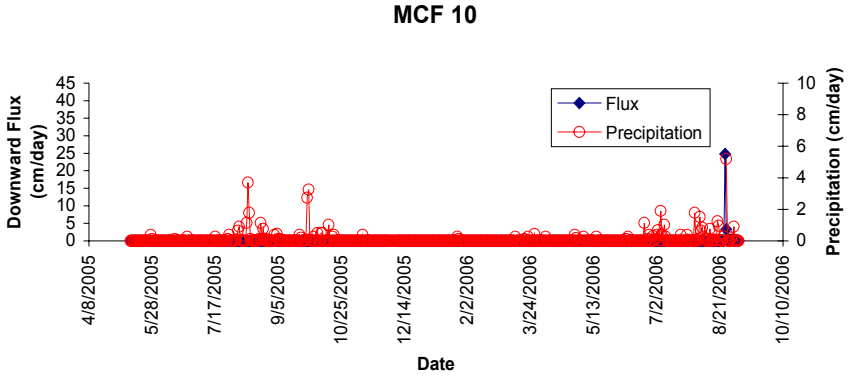
(a)



(b)



(c)



(d)

Figure M-3.0-1. Flux meter results for shallow alluvium in Mortandad Canyon

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Appendix N

Analysis of Spatial Variability of the Regional Water Table and Generation of a Contour Map of the Water-Table Elevation

The regional aquifer beneath Los Alamos National Laboratory is a complex hydrogeological setting (Section 7.2.1.5). The water table in the regional aquifer is predominantly under unconfined conditions, but there are zones of local confinement as well. The gradients and flow directions are predominantly controlled by the areas of regional recharge (flanks of Sierra de los Valles and along segments of some of the canyons on the plateau) and discharge to the east (the Rio Grande and the White Rock Canyon Springs).

Information about elevation of the top of the regional water table is provided by existing data from nonpumping wells and some of the springs (discharge elevation) (Figure N-1). Only a small number of the springs displayed on the figure are discharging from the regional aquifer (predominantly springs close to the Rio Grande) and only those are considered in our analysis. Well-head data shown in Figure N-1 are representative of flow conditions in January 2006; yet, the average heads for 2005-2006 are similar. The data are analyzed to create a water-table map presented in Figure 7.2.1.5-1. Contouring of the head data is also influenced by conceptual model assumptions.

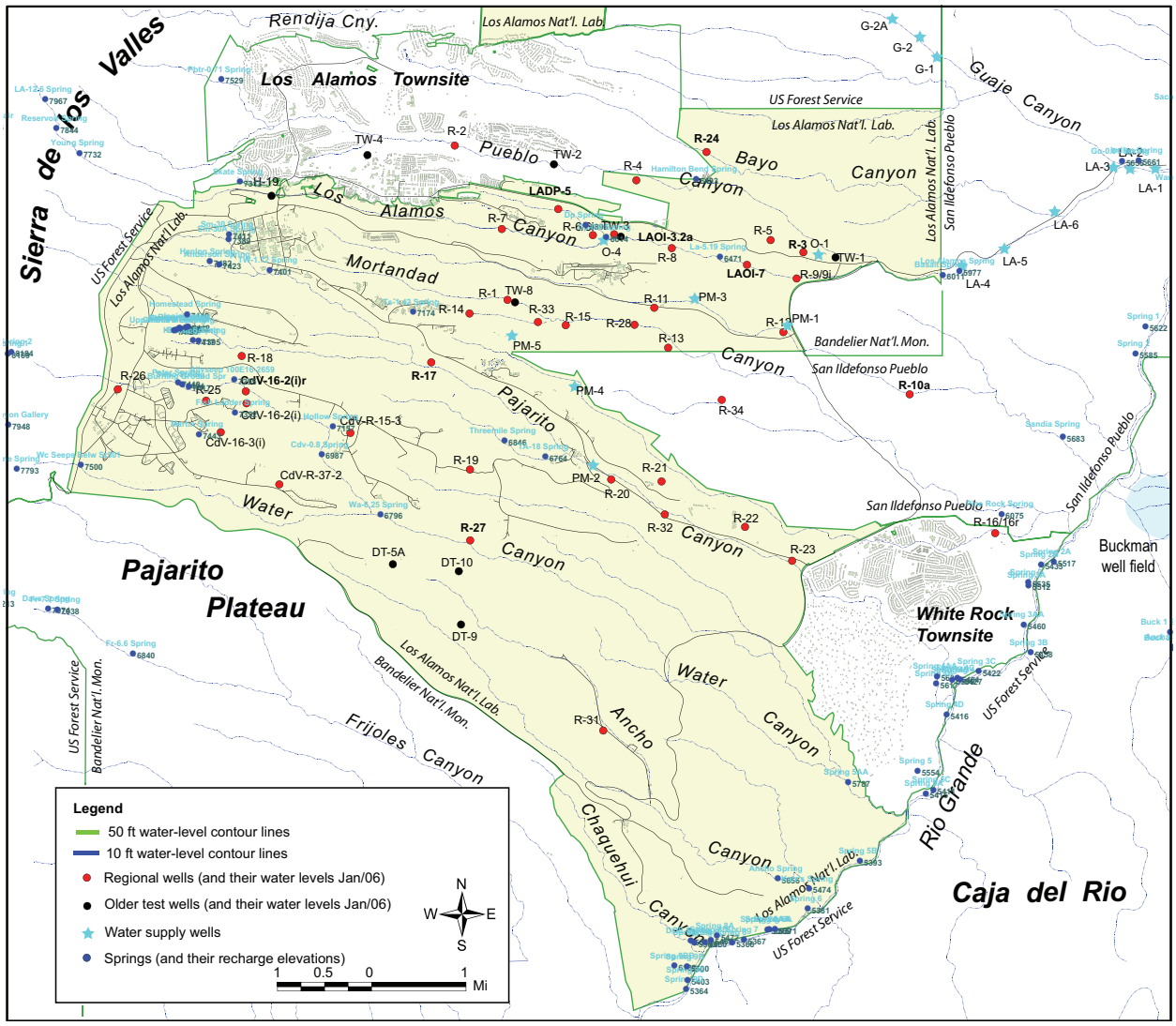
In the water-table analyses presented here, it is assumed that a predominant portion of groundwater flow in the shallow zone of the regional aquifer is discharged to the Rio Grande and the White Rock Canyon Springs. This assumption is not valid for the deep zone of the regional aquifer, which is predominantly discharged by the water-supply well fields on the Pajarito Plateau and at Buckman. Flow directions in portions of the deep zone that are unaffected by pumping should be expected to have much more southerly components than the flow directions in the shallow zone. It is also assumed that the water-table shape is impacted by the local recharge along the canyons. It is important to note that these two assumptions are also supported by the water-level data. In this sense, they are also conclusions inferred by the measured water-table elevation.

