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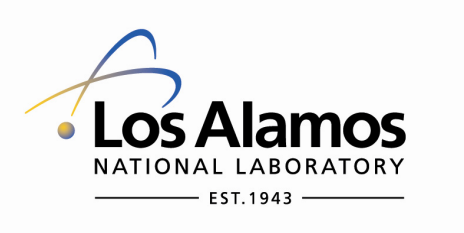
Corrective Measures Evaluation Report for Material Disposal Area C, Solid Waste Management Unit 50-009 at Technical Area 50



Prepared by the Environmental Programs Directorate

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EP2012-0194

Corrective Measures Evaluation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50

September 2012

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EXECUTIVE SUMMARY

This report documents the corrective measures evaluation (CME) conducted for Material Disposal Area (MDA) C, Solid Waste Management Unit (SWMU) 50-009, located at Los Alamos National Laboratory's Technical Area 50 (TA-50). MDA C consists of 115 subsurface disposal units (7 pits and 108 shafts). MDA C was in operation from 1948 to 1974. The wastes disposed of in these disposal units contain both hazardous constituents that are regulated by the New Mexico Environment Department (NMED) and radionuclides that are regulated by the U.S. Department of Energy (DOE).

The goal of the CME is to recommend a corrective measures alternative for SWMU 50-009 in accordance with the requirements of the Compliance Order on Consent (the Consent Order). The corrective measures alternative must also meet requirements for radiation protection under DOE regulations and orders. Compliance with DOE radiation protection standards may necessitate more stringent technical design requirements than are needed to comply with those under the Consent Order. These technical requirements will be identified during the corrective measures implementation (CMI) phase of the project and incorporated into the design of the final remedy.

A subsurface volatile organic compound (VOC) vapor plume is present in the vadose zone beneath MDA C. The sources of VOC vapors at MDA C are thought to be associated with wastes disposed of in the pits and shafts at the site, with VOCs being a component of the waste rather than a primary waste form.

The objectives of this CME are to identify and evaluate technically appropriate corrective measures alternatives that will

- achieve cleanup objectives in a timely manner,
- protect human and ecological receptors,
- control or eliminate the sources of contamination,
- control migration of released contaminants, and
- manage remediation waste in accordance with state and federal regulations.

A conceptual site model (CSM) was developed to evaluate primary and secondary release mechanisms from the source areas (pits and shafts). The CSM evaluates the exposure pathways and potential risks. The remedial action objectives (RAOs) for these source areas are as follows:

- Prevent human and ecological exposure to the waste through excavation, biointrusion, and erosion
- Prevent human and ecological exposure to the contaminated surface soil and/or subsurface soil through excavation and biointrusion
- Prevent groundwater from being impacted above a regulatory standard by the transport of VOCs through soil vapor
- Prevent the creation of contaminated leachate by restricting the infiltration of water into the waste

To complete the CME, treatment technologies were identified and screened for applicability to the sources of contamination present at MDA C. Applicable technologies were then combined into corrective measures alternatives to address the RAOs for MDA C. The corrective measures alternatives were screened against the threshold criteria per Section VII.D.4.a of the Consent Order. Alternatives that satisfy the threshold criteria were then evaluated and ranked against the Remedial Alternative Evaluation

Criteria (i.e., balancing criteria) identified in Section VII.D.4.b of the Consent Order. The highest-ranking alternative was selected as the recommended corrective measures alternative.

As a result of this evaluation, the recommended corrective measures alternative includes constructing an evapotranspiration (ET) cover over the pits and shafts to provide a barrier against human and ecological exposure to waste and contaminated soils. The ET cover also restricts the infiltration of water by providing a soil medium to hold infiltrated water until it is removed by evaporation from the surface and by transpiration through vegetation. The alternative also includes constructing and operating a soil-vapor extraction system to remove VOCs from the subsurface to prevent the downward migration of these VOCs to the groundwater. Performance monitoring and institutional controls will be included to ensure the RAOs have been satisfied. The impact of the recommended alternative on the CSM demonstrates the resulting reduction in exposure potential and future risk. Long-term monitoring at MDA C that couples vapor monitoring in the vadose zone near the disposal units with regional aquifer monitoring will provide a defense-in-depth approach to demonstrate the effectiveness of the final remedy.

Although not part of the CME, a preliminary radiological dose assessment was performed to determine whether the recommended corrective measures alternative would also meet DOE radiation-protection requirements. The results of this evaluation demonstrate that an ET cover would provide long-term radiological protection to on- and off-site receptors. A detailed evaluation to establish specific design criteria will be performed during the CMI.

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1.0 INTRODUCTION

This report documents the corrective measures evaluation (CME) conducted for Material Disposal Area (MDA) C, Solid Waste Management Unit (SWMU) 50-009, at Los Alamos National Laboratory (LANL or the Laboratory). MDA C consists of 115 subsurface waste disposal units (7 pits and 108 shafts) and is located within the boundaries of Technical Area 50 (TA-50) (Figures 1.0-1 and 1.0-2). This CME is developed and submitted pursuant to the Compliance Order on Consent (Consent Order).

The Laboratory is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico, approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas that are separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft above mean sea level (amsl). The eastern portion of the Pajarito Plateau stands 300 ft to 1000 ft above the Rio Grande.

The Laboratory is participating in a national effort by DOE to clean up sites and facilities formerly involved in weapons research and development. The goal of the Laboratory's effort is to ensure past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. These sites are designated as either SWMUs or areas of concern (AOCs).

The Laboratory is divided into numerous TAs based upon facility operations. Several of the TAs include MDAs where waste was previously disposed of. MDA C is comprised of subsurface pits and shafts used for the disposal of solid waste containing hazardous constituents and radionuclides.

The objectives of this CME are to identify and evaluate technically appropriate corrective measures alternatives that will

- achieve cleanup objectives in a timely manner,
- protect human and ecological receptors,
- control or eliminate the sources of contamination,
- control migration of released contaminants, and
- manage remediation waste in accordance with state and federal regulations.

The Consent Order addresses corrective action for the hazardous component of wastes disposed of at MDA C. The requirements of the Consent Order do not apply to radionuclides, including but not limited to source, special nuclear, or byproduct material as defined in the Atomic Energy Act of 1954 (AEA), as amended, or the radioactive portion of mixed waste. Radioactive waste disposal units are regulated by the DOE under the AEA. DOE's authority to regulate nuclear safety is governed by the provisions of 10 Code of Federal Regulations (CFR) Parts 830 through 835. Pursuant to these regulations, DOE is required to review and approve all activities and work related to radionuclides, including activities and work under the Consent Order. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to New Mexico Environment Department (NMED) in accordance with DOE policy and Section III.A of the Consent Order.

Remediation of MDA C requires integration of solutions that address waste and regulatory issues specific to MDA C. Both recent and historical characterization data have been used as the basis for defining the

nature and extent of contamination at MDA C. The CME report identifies and evaluates appropriate technologies that manage potential unacceptable future risk from MDA C. Finally, this CME report screens and evaluates alternatives based on known performance data that have demonstrated the technologies' abilities to meet regulatory threshold criteria and Remedial Alternative Evaluation Criteria (i.e., balancing criteria) and recommends an alternative as the proposed remedy.

This CME report is organized according to the Consent Order requirements. Table 1.0-1 summarizes the Consent Order requirements and identifies where the applicable requirements are addressed in this report. Section 1 provides an overview of the CME. Section 2 provides a brief site history, discusses the waste inventory, and summarizes the results of previous investigations. Section 3 describes surface and subsurface site conditions. Section 4 summarizes the conceptual site model (CSM) and includes a description of sources, pathways, and receptors. Section 5 details the regulatory criteria for the CME, including applicable cleanup standards, risk-based screening levels, and risk-based cleanup goals for each pertinent medium at MDA C subsurface units. Section 5 also includes a discussion of the Consent Order evaluation criteria process used for screening and evaluating the available treatment technologies as well as the recommended corrective measures alternatives. Section 6 presents the identification and screening of technologies. The corrective measures alternatives are developed from the retained technologies identified and described in section 7. Section 7 also presents the screening of these alternatives against the four threshold criteria identified in Section VII.D.4.a of the Consent Order. In section 8, the alternatives that pass the threshold criteria are further evaluated against the five balancing criteria of Section VII.D.4.b of the Consent Order. The recommended corrective measures alternative is selected in section 9. The design criteria to meet cleanup objectives are presented in section 10, the proposed schedule is provided in section 11, and references and map data sources are presented in section 12.

This CME report includes appendixes that provide supporting information. Appendix A provides the acronyms and abbreviations used throughout the report as well as a metric conversion table and data qualifier definitions. Appendix B presents an evaluation of subsurface moisture content data. Appendix C presents the results of the Consent Order investigations conducted at MDA C. Appendix D provides an evaluation of the extent of the trichloroethene (TCE) vapor plume beneath MDA C. Appendix E presents an evaluation of groundwater data collected from the MDA C groundwater monitoring wells. Appendix F contains an update of the groundwater monitoring network evaluation for MDA C. Appendix G provides a summary of DOE's radiological-protection requirements applicable to the MDA C corrective measure, and includes a preliminary radiological dose assessment. Appendix H presents conceptual design information for soil-vapor extraction (SVE). Appendix I provides the cost estimates for the corrective measures alternatives identified and carried through sections 7 and 8. Appendix J presents a conceptual design and preliminary specifications for the recommended site cover. Appendix K (on CD with this report) contains the vapor-monitoring data collected after the Phase III investigation.

2.0 BACKGROUND INFORMATION

MDA C is located within TA-50 at the head of Ten Site Canyon. TA-50 is bounded on the north by Effluent and Mortandad Canyons, on the east by the upper reaches of Ten Site Canyon, on the south by Twomile Canyon, and on the west by TA-55. Facilities at TA-50 include a radioactive liquid waste treatment facility (RLWTF), a waste characterization, reduction, and repackaging facility, offices, several storage areas, SWMUs and AOCs, and MDA C. Figure 1.0-1 shows the location of MDA C and the surrounding technical areas.

MDA C is an inactive 11.8-acre landfill consisting of 6 disposal pits, a chemical disposal pit, and 108 shafts (Figure 1.0-2). Solid waste containing hazardous constituents as well as radioactive waste was

disposed of in the landfill between 1948 and 1974. The depths of the 7 pits at MDA C range from 12 to 25 ft below the original ground surface, and the depths of the 108 shafts range from 4 to 25 ft below the original ground surface. The original ground surface is defined as the surface beneath the operational cover that was placed over the site in 1984. The pits and shafts are constructed in the Tshirege Member of the Bandelier Tuff. The regional aquifer is estimated to be approximately 1320 ft below ground surface (bgs) (LANL 2011, 204370, p. 13). The topography of MDA C is relatively flat, although the slope steepens to the north where the northeast corner of MDA C abuts the south wall of Ten Site Canyon.

The following subsections provide a summary of site information. Additional information is provided in the MDA C investigation work plan (LANL 2005, 091493) and report (LANL 2006, 094688); the Phase II investigation work plan (LANL 2007, 098425) and report (LANL 2009, 107389); and the Phase III investigation work plan (LANL 2010, 109260) and report (LANL 2011, 204370). These documents describe the site and include information on the disposal units, waste inventories, characterization activities, analytical results from sampling, and assessments of potential present-day risks to human health and the environment.

2.1 Site History

MDA C was established to replace MDA B at TA-21 as a disposal area for Laboratory-derived waste. MDA C operated from May 1948 to April 1974 but received waste only intermittently from 1968 until it was decommissioned in 1974. Wastes disposed of at MDA C consisted of liquids, solids, and containerized gases generated from a broad range of nuclear research and development activities conducted at the Laboratory. These wastes included uncontaminated classified materials, metals, hazardous materials, and radioactively contaminated materials.

There are 7 pits and 108 shafts at MDA C (Figure 1.0-2). Ten shafts in Shaft Group 3 (Shafts 98–107) are lined with 12-in.-thick concrete, while the rest of the pits and shafts are unlined. Fill dirt was used to cover the material disposed of in the pits as they were being filled. The dirt acted as a temporary cover. The pits were filled with crushed tuff when they were decommissioned. The shafts were sealed by filling them with crushed tuff, followed by concrete. The dimensions and operation dates of the pits and shafts are listed in Table 2.1-1.

2.2 MDA C Inventory

The waste disposal records for MDA C are contained in a series of disposal logbooks (LASL 1948–1969, 076035). The radioactive waste disposal records provide some basis for estimating the location, type, and volume of the waste disposed of and to estimate the number of curies present in specific pits and shafts. However, little data exist on the volume of nonradioactive waste (i.e., hazardous constituents) disposed of at MDA C. Waste inventory information gleaned from the logbooks is summarized in the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan for Operable Unit (OU) 1147 (LANL 1992, 007672, pp. 2-52–2-56).

2.2.1 MDA C Disposal Pit Inventory

The pits at MDA C (Figure 1.0-2) were used to dispose of solid wastes containing hazardous constituents, uncontaminated classified materials, and low-level waste (LLW). Operating dates for each disposal pit and a discussion of the waste inventory for each disposal pit compiled from disposal records for MDA C are summarized below.

Pit 1 (Nov 1948–Sept 1951)

Based on Los Alamos Scientific Laboratory (LASL) logbooks 2587 and 3478, materials disposed of to Pit 1 included TCE, boron, sulfuric acid, graphite, medical laboratory solutions, contaminated materials and trash, tritium, americium-241, uranium, classified materials, plutonium, cyanide, mercury, radium-226, acids, lead, and waste oil (LANL 2006, 094688, pp. 3–4).

Pit 2 (Apr 1950–Sept 1951)

Based on LASL logbooks 2587 and 3478, materials disposed of to Pit 2 included TCE, contaminated materials and trash, boron, tritium, americium-241, uranium, sulfuric acid, biological waste, graphite, classified materials, plutonium, cyanide, mercury, radium-226, acids, lead, and waste oil (LANL 2006, 094688, p. 4).

Pit 3 (Oct 1951–Apr 1953)

Based on LASL logbook 4644, materials disposed of to Pit 3 included mercury teplers, tritium-contaminated glassware, cyanide solutions, contaminated materials and trash, TCE, boron, americium-241, uranium, sulfuric acid, biological waste, graphite, classified materials, plutonium, radium-226, acids, lead, waste oil, and beryllium (LANL 2006, 094688, p. 4).

Pit 4 (Oct 1951–Feb 1955)

Based on LASL logbooks 4644 and 6030, materials disposed of to Pit 4 included tritium-contaminated glassware, boxes and urine samples, mercury teplers, actinium-227, vials of radium-226, cyanide and cyanide solutions, a 5-gal. can of actinium waste, empty bottles, contaminated materials and trash, TCE, boron, americium-241, uranium, sulfuric acid, biological waste, graphite, classified materials, plutonium, acids, lead, waste oil, and beryllium (LANL 2006, 094688, p. 4).

Pit 5 (Apr 1953–Sept 1959)

Based on LASL logbooks 6030, 7277, and 9593, materials disposed of to Pit 5 included batteries (acids and lead), a 5-gal. can of actinium-227 waste, lead bricks, vials of radium-226, zirconium shavings, cyanide and cyanide solutions, radionuclide-contaminated waste oil, empty bottles, silver nitrate, beryllium chips, tritium-contaminated boxes and urine samples, contaminated materials and trash, TCE, boron, americium-241, uranium, sulfuric acid, biological waste, graphite, classified materials, and plutonium (LANL 2006, 094688, p. 4).

Pit 6 (Oct 1956–Sept 1959)

Based on LASL logbooks 9293, 9593, and 11363, materials disposed of to Pit 6 included radionuclide-contaminated oil, tritium-contaminated oil, copper sheets, cobalt chips, bottles of cadmium-boron tungstate, tritium-contaminated boxes and cans, a can of oil, approximately 100 Ci of source-strength cobalt-60, a lanthanum source, 10 bottles of platinum chloride, beryllium chips, carbon-14 contaminated graphite, a plutonium slug, contaminated materials and trash, TCE, boron, americium-241, uranium, sulfuric acid, biological waste, classified materials, mercury, actinium-227, radium-226, acids, and lead (LANL 2006, 094688, p. 4).

Chemical Pit (Early 1960–June 1964)

No logbook entries were made for specific wastes disposed of in the Chemical Pit at MDA C. The RFI work plan for OU 1147 states that the area "was used for burial of a variety of chemicals, pyrophoric metals, natural uranium powders and hydrides, sealed vessels containing sodium-potassium alloy, compressed gases, and unspecified equipment" (LANL 1992, 007672, p. 2-54). The RFI work plan also notes that plutonium- and uranium-contaminated objects were inadvertently placed in the pit but that no high explosives were ever disposed of there. The work plan also states "low-level radioactive waste placed in the pit may have included cardboard boxes containing materials from chemistry labs, as well as 55-gal. barrels of sludge from the waste treatment plants at building 35, DP West and TA-45" (LANL 1992, 007672, p. 2-54). Disposal of wastes at the Chemical Pit ceased in June 1964 when Area L at TA-54 became the Laboratory's chemical waste disposal site.

2.2.2 MDA C Disposal Shaft Inventory

The disposal shafts at MDA C were primarily used for disposing of beta- and gamma-contaminated waste from the Chemistry and Metallurgy Research building at TA-03; however, other Laboratory groups used the MDA C shafts for waste disposal as well. Radionuclide activities currently in the shafts are considerably lower than the as-disposed activities since most of the radionuclides associated with the waste are relatively short-lived. Estimated activities (decayed to January 2005) for Shaft Groups 1 through 3 were presented in the investigation report (LANL 2006, 094688, pp. J-37–J-38).

Three groups of shafts were used sequentially over time. The Shaft Group 1 consists of 12 shafts numbered 56–67. These shafts were originally numbered 1–12; however, they were renumbered in 1962 to be sequential with subsequent shafts. Shaft Group 1 is south of Pit 5. Shaft Group 2 consists of Shafts 1–55, which are located between Pits 1 and 3. Shaft Group 3 (Shafts 68–107) is west of Pits 1 through 4. The locations of the disposal pits and shafts are included in Figure 1.0-2. All the shafts were unlined, with the exception of Shafts 98–107, which were lined with 12-in.-thick concrete. In the 1950s or 1960s, a single disposal shaft was dug at MDA C solely for disposing of a single strontium-90 source.

The operating dates for each shaft group and a discussion of the waste inventory for each group of disposal shafts compiled from disposal records for MDA C follows.

Shaft Group 1 (Shafts 56–67 [Feb 1958–Oct 1959])

Based on LASL logbook 9593, materials disposed of to Shaft Group 1 included barium, tritium, radium, lanthanum-140, strontium-89 and -90, tantalum, cerium waste, two cerium sources, fission products, one lanthanum-140 static source, phosphoric acid, depleted uranium (DU), a charcoal trap, and polonium-beryllium-fluorine compounds (LANL 2006, 094688, p. 5).

Shaft Group 2 (Shafts 1–55 [Nov 1959–May 1967])

Based on LASL logbooks 9593 and 11363, materials disposed of to Shaft Group 2 included barium-140, lanthanum-140, fission products from the Omega Reactor, uranyl phosphate, graphite slugs, a cobalt-60 capsule, radioactive graphite, radioactive tantalum, 1 g of irradiated plutonium, thallium, irradiated uranium graphite, lead-beryllium sources, thorium, cesium, strontium, plasma thermocouples, fuel elements (rods), cobalt-60 slugs and sources, sulfuric acid solution, zirconium carbide, a copper sphere, two "rabbit" tubes of beryllium ("rabbits" are containers placed in a reactor neutron flux to irradiate the contents), reactor seals, alpha emitters in solution, acid solutions, actinium components, various uranium isotopes, DU, cerium-141, yttrium, silver-110, sodium-22, cesium-137, cesium-144, plutonium waste,

oralloy (enriched uranium from Oak Ridge National Laboratory), benzene, isopropyl alcohol, neptunium-237, contaminated materials and trash, americium-241, biological waste, classified material, radium-226, lead, silver, and “induced activity” (activation products, usually from a linear accelerator) (LANL 2006, 094688, p. 5).

Shaft Group 3 (Shafts 68–107 [Oct 1962–April 1974])

Based on LASL logbooks 11363 and 12442, materials disposed of to Shaft Group 3 included plutonium-contaminated trash, fission products, aluminum sheets and tubes, acids, cesium-137, sodium, cobalt-60, antimony, lanthanum-140, cobalt-60 sources, polonium, beryllium, vacuum pump oil, empty glass bottles, graphite, plutonium, boron, fuel element end caps, thermocouples, acetone, uranium, zirconium carbide, zinc and aluminum residues, barium, irradiated tantalum, tuballoy (a uranium alloy), shell waste, yttrium-91, radioactive chemicals and organic solutions, hydrochloric acid waste, plutonium in ether solution, zinc and mercury solutions, DU chips, miscellaneous sources, oralloy solution, iridium-192, tantalum, indium-114, animal tissues, solvents, a Los Alamos Molten Plutonium Reactor Experiment rod assembly, waste oil, detonator components, Navy reactor experiment reactor parts, trinitrotoluene (TNT) element samples, americium-242, aluminum-105, zinc-65, neptunium-237, contaminated materials and trash, americium-241, classified material, actinium-227, radium-226, lead, silver, strontium-90, and “induced activity” (LANL 2006, 094688, p. 6).

Strontium Disposal Shaft

A single unnumbered shaft located a few feet from the south corner of the MDA C fence (Rogers 1977, 005707, p. C-7) was used to dispose of a strontium-90 source sometime in the 1950s or 1960s.

2.3 Site Description

MDA C is located on Mesita del Buey, a finger-shaped mesa that trends southeast (Figure 2.3-1). The elevation of Mesita del Buey ranges from 7210 to 7280 ft above sea level. The topography at MDA C slopes gently from west to northeast, gradually becoming steeper across the northeastern quadrant of the site toward Ten Site Canyon. At MDA C, Mesita del Buey is approximately 2000 ft wide and is bounded by Ten Site and Effluent Canyons to the north and Twomile Canyon 750 ft to the south, across Pajarito Road (Figure 2.3-1).

2.3.1 Surface Soil

The soil of Mesita del Buey is derived from the weathering of the Tshirege Member tuffs (phenocrysts and phenocryst fragments, devitrified glass, and minor lithic fragments) and from wind-blown sources. Soil on the flanks of the mesa is developed on Tshirege Member tuffs and colluvium with additions from wind-blown and water-transported sources. Native soil has been disturbed by waste management operations over much of the surface of Mesita del Buey, but when present, native soils are generally thickest near the center of the mesa and thinner toward the edges,

In general, soil can be considered thin and poorly developed on the mesa surface; it tends to be sandy in texture near the surface and more clay-like beneath the surface. More highly developed soil profiles exist on the north-facing slopes; they tend to be richer in organic matter. Soil profiles on the south-facing slopes tend to be poorly developed. Soil-forming processes have been identified along fractures in the upper part of the mesa, and the translocation of clay minerals from surface soil into fractures has been described at Mesita del Buey.

The original soil in the vicinity of MDA C was poorly developed, as is typical of soils derived from Bandelier Tuff and formed under semiarid climate conditions, In general, undisturbed soil on the mesa tops consist of the Carjo loam, the Hackroy loam, and the Seaby loam. At MDA C, natural or undisturbed surface soil cover is limited as a result of disposal unit and cover construction. The present-day surface of MDA C is predominantly fill (crushed tuff) and imported topsoil.

Canyon bottoms near MDA C (Cañada del Buey, Twomile Canyon, Pajarito Canyon, Mortandad Canyon, and Ten Site Canyon) are covered with colluvium and alluvium that has eroded from the tuff and soil on the mesa top and canyon walls. The canyon rims and slopes are composed of soil from the Hackroy Rock outcrop complex; canyon bottoms are composed of the Tocal, a very fine sandy loam. Since disposal activities began at MDA C, Ten Site Canyon has experienced a period of accretion, and eroded soil from MDA C as well as other SWMUs and AOCs at TA-50 has been deposited on the canyon bottom and on the stream banks.

2.3.2 Subsurface Geology

A generalized stratigraphic cross-section of the Bandelier Tuff is shown in Figure 2.3-2. Detailed cross-sections through MDA C, as defined by the stratigraphy encountered during drilling of the vapor-monitoring wells and regional wells R-46 and R-60, are shown in Figure 2.3-3. The stratigraphic units present at the MDA C site are summarized below.

The predominant tuff unit at the surface is unit 3 of the Tshirege Member of the Bandelier Tuff (Qbt 3), a series of volcanic ash fall and ash flow deposits. Qbt 3 is poorly welded and nonindurated to slightly indurated and forms cliffs. Qbt 3 is approximately 100 ft thick at MDA C.

Below unit 3 is unit 2 of the Tshirege Member (Qbt 2). Qbt 2 is a competent, resistant unit that forms cliffs where it is exposed on the sides of the mesa. The rock is described as a moderately welded ash-flow tuff composed of crystal-rich, devitrified pumice fragments in a matrix of ash, shards, and phenocrysts. Unit 2 is extensively fractured as a consequence of contraction during post-depositional cooling. The cooling-joint fractures are visible on the mesa edges. In general, the fractures dissipate at the bottom of the unit. Qbt 2 is approximately 65 ft thick at MDA C.

Below unit 2 is unit 1v of the Tshirege Member (Qbt 1v). Qbt 1v is a vapor-phase-altered cooling unit that forms sloping outcrops, which contrast with the near-vertical cliffs of Qbt 2. Qbt 1v is approximately 75 ft thick at MDA C. Unit 1v is further subdivided into units 1vu (Qbt 1vu), where u stands for upper, and 1vc (Qbt 1vc), where c stands for colonnade. Qbt 1vu is the uppermost portion of unit 1v and consists of vapor-phase-altered ash-fall and ash-flow tuff. Qbt 1vu is unconsolidated at its base and becomes moderately welded nearer the overlying Qbt 2. Only the more prominent cooling fractures originating in Qbt 2 continue into the more welded upper section of Qbt 1vu but not in the less-consolidated lower section. More typically, fractures in Qbt 2 do not extend into unit 1 vu. Unit 1vc is a poorly welded, devitrified ash-flow tuff at its base and top, becoming more welded in its interior.

Below unit 1v is unit 1g of the Tshirege Member (Qbt 1g), Qbt 1g is a vitric, pumiceous, nonwelded ash-flow tuff underlying the devitrified Qbt 1vc. Few fractures are observed in the visible outcrops of this unit, and the weathered cliff faces have a distinctive Swiss-cheese appearance because of the softness of the tuff. Qbt 1g is approximately 75 ft thick at MDA C.

Below unit 1g is approximately is the Tsankawi pumice (Qbtt). Qbtt is the basal air-fall deposit of the Tshirege Member of the Bandelier Tuff. It is a thin bed of gravel-sized vitric pumice approximately 2 ft thick at MDA C.

Below Qbtt is the Cerro Toledo interval (Qct). Qct consists of thin beds of tuffaceous sandstones, paleosols, siltstones, ash, and pumice falls, which separates the Tshirege and Otowi Members of the Bandelier Tuff. Qct is approximately 65 ft thick at MDA C.

Below the Cerro Toledo interval is the Otowi Member of the Bandelier Tuff (Qbof). Qbof is a massive, nonwelded, pumice-rich, and mostly vitric ash flow. The pumices are fully inflated, supporting tubular structures that have not collapsed as a result of welding. The matrix is an unsorted mix of glass shards, phenocrysts, perlite clasts, and minute broken pumice fragments. Qbof is approximately 230 ft thick at MDA C.

Below the Otowi Member lies the Guaje Pumice Bed (Qbog). Qbog is the basal air-fall deposit of the Otowi Member of the Bandelier Tuff and is approximately 35 ft thick at MDA C.

Below the Guaje Pumice Bed is the Tschicoma Formation (Tvt 2). At regional well R-60 (Figure 2.3-3), Tvt 2 is 244 ft thick and consists of a thick section of generally massive, light gray dacite lava (LANL 2011, 111798). The dacite chips collected during drilling were too small to provide information about fractures and/or joints. However, the dacite lava flows at nearby regional well R-46 (Figure 2.3-3) and seismic hazard characterization borehole SHB-1 (located approximately 2400 ft to the northwest of R-60) are observed to be moderately to strongly fractured. Regional well R-46 contains an upper vesicular and scoriaceous unit that transitions to moderately to strongly fractured massive and nonvesicular dacite lava (LANL 2009, 105592). The fractures/joints are partially filled with iron-oxide precipitates. The basal dacite unit (921 ft–955 ft bgs) consists of breccia and scoria, containing fractures with iron-oxide precipitates. In addition, a dacite lava flow (644 ft–700 ft bgs) was intersected at the bottom of the 700-ft-deep borehole SHB-1 (Gardner et al. 1993, 012582). The dacite chips are intensely oxidized and exhibit faulting with cataclastic brecciation and shearing at 638 and 656 ft bgs. The intensity of oxidation noted in the dacite chips from the three wells is similar, and it is most likely that the thick, massive dacite lava flow in R-60 is also intensely fractured and jointed.

Below the Tschicoma Formation is the Puye Formation (Tpf), which contains the regional groundwater aquifer below MDA C. As described in the completion report for well R-60, Tpf is volcaniclastic sediment consisting of poorly sorted to unsorted, moderately indurated, medium to coarse gravels, fine to coarse sand, and varying amounts of silt. Well R-60 penetrated 513 ft of Tpf before drilling was completed (LANL 2011, 111798).

2.3.3 Surface Water

No permanent surface water exists at MDA C. Occasional surface runoff occurs as a result of snowmelt or seasonal thunderstorms that can produce significant rainfall in short time periods. Surface runoff may occur as minor sheet flow that drains toward the east-northeast into the upper portion of Ten Site Canyon, which borders the northeast corner of the site. No significant drainage channels exist on the site.

2.3.4 Vadose Zone Hydrology

The region beneath the ground surface and above the regional aquifer is called the vadose (unsaturated) zone. This discussion focuses on the vadose zone beneath the mesa at MDA C. The source of moisture in the vadose zone is precipitation, most of which is removed as runoff, evaporation, and transpiration (Hollis et al. 1997, 063131). In the Los Alamos area, evaporation and transpiration exceed precipitation (Figure 2.3-4). The subsurface movement of the remaining moisture (often referred to as recharge) is predominantly vertical in direction and is influenced by properties and conditions of the vadose zone.

The geologic property of the Bandelier Tuff that most influences fluid flow in the unsaturated zone is the degree of welding. Welded tuff tends to have less matrix porosity and more fractures than nonwelded tuff. Fractures in welded tuff may include relatively close-spaced cooling joints as well as tectonic fractures. Although nonwelded tuff also has fractures, it is generally less abundant than in welded tuff.

Several competing effects determine moisture content and fluid flux in welded, devitrified tuff. While water moves slowly through the unsaturated tuff matrix, it can move relatively rapidly through fractures if nearly saturated conditions exist (Hollis et al. 1997, 063131). The saturation levels measured at MDA C are relatively low (1%–10% gravimetric moisture content) (LANL 2005, 091493, pp. B-88–B-90). At these saturation levels, most of the fractures beneath the site are expected to be dry, and the water will exist predominantly in the tuff matrix. Only in situations when substantial infiltration occurs from the ground surface will the fractures become wet and conduct water. However, modeling studies predict that when fractures disappear at contacts between stratigraphic subunits, when fracture fills are encountered, or when coatings are interrupted, fracture moisture is absorbed into the tuff matrix (Soll and Birdsell 1998, 070011).

Analyses of moisture content and chloride data were performed on core collected from 20 boreholes during the Phase I investigation at MDA C. This core was collected predominantly from units Qbt 3, Qbt 2, Qbt 1v, and Qbt 1g (LANL 2006, 094688, Appendix L). That study found the water contents beneath the mesa were low, with average water contents below about 13% by volume and the majority less than 10%. The chloride mass-balance method is useful for estimating vadose zone fluxes and residence times in semiarid and arid environments. Downward water fluxes using the chloride method were estimated to be low at less than 0.12 in./yr (0.3 cm/yr), with about half the boreholes having flux estimates of less than 0.04 in./yr (0.1 cm/yr). Residence times for water to flow from the surface through the mesa were estimated to be greater than 1000 yr, with 2 of the boreholes having predicted residence times greater than 10,000 yr. Additional moisture content data from 14 new or deepened boreholes extending into Qct and Qbo were collected during the Phase II investigation (LANL 2009, 107389). The data are evaluated in Appendix B of this report and also indicate the mesa has low average water contents.

Tuff samples were collected to test for potential contaminants in and adjacent to substantial fractures at MDA C (LANL 2009, 107389). Five major fractures from four boreholes were sampled. That study provided evidence the fractures and the tuff adjacent to the fractures did not contain higher concentrations of contaminants or facilitate downward infiltration of contaminants. Therefore, fractures in the tuff units beneath MDA C are not likely to have a controlling impact on the fate and transport of water-soluble contaminants at the site.

No perched groundwater or intermediate-depth saturated horizons were encountered during any of the investigations conducted at MDA C or during the drilling of nearby regional wells R-14, R-46, or R-60. Perched groundwater was encountered in the Puye Formation and dacite lavas at wells R-17 and PCI-2, located in Pajarito Canyon, 3000 ft southeast of MDA C. Based on the results of drilling beneath the mesa, these perched zones do not appear to extend under Mesita del Buey at MDA C. MDA C is located on a mesa top, so no shallow alluvial groundwater is present in the immediate vicinity. Alluvial groundwater is not known to be present in Ten Site Canyon to the north and northeast of MDA C.

2.3.5 Regional Aquifer Hydrology and Groundwater Monitoring Network

The regional aquifer is the only known aquifer in the Los Alamos area capable of producing a municipal and industrial water supply. Beneath MDA C, the regional water-table elevation is approximately 5920 ft amsl or approximately 1320 ft bgs (400 m bgs).

Beneath MDA C, the shallow portion of the regional aquifer is located within the Puye Formation (Tpf). Puye Formation sediments within the regional aquifer appear to be highly heterogeneous. Estimates of Puye Formation permeability in the regional aquifer at the monitoring wells downgradient of MDA C vary between 0.3 and 20 m/d (~1–60 ft/d) (LANL 2011, 204370).

Near MDA C, the groundwater velocity is approximately 450 ft/yr, the hydraulic gradient is approximately 0.014, and the direction of groundwater flow in the regional aquifer is to the east-southeast, toward the Rio Grande (LANL 2012, 209658). More detailed information about groundwater flow directions beneath MDA C is presented in Appendix F of this report and Appendix G of the Phase III investigation report (LANL 2011, 204370).

Groundwater monitoring wells in the MDA C monitoring group include regional wells R-14, R-46, and R-60 (Figure 2.3-1) (LANL 2011, 208811). Nearby regional well R-17 is part of general surveillance monitoring because it is not downgradient of MDA C, but it helps define the water table map and general chemistry of regional aquifer water near MDA C.

Well R-14 was installed in 2002 as a regional aquifer characterization well (LANL 2003, 076062). Well R-14 is located approximately 3200 ft east of MDA C in Ten Site Canyon (Figure 2.3 1). This well was installed primarily to determine the potential impacts of TA-50 effluent discharges on groundwater quality in the regional aquifer south of Mortandad Canyon (LANL 2003, 076062, p. 2).

Well R-17 was installed in 2005 as a regional aquifer characterization well (Kleinfelder 2006, 096578). Well R-17 is located approximately 3000 ft southeast of MDA C in Pajarito Canyon (Figure 2.3 1). This well was required by the Consent Order as part of the Pajarito Canyon investigation and was installed to evaluate perched and intermediate groundwater in the west-central region of the Laboratory (Kleinfelder 2006, 096578, p. 1).

Well R-46 was installed in 2009 to serve as a monitoring well for MDA C (LANL 2009, 105592). Well R-46 is located 880 ft downgradient (east-southeast) of MDA C on Mesita del Buey (Figure 2.3-1) Installation of well R-46 was directed by NMED as part of the approval of the Mortandad Canyon Groundwater Monitoring Well Network Evaluation (NMED 2007, 098775). Well R-46 was installed to increase the probability of detecting releases from MDA C before they can migrate to water-supply well PM-5 and the Laboratory boundary.

Regional monitoring well R-60 was installed in 2010 as an additional monitoring well for the site (LANL 2011, 111798). Well R-60 is located 100 ft downgradient (east) of MDA C on Mesita del Buey (Figure 2.3-1). Installation of well R-60 was directed by NMED as part of the second notice of disapproval for the MDA C Phase II investigation report (NMED 2009, 107361). One of the purposes of well R-60 was to monitor potential releases of contaminants from MDA C to groundwater (LANL 2011, 111798, p. 1).

2.4 Summary of Previous Investigations

A variety of investigations have previously been performed at MDA C. These include investigations performed before 1990 when the corrective action requirements of RCRA became effective, investigations performed as part of the MDA C RFI, and investigations performed under the Consent Order. Results of these investigations are summarized below. The pre-1990 investigations and RFI are described in the MDA C historical investigation report (LANL 2005, 091493, Appendix B), which also contains relevant data, figures, and tables. Descriptions of the Consent Order investigations and relevant data, figures, and tables are presented in Appendix C.

2.4.1 Summary of Pre-RFI Investigations

The scope and results of pre-RFI investigations are summarized in Table 2.4-1 and briefly described below.

Water Infiltration Study

From 1956 to 1961, the U.S. Geological Survey (USGS) conducted water infiltration tests at MDA C. The study concluded that in the presence of a continuous and consistent hydraulic head maintained for 99 d in a shallow pit, subsurface moisture preferentially moved laterally in the soil profile rather than downward into tuff. The study further concluded that the downward movement through soil and tuff is slow and inefficient, requiring more hydraulic head than is typically present at MDA C (LANL 1992, 007672, p. 2-57).

In separate studies in the 1960s, the Laboratory and USGS conducted a series of water-injection tests near TA-50 using uncontaminated water to explore the possible use of vadose zone injection wells for water disposal (Purtymun et al. 1989, 006889). The injection wells were completed in unit Qbt 3. Three longer-duration (89-d) injection tests were performed in which the water content was monitored to track the movement of fluids through the unsaturated tuff. The researchers measured the lateral migration of the moisture front and constructed cross-sections of water content at various times throughout the tests, and they concluded the tuff can retain or arrest the movement of water-soluble contaminants originating from liquid or solid wastes stored in the tuff (Purtymun et al. 1989, 006889). The injection results and subsequent modeling of the test indicate unsaturated flow and transport through the Bandelier Tuff units tested should be represented using a formulation that favors matrix flow and transport, rather than fracture-controlled transport. This behavior is believed to be a consequence of the high matrix permeability of the Bandelier Tuff (Robinson et al. 2005, 092040), which can transmit water away from the saturated injection borehole without saturating the surrounding tuff.

Surface Radiation Surveys and Sampling

Between 1976 and 1984, radiation surveys were conducted on the surface of MDA C to identify localized areas of elevated radioactivity (LANL 1992, 007672, p. 2-57). Surface soil and vegetation samples were subsequently collected from areas with elevated radiation levels and analyzed for radionuclides. Based on the results of these radiation surveys, MDA C was covered with crushed tuff, except in the northeast corner where no disposal pits or shafts are located.

In 1985, radiation surveys were conducted around the MDA C perimeter. Thermoluminescent dosimeters (TLDs) were used to estimate external penetrating radiation doses. TLD readings taken at 18 locations were all near local background levels. The TLD survey was repeated in 1986 with similar results (LANL 2005, 091943).

A Phoswich detector was used to perform a second 1985 radiation survey for the low end of the energy spectrum to detect the presence of x-ray and gamma-ray emitters on the soil surface using a 64-ft by 64-ft grid over the entire site. A high-pressure ion chamber was used to measure radiation doses at the high end. Both surveys indicated background conditions over most of the site; however, elevated levels of radioactivity were measured in the northeast corner of MDA C (LANL 2005, 091943).

Surface (0 to 1 cm) soil samples were collected in 1985 and analyzed for tritium, plutonium-238, plutonium-239, -240, and uranium. Tritium samples from the eastern half of MDA C were below the local background concentration of 4.0 pCi/mL (LANL 1998, 059730). Isotopic plutonium (up to 10 pCi/g of plutonium-239 and plutonium-240 and 30 pCi/g of plutonium-238) was detected on the north and east

sides of MDA C. Concentrations of uranium were all less than the soil background value (BV) within the MDA C boundary. The areas with elevated radionuclides correspond to the portion of MDA C that was not covered with soil in 1984. Additional surface soil sampling was performed in 1986, and samples were analyzed for americium-241, cesium-137, plutonium-238 and plutonium-239, and tritium. The results of these analyses were consistent with the 1985 results (LANL 2005, 091943).

Perimeter Pore-Gas and Sediment Sampling

In 1989, pore-gas samples were collected from a depth of 4 ft at six locations near the chemical pit and 12 perimeter locations immediately surrounding MDA C and analyzed for volatile organic compounds (VOCs). No VOCs were detected (DOE 1989, 015364).

Three sediment samples were also collected at 0- to 12-in. intervals from a drainage channel at the head of Ten Site Canyon and analyzed for pesticides, polychlorinated biphenyls (PCBs), VOCs, semivolatile organic compounds (SVOCs), metals, and radionuclides. Organic chemicals detected were one VOC, eight SVOCs, and four pesticides. Metals detected were barium, chromium, nickel, and zinc. Radionuclides detected were americium-241, cesium-137, plutonium-238, plutonium-239/240, radium-226, uranium-235, and total uranium (all isotopes) (DOE 1989, 015364).

2.4.2 Summary of RFI Investigations

Phase I RFI fieldwork was conducted at MDA C from 1993 to 2003. The scope and results of RFI investigations are summarized in Table 2.4-1 and briefly described below.

RFI fieldwork included the following activities (LANL 2005, 091493):

- surface investigations that included surface soil and fill sampling (1993) and VOC surface flux measurements (2000);
- subsurface investigations that included core sampling (1995–1996), pore-gas sampling (2001–2003), tritium probe sampling (2003), and borehole air-flow velocity measurements (1995–1996);
- three geophysical surveys in 1994, 2001, and 2002;
- biota screening and sampling in 2003; and
- tritium air monitoring in 2003 and 2004.

The key findings from these studies are summarized below:

- In surface samples collected in 1993, lead and silver were detected above soil BVs in 9 and 2 of 68 samples, respectively. Five organic chemicals were detected in 1 to 4 samples each. Radionuclides detected above BVs/fallout values (FVs) in 1 to 15 samples each were americium-241, plutonium-238, plutonium-239, thorium-232, and uranium-238. All inorganic chemicals detected above BVs, detected organic chemicals, and radionuclides detected above BVs/FVs were below respective residential soil screening levels (SSLs) and screening action levels (SALs) (LANL 2005, 091493, pp. B56, B-58–B-59). The low frequency of detection and low detected concentrations and activities indicated minor historical releases may have occurred. Americium-241 and plutonium isotopes were elevated in the northeast corner of MDA C compared to the remainder of the site.

- VOC surface flux samplers detected six VOCs above laboratory quantitation limits with tetrachloroethene (PCE) being detected most frequently (i.e., detected in all but one sample) (LANL 2005, 091493, pp. B-60–B-62). The highest PCE fluxes were measured south of Pit 6 in the vicinity of the Chemical Pit and near the southeast corner of Pit 5.
- Inorganic chemicals detected above BVs for tuff in borehole samples were aluminum, antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, lead, magnesium, nickel, selenium, and thallium. These inorganic chemicals were detected above BVs in 1 to 9 of 82 samples each. Six organic chemicals were detected in 1 to 8 samples each (LANL 2005, 091943, pp. B-81–B-82). Radionuclides detected or detected above BVs were americium-241, cesium-134, cesium-137, cobalt-60, europium-152, plutonium-238, plutonium-239, sodium-22, strontium-90, tritium, uranium-235, and uranium-238. These radionuclides were detected in 1 to 16 samples each, except for tritium, which was detected in 64 samples (LANL 2005, 091943, pp. B-84–B-86). All inorganic chemicals detected above BVs, detected organic chemicals, and radionuclides detected or detected above BVs/FVs were below respective residential SSLs and SALs, except for arsenic (1 sample) and tritium (5 samples) (LANL 2005, 091493, pp. B-81–B82, B-84–B-86, B-87). With the exception of tritium, the low frequency of detection and low detected concentrations and activities indicate limited mobility and transport from the disposal units. Lateral and vertical extent of metals, cyanide, and radionuclides were not defined.
- Twenty-four VOCs were detected in pore-gas samples collected from two boreholes near the Chemical Pit. Consistent with surface flux results, PCE and TCE were detected most frequently and at the highest concentrations. The nature and extent of VOC contamination in pore gas was not defined.
- Results for the tritium probe sampling showed tritium detected in all 15 shallow vapor probe samples. The two highest activities were detected west of Shaft Group 3 and north of the west end of Pit 6.
- The borehole air velocity study demonstrated air flow into and out of the MDA C boreholes in response to changes in atmospheric pressure. Instantaneous flow rates for the MDA C boreholes were in the range of 0.2 to 2 ft^3/min (SEA 1997, 076055, p. 6).
- Results of the August 1994 magnetometry demonstration survey were inconclusive because ferrous materials could only be identified within 12 ft of the surface. The 2001 geophysical survey identified the pit boundaries, although there was interference from a chainlink fence at the site. The results indicated most metal objects were buried in the southern part of Pit 5 and the cover thickness ranged from 0 ft to 8.8 ft, with a mean of 3.4 ft. The 2002 geophysical survey was conducted after the fence had been removed and found no evidence of disposal pits outside the fence line in the surveyed areas.
- Biota sampling results indicated burrowing mammals and ants are not transporting radionuclides from the subsurface to the ground surface at MDA C. The results also showed that pine trees had elevated levels of gross-alpha and -beta radioactivity in their needles, indicating that trees are able to transport radionuclides from the subsurface.
- Airborne tritium samples were collected at the MDA C air monitoring station biweekly from February 3, 2003, to March 15, 2004. The average airborne tritium concentration was 11.5 pCi/m^3.

2.4.3 Summary of Consent Order Investigations

2004–2007 Site Investigation

Field investigations conducted from 2004 to 2007 at MDA C under the Consent Order are reported in the MDA C investigation report (LANL 2006, 094688) and a supplemental data report (LANL 2007, 097285) and results are presented in Appendix C, section C-2.0, of this CME report. Under this investigation, a radiological survey was conducted and surface samples were collected at six locations and analyzed for radionuclides to supplement the surface sample data from the Phase I RFI. Geophysical and seismic surveys were performed to better define pit boundaries and to map the walls between Pits 1–4. Thirty-three boreholes were drilled, and 209 core samples were collected and analyzed for inorganic and organic chemicals and radionuclides to characterize the nature and extent of subsurface contamination. Core samples for geotechnical characterization were also collected from one of the boreholes. A total of 378 pore-gas samples were collected from the 33 boreholes and 2 existing boreholes in 2 sampling rounds and analyzed for VOCs and tritium to characterize subsurface vapor contamination. Three additional boreholes were drilled, and 40 pairs of core and pore gas samples were collected to determine the relationship between VOC and tritium concentrations in core and pore gas. Four additional boreholes were drilled between Pits 2 and 3, and 25 core and 25 pore-gas samples were collected to characterize potential contamination beneath the pits. A risk-screening assessment was conducted that concluded surface and shallow subsurface contamination did not pose a potential unacceptable risk to human health and the environment based on current (i.e., industrial) site use.

The soil and rock sample results indicated a number of inorganic and organic chemicals were detected at low concentrations beneath the former disposal units and were consistent with the results obtained during the Phase I RFI. Inorganic chemicals detected above BVs during the 2005–2006 study were generally less than 5 times the BV. The interpretation of these results indicates little if any migration of metals and other inorganic chemicals from the disposal units. Although several inorganic chemicals were detected above BV or the maximum background concentration in samples collected at the total depth (TD) of the borehole, the detections above background in TD samples were generally only slightly above background and were generally not accompanied by detections above background in higher lithologic units. The results appear to indicate the detections above background in TD samples are associated with natural variability of the tuff rather than indicative of unbounded releases.

Thirty-six organic compounds were detected in core samples. These compounds consisted of 2 VOCs, 18 SVOCs (primarily polycyclic aromatic hydrocarbons), 3 PCBs, 9 dioxin or furan congeners, and 4 explosive compounds or degradation products. All detected concentrations were low (i.e., below 1 mg/kg) and many were below the estimated quantitation limits. Detections were generally sporadic with no discernible spatial pattern indicative of a release.

Forty-two VOCs were detected in pore-gas samples collected during the first round of sampling. The VOCs with the highest frequency of detection were chloroform (209 of 210 samples), dichlorodifluoromethane (208 of 210 samples), PCE (209 of 210 samples), and TCE (210 of 210 samples). The VOCs with the highest detected concentrations were PCE (maximum concentration 24,000 µg/m^3) and TCE (54,000 µg/m^3). All other VOCs had maximum concentrations less than 10,000 µg/m^3. Similar results were obtained from the second round of pore-gas sampling and the paired core–pore-gas sampling. The pore-gas results indicated a release of VOCs from the disposal units. The results of the paired core–pore-gas samples indicated vapor diffusion was the mode of VOC release and transport (i.e., concentrations in core samples were too low to indicate liquid-phase migration).

Uranium isotopes were detected above BVs in core samples, and 5 fallout radionuclides (americium-241, cesium-137, plutonium-238, plutonium-239, and strontium-90) were detected in core samples.

Uranium-235 was detected most frequently above BV, but all results were less than 4 times BV. All fallout radionuclides were detected at low activities (less than 1 pCi/g). Detections were generally sporadic with no discernible spatial pattern indicative of a release.

Tritium was not analyzed in core samples but was detected in pore-gas samples. Tritium was detected in 197 of 210 samples during the first round of pore-gas sampling and 162 of 168 samples during the second round. The highest activities (up to 1.94×10^8 pCi/L) were detected near the southwest corner of Pit 5 and southeast corner of Pit 6, indicating a release in this area.

2008–2009 Phase II Site Investigation

Phase II investigations conducted in 2008 and 2009 at MDA C under the Consent Order are reported in the Phase II MDA C investigation report (LANL 2009, 107389), and results are presented in Appendix C, section C-3.0, of this CME report. The specific objectives for the Phase II investigation were (1) to define the nature and extent of target analyte list (TAL) metals at the surface at MDA C and (2) to characterize subsurface pore-gas concentrations of VOCs and tritium (LANL 2007, 098425). Under this investigation, 59 surface and near-surface samples were collected at 30 locations to define the extent of TAL metals and conduct risk-screening assessments. Subsurface investigation activities included installing 5 new boreholes at locations without existing boreholes, extending 8 existing boreholes, installing 7 new deep boreholes next to existing shallow boreholes, and installing 1 new pilot-test borehole. Fourteen vapor-monitoring wells were constructed in the new boreholes and associated existing boreholes. A total of 104 core and 91 pore-gas samples were collected from these boreholes and vapor-monitoring wells to better define the vertical and lateral extent of contamination in tuff and pore gas.

The surface and near-surface samples showed 6 metals detected above BVs in 1 to 15 samples each. Detected concentrations above BVs were low, with maximum concentrations less than 5 times BV. The low concentrations and low frequency of detection above BVs are not indicative of releases from the site. The vertical and lateral extent of contamination were defined for all TAL metals in the surface and near-surface at MDA C.

The core sample results for inorganic chemicals were consistent with the results obtained during the 2004–2006 investigation. With the exception of chromium, detections of inorganic chemicals above BV were generally sporadic and not indicative of a release. Chromium was generally detected above BV only in deeper tuff units (Qbt 1g, Qct, and Qbo). Detections were only slightly above BVs and appeared to be associated with natural variability. With the possible exception of borehole 50-603470, vertical and lateral extent of contamination were defined for all inorganic chemicals in tuff at MDA C. Borehole 50-603470 penetrated the Tschicoma dacite and the TD sample was collected in the dacite. Concentrations of inorganic chemicals in this sample were generally higher than in overlying samples, but it was not possible to determine whether concentrations were above BV since no background data are available for dacite.

The core sample results for organic chemicals showed organic chemicals were not detected or were detected infrequently (i.e., in one to eight samples each) and at low concentrations. All detected concentrations were less than 1 mg/kg, and most results were less than the estimated quantitation limits. The vertical and lateral extent of contamination were defined for all organic chemicals in tuff at MDA C.

With the exception of uranium-235/236, radionuclides were not detected in core samples or were detected in only 1 or 2 samples at low activities (less than 1 pCi/g for fallout radionuclides). Uranium-234 and uranium-238 were not detected above BV in any samples but were detected in the dacite sample from borehole 50-603470. Uranium-235/236 was detected above BV in 35 samples, but all results were

less than 2 times BV. The vertical and lateral extent of contamination were defined for all radionuclides in tuff at MDA C.

The results of the pore-gas sampling for VOCs were similar to the results from the 2004–2006 investigation in terms of the VOCs detected and the frequency of detection. The samples from the new boreholes showed that VOC concentrations decreased with depth and decreased with distance away from the disposal units. Therefore, the lateral and vertical extent of VOCs were defined in terms of decreasing concentration trends. Concentrations of PCE and TCE in the deepest samples at several locations were, however, above screening levels based on protection of groundwater. Therefore, extent was not defined to screening levels, which was one of the objectives of the Phase II investigation.

Pore-gas tritium samples from the new boreholes installed for the Phase II investigation showed tritium activities decreasing with depth and with distance from disposal units. The lateral and vertical extent of tritium in pore gas were defined at MDA C.

2010–2011 Phase III Investigation

Phase III investigations conducted in 2010 and 2011 at MDA C under the Consent Order are reported in the Phase III MDA C investigation report (LANL 2011, 204370) and results are presented in Appendix C, section C-4.0, of this CME report. Based on the results of the Phase II investigation, NMED directed the Laboratory to conduct a Phase III investigation to define the vertical extent of VOCs in pore gas to screening levels, evaluate concentrations of metals in the Tschicoma dacite, and determine whether contaminants had migrated to groundwater (NMED 2009, 107361). Four new boreholes were advanced into the top of the Tschicoma dacite. Dacite samples were collected at two depths from each of the two boreholes located outside the MDA C boundary and analyzed for TAL metals. Because the lateral and vertical extent of inorganic chemicals, organic chemicals, and radionuclides in tuff had been defined previously, no samples were collected from the overlying tuff in any of the new boreholes. The four new boreholes were completed as vapor-monitoring wells. Six quarterly rounds of vapor sampling were performed in 2010 and 2011. The first 4 rounds were performed using the 14 existing Phase II vapor-monitoring wells, and the final 2 rounds were performed using the Phase II wells and the 4 new Phase III wells. To evaluate potential groundwater contamination, a new regional well, well R-60, was installed approximately 100 ft east of MDA C. Two quarterly rounds of groundwater samples were collected from well R-60 in January and April 2011.

The concentrations of most metals detected in the dacite samples were much lower than the concentrations previously detected in the sample from borehole 50-603470. Because the concentrations of metals in the sample from borehole 50-603470 appeared more representative of soil and a soil horizon was video-logged at the top of the dacite in nearby well R-60, it was concluded the metals detected in dacite at borehole 50-603470 were not associated with a contaminant release.

The results of pore-gas samples collected from the deep Phase III monitoring wells showed VOC concentrations decreasing with depth to concentrations below screening levels for the protection of groundwater. The lateral and vertical extent of VOC contamination in pore gas at MDA C were defined.

Groundwater samples collected from well R-60 showed one VOC (acetone) detected in the first sample, but no VOCs were detected in the second sample. Tritium was not detected in either sample. These results indicate vapor-phase migration of VOCs and tritium from MDA C to the regional aquifer has not occurred.

2.4.4 Status of Vapor Monitoring

Vapor monitoring conducted after submittal of the Phase III investigation report has not previously been reported and results are presented in Appendix C, section C-5.0, of this CME report. The Phase III investigation report recommended quarterly monitoring from 46 sampling ports at 7 locations and annual monitoring from 108 ports at 10 locations (LANL 2011, 204370, pp. 96–97). The first two rounds of quarterly sampling using this recommended network and schedule were performed in August 2011 and October/November 2011. In December 2011, NMED approved the Phase III investigation report (NMED 2011, 208797) and directed vapor monitoring that replaced the monitoring recommended in the Phase III investigation report. NMED's approval requires semiannual monitoring from 80 sampling ports at 18 locations, with all samples analyzed for VOCs and tritium. The first semiannual monitoring event using this network was performed in March–April 2012. The results from the three monitoring events conducted after submittal of the Phase III investigation report are consistent with results of previous monitoring and are presented in Appendix C, section C-5.0, of this CME report. Data from these three monitoring events are included in Appendix K (on CD included with this report).

2.4.5 Summary of Canyons Investigations

Sediment, surface water, and groundwater data were collected as part of the canyons investigations required by the Consent Order. These data are very useful at helping determine whether SWMUs and AOCs (particularly those with outfall/mesa slope aspects) have contamination or release histories that manifest in the canyon floor and whether they are at levels that represent potentially unacceptable human-health risk or adverse ecological affects. These data are presented in canyons investigation reports. For MDA C, potential releases are also discussed within previous documents (LANL 2007, 097285; LANL 2009, 107389; LANL 2011, 204370) that address the nature and extent of contamination from the subsurface units comprising MDA C.

The data from adjacent canyons, specifically Ten Site and Pajarito Canyons, are used to address potential impacts from MDA C on shallow surface media including sediment, surface water, alluvial groundwater, and biota. The possible impact of releases from MDA C on sediment in Ten Site Canyon was evaluated using data collected from sediment investigation reaches downcanyon from MDA C as part of the Mortandad Canyon investigation (LANL 2006, 094161). These sediment data indicate no potential impacts from MDA C in canyon-bottom sediment. The spatial distribution of chemicals of potential concern (COPCs) indicates that other sources in TA-35 and TA-50 are the main sources of contaminants in sediment in Ten Site Canyon. The COPCs detected in reach TS-1W, which is the first reach downgradient of MDA C, were 4 metals, 26 organic chemicals, and 10 radionuclides. These COPCs are consistent with industrial operations in TA-35 and TA-50, and their concentrations and activities generally increased in the next downstream reach, which receives additional runoff from TA-35 sources. The potential impact on surface water was evaluated using data from surface-water samples collected in Ten Site Canyon downstream of reach TS-1W. The COPCs identified in filtered water samples from the sampling location nearest to MDA C were 26 inorganic chemicals (metals and anions) and 7 radionuclides. The COPCs identified in unfiltered water samples at the same location were 41 inorganic chemicals (metals and anions), 2 organic chemicals, and 10 radionuclides. These COPCs are consistent with industrial operations in TA-35 and TA-50 and do not indicate impacts from MDA C.

At the time of the Mortandad Canyon investigation, no alluvial, intermediate, or regional monitoring wells had been drilled in Ten Site Canyon, other than regional well R-14 and intermediate and regional wells farther downstream near the confluence with Mortandad Canyon. Therefore, no groundwater evaluation had been specifically directed to MDA C. The overall conclusion of the report, however, was that spatial distributions of inorganic chemical and radionuclide concentrations and activities indicate only a few key

sources of the COPCs observed in groundwater and vadose-zone pore water. The most important source is the outfall from the TA-50 RLWTF into Effluent Canyon. Other sources include the former TA-35 wastewater treatment plant outfall in Ten Site Canyon and possible discharges from cooling towers and radiochemistry laboratories at TA-48 in Effluent Canyon west of the TA-50 outfall (LANL 2006, 094161, p. 68). The data did not indicate impacts from MDA C.

All surface water runoff from MDA C goes into Ten Site Canyon, and none runs off into the Pajarito Canyon watershed. The Pajarito Canyon investigation, therefore, did not address potential impacts from MDA C on sediment and surface water in Pajarito Canyon. The groundwater evaluations in the Pajarito Canyon investigation report did describe elevated tritium activities in pore water from core samples collected during installation of regional monitoring well R-17 and perched-intermediate monitoring well PCI-2. These wells are located at the confluence of Twomile and Pajarito Canyons, approximately one-half mile south-southeast of MDA C. The source of this tritium was not known. Possible sources identified in the investigation report were historical sources in the upper watershed or possibly MDA C (LANL 2009, 106939, p. 60).

2.4.6 Status of Groundwater Monitoring

Groundwater monitoring under the Consent Order is conducted in accordance with an Interim Facility-Wide Groundwater Monitoring Plan (IFGMP). The IFGMP is updated annually to revise monitoring suites, frequencies, and locations based on evaluation of previous monitoring results and installation of new wells. Data from groundwater monitoring wells in the vicinity of MDA C have previously been reported in the periodic monitoring reports for the Pajarito Canyon watershed (wells R-17, R-60, and PCI-2) and the Mortandad and Sandia Canyons watershed (wells R-14 and R-46). The well locations are shown in Figure 2.3-1. The monitoring requirements for these wells specified in the 2010 IFGMP (LANL 2010, 109830) are summarized in Table 2.4-2. Revisions incorporated into the 2011 IFGMP, Revision 1, included moving wells PCI-2 and R-17 from the MDA C monitoring group to the General Surveillance monitoring group (LANL 2011, 208811). The monitoring requirements for the MDA C monitoring group contained in the 2011 IFGMP, Revision 1, are summarized in Table 2.4-3. In April 2012, the Consent Order was modified to allow groundwater monitoring to be performed and reported on an area-specific basis rather than by watershed (NMED 2012, 520171). Beginning with the periodic monitoring report submitted in May 2012, data from wells R-14, R-46, and R-60 are included in the MDA C monitoring group (LANL 2012, 218416). Data from wells R-17 and PCI-2, which are not specific to MDA C, are part of the General Surveillance monitoring group.

The second notice of disapproval for the MDA C Phase II investigation report required installation of two regional groundwater monitoring wells at MDA C (NMED 2009, 107361). One well was to be located near the southeast corner of MDA C and the other approximately 300 ft to the south. Based on the results of a network evaluation performed by the Laboratory, the MDA C Phase III investigation work plan (LANL 2010, 109260) specified revised locations approximately 200 ft to the north of those originally proposed. The investigation work plan also proposed installing the southern well (identified as well R-59) first, so groundwater elevation data could be collected and used to refine the location of the second well (identified as well R-60). Because of limited access caused by construction activities at the proposed location of well R-59, the Laboratory requested a deviation from the approved work plan to allow installation of the well R-60 first (LANL 2010, 109611). This revised approach was incorporated into the drilling work plan for well R-60 (TerranearPMC 2010, 109963), which was approved by NMED (2010, 109635). After well R-60 was installed, the Laboratory evaluated the water-level data and determined that installing an additional regional well at the proposed location of well R-59 would do little to improve the effectiveness of the MDA C monitoring network. The Laboratory, therefore, requested an extension for

proposing a location for R-59 until vapor-monitoring and groundwater data collected during the Phase III investigation could be evaluated (LANL 2011, 203595).

The Phase III investigation report includes a groundwater monitoring network evaluation for MDA C (LANL 2011, 204370, Appendix G). The purpose of this network evaluation was to determine the effectiveness of the existing network (i.e., wells R-46 and R-60) in detecting releases of contaminants from MDA C. This network evaluation was an update of the network evaluation performed during preparation of the Phase III investigation work plan that was used to propose locations for wells R-59 and R-60. The previous evaluation was updated using groundwater-elevation data from recently installed well R-60. The results of the evaluation show a detection efficiency for wells R-46 and R-60 of greater than 99% for TCE and greater than 95% for tritium (LANL 2011, 204370, p. G-9). Based on the results of the network evaluation, an evaluation of data from the vapor-monitoring network at MDA C, and an evaluation of groundwater data from wells R-46 and R-60, the MDA C Phase III investigation report recommended that well R-59 not be installed for monitoring purposes (LANL 2011, 204370). Instead, the investigation report recommended that the need for additional regional well or wells at MDA C be identified during the CME based on other monitoring objectives.

Appendix F of this report further evaluates the network efficiency with respect to potential releases of 2-hexanone at vapor-monitoring well location 50-603467 and tritium at vapor-monitoring well location 50-603383. The evaluation showed detection efficiencies of greater than 98% for 2-hexanone and greater than 99% for tritium.

The regional monitoring-well network around MDA C is designed to provide reliable detection of potential contaminants from MDA C reaching the regional aquifer. Appendix E provides a reliability assessment indicating the three deep monitoring wells in the MDA C monitoring group, R-14, R-46, and R-60, as well as nearby well R-17, are capable of producing reliable water-quality samples.

3.0 SITE CONDITIONS

3.1 Surface Conditions

Currently, MDA C has a vegetated surface cover consisting primarily of a native grama grass mixture. The vegetation was initially established after the 1984 addition of fill and topsoil to the site. MDA C is posted as a radiologically controlled area and is surrounded by an 8-ft-high chainlink fence. Access to the site is controlled by the Laboratory. Pajarito Road, which is used to access the site, is open only to Laboratory employees. Access to MDA C is gained through a locked gate only. No on-site activity may be conducted without prior review and approval of the activity by the facility manager.

3.1.1 Nature and Extent of Surface Contamination

As described in section 2.4.3 and Appendix C of this CME report, the Consent Order investigation data indicate very limited and minor contamination of surface and shallow subsurface soil and tuff. All sampling results for inorganic chemicals in surface and shallow subsurface soil and tuff were below residential and industrial SSLs. The Consent Order investigations did not include collection of surface and shallow subsurface samples for organic chemical analysis, but results of previous investigations showed all organic chemicals in surface samples to be below residential and industrial SSLs (LANL 2005, 091493, p. B-59). The nature and extent of surface radionuclide contamination is discussed in Appendix G.

3.2 Subsurface Conditions

3.2.1 Subsurface Utilities

The location of subsurface utilities is shown in Figure 3.2-1. Underground utilities next to the site include electrical, communication, gas, and water lines along the south and west sides of the site and a liquid radioactive waste line along the north side of the site. No utilities lie within the boundary of the site, with the exception of a short water line.

3.2.2 Disposal Pits

The subsurface waste disposal units at MDA C include seven unlined disposal pits excavated into unit Qbt 3 of the Bandelier Tuff. Disposal pit dimensions are summarized in Table 2.1-1. The waste in the pits was covered with crushed tuff at the time of pit closure and the closed pits have been covered with additional fill.

3.2.3 Disposal Shafts

The subsurface waste disposal units at MDA C include 98 unlined disposal shafts and 10 lined disposal shafts excavated into unit Qbt 3 of the Bandelier Tuff. Disposal shaft dimensions are summarized in Table 2.1-1. The waste in the shafts was covered with crushed tuff at the time of shaft closure and tops of the shafts sealed with concrete. The closed shafts were later covered with additional fill.

3.2.4 Nature and Extent of Vadose Zone Contaminants

3.2.4.1 Contaminants in Tuff

As described in section 2.4.3, the Consent Order investigation data indicate very limited and minor releases of contaminants from the MDA C disposal units into underlying tuff. No analytical results for tuff samples exceeded industrial SSLs for inorganic and organic chemicals. The nature and extent of radionuclide contamination in tuff is discussed in Appendix G.

3.2.4.2 VOCs in Pore Gas

Forty-three VOCs have been detected in subsurface vapor samples collected at MDA C from January 2010 to April 2012. Frequency of detection status for each of the nine sampling events is summarized in Tables 3.2-1 through 3.2-9. Most VOCs were detected infrequently (i.e., in less than 25% of samples). The only VOCs that have been detected at more than half the sampling ports are carbon tetrachloride, chloroform, dichlorodifluoromethane, methylene chloride, PCE, and TCE. These six VOCs were detected at more than half the sampling ports in most sampling events, and dichlorodifluoromethane, PCE, and TCE were detected in more than half the sampling events in every event. TCE is the most frequently detected VOC, being detected at 90% to 100% of the sampling ports and is also the VOC detected at the highest concentrations. The nature and extent of tritium contamination in pore gas is discussed in Appendix G.

The sources of VOC vapors at MDA C are thought to be associated with wastes disposed in the pits and shafts at the site, with VOCs being a component of the waste rather than a primary waste form. Significant quantities of VOCs are not expected to be present in the waste disposal units as solvents in a liquid phase, and the results of analysis of subsurface core samples for VOCs are consistent with this hypothesis. The highest concentrations of VOCs are generally detected at depths ranging from 100 ft to

400 ft bgs. This vertical distribution of VOCs indicates the source is not ongoing. If the subsurface VOCs are from past releases, the center of mass of the plume would have migrated vertically downward when the source was ongoing and the rate of release exceeded the rate at which VOCs could diffuse to the surface and volatilize. After release from the source stopped, concentrations near the surface would decrease, producing the vertical distribution that is observed. If subsurface VOCs were from an active, ongoing source, higher concentrations would be observed at higher elevations (i.e., shallower depths) near the base of the disposal units. This distribution is not observed.

As part of the Phase III investigation, a two-tiered-method screening evaluation was developed to identify vapor-phase VOCs that could potentially affect groundwater at concentrations exceeding applicable screening levels (LANL 2011,204370, Appendix F; LANL 2012, 209658). This screening evaluation was expanded to include all VOC vapor data collected during and after the Phase III investigation. The results of the screening evaluation are summarized below.

Tier I Screening

The Tier I screening method uses Henry's law to identify the vapor-phase VOC concentration threshold that would have to be exceeded for a given VOC to potentially impact the groundwater at concentrations exceeding applicable groundwater standards. If the Tier I screening level is exceeded for a given VOC, a Tier II screen is applied. The Tier I screening method is consistent with screening performed in the pore-gas periodic monitoring reports.

Tier I screening levels for all VOCs detected in pore gas samples collected from January 2010 to March 2012 are presented in Table 3.2-10. The maximum detected concentrations are compared with Tier I screening levels for each sampling event in Tables 3.2-1 through 3.2-9. As shown by this screening, maximum concentrations of six VOCs have exceeded Tier I screening levels:

- benzene (January 2011–March 2011 and August 2011 events only)
- 1,2-dichloropropane (April 2010–July 2010 event only)
- 2-hexanone (all events except August 2011 and October 2011–November 2011)
- methylene chloride (all events)
- PCE (January 2010–April 2010 event only)
- TCE (all events)

Benzene was detected infrequently, detected in only 11% of the vapor samples collected at MDA C. Benzene was detected above the Tier I screening level only for the January 2011–March 2011 and August 2011 sampling events and only in one sample for each event. For the January 2011–March 2011 event, benzene was detected at 1300 µg/m^3, which is slightly greater than the Tier I screening level (1150 µg/m^3), in the sample from 632.5 ft bgs at location 50-613182. For the August 2011 event, benzene was detected at 4100 µg/m^3 in the sample from 600 ft bgs at location 50-24813. Benzene has been detected at every sampling location and was detected during one to five sampling events at each location. The maximum concentration has been detected at eight locations for the nine sampling events. The pattern of benzene detections suggests diffuse contamination across the site at concentrations near detection limits. The two results above the Tier I screening level were one-time events that were not repeated. At 600 ft bgs at location 50-24813, results from all other sampling events were below detection limits. At 632.5 ft bgs at location 50-613182, benzene was detected at 1.8 µg/m^3 in the August 2011 sampling event and was below detection limits for all other sampling events.

Dichloropropane(1,2-) was detected above the Tier I screening level only for the April 2010–July 2010 sampling event and only in one sample (244 ft bgs at location 50-603383). The maximum concentration (600 µg/m^3) was only slightly greater than the Tier I screening level (580 µg/m^3). Dichloropropane(1,2-) has been detected at seven locations. It was detected in every sampling event at locations 50-24784, 50-603383, and 50-603503; three sampling events at location 50-603472; and one event at locations 50-603063, 50-603470, and 50-603471. The maximum concentration has always been detected at location 50-603383 at depths of 139 to 244 ft bgs, except for the March 2012–April 2012 event, when the maximum concentration was detected at location 50-603472 at 146 ft bgs (location 50-603383 was not sampled during this event). The spatial distribution of 1,2-dichloropropane indicates the presence of this VOC is primarily at the western end of MDA C.

In the four sampling events before the Phase III wells were installed, 2-hexanone was detected in only one sampling port (600 ft bgs) at one location (50-603467). The detected concentrations (190 µg/m^3 to 710 µg/m^3) all exceeded the Tier I screening level (105 µg/m^3). In the first two sampling events after the Phase III wells were installed, 2-hexanone was detected in one sample each at new locations 50-603183, 50-603184, and 50-603185 at concentrations ranging from 2 µg/m^3 to 2.9 µg/m^3, and continued to be detected at 600 ft bgs at location 50-603467 (1500 µg/m^3 and 1200 µg/m^3). In the three sampling events since the Phase III investigation report was submitted, location 50-603467 was sampled only once (March 2012–April 2012 event), and 2-hexanone was detected at 737 µg/m^3 at 600 ft bgs. The only other detection of 2-hexanone during this period was a detection of 2.1 µg/m^3 at 650 ft bgs at location 50-603470 in the October 2011–November 2011 event. Based on vapor-sampling results, the extent of 2-hexanone contamination is limited to the vicinity of location 50-603467.

Methylene chloride has been detected frequently in vapor samples collected at MDA C. In the six Phase III sampling events where all sampling ports were sampled, methylene chloride was detected in 54% of the samples collected and was detected above the Tier I screening level in 6% of the samples. Locations where methylene chloride has been detected above the Tier I screening level are 50-24813 (seven of nine events), 50-603064 (one of seven events), 50-603467 (two of seven events), 50-603468 (one of nine events), 50-603470 (seven of nine events), 50-603471 (nine of nine events), and 50-603472 (five of nine events). The maximum detected concentration has always been detected at either location 50-24813 or location 50-603471. These results indicate the highest levels of methylene chloride contamination in the central part of MDA C (i.e., in the vicinity of Pits 1–5). All detected concentrations greater than the Tier I screening level were from samples collected at 410 ft bgs or shallower depths, and concentrations decreased with depth at all locations.

PCE has been detected frequently in vapor samples collected at MDA C. In the six Phase III sampling events where all sampling ports were sampled, PCE was detected in 63% of the samples collected. PCE was detected above the Tier I screening level only during the January 2010–April 2010 sampling event, however, and in only two samples (96 ft bgs and 244 ft bgs) at one location (50-24784). The maximum concentration (4600 µg/m^3) was only slightly greater than the Tier I screening level (3630 µg/m^3). The maximum detected PCE concentration has always been at location 50-24784, at the west end of MDA C, except for the August 2011 event, when location 50-24784 was not sampled. PCE is detected at a higher frequency at the western portion of MDA C. The five western-most locations (50-24784, 50-603063, 50-603383, 50-603472, and 50-603503) had the highest frequency of detection (93% to 100% of all samples collected), while the five eastern-most locations (50-24813, 50-24822, 50-603062, 50-603468, and 50-603470) had the lowest frequency of detection (5% to 60% of all samples collected). This spatial distribution possibly indicates Pit 6 and the Chemical Pit, which were the last pits to operate, as the source of PCE.

TCE is the most frequently detected VOC and was detected in 98% of the vapor samples collected at MDA C. TCE is also the VOC most frequently detected above the Tier I screening level, with 71% of all sampling results exceeding the Tier I screening level. In addition, TCE is the VOC detected at the highest concentrations in vapor samples at MDA C. Because of the frequency and magnitude of TCE detections, the nature and extent of vapor-phase TCE contamination was thoroughly evaluated in the Phase III investigation report (LANL 2011, 204370, Appendix F). Vapor data were used to develop a three-dimensional model of the TCE plume. The TCE plume evaluation was updated to include the vapor-monitoring data collected since the Phase III investigation report was prepared. This updated evaluation is presented in Appendix D. Figure 3.2-2 shows a summary representation of the plume; a more detailed description of the model and results are presented in Appendix F of the Phase III investigation report (LANL 2011, 204370) and Appendix D of this report. The model results demonstrate the extent of TCE concentrations exceeding the Tier I screening level is defined in all directions. The highest TCE concentrations are beneath the southeast corner of MDA C at approximately 200 ft to 300 ft bgs.

Tier II Screening

The Tier II screening method analysis considers the migration of the VOCs to the water table and subsequent mixing with groundwater. This analysis includes migration of VOCs through the vadose zone in both the pore water and vapor phases. The resulting groundwater concentration following mixing immediately beneath the site is calculated and compared with applicable groundwater standards. If that calculated groundwater concentration exceeds a standard, further evaluation of the soil-vapor data is required to assess the potential impact that the particular VOC may have on groundwater.

Because 2-hexanone, methylene chloride, and TCE were detected above Tier I screening levels in all sampling events, a Tier II screening analysis was performed for these VOCs. This Tier II screening evaluation expands upon that presented in the MDA C Phase III investigation report (LANL 2011, 204370, Appendix F) by including all VOC pore gas data collected during and after the Phase III investigation and considering depth dependence and fracture flow. Because detections of benzene, 1,2-dichloropropane, and PCE above Tier I screening levels were infrequent, Tier II screening was not performed for these chemicals.

As noted above, the Tier II evaluation considers dilution and attenuation in the aquifer and in the vadose zone. As a first step in the Tier II evaluation, the Tier I screening levels were multiplied by aquifer dilution factors and compared with maximum pore-gas concentrations. The aquifer dilution factors were obtained from the analysis used to calculated depth-dependent Tier II screening levels in response to the approval with modifications for the Phase III investigation report (LANL 2012, 209658). This preliminary Tier II screening comparison is conservative because it only considers dilution in the aquifer and does not account for attenuation in the vadose zone. If a contaminant passes this screening comparison, no further evaluation is necessary. If not, a more detailed Tier II screening considering vadose zone attenuation is performed.

The preliminary Tier II screening level for 2-hexanone (1880 µg/m^3) is equal to the product of the Tier I screening level (130 µg/m^3) and the aquifer dilution factor for fracture flow (14.44), which is less than the aquifer dilution factor for porous media flow (330.52). The maximum detected concentration of 2-hexanone (1500 µg/m^3) is less than this screening level, so no further Tier II evaluation is needed. Because detection limits for 2-hexanone exceeded this screening level, however, the distribution of sample locations with elevated detection limits was evaluated to ensure that locations with elevated detection limits were bounded.

The Tier II screening for 2-hexanone is presented in Table 3.2-11. As shown in Table 3.2-11, detection limits for 2-hexanone exceeded the Tier II screening level at three locations: 50-24813, 50-603470, and 50-603471. These three locations are at the southeast corner of MDA C and are bounded laterally by locations where all detection limits were less than the Tier II screening level. The elevated detection limits for 2-hexanone at these locations are a result of sample dilution by the analytical laboratory from the high concentrations of other VOCs (e.g., TCE). Detection limits above the Tier II screening level are bounded vertically at all locations. At location 50-24813, detection limits exceeded the Tier II screening level for samples collected at depths of 99 ft, 150 ft, 207 ft, 241 ft, 286 ft, 358 ft, and 408 ft bgs. All detection limits for deeper samples collected at this location at depths of 450 ft and 600 ft bgs were less than the Tier II screening level. At location 50-603470, detection limits exceeded the Tier II screening level for samples collected at depths of 143 ft, 203 ft, 233 ft, 278 ft, and 450 ft bgs. All detection limits for deeper samples collected at this location at depths of 600 ft and 650 ft bgs were less than the Tier II screening level. At location 50-603471, detection limits exceeded the Tier II screening level for samples collected at depths of 146 ft, 209 ft, 242 ft, 288 ft, 360 ft, and 410 ft bgs. All detection limits for deeper samples collected at this location and adjacent location 50-613183 at depths of 450 ft, 500 ft, 550 ft, 600 ft, and 630 ft bgs were less than the Tier II screening level.

The preliminary Tier II screening level for methylene chloride (9600 µg/m^3) is equal to the product of the Tier I screening level (665 µg/m^3) and the aquifer dilution factor for fracture flow (14.44), which is less than the aquifer dilution factor for porous media flow (330.52). The maximum detected concentration of methylene chloride (3900 µg/m^3) is less than this screening level, so no further Tier II evaluation is needed. No detection limits for methylene chloride exceeded the Tier II screening level, so no evaluation of elevated detection limits is needed.

The preliminary Tier II screening level for TCE (28,900 µg/m^3) is equal to the product of the Tier I screening level (2000 µg/m^3) and the aquifer dilution factor for fracture flow (14.44), which is less than the aquifer dilution factor for porous media flow (330.52). The maximum detected concentration of TCE (130,000 µg/m^3) exceeds this screening level, so further Tier II evaluation is needed.

As directed by the approval with modification for the MDA C Phase III investigation report (NMED 2011, 208797), the Tier II evaluation presented in the MDA C Phase III investigation report was expanded to consider transport through fractured media in the vadose zone and to consider depth dependence of Tier II screening levels. The revised Tier II screening levels developed in response to NMED's approval comments (NMED 2011, 208797; LANL 2012, 209658) consider vapor diffusion through porous media in the Bandelier Tuff units and vapor diffusion through both porous media and fractures in the Tschicoma dacite and Puye Formation below the Bandelier Tuff. The effect of fracture flow is conservatively accounted for assuming no attenuation in the units below the tuff (i.e., the depth-dependent Tier II screening level is applied at the top of the dacite rather than at the water table). These depth-dependent Tier II screening levels for TCE are presented in Figure 3.2-3. Tier II screening results for all TCE data collected during and after the Phase III investigation are presented in Table 3.2-12.

The Tier II screening evaluation shows Tier II screening levels based on porous media flow (which are higher than the Tier II screening levels based on fracture flow) to be exceeded at four locations: 50-24813, 50-603468, 50-603470, and 50-603471. These results are consistent with the three-dimensional TCE plume model presented in Appendix D, which shows the highest TCE concentrations to be bounded by these three locations. Tier II screening levels based on fracture flow were exceeded at six additional locations (50-24822, 50-603063, 50-603064, 50-603467, 50-603472, and 50-613183). Five of these locations surround the three locations where Tier II screening levels for porous media flow were exceeded and the remaining location is collocated with one of the three locations. These results are consistent with the plume model presented in Appendix D. The area where Tier II screening levels were

exceeded is bounded laterally in all directions by locations where Tier II screening levels were not exceeded (50-24784, 50-603061, 50-603062, 50-603383, 50-603503, and 50-613185). At each location where Tier II screening levels were exceeded, the deepest sample collected at that location was less than Tier II screening levels. Therefore, the depth where Tier II screening levels were exceeded is bounded vertically at all locations.

3.2.5 Nature and Extent of Groundwater Contaminants

Data from the MDA C monitoring wells (R-14, R-46, and R-60) do not indicate any release of contaminants from MDA C to the regional aquifer. As described above, data from the Consent Order investigation of MDA C do not indicate a release of contaminants from the MDA C disposal units other than vapor-phase VOCs. Organic chemicals detected in samples collected from the MDA C groundwater monitoring wells during 2010 and 2011 are presented in Table 3.2-13. No organic chemicals were detected in samples from well R-14 during 2010 and 2011.

Three organic chemicals [acetone, bis(2-ethylhexyl)phthalate, and toluene] were detected in samples from well R-46. Acetone was only detected during one sampling event for 2010, and toluene was detected in all four sampling events for 2010. Neither chemical was detected in samples from four sampling events in 2011. The VOCs acetone and toluene are detected infrequently and at low concentrations in MDA C vapor samples. Bis(2-ethylhexyl)phthalate, an SVOC, was detected in all samples from well R-46 analyzed for SVOCs. Concentrations of bis(2-ethylhexyl)phthalate in samples from well R-46 are decreasing with time. Bis(2-ethylhexyl)phthalate is not a VOC and is not associated with the VOC vapor contamination at MDA C.

Seven organic chemicals [acetone; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; diethylphthalate; and 4-nitrotoluene) were detected in samples from well R-60. Acetone was detected in the first and third sampling events but was not detected in the two subsequent sampling events. Acetone, a VOC, is detected infrequently and at low concentrations in MDA C vapor samples. Benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; and benzo(k)fluoranthene, which are SVOCs, were detected only in the first sampling event and were not detected in four subsequent events. Diethylphthalate and 4-nitrotoluene were each detected in one of five sampling events. Diethylphthalate and 4-nitrotoluene are not associated with VOC vapor contamination at MDA C. No organic chemicals were detected in the sample from the most recent sampling event at well R-60. As discussed in Appendix E, the organic chemicals detected in wells R-46 and R-60 likely result from materials or chemical compounds introduced downhole during drilling and well construction.

The groundwater monitoring network evaluation presented in Appendix G of the Phase III investigation report evaluated the detection efficiency of TCE based on release of TCE to the regional aquifer at the locations where vapor-phase TCE concentrations exceeded Tier II screening levels. Although TCE was the only VOC with concentrations exceeding Tier II screening levels, as described in section 3.2.4.2, the maximum concentration of 2-hexanone detected at location 50-603467 approaches the Tier II screening level. Therefore, the groundwater monitoring network evaluation was updated to determine the detection efficiency for a release of 2-hexanone to the regional aquifer at location 50-603467. This evaluation is presented in Appendix F and indicates a detection efficiency of greater than 98% for releases of 2-hexanone at location 50-603467.

4.0 CONCEPTUAL MODEL FOR MDA C

A CSM is a representation of site conditions that conveys what is known or suspected about the sources, releases and release mechanisms, contaminant fate and transport, exposure pathways, potential

receptors, and potential exposures (EPA 1989, 008021, pp. 4-10). CSMs are developed based on analyses and interpretations of existing site knowledge, observations, and data. The sources, pathways, and receptors applicable to MDA C are shown pictorially in Figure 4.0-1. The MDA C CSM was used to support risk-based decision-making and to aid in identifying potential remedial alternatives.

A schematic diagram of the CSM that displays the release mechanisms from the sources (the disposal pits and shafts) and the potential exposures to receptors is shown in Figure 4.0-2.

The CSM diagram describes whether the exposure pathways are complete under current and future site conditions. The future scenario conservatively assumes that institutional controls are not maintained and no remedy is implemented. Current and future risks are also qualitatively evaluated for the purpose of the CME.

4.1 Primary Sources of Contamination

The primary sources of buried waste at MDA C are the disposal pits and shafts. MDA C was used as a disposal area for Laboratory-derived waste from May 1948 to April 1974 but received waste only intermittently from 1968 until it was decommissioned in 1974. Wastes disposed of at MDA C consisted of liquids, solids, and containerized gases generated from a broad range of nuclear research and development activities conducted at the Laboratory. These wastes included uncontaminated classified materials, metals, hazardous materials, and radioactively contaminated materials (section 2.1). For this CME, the CSM is concerned with the transport and risks associated with the hazardous constituents present at MDA C.

4.2 Primary Release Mechanisms

Six primary release mechanisms for the waste from the pits and shafts are identified (Figure 4.0-2). These are (1) release of waste into subsurface soil by biointrusion and leaching, (2) volatilization of VOCs to become soil vapor, (3) excavation into the waste, (4) biointrusion into the waste, (5) surface erosion and subsidence of the waste, and (6) cliff retreat and seismic events that expose waste. Surface soil is defined here as that which extends from the ground surface to 1 ft bgs. Subsurface soil is defined here as unconsolidated subsurface materials and consolidated rock located at depths greater than 1 ft bgs.

Biointrusion into the waste has the potential to spread contaminants into subsurface soils or to the surface through (1) adsorption of soluble chemicals by plant roots or (2) movement of wastes by burrowing animals. For plants common to Mesita del Buey, roots are most abundant in the upper 6.6 ft (2 m) but may extend deeper for some bushes and trees (Tierney and Foxx 1987, 006669). Burrow depths for ants and small mammals are generally less than 3.3 ft (1 m), although a small fraction of burrows extend to 6.6 ft (2 m) (Tierney and Foxx 1987, 006669). The crushed tuff covering the pits and shafts is subject to biointrusion, and the rooting and burrow depths cited are similar to the estimated crushed tuff thickness that currently covers the pit waste at the site (section 2.4.2). Shallow rooting plants and animal burrows are present across MDA C. The 2003 biota sampling indicated that burrowing mammals and ants did not transport radionuclides to the surface but that trees had transported radionuclides from the subsurface into their needles (section 2.4.2). An assumption of the CSM is that if trees transport radionuclides, they may also transport hazardous constituents such as metals. Under current conditions, the site is periodically mowed during the growing season for fire suppression. Pine trees and juniper were removed from the site several years ago, and mowing inhibits deeper-rooted plants (shrubs and trees) from reestablishing, although one juniper is currently present at the site. Currently, no efforts are made to fill animal burrows or limit small-animal activity. Under the future

conditions assumed in the CSM, which includes loss of institutional controls, deeper-rooted plant communities and larger animal populations may be established.

Leaching of waste constituents into the subsurface soil beneath and next to the pits and shafts potentially began during waste disposal. During disposal, open pits collected precipitation and runoff for periods ranging from approximately 1.5 yr to 4 yr; therefore, leaching rates were probably elevated compared with rates following pit closure. Because the shafts have a much smaller surface area and were commonly covered, collection of precipitation and runoff was probably minimal during disposal. Most of the shafts were unlined, although 10 were lined with 12-in.-thick concrete. Following pit/shaft closure, leaching of contaminants by water that infiltrates the disposal units continues. Leach rates are currently expected to be controlled by infiltration rates, which are estimated to be less than 0.1 in./yr (0.3 cm/yr) across the site (section 2.3.4). Investigation data indicate little if any migration of metals and other inorganic chemicals from the disposal units. Therefore, leaching from the disposal units has likely been minimal (section 3.2.4. of this report and LANL 2005, 090513).

The source of VOC vapors in the subsurface at MDA C is not well documented. The VOCs may be from waste solvents as well as solid wastes with incidental solvent contamination disposed of in the MDA C pits and shafts. While volatilization of VOCs within the disposal units may occur and represent an ongoing source, the spatial distribution of the subsurface TCE vapor plume indicates current-day releases are less than previous releases (section 3.2.4.2). Volatilization of VOCs present in the waste will affect soil vapor in fill material within the disposal units before diffusing further to subsurface soil vapor.

The third primary release mechanism is excavation (i.e., accidental human intrusion), which would take place through the crushed tuff covering the pits. Shafts have concrete covers (Rogers 1977, 005708), which may be less susceptible to excavation than is the pit waste. Exposure by excavation is a function of the volume and depth of waste excavated and will depend largely upon site access. Excavation into wastes is currently prohibited by site controls, but lack of these controls in the future may increase the potential for this release mechanism.

Biointrusion into the buried wastes can result in direct exposure to biological receptors. Vegetation at the site is presently mowed to control development of deep-rooted vegetation. No controls are currently in place to control burrowing animals at the site. The thickness of the cover soil may currently prevent biointrusion as past sampling results indicated burrowing mammals and ants are not transporting radionuclides from the subsurface to the ground surface at MDA C (section 2.4.2). Erosion may thin the cover in the future, however, increasing the potential for biointrusion.

Erosion is another primary release mechanism that can expose waste. Erosional rills and gullies sometimes form in the crushed tuff covers at the Laboratory (Broxton and Eller 1995, 058207). Historically, at MDA C, some erosion of the soil cover in the vicinity of Pit 5 was observed and repaired (LANL 2005, 091493, p. 6). While the current interim cover has sufficient thickness to prevent waste exposure though erosion, in the future, erosion could degrade the cover over time. For the most part, surface erosion will result in a gradual thinning of the crushed tuff cover over extended periods of time, and eroded sediment will be transported into the adjacent canyons. However, the quantities and intensities of precipitation falling on the disposal units will determine the generation of surface runoff and, hence, rates and patterns of erosion (Wilson et al. 2005, 092034; French et al. 2008, 106890).

Subsidence of the waste within the disposal units has the potential to expose wastes, although evidence of waste settling is not currently observed. Subsidence could occur In the future, but the existing soil cover should minimize the potential for waste exposure.

Exposure of the waste by cliff retreat is not currently observed, because the disposal units are set back several hundred feet from the mesa edge. Cliff retreat and seismic events are potential release mechanisms that may expose wastes over time. However, seismic rupture studies at TA-3 and TA-55 and detailed geological and structural analyses at the Chemistry and Metallurgy Research Replacement Nuclear Facility pit located west of MDA C show no evidence of faulting and high-density fractures that are indicative of ground motion (Gardner et al. 1999, 063492; Gardner et al. 2008, 104727).

4.3 Secondary Sources of Contamination

Two secondary sources, subsurface soil and soil vapor, are generated directly from primary release mechanisms (Figure 4.0-2). Direct release of waste from the pits and shafts to surface soil is not included as a secondary source because all indications are solid wastes were successfully disposed of in the disposal units rather than spilled and left at the surface. However, surface soil is included as an additional secondary source because migration of contaminants from subsurface soil to surface soil may occur through biointrusion, volatilization, excavation, erosion, and subsidence (via upward movement through the soil column).

4.4 Secondary Release Mechanisms

Several secondary release mechanisms can further spread contaminants from secondary sources toward potential receptors (Figure 4.0-2). For surface soil, these mechanisms are (1) stormwater runoff and erosion, (2) volatilization/vapor diffusion of VOCs, (3) excavation, (4) biointrusion, and (5) wind. For subsurface soil, the secondary release mechanisms are (1) leaching by percolating water (e.g., rain, snowfall), (2) volatilization and vapor diffusion of VOCs, (3) excavation, and (4) biointrusion. For soil vapor, the secondary release mechanism is vapor transport, consisting predominantly of vapor diffusion through the tuff units and Puye Formation and a combination of vapor diffusion and advection in the dacite. Excavation, biointrusion, erosion/subsidence, and cliff retreat/seismic events may result in direct exposure of receptors to waste without an associated secondary release mechanism.

Currently, limited contaminant transport by stormwater runoff and erosion of surface soils may occur at MDA C. Soil and sediment sampling during the pre-RFI studies (section 2.4.1) showed evidence of soil and sediment contamination at the top of the Ten Site Canyon drainage channel. Soil sampling during the RFI studies (section 2.4.2) and the Consent Order investigations (section 2.4.3) showed evidence of soil contamination. These pathways will become even more viable with a loss of institutional control.

Volatilization and vapor diffusion of VOCs can occur in both surface soil and in subsurface soil with subsequent migration in soil vapor. VOCs in waste or in pore water volatilize to form soil vapor as determined by Henry's law partitioning. Vapor-phase diffusion is a relatively rapid process, which, under existing conditions (low infiltration rates), is faster than unsaturated water flow and accounts for the observed migration to depth of VOCs in soil vapor within the Bandelier Tuff (Stauffer et al. 2005, 090537).

Topography is an important control on vapor transport within Mesita del Buey. With low contaminant concentrations in the air phase along the top and sides of the mesas, the steepest concentration gradients are toward the surface, which leads to preferential VOC transport toward the external mesa boundaries and yields releases of VOCs to the atmosphere, as observed from the surface-flux survey conducted at the site (section 2.4.2). Shallow vapor-phase contaminants will tend to diffuse out at the surface, while deeper vapor-phase contaminants may diffuse deeper. In paved areas, asphalt decreases this mechanism somewhat because it blocks the diffusive transport of VOC vapors from exiting at the surface (Stauffer et al. 2005, 090537). Diffusive gradients may also spread vapor-phase contaminants downward toward the regional aquifer. Although uniform diffusive contaminant migration is observed in

the high-porosity tuff, it is uncertain whether or not diffusion through the low-porosity, fractured Tschicoma dacite is uniform. In addition, air flow within the dacite may also contribute to migration of vapor-phase VOCs.

Vapor-phase VOCs originating from the pits and shafts are spread in soil vapor in the vadose zone; pore-gas data indicate a vapor plume, dominated by TCE, from the surface to a depth of approximately 600 ft, with the highest concentrations ranging between 250 ft and 300 ft bgs (LANL 2011, 204370). The TCE vapor plume is centered near the eastern end of Pits 1 through 4. Surface-flux measurements detected six VOCs with PCE being detected most frequently (Trujillo et al. 1998, 058242). Vapor-phase diffusion from the pits and shafts impacts air and may potentially impact regional groundwater in the future. The future impact to groundwater is not known because of uncertainty related to vapor transport through the dacite beneath the site, although only TCE exceeds the Tier II screening level for its potential to impact groundwater.

Leaching of contaminants from the disposal units and downward migration by percolation will continue at a slow rate because water will infiltrate into the surface of the site, as discussed in section 2.3.4. Shallow-rooting plants are well established at the site, which leads to low leaching and percolation rates. Travel times for leached, dissolved-phase, nonsorbing species (such as general inorganic anions and nonvolatile organic compounds) from the source areas to the regional aquifer on the order of 1000 yr or longer are predicted under this scenario, based on an assessment using the chloride mass balance technique (section 2.3.4 and Appendix B). Absorbing constituents, like metals, have longer travel times than adsorbing constituents. Both vadose zone and regional groundwater data indicate this release mechanism to groundwater is currently incomplete for both inorganic and organic chemicals.

4.5 Exposure Media

Contact with contaminated environmental media creates exposure pathways for both human and ecological receptors. Seven potential exposure media are identified for the site: (1) sediment, (2) surface water, (3) air, (4) soil, (5) dust, (6) groundwater, and (7) waste (Figure 4.0-2).

4.6 Receptors and Risks

Three potential receptors have been identified: (1) humans, (2) ecological receptors, and (3) groundwater. Groundwater is an exposure medium because it is used by both human and ecological receptors. Groundwater is also included in the CSM as a receptor because it is a resource. Human and ecological receptors may be exposed if pathways are complete through exposure routes such as inhalation, ingestion, or dermal contact. The air pathway from surface soils includes releases both to outside air and vapor intrusion into buildings. Risks to human health and the environment may occur if elevated concentrations of contaminants are present in the exposure media. Both current and future exposures are qualitatively evaluated below and in the CSM (Figure 4.0-2). The future exposure scenario includes the loss of institutional controls.

Under current conditions, several transport pathways are considered to be complete or potentially complete.

- Based on field data, the stormwater runoff, erosion of surface soil/sediment, and wind pathways are complete. The potential exposure is very low because current surface and subsurface contaminant levels do not pose a potential unacceptable risk to human health or ecological receptors (LANL 2005, 090513; LANL 2007, 098644).

- The air pathway (volatilization/vapor diffusion) is complete for VOCs. However, based on the low vapor fluxes emitted at the surface (Trujillo et al. 1998, 058242) the potential exposure from ambient air is low. The potential exposure from vapor intrusion into buildings is very low (LANL 2012, 215002, Appendix C). Exposure via the air pathway is currently limited to industrial workers and is regulated and controlled under occupational safety and health regulations.
- The completeness of the biointrusion pathway differs with depth because the density of plant roots and animal burrows decreases with depth (section 4.2). It is complete for surface soil and potentially complete for subsurface soil and wastes. Mowing minimizes the establishment of deeper-rooting plants, which helps to keep the exposure very low. The thickness of the operational cover helps to limit animal burrows and minimize direct exposure to the waste.
- The excavation pathway is potentially complete for site workers for surface soil and subsurface soil. However, excavation directly into the waste is an incomplete pathway because of current site controls. The exposure to site workers is very low because of operational controls. For the general public, the excavation pathway is not complete.
- All other pathways (leaching and diffusion/volatilization of contamination in subsurface soils to groundwater, diffusion of soil vapor to groundwater, erosion/waste subsidence, and cliff retreat/seismic events) are currently incomplete.

Under future conditions, the transport processes have longer to develop and pathways may become complete. For the CSM, institutional controls are assumed to cease and no corrective measures are implemented. These changes impact the following pathways and exposure scenarios. Most exposures are for human and ecological receptors unless groundwater is specified.

- Stormwater runoff and erosion of surface soil/sediment remain complete pathways. In the future, sediment and surface-water concentrations may increase as these processes erode the existing cover, resulting in a low future exposure.
- The air pathway (volatilization/vapor diffusion) remains complete for VOCs. Air concentrations in the future may increase if new releases of VOCs occur in the disposal units. However, based on the current configuration of the plume, it appears that VOC releases are less than in the past (LANL 2011, 204370). The future exposure, including vapor intrusion into buildings, is very low to low and would be controlled under occupational safety and health regulations as long as institutional controls are maintained.
- Wind remains a complete pathway for exposure to dust. The future exposure from this pathway increases from very low to low because surface-soil concentrations may increase without site controls.
- The potential for excavation into surface soil, subsurface soil, and waste increases in the future if people inadvertently enter the site. Exposures range from low/medium for surface soil to medium for subsurface soil and waste because concentrations closer to the waste are assumed to be higher. The assumed future medium exposure is based on uncertainty related to the inventory and concentrations of hazardous constituents in the waste.
- The completeness of the biointrusion pathway also differs with depth under future conditions because of the decreasing density of plant roots and animal burrows with depth. Under the future scenario, the pathway is complete for surface soil and subsurface soil, and potentially complete for wastes. The site is periodically mowed to reduce combustible loading when needed, but plants are generally left in place to limit erosion. Under the future conditions assumed in the CSM, which includes loss of mowing, deeper-rooting plant communities and larger animal populations may be established. Exposures range from low/medium for surface soils to medium for subsurface soils

and waste. The assumed future medium exposure is based on uncertainty related to the inventory and concentrations of hazardous constituents in the waste.

- Leaching of water-soluble contaminants from subsurface soils to groundwater is a potentially complete future pathway. However, completion of the pathway is expected to occur over a long time frame (e.g., several hundred to several thousand years) because of low infiltration rates across the mesa top, the distance to groundwater, and because many of the water-soluble contaminants (such as metals) strongly adsorb to subsurface soils and rocks. This pathway results in a very low future exposure.
- Uncertainties are associated with transport of vapor-phase contaminants through the fractured dacite; therefore, there are uncertainties about the potential of vapor-phase diffusion to impact groundwater in the future. Vapor-phase concentrations of TCE exceed the Tier II screening level (section 3.2.4.2). In the current configuration of the TCE vapor plume, the maximum vapor concentrations for TCE are present between 250 ft and 300 ft bgs, which is beneath the disposal units. This indicates the vapors have transported downward. For this reason, the future pathway is considered to be potentially complete. Because of uncertainty associated with this pathway, it is ranked as a future medium exposure to the groundwater resource.
- The future human and ecological receptor exposure to contaminated groundwater (from vapor-phase transport of contaminants to groundwater) is low. The groundwater exposure location for receptors is not likely to occur within the bounds of MDA C. Therefore, the concentrations of any contaminants reaching groundwater in the future will decrease because of dilution, dispersion, and attenuation before reaching a groundwater well. It is unlikely that groundwater would be extracted from a location having significant VOC concentrations.
- Erosion and subsidence may result in a potentially complete pathway to the waste. If these processes directly expose wastes, a low to medium exposure could result. The assumed future low to medium exposure is based on uncertainty related to the inventory and concentrations of hazardous constituents in the waste.
- Exposure of waste from cliff retreat and seismic activities may result in a potentially complete pathway. The disposal units are located several hundred feet from the mesa edge and are not expected to be impacted by cliff retreat for more than 10,000 yr (Broxton and Eller 1995, 058207; Reneau and Raymond 1995, 054709, and Appendix E of this report), which results in a very low future exposure.

4.7 Remedial Action Objectives

The remedial action objectives (RAOs) address exposure pathways with the potential for medium and high exposure. Based on the CSM, the RAOs for MDA C are as follows:

- Prevent human and ecological exposure to the waste through excavation, biointrusion, and erosion;
- Prevent human and ecological exposure to the contaminated surface soils and/or subsurface soils through excavation and biointrusion;
- Prevent groundwater from being impacted above a regulatory standard by the transport of VOCs through soil vapor; and
- Prevent the creation of contaminated leachate by restricting the infiltration of water into the waste.

The last RAO listed above is defined to address uncertainty related to potential leachate production from the unlined pits and shafts at MDA C. If excess water accumulates in the units, contaminated leachate may be generated and migrate downward from the site. Although water accumulation has not been observed, it is an undesired condition that warrants long-term prevention.

5.0 CORRECTIVE ACTION REQUIREMENTS

The MDA C subsurface disposal units are subject to a CME as outlined in Section VII.D of the Consent Order. The corrective action requirements for the MDA C disposal units are discussed below. The MDA C disposal units also contain radioactive materials that are regulated by DOE under the AEA and its implementing regulations and orders. Corrective action requirements applicable to radioactive materials are described in Appendix G.

5.1 Media Cleanup Standards

The cleanup and screening levels described in Section VIII of the Consent Order were followed in this CME to determine the recommended corrective measures alternative. Cleanup levels are based on the New Mexico Water Quality Control Commission's (NMWQCC's) groundwater and surface-water standards and NMED's cleanup levels for protection of human health and are consistent with the U.S. Environmental Protection Agency's (EPA's) National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Section 300.430(e)(2)(i)(A)(2).

NMED selected a human health target risk level of 10^{-5} and a hazard index (HI) of 1 for establishing site-specific cleanup levels for one or more contaminants for which toxicological data are published. NMED and the EPA have developed SSLs, EPA has established maximum contaminant levels (MCLs), and the NMWQCC has adopted groundwater and surface-water standards that are described below.

5.1.1 Soil

For residential and industrial land use, NMED specified SSLs that are based on a target total excess cancer risk of 10^{-5} and, for noncarcinogenic contaminants, a target HI of 1.0. Residential and industrial SSLs are from NMED guidance (NMED 2012, 219971). If an NMED SSL has not been established for a contaminant for which toxicological information is published, the Laboratory uses the most recent version of the EPA regional human health medium specific screening level for residential and industrial soil (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

If an excavation alternative is selected, these SSLs will be used as cleanup levels as specified in Section VIII.B.1 of the Consent Order.

5.1.2 Groundwater

The corrective measures alternative chosen will be required to meet the groundwater-quality standards given in Section VIII.A of the Consent Order. These standards include the NMWQCC groundwater standards, including alternative abatement standards (20.6.2.4103 New Mexico Administrative Code [NMAC]), and the drinking water MCLs adopted by EPA under the federal Safe Drinking Water Act (42 U.S. Code Sections 300f to 300j-26) or the Environmental Improvement Board (20.7.10 NMAC). If both an NMWQCC standard and an MCL have been established for an individual substance, then the lower of the two levels is the cleanup level for that chemical.

If no MCL or NMWQCC standard is available, the Laboratory uses EPA regional tap water screening levels (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm), adjusted to the 10^{-5} risk for carcinogens and/or an HI of 1 for noncarcinogens as the basis for proposing a cleanup level for the contaminant. If the naturally occurring (background) concentration of a contaminant exceeds the standard, then the cleanup level defaults to the background concentration for that specific contaminant.

5.1.3 Surface Water

No permanent surface water is present at MDA C and any impacts to surface water quality from MDA C would be caused by stormwater runoff. Discharge of stormwater runoff from MDA C is regulated under the Laboratory's National Pollutant Discharge Elimination System (NPDES) individual permit for discharge of stormwater from SWMUs and AOCs (NPDES Permit No. NM0030759). Because stormwater runoff from MDA C is subject to a permit under Section 402 of the federal Clean Water Act, additional controls under the Consent Order are not necessary.

5.1.4 Vapor-Phase Contamination

The Consent Order does not specifically address cleanup standards, screening levels, or other regulatory criteria for contaminants in subsurface vapor. The Laboratory, therefore, recommends the two-tiered approach to screen vapor-phase VOCs detected in the vadose zone described in section 3.2.4 be used to identify vapor-phase constituents potentially requiring corrective action and to establish cleanup levels for vapor-phase contaminants.

5.2 Consent Order CME Requirements

The purpose of the CME is to identify and evaluate potential remedial alternatives for MDA C. This CME focuses on realistic remedies, is tailored to this site, and is consistent with expected future land uses. Consent Order–specified evaluation criteria were used to select the recommended corrective measures alternative for the MDA C subsurface units based on evaluation of specific site conditions, including the contaminant inventory, the design of the disposal units, the environmental setting, and the nature and extent of contamination. Sections VII.D.4.a and VII.D.4.b of the Consent Order provide threshold and balancing criteria for screening and evaluation of prospective corrective measures, respectively. These criteria are listed in sections 5.2.1 and 5.2.2. Figure 5.2-1 presents a flow chart of the selection process used to determine the recommended corrective measures alternative.

5.2.1 Threshold Criteria

All alternatives must be screened based on the threshold criteria described in Section VII.D.4.a of the Consent Order. These threshold criteria are as follows:

1. be protective of human health and the environment;
2. attain media cleanup standards;
3. control the source or sources of release so as to reduce or eliminate, to the extent practicable, further releases of contaminants that may pose a threat to human health and the environment; and
4. comply with applicable standards for management of wastes.

5.2.2 Remedial Alternative Evaluation Criteria

Section VII.D.4.b of the Consent Order identifies five evaluation criteria (also known as balancing criteria) against which each alternative shall be evaluated in proposing a recommended alternative. The balancing criteria are as follows:

1. long-term reliability and effectiveness;
2. reduction of toxicity, mobility, or volume;
3. short-term effectiveness;
4. implementability; and
5. cost.

The justification for the recommended corrective measures alternative includes the supporting rationale based on the factors listed in sections 7 and 8, as well as a discussion of short- and long-term objectives for the site, and the benefits and possible risks of the recommended alternative.

5.2.3 RCRA Requirements

Waste disposal at MDA C ceased before the effective date of the RCRA hazardous waste regulations. Therefore, although wastes disposed of at MDA C might meet the current definition of hazardous or mixed wastes, MDA C is not a RCRA-regulated land disposal unit and is not subject to RCRA closure or post-closure care requirements. Wastes removed from MDA C disposal units as part of a corrective measure would be subject to the waste characterization requirements for newly generated wastes. If these wastes were characterized as RCRA-regulated hazardous or mixed wastes, they would be subject to RCRA requirements for storage, treatment, and disposal.

6.0 IDENTIFICATION OF TREATMENT TECHNOLOGIES

Section 6.1 describes the process used to identify treatment technologies, and section 6.2 screens treatment technologies applicable at MDA C. The technologies retained in section 6.2 are summarized in section 6.3 and carried forward to section 7 for inclusion in the corrective measures alternatives.

6.1 Classification of Treatment Technologies

General types of corrective measures technologies potentially applicable to MDA C site conditions and waste types were selected from the comprehensive technology list developed by the Federal Remediation Technologies Roundtable (FRTR 2009, 104730, Table B-1) available at http://www.frtr.gov/matrix2/section1/list-of-tables.html.

For wastes disposed at MDA C, potentially appropriate technologies fall into the four general categories listed below:

- containment
- in situ treatment
- excavation/retrieval
- ex situ treatment

Within the containment category, the subcategories evaluated are vertical barriers, deep and near-surface horizontal barriers, and surface barriers. Within the treatment categories, the subcategories include biological, chemical, physical, and thermal treatment. The excavation/retrieval technology will require either on-site waste disposal, off-site waste disposal, or ex situ treatment.

The majority of waste disposed at MDA C was LLW. Pre-1970 transuranic (TRU) and mixed LLW (MLLW) may also have been disposed at MDA C. Although a vapor-phase VOC plume exists in the subsurface of MDA C, the characteristics of the plume do not indicate an active, ongoing source or the presence of liquid VOCs in the pits or shafts. The screening of technologies is focused on (1) containment, in situ treatment, excavation/retrieval, or ex situ treatment of the hazardous constituents in the pits and shafts and (2) in situ treatment of the VOC plume in the vadose zone.

6.2 Screening of Technologies

Corrective action guidance from EPA (1994, 095975, p. 58) and DOE (1993, 073487, pp. 4-51-4-52) requires that potential corrective measures technologies be screened to eliminate those that prove impractical to implement, that rely on technologies not likely to perform satisfactorily or reliably, or that do not achieve the corrective action objectives within a reasonable time frame. When technologies provide similar benefits, cost is often also used as a screening tool.

For the MDA C CME, the screening of technologies included the following:

- review of site setting, characterization data and the CSM to identify conditions that may limit or promote the use of certain technologies;
- identification of the waste characteristics that limit the effectiveness or feasibility of technologies; and
- identification of the level of technology development, performance record and inherent construction, and operations and maintenance (O&M) requirements for each technology considered.

6.2.1 Containment Technologies

Containment technologies are intended to limit migration of contaminants or limit infiltration into the vadose zone. Such technologies may include surface and subsurface barriers, and various orientations and compositions of barriers may be used. The general functionality and potential applicability of each containment technology considered at MDA C are discussed below.

6.2.1.1 Vertical Barriers

Vertical barrier technologies, such as grout curtains, synthetic membranes, and reactive barriers, were considered of limited benefit for MDA C applications because the absence of near-surface groundwater at the site already limits lateral migration of most contaminants. Limiting the lateral component of vapor-phase transport of a limited number of volatile contaminants at the site is one potential application for vertical barriers at MDA C. However, this technology has been demonstrated primarily with groundwater contamination and its applicability with vapor-phase contamination is unproven.

Vertical barrier technologies were not retained.

6.2.1.2 Deep Subsurface Horizontal Barriers

The purpose of a deep subsurface horizontal barrier, such as forced grout injection, is to contain downward aqueous-phase contaminant transport and is generally suitable for sites with known aqueous-phase releases and/or climates with significant infiltration from the surface. Bottom barriers are horizontal subsurface barriers (i.e., underground barriers that run parallel to the surface) that prevent vertical liquid migration by providing a floor of impermeable materials beneath the waste. Subsurface tuff sampling data have not demonstrated that aqueous phase transport of contaminants from MDA C disposal units is occurring.

Deep subsurface horizontal barrier technologies were not retained.

6.2.1.3 Near-Surface Horizontal Barriers

Near-surface horizontal barriers created by a soil-grout mixture or vitrification could potentially provide protection from exposure by controlling intrusion into the waste by plants, animals, or people. Additionally, these barriers could limit the transport of contaminants by reducing infiltration of water through the waste. However, these technologies do not provide water storage. Rainfall that does not infiltrate may migrate to the edge of the treated area, potentially creating a focused area of recharge and increasing infiltration in those areas.

Near-surface horizontal barrier technologies were not retained.

6.2.1.4 Surface Barriers

Barriers placed on the surface of disposal sites can provide exposure protection, restrict infiltration of water, provide resistance to water and wind erosion, prevent or minimize intrusion into wastes by plants or animals, act as a deterrent to inadvertent human intrusion, and limit flux of gas-phase contaminants. Surface barriers can allow MDA C to meet the threshold criteria for protecting human health and the environment.

Surface barriers would likely be drawn from the following readily available technologies.

Asphalt Cover

Asphalt provides protection from contaminated soil and waste as well as a substantial barrier to surface erosion processes but has been shown at another Laboratory site, MDA AB Area 2 at TA-49 (LANL 1999, 063918, p. 22), to trap moisture that would otherwise be evaporated or transpired from the subsurface. Such trapped moisture could induce vertical transport of contaminants in the subsurface. As maintaining low moisture content is a desirable feature for MDA C, an asphalt cover is not suitable for this site. Additionally, a permeable cover allows the gradual diffusion of VOC vapors from the subsurface to the atmosphere, thereby reducing the subsurface contaminant inventory. A low-permeability asphalt cover would prevent the natural attenuation of subsurface VOC contamination by this mechanism.

Asphalt cover technology was not retained.

Concrete Cap

A concrete cap consists of a single layer of concrete that provides protection from contaminated soils and waste. However, as with the asphalt cover, moisture trapped under the cap is of concern. Such trapped moisture could induce vertical transport of contaminants in the subsurface. Additionally, because of the

size of the cap required to cover the pits/impoundments and shafts, the potential exists for significant cracking, thus limiting its effectiveness. A low-permeability concrete cover would also prevent natural attenuation of subsurface VOC contamination by surface diffusion.

Concrete cap technology was not retained.

Soil Barrier

A soil barrier consists of adding soil and planting vegetation over the disposal unit to provide an exposure barrier to contaminated soils and waste. The existing vegetated soil cover at MDA C is an example of a soil barrier. The soil barrier is not equivalent to an engineered store-and-release type of cover and protects primarily against erosion and inadvertent access. A vegetated soil barrier will result in less infiltration than a nonvegetated cover but is not specifically designed to minimize infiltration. Subsurface tuff data have demonstrated the existing soil cover at MDA C has been effective in preventing aqueous phase transport of contaminants from MDA C disposal units resulting from infiltration and leaching. Thus, a soil barrier may be effective at the MDA C site.

The soil barrier technology was retained.

Biointrusion Barriers

Various materials have been used as biointrusion barriers to control the intrusion of plants and animals into hazardous waste landfills. Installation of horizontal barriers constructed of angular cobbles, 4 in. to 6 in. in diameter with an overlying filter layer composed of sand and gravel, inhibits deep-rooting plants and discourages burrowing animals. The filter layer is designed to prevent fine soils in the overlying cover soil from migrating into the barrier. Results of an animal intrusion experiment conducted at the Laboratory using pocket gophers demonstrated that cobbles and cobbles with gravel effectively prevented animal intrusion. The weight and size of the cobbles prevented these animals from burrowing below the barrier. Cobbles were also effective in limiting root intrusion as the spaces between the cobbles are relatively free of soil and water (Nyhan 1989, 006876).

Chainlink fencing laid on the surface of a cover has been successfully used at a Laboratory site to discourage burrowing animals, while having no observable impact on beneficial vegetation (LANL 1999, 063919).

Biointrusion barrier technology was retained.

Compacted Clay Cover

Compacted clay covers have successfully controlled excess infiltration at RCRA-regulated landfills. However, clay liners are far less effective in arid and semiarid climates than in more humid environments because the clay tends to dry out and crack, allowing moisture to flow directly into disposal units (Mulder and Haven 1995, 071297, p. 7). As a standalone technology, compacted clay covers are not suitable for MDA C. However, compacted clay layers can be incorporated into multilayer cover designs considered for MDA C.

Compacted clay cover technology was not retained as a standalone technology.

Multilayer Cover (RCRA Cover)

Multilayer covers consist of different geologic and synthetic materials layered in a specific order to control various potentially detrimental processes and conditions (e.g., infiltration, erosion, and biointrusion). RCRA Subtitle C covers belong in this category. A standard RCRA Subtitle C cover includes the following: a surface vegetation layer, a sand drainage layer, a flexible geomembrane, and a base layer of compacted soil (typically clay) to meet hydraulic conductivity limits. The geomembrane is a thin impermeable barrier of synthetic material that offers very little structural capacity. Multilayer covers can be compromised if any of their components are not suited for the site.

Los Alamos's semiarid climate is considered potentially incompatible with the typical clay layer of the RCRA Subtitle C multilayer cover. Clay components are far less effective in arid to semiarid climates because the clay tends to dry out and crack, allowing moisture to flow directly into the disposal unit (Mulder and Haven 1995, 071297, p. 7). While long-term concerns are associated with the desiccation of the clay layer, the geomembrane may provide protection against infiltration of water should the clay layer crack.

The multilayer cover technology was retained.

Evapotranspiration Cover

The concept of the evapotranspiration (ET) cover relies on the soil to act as a "sponge" until infiltrated water can be removed via ET (Dwyer 2003, 097902). Generally, ET is defined as the combination of water removed by evaporation from the surface and transpiration through vegetation. ET covers are designed to provide infiltration protection for arid and semiarid environments, where materials such as clays and synthetic/geosynthetic membranes are less reliable. ET covers may consist of multiple layers of geologic materials suited to achieve the ET criteria. Suitable vegetation is a significant component for most ET covers to aid in the dewatering of the cover material(s). The vegetated ET cover was developed specifically for landfills located in arid and semiarid environments such as Los Alamos (Barnes et al. 1990, 070209, pp. 1201–1202). The earliest research in this area was conducted by the Laboratory at a test site approximately 2 mi from MDA C (Nyhan et al. 1984, 008797; Nyhan 1989, 006876; Nyhan et al. 1989, 006874).

The Los Alamos climate's demand for water or potential ET (PET) far exceeds annual precipitation (Figure 2.3-4). The ET cover also provides a medium for native vegetation.

Therefore, ET cover technology was retained.

6.2.2 In Situ Treatment Technologies

In situ waste treatment technologies are used to reduce the mobility and/or toxicity of wastes or to increase their stability without removing the wastes from their disposal location. In situ treatment generally requires longer time periods, and the uniformity of treatment is less certain because of the variability in soil and aquifer characteristics and because the effectiveness of the process is more difficult to verify. Different in situ methods (biological, chemical, physical, and thermal) are appropriate for different contaminants and disposal environments.

6.2.2.1 Natural Attenuation

Natural attenuation uses natural subsurface processes to reduce contaminant concentrations to acceptable levels. The natural attenuation processes include a variety of physical, chemical, or biological

processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil, soil vapor, or groundwater. These in situ processes include adsorption, biodegradation, dispersion, dilution, sorption, volatilization, radioactive decay, chemical reactions, and chemical or biological stabilization.

Consideration of the natural attenuation technology requires evaluating contaminant degradation rates and products as well as concentrations at potential downgradient receptor points. The primary objective is to demonstrate that natural processes of contaminant degradation will reduce contaminant concentrations below regulatory standards or risk-based levels before potential exposure pathways are completed. In addition, long-term monitoring is conducted to measure degradation rates to evaluate compliance with cleanup objectives. Commonly targeted contaminants for natural attenuation include halogenated VOCs, SVOCs, and fuel hydrocarbons. This technology may also be applicable to the VOCs in the vadose zone.

Therefore, natural attenuation was retained.

6.2.2.2 Biological Treatment Technologies

Biological methods using various microorganisms or vegetation have been effective in metabolizing a variety of organic contaminants and also in changing the solubility of certain inorganic chemical and radioactive species in low concentrations during the wastewater treatment processes. Potential in situ biological treatment technologies, including bioventing, enhanced bioremediation, and phytoremediation, provide limited benefit because of the dry soils present at MDA C. Biological treatment is also less viable for many chlorine-containing organic chemicals and may lead to more toxic byproducts than the original contaminant, such as TCE to vinyl chloride.

Biological treatment technologies were not retained.

6.2.2.3 Chemical Treatment Technologies

Chemical treatment, such as chemical oxidation or soil flushing, uses the physical properties of the contaminants or the contaminated medium to destroy (i.e., chemically convert), separate, or contain the contamination.

These technologies were not considered potentially applicable to the MDA C site because of difficulties in delivering the reactive chemicals uniformly to the soil. Incorporating large quantities of hazardous oxidizing materials or extraction fluids poses additional concerns for workers and possibly the environment.

Chemical treatment technologies were not retained.

6.2.2.4 Physical Treatment Technologies

In situ physical treatment technologies are a diverse group of technologies that include methods to remove mobile contaminants, to increase the mobility of contaminants, to further stabilize contaminants, and to destroy contaminants in place.

Physical treatments would likely be drawn from the following technologies.

Soil-Vapor Extraction

This technology uses vacuum blowers to accelerate the removal of vapor-phase contaminants, primarily VOCs and methane, from the vadose zone. The blowers create a negative pressure or vacuum in one or more boreholes. The vacuum removes the gases or vapors from boreholes by advective transport. This technology commonly requires a treatment system for the contaminated vapor that is extracted from the subsurface. SVE is generally applicable to contaminants having a dimensionless Henry's law constant greater than 0.01 (http://www.frtr.gov/matrix2/section4/4-7.html). The dimensionless Henry's law constant for TCE is 0.404 (NMED 2012, 219971); therefore, SVE would be an applicable technology for removing TCE from the vadose zone at MDA C. SVE can be applied as either an active system or as a passive system that uses ambient meteorological conditions to extract vapor-phase contaminants. Passive SVE is enhanced by using a wellhead control device that restricts the inward flow of ambient air into the subsurface under high atmospheric barometric conditions, allowing only outward flow of air.

The SVE pilot studies conducted by the Laboratory at MDA L in 2006 (LANL 2006, 094152) at MDA G in 2008 and 2010 (LANL 2009, 105112; LANL 2010, 109657) support retaining this technology for further consideration.

Pneumatic Fracturing

Pneumatic fracturing uses the injection of a fluid under pressure to create open fractures in an area where a contaminant plume exists. Opening subsurface flow paths allows access to the contaminated media for removal or treatment. Pneumatic fracturing has the potential to introduce large amounts of water into a formation that has optimal low moisture content and is not desirable. The shallow tuff is already highly fractured; therefore, pneumatic fracturing has limited benefit.

Pneumatic fracturing technology was not retained.

Dynamic Compaction

Dynamic compaction is used to compact and consolidate wastes in place to reduce the potential for settling or sinking over time. The technology has been successfully demonstrated on landfills where subsidence (e.g., settling) over large areas is likely and where waste is near the surface and of a homogeneous waste form (EPA 2002, 102739, p. 1). Dynamic compaction may adversely affect existing waste forms, creating the potential for release.

Dynamic compaction technology was not retained.

Jet Grouting Stabilization

Jet grouting employs high-pressure injection of a cementitious grout slurry into a soil strata to hydraulically mix the in situ material with the grout. The grout slurry is injected into and/or around the waste to fill void spaces and to reduce the porosity within and between buried objects. The objective of this treatment is to stabilize the waste form to reduce the infiltration and movement of surface water into and through the waste and to reduce the future potential for subsidence of waste and overburden.

One method involves injecting grout into holes drilled through the waste while simultaneously pulverizing the waste and mixing it with the grout. This approach is applicable only for homogeneous, soil-like wastes. Because of the heterogeneous nature of the waste at MDA C, this technology is not viable.

A second waste stabilization method involves the direct injection of grout into void spaces surrounding the waste. A pipe or auger is drilled into the subsurface and slowly rotated and pressurized. The high pressure (4000–13,000 psi) forces the grout laterally through special ports on the sides of the pipe or auger. The slurry exits the jet port at very high velocity, penetrating the soil several inches to several feet away from the ports. The rotating ports destroy soft soil formations while mixing the native soil with cement. Finally, the rotating pipe/auger is drawn slowly upward at a controlled rate to create a nearly cylindrical column of treated soil.

The waste material in the pits and shafts ranges from 10 ft to 25 ft bgs. Use of high pressure at shallower depths could be hazardous to workers. A breach may occur with the high-pressure application of grout. Additionally, the integrity of the drums and other waste containers in the disposal units could be damaged by high-pressure injection of grout.

Jet grouting stabilization technology was not retained.

6.2.2.5 Thermal Treatment Technologies

Thermal treatment technologies have been developed and implemented to decompose heat-sensitive contaminants into less toxic or less mobile forms or to enhance the extractability of a contaminant by heating it into a vapor phase. Heat is generated or delivered using several types of radiation (e.g., microwave, radio frequency, or thermal), using direct conductance of electricity, or injecting already heated materials (e.g., steam). VOCs present at MDA C are already readily extractable given the highly fractured subsurface where air readily travels through the mesa. Therefore, application of this technology at MDA C would provide minimal benefit.

Thermal treatment technologies were not retained.

6.2.3 Excavation/Retrieval Technologies

Excavation/retrieval technologies are used to remove wastes from the subsurface disposal units for disposal at another site. Factors affecting the viability of excavation/retrieval include the potential to reduce long-term human health and environmental risk versus increased short-term risk to human health and the environment during excavation, availability of treatments necessary to meet disposal requirements, and costs and risks of shipping large quantities of material off-site.

Excavation/retrieval of materials will require disposal in an appropriate facility (see section 6.2.5). Various methods for excavation and disposal are evaluated below.

6.2.3.1 Excavation

Excavation is the primary option for removing waste from the MDA C subsurface units. Waste in the larger disposal areas (i.e., pits) of MDA C would require large-scale soil moving and excavating equipment (remotely operated, if necessary), to safely remove the waste from the subsurface. The disposal shafts at MDA C are next to and at approximately the same depth as the pits. Therefore, it is anticipated the shaft waste would be excavated in conjunction with the pit waste. The maximum reported depth of the pits and shafts is 25 ft (Table 2.1-1). The Laboratory successfully excavated waste from disposal pits to this depth at MDA B (LANL 2012, 215119).

The excavation technology was retained.

6.2.3.2 Overcoring Retrieval—Shafts

Overcoring retrieval is a technology for retrieving an entire shaft without digging a trench. This method typically involves using a crane to lift and suspend a large-diameter steel casing over the shaft. The diameter of the casing is larger than that of the shaft. The casing is then driven into the ground by a vibratory driver until the casing encompasses the entire shaft. Once the casing has reached the appropriate depth, the casing's open bottom is sealed shut by injecting grout into the ground within the casing to the base of the core. When the seal has cured and hardened, the entire casing is lifted to retrieve the intact shaft contained within. The excavated core is then backfilled.

This technology has been demonstrated at the DOE facility in Hanford, Washington, to a depth of 25 ft, which is the maximum depth of the MDA C shafts. As noted above, the shafts at MDA C are next to the pits, therefore, they could be retrieved at the same time as all other wastes and there would be no need to retrieve the shaft wastes separately.

Overcoring retrieval technology was not retained.

6.2.3.3 Waste Container Retrieval—Shafts

Waste container retrieval involves removing the concrete cap and cover soil from a waste shaft and retrieving waste containers from the shafts. The small diameter of the MDA C shafts (1 to 2 ft in diameter) provides limited space for manipulating retrieval equipment. Additionally, the type and condition of the containers in the shafts is not known, and it is possible uncontainerized waste is also present in the shafts. As noted above, the depths of the shafts and their location next to the pits eliminate the need to consider separate retrieval of shaft waste.

Waste container retrieval technology was not retained.

6.2.4 Ex Situ Treatment Technologies

If excavated, MDA C waste materials and/or contaminated media will require characterization to determine whether the waste material meets the waste acceptance criteria (WAC) of the appropriate treatment, storage, and disposal facility. Some of the waste may require treatment before it is reused as backfill or placed in an approved facility. General treatment technologies include neutralization, extraction, thermal treatment, stabilization, and the various debris treatments specified under RCRA.

During the recent remediation activities at MDA B, the only excavated wastes that required treatment before shipment off-site were gas cylinders (LANL 2012, 215119). Liquid residuals in some cylinders removed from MDA B required treatment by elementary neutralization. It is expected similar wastes may be present at MDA C, and thus elementary neutralization was retained as a treatment technology to use in conjunction with excavation.

6.2.5 Waste Management and Disposal

Waste management and disposal are not treatment technologies that apply directly to the RAOs for MDA C, but because many technologies require waste removal, waste management options are discussed below.

On-Site RCRA Landfill

This technology would require the construction of a new landfill at the Laboratory designed to meet the RCRA Subtitle C minimum technology requirements (MTRs). A RCRA Subtitle C landfill is defined as a disposal facility or part of a facility where hazardous waste is placed. Consolidation or placement of wastes into a RCRA landfill has strict requirements, such as land disposal restrictions (LDRs).

At this time, the Laboratory is not considering the construction of a RCRA landfill. A new RCRA landfill would require a lengthy siting study and permit modification approval process. This option would delay final action through the permitting approval process and construction of the new landfill. This delay impacts the Consent Order corrective action requirements.

An on-site RCRA landfill is not a preferred option for waste management and disposal.

On-Site Corrective Action Management Unit

Corrective action management units (CAMUs) are used for the on-site management of remediation wastes under RCRA. A CAMU under RCRA is used for on-site treatment, storage, or disposal of hazardous wastes managed during cleanup. Consolidation or placement of remediation wastes into a CAMU is not considered land disposal and does not trigger LDRs or create a unit subject to MTRs. CAMUs can be temporary or permanent (i.e., can be closed after removing waste or become a disposal unit).

A CAMU would require prior approval by the New Mexico Secretary of the Environment, a process that includes submittal of a Class 3 permit modification. This option would delay final action through the approval process and construction of the CAMU. This delay impacts the Consent Order corrective action requirements.

For these reasons, an on-site CAMU is not a preferred option for waste management and disposal.

Off-Site Disposal

Off-site disposal allows waste to be shipped off-site to permitted facilities. Transportation of wastes in approved trucking containers will occur on public highways. Facilities considered for this option include the Nevada National Security Site; Energy Solutions in Clive, Utah; and other approved facilities. The off-site disposal option is readily available and applicable to MDA C wastes.

Therefore, off-site disposal is the preferred option for waste management and disposal and was retained.

6.3 Summary of Technologies Retained for Further Evaluation at MDA C

Technologies considered applicable for MDA C and retained for further consideration in developing corrective measures alternatives in section 7 are summarized below.

6.3.1 Containment Technologies

The following technologies are suitable to contain the waste in the pits and shafts at MDA C:

- Surface Barriers—Soil barrier
- Surface Barriers—Biointrusion barrier

- Surface Barriers—Multilayer (RCRA) cover
- Surface Barriers—ET cover

6.3.2 In Situ Treatment Technologies

The following technologies are suitable for managing and treating the subsurface vapor plume at MDA C:

- Natural attenuation
- Physical treatment—SVE

6.3.3 Excavation/Retrieval Technologies

The following technology is suitable for removal of the waste in the pits and shafts at MDA C:

- Excavation

6.3.4 Ex Situ Treatment Technologies

The following technology is suitable for use on site to treat wastes removed from the pits and shafts at MDA C:

- Elementary neutralization

6.3.5 Waste Management and Disposal

The following option is suitable for managing and disposing waste removed from MDA C:

- Off-site disposal

7.0 IDENTIFICATION AND SCREENING OF CORRECTIVE MEASURES ALTERNATIVES

The process for alternative identification and screening employed in this CME began with identifying and screening technologies that can be used to address previously identified RAOs. Table 7.0-1 presents a matrix of the potential corrective measures alternatives using the technologies that were carried forward from section 6. The corrective measures alternatives are as follows:

- Alternative 1—No Action
- Alternative 2—Soil Barrier, Natural Attenuation, and Institutional Controls
- Alternative 3A—Multilayer Cover, SVE, and Institutional Controls
- Alternative 3B—ET Cover, SVE, and Institutional Controls
- Alternative 4—Excavation, SVE, and Institutional Controls

Section 7.1 presents the threshold-screening criteria that are listed in Section VII.D.4.a of the Consent Order. Section 7.2 presents the screening of alternatives against the threshold criteria. The alternatives that satisfy all four of the threshold criteria are carried forward into section 8, where they are evaluated against the remedial alternative evaluation criteria (also referred to as balancing criteria) defined in Section VII.D.4.b of the Consent Order.

7.1 Corrective Measures Threshold-Screening Criteria

Section VII.D.4.a of the Consent Order states that to be selected, the remedy alternative must

1. be protective of human health and the environment.

   Protection of human health and the environment should be evaluated based on reasonably anticipated land use, both now and in the future. It should take into consideration the potential exposure pathways identified in the CSM.

2. attain media cleanup standards.

   The applicable cleanup standards developed in accordance with Section VIII of the Consent Order are presented in section 5.1. EPA guidance (61 Federal Register 19432, May 1, 1996) states, “Media cleanup standards should reflect the potential risks of the facility and media in question by considering the toxicity of the constituents of concern, exposure pathways, and fate and transport characteristics.” EPA guidance further explains, “Attaining media cleanup standards does not necessarily entail removal or treatment of all contaminated material above specific constituent concentrations. Depending on the site-specific circumstances, remedies may attain media cleanup standards through various combinations of removal, treatment, engineering and institutional controls.”

3. control the source or sources of releases so as to reduce or eliminate, to the extent practicable, further releases of contaminants that may pose a threat to human health and the environment.

   Source control measures evaluated may include a combination of treatment, containment, removal, and institutional controls.

4. comply with applicable standards for management of wastes.

   A remedy must be able to comply with all applicable regulatory requirements for management of any wastes removed or generated during corrective action, as well as closure requirements for any waste or remaining contamination following implementation of the remedial alternative.

7.2 Description and Screening of Alternatives

This section describes the potential corrective measures alternatives for MDA C and presents a qualitative evaluation of these alternatives against the threshold criteria contained in Section VII.D.4.a of the Consent Order. Table 7.2-1 summarizes the evaluation performed in section 7.2.

7.2.1 Alternative 1: No Action

Alternative 1 represents a true no-action alternative. Under this alternative, no action will be taken. Institutional controls will not be maintained and vapor monitoring will not be performed. No maintenance of the surface soil will be performed. In summary, this alternative includes

- no monitoring of groundwater or soil vapor,
- no maintenance, and
- no institutional controls.

7.2.1.1 Protection of Human Health and the Environment

The surface soil will likely erode, which will increase the potential for exposure to waste and contaminated surface and subsurface soil. The potential will exist for exposure through direct contact and biointrusion. This alternative is not protective of human health and the environment.

7.2.1.2 Attainment of Media Cleanup Standards

Under this alternative, the existing waste inventory, which includes hazardous constituents and wastes subject to regulation as hazardous wastes under RCRA, will not be removed or treated. This alternative does not comply with the EPA guidance for attaining media cleanup standards when waste is left in place since engineered or institutional controls would not be implemented. This alternative does not attain media cleanup standards.

7.2.1.3 Control of Source and Releases

Soil erosion has the potential to expose buried waste, resulting in potential releases. No monitoring will be performed to determine whether the existing VOC plume is migrating to groundwater or if additional releases are occurring. This alternative will not control sources and releases.

7.2.1.4 Compliance with Applicable Waste Management Standards

No wastes will be generated under the no-action alternative; therefore, it complies with applicable waste management standards.

7.2.1.5 Summary

Although the no-action alternative does not satisfy all of the threshold criteria, it is carried forward for comparison purposes in evaluating the other alternatives.

7.2.2 Alternative 2: Soil Barrier, Natural Attenuation, and Institutional Controls

Under this alternative, the existing soil cover at MDA C will be inspected and maintained, including repair of animal burrows and removal of deep-rooted vegetation. Institutional controls will also be implemented to control access to the site. Vapor and groundwater monitoring will be performed to verify natural attenuation of the VOC plume and to confirm that groundwater contamination from vapor migration is not occurring.

Institutional and engineering controls will be implemented to limit the potential for future exposure to buried waste and potentially contaminated surface and subsurface soils. These controls are assumed to remain in place for 100 yr. A restrictive covenant will be placed on the deed and recorded locally and in the EPA institutional controls database. Active monitoring and maintenance will also be performed for 100 yr. Vapor monitoring will be performed to determine whether additional releases have occurred and to evaluate whether VOC vapors are migrating vertically toward the regional aquifer. Groundwater monitoring will be performed to verify that contamination because of vapor migration from MDA C has not occurred. Maintenance activities will be performed to address erosion and animal burrowing and to manage vegetation. Fencing will be used to restrict site access.

If monitoring indicates vertical migration of VOC vapors at concentrations exceeding action levels or groundwater contamination, additional corrective actions would need to be implemented.

7.2.2.1 Protection of Human Health and the Environment

The results of the investigations conducted at MDA C have shown very limited migration of contaminants (other than vapors) from the wastes into the subsurface. Therefore, the existing cover appears to be effective in controlling infiltration and subsequent leaching and transport of contaminants. The existing cover also prevents direct contact with the buried waste by potential receptors. Biointrusion would be prevented by removing deep-rooted vegetation. The results of the risk-screening assessments for MDA C show no potential unacceptable risk to human or ecological receptors under current conditions (LANL 2009, 107389). Maintenance of current conditions into the future would, therefore, be protective of human health and the environment.

Results from the MDA C groundwater monitoring wells show no migration of contaminants from MDA C to the regional aquifer. These results are consistent with results of vapor monitoring, which show vapor concentrations to decrease to concentrations well below screening levels in deeper stratigraphic units. Human health and the environment would be protected if the vapor plume remains in its current state and the portion of the plume above screening levels does not migrate vertically downward or if concentrations decrease in the future as a result of natural attenuation.

Institutional controls will be implemented to provide access controls, thereby restricting human exposure.

This alternative is protective of human health and the environment.

7.2.2.2 Attainment of Media Cleanup Standards

Under this alternative, the existing waste inventory, which includes hazardous constituents and wastes subject to regulation as hazardous wastes under RCRA, would not be removed or treated. Maintenance of the existing soil cover attains media cleanup standards when waste is left in place by breaking the exposure pathway and reducing risk for human and ecological receptors. Though not specifically designed to do so, the existing cover appears to control infiltration of precipitation that could otherwise mobilize subsurface contaminants.

Contaminant releases from the site currently do not exceed media cleanup standards for soil or groundwater. If current conditions are maintained into the future, or if concentrations decrease in the future as a result of natural attenuation, this alternative would attain media cleanup standards.

7.2.2.3 Control of Source and Releases

The existing soil cover reduces infiltration of precipitation that could otherwise mobilize subsurface contaminants. The existing cover, when maintained, will also limit exposure to waste and contaminated surface and subsurface soils and will reduce the potential for erosion and dust generation of contaminated surface soils.

The potential exists for continued release of VOCs to the vadose zone that may diffuse to the groundwater. This alternative does not actively control such releases, but instead relies on natural attenuation and the physical properties of the stratigraphic units at the site to prevent diffusion to groundwater at concentrations exceeding cleanup levels.

This alternative will control sources and releases.

7.2.2.4 Compliance with Applicable Waste Management Standards

No waste is projected to be generated during implementation of this alternative.

This alternative complies with applicable waste management standards.

7.2.2.5 Summary

This alternative complies with each of the four threshold criteria. Therefore, this alternative is retained for further consideration.

7.2.3 Alternative 3A: Multilayer Cover, SVE, and Institutional Controls

Under this alternative, a multilayer cover will be installed over MDA C (Figure 7.2-1). The area of the cover would be approximately 11 acres. The conceptual multilayer cover design (Figure 7.2-2) and construction consists of (from bottom to top)

- site preparation of the existing soil surface, which includes 3 ft of existing operational cover above the waste material;
- 2-ft layer of compacted natural or amended soil with a maximum saturated hydraulic conductivity of 1×10^{-7} cm/s (e.g., clay layer);
- 40-mil flexible geomembrane liner to limit downward moisture movement;
- 1-ft drainage layer of sand having a minimum saturated hydraulic conductivity of 1×10^{-2} cm/s; and
- 2-ft soil and vegetation layer graded at slopes between 3% and 50%.

The conceptual design of the multilayer cover described above is the same as that presented in the MDA G CME report (LANL 2011, 206324, Appendix H), and additional details are provided in that document.

The conceptual SVE design (Appendix H) includes the following principal assumptions and components.

- Installation of four SVE boreholes (Figure 7.2-3), each to a depth of approximately 315 ft bgs within the lower reaches of unit Qbt 1g (Figure 7.2-4). The boreholes will be screened from 185 ft to 315 ft bgs, where most of the VOC mass is located. The boreholes will be located to provide effective extraction of vapors containing TCE in excess of the Tier II screening level but where drilling access is not impeded by the disposal pits and shafts.
- Installation of four SVE boreholes (Figure 7.2-3) into the Cerro Toledo interval (Qct unit) to approximately 395 ft bgs. These boreholes will be screened within the Qct unit (325 ft to 395 ft bgs). The purpose of these boreholes is to extract vapors containing TCE approaching the Tier II screening level and to provide a barrier against further downward migration of VOC vapors in the vadose zone.
- Two portable skid-mounted SVE units will be cycled between the extraction boreholes during operations. Each SVE unit will utilize a 15-horsepower (hp) blower motor, capable of providing up to 320 standard cubic feet per minute (scfm) at a vacuum of 120 in. of water. The system will be optimized during the initial setup, although a vacuum between 50 in. and 70 in. of water has been demonstrated to be effective in pilot tests previously performed at TA-54. Offgas from the SVE system would be treated using granular activated carbon (GAC).

- Extraction boreholes in the upper units are projected to provide a 125-ft radius of influence (ROI), providing an effective area of extraction of approximately 49,000 ft^2 for each borehole. Extraction boreholes in the Qct unit are expected to provide a 150-ft ROI, providing an effective area of extraction of approximately 70,650 ft^2. Borehole spacing will target the vapor plume areas but may be impacted by the inability to drill through the pits and shafts.

Institutional and engineering controls will be implemented to limit the potential for future exposure to buried waste and potentially contaminated surface and subsurface soil. These controls are assumed to remain in place for 100 yr. A restrictive covenant will be placed on the deed and recorded locally and in the EPA institutional controls database. Active monitoring and maintenance will be performed for 100 yr. Vapor monitoring will be performed to evaluate the performance of the SVE system. Groundwater monitoring will be performed to verify that groundwater contamination has not occurred. Maintenance activities will be performed to address erosion and animal burrowing and to manage vegetation. Fencing will be used to restrict site access.

The multilayer cover minimizes exposure on the surface of the waste facility, prevents vertical infiltration of water into wastes that would potentially create contaminated leachate, and creates a land surface that can support vegetation.

The most efficient means of operating the SVE system is intermittent operation with alternating periods of extraction and rebound. The operational plan for the SVE system is provided in Appendix H. As described in section 3.2.4.2, the spatial distribution of VOCs in the subsurface indicates most of the VOC mass is not associated with ongoing releases. Therefore, operation of the SVE system could result in a fairly rapid reduction in contaminant mass with little rebound. Based on the results of previous pilot testing at TA-54, SVE will be conducted at an extraction borehole for 90 d. After 90 d of extraction with the upper (Qbt) wells, the SVE units will be connected to the lower (Qct) wells and operated for 90 d. This cycle will then be repeated with an additional 90 d of extraction in each zone. Performance monitoring at select pore-gas monitoring wells will be conducted at the end of each 90-d operational period. Performance monitoring will indicate whether rebounding is occurring and whether additional operation is needed.

7.2.3.1 Protection of Human Health and the Environment

A multilayer cover will provide protection against erosion, direct contact, biointrusion, and moisture infiltration. The multilayer cover, as described above, places a minimum of 5 ft of varying soil layers between a potential human or ecological receptor and the top of the existing operational cover, thereby breaking the exposure pathway. The multilayer cover is designed to restrict infiltration of water, thereby breaking the contaminant transport pathway (via leaching) to groundwater.

SVE will remove vapor-phase contaminants from the subsurface thereby preventing the potential future migration to groundwater.

Institutional controls will be implemented to provide access controls, thereby restricting human exposure.

This alternative is protective of human health and the environment.

7.2.3.2 Attainment of Media Cleanup Standards

Under this alternative, the existing waste inventory, which includes hazardous constituents and wastes subject to regulation as hazardous wastes under RCRA, would not be removed or treated. The installation of a multilayer cover attains media cleanup standards when waste is left in place by breaking the exposure pathway and reducing risk for human and ecological receptors. A multilayer cover will also

minimize or eliminate infiltration of precipitation that could otherwise mobilize subsurface contaminants. SVE will assure media cleanup standards are not exceeded in the future by removing vapor-phase contaminants from the subsurface.

This alternative attains media cleanup standards.

7.2.3.3 Control of Source and Releases

A multilayer cover will minimize or eliminate infiltration of precipitation that could otherwise mobilize subsurface contaminants. A multilayer cover will also limit exposure to waste and contaminated surface and subsurface soil and will reduce the potential for erosion and dust generation of contaminated surface soil.

Vapor-phase contaminants in the vadose zone are a potential source of groundwater contamination. SVE will reduce this contaminant source.

This alternative will control sources and releases.

7.2.3.4 Compliance with Applicable Waste Management Standards

No waste is projected to be generated during the construction of the multilayer cover. The drill cuttings and off-gas waste streams generated from construction and operation of the SVE system can be effectively managed to comply with waste management standards.

This alternative complies with applicable waste management standards.

7.2.3.5 Summary

This alternative complies with each of the four threshold criteria. Therefore, this alternative is retained for further consideration.

7.2.4 Alternative 3B: ET Cover, SVE, and Institutional Controls

Under this alternative, an ET cover will be installed over MDA C (Figure 7.2-1). The area of the cover would be approximately 11 acres. The conceptual ET cover design (Figure 7.2-5) and construction consists of (from bottom to top)

- site preparation of the existing soil surface, which includes 3 ft of existing operational cover above the waste material;
- 1 ft of cobbles with a minimum diameter of 4 in. to 6 in. to act as a biointrusion barrier;
- 0.5 ft of sand and gravel mixture to prevent the mixing of soil layers;
- 3.5 ft of natural or amended soil meeting the water-storage capacity of a typical sandy loam; and
- 1.5 ft of natural or amended soil and vegetation.

The conceptual design of the ET cover described above is the same as that presented in the MDA G CME report (LANL 2011, 206324, Appendix I), and additional details are provided in that document.

The conceptual SVE design (Appendix H) includes the following principal assumptions and components.

- Installation of four SVE boreholes (Figure 7.2-3), each to a depth of approximately 315 ft bgs within the lower reaches of unit Qbt 1g (Figure 7.2-4). The boreholes will be screened from 185 ft to 315 ft bgs, where most of the VOC mass is located. The boreholes will be located to provide effective extraction of vapors containing TCE in excess of the Tier II screening level but where drilling access is not impeded by the disposal pits and shafts.
- Installation of four SVE boreholes (Figure 7.2-3) into the Qct unit to approximately 395 ft bgs. These boreholes will be screened within the Qct unit (325 ft to 395 ft bgs). The purpose of these boreholes is to extract vapors containing TCE approaching the Tier II screening level and to provide a barrier against further downward migration of VOC vapors in the vadose zone.
- Two portable skid-mounted SVE units will be cycled between the extraction boreholes during operations. Each SVE unit will utilize a 15-hp blower motor, capable of providing up to 320 scfm at a vacuum of 120 in. of water. The system will be optimized during the initial setup, although a vacuum between 50 in. and 70 in. of water has been demonstrated to be effective in pilot tests previously performed at TA-54. Offgas from the SVE system would be treated using GAC.
- Extraction boreholes in the upper units are projected to provide a 125-ft ROI, providing an effective area of extraction of approximately 49,000 ft^2 for each borehole. Extraction boreholes in the Qct unit are expected to provide a 150-ft ROI, providing an effective area of extraction of approximately 70,650 ft^2. Borehole spacing will target the vapor plume areas but may be impacted by the inability to drill through the pits and shafts.

Institutional and engineering controls will be implemented to limit the potential for future exposure to buried waste and potentially contaminated surface and subsurface soil. These controls are assumed to remain in place for 100 yr. A restrictive covenant will be placed on the deed and recorded locally and in the EPA institutional controls database. Active monitoring and maintenance will be performed for 100 yr. Vapor monitoring will be performed to evaluate the performance of the SVE system. Moisture monitoring will be performed to evaluate the performance of the ET cover. Groundwater monitoring will be performed to verify that groundwater contamination has not occurred. Maintenance activities will be performed to address erosion and animal burrowing and to manage vegetation. Fencing will be used to restrict site access.

The ET cover minimizes exposure on the surface of the waste facility, prevents vertical infiltration of water into wastes that could create contaminated leachate, and creates a land surface that can support vegetation.

The ET cover takes advantage of the semiarid site conditions by evaporating and transpiring water from the cover. The surface of the cover has minimum slope to limit erosion. The ET cover includes little or no clay and no geosynthetic membrane materials, both of which are more likely to fail because the clay tends to dry out and crack and the polymer degrades in an arid to semiarid environment.

Engineered ET covers have demonstrated effectiveness in reducing infiltration in semiarid regions (Davenport et al. 1998, 069674, p. 1; Dwyer et al. 2000, 069673, pp. 23–26). ET covers can be adapted to enhance specific desired properties for a given application, such as increasing erosion resistance by adding gravel surface amendments, enhancing or limiting plant growth and types for transpiration by varying depths of enriched soil, modifying the size of the ET reservoir layer above the waste layer by varying the depths of the soil or amended crushed-tuff ET layer, or preventing biointrusion by using barriers such as cobbles.

The most efficient means of operating the SVE system is intermittent operation with alternating periods of extraction and rebound. The operational plan for the SVE system is provided in Appendix H. As described in section 3.2.4.2, the spatial distribution of VOCs in the subsurface indicates most of the VOC mass is not associated with ongoing releases. Therefore, operation of the SVE system could result in a fairly rapid reduction in contaminant mass with little rebound. Based on the results of previous pilot testing at TA-54, SVE will be conducted at an extraction borehole for 90 d. After 90 d of extraction with the upper (Qbt) wells, the SVE units will be connected to the lower (Qct) wells and operated for 90 d. This cycle will then be repeated with an additional 90 d of extraction in each zone. Performance monitoring at select pore-gas monitoring wells will be conducted at the end of each 90-d operational period. Performance monitoring will indicate whether rebounding is occurring and whether additional operation is needed.

7.2.4.1 Protection of Human Health and the Environment

An ET cover will provide protection against erosion, direct contact, biointrusion, and moisture infiltration. The ET cover, as described above, places a minimum of 6.5 ft of varying soil layers between a potential human or ecological receptor and the top of the existing operational cover, thereby breaking the exposure pathways associated with erosion, direct contract, and biointrusion. The ET cover is designed to restrict infiltration of water, thereby breaking the contaminant transport pathway (via leaching) to groundwater.

SVE will remove vapor-phase contaminants from the subsurface, thereby preventing the potential future migration to groundwater.

Institutional controls will be implemented to provide access controls, thereby restricting human exposure.

This alternative is protective of human health and the environment.

7.2.4.2 Attainment of Media Cleanup Standards

Under this alternative, the existing waste inventory, which includes hazardous constituents and wastes subject to regulation as hazardous wastes under RCRA, would not be removed or treated. The installation of an ET cover attains media cleanup standards when waste is left in place by breaking the exposure pathway and reducing risk for human and ecological receptors. An ET cover will also minimize or eliminate infiltration of precipitation that could otherwise mobilize subsurface contaminants. SVE will ensure media cleanup standards are not exceeded in the future by removing vapor-phase contaminants from the subsurface.

This alternative attains media cleanup standards.

7.2.4.3 Control of Source and Releases

An ET cover will minimize or eliminate infiltration of precipitation that could otherwise mobilize subsurface contaminants. An ET cover will also limit exposure to waste and contaminated surface and subsurface soils and will reduce the potential for erosion and dust generation of contaminated surface soil.

Vapor-phase contaminants in the vadose zone are a potential source of groundwater contamination. SVE will reduce this contaminant source.

This alternative will control sources and releases.

7.2.4.4 Compliance with Applicable Waste Management Standards

No waste is projected to be generated during the construction of the ET cover. The drill cuttings and off-gas waste streams generated from construction and operation of the SVE system can be effectively managed to comply with waste management standards.

This alternative complies with applicable waste management standards.

7.2.4.5 Summary

This alternative complies with each of the four threshold criteria. Therefore, this alternative is retained for further consideration.

7.2.5 Alternative 4: Excavation, SVE, and Institutional Controls

Under this alternative, the shafts and the pits will be excavated. Excavation of the pits and shafts will be accomplished using standard excavation methods. However, the excavation will be performed within enclosures to control releases and to provide weather protection for the excavation. The pits were excavated with nearly vertical side walls with an entry ramp on one end. The remediation activities may employ excavation using a similar configuration, with nearly vertical slopes (1-ft horizontal to 6-ft vertical) (Figure 7.2-6). The disposal shafts are next to and at the same depth as the disposal pits. The shafts would, therefore, be excavated in conjunction with the pit excavations. The estimated volume of excavated materials is provided in Appendix I. Confirmatory sampling will be conducted to ensure all contaminated material has been removed from the excavations.

Based on the recent excavation of waste from MDA B (LANL 2012, 215119), it is likely the wastes excavated from MDA C will include gas cylinders containing corrosive liquids. The liquid in the cylinders will need to be treated on-site using elementary neutralization before the waste is shipped off site.

Some waste may be classified as newly generated TRU waste. This waste was not included in the original permit of the Waste Isolation Pilot Plant (WIPP) facility, and a permit modification may be required for disposal of this waste at WIPP.

A summary of activities for excavation of the pits and shafts includes the following:

- construction of relocatable excavation enclosures with supplied air and high-efficiency particulate air filters to control releases and for weather protection;
- waste removal activities using standard excavation techniques;
- analysis and segregation of the waste for off-site shipment and disposal based on the WAC of the receiving facility;
- treatment of corrosive liquids by elementary neutralization;
- collection and analysis of confirmation samples from the excavation sidewalls and floor;
- replacement within the original excavation of any environmental media meeting industrial SSLs and then backfilling to grade; and
- off-site shipment and disposal of wastes that do not meet industrial SSLs.

The conceptual SVE design (Appendix H) includes the following principal assumptions and components.

- Installation of four SVE boreholes (Figure 7.2-3), each to a depth of approximately 315 ft bgs within the lower reaches of unit Qbt 1g (Figure 7.2-4). The boreholes will be screened from 185 ft to 315 ft bgs, where most of the VOC mass is located. The boreholes will be sited to provide effective extraction of vapors containing TCE in excess of the Tier II screening level.
- Installation of four SVE boreholes (Figure 7.2-3) into the Qct unit to approximately 395 ft bgs. These boreholes will be screened within the Qct unit (325 ft to 395 ft bgs). The purpose of these boreholes is to extract vapors containing TCE approaching the Tier II screening level and to provide a barrier against further downward migration of VOC vapors in the vadose zone.
- Two portable skid-mounted SVE units will be cycled between the extraction boreholes during operations. Each SVE unit will utilize a 15-hp blower motor, capable of providing up to 320 scfm at a vacuum of 120 in. of water. The system will be optimized during the initial setup, although a vacuum between 50 in. and 70 in. of water has been demonstrated to be effective in pilot tests previously performed at TA-54. Offgas from the SVE system would be treated using GAC.
- Extraction boreholes in the upper units are projected to provide a 125-ft ROI, providing an effective area of extraction of approximately 49,000 ft^2 for each borehole. Extraction boreholes in the Qct unit are expected to provide a 150-ft ROI, providing an effective area of extraction of approximately 70,650 ft^2. Boreholes will be installed after the pits and shafts have been excavated and backfilled. Borehole locations and spacing, therefore, will not be constrained by the need to avoid drilling through the pits and shafts.

Institutional and engineering controls (e.g., fencing) will be implemented to restrict access to the area during site activities. Following waste removal and site restoration, the site will be restricted to industrial land use. A restrictive covenant, which is assumed to remain in place for 100 yr, will be placed on the deed and recorded locally and in the EPA institutional controls database.

The most efficient means of operating the SVE system is intermittent operation with alternating periods of extraction and rebound. The operational plan for the SVE system is provided in Appendix H. As described in section 3.2.4.2, the spatial distribution of VOCs in the subsurface indicates most of the VOC mass is not associated with ongoing releases. Therefore, operation of the SVE system could result in a fairly rapid reduction in contaminant mass with little rebound. Based on the results of previous pilot testing at TA-54, SVE will be conducted at an extraction borehole for 90 d. After 90 d of extraction with the upper (Qbt) wells, the SVE units will be connected to the lower (Qct) wells and operated for 90 d. This cycle will then be repeated with an additional 90 d of extraction in each zone. Performance monitoring at select pore-gas monitoring wells will be conducted at the end of each 90-d operational period. Performance monitoring will indicate whether rebounding is occurring and whether additional operation is needed. Because the source of potential future VOC contamination will be removed, long-term vapor monitoring will not be required following completion of SVE operations.

7.2.5.1 Protection of Human Health and the Environment

Excavation of the pits and shafts will remove source material.

SVE will remove vapor-phase contaminants from the subsurface, thereby preventing the potential future migration to groundwater.

Institutional controls will be implemented to assure future land use is consistent with the residual contamination (i.e., industrial SSLs).

This alternative is protective of human health and the environment.

7.2.5.2 Attainment of Media Cleanup Standards

Wastes will be excavated from the pits and shafts to a level that meets industrial SSLs. Investigation sampling has indicated soil concentrations beneath the pits and shafts are currently below the cleanup standards. Environmental media with concentrations below industrial SSLs may be returned to the original disposal unit.

SVE will ensure media cleanup standards are not exceeded in the future by removing vapor-phase contaminants from the subsurface.

This alternative attains media cleanup standards.

7.2.5.3 Control of Source and Releases

Excavation of the pits and shafts will remove source material.

Vapor-phase contaminants in the vadose zone are a potential source of groundwater contamination. SVE will reduce this contaminant source.

This alternative eliminates or reduces sources and releases.

7.2.5.4 Compliance with Applicable Waste Management Standards

Excavated wastes and media that exceed cleanup standards will be prepared for off-site shipment to meet the WAC of the permitted disposal facility.

The drill cuttings and off-gas waste streams generated from construction and operation of the SVE system can be effectively managed to comply with waste management standards.

This alternative complies with applicable waste management standards.

7.2.5.5 Summary

This alternative complies with each of the four threshold criteria. Therefore, this alternative is retained for further consideration.

8.0 EVALUATION OF ALTERNATIVES AGAINST REMEDIAL ALTERNATIVE EVALUATION CRITERIA

Corrective measures alternatives appropriate for MDA C were screened against the Consent Order threshold criteria in section 7. Alternatives found to meet the Consent Order threshold criteria have been brought forward for further evaluation along with the no-action alternative. These alternatives are evaluated against the remedial alternative evaluation criteria (also known as the balancing criteria) from Section VII.D.4.b of the Consent Order.

8.1 Remedial Alternative Evaluation Criteria (Consent Order Section VII.D.4.b)

Section VII.D.4.b of the Consent Order requires the evaluation of each remedial alternative for the factors listed below. These factors shall be balanced in proposing a recommended alternative.

8.1.1 Long-Term Reliability and Effectiveness (Consent Order Section VII.D.4.b.i)

This factor considers the magnitude of risks that will remain after implementation of the remedy, the extent of long-term monitoring or other management that will be required after implementation of the remedy, the uncertainties associated with leaving contaminants in place, and the potential for failure of the remedy. Preference is given to a remedy that reduces risks with little long-term management and that has proven effective under similar conditions.

8.1.2 Reduction of Toxicity, Mobility, or Volume (Consent Order Section VII.D.4.b.ii)

This factor considers the reduction in the toxicity, mobility, and volume of contaminants. Preference is given to a remedy that uses treatment to more completely and permanently reduce the toxicity, mobility, and volume of contaminants.

8.1.3 Short-Term Effectiveness (Consent Order Section VII.D.4.b.iii)

This factor considers the short-term reduction in existing risks the remedy would achieve; the time needed to achieve that reduction; and the short-term risks that might be posed to the community, workers, and the environment during implementation of the remedy. Preference is given to a remedy that quickly reduces short-term risks without creating significant additional risks.

8.1.4 Implementability (Consent Order Section VII.D.4.b.iv)

This factor considers installation and construction difficulties; O&M difficulties; cleanup technology difficulties; permitting and approvals; and the availability of necessary equipment, services, expertise, and storage and disposal capacity. Preference is given to a remedy that can be implemented quickly and easily, and poses fewer difficulties.

8.1.5 Cost (Consent Order Section VII.D.4.b.v)

This factor considers both capital costs and O&M costs. Capital costs shall include, without limitation, construction and installation costs; equipment costs; land development costs; and indirect costs, including engineering costs, legal fees, permitting fees, startup and shakedown costs, and contingency allowances. O&M costs shall include, without limitation, operating labor and materials costs; maintenance labor and materials costs; replacement costs; utilities; monitoring and reporting costs; administrative costs; indirect costs; and contingency allowances. All costs shall be calculated based on their net present value (PV). Preference is given to a remedy that is less costly but does not sacrifice protection of human health and the environment.

8.2 Evaluation of Alternatives for MDA C

8.2.1 Alternative 1: No Action

The no-action alternative is described in section 7.2.1.