In the water-table map, pressure data from wells R-5, R-9, and R-12 have been excluded. The pressures at these boreholes are substantially lower than other boreholes in their vicinity. These boreholes are located very close to water-supply wells (PM-1, O-1, PM-3). Lack of temporal variability in pressures at the boreholes due to pumping suggests that the low heads are not representative of a local cone of depression near water-supply pumping. More likely, top screens in these boreholes are located deeper than the regional water table, and the measured pressures do not characterize the elevation of the regional water table. This explanation may also be related to screens completed in a spatially limited low permeability basalt within the Santa Fe Group sediments causing this anomalous pressure pattern.

The water-table map includes more detailed contouring (10 ft) in the central region of the aquifer (Figure 7.2.1.5-1). The Pajarito and Otowi well fields are located in this region. The 10-ft contours do not indicate that the intensive water-supply pumping in the deep zone of the regional aquifer is impacting the regional water table. The contours suggest an impact of local recharge on the water-table shape along Bayo (near R-24), Los Alamos (TW-1), Sandia (R-7), Mortandad (R-11), Cañon de Valle (R-25), and Water (R-27) Canyons.

Based on the water-table maps, potential contaminant plumes originating beneath Mortandad Canyon will be moving predominantly to the east, toward zones of regional discharge: the Rio Grande and the White Rock Canyon Springs. The possibility exists that a portion of these contaminant plumes will be captured by the water-supply wells on the Pajarito Plateau. But it appears, based on existing data, that contaminants will more likely flow laterally along the water table and not be captured by the water-supply wells.

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Notes: The water-table elevations (ft) in blue are measured in the nonpumping regional boreholes. The water-table elevations (ft) in pink have been ignored. The discharge elevations (ft) of springs are given in green.

Figure N-1. Data considered in generating a water-table map of the regional aquifer

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Appendix O

Analysis of Variability in the
Regional Water-Table Elevation Near Mortandad Canyon

In the vicinity of Mortandad Canyon, the water-table in regional wells TW-8, R-1, R-11, R-13, R-15, R-28, and R-33 is encountered within Miocene pumiceous sedimentary deposits that underlie the Pliocene Puye Formation.. A series of water-supply wells are nearby (Figure 7.2-15). More information regarding water-supply wells and their pumping regime is provided in Appendix P.

There is a very limited amount of preliminary data for water levels the two screens at R-33. The top screen is representative of water-table elevation, and preliminary data indicate that the observed drawdowns due to the water-supply pumping in the vicinity are small (several centimeters). The pressures at the deep screen are influenced by PM-5 pumping, and the drawdowns are on the order of 0.5 m. The drawdown at PM-5 during pumping is on the order of 24 m.

The water-level data for R-1, R-11, R-13, R-15, and R-28 are shown in Figure O-1. All the available data since January 2005 are presented. The water levels are influenced by high-frequency barometric pressure effects; however on the figure, the barometric pressure effects have been removed. The boreholes have very similar barometric efficiencies (approximately 100%). The same figure also presents the temporal variability of the pumping at the Pajarito water-supply wells. The comparison of the temporal variability of the water levels and the pumping reveals valuable insights about the properties of the regional phreatic zone. It is important to note that these boreholes (R-1, R-15, R-28, and R-13) are approximately along the axis of Mortandad Canyon covering a segment of about 2 km in length; R-11 is located in Sandia Canyon northeast of R-28.

Figure O-1 demonstrates that during the PM-4 pumping test in February 2005, only R-15 and R-13 pressures are clearly affected (see also McLin 2006a, 92218). But transducers were not present in R-1, R-28, and R-34 for a time during the PM-4 pump test, which does does not allow for a full analysis from this test. However, in June 2006, PM-4 was also intensively pumped, which can be viewed as a repetition of the field test. Similarly, R-15 and R-13 data demonstrated response to the pumping, and R-1 did not respond. However, the figure suggests that R-28 and R-11 pressures are somewhat influenced by the PM-4 pumping. The R-28 response during the 2005 pumping test is questionable, and R-11 was not monitored at that time. The R-28 and R-11 drawdowns due to PM-4 pumping are on the order of centimeters.

In the R-1 and R-15 time series data, there is a well-defined inflection point of water-level increase at the end of September 2005 (Figure O-1). This inflection point is well correlated with a decline in the PM-5 pumping rate at the same moment. In addition, the overall water-level decline between April and September 2005 at R-1 and R-15 seems to be well correlated with the PM-5 pumping pattern. Therefore, we can conclude that PM-5 pumping is influencing the water levels at R-1 and R-15 as well as at R-33 and R-14. These observed drawdowns are in the order of decimeters.

The lowest water levels at R-11, R-13, and R-28 are at the beginning of October 2005 (Figure O-1). This inflection point is not as well defined as for the case of R-1 and R-15 discussed above. There can be other explanations, but this poorly defined inflection point is somewhat related with the decline of pumping at PM-2. If these are real pumping drawdowns, the magnitude is on the order of centimeters. The PM-2 pumping test conducted by McLin (2005, 90073) did not demonstrate a clear pumping response at R-11, R-13, and R-28.

Most importantly, PM-3 and O-4 pumping does not seem to cause pressure drawdowns at the monitoring wells in Mortandad and Sandia Canyons (Figure O-1). There are no changes in the Mortandad and Sandia Canyon monitoring-well water levels that can be associated with the peaks of pumping at PM-3 and O-4 in June 2005 and June 2006. It should be also emphasized that PM-3 has a very distinctive temporal pattern of pumping at the end of 2005. This pattern allowed us to identify the impact of PM-3 pumping on the pressures in both of the screens of R-8. However, it is difficult to establish similar

correlation with the water levels in the single completion monitoring wells beneath Mortandad and Sandia Canyons.

PM-1 has a very uniform pattern of pumping; as a result, it is difficult to make conclusions regarding potential PM-1 influence on the water levels of monitoring wells in Mortandad and Sandia Canyons. Since PM-3 does not seem to disturb the water levels of these monitoring wells, we might anticipate that PM-1 is not affecting the water levels as well, based on the spatial locations of these supply wells.

Previous pumping tests at PM-3 (McLin 2006b, 93670) also suggested limited influence of their pumping to the west. This might be a result of heterogeneities in the regional aquifer that affect the spatial distributing of their pumping influence.

The seasonal variability observed in the monitoring well water levels at the top surface of the regional aquifer (the water table) does not significantly impact the directions and the magnitudes of hydraulic gradients in the phreatic zone. Figure O-2 shows contours of water-table elevation based on March and June 2006 data. The data represent the highest and lowest water-table levels for 2006. The map demonstrates the seasonal effect on the flow directions, and their magnitude at the water table is minor. Therefore, we can conclude that the water-supply pumping has a small impact on the potential contaminant pathway at the regional groundwater table beneath Mortandad Canyon.

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 Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

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McLin, S.G., July 2005. "Analyses of the PM-2 Aquifer Test Using Multiple Observation Wells," Los Alamos National Laboratory report LA-14225-MS, Los Alamos, New Mexico. (McLin 2005, 90073)

McLin, S.G., January 2006a. "Analyses of the PM-4 Aquifer Test Using Multiple Observation Wells," Los Alamos National Laboratory report LA-14252-MS, Los Alamos, New Mexico. (McLin 2006a, 92218)

McLin, S.G., A. Simmons, August 2006b. "A Catalog of Historical Aquifer Tests on Pajarito Plateau," Los Alamos National Laboratory document, LA-UR-06-3789, Los Alamos, New Mexico. (McLin 2006b, 93670)