8.2.1.1 Long-Term Reliability and Effectiveness

An increase in future risk is associated with implementation of this alternative because it removes institutional controls. No long-term monitoring or other management will be required because no remedy is implemented. Uncertainty is associated with future exposure to waste resulting from the lack of institutional controls. This alternative does not involve implementation of any action; therefore, no potential exists for remedy failure. This alternative does not provide long-term reliability and effectiveness.

8.2.1.2 Reduction of Toxicity, Mobility, or Volume

Under the no-action alternative, no reduction in toxicity, mobility, or volume occurs.

8.2.1.3 Short-Term Effectiveness

Under the no-action alternative, risk is neither created nor alleviated in the short term.

8.2.1.4 Implementability

Under the no-action alternative, no remedy is implemented.

8.2.1.5 Cost

Under the no-action alternative, no costs are incurred.

8.2.2 Alternative 2: Soil Barrier, Natural Attenuation, and Institutional Controls

This alternative is described in section 7.2.2.

8.2.2.1 Long-Term Reliability and Effectiveness

The existing soil cover is effective in controlling migration of contaminants from infiltration and leaching. Long-term maintenance, including periodic inspections and repairs, would be needed to maintain the effectiveness of the cover. Site-specific studies have shown the existing cover is not effective in preventing biointrusion from deep-rooted vegetation, and maintenance activities would need to include removal of such vegetation. Site access and land-use controls would also be needed to prevent intrusion into the waste inventory.

Vapor and groundwater monitoring currently shows that vapor-phase contaminants from MDA C have not migrated to the regional aquifer at detectable levels. Assuming no future releases of VOCs occur, the vapor plume may be expected to naturally attenuate through diffusion, with the primary pathway being toward the surface. Long-term vapor and groundwater monitoring would be needed to verify that migration to the regional aquifer is not occurring.

The effectiveness of this alternative relies entirely on institutional controls, with no engineered controls, redundancy, or defense-in-depth. Long-term reliability depends entirely on the ability to maintain these controls, thus, there is considerable uncertainty in long-term reliability and effectiveness.

8.2.2.2 Reduction of Toxicity, Mobility, or Volume

The existing soil cover, if maintained, will reduce mobility of waste by controlling erosion and infiltration but will have no impact on reduction of toxicity or volume. The soil cover will not reduce mobility associated with vapor transport.

This alternative does not include any actions to reduce the mobility and volume of vapor-phase contamination that has already been released to the vadose zone but instead relies on natural attenuation.

8.2.2.3 Short-Term Effectiveness

This alternative does not include any intrusive activities that would result in short-term risk to workers or the public. The site does not currently pose an unacceptable risk to human health or the environment and current site conditions would not be changed.

8.2.2.4 Implementability

The institutional controls associated with this alternative (e.g., fencing, inspections, maintenance, repairs, monitoring) can easily be implemented.

8.2.2.5 Cost

Annual O&M costs for inspections, maintenance, and reporting are estimated to be $58,000. The PV of total O&M costs is estimated to be $763,000. Long-term vapor and groundwater monitoring are assumed to be performed as part of the Laboratory's long-term stewardship program and are not included in the O&M estimate.

Indirect O&M costs are estimated to be $65,000, which includes professional management and construction management.

Management reserve costs are estimated to be $422,000.

The total PV cost is estimated to be $1,250,000 (Table 8.2-1). Assumptions and cost estimates are provided in Appendix I.

8.2.3 Alternative 3A: Multilayer Cover, SVE, and Institutional Controls

This alternative is described in section 7.2.3.

8.2.3.1 Long-Term Reliability and Effectiveness

Installation of a multilayer cover will reduce erosion, biointrusion, and infiltration and will also reduce the potential for exposure. Los Alamos's semiarid climate is considered potentially incompatible with the typical clay layer of the cover as clay components may become desiccated and crack when installed in arid to semiarid environments. Long-term maintenance requirements for multilayer covers include visual inspection, removal of unwanted debris and large woody plants, erosion control, and mowing.

Operation of an SVE system will remove vapor-phase VOCs from the vadose zone and will manage future releases and exposure. Some uncertainty and long-term risks are associated with the continuing

release of VOCs from the source area. This uncertainty is managed by performance monitoring to evaluate the effectiveness of the SVE system.

Residual uncertainty and long-term risk will be associated with waste that remains in place. Institutional controls will be used to manage this uncertainty by restricting site access.

8.2.3.2 Reduction of Toxicity, Mobility, or Volume

The multilayer cover will reduce mobility of waste by controlling erosion and infiltration but will have no impact on reduction of toxicity or volume. The multilayer cover will not reduce mobility associated with vapor transport.

SVE will be effective in reducing the mobility and volume of VOC contamination. SVE will have an immediate impact on vapor-phase VOC concentrations. If spent GAC from the SVE system is thermally regenerated, VOCs adsorbed to the GAC would be destroyed, reducing toxicity.

8.2.3.3 Short-Term Effectiveness

A multilayer cover can be constructed in a relatively short time frame (i.e., approximately 18 mo). This cover poses relatively low risk to the community, workers, and the environment during construction because it does not involve any waste excavation or management. The greatest impacts to human health during cover installation are associated with the physical hazards of construction activities and traffic risks while transporting materials to the site. Workers will not be exposed to buried waste during cover construction.

The risk of traffic accidents associated with the remedy is generally considered a function of total miles of travel for the project vehicles. Based on an average accident rate for large trucks of 2.3 fatal accidents per 100 million miles (DOT 2002, 097082, p. 2), or 2.3×10^{-8} fatal accidents per mile, and approximately 296,000 truck transport miles (Appendix I) on public roads for delivery of project resources, the overall incident rate for fatal traffic accidents for the project would be approximately 0.007.

SVE equipment is commercially available and extraction boreholes can be constructed within a 3-mo time frame. The SVE system poses relatively low risk to community, workers, and the environment during construction as demonstrated by previous SVE pilot studies at the Laboratory (LANL 2006, 094152; LANL 2009, 105112; LANL 2010, 109657).

This alternative is effective in the short term without creating significant additional risk.

8.2.3.4 Implementability

The multilayer cover is installed using standard construction techniques and presents minimal installation and construction difficulties. Following installation, low to moderate maintenance is required.

SVE is a well-developed technology, presenting minimal installation and construction difficulties. Operation of the SVE system may require a modification to the Laboratory's air permit.

8.2.3.5 Cost

The capital cost for installation of the multilayer cover is estimated to be $14,615,000. Total capital costs for installation of the SVE and monitoring systems are estimated to be $3,131,000. SVE operational and monitoring costs are estimated to be $194,000. Annual O&M costs for inspections, maintenance, and

reporting are estimated to be $58,000. The PV of total O&M costs (exclusive of SVE operation and monitoring) is estimated to be $763,000. Long-term vapor and groundwater monitoring are assumed to be performed as part of the Laboratory's long-term stewardship program and are not included in the O&M estimate.

The indirect capital costs are estimated to be $5,592,000, which includes design of the alternative as well as project management and construction management. Indirect O&M costs are estimated to be $65,000, which includes project management and construction management.

Total management reserve costs are estimated to be $12,801,000.

The total PV cost is estimated to be $37,966,000 (Table 8.2-2). Assumptions and cost estimates are provided in Appendix I.

8.2.4 Alternative 3B: ET Cover, SVE, and Institutional Controls

This alternative is described in section 7.2.4.

8.2.4.1 Long-Term Reliability and Effectiveness

Installation of an ET cover will reduce erosion, biointrusion, and infiltration and will also reduce the potential for future exposure. The ET cover is reliable over the long term, and it does not suffer from desiccation issues associated with standard RCRA covers. Long-term maintenance requirements for ET covers include visual inspection, removal of unwanted debris and large woody plants, erosion control, and mowing. ET covers have demonstrated effectiveness in arid and semiarid climates and possibility of failure is relatively low (Dwyer et al. 2000, 069673; Dwyer 2007, 098276).

Operation of an SVE system will remove vapor-phase VOCs from the vadose zone and will manage future releases and exposure. Some uncertainty and long-term risks are associated with the continuing release of VOCs from the source area. This uncertainty is managed by performance monitoring to evaluate the effectiveness of the SVE system.

Residual uncertainty and long-term risk will be associated with waste that remains in place. Institutional controls will be used to manage this uncertainty by restricting site access.

8.2.4.2 Reduction of Toxicity, Mobility, or Volume

The ET cover will reduce mobility of waste by controlling erosion and infiltration but will have no impact on reducing toxicity or volume. The ET cover will not reduce mobility associated with vapor transport.

SVE will be effective in reducing the mobility and volume of VOC contamination. SVE will have an immediate impact on vapor-phase VOC concentrations. If spent GAC from the SVE system is thermally regenerated, VOCs adsorbed to the GAC would be destroyed, reducing toxicity.

8.2.4.3 Short-Term Effectiveness

An ET cover can be constructed in a relatively short time frame (i.e., approximately 18 mo). This cover poses relatively low risk to the community, workers, and the environment during construction because it does not involve any waste excavation or management. The greatest impacts to human health during cover installation are associated with the physical hazards of construction activities and traffic risks while

transporting raw materials to the site. Workers will not be exposed to buried waste during ET cover construction.

The risk of vehicle traffic accidents associated with implementation of the remedy is generally considered a function of total miles of travel for the project vehicles. Based on an average fatal accident rate per vehicle miles for large trucks of 2.3 fatal accidents per 100 million miles (DOT 2002, 097082, p. 2) and approximately 155,000 truck transport miles (Appendix I) on public roads for delivery of project resources, an overall incident rate for fatal traffic accidents for the project would be approximately 0.004.

SVE equipment is commercially available and extraction boreholes can be constructed within a 3-mo time frame. The SVE system poses relatively low risk to community, workers, and the environment during construction as demonstrated by the SVE pilot study (LANL 2009, 105112).

This alternative is effective in the short term without creating significant additional risk.

8.2.4.4 Implementability

The ET cover is installed using standard construction techniques and presents minimal installation and construction difficulties. Following installation, low to moderate maintenance is required.

SVE is a well-developed technology, presenting minimal installation and construction difficulties. Operation of the SVE system may require a modification to the Laboratory's air permit.

8.2.4.5 Cost

The capital cost for installation of the ET cover is estimated to be $13,796,000. Total capital costs for installation of the SVE and monitoring systems are estimated to be $3,131,000. SVE operational and monitoring costs are estimated to be $194,000. Annual O&M costs for inspections, maintenance, and reporting are estimated to be $58,000. The PV of total O&M costs (exclusive of SVE operation and monitoring) is estimated to be $763,000. Long-term vapor and groundwater monitoring are assumed to be performed as part of the Laboratory's long-term stewardship program and are not included in the O&M estimate.

The indirect capital costs are estimated to be $5,295,000, which includes design of the alternative as well as project management and contingency. Indirect O&M costs are estimated to be $65,000, which includes project management and construction management.

Total management reserve costs are estimated to be $12,140,000.

The total PV cost is estimated to be $36,022,000 (Table 8.2-3). Assumptions and cost estimates are provided in Appendix I.

8.2.5 Alternative 4: Excavation, SVE, and Institutional Controls

This alternative is described in section 7.2.5.

8.2.5.1 Long-Term Reliability and Effectiveness

Removal of the waste in the pits and shafts will eliminate the primary source and the potential for future exposure. Uncertainties will be managed by collecting confirmatory samples to determine the required extent of the excavation. After the waste has been removed, the excavation will be backfilled and the area

regraded, revegetated, and maintained to establish the vegetation. This alternative transfers the potential impact of the waste to the permitted off-site disposal facility.

Operation of an SVE system will remove vapor-phase VOCs from the vadose zone. Pore-gas monitoring will be used to evaluate the effectiveness of the system.

Institutional controls will be used to manage this uncertainty by restricting site access.

8.2.5.2 Reduction of Toxicity, Mobility, or Volume

The removal of waste in the pits and shafts will reduce toxicity and mobility of contaminants from the current site. However, the sorting and segregation of the excavated materials will increase the volume of waste to be disposed of by increasing the amount of packaging materials necessary for transport and disposal. A small volume of the waste excavated is expected to be corrosive liquids that will be treated on site using elementary neutralization.

SVE will be effective in reducing the mobility and volume of VOC contamination. SVE will have an immediate impact on vapor-phase VOC concentrations. If spent GAC from the SVE system is thermally regenerated, VOCs adsorbed to the GAC would be destroyed, reducing toxicity.

8.2.5.3 Short-Term Effectiveness

Based on previous excavation projects at the Laboratory (e.g., MDA B and North Ancho Canyon), excavation of the MDA C waste inventory is expected to require 3 yr. Clean fill will be imported from TA-61, or other borrow pits, to backfill the excavation.

Removal activities have a higher risk for injuries and accidents. Disturbance and excavation of the units increase the possibility of accidental release of hazardous materials. The possibility of release upon disturbance of the units containing unknown chemical waste increases the short-term risk of contaminant dispersal. Excavation activities will be performed within enclosures to minimize short-term risks.

Potential accidents resulting from excavation and associated waste handling include industrial hazards/accidents, fires with release of hazardous materials, explosions and associated releases of radioactive materials, spills of hazardous and radioactive materials, inadvertent exposures to penetrating radiation, and transportation accidents.

The risk to the public from all activities, except potential fire and explosions and on-site/off-site transportation, is negligible. The risk of vehicle traffic accidents associated with implementation of the remedy is generally considered a function of total miles of travel for the project vehicles. Based on an average fatal accident rate per vehicle miles for large trucks of 2.3 fatal accidents per 100 million miles (DOT 2002, 097082, p. 2) and approximately 24 million truck transport miles (Appendix I) on public roads for waste transport and material delivery, an overall incident rate for fatal traffic accidents for the project would be between 0 and 1.

SVE equipment is commercially available and extraction boreholes can be constructed within a 3-mo time frame. The SVE system poses relatively low risk to the community, workers, and the environment during construction as demonstrated by the SVE pilot study.

This alternative is effective in the short term because waste is removed; however, additional risk is created as a result of excavating, sorting, packaging, and transporting the waste.

8.2.5.4 Implementability

The pits and shafts will be excavated using a tiered approach based on hazard level and assessment of specific inventory. Excavation will be accomplished using standard excavation methods, unless potential or real hazards dictate remote handling. Following excavation of waste, no maintenance is required.

One significant challenge of this alternative is ensuring the permitted off-site disposal facilities can receive all the various waste streams.

SVE is a well-developed technology, presenting minimal installation and construction difficulties. Operation of the SVE system may require a modification to the Laboratory's air permit.

8.2.5.5 Cost

The total capital costs for the excavation of the pits and shafts are estimated to be $406,341,000, of which $365,899,000 is estimated for disposal of waste materials. The total capital costs for installation of the SVE and monitoring systems are estimated to be $3,131,000.

SVE operational and monitoring costs are estimated to be $194,000.

The indirect capital costs are estimated to be $107,788,000, which includes design of the alternative as well as project management and construction management. Indirect O&M costs are estimated to be $34,000, which includes project management and construction management.

Total management reserve costs are estimated to be $265,383,000.

The total PV cost is estimated to be $787,116,000 (Table 8.2-4). Assumptions and cost estimates are provided in Appendix I.

9.0 SELECTION OF THE RECOMMENDED CORRECTIVE MEASURES ALTERNATIVE

The purpose of this CME is to identify, develop, and evaluate corrective measures alternatives and recommend the corrective measure for MDA C. Alternatives that met the threshold criteria in section 7 were evaluated against the remedial alternative evaluation criteria (i.e., the balancing criteria) in section 8. A comparative analysis of the alternatives and their relative ranking for each of the balancing criteria is provided in section 9.1. The recommended alternative is discussed in section 9.2.

9.1 Comparative Analysis of the Alternatives for MDA C

Alternatives were evaluated against the five balancing criteria in section 8. Each alternative has been rated per the rating system shown in Table 9.1-1. The relative rating for each alternative against the balancing criteria is provided in Table 9.1-2.

9.1.1 Long-Term Reliability and Effectiveness

Alternative 4, excavation with SVE and institutional controls, provides the highest degree of long-term reliability and effectiveness because all the waste materials at the site are removed (rating = 5 on a 1 to 5 scale). Alternative 1, no action, provides the least degree of long-term reliability and effectiveness because no action is taken and therefore is rated the lowest, at 1. Alternative 2, soil barrier, natural attenuation, and institutional controls, does not include any engineered controls and relies entirely on institutional control, and is therefore ranked next lowest at 2.

An ET cover provides a higher degree of long-term reliability and effectiveness compared with the multilayer cover because of the potential desiccation in the clay layers of the multilayer cover. Therefore, Alternative 3B, ET cover with SVE and institutional controls, is rated higher, at 4, than Alternative 3A, multilayer cover with SVE and institutional controls, which is rated 3. SVE is a component of both alternatives and therefore does not impact their relative ratings when determining long-term reliability and effectiveness.

9.1.2 Reduction of Toxicity, Mobility, or Volume

Alternative 4, excavation with SVE and institutional controls, provides the highest degree of reduction of toxicity, mobility, or volume because all wastes at the site are removed (rating = 5 on a 1 to 5 scale). Alternative 1, no action, provides the least degree of reduction of toxicity, mobility, or volume because no action is taken and therefore is rated the lowest, at 1.

Alternative 2, soil barrier and natural attenuation with institutional controls, Alternative 3A, multilayer cover with SVE and institutional controls, and Alternative 3B, ET cover with SVE and institutional controls all reduce contaminant mobility by using a soil cover to control infiltration. The multilayer and ET covers provide similar performance. This performance should be better than the performance of the existing soil cover, which is a component of Alternative 2, because the existing cover was not specifically engineered to minimize infiltration. Additionally, Alternatives 3A and 3B provide contaminant reduction through SVE, which is not a component of Alternative 2. Alternative 2 is given a rating of 2 and Alternatives 3A and 3B are rated equally at 3.

9.1.3 Short-Term Effectiveness

The site currently poses no potential unacceptable risk from exposure to site contaminants. Alternative 1, no action; Alternative 2, soil barrier and natural attenuation with institutional controls; Alternative 3A, multilayer cover with SVE and institutional controls; and Alternative 3B, ET cover with SVE and institutional controls, will not result in any change in short-term risk associated with the waste inventory. Alternative 4, excavation with SVE and institutional controls, will result in an increase in short-term risk to site workers.

Alternative 1, no action, and Alternative 2, soil barrier and natural attenuation with institutional controls, do not include SVE and will result in no short-term reduction in risk associated with the vapor plume. Alternatives 3A, multilayer cover with SVE and institutional controls, and Alternative 3B, ET cover with SVE and institutional controls, include SVE and will result in short-term reduction in risk associated with the vapor plume. Alternative 4, excavation with SVE and institutional controls, includes SVE, but SVE cannot be implemented until after excavation is complete and will not result in immediate short-term risk reduction.

Alternative 3A, multilayer cover with SVE and institutional controls, and Alternative 3B, ET cover with SVE and institutional controls, are rated highest (rating = 3 on a 1 to 5 scale) because they result in short-term risk reduction for the vapor plume and do not increase risk associated with the buried waste inventory. Alternative 4, excavation with SVE and institutional controls, is rated lowest (rating = 1 on a 1 to 5 scale) because it results in a short-term increase in risk. Alternative 1, no action, and Alternative 2, soil barrier and natural attenuation with institutional controls, are given a rating of 2 because the result in no increase or decrease in short-term risk.

9.1.4 Implementability

Alternative 1, no action, is the easiest to implement because no remedy is required, so it is rated the highest (rating = 5 on a 1 to 5 scale). Alternative 2, soil barrier and natural attenuation with institutional controls, consists of easily implementable activities, such as construction of a fence, monitoring, and maintenance, and is given a rating of 4. SVE is a component of each of the remaining alternatives and therefore does not impact their relative rating when determining implementability. Excavation of waste materials adds complexity to implementability because of safety controls for performing the tasks and handling the waste. Because Alternative 4, excavation with SVE and institutional controls, includes excavation of all waste materials, it is rated the lowest, at 2.

Since each type of engineered cover has similar design and construction requirements shown to be implementable, Alternatives 3A, multilayer cover with SVE and institutional controls, and 3B, ET cover with SVE and institutional controls, are rated equally, at 3.

9.1.5 Cost

Alternative 1, no action, has no cost, so it is rated the highest (rating = 5, on a1 to 5 scale). Alternative 2, soil barrier and natural attenuation with institutional controls, has the next lowest cost and is given a rating of 4. SVE is a component of each of the remaining alternatives and therefore does not impact their relative ratings when costs are compared. The cost criterion is impacted most by the excavation of waste materials, handling of the waste, and the disposal of the waste. Because Alternative 4, excavation with SVE and institutional controls, includes excavation of all waste materials and has the highest cost, it is rated the lowest, at 1.

Since each type of cover has similar cost requirements and excavation is not required, Alternatives 3A, multilayer cover with SVE and institutional controls, and 3B, ET cover with SVE and institutional controls, are rated equally, at 3.

9.2 Selection of Recommended Corrective Measure

Based on the alternatives evaluation, the recommended alternative for MDA C is Alternative 3B, ET cover, SVE, and institutional controls.

The recommended alternative effectively addresses the RAOs developed from the CSM (section 4.0). The RAOs include the following:

- Prevent human and ecological exposure to the waste through excavation, biointrusion, and erosion;
- Prevent human and ecological exposure to the contaminated surface soils and/or subsurface soils through excavation and biointrusion;
- Prevent groundwater from being impacted above a regulatory standard by the transport of VOCs through soil vapor; and
- Prevent the creation of contaminated leachate by restricting the infiltration of water into the waste.

The final RAO is defined to address uncertainty related to potential leachate production from the unlined pits and shafts at MDA C. If excess water accumulates in the units, contaminated leachate may be generated and transport downward from the site. Although water accumulation has not been observed to date, it is an undesired condition that warrants long-term prevention.

An ET cover can be constructed in a relatively short time frame (i.e., approximately 18 mo). This cover poses relatively low risk to the community, workers, and the environment during construction because it does not involve any waste excavation or management. SVE equipment is commercially available and extraction boreholes can be constructed within a 3-mo time frame. The SVE system poses relatively low risk to the community, workers, and the environment during construction as demonstrated by the SVE pilot studies conducted at TA-54. This alternative can be implemented in a timely manner.

An ET cover will provide protection against erosion, direct contact, biointrusion, and moisture infiltration. The ET cover puts a minimum of 6.5 ft of varying soil layers between a potential human or ecological receptor and the top of the disposal pits, thereby breaking the exposure pathway. The ET cover is designed to restrict infiltration of water, thereby breaking the contaminant transport pathway (via leaching) to groundwater. SVE will remove soil-vapor contaminants and will inhibit the downward migration of VOC-contaminated soil vapors, thereby breaking the contaminant transport pathway (via volatilization) to groundwater. Institutional controls will be implemented to provide access controls, thereby restricting human exposure. This alternative is protective of human health and the environment.

An ET cover will minimize or eliminate infiltration of precipitation that could otherwise mobilize subsurface contaminants. An ET cover will also limit exposure to waste and contaminated surface and subsurface soils and will reduce the potential for erosion and dust generation of contaminated surface soil. The potential exists for continued release of VOCs to the vadose zone that may diffuse to the groundwater. However, these releases would be controlled by SVE, which removes vapor-phase contaminants and reduces their potential to diffuse to groundwater. This alternative will control sources and the migration of released contaminants.

No waste is expected to be generated during the construction of the ET cover. The off-gas waste stream generated from the operation of the SVE system can be effectively managed to comply with waste management standards. Remediation wastes will be managed in accordance with state and federal regulations under this alternative.

The CSM has been refined to illustrate the impact of the recommended alternative on the source areas and release mechanisms, and the resulting reduction in exposure potential (e.g., incomplete pathways). The refined CSM is shown in Figure 9.2-1.

Although not part of the Consent Order CME process, the recommended alternative was evaluated to determine whether it would comply with the radiological-protection requirements of DOE Order 458.1. Specifically, a preliminary radiological dose assessment was conducted to evaluate the dose to industrial workers and members of the public from the radionuclide inventory contained in the MDA C waste disposal units with the recommended ET cover installed. The details of this assessment and the results are presented in Appendix G. The results of this assessment show that DOE radiological-protection requirements will be met over a 1000-yr period. Therefore, the corrective action alternative recommended under the Consent Order is consistent with and can meet DOE radiological-protection requirements. Specific design features needed to ensure the longevity and long-term performance of the cover will be developed as part of the final design during the CMI.

10.0 DESIGN CRITERIA TO MEET CLEANUP OBJECTIVES

This section presents a preliminary plan and key specifications for design and implementation of the recommended alternative.

10.1 Design Approach

Selection of the recommended alternative requires designing an ET cover and finalizing the design of an SVE system during the CMI phase for MDA C. The design described below does not specifically address meeting the radiological-protection requirements defined by DOE Order 458.1, Radiological Protection of the Public and the Environment. As summarized in section 9.2 and described in Appendix G, a preliminary radiological dose assessment has been performed to demonstrate that the ET cover described in this section is capable of meeting DOE radiological-protection requirements over a 1000-yr period. Additional design features may be needed, however, to ensure the longevity of the cover, and these features will be addressed in the CMI phase. The final design for the ET cover will satisfy both Consent Order and DOE Order 458.1 performance objectives.

The design process will include the following.

ET Cover

One ET cover will be installed over MDA C (Figure 7.2-1). The area of the cover will be approximately 11 acres. A preliminary conceptual design of the ET cover and preliminary specifications of the cover components are presented in Appendix J. The preliminary cover design includes

- 1 ft of angular cobbles with a minimum diameter of 4 in. to 6 in. to act as a biointrusion barrier;
- 0.5 ft of sand and gravel mixture to prevent the mixing of soil layers;
- 3.5 ft of natural or amended soil meeting the water storage capacity of a typical sandy loam; and
- 1.5 ft of natural or amended soil and vegetation, with minimal slopes, to ensure a desired stand of vegetation is maintained.

The preliminary ET cover design may be modified based on further evaluation of the critical design requirements. The critical design requirements include

- identifying critical infiltration events, including identification of the design precipitation event (i.e., maximum precipitation event that the design can endure), or series of events;
- determining the minimum required thickness and contours required to ensure the ET cover can control erosion and infiltration over the 100-yr maintenance period based on precipitation events identified above. Also, determining the minimum soil thickness required to establish and maintain vegetation;
- determining the minimum required water-storage capacity of MDA C soil based on design infiltration events identified above;
- identifying the seed mixture to be used and meeting with representatives of San Ildefonso Pueblo to ensure the mixture has no adverse effect on downstream Pueblo lands, and identifying the surface treatment to be employed before seeding and the frequency of watering necessary to establish vegetation on the cover;
- planning for long-term maintenance requirements of the ET cover that includes annual inspection and repair for erosion and subsidence, removal of debris and large woody plants, removal of burrowing animals, and mowing as needed to maintain the ET cover; and
- satisfying DOE Order 458.1 radiological-protection requirements.

Time-domain reflectometers will be installed in the ET cover to monitor moisture content in the cover. Specific performance criteria for cover performance (e.g., maximum moisture flux) will be developed during the design process.

SVE

The results and conclusions of the SVE pilot tests conducted at MDA L in 2006 (LANL 2006, 094152) and MDA G in 2008 and 2010 (LANL 2009, 105112; LANL 2010, 109657) determined that SVE is a viable technology for removing VOCs from the subsurface at MDA C. A conceptual SVE design (Appendix H) includes the following principal assumptions and components:

- Installation of four SVE boreholes (Figure 7.2-3), each to a depth of approximately 315 ft bgs within the lower reaches of unit Qbt 1g (Figure 7.2-4). The boreholes will be screened from 185 ft to 315 ft bgs, where most of the VOC mass is located. The boreholes will be located where vapor-phase TCE concentrations exceed Tier II screening levels for porous media flow but where drilling access is not impeded by the disposal pits and shafts.
- Installation of four SVE boreholes (Figure 7.2-3) into the Qct unit to approximately 395 ft bgs. These boreholes will be screened within the Qct unit (325 ft to 395 ft bgs). The purpose of these boreholes is to extract vapors containing TCE approaching the Tier II screening level and to provide a barrier against further downward migration of VOC vapors in the vadose zone.
- Two portable skid-mounted SVE units will be cycled between the extraction boreholes during operations. Each SVE unit will utilize a 15-hp blower motor, providing up to 320 scfm at a vacuum of 120 in. of water. The system will be optimized during the initial setup, although a vacuum between 50 in. and 70 in. of water has been demonstrated to be effective in pilot tests previously performed at TA-54.
- Extraction boreholes in the upper units are projected to provide a 125-ft ROI, providing an effective area of extraction of approximately 49,000 ft^2 for each borehole. Extraction boreholes in the Qct unit are expected to provide a 150-ft ROI, providing an effective area of extraction of approximately 70,650 ft^2. Borehole spacing will target the vapor plume areas but may be impacted by the inability to drill through the pits and shafts.

10.2 Preliminary Design Criteria and Rationale

Preparation of the CMI plan includes a schedule for design of the recommended alternative, including development of design drawings, calculations, and supporting documentation that will be submitted to NMED according to the CMI schedule. The CMI plan will be written to ensure the following.

- The cover will have sufficient thickness and will be contoured to control erosion resulting from the worst-case precipitation event.
- The cover will have sufficient thickness and incorporate a biointrusion barrier to restrict deep-rooting vegetation and burrowing animals.
- The cover will have sufficient capacity to store the “maximum” infiltration quantity resulting from the worst-case precipitation event until it can be removed through ET.
- The proposed seed mixture used to stabilize the cover with vegetation will closely emulate the local shallow-rooting plant community, will ensure the vegetative cover remains viable, and will have no detrimental effect on downstream Pueblo lands.

- The surface treatment method will encourage native vegetation establishment and growth and reduce erosion.
- The proposed SVE system will effectively remove VOC mass and limit VOC migration.

10.2.1 Surface Treatment

Surface treatments, such as soil nutrients, a gravel layer, or a soil-gravel admixture, may be warranted in the semiarid climate at the Laboratory to help establish native vegetation and reduce erosion. During the CMI design phase, a seed mix will be specified to stabilize the cover with native vegetation similar to the undisturbed and well-established plant communities inhabiting Mesita del Buey.

The addition of a layer of soil-gravel admixture on the surface of the cover provides erosion protection for the design storm event and promotes ET from native species of grasses. Erosion and water-balance studies at the Laboratory indicate moderate amounts of gravel mixed into the cover topsoil will control both water and wind erosion with little effect on the vegetation or the soil-water balance (Wilson et al. 2005, 092034). The protection from water erosion depends on the depth, velocity, and duration of stormwater flowing across the MDA C cover. Flow values can be established from the physical properties (i.e., slope, convex or concave grading, slope uniformity, and length of flow paths) of the cover and the intensity of the precipitation (i.e., precipitation rates, infiltration versus runoff relationships, snowmelt, and off-site flows). As wind blows and water flows over the cover surface, some winnowing of fines from the admixture is expected, creating a vegetated, erosion-resistant surface.

An ET cover is intended to function in unsaturated conditions; consequently, obtaining very low saturated hydraulic conductivity is not essential to a successful cover. The ET cover soil moisture characteristics and cover compaction density are crucial parameters. Compaction density requirements will be based on the design criteria used but generally will achieve a density in the upper soil layer that approximates the surrounding undisturbed soil. Uniformity of compaction is critical to avoid creating preferential infiltration pathways.

The recommendation on surface treatment is based on review of site-specific conditions at MDA C and Laboratory data from cover experiments at TA-51 (Nyhan et al. 1996, 063111). The best surface layer will be chosen during the CMI design phase and after discussion with NMED. Additional information and specifications for the surface treatment are provided in Appendix J.

10.2.2 Cover Soil

The performance of the ET cover relies on its thickness, materials, and placement. The ET cover for MDA C will be thick enough to ensure that the water-storage capacity exceeds the maximum infiltration resulting from the design precipitation event. Additional information and specifications for the cover soil are provided in Appendix J.

10.2.3 Filter Media

Inclusion of a filter media layer with a particle size between that of the cover soil and the biointrusion barrier will enhance the water storage of the cover by providing a capillary break. Additional information and specifications for the filter media are provided in Appendix J.

10.2.4 Biointrusion Barrier

When the final cover depth is established in the CMI, the biointrusion barrier requirements will be evaluated to optimize performance. The biointrusion barrier must prevent deep-rooting plants and burrowing animals from encroaching into the waste where they may become exposed, create conduits for water infiltration, or transport waste to the surface. Additional information and specifications for the biointrusion barrier are provided in Appendix J.

10.3 General O&M Requirements

An O&M manual based on the design and monitoring requirements for the ET cover will be prepared and submitted as part of the CMI plan. O&M considerations will include irrigation needs, moisture monitoring, erosion monitoring, biota monitoring, and cover maintenance.

An O&M manual based on the design and monitoring requirements for the SVE system will be prepared and submitted as part of the CMI plan. The SVE system will be operated as described in Appendix H.

10.3.1 Long-Term Monitoring Requirements

Groundwater monitoring of the regional aquifer will be conducted in accordance with a long-term groundwater monitoring plan for MDA C, as required in Section IV.C.3.c.viii of the Consent Order.

Long-term subsurface vapor monitoring will be performed according to the plan in Appendix H or until NMED determines that monitoring is not necessary.

The coupled monitoring network for MDA C uses vapor monitoring in the vadose zone, along with regional aquifer monitoring, to provide a defense-in-depth monitoring approach that will demonstrate the effectiveness of the final remedy and satisfy long-term monitoring requirements.

10.4 Additional Engineering Data Requirements

Before the CMI design is completed, additional data are required, including but not limited to

- testing the geotechnical properties of all materials used for the ET cover and
- performing in situ air-permeability testing from pilot vapor-extraction boreholes.

10.5 Additional Requirements

10.5.1 Permits and Regulatory Requirements

NMED will select a final remedy, issue a Statement of Basis for the selected remedy, and designate a period of time for public comment (section 11). The emission source from the SVE system will be evaluated to determine if a permit is required to operate the SVE system.

10.5.2 Access, Easements, Right-of-Way Agreements

Access, easements, and right-of-way agreements are managed through the Laboratory and will be developed as required once the corrective measure is selected.

10.5.3 Health and Safety Requirements

A site-specific health and safety plan will be prepared to describe the health and safety requirements to be followed during construction of the ET cover, construction and installation of the SVE boreholes and system, O&M activities, and monitoring activities.

10.5.4 Community Relations Activities

A community relations program will be developed in accordance with Section VII.E.4 of the Consent Order to keep Northern New Mexico stakeholders and other interested parties regularly informed of project activities and progress at MDA C.

11.0 SCHEDULE FOR COMPLETION OF ACTIVITIES

The Consent Order requires that a schedule for completion of activities be submitted in the CME report. Activities leading to completion of the remedy include planning, design, and construction of the ET cover and planning, design, installation, testing, and operation of the SVE system and monitoring systems. Several milestones for completion of the corrective measure at MDA C are presented in the Consent Order, along with schedule updates. In addition to these milestones, the Consent Order requires that the CME report include a proposed schedule for implementation of the preferred remedy. The schedule identifies the duration of corrective action operations, the frequency of monitoring and sampling activities, and the dates for submitting inspection and monitoring reports to NMED, including all status reports and preliminary data.

Proposed milestones include the following.

- NMED will prepare a Statement of Basis for remedy selection and issue the statement for public comment.
- NMED will receive public comments on the Statement of Basis for at least 60 d following public notice. NMED will provide an opportunity for a public hearing that may extend the public comment period.
- Based upon the Laboratory's preferred remedy in the CME, the Laboratory will request to submit a CMI plan within 18 mo after NMED selects a final remedy. The plan will contain detailed engineering design drawings and system specifications for all elements of the remedy and a schedule for implementation of the corrective action.
- The corrective measure will be implemented and a remedy completion report submitted according to the schedule in the CMI plan. Following approval of the CMI plan, construction of the Laboratory's preferred remedy is expected to take approximately 18 mo.
- Active SVE and pore-gas monitoring will be conducted, as discussed in Appendix H.
- Monitoring and maintenance, including reporting requirements, will be completed according to the CMI plan.
- Following completion of the remedy, groundwater monitoring will be conducted and reported as required by the long-term groundwater monitoring plan for MDA C.

12.0 REFERENCES AND MAP DATA SOURCES

12.1 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. This information is also included in text citations. ER IDs 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 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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12.2 Map Data Sources

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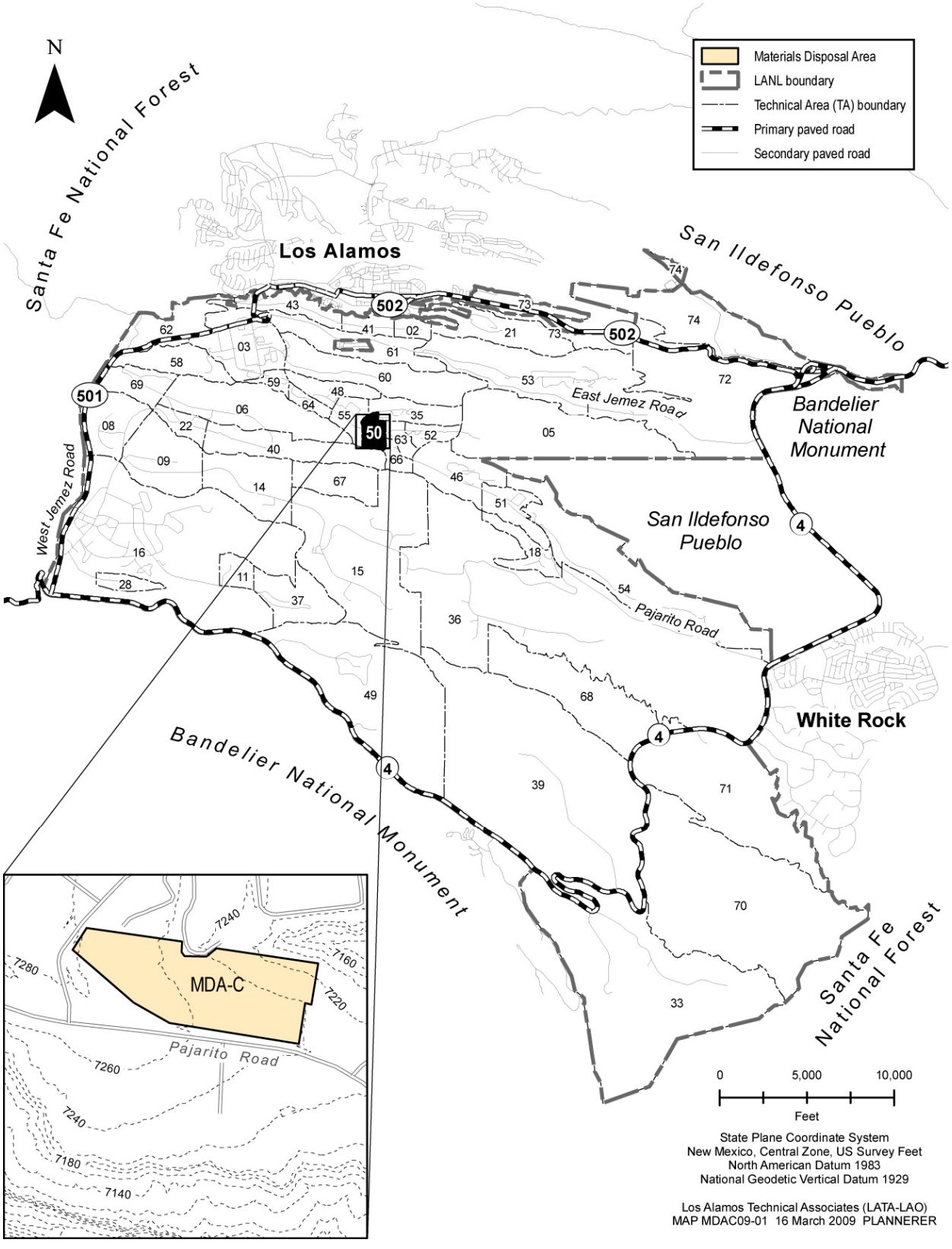


Figure 1.0-1 Locations of MDA C and surrounding TAs

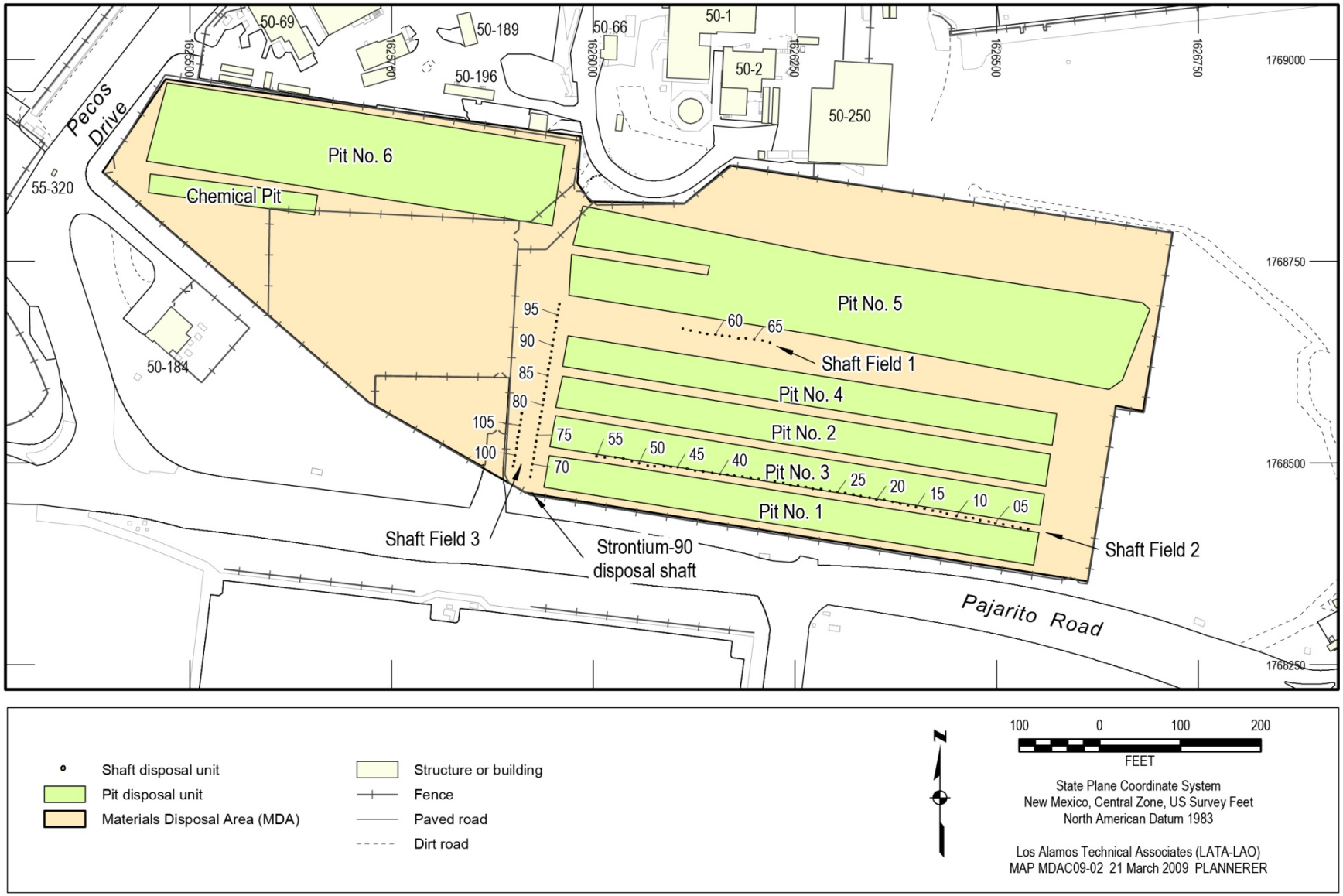


Figure 1.0-2 Locations of pits and shafts at MDA C

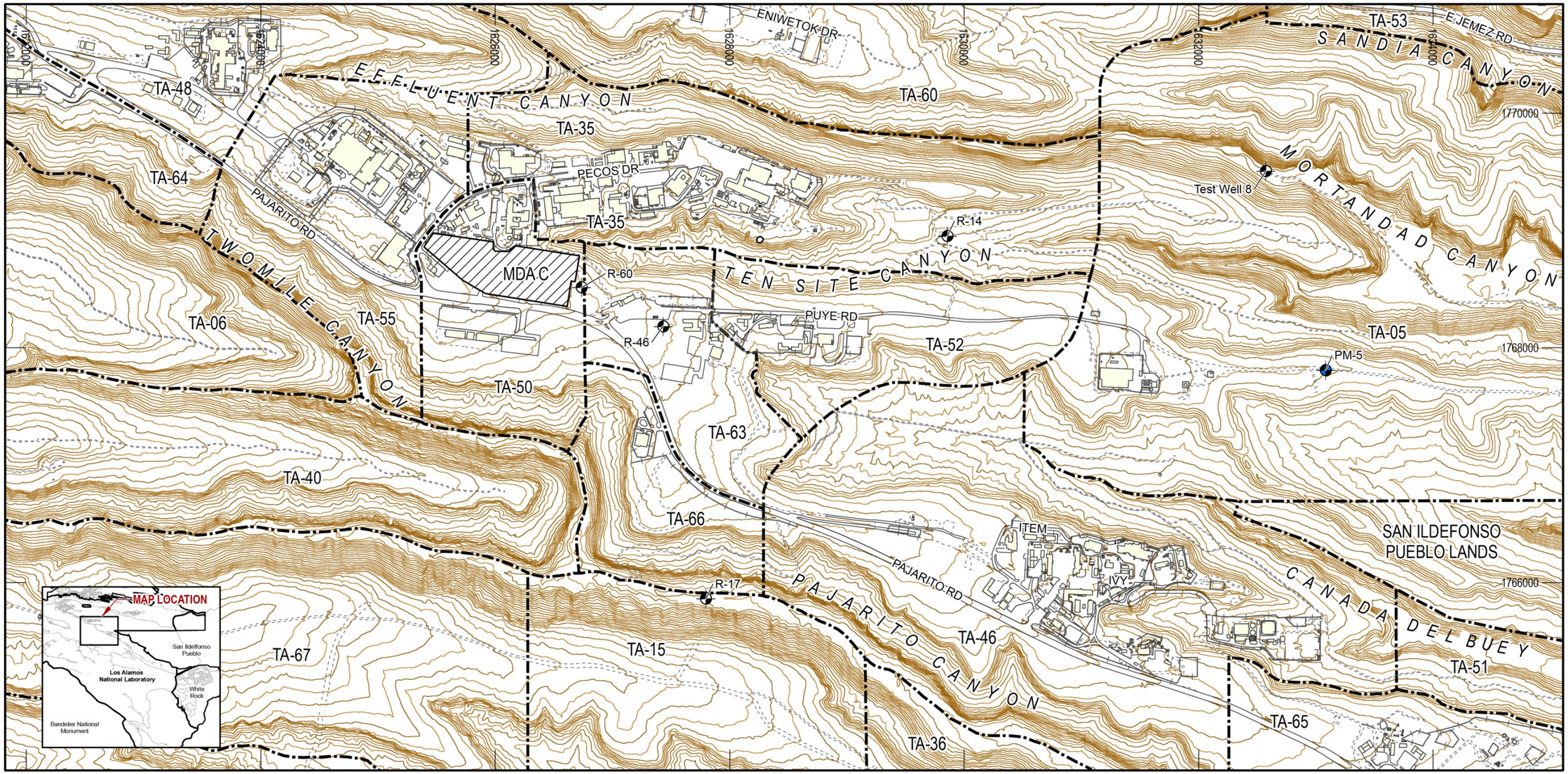


Figure 2.3-1 Area map of MDA C showing mesa-top setting, nearby TAs, and related canyons

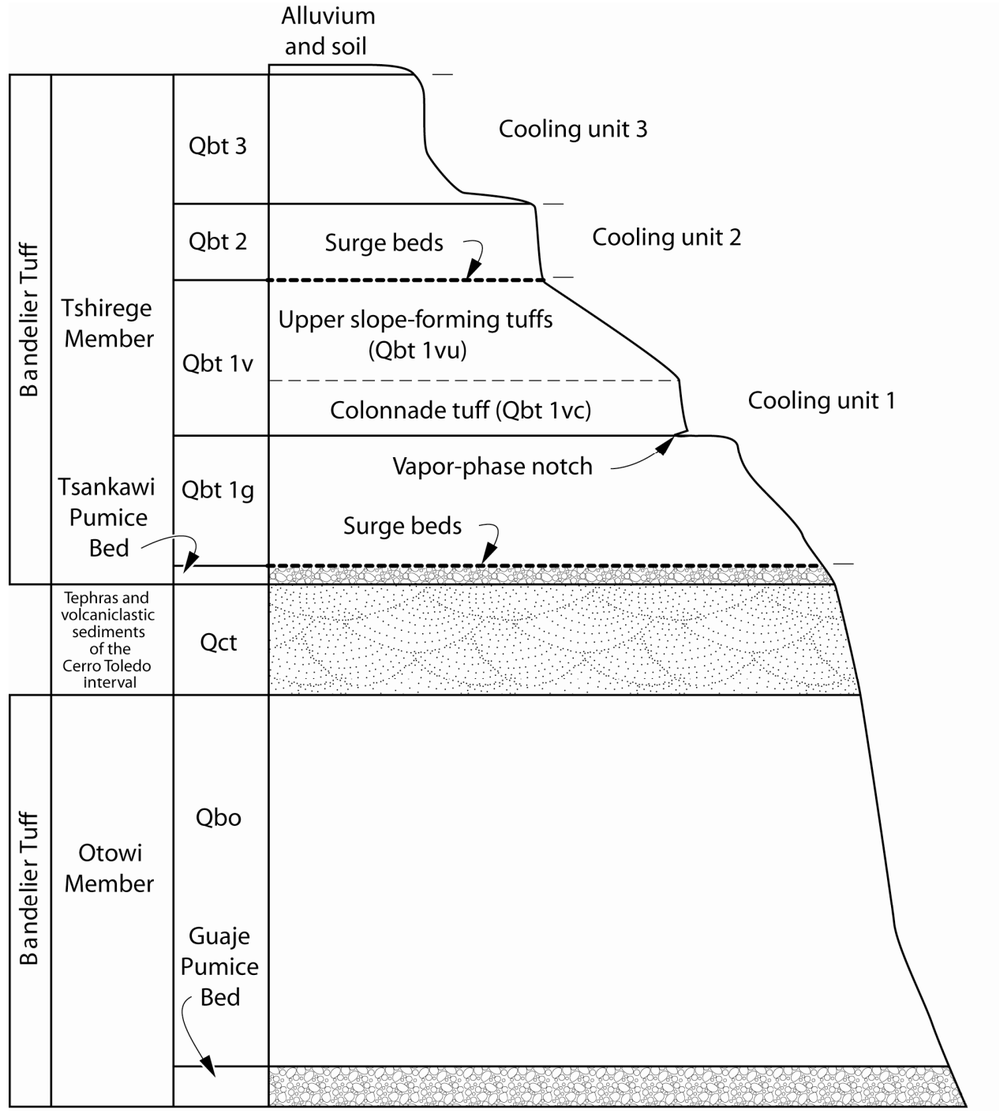
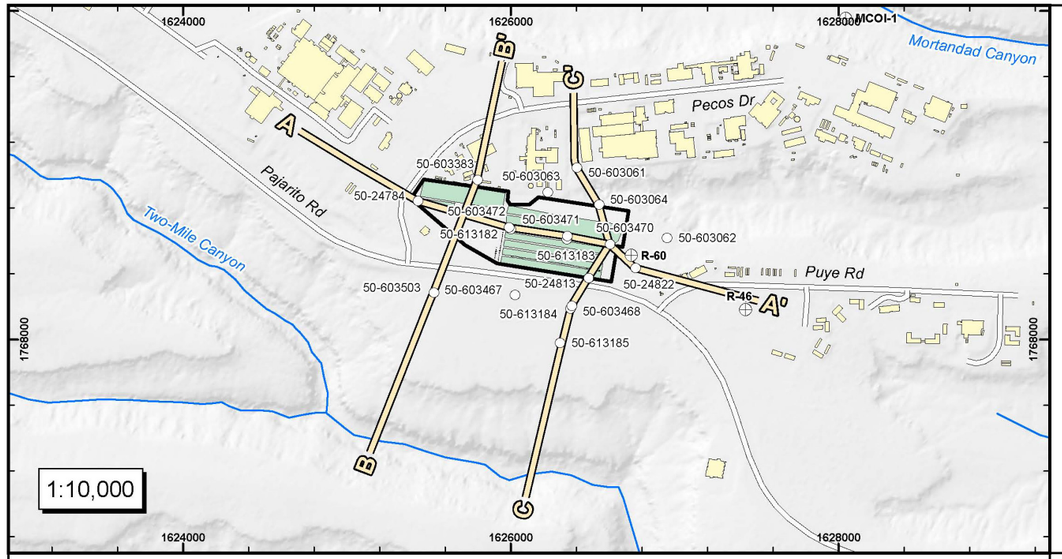
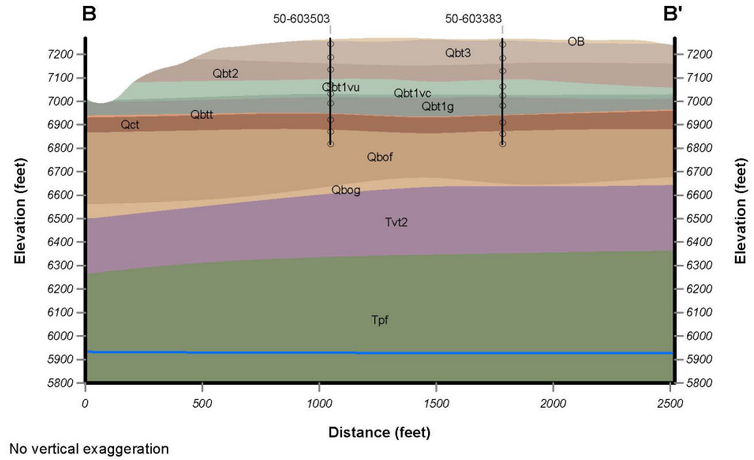
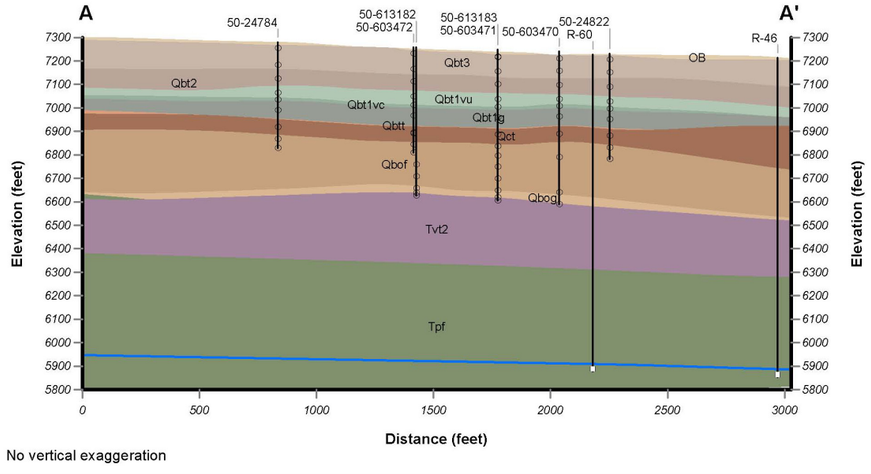
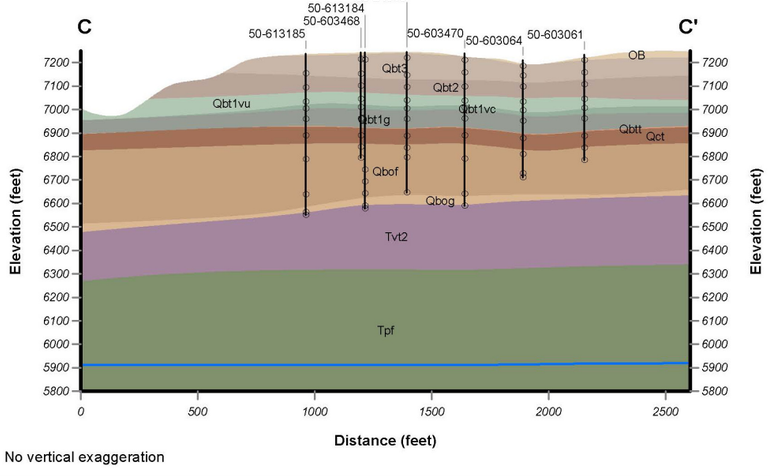


Figure 2.3-2 Generalized stratigraphy in the vicinity of MDA C









Legend

- Vapor Ports
- Transects
- Roads
- MDA Boundary
- Drainage
- Structure
- Disposal Pit
- Disposal Shaft
- Regional Wells
- Regional Water Table

Geologic Unit

- OB - Fill, Soil
- Qbt3 - Bandelier tuff - Unit3
- Qbt2 - Bandelier tuff - Unit2
- Qbt1vu - Bandelier tuff - Unit1vu
- Qbt1vc - Bandelier tuff - Unit1vc
- Qbt1g - Bandelier tuff - Unit1g
- Qbtt - Tsankawi Pumice
- Qct - Cerro Toledo interval
- Qbof - Bandelier tuff - Otowi unit
- Qbog - Bandelier tuff - Guaje Pumice
- Tvt2 - Younger Tschicoma Dacite
- Tpf - Puye Formation

Note:
The geology depicted on these cross-sections was extracted from Weston's WC09e update to the LANL FY09 Geologic Framework Model.

Figure 2.3-3 Stratigraphic units beneath MDA C, locations of vapor-monitoring wells and ports, and locations of regional wells R-60 and R-46 and their well screens

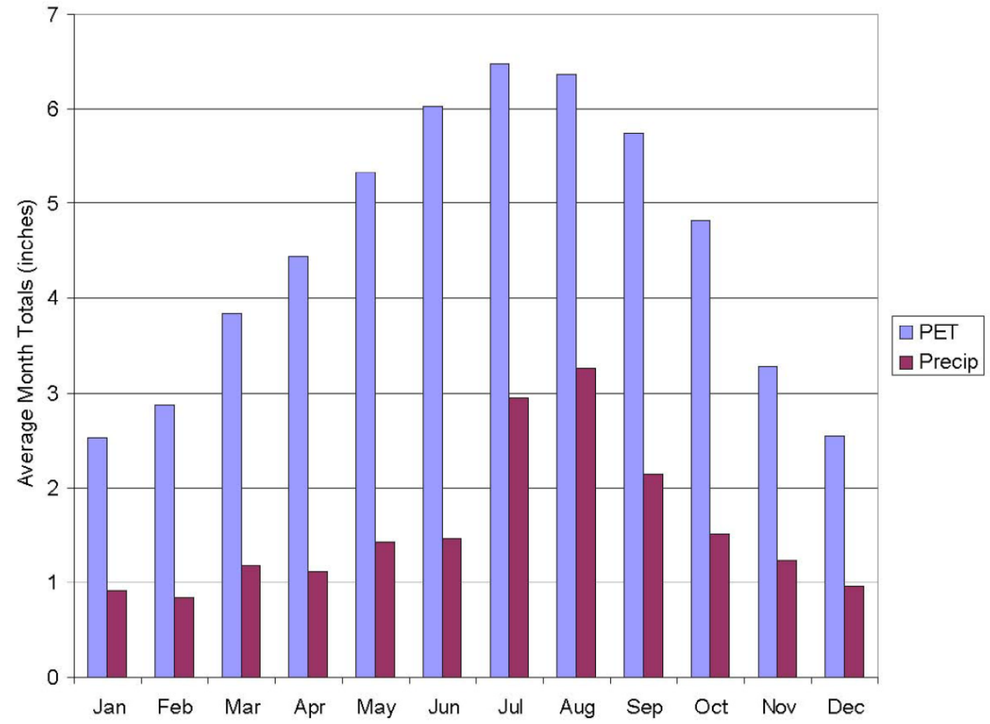


Figure 2.3-4 PET versus precipitation for Los Alamos, New Mexico

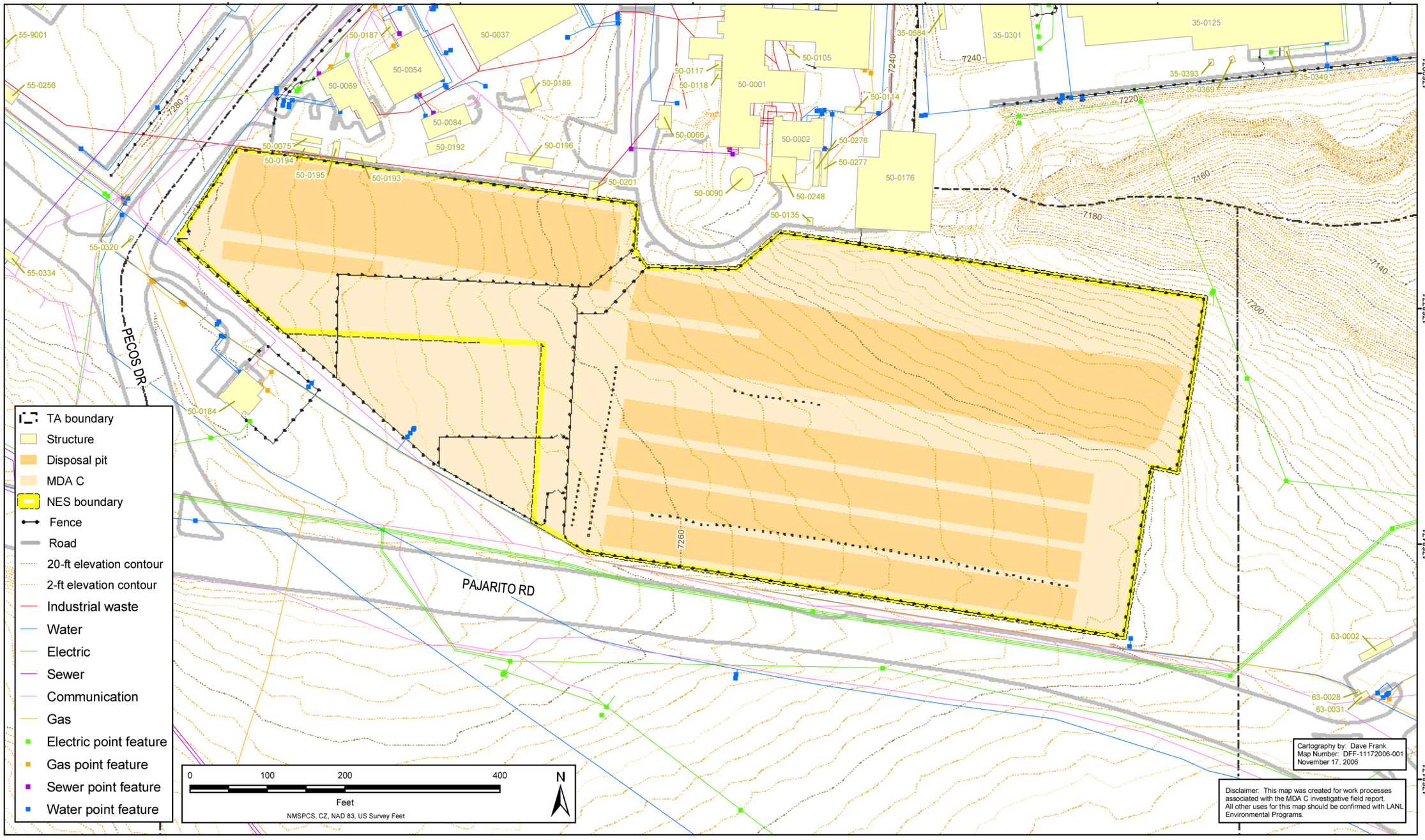


Figure 3.2-1 Utilities and other subsurface and surface structures at MDA C

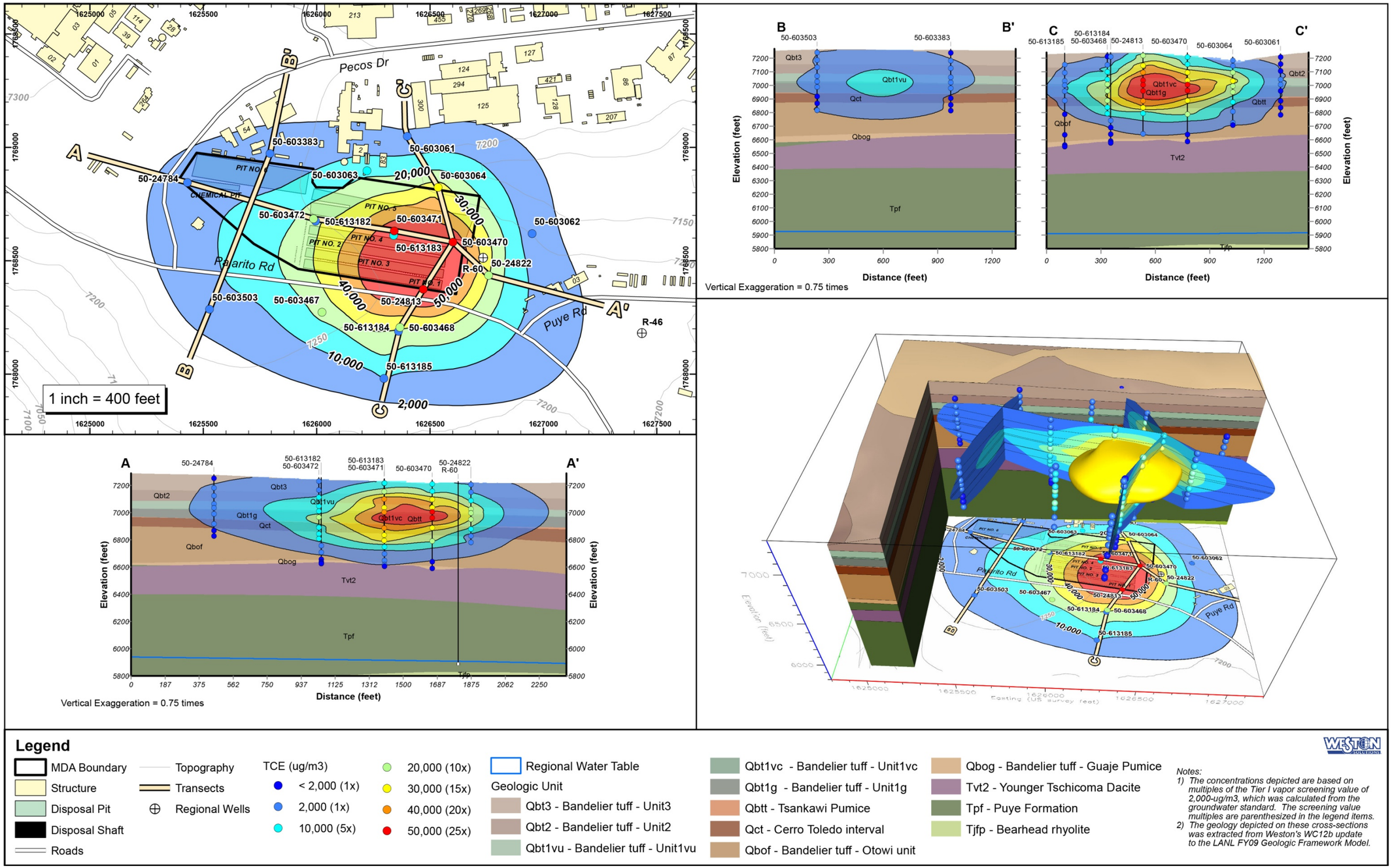


Figure 3.2-2 Three-dimensional representation of TCE vapor plume beneath MDA C

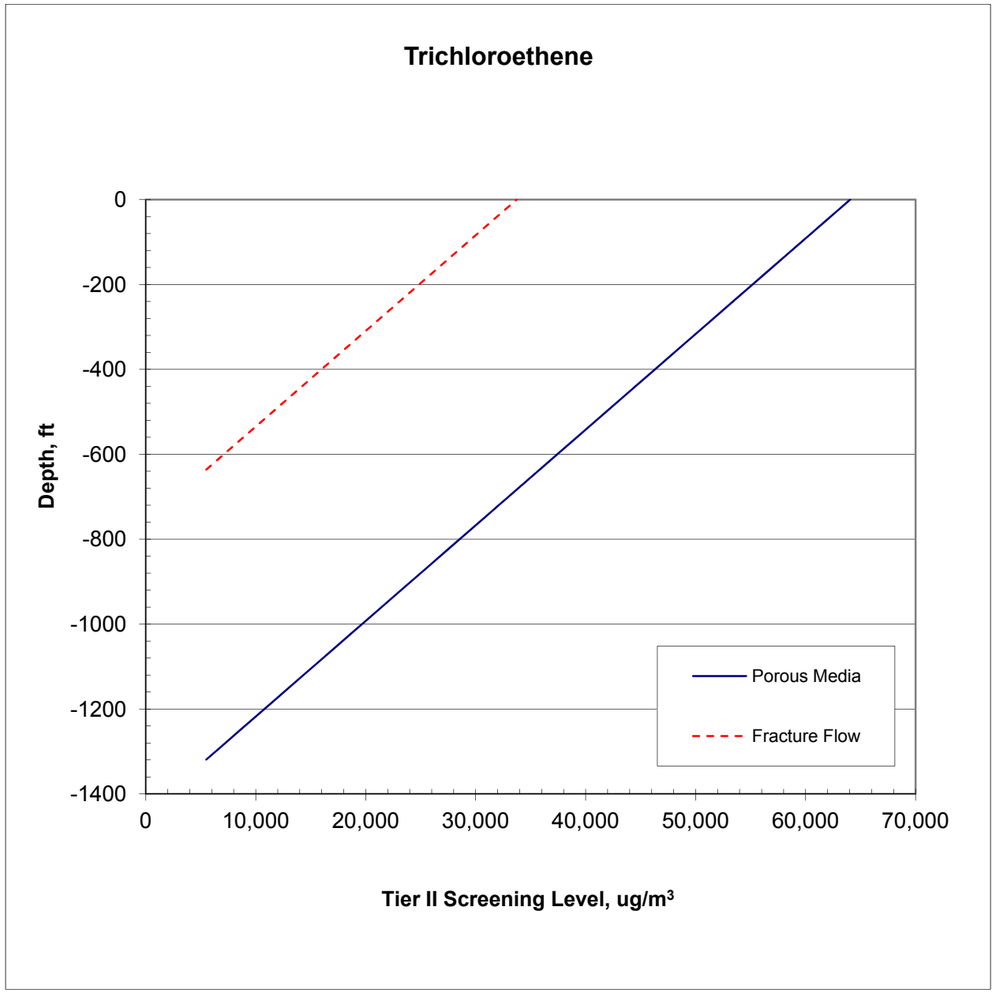


Figure 3.2-3 Tier II screening levels for TCE as a function of depth

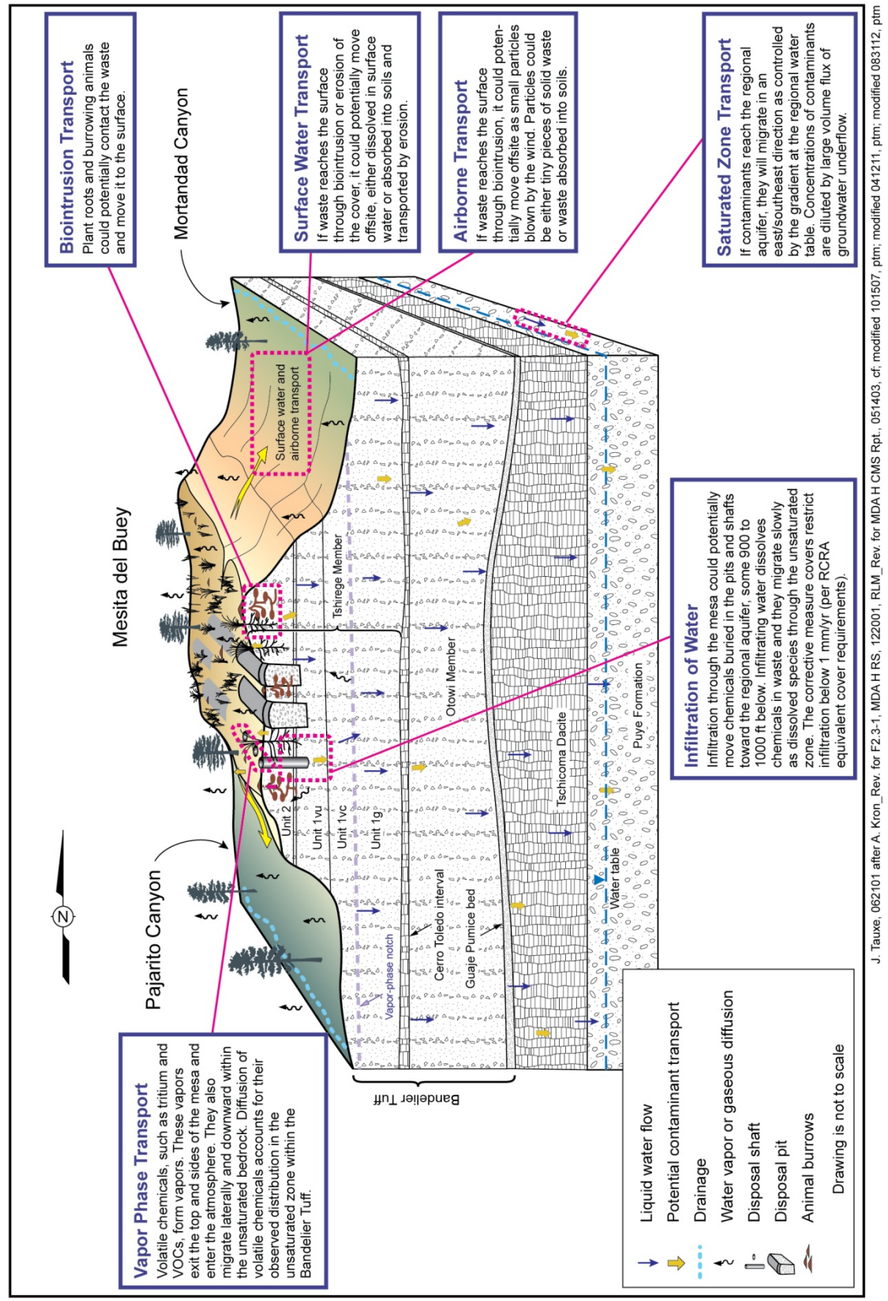
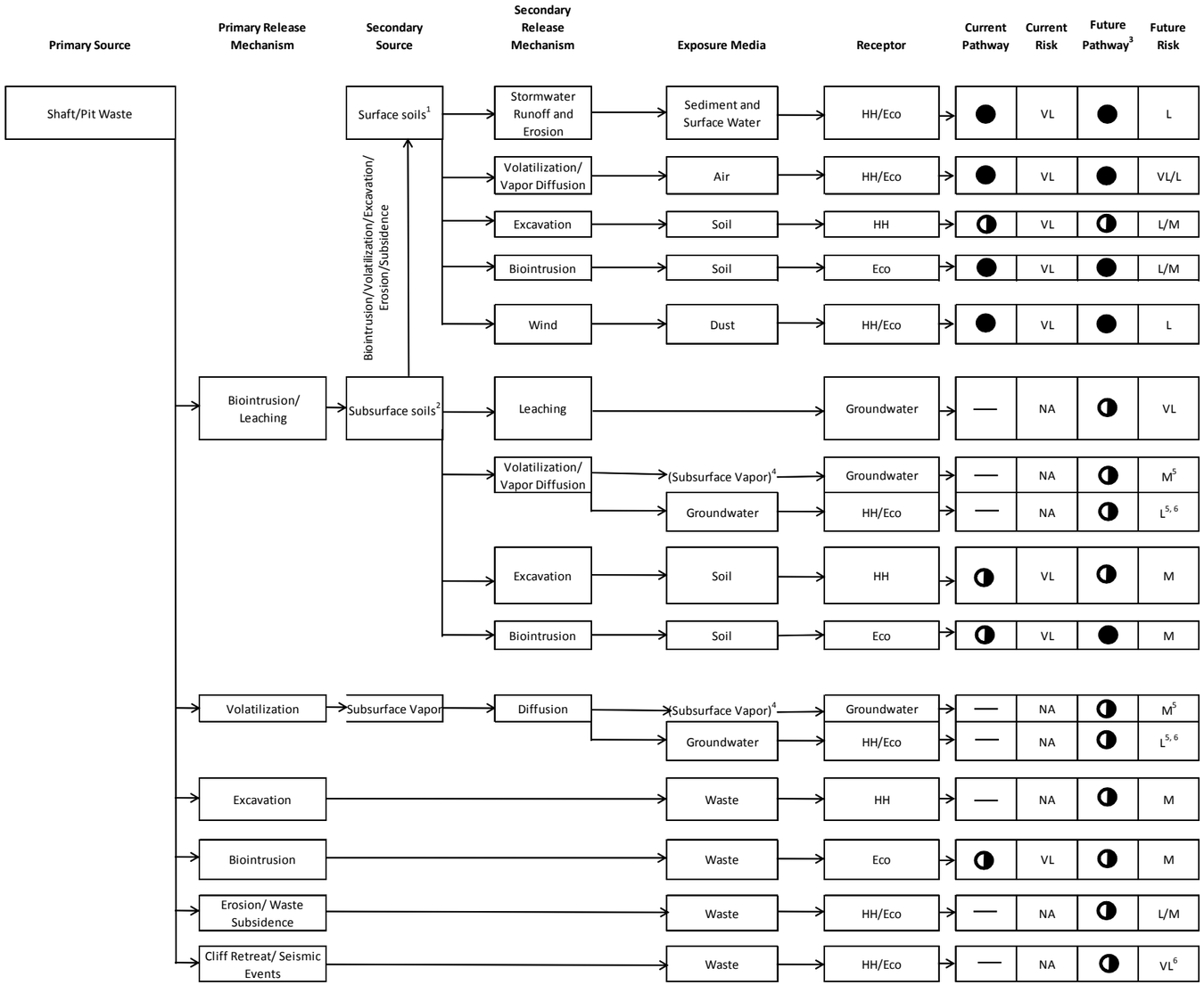


Figure 4.0-1 Hydrogeologic CSM for MDA C



Exposure Pathways

● = Complete pathway

◑ = Potentially complete pathway

— = Incomplete pathway

Notes:

HH = Human Health

Eco = Ecological

Risks of Exposure

VL = Very Low

L = Low

M = Medium

NA = Not Applicable

Footnotes:

[1] = Surface soil is defined as 0 to 1 ft bgs.

[2] = Subsurface soil is defined as deeper than 1 ft bgs.

[3] = Future scenario assumes no remedy implemented and no institutional controls.

[4] = This is not an exposure media but a potential source to groundwater.

[5] = There is uncertainty associated with the contaminant transport of soil vapor to groundwater.

[6] = The risk associated with this pathway is quantified as low or very low due to the low potential of this pathway becoming complete.

Figure 4.0-2 CSM for pit and shaft waste at MDA C

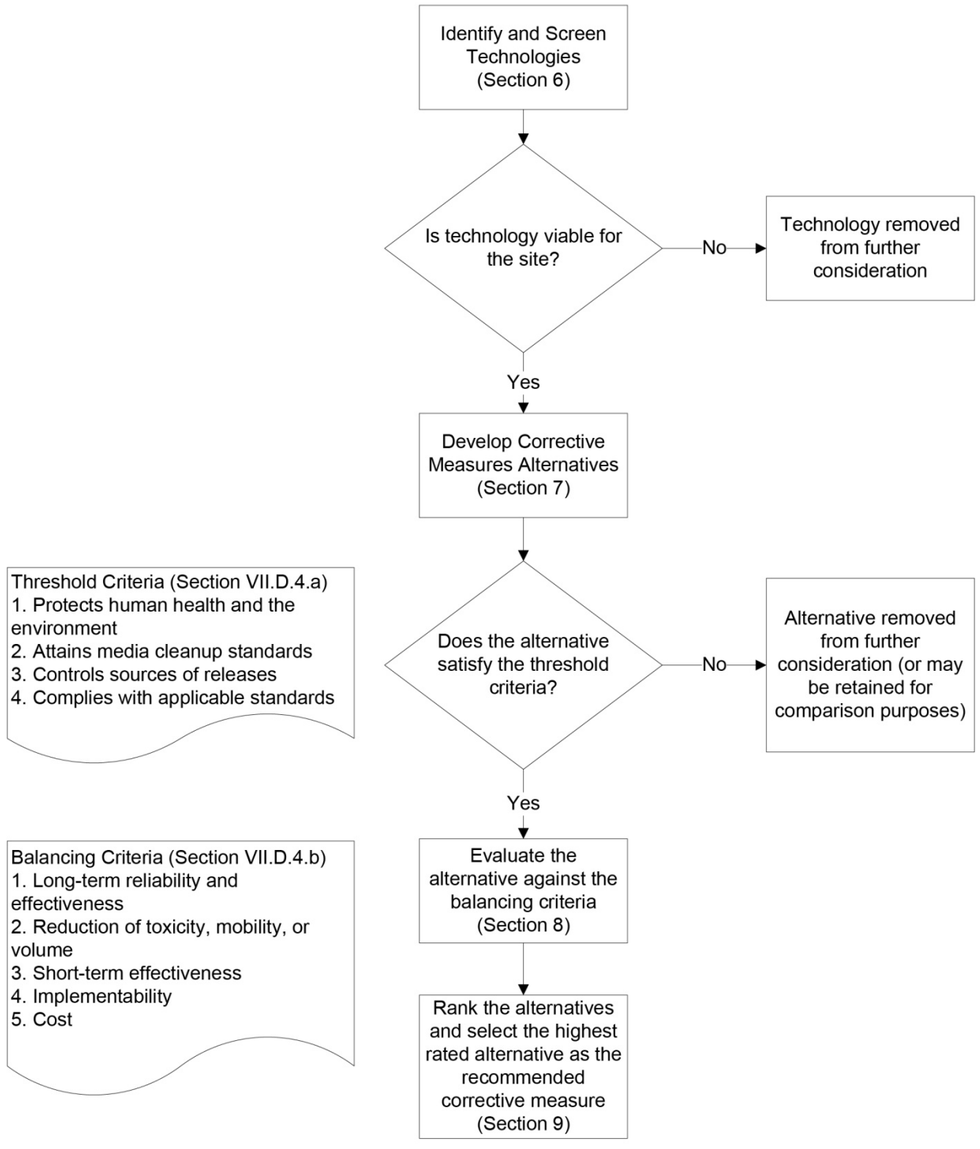


Figure 5.2-1 The selection process for the preferred corrective measures alternative

Figure 7.2-1 Conceptual cover layout for Alternatives 3A and 3B

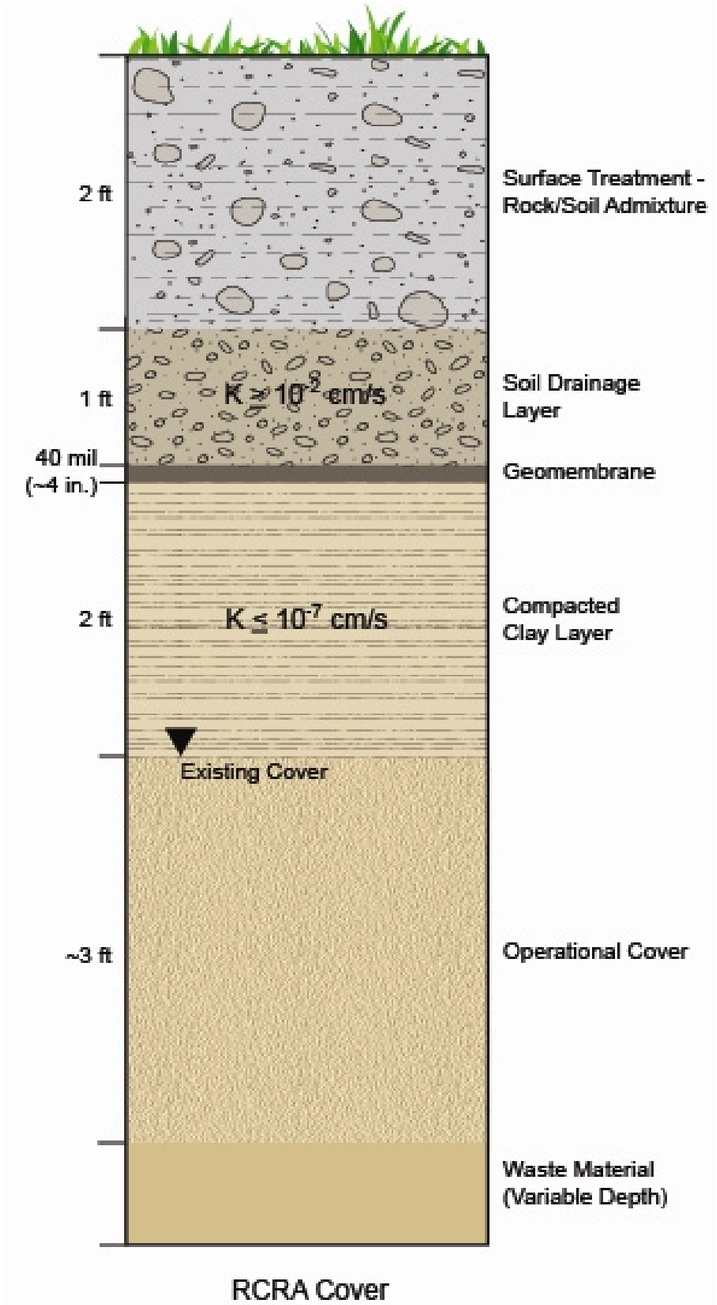


Figure 7.2-2 Cross-section of RCRA cover

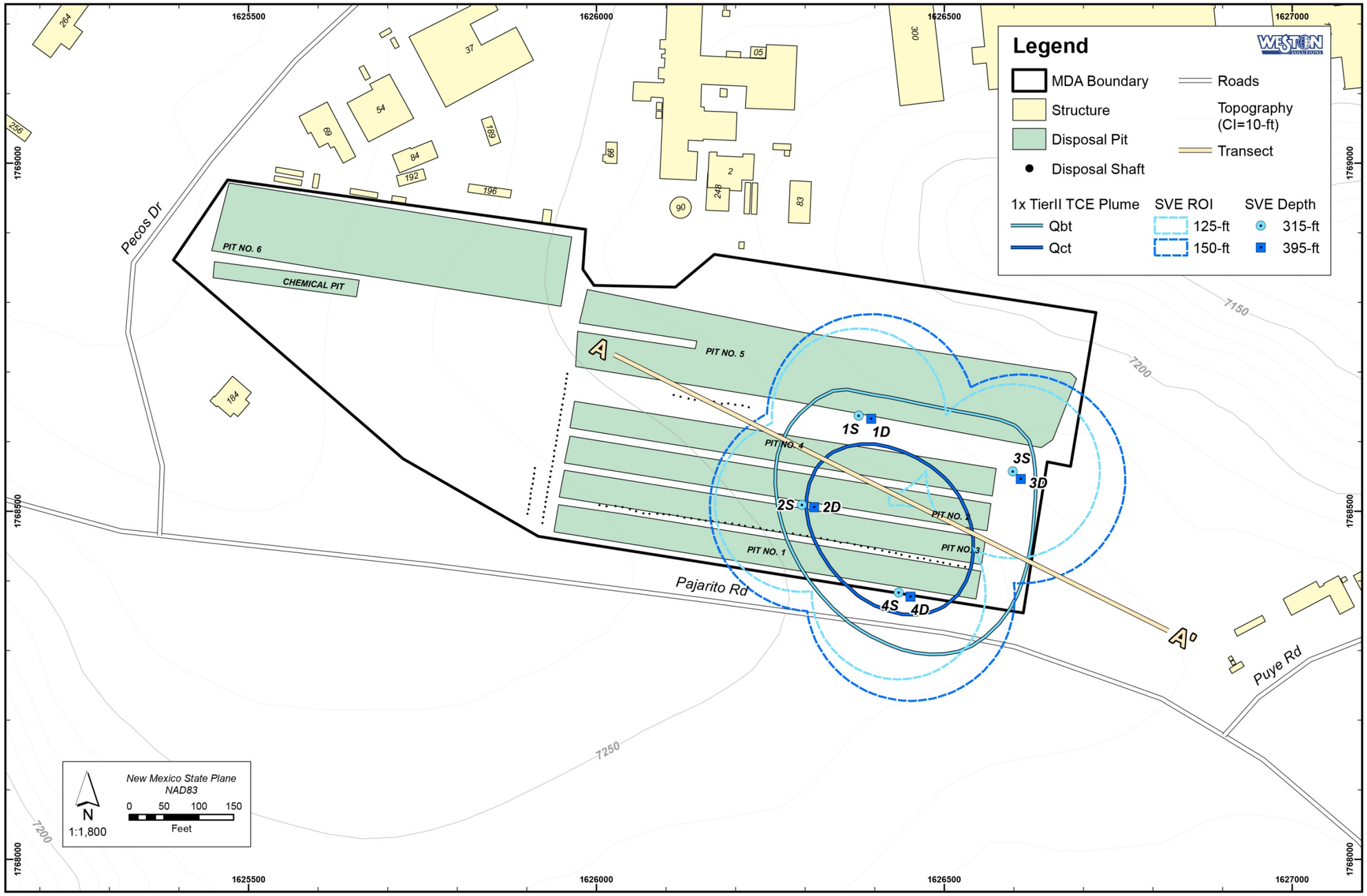


Figure 7.2-3 Layout of proposed SVE system

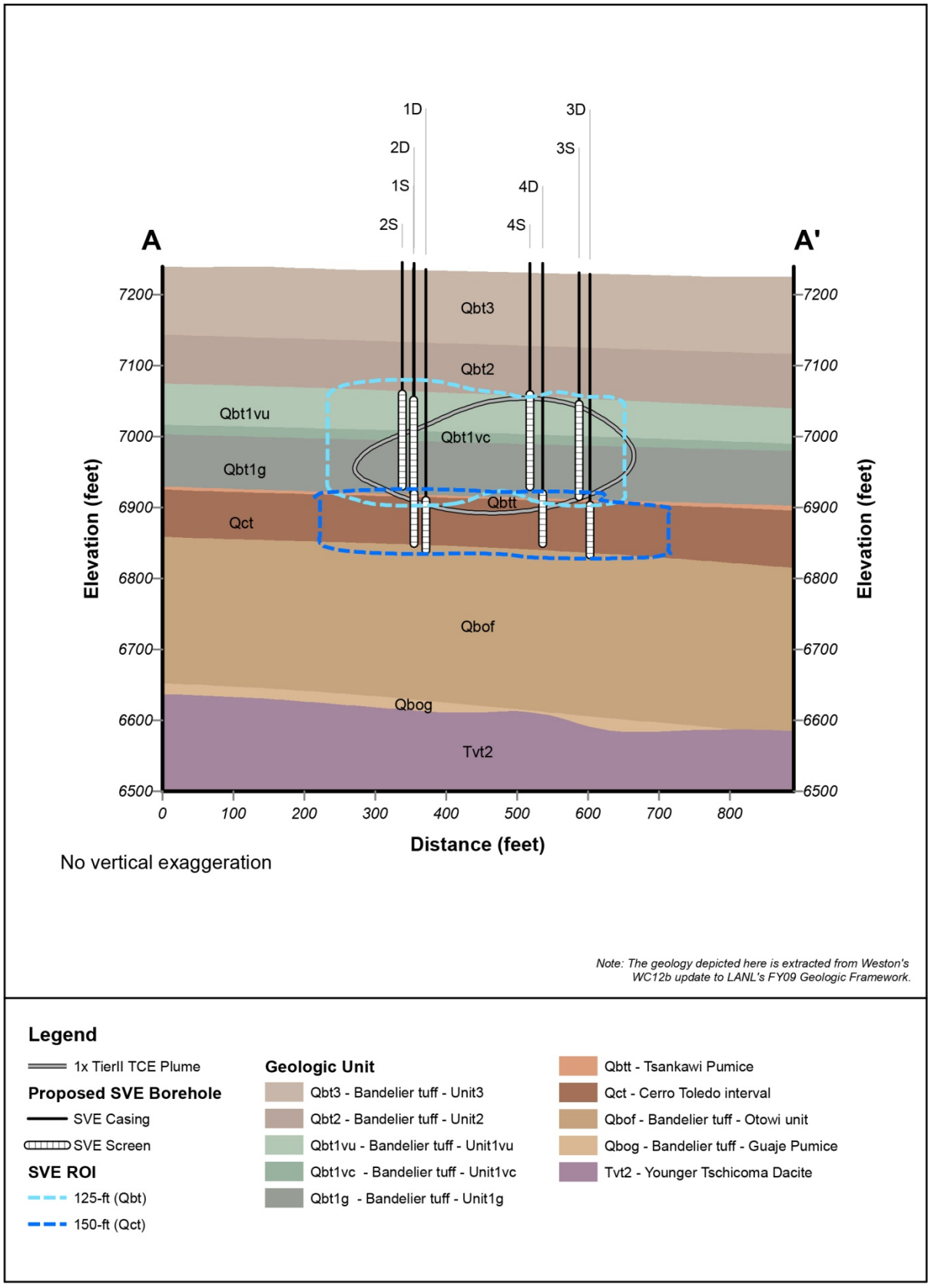


Figure 7.2-4 Cross-section of proposed SVE system

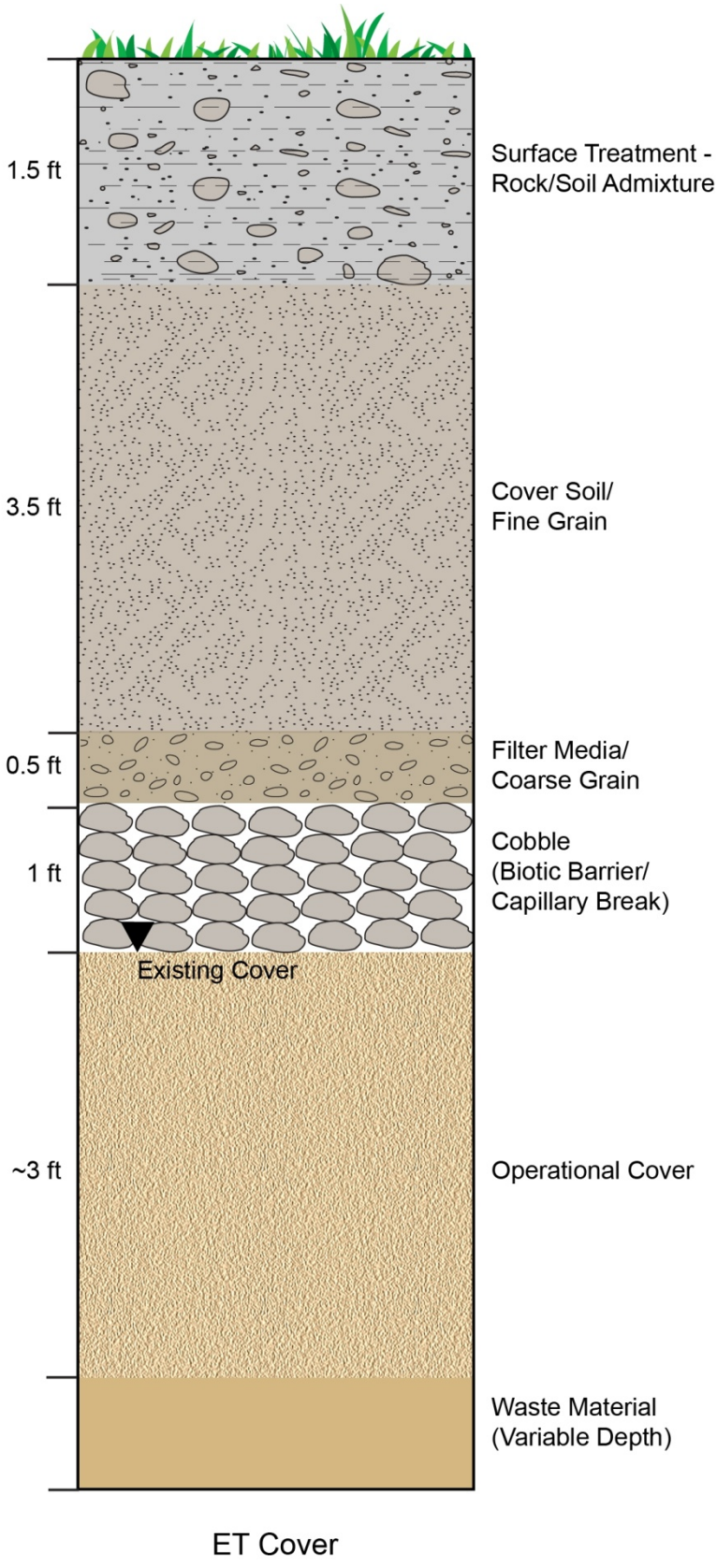


Figure 7.2-5 Cross-section of ET cover

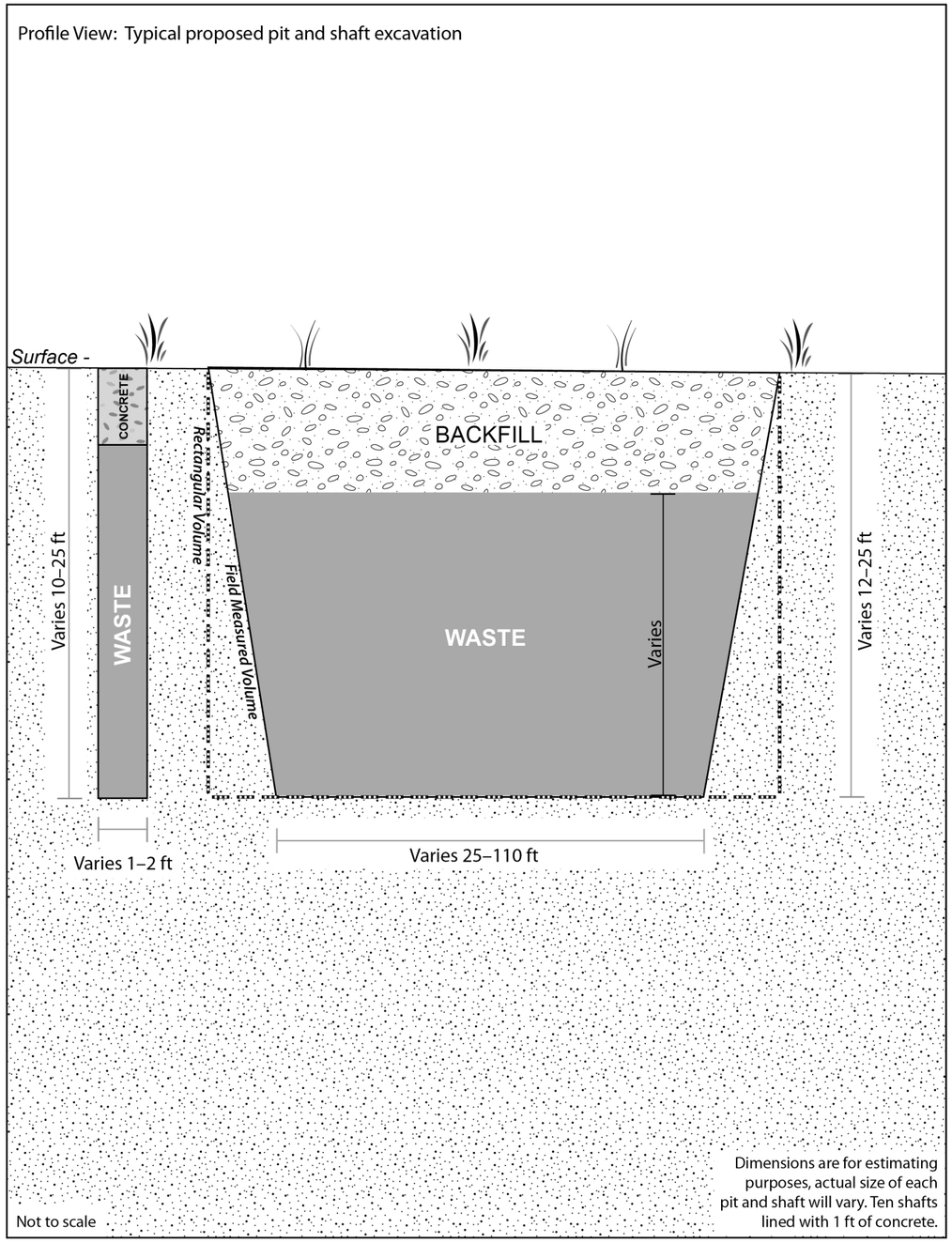
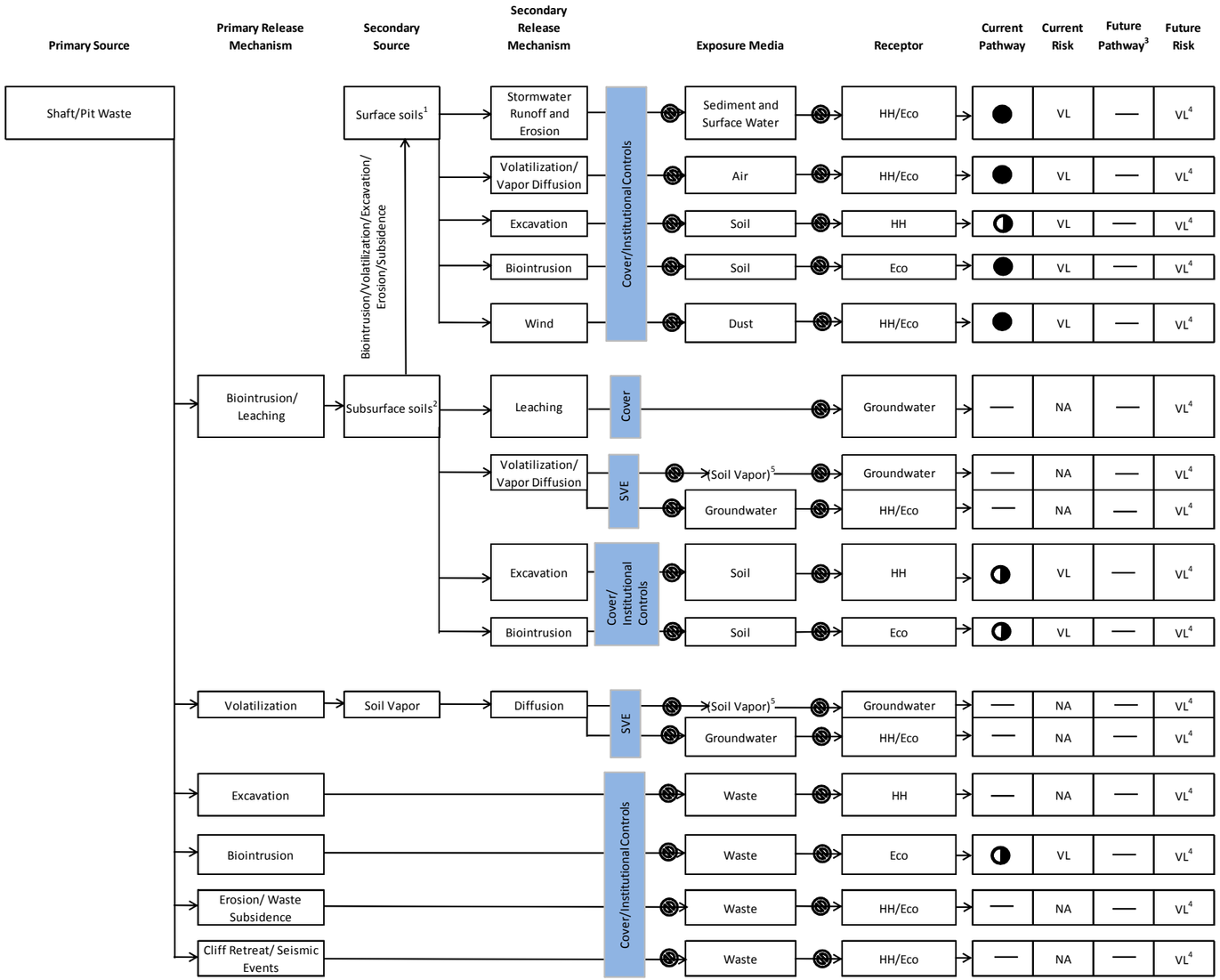


Figure 7.2-6 Typical cross-section of pit and shaft excavation



Exposure Pathways

● = Complete pathway

◑ = Potentially complete pathway

— = Incomplete pathway

⊘ = Pathway broken by corrective measure

Notes:
HH = Human Health
Eco = Ecological

Risks of Exposure

VL = Very Low
L = Low
M = Medium
NA = Not Applicable

Footnotes:

[1] = Surface soil is defined as 0 to 1 ft bgs.

[2] = Subsurface soil is defined as deeper than 1 ft bgs.

[3] = Future scenario assumes implementing the recommended alternative.

[4] = Future risk is shown as very low because the transport/exposure pathway is incomplete based on implementation of the recommended alte

[5] = This is not an exposure media but a potential source to groundwater.

Figure 9.2-1 Refined CSM for pit and shaft wastes

Table 1.0-1
Crosswalk with Consent Order Requirements

No.	Consent Order Requirement	Consent Order Section Reference	CME Report Section or Other Source
1	The Respondents shall follow the Corrective Measures Evaluation Report format outlined in Section XI.F of this Consent Order.	VII.D.2	Table of Contents
2	The corrective measures evaluation shall evaluate potential remedial alternatives and shall recommend a preferred remedy that will be protective of human health and the environment and attain the appropriate cleanup goals.	VII.D.2	Sections 5 through 9
3	1. A description of the location, status, and current use of the site.	VII.D.2	Sections 1 and 2
4	2. A description of the history of site operations and the history of releases of contaminants.	VII.D.2	Section 2
5	3. A description of site surface conditions.	VII.D.2	Sections 2 and 3
6	4. A description of site subsurface conditions.	VII.D.2	Sections 2 and 3
7	5. A description of on- and off-site contamination in all affected media.	VII.D.2	Sections 2, 3, and Appendix B
8	6. An identification and description of all sources of contaminants.	VII.D.2	Sections 2, 3, and Appendix B
9	7. An identification and description of contaminant migration pathways.	VII.D.2	Section 4
10	8. An identification and description of potential receptors.	VII.D.2	Section 4
11	9. A description of cleanup standards or other applicable regulatory criteria.	VII.D.2	Section 5
12	10. An identification and description of a range of remedy alternatives.	VII.D.2	Section 6
13	11. Remedial alternative pilot or bench scale testing results.	VII.D.2	Section 2 and Appendix B
14	12. A detailed evaluation and rating of each of the remedy alternatives, applying the criteria set forth in Section VII.D.4.	VII.D.2	Sections 7, 8, and 9
15	13. An identification of a proposed preferred remedy or remedies.	VII.D.2	Section 9
16	14. Design criteria of the selected remedy or remedies.	VII.D.2	Section10
17	15. A proposed schedule for implementation of the preferred remedy.	VII.D.2	Section 11
18	The Respondents shall select corrective measures that are capable of achieving the cleanup standards and goals outlined in Section VIII of this Consent Order including, as applicable, approved alternate cleanup goals established by a risk assessment.	VII.D.3	Sections 7, 8, and 9

Table 1.0-1 (continued)

No.	Consent Order Requirement	Consent Order Section Reference	CME Report Section or Other Source
19	The Respondents shall evaluate each of the remedy alternatives for the following threshold criteria. To be selected, the remedy alternative must: 1. Be protective of human health and the environment. 2. Attain media cleanup standards. 3. Control the source or sources of release so as to reduce or eliminate, to the extent practicable, further releases of contaminants that may pose a threat to human health and the environment. 4. Comply with applicable standards for management of waste.	VII.D.4.a	Section 7
20	The remedy shall be evaluated for long-term reliability and effectiveness. This factor includes consideration of the magnitude of risks that will remain after implementation of the remedy; the extent of long-term monitoring, or other management that will be required after implementation of the remedy; the uncertainties associated with leaving contaminants in place; and the potential for failure of the remedy. Respondents shall give preference to a remedy that reduces risks with little long-term management, and that has proven effective under similar conditions.	VII.D.4.b.i	Section 8
21	The remedy shall be evaluated for its reduction in the toxicity, mobility, and volume of contaminants. Respondents shall give preference to remedy that uses treatment to more completely and permanently reduce the toxicity, mobility, and volume of contaminants.	VII.D.4.b.ii	Section 8
22	The remedy shall be evaluated for its short-term effectiveness. This factor includes consideration of the short-term reduction in existing risks that the remedy would achieve; the time needed to achieve that reduction; and the short-term risks that might be posed to the community, workers, and the environment during implementation of the remedy. Respondents shall give preference to a remedy that quickly reduces short-term risks, without creating significant additional risks.	VII.D.4.b.iii	Section 8
23	The remedy shall be evaluated for its implementability or the difficulty of implementing the remedy. This factor includes consideration of installation and construction difficulties; operation and maintenance difficulties; difficulties with cleanup technology; permitting and approvals; and the availability of necessary equipment, services, expertise, and storage and disposal capacity. Respondents shall give preference to a remedy that can be implemented quickly and easily, and poses fewer and lesser difficulties.	VII.D.4.b.iv	Section 8
24	The remedy shall be evaluated for its cost. This factor includes a consideration of both capital costs, and operation and maintenance costs. Capital costs shall include, without limitation, construction and installation costs; equipment costs; land development costs; and indirect costs including engineering costs, legal fees, permitting fees, startup and shakedown costs, and contingency allowances. Operation and maintenance costs shall include, without limitation, operating labor and materials costs; maintenance labor and materials costs; replacement costs; utilities; monitoring and reporting costs; administrative costs; indirect costs; and contingency allowances. All costs shall be calculated based on their net PV. Respondents shall give preference to a remedy that is less costly, but does not sacrifice protection of health and the environment.	VII.D.4.b.v	Section 8

Table 2.1-1
Dimensions of the Disposal Units at MDA C

Disposal Unit	Dimensions[a] (ft)	Period of Operations
Pit 1	610 × 40 × 25	1948–1951
Pit 2	610 × 40 × 25	1950–1951
Pit 3	610 × 40 × 25	1951–1953
Pit 4	610 × 40 × 25	1951–1955
Pit 5	705 × 110 × 18	1953–1959
Pit 6	505 × 100 × 25	1956–1959
Chemical Pit	180 × 25 × 12	1960–1964
Shaft Group 1 (12 [Shafts 56–67])	2 × 10	1958–1959
Shaft Group 2 (55 [Shafts 1–55])	2 × 15	1959–1967
Shaft Group 3 (40 [Shafts 68–107])	1–2[b] × 20–25	1962–1974
Shaft 108 (Strontium-90 Disposal Shaft)	4 × 4 × 4	1956

[a] As stated in Table 2-11 of the OU 1147 work plan, pit dimensions are length by width by depth; shaft dimensions are diameter by depth (LANL 1992, 007672). Dimensions are approximate.

[b] Shafts 98–107 are 1 ft inside diameter and lined with 12-in.-thick concrete. Shafts 68–97 are 2 ft in diameter and unlined.

Table 2.4-1
Summary of Previous Investigations at MDA C from 1956 to 2004

Time of Investigation	Investigation Activities	Analysis Conducted/ Instrument Used	Investigation Result(s)
Pre-RFI Activities			
1956–1961	Water-infiltration tests	Subsurface moisture	Moisture predominantly moves laterally not vertical at MDA C.
1976–1984	Radiation surveys	Field instruments	Identified localized areas of elevated radioactivity and, in 1984, covered MDA C with crushed tuff and topsoil, except in the northeast corner.
1985–1986	Radiation surveys	TLD, Phoswich detector, and high-pressure ion chamber (HPIC)	TLD monitoring at perimeter locations did not identify significant radiation source; Phoswich and HPIC detected elevated radioactivity in the northeast corner of MDA C.
1985	Surface soil sampling	Isotopic plutonium, isotopic uranium, and tritium	Detected elevated radioactivity on the north and east side of MDA C and to the west of Pits 2, 4, 5, and 6 and/or the associated disposal shafts.
1986	Surface soil sampling	Americum-241, cesium-137, isotopic plutonium, and tritium	Confirmed 1985 results.
1989	Shallow subsurface pore-gas sampling	VOCs	No VOCs detected.
1989	Sediment sampling at drainage channel to Ten Site Canyon	Inorganic chemicals, pesticides, PCBs, SVOCs, VOCs, and radionuclides	Four metals, one VOC, eight SVOCs, four pesticides, and radionuclides (americium-241, cesium-137, plutonium isotopes, radium-226, and uranium isotopes) detected.
RFI Activities			
1993	Surface soil sampling	Inorganic chemicals, PCBs, SVOCs, and radionuclides (americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, strontium-90, and tritium)	Sporadic detects of SVOCs and Aroclor-1254 and Aroclor-1260; detected elevated concentrations of americium-241 and plutonium isotopes in the northeast area of MDA C.
1994	Geophysical survey	Magnetometer	Not conclusive—could identify only ferrous materials within 12 ft bgs.
1995–1996	Borehole air-flow velocity measurements	Air-flow velocity, oxygen content, and atmospheric pressure	Instantaneous air flow rates were 0.2–2 ft^3/min.
1995–1996	Subsurface tuff sampling (drilled 11 boreholes)	TAL metals, cyanide, pesticides and PCBs, SVOCs, VOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic thorium, isotopic uranium, strontium-90, and tritium	VOCs and radionuclides present in vadose zone; the vertical and lateral extent of contamination of metals, cyanide, and radionuclides not defined.

Table 2.4-1 (continued)

Time of Investigation	Investigation Activities	Analysis Conducted/ Instrument Used	Investigation Result(s)
2000	EMFLUX measurements	VOC surface flux	Six VOCs detected with PCE being the most frequently detected organic chemical.
2001–2003	Pore-gas sampling in boreholes 50-09100 and 50-10131 (drilled in 2001)	VOCs	Nature and extent of VOCs in pore-gas not defined.
2001–2002	Two consecutive geophysical surveys	Terrain conductivity, high-sensitivity metal detector, and digital ground-penetrating radar to locate pits and shafts; electrical resistivity technique to map thickness of cover materials	2001 survey indicated pit boundaries, while interference from a chain-link fence obscured pit boundaries along the southern and eastern edges of MDA C. Second survey conducted in 2002 after the fence was removed found no evidence of disposal pits outside the fence line.
2003	Biota screening and sampling	Ant mounds and animal burrows field screened for gross-alpha, -beta, and -gamma activity; soil samples collected from ant mounds and animal burrows and pine needles analyzed for gross-alpha, -beta, and -gamma activity.	Burrowing mammals and ants are not transporting radionuclides from the subsurface to the ground surface at MDA C; however, pine trees had elevated levels of gross alpha and beta radioactivity, indicating that trees are able to transport radionuclides from the subsurface into their needles.
2003	Tritium in shallow subsurface pore gas	Pore-gas vapor probes	Two highest tritium concentrations were detected to the west of Shaft Group 3 and to the north of the west end of Pit 6
2003–2004	Air monitoring of tritium	Biweekly airborne tritium data collection	Average tritium concentration = 11.5 pCi/m^3

Table 2.4-2
Monitoring Plan for MDA C Monitoring Group Specified in 2010 IFGMP

Well	Rationale for Selection of Well	Source Aquifer	Watershed	Analytical Suites												
				Metals	Organics					Radionuclides		Inorganics			Field[g]	
				Metals[a]	VOCs + TICs[b]	SVOCs + TICs	Pesticides	PCB	Explosive Compounds	Radionuclides[c]	Low-Level Tritium[d]	General Inorganics[e]	Perchlorate	Stable Isotopes[f]	DO, ORP, pH, SC, T, Turbidity	
PCI-2	Monitors perched-intermediate groundwater at the confluence of Twomile and Pajarito Canyons.	Intermediate	Pajarito	S[h]	Q[i]	A[j]	—[k]	—	T	A	S	Q	A	A	Q	
R-14	Monitors for potential contaminants from Ten Site Canyon or upper Mortandad Canyon, including MDA C.	Regional	Mortandad	S	Q	A	—	—	A	A	S	Q	A	A	Q	
R-17	Monitors MDA C, TA-16 and potential sources in upper Pajarito watershed.	Regional	Pajarito	S	Q	A	—	—	T	A	S	Q	A	A	Q	
R-46	Monitors groundwater quality downgradient of MDA C.	Regional	Mortandad	S	Q	A	—	—	A	A	S	Q	A	A	Q	
R-60	Monitors for potential contaminant releases from MDA C.	Regional	Mortandad	Q	Q	S	S	S	S	Q	Q	Q	Q	S	Q	

Notes: Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals and anions samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only. Organic constituents will be nonfiltered.

[a] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[b] TIC = tentatively identified compounds.

[c] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[d] Tritium samples may be submitted for analysis be liquid scintillation if average activities are expected to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[e] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity; pH; and hardness.

[f] Analysis for stable nitrogen and oxygen isotopes and deuterium.

[g] Field parameters include pH, turbidity, specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) will be measured if a flowthrough cell is used.

[h] S = Samples collected on a semiannual basis (2 times/yr).

[i] Q = Samples collected on a quarterly basis (4 times/yr).

[j] A = Samples collected on an annual basis (1 time/yr).

[k] — = This analytical suite is not scheduled to be collected.

Table 2.4-3
Monitoring Plan for MDA C Monitoring Group Specified in 2011 IFGMP

Well	Rationale for Selection of Well	Source Aquifer	Analytical Suites						
			Metals	Organics		Radionuclides		Inorganics	Field[e]
			Metals (Filtered)[a]	VOCs	SVOCs	Radionuclides[b]	Low-Level Tritium[c]	General Inorganics[d]	DO, ORP, pH, SC, T, Turbidity
R-14	Monitors for potential contaminants from Ten Site Canyon or upper Mortandad Canyon, including MDA C.	Regional	—[f]	S[g]	S	A[h]	S	A	S
R-46	Monitors groundwater quality downgradient of MDA C.	Regional	—	S	S	A	S	A	S
R-60	Monitors for potential contaminant releases from MDA C.	Regional	S	S	S	A	S	A	S

Notes: Nonfiltered and filtered samples will be collected for general inorganics (excluding anions). Metals and anions samples will be filtered. Samples collected for radionuclide analysis will be nonfiltered only. Organic constituents will be nonfiltered.

[a] Metals analysis includes the 23 TAL metals (Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn), plus boron, molybdenum, silicon dioxide, strontium, tin, and uranium.

[b] The radionuclide suite includes gross alpha, gross beta, alpha spectroscopy, gamma spectroscopy, and strontium-90.

[c] Tritium samples may be submitted for analysis be liquid scintillation if average activities are expected to exceed 200 pCi/L. Low-level tritium is analyzed using electrolytic enrichment or direct counting.

[d] General inorganic analysis includes major anions (bromide, chloride, fluoride, sulfate); major cations (calcium, magnesium, sodium, potassium); nitrate plus nitrite (as N); total Kjeldahl nitrogen (TKN); ammonia; total phosphorus, total organic carbon (TOC); total dissolved solids (TDS); alkalinity; specific conductivity (SC); pH; and hardness.

[e] Field parameters include pH, turbidity, specific conductance (SC), dissolved oxygen (DO), and temperature (T) at all locations. Oxidation-reduction potential (ORP) will be measured if a flowthrough cell is used.

[f] — = This analytical suite is not scheduled to be collected.

[g] S = Samples collected on a semiannual basis (2 times/yr).

[h] A = Samples collected on an annual basis (1 time/yr).

Table 3.2-1
Summary of VOC Detection Status and Tier I Screening Results for January 2010–April 2010 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	132	14	7	[4.2] to [2400]	50-603503 (133 ft)	100	31,400
Benzene	132	45	10	[0.96] to [980]	50-603061 (128 ft)	140	1150
Butadiene[1,3-]	17	7	3	[1.9] to 21	50-603063 (274 ft)	21	526
Butanone[2-]	132	3	3	[2.6] to [3000]	50-603467 (600 ft)	110	16,200
Carbon Tetrachloride	132	79	13	[1.9] to 1600	50-24813 (99 ft)	1600	5550
Chlorobenzene	132	2	1	[1.4] to [940]	50-603383 (408 ft)	9	12,000
Chlorodifluoromethane	17	4	1	[12] to [140]	50-603063 (190 ft)	110	1,470,000,000
Chloroform	132	90	14	[1.5] to 2300	50-603471 (146 ft)	2300	12,000
Chloromethane	132	1	1	[1.7] to [840]	50-603062 (387 ft)	7.8	68,100
Cyclohexane	17	4	2	[3] to [33]	50-603468 (92 ft) 50-603468 (142 ft)	12	79,700,000
Dichlorodifluoromethane	132	95	14	3.5 to [1500]	50-24813 (286 ft)	1400	2,860,000
Dichloroethane[1,1-]	132	3	1	[1.2] to [820]	50-603063 (76 ft)	33	5,570
Dichloroethane[1,2-]	132	1	1	[3.2] to [1200]	50-603471 (30 ft)	64	242
Dichloroethene[1,1-]	132	24	4	[0.79] to 970	50-603061 (76 ft)	970	5350
Dichloroethene[cis-1,2-]	132	38	11	[0.79] to [810]	50-603471 (146 ft)	470	11,700
Dichloropropane[1,2-]	132	18	3	[0.92] to [1400]	50-603383 (139 ft)	200	580
Ethanol	17	10	3	[6.6] to 190	50-603064 (176 ft)	190	na[b]
Ethylbenzene	132	21	6	[1.3] to [880]	50-603062 (450 ft)	64	226,000
Ethyltoluene[4-]	132	12	6	[2.5] to [1000]	50-603062 (450 ft)	56	na
Hexane	17	6	2	[3.1] to 38	50-603468 (92 ft)	38	64,600,000
Hexanone[2-]	132	1	1	[2] to [4200]	50-603467 (600 ft)	**250**	130
Methylene Chloride	132	78	13	[1] to 2500	50-603471 (242 ft)	**2500**	665
n-Heptane	17	3	1	[3.6] to [39]	50-603468 (92 ft)	9.6	na

Table 3.2-1 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Propylene	17	11	3	[6] to 100	50-603063 (274 ft)	100	na
Styrene	121	7	5	[1.7] to [870]	50-603383 (408 ft)	10	11,200
Tetrachloroethene	132	91	12	[2.7] to 4600	50-24784 (244 ft)	**4600**	3630
Toluene	132	46	10	[1.1] to [770]	50-603062 (450 ft)	320	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	132	56	9	[3.8] to 29000	50-603061 (76 ft)	29,000	1,280,000,000
Trichloroethane[1,1,1-]	132	45	9	[1.6] to 4400	50-603061 (76 ft)	4400	42,300
Trichloroethene	132	132	14	14 to 67000	50-24813 (207 ft) 50-24813 (207 ft)	**67,000**	2000
Trichlorofluoromethane	132	11	7	[2.2] to [1100]	50-603063 (76 ft)	21	5,130,000
Trimethylbenzene[1,2,4-]	132	12	6	[2.5] to [1500]	50-603062 (450 ft)	57	3780
Trimethylbenzene[1,3,5-]	132	3	2	[2.5] to [2000]	50-603062 (450 ft)	18	31,100
Xylene (Total)	115	21	6	[1.3] to [880]	50-603062 (450 ft)	250	131,000
Xylene[1,2-]	132	23	7	[1.3] to [880]	50-603062 (450 ft)	66	131,000
Xylene[1,3-]+Xylene[1,4-]	132	31	8	[2.6] to [1800]	50-603062 (450 ft)	180	182,000

Notes: Units in $\mu g/m^3$. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3.2-2
Summary of VOC Detection Status and Tier I Screening Results for April 2010–July 2010 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	126	3	3	[5.1] to [1700]	50-603467 (600 ft)	110	31,400
Benzene	126	2	2	[0.96] to [700]	50-603064 (400 ft)	74	1150
Butanone[2-]	126	2	2	[2.9] to [2200]	50-603467 (600 ft)	160	16,200
Carbon Disulfide	126	1	1	[3.1] to [2300]	50-603061 (397 ft)	54	597,000
Carbon Tetrachloride	126	65	14	[1.9] to 2100	50-24813 (99 ft)	2100	5550
Chlorobenzene	126	1	1	[1.4] to [670]	50-603383 (359 ft)	1.7	12,000
Chloroform	126	78	14	[1.5] to 2600	50-24813 (99 ft)	2600	12,000
Chloromethane	116	1	1	[1.7] to [590]	50-603062 (263 ft)	32	68,100
Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	126	1	1	[2.1] to [1000]	50-603383 (244 ft)	36	na[b]
Dichlorodifluoromethane	126	78	14	2.3 to 1400	50-24813 (241 ft)	1400	2,860,000
Dichloroethane[1,1-]	126	4	1	[1.2] to [590]	50-603383 (139 ft)	30	5570
Dichloroethene[1,1-]	126	25	4	[0.79] to 1300	50-603061 (128 ft)	1300	5350
Dichloroethene[cis-1,2-]	126	18	7	[0.79] to 660	50-24813 (241 ft)	660	11,700
Dichloropropane[1,2-]	126	13	3	[0.92] to [1000]	50-603383 (244 ft)	**600**	580
Hexanone[2-]	126	1	1	[2] to [3000]	50-603467 (600 ft)	**710**	130
Methylene Chloride	126	76	14	[1] to 2200	50-603471 (288 ft)	**2200**	665
Tetrachloroethene	126	81	13	[2.7] to 3100	50-24784 (25 ft)	3100	3630
Toluene	126	5	4	[1.1] to [550]	50-24822 (142 ft)	240	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	126	51	8	[3.8] to 30000	50-603061 (128 ft)	30,000	1,280,000,000
Trichloroethane[1,1,1-]	126	34	8	[1.6] to 6400	50-603061 (128 ft)	6400	42,300
Trichloroethene	126	125	14	18 to 70000	50-24813 (241 ft)	**70,000**	2000
Trichlorofluoromethane	126	7	3	[2.2] to [820]	50-603383 (244 ft)	38	5,130,000
Trimethylbenzene[1,2,4-]	126	1	1	[2.5] to [1100]	50-603064 (500 ft)	15	3780

Notes: Units in $\mu g/m^3$. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3.2-3
Summary of VOC Detection Status and Tier I Screening Results for July 2010–September 2010 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	126	5	5	[2.4] to [1800]	50-603467 (600 ft)	50	31,400
Benzene	126	5	4	[0.96] to [720]	50-603064 (176 ft)	240	1150
Bromomethane	126	1	1	[1.6] to [1200]	50-603061 (347 ft)	23	2200
Butanone[2-]	126	2	2	[2.9] to [2200]	50-603467 (600 ft)	56	16,200
Carbon Disulfide	126	1	1	[3.1] to [2300]	50-603061 (450 ft)	100	597,000
Carbon Tetrachloride	126	55	12	[1.9] to 2800	50-24813 (99 ft)	2800	5550
Chloroform	126	89	14	[1.5] to 3200	50-24813 (99 ft)	3200	12,000
Chloromethane	118	1	1	1.7 to [620]	50-603383 (359 ft)	1.7	68,100
Dichlorodifluoromethane	124	83	13	2 to 1300	50-24813 (207 ft)	1300	2,860,000
Dichloroethane[1,2-]	126	1	1	[3.2] to [910]	50-24813 (99 ft)	58	242
Dichloroethene[1,1-]	126	23	4	[0.79] to 1700	50-603061 (228 ft)	1700	5350
Dichloroethene[cis-1,2-]	126	21	8	[0.79] to 590	50-24813 (207 ft)	590	11,700
Dichloropropane[1,2-]	126	9	3	[0.92] to [1000]	50-603383 (206 ft)	430	580
Ethylbenzene	126	1	1	[1.3] to [650]	50-603503 (25 ft)	8.7	226,000
Ethyltoluene[4-]	126	1	1	[2.5] to [730]	50-603503 (25 ft)	3.5	na[b]
Hexanone[2-]	126	1	1	[2] to [3100]	50-603467 (600 ft)	**190**	130
Methylene Chloride	126	87	14	[1] to 1800	50-603471 (209 ft) 50-603471 (242 ft)	**1800**	665
Tetrachloroethene	126	89	14	[2.7] to 2800	50-24784 (96 ft)	2800	3630
Toluene	126	6	5	[1.1] to [560]	50-603064 (176 ft)	250	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	126	51	8	[3.8] to 22000	50-603061 (228 ft)	22,000	1,280,000,000
Trichloroethane[1,1,1-]	126	31	7	[1.6] to 2700	50-603061 (128 ft)	2700	42,300
Trichloroethane[1,1,2-]	126	1	1	[1.6] to [810]	50-24813 (99 ft)	140	169
Trichloroethene	126	124	14	[3.2] to 75000	50-24813 (286 ft)	**75,000**	2000

Table 3.2-3 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Trichlorofluoromethane	126	8	4	[2.2] to [840]	50-603061 (450 ft)	30	5,130,000
Trimethylbenzene[1,2,4-]	126	1	1	[2.5] to [1100]	50-603503 (25 ft)	3.9	3780
Vinyl Chloride	126	1	1	[0.51] to [760]	50-603061 (76 ft)	57	2280
Xylene (Total)	126	1	1	[1.3] to [650]	50-603503 (25 ft)	31	131,000
Xylene[1,2-]	126	1	1	[1.3] to [650]	50-603503 (25 ft)	7.2	131,000
Xylene[1,3-]+Xylene[1,4-]	126	1	1	[2.6] to [1300]	50-603503 (25 ft)	23	182,000

Notes: Units in µg/m^3. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3.2-4
Summary of VOC Detection Status and Tier I Screening Results for October 2010–January 2011 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	126	11	7	[5.2] to [1300]	50-603467 (600 ft)	83	31,400
Benzene	126	10	6	[0.96] to [510]	50-603503 (397 ft)	100	1150
Bromomethane	126	1	1	[1.6] to [820]	50-603472 (210 ft)	24	2200
Butanone[2-]	126	4	4	2.9 to [1600]	50-603467 (600 ft)	120	16,200
Carbon Disulfide	126	3	3	[3.1] to [1600]	50-603472 (146 ft)	33	597,000
Carbon Tetrachloride	126	60	12	[1.9] to 2600	50-603471 (30 ft)	2600	5550
Chlorobenzene	126	1	1	[1.4] to [490]	50-603383 (244 ft)	7.3	12,000
Chloroform	126	84	14	1.5 to 2300	50-24813 (99 ft)	2300	12,000
Chloromethane	126	1	1	[1.7] to [440]	50-603472 (146 ft)	3	68,100
Dichlorodifluoromethane	126	89	14	2 to 1200	50-24813 (358 ft)	1200	2,860,000
Dichloroethane[1,1-]	126	1	1	[1.2] to [430]	50-603061 (450 ft)	1.5	5570
Dichloroethene[1,1-]	126	23	6	[0.79] to 1600	50-603061 (190 ft)	1600	5350
Dichloroethene[cis-1,2-]	126	25	10	[0.79] to 460	50-24813 (150 ft)	460	11,700
Dichloropropane[1,2-]	126	12	4	[0.92] to [730]	50-603383 (206 ft)	370	580
Ethylbenzene	126	6	4	[1.3] to 790	50-603063 (228 ft)	790	226,000
Ethyltoluene[4-]	126	6	4	[2.5] to 580	50-603063 (228 ft)	580	na[b]
Hexanone[2-]	126	1	1	[2] to [2200]	50-603467 (600 ft)	**430**	130
Methylene Chloride	126	72	14	[1] to 1900	50-603471 (242 ft)	**1900**	665
Tetrachloroethene	126	82	13	[2.7] to 3000	50-24784 (96 ft)	3000	3630
Toluene	126	15	8	[1.1] to 820	50-603063 (228 ft)	820	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	126	52	9	[3.8] to 35000	50-603061 (190 ft)	35,000	1,280,000,000
Trichloroethane[1,1,1-]	126	38	7	[1.6] to 5800	50-603061 (128 ft) 50-603061 (190 ft)	5800	42,300
Trichloroethene	126	126	14	12 to 72000	50-603471 (242 ft)	**72,000**	2000

Table 3.2-4 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Trichlorofluoromethane	126	3	3	[2.2] to [590]	50-24813 (358 ft)	33	5,130,000
Trimethylbenzene[1,2,4-]	126	5	3	[2.5] to 1300	50-603063 (228 ft)	1300	3780
Trimethylbenzene[1,3,5-]	126	3	1	[2.5] to [1000]	50-603472 (414 ft)	7.6	31,100
Vinyl Chloride	126	1	1	[0.51] to [540]	50-24813 (358 ft)	1.1	2280
Xylene (Total)	126	8	5	[1.3] to 1600	50-603063 (228 ft)	1600	131,000
Xylene[1,2-]	126	6	4	[1.3] to [460]	50-603063 (228 ft)	320	131,000
Xylene[1,3-]+Xylene[1,4-]	126	7	4	[2.6] to 1300	50-603063 (228 ft)	1300	182,000

Notes: Units in $\mu g/m^3$. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3.2-5
Summary of VOC Detection Status and Tier I Screening Results for January 2011–March 2011 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	148	26	12	[2.4] to [1300]	50-603467 (600 ft)	200	31,400
Benzene	148	26	10	[0.96] to 1300	50-613182 (632.5 ft)	**1300**	1150
Butanone[2-]	148	14	9	2.9 to [1600]	50-603383 (139 ft)	450	16,200
Carbon Disulfide	148	10	6	[3.1] to [1600]	50-613184 (652 ft)	140	597,000
Carbon Tetrachloride	148	90	17	[1.9] to 3900	50-613183 (30 ft)	3900	5550
Chlorobenzene	148	1	1	[1.4] to [490]	50-603383 (286 ft)	1.7	12,000
Chloroform	148	78	16	[1.5] to 3400	50-24813 (25 ft)	3400	12,000
Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	148	2	1	[2.1] to [740]	50-24784 (96 ft)	79	na[b]
Dichlorodifluoromethane	148	122	18	2.4 to 1100	50-24813 (99 ft)	1100	2,860,000
Dichloroethane[1,1-]	148	1	1	[1.2] to [430]	50-603063 (128 ft)	79	5570
Dichloroethene[1,1-]	148	27	5	[0.79] to 1500	50-603061 (128 ft) 50-603061 (190 ft)	1500	5350
Dichloroethene[cis-1,2-]	148	37	13	[0.79] to 550	50-24813 (25 ft) 50-24813 (150 ft)	550	11,700
Dichloropropane[1,2-]	148	11	3	[0.92] to [730]	50-603383 (244 ft)	370	580
Ethylbenzene	148	21	9	[1.3] to [460]	50-613182 (632.5 ft)	180	226,000
Ethyltoluene[4-]	148	15	5	[2.5] to [520]	50-613182 (632.5 ft)	100	na
Hexanone[2-]	148	4	4	[2] to [2200]	50-603467 (600 ft)	**1500**	130
Methylene Chloride	148	65	15	[1] to 3900	50-24813 (358 ft)	**3900**	665
Styrene	148	7	5	1.7 to [450]	50-613182 (632.5 ft)	100	11,200
Tetrachloroethene	148	79	17	[2.7] to 2800	50-24784 (96 ft)	2800	3630
Toluene	148	31	13	1.1 to 1700	50-603383 (139 ft) 50-613182 (632.5 ft)	1700	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	148	52	9	[3.8] to 28000	50-603061 (128 ft) 50-603061 (190 ft)	28,000	1,280,000,000

Table 3.2-5 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Trichloroethane[1,1,1-]	148	32	7	[1.6] to 5800	50-603061 (128 ft)	5800	42,300
Trichloroethene	148	134	18	[2.1] to 46000	50-603471 (146 ft)	**46,000**	2000
Trichlorofluoromethane	148	13	9	[2.2] to [590]	50-603383 (26 ft)	31	5,130,000
Trimethylbenzene[1,2,4-]	148	16	5	[2.5] to [780]	50-613182 (632.5 ft)	110	3780
Trimethylbenzene[1,3,5-]	148	3	3	[2.5] to [1000]	50-613182 (632.5 ft)	35	31,100
Xylene (Total)	148	21	10	[1.3] to 750	50-613182 (632.5 ft)	750	131,000
Xylene[1,2-]	148	19	7	1.3 to [460]	50-613182 (632.5 ft)	170	131,000
Xylene[1,3-]+Xylene[1,4-]	148	20	9	[2.6] to [920]	50-613182 (632.5 ft)	590	182,000

Notes: Units in $\mu g/m^3$. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3.2-6
Summary of VOC Detection Status and Tier I Screening Results for March 2011–May 2011 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	153	21	14	5 to [2200]	50-603467 (600 ft)	98	31,400
Benzene	153	16	11	[0.96] to [1100]	50-24784 (362 ft)	46	1150
Bromomethane	153	1	1	[1.6] to [3700]	50-603468 (92 ft)	90	2200
Butanone[2-]	153	4	4	[2.4] to [2800]	50-603467 (600 ft)	200	16,200
Carbon Disulfide	153	8	4	[2.5] to [2900]	50-613184 (652 ft)	250	597,000
Carbon Tetrachloride	153	82	17	[1.9] to [5900]	50-613183 (550 ft)	3000	5550
Chloroform	153	87	17	[1.5] to 2700	50-613183 (550 ft)	3200	12,000
Chloromethane	153	2	2	[1.7] to [1900]	50-603468 (92 ft)	31	68,100
Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	153	2	2	[2.1] to [3300]	50-603503 (133 ft)	39	na[b]
Dichlorodifluoromethane	153	123	18	2.4 to [2300]	50-24813 (25 ft) 50-24813 (99 ft)	1900	2,860,000
Dichloroethane[1,2-]	153	1	1	[3.2] to 200	50-613183 (550 ft)	200	242
Dichloroethene[1,1-]	153	19	5	[0.79] to [3700]	50-603061 (228 ft) 50-603061 (347 ft)	1400	5350
Dichloroethene[cis-1,2-]	153	18	8	[0.79] to [1900]	50-24813 (150 ft)	450	11,700
Dichloropropane[1,2-]	153	13	4	[0.92] to [2200]	50-603383 (244 ft)	350	580
Ethylbenzene	153	8	6	[1.3] to [2000]	50-24784 (362 ft)	23	226,000
Ethyltoluene[4-]	153	4	4	[2] to [2300]	50-24784 (362 ft)	22	na
Hexanone[2-]	153	2	2	[1.6] to [1900]	50-603467 (600 ft)	**1200**	130
Methylene Chloride	153	57	15	[1] to 1600	50-24813 (25 ft)	**1600**	665
Styrene	153	4	4	[1.7] to [2000]	50-613184 (652 ft)	10	11,200
Tetrachloroethene	153	92	17	[2.7] to 3400	50-24784 (96 ft)	3400	3630
Toluene	153	18	11	[1.1] to [1800]	50-24784 (362 ft)	120	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	153	55	9	[3.1] to 25000	50-603061 (347 ft)	25,000	1,280,000,000

Table 3.2-6 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Trichloroethane[1,1,1-]	153	38	8	[1.6] to 5500	50-603061 (347 ft)	5500	42,300
Trichloroethene	153	149	18	[2.1] to 93000	50-24813 (25 ft) 50-24813 (99 ft)	**93,000**	2000
Trichlorofluoromethane	153	8	4	[2.2] to [2600]	50-603061 (450 ft)	12	5,130,000
Trimethylbenzene[1,2,4-]	153	3	3	[2.5] to [14000]	50-24784 (362 ft)	25	3780
Trimethylbenzene[1,3,5-]	153	1	1	[2] to [2300]	50-24784 (362 ft)	7.5	31,100
Xylene (Total)	153	7	4	[1.3] to [2000]	50-24784 (362 ft)	91	131,000
Xylene[1,2-]	153	6	4	[1.3] to [2000]	50-24784 (362 ft)	23	131,000
Xylene[1,3-]+Xylene[1,4-]	153	5	4	[2.6] to [4100]	50-24784 (362 ft)	68	182,000

Notes: Units in µg/m^3. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I SLs from Table 3.2-6.

[b] na = Not available.

Table 3.2-7
Summary of VOC Detection Status and Tier I Screening for August 2011 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	46	4	4	[1.9] to [550]	50-603383 (450 ft)	53	31,400
Benzene	46	9	5	[0.96] to 4100	50-24813 (600 ft)	**4100**	1150
Butanone[2-]	46	4	2	[2.4] to [690]	50-603383 (450 ft)	13	16,200
Carbon Disulfide	46	7	4	[2.5] to [730]	50-613183 (642.5 ft)	84	597,000
Carbon Tetrachloride	46	24	7	[5] to [1500]	50-613183 (600 ft)	270	5550
Chlorobenzene	46	2	1	[1.4] to [400]	50-603383 (359 ft)	2.1	12,000
Chloroform	46	14	5	[1.5] to 810	50-603471 (410 ft)	810	12,000
Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	46	1	1	[2.8] to [820]	50-24813 (450 ft)	100	na[b]
Dichlorodifluoromethane	46	44	10	3.9 to 900	50-603470 (351 ft)	900	2,860,000
Dichloroethane[1,1-]	46	1	1	[1.2] to [350]	50-603383 (139 ft)	31	5570
Dichloroethene[1,1-]	46	1	1	[3.2] to [930]	50-603383 (139 ft)	63	5350
Dichloroethene[cis-1,2-]	46	6	2	[1.6] to [460]	50-603383 (244 ft)	51	11,700
Dichloropropane[1,2-]	46	8	1	[1.8] to [540]	50-603383 (244 ft)	310	580
Ethylbenzene	46	6	4	[1.7] to 5900	50-24813 (600 ft)	5900	226,000
Ethyltoluene[4-]	46	5	3	[2] to 5100	50-24813 (600 ft)	5100	na
Methylene Chloride	46	11	8	[1.4] to 1200	50-603471 (360 ft)	**1200**	665
Styrene	46	2	2	[1.7] to [500]	50-603383 (408 ft)	13	11,200
Tetrachloroethene	46	23	6	[2.7] to 1100	50-603471 (360 ft)	1100	3630
Toluene	46	13	7	[1.5] to 26000	50-24813 (600 ft)	26,000	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	46	9	1	[3.1] to 1400	50-603383 (139 ft)	1400	1,280,000,000
Trichloroethane[1,1,1-]	46	9	1	[1.6] to [480]	50-603383 (139 ft)	260	42,300
Trichloroethene	46	45	10	[2.1] to 57000	50-603471 (360 ft)	**57,000**	2000
Trichlorofluoromethane	46	8	6	[2.2] to [660]	50-603383 (139 ft)	30	5,130,000
Trimethylbenzene[1,2,4-]	46	3	2	[12] to 5500	50-24813 (600 ft)	5500	3780

Table 3.2-7 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Trimethylbenzene[1,3,5-]	46	4	3	[2] to 1500	50-24813 (600 ft)	1500	31,100
Xylene (Total)	46	6	4	[1.7] to 16000	50-24813 (600 ft)	16,000	131,000
Xylene[1,2-]	46	6	4	[1.7] to 5300	50-24813 (600 ft)	5300	131,000
Xylene[1,3-]+Xylene[1,4-]	46	6	4	[1.7] to 22000	50-24813 (600 ft)	22,000	182,000

Notes: Units in µg/m^3. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3.2-8
Summary of VOC Detection Status and Tier I Screening for October 2011–November 2011 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Acetone	107	14	7	[1.9] to [1300]	50-603472 (146 ft)	210	31,400
Benzene	107	5	4	[0.96] to [630]	50-603470 (650 ft)	60	1150
Butanone[2-]	107	6	6	2.4 to [1600]	50-603470 (650 ft)	10	16,200
Carbon Disulfide	107	9	6	[2.5] to [1600]	50-613184 (652 ft)	180	597,000
Carbon Tetrachloride	107	70	13	[5] to 5000	50-24813 (99 ft)	5000	5550
Chloroform	107	69	12	[1.5] to 3900	50-24813 (99 ft)	3900	12,000
Chloromethane	107	1	1	[1.6] to [1100]	50-24784 (215 ft)	2	68,100
Dichlorodifluoromethane	107	102	13	4.3 to 2400	50-24813 (241 ft)	2400	2,860,000
Dichloroethane[1,1-]	107	1	1	[1.2] to [800]	50-613185 (675 ft)	13	5570
Dichloroethene[1,1-]	107	3	1	[3.2] to [2100]	50-603064 (176 ft)	850	5350
Dichloroethene[cis-1,2-]	107	18	8	[1.6] to [1000]	50-24813 (207 ft)	770	11,700
Dichloropropane[1,2-]	107	10	2	[1.8] to [1200]	50-603383 (206 ft)	500	580
Ethylbenzene	107	1	1	[1.7] to [1100]	50-603470 (650 ft)	110	226,000
Ethyltoluene[4-]	107	2	1	[2] to [1300]	50-603470 (600 ft)	36	na
Hexanone[2-]	107	1	1	[1.6] to [1100]	50-603470 (650 ft)	2.1	130
Methylene Chloride	107	39	9	[1.4] to 3200	50-603471 (242 ft)	**3200**	665
Styrene	107	1	1	[1.7] to [1100]	50-613184 (652 ft)	2.1	11,200
Tetrachloroethene	107	68	13	[2.7] to 3600	50-24784 (96 ft)	3600	3630
Toluene	107	4	3	[1.5] to [990]	50-24784 (215 ft)	9.2	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	107	28	4	[3.1] to 19,000	50-603064 (176 ft)	19,000	1,280,000,000
Trichloroethane[1,1,1-]	107	20	5	[1.6] to 3900	50-603064 (176 ft)	3900	42,300
Trichloroethene	107	107	13	4.9 to 130,000	50-24813 (207 ft)	**130,000**	2000
Trichlorofluoromethane	107	7	6	[2.2] to [1500]	50-603383 (26 ft)	33	5,130,000
Trimethylbenzene[1,2,4-]	107	1	1	[12] to [8100]	50-603470 (650 ft)	27	3780

Table 3.2-8 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Trimethylbenzene[1,3,5-]	107	2	1	[2] to [1300]	50-603470 (650 ft)	20	31,100
Xylene (Total)	107	3	2	3.5 to [2300]	50-603470 (600 ft)	42	131,000
Xylene[1,2-]	107	1	1	[1.7] to [1100]	50-603470 (650 ft)	5.3	131,000
Xylene[1,3-]+Xylene[1,4-]	107	4	3	[1.7] to [1100]	50-603470 (600 ft)	42	182,000

Notes: Units in µg/m^3. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3.2-9
Summary of VOC Detection Status and Tier I Screening for March 2012–April 2012 Sampling Event

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Benzene	80	1	1	[3.1] to 182	50-603503 (133 ft)	182	1150
Butadiene[1,3-]	80	1	1	[2.1] to [66]	50-603503 (133 ft)	46	526
Butanol[1-]	80	1	1	[12] to [364]	50-603063 (25 ft)	245	540
Carbon Tetrachloride	80	61	18	[6.0] to 1886	50-24813 (241 ft)	1886	5550
Chlorodifluoromethane	80	5	2	[13] to [424]	50-603063 (228 ft)	353	1,470,000,000
Chloroform	80	49	14	[4.7] to 2733	50-24813 (150 ft)	2733	12,000
Cyclohexane	80	1	1	[3.3] to [103]	50-603503 (133 ft)	62	68,100
Dichlorodifluoromethane	80	77	18	6.9 to 2224	50-24813 (241 ft)	2224	2,860,000
Dichloroethane[1,1-]	80	2	1	[3.9] to [121]	50-613063 (128 ft)	85	5570
Dichloroethane[1,2-]	80	4	3	[3.9] to 150	50-603471 (90 ft)	150	242
Dichloroethene[1,1-]	80	12	4	[3.8] to 1625	50-603061 (128 ft)	1625	5350
Dichloroethene[cis-1,2-]	80	35	11	[3.8] to 713	50-24813 (241 ft)	713	11,700
Dichloropropane[1,2-]	80	11	8	[4.4] to 351	50-603383 (244 ft)	351	580
Ethanol	80	2	2	9.0 to 527	50-603503 (133 ft)	527	na[b]
Ethylbenzene	80	1	1	[4.2] to [130]	50-603503 (133 ft)	43	226,000
Hexane	80	2	2	[3.4] to 137	50-603503 (133 ft)	137	64,600,000
Hexanone[2-]	80	1	1	[16] to 737	50-603467 (600 ft)	**737**	130
Methylene Chloride	80	43	13	[29] to 2430	50-603471 (288 ft)	**2430**	665
n-Heptane	80	1	1	[3.9] to [123]	50-613183 (642.5 ft)	49	na
Propylene	80	2	2	19 to 224	50-603503 (133 ft)	224	50,500,000
Tetrachloroethene	80	63	17	[6.5] to 2305	50-24784 (155 ft)	2305	3630
Tetrahydrofuran	80	2	2	[2.8] to [88]	50-603467 (600 ft)	56	na
Toluene	80	1	1	[3.6] to 313	50-603503 (133 ft)	313	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	80	39	11	[7.4] to 29,100	50-603061 (128 ft)	29,100	1,280,000,000

Table 3.2-9 (continued)

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Concentration Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I SL[a]
Trichloroethane[1,1,1-]	80	22	9	[5.2] to 5453	50-603061 (128 ft)	5453	42,300
Trichloroethene	80	80	18	7.0 to 85,930	50-24813 (241 ft)	**85,930**	2000
Trichlorofluoromethane	80	4	4	[5.4] to [168]	50-603063 (228 ft)	79	5,130,000
Xylene[1,3-]+Xylene[1,4-]	80	1	1	[4.2] to [130]	50-603503 (133 ft)	117	182,000

Notes: Units in $\mu g/m^3$. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

[a] Tier I screening levels from Table 3.2-10.

[b] na = Not available.

Table 3-2-10
Henry's Law Constants, Groundwater Screening Levels, and
Tier I Vapor-Phase Screening Levels for VOCs Detected at MDA C

VOC	Henry's Law Constant[a] (dimensionless)	Groundwater SL (µg/L)	Source of Groundwater SL	Tier I Vapor-Phase SL (µg/m^3)
Acetone	0.00144	21,800	NMED SL[b]	31,400
Benzene	0.23	5	EPA MCL[c]	1150
Bromomethane	0.254	8.66	NMED SL[b]	2200
Butadiene[1,3-]	2.99	0.176	NMED SL[b]	526
Butanol[1-]	0.00036[d]	1500	EPA Regional SL[e]	540
Butanone[2-]	0.0023	7060	NMED SL[b]	16,200
Carbon Disulfide	0.574	1040	NMED SL[b]	597,000
Carbon Tetrachloride	1.11	5	EPA MCL[c]	5550
Chlorobenzene	0.131	91.3	NMED SL[b]	12,000
Chlorodifluoromethane	14.1	104,000	NMED SL[b]	1,470,000,000
Chloroform	0.15	80	EPA MCL[f]	12,000
Chloromethane	0.362	188	NMED SL[b]	68,100
Cyclohexane	6.13[d]	13,000	EPA Regional SL[e]	79,700,000
Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	na[g]	na	na	na
Dichlorodifluoromethane	14.1	203	NMED SL[b]	2,860,000
Dichloroethane[1,1-]	0.23	24.2	NMED SL[b]	5570
Dichloroethane[1,2-]	0.0484	5	EPA MCL[c]	242
Dichloroethene[1,1-]	1.07	5	NMWQCC[h]	5350
Dichloroethene[cis-1,2-]	0.167	70	EPA MCL[c]	11,700
Dichloropropane[1,2-]	0.116	5	EPA MCL[c]	580
Ethanol	na	na	na	na
Ethylbenzene	0.323	700	EPA MCL[c]	226,000
Ethyltoluene[4-]	na	na	na	na
n-Heptane	na	na	na	na
n-Hexane	73.8	876	NMED SL[b]	64,600,000
Hexanone[2-]	0.00381[e]	34	EPA regional SL[f]	130
Methylene Chloride	0.133	5	EPA MCL[c]	665
Propylene	8.01[e]	6300	EPA regional SL[f]	50,500,000
Styrene	0.112	100	EPA MCL[c]	11,200
Tetrachloroethene	0.726	5	EPA MCL[c]	3630
Tetrahydrofuran	na	na	na	na
Toluene	0.272	750	NMWQCC[h]	204,000
Trichloro-1,2,2-trifluoroethane[1,1,2-]	21.6	59,200	NMED SL[b]	1,280,000,000
Trichloroethane[1,1,1-]	0.705	60	NMWQCC[h]	42,300

Table 3.2-10 (continued)

VOC	Henry's Law Constant[a] (dimensionless)	Groundwater SL (µg/L)	Source of Groundwater SL	Tier I Vapor-Phase SL (µg/m^3)
Trichloroethane[1,1,2-]	0.0338	5	EPA MCL[c]	169
Trichloroethene	0.404	5	EPA MCL[c]	2000
Trichlorofluoromethane	3.98	1290	NMED SL[b]	5,130,000
Trimethylbenzene[1,2,4-]	0.252[e]	15	EPA regional SL[f]	3780
Trimethylbenzene[1,3,5-]	0.358[e]	87	EPA regional SL[f]	31,100
Vinyl Chloride	1.14	2	EPA MCL[c]	2280
Xylene (Total)	0.212	620	NMWQCC[h]	131,000
Xylene[1,2-]	0.212	620[i]	NMWQCC[h]	131,000
Xylene[1,3-]+Xylene[1,4-]	0.294[j]	620 [i]	NMWQCC[h]	182,000

[a] From NMED (2012, 210142, Appendix B) unless otherwise noted.

[b] NMED tap water screening level (NMED 2012, 210142, Appendix A).

[c] MCL for organic contaminants (40 CFR 141.61).

[d] Henry's law constant from EPA regional screening tables (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[e] EPA regional tap water screening level (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[f] MCL for total trihalomethanes (40 CFR 141.64).

[g] na = Not available.

[h] NMWQCC standard (20 NMAC 6.2.3103).

[i] Screening level for xylene[1,3-]+xylene[1,4-] is for total xylenes.

[j] Henry's law constant for xylene[1,3-].

Table 3.2-11
Tier II Screening of 2-Hexanone Vapor Data at MDA C

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-24784	25	MD50-10-8677	8.3 (U)	MD50-10-15742	46 (U)	MD50-10-24362	69 (U)	MD50-10-27179	39 (U)	MD50-11-4012	82 (U)
50-24784	96	MD50-10-8680	45 (U)	MD50-10-15745	92 (U)	MD50-10-24364	100 (U)	MD50-10-27176	100 (U)	MD50-11-4010	44 (U)
50-24784	155	MD50-10-8681	37 (U)	MD50-10-15747	200 (U)	MD50-10-24365	140 (U)	MD50-10-27175	140 (U)	MD50-11-4009	44 (U)
50-24784	215	MD50-10-8679	230 (U)	MD50-10-15744	240 (U)	MD50-10-24361	210 (U)	MD50-10-27181	200 (U)	MD50-11-4006	230 (U)
50-24784	244	MD50-10-8685	43 (U)	MD50-10-15741	230 (U)	MD50-10-24359	210 (U)	MD50-10-27180	210 (U)	MD50-11-4004	180 (U)
50-24784	289	MD50-10-8683	44 (U)	MD50-10-15748	240 (U)	MD50-10-24366	200 (U)	MD50-10-27178	200 (U)	MD50-11-4008	220 (U)
50-24784	362	MD50-10-8684	37 (U)	MD50-10-15743	110 (U)	MD50-10-24360	83 (U)	MD50-10-27182	100 (U)	MD50-11-4007	100 (U)
50-24784	411	MD50-10-8682	18 (U)	MD50-10-15746	45 (U)	MD50-10-24367	22 (U)	MD50-10-27177	42 (U)	MD50-11-4005	21 (U)
50-24784	450	MD50-10-8678	11 (U)	MD50-10-15740	45 (U)	MD50-10-24363	10 (U)	MD50-10-27183	18 (U)	MD50-11-4003	22 (U)
50-24813	25	MD50-10-8697	800 (U)	MD50-10-15902	420 (U)	MD50-10-24369	460 (U)	MD50-10-27186	410 (U)	MD50-11-4023	1200 (U)
50-24813	99	MD50-10-8696	**2700 (U)**	MD50-10-15906	1500 (U)	MD50-10-24375	140 (U)	MD50-10-27189	1500 (U)	MD50-11-4021	1600 (U)
50-24813	150	MD50-10-8693	**3000 (U)**	MD50-10-15903	1600 (U)	MD50-10-24370	1700 (U)	MD50-10-27185	1600 (U)	MD50-11-4095	1300 (U)
50-24813	207	MD50-10-8702	**4200 (U)**	MD50-10-15907	**2200 (U)**	MD50-10-24376	**2300 (U)**	MD50-10-27190	20 (U)	MD50-11-4019	17 (U)
50-24813	241	MD50-10-8699	**2700 (U)**	MD50-10-15904	**2900 (U)**	MD50-10-24371	**2900 (U)**	MD50-10-27193	620 (U)	MD50-11-4018	8.3 (U)
50-24813	241	—*	—	—	—	—	—	MD50-10-27194	450 (U)	—	—
50-24813	286	MD50-10-8694	870 (U)	MD50-10-15909	1500 (U)	MD50-10-24377	**3100 (U)**	MD50-10-27191	21 (U)	MD50-11-4017	300 (U)
50-24813	358	MD50-10-8700	1400 (U)	MD50-10-15905	**1900 (U)**	MD50-10-24372	**1900 (U)**	MD50-10-27343	4.4 (U)	MD50-11-4014	1400 (U)
50-24813	408	MD50-10-8695	**2000 (U)**	MD50-10-15910	**3000 (U)**	MD50-10-24378	1600 (U)	MD50-10-27192	1200 (U)	MD50-11-4013	440 (U)
50-24813	450	MD50-10-8701	390 (U)	MD50-10-15908	900 (U)	MD50-10-24374	130 (U)	MD50-10-27188	240 (U)	MD50-11-4015	380 (U)
50-24813	600	MD50-10-8698	10 (U)	MD50-10-15911	90 (U)	MD50-10-24373	96 (U)	MD50-10-27195	2 (U)	MD50-11-4016	2.3 (U)
50-24822	25	MD50-10-8703	43 (U)	MD50-10-15848	1100 (U)	MD50-10-24413	160 (U)	MD50-10-27227	280 (U)	MD50-11-4058	110 (U)
50-24822	81	MD50-10-8704	450 (U)	MD50-10-15854	480 (U)	MD50-10-24419	360 (U)	MD50-10-27232	350 (U)	—	—
50-24822	142	MD50-10-8705	1400 (U)	MD50-10-15850	540 (U)	MD50-10-24416	900 (U)	MD50-10-27235	610 (U)	MD50-11-4057	9.9 (U)
50-24822	204	MD50-10-8706	1100 (U)	MD50-10-15856	1100 (U)	MD50-10-24414	880 (U)	MD50-10-27229	1300 (U)	MD50-11-4055	1700 (U)
50-24822	235	MD50-10-8707	1400 (U)	MD50-10-15849	220 (U)	MD50-10-24418	1500 (U)	MD50-10-27233	1500 (U)	MD50-11-4060	1800 (U)
50-24822	280	MD50-10-8708	1600 (U)	MD50-10-15855	1100 (U)	MD50-10-24412	1100 (U)	MD50-10-27231	1100 (U)	MD50-11-4061	300 (U)
50-24822	351	MD50-10-8709	56 (U)	MD50-10-15852	570 (U)	MD50-10-24415	650 (U)	MD50-10-27230	440 (U)	MD50-11-4056	2.9
50-24822	402	MD50-10-8710	450 (U)	MD50-10-15851	540 (U)	MD50-10-24411	2 (U)	—	—	—	—
50-24822	450	MD50-10-8711	23 (U)	MD50-10-15853	450 (U)	MD50-10-24417	320 (U)	MD50-10-27228	460 (U)	—	—
50-603061	25	MD50-10-8715	170 (U)	MD50-10-15840	41 (U)	MD50-10-26315	400 (U)	MD50-10-27249	390 (U)	MD50-11-4080	110 (U)
50-603061	76	MD50-10-8716	120 (U)	MD50-10-15837	95 (U)	MD50-10-24432	73 (U)	MD50-10-27251	390 (U)	MD50-11-4081	190 (U)
50-603061	128	MD50-10-8717	4.4 (U)	MD50-10-15841	920 (U)	MD50-10-24437	88 (U)	MD50-10-27247	1500 (U)	MD50-11-4083	200 (U)
50-603061	190	MD50-10-8718	11 (U)	MD50-10-15843	420 (U)	MD50-10-24433	120 (U)	MD50-10-27255	840 (UJ)	MD50-11-4082	270 (U)
50-603061	228	MD50-10-8719	11 (U)	MD50-10-15839	85 (U)	MD50-10-24436	86 (U)	MD50-10-27248	860 (U)	MD50-11-4084	140 (U)
50-603061	274	MD50-10-8720	21 (U)	MD50-10-15844	460 (U)	MD50-10-24434	91 (U)	MD50-10-27253	540 (U)	MD50-11-4076	48 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Concentration	Result	Sample ID	Result	Sample ID	Result
50-603061	347	MD50-10-8721	11 (U)	MD50-10-15842	210 (U)	MD50-10-24438	57 (U)	MD50-10-27252	24 (U)	MD50-11-4077	22 (U)
50-603061	397	MD50-10-8722	5.2 (U)	MD50-10-15838	28 (UJ)	MD50-10-26314	21 (U)	MD50-10-27254	20 (U)	MD50-11-4078	21 (U)
50-603061	450	MD50-10-8724	2 (U)	MD50-10-15836	12 (U)	MD50-10-24439	10 (U)	MD50-10-27250	2 (U)	MD50-11-4079	7.2 (U)
50-603062	25	MD50-10-8727	17 (U)	MD50-10-15893	22 (U)	MD50-10-24441	11 (U)	MD50-10-27262	22 (U)	MD50-11-4092	27 (U)
50-603062	64	MD50-10-8728	8.6 (U)	MD50-10-15894	84 (U)	MD50-10-24446	110 (U)	MD50-10-27265	19 (U)	MD50-11-4091	210 (U)
50-603062	122	MD50-10-8729	42 (U)	MD50-10-15891	170 (U)	MD50-10-24443	230 (U)	MD50-10-27257	46 (UJ)	MD50-11-4093	170 (U)
50-603062	184	MD50-10-8730	10 (U)	MD50-10-15896	580 (U)	MD50-10-24445	380 (U)	MD50-10-27263	45 (U)	MD50-11-4090	180 (U)
50-603062	217	MD50-10-8731	43 (U)	MD50-10-15895	460 (U)	MD50-10-24447	240 (U)	MD50-10-27260	4.5 (UJ)	MD50-11-4089	2 (U)
50-603062	263	MD50-10-15366	11 (U)	MD50-10-15890	140 (U)	MD50-10-24442	180 (U)	MD50-10-27264	47 (U)	MD50-11-4087	290 (U)
50-603062	337	MD50-10-8733	2 (U)	MD50-10-15898	23 (U)	MD50-10-24448	130 (U)	MD50-10-27259	38 (U)	MD50-11-4086	22 (U)
50-603062	387	MD50-10-8734	14 (U)	MD50-10-15892	9.1 (U)	MD50-10-24444	22 (U)	MD50-10-27261	19 (U)	MD50-11-4088	40 (U)
50-603062	450	MD50-10-8735	9.1 (U)	MD50-10-15897	5.9 (U)	MD50-10-24449	11 (U)	MD50-10-27258	18 (U)	MD50-11-4085	4.4 (U)
50-603063	25	MD50-10-8755	14 (U)	MD50-10-15827	26 (U)	MD50-10-24451	79 (U)	MD50-10-27267	41 (U)	MD50-11-4103	19 (U)
50-603063	76	MD50-10-8754	56 (U)	MD50-10-15832	450 (U)	MD50-10-24457	270 (U)	MD50-10-27272	350 (U)	MD50-11-4102	180 (U)
50-603063	128	MD50-10-8753	46 (U)	MD50-10-15825	240 (U)	MD50-10-24453	110 (U)	MD50-10-27275	390 (U)	MD50-11-4101	260 (U)
50-603063	190	MD50-10-8752	110 (U)	MD50-10-15830	560 (U)	MD50-10-24454	870 (U)	MD50-10-27268	880 (U)	MD50-11-4100	480 (U)
50-603063	228	MD50-10-8751	99 (U)	MD50-10-15824	550 (U)	MD50-10-24456	350 (U)	MD50-10-27273	880 (U)	MD50-11-4099	2 (U)
50-603063	274	MD50-10-8749	110 (U)	MD50-10-15829	930 (U)	MD50-10-24458	930 (U)	MD50-10-27269	1100 (U)	MD50-11-4098	890 (U)
50-603063	347	MD50-10-8750	37 (U)	MD50-10-15833	330 (U)	MD50-10-24452	110 (U)	MD50-10-27274	410 (U)	MD50-11-4096	140 (U)
50-603063	397	MD50-10-8748	120 (U)	MD50-10-15826	880 (U)	—	—	—	—	MD50-11-4104	13 (U)
50-603063	450	MD50-10-8747	83 (U)	MD50-10-15831	460 (U)	MD50-10-24455	360 (U)	MD50-10-27271	320 (U)	MD50-11-4097	230 (U)
50-603064	25	MD50-10-8759	42 (U)	MD50-10-15816	160 (U)	MD50-10-24461	120 (U)	MD50-10-27280	150 (U)	MD50-11-4113	43 (U)
50-603064	66	MD50-10-8760	56 (U)	MD50-10-15817	150 (U)	MD50-10-24467	320 (U)	MD50-10-27285	280 (U)	MD50-11-4112	120 (U)
50-603064	113	MD50-10-8761	45 (U)	MD50-10-15814	1000 (U)	MD50-10-24462	750 (U)	MD50-10-27279	1200 (U)	MD50-11-4111	360 (U)
50-603064	176	MD50-10-8762	820 (U)	MD50-10-15812	1600 (U)	MD50-10-24465	790 (U)	MD50-10-27283	1400 (U)	MD50-11-4109	1100 (U)
50-603064	214	MD50-10-8763	390 (U)	MD50-10-15819	300 (U)	MD50-10-24463	1700 (U)	MD50-10-27277	1400 (U)	MD50-11-4110	110 (U)
50-603064	259	MD50-10-8764	280 (U)	MD50-10-15820	930 (U)	MD50-10-24468	920 (U)	MD50-10-27281	1000 (U)	MD50-11-4105	330 (U)
50-603064	332	MD50-10-8765	300 (U)	MD50-10-15813	470 (U)	MD50-10-24464	390 (U)	MD50-10-27278	430 (U)	MD50-11-4106	150 (U)
50-603064	482	MD50-10-8766	41 (U)	MD50-10-15818	79 (U)	MD50-10-24469	240 (U)	MD50-10-27282	290 (U)	MD50-11-4107	73 (U)
50-603064	500	MD50-10-8767	2 (U)	MD50-10-15821	9.3 (U)	MD50-10-24466	19 (U)	MD50-10-27284	23 (U)	MD50-11-4108	18 (U)
50-603383	26	MD50-10-8771	8 (U)	MD50-10-15871	18 (U)	MD50-10-24380	12 (U)	MD50-10-27199	20 (U)	MD50-11-4024	23 (U)
50-603383	85	MD50-10-8772	82 (U)	MD50-10-15866	41 (U)	MD50-10-24384	84 (U)	MD50-10-27197	100 (U)	MD50-11-4029	35 (U)
50-603383	139	MD50-10-8773	160 (U)	MD50-10-15873	12 (U)	MD50-10-24388	140 (U)	MD50-10-27205	290 (U)	MD50-11-4025	69 (U)
50-603383	206	MD50-10-8774	100 (U)	MD50-10-15867	65 (U)	MD50-10-24382	300 (U)	MD50-10-27204	290 (U)	MD50-11-4030	130 (U)
50-603383	244	MD50-10-8775	110 (U)	MD50-10-15874	11 (U)	MD50-10-24387	280 (U)	MD50-10-27203	9.5 (U)	MD50-11-4026	160 (U)
50-603383	286	MD50-10-8776	85 (U)	MD50-10-15869	90 (U)	MD50-10-24385	140 (U)	MD50-10-27201	140 (U)	MD50-11-4031	2 (U)
50-603383	359	MD50-10-8777	2 (U)	MD50-10-15872	2 (UJ)	MD50-10-24381	2 (U)	MD50-10-27202	190 (U)	MD50-11-4027	2.2 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Concentration	Result	Sample ID	Result	Sample ID	Result
50-603383	408	MD50-10-8778	4.9 (U)	MD50-10-15870	18 (U)	MD50-10-24386	19 (U)	MD50-10-27200	43 (U)	MD50-11-4032	24 (U)
50-603383	450	MD50-10-8779	2 (U)	MD50-10-15875	4.7 (U)	MD50-10-24383	21 (U)	—	—	MD50-11-4028	22 (U)
50-603467	26	MD50-10-8785	20 (U)	MD50-10-15805	140 (U)	MD50-10-24394	220 (U)	MD50-10-27214	420 (U)	MD50-11-4034	430 (U)
50-603467	91	MD50-10-8783	420 (U)	MD50-10-15801	870 (U)	MD50-10-24398	430 (U)	MD50-10-27210	300 (U)	MD50-11-4038	210 (U)
50-603467	91	MD50-10-8784	10 (U)	—	—	—	—	—	—	—	—
50-603467	143	MD50-10-8786	790 (U)	MD50-10-15807	1100 (U)	MD50-10-24395	460 (U)	MD50-10-27211	580 (U)	MD50-11-4035	840 (U)
50-603467	206	MD50-10-8787	280 (U)	MD50-10-15809	1200 (U)	MD50-10-24396	830 (U)	MD50-10-27215	880 (U)	MD50-11-4039	150 (U)
50-603467	244	MD50-10-8788	260 (U)	MD50-10-15804	1800 (U)	MD50-10-24399	1200 (U)	MD50-10-27207	1100 (U)	MD50-11-4036	1400 (U)
50-603467	287	MD50-10-8793	280 (U)	—	—	MD50-10-24393	1100 (U)	MD50-10-27213	860 (U)	MD50-11-4042	160 (UJ)
50-603467	360	MD50-10-8790	830 (U)	MD50-10-15808	770 (U)	MD50-10-24397	1100 (U)	MD50-10-27212	850 (U)	MD50-11-4037	220 (UJ)
50-603467	409	MD50-10-8789	120 (U)	MD50-10-15802	540 (U)	MD50-10-24391	950 (U)	MD50-10-27208	660 (U)	MD50-11-4040	270 (U)
50-603467	500	MD50-10-8791	80 (U)	MD50-10-15803	430 (U)	MD50-10-24392	390 (U)	MD50-10-27206	380 (U)	MD50-11-4043	190 (U)
50-603467	600	MD50-10-8852	250	MD50-10-15806	710	MD50-10-24390	190	MD50-10-27209	430	MD50-11-4041	1500 (J-)
50-603468	30	MD50-10-8795	14 (U)	—	—	—	—	—	—	—	—
50-603468	92	MD50-10-8796	29 (U)	MD50-10-15879	450 (U)	MD50-10-24402	220 (U)	MD50-10-27220	440 (U)	MD50-11-4047	2 (U)
50-603468	142	MD50-10-8797	15 (U)	MD50-10-15882	230 (U)	MD50-10-24407	170 (U)	MD50-10-27217	200 (U)	MD50-11-4046	2 (U)
50-603468	198	MD50-10-8798	56 (U)	MD50-10-15884	700 (U)	MD50-10-24401	900 (U)	MD50-10-27218	690 (U)	MD50-11-4045	170 (U)
50-603468	233	MD50-10-8799	79 (U)	MD50-10-15878	1100 (U)	MD50-10-24405	870 (U)	MD50-10-27219	950 (U)	MD50-11-4054	2 (U)
50-603468	282	MD50-10-8800	56 (U)	MD50-10-15885	1100 (U)	MD50-10-24403	940 (U)	MD50-10-27226	800 (U)	MD50-11-4050	330 (U)
50-603468	354	MD50-10-8801	84 (U)	MD50-10-15881	1100 (U)	MD50-10-24404	1200 (U)	MD50-10-27223	880 (U)	MD50-11-4051	330 (U)
50-603468	403	MD50-10-8803	37 (U)	MD50-10-15883	840 (U)	MD50-10-24408	910 (U)	MD50-10-27221	780 (U)	MD50-11-4052	270 (U)
50-603468	403	MD50-10-8802	160 (U)	—	—	—	—	—	—	—	—
50-603468	450	MD50-10-8804	44 (U)	MD50-10-15880	540 (U)	MD50-10-24406	870 (U)	MD50-10-27222	340 (U)	MD50-11-4053	220 (U)
50-603470	30	MD50-10-8807	450 (UJ)	MD50-10-15752	890 (U)	MD50-10-24328	570 (U)	MD50-10-27145	440 (UJ)	—	—
50-603470	83	MD50-10-8809	870 (U)	MD50-10-15760	540 (U)	MD50-10-24333	370 (U)	MD50-10-27149	410 (U)	MD50-11-3980	280 (U)
50-603470	143	MD50-10-8811	1800 (UJ)	MD50-10-15753	1500 (U)	MD50-10-24329	930 (U)	MD50-10-27144	1100 (UJ)	MD50-11-3975	**2200 (U)**
50-603470	203	MD50-10-8810	**2000 (U)**	MD50-10-15761	1500 (U)	MD50-10-24334	1800 (U)	MD50-10-27151	280 (U)	MD50-11-3973	580 (U)
50-603470	233	MD50-10-8813	**2200 (U)**	MD50-10-15756	**2900 (U)**	MD50-10-24330	1800 (U)	MD50-10-27147	**2100 (UJ)**	MD50-11-3972	2 (U)
50-603470	278	MD50-10-8808	**4100 (U)**	MD50-10-15758	1800 (U)	MD50-10-24335	**1900 (U)**	MD50-10-27153	**2200 (U)**	MD50-11-3974	1500 (U)
50-603470	351	MD50-10-8814	520 (U)	MD50-10-15754	1200 (U)	MD50-10-24331	1100 (U)	MD50-10-27146	1500 (UJ)	MD50-11-3979	2 (U)
50-603470	450	MD50-10-8816	200 (U)	MD50-10-15757	**2900 (U)**	MD50-10-24336	910 (U)	MD50-10-27152	750 (U)	MD50-11-3978	2 (U)
50-603470	600	MD50-10-8815	5.9 (U)	MD50-10-15755	32 (U)	MD50-10-24332	30 (U)	MD50-10-27148	23 (U)	MD50-11-3977	2 (U)
50-603470	650	MD50-10-8812	2 (U)	MD50-10-15759	2 (U)	MD50-10-24337	4.5 (U)	MD50-10-27115	2 (U)	MD50-11-3976	2 (U)
50-603471	30	MD50-10-8826	150 (U)	—	—	—	—	MD50-10-27158	750 (UJ)	MD50-11-3983	220 (U)
50-603471	90	MD50-10-8822	1500 (UJ)	MD50-10-15769	870 (U)	MD50-10-24339	850 (U)	MD50-10-27155	1300 (U)	MD50-11-3992	150 (U)
50-603471	146	MD50-10-8823	1700 (UJ)	MD50-10-15768	1400 (U)	MD50-10-24344	**2100 (U)**	MD50-10-27157	56 (U)	MD50-11-3990	1300 (U)
50-603471	209	MD50-10-8825	**2000 (U)**	MD50-10-15766	1800 (U)	MD50-10-24340	**2300 (U)**	MD50-10-27162	**1900 (U)**	MD50-11-3988	410 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Concentration	Result	Sample ID	Result	Sample ID	Result
50-603471	242	MD50-10-8819	**4200 (UJ)**	MD50-10-15771	**2400 (U)**	MD50-10-24345	**2200 (U)**	MD50-10-27161	1800 (UJ)	MD50-11-3989	410 (U)
50-603471	288	MD50-10-8821	**2900 (UJ)**	MD50-10-15765	**2700 (U)**	MD50-10-24341	**2900 (U)**	MD50-10-27160	1700 (UJ)	MD50-11-3987	1100 (U)
50-603471	360	MD50-10-8827	**2200 (U)**	MD50-10-15772	1500 (U)	MD50-10-24343	**2100 (U)**	MD50-10-27156	890 (UJ)	MD50-11-3986	890 (U)
50-603471	410	MD50-10-8824	**2100 (U)**	MD50-10-15764	**2300 (U)**	MD50-10-24342	1500 (U)	MD50-10-27163	830 (UJ)	MD50-11-3984	1700 (U)
50-603471	450	MD50-10-8820	1800 (UJ)	MD50-10-15770	1400 (U)	MD50-10-24346	1500 (U)	MD50-10-27159	700 (UJ)	MD50-11-3985	890 (U)
50-603472	27	MD50-10-8834	220 (U)	MD50-10-15779	210 (U)	MD50-10-24354	210 (U)	MD50-10-27165	110 (U)	MD50-11-4002	84 (U)
50-603472	93	MD50-10-8837	290 (U)	MD50-10-15782	290 (U)	MD50-10-24357	230 (U)	MD50-10-27168	2 (U)	MD50-11-4000	43 (U)
50-603472	93	MD50-10-8833	620 (U)	—	—	—	—	—	—	—	—
50-603472	146	MD50-10-8838	430 (U)	MD50-10-15780	340 (U)	MD50-10-24352	430 (U)	MD50-10-27170	2 (U)	MD50-11-4001	410 (U)
50-603472	210	MD50-10-8831	890 (U)	MD50-10-15783	510 (U)	MD50-10-24356	830 (U)	MD50-10-27172	8 (U)	MD50-11-3998	170 (U)
50-603472	247	MD50-10-8835	440 (U)	MD50-10-15776	460 (U)	MD50-10-24350	510 (U)	MD50-10-27166	220 (U)	MD50-11-3999	140 (U)
50-603472	292	MD50-10-8840	1400 (U)	MD50-10-15778	1500 (U)	MD50-10-24353	1500 (U)	MD50-10-27174	8.2 (U)	—	—
50-603472	364	MD50-10-8839	590 (U)	MD50-10-15777	930 (U)	MD50-10-24349	720 (U)	MD50-10-27169	23 (U)	MD50-11-3993	2 (U)
50-603472	414	MD50-10-8836	620 (U)	MD50-10-15781	900 (U)	MD50-10-24355	470 (U)	MD50-10-27167	2 (U)	MD50-11-3994	430 (U)
50-603472	450	MD50-10-8832	450 (U)	MD50-10-15784	470 (U)	MD50-10-24351	420 (U)	MD50-10-27173	2 (U)	MD50-11-3995	420 (U)
50-603503	25	MD50-10-8843	10 (U)	MD50-10-15793	22 (U)	MD50-10-24423	2 (U)	MD50-10-27243	43 (U)	MD50-11-4071	27 (U)
50-603503	80	MD50-10-8844	8.6 (U)	MD50-10-15791	20 (UJ)	MD50-10-24426	88 (U)	MD50-10-27237	35 (U)	MD50-11-4072	36 (U)
50-603503	133	MD50-10-8845	4.3 (U)	MD50-10-15792	42 (U)	MD50-10-24422	39 (U)	MD50-10-27244	48 (U)	MD50-11-4069	34 (U)
50-603503	198	MD50-10-8846	4 (U)	MD50-10-15788	20 (UJ)	MD50-10-24425	220 (U)	MD50-10-27238	84 (U)	MD50-11-4073	52 (U)
50-603503	237	MD50-10-8847	10 (U)	MD50-10-15794	250 (U)	MD50-10-24421	220 (U)	MD50-10-27245	420 (U)	MD50-11-4070	52 (U)
50-603503	278	MD50-10-8848	20 (U)	MD50-10-15795	9.2 (U)	MD50-10-24427	230 (U)	MD50-10-27239	210 (U)	MD50-11-4067	84 (U)
50-603503	347	MD50-10-8849	2 (U)	MD50-10-15790	20 (UJ)	MD50-10-24424	46 (U)	MD50-10-27241	22 (U)	MD50-11-4066	44 (U)
50-603503	397	MD50-10-8850	2 (U)	MD50-10-15796	280 (U)	MD50-10-24428	2 (U)	MD50-10-27240	8.3 (U)	MD50-11-4068	27 (U)
50-603503	450	MD50-10-8851	8.7 (U)	MD50-10-15789	10 (UJ)	MD50-10-24429	96 (U)	MD50-10-27242	44 (U)	MD50-11-4065	44 (U)
50-613182	500	—	—	—	—	—	—	—	—	—	—
50-613182	550	—	—	—	—	—	—	—	—	MD50-11-3943	4.4 (U)
50-613182	600	—	—	—	—	—	—	—	—	MD50-11-3942	2 (U)
50-613182	620	—	—	—	—	—	—	—	—	MD50-11-3953	4.4 (U)
50-613182	632.5	—	—	—	—	—	—	—	—	MD50-11-3941	22 (U)
50-613183	30	—	—	—	—	—	—	—	—	MD50-11-3947	240 (U)
50-613183	500	—	—	—	—	—	—	—	—	MD50-11-3948	160 (UJ)
50-613183	550	—	—	—	—	—	—	—	—	MD50-11-3949	180 (U)
50-613183	600	—	—	—	—	—	—	—	—	MD50-11-3950	27 (U)
50-613183	630	—	—	—	—	—	—	—	—	MD50-11-3951	21 (U)
50-613183	642.5	—	—	—	—	—	—	—	—	MD50-11-3952	2.3
50-613184	30	—	—	—	—	—	—	—	—	MD50-11-3959	28 (UJ)
50-613184	500	—	—	—	—	—	—	—	—	MD50-11-3956	88 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Concentration	Result	Sample ID	Result	Sample ID	Result
50-613184	550	—	—	—	—	—	—	—	—	MD50-11-3958	33 (UJ)
50-613184	600	—	—	—	—	—	—	—	—	MD50-11-3954	9.8 (UJ)
50-613184	652	—	—	—	—	—	—	—	—	MD50-11-3957	2.4 (J-)
50-613184	664.5	—	—	—	—	—	—	—	—	MD50-11-3955	2 (UJ)
50-613185	85	—	—	—	—	—	—	—	—	—	—
50-613185	145	—	—	—	—	—	—	—	—	MD50-11-3962	190 (U)
50-613185	205	—	—	—	—	—	—	—	—	MD50-11-3963	2 (U)
50-613185	235	—	—	—	—	—	—	—	—	MD50-11-3964	8.7 (U)
50-613185	280	—	—	—	—	—	—	—	—	MD50-11-3965	2 (U)
50-613185	350	—	—	—	—	—	—	—	—	MD50-11-3966	2 (U)
50-613185	450	—	—	—	—	—	—	—	—	MD50-11-3967	18 (U)
50-613185	600	—	—	—	—	—	—	—	—	MD50-11-3969	2 (U)
50-613185	675	—	—	—	—	—	—	—	—	MD50-11-3968	2 (U)
50-613185	688	—	—	—	—	—	—	—	—	MD50-11-3970	2 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October–November 2011		March–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-24784	25	MD50-11-6010	23 (U)	—	—	MD50-12-936	9.1 (U)	—	—
50-24784	96	MD50-11-6007	39 (U)	—	—	MD50-12-935	21 (U)	—	—
50-24784	155	MD50-11-6011	31 (U)	—	—	MD50-12-934	42 (U)	MD50-12-12060	159.7 (U)
50-24784	215	MD50-11-6005	38 (U)	—	—	MD50-12-933	1.6 (U)	—	—
50-24784	244	MD50-11-6009	6.3 (U)	—	—	MD50-12-932	41 (U)	MD50-12-12061	184.2 (U)
50-24784	289	MD50-11-6006	36 (U)	—	—	MD50-12-931	76 (U)	—	—
50-24784	362	MD50-11-6008	2 (U)	—	—	MD50-12-930	35 (U)	MD50-12-12062	188.3 (U)
50-24784	411	MD50-11-6004	18 (U)	—	—	MD50-12-929	17 (U)	—	—
50-24784	450	MD50-11-6003	23 (U)	—	—	MD50-12-928	9 (U)	MD50-12-12063	151.5 (U)
50-24813	25	MD50-11-6022	930 (U)	—	—	MD50-12-946	180 (U)	MD50-12-12067	143.3 (U)
50-24813	99	MD50-11-6021	970 (U)	—	—	MD50-12-945	290 (U)	—	—
50-24813	150	MD50-11-6019	460 (U)	—	—	MD50-12-944	450 (U)	MD50-12-12066	286.6 (U)
50-24813	207	MD50-11-6020	350 (U)	—	—	MD50-12-943	800 (U)	—	—
50-24813	241	MD50-11-6018	160 (U)	—	—	MD50-12-942	1100 (U)	MD50-12-12065	491.3 (U)
50-24813	286	MD50-11-6017	**1900 (U)**	—	—	MD50-12-941	910 (U)	—	—
50-24813	358	MD50-11-6013	1200 (U)	MD50-11-23296	250 (U)	MD50-12-940	460 (U)	MD50-12-12064	249.7 (U)
50-24813	408	MD50-11-6015	400 (U)	MD50-11-23297	310 (U)	MD50-12-939	490 (U)	—	—
50-24813	450	MD50-11-6016	330 (U)	MD50-11-23298	36 (U)	MD50-12-938	160 (U)	MD50-12-12068	159.7 (U)
50-24813	600	MD50-11-6014	68 (U)	MD50-11-23299	180 (U)	MD50-12-937	47 (U)	MD50-12-12069	155.6 (U)
50-24822	25	MD50-11-6062	44 (U)	—	—	MD50-12-947	95 (U)	MD50-12-12074	143.3 (U)
50-24822	81	MD50-11-6059	83 (U)	—	—	MD50-12-948	41 (U)	—	—
50-24822	142	MD50-11-6061	34 (U)	—	—	MD50-12-949	76 (U)	MD50-12-12073	143.3 (U)
50-24822	204	MD50-11-6058	900 (U)	—	—	MD50-12-951	85 (U)	—	—
50-24822	235	MD50-11-6060	220 (U)	—	—	MD50-12-952	410 (U)	MD50-12-12072	290.7 (U)
50-24822	280	MD50-11-6055	820 (U)	—	—	MD50-12-950	400 (U)	—	—
50-24822	351	MD50-11-6056	430 (U)	—	—	MD50-12-953	79 (U)	MD50-12-12071	163.8 (U)
50-24822	402	MD50-11-6063	2 (U)	—	—	MD50-12-954	82 (U)	—	—
50-24822	450	MD50-11-6057	130 (U)	—	—	MD50-12-955	100 (U)	MD50-12-12070	171.9 (U)
50-603061	25	MD50-11-6083	89 (U)	—	—	—	—	MD50-12-12079	155.6 (U)
50-603061	76	MD50-11-6080	1.6 (U)	—	—	—	—	—	—
50-603061	128	MD50-11-6079	8.2 (U)	—	—	—	—	MD50-12-12078	212.9 (U)
50-603061	190	MD50-11-6078	3.5 (U)	—	—	—	—	—	—
50-603061	228	MD50-11-6081	67 (U)	—	—	—	—	MD50-12-12077	155.6 (U)
50-603061	274	MD50-11-6077	15 (U)	—	—	—	—	—	—
50-603061	347	MD50-11-6082	63 (U)	—	—	—	—	MD50-12-12076	171.9 (U)
50-603061	397	MD50-11-6076	7.1 (U)	—	—	—	—	—	—
50-603061	450	MD50-11-6075	5.4 (U)	—	—	—	—	MD50-12-12075	249.7 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October–November 2011		March–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603062	25	MD50-11-6088	11 (U)	—	—	—	—	—	—
50-603062	64	MD50-11-6085	26 (U)	—	—	—	—	—	—
50-603062	122	MD50-11-6087	150 (U)	—	—	—	—	MD50-12-12087	143.3 (U)
50-603062	184	MD50-11-6092	330 (U)	—	—	—	—	—	—
50-603062	217	MD50-11-6086	180 (U)	—	—	—	—	MD50-12-12086	139.2 (U)
50-603062	263	MD50-11-6090	200 (U)	—	—	—	—	—	—
50-603062	337	MD50-11-6094	22 (U)	—	—	—	—	MD50-12-12085	139.2 (U)
50-603062	387	MD50-11-6091	14 (U)	—	—	—	—	—	—
50-603062	450	MD50-11-6089	6.1 (U)	—	—	—	—	MD50-12-12084	139.2 (U)
50-603063	25	MD50-11-6102	300 (U)	—	—	—	—	MD50-12-12088	143.3 (U)
50-603063	76	MD50-11-6100	330 (U)	—	—	—	—	—	—
50-603063	128	MD50-11-6099	400 (U)	—	—	—	—	MD50-12-12089	180.1 (U)
50-603063	190	MD50-11-6097	4.1 (U)	—	—	—	—	—	—
50-603063	228	MD50-11-6098	340 (U)	—	—	—	—	MD50-12-12090	147.4 (U)
50-603063	274	MD50-11-6103	470 (U)	—	—	—	—	—	—
50-603063	347	MD50-11-6095	320 (U)	—	—	—	—	MD50-12-12091	147.4 (U)
50-603063	397	MD50-11-6101	220 (U)	—	—	—	—	—	—
50-603063	450	MD50-11-6096	330 (U)	—	—	—	—	MD50-12-12092	155.6 (U)
50-603064	25	MD50-11-6108	30 (U)	—	—	MD50-12-956	47 (U)	—	—
50-603064	66	MD50-11-6107	71 (U)	—	—	MD50-12-957	79 (U)	—	—
50-603064	113	MD50-11-6105	310 (U)	—	—	MD50-12-958	260 (U)	MD50-12-12096	156 (U)
50-603064	176	MD50-11-6110	270 (U)	—	—	MD50-12-959	310 (U)	—	—
50-603064	214	MD50-11-6111	360 (U)	—	—	MD50-12-960	330 (U)	MD50-12-12095	151 (U)
50-603064	259	MD50-11-6112	310 (U)	—	—	MD50-12-961	310 (U)	—	—
50-603064	332	MD50-11-6113	71 (U)	—	—	MD50-12-962	140 (U)	MD50-12-12094	139 (U)
50-603064	482	MD50-11-6109	51 (U)	—	—	MD50-12-963	85 (U)	—	—
50-603064	500	MD50-11-6106	7.1 (U)	—	—	MD50-12-964	20 (U)	MD50-12-12093	147 (U)
50-603383	26	MD50-11-6027	34 (U)	MD50-11-23287	9.1 (U)	MD50-12-982	16 (U)	MD50-12-12101	139 (U)
50-603383	85	MD50-11-6025	29 (U)	MD50-11-23288	37 (U)	MD50-12-978	37 (U)	—	—
50-603383	139	MD50-11-6024	20 (U)	MD50-11-23289	9 (U)	MD50-12-979	48 (U)	MD50-12-12097	143 (U)
50-603383	206	MD50-11-6032	2 (U)	MD50-11-23290	22 (U)	MD50-12-980	99 (U)	—	—
50-603383	244	MD50-11-6026	270 (U)	MD50-11-23291	35 (U)	MD50-12-981	80 (U)	MD50-12-12098	151 (U)
50-603383	286	MD50-11-6029	27 (U)	MD50-11-23292	39 (U)	MD50-12-977	87 (U)	—	—
50-603383	359	MD50-11-6028	22 (U)	MD50-11-23295	1.6 (U)	MD50-12-976	1.6 (U)	MD50-12-12099	205 (U)
50-603383	408	MD50-11-6030	20 (U)	MD50-11-23294	1.6 (U)	MD50-12-975	18 (U)	—	—
50-603383	450	MD50-11-6031	38 (U)	MD50-11-23293	7.5 (U)	MD50-12-974	20 (U)	MD50-12-12100	151 (U)
50-603467	26	MD50-11-6041	100 (U)	—	—	—	—	—	—

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October–November 2011		March–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603467	91	MD50-11-6043	310 (U)	—	—	—	—	—	—
50-603467	143	MD50-11-6038	110 (U)	—	—	—	—	MD50-12-12106	151.5 (U)
50-603467	206	MD50-11-6042	330 (U)	—	—	—	—	—	—
50-603467	244	MD50-11-6037	240 (U)	—	—	—	—	MD50-12-12102	167.9 (U)
50-603467	287	MD50-11-6039	300 (U)	—	—	—	—	—	—
50-603467	360	MD50-11-6040	290 (U)	—	—	—	—	MD50-12-12103	151.5 (U)
50-603467	409	MD50-11-6036	400 (U)	—	—	—	—	—	—
50-603467	500	MD50-11-6035	40 (U)	—	—	—	—	MD50-12-12104	151.5 (U)
50-603467	600	MD50-11-6034	1200	—	—	—	—	MD50-12-12105	736.9
50-603468	30	—	—	—	—	—	—	—	—
50-603468	92	MD50-11-6051	150 (U)	—	—	MD49-12-967	73 (U)	—	—
50-603468	142	MD50-11-6050	450 (U)	—	—	MD49-12-965	78 (U)	MD50-12-12108	139.2 (U)
50-603468	198	MD50-11-6052	760 (U)	—	—	MD49-12-966	93 (U)	—	—
50-603468	233	MD50-11-6049	1100 (U)	—	—	MD49-12-971	180 (U)	MD50-12-12109	139.2 (U)
50-603468	282	MD50-11-6047	950 (U)	—	—	MD49-12-969	170 (U)	—	—
50-603468	354	MD50-11-6046	790 (U)	MD50-11-23278	1.6 (U)	MD49-12-970	620 (U)	MD50-12-12110	143.3 (U)
50-603468	403	MD50-11-6045	720 (U)	MD50-11-23279	37 (U)	MD49-12-972	420 (U)	MD50-12-12107	139.2 (U)
50-603468	450	MD50-11-6048	310 (U)	MD50-11-23280	200 (U)	MD49-12-973	180 (U)	—	—
50-603470	30	MD50-11-5978	140 (U)	—	—	MD50-12-983	90 (U)	—	—
50-603470	83	MD50-11-5980	120 (U)	—	—	MD50-12-984	170 (U)	MD50-12-12114	143.3 (U)
50-603470	143	MD50-11-5982	280 (U)	—	—	MD50-12-985	340 (U)	—	—
50-603470	203	MD50-11-5977	410 (U)	—	—	MD50-12-986	580 (U)	MD50-12-12120	151.5 (U)
50-603470	233	MD50-11-5976	240 (U)	—	—	MD50-12-987	610 (U)	—	—
50-603470	278	MD50-11-5979	560 (U)	—	—	MD50-12-988	340 (U)	MD50-12-12119	294.8 (U)
50-603470	351	MD50-11-5973	33 (U)	MD50-11-23311	410 (U)	MD50-12-989	280 (U)	MD50-12-12118	151.5 (U)
50-603470	450	MD50-11-5972	180 (U)	MD50-11-23312	170 (U)	MD50-12-990	190 (U)	MD50-12-12115	159.7 (U)
50-603470	600	MD50-11-5975	15 (U)	MD50-11-23313	16 (U)	MD50-12-991	13 (U)	MD50-12-12116	221.1 (U)
50-603470	650	MD50-11-5974	1.6 (U)	MD50-11-23314	1.6 (U)	MD50-12-992	2.1	MD50-12-12117	159.7 (U)
50-603471	30	—	—	—	—	—	—	—	—
50-603471	90	MD50-11-5990	420 (U)	—	—	MD50-12-1000	350 (U)	MD50-12-12124	147.4 (U)
50-603471	146	MD50-11-5989	1400 (U)	—	—	MD50-12-999	820 (U)	—	—
50-603471	209	MD50-11-5988	33 (U)	—	—	MD50-12-998	690 (U)	MD50-12-12125	294.8 (U)
50-603471	242	MD50-11-5987	8.7 (U)	—	—	MD50-12-997	840 (U)	—	—
50-603471	288	—	—	—	—	MD50-12-996	830 (U)	MD50-12-12122	319.3 (U)
50-603471	360	MD50-11-5986	290 (U)	MD50-11-23308	480 (U)	—	—	MD50-12-12123	176 (U)
50-603471	410	MD50-11-5983	440 (U)	MD50-11-23310	410 (U)	MD50-12-994	580 (U)	—	—
50-603471	450	MD50-11-5985	520 (U)	MD50-11-23309	210 (U)	MD50-12-993	470 (U)	MD50-12-12121	147.4 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October–November 2011		March–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603472	27	MD50-11-6000	36 (U)	—	—	MD50-12-1010	22 (U)	MD50-12-12128	143.3 (U)
50-603472	93	MD50-11-5998	39 (U)	—	—	MD50-12-1007	120 (U)	—	—
50-603472	146	MD50-11-6001	94 (U)	—	—	MD50-12-1008	120 (U)	MD50-12-12129	143.3 (U)
50-603472	210	MD50-11-5997	130 (U)	—	—	MD50-12-1006	80 (U)	—	—
50-603472	247	MD50-11-5999	99 (U)	—	—	MD50-12-1009	320 (U)	—	—
50-603472	292	MD50-11-5995	170 (U)	—	—	MD50-12-1005	150 (U)	MD50-12-12132	139.2 (U)
50-603472	364	MD50-11-5994	91 (U)	MD50-11-23307	95 (U)	MD50-12-1004	110 (U)	MD50-12-12131	139.2 (U)
50-603472	414	MD50-11-5993	96 (U)	MD50-11-23306	160 (U)	MD50-12-1003	200 (U)	—	—
50-603472	450	MD50-11-5996	140 (U)	MD50-11-23305	62 (U)	MD50-12-1002	160 (U)	MD50-12-12130	151.5 (U)
50-603503	25	MD50-11-6072	2 (U)	—	—	—	—	—	—
50-603503	80	MD50-11-5992	41 (U)	—	—	—	—	—	—
50-603503	133	MD50-11-6073	29 (U)	—	—	—	—	MD50-12-12136	147.4 (U)
50-603503	198	MD50-11-6069	33 (U)	—	—	—	—	—	—
50-603503	237	MD50-11-6068	67 (U)	—	—	—	—	MD50-12-12135	151.5 (U)
50-603503	278	MD50-11-6070	68 (U)	—	—	—	—	—	—
50-603503	347	MD50-11-6065	22 (U)	—	—	—	—	MD50-12-12137	147.4 (U)
50-603503	397	MD50-11-6066	18 (U)	—	—	—	—	—	—
50-603503	450	MD50-11-6067	34 (U)	—	—	—	—	MD50-12-12138	151.5 (U)
50-613182	500	MD50-11-5933	260 (U)	MD50-11-23273	50 (U)	MD50-12-1015	45 (U)	—	—
50-613182	550	MD50-11-5934	36 (U)	MD50-11-23276	40 (U)	MD50-12-1014	33 (U)	MD50-12-12133	143.3 (U)
50-613182	600	MD50-11-5936	2 (U)	MD50-11-23275	1.6 (U)	MD50-12-1013	1.6 (U)	—	—
50-613182	620	MD50-11-5937	2 (U)	MD50-11-23274	9.5 (U)	MD50-12-1012	7.8 (U)	—	—
50-613182	632.5	MD50-11-5935	2 (U)	MD50-11-23277	1.6 (U)	MD50-12-1011	1.6 (U)	MD50-12-12134	15.56 (U)
50-613183	30	MD50-11-5942	340 (U)	—	—	MD50-12-1020	130 (U)	—	—
50-613183	500	MD50-11-5939	18 (U)	MD50-11-23282	200 (U)	MD50-12-1021	89 (U)	—	—
50-613183	550	MD50-11-5943	400 (U)	MD50-11-23283	24 (U)	MD50-12-1022	38 (U)	MD50-12-12127	163.8 (U)
50-613183	600	MD50-11-5941	200 (U)	MD50-11-23284	68 (U)	MD50-12-1017	90 (U)	—	—
50-613183	630	MD50-11-5944	200 (U)	MD50-11-23285	23 (U)	MD50-12-1018	33 (U)	—	—
50-613183	642.5	MD50-11-5940	2 (U)	MD50-11-23286	1.6 (U)	MD50-12-1019	1.6 (U)	MD50-12-12126	151.5 (U)
50-613184	30	MD50-11-5948	110 (U)	—	—	MD50-12-1023	44 (U)	—	—
50-613184	500	MD50-11-5951	110 (U)	MD50-11-23300	7.5 (U)	MD50-12-1024	44 (U)	MD50-12-12113	147.4 (U)
50-613184	550	MD50-11-5946	77 (U)	MD50-11-23302	3.3 (U)	MD50-12-1025	13 (U)	—	—
50-613184	600	MD50-11-5947	8.3 (U)	MD50-11-23301	9.2 (U)	MD50-12-1026	5 (U)	MD50-12-12112	143.3 (U)
50-613184	652	MD50-11-5950	7.9 (U)	MD50-11-23303	1.6 (U)	MD50-12-1027	1.6 (U)	—	—
50-613184	664.5	MD50-11-5949	2 (U)	MD50-11-23304	1.6 (U)	MD50-12-1028	1.6 (U)	MD50-12-12111	167.9 (U)
50-613185	85	MD50-11-5960	19 (U)	—	—	MD50-12-1038	41 (U)	—	—
50-613185	145	MD50-11-5961	200 (U)	—	—	MD50-12-1035	76 (U)	MD50-12-12143	143.3 (U)

Table 3.2-11 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October–November 2011		March–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-613185	205	MD50-11-5957	160 (U)	—	—	MD50-12-1036	95 (U)	—	—
50-613185	235	MD50-11-5962	200 (U)	—	—	MD50-12-1037	110 (U)	MD50-12-12139	147.4 (U)
50-613185	280	MD50-11-5959	200 (U)	—	—	MD50-12-1034	94 (U)	—	—
50-613185	350	MD50-11-5955	37 (U)	MD50-11-23268	44 (U)	MD50-12-1033	88 (U)	MD50-12-12140	159.7 (U)
50-613185	450	MD50-11-5954	20 (U)	MD50-11-23269	22 (U)	MD50-12-1032	1.6 (U)	MD50-12-12141	151.5 (U)
50-613185	600	MD50-11-5953	2	MD50-11-23271	1.6 (U)	MD50-12-1031	1.6 (U)	MD50-12-12142	167.9 (U)
50-613185	675	MD50-11-5958	2 (U)	MD50-11-23270	1.6 (U)	MD50-12-1030	1.6 (U)	—	—
50-613185	688	MD50-11-5956	2 (U)	MD50-11-23272	1.6 (U)	MD50-12-1029	1.6 (U)	—	—

Note: Units are µg/m^3. Data qualifiers are defined in Appendix A. Bold indicates result exceeds Tier II screening level for fracture flow (1880 µg/m^3).
* — = Not sampled.

Table 3.2-12
Tier II Screening of TCE Vapor Data at MDA C

Location ID	Depth (ft bgs)	Tier II Screening Level		January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-24784	25	32,622	62,946	MD50-10-8677	1100	MD50-10-15742	1300	MD50-10-24362	900	MD50-10-27179	990	MD50-11-4012	920
50-24784	96	29,470	59,794	MD50-10-8680	3700	MD50-10-15745	2500	MD50-10-24364	2700	MD50-10-27176	2800	MD50-11-4010	2600
50-24784	155	26,850	57,174	MD50-10-8681	3800	MD50-10-15747	2600	MD50-10-24365	3200	MD50-10-27175	3700	MD50-11-4009	3000
50-24784	215	24,186	54,510	MD50-10-8679	5200	MD50-10-15744	4700	MD50-10-24361	4900	MD50-10-27181	5400	MD50-11-4006	5000
50-24784	244	22,898	53,222	MD50-10-8685	6800	MD50-10-15741	4300	MD50-10-24359	4500	MD50-10-27180	5100	MD50-11-4004	4600
50-24784	289	20,900	51,224	MD50-10-8683	4000	MD50-10-15748	4500	MD50-10-24366	4600	MD50-10-27178	4800	MD50-11-4008	5000
50-24784	362	17,659	47,983	MD50-10-8684	4300	MD50-10-15743	3900	MD50-10-24360	1800	MD50-10-27182	3000	MD50-11-4007	2600
50-24784	411	15,484	45,808	MD50-10-8682	1400	MD50-10-15746	1600	MD50-10-24367	1700	MD50-10-27177	2100	MD50-11-4005	1500 (U)
50-24784	450	13,752	44,076	MD50-10-8678	1000	MD50-10-15740	1200	MD50-10-24363	630	MD50-10-27183	1200	MD50-11-4003	550 (U)
50-24813	25	32,622	62,946	MD50-10-8697	13,000	MD50-10-15902	12,000	MD50-10-24369	11,000	MD50-10-27186	13,000	MD50-11-4023	**37,000**
50-24813	99	29,336	59,660	MD50-10-8696	**31,000**	MD50-10-15906	**32,000**	MD50-10-24375	37 (U)	MD50-10-27189	26,000	MD50-11-4021	**42,000**
50-24813	150	27,072	57,396	MD50-10-8693	**44,000**	MD50-10-15903	**37,000**	MD50-10-24370	**41,000**	MD50-10-27185	**31,000**	MD50-11-4095	**39,000**
50-24813	207	24,541	54,865	MD50-10-8702	**67,000**	MD50-10-15907	**50,000**	MD50-10-24376	**62,000**	MD50-10-27190	1200	MD50-11-4019	1100
50-24813	241	23,032	53,356	MD50-10-8699	**67,000**	MD50-10-15904	**70,000**	MD50-10-24371	**62,000**	MD50-10-27193	15,000	MD50-11-4018	360
50-24813	241	23,032	53,356	—*	—	—	—	—	—	MD50-10-27194	10,000	—	—
50-24813	286	21,034	51,358	MD50-10-8694	**62,000**	MD50-10-15909	**33,000**	MD50-10-24377	**75,000**	MD50-10-27191	1300	MD50-11-4017	9900
50-24813	358	17,837	48,161	MD50-10-8700	**19,000**	MD50-10-15905	**46,000**	MD50-10-24372	**45,000**	MD50-10-27343	120	MD50-11-4014	**43,000**
50-24813	408	15,617	45,941	MD50-10-8695	**35,000**	MD50-10-15910	**60,000**	MD50-10-24378	**43,000**	MD50-10-27192	**32,000**	MD50-11-4013	15,000
50-24813	450	13,752	44,076	MD50-10-8701	6000	MD50-10-15908	**23,000**	MD50-10-24374	3900	MD50-10-27188	5300	MD50-11-4015	13,000
50-24813	600	7092	37,416	MD50-10-8698	430	MD50-10-15911	2400	MD50-10-24373	2400	MD50-10-27195	12	MD50-11-4016	170
50-24822	25	32,622	62,946	MD50-10-8703	4100	MD50-10-15848	32000	MD50-10-24413	6100	MD50-10-27227	7000	MD50-11-4058	6100
50-24822	81	30,136	60,460	MD50-10-8704	12,000	MD50-10-15854	11,000	MD50-10-24419	11,000	MD50-10-27232	11,000	—	—
50-24822	142	27,427	57,751	MD50-10-8705	**29,000**	MD50-10-15850	14,000	MD50-10-24416	19,000	MD50-10-27235	9000	MD50-11-4057	500
50-24822	204	24,674	54,998	MD50-10-8706	17,000	MD50-10-15856	**33,000**	MD50-10-24414	**32,000**	MD50-10-27229	**28,000**	MD50-11-4055	**28,000**
50-24822	235	23,298	53,622	MD50-10-8707	27,000	MD50-10-15849	6000	MD50-10-24418	**32,000**	MD50-10-27233	**32,000**	MD50-11-4060	**32,000**
50-24822	280	21,300	51,624	MD50-10-8708	**30,000**	MD50-10-15855	**27,000**	MD50-10-24412	**30,000**	MD50-10-27231	**32,000**	MD50-11-4061	17,000
50-24822	351	18,148	48,472	MD50-10-8709	5700	MD50-10-15852	17,000	MD50-10-24415	17,000	MD50-10-27230	14,000	MD50-11-4056	11
50-24822	402	15,883	46,207	MD50-10-8710	11,000	MD50-10-15851	14,000	MD50-10-24411	3.2 (U)	—	—	—	—
50-24822	450	13,752	44,076	MD50-10-8711	2400	MD50-10-15853	10,000	MD50-10-24417	9300	MD50-10-27228	11,000	—	—
50-603061	25	32,622	62,946	MD50-10-8715	160	MD50-10-15840	250	MD50-10-26315	370	MD50-10-27249	290	MD50-11-4080	380
50-603061	76	30,358	60,682	MD50-10-8716	1800	MD50-10-15837	1900	MD50-10-24432	1200	MD50-10-27251	1900	MD50-11-4081	1900
50-603061	128	28,049	58,373	MD50-10-8717	42	MD50-10-15841	2400	MD50-10-24437	1700	MD50-10-27247	2500	MD50-11-4083	2500
50-603061	190	25,296	55,620	MD50-10-8718	2100	MD50-10-15843	1800	MD50-10-24433	2000	MD50-10-27255	4000	MD50-11-4082	3700
50-603061	228	23,609	53,933	MD50-10-8719	3300	MD50-10-15839	2800	MD50-10-24436	3400	MD50-10-27248	3200	MD50-11-4084	2700
50-603061	274	21,566	51,890	MD50-10-8720	1100	MD50-10-15844	2100	MD50-10-24434	2100	MD50-10-27253	2000	MD50-11-4076	1500
50-603061	347	18,325	48,649	MD50-10-8721	470	MD50-10-15842	1100	MD50-10-24438	1200	MD50-10-27252	1200	MD50-11-4077	1000

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603061	397	16,105	46,429	MD50-10-8722	610	MD50-10-15838	1600	MD50-10-26314	1200	MD50-10-27254	960	MD50-11-4078	1300
50-603061	450	13,752	44,076	MD50-10-8724	180	MD50-10-15836	500	MD50-10-24439	620	MD50-10-27250	550	MD50-11-4079	390
50-603062	25	32,622	62,946	MD50-10-8727	1700	MD50-10-15893	1700	MD50-10-24441	1600	MD50-10-27262	1200	MD50-11-4092	1400
50-603062	64	30,890	61,214	MD50-10-8728	890	MD50-10-15894	2100	MD50-10-24446	2900	MD50-10-27265	2400	MD50-11-4091	7400
50-603062	122	28,315	58,639	MD50-10-8729	2700	MD50-10-15891	3900	MD50-10-24443	6700	MD50-10-27257	7200 (J)	MD50-11-4093	6100
50-603062	184	25,562	55,886	MD50-10-8730	1800	MD50-10-15896	8300	MD50-10-24445	8000	MD50-10-27263	5900	MD50-11-4090	6000
50-603062	217	24,097	54,421	MD50-10-8731	2300	MD50-10-15895	8400	MD50-10-24447	4800	MD50-10-27260	5700	MD50-11-4089	1100
50-603062	263	22,055	52,379	MD50-10-15366	970	MD50-10-15890	4400	MD50-10-24442	4000	MD50-10-27264	6300	MD50-11-4087	5700
50-603062	337	18,769	49,093	MD50-10-8733	14	MD50-10-15898	2400	MD50-10-24448	2000	MD50-10-27259	1900	MD50-11-4086	1400
50-603062	387	16,549	46,873	MD50-10-8734	680	MD50-10-15892	1100	MD50-10-24444	1700	MD50-10-27261	1900	MD50-11-4088	1700
50-603062	450	13,752	44,076	MD50-10-8735	140	MD50-10-15897	500	MD50-10-24449	660	MD50-10-27258	700	MD50-11-4085	320
50-603063	25	32,622	62,946	MD50-10-8755	1000	MD50-10-15827	1800	MD50-10-24451	960	MD50-10-27267	2100	MD50-11-4103	1700
50-603063	76	30,358	60,682	MD50-10-8754	4200	MD50-10-15832	7200	MD50-10-24457	5600	MD50-10-27272	5400	MD50-11-4102	6500
50-603063	128	28,049	58,373	MD50-10-8753	3500	MD50-10-15825	5700	MD50-10-24453	2700	MD50-10-27275	9600	MD50-11-4101	8700
50-603063	190	25,296	55,620	MD50-10-8752	9400	MD50-10-15830	16,000	MD50-10-24454	18,000	MD50-10-27268	22,000	MD50-11-4100	20,000
50-603063	228	23,609	53,933	MD50-10-8751	7400	MD50-10-15824	17,000	MD50-10-24456	5500	MD50-10-27273	22,000	MD50-11-4099	3.3
50-603063	274	21,566	51,890	MD50-10-8749	7400	MD50-10-15829	20,000	MD50-10-24458	18,000	MD50-10-27269	**25,000**	MD50-11-4098	**22,000**
50-603063	347	18,325	48,649	MD50-10-8750	2900	MD50-10-15833	8700	MD50-10-24452	2900	MD50-10-27274	9900	MD50-11-4096	4600
50-603063	397	16,105	46,429	MD50-10-8748	2400	MD50-10-15826	9300	—	—	—	—	MD50-11-4104	910
50-603063	450	13,752	44,076	MD50-10-8747	1700	MD50-10-15831	8600	MD50-10-24455	6700	MD50-10-27271	8200	MD50-11-4097	8400
50-603064	25	32,622	62,946	MD50-10-8759	4600	MD50-10-15816	3300	MD50-10-24461	3700	MD50-10-27280	3600	MD50-11-4113	3900
50-603064	66	30,802	61,126	MD50-10-8760	5100	MD50-10-15817	3300	MD50-10-24467	9000	MD50-10-27285	7300	MD50-11-4112	3700
50-603064	113	28,715	59,039	MD50-10-8761	2900	MD50-10-15814	18,000	MD50-10-24462	23,000	MD50-10-27279	28,000	MD50-11-4111	**31,000**
50-603064	176	25,918	56,242	MD50-10-8762	20,000	MD50-10-15812	**45,000**	MD50-10-24465	24,000	MD50-10-27283	**40,000**	MD50-11-4109	**34,000**
50-603064	214	24,230	54,554	MD50-10-8763	11,000	MD50-10-15819	5700	MD50-10-24463	**32,000**	MD50-10-27277	**36,000**	MD50-11-4110	3800
50-603064	259	22,232	52,556	MD50-10-8764	8200	MD50-10-15820	17,000	MD50-10-24468	**28,000**	MD50-10-27281	**27,000**	MD50-11-4105	21,000
50-603064	332	18,991	49,315	MD50-10-8765	8600	MD50-10-15813	9500	MD50-10-24464	12,000	MD50-10-27278	13,000	MD50-11-4106	11,000
50-603064	482	15,972	46,296	MD50-10-8766	3600	MD50-10-15818	2000	MD50-10-24469	8200	MD50-10-27282	8700	MD50-11-4107	4800
50-603064	500	11,532	41,856	MD50-10-8767	290	MD50-10-15821	1200	MD50-10-24466	1200	MD50-10-27284	1600	MD50-11-4108	1500
50-603383	26	32,578	62,902	MD50-10-8771	180	MD50-10-15871	1100	MD50-10-24380	910	MD50-10-27199	690	MD50-11-4024	2000
50-603383	85	29,958	60,282	MD50-10-8772	1200	MD50-10-15866	2200	MD50-10-24384	2400	MD50-10-27197	2600	MD50-11-4029	1900
50-603383	139	27,560	57,884	MD50-10-8773	3600	MD50-10-15873	4500	MD50-10-24388	4100	MD50-10-27205	5200	MD50-11-4025	250
50-603383	206	24,586	54,910	MD50-10-8774	2100	MD50-10-15867	4800	MD50-10-24382	7100	MD50-10-27204	6700	MD50-11-4030	4600
50-603383	244	22,898	53,222	MD50-10-8775	2200	MD50-10-15874	6500	MD50-10-24387	6700	MD50-10-27203	510	MD50-11-4026	5900
50-603383	286	21,034	51,358	MD50-10-8776	1100	MD50-10-15869	2700	MD50-10-24385	3900	MD50-10-27201	3300	MD50-11-4031	190 (U)

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603383	359	17,792	48,116	MD50-10-8777	80	MD50-10-15872	18 (J-)	MD50-10-24381	29	MD50-10-27202	4000	MD50-11-4027	300
50-603383	408	15,617	45,941	MD50-10-8778	520	MD50-10-15870	1100	MD50-10-24386	1800	MD50-10-27200	1400	MD50-11-4032	1500
50-603383	450	13,752	44,076	MD50-10-8779	110	MD50-10-15875	220	MD50-10-24383	2000	—	—	MD50-11-4028	1500
50-603467	26	32,578	62,902	MD50-10-8785	3500	MD50-10-15805	2700	MD50-10-24394	5900	MD50-10-27214	9400	MD50-11-4034	9400 (U)
50-603467	91	29,692	60,016	MD50-10-8783	4900	MD50-10-15801	12,000	MD50-10-24398	13,000	MD50-10-27210	7400	MD50-11-4038	12000
50-603467	91	29,692	60,016	MD50-10-8784	3200	—	—	—	—	—	—	—	—
50-603467	143	27,383	57,707	MD50-10-8786	12,000	MD50-10-15807	12,000	MD50-10-24395	15,000	MD50-10-27211	18,000	MD50-11-4035	18,000 (U)
50-603467	206	24,586	54,910	MD50-10-8787	7700	MD50-10-15809	**25,000**	MD50-10-24396	24,000	MD50-10-27215	**25,000**	MD50-11-4039	11,000
50-603467	244	22,898	53,222	MD50-10-8788	8000	MD50-10-15804	**24,000**	MD50-10-24399	**31,000**	MD50-10-27207	**26,000**	MD50-11-4036	20,000 (U)
50-603467	287	20,989	51,313	MD50-10-8793	7900	—	—	MD50-10-24393	**33,000**	MD50-10-27213	**22,000**	MD50-11-4042	8800 (J-)
50-603467	360	17,748	48,072	MD50-10-8790	12,000	MD50-10-15808	**19,000**	MD50-10-24397	**24,000**	MD50-10-27212	26,000	MD50-11-4037	12,000 (U)
50-603467	409	15,572	45,896	MD50-10-8789	1900	MD50-10-15802	7600	MD50-10-24391	**18,000**	MD50-10-27208	15,000	MD50-11-4040	7200
50-603467	500	11,532	41,856	MD50-10-8791	1000	MD50-10-15803	5500	MD50-10-24392	8100	MD50-10-27206	8100	MD50-11-4043	6000
50-603467	600	7092	37,416	MD50-10-8852	530	MD50-10-15806	1500	MD50-10-24390	**8500**	MD50-10-27209	3700	MD50-11-4041	3400 (J-)
50-603468	30	32,400	62,724	MD50-10-8795	28	—	—	—	—	—	—	—	—
50-603468	92	29,647	59,971	MD50-10-8796	2900	MD50-10-15879	9200	MD50-10-24402	6400	MD50-10-27220	5700	MD50-11-4047	33
50-603468	142	27,427	57,751	MD50-10-8797	1500	MD50-10-15882	6400	MD50-10-24407	3900	MD50-10-27217	5500	MD50-11-4046	55
50-603468	198	24,941	55,265	MD50-10-8798	6400	MD50-10-15884	18,000	MD50-10-24401	19,000	MD50-10-27218	20,000	MD50-11-4045	11,000
50-603468	233	23,387	53,711	MD50-10-8799	7600	MD50-10-15878	**27,000**	MD50-10-24405	23,000	MD50-10-27219	23,000	MD50-11-4054	21
50-603468	282	21,211	51,535	MD50-10-8800	5600	MD50-10-15885	**23,000**	MD50-10-24403	**22,000**	MD50-10-27226	**23,000**	MD50-11-4050	**23,000**
50-603468	354	18,014	48,338	MD50-10-8801	7600	MD50-10-15881	**24,000**	MD50-10-24404	**25,000**	MD50-10-27223	**20,000**	MD50-11-4051	**38,000**
50-603468	403	15,839	46,163	MD50-10-8803	4000	MD50-10-15883	**19,000**	MD50-10-24408	**25,000**	MD50-10-27221	**22,000**	MD50-11-4052	**19,000**
50-603468	403	15,839	46,163	MD50-10-8802	**16,000**	—	—	—	—	—	—	—	—
50-603468	450	13,752	44,076	MD50-10-8804	6700	MD50-10-15880	12,000	MD50-10-24406	**15,000**	MD50-10-27222	12,000	MD50-11-4053	**15,000**
50-603470	30	32,400	62,724	MD50-10-8807	9700	MD50-10-15752	12,000	MD50-10-24328	13,000	MD50-10-27145	14,000	—	—
50-603470	83	30,047	60,371	MD50-10-8809	19,000	MD50-10-15760	18,000	MD50-10-24333	18,000	MD50-10-27149	13,000	MD50-11-3980	6000
50-603470	143	27,383	57,707	MD50-10-8811	**35,000**	MD50-10-15753	**32,000**	MD50-10-24329	**29,000**	MD50-10-27144	**33,000**	MD50-11-3975	**41,000**
50-603470	203	24,719	55,043	MD50-10-8810	**48,000**	MD50-10-15761	**34,000**	MD50-10-24334	**44,000**	MD50-10-27151	9200	MD50-11-3973	12,000
50-603470	233	23,387	53,711	MD50-10-8813	**49,000**	MD50-10-15756	**53,000**	MD50-10-24330	**46,000**	MD50-10-27147	**50,000**	MD50-11-3972	2.1 (U)
50-603470	278	21,389	51,713	MD50-10-8808	**52,000**	MD50-10-15758	**61,000**	MD50-10-24335	**48,000**	MD50-10-27153	**55,000**	MD50-11-3974	**39,000**
50-603470	351	18,148	48,472	MD50-10-8814	10,000	MD50-10-15754	**29,000**	MD50-10-24331	**31,000**	MD50-10-27146	**37,000**	MD50-11-3979	32
50-603470	450	13,752	44,076	MD50-10-8816	11,000	MD50-10-15757	**47,000**	MD50-10-24336	**17,000**	MD50-10-27152	12,000	MD50-11-3978	120
50-603470	600	7092	37,416	MD50-10-8815	1200	MD50-10-15755	1400	MD50-10-24332	1800	MD50-10-27148	1700	MD50-11-3977	19
50-603470	650	4872	35,196	MD50-10-8812	14	MD50-10-15759	120 (U)	MD50-10-24337	94	MD50-10-27115	12	MD50-11-3976	13 (U)
50-603471	30	32,400	62,724	MD50-10-8826	18,000	—	—	—	—	MD50-10-27158	20,000	MD50-11-3983	5900
50-603471	90	29,736	60,060	MD50-10-8822	27,000	MD50-10-15769	17,000	MD50-10-24339	19,000	MD50-10-27155	28,000	MD50-11-3992	3700
50-603471	146	27,250	57,574	MD50-10-8823	**47,000**	MD50-10-15768	27,000	MD50-10-24344	**38,000**	MD50-10-27157	4300	MD50-11-3990	**46,000**

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603471	209	24,452	54,776	MD50-10-8825	**41,000**	MD50-10-15766	**44,000**	MD50-10-24340	**51,000**	MD50-10-27162	**48,000**	MD50-11-3988	11,000
50-603471	242	22,987	53,311	MD50-10-8819	**62,000**	MD50-10-15771	**50,000**	MD50-10-24345	**52,000**	MD50-10-27161	**72,000**	MD50-11-3989	12,000
50-603471	288	20,945	51,269	MD50-10-8821	**48,000**	MD50-10-15765	**58,000**	MD50-10-24341	**50,000**	MD50-10-27160	**70,000**	MD50-11-3987	**37,000**
50-603471	360	17,748	48,072	MD50-10-8827	45,000	MD50-10-15772	**43,000**	MD50-10-24343	**51,000**	MD50-10-27156	**34,000**	MD50-11-3986	**24,000**
50-603471	410	15,528	45,852	MD50-10-8824	36,000	MD50-10-15764	**40,000**	MD50-10-24342	**38,000**	MD50-10-27163	**34,000**	MD50-11-3984	**23,000**
50-603471	450	13,752	44,076	MD50-10-8820	30,000	MD50-10-15770	**42,000**	MD50-10-24346	**35,000**	MD50-10-27159	**23,000**	MD50-11-3985	**31,000**
50-603472	27	32,533	62,857	MD50-10-8834	4800	MD50-10-15779	4400	MD50-10-24354	4100	MD50-10-27165	3000	MD50-11-4002	3200
50-603472	93	29,603	59,927	MD50-10-8837	7400	MD50-10-15782	6000	MD50-10-24357	4600	MD50-10-27168	19	MD50-11-4000	2200
50-603472	93	29,603	59,927	MD50-10-8833	15,000	—	—	—	—	—	—	—	—
50-603472	146	27,250	57,574	MD50-10-8838	13,000	MD50-10-15780	7700	MD50-10-24352	9100	MD50-10-27170	29	MD50-11-4001	11,000
50-603472	210	24,408	54,732	MD50-10-8831	20,000	MD50-10-15783	15,000	MD50-10-24356	17,000	MD50-10-27172	110	MD50-11-3998	7100
50-603472	247	22,765	53,089	MD50-10-8835	12,000	MD50-10-15776	9400	MD50-10-24350	9500	MD50-10-27166	7100	MD50-11-3999	3700
50-603472	292	20,767	51,091	MD50-10-8840	**35,000**	MD50-10-15778	**39,000**	MD50-10-24353	**31,000**	MD50-10-27174	240	—	—
50-603472	364	17,570	47,894	MD50-10-8839	17,000	MD50-10-15777	**20,000**	MD50-10-24349	**19,000**	MD50-10-27169	910	MD50-11-3993	310
50-603472	414	15,350	45,674	MD50-10-8836	**17,000**	MD50-10-15781	**17,000**	MD50-10-24355	15,000	MD50-10-27167	20	MD50-11-3994	15,000
50-603472	450	13,752	44,076	MD50-10-8832	12,000	MD50-10-15784	**14,000**	MD50-10-24351	**14,000**	MD50-10-27173	56	MD50-11-3995	11,000
50-603503	25	32,622	62,946	MD50-10-8843	2800	MD50-10-15793	4200	MD50-10-24423	660	MD50-10-27243	1300	MD50-11-4071	1900
50-603503	80	30,180	60,504	MD50-10-8844	2000	MD50-10-15791	4300	MD50-10-24426	1900	MD50-10-27237	2000	MD50-11-4072	1900
50-603503	133	27,827	58,151	MD50-10-8845	990	MD50-10-15792	4200	MD50-10-24422	1500	MD50-10-27244	2300	MD50-11-4069	2600
50-603503	198	24,941	55,265	MD50-10-8846	1000	MD50-10-15788	4400	MD50-10-24425	4500	MD50-10-27238	2200	MD50-11-4073	5600
50-603503	237	23,209	53,533	MD50-10-8847	2000	MD50-10-15794	4600	MD50-10-24421	4700	MD50-10-27245	12,000	MD50-11-4070	6600
50-603503	278	21,389	51,713	MD50-10-8848	3200	MD50-10-15795	490	MD50-10-24427	5900	MD50-10-27239	5600	MD50-11-4067	4000
50-603503	347	18,325	48,649	MD50-10-8849	530	MD50-10-15790	2600	MD50-10-24424	1600	MD50-10-27241	1200	MD50-11-4066	1800
50-603503	397	16,105	46,429	MD50-10-8850	70	MD50-10-15796	5200	MD50-10-24428	1300	MD50-10-27240	1100	MD50-11-4068	2100
50-603503	450	13,752	44,076	MD50-10-8851	910	MD50-10-15789	1500	MD50-10-24429	3200	MD50-10-27242	2000	MD50-11-4065	2400
50-613182	500	11,532	41,856	—	—	—	—	—	—	—	—	—	—
50-613182	550	9312	39,636	—	—	—	—	—	—	—	—	MD50-11-3943	31
50-613182	600	7092	37,416	—	—	—	—	—	—	—	—	MD50-11-3942	2.2
50-613182	620	6204	36,528	—	—	—	—	—	—	—	—	MD50-11-3953	290
50-613182	632.5	5649	35,973	—	—	—	—	—	—	—	—	MD50-11-3941	23 (U)
50-613183	30	32,400	62,724	—	—	—	—	—	—	—	—	MD50-11-3947	14,000
50-613183	500	11,532	41,856	—	—	—	—	—	—	—	—	MD50-11-3948	**16,000 (J-)**
50-613183	550	9312	39,636	—	—	—	—	—	—	—	—	MD50-11-3949	6500
50-613183	600	7092	37,416	—	—	—	—	—	—	—	—	MD50-11-3950	1400
50-613183	630	5760	36,084	—	—	—	—	—	—	—	—	MD50-11-3951	1400
50-613183	642.5	5205	35,529	—	—	—	—	—	—	—	—	MD50-11-3952	58 (U)
50-613184	30	32,400	62,724	—	—	—	—	—	—	—	—	MD50-11-3959	2700 (J-)

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-613184	500	11,532	41,856	—	—	—	—	—	—	—	—	MD50-11-3956	3400
50-613184	550	9312	39,636	—	—	—	—	—	—	—	—	MD50-11-3958	2000 (J-)
50-613184	600	7092	37,416	—	—	—	—	—	—	—	—	MD50-11-3954	680 (J-)
50-613184	652	4783	35,107	—	—	—	—	—	—	—	—	MD50-11-3957	150 (J-)
50-613184	664.5	4228	34,552	—	—	—	—	—	—	—	—	MD50-11-3955	31 (J-)
50-613185	85	29,958	60,282	—	—	—	—	—	—	—	—	—	—
50-613185	145	27,294	57,618	—	—	—	—	—	—	—	—	MD50-11-3962	3500
50-613185	205	24,630	54,954	—	—	—	—	—	—	—	—	MD50-11-3963	2.1 (U)
50-613185	235	23,298	53,622	—	—	—	—	—	—	—	—	MD50-11-3964	9.1 (U)
50-613185	280	21,300	51,624	—	—	—	—	—	—	—	—	MD50-11-3965	27
50-613185	350	18,192	48,516	—	—	—	—	—	—	—	—	MD50-11-3966	29
50-613185	450	13,752	44,076	—	—	—	—	—	—	—	—	MD50-11-3967	930
50-613185	600	7092	37,416	—	—	—	—	—	—	—	—	MD50-11-3969	110
50-613185	675	3762	34,086	—	—	—	—	—	—	—	—	MD50-11-3968	2.1 (U)
50-613185	688	3185	33,509	—	—	—	—	—	—	—	—	MD50-11-3970	18

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		March–May 2011		August 2011		October–November 2011		March–April 2012	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-24784	25	32,622	62,946	MD50-11-6010	1100	—	—	MD50-12-936	1100	—	—
50-24784	96	29,470	59,794	MD50-11-6007	3200	—	—	MD50-12-935	3300	—	—
50-24784	155	26,850	57,174	MD50-11-6011	2300	—	—	MD50-12-934	4400	MD50-12-12060	3598
50-24784	215	24,186	54,510	MD50-11-6005	3600	—	—	MD50-12-933	320	—	—
50-24784	244	22,898	53,222	MD50-11-6009	630	—	—	MD50-12-932	5000	MD50-12-12061	4082
50-24784	289	20,900	51,224	MD50-11-6006	5000	—	—	MD50-12-931	5500	—	—
50-24784	362	17,659	47,983	MD50-11-6008	510	—	—	MD50-12-930	3600	MD50-12-12062	2632
50-24784	411	15,484	45,808	MD50-11-6004	1400	—	—	MD50-12-929	1900	—	—
50-24784	450	13,752	44,076	MD50-11-6003	1200	—	—	MD50-12-928	1100	MD50-12-12063	1020
50-24813	25	32,622	62,946	MD50-11-6022	**93,000**	—	—	MD50-12-946	19,000	MD50-12-12067	13,960
50-24813	99	29,336	59,660	MD50-11-6021	**93,000**	—	—	MD50-12-945	**52,000**	—	—
50-24813	150	27,072	57,396	MD50-11-6019	**48,000**	—	—	MD50-12-944	**68,000**	MD50-12-12066	**42,430**
50-24813	207	24,541	54,865	MD50-11-6020	**39,000**	—	—	MD50-12-943	**130,000**	—	—
50-24813	241	23,032	53,356	MD50-11-6018	15,000	—	—	MD50-12-942	**120,000**	MD50-12-12065	**85,930**
50-24813	286	21,034	51,358	MD50-11-6017	**79,000**	—	—	MD50-12-941	**110,000**	—	—
50-24813	358	17,837	48,161	MD50-11-6013	**52,000**	MD50-11-23296	**32,000**	MD50-12-940	**70,000**	MD50-12-12064	**53,700**
50-24813	408	15,617	45,941	MD50-11-6015	**36,000**	MD50-11-23297	**31,000**	MD50-12-939	**50,000**	—	—
50-24813	450	13,752	44,076	MD50-11-6016	**16,000**	MD50-11-23298	3800	MD50-12-938	**27,000**	MD50-12-12068	**24,700**
50-24813	600	7092	37,416	MD50-11-6014	3100	MD50-11-23299	2100	MD50-12-937	3600	MD50-12-12069	2632
50-24822	25	32,622	62,946	MD50-11-6062	1500	—	—	MD50-12-947	8900	MD50-12-12074	8056
50-24822	81	30,136	60,460	MD50-11-6059	2400	—	—	MD50-12-948	9900	—	—
50-24822	142	27,427	57,751	MD50-11-6061	1100	—	—	MD50-12-949	**28,000**	MD50-12-12073	25,240
50-24822	204	24,674	54,998	MD50-11-6058	**33,000**	—	—	MD50-12-951	**36,000**	—	—
50-24822	235	23,298	53,622	MD50-11-6060	6900	—	—	MD50-12-952	**50,000**	MD50-12-12072	**40,820**
50-24822	280	21,300	51,624	MD50-11-6055	**28,000**	—	—	MD50-12-950	**42,000**	—	—
50-24822	351	18,148	48,472	MD50-11-6056	18,000	—	—	MD50-12-953	**26,000**	MD50-12-12071	**22,020**
50-24822	402	15,883	46,207	MD50-11-6063	2.1 (U)	—	—	MD50-12-954	6900	—	—
50-24822	450	13,752	44,076	MD50-11-6057	4300	—	—	MD50-12-955	13,000	MD50-12-12070	10,740
50-603061	25	32,622	62,946	MD50-11-6083	390	—	—	—	—	MD50-12-12079	526.3
50-603061	76	30,358	60,682	MD50-11-6080	5.1	—	—	—	—	—	—
50-603061	128	28,049	58,373	MD50-11-6079	580	—	—	—	—	MD50-12-12078	2793
50-603061	190	25,296	55,620	MD50-11-6078	38	—	—	—	—	—	—
50-603061	228	23,609	53,933	MD50-11-6081	3600	—	—	—	—	MD50-12-12077	590.8
50-603061	274	21,566	51,890	MD50-11-6077	1600	—	—	—	—	—	—
50-603061	347	18,325	48,649	MD50-11-6082	2100	—	—	—	—	MD50-12-12076	1343
50-603061	397	16,105	46,429	MD50-11-6076	760	—	—	—	—	—	—

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		March–May 2011		August 2011		October–November 2011		March–April 2012	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603061	450	13,752	44,076	MD50-11-6075	650	—	—	—	—	MD50-12-12075	483.3
50-603062	25	32,622	62,946	MD50-11-6088	1500	—	—	—	—	—	—
50-603062	64	30,890	61,214	MD50-11-6085	2400	—	—	—	—	—	—
50-603062	122	28,315	58,639	MD50-11-6087	5700	—	—	—	—	MD50-12-12087	6445
50-603062	184	25,562	55,886	MD50-11-6092	85 (U)	—	—	—	—	—	—
50-603062	217	24,097	54,421	MD50-11-6086	5800	—	—	—	—	MD50-12-12086	8056
50-603062	263	22,055	52,379	MD50-11-6090	4700	—	—	—	—	—	—
50-603062	337	18,769	49,093	MD50-11-6094	2000	—	—	—	—	MD50-12-12085	2041
50-603062	387	16,549	46,873	MD50-11-6091	1000	—	—	—	—	—	—
50-603062	450	13,752	44,076	MD50-11-6089	580	—	—	—	—	MD50-12-12084	590.8
50-603063	25	32,622	62,946	MD50-11-6102	6300	—	—	—	—	MD50-12-12088	1611
50-603063	76	30,358	60,682	MD50-11-6100	7400	—	—	—	—	—	—
50-603063	128	28,049	58,373	MD50-11-6099	11,000	—	—	—	—	MD50-12-12089	10,740
50-603063	190	25,296	55,620	MD50-11-6097	220	—	—	—	—	—	—
50-603063	228	23,609	53,933	MD50-11-6098	9700	—	—	—	—	MD50-12-12090	**25,240**
50-603063	274	21,566	51,890	MD50-11-6103	14,000	—	—	—	—	—	—
50-603063	347	18,325	48,649	MD50-11-6095	7500	—	—	—	—	MD50-12-12091	12,890
50-603063	397	16,105	46,429	MD50-11-6101	5800	—	—	—	—	—	—
50-603063	450	13,752	44,076	MD50-11-6096	7900	—	—	—	—	MD50-12-12092	8593
50-603064	25	32,622	62,946	MD50-11-6108	2600	—	—	MD50-12-956	4100	—	—
50-603064	66	30,802	61,126	MD50-11-6107	7000	—	—	MD50-12-957	8400	—	—
50-603064	113	28,715	59,039	MD50-11-6105	**32,000**	—	—	MD50-12-958	**29,000**	MD50-12-12096	24,700
50-603064	176	25,918	56,242	MD50-11-6110	**39,000**	—	—	MD50-12-959	**53,000**	—	—
50-603064	214	24,230	54,554	MD50-11-6111	**37,000**	—	—	MD50-12-960	**34,000**	MD50-12-12095	**34,900**
50-603064	259	22,232	52,556	MD50-11-6112	**30,000**	—	—	MD50-12-961	**35,000**	—	—
50-603064	332	18,991	49,315	MD50-11-6113	7200	—	—	MD50-12-962	16,000	MD50-12-12094	12,900
50-603064	482	15,972	46,296	MD50-11-6109	6500	—	—	MD50-12-963	9000	—	—
50-603064	500	11,532	41,856	MD50-11-6106	600	—	—	MD50-12-964	1500	MD50-12-12093	1400
50-603383	26	32,578	62,902	MD50-11-6027	2400	MD50-11-23287	1100	MD50-12-982	1800	MD50-12-12101	698
50-603383	85	29,958	60,282	MD50-11-6025	2800	MD50-11-23288	2700	MD50-12-978	3100	—	—
50-603383	139	27,560	57,884	MD50-11-6024	1100	MD50-11-23289	3700	MD50-12-979	4900	MD50-12-12097	4990
50-603383	206	24,586	54,910	MD50-11-6032	2.1 (U)	MD50-11-23290	3100	MD50-12-980	8700	—	—
50-603383	244	22,898	53,222	MD50-11-6026	6400	MD50-11-23291	4800	MD50-12-981	9300	MD50-12-12098	5370
50-603383	286	21,034	51,358	MD50-11-6029	1300	MD50-11-23292	4600	MD50-12-977	5100	—	—
50-603383	359	17,792	48,116	MD50-11-6028	1500	MD50-11-23295	91	MD50-12-976	55	MD50-12-12099	1400
50-603383	408	15,617	45,941	MD50-11-6030	1600	MD50-11-23294	140	MD50-12-975	1300	—	—
50-603383	450	13,752	44,076	MD50-11-6031	2700	MD50-11-23293	1200	MD50-12-974	1500	MD50-12-12100	1340

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		March–May 2011		August 2011		October–November 2011		March–April 2012	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603467	26	32,578	62,902	MD50-11-6041	6300	—	—	—	—	—	—
50-603467	91	29,692	60,016	MD50-11-6043	12,000	—	—	—	—	—	—
50-603467	143	27,383	57,707	MD50-11-6038	16,000	—	—	—	—	MD50-12-12106	15,040
50-603467	206	24,586	54,910	MD50-11-6042	**25,000**	—	—	—	—	—	—
50-603467	244	22,898	53,222	MD50-11-6037	**29,000**	—	—	—	—	MD50-12-12102	**25,240**
50-603467	287	20,989	51,313	MD50-11-6039	**21,000**	—	—	—	—	—	—
50-603467	360	17,748	48,072	MD50-11-6040	11,000	—	—	—	—	MD50-12-12103	**30,610**
50-603467	409	15,572	45,896	MD50-11-6036	11,000	—	—	—	—	—	—
50-603467	500	11,532	41,856	MD50-11-6035	3300	—	—	—	—	MD50-12-12104	6982
50-603467	600	7092	37,416	MD50-11-6034	4300	—	—	—	—	MD50-12-12105	3383
50-603468	92	29,647	59,971	MD50-11-6051	5300	—	—	MD49-12-967	12,000	—	—
50-603468	142	27,427	57,751	MD50-11-6050	12,000	—	—	MD49-12-965	**37,000**	MD50-12-12108	10,200
50-603468	198	24,941	55,265	MD50-11-6052	24,000	—	—	MD49-12-966	**35,000**	—	—
50-603468	233	23,387	53,711	MD50-11-6049	**26,000**	—	—	MD49-12-971	**37,000**	MD50-12-12109	**29,000**
50-603468	282	21,211	51,535	MD50-11-6047	**29,000**	—	—	MD49-12-969	**55,000**	—	—
50-603468	354	18,014	48,338	MD50-11-6046	**34,000**	MD50-11-23278	900	MD49-12-970	**43,000**	MD50-12-12110	**32,760**
50-603468	403	15,839	46,163	MD50-11-6045	**20,000**	MD50-11-23279	3700	MD49-12-972	**39,000**	MD50-12-12107	**27,930**
50-603468	450	13,752	44,076	MD50-11-6048	10,000	MD50-11-23280	**21,000**	MD49-12-973	**23,000**	—	—
50-603470	30	32,400	62,724	MD50-11-5978	13,000	—	—	MD50-12-983	17,000	—	—
50-603470	83	30,047	60,371	MD50-11-5980	13,000	—	—	MD50-12-984	26,000	MD50-12-12114	15,570
50-603470	143	27,383	57,707	MD50-11-5982	**34,000**	—	—	MD50-12-985	**40,000**	—	—
50-603470	203	24,719	55,043	MD50-11-5977	**55,000**	—	—	MD50-12-986	**59,000**	MD50-12-12120	**40,820**
50-603470	233	23,387	53,711	MD50-11-5976	**32,000**	—	—	MD50-12-987	**83,000**	—	—
50-603470	278	21,389	51,713	MD50-11-5979	**58,000**	—	—	MD50-12-988	**80,000**	MD50-12-12119	**64,450**
50-603470	351	18,148	48,472	MD50-11-5973	**25,000**	MD50-11-23311	**42,000**	MD50-12-989	**57,000**	MD50-12-12118	**40,280**
50-603470	450	13,752	44,076	MD50-11-5972	**16,000**	MD50-11-23312	**18,000**	MD50-12-990	**27,000**	MD50-12-12115	**17,190**
50-603470	600	7092	37,416	MD50-11-5975	1800	MD50-11-23313	1800	MD50-12-991	1700	MD50-12-12116	1719
50-603470	650	4872	35,196	MD50-11-5974	35	MD50-11-23314	120	MD50-12-992	190	MD50-12-12117	80.56
50-603471	90	29,736	60,060	MD50-11-5990	20,000	—	—	MD50-12-1000	**34,000**	MD50-12-12124	19,870
50-603471	146	27,250	57,574	MD50-11-5989	**63,000**	—	—	MD50-12-999	**68,000**	—	—
50-603471	209	24,452	54,776	MD50-11-5988	1800	—	—	MD50-12-998	**69,000**	MD50-12-12125	**53,700**
50-603471	242	22,987	53,311	MD50-11-5987	890	—	—	MD50-12-997	**100,000**	—	—
50-603471	288	20,945	51,269	—	—	—	—	MD50-12-996	**73,000**	MD50-12-12122	**69,820**
50-603471	360	17,748	48,072	MD50-11-5986	15,000	MD50-11-23308	**57,000**	—	—	MD50-12-12123	**53,170**
50-603471	410	15,528	45,852	MD50-11-5983	**21,000**	MD50-11-23310	**44,000**	MD50-12-994	**59,000**	—	—
50-603471	450	13,752	44,076	MD50-11-5985	**31,000**	MD50-11-23309	**26,000**	MD50-12-993	**50,000**	MD50-12-12121	**39,740**
50-603472	27	32,533	62,857	MD50-11-6000	3200	—	—	MD50-12-1010	2300	MD50-12-12128	3330

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		March–May 2011		August 2011		October–November 2011		March–April 2012	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603472	93	29,603	59,927	MD50-11-5998	3800	—	—	MD50-12-1007	9700	—	—
50-603472	146	27,250	57,574	MD50-11-6001	6900	—	—	MD50-12-1008	7600	MD50-12-12129	17,190
50-603472	210	24,408	54,732	MD50-11-5997	14,000	—	—	MD50-12-1006	6200	—	—
50-603472	247	22,765	53,089	MD50-11-5999	10,000	—	—	MD50-12-1009	**41,000**	—	—
50-603472	292	20,767	51,091	MD50-11-5995	18,000	—	—	MD50-12-1005	**21,000**	MD50-12-12132	**28,460**
50-603472	364	17,570	47,894	MD50-11-5994	10,000	MD50-11-23307	10,000	MD50-12-1004	17,000	MD50-12-12131	15,570
50-603472	414	15,350	45,674	MD50-11-5993	12,000	MD50-11-23306	**21,000**	MD50-12-1003	**27,000**	—	—
50-603472	450	13,752	44,076	MD50-11-5996	**14,000**	MD50-11-23305	5900	MD50-12-1002	**17,000**	MD50-12-12130	12,890
50-603503	25	32,622	62,946	MD50-11-6072	1300	—	—	—	—	—	—
50-603503	80	30,180	60,504	MD50-11-5992	2300	—	—	—	—	—	—
50-603503	133	27,827	58,151	MD50-11-6073	2500	—	—	—	—	MD50-12-12136	435
50-603503	198	24,941	55,265	MD50-11-6069	3400	—	—	—	—	—	—
50-603503	237	23,209	53,533	MD50-11-6068	5700	—	—	—	—	MD50-12-12135	5370
50-603503	278	21,389	51,713	MD50-11-6070	6300	—	—	—	—	—	—
50-603503	347	18,325	48,649	MD50-11-6065	1800	—	—	—	—	MD50-12-12137	2632
50-603503	397	16,105	46,429	MD50-11-6066	1600	—	—	—	—	—	—
50-603503	450	13,752	44,076	MD50-11-6067	3400	—	—	—	—	MD50-12-12138	3115
50-613182	500	11,532	41,856	MD50-11-5933	4500	MD50-11-23273	6100	MD50-12-1015	8800	—	—
50-613182	550	9312	39,636	MD50-11-5934	3600	MD50-11-23276	4700	MD50-12-1014	4100	MD50-12-12133	3491
50-613182	600	7092	37,416	MD50-11-5936	5.2	MD50-11-23275	110	MD50-12-1013	48	—	—
50-613182	620	6204	36,528	MD50-11-5937	2.1 (U)	MD50-11-23274	1200	MD50-12-1012	1500	—	—
50-613182	632.5	5649	35,973	MD50-11-5935	4.6	MD50-11-23277	2.1 (U)	MD50-12-1011	4.9	MD50-12-12134	6.98
50-613183	30	32,400	62,724	MD50-11-5942	11,000	—	—	MD50-12-1020	13,000	—	—
50-613183	500	11,532	41,856	MD50-11-5939	1500	MD50-11-23282	**19,000**	MD50-12-1021	**20,000**	—	—
50-613183	550	9312	39,636	MD50-11-5943	**15,000**	MD50-11-23283	2600	MD50-12-1022	4500	MD50-12-12127	3813
50-613183	600	7092	37,416	MD50-11-5941	7000	MD50-11-23284	**8300**	MD50-12-1017	**10,000**	—	—
50-613183	630	5760	36,084	MD50-11-5944	**7500**	MD50-11-23285	2800	MD50-12-1018	3200	—	—
50-613183	642.5	5205	35,529	MD50-11-5940	39	MD50-11-23286	93	MD50-12-1019	94	MD50-12-12126	96.67
50-613184	30	32,400	62,724	MD50-11-5948	2100	—	—	MD50-12-1023	6200	—	—
50-613184	500	11,532	41,856	MD50-11-5951	3000	MD50-11-23300	720	MD50-12-1024	4900	MD50-12-12113	4296
50-613184	550	9312	39,636	MD50-11-5946	1800	MD50-11-23302	220	MD50-12-1025	2200	—	—
50-613184	600	7092	37,416	MD50-11-5947	580	MD50-11-23301	1100	MD50-12-1026	880	MD50-12-12112	698.2
50-613184	652	4783	35,107	MD50-11-5950	160	MD50-11-23303	17	MD50-12-1027	320	—	—
50-613184	664.5	4228	34,552	MD50-11-5949	61	MD50-11-23304	33	MD50-12-1028	120	MD50-12-12111	102
50-613185	85	29,958	60,282	MD50-11-5960	460	—	—	MD50-12-1038	4100	—	—
50-613185	145	27,294	57,618	MD50-11-5961	3700	—	—	MD50-12-1035	5600	MD50-12-12143	5317
50-613185	205	24,630	54,954	MD50-11-5957	2900	—	—	MD50-12-1036	9600	—	—

Table 3.2-12 (continued)

Location ID	Depth (ft bgs)	Tier II Screening Level		March–May 2011		August 2011		October–November 2011		March–April 2012	
		Fracture Flow	Porous Media Flow	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-613185	235	23,298	53,622	MD50-11-5962	7100	—	—	MD50-12-1037	10,000	MD50-12-12139	8593
50-613185	280	21,300	51,624	MD50-11-5959	4500	—	—	MD50-12-1034	15,000	—	—
50-613185	350	18,192	48,516	MD50-11-5955	3100	MD50-11-23268	3900	MD50-12-1033	4500	MD50-12-12140	4243
50-613185	450	13,752	44,076	MD50-11-5954	1400	MD50-11-23269	1300	MD50-12-1032	52	MD50-12-12141	1719
50-613185	600	7092	37,416	MD50-11-5953	120	MD50-11-23271	110	MD50-12-1031	140	MD50-12-12142	145
50-613185	675	3762	34,086	MD50-11-5958	26	MD50-11-23270	37	MD50-12-1030	42	—	—
50-613185	688	3185	33,509	MD50-11-5956	16	MD50-11-23272	10	MD50-12-1029	38	—	—

Note: Units are µg/m^3. Data qualifiers are defined in Appendix A. Bold indicates result exceeds Tier II screening level for fracture flow. Shading indicates value exceeds Tier II screening level for porous media flow.

* — = Not sampled.

Table 3.2-13
Organic Chemicals Detected in Samples from MDA C Groundwater Monitoring Wells during 2010 and 2011

Sample ID	Sample Date	Acetone	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Bis(2-ethylhexyl)phthalate	Diethylphthalate	Nitrotoluene[4-]	Toluene
R-46										
CAMO-10-9358	2/5/2010	6.24 (J)	—[a]	—	—	—	35.4	—	—	3.24
CAMO-10-16830	5/7/2010	—	NA[b]	NA	NA	NA	NA	NA	NA	1.38
CAMO-10-22890	7/1/2010	—	—	—	—	—	13.6	—	—	1.17
CAMO-11-1285	11/12/2010	—	NA	NA	NA	NA	NA	NA	NA	0.38 (J)
CAMO-11-4623	2/17/2011	—	NA	NA	NA	NA	NA	NA	NA	—
CAMO-11-10733	5/17/2011	—	NA	NA	NA	NA	NA	NA	NA	—
CAMO-11-24656	8/3/2011	—	NA	NA	NA	NA	NA	NA	NA	—
CAMO-12-1530	11/8/2011	—	—	—	—	—	7.48 (J)	—	NA	—
R-60										
CAPA-11-2810	12/16/2010	68.5 (J)	0.851 (J)	0.839 (J)	0.391 (J)	0.379 (J)	—	—	—	—
CAPA-11-3055	1/24/2011	—	—	—	—	—	—	—	0.327 (J)	—
CAPA-11-9591	4/27/2011	14.1 (J)	—	—	—	—	—	—	—	—
CAPA-11-23020	7/26/2011	—	—	—	—	—	—	22.7	—	—
CAMO-12-1522	11/22/2011	—	—	—	—	—	—	—	—	—

Note: Units are µg/L. Data qualifiers are defined in Appendix A.

[a] — = Not detected.

[b] NA = Not analyzed.

Table 7.0-1
Summary of Potential Remedial Action Technologies

Area	No Action	Containment Technologies	In Situ Treatment	Excavation	Ex Situ Treatment
Pits and Shafts Exposure pathways of concern include • direct exposure to waste via erosion, biointrusion, waste subsidence, or excavation • exposure to contaminated surface and/or subsurface soils via excavation or biointrusion • creation of contaminated leachate from infiltration of water into the waste • volatilization of VOCs from waste or contaminated subsurface soils with vapor transport through pore gas to groundwate	Alternative 1 No action	Alternative 2 – Soil barrier Alternative 3A – Multilayer cover Alternative 3B – ET cover	n/a*	Alternative 4 – Excavation of pits and shafts with off-site disposal	Alternative 4 – Elementary neutralization of corrosive liquids
Vadose Zone Exposure pathway includes • volatilization of VOCs from waste or volatilization/vapor diffusion from contaminated subsurface soils with vapor transport through pore gas to groundwate	Alternative 1 No action	n/a	Alternative 2 – Natural attenuation of SVE plume Alternative 3A – Plume area SVE Alternative 3B – Plume area SVE Alternative 4 – Plume area SVE	n/a	n/a

Note: Groundwater and vapor monitoring and institutional controls will be implemented in conjunction with all technologies other than the no-action technology.
* n/a = Not applicable.

Table 7.2-1
Screening of Alternatives against the Threshold-Screening Criteria

Alternative	Description	Threshold-Screening Criteria			
		Protective of HH&E*	Attains Media Cleanup Standards	Controls Source and Releases	Complies with Waste Management Standards
Alternative 1 No action	This technology includes no groundwater or vapor monitoring, no maintenance, and no institutional controls.	**No** Potential remains for exposure through erosion, direct contact, and biointrusion.	**No** Does not comply with the EPA guidance for attaining media cleanup standards when waste is left in place.	**No** No source removal or control. No monitoring of VOC releases.	**Yes** No waste will be generated.
Alternative 2 Soil barrier, natural attenuation, and institutional controls	• Existing soil cover will be maintained and repaired as needed. • Groundwater and vapor monitoring will be conducted for 100 yr. • Institutional controls will be implemented for 100 yr.	**Yes** Existing soil cover provides protection against erosion, direct contact, and moisture infiltration. Monitoring and institutional controls will provide protection for biointrusion and vapor migration. Current conditions pose no unacceptable risk and will be maintained.	**Yes** Complies with the EPA guidance for attaining media cleanup standards when waste is left in place. Media cleanup standards are not currently exceeded.	**Yes** Existing soil cover controls moisture infiltration and provides protection from exposure to waste and soils. Natural attenuation and properties of stratigraphic units control vapor migration to groundwater.	**Yes** No waste will be generated.

Table 7.2-1 (continued)

Alternative	Description	Threshold-Screening Criteria			
		Protective of HH&E*	Attains Media Cleanup Standards	Controls Source and Releases	Complies with Waste Management Standards
Alternative 3A Multilayer cover, SVE, and institutional controls	• A multilayer cover will be constructed over the pits and shafts. • An SVE system will be installed and operated to remove VOC vapors from the vadose zone. • Groundwater and vapor monitoring will be conducted for 100 yr. • Institutional controls will be implemented for 100 yr.	**Yes** The multilayer cover provides protection against erosion, direct contact, biointrusion, and moisture infiltration. SVE prevents potential future migration of vapors to groundwater. Institutional controls restrict site access.	**Yes** Complies with the EPA guidance for attaining media cleanup standards when waste is left in place. SVE will ensure media cleanup standards are not exceeded in the future.	**Yes** The cover will minimize/ eliminate moisture infiltration. The cover will provide protection from exposure to waste and soils and reduce erosion. SVE will remove potential source of groundwater contamination.	**Yes** Any waste generated under this technology will comply with all applicable regulatory requirements.
Alternative 3B ET cover, SVE, and institutional controls	• An ET cover will be constructed over the pit/shafts/impoundments. • An SVE system will be installed and operated to remove VOC vapors from the vadose zone. • Groundwater and vapor monitoring will be conducted for 100 yr. • Institutional controls will be implemented for 100 yr.	**Yes** The ET cover provides protection against erosion, direct contact, biointrusion, and moisture infiltration. SVE prevents potential future migration of vapors to groundwater. Institutional controls restrict site access.	**Yes** Complies with the EPA guidance for attaining media cleanup standards when waste is left in place. SVE will ensure media cleanup standards are not exceeded in the future.	**Yes** The cover will minimize/eliminate moisture infiltration. The cover will provide protection from exposure to waste, soils, and reduce erosion. SVE will remove potential source of groundwater contamination.	**Yes** Any waste generated under this technology will comply with all applicable regulatory requirements.

Table 7.2-1 (continued)

Alternative	Description	Threshold-Screening Criteria			
		Protective of HH&E*	Attains Media Cleanup Standards	Controls Source and Releases	Complies with Waste Management Standards
Alternative 4 Waste excavation, SVE, and institutional controls	• Waste from the pits and shafts will be excavated and sent off-site for treatment and/or disposal. • The excavated areas will be backfilled with clean fill material. Some treated waste may be returned to the unit if it meets the media cleanup standards. • An SVE system will be installed and operated to remove VOC vapors from the vadose zone. • Institutional controls will be implemented for 100 yr.	**Yes** Removal of the waste will be protective of HH&E by eliminating the source.	**Yes** The pits and shafts will be excavated. SVE will ensure media cleanup standards are not exceeded in the future.	**Yes** Excavation will remove the source material and prevent future releases. SVE will remove potential source of groundwater contamination.	**Yes** Any waste generated under this technology will comply with all applicable regulatory requirements. This includes complying with WAC for off-site disposal of excavated wastes.

*Human health and the environment.

Table 8.2-1
Cost Estimate for Alternative 2

	Item Description	Labor Cost	Material Cost	Equipment Cost	Subcontractor Cost	Other Costs	Gross Cost
Alternative 2 – Soil Barrier, Natural Attenuation, and Institutional Controls							
Direct Costs	**O&M**						
	Maintenance and Inspections (100 yr)	$316,365					$316,365
	Annual Reporting (100 yr)	$446,988					$446,988
	O&M Total						**$763,353**
Indirect Costs	**Indirect O&M**						
	Project Management	$29,436					$29,436
	Construction Management	$35,323					$35,323
	Indirect O&M Total						**$64,759**
	Management Reserve						
	Management Reserve					$421,504	**$421,504**
	Total Costs 2 – Soil Barrier, Natural Attenuation and Institutional Controls						**$1,249,616**

Notes: Labor costs are RS Mean's determination of the proper craft mix and productivity rate to complete the specific task in the detailed cost estimate in Appendix I. Costs included in the above table are burdened, including New Mexico gross receipts tax, general and administrative, infrastructure, and Associate Directorate support taxes. Management reserve costs are calculated at 50.9% of all other costs.

Table 8.2-2
Cost Estimate for Alternative 3A

	Item Description	Labor Cost	Material Cost	Equipment Cost	Subcontractor Cost	Other Costs	Gross Cost
Alternative 3A – Multilayer (RCRA) Cover, SVE, Institutional Controls							
Direct Costs	**Multilayer Cover**						
	Site Prep	$196,309	$245,833	$95,200			$537,342
	Cover Prep	$392,363	$3,677,347	$404,512			$4,474,222
	Retaining Wall	$691,464	$443,980	$59,272		$5,999	$1,200,715
	Compacted Clay (2 ft)	$703,936	$2,596,545	$1,189,453			$4,489,934
	Geomembrane (40-mil HDPE)	$135,367	$578,152	$52,605			$766,124
	Drainage Layer (1 ft)	$113,313	$636,172	$116,592			$866,077
	Cover Soil/Surface Treatment (2 ft)	$319,808	$1,304,801	$369,826			$1,994,435
	Cover Armoring	$45,583	$18,806	$1,378			$65,767
	Vegetation	$112,661	$24,142	$24,142			$160,945
	TDR Moisture Monitor	$4,728	$54,867				$59,595
	RCRA Cover Total						**$14,615,156**
	SVE and Monitoring						
	SVE Unit				$137,534		$137,534
	SVE Extraction Wells – Qbt	$100,486	$7,515	$3,345			$111,346
	SVE Extraction Wells – Qct	$100,882	$9,888	$3,348			$114,118
	SVE Monitoring Wells				$2,768,244		$2,768,244
	SVE Total						**$3,131,242**
	Craft Distributables						
	Craft Distributables	$699,691	$105,717				**$805,408**
	O&M						
	SVE Operation (1 yr)	$51,426	$64,386	$14,285			$130,097
	Vapor Monitoring (15 mo)	$14,506			$48,999		$63,505
	Maintenance and Inspections (100 yr)	$316,365					$316,365

Table 8.2-2 (continued)

	Item Description	Labor Cost	Material Cost	Equipment Cost	Subcontractor Cost	Other Costs	Gross Cost
	Annual Reporting (100 yr)	$446,988					$446,988
	O&M Total						**$956,955**
Indirect Costs	**Indirect Capital Costs**						
	Design				$1,385,708		$1,385,708
	Project Management	$2,093,134					$2,093,134
	Construction Management	$2,113,205					$2,113,205
	Indirect Total						**$5,592,047**
	Indirect O&M						
	Project Management	$29,436					$29,436
	Construction Management	$35,323					$35,323
	Indirect O&M Total						**$64,759**
	Management Reserve						
	Management Reserve					$12,800,661	**$12,800,661**
	Total Costs 3A – Multilayer (RCRA) Cover, SVE, Institutional Controls						**$37,966,228**

Notes: Labor costs are RS Mean's determination of the proper craft mix and productivity rate to complete the specific task in the detailed cost estimate in Appendix I. Material costs are products necessary to complete the specific tasks in the detailed cost estimate in Appendix I. Equipment costs are the mechanized and/or hand tools needed to complete the specific tasks in the detailed cost estimate in Appendix I. Subcontract costs are a lump-sum costs, usually based on past history, to complete the specific tasks in the detailed cost estimate in Appendix I. This includes material, labor, and equipment to perform the task. Craft distributables include a $7 per direct job hour cost to account for the nonlabor costs associated with temporary utilities/services, small tools, consumables, construction equipment not specifically identified in direct work line items, and training costs. Costs included in the above table are burdened, including New Mexico gross receipts tax, general and administrative, infrastructure, and Associate Directorate support taxes. Contingency costs are calculated at 50.9% of all other costs.

Table 8.2-3
Cost Estimate for Alternative 3B

	Item Description	Labor Cost	Material Cost	Equipment Cost	Subcontractor Cost	Other Costs	Gross Cost
Alternative 3B – ET Cover, SVE, Institutional Controls							
Direct Costs	**ET Cover**						
	Site Prep	$196,309	$245,833	$95,200			$537,342
	Cover Prep	$392,363	$3,677,347	$404,512			$4,474,222
	Retaining Wall	$760,029	$488,522	$63,009		$5,999	$1,317,559
	Biobarrier (1 ft)	$24,124	$718,631	$52,710			$795,465
	Filter Layer (0.5 ft)	$6,880	$96,080	$9,610			$112,570
	Soil Layer (3.5 ft)	$179,979	$3,772,729	$378,975			$4,331,683
	Cover Soil/Surface Treatment (1.5 ft)	$301,172	$1,256,763	$342,498			$1,900,433
	Cover Armoring	$73,680	$30,354	$2,228			$106,262
	Vegetation	$112,661	$24,142	$24,142			$160,945
	TDR Moisture Monitor	$4,728	$54,867				$59,595
	ET Cover Total						**$13,796,076**
	SVE and Monitoring						
	SVE Unit				$137,534		$137,534
	SVE Extraction Wells – Qbt	$100,486	$7,515	$3,345			$111,346
	SVE Extraction Wells – Qct	$100,882	$9,888	$3,348			$114,118
	SVE Monitoring Wells				$2,768,244		$2,768,244
	SVE Total						**$3,131,242**
	Craft Distributables						
	Craft Distributables	$554,425	$83,769				**$638,194**
	O&M						
	SVE Operation (1 yr)	$51,425	$64,386	$14,285			$130,096
	Vapor Monitoring (15 mo)	$14,506			$48,999		$63,505
	Maintenance and Inspections (100 yr)	$316,365					$316,365

Table 8.2-3 (continued)

	Item Description	Labor Cost	Material Cost	Equipment Cost	Subcontractor Cost	Other Costs	Gross Cost
	Annual Reporting (100 yr)	$446,988					$446,988
	O&M Total						**$956,954**
Indirect Costs	**Indirect Capital Costs**						
	Design				$1,312,038		$1,312,038
	Project Management	$1,981,853					$1,981,853
	Construction Management	$2,000,858					$2,000,858
	Indirect Total						**$5,294,749**
	Indirect O&M						
	Project Management	$29,436					$29,436
	Construction Management	$35,323					$35,323
	Indirect O&M Total						**$64,759**
	Management Reserve						
	Management Reserve					$12,140,465	**$12,140,465**
	Total Costs 3B – ET Cover, SVE, Institutional Controls						**$36,022,439**

Notes: Labor costs are RS Mean's determination of the proper craft mix and productivity rate to complete the specific task in the detailed cost estimate in Appendix I. Material costs are products necessary to complete the specific tasks in the detailed cost estimate in Appendix I. Equipment costs are the mechanized and/or hand tools needed to complete the specific tasks in the detailed cost estimate in Appendix I. Subcontract costs are a lump-sum costs, usually based on past history, to complete the specific tasks in the detailed cost estimate in Appendix I. This includes material, labor, and equipment to perform the task. Craft distributables include a $7 per direct job hour cost to account for the nonlabor costs associated with temporary utilities/services, small tools, consumables, construction equipment not specifically identified in direct work line items, and training costs. Costs included in the above table are burdened, including New Mexico gross receipts tax, general and administrative, infrastructure, and Associate Directorate support taxes. Management reserve costs are calculated at 50.8% of all other costs.

Table 8.2-4
Cost Estimate for Alternative 4

	Item Description	Labor Cost	Material Cost	Equipment Cost	Subcontractor Cost	Other Costs	Gross Cost
Alternative 4 – Excavation, SVE, Institutional Controls							
Direct Costs	**Excavation**						
	Site Prep	$4,519,161	$7,314,720	$2,611,128			$14,445,009
	Site Excavation	$3,059,022	$2,480,007	$2,075,396			$7,614,425
	Site backfill	$2,633,052	$6,966,520	$2,868,520			$12,467,938
	Disposal of Waste	$54,393,464		$1,530	$311,503,744		$365,898,738
	Confirmatory Sampling	$69,200		$263	$2,554,907		$2,624,370
	Equipment Decontamination	$364,402	$2,765,318				$3,129,720
	Vegetation	$112,661	$24,142	$24,142			$160,945
	Excavation Total						**$406,341,145**
	SVE and Monitoring						
	SVE Unit				$137,534		$137,534
	SVE Extraction Wells – Qbt	$100,486	$7,515	$3,345			$111,346
	SVE Extraction Wells – Qct	$100,882	$9,888	$3,348			$114,118
	SVE Monitoring Wells				$2,768,244		$2,768,244
	SVE Total						**$3,131,242**
	Craft Distributables						
	Craft Distributables	$3,389,319	$855,200				**$4,244,519**
	O&M						
	SVE Operation (1 yr)	$51,425	$64,386	$14,285			$130,096
	Vapor Monitoring (15 mo)	$14,506	$48,999				$63,505
	O&M Total						**$193,601**

Table 8.2-4 (continued)

	Item Description	Labor Cost	Material Cost	Equipment Cost	Subcontractor Cost	Other Costs	Gross Cost
Indirect Costs	**Indirect Capital Costs**						
	Design				$15,541,085		$15,541,085
	Project Management	$45,211,534					$45,211,534
	Construction Management	$47,125,809					$47,125,809
	Indirect Total						**$107,788,428**
	Indirect O&M						
	Project Management	$17,018					$17,018
	Construction Management	$17,018					$17,018
	Indirect O&M Total						**$34,036**
	Management Reserve						
	Management Reserve					$265,383,324	**$265,383,324**
	Total Costs 4 – Excavation, SVE, Institutional Controls						**$787,116,295**

Notes: Labor costs are RS Mean's determination of the proper craft mix and productivity rate to complete the specific task in the detailed cost estimate in Appendix I. Material costs are products necessary to complete the specific tasks in the detailed cost estimate in Appendix I. Equipment costs are the mechanized and/or hand tools needed to complete the specific tasks in the detailed cost estimate in Appendix I. Subcontract costs are a lump-sum costs, usually based on past history, to complete the specific tasks in the detailed cost estimate in Appendix I. This includes material, labor, and equipment to perform the task. Costs included in the above table are burdened, including New Mexico gross receipts tax, general and administrative, infrastructure, and Associate Directorate support taxes. Management reserve costs are calculated at 50.9% of all other costs.

Table 9.1-1
Explanation of Rating System Used for Evaluating Remedial Alternative Evaluation Criteria

Balancing Criteria	Rating				
	1	2	3	4	5
Long-Term Reliability and Effectiveness	Not demonstrated as effective; potential for remedy failure.	→			Reduces risk with little long-term management and has proven effective under similar conditions.
Reduction of Toxicity, Mobility, or Volume	No reduction of toxicity, mobility, or volume of contaminants.	→			Completely and permanently reduces the toxicity, mobility, and volume of contaminants.
Short-Term Effectiveness	Provides no short-term risk reduction and may create significant additional risks to the community, workers, and the environment.	→			Quickly reduces short-term risk without creating significant additional risks.
Implementability	Difficult to implement. Significant amount of time needed for implementation.	→			Can be implemented quickly and easily and poses few difficulties.
Cost	Highest costs.	→			Less costly and does not sacrifice protection of human health and the environment.

Table 9.1-2
Screening of Alternatives against the Balancing Criteria

Alternative	Balancing Criteria	Rating Justification	Rating
Alternative 1 No Action	Long-Term Reliability and Effectiveness	This alternative is rated lowest in long-term reliability and effectiveness since there is high long-term risk, high uncertainty with leaving waste in place, potentially high amount of long-term management and monitoring, and high potential for remedy failure.	1
	Reduction of Toxicity, Mobility, or Volume	This alternative is rated lowest in reduction of toxicity, mobility, or volume since there is no reduction.	1
	Short-Term Effectiveness	This alternative is mid-rated for short-term effectiveness because no additional risk is generated, although no risk reduction is obtained.	2
	Implementability	This alternative is rated highest in implementability because it easiest to implement, as no remedy is required.	5
	Cost	This alternative is rated highest in the cost criteria because it has no associated costs.	5
	Total		**14**

Table 9.1-2 (continued)

Alternative	Balancing Criteria	Rating Justification	Rating
Alternative 2 Soil Barrier, Natural Attenuation, and Institutional Controls	Long-Term Reliability and Effectiveness	This alternative is rated next to lowest in long-term reliability and effectiveness since there is high uncertainty and potential for remedy failure in not having engineered controls and relying on institutional controls.	2
	Reduction of Toxicity, Mobility, or Volume	The existing soil cover reduces infiltration, therefore reducing mobility. This alternative is rated lower than Alternatives 3A and 3B because it does not include an engineered cover and does not include SVE to reduce contaminant volume.	2
	Short-Term Effectiveness	This alternative is mid-rated for short-term effectiveness because no additional risk is generated, although no risk reduction is obtained.	2
	Implementability	This alternative is more complicated that Alternative 1, but consists of easily implementable activities.	4
	Cost	This alternative has the lowest cost of the action alternatives.	4
	Total		**14**

Table 9.1-2 (continued)

Alternative	Balancing Criteria	Rating Justification	Rating
Alternative 3A Multilayer cover, SVE, and institutional controls	Long-Term Reliability and Effectiveness	A multilayer cover with SVE is more reliable in the long-term compared with Alternatives 1 or 2. However, because of the potential for desiccation in the clay layers, it is rated as less reliable than Alternative 3B and Alternative 4, which includes excavation.	3
	Reduction of Toxicity, Mobility, or Volume	SVE will reduce volume and downward mobility of VOCs. The multilayer cover reduces infiltration, therefore reducing mobility. This alternative is comparable to Alternative 3B but is rated lower than Alternative 4, which includes excavation.	3
	Short-Term Effectiveness	This alternative is comparable to Alternative 3B but is rated higher than Alternative 4, which includes excavation because of the risks associated with excavation and waste handling.	3
	Implementability	This alternative uses standard construction techniques. This alternative is comparable to Alternative 3B but is rated higher than Alternative 4, which includes excavation because of the additional difficulty with performing excavation and waste handling.	3
	Cost	This alternative is comparable in cost with Alternative 3B but is rated higher than Alternative 4, which includes excavation because of its additional costs for excavation and waste handling.	3
	Total		**15**

Table 9.1-2 (continued)

Alternative	Balancing Criteria	Rating Justification	Rating
Alternative 3B ET cover, SVE, and institutional controls	Long-Term Reliability and Effectiveness	This alternative is more reliable in the long-term compared with Alternatives 1 and 2. This alternative is also rated higher than Alternative 3A because it does not have the desiccation issue associated with the clay layer. Excavation provides more long-term reliability; therefore, Alternative 4 is rated higher.	4
	Reduction of Toxicity, Mobility, or Volume	SVE will reduce volume and downward mobility of VOCs. The ET cover reduces infiltration, therefore reducing mobility. This alternative is comparable with Alternative 3A but is rated lower than Alternative 4, which includes excavation.	3
	Short-Term Effectiveness	This alternative is comparable to Alternative 3A but is rated higher than Alternative 4, which includes excavation because of the risks associated with excavation and waste handling.	3
	Implementability	This alternative uses standard construction techniques. This alternative is comparable with Alternative 3A but is rated higher than Alternative 4, which includes excavation because of the additional difficulty with performing excavation and waste handling.	3
	Cost	This alternative is comparable in cost with Alternative 3A but is rated higher than Alternative 4, which includes excavation because of its additional costs for excavation and waste handling.	3
	Total		**16**

Table 9.1-2 (continued)

Alternative	Balancing Criteria	Rating Justification	Rating
Alternative 4 Waste excavation, SVE, and institutional controls	Long-Term Reliability and Effectiveness	Excavation with SVE provides the most reliable long-term effectiveness because all wastes are removed. This alternative is rated higher than all other alternatives.	5
	Reduction of Toxicity, Mobility, or Volume	Excavation reduces volume of waste at the site. SVE will reduce volume and downward mobility of VOCs. This alternative provides the greatest reduction in toxicity, mobility, or volume because all waste is removed; therefore, this alternative is rated higher than all other alternatives.	5
	Short-Term Effectiveness	This alternative is rated lower than all other alternatives because of the increased short-term risks associated with excavation and waste handling.	1
	Implementability	This alternative is rated lower than all other alternatives because of the additional difficulty with performing excavation.	2
	Cost	This alternative is rated lower than all other alternatives because of the additional costs for excavation to depths required to retrieve wastes from the shafts and for waste handling.	1
	Total		**14**

Appendix A

Acronyms and Abbreviations,
Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

3-D	three-dimensional
ACZ	acceptable compaction zone
AD	Associate Director
AEA	Atomic Energy Act
AOC	area of concern
ALARA	as low as reasonably achievable
amsl	above mean sea level
ASTM	American Society for Testing and Materials
bgs	below ground surface
BV	background value
CAMU	corrective action management unit
CFR	Code of Federal Regulations
cfs	cubic feet per second
CME	corrective measures evaluation
CMI	corrective measures implementation
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
CSM	conceptual site model
CV	coefficient of variation
DO	dissolved oxygen
DOE	Department of Energy (U.S.)
DSA	documented safety analysis
DU	depleted uranium
EPA	Environmental Protection Agency (U.S.)
ET	evapotranspiration
FD	field duplicate
FHC	Final Hazard Categorization
FLUTe	Flexible Liner Underground Technology
FSP	facility safety plan
FV	fallout value
FY	fiscal year
G&A	general and administrative
GAC	granular activated carbon
GPR	ground penetrating radar
HC	hazard category
HH&E	human health and the environment

HI	hazard index
hp	horsepower
HPIC	high-pressure ion chamber
IFGMP	Interim Facility-Wide Groundwater Monitoring Plan
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory
LDR	land disposal restriction
LLW	low-level waste
MAR	material at risk
MASW	multichannel analysis of surface waves
MCL	maximum contaminant level
MDA	material disposal area
MDD	maximum dry density
MLLW	mixed LLW
MTR	minimum technology requirement
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMGRT	New Mexico gross receipts tax
NMWQCC	New Mexico Water Quality Control Commission
NPDES	National Pollutant Discharge Elimination System
NRX	Navy reactor experiment
NTU	nephelometric turbidity unit
O&M	operations and maintenance
ORP	oxidation-reduction potential
OU	operable unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PET	potential evapotranspiration
PLS	pure live seed
PQL	practical quantitation limit
PV	present value
PVC	polyvinyl chloride
RAO	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RESRAD	residual radioactivity
RFI	RCRA facility investigation
RLWTF	radioactive liquid waste treatment facility
ROI	radius of influence

RPF	Records Processing Facility
SAL	screening action level
scfm	standard cubic feet per minute
SL	screening level
SOP	standard operating procedure
SSD	saturated dry surface
SSL	soil screening level
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list
TCE	trichloroethylene
TD	total depth
TDR	time-domain reflectometer
TDS	total dissolved solids
TIC	tentatively identified compound
TKN	total Kjeldahl nitrogen
TLD	thermoluminescent dosimeter
TNT	trinitrotoluene
TOC	total organic carbon
TRU	transuranic
USGS	United States Geological Survey
UTL	upper tolerance limit
VOC	volatile organic compound
WAC	waste acceptance criteria
WIPP	Waste Isolation Pilot Plant

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain U.S. 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)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control parameters.

Appendix B

Reinvestigation of Vadose-Zone
Water Contents at Material Disposal Area C

B-1.0 INTRODUCTION

As part of the site investigation, the vadose zone hydrology of Material Disposal Area (MDA) C at Los Alamos National Laboratory was analyzed based on volumetric water content and chloride data (LANL 2006, 094688, Appendix L). These data were primarily from boreholes drilled in the shallower parts of the mesa into the Tshirege Member of the Bandelier Tuff from the surface to depths ranging from approximately 160 ft to 270 ft below ground surface (bgs). For the Phase II investigation of MDA C (LANL 2009, 107389), new or extended boreholes were drilled at 14 locations to provide additional contaminant data from deeper parts of the mesa to depths ranging from 300 ft to 653 ft bgs. These Phase II boreholes extended into the Cerro Toledo interval and the Otowi Member of the Bandelier Tuff; one extended into the top of the Tschicoma dacite. Phase II borehole locations are shown in Figure B-1.0-1, and the details are summarized in Table B-1.0-1. Borehole logs can be found in Appendix C of the Phase II investigation report (LANL 2009, 107389). As part of characterization efforts, laboratory gravimetric water content measurements were made on selected core samples from the boreholes, but the data were not included in the Phase II report. The objective of this appendix is to present these MDA C water content data and discuss their implications for flow and transport in the vadose zone beneath the site.

B-2.0 METHODS AND RESULTS

A total of 103 core samples collected in the field were sealed to prevent evaporation and analyzed in the laboratory using the standard oven drying method for gravimetric water content. To make these results more useful for understanding vadose-zone flow conditions and to compare them with previous MDA C results described in Appendix L of the MDA C investigation report (LANL 2006, 094688), gravimetric water content values were converted to volumetric water content values using bulk density values from Rogers and Gallaher (1995, 097569) for the various rock units. Because no bulk density data were available for the Tschicoma dacite in the Rogers and Gallaher study, the average bulk density of this unit, based on the geophysical density log from regional well R-46, was used (LANL 2009, 105592, Appendix E). Gravimetric and volumetric water content results for each borehole sample are included in Table B-2.0-1.

B-3.0 DISCUSSION

The average volumetric water content for the entire 103 sample data set was 10%, and the minimum and maximum water contents were 2% and 24%, respectively. Only 3 samples had water contents over 20% (2 in the Cerro Toledo interval and 1 in the Tschicoma dacite). The distribution of water contents is shown in Figure B-3.0-1 and is dominated by water contents near the average value.

Boreholes 50-603061 and 50-603064 have two of the most complete moisture content profiles of the 14 Phase II boreholes and are good examples of how MDA C water contents vary with depth and stratigraphy (Figure B-3.0-2). Borehole 50-603061 is slightly wetter than 50-603064, but both profiles show that the water contents over much of the upper 500 ft are relatively low (less than approximately 15%).

The spike in water content in the Qct of borehole 50-603061 is the highest measured of all the samples (24%) but is quite far from saturated conditions. A water-content spike in the Qct was also observed in borehole 50-24817 (Table B-2.0-1). As the data from borehole 50-603064 show, water contents in the Qct are not always elevated and, as discussed later, the average water content in the Qct is not much higher than in the Bandelier Tuff units. The variation in water content in Qct is probably related to the fact that Qct is a heterogeneous unit composed of volcanoclastic sediments and buried soils that have fine pore

structure that can hold moisture without indicating a higher water flux. This characteristic is quite different from the ash flow Bandelier Tuff units, and the water contents measured in the more homogeneous Bandelier Tuff units are considered to be a better measure of average moisture flux.

The MDA C water contents indicate relatively dry mesa conditions and can also be used to examine how close the vadose zone is to saturation. The porosity of the Bandelier Tuff is around 40%, and the volumetric water content data can be divided by porosity to estimate the percent saturation in the mesa. The data indicate the MDA C vadose zone is well below saturation, with most of the mesa having saturations of 25% or lower. These results suggest downward fluxes are likely to be relatively low. As discussed in Appendix L of the MDA C investigation report (LANL 2006, 094688), downward fluxes estimated using chloride mass balance were less than 0.12 in./yr (0.32 cm/yr) and about half of the profiles examined had fluxes below 0.04 in./yr (0.1 cm/yr). Table B-3.0-1 compares average volumetric water contents for each geologic unit measured during the Phase I (2004–2007) and Phase II investigations, and the differences are small. Given the similarity of the water content data between the two investigations, it is likely that fluxes predicted for the Phase II boreholes would be similar to those calculated in Phase I.

B-4.0 SUMMARY

Water content data from deeper boreholes drilled as part of the MDA C Phase II investigation are consistent with those reported in Phase I and show that the vadose zone beneath MDA C has low water contents that are quite far from saturation. These water contents suggest downward fluxes of water (and dissolved contaminants) are likely to be low. The low flux interpretation is supported by the chloride mass balance results presented in the MDA C investigation report (LANL 2006, 094688), which indicate downwater fluxes are less than 0.32 cm/yr, and vadose zone transport times are estimated to be on the order of 1000 yr or longer.

B-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. This information is also included in text citations. ER IDs 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 New Mexico Environment Department Hazardous Waste Bureau 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.

LANL (Los Alamos National Laboratory), December 2006. "Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," Los Alamos National Laboratory document LA-UR-06-8096, Los Alamos, New Mexico. (LANL 2006, 094688)

LANL (Los Alamos National Laboratory), March 2009. "Completion Report for Regional Aquifer Well R-46," Los Alamos National Laboratory document LA-UR-09-1338, Los Alamos, New Mexico. (LANL 2009, 105592)

LANL (Los Alamos National Laboratory), October 2009. "Phase II Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50, Revision 1," Los Alamos National Laboratory document LA-UR-09-6266, Los Alamos, New Mexico. (LANL 2009, 107389)

Rogers, D.B., and B.M. Gallaher, September 1995. "The Unsaturated Hydraulic Characteristics of the Bandelier Tuff," Los Alamos National Laboratory report LA-12968-MS, Los Alamos, New Mexico. (Rogers and Gallaher 1995, 097569)

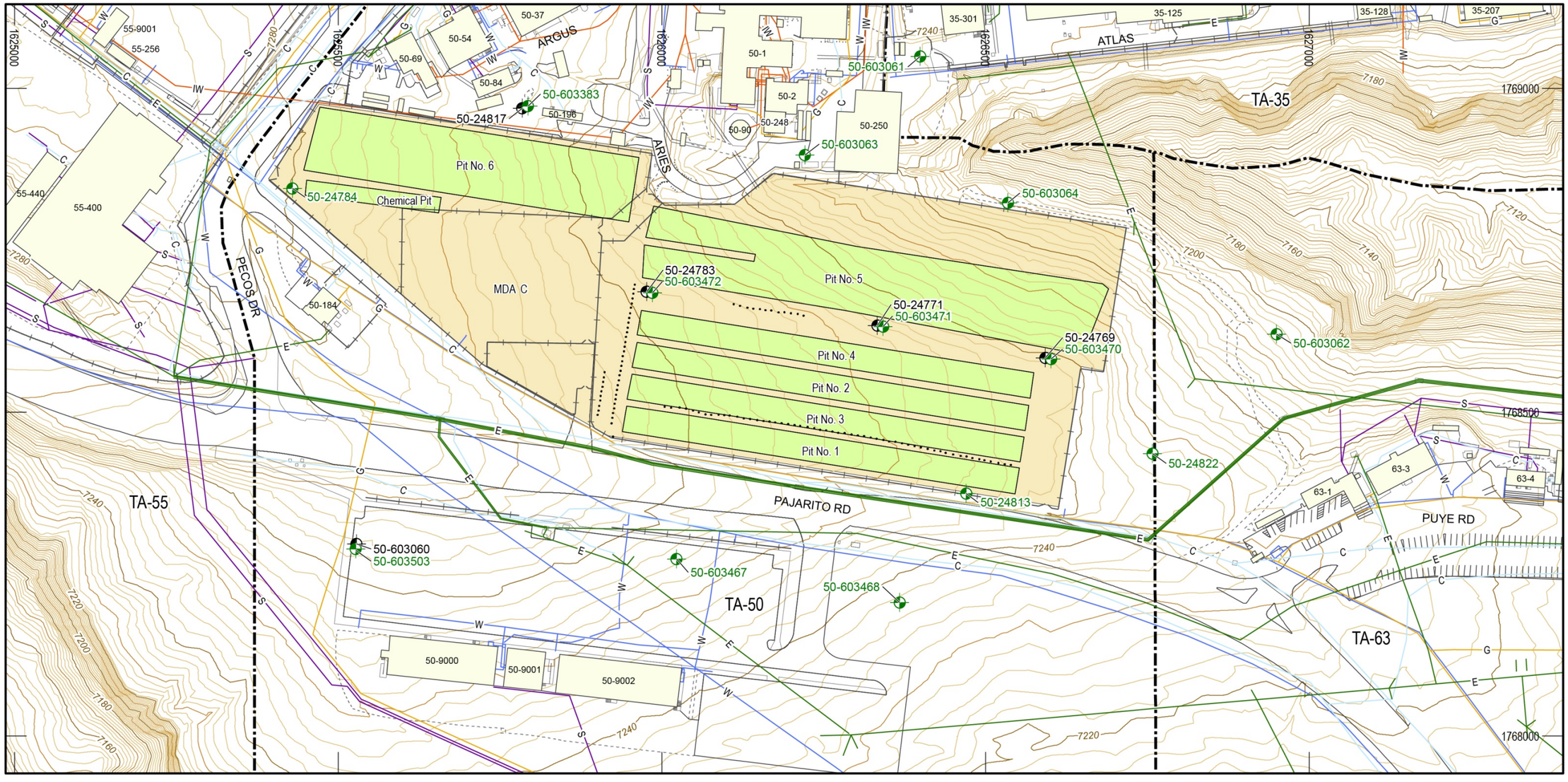


Figure B-1.0-1 Locations of Phase II boreholes and vapor-monitoring wells

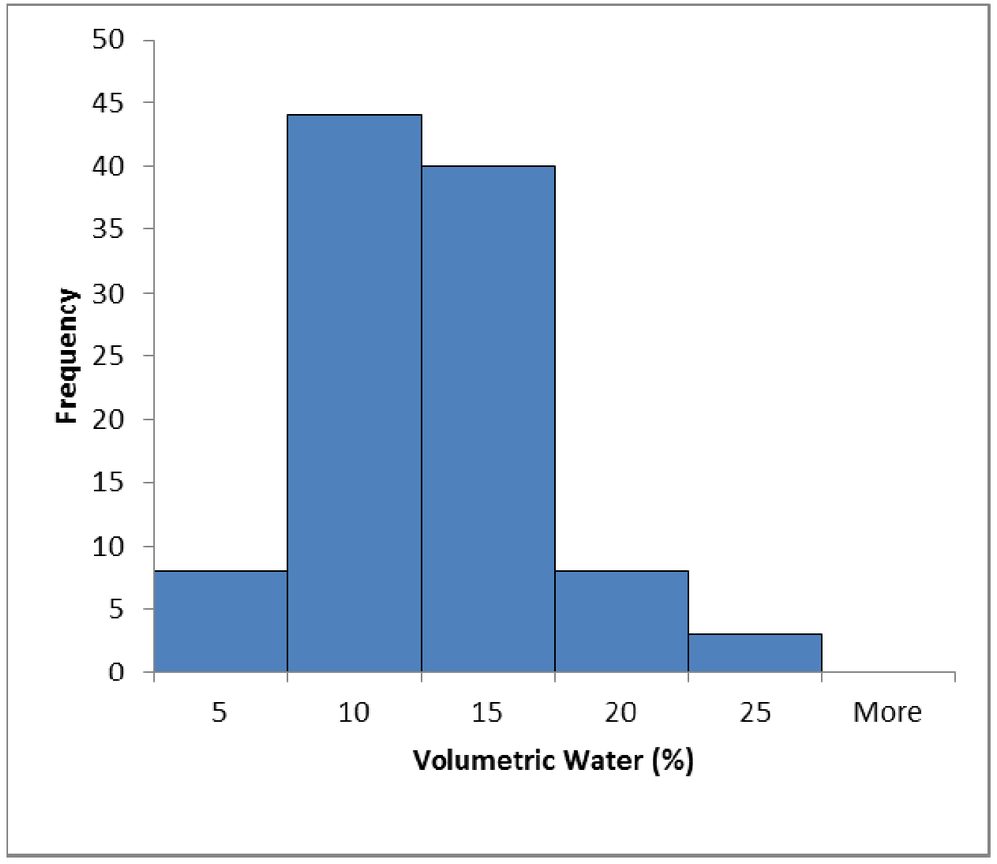
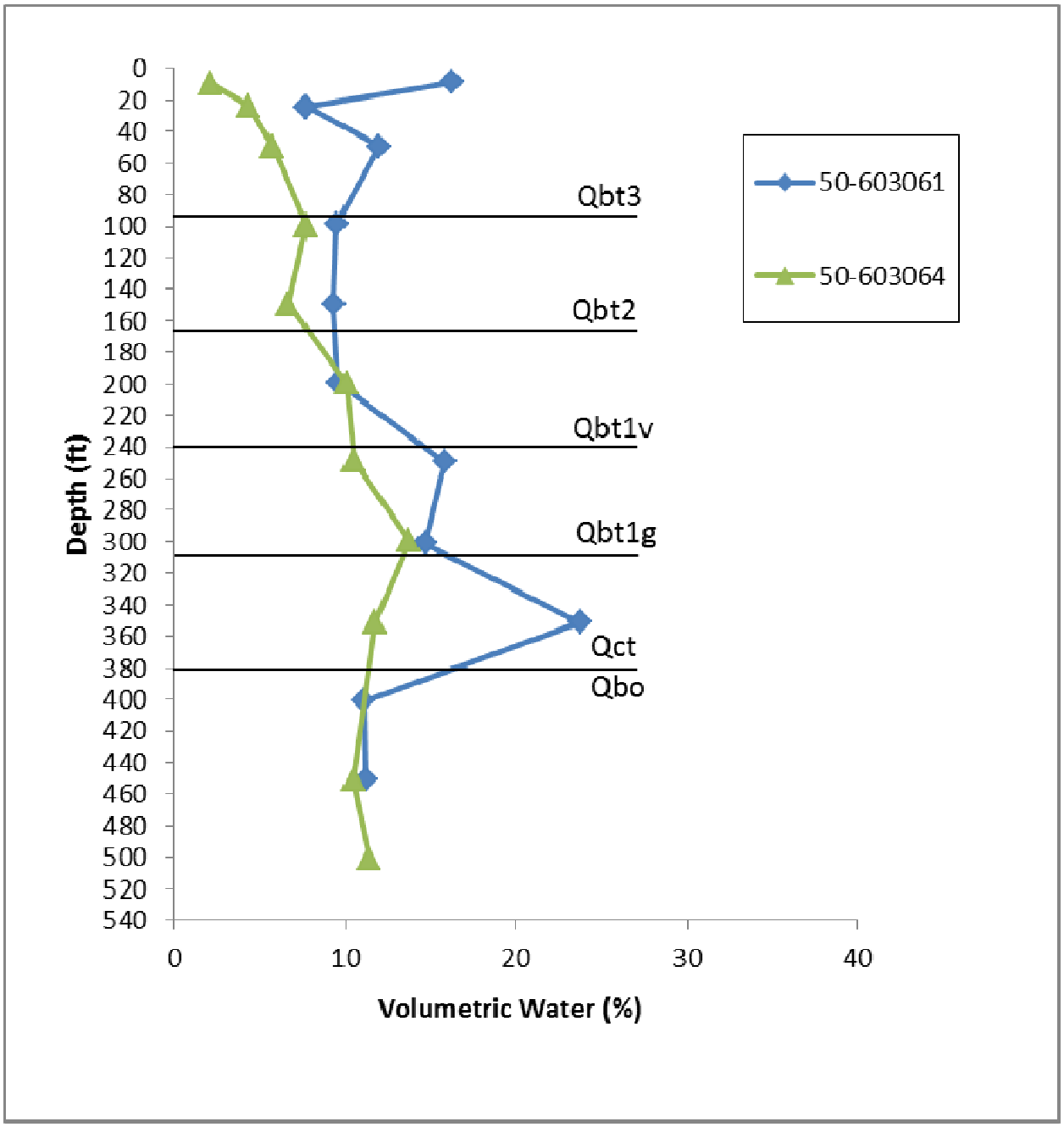


Figure B-2.0-1 Histogram of MDA C water contents from Phase II boreholes



Note: Depths of stratigraphic contacts are approximate because of differences in contact depths for the two boreholes. Actual borehole stratigraphy is presented in Phase II investigation report (LANL 2009, 107389)

Figure B-3.0-1 Volumetric water content profiles for boreholes 50-603061 and 50-603064

Table B-1.0-1
Summary of Phase II Investigation Boreholes

Borehole or Grouped Boreholes	Location ID	Year Drilled	Final Total Depth (ft)	Core Samples Depth Range (ft)	Vapor Samples Depth Range (ft)	Vapor-Sampling System
1	50-24769	2006; extended in 2008	300	18.1–300	20–300	Packer (2006)
	50-603470	2008	653	360–653	351–650	SS[a] Tubing (2008)
2	50-24771	2006; extended in 2008	300	15.9–300	17–300	Packer (2006, 2008)
	50-603471	2008	460	350–452	360–450	FLUTe[b] (2008)
3	50-24783	2006; extended in 2008	300	17.5–300	20–300	Packer (2006)
	50-603472	2008	460	350–452	364–450	SS Tubing (2008)
4	50-24784	2006; extended in 2009	460	8–452	10–450	Packer (2006); SS Tubing (2009)
5	50-24813	2006; extended in 2008 and 2009	635	18.2–602	20–600	Packer (2006); SS Tubing (2008)
6	50-24817	2005; extended in 2008	460	18.4–452.5	20–250	Packer (2005, 2008)
	50-603383	2008	460	n/a[c]	286–450	FLUTe (2008)
7	50-24820	2005; extended in 2008	602.5	17.5–602.5	20–250	Packer (2005)
	50-603467	2008	600	n/a	287–600	FLUTe (2008)
8	50-24821	2005	250	18.6–250	20–250	Packer (2005)
	50-603373	2008	300	n/a	30–260	Packer and SS Tubing (2008)
	50-603468	2008	460	300–451.5	300–450	FLUTe (2008)
9	50-24822	2005; extended in 2008	452.5	18.6–452.5	20–450	Packer (2005); SS Tubing (2008)
10	50-603060	2008	451.5	48–451.5	50–450	None
	50-603503	2008	460	n/a	347–450	SS Tubing (2008)
11	50-603061	2008	460	8–452	13–450	SS Tubing (2008)
12	50-603062	2008	460	48.5–452	50–450	SS Tubing (2008)
13	50-603063	2008	460	8–452	10–450	SS Tubing (2008)
14	50-603064	2008	510	8.5–502	25–500	SS Tubing (2008)

[a] SS = Stainless steel.

[b] FLUTe = Flexible Liner Underground Technology.

[c] n/a = Not applicable; no core collected.

Table B-2.0-1
MDA C Phase II Water Content Data

Sample ID	Depth (ft)	Unit	Gravimetric Water Content (%)	Bulk Density (g/cm^3)	Volumetric Water Content (%)
Borehole 50-24769[a]					
MD50-08-7442	198–200	Qbt 1v	1.5	1.26	2
MD50-08-7443	248–250	Qbt 1vc	8.6	1.26	11
MD50-08-7444	298–300	Qbt 1g	8.3	1.13	9
Borehole 50-24771[b]					
MD50-08-7616	198–200	Qbt 1v	2.2	1.26	3
MD50-08-7617	248.5–250	Qbt 1vc	8.9	1.26	11
MD50-08-7618	297.5–300	Qbt 1g	9	1.13	10
Borehole 50-24783[c]					
MD50-08-7646	198–200	Qbt 1v	2.9	1.26	4
MD50-08-7647	248.5–250	Qbt 1vc	8.7	1.26	11
MD50-08-7648	298.5–300	Qbt 1g	10	1.13	11
Borehole 50-24784					
MD50-08-7676	350–352	Qct	8.8	1.25	11
MD50-08-7677	400–402	Qbo	8.2	1.18	10
MD50-08-7678	450–452	Qbo	6.8	1.18	8
Borehole 50-24813					
MD50-08-7706	198.5–200	Qbt 1v	7.7	1.26	10
MD50-08-7707	248.5–250	Qbt 1g	11	1.13	12
MD50-08-7708	298–300	Qbt 1g	8.5	1.13	10
MD50-08-7709	350–352	Qct	10	1.25	13
MD50-08-7710	400–402	Qbo	6.2	1.18	7
MD50-08-7711	450–452	Qbo	7.9	1.18	9
MD50-08-7712	500–502	Qbo	7.1	1.18	8
MD50-08-7713	550–552	Qbo	7.8	1.18	9
MD50-08-7714	600–602	Qbo	9.1	1.18	11
Borehole 50-24817[d]					
MD50-08-7739	300–302.5	Qbt 1g	9	1.13	10
MD50-08-7743	350–352	Qct	18	1.25	23
MD50-08-7741	450–452.5	Qbo	9.6	1.18	11
Borehole 50-24820[e]					
MD50-08-7829	300–303	Qbt 1g	7.9	1.13	9
MD50-08-7830	350–351.5	Qct	9.9	1.25	12
MD50-08-7831	400–401.5	Qbo	6.3	1.18	7
MD50-08-7832	450–452	Qbo	7.2	1.18	8
MD50-08-7833	500–502.5	Qbo	8	1.18	9

Table B-2.0-1 (continued)

Sample ID	Depth (ft)	Unit	Gravimetric Water Content (%)	Bulk Density (g/cm³)	Volumetric Water Content (%)
MD50-08-7834	550–552.5	Qbo	8.6	1.18	10
MD50-08-7828	600–602.5	Qbo	11	1.18	13
Borehole 50-24822					
MD50-08-7940	300–302	Qbt 1g	7.6	1.13	9
MD50-08-7941	350–352.5	Qct	10	1.25	13
MD50-08-7942	400–402	Qbo	6.6	1.18	8
MD50-08-7943	450–452.5	Qbo	8.9	1.18	11
Borehole 50-603060[f]					
MD50-08-8148	48–50	Qbt 3	4.1	1.25	5
MD50-08-8149	99–100	Qbt 3	2	1.25	3
MD50-08-8150	149–150	Qbt 2	2	1.46	3
MD50-08-8151	199–200	Qbt 1v	2.7	1.26	3
MD50-08-8152	248.5–250	Qbt 1vc	15	1.26	19
MD50-08-8153	298.5–300	Qbt 1g	9.4	1.13	11
MD50-08-8154	360–362	Qct	7.1	1.25	9
MD50-08-8156	410–412.5	Qbo	6.2	1.18	7
MD50-08-8182	450–451.5	Qbo	6.5	1.18	8
Borehole 50-603061					
MD50-08-8192	8–10	Fill/Qbt 3	13	1.25	16
MD50-08-8193	24–25	Qbt 3	6.2	1.25	8
MD50-08-8194	49–50	Qbt 3	9.6	1.25	12
MD50-08-8195	97.5–100	Qbt 2	6.5	1.46	9
MD50-08-8196	149–150	Qbt 2	6.4	1.46	9
MD50-08-8197	198.5–200	Qbt 1v	7.6	1.26	10
MD50-08-8198	249–250	Qbt 1g	14	1.13	16
MD50-08-8199	300–302	Qbt 1g	13	1.13	15
MD50-08-8200	350–352	Qct	19	1.25	24
MD50-08-8221	400–402	Qbo	9.4	1.18	11
MD50-08-8222	450–452	Qbo	9.5	1.18	11
Borehole 50-603062					
MD50-08-8238	48.5–50	Qbt 3	5.9	1.25	7
MD50-08-8239	98.5–100	Qbt 2	6.4	1.46	9
MD50-08-8240	148.5–150	Qbt 2	7.1	1.46	10
MD50-08-8241	198.5–200	Qbt 1v	4.4	1.26	6
MD50-08-8242	248.5–250	Qbt 1g	8.2	1.13	9
MD50-08-8243	298.5–300	Qbt 1g	11	1.13	12
MD50-08-8244	350–352	Qct	6.7	1.25	8
MD50-08-8245	400–402	Qbo	8.5	1.18	10

Table B-2.0-1 (continued)

Sample ID	Depth (ft)	Unit	Gravimetric Water Content (%)	Bulk Density (g/cm³)	Volumetric Water Content (%)
MD50-08-8246	450–452	Qbo	8.5	1.18	10
Borehole 50-603063					
MD50-08-8282	8–10	Qbt 3	10	1.25	13
MD50-08-8283	23.5–25	Qbt 3	6.5	1.25	8
MD50-08-8284	48.5–50	Qbt 3	7	1.25	9
MD50-08-8285	97.5–99	Qbt 3	6.3	1.25	8
MD50-08-8286	148–150	Qbt 2	6.3	1.46	9
MD50-08-8287	198–200	Qbt 1v	7.3	1.26	9
MD50-08-8288	248–250	Qbt 1g	15	1.13	17
MD50-08-8311	300–302.5	Qbt 1g	14	1.13	16
MD50-08-8290	400–402.5	Qbo	14	1.18	17
MD50-08-8312	450–452	Qbo	13	1.18	15
Borehole 50-603064					
MD50-08-8328	8.5–10	Qbt 3	1.7	1.25	2
MD50-08-8329	23–25	Qbt 3	3.5	1.25	4
MD50-08-8330	48.5–50	Qbt 3	4.6	1.25	6
MD50-08-8331	98.5–100	Qbt 2	5.3	1.46	8
MD50-08-8332	148.5–150	Qbt 1v	5.3	1.26	7
MD50-08-8333	198.5–200	Qbt 1v	8	1.26	10
MD50-08-8334	247.5–250	Qbt 1g	9.3	1.13	11
MD50-08-8335	298.5–300	Qct	11	1.25	14
MD50-08-8336	350–351.5	Qct	9.4	1.25	12
MD50-08-8357	400–401.5	Qbo	8.1	1.18	10
MD50-08-8358	450–451.5	Qbo	8.9	1.18	11
MD50-08-8359	500–502	Qbo	9.7	1.18	11
Borehole 50-603468					
MD50-08-7888	300–301.5	Qbt 1g	9.2	1.13	10
MD50-08-7889	350–351	Qct	5.7	1.25	7
MD50-08-7890	400–401.5	Qbo	7.5	1.18	9
MD50-08-7891	450–451.5	Qbo	8.5	1.18	10
Borehole 50-603470					
MD50-08-7445	360–362	Qct	7	1.25	9
MD50-08-7446	400–402	Qbo	7	1.18	8
MD50-08-7447	450–452.5	Qbo	8.8	1.18	10
MD50-08-7448	500–502	Qbo	9.5	1.18	11
MD50-08-7449	550.5–552.5	Qbo	9	1.18	11
MD50-08-7450	600–602	Qbo	9.4	1.18	11
MD50-08-7441	650–653	Tt2	9.8	2.25	22

Table B-2.0-1 (continued)

Sample ID	Depth (ft)	Unit	Gravimetric Water Content (%)	Bulk Density (g/cm³)	Volumetric Water Content (%)
Borehole 50-603471					
MD50-08-7620	350–351.5	Qct	14	1.25	18
MD50-08-7619	400–402	Qbo	7.4	1.18	9
MD50-08-7621	450–452	Qbo	8.7	1.18	10
Borehole 50-603472					
MD50-08-7649	350–354	Qct	6.8	1.25	9
MD50-08-7650	400–402.5	Qbo	7.6	1.18	9
MD50-08-7651	450–452	Qbo	8.9	1.18	11

[a] Collocated with Phase II borehole 50-603470.

[b] Collocated with Phase II borehole 50-603471.

[c] Collocated with Phase II borehole 50-603472.

[d] Collocated with Phase II borehole 50-603383.

[e] Collocated with Phase II borehole 50-603467.

[f] Collocated with Phase II borehole 50-603503.

Table B-3.0-1
Comparison of Average Volumetric Water Contents by Geologic Unit from MDA C Phase I and Phase II Investigations

Unit	Phase I (%)[a]	Phase II (%)[b]	Number of Phase II Samples
Qbt 3	8	7	12
Qbt 2	8	8	7
Qbt 1g	12	12	17
Qbt 1v	6	8	14
Qct	—[c]	13	14
Qbo	—	10	37

[a] Phase I value is average of multiple neutron probe measurements.

[b] Phase II value is average of results of core sample analysis.

[c] — = No measurements made in this unit.

Appendix C

Compliance Order on Consent
Investigation Results for Material Disposal Area C

C-1.0 INTRODUCTION

This appendix provides a summary of the scope of investigations conducted at Material Disposal Area (MDA) C under the Compliance Order on Consent (the Consent Order) and presents the results of these investigations. Information on other historical investigations at MDA C before the Consent Order are summarized in the MDA C historical investigation report (LANL 2005, 091493, Appendix B).

C-2.0 2004–2007 SITE INVESTIGATION

Field investigations conducted from 2004 through 2007 at MDA C under the Consent Order are reported in the MDA C investigation report (LANL 2006, 094688) and a supplemental data report (LANL 2007, 097285). Under this investigation, a radiological survey was conducted and surface fill samples were collected at 6 locations and analyzed for radionuclides to supplement the surface sample data from the previous Phase I Resource Conservation and Recovery Act facility investigation (RFI). Geophysical and seismic surveys were performed to better define disposal pit boundaries and to map the walls between Pits 1–4. Thirty-three boreholes were drilled, and 209 core samples were collected and analyzed for inorganic and organic chemicals and radionuclides to characterize the nature and extent of subsurface contamination. Core samples for geotechnical characterization were also collected from one of the boreholes. A total of 378 vapor samples were collected from these boreholes and 2 existing boreholes in two sampling rounds and analyzed for volatile organic compound (VOC) and tritium to characterize subsurface vapor contamination. Three additional boreholes were drilled and 40 pairs of core and vapor samples were collected to determine the relationship between VOCs and tritium concentrations in solid and vapor phases. Four additional boreholes were drilled between Pits 2 and 3, and 25 core and 25 vapor samples were collected to characterize potential contamination beneath the pits.

C-2.1 Radiological Survey and Surface Fill Sampling

A radiological survey was conducted east of the MDA C boundary and outside the fenceline in May 2004 to identify potential surface or near-surface radiological contamination and select biased surface sampling locations. The survey was performed with a portable gamma spectroscopy instrument with an integrated multichannel analyzer that used a sodium iodide detector to identify multiple isotopes and the isotope specific/total dose rates at each survey location. The radiological survey was conducted on a grid with 15-ft by 15-ft spacing.

Six surface sampling locations were selected based on the gamma spectroscopy survey conducted at the site. A discrete grab sample was collected from 0 ft to 0.5 ft below ground surface (bgs) at each of the six locations. The six surface fill samples were analyzed at an off-site analytical laboratory for americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and strontium-90. Table C-2.1-1 summarizes the samples collected and analyses requested. Locations of these samples are included in Figure C-2.1-1.

The radionuclides detected or detected above background values (BVs) or fallout values (FVs) in surface fill samples are presented in Table C-2.1-2.

C-2.2 Geophysical and Seismic Surveys

In April 2006, a geophysical investigation was performed to delineate the lateral boundaries of Pits 1-4 and to locate any anomalies that could be attributed to the disposal shafts (ARM 2006, 094164). Four geophysical techniques were used: high-sensitivity metal detector (EM61), cesium vapor magnetometer, terrain conductivity (EM31), and ground penetrating radar (GPR). A seismic survey was also performed in April 2006. The survey used the multichannel analysis of surface waves (MASW) method to identify and map the walls between Pits 1–4 (Lee 2006, 094163).

The results of the geophysical survey provided clearer delineation of the boundaries of Pits 1–4 than had been previously available. The interpreted pit boundaries based on these data showed a significant variance in some cases with respect to historical information. Although the shapes and sizes of the pits were generally consistent with engineering drawings and other historical information, the interpreted locations were offset by as much as 25 ft from the historical data. The disposal shafts along the western side of Pits 1–4 were shown as anomaly locations that varied by less than 3 ft in comparison with historical data. The shafts located between Pits 1 and 3 that are shown in historical drawings were not observed in the geophysical data. The shafts were not observed either because they contain very little metal or they are too deep (greater than approximately 15 ft) to be detected (ARM 2006, 094164).

It was assumed that Pits 1–4 were separated from one another by walls of intact tuff bedrock. However, the seismic survey could not confirm this assumption (Lee 2006, 094163). The seismic survey results noted the wall between Pit 2 and Pit 3 was the most prominent, the wall between Pit 1 and Pit 3 was less prominent or well-defined, and no wall between Pit 2 and Pit 4 was observed (Lee 2006, 091463).

C-2.3 Borehole Sampling

C-2.3.1 Core Sampling and Analysis

A total of 33 boreholes were drilled in 2005–2006 at MDA C to collect samples to define the vertical and lateral extent of site contamination. An additional three boreholes were drilled to collect paired core and vapor samples for the purpose of correlating VOC concentrations in tuff (core) samples with VOC concentrations in vapor samples. One borehole was drilled to a depth of 620 ft bgs to define the vertical extent of contamination as well as to determine the nature and depth of fracture zones and any possible perched saturation zones. The remaining boreholes ranged in depth from 90 ft to 300 ft bgs. Core samples were collected from a minimum of five depths in each borehole. Additional samples were collected at fracture zones, with samples collected above, within, and beneath those fractures that were large enough to make up 80% of the required sample volume. Five major fractures in four boreholes were sampled during the 2005–2006 borehole investigation.

All core samples were analyzed for various combinations of radionuclides (gamma-emitting radionuclides, americium-241, strontium-90, isotopic uranium, and isotopic plutonium), target analyte list (TAL) metals, perchlorate, cyanide, nitrate, polychlorinated biphenyls (PCBs), dioxins and furans, explosive compounds, VOCs, and semivolatile organic compounds (SVOCs). Table C-2.3-1 summarizes the samples collected and analyses requested. These sample locations are included in Figure C-2.3-1.

After the submission of the MDA C investigation report in December 2006 (LANL 2006, 094688), four additional boreholes were drilled between Pits 2 and 3 in February 2007, as requested by the New Mexico Environment Department (NMED) (2007, 095437). A total of 25 fill and tuff samples were collected and submitted to off-site contract laboratories for analysis of TAL metals, cyanide (total), nitrate, perchlorate, dioxins and furans, explosive compounds, PCBs, SVOCs, VOCs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and strontium-90. Table C-2.3-2 summarizes the samples collected and analyses requested. These sampling locations are included in Figure C-2.3-1.

Inorganic chemicals detected above BVs, detected organic chemicals, and radionuclides detected or detected above BVs in core samples collected in 2005–2006 are presented in Tables C-2.3-3 through C-2.3-5, respectively. Inorganic chemicals detected above BVs, detected organic chemicals, and radionuclides detected or detected above BVs in samples collected from the boreholes drilling between Pits 2 and 3 in 2007 are presented in Tables C-2.3-6 through C-2.3-8, respectively. The results of the fracture investigation are summarized in Table C-2.3-9.

The core sample results indicated a number of inorganic and organic chemicals were detected at low concentrations beneath the former disposal units and were consistent with the results obtained during the Phase I RFI. All inorganic chemicals detected above BVs during the 2005–2006 sampling campaign were generally less than 5 times the BV. The interpretation of these results indicates little if any migration of metals and other inorganic chemicals from the disposal units. Although several inorganic chemicals were detected above BV or the maximum background concentration in samples collected at the total depth (TD) of the borehole, the detections above background in TD samples were generally only slightly above background and were generally not accompanied by detections above background in higher lithologic units. The results appeared to indicate the detections above background in TD samples were associated with natural variability of the tuff rather than indicative of unbounded releases.

Forty-two organic compounds were detected in core samples. These compounds consisted of 8 VOCs, 18 SVOCs (primarily polycyclic aromatic hydrocarbons), 3 polychlorinated biphenyls, 9 dioxin or furan congeners, and 4 explosive compounds or degradation products. All detected concentrations were low (i.e., less than 1 mg/kg), and many were less than estimated quantitation limits. Detections were generally sporadic with no discernible spatial pattern indicative of a release.

Uranium isotopes were detected above BVs in core samples, and five fallout radionuclides (americium-241, cesium-137, plutonium-238, plutonium-239, and strontium-90) were detected in core samples. Uranium-235 was detected most frequently above BV, but all results were less than 4 times BV. All fallout radionuclides were detected at low activities (less than 1 pCi/g). Detections were generally sporadic, with no discernible spatial pattern indicative of a release.

C-2.3.2 Vapor Sampling and Analysis

Subsurface vapor samples were collected from each of 34 boreholes between August 2005 and August 2006. A total of 210 first-round vapor samples were collected and analyzed for VOCs and tritium. A second round of vapor samples was collected from some of the boreholes to measure the concentrations of VOCs in vapor after drilling was completed to allow borehole conditions to equilibrate. Second-round samples were collected at least 30 d after the initial vapor samples were taken using the same collection methods. A total of 168 second-round vapor samples were collected and analyzed for VOCs and tritium. An additional three boreholes were drilled to collect paired core and vapor samples to correlate VOC concentrations in tuff (core) samples with VOC concentrations in vapor samples. Vapor samples were collected for VOCs and tritium, and corresponding core samples were collected for VOCs. Table C-2.3-10 summarizes the samples collected and analyses requested for the two rounds of vapor sampling performed during 2005 and 2006. The locations of boreholes where these vapor samples were collected are included in Figure C-2.3-1. Vapor samples were collected from discrete 1-ft sampling intervals using a straddle-packer system. Samples for VOCs were collected in SUMMA canisters, and samples for tritium were collected in silica gel sample tubes.

Vapor samples were also collected from the 4 boreholes drilled between Pits 2 and 3 in 2007. A total of 25 vapor samples were collected and submitted to off-site contract laboratories for analysis of VOCs and tritium. Table C-2.3-2 summarizes the samples collected and analyses requested.

Results for VOCs and tritium in vapor samples collected in 2005–2006 are presented in Tables C-2.3-11 through C-2.3-13. Results for VOCs and tritium in vapor samples collected between Pits 2 and 3 in 2007 are presented in Tables C-2.3-14 and C-2.3-15, respectively.

Forty-two VOCs were detected in vapor samples collected during the first round of sampling. The VOCs with the highest frequency of detection were chloroform (209 of 210 samples), dichlorodifluoromethane (208 of 210 samples), tetrachloroethene (PCE) (209 of 210 samples), and trichloroethene (TCE) (210 of 210 samples). The VOCs with the highest detected concentrations were PCE (maximum concentration

24,000 µg/m^3) and TCE (54,000 µg/m^3). All other VOCs had maximum concentrations less than 10,000 µg/m^3. Similar results were obtained from the second round of vapor sampling and the vapor sampling between Pits 2 and 3. The vapor-phase VOC results are indicative of a release from the MDA C disposal units and migration of VOCs by vapor-phase diffusion.

Collocated core and vapor samples were collected at three borehole locations (50-26823, 50-26824, and 50-26825) to determine the relationship between the concentrations of VOCs in vapor and in core samples. Concentrations of VOCs in vapor samples and the corresponding collocated core samples are presented in Table C-2.3-16. Pairs of results for individual analytes were evaluated using various regression techniques to determine whether the two sets of concentrations are correlated. The concentrations of VOCs in core samples are much lower than the concentrations in pore-gas samples. The correlations between concentrations of individual analytes in core and in vapor samples were found to be very poor, with r-squared values on the order of 0.1 or less for most analytes, indicating very low correlation (strong correlations are indicated by r-squared values approaching 1.0). The highest correlation was for methylene chloride, with an r-squared value of 0.2589.

Tritium was not analyzed in core samples but was detected in vapor samples. Tritium was detected in 197 of 210 samples during the first round of pore gas sampling, 162 of 168 samples during the second round, and 25 of 25 samples collected between Pits 2 and 3. The highest activities were detected near the southwest corner of Pit 5 and southeast corner of Pit 6, indicating a release in this area.

C-2.3.3 Geotechnical Characterization

Samples for geotechnical characterization were also collected from the 620-ft-deep borehole to determine the geotechnical properties of the bedrock underlying MDA C. Eight geotechnical samples were collected at depths ranging from 71.5 ft to 329 ft bgs. Geotechnical samples were analyzed for moisture content, bulk density, porosity, saturated hydraulic conductivity, and pH. Volumetric water-content profiles were also collected in 19 boreholes across MDA C using neutron thermalization (neutron probe). One-time measurements were taken at 0.5-ft increments over the entire depth of each borehole. Core samples from 20 boreholes were also analyzed for anions using a deionized water leaching procedure to collect data to perform a chloride mass balance.

The total calculated porosity ranged from 38.90% to 67.00%, with the highest porosity in the Tsankawi pumice (Qbtt). Bulk density ranged from 0.88 g/cm^3 in Qbtt to 1.62 g/cm^3 in tuff unit Qbt 3. The moisture content ranged from 6.80% to 31.30%, with the highest moisture content at a depth of 236.5 ft to 237.5 ft in tuff unit Qbt 1v. The pH ranged from 6.01 in tuff unit Qbt 1g to 8.77 in the Otowi Member (Qbo). The saturated hydraulic conductivity ranged from a low of 0.00024 cm/s in tuff unit Qbt 3 to a high of 0.02 cm/s in Qbtt. Porosity, bulk density, and saturated hydraulic conductivity correspond well and reflect the variation between the extremes of welded tuff at the boundary of tuff units Qbt 3 and Qbt 2 and the loose pumice deposit of unit Qbtt. The moisture content is generally low, with the highest moisture content occurring at the base of tuff unit Qbt 1v.

The volumetric water-content profiles collected using neutron probes showed the water contents to be low, with average for each borehole/unit below 13%, and most values less than 10%. Maximum water contents were also low (with the exception of a few values in the 18% to 20% range), and the average maximum values for the various units were less than 18%. Most of the water content values indicate percent saturations below 25%, and a good number of those values indicate water contents substantially below that. Thus, none of the boreholes appeared to contact any zones of saturation, and much of the mesa subsurface is very dry.

Vadose zone fluxes and residence times were also measured using a chloride mass-balance approach. This approach involves measuring chloride concentrations in vadose zone pore water with depth. The

relatively low chloride contents indicate a high downward flux because water can move through the vadose zone at a fast enough rate to flush chloride from the vadose zone. At MDA C, all of the boreholes measured had substantial inventories of chloride, which qualitatively indicates that moisture fluxes are low and the residence times are long. Residence times for a packet of water to travel 150 ft in the vadose zone at MDA C were estimated to be greater than 1000 yr for the majority of the boreholes, and at two of the boreholes, the results were greater than 10,000 yr.

C-3.0 2008–2009 PHASE II INVESTIGATION

Phase II field investigations conducted in 2008 and 2009 at MDA C under the Consent Order are reported in the Phase II MDA C investigation report (LANL 2009, 107389). The specific objectives for the Phase II investigation were (1) to define the nature and extent of inorganic chemicals (TAL metals) at the surface at MDA C and (2) to characterize subsurface vapor concentrations of VOCs and tritium (LANL 2007, 098425). Under this phase of investigation, 59 surface and near-surface samples were collected at 30 locations to define the extent of inorganic chemical contamination and conduct risk-screening assessments. Subsurface investigation activities included installing 5 new boreholes at locations without existing boreholes, extending 8 existing boreholes, installing 7 new deep boreholes next to existing shallow boreholes, and installing 1 new pilot-test borehole. Fourteen vapor-monitoring wells were constructed in the new boreholes and associated existing boreholes. A total of 104 core and 91 vapor samples were collected from these boreholes and vapor-monitoring wells to better define the vertical and lateral extent of contamination in subsurface tuff and vapor.

C-3.1 Surface and Near-Surface Sampling

Fifty-nine surface and near-surface soil samples were collected from 2 depths (generally 0 ft to 0.5 ft and 1.0 ft to 1.5 ft bgs) at 30 locations in 2008. The samples were analyzed at an off-site analytical laboratory for TAL metals. Table C-3.1-1 summarizes the samples collected and analyses requested. Locations of these samples are included in Figure C-2.1-1.

Inorganic chemicals detected above BVs in surface and near-surface samples collected during 2008 are presented in Table C-3.1-2.

The surface and near surface samples showed 6 inorganic chemicals detected above BVs in 1 to 15 samples each. Detected concentrations above BVs were low, with maximum concentrations less than 5 times BV. The low concentrations and low frequency of detection above BVs are not indicative of releases from the site. The vertical and lateral extent of contamination were defined for all inorganic chemicals in surface and near-surface at MDA C.

C-3.2 Core Sampling

Core samples were collected from the new and extended boreholes. A summary of the Phase II boreholes is presented in Table C-3.2-1. The Phase II boreholes consist of 22 boreholes installed at 14 locations (Figure C-3.2-1). The Phase II investigation work plan (LANL 2007, 098425) specified advancing the boreholes at each location until concentrations of PCE and TCE in vapor samples were less than target concentrations (2100 $\mu g/m^3$ for TCE and 3800 $\mu g/m^3$ for PCE). Vapor-screening samples to determine if target levels had been met were collected during drilling and submitted to an off-site laboratory for 24-h screening-level analysis of TCE and PCE by standard gas chromatographic methods. Drilling continued until TCE and PCE concentrations in vapor-screening samples were less than target levels.

A total of 104 core samples were collected during the Phase II borehole investigation and submitted for laboratory analysis of TAL metals, total cyanide, nitrate, perchlorate, SVOCs, PCBs, americium-241, gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and strontium-90. Figure C-3.2-1

shows the sampling locations, and Table C-3.2-2 summarizes the samples collected and analyses requested.

Inorganic chemicals detected above BVs, detected organic chemicals, and radionuclides detected or detected above BVs in core samples collected during the Phase II investigation are presented in Tables C-3.2-3 through C-2.3-5, respectively.

The core sample results for inorganic chemicals were consistent with the results obtained during the 2004–2006 investigation. With the exception of chromium, detections of inorganic chemicals above BV were generally sporadic and not indicative of a release. Chromium was generally detected above BV in only the deeper tuff units (Qbt 1g, Qct, and Qbo). The detections were only slightly above BVs and appeared to be associated with natural variability. With the possible exception of borehole 50-603470, vertical and lateral extent of contamination were defined for all inorganic chemicals in tuff at MDA C. Borehole 50-603470 penetrated the Tschicoma dacite, and the TD sample was collected in the dacite. Concentrations of inorganic chemicals in this sample were generally higher than in overlying samples, but it was not possible to determine whether the concentrations were above BV since no background data for dacite are available.

The core sample results for organic chemicals showed organic chemicals were not detected or were detected infrequently (i.e., in one to eight samples each) and at low concentrations. All detected concentrations were less than 1 mg/kg, and most results were less than estimated quantitation limits. The vertical and lateral extent of contamination were defined for all organic chemicals in tuff at MDA C.

With the exception of uranium-235/236, radionuclides were not detected in core samples or were detected in only 1 or 2 samples at low activities (less than 1 pCi/g for fallout radionuclides). Uranium-234 and uranium-238 were not detected above BV in any samples but were detected in the dacite sample from borehole 50-603470. Uranium-235/236 was detected above BV in 35 samples, but all results were less than 2 times BV. The vertical and lateral extent of contamination were defined for all radionuclides in tuff at MDA C.

C-3.3 Vapor Sampling

After drilling was completed at a borehole location, vapor-monitoring wells were constructed using stainless-steel or Flexible Liner Underground Technology (FLUTe) membrane systems. Vapor samples were then collected using the stainless-steel or FLUTe systems. A total of 91 vapor samples were collected during the Phase II investigation. Figure C-3.2-1 shows the sampling locations, and Table C-3.2-2 summarizes the samples collected and analyses requested. Samples for VOCs were collected in SUMMA canisters and samples for tritium were collected in silica gel sample tubes.