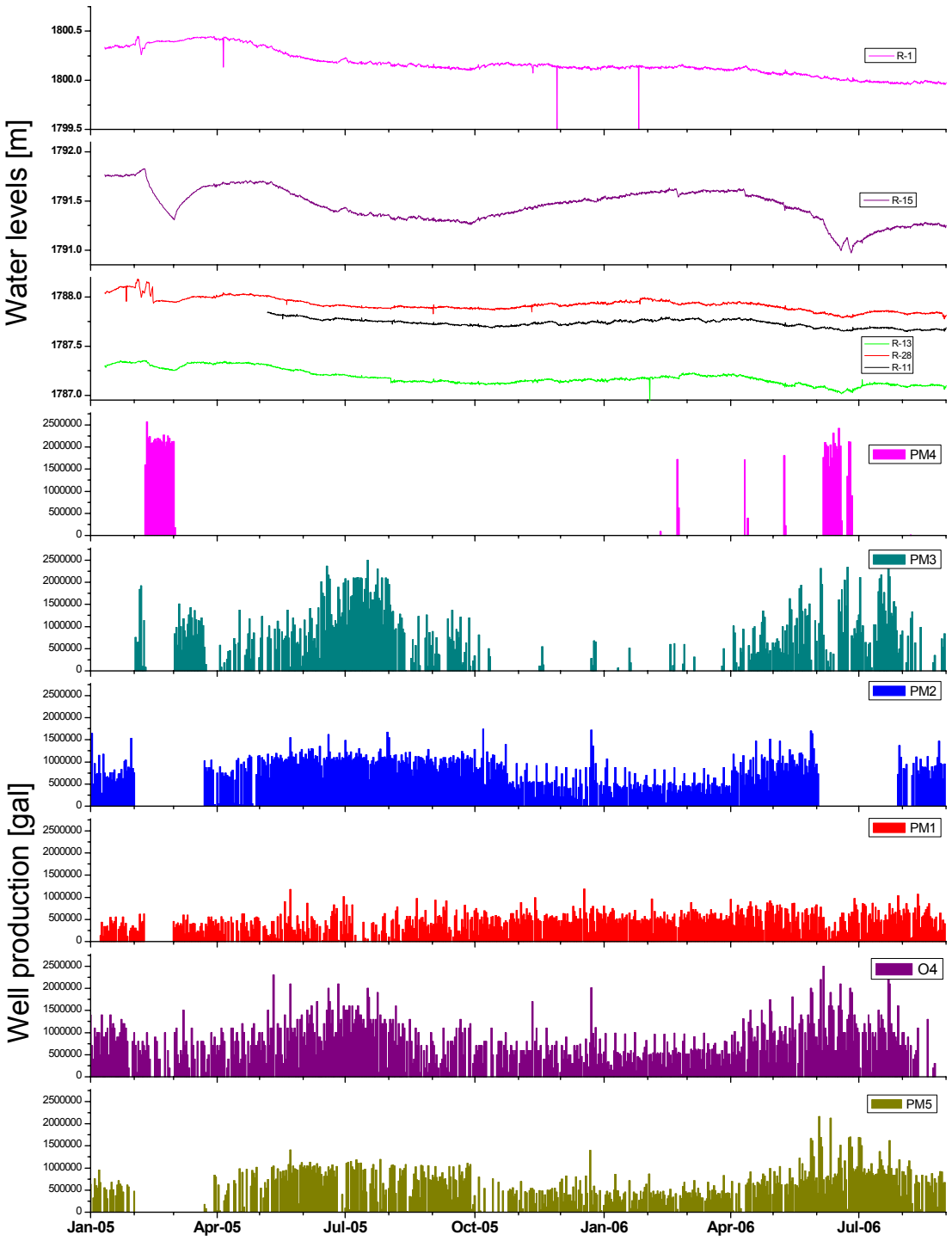


Figure O-1. Comparisons between water-level (m) fluctuations (barometric pressure effects are removed) at the regional boreholes and water-supply pumping in the vicinity