Results for VOCs and tritium in vapor samples collected in the Phase II investigation are presented in Tables C-3.3-1 and C-3.3-2, respectively.

The results of the pore-gas sampling for VOCs were similar to the results from the 2004–2006 investigation in terms of the VOCs detected and the frequency of detection. The samples from the new boreholes showed that concentrations of VOCs decreased with depth and decreased with distance away from the disposal units. Therefore, the lateral and vertical extent of VOCs were defined by decreasing trends. Concentrations of PCE and TCE in the deepest samples at several locations were, however, above screening levels based on protection of groundwater. Extent was, therefore, not defined to screening levels, which was one of the objectives of the Phase II investigation.

Tritium vapor samples from the new boreholes installed for the Phase II investigation indicated tritium activities decreased with depth and with distance from disposal units. The lateral and vertical extent of tritium in subsurface vapor were defined at MDA C.

During the Phase II investigation, NMED requested that the Laboratory conduct a pilot test to evaluate and compare three different vapor-sampling systems because of possible adsorption of contaminants to sampling tubing. A pilot test work plan was submitted to NMED in March 2008 (LANL 2008, 101653) and was subsequently approved with modification (NMED 2008, 101113). Eight pilot test boreholes, located as four sets of paired boreholes inside and outside the boundary of MDA C (LANL 2008, 102651, Figure 2.1-1), were systematically installed with the packer system, the FLUTe system, and/or the stainless-steel tubing system. Vapor samples were collected and analyzed for VOCs and tritium. The pilot test results were submitted to NMED in a report in July 2008 (LANL 2008, 102651), and the report was approved in September 2008 (NMED 2008, 102903). The pilot test concluded that either a FLUTe or a stainless-steel system is appropriate to use as a vapor-monitoring system. Table C-3.2-1 summarizes the vapor-sampling system installed for each Phase II borehole as well as the depth ranges for core and pore-gas sampling.

C-4.0 2010–2011 PHASE III INVESTIGATION

Phase III field investigations conducted in 2010 and 2011 at MDA C under the Consent Order are reported in the Phase III MDA C investigation report (LANL 2011, 204370). Based on the results of the Phase II investigation, NMED directed a Phase III investigation to define the vertical extent of vapor-phase VOCs, evaluate concentrations of metals in Tschicoma dacite, and determine whether contaminants had migrated to groundwater (NMED 2009, 107361). Four new boreholes were advanced into the top of the Tschicoma dacite. Dacite samples were collected at two depths from each of the two boreholes located outside the MDA C boundary and analyzed for TAL metals. Because the lateral and vertical extent of inorganic chemicals, organic chemicals, and radionuclides in tuff had previously been defined, no samples were collected from the overlying tuff in any of the new boreholes. The four new boreholes were completed as vapor-monitoring wells. Six quarterly rounds of vapor sampling were performed during 2010 and 2011. The first 4 rounds were performed using the 14 existing Phase II vapor-monitoring wells, and final 2 rounds were performed using the Phase II wells and the 4 new Phase III wells. To evaluate potential groundwater contamination, a new regional well, well R-60, was installed approximately 100 ft east of MDA C. Two quarterly rounds of groundwater samples were collected from well R-60.

C-4.1 Vapor Sampling

Four new vapor-monitoring wells were installed during the Phase III investigation. Three of these wells were installed next to existing Phase II vapor-monitoring wells to provide deeper sampling ports below the TD of the existing wells. The remaining well was installed at a location without an existing well. Before these 4 new wells were installed, 4 rounds of vapor samples (January 2010–April 2010, April 2010–July 2010, July 2010–September 2010, and October 2010–January 2011) were collected using the vapor-monitoring well network installed during the 2008–2009 Phase II investigation. Following installation of the 4 new wells, 2 additional rounds of vapor samples (January 2011–March 2011 and March 2011–May 2011) were collected from the existing and new wells. The total number of vapor samples collected during these 6 events was 132, 127, 126, 127, 154, and 154, respectively, for a total of 820 samples). The vapor samples were submitted for analysis of VOCs and tritium. Figure C-4.1-1 shows the sampling locations, and Table C-4.1-1 shows the sampling port depths and geologic units monitored at each location. Tables C-4.1-2 through C-4.1-7 summarize the samples collected and analyses requested during each of the 6 events. Samples for VOCs were collected in SUMMA canisters, and samples for tritium were collected in silica gel sample tubes.

Results for VOCs and tritium in vapor samples collected in the Phase II investigation are presented in Tables C-4.1-8 through C-4.1-13 and Tables C-4.1-14 through C-4.1-19, respectively.

The results of pore-gas samples collected from the deep Phase III monitoring wells showed VOC concentrations to decrease with depth to concentrations below screening levels. The lateral and vertical extent of vapor-phase VOC contamination at MDA C were defined.

C-4.2 Tschicoma Dacite Sampling

Two of the four deep boreholes installed during the 2010–2011 Phase III investigation were installed outside the footprint of MDA C to the south of Pajarito Road (locations 50-613184 and 50-613185 in Figure C-4.1-1). These boreholes were advanced approximately 20 ft into the top of the dacite and two samples were collected from each borehole and analyzed for TAL metals. The boreholes outside the MDA C footprint were sampled because these locations were judged to be most likely to be representative of background conditions. Table C-4-2-1 summarizes the samples collected and analyses requested.

TAL metals detected in the dacite samples are presented in Table C-4.2-2.

No background concentration data are available for metals in the Tschicoma dacite. The concentrations of most metals detected in the Phase III dacite samples were much lower than the concentrations previously detected in the Phase II sample from borehole 50-603470. Because the concentrations of metals in the sample from borehole 50-603470 appeared more representative of soil and a soil horizon was video-logged at the top of the dacite in nearby well R-60, it was concluded that the metals detected in dacite at borehole 50-603470 were not associated with a contaminant release.

C-4.3 Groundwater Sampling

Regional well R-60 was completed during the 2010–2011 Phase III investigation. Data from the first two sampling events (December 16, 2010, and January 24, 2011) were evaluated as part of the Phase III investigation report. Based on the results of the core and vapor sampling, VOCs and tritium were the only contaminants that had migrated any significant distance from the MDA C disposal units toward the regional aquifer. Groundwater samples collected from well R-60 showed one VOC (acetone) detected in the first sample but no VOCs detected in the second sample. Tritium was not detected in either sample. These results indicate vapor-phase migration of VOCs and tritium from MDA C to the regional aquifer is not occurring.

C-5.0 POST-INVESTIGATION VAPOR SAMPLING

Follow submittal of the Phase III investigation report for MDA C, vapor monitoring was performed in accordance with the frequencies and locations recommended in the report (LANL 2011, 204370, pp. 96–97). The report recommended quarterly sampling from 46 ports at 10 locations and annual sampling from 108 ports at 13 locations. The ports recommended for quarterly sampling were sampled in August 2011 and the ports recommended for annual sampling were sampled in October and November 2011. The samples collected and analyses requested for these two sampling events are presented in Tables C-5.0-1 and C-5.0-2, respectively. The Phase III investigation report was approved by NMED with modifications in December 2011 (NMED 2011, 208797). NMED's approval with modifications specified a revised monitoring program consisting of semiannual sampling from 80 ports at 18 locations. The first semiannual sampling event was conducted in March and April 2012. The samples collected and analyses requested for this event are presented in Table C-5.0-3.

VOCs detected in vapor samples collected during the August 2011, October–November 2011, and March–April 2012 sampling events are presented in Tables C-5.0-4 through C-5.0-6, respectively. Tritium detected in vapor samples from these events is presented in Tables C-5.0-7 through C-5.0-9.

C-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. This information is also included in text citations. ER IDs 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 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), October 2005. "Investigation Work Plan for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50, Revision 2," Los Alamos National Laboratory document LA-UR-05-7363, Los Alamos, New Mexico. (LANL 2005, 091493)

LANL (Los Alamos National Laboratory), December 2006. "Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," Los Alamos National Laboratory document LA-UR-06-8096, Los Alamos, New Mexico. (LANL 2006, 094688)

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LANL (Los Alamos National Laboratory), July 2007. "Phase II Investigation Work Plan for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50, Revision 1," Los Alamos National Laboratory document LA-UR-07-5083, Los Alamos, New Mexico. (LANL 2007, 098425)

LANL (Los Alamos National Laboratory), March 2008. "Pilot Test Work Plan for Evaluating Vapor-Sampling Systems at Material Disposal Area C," Los Alamos National Laboratory document LA-UR-08-1614, Los Alamos, New Mexico. (LANL 2008, 101653)

LANL (Los Alamos National Laboratory), July 2008. "Pilot Test Investigation Report for Evaluating Vapor-Sampling Systems at Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," Los Alamos National Laboratory document LA-UR-08-4814, Los Alamos, New Mexico. (LANL 2008, 102651)

LANL (Los Alamos National Laboratory), October 2009. "Phase II Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50, Revision 1," Los Alamos National Laboratory document LA-UR-09-6266, Los Alamos, New Mexico. (LANL 2009, 107389)

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LANL (Los Alamos National Laboratory), June 2011. "Phase III Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," Los Alamos National Laboratory document LA-UR-11-3429, Los Alamos, New Mexico. (LANL 2011, 204370)

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NMED (New Mexico Environment Department), February 19, 2007. "Notice of Disapproval (NOD) for Material Disposal Area (MDA) C, Solid Waste Management Unit 50-009, at Technical Area 50," New Mexico Environment Department letter to D. Gregory (DOE LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2007, 095437)

NMED (New Mexico Environment Department), March 28, 2008. "Approval with Modification, Pilot Test Work Plan for Evaluating Vapor-Sampling Systems at Material Disposal Area C," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 101113)

NMED (New Mexico Environment Department), September 10, 2008. "Approval, Pilot Test Investigation Report for Evaluating Vapor-Sampling Systems at Material Disposal Area C," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 102903)

NMED (New Mexico Environment Department), October 15, 2009. "Second Notice of Disapproval, Phase II Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 107361)

NMED (New Mexico Environment Department), December 8, 2011. "Approval, Phase III Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 208797)

NMED (New Mexico Environment Department), February 2012 (updated June 2012). "Risk Assessment Guidance for Site Investigations and Remediation," Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2012, 219971)

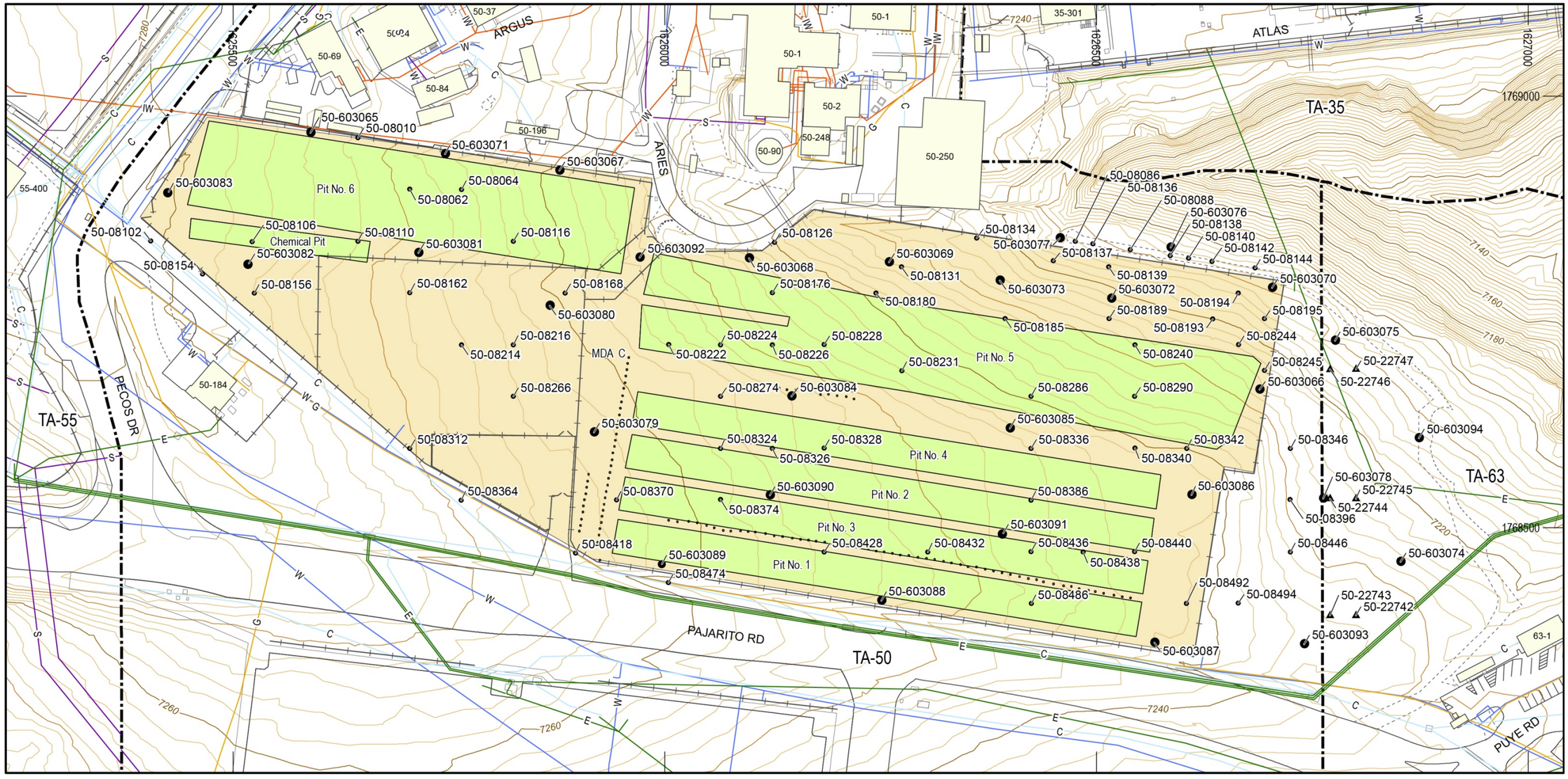

Figure C-2.1-1 All surface and near-surface sampling locations at MDA C

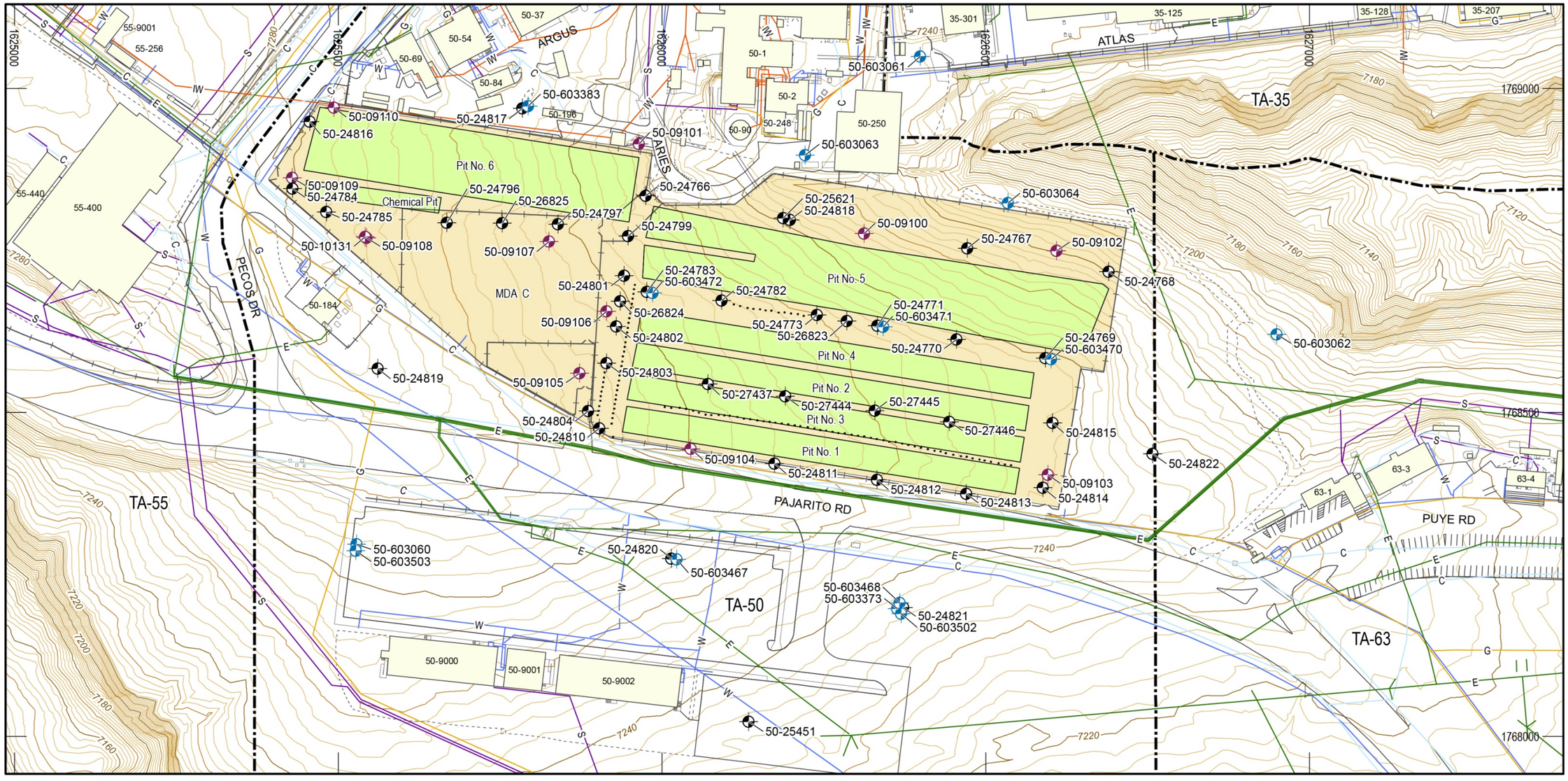

Figure C-2.3-1 Locations of boreholes used to collect core samples at MDA C

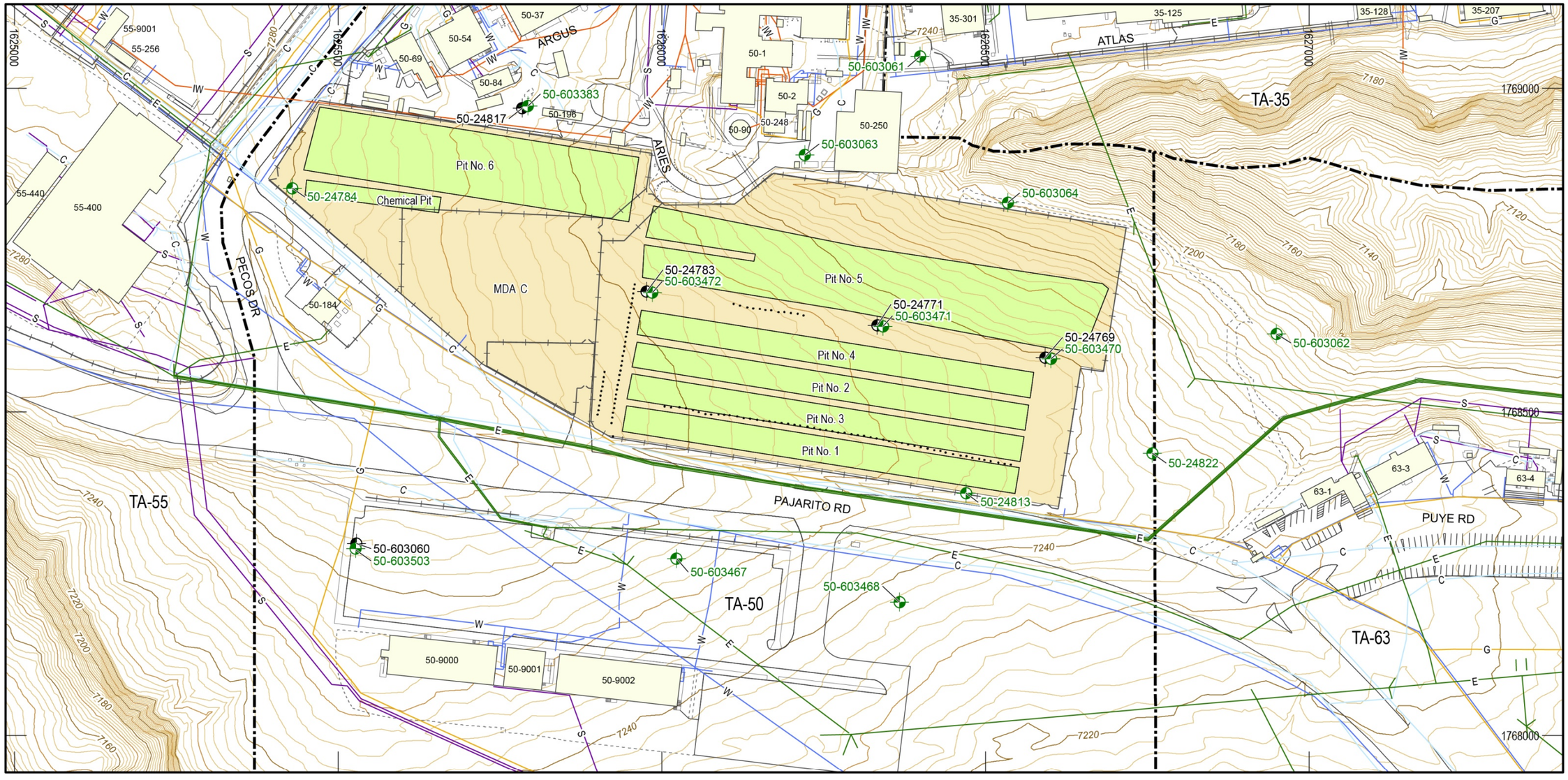

Figure C-3.2-1 Phase II boreholes and vapor-sampling locations

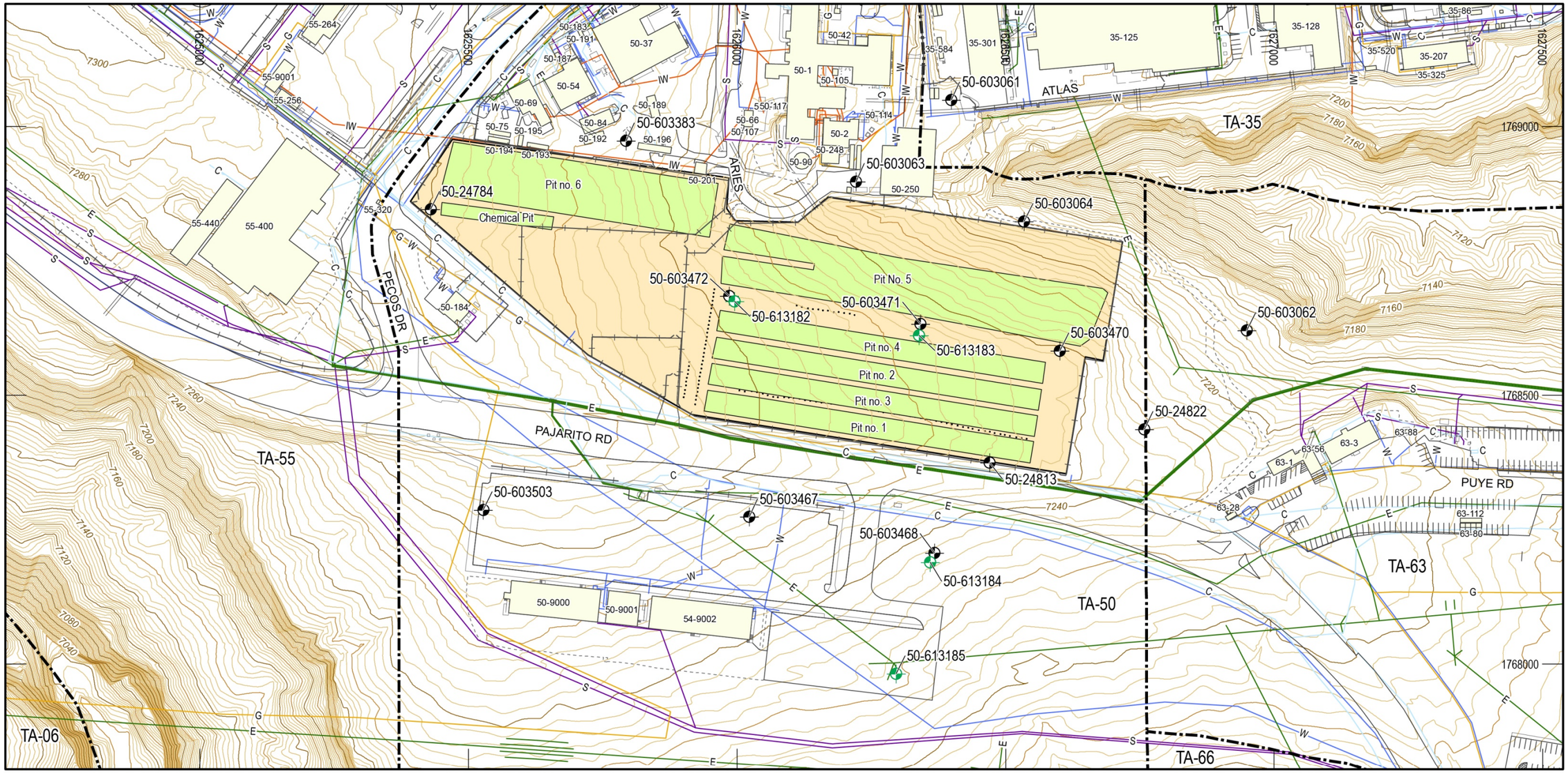

Figure C-4.1-1 Locations of vapor-monitoring boreholes sampled during Phase III investigation at MDA C

Table C-2.1-1
Summary of Surface Soil Samples Collected at MDA C during 2004–2007 Investigation

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Gamma-Emitting Radionuclides	Isotopic Plutonium	Isotopic Uranium	Strontium-90
50-22742	MD50-04-53250	0–0.5	Soil	2149S*	2149S	2149S	2149S	2149S
50-22743	MD50-04-53251	0–0.5	Soil	2149S	2149S	2149S	2149S	2149S
50-22744	MD50-04-53252	0–0.5	Soil	2149S	2149S	2149S	2149S	2149S
50-22745	MD50-04-53253	0–0.5	Soil	2149S	2149S	2149S	2149S	2149S
50-22746	MD50-04-53254	0–0.5	Soil	2149S	2149S	2149S	2149S	2149S
50-22747	MD50-04-53255	0–0.5	Soil	2149S	2149S	2149S	2149S	2149S

*Analytical request number.

Table C-2.1-2
Radionuclides Detected or Detected Above BVs/FVs in
Surface Soil Samples at MDA C during 2004–2007 Investigation

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Cesium-134	Plutonium-238	Plutonium-239
Soil/Fill BV/FV[a]				**0.013**	**na**[b]	**0.023**	**0.054**
Industrial SAL[c]				**180**	**9.7**	**240**	**210**
Residential SAL[c]				**30**	**2.4**	**37**	**33**
50-22742	MD50-04-53250	0.0–0.5	Soil	—[d]	0.08	—	0.36
50-22743	MD50-04-53251	0.0–0.5	Soil	0.05	—	0.04	1.12
50-22744	MD50-04-53252	0.0–0.5	Soil	—	0.08	—	0.74
50-22745	MD50-04-53253	0.0–0.5	Soil	0.08	0.08	0.07	0.62
50-22746	MD50-04-53254	0.0–0.5	Soil	—	—	—	1.84
50-22747	MD50-04-53255	0.0–0.5	Soil	0.1	—	0.03	3

Note: Units are pCi/g.

[a] BVs and FVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SALs are from LANL (2009, 107655).

[d] — = Not detected or not detected greater than BV/FV.

Table C-2.3-1
Summary of Subsurface Tuff Samples Collected at MDA C during 2004–2007 Investigation

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Anions	Cyanide	Dioxins & Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs
50-24766	MD50-06-64603	15.6–17.1	Qbt 3	5069S[a]	5068S	5068S	5066S	5069S	5067S	5069S	5069S	5068S	5067S	5067S	5069S	5067S	—[b]
50-24766	MD50-06-64604	27.5–29.2	Qbt 3	5069S	5068S	5068S	5066S	5069S	5067S	5069S	5069S	5068S	5067S	5067S	5069S	5067S	—
50-24766	MD50-06-64586	97.5–99.9	Qbt 2	5073S	5072S	5072S	—	5073S	—	5073S	5073S	5072S	5071S	5071S	5073S	5071S	—
50-24766	MD50-06-64587	122.5–124.6	Qbt 2	5073S	5072S	5072S	—	5073S	—	5073S	5073S	5072S	5071S	5071S	5073S	5071S	—
50-24766	MD50-06-64605	148.1–149.5	Qbt 2	5082S	5082S	5082S	5080S	5082S	—	5082S	5082S	5082S	5081S	5081S	5082S	5081S	—
50-24767	MD50-06-64635	8–10	Qbt 3	4737S	4737S	4737S	4735S	4737S	4736S	4737S	4737S	4737S	4736S	4736S	4737S	4736S	—
50-24767	MD50-06-64636	28.1–30	Qbt 3	4754S	4754S	4754S	4752S	4754S	4753S	4754S	4754S	4754S	4753S	4753S	4754S	4753S	—
50-24767	MD50-06-66770	29.5–30	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	4741S
50-24767	MD50-06-64618	58.3–59.8	Qbt 3	4768S	4767S	4767S	—	4768S	—	4768S	4768S	4767S	4766S	4766S	4768S	4766S	—
50-24767	MD50-06-66772	59.9–60	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	4764S
50-24767	MD50-06-64619	123.2–125	Qbt 2	4768S	4767S	4767S	—	4768S	—	4768S	4768S	4767S	4766S	4766S	4768S	4766S	—
50-24767	MD50-06-64637	148.3–149.8	Qbt 2	4768S	4767S	4767S	4765S	4768S	—	4768S	4768S	4767S	4766S	4766S	4768S	4766S	—
50-24768	MD50-06-64667	12.5–15	Qbt 3	4782S	4781S	4781S	4779S	4782S	4780S	4782S	4782S	4781S	4780S	4780S	4782S	4780S	—
50-24768	MD50-06-64668	27.5–29.5	Qbt 3	4782S	4781S	4781S	4779S	4782S	4780S	4782S	4782S	4781S	4780S	4780S	4782S	4780S	—
50-24768	MD50-06-64650	96.7–99.5	Qbt 2	4807S	4806S	4806S	—	4807S	—	4807S	4807S	4806S	4805S	4805S	4807S	4805S	—
50-24768	MD50-06-64651	123.2–125	Qbt 2	4807S	4806S	4806S	—	4807S	—	4807S	4807S	4806S	4805S	4805S	4807S	4805S	—
50-24768	MD50-06-64669	148.6–151.5	Qbt 2	4807S	4806S	4806S	4804S	4807S	—	4807S	4807S	4806S	4805S	4805S	4807S	4805S	—
50-24769	MD50-06-64699	18.1–20	Qbt 3	4815S	4814S	4814S	4812S	4815S	4813S	4815S	4815S	4814S	4813S	4813S	4815S	4813S	—
50-24769	MD50-06-64700	37.5–39.9	Qbt 3	4815S	4814S	4814S	4812S	4815S	4813S	4815S	4815S	4814S	4813S	4813S	4815S	4813S	—
50-24769	MD50-06-64682	97.5–99.3	Qbt 3	4839S	4838S	4838S	—	4839S	—	4839S	4839S	4838S	4837S	4837S	4839S	4837S	—
50-24769	MD50-06-64683	122.5–124.5	Qbt 2	4839S	4838S	4838S	—	4839S	—	4839S	4839S	4838S	4837S	4837S	4839S	4837S	—
50-24769	MD50-06-64701	147.9–149.8	Qbt 2	4839S	4838S	4838S	4841S	4839S	—	4839S	4839S	4838S	4837S	4837S	4839S	4837S	—
50-24770	MD50-06-64731	18.1–22.5	Qbt 3	4909S	4908S	4908S	4906S	4909S	4907S	4909S	4909S	4908S	4907S	4907S	4909S	4907S	—
50-24770	MD50-06-64717	24.6–25	Qbt 3	4909S	4908S	4908S	—	4909S	—	4909S	4909S	4908S	4907S	4907S	4909S	4907S	—
50-24770	MD50-06-64732	38.2–39.9	Qbt 3	4909S	4908S	4908S	4906S	4909S	4907S	4909S	4909S	4908S	4907S	4907S	4909S	4907S	—
50-24770	MD50-06-64714	98.7–100	Qbt 3	4931S	4931S	4931S	—	4931S	—	4931S	4931S	4931S	4930S	4930S	4931S	4930S	—
50-24770	MD50-06-64715	123.2–124.6	Qbt 3	4939S	4938S	4938S	—	4939S	—	4939S	4939S	4938S	4937S	4937S	4939S	4937S	—
50-24770	MD50-06-64733	147.5–150	Qbt 2	4939S	4938S	4938S	4936S	4939S	—	4939S	4939S	4938S	4937S	4937S	4939S	4937S	—
50-24771	MD50-06-64756	15.9–17.5	Qbt 3	4853S	4853S	4853S	4851S	4853S	4852S	4853S	4853S	4853S	4852S	4852S	4853S	4852S	—
50-24771	MD50-06-64757	38–40	Qbt 3	4884S	4883S	4883S	4881S	4884S	4882S	4884S	4884S	4883S	4882S	4882S	4884S	4882S	—
50-24771	MD50-06-64739	98.8–100	Qbt 2	4884S	4883S	4883S	—	4884S	—	4884S	4884S	4883S	4882S	4882S	4884S	4882S	—
50-24771	MD50-06-64740	123.6–125	Qbt 2	4884S	4883S	4883S	—	4884S	—	4884S	4884S	4883S	4882S	4882S	4884S	4882S	—
50-24771	MD50-06-64758	148.2–150	Qbt 2	4884S	4883S	4883S	4881S	4884S	—	4884S	4884S	4883S	4882S	4882S	4884S	4882S	—
50-24773	MD50-06-64781	20–22.5	Qbt 3	4819S	4818S	4818S	4816S	4819S	4817S	4819S	4819S	4818S	4817S	4817S	4819S	4817S	—
50-24773	MD50-06-64782	38–40	Qbt 3	4836S	4836S	4836S	4840S	4836S	4835S	4836S	4836S	4836S	4835S	4835S	4836S	4835S	—

Table C-2.3-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Anions	Cyanide	Dioxins & Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs
50-24773	MD50-06-64764	98.5–100	Qbt 2	4850S	4849S	4849S	—	4850S	—	4850S	4850S	4849S	4848S	4848S	4850S	4848S	—
50-24773	MD50-06-64765	123.7–124.8	Qbt 2	4850S	4849S	4849S	—	4850S	—	4850S	4850S	4849S	4848S	4848S	4850S	4848S	—
50-24773	MD50-06-64783	150–152.8	Qbt 2	4850S	4849S	4849S	4847S	4850S	—	4850S	4850S	4849S	4848S	4848S	4850S	4848S	—
50-24782	MD50-06-64813	20.9–22.5	Qbt 3	4763S	4762S	4762S	4760S	4763S	4761S	4763S	4763S	4762S	4761S	4761S	4763S	4761S	—
50-24782	MD50-06-64814	35.3–37.1	Qbt 3	4763S	4762S	4762S	4760S	4763S	4761S	4763S	4763S	4762S	4761S	4761S	4763S	4761S	—
50-24782	MD50-06-64796	98.5–100	Qbt 3	4784S	4784S	4784S	—	4784S	—	4784S	4784S	4784S	4783S	4783S	4784S	4783S	—
50-24782	MD50-06-64797	123.5–125	Qbt 3	4803S	4802S	4802S	—	4803S	—	4803S	4803S	4802S	4801S	4801S	4803S	4801S	—
50-24782	MD50-06-64815	156–157.5	Qbt 3	4803S	4802S	4802S	4800S	4803S	—	4803S	4803S	4802S	4801S	4801S	4803S	4801S	—
50-24783	MD50-06-64838	17.5–20	Qbt 3	4725S	4724S	4724S	4730S	4725S	4723S	4725S	4725S	4724S	4723S	4723S	4725S	4723S	—
50-24783	MD50-06-64839	35.4–37.5	Qbt 3	4725S	4724S	4724S	4730S	4725S	4723S	4725S	4725S	4724S	4723S	4723S	4725S	4723S	—
50-24783	MD50-06-64821	98.6–100	Qbt 3	4739S	4739S	4739S	—	4739S	—	4739S	4739S	4739S	4738S	4738S	4739S	4738S	—
50-24783	MD50-06-64822	123.3–125	Qbt 2	4751S	4750S	4750S	—	4751S	—	4751S	4751S	4750S	4749S	4749S	4751S	4749S	—
50-24783	MD50-06-64840	150.3–152.5	Qbt 2	4751S	4750S	4750S	4748S	4751S	—	4751S	4751S	4750S	4749S	4749S	4751S	4749S	—
50-24784	MD50-06-64380	8–10	Qbt 3	4579S	4579S	4579S	4577S	4579S	4578S	4579S	4579S	4579S	4578S	4578S	4579S	4578S	—
50-24784	MD50-06-64381	18–20	Qbt 3	4598S	4597S	4597S	4595S	4598S	4596S	4598S	4598S	4597S	4596S	4596S	4598S	4596S	—
50-24784	MD50-06-64363	46.1–47.5	Qbt 3	4598S	4597S	4597S	—	4598S	—	4598S	4598S	4597S	4596S	4596S	4598S	4596S	—
50-24784	MD50-06-64364	48.7–50	Qbt 3	4598S	4597S	4597S	—	4598S	—	4598S	4598S	4597S	4596S	4596S	4598S	4596S	—
50-24784	MD50-06-64365	51–55	Qbt 3	4626S	4625S	4625S	—	4626S	—	4626S	4626S	4625S	4624S	4624S	4626S	4624S	—
50-24784	MD50-06-64367	98.5–100	Qbt 3	4626S	4625S	4625S	—	4626S	—	4626S	4626S	4625S	4624S	4624S	4626S	4624S	—
50-24784	MD50-06-64366	167.5–169	Qbt 2	4661S	4660S	4660S	—	4661S	—	4661S	4661S	4660S	4659S	4659S	4661S	4659S	—
50-24784	MD50-06-64369	197.9–199.2	Qbt 1v	4672S	4671S	4671S	—	4672S	—	4672S	4672S	4671S	4670S	4670S	4672S	4670S	—
50-24784	MD50-06-64368	248–250	Qbt 1v	4672S	4671S	4671S	—	4672S	—	4672S	4672S	4671S	4670S	4670S	4672S	4670S	—
50-24784	MD50-06-65526	273.5–275	Qbt 1g	4681S	4681S	4681S	—	4681S	—	4681S	4681S	4681S	4680S	4680S	4681S	4680S	—
50-24784	MD50-06-64382	298.3–299.8	Qbt 1g	4679S	4679S	4679S	4678S	4679S	—	4679S	4679S	4679S	4677S	4677S	4679S	4677S	—
50-24785	MD50-06-64412	8.5–10	Qbt 3	4425S	4424S	4424S	4422S	4425S	4423S	4425S	4425S	4424S	4423S	4423S	4425S	4423S	—
50-24785	MD50-06-64413	17.5–19	Qbt 3	4438S	4437S	4437S	4435S	4438S	4436S	4438S	4438S	4437S	4436S	4436S	4438S	4436S	—
50-24785	MD50-06-64395	57.5–60	Qbt 3	4468S	4467S	4467S	—	4468S	—	4468S	4468S	4467S	4466S	4466S	4468S	4466S	—
50-24785	MD50-06-64396	117.5–120	Qbt 2	4484S	4483S	4483S	—	4484S	—	4484S	4484S	4483S	4482S	4482S	4484S	4482S	—
50-24785	MD50-06-64397	198.7–200	Qbt 1v	4499S	4498S	4498S	—	4499S	—	4499S	4499S	4498S	4497S	4497S	4499S	4497S	—
50-24785	MD50-06-64398	248.5–250	Qbt 1g	4539S	4539S	4539S	—	4539S	—	4539S	4539S	4539S	4538S	4538S	4539S	4538S	—
50-24785	MD50-06-64414	273.8–275	Qbt 1g	4544S	4544S	4544S	4545S	4544S	—	4544S	4544S	4544S	4544S	4544S	4544S	4544S	—
50-24796	MD50-06-64457	8–10	Qbt 3	4250S	4250S	4250S	4250S	4250S	4250S	4250S	4250S	4250S	4250S	—	4250S	4250S	—
50-24796	MD50-06-64458	17.5–19.3	Qbt 3	4250S	4250S	4250S	4250S	4250S	4250S	4250S	4250S	4250S	4250S	—	4250S	4250S	—
50-24796	MD50-06-64440	37.5–39.3	Qbt 3	4271S	4270S	4270S	—	4271S	—	4271S	4271S	4270S	4269S	—	4271S	4269S	—
50-24796	MD50-06-64441	97.5–100	Qbt 3	4271S	4270S	4270S	—	4271S	—	4271S	4271S	4270S	4269S	—	4271S	4269S	—
50-24796	MD50-06-64442	118.7–120	Qbt 2	4281S	4280S	4280S	—	4281S	—	4281S	4281S	4280S	4278S	—	4281S	4278S	—

Table C-2.3-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Anions	Cyanide	Dioxins & Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs
50-24796	MD50-06-64459	147.5–149.4	Qbt 2	4281S	4280S	4280S	4279S	4281S	—	4281S	4281S	4280S	4278S	—	4281S	4278S	—
50-24797	MD50-06-64506	17.5–18.3	Qbt 3	4311S	4311S	4311S	4304S	4311S	4311S	4311S	4311S	4311S	4311S	4311S	4311S	4311S	—
50-24797	MD50-06-64509	37–38	Qbt 3	4320S	4320S	4320S	4319S	4320S	4320S	4320S	4320S	4320S	4320S	4320S	4320S	4320S	—
50-24797	MD50-06-64489	58–60	Qbt 3	4335S	4334S	4334S	—	4335S	—	4335S	4335S	4334S	4333S	4333S	4335S	4333S	—
50-24797	MD50-06-64490	117–120	Qbt 2	4335S	4334S	4334S	—	4335S	—	4335S	4335S	4334S	4333S	4333S	4335S	4333S	—
50-24797	MD50-06-64508	157.5–159	Qbt 2	4380S	4380S	4380S	4378S	4380S	—	4380S	4380S	4380S	4379S	4379S	4380S	4379S	—
50-24799	MD50-06-64516	13.1–15	Qbt 3	4298S	4298S	4298S	—	4298S	—	4298S	4298S	4298S	4298S	4298S	4298S	4298S	—
50-24799	MD50-06-64517	15–16.5	Qbt 3	4298S	4298S	4298S	—	4298S	—	4298S	4298S	4298S	4298S	4298S	4298S	4298S	—
50-24799	MD50-06-64531	18–20	Qbt 3	4298S	4298S	4298S	4297S	4298S	4298S	4298S	4298S	4298S	4298S	4298S	4298S	4298S	—
50-24799	MD50-06-64532	30.6–32.5	Qbt 3	4310S	4310S	4310S	4301S	4310S	4309S	4310S	4310S	4310S	4309S	4309S	4310S	4309S	—
50-24799	MD50-06-64518	34.5–36	Qbt 3	4310S	4310S	4310S	—	4310S	—	4310S	4310S	4310S	4309S	4309S	4310S	4309S	—
50-24799	MD50-06-64519	38.5–40	Qbt 3	4310S	4310S	4310S	—	4310S	—	4310S	4310S	4310S	4309S	4309S	4310S	4309S	—
50-24799	MD50-06-64514	98.3–100	Qbt 3	4337S	4337S	4337S	—	4337S	—	4337S	4337S	4337S	4336S	4336S	4337S	4336S	—
50-24799	MD50-06-64515	118.4–120	Qbt 2	4374S	4373S	4373S	—	4374S	—	4374S	4374S	4373S	4371S	4371S	4374S	4371S	—
50-24799	MD50-06-64533	158.5–160	Qbt 2	4374S	4373S	4373S	4372S	4374S	—	4374S	4374S	4373S	4371S	4371S	4374S	4371S	—
50-24801	MD50-06-64863	16.8–20	Qbt 3	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	—
50-24801	MD50-06-64864	33–35	Qbt 3	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	4504S	—
50-24801	MD50-06-64846	78–80	Qbt 3	4541S	4541S	4541S	—	4541S	—	4541S	4541S	4541S	4540S	4540S	4541S	4540S	—
50-24801	MD50-06-64847	118–120	Qbt 2	4542S	4542S	4542S	—	4542S	—	4542S	4542S	4542S	4542S	4542S	4542S	4542S	—
50-24801	MD50-06-64865	148.3–150	Qbt 2	4542S	4542S	4542S	4543S	4542S	—	4542S	4542S	4542S	4542S	4542S	4542S	4542S	—
50-24802	MD50-06-64888	12.5–16.1	Qbt 3	4686S	4686S	4686S	4695S	4686S	4687S	4686S	4686S	4686S	4687S	4687S	4686S	4687S	—
50-24802	MD50-06-64889	40.6–42.5	Qbt 3	4686S	4686S	4686S	4695S	4686S	4687S	4686S	4686S	4686S	4687S	4687S	4686S	4687S	—
50-24802	MD50-06-64871	98.2–100	Qbt 3	4694S	4693S	4693S	—	4694S	—	4694S	4694S	4693S	4691S	4691S	4694S	4691S	—
50-24802	MD50-06-64872	123.1–125	Qbt 2	4694S	4693S	4693S	—	4694S	—	4694S	4694S	4693S	4691S	4691S	4694S	4691S	—
50-24802	MD50-06-64890	157.5–159.1	Qbt 2	4694S	4693S	4693S	4692S	4694S	—	4694S	4694S	4693S	4691S	4691S	4694S	4691S	—
50-24803	MD50-06-64913	15.4–17.5	Qbt 3	4707S	4707S	4707S	4705S	4707S	4706S	4707S	4707S	4707S	4706S	4706S	4707S	4706S	—
50-24803	MD50-06-64914	36–37.5	Qbt 3	4711S	4710S	4710S	4708S	4711S	4709S	4711S	4711S	4710S	4709S	4709S	4711S	4709S	—
50-24803	MD50-06-64896	98.7–99.8	Qbt 3	4711S	4710S	4710S	—	4711S	—	4711S	4711S	4710S	4709S	4709S	4711S	4709S	—
50-24803	MD50-06-64897	123.3–124.8	Qbt 2	4711S	4710S	4710S	—	4711S	—	4711S	4711S	4710S	4709S	4709S	4711S	4709S	—
50-24803	MD50-06-64915	150–153.9	Qbt 2	4711S	4710S	4710S	4708S	4711S	—	4711S	4711S	4710S	4709S	4709S	4711S	4709S	—
50-24804	MD50-06-64965	8.6–9.8	Qbt 3	5091S	5090S	5090S	—	5091S	—	5091S	5091S	5090S	5089S	5089S	5091S	5089S	—
50-24804	MD50-06-64966	10–11.4	Qbt 3	5091S	5090S	5090S	—	5091S	—	5091S	5091S	5090S	5089S	5089S	5091S	5089S	—
50-24804	MD50-06-64980	15.4–17.1	Qbt 3	5091S	5090S	5090S	5088S	5091S	5089S	5091S	5091S	5090S	5089S	5089S	5091S	5089S	—
50-24804	MD50-06-64981	32.5–34.2	Qbt 3	5114S	5113S	5113S	5111S	5114S	5112S	5114S	5114S	5113S	5112S	5112S	5114S	5112S	—
50-24804	MD50-06-64963	97.8–99.2	Qbt 3	5114S	5113S	5113S	—	5114S	—	5114S	5114S	5113S	5112S	5112S	5114S	5112S	—
50-24804	MD50-06-64964	122.5–124.1	Qbt 3	5114S	5113S	5113S	—	5114S	—	5114S	5114S	5113S	5112S	5112S	5114S	5112S	—

Table C-2.3-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Anions	Cyanide	Dioxins & Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs
50-24804	MD50-06-64982	147.5–149.8	Qbt 2	5114S	5113S	5113S	5111S	5114S	—	5114S	5114S	5113S	5112S	5112S	5114S	5112S	—
50-24810	MD50-06-65005	17.5–19	Qbt 3	5038S	5037S	5037S	5035S	5038S	5036S	5038S	5038S	5037S	5036S	5036S	5038S	5036S	—
50-24810	MD50-06-65006	35.5–37.1	Qbt 3	5038S	5037S	5037S	5035S	5038S	5036S	5038S	5038S	5037S	5036S	5036S	5038S	5036S	—
50-24810	MD50-06-64988	97.5–99	Qbt 3	5038S	5037S	5037S	—	5038S	—	5038S	5038S	5037S	5036S	5036S	5038S	5036S	—
50-24810	MD50-06-64989	122.5–123.9	Qbt 2	5038S	5037S	5037S	—	5038S	—	5038S	5038S	5037S	5036S	5036S	5038S	5036S	—
50-24810	MD50-06-65007	148.3–151.6	Qbt 2	5042S	5041S	5041S	5039S	5042S	—	5042S	5042S	5041S	5040S	5040S	5042S	5040S	—
50-24811	MD50-06-65075	18.5–20	Qbt 3	5004S	5003S	5003S	5001S	5004S	5002S	5004S	5004S	5003S	5002S	5002S	5004S	5002S	—
50-24811	MD50-06-65076	38.5–40	Qbt 3	5004S	5003S	5003S	5001S	5004S	5002S	5004S	5004S	5003S	5002S	5002S	5004S	5002S	—
50-24811	MD50-06-65058	97.5–98.7	Qbt 3	5010S	5009S	5009S	—	5010S	—	5010S	5010S	5009S	5008S	5008S	5010S	5008S	—
50-24811	MD50-06-65059	123.2–125	Qbt 2	5010S	5009S	5009S	—	5010S	—	5010S	5010S	5009S	5008S	5008S	5010S	5008S	—
50-24811	MD50-06-65077	147.5–150.6	Qbt 2	5025S	5025S	5025S	5023S	5025S	—	5025S	5025S	5025S	5024S	5024S	5025S	5024S	—
50-24812	MD50-06-65100	8.4–10	Qbt 3	4970S	4970S	4970S	4969S	4970S	4970S	4970S	4970S	4970S	4970S	4970S	4970S	4970S	—
50-24812	MD50-06-65101	33.5–35	Qbt 3	4970S	4970S	4970S	4969S	4970S	4970S	4970S	4970S	4970S	4970S	4970S	4970S	4970S	—
50-24812	MD50-06-65083	97.5–98.9	Qbt 3	4968S	4968S	4968S	—	4968S	—	4968S	4968S	4968S	4968S	4968S	4968S	4968S	—
50-24812	MD50-06-65084	122.5–123.7	Qbt 2	4968S	4968S	4968S	—	4968S	—	4968S	4968S	4968S	4968S	4968S	4968S	4968S	—
50-24812	MD50-06-65102	146–150	Qbt 2	4975S	4975S	4975S	4974S	4975S	—	4975S	4975S	4975S	4975S	4975S	4975S	4975S	—
50-24813	MD50-06-65132	18.2–20	Qbt 3	4935S	4934S	4934S	4932S	4935S	4933S	4935S	4935S	4934S	4933S	4933S	4935S	4933S	—
50-24813	MD50-06-65133	30–31.9	Qbt 3	4935S	4934S	4934S	4932S	4935S	4933S	4935S	4935S	4934S	4933S	4933S	4935S	4933S	—
50-24813	MD50-06-65115	98.2–99.7	Qbt 3	4949S	4948S	4948S	—	4949S	—	4949S	4949S	4948S	4947S	4947S	4949S	4947S	—
50-24813	MD50-06-65116	123.5–125	Qbt 2	4949S	4948S	4948S	—	4949S	—	4949S	4949S	4948S	4947S	4947S	4949S	4947S	—
50-24813	MD50-06-65134	148–150	Qbt 2	4949S	4948S	4948S	4946S	4949S	—	4949S	4949S	4948S	4947S	4947S	4949S	4947S	—
50-24814	MD50-06-65157	7.5–9.1	Qbt 3	4880S	4880S	4880S	4878S	4880S	4879S	4880S	4880S	4880S	4879S	4879S	4880S	4879S	—
50-24814	MD50-06-65158	30–31.6	Qbt 3	4913S	4912S	4912S	4910S	4913S	4911S	4913S	4913S	4912S	4911S	4912S	4913S	4911S	—
50-24814	MD50-06-65140	96.8–99.9	Qbt 3	4913S	4912S	4912S	—	4913S	—	4913S	4913S	4912S	4911S	4911S	4913S	4911S	—
50-24814	MD50-06-65141	123.5–124.8	Qbt 2	4913S	4912S	4912S	—	4913S	—	4913S	4913S	4912S	4911S	4911S	4913S	4911S	—
50-24814	MD50-06-65159	147.5–149.5	Qbt 2	4913S	4912S	4912S	4910S	4913S	—	4913S	4913S	4912S	4911S	4911S	4913S	4911S	—
50-24815	MD50-06-65189	17.5–20	Qbt 3	4846S	4845S	4845S	4843S	4846S	4844S	4846S	4846S	4845S	4844S	4844S	4846S	4844S	—
50-24815	MD50-06-65190	37.8–41.5	Qbt 3	4846S	4845S	4845S	4843S	4846S	4844S	4846S	4846S	4845S	4844S	4844S	4846S	4844S	—
50-24815	MD50-06-65172	98.8–100	Qbt 3	4857S	4856S	4856S	—	4857S	—	4857S	4857S	4856S	4855S	4855S	4857S	4855S	—
50-24815	MD50-06-65173	123.4–125	Qbt 2	4857S	4856S	4856S	—	4857S	—	4857S	4857S	4856S	4855S	4855S	4857S	4855S	—
50-24815	MD50-06-65191	147.8–149.7	Qbt 2	4857S	4856S	4856S	4854S	4857S	—	4857S	4857S	4856S	4855S	4855S	4857S	4855S	—
50-24816	MD50-06-65214	23.1–24.7	Qbt 3	4415S	4414S	4414S	4412S	4415S	4413S	4415S	4415S	4414S	4413S	4413S	4415S	4413S	—
50-24816	MD50-06-65215	32.2–34	Qbt 3	4415S	4414S	4414S	4412S	4415S	4413S	4415S	4415S	4414S	4413S	4413S	4415S	4413S	—
50-24816	MD50-06-65197	63.8–65	Qbt 3	4441S	4440S	4440S	—	4441S	—	4441S	4441S	4440S	4439S	4439S	4441S	4439S	—
50-24816	MD50-06-65198	118.7–120	Qbt 2	4441S	4440S	4440S	—	4441S	—	4441S	4441S	4440S	4439S	4439S	4441S	4439S	—
50-24816	MD50-06-65199	198.8–200	Qbt 2	4465S	4464S	4464S	—	4465S	—	4465S	4465S	4464S	4463S	4463S	4465S	4463S	—

Table C-2.3-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Anions	Cyanide	Dioxins & Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs
50-24816	MD50-06-65216	223.4–225	Qbt 2	4465S	4464S	4464S	4462S	4465S	—	4465S	4465S	4464S	4463S	4463S	4465S	4463S	—
50-24817	MD50-05-63837	18.4–20	Qbt 3	4015S	4014S	4014S	4012S	4015S	—	4015S	4015S	4014S	4013S	—	4015S	4013S	—
50-24817	RE50-05-63807	18.4–20	Qbt 3	—	—	—	—	—	3983S	—	—	—	—	—	—	—	—
50-24817	MD50-05-63838	37–40	Qbt 3	4015S	4014S	4014S	4012S	4015S	—	4015S	4015S	4014S	4013S	—	4015S	4013S	—
50-24817	RE50-05-63808	37–40	Qbt 3	—	—	—	—	—	3994S	—	—	—	—	—	—	—	—
50-24817	RE50-05-63810	98.8–100	Qbt 3	4016S	4016S	4016S	—	4016S	—	4016S	4016S	4016S	4016S	—	4016S	4016S	—
50-24817	RE50-05-63811	138–140	Qbt 2	4034S	4033S	4033S	—	4034S	—	4034S	4034S	4033S	4032S	—	4034S	4032S	—
50-24817	RE50-05-63812	198.4–200	Qbt 1v	4034S	4033S	4033S	—	4034S	—	4034S	4034S	4033S	4032S	—	4034S	4032S	—
50-24817	MD50-05-63839	248.1–250	Qbt 1g	4055S	4055S	4055S	4056S	4055S	—	4055S	4055S	4055S	4055S	—	4055S	4055S	—
50-24818	MD50-06-65229	8.5–10	Qbt 3	4556S	4556S	4556S	4554S	4556S	4555S	4556S	4556S	4556S	4555S	4555S	4556S	4555S	—
50-24818	MD50-06-65230	22.1–25	Qbt 3	4571S	4570S	4570S	4569S	4571S	4568S	4571S	4571S	4570S	4568S	4568S	4571S	4568S	—
50-24818	MD50-06-65261	98.5–100	Qbt 2	4588S	4587S	4587S	—	4588S	—	4588S	4588S	4587S	4586S	4586S	4588S	4586S	—
50-24818	MD50-06-66758	100.4–100.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	4602S
50-24818	MD50-06-65262	147.5–149.2	Qbt 2	4623S	4623S	4623S	—	4623S	—	4623S	4623S	4623S	4622S	4622S	4623S	4622S	—
50-24818	MD50-06-65263	189.9–190	Qbt 1v	4648S	4649S	4649S	—	4648S	—	4648S	4648S	4649S	4647S	4647S	4648S	4647S	—
50-24818	MD50-06-66759	190–190	Qbt 1v	—	—	—	—	—	—	—	—	—	—	—	—	—	4632S
50-24818	MD50-06-65264	247.7–249.2	Qbt 1g	4658S	4657S	4657S	—	4658S	—	4658S	4658S	4657S	4656S	4656S	4658S	4656S	—
50-24818	MD50-06-65265	280–282.5	Qbt 1g	4675S	4674S	4674S	—	4675S	—	4675S	4675S	4674S	4673S	4673S	4675S	4673S	—
50-24818	MD50-06-66760	312.9–313	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	4666S
50-24818	MD50-06-65266	313.5–315	Qbt 1g	4683S	4683S	4683S	—	4683S	—	4683S	4683S	4683S	4682S	4682S	4683S	4682S	—
50-24818	MD50-06-65267	396–402	Qbo	5110S	5110S	5110S	—	5110S	—	5110S	5110S	5110S	5109S	5109S	5110S	5109S	—
50-24818	MD50-06-66761	397.9–398	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	5108S
50-24818	MD50-06-65268	449–452	Qbo	5345S	5345S	5345S	—	5345S	—	5345S	5345S	5345S	5344S	5344S	5345S	5344S	—
50-24818	MD50-06-65269	497–500.5	Qbo	5366S	5366S	5366S	—	5366S	—	5366S	5366S	5366S	5365S	5365S	5366S	5365S	—
50-24818	MD50-06-66762	498.4–498.5	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	5328S
50-24818	MD50-06-65270	547–551.5	Qbo	5369S	5368S	5368S	—	5369S	—	5369S	5369S	5368S	5367S	5367S	5369S	5367S	—
50-24818	MD50-06-65271	597–600.4	Qbo	5369S	5368S	5368S	—	5369S	—	5369S	5369S	5368S	5367S	5367S	5369S	5367S	—
50-24818	MD50-06-66763	600.4–600.5	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	5334S
50-24819	RE50-05-61422	18.5–20	Qbt 3	3676S	3675S	3675S	—	3676S	—	3676S	3676S	3675S	3674S	—	3676S	3674S	—
50-24819	RE50-05-61423	48–50	Qbt 3	3689S	3688S	3688S	3840S	3689S	—	3689S	3689S	3688S	3687S	—	3689S	3687S	—
50-24819	RE50-05-61424	97.5–100	Qbt 3	3707S	3706S	3706S	—	3707S	—	3707S	3707S	3706S	3705S	—	3707S	3705S	—
50-24819	RE50-05-61425	138.5–140	Qbt 2	3707S	3706S	3706S	—	3707S	—	3707S	3707S	3706S	3705S	—	3707S	3705S	—
50-24819	RE50-05-61426	198.1–200	Qbt 1v	3737S	3737S	3737S	—	3737S	—	3737S	3737S	3737S	3737S	—	3737S	3737S	—
50-24819	RE50-05-61427	246.5–250	Qbt 1v	3734S	3734S	3734S	—	3734S	—	3734S	3734S	3734S	3734S	—	3734S	3734S	—
50-24819	RE50-05-61428	273–275	Qbt 1g	3757S	3756S	3756S	3755S	3757S	—	3757S	3757S	3756S	3754S	—	3757S	3754S	—
50-24820	RE50-05-61438	17.5–20	Qbt 3	3788S	3788S	3788S	—	3788S	—	3788S	3788S	3788S	3788S	3788S	3788S	—	—

Table C-2.3-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Anions	Cyanide	Dioxins & Furans	Gamma-Emitting Radionuclides	Explosive Compounds	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs
50-24820	RE50-05-61439	48.4–50	Qbt 3	3794S	3794S	3794S	3793S	3794S	—	3794S	3794S	3794S	3794S	3794S	3794S	—	—
50-24820	RE50-05-63429	48.4–50	Qbt 3	—	—	—	—	—	3792S	—	—	—	—	—	—	—	—
50-24820	RE50-05-61440	97.5–100	Qbt 3	3806S	3805S	3805S	—	3806S	—	3806S	3806S	3805S	3804S	3806S	3804S	—	—
50-24820	RE50-05-61441	138.7–140	Qbt 2	3826S	3826S	3826S	—	3826S	—	3826S	3826S	3826S	3826S	3826S	3826S	—	—
50-24820	RE50-05-61442	198.2–200	Qbt 1v	3833S	3832S	3832S	—	3833S	—	3833S	3833S	3832S	3831S	3833S	3831S	—	—
50-24820	RE50-05-61443	248.3–250	Qbt 1g	3833S	3832S	3832S	—	3833S	—	3833S	3833S	3832S	3831S	3833S	3831S	—	—
50-24821	RE50-05-61456	18.6–20	Qbt 3	3841S	3841S	3841S	—	3841S	—	3841S	3841S	3841S	3841S	3841S	3841S	—	—
50-24821	RE50-05-63430	18.6–20	Qbt 3	—	—	—	—	—	3866S	—	—	—	—	—	—	—	—
50-24821	RE50-05-61457	48.6–50	Qbt 3	3841S	3841S	3841S	3840S	3841S	—	3841S	3841S	3841S	3841S	3841S	3841S	—	—
50-24821	RE50-05-63535	48.6–50	Qbt 3	—	—	—	—	—	3856S	—	—	—	—	—	—	—	—
50-24821	RE50-05-61458	98.4–100	Qbt 3	3859S	3859S	3859S	—	3859S	—	3859S	3859S	3859S	3859S	3859S	3859S	—	—
50-24821	RE50-05-61460	137.5–140	Qbt 2	3870S	3870S	3870S	—	3870S	—	3870S	3870S	3870S	3870S	3870S	3870S	—	—
50-24821	RE50-05-61459	157.5–160	Qbt 2	3881S	3881S	3881S	—	3881S	—	3881S	3881S	3881S	3881S	3881S	3881S	—	—
50-24821	RE50-05-61461	248.6–250	Qbt 1g	3893S	3893S	3893S	—	3893S	—	3893S	3893S	3893S	3893S	3893S	3893S	—	—
50-24822	RE50-05-61474	18.6–20	Qbt 3	3902S	3902S	3902S	—	3902S	—	3902S	3902S	3902S	3902S	—	3902S	3902S	—
50-24822	RE50-05-61475	47.5–49.1	Qbt 3	3924S	3924S	3924S	3925S	3924S	—	3924S	3924S	3924S	3924S	—	3924S	3924S	—
50-24822	RE50-05-63431	47.5–49.1	Qbt 3	—	—	—	—	—	3920S	—	—	—	—	—	—	—	—
50-24822	RE50-05-61476	98.6–100	Qbt 3	3924S	3924S	3924S	—	3924S	—	3924S	3924S	3924S	3924S	—	3924S	3924S	—
50-24822	RE50-05-61477	137.5–139.2	Qbt 2	3946S	3946S	3946S	—	3946S	—	3946S	3946S	3946S	3946S	—	3946S	3946S	—
50-24822	RE50-05-61478	198.5–200	Qbt 1v	3951S	3951S	3951S	—	3951S	—	3951S	3951S	3951S	3951S	—	3951S	3951S	—
50-24822	RE50-05-61479	248.7–250	Qbt 1g	3961S	3961S	3961S	—	3961S	—	3961S	3961S	3961S	3960S	—	3961S	3960S	—
50-25451	MD50-06-66697	18.7–19.9	Qbt 3	4967S	4967S	4967S	4966S	4967S	4967S	4967S	4967S	4967S	4967S	4967S	4967S	4967S	—
50-25451	MD50-06-66698	48.1–49.9	Qbt 3	4967S	4967S	4967S	4966S	4967S	4967S	4967S	4967S	4967S	4967S	4967S	4967S	4967S	—
50-25451	MD50-06-66671	96–100	Qbt 2	5000S	4999S	4999S	—	5000S	—	5000S	5000S	4999S	4998S	4998S	5000S	4998S	—
50-25451	MD50-06-66672	146–147.5	Qbt 2	5000S	4999S	4999S	—	5000S	—	5000S	5000S	4999S	4998S	4998S	5000S	4998S	—
50-25451	MD50-06-66673	198.9–200	Qbt 2	5000S	4999S	4999S	—	5000S	—	5000S	5000S	4999S	4998S	4998S	5000S	4998S	—
50-25451	MD50-06-66674	251.2–252.5	Qbt 1g	5012S	5012S	5012S	—	5012S	—	5012S	5012S	5012S	5011S	5011S	5012S	5011S	—
50-25451	MD50-06-66699	298.5–300	Qbt 1g	5028S	5028S	5028S	5026S	5028S	—	5028S	5028S	5028S	5027S	5027S	5028S	5027S	—
50-25621	MD50-06-68034	29.7–30	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	4861S
50-25621	MD50-06-68035	59.7–60	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	4861S

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-2.3-2
Samples Collected and Analyses Requested in Boreholes between Pits 2 and 3 during 2004–2007 Investigation

Sample ID	Location ID	Depth (ft)	Media	Anions	Cyanide (total)	TAL metals	Perchlorate	Dioxins and furans	Explosive compounds	PCBs	SVOCs	VOCs	Americium-241	Gamma-emitting radionuclides	Tritium	Isotopic plutonium	Isotopic uranium	Strontium-90
MD50-07-75313	50-27437	4–5	Fill	6660S	6660S	6660S	6660S	—*	—	6659S	6659S	6659S	6661S	6661S	—	6661S	6661S	6661S
MD50-07-75329	50-27437	10–10	Vapor	—	—	—	—	—	—	—	—	6718S	—	—	6719S	—	—	—
MD50-07-75328	50-27437	20–20	Vapor	—	—	—	—	—	—	—	—	6718S	—	—	6719S	—	—	—
MD50-07-75314	50-27437	20.5–22.5	Qbt 3	6666S	6666S	6666S	6666S	—	—	6665S	6665S	6665S	6667S	6667S	—	6667S	6667S	6667S
MD50-07-75327	50-27437	32–32	Vapor	—	—	—	—	—	—	—	—	6718S	—	—	6719S	—	—	—
MD50-07-75317	50-27437	32.5–35	Qbt 3	6666S	6666S	6666S	6666S	6664S	6665S	6665S	6665S	6665S	6667S	6667S	—	6667S	6667S	6667S
MD50-07-75315	50-27437	60—62.5	Qbt 3	6666S	6666S	6666S	6666S	—	—	6665S	6665S	6665S	6667S	6667S	—	6667S	6667S	6667S
MD50-07-75326	50-27437	60–60	Vapor	—	—	—	—	—	—	—	—	6702S	—	—	6703S	—	—	—
MD50-07-75318	50-27437	80–82	Qbt 3	6666S	6666S	6666S	6666S	6664S	6665S	6665S	6665S	6665S	6667S	6667S	—	6667S	6667S	6667S
MD50-07-75325	50-27437	80–80	Vapor	—	—	—	—	—	—	—	—	6702S	—	—	6703S	—	—	—
MD50-07-75351	50-27444	20–22.5	Qbt 3	6713S	6713S	6713S	6713S	—	—	6712S	6712S	6712S	6714S	6714S	—	6714S	6714S	6714S
MD50-07-75367	50-27444	20–20	Vapor	—	—	—	—	—	—	—	—	6794S	—	—	6793S	—	—	—
MD50-07-75355	50-27444	35–37.5	Qbt 3	6713S	6713S	6713S	6713S	6710S	6711S	6712S	6712S	6712S	6714S	6714S	—	6714S	6714S	6714S
MD50-07-75366	50-27444	35–35	Vapor	—	—	—	—	—	—	—	—	6794S	—	—	6793S	—	—	—
MD50-07-75352	50-27444	60–65	Qbt 3	6721S	6721S	6721S	6721S	—	—	6720S	6720S	6720S	6722S	6722S	—	6722S	6722S	6722S
MD50-07-75365	50-27444	60–60	Vapor	—	—	—	—	—	—	—	—	6794S	—	—	6793S	—	—	—
MD50-07-75354	50-27444	80–82.5	Qbt 3	6721S	6721S	6721S	6721S	—	—	6720S	6720S	6720S	6722S	6722S	—	6722S	6722S	6722S
MD50-07-75364	50-27444	80–80	Vapor	—	—	—	—	—	—	—	—	6782S	—	—	6790S	—	—	—
MD50-07-75363	50-27444	97–97	Vapor	—	—	—	—	—	—	—	—	6782S	—	—	6790S	—	—	—
MD50-07-75357	50-27444	97.5–100	Qbt 3	6735S	6735S	6735S	6735S	—	—	6734S	6734S	6734S	6736S	6736S	—	6736S	6736S	6736S
MD50-07-75362	50-27444	140–140	Vapor	—	—	—	—	—	—	—	—	6782S	—	—	6790S	—	—	—
MD50-07-75368	50-27444	140–153	Qbt 2	6735S	6735S	6735S	6735S	—	—	6734S	6734S	6734S	6736S	6736S	—	6736S	6736S	6736S
MD50-07-75361	50-27444	197–197	Vapor	—	—	—	—	—	—	—	—	6776S	—	—	6777S	—	—	—
MD50-07-76314	50-27444	197.5–200	Qbt 1v	6750S	6750S	6750S	6750S	—	—	6749S	6749S	6749S	6750S	6750S	—	6750S	6750S	6750S
MD50-07-75360	50-27444	247–247	Vapor	—	—	—	—	—	—	—	—	6776S	—	—	6777S	—	—	—
MD50-07-76315	50-27444	247.5–250	Qbt 1v	6764S	6764S	6764S	6764S	—	—	6763S	6763S	6763S	6765S	6765S	—	6765S	6765S	6765S
MD50-07-75359	50-27444	296–296	Vapor	—	—	—	—	—	—	—	—	6776S	—	—	6777S	—	—	—
MD50-07-76316	50-27444	296–300	Qbt 1g	6764S	6764S	6764S	6764S	—	—	6763S	6763S	6763S	6765S	6765S	—	6765S	6765S	6765S
MD50-07-75356	50-27444	332.5–335	Qct	6762S	6762S	6762S	6762S	6759S	6760S	6761S	6761S	6761S	6762S	6762S	—	6762S	6762S	6762S

Table C-2.3-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Anions	Cyanide (total)	TAL metals	Perchlorate	Dioxins and furans	Explosive compounds	PCBs	SVOCs	VOCs	Americium-241	Gamma-emitting radionuclides	Tritium	Isotopic plutonium	Isotopic uranium	Strontium-90
MD50-07-75358	50-27444	335–335	Vapor	—	—	—	—	—	—	—	—	6756S	—	—	6758S	—	—	—
MD50-07-75374	50-27445	2.5–5	Fill	6679S	6679S	6679S	6679S	—	—	6678S	6678S	6678S	6680S	6680S	—	6680S	6680S	6680S
MD50-07-75386	50-27445	10–10	Vapor	—	—	—	—	—	—	—	—	6742S	—	—	6743S	—	—	—
MD50-07-75375	50-27445	20–22.5	Qbt 3	6679S	6679S	6679S	6679S	—	—	6678S	6678S	6678S	6680S	6680S	—	6680S	6680S	6680S
MD50-07-75385	50-27445	20–20	Vapor	—	—	—	—	—	—	—	—	6742S	—	—	6743S	—	—	—
MD50-07-75379	50-27445	35–37.5	Qbt 3	6679S	6679S	6679S	6679S	6678S	6678S	6678S	6678S	6678S	6680S	6680S	—	6680S	6680S	6680S
MD50-07-75384	50-27445	35–35	Vapor	—	—	—	—	—	—	—	—	6731S	—	—	6732S	—	—	—
MD50-07-75383	50-27445	62–62	Vapor	—	—	—	—	—	—	—	—	6731S	—	—	6732S	—	—	—
MD50-07-75376	50-27445	62.5–65	Qbt 3	6688S	6688S	6688S	6688S	—	—	6686S	6686S	6686S	6689S	6689S	—	6689S	6689S	6689S
MD50-07-75380	50-27445	80–82.5	Qbt 3	6688S	6688S	6688S	6688S	6684S	6687S	6686S	6686S	6686S	6689S	6689S	—	6689S	6689S	6689S
MD50-07-75382	50-27445	80–80	Vapor	—	—	—	—	—	—	—	—	6730S	—	—	6732S	—	—	—
MD50-07-75398	50-27446	2.5–5	Fill	6697S	6697S	6697S	6697S	—	—	6696S	6696S	6696S	6698S	6698S	—	6698S	6698S	6698S
MD50-07-75410	50-27446	10–10	Vapor	—	—	—	—	—	—	—	—	6755S	—	—	6757S	—	—	—
MD50-07-75399	50-27446	20–22.5	Qbt 3	6697S	6697S	6697S	6697S	—	—	6696S	6696S	6696S	6698S	6698S	—	6698S	6698S	6698S
MD50-07-75409	50-27446	20–20	Vapor	—	—	—	—	—	—	—	—	6755S	—	—	6757S	—	—	—
MD50-07-75408	50-27446	32–32	Vapor	—	—	—	—	—	—	—	—	6751S	—	—	6752S	—	—	—
MD50-07-75403	50-27446	35–37.5	Qbt 3	6697S	6697S	6697S	6697S	6704S	6705S	6696S	6696S	6696S	6698S	6698S	—	6698S	6698S	6698S
MD50-07-75400	50-27446	61–65	Qbt 3	6700S	6700S	6700S	6700S	—	—	6699S	6699S	6699S	6701S	6701S	—	6701S	6701S	6701S
MD50-07-75407	50-27446	61–61	Vapor	—	—	—	—	—	—	—	—	6751S	—	—	6752S	—	—	—
MD50-07-75404	50-27446	80–82.5	Qbt 3	6700S	6700S	6700S	6700S	6706S	6707S	6699S	6699S	6699S	6701S	6701S	—	6701S	6701S	6701S
MD50-07-75406	50-27446	80–80	Vapor	—	—	—	—	—	—	—	—	6751S	—	—	6752S	—	—	—

Note: Numbers in analyte columns are request numbers.

*— = Analysis not requested.

Table C-2.3-3
Summary of Inorganic Chemicals Detected or Detected above Background Values in Tuff at MDA C during 2005–2006 Sampling

Location ID	Sample ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Qbt2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**
Qbt1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**
Qbt1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na**[c]	**1700000**[d]	**302**[e]	**45400**	**795000**
Residential SSL[b]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000**[d]	**23**[e]	**31300**	**54800**
50-24766	MD50-06-64604	27.5–29.2	Qbt 3	—[f]	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64586	97.5–99.9	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64587	122.5–124.6	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64605	148.1–149.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24767	MD50-06-64635	8–10	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24767	MD50-06-64636	28.1–30	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24767	MD50-06-64618	58.3–59.8	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24767	MD50-06-64619	123.2–125	Qbt 2	16300 (J+)	—	2.93	56.3	3.4	—	—	—	—	4.73	—
50-24767	MD50-06-64637	148.3–149.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64667	12.5–15	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64668	27.5–29.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64650	96.7–99.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64651	123.2–125	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64669	148.6–151.5	Qbt 2	7580 (J+)	—	—	—	1.5	—	—	—	—	—	—
50-24769	MD50-06-64699	18.1–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64700	37.5–39.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64682	97.5–99.3	Qbt 3	25400	—	4.76	87.2 (J+)	—	—	3970	14.8	3.63	9.25	15600
50-24769	MD50-06-64683	122.5–124.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64701	147.9–149.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64731	18.1–22.5	Qbt 3	15200 (J+)	—	3.45	96.2	—	—	2540 (J+)	7.84	—	7.49	—
50-24770	MD50-06-64717	24.6–25	Qbt 3	—	—	—	217	—	—	3400 (J+)	—	—	—	—
50-24770	MD50-06-64732	38.2–39.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64714	98.7–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64715	123.2–124.6	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64733	147.5–150	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24771	MD50-06-64756	15.9–17.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24771	MD50-06-64757	38–40	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24771	MD50-06-64739	98.8–100	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24771	MD50-06-64740	123.6–125	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24771	MD50-06-64758	148.2–150	Qbt 2	—	—	—	—	—	—	—	—	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Qbt2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**
Qbt1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**
Qbt1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na[c]**	**1700000[d]**	**300[e]**	**45400**	**795000**
Residential SSL[b]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**54800**
50-24773	MD50-06-64781	20–22.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64782	38–40	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64764	98.5–100	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64765	123.7–124.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64783	150–152.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24782	MD50-06-64813	20.9–22.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24782	MD50-06-64814	35.3–37.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24782	MD50-06-64796	98.5–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24782	MD50-06-64797	123.5–125	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24782	MD50-06-64815	156–157.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64838	17.5–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64839	35.4–37.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64821	98.6–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64822	123.3–125	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64840	150.3–152.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64380	8–10	Qbt 3	—	—	—	—	—	—	—	7.89	—	—	—
50-24784	MD50-06-64381	18–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64363	46.1–47.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64364	48.7–50	Qbt 3	51100 (J+)	0.557 (U)	7.06	258	6.67	—	6040	23.4	5.79	20.7	26500
50-24784	MD50-06-64365	51–55	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64367	98.5–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64366	167.5–169	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64369	197.9–199.2	Qbt 1v	—	—	1.84	—	—	0.506 (U)	—	—	—	—	—
50-24784	MD50-06-64368	248–250	Qbt 1v	—	—	2.94	—	—	0.52 (U)	—	2.29	—	—	—
50-24784	MD50-06-65526	273.5–275	Qbt 1g	—	—	1.57 (U)	—	—	0.524 (U)	—	—	—	—	—
50-24784	MD50-06-64382	298.3–299.8	Qbt 1g	—	—	1.62 (U)	—	—	0.541 (U)	—	19.4	—	—	—
50-24785	MD50-06-64412	8.5–10	Qbt 3	11800 (J+)	—	—	65.2	—	—	—	9.36 (J)	—	—	—
50-24785	MD50-06-64413	17.5–19	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24785	MD50-06-64395	57.5–60	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24785	MD50-06-64396	117.5–120	Qbt 2	—	—	—	—	1.39	—	—	—	—	—	—
50-24785	MD50-06-64397	198.7–200	Qbt 1v	—	—	—	—	—	0.502 (U)	—	—	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Qbt2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**
Qbt1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**
Qbt1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na[c]**	**1700000[d]**	**300[e]**	**45400**	**795000**
Residential SSL[b]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**54800**
50-24785	MD50-06-64398	248.5–250	Qbt 1g	—	—	2.93	—	—	0.575 (U)	—	4.67 (J)	—	—	7640
50-24785	MD50-06-64414	273.8–275	Qbt 1g	—	—	0.668 (J)	—	—	0.541 (U)	—	—	—	—	—
50-24796	MD50-06-64457	8–10	Qbt 3	15100 (J+)	—	—	—	—	—	—	29	—	6.69	—
50-24796	MD50-06-64458	17.5–19.3	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64440	37.5–39.3	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64441	97.5–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64442	118.7–120	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64459	147.5–149.4	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64506	17.5–18.3	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64509	37–38	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64489	58–60	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64490	117–120	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64508	157.5–159	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64516	13.1–15	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64517	15–16.5	Qbt 3	9940 (J+)	—	2.82	51.2	—	—	—	7.69	—	—	—
50-24799	MD50-06-64531	18–20	Qbt 3	18000 (J+)	—	2.99	58	—	—	2330	11.5	—	5.82	—
50-24799	MD50-06-64532	30.6–32.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64518	34.5–36	Qbt 3	22600 (J+)	—	2.96	84.1 (J+)	2.32 (J)	—	3560 (J)	11.8	—	6.19	17200
50-24799	MD50-06-64519	38.5–40	Qbt 3	—	—	—	—	—	—	—	10.4	—	—	—
50-24799	MD50-06-64514	98.3–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64515	118.4–120	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64533	158.5–160	Qbt 2	—	—	—	—	2.67	—	—	—	—	—	—
50-24801	MD50-06-64863	16.8–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24801	MD50-06-64864	33–35	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24801	MD50-06-64846	78–80	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24801	MD50-06-64847	118–120	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24801	MD50-06-64865	148.3–150	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64888	12.5–16.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64889	40.6–42.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64871	98.2–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64872	123.1–125	Qbt 2	—	—	—	—	—	—	—	—	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Qbt2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**
Qbt1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**
Qbt1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na[c]**	**1700000[d]**	**300[e]**	**45400**	**795000**
Residential SSL[b]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**54800**
50-24802	MD50-06-64890	157.5–159.1	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64913	15.4–17.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64914	36–37.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64896	98.7–99.8	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64897	123.3–124.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64915	150–153.9	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64965	8.6–9.8	Qbt 3	—	—	3.63	—	—	—	—	—	—	5.16	—
50-24804	MD50-06-64966	10–11.4	Qbt 3	12700 (J+)	—	3.82	47.8	—	—	—	—	—	4.95	—
50-24804	MD50-06-64980	15.4–17.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64981	32.5–34.2	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64963	97.8–99.2	Qbt 3	—	1.08	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64964	122.5–124.1	Qbt 3	—	1.01	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64982	147.5–149.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-65005	17.5–19	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-65006	35.5–37.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-64988	97.5–99	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-64989	122.5–123.9	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-65007	148.3–151.6	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24811	MD50-06-65075	18.5–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24811	MD50-06-65076	38.5–40	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24811	MD50-06-65058	97.5–98.7	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24811	MD50-06-65059	123.2–125	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24811	MD50-06-65077	147.5–150.6	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24812	MD50-06-65100	8.4–10	Qbt 3	—	—	7.11	—	—	—	4850 (J)	8.08 (J)	3.56	11.4 (J)	—
50-24812	MD50-06-65101	33.5–35	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24812	MD50-06-65083	97.5–98.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24812	MD50-06-65084	122.5–123.7	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24812	MD50-06-65102	146–150	Qbt 2	24300 (J+)	—	4.56	—	5.62 (J)	—	2560 (J)	9.95 (J)	—	7.75 (J)	—
50-24813	MD50-06-65132	18.2–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24813	MD50-06-65133	30–31.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24813	MD50-06-65115	98.2–99.7	Qbt 3	—	—	—	—	—	—	—	—	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Qbt2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**
Qbt1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**
Qbt1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na[c]**	**1700000[d]**	**300[e]**	**45400**	**795000**
Residential SSL[b]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**54800**
50-24813	MD50-06-65116	123.5–125	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24813	MD50-06-65134	148–150	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65157	7.5–9.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65158	30–31.6	Qbt 3	—	—	—	—	1.26	—	—	—	—	—	—
50-24814	MD50-06-65140	96.8–99.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65141	123.5–124.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65159	147.5–149.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65189	17.5–20	Qbt 3	9660 (J+)	—	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65190	37.8–41.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65172	98.8–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65173	123.4–125	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65191	147.8–149.7	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65214	23.1–24.7	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65215	32.2–34	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65197	63.8–65	Qbt 3	—	—	—	—	1.69	—	—	—	—	—	—
50-24816	MD50-06-65198	118.7–120	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65199	198.8–200	Qbt 2	—	—	—	—	—	—	—	8.14 (J)	—	—	—
50-24816	MD50-06-65216	223.4–225	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24817	MD50-05-63837	18.4–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24817	MD50-05-63838	37–40	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24817	RE50-05-63810	98.8–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24817	RE50-05-63811	138–140	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24817	RE50-05-63812	198.4–200	Qbt 1v	—	—	—	—	—	0.525 (U)	—	—	—	—	—
50-24817	MD50-05-63839	248.1–250	Qbt 1g	7870	—	2.88	31.2	2.07	0.576 (U)	—	—	—	—	5740
50-24818	MD50-06-65229	8.5–10	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65230	22.1–25	Qbt 3	—	—	2.86	—	—	—	—	—	—	—	—
50-24818	MD50-06-65261	98.5–100	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65262	147.5–149.2	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65263	189.9–190	Qbt 1v	—	—	—	—	—	0.515 (U)	—	5.7	—	—	—
50-24818	MD50-06-65264	247.7–249.2	Qbt 1g	—	—	0.762 (J)	—	—	0.531 (U)	—	—	—	—	3760
50-24818	MD50-06-65265	280–282.5	Qbt 1g	—	—	1.61 (U)	—	—	0.537 (U)	—	7.63	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Qbt2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**
Qbt1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**
Qbt1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na[c]**	**1700000[d]**	**300[e]**	**45400**	**795000**
Residential SSL[b]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**54800**
50-24818	MD50-06-65266	313.5–315	Qbt 1g	—	—	1.71 (U)	—	—	0.571 (U)	—	—	—	—	—
50-24818	MD50-06-65267	396–402	Qbo	—	—	0.75 (J)	—	—	0.534 (U)	—	4.33	—	18.2 (J)	5600
50-24818	MD50-06-65268	449–452	Qbo	—	—	13.3	29.9	—	11.1 (U)	—	998	17.4	446	184000
50-24818	MD50-06-65269	497–500.5	Qbo	—	—	1.61 (U)	27 (J+)	—	0.538 (U)	—	3.56 (J)	—	14.3	5150
50-24818	MD50-06-65270	547–551.5	Qbo	—	—	1.63 (U)	—	—	0.545 (U)	—	2.66 (J)	—	127	—
50-24818	MD50-06-65271	597–600.4	Qbo	—	—	1.72 (U)	—	—	0.572 (U)	—	—	—	11.3	—
50-24819	RE50-05-61422	18.5–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24819	RE50-05-61423	48–50	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24819	RE50-05-61424	97.5–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24819	RE50-05-61425	138.5–140	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24819	RE50-05-61426	198.1–200	Qbt 1v	—	—	—	—	—	0.502 (U)	—	2.68 (J)	—	—	—
50-24819	RE50-05-61427	246.5–250	Qbt 1v	—	—	—	—	—	0.541 (U)	—	—	—	—	—
50-24819	RE50-05-61428	273–275	Qbt 1g	—	—	1.6 (U)	—	—	0.534 (U)	—	—	—	—	—
50-24820	RE50-05-61438	17.5–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61439	48.4–50	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61440	97.5–100	Qbt 3	10600 (J+)	—	—	108	—	—	2410	—	—	—	—
50-24820	RE50-05-61441	138.7–140	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61442	198.2–200	Qbt 1v	—	—	—	—	—	0.498 (U)	—	—	—	—	—
50-24820	RE50-05-61443	248.3–250	Qbt 1g	—	—	1.84	33.5	—	0.536 (U)	—	—	—	—	4660
50-24821	RE50-05-61456	18.6–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24821	RE50-05-61457	48.6–50	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24821	RE50-05-61458	98.4–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24821	RE50-05-61460	137.5–140	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24821	RE50-05-61459	157.5–160	Qbt 2	—	—	4.21	—	—	—	—	14.9 (J)	—	—	—
50-24821	RE50-05-61461	248.6–250	Qbt 1g	—	—	1.56 (U)	—	—	0.519 (U)	—	3.8 (J)	—	—	5260
50-24822	RE50-05-61474	18.6–20	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24822	RE50-05-61475	47.5–49.1	Qbt 3	—	—	—	—	1.36	—	—	—	—	—	—
50-24822	RE50-05-61476	98.6–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-24822	RE50-05-61477	137.5–139.2	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-24822	RE50-05-61478	198.5–200	Qbt 1v	—	—	—	—	—	0.499 (U)	—	—	—	—	—
50-24822	RE50-05-61479	248.7–250	Qbt 1g	—	—	0.643 (J)	—	—	0.519 (U)	—	2.76	—	—	4520

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Qbt2, 3, 4 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**14500**
Qbt1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**9900**
Qbt1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**3700**
Industrial SSL[b]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na[c]**	**1700000[d]**	**300[e]**	**45400**	**795000**
Residential SSL[b]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**54800**
50-25451	MD50-06-66697	18.7–19.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—
50-25451	MD50-06-66698	48.1–49.9	Qbt 3	—	—	—	—	2.07 (J)	—	—	—	—	—	—
50-25451	MD50-06-66671	96–100	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-25451	MD50-06-66672	146–147.5	Qbt 2	—	—	—	—	—	—	—	—	—	—	—
50-25451	MD50-06-66673	198.9–200	Qbt 2	—	—	—	—	—	—	—		—	—	—
50-25451	MD50-06-66674	251.2–252.5	Qbt 1g	—	—	1.56 (U)	—	—	0.519 (U)	—	—	—	—	—
50-25451	MD50-06-66699	298.5–300	Qbt 1g	—	—	1.61 (U)	—	—	0.538 (U)	—	2.99	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Vanadium	Zinc
Qbt2, 3, 4 BV[a]				**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**17**	**63.5**
Qbt1v BV[a]				**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**4.48**	**84.6**
Qbt1g, Qct, Qbo BV[a]				**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4.59**	**40**
Industrial SSL[b]				**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**5680**	**341000**
Residential SSL[b]				**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**391**	**23500**
50-24766	MD50-06-64604	27.5–29.2	Qbt 3	—	—	—	—	1.76	—	—	—	—	—	—
50-24766	MD50-06-64586	97.5–99.9	Qbt 2	—	—	—	—	1.19	0.00101 (J)	—	0.772 (J)	—	—	—
50-24766	MD50-06-64587	122.5–124.6	Qbt 2	—	—	—	—	1.24	0.00728	—	0.667 (J)	—	—	—
50-24766	MD50-06-64605	148.1–149.5	Qbt 2	—	—	—	—	1.1	—	—	1.57 (U)	—	—	—
50-24767	MD50-06-64635	8.0–10.0	Qbt 3	17.1	—	—	—	1.32	—	—	1.56 (U)	—	—	—
50-24767	MD50-06-64636	28.1–30.0	Qbt 3	18.6	—	—	—	2.36	—	—	1.53 (U)	—	—	—
50-24767	MD50-06-64618	58.3–59.8	Qbt 3	19.9	—	—	—	1.1	—	—	1.56 (U)	—	—	—
50-24767	MD50-06-64619	123.2–125.0	Qbt 2	—	1730 (J+)	—	—	—	—	—	1.65 (U)	—	—	—
50-24767	MD50-06-64637	148.3–149.8	Qbt 2	—	—	—	—	—	—	—	1.53 (U)	—	—	—
50-24768	MD50-06-64667	12.5–15.0	Qbt 3	—	—	—	—	—	—	—	1.47 (U)	—	—	—
50-24768	MD50-06-64668	27.5–29.5	Qbt 3	—	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24768	MD50-06-64650	96.7–99.5	Qbt 2	—	—	—	—	—	—	—	1.49 (U)	—	—	—
50-24768	MD50-06-64651	123.2–125.0	Qbt 2	14.6	—	—	—	—	—	—	1.45 (U)	—	—	—
50-24768	MD50-06-64669	148.6–151.5	Qbt 2	19.7	—	—	—	—	—	—	1.57 (U)	—	—	—
50-24769	MD50-06-64699	18.1–20.0	Qbt 3	—	—	—	—	6.99	0.00085 (J)	—	9.09	—	—	—
50-24769	MD50-06-64700	37.5–39.9	Qbt 3	—	—	—	—	2.9	0.000893 (J)	—	8.4	—	—	—
50-24769	MD50-06-64682	97.5–99.3	Qbt 3	12.6	4000 (J+)	—	—	—	0.00118 (J)	—	1.49 (U)	—	27.1	—
50-24769	MD50-06-64683	122.5–124.5	Qbt 2	—	—	—	—	1.22	0.00174 (J)	—	1.5 (U)	—	—	—
50-24769	MD50-06-64701	147.9–149.8	Qbt 2	—	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24770	MD50-06-64731	18.1–22.5	Qbt 3	24.6	2400	—	—	0.771 (J-)	0.00823	—	1.62 (U)	—	—	—
50-24770	MD50-06-64717	24.6–25.0	Qbt 3	14.1	—	—	—	0.741 (J-)	0.0209	—	1.54 (U)	—	—	—
50-24770	MD50-06-64732	38.2–39.9	Qbt 3	—	—	—	—	0.754 (J-)	0.00348	—	1.49 (U)	—	—	—
50-24770	MD50-06-64714	98.7–100.0	Qbt 3	—	—	—	—	0.786 (J)	—	—	1.51 (U)	—	—	—
50-24770	MD50-06-64715	123.2–124.6	Qbt 3	—	—	—	—	0.751 (J)	—	—	1.48 (U)	—	—	—
50-24770	MD50-06-64733	147.5–150.0	Qbt 2	—	—	—	—	0.795 (J)	—	—	1.5 (U)	—	—	—
50-24771	MD50-06-64756	15.9–17.5	Qbt 3	—	—	—	—	2.9	—	—	1.55 (U)	—	—	—
50-24771	MD50-06-64757	38.0–40.0	Qbt 3	—	—	—	—	0.828 (J)	0.000538 (J)	—	11	—	—	—
50-24771	MD50-06-64739	98.8–100.0	Qbt 2	—	—	—	—	2.06	0.00507	—	10.1	—	—	—
50-24771	MD50-06-64740	123.6–125.0	Qbt 2	—	—	—	—	0.919 (J)	0.00318	—	11.4	—	—	—
50-24771	MD50-06-64758	148.2–150.0	Qbt 2	—	—	—	—	0.694 (J)	—	—	12	—	—	—
50-24773	MD50-06-64781	20.0–22.5	Qbt 3	—	—	—	—	1.03 (J-)	0.00118 (J)	—	1.52 (U)	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Vanadium	Zinc
Qbt2, 3, 4 BV[a]				**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**17**	**63.5**
Qbt1v BV[a]				**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**4.48**	**84.6**
Qbt1g, Qct, Qbo BV[a]				**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4.59**	**40**
Industrial SSL[b]				**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**5680**	**341000**
Residential SSL[b]				**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**391**	**23500**
50-24773	MD50-06-64782	38.0–40.0	Qbt 3	—	—	—	—	1.13	—	—	1.54 (U)	—	—	—
50-24773	MD50-06-64764	98.5–100.0	Qbt 2	—	—	—	—	0.795 (J)	—	—	1.48 (U)	—	—	—
50-24773	MD50-06-64765	123.7–124.8	Qbt 2	—	—	—	—	0.693 (J)	—	—	1.45 (U)	—	—	—
50-24773	MD50-06-64783	150.0–152.8	Qbt 2	—	—	—	—	0.707 (J)	—	—	1.49 (U)	—	—	—
50-24782	MD50-06-64813	20.9–22.5	Qbt 3	—	—	—	—	1.51	0.00647	—	1.48 (U)	—	—	—
50-24782	MD50-06-64814	35.3–37.1	Qbt 3	—	—	—	—	2.43	0.0211	—	1.54 (U)	—	—	—
50-24782	MD50-06-64796	98.5–100.0	Qbt 3	—	—	—	—	—	—	—	1.46 (U)	—	—	—
50-24782	MD50-06-64797	123.5–125.0	Qbt 3	—	—	—	—	—	—	—	1.46 (U)	—	—	—
50-24782	MD50-06-64815	156.0–157.5	Qbt 3	—	—	—	—	—	—	—	1.51 (U)	—	—	—
50-24783	MD50-06-64838	17.5–20.0	Qbt 3	—	—	—	—	1.96	0.000591 (J)	—	1.52 (U)	—	—	—
50-24783	MD50-06-64839	35.4–37.5	Qbt 3	—	—	—	—	1.2	—	—	1.52 (U)	—	—	—
50-24783	MD50-06-64821	98.6–100.0	Qbt 3	14.2	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24783	MD50-06-64822	123.3–125.0	Qbt 2	—	—	—	—	—	—	—	1.47 (U)	—	—	—
50-24783	MD50-06-64840	150.3–152.5	Qbt 2	—	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24784	MD50-06-64380	8.0–10.0	Qbt 3	—	—	—	—	2.18 (J-)	—	—	15	—	—	—
50-24784	MD50-06-64381	18.0–20.0	Qbt 3	—	—	—	—	2.31	0.000758 (J)	—	6.12	—	—	—
50-24784	MD50-06-64363	46.1–47.5	Qbt 3	—	—	—	—	—	—	—	6.79	—	—	—
50-24784	MD50-06-64364	48.7–50.0	Qbt 3	25.8	7720	—	20.3	2.48	0.00123 (J)	6770 (J+)	20	—	39.3	103
50-24784	MD50-06-64365	51.0–55.0	Qbt 3	—	—	—	—	0.652 (J)	—	—	1.54 (U)	—	—	—
50-24784	MD50-06-64367	98.5–100.0	Qbt 3	—	—	—	—	0.51 (J)	—	—	1.55 (U)	—	—	—
50-24784	MD50-06-64366	167.5–169.0	Qbt 2	—	—	—	—	0.498 (J-)	—	—	1.48 (U)	—	—	—
50-24784	MD50-06-64369	197.9–199.2	Qbt 1v	—	—	—	—	0.53 (J-)	—	—	1.52 (U)	—	—	—
50-24784	MD50-06-64368	248.0–250.0	Qbt 1v	—	—	—	—	0.879 (J-)	0.00201 (J)	—	1.56 (U)	—	—	—
50-24784	MD50-06-65526	273.5–275.0	Qbt 1g	—	—	—	—	0.658 (J)	—	—	1.57 (U)	—	—	—
50-24784	MD50-06-64382	298.3–299.8	Qbt 1g	—	—	—	—	0.625 (J)	—	—	1.62 (U)	—	—	—
50-24785	MD50-06-64412	8.5–10.0	Qbt 3	—	—	—	—	—	0.00145 (J)	—	1.76 (U)	—	—	—
50-24785	MD50-06-64413	17.5–19.0	Qbt 3	—	—	—	—	—	—	—	1.52 (U)	—	—	—
50-24785	MD50-06-64395	57.5–60.0	Qbt 3	—	—	—	—	0.893	—	—	1.54 (U)	—	—	—
50-24785	MD50-06-64396	117.5–120.0	Qbt 2	—	—	—	—	—	—	—	1.54 (U)	—	—	—
50-24785	MD50-06-64397	198.7–200.0	Qbt 1v	—	—	—	—	1.12 (J-)	—	—	1.51 (U)	—	—	—
50-24785	MD50-06-64398	248.5–250.0	Qbt 1g	25.6	—	275	—	1.67	0.000926	—	3.14	—	—	62

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Vanadium	Zinc
Qbt2, 3, 4 BV[a]				**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**17**	**63.5**
Qbt1v BV[a]				**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**4.48**	**84.6**
Qbt1g, Qct, Qbo BV[a]				**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4.59**	**40**
Industrial SSL[b]				**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**5680**	**341000**
Residential SSL[b]				**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**391**	**23500**
50-24785	MD50-06-64414	273.8–275.0	Qbt 1g	81.5	—	—	—	—	—	—	1.75	—	—	81.7 (J)
50-24796	MD50-06-64457	8.0–10.0	Qbt 3	60.9 (J)	2530	—	—	4.54	0.00412	—	1.55 (U)	—	—	—
50-24796	MD50-06-64458	17.5–19.3	Qbt 3	17.3 (J)	—	—	—	1.89	0.000583 (J)	—	1.54 (U)	—	—	—
50-24796	MD50-06-64440	37.5–39.3	Qbt 3	—	—	—	—	0.659 (J)	—	—	1.5 (U)	—	—	—
50-24796	MD50-06-64441	97.5–100.0	Qbt 3	—	—	—	—	0.54 (J)	—	—	1.5 (U)	—	—	—
50-24796	MD50-06-64442	118.7–120.0	Qbt 2	—	—	—	—	0.555 (J-)	—	—	1.46 (U)	—	—	—
50-24796	MD50-06-64459	147.5–149.4	Qbt 2	—	—	—	—	0.629 (J-)	—	—	1.49 (U)	—	—	—
50-24797	MD50-06-64506	17.5–18.3	Qbt 3	—	—	—	—	1.17	—	—	1.54 (U)	—	—	—
50-24797	MD50-06-64509	37.0–38.0	Qbt 3	—	—	—	—	0.991 (J)	—	—	1.54 (U)	—	—	—
50-24797	MD50-06-64489	58.0–60.0	Qbt 3	—	—	—	—	—	—	—	1.49 (U)	—	—	—
50-24797	MD50-06-64490	117.0–120.0	Qbt 2	—	—	—	—	0.532 (J)	—	—	1.51 (U)	—	—	—
50-24797	MD50-06-64508	157.5–159.0	Qbt 2	—	—	—	—	—	—	—	1.54 (U)	—	—	—
50-24799	MD50-06-64516	13.1–15.0	Qbt 3	—	—	—	—	1.79	—	—	1.59 (U)	—	—	—
50-24799	MD50-06-64517	15.0–16.5	Qbt 3	—	—	—	—	1.73	—	—	1.56 (U)	—	—	—
50-24799	MD50-06-64531	18.0–20.0	Qbt 3	—	2550	—	—	1.7	—	—	1.59 (U)	—	—	—
50-24799	MD50-06-64532	30.6–32.5	Qbt 3	—	—	—	—	1.42	—	—	1.53 (U)	—	—	—
50-24799	MD50-06-64518	34.5–36.0	Qbt 3	16	3000	—	—	2.16	—	—	1.67 (U)	—	20.3	65
50-24799	MD50-06-64519	38.5–40.0	Qbt 3	—	—	—	—	1.35	0.000942 (J)	—	1.56 (U)	—	—	—
50-24799	MD50-06-64514	98.3–100.0	Qbt 3	—	—	—	—	3.32 (J-)	0.00069 (J)	—	1.54 (U)	—	—	—
50-24799	MD50-06-64515	118.4–120.0	Qbt 2	—	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24799	MD50-06-64533	158.5–160.0	Qbt 2	—	—	—	—	—	—	—	1.58 (U)	—	—	—
50-24801	MD50-06-64863	16.8–20.0	Qbt 3	—	—	—	—	2	—	—	1.56 (U)	—	—	—
50-24801	MD50-06-64864	33.0–35.0	Qbt 3	—	—	—	—	0.974 (J)	—	—	1.61 (U)	—	—	—
50-24801	MD50-06-64846	78.0–80.0	Qbt 3	—	—	—	—	—	—	—	1.53 (U)	—	—	—
50-24801	MD50-06-64847	118.0–120.0	Qbt 2	—	—	—	—	—	—	—	1.07 (J)	—	—	—
50-24801	MD50-06-64865	148.3–150.0	Qbt 2	—	—	—	—	—	—	—	1.42 (J)	—	—	—
50-24802	MD50-06-64888	12.5–16.1	Qbt 3	—	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24802	MD50-06-64889	40.6–42.5	Qbt 3	—	—	—	—	1.27	—	—	1.56 (U)	—	—	—
50-24802	MD50-06-64871	98.2–100.0	Qbt 3	—	—	—	—	0.708 (J)	—	—	1.55 (U)	—	—	—
50-24802	MD50-06-64872	123.1–125.0	Qbt 2	—	—	—	—	0.795 (J)	—	—	1.51 (U)	—	—	—
50-24802	MD50-06-64890	157.5–159.1	Qbt 2	—	—	—	—	0.664 (J)	—	—	1.46 (U)	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Vanadium	Zinc
Qbt2, 3, 4 BV[a]				**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**17**	**63.5**
Qbt1v BV[a]				**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**4.48**	**84.6**
Qbt1g, Qct, Qbo BV[a]				**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4.59**	**40**
Industrial SSL[b]				**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**5680**	**341000**
Residential SSL[b]				**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**391**	**23500**
50-24803	MD50-06-64913	15.4–17.5	Qbt 3	—	—	—	—	1.23	0.000538 (J)	—	1.67 (U)	—	—	—
50-24803	MD50-06-64914	36.0–37.5	Qbt 3	42.8	—	—	—	0.709 (J)	—	—	1.56 (U)	—	—	—
50-24803	MD50-06-64896	98.7–99.8	Qbt 3	—	—	—	—	1.18	—	—	1.56 (U)	—	—	—
50-24803	MD50-06-64897	123.3–124.8	Qbt 2	—	—	—	—	0.619 (J)	—	—	1.51 (U)	—	—	—
50-24803	MD50-06-64915	150.0–153.9	Qbt 2	—	—	—	—	0.641 (J)	—	—	1.54 (U)	—	—	—
50-24804	MD50-06-64965	8.6–9.8	Qbt 3	51.9	—	—	—	—	—	—	1.19 (J)	—	—	101
50-24804	MD50-06-64966	10.0–11.4	Qbt 3	32.4	2060	—	—	—	—	—	2.49	—	—	—
50-24804	MD50-06-64980	15.4–17.1	Qbt 3	68.6	—	—	—	1.14	—	—	0.75 (J)	—	—	—
50-24804	MD50-06-64981	32.5–34.2	Qbt 3	34.9	—	—	—	1.05	—	—	1 (J)	—	—	—
50-24804	MD50-06-64963	97.8–99.2	Qbt 3	—	—	—	—	1.13	—	—	0.695 (J)	1.53	—	—
50-24804	MD50-06-64964	122.5–124.1	Qbt 3	36	—	—	—	1.06	0.00735	—	1.58 (U)	1.43	—	—
50-24804	MD50-06-64982	147.5–149.8	Qbt 2	47.8	—	—	—	1 (J)	0.00668	—	1.52 (U)	—	—	—
50-24810	MD50-06-65005	17.5–19.0	Qbt 3	—	—	—	—	—	—	—	1.6 (U)	—	—	—
50-24810	MD50-06-65006	35.5–37.1	Qbt 3	—	—	—	—	—	—	—	1.59 (U)	—	—	—
50-24810	MD50-06-64988	97.5–99.0	Qbt 3	—	—	—	—	—	0.000538 (J)	—	1.58 (U)	—	—	—
50-24810	MD50-06-64989	122.5–123.9	Qbt 2	—	—	—	—	0.847 (J)	—	—	1.59 (U)	—	—	—
50-24810	MD50-06-65007	148.3–151.6	Qbt 2	—	—	—	—	0.787 (J-)	—	—	1.57 (U)	—	—	—
50-24811	MD50-06-65075	18.5–20.0	Qbt 3	—	—	—	—	0.788 (J)	—	—	1.58 (U)	—	—	—
50-24811	MD50-06-65076	38.5–40.0	Qbt 3	—	—	—	—	0.805 (J)	0.000666 (J)	—	1.56 (U)	—	—	—
50-24811	MD50-06-65058	97.5–98.7	Qbt 3	—	—	—	—	0.722 (J)	—	—	1.56 (U)	—	—	—
50-24811	MD50-06-65059	123.2–125.0	Qbt 2	—	—	—	—	0.703 (J)	—	—	1.51 (U)	—	—	—
50-24811	MD50-06-65077	147.5–150.6	Qbt 2	—	—	—	—	1.25	0.000989 (J)	—	1.5 (U)	—	—	—
50-24812	MD50-06-65100	8.4–10.0	Qbt 3	29.8	—	—	—	—	—	—	0.919 (J)	—	—	78.7 (J-)
50-24812	MD50-06-65101	33.5–35.0	Qbt 3	17.7	—	—	—	—	—	—	1.44 (J)	—	—	—
50-24812	MD50-06-65083	97.5–98.9	Qbt 3	—	—	—	—	0.978 (J)	—	—	1.59 (U)	—	—	—
50-24812	MD50-06-65084	122.5–123.7	Qbt 2	—	—	—	—	0.814 (J)	—	—	1.2 (J)	—	—	—
50-24812	MD50-06-65102	146.0–150.0	Qbt 2	11.3	3420 (J)	—	—	—	—	—	3.33	—	—	69.7 (J-)
50-24813	MD50-06-65132	18.2–20.0	Qbt 3	—	—	—	—	0.785 (J-)	—	—	1.55 (U)	—	—	—
50-24813	MD50-06-65133	30.0–31.9	Qbt 3	—	—	—	—	0.798 (J-)	—	—	1.54 (U)	—	—	—
50-24813	MD50-06-65115	98.2–99.7	Qbt 3	—	—	—	—	0.769 (J)	—	—	1.59 (U)	—	—	—
50-24813	MD50-06-65116	123.5–125.0	Qbt 2	—	—	—	—	0.775 (J)	0.000558 (J)	—	1.52 (U)	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Vanadium	Zinc
Qbt2, 3, 4 BV[a]				**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**17**	**63.5**
Qbt1v BV[a]				**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**4.48**	**84.6**
Qbt1g, Qct, Qbo BV[a]				**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4.59**	**40**
Industrial SSL[b]				**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**5680**	**341000**
Residential SSL[b]				**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**391**	**23500**
50-24813	MD50-06-65134	148.0–150.0	Qbt 2	—	—	—	—	0.768 (J)	0.048	—	1.59 (U)	—	—	—
50-24814	MD50-06-65157	7.5–9.1	Qbt 3	—	—	—	—	0.86 (J)	0.00142 (J)	—	1.52 (U)	—	—	—
50-24814	MD50-06-65158	30.0–31.6	Qbt 3	—	—	—	—	0.805 (J)	—	—	1.55 (U)	—	—	—
50-24814	MD50-06-65140	96.8–99.9	Qbt 3	—	—	—	—	0.686 (J)	—	—	1.56 (U)	—	—	—
50-24814	MD50-06-65141	123.5–124.8	Qbt 2	—	—	—	—	0.807 (J)	—	—	1.5 (U)	—	—	—
50-24814	MD50-06-65159	147.5–149.5	Qbt 2	—	—	—	—	0.668 (J)	—	—	1.56 (U)	—	—	—
50-24815	MD50-06-65189	17.5–20.0	Qbt 3	23.1	—	—	—	1.57	—	—	1.57 (U)	—	—	—
50-24815	MD50-06-65190	37.8–41.5	Qbt 3	—	—	—	—	1.1	—	—	1.56 (U)	—	—	—
50-24815	MD50-06-65172	98.8–100.0	Qbt 3	—	—	—	—	0.871 (J)	—	—	1.54 (U)	—	—	—
50-24815	MD50-06-65173	123.4–125.0	Qbt 2	—	—	—	—	0.757 (J)	0.00059 (J)	—	1.55 (U)	—	—	—
50-24815	MD50-06-65191	147.8–149.7	Qbt 2	—	—	—	—	0.767 (J)	0.00272	—	1.58 (U)	—	—	—
50-24816	MD50-06-65214	23.1–24.7	Qbt 3	15.4	—	—	—	—	—	—	1.69 (U)	—	—	—
50-24816	MD50-06-65215	32.2–34.0	Qbt 3	28.6	—	—	—	—	—	—	1.66 (U)	—	—	—
50-24816	MD50-06-65197	63.8–65.0	Qbt 3	—	—	—	—	—	—	—	1.58 (U)	—	—	—
50-24816	MD50-06-65198	118.7–120.0	Qbt 2	—	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24816	MD50-06-65199	198.8–200.0	Qbt 2	—	—	—	—	—	—	—	1.46 (U)	—	—	—
50-24816	MD50-06-65216	223.4–225.0	Qbt 2	—	—	—	—	—	—	—	1.51 (U)	—	—	—
50-24817	MD50-05-63837	18.4–20.0	Qbt 3	—	—	—	—	—	—	—	1.53 (U)	—	—	—
50-24817	MD50-05-63838	37.0–40.0	Qbt 3	—	—	—	—	0.77 (J)	—	—	1.54 (U)	—	—	—
50-24817	RE50-05-63810	98.8–100.0	Qbt 3	—	—	—	—	0.945 (J)	0.000739 (J)	—	1.57 (U)	—	—	—
50-24817	RE50-05-63811	138.0–140.0	Qbt 2	—	—	—	—	0.846 (J)	—	—	1.57 (U)	—	—	—
50-24817	RE50-05-63812	198.4–200.0	Qbt 1v	—	—	—	—	0.932 (J)	—	—	1.57 (U)	—	—	—
50-24817	MD50-05-63839	248.1–250.0	Qbt 1g	—	—	243	—	1.38	0.000975 (J)	—	1.73 (U)	—	—	44.8
50-24818	MD50-06-65229	8.5–10.0	Qbt 3	—	—	—	—	4.9 (J-)	—	—	1.53 (U)	—	—	—
50-24818	MD50-06-65230	22.1–25.0	Qbt 3	—	—	—	—	2.48 (J-)	0.00056 (J)	—	1.57 (U)	—	—	—
50-24818	MD50-06-65261	98.5–100.0	Qbt 2	—	—	—	—	0.354 (J-)	—	—	5.57	—	—	—
50-24818	MD50-06-65262	147.5–149.2	Qbt 2	—	—	—	—	0.424 (J)	—	—	1.54 (U)	—	—	—
50-24818	MD50-06-65263	189.9–190.0	Qbt 1v	—	—	—	—	0.399 (J)	0.00095 (J)	—	1.55 (U)	—	—	—
50-24818	MD50-06-65264	247.7–249.2	Qbt 1g	—	—	—	—	0.658 (J-)	—	—	1.59 (U)	—	—	—
50-24818	MD50-06-65265	280.0–282.5	Qbt 1g	—	—	—	—	0.468 (J-)	—	—	1.61 (U)	—	—	—
50-24818	MD50-06-65266	313.5–315.0	Qbt 1g	13.8 (J+)	—	—	—	0.584 (J)	—	—	1.71 (U)	—	—	93.1

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Vanadium	Zinc
Qbt2, 3, 4 BV[a]				**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**17**	**63.5**
Qbt1v BV[a]				**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**4.48**	**84.6**
Qbt1g, Qct, Qbo BV[a]				**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4.59**	**40**
Industrial SSL[b]				**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**5680**	**341000**
Residential SSL[b]				**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**391**	**23500**
50-24818	MD50-06-65267	396.0–402.0	Qbo	—	—	—	2.87	1.02 (J)	—	—	2.13	—	—	—
50-24818	MD50-06-65268	449.0–452.0	Qbo	22.1 (U)	—	1900	—	0.74 (J-)	—	—	33.2 (U)	—	55.2	—
50-24818	MD50-06-65269	497.0–500.5	Qbo	—	1180 (J+)	—	4.11 (J)	—	—	—	1.61 (U)	—	6.36 (J)	—
50-24818	MD50-06-65270	547.0–551.5	Qbo	—	872 (J+)	—	—	—	—	—	1.63 (U)	—	—	54.2
50-24818	MD50-06-65271	597.0–600.4	Qbo	—	—	—	—	—	—	—	1.72 (U)	—	—	—
50-24819	RE50-05-61422	18.5–20.0	Qbt 3	—	—	—	—	1.18	—	—	1.6 (U)	—	—	—
50-24819	RE50-05-61423	48.0–50.0	Qbt 3	—	—	—	—	0.942 (J+)	—	—	1.53 (U)	—	—	—
50-24819	RE50-05-61424	97.5–100.0	Qbt 3	—	—	—	—	0.889 (J)	0.00128 (J)	—	1.53 (U)	—	—	—
50-24819	RE50-05-61425	138.5–140.0	Qbt 2	—	—	—	—	1.11	—	—	1.5 (U)	—	—	—
50-24819	RE50-05-61426	198.1–200.0	Qbt 1v	—	—	—	—	0.809 (J)	0.000663 (J-)	—	1.51 (U)	—	—	—
50-24819	RE50-05-61427	246.5–250.0	Qbt 1v	—	—	—	—	0.909 (J)	0.000784 (J-)	—	1.62 (U)	—	—	—
50-24819	RE50-05-61428	273.0–275.0	Qbt 1g	—	—	—	—	0.876 (J)	0.000589 (J-)	—	1.6 (U)	—	—	—
50-24820	RE50-05-61438	17.5–20.0	Qbt 3	—	—	—	—	0.898 (J)	0.000635 (J-)	—	1.52 (U)	—	—	—
50-24820	RE50-05-61439	48.4–50.0	Qbt 3	—	—	—	—	0.98 (J)	0.00126 (J-)	—	1.49 (U)	—	—	—
50-24820	RE50-05-61440	97.5–100.0	Qbt 3	—	—	—	—	0.948 (J)	—	—	1.53 (U)	—	—	—
50-24820	RE50-05-61441	138.7–140.0	Qbt 2	—	—	—	—	0.687 (J)	—	—	1.5 (U)	—	—	—
50-24820	RE50-05-61442	198.2–200.0	Qbt 1v	—	—	—	—	0.687 (J)	—	—	1.49 (U)	—	—	—
50-24820	RE50-05-61443	248.3–250.0	Qbt 1g	—	—	225	—	0.797 (J)	—	—	1.61 (U)	—	—	—
50-24821	RE50-05-61456	18.6–20.0	Qbt 3	—	—	—	—	0.692 (J)	—	—	1.54 (U)	—	—	—
50-24821	RE50-05-61457	48.6–50.0	Qbt 3	—	—	—	—	0.685 (J)	—	—	1.55 (U)	—	—	—
50-24821	RE50-05-61458	98.4–100.0	Qbt 3	—	—	—	—	—	—	—	1.58 (U)	—	—	—
50-24821	RE50-05-61460	137.5–140.0	Qbt 2	—	—	—	—	1.07 (J)	—	—	1.61 (U)	—	—	—
50-24821	RE50-05-61459	157.5–160.0	Qbt 2	—	—	—	—	0.862 (J)	—	—	1.6 (U)	—	—	—
50-24821	RE50-05-61461	248.6–250.0	Qbt 1g	—	—	264	—	0.708 (J)	0.00062 (J)	—	1.56 (U)	—	—	—
50-24822	RE50-05-61474	18.6–20.0	Qbt 3	17.8	—	—	—	—	0.000658 (J)	—	1.5 (U)	—	—	—
50-24822	RE50-05-61475	47.5–49.1	Qbt 3	20.3	—	—	—	—	0.00504	—	1.53 (U)	—	—	—
50-24822	RE50-05-61476	98.6–100.0	Qbt 3	50.9	—	—	—	—	—	—	1.51 (U)	—	—	—
50-24822	RE50-05-61477	137.5–139.2	Qbt 2	—	—	—	—	0.726 (J)	—	—	1.58 (U)	—	—	—
50-24822	RE50-05-61478	198.5–200.0	Qbt 1v	—	—	—	—	—	—	—	1.5 (U)	—	—	—
50-24822	RE50-05-61479	248.7–250.0	Qbt 1g	—	—	257 (J)	—	—	—	—	1.56 (U)	—	—	—
50-25451	MD50-06-66697	18.7–19.9	Qbt 3	—	—	—	—	—	—	—	2.17	—	—	—

Table C-2.3-3 (continued)

Location ID	Sample ID	Depth (ft)	Media	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Vanadium	Zinc
Qbt2, 3, 4 BV[a]				**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**17**	**63.5**
Qbt1v BV[a]				**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**4.48**	**84.6**
Qbt1g, Qct, Qbo BV[a]				**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4.59**	**40**
Industrial SSL[b]				**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**5680**	**341000**
Residential SSL[b]				**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**391**	**23500**
50-25451	MD50-06-66698	48.1–49.9	Qbt 3	—	—	—	—	—	—	—	2.38	—	—	—
50-25451	MD50-06-66671	96.0–100.0	Qbt 2	—	—	—	—	—	—	—	1.45 (U)	—	—	—
50-25451	MD50-06-66672	146.0–147.5	Qbt 2	—	—	—	—	—	—	—	1.51 (U)	—	—	—
50-25451	MD50-06-66673	198.9–200.0	Qbt 2	—	—	—	—	—	—	—	1.48 (U)	—	—	—
50-25451	MD50-06-66674	251.2–252.5	Qbt 1g	—	—	—	—	—	—	—	1.56 (U)	—	—	—
50-25451	MD50-06-66699	298.5–300.0	Qbt 1g	—	—	—	—	—	—	—	1.61 (U)	—	—	—

Note: Units are mg/kg. See Appendix A for data qualifier definitions.

[a] BVs are from LANL (1998, 059730).

[b] SSLs are from NMED (2012, 219971) unless otherwise indicated.

[c] na = Not available.

[d] SSL is for trivalent chromium.

[e] SSL from EPA regional screening table (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[f] — = Not detected above BV or not detected.

Table C-2.3-4
Summary of Organic Chemicals Detected in Tuff at MDA C during 2005–2006 Sampling

Location ID	Sample ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzoic acid	Bis(2-ethylhexyl)phthalate	Chloronaphthalene[2-]	Chrysene	Di-n-butylphthalate
Industrial SSL[a]				**36700**	**18300**[b]	**868000**	**183000**	**8.26**	**8.26**	**8.26**	**2.34**	**23.4**	**234**	**2500000**[c]	**1370**	**90800**	**2340**	**68400**
Residential SSL[a]				**3440**	**1720**[b]	**66600**	**1720**	**2.22**	**1.12**	**2.22**	**0.148**	**1.48**	**14.8**	**240000**[c]	**347**	**6260**	**148**	**6110**
50-24766	MD50-06-64603	15.6–17.1	Qbt 3	—[d]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64604	27.5–29.2	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64586	97.5–99.9	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24767	MD50-06-66770	29.5–30.0	Qbt 3	—	—	0.00887	—	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64651	123.2–125.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64699	18.1–20.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64700	37.5–39.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64701	147.9–149.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64731	18.1–22.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64733	147.5–150.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64782	38.0–40.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64783	150.0–152.8	Qbt 2	—	—	—	—	0.02	0.0055	0.0032 (J)	—	—	—	—	—	—	—	—
50-24783	MD50-06-64838	17.5–20.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64839	35.4–37.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64821	98.6–100.0	Qbt 3	—	—	—	—	—	0.00091 (J)	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64381	18.0–20.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64382	298.3–299.8	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	0.366	—	—	0.106 (J)
50-24785	MD50-06-64413	17.5–19.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64457	8.0–10.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64458	17.5–19.3	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64442	118.7–120.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	0.541 (J)	—	—	—	—
50-24796	MD50-06-64459	147.5–149.4	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64509	37.0–38.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64516	13.1–15.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	0.58 (J)	—	—	—	—
50-24799	MD50-06-64517	15.0–16.5	Qbt 3	—	—	—	—	—	0.0021 (J)	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64888	12.5–16.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64889	40.6–42.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64872	123.1–125.0	Qbt 2	—	—	—	—	—	0.0022 (J)	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64890	157.5–159.1	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64913	15.4–17.5	Qbt 3	—	—	—	—	0.0134	0.0098 (J)	0.0065	—	—	—	—	—	—	—	—
50-24804	MD50-06-64980	15.4–17.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64982	147.5–149.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-65005	17.5–19.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table C-2.3-4 (continued)

Location ID	Sample ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Acetone	Anthracene	Aroclor-1242	Aroclor-1254	Aroclor-1260	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzoic acid	Bis(2-ethylhexyl)phthalate	Chloronaphthalene[2-]	Chrysene	Di-n-butylphthalate
Industrial SSL[a]				**36700**	**18300**[b]	**868000**	**183000**	**8.26**	**8.26**	**8.26**	**2.34**	**23.4**	**234**	**2500000**[c]	**1370**	**90800**	**2340**	**68400**
Residential SSL[a]				**3440**	**1720**[b]	**66600**	**1720**	**2.22**	**1.12**	**2.22**	**0.148**	**1.48**	**14.8**	**240000**[c]	**347**	**6260**	**148**	**6110**
50-24812	MD50-06-65100	8.4–10.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24812	MD50-06-65102	146.0–150.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24813	MD50-06-65116	123.5–125.0	Qbt 2	—	—	—	—	—	0.007	0.0031 (J)	—	—	—	—	—	—	—	—
50-24814	MD50-06-65157	7.5–9.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65158	30.0–31.6	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65191	147.8–149.7	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65214	23.1–24.7	Qbt 3	—	—	—	0.00945 (J)	—	—	—	—	—	—	—	0.0868 (J)	—	0.0114 (J)	—
50-24816	MD50-06-65198	118.7–120.0	Qbt 2	—	—	—	—	—	0.369	0.129	—	—	—	—	—	—	—	—
50-24816	MD50-06-65216	223.40–225.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24817	MD50-05-63838	37.0–40.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65229	8.5–10.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65230	22.1–25.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65264	247.7–249.2	Qbt 1g	—	—	—	—	0.0028 (J)	0.0023 (J)	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66760	312.90–313.0	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66761	397.90–398.0	Qbo	—	—	0.0098	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66762	498.40–498.5	Qbo	—	—	0.00374 (J)	—	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61441	138.7–140.0	Qbt 2	—	—	—	—	—	—	—	—	0.113	—	—	0.11 (J)	—	—	—
50-24820	RE50-05-61442	198.2–200.0	Qbt 1v	—	—	—	0.0078 (J)	—	—	—	0.103	0.112	—	—	0.114 (J)	—	—	—
50-24820	RE50-05-61443	248.3–250.0	Qbt 1g	—	—	—	0.0076 (J)	—	—	—	0.113	0.122	—	0.605 (J)	0.128 (J)	—	—	—
50-24821	RE50-05-61458	98.4–100.0	Qbt 3	0.0143 (J)	0.0109 (J)	—	0.0142 (J)	—	—	—	—	0.0117 (J)	0.0126 (J)	—	—	0.0134 (J)	0.0188 (J-)	—
50-24822	RE50-05-61475	47.5–49.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24822	RE50-05-61477	137.5–139.2	Qbt 2	—	—	—	—	—	—	0.0118	—	—	—	—	—	—	—	—
50-25451	MD50-06-66697	18.7–19.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table C-2.3-4 (continued)

Location ID	Sample ID	Depth (ft)	Media	Di-n-octylphthalate	Fluoranthene	Fluorene	Heptachlorodibenzodioxin [1,2,3,4,6,7,8-]	Heptachlorodibenzodioxins (Total)	Heptachlorodibenzofuran [1,2,3,4,6,7,8-]	Heptachlorodibenzofurans (Total)	Hexachlorodibenzodioxins (Total)	Hexachlorodibenzofuran[1,2,3,4,7,8-]	Hexachlorodibenzofuran [2,3,4,6,7,8-]	Hexachlorodibenzofurans (Total)	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Nitrotoluene[2-]
Industrial SSL[a]				**68400**[e]	**24400**	**24400**	**na**[f]	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**23.4**	**2200**[c]	**1020**
Residential SSL[a]				**6110**[e]	**2290**	**2290**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**1.48**	**230**[c]	**29.1**
50-24766	MD50-06-64603	15.6–17.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64604	27.5–29.2	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64586	97.5–99.9	Qbt 2	0.308 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24767	MD50-06-66770	29.5–30.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64651	123.2–125.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64699	18.1–20.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64700	37.5–39.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64701	147.9–149.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64731	18.1–22.5	Qbt 3	—	—	—	5.65E-07 (J)	1.07E-06	5.41E-07 (J)	5.41E-07	—	1.36E-07 (J)	—	2.32E-07	—	—	—
50-24770	MD50-06-64733	147.5–150.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64782	38.0–40.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64783	150.0–152.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64838	17.5–20.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64839	35.4–37.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64821	98.6–100.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64381	18.0–20.0	Qbt 3	—	—	—	4.49E-07 (J)	4.49E-07	—	—	8.97E-07	—	—	1.39E-07	—	—	—
50-24784	MD50-06-64382	298.3–299.8	Qbt 1g	—	0.0228 (J)	—	5.85E-07 (J)	1.01E-06	—	—	—	—	—	7.52E-08	—	—	—
50-24785	MD50-06-64413	17.5–19.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64457	8.0–10.0	Qbt 3	—	—	—	1.3E-07 (J)	1.3E-07	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64458	17.5–19.3	Qbt 3	—	—	—	3.4E-07 (J)	6.46E-07	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64442	118.7–120.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64459	147.5–149.4	Qbt 2	—	—	—	7.66E-07 (J)	0.0000017	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64509	37.0–38.0	Qbt 3	—	—	—	3.01E-07 (J)	5.7E-07	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64516	13.1–15.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64517	15.0–16.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64888	12.5–16.1	Qbt 3	—	—	—	5.03E-07 (J)	5.03E-07	—	3.26E-07	—	—	—	5.62E-08	—	—	—
50-24802	MD50-06-64889	40.6–42.5	Qbt 3	—	—	—	1.82E-07 (J)	3.04E-07	3.84E-07 (J)	3.84E-07	—	2.89E-07 (J)	9.89E-08 (J)	7.06E-07	—	—	—
50-24802	MD50-06-64872	123.1–125.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64890	157.5–159.1	Qbt 2	—	—	—	1.92E-07 (J)	1.92E-07	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64913	15.4–17.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64980	15.4–17.1	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64982	147.5–149.8	Qbt 2	—	—	—	1.02E-07 (J)	1.02E-07	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-65005	17.5–19.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table C-2.3-4 (continued)

Location ID	Sample ID	Depth (ft)	Media	Di-n-octylphthalate	Fluoranthene	Fluorene	Heptachlorodibenzodioxin [1,2,3,4,6,7,8-]	Heptachlorodibenzodioxins (Total)	Heptachlorodibenzofuran [1,2,3,4,6,7,8-]	Heptachlorodibenzofurans (Total)	Hexachlorodibenzodioxins (Total)	Hexachlorodibenzofuran[1,2,3,4,7,8-]	Hexachlorodibenzofuran [2,3,4,6,7,8-]	Hexachlorodibenzofurans (Total)	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Nitrotoluene[2-]
Industrial SSL[a]				**68400**[e]	**24400**	**24400**	**na**[f]	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**23.4**	**2200**[c]	**1020**
Residential SSL[a]				**6110**[e]	**2290**	**2290**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**1.48**	**230**[c]	**29.1**
50-24812	MD50-06-65100	8.4–10.0	Qbt 3	—	—	—	—	—	6.41E-07 (J)	6.41E-07	—	—	—	—	—	—	—
50-24812	MD50-06-65102	146.0–150.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24813	MD50-06-65116	123.5–125.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65157	7.5–9.1	Qbt 3	—	—	—	8.67E-07 (J)	1.86E-06	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65158	30.0–31.6	Qbt 3	—	—	—	2.2E-07 (J)	2.2E-07	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65191	147.8–149.7	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65214	23.1–24.7	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	0.00903 (J)	—
50-24816	MD50-06-65198	118.7–120.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65216	223.4–225.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24817	MD50-05-63838	37.0–40.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65229	8.5–10.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65230	22.1–25.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65264	247.7–249.2	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66760	312.9–313.0	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66761	397.9–398.0	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66762	498.4–498.5	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61441	138.7–140.0	Qbt 2	—	0.0167 (J)	—	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61442	198.2–200.0	Qbt 1v	0.178 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61443	248.3–250.0	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24821	RE50-05-61458	98.4–100.0	Qbt 3	—	0.0138 (J)	0.0136 (J)	—	—	—	—	—	—	—	—	0.149	0.014 (J)	—
50-24822	RE50-05-61475	47.5–49.1	Qbt 3	—	—	—	3.58E-07 (J)	6.46E-07	—	—	4.88E-07	3.97E-08 (J)	—	3.97E-08	—	—	—
50-24822	RE50-05-61477	137.5–139.2	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-25451	MD50-06-66697	18.7–19.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	0.135 (J)

Table C-2.3-4 (continued)

Location ID	Sample ID	Depth (ft)	Media	Nitrotoluene[3-]	Nitrotoluene[4-]	Octachlorodibenzodioxin [1,2,3,4,6,7,8,9-]	Octachlorodibenzofuran [1,2,3,4,6,7,8,9-]	Pentachlorodibenzodioxins (Total)	Pentachlorodibenzofuran [1,2,3,7,8-]	Pentachlorodibenzofuran [2,3,4,7,8-]	Pentachlorodibenzofurans (Totals)	Phenanthrene	Pyrene	RDX	Tetrachlorodibenzofuran [2,3,7,8-]	Tetrachlorodibenzofurans (Total)	Trichloroethene
Industrial SSL[a]				**114**	**2740**	**na**	**na**	**na**	**na**	**na**	**na**	**20500**	**18300**	**3410**	**na**	**na**	**41.3**
Residential SSL[a]				**7.82**	**244**	**na**	**na**	**na**	**na**	**na**	**na**	**1830**	**1720**	**58.2**	**na**	**na**	**8.77**
50-24766	MD50-06-64603	15.6–17.1	Qbt 3	—	0.389 (J)	2.65E-07 (J)	1.35E-07 (J)	—	—	—	—	—	—	—	—	—	—
50-24766	MD50-06-64604	27.5–29.2	Qbt 3	—	—	4.27E-07 (J)	—	—	—	—	—	—	—	0.165 (J)	—	—	—
50-24766	MD50-06-64586	97.5–99.9	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24767	MD50-06-66770	29.5–30.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24768	MD50-06-64651	123.2–125.0	Qbt 2	—	—	—	—	—	—	—	—	—	0.0119 (J)	—	—	—	—
50-24769	MD50-06-64699	18.1–20.0	Qbt 3	—	—	6.98E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64700	37.5–39.9	Qbt 3	—	—	3.68E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24769	MD50-06-64701	147.9–149.8	Qbt 2	—	—	3.52E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64731	18.1–22.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24770	MD50-06-64733	147.5–150.0	Qbt 2	—	—	8.17E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64782	38.0–40.0	Qbt 3	—	—	2.07E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24773	MD50-06-64783	150.0–152.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64838	17.5–20.0	Qbt 3	—	—	4.49E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64839	35.4–37.5	Qbt 3	—	—	6.12E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24783	MD50-06-64821	98.6–100.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24784	MD50-06-64381	18.0–20.0	Qbt 3	—	—	6.78E-07 (J)	—	—	—	—	—	—	—	—	—	2.04E-07	—
50-24784	MD50-06-64382	298.3–299.8	Qbt 1g	—	—	0.0000113	5.32E-07 (J)	—	—	—	—	—	0.0317 (J)	—	—	—	—
50-24785	MD50-06-64413	17.5–19.0	Qbt 3	—	—	5.37E-07 (J)	—	—	—	—	—	—	—	—	1.05E-07 (J)	1.05E-07	—
50-24796	MD50-06-64457	8.0–10.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64458	17.5–19.3	Qbt 3	—	—	2.45E-06 (J)	4.65E-07 (J)	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64442	118.7–120.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24796	MD50-06-64459	147.5–149.4	Qbt 2	—	—	4.52E-06 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24797	MD50-06-64509	37.0–38.0	Qbt 3	—	—	—	1.69E-07 (J)	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64516	13.1–15.0	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24799	MD50-06-64517	15.0–16.5	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64888	12.5–16.1	Qbt 3	—	—	5.29E-06	4.76E-07 (J)	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64889	40.6–42.5	Qbt 3	—	—	6.35E-07 (J)	4.01E-07 (J)	—	1.21E-07 (J)	1.11E-07 (J)	7.17E-07	—	—	—	—	—	—
50-24802	MD50-06-64872	123.1–125.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24802	MD50-06-64890	157.5–159.1	Qbt 2	—	—	3.44E-06 (J)	2.51E-07 (J)	—	—	—	—	—	—	—	—	—	—
50-24803	MD50-06-64913	15.4–17.5	Qbt 3	—	—	3.77E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64980	15.4–17.1	Qbt 3	—	—	3.03E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24804	MD50-06-64982	147.5–149.8	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24810	MD50-06-65005	17.5–19.0	Qbt 3	0.346 (J+)	—	—	—	—	—	—	—	—	—	—	—	—	—

Table C-2.3-4 (continued)

Location ID	Sample ID	Depth (ft)	Media	Nitrotoluene[3-]	Nitrotoluene[4-]	Octachlorodibenzodioxin [1,2,3,4,6,7,8,9-]	Octachlorodibenzofuran [1,2,3,4,6,7,8,9-]	Pentachlorodibenzodioxins (Total)	Pentachlorodibenzofuran [1,2,3,7,8-]	Pentachlorodibenzofuran [2,3,4,7,8-]	Pentachlorodibenzofurans (Totals)	Phenanthrene	Pyrene	RDX	Tetrachlorodibenzofuran [2,3,7,8-]	Tetrachlorodibenzofurans (Total)	Trichloroethene
Industrial SSL[a]				**114**	**2740**	**na**	**na**	**na**	**na**	**na**	**na**	**20500**	**18300**	**3410**	**na**	**na**	**41.3**
Residential SSL[a]				**7.82**	**244**	**na**	**na**	**na**	**na**	**na**	**na**	**1830**	**1720**	**58.2**	**na**	**na**	**8.77**
50-24812	MD50-06-65100	8.4–10.0	Qbt 3	—	—	1.53E-06 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24812	MD50-06-65102	146.0–150.0	Qbt 2	—	—	—	—	—	3.13E-07 (J)	—	3.13E-07	—	—	—	—	—	—
50-24813	MD50-06-65116	123.5–125.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65157	7.5–9.1	Qbt 3	—	—	0.0000117 (J)	7.88E-07 (J)	—	—	—	—	—	—	—	—	—	—
50-24814	MD50-06-65158	30.0–31.6	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24815	MD50-06-65191	147.8–149.7	Qbt 2	—	—	3.36E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65214	23.1–24.7	Qbt 3	—	—	4.58E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65198	118.7–120.0	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65216	223.4–225.0	Qbt 2	—	—	6.95E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24817	MD50-05-63838	37.0–40.0	Qbt 3	—	—	1.12E-06 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65229	8.5–10.0	Qbt 3	—	—	5.85E-07 (J)	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-65230	22.1–25.0	Qbt 3	—	—	—	—	—	—	—	—	—	0.0148 (J)	—	—	—	—
50-24818	MD50-06-65264	247.7–249.2	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66760	312.9–313.0	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00199
50-24818	MD50-06-66761	397.9–398.0	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24818	MD50-06-66762	498.4–498.5	Qbo	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61441	138.7–140.0	Qbt 2	—	—	—	—	—	—	—	—	0.0113 (J)	0.0118 (J)	—	—	—	—
50-24820	RE50-05-61442	198.2–200.0	Qbt 1v	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24820	RE50-05-61443	248.3–250.0	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-24821	RE50-05-61458	98.4–100.0	Qbt 3	—	—	—	—	—	—	—	—	0.0169 (J)	0.0148 (J)	—	—	—	—
50-24822	RE50-05-61475	47.5–49.1	Qbt 3	—	—	0.0000129	2.65E-07 (J)	7.64E-08	—	—	—	—	—	—	—	—	—
50-24822	RE50-05-61477	137.5–139.2	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-25451	MD50-06-66697	18.7–19.9	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Note: Units are mg/kg.

[a] SSLs are from NMED (2012, 219971) unless otherwise indicated.

[b] Pyrene used as a surrogate based on structural similarity.

[c] SSL from EPA regional screening table (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[d] — = Not detected.

[e] Di-n-butylphthalate used a surrogate based on structural similarity.

[f] na = Not available.

Table C-2.3-5
Summary of Radionuclides Detected or Detected above BVs in Tuff at MDA C during 2005–2006 Sampling

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Qbt2, 3 BV[a]				**na[b]**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Qbt1v BV[a]				**na**	**na**	**na**	**na**	**na**	**3.12**	**0.14**	**3.05**
Qbt1g, Qbo BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
Industrial SAL[c]				**180**	**23**	**240**	**210**	**1900**	**1500**	**87**	**430**
Residential SAL[c]				**30**	**5.6**	**37**	**33**	**5.7**	**170**	**17**	**87**
50-24766	MD50-06-64587	122.5–124.6	Qbt 2	—[d]	—	—	—	0.0688	—	—	—
50-24767	MD50-06-64636	28.1–30.0	Qbt 3	—	—	—	0.278	—	—	—	—
50-24767	MD50-06-64619	123.2–125.0	Qbt 2	—	—	—	0.0682	—	—	—	—
50-24768	MD50-06-64668	27.5–29.5	Qbt 3	—	—	—	—	—	—	0.118	—
50-24768	MD50-06-64669	148.6–151.5	Qbt 2	0.0872	—	—	—	—	—	—	—
50-24769	MD50-06-64699	18.1–20.0	Qbt 3	—	—	—	—	—	—	0.0957	—
50-24771	MD50-06-64756	15.90–17.5	Qbt 3	—	—	—	—	—	—	0.0945	—
50-24771	MD50-06-64757	38.0–40.0	Qbt 3	—	—	—	—	—	—	0.162	—
50-24771	MD50-06-64740	123.6–125.0	Qbt 2	—	—	—	—	—	—	0.137	—
50-24771	MD50-06-64758	148.2–150.0	Qbt 2	—	—	—	—	—	—	0.105	—
50-24773	MD50-06-64782	38.0–40.0	Qbt 3	—	0.131	—	—	—	—	—	—
50-24782	MD50-06-64813	20.90–22.5	Qbt 3	—	—	—	0.029	—	—	—	—
50-24782	MD50-06-64797	123.5–125.0	Qbt 3	—	—	0.302	0.684	—	—	—	—
50-24782	MD50-06-64815	156.0–157.5	Qbt 3	—	—	0.0883	0.0478	—	—	—	—
50-24783	MD50-06-64840	150.3–152.5	Qbt 2	0.423	—	0.248	0.106	—	—	—	—
50-24784	MD50-06-64368	248.0–250.0	Qbt 1v	—	—	—	—	—	—	0.151	—
50-24784	MD50-06-64382	298.3–299.8	Qbt 1g	—	—	—	—	—	—	0.211	—
50-24785	MD50-06-64412	8.5–10.0	Qbt 3	—	—	—	—	—	—	0.101	—

Table C-2.3-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Qbt2, 3 BV[a]				**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Qbt1v BV[a]				**na**	**na**	**na**	**na**	**na**	**3.12**	**0.14**	**3.05**
Qbt1g, Qbo BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
Industrial SAL[c]				**180**	**23**	**240**	**210**	**1900**	**1500**	**87**	**430**
Residential SAL[c]				**30**	**5.6**	**37**	**33**	**5.7**	**170**	**17**	**87**
50-24785	MD50-06-64413	17.5–19.0	Qbt 3	—	—	—	—	—	—	0.148	—
50-24785	MD50-06-64398	248.5–250.0	Qbt 1g	—	—	—	—	—	—	0.357	—
50-24785	MD50-06-64414	273.8–275.0	Qbt 1g	—	—	—	—	—	—	0.236	—
50-24796	MD50-06-64458	17.5–19.3	Qbt 3	—	—	—	—	—	—	0.0903	—
50-24796	MD50-06-64440	37.5–39.3	Qbt 3	—	—	—	—	—	—	0.116	—
50-24799	MD50-06-64515	118.4–120.0	Qbt 2	—	—	—	—	—	—	0.145	—
50-24799	MD50-06-64533	158.5–160.0	Qbt 2	—	—	—	—	—	—	0.158	—
50-24801	MD50-06-64847	118.0–120.0	Qbt 2	—	—	—	—	—	—	0.105	—
50-24811	MD50-06-65075	18.5–20.0	Qbt 3	—	—	—	0.0463	—	—	—	—
50-24811	MD50-06-65076	38.5–40.0	Qbt 3	—	—	—	0.252	—	—	—	—
50-24811	MD50-06-65058	97.5–98.7	Qbt 3	—	—	—	0.132	—	—	—	—
50-24811	MD50-06-65059	123.2–125.0	Qbt 2	—	—	—	0.0651	—	—	—	—
50-24812	MD50-06-65083	97.5–98.9	Qbt 3	—	—	—	—	—	—	0.0913	—
50-24814	MD50-06-65157	7.5–9.1	Qbt 3	—	—	—	0.241	—	—	—	—
50-24816	MD50-06-65214	23.1–24.7	Qbt 3	—	—	—	—	—	—	0.115	—
50-24816	MD50-06-65198	118.7–120.0	Qbt 2	—	—	—	—	—	—	0.113	—
50-24816	MD50-06-65199	198.8–200.0	Qbt 2	—	—	—	—	—	2.15	—	2.43
50-24817	RE50-05-63810	98.8–100.0	Qbt 3	—	—	—	—	—	—	0.15	—
50-24817	RE50-05-63811	138.0–140.0	Qbt 2	—	—	—	—	—	—	0.0984	—

Table C-2.3-5 (continued)

Location ID	Sample ID	Depth (ft)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239	Strontium-90	Uranium-234	Uranium-235	Uranium-238
Qbt2, 3 BV[a]				**na**	**na**	**na**	**na**	**na**	**1.98**	**0.09**	**1.93**
Qbt1v BV[a]				**na**	**na**	**na**	**na**	**na**	**3.12**	**0.14**	**3.05**
Qbt1g, Qbo BV[a]				**na**	**na**	**na**	**na**	**na**	**4**	**0.18**	**3.9**
Industrial SAL[c]				**180**	**23**	**240**	**210**	**1900**	**1500**	**87**	**430**
Residential SAL[c]				**30**	**5.6**	**37**	**33**	**5.7**	**170**	**17**	**87**
50-24817	MD50-05-63839	248.1–250.0	Qbt 1g	—	—	—	—	—	—	0.233	—
50-24818	MD50-06-65265	280.0–282.5	Qbt 1g	—	—	—	—	—	—	0.209	—
50-24818	MD50-06-65266	313.5–315.0	Qbt 1g	—	—	—	—	—	—	0.244	—
50-24819	RE50-05-61424	97.5–100.0	Qbt 3	—	—	—	—	—	—	0.119	—
50-24819	RE50-05-61426	198.1–200.0	Qbt 1v	—	—	—	—	—	3.18	0.216	3.52
50-24819	RE50-05-61427	246.5–250.0	Qbt 1v	—	—	—	—	—	—	0.201	—
50-24819	RE50-05-61428	273.0–275.0	Qbt 1g	—	—	—	—	—	—	0.272	—
50-24820	RE50-05-61443	248.3–250.0	Qbt 1g	—	—	—	—	—	—	0.245	—
50-24821	RE50-05-61461	248.6–250.0	Qbt 1g	—	—	—	—	—	—	0.272	—
50-24822	RE50-05-61478	198.5–200.0	Qbt 1v	—	—	—	—	—	—	0.238	—
50-24822	RE50-05-61479	248.7–250.0	Qbt 1g	—	—	—	—	—	—	0.312	—
50-25451	MD50-06-66672	146.0–147.5	Qbt 2	—	—	—	0.0269	—	—	—	—

Note: Units are pCi/g.

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SALs from LANL(2009, 107655).

[d] — = Not detected greater than BV or not detected.

Table C-2.3-6
Inorganic Chemicals above BVs in Tuff in Boreholes between Pits 2 and 3 during 2007 Sampling

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Iron	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Vanadium
Soil BV[a]				**0.5**	**21500**	**0.1**	**15.4**	**na**[b]	**na**	**1.52**	**39.6**
Qbt 2, 3, 4 BV[a]				**0.5**	**14500**	**0.1**	**6.58**	**na**	**na**	**0.3**	**17**
Qbt 1v BV[a]				**0.5**	**9900**	**0.1**	**2**	**na**	**na**	**0.3**	**4.48**
Qbt 1g, Qct, Qbo BV[a]				**0.5**	**3700**	**0.1**	**2**	**na**	**na**	**0.3**	**4.59**
Industrial SSL[c]				**681**	**795000**	**341**[d]	**22500**	**1820000**	**795**	**5680**	**5680**
Residential SSL[c]				**46.9**	**54800**	**23.5**[d]	**1560**	**125000**	**54.8**	**391**	**391**
MD50-07-75314	50-27437	20.5–22.5	Qbt 3	—[e]	—	—	—	3.9	0.00073 (J-)	—	—
MD50-07-75317	50-27437	32.5–35	Qbt 3	—	—	—	—	0.41	—	—	—
MD50-07-75315	50-27437	60–62.5	Qbt 3	—	—	—	—	0.41	—	—	—
MD50-07-75318	50-27437	80–82	Qbt 3	—	—	—	—	0.37	—	—	—
MD50-07-75351	50-27444	20–22.5	Qbt 3	0.52 (UJ)	—	—	—	1	0.0011 (J-)	0.42	—
MD50-07-75355	50-27444	35–37.5	Qbt 3	—	—	—	—	0.62	0.00086 (J-)	0.36	—
MD50-07-75352	50-27444	60–65	Qbt 3	—	—	—	—	0.34 (J-)	—	0.36	—
MD50-07-75354	50-27444	80–82.5	Qbt 3	—	—	0.17 (U)	—	0.47 (J-)	—	—	—
MD50-07-75357	50-27444	97.5–100	Qbt 3	0.51 (UJ)	—	—	—	0.45 (J-)	—	—	—
MD50-07-75368	50-27444	140–153	Qbt 2	0.51 (UJ)	—	—	—	0.56 (J-)	—	0.35	—
MD50-07-76314	50-27444	197.5–200	Qbt 1v	—	—	—	—	0.24	0.00098 (J-)	0.35	—
MD50-07-76315	50-27444	247.5–250	Qbt 1v	0.55 (UJ)	—	—	—	0.9	0.0018 (J-)	0.47	—
MD50-07-76316	50-27444	296–300	Qbt 1g	0.54 (UJ)	—	—	—	0.26	—	—	—
MD50-07-75356	50-27444	332.5–335	Qct	0.53 (U)	3810	—	2.2 (J-)	0.14 (J)	—	—	5.8

Table C-2.3-6 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cyanide (Total)	Iron	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Vanadium
Soil BV[a]				**0.5**	**21500**	**0.1**	**15.4**	**na[b]**	**na**	**1.52**	**39.6**
Qbt 2, 3, 4 BV[a]				**0.5**	**14500**	**0.1**	**6.58**	**na**	**na**	**0.3**	**17**
Qbt 1v BV[a]				**0.5**	**9900**	**0.1**	**2**	**na**	**na**	**0.3**	**4.48**
Qbt 1g, Qct, Qbo BV[a]				**0.5**	**3700**	**0.1**	**2**	**na**	**na**	**0.3**	**4.59**
Industrial SSL[c]				**681**	**795000**	**341[d]**	**22500**	**1820000**	**795**	**5680**	**5680**
Residential SSL[c]				**46.9**	**54800**	**23.5[d]**	**1560**	**125000**	**54.8**	**391**	**391**
MD50-07-75374	50-27445	2.5–5	Fill	—	—	—	—	2.4 (J-)	—	—	—
MD50-07-75375	50-27445	20–22.5	Qbt 3	—	—	—	—	0.45 (J-)	0.014 (J-)	0.39	—
MD50-07-75379	50-27445	35–37.5	Qbt 3	—	—	—	—	0.64 (J-)	0.016 (J-)	0.37	—
MD50-07-75376	50-27445	62.5–65	Qbt 3	—	—	—	—	0.22 (J-)	0.07 (J-)	—	—
MD50-07-75380	50-27445	80–82.5	Qbt 3	0.52 (U)	—	—	—	0.38 (J-)	—	—	—
MD50-07-75398	50-27446	2.5–5	Fill	—	—	—	—	0.96 (J-)	—	—	—
MD50-07-75399	50-27446	20–22.5	Qbt 3	—	—	—	—	0.69 (J-)	—	—	—
MD50-07-75403	50-27446	35–37.5	Qbt 3	—	—	—	—	0.68 (J-)	0.0038 (J-)	—	—
MD50-07-75400	50-27446	61–65	Qbt 3	—	—	—	—	0.18 (J-)	—	—	—

Note: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2012, 219971).

[d] SSL for mercury salts.

[e] — = Not detected or not detected above BV.

Table C-2.3-7
Organic Chemicals Detected in Tuff in Boreholes between Pits 2 and 3 during 2007 Sampling

Sample ID	Location ID	Depth (ft)	Media	Acetone	Bis(2-ethylhexyl)phthalate	Carbon Tetrachloride	Chloroform	Isopropyltoluene[4-]	Methylene Chloride	Octachlorodibenzodioxin [1,2,3,4,6,7,8,9-]	Tetrachloroethene	Toluene	Trichloroethene
Industrial SSL[a]				**868000**	**1370**	**59.8**	**32.7**	**14500[b]**	**4700**	**na[c]**	**36.6**	**57700**	**41.3**
Residential SSL[a]				**66600**	**347**	**10.8**	**5.86**	**2430[b]**	**409**	**na**	**7.02**	**5270**	**8.77**
MD50-07-75313	50-27437	4–5	Fill	0.018 (J)	—[d]	—	—	0.0062 (J)	—	—	0.0013 (J)	—	0.00093 (J)
MD50-07-75317	50-27437	32.5–35	Qbt 3	0.0046 (J)	—	—	—	—	—	3.83E-07 (J)	—	—	—
MD50-07-75318	50-27437	80–82	Qbt 3	—	—	—	—	—	—	3.53E-07 (J)	—	—	—
MD50-07-75351	50-27444	20–22.5	Qbt 3	—	—	—	—	—	0.011	—	—	—	—
MD50-07-75355	50-27444	35–37.5	Qbt 3	0.009 (J)	—	—	—	—	0.0088	—	—	—	—
MD50-07-75354	50-27444	80–82.5	Qbt 3	—	—	—	—	—	0.0028 (J)	—	—	—	—
MD50-07-76314	50-27444	197.5–200	Qbt 1v	—	—	—	—	—	0.0032 (J)	—	—	—	—
MD50-07-76315	50-27444	247.5–250	Qbt 1v	—	—	—	—	—	0.0055	—	—	—	—
MD50-07-76316	50-27444	296–300	Qbt 1g	—	—	—	—	—	0.006	—	—	—	—
MD50-07-75356	50-27444	332.5–335	Qct	—	—	—	—	—	0.0035 (J)	—	—	—	0.0009 (J)
MD50-07-75374	50-27445	2.5–5	Fill	—	—	0.0032 (J)	0.0028 (J)	—	—	—	—	0.0046 (J)	0.0022 (J)
MD50-07-75375	50-27445	20–22.5	Qbt 3	0.0094 (J)	0.036 (J)	—	—	—	—	—	—	0.00059 (J)	—
MD50-07-75376	50-27445	62.5–65	Qbt 3	—	—	—	—	—	0.0068	—	—	—	—
MD50-07-75380	50-27445	80–82.5	Qbt 3	—	—	—	—	—	0.0045 (J)	—	—	—	—
MD50-07-75398	50-27446	2.5–5	Fill	—	—	—	—	—	0.0075	—	—	—	—
MD50-07-75399	50-27446	20–22.5	Qbt 3	—	—	—	—	—	0.0082	—	—	—	—
MD50-07-75403	50-27446	35–37.5	Qbt 3	—	—	—	—	—	0.008	—	—	—	—
MD50-07-75400	50-27446	61–65	Qbt 3	—	—	—	—	—	0.0045 (J)	—	—	—	—
MD50-07-75404	50-27446	80–82.5	Qbt 3	—	—	—	—	—	0.0028 (J)	—	—	—	—

Note: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED (2012, 219971).

[b] Isopropylbenzene used as a surrogate based on structure similarity.

[c] na = Not available.

[d] — = Not detected.

Table C-2.3-8
Radionuclides Detected or Detected in Tuff
in Boreholes between Pits 2 and 3 during 2007 Sampling

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Plutonium-238	Plutonium-239/240
Industrial SAL[a]				**180**	**23**	**240**	**210**
Residential SAL[a]				**30**	**5.6**	**37**	**33**
MD50-07-75351	50-27444	20–22.5	Qbt 3	—[b]	—	0.064	0.352
MD50-07-75355	50-27444	35–37.5	Qbt 3	—	—	—	0.227
MD50-07-75352	50-27444	60–65	Qbt 3	—	—	—	0.052
MD50-07-75354	50-27444	80–82.5	Qbt 3	—	—	—	0.046
MD50-07-75374	50-27445	2.5–5	Fill	0.102	—	—	0.863
MD50-07-75398	50-27446	2.5–5	Fill	0.566	0.164	0.078	8.96

Note: Results are in pCi/g.

[a] SALs from LANL (2009, 107655).

[b] — = Not detected.

Table C-2.3-9
Summary of Results of Samples Collected above, within, and beneath Major Fractures during 2005–2006 Sampling

Location ID	Sample ID	Depth (ft)	Media	Sample Source	Inorganic Chemicals above BVs*	Organic Chemicals Detected	Radionuclides Detected or Detected above BVs/FVs
50-24770	MD50-06-64731	18.1–22.5	Qbt 3	Inside fracture	Aluminum, arsenic, barium, calcium, chromium, copper, lead, magnesium, nitrate, perchlorate, and selenium	Dioxins and furans	None
	MD50-06-64717	24.6–25	Qbt 3	Beneath fracture	Barium, calcium, lead, nitrate, perchlorate, and selenium	None	None
50-24784	MD50-06-64363	46.1–47.5	Qbt 3	Above fracture	Selenium	None	None
	MD50-06-64364	48.7–50	Qbt 3	Inside fracture	Aluminum, antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, nickel, nitrate, perchlorate, potassium, selenium, vanadium, and zinc	None	None
	MD50-06-64365	51–55	Qbt 3	Beneath fracture	Nitrate and selenium	None	None
50-24799	MD50-06-64516	13.1–15	Qbt 3	Above fracture	Nitrate and selenium	Benzoic acid	None
	MD50-06-64517	15–16.5	Qbt 3	Inside fracture	Aluminum, arsenic, barium, chromium, nitrate, and selenium	Aroclor-1254	None
	MD50-06-64531	18–20	Qbt 3	Beneath fracture	Aluminum, arsenic, barium, calcium, chromium, copper, magnesium, nitrate, and selenium	None	None
	MD50-06-64532	30.6–32.5	Qbt 3	Above fracture	Nitrate and selenium	None	None
	MD50-06-64518	34.5–36	Qbt 3	Inside fracture	Aluminum, arsenic, barium, beryllium, calcium, chromium, copper, iron, lead, magnesium, nitrate, selenium, vanadium, and zinc	None	None
	MD50-06-64519	38.5–40	Qbt 3	Beneath fracture	Chromium, nitrate, perchlorate, and selenium	None	None
50-24804	MD50-06-64965	8.6–9.8	Qbt 3	Above fracture	Arsenic, copper, lead, selenium, and zinc	None	None
	MD50-06-64966	10–11.4	Qbt 3	Inside fracture	Aluminum, arsenic, barium, copper, lead, magnesium, and selenium	None	None
	MD50-06-64980	15.4–17.1	Qbt 3	Beneath fracture	Lead, nitrate, and selenium	Dioxin	None

*Detected at concentrations above BVs, not detected but detection limits are above BVs, or detected but with no BVs.

Table C-2.3-10
Summary of Pore-Gas Samples Collected at MDA C during 2005–2006 Sampling

Location ID	1st Round Sample ID	Depth (ft)	Tritium	VOCs	2nd Round Sample ID	Depth (ft)	Tritium	VOCs
50-09100	MD50-06-70880	20	5372S[a]	5331S	n.c.[b]	n.c.	n.c.	n.c.
50-09100	MD50-06-70881	50	5372S	5331S	n.c.	n.c.	n.c.	n.c.
50-09100	MD50-06-70882	90	5321S	5320S	n.c.	n.c.	n.c.	n.c.
50-09100	MD50-06-70883	103	5321S	5320S	n.c.	n.c.	n.c.	n.c.
50-09100	MD50-06-70884	120	5314S	5313S	n.c.	n.c.	n.c.	n.c.
50-09100	MD50-06-70885	160	5314S	5313S	n.c.	n.c.	n.c.	n.c.
50-09100	MD50-06-70886	200	5372S	5331S	n.c.	n.c.	n.c.	n.c.
50-09100	MD50-06-70887	233	5311S	5308S	n.c.	n.c.	n.c.	n.c.
50-09100	MD50-06-70888	260	5309S	5303S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70868	25	5316S	5315S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70869	50	5316S	5315S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70870	75	5316S	5315S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70871	100	5310S	5304S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70872	125	5310S	5304S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70873	150	5302S	5301S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70874	175	5302S	5301S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70875	200	5302S	5301S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70876	225	5292S	5291S	n.c.	n.c.	n.c.	n.c.
50-10131	MD50-06-70877	250	5292S	5291S	n.c.	n.c.	n.c.	n.c.
50-24766	MD50-06-64597	17	5154S	5153S	MD50-06-65331	17	5597S	5596S
50-24766	MD50-06-64596	29	5154S	5153S	MD50-06-65330	29	5597S	5596S
50-24766	MD50-06-64595	99	5127S	5126S	MD50-06-65329	99	5597S	5596S
50-24766	MD50-06-64594	124	5127S	5126S	MD50-06-65328	124	5579S	5578S
50-24766	MD50-06-64593	149	5127S	5126S	MD50-06-65327	149	5579S	5578S
50-24767	MD50-06-64625	10	4901S	4900S	MD50-06-65362	10	5377S	5363S
50-24767	MD50-06-64626	30	4901S	4900S	MD50-06-65361	30	5373S	5335S
50-24767	MD50-06-64627	60	4901S	4900S	MD50-06-65360	60	5373S	5335S
50-24767	MD50-06-64628	124	4893S	4874S	MD50-06-65359	124	5373S	5335S
50-24767	MD50-06-64629	149	4892S	4863S	MD50-06-65358	149	5371S	5330S
50-24768	MD50-06-64661	14	4956S	4944S	MD50-06-65370	14	5387S	5384S
50-24768	MD50-06-64660	29	4957S	4945S	MD50-06-65369	29	5387S	5384S
50-24768	MD50-06-64659	99	4954S	4915S	MD50-06-65368	99	5387S	5384S
50-24768	MD50-06-64658	125	4954S	4915S	MD50-06-65367	125	5387S	5384S
50-24768	MD50-06-64657	150	4954S	4915S	MD50-06-65366	150	5387S	5384S
50-24769	MD50-06-64693	20	5205S	5204S	MD50-06-65378	20	5466S	5465S
50-24769	MD50-06-64692	39	5205S	5204S	MD50-06-65377	39	5466S	5465S
50-24769	MD50-06-64691	99	5199S	5197S	MD50-06-65376	99	5466S	5465S

Table C-2.3-10 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Tritium	VOCs	2nd Round Sample ID	Depth (ft)	Tritium	VOCs
50-24769	MD50-06-64690	124	5199S	5197S	MD50-06-65375	124	5430S	5429S
50-24769	MD50-06-64689	149	5199S	5197S	MD50-06-65374	149	5430S	5429S
50-24770	MD50-06-64738	20	5052S	5051S	MD50-06-65387	20	5479S	5478S
50-24770	MD50-06-64725	25	5052S	5051S	MD50-06-65386	25	5479S	5478S
50-24770	MD50-06-64724	39	5052S	5051S	MD50-06-65385	39	5472S	5468S
50-24770	MD50-06-64723	100	5052S	5051S	MD50-06-65384	100	5472S	5468S
50-24770	MD50-06-64722	124	5052S	5051S	MD50-06-65383	124	5472S	5468S
50-24770	MD50-06-64721	150	5052S	5051S	MD50-06-65382	148	5464S	5463S
50-24771	MD50-06-64750	17	5044S	5043S	MD50-06-65394	17	5462S	5461S
50-24771	MD50-06-64749	40	5044S	5043S	MD50-06-65393	40	5462S	5461S
50-24771	MD50-06-64748	100	5016S	5007S	MD50-06-65392	100	5462S	5461S
50-24771	MD50-06-64747	125	5016S	5007S	MD50-06-65391	125	5428S	5427S
50-24771	MD50-06-64746	150	5016S	5007S	MD50-06-65390	149	5428S	5427S
50-24773	MD50-06-64775	20	4996S	4995S	MD50-06-65405	20	5425S	5424S
50-24773	MD50-06-64774	40	4996S	4995S	MD50-06-65404	40	5426S	5423S
50-24773	MD50-06-64773	100	4996S	4995S	MD50-06-65403	100	5426S	5423S
50-24773	MD50-06-64776	125	4993S	4989S	MD50-06-65402	125	5426S	5423S
50-24773	MD50-06-64772	150	4994S	4990S	MD50-06-65401	149	5410S	5407S
50-24782	MD50-06-64803	20	4992S	4988S	MD50-06-65413	21	5409S	5406S
50-24782	MD50-06-64804	40	4971S	4972S	MD50-06-65412	40	5409S	5406S
50-24782	MD50-06-64805	100	4971S	4972S	MD50-06-65411	100	5409S	5406S
50-24782	MD50-06-64806	125	4971S	4972S	MD50-06-65410	125	5409S	5406S
50-24782	MD50-06-64807	155	4965S	4964S	MD50-06-65409	151	5397S	5396S
50-24783	MD50-06-64832	20	4962S	4961S	MD50-06-65421	20	5393S	5392S
50-24783	MD50-06-64831	36	4958S	4951S	MD50-06-65420	36	5391S	5390S
50-24783	MD50-06-64830	100	4958S	4951S	MD50-06-65419	100	5391S	5390S
50-24783	MD50-06-64829	125	4959S	4952S	MD50-06-65418	125	5391S	5390S
50-24783	MD50-06-64828	151	4955S	4943S	MD50-06-65417	148	5391S	5390S
50-24784	MD50-06-64374	10	4775S	4776S	MD50-06-70724	10	5118S	5117S
50-24784	MD50-06-64373	20	4775S	4776S	MD50-06-70723	20	5118S	5117S
50-24784	MD50-06-64372	47	4778S	4770S	MD50-06-70722	47	5104S	5092S
50-24784	MD50-06-64371	49	4778S	4770S	MD50-06-70721	49	5104S	5092S
50-24784	MD50-06-64370	55	4778S	4770S	MD50-06-65292	55	5105S	5094S
50-24784	MD50-06-64375	100	4744S	4743S	MD50-06-65291	100	5105S	5093S
50-24784	MD50-06-64379	168	4744S	4743S	MD50-06-65290	168	5105S	5093S
50-24784	MD50-06-64378	199	4742S	4740S	MD50-06-65289	199	5087S	5086S
50-24784	MD50-06-64377	250	4742S	4740S	MD50-06-65288	250	5084S	5083S
50-24784	MD50-06-64376	268	4742S	4740S	MD50-06-65287	265	5084S	5083S

Table C-2.3-10 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Tritium	VOCs	2nd Round Sample ID	Depth (ft)	Tritium	VOCs
50-24785	MD50-06-64402	10	4421S	4420S	MD50-06-66783	10	5150S	5149S
50-24785	MD50-06-64403	19	4447S	4426S	MD50-06-65300	19	5152S	5151S
50-24785	MD50-06-64408	60	4585S	4563S	MD50-06-65299	60	5152S	5151S
50-24785	MD50-06-64407	120	4585S	4563S	MD50-06-65298	120	5125S	5124S
50-24785	MD50-06-64404	200	4494S	4493S	MD50-06-65297	200	5116S	5115S
50-24785	MD50-06-64405	250	4520S	4515S	MD50-06-65296	250	5116S	5115S
50-24785	MD50-06-64406	275	4522S	4517S	MD50-06-65295	256	5116S	5115S
50-24796	MD50-06-64448	10	4251S	4252S	MD50-06-65308	10	5374S	5337S
50-24796	MD50-06-64447	20	4251S	4252S	MD50-06-65307	20	5370S	5329S
50-24796	MD50-06-64449	40	4262S	4261S	MD50-06-65306	40	5370S	5329S
50-24796	MD50-06-64450	100	4262S	4261S	MD50-06-65305	100	5370S	5329S
50-24796	MD50-06-64451	120	4283S	4282S	MD50-06-65304	120	5323S	5322S
50-24796	MD50-06-64452	150	4285S	4284S	MD50-06-65303	144	5323S	5322S
50-24797	MD50-06-64496	18.3	4302S	4303S	MD50-06-65315	18.3	5395S	5394S
50-24797	MD50-06-64497	38	4318S	4317S	MD50-06-65314	38	5395S	5394S
50-24797	MD50-06-66198	60	4553S	4552S	MD50-06-65313	60	5386S	5383S
50-24797	MD50-06-64498	120	4329S	4330S	MD50-06-65312	120	5375S	5339S
50-24797	MD50-06-64500	160	4445S	4429S	MD50-06-65311	154	5375S	5339S
50-24799	MD50-06-66197	15	4527S	4528S	MD50-06-65323	20	5611S	5610S
50-24799	MD50-06-64521	17.5	4295S	4296S	MD50-06-65322	32.5	5611S	5610S
50-24799	MD50-06-64522	20	4295S	4296S	MD50-06-65321	100	5607S	5606S
50-24799	MD50-06-64523	32.5	4299S	4300S	MD50-06-65320	120	5595S	5594S
50-24799	MD50-06-64538	37.5	4299S	4300S	MD50-06-65319	160	5595S	5594S
50-24799	MD50-06-64524	40.5	4315S	4316S	n.c.	n.c.	n.c.	n.c.
50-24799	MD50-06-64525	100	4331S	4332S	n.c.	n.c.	n.c.	n.c.
50-24799	MD50-06-64526	120	4345S	4344S	n.c.	n.c.	n.c.	n.c.
50-24799	MD50-06-64527	160	4345S	4344S	n.c.	n.c.	n.c.	n.c.
50-24801	MD50-06-64853	20	4519S	4501S	MD50-06-65429	20	5577S	5576S
50-24801	MD50-06-64870	35	4519S	4501S	MD50-06-65428	35	5577S	5576S
50-24801	MD50-06-64856	80	4530S	4531S	MD50-06-65427	80	5577S	5576S
50-24801	MD50-06-64855	120	4530S	4531S	MD50-06-65426	120	5577S	5576S
50-24801	MD50-06-64854	150	4523S	4518S	MD50-06-65425	150	5566S	5565S
50-24802	MD50-06-64878	15	4799S	4794S	MD50-06-65437	15	5534S	5533S
50-24802	MD50-06-64879	42	4799S	4794S	MD50-06-65436	42	5534S	5533S
50-24802	MD50-06-64880	99.4	4799S	4794S	MD50-06-65435	99	5534S	5533S
50-24802	MD50-06-64881	124.4	4798S	4786S	MD50-06-65434	124	5534S	5533S
50-24802	MD50-06-64882	156.4	4798S	4786S	MD50-06-65433	156	5534S	5533S
50-24803	MD50-06-64904	16	4891S	4862S	MD50-06-65445	16	5525S	5524S

Table C-2.3-10 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Tritium	VOCs	2nd Round Sample ID	Depth (ft)	Tritium	VOCs
50-24803	MD50-06-64903	37	4891S	4862S	MD50-06-65444	37	5525S	5524S
50-24803	MD50-06-64905	99.5	4890S	4820S	MD50-06-65443	99.5	5525S	5524S
50-24803	MD50-06-64906	124	4890S	4820S	MD50-06-65442	124	5520S	5519S
50-24803	MD50-06-64907	151	4810S	4809S	MD50-06-65441	150	5520S	5519S
50-24804	MD50-06-64970	10	5171S	5161S	MD50-06-65454	10	5605S	5604S
50-24804	MD50-06-64971	16	5171S	5161S	MD50-06-65453	16	5593S	5592S
50-24804	MD50-06-64972	33	5171S	5161S	MD50-06-65452	33	5593S	5592S
50-24804	MD50-06-64973	99	5172S	5164S	MD50-06-65451	99	5593S	5592S
50-24804	MD50-06-64974	124	5172S	5164S	MD50-06-65450	124	5593S	5592S
50-24804	MD50-06-64975	149	5172S	5164S	MD50-06-65449	149	5593S	5592S
50-24810	MD50-06-64999	19	5281S	5280S	MD50-06-65461	19	5575S	5574S
50-24810	MD50-06-64998	37	5281S	5280S	MD50-06-65460	37	5575S	5574S
50-24810	MD50-06-64997	99	5281S	5280S	MD50-06-65459	99	5575S	5574S
50-24810	MD50-06-64996	123	5281S	5280S	MD50-06-65458	123	5575S	5574S
50-24810	MD50-06-64995	150	5232S	5225S	MD50-06-65457	150	5575S	5574S
50-24811	MD50-06-65069	20	5230S	5222S	MD50-06-65469	20	5570S	5569S
50-24811	MD50-06-65068	40	5203S	5202S	MD50-06-65468	40	5570S	5569S
50-24811	MD50-06-65067	98	5203S	5202S	MD50-06-65467	98	5570S	5569S
50-24811	MD50-06-65066	125	5203S	5202S	MD50-06-65466	125	5570S	5569S
50-24811	MD50-06-65065	150	5203S	5202S	MD50-06-65465	150	5540S	5539S
50-24812	MD50-06-65094	10	5198S	5196S	MD50-06-65477	10	5536S	5535S
50-24812	MD50-06-65093	35	5198S	5196S	MD50-06-65476	35	5536S	5535S
50-24812	MD50-06-65092	98	5198S	5196S	MD50-06-65474	98	5536S	5535S
50-24812	MD50-06-65091	123	5173S	5165S	MD50-06-65475	123	5527S	5526S
50-24812	MD50-06-65090	150	5173S	5165S	MD50-06-65473	150	5527S	5526S
50-24813	MD50-06-65126	20	5167S	5166S	MD50-06-65485	20	5518S	5517S
50-24813	MD50-06-65125	30	5170S	5160S	MD50-06-65484	30	5518S	5517S
50-24813	MD50-06-65124	99	5170S	5160S	MD50-06-65483	99	5518S	5517S
50-24813	MD50-06-65123	125	5170S	5160S	MD50-06-65482	125	5502S	5501S
50-24813	MD50-06-65122	150	5170S	5160S	MD50-06-65481	150	5502S	5501S
50-24814	MD50-06-65151	10	5294S	5293S	MD50-06-65493	10	5498S	5497S
50-24814	MD50-06-65150	30	5294S	5293S	MD50-06-65492	30	5484S	5483S
50-24814	MD50-06-65149	99	5294S	5293S	MD50-06-65491	99	5484S	5483S
50-24814	MD50-06-65148	124	5283S	5282S	MD50-06-65490	124	5484S	5483S
50-24814	MD50-06-65147	149	5283S	5282S	MD50-06-65489	149	5484S	5483S
50-24815	MD50-06-65183	30	5244S	5243S	MD50-06-65501	30	5475S	5474S
50-24815	MD50-06-65182	40	5231S	5224S	MD50-06-65500	40	5473S	5469S
50-24815	MD50-06-65181	100	5231S	5224S	MD50-06-65499	100	5473S	5469S

Table C-2.3-10 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Tritium	VOCs	2nd Round Sample ID	Depth (ft)	Tritium	VOCs
50-24815	MD50-06-65180	125	5231S	5224S	MD50-06-65498	125	5473S	5469S
50-24815	MD50-06-65179	149	5201S	5200S	MD50-06-65497	149	5460S	5459S
50-24816	MD50-06-65204	25	4410S	4411S	MD50-06-65510	25	5123S	5057S
50-24816	MD50-06-65205	35	4448S	4427S	MD50-06-65509	35	5055S	5054S
50-24816	MD50-06-65209	65	4496S	4495S	MD50-06-65508	65	5055S	5053S
50-24816	MD50-06-65206	120	4448S	4428S	MD50-06-65507	120	5055S	5053S
50-24816	MD50-06-65208	200	4477S	4476S	MD50-06-65506	200	5055S	5053S
50-24816	MD50-06-65207	225	4477S	4476S	MD50-06-65505	215.8	5055S	5053S
50-24817	MD50-05-63841	20	4011S	4010S	MD50-06-65903	20	4116S	4115S
50-24817	MD50-05-63842	40	4011S	4010S	MD50-06-65904	50	4116S	4115S
50-24817	RE50-05-63816	100	4009S	4008S	MD50-06-65905	100	4116S	4115S
50-24817	RE50-05-63817	140	4028S	4027S	MD50-06-65906	140	4116S	4115S
50-24817	RE50-05-63818	200	4030S	4029S	MD50-06-65907	200	4114S	4113S
50-24817	MD50-05-63843	250	4045S	4044S	MD50-06-65908	240.9	4114S	4113S
50-24818	MD50-06-65232	10	4548s	4549S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65233	25	4548s	4549S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65234	100	4593S	4594S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65235	150	4650S	4610S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65236	190	4655S	4641S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65237	250	4662S	4645S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65238	280	4662S	4645S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65239	315	4663S	4664S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65240	414	5299S	5298S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65242	452	5477S	5476S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65245	500	5516S	5512S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65244	548	5500S	5499S	n.c.	n.c.	n.c.	n.c.
50-24818	MD50-06-65243	591	5500S	5499S	n.c.	n.c.	n.c.	n.c.
50-24819	RE50-05-61430	20	3667S	3666S	MD50-06-63863	20	4072S	4073S
50-24819	RE50-05-61431	50	3684S	3685S	MD50-06-63864	50	4072S	4073S
50-24819	RE50-05-61432	100	3709S	3708S	MD50-06-63865	100	4072S	4073S
50-24819	RE50-05-61732	138.5–140	3703S	3702S	MD50-06-63866	140	4072S	4073S
50-24819	RE50-05-61733	200	3724S	3723S	MD50-06-63867	200	4068S	4067S
50-24819	RE50-05-61734	250	3731S	3730S	MD50-06-63868	250	4068S	4067S
50-24819	RE50-05-61735	275	3752S	3751S	MD50-06-63869	275	4068S	4067S
50-24820	RE50-05-61446	20	3786S	3785S	MD50-06-64240	20	4085S	4084S
50-24820	RE50-05-61449	50	3797S	3796S	MD50-06-64241	50	4085S	4084S
50-24820	RE50-05-61447	100	3809S	3808S	MD50-06-64242	100	4085S	4084S
50-24820	RE50-05-61448	140	3809S	3808S	MD50-06-64243	140	4085S	4084S

Table C-2.3-10 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Tritium	VOCs	2nd Round Sample ID	Depth (ft)	Tritium	VOCs
50-24820	RE50-05-61450	200	3827S	3821S	MD50-06-64244	200	4085S	4084S
50-24820	RE50-05-61736	250	3828S	3822S	MD50-06-64245	225	4085S	4084S
50-24821	RE50-05-61464	20	3839S	3838S	MD50-06-64248	20	4108S	4109S
50-24821	RE50-05-61466	50	3839S	3838S	MD50-06-64249	50	4108S	4109S
50-24821	RE50-05-61465	98.4–100	3858S	3855S	MD50-06-64250	100	4104S	4105S
50-24821	RE50-05-61467	137.5–140	3868S	—[c]	MD50-06-64251	140	4102S	4103S
50-24821	RE50-05-61469	137.5–140	—	3867S	MD50-06-64254	160	4130S	4129S
50-24821	RE50-05-61473	160	4059S	4058S	MD50-06-64252	200	4102S	4103S
50-24821	RE50-05-61468	248.6–250	3892S	3891S	MD50-06-64253	238.4	4102S	4103S
50-24822	RE50-05-61482	20	3903S	3904S	MD50-06-64928	20	4097S	4096S
50-24822	RE50-05-61483	50	3922S	3921S	MD50-06-64929	50	4097S	4096S
50-24822	RE50-05-61484	100	3922S	3921S	MD50-06-64930	100	4097S	4096S
50-24822	RE50-05-61485	140	3945S	3944S	MD50-06-64931	140	4097S	4096S
50-24822	RE50-05-61486	200	3950S	3949S	MD50-06-64932	200	4090S	4091S
50-24822	RE50-05-61737	250	3959S	3958S	MD50-06-64933	250	4090S	4091S
50-25451	MD50-06-66691	19	5568S	5567S	n.c.	n.c.	n.c.	n.c.
50-25451	MD50-06-66690	49	5568S	5567S	n.c.	n.c.	n.c.	n.c.
50-25451	MD50-06-66689	100	5568S	5567S	n.c.	n.c.	n.c.	n.c.
50-25451	MD50-06-66688	147	5568S	5567S	n.c.	n.c.	n.c.	n.c.
50-25451	MD50-06-66687	200	5568S	5567S	n.c.	n.c.	n.c.	n.c.
50-25451	MD50-06-66686	251	5079S	5075S	n.c.	n.c.	n.c.	n.c.
50-25451	MD50-06-66685	287	5079S	5076S	n.c.	n.c.	n.c.	n.c.

[a] Analytical request number.

[b] n.c. = Not collected.

[c] — = Analysis not requested.

Table C-2.3-11
Summary of VOCs Detected in First Round of 2005–2006 Vapor Sampling at MDA C

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Dioxane[1,4-]	Ethanol	Ethylbenzene
50-09100	MD50-06-70880	20	—*	—	—	—	—	—	—	—	300	—	—	—	130	—	—	—	33	—	—	—	—
50-09100	MD50-06-70881	50	86	—	—	—	—	—	28	—	120	—	—	—	38	—	—	—	19	—	—	—	11
50-09100	MD50-06-70882	90	28	—	—	—	—	—	76	—	360	—	—	—	160	—	13	—	68	17	—	—	—
50-09100	MD50-06-70883	103	—	—	—	—	—	—	160	—	820	—	—	—	390	—	—	—	140	—	—	—	—
50-09100	MD50-06-70884	120	—	—	—	—	—	—	150	—	870	—	—	—	480	—	—	—	190	—	—	—	—
50-09100	MD50-06-70885	160	—	—	—	—	—	—	—	—	820	—	—	—	440	—	—	—	220	—	—	—	—
50-09100	MD50-06-70886	200	—	—	—	—	—	—	590	—	1300	—	—	—	800	—	29	—	360	67	—	—	—
50-09100	MD50-06-70887	233	—	—	—	—	—	—	—	—	310	—	—	—	200	—	—	—	96	—	—	—	—
50-09100	MD50-06-70888	260	100	—	—	—	—	—	78	—	290	—	—	—	200	—	—	—	98	—	—	—	—
50-10131	MD50-06-70868	25	—	—	—	—	—	—	66	—	890	—	—	—	150	—	—	—	—	120	—	—	—
50-10131	MD50-06-70869	50	—	—	—	—	—	—	87	—	810	—	—	—	200	—	—	—	—	130	—	—	—
50-10131	MD50-06-70870	75	—	—	—	—	—	—	90	—	920	—	—	—	200	—	28	—	—	130	—	—	—
50-10131	MD50-06-70871	100	—	—	—	—	—	—	—	—	590	—	—	—	130	—	—	—	—	99	—	—	—
50-10131	MD50-06-70872	125	—	—	—	—	—	—	52	—	660	—	—	—	190	—	22	—	24	120	—	—	—
50-10131	MD50-06-70873	150	—	—	—	—	—	—	33	—	310	—	—	61	110	—	—	—	—	73	—	—	—
50-10131	MD50-06-70874	175	—	—	—	—	—	—	100	—	620	—	—	—	230	—	—	—	34	130	—	—	—
50-10131	MD50-06-70875	200	—	—	—	—	—	—	110	—	400	—	—	110	220	—	—	—	—	110	—	—	—
50-10131	MD50-06-70876	225	—	—	—	—	—	—	95	—	760	—	—	67	250	—	—	—	31	91	—	—	—
50-10131	MD50-06-70877	250	—	—	—	—	—	—	100	—	570	—	—	—	210	—	—	—	—	120	—	—	—
50-24766	MD50-06-64597	17	99	—	—	—	—	—	14	—	63	—	—	38	110	—	—	—	—	16	—	—	—
50-24766	MD50-06-64596	29	140	—	—	—	—	—	29	—	99	—	—	89	220	—	—	—	—	26	—	—	—
50-24766	MD50-06-64595	99	—	—	—	—	—	—	450	—	190	—	—	—	210	—	—	—	—	64	—	—	—
50-24766	MD50-06-64594	124	190	—	—	—	—	—	14	—	100	—	—	43	47	7.3	7.3	—	17	60	—	—	—
50-24766	MD50-06-64593	149	62	—	—	—	—	—	41	—	190	—	—	—	84	14	16	9.8	37	130	—	—	—
50-24767	MD50-06-64625	10	—	11	—	—	—	—	—	—	160	—	—	—	100	—	—	—	29	—	—	—	—
50-24767	MD50-06-64626	30	52	24	—	—	—	—	16	—	120	—	—	—	74	—	—	—	24	—	—	—	12
50-24767	MD50-06-64627	60	32	3	—	—	—	—	6.8	—	40	—	—	—	23	—	—	2.9	8.4	—	—	—	2.6
50-24767	MD50-06-64628	124	—	—	—	—	—	—	—	—	73	—	—	—	64	—	—	—	15	—	—	—	—
50-24767	MD50-06-64629	149	—	—	—	—	—	—	—	—	240	—	—	—	150	—	—	—	67	—	—	—	—
50-24768	MD50-06-64661	14	31	—	—	—	—	—	7.2	—	35	—	—	—	36	—	—	—	5.9	—	—	—	—
50-24768	MD50-06-64660	29	35	—	—	—	—	—	—	—	22	—	—	—	17	—	—	—	3.8	—	—	—	—
50-24768	MD50-06-64659	99	—	—	—	—	—	—	—	—	390	—	—	—	390	—	—	—	90	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Dioxane[1,4-]	Ethanol	Ethylbenzene
50-24768	MD50-06-64658	125	—	—	—	—	—	—	—	—	320	—	—	—	470	—	—	—	100	—	—	—	—
50-24768	MD50-06-64657	150	—	—	—	—	—	—	—	—	290	—	—	—	450	—	—	—	91	—	—	—	—
50-24769	MD50-06-64693	20	34	—	—	—	—	3.2	8	—	21	—	—	25	25	—	—	—	1.9	—	—	—	—
50-24769	MD50-06-64692	39	44	—	—	—	3	—	7.4	—	33	1.7	—	18	23	—	0.88	—	4.8	1	—	—	—
50-24769	MD50-06-64691	99	—	—	—	—	—	—	440	—	1900	—	—	—	2000	—	—	—	330	—	—	—	—
50-24769	MD50-06-64690	124	—	—	—	—	—	—	170	—	1300	—	—	—	1100	—	—	—	240	—	—	—	—
50-24769	MD50-06-64689	149	—	—	—	—	—	—	—	—	2300	—	—	—	2400	—	—	—	420	—	—	—	—
50-24770	MD50-06-64738	20	—	—	—	—	—	—	2100 (J)	—	1700	—	—	—	1700	—	—	—	160	—	—	—	—
50-24770	MD50-06-64725	25	—	—	—	—	—	—	2500 (J)	—	1900	—	—	—	1700	—	—	—	190	—	—	—	—
50-24770	MD50-06-64724	39	—	—	—	—	—	—	2700 (J)	—	2100	—	—	—	1800	—	—	—	220	—	—	—	—
50-24770	MD50-06-64723	100	—	—	—	—	—	—	1800 (J)	—	1900	—	—	—	1500	—	56	—	280	—	—	—	—
50-24770	MD50-06-64722	124	—	—	—	—	—	—	2900 (J)	—	3200	—	—	—	2400	—	—	—	490	—	—	—	—
50-24770	MD50-06-64721	150	—	—	—	—	—	—	720 (J)	—	1000	—	—	—	850	—	—	—	210	—	—	—	—
50-24771	MD50-06-64750	17	—	—	—	—	—	—	1600 (J)	—	1600	—	—	—	710	—	—	—	110	—	—	—	—
50-24771	MD50-06-64749	40	—	—	—	—	—	—	2500 (J)	—	2300	—	—	—	1100	—	94	—	230	—	—	—	—
50-24771	MD50-06-64748	100	31	—	—	—	—	—	99	—	190	—	—	—	64	—	18	—	32	—	—	—	—
50-24771	MD50-06-64747	125	—	—	—	—	—	—	1200	—	2300	—	—	—	440	—	180	—	330	120	—	—	—
50-24771	MD50-06-64746	150	—	—	—	—	—	—	2400	—	3600	—	—	—	1200	—	270	—	680	—	—	—	—
50-24773	MD50-06-64775	20	—	—	—	—	—	—	350	—	940	—	—	—	340	—	—	—	110	—	—	—	—
50-24773	MD50-06-64774	40	—	—	—	—	—	—	450	—	1200	—	—	—	430	—	75	—	160	—	—	—	—
50-24773	MD50-06-64773	100	—	—	—	—	—	—	490	—	1300	—	—	—	410	—	120	—	210	—	—	—	—
50-24773	MD50-06-64776	125	—	—	—	—	—	—	1000	—	2300	—	—	—	870	—	200	—	430	160	—	—	—
50-24773	MD50-06-64772	150	—	—	—	—	—	—	1800 (J)	—	3000	—	—	—	950	—	260	—	520	—	—	—	—
50-24782	MD50-06-64803	20	—	—	—	—	—	—	—	—	520	—	—	—	170	—	—	—	62	—	—	—	—
50-24782	MD50-06-64804	40	—	—	—	—	—	—	110	—	980	—	—	—	290	—	35	—	110	50	—	—	—
50-24782	MD50-06-64805	100	—	—	—	—	—	—	100	—	710	—	—	—	210	—	54	—	110	58	—	—	—
50-24782	MD50-06-64806	125	—	—	—	—	—	—	320	—	1500	—	—	—	500	—	86	—	260	110	—	—	—
50-24782	MD50-06-64807	155	82	—	—	—	—	—	50	—	240	—	—	—	94	—	—	—	40	42	—	—	—
50-24783	MD50-06-64832	20	—	—	—	—	—	—	180	—	1100	—	—	—	360	—	120	—	250	130	—	—	—
50-24783	MD50-06-64831	36	—	—	—	—	—	—	—	—	200	—	—	—	85	—	—	—	25	38	—	—	—
50-24783	MD50-06-64830	100	—	—	—	—	—	—	—	—	140	—	—	—	42	—	—	—	23	23	—	—	—
50-24783	MD50-06-64829	125	—	—	—	—	—	—	360	—	830	—	—	—	240	—	58	—	130	150	—	—	—
50-24783	MD50-06-64828	151	—	—	—	—	—	—	410	—	1000	—	—	—	370	—	—	—	190	170	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Dioxane[1,4-]	Ethanol	Ethylbenzene
50-24784	MD50-06-64374	10	—	—	—	—	—	—	32	—	73	—	—	—	30	—	—	—	—	—	—	—	—
50-24784	MD50-06-64373	20	—	—	—	—	—	—	5	—	14	0.93	—	—	6.9	—	—	—	—	—	—	—	0.96
50-24784	MD50-06-64372	47	41 (J)	—	—	—	—	48	140	—	190	—	—	—	79	—	—	—	—	31	—	—	—
50-24784	MD50-06-64371	49	58 (J)	—	—	—	—	—	130	—	200	—	—	—	69	—	—	—	—	36	—	—	—
50-24784	MD50-06-64370	55	80 (J)	4.6	—	—	—	22	120	—	210	—	—	—	66	—	4.9	—	8.5	39	—	—	7.7
50-24784	MD50-06-64375	100	21 (J)	3.7	—	—	—	—	51	—	100	—	—	—	34	—	3.5	—	4.8	22	—	—	—
50-24784	MD50-06-64379	168	29 (J)	—	—	—	—	—	190	—	90	—	—	—	83	—	—	—	12	28	—	—	—
50-24784	MD50-06-64378	199	170	9.5	—	—	4.7	3.4	63	—	46	0.94	—	—	31	1.6	1.5	—	6	22 (J)	—	—	8.7
50-24784	MD50-06-64377	250	140	12	—	—	—	—	170	—	58	—	—	—	78	—	—	—	9.1	20 (J)	—	—	9.7
50-24784	MD50-06-64376	268	—	—	—	—	—	—	300	—	70	—	—	—	210	—	—	—	—	—	—	—	—
50-24785	MD50-06-64402	10	20	—	—	—	—	8.7	—	—	76	—	11	—	4.8	—	—	—	—	—	—	—	7.2
50-24785	MD50-06-64403	19	19	—	3	—	3.8	—	9.2	—	350	—	—	—	13	—	5.6	—	—	7.8	—	—	19
50-24785	MD50-06-64408	60	—	—	—	—	—	—	130	—	3000	—	—	—	130	—	44	—	—	110	—	—	—
50-24785	MD50-06-64407	120	—	—	—	—	—	—	170	—	940	—	—	—	140	—	38	—	19	150	—	—	—
50-24785	MD50-06-64404	200	—	—	—	—	—	—	330	—	470	—	—	—	200	—	—	—	35	160	—	—	—
50-24785	MD50-06-64405	250	—	—	—	—	—	—	600 (J)	—	160	—	—	—	260	—	—	—	—	86	—	—	—
50-24785	MD50-06-64406	275	47	4.7	—	—	—	—	11	—	23	—	—	—	7.1	—	—	—	—	6.9 (J)	—	—	—
50-24796	MD50-06-64448	10	120	4.4	—	—	33	14	—	—	1.8	1.9	—	—	6	—	—	—	—	—	—	—	2
50-24796	MD50-06-64447	20	73	10	—	—	12	6.5	5.6	—	44	1.1	—	—	38	0.81	—	—	2	21	—	—	5
50-24796	MD50-06-64449	40	41	—	—	—	—	—	28	—	200	—	—	—	220	—	—	—	9.1	110	—	—	—
50-24796	MD50-06-64450	100	—	—	—	—	—	—	—	—	680	—	—	—	840	—	—	—	63	420	—	—	—
50-24796	MD50-06-64451	120	38	1.8	—	—	—	—	4.7	—	27	1.3	—	—	26	—	2.5	0.91	2.4	19	—	—	—
50-24796	MD50-06-64452	150	83	10	—	—	—	—	92	—	290	—	—	—	220	—	25	15	37	280	—	—	—
50-24797	MD50-06-64496	18.3	42 (J)	3.2	—	—	7.5	—	11 (J)	—	49	1.2	—	3.7	180 (J)	2	—	—	2.5	18	—	—	3 (J)
50-24797	MD50-06-64497	38	31 (J)	—	—	—	—	—	28 (J)	—	180	—	—	—	400 (J)	—	—	—	14	99	—	—	—
50-24797	MD50-06-66198	60	—	—	—	—	—	—	—	—	180	—	—	—	350	—	—	—	24	160	—	—	—
50-24797	MD50-06-64498	120	49	—	—	—	—	—	41	—	210	—	—	—	260	—	—	—	38 (J+)	200	—	—	—
50-24797	MD50-06-64500	160	—	—	—	—	—	—	200	—	460	—	—	—	620	45	—	65	94 (J+)	460	—	—	—
50-24799	MD50-06-66197	15	120	—	—	—	—	—	—	—	61	—	—	—	31	—	—	—	8	24 (J)	—	—	—
50-24799	MD50-06-64521	17.5	56	2.7	—	—	12	—	—	—	4	1.3	—	—	4.5	—	—	—	—	—	—	—	1.7 (J)
50-24799	MD50-06-64522	20	89	5.1	—	—	20	—	—	—	5.1	1.4	—	—	5.4	—	—	—	—	—	—	—	2.8 (J)
50-24799	MD50-06-64523	32.5	290 (J)	27	—	—	110	—	—	—	68	—	—	—	38 (J)	—	—	—	5.7	17	—	—	11 (J)
50-24799	MD50-06-64538	37.5	390 (J)	21	—	—	160	—	8.7 (J)	—	95	—	—	—	43 (J)	5.2	—	—	8.9	26	—	—	7.5 (J)

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Dioxane[1,4-]	Ethanol	Ethylbenzene
50-24799	MD50-06-64524	40.5	330	—	—	32	120	3.9	5.7	—	76	—	—	—	35	3.7	—	—	—	—	—	7.2	—
50-24799	MD50-06-64525	100	26	—	13	—	—	—	—	—	11	—	—	—	—	—	—	—	—	—	2300	—	—
50-24799	MD50-06-64526	120	60	—	1.8	65	9.7	—	5.4	—	40	—	—	—	17	—	4.9	—	8.7 (J+)	16	980	—	—
50-24799	MD50-06-64527	160	—	—	22	—	—	—	110	61	440	—	—	—	160	18	42	—	100 (J+)	230	—	—	—
50-24801	MD50-06-64853	20	35	—	—	—	—	—	—	—	69	—	—	—	18	—	—	—	—	9.5 (J)	—	—	—
50-24801	MD50-06-64870	35	27	—	—	—	—	—	—	—	140	—	—	—	34	—	—	—	11	24 (J)	—	—	—
50-24801	MD50-06-64856	80	—	—	—	—	—	—	370 (J)	—	720	—	—	—	340	—	51	—	120	210	—	—	—
50-24801	MD50-06-64855	120	—	—	—	—	—	—	51 (J)	—	260	—	—	—	120	—	16	—	41	71	—	—	—
50-24801	MD50-06-64854	150	50	—	—	—	—	—	25	—	130	—	—	—	25	—	17	—	24	42 (J)	—	—	—
50-24802	MD50-06-64878	15	—	—	—	—	—	—	—	—	350	—	—	—	130	—	—	—	48	55	—	—	—
50-24802	MD50-06-64879	42	—	—	—	—	—	—	—	—	690	—	—	—	250	—	—	—	97	110	—	—	—
50-24802	MD50-06-64880	99.4	—	—	—	—	—	—	—	—	360	—	—	—	130	—	—	—	59	60	—	—	—
50-24802	MD50-06-64881	124.4	—	—	—	—	—	—	78 (J)	—	490	—	—	—	210	—	41	—	88	75	—	—	—
50-24802	MD50-06-64882	156.4	—	—	—	—	—	—	85 (J)	—	480	—	—	—	210	—	—	—	67	81	—	—	—
50-24803	MD50-06-64904	16	28 (J)	—	—	—	—	20	16	—	36	—	—	—	12	3	—	—	4.2	3.6	—	—	4.3
50-24803	MD50-06-64903	37	19 (J)	5.1	—	—	—	—	40	—	93	—	—	—	27	2.8	5.3	—	14	13	—	—	3.2
50-24803	MD50-06-64905	99.5	42	—	—	—	—	—	—	—	230	—	—	—	70	—	15	—	41	21	—	—	—
50-24803	MD50-06-64906	124	—	—	—	—	—	—	51	—	290	—	—	—	120	—	—	—	49	32	—	—	—
50-24803	MD50-06-64907	151	—	—	—	—	—	—	—	—	140	—	—	—	54	—	—	—	25	18	—	—	—
50-24804	MD50-06-64970	10	150	2.9	—	—	—	—	22	—	49	—	—	150	47	—	—	—	—	—	—	—	—
50-24804	MD50-06-64971	16	70	—	—	—	—	—	64	—	230	—	—	150	160	—	—	—	22	—	—	—	—
50-24804	MD50-06-64972	33	90	—	—	—	—	—	110	—	240	—	—	—	72	—	—	—	28	23	—	—	—
50-24804	MD50-06-64973	99	—	—	—	—	—	—	130	—	560	—	—	—	200	—	—	—	88	61	—	—	—
50-24804	MD50-06-64974	124	—	—	—	—	—	—	310	—	990	—	—	—	370	—	48	—	160	74	—	—	—
50-24804	MD50-06-64975	149	—	—	—	—	—	—	240	—	860	—	—	—	330	—	67	—	150	93	—	—	—
50-24810	MD50-06-64999	19	30 (J)	—	—	—	—	—	49	—	71	—	—	—	30	—	—	—	6.3	—	—	—	—
50-24810	MD50-06-64998	37	27	—	—	—	—	—	41	—	180	—	—	—	70	—	—	—	24	—	—	—	—
50-24810	MD50-06-64997	99	24 (J)	—	—	—	—	—	57	—	140	—	—	—	39	—	9	—	21	13	—	—	—
50-24810	MD50-06-64996	123	—	—	—	—	—	—	160	—	400	—	—	—	170	—	—	—	57	34	—	—	—
50-24810	MD50-06-64995	150	—	—	—	—	—	—	170	—	540	—	—	—	200	—	41	—	91	46	—	—	—
50-24811	MD50-06-65069	20	—	—	—	—	—	—	1500	—	2500	—	—	—	440	—	—	—	84	—	—	—	—
50-24811	MD50-06-65068	40	—	—	—	—	—	—	1700	—	2900	—	—	—	610	—	—	—	160	—	—	—	—
50-24811	MD50-06-65067	98	—	—	—	—	—	—	580	—	1400	—	—	—	300	—	43	—	140	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Dioxane[1,4-]	Ethanol	Ethylbenzene
50-24811	MD50-06-65066	125	—	—	—	—	—	—	410	—	750	—	—	—	250	—	—	—	89	—	—	—	—
50-24811	MD50-06-65065	150	—	—	—	—	—	—	2000	—	3900	—	—	—	1000	—	230	—	660	—	—	—	—
50-24812	MD50-06-65094	10	—	—	—	—	—	—	7200	—	2900	—	—	—	1400	—	—	—	270	—	—	—	—
50-24812	MD50-06-65093	35	—	—	—	—	—	—	1800	—	830	—	—	—	95	—	—	—	66	—	—	—	—
50-24812	MD50-06-65092	98	—	—	—	—	—	—	5200	—	2800	—	—	—	1200	—	88	—	330	—	—	—	—
50-24812	MD50-06-65091	123	—	—	—	—	—	—	2900	—	2300	—	—	—	980	—	80	—	310	—	—	—	—
50-24812	MD50-06-65090	150	—	—	—	—	—	—	3800	—	3800	—	—	—	2000	—	140	—	840	—	—	—	—
50-24813	MD50-06-65126	20	—	—	—	—	—	—	490	—	540	—	—	—	630	—	—	—	76	—	—	—	—
50-24813	MD50-06-65125	30	—	—	—	—	—	—	1100	—	1000	—	—	65	1000	—	—	—	170	—	—	—	—
50-24813	MD50-06-65124	99	—	—	—	—	—	—	1200	—	1300	—	—	—	1100	—	—	—	240	—	—	—	—
50-24813	MD50-06-65123	125	—	—	—	—	—	—	1900	—	2400	—	—	—	1900	—	57	—	470	—	—	—	—
50-24813	MD50-06-65122	150	—	—	—	—	—	—	2100	—	3700	—	—	—	2600	—	120	—	820	—	—	—	—
50-24814	MD50-06-65151	10	—	—	—	—	—	—	67	—	220	—	—	51	380	—	—	—	38	—	—	—	—
50-24814	MD50-06-65150	30	42	—	—	—	—	—	57	—	170	—	—	45	280	—	—	—	32	—	—	—	—
50-24814	MD50-06-65149	99	62	—	—	—	—	—	30	—	72	—	—	38	72	—	—	—	12	—	—	—	—
50-24814	MD50-06-65148	124	—	—	—	—	—	—	140	—	340	—	—	—	400	—	—	—	79	—	—	—	—
50-24814	MD50-06-65147	149	—	—	—	—	—	—	72	—	320	—	—	—	240	—	—	—	77	—	—	—	—
50-24815	MD50-06-65183	30	96 (J)	—	—	—	—	—	37	—	120	—	—	33	77	—	—	—	17	—	—	—	—
50-24815	MD50-06-65182	40	58	—	—	—	—	—	34	—	270	—	—	28 (J)	260	—	—	—	51	—	—	—	—
50-24815	MD50-06-65181	100	51 (J)	—	—	—	—	—	15	—	60	—	—	14	35	—	—	—	8.8	—	—	—	—
50-24815	MD50-06-65180	125	75 (J)	—	—	—	5.2	—	4.2	—	23	0.93	—	8.9	11	—	1.1	—	3.4	—	—	—	—
50-24815	MD50-06-65179	149	110	—	—	—	—	—	72	—	310	—	—	24	150	—	20	—	61	—	—	—	—
50-24816	MD50-06-65204	25	25	—	2.2	18	6.8	3.1	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—
50-24816	MD50-06-65205	35	30	—	4.7	21	6.7	—	—	—	12	—	2.9	—	3.9	—	—	—	—	—	—	—	—
50-24816	MD50-06-65209	65	—	—	—	—	—	—	320	—	270	—	—	—	170	—	—	—	—	140	—	—	—
50-24816	MD50-06-65206	120	43	—	—	—	—	—	40	—	140	—	—	—	34 (J)	—	—	—	—	55	—	—	—
50-24816	MD50-06-65208	200	67	—	—	—	—	—	250	—	92	—	—	—	130	—	—	—	17	63	—	—	—
50-24816	MD50-06-65207	225	—	—	—	—	—	—	440	—	130	—	—	—	200	—	—	—	—	88	—	—	—
50-24817	MD50-05-63841	20	96	—	14	—	11	6.9	10	—	9.8	—	14	—	64	—	—	—	—	—	—	—	4.2
50-24817	MD50-05-63842	40	65	11	16	21	9.3	10	46	—	48	—	—	—	210	—	—	8.8	—	18	—	—	3.9
50-24817	RE50-05-63816	100	62	—	200	—	—	21	150	—	210	—	—	—	500	28	—	73	39	280	—	—	33
50-24817	RE50-05-63817	140	210	—	33	—	24	13	210	—	300	—	—	—	580	36	—	78	62 (J+)	430	—	—	—
50-24817	RE50-05-63818	200	—	—	230	—	—	89	390	—	400	—	—	—	640	50	—	110	120 (J+)	860	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Dioxane[1,4-]	Ethanol	Ethylbenzene
50-24817	MD50-05-63843	250	—	—	20	—	—	—	510	—	240	—	—	—	550	34	—	88	110	630	—	—	—
50-24818	MD50-06-65232	10	33	9.1	—	—	6.5	8.8	1.5	—	5.7	0.82	—	—	5.4	—	—	—	—	—	—	—	2.8
50-24818	MD50-06-65233	25	56	9	—	—	—	71	35	—	180	—	—	—	68	—	—	—	—	—	—	—	—
50-24818	MD50-06-65234	100	—	—	—	—	—	—	330 (J)	—	1500	—	—	—	600	—	—	—	200	—	—	—	—
50-24818	MD50-06-65235	150	—	—	—	—	—	—	—	—	1900	—	—	—	610	—	—	—	340	—	—	—	—
50-24818	MD50-06-65236	190	—	—	—	—	—	—	—	—	390	—	—	—	79	—	—	—	90	—	—	—	—
50-24818	MD50-06-65237	250	—	—	—	—	—	—	370	—	1000	—	—	—	500	—	—	—	270	—	—	—	—
50-24818	MD50-06-65238	280	—	—	—	—	—	—	390	—	830	—	—	—	480	—	—	—	220	—	—	—	—
50-24818	MD50-06-65239	315	—	—	—	—	—	—	290 (J)	—	430	—	—	—	310	—	—	—	120	—	—	—	—
50-24818	MD50-06-65240	414	160	9.9	—	—	12	7.5	2.7	—	3.2	2.1	—	—	6.2	—	—	—	—	—	—	—	—
50-24818	MD50-06-65242	452	65	—	—	—	—	—	26	—	8.1	—	—	—	44	—	—	—	—	—	—	—	—
50-24818	MD50-06-65245	500	190	1.6	—	—	18	9.2	9.4	—	11	2.3	—	—	6.4	—	—	—	—	—	—	—	—
50-24818	MD50-06-65244	548	70	—	—	—	8.5	—	6.9	—	3.9	—	—	—	12	—	—	—	—	—	—	—	—
50-24818	MD50-06-65243	591	120	—	—	—	—	9.6	9.4	—	10	—	—	—	8	—	—	—	—	—	—	—	—
50-24819	RE50-05-61430	20	60	—	—	—	6.2	—	8.9	—	23	—	—	—	13	—	—	—	—	—	—	—	—
50-24819	RE50-05-61431	50	58	—	—	—	5.6	—	25	—	77	—	—	—	34	—	—	—	5	14	—	—	—
50-24819	RE50-05-61432	100	54	—	—	—	5.1	—	31	—	110	—	—	—	40	—	6.4	—	14	56	—	—	—
50-24819	RE50-05-61732	138.5–140	32	—	—	—	—	—	140	—	260	—	—	—	150	—	14	12	38	140	—	—	—
50-24819	RE50-05-61733	200	55	—	8.9	—	13	—	160	—	250	—	—	—	160	—	—	—	47	160	—	—	—
50-24819	RE50-05-61734	250	—	—	—	—	—	—	190	—	220	—	—	—	180	—	—	—	55	140	—	—	—
50-24819	RE50-05-61735	275	—	—	9.8	—	—	—	150	—	170	—	—	—	140	—	—	—	43	110	—	—	—
50-24820	RE50-05-61446	20	55	—	4.4	—	9.2	—	91	—	140	—	—	—	70	—	—	—	11	—	—	—	—
50-24820	RE50-05-61449	50	92	—	17	—	14	—	160	—	240	—	—	—	110	—	—	—	29	—	—	—	—
50-24820	RE50-05-61447	100	140	15	29	—	12	7.9	85	—	180	—	—	—	74	—	11	—	32	—	—	—	7.7
50-24820	RE50-05-61448	140	300	60	19	—	29	—	470	—	670	—	—	—	340	—	34	—	120	—	—	—	—
50-24820	RE50-05-61450	200	—	—	—	—	—	—	720	—	920	—	—	—	500	—	—	—	220	—	—	—	—
50-24820	RE50-05-61736	250	—	—	—	—	—	—	760	—	890	—	—	—	510	—	—	—	260	—	—	—	—
50-24821	RE50-05-61464	20	84	5.2	5.8	—	4.4	3.2	54	—	68	—	—	—	76	—	—	—	9.2	—	—	—	—
50-24821	RE50-05-61466	50	76	58	91	—	—	22	190	—	320	—	—	—	250	—	—	—	72	—	—	—	20
50-24821	RE50-05-61465	98.4–100	—	—	30	—	—	—	190	—	380	—	—	—	270	—	—	—	97	—	—	—	—
50-24821	RE50-05-61469	137.5–140	180	—	—	—	—	29	220	—	350	—	—	—	270	—	—	—	91	—	—	—	—
50-24821	RE50-05-61473	160	—	—	—	—	—	—	510	—	610	—	—	—	620	—	—	—	210 (J+)	—	—	—	—
50-24821	RE50-05-61468	248.6–250	—	—	—	—	—	—	340	—	450	—	—	—	450	—	—	—	180	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Dioxane[1,4-]	Ethanol	Ethylbenzene
50-24822	RE50-05-61482	20	180	—	—	—	6.2	—	11	—	72	—	30	—	74	—	—	—	—	—	—	—	—
50-24822	RE50-05-61483	50	54	—	—	—	—	—	64	—	340	—	—	—	400	—	—	—	63	—	—	—	—
50-24822	RE50-05-61484	100	100	—	—	13	—	—	—	—	36	—	17	—	30	—	—	—	—	—	—	—	5
50-24822	RE50-05-61485	140	120	—	—	—	—	—	84	—	380	—	—	—	460	—	—	—	87	—	—	—	—
50-24822	RE50-05-61486	200	110	—	—	—	—	—	43	—	160	—	28	—	180	—	—	—	48	—	—	—	—
50-24822	RE50-05-61737	250	59	—	—	—	—	—	43	—	150	—	—	—	140	—	—	—	45	—	—	—	—
50-25451	MD50-06-66691	19	55	2.3	—	—	3.2	—	4.6	—	3.4	—	—	33	8.5	—	—	—	—	—	—	—	—
50-25451	MD50-06-66690	49	30	—	—	—	—	—	56	—	40	—	—	500	92	—	—	—	—	—	—	—	—
50-25451	MD50-06-66689	100	34	—	—	—	—	—	35	—	33	—	—	240	55	—	—	—	6.6	—	—	—	—
50-25451	MD50-06-66688	147	49	—	—	—	—	—	25	—	26	—	—	200	41	—	—	—	5.7	—	—	—	—
50-25451	MD50-06-66687	200	62	—	—	—	—	—	86 (J)	—	63	—	—	490	250	—	—	—	19	—	—	—	—
50-25451	MD50-06-66686	251	—	—	—	—	—	—	120	—	100	—	—	—	120	—	—	—	33	—	—	—	—
50-25451	MD50-06-66685	287	—	—	—	—	—	—	98	—	90	—	—	—	210	—	—	—	—	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methanol	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-09100	MD50-06-70880	20	—	—	—	—	—	25	—	—	—	210	—	500	77	—	4100	—	—	—	—	—	—
50-09100	MD50-06-70881	50	—	—	—	—	—	21	—	—	—	77	—	87	21	—	1800	—	—	—	1100	—	—
50-09100	MD50-06-70882	90	—	—	—	—	—	61	—	—	—	200	—	390	79	—	4400	—	—	—	—	—	—
50-09100	MD50-06-70883	103	—	—	—	—	—	150	—	—	—	600	—	1100	190	—	14000	—	—	—	—	—	—
50-09100	MD50-06-70884	120	—	—	—	—	—	290	—	—	—	730	—	1300	160	—	17000	—	—	—	—	—	—
50-09100	MD50-06-70885	160	—	—	—	—	—	490	—	—	—	730	—	960	—	—	19000	—	—	—	—	—	—
50-09100	MD50-06-70886	200	—	—	—	—	—	710	—	—	—	990	—	1600	250	—	29000	64	—	—	—	—	—
50-09100	MD50-06-70887	233	—	—	—	—	—	240	—	—	—	300	—	370	—	—	8800	—	—	—	—	—	—
50-09100	MD50-06-70888	260	—	—	—	—	—	250	—	—	—	240	—	280	—	—	7900	—	—	—	—	—	—
50-10131	MD50-06-70868	25	—	—	—	—	—	31	—	—	—	8300	—	170	89	—	6600	—	—	—	—	—	—
50-10131	MD50-06-70869	50	—	—	—	—	—	30	—	—	—	6000	—	210	87	—	5700	—	—	—	—	—	—
50-10131	MD50-06-70870	75	—	—	—	—	—	34	—	—	—	6000	—	220	90	—	5500	—	—	—	—	—	—
50-10131	MD50-06-70871	100	—	—	—	—	—	41	—	—	—	5400	85	160	51	—	4700	—	—	—	—	—	—
50-10131	MD50-06-70872	125	—	—	—	—	—	57	—	—	—	3800	130	270	70	—	3900	—	—	—	—	—	—
50-10131	MD50-06-70873	150	—	—	—	—	—	27	—	—	—	2700	—	130	36	—	2700	—	—	—	—	—	—
50-10131	MD50-06-70874	175	—	—	—	—	—	81	—	—	—	5400	80	270	83	—	5700	—	—	—	—	—	—
50-10131	MD50-06-70875	200	—	—	—	—	—	57	—	—	—	4800	24	190	57	—	5500	—	—	—	—	—	—
50-10131	MD50-06-70876	225	—	—	—	—	—	70	—	—	—	6700	—	220	83	—	6100	—	—	—	—	—	—
50-10131	MD50-06-70877	250	—	—	—	—	—	66	—	—	—	7500	—	180	70	—	7200	—	—	—	—	—	—
50-24766	MD50-06-64597	17	—	—	—	—	—	—	—	—	—	1200	—	70	28	—	1100	—	—	—	—	—	—
50-24766	MD50-06-64596	29	—	—	—	—	—	—	—	—	—	1500	—	140	42	—	1900	36	—	—	—	—	—
50-24766	MD50-06-64595	99	—	—	—	—	—	36	—	—	—	3000	—	86	62	—	5400	—	—	—	—	—	—
50-24766	MD50-06-64594	124	—	—	—	—	—	18	—	—	—	350	—	43	24	—	1300	—	—	—	—	—	—
50-24766	MD50-06-64593	149	—	—	—	—	—	50	—	—	—	580	—	130	59	—	3100	—	—	—	—	—	—
50-24767	MD50-06-64625	10	—	—	—	—	—	16	—	—	—	140	29	390	62	—	1900	—	—	—	19	—	—
50-24767	MD50-06-64626	30	10	—	—	—	—	—	—	—	—	100	59	260	51	—	1500	—	—	—	53	13	—
50-24767	MD50-06-64627	60	—	—	—	—	—	3.2	—	—	—	26	8.4	72	18	—	490	—	—	—	13	3.3	—
50-24767	MD50-06-64628	124	—	—	—	—	—	17	—	—	—	55	26	450	64	—	1400	—	—	—	—	—	—
50-24767	MD50-06-64629	149	—	—	—	—	—	110	—	—	—	140	55	730	120	—	4300	—	30	—	63	—	—
50-24768	MD50-06-64661	14	—	—	—	—	—	—	—	—	—	46	—	150	38	—	930	—	—	—	11	—	—
50-24768	MD50-06-64660	29	—	—	—	—	—	—	4.8	—	—	27	4	59	16	—	480	—	—	—	—	—	11
50-24768	MD50-06-64659	99	—	—	—	—	—	69	—	—	—	490	—	2500	410	—	13000	—	—	—	—	—	—
50-24768	MD50-06-64658	125	—	—	—	—	—	120	—	—	—	260	—	2900	440	—	14000	—	—	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methanol	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24768	MD50-06-64657	150	—	—	—	—	—	130	—	—	—	210	—	2600	380	—	13000	—	—	—	—	—	—
50-24769	MD50-06-64693	20	—	—	—	—	—	—	—	—	—	19	—	9.1	1.8	1.5	320	5.1	—	—	—	—	—
50-24769	MD50-06-64692	39	—	—	—	—	—	0.91	—	—	—	19	—	7.1	1.7	3.6	460	4.4	—	—	—	—	—
50-24769	MD50-06-64691	99	—	—	—	—	—	—	—	—	—	1300	—	840	—	—	31000	—	—	—	—	—	—
50-24769	MD50-06-64690	124	—	—	—	—	—	—	—	—	—	600	—	360	—	—	18000	—	—	—	—	—	—
50-24769	MD50-06-64689	149	—	—	—	—	—	—	—	—	—	1100	—	940	—	—	43000	—	—	—	—	—	—
50-24770	MD50-06-64738	20	—	—	—	—	—	—	—	—	—	24000	—	500	—	—	15000	—	—	—	—	—	—
50-24770	MD50-06-64725	25	—	—	—	—	—	49	—	—	—	19000	—	540	—	—	16000	—	—	—	—	—	—
50-24770	MD50-06-64724	39	—	—	—	—	—	—	—	—	—	14000	—	570	120	—	19000	—	—	—	—	—	—
50-24770	MD50-06-64723	100	—	—	—	—	—	120	—	—	—	2600	—	450	100	75	16000	—	—	—	—	—	—
50-24770	MD50-06-64722	124	—	—	—	—	—	310	—	—	—	3800	—	870	190	—	37000	—	—	—	—	—	—
50-24770	MD50-06-64721	150	—	—	—	—	—	240	—	—	—	890	—	310	—	—	16000	—	—	—	—	—	—
50-24771	MD50-06-64750	17	—	—	—	—	—	58	—	—	—	840	—	260	—	—	11000	—	—	—	—	—	—
50-24771	MD50-06-64749	40	—	—	—	—	—	84	—	—	—	1100	—	420	—	—	16000	—	—	—	—	—	—
50-24771	MD50-06-64748	100	—	—	—	—	—	29	—	—	—	80	—	—	—	—	1900	—	—	—	—	—	—
50-24771	MD50-06-64747	125	—	—	—	—	—	320	—	—	—	1000	—	—	—	—	21000	—	—	—	—	—	—
50-24771	MD50-06-64746	150	—	—	—	—	—	1200	—	—	—	1800	—	—	—	—	50000	—	—	—	—	—	—
50-24773	MD50-06-64775	20	—	—	—	—	—	110	—	—	—	470	—	190	—	—	6500	—	—	—	—	—	—
50-24773	MD50-06-64774	40	—	—	—	—	—	100	—	—	—	840	—	250	—	—	12000	—	—	—	—	—	—
50-24773	MD50-06-64773	100	—	—	—	—	—	270	—	—	—	880	—	270	—	—	15000	—	—	—	—	—	—
50-24773	MD50-06-64776	125	—	—	—	—	—	700	—	—	—	1700	—	510	—	—	29000	—	—	—	—	—	—
50-24773	MD50-06-64772	150	—	—	—	—	—	1100	—	—	—	2100	—	380	—	—	43000	—	—	—	—	—	—
50-24782	MD50-06-64803	20	—	—	—	—	—	58	—	—	—	770	—	100	—	—	5000	—	—	—	—	—	—
50-24782	MD50-06-64804	40	—	—	—	—	—	56	—	—	—	1200	—	180	49	—	7100	—	—	—	—	—	—
50-24782	MD50-06-64805	100	—	—	—	—	—	130	—	—	—	840	—	130	—	—	8400	—	—	—	—	—	—
50-24782	MD50-06-64806	125	—	—	—	—	—	450	—	—	—	1300	—	350	—	—	16000	—	—	—	—	—	—
50-24782	MD50-06-64807	155	—	—	—	—	—	52	—	—	—	460	40	66	35	—	3800	—	—	—	36	—	—
50-24783	MD50-06-64832	20	—	—	—	—	—	930	—	—	—	1500	—	—	—	—	23000	—	—	—	—	—	—
50-24783	MD50-06-64831	36	—	—	—	—	—	—	—	—	—	450	—	54	33	—	3100	—	—	—	—	—	—
50-24783	MD50-06-64830	100	—	—	—	—	—	49	—	—	—	270	—	46	—	—	2700	—	—	—	—	—	—
50-24783	MD50-06-64829	125	—	—	—	—	—	170	—	—	—	1300	—	180	73	—	14000	—	—	—	—	—	—
50-24783	MD50-06-64828	151	—	—	—	—	—	470	—	—	—	1600	—	190	—	—	19000	—	—	—	—	—	—
50-24784	MD50-06-64374	10	—	—	—	—	—	—	—	—	—	1100	—	40	120	—	520	—	—	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methanol	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24784	MD50-06-64373	20	—	—	—	—	—	—	—	—	—	190	—	6.9	19	—	77	2.4	—	—	4.9	0.91	—
50-24784	MD50-06-64372	47	—	—	—	—	—	11	—	—	—	1600	—	78	56	—	2300	—	—	—	—	—	—
50-24784	MD50-06-64371	49	—	—	—	—	—	11	—	—	—	1700	12	77	57	—	2200	—	—	—	—	—	—
50-24784	MD50-06-64370	55	—	—	—	—	—	11	—	—	—	1700	28	72	64	—	1500	13	—	—	37	8.9	—
50-24784	MD50-06-64375	100	—	—	—	—	—	6.9	—	—	—	680	10	43	28	—	1000	—	—	—	16	3.8	—
50-24784	MD50-06-64379	168	—	—	—	—	—	18	—	—	—	1400		65	40	—	2700	—	—	—	—	—	—
50-24784	MD50-06-64378	199	2	—	1.8 (J)	—	—	9.5	—	—	—	370	33	12	17	—	760	5	—	—	27	5.4	—
50-24784	MD50-06-64377	250	—	—	—	—	—	19	—	—	—	850	34	29	24	—	2100	—	—	—	53	12	—
50-24784	MD50-06-64376	268	—	—	—	—	—	37	—	—	—	1900	—	76	40	—	3900	—	—	—	—	—	—
50-24785	MD50-06-64402	10	12	49	—	—	—	—	15	—	—	270	54	—	—	—	140	—	14	4.5	—	10	24
50-24785	MD50-06-64403	19	15	4.8	—	—	—	—	13	—	—	1200	120	10	13	—	610	—	15	4.5	—	20	59
50-24785	MD50-06-64408	60	—	—	—	—	—	—	—	—	—	7900	—	140	120	—	4900	—	—	—	—	—	—
50-24785	MD50-06-64407	120	—	—	—	—	—	24	—	—	—	4900	—	160	85	—	4900	—	—	—	—	—	—
50-24785	MD50-06-64404	200	—	—	—	—	—	49	—	—	—	5400	—	190	92	—	7600	—	—	—	—	—	—
50-24785	MD50-06-64405	250	—	—	—	—	—	49	—	—	—	4600	—	130	79	—	7700	—	—	—	—	—	—
50-24785	MD50-06-64406	275	—	—	—	—	—	7	—	—	—	130	260	—	—	—	330	—	—	—	—	—	—
50-24796	MD50-06-64448	10	2 (J)	—	3 (J)	—	—	—	—	—	—	180	12	—	—	—	19	—	2.1	—	4.8	1.6	—
50-24796	MD50-06-64447	20	—	—	1.7 (J)	—	—	0.8	—	—	2.2	300	27	19	7.9	—	420	5.4	—	—	11	3.7	—
50-24796	MD50-06-64449	40	—	—	—	—	—	—	—	—	—	1200	15	110	37	—	2000	25	—	—	—	—	—
50-24796	MD50-06-64450	100	—	—	—	—	—	71 (J)	—	—	—	3000	—	900	180	—	6000	84	—	—	—	—	—
50-24796	MD50-06-64451	120	—	—	—	—	—	2.9	—	—	—	110	5.9	13	5.3	—	270	3.9	—	—	2.7	—	—
50-24796	MD50-06-64452	150	—	—	—	—	—	49	—	—	—	1200	25	320	100	—	2200		—	—	—	—	—
50-24797	MD50-06-64496	18.3	19 (J)	—	—	—	—	—	—	—	—	300	34	56	20	—	550	66	29	10	26 (J)	9.6 (J)	—
50-24797	MD50-06-64497	38	—	—	—	—	—	—	—	—	—	1000	—	160	57	—	2400	130	—	—	—	—	—
50-24797	MD50-06-66198	60	—	—	—	—	—	—	—	—	—	920	—	190	66	—	3000	58	—	—	—	—	—
50-24797	MD50-06-64498	120	—	—	—	—	—	35	—	—	—	780	—	180	66	—	3200	35	—	—	—	—	—
50-24797	MD50-06-64500	160	—	—	—	—	—	120	—	—	—	2300	—	700	490	—	9600	87	—	—	—	—	—
50-24799	MD50-06-66197	15	—	—	—	—	—	4	—	—	—	590	—	20	11	—	920	—	—	—	13	5.4	—
50-24799	MD50-06-64521	17.5	—	—	—	—	—	—	—	—	—	83	8.2	—	—	—	46	—	2.2	—	6.3 (J)	2.2 (J)	—
50-24799	MD50-06-64522	20	2.7 (J)	—	2.1 (J)	—	—	—	—	—	—	98	15	—	—	—	62	—	2.9	—	10 (J)	2.9 (J)	—
50-24799	MD50-06-64523	32.5	—	—	11 (J)	—	—	—	—	—	—	1600	54	26	14	—	1100	—	—	—	26 (J)	—	—
50-24799	MD50-06-64538	37.5	—	—	18 (J)	—	—	—	—	—	—	1800	34	30	19	—	1300	—	—	—	—	—	—
50-24799	MD50-06-64524	40.5	—	12	—	130	7.6	—	11	—	—	1100	15	18	12	—	960	—	—	—	—	—	6.1

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methanol	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24799	MD50-06-64525	100	—	—	—	—	—	—	—	—	—	43	10	—	—	—	95	—	—	—	—	—	—
50-24799	MD50-06-64526	120	—	—	—	—	—	11	—	13	—	80	5.7	8.3	4.8	—	450	—	—	—	—	—	—
50-24799	MD50-06-64527	160	—	—	—	—	—	220	—	210	—	1000	20	140	72	—	7600	—	—	—	—	—	—
50-24801	MD50-06-64853	20	—	—	—	—	—	—	—	—	—	250	—	—	30	—	910	—	—	—	—	—	—
50-24801	MD50-06-64870	35	—	—	—	—	—	—	—	—	—	440	—	—	49	—	1900	—	—	—	—	—	—
50-24801	MD50-06-64856	80	—	—	—	—	—	170	—	—	—	1700	—	270	93	—	14000	—	—	—	—	—	—
50-24801	MD50-06-64855	120	—	—	—	—	—	32	—	—	—	600	32	66	34	—	3800	12	—	—	—	—	—
50-24801	MD50-06-64854	150	—	—	—	—	—	65	—	—	—	160	32	—	—	—	1900	—	—	—	—	—	—
50-24802	MD50-06-64878	15	—	—	—	—	—	73	—	—	—	600	—	81	—	—	5500	—	—	—	—	—	—
50-24802	MD50-06-64879	42	—	—	—	—	—	140	—	—	—	1200	—	170	—	—	11000	—	—	—	—	—	—
50-24802	MD50-06-64880	99.4	—	—	—	—	—	79	—	—	—	560	—	73	—	—	5400	—	—	—	—	—	—
50-24802	MD50-06-64881	124.4	—	—	—	—	—	260	—	—	—	760	—	110	—	—	9400	—	—	—	—	—	—
50-24802	MD50-06-64882	156.4	—	—	—	—	—	150	—	—	—	770	—	130	—	—	8600	—	—	—	—	—	—
50-24803	MD50-06-64904	16	—	—	—	—	—	2.6	—	—	—	56	5.2	—	3.2	—	570	—	—	—	23	5.6	—
50-24803	MD50-06-64903	37	—	—	—	—	—	5.7	—	—	—	120	11	13	6.9	6	1100	3.5	—	—	15	3.6	—
50-24803	MD50-06-64905	99.5	—	—	—	—	—	55	—	—	—	160	—	26	—	—	2100	—	—	—	20	20	—
50-24803	MD50-06-64906	124	—	—	—	—	—	97	—	—	—	350	—	57	—	—	4600	—	—	—	33	33	—
50-24803	MD50-06-64907	151	—	—	—	—	—	91	—	—	—	190	—	—	—	—	2700	—	—	—	—	—	—
50-24804	MD50-06-64970	10	—	—	—	—	—	—	—	—	—	44	6.5	16	—	—	500	18	—	—	—	—	—
50-24804	MD50-06-64971	16	—	—	—	—	—	16	—	—	—	320	—	53	—	—	3300	—	—	—	—	—	—
50-24804	MD50-06-64972	33	—	—	—	—	—	13	—	—	—	270	—	—	—	—	4000	—	—	—	—	—	—
50-24804	MD50-06-64973	99	—	—	—	—	—	86	—	—	—	600	—	81	—	—	7500	—	—	—	—	—	—
50-24804	MD50-06-64974	124	—	—	—	—	—	250	—	—	—	840	—	160	—	—	11000	—	—	—	—	—	—
50-24804	MD50-06-64975	149	—	—	—	—	—	480	—	—	—	1200	—	130	—	—	16000	—	—	—	—	—	—
50-24810	MD50-06-64999	19	—	—	—	—	—	—	—	—	—	92	8.5	—	—	—	1200	—	—	—	18	—	—
50-24810	MD50-06-64998	37	—	—	—	—	—	21	—	—	—	150	—	24	—	—	1700	—	—	—	55	17	—
50-24810	MD50-06-64997	99	—	—	—	—	—	21	—	—	—	120	37	—	—	—	1900	—	—	—	—	—	—
50-24810	MD50-06-64996	123	—	—	—	—	—	110	—	—	—	480	—	68	—	—	6200	—	—	—	—	—	—
50-24810	MD50-06-64995	150	—	—	—	—	—	200	—	—	—	550	—	74	—	—	8100	—	—	—	—	—	—
50-24811	MD50-06-65069	20	—	—	—	—	—	43	—	—	—	730	—	—	—	—	6100	—	—	—	—	—	—
50-24811	MD50-06-65068	40	—	—	—	—	—	63	—	—	—	750	—	—	—	—	10000	—	—	—	—	—	—
50-24811	MD50-06-65067	98	—	—	—	—	—	130	—	—	—	290	—	—	—	—	6300	—	—	—	—	—	—
50-24811	MD50-06-65066	125	—	—	—	—	—	130	—	—	—	340	—	—	—	—	7300	—	—	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methanol	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24811	MD50-06-65065	150	—	—	—	—	—	1800	—	—	—	1400	—	—	—	—	36000	—	—	—	—	—	—
50-24812	MD50-06-65094	10	—	—	—	—	—	180	—	—	—	1100	—	—	—	—	23000	—	—	—	—	—	—
50-24812	MD50-06-65093	35	—	—	—	—	—	41	—	—	—	380	—	—	—	—	4600	—	—	—	—	—	—
50-24812	MD50-06-65092	98	—	—	—	—	—	270	—	—	—	810	—	—	—	—	23000	—	—	—	—	—	—
50-24812	MD50-06-65091	123	—	—	—	—	—	310	—	—	—	570	—	—	—	92	13000	—	—	—	—	—	—
50-24812	MD50-06-65090	150	—	—	—	—	—	1900	—	—	—	1100	—	—	—	—	51000	—	—	—	—	—	—
50-24813	MD50-06-65126	20	—	—	—	—	—	32	—	—	—	150	—	—	—	—	4800	—	—	—	—	—	—
50-24813	MD50-06-65125	30	—	—	—	—	—	40	—	—	—	310	—	—	—	—	11000	—	—	—	—	—	—
50-24813	MD50-06-65124	99	—	—	—	—	—	110	—	—	—	270	—	—	—	—	11000	—	—	—	—	—	—
50-24813	MD50-06-65123	125	—	—	—	—	—	220	—	—	—	520	—	—	—	100	26000	—	—	—	—	—	—
50-24813	MD50-06-65122	150	—	—	—	—	—	960	—	—	—	900	—	—	—	190	54000	—	—	—	—	—	—
50-24814	MD50-06-65151	10	—	—	—	—	—	17	—	—	—	57	—	—	—	—	3700	—	—	—	—	—	—
50-24814	MD50-06-65150	30	—	—	—	—	—	11	—	—	—	84	32	—	—	—	2500	—	—	—	—	—	—
50-24814	MD50-06-65149	99	—	—	—	—	—	—	—	—	—	14	—	—	—	—	1300	—	—	—	—	—	—
50-24814	MD50-06-65148	124	—	—	—	—	—	50	—	—	—	93	—	—	—	—	6000	—	—	—	—	—	—
50-24814	MD50-06-65147	149	—	—	—	—	—	110	—	—	—	72	39	—	—	25	4800	—	—	—	—	—	—
50-24815	MD50-06-65183	30	—	—	—	—	—	—	—	—	—	24	—	—	—	16	1600	—	—	—	—	—	—
50-24815	MD50-06-65182	40	—	—	—	—	—	13	—	—	—	41	—	25	—	12	1900	—	—	—	—	—	—
50-24815	MD50-06-65181	100	—	—	—	—	—	—	—	—	—	10	—	—	—	7.7	660	—	—	—	—	—	—
50-24815	MD50-06-65180	125	—	—	—	—	—	1	—	—	—	5.1	—	—	—	4.4	230	3	—	—	—	—	—
50-24815	MD50-06-65179	149	—	—	—	—	—	28	—	—	—	67	—	—	—	69	3700	—	—	—	—	—	—
50-24816	MD50-06-65204	25	—	—	—	—	—	—	—	—	—	26	6.1	—	—	—	18	—	—	—	—	—	3.8
50-24816	MD50-06-65205	35	—	4.3	—	—	—	—	—	—	—	62	11	—	—	—	47	—	—	—	—	—	4.6
50-24816	MD50-06-65209	65	—	—	—	—	—	—	—	—	—	3800	—	220	98	—	4700	—	—	—	—	—	—
50-24816	MD50-06-65206	120	—	—	—	—	—	—	—	—	—	860	—	46	28	—	1100	—	—	—	—	—	—
50-24816	MD50-06-65208	200	—	—	—	—	—	23	—	—	—	2000	—	110	45	—	3800	—	—	—	—	—	—
50-24816	MD50-06-65207	225	—	—	—	—	—	31	—	—	—	3900	—	170	75	—	6500	—	—	—	—	—	—
50-24817	MD50-05-63841	20	4.6	6.9	—	—	—	—	—	110	—	150	20	130	40	—	210	16	4.4	—	—	4.4	12
50-24817	MD50-05-63842	40	—	7.2	—	—	—	—	3.6	99	—	480	17	470	140	—	1000	39	—	—	—	6.7	8
50-24817	RE50-05-63816	100	22	170	—	—	—	30	66	—	17	1300	140	1400	390	—	4600	—	—	—	—	24	49
50-24817	RE50-05-63817	140	—	13	—	—	—	59	—	—	—	1700	54	1800	450	—	6700	68	—	—	—	—	33
50-24817	RE50-05-63818	200	—	100	—	—	—	130	37	—	—	2300	140	1900	530	—	9900	—	—	—	—	—	44
50-24817	MD50-05-63843	250	—	—	—	—	—	110	—	—	—	2400	41	1200	390	—	9800	62	—	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methanol	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24818	MD50-06-65232	10	3	—	—	—	—	—	—	—	—	11	17	11	2.2	—	81	—	3.4	—	12	3.3	—
50-24818	MD50-06-65233	25	—	—	—	—	—	—	—	—	—	260	360	230	51	—	3000	—	—	—	—	—	—
50-24818	MD50-06-65234	100	—	—	—	—	—	92	—	—	—	2000	—	2200	440	—	27000	—	—	—	—	—	—
50-24818	MD50-06-65235	150	—	—	—	—	—	270	—	—	—	2100	750	1500	310	—	37000	—	—	—	—	—	—
50-24818	MD50-06-65236	190	—	—	—	—	—	240	—	—	—	280	530	79	—	—	7600	—	—	—	—	—	—
50-24818	MD50-06-65237	250	—	—	—	—	—	760	—	—	—	1700	490	640	—	—	37000	—	—	—	—	—	—
50-24818	MD50-06-65238	280	—	—	—	—	—	760	—	—	—	1600	190	410	—	—	36000	—	—	—	—	—	—
50-24818	MD50-06-65239	315	—	—	—	—	—	370	—	—	—	1000	110	220	—	—	23000	—	—	—	—	—	—
50-24818	MD50-06-65240	414	—	—	—	—	9.2	3.9	—	—	—	4.9	3.8	—	—	—	170	—	2.3	2.3	6.9	1.6	—
50-24818	MD50-06-65242	452	—	—	—	—	11	4.8	—	—	—	25	—	—	—	—	840	—	—	—	—	—	—
50-24818	MD50-06-65245	500	—	—	4.9	—	26	1.5	—	—	—	51	5.3	—	—	—	470	—	—	—	16	3	—
50-24818	MD50-06-65244	548	—	—	—	—	8.6	—	—	—	—	18	3.1	—	—	—	210	—	—	—	5.6	—	—
50-24818	MD50-06-65243	591	—	—	—	—	8.1	—	—	—	—	32	—	—	—	—	360	—	—	—	—	—	—
50-24819	RE50-05-61430	20	—	—	—	—	—	—	—	12	—	210	—	17	8.2	—	420	—	—	—	—	—	—
50-24819	RE50-05-61431	50	—	—	—	—	—	—	—	27	—	450	5.8	42	20	—	1200	—	—	—	—	—	—
50-24819	RE50-05-61432	100	—	5.4	—	—	—	20	—	50	—	430	4.1	51	22	—	1600	6.1	—	—	—	—	—
50-24819	RE50-05-61732	138.5–140	—	—	—	—	—	67	—	—	—	1400	—	280	85	—	5100	19	—	—	—	—	—
50-24819	RE50-05-61733	200	—	—	—	—	—	120	—	66	—	1400	—	250	79	—	5900	22	—	—	—	—	—
50-24819	RE50-05-61734	250	—	—	—	—	—	160	—	52	—	1500	—	210	70	—	7800	—	—	—	—	—	—
50-24819	RE50-05-61735	275	—	—	—	—	—	160	—	89	—	1200	—	120	46	—	6400	—	—	—	—	—	—
50-24820	RE50-05-61446	20	8.6 (J-)	—	—	—	—	—	—	31	—	91	21	—	—	—	2000	—	9.5	—	—	—	21
50-24820	RE50-05-61449	50	—	9.9	—	—	—	16	—	170	—	140	23	—	—	—	3400	—	—	—	—	—	14
50-24820	RE50-05-61447	100	—	15	—	—	—	43	6.6	280	—	68	23	—	—	11	2200	—	—	—	—	8.3	20
50-24820	RE50-05-61448	140	—	45	—	—	—	200	—	180	—	360	140	—	—	—	10000	—	—	—	—	—	76
50-24820	RE50-05-61450	200	—	—	—	—	—	790	—	160	—	780	82	—	—	—	25000	—	—	—	—	—	—
50-24820	RE50-05-61736	250	—	—	—	—	—	1100	—	—	—	1100	—	—	—	—	35000	—	—	—	—	—	—
50-24821	RE50-05-61464	20	—	3.1	—	—	—	—	—	50	—	33	13	—	—	—	1600	—	—	—	—	—	6.8
50-24821	RE50-05-61466	50	—	50	—	—	—	—	20	760	—	120	100	—	—	—	6600	—	—	—	—	16	32
50-24821	RE50-05-61465	98.4–100	—	26	—	—	—	64 (J+)	—	250	—	120	27	—	—	—	7200	—	—	—	—	—	—
50-24821	RE50-05-61469	137.5–140	—	44	—	—	—	100	—	730	—	140	54	—	—	—	7600	—	—	—	—	—	—
50-24821	RE50-05-61473	160	—	60	—	—	—	390	86	—	—	350	—	—	—	—	21000	—	—	—	—	—	—
50-24821	RE50-05-61468	248.6–250	—	120	—	—	—	610	—	—	—	310	250	—	—	—	22000	—	—	—	—	—	160
50-24822	RE50-05-61482	20	—	—	—	—	—	—	—	17	—	18	—	—	—	—	1700	—	—	—	—	—	—

Table C-2.3-11 (continued)

Location ID	Sample ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methanol	Methyl-2-pentanone[4-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24822	RE50-05-61483	50	—	—	—	—	—	34 (J+)	—	—	—	81	—	48	—	—	9100	—	—	—	—	—	—
50-24822	RE50-05-61484	100	10	3.6	—	—	—	—	—	14	—	—	19	—	—	—	680	—	10	—	—	7.3	20
50-24822	RE50-05-61485	140	—	—	—	—	—	80	—	—	—	100	31	58	200	—	13000	—	—	—	—	—	—
50-24822	RE50-05-61486	200	18	—	—	—	—	100	—	—	—	33	33	—	—	—	7100	—	21	—	—	—	31
50-24822	RE50-05-61737	250	—	—	—	—	—	120	—	—	—	29	—	—	—	—	7300	—	—	—	—	—	—
50-25451	MD50-06-66691	19	—	—	—	—	—	—	—	—	—	2.4	3.3	—	—	—	79	6	—	—	—	—	—
50-25451	MD50-06-66690	49	—	—	—	—	—	8.1	—	—	—	19	—	—	—	—	870	65	—	—	—	—	—
50-25451	MD50-06-66689	100	—	—	—	—	—	8.9	—	—	—	14	—	—	—	—	720	33	—	—	—	—	—
50-25451	MD50-06-66688	147	—	—	—	—	—	9.8	—	—	—	12	—	13	—	—	560	29	—	—	—	—	—
50-25451	MD50-06-66687	200	—	—	—	—	—	48	—	—	—	41	—	40	—	—	1900	68	—	—	—	—	—
50-25451	MD50-06-66686	251	—	—	—	—	—	82	—	—	—	130	—	—	—	—	6400	—	—	—	—	—	—
50-25451	MD50-06-66685	287	—	—	—	—	—	72	—	—	—	170	—	—	—	—	7300	—	—	—	—	—	—

Note: Units are µg/m^3.

*— = Not detected.

Table C-2.3-12
Summary of VOCs Detected in Second Round of 2005–2006 Vapor Sampling at MDA C

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Tetrachloride	Chlorodibromomethane	Chlorodifluoromethane	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorobenzene[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]
50-24766	MD50-06-65331	17	34	—*	—	7.3	—	—	27	—	12	—	38	—	—	—	—	8
50-24766	MD50-06-65330	29	27	—	—	23	—	—	86	—	—	—	79	—	—	—	12	38
50-24766	MD50-06-65329	99	93	—	—	22	—	—	74	—	—	—	62	—	—	—	13	35
50-24766	MD50-06-65328	124	53	—	—	64	—	—	150	—	52	—	130	13	—	15	29	87
50-24766	MD50-06-65327	149	—	—	—	250 (J)	—	—	450	—	88	—	370	—	—	—	110	230
50-24767	MD50-06-65362	10	—	—	—	—	—	—	380	—	—	—	270	—	—	—	67	—
50-24767	MD50-06-65361	30	—	—	—	—	—	—	380	—	—	—	270	—	—	—	69	—
50-24767	MD50-06-65360	60	—	—	—	—	—	—	420	—	—	—	300	—	—	—	76	—
50-24767	MD50-06-65359	124	—	—	—	—	—	—	240	—	—	—	160	—	—	—	61	—
50-24767	MD50-06-65358	149	—	—	—	—	—	—	190	—	—	—	60	—	—	—	63	—
50-24768	MD50-06-65370	14	17	—	—	7.2	—	—	31	—	240	—	46	—	—	—	—	—
50-24768	MD50-06-65369	29	17	—	—	4.4	—	—	20	1.4	82	—	19	—	—	—	—	—
50-24768	MD50-06-65368	99	40	—	—	3.3	—	—	16	1.4	42	—	14	—	—	—	1	—
50-24768	MD50-06-65367	125	100	—	—	—	—	—	51	—	56	—	45	—	—	—	8.9	—
50-24768	MD50-06-65366	150	93	—	—	—	—	—	81	—	100	—	85	—	—	—	24	—
50-24769	MD50-06-65378	20	25	—	—	77 (J)	—	—	370	—	—	—	380	—	—	—	58	—
50-24769	MD50-06-65377	39	42	—	—	—	—	—	38	—	—	—	42	—	—	—	—	—
50-24769	MD50-06-65376	99	52	0.76	—	8.6	—	—	40	0.92	5.2	—	24	—	1.2	—	5.9	1.5
50-24769	MD50-06-65375	124	41	6.7	—	—	—	—	150	—	—	—	120	—	—	—	33	—
50-24769	MD50-06-65374	149	240	11	—	—	—	—	180	—	—	—	130	—	—	—	44	—
50-24770	MD50-06-65387	20	—	—	—	1400	—	—	1300	—	—	—	1100	—	—	—	160	—
50-24770	MD50-06-65386	25	—	—	—	1500	—	—	1300	—	—	—	1100	—	—	—	150	—
50-24770	MD50-06-65385	39	—	—	—	2000	—	—	1700	—	—	—	1300	—	—	—	210	—
50-24770	MD50-06-65384	100	—	—	—	1900	—	—	1900	—	—	—	1500	—	—	—	280	—
50-24770	MD50-06-65383	124	—	—	—	1700	—	—	1900	—	—	—	1400	—	—	—	290	—
50-24770	MD50-06-65382	148	—	—	—	3600 (J)	—	—	4600	—	—	—	3900	—	—	—	770	—
50-24771	MD50-06-65394	17	—	—	—	1400 (J)	—	—	1200	—	—	—	640	—	—	—	71	—
50-24771	MD50-06-65393	40	—	—	—	1900 (J)	—	—	1700	—	—	—	800	—	54	—	130	52
50-24771	MD50-06-65392	100	55	—	—	200 (J)	—	—	440	—	19	—	170	—	27	—	57	17
50-24771	MD50-06-65391	125	—	—	—	1100	—	—	2300	—	—	—	640	—	160	—	370	100
50-24771	MD50-06-65390	149	—	—	—	2200	—	—	3800	—	—	—	1500	—	430	—	790	240
50-24773	MD50-06-65405	20	—	—	—	220	—	—	520	—	—	—	210	—	—	—	54	—

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Tetrachloride	Chlorodibromomethane	Chlorodifluoromethane	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorobenzene[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]
50-24773	MD50-06-65404	40	—	—	—	1100 (J)	—	—	1500	—	—	—	600	—	56	—	140	57
50-24773	MD50-06-65403	100	—	—	—	450 (J)	—	—	750	—	—	—	260	—	51	—	87	43
50-24773	MD50-06-65402	125	—	—	—	1100 (J)	—	—	1500	—	—	—	680	—	90	—	210	81
50-24773	MD50-06-65401	149	—	—	—	930	—	—	2400	—	—	—	730	—	200	—	440	130
50-24782	MD50-06-65413	21	67	—	—	19	—	—	310	—	—	—	120	—	—	—	29	11
50-24782	MD50-06-65412	40	160	—	—	—	—	—	310	—	—	—	98	—	—	—	33	20
50-24782	MD50-06-65411	100	40	—	—	17	—	—	240	—	—	—	79	—	14	—	41	13
50-24782	MD50-06-65410	125	100	—	—	130	—	—	640	—	—	—	210	—	40	—	110	43
50-24782	MD50-06-65409	151	—	—	—	440	—	—	1700	—	—	—	—	—	130	—	350	130
50-24783	MD50-06-65421	20	—	—	—	—	—	—	250	—	—	—	110	—	—	—	34	35
50-24783	MD50-06-65420	36	34	—	—	—	—	—	84	—	—	—	29	—	—	—	11	9.8
50-24783	MD50-06-65419	100	56	—	—	—	—	—	140	—	17	—	57	—	9.1	—	24	22
50-24783	MD50-06-65418	125	—	—	—	99	—	—	540	—	—	—	210	—	—	—	91	81
50-24783	MD50-06-65417	148	—	—	—	—	—	—	490	—	—	—	210	—	—	—	100	76
50-24784	MD50-06-70724	10	38	—	—	160	—	—	180	—	—	—	87	—	—	—	—	28
50-24784	MD50-06-70723	20	29	—	—	120	—	—	170	—	—	—	68	—	—	—	—	19
50-24784	MD50-06-70722	47	29	6.7	—	160	—	—	160	—	—	—	49	—	—	—	—	25
50-24784	MD50-06-70721	49	—	—	—	160	—	—	210	—	—	—	89	—	—	—	—	34
50-24784	MD50-06-65292	55	62	—	—	130	—	—	290	—	—	—	78	—	—	—	9	50
50-24784	MD50-06-65291	100	11	—	—	74	—	—	200	—	—	—	48	—	5.8	—	6.7	33
50-24784	MD50-06-65290	168	39	—	—	130	—	—	140	—	—	—	75	—	—	7	11	33
50-24784	MD50-06-65289	199	—	—	—	18	—	—	21	—	—	—	14	—	—	—	—	4.3
50-24784	MD50-06-65288	250	—	—	—	140	—	—	85	—	—	—	67	—	—	—	9.6	24
50-24784	MD50-06-65287	265	—	—	—	220	—	—	82	—	—	—	110	—	—	—	13	27
50-24785	MD50-06-66783	10	—	—	—	—	—	—	1000	—	—	—	64	—	—	—	—	24
50-24785	MD50-06-65300	19	—	—	—	—	—	—	980	—	—	—	66	—	—	—	—	24
50-24785	MD50-06-65299	60	—	—	—	70	—	—	1300	—	—	—	84	—	30	—	—	70
50-24785	MD50-06-65298	120	—	—	—	190	—	—	1200	—	—	—	160	—	30	—	21	120
50-24785	MD50-06-65297	200	—	—	—	230	—	—	340	—	—	—	150	—	—	—	20	75
50-24785	MD50-06-65296	250	—	—	—	360	—	—	210	—	—	—	220	—	—	—	—	59
50-24785	MD50-06-65295	256	70	—	—	62	—	—	220	—	18	—	180	17	—	—	34	100
50-24796	MD50-06-65308	10	9.9	2.4	—	7	—	—	32	1.1	—	—	46	0.86	1.3	1.2	2.2	23
50-24796	MD50-06-65307	20	21	11	—	11	—	—	44	0.95	—	—	62	1.1	1.8	1.2	3	28
50-24796	MD50-06-65306	40	27	5.6	78	27	—	—	120	1.4	—	—	150	3.2	5.8	4.2	9.3	85

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Tetrachloride	Chlorodibromomethane	Chlorodifluoromethane	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorobenzene[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]
50-24796	MD50-06-65305	100	—	—	—	24	—	—	210	—	—	—	250	—	9.5	—	25	110
50-24796	MD50-06-65304	120	25	—	—	52	—	—	150	—	—	—	180	—	9.6	—	21	120
50-24796	MD50-06-65303	144	—	—	—	37	—	—	200	—	—	—	230	—	—	—	34	180
50-24797	MD50-06-65315	18.3	48	—	—	29 (J)	—	—	140	—	—	—	550	—	—	—	11	87
50-24797	MD50-06-65314	38	—	—	—	26 (J)	—	—	180	—	—	—	370	—	—	—	22	150
50-24797	MD50-06-65313	60	34	—	—	—	—	—	170	—	—	—	290	8.1	—	—	27	110
50-24797	MD50-06-65312	120	—	—	—	65	—	—	290	—	—	—	410	—	—	—	55	260
50-24797	MD50-06-65311	154	—	—	—	98	—	—	380	—	—	—	430	—	—	—	100	460
50-24799	MD50-06-65323	20	57	—	—	—	—	—	140	—	—	—	94	—	—	—	22	39
50-24799	MD50-06-65322	32.5	—	—	—	—	—	—	310	—	—	—	190	—	—	—	47	92
50-24799	MD50-06-65321	100	—	—	—	—	—	—	73	—	—	—	45	—	—	—	12	25
50-24799	MD50-06-65320	120	—	—	—	—	—	—	88	—	—	—	44	—	—	—	—	36
50-24799	MD50-06-65319	160	—	—	—	98	—	—	220	—	—	—	130	—	—	—	53	93
50-24801	MD50-06-65429	20	50	—	—	9.6	—	—	64	—	—	—	25	—	—	—	7.2	12
50-24801	MD50-06-65428	35	—	—	—	34 (J)	—	—	310	—	—	—	140	—	—	—	45	66
50-24801	MD50-06-65427	80	—	—	—	48 (J)	—	—	370	—	—	—	160	—	—	—	57	79
50-24801	MD50-06-65426	120	—	—	—	180 (J)	—	—	510	—	—	—	220	—	—	—	88	120
50-24801	MD50-06-65425	150	—	—	—	380	—	—	760	—	—	—	310	—	—	—	160	190
50-24802	MD50-06-65437	15	54	—	—	12	—	—	35	—	—	—	13	—	—	—	3	5.2
50-24802	MD50-06-65436	42	—	—	—	53	—	—	240	—	—	—	89	—	—	—	34	31
50-24802	MD50-06-65435	99	—	—	—	73	—	—	320	—	—	—	110	—	—	—	49	41
50-24802	MD50-06-65434	124	—	—	—	150	—	—	440	—	—	—	180	—	—	—	60	53
50-24802	MD50-06-65433	156	—	—	—	100	—	—	310	—	—	—	—	—	23	—	50	47
50-24803	MD50-06-65445	16	—	—	—	20	—	—	79	—	—	—	30	—	—	—	12	—
50-24803	MD50-06-65444	37	25	—	—	57	—	—	130	—	—	—	45	—	—	—	19	13
50-24803	MD50-06-65443	99.5	36	—	—	54	—	—	140	—	—	—	38	—	8.9	—	21	15
50-24803	MD50-06-65442	124	—	—	—	58	—	—	160	—	—	—	57	—	—	—	23	18
50-24803	MD50-06-65441	150	52	—	—	56	—	—	190	—	—	—	46	—	16	—	33	23
50-24804	MD50-06-65454	10	35	1.4	—	2.2 (J)	—	—	2.5	0.98	5.9	—	3.6	—	—	—	—	—
50-24804	MD50-06-65453	16	38	—	—	66	—	—	120	—	—	—	37	—	—	—	13	—
50-24804	MD50-06-65452	33	38	—	—	24	—	—	52	—	—	—	20	—	—	—	—	—
50-24804	MD50-06-65451	99	62	—	—	56	110	—	140	—	—	—	36	—	8.7	—	22	15
50-24804	MD50-06-65450	124	—	—	—	—	—	—	410	—	—	—	150	—	—	—	—	—
50-24804	MD50-06-65449	149	—	—	—	220	—	—	530	—	—	—	180	—	—	—	86	49

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Tetrachloride	Chlorodibromomethane	Chlorodifluoromethane	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorobenzene[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]
50-24810	MD50-06-65461	19	21	—	—	57	—	—	77	—	—	—	31	—	—	—	8.6	—
50-24810	MD50-06-65460	37	26	—	—	48	—	—	90	—	—	—	29	—	—	—	10	—
50-24810	MD50-06-65459	99	68	—	—	35	—	—	91	—	—	—	19	—	6.2	—	12	8.6
50-24810	MD50-06-65458	123	—	—	—	230	—	—	450	—	—	—	180	—	—	—	62	—
50-24810	MD50-06-65457	150	70	—	—	140	—	—	190	—	—	—	76	—	—	—	29	21
50-24811	MD50-06-65469	20	—	—	—	1100 (J)	—	—	1000	—	430	—	320	—	—	—	32	—
50-24811	MD50-06-65468	40	—	—	—	2100 (J)	—	—	1800	—	—	—	370	—	—	—	96	—
50-24811	MD50-06-65467	98	—	—	—	2200 (J)	—	—	2100	—	—	—	460	—	64	—	200	—
50-24811	MD50-06-65466	125	—	—	—	1900 (J)	—	—	1600	—	—	—	460	—	68	—	180	—
50-24811	MD50-06-65465	150	—	—	—	1600	—	—	2100	—	—	—	580	—	120	—	300	—
50-24812	MD50-06-65477	10	—	—	—	1300	—	—	510	—	—	—	230	—	—	—	43	—
50-24812	MD50-06-65476	35	—	—	—	2400	—	—	1100	—	—	—	450	—	—	—	110	—
50-24812	MD50-06-65474	98	—	—	—	1100	—	—	600	—	—	—	200	—	—	—	58	—
50-24812	MD50-06-65475	123	—	—	—	1000	—	—	500	—	—	—	190	—	19	—	59	11
50-24812	MD50-06-65473	150	43	—	—	460	—	—	320	—	—	—	110	—	12	—	37	—
50-24813	MD50-06-65485	20	27	—	—	150	—	—	110	—	—	—	72	—	—	—	11	—
50-24813	MD50-06-65484	30	39	—	—	130	—	—	97	—	—	—	100	—	—	—	10	—
50-24813	MD50-06-65483	99	49	—	—	170	—	—	220	—	—	—	140	—	—	—	37	—
50-24813	MD50-06-65482	125	—	—	—	2100	—	—	1800	—	—	—	1400	—	—	—	340	—
50-24813	MD50-06-65481	150	—	—	—	1800	—	—	2000	—	—	—	1300	—	—	—	440	—
50-24814	MD50-06-65493	10	—	—	—	200	—	—	350	—	—	—	440	—	—	—	69	—
50-24814	MD50-06-65492	30	54	—	—	24	—	—	50	1.1	13	—	53	—	—	—	6.6	—
50-24814	MD50-06-65491	99	74	—	—	47	—	—	140	—	—	—	150	—	—	—	30	—
50-24814	MD50-06-65490	124	—	—	—	200	—	—	370	—	—	—	450	—	—	—	79	—
50-24814	MD50-06-65489	149	—	—	—	420	—	—	820	—	—	—	810	—	—	—	180	—
50-24815	MD50-06-65501	30	—	—	—	380	—	—	1300	—	—	—	1400	—	—	—	230	—
50-24815	MD50-06-65500	40	—	—	—	680 (J)	—	—	1700	—	—	—	2000	—	—	—	240	—
50-24815	MD50-06-65499	100	—	—	—	710 (J)	—	—	1900	—	—	—	2100	—	—	—	270	—
50-24815	MD50-06-65498	125	—	—	—	500 (J)	—	—	1400	—	—	—	1700	—	—	—	230	—
50-24815	MD50-06-65497	149	—	—	—	260 (J)	—	—	820	—	—	—	940	—	—	—	140	—
50-24816	MD50-06-65510	25	56	—	—	—	—	—	210	—	—	—	49	—	—	—	—	30
50-24816	MD50-06-65509	35	23	—	—	68	—	—	360	—	—	—	92	—	—	—	—	53
50-24816	MD50-06-65508	65	50	—	11	63	—	—	160	—	—	—	54	—	5.1	8.6	7.3	58
50-24816	MD50-06-65507	120	71	—	7.1	150	—	—	180	—	—	—	86	—	8.5	—	14	92

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Tetrachloride	Chlorodibromomethane	Chlorodifluoromethane	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorobenzene[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]
50-24816	MD50-06-65506	200	51	—	10	280	—	—	130	—	—	—	110	—	—	—	18	89
50-24816	MD50-06-65505	215.8	100	—	11	250	—	—	120	—	—	—	110	—	—	7.3	18	84
50-24817	MD50-06-65903	20	—	—	—	39	—	—	38	—	—	—	130	4.3	—	8.5	5	44
50-24817	MD50-06-65904	50	130 (J)	0.68	—	15	—	—	15	1.2	2.2	5.7	51	1.6	—	3	2.5	17
50-24817	MD50-06-65905	100	210 (J)	—	—	10	—	—	15	2.1	—	—	22	—	—	2.3	2.1	19
50-24817	MD50-06-65906	140	—	—	—	320	—	—	170	—	—	—	410	—	—	—	65	420
50-24817	MD50-06-65907	200	—	—	—	420	—	—	140	—	—	—	420	—	—	—	68	400
50-24817	MD50-06-65908	240.9	—	—	—	220	—	—	140	—	—	—	310	—	—	—	46	310
50-24819	MD50-06-63863	20	24 (J)	—	—	57	—	—	110	—	—	—	58	—	—	—	—	30
50-24819	MD50-06-63864	50	73 (J)	—	—	79	—	—	130	—	—	—	81	—	—	—	14	61
50-24819	MD50-06-63865	100	—	—	—	52	—	—	93	—	—	—	59	—	—	—	12	50
50-24819	MD50-06-63866	140	24 (J)	—	—	43	—	—	61	—	—	—	45	—	—	—	9	35
50-24819	MD50-06-63867	200	49	—	—	61	—	20	85	—	—	—	68	—	6.7	—	22 (J+)	57
50-24819	MD50-06-63868	250	—	—	—	100	—	—	100	—	—	—	110	—	—	—	34 (J+)	69
50-24819	MD50-06-63869	275	71	—	—	120	—	—	140	—	—	—	120	—	—	—	42 (J+)	95
50-24820	MD50-06-64240	20	250	—	—	170	—	—	220	—	—	—	120	—	—	—	31	—
50-24820	MD50-06-64241	50	—	—	—	340	—	—	410	—	—	—	230	—	—	—	67	—
50-24820	MD50-06-64242	100	230 (J)	—	—	110	—	—	170	—	—	—	73	—	10	—	27	—
50-24820	MD50-06-64243	140	—	—	—	630	—	—	710	—	—	—	440	—	—	—	160	—
50-24820	MD50-06-64244	200	—	—	—	630	—	—	750	—	—	—	450	—	—	—	190	—
50-24820	MD50-06-64245	225	—	—	—	650	—	—	760	—	—	—	450	—	—	—	200	—
50-24821	MD50-06-64248	20	—	—	—	330	—	—	350	—	—	—	500	—	—	—	93	—
50-24821	MD50-06-64249	50	—	—	—	340	—	—	350	—	—	—	510	—	—	—	100	—
50-24821	MD50-06-64250	100	—	—	—	—	—	—	38	—	—	—	—	120	—	400	89	—
50-24821	MD50-06-64251	140	—	—	—	280	—	—	400	—	—	—	520	—	—	—	100	—
50-24821	MD50-06-64254	160	—	—	—	410	—	—	420	—	—	—	560	—	—	—	150	—
50-24821	MD50-06-64252	200	—	—	—	270	—	—	460	—	—	—	530	—	—	—	170	—
50-24821	MD50-06-64253	238.4	—	—	—	360	—	—	520	—	—	—	720	—	—	—	190	—
50-24822	MD50-06-64928	20	95 (J)	—	—	16	—	—	68	—	—	—	88	—	—	—	—	—
50-24822	MD50-06-64929	50	—	—	—	—	—	—	130	—	—	—	190	—	—	—	23	—
50-24822	MD50-06-64930	100	—	—	—	19	—	—	62	—	—	—	95	—	—	—	9.8	—
50-24822	MD50-06-64931	140	150 (J)	—	—	—	—	—	35	—	—	—	33	—	—	—	6.2	—
50-24822	MD50-06-64932	200	—	—	—	—	—	—	120	—	—	—	160	—	—	—	33	—
50-24822	MD50-06-64933	250	—	—	—	—	—	—	240	—	—	—	300	—	—	—	66	—

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Ethylbenzene	Ethyltoluene[4-]	Methylene Chloride	n-Heptane	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24766	MD50-06-65331	17	—	—	—	—	—	600	—	30	15	—	440	—	—	—	—	—	—
50-24766	MD50-06-65330	29	—	—	—	—	—	660	—	84	42	—	1400	—	—	—	—	—	—
50-24766	MD50-06-65329	99	—	—	11	—	—	340	—	76	37	—	1100	—	—	—	—	—	—
50-24766	MD50-06-65328	124	—	—	27	—	—	600	—	230	85	—	2700	—	—	—	—	—	—
50-24766	MD50-06-65327	149	—	—	160	—	—	1400	—	500	150	—	8200	—	—	—	—	—	—
50-24767	MD50-06-65362	10	—	—	40	—	—	460	—	1700	270	—	5500	—	—	—	—	—	—
50-24767	MD50-06-65361	30	—	—	39	—	—	450	—	1800	270	—	5900	—	—	—	—	—	—
50-24767	MD50-06-65360	60	—	—	48	—	—	330	—	1900	280	—	4500	—	—	—	—	—	—
50-24767	MD50-06-65359	124	—	—	76	—	—	160	—	1100	160	—	3600	—	—	—	—	—	—
50-24767	MD50-06-65358	149	—	—	120	—	—	70	—	180	33	—	2900	—	—	—	—	—	—
50-24768	MD50-06-65370	14	—	—	—	—	—	2.8	1.9	17	1.3	—	24	29	—	—	—	—	—
50-24768	MD50-06-65369	29	—	—	—	—	—	6.2	—	14	3.6	—	90	13	—	—	—	—	—
50-24768	MD50-06-65368	99	—	—	0.76	—	—	6.1	—	16	4	—	150	8.5	—	—	—	—	—
50-24768	MD50-06-65367	125	—	—	9.4	—	—	24	—	120	32	—	1100	—	—	—	—	—	—
50-24768	MD50-06-65366	150	—	—	36	—	—	27	—	190	38	—	1400	14	—	—	—	—	—
50-24769	MD50-06-65378	20	—	—	8.8	—	—	200	7.8	95	26	15	3600	—	—	—	—	—	—
50-24769	MD50-06-65377	39	240	22	—	—	76	—	610	—	—	—	430	—	29	11	240	39	—
50-24769	MD50-06-65376	99	1.3	—	1	—	—	16	1.7	6.7	2.1	4.5	510	2.7	—	—	7.4	1.7	—
50-24769	MD50-06-65375	124	—	—	—	—	—	50	12	32	—	11	1100	—	—	—	27	—	—
50-24769	MD50-06-65374	149	11	—	—	—	—	47	90	38	—	11	1600	—	—	—	32	8.9	—
50-24770	MD50-06-65387	20	—	—	—	—	—	14000	—	350	—	—	13000	—	—	—	—	—	—
50-24770	MD50-06-65386	25	—	—	—	—	—	12000	—	370	—	—	13000	—	—	—	—	—	—
50-24770	MD50-06-65385	39	—	—	—	—	—	8200	—	460	—	—	17000	—	—	—	—	—	—
50-24770	MD50-06-65384	100	—	—	130	—	—	2400	—	550	—	—	21000	—	—	—	—	—	—
50-24770	MD50-06-65383	124	—	—	250	—	—	2100	—	530	—	—	25000	—	—	—	—	—	—
50-24770	MD50-06-65382	148	—	—	920	—	—	3500	—	1400	300	—	57000	—	—	—	—	—	—
50-24771	MD50-06-65394	17	—	—	42	—	—	550	—	210	46 (J)	—	6700	—	—	—	—	—	—
50-24771	MD50-06-65393	40	—	—	50	—	—	730	—	280	60 (J)	—	10000	—	—	—	—	—	—
50-24771	MD50-06-65392	100	—	—	40	—	—	110	—	36	16 (J)	11	2300	—	—	—	—	—	—
50-24771	MD50-06-65391	125	—	—	460	—	—	830	—	260	—	—	16000	—	—	—	—	—	—
50-24771	MD50-06-65390	149	—	—	1600	—	—	2300	—	520	—	—	77000	—	—	—	—	—	—
50-24773	MD50-06-65405	20	—	—	44	—	—	330	—	120	—	—	4800	—	—	—	—	—	—
50-24773	MD50-06-65404	40	—	—	65	—	—	690	—	280	58 (J)	—	11000	—	—	—	—	—	—
50-24773	MD50-06-65403	100	—	—	91	—	—	310	—	97	—	—	6400	—	—	—	—	—	—

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Ethylbenzene	Ethyltoluene[4-]	Methylene Chloride	n-Heptane	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24773	MD50-06-65402	125	—	—	240	—	—	1200	—	390	81 (J)	—	19000	—	—	—	—	—	—
50-24773	MD50-06-65401	149	—	—	1100	—	—	1100	—	360	—	—	22000	—	—	—	—	—	—
50-24782	MD50-06-65413	21	—	—	20	—	—	310	—	65	14	—	1800	14	—	—	—	—	—
50-24782	MD50-06-65412	40	—	—	20	—	—	430	53	54	—	—	3000	—	—	—	—	—	—
50-24782	MD50-06-65411	100	—	—	55	—	—	150	—	31	—	—	1600	—	—	—	—	—	—
50-24782	MD50-06-65410	125	—	—	180	—	—	510	77	130	—	—	6100	—	—	—	—	—	—
50-24782	MD50-06-65409	151	—	—	1100	—	—	1500	—	260	—	—	22000	—	—	—	—	—	—
50-24783	MD50-06-65421	20	—	—	38	—	—	410	—	69	38	—	3100	—	—	—	—	—	—
50-24783	MD50-06-65420	36	—	—	12	—	—	120	—	16	12	—	860	—	—	—	—	—	—
50-24783	MD50-06-65419	100	—	—	31	—	—	160	—	31	—	—	1500	—	—	—	—	—	—
50-24783	MD50-06-65418	125	—	—	140	—	—	910	—	150	—	—	8300	—	—	—	—	—	—
50-24783	MD50-06-65417	148	—	—	300	—	—	720	—	120	—	—	8600	—	—	—	—	—	—
50-24784	MD50-06-70724	10	—	—	12	—	—	2000	—	88	92	—	2600	—	—	—	—	—	—
50-24784	MD50-06-70723	20	—	—	—	—	—	2000	—	79	110	—	1900	—	—	—	—	—	—
50-24784	MD50-06-70722	47	—	—	13	—	—	1500	71	69	48	—	2000	15	—	—	21	—	—
50-24784	MD50-06-70721	49	—	—	8.4	—	—	1900	—	80	59	—	2200	15	—	—	11	—	—
50-24784	MD50-06-65292	55	—	—	11	—	—	2500	—	110	75	—	2900	—	—	—	—	—	—
50-24784	MD50-06-65291	100	—	—	6.2	—	—	1300	3.6	70	49	—	1700	9.4	—	—	—	—	5.4
50-24784	MD50-06-65290	168	8.6	—	14	9.8	—	1200	9	70	33	—	2300	11	—	—	—	9.8	31
50-24784	MD50-06-65289	199	—	—	—	—	—	230	—	10	4.8	—	370	—	—	—	—	—	—
50-24784	MD50-06-65288	250	—	—	14	—	—	1100	—	42	30	—	2200	10	—	—	—	—	—
50-24784	MD50-06-65287	265	—	—	22	—	—	1400	—	54	27	—	3200	14	—	—	—	—	—
50-24785	MD50-06-66783	10	—	—	22	—	—	3900	—	76	49	—	2100	—	—	—	—	—	—
50-24785	MD50-06-65300	19	—	—	24	—	—	3300	—	74	39	—	1900	—	—	—	—	—	—
50-24785	MD50-06-65299	60	—	—	18	—	—	3700	—	92	59	—	2800	—	—	—	—	—	—
50-24785	MD50-06-65298	120	—	—	26	—	—	3900	—	180	100	—	3900	26	—	—	—	—	—
50-24785	MD50-06-65297	200	—	—	34	—	—	2600	—	91	59	—	4100	—	—	—	—	—	—
50-24785	MD50-06-65296	250	—	—	43	—	—	3000	—	94	62	—	5100	—	—	—	—	—	—
50-24785	MD50-06-65295	256	—	—	21	—	—	1100	—	240	120	—	3400	23	—	—	—	—	—
50-24796	MD50-06-65308	10	1.1	—	1.8	—	—	210	33	33	9.3	—	300	6.1	—	—	5.7	1.4	—
50-24796	MD50-06-65307	20	20	9.1 (J)	2.1	—	—	320	60	38	12	—	440	7.7	7.3	3	120	30	—
50-24796	MD50-06-65306	40	2.7	—	6.4	—	—	590	16	110	32	—	1300	17	—	—	14	3.1	—
50-24796	MD50-06-65305	100	—	—	39	—	—	680	—	270	52	—	1600	20	—	—	—	—	—
50-24796	MD50-06-65304	120	—	—	28	—	—	690	69	290	67	—	1900	20	—	—	14	—	—

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Ethylbenzene	Ethyltoluene[4-]	Methylene Chloride	n-Heptane	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24796	MD50-06-65303	144	—	—	55	—	—	970	47	420	82	—	3000	21	—	—	31	—	—
50-24797	MD50-06-65315	18.3	—	—	—	—	—	1100	—	180	66 (J)	—	1900	190	—	—	—	—	—
50-24797	MD50-06-65314	38	—	—	13	—	—	960	—	200	73 (J)	—	2600	75	—	—	—	—	—
50-24797	MD50-06-65313	60	—	—	23	—	—	620	—	200	49	—	1800	45	—	—	—	—	—
50-24797	MD50-06-65312	120	—	—	84	—	—	1400	—	640	130	—	5700	—	—	—	—	—	—
50-24797	MD50-06-65311	154	—	—	210	—	—	1600	—	470	120	—	9100	—	—	—	—	—	—
50-24799	MD50-06-65323	20	—	—	21	—	—	1100	—	87	30	—	2400	—	—	—	—	—	—
50-24799	MD50-06-65322	32.5	—	—	39	—	—	1700	—	180	62	—	5200	—	—	—	—	—	—
50-24799	MD50-06-65321	100	—	—	15	—	—	340	—	—	12	—	1200	—	—	—	—	—	—
50-24799	MD50-06-65320	120	—	—	22	—	—	290	—	35	—	—	1400	—	—	—	—	—	—
50-24799	MD50-06-65319	160	—	—	99	—	—	600	—	97	37	—	4800	—	—	—	—	—	—
50-24801	MD50-06-65429	20	—	—	—	—	—	160	—	—	22	—	800	—	—	—	—	—	—
50-24801	MD50-06-65428	35	—	—	31	—	—	760	—	110	40	—	3800	—	—	—	—	—	—
50-24801	MD50-06-65427	80	—	—	45	—	—	780	—	120	46	—	4100	—	—	—	—	—	—
50-24801	MD50-06-65426	120	—	—	110	—	—	1000	—	180	61	—	6700	—	—	—	—	—	—
50-24801	MD50-06-65425	150	—	—	340	—	—	1400	—	270	—	—	13000	—	—	—	—	—	—
50-24802	MD50-06-65437	15	—	—	3.4	—	—	48	—	—	9.3	—	540	—	—	—	—	—	—
50-24802	MD50-06-65436	42	—	—	31	—	—	360	32	48	—	—	3600	—	—	—	—	—	—
50-24802	MD50-06-65435	99	—	—	56	—	—	430	—	57	—	—	4600	—	—	—	—	—	—
50-24802	MD50-06-65434	124	—	—	110	—	—	630	—	110	—	—	7400	—	—	—	—	—	—
50-24802	MD50-06-65433	156	—	—	120	—	—	310	—	—	—	—	4700	—	—	—	—	—	—
50-24803	MD50-06-65445	16	—	—	—	—	—	110	—	—	—	—	1300	—	—	—	—	—	—
50-24803	MD50-06-65444	37	—	—	8.8	—	—	150	—	17	—	—	1900	—	—	—	—	—	—
50-24803	MD50-06-65443	99.5	—	—	14	—	—	120	—	—	—	—	1700	—	—	—	—	—	—
50-24803	MD50-06-65442	124	—	—	35	—	—	130	—	—	—	—	2200	—	—	—	—	—	—
50-24803	MD50-06-65441	150	—	—	75	—	—	130	—	—	—	—	2400	—	—	—	—	—	—
50-24804	MD50-06-65454	10	1.7	—	—	—	—	8.4	4.4	—	—	—	55	2.4	—	—	9.8	3.6	—
50-24804	MD50-06-65453	16	—	—	7.4	—	—	150	—	—	—	—	1900	—	—	—	—	—	—
50-24804	MD50-06-65452	33	—	—	—	—	—	53	—	—	—	—	800	—	—	—	—	—	—
50-24804	MD50-06-65451	99	—	—	18	—	—	170	—	—	—	—	1800	—	—	—	13	—	—
50-24804	MD50-06-65450	124	—	—	100	—	—	420	—	—	—	—	6500	—	—	—	—	—	—
50-24804	MD50-06-65449	149	—	—	210	—	—	460	—	70	—	—	8400	—	—	—	—	—	—
50-24810	MD50-06-65461	19	—	—	—	—	—	75	19	—	—	—	1100	—	—	—	—	—	—
50-24810	MD50-06-65460	37	—	—	—	—	—	90	—	—	—	—	1400	—	—	—	—	—	—

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Ethylbenzene	Ethyltoluene[4-]	Methylene Chloride	n-Heptane	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24810	MD50-06-65459	99	—	—	8.5	—	—	53	—	—	—	—	980	—	—	—	24	6	—
50-24810	MD50-06-65458	123	—	—	97	—	—	480	—	—	—	—	7500	—	—	—	—	—	—
50-24810	MD50-06-65457	150	—	—	48	—	—	180	—	28	—	—	3100	—	—	—	—	—	—
50-24811	MD50-06-65469	20	—	—	—	—	—	380	—	—	—	—	3000	51	—	—	—	—	—
50-24811	MD50-06-65468	40	—	—	33	—	—	520	—	—	—	—	6800	—	—	—	—	—	—
50-24811	MD50-06-65467	98	—	—	140	—	—	500	—	—	—	—	10000	—	—	—	—	—	—
50-24811	MD50-06-65466	125	—	—	190	—	—	470	—	—	—	—	10000	—	—	—	—	—	—
50-24811	MD50-06-65465	150	—	—	840	—	—	820	—	—	—	—	27000	—	—	—	—	—	—
50-24812	MD50-06-65477	10	—	—	24	—	—	230	—	—	—	—	3500	—	—	—	—	—	—
50-24812	MD50-06-65476	35	—	—	51	—	—	390	—	—	—	—	7500	—	—	—	—	—	—
50-24812	MD50-06-65474	98	—	—	24	—	—	210	—	—	—	—	3700	—	—	—	—	—	—
50-24812	MD50-06-65475	123	—	—	44	—	—	150	—	—	—	25	4000	—	—	—	—	—	—
50-24812	MD50-06-65473	150	—	25	46	—	—	86	—	—	—	17	2100	—	17	16	34	9.9	—
50-24813	MD50-06-65485	20	—	—	—	—	—	30	—	—	—	—	1300	—	—	—	9	—	—
50-24813	MD50-06-65484	30	—	—	—	—	—	28	—	—	—	—	1200	—	—	—	16	—	—
50-24813	MD50-06-65483	99	—	—	12	—	—	32	—	—	—	14	2200	—	—	—	10	—	—
50-24813	MD50-06-65482	125	—	—	140	—	—	430	—	—	—	—	25000	—	—	—	—	—	—
50-24813	MD50-06-65481	150	—	—	480	—	—	460	—	—	—	100	31000	—	—	—	—	—	—
50-24814	MD50-06-65493	10	—	—	—	—	—	73	—	—	—	—	6500	—	—	—	—	—	—
50-24814	MD50-06-65492	30	—	—	1.2	—	—	10	—	—	—	2.5	890	3.9	—	—	—	—	—
50-24814	MD50-06-65491	99	—	—	8.5	—	—	26	—	—	—	—	2000	—	—	—	—	—	—
50-24814	MD50-06-65490	124	—	—	44	—	—	78	—	—	—	—	6700	—	—	—	—	—	—
50-24814	MD50-06-65489	149	—	—	190	—	—	170	—	—	—	—	16000	—	—	—	—	—	—
50-24815	MD50-06-65501	30	—	—	—	—	—	340	—	—	—	—	23000	—	—	—	—	—	—
50-24815	MD50-06-65500	40	—	—	64	—	—	460	—	160	—	110	24000	—	—	—	—	—	—
50-24815	MD50-06-65499	100	—	—	78	—	—	500	—	—	—	120	29000	—	—	—	—	—	—
50-24815	MD50-06-65498	125	—	—	86	—	—	320	—	—	—	—	22000	—	—	—	—	—	—
50-24815	MD50-06-65497	149	—	—	56	—	—	180	—	—	—	—	12000	—	—	—	—	—	—
50-24816	MD50-06-65510	25	—	—	—	—	—	1900	—	54	30	—	1100	24	—	—	—	—	—
50-24816	MD50-06-65509	35	—	—	—	—	—	3500	—	120	47	—	2000	34	—	—	—	—	—
50-24816	MD50-06-65508	65	—	—	4.7	—	—	1300	—	83	27	—	1600	14	—	—	—	—	—
50-24816	MD50-06-65507	120	—	—	11	—	—	1800	—	120	58	—	2600	18	—	—	—	—	—
50-24816	MD50-06-65506	200	—	—	22	—	—	2100	—	110	62	—	3800	20	—	—	—	—	—
50-24816	MD50-06-65505	215.8	—	—	19	—	—	1600	—	98	56	—	3300	18	—	—	—	—	—

Table C-2.3-12 (continued)

Location ID	Sample ID	Depth (ft)	Ethylbenzene	Ethyltoluene[4-]	Methylene Chloride	n-Heptane	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24817	MD50-06-65903	20	—	—	5.4	—	—	250	—	260	81	—	1000	23 (J)	—	—	—	—	—
50-24817	MD50-06-65904	50	9.8	—	2.1	—	—	96	3.1	94	32	—	370	9.6 (J)	—	—	39 (J)	13	—
50-24817	MD50-06-65905	100	6	—	3.8	—	—	61	5.6	59	22	—	300	6.9	—	—	32	—	—
50-24817	MD50-06-65906	140	—	—	94	—	—	1600	—	950	260	—	5800	49	—	—	—	—	—
50-24817	MD50-06-65907	200	—	—	84	—	—	1500	—	760	220	—	5900	51	—	—	—	—	—
50-24817	MD50-06-65908	240.9	—	—	60	—	—	1100	—	980	220	—	4400	—	—	—	—	—	—
50-24819	MD50-06-63863	20	—	—	9.9	—	—	790	—	95	42	—	2300	—	—	—	—	—	—
50-24819	MD50-06-63864	50	—	—	29	—	—	710	—	140	47	—	2800	—	—	—	—	—	—
50-24819	MD50-06-63865	100	—	—	25	—	—	430	—	92	31	—	1900	—	—	—	—	—	—
50-24819	MD50-06-63866	140	—	—	27	—	—	270	—	66	21	—	1400	—	—	—	—	—	—
50-24819	MD50-06-63867	200	9.6	—	65	220	—	400	10	57	22	—	2500	7.3	—	—	—	10	35
50-24819	MD50-06-63868	250	—	—	100	140	—	570	—	78	30	—	4000	—	—	—	—	—	20
50-24819	MD50-06-63869	275	—	—	130	—	—	860	35	87	35	—	5200	—	—	—	—	—	28
50-24820	MD50-06-64240	20	—	—	30	—	—	140	—	—	—	—	4000	—	—	—	29	—	—
50-24820	MD50-06-64241	50	—	—	69	—	—	240	—	—	—	—	7400	—	—	—	—	—	—
50-24820	MD50-06-64242	100	—	—	51	—	—	81	—	—	—	—	2900	—	—	—	—	—	—
50-24820	MD50-06-64243	140	—	—	370	—	—	470	—	—	—	—	18000	—	—	—	—	—	—
50-24820	MD50-06-64244	200	—	—	590	—	—	600	—	—	—	—	24000	—	—	—	—	—	—
50-24820	MD50-06-64245	225	—	—	620	—	—	690	—	—	—	—	26000	—	—	—	—	—	—
50-24821	MD50-06-64248	20	—	—	150	—	—	220	—	—	—	—	9800	—	—	—	—	—	—
50-24821	MD50-06-64249	50	—	—	180	—	—	230	—	—	—	—	10000	—	—	—	—	—	—
50-24821	MD50-06-64250	100	—	—	—	—	70	1800	—	—	11	29	8200	—	—	—	—	—	—
50-24821	MD50-06-64251	140	—	—	120	—	—	230	—	—	—	—	13000	—	—	—	—	—	—
50-24821	MD50-06-64254	160	—	—	450	—	—	360	—	—	—	—	20000	—	—	—	—	—	—
50-24821	MD50-06-64252	200	—	—	450	—	—	270	—	—	—	—	23000	—	—	—	—	—	—
50-24821	MD50-06-64253	238.4	—	—	560	—	—	370	—	—	—	—	31000	—	—	—	—	—	—
50-24822	MD50-06-64928	20	—	—	—	—	—	15	—	—	—	—	1900	—	—	—	—	—	—
50-24822	MD50-06-64929	50	—	—	—	—	—	31	—	—	—	—	4000	—	—	—	—	—	—
50-24822	MD50-06-64930	100	—	—	9.8	—	—	15	—	—	—	—	2100	—	—	—	—	—	—
50-24822	MD50-06-64931	140	—	—	11	—	—	—	5.8	—	—	—	1100	—	—	—	—	—	—
50-24822	MD50-06-64932	200	—	—	72	—	—	—	—	—	—	—	5500	—	—	—	—	—	—
50-24822	MD50-06-64933	250	—	—	140	—	—	—	—	—	—	—	12000	—	—	—	—	—	—

Note: Units are µg/m^3.
*— = Not detected.

Table C-2.3-13
Tritium Detected in 2005–2006 Vapor Sampling at MDA C

Location ID	1st Round Sample ID	Depth (ft)	Concentration (pCi/L)	2nd Round Sample ID	Depth (ft)	Concentration (pCi/L)
50-09100	MD50-06-70880	20	171000	n.c.[a]	n.c.	n.c.
50-09100	MD50-06-70881	50	432000	n.c.	n.c.	n.c.
50-09100	MD50-06-70882	90	94400	n.c.	n.c.	n.c.
50-09100	MD50-06-70883	103	54600	n.c.	n.c.	n.c.
50-09100	MD50-06-70884	120	26880	n.c.	n.c.	n.c.
50-09100	MD50-06-70885	160	9640	n.c.	n.c.	n.c.
50-09100	MD50-06-70886	200	3740	n.c.	n.c.	n.c.
50-09100	MD50-06-70887	233	4400	n.c.	n.c.	n.c.
50-09100	MD50-06-70888	260	4240	n.c.	n.c.	n.c.
50-10131	MD50-06-70868	25	10320	n.c.	n.c.	n.c.
50-10131	MD50-06-70869	50	14300	n.c.	n.c.	n.c.
50-10131	MD50-06-70870	75	12880	n.c.	n.c.	n.c.
50-10131	MD50-06-70871	100	11900	n.c.	n.c.	n.c.
50-10131	MD50-06-70872	125	18100	n.c.	n.c.	n.c.
50-10131	MD50-06-70873	150	14520	n.c.	n.c.	n.c.
50-10131	MD50-06-70874	175	13980	n.c.	n.c.	n.c.
50-10131	MD50-06-70875	200	18560	n.c.	n.c.	n.c.
50-10131	MD50-06-70876	225	12120	n.c.	n.c.	n.c.
50-10131	MD50-06-70877	250	15680	n.c.	n.c.	n.c.
50-24766	MD50-06-64597	17	3341.99	MD50-06-65331	17	11467.9
50-24766	MD50-06-64596	29	5097.58	MD50-06-65330	29	13448.7
50-24766	MD50-06-64595	99	11253.1	MD50-06-65329	99	24401.7
50-24766	MD50-06-64594	124	10609.6	MD50-06-65328	124	20816.3
50-24766	MD50-06-64593	149	2955.98	MD50-06-65327	149	14724.6
50-24767	MD50-06-64625	10	1108	MD50-06-65362	10	3180
50-24767	MD50-06-64626	30	1551.2	MD50-06-65361	30	2360
50-24767	MD50-06-64627	60	4986	MD50-06-65360	60	4280
50-24767	MD50-06-64628	124	1329.6	MD50-06-65359	124	1340
50-24767	MD50-06-64629	149	753.44	MD50-06-65358	149	1660
50-24768	MD50-06-64661	14	1192.21	MD50-06-65370	14	2711.3
50-24768	MD50-06-64660	29	2858.64	MD50-06-65369	29	3297.62
50-24768	MD50-06-64659	99	2459.76	MD50-06-65368	99	1023.18
50-24768	MD50-06-64658	125	2105.2	MD50-06-65367	125	558.117
50-24768	MD50-06-64657	150	2725.68	MD50-06-65366	150	783.485
50-24769	MD50-06-64693	20	49600	MD50-06-65378	20	99075.5
50-24769	MD50-06-64692	39	264491	MD50-06-65377	39	319122
50-24769	MD50-06-64691	99	3.59E+06	MD50-06-65376	99	4.39E+06

Table C-2.3-13 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Concentration (pCi/L)	2nd Round Sample ID	Depth (ft)	Concentration (pCi/L)
50-24769	MD50-06-64690	124	216821	MD50-06-65375	124	165719
50-24769	MD50-06-64689	149	145435	MD50-06-65374	149	60565.8
50-24770	MD50-06-64738	20	405198	MD50-06-65387	20	476528
50-24770	MD50-06-64725	25	1.16E+06	MD50-06-65386	25	672994
50-24770	MD50-06-64724	39	778220	MD50-06-65385	39	711987
50-24770	MD50-06-64723	100	25090.1	MD50-06-65384	100	65371.3
50-24770	MD50-06-64722	124	34489.6	MD50-06-65383	124	38857.9
50-24770	MD50-06-64721	150	39565.3	MD50-06-65382	148	48480.3
50-24771	MD50-06-64750	17	45942.7	MD50-06-65394	17	41698.9
50-24771	MD50-06-64749	40	76227.9	MD50-06-65393	40	52255.2
50-24771	MD50-06-64748	100	62003.8	MD50-06-65392	100	75094.8
50-24771	MD50-06-64747	125	77408	MD50-06-65391	125	64189.9
50-24771	MD50-06-64746	150	60982.3	MD50-06-65390	149	54347.8
50-24773	MD50-06-64775	20	294285	MD50-06-65405	20	176600
50-24773	MD50-06-64774	40	374726	MD50-06-65404	40	458000
50-24773	MD50-06-64773	100	86645.6	MD50-06-65403	100	130600
50-24773	MD50-06-64776	125	102379	MD50-06-65402	125	76600
50-24773	MD50-06-64772	150	305586	MD50-06-65401	149	86600
50-24782	MD50-06-64803	20	2.59E+06	MD50-06-65413	21	1.89E+06
50-24782	MD50-06-64804	40	2.74E+06	MD50-06-65412	40	2.19E+06
50-24782	MD50-06-64805	100	329680	MD50-06-65411	100	152200
50-24782	MD50-06-64806	125	405760	MD50-06-65410	125	179200
50-24782	MD50-06-64807	155	1.50E+06	MD50-06-65409	151	228400
50-24783	MD50-06-64832	20	1.94E+08	MD50-06-65421	20	1.85E+08
50-24783	MD50-06-64831	36	1.28E+08	MD50-06-65420	36	1.20E+08
50-24783	MD50-06-64830	100	7.42E+06	MD50-06-65419	100	9.26E+06
50-24783	MD50-06-64829	125	4.01E+06	MD50-06-65418	125	5.56E+06
50-24783	MD50-06-64828	151	1.97E+06	MD50-06-65417	148	892000
50-24784	MD50-06-64374	10	4638.62	MD50-06-70724	10	12520.7
50-24784	MD50-06-64373	20	5691.32	MD50-06-70723	20	15190.6
50-24784	MD50-06-64372	47	5316.08	MD50-06-70722	47	17357.6
50-24784	MD50-06-64371	49	6073.6	MD50-06-70721	49	12025.1
50-24784	MD50-06-64370	55	4265.68	MD50-06-65292	55	11534.1
50-24784	MD50-06-64375	100	2533.65	MD50-06-65291	100	9924.32
50-24784	MD50-06-64379	168	4191.78	MD50-06-65290	168	14904.3
50-24784	MD50-06-64378	199	1847.67	MD50-06-65289	199	13883.2
50-24784	MD50-06-64377	250	5990.16	MD50-06-65288	250	11573.5
50-24784	MD50-06-64376	268	7867.6	MD50-06-65287	265	15021.7

Table C-2.3-13 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Concentration (pCi/L)	2nd Round Sample ID	Depth (ft)	Concentration (pCi/L)
50-24785	MD50-06-64402	10	1351.87	MD50-06-66783	10	13716.8
50-24785	MD50-06-64403	19	2304.74	MD50-06-65300	19	17954.6
50-24785	MD50-06-64408	60	6795.89	MD50-06-65299	60	22232.3
50-24785	MD50-06-64407	120	9276.57	MD50-06-65298	120	19364.2
50-24785	MD50-06-64404	200	9661.76	MD50-06-65297	200	15705.8
50-24785	MD50-06-64405	250	7701.07	MD50-06-65296	250	16951.9
50-24785	MD50-06-64406	275	—[b]	MD50-06-65295	256	20061.8
50-24796	MD50-06-64448	10	10802.4	MD50-06-65308	10	13180
50-24796	MD50-06-64447	20	9216.98	MD50-06-65307	20	7500
50-24796	MD50-06-64449	40	41568.4	MD50-06-65306	40	14380
50-24796	MD50-06-64450	100	79647.2	MD50-06-65305	100	13520
50-24796	MD50-06-64451	120	6166.27	MD50-06-65304	120	17420
50-24796	MD50-06-64452	150	21472.2	MD50-06-65303	144	18900
50-24797	MD50-06-64496	18.3	67519.3	MD50-06-65315	18.3	976000
50-24797	MD50-06-64497	38	9.13E+06	MD50-06-65314	38	6.30E+06
50-24797	MD50-06-66198	60	391496	MD50-06-65313	60	759762
50-24797	MD50-06-64498	120	84346.3	MD50-06-65312	120	34200
50-24797	MD50-06-64500	160	20013.6	MD50-06-65311	154	23840
50-24799	MD50-06-66197	15	64928.8	MD50-06-65323	20	36447.5
50-24799	MD50-06-64521	17.5	2569.3	MD50-06-65322	32.5	47309.9
50-24799	MD50-06-64522	20	3691.82	MD50-06-65321	100	1.36E+06
50-24799	MD50-06-64523	32.5	3952.91	MD50-06-65320	120	406875
50-24799	MD50-06-64538	37.5	5069.45	MD50-06-65319	160	21225.2
50-24799	MD50-06-64524	40.5	4528.53	n.c.	n.c.	n.c.
50-24799	MD50-06-64525	100	1.64E+06	n.c.	n.c.	n.c.
50-24799	MD50-06-64526	120	883850	n.c.	n.c.	n.c.
50-24799	MD50-06-64527	160	57908.4	n.c.	n.c.	n.c.
50-24801	MD50-06-64853	20	2867.02	MD50-06-65429	20	25055.3
50-24801	MD50-06-64870	35	6784.73	MD50-06-65428	35	35286.4
50-24801	MD50-06-64856	80	4990.51	MD50-06-65427	80	22566.1
50-24801	MD50-06-64855	120	9899.57	MD50-06-65426	120	18781.7
50-24801	MD50-06-64854	150	—	MD50-06-65425	150	21432.1
50-24802	MD50-06-64878	15	41660.8	MD50-06-65437	15	38300.5
50-24802	MD50-06-64879	42	17462.1	MD50-06-65436	42	43716.5
50-24802	MD50-06-64880	99.4	5052.48	MD50-06-65435	99	13555.1
50-24802	MD50-06-64881	124.4	6116.16	MD50-06-65434	124	17240
50-24802	MD50-06-64882	156.4	4986	MD50-06-65433	156	17485.7
50-24803	MD50-06-64904	16	2038.72	MD50-06-65445	16	13688.5

Table C-2.3-13 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Concentration (pCi/L)	2nd Round Sample ID	Depth (ft)	Concentration (pCi/L)
50-24803	MD50-06-64903	37	2016.56	MD50-06-65444	37	14782.6
50-24803	MD50-06-64905	99.5	1972.24	MD50-06-65443	99.5	16541.2
50-24803	MD50-06-64906	124	5118.96	MD50-06-65442	124	11625.2
50-24803	MD50-06-64907	151	4077.44	MD50-06-65441	150	12962.8
50-24804	MD50-06-64970	10	844.906	MD50-06-65454	10	2521.99
50-24804	MD50-06-64971	16	2247.76	MD50-06-65453	16	2554.37
50-24804	MD50-06-64972	33	5226.16	MD50-06-65452	33	4082.54
50-24804	MD50-06-64973	99	2129.36	MD50-06-65451	99	2358.25
50-24804	MD50-06-64974	124	2484.63	MD50-06-65450	124	1805.49
50-24804	MD50-06-64975	149	3616.22	MD50-06-65449	149	2958.39
50-24810	MD50-06-64999	19	8320	MD50-06-65461	19	4120.19
50-24810	MD50-06-64998	37	8900	MD50-06-65460	37	2208.91
50-24810	MD50-06-64997	99	52400	MD50-06-65459	99	4368.79
50-24810	MD50-06-64996	123	5940	MD50-06-65458	123	2639.7
50-24810	MD50-06-64995	150	8532.89	MD50-06-65457	150	2643.06
50-24811	MD50-06-65069	20	253371	MD50-06-65469	20	311840
50-24811	MD50-06-65068	40	482009	MD50-06-65468	40	544683
50-24811	MD50-06-65067	98	18354.1	MD50-06-65467	98	8723.73
50-24811	MD50-06-65066	125	16931.5	MD50-06-65466	125	4260.77
50-24811	MD50-06-65065	150	20833.6	MD50-06-65465	150	2988.19
50-24812	MD50-06-65094	10	431202	MD50-06-65477	10	206297
50-24812	MD50-06-65093	35	435669	MD50-06-65476	35	311191
50-24812	MD50-06-65092	98	483598	MD50-06-65474	98	618414
50-24812	MD50-06-65091	123	116972	MD50-06-65475	123	161030
50-24812	MD50-06-65090	150	27855.1	MD50-06-65473	150	11770
50-24813	MD50-06-65126	20	18041.6	MD50-06-65485	20	5337.42
50-24813	MD50-06-65125	30	18926.7	MD50-06-65484	30	7572.56
50-24813	MD50-06-65124	99	50065.5	MD50-06-65483	99	21617.4
50-24813	MD50-06-65123	125	74026.3	MD50-06-65482	125	58730.7
50-24813	MD50-06-65122	150	279016	MD50-06-65481	150	197983
50-24814	MD50-06-65151	10	9025.11	MD50-06-65493	10	25557.8
50-24814	MD50-06-65150	30	19019.6	MD50-06-65492	30	50393.2
50-24814	MD50-06-65149	99	68456.2	MD50-06-65491	99	66823.9
50-24814	MD50-06-65148	124	501906	MD50-06-65490	124	674050
50-24814	MD50-06-65147	149	26982.9	MD50-06-65489	149	180276
50-24815	MD50-06-65183	30	3972.74	MD50-06-65501	30	20567.5
50-24815	MD50-06-65182	40	11182.8	MD50-06-65500	40	2406.48
50-24815	MD50-06-65181	100	86190.8	MD50-06-65499	100	2754.79

Table C-2.3-13 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Concentration (pCi/L)	2nd Round Sample ID	Depth (ft)	Concentration (pCi/L)
50-24815	MD50-06-65180	125	5221.05	MD50-06-65498	125	3286.58
50-24815	MD50-06-65179	149	4053.38	MD50-06-65497	149	837.264
50-24816	MD50-06-65204	25	8466.02	MD50-06-65510	25	825.214
50-24816	MD50-06-65205	35	1015.48	MD50-06-65509	35	3669.37
50-24816	MD50-06-65209	65	6855.32	MD50-06-65508	65	3749.99
50-24816	MD50-06-65206	120	4007.47	MD50-06-65507	120	6093.67
50-24816	MD50-06-65208	200	3459.75	MD50-06-65506	200	4509.88
50-24816	MD50-06-65207	225	6503.3	MD50-06-65505	215.8	3831.86
50-24817	MD50-05-63841	20	92996.7	MD50-06-65903	20	359845
50-24817	MD50-05-63842	40	69591.3	MD50-06-65904	50	493463
50-24817	RE50-05-63816	100	1.55E+06	MD50-06-65905	100	381500
50-24817	RE50-05-63817	140	280852	MD50-06-65906	140	501606
50-24817	RE50-05-63818	200	103015	MD50-06-65907	200	164658
50-24817	MD50-05-63843	250	15032	MD50-06-65908	240.9	47666.4
50-24818	MD50-06-65232	10	11510.1	n.c.	n.c.	n.c.
50-24818	MD50-06-65233	25	619618	n.c.	n.c.	n.c.
50-24818	MD50-06-65234	100	39888	n.c.	n.c.	n.c.
50-24818	MD50-06-65235	150	5717.28	n.c.	n.c.	n.c.
50-24818	MD50-06-65236	190	1839.28	n.c.	n.c.	n.c.
50-24818	MD50-06-65237	250	3013.76	n.c.	n.c.	n.c.
50-24818	MD50-06-65238	280	1950.08	n.c.	n.c.	n.c.
50-24818	MD50-06-65239	315	—	n.c.	n.c.	n.c.
50-24818	MD50-06-65240	414	189308	n.c.	n.c.	n.c.
50-24818	MD50-06-65242	452	1720	n.c.	n.c.	n.c.
50-24818	MD50-06-65245	500	32297.5	n.c.	n.c.	n.c.
50-24818	MD50-06-65244	548	24880	n.c.	n.c.	n.c.
50-24818	MD50-06-65243	591	38200	n.c.	n.c.	n.c.
50-24819	RE50-05-61430	20	1389.62	MD50-06-63863	20	1668.83
50-24819	RE50-05-61431	50	1800.85	MD50-06-63864	50	4605.01
50-24819	RE50-05-61432	100	2826.52	MD50-06-63865	100	3717.75
50-24819	RE50-05-61732	138.5–140	5607.89	MD50-06-63866	140	2582.25
50-24819	RE50-05-61733	200	6138.57	MD50-06-63867	200	985.997
50-24819	RE50-05-61734	250	9173.39	MD50-06-63868	250	1263.79
50-24819	RE50-05-61735	275	—	MD50-06-63869	275	3994.56
50-24820	RE50-05-61446	20	—	MD50-06-64240	20	1569.89
50-24820	RE50-05-61449	50	—	MD50-06-64241	50	294831
50-24820	RE50-05-61447	100	—	MD50-06-64242	100	1881.11
50-24820	RE50-05-61448	140	—	MD50-06-64243	140	3300.83

Table C-2.3-13 (continued)

Location ID	1st Round Sample ID	Depth (ft)	Concentration (pCi/L)	2nd Round Sample ID	Depth (ft)	Concentration (pCi/L)
50-24820	RE50-05-61450	200	—	MD50-06-64244	200	3514.5
50-24820	RE50-05-61736	250	—	MD50-06-64245	225	7248.23
50-24821	RE50-05-61464	20	—	MD50-06-64248	20	1530.78
50-24821	RE50-05-61466	50	—	MD50-06-64249	50	2513.57
50-24821	RE50-05-61465	98.4–100	—	MD50-06-64250	100	—
50-24821	RE50-05-61467	137.5–140	—	MD50-06-64251	140	—
50-24821	RE50-05-61473	160	723.206	MD50-06-64254	160	3815.93
50-24821	RE50-05-61468	248.6–250	—	MD50-06-64252	200	—
50-24821	n.c.	n.c.	n.c.	MD50-06-64253	238.4	2642.63
50-24822	RE50-05-61482	20	—	MD50-06-64928	20	128096
50-24822	RE50-05-61483	50	—	MD50-06-64929	50	—
50-24822	RE50-05-61484	100	—	MD50-06-64930	100	—
50-24822	RE50-05-61485	140	—	MD50-06-64931	140	18421.2
50-24822	RE50-05-61486	200	—	MD50-06-64932	200	—
50-24822	RE50-05-61737	250	—	MD50-06-64933	250	2798.02
50-25451	MD50-06-66691	19	28394.1	n.c.	n.c.	n.c.
50-25451	MD50-06-66690	49	18892.4	n.c.	n.c.	n.c.
50-25451	MD50-06-66689	100	15779.5	n.c.	n.c.	n.c.
50-25451	MD50-06-66688	147	20485.1	n.c.	n.c.	n.c.
50-25451	MD50-06-66687	200	23704.5	n.c.	n.c.	n.c.
50-25451	MD50-06-66686	251	11706.8	n.c.	n.c.	n.c.
50-25451	MD50-06-66685	287	8850.87	n.c.	n.c.	n.c.

[a] n.c. = Sample not collected.

[b] — = Not detected.

Table C-2.3-14
VOCs Detected in Vapor Samples from Boreholes between Pits 2 and 3 during 2007 Sampling

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanone[2-]	Carbon Tetrachloride	Chloroform	Dichlorodifluoromethane	Dichloroethane[1,2-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol	Ethylbenzene	Ethyltoluene[4-]	Hexane	Methylene Chloride	n-Heptane	Propylene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,2-]	Trichloroethene	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-07-75329	50-27437	10–10	—*	11	—	—	310	1200	130	29	47	28	—	—	—	—	12	—	—	1900	37	30	39	5200	—	—	—	—	20
MD50-07-75328	50-27437	20–20	18	40	9	3.2	84	340	37	8.9	14	8.6	—	9.9	9.6	6.6	3.7	4.3	36	490	71	8.8	12	1500	13	—	—	13	38
MD50-07-75327	50-27437	32–32	33	12	—	—	100	590	52	22	28	17	—	17	15	9.5	7.7	10	—	540	160	—	32	2200	16	—	—	23	61
MD50-07-75326	50-27437	60–60	—	—	—	—	390	1800	200	71	120	53	—	—	—	—	25	—	—	1200	170	—	90	8500	—	—	—	—	—
MD50-07-75325	50-27437	80–80	310	—	—	—	330	1500	170	66	96	49	47	—	—	—	23	—	30	860	130	33	72	7000	—	—	—	—	—
MD50-07-75367	50-27444	20–20	—	—	—	—	22	57	7.2	3.2	5.4	—	—	—	—	—	21	—	—	27	27	—	5.9	570	—	—	—	—	—
MD50-07-75366	50-27444	35–35	—	—	—	—	260	350	55	18	31	—	—	—	—	—	100	—	—	140	45	—	—	3000	—	—	—	—	—
MD50-07-75365	50-27444	60–60	—	—	—	—	370	590	—	39	57	—	—	—	—	—	150	—	—	180	49	—	44	4400	—	—	—	—	—
MD50-07-75364	50-27444	80–80	—	—	—	—	180	490	59	35	43	—	—	—	—	—	120	—	—	120	31	—	38	3000	—	—	—	—	—
MD50-07-75363	50-27444	97–97	—	—	—	—	5400	4800	1100	240	410	—	—	—	—	—	500	—	—	2000	—	—	—	41000	—	—	—	—	—
MD50-07-75362	50-27444	140–140	—	—	—	—	9100	5600	1700	330	590	—	—	—	—	—	1100	—	—	2300	—	—	—	57000	—	—	—	—	—
MD50-07-75361	50-27444	197–197	—	—	—	—	2600	2700	1100	—	670	—	—	—	—	—	3100	—	—	1900	—	—	—	75000	—	—	—	—	—
MD50-07-75360	50-27444	247–247	—	—	—	—	1500	1700	750	—	510	—	—	—	—	—	2400	—	—	1400	—	—	—	53000	—	—	—	—	—
MD50-07-75359	50-27444	296–296	—	—	—	—	820	1200	710	—	350	—	—	—	—	—	2100	—	—	—	—	—	—	29000	—	—	—	—	—
MD50-07-75358	50-27444	335–335	—	—	—	—	850	810	660	—	240	—	—	—	—	—	1500	—	—	1300	—	—	—	51000	—	—	—	—	—
MD50-07-75386	50-27445	10–10	—	—	—	—	54000 (J)	8100	590	—	75	—	—	—	—	—	—	—	—	1100	—	—	59	8400	—	—	—	—	—
MD50-07-75385	50-27445	20–20	—	—	—	—	18000 (J)	3200	210	—	30	—	—	—	—	—	—	—	—	400	28	—	26	3100	—	—	—	—	—
MD50-07-75384	50-27445	35–35	—	—	—	—	12000 (J)	3000	260	30	56	—	—	—	—	—	—	—	—	330	58	—	46	3900	—	—	88	23	65
MD50-07-75383	50-27445	62–62	30	—	—	—	4500 (J)	1300	37	22	31	11	—	20	30	—	—	—	—	130	82	—	33	1700	28	10	130	35	90
MD50-07-75382	50-27445	80–80	34	—	—	—	2400	1200	56	22	24	8.7	—	31	28	—	—	—	—	100	120	—	34	1200	30	11	—	40	110
MD50-07-75410	50-27446	10–10	—	—	—	—	7900	2200	960	—	180	—	—	—	—	—	—	—	—	540	—	—	—	13000	—	—	—	—	—
MD50-07-75409	50-27446	20–20	—	—	—	—	370	240	44	—	21	—	—	—	—	—	—	—	—	45	—	—	32	1200	—	—	—	—	—
MD50-07-75408	50-27446	32–32	—	—	—	—	13000	3800	1700	—	310	—	—	—	—	—	—	—	—	950	—	—	—	24000	—	—	—	—	—
MD50-07-75407	50-27446	61–61	—	—	—	—	4000	1300	630	—	130	—	—	—	—	—	—	—	—	360	—	—	77	9500	—	—	—	—	—
MD50-07-75406	50-27446	80–80	—	—	—	—	11000	4100	1900	—	400	—	—	—	—	—	—	—	—	990	—	—	210	27000	—	—	—	—	—

Note: Results are in $\mu g/m^3$. Data qualifiers are defined in Appendix A.
* — = Not detected.

Table C-2.3-15
Tritium Detected in Vapor Samples from Boreholes between Pits 2 and 3 during 2007 Sampling

Sample ID	Location ID	Depth (ft)	Tritium
MD50-07-75329	50-27437	10–10	7540 (J)
MD50-07-75328	50-27437	20–20	11840 (J)
MD50-07-75327	50-27437	32–32	9860 (J)
MD50-07-75326	50-27437	60–60	2720 (J)
MD50-07-75325	50-27437	80–80	3800 (J)
MD50-07-75367	50-27444	20–20	184600 (J)
MD50-07-75366	50-27444	35–35	40600 (J)
MD50-07-75365	50-27444	60–60	12840 (J)
MD50-07-75364	50-27444	80–80	7160 (J)
MD50-07-75363	50-27444	97–97	8540 (J)
MD50-07-75362	50-27444	140–140	7900 (J)
MD50-07-75361	50-27444	197–197	5220 (J)
MD50-07-75360	50-27444	247–247	3980 (J)
MD50-07-75359	50-27444	296–296	6780 (J)
MD50-07-75358	50-27444	335–335	1440 (J)
MD50-07-75386	50-27445	10–10	2640 (J)
MD50-07-75385	50-27445	20–20	2880 (J)
MD50-07-75384	50-27445	35–35	4520 (J)
MD50-07-75383	50-27445	62–62	5260 (J)
MD50-07-75382	50-27445	80–80	3960 (J)
MD50-07-75410	50-27446	10–10	3600 (J)
MD50-07-75409	50-27446	20–20	3020 (J)
MD50-07-75408	50-27446	32–32	7560 (J)
MD50-07-75407	50-27446	61–61	8240 (J)
MD50-07-75406	50-27446	80–80	10980 (J)

Note: Results are in pCi/L. Data qualifiers are defined in Appendix A.