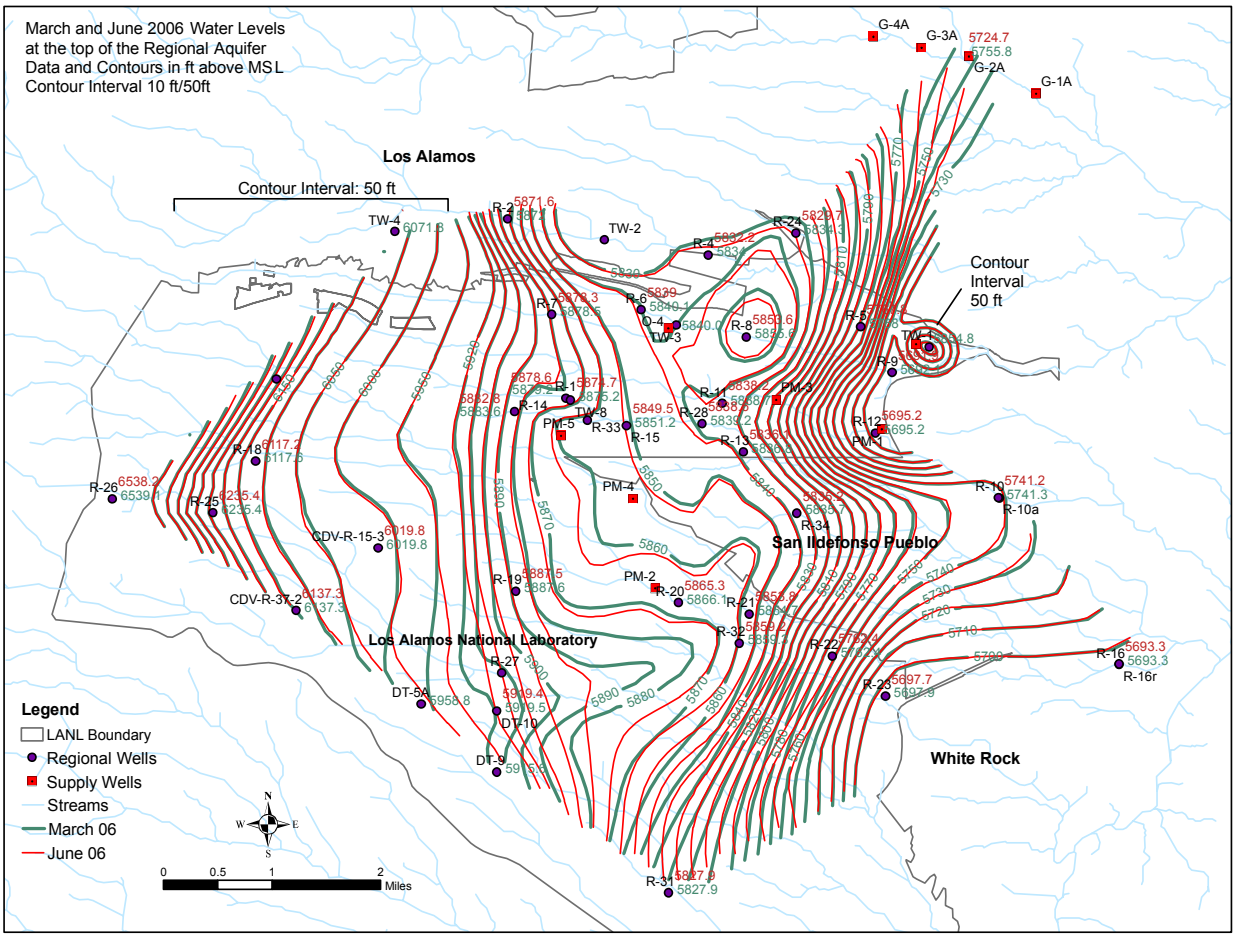


Figure O-2. **Contour map of water-table elevations at March (dark cyan) and June (red) 2006; data for March and June represent the highest (dark cyan) and lowest (red) water-table levels, respectively, for 2006**

Appendix P

Analysis of Variability in the Pumping Rate and Hydraulic Heads at the Water-Supply Wells Near the Mortandad Canyon

Water-supply wells used for Los Alamos National Laboratory (LANL) and Los Alamos County are located very close to Mortandad Canyon (Figure 7.2-16). The closest water-supply wells are in the Pajarito (PM-1, PM-2, PM-3, PM-4, and PM-5) and Otowi (O-1 and O-4) well fields. These well fields provide a substantial portion (about half) of the current Los Alamos water supply (LANL and Los Alamos County). The pumping wells are screened over 200 to 500 m, beginning about 50 to 70 m below the water table. The annually averaged rate of pumping of the two well fields varies substantially, but there is temporal trend of general rate increase (Koch and Rogers 2003, 88425).

The temporal variability of the annually averaged pumping rates for the individual wells is high (Figure P-1). The first wells to start pumping are PM-1, PM-2, and PM-3 between 1965 and 1968. After that, PM-4 (1982) and PM-5 (1986) were introduced. The latest wells to start pumping are O-4 (1993) and O-1 (1996). In Figure P-1, the addition of PM-4 and PM-5 in the 1980s caused a substantial decrease of the PM-2 pumping rate. The PM-2 pumping rate has steadily increased since 1986. The pumping rates of PM-1 and PM-3 declined in the 1990s. The PM-5 pumping rate has a generally increasing trend. PM-2 and PM-4 have the most variable annual pumping rates. Currently, the major water producers near Mortandad Canyon are PM-3 and O-4.

The water-supply wells are pumped irregularly within each year as well. On average, all the wells work about 30% of the time each year (Figure P-2). The wells are predominantly pumped during the summer season, particularly PM-4. In nonpumping periods, the hydraulic heads at the wells and in their vicinity recover. The peak in the water-supply pumping is in June–July, and the low is in December–January (Figure P-3). The pumping also varies daily for all the wells except PM-4.

The substantial temporal variability in the pumping allows us to identify monitoring boreholes where hydraulic heads are impacted by the pumping. For example, analysis of R-15 water levels demonstrated that the borehole is impacted by pumping at PM-4 but not by pumping at PM-5 (even though PM-5 is closer to R-15 than to PM-4). The deep screen of R-33 is affected by PM-5 pumping. The deep screens of R-8 are impacted by pumping at PM-3. The deep screens of R-5 are influenced by pumping at PM-1. The top screens of R-33, R-8, and R-5 did not show obvious response to the water-supply pumping.

Figure P-4 presents observed variability in hydraulic heads at the water-supply wells. The figures compare the annual pumping and nonpumping heads with the annually averaged pumping rates for the wells from the Pajarito well field. The annual nonpumping heads represent the highest water level measured at each well within a given year. The annual pumping heads represent the lowest water level measured at each well within a given year. The hydraulic heads measured at the water-supply wells are not representative for the elevations of the regional water table because of the existing hydraulic separation between the shallow phreatic and the deep confined zone of the regional aquifer.

The data in Figure P-4 do not show a clear relationship between hydraulic heads and pumping rates. For example, there is a well-defined long-term decline of pumping and nonpumping heads in PM-1 and PM-3. However, the decline seems not to be driven by an increase of pumping rates at the two wells. Similar pressure decline is not clearly observed at PM-2, PM-4, and PM-5. Especially at PM-5, the nonpumping heads have not changed much since it started pumping. It is possible that the declining trends at PM-1 and PM-3 are a result of the intensive pumping throughout the aquifer rather than only at these two wells. Water-supply pumping is also performed at the Los Alamos, Guaje, and Buckman well fields. The considerable contrast in the transient behavior in the hydraulic heads at PM-1 and PM-3 compared to PM-2, PM-4, and PM-5 might be an indication of large-scale heterogeneous features in the aquifer (Purtymun 1995, 45344).

REFERENCES

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Purtymun, W.D., 1995. "Geologic and Hydrologic Records of Observation Wells, Test Holes, Test Wells, Supply Wells, Springs, and Surface Water Stations in the Los Alamos Area," Los Alamos, New Mexico. (Purtymun 1995, 45344)

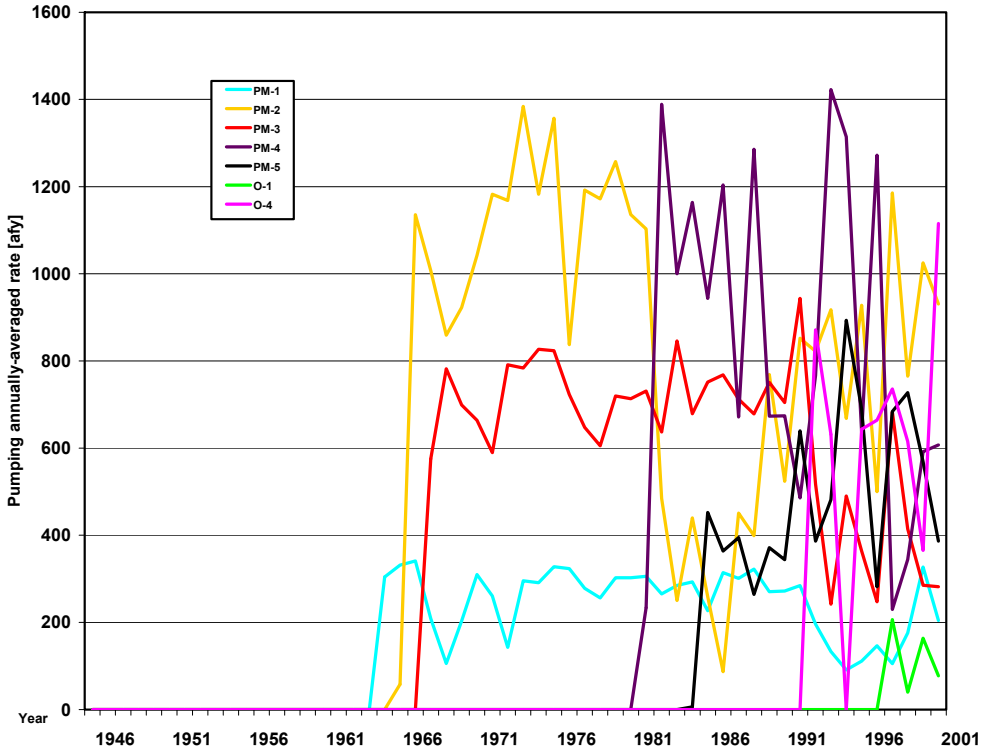


Figure P-1. Annually averaged pumping rates [afy] of the wells near Mortandad Canyon

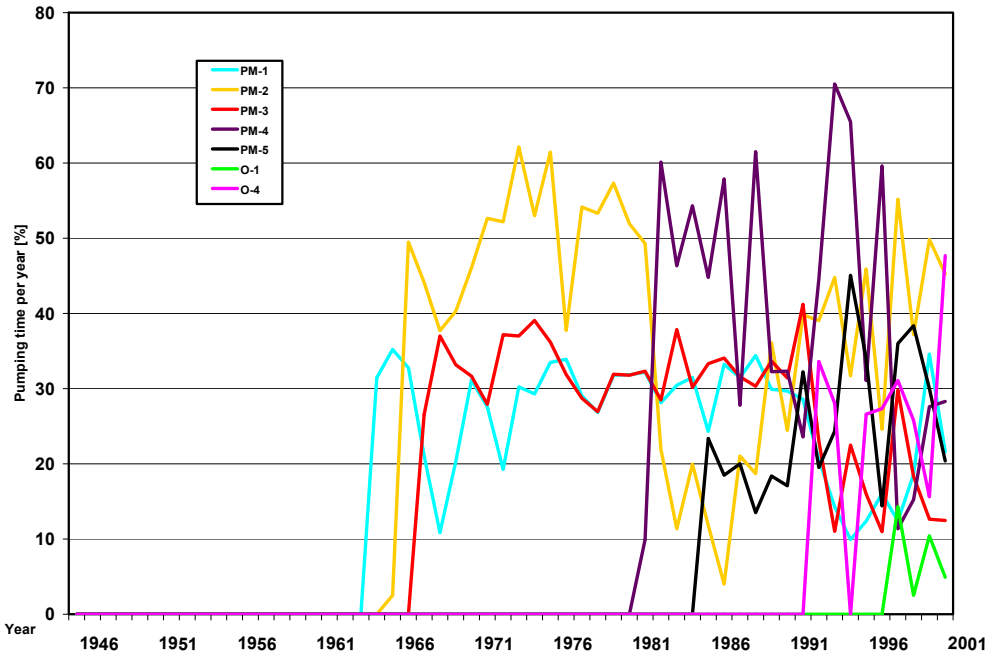


Figure P-2. Percent of time the wells near Mortandad Canyon were pumping each year