Table C-2.3-16
Comparison of Vapor and Core Sample VOC Concentrations during 2005–2006 Sampling

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26823	20	Acetone	170 (U)	0.0061 (UJ)
50-26823	20	Benzene	45 (U)	0.00122 (U)
50-26823	20	Butanone[2-]	210 (U)	0.0061 (U)
50-26823	20	Carbon Tetrachloride	1000	0.00122 (U)
50-26823	20	Chloroform	1200	0.000348 (U)
50-26823	20	Chloromethane	58 (UJ)	0.00122 (U)
50-26823	20	Dichlorodifluoromethane	440	0.00122 (UJ)
50-26823	20	Dichloroethane[1,2-]	57 (UJ)	0.00122 (U)
50-26823	20	Dichloroethene[cis-1,2-]	130	0.00122 (U)
50-26823	20	Dichloropropane[1,2-]	65 (U)	0.00122 (U)
50-26823	20	Ethylbenzene	61 (U)	0.00122 (U)
50-26823	20	Methylene Chloride	120	0.00592 (J)
50-26823	20	Styrene	60 (U)	0.00122 (U)
50-26823	20	Tetrachloroethene	630	0.00122 (U)
50-26823	20	Toluene	53 (U)	0.00122 (U)
50-26823	20	Trichloro-1,2,2-trifluoroethane[1,1,2-]	200	0.0061 (U)
50-26823	20	Trichloroethane[1,1,1-]	77 (U)	0.00122 (U)
50-26823	20	Trichloroethene	11000	0.00122 (U)
50-26823	20	Trichlorofluoromethane	79 (U)	0.00122 (UJ)
50-26823	20	Trimethylbenzene[1,2,4-]	69 (U)	0.00122 (U)
50-26823	20	Xylene[1,2-]	61 (U)	0.00122 (U)
50-26823	37.5	Acetone	180 (U)	0.00581 (UJ)
50-26823	37.5	Benzene	49 (U)	0.00116 (U)
50-26823	37.5	Butanone[2-]	230 (U)	0.00581 (U)
50-26823	37.5	Carbon Tetrachloride	1400	0.00116 (U)
50-26823	37.5	Chloroform	1700	0.000252 (U)
50-26823	37.5	Chloromethane	63 (UJ)	0.00116 (U)
50-26823	37.5	Dichlorodifluoromethane	540	0.00116 (UJ)
50-26823	37.5	Dichloroethane[1,2-]	63	0.00116 (U)
50-26823	37.5	Dichloroethene[cis-1,2-]	190	0.00116 (U)
50-26823	37.5	Dichloropropane[1,2-]	71 (U)	0.00116 (U)
50-26823	37.5	Ethylbenzene	66 (U)	0.00116 (U)
50-26823	37.5	Methylene Chloride	130	0.00447 (J)
50-26823	37.5	Styrene	65 (U)	0.00116 (U)
50-26823	37.5	Tetrachloroethene	760	0.00116 (U)
50-26823	37.5	Toluene	58 (U)	0.00116 (U)
50-26823	37.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	270	0.00581 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26823	37.5	Trichloroethane[1,1,1-]	84 (U)	0.00116 (U)
50-26823	37.5	Trichloroethene	15000	0.00116 (U)
50-26823	37.5	Trichlorofluoromethane	86 (U)	0.00116 (UJ)
50-26823	37.5	Trimethylbenzene[1,2,4-]	75 (U)	0.00116 (U)
50-26823	37.5	Xylene[1,2-]	67 (U)	0.00116 (U)
50-26823	70	Acetone	250 (U)	0.0061 (UJ)
50-26823	70	Benzene	68 (U)	0.00122 (U)
50-26823	70	Butanone[2-]	310 (U)	0.0061 (U)
50-26823	70	Carbon Tetrachloride	850	0.00122 (U)
50-26823	70	Chloroform	1300	0.000442 (U)
50-26823	70	Chloromethane	88 (UJ)	0.00122 (U)
50-26823	70	Dichlorodifluoromethane	380	0.00122 (UJ)
50-26823	70	Dichloroethane[1,2-]	87 (U)	0.00122 (U)
50-26823	70	Dichloroethene[cis-1,2-]	190	0.00122 (U)
50-26823	70	Dichloropropane[1,2-]	99 (U)	0.00122 (U)
50-26823	70	Ethylbenzene	93 (U)	0.00122 (U)
50-26823	70	Methylene Chloride	170	0.00541 (J)
50-26823	70	Styrene	91 (U)	0.00122 (U)
50-26823	70	Tetrachloroethene	500	0.00122 (U)
50-26823	70	Toluene	81 (U)	0.00122 (U)
50-26823	70	Trichloro-1,2,2-trifluoroethane[1,1,2-]	160	0.0061 (U)
50-26823	70	Trichloroethane[1,1,1-]	120 (U)	0.00122 (U)
50-26823	70	Trichloroethene	12000	0.00122 (U)
50-26823	70	Trichlorofluoromethane	120 (U)	0.00122 (UJ)
50-26823	70	Trimethylbenzene[1,2,4-]	110 (U)	0.00122 (U)
50-26823	70	Xylene[1,2-]	93 (U)	0.00122 (U)
50-26823	99	Acetone	670 (U)	0.0051 (UJ)
50-26823	99	Benzene	180 (U)	0.00102 (U)
50-26823	99	Butanone[2-]	830 (U)	0.0051 (U)
50-26823	99	Carbon Tetrachloride	3200	0.00102 (U)
50-26823	99	Chloroform	3200	0.00102 (U)
50-26823	99	Chloromethane	230 (U)	0.00102 (U)
50-26823	99	Dichlorodifluoromethane	1000 (J)	0.00102 (UJ)
50-26823	99	Dichloroethane[1,2-]	230 (UJ)	0.00102 (U)
50-26823	99	Dichloroethene[cis-1,2-]	500	0.00102 (U)
50-26823	99	Dichloropropane[1,2-]	260 (U)	0.00102 (U)
50-26823	99	Ethylbenzene	240 (U)	0.00102 (U)
50-26823	99	Methylene Chloride	470	0.0051 (UJ)
50-26823	99	Styrene	240 (U)	0.00102 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26823	99	Tetrachloroethene	1800	0.00102 (U)
50-26823	99	Toluene	210 (U)	0.00102 (U)
50-26823	99	Trichloro-1,2,2-trifluoroethane[1,1,2-]	540	0.0051 (U)
50-26823	99	Trichloroethane[1,1,1-]	310 (U)	0.00102 (U)
50-26823	99	Trichloroethene	38000	0.00102 (U)
50-26823	99	Trichlorofluoromethane	310 (U)	0.00102 (UJ)
50-26823	99	Trimethylbenzene[1,2,4-]	280 (U)	0.00102 (U)
50-26823	99	Xylene[1,2-]	240 (U)	0.00102 (U)
50-26823	148.5	Acetone	890 (U)	0.005 (UJ)
50-26823	148.5	Benzene	240 (U)	0.001 (U)
50-26823	148.5	Butanone[2-]	1100 (U)	0.005 (U)
50-26823	148.5	Carbon Tetrachloride	2300	0.001 (U)
50-26823	148.5	Chloroform	3200	0.001 (U)
50-26823	148.5	Chloromethane	310 (U)	0.001 (U)
50-26823	148.5	Dichlorodifluoromethane	1100 (J)	0.001 (UJ)
50-26823	148.5	Dichloroethane[1,2-]	300 (UJ)	0.001 (U)
50-26823	148.5	Dichloroethene[cis-1,2-]	680	0.001 (U)
50-26823	148.5	Dichloropropane[1,2-]	350 (U)	0.001 (U)
50-26823	148.5	Ethylbenzene	320 (U)	0.001 (U)
50-26823	148.5	Methylene Chloride	1400	0.005 (UJ)
50-26823	148.5	Styrene	320 (U)	0.001 (U)
50-26823	148.5	Tetrachloroethene	1800	0.001 (U)
50-26823	148.5	Toluene	280 (U)	0.001 (U)
50-26823	148.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	570 (U)	0.005 (U)
50-26823	148.5	Trichloroethane[1,1,1-]	410 (U)	0.001 (U)
50-26823	148.5	Trichloroethene	51000	0.001 (U)
50-26823	148.5	Trichlorofluoromethane	420 (U)	0.001 (UJ)
50-26823	148.5	Trimethylbenzene[1,2,4-]	370 (U)	0.001 (U)
50-26823	148.5	Xylene[1,2-]	330 (U)	0.001 (U)
50-26823	200	Acetone	1000 (U)	0.00543 (UJ)
50-26823	200	Benzene	280 (U)	0.00109 (U)
50-26823	200	Butanone[2-]	1300 (U)	0.00543 (U)
50-26823	200	Carbon Tetrachloride	1800	0.00109 (U)
50-26823	200	Chloroform	2700	0.00109 (U)
50-26823	200	Chloromethane	360 (UJ)	0.00109 (U)
50-26823	200	Dichlorodifluoromethane	1200	0.00109 (UJ)
50-26823	200	Dichloroethane[1,2-]	360 (UJ)	0.00109 (U)
50-26823	200	Dichloroethene[cis-1,2-]	700	0.00109 (U)
50-26823	200	Dichloropropane[1,2-]	410 (U)	0.00109 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26823	200	Ethylbenzene	380 (U)	0.00109 (U)
50-26823	200	Methylene Chloride	2200	0.00543 (UJ)
50-26823	200	Styrene	380 (U)	0.00109 (U)
50-26823	200	Tetrachloroethene	1700	0.00109 (U)
50-26823	200	Toluene	330 (U)	0.00109 (U)
50-26823	200	Trichloro-1,2,2-trifluoroethane[1,1,2-]	680 (U)	0.00543 (U)
50-26823	200	Trichloroethane[1,1,1-]	480 (U)	0.00109 (U)
50-26823	200	Trichloroethene	64000	0.00109 (U)
50-26823	200	Trichlorofluoromethane	500 (U)	0.00109 (UJ)
50-26823	200	Trimethylbenzene[1,2,4-]	430 (U)	0.00109 (U)
50-26823	200	Xylene[1,2-]	390 (U)	0.00109 (U)
50-26823	250	Acetone	850 (U)	0.00781 (UJ)
50-26823	250	Benzene	230 (U)	0.00156 (U)
50-26823	250	Butanone[2-]	1100 (U)	0.00781 (U)
50-26823	250	Carbon Tetrachloride	1300	0.00156 (U)
50-26823	250	Chloroform	2200	0.00156 (U)
50-26823	250	Chloromethane	300 (UJ)	0.00156 (U)
50-26823	250	Dichlorodifluoromethane	950	0.00156 (UJ)
50-26823	250	Dichloroethane[1,2-]	290 (UJ)	0.00156 (U)
50-26823	250	Dichloroethene[cis-1,2-]	580	0.00156 (U)
50-26823	250	Dichloropropane[1,2-]	330 (U)	0.00156 (U)
50-26823	250	Ethylbenzene	310 (U)	0.00156 (U)
50-26823	250	Methylene Chloride	2200	0.00781 (UJ)
50-26823	250	Styrene	310 (U)	0.00156 (U)
50-26823	250	Tetrachloroethene	1400	0.00156 (U)
50-26823	250	Toluene	270 (U)	0.00156 (U)
50-26823	250	Trichloro-1,2,2-trifluoroethane[1,1,2-]	550 (U)	0.00781 (U)
50-26823	250	Trichloroethane[1,1,1-]	390 (U)	0.00156 (U)
50-26823	250	Trichloroethene	56000	0.00156 (U)
50-26823	250	Trichlorofluoromethane	400 (U)	0.00156 (UJ)
50-26823	250	Trimethylbenzene[1,2,4-]	350 (U)	0.00156 (U)
50-26823	250	Xylene[1,2-]	310 (U)	0.00156 (U)
50-26823	300	Acetone	670 (U)	0.00658 (UJ)
50-26823	300	Benzene	180 (U)	0.00132 (U)
50-26823	300	Butanone[2-]	830 (U)	0.00658 (U)
50-26823	300	Carbon Tetrachloride	1300	0.00132 (U)
50-26823	300	Chloroform	1900	0.000381 (J)
50-26823	300	Chloromethane	230 (UJ)	0.00132 (U)
50-26823	300	Dichlorodifluoromethane	900	0.00132 (UJ)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26823	300	Dichloroethane[1,2-]	230 (UJ)	0.00132 (U)
50-26823	300	Dichloroethene[cis-1,2-]	510	0.00132 (U)
50-26823	300	Dichloropropane[1,2-]	260 (U)	0.00132 (U)
50-26823	300	Ethylbenzene	250 (U)	0.00132 (U)
50-26823	300	Methylene Chloride	2100	0.00658 (UJ)
50-26823	300	Styrene	240 (U)	0.00132 (U)
50-26823	300	Tetrachloroethene	1500	0.00132 (U)
50-26823	300	Toluene	210 (U)	0.00132 (U)
50-26823	300	Trichloro-1,2,2-trifluoroethane[1,1,2-]	430 (U)	0.00658 (U)
50-26823	300	Trichloroethane[1,1,1-]	310 (U)	0.00132 (U)
50-26823	300	Trichloroethene	54000	0.00235
50-26823	300	Trichlorofluoromethane	320 (U)	0.00132 (UJ)
50-26823	300	Trimethylbenzene[1,2,4-]	280 (U)	0.00132 (U)
50-26823	300	Xylene[1,2-]	250 (U)	0.00132 (U)
50-26824	20	Acetone	26	0.0051 (U)
50-26824	20	Benzene	6.4 (U)	0.00102 (U)
50-26824	20	Butanone[2-]	29 (U)	0.0051 (U)
50-26824	20	Carbon Tetrachloride	28	0.00102 (U)
50-26824	20	Chloroform	180	0.000524 (J)
50-26824	20	Chloromethane	8.2 (U)	0.00102 (U)
50-26824	20	Dichlorodifluoromethane	54 (J)	0.00102 (UJ)
50-26824	20	Dichloroethane[1,2-]	8.1 (UJ)	0.00102 (U)
50-26824	20	Dichloroethene[cis-1,2-]	21	0.00102 (U)
50-26824	20	Dichloropropane[1,2-]	20 (J)	0.00102 (U)
50-26824	20	Ethylbenzene	8.7 (U)	0.00102 (U)
50-26824	20	Methylene Chloride	10	0.0051 (UJ)
50-26824	20	Styrene	8.5 (U)	0.00102 (U)
50-26824	20	Tetrachloroethene	390	0.00102 (U)
50-26824	20	Toluene	7.5 (U)	0.00102 (U)
50-26824	20	Trichloro-1,2,2-trifluoroethane[1,1,2-]	40	0.0051 (U)
50-26824	20	Trichloroethane[1,1,1-]	66	0.00102 (U)
50-26824	20	Trichloroethene	2500	0.00182
50-26824	20	Trichlorofluoromethane	11 (UJ)	0.00102 (UJ)
50-26824	20	Trimethylbenzene[1,2,4-]	9.8 (U)	0.00102 (U)
50-26824	20	Xylene[1,2-]	8.7 (U)	0.00102 (U)
50-26824	37.5	Acetone	97 (U)	0.00532 (U)
50-26824	37.5	Benzene	26 (U)	0.00106 (U)
50-26824	37.5	Butanone[2-]	120 (U)	0.00532 (U)
50-26824	37.5	Carbon Tetrachloride	51 (U)	0.00106 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26824	37.5	Chloroform	460	0.00106 (U)
50-26824	37.5	Chloromethane	34 (U)	0.00106 (U)
50-26824	37.5	Dichlorodifluoromethane	140 (J)	0.00106 (UJ)
50-26824	37.5	Dichloroethane[1,2-]	33 (UJ)	0.00106 (U)
50-26824	37.5	Dichloroethene[cis-1,2-]	55	0.00106 (U)
50-26824	37.5	Dichloropropane[1,2-]	58 (J)	0.00106 (U)
50-26824	37.5	Ethylbenzene	35 (U)	0.00106 (U)
50-26824	37.5	Methylene Chloride	28 (U)	0.00532 (UJ)
50-26824	37.5	Styrene	35 (U)	0.00106 (U)
50-26824	37.5	Tetrachloroethene	980	0.00106 (U)
50-26824	37.5	Toluene	31 (U)	0.00106 (U)
50-26824	37.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	110	0.00532 (U)
50-26824	37.5	Trichloroethane[1,1,1-]	120	0.00106 (U)
50-26824	37.5	Trichloroethene	6500	0.00106 (U)
50-26824	37.5	Trichlorofluoromethane	46 (UJ)	0.00106 (UJ)
50-26824	37.5	Trimethylbenzene[1,2,4-]	40 (U)	0.00106 (U)
50-26824	37.5	Xylene[1,2-]	35 (U)	0.00106 (U)
50-26824	70	Acetone	120 (U)	0.00532 (U)
50-26824	70	Benzene	33 (U)	0.00106 (U)
50-26824	70	Butanone[2-]	150 (U)	0.00532 (U)
50-26824	70	Carbon Tetrachloride	66 (U)	0.00106 (U)
50-26824	70	Chloroform	550	0.00106 (U)
50-26824	70	Chloromethane	43 (U)	0.00106 (U)
50-26824	70	Dichlorodifluoromethane	150 (J)	0.00106 (UJ)
50-26824	70	Dichloroethane[1,2-]	42 (UJ)	0.00106 (U)
50-26824	70	Dichloroethene[cis-1,2-]	82	0.00106 (U)
50-26824	70	Dichloropropane[1,2-]	79 (J)	0.00106 (U)
50-26824	70	Ethylbenzene	45 (U)	0.00106 (U)
50-26824	70	Methylene Chloride	53	0.00532 (UJ)
50-26824	70	Styrene	44 (U)	0.00106 (U)
50-26824	70	Tetrachloroethene	970	0.00106 (U)
50-26824	70	Toluene	39 (U)	0.00106 (U)
50-26824	70	Trichloro-1,2,2-trifluoroethane[1,1,2-]	130	0.00532 (U)
50-26824	70	Trichloroethane[1,1,1-]	59	0.00106 (U)
50-26824	70	Trichloroethene	7600	0.00106 (U)
50-26824	70	Trichlorofluoromethane	59 (UJ)	0.00106 (UJ)
50-26824	70	Trimethylbenzene[1,2,4-]	51 (U)	0.00106 (U)
50-26824	70	Xylene[1,2-]	46 (U)	0.00106 (U)
50-26824	100	Acetone	120 (U)	0.00568 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26824	100	Benzene	31 (U)	0.00114 (U)
50-26824	100	Butanone[2-]	140 (U)	0.00568 (U)
50-26824	100	Carbon Tetrachloride	78	0.00114 (U)
50-26824	100	Chloroform	500	0.00114 (U)
50-26824	100	Chloromethane	41 (U)	0.00114 (U)
50-26824	100	Dichlorodifluoromethane	150 (J)	0.00114 (UJ)
50-26824	100	Dichloroethane[1,2-]	40 (UJ)	0.00114 (U)
50-26824	100	Dichloroethene[cis-1,2-]	77	0.00114 (U)
50-26824	100	Dichloropropane[1,2-]	76 (J)	0.00114 (U)
50-26824	100	Ethylbenzene	43 (U)	0.00114 (U)
50-26824	100	Methylene Chloride	87	0.00568 (UJ)
50-26824	100	Styrene	42 (U)	0.00114 (U)
50-26824	100	Tetrachloroethene	850	0.00114 (U)
50-26824	100	Toluene	37 (U)	0.00114 (U)
50-26824	100	Trichloro-1,2,2-trifluoroethane[1,1,2-]	120	0.00568 (U)
50-26824	100	Trichloroethane[1,1,1-]	54 (U)	0.00114 (U)
50-26824	100	Trichloroethene	7500	0.00114 (U)
50-26824	100	Trichlorofluoromethane	55 (UJ)	0.00114 (UJ)
50-26824	100	Trimethylbenzene[1,2,4-]	48 (U)	0.00114 (U)
50-26824	100	Xylene[1,2-]	43 (U)	0.00114 (U)
50-26824	150	Acetone	130 (U)	0.00639 (U)
50-26824	150	Benzene	35 (U)	0.00122 (U)
50-26824	150	Butanone[2-]	160 (U)	0.0061 (U)
50-26824	150	Carbon Tetrachloride	120	0.00122 (U)
50-26824	150	Chloroform	440	0.00122 (U)
50-26824	150	Chloromethane	45 (U)	0.00122 (U)
50-26824	150	Dichlorodifluoromethane	150 (J)	0.00122 (UJ)
50-26824	150	Dichloroethane[1,2-]	44 (UJ)	0.00122 (U)
50-26824	150	Dichloroethene[cis-1,2-]	91	0.00122 (U)
50-26824	150	Dichloropropane[1,2-]	68 (J)	0.00122 (U)
50-26824	150	Ethylbenzene	48 (U)	0.00122 (U)
50-26824	150	Methylene Chloride	200	0.0061 (UJ)
50-26824	150	Styrene	47 (U)	0.00122 (U)
50-26824	150	Tetrachloroethene	700	0.00122 (U)
50-26824	150	Toluene	41 (U)	0.00122 (U)
50-26824	150	Trichloro-1,2,2-trifluoroethane[1,1,2-]	120	0.0061 (U)
50-26824	150	Trichloroethane[1,1,1-]	60 (U)	0.00122 (U)
50-26824	150	Trichloroethene	59 (U)	0.00122 (U)
50-26824	150	Trichlorofluoromethane	61 (UJ)	0.00122 (UJ)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26824	150	Trimethylbenzene[1,2,4-]	54 (U)	0.00122 (U)
50-26824	150	Xylene[1,2-]	48 (U)	0.00122 (U)
50-26824	200	Acetone	280 (U)	0.00641 (U)
50-26824	200	Benzene	75 (U)	0.00128 (U)
50-26824	200	Butanone[2-]	350 (U)	0.00641 (U)
50-26824	200	Carbon Tetrachloride	180	0.00128 (U)
50-26824	200	Chloroform	600	0.00128 (U)
50-26824	200	Chloromethane	97 (U)	0.00128 (U)
50-26824	200	Dichlorodifluoromethane	260 (J)	0.00128 (UJ)
50-26824	200	Dichloroethane[1,2-]	95 (UJ)	0.00128 (U)
50-26824	200	Dichloroethene[cis-1,2-]	170	0.00128 (U)
50-26824	200	Dichloropropane[1,2-]	110 (UJ)	0.00128 (U)
50-26824	200	Ethylbenzene	100 (U)	0.00128 (U)
50-26824	200	Methylene Chloride	580	0.00641 (UJ)
50-26824	200	Styrene	100 (U)	0.00128 (U)
50-26824	200	Tetrachloroethene	1100	0.00128 (U)
50-26824	200	Toluene	88 (U)	0.00128 (U)
50-26824	200	Trichloro-1,2,2-trifluoroethane[1,1,2-]	180 (U)	0.00641 (U)
50-26824	200	Trichloroethane[1,1,1-]	130 (U)	0.00128 (U)
50-26824	200	Trichloroethene	16000	0.00128 (U)
50-26824	200	Trichlorofluoromethane	130 (UJ)	0.00128 (UJ)
50-26824	200	Trimethylbenzene[1,2,4-]	120 (U)	0.00128 (U)
50-26824	200	Xylene[1,2-]	100 (U)	0.00128 (U)
50-26825	20	Acetone	44 (U)	0.00521 (U)
50-26825	20	Benzene	6.2 (U)	0.00104 (U)
50-26825	20	Butanone[2-]	28 (U)	0.00521 (U)
50-26825	20	Carbon Tetrachloride	48	0.00104 (U)
50-26825	20	Chloroform	100	0.00104 (U)
50-26825	20	Chloromethane	8 (U)	0.00104 (U)
50-26825	20	Dichlorodifluoromethane	470	0.00104 (U)
50-26825	20	Dichloroethane[1,2-]	7.9 (U)	0.00104 (U)
50-26825	20	Dichloroethene[cis-1,2-]	8	0.00104 (U)
50-26825	20	Dichloropropane[1,2-]	120	0.00104 (U)
50-26825	20	Ethylbenzene	8.4 (U)	0.00104 (U)
50-26825	20	Methylene Chloride	6.7 (U)	0.00521 (U)
50-26825	20	Styrene	8.2 (U)	0.00104 (U)
50-26825	20	Tetrachloroethene	610	0.00104 (U)
50-26825	20	Toluene	11 (U)	0.00104 (U)
50-26825	20	Trichloro-1,2,2-trifluoroethane[1,1,2-]	210	0.00521 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26825	20	Trichloroethane[1,1,1-]	63	0.00104 (U)
50-26825	20	Trichloroethene	1900	0.00104 (U)
50-26825	20	Trichlorofluoromethane	49	0.00104 (U)
50-26825	20	Trimethylbenzene[1,2,4-]	19 (U)	0.00104 (U)
50-26825	20	Xylene[1,2-]	8.4 (U)	0.00104 (U)
50-26825	37.5	Acetone	50	0.00595 (U)
50-26825	37.5	Benzene	6.4 (U)	0.00119 (U)
50-26825	37.5	Butanone[2-]	29 (U)	0.00595 (U)
50-26825	37.5	Carbon Tetrachloride	43	0.00119 (U)
50-26825	37.5	Chloroform	120	0.00119 (U)
50-26825	37.5	Chloromethane	8.2 (UJ)	0.00119 (U)
50-26825	37.5	Dichlorodifluoromethane	450	0.00119 (U)
50-26825	37.5	Dichloroethane[1,2-]	8.1 (UJ)	0.00119 (U)
50-26825	37.5	Dichloroethene[cis-1,2-]	17	0.00119 (U)
50-26825	37.5	Dichloropropane[1,2-]	120 (J)	0.00119 (U)
50-26825	37.5	Ethylbenzene	8.7 (U)	0.00119 (U)
50-26825	37.5	Methylene Chloride	7	0.00595 (U)
50-26825	37.5	Styrene	8.5 (U)	0.00119 (U)
50-26825	37.5	Tetrachloroethene	650	0.00119 (U)
50-26825	37.5	Toluene	7.5 (U)	0.00119 (U)
50-26825	37.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	250	0.00595 (U)
50-26825	37.5	Trichloroethane[1,1,1-]	56	0.00119 (U)
50-26825	37.5	Trichloroethene	2100	0.00119 (U)
50-26825	37.5	Trichlorofluoromethane	37 (J)	0.00119 (U)
50-26825	37.5	Trimethylbenzene[1,2,4-]	9.8 (U)	0.00119 (U)
50-26825	37.5	Xylene[1,2-]	8.7 (U)	0.00119 (U)
50-26825	69	Acetone	78	0.00422 (J)
50-26825	69	Benzene	2.3	0.00104 (U)
50-26825	69	Butanone[2-]	6.3	0.00521 (U)
50-26825	69	Carbon Tetrachloride	1.9	0.00104 (U)
50-26825	69	Chloroform	0.97 (U)	0.00104 (U)
50-26825	69	Chloromethane	2.3	0.00104 (UJ)
50-26825	69	Dichlorodifluoromethane	8.3	0.00104 (U)
50-26825	69	Dichloroethane[1,2-]	0.81 (U)	0.00104 (U)
50-26825	69	Dichloroethene[cis-1,2-]	0.79 (U)	0.00104 (U)
50-26825	69	Dichloropropane[1,2-]	0.92 (U)	0.00104 (U)
50-26825	69	Ethylbenzene	1.6	0.00104 (U)
50-26825	69	Methylene Chloride	11	0.00521 (UJ)
50-26825	69	Styrene	5.8	0.00104 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26825	69	Tetrachloroethene	2.9	0.00104 (U)
50-26825	69	Toluene	14	0.00104 (U)
50-26825	69	Trichloro-1,2,2-trifluoroethane[1,1,2-]	3.1 (U)	0.00521 (UJ)
50-26825	69	Trichloroethane[1,1,1-]	1.1 (U)	0.00104 (U)
50-26825	69	Trichloroethene	6.9	0.00104 (U)
50-26825	69	Trichlorofluoromethane	4.1	0.00104 (U)
50-26825	69	Trimethylbenzene[1,2,4-]	2	0.00104 (U)
50-26825	69	Xylene[1,2-]	2.1	0.00104 (U)
50-26825	99.5	Acetone	57 (U)	0.00302 (J)
50-26825	99.5	Benzene	15 (U)	0.00114 (U)
50-26825	99.5	Butanone[2-]	71 (U)	0.00568 (U)
50-26825	99.5	Carbon Tetrachloride	43	0.00114 (U)
50-26825	99.5	Chloroform	200	0.00114 (U)
50-26825	99.5	Chloromethane	20 (UJ)	0.00114 (UJ)
50-26825	99.5	Dichlorodifluoromethane	370	0.00114 (U)
50-26825	99.5	Dichloroethane[1,2-]	19 (UJ)	0.00114 (U)
50-26825	99.5	Dichloroethene[cis-1,2-]	35	0.00114 (U)
50-26825	99.5	Dichloropropane[1,2-]	190 (J)	0.00114 (U)
50-26825	99.5	Ethylbenzene	21 (U)	0.00114 (U)
50-26825	99.5	Methylene Chloride	38	0.00568 (UJ)
50-26825	99.5	Styrene	20 (U)	0.00114 (U)
50-26825	99.5	Tetrachloroethene	870	0.00114 (U)
50-26825	99.5	Toluene	18 (U)	0.00114 (U)
50-26825	99.5	Trichloro-1,2,2-trifluoroethane[1,1,2-]	470	0.00568 (UJ)
50-26825	99.5	Trichloroethane[1,1,1-]	90	0.00114 (U)
50-26825	99.5	Trichloroethene	3400	0.00114 (U)
50-26825	99.5	Trichlorofluoromethane	32 (J)	0.00114 (U)
50-26825	99.5	Trimethylbenzene[1,2,4-]	24 (U)	0.00114 (U)
50-26825	99.5	Xylene[1,2-]	21 (U)	0.00114 (U)
50-26825	149	Acetone	88 (U)	0.00329 (J)
50-26825	149	Benzene	24 (U)	0.00109 (U)
50-26825	149	Butanone[2-]	110 (U)	0.00543 (U)
50-26825	149	Carbon Tetrachloride	110	0.00109 (U)
50-26825	149	Chloroform	200	0.00109 (U)
50-26825	149	Chloromethane	31 (UJ)	0.00109 (UJ)
50-26825	149	Dichlorodifluoromethane	290	0.00109 (U)
50-26825	149	Dichloroethane[1,2-]	30 (UJ)	0.00109 (U)
50-26825	149	Dichloroethene[cis-1,2-]	57	0.00109 (U)
50-26825	149	Dichloropropane[1,2-]	210 (J)	0.00109 (U)

Table C-2.3-16 (continued)

Location ID	Depth (ft)	Analyte	Pore-Gas Concentration (µg/m^3)	Core Concentration (mg/kg)
50-26825	149	Ethylbenzene	32 (U)	0.00109 (U)
50-26825	149	Methylene Chloride	88	0.00543 (UJ)
50-26825	149	Styrene	32 (U)	0.00109 (U)
50-26825	149	Tetrachloroethene	1100	0.00109 (U)
50-26825	149	Toluene	28 (U)	0.00109 (U)
50-26825	149	Trichloro-1,2,2-trifluoroethane[1,1,2-]	440	0.00543 (UJ)
50-26825	149	Trichloroethane[1,1,1-]	91	0.00109 (U)
50-26825	149	Trichloroethene	5300	0.00109 (U)
50-26825	149	Trichlorofluoromethane	42 (UJ)	0.00109 (U)
50-26825	149	Trimethylbenzene[1,2,4-]	36 (U)	0.00109 (U)
50-26825	149	Xylene[1,2-]	32 (U)	0.00109 (U)
50-26825	200	Acetone	130 (U)	0.00322 (J)
50-26825	200	Benzene	35 (U)	0.00116 (U)
50-26825	200	Butanone[2-]	160 (U)	0.00581 (UJ)
50-26825	200	Carbon Tetrachloride	170	0.00116 (U)
50-26825	200	Chloroform	220	0.00116 (U)
50-26825	200	Chloromethane	45 (UJ)	0.00116 (UJ)
50-26825	200	Dichlorodifluoromethane	340	0.00116 (U)
50-26825	200	Dichloroethane[1,2-]	44 (UJ)	0.00116 (U)
50-26825	200	Dichloroethene[cis-1,2-]	80	0.00116 (U)
50-26825	200	Dichloropropane[1,2-]	250 (J)	0.00116 (U)
50-26825	200	Ethylbenzene	47 (U)	0.00116 (U)
50-26825	200	Methylene Chloride	130	0.00581 (UJ)
50-26825	200	Styrene	46 (U)	0.00116 (U)
50-26825	200	Tetrachloroethene	1400	0.00116 (U)
50-26825	200	Toluene	41 (U)	0.00116 (U)
50-26825	200	Trichloro-1,2,2-trifluoroethane[1,1,2-]	450	0.00581 (UJ)
50-26825	200	Trichloroethane[1,1,1-]	100	0.00116 (U)
50-26825	200	Trichloroethene	7600	0.00116 (U)
50-26825	200	Trichlorofluoromethane	61 (UJ)	0.00116 (UJ)
50-26825	200	Trimethylbenzene[1,2,4-]	53 (U)	0.00116 (U)
50-26825	200	Xylene[1,2-]	47 (U)	0.00116 (U)

Note: Data qualifiers are defined in Appendix A.

Table C-3.1-1
Surface and Near-Surface Samples Collected and Analyses Requested at MDA C during Phase II Investigation

Sample ID	Location ID	Depth (ft)	Media	TAL Metals
MD50-08-8373	50-603065	0.0–0.5	Fill	08-1264
MD50-08-8374	50-603065	1.0–1.5	Fill	08-1264
MD50-08-8376	50-603066	0.0–0.5	Fill	08-1285
MD50-08-8386	50-603066	1.0–1.5	Fill	08-1285
MD50-08-8377	50-603067	0.0–0.5	Fill	08-1264
MD50-08-8378	50-603067	1.0–1.5	Fill	08-1264
MD50-08-8379	50-603068	0.0–0.5	Fill	08-1264
MD50-08-8380	50-603068	1.0–1.5	Fill	08-1264
MD50-08-8381	50-603069	0.0–0.5	Fill	08-1264
MD50-08-8382	50-603069	1.0–1.5	Fill	08-1264
MD50-08-8383	50-603070	0.0–0.5	Fill	08-1285
MD50-08-8384	50-603070	0.9–1.0	Qbt 3	08-1285
MD50-08-8385	50-603071	0.0–0.5	Fill	08-1264
MD50-08-8375	50-603071	1.0–1.5	Fill	08-1264
MD50-08-8387	50-603072	0.0–0.5	Fill	08-1285
MD50-08-8388	50-603072	1.0–1.5	Fill	08-1285
MD50-08-8389	50-603073	0.0–0.5	Fill	08-1285
MD50-08-8390	50-603073	0.5–1.0	Fill	08-1285
MD50-08-8391	50-603074	0.0–0.5	Soil	08-1287
MD50-08-8392	50-603074	1.0–1.5	Soil	08-1287
MD50-08-8393	50-603075	0.0–0.5	Soil	08-1287
MD50-08-8394	50-603075	0.5–0.7	Soil	08-1287
MD50-08-8395	50-603076	0.0–0.5	Soil	08-1287
MD50-08-8396	50-603076	0.5–1.0	Soil	08-1287
MD50-08-8397	50-603077	0.0–0.3	Soil	08-1287
MD50-08-8399	50-603078	0.0–0.5	Soil	08-1287
MD50-08-8400	50-603078	1.0–1.5	Soil	08-1287
MD50-08-8401	50-603079	0.0–0.5	Fill	08-1118
MD50-08-8402	50-603079	1.0–1.5	Fill	08-1118
MD50-08-8403	50-603080	0.0–0.5	Fill	08-1118
MD50-08-8404	50-603080	1.0–1.5	Fill	08-1118
MD50-08-8405	50-603081	0.0–0.5	Fill	08-1118
MD50-08-8406	50-603081	1.0–1.5	Fill	08-1118
MD50-08-8407	50-603082	0.0–0.5	Fill	08-1118
MD50-08-8408	50-603082	1.0–1.2	Fill	08-1118

Table C-3.1-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	TAL Metals
MD50-08-8409	50-603083	0.0–0.5	Fill	08-1118
MD50-08-8410	50-603083	1.0–1.5	Fill	08-1118
MD50-08-8411	50-603084	0.0–0.5	Fill	08-1179
MD50-08-8412	50-603084	1.0–1.5	Fill	08-1179
MD50-08-8413	50-603085	0.0–0.5	Fill	08-1179
MD50-08-8414	50-603085	1.0–1.5	Fill	08-1179
MD50-08-8415	50-603086	0.0–0.5	Fill	08-1179
MD50-08-8416	50-603086	1.0–1.5	Fill	08-1179
MD50-08-8417	50-603087	0.0–0.5	Fill	08-1179
MD50-08-8418	50-603087	1.0–1.5	Fill	08-1179
MD50-08-8419	50-603088	0.0–0.5	Fill	08-1179
MD50-08-8420	50-603088	1.0–1.5	Fill	08-1179
MD50-08-8421	50-603089	0.0–0.5	Fill	08-1179
MD50-08-8422	50-603089	1.0–1.5	Fill	08-1179
MD50-08-8423	50-603090	0.0–0.5	Fill	08-1179
MD50-08-8424	50-603090	1.0–1.5	Fill	08-1179
MD50-08-8425	50-603091	0.0–0.5	Fill	08-1179
MD50-08-8426	50-603091	1.0–1.5	Fill	08-1179
MD50-08-8427	50-603092	0.0–0.5	Fill	08-1229
MD50-08-8428	50-603092	1.0–1.5	Fill	08-1229
MD50-08-8429	50-603093	0.0–0.5	Soil	08-1287
MD50-08-8430	50-603093	1.0–1.5	Soil	08-1287
MD50-08-8431	50-603094	0.0–0.3	Soil	08-1287
MD50-08-8432	50-603094	0.3–0.5	Soil	08-1287

Note: Numbers in analyte columns are request numbers.

Table C-3.1-2
Inorganic Chemicals above BVs in Surface and
Near-Surface Samples at MDA C during Phase II Investigation

Sample ID	Location ID	Depth (ft)	Media	Cadmium	Chromium	Cobalt	Manganese	Selenium	Zinc
Soil BV[a]				**0.4**	**19.3**	**8.64**	**671**	**1.52**	**48.8**
Qbt 3 BV[a]				**1.63**	**7.14**	**3.14**	**482**	**0.3**	**63.5**
Industrial SSL[b]				**897**	**1700000**[c]	**300**[d]	**26700**	**5680**	**341000**
Residential SSL[b]				**70.3**	**117000**[c]	**23**[d]	**1860**	**391**	**23500**
MD50-08-8374	50-603065	1.0–1.5	Fill	—[e]	—	—	—	1.7 (U)	—
MD50-08-8386	50-603066	1.0–1.5	Fill	—	—	—	—	1.58 (U)	—
MD50-08-8377	50-603067	0.0–0.5	Fill	—	—	—	—	1.57 (U)	—
MD50-08-8378	50-603067	1.0–1.5	Fill	—	—	—	—	1.59 (U)	—
MD50-08-8379	50-603068	0.0–0.5	Fill	0.511 (U)	—	—	—	—	—
MD50-08-8382	50-603069	1.0–1.5	Fill	—	—	—	—	1.54 (U)	—
MD50-08-8383	50-603070	0.0–0.5	Fill	—	—	—	—	1.57 (U)	—
MD50-08-8384	50-603070	0.9–1.0	Qbt 3	—	18.2	—	—	1.47 (U)	—
MD50-08-8385	50-603071	0.0–0.5	Fill	—	—	—	—	—	82.2
MD50-08-8391	50-603074	0.0–0.5	Soil	—	—	—	—	1.98	—
MD50-08-8393	50-603075	0.0–0.5	Soil	—	—	—	—	1.56 (U)	—
MD50-08-8394	50-603075	0.5–0.7	Soil	—	—	—	—	1.76	—
MD50-08-8396	50-603076	0.5–1.0	Soil	0.522 (U)	—	—	—	—	—
MD50-08-8397	50-603077	0.0–0.3	Soil	0.521 (U)	—	—	—	—	—
MD50-08-8399	50-603078	0.0–0.5	Soil	0.555 (U)	—	—	—	1.8	—
MD50-08-8401	50-603079	0.0–0.5	Fill	0.887	—	—	—	4.27	—
MD50-08-8402	50-603079	1.0–1.5	Fill	0.546 (U)	—	—	—	2.7 (U)	—
MD50-08-8403	50-603080	0.0–0.5	Fill	0.52 (U)	—	—	—	4.3	—
MD50-08-8404	50-603080	1.0–1.5	Fill	0.54 (U)	—	10.7	836	5.43	—
MD50-08-8405	50-603081	0.0–0.5	Fill	0.505 (U)	—	—	—	3.52 (U)	—
MD50-08-8406	50-603081	1.0–1.5	Fill	0.524 (U)	—	—	—	6.18	—
MD50-08-8407	50-603082	0.0–0.5	Fill	0.507 (U)	—	—	—	3.81	—
MD50-08-8408	50-603082	1.0–1.2	Fill	0.515 (U)	—	—	—	5.17	—
MD50-08-8409	50-603083	0.0–0.5	Fill	—	—	—	—	3.76	53.8
MD50-08-8410	50-603083	1.0–1.5	Fill	0.537 (U)	—	—	—	5.92	—
MD50-08-8411	50-603084	0.0–0.5	Fill	—	—	—	—	1.61 (U)	—
MD50-08-8412	50-603084	1.0–1.5	Fill	—	—	—	—	1.55 (U)	—
MD50-08-8413	50-603085	0.0–0.5	Fill	0.549 (U)	—	—	—	1.81 (U)	—
MD50-08-8414	50-603085	1.0–1.5	Fill	0.539 (U)	—	—	—	—	—
MD50-08-8415	50-603086	0.0–0.5	Fill	—	—	—	—	1.64 (U)	—

Table C-3.1-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cadmium	Chromium	Cobalt	Manganese	Selenium	Zinc
Soil BV[a]				**0.4**	**19.3**	**8.64**	**671**	**1.52**	**48.8**
Qbt 3 BV[a]				**1.63**	**7.14**	**3.14**	**482**	**0.3**	**63.5**
Industrial SSL[b]				**897**	**1700000**[c]	**300**[d]	**26700**	**5680**	**341000**
Residential SSL[b]				**70.3**	**117000**[c]	**23**[d]	**1860**	**391**	**23500**
MD50-08-8416	50-603086	1.0–1.5	Fill	0.575 (U)	—	—	—	1.73 (U)	—
MD50-08-8417	50-603087	0.0–0.5	Fill	—	—	—	—	1.63 (U)	—
MD50-08-8418	50-603087	1.0–1.5	Fill	—	—	—	—	1.57 (U)	—
MD50-08-8419	50-603088	0.0–0.5	Fill	—	—	—	—	1.64 (U)	—
MD50-08-8420	50-603088	1.0–1.5	Fill	0.537 (U)	—	—	—	—	—
MD50-08-8421	50-603089	0.0–0.5	Fill	—	—	—	—	1.81 (U)	—
MD50-08-8422	50-603089	1.0–1.5	Fill	—	—	—	—	1.55 (U)	—
MD50-08-8424	50-603090	1.0–1.5	Fill	0.544 (U)	—	—	—	1.63 (U)	—
MD50-08-8426	50-603091	1.0–1.5	Fill	0.534 (U)	—	—	—	1.6 (U)	—
MD50-08-8427	50-603092	0.0–0.5	Fill	0.519 (U)	—	—	—	4.85	—
MD50-08-8428	50-603092	1.0–1.5	Fill	0.531 (U)	—	—	—	4.05	—
MD50-08-8429	50-603093	0.0–0.5	Soil	0.547 (U)	—	—	—	1.98	—
MD50-08-8430	50-603093	1.0–1.5	Soil	0.535 (U)	—	—	—	—	—
MD50-08-8431	50-603094	0.0–0.3	Soil	—	—	—	—	2.15	—

Note: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL (1998, 059730).

[b] SSLs from NMED (2012, 219971) unless indicated otherwise.

[c] SSL for trivalent chromium.

[d] SSLs from EPA regional screening table (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[e] — = Not detected or not detected above BV.

Table C-3.2-1
Summary of Phase II Investigation Boreholes

Borehole or Grouped Boreholes	Location ID	Year Drilled	Final Total Depth (ft)	Core Samples Depth Range (ft)	Vapor Samples Depth Range (ft)	Vapor-Sampling System
1	50-24769	2006; extended in 2008	300	18.1–300	20–300	Packer (2006)
	50-603470	2008	653	360–653	351–650	SS[a] Tubing (2008)
2	50-24771	2006; extended in 2008	300	15.9–300	17–300	Packer (2006, 2008)
	50-603471	2008	460	350–452	360–450	FLUTe (2008)
3	50-24783	2006; extended in 2008	300	17.5–300	20–300	Packer (2006)
	50-603472	2008	460	350–452	364–450	SS Tubing (2008)
4	50-24784	2006; extended in 2009	460	8–452	10–450	Packer (2006); SS Tubing (2009)
5	50-24813	2006; extended in 2008 and 2009	635	18.2–602	20–600	Packer (2006); SS Tubing (2008)
6	50-24817	2005; extended in 2008	460	18.4–452.5	20–250	Packer (2005, 2008)
	50-603383	2008	460	n/a[b]	286–450	FLUTe (2008)
7	50-24820	2005; extended in 2008	602.5	17.5–602.5	20–250	Packer (2005)
	50-603467	2008	600	n/a	287–600	FLUTe (2008)
8	50-24821	2005	250	18.6–250	20–250	Packer (2005)
	50-603373	2008	300	n/a	30–260	Packer and SS Tubing (2008)
	50-603468	2008	460	300–451.5	300–450	FLUTe (2008)
9	50-24822	2005; extended in 2008	452.5	18.6–452.5	20–450	Packer (2005); SS Tubing (2008)
10	50-603060	2008	451.5	48–451.5	50–450	None
	50-603503	2008	460	n/a	347–450	SS Tubing (2008)
11	50-603061	2008	460	8–452	13–450	SS Tubing (2008)
12	50-603062	2008	460	48.5–452	50–450	SS Tubing (2008)
13	50-603063	2008	460	8–452	10–450	SS Tubing (2008)
14	50-603064	2008	510	8.5–502	25–500	SS Tubing (2008)

[a] SS = Stainless steel.

[b] n/a = Not applicable; no core collected.

Table C-3.2-2
Tuff and Vapor Samples Collected and Analyses Requested for Phase II Investigation at MDA C

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Anions	Gamma-emitting radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
Boreholes 50-24769 and 50-603470																
MD50-08-7442	50-24769	198–200	Qbt 1v	08-1103	08-1103	08-1103	—*	08-1103	08-1103	08-1103	08-1103	08-1103	08-1103	08-1103	—	08-1103
MD50-08-7443	50-24769	248–250	Qbt 1g	08-1102	08-1102	08-1102	—	08-1102	08-1102	08-1102	08-1102	08-1102	08-1102	08-1102	—	08-1102
MD50-08-7444	50-24769	298–300	Qbt 1g	08-1102	08-1102	08-1102	—	08-1102	08-1102	08-1102	08-1102	08-1102	08-1102	08-1102	—	08-1102
MD50-08-7445	50-603470	360–362	Qct	08-1651	08-1651	08-1651	—	08-1651	08-1651	08-1651	08-1651	08-1651	08-1651	08-1651	—	08-1651
MD50-08-7446	50-603470	400–402	Qbo	08-1654	08-1654	08-1654	—	08-1654	08-1654	08-1654	08-1654	08-1654	08-1654	08-1654	—	08-1654
MD50-08-7447	50-603470	450–452.5	Qbo	08-1677	08-1677	08-1677	—	08-1677	08-1677	08-1677	08-1677	08-1677	08-1677	08-1677	—	08-1677
MD50-08-7448	50-603470	500–502	Qbo	08-1717	08-1717	08-1717	—	08-1717	08-1717	08-1717	08-1717	08-1717	08-1717	08-1717	—	08-1717
MD50-08-7449	50-603470	550.5–552.5	Qbo	08-1746	08-1746	08-1746	—	08-1746	08-1746	08-1746	08-1746	08-1746	08-1746	08-1746	—	08-1746
MD50-08-7450	50-603470	600–602	Qbo	08-1747	08-1747	08-1747	—	08-1747	08-1747	08-1747	08-1747	08-1747	08-1747	08-1747	—	08-1747
MD50-08-7441	50-603470	650–653	Tt	09-10	09-10	09-10	—	09-10	09-10	09-10	09-10	09-10	09-10	09-10	—	09-10
MD50-08-7459	50-24769	200–200	Vapor	—	—	—	08-1112	—	—	—	—	—	—	—	08-1111	—
MD50-08-7460	50-24769	250–250	Vapor	—	—	—	08-1112	—	—	—	—	—	—	—	08-1111	—
MD50-08-7451	50-24769	300–300	Vapor	—	—	—	08-1112	—	—	—	—	—	—	—	08-1111	—
MD50-08-7465	50-603470	351–351	Vapor	—	—	—	09-375	—	—	—	—	—	—	—	09-376	—
MD50-08-7464	50-603470	450–450	Vapor	—	—	—	09-375	—	—	—	—	—	—	—	09-376	—
MD50-08-7462	50-603470	600–600	Vapor	—	—	—	09-411	—	—	—	—	—	—	—	09-412	—
MD50-08-7461	50-603470	650–650	Vapor	—	—	—	09-306	—	—	—	—	—	—	—	09-305	—
Boreholes 50-24783 and 50-603472																
MD50-08-7646	50-24783	198–200	Qbt 1v	08-1125	08-1125	08-1125	—	08-1125	08-1125	08-1125	08-1125	08-1125	08-1125	08-1125	—	08-1125
MD50-08-7647	50-24783	248.5–250	Qbt 1v	08-1125	08-1125	08-1125	—	08-1125	08-1125	08-1125	08-1125	08-1125	08-1125	08-1125	—	08-1125
MD50-08-7648	50-24783	298.5–300	Qbt 1g	08-1144	08-1144	08-1144	—	08-1144	08-1144	08-1144	08-1144	08-1144	08-1144	08-1144	—	08-1144
MD50-08-7649	50-603472	350–354	Qct	08-1603	08-1603	08-1603	—	08-1603	08-1603	08-1603	08-1603	08-1603	08-1603	08-1603	—	08-1603
MD50-08-7650	50-603472	400–402.5	Qbo	08-1607	08-1607	08-1607	—	08-1607	08-1607	08-1607	08-1607	08-1607	08-1607	08-1607	—	08-1607
MD50-08-7651	50-603472	450–452	Qbo	08-1612	08-1612	08-1612	—	08-1612	08-1612	08-1612	08-1612	08-1612	08-1612	08-1612	—	08-1612
MD50-08-7656	50-24783	200–200	Vapor	—	—	—	08-1158	—	—	—	—	—	—	—	08-1157	—
MD50-08-7657	50-24783	250–250	Vapor	—	—	—	08-1158	—	—	—	—	—	—	—	08-1157	—
MD50-08-7655	50-24783	300–300	Vapor	—	—	—	08-1146	—	—	—	—	—	—	—	08-1145	—
MD50-08-7658	50-603472	364–364	Vapor	—	—	—	09-201	—	—	—	—	—	—	—	09-202	—
MD50-08-7659	50-603472	414–414	Vapor	—	—	—	09-201	—	—	—	—	—	—	—	09-202	—
MD50-08-7660	50-603472	450–450	Vapor	—	—	—	09-211	—	—	—	—	—	—	—	09-212	—

Table C-3.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Anions	Gamma-emitting radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
Borehole 50-24784																
MD50-08-7676	50-24784	350–352	Qct	09-753	09-753	09-753	—	09-753	09-753	09-753	09-753	09-753	09-753	09-753	—	09-753
MD50-08-7677	50-24784	400–402	Qbo	09-753	09-753	09-753	—	09-753	09-753	09-753	09-753	09-753	09-753	09-753	—	09-753
MD50-08-7678	50-24784	450–452	Qbo	09-766	09-766	09-766	—	09-766	09-766	09-766	09-766	09-766	09-766	09-766	—	09-766
MD50-08-7691	50-24784	362–362	Vapor	—	—	—	09-1108	—	—	—	—	—	—	—	09-1107	—
MD50-08-7690	50-24784	411–411	Vapor	—	—	—	09-1108	—	—	—	—	—	—	—	09-1107	—
MD50-08-7689	50-24784	450–450	Vapor	—	—	—	09-1085	—	—	—	—	—	—	—	09-1084	—
Borehole 50-24813																
MD50-08-7706	50-24813	198.5–200	Qbt 1v	08-1164	08-1164	08-1164	—	08-1164	08-1164	08-1164	08-1164	08-1164	08-1164	08-1164	—	08-1164
MD50-08-7707	50-24813	248.5–250	Qbt 1v	08-1180	08-1180	08-1180	—	08-1180	08-1180	08-1180	08-1180	08-1180	08-1180	08-1180	—	08-1180
MD50-08-7708	50-24813	298–300	Qbt 1g	08-1189	08-1189	08-1189	—	08-1189	08-1189	08-1189	08-1189	08-1189	08-1189	08-1189	—	08-1189
MD50-08-7709	50-24813	350–352	Qct	09-840	09-840	09-840	—	09-840	09-840	09-840	09-840	09-840	09-840	09-840	—	09-840
MD50-08-7710	50-24813	400–402	Qbo	09-854	09-854	09-854	—	09-854	09-854	09-854	09-854	09-854	09-854	09-854	—	09-854
MD50-08-7711	50-24813	450–452	Qbo	09-873	09-873	09-873	—	09-873	09-873	09-873	09-873	09-873	09-873	09-873	—	09-873
MD50-08-7712	50-24813	500–502	Qbo	09-900	09-900	09-900	—	09-900	09-900	09-900	09-900	09-900	09-900	09-900	—	09-900
MD50-08-7713	50-24813	550–552	Qbo	09-929	09-929	09-929	—	09-929	09-929	09-929	09-929	09-929	09-929	09-929	—	09-929
MD50-08-7714	50-24813	600–602	Qbo	09-957	09-957	09-957	—	09-957	09-957	09-957	09-957	09-957	09-957	09-957	—	09-957
MD50-08-7716	50-24813	200–200	Vapor	—	—	—	08-1228	—	—	—	—	—	—	—	08-1227	—
MD50-08-7717	50-24813	250–250	Vapor	—	—	—	08-1242	—	—	—	—	—	—	—	08-1241	—
MD50-08-7715	50-24813	300–300	Vapor	—	—	—	08-1191	—	—	—	—	—	—	—	08-1190	—
MD50-08-7721	50-24813	358-358	Vapor	—	—	—	09-1251	—	—	—	—	—	—	—	09-1250	—
MD50-08-7720	50-24813	408-408	Vapor	—	—	—	09-1251	—	—	—	—	—	—	—	09-1250	—
MD50-08-7719	50-24813	450-450	Vapor	—	—	—	09-1246	—	—	—	—	—	—	—	09-1245	—
MD50-08-7718	50-24813	600-600	Vapor	—	—	—	09-1246	—	—	—	—	—	—	—	09-1245	—
Borehole 50-603468																
MD50-08-7888	50-603468	300–301.5	Qbt 1g	08-1257	08-1257	08-1257	—	08-1257	08-1257	08-1257	08-1257	08-1257	08-1257	08-1257	—	08-1257
MD50-08-7889	50-603468	350–351	Qct	08-1257	08-1257	08-1257	—	08-1257	08-1257	08-1257	08-1257	08-1257	08-1257	08-1257	—	08-1257
MD50-08-7890	50-603468	400–401.5	Qbo	08-1274	08-1274	08-1274	—	08-1274	08-1274	08-1274	08-1274	08-1274	08-1274	08-1274	—	08-1274
MD50-08-7891	50-603468	450–451.5	Qbo	08-1280	08-1280	08-1280	—	08-1280	08-1280	08-1280	08-1280	08-1280	08-1280	08-1280	—	08-1280
MD50-08-7894	50-603468	300–300	Vapor	—	—	—	08-1650	—	—	—	—	—	—	—	08-1649	—
MD50-08-7895	50-603468	354–354	Vapor	—	—	—	08-1650	—	—	—	—	—	—	—	08-1649	—
MD50-08-7896	50-603468	403–403	Vapor	—	—	—	08-1650	—	—	—	—	—	—	—	08-1649	—
MD50-08-7897	50-603468	450–450	Vapor	—	—	—	08-1656	—	—	—	—	—	—	—	08-1655	—

Table C-3.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Anions	Gamma-emitting radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
Borehole 50-24822																
MD50-08-7940	50-24822	300–302	Qbt 1g	09-374	09-374	09-374	—	09-374	09-374	09-374	09-374	09-374	09-374	09-374	—	09-374
MD50-08-7941	50-24822	350–352.5	Qbt 1g	09-389	09-389	09-389	—	09-389	09-389	09-389	09-389	09-389	09-389	09-389	—	09-389
MD50-08-7942	50-24822	400–402	Qbo	09-394	09-394	09-394	—	09-394	09-394	09-394	09-394	09-394	09-394	09-394	—	09-394
MD50-08-7943	50-24822	450–452.5	Qbo	09-404	09-404	09-404	—	09-404	09-404	09-404	09-404	09-404	09-404	09-404	—	09-404
MD50-08-7949	50-24822	351–351	Vapor	—	—	—	09-783	—	—	—	—	—	—	—	09-782	—
MD50-08-7948	50-24822	402–402	Vapor	—	—	—	09-778	—	—	—	—	—	—	—	09-777	—
MD50-08-7947	50-24822	450–450	Vapor	—	—	—	09-778	—	—	—	—	—	—	—	09-777	—
Borehole 50-603060																
MD50-08-8148	50-603060	48–50	Qbt 3	08-704	08-704	08-704	—	08-704	08-704	08-704	08-704	08-704	08-704	08-704	—	08-704
MD50-08-8149	50-603060	99–100	Qbt 3	08-710	08-710	08-710	—	08-710	08-710	08-710	08-710	08-710	08-710	08-710	—	08-710
MD50-08-8150	50-603060	149–150	Qbt 2	08-710	08-710	08-710	—	08-710	08-710	08-710	08-710	08-710	08-710	08-710	—	08-710
MD50-08-8151	50-603060	199–200	Qbt 1v	08-717	08-717	08-717	—	08-717	08-717	08-717	08-717	08-717	08-717	08-717	—	08-717
MD50-08-8152	50-603060	248.5–250	Qbt 1v	08-722	08-722	08-722	—	08-722	08-722	08-722	08-722	08-722	08-722	08-722	—	08-722
MD50-08-8153	50-603060	298.5–300	Qbt 1g	08-737	08-737	08-737	—	08-737	08-737	08-737	08-737	08-737	08-737	08-737	—	08-737
MD50-08-8154	50-603060	360–362	Qct	08-834	08-834	08-834	—	08-834	08-834	08-834	08-834	08-834	08-834	08-834	—	08-834
MD50-08-8156	50-603060	410–412.5	Qbo	08-848	08-848	08-848	—	08-848	08-848	08-848	08-848	08-848	08-848	08-848	—	08-848
MD50-08-8182	50-603060	450–451.5	Qbo	08-848	08-848	08-848	—	08-848	08-848	08-848	08-848	08-848	08-848	08-848	—	08-848
MD50-08-8161	50-603060	50–50	Vapor	—	—	—	08-770	—	—	—	—	—	—	—	08-769	—
MD50-08-8160	50-603060	100–100	Vapor	—	—	—	08-770	—	—	—	—	—	—	—	08-769	—
MD50-08-8159	50-603060	150–150	Vapor	—	—	—	08-764	—	—	—	—	—	—	—	08-765	—
MD50-08-8158	50-603060	200–200	Vapor	—	—	—	08-758	—	—	—	—	—	—	—	08-757	—
MD50-08-8157	50-603060	250–250	Vapor	—	—	—	08-758	—	—	—	—	—	—	—	08-757	—
MD50-08-8162	50-603503	347–347	Vapor	—	—	—	09-2	—	—	—	—	—	—	—	09-1	—
MD50-08-8163	50-603503	397–397	Vapor	—	—	—	09-2	—	—	—	—	—	—	—	09-1	—
MD50-08-8164	50-603503	450–450	Vapor	—	—	—	09-17	—	—	—	—	—	—	—	09-16	—
Borehole 50-603061																
MD50-08-8192	50-603061	8–10	Fill	08-645	08-645	08-645	—	08-645	08-645	08-645	08-645	08-645	08-645	08-645	—	08-645
MD50-08-8193	50-603061	24–25	Qbt 3	08-645	08-645	08-645	—	08-645	08-645	08-645	08-645	08-645	08-645	08-645	—	08-645
MD50-08-8194	50-603061	49–50	Qbt 3	08-645	08-645	08-645	—	08-645	08-645	08-645	08-645	08-645	08-645	08-645	—	08-645
MD50-08-8195	50-603061	97.5–100	Qbt 2	08-645	08-645	08-645	—	08-645	08-645	08-645	08-645	08-645	08-645	08-645	—	08-645
MD50-08-8196	50-603061	149–150	Qbt 2	08-662	08-662	08-662	—	08-662	08-662	08-662	08-662	08-662	08-662	08-662	—	08-662
MD50-08-8197	50-603061	198.5–200	Qbt 1v	08-670	08-670	08-670	—	08-670	08-670	08-670	08-670	08-670	08-670	08-670	—	08-670
MD50-08-8198	50-603061	249–250	Qbt 1g	08-670	08-670	08-670	—	08-670	08-670	08-670	08-670	08-670	08-670	08-670	—	08-670
MD50-08-8199	50-603061	300–302	Qbt 1g	09-635	09-635	09-635	—	09-635	09-635	09-635	09-635	09-635	09-635	09-635	—	09-635

Table C-3.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Anions	Gamma-emitting radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
MD50-08-8200	50-603061	350–352	Qct	09-635	09-635	09-635	—	09-635	09-635	09-635	09-635	09-635	09-635	09-635	—	09-635
MD50-08-8221	50-603061	400–402	Qbo	09-662	09-662	09-662	—	09-662	09-662	09-662	09-662	09-662	09-662	09-662	—	09-662
MD50-08-8222	50-603061	450–452	Qbo	09-680	09-680	09-680	—	09-680	09-680	09-680	09-680	09-680	09-680	09-680	—	09-680
MD50-08-8206	50-603061	13–13	Vapor	—	—	—	08-735	—	—	—	—	—	—	—	08-734	—
MD50-08-8205	50-603061	25–25	Vapor	—	—	—	08-726	—	—	—	—	—	—	—	08-725	—
MD50-08-8204	50-603061	50–50	Vapor	—	—	—	08-726	—	—	—	—	—	—	—	08-725	—
MD50-08-8203	50-603061	100–100	Vapor	—	—	—	08-724	—	—	—	—	—	—	—	08-723	—
MD50-08-8202	50-603061	150–150	Vapor	—	—	—	08-724	—	—	—	—	—	—	—	08-723	—
MD50-08-8201	50-603061	185–185	Vapor	—	—	—	08-715	—	—	—	—	—	—	—	08-714	—
MD50-08-8230	50-603061	228–228	Vapor	—	—	—	09-1010	—	—	—	—	—	—	—	09-988	—
MD50-08-8231	50-603061	274–274	Vapor	—	—	—	09-1010	—	—	—	—	—	—	—	09-988	—
MD50-08-8209	50-603061	347–347	Vapor	—	—	—	09-902	—	—	—	—	—	—	—	09-901	—
MD50-08-8208	50-603061	397–397	Vapor	—	—	—	09-902	—	—	—	—	—	—	—	09-901	—
MD50-08-8207	50-603061	450–450	Vapor	—	—	—	09-872	—	—	—	—	—	—	—	09-871	—
Borehole 50-603062																
MD50-08-8238	50-603062	48.5–50	Qbt 3	08-759	08-759	08-759	—	08-759	08-759	08-759	08-759	08-759	08-759	08-759	—	08-759
MD50-08-8239	50-603062	98.5–100	Qbt 2	08-771	08-771	08-771	—	08-771	08-771	08-771	08-771	08-771	08-771	08-771	—	08-771
MD50-08-8240	50-603062	148.5–150	Qbt 2	08-771	08-771	08-771	—	08-771	08-771	08-771	08-771	08-771	08-771	08-771	—	08-771
MD50-08-8241	50-603062	198.5–200	Qbt 1v	08-780	08-780	08-780	—	08-780	08-780	08-780	08-780	08-780	08-780	08-780	—	08-780
MD50-08-8242	50-603062	248.5–250	Qbt 1g	08-785	08-785	08-785	—	08-785	08-785	08-785	08-785	08-785	08-785	08-785	—	08-785
MD50-08-8243	50-603062	298.5–300	Qbt 1g	08-798	08-798	08-798	—	08-798	08-798	08-798	08-798	08-798	08-798	08-798	—	08-798
MD50-08-8244	50-603062	350–352	Qct	09-239	09-239	09-239	—	09-239	09-239	09-239	09-239	09-239	09-239	09-239	—	09-239
MD50-08-8245	50-603062	400–402	Qbo	09-247	09-247	09-247	—	09-247	09-247	09-247	09-247	09-247	09-247	09-247	—	09-247
MD50-08-8246	50-603062	450–452	Qbo	09-321	09-321	09-321	—	09-321	09-321	09-321	09-321	09-321	09-321	09-321	—	09-321
MD50-08-8251	50-603062	50–50	Vapor	—	—	—	08-871	—	—	—	—	—	—	—	08-839	—
MD50-08-8250	50-603062	100–100	Vapor	—	—	—	08-829	—	—	—	—	—	—	—	08-828	—
MD50-08-8249	50-603062	150–150	Vapor	—	—	—	08-829	—	—	—	—	—	—	—	08-828	—
MD50-08-8248	50-603062	200–200	Vapor	—	—	—	08-815	—	—	—	—	—	—	—	08-814	—
MD50-08-8247	50-603062	250–250	Vapor	—	—	—	08-815	—	—	—	—	—	—	—	08-814	—
MD50-08-8252	50-603062	337–337	Vapor	—	—	—	09-665	—	—	—	—	—	—	—	09-666	—
MD50-08-8253	50-603062	387–387	Vapor	—	—	—	09-700	—	—	—	—	—	—	—	09-699	—
MD50-08-8254	50-603062	450–450	Vapor	—	—	—	09-700	—	—	—	—	—	—	—	09-699	—
Borehole 50-603064																
MD50-08-8328	50-603064	8.5–10	Qbt 3	08-835	08-835	08-835	—	08-835	08-835	08-835	08-835	08-835	08-835	08-835	—	08-835
MD50-08-8329	50-603064	23–25	Qbt 3	08-835	08-835	08-835	—	08-835	08-835	08-835	08-835	08-835	08-835	08-835	—	08-835

Table C-3.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Anions	Gamma-emitting radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
MD50-08-8330	50-603064	48.5–50	Qbt 3	08-835	08-835	08-835	—	08-835	08-835	08-835	08-835	08-835	08-835	08-835	—	08-835
MD50-08-8331	50-603064	98.5–100	Qbt 2	08-852	08-852	08-852	—	08-852	08-852	08-852	08-852	08-852	08-852	08-852	—	08-852
MD50-08-8332	50-603064	148.5–150	Qbt 1v	08-852	08-852	08-852	—	08-852	08-852	08-852	08-852	08-852	08-852	08-852	—	08-852
MD50-08-8333	50-603064	198.5–200	Qbt 1v	08-867	08-867	08-867	—	08-867	08-867	08-867	08-867	08-867	08-867	08-867	—	08-867
MD50-08-8334	50-603064	247.5–250	Qbt 1g	08-868	08-868	08-868	—	08-868	08-868	08-868	08-868	08-868	08-868	08-868	—	08-868
MD50-08-8335	50-603064	298.5–300	Qbt 1g	08-870	08-870	08-870	—	08-870	08-870	08-870	08-870	08-870	08-870	08-870	—	08-870
MD50-08-8336	50-603064	350–351.5	Qct	09-63	09-63	09-63	—	09-63	09-63	09-63	09-63	09-63	09-63	09-63	—	09-63
MD50-08-8357	50-603064	400–401.5	Qbo	09-65	09-65	09-65	—	09-65	09-65	09-65	09-65	09-65	09-65	09-65	—	09-65
MD50-08-8358	50-603064	450–451.5	Qbo	09-66	09-66	09-66	—	09-66	09-66	09-66	09-66	09-66	09-66	09-66	—	09-66
MD50-08-8359	50-603064	500–502	Qbo	09-184	09-184	09-184	—	09-184	09-184	09-184	09-184	09-184	09-184	09-184	—	09-184
MD50-08-8343	50-603064	25–25	Vapor	—	—	—	09-733	—	—	—	—	—	—	—	09-732	—
MD50-08-8342	50-603064	66–66	Vapor	—	—	—	09-663	—	—	—	—	—	—	—	09-664	—
MD50-08-8344	50-603064	113–113	Vapor	—	—	—	09-733	—	—	—	—	—	—	—	09-732	—
MD50-08-8345	50-603064	176–176	Vapor	—	—	—	09-720	—	—	—	—	—	—	—	09-719	—
MD50-08-8338	50-603064	200–200	Vapor	—	—	—	08-1043	—	—	—	—	—	—	—	08-1042	—
MD50-08-8337	50-603064	250–250	Vapor	—	—	—	08-1038	—	—	—	—	—	—	—	08-1037	—
MD50-08-8341	50-603064	332–332	Vapor	—	—	—	09-634	—	—	—	—	—	—	—	09-633	—
MD50-08-8340	50-603064	400–400	Vapor	—	—	—	09-634	—	—	—	—	—	—	—	09-633	—
MD50-08-8339	50-603064	500–500	Vapor	—	—	—	09-601	—	—	—	—	—	—	—	09-600	—
Boreholes 50-24771 and 50-603471																
MD50-08-7616	50-24771	198–200	Qbt 1v	08-1072	08-1072	08-1072	—	08-1072	08-1072	08-1072	08-1072	08-1072	08-1072	08-1072	—	08-1072
MD50-08-7617	50-24771	248.5–250	Qbt 1g	08-1072	08-1072	08-1072	—	08-1072	08-1072	08-1072	08-1072	08-1072	08-1072	08-1072	—	08-1072
MD50-08-7618	50-24771	297.5–300	Qbt 1g	08-1089	08-1089	08-1089	—	08-1089	08-1089	08-1089	08-1089	08-1089	08-1089	08-1089	—	08-1089
MD50-08-7620	50-603471	350–351.5	Qct	08-1465	08-1465	08-1465	—	08-1465	08-1465	08-1465	08-1465	08-1465	08-1465	08-1465	—	08-1465
MD50-08-7619	50-603471	400–402	Qbo	08-1489	08-1489	08-1489	—	08-1489	08-1489	08-1489	08-1489	08-1489	08-1489	08-1489	—	08-1489
MD50-08-7621	50-603471	450–452	Qbo	08-1490	08-1490	08-1490	—	08-1490	08-1490	08-1490	08-1490	08-1490	08-1490	08-1490	—	08-1490
MD50-08-7626	50-24771	200–200	Vapor	—	—	—	08-1100	—	—	—	—	—	—	—	08-1099	—
MD50-08-7627	50-24771	250–250	Vapor	—	—	—	08-1100	—	—	—	—	—	—	—	08-1099	—
MD50-08-7625	50-24771	300–300	Vapor	—	—	—	08-1095	—	—	—	—	—	—	—	08-1088	—
MD50-08-7628	50-603471	360–360	Vapor	—	—	—	08-1615	—	—	—	—	—	—	—	08-1616	—
MD50-08-7629	50-603471	410–410	Vapor	—	—	—	08-1615	—	—	—	—	—	—	—	08-1616	—
MD50-08-7630	50-603471	450–450	Vapor	—	—	—	08-1615	—	—	—	—	—	—	—	08-1616	—
MD50-09-3534	50-603471	450–450	Vapor	—	—	—	09-814	—	—	—	—	—	—	—	09-813	—

Table C-3.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Anions	Gamma-emitting radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
Boreholes 50-24817 and 50-603383																
MD50-08-7739	50-24817	300–302.5	Qbt 1g	08-978	08-978	08-978	—	08-978	08-978	08-978	08-978	08-978	08-978	08-978	—	08-978
MD50-08-7743	50-24817	350–352	Qct	08-992	08-992	08-992	—	08-992	08-992	08-992	08-992	08-992	08-992	08-992	—	08-992
D50-08-7742	50-24817	400–402	Qbo	08-996	08-996	08-996	—	08-996	08-996	08-996	08-996	08-996	08-996	08-996	—	08-996
MD50-08-7741	50-24817	450–452.5	Qbo	08-996	08-996	08-996	—	08-996	08-996	08-996	08-996	08-996	08-996	08-996	—	08-996
MD50-08-14863	50-603383	286–286	Vapor	—	—	—	08-1903	—	—	—	—	—	—	—	08-1902	—
MD50-08-14864	50-603383	359–359	Vapor	—	—	—	08-1942	—	—	—	—	—	—	—	08-1941	—
MD50-08-14865	50-603383	408–408	Vapor	—	—	—	08-1965	—	—	—	—	—	—	—	08-1966	—
MD50-08-14866	50-603383	450–450	Vapor	—	—	—	08-1992	—	—	—	—	—	—	—	08-1991	—
Boreholes 50-24820 and 50-603467																
MD50-08-7829	50-24820	300–303	Qbt 1g	08-644	08-644	08-644	—	08-644	08-644	08-644	08-644	08-644	08-644	08-644	—	08-644
MD50-08-7830	50-24820	350–351.5	Qct	08-644	08-644	08-644	—	08-644	08-644	08-644	08-644	08-644	08-644	08-644	—	08-644
MD50-08-7831	50-24820	400–401.5	Qbo	08-644	08-644	08-644	—	08-644	08-644	08-644	08-644	08-644	08-644	08-644	—	08-644
MD50-08-7832	50-24820	450–452	Qbo	08-671	08-671	08-671	—	08-671	08-671	08-671	08-671	08-671	08-671	08-671	—	08-671
MD50-08-7833	50-24820	500–502.5	Qbo	08-718	08-718	08-718	—	08-718	08-718	08-718	08-718	08-718	08-718	08-718	—	08-718
MD50-08-7834	50-24820	550–552.5	Qbo	08-736	08-736	08-736	—	08-736	08-736	08-736	08-736	08-736	08-736	08-736	—	08-736
MD50-08-7828	50-24820	600–602.5	Qbo	08-781	08-781	08-781	—	08-781	08-781	08-781	08-781	08-781	08-781	08-781	—	08-781
MD50-08-14858	50-603467	287–287	Vapor	—	—	—	08-1734	—	—	—	—	—	—	—	08-1733	—
MD50-08-14860	50-603467	360–360	Vapor	—	—	—	08-1786	—	—	—	—	—	—	—	08-1769	—
MD50-08-14859	50-603467	409–409	Vapor	—	—	—	08-1753	—	—	—	—	—	—	—	08-1754	—
MD50-08-14857	50-603467	500–500	Vapor	—	—	—	08-1740	—	—	—	—	—	—	—	08-1723	—
MD50-08-14856	50-603467	600–600	Vapor	—	—	—	08-1679	—	—	—	—	—	—	—	08-1678	—
Borehole 50-603063																
MD50-08-8282	50-603063	8–10	Qbt 3	08-606	08-606	08-606	—	08-606	08-606	08-606	08-606	08-606	08-606	08-606	—	08-606
MD50-08-8283	50-603063	23.5–25	Qbt 3	08-606	08-606	08-606	—	08-606	08-606	08-606	08-606	08-606	08-606	08-606	—	08-606
MD50-08-8284	50-603063	48.5–50	Qbt 3	08-606	08-606	08-606	—	08-606	08-606	08-606	08-606	08-606	08-606	08-606	—	08-606
MD50-08-8285	50-603063	97.5–99	Qbt 3	08-607	08-607	08-607	—	08-607	08-607	08-607	08-607	08-607	08-607	08-607	—	08-607
MD50-08-8286	50-603063	148–150	Qbt 2	08-622	08-622	08-622	—	08-622	08-622	08-622	08-622	08-622	08-622	08-622	—	08-622
MD50-08-8287	50-603063	198–200	Qbt 1v	08-622	08-622	08-622	—	08-622	08-622	08-622	08-622	08-622	08-622	08-622	—	08-622
MD50-08-8288	50-603063	248–250	Qbt 1g	08-629	08-629	08-629	—	08-629	08-629	08-629	08-629	08-629	08-629	08-629	—	08-629
MD50-08-8311	50-603063	300–302.5	Qbt 1g	08-799	08-799	08-799	—	08-799	08-799	08-799	08-799	08-799	08-799	08-799	—	08-799
MD50-08-8290	50-603063	400–402.5	Qbo	08-821	08-821	08-821	—	08-821	08-821	08-821	08-821	08-821	08-821	08-821	—	08-821
MD50-08-8312	50-603063	450–452	Qbo	08-851	08-851	08-851	—	08-851	08-851	08-851	08-851	08-851	08-851	08-851	—	08-851
MD50-08-8296	50-603063	10–10	Vapor	—	—	—	08-716	—	—	—	—	—	—	—	08-713	—
MD50-08-8295	50-603063	25–25	Vapor	—	—	—	08-708	—	—	—	—	—	—	—	08-709	—

Table C-3.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Anions	Gamma-emitting radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Cyanide (Total)
MD50-08-8294	50-603063	50–50	Vapor	—	—	—	08-708	—	—	—	—	—	—	—	08-709	—
MD50-08-8291	50-603063	99–99	Vapor	—	—	—	08-702	—	—	—	—	—	—	—	08-703	—
MD50-08-8292	50-603063	150–150	Vapor	—	—	—	08-702	—	—	—	—	—	—	—	08-703	—
MD50-08-8293	50-603063	200–200	Vapor	—	—	—	08-708	—	—	—	—	—	—	—	08-709	—
MD50-09-1668	50-603063	347–347	Vapor	—	—	—	09-793	—	—	—	—	—	—	—	09-792	—
MD50-09-1667	50-603063	397–397	Vapor	—	—	—	09-793	—	—	—	—	—	—	—	09-792	—
MD50-09-1666	50-603063	450–450	Vapor	—	—	—	09-793	—	—	—	—	—	—	—	09-792	—

Note: Numbers in analyte columns are request numbers.

* — = Analysis not requested.

Table C-3.2-3
Inorganic Chemicals above BVs in Tuff at MDA C during Phase II Investigation

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**15.4**	**na[b]**	**na**	**3460**	**1.52**	**1**	**915**	**39.6**	**48.8**
Qbt 2, 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**17**	**63.5**
Qbt 1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**4.59**	**40**
Tt BV				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na**	**1700000[d]**	**300[e]**	**45400**	**681**	**795000**	**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**na**	**5680**	**341000**
Residential SSL[c]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**46.9**	**54800**	**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**na**	**391**	**23500**
Boreholes 50-24769 and 50-603470																											
MD50-08-7442	50-24769	198–200	Qbt 1v	—[f]	—	—	—	—	0.494 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	5.26	—	—	—	—
MD50-08-7443	50-24769	248–250	Qbt 1g	—	—	1.18 (J)	42.2	—	0.526 (U)	—	—	—	—	—	6550	—	—	233	—	—	—	—	4.6	—	—	—	—
MD50-08-7444	50-24769	298–300	Qbt 1g	—	—	0.649 (J)	—	—	0.526 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	1.39 (J)	—	—	—	—
MD50-08-7445	50-603470	360–362	Qct	—	—	15.7 (U)	—	—	0.523 (U)	—	7.79	—	—	—	4970	—	—	—	2.41	—	—	—	1.57 (U)	—	—	5.64 (J)	—
MD50-08-7446	50-603470	400–402	Qbo	—	—	1.58 (U)	—	—	0.527 (U)	—	6.37 (J)	—	—	—	4850	—	—	—	—	—	—	—	1.38 (U)	—	—	—	—
MD50-08-7447	50-603470	450–452.5	Qbo	—	—	1.61 (U)	—	—	0.535 (U)	—	6.34	—	—	—	4780	—	—	—	—	—	—	—	1.61 (U)	—	—	—	—
MD50-08-7448	50-603470	500–502	Qbo	—	—	7.91 (U)	26.2	—	0.527 (U)	—	3.59	—	—	—	3720	—	763 (J+)	—	2.01	0.715 (J)	—	—	1.58 (U)	—	—	—	—
MD50-08-7449	50-603470	550.5–552.5	Qbo	—	—	8.15 (U)	—	—	0.543 (U)	—	6.78	—	5.5	—	5310	—	1330 (J+)	—	3.67	—	—	—	1.63 (U)	—	—	8.12	—
MD50-08-7450	50-603470	600–602	Qbo	—	—	7.99 (U)	—	—	0.533 (U)	—	2.82	—	—	—	—	—	—	—	—	—	—	—	1.6 (U)	—	—	—	—
MD50-08-7441	50-603470	650–653	Tt	17200	—	12.6	151 (J)	0.749	0.333 (J)	22000	25.4	9.13	14.7	—	19300	7.46	6590 (J)	366 (J)	40.2	—	—	4250	3.69	0.124 (J-)	331	28.8	34.8
Boreholes 50-24771 and 50-603471																											
MD50-08-7616	50-24771	198–200	Qbt 1v	—	—	—	—	—	0.498 (U)	—	5.45 (J)	—	—	—	—	—	—	—	—	—	—	—	1.27 (J)	—	—	—	—
MD50-08-7617	50-24771	248.5–250	Qbt 1g	—	—	1.58 (J)	30.1	—	0.532 (U)	—	—	—	—	—	5580	—	—	340	—	0.912 (J)	—	—	1.6 (U)	—	—	—	—
MD50-08-7618	50-24771	297.5–300	Qbt 1g	—	—	1.63 (U)	—	—	0.543 (U)	—	3.19	—	—	—	4040	53.4	—	290	—	—	—	—	2.99	—	—	9.5 (J)	—
MD50-08-7620	50-603471	350–351.5	Qct	—	—	1.67 (U)	—	—	0.557 (U)	—	5.99	—	—	—	—	—	—	—	—	0.955 (J)	—	—	0.561 (J)	—	—	—	—
MD50-08-7619	50-603471	400–402	Qbo	—	—	1.61 (U)	—	—	0.535 (U)	—	3.18	—	—	—	4330	—	—	—	—	0.836 (J)	—	—	0.608 (J)	—	—	—	—
MD50-08-7621	50-603471	450–452	Qbo	—	—	1.64 (U)	—	—	0.548 (U)	—	5.92	—	—	—	4320	—	—	—	—	0.837 (J)	—	—	0.952 (J)	—	—	—	—
Boreholes 50-24783 and 50-603472																											
MD50-08-7646	50-24783	198–200	Qbt 1v	—	—	—	—	—	0.492 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	1.99 (U)	—	—	—	—
MD50-08-7647	50-24783	248.5–250	Qbt 1v	—	—	—	33	—	0.527 (U)	—	—	—	—	—	—	—	—	—	—	0.975 (J)	0.00073 (J)	—	3.55	—	—	—	—
MD50-08-7648	50-24783	298.5–300	Qbt 1g	—	—	1.65 (U)	—	—	0.551 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	1.65 (U)	—	—	—	—
MD50-08-7649	50-603472	350–354	Qct	—	—	0.66 (J)	37.5	—	—	—	3.9	—	—	0.54 (UJ)	—	—	1210 (J)	195	4.2	—	—	—	0.54 (U)	—	—	4.9 (J)	—
MD50-08-7650	50-603472	400–402.5	Qbo	—	0.54 (U)	—	—	—	—	—	6	—	—	0.54 (UJ)	—	—	—	—	2.6	—	—	—	0.54 (U)	—	—	—	—
MD50-08-7651	50-603472	450–452	Qbo	—	—	8.09 (U)	33.5	—	0.539 (U)	—	11.1	—	4.23	—	5750	—	869 (J+)	—	2.36	—	—	—	1.62 (U)	—	—	6.24	—

Table C-3.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**15.4**	**na[b]**	**na**	**3460**	**1.52**	**1**	**915**	**39.6**	**48.8**
Qbt 2, 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**17**	**63.5**
Qbt 1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**4.59**	**40**
Tt BV				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na**	**1700000[d]**	**300[e]**	**45400**	**681**	**795000**	**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**na**	**5680**	**341000**
Residential SSL[c]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**46.9**	**54800**	**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**na**	**391**	**23500**
Borehole 50-24784																											
MD50-08-7676	50-24784	350–352	Qct	—	—	0.57 (J)	27.9	—	—	—	4.2 (J)	—	—	—	—	—	—	—	4.5	—	—	—	0.55 (U)	—	—	—	—
MD50-08-7677	50-24784	400–402	Qbo	—	0.55 (U)	1.1 (U)	29.9	—	—	—	4.2 (J)	—	—	—	—	—	1310	—	2.2	—	—	—	0.55 (U)	—	—	4.8	—
MD50-08-7678	50-24784	450–452	Qbo	—	0.54 (U)	—	33.6	—	—	—	10.2	—	—	—	—	—	—	—	5.3	0.12 (J)	—	—	0.54 (U)	—	—	—	—
Borehole 50-24813																											
MD50-08-7706	50-24813	198.5–200	Qbt 1v	—	—	2.71	—	—	0.52 (U)	—	—	—	—	—	—	—	—	—	—	1.11	0.00123 (J+)	—	0.533 (U)	—	—	—	—
MD50-08-7707	50-24813	248.5–250	Qbt 1v	—	—	2.07	55.5 (J)	—	0.556 (U)	—	—	—	—	—	—	—	—	—	—	1.69 (J-)	0.000576 (J+)	—	0.895 (J)	—	—	—	—
MD50-08-7708	50-24813	298–300	Qbt 1g	—	—	1.62 (U)	—	—	0.539 (U)	—	—	—	—	—	—	—	—	—	—	1.04 (J-)	—	—	1.62 (U)	—	—	—	—
MD50-08-7709	50-24813	350–352	Qct	—	1.11 (U)	—	27.8	—	0.553 (U)	—	4.94	—	—	—	—	—	741 (J+)	—	2.73	0.667 (J)	—	—	1.08 (U)	—	—	4.83	—
MD50-08-7710	50-24813	400–402	Qbo	—	1.02 (UJ)	1.05 (U)	—	—	0.509 (U)	—	4	—	—	—	—	—	—	—	—	—	—	—	1.05 (U)	—	—	—	—
MD50-08-7711	50-24813	450–452	Qbo	—	1.06 (U)	1.07 (U)	—	—	0.531 (U)	—	5.04	—	—	—	4530	—	—	—	—	—	—	—	1.07 (U)	—	—	—	—
MD50-08-7712	50-24813	500–502	Qbo	—	1.02 (U)	1.07 (U)	—	—	0.512 (U)	—	4.01	—	—	—	—	—	—	—	—	—	—	—	1.07 (U)	—	—	—	—
MD50-08-7713	50-24813	550–552	Qbo	—	1.06 (U)	1.07 (U)	—	—	0.53 (U)	—	5.5	—	—	—	4870	—	1400	—	2.84	—	—	—	1.07 (U)	—	—	5.95	—
MD50-08-7714	50-24813	600–602	Qbo	—	1.07 (U)	1.09 (U)	—	—	0.534 (U)	—	3.29	—	—	—	—	—	—	—	—	—	0.000683 (J)	—	1.09 (U)	—	—	—	—
Borehole 50-24817																											
MD50-08-7739	50-24817	300–302.5	Qbt 1g	—	—	0.786 (J)	—	—	0.534 (U)	—	—	—	—	—	—	—	—	—	—	1.18	—	—	1.6 (U)	—	—	—	—
MD50-08-7743	50-24817	350–352	Qct	6340 (J+)	—	3.04	93.8	—	0.591 (U)	2890 (J+)	7.4	—	7.95	—	7910	—	1930 (J+)	269 (J+)	6.85	1.4	—	—	1.77 (U)	—	—	11.7	—
MD50-08-7742	50-24817	400–402	Qbo	—	—	—	—	—	0.544 (U)	—	3.81	—	—	—	4240	—	—	—	—	—	—	—	1.63 (U)	—	—	—	—
MD50-08-7741	50-24817	450–452.5	Qbo	—	—	0.596 (J)	—	—	0.53 (U)	—	5.4	—	—	—	4680	—	—	—	—	—	—	—	0.683 (J)	—	—	—	—
Borehole 50-24820																											
MD50-08-7829	50-24820	300–303	Qbt 1g	—	—	1.56 (U)	—	—	0.52 (U)	—	16.6 (U)	—	—	—	—	22.1	—	—	—	—	—	—	0.707 (J)	—	—	—	—
MD50-08-7830	50-24820	350–351.5	Qct	5270 (J+)	—	1.63 (U)	57.2	—	0.543 (U)	2300	5.24 (J)	—	6.13	—	7260	—	1440	256	5.15	—	—	—	2.72	—	—	9.58	—
MD50-08-7831	50-24820	400–401.5	Qbo	—	—	1.56 (U)	—	—	0.52 (U)	—	2.93 (J)	—	—	—	6430	—	—	—	—	—	—	—	2.01	—	—	6.99	—
MD50-08-7832	50-24820	450–452	Qbo	—	—	1.6 (U)	—	—	0.534 (U)	—	—	—	—	—	4560	—	—	—	—	—	—	—	1.6 (U)	—	—	—	—
MD50-08-7833	50-24820	500–502.5	Qbo	—	—	1.62 (U)	—	—	0.54 (U)	—	9.48	—	—	—	3840	—	—	—	2.72 (J)	—	—	—	1.28 (J)	—	—	—	—
MD50-08-7834	50-24820	550–552.5	Qbo	—	—	1.62 (U)	34.2	—	0.538 (U)	2640 (J)	6.12 (J)	—	4.7	—	5320	—	1420 (J+)	—	4.53 (J+)	—	—	—	1.08 (J)	—	—	7.44	—
MD50-08-7828	50-24820	600–602.5	Qbo	—	—	1.61 (U)	—	—	0.538 (U)	—	3.71	—	—	—	—	—	—	—	—	—	—	—	1.61 (U)	—	—	—	—

Table C-3.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**15.4**	**na[b]**	**na**	**3460**	**1.52**	**1**	**915**	**39.6**	**48.8**
Qbt 2, 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**17**	**63.5**
Qbt 1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**4.59**	**40**
Tt BV				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na**	**1700000[d]**	**300[e]**	**45400**	**681**	**795000**	**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**na**	**5680**	**341000**
Residential SSL[c]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**46.9**	**54800**	**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**na**	**391**	**23500**
Borehole 50-603468																											
MD50-08-7888	50-603468	300–301.5	Qbt 1g	—	—	0.674 (J)	—	—	0.541 (U)	—	2.69	—	—	—	—	48.8 (J-)	—	—	—	—	—	—	1.23 (J)	—	—	—	68.7 (J-)
MD50-08-7889	50-603468	350–351	Qct	—	—	1.52 (J)	—	—	0.52 (U)	—	5.78	—	—	—	4660 (J)	—	—	—	2.64	—	—	—	2.46	—	—	5.38	—
MD50-08-7890	50-603468	400–401.5	Qbo	—	—	1.56 (U)	—	—	0.519 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	1.56 (U)	—	—	—	—
MD50-08-7891	50-603468	450–451.5	Qbo	—	—	1.11 (J)	29.5	—	0.541 (U)	—	7.57 (J-)	—	—	—	4930	—	—	—	—	—	—	—	1.94	—	—	—	—
Borehole 50-24822																											
MD50-08-7940	50-24822	300–302	Qbt 1g	—	1.08 (U)	0.818 (J)	—	—	0.54 (U)	—	—	—	—	—	—	—	—	—	—	1.1 (J-)	—	—	1.07 (U)	—	—	—	—
MD50-08-7941	50-24822	350–352.5	Qbt 1g	—	—	1.11 (J)	—	—	0.546 (U)	—	3.43	—	—	—	—	—	—	—	—	1.15 (J-)	—	—	1.11 (U)	—	—	—	—
MD50-08-7942	50-24822	400–402	Qbo	—	0.676 (U)	1.43 (J)	—	—	0.519 (U)	—	6.36 (J)	—	—	—	4280	—	—	—	—	—	—	—	1.04 (U)	—	—	—	—
MD50-08-7943	50-24822	450–452.5	Qbo	—	—	1.72	—	—	0.534 (U)	—	7.01	—	—	—	4330	—	—	—	2.05 (J)	—	—	—	1.09 (UJ)	—	—	—	—
Borehole 50-603060																											
MD50-08-8148	50-603060	48–50	Qbt 3	—	2 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.03	—	—	—	—
MD50-08-8149	50-603060	99–100	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.989 (J)	—	—	—	—
MD50-08-8150	50-603060	149–150	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.51	—	—	—	—
MD50-08-8151	50-603060	199–200	Qbt 1v	—	—	—	—	—	0.494 (U)	—	6.92	—	—	—	—	—	—	—	—	—	0.000704 (J)	—	1.05 (J)	—	—	—	—
MD50-08-8152	50-603060	248.5–250	Qbt 1v	—	—	—	—	—	0.583 (U)	—	3.09	—	—	—	—	—	—	—	—	—	—	—	1.71 (J)	—	—	—	—
MD50-08-8153	50-603060	298.5–300	Qbt 1g	—	—	1.63 (U)	—	—	0.543 (U)	—	2.69 (J)	—	—	—	—	—	—	—	—	—	—	—	0.641 (J)	—	—	—	—
MD50-08-8154	50-603060	360–362	Qct	—	—	1.57 (U)	28.8	—	0.523 (U)	—	3.88	—	—	—	—	—	—	199	—	—	—	—	1.57 (U)	—	—	4.6	—
MD50-08-8156	50-603060	410–412.5	Qbo	—	—	1.54 (U)	—	—	0.514 (U)	—	3.24 (J)	—	—	—	4050	—	—	—	—	—	—	—	0.593 (J)	—	—	—	—
MD50-08-8182	50-603060	450–451.5	Qbo	—	—	1.58 (U)	—	—	0.527 (U)	—	2.71 (J)	—	—	—	3900	—	—	—	—	—	—	—	0.763 (J)	—	—	—	—
Borehole 50-603061																											
MD50-08-8192	50-603061	8–10	Fill	—	—	—	—	—	0.573 (U)	—	—	—	—	—	—	—	—	—	—	13.3	0.000648 (J)	—	3.67	—	—	—	—
MD50-08-8193	50-603061	24–25	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.03	—	—	2.57	—	—	—	—
MD50-08-8194	50-603061	49–50	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8.95	0.00212 (J)	—	2.99	—	—	—	—
MD50-08-8195	50-603061	97.5–100	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.02	0.00151 (J)	—	2.2	—	—	—	—
MD50-08-8196	50-603061	149–150	Qbt 2	—	—	—	—	—	—	—	8.33 (J)	—	—	—	—	—	—	—	—	—	0.00236	—	2.38	—	—	—	—
MD50-08-8197	50-603061	198.5–200	Qbt 1v	—	—	—	—	—	0.539 (U)	—	6.71 (J)	—	—	—	—	—	—	—	—	—	—	—	0.54 (J)	—	—	—	—
MD50-08-8198	50-603061	249–250	Qbt 1g	—	—	1.71 (U)	—	—	0.571 (U)	—	—	—	—	—	4160	—	—	—	—	—	—	—	1.71 (U)	—	—	—	—
MD50-08-8199	50-603061	300–302	Qbt 1g	—	1.12 (U)	1.67 (U)	—	—	—	—	3.31	—	—	—	—	—	—	—	—	—	—	—	1.13 (U)	—	—	—	92.7

Table C-3.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**15.4**	**na**[b]	**na**	**3460**	**1.52**	**1**	**915**	**39.6**	**48.8**
Qbt 2, 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**17**	**63.5**
Qbt 1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**4.59**	**40**
Tt BV				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na**	**1700000**[d]	**300**[e]	**45400**	**681**	**795000**	**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**na**	**5680**	**341000**
Residential SSL[c]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000**[d]	**23**[e]	**3130**	**46.9**	**54800**	**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**na**	**391**	**23500**
Borehole 50-603061 (continued)																											
MD50-08-8200	50-603061	350–352	Qct	—	1.2 (U)	1.03 (J)	41.6	1.58	0.598 (U)	—	9.06	—	—	—	5670	—	1770	—	6.6	—	—	—	1.19 (U)	—	—	6.74	40.5
MD50-08-8221	50-603061	400–402	Qbo	—	0.55 (UJ)	1.1 (U)	—	—	—	—	3.3	—	—	0.55 (UJ)	—	—	—	—	—	—	—	—	0.55 (U)	—	—	—	—
MD50-08-8222	50-603061	450–452	Qbo	—	0.55 (UJ)	1.1 (U)	—	—	—	—	4.5	—	—	0.55 (UJ)	3710	—	—	—	2.6	—	—	—	0.55 (U)	—	—	—	—
Borehole 50-603062																											
MD50-08-8238	50-603062	48.5–50	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55 (U)	—	—	—	—
MD50-08-8239	50-603062	98.5–100	Qbt 2	—	—	7.84 (U)	—	—	—	—	9.7	—	—	—	—	—	—	—	—	—	—	—	2.06	—	—	—	—
MD50-08-8240	50-603062	148.5–150	Qbt 2	—	—	7.97 (U)	—	1.31	—	—	11	—	—	—	—	—	—	—	—	—	—	—	0.604 (J)	—	—	—	—
MD50-08-8241	50-603062	198.5–200	Qbt 1v	—	—	7.8 (U)	—	—	0.52 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	1.56 (U)	—	—	—	—
MD50-08-8242	50-603062	248.5–250	Qbt 1g	—	—	1.62 (U)	—	—	0.538 (U)	—	—	—	—	—	3710	—	—	—	—	—	—	—	1.62 (U)	—	—	—	—
MD50-08-8243	50-603062	298.5–300	Qbt 1g	—	—	1.67 (U)	—	—	0.557 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	1.67 (U)	—	—	—	—
MD50-08-8244	50-603062	350–352	Qct	—	—	5.26	27.2	—	—	—	3.7	—	—	—	5490	—	—	243	2.37 (J)	—	—	—	1.59 (U)	—	—	5.29	—
MD50-08-8245	50-603062	400–402	Qbo	—	—	0.828 (J)	—	—	0.527 (U)	—	3.45	—	—	—	4430	—	—	—	—	—	—	—	1.12 (J)	—	—	—	—
MD50-08-8246	50-603062	450–452	Qbo	—	0.606 (J)	2.42	46.6 (J-)	—	0.529 (U)	—	5.96	—	—	—	5830	—	—	326 (J)	—	—	—	—	1.06 (U)	—	—	6.31 (J)	—
Borehole 50-603063																											
MD50-08-8282	50-603063	8–10	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.49	—	—	2.88	—	—	—	—
MD50-08-8283	50-603063	23.5–25	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.65	—	—	2.21	—	—	—	—
MD50-08-8284	50-603063	48.5–50	Qbt 3	—	—	7.91 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	3.5	0.00115 (J)	—	3.66	—	—	—	—
D50-08-8285	50-603063	97.5–99	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.27	—	—	2.97	—	—	—	—
MD50-08-8286	50-603063	148–150	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.59	—	—	—	—
MD50-08-8287	50-603063	198–200	Qbt 1v	—	—	—	—	—	0.516 (U)	—	2.42	—	—	—	—	—	—	—	—	—	—	—	2.89	—	—	—	—
MD50-08-8288	50-603063	248–250	Qbt 1g	—	—	1.74 (U)	—	—	0.579 (U)	—	9.08	—	—	—	5390	—	—	216 (J-)	—	—	—	—	2.28	—	—	—	—
MD50-08-8311	50-603063	300–302.5	Qbt 1g	—	—	1.71 (U)	—	—	0.57 (U)	—	3.25 (J)	—	—	—	—	—	—	—	—	—	0.00176 (J)	—	1.71 (U)	—	—	—	—
MD50-08-8290	50-603063	400–402.5	Qbo	—	—	1.71 (U)	—	—	0.571 (U)	—	—	—	—	—	4920	—	—	—	—	—	—	—	1.71 (U)	—	—	—	—
MD50-08-8312	50-603063	450–452	Qbo	—	—	1.69 (U)	—	—	0.564 (U)	—	2.7	—	—	—	4480	—	—	—	2.16 (J+)	—	0.000752 (J)	—	2.34	—	—	—	—

Table C-3.2-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Magnesium	Manganese	Nickel	Nitrate	Perchlorate	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
Soil BV[a]				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**0.5**	**21500**	**22.3**	**4610**	**671**	**15.4**	**na[b]**	**na**	**3460**	**1.52**	**1**	**915**	**39.6**	**48.8**
Qbt 2, 3 BV[a]				**7340**	**0.5**	**2.79**	**46**	**1.21**	**1.63**	**2200**	**7.14**	**3.14**	**4.66**	**0.5**	**14500**	**11.2**	**1690**	**482**	**6.58**	**na**	**na**	**3500**	**0.3**	**1**	**2770**	**17**	**63.5**
Qbt 1v BV[a]				**8170**	**0.5**	**1.81**	**26.5**	**1.7**	**0.4**	**3700**	**2.24**	**1.78**	**3.26**	**0.5**	**9900**	**18.4**	**780**	**408**	**2**	**na**	**na**	**6670**	**0.3**	**1**	**6330**	**4.48**	**84.6**
Qbt 1g, Qct, Qbo BV[a]				**3560**	**0.5**	**0.56**	**25.7**	**1.44**	**0.4**	**1900**	**2.6**	**8.89**	**3.96**	**0.5**	**3700**	**13.5**	**739**	**189**	**2**	**na**	**na**	**2390**	**0.3**	**1**	**4350**	**4.59**	**40**
Tt BV				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Industrial SSL[c]				**1130000**	**454**	**17.7**	**223000**	**2260**	**897**	**na**	**1700000[d]**	**300[e]**	**45400**	**681**	**795000**	**800**	**na**	**26700**	**22500**	**1820000**	**795**	**na**	**5680**	**5680**	**na**	**5680**	**341000**
Residential SSL[c]				**78000**	**31.3**	**3.9**	**15600**	**156**	**70.3**	**na**	**117000[d]**	**23[e]**	**3130**	**46.9**	**54800**	**400**	**na**	**1860**	**1560**	**125000**	**54.8**	**na**	**391**	**391**	**na**	**391**	**23500**
Borehole 50-603064																											
MD50-08-8328	50-603064	8.5–10	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.6 (J)	—	—	—	—
MD50-08-8329	50-603064	23–25	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.12 (J)	—	—	—	—
MD50-08-8330	50-603064	48.5–50	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4.73 (J)	—	—	—	—
MD50-08-8331	50-603064	98.5–100	Qbt 2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.56 (U)	—	—	—	—
MD50-08-8332	50-603064	148.5–150	Qbt 1v	—	—	—	—	—	0.523 (U)	—	—	—	—	—	—	—	—	—	—	—	—	—	1.57 (U)	—	—	—	—
MD50-08-8333	50-603064	198.5–200	Qbt 1v	—	—	2.38	—	—	0.518 (U)	—	3.23	—	—	—	—	—	—	—	—	—	—	—	1.55 (U)	—	—	—	—
MD50-08-8334	50-603064	247.5–250	Qbt 1g	—	—	0.907 (J)	—	—	0.538 (U)	—	—	—	—	—	4770 (J+)	—	—	—	—	—	—	—	0.72 (J)	—	—	—	—
MD50-08-8335	50-603064	298.5–300	Qbt 1g	—	—	0.725 (J)	—	—	0.557 (U)	—	2.97	—	—	—	—	—	—	—	—	—	—	—	1.67 (U)	—	—	—	—
MD50-08-8336	50-603064	350–351.5	Qct	3680	—	6.51	35.6	—	—	—	6.14	—	5.05	—	7320	—	1220 (J+)	304	3.45	—	—	—	4.43	—	—	7.85	—
MD50-08-8357	50-603064	400–401.5	Qbo	—	—	1.47 (J)	—	—	0.528 (U)	—	—	—	—	—	4500	—	—	—	—	—	—	—	1.71	—	—	—	—
MD50-08-8358	50-603064	450–451.5	Qbo	—	—	1.5 (J)	—	—	0.547 (U)	—	4.4	—	—	—	—	—	—	—	—	—	—	—	1.2 (J)	—	—	—	—
MD50-08-8359	50-603064	500–502	Qbo	—	—	2.02	36.8	—	0.542 (U)	—	4.93	—	—	—	4280	—	1190	—	2.18 (J+)	—	—	—	0.588 (J)	—	—	5.73	—

Note: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SSLs from NMED (2012, 219971) unless indicated otherwise.

[d] SSL for trivalent chromium.

[e] SSLs from EPA regional screening tables (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[f] — = Not detected or not detected above BV.

Table C-3.2-4
Organic Chemicals Detected in Tuff at MDA C during Phase II Investigation

Sample ID	Location ID	Depth (ft)	Media	Acenaphthene	Acenaphthylene	Anthracene	Aroclor-1242	Aroclor-1248	Aroclor-1254	Aroclor-1260	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene
Industrial SSL[a]				**36700**	**18300[b]**	**183000**	**8.26**	**8.26**	**8.26**	**8.26**	**2.34**	**23.4**	**18300[b]**	**234**
Residential SSL[a]				**3440**	**1720[b]**	**17200**	**2.22**	**2.22**	**1.12**	**2.22**	**0.148**	**1.48**	**1720[b]**	**14.8**
Boreholes 50-24769 and 50-603470														
MD50-08-7444	50-24769	298–300	Qbt 1g	—[c]	—	—	0.0022 (J)	—	—	—	—	—	—	—
MD50-08-7446	50-603470	400–402	Qbo	—	—	—	0.0081	—	0.0182	0.0047	—	—	—	—
MD50-08-7450	50-603470	600–602	Qbo	—	—	0.00826 (J)	—	—	—	—	0.0128 (J)	0.0248 (J)	—	—
MD50-08-7441	50-603470	650–653	Tt	—	—	—	—	—	—	—	—	—	—	—
Borehole 50-24820														
MD50-08-7829	50-24820	300–303	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—
Borehole 50-603468														
MD50-08-7891	50-603468	450–451.5	Qbo	—	—	—	—	—	—	—	—	—	—	—
Borehole 50-24822														
MD50-08-7942	50-24822	400–402	Qbo	—	—	—	0.0104	—	—	—	—	—	—	—
Borehole 50-603060														
MD50-08-8151	50-603060	199–200	Qbt 1v	—	—	—	—	—	0.0017 (J)	—	—	—	—	—
MD50-08-8156	50-603060	410–412.5	Qbo	—	—	—	—	—	0.0052	—	—	—	—	—
Borehole 50-603061														
MD50-08-8197	50-603061	198.5–200	Qbt 1v	—	—	—	0.0181	—	—	—	—	—	—	—
MD50-08-8221	50-603061	400–402	Qbo	—	—	—	—	—	—	—	—	—	—	—
MD50-08-8222	50-603061	450–452	Qbo	—	—	—	—	—	—	—	—	—	—	—
Borehole 50-603062														
MD50-08-8244	50-603062	350–352	Qct	0.0185 (J)	0.0165 (J)	0.0206 (J)	—	—	—	—	0.0182 (J)	0.026 (J)	0.0812 (J)	0.0196 (J)
MD50-08-8245	50-603062	400–402	Qbo	—	—	—	—	—	—	—	—	—	—	—
Borehole 50-603063														
MD50-08-8282	50-603063	8–10	Qbt 3	—	—	—	—	—	—	0.0018 (J)	—	—	—	—
Borehole 50-603064														
MD50-08-8330	50-603064	48.5–50	Qbt 3	—	—	—	—	0.109	—	0.0061	—	—	—	—
MD50-08-8332	50-603064	148.5–150	Qbt 1v	—	—	—	0.002 (J)	—	—	—	—	—	—	—
MD50-08-8334	50-603064	247.5–250	Qbt 1g	—	—	—	0.0093	—	0.0145	0.0078	—	—	—	—

Table C-3.2-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Benzoic Acid	Bis(2-ethylhexyl)phthalate	Chloronaphthalene[2-]	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Methylnaphthalene[2-]	Naphthalene	Phenanthrene	Pyrene
Industrial SSL[a]				**2500000[d]**	**1370**	**90800**	**2340**	**2.34**	**24400**	**24400**	**23.4**	**2200[d]**	**241**	**20500**	**18300**
Residential SSL[a]				**240000[d]**	**347**	**6260**	**148**	**0.148**	**2290**	**2290**	**1.48**	**230[d]**	**43**	**1830**	**1720**
Boreholes 50-24769 and 50-603470															
MD50-08-7444	50-24769	298–300	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—
MD50-08-7446	50-603470	400–402	Qbo	—	—	—	—	—	—	—	—	—	—	—	—
MD50-08-7450	50-603470	600–602	Qbo	—	—	—	0.0147 (J)	—	0.0379	—	—	—	—	0.0363 (J)	0.0283 (J)
MD50-08-7441	50-603470	650–653	Tt	—	0.0995 (J)	—	—	—	—	—	—	—	—	—	—
Borehole 50-24820															
MD50-08-7829	50-24820	300–303	Qbt 1g	—	0.121 (J)	—	—	—	—	—	—	—	—	—	—
Borehole 50-603468															
MD50-08-7891	50-603468	450–451.5	Qbo	—	0.0831 (J)	—	—	—	—	—	—	—	—	—	—
Borehole 50-24822															
MD50-08-7942	50-24822	400–402	Qbo	—	—	—	—	—	—	—	—	—	—	—	—
Borehole 50-603060															
MD50-08-8151	50-603060	199–200	Qbt 1v	—	—	—	—	—	—	—	—	—	—	—	—
MD50-08-8156	50-603060	410–412.5	Qbo	—	—	—	—	—	—	—	—	—	—	—	—
Borehole 50-603061															
MD50-08-8197	50-603061	198.5–200	Qbt 1v	—	—	—	—	—	—	—	—	—	—	—	—
MD50-08-8221	50-603061	400–402	Qbo	—	0.34 (J)	—	—	—	—	—	—	—	—	—	—
MD50-08-8222	50-603061	450–452	Qbo	—	0.1 (J)	—	—	—	—	—	—	—	—	—	—
Borehole 50-603062															
MD50-08-8244	50-603062	350–352	Qct	—	0.12 (J)	0.02 (J)	0.018 (J)	0.0815 (J)	0.0239 (J)	0.0204 (J)	0.0723 (J)	0.0203 (J)	0.0178 (J)	0.0276 (J)	0.0217 (J)
MD50-08-8245	50-603062	400–402	Qbo	—	0.0828 (J)	—	0.0184 (J)	—	—	—	—	—	—	—	—
Borehole 50-603063															
MD50-08-8282	50-603063	8–10	Qbt 3	—	0.225	—	—	—	—	—	—	—	—	—	—
Borehole 50-603064															
MD50-08-8330	50-603064	48.5–50	Qbt 3	—	—	—	—	—	—	—	—	—	—	—	—
MD50-08-8332	50-603064	148.5–150	Qbt 1v	0.317 (J)	—	—	—	—	—	—	—	—	—	—	—
MD50-08-8334	50-603064	247.5–250	Qbt 1g	—	—	—	—	—	—	—	—	—	—	—	—

Note: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED (2012, 219971).

[b] Pyrene used as a surrogate based on structural similarity.

[c] — = Not detected.

[d] SSLs from EPA regional screening table (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

Table C-3.2-5
Radionuclides Detected or above BVs in Tuff at MDA C during Phase II Investigation

Sample ID	Location ID	Depth (ft)	Media	Cesium-134	Plutonium-239/240	Uranium-234	Uranium-235/236	Uranium-238
Soil BV[a]				**na**[b]	**na**	**2.59**	**0.2**	**2.29**
Qbt 2, Qbt 3 BV[a]				**na**	**na**	**1.98**	**0.09**	**1.93**
Qbt 1v BV[a]				**na**	**na**	**3.12**	**0.14**	**3.05**
Qbt 1g, QBO BV[a]				**na**	**na**	**4**	**0.18**	**3.9**
Tt BV				**na**	**na**	**na**	**na**	**na**
Industrial SAL[c]				**9.7**	**210**	**1500**	**87**	**430**
Residential SAL[c]				**2.4**	**33**	**170**	**17**	**87**
Boreholes 50-24769 and 50-603470								
MD50-08-7443	50-24769	248–250	Qbt 1g	—[d]	—	—	0.26	—
MD50-08-7444	50-24769	298–300	Qbt 1g	—	—	—	0.201	—
MD50-08-7450	50-603470	600–602	Qbo	—	—	—	0.226	—
MD50-08-7441	50-603470	650–653	Tt	—	—	1.02	0.0673	0.912
Borehole 50-24771								
MD50-08-7616	50-24771	198–200	Qbt 1v	—	—	—	0.189	—
MD50-08-7617	50-24771	248.50–250	Qbt 1g	—	—	—	0.22	—
MD50-08-7618	50-24771	297.50–300	Qbt 1g	—	—	—	0.199	—
Borehole 50-24783								
MD50-08-7647	50-24783	248.50–250	Qbt 1v	—	—	—	0.156	—
MD50-08-7648	50-24783	298.50–300	Qbt 1g	—	—	—	0.181	—
Borehole 50-24784								
MD50-08-7677	50-24784	400–402	Qbo	0.062	—	—	0.196	—
Borehole 50-24813								
MD50-08-7707	50-24813	248.50–250	Qbt 1v	—	—	—	0.175	—
MD50-08-7708	50-24813	298–300	Qbt 1g	—	—	—	0.25	—
Borehole 50-24820								
MD50-08-7829	50-24820	300–303	Qbt 1g	—	—	—	0.26	—
MD50-08-7828	50-24820	600–602.50	Qbo	—	—	—	0.359	—
Borehole 50-603468								
MD50-08-7888	50-603468	300–301.50	Qbt 1g	—	—	—	0.182	—
MD50-08-7890	50-603468	400–401.50	Qbo	—	—	—	0.185 (J)	—
Borehole 50-603060								
MD50-08-8151	50-603060	199–200	Qbt 1v	—	—	—	0.237	—
MD50-08-8153	50-603060	298.50–300	Qbt 1g	—	—	—	0.224	—
MD50-08-8156	50-603060	410–412.50	Qbo	—	—	—	0.19	—

Table C-3.2-5 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cesium-134	Plutonium-239/240	Uranium-234	Uranium-235/236	Uranium-238
Soil BV[a]				**na**[b]	**na**	**2.59**	**0.2**	**2.29**
Qbt 2, Qbt 3 BV[a]				**na**	**na**	**1.98**	**0.09**	**1.93**
Qbt 1v BV[a]				**na**	**na**	**3.12**	**0.14**	**3.05**
Qbt 1g, QBO BV[a]				**na**	**na**	**4**	**0.18**	**3.9**
Tt BV				**na**	**na**	**na**	**na**	**na**
Industrial SAL[c]				**9.7**	**210**	**1500**	**87**	**430**
Residential SAL[c]				**2.4**	**33**	**170**	**17**	**87**
Borehole 50-603061								
MD50-08-8192	50-603061	8–10	Fill	—	0.195	—	—	—
MD50-08-8196	50-603061	149–150	Qbt 2	—	—	—	0.0984	—
MD50-08-8199	50-603061	300–302	Qbt 1g	—	—	—	0.237	—
Borehole 50-603062								
MD50-08-8239	50-603062	98.5–100	Qbt 2	—	—	—	0.11	—
MD50-08-8240	50-603062	148.5–150	Qbt 2	—	—	—	0.0989	—
MD50-08-8241	50-603062	198.5–200	Qbt 1v	—	—	—	0.198	—
MD50-08-8242	50-603062	248.5–250	Qbt 1g	—	—	—	0.242	—
MD50-08-8246	50-603062	450–452	Qbo	—	—	—	0.214	—
Borehole 50-603063								
MD50-08-8282	50-603063	8–10	Qbt 3	—	0.0371	—	—	—
MD50-08-8284	50-603063	48.5–50	Qbt 3	—	—	—	0.107	—
MD50-08-8285	50-603063	97.5–99	Qbt 3	—	—	—	0.101	—
MD50-08-8287	50-603063	198–200	Qbt 1v	—	—	—	0.15	—
MD50-08-8288	50-603063	248–250	Qbt 1g	—	—	—	0.237	—
MD50-08-8311	50-603063	300–302.5	Qbt 1g	—	—	—	0.189	—
Borehole 50-603064								
MD50-08-8328	50-603064	8.5–10	Qbt 3	—	—	—	0.103	—
MD50-08-8330	50-603064	48.5–50	Qbt 3	—	—	—	0.116	—
MD50-08-8334	50-603064	247.5–250	Qbt 1g	—	—	—	0.222	—
MD50-08-8335	50-603064	298.5–300	Qbt 1g	—	—	—	0.224	—
MD50-08-8359	50-603064	500–502	Qbo	—	—	—	0.221	—

Note: Results are in pCi/g. Data qualifiers are defined in Appendix A.

[a] BVs from LANL (1998, 059730).

[b] na = Not available.

[c] SALs from LANL (2009, 107655).

[d] — = Not detected or not detected above BV.

Table C-3.3-1
VOCs Detected in Vapor Samples at MDA C during Phase II Investigation

Sample ID	Location ID	Depth (ft)	Media	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol
Boreholes 50-24769 and 50-603470																						
MD50-08-7459	50-24769	200–200	Vapor	—*	—	—	—	—	—	550	—	—	1500	—	—	1700	—	—	—	490	—	—
MD50-08-7460	50-24769	250–250	Vapor	—	—	—	—	—	—	570	—	—	1200	—	—	1600	—	—	—	410	—	—
MD50-08-7451	50-24769	300–300	Vapor	—	—	—	—	—	—	630	—	—	980	—	—	1500	—	—	—	330	—	—
MD50-08-7465	50-603470	351–351	Vapor	—	—	—	—	—	—	71	—	—	97	—	—	340	—	—	—	—	—	—
MD50-08-7464	50-603470	450–450	Vapor	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-08-7461	50-603470	650–650	Vapor	—	—	—	—	—	27	—	—	—	—	—	—	140	—	—	—	—	—	—
Boreholes 50-24771 and 50-603471																						
MD50-08-7626	50-24771	200–200	Vapor	—	—	—	—	—	—	2400	—	—	3400	—	—	1600	—	—	—	800	—	—
MD50-08-7627	50-24771	250–250	Vapor	—	—	—	—	—	—	2100	—	—	2700	—	—	1600	—	—	—	700	—	—
MD50-08-7625	50-24771	300–300	Vapor	—	—	—	—	—	—	1200	—	—	1500	—	—	1100	—	—	—	510	—	—
MD50-08-7628	50-603471	360–360	Vapor	—	—	—	—	—	—	680	—	—	600	—	—	780	—	—	—	200	—	—
MD50-08-7629	50-603471	410–410	Vapor	—	—	—	—	—	—	600	—	—	710	—	—	230	—	—	—	220	—	—
MD50-08-7630	50-603471	450–450	Vapor	—	—	—	—	—	—	450	—	—	1100	—	—	—	—	—	—	290	—	—
MD50-09-3534	50-603471	450–450	Vapor	—	—	—	—	—	—	210	—	—	960	—	—	—	—	—	—	200	—	—
Boreholes 50-24783 and 50-603472																						
MD50-08-7656	50-24783	200–200	Vapor	—	—	—	—	—	—	350	—	—	720	—	—	320	—	—	—	190	110	—
MD50-08-7657	50-24783	250–250	Vapor	—	—	—	—	—	—	490	—	—	710	—	—	400	—	—	—	210	93	—
MD50-08-7655	50-24783	300–300	Vapor	—	—	—	—	—	—	570	—	250	640	—	—	480	—	—	—	190	—	—
MD50-08-7658	50-603472	364–364	Vapor	—	—	—	—	—	—	170	—	50	140	—	—	170	—	—	—	32	16	—
MD50-08-7659	50-603472	414–414	Vapor	86	—	—	—	—	—	130	—	—	38	—	—	130	—	—	—	—	—	—
MD50-08-7660	50-603472	450–450	Vapor	56	—	—	—	—	38	240	—	—	42	—	—	260	—	—	—	—	—	—
Borehole 50-24784																						
MD50-08-7691	50-24784	362–362	Vapor	18	—	—	—	4.8	17	330	—	—	16	—	—	170	—	—	5.4	3.5	—	—
MD50-08-7690	50-24784	411–411	Vapor	—	—	—	—	—	22	370	—	—	7.3	—	—	210	—	—	4.4	—	—	—
MD50-08-7689	50-24784	450–450	Vapor	—	—	—	—	—	14	120	—	—	—	—	—	83	—	—	—	—	—	—
Borehole 50-24813																						
MD50-08-7716	50-24813	200–200	Vapor	—	—	—	—	—	—	2400	—	—	2300	—	—	2400	—	—	—	690	—	—
MD50-08-7717	50-24813	250–250	Vapor	120	—	—	—	—	—	260	—	—	440	—	—	250	—	—	—	130	—	—
MD50-08-7715	50-24813	300–300	Vapor	—	—	—	—	—	—	360	—	—	420	—	—	430	—	—	—	130	—	—
MD50-08-7721	50-24813	358–358	Vapor	—	—	—	—	—	29	640	—	—	500	—	—	980	—	—	—	170	—	—
MD50-08-7720	50-24813	408–408	Vapor	—	—	—	—	—	—	500	—	—	220	—	—	960	—	—	—	85	—	—

Table C-3.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol
MD50-08-7719	50-24813	450–450	Vapor	—	—	—	—	—	—	280	—	—	—	—	—	610	—	—	—	—	—	—
MD50-08-7718	50-24813	600–600	Vapor	—	—	—	—	—	14	110	—	—	—	—	—	240	—	—	—	—	—	—
Borehole 50-603383																						
MD50-08-14863	50-603383	286–286	Vapor	26	—	—	12	4.7	—	120	4.3	—	27	—	8.7	83	4	—	11	14	69	—
MD50-08-14864	50-603383	359–359	Vapor	14	11	—	18	5.6	39	—	6.4	—	—	—	—	—	—	—	—	—	—	—
MD50-08-14865	50-603383	408–408	Vapor	—	4.3	—	50	—	—	250	25	14 (J)	7.9	—	8.4	210	—	—	10	6.2	7	—
MD50-08-14866	50-603383	450–450	Vapor	—	4.7	—	39	3.6	—	140	21	13 (J)	5.7	—	8.5	170	—	—	6.8	4.8	5.9	—
Borehole 50-603467																						
MD50-08-14858	50-603467	287–287	Vapor	—	—	—	—	—	—	630	—	—	530	—	—	340	—	—	—	160	—	—
MD50-08-14860	50-603467	360–360	Vapor	—	—	—	—	—	—	340	—	—	230	—	—	200	—	—	—	76	—	—
MD50-08-14859	50-603467	409–409	Vapor	—	—	—	—	—	—	300 (J)	—	—	82 (J)	—	—	200 (J)	—	—	—	—	—	—
MD50-08-14857	50-603467	500–500	Vapor	—	—	—	—	—	—	270	—	—	54	—	—	230	—	—	—	—	—	—
MD50-08-14856	50-603467	600–600	Vapor	140	—	—	140	45	—	310	27	—	52	—	—	230	—	—	—	—	—	160
Borehole 50-603468																						
MD50-08-7894	50-603468	300–300	Vapor	—	—	—	—	—	—	580	—	—	370	—	—	670	—	—	—	140	—	—
MD50-08-7895	50-603468	354–354	Vapor	—	—	—	—	—	—	500	—	—	190	—	—	640	—	—	—	—	—	—
MD50-08-7896	50-603468	403–403	Vapor	—	—	—	—	—	—	370	—	—	85	—	—	450	—	—	—	—	—	—
MD50-08-7897	50-603468	450–450	Vapor	180	—	—	—	78	—	270	—	—	140	—	—	260	—	—	—	—	—	—
Borehole 50-24822																						
MD50-08-7949	50-24822	351–351	Vapor	—	—	—	—	—	9.6	21	—	—	20	—	—	63	—	—	—	5.5	—	—
MD50-08-7948	50-24822	402–402	Vapor	—	—	—	—	—	—	210	—	—	64	—	—	530	—	—	—	—	—	—
MD50-08-7947	50-24822	450–450	Vapor	—	—	—	—	—	18	160	—	—	31	—	—	430	—	—	—	—	—	—
Boreholes 50-603060 and 50-603503																						
MD50-08-8161	50-603060	50–50	Vapor	11	—	—	—	2.4	—	15	—	—	29	—	—	19	—	—	—	3.7	7.6	5.3
MD50-08-8160	50-603060	100–100	Vapor	12	—	—	—	—	2.8	34	—	—	60	—	—	35	—	3.5	—	8.8	21	—
MD50-08-8159	50-603060	150–150	Vapor	20	—	—	—	—	—	18	—	—	27	—	—	17	—	—	—	4.5	10	—
MD50-08-8158	50-603060	200–200	Vapor	—	—	—	—	—	—	36	—	—	34	—	—	28	—	—	—	8.5	12	—
MD50-08-8157	50-603060	250–250	Vapor	17	—	—	—	—	—	57	—	—	50	—	—	47	—	—	—	13	14	—
MD50-08-8162	50-603503	347–347	Vapor	49	—	—	—	6.7	8	24	—	—	25	3.4	—	23	—	—	—	5.8	—	—
MD50-08-8163	50-603503	397–397	Vapor	18	—	—	—	3.2	—	22	—	—	46	—	—	19	—	—	—	4.7	9.2	—
MD50-08-8164	50-603503	450–450	Vapor	57	—	—	—	22	130	88	—	—	12	—	—	68	—	—	—	5.6	—	—

Table C-3.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol
Borehole 50-603061																						
MD50-08-8206	50-603061	13–13	Vapor	—	—	—	—	—	—	—	—	—	—	3.5	—	510	—	—	24	—	—	—
MD50-08-8205	50-603061	25–25	Vapor	—	—	—	—	—	—	—	—	—	—	—	—	46	—	—	6.3	—	—	—
MD50-08-8204	50-603061	50–50	Vapor	40	—	—	—	—	—	—	—	—	4.2	—	—	64	—	—	30	—	—	—
MD50-08-8203	50-603061	100–100	Vapor	16	—	—	—	2.8	—	6	—	—	5.8	8.6	—	63	—	—	90	—	—	—
MD50-08-8202	50-603061	150–150	Vapor	—	—	—	—	—	—	—	—	—	—	—	—	220	—	—	1200	—	—	—
MD50-08-8201	50-603061	185–185	Vapor	—	—	—	—	—	—	—	—	—	—	—	—	200	—	—	500	—	—	—
MD50-08-8230	50-603061	228–228	Vapor	—	—	—	—	—	—	130	—	—	—	—	—	340	—	—	1600	—	—	—
MD50-08-8231	50-603061	274–274	Vapor	—	—	—	—	—	25	120	—	—	—	—	—	280	—	—	710	—	—	—
MD50-08-8209	50-603061	347–347	Vapor	—	—	—	—	—	3.6	7.3	—	—	—	—	—	20	—	—	18	—	—	—
MD50-08-8208	50-603061	397–397	Vapor	29	53	10	—	—	16	16	—	—	—	3.3	—	51	—	—	33	—	—	15
MD50-08-8207	50-603061	450–450	Vapor	35	5.7	—	—	5.9	59	36	—	—	—	—	—	130	—	—	44	—	—	—
Borehole 50-603062																						
MD50-08-8251	50-603062	50–50	Vapor	12	—	—	—	—	—	8.1	—	—	16	—	—	31	—	—	—	—	—	—
MD50-08-8250	50-603062	100–100	Vapor	—	—	—	—	—	—	49	—	—	36	—	—	180	—	—	—	—	—	—
MD50-08-8249	50-603062	150–150	Vapor	—	—	—	—	—	—	44	—	—	33	—	—	180	—	—	—	—	—	—
MD50-08-8248	50-603062	200–200	Vapor	—	—	—	—	—	—	40	—	—	26	—	—	160	—	—	—	—	—	—
MD50-08-8247	50-603062	250–250	Vapor	—	—	—	—	—	—	44	—	—	19	—	—	170	—	—	—	—	—	—
MD50-08-8252	50-603062	337–337	Vapor	170	—	—	—	22	5.8	8.3	—	—	—	—	—	46	—	—	—	—	—	—
MD50-08-8253	50-603062	387–387	Vapor	—	—	—	—	—	15	28	—	—	—	—	—	110	—	—	—	—	—	—
MD50-08-8254	50-603062	450–450	Vapor	—	—	—	—	—	27	14	—	—	—	—	—	71	—	—	—	—	—	—
Borehole 50-603063																						
MD50-08-8296	50-603063	10–10	Vapor	12	—	—	—	—	—	6.7	—	—	9.9	—	—	35	—	—	6.3	—	—	—
MD50-08-8295	50-603063	25–25	Vapor	17	—	—	—	—	—	—	—	—	12	—	—	14	—	—	5.5	—	—	—
MD50-08-8294	50-603063	50–50	Vapor	12	—	—	—	—	—	12	—	—	25	—	—	36	5.1	—	17	—	—	—
MD50-08-8291	50-603063	99–99	Vapor	50	—	—	—	—	—	31	—	—	100	—	—	80	21	—	51	12	—	—
MD50-08-8292	50-603063	150–150	Vapor	—	—	—	—	—	—	160	—	91	270	—	—	310	43	—	180	48	—	—
MD50-08-8293	50-603063	200–200	Vapor	—	—	—	—	—	—	240	—	130	390	—	—	430	34	—	210	82	—	—
MD50-09-1668	50-603063	347–347	Vapor	—	—	—	—	—	4.6	45	—	—	31	—	—	72	—	—	7	6.9	—	—
MD50-09-1667	50-603063	397–397	Vapor	—	—	—	—	—	63	200	—	—	170	—	—	240	23	—	—	22	—	—
MD50-09-1666	50-603063	450–450	Vapor	—	—	—	—	—	55	140	—	—	130	—	—	200	20	—	—	15	—	—

Table C-3.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Acetone	Benzene	Butadiene[1,3-]	Butanol[1-]	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Cyclohexane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol
Borehole 50-603064																						
MD50-08-8343	50-603064	25–25	Vapor	—	—	—	—	—	50	160	—	—	480	—	—	620	—	—	530	150	—	—
MD50-08-8342	50-603064	66–66	Vapor	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9.3
MD50-08-8344	50-603064	113–113	Vapor	—	—	—	—	—	—	—	—	—	170	—	—	120	—	—	100	—	—	—
MD50-08-8345	50-603064	176–176	Vapor	—	—	—	—	—	—	230	—	—	480	—	—	720	—	—	540	190	—	—
MD50-08-8338	50-603064	200–200	Vapor	—	—	—	—	—	—	56	—	—	140	—	—	170	—	—	100	47	—	—
MD50-08-8337	50-603064	250–250	Vapor	16	20	—	—	—	—	11	—	—	43	6.3	—	34	—	—	23	18	—	—
MD50-08-8341	50-603064	332–332	Vapor	50	6.8	—	—	12 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-08-8340	50-603064	400–400	Vapor	8.2	64	6.8	—	—	—	—	—	—	—	42	—	—	—	—	—	—	—	—
MD50-08-8339	50-603064	500–500	Vapor	—	3.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table C-3.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Ethylbenzene	Ethyltoluene[4-]	Hexane	Methanol	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
Boreholes 50-24769 and 50-603470																						
MD50-08-7459	50-24769	200–200	Vapor	—	—	—	—	780	—	—	—	670	—	—	940	—	57000	—	—	—	—	—
MD50-08-7460	50-24769	250–250	Vapor	—	—	—	—	860	—	—	—	590	—	—	800	—	56000	—	—	—	—	—
MD50-08-7451	50-24769	300–300	Vapor	—	—	—	—	970	—	—	—	610	—	—	680	—	60000	—	—	—	—	—
MD50-08-7465	50-603470	351–351	Vapor	—	—	—	—	120	—	—	—	—	—	—	—	—	8700	—	—	—	—	—
MD50-08-7464	50-603470	450–450	Vapor	—	—	—	—	—	—	—	—	—	—	—	—	—	150	—	—	—	—	—
MD50-08-7461	50-603470	650–650	Vapor	—	—	—	—	—	—	—	—	—	—	—	—	—	180	—	—	—	—	—
Boreholes 50-24771 and 50-603471																						
MD50-08-7626	50-24771	200–200	Vapor	—	—	—	—	2800	—	—	—	2500	—	—	780	—	88000	—	—	—	—	—
MD50-08-7627	50-24771	250–250	Vapor	—	—	—	—	2900	—	—	—	2300	—	—	600	—	91000	—	—	—	—	—
MD50-08-7625	50-24771	300–300	Vapor	—	—	—	—	2200	—	—	—	1600	—	—	—	—	69000	—	—	—	—	—
MD50-08-7628	50-603471	360–360	Vapor	—	—	—	—	890	—	—	—	820	—	—	—	—	43000	—	—	—	—	—
MD50-08-7629	50-603471	410–410	Vapor	—	—	—	—	900	—	—	—	790	—	—	—	—	43000	—	—	—	—	—
MD50-08-7630	50-603471	450–450	Vapor	—	—	—	—	940	—	—	—	880	—	—	—	—	48000	—	—	—	—	—
MD50-09-3534	50-603471	450–450	Vapor	—	—	—	—	680	—	—	—	950	—	—	—	—	34000	—	—	—	—	—
Boreholes 50-24783 and 50-603472																						
MD50-08-7656	50-24783	200–200	Vapor	—	—	—	—	760	—	—	—	1400	—	—	140	—	21000	—	—	—	—	—
MD50-08-7657	50-24783	250–250	Vapor	—	—	—	—	890	—	—	—	1900	—	—	140	—	28000	—	—	—	—	—
MD50-08-7655	50-24783	300–300	Vapor	—	—	—	—	850	—	—	—	2000	—	—	—	—	30000	—	—	—	—	—
MD50-08-7658	50-603472	364–364	Vapor	—	—	—	—	100	—	—	—	440	—	—	38	—	6900	—	—	—	—	—
MD50-08-7659	50-603472	414–414	Vapor	—	—	—	—	47	—	—	—	190	—	—	—	—	4700	—	—	—	—	—
MD50-08-7660	50-603472	450–450	Vapor	—	—	—	—	52	—	—	—	230	—	29	—	—	6500	—	—	—	—	—
Borehole 50-24784																						
MD50-08-7691	50-24784	362–362	Vapor	—	—	—	—	4.5	—	—	—	800	—	—	36	14	1600	17	—	—	—	—
MD50-08-7690	50-24784	411–411	Vapor	—	—	—	—	—	—	—	—	440	—	4.2	20	8.1	1200	18	—	—	—	—
MD50-08-7689	50-24784	450–450	Vapor	—	—	—	—	—	—	—	—	130	—	3.3	—	—	350	7.4	—	—	—	—
Borehole 50-24813																						
MD50-08-7716	50-24813	200–200	Vapor	—	—	—	—	2300	—	—	—	940	—	—	—	—	78000	—	—	—	—	—
MD50-08-7717	50-24813	250–250	Vapor	—	—	—	—	540	—	—	—	130	—	—	—	—	13000	53	—	—	—	—
MD50-08-7715	50-24813	300–300	Vapor	—	—	—	—	500	—	—	—	210	—	—	—	—	19000	—	—	—	—	—
MD50-08-7721	50-24813	358–358	Vapor	—	—	—	—	640	—	—	—	350	—	—	—	—	40000	—	—	—	—	—
MD50-08-7720	50-24813	408–408	Vapor	—	—	—	—	310	—	—	—	270	—	—	—	—	32000	—	—	—	—	—

Table C-3.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Ethylbenzene	Ethyltoluene[4-]	Hexane	Methanol	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-08-7719	50-24813	450–450	Vapor	—	—	—	—	140	—	—	—	—	—	—	—	—	15000	—	—	—	—	—
MD50-08-7718	50-24813	600–600	Vapor	—	—	—	—	—	—	14	—	19	—	—	—	—	2400	15	—	—	—	—
Borehole 50-603383																						
MD50-08-14863	50-603383	286–286	Vapor	—	—	—	—	14	—	—	—	400	—	5.1	150	46	1700	10	—	—	—	—
MD50-08-14864	50-603383	359–359	Vapor	4.4	—	6.7	—	—	—	7.5	—	—	—	27	—	—	16	—	—	—	4.7	12
MD50-08-14865	50-603383	408–408	Vapor	—	—	—	—	4.4	—	—	—	320	—	16	89	19	1600	20	—	—	—	—
MD50-08-14866	50-603383	450–450	Vapor	—	—	—	—	3.7	—	—	—	290	86	16	170	12	1400	14	—	—	—	—
Borehole 50-603467																						
MD50-08-14858	50-603467	287–287	Vapor	—	—	—	—	580	—	—	—	980	—	—	—	—	21000	—	—	—	—	—
MD50-08-14860	50-603467	360–360	Vapor	—	—	—	—	250	—	—	—	560	—	—	—	—	14000	—	—	—	—	—
MD50-08-14859	50-603467	409–409	Vapor	—	—	—	—	78 (J)	—	—	—	450 (J)	—	—	—	—	11000 (J)	—	—	—	—	—
MD50-08-14857	50-603467	500–500	Vapor	—	—	—	—	40	—	—	—	280	—	—	—	—	10000	—	—	—	—	—
MD50-08-14856	50-603467	600–600	Vapor	—	—	160	—	32	630	58	—	200	35	—	—	—	6900	—	—	—	—	—
Borehole 50-603468																						
MD50-08-7894	50-603468	300–300	Vapor	—	—	—	—	430	—	—	—	350	—	—	—	—	32000	—	—	—	—	—
MD50-08-7895	50-603468	354–354	Vapor	—	—	—	—	230	—	—	—	260	—	—	—	—	24000	—	—	—	—	—
MD50-08-7896	50-603468	403–403	Vapor	—	—	—	—	100	—	—	—	280	—	—	—	—	18000	—	—	—	—	—
MD50-08-7897	50-603468	450–450	Vapor	—	—	—	—	120	—	—	—	200	340	—	—	—	18000	—	—	—	—	—
Borehole 50-24822																						
MD50-08-7949	50-24822	351–351	Vapor	—	—	—	—	21	—	—	—	16	—	—	—	—	1900	—	—	—	—	—
MD50-08-7948	50-24822	402–402	Vapor	—	—	—	—	51	—	—	—	46	—	—	—	—	12000	—	—	—	—	—
MD50-08-7947	50-24822	450–450	Vapor	—	—	—	—	22	—	—	—	—	—	—	—	—	7700	—	—	—	—	—
Boreholes 50-603060 and 50-603503																						
MD50-08-8161	50-603060	50–50	Vapor	—	—	—	—	5.8	—	—	—	110	—	9.2	20	8.5	590	—	—	—	—	—
MD50-08-8160	50-603060	100–100	Vapor	—	—	—	—	14	—	—	—	210	—	14	52	20	1200	—	—	—	—	—
MD50-08-8159	50-603060	150–150	Vapor	—	—	—	—	9.2	—	—	—	93	—	5.2	29	10	620	—	—	—	—	—
MD50-08-8158	50-603060	200–200	Vapor	—	—	—	—	24	—	—	—	160	—	13	21	9.7	1400	—	—	—	—	—
MD50-08-8157	50-603060	250–250	Vapor	—	—	—	—	45	—	—	—	240	—	18	34	16	2200	—	—	—	—	—
MD50-08-8162	50-603503	347–347	Vapor	—	—	—	—	28	—	—	—	72	—	—	24	7.7	970	—	—	—	—	—
MD50-08-8163	50-603503	397–397	Vapor	—	—	—	—	9.8	—	—	—	190	—	—	21	9.7	990	—	—	—	—	—
MD50-08-8164	50-603503	450–450	Vapor	—	—	—	—	13	—	—	—	120	—	—	—	—	2000	—	—	—	—	—

Table C-3.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Ethylbenzene	Ethyltoluene[4-]	Hexane	Methanol	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
Borehole 50-603061																						
MD50-08-8206	50-603061	13–13	Vapor	—	—	—	—	—	—	—	—	8.2	—	31	2400	260	58	5.6	—	—	—	—
MD50-08-8205	50-603061	25–25	Vapor	—	—	—	—	—	—	—	—	—	—	56	240	55	28	—	—	—	—	—
MD50-08-8204	50-603061	50–50	Vapor	—	—	—	—	—	—	—	—	22	—	260	640	320	170	—	—	—	—	—
MD50-08-8203	50-603061	100–100	Vapor	—	—	—	—	—	—	—	—	30	—	49	2400	520	290	—	—	—	—	—
MD50-08-8202	50-603061	150–150	Vapor	—	—	—	—	86	—	—	—	130	—	52	25000	4800	1800	—	—	—	—	—
MD50-08-8201	50-603061	185–185	Vapor	—	—	—	—	27	—	—	—	84	—	670	13000	2600	1200	—	—	—	—	—
MD50-08-8230	50-603061	228–228	Vapor	—	—	—	—	100	—	—	—	180	—	—	31000	4800	3400	—	—	—	—	—
MD50-08-8231	50-603061	274–274	Vapor	—	—	—	—	—	—	—	—	94	—	—	16000	1900	2300	—	—	—	—	—
MD50-08-8209	50-603061	347–347	Vapor	—	—	—	—	—	—	—	—	5.7	—	5.4	560	28	110	—	—	—	—	—
MD50-08-8208	50-603061	397–397	Vapor	9.2	7.5 (J)	5.3	110	—	—	50	6.6	7.4	—	83	900	32	200	6.1	8.7	—	11	32
MD50-08-8207	50-603061	450–450	Vapor	—	—	13	—	—	110	—	—	8.4	—	5.6	1400	30	230	12	—	—	—	—
Borehole 50-603062																						
MD50-08-8251	50-603062	50–50	Vapor	—	—	—	—	—	—	—	—	11	—	59	40	13	1200	—	—	—	—	—
MD50-08-8250	50-603062	100–100	Vapor	—	—	—	—	—	—	—	—	—	—	15	190	28	5100	—	—	—	—	—
MD50-08-8249	50-603062	150–150	Vapor	—	—	—	—	—	—	—	—	—	—	—	200	27	5000	—	—	—	—	—
MD50-08-8248	50-603062	200–200	Vapor	—	—	—	—	—	—	—	—	—	—	66	170	23	4500	—	—	—	—	—
MD50-08-8247	50-603062	250–250	Vapor	—	—	—	—	—	—	—	—	—	—	—	150	—	4100	—	—	—	—	—
MD50-08-8252	50-603062	337–337	Vapor	—	—	—	—	—	—	—	—	—	—	4.5	18	—	330	—	—	—	—	—
MD50-08-8253	50-603062	387–387	Vapor	—	—	—	—	—	—	—	—	—	—	—	35	—	1200	7.1	—	—	—	—
MD50-08-8254	50-603062	450–450	Vapor	—	—	—	—	—	—	—	—	—	—	4	9.5	—	400	—	—	—	—	—
Borehole 50-603063																						
MD50-08-8296	50-603063	10–10	Vapor	—	—	—	—	—	—	—	—	52	—	94	390	65	450	—	—	—	—	—
MD50-08-8295	50-603063	25–25	Vapor	—	—	—	—	—	—	—	—	36	—	190	100	33	370	—	—	—	—	—
MD50-08-8294	50-603063	50–50	Vapor	—	—	—	—	—	—	—	—	85	—	90	320	85	880	—	—	—	—	—
MD50-08-8291	50-603063	99–99	Vapor	—	—	—	—	7.5	—	—	—	170	—	920	920	250	2200	—	—	—	—	—
MD50-08-8292	50-603063	150–150	Vapor	—	—	—	—	28	—	—	—	670	—	1000	3200	680	8600	33	—	—	—	—
MD50-08-8293	50-603063	200–200	Vapor	—	—	—	—	84	—	—	—	840	—	130	3700	660	14000	—	—	—	—	—
MD50-09-1668	50-603063	347–347	Vapor	—	—	—	—	23	—	—	—	100	—	—	230	7.7	1900	8	—	—	—	—
MD50-09-1667	50-603063	397–397	Vapor	—	—	—	—	75	—	—	—	270	—	—	160	—	7600	—	—	—	—	—
MD50-09-1666	50-603063	450–450	Vapor	—	—	—	—	56	—	—	—	150	—	—	77	—	5000	—	—	—	—	—

Table C-3.3-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Ethylbenzene	Ethyltoluene[4-]	Hexane	Methanol	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
Borehole 50-603064																						
MD50-08-8343	50-603064	25–25	Vapor	—	—	—	540	110	—	—	—	220	—	—	9800	2000	15000	—	—	—	—	—
MD50-08-8342	50-603064	66–66	Vapor	—	—	—	—	—	—	—	—	—	—	7.9	11	—	15	—	—	—	—	5.9
MD50-08-8344	50-603064	113–113	Vapor	—	—	—	—	—	—	—	—	110	—	—	2700	510	2500	—	—	—	—	—
MD50-08-8345	50-603064	176–176	Vapor	—	—	—	—	290	—	—	—	400	—	—	9700	2000	24000	—	—	—	—	—
MD50-08-8338	50-603064	200–200	Vapor	—	—	—	—	86	—	—	—	76	—	36	2300	530	6200	—	—	—	—	—
MD50-08-8337	50-603064	250–250	Vapor	20	25	14	—	35	10	—	—	18	—	120	320	96	1600	—	29	8.5	30	79
MD50-08-8341	50-603064	332–332	Vapor	4.8	—	4.6 (J)	—	—	—	8.4	—	—	—	18	—	—	13	—	—	—	3.7	11
MD50-08-8340	50-603064	400–400	Vapor	56	43	68 (J)	—	—	23	22	—	—	—	210	—	—	25	—	47	12	50	140
MD50-08-8339	50-603064	500–500	Vapor	—	—	—	—	—	—	—	—	—	—	7.6	—	—	6	—	—	—	—	4.6

Note: Results are in $\mu g/m^3$. Data qualifiers are defined in Appendix A.

* — = Not detected.

Table C-3.3-2
Tritium Detected in Vapor Samples at MDA C during Phase II Investigation

Sample ID	Location ID	Depth (ft)	Media	Tritium
Boreholes 50-24769 and 50-603470				
MD50-08-7459	50-24769	200–200	Vapor	59527.1
MD50-08-7460	50-24769	250–250	Vapor	30720
MD50-08-7451	50-24769	300–300	Vapor	3682.7
MD50-08-7465	50-603470	351–351	Vapor	720.151
MD50-08-7464	50-603470	450–450	Vapor	1150.88
MD50-08-7462	50-603470	600–600	Vapor	5825.88
MD50-08-7461	50-603470	650–650	Vapor	1384.03
Boreholes 50-24771 and 50-603471				
MD50-08-7626	50-24771	200–200	Vapor	4639.13 (J)
MD50-08-7627	50-24771	250–250	Vapor	1999.93 (J)
MD50-08-7625	50-24771	300–300	Vapor	1019.06 (J)
MD50-08-7628	50-603471	360–360	Vapor	1341.37
MD50-08-7629	50-603471	410–410	Vapor	1892.02
MD50-08-7630	50-603471	450–450	Vapor	2365.86
MD50-09-3534	50-603471	450–450	Vapor	2630.41
Boreholes 50-24783 and 50-603472				
MD50-08-7656	50-24783	200–200	Vapor	2738130
MD50-08-7657	50-24783	250–250	Vapor	1633910
MD50-08-7655	50-24783	300–300	Vapor	143251
MD50-08-7658	50-603472	364–364	Vapor	1655.03
MD50-08-7659	50-603472	414–414	Vapor	13087.5
MD50-08-7660	50-603472	450–450	Vapor	2966.66
Borehole 50-24784				
MD50-08-7691	50-24784	362–362	Vapor	2361.43
MD50-08-7690	50-24784	411–411	Vapor	1128.81
MD50-08-7689	50-24784	450–450	Vapor	727.705
Borehole 50-24813				
MD50-08-7716	50-24813	200–200	Vapor	17859.2
MD50-08-7717	50-24813	250–250	Vapor	57555.3
MD50-08-7715	50-24813	300–300	Vapor	8554.36
MD50-08-7721	50-24813	358–358	Vapor	2170.32
MD50-08-7720	50-24813	408–408	Vapor	1082.9
MD50-08-7719	50-24813	450–450	Vapor	775.227
MD50-08-7718	50-24813	600–600	Vapor	839.79
Borehole 50-603383				
MD50-08-14863	50-603383	286–286	Vapor	59153.5
MD50-08-14864	50-603383	359–359	Vapor	64216.3

Table C-3.3-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Tritium
MD50-08-14865	50-603383	408–408	Vapor	70989
MD50-08-14866	50-603383	450–450	Vapor	52007.3
Borehole 50-603467				
MD50-08-14858	50-603467	287–287	Vapor	4199.1 (J)
MD50-08-14860	50-603467	360–360	Vapor	419.125
MD50-08-14859	50-603467	409–409	Vapor	—*
MD50-08-14857	50-603467	500–500	Vapor	7512.63 (J)
MD50-08-14856	50-603467	600–600	Vapor	—
Borehole 50-603468				
MD50-08-7894	50-603468	300–300	Vapor	684.274
MD50-08-7895	50-603468	354–354	Vapor	—
MD50-08-7896	50-603468	403–403	Vapor	—
MD50-08-7897	50-603468	450–450	Vapor	—
Borehole 50-24822				
MD50-08-7949	50-24822	351–351	Vapor	4506.35
MD50-08-7948	50-24822	402–402	Vapor	1135.58
MD50-08-7947	50-24822	450–450	Vapor	808.382
Boreholes 50-603060 and 50-603503				
MD50-08-8161	50-603060	50–50	Vapor	3405.46
MD50-08-8160	50-603060	100–100	Vapor	2334.79
MD50-08-8159	50-603060	150–150	Vapor	—
MD50-08-8158	50-603060	200–200	Vapor	3310.42
MD50-08-8157	50-603060	250–250	Vapor	2488.95
MD50-08-8162	50-603503	347–347	Vapor	—
MD50-08-8163	50-603503	397–397	Vapor	1152.98
MD50-08-8164	50-603503	450–450	Vapor	—
Borehole 50-603061				
MD50-08-8206	50-603061	13–13	Vapor	—
MD50-08-8205	50-603061	25–25	Vapor	1810.75
MD50-08-8204	50-603061	50–50	Vapor	1364.87
MD50-08-8203	50-603061	100–100	Vapor	—
MD50-08-8202	50-603061	150–150	Vapor	1052.23
MD50-08-8201	50-603061	185–185	Vapor	839.544
MD50-08-8230	50-603061	228–228	Vapor	1083.26
MD50-08-8231	50-603061	274–274	Vapor	5836.75
MD50-08-8209	50-603061	347–347	Vapor	—
MD50-08-8208	50-603061	397–397	Vapor	7851.11
MD50-08-8207	50-603061	450–450	Vapor	1295.12

Table C-3.3-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Tritium
Borehole 50-603062				
MD50-08-8251	50-603062	50–50	Vapor	—
MD50-08-8250	50-603062	100–100	Vapor	2300.12
MD50-08-8249	50-603062	150–150	Vapor	—
MD50-08-8248	50-603062	200–200	Vapor	—
MD50-08-8247	50-603062	250–250	Vapor	—
MD50-08-8252	50-603062	337–337	Vapor	618.754
MD50-08-8253	50-603062	387–387	Vapor	405.546 (J)
MD50-08-8254	50-603062	450–450	Vapor	—
Borehole 50-603063				
MD50-08-8296	50-603063	10–10	Vapor	856.127
MD50-08-8295	50-603063	25–25	Vapor	2027.99
MD50-08-8294	50-603063	50–50	Vapor	1476.79
MD50-08-8291	50-603063	99–99	Vapor	2009.8
MD50-08-8292	50-603063	150–150	Vapor	2589.24
MD50-08-8293	50-603063	200–200	Vapor	7674.74
MD50-09-1668	50-603063	347–347	Vapor	964.124
MD50-09-1667	50-603063	397–397	Vapor	1456.73
MD50-09-1666	50-603063	450–450	Vapor	3262.14
Borehole 50-603064				
MD50-08-8343	50-603064	25–25	Vapor	—
MD50-08-8342	50-603064	66–66	Vapor	612.348
MD50-08-8344	50-603064	113–113	Vapor	1476.51 (J)
MD50-08-8345	50-603064	176–176	Vapor	1318.47 (J)
MD50-08-8338	50-603064	200–200	Vapor	534.669
MD50-08-8337	50-603064	250–250	Vapor	525.898
MD50-08-8341	50-603064	332–332	Vapor	838.065
MD50-08-8340	50-603064	400–400	Vapor	998.676
MD50-08-8339	50-603064	500–500	Vapor	2077.88

Note: Results are in pCi/L. Data qualifiers are defined in Appendix A.
* — = Not detected.

Table C-4.1-1
Vapor-Monitoring Wells and Ports
Sampled during Phase III Investigation

Sampling Port	Depth (ft bgs)	Unit Screened
Well 50-603470 (stainless steel)		
1	30	Qbt 3
2	83	Qbt 3
3	143	Qbt 2
4	203	Qbt 1v
5	233	Qbt 1vc
6	278	Qbt 1g
7	351	Qct
8	450	Qbo
9	600	Qbo
10	650	Qbog
Well 50-603471 (FLUTe)		
1	30	Qbt 3
2	90	Qbt 3
3	146	Qbt 2
4	209	Qbt 1v
5	242	Qbt 1vc
6	288	Qbt 1g
7	360	Qct
8	410	Qbo
9	450	Qbo
Well 50-603472 (stainless steel)		
1	27	Qbt 3
2	93	Qbt 3
3	146	Qbt 2
4	210	Qbt 1v
5	247	Qbt 1vc
6	292	Qbt 1g
7	364	Qct
8	414	Qbo
9	450	Qbo
Well 50-24784 (stainless steel)		
1	25	Qbt 3
2	96	Qbt 3
3	155	Qbt 2
4	215	Qbt 1v
5	244	Qbt 1vc
6	289	Qbt 1g
7	362	Qct
8	411	Qbo
9	450	Qbo

Table C-4.1-1 (continued)

Sampling Port	Depth (ft bgs)	Unit Screened
Well 50-24813 (stainless steel)		
1	25	Qbt 3
2	99	Qbt 3
3	150	Qbt 2
4	207	Qbt 1v
5	241	Qbt 1vc
6	286	Qbt 1g
7	358	Qct
8	408	Qbo
9	450	Qbo
10	600	Qbo
Well 50-603383 (FLUTe)		
1	26	Qbt 3
2	85	Qbt 3
3	139	Qbt 2
4	206	Qbt 1v
5	244	Qbt 1vc
6	286	Qbt 1g
7	359	Qct
8	408	Qbo
9	450	Qbo
Well 50-603467 (FLUTe)		
1	26	Qbt 3
2	91	Qbt 3
3	143	Qbt 2
4	206	Qbt 1v
5	244	Qbt 1vc
6	287	Qbt 1g
7	360	Qct
8	409	Qbo
9	500	Qbo
10	600	Qbo
Well 50-603468 (FLUTe)		
1	30	Qbt 3
2	92	Qbt 3
3	142	Qbt 2
4	198	Qbt 1v
5	233	Qbt 1vc
6	282	Qbt 1g
7	354	Qct
8	403	Qbo
9	450	Qbo

Table C-4.1-1 (continued)

Sampling Port	Depth (ft bgs)	Unit Screened
Well 50-24822 (stainless steel)		
1	25	Qbt 3
2	81	Qbt 3
3	142	Qbt 2
4	204	Qbt 1v
5	235	Qbt 1vc
6	280	Qbt 1g
7	351	Qct
8	402	Qbo
9	450	Qbo
Well 50-603503 (stainless steel)		
1	25	Qbt 3
2	80	Qbt 3
3	133	Qbt 2
4	198	Qbt 1v
5	237	Qbt 1vc
6	278	Qbt 1g
7	347	Qct
8	397	Qbo
9	450	Qbo
Well 50-603061 (stainless steel)		
1	25	Qbt 3
2	76	Qbt 3
3	128	Qbt 2
4	190	Qbt 1v
5	228	Qbt 1vc
6	274	Qbt 1g
7	347	Qct
8	397	Qbo
9	450	Qbo
Well 50-603062 (stainless steel)		
1	25	Qbt 3
2	64	Qbt 3
3	122	Qbt 2
4	184	Qbt 1v
5	217	Qbt 1vc
6	263	Qbt 1g
7	337	Qct
8	387	Qbo
9	450	Qbo
Well 50-603063 (stainless steel)		
1	25	Qbt 3
2	76	Qbt 3
3	128	Qbt 2
4	190	Qbt 1v
5	228	Qbt 1vc
6	274	Qbt 1g

Table C-4.1-1 (continued)

Sampling Port	Depth (ft bgs)	Unit Screened
7	347	Qct
8	397	Qbo
9	450	Qbo
Well 50-603064 (stainless steel)		
1	25	Qbt 3
2	66	Qbt 3
3	113	Qbt 2
4	176	Qbt 1v
5	214	Qbt 1vc
6	259	Qbt 1g
7	332	Qct
8	482	Qbo
9	500	Qbo
Well 50-613182 (stainless steel)		
1	500	Qbo
2	550	Qbo
3	600	Qbog
4	620	Qbog
5	632.5	Tt
Well 50-613183 (stainless steel)		
1	30	Qbt 3
2	500	Qbo
3	550	Qbo
4	600	Qbog
5	630	Qbog
6	642.5	Tt
Well 50-613184 (stainless steel)		
1	30	Qbt 3
2	500	Qbo
3	550	Qbo
4	600	Qbo
5	652	Qbog
6	664.5	Tt
Well 50-613185 (stainless steel)		
1	85	Qbt 3
2	145	Qbt 2
3	205	Qbt 1v
4	235	Qbt 1vc
5	280	Qbt 1g
6	350	Qct
7	450	Qbo
8	600	Qbo
9	675	Qbog
10	688	Tt

Table C-4.1-2
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, January 2010–April 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-8677	50-24784	25–25	10-2706[a]	10-2705
MD50-10-8680	50-24784	96–96	10-2720	10-2719
MD50-10-8681	50-24784	155–155	10-2720	10-2719
MD50-10-8679	50-24784	215–215	10-2706	10-2705
MD50-10-8685	50-24784	244–244	10-2720	10-2719
MD50-10-8683	50-24784	289–289	10-2720	10-2719
MD50-10-8684	50-24784	362–362	10-2720	10-2719
MD50-10-8682	50-24784	411–411	10-2720	10-2719
MD50-10-8678	50-24784	450–450	10-2706	10-2705
MD50-10-8697	50-24813	25–25	10-2915	10-2914
MD50-10-8696	50-24813	99–99	10-2915	10-2914
MD50-10-8693	50-24813	150–150	10-2915	10-2914
MD50-10-8702	50-24813	207–207	10-2941	10-2940
MD50-10-8699	50-24813	241–241	10-2941	10-2940
MD50-10-8694	50-24813	286–286	10-2897	10-2896
MD50-10-8700	50-24813	358–358	10-2941	10-2940
MD50-10-8695	50-24813	408–408	10-2915	10-2914
MD50-10-8701	50-24813	450–450	10-2941	10-2940
MD50-10-8698	50-24813	600–600	10-2915	10-2914
MD50-10-8703	50-24822	25–25	10-2642	10-2641
MD50-10-8704	50-24822	81–81	10-2642	10-2641
MD50-10-8705	50-24822	142–142	10-2664	10-2663
MD50-10-8706	50-24822	204–204	10-2664	10-2663
MD50-10-8707	50-24822	235–235	10-2664	10-2663
MD50-10-8708	50-24822	280–280	10-2664	10-2663
MD50-10-8709	50-24822	351–351	10-2664	10-2663
MD50-10-8710	50-24822	402–402	10-2664	10-2663
MD50-10-8711	50-24822	450–450	10-2664	10-2663
MD50-10-8715	50-603061	25–25	10-2307	10-2306
MD50-10-8716	50-603061	76–76	10-2307	10-2306
MD50-10-8717	50-603061	128–128	10-2329	10-2328
MD50-10-8718	50-603061	190–190	10-2329	10-2328
MD50-10-8719	50-603061	228–228	10-2329	10-2328
MD50-10-8720	50-603061	274–274	10-2338	10-2337
MD50-10-8721	50-603061	347–347	10-2338	10-2337
MD50-10-8722	50-603061	397–397	10-2369	10-2368

Table C-4.1-2 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-8724	50-603061	450–450	10-2369	10-2368
MD50-10-8727	50-603062	25–25	10-2372	10-2371
MD50-10-8728	50-603062	64–64	10-2372	10-2371
MD50-10-8729	50-603062	122–122	10-2396	10-2395
MD50-10-8730	50-603062	184–184	10-2396	10-2395
MD50-10-8731	50-603062	217–217	10-2396	10-2395
MD50-10-15366	50-603062	263–263	—[b]	10-2643
MD50-10-8732	50-603062	263–263	10-2396	—
MD50-10-8733	50-603062	337–337	10-2450	10-2452
MD50-10-8734	50-603062	387–387	10-2450	10-2451
MD50-10-8735	50-603062	450–450	10-2450	10-2452
MD50-10-8755	50-603063	25–25	10-2163	10-2162
MD50-10-8754	50-603063	76–76	10-2163	10-2162
MD50-10-8753	50-603063	128–128	10-2163	10-2162
MD50-10-8752	50-603063	190–190	10-2163	10-2162
MD50-10-8751	50-603063	228–228	10-2163	10-2162
MD50-10-8749	50-603063	274–274	10-2163	10-2162
MD50-10-8750	50-603063	347–347	10-2163	10-2162
MD50-10-8748	50-603063	397–397	10-2064	10-2063
MD50-10-8747	50-603063	450–450	10-2064	10-2063
MD50-10-8759	50-603064	25–25	10-2615	10-2614
MD50-10-8760	50-603064	66–66	10-2615	10-2614
MD50-10-8761	50-603064	113–113	10-2615	10-2614
MD50-10-8762	50-603064	176–176	10-2615	10-2614
MD50-10-8763	50-603064	214–214	10-2615	10-2614
MD50-10-8764	50-603064	259–259	10-2615	10-2614
MD50-10-8765	50-603064	332–332	10-2615	10-2614
MD50-10-8766	50-603064	400–400	10-2640	10-2639
MD50-10-8767	50-603064	500–500	10-2640	10-2639
MD50-10-8771	50-603383	26–26	10-2228	10-2227
MD50-10-8772	50-603383	85–85	10-2228	10-2227
MD50-10-8773	50-603383	139–139	10-2228	10-2227
MD50-10-8774	50-603383	206–206	10-2266	10-2265
MD50-10-8775	50-603383	244–244	10-2266	10-2265
MD50-10-8776	50-603383	286–286	10-2266	10-2265
MD50-10-8777	50-603383	359–359	10-2266	10-2265
MD50-10-8778	50-603383	408–408	10-2266	10-2265
MD50-10-8779	50-603383	450–450	10-2327	10-2326
MD50-10-8785	50-603467	26–26	10-1891	10-1890

Table C-4.1-2 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-8783	50-603467	91–91	10-1858	10-1857
MD50-10-8784	50-603467	91–91	10-1891	10-1890
MD50-10-8786	50-603467	143–143	10-1891	10-1890
MD50-10-8787	50-603467	206–206	10-1891	10-1890
MD50-10-8788	50-603467	244–244	10-1986	10-1985
MD50-10-8793	50-603467	287–287	10-1986	10-1985
MD50-10-8790	50-603467	360–360	10-1986	10-1985
MD50-10-8789	50-603467	409–409	10-1986	10-1985
MD50-10-8791	50-603467	500–500	10-1986	10-1985
MD50-10-8852	50-603467	600–600	10-1988	10-1987
MD50-10-8795	50-603468	30–30	10-2514	10-2513
MD50-10-8796	50-603468	92–92	10-2514	10-2513
MD50-10-8797	50-603468	142–142	10-2514	10-2513
MD50-10-8798	50-603468	198–198	10-2514	10-2513
MD50-10-8799	50-603468	233–233	10-2533	10-2532
MD50-10-8800	50-603468	282–282	10-2550	10-2549
MD50-10-8801	50-603468	354–354	10-2533	10-2532
MD50-10-8802	50-603468	403–403	10-2533	10-2532
MD50-10-8803	50-603468	403–403	10-2533	10-2532
MD50-10-8804	50-603468	450–450	10-2613	10-2612
MD50-10-8807	50-603470	30–30	10-2791	10-2790
MD50-10-8809	50-603470	83–83	10-2785	10-2784
MD50-10-8811	50-603470	143–143	10-2791	10-2790
MD50-10-8810	50-603470	203–203	10-2785	10-2784
MD50-10-8813	50-603470	233–233	10-2810	10-2809
MD50-10-8808	50-603470	278–278	10-2785	10-2784
MD50-10-8814	50-603470	351–351	10-2810	10-2809
MD50-10-8816	50-603470	450–450	10-2899	10-2898
MD50-10-8815	50-603470	600–600	10-2810	10-2809
MD50-10-8812	50-603470	650–650	10-2810	10-2809
MD50-10-8826	50-603471	30–30	10-2812	10-2811
MD50-10-8822	50-603471	90–90	10-2753	10-2752
MD50-10-8823	50-603471	146–146	10-2753	10-2752
MD50-10-8825	50-603471	209–209	10-2783	10-2782
MD50-10-8819	50-603471	242–242	10-2753	10-2752
MD50-10-8821	50-603471	288–288	10-2753	10-2752
MD50-10-8827	50-603471	360–360	10-2793	10-2792
MD50-10-8824	50-603471	410–410	10-2783	10-2782
MD50-10-8820	50-603471	450–450	10-2753	10-2752

Table C-4.1-2 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-8834	50-603472	27–27	10-2727	10-2726
MD50-10-8833	50-603472	93–93	10-2727	10-2726
MD50-10-8837	50-603472	93–93	10-2737	10-2736
MD50-10-8838	50-603472	146–146	10-2737	10-2736
MD50-10-8831	50-603472	210–210	10-2725	10-2724
MD50-10-8835	50-603472	247–247	10-2737	10-2736
MD50-10-8840	50-603472	292–292	10-2737	10-2736
MD50-10-8839	50-603472	364–364	10-2737	10-2736
MD50-10-8836	50-603472	414–414	10-2737	10-2736
MD50-10-8832	50-603472	450–450	10-2725	10-2724
MD50-10-8843	50-603503	25–25	10-1494	10-1534
MD50-10-8844	50-603503	80–80	10-1533	10-1534
MD50-10-8845	50-603503	133–133	10-1533	10-1534
MD50-10-8846	50-603503	198–198	10-1588	10-1587
MD50-10-8847	50-603503	237–237	10-1664	10-1663
MD50-10-8848	50-603503	278–278	10-1664	10-1663
MD50-10-8849	50-603503	347–347	10-1763	10-1762
MD50-10-8850	50-603503	397–397	10-1763	10-1762
MD50-10-8851	50-603503	450–450	10-1856	10-1855

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-4.1-3
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, April 2010–July 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-15742	50-24784	25–25	10-3614[a]	10-3613
MD50-10-15745	50-24784	96–96	10-3614	10-3613
MD50-10-15747	50-24784	155–155	10-3614	10-3613
MD50-10-15744	50-24784	215–215	10-3614	10-3613
MD50-10-15741	50-24784	244–244	10-3614	10-3613
MD50-10-15748	50-24784	289–289	10-3614	10-3613
MD50-10-15743	50-24784	362–362	10-3614	10-3613
MD50-10-15746	50-24784	411–411	10-3614	10-3613
MD50-10-15740	50-24784	450–450	10-3614	10-3613
MD50-10-15902	50-24813	25–25	10-3732	10-3731
MD50-10-15906	50-24813	99–99	10-3732	10-3731
MD50-10-15903	50-24813	150–150	10-3732	10-3731
MD50-10-15907	50-24813	207–207	10-3732	10-3731
MD50-10-15904	50-24813	241–241	10-3732	10-3731
MD50-10-15909	50-24813	286–286	10-3732	10-3731
MD50-10-15905	50-24813	358–358	10-3732	10-3731
MD50-10-15910	50-24813	408–408	10-3732	10-3731
MD50-10-15908	50-24813	450–450	10-3732	10-3731
MD50-10-15911	50-24813	600–600	10-3732	10-3731
MD50-10-15848	50-24822	25–25	10-3511	10-3510
MD50-10-15854	50-24822	81–81	10-3511	10-3510
MD50-10-15850	50-24822	142–142	10-3511	10-3510
MD50-10-15856	50-24822	204–204	10-3511	10-3510
MD50-10-15849	50-24822	235–235	10-3511	10-3510
MD50-10-15855	50-24822	280–280	10-3511	10-3510
MD50-10-15852	50-24822	351–351	10-3511	10-3510
MD50-10-15851	50-24822	402–402	10-3511	10-3510
MD50-10-15853	50-24822	450–450	10-3523	10-3522
MD50-10-15840	50-603061	25–25	10-3554	10-3553
MD50-10-15837	50-603061	76–76	10-3525	10-3524
MD50-10-15841	50-603061	128–128	10-3554	10-3553
MD50-10-15843	50-603061	190–190	10-3554	10-3553
MD50-10-15839	50-603061	228–228	10-3525	10-3524
MD50-10-15844	50-603061	274–274	10-3554	10-3553
MD50-10-15842	50-603061	347–347	10-3554	10-3553
MD50-10-15838	50-603061	397–397	10-3525	10-3524

Table C-4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-15836	50-603061	450–450	10-3525	10-3524
MD50-10-15893	50-603062	25–25	10-3468	10-3469
MD50-10-15894	50-603062	64–64	10-3468	10-3469
MD50-10-15891	50-603062	122–122	10-3464	10-3463
MD50-10-15896	50-603062	184–184	10-3468	10-3469
MD50-10-15895	50-603062	217–217	10-3475	10-3474
MD50-10-15890	50-603062	263–263	10-3464	10-3463
MD50-10-15898	50-603062	337–337	10-3475	10-3474
MD50-10-15892	50-603062	387–387	10-3468	10-3469
MD50-10-15897	50-603062	450–450	10-3468	10-3469
MD50-10-15827	50-603063	25–25	10-3495	10-3494
MD50-10-15832	50-603063	76–76	10-3495	10-3494
MD50-10-15825	50-603063	128–128	10-3536	10-3535
MD50-10-15830	50-603063	190–190	10-3495	10-3494
MD50-10-15824	50-603063	228–228	10-3495	10-3494
MD50-10-15829	50-603063	274–274	10-3536	10-3535
MD50-10-15833	50-603063	347–347	10-3536	10-3535
MD50-10-15826	50-603063	397–397	10-3495	10-3494
MD50-10-15831	50-603063	450–450	10-3495	10-3494
MD50-10-15816	50-603064	25–25	10-3477	10-3476
MD50-10-15817	50-603064	66–66	10-3477	10-3476
MD50-10-15814	50-603064	113–113	10-3487	10-3486
MD50-10-15812	50-603064	176–176	10-3477	10-3476
MD50-10-15819	50-603064	214–214	10-3477	10-3476
MD50-10-15820	50-603064	259–259	10-3477	10-3476
MD50-10-15813	50-603064	332–332	10-3487	10-3486
MD50-10-15818	50-603064	400–400	10-3477	10-3476
MD50-10-15821	50-603064	500–500	10-3487	10-3486
MD50-10-15871	50-603383	26–26	10-3493	10-3492
MD50-10-15866	50-603383	85–85	10-3485	10-3484
MD50-10-15873	50-603383	139–139	10-3493	10-3492
MD50-10-15867	50-603383	206–206	10-3485	10-3484
MD50-10-15874	50-603383	244–244	10-3493	10-3492
MD50-10-15869	50-603383	286–286	10-3485	10-3484
MD50-10-15872	50-603383	359–359	10-3493	10-3492
MD50-10-15870	50-603383	408–408	10-3485	10-3484
MD50-10-15875	50-603383	450–450	10-3493	10-3492
MD50-10-15805	50-603467	26–26	10-2994	10-2993
MD50-10-15801	50-603467	91–91	10-2994	10-2993

Table C-4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-15807	50-603467	143–143	10-2994	10-2993
MD50-10-15809	50-603467	206–206	10-3044	10-3043
MD50-10-15804	50-603467	244–244	10-2994	10-2993
MD50-10-15800	50-603467	287–287	10-2994	—[b]
MD50-10-15808	50-603467	360–360	10-2994	10-2993
MD50-10-15802	50-603467	409–409	10-2994	10-2993
MD50-10-15803	50-603467	500–500	10-2994	10-2993
MD50-10-15806	50-603467	600–600	10-2994	10-2993
MD50-10-15879	50-603468	92–92	10-3046	10-3045
MD50-10-15882	50-603468	142–142	10-3046	10-3045
MD50-10-15884	50-603468	198–198	10-3046	10-3045
MD50-10-15878	50-603468	233–233	10-3046	10-3045
MD50-10-15885	50-603468	282–282	10-3046	10-3045
MD50-10-15881	50-603468	354–354	10-3046	10-3045
MD50-10-15883	50-603468	403–403	10-3046	10-3045
MD50-10-15880	50-603468	450–450	10-3046	10-3045
MD50-10-15752	50-603470	30–30	10-3726	10-3725
MD50-10-15760	50-603470	83–83	10-3726	10-3725
MD50-10-15753	50-603470	143–143	10-3726	10-3725
MD50-10-15761	50-603470	203–203	10-3726	10-3725
MD50-10-15756	50-603470	233–233	10-3726	10-3725
MD50-10-15758	50-603470	278–278	10-3726	10-3725
MD50-10-15754	50-603470	351–351	10-3734	10-3733
MD50-10-15757	50-603470	450–450	10-3726	10-3725
MD50-10-15755	50-603470	600–600	10-3734	10-3733
MD50-10-15759	50-603470	650–650	10-3726	10-3725
MD50-10-15769	50-603471	90–90	10-3638	10-3637
MD50-10-15768	50-603471	146–146	10-3638	10-3637
MD50-10-15766	50-603471	209–209	10-3638	10-3637
MD50-10-15771	50-603471	242–242	10-3638	10-3637
MD50-10-15765	50-603471	288–288	10-3638	10-3637
MD50-10-15772	50-603471	360–360	10-3638	10-3637
MD50-10-15764	50-603471	410–410	10-3638	10-3637
MD50-10-15770	50-603471	450–450	10-3728	10-3727
MD50-10-15779	50-603472	27–27	10-3640	10-3639
MD50-10-15782	50-603472	93–93	10-3640	10-3639
MD50-10-15780	50-603472	146–146	10-3640	10-3639
MD50-10-15783	50-603472	210–210	10-3640	10-3639
MD50-10-15776	50-603472	247–247	10-3612	10-3611

Table C-4.1-3 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-15778	50-603472	292–292	10-3640	10-3639
MD50-10-15777	50-603472	364–364	10-3612	10-3611
MD50-10-15781	50-603472	414–414	10-3640	10-3639
MD50-10-15784	50-603472	450–450	10-3640	10-3639
MD50-10-15793	50-603503	25–25	10-2992	10-2991
MD50-10-15791	50-603503	80–80	10-2961	10-2960
MD50-10-15792	50-603503	133–133	10-2992	10-2991
MD50-10-15788	50-603503	198–198	10-2943	10-2942
MD50-10-15794	50-603503	237–237	10-2992	10-2991
MD50-10-15795	50-603503	278–278	10-2992	10-2991
MD50-10-15790	50-603503	347–347	10-2961	10-2960
MD50-10-15796	50-603503	397–397	10-2992	10-2991
MD50-10-15789	50-603503	450–450	10-2943	10-2942

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-4.1-4
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, July 2010–September 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-24362	50-24784	25–25	10-4280[a]	10-4279
MD50-10-24364	50-24784	96–96	10-4280	10-4279
MD50-10-24365	50-24784	155–155	10-4280	10-4279
MD50-10-24361	50-24784	215–215	10-4280	10-4279
MD50-10-24359	50-24784	244–244	10-4280	10-4279
MD50-10-24366	50-24784	289–289	10-4280	10-4279
MD50-10-24360	50-24784	362–362	10-4303	10-4302
MD50-10-24367	50-24784	411–411	10-4303	10-4302
MD50-10-24363	50-24784	450–450	10-4280	10-4279
MD50-10-24369	50-24813	25–25	10-4461	10-4444
MD50-10-24375	50-24813	99–99	10-4461	10-4444
MD50-10-24370	50-24813	150–150	10-4461	10-4444
MD50-10-24376	50-24813	207–207	10-4461	10-4444
MD50-10-24371	50-24813	241–241	10-4461	10-4444
MD50-10-24377	50-24813	286–286	10-4461	10-4460
MD50-10-24372	50-24813	358–358	10-4461	10-4444
MD50-10-24378	50-24813	408–408	10-4461	10-4460

Table C-4.1-4 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-24374	50-24813	450–450	10-4461	10-4460
MD50-10-24373	50-24813	600–600	10-4461	10-4444
MD50-10-24413	50-24822	25–25	10-4038	10-4037
MD50-10-24419	50-24822	81–81	10-4038	10-4037
MD50-10-24416	50-24822	142–142	10-4038	10-4037
MD50-10-24414	50-24822	204–204	10-4038	10-4037
MD50-10-24418	50-24822	235–235	10-4038	10-4037
MD50-10-24412	50-24822	280–280	10-4038	10-4037
MD50-10-24415	50-24822	351–351	10-4038	10-4037
MD50-10-24411	50-24822	402–402	10-4038	10-4037
MD50-10-24417	50-24822	450–450	10-4038	10-4037
MD50-10-24435	50-603061	25–25	10-4170	—[b]
MD50-10-26315	50-603061	25–25	—	10-4494
MD50-10-24432	50-603061	76–76	10-4170	10-4169
MD50-10-24437	50-603061	128–128	10-4170	10-4169
MD50-10-24433	50-603061	190–190	10-4170	10-4169
MD50-10-24436	50-603061	228–228	10-4170	10-4169
MD50-10-24434	50-603061	274–274	10-4170	10-4169
MD50-10-24438	50-603061	347–347	10-4170	10-4169
MD50-10-24431	50-603061	397–397	10-4170	—
MD50-10-26314	50-603061	397–397	—	10-4494
MD50-10-24439	50-603061	450–450	10-4170	10-4169
MD50-10-24441	50-603062	25–25	10-4053	10-4052
MD50-10-24446	50-603062	64–64	10-4082	10-4081
MD50-10-24443	50-603062	122–122	10-4053	10-4052
MD50-10-24445	50-603062	184–184	10-4082	10-4081
MD50-10-24447	50-603062	217–217	10-4103	10-4102
MD50-10-24442	50-603062	263–263	10-4053	10-4052
MD50-10-24448	50-603062	337–337	10-4082	10-4081
MD50-10-24444	50-603062	387–387	10-4103	10-4102
MD50-10-24449	50-603062	450–450	10-4103	10-4102
MD50-10-24451	50-603063	25–25	10-4170	10-4169
MD50-10-24457	50-603063	76–76	10-4170	10-4169
MD50-10-24453	50-603063	128–128	10-4170	10-4169
MD50-10-24454	50-603063	190–190	10-4170	10-4169
MD50-10-24456	50-603063	228–228	10-4170	10-4169
MD50-10-24458	50-603063	274–274	10-4170	10-4169
MD50-10-24452	50-603063	347–347	10-4170	10-4169
MD50-10-24455	50-603063	450–450	10-4170	10-4169

Table C-4.1-4 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-24461	50-603064	25–25	10-4038	10-4037
MD50-10-24467	50-603064	66–66	10-4053	10-4052
MD50-10-24462	50-603064	113–113	10-4038	10-4037
MD50-10-24465	50-603064	176–176	10-4038	10-4037
MD50-10-24463	50-603064	214–214	10-4038	10-4037
MD50-10-24468	50-603064	259–259	10-4053	10-4052
MD50-10-24464	50-603064	332–332	10-4038	10-4037
MD50-10-24469	50-603064	482–482	10-4053	10-4060
MD50-10-24466	50-603064	500–500	10-4038	10-4037
MD50-10-24380	50-603383	26–26	10-4192	10-4191
MD50-10-24384	50-603383	85–85	10-4192	10-4191
MD50-10-24388	50-603383	139–139	10-4280	10-4279
MD50-10-24382	50-603383	206–206	10-4192	10-4191
MD50-10-24387	50-603383	244–244	10-4192	10-4191
MD50-10-24385	50-603383	286–286	10-4280	10-4279
MD50-10-24381	50-603383	359–359	10-4192	10-4191
MD50-10-24386	50-603383	408–408	10-4192	10-4191
MD50-10-24383	50-603383	450–450	10-4192	10-4191
MD50-10-24394	50-603467	26–26	10-3805	10-3804
MD50-10-24398	50-603467	91–91	10-3805	10-3804
MD50-10-24395	50-603467	143–143	10-3805	10-3804
MD50-10-24396	50-603467	206–206	10-3805	10-3804
MD50-10-24399	50-603467	244–244	10-3805	10-3804
MD50-10-24393	50-603467	287–287	10-3805	10-3804
MD50-10-24397	50-603467	360–360	10-3805	10-3804
MD50-10-24391	50-603467	409–409	10-3805	10-3804
MD50-10-24392	50-603467	500–500	10-3805	10-3804
MD50-10-24390	50-603467	600–600	10-3805	10-3804
MD50-10-24402	50-603468	92–92	10-3763	10-3762
MD50-10-24407	50-603468	142–142	10-3763	10-3762
MD50-10-24401	50-603468	198–198	10-3763	10-3762
MD50-10-24405	50-603468	233–233	10-3763	10-3762
MD50-10-24403	50-603468	282–282	10-3763	10-3762
MD50-10-24404	50-603468	354–354	10-3763	10-3762
MD50-10-24408	50-603468	403–403	10-3763	10-3762
MD50-10-24406	50-603468	450–450	10-3763	10-3762
MD50-10-24328	50-603470	30–30	10-4461	10-4444
MD50-10-24333	50-603470	83–83	10-4461	10-4444
MD50-10-24329	50-603470	143–143	10-4461	10-4444

Table C-4.1-4 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-24334	50-603470	203–203	10-4461	10-4444
MD50-10-24330	50-603470	233–233	10-4461	10-4444
MD50-10-24335	50-603470	278–278	10-4461	10-4444
MD50-10-24331	50-603470	351–351	10-4461	10-4444
MD50-10-24336	50-603470	450–450	10-4461	10-4444
MD50-10-24332	50-603470	600–600	10-4461	10-4444
MD50-10-24337	50-603470	650–650	10-4461	10-4444
MD50-10-24339	50-603471	90–90	10-4384	10-4385
MD50-10-24344	50-603471	146–146	10-4400	10-4399
MD50-10-24340	50-603471	209–209	10-4400	10-4399
MD50-10-24345	50-603471	242–242	10-4400	10-4399
MD50-10-24341	50-603471	288–288	10-4384	10-4385
MD50-10-24343	50-603471	360–360	10-4400	10-4399
MD50-10-24342	50-603471	410–410	10-4400	10-4399
MD50-10-24346	50-603471	450–450	10-4400	10-4399
MD50-10-24354	50-603472	27–27	10-4340	10-4339
MD50-10-24357	50-603472	93–93	10-4340	10-4339
MD50-10-24352	50-603472	146–146	10-4303	10-4302
MD50-10-24356	50-603472	210–210	10-4340	10-4339
MD50-10-24350	50-603472	247–247	10-4303	10-4302
MD50-10-24353	50-603472	292–292	10-4340	10-4339
MD50-10-24349	50-603472	367–367	10-4303	10-4302
MD50-10-24355	50-603472	414–414	10-4340	10-4339
MD50-10-24351	50-603472	450–450	10-4303	10-4302
MD50-10-24423	50-603503	25–25	10-3763	10-3762
MD50-10-24426	50-603503	80–80	10-3805	10-3804
MD50-10-24422	50-603503	133–133	10-3763	10-3762
MD50-10-24425	50-603503	198–198	10-3805	10-3804
MD50-10-24421	50-603503	237–237	10-3763	10-3762
MD50-10-24427	50-603503	278–278	10-3805	10-3804
MD50-10-24424	50-603503	347–347	10-3763	10-3762
MD50-10-24428	50-603503	397–397	10-3805	10-3804
MD50-10-24429	50-603503	450–450	10-3805	10-3804

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-4.1-5
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, October 2010–January 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-27179	50-24784	25–25	11-533[a]	11-534
MD50-10-27176	50-24784	96–96	11-533	11-534
MD50-10-27175	50-24784	155–155	11-533	11-534
MD50-10-27181	50-24784	215–215	11-533	11-534
MD50-10-27180	50-24784	244–244	11-533	11-534
MD50-10-27178	50-24784	289–289	11-543	11-544
MD50-10-27182	50-24784	362–362	11-533	11-534
MD50-10-27177	50-24784	411–411	11-607	11-606
MD50-10-27183	50-24784	450–450	11-587	11-586
MD50-10-27186	50-24813	25–25	11-993	11-992
MD50-10-27189	50-24813	99–99	11-1043	11-1042
MD50-10-27185	50-24813	150–150	11-993	11-992
MD50-10-27190	50-24813	207–207	11-1031	11-1030
MD50-10-27193	50-24813	241–241	11-1043	11-1042
MD50-10-27194	50-24813	241–241	11-1043	11-1042
MD50-10-27191	50-24813	286–286	11-1031	11-1030
MD50-10-27343	50-24813	358–358	11-1110	11-1111
MD50-10-27192	50-24813	408–408	11-1043	11-1042
MD50-10-27188	50-24813	450–450	11-1110	11-1111
MD50-10-27195	50-24813	600–600	11-1065	11-1064
MD50-10-27227	50-24822	25–25	11-319	11-318
MD50-10-27232	50-24822	81–81	11-319	11-318
MD50-10-27235	50-24822	142–142	11-501	11-500
MD50-10-27229	50-24822	204–204	11-319	11-318
MD50-10-27233	50-24822	235–235	11-501	11-500
MD50-10-27231	50-24822	280–280	11-319	11-318
MD50-10-27230	50-24822	351–351	11-364	11-352
MD50-10-27228	50-24822	450–450	11-319	11-318
MD50-10-27249	50-603061	25–25	11-635	11-634
MD50-10-27251	50-603061	76–76	11-661	11-662
MD50-10-27247	50-603061	128–128	11-635	11-634
MD50-10-27255	50-603061	190–190	11-661	11-662
MD50-10-27248	50-603061	228–228	11-635	11-634
MD50-10-27253	50-603061	274–274	11-635	11-634
MD50-10-27252	50-603061	347–347	11-661	11-662
MD50-10-27254	50-603061	397–397	11-635	11-634

Table C-4.1-5 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-27250	50-603061	450–450	11-635	11-634
MD50-10-27262	50-603062	25–25	11-212	11-211
MD50-10-27265	50-603062	64–64	11-212	11-211
MD50-10-27257	50-603062	122–122	11-192	11-191
MD50-10-27263	50-603062	184–184	11-212	11-211
MD50-10-27260	50-603062	217–217	11-192	11-191
MD50-10-27264	50-603062	263–263	11-212	11-211
MD50-10-27259	50-603062	337–337	11-245	11-244
MD50-10-27261	50-603062	387–387	11-212	11-211
MD50-10-27258	50-603062	450–450	11-192	11-191
MD50-10-27267	50-603063	25–25	11-607	11-606
MD50-10-27272	50-603063	76–76	11-607	11-606
MD50-10-27275	50-603063	128–128	11-612	11-611
MD50-10-27268	50-603063	190–190	11-607	11-606
MD50-10-27273	50-603063	228–228	11-607	11-606
MD50-10-27269	50-603063	274–274	11-607	11-606
MD50-10-27274	50-603063	347–347	11-607	11-606
MD50-10-27271	50-603063	450–450	11-612	11-611
MD50-10-27280	50-603064	25–25	11-302	11-301
MD50-10-27285	50-603064	66–66	11-302	11-301
MD50-10-27279	50-603064	113–113	11-275	11-274
MD50-10-27283	50-603064	176–176	11-302	11-301
MD50-10-27277	50-603064	214–214	11-275	11-274
MD50-10-27281	50-603064	259–259	11-302	11-301
MD50-10-27278	50-603064	332–332	11-302	11-301
MD50-10-27282	50-603064	400–400	11-302	11-301
MD50-10-27284	50-603064	500–500	11-302	11-301
MD50-10-27199	50-603383	26–26	11-516	11-515
MD50-10-27197	50-603383	85–85	11-516	11-515
MD50-10-27205	50-603383	139–139	11-566	11-565
MD50-10-27204	50-603383	206–206	11-566	11-565
MD50-10-27203	50-603383	244–244	11-566	11-565
MD50-10-27201	50-603383	286–286	11-516	11-515
MD50-10-27202	50-603383	359–359	11-566	11-565
MD50-10-27200	50-603383	408–408	11-516	11-515
MD50-10-27196	50-603383	450–450	11-566	—[b]
MD50-10-27214	50-603467	26–26	11-261	11-260
MD50-10-27210	50-603467	91–91	11-261	11-260
MD50-10-27211	50-603467	143–143	11-261	11-260

Table C-4.1-5 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-27215	50-603467	206–206	11-261	11-260
MD50-10-27207	50-603467	244–244	11-261	11-260
MD50-10-27213	50-603467	287–287	11-261	11-260
MD50-10-27212	50-603467	360–360	11-275	11-274
MD50-10-27208	50-603467	409–409	11-275	11-274
MD50-10-27206	50-603467	500–500	11-261	11-260
MD50-10-27209	50-603467	600–600	11-275	11-274
MD50-10-27220	50-603468	92–92	11-946	11-945
MD50-10-27217	50-603468	142–142	11-935	11-934
MD50-10-27218	50-603468	198–198	11-935	11-934
MD50-10-27219	50-603468	233–233	11-946	11-945
MD50-10-27226	50-603468	282–282	11-935	11-934
MD50-10-27223	50-603468	354–354	11-946	11-945
MD50-10-27221	50-603468	403–403	11-935	11-934
MD50-10-27222	50-603468	450–450	11-935	11-934
MD50-10-27145	50-603470	30–30	11-790	11-791
MD50-10-27149	50-603470	83–83	11-862	11-861
MD50-10-27144	50-603470	143–143	11-790	11-791
MD50-10-27151	50-603470	203–203	11-862	11-861
MD50-10-27147	50-603470	233–233	11-790	11-791
MD50-10-27153	50-603470	278–278	11-862	11-861
MD50-10-27146	50-603470	351–351	11-790	11-791
MD50-10-27152	50-603470	450–450	11-862	11-861
MD50-10-27148	50-603470	600–600	11-862	11-861
MD50-10-27115	50-603470	650–650	11-1065	11-1064
MD50-10-27158	50-603471	30–30	11-792	11-793
MD50-10-27155	50-603471	90–90	11-678	11-679
MD50-10-27157	50-603471	146–146	11-711	11-710
MD50-10-27162	50-603471	209–209	11-711	11-710
MD50-10-27161	50-603471	242–242	11-792	11-793
MD50-10-27160	50-603471	288–288	11-792	11-793
MD50-10-27156	50-603471	360–360	11-792	11-793
MD50-10-27163	50-603471	410–410	11-792	11-793
MD50-10-27159	50-603471	450–450	11-792	11-793
MD50-10-27165	50-603472	27–27	11-1008	11-1007
MD50-10-27168	50-603472	93–93	11-1008	11-1007
MD50-10-27170	50-603472	146–146	11-1011	11-1012
MD50-10-27172	50-603472	210–210	11-1019	11-1018
MD50-10-27166	50-603472	247–247	11-1008	11-1007

Table C-4.1-5 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-10-27174	50-603472	292–292	11-1019	11-1018
MD50-10-27169	50-603472	364–364	11-1008	11-1007
MD50-10-27167	50-603472	414–414	11-1011	11-1012
MD50-10-27173	50-603472	450–450	11-1019	11-1018
MD50-10-27243	50-603503	25–25	11-245	11-244
MD50-10-27237	50-603503	80–80	11-245	11-244
MD50-10-27244	50-603503	133–133	11-245	11-244
MD50-10-27238	50-603503	198–198	11-245	11-244
MD50-10-27245	50-603503	237–237	11-245	11-244
MD50-10-27239	50-603503	278–278	11-245	11-244
MD50-10-27241	50-603503	347–347	11-245	11-244
MD50-10-27240	50-603503	397–397	11-245	11-244
MD50-10-27242	50-603503	450–450	11-245	11-244

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-4.1-6
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, January 2011–March 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-4012	50-24784	25–25	11-1357[a]	11-1356
MD50-11-4010	50-24784	96–96	11-1357	11-1356
MD50-11-4009	50-24784	155–155	11-1357	11-1356
MD50-11-4006	50-24784	215–215	11-1357	11-1356
MD50-11-4004	50-24784	244–244	11-1341	11-1340
MD50-11-4008	50-24784	289–289	11-1341	11-1340
MD50-11-4007	50-24784	362–362	11-1357	11-1356
MD50-11-4005	50-24784	411–411	11-1341	11-1340
MD50-11-4003	50-24784	450–450	11-1341	11-1340
MD50-11-4023	50-24813	25–25	11-1411	11-1410
MD50-11-4021	50-24813	99–99	11-1408	11-1407
MD50-11-4020	50-24813	150–150	11-1408	—[b]
MD50-11-4095	50-24813	150–150	—	11-1623
MD50-11-4019	50-24813	207–207	11-1372	11-1371
MD50-11-4018	50-24813	241–241	11-1372	11-1371
MD50-11-4017	50-24813	286–286	11-1408	11-1407
MD50-11-4014	50-24813	358–358	11-1372	11-1371
MD50-11-4013	50-24813	408–408	11-1408	11-1407

Table C-4.1-6 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-4015	50-24813	450–450	11-1408	11-1407
MD50-11-4016	50-24813	600–600	11-1408	11-1407
MD50-11-4058	50-24822	25–25	11-1223	11-1224
MD50-11-4059	50-24822	81–81	11-1250	—
MD50-11-4057	50-24822	142–142	11-1223	11-1224
MD50-11-4055	50-24822	204–204	11-1209	11-1208
MD50-11-4060	50-24822	235–235	11-1250	11-1249
MD50-11-4061	50-24822	280–280	11-1223	11-1224
MD50-11-4056	50-24822	351–351	11-1209	11-1208
MD50-11-4062	50-24822	402–402	11-1250	—
MD50-11-4064	50-24822	450–450	11-1250	—
MD50-11-4080	50-603061	25–25	11-1535	11-1536
MD50-11-4081	50-603061	76–76	11-1535	11-1536
MD50-11-4083	50-603061	128–128	11-1535	11-1536
MD50-11-4082	50-603061	190–190	11-1535	11-1536
MD50-11-4084	50-603061	228–228	11-1535	11-1536
MD50-11-4076	50-603061	274–274	11-1530	11-1529
MD50-11-4077	50-603061	347–347	11-1530	11-1529
MD50-11-4078	50-603061	397–397	11-1530	11-1529
MD50-11-4079	50-603061	450–450	11-1535	11-1536
MD50-11-4092	50-603062	25–25	11-1265	11-1264
MD50-11-4091	50-603062	64–64	11-1265	11-1264
MD50-11-4093	50-603062	122–122	11-1265	11-1264
MD50-11-4090	50-603062	184–184	11-1265	11-1264
MD50-11-4089	50-603062	217–217	11-1259	11-1258
MD50-11-4087	50-603062	263–263	11-1259	11-1258
MD50-11-4086	50-603062	337–337	11-1259	11-1258
MD50-11-4088	50-603062	387–387	11-1265	11-1264
MD50-11-4085	50-603062	450–450	11-1265	11-1264
MD50-11-4103	50-603063	25–25	11-1665	11-1664
MD50-11-4102	50-603063	76–76	11-1665	11-1664
MD50-11-4101	50-603063	128–128	11-1665	11-1664
MD50-11-4100	50-603063	190–190	11-1665	11-1664
MD50-11-4099	50-603063	228–228	11-1665	11-1664
MD50-11-4098	50-603063	274–274	11-1648	11-1647
MD50-11-4096	50-603063	347–347	11-1648	11-1647
MD50-11-4104	50-603063	397–397	11-1665	11-1664
MD50-11-4097	50-603063	450–450	11-1648	11-1647
MD50-11-4113	50-603064	25–25	11-1600	11-1599

Table C-4.1-6 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-4112	50-603064	66–66	11-1600	11-1599
MD50-11-4111	50-603064	113–113	11-1600	11-1599
MD50-11-4109	50-603064	176–176	11-1600	11-1599
MD50-11-4110	50-603064	214–214	11-1600	11-1599
MD50-11-4105	50-603064	259–259	11-1559	11-1558
MD50-11-4106	50-603064	332–332	11-1559	11-1558
MD50-11-4107	50-603064	400–400	11-1559	11-1558
MD50-11-4108	50-603064	500–500	11-1559	11-1558
MD50-11-4024	50-603383	26–26	11-1408	11-1407
MD50-11-4029	50-603383	85–85	11-1427	11-1426
MD50-11-4025	50-603383	139–139	11-1411	11-1410
MD50-11-4030	50-603383	206–206	11-1411	11-1410
MD50-11-4026	50-603383	244–244	11-1408	11-1407
MD50-11-4031	50-603383	286–286	11-1427	11-1426
MD50-11-4027	50-603383	359–359	11-1411	11-1410
MD50-11-4032	50-603383	408–408	11-1411	11-1410
MD50-11-4028	50-603383	450–450	11-1427	11-1426
MD50-11-4038	50-603467	91–91	11-1452	11-1451
MD50-11-4034	50-603467	26–26	11-1427	11-1426
MD50-11-4035	50-603467	143–143	11-1427	11-1426
MD50-11-4039	50-603467	206–206	11-1452	11-1451
MD50-11-4036	50-603467	244–244	11-1427	11-1426
MD50-11-4042	50-603467	287–287	11-1452	11-1451
MD50-11-4037	50-603467	360–360	11-1452	11-1451
MD50-11-4040	50-603467	409–409	11-1452	11-1451
MD50-11-4043	50-603467	500–500	11-1452	11-1451
MD50-11-4041	50-603467	600–600	11-1452	11-1451
MD50-11-4047	50-603468	92–92	11-1468	11-1467
MD50-11-4046	50-603468	142–142	11-1468	11-1467
MD50-11-4045	50-603468	198–198	11-1490	11-1489
MD50-11-4054	50-603468	233–233	11-1468	11-1467
MD50-11-4050	50-603468	282–282	11-1490	11-1489
MD50-11-4051	50-603468	354–354	11-1490	11-1489
MD50-11-4052	50-603468	403–403	11-1490	11-1489
MD50-11-4053	50-603468	450–450	11-1490	11-1489
MD50-11-3980	50-603470	83–83	11-1322	11-1321
MD50-11-3975	50-603470	143–143	11-1302	11-1301
MD50-11-3973	50-603470	203–203	11-1302	11-1301
MD50-11-3972	50-603470	233–233	11-1322	11-1321

Table C-4.1-6 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-3974	50-603470	278–278	11-1302	11-1301
MD50-11-3979	50-603470	351–351	11-1306	11-1305
MD50-11-3978	50-603470	450–450	11-1306	11-1305
MD50-11-3977	50-603470	600–600	11-1306	11-1305
MD50-11-3976	50-603470	650–650	11-1322	11-1321
MD50-11-3983	50-603471	30-30	11-1302	11-1301
MD50-11-3992	50-603471	90–90	11-1341	11-1340
MD50-11-3990	50-603471	146–146	11-1336	11-1335
MD50-11-3988	50-603471	209–209	11-1341	11-1340
MD50-11-3989	50-603471	242–242	11-1336	11-1335
MD50-11-3987	50-603471	288–288	11-1336	11-1335
MD50-11-3986	50-603471	360–360	11-1336	11-1335
MD50-11-3984	50-603471	410–410	11-1322	11-1321
MD50-11-3985	50-603471	450–450	11-1336	11-1335
MD50-11-4002	50-603472	27–27	11-1341	11-1340
MD50-11-4000	50-603472	93–93	11-1341	11-1340
MD50-11-4001	50-603472	146–146	11-1341	11-1340
MD50-11-3998	50-603472	210–210	11-1341	11-1340
MD50-11-3999	50-603472	247–247	11-1341	11-1340
MD50-11-3996	50-603472	292–292	11-1341	—
MD50-11-3993	50-603472	364–364	11-1341	11-1340
MD50-11-3994	50-603472	414–414	11-1341	11-1340
MD50-11-3995	50-603472	450–450	11-1341	11-1340
MD50-11-4071	50-603503	25–25	11-1510	11-1509
MD50-11-4072	50-603503	80–80	11-1510	11-1509
MD50-11-4069	50-603503	133–133	11-1510	11-1509
MD50-11-4073	50-603503	198–198	11-1510	11-1509
MD50-11-4070	50-603503	237–237	11-1510	11-1509
MD50-11-4067	50-603503	278–278	11-1494	11-1493
MD50-11-4066	50-603503	347–347	11-1494	11-1493
MD50-11-4068	50-603503	397–397	11-1494	11-1493
MD50-11-4065	50-603503	450–450	11-1494	11-1493
MD50-11-3944	50-613182	500–500	11-1163	—
MD50-11-3943	50-613182	550–550	11-1132	11-1131
MD50-11-3942	50-613182	600–600	11-1132	11-1131
MD50-11-3945	50-613182	620–620	11-1145	—
MD50-11-3953	50-613182	620–620	—	11-1451
MD50-11-3941	50-613182	632.5–632.5	11-1132	11-1131
MD50-11-3947	50-613183	30–30	11-1452	11-1451

Table C-4.1-6 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-3948	50-613183	500–500	11-1490	11-1489
MD50-11-3949	50-613183	550–550	11-1468	11-1467
MD50-11-3950	50-613183	600–600	11-1452	11-1451
MD50-11-3951	50-613183	630–630	11-1490	11-1489
MD50-11-3952	50-613183	642.5–642.5	11-1452	11-1451
MD50-11-3959	50-613184	30–30	11-1613	11-1612
MD50-11-3956	50-613184	500–500	11-1613	11-1612
MD50-11-3958	50-613184	550–550	11-1613	11-1612
MD50-11-3954	50-613184	600–600	11-1613	11-1612
MD50-11-3957	50-613184	652–652	11-1613	11-1612
MD50-11-3955	50-613184	664.5–664.5	11-1613	11-1612
MD50-11-3961	50-613185	85–85	11-1163	—
MD50-11-3962	50-613185	145–145	11-1250	11-1249
MD50-11-3963	50-613185	205–205	11-1145	11-1144
MD50-11-3964	50-613185	235–235	11-1145	11-1144
MD50-11-3965	50-613185	280–280	11-1169	11-1168
MD50-11-3966	50-613185	350–350	11-1169	11-1168
MD50-11-3967	50-613185	450–450	11-1196	11-1195
MD50-11-3969	50-613185	600–600	11-1196	11-1195
MD50-11-3968	50-613185	675–675	11-1171	11-1170
MD50-11-3970	50-613185	688–688	11-1196	11-1195

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-4.1-7
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, March 2011–May 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-6010	50-24784	25–25	11-2105[a]	11-2106
MD50-11-6007	50-24784	96–96	11-2105	11-2106
MD50-11-6011	50-24784	155–155	11-2105	11-2106
MD50-11-6005	50-24784	215–215	11-2081	11-2080
MD50-11-6009	50-24784	244–244	11-2105	11-2106
MD50-11-6006	50-24784	289–289	11-2081	11-2080
MD50-11-6008	50-24784	362–362	11-2105	11-2106
MD50-11-6004	50-24784	411–411	11-2081	11-2080
MD50-11-6003	50-24784	450–450	11-2081	11-2080
MD50-11-6022	50-24813	25–25	11-2174	11-2173

Table C-4.1-7 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-6021	50-24813	99–99	11-2174	11-2173
MD50-11-6019	50-24813	150–150	11-2174	11-2173
MD50-11-6020	50-24813	207–207	11-2174	11-2173
MD50-11-6018	50-24813	241–241	11-2174	11-2173
MD50-11-6017	50-24813	286–286	11-2164	11-2163
MD50-11-6013	50-24813	358–358	11-2164	11-2163
MD50-11-6015	50-24813	408–408	11-2164	11-2163
MD50-11-6016	50-24813	450–450	11-2164	11-2163
MD50-11-6014	50-24813	600–600	11-2164	11-2163
MD50-11-6062	50-24822	25–25	11-1855	11-1854
MD50-11-6059	50-24822	81–81	11-1855	11-1854
MD50-11-6061	50-24822	142–142	11-1855	11-1854
MD50-11-6058	50-24822	204–204	11-1834	11-1833
MD50-11-6060	50-24822	235–235	11-1855	11-1854
MD50-11-6055	50-24822	280–280	11-1834	11-1833
MD50-11-6056	50-24822	351–351	11-1834	11-1833
MD50-11-6063	50-24822	402–402	11-1855	11-1854
MD50-11-6057	50-24822	450–450	11-1834	11-1833
MD50-11-6083	50-603061	25–25	11-2060	11-2059
MD50-11-6080	50-603061	76–76	11-2060	11-2059
MD50-11-6079	50-603061	128–128	11-2060	11-2059
MD50-11-6078	50-603061	190–190	11-2036	11-2035
MD50-11-6081	50-603061	228–228	11-2060	11-2059
MD50-11-6077	50-603061	274–274	11-2036	11-2035
MD50-11-6082	50-603061	347–347	11-2060	11-2059
MD50-11-6076	50-603061	397–397	11-2036	11-2035
MD50-11-6075	50-603061	450–450	11-2036	11-2035
MD50-11-6088	50-603062	25–25	11-1896	11-1895
MD50-11-6085	50-603062	64–64	11-1942	11-1941
MD50-11-6087	50-603062	122–122	11-1896	11-1895
MD50-11-6092	50-603062	184–184	11-1942	11-1941
MD50-11-6086	50-603062	217–217	11-1896	11-1895
MD50-11-6090	50-603062	263–263	11-1942	11-1941
MD50-11-6094	50-603062	337–337	11-1921	11-1920
MD50-11-6091	50-603062	387–387	11-1942	11-1941
MD50-11-6089	50-603062	450–450	11-1942	11-1941

Table C-4.1-7 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-6102	50-603063	25–25	11-2014	11-2013
MD50-11-6100	50-603063	76–76	11-2014	11-2013
MD50-11-6099	50-603063	128–128	11-2014	11-2013
MD50-11-6097	50-603063	190–190	11-1989	11-1988
MD50-11-6098	50-603063	228–228	11-1989	11-1988
MD50-11-6103	50-603063	274–274	11-2014	11-2013
MD50-11-6095	50-603063	347–347	11-1989	11-1988
MD50-11-6101	50-603063	397–397	11-2014	11-2013
MD50-11-6096	50-603063	450–450	11-1989	11-1988
MD50-11-6108	50-603064	25–25	11-2239	11-2238
MD50-11-6107	50-603064	66–66	11-2239	11-2238
MD50-11-6105	50-603064	113–113	11-2239	11-2238
MD50-11-6110	50-603064	176–176	11-2255	11-2254
MD50-11-6111	50-603064	214–214	11-2255	11-2254
MD50-11-6112	50-603064	259–259	11-2255	11-2254
MD50-11-6113	50-603064	332–332	11-2255	11-2254
MD50-11-6109	50-603064	482–482	11-2255	11-2254
MD50-11-6106	50-603064	500–500	11-2252	11-2251
MD50-11-6027	50-603383	26–26	11-1989	11-1988
MD50-11-6025	50-603383	85–85	11-1989	11-1988
MD50-11-6024	50-603383	139–139	11-1989	11-1988
MD50-11-6032	50-603383	206–206	11-1989	11-1988
MD50-11-6026	50-603383	244–244	11-1989	11-1988
MD50-11-6029	50-603383	286–286	11-1989	11-1988
MD50-11-6028	50-603383	359–359	11-1989	11-1988
MD50-11-6030	50-603383	408–408	11-1989	11-1988
MD50-11-6031	50-603383	450–450	11-1989	11-1988
MD50-11-6041	50-603467	26–26	11-1981	11-1980
MD50-11-6043	50-603467	91–91	11-1981	11-1980
MD50-11-6038	50-603467	143–143	11-1981	11-1980
MD50-11-6042	50-603467	206–206	11-1981	11-1980
MD50-11-6037	50-603467	244–244	11-1981	11-1980
MD50-11-6039	50-603467	287–287	11-1981	11-1980
MD50-11-6040	50-603467	360–360	11-1981	11-1980
MD50-11-6036	50-603467	409–409	11-1958	11-1957
MD50-11-6035	50-603467	500–500	11-1958	11-1957
MD50-11-6034	50-603467	600–600	11-1958	11-1957
MD50-11-6051	50-603468	92–92	11-1921	11-1920

Table C-4.1-7 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-6050	50-603468	142–142	11-1921	11-1920
MD50-11-6052	50-603468	198–198	11-1921	11-1920
MD50-11-6049	50-603468	233–233	11-1921	11-1920
MD50-11-6047	50-603468	282–282	11-1896	11-1895
MD50-11-6046	50-603468	354–354	11-1896	11-1895
MD50-11-6045	50-603468	403–403	11-1896	11-1895
MD50-11-6048	50-603468	450–450	11-1896	11-1895
MD50-11-5978	50-603470	30–30	11-2239	11-2238
MD50-11-5980	50-603470	83–83	11-2239	11-2238
MD50-11-5982	50-603470	143–143	11-2239	11-2238
MD50-11-5977	50-603470	203–203	11-2239	11-2238
MD50-11-5976	50-603470	233–233	11-2221	11-2220
MD50-11-5979	50-603470	278–278	11-2239	11-2238
MD50-11-5973	50-603470	351–351	11-2221	11-2220
MD50-11-5972	50-603470	450–450	11-2221	11-2220
MD50-11-5975	50-603470	600–600	11-2221	11-2220
MD50-11-5974	50-603470	650–650	11-2221	11-2220
MD50-11-5990	50-603471	90–90	11-2164	11-2163
MD50-11-5989	50-603471	146–146	11-2164	11-2163
MD50-11-5988	50-603471	209–209	11-2164	11-2163
MD50-11-5987	50-603471	242–242	11-2164	11-2163
MD50-11-6156	50-603471	288–288	11-2164	11-2163
MD50-11-5986	50-603471	360–360	11-2164	11-2163
MD50-11-5983	50-603471	410–410	11-2164	11-2163
MD50-11-5985	50-603471	450–450	11-2164	11-2163
MD50-11-6000	50-603472	27–27	11-2127	11-2126
MD50-11-5998	50-603472	93–93	11-2124	11-2125
MD50-11-6001	50-603472	146–146	11-2127	11-2126
MD50-11-5997	50-603472	210–210	11-2124	11-2125
MD50-11-5999	50-603472	247–247	11-2124	11-2125
MD50-11-5995	50-603472	292–292	11-2124	11-2125
MD50-11-5994	50-603472	364–364	11-2124	11-2125
MD50-11-5993	50-603472	414–414	11-2124	11-2125
MD50-11-5996	50-603472	450–450	11-2124	11-2125
MD50-11-6072	50-603503	25–25	11-1885	11-1884
MD50-11-5992	50-603503	80–80	—[b]	11-2163
MD50-11-6071	50-603503	80–80	11-1885	—
MD50-11-6073	50-603503	133–133	11-1885	11-1884

Table C-4.1-7 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-11-6069	50-603503	198–198	11-1885	11-1884
MD50-11-6068	50-603503	237–237	11-1885	11-1884
MD50-11-6070	50-603503	278–278	11-1885	11-1884
MD50-11-6065	50-603503	347–347	11-1885	11-1884
MD50-11-6066	50-603503	397–397	11-1885	11-1884
MD50-11-6067	50-603503	450–450	11-1885	11-1884
MD50-11-5933	50-613182	500–500	11-1756	11-1757
MD50-11-5934	50-613182	550–550	11-1756	11-1757
MD50-11-5936	50-613182	600–600	11-1756	11-1757
MD50-11-5937	50-613182	620–620	11-1756	11-1757
MD50-11-5935	50-613182	632.5–632.5	11-1756	11-1757
MD50-11-5942	50-613183	30–30	11-1788	11-1787
MD50-11-5939	50-613183	500–500	11-1788	11-1787
MD50-11-5943	50-613183	550–550	11-1788	11-1787
MD50-11-5941	50-613183	600–600	11-1802	11-1801
MD50-11-5944	50-613183	630–630	11-1788	11-1787
MD50-11-5940	50-613183	642.5–642.5	11-1788	11-1787
MD50-11-5948	50-613184	30–30	11-1682	11-1683
MD50-11-5951	50-613184	500–500	11-1682	11-1683
MD50-11-5946	50-613184	550–550	11-1682	11-1683
MD50-11-5947	50-613184	600–600	11-1682	11-1683
MD50-11-5950	50-613184	652–652	11-1682	11-1683
MD50-11-5949	50-613184	664.5–664.5	11-1682	11-1683
MD50-11-5960	50-613185	85–85	11-1732	11-1733
MD50-11-5961	50-613185	145–145	11-1732	11-1733
MD50-11-5957	50-613185	205–205	11-1732	11-1733
MD50-11-5962	50-613185	235–235	11-1732	11-1733
MD50-11-5959	50-613185	280–280	11-1732	11-1733
MD50-11-5955	50-613185	350–350	11-1709	11-1708
MD50-11-5954	50-613185	450–450	11-1709	11-1708
MD50-11-5953	50-613185	600–600	11-1709	11-1708
MD50-11-5958	50-613185	675–675	11-1732	11-1733
MD50-11-5956	50-613185	688–688	11-1709	11-1708

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-4.1-8
VOCs Detected in Vapor Samples at MDA C during January 2010–April 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanone[2-]	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol	Ethylbenzene
MD50-10-8677	50-24784	25–25	13 (J)	—[a]	NA[b]	—	39	—	NA	230	—	NA	25	—	—	—	—	—	NA	—
MD50-10-8680	50-24784	96–96	—	—	NA	—	160	—	NA	690	—	NA	55	—	—	—	—	62	NA	—
MD50-10-8681	50-24784	155–155	—	—	NA	—	290	—	NA	290	—	NA	80	—	—	—	—	75	NA	—
MD50-10-8679	50-24784	215–215	—	—	NA	—	190 (J)	—	NA	100	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8685	50-24784	244–244	—	—	NA	—	700	—	NA	190	—	NA	150	—	—	—	27	70	NA	—
MD50-10-8683	50-24784	289–289	—	—	NA	—	720	—	NA	88	—	NA	140	—	—	—	—	26	NA	—
MD50-10-8684	50-24784	362–362	—	—	NA	—	760	—	NA	27	—	NA	180	—	—	—	—	—	NA	—
MD50-10-8682	50-24784	411–411	—	—	NA	—	400	—	NA	—	—	NA	56	—	—	—	—	—	NA	—
MD50-10-8678	50-24784	450–450	—	8.2	NA	—	330	—	NA	—	—	NA	120	—	—	—	—	—	NA	—
MD50-10-8697	50-24813	25–25	—	—	NA	—	1200	—	NA	840	—	NA	360	—	—	—	—	—	NA	—
MD50-10-8696	50-24813	99–99	—	—	NA	—	1600	—	NA	2300	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8693	50-24813	150–150	—	—	NA	—	960	—	NA	2200	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8702	50-24813	207–207	—	—	NA	—	—	—	NA	1800	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8699	50-24813	241–241	—	—	NA	—	920	—	NA	1400	—	NA	1100	—	—	—	—	—	NA	—
MD50-10-8694	50-24813	286–286	—	—	NA	—	1300	—	NA	1500	—	NA	1400	—	—	—	460	—	NA	—
MD50-10-8700	50-24813	358–358	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8695	50-24813	408–408	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8701	50-24813	450–450	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8698	50-24813	600–600	—	—	NA	—	24	—	NA	—	—	NA	40	—	—	—	—	—	NA	—
MD50-10-8703	50-24822	25–25	—	—	NA	—	43	—	NA	140	—	NA	120	—	—	—	—	—	NA	—
MD50-10-8704	50-24822	81–81	—	—	NA	—	140	—	NA	490	—	NA	360	—	—	—	110	—	NA	—
MD50-10-8705	50-24822	142–142	—	—	NA	—	—	—	NA	360	—	NA	640 (J)	—	—	—	—	—	NA	—
MD50-10-8706	50-24822	204–204	—	—	NA	—	—	—	NA	280	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8707	50-24822	235–235	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8708	50-24822	280–280	—	—	NA	—	—	—	NA	—	—	NA	600 (J)	—	—	—	—	—	NA	—
MD50-10-8709	50-24822	351–351	—	—	NA	—	85	—	NA	—	—	NA	160	—	—	—	—	—	NA	—
MD50-10-8710	50-24822	402–402	—	—	NA	—	—	—	NA	—	—	NA	290 (J)	—	—	—	—	—	NA	—
MD50-10-8711	50-24822	450–450	—	—	NA	—	44	—	NA	—	—	NA	71	—	—	—	—	—	NA	—
MD50-10-8715	50-603061	25–25	—	—	NA	—	—	—	NA	—	—	NA	280	—	—	—	—	—	NA	—
MD50-10-8716	50-603061	76–76	—	—	NA	—	—	—	NA	36	—	NA	820	—	—	970	—	—	NA	—
MD50-10-8717	50-603061	128–128	—	140	NA	—	—	—	NA	—	—	NA	7.4	—	—	28	—	—	NA	29
MD50-10-8718	50-603061	190–190	—	100	NA	—	43	—	NA	19	—	NA	86	—	—	590	4.3	—	NA	14

Table C-4.1-8 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanone[2-]	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol	Ethylbenzene
MD50-10-8719	50-603061	228–228	—	61	NA	—	46	—	NA	17	—	NA	100	—	—	550	—	—	NA	12
MD50-10-8720	50-603061	274–274	—	84	NA	—	49	—	NA	—	—	NA	90	—	—	300	—	—	NA	15
MD50-10-8721	50-603061	347–347	—	68	NA	—	32	—	NA	—	—	NA	64	—	—	82	—	—	NA	8.6
MD50-10-8722	50-603061	397–397	—	47	NA	—	38	—	NA	4	—	NA	73	—	—	52	—	—	NA	11
MD50-10-8724	50-603061	450–450	—	37	NA	—	14	—	NA	—	—	NA	42	—	—	14	—	—	NA	19
MD50-10-8727	50-603062	25–25	—	18	NA	—	—	—	NA	32	—	NA	32	—	—	—	—	—	NA	—
MD50-10-8728	50-603062	64–64	—	21	NA	—	—	—	NA	18	—	NA	31	—	—	—	—	—	NA	—
MD50-10-8729	50-603062	122–122	—	130	NA	—	—	—	NA	60	—	NA	150	—	—	—	—	—	NA	—
MD50-10-8730	50-603062	184–184	—	74	NA	—	14	—	NA	14	—	NA	56	—	—	—	—	—	NA	—
MD50-10-8731	50-603062	217–217	—	53	NA	—	—	—	NA	—	—	NA	120	—	—	—	—	—	NA	—
MD50-10-15366	50-603062	263–263	—	41	NA	—	9.8	—	NA	—	—	NA	39	—	—	—	—	—	NA	14
MD50-10-8733	50-603062	337–337	—	13	NA	—	—	—	NA	—	—	NA	3.5	—	—	—	—	—	NA	2
MD50-10-8734	50-603062	387–387	—	42	8.1 (J-)	—	15	—	—	—	7.8	3.2	68	—	—	—	—	—	31	6
MD50-10-8735	50-603062	450–450	—	95	NA	—	—	—	NA	—	—	NA	21	—	—	—	—	—	NA	64
MD50-10-8755	50-603063	25–25	—	3.2	—	—	20	—	21	21	—	—	120	5.5	—	12	—	—	—	—
MD50-10-8754	50-603063	76–76	—	41	—	—	74	—	58	130	—	—	240	33	—	100	14	—	—	—
MD50-10-8753	50-603063	128–128	—	19	—	—	55	—	45	110	—	—	190	27	—	85	12	—	—	—
MD50-10-8752	50-603063	190–190	—	83	—	—	150	—	110	190	—	—	280	—	—	120	44	—	51 (J)	—
MD50-10-8751	50-603063	228–228	—	45	—	—	120	—	—	150	—	—	200	—	—	81	36	—	—	—
MD50-10-8749	50-603063	274–274	—	110	21	—	140	—	—	110	—	—	200	—	—	39	31	—	190	—
MD50-10-8750	50-603063	347–347	—	18	—	—	54	—	—	42	—	—	93	—	—	9	10	—	—	—
MD50-10-8748	50-603063	397–397	—	32	NA	—	—	—	NA	35	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8747	50-603063	450–450	—	39	NA	—	—	—	NA	27	—	NA	48	—	—	—	—	—	NA	—
MD50-10-8759	50-603064	25–25	—	—	NA	—	41	—	NA	250	—	NA	100	—	—	91	25	—	NA	—
MD50-10-8760	50-603064	66–66	—	—	NA	—	62	—	NA	270	—	NA	170	—	—	230	43	—	NA	—
MD50-10-8761	50-603064	113–113	—	—	NA	—	—	—	NA	93	—	NA	71	—	—	65	22	—	NA	—
MD50-10-8762	50-603064	176–176	—	—	NA	—	—	—	NA	470	—	NA	430	—	—	430	190	—	NA	—
MD50-10-8763	50-603064	214–214	—	—	NA	—	—	—	NA	200	—	NA	220	—	—	190	—	—	NA	—
MD50-10-8764	50-603064	259–259	—	—	NA	—	—	—	NA	110	—	NA	180	—	—	110	—	—	NA	—
MD50-10-8765	50-603064	332–332	—	—	NA	—	170	—	NA	—	—	NA	390	—	—	99	—	—	NA	—
MD50-10-8766	50-603064	400–400	—	—	NA	—	67	—	NA	—	—	NA	140	—	—	—	—	—	NA	—
MD50-10-8767	50-603064	500–500	4.4	39	NA	—	16	—	NA	—	—	NA	55	—	—	—	—	—	NA	8.8
MD50-10-8771	50-603383	26–26	—	9.2	NA	—	—	—	NA	8.3	—	NA	16	—	—	—	—	5.4	NA	—
MD50-10-8772	50-603383	85–85	—	—	NA	—	84	—	NA	43	—	NA	140	—	—	—	—	47	NA	—

Table C-4.1-8 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanone[2-]	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol	Ethylbenzene
MD50-10-8773	50-603383	139–139	—	—	NA	—	82	—	NA	120	—	NA	150	—	—	36	31	200	NA	—
MD50-10-8774	50-603383	206–206	—	—	NA	—	84	—	NA	50	—	NA	110	—	—	—	—	120	NA	—
MD50-10-8775	50-603383	244–244	—	—	NA	—	100	—	NA	42	—	NA	90	—	—	—	22	110	NA	—
MD50-10-8776	50-603383	286–286	—	—	NA	—	40	—	NA	—	—	NA	—	—	—	—	—	41	NA	—
MD50-10-8777	50-603383	359–359	8.4	5.9	NA	—	4.5	1.6	NA	—	—	NA	4.9	—	—	—	—	1.4	NA	3.1
MD50-10-8778	50-603383	408–408	8.8	86	NA	—	70	9	NA	—	—	NA	46	—	—	2.8	2.1	—	NA	15
MD50-10-8779	50-603383	450–450	5.8	16	NA	—	17	—	NA	—	—	NA	11	—	—	—	—	—	NA	2.3
MD50-10-8785	50-603467	26–26	—	11	NA	—	160 (J)	—	NA	170	—	NA	80	—	—	—	17	—	NA	—
MD50-10-8783	50-603467	91–91	—	—	NA	—	200	—	NA	250	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8784	50-603467	91–91	18	—	NA	—	120 (J)	—	NA	100	—	NA	47	—	—	—	14	—	NA	—
MD50-10-8786	50-603467	143–143	—	—	NA	—	480	—	NA	410	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8787	50-603467	206–206	—	—	NA	—	180	—	NA	170	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8788	50-603467	244–244	—	—	NA	—	310	—	NA	120	—	NA	100	—	—	—	—	—	NA	—
MD50-10-8793	50-603467	287–287	—	—	NA	—	200	—	NA	140	—	NA	110	—	—	—	60	—	NA	—
MD50-10-8790	50-603467	360–360	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8789	50-603467	409–409	—	—	NA	—	—	—	NA	—	—	NA	48	—	—	—	—	—	NA	—
MD50-10-8791	50-603467	500–500	—	76	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8852	50-603467	600–600	74	7.7	NA	110	22	—	NA	—	—	NA	25	—	—	—	—	—	NA	—
MD50-10-8795	50-603468	30–30	—	50	9	—	—	—	—	—	—	6	—	—	—	—	—	—	64	11
MD50-10-8796	50-603468	92–92	—	75	12	—	72	—	—	140	—	12	46	—	—	—	31	—	180	14
MD50-10-8797	50-603468	142–142	14	56	10	6	18	—	—	55	—	12	16	—	—	—	16	—	67	10
MD50-10-8798	50-603468	198–198	—	100	20	—	110	—	—	150	—	—	100	—	—	—	56	—	51	20
MD50-10-8799	50-603468	233–233	—	30	—	—	140	—	—	180	—	—	170	—	—	—	66	—	—	—
MD50-10-8800	50-603468	282–282	—	—	—	—	100	—	—	98	—	—	110	—	—	—	37	—	27	—
MD50-10-8801	50-603468	354–354	—	70	12	—	120	—	—	100	—	—	150	—	—	—	40	—	63	—
MD50-10-8802	50-603468	403–403	—	—	—	—	270	—	—	140	—	—	370	—	—	—	64	—	—	—
MD50-10-8803	50-603468	403–403	—	—	—	—	76	—	—	26	—	—	110	—	—	—	11	—	21	—
MD50-10-8804	50-603468	450–450	—	39	NA	—	81	—	NA	75	—	NA	—	—	—	—	29	—	NA	—
MD50-10-8807	50-603470	30–30	—	—	NA	—	—	—	NA	520	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8809	50-603470	83–83	—	—	NA	—	—	—	NA	990	—	NA	400 (J)	—	—	—	—	—	NA	—
MD50-10-8811	50-603470	143–143	—	—	NA	—	—	—	NA	1400	—	NA	670 (J)	—	—	—	—	—	NA	—
MD50-10-8810	50-603470	203–203	—	—	NA	—	—	—	NA	990	—	NA	810 (J)	—	—	—	—	—	NA	—
MD50-10-8813	50-603470	233–233	—	—	NA	—	—	—	NA	1200	—	NA	950	—	—	—	—	—	NA	—
MD50-10-8808	50-603470	278–278	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—

Table C-4.1-8 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butadiene[1,3-]	Butanone[2-]	Carbon Tetrachloride	Chlorobenzene	Chlorodifluoromethane	Chloroform	Chloromethane	Cyclohexane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol	Ethylbenzene
MD50-10-8814	50-603470	351–351	—	—	NA	—	—	—	NA	—	—	NA	230	—	—	—	—	—	NA	—
MD50-10-8816	50-603470	450–450	—	—	NA	—	180	—	NA	49	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8815	50-603470	600–600	8.8 (J)	—	NA	—	65	—	NA	—	—	NA	160	—	—	—	—	—	NA	—
MD50-10-8812	50-603470	650–650	7.1 (J)	1.6	NA	—	6.2	—	NA	—	—	NA	34	—	—	—	—	—	NA	—
MD50-10-8826	50-603471	30–30	—	—	NA	—	1400	—	NA	1800	—	NA	260	—	64	—	150	—	NA	—
MD50-10-8822	50-603471	90–90	—	—	NA	—	1100 (J)	—	NA	2100	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8823	50-603471	146–146	—	—	NA	—	—	—	NA	2300	—	NA	670 (J)	—	—	—	470	—	NA	—
MD50-10-8825	50-603471	209–209	—	—	NA	—	—	—	NA	1700	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8819	50-603471	242–242	—	—	NA	—	—	—	NA	1600	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8821	50-603471	288–288	—	—	NA	—	—	—	NA	1000	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8827	50-603471	360–360	—	—	NA	—	—	—	NA	640	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8824	50-603471	410–410	—	—	NA	—	—	—	NA	530	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8820	50-603471	450–450	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8834	50-603472	27–27	—	—	NA	—	—	—	NA	380	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8833	50-603472	93–93	—	—	NA	—	—	—	NA	340	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8837	50-603472	93–93	—	—	NA	—	—	—	NA	460	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8838	50-603472	146–146	—	—	NA	—	—	—	NA	570	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8831	50-603472	210–210	—	—	NA	—	—	—	NA	440	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8835	50-603472	247–247	—	—	NA	—	—	—	NA	210	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8840	50-603472	292–292	—	—	NA	—	—	—	NA	430	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8839	50-603472	364–364	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8836	50-603472	414–414	—	—	NA	—	—	—	NA	—	—	NA	—	—	—	—	—	—	NA	—
MD50-10-8832	50-603472	450–450	—	—	NA	—	—	—	NA	—	—	NA	280 (J)	—	—	—	—	—	NA	—
MD50-10-8843	50-603503	25–25	—	—	NA	—	81	—	NA	76	—	NA	53	—	—	—	12	16	NA	—
MD50-10-8844	50-603503	80–80	—	—	NA	—	57	—	NA	78	—	NA	32	—	—	—	9.6	17	NA	—
MD50-10-8845	50-603503	133–133	100	15	NA	66	32	—	NA	42	—	NA	22	—	—	—	7.1	8.1	NA	19
MD50-10-8846	50-603503	198–198	9.3	3.1	NA	—	24	—	NA	29	—	NA	18	—	—	—	5.6	9.2	NA	—
MD50-10-8847	50-603503	237–237	—	—	NA	—	55	—	NA	47	—	NA	32	—	—	—	11	10	NA	—
MD50-10-8848	50-603503	278–278	—	—	NA	—	84	—	NA	65	—	NA	49	—	—	—	14	12	NA	—
MD50-10-8849	50-603503	347–347	14 (J)	—	NA	—	16 (J)	—	NA	14	—	NA	14	—	—	—	2.4	2.6	NA	—
MD50-10-8850	50-603503	397–397	18 (J)	14	NA	—	2.7 (J)	—	NA	—	—	NA	4.1	—	—	—	—	—	NA	1.4
MD50-10-8851	50-603503	450–450	—	—	NA	—	46 (J)	—	NA	6.6	—	NA	28	—	—	—	—	—	NA	—

Table C-4.1-8 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-8677	50-24784	25–25	—	NA	—	—	NA	NA	—	1600	—	49	62	1100	—	—	—	—	—	—
MD50-10-8680	50-24784	96–96	—	NA	—	—	NA	NA	—	4000	—	170	93	3700	—	—	—	—	—	—
MD50-10-8681	50-24784	155–155	—	NA	—	20	NA	NA	—	3000	—	160	70	3800	—	—	—	—	—	—
MD50-10-8679	50-24784	215–215	—	NA	—	54	NA	NA	—	3000	—	110	—	5200	—	—	—	—	—	—
MD50-10-8685	50-24784	244–244	—	NA	—	48	NA	NA	—	4600	—	170	85	6800	—	—	—	—	—	—
MD50-10-8683	50-24784	289–289	—	NA	—	26	NA	NA	—	3300	—	110	49	4000	—	—	—	—	—	—
MD50-10-8684	50-24784	362–362	—	NA	—	—	NA	NA	—	2000	—	—	—	4300	—	—	—	—	—	—
MD50-10-8682	50-24784	411–411	—	NA	—	—	NA	NA	—	590	—	—	—	1400	—	—	—	—	—	—
MD50-10-8678	50-24784	450–450	—	NA	—	—	NA	NA	—	430	11	—	—	1000	13	—	—	—	—	—
MD50-10-8697	50-24813	25–25	—	NA	—	—	NA	NA	—	350	—	—	—	13000	—	—	—	—	—	—
MD50-10-8696	50-24813	99–99	—	NA	—	—	NA	NA	—	—	—	—	—	31000	—	—	—	—	—	—
MD50-10-8693	50-24813	150–150	—	NA	—	620	NA	NA	—	—	—	—	—	44000	—	—	—	—	—	—
MD50-10-8702	50-24813	207–207	—	NA	—	1100	NA	NA	—	—	—	—	—	67000	—	—	—	—	—	—
MD50-10-8699	50-24813	241–241	—	NA	—	1300	NA	NA	—	—	—	—	—	67000	—	—	—	—	—	—
MD50-10-8694	50-24813	286–286	—	NA	—	1200 (J)	NA	NA	—	720	—	—	—	62000	—	—	—	—	—	—
MD50-10-8700	50-24813	358–358	—	NA	—	270	NA	NA	—	—	—	—	—	19000	—	—	—	—	—	—
MD50-10-8695	50-24813	408–408	—	NA	—	350	NA	NA	—	—	—	—	—	35000	—	—	—	—	—	—
MD50-10-8701	50-24813	450–450	—	NA	—	82	NA	NA	—	—	—	—	—	6000	—	—	—	—	—	—
MD50-10-8698	50-24813	600–600	—	NA	—	—	NA	NA	—	—	—	—	—	430	—	—	—	—	—	—
MD50-10-8703	50-24822	25–25	—	NA	—	—	NA	NA	—	—	—	—	—	4100	—	—	—	—	—	—
MD50-10-8704	50-24822	81–81	—	NA	—	—	NA	NA	—	—	—	—	—	12000	—	—	—	—	—	—
MD50-10-8705	50-24822	142–142	—	NA	—	310	NA	NA	—	—	—	—	—	29000	—	—	—	—	—	—
MD50-10-8706	50-24822	204–204	—	NA	—	—	NA	NA	—	—	—	—	—	17000	—	—	—	—	—	—
MD50-10-8707	50-24822	235–235	—	NA	—	400	NA	NA	—	—	—	—	—	27000	—	—	—	—	—	—
MD50-10-8708	50-24822	280–280	—	NA	—	360	NA	NA	—	—	—	—	—	30000	—	—	—	—	—	—
MD50-10-8709	50-24822	351–351	—	NA	—	—	NA	NA	—	—	—	—	—	5700	—	—	—	—	—	—
MD50-10-8710	50-24822	402–402	—	NA	—	—	NA	NA	—	—	—	—	—	11000	—	—	—	—	—	—
MD50-10-8711	50-24822	450–450	—	NA	—	—	NA	NA	—	—	—	—	—	2400	—	—	—	—	—	—
MD50-10-8715	50-603061	25–25	—	NA	—	—	NA	NA	—	—	—	6000	830	160	—	—	—	—	—	—
MD50-10-8716	50-603061	76–76	—	NA	—	—	NA	NA	—	220	—	29000	4400	1800	—	—	—	—	—	—
MD50-10-8717	50-603061	128–128	16	NA	—	—	NA	NA	8.1	—	250	400	92	42	—	18	5.6	120	29	90
MD50-10-8718	50-603061	190–190	—	NA	—	35	NA	NA	—	83	130	13000	3200	2100	—	—	—	63	15	47
MD50-10-8719	50-603061	228–228	—	NA	—	30	NA	NA	—	78	93	13000	3800	3300	—	—	—	50	12	38
MD50-10-8720	50-603061	274–274	—	NA	—	—	NA	NA	—	55	—	6500	880	1100	—	—	—	63	15	49

Table C-4.1-8 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-8721	50-603061	347–347	—	NA	—	—	NA	NA	—	24	—	4700	150	470	—	—	—	36	8.9	27
MD50-10-8722	50-603061	397–397	10	NA	—	—	NA	NA	6.2	26	—	1600	74	610	8.5	13	—	52	14	38
MD50-10-8724	50-603061	450–450	12	NA	—	—	NA	NA	3	7.7	—	500	13	180	4.6	12	4.3	71	19	52
MD50-10-8727	50-603062	25–25	—	NA	—	—	NA	NA	—	—	24	130	26	1700	—	—	—	—	—	—
MD50-10-8728	50-603062	64–64	—	NA	—	—	NA	NA	—	—	33	83	19	890	—	—	—	13	—	13
MD50-10-8729	50-603062	122–122	—	NA	—	—	NA	NA	—	—	200	340	45	2700	—	—	—	81	—	81
MD50-10-8730	50-603062	184–184	—	NA	—	—	NA	NA	—	—	46	110	13	1800	—	—	—	27	7.1	20
MD50-10-8731	50-603062	217–217	—	NA	—	—	NA	NA	—	—	81	210	—	2300	—	—	—	—	—	—
MD50-10-15366	50-603062	263–263	—	NA	—	—	NA	NA	—	—	90	44	—	970	—	—	—	57	14	43
MD50-10-8733	50-603062	337–337	—	NA	—	—	NA	NA	—	—	—	—	—	14	—	—	—	9.8	2.5	7.3
MD50-10-8734	50-603062	387–387	4.8	8.4	—	—	—	38	—	—	57	24	—	680	—	5.2	—	NA	7	22
MD50-10-8735	50-603062	450–450	56	NA	—	—	NA	NA	—	—	320	—	—	140	—	57	18	250	66	180
MD50-10-8755	50-603063	25–25	—	—	—	—	—	—	—	200	5.4	1500	210	1000	10	—	—	NA	—	—
MD50-10-8754	50-603063	76–76	—	—	—	—	—	49	—	510	58	3400	530	4200	21	—	—	NA	—	20
MD50-10-8753	50-603063	128–128	—	—	—	—	—	21	—	430	25	2800	440	3500	17	—	—	NA	—	—
MD50-10-8752	50-603063	190–190	—	—	—	37	—	68	—	760	120	2500	360	9400	—	—	—	NA	—	39
MD50-10-8751	50-603063	228–228	—	—	—	46	—	—	—	510	65	1600	200	7400	—	—	—	NA	—	—
MD50-10-8749	50-603063	274–274	—	—	—	56	—	100	—	490	130	730	75	7400	—	—	—	NA	—	46
MD50-10-8750	50-603063	347–347	—	—	—	26	—	—	—	260	31	380	—	2900	—	—	—	NA	—	13
MD50-10-8748	50-603063	397–397	—	NA	—	30	NA	NA	—	88	45	53	—	2400	—	—	—	—	—	—
MD50-10-8747	50-603063	450–450	—	NA	—	—	NA	NA	—	59	51	—	—	1700	—	—	—	—	—	—
MD50-10-8759	50-603064	25–25	—	NA	—	—	NA	NA	—	190	—	4600	870	4600	—	—	—	—	—	—
MD50-10-8760	50-603064	66–66	—	NA	—	—	NA	NA	—	220	—	9200	1200	5100	—	—	—	—	—	—
MD50-10-8761	50-603064	113–113	—	NA	—	—	NA	NA	—	—	48	1700	290	2900	—	—	—	—	—	—
MD50-10-8762	50-603064	176–176	—	NA	—	300 (J)	NA	NA	—	310	—	9100	1800	20000	—	—	—	—	—	—
MD50-10-8763	50-603064	214–214	—	NA	—	150 (J)	NA	NA	—	180	—	4500	800	11000	—	—	—	—	—	—
MD50-10-8764	50-603064	259–259	—	NA	—	93 (J)	NA	NA	—	130	—	2600	330	8200	—	—	—	—	—	—
MD50-10-8765	50-603064	332–332	—	NA	—	76 (J)	NA	NA	—	130	—	3000	150	8600	—	—	—	—	—	—
MD50-10-8766	50-603064	400–400	—	NA	—	—	NA	NA	—	—	25	490	—	3600	—	—	—	—	—	—
MD50-10-8767	50-603064	500–500	5.6 (J+)	NA	—	—	NA	NA	2.8	4.9	65	30	—	290	5.8	5.6	—	35	8.5	27
MD50-10-8771	50-603383	26–26	—	NA	—	—	NA	NA	—	68	—	69	15	180	—	—	—	—	—	—
MD50-10-8772	50-603383	85–85	—	NA	—	27	NA	NA	—	360	—	620	120	1200	—	—	—	—	—	—
MD50-10-8773	50-603383	139–139	—	NA	—	44	NA	NA	—	850	—	920	180	3600	—	—	—	—	—	—
MD50-10-8774	50-603383	206–206	—	NA	—	28	NA	NA	—	490	33	340	75	2100	—	—	—	—	—	—

Table C-4.1-8 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-8775	50-603383	244–244	—	NA	—	29	NA	NA	—	490	32	230	61	2200	—	—	—	—	—	—
MD50-10-8776	50-603383	286–286	—	NA	—	19	NA	NA	—	220	—	83	—	1100	—	—	—	—	—	—
MD50-10-8777	50-603383	359–359	2.8	NA	—	—	NA	NA	—	12	18	—	—	80	—	3.6	—	15	4.1	11
MD50-10-8778	50-603383	408–408	11	NA	—	—	NA	NA	10	90	140	21	5.2	520	5.8	12	—	74	19	55
MD50-10-8779	50-603383	450–450	—	NA	—	—	NA	NA	—	20	22	4.9	—	110	—	—	—	11	2.6	8
MD50-10-8785	50-603467	26–26	—	NA	—	18	NA	NA	—	110	14	—	—	3500	—	—	—	—	—	—
MD50-10-8783	50-603467	91–91	—	NA	—	—	NA	NA	—	160	—	—	—	4900	—	—	—	—	—	—
MD50-10-8784	50-603467	91–91	—	NA	—	22	NA	NA	—	61	—	—	—	3200	—	—	—	—	—	—
MD50-10-8786	50-603467	143–143	—	NA	—	—	NA	NA	—	320	—	—	—	12000	—	—	—	—	—	—
MD50-10-8787	50-603467	206–206	—	NA	—	150	NA	NA	—	190	—	—	—	7700	—	—	—	—	—	—
MD50-10-8788	50-603467	244–244	—	NA	—	200	NA	NA	—	200	—	—	—	8000	—	—	—	—	—	—
MD50-10-8793	50-603467	287–287	—	NA	—	220	NA	NA	—	190	—	—	—	7900	—	—	—	—	—	—
MD50-10-8790	50-603467	360–360	—	NA	—	200	NA	NA	—	310	—	—	—	12000	—	—	—	—	—	—
MD50-10-8789	50-603467	409–409	—	NA	—	36	NA	NA	—	41	31	—	—	1900	—	—	—	—	—	—
MD50-10-8791	50-603467	500–500	—	NA	—	25	NA	NA	—	—	100	—	—	1000	—	—	—	42	—	42
MD50-10-8852	50-603467	600–600	—	NA	250	—	NA	NA	—	16	22	—	—	530	—	—	—	21	5.7	15
MD50-10-8795	50-603468	30–30	9.8	16	—	—	4.8	43	5.5	—	75	—	—	28	—	12	—	NA	12	38
MD50-10-8796	50-603468	92–92	13	38	—	18	9.6	68	—	60	110	—	—	2900	—	16	—	NA	16	50
MD50-10-8797	50-603468	142–142	8.1	37	—	23	7.7	56	3.9	31	76	—	—	1500	—	8.4	—	NA	10	32
MD50-10-8798	50-603468	198–198	—	17	—	130	—	96	—	100	140	—	—	6400	—	—	—	NA	20	62
MD50-10-8799	50-603468	233–233	—	—	—	160	—	34	—	120	42	—	—	7600	—	—	—	NA	—	—
MD50-10-8800	50-603468	282–282	—	—	—	94	—	—	—	80	—	—	—	5600	—	—	—	NA	—	—
MD50-10-8801	50-603468	354–354	—	20	—	100	—	62	—	120	96	—	—	7600	—	—	—	NA	—	42
MD50-10-8802	50-603468	403–403	—	—	—	150	—	—	—	240	—	—	—	16000	—	—	—	NA	—	—
MD50-10-8803	50-603468	403–403	—	—	—	24	—	—	—	60	—	—	—	4000	—	—	—	NA	—	—
MD50-10-8804	50-603468	450–450	—	NA	—	92	NA	NA	—	86	81	—	—	6700	—	—	—	—	—	—
MD50-10-8807	50-603470	30–30	—	NA	—	—	NA	NA	—	500	—	200	—	9700	—	—	—	—	—	—
MD50-10-8809	50-603470	83–83	—	NA	—	—	NA	NA	—	750	—	—	—	19000	—	—	—	—	—	—
MD50-10-8811	50-603470	143–143	—	NA	—	410	NA	NA	—	670	—	—	—	35000	—	—	—	—	—	—
MD50-10-8810	50-603470	203–203	—	NA	—	630	NA	NA	—	—	—	—	—	48000	—	—	—	—	—	—
MD50-10-8813	50-603470	233–233	—	NA	—	800	NA	NA	—	—	—	—	—	49000	—	—	—	—	—	—
MD50-10-8808	50-603470	278–278	—	NA	—	760	NA	NA	—	—	—	—	—	52000	—	—	—	—	—	—
MD50-10-8814	50-603470	351–351	—	NA	—	130	NA	NA	—	—	—	—	—	10000	—	—	—	—	—	—
MD50-10-8816	50-603470	450–450	—	NA	—	70 (J)	NA	NA	—	82	—	80	—	11000	—	—	—	—	—	—

Table C-4.1-8 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexane	Hexanone[2-]	Methylene Chloride	n-Heptane	Propylene	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-8815	50-603470	600–600	—	NA	—	—	NA	NA	—	—	—	—	—	1200	11	—	—	—	—	—
MD50-10-8812	50-603470	650–650	—	NA	—	—	NA	NA	—	—	3.1	—	—	14	2.6	—	—	—	—	—
MD50-10-8826	50-603471	30–30	—	NA	—	110 (J)	NA	NA	—	650	—	210	43	18000	—	—	—	—	—	—
MD50-10-8822	50-603471	90–90	—	NA	—	470	NA	NA	—	1100	—	—	—	27000	—	—	—	—	—	—
MD50-10-8823	50-603471	146–146	—	NA	—	1600	NA	NA	—	1100	—	—	—	47000	—	—	—	—	—	—
MD50-10-8825	50-603471	209–209	—	NA	—	1400	NA	NA	—	1000	—	—	—	41000	—	—	—	—	—	—
MD50-10-8819	50-603471	242–242	—	NA	—	2500	NA	NA	—	—	—	—	—	62000	—	—	—	—	—	—
MD50-10-8821	50-603471	288–288	—	NA	—	1700	NA	NA	—	—	—	—	—	48000	—	—	—	—	—	—
MD50-10-8827	50-603471	360–360	—	NA	—	1000	NA	NA	—	980	—	—	—	45000	—	—	—	—	—	—
MD50-10-8824	50-603471	410–410	—	NA	—	650	NA	NA	—	840	—	—	—	36000	—	—	—	—	—	—
MD50-10-8820	50-603471	450–450	—	NA	—	640	NA	NA	—	—	—	—	—	30000	—	—	—	—	—	—
MD50-10-8834	50-603472	27–27	—	NA	—	—	NA	NA	—	730	—	—	63	4800	—	—	—	—	—	—
MD50-10-8833	50-603472	93–93	—	NA	—	450	NA	NA	—	750	—	—	—	15000	—	—	—	—	—	—
MD50-10-8837	50-603472	93–93	—	NA	—	80	NA	NA	—	730	—	—	—	7400	—	—	—	—	—	—
MD50-10-8838	50-603472	146–146	—	NA	—	360	NA	NA	—	870	—	—	—	13000	—	—	—	—	—	—
MD50-10-8831	50-603472	210–210	—	NA	—	560	NA	NA	—	1100	—	—	—	20000	—	—	—	—	—	—
MD50-10-8835	50-603472	247–247	—	NA	—	310	NA	NA	—	570	—	—	—	12000	—	—	—	—	—	—
MD50-10-8840	50-603472	292–292	—	NA	—	830	NA	NA	—	1600	—	—	—	35000	—	—	—	—	—	—
MD50-10-8839	50-603472	364–364	—	NA	—	190	NA	NA	—	790	—	—	—	17000	—	—	—	—	—	—
MD50-10-8836	50-603472	414–414	—	NA	—	—	NA	NA	—	760	—	—	—	17000	—	—	—	—	—	—
MD50-10-8832	50-603472	450–450	—	NA	—	80	NA	NA	—	560	—	—	—	12000	—	—	—	—	—	—
MD50-10-8843	50-603503	25–25	—	NA	—	27	NA	NA	—	290	7.3	49	13	2800	—	—	—	—	—	—
MD50-10-8844	50-603503	80–80	—	NA	—	18	NA	NA	—	250	—	50	14	2000	—	—	—	—	—	—
MD50-10-8845	50-603503	133–133	13	NA	—	14	NA	NA	—	95	100	24	5.8	990	—	12	—	71	17	53
MD50-10-8846	50-603503	198–198	—	NA	—	18	NA	NA	—	110	4.6	15	4.5	1000	—	—	—	—	—	—
MD50-10-8847	50-603503	237–237	—	NA	—	42	NA	NA	—	160	—	27	8.7	2000	—	—	—	—	—	—
MD50-10-8848	50-603503	278–278	—	NA	—	65	NA	NA	—	290	—	—	—	3200	—	—	—	—	—	—
MD50-10-8849	50-603503	347–347	—	NA	—	8.2	NA	NA	—	65	—	7.7	2.1	530	2.3	—	—	—	—	—
MD50-10-8850	50-603503	397–397	—	NA	—	—	NA	NA	—	5.8	18	—	—	70	—	—	—	8.4	1.9	6.5
MD50-10-8851	50-603503	450–450	—	NA	—	6.6	NA	NA	—	90	4.9	—	—	910	—	—	—	—	—	—

Note: Results are in µg/m^3. Data qualifiers are defined in Appendix A.

[a] — = Not detected.

[b] NA = Not analyzed.

Table C-4.1-9
VOCs Detected in Vapor Samples at MDA C during April 2010–July 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]
MD50-10-15742	50-24784	25–25	—*	—	—	—	49	—	340	—	—	—	—	—	—	—	—	—	3100	—	—	81	1300	—	—
MD50-10-15745	50-24784	96–96	—	—	—	—	120 (J)	—	480	—	—	—	—	—	—	61	—	17	2700	—	120	60	2500	—	—
MD50-10-15747	50-24784	155–155	—	—	—	—	190 (J)	—	180	—	—	75	—	—	—	—	—	76	1800	—	110	—	2600	—	—
MD50-10-15744	50-24784	215–215	—	—	—	—	730 (J)	—	140	—	—	140	—	—	—	—	—	—	2600	—	130	—	4700	—	—
MD50-10-15741	50-24784	244–244	—	—	—	—	580 (J)	—	120	—	—	140	—	—	—	—	—	46	2400	—	110	—	4300	—	—
MD50-10-15748	50-24784	289–289	—	—	—	—	910 (J)	—	79	—	—	170	—	—	—	—	—	42	2500	—	93	—	4500	—	—
MD50-10-15743	50-24784	362–362	—	—	—	—	650	—	—	—	—	210	—	—	—	—	—	—	1900	—	—	—	3900	—	—
MD50-10-15746	50-24784	411–411	—	—	—	—	430	—	—	—	—	150	—	—	—	—	—	—	730	—	—	—	1600	—	—
MD50-10-15740	50-24784	450–450	—	44	—	—	400	—	—	—	—	170	—	—	—	—	—	—	570	54	—	—	1200	—	—
MD50-10-15902	50-24813	25–25	—	—	—	—	1700 (J)	—	960	—	—	370 (J-)	—	—	—	—	—	—	470	—	—	—	12000	—	—
MD50-10-15906	50-24813	99–99	—	—	—	—	2100 (J)	—	2600	—	—	790 (J-)	—	—	400	—	—	—	690	—	—	—	32000	—	—
MD50-10-15903	50-24813	150–150	—	—	—	—	890 (J)	—	2200	—	—	690 (J-)	—	—	460	—	—	620	640	—	—	—	37000	—	—
MD50-10-15907	50-24813	207–207	—	—	—	—	—	—	1700	—	—	980 (J-)	—	—	450	—	—	1100	—	—	—	—	50000	—	—
MD50-10-15904	50-24813	241–241	—	—	—	—	—	—	1900	—	—	1400 (J-)	—	—	660	—	—	1900	960 (J)	—	—	—	70000	—	—
MD50-10-15909	50-24813	286–286	—	—	—	—	—	—	—	—	—	740 (J-)	—	—	—	—	—	420	—	—	—	—	33000	—	—
MD50-10-15905	50-24813	358–358	—	—	—	—	—	—	—	—	—	900 (J-)	—	—	—	—	—	560	—	—	—	—	46000	—	—
MD50-10-15910	50-24813	408–408	—	—	—	—	—	—	1200	—	—	1200 (J-)	—	—	—	—	—	1200	—	—	—	—	60000	—	—
MD50-10-15908	50-24813	450–450	—	—	—	—	—	—	—	—	—	560 (J-)	—	—	—	—	—	180	—	—	—	—	23000	—	—
MD50-10-15911	50-24813	600–600	—	—	—	—	130 (J)	—	—	—	—	230 (J-)	—	—	—	—	—	—	30	—	—	—	2400	—	—
MD50-10-15848	50-24822	25–25	—	—	—	—	—	—	350	—	—	480	—	—	—	—	—	260	—	—	—	—	32000	—	—
MD50-10-15854	50-24822	81–81	—	—	—	—	170 (J)	—	350	—	—	180	—	—	—	—	—	—	—	—	—	—	11000	—	—
MD50-10-15850	50-24822	142–142	—	—	—	—	—	—	260	—	—	240	—	—	—	—	—	100	—	240	—	—	14000	—	—
MD50-10-15856	50-24822	204–204	—	—	—	—	—	—	470	—	—	540	—	—	—	—	—	270	—	—	—	—	33000	—	—
MD50-10-15849	50-24822	235–235	—	—	—	—	—	—	180	—	—	—	—	—	—	—	—	—	—	—	—	—	6000	—	—
MD50-10-15855	50-24822	280–280	—	—	—	—	—	—	—	—	—	470	—	—	—	—	—	230	—	—	—	—	27000	—	—
MD50-10-15852	50-24822	351–351	—	—	—	—	270 (J)	—	—	—	—	360	—	—	—	—	—	—	—	—	—	—	17000	—	—
MD50-10-15851	50-24822	402–402	—	—	—	—	330 (J)	—	—	—	—	300	—	—	—	—	—	—	690	—	—	—	14000	—	—
MD50-10-15853	50-24822	450–450	—	—	—	—	210 (J)	—	—	—	—	290	—	—	—	—	—	—	—	—	—	—	10000	—	—
MD50-10-15840	50-603061	25–25	—	—	—	—	—	—	—	—	—	—	—	120	—	—	—	36	49	—	9800	1400	250	—	—
MD50-10-15837	50-603061	76–76	—	—	—	—	90 (J)	—	44	—	—	460	—	770	—	—	—	—	240	—	22000	4100	1900	—	—
MD50-10-15841	50-603061	128–128	—	—	—	—	—	—	—	—	—	—	—	1300	—	—	—	—	—	—	30000	6400	2400	—	—

Table C-4.1-9 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]
MD50-10-15843	50-603061	190–190	—	—	—	—	—	—	—	—	—	—	—	640	—	—	—	—	—	—	14000	2600	1800	—	—
MD50-10-15839	50-603061	228–228	—	—	—	—	170 (J)	—	31	—	—	190	—	1100	—	—	—	55	190	—	21000	3700	2800	—	—
MD50-10-15844	50-603061	274–274	—	—	—	—	—	—	—	—	—	—	—	520	—	—	—	—	—	—	15000	1700	2100	—	—
MD50-10-15842	50-603061	347–347	—	—	—	—	110 (J)	—	—	—	—	150	—	160	—	—	—	—	—	—	6200	370	1100	—	—
MD50-10-15838	50-603061	397–397	—	—	—	54	98	—	—	—	—	110	—	120	—	—	—	—	61	—	4000	190	1600	—	—
MD50-10-15836	50-603061	450–450	—	—	—	—	54	—	—	—	—	99	—	38	—	—	—	—	26	—	1400	41	500	—	—
MD50-10-15893	50-603062	25–25	—	—	—	—	—	—	47	—	—	75	—	—	—	—	—	—	—	18	200	51	1700	—	—
MD50-10-15894	50-603062	64–64	—	—	—	—	—	—	26	—	—	70	—	—	—	—	—	—	—	—	170	34	2100	—	—
MD50-10-15891	50-603062	122–122	—	—	—	—	—	—	—	—	—	76	—	—	—	—	—	42	—	—	220	—	3900	—	—
MD50-10-15896	50-603062	184–184	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	430	—	8300	—	—
MD50-10-15895	50-603062	217–217	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	460	—	8400	—	—
MD50-10-15890	50-603062	263–263	—	—	—	—	—	—	—	32 (J+)	—	130	—	—	—	—	—	—	—	—	210	—	4400	—	—
MD50-10-15898	50-603062	337–337	—	—	—	—	40	—	—	—	—	110	—	—	—	—	—	—	—	—	73	—	2400	—	—
MD50-10-15892	50-603062	387–387	—	—	—	—	32	—	—	—	—	77	—	—	—	—	—	—	—	—	37	—	1100	—	—
MD50-10-15897	50-603062	450–450	10	—	—	—	24	—	—	—	—	68	—	—	—	—	—	—	—	—	14	—	500	—	—
MD50-10-15827	50-603063	25–25	—	—	—	—	37	—	37	—	—	—	—	13	—	—	—	—	230	—	3100	400	1800	—	—
MD50-10-15832	50-603063	76–76	—	—	—	—	—	—	—	—	—	230 (J-)	—	150	—	—	—	—	710	—	5000	790	7200	—	—
MD50-10-15825	50-603063	128–128	—	—	—	—	140 (J)	—	150	—	—	—	—	—	—	—	—	—	450	—	1300	470	5700	—	—
MD50-10-15830	50-603063	190–190	—	—	—	—	320 (J)	—	300	—	—	330 (J-)	—	170	—	—	—	—	1000	—	4100	570	16000	—	—
MD50-10-15824	50-603063	228–228	—	—	—	—	290 (J)	—	300	—	—	330	—	160	—	—	—	120	980	—	3700	450	17000	—	—
MD50-10-15829	50-603063	274–274	—	—	—	—	480 (J)	—	280	—	—	—	—	—	—	—	—	—	1100	—	1700	—	20000	—	—
MD50-10-15833	50-603063	347–347	—	—	—	—	220 (J)	—	120	—	—	160 (J-)	—	—	—	—	—	92	380	—	910	—	8700	—	—
MD50-10-15826	50-603063	397–397	—	—	—	—	270 (J)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9300	—	—
MD50-10-15831	50-603063	450–450	—	—	—	—	250 (J)	—	140	—	—	—	—	—	—	—	—	—	260	—	—	—	8600	—	—
MD50-10-15816	50-603064	25–25	—	—	—	—	—	—	170	—	—	83	—	120	—	—	—	—	230	—	3400	680	3300	—	—
MD50-10-15817	50-603064	66–66	—	—	—	—	—	—	160	—	—	77	—	140	32	—	—	42	210	—	4000	790	3300	—	—
MD50-10-15814	50-603064	113–113	—	—	—	—	510 (J)	—	580	—	—	—	—	450	—	—	—	—	470	—	9500	1900	18000	—	—
MD50-10-15812	50-603064	176–176	—	—	—	—	—	—	700	—	—	—	—	650	—	—	—	530	580	—	18000	3000	45000	—	—
MD50-10-15819	50-603064	214–214	—	—	—	—	—	—	97	—	—	120	—	110	—	—	—	95	—	59	2300	360	5700	—	—
MD50-10-15820	50-603064	259–259	—	—	—	—	—	—	—	—	—	420	—	270	—	—	—	310	—	—	5700	620	17000	—	—
MD50-10-15813	50-603064	332–332	—	—	—	—	—	—	—	—	—	410	—	—	—	—	—	100	—	—	2700	130	9500	—	—
MD50-10-15818	50-603064	400–400	—	74	—	—	—	—	—	—	—	88	—	—	—	—	—	16	32	100	320	—	2000	—	—
MD50-10-15821	50-603064	500–500	19	—	—	—	79	—	—	—	—	150	—	—	—	—	—	—	18	—	100	—	1200	19	15

Table C-4.1-9 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]
MD50-10-15871	50-603383	26–26	—	—	—	—	58	—	40	—	—	100	—	—	—	18	—	—	380	—	500	110	1100	25	—
MD50-10-15866	50-603383	85–85	—	—	—	—	140 (J)	—	110	—	—	200	13	34	16	110	—	11	800	—	940	210	2200	29	—
MD50-10-15873	50-603383	139–139	—	—	—	—	210	—	230	—	—	180	30	57	46	430	—	45	1100	—	1500	320	4500	33	—
MD50-10-15867	50-603383	206–206	—	—	—	—	420 (J)	—	160	—	—	160	20	39	55	400	—	57	1300	—	700	210	4800	27	—
MD50-10-15874	50-603383	244–244	—	—	—	—	510	—	200	—	36	210	25	50	79	600	—	79	1400	—	830	260	6500	38	—
MD50-10-15869	50-603383	286–286	—	—	—	—	150 (J)	—	33	—	—	91	—	22	26	140	—	39	610	—	270	75	2700	—	—
MD50-10-15872	50-603383	359–359	—	—	4.4 (J-)	—	—	1.7 (J-)	—	—	—	2.3 (J-)	—	—	—	2 (J-)	—	—	4.3 (J-)	—	—	—	18 (J-)	—	—
MD50-10-15870	50-603383	408–408	—	—	—	—	320	—	—	—	—	120	—	8.4	—	8.9	—	12	300	—	66	20	1100	—	—
MD50-10-15875	50-603383	450–450	—	—	—	—	11	—	—	—	—	6.8	—	—	—	—	—	—	44	—	—	—	220	—	—
MD50-10-15805	50-603467	26–26	—	—	—	—	130 (J)	—	180	—	—	63 (J-)	—	—	28	—	—	40	93	—	—	—	2700	—	—
MD50-10-15801	50-603467	91–91	—	—	—	—	500 (J)	—	650	—	—	—	—	—	—	—	—	170	400	—	—	—	12000	—	—
MD50-10-15807	50-603467	143–143	—	—	—	—	—	—	460	—	—	—	—	—	—	—	—	210	380	—	—	—	12000	—	—
MD50-10-15809	50-603467	206–206	—	—	—	—	610 (J)	—	550	—	—	—	—	—	—	—	—	400	780	—	—	—	25000	—	—
MD50-10-15804	50-603467	244–244	—	—	—	—	—	—	590	—	—	—	—	—	—	—	—	740	—	—	—	—	24000	—	—
MD50-10-15808	50-603467	360–360	—	—	—	—	590 (J)	—	220	—	—	290 (J-)	—	—	—	—	—	270	580	—	—	—	19000	—	—
MD50-10-15802	50-603467	409–409	—	—	—	—	290 (J)	—	—	—	—	—	—	—	—	—	—	98	240	—	—	—	7600	—	—
MD50-10-15803	50-603467	500–500	—	—	—	—	200 (J)	—	—	—	—	—	—	—	—	—	—	—	170	—	—	—	5500	—	—
MD50-10-15806	50-603467	600–600	110	—	160	—	120 (J)	—	—	—	—	—	—	—	—	—	710	—	48	—	—	—	1500	—	—
MD50-10-15879	50-603468	92–92	—	—	—	—	150	—	300	—	—	—	—	—	—	—	—	—	—	—	—	—	9200	—	—
MD50-10-15882	50-603468	142–142	—	—	—	—	—	—	130	—	—	—	—	—	—	—	—	69	99	—	—	—	6400	—	—
MD50-10-15884	50-603468	198–198	—	—	—	—	—	—	330	—	—	—	—	—	—	—	—	370	—	—	—	—	18000	—	—
MD50-10-15878	50-603468	233–233	—	—	—	—	—	—	410	—	—	—	—	—	—	—	—	480	—	—	—	—	27000	—	—
MD50-10-15885	50-603468	282–282	—	—	—	—	—	—	300	—	—	—	—	—	—	—	—	330	—	—	—	—	23000	—	—
MD50-10-15881	50-603468	354–354	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	300	—	—	—	—	24000	—	—
MD50-10-15883	50-603468	403–403	—	—	—	—	—	—	—	—	—	370	—	—	—	—	—	210	—	—	—	—	19000	—	—
MD50-10-15880	50-603468	450–450	—	—	—	—	—	—	—	—	—	240	—	—	—	—	—	96	—	—	—	—	12000	—	—
MD50-10-15752	50-603470	30–30	—	—	—	—	—	—	730	—	—	—	—	—	—	—	—	—	730	—	—	—	12000	—	—
MD50-10-15760	50-603470	83–83	—	—	—	—	440 (J)	—	1100	—	—	330	—	—	130	—	—	—	740	—	290	—	18000	—	—
MD50-10-15753	50-603470	143–143	—	—	—	—	—	—	1400	—	—	—	—	—	—	—	—	—	670	—	—	—	32000	—	—
MD50-10-15761	50-603470	203–203	—	—	—	—	—	—	—	—	—	610	—	—	—	—	—	320	—	—	—	—	34000	—	—
MD50-10-15756	50-603470	233–233	—	—	—	—	—	—	1100	—	—	—	—	—	—	—	—	680	—	—	—	—	53000	—	—
MD50-10-15758	50-603470	278–278	—	—	—	—	—	—	920	—	—	890	—	—	—	—	—	760	—	—	—	—	61000	—	—
MD50-10-15754	50-603470	351–351	—	—	—	—	—	—	—	—	—	720	—	—	—	—	—	420	—	—	—	—	29000	—	—

Table C-4.1-9 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]
MD50-10-15757	50-603470	450–450	—	—	—	—	—	—	1000	—	—	—	—	—	—	—	—	640	—	—	—	—	47000	—	—
MD50-10-15755	50-603470	600–600	—	—	—	—	80 (J)	—	—	—	—	200	—	—	—	—	—	—	—	—	—	—	1400	—	—
MD50-10-15759	50-603470	650–650	—	—	—	—	37 (J)	—	—	—	—	100	—	—	—	—	—	—	—	—	—	—	—	8.5 (J)	—
MD50-10-15769	50-603471	90–90	—	—	—	—	1700 (J)	—	1800	—	—	330	—	—	240	—	—	300	1000	—	—	—	17000	—	—
MD50-10-15768	50-603471	146–146	—	—	—	—	—	—	1700	—	—	—	—	—	330	—	—	960	850	—	—	—	27000	—	—
MD50-10-15766	50-603471	209–209	—	—	—	—	—	—	1800	—	—	—	—	—	—	—	—	1600	1300	—	—	—	44000	—	—
MD50-10-15771	50-603471	242–242	—	—	—	—	—	—	1600	—	—	—	—	—	650	—	—	2000	1200	—	—	—	50000	—	—
MD50-10-15765	50-603471	288–288	—	—	—	—	—	—	1700	—	—	—	—	—	—	—	—	2200	1300	—	—	—	58000	—	—
MD50-10-15772	50-603471	360–360	—	—	—	—	—	—	710	—	—	720	—	—	—	—	—	1000	960	—	—	—	43000	—	—
MD50-10-15764	50-603471	410–410	—	—	—	—	—	—	770	—	—	—	—	—	—	—	—	1100	930	—	—	—	40000	—	—
MD50-10-15770	50-603471	450–450	—	—	—	—	—	—	1000	—	—	—	—	—	—	—	—	650	830	—	—	—	42000	—	—
MD50-10-15779	50-603472	27–27	—	—	—	—	—	—	390	—	—	—	—	—	—	—	—	—	670	—	—	67	4400	—	—
MD50-10-15782	50-603472	93–93	—	—	—	—	—	—	420	—	—	—	—	—	—	—	—	51	620	—	—	—	6000	—	—
MD50-10-15780	50-603472	146–146	—	—	—	—	—	—	360	—	—	—	—	—	—	—	—	200	460	—	—	—	7700	—	—
MD50-10-15783	50-603472	210–210	—	—	—	—	200 (J)	—	400	—	—	—	—	—	—	—	—	410	790	—	—	—	15000	—	—
MD50-10-15776	50-603472	247–247	—	—	—	—	—	—	240	—	—	—	—	—	—	—	—	320	570	—	—	—	9400	—	—
MD50-10-15778	50-603472	292–292	—	—	—	—	—	—	580	—	—	—	—	—	—	—	—	780	2000	—	—	—	39000	—	—
MD50-10-15777	50-603472	364–364	—	—	—	—	—	—	—	—	—	380	—	—	—	—	—	360	1200	—	—	—	20000	—	—
MD50-10-15781	50-603472	414–414	—	—	—	—	400 (J)	—	—	—	—	—	—	—	—	—	—	190	750	—	—	—	17000	—	—
MD50-10-15784	50-603472	450–450	—	—	—	—	430 (J)	—	—	—	—	260	—	—	—	—	—	100	640	—	—	—	14000	—	—
MD50-10-15793	50-603503	25–25	—	—	—	—	140 (J)	—	120	—	—	76	—	—	15	25	—	40	530	—	100	24	4200	—	—
MD50-10-15791	50-603503	80–80	—	—	—	—	70 (J)	—	48	—	—	24	—	—	—	—	—	28	200	—	—	—	4300	—	—
MD50-10-15792	50-603503	133–133	—	—	—	—	140 (J)	—	130	—	—	82	—	—	—	25	—	44	450	—	130	—	4200	—	—
MD50-10-15788	50-603503	198–198	—	—	—	—	110 (J)	—	110	—	—	47	—	—	20	32	—	69	400	—	48	—	4400	—	—
MD50-10-15794	50-603503	237–237	—	—	—	—	—	—	100	—	—	—	—	—	—	—	—	150	470	—	—	—	4600	—	—
MD50-10-15795	50-603503	278–278	—	—	—	—	16 (J)	—	7.7	—	—	11	—	—	—	—	—	6.3	41	—	—	—	490	—	—
MD50-10-15790	50-603503	347–347	—	—	—	—	77 (J)	—	86	—	—	49	—	—	11	15	—	23	300	—	55	—	2600	—	—
MD50-10-15796	50-603503	397–397	—	—	—	—	—	—	82	—	—	—	—	—	—	—	—	110	500	—	—	—	5200	—	—
MD50-10-15789	50-603503	450–450	—	—	—	—	55 (J)	—	—	—	—	32	—	—	—	—	—	7	91	—	—	—	1500	—	—

Note: Results are in µg/m^3. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-4.1-10
VOCs Detected in Vapor Samples at MDA C during July 2010–September 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-10-24362	50-24784	25–25	—*	—	—	—	—	27	230	—	—	—	—	—	—	—	—
MD50-10-24364	50-24784	96–96	—	—	—	—	—	85	530	—	68	—	—	—	43	—	—
MD50-10-24365	50-24784	155–155	—	—	—	—	—	140	210	—	71 (J)	—	—	—	—	—	—
MD50-10-24361	50-24784	215–215	—	—	—	—	—	250	110	—	100	—	—	—	—	—	—
MD50-10-24359	50-24784	244–244	—	—	—	—	—	270	96	—	120 (J)	—	—	—	—	—	—
MD50-10-24366	50-24784	289–289	—	—	—	—	—	340	57	—	130	—	—	—	—	—	—
MD50-10-24360	50-24784	362–362	—	—	—	—	—	250	—	—	100	—	—	—	—	—	—
MD50-10-24367	50-24784	411–411	—	—	—	—	—	510 (J)	—	—	110	—	—	—	—	—	—
MD50-10-24363	50-24784	450–450	—	—	—	—	—	230 (J)	—	—	88	—	—	—	—	—	—
MD50-10-24369	50-24813	25–25	—	—	—	—	—	1200	960	—	330	—	—	—	—	—	—
MD50-10-24375	50-24813	99–99	—	—	—	—	—	2800 (J-)	3200	—	730	58	—	450	—	—	—
MD50-10-24370	50-24813	150–150	—	—	—	—	—	—	2100	—	—	—	—	380	—	—	—
MD50-10-24376	50-24813	207–207	—	—	—	—	—	1700	2100	—	1300	—	—	590	—	—	—
MD50-10-24371	50-24813	241–241	—	—	—	—	—	1400	1800	—	1200	—	—	—	—	—	—
MD50-10-24377	50-24813	286–286	—	—	—	—	—	—	1100	—	—	—	—	—	—	—	—
MD50-10-24372	50-24813	358–358	—	—	—	—	—	740	520	—	960	—	—	—	—	—	—
MD50-10-24378	50-24813	408–408	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-24374	50-24813	450–450	—	—	—	—	—	—	—	—	82	—	—	—	—	—	—
MD50-10-24373	50-24813	600–600	—	—	—	—	—	130	—	—	240	—	—	—	—	—	—
MD50-10-24413	50-24822	25–25	—	—	—	—	—	—	210	—	130 (J-)	—	—	—	—	—	—
MD50-10-24419	50-24822	81–81	—	—	—	—	—	—	430	—	300 (J-)	—	—	—	—	—	—
MD50-10-24416	50-24822	142–142	—	—	—	—	—	—	470	—	470 (J-)	—	—	—	—	—	—
MD50-10-24414	50-24822	204–204	—	—	—	—	—	—	510	—	660 (J-)	—	—	—	—	—	—
MD50-10-24418	50-24822	235–235	—	—	—	—	—	—	480	—	670 (J-)	—	—	—	—	—	—
MD50-10-24412	50-24822	280–280	—	—	—	—	—	—	310	—	550 (J-)	—	—	—	—	—	—
MD50-10-24415	50-24822	351–351	—	—	—	—	—	—	—	—	490 (J-)	—	—	—	—	—	—
MD50-10-24411	50-24822	402–402	5.9 (J)	1.2	—	—	—	—	—	—	2.2	—	—	—	—	—	—
MD50-10-24417	50-24822	450–450	—	—	—	—	—	—	—	—	330 (J-)	—	—	—	—	—	—
MD50-10-26315	50-603061	25–25	—	—	—	—	—	—	—	—	730	—	210	—	—	—	—
MD50-10-24432	50-603061	76–76	—	—	—	—	—	—	40	—	350	—	1100	—	—	—	—
MD50-10-24437	50-603061	128–128	—	—	—	—	—	—	42	—	150	—	1500	—	—	—	—

Table C-4.1-10 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-10-24433	50-603061	190–190	—	—	—	—	—	—	29	—	150	—	1400	—	—	—	—
MD50-10-24436	50-603061	228–228	—	—	—	—	—	—	40	—	220	—	1700	—	—	—	—
MD50-10-24434	50-603061	274–274	—	—	—	—	—	—	—	—	—	—	940	—	—	—	—
MD50-10-24438	50-603061	347–347	—	—	23 (J-)	—	—	—	—	—	210 (J-)	—	340	—	—	—	—
MD50-10-26314	50-603061	397–397	—	—	—	—	—	130 (J)	—	—	160 (J)	—	110	—	—	—	—
MD50-10-24439	50-603061	450–450	—	—	—	—	100	70 (J)	—	—	79	—	42	—	—	—	—
MD50-10-24441	50-603062	25–25	14 (J-)	—	—	—	—	10	25	—	42	—	—	—	—	—	—
MD50-10-24446	50-603062	64–64	—	—	—	—	—	—	46	—	—	—	—	—	—	—	—
MD50-10-24443	50-603062	122–122	—	—	—	—	—	—	57	—	110	—	—	—	—	—	—
MD50-10-24445	50-603062	184–184	—	—	—	—	—	—	—	—	140 (J-)	—	—	—	—	—	—
MD50-10-24447	50-603062	217–217	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-24442	50-603062	263–263	—	—	—	—	—	—	—	—	110	—	—	—	—	—	—
MD50-10-24448	50-603062	337–337	—	—	—	—	—	—	—	—	150	—	—	—	—	—	—
MD50-10-24444	50-603062	387–387	—	—	—	—	—	50 (J)	—	—	84	—	—	—	—	—	—
MD50-10-24449	50-603062	450–450	—	—	—	—	—	22 (J)	—	—	94	—	—	—	—	—	—
MD50-10-24451	50-603063	25–25	—	—	—	—	—	—	19	—	160	—	110	—	—	—	—
MD50-10-24457	50-603063	76–76	—	—	—	—	—	—	190	—	260	—	310	—	—	—	—
MD50-10-24453	50-603063	128–128	—	—	—	—	—	—	63	—	230	—	190	—	—	—	—
MD50-10-24454	50-603063	190–190	—	—	—	—	—	—	430	—	480	—	430	—	—	—	—
MD50-10-24456	50-603063	228–228	—	—	—	—	—	—	120	—	—	—	110	—	—	—	—
MD50-10-24458	50-603063	274–274	—	—	—	—	—	—	270	—	—	—	—	—	—	—	—
MD50-10-24452	50-603063	347–347	—	—	—	—	—	—	51	—	76	—	—	—	—	—	—
MD50-10-24455	50-603063	450–450	—	—	—	—	—	—	140	—	180	—	—	—	—	—	—
MD50-10-24461	50-603064	25–25	—	—	—	—	—	—	230	—	73 (J-)	—	240	28	—	—	—
MD50-10-24467	50-603064	66–66	—	—	—	—	—	—	480	—	140	—	270	72	—	—	—
MD50-10-24462	50-603064	113–113	—	—	—	—	—	—	760	—	390 (J-)	—	900	210	—	—	—
MD50-10-24465	50-603064	176–176	—	240	—	—	—	—	450	—	460 (J-)	—	850	190	—	—	—
MD50-10-24463	50-603064	214–214	—	—	—	—	—	—	530	—	—	—	880	—	—	—	—
MD50-10-24468	50-603064	259–259	—	—	—	—	—	—	220	—	410	—	240	—	—	—	—
MD50-10-24464	50-603064	332–332	—	—	—	—	—	—	—	—	440 (J-)	—	150	—	—	—	—
MD50-10-24469	50-603064	482–482	—	—	—	—	—	200 (J)	—	—	260	—	—	—	—	—	—
MD50-10-24466	50-603064	500–500	—	—	—	—	—	70	—	—	150	—	—	—	—	—	—
MD50-10-24380	50-603383	26–26	—	—	—	—	—	51 (J)	34	—	66	—	—	—	16	—	—

Table C-4.1-10 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-10-24384	50-603383	85–85	—	—	—	—	—	79	83	—	200	—	29	—	87	—	—
MD50-10-24388	50-603383	139–139	—	—	—	—	—	130	160	—	190 (J)	—	43	36	220	—	—
MD50-10-24382	50-603383	206–206	—	—	—	—	—	300	170	—	200	—	—	—	430	—	—
MD50-10-24387	50-603383	244–244	—	—	—	—	—	300	120	—	190	—	—	—	370	—	—
MD50-10-24385	50-603383	286–286	—	—	—	—	—	150	55	—	85 (J)	—	—	31	160	—	—
MD50-10-24381	50-603383	359–359	8 (J)	—	—	3.8 (J-)	—	—	—	1.7	2	—	—	—	1.8	—	—
MD50-10-24386	50-603383	408–408	—	—	—	—	—	220 (J)	—	—	120	—	—	—	—	—	—
MD50-10-24383	50-603383	450–450	—	—	—	—	—	140 (J)	—	—	30	—	—	—	—	—	—
MD50-10-24394	50-603467	26–26	—	—	—	—	—	360 (J)	310	—	—	—	—	—	—	—	—
MD50-10-24398	50-603467	91–91	—	—	—	—	—	660 (J)	700	—	190	—	—	97	—	—	—
MD50-10-24395	50-603467	143–143	—	—	—	—	—	770 (J)	650	—	180	—	—	100	—	—	—
MD50-10-24396	50-603467	206–206	—	—	—	—	—	760 (J)	610	—	—	—	—	—	—	—	—
MD50-10-24399	50-603467	244–244	—	—	—	—	—	780 (J)	650	—	—	—	—	—	—	—	—
MD50-10-24393	50-603467	287–287	—	—	—	—	—	790 (J)	480	—	—	—	—	—	—	—	—
MD50-10-24397	50-603467	360–360	—	—	—	—	—	—	360	—	—	—	—	—	—	—	—
MD50-10-24391	50-603467	409–409	—	—	—	—	—	430 (J)	—	—	—	—	—	—	—	—	—
MD50-10-24392	50-603467	500–500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-24390	50-603467	600–600	50	12	—	56	—	370	65	—	160	—	—	13	—	—	—
MD50-10-24402	50-603468	92–92	—	—	—	—	—	290 (J)	340	NA	140 (J-)	—	—	79	—	—	—
MD50-10-24407	50-603468	142–142	—	—	—	—	—	—	160	NA	NA	—	—	49	—	—	—
MD50-10-24401	50-603468	198–198	—	—	—	—	—	—	510	NA	320 (J-)	—	—	—	—	—	—
MD50-10-24405	50-603468	233–233	—	—	—	—	—	—	600	NA	440 (J-)	—	—	210	—	—	—
MD50-10-24403	50-603468	282–282	—	—	—	—	—	—	450	NA	390 (J-)	—	—	—	—	—	—
MD50-10-24404	50-603468	354–354	—	—	—	—	—	—	370	NA	490 (J-)	—	—	—	—	—	—
MD50-10-24408	50-603468	403–403	—	—	—	—	—	520 (J)	—	—	420	—	—	—	—	—	—
MD50-10-24406	50-603468	450–450	—	—	—	—	—	—	—	NA	350 (J-)	—	—	—	—	—	—
MD50-10-24328	50-603470	30–30	—	—	—	—	—	—	700	—	250	—	—	—	—	—	—
MD50-10-24333	50-603470	83–83	—	—	—	—	—	400	1200	—	450	—	—	190	—	—	—
MD50-10-24329	50-603470	143–143	—	—	—	—	—	—	1600	—	740	—	—	340	—	—	—
MD50-10-24334	50-603470	203–203	—	—	—	—	—	—	970	—	—	—	—	—	—	—	—
MD50-10-24330	50-603470	233–233	—	—	—	—	—	—	1200	—	990	—	—	400	—	—	—
MD50-10-24335	50-603470	278–278	—	—	—	—	—	—	1100	—	1100	—	—	—	—	—	—
MD50-10-24331	50-603470	351–351	—	—	—	—	—	350	300	—	810	—	—	—	—	—	—

Table C-4.1-10 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-10-24336	50-603470	450–450	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-24332	50-603470	600–600	—	—	—	—	—	92 (J)	—	—	120	—	—	—	—	—	—
MD50-10-24337	50-603470	650–650	17 (J)	—	—	—	—	21 (J)	—	—	70	—	—	—	—	—	—
MD50-10-24339	50-603471	90–90	—	—	—	—	—	1400	1900	—	—	—	—	200	—	—	—
MD50-10-24344	50-603471	146–146	—	—	—	—	—	—	1900	—	—	—	—	—	—	—	—
MD50-10-24340	50-603471	209–209	—	—	—	—	—	720 (J-)	2000	—	—	—	—	510	—	—	—
MD50-10-24345	50-603471	242–242	—	—	—	—	—	—	1400	—	—	—	—	—	—	—	—
MD50-10-24341	50-603471	288–288	—	—	—	—	—	—	1300	—	—	—	—	—	—	—	—
MD50-10-24343	50-603471	360–360	—	—	—	—	—	—	660	—	—	—	—	—	—	—	—
MD50-10-24342	50-603471	410–410	—	—	—	—	—	—	750	—	—	—	—	—	—	—	—
MD50-10-24346	50-603471	450–450	—	—	—	—	—	—	540	—	—	—	—	—	—	—	—
MD50-10-24354	50-603472	27–27	—	—	—	—	—	—	350	—	—	—	—	—	—	—	—
MD50-10-24357	50-603472	93–93	—	—	—	—	—	—	310	—	—	—	—	—	—	—	—
MD50-10-24352	50-603472	146–146	—	—	—	—	—	—	410	—	—	—	—	—	—	—	—
MD50-10-24356	50-603472	210–210	—	—	—	—	—	—	460	—	—	—	—	—	—	—	—
MD50-10-24350	50-603472	247–247	—	—	—	—	—	—	200	—	—	—	—	—	—	—	—
MD50-10-24353	50-603472	292–292	—	—	—	—	—	—	470	—	—	—	—	—	—	—	—
MD50-10-24349	50-603472	367–367	—	—	—	—	—	270	—	—	—	—	—	—	—	—	—
MD50-10-24355	50-603472	414–414	—	—	—	—	—	240	—	—	290	—	—	—	—	—	—
MD50-10-24351	50-603472	450–450	—	—	—	—	—	230	—	—	—	—	—	—	—	—	—
MD50-10-24423	50-603503	25–25	—	67	—	—	—	22 (J)	31	—	11	—	—	3.8	6.5	8.7	3.5
MD50-10-24426	50-603503	80–80	—	—	—	—	—	—	72	—	41	—	—	—	—	—	—
MD50-10-24422	50-603503	133–133	—	—	—	—	—	44 (J)	66	—	—	—	—	—	—	—	—
MD50-10-24425	50-603503	198–198	—	—	—	—	—	130 (J)	120	—	—	—	—	—	—	—	—
MD50-10-24421	50-603503	237–237	—	—	—	—	—	—	120	NA	NA	—	—	—	—	—	—
MD50-10-24427	50-603503	278–278	—	—	—	—	—	170 (J)	110	—	—	—	—	—	—	—	—
MD50-10-24424	50-603503	347–347	—	—	—	—	—	—	56	—	—	—	—	—	—	—	—
MD50-10-24428	50-603503	397–397	—	—	—	—	—	38	45	—	—	—	—	—	—	—	—
MD50-10-24429	50-603503	450–450	—	22	—	—	—	190 (J)	—	—	—	—	—	—	—	—	—

Table C-4.1-10 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-24362	50-24784	25–25	—	—	2000	—	37	53	—	900	—	—	—	—	—	—
MD50-10-24364	50-24784	96–96	—	—	2800	—	110	65	—	2700	—	—	—	—	—	—
MD50-10-24365	50-24784	155–155	—	25	2100	—	93	49	—	3200	—	—	—	—	—	—
MD50-10-24361	50-24784	215–215	—	—	2600	—	86	—	—	4900	—	—	—	—	—	—
MD50-10-24359	50-24784	244–244	—	—	2400	—	86	—	—	4500	—	—	—	—	—	—
MD50-10-24366	50-24784	289–289	—	—	2300	—	—	—	—	4600	—	—	—	—	—	—
MD50-10-24360	50-24784	362–362	—	20	860	—	—	—	—	1800	—	—	—	—	—	—
MD50-10-24367	50-24784	411–411	—	—	910	—	—	—	—	1700	—	—	—	—	—	—
MD50-10-24363	50-24784	450–450	—	—	300	—	—	—	—	630	—	—	—	—	—	—
MD50-10-24369	50-24813	25–25	—	—	380	—	—	—	—	11000	—	—	—	—	—	—
MD50-10-24375	50-24813	99–99	—	100	720	—	—	—	140	—	—	—	—	—	—	—
MD50-10-24370	50-24813	150–150	—	480	—	—	—	—	—	41000	—	—	—	—	—	—
MD50-10-24376	50-24813	207–207	—	1300	800	—	—	—	—	62000	—	—	—	—	—	—
MD50-10-24371	50-24813	241–241	—	1600	—	—	—	—	—	62000	—	—	—	—	—	—
MD50-10-24377	50-24813	286–286	—	1000	—	—	—	—	—	75000	—	—	—	—	—	—
MD50-10-24372	50-24813	358–358	—	610	—	—	—	—	—	45000	—	—	—	—	—	—
MD50-10-24378	50-24813	408–408	—	440	—	—	—	—	—	43000	—	—	—	—	—	—
MD50-10-24374	50-24813	450–450	—	30	—	—	—	—	—	3900	—	—	—	—	—	—
MD50-10-24373	50-24813	600–600	—	—	—	—	—	—	—	2400	—	—	—	—	—	—
MD50-10-24413	50-24822	25–25	—	—	73	—	—	—	—	6100	—	—	—	—	—	—
MD50-10-24419	50-24822	81–81	—	81	130	—	—	—	—	11000	—	—	—	—	—	—
MD50-10-24416	50-24822	142–142	—	210	—	—	—	—	—	19000	—	—	—	—	—	—
MD50-10-24414	50-24822	204–204	—	390	—	—	—	—	—	32000	—	—	—	—	—	—
MD50-10-24418	50-24822	235–235	—	470	—	—	—	—	—	32000	—	—	—	—	—	—
MD50-10-24412	50-24822	280–280	—	—	—	—	—	—	—	30000	—	—	—	—	—	—
MD50-10-24415	50-24822	351–351	—	170	—	—	—	—	—	17000	—	—	—	—	—	—
MD50-10-24411	50-24822	402–402	—	—	—	1.7	—	—	—	—	—	—	—	—	—	—
MD50-10-24417	50-24822	450–450	—	—	—	—	—	—	—	9300	—	—	—	—	—	—
MD50-10-26315	50-603061	25–25	—	—	—	—	15000	1700	—	370	—	—	—	—	—	—
MD50-10-24432	50-603061	76–76	—	31	160	—	14000	2000	—	1200	—	—	57	—	—	—
MD50-10-24437	50-603061	128–128	—	29	170	—	18000	2700	—	1700	—	—	—	—	—	—
MD50-10-24433	50-603061	190–190	—	64	140	—	13000	2100	—	2000	—	—	—	—	—	—
MD50-10-24436	50-603061	228–228	—	72	220	—	22000	2600	—	3400	29	—	—	—	—	—

Table C-4.1-10 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-24434	50-603061	274–274	—	21	140	—	12000	1200	—	2100	26	—	—	—	—	—
MD50-10-24438	50-603061	347–347	—	21	78	—	6100	330	—	1200	28	—	—	—	—	—
MD50-10-26314	50-603061	397–397	—	—	55	—	3900	170	—	1200	—	—	—	—	—	—
MD50-10-24439	50-603061	450–450	—	—	26	—	2000	44	—	620	30 (J+)	—	—	—	—	—
MD50-10-24441	50-603062	25–25	—	—	15	—	100	27	—	1600	—	—	—	—	—	—
MD50-10-24446	50-603062	64–64	—	—	—	—	170	40	—	2900	—	—	—	—	—	—
MD50-10-24443	50-603062	122–122	—	—	—	—	290	—	—	6700	—	—	—	—	—	—
MD50-10-24445	50-603062	184–184	—	—	—	—	370	—	—	8000	—	—	—	—	—	—
MD50-10-24447	50-603062	217–217	—	46	—	—	300	—	—	4800	—	—	—	—	—	—
MD50-10-24442	50-603062	263–263	—	—	—	—	140	—	—	4000	—	—	—	—	—	—
MD50-10-24448	50-603062	337–337	—	—	—	—	—	—	—	2000	—	—	—	—	—	—
MD50-10-24444	50-603062	387–387	—	—	—	—	57	—	—	1700	—	—	—	—	—	—
MD50-10-24449	50-603062	450–450	—	—	—	—	—	—	—	660	—	—	—	—	—	—
MD50-10-24451	50-603063	25–25	—	19	220	—	2500	210	—	960	—	—	—	—	—	—
MD50-10-24457	50-603063	76–76	—	—	660	—	4600	580	—	5600	—	—	—	—	—	—
MD50-10-24453	50-603063	128–128	—	32	310	—	2900	230	—	2700	—	—	—	—	—	—
MD50-10-24454	50-603063	190–190	—	150	1500	—	5200	550	—	18000	—	—	—	—	—	—
MD50-10-24456	50-603063	228–228	—	400	390	—	1500	—	—	5500	—	—	—	—	—	—
MD50-10-24458	50-603063	274–274	—	—	1100	—	2000	—	—	18000	—	—	—	—	—	—
MD50-10-24452	50-603063	347–347	—	45	150	—	320	—	—	2900	—	—	—	—	—	—
MD50-10-24455	50-603063	450–450	—	74	300	—	—	—	—	6700	—	—	—	—	—	—
MD50-10-24461	50-603064	25–25	—	23	260	—	3100	560	—	3700	—	—	—	—	—	—
MD50-10-24467	50-603064	66–66	—	—	460	—	9300	1900	—	9000	—	—	—	—	—	—
MD50-10-24462	50-603064	113–113	—	190	560	—	11000	1800	—	23000	—	—	—	—	—	—
MD50-10-24465	50-603064	176–176	—	360	410	250	9700	1400	—	24000	—	—	—	—	—	—
MD50-10-24463	50-603064	214–214	—	550	—	—	12000	1500	—	32000	—	—	—	—	—	—
MD50-10-24468	50-603064	259–259	—	200	310	—	6800	770	—	28000	—	—	—	—	—	—
MD50-10-24464	50-603064	332–332	—	120	200	—	2700	—	—	12000	—	—	—	—	—	—
MD50-10-24469	50-603064	482–482	—	—	91	—	1000	—	—	8200	—	—	—	—	—	—
MD50-10-24466	50-603064	500–500	—	—	—	—	94 (J)	—	—	1200	—	—	—	—	—	—
MD50-10-24380	50-603383	26–26	—	—	390	—	390	81	—	910	19	—	—	—	—	—
MD50-10-24384	50-603383	85–85	—	19	780	—	940	190	—	2400	28	—	—	—	—	—
MD50-10-24388	50-603383	139–139	—	39	980	—	1100	240	—	4100	—	—	—	—	—	—

Table C-4.1-10 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-24382	50-603383	206–206	—	84	1800	—	930	230	—	7100	—	—	—	—	—	—
MD50-10-24387	50-603383	244–244	—	73	1400	—	640	190	—	6700	—	—	—	—	—	—
MD50-10-24385	50-603383	286–286	—	34	880	—	200	73	—	3900	—	—	—	—	—	—
MD50-10-24381	50-603383	359–359	—	—	4.8	—	—	—	—	29	—	—	—	—	—	—
MD50-10-24386	50-603383	408–408	—	—	210	—	46	—	—	1800	—	—	—	—	—	—
MD50-10-24383	50-603383	450–450	—	—	260	—	—	—	—	2000	—	—	—	—	—	—
MD50-10-24394	50-603467	26–26	—	43	190	—	—	—	—	5900	—	—	—	—	—	—
MD50-10-24398	50-603467	91–91	—	150	360	—	—	—	—	13000	—	—	—	—	—	—
MD50-10-24395	50-603467	143–143	—	160	400	—	—	—	—	15000	—	—	—	—	—	—
MD50-10-24396	50-603467	206–206	—	420	560	—	—	—	—	24000	—	—	—	—	—	—
MD50-10-24399	50-603467	244–244	—	600	720	—	—	—	—	31000	—	—	—	—	—	—
MD50-10-24393	50-603467	287–287	—	510	790	—	—	—	—	33000	—	—	—	—	—	—
MD50-10-24397	50-603467	360–360	—	480	730	—	—	—	—	24000	—	—	—	—	—	—
MD50-10-24391	50-603467	409–409	—	—	430	—	—	—	—	18000	—	—	—	—	—	—
MD50-10-24392	50-603467	500–500	—	94	260	—	—	—	—	8100	—	—	—	—	—	—
MD50-10-24390	50-603467	600–600	190	36	210	14	—	—	—	8500	—	—	—	—	—	—
MD50-10-24402	50-603468	92–92	—	58	130	—	—	—	—	6400	—	—	—	—	—	—
MD50-10-24407	50-603468	142–142	—	82	68	—	—	—	—	3900	—	—	—	—	—	—
MD50-10-24401	50-603468	198–198	—	530	—	—	—	—	—	19000	—	—	—	—	—	—
MD50-10-24405	50-603468	233–233	—	630	330	—	—	—	—	23000	—	—	—	—	—	—
MD50-10-24403	50-603468	282–282	—	500	340	—	—	—	—	22000	—	—	—	—	—	—
MD50-10-24404	50-603468	354–354	—	520	—	—	—	—	—	25000	—	—	—	—	—	—
MD50-10-24408	50-603468	403–403	—	—	—	—	—	—	—	25000	—	—	—	—	—	—
MD50-10-24406	50-603468	450–450	—	200	—	—	—	—	—	15000	—	—	—	—	—	—
MD50-10-24328	50-603470	30–30	—	—	680	—	250	—	—	13000	—	—	—	—	—	—
MD50-10-24333	50-603470	83–83	—	95	830	—	420	—	—	18000	—	—	—	—	—	—
MD50-10-24329	50-603470	143–143	—	260	730	—	620	—	—	29000	—	—	—	—	—	—
MD50-10-24334	50-603470	203–203	—	490	—	—	—	—	—	44000	—	—	—	—	—	—
MD50-10-24330	50-603470	233–233	—	830	—	—	780	—	—	46000	—	—	—	—	—	—
MD50-10-24335	50-603470	278–278	—	1000	—	—	750	—	—	48000	—	—	—	—	—	—
MD50-10-24331	50-603470	351–351	—	330	—	—	—	—	—	31000	—	—	—	—	—	—
MD50-10-24336	50-603470	450–450	—	190	—	—	—	—	—	17000	—	—	—	—	—	—
MD50-10-24332	50-603470	600–600	—	—	—	—	—	—	—	1800	—	—	—	—	—	—

Table C-4.1-10 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethane[1,1,2-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-24337	50-603470	650–650	—	5.1	—	3.5	—	—	—	94	6.2 (J+)	—	—	—	—	—
MD50-10-24339	50-603471	90–90	—	240	850	—	—	—	—	19000	—	—	—	—	—	—
MD50-10-24344	50-603471	146–146	—	1100	840	—	—	—	—	38000	—	—	—	—	—	—
MD50-10-24340	50-603471	209–209	—	1800	1100	—	—	—	—	51000	—	—	—	—	—	—
MD50-10-24345	50-603471	242–242	—	1800	960	—	—	—	—	52000	—	—	—	—	—	—
MD50-10-24341	50-603471	288–288	—	1600	—	—	—	—	—	50000	—	—	—	—	—	—
MD50-10-24343	50-603471	360–360	—	870	880	—	—	—	—	51000	—	—	—	—	—	—
MD50-10-24342	50-603471	410–410	—	640	800	—	—	—	—	38000	—	—	—	—	—	—
MD50-10-24346	50-603471	450–450	—	490	670	—	—	—	—	35000	—	—	—	—	—	—
MD50-10-24354	50-603472	27–27	—	—	690	—	—	—	—	4100	—	—	—	—	—	—
MD50-10-24357	50-603472	93–93	—	43	500	—	—	—	—	4600	—	—	—	—	—	—
MD50-10-24352	50-603472	146–146	—	190	550	—	—	—	—	9100	—	—	—	—	—	—
MD50-10-24356	50-603472	210–210	—	470	920	—	—	—	—	17000	—	—	—	—	—	—
MD50-10-24350	50-603472	247–247	—	250	450	—	—	—	—	9500	—	—	—	—	—	—
MD50-10-24353	50-603472	292–292	—	710	1600	—	—	—	—	31000	—	—	—	—	—	—
MD50-10-24349	50-603472	367–367	—	210	920	—	—	—	—	19000	—	—	—	—	—	—
MD50-10-24355	50-603472	414–414	—	130	750	—	—	—	—	15000	—	—	—	—	—	—
MD50-10-24351	50-603472	450–450	—	76	600	—	—	—	—	14000	—	—	—	—	—	—
MD50-10-24423	50-603503	25–25	—	9	150	76	17	5.7	—	660	3.3	3.9	—	31	7.2	23
MD50-10-24426	50-603503	80–80	—	30	260	—	49	—	—	1900	—	—	—	—	—	—
MD50-10-24422	50-603503	133–133	—	—	240	—	—	—	—	1500	—	—	—	—	—	—
MD50-10-24425	50-603503	198–198	—	90	450	—	—	—	—	4500	—	—	—	—	—	—
MD50-10-24421	50-603503	237–237	—	120	560	—	—	—	—	4700	—	—	—	—	—	—
MD50-10-24427	50-603503	278–278	—	110	520	—	—	—	—	5900	—	—	—	—	—	—
MD50-10-24424	50-603503	347–347	—	26	220	—	—	—	—	1600	—	—	—	—	—	—
MD50-10-24428	50-603503	397–397	—	12	180	—	—	—	—	1300	—	—	—	—	—	—
MD50-10-24429	50-603503	450–450	—	25	230	19	—	—	—	3200	—	—	—	—	—	—

Note: Results are in µg/m^3. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-4.1-11
VOCs Detected in Vapor Samples at MDA C during October 2010–January 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene
MD50-10-27179	50-24784	25–25	—*	—	—	—	—	—	—	250	—	—	—	—	—	—	—
MD50-10-27176	50-24784	96–96	—	—	—	—	—	110 (J-)	—	470	—	74	—	—	—	45	—
MD50-10-27175	50-24784	155–155	—	—	—	—	—	190 (J-)	—	180	—	94	—	—	—	46	—
MD50-10-27181	50-24784	215–215	—	—	—	—	—	290 (J-)	—	85	—	120	—	—	—	—	—
MD50-10-27180	50-24784	244–244	—	—	—	—	—	290 (J-)	—	73	—	110	—	—	—	—	—
MD50-10-27178	50-24784	289–289	—	—	—	—	—	420	—	51	—	160	—	—	—	—	—
MD50-10-27182	50-24784	362–362	—	—	—	—	—	440 (J-)	—	—	—	170	—	—	—	—	—
MD50-10-27177	50-24784	411–411	—	—	—	—	—	460	—	—	—	180	—	—	—	—	—
MD50-10-27183	50-24784	450–450	—	—	—	—	—	330	—	—	—	130	—	—	—	—	—
MD50-10-27186	50-24813	25–25	—	—	—	—	—	2400 (J)	—	1300	—	400 (J)	—	—	—	—	—
MD50-10-27189	50-24813	99–99	—	—	—	—	—	1700	—	2300	—	—	—	—	360	—	—
MD50-10-27185	50-24813	150–150	—	—	—	—	—	1300 (J)	—	2200	—	650 (J)	—	—	460	—	—
MD50-10-27190	50-24813	207–207	—	—	—	—	—	23 (J)	—	20	—	21	—	—	—	—	—
MD50-10-27193	50-24813	241–241	—	—	—	—	—	280	—	350	—	—	—	—	—	—	—
MD50-10-27194	50-24813	241–241	—	—	—	—	—	190	—	260	—	170	—	—	—	—	—
MD50-10-27191	50-24813	286–286	—	—	—	—	—	49 (J)	—	54	—	27	—	—	9.8	—	—
MD50-10-27343	50-24813	358–358	8.1	—	—	—	11	—	—	—	—	1200	—	—	—	—	—
MD50-10-27192	50-24813	408–408	—	—	—	—	—	410	—	—	—	—	—	—	—	—	—
MD50-10-27188	50-24813	450–450	—	77	—	—	—	—	—	—	—	130 (J-)	—	—	—	—	—
MD50-10-27195	50-24813	600–600	6.9	—	—	3.2	—	2.4	—	—	—	3.2	—	0.82	0.8	—	—
MD50-10-27227	50-24822	25–25	—	—	—	—	—	—	—	200	—	120	—	—	—	—	—
MD50-10-27232	50-24822	81–81	—	—	—	—	—	—	—	320	—	180	—	—	—	—	—
MD50-10-27235	50-24822	142–142	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-27229	50-24822	204–204	—	—	—	—	—	—	—	400	—	470	—	—	—	—	—
MD50-10-27233	50-24822	235–235	—	—	—	—	—	—	—	390	—	—	—	—	—	—	—
MD50-10-27231	50-24822	280–280	—	—	—	—	—	—	—	290	—	540	—	—	—	—	—
MD50-10-27230	50-24822	351–351	—	—	—	—	—	—	—	—	—	280	—	—	—	—	—
MD50-10-27228	50-24822	450–450	—	—	—	—	—	—	—	—	—	300	—	—	—	—	—
MD50-10-27249	50-603061	25–25	—	—	—	—	—	—	—	—	—	580	—	180	—	—	—

Table C-4.1-11 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene
MD50-10-27251	50-603061	76–76	—	—	—	—	—	—	—	—	—	380	—	700	—	—	—
MD50-10-27247	50-603061	128–128	—	—	—	—	—	—	—	—	—	—	—	1400	—	—	—
MD50-10-27255	50-603061	190–190	—	—	—	—	—	—	—	—	—	—	—	1600	—	—	—
MD50-10-27248	50-603061	228–228	—	—	—	—	—	—	—	—	—	—	—	950	—	—	—
MD50-10-27253	50-603061	274–274	—	—	—	—	—	—	—	—	—	—	—	470	—	—	—
MD50-10-27252	50-603061	347–347	—	—	—	—	—	110	—	—	—	150	—	170	—	—	—
MD50-10-27254	50-603061	397–397	—	—	—	—	—	85	—	—	—	150	—	96	—	—	—
MD50-10-27250	50-603061	450–450	15 (J)	1.6	—	2.9	15	50	—	2	—	100	1.5	34	—	—	—
MD50-10-27262	50-603062	25–25	—	—	—	—	—	—	—	26	—	45	—	—	—	—	—
MD50-10-27265	50-603062	64–64	—	—	—	—	—	—	—	49	—	50	—	—	—	—	—
MD50-10-27257	50-603062	122–122	—	—	—	—	—	51 (J)	—	72 (J)	—	140 (J)	—	—	—	—	—
MD50-10-27263	50-603062	184–184	—	—	—	—	—	59 (J)	—	50	—	160	—	—	—	—	—
MD50-10-27260	50-603062	217–217	—	18 (J)	—	—	—	65 (J)	—	44 (J)	—	160 (J)	—	7 (J)	11 (J)	—	—
MD50-10-27264	50-603062	263–263	—	—	—	—	—	140 (J)	—	52	—	360	—	—	—	—	—
MD50-10-27259	50-603062	337–337	—	—	—	—	—	—	—	—	—	120 (J-)	—	—	—	—	—
MD50-10-27261	50-603062	387–387	21	—	—	—	—	49 (J)	—	—	—	120	—	—	—	—	—
MD50-10-27258	50-603062	450–450	—	—	—	—	—	23	—	—	—	69 (J)	—	—	—	—	—
MD50-10-27267	50-603063	25–25	—	—	—	—	—	—	—	34	—	180	—	—	—	—	—
MD50-10-27272	50-603063	76–76	—	—	—	—	—	—	—	150	—	170	—	95	—	—	—
MD50-10-27275	50-603063	128–128	—	—	—	—	—	190 (J)	—	210	—	320	—	210	—	—	—
MD50-10-27268	50-603063	190–190	—	—	—	—	—	—	—	350	—	360	—	230	—	—	—
MD50-10-27273	50-603063	228–228	—	—	—	—	—	—	—	340	—	370	—	210	—	—	790
MD50-10-27269	50-603063	274–274	—	—	—	—	—	—	—	320	—	—	—	—	—	—	—
MD50-10-27274	50-603063	347–347	—	—	—	—	—	—	—	120	—	170	—	—	—	—	—
MD50-10-27271	50-603063	450–450	—	—	—	—	—	230 (J)	—	110	—	—	—	—	—	—	—
MD50-10-27280	50-603064	25–25	—	—	—	—	—	—	—	200	—	—	—	74	—	—	—
MD50-10-27285	50-603064	66–66	—	—	—	—	—	—	—	400	—	130	—	210	58	—	—
MD50-10-27279	50-603064	113–113	—	—	—	—	—	—	—	740	—	—	—	490	—	—	—
MD50-10-27283	50-603064	176–176	—	—	—	—	—	—	—	570	—	530	—	520	—	—	—
MD50-10-27277	50-603064	214–214	—	—	—	—	—	—	—	470	—	520	—	450	—	—	—
MD50-10-27281	50-603064	259–259	—	—	—	—	—	—	—	—	—	460	—	280	—	—	—
MD50-10-27278	50-603064	332–332	—	—	—	—	—	140	—	—	—	—	—	97	—	—	—
MD50-10-27282	50-603064	400–400	—	—	—	—	—	120	—	—	—	310	—	—	—	—	—

Table C-4.1-11 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene
MD50-10-27284	50-603064	500–500	—	—	—	—	—	87	—	—	—	240	—	—	—	—	—
MD50-10-27199	50-603383	26–26	—	—	—	—	—	27	—	24	—	65	—	—	—	16	—
MD50-10-27197	50-603383	85–85	—	—	—	—	—	65 (J-)	—	98	—	170	—	31	—	110	—
MD50-10-27205	50-603383	139–139	—	—	—	—	—	99	—	130	—	140	—	—	—	290	—
MD50-10-27204	50-603383	206–206	—	—	—	—	—	210	—	120	—	190	—	—	62	370	—
MD50-10-27203	50-603383	244–244	—	—	—	—	—	31	7.3	—	—	23	—	—	—	—	—
MD50-10-27201	50-603383	286–286	—	—	—	—	—	150 (J-)	—	39	—	100	—	—	—	140	—
MD50-10-27202	50-603383	359–359	—	—	—	—	—	130	—	60	—	100	—	—	—	220	—
MD50-10-27200	50-603383	408–408	—	—	—	—	—	190	—	—	—	100	—	—	—	—	—
MD50-10-27214	50-603467	26–26	—	—	—	—	—	—	—	550	—	220 (J)	—	—	91	—	—
MD50-10-27210	50-603467	91–91	—	—	—	—	—	—	—	410	—	170 (J)	—	—	72	—	—
MD50-10-27211	50-603467	143–143	—	—	—	—	—	180 (J-)	—	750	—	370 (J)	—	—	180	—	—
MD50-10-27215	50-603467	206–206	—	—	—	—	—	—	—	570	—	430 (J)	—	—	170	—	—
MD50-10-27207	50-603467	244–244	—	—	—	—	—	—	—	680	—	420 (J)	—	—	—	—	—
MD50-10-27213	50-603467	287–287	—	—	—	—	—	—	—	430	—	340 (J)	—	—	—	—	—
MD50-10-27212	50-603467	360–360	—	—	—	—	—	430	—	260	—	—	—	—	—	—	—
MD50-10-27208	50-603467	409–409	—	—	—	—	—	290	—	—	—	—	—	—	—	—	—
MD50-10-27206	50-603467	500–500	—	—	—	—	—	—	—	—	—	210 (J)	—	—	—	—	—
MD50-10-27209	50-603467	600–600	83	—	—	120	—	150	—	—	—	—	—	—	—	—	—
MD50-10-27220	50-603468	92–92	—	—	—	—	—	—	—	300	—	—	—	—	—	—	—
MD50-10-27217	50-603468	142–142	—	—	—	—	—	—	—	180	—	—	—	—	58	—	—
MD50-10-27218	50-603468	198–198	—	—	—	—	—	—	—	510	—	350 (J)	—	—	—	—	—
MD50-10-27219	50-603468	233–233	—	—	—	—	—	—	—	510	—	430 (J)	—	—	190	—	—
MD50-10-27226	50-603468	282–282	—	—	—	—	—	—	—	430	—	410 (J)	—	—	180	—	—
MD50-10-27223	50-603468	354–354	—	—	—	—	—	—	—	270	—	400 (J)	—	—	—	—	—
MD50-10-27221	50-603468	403–403	—	—	—	—	—	—	—	210	—	520 (J)	—	—	—	—	—
MD50-10-27222	50-603468	450–450	—	—	—	—	—	—	—	—	—	280 (J)	—	—	—	—	—
MD50-10-27145	50-603470	30–30	—	—	—	—	—	180 (J)	—	800	—	300	—	—	—	—	—
MD50-10-27149	50-603470	83–83	—	—	—	—	—	—	—	990	—	330	—	—	190	—	—
MD50-10-27144	50-603470	143–143	—	—	—	—	—	—	—	1400	—	—	—	—	270	—	—
MD50-10-27151	50-603470	203–203	—	—	—	—	—	—	—	200	—	130	—	—	54	—	—
MD50-10-27147	50-603470	233–233	—	—	—	—	—	—	—	1000	—	—	—	—	—	—	—
MD50-10-27153	50-603470	278–278	—	—	—	—	—	—	—	750	—	860	—	—	—	—	—

Table C-4.1-11 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene
MD50-10-27146	50-603470	351–351	—	—	—	—	—	—	—	—	—	670	—	—	—	—	—
MD50-10-27152	50-603470	450–450	—	—	—	—	—	—	—	—	—	380	—	—	—	—	—
MD50-10-27148	50-603470	600–600	—	—	—	—	—	86 (J)	—	—	—	200	—	—	—	—	—
MD50-10-27115	50-603470	650–650	7.1	6.2	—	—	—	—	—	—	—	3.7	—	—	—	—	3.7
MD50-10-27158	50-603471	30–30	—	—	—	—	—	2600 (J)	—	1400	—	270 (J-)	—	—	140	—	—
MD50-10-27155	50-603471	90–90	—	—	—	—	—	2300 (J)	—	1900	—	—	—	—	270	—	—
MD50-10-27157	50-603471	146–146	—	—	—	—	—	110	—	160	—	58	—	—	30	—	—
MD50-10-27162	50-603471	209–209	—	—	—	—	—	—	—	630	—	—	—	—	—	—	—
MD50-10-27161	50-603471	242–242	—	—	—	—	—	1700 (J)	—	1600	—	760 (J-)	—	—	360	—	—
MD50-10-27160	50-603471	288–288	—	—	—	—	—	1100 (J)	—	1300	—	—	—	—	420	—	—
MD50-10-27156	50-603471	360–360	—	—	—	—	—	700 (J)	—	370	—	460 (J-)	—	—	—	—	—
MD50-10-27163	50-603471	410–410	—	—	—	—	—	420 (J)	—	300	—	400 (J-)	—	—	—	—	—
MD50-10-27159	50-603471	450–450	—	—	—	—	—	320 (J)	—	200	—	—	—	—	—	—	—
MD50-10-27165	50-603472	27–27	—	—	—	—	—	—	—	390	—	—	—	—	27	39	—
MD50-10-27168	50-603472	93–93	8.5	23	—	—	—	—	—	—	—	2	—	—	—	—	20
MD50-10-27170	50-603472	146–146	22	11	—	—	33	—	—	1.5	3 (J+)	2.4	—	—	—	—	11
MD50-10-27172	50-603472	210–210	—	9.2	24	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-27166	50-603472	247–247	—	—	—	—	—	—	—	220	—	—	—	—	62	—	—
MD50-10-27174	50-603472	292–292	—	—	—	—	—	—	—	7.2	—	—	—	—	—	—	—
MD50-10-27169	50-603472	364–364	—	48	—	—	—	38 (J)	—	18	—	33	—	—	—	—	—
MD50-10-27167	50-603472	414–414	35	22	—	—	—	—	—	—	—	2.4	—	—	—	—	23
MD50-10-27173	50-603472	450–450	—	—	—	—	—	2.7 (J)	—	—	—	4.6	—	—	—	—	—
MD50-10-27243	50-603503	25–25	—	—	—	—	—	—	—	52	—	—	—	—	—	—	—
MD50-10-27237	50-603503	80–80	75	—	—	55	—	99	—	160	—	46	—	—	18	33	—
MD50-10-27244	50-603503	133–133	—	—	—	—	—	59	—	98	—	—	—	—	—	24	—
MD50-10-27238	50-603503	198–198	—	—	—	—	—	—	—	60	—	—	—	—	—	—	—
MD50-10-27245	50-603503	237–237	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-27239	50-603503	278–278	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-10-27241	50-603503	347–347	—	—	—	—	—	24	—	43	—	—	—	—	—	—	—
MD50-10-27240	50-603503	397–397	40	100	—	—	—	21	—	24	—	12	—	—	—	4.2	7.5
MD50-10-27242	50-603503	450–450	—	—	—	—	—	60	—	—	—	—	—	—	—	—	—

Table C-4.1-11 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-27179	50-24784	25–25	—	—	—	2300	—	—	62	990	—	—	—	—	—	—	—
MD50-10-27176	50-24784	96–96	—	—	—	3000	—	130	70	2800	—	—	—	—	—	—	—
MD50-10-27175	50-24784	155–155	42	—	23	1600	—	130	57	3700	—	—	—	—	31	31	—
MD50-10-27181	50-24784	215–215	—	—	37	2800	—	110	55	5400	—	—	—	—	—	—	—
MD50-10-27180	50-24784	244–244	—	—	37	2600	—	96	—	5100	—	—	—	—	—	—	—
MD50-10-27178	50-24784	289–289	—	—	41	2400	—	94	—	4800	—	—	—	—	—	—	—
MD50-10-27182	50-24784	362–362	—	—	—	1500	—	45	—	3000	—	—	—	—	—	—	—
MD50-10-27177	50-24784	411–411	—	—	—	870	—	—	—	2100	—	—	—	—	—	—	—
MD50-10-27183	50-24784	450–450	—	—	—	520	—	—	—	1200	—	—	—	—	—	—	—
MD50-10-27186	50-24813	25–25	—	—	—	500	—	—	—	13000	—	—	—	—	—	—	—
MD50-10-27189	50-24813	99–99	—	—	—	—	—	—	—	26000	—	—	—	—	—	—	—
MD50-10-27185	50-24813	150–150	—	—	600 (J)	560	—	—	—	31000	—	—	—	—	—	—	—
MD50-10-27190	50-24813	207–207	—	—	12	—	—	—	—	1200	—	—	—	—	—	—	—
MD50-10-27193	50-24813	241–241	—	—	330	—	—	—	—	15000	—	—	—	—	—	—	—
MD50-10-27194	50-24813	241–241	—	—	250	—	—	—	—	10000	—	—	—	—	—	—	—
MD50-10-27191	50-24813	286–286	—	—	27	—	—	—	—	1300	—	—	—	—	—	—	—
MD50-10-27343	50-24813	358–358	—	—	32	—	4.6	—	—	120	33	—	—	1.1	—	—	—
MD50-10-27192	50-24813	408–408	—	—	330	—	—	—	—	32000	—	—	—	—	—	—	—
MD50-10-27188	50-24813	450–450	—	—	48 (J)	—	98	—	—	5300	—	—	—	—	—	—	—
MD50-10-27195	50-24813	600–600	—	—	—	—	1.4	—	—	12	—	—	—	—	—	—	—
MD50-10-27227	50-24822	25–25	—	—	—	—	—	—	—	7000	—	—	—	—	—	—	—
MD50-10-27232	50-24822	81–81	—	—	—	—	—	—	—	11000	—	—	—	—	—	—	—
MD50-10-27235	50-24822	142–142	—	—	220	—	110	—	—	9000	—	—	—	—	—	—	—
MD50-10-27229	50-24822	204–204	—	—	300	—	—	—	—	28000	—	—	—	—	—	—	—
MD50-10-27233	50-24822	235–235	—	—	350	—	—	—	—	32000	—	—	—	—	—	—	—
MD50-10-27231	50-24822	280–280	—	—	280	—	—	—	—	32000	—	—	—	—	—	—	—
MD50-10-27230	50-24822	351–351	—	—	91	—	—	—	—	14000	—	—	—	—	—	—	—
MD50-10-27228	50-24822	450–450	—	—	—	—	—	—	—	11000	—	—	—	—	—	—	—
MD50-10-27249	50-603061	25–25	—	—	—	—	—	11000	1300	290	—	—	—	—	—	—	—
MD50-10-27251	50-603061	76–76	—	—	—	210	—	25000	3900	1900	—	—	—	—	—	—	—
MD50-10-27247	50-603061	128–128	—	—	—	—	—	32000	5800	2500	—	—	—	—	—	—	—
MD50-10-27255	50-603061	190–190	—	—	150	—	—	35000	5800	4000	—	—	—	—	—	—	—
MD50-10-27248	50-603061	228–228	—	—	—	—	—	23000	3600	3200	—	—	—	—	—	—	—

Table C-4.1-11 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-27253	50-603061	274–274	—	—	—	—	—	14000	1500	2000	—	—	—	—	—	—	—
MD50-10-27252	50-603061	347–347	—	—	—	86	—	6500	410	1200	—	—	—	—	—	—	—
MD50-10-27254	50-603061	397–397	—	—	—	48	—	3100	140	960	—	—	—	—	—	—	—
MD50-10-27250	50-603061	450–450	—	—	—	22	1.3	1500	34	550	10	—	—	—	—	—	—
MD50-10-27262	50-603062	25–25	—	—	—	—	—	120	29	1200	—	—	—	—	—	—	—
MD50-10-27265	50-603062	64–64	—	—	—	—	—	180	42	2400	—	—	—	—	—	—	—
MD50-10-27257	50-603062	122–122	—	—	—	—	—	400 (J)	60 (J)	7200 (J)	—	—	—	—	—	—	—
MD50-10-27263	50-603062	184–184	—	—	—	—	—	410	50	5900	—	—	—	—	—	—	—
MD50-10-27260	50-603062	217–217	—	—	11 (J)	24 (J)	16 (J)	380 (J)	47 (J)	5700	14 (J)	—	—	—	—	—	—
MD50-10-27264	50-603062	263–263	—	—	—	—	—	550	51	6300	—	—	—	—	—	—	—
MD50-10-27259	50-603062	337–337	—	—	—	—	—	92	—	1900	—	—	—	—	—	—	—
MD50-10-27261	50-603062	387–387	—	—	—	—	—	71	—	1900	—	—	—	—	—	—	—
MD50-10-27258	50-603062	450–450	—	—	—	—	—	—	—	700	—	—	—	—	—	—	—
MD50-10-27267	50-603063	25–25	—	—	—	370	—	3500	450	2100	—	—	—	—	—	—	—
MD50-10-27272	50-603063	76–76	—	—	—	550	—	3800	560	5400	—	—	—	—	—	—	—
MD50-10-27275	50-603063	128–128	—	—	—	810	—	5200	830	9600	—	—	—	—	—	—	—
MD50-10-27268	50-603063	190–190	—	—	—	1400	—	5400	690	22000	—	—	—	—	—	—	—
MD50-10-27273	50-603063	228–228	580	—	180	950	820	4800	540	22000	—	1300	—	—	1600	320	1300
MD50-10-27269	50-603063	274–274	—	—	—	1000	—	1700	—	25000	—	—	—	—	—	—	—
MD50-10-27274	50-603063	347–347	—	—	92	400	—	640	—	9900	—	—	—	—	—	—	—
MD50-10-27271	50-603063	450–450	—	—	—	350	—	—	—	8200	—	—	—	—	—	—	—
MD50-10-27280	50-603064	25–25	—	—	—	230	—	3600	700	3600	—	—	—	—	—	—	—
MD50-10-27285	50-603064	66–66	—	—	—	360	—	8700	1600	7300	—	—	—	—	—	—	—
MD50-10-27279	50-603064	113–113	—	—	—	520	—	13000	2700	28000	—	—	—	—	—	—	—
MD50-10-27283	50-603064	176–176	—	—	450	530	—	14000	2400	40000	—	—	—	—	—	—	—
MD50-10-27277	50-603064	214–214	—	—	390	460	—	13000	2000	36000	—	—	—	—	—	—	—
MD50-10-27281	50-603064	259–259	—	—	270	—	—	8000	860	27000	—	—	—	—	—	—	—
MD50-10-27278	50-603064	332–332	—	—	86	170	—	3200	150	13000	—	—	—	—	—	—	—
MD50-10-27282	50-603064	400–400	—	—	—	100	—	1300	—	8700	—	—	—	—	—	—	—
MD50-10-27284	50-603064	500–500	—	—	—	—	—	150	—	1600	—	—	—	—	—	—	—
MD50-10-27199	50-603383	26–26	—	—	—	260	—	240	53	690	—	—	—	—	—	—	—
MD50-10-27197	50-603383	85–85	—	—	19	620	—	830	170	2600	—	—	—	—	—	—	—
MD50-10-27205	50-603383	139–139	—	—	54	1200	—	1000	230	5200	—	—	—	—	—	—	—

Table C-4.1-11 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-27204	50-603383	206–206	—	—	74	1400	—	780	190	6700	—	—	—	—	—	—	—
MD50-10-27203	50-603383	244–244	—	—	—	66	—	20	—	510	—	—	—	—	—	—	—
MD50-10-27201	50-603383	286–286	—	—	42	530	—	210	77	3300	—	—	—	—	—	—	—
MD50-10-27202	50-603383	359–359	—	—	42	880	—	340	95	4000	—	—	—	—	—	—	—
MD50-10-27200	50-603383	408–408	—	—	—	220	—	—	—	1400	—	—	—	—	—	—	—
MD50-10-27214	50-603467	26–26	—	—	110	380	—	—	—	9400	—	—	—	—	—	—	—
MD50-10-27210	50-603467	91–91	—	—	110	280	—	—	—	7400	—	—	—	—	—	—	—
MD50-10-27211	50-603467	143–143	—	—	260	580	—	—	—	18000	—	—	—	—	—	—	—
MD50-10-27215	50-603467	206–206	—	—	400	860	—	—	—	25000	—	—	—	—	—	—	—
MD50-10-27207	50-603467	244–244	—	—	720	840	—	—	—	26000	—	—	—	—	—	—	—
MD50-10-27213	50-603467	287–287	—	—	520	700	—	—	—	22000	—	—	—	—	—	—	—
MD50-10-27212	50-603467	360–360	—	—	310	650	—	—	—	26000	—	—	—	—	—	—	—
MD50-10-27208	50-603467	409–409	—	—	160	400	—	—	—	15000	—	—	—	—	—	—	—
MD50-10-27206	50-603467	500–500	—	—	70	280	—	—	—	8100	—	—	—	—	—	—	—
MD50-10-27209	50-603467	600–600	—	430	27	97	—	—	—	3700	—	—	—	—	—	—	—
MD50-10-27220	50-603468	92–92	—	—	—	—	—	—	—	5700	—	—	—	—	—	—	—
MD50-10-27217	50-603468	142–142	—	—	91 (J)	100	—	—	—	5500	—	—	—	—	—	—	—
MD50-10-27218	50-603468	198–198	—	—	510 (J)	310	—	—	—	20000	—	—	—	—	—	—	—
MD50-10-27219	50-603468	233–233	—	—	630 (J)	340	—	—	—	23000	—	—	—	—	—	—	—
MD50-10-27226	50-603468	282–282	—	—	510 (J)	360	—	—	—	23000	—	—	—	—	—	—	—
MD50-10-27223	50-603468	354–354	—	—	400 (J)	330	—	—	—	20000	—	—	—	—	—	—	—
MD50-10-27221	50-603468	403–403	—	—	370 (J)	350	—	—	—	22000	—	—	—	—	—	—	—
MD50-10-27222	50-603468	450–450	—	—	130 (J)	200	—	—	—	12000	—	—	—	—	—	—	—
MD50-10-27145	50-603470	30–30	—	—	—	980	—	240	—	14000	—	—	—	—	—	—	—
MD50-10-27149	50-603470	83–83	—	—	92 (J)	730	—	310	—	13000	—	—	—	—	—	—	—
MD50-10-27144	50-603470	143–143	—	—	190	720	—	440	—	33000	—	—	—	—	—	—	—
MD50-10-27151	50-603470	203–203	—	—	98	100 (J)	—	—	—	9200	—	—	—	—	—	—	—
MD50-10-27147	50-603470	233–233	—	—	610	—	—	—	—	50000	—	—	—	—	—	—	—
MD50-10-27153	50-603470	278–278	—	—	640	—	—	—	—	55000	—	—	—	—	—	—	—
MD50-10-27146	50-603470	351–351	—	—	360	—	—	—	—	37000	—	—	—	—	—	—	—
MD50-10-27152	50-603470	450–450	—	—	—	—	—	—	—	12000	—	—	—	—	—	—	—
MD50-10-27148	50-603470	600–600	—	—	—	—	33	—	—	1700	—	—	—	—	30	—	30
MD50-10-27115	50-603470	650–650	4.4	—	—	—	15	—	—	12	—	5.3	—	—	14	3.9	10

Table C-4.1-11 (continued)

Sample ID	Location ID	Depth (ft)	Ethyltoluene[4-]	Hexanone[2-]	Methylene Chloride	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Vinyl Chloride	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-10-27158	50-603471	30–30	—	—	220	910	—	—	—	20000	—	—	—	—	—	—	—
MD50-10-27155	50-603471	90–90	—	—	440	1300	—	—	—	28000	—	—	—	—	—	—	—
MD50-10-27157	50-603471	146–146	—	—	98	79	—	—	—	4300	—	—	—	—	—	—	—
MD50-10-27162	50-603471	209–209	—	—	910	860	—	—	—	48000	—	—	—	—	—	—	—
MD50-10-27161	50-603471	242–242	—	—	1900	1300	—	—	—	72000	—	—	—	—	—	—	—
MD50-10-27160	50-603471	288–288	—	—	1700	1300	—	—	—	70000	—	—	—	—	—	—	—
MD50-10-27156	50-603471	360–360	—	—	690	640	—	—	—	34000	—	—	—	—	—	—	—
MD50-10-27163	50-603471	410–410	—	—	400	620	—	—	—	34000	—	—	—	—	—	—	—
MD50-10-27159	50-603471	450–450	—	—	250	350	—	—	—	23000	—	—	—	—	—	—	—
MD50-10-27165	50-603472	27–27	—	—	25 (J)	630	—	46	46	3000	—	—	—	—	—	—	—
MD50-10-27168	50-603472	93–93	15	—	—	—	78	—	—	19	—	16	4.3	—	74	18	55
MD50-10-27170	50-603472	146–146	11	—	1.2	—	55	—	—	29	—	12	3.5	—	51	13	38
MD50-10-27172	50-603472	210–210	—	—	10	—	—	—	—	110	—	—	—	—	—	—	—
MD50-10-27166	50-603472	247–247	—	—	270 (J)	500	—	—	—	7100	—	—	—	—	—	—	—
MD50-10-27174	50-603472	292–292	—	—	7.9	13	—	—	—	240	—	—	—	—	—	—	—
MD50-10-27169	50-603472	364–364	—	—	25	70	42	—	—	910	—	—	—	—	—	—	—
MD50-10-27167	50-603472	414–414	23	—	—	—	110	—	—	20	—	24	7.6	—	120	28	88
MD50-10-27173	50-603472	450–450	—	—	—	—	—	—	—	56	—	—	—	—	—	—	—
MD50-10-27243	50-603503	25–25	—	—	—	240	—	—	—	1300	—	—	—	—	—	—	—
MD50-10-27237	50-603503	80–80	—	—	34	590	180	77	—	2000	—	—	—	—	—	—	—
MD50-10-27244	50-603503	133–133	—	—	24	360	—	99	—	2300	—	—	—	—	—	—	—
MD50-10-27238	50-603503	198–198	—	—	—	220	—	—	—	2200	—	—	—	—	—	—	—
MD50-10-27245	50-603503	237–237	—	—	—	1300	—	—	—	12000	—	—	—	—	—	—	—
MD50-10-27239	50-603503	278–278	—	—	—	460	—	—	—	5600	—	—	—	—	—	—	—
MD50-10-27241	50-603503	347–347	—	—	14	190	—	—	—	1200	—	—	—	—	—	—	—
MD50-10-27240	50-603503	397–397	—	—	7.5	130	120	—	—	1100	—	—	—	—	23	—	18
MD50-10-27242	50-603503	450–450	—	—	—	130	—	—	—	2000	—	—	—	—	—	—	—