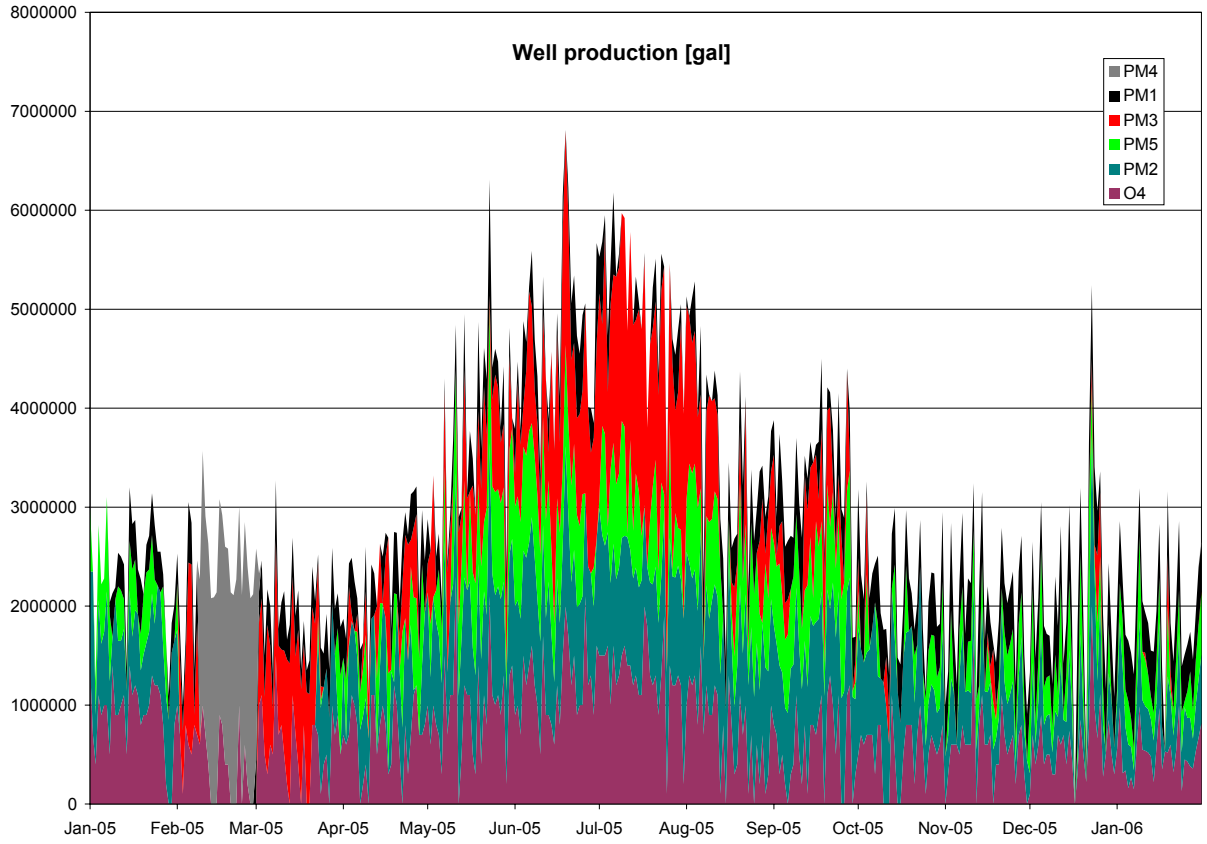


Figure P-3. Daily well production (gal.) at the water-supply wells near Mortandad Canyon in 2005

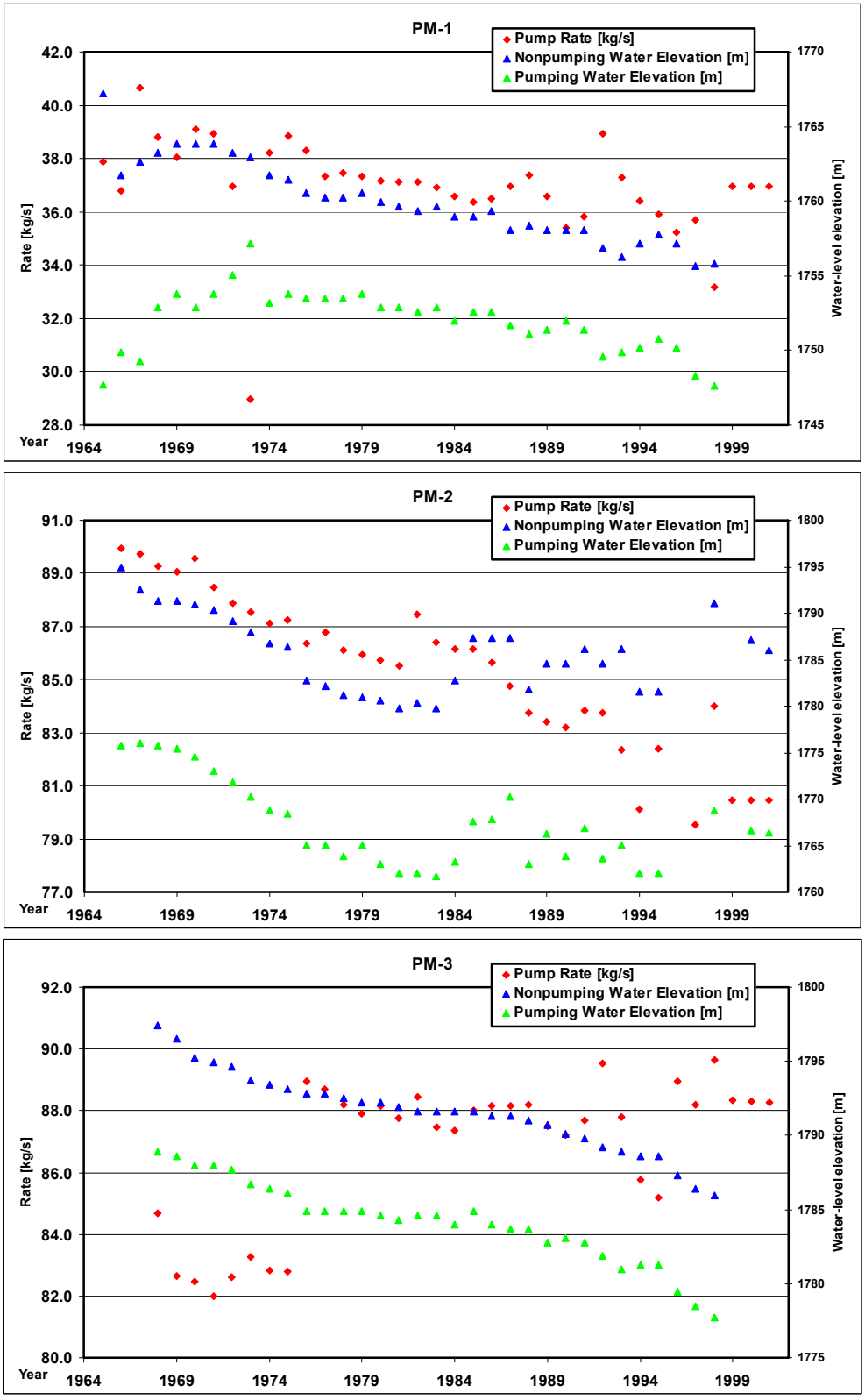


Figure P-4. **Transient hydraulic heads (triangles: nonpumping [blue]; pumping [red]) and annually averaged pumping rates (red dots) for the wells from the Pajarito well field**

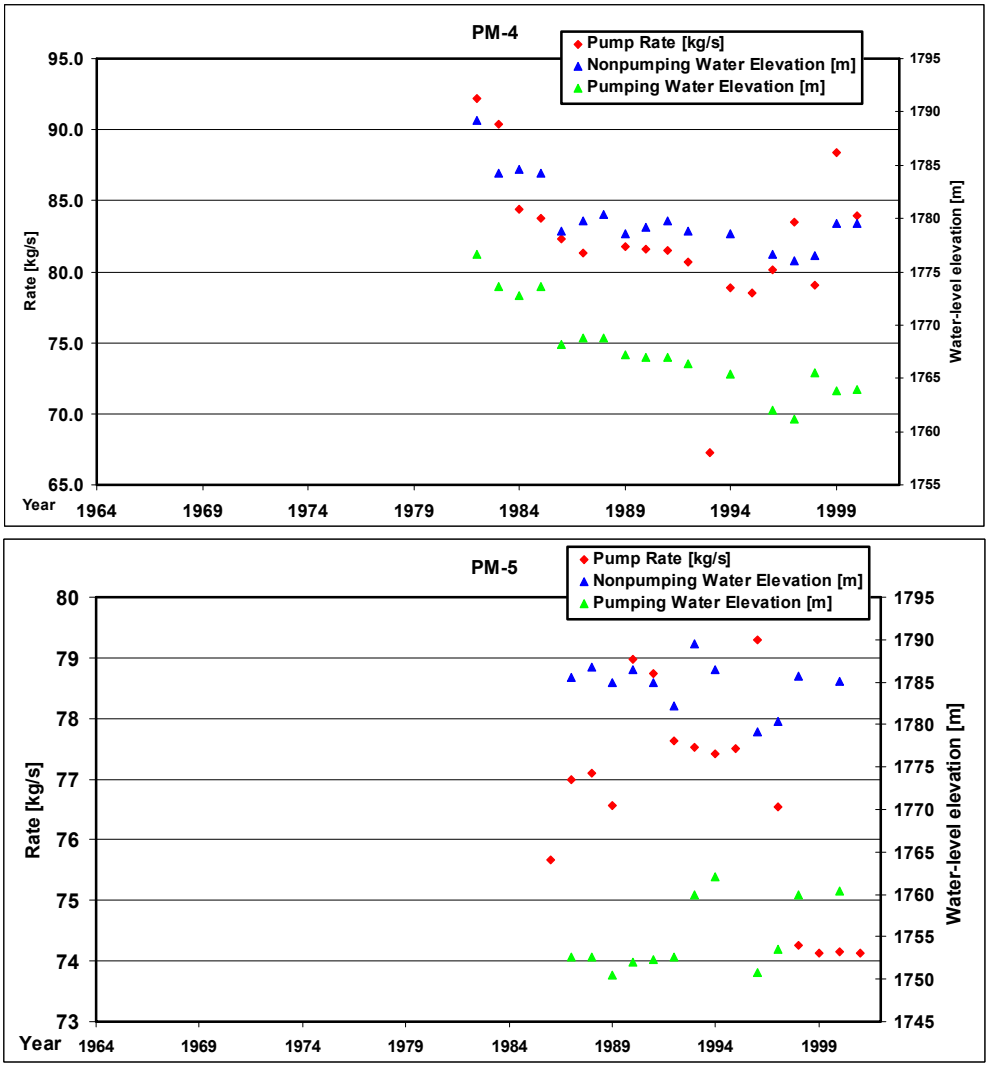


Figure P-4 (continued). Transient hydraulic heads (triangles: nonpumping [blue]; pumping [red]) and annually averaged pumping rates (red dots) for the wells from the Pajarito well field