Notes: Results are in µg/m^3. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-4.1-12
VOCs Detected in Vapor Samples at MDA C during January 2011–March 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-4012	50-24784	25–25	—*	—	—	—	55 (J-)	—	210	—	39	—	—	—	—	—	—
MD50-11-4010	50-24784	96–96	—	—	—	—	110	—	530	79	100	—	—	—	34	—	—
MD50-11-4009	50-24784	155–155	—	—	—	—	190	—	220	72	150	—	—	—	34	—	—
MD50-11-4006	50-24784	215–215	—	—	—	—	77 (J-)	—	160	—	170	—	—	—	—	—	—
MD50-11-4004	50-24784	244–244	—	—	—	—	380 (J)	—	99	—	160	—	—	—	—	—	—
MD50-11-4008	50-24784	289–289	—	—	—	—	510 (J)	—	58	—	—	—	—	—	—	—	—
MD50-11-4007	50-24784	362–362	—	—	—	—	480 (J-)	—	—	—	180	—	—	—	—	—	—
MD50-11-4005	50-24784	411–411	—	—	—	—	370	—	—	—	190	—	—	—	—	—	—
MD50-11-4003	50-24784	450–450	—	—	—	—	—	—	—	—	22	—	—	—	—	—	—
MD50-11-4023	50-24813	25–25	—	—	—	—	3000	—	3400	—	980	—	—	550	—	—	—
MD50-11-4021	50-24813	99–99	—	—	—	—	880	—	950	—	1100	—	—	350	—	—	—
MD50-11-4095	50-24813	150–150	—	—	—	—	1400	—	2300	—	1000 (J)	—	—	550	—	—	—
MD50-11-4019	50-24813	207–207	—	—	—	—	33	—	41	—	25	—	—	9.3	—	—	—
MD50-11-4018	50-24813	241–241	—	10	—	—	7.7	—	8.9	—	12	—	—	—	—	5.8	—
MD50-11-4017	50-24813	286–286	—	—	—	—	190	—	190	—	200	—	—	—	—	—	—
MD50-11-4014	50-24813	358–358	—	—	—	—	—	—	370	—	920	—	—	—	—	—	—
MD50-11-4013	50-24813	408–408	—	—	—	—	270	—	130	—	400	—	—	—	—	—	—
MD50-11-4015	50-24813	450–450	—	—	—	—	270	—	—	—	410	—	—	—	—	—	—
MD50-11-4016	50-24813	600–600	5.2	—	—	—	11 (J+)	—	—	—	22	—	—	—	—	—	—
MD50-11-4058	50-24822	25–25	—	—	—	—	—	—	210	—	160	—	—	—	—	—	—
MD50-11-4057	50-24822	142–142	—	—	—	—	—	—	7.6	—	11	—	—	—	—	—	—
MD50-11-4055	50-24822	204–204	—	—	—	—	—	—	440	—	870	—	—	—	—	—	—
MD50-11-4060	50-24822	235–235	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-4061	50-24822	280–280	—	—	—	—	—	—	250	—	580	—	—	—	—	—	—
MD50-11-4056	50-24822	351–351	14	2.7	8.9	—	—	—	—	—	2.7	—	—	—	—	1.9	—
MD50-11-4080	50-603061	25–25	—	—	—	—	—	—	—	—	520	—	220	—	—	—	—
MD50-11-4081	50-603061	76–76	—	—	—	—	—	—	—	—	480	—	700	—	—	—	—
MD50-11-4083	50-603061	128–128	—	—	—	—	—	—	—	—	350	—	1500	—	—	—	—
MD50-11-4082	50-603061	190–190	—	—	—	—	—	—	—	—	280	—	1500	—	—	—	—
MD50-11-4084	50-603061	228–228	—	—	—	—	170 (J)	—	—	—	180	—	1000	—	—	—	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-4076	50-603061	274–274	—	—	—	—	84	—	—	—	220	—	460	—	—	—	—
MD50-11-4077	50-603061	347–347	52	—	—	—	110	—	—	—	230	—	230	—	—	—	—
MD50-11-4078	50-603061	397–397	—	—	—	—	100	—	—	—	180	—	120	—	—	—	—
MD50-11-4079	50-603061	450–450	—	—	—	—	63 (J)	—	—	—	64	—	29	—	—	—	—
MD50-11-4092	50-603062	25–25	—	—	—	—	—	—	24	—	62	—	—	—	—	—	—
MD50-11-4091	50-603062	64–64	—	—	—	—	—	—	50	—	240 (J)	—	—	—	—	—	—
MD50-11-4093	50-603062	122–122	—	—	—	—	—	—	69	—	—	—	—	—	—	—	—
MD50-11-4090	50-603062	184–184	—	—	—	—	—	—	45	—	190 (J)	—	—	—	—	—	—
MD50-11-4089	50-603062	217–217	13	1.2	—	—	11	—	7.8	—	39	—	1.4	2	—	—	—
MD50-11-4087	50-603062	263–263	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-4086	50-603062	337–337	—	—	—	—	26	—	—	—	110	—	—	—	—	—	—
MD50-11-4088	50-603062	387–387	—	—	—	—	39	—	—	—	140	—	—	—	—	—	—
MD50-11-4085	50-603062	450–450	—	—	—	—	12	—	—	—	45	—	—	—	—	—	—
MD50-11-4103	50-603063	25–25	—	—	—	—	40	—	36	—	210	—	9.5	—	—	—	—
MD50-11-4102	50-603063	76–76	—	—	—	—	89	—	180	—	—	—	260	—	—	—	—
MD50-11-4101	50-603063	128–128	—	—	—	—	—	—	230	—	700 (J)	79	390	—	—	—	—
MD50-11-4100	50-603063	190–190	—	—	—	—	290	—	460	—	890 (J)	—	450	120	—	—	—
MD50-11-4099	50-603063	228–228	—	34	—	—	—	—	—	—	2.4	—	—	—	—	3.2	—
MD50-11-4098	50-603063	274–274	—	—	—	—	350 (J-)	—	430	—	830 (J)	—	—	170	—	—	—
MD50-11-4096	50-603063	347–347	—	—	—	—	—	—	85	—	210 (J)	—	—	—	—	—	—
MD50-11-4104	50-603063	397–397	—	11	—	—	12	—	16	—	15	—	—	—	—	—	—
MD50-11-4097	50-603063	450–450	—	—	—	—	190 (J-)	—	120	—	430 (J)	—	—	—	—	—	—
MD50-11-4113	50-603064	25–25	—	—	—	—	—	—	220	—	60	—	71	22	—	—	—
MD50-11-4112	50-603064	66–66	—	—	—	—	—	—	250	—	—	—	210	38	—	—	—
MD50-11-4111	50-603064	113–113	—	—	—	—	—	—	850	—	470	—	510	220	—	—	—
MD50-11-4109	50-603064	176–176	—	—	—	—	—	—	670	—	750	—	1000	230	—	—	—
MD50-11-4110	50-603064	214–214	—	—	—	—	270 (J+)	—	270	—	71	—	160	26	—	—	—
MD50-11-4105	50-603064	259–259	—	—	—	—	360 (J)	—	—	—	410	—	240	—	—	—	—
MD50-11-4106	50-603064	332–332	—	—	—	—	300 (J)	—	—	—	400	—	82	—	—	—	—
MD50-11-4107	50-603064	400–400	—	—	—	—	160 (J)	—	—	—	240	—	—	—	—	—	—
MD50-11-4108	50-603064	500–500	—	—	—	29	120 (J)	—	—	—	210	—	—	—	—	—	—
MD50-11-4024	50-603383	26–26	—	—	—	—	98 (J+)	—	83	—	200	—	14	—	49	—	—
MD50-11-4029	50-603383	85–85	—	—	—	—	120	—	120	—	240	—	29	—	110	—	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-4025	50-603383	139–139	160	—	450	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-4030	50-603383	206–206	—	—	—	—	280	—	110	—	220	—	49	62	360	—	—
MD50-11-4026	50-603383	244–244	—	—	—	—	370	—	120	—	280	—	59	75	370	—	—
MD50-11-4031	50-603383	286–286	5.6	—	—	—	—	1.7	—	—	—	—	1.2	1.8	8.6	—	—
MD50-11-4027	50-603383	359–359	10	—	—	43	16	—	3.1	—	9.9 (J)	—	1.2	1.5	2.3	—	—
MD50-11-4032	50-603383	408–408	—	—	—	—	260	—	—	—	170 (J)	—	—	—	—	—	—
MD50-11-4028	50-603383	450–450	27	—	—	—	280	—	—	—	200	—	—	—	—	—	—
MD50-11-4038	50-603467	91–91	—	—	—	—	820 (J+)	—	670	—	200	—	—	110	—	—	—
MD50-11-4039	50-603467	206–206	—	—	—	—	440 (J+)	—	280	—	—	—	—	77	—	—	—
MD50-11-4042	50-603467	287–287	—	—	—	—	340 (J-)	—	170 (J-)	—	—	—	—	—	—	—	—
MD50-11-4040	50-603467	409–409	—	—	—	—	300 (J+)	—	—	—	—	—	—	—	—	—	—
MD50-11-4043	50-603467	500–500	—	—	—	—	330 (J+)	—	—	—	180	—	—	—	—	—	—
MD50-11-4041	50-603467	600–600	200 (J-)	—	330 (J-)	—	260 (J-)	—	—	—	78 (J-)	—	—	—	—	—	—
MD50-11-4047	50-603468	92–92	37	15	8	—	—	—	1.7	—	4.9	—	—	—	—	11	7.5
MD50-11-4046	50-603468	142–142	37	15	6.4	—	—	—	—	—	3.4	—	—	—	—	9.8	5.3
MD50-11-4045	50-603468	198–198	—	—	—	—	330 (J)	—	210	—	—	—	—	71	—	—	—
MD50-11-4054	50-603468	233–233	29	12	6.5	—	—	—	—	—	3	—	—	—	—	7.7	5.4
MD50-11-4050	50-603468	282–282	—	—	—	—	700 (J)	—	330	—	410	—	—	—	—	—	—
MD50-11-4051	50-603468	354–354	—	—	—	—	1200 (J)	—	400	—	630	—	—	150	—	—	—
MD50-11-4052	50-603468	403–403	—	—	—	—	680 (J)	—	—	—	440	—	—	—	—	—	—
MD50-11-4053	50-603468	450–450	—	—	—	—	550 (J)	—	—	—	350	—	—	—	—	—	—
MD50-11-3980	50-603470	83–83	—	—	—	—	—	—	390	—	140	—	—	75	—	—	—
MD50-11-3975	50-603470	143–143	—	—	—	—	—	—	970	—	—	—	—	—	—	—	—
MD50-11-3973	50-603470	203–203	—	—	—	—	—	—	250	—	240	—	—	—	—	—	—
MD50-11-3972	50-603470	233–233	—	2.4	—	—	—	—	—	—	2.8	—	—	—	—	—	—
MD50-11-3974	50-603470	278–278	—	—	—	—	—	—	590	—	—	—	—	—	—	—	—
MD50-11-3979	50-603470	351–351	4.9	58	—	—	—	—	—	—	2.8	—	—	—	—	10	6.3
MD50-11-3978	50-603470	450–450	20	15	—	—	2.2	—	—	—	7.6	—	—	—	—	8.1	7.4
MD50-11-3977	50-603470	600–600	34	14	4.1	—	—	—	—	—	4.8	—	—	—	—	10	15
MD50-11-3976	50-603470	650–650	—	22	10	—	2.9	—	—	—	18	—	—	—	—	4.9	3.2
MD50-11-3983	50-603471	30–30	—	—	—	—	—	—	350	—	—	—	—	45	—	—	—
MD50-11-3992	50-603471	90–90	—	—	—	—	210 (J)	—	400	—	65	—	—	48	—	—	—
MD50-11-3990	50-603471	146–146	—	—	—	—	—	—	930	—	600	—	—	400	—	—	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-3988	50-603471	209–209	—	—	—	—	150 (J)	—	480	—	160	—	—	110	—	—	—
MD50-11-3989	50-603471	242–242	—	—	—	—	210 (J)	—	360	—	320	—	—	110	—	—	—
MD50-11-3987	50-603471	288–288	—	—	—	—	460 (J)	—	1700	—	480	—	—	440	—	—	—
MD50-11-3986	50-603471	360–360	—	—	—	—	—	—	310	—	370	—	—	—	—	—	—
MD50-11-3984	50-603471	410–410	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-3985	50-603471	450–450	—	—	—	—	—	—	280	—	550	—	—	—	—	—	—
MD50-11-4002	50-603472	27–27	—	—	—	—	—	—	330	—	41	—	—	24	—	—	—
MD50-11-4000	50-603472	93–93	—	35	—	—	43	—	170	—	45	—	—	20	—	—	—
MD50-11-4001	50-603472	146–146	—	—	—	—	—	—	450	—	—	—	—	94	—	—	—
MD50-11-3998	50-603472	210–210	—	—	—	—	—	—	170	—	72	—	—	56	—	—	—
MD50-11-3999	50-603472	247–247	—	—	—	—	—	—	96	—	—	—	—	27	—	—	—
MD50-11-3993	50-603472	364–364	10	1.4	3.1	—	11	—	3.8	—	13	—	—	1.1	—	—	—
MD50-11-3994	50-603472	414–414	—	—	—	—	—	—	—	—	350	—	—	—	—	—	—
MD50-11-3995	50-603472	450–450	—	—	—	—	190 (J)	—	—	—	270	—	—	—	—	—	—
MD50-11-4071	50-603503	25–25	—	—	—	—	82 (J)	—	52	—	32	—	—	—	—	—	—
MD50-11-4072	50-603503	80–80	—	—	—	—	95 (J)	—	61	—	40	—	—	—	—	—	—
MD50-11-4069	50-603503	133–133	—	—	—	—	120 (J)	—	84	—	41	—	—	—	28	—	—
MD50-11-4073	50-603503	198–198	—	—	—	—	190 (J)	—	120	—	50	—	—	22	52	—	—
MD50-11-4070	50-603503	237–237	—	—	—	—	220 (J)	—	120	—	50	—	—	25	36	—	—
MD50-11-4067	50-603503	278–278	—	—	—	—	140 (J)	—	85	—	—	—	—	—	—	—	—
MD50-11-4066	50-603503	347–347	—	—	—	—	76 (J)	—	53	—	—	—	—	—	—	—	—
MD50-11-4068	50-603503	397–397	—	—	—	—	100 (J)	—	34	—	43	—	—	—	—	—	—
MD50-11-4065	50-603503	450–450	—	—	—	—	140 (J)	—	—	—	63	—	—	—	—	—	—
MD50-11-3943	50-613182	550–550	9.7	70	—	—	—	—	—	—	5.1	—	—	—	—	40	16
MD50-11-3942	50-613182	600–600	5.4	29	—	3.3	—	—	—	—	4.2	—	—	—	—	4	2.6
MD50-11-3953	50-613182	620–620	—	—	—	—	27 (J+)	—	—	—	48	—	—	—	—	—	—
MD50-11-3941	50-613182	632.5–632.5	—	1300	—	—	—	—	—	—	—	—	—	—	—	180	100
MD50-11-3947	50-613183	30–30	—	—	—	—	3900 (J+)	—	2700	—	310	—	—	160	—	—	—
MD50-11-3948	50-613183	500–500	—	—	—	—	640 (J-)	—	—	—	500 (J-)	—	—	—	—	—	—
MD50-11-3949	50-613183	550–550	—	—	—	—	220	—	—	—	550 (J)	—	—	—	—	—	—
MD50-11-3950	50-613183	600–600	—	—	—	—	76	—	—	—	150	—	—	—	—	—	—
MD50-11-3951	50-613183	630–630	—	—	—	—	110	—	—	—	210	—	—	—	—	—	—
MD50-11-3952	50-613183	642.5–642.5	—	—	9.4	110	4.7 (J+)	—	—	—	11	—	—	—	—	2.1	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-3959	50-613184	30–30	—	—	—	64 (J-)	89 (J-)	—	120 (J-)	—	82 (J-)	—	—	19 (J-)	—	—	—
MD50-11-3956	50-613184	500–500	—	—	—	—	120 (J-)	—	—	—	330 (J)	—	—	—	—	—	—
MD50-11-3958	50-613184	550–550	—	—	—	66 (J-)	120 (J-)	—	—	—	200 (J-)	—	—	—	—	—	—
MD50-11-3954	50-613184	600–600	—	—	—	—	58 (J-)	—	—	—	120 (J-)	—	—	—	—	—	—
MD50-11-3957	50-613184	652–652	68 (J-)	4 (J-)	8.8 (J-)	140 (J-)	18 (J-)	—	—	—	29 (J-)	—	—	—	—	2 (J-)	2.6 (J-)
MD50-11-3955	50-613184	664.5–664.5	25 (J-)	5.9 (J-)	7.8 (J-)	94 (J-)	3.8 (J-)	—	—	—	8.6 (J-)	—	—	—	—	2.8 (J-)	—
MD50-11-3962	50-613185	145–145	—	—	—	—	80	—	85	—	95	—	—	—	—	—	—
MD50-11-3963	50-613185	205–205	35	14	11	—	—	—	—	—	4.3	—	—	—	—	10	6.6
MD50-11-3964	50-613185	235–235	—	97	—	—	—	—	—	—	—	—	—	—	—	35	15
MD50-11-3965	50-613185	280–280	8.8	3.6	—	—	—	—	—	—	3.4	—	—	—	—	3.2	3.2
MD50-11-3966	50-613185	350–350	7.2	2.5	—	—	—	—	—	—	3.4	—	—	—	—	—	—
MD50-11-3967	50-613185	450–450	—	—	—	—	40	—	—	—	44	—	—	—	—	—	—
MD50-11-3969	50-613185	600–600	9.8	1.6	2.9	18	16	—	—	—	34	—	—	—	—	1.9	—
MD50-11-3968	50-613185	675–675	6.9	—	—	—	—	—	—	—	2.6	—	—	—	—	—	—
MD50-11-3970	50-613185	688–688	7.9	9.6	—	62	5.8	—	2.2	—	16	—	—	—	—	7.5	6.4

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-4012	50-24784	25–25	—	14	—	1800	—	43	57	920	—	—	—	—	—	—
MD50-11-4010	50-24784	96–96	—	—	—	2800	—	150 (J+)	62	2600	—	—	—	—	—	—
MD50-11-4009	50-24784	155–155	—	—	—	2000	—	150 (J+)	50	3000	—	—	—	—	—	—
MD50-11-4006	50-24784	215–215	—	120	—	2500	—	140	—	5000	—	—	—	—	—	—
MD50-11-4004	50-24784	244–244	—	55	—	2400	—	120	—	4600	—	—	—	—	—	—
MD50-11-4008	50-24784	289–289	—	68	—	2400	—	99	—	5000	—	—	—	—	—	—
MD50-11-4007	50-24784	362–362	—	26	—	1200	—	43	—	2600	—	—	—	—	—	—
MD50-11-4005	50-24784	411–411	—	—	—	630	—	—	—	—	—	—	—	—	—	—
MD50-11-4003	50-24784	450–450	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-4023	50-24813	25–25	—	230 (J+)	—	820	—	—	—	37000	—	—	—	—	—	—
MD50-11-4021	50-24813	99–99	—	570 (J+)	—	530	—	—	—	42000	—	—	—	—	—	—
MD50-11-4095	50-24813	150–150	—	430	—	590	—	—	—	39000	—	—	—	—	—	—
MD50-11-4019	50-24813	207–207	—	330	—	—	—	—	—	1100	—	—	—	—	—	—
MD50-11-4018	50-24813	241–241	—	77	—	—	32	—	—	360	—	—	—	14	—	14
MD50-11-4017	50-24813	286–286	—	81 (J+)	—	120	—	—	—	9900	—	—	—	—	—	—
MD50-11-4014	50-24813	358–358	—	3900 (J)	—	490	—	—	—	43000	—	—	—	—	—	—
MD50-11-4013	50-24813	408–408	—	180 (J+)	—	210	—	—	—	15000	—	—	—	—	—	—
MD50-11-4015	50-24813	450–450	—	120 (J+)	—	150	—	—	—	13000	—	—	—	—	—	—
MD50-11-4016	50-24813	600–600	—	—	—	—	—	—	—	170	2.7	—	—	—	—	—
MD50-11-4058	50-24822	25–25	—	—	—	—	—	—	—	6100	—	—	—	—	—	—
MD50-11-4057	50-24822	142–142	—	—	—	—	—	—	—	500	—	—	—	—	—	—
MD50-11-4055	50-24822	204–204	—	640 (J)	—	—	—	—	—	28000	—	—	—	—	—	—
MD50-11-4060	50-24822	235–235	—	470 (J)	—	—	—	—	—	32000	—	—	—	—	—	—
MD50-11-4061	50-24822	280–280	—	190	—	—	—	—	—	17000	—	—	—	—	—	—
MD50-11-4056	50-24822	351–351	2.9	—	—	—	9.6	—	—	11	—	—	—	4.3	—	4.3
MD50-11-4080	50-603061	25–25	—	—	—	—	—	15000	1700	380	—	—	—	—	—	—
MD50-11-4081	50-603061	76–76	—	—	—	250	—	22000	3400	1900	—	—	—	—	—	—
MD50-11-4083	50-603061	128–128	—	—	—	—	—	28000	5800	2500	—	—	—	—	—	—
MD50-11-4082	50-603061	190–190	—	—	—	—	—	28000	4800	3700	—	—	—	—	—	—
MD50-11-4084	50-603061	228–228	—	—	—	—	160	22000	3200	2700	—	—	—	—	—	—
MD50-11-4076	50-603061	274–274	—	—	—	72	—	9100	1200	1500	—	—	—	—	—	—
MD50-11-4077	50-603061	347–347	—	—	—	—	—	6600	430	1000	24	—	—	—	—	—
MD50-11-4078	50-603061	397–397	—	—	—	55	11	4000	180	1300	—	—	—	—	—	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-4079	50-603061	450–450	—	—	—	18	—	1100	24	390	—	—	—	—	—	—
MD50-11-4092	50-603062	25–25	—	—	—	—	—	120	26	1400	—	—	—	—	—	—
MD50-11-4091	50-603062	64–64	—	—	—	—	—	530	—	7400	—	—	—	—	—	—
MD50-11-4093	50-603062	122–122	—	—	—	—	—	500	—	6100	—	—	—	—	—	—
MD50-11-4090	50-603062	184–184	—	—	—	—	—	410	—	6000	—	—	—	—	—	—
MD50-11-4089	50-603062	217–217	—	2.4	—	3.8	1.5	75	7.8	1100	3.5	—	—	—	—	—
MD50-11-4087	50-603062	263–263	—	—	—	—	—	280	—	5700	—	—	—	—	—	—
MD50-11-4086	50-603062	337–337	—	—	—	—	—	61	—	1400	—	—	—	—	—	—
MD50-11-4088	50-603062	387–387	—	—	—	—	—	—	—	1700	—	—	—	—	—	—
MD50-11-4085	50-603062	450–450	—	—	—	—	—	8.7	—	320	—	—	—	—	—	—
MD50-11-4103	50-603063	25–25	—	—	—	360	—	3500	450	1700	—	—	—	—	—	—
MD50-11-4102	50-603063	76–76	—	41	—	810	—	6100	850	6500	—	—	—	—	—	—
MD50-11-4101	50-603063	128–128	—	72	—	890	—	6900	920	8700	—	—	—	—	—	—
MD50-11-4100	50-603063	190–190	—	200	—	1600	—	7300	900	20000	—	—	—	—	—	—
MD50-11-4099	50-603063	228–228	—	—	—	—	42	—	—	3.3	3.8	—	—	11	2.6	8.5
MD50-11-4098	50-603063	274–274	—	270	—	1400	—	3200	—	22000	—	—	—	—	—	—
MD50-11-4096	50-603063	347–347	—	60	—	220	—	650	—	4600	—	—	—	—	—	—
MD50-11-4104	50-603063	397–397	—	9.4	—	38	12	—	—	910	—	—	—	—	—	—
MD50-11-4097	50-603063	450–450	—	95	—	380	—	150	—	8400	—	—	—	—	—	—
MD50-11-4113	50-603064	25–25	—	—	—	210	—	2600	630	3900	—	—	—	—	—	—
MD50-11-4112	50-603064	66–66	—	—	—	190	—	5300	950	3700	—	—	—	—	—	—
MD50-11-4111	50-603064	113–113	—	—	—	570	—	12000	2500	31000	—	—	—	—	—	—
MD50-11-4109	50-603064	176–176	—	590 (J)	—	500	—	18000	2600	34000	—	—	—	—	—	—
MD50-11-4110	50-603064	214–214	—	—	—	220	—	4200	820	3800	—	—	—	—	—	—
MD50-11-4105	50-603064	259–259	—	190	—	—	—	5200	620	21000	—	—	—	—	—	—
MD50-11-4106	50-603064	332–332	—	—	—	—	—	2400	120	11000	—	—	—	—	—	—
MD50-11-4107	50-603064	400–400	—	—	—	—	—	590	—	4800	—	—	—	—	—	—
MD50-11-4108	50-603064	500–500	—	—	—	—	—	110	—	1500	—	—	—	—	—	—
MD50-11-4024	50-603383	26–26	—	—	—	690	—	880 (J+)	170	2000	31	—	—	—	—	—
MD50-11-4029	50-603383	85–85	—	—	—	800	—	1100	210	1900	—	—	—	—	—	—
MD50-11-4025	50-603383	139–139	—	—	—	—	1700	—	—	250	—	—	—	—	—	—
MD50-11-4030	50-603383	206–206	—	77 (J+)	—	1200	—	720	180	4600	—	—	—	—	—	—
MD50-11-4026	50-603383	244–244	—	91 (J+)	—	1500	—	750	220	5900	—	—	—	—	—	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-4031	50-603383	286–286	—	2.3	—	48	1.2	22	5.9	—	2.6	—	—	—	—	—
MD50-11-4027	50-603383	359–359	—	1.8	—	38	2.8	12 (J+)	4.8	300	—	—	—	—	—	—
MD50-11-4032	50-603383	408–408	—	—	—	200	—	70 (J+)	—	1500	—	—	—	—	—	—
MD50-11-4028	50-603383	450–450	—	—	—	280	—	75	—	1500	—	—	—	—	—	—
MD50-11-4038	50-603467	91–91	—	130	—	390	—	—	—	12000	—	—	—	—	—	—
MD50-11-4039	50-603467	206–206	—	140	—	340	—	—	—	11000	—	—	—	—	—	—
MD50-11-4042	50-603467	287–287	—	170 (J-)	—	250 (J-)	—	—	—	8800 (J-)	—	—	—	—	—	—
MD50-11-4040	50-603467	409–409	—	—	—	—	—	—	—	7200	—	—	—	—	—	—
MD50-11-4043	50-603467	500–500	—	—	—	—	—	—	—	6000	—	—	—	—	—	—
MD50-11-4041	50-603467	600–600	1500 (J-)	—	—	110 (J-)	—	—	—	3400 (J-)	—	—	—	—	—	—
MD50-11-4047	50-603468	92–92	—	—	—	—	60	—	—	33	3.4	7.4	—	39	9.5	29
MD50-11-4046	50-603468	142–142	—	—	—	—	57	—	—	55	3.3	4.1	—	34	8.2	26
MD50-11-4045	50-603468	198–198	—	210	—	—	—	—	—	11000	—	—	—	—	—	—
MD50-11-4054	50-603468	233–233	—	—	—	—	43	—	—	21	2.8	5.4	—	27	6.7	20
MD50-11-4050	50-603468	282–282	—	380	—	—	—	—	—	23000	—	—	—	—	—	—
MD50-11-4051	50-603468	354–354	—	450	—	490	—	—	—	38000	—	—	—	—	—	—
MD50-11-4052	50-603468	403–403	—	200	—	—	—	—	—	19000	—	—	—	—	—	—
MD50-11-4053	50-603468	450–450	—	—	—	—	—	—	—	15000	—	—	—	—	—	—
MD50-11-3980	50-603470	83–83	—	—	—	260	—	130	—	6000	—	—	—	—	—	—
MD50-11-3975	50-603470	143–143	—	890 (J)	—	—	—	—	—	41000	—	—	—	—	—	—
MD50-11-3973	50-603470	203–203	—	—	—	—	—	—	—	12000	—	—	—	—	—	—
MD50-11-3972	50-603470	233–233	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-3974	50-603470	278–278	—	770 (J)	—	—	—	580	—	39000	—	—	—	—	—	—
MD50-11-3979	50-603470	351–351	—	—	5.5	—	89	—	—	32	—	6.7	—	43	9.9	33
MD50-11-3978	50-603470	450–450	—	—	—	—	44	—	—	120	4.7	7.9	—	27	7.3	20
MD50-11-3977	50-603470	600–600	—	—	—	—	38	—	—	19	4.7	17	4.2	38	11	28
MD50-11-3976	50-603470	650–650	—	—	1.7	—	34	—	—	—	—	3.6	—	18	4.4	14
MD50-11-3983	50-603471	30–30	—	—	—	330	150	160	—	5900	—	—	—	100	—	100
MD50-11-3992	50-603471	90–90	—	67	—	190	—	—	—	3700	—	—	—	—	—	—
MD50-11-3990	50-603471	146–146	—	1400 (J)	—	1000	—	—	—	46000	—	—	—	—	—	—
MD50-11-3988	50-603471	209–209	—	370	—	240	—	—	—	11000	—	—	—	—	—	—
MD50-11-3989	50-603471	242–242	—	530 (J)	—	270	—	—	—	12000	—	—	—	—	—	—
MD50-11-3987	50-603471	288–288	—	1000 (J)	—	1000	—	—	—	37000	—	—	—	—	—	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-3986	50-603471	360–360	—	570 (J)	—	500	—	—	—	24000	—	—	—	—	—	—
MD50-11-3984	50-603471	410–410	—	610 (J)	—	—	—	—	—	23000	—	—	—	—	—	—
MD50-11-3985	50-603471	450–450	—	480 (J)	—	670	—	—	—	31000	—	—	—	—	—	—
MD50-11-4002	50-603472	27–27	—	23	—	570	—	40	46	3200	—	—	—	—	—	—
MD50-11-4000	50-603472	93–93	—	36	—	170	36	—	—	2200	—	—	—	—	—	—
MD50-11-4001	50-603472	146–146	—	360	—	610	—	—	—	11000	—	—	—	—	—	—
MD50-11-3998	50-603472	210–210	—	230 (J)	—	410	—	—	—	7100	—	—	—	—	—	—
MD50-11-3999	50-603472	247–247	—	160	—	180	—	—	—	3700	—	—	—	—	—	—
MD50-11-3993	50-603472	364–364	—	5.3	—	19	—	—	—	310	2.4	—	—	—	—	—
MD50-11-3994	50-603472	414–414	—	220 (J)	—	850	—	—	—	15000	—	—	—	—	—	—
MD50-11-3995	50-603472	450–450	—	99	—	510	—	—	—	11000	—	—	—	—	—	—
MD50-11-4071	50-603503	25–25	—	—	—	200	—	—	—	1900	—	—	—	—	—	—
MD50-11-4072	50-603503	80–80	—	18	—	210	—	—	—	1900	—	—	—	—	—	—
MD50-11-4069	50-603503	133–133	—	32	—	290	—	—	—	2600	—	—	—	—	—	—
MD50-11-4073	50-603503	198–198	—	94	—	440	—	—	—	5600	—	—	—	—	—	—
MD50-11-4070	50-603503	237–237	—	110	—	480	—	—	—	6600	—	—	—	—	—	—
MD50-11-4067	50-603503	278–278	—	85	—	390	—	—	—	4000	—	—	—	—	—	—
MD50-11-4066	50-603503	347–347	—	26	—	220	—	—	—	1800	—	—	—	—	—	—
MD50-11-4068	50-603503	397–397	—	21	—	200	—	—	—	2100	—	—	—	—	—	—
MD50-11-4065	50-603503	450–450	—	—	—	190	—	—	—	2400	—	—	—	—	—	—
MD50-11-3943	50-613182	550–550	—	—	—	—	130	—	—	31	—	11	—	120	28	89
MD50-11-3942	50-613182	600–600	—	—	2.2	—	38	—	—	2.2	—	2.7	—	17	3.9	13
MD50-11-3953	50-613182	620–620	—	—	—	15	—	—	—	290	—	—	—	—	—	—
MD50-11-3941	50-613182	632.5–632.5	—	—	100	—	1700	—	—	—	—	110	35	750	170	590
MD50-11-3947	50-613183	30–30	—	—	—	1100	—	—	—	14000	—	—	—	—	—	—
MD50-11-3948	50-613183	500–500	—	—	—	270 (J-)	—	—	—	16000 (J-)	—	—	—	—	—	—
MD50-11-3949	50-613183	550–550	—	—	—	130	—	—	—	6500	—	—	—	—	—	—
MD50-11-3950	50-613183	600–600	—	—	—	—	—	—	—	1400	—	—	—	—	—	—
MD50-11-3951	50-613183	630–630	—	—	—	—	—	—	—	1400	—	—	—	—	—	—
MD50-11-3952	50-613183	642.5–642.5	2.3	—	4.3	—	—	—	—	—	—	—	—	1.4	1.4	—
MD50-11-3959	50-613184	30–30	—	—	—	57 (J-)	—	—	—	2700 (J-)	—	—	—	—	—	—
MD50-11-3956	50-613184	500–500	—	28	—	64	—	—	—	3400	—	—	—	—	—	—
MD50-11-3958	50-613184	550–550	—	—	—	—	—	—	—	2000 (J-)	—	—	—	—	—	—

Table C-4.1-12 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-3954	50-613184	600–600	—	—	—	—	—	—	—	680 (J-)	—	—	—	—	—	—
MD50-11-3957	50-613184	652–652	2.4 (J-)	—	40 (J-)	—	5.2 (J-)	—	—	150 (J-)	2.6 (J-)	2.9 (J-)	—	5.8 (J-)	1.7 (J-)	4.1 (J-)
MD50-11-3955	50-613184	664.5–664.5	—	—	—	—	8.1 (J-)	—	—	31 (J-)	—	4.3 (J-)	—	7.7 (J-)	2.1 (J-)	5.6 (J-)
MD50-11-3962	50-613185	145–145	—	—	—	—	—	—	—	3500	—	—	—	—	—	—
MD50-11-3963	50-613185	205–205	—	1.5	1.8	—	88	—	—	—	—	7.6	—	49	12	36
MD50-11-3964	50-613185	235–235	—	—	—	—	300	—	—	—	—	15	—	110	25	87
MD50-11-3965	50-613185	280–280	—	—	—	—	14	—	—	27	—	3.6	—	11	2.8	7.8
MD50-11-3966	50-613185	350–350	—	—	—	—	1.1	—	—	29	—	—	—	—	—	—
MD50-11-3967	50-613185	450–450	—	—	—	—	—	—	—	930	—	—	—	—	—	—
MD50-11-3969	50-613185	600–600	—	—	—	—	3.1	—	—	110	—	—	—	—	1.3	—
MD50-11-3968	50-613185	675–675	—	—	—	—	4	—	—	—	—	—	—	—	—	—
MD50-11-3970	50-613185	688–688	—	—	—	2.8	14	—	—	18	—	7.2	2.9	18	6.9	11

Notes: Results are in µg/m^3. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-4.1-13
VOCs Detected in Vapor Samples at MDA C during March 2011–May 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-6010	50-24784	25–25	—*	—	—	—	—	37 (J)	270	—	—	38	—	—	—	—	—
MD50-11-6007	50-24784	96–96	—	—	—	—	—	130 (J)	640	—	—	85	—	—	58	—	—
MD50-11-6011	50-24784	155–155	—	—	—	—	—	140 (J)	140	—	—	67	—	—	25	—	—
MD50-11-6005	50-24784	215–215	—	—	—	—	—	250	100	—	—	100	—	—	—	—	—
MD50-11-6009	50-24784	244–244	—	—	—	—	—	180 (J)	—	—	—	81	—	—	—	—	—
MD50-11-6006	50-24784	289–289	—	—	—	—	—	520	87	—	—	—	—	—	—	—	—
MD50-11-6008	50-24784	362–362	16	46	—	—	—	76 (J)	4.9	—	—	8.6	0.96	—	—	23	22
MD50-11-6004	50-24784	411–411	—	—	—	—	—	300	—	—	—	150	—	—	—	—	—
MD50-11-6003	50-24784	450–450	—	—	—	—	—	320	—	—	—	170	—	—	—	—	—
MD50-11-6022	50-24813	25–25	—	—	—	—	—	—	2100	—	—	1900	—	—	—	—	—
MD50-11-6021	50-24813	99–99	—	—	—	—	—	—	2300	—	—	1900	—	—	—	—	—
MD50-11-6019	50-24813	150–150	—	—	—	—	—	1900	2500	—	—	890	—	450	—	—	—
MD50-11-6020	50-24813	207–207	—	—	—	—	—	2600	2700	—	—	670	—	360	—	—	—
MD50-11-6018	50-24813	241–241	—	—	—	—	—	1500	1000	—	—	500	—	—	—	—	—
MD50-11-6017	50-24813	286–286	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-6013	50-24813	358–358	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-6015	50-24813	408–408	—	—	—	—	—	—	—	—	—	720	—	—	—	—	—
MD50-11-6016	50-24813	450–450	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-6014	50-24813	600–600	—	—	—	—	—	—	—	—	—	260	—	—	—	—	—
MD50-11-6062	50-24822	25–25	—	—	—	—	—	—	62	—	—	43 (J-)	—	—	—	—	—
MD50-11-6059	50-24822	81–81	—	—	—	—	—	—	100	—	—	—	—	16	—	—	—
MD50-11-6061	50-24822	142–142	—	10	—	—	—	—	30	—	—	35 (J-)	—	—	—	—	—
MD50-11-6058	50-24822	204–204	—	—	—	—	—	—	540	—	—	1200 (J)	—	—	—	—	—
MD50-11-6060	50-24822	235–235	—	—	—	—	—	—	110	—	—	170 (J-)	—	—	—	—	—
MD50-11-6055	50-24822	280–280	—	—	—	—	—	—	270	—	—	1200 (J)	—	—	—	—	—
MD50-11-6056	50-24822	351–351	—	—	—	—	—	130 (J-)	110	—	—	870 (J)	—	—	—	—	—
MD50-11-6063	50-24822	402–402	9.8	—	—	—	3.2	—	—	—	—	2.4	—	—	—	—	—
MD50-11-6057	50-24822	450–450	—	—	—	—	—	61 (J-)	—	—	—	—	—	—	—	—	—
MD50-11-6083	50-603061	25–25	—	—	—	—	—	—	—	—	—	690	230	—	—	—	—
MD50-11-6080	50-603061	76–76	5.8	5.9	—	—	—	—	—	—	—	3.2	—	—	—	3.6	2.8
MD50-11-6079	50-603061	128–128	—	—	—	—	—	—	12	—	—	65	330	—	—	—	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-6078	50-603061	190–190	7.7 (J)	5	—	—	—	—	—	—	—	5.8	18	—	—	—	—
MD50-11-6081	50-603061	228–228	—	—	—	—	—	—	—	—	—	290	1400	—	—	—	—
MD50-11-6077	50-603061	274–274	—	—	—	—	—	93 (J)	—	—	—	130	400	—	—	—	—
MD50-11-6082	50-603061	347–347	—	—	—	—	—	—	—	—	—	320	1400	—	—	—	—
MD50-11-6076	50-603061	397–397	—	14	—	—	—	66 (J)	—	—	—	95	75	—	—	—	—
MD50-11-6075	50-603061	450–450	6.6 (J)	—	—	—	—	73 (J)	—	—	—	120	51	—	—	—	—
MD50-11-6088	50-603062	25–25	14	—	—	—	—	—	24	—	—	45	—	—	—	—	—
MD50-11-6085	50-603062	64–64	—	—	—	—	—	—	41	—	—	78	—	—	—	—	—
MD50-11-6087	50-603062	122–122	—	—	—	—	—	—	44	—	—	250 (J)	—	—	—	—	—
MD50-11-6092	50-603062	184–184	—	—	—	—	—	—	—	—	—	200	—	—	—	—	—
MD50-11-6086	50-603062	217–217	—	—	—	—	—	—	—	—	—	250 (J)	—	—	—	—	—
MD50-11-6090	50-603062	263–263	—	—	—	—	—	—	—	—	—	200	—	—	—	—	—
MD50-11-6094	50-603062	337–337	—	—	—	—	—	30	—	—	—	110	—	—	—	—	—
MD50-11-6091	50-603062	387–387	—	—	—	—	—	20 (J)	—	—	—	80	—	—	—	—	—
MD50-11-6089	50-603062	450–450	—	—	—	—	—	20 (J)	—	—	—	79	—	—	—	—	—
MD50-11-6102	50-603063	25–25	—	—	—	—	—	—	190	—	—	290	170	—	—	—	—
MD50-11-6100	50-603063	76–76	—	—	—	—	—	220 (J+)	210	—	—	340	210	—	—	—	—
MD50-11-6099	50-603063	128–128	—	—	—	—	—	—	260	—	—	440	280	—	—	—	—
MD50-11-6097	50-603063	190–190	5	—	—	—	—	3.9 (J)	4.5	—	—	7.8	2.7	—	—	—	—
MD50-11-6098	50-603063	228–228	—	—	—	—	—	—	230	—	—	—	—	—	—	—	—
MD50-11-6103	50-603063	274–274	—	—	—	—	—	480 (J+)	200	—	—	300	—	—	—	—	—
MD50-11-6095	50-603063	347–347	—	—	—	—	—	—	120	—	—	170 (J)	—	—	—	—	—
MD50-11-6101	50-603063	397–397	—	—	—	—	—	160 (J+)	79	—	—	130	—	—	—	—	—
MD50-11-6096	50-603063	450–450	—	—	—	—	—	200	130	—	—	210	—	—	—	—	—
MD50-11-6108	50-603064	25–25	—	—	—	—	—	—	150	—	—	41	—	—	—	—	—
MD50-11-6107	50-603064	66–66	—	—	—	—	—	—	350	—	—	240	250	—	—	—	—
MD50-11-6105	50-603064	113–113	—	—	—	—	—	—	880	—	—	600	—	—	—	—	—
MD50-11-6110	50-603064	176–176	—	—	—	—	—	—	580	—	—	970	560	—	—	—	—
MD50-11-6111	50-603064	214–214	—	—	—	—	—	—	500	—	—	970	—	—	—	—	—
MD50-11-6112	50-603064	259–259	—	—	—	—	—	—	280	—	—	800	—	—	—	—	—
MD50-11-6113	50-603064	332–332	—	—	—	—	—	—	—	—	—	470	—	—	—	—	—
MD50-11-6109	50-603064	482–482	—	—	—	—	—	—	—	—	—	310	—	—	—	—	—
MD50-11-6106	50-603064	500–500	9.7	8.9	—	—	—	29	—	—	—	100	—	—	—	—	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-6027	50-603383	26–26	—	—	—	—	—	100 (J)	88	—	—	90	21	—	72	—	—
MD50-11-6025	50-603383	85–85	—	—	—	—	—	110 (J)	100	—	—	—	37	11	120	—	—
MD50-11-6024	50-603383	139–139	—	—	—	—	—	44 (J)	38	—	—	60	12	—	66	—	—
MD50-11-6032	50-603383	206–206	5.1	—	—	—	—	—	—	—	—	2.6	—	—	—	—	—
MD50-11-6026	50-603383	244–244	—	—	—	—	—	440 (J+)	110	—	—	250 (J)	—	72	350	—	—
MD50-11-6029	50-603383	286–286	—	—	—	—	—	87 (J)	23	—	—	60	—	—	53	—	—
MD50-11-6028	50-603383	359–359	—	—	—	—	—	170 (J)	—	—	—	160	16	—	—	—	—
MD50-11-6030	50-603383	408–408	—	—	—	—	—	230 (J)	—	—	—	140	—	—	—	—	—
MD50-11-6031	50-603383	450–450	—	—	—	—	—	170 (J)	43	—	—	91	—	15	97	—	—
MD50-11-6041	50-603467	26–26	—	—	—	—	—	360 (J)	360	—	—	—	—	—	—	—	—
MD50-11-6043	50-603467	91–91	—	—	—	—	—	—	660	—	—	—	—	—	—	—	—
MD50-11-6038	50-603467	143–143	—	—	—	—	—	670 (J)	570	—	—	210	—	—	—	—	—
MD50-11-6042	50-603467	206–206	—	—	—	—	—	—	630	—	—	—	—	—	—	—	—
MD50-11-6037	50-603467	244–244	—	—	—	—	—	930 (J)	640	—	—	330	—	—	—	—	—
MD50-11-6039	50-603467	287–287	—	—	—	—	—	—	360	—	—	—	—	—	—	—	—
MD50-11-6040	50-603467	360–360	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-6036	50-603467	409–409	—	—	—	—	—	140 (J)	—	—	—	220	—	—	—	—	—
MD50-11-6035	50-603467	500–500	—	—	—	—	—	110 (J+)	—	—	—	92 (J)	—	—	—	—	—
MD50-11-6034	50-603467	600–600	98	—	—	200	—	200 (J)	—	—	—	170	—	—	—	—	—
MD50-11-6051	50-603468	92–92	—	—	90	—	—	240	260	31	—	93	—	60	—	—	—
MD50-11-6050	50-603468	142–142	—	—	—	—	—	—	270	—	—	—	—	88	—	—	—
MD50-11-6052	50-603468	198–198	—	—	—	—	—	—	540	—	—	340	—	200	—	—	—
MD50-11-6049	50-603468	233–233	—	—	—	—	—	400 (J)	510	—	—	410	—	—	—	—	—
MD50-11-6047	50-603468	282–282	—	—	—	—	—	—	570	—	—	680 (J)	—	210	—	—	—
MD50-11-6046	50-603468	354–354	—	—	—	—	—	400 (J)	400	—	—	1100 (J)	—	180	—	—	—
MD50-11-6045	50-603468	403–403	—	—	—	—	—	220 (J)	—	—	—	770 (J)	—	—	—	—	—
MD50-11-6048	50-603468	450–450	—	—	—	—	—	130 (J)	—	—	—	320 (J)	—	—	—	—	—
MD50-11-5978	50-603470	30–30	—	—	—	—	—	—	760	—	—	350	—	—	—	—	—
MD50-11-5980	50-603470	83–83	—	—	—	—	—	—	820	—	—	160	—	110	—	—	—
MD50-11-5982	50-603470	143–143	—	—	—	—	—	—	1300	—	—	700	—	—	—	—	—
MD50-11-5977	50-603470	203–203	—	—	—	—	—	—	1100	—	—	1100	—	—	—	—	—
MD50-11-5976	50-603470	233–233	—	—	—	—	—	—	630	—	—	590	—	—	—	—	—
MD50-11-5979	50-603470	278–278	—	—	—	—	—	—	840	—	—	1100	—	—	—	—	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-5973	50-603470	351–351	—	—	—	—	—	280	190	—	—	590	—	70	—	—	—
MD50-11-5972	50-603470	450–450	—	—	—	—	—	—	—	—	—	520	—	—	—	—	—
MD50-11-5975	50-603470	600–600	—	—	—	—	—	84	—	—	—	250	—	—	—	—	—
MD50-11-5974	50-603470	650–650	9.1	2.3	—	—	—	11	—	—	—	52	—	—	—	—	—
MD50-11-5990	50-603471	90–90	—	—	—	—	—	1400	1600	—	—	—	—	—	—	—	—
MD50-11-5989	50-603471	146–146	—	—	—	—	—	—	1300	—	—	—	—	—	—	—	—
MD50-11-5988	50-603471	209–209	—	—	—	—	—	—	72	—	—	—	—	—	—	—	—
MD50-11-5987	50-603471	242–242	18	6.9	—	—	—	—	26	—	—	17	—	—	—	—	—
MD50-11-6156	50-603471	288–288	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-5986	50-603471	360–360	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-5983	50-603471	410–410	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-5985	50-603471	450–450	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-6000	50-603472	27–27	—	—	—	—	—	—	320	—	—	—	—	—	—	—	—
MD50-11-5998	50-603472	93–93	—	—	—	—	—	—	340	—	—	62	—	40	47	—	—
MD50-11-6001	50-603472	146–146	—	—	—	—	—	—	380	—	—	—	—	—	—	—	—
MD50-11-5997	50-603472	210–210	—	—	—	—	—	—	370	—	—	—	—	—	—	—	—
MD50-11-5999	50-603472	247–247	—	—	—	—	—	—	250	—	—	—	—	—	—	—	—
MD50-11-5995	50-603472	292–292	—	—	—	—	—	—	360	—	—	—	—	—	—	—	—
MD50-11-5994	50-603472	364–364	—	—	—	—	—	—	82	—	—	200	—	—	—	—	—
MD50-11-5993	50-603472	414–414	—	—	—	—	—	—	—	—	—	220	—	—	—	—	—
MD50-11-5996	50-603472	450–450	—	—	—	—	—	—	—	—	—	310	—	—	—	—	—
MD50-11-6072	50-603503	25–25	15	1.6	—	5.8	—	41 (J)	58	1.9	—	31	—	5.9	7.1	—	—
MD50-11-5992	50-603503	80–80	—	—	—	—	—	—	86	—	—	—	—	—	—	—	—
MD50-11-6073	50-603503	133–133	—	—	—	—	—	64	86	—	39	45	—	—	22	—	—
MD50-11-6069	50-603503	198–198	—	—	—	—	—	74 (J)	99	—	—	46	—	19	34	—	—
MD50-11-6068	50-603503	237–237	—	—	—	—	—	120 (J)	140	—	—	74	—	28	41	—	—
MD50-11-6070	50-603503	278–278	—	—	—	—	—	110	110	—	—	—	—	—	—	—	—
MD50-11-6065	50-603503	347–347	—	—	—	—	—	42	42	—	—	29	—	—	—	—	—
MD50-11-6066	50-603503	397–397	—	—	—	—	—	38	21	—	—	25	—	—	—	—	—
MD50-11-6067	50-603503	450–450	—	—	—	—	—	100	—	—	—	69	—	—	—	—	—
MD50-11-5933	50-613182	500–500	—	—	—	—	—	230	—	—	—	—	—	—	—	—	—
MD50-11-5934	50-613182	550–550	—	—	—	—	—	180	—	—	—	82	—	—	—	—	—
MD50-11-5936	50-613182	600–600	5	27	—	—	—	—	—	—	—	4.2	—	—	—	3.3	2.6

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Acetone	Benzene	Bromomethane	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
MD50-11-5937	50-613182	620–620	4.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-5935	50-613182	632.5–632.5	13	—	—	—	—	2.8	—	—	—	4	—	—	—	—	—
MD50-11-5942	50-613183	30–30	—	—	—	—	—	250 (J-)	—	—	—	780 (J)	—	—	—	—	—
MD50-11-5939	50-613183	500–500	—	—	—	—	—	80	—	—	—	150	—	—	—	—	—
MD50-11-5943	50-613183	550–550	—	—	—	—	—	3000 (J-)	3200	—	—	630 (J)	200	180	—	—	—
MD50-11-5941	50-613183	600–600	—	—	—	—	—	220 (J-)	—	—	—	660 (J)	—	—	—	—	—
MD50-11-5944	50-613183	630–630	—	—	—	—	—	230 (J-)	—	—	—	660 (J)	—	—	—	—	—
MD50-11-5940	50-613183	642.5–642.5	—	21	—	—	110	2.8	—	—	—	7	—	—	—	5.9	5.6
MD50-11-5948	50-613184	30–30	—	—	—	—	—	100 (J+)	110	—	—	61	—	—	—	—	—
MD50-11-5951	50-613184	500–500	—	—	—	—	—	260 (J+)	—	—	—	180	—	—	—	—	—
MD50-11-5946	50-613184	550–550	—	—	—	—	—	180 (J+)	—	—	—	180	—	—	—	—	—
MD50-11-5947	50-613184	600–600	10	4.2	—	—	—	49	—	—	—	90	—	—	—	—	—
MD50-11-5950	50-613184	652–652	73	—	—	—	250	19	—	—	—	47	—	—	—	—	—
MD50-11-5949	50-613184	664.5–664.5	12	1.5	—	3.7	52	7.2	—	—	—	13	—	—	—	2.1	—
MD50-11-5960	50-613185	85–85	—	—	—	—	—	19	11	—	—	16 (J-)	—	—	—	—	—
MD50-11-5961	50-613185	145–145	—	—	—	—	—	98 (J)	73	—	—	120	—	—	—	—	—
MD50-11-5957	50-613185	205-205	—	—	—	—	—	65 (J)	38	—	—	91	—	—	—	—	—
MD50-11-5962	50-613185	235–235	—	—	—	—	—	250 (J)	65	—	—	230	—	—	—	—	—
MD50-11-5959	50-613185	280–280	—	—	—	—	—	94 (J)	—	—	—	—	—	—	—	—	—
MD50-11-5955	50-613185	350–350	—	—	—	—	—	86	—	—	—	100	—	—	—	—	—
MD50-11-5954	50-613185	450–450	—	—	—	—	200	66	—	—	—	96	—	—	—	—	—
MD50-11-5953	50-613185	600–600	17	3.4	—	—	12	18	—	—	5.4	40	—	—	—	2	—
MD50-11-5958	50-613185	675–675	—	1.6	—	—	35	7.8	—	—	—	5.8	—	—	—	1.8	—
MD50-11-5956	50-613185	688–688	15	1.5	—	4.3	50	5.3	—	—	—	17	—	—	—	2.5	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-6010	50-24784	25–25	—	—	—	2600	—	43	61	1100	—	—	—	—	—	—
MD50-11-6007	50-24784	96–96	—	—	—	3400	—	140	73	3200	—	—	—	—	—	—
MD50-11-6011	50-24784	155–155	—	—	—	1400	—	80	32	2300	—	—	—	—	—	—
MD50-11-6005	50-24784	215–215	—	—	—	2000	—	89	40	3600	—	—	—	—	—	—
MD50-11-6009	50-24784	244–244	—	—	—	280	5	—	—	630	7.2	—	—	—	—	—
MD50-11-6006	50-24784	289–289	—	—	—	3200	—	110	47	5000	—	—	—	—	—	—
MD50-11-6008	50-24784	362–362	—	1.2	4.8	240	120	13	3.9	510	6.4	25	7.5	91	23	68
MD50-11-6004	50-24784	411–411	—	—	—	630	—	—	—	1400	—	—	—	—	—	—
MD50-11-6003	50-24784	450–450	—	—	—	530	—	—	—	1200	—	—	—	—	—	—
MD50-11-6022	50-24813	25–25	—	1600	—	—	—	—	—	93000	—	—	—	—	—	—
MD50-11-6021	50-24813	99–99	—	1200	—	—	—	—	—	93000	—	—	—	—	—	—
MD50-11-6019	50-24813	150–150	—	540	—	—	—	—	—	48000	—	—	—	—	—	—
MD50-11-6020	50-24813	207–207	—	—	—	580	—	—	—	39000	—	—	—	—	—	—
MD50-11-6018	50-24813	241–241	—	—	—	370	—	—	—	15000	—	—	—	—	—	—
MD50-11-6017	50-24813	286–286	—	—	—	—	—	—	—	79000	—	—	—	—	—	—
MD50-11-6013	50-24813	358–358	—	—	—	—	—	—	—	52000	—	—	—	—	—	—
MD50-11-6015	50-24813	408–408	—	—	—	—	—	—	—	36000	—	—	—	—	—	—
MD50-11-6016	50-24813	450–450	—	—	—	—	—	—	—	16000	—	—	—	—	—	—
MD50-11-6014	50-24813	600–600	—	—	—	—	—	—	—	3100	—	—	—	—	—	—
MD50-11-6062	50-24822	25–25	—	—	—	15	—	—	—	1500	—	—	—	—	—	—
MD50-11-6059	50-24822	81–81	—	—	—	—	—	—	—	2400	—	—	—	—	—	—
MD50-11-6061	50-24822	142–142	—	—	—	—	13	—	—	1100	—	—	—	—	—	—
MD50-11-6058	50-24822	204–204	—	440	—	—	—	—	—	33000	—	—	—	—	—	—
MD50-11-6060	50-24822	235–235	—	—	—	—	—	—	—	6900	—	—	—	—	—	—
MD50-11-6055	50-24822	280–280	—	360	—	—	—	—	—	28000	—	—	—	—	—	—
MD50-11-6056	50-24822	351–351	—	190	—	—	—	—	—	18000	—	—	—	—	—	—
MD50-11-6063	50-24822	402–402	—	1.7	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-6057	50-24822	450–450	—	—	—	—	—	—	—	4300	—	—	—	—	—	—
MD50-11-6083	50-603061	25–25	—	—	—	—	—	19000	1900	390	—	—	—	—	—	—
MD50-11-6080	50-603061	76–76	—	—	—	—	21	20	—	5.1	3.7	—	—	14	3.3	11
MD50-11-6079	50-603061	128–128	—	—	—	48	—	5400	1000	580	—	—	—	—	—	—
MD50-11-6078	50-603061	190–190	—	—	—	—	18	330	48	38	7.2	—	—	8.6	—	8.6
MD50-11-6081	50-603061	228–228	—	—	—	200	—	19000	5200	3600	—	—	—	—	—	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-6077	50-603061	274–274	—	—	—	81	—	11000	1100	1600	—	—	—	—	—	—
MD50-11-6082	50-603061	347–347	—	—	—	180	—	25000	5500	2100	—	—	—	—	—	—
MD50-11-6076	50-603061	397–397	—	—	—	32	30	2500	90	760	11	—	—	—	—	—
MD50-11-6075	50-603061	450–450	—	—	—	26	—	1800	41	650	12	—	—	—	—	—
MD50-11-6088	50-603062	25–25	—	—	—	—	—	110	25	1500	—	—	—	—	—	—
MD50-11-6085	50-603062	64–64	—	—	—	—	—	150	32	2400	—	—	—	—	—	—
MD50-11-6087	50-603062	122–122	—	—	—	—	—	470	—	5700	—	—	—	—	—	—
MD50-11-6092	50-603062	184–184	—	—	—	—	—	460	—	—	—	—	—	—	—	—
MD50-11-6086	50-603062	217–217	—	42	—	—	—	440	—	5800	—	—	—	—	—	—
MD50-11-6090	50-603062	263–263	—	—	—	—	—	270	—	4700	—	—	—	—	—	—
MD50-11-6094	50-603062	337–337	—	—	—	—	—	75	—	2000	—	—	—	—	—	—
MD50-11-6091	50-603062	387–387	—	—	—	—	—	34	—	1000	—	—	—	—	—	—
MD50-11-6089	50-603062	450–450	—	—	—	—	—	15	—	580	—	—	—	—	—	—
MD50-11-6102	50-603063	25–25	—	—	—	720	—	5300	830	6300	—	—	—	—	—	—
MD50-11-6100	50-603063	76–76	—	—	—	840	—	6200	950	7400	—	—	—	—	—	—
MD50-11-6099	50-603063	128–128	—	—	—	960	—	6400	1000	11000	—	—	—	—	—	—
MD50-11-6097	50-603063	190–190	—	—	—	13	—	63	8.1	220	—	—	—	—	—	—
MD50-11-6098	50-603063	228–228	—	82	—	610	—	2600	300	9700	—	—	—	—	—	—
MD50-11-6103	50-603063	274–274	—	86 (J-)	—	840	—	2000	240	14000	—	—	—	—	—	—
MD50-11-6095	50-603063	347–347	—	91	—	330	—	860	—	7500	—	—	—	—	—	—
MD50-11-6101	50-603063	397–397	—	67 (J-)	—	260	—	640	—	5800	—	—	—	—	—	—
MD50-11-6096	50-603063	450–450	—	68	—	310	—	—	—	7900	—	—	—	—	—	—
MD50-11-6108	50-603064	25–25	—	—	—	150	—	1500	380	2600	—	—	—	—	—	—
MD50-11-6107	50-603064	66–66	—	—	—	320	—	8100	1300	7000	—	—	—	—	—	—
MD50-11-6105	50-603064	113–113	—	—	—	560	—	13000	2800	32000	—	—	—	—	—	—
MD50-11-6110	50-603064	176–176	—	350	—	460	—	13000	2300	39000	—	—	—	—	—	—
MD50-11-6111	50-603064	214–214	—	350	—	—	—	13000	1900	37000	—	—	—	—	—	—
MD50-11-6112	50-603064	259–259	—	—	—	—	—	10000	940	30000	—	—	—	—	—	—
MD50-11-6113	50-603064	332–332	—	—	—	150	—	3700	160	7200	—	—	—	—	—	—
MD50-11-6109	50-603064	482–482	—	—	—	91	—	960	—	6500	—	—	—	—	—	—
MD50-11-6106	50-603064	500–500	—	—	—	—	15	51	—	600	—	—	—	—	—	—
MD50-11-6027	50-603383	26–26	—	—	—	750	—	960	180	2400	—	—	—	—	—	—
MD50-11-6025	50-603383	85–85	—	—	—	730	—	1100	190	2800	—	—	—	—	—	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-6024	50-603383	139–139	—	—	—	240	—	340	53	1100	—	—	—	—	—	—
MD50-11-6032	50-603383	206–206	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-6026	50-603383	244–244	—	100	—	1400	—	790	200	6400	—	—	—	—	—	—
MD50-11-6029	50-603383	286–286	—	—	—	260	—	120	34	1300	—	—	—	—	—	—
MD50-11-6028	50-603383	359–359	—	—	—	230	—	220	32	1500	—	—	—	—	—	—
MD50-11-6030	50-603383	408–408	—	—	—	260	—	52	—	1600	—	—	—	—	—	—
MD50-11-6031	50-603383	450–450	—	22	—	500	—	230	62	2700	—	—	—	—	—	—
MD50-11-6041	50-603467	26–26	—	—	—	190	—	—	—	6300	—	—	—	—	—	—
MD50-11-6043	50-603467	91–91	—	—	—	—	—	—	—	12000	—	—	—	—	—	—
MD50-11-6038	50-603467	143–143	—	140	—	370	—	—	—	16000	—	—	—	—	—	—
MD50-11-6042	50-603467	206–206	—	290	—	670	—	—	—	25000	—	—	—	—	—	—
MD50-11-6037	50-603467	244–244	—	560	—	660	—	—	—	29000	—	—	—	—	—	—
MD50-11-6039	50-603467	287–287	—	390	—	500	—	—	—	21000	—	—	—	—	—	—
MD50-11-6040	50-603467	360–360	—	—	—	—	—	—	—	11000	—	—	—	—	—	—
MD50-11-6036	50-603467	409–409	—	120	—	290	—	—	—	11000	—	—	—	—	—	—
MD50-11-6035	50-603467	500–500	—	—	—	79	—	—	—	3300	—	—	—	—	—	—
MD50-11-6034	50-603467	600–600	1200	—	—	95	—	—	—	4300	—	—	—	—	—	—
MD50-11-6051	50-603468	92–92	—	—	—	81	—	—	—	5300	—	—	—	—	—	—
MD50-11-6050	50-603468	142–142	—	—	—	160	—	—	—	12000	—	—	—	—	—	—
MD50-11-6052	50-603468	198–198	—	—	—	310	—	—	—	24000	—	—	—	—	—	—
MD50-11-6049	50-603468	233–233	—	—	—	—	—	—	—	26000	—	—	—	—	—	—
MD50-11-6047	50-603468	282–282	—	730	—	450	—	—	—	29000	—	—	—	—	—	—
MD50-11-6046	50-603468	354–354	—	—	—	530	—	—	—	34000	—	—	—	—	—	—
MD50-11-6045	50-603468	403–403	—	320	—	330	—	—	—	20000	—	—	—	—	—	—
MD50-11-6048	50-603468	450–450	—	99	—	140	—	—	—	10000	—	—	—	—	—	—
MD50-11-5978	50-603470	30–30	—	—	—	680	—	260	—	13000	—	—	—	—	—	—
MD50-11-5980	50-603470	83–83	—	—	—	430	—	—	—	13000	—	—	—	—	—	—
MD50-11-5982	50-603470	143–143	—	—	—	570	—	—	—	34000	—	—	—	—	—	—
MD50-11-5977	50-603470	203–203	—	550	—	—	—	—	—	55000	—	—	—	—	—	—
MD50-11-5976	50-603470	233–233	—	350	—	—	—	—	—	32000	—	—	—	—	—	—
MD50-11-5979	50-603470	278–278	—	690	—	—	—	—	—	58000	—	—	—	—	—	—
MD50-11-5973	50-603470	351–351	—	190	—	160	—	280	—	25000	—	—	—	—	—	—
MD50-11-5972	50-603470	450–450	—	—	—	—	—	—	—	16000	—	—	—	—	—	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-5975	50-603470	600–600	—	—	—	—	—	—	—	1800	—	—	—	—	—	—
MD50-11-5974	50-603470	650–650	—	4.5	—	—	36	—	—	35	3.6	—	—	—	—	—
MD50-11-5990	50-603471	90–90	—	—	—	820	—	—	—	20000	—	—	—	—	—	—
MD50-11-5989	50-603471	146–146	—	1500	—	—	—	—	—	63000	—	—	—	—	—	—
MD50-11-5988	50-603471	209–209	—	50	—	—	58	—	—	1800	—	—	—	—	—	—
MD50-11-5987	50-603471	242–242	—	31	—	16	29	—	—	890	—	—	—	—	—	—
MD50-11-6156	50-603471	288–288	—	2000	—	—	—	—	—	67000	—	—	—	—	—	—
MD50-11-5986	50-603471	360–360	—	300	—	—	—	—	—	15000	—	—	—	—	—	—
MD50-11-5983	50-603471	410–410	—	—	—	—	—	—	—	21000	—	—	—	—	—	—
MD50-11-5985	50-603471	450–450	—	—	—	—	—	—	—	31000	—	—	—	—	—	—
MD50-11-6000	50-603472	27–27	—	—	—	550	—	—	51	3200	—	—	—	—	—	—
MD50-11-5998	50-603472	93–93	—	48	—	450	—	—	—	3800	—	—	—	—	—	—
MD50-11-6001	50-603472	146–146	—	250	—	510	—	—	—	6900	—	—	—	—	—	—
MD50-11-5997	50-603472	210–210	—	410	—	680	—	—	—	14000	—	—	—	—	—	—
MD50-11-5999	50-603472	247–247	—	310	—	510	—	—	—	10000	—	—	—	—	—	—
MD50-11-5995	50-603472	292–292	—	590	—	850	—	—	—	18000	—	—	—	—	—	—
MD50-11-5994	50-603472	364–364	—	120	—	470	—	—	—	10000	—	—	—	—	—	—
MD50-11-5993	50-603472	414–414	—	100	—	570	—	—	—	12000	—	—	—	—	—	—
MD50-11-5996	50-603472	450–450	—	—	—	610	—	—	—	14000	—	—	—	—	—	—
MD50-11-6072	50-603503	25–25	—	9.1	—	250	2.2	38	9.8	1300	4.1	—	—	—	—	—
MD50-11-5992	50-603503	80–80	—	—	—	280	—	93	—	2300	—	—	—	—	—	—
MD50-11-6073	50-603503	133–133	—	28	—	280	—	61	—	2500	—	—	—	—	—	—
MD50-11-6069	50-603503	198–198	—	66	—	370	—	—	—	3400	—	—	—	—	—	—
MD50-11-6068	50-603503	237–237	—	110	—	600	—	—	—	5700	—	—	—	—	—	—
MD50-11-6070	50-603503	278–278	—	110	—	480	—	—	—	6300	—	—	—	—	—	—
MD50-11-6065	50-603503	347–347	—	20	—	160	—	—	—	1800	—	—	—	—	—	—
MD50-11-6066	50-603503	397–397	—	12	—	120	—	—	—	1600	—	—	—	—	—	—
MD50-11-6067	50-603503	450–450	—	17	—	210	—	—	—	3400	—	—	—	—	—	—
MD50-11-5933	50-613182	500–500	—	—	—	200	—	—	—	4500	—	—	—	—	—	—
MD50-11-5934	50-613182	550–550	—	—	—	150	—	—	—	3600	—	—	—	—	—	—
MD50-11-5936	50-613182	600–600	—	—	2.1	—	31	—	—	5.2	—	2.7	—	—	—	—
MD50-11-5937	50-613182	620–620	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MD50-11-5935	50-613182	632.5-632.5	—	—	—	—	—	—	—	4.6	—	—	—	—	—	—

Table C-4.1-13 (continued)

Sample ID	Location ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-5942	50-613183	30–30	—	120	—	110	—	—	—	11000	—	—	—	—	—	—
MD50-11-5939	50-613183	500–500	—	—	—	27	—	—	—	1500	—	—	—	—	—	—
MD50-11-5943	50-613183	550–550	—	130	—	1200	—	310	—	15000	—	—	—	—	—	—
MD50-11-5941	50-613183	600–600	—	45	—	150	—	—	—	7000	—	—	—	—	—	—
MD50-11-5944	50-613183	630–630	—	—	—	170	—	—	—	7500	—	—	—	—	—	—
MD50-11-5940	50-613183	642.5-642.5	—	—	3.9	—	31	—	—	39	—	5.8	—	21	5.5	15
MD50-11-5948	50-613184	30–30	—	—	—	42	—	—	—	2100	—	—	—	—	—	—
MD50-11-5951	50-613184	500-500	—	—	—	38	—	—	—	3000	—	—	—	—	—	—
MD50-11-5946	50-613184	550–550	—	—	—	—	—	—	—	1800	—	—	—	—	—	—
MD50-11-5947	50-613184	600–600	—	—	—	—	5.9	—	—	580	—	—	—	—	—	—
MD50-11-5950	50-613184	652-652	—	—	10	—	—	—	—	160	—	—	—	—	—	—
MD50-11-5949	50-613184	664.5-664.5	—	—	—	—	3	—	—	61	—	—	—	—	—	—
MD50-11-5960	50-613185	85–85	—	—	—	7.5	—	—	—	460	—	—	—	—	—	—
MD50-11-5961	50-613185	145-145	—	100 (J)	—	—	—	—	—	3700	—	—	—	—	—	—
MD50-11-5957	50-613185	205–205	—	130 (J)	—	—	—	—	—	2900	—	—	—	—	—	—
MD50-11-5962	50-613185	235–35	—	120 (J)	—	100	—	—	—	7100	—	—	—	—	—	—
MD50-11-5959	50-613185	280–280	—	—	—	—	—	—	—	4500	—	—	—	—	—	—
MD50-11-5955	50-613185	350–350	—	—	—	—	—	—	—	3100	—	—	—	—	—	—
MD50-11-5954	50-613185	450–450	—	—	—	—	—	—	—	1400	—	—	—	—	—	—
MD50-11-5953	50-613185	600–600	2	—	—	2.7	4.9	—	—	120	—	—	—	4.7	1.5	3.1
MD50-11-5958	50-613185	675–675	—	—	—	—	3.3	—	—	26	—	—	—	1.3	1.3	—
MD50-11-5956	50-613185	688–688	—	8.9	—	—	3.4	—	—	16	—	—	—	2	2	—

Notes: Results are in µg/m^3. Data qualifiers are defined in Appendix A.

*— = Not detected.

Table C-4.1-14
Tritium Detected in Vapor Samples at MDA C during
January 2010–April 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-8677	50-24784	25–25	3413.92
MD50-10-8680	50-24784	96–96	2882.38
MD50-10-8681	50-24784	155–155	2970.67
MD50-10-8679	50-24784	215–215	4528.12
MD50-10-8685	50-24784	244–244	3110.35
MD50-10-8683	50-24784	289–289	3605.46
MD50-10-8684	50-24784	362–362	1299.08
MD50-10-8682	50-24784	411–411	908.698
MD50-10-8678	50-24784	450–450	1799.63
MD50-10-8697	50-24813	25–25	739.433
MD50-10-8696	50-24813	99–99	21617.4
MD50-10-8693	50-24813	150–150	147992
MD50-10-8702	50-24813	207–207	5173.99
MD50-10-8699	50-24813	241–241	3325.24
MD50-10-8694	50-24813	286–286	1439.37
MD50-10-8700	50-24813	358–358	2121.74
MD50-10-8695	50-24813	408–408	674.658
MD50-10-8701	50-24813	450–450	2992.26
MD50-10-8698	50-24813	600–600	2011.76
MD50-10-8703	50-24822	25–25	881.043
MD50-10-8704	50-24822	81–81	891.68
MD50-10-8705	50-24822	142–142	892.977
MD50-10-8706	50-24822	204–204	1279.38
MD50-10-8707	50-24822	235–235	934.264
MD50-10-8708	50-24822	280–280	556.108
MD50-10-8709	50-24822	351–351	703.431
MD50-10-8710	50-24822	402–402	591.561
MD50-10-8711	50-24822	450–450	537.685
MD50-10-8716	50-603061	76–76	1261.59
MD50-10-8717	50-603061	128–128	1846.54
MD50-10-8718	50-603061	190–190	2744.4
MD50-10-8719	50-603061	228–228	2878.75
MD50-10-8720	50-603061	274–274	2958.58
MD50-10-8721	50-603061	347–347	727.406
MD50-10-8722	50-603061	397–397	1072.9
MD50-10-8724	50-603061	450–450	344.844
MD50-10-8728	50-603062	64–64	883.372

Table C-4-1-14 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-8755	50-603063	25–25	1280.25
MD50-10-8754	50-603063	76–76	3139.59
MD50-10-8753	50-603063	128–128	3346.91
MD50-10-8752	50-603063	190–190	6384.08
MD50-10-8751	50-603063	228–228	5796.61
MD50-10-8749	50-603063	274–274	4699.57
MD50-10-8750	50-603063	347–347	2994.43
MD50-10-8748	50-603063	397–397	2649.04
MD50-10-8747	50-603063	450–450	1513.08
MD50-10-8759	50-603064	25–25	857.69
MD50-10-8760	50-603064	66–66	946.6
MD50-10-8761	50-603064	113–113	2332.13
MD50-10-8762	50-603064	176–176	1841.68
MD50-10-8763	50-603064	214–214	2209.67
MD50-10-8764	50-603064	259–259	978.864
MD50-10-8765	50-603064	332–332	640.585
MD50-10-8766	50-603064	400–400	1107.09
MD50-10-8767	50-603064	500–500	641.273
MD50-10-8771	50-603383	26–26	271227
MD50-10-8772	50-603383	85–85	1071870
MD50-10-8773	50-603383	139–139	975749
MD50-10-8774	50-603383	206–206	190809
MD50-10-8775	50-603383	244–244	121865
MD50-10-8776	50-603383	286–286	163640
MD50-10-8777	50-603383	359–359	288105
MD50-10-8778	50-603383	408–408	93553
MD50-10-8779	50-603383	450–450	742303
MD50-10-8783	50-603467	91–91	861.219
MD50-10-8784	50-603467	91–91	729.879
MD50-10-8786	50-603467	143–143	1062.23
MD50-10-8787	50-603467	206–206	701.597
MD50-10-8788	50-603467	244–244	1149.74
MD50-10-8793	50-603467	287–287	846.848
MD50-10-8790	50-603467	360–360	557.354
MD50-10-8795	50-603468	30–30	539.438
MD50-10-8796	50-603468	92–92	798.1
MD50-10-8797	50-603468	142–142	441.855
MD50-10-8798	50-603468	198–198	1039.21
MD50-10-8799	50-603468	233–233	705.943

Table C-4-1-14 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-8800	50-603468	282–282	1024.01
MD50-10-8801	50-603468	354–354	670.351
MD50-10-8802	50-603468	403–403	508.821
MD50-10-8807	50-603470	30–30	43866.4
MD50-10-8809	50-603470	83–83	2920220
MD50-10-8811	50-603470	143–143	14233.9
MD50-10-8810	50-603470	203–203	2008.19
MD50-10-8813	50-603470	233–233	1622.02
MD50-10-8808	50-603470	278–278	1867.56
MD50-10-8814	50-603470	351–351	866.655
MD50-10-8815	50-603470	600–600	694.592
MD50-10-8812	50-603470	650–650	933.968
MD50-10-8826	50-603471	30–30	4390.82
MD50-10-8822	50-603471	90–90	48744.9
MD50-10-8823	50-603471	146–146	3972.93
MD50-10-8825	50-603471	209–209	3668.15
MD50-10-8819	50-603471	242–242	2180.59
MD50-10-8821	50-603471	288–288	2982.84
MD50-10-8827	50-603471	360–360	2200.64
MD50-10-8824	50-603471	410–410	2500.71
MD50-10-8820	50-603471	450–450	2775.99
MD50-10-8834	50-603472	27–27	161836
MD50-10-8833	50-603472	93–93	10356.8
MD50-10-8837	50-603472	93–93	5989.77
MD50-10-8838	50-603472	146–146	4012.92
MD50-10-8831	50-603472	210–210	19800.7
MD50-10-8835	50-603472	247–247	6174.24
MD50-10-8840	50-603472	292–292	3597.1
MD50-10-8839	50-603472	364–364	1294.59
MD50-10-8836	50-603472	414–414	1777.75
MD50-10-8832	50-603472	450–450	954.058
MD50-10-8843	50-603503	25–25	2362.64
MD50-10-8844	50-603503	80–80	2861.2
MD50-10-8845	50-603503	133–133	2471.27
MD50-10-8846	50-603503	198–198	2554.8
MD50-10-8847	50-603503	237–237	3268.24
MD50-10-8848	50-603503	278–278	2632.5
MD50-10-8849	50-603503	347–347	1003.58
MD50-10-8850	50-603503	397–397	1021.83

Note: Results are in pCi/L.

Table C-4.1-15
Tritium Detected in Vapor Samples at MDA C during
April 2010–July 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-15760	50-603470	83–83	2675700
MD50-10-15873	50-603383	139–139	1058670
MD50-10-15866	50-603383	85–85	913258
MD50-10-15874	50-603383	244–244	447327
MD50-10-15869	50-603383	286–286	445718
MD50-10-15867	50-603383	206–206	385358
MD50-10-15872	50-603383	359–359	360249
MD50-10-15870	50-603383	408–408	353883
MD50-10-15875	50-603383	450–450	322214
MD50-10-15779	50-603472	27–27	310290
MD50-10-15903	50-24813	150–150	219728
MD50-10-15871	50-603383	26–26	190110
MD50-10-15752	50-603470	30–30	73252.2
MD50-10-15776	50-603472	247–247	43787.5
MD50-10-15769	50-603471	90–90	42368.1
MD50-10-15783	50-603472	210–210	32039.2
MD50-10-15906	50-24813	99–99	29952.9
MD50-10-15753	50-603470	143–143	10685.3
MD50-10-15780	50-603472	146–146	9809.85
MD50-10-15784	50-603472	450–450	9466.29
MD50-10-15782	50-603472	93–93	9139.35
MD50-10-15907	50-24813	207–207	5757.71
MD50-10-15766	50-603471	209–209	4922.22
MD50-10-15904	50-24813	241–241	3991.23
MD50-10-15768	50-603471	146–146	3918.26
MD50-10-15819	50-603064	214–214	3917.06
MD50-10-15771	50-603471	242–242	3828.08
MD50-10-15778	50-603472	292–292	3765.53
MD50-10-15742	50-24784	25–25	3764.65
MD50-10-15765	50-603471	288–288	3688.75
MD50-10-15748	50-24784	289–289	3545.48
MD50-10-15741	50-24784	244–244	3393.56
MD50-10-15770	50-603471	450–450	3383.5
MD50-10-15744	50-24784	215–215	3360.45
MD50-10-15829	50-603063	274–274	3320.82

Table C-4.1-15 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-15764	50-603471	410–410	2969.11
MD50-10-15747	50-24784	155–155	2962.82
MD50-10-15814	50-603064	113–113	2771.77
MD50-10-15824	50-603063	228–228	2622.81
MD50-10-15772	50-603471	360–360	2582.09
MD50-10-15777	50-603472	364–364	2519.06
MD50-10-15745	50-24784	96–96	2475.55
MD50-10-15844	50-603061	274–274	2328.91
MD50-10-15781	50-603472	414–414	2220.2
MD50-10-15756	50-603470	233–233	2210.48
MD50-10-15842	50-603061	347–347	2150.47
MD50-10-15758	50-603470	278–278	1764.75
MD50-10-15830	50-603063	190–190	1748.91
MD50-10-15788	50-603503	198–198	1731.95
MD50-10-15743	50-24784	362–362	1698.46
MD50-10-15910	50-24813	408–408	1574.73
MD50-10-15794	50-603503	237–237	1470.72
MD50-10-15820	50-603064	259–259	1464.48
MD50-10-15791	50-603503	80–80	1364.72
MD50-10-15817	50-603064	66–66	1328.17
MD50-10-15793	50-603503	25–25	1249.95
MD50-10-15831	50-603063	450–450	1245.91
MD50-10-15746	50-24784	411–411	1237.12
MD50-10-15807	50-603467	143–143	1231.16
MD50-10-15832	50-603063	76–76	1219.12
MD50-10-15891	50-603062	122–122	1203.28
MD50-10-15905	50-24813	358–358	1190.91
MD50-10-15812	50-603064	176–176	1151.75
MD50-10-15843	50-603061	190–190	1135.27
MD50-10-15826	50-603063	397–397	1119.44
MD50-10-15833	50-603063	347–347	1116.01
MD50-10-15755	50-603470	600–600	1078.57
MD50-10-15740	50-24784	450–450	1070.5
MD50-10-15816	50-603064	25–25	1066.59
MD50-10-15761	50-603470	203–203	1010.81
MD50-10-15808	50-603467	360–360	992.175
MD50-10-15839	50-603061	228–228	981.272
MD50-10-15754	50-603470	351–351	979.648
MD50-10-15837	50-603061	76–76	971.678

Table C-4.1-15 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-15902	50-24813	25–25	936.928
MD50-10-15894	50-603062	64–64	883.901
MD50-10-15789	50-603503	450–450	881.392
MD50-10-15800	50-603467	287–287	877.304
MD50-10-15801	50-603467	91–91	827.762
MD50-10-15878	50-603468	233–233	815.777
MD50-10-15884	50-603468	198–198	806.555
MD50-10-15841	50-603061	128–128	798.725
MD50-10-15854	50-24822	81–81	791.945
MD50-10-15827	50-603063	25–25	752.139
MD50-10-15809	50-603467	206–206	685.236
MD50-10-15909	50-24813	286–286	663.914
MD50-10-15790	50-603503	347–347	660.954
MD50-10-15856	50-24822	204–204	655.605
MD50-10-15757	50-603470	450–450	631.799
MD50-10-15813	50-603064	332–332	597.171
MD50-10-15890	50-603062	263–263	578.892
MD50-10-15851	50-24822	402–402	559.206
MD50-10-15908	50-24813	450–450	532.831
MD50-10-15802	50-603467	409–409	528.116
MD50-10-15838	50-603061	397–397	513.967
MD50-10-15885	50-603468	282–282	496.725
MD50-10-15849	50-24822	235–235	477.997
MD50-10-15805	50-603467	26–26	362.886

Note: Results are in pCi/L.

Table C-4.1-16
Tritium Detected in Vapor Samples at MDA C during
July 2010–September 2010 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-24333	50-603470	83–83	3417920
MD50-10-24388	50-603383	139–139	847514
MD50-10-24385	50-603383	286–286	638249
MD50-10-24384	50-603383	85–85	623832
MD50-10-24383	50-603383	450–450	445698
MD50-10-24382	50-603383	206–206	411937
MD50-10-24354	50-603472	27–27	393217
MD50-10-24387	50-603383	244–244	314516
MD50-10-24381	50-603383	359–359	285660
MD50-10-24370	50-24813	150–150	264844
MD50-10-24380	50-603383	26–26	192102
MD50-10-24350	50-603472	247–247	89300.9
MD50-10-24328	50-603470	30–30	57621.7
MD50-10-24339	50-603471	90–90	47123.1
MD50-10-24375	50-24813	99–99	46402.7
MD50-10-24386	50-603383	408–408	37651.4
MD50-10-24352	50-603472	146–146	37130.5
MD50-10-24357	50-603472	93–93	35557
MD50-10-24356	50-603472	210–210	34469
MD50-10-24376	50-24813	207–207	19656.9
MD50-10-24351	50-603472	450–450	14755.2
MD50-10-24329	50-603470	143–143	11481.6
MD50-10-24374	50-24813	450–450	10075.6
MD50-10-24353	50-603472	292–292	8092.06
MD50-10-24371	50-24813	241–241	7621.74
MD50-10-24361	50-24784	215–215	7129.08
MD50-10-24349	50-603472	367–367	6119.3
MD50-10-24341	50-603471	288–288	5754.39
MD50-10-24366	50-24784	289–289	5168.45
MD50-10-24343	50-603471	360–360	4875.38
MD50-10-24345	50-603471	242–242	4826.24
MD50-10-24367	50-24784	411–411	4743.38
MD50-10-24340	50-603471	209–209	4739.53
MD50-10-24469	50-603064	482–482	4192.96
MD50-10-24344	50-603471	146–146	4169.12
MD50-10-24342	50-603471	410–410	4077.15

Table C-4.1-16 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-24331	50-603470	351–351	3810.13
MD50-10-24334	50-603470	203–203	3622
MD50-10-24365	50-24784	155–155	3572.22
MD50-10-24443	50-603062	122–122	3565.39
MD50-10-24377	50-24813	286–286	3329.36
MD50-10-24360	50-24784	362–362	3307.05
MD50-10-24359	50-24784	244–244	3292.81
MD50-10-24433	50-603061	190–190	3286.56
MD50-10-24362	50-24784	25–25	3219.85
MD50-10-24432	50-603061	76–76	3217.63
MD50-10-24364	50-24784	96–96	3185.58
MD50-10-24456	50-603063	228–228	3074.86
MD50-10-24372	50-24813	358–358	3046.49
MD50-10-24403	50-603468	282–282	2997.11
MD50-10-24346	50-603471	450–450	2996.96
MD50-10-24355	50-603472	414–414	2653.9
MD50-10-24455	50-603063	450–450	2648.4
MD50-10-24438	50-603061	347–347	2594.94
MD50-10-24330	50-603470	233–233	2478.02
MD50-10-24457	50-603063	76–76	2458.27
MD50-10-24407	50-603468	142–142	2438.71
MD50-10-24363	50-24784	450–450	2303.1
MD50-10-24332	50-603470	600–600	2220.85
MD50-10-24337	50-603470	650–650	2211.73
MD50-10-24465	50-603064	176–176	2159.8
MD50-10-24462	50-603064	113–113	2047.61
MD50-10-24452	50-603063	347–347	1966.42
MD50-10-24335	50-603470	278–278	1925.93
MD50-10-24426	50-603503	80–80	1881.49
MD50-10-24434	50-603061	274–274	1869.35
MD50-10-24437	50-603061	128–128	1734.72
MD50-10-24421	50-603503	237–237	1501.24
MD50-10-24423	50-603503	25–25	1414.06
MD50-10-24458	50-603063	274–274	1336.8
MD50-10-24373	50-24813	600–600	1328.82
MD50-10-24454	50-603063	190–190	1300.78
MD50-10-24378	50-24813	408–408	1292.16
MD50-10-24444	50-603062	387–387	1286.86
MD50-10-24422	50-603503	133–133	1262.32

Table C-4.1-16 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-24427	50-603503	278–278	1259.8
MD50-10-24369	50-24813	25–25	1240.01
MD50-10-24446	50-603062	64–64	1109.41
MD50-10-24467	50-603064	66–66	1070.76
MD50-10-24414	50-24822	204–204	1060.88
MD50-10-24436	50-603061	228–228	1048.97
MD50-10-24396	50-603467	206–206	976.308
MD50-10-24463	50-603064	214–214	975.676
MD50-10-24424	50-603503	347–347	968.564
MD50-10-24419	50-24822	81–81	944.627
MD50-10-24411	50-24822	402–402	938.747
MD50-10-24425	50-603503	198–198	935.445
MD50-10-24468	50-603064	259–259	934.53
MD50-10-24431	50-603061	397–397	915.021
MD50-10-24412	50-24822	280–280	907.234
MD50-10-24461	50-603064	25–25	868.096
MD50-10-24393	50-603467	287–287	839.743
MD50-10-24418	50-24822	235–235	812.479
MD50-10-24416	50-24822	142–142	780.527
MD50-10-24336	50-603470	450–450	769.462
MD50-10-24401	50-603468	198–198	741.918
MD50-10-24413	50-24822	25–25	736.749
MD50-10-24442	50-603062	263–263	718.044
MD50-10-24399	50-603467	244–244	698.227
MD50-10-24448	50-603062	337–337	692.259
MD50-10-24464	50-603064	332–332	690.308
MD50-10-24449	50-603062	450–450	629.448
MD50-10-24447	50-603062	217–217	589.846
MD50-10-24453	50-603063	128–128	538.263
MD50-10-24415	50-24822	351–351	500.505
MD50-10-24417	50-24822	450–450	484.494
MD50-10-24441	50-603062	25–25	468.336
MD50-10-24445	50-603062	184–184	409.331

Note: Results are in pCi/L.

Table C-4.1-17
Tritium Detected in Vapor Samples at MDA C during
October 2010–January 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-27179	50-24784	25–25	3424.39
MD50-10-27176	50-24784	96–96	26930.3
MD50-10-27175	50-24784	155–155	4811.13
MD50-10-27181	50-24784	215–215	4376.64
MD50-10-27180	50-24784	244–244	3410.01
MD50-10-27178	50-24784	289–289	2637.69
MD50-10-27182	50-24784	362–362	1527.11
MD50-10-27177	50-24784	411–411	2133.35
MD50-10-27183	50-24784	450–450	1295.11
MD50-10-27186	50-24813	25–25	1461.9
MD50-10-27189	50-24813	99–99	15322.2
MD50-10-27185	50-24813	150–150	150165
MD50-10-27190	50-24813	207–207	6088.51
MD50-10-27193	50-24813	241–241	3376.21
MD50-10-27194	50-24813	241–241	4271.92
MD50-10-27191	50-24813	286–286	3649.94
MD50-10-27343	50-24813	358–358	2722
MD50-10-27192	50-24813	408–408	2592.53
MD50-10-27188	50-24813	450–450	1793.02
MD50-10-27195	50-24813	600–600	932.357
MD50-10-27227	50-24822	25–25	661.459
MD50-10-27229	50-24822	204–204	702.357
MD50-10-27233	50-24822	235–235	2341.01
MD50-10-27231	50-24822	280–280	587.23
MD50-10-27230	50-24822	351–351	1058.96
MD50-10-27249	50-603061	25–25	1149.9
MD50-10-27251	50-603061	76–76	2314.69
MD50-10-27247	50-603061	128–128	2606.74
MD50-10-27255	50-603061	190–190	1941.01
MD50-10-27248	50-603061	228–228	1504.95
MD50-10-27253	50-603061	274–274	3534.92
MD50-10-27252	50-603061	347–347	2654.12
MD50-10-27254	50-603061	397–397	839.172
MD50-10-27265	50-603062	64–64	914.559
MD50-10-27257	50-603062	122–122	5527.48
MD50-10-27259	50-603062	337–337	1850.9

Table C-4.1-17 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-27267	50-603063	25–25	2260.32
MD50-10-27272	50-603063	76–76	2094.8
MD50-10-27275	50-603063	128–128	1262.6
MD50-10-27268	50-603063	190–190	2335.43
MD50-10-27273	50-603063	228–228	1491.42
MD50-10-27269	50-603063	274–274	4126.76
MD50-10-27274	50-603063	347–347	1338.88
MD50-10-27271	50-603063	450–450	1640.14
MD50-10-27280	50-603064	25–25	761.357
MD50-10-27285	50-603064	66–66	733.386
MD50-10-27279	50-603064	113–113	2930.26
MD50-10-27283	50-603064	176–176	906.704
MD50-10-27277	50-603064	214–214	3015.69
MD50-10-27281	50-603064	259–259	2794.56
MD50-10-27278	50-603064	332–332	938.64
MD50-10-27282	50-603064	400–400	1691.06
MD50-10-27284	50-603064	500–500	620.463
MD50-10-27199	50-603383	26–26	260604
MD50-10-27197	50-603383	85–85	686091
MD50-10-27205	50-603383	139–139	949038
MD50-10-27204	50-603383	206–206	111487
MD50-10-27203	50-603383	244–244	307955
MD50-10-27201	50-603383	286–286	269984
MD50-10-27202	50-603383	359–359	228848
MD50-10-27200	50-603383	408–408	587105
MD50-10-27196	50-603383	450–450	455279
MD50-10-27210	50-603467	91–91	1308.37
MD50-10-27211	50-603467	143–143	837.86
MD50-10-27215	50-603467	206–206	553.942
MD50-10-27213	50-603467	287–287	718.525
MD50-10-27212	50-603467	360–360	1515.59
MD50-10-27218	50-603468	198–198	821.823
MD50-10-27219	50-603468	233–233	966.29
MD50-10-27226	50-603468	282–282	788.433
MD50-10-27223	50-603468	354–354	676.651
MD50-10-27222	50-603468	450–450	1056.93
MD50-10-27145	50-603470	30–30	56635.6
MD50-10-27149	50-603470	83–83	2948440
MD50-10-27144	50-603470	143–143	9032.82

Table C-4.1-17 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-10-27151	50-603470	203–203	15685.5
MD50-10-27147	50-603470	233–233	2004.08
MD50-10-27153	50-603470	278–278	2597.51
MD50-10-27146	50-603470	351–351	2016.49
MD50-10-27152	50-603470	450–450	802.788
MD50-10-27158	50-603471	30–30	18442.4
MD50-10-27155	50-603471	90–90	26565.2
MD50-10-27157	50-603471	146–146	6009.75
MD50-10-27162	50-603471	209–209	13236.6
MD50-10-27161	50-603471	242–242	7222.64
MD50-10-27160	50-603471	288–288	9746.33
MD50-10-27156	50-603471	360–360	7716.89
MD50-10-27163	50-603471	410–410	4170.76
MD50-10-27159	50-603471	450–450	5956.37
MD50-10-27165	50-603472	27–27	299759
MD50-10-27168	50-603472	93–93	6351.23
MD50-10-27170	50-603472	146–146	2794.7
MD50-10-27172	50-603472	210–210	13209.7
MD50-10-27166	50-603472	247–247	2747.59
MD50-10-27174	50-603472	292–292	9694.81
MD50-10-27167	50-603472	414–414	2046.2
MD50-10-27173	50-603472	450–450	5655.52
MD50-10-27243	50-603503	25–25	769.383
MD50-10-27237	50-603503	80–80	1015.89
MD50-10-27244	50-603503	133–133	1486.69
MD50-10-27238	50-603503	198–198	2338.17
MD50-10-27245	50-603503	237–237	1326.68
MD50-10-27239	50-603503	278–278	980.152
MD50-10-27242	50-603503	450–450	1326.62

Note: Results are in pCi/L.

Table C-4.1-18
Tritium Detected in Vapor Samples at MDA C during
January 2011–March 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium
MD50-11-4012	50-24784	25–25	3568.8
MD50-11-4010	50-24784	96–96	4038.74
MD50-11-4009	50-24784	155–155	6174.87
MD50-11-4006	50-24784	215–215	7007.02
MD50-11-4004	50-24784	244–244	3074.5
MD50-11-4008	50-24784	289–289	1871.12
MD50-11-4007	50-24784	362–362	3507.55
MD50-11-4005	50-24784	411–411	1516.3
MD50-11-4003	50-24784	450–450	1725.77
MD50-11-4023	50-24813	25–25	30450.9
MD50-11-4021	50-24813	99–99	40040.7
MD50-11-4020	50-24813	150–150	187502
MD50-11-4019	50-24813	207–207	4343.06
MD50-11-4018	50-24813	241–241	2738.5
MD50-11-4017	50-24813	286–286	4468.2
MD50-11-4014	50-24813	358–358	686.167
MD50-11-4013	50-24813	408–408	720.983
MD50-11-4015	50-24813	450–450	3375.43
MD50-11-4058	50-24822	25–25	873.3
MD50-11-4059	50-24822	81–81	1078.76
MD50-11-4057	50-24822	142–142	1510.41
MD50-11-4055	50-24822	204–204	938.98
MD50-11-4060	50-24822	235–235	1362.39
MD50-11-4061	50-24822	280–280	734.991
MD50-11-4056	50-24822	351–351	645.717
MD50-11-4064	50-24822	450–450	663.654
MD50-11-4080	50-603061	25–25	480.376
MD50-11-4081	50-603061	76–76	1890.98
MD50-11-4083	50-603061	128–128	972.27
MD50-11-4082	50-603061	190–190	2034.15
MD50-11-4084	50-603061	228–228	1536.53
MD50-11-4076	50-603061	274–274	3698.88
MD50-11-4077	50-603061	347–347	3038.69
MD50-11-4078	50-603061	397–397	1269.1
MD50-11-4092	50-603062	25–25	310.845
MD50-11-4091	50-603062	64–64	619.661
MD50-11-4090	50-603062	184–184	492.612
MD50-11-4103	50-603063	25–25	789.72
MD50-11-4102	50-603063	76–76	1669.9

Table C-4.1-18 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-11-4101	50-603063	128–128	1050.58
MD50-11-4100	50-603063	190–190	2965.12
MD50-11-4099	50-603063	228–228	3672.71
MD50-11-4098	50-603063	274–274	2331.5
MD50-11-4096	50-603063	347–347	1785.02
MD50-11-4104	50-603063	397–397	1438.22
MD50-11-4097	50-603063	450–450	1488.64
MD50-11-4113	50-603064	25–25	1124.85
MD50-11-4112	50-603064	66–66	1514.99
MD50-11-4111	50-603064	113–113	2126.53
MD50-11-4109	50-603064	176–176	2070.25
MD50-11-4110	50-603064	214–214	1795.68
MD50-11-4105	50-603064	259–259	3051.3
MD50-11-4106	50-603064	332–332	722.173
MD50-11-4107	50-603064	400–400	620.817
MD50-11-4024	50-603383	26–26	170258
MD50-11-4029	50-603383	85–85	655179
MD50-11-4025	50-603383	139–139	945513
MD50-11-4030	50-603383	206–206	317623
MD50-11-4026	50-603383	244–244	368727
MD50-11-4031	50-603383	286–286	59677.4
MD50-11-4027	50-603383	359–359	69096.1
MD50-11-4032	50-603383	408–408	559319
MD50-11-4028	50-603383	450–450	471537
MD50-11-4034	50-603467	26–26	1200.31
MD50-11-4038	50-603467	91–91	1439.81
MD50-11-4035	50-603467	143–143	1637.15
MD50-11-4039	50-603467	206–206	1620.96
MD50-11-4036	50-603467	244–244	822.644
MD50-11-4042	50-603467	287–287	1818.76
MD50-11-4037	50-603467	360–360	2881.15
MD50-11-4040	50-603467	409–409	1354.94
MD50-11-4041	50-603467	600–600	5444.75
MD50-11-4045	50-603468	198–198	1866.98
MD50-11-4050	50-603468	282–282	798.412
MD50-11-4051	50-603468	354–354	5156.85
MD50-11-4052	50-603468	403–403	7596950
MD50-11-3980	50-603470	83–83	2079590
MD50-11-3975	50-603470	143–143	3086.77 (J)
MD50-11-3973	50-603470	203–203	5540.36 (J)
MD50-11-3972	50-603470	233–233	9826.54

Table C-4.1-18 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-11-3974	50-603470	278–278	6310.42 (J)
MD50-11-3978	50-603470	450–450	3167.54 (J)
MD50-11-3983	50-603471	30–30	48419.2
MD50-11-3992	50-603471	90–90	38944.5
MD50-11-3990	50-603471	146–146	563784
MD50-11-3988	50-603471	209–209	885.424
MD50-11-3989	50-603471	242–242	10224.1
MD50-11-3987	50-603471	288–288	13906.1
MD50-11-3986	50-603471	360–360	598709
MD50-11-3984	50-603471	410–410	836701
MD50-11-3985	50-603471	450–450	73835
MD50-11-3947	50-613183	30–30	2092660
MD50-11-3948	50-613183	500–500	3082.7
MD50-11-3949	50-613183	550–550	917.003
MD50-11-3950	50-613183	600–600	2402.05
MD50-11-3951	50-613183	630–630	2702.14
MD50-11-4002	50-603472	27–27	375685
MD50-11-4000	50-603472	93–93	6535.31
MD50-11-4001	50-603472	146–146	5783.15
MD50-11-3998	50-603472	210–210	14784.1
MD50-11-3999	50-603472	247–247	10880.1
MD50-11-3996	50-603472	292–292	10481.8
MD50-11-3993	50-603472	364–364	1204.52
MD50-11-3994	50-603472	414–414	6132.84
MD50-11-3995	50-603472	450–450	1283.42
MD50-11-3944	50-613182	500–500	3407.76
MD50-11-3942	50-613182	600–600	1549.87
MD50-11-4071	50-603503	25–25	3187.04
MD50-11-4072	50-603503	80–80	1799.89
MD50-11-4069	50-603503	133–133	2876.99
MD50-11-4073	50-603503	198–198	2567.89
MD50-11-4070	50-603503	237–237	1914.86
MD50-11-4067	50-603503	278–278	1834.19
MD50-11-4066	50-603503	347–347	1553.13
MD50-11-4068	50-603503	397–397	2823.19
MD50-11-4065	50-603503	450–450	2377.86
MD50-11-3963	50-613185	205–205	885.976
MD50-11-3964	50-613185	235–235	4551.9
MD50-11-3969	50-613185	600–600	1468.83

Notes: Results are in pCi/L. Data qualifiers are defined in Appendix A.

Table C-4.1-19
Tritium Detected in Vapor Samples at MDA C during
March 2011–May 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium
MD50-11-6010	50-24784	25–25	4015.08
MD50-11-6007	50-24784	96–96	2759.61
MD50-11-6011	50-24784	155–155	1096.21
MD50-11-6005	50-24784	215–215	3507.57
MD50-11-6009	50-24784	244–244	3346.95
MD50-11-6006	50-24784	289–289	2628.94
MD50-11-6008	50-24784	362–362	1352.25
MD50-11-6004	50-24784	411–411	1407.69
MD50-11-6022	50-24813	25–25	3587.27
MD50-11-6021	50-24813	99–99	48049.3
MD50-11-6019	50-24813	150–150	195977
MD50-11-6020	50-24813	207–207	4138.01
MD50-11-6018	50-24813	241–241	2289.83
MD50-11-6017	50-24813	286–286	1081.82
MD50-11-6013	50-24813	358–358	463.481
MD50-11-6015	50-24813	408–408	623.879
MD50-11-6062	50-24822	25–25	1816.19
MD50-11-6059	50-24822	81–81	4098.9
MD50-11-6061	50-24822	142–142	896.287
MD50-11-6058	50-24822	204–204	3233.39
MD50-11-6060	50-24822	235–235	1491.71
MD50-11-6055	50-24822	280–280	535.226
MD50-11-6056	50-24822	351–351	286691
MD50-11-6080	50-603061	76–76	936.944
MD50-11-6079	50-603061	128–128	929.158
MD50-11-6078	50-603061	190–190	3186.9
MD50-11-6081	50-603061	228–228	1013.65
MD50-11-6077	50-603061	274–274	3994.15
MD50-11-6082	50-603061	347–347	2192.69
MD50-11-6076	50-603061	397–397	1094.76
MD50-11-6075	50-603061	450–450	1833.15
MD50-11-6085	50-603062	64–64	3661.06
MD50-11-6087	50-603062	122–122	1046.93
MD50-11-6092	50-603062	184–184	2461.43
MD50-11-6086	50-603062	217–217	591.543
MD50-11-6090	50-603062	263–263	1154.53
MD50-11-6094	50-603062	337–337	729.532
MD50-11-6091	50-603062	387–387	2412.41

Table C-4.1-19 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-11-6089	50-603062	450–450	5192.59
MD50-11-6102	50-603063	25–25	3219.01
MD50-11-6100	50-603063	76–76	8294.67
MD50-11-6099	50-603063	128–128	1158.67
MD50-11-6097	50-603063	190–190	4292.39
MD50-11-6098	50-603063	228–228	3825.28
MD50-11-6103	50-603063	274–274	5154.91
MD50-11-6095	50-603063	347–347	5913.95
MD50-11-6101	50-603063	397–397	3133.2
MD50-11-6096	50-603063	450–450	2119.51
MD50-11-6108	50-603064	25–25	676.519
MD50-11-6107	50-603064	66–66	1192.13
MD50-11-6105	50-603064	113–113	1443.41
MD50-11-6110	50-603064	176–176	1094.69
MD50-11-6111	50-603064	214–214	2587.17
MD50-11-6109	50-603064	482–482	1428.95
MD50-11-6027	50-603383	26–26	254478
MD50-11-6025	50-603383	85–85	761943
MD50-11-6024	50-603383	139–139	971640
MD50-11-6032	50-603383	206–206	113930
MD50-11-6026	50-603383	244–244	219669
MD50-11-6029	50-603383	286–286	80416.5
MD50-11-6028	50-603383	359–359	518598
MD50-11-6030	50-603383	408–408	439230
MD50-11-6031	50-603383	450–450	350433
MD50-11-6041	50-603467	26–26	411.024
MD50-11-6043	50-603467	91–91	1005.32
MD50-11-6038	50-603467	143–143	1192.99
MD50-11-6042	50-603467	206–206	1372.98
MD50-11-6037	50-603467	244–244	1670.36
MD50-11-6039	50-603467	287–287	647.931
MD50-11-6040	50-603467	360–360	550.912
MD50-11-6035	50-603467	500–500	573.867
MD50-11-6034	50-603467	600–600	547.748
MD50-11-6051	50-603468	92–92	3980.49
MD50-11-6050	50-603468	142–142	900.385
MD50-11-6052	50-603468	198–198	1420.04
MD50-11-6049	50-603468	233–233	853.235
MD50-11-6047	50-603468	282–282	604.306
MD50-11-6046	50-603468	354–354	2795.39

Table C-4.1-19 (continued)

Sample ID	Location ID	Depth (ft)	Tritium
MD50-11-6048	50-603468	450–450	793.816
MD50-11-5978	50-603470	30–30	64701.4
MD50-11-5980	50-603470	83–83	2502750
MD50-11-5982	50-603470	143–143	9259.65
MD50-11-5977	50-603470	203–203	2180.77
MD50-11-5976	50-603470	233–233	3224.03
MD50-11-5979	50-603470	278–278	1137.7
MD50-11-5973	50-603470	351–351	1039.58
MD50-11-5990	50-603471	90–90	53054.6
MD50-11-5989	50-603471	146–146	6877.24
MD50-11-5988	50-603471	209–209	5606.71
MD50-11-5987	50-603471	242–242	4053.82
MD50-11-6156	50-603471	288–288	5846.41
MD50-11-5986	50-603471	360–360	4461.89
MD50-11-5983	50-603471	410–410	2093.01
MD50-11-5985	50-603471	450–450	4506.41
MD50-11-6000	50-603472	27–27	420066
MD50-11-5998	50-603472	93–93	6523.26
MD50-11-6001	50-603472	146–146	4411.23
MD50-11-5997	50-603472	210–210	3990.94
MD50-11-5999	50-603472	247–247	6414.21
MD50-11-5995	50-603472	292–292	5292.12
MD50-11-5994	50-603472	364–364	681.137
MD50-11-5993	50-603472	414–414	2371.69
MD50-11-5996	50-603472	450–450	568.81
MD50-11-6072	50-603503	25–25	934.732
MD50-11-6071	50-603503	80–80	1136.84
MD50-11-6073	50-603503	133–133	1512.3
MD50-11-6069	50-603503	198–198	1746.6
MD50-11-6068	50-603503	237–237	1922.34
MD50-11-6070	50-603503	278–278	1418.69
MD50-11-6066	50-603503	397–397	625.523
MD50-11-5933	50-613182	500-500	555.9
MD50-11-5934	50-613182	550-550	555.569
MD50-11-5937	50-613182	620-620	669.695
MD50-11-5942	50-613183	30-30	2525710
MD50-11-5941	50-613183	600-600	431.214
MD50-11-5944	50-613183	630-630	2524.53
MD50-11-5946	50-613184	550-550	4429.21

Note: Results are in pCi/L.

Table C-4.2-1
Samples Collected in and Analyses Requested
for Tschicoma Formation Dacite

Sample ID	Location ID	Depth (ft)	Media	TAL Metals
RE50-11-4142	50-613184	654–654.2	Tt	11-1114*
RE50-11-4143	50-613184	675.8–676	Tt	11-1114
RE50-11-4144	50-613185	677.5–677.7	Tt	11-1114
RE50-11-4145	50-613185	697.3–697.5	Tt	11-1114

*Analytical request number.

Table C-4.2-2
TAL Metals Detected in Tschicoma Formation Dacite during MDA C Phase III Investigation

Sample ID	Location ID	Depth (ft)	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium
RE50-11-4142	50-613184	654–654.2	Tt	956	—*	—	15.6 (J)	0.0327 (J)
RE50-11-4143	50-613184	675.8–676	Tt	935	—	—	18.9 (J+)	0.0255 (J)
RE50-11-4144	50-613185	677.5–677.7	Tt	2710	0.35 (J)	0.278 (J)	92.6 (J+)	0.516
RE50-11-4145	50-613185	697.3–697.5	Tt	2940	0.312 (J)	0.313 (J)	71.1 (J+)	0.255

Table C-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Cadmium	Calcium	Chromium	Cobalt	Copper
RE50-11-4142	50-613184	654–654.2	Tt	0.121 (J)	2550	—	1.85	4.19
RE50-11-4143	50-613184	675.8–676	Tt	—	2890	—	1.43	2.11
RE50-11-4144	50-613185	677.5–677.7	Tt	0.417 (J)	5260	5.71 (J)	3.93	3.83
RE50-11-4145	50-613185	697.3–697.5	Tt	0.248 (J)	18700	2.86 (J)	2.08	2.85

Table C-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Iron	Lead	Magnesium	Manganese	Nickel
RE50-11-4142	50-613184	654–654.2	Tt	5340	—	217 (J+)	42.9	1.88 (J)
RE50-11-4143	50-613184	675.8–676	Tt	4100	—	194 (J+)	33.4	1.51 (J)
RE50-11-4144	50-613185	677.5–677.7	Tt	10400	9.26	1160 (J+)	118	7.2 (J)
RE50-11-4145	50-613185	697.3–697.5	Tt	6430	6.91	9820 (J+)	79.5	5.01 (J)

Table C-4.2-2 (continued)

Sample ID	Location ID	Depth (ft)	Media	Potassium	Sodium	Thallium	Vanadium	Zinc
RE50-11-4142	50-613184	654–654.2	Tt	160 (J)	687 (J-)	—	24	7.35
RE50-11-4143	50-613184	675.8–676	Tt	129 (J)	865 (J-)	—	16.7	3.74
RE50-11-4144	50-613185	677.5–677.7	Tt	872 (J-)	954 (J-)	0.0605 (J)	42.4	16.4
RE50-11-4145	50-613185	697.3–697.5	Tt	393 (J)	602 (J-)	—	20.4	11.3

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-5.0-1
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, August 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	H3	VOC
MD50-11-23296	50-24813	358–358	—[a]	11-3058[b]
MD50-11-23297	50-24813	408–408	—	11-3058
MD50-11-23298	50-24813	450–450	—	11-3058
MD50-11-23299	50-24813	600–600	—	11-3058
MD50-11-23287	50-603383	26–26	11-3194	11-3161
MD50-11-23288	50-603383	85–85	11-3194	11-3161
MD50-11-23289	50-603383	139–139	11-3374	11-3373
MD50-11-23290	50-603383	206–206	11-3374	11-3373
MD50-11-23291	50-603383	244–244	11-3374	11-3373
MD50-11-23292	50-603383	286–286	11-3374	11-3373
MD50-11-23295	50-603383	359–359	11-3374	11-3373
MD50-11-23294	50-603383	408–408	11-3374	11-3373
MD50-11-23293	50-603383	450–450	11-3374	11-3373
MD50-11-23278	50-603468	354–354	—	11-3078
MD50-11-23279	50-603468	403–403	—	11-3078
MD50-11-23280	50-603468	450–450	—	11-3078
MD50-11-23311	50-603470	351–351	11-3059	11-3058
MD50-11-23312	50-603470	450–450	11-3059	11-3058
MD50-11-23313	50-603470	600–600	11-3059	11-3058
MD50-11-23314	50-603470	650–650	11-3059	11-3058
MD50-11-23308	50-603471	360–360	11-3059	11-3058
MD50-11-23310	50-603471	410–410	11-3059	11-3058
MD50-11-23309	50-603471	450–450	11-3059	11-3058
MD50-11-23307	50-603472	364–364	11-3005	11-3004

Table C-5.0-1 (continued)

Sample ID	Location ID	Depth (ft)	H3	VOC
MD50-11-23306	50-603472	414–414	11-3005	11-3004
MD50-11-23305	50-603472	450–450	11-3005	11-3004
MD50-11-23273	50-613182	500–500	11-3005	11-3004
MD50-11-23276	50-613182	550–550	11-3005	11-3004
MD50-11-23275	50-613182	600–600	11-3005	11-3004
MD50-11-23274	50-613182	620–620	11-3005	11-3004
MD50-11-23277	50-613182	632.5–632.5	11-3005	11-3004
MD50-11-23282	50-613183	500–500	11-3059	11-3058
MD50-11-23283	50-613183	550–550	11-3059	11-3058
MD50-11-23284	50-613183	600–600	11-3059	11-3058
MD50-11-23285	50-613183	630–630	11-3059	11-3058
MD50-11-23286	50-613183	642.5–642.5	11-3059	11-3058
MD50-11-23300	50-613184	500–500	—	11-3078
MD50-11-23302	50-613184	550–550	—	11-3078
MD50-11-23301	50-613184	600–600	—	11-3078
MD50-11-23303	50-613184	652–652	—	11-3078
MD50-11-23304	50-613184	664.5–664.5	—	11-3078
MD50-11-23268	50-613185	350–350	11-3117	11-3116
MD50-11-23269	50-613185	450–450	11-3117	11-3116
MD50-11-23271	50-613185	600–600	11-3117	11-3116
MD50-11-23270	50-613185	675–675	11-3117	11-3116
MD50-11-23272	50-613185	688–688	11-3194	11-3161

[a] — = Analysis not requested.

[b] Analytical request number.

Table C-5.0-2
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, October 2011–November 2011 Sampling Event

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-12-936	50-24784	25–25	12-206[a]	12-205
MD50-12-935	50-24784	96–96	12-206	12-205
MD50-12-934	50-24784	155–155	12-206	12-205
MD50-12-933	50-24784	215–215	12-206	12-205
MD50-12-932	50-24784	244–244	12-206	12-205
MD50-12-931	50-24784	289–289	12-206	12-205
MD50-12-930	50-24784	362–362	12-206	12-205
MD50-12-929	50-24784	411–411	12-206	12-205
MD50-12-928	50-24784	450–450	12-206	12-205
MD50-12-946	50-24813	25–25	12-255	12-254
MD50-12-945	50-24813	99–99	12-268	12-267
MD50-12-944	50-24813	150–150	12-268	12-267
MD50-12-943	50-24813	207–207	12-255	12-254
MD50-12-942	50-24813	241–241	12-255	12-254
MD50-12-941	50-24813	286–286	12-255	12-254
MD50-12-940	50-24813	358–358	12-255	12-254
MD50-12-939	50-24813	408–408	12-255	12-254
MD50-12-938	50-24813	450–450	12-255	12-254
MD50-12-937	50-24813	600–600	12-255	12-254
MD50-12-947	50-24822	25–25	12-110	12-109
MD50-12-948	50-24822	81–81	12-110	12-109
MD50-12-949	50-24822	142–142	12-110	12-109
MD50-12-951	50-24822	204–204	12-110	12-109
MD50-12-952	50-24822	235–235	12-110	12-109
MD50-12-950	50-24822	280–280	12-110	12-109
MD50-12-953	50-24822	351–351	12-110	12-109
MD50-12-954	50-24822	402–402	12-189	12-188
MD50-12-955	50-24822	450–450	12-110	12-109
MD50-12-956	50-603064	25–25	12-104	12-103
MD50-12-957	50-603064	66–66	12-104	12-103
MD50-12-958	50-603064	113–113	12-104	12-103
MD50-12-959	50-603064	176–176	12-104	12-103
MD50-12-960	50-603064	214–214	12-104	12-103
MD50-12-961	50-603064	259–259	12-104	12-103
MD50-12-962	50-603064	332–332	12-104	12-103
MD50-12-963	50-603064	482–482	12-104	12-103

Table C-5.0-2 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-12-964	50-603064	500–500	12-104	12-103
MD50-12-982	50-603383	26–26	12-181	12-180
MD50-12-978	50-603383	85–85	12-181	12-180
MD50-12-979	50-603383	139–139	12-181	12-180
MD50-12-980	50-603383	206–206	12-181	12-180
MD50-12-981	50-603383	244–244	12-181	12-180
MD50-12-977	50-603383	286–286	12-162	12-161
MD50-12-976	50-603383	359–359	12-162	12-161
MD50-12-975	50-603383	408–408	12-162	12-161
MD50-12-974	50-603383	450–450	12-162	12-161
MD49-12-967	50-603468	92–92	12-128	12-127
MD49-12-965	50-603468	142–142	12-128	12-127
MD49-12-966	50-603468	198–198	12-128	12-127
MD49-12-971	50-603468	233–233	12-128	12-127
MD49-12-969	50-603468	282–282	12-128	12-127
MD49-12-970	50-603468	354–354	12-128	12-127
MD49-12-972	50-603468	403–403	12-128	12-127
MD49-12-973	50-603468	450–450	12-128	12-127
MD50-12-983	50-603470	30–30	12-275	12-274
MD50-12-984	50-603470	83–83	12-268	12-267
MD50-12-985	50-603470	143–143	12-268	12-267
MD50-12-986	50-603470	203–203	12-268	12-267
MD50-12-987	50-603470	233–233	12-268	12-267
MD50-12-988	50-603470	278–278	12-275	12-274
MD50-12-989	50-603470	351–351	12-275	12-274
MD50-12-990	50-603470	450–450	12-275	12-274
MD50-12-991	50-603470	600–600	12-282	12-281
MD50-12-992	50-603470	650–650	12-282	12-281
MD50-12-1000	50-603471	90–90	12-305	12-303
MD50-12-999	50-603471	146–146	12-305	12-303
MD50-12-998	50-603471	209–209	12-305	12-303
MD50-12-997	50-603471	242–242	12-305	12-303
MD50-12-996	50-603471	288–288	12-304	12-302
MD50-12-995	50-603471	360–360	12-304	—[b]
MD50-12-994	50-603471	410–410	12-304	12-302
MD50-12-993	50-603471	450–450	12-304	12-302
MD50-12-1010	50-603472	27–27	12-372	12-371
MD50-12-1007	50-603472	93–93	12-372	12-371
MD50-12-1008	50-603472	146–146	12-391	12-390

Table C-5.0-2 (continued)

Sample ID	Location ID	Depth (ft)	Tritium	VOC
MD50-12-1006	50-603472	210–210	12-391	12-390
MD50-12-1009	50-603472	247–247	12-391	12-390
MD50-12-1005	50-603472	292–292	12-372	12-371
MD50-12-1004	50-603472	364–364	12-349	12-348
MD50-12-1003	50-603472	414–414	12-349	12-348
MD50-12-1002	50-603472	450–450	12-349	12-348
MD50-12-1015	50-613182	500–500	12-349	12-348
MD50-12-1014	50-613182	550–550	12-349	12-348
MD50-12-1013	50-613182	600–600	12-349	12-348
MD50-12-1012	50-613182	620–620	12-349	12-348
MD50-12-1011	50-613182	632.5–632.5	12-349	12-348
MD50-12-1020	50-613183	30–30	12-309	12-308
MD50-12-1021	50-613183	500–500	12-325	12-324
MD50-12-1022	50-613183	550–550	12-325	12-324
MD50-12-1017	50-613183	600–600	12-309	12-308
MD50-12-1018	50-613183	630–630	12-309	12-308
MD50-12-1019	50-613183	642.5–642.5	12-309	12-308
MD50-12-1023	50-613184	30–30	12-128	12-127
MD50-12-1024	50-613184	500–500	12-128	12-127
MD50-12-1025	50-613184	550–550	12-128	12-127
MD50-12-1026	50-613184	600–600	12-128	12-127
MD50-12-1027	50-613184	652–652	12-128	12-127
MD50-12-1028	50-613184	664.5–664.5	12-138	12-137
MD50-12-1038	50-613185	85–85	12-138	12-137
MD50-12-1035	50-613185	145–145	12-140	12-139
MD50-12-1036	50-613185	205–205	12-140	12-139
MD50-12-1037	50-613185	235–235	12-140	12-139
MD50-12-1034	50-613185	280–280	12-140	12-139
MD50-12-1033	50-613185	350–350	12-140	12-139
MD50-12-1032	50-613185	450–450	12-138	12-137
MD50-12-1031	50-613185	600–600	12-138	12-137
MD50-12-1030	50-613185	675–675	12-138	12-137
MD50-12-1029	50-613185	688–688	12-138	12-137

[a] Analytical request number.

[b] — = Analysis not requested.

Table C-5.0-3
Samples Collected in and Analyses Requested for MDA C
Vapor-Monitoring Wells, March 2012–Arril 2012 Sampling Event

Location ID	Sample ID	Depth (ft)	Tritium	VOC
50-24784	MD50-12-12060	155–155	12-1155*	12-1156
50-24784	MD50-12-12061	244–244	12-1142	12-1143
50-24784	MD50-12-12062	362–362	12-1142	12-1143
50-24784	MD50-12-12063	450–450	12-1142	12-1143
50-24813	MD50-12-12067	25–25	12-1153	12-1154
50-24813	MD50-12-12066	150–150	12-1153	12-1154
50-24813	MD50-12-12065	241–241	12-1153	12-1154
50-24813	MD50-12-12064	358–358	12-1168	12-1169
50-24813	MD50-12-12068	450–450	12-1167	12-1166
50-24813	MD50-12-12069	600–600	12-1167	12-1166
50-24822	MD50-12-12074	25–25	12-1093	12-1094
50-24822	MD50-12-12073	142–142	12-1083	12-1084
50-24822	MD50-12-12072	235–235	12-1093	12-1094
50-24822	MD50-12-12071	351–351	12-1083	12-1084
50-24822	MD50-12-12070	450–450	12-1083	12-1084
50-603061	MD50-12-12079	25–25	12-1139	12-1140
50-603061	MD50-12-12078	128–128	12-1134	12-1135
50-603061	MD50-12-12077	228–228	12-1134	12-1135
50-603061	MD50-12-12076	347–347	12-1134	12-1135
50-603061	MD50-12-12075	450–450	12-1134	12-1135
50-603062	MD50-12-12087	122–122	12-1130	12-1132
50-603062	MD50-12-12086	217–217	12-1122	12-1123
50-603062	MD50-12-12085	337–337	12-1122	12-1123
50-603062	MD50-12-12084	450–450	12-1122	12-1123
50-603063	MD50-12-12088	25–25	12-1187	12-1188
50-603063	MD50-12-12089	128–128	12-1189	12-1190
50-603063	MD50-12-12090	228–228	12-1189	12-1190
50-603063	MD50-12-12091	347–347	12-1189	12-1190
50-603063	MD50-12-12092	450–450	12-1187	12-1188
50-603064	MD50-12-12096	113–113	12-1220	12-1221
50-603064	MD50-12-12095	214–214	12-1220	12-1221
50-603064	MD50-12-12094	332–332t	12-1220	12-1221
50-603064	MD50-12-12093	500–500t	12-1220	12-1221
50-603383	MD50-12-12101	26–26t	12-1198	12-1199
50-603383	MD50-12-12097	139–139t	12-1200	12-1201
50-603383	MD50-12-12098	244–244	12-1200	12-1201
50-603383	MD50-12-12099	359–359	12-1200	12-1201
50-603383	MD50-12-12100	450–450	12-1200	12-1201
50-603467	MD50-12-12106	143-143	12-1118	12-1119

Table C-5.0-3 (continued)

Location ID	Sample ID	Depth (ft)	Tritium	VOC
50-603467	MD50-12-12102	244–244	12-1118	12-1119
50-603467	MD50-12-12103	360–360	12-1103	12-1104
50-603467	MD50-12-12104	500–500	12-1118	12-1119
50-603467	MD50-12-12105	600–600	12-1103	12-1104
50-603468	MD50-12-12108	142–142	12-1073	12-1072
50-603468	MD50-12-12109	233–233	12-1073	12-1072
50-603468	MD50-12-12110	354–354	12-1073	12-1072
50-603468	MD50-12-12107	403–403	12-1070	12-1071
50-603470	MD50-12-12114	83–83	12-1171	12-1172
50-603470	MD50-12-12120	203–203	12-1178	12-1179
50-603470	MD50-12-12119	278–278	12-1178	12-1179
50-603470	MD50-12-12118	351–351	12-1178	12-1179
50-603470	MD50-12-12115	450–450	12-1171	12-1172
50-603470	MD50-12-12116	600–600	12-1171	12-1172
50-603470	MD50-12-12117	650–650	12-1171	12-1172
50-603471	MD50-12-12124	90–90	12-1176	12-1177
50-603471	MD50-12-12125	209–209	12-1176	12-1177
50-603471	MD50-12-12122	288–288	12-1176	12-1177
50-603471	MD50-12-12123	360–360	12-1176	12-1177
50-603471	MD50-12-12121	450–450	12-1176	12-1177
50-603472	MD50-12-12128	27–27	12-1182	12-1183
50-603472	MD50-12-12129	146–146	12-1182	12-1183
50-603472	MD50-12-12132	292–292	12-1182	12-1183
50-603472	MD50-12-12131	364–364	12-1182	12-1183
50-603472	MD50-12-12130	450–450	12-1182	12-1183
50-603503	MD50-12-12136	133–133	12-1116	12-1117
50-603503	MD50-12-12135	237–237	12-1116	12-1117
50-603503	MD50-12-12137	347–347	12-1116	12-1117
50-603503	MD50-12-12138	450–450	12-1116	12-1117
50-613182	MD50-12-12133	550–550	12-1182	12-1183
50-613182	MD50-12-12134	632.5–632.5	12-1182	12-1183
50-613183	MD50-12-12127	550–550	12-1176	12-1177
50-613183	MD50-12-12126	642.5–642.5	12-1176	12-1177
50-613184	MD50-12-12113	500–500	12-1070	12-1071
50-613184	MD50-12-12112	600–600	12-1070	12-1071
50-613184	MD50-12-12111	664.5–664.5	12-1070	12-1071
50-613185	MD50-12-12143	145–145	12-1060	12-1059
50-613185	MD50-12-12139	235–235	12-1055	12-1056_1
50-613185	MD50-12-12140	350–350	12-1055	12-1056_1
50-613185	MD50-12-12141	450–450	12-1055	12-1056_1
50-613185	MD50-12-12142	600–600	12-1055	12-1056_1

*Analytical request number.

Table C-5.0-4
VOCs Detected in Vapor Samples at MDA C during August 2011 Sampling Event

Sample ID	Location ID	Media	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene
MD50-11-23296	50-24813	358–358	—*	—	—	—	—	—	270	—	550	—	—	—	—	—
MD50-11-23297	50-24813	408–408	—	—	—	—	—	—	—	—	660	—	—	—	—	—
MD50-11-23298	50-24813	450–450	—	29	—	—	—	—	—	100	78	—	—	—	—	—
MD50-11-23299	50-24813	600–600	—	4100	—	—	—	—	—	—	—	—	—	—	—	5900
MD50-11-23287	50-603383	26–26	—	74	—	—	43 (J)	—	37	—	100	—	—	—	25	26
MD50-11-23288	50-603383	85–85	—	—	—	—	—	—	100	—	230	—	—	—	120	—
MD50-11-23289	50-603383	139–139	—	360	—	—	170	—	180	—	230	31	63	40	290	500
MD50-11-23290	50-603383	206–206	—	—	—	—	160	—	91	—	130	—	—	34	230	—
MD50-11-23291	50-603383	244–244	—	—	—	—	240	—	120	—	180	—	—	51	310	—
MD50-11-23292	50-603383	286–286	—	—	—	—	230	—	91	—	150	—	—	46	240	—
MD50-11-23295	50-603383	359–359	—	—	4	—	—	2.1	2.1	—	6.6	—	—	—	3.3	—
MD50-11-23294	50-603383	408–408	—	170	4.9	—	19	1.6	—	—	15	—	—	—	—	56
MD50-11-23293	50-603383	450–450	53	—	13	—	110	—	11	—	100	—	—	7	14	—
MD50-11-23278	50-603468	354–354	6.8	—	—	3.1	33	—	43	—	150	—	—	16	—	—
MD50-11-23279	50-603468	403–403	—	100	—	—	—	—	—	—	60	—	—	—	—	110
MD50-11-23280	50-603468	450–450	—	—	—	—	—	—	—	—	390	—	—	—	—	—
MD50-11-23311	50-603470	351–351	—	—	—	—	—	—	—	—	900	—	—	—	—	—
MD50-11-23312	50-603470	450–450	—	—	—	—	—	—	—	—	500	—	—	—	—	—
MD50-11-23313	50-603470	600–600	—	—	—	—	76	—	—	—	220	—	—	—	—	—
MD50-11-23314	50-603470	650–650	—	—	—	—	30	—	2.4	—	140	—	—	—	—	—
MD50-11-23308	50-603471	360–360	—	—	—	—	—	—	800	—	780	—	—	—	—	—
MD50-11-23310	50-603471	410–410	—	—	—	—	—	—	810	—	560	—	—	—	—	—
MD50-11-23309	50-603471	450–450	—	—	—	—	—	—	530	—	310	—	—	—	—	—
MD50-11-23307	50-603472	364–364	—	—	—	—	—	—	—	—	190	—	—	—	—	—
MD50-11-23306	50-603472	414–414	—	—	—	—	—	—	—	—	360	—	—	—	—	—
MD50-11-23305	50-603472	450–450	—	—	—	—	—	—	—	—	140	—	—	—	—	—
MD50-11-23273	50-613182	500–500	—	—	—	—	210 (J)	—	—	—	210	—	—	—	—	—
MD50-11-23276	50-613182	550–550	—	—	—	—	190 (J)	—	—	—	190	—	—	—	—	—
MD50-11-23275	50-613182	600–600	—	92	—	—	14 (J)	—	—	—	23	—	—	—	—	24
MD50-11-23274	50-613182	620–620	—	—	—	—	88 (J)	—	—	—	130	—	—	—	—	—
MD50-11-23277	50-613182	632.5–632.5	—	1.8	—	—	—	—	—	—	3.9	—	—	—	—	—

Table C-5.0-4 (continued)

Sample ID	Location ID	Media	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene	Chloroform	Dichloro-1,1,2,2-tetrafluoroethane[1,2-]	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene
MD50-11-23282	50-613183	500–500	—	—	—	—	—	—	—	—	510	—	—	—	—	—
MD50-11-23283	50-613183	550–550	—	—	—	—	120	—	—	—	190	—	—	—	—	—
MD50-11-23284	50-613183	600–600	—	—	—	—	270	—	—	—	—	—	—	—	—	—
MD50-11-23285	50-613183	630–630	—	—	—	—	170	—	—	—	330	—	—	—	—	—
MD50-11-23286	50-613183	642.5–642.5	41	3.9	10	84	8.3	—	—	—	16	—	—	—	—	—
MD50-11-23300	50-613184	500–500	—	—	—	—	26	—	—	—	34	—	—	—	—	—
MD50-11-23302	50-613184	550–550	—	—	—	—	17	—	—	—	30	—	—	—	—	—
MD50-11-23301	50-613184	600–600	—	—	—	—	50	—	—	—	76	—	—	—	—	—
MD50-11-23303	50-613184	652–652	—	—	—	17	—	—	—	—	6.8	—	—	—	—	—
MD50-11-23304	50-613184	664.5–664.5	—	—	—	9.5	—	—	—	—	9.8	—	—	—	—	—
MD50-11-23268	50-613185	350–350	—	—	—	—	—	—	—	—	130	—	—	—	—	—
MD50-11-23269	50-613185	450–450	—	—	—	—	—	—	—	—	88	—	—	—	—	—
MD50-11-23271	50-613185	600–600	—	—	—	10	17 (J)	—	—	—	34	—	—	—	—	—
MD50-11-23270	50-613185	675–675	—	—	—	18	13 (J)	—	—	—	34	—	—	—	—	—
MD50-11-23272	50-613185	688–688	9.9	—	—	7.2	5.1 (J)	—	—	—	16	—	—	—	—	—

Table C-5.0-4 (continued)

Sample ID	Location ID	Media	Ethyltoluene[4-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-23296	50-24813	358–358	—	—	—	—	—	—	—	32000	—	—	—	—	—	—
MD50-11-23297	50-24813	408–408	—	270	—	—	—	—	—	31000	—	—	—	—	—	—
MD50-11-23298	50-24813	450–450	—	—	—	—	66	—	—	3800	—	—	—	—	—	—
MD50-11-23299	50-24813	600–600	5100	—	—	—	26000	—	—	2100	—	5500	1500	16000	5300	22000
MD50-11-23287	50-603383	26–26	24	—	—	320	140	460	79	1100	14	—	—	70	24	94
MD50-11-23288	50-603383	85–85	—	—	—	710	—	1200	180	2700	—	—	—	—	—	—
MD50-11-23289	50-603383	139–139	370	—	—	920	2300	1400	260	3700	30	340	120	1200	460	1700
MD50-11-23290	50-603383	206–206	—	110	—	690	—	480	110	3100	—	—	—	—	—	—
MD50-11-23291	50-603383	244–244	—	—	—	1000	—	560	140	4800	—	—	—	—	—	—
MD50-11-23292	50-603383	286–286	—	—	—	950	—	410	110	4600	—	—	—	—	—	—
MD50-11-23295	50-603383	359–359	—	—	—	20	—	11	1.7	91	—	—	—	—	—	—
MD50-11-23294	50-603383	408–408	36	—	13	25	410	6.9	1.7	140	2.4	36	11	160	53	210
MD50-11-23293	50-603383	450–450	—	—	—	220	6.9	62	14	1200	—	—	—	—	—	—
MD50-11-23278	50-603468	354–354	—	87	—	—	—	—	—	900	4.5	—	—	—	—	—
MD50-11-23279	50-603468	403–403	—	—	—	86	740	—	—	3700	—	—	—	170	42	210
MD50-11-23280	50-603468	450–450	—	—	—	—	—	—	—	21000	—	—	—	—	—	—
MD50-11-23311	50-603470	351–351	—	350	—	—	—	—	—	42000	—	—	—	—	—	—
MD50-11-23312	50-603470	450–450	—	—	—	—	—	—	—	18000	—	—	—	—	—	—
MD50-11-23313	50-603470	600–600	—	—	—	—	—	—	—	1800	—	—	—	—	—	—
MD50-11-23314	50-603470	650–650	—	—	—	—	—	—	—	120	6.7	—	—	—	—	—
MD50-11-23308	50-603471	360–360	—	1200	—	1100	—	—	—	57000	—	—	—	—	—	—
MD50-11-23310	50-603471	410–410	—	710	—	790	—	—	—	44000	—	—	—	—	—	—
MD50-11-23309	50-603471	450–450	—	370	—	510	—	—	—	26000	—	—	—	—	—	—
MD50-11-23307	50-603472	364–364	—	130	—	460	—	—	—	10000	—	—	—	—	—	—
MD50-11-23306	50-603472	414–414	—	170	—	860	—	—	—	21000	—	—	—	—	—	—
MD50-11-23305	50-603472	450–450	—	—	—	250	—	—	—	5900	—	—	—	—	—	—
MD50-11-23273	50-613182	500–500	—	—	—	240	—	—	—	6100	—	—	—	—	—	—
MD50-11-23276	50-613182	550–550	—	—	—	240	—	—	—	4700	—	—	—	—	—	—
MD50-11-23275	50-613182	600–600	11	—	4.9	6.3	200	—	—	110	—	—	3.4	70	17	53
MD50-11-23274	50-613182	620–620	—	—	—	57	—	—	—	1200	—	—	—	—	—	—
MD50-11-23277	50-613182	632.5–632.5	—	—	—	—	8.3	—	—	—	—	—	—	—	—	—
MD50-11-23282	50-613183	500–500	—	—	—	—	—	—	—	19000	—	—	—	—	—	—
MD50-11-23283	50-613183	550–550	—	—	—	44	—	—	—	2600	—	—	—	—	—	—

Table C-5.0-4 (continued)

Sample ID	Location ID	Media	Ethyltoluene[4-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
MD50-11-23284	50-613183	600–600	—	—	—	140	—	—	—	8300	—	—	—	—	—	—
MD50-11-23285	50-613183	630–630	—	—	—	55	—	—	—	2800	—	—	—	—	—	—
MD50-11-23286	50-613183	642.5–642.5	—	—	—	—	1.9	—	—	93	2.5 (J)	—	—	—	—	—
MD50-11-23300	50-613184	500–500	—	—	—	—	9.9	—	—	720	—	—	—	—	—	—
MD50-11-23302	50-613184	550–550	—	4.3	—	—	—	—	—	220	5	—	—	—	—	—
MD50-11-23301	50-613184	600–600	—	—	—	—	—	—	—	1100	—	—	—	—	—	—
MD50-11-23303	50-613184	652–652	—	—	—	—	2	—	—	17	—	—	—	—	—	—
MD50-11-23304	50-613184	664.5–664.5	—	—	—	—	—	—	—	33	—	—	—	—	—	—
MD50-11-23268	50-613185	350–350	—	—	—	—	—	—	—	3900	—	—	—	—	—	—
MD50-11-23269	50-613185	450–450	—	—	—	—	—	—	—	1300	—	—	—	—	—	—
MD50-11-23271	50-613185	600–600	—	—	—	—	—	—	—	110	3.2	—	—	—	—	—
MD50-11-23270	50-613185	675–675	—	—	—	—	—	—	—	37	—	—	—	—	—	—
MD50-11-23272	50-613185	688–688	—	26	—	—	2	—	—	10	—	—	—	—	—	—

Notes: Results are in µg/m^3. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-5.0-5
VOCs Detected in Vapor Samples at MDA C during October 2011–November 2011 Sampling Event

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
50-24784	MD50-12-936	25–25	—*	—	—	—	37.7 (J+)	317	—	41.5	—	—	—	—	—	—
50-24784	MD50-12-935	96–96	—	—	—	—	176 (J+)	781	—	119	—	—	—	55.4	—	—
50-24784	MD50-12-934	155–155	—	—	—	—	308 (J+)	346	—	138	—	—	—	55.4	—	—
50-24784	MD50-12-933	215–215	23	4.79	4.13	6.22	31.4 (J+)	9.76	2.04	12.8	—	—	—	2.72	—	—
50-24784	MD50-12-932	244–244	—	—	—	—	484 (J+)	132	—	168	—	—	—	—	—	—
50-24784	MD50-12-931	289–289	—	—	—	—	692 (J+)	97.6	—	227	—	—	—	—	—	—
50-24784	MD50-12-930	362–362	—	—	—	—	754 (J+)	—	—	262	—	—	—	—	—	—
50-24784	MD50-12-929	411–411	—	—	—	—	578 (J+)	—	—	237	—	—	—	—	—	—
50-24784	MD50-12-928	450–450	—	—	—	—	415 (J+)	—	—	188	—	—	—	—	—	—
50-24813	MD50-12-946	25–25	—	—	—	—	2390 (J+)	1560	—	494	—	—	—	—	—	—
50-24813	MD50-12-945	99–99	—	—	—	—	5030	3950	—	988	—	—	515	—	—	—
50-24813	MD50-12-944	150–150	—	—	—	—	4090	3950	—	1140	—	—	674	—	—	—
50-24813	MD50-12-943	207–207	—	—	—	—	3520 (J+)	3220	—	2030	—	—	753	—	—	—
50-24813	MD50-12-942	241–241	—	—	—	—	3400 (J+)	3120	—	2420	—	—	—	—	—	—
50-24813	MD50-12-941	286–286	—	—	—	—	—	2100	—	2320	—	—	—	—	—	—
50-24813	MD50-12-940	358–358	—	—	—	—	1380 (J+)	732	—	1480	—	—	—	—	—	—
50-24813	MD50-12-939	408–408	—	—	—	—	—	—	—	1190	—	—	—	—	—	—
50-24813	MD50-12-938	450–450	—	—	—	—	610 (J+)	—	—	692	—	—	—	—	—	—
50-24813	MD50-12-937	600–600	—	—	—	—	214 (J+)	—	—	366	—	—	—	—	—	—
50-24822	MD50-12-947	25–25	—	—	—	—	—	322	—	217	—	—	—	—	—	—
50-24822	MD50-12-948	81–81	—	—	—	—	126	337	—	217	—	—	47.5	—	—	—
50-24822	MD50-12-949	142–142	—	—	—	—	239	537	—	470	—	—	115	—	—	—
50-24822	MD50-12-951	204–204	—	—	—	—	384	537	—	741	—	—	151	—	—	—
50-24822	MD50-12-952	235–235	—	—	—	—	—	683	—	1140	—	—	—	—	—	—
50-24822	MD50-12-950	280–280	—	—	—	—	—	444	—	890	—	—	—	—	—	—
50-24822	MD50-12-953	351–351	—	—	—	—	340	156	—	642	—	—	—	—	—	—
50-24822	MD50-12-954	402–402	—	—	—	—	—	—	—	173	—	—	—	—	—	—
50-24822	MD50-12-955	450–450	—	—	—	—	—	—	—	494	—	—	—	—	—	—
50-603064	MD50-12-956	25–25	—	—	—	—	—	288	—	74.1	—	—	—	—	—	—
50-603064	MD50-12-957	66–66	—	—	—	—	—	488	—	188	—	269	—	—	—	—
50-603064	MD50-12-958	113–113	—	—	—	—	—	927	—	489	—	594	—	—	—	—

Table C-5.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
50-603064	MD50-12-959	176–176	—	—	—	—	—	878	—	939	—	872	309	—	—	—
50-603064	MD50-12-960	214–214	—	—	—	—	—	537	—	692	—	—	—	—	—	—
50-603064	MD50-12-961	259–259	—	—	—	—	—	381	—	791	—	—	—	—	—	—
50-603064	MD50-12-962	332–332	—	—	—	—	—	—	—	593	—	—	—	—	—	—
50-603064	MD50-12-963	482–482	—	—	—	—	264 (J+)	—	—	415	—	—	—	—	—	—
50-603064	MD50-12-964	500–500	—	—	—	—	107 (J+)	—	—	227	—	—	—	—	—	—
50-603383	MD50-12-982	26–26	—	—	—	24.9	94.3	73.2	—	203	—	—	—	36.9	—	—
50-603383	MD50-12-978	85–85	—	—	—	—	145	137	—	262	—	—	—	125	—	—
50-603383	MD50-12-979	139–139	—	—	—	—	220	195	—	272	—	—	—	277	—	—
50-603383	MD50-12-980	206–206	—	—	—	—	522	244	—	361	—	—	—	508	—	—
50-603383	MD50-12-981	244–244	—	—	—	—	560	220	—	351	—	—	79.2	508	—	—
50-603383	MD50-12-977	286–286	164	—	—	—	327 (J+)	97.6	—	183	—	—	—	217	—	—
50-603383	MD50-12-976	359–359	6.41	—	2.36	—	—	2	—	4.3	—	—	—	2.49	—	—
50-603383	MD50-12-975	408–408	—	—	—	—	207 (J+)	—	—	119	—	—	—	—	—	—
50-603383	MD50-12-974	450–450	—	—	—	—	207 (J+)	—	—	93.9	—	—	—	—	—	—
50-603468	MD49-12-967	92–92	—	—	—	—	516	488	—	247	—	—	99.1	—	—	—
50-603468	MD49-12-965	142–142	—	—	—	—	314	420	—	124	—	—	95.1	—	—	—
50-603468	MD49-12-966	198–198	—	—	—	—	754	732	—	474	—	—	250	—	—	—
50-603468	MD49-12-971	233–233	—	—	—	—	754	683	—	494	—	—	242	—	—	—
50-603468	MD49-12-969	282–282	—	—	—	—	817	634	—	593	—	—	250	—	—	—
50-603468	MD49-12-970	354–354	—	—	—	—	—	537	—	791	—	—	—	—	—	—
50-603468	MD49-12-972	403–403	—	—	—	—	—	—	—	791	—	—	—	—	—	—
50-603468	MD49-12-973	450–450	—	—	—	—	578	—	—	544	—	—	—	—	—	—
50-603470	MD50-12-983	30–30	—	—	—	—	484	1070	—	371	—	—	87.2	—	—	—
50-603470	MD50-12-984	83–83	—	—	—	—	754	1560	—	544	—	—	230	—	—	—
50-603470	MD50-12-985	143–143	—	—	—	—	—	1760	—	791	—	—	—	—	—	—
50-603470	MD50-12-986	203–203	—	—	—	—	—	1510	—	1140	—	—	—	—	—	—
50-603470	MD50-12-987	233–233	—	—	—	—	—	1760	—	1530	—	—	—	—	—	—
50-603470	MD50-12-988	278–278	—	—	—	—	—	1270	—	1480	—	—	353	—	—	—
50-603470	MD50-12-989	351–351	—	—	—	—	943	464	—	1330	—	—	—	—	—	—
50-603470	MD50-12-990	450–450	—	—	—	—	—	—	—	840	—	—	—	—	—	—
50-603470	MD50-12-991	600–600	—	—	—	—	94.3	—	—	217	—	—	—	—	—	35.9
50-603470	MD50-12-992	650–650	14.2 (J)	60.7	10	11.2	37.1	2.68	—	109	—	—	—	—	113	10.8

Table C-5.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
50-603471	MD50-12-1000	90–90	—	—	—	—	3270 (J+)	2680	—	494	—	—	361	—	—	—
50-603471	MD50-12-999	146–146	—	—	—	—	2580 (J+)	2930	—	—	—	—	—	—	—	—
50-603471	MD50-12-998	209–209	—	—	—	—	—	1220	—	840	—	—	—	—	—	—
50-603471	MD50-12-997	242–242	—	—	—	—	2640 (J+)	2730	—	1430	—	—	—	—	—	—
50-603471	MD50-12-996	288–288	—	—	—	—	—	976	—	1090	—	—	—	—	—	—
50-603471	MD50-12-994	410–410	—	—	—	—	—	586	—	890	—	—	—	—	—	—
50-603471	MD50-12-993	450–450	—	—	—	—	—	537	—	741	—	—	—	—	—	—
50-603472	MD50-12-1010	27–27	—	—	—	—	—	215	—	27.2	—	—	—	—	—	—
50-603472	MD50-12-1007	93–93	—	—	—	—	390 (J+)	732	—	168	—	—	127	—	—	—
50-603472	MD50-12-1008	146–146	207 (J)	—	—	—	—	303	—	—	—	—	—	—	—	—
50-603472	MD50-12-1006	210–210	138 (J)	—	—	—	—	454	—	—	—	—	—	—	—	—
50-603472	MD50-12-1009	247–247	—	—	—	—	—	878	—	—	—	—	—	—	—	—
50-603472	MD50-12-1005	292–292	—	—	—	—	497 (J+)	415	—	232	—	—	—	—	—	—
50-603472	MD50-12-1004	364–364	—	—	—	—	528 (J+)	146	—	341	—	—	—	—	—	—
50-603472	MD50-12-1003	414–414	—	—	—	—	817 (J+)	—	—	470	—	—	—	—	—	—
50-603472	MD50-12-1002	450–450	—	—	—	—	629 (J+)	—	—	405	—	—	—	—	—	—
50-613182	MD50-12-1015	500–500	—	—	—	—	415 (J+)	—	—	311	—	—	—	—	—	—
50-613182	MD50-12-1014	550–550	—	—	—	—	296 (J+)	—	—	252	—	—	—	—	—	—
50-613182	MD50-12-1013	600–600	—	—	—	—	12.6 (J+)	—	—	13.8	—	—	—	—	—	—
50-613182	MD50-12-1012	620–620	—	—	—	—	157 (J+)	—	—	173	—	—	—	—	—	—
50-613182	MD50-12-1011	632–632	—	—	—	—	—	—	—	6.42	—	—	—	—	—	—
50-613183	MD50-12-1020	30–30	—	—	—	—	3400 (J+)	3220	—	—	—	—	—	—	—	—
50-613183	MD50-12-1021	500–500	—	—	—	—	604 (J+)	—	—	544	—	—	—	—	—	—
50-613183	MD50-12-1022	550–550	—	—	—	—	296 (J+)	—	—	371	—	—	—	—	—	—
50-613183	MD50-12-1017	600–600	—	—	—	—	453 (J+)	—	—	489	—	—	—	—	—	—
50-613183	MD50-12-1018	630–630	—	—	—	—	264 (J+)	—	—	356	—	—	—	—	—	—
50-613183	MD50-12-1019	642.5–642.5	23.7 (J)	—	3.83	37.3	12.6 (J+)	1.81	—	14.8	—	—	—	—	—	—
50-613184	MD50-12-1023	30–30	—	—	—	—	289	259	—	183	—	—	—	—	—	—
50-613184	MD50-12-1024	500–500	—	—	—	—	195	—	—	242	—	—	—	—	—	—
50-613184	MD50-12-1025	550–550	—	—	—	—	138	—	—	178	—	—	—	—	—	—
50-613184	MD50-12-1026	600–600	8.07	—	—	—	81.7	—	—	128	—	—	—	—	—	—
50-613184	MD50-12-1027	652–652	10.9	2.01	—	177	48.4	—	—	84	—	—	—	—	—	—
50-613184	MD50-12-1028	664.5–664.5	11.2	1.21	3.54	30.2	12.6 (J+)	—	—	31.1	—	—	—	—	—	—

Table C-5.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Acetone	Benzene	Butanone[2-]	Carbon Disulfide	Carbon Tetrachloride	Chloroform	Chloromethane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethylbenzene	Ethyltoluene[4-]
50-613185	MD50-12-1038	85–85	—	—	—	—	126	122	—	114	—	—	—	—	—	—
50-613185	MD50-12-1035	145–145	—	—	—	—	—	127	—	128	—	—	—	—	—	—
50-613185	MD50-12-1036	205–205	—	—	—	—	—	132	—	198	—	—	—	—	—	—
50-613185	MD50-12-1037	235–235	—	—	—	—	—	127	—	213	—	—	—	—	—	—
50-613185	MD50-12-1034	280–280	—	—	—	—	—	92.7	—	208	—	—	—	—	—	—
50-613185	MD50-12-1033	350–350	—	—	—	—	—	—	—	173	—	—	—	—	—	—
50-613185	MD50-12-1032	450–450	9.73	1.15	2.45	—	—	—	—	5.93	—	—	—	—	—	—
50-613185	MD50-12-1031	600–600	7.12	—	—	4.36	27	—	—	49.4	—	—	—	—	—	—
50-613185	MD50-12-1030	675–675	7.6	—	—	13.4	17.6	—	—	42	12.5	—	—	—	—	—
50-613185	MD50-12-1029	688–688	4.27	—	—	16.5	12.6 (J+)	—	—	42	—	—	—	—	—	—

Table C-5.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-24784	MD50-12-936	25–25	—	—	—	2370	—	53.6 (J+)	60	1070	—	—	—	—	—	—
50-24784	MD50-12-935	96–96	—	—	—	3520	—	176 (J+)	87.2	3330	—	—	—	—	—	—
50-24784	MD50-12-934	155–155	—	—	—	2850	—	176 (J+)	76.3	4400	—	—	—	—	—	—
50-24784	MD50-12-933	215–215	—	1.91	—	176	9.04	7.66 (J+)	3.76	322	2.7	—	—	3.47	—	3.47
50-24784	MD50-12-932	244–244	—	—	—	2580	—	107 (J+)	52.9	4990	—	—	—	—	—	—
50-24784	MD50-12-931	289–289	—	—	—	2850	—	—	—	5370	—	—	—	—	—	—
50-24784	MD50-12-930	362–362	—	—	—	1690	—	—	—	3600	—	—	—	—	—	—
50-24784	MD50-12-929	411–411	—	—	—	881	—	—	—	1880	—	—	—	—	—	—
50-24784	MD50-12-928	450–450	—	—	—	502	—	—	—	1130	15.7	—	—	—	—	—
50-24813	MD50-12-946	25–25	—	—	—	563	—	—	—	18800	—	—	—	—	—	—
50-24813	MD50-12-945	99–99	—	—	—	813	—	—	—	52100	—	—	—	—	—	—
50-24813	MD50-12-944	150–150	—	798	—	813	—	—	—	69800	—	—	—	—	—	—
50-24813	MD50-12-943	207–207	—	1180	—	1630	—	—	—	129000	—	—	—	—	—	—
50-24813	MD50-12-942	241–241	—	1940	—	—	—	—	—	118000	—	—	—	—	—	—
50-24813	MD50-12-941	286–286	—	833	—	—	—	—	—	113000	—	—	—	—	—	—
50-24813	MD50-12-940	358–358	—	—	—	—	—	—	—	69800	—	—	—	—	—	—
50-24813	MD50-12-939	408–408	—	—	—	—	—	—	—	49900	—	—	—	—	—	—
50-24813	MD50-12-938	450–450	—	—	—	—	—	—	—	26900	—	—	—	—	—	—
50-24813	MD50-12-937	600–600	—	—	—	—	—	—	—	3650	—	—	—	—	—	—
50-24822	MD50-12-947	25–25	—	—	—	—	—	—	—	9130	—	—	—	—	—	—
50-24822	MD50-12-948	81–81	—	—	—	94.9	—	—	—	10200	—	—	—	—	—	—
50-24822	MD50-12-949	142–142	—	347	—	156	—	—	—	27900	—	—	—	—	—	—
50-24822	MD50-12-951	204–204	—	278	—	190	—	—	—	36000	—	—	—	—	—	—
50-24822	MD50-12-952	235–235	—	417	—	—	—	—	—	50500	—	—	—	—	—	—
50-24822	MD50-12-950	280–280	—	—	—	—	—	—	—	42400	—	—	—	—	—	—
50-24822	MD50-12-953	351–351	—	111	—	—	—	—	—	25800	—	—	—	—	—	—
50-24822	MD50-12-954	402–402	—	—	—	—	—	—	—	6980	—	—	—	—	—	—
50-24822	MD50-12-955	450–450	—	—	—	—	—	—	—	12900	—	—	—	—	—	—
50-603064	MD50-12-956	25–25	—	—	—	264	—	2910	872	4140	—	—	—	—	—	—
50-603064	MD50-12-957	66–66	—	—	—	427	—	8420	2070	8590	—	—	—	—	—	—
50-603064	MD50-12-958	113–113	—	—	—	610	—	13800	3220	29000	—	—	—	—	—	—
50-603064	MD50-12-959	176–176	—	521	—	671	—	19100	3870	52600	—	—	—	—	—	—
50-603064	MD50-12-960	214–214	—	486	—	—	—	12300	2450	33800	—	—	—	—	—	—

Table C-5.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-603064	MD50-12-961	259–259	—	323	—	—	—	11500	1420	35400	—	—	—	—	—	—
50-603064	MD50-12-962	332–332	—	1810	—	—	—	3680	234	16100	—	—	—	—	—	—
50-603064	MD50-12-963	482–482	—	—	—	—	—	1380	—	9130	—	—	—	—	—	—
50-603064	MD50-12-964	500–500	—	18.7	—	—	—	153	—	1560	—	—	—	—	—	—
50-603383	MD50-12-982	26–26	—	—	—	630	—	996 (J+)	158	1770	33.1	—	—	—	—	—
50-603383	MD50-12-978	85–85	—	—	—	881	—	1460 (J+)	240	3060	—	—	—	—	—	—
50-603383	MD50-12-979	139–139	—	—	—	1150	—	1840 (J+)	278	4890	—	—	—	—	—	—
50-603383	MD50-12-980	206–206	—	90.3	—	1830	—	1380 (J+)	305	8590	—	—	—	—	—	—
50-603383	MD50-12-981	244–244	—	93.7	—	1970	—	1150 (J+)	273	9130	—	—	—	—	—	—
50-603383	MD50-12-977	286–286	—	—	—	1080	—	551	131	5050	—	—	—	—	—	—
50-603383	MD50-12-976	359–359	—	—	—	10.2	—	4.75	—	53.7	—	—	—	—	—	—
50-603383	MD50-12-975	408–408	—	—	—	217	—	52.8	—	1240	—	—	—	—	—	—
50-603383	MD50-12-974	450–450	—	—	—	278	—	—	—	1560	—	—	—	—	—	—
50-603468	MD49-12-967	92–92	—	—	—	197	—	—	—	11800	—	—	—	—	—	—
50-603468	MD49-12-965	142–142	—	93.7	—	210	—	—	—	37100	—	—	—	—	—	—
50-603468	MD49-12-966	198–198	—	625	—	420	—	—	—	34900	—	—	—	—	—	—
50-603468	MD49-12-971	233–233	—	625	—	434	—	—	—	37100	—	—	—	—	—	—
50-603468	MD49-12-969	282–282	—	625	—	454	—	—	—	53700	—	—	—	—	—	—
50-603468	MD49-12-970	354–354	—	555	—	—	—	—	—	43000	—	—	—	—	—	—
50-603468	MD49-12-972	403–403	—	382	—	—	—	—	—	38700	—	—	—	—	—	—
50-603468	MD49-12-973	450–450	—	—	—	—	—	—	—	23100	—	—	—	—	—	—
50-603470	MD50-12-983	30–30	—	—	—	949	—	337	—	16600	—	—	—	—	—	—
50-603470	MD50-12-984	83–83	—	—	—	1080	—	505	—	25800	—	—	—	—	—	—
50-603470	MD50-12-985	143–143	—	—	—	746	—	682	—	40300	—	—	—	—	—	—
50-603470	MD50-12-986	203–203	—	729	—	—	—	—	—	59100	—	—	—	—	—	—
50-603470	MD50-12-987	233–233	—	1010	—	—	—	1230	—	80600	—	—	—	—	—	—
50-603470	MD50-12-988	278–278	—	972	—	—	—	996	—	80600	—	—	—	—	—	—
50-603470	MD50-12-989	351–351	—	451	—	—	—	620	—	59100	—	—	—	—	—	—
50-603470	MD50-12-990	450–450	—	—	—	—	—	—	—	27400	—	—	—	—	—	—
50-603470	MD50-12-991	600–600	—	—	—	—	—	—	—	1660	—	—	20.1	42.1	—	42.1
50-603470	MD50-12-992	650–650	2.13	—	—	—	2.18	—	—	188	7.3	27	4.13	31.7	5.21	37.3
50-603471	MD50-12-1000	90–90	—	451	—	1290	—	—	—	33300	—	—	—	—	—	—
50-603471	MD50-12-999	146–146	—	1770	—	1420	—	—	—	69800	—	—	—	—	—	—

Table C-5.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-603471	MD50-12-998	209–209	—	1250	—	1150	—	—	—	69800	—	—	—	—	—	—
50-603471	MD50-12-997	242–242	—	3230	—	1760	—	—	—	102000	—	—	—	—	—	—
50-603471	MD50-12-996	288–288	—	1420	—	—	—	—	—	75200	—	—	—	—	—	—
50-603471	MD50-12-994	410–410	—	729	—	949	—	—	—	59100	—	—	—	—	—	—
50-603471	MD50-12-993	450–450	—	555	—	813	—	—	—	49900	—	—	—	—	—	—
50-603472	MD50-12-1010	27–27	—	—	—	352	—	—	36.5	2310	—	—	—	—	—	—
50-603472	MD50-12-1007	93–93	—	451	—	881	—	—	—	9670	—	—	—	—	—	—
50-603472	MD50-12-1008	146–146	—	660	—	407	—	—	—	7520	—	—	—	—	—	—
50-603472	MD50-12-1006	210–210	—	—	—	535	—	—	—	6440	—	—	—	—	—	—
50-603472	MD50-12-1009	247–247	—	1180	—	1690	—	—	—	40800	—	—	—	—	—	—
50-603472	MD50-12-1005	292–292	—	590	—	949	—	—	—	20900	—	—	—	—	—	—
50-603472	MD50-12-1004	364–364	—	219	—	746	—	—	—	17200	—	—	—	—	—	—
50-603472	MD50-12-1003	414–414	—	240	—	1080	—	—	—	26900	—	—	—	—	—	—
50-603472	MD50-12-1002	450–450	—	—	—	678	—	—	—	16600	—	—	—	—	—	—
50-613182	MD50-12-1015	500–500	—	—	—	346	—	—	—	8590	—	—	—	—	—	—
50-613182	MD50-12-1014	550–550	—	—	—	203	—	—	—	4140	—	—	—	—	—	—
50-613182	MD50-12-1013	600–600	—	—	—	4.2	—	—	—	48.3	—	—	—	—	—	—
50-613182	MD50-12-1012	620–620	—	—	—	74.6	—	—	—	1500	14	—	—	—	—	—
50-613182	MD50-12-1011	632–632	—	—	—	—	—	—	—	4.83	—	—	—	—	—	3.51
50-613183	MD50-12-1020	30–30	—	—	—	1020	—	—	—	13400	—	—	—	—	—	—
50-613183	MD50-12-1021	500–500	—	—	—	312	—	—	—	20400	—	—	—	—	—	—
50-613183	MD50-12-1022	550–550	—	—	—	74.6	—	—	—	4510	—	—	—	—	—	—
50-613183	MD50-12-1017	600–600	—	—	—	156	—	—	—	10200	—	—	—	—	—	—
50-613183	MD50-12-1018	630–630	—	—	—	55.6	—	—	—	3220	—	—	—	—	—	—
50-613183	MD50-12-1019	642.5–642.5	—	—	—	—	—	—	—	96.7	—	—	—	—	—	—
50-613184	MD50-12-1023	30–30	—	—	—	129	—	—	—	6440	—	—	—	—	—	—
50-613184	MD50-12-1024	500–500	—	—	—	—	—	—	—	4830	—	—	—	—	—	—
50-613184	MD50-12-1025	550–550	—	—	—	26.4	—	—	—	2200	—	—	—	—	—	—
50-613184	MD50-12-1026	600–600	—	—	—	12.2	—	—	—	859	—	—	—	—	—	—
50-613184	MD50-12-1027	652–652	—	—	2.13	5.35	2	—	—	322	4.04	—	—	—	—	—
50-613184	MD50-12-1028	664.5–664.5	—	—	—	—	1.66	—	—	113	—	—	—	—	—	—
50-613185	MD50-12-1038	85–85	—	—	—	74.6	—	—	—	4080	—	—	—	—	—	—
50-613185	MD50-12-1035	145–145	—	—	—	—	—	—	—	5370	—	—	—	—	—	—

Table C-5.0-5 (continued)

Location ID	Sample ID	Depth (ft)	Hexanone[2-]	Methylene Chloride	Styrene	Tetrachloroethene	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene[1,2,4-]	Trimethylbenzene[1,3,5-]	Xylene (Total)	Xylene[1,2-]	Xylene[1,3-]+Xylene[1,4-]
50-613185	MD50-12-1036	205–205	—	—	—	—	—	—	—	9670	—	—	—	—	—	—
50-613185	MD50-12-1037	235–235	—	—	—	—	—	—	—	10200	—	—	—	—	—	—
50-613185	MD50-12-1034	280–280	—	—	—	237	—	—	—	15000	—	—	—	—	—	—
50-613185	MD50-12-1033	350–350	—	—	—	—	—	—	—	4510	—	—	—	—	—	—
50-613185	MD50-12-1032	450–450	—	—	—	—	—	—	—	52.1	—	—	—	—	—	—
50-613185	MD50-12-1031	600–600	—	—	—	2.85	—	—	—	140	2.25	—	—	—	—	—
50-613185	MD50-12-1030	675–675	—	—	—	—	—	—	9.27	41.9	—	—	—	—	—	—
50-613185	MD50-12-1029	688–688	—	—	—	—	—	—	—	38.1	—	—	—	—	—	—

Notes: Results are in µg/m^3. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-5.0-6
VOCs Detected in Vapor Samples at MDA C during March 2012–April 2012 Sampling Event

Location ID	Field Sample ID	Depth (ft)	Benzene	Butadiene[1,3-]	Butanol[1-]	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Cyclohexane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol
50-24784	MD50-12-12060	155–155	—*	—	—	189	—	288	—	143	—	—	—	—	64.7	—
50-24784	MD50-12-12061	244–244	—	—	—	289	—	112	—	193	—	—	—	—	—	—
50-24784	MD50-12-12062	362–362	—	—	—	371	—	—	—	267	—	—	—	—	—	—
50-24784	MD50-12-12063	450–450	—	—	—	277	—	—	—	227	—	—	—	—	—	—
50-24813	MD50-12-12067	25–25	—	—	—	1320	—	1120	—	484	—	—	—	63.4	—	—
50-24813	MD50-12-12066	150–150	—	—	—	1760	—	2730	—	988	—	97.1	—	555	—	—
50-24813	MD50-12-12065	241–241	—	—	—	1890	—	2290	—	2220	—	—	—	713	—	—
50-24813	MD50-12-12064	358–358	—	—	—	817	—	586	—	1480	—	—	—	214	—	—
50-24813	MD50-12-12068	450–450	—	—	—	428	—	122	—	890	—	—	—	47.5	—	—
50-24813	MD50-12-12069	600–600	—	—	—	107	—	—	—	321	—	—	—	—	—	—
50-24822	MD50-12-12074	25–25	—	—	—	81.7	—	288	—	257	—	—	—	—	—	—
50-24822	MD50-12-12073	142–142	—	—	—	226	—	586	—	692	—	—	—	115	—	—
50-24822	MD50-12-12072	235–235	—	—	—	327	—	586	—	1190	—	—	—	155	—	—
50-24822	MD50-12-12071	351–351	—	—	—	207	—	137	—	692	—	—	—	47.5	—	—
50-24822	MD50-12-12070	450–450	—	—	—	151	—	—	—	494	—	—	—	—	—	—
50-603061	MD50-12-12079	25–25	—	—	—	—	—	—	—	840	—	—	325	—	—	—
50-603061	MD50-12-12078	128–128	—	—	—	—	—	—	—	425	—	—	1620	—	—	—
50-603061	MD50-12-12077	228–228	—	—	—	—	—	—	—	64.2	—	—	210	—	—	—
50-603061	MD50-12-12076	347–347	—	—	—	88	—	—	—	257	—	—	246	—	—	—
50-603061	MD50-12-12075	450–450	—	—	—	—	—	—	—	138	—	—	—	—	—	—
50-603062	MD50-12-12087	122–122	—	—	—	—	—	73.2	—	237	—	—	—	—	—	—
50-603062	MD50-12-12086	217–217	—	—	—	56	—	48.8	—	306	—	—	—	—	—	—
50-603062	MD50-12-12085	337–337	—	—	—	—	—	—	—	188	—	—	—	—	—	—
50-603062	MD50-12-12084	450–450	—	—	—	—	—	—	—	114	—	—	—	—	—	—
50-603063	MD50-12-12088	25–25	—	—	245	—	—	—	—	257	—	—	—	—	—	—
50-603063	MD50-12-12089	128–128	—	—	—	176	262	332	—	593	84.9	—	321	47.5	—	—
50-603063	MD50-12-12090	228–228	—	—	—	409	353	586	—	840	48.5	—	372	151	45.3	—
50-603063	MD50-12-12091	347–347	—	—	—	226	—	220	—	425	—	—	55.5	43.6	—	—
50-603063	MD50-12-12092	450–450	—	—	—	195	—	156	—	306	—	—	—	—	—	—
50-603064	MD50-12-12096	113–113	—	—	—	151	—	781	—	544	—	—	555	214	46.2	—
50-603064	MD50-12-12095	214–214	—	—	—	289	—	586	—	988	—	—	674	226	—	—

Table C-5.0-6 (continued)

Location ID	Field Sample ID	Depth (ft)	Benzene	Butadiene[1,3-]	Butanol[1-]	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Cyclohexane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol
50-603064	MD50-12-12094	332–332	—	—	—	176	—	58.6	—	642	—	—	147	—	—	—
50-603064	MD50-12-12093	500–500	—	—	—	—	—	—	—	267	—	—	—	—	—	—
50-603383	MD50-12-12101	26–26	—	—	—	—	—	—	—	109	—	—	—	—	—	—
50-603383	MD50-12-12097	139–139	—	—	—	176	—	171	—	336	—	—	79.2	43.6	342	—
50-603383	MD50-12-12098	244–244	—	—	—	264	—	122	—	292	—	—	47.5	51.5	351	—
50-603383	MD50-12-12099	359–359	—	—	—	113	—	—	—	148	—	—	—	—	—	—
50-603383	MD50-12-12100	450–450	—	—	—	214	—	—	—	232	—	—	—	—	—	—
50-603467	MD50-12-12106	143–143	—	—	—	440	—	683	—	292	—	—	—	131	—	—
50-603467	MD50-12-12102	244–244	—	—	—	459	—	356	—	400	—	—	—	103	—	—
50-603467	MD50-12-12103	360–360	—	—	—	692	—	781	—	489	—	—	—	206	—	—
50-603467	MD50-12-12104	500–500	—	—	—	132	—	78.1	—	198	—	—	—	—	—	—
50-603467	MD50-12-12105	600–600	—	—	—	138	—	—	—	188	—	—	—	—	—	—
50-603468	MD50-12-12108	142–142	—	—	—	176	—	263	—	178	—	—	—	71.3	—	—
50-603468	MD50-12-12109	233–233	—	—	—	478	—	586	—	544	—	—	—	198	—	—
50-603468	MD50-12-12110	354–354	—	—	—	591	—	390	—	791	—	—	—	147	—	—
50-603468	MD50-12-12107	403–403	—	—	—	516	—	239	—	741	—	—	—	95.1	—	—
50-603470	MD50-12-12114	83–83	—	—	—	321	—	1170	—	425	—	—	—	186	45.3	—
50-603470	MD50-12-12120	203–203	—	—	—	371	—	1070	—	1090	—	—	—	293	—	—
50-603470	MD50-12-12119	278–278	—	—	—	629	—	1070	—	1780	—	—	—	353	—	—
50-603470	MD50-12-12118	351–351	—	—	—	409	—	337	—	1280	—	—	—	131	—	—
50-603470	MD50-12-12115	450–450	—	—	—	239	—	73.2	—	741	—	—	—	—	—	—
50-603470	MD50-12-12116	600–600	—	—	—	—	—	—	—	356	—	—	—	—	—	—
50-603470	MD50-12-12117	650–650	—	—	—	—	—	—	—	133	—	—	—	—	—	—
50-603471	MD50-12-12124	90–90	—	—	—	1570	—	1900	—	470	—	150	—	246	102	—
50-603471	MD50-12-12125	209–209	—	—	—	1070	—	2100	—	1240	—	138	—	555	111	—
50-603471	MD50-12-12122	288–288	—	—	—	1320	—	1850	—	1480	—	—	—	555	—	—
50-603471	MD50-12-12123	360–360	—	—	—	817	—	781	—	1240	—	—	—	262	—	—
50-603471	MD50-12-12121	450–450	—	—	—	604	—	537	—	692	—	—	—	158	—	—
50-603472	MD50-12-12128	27–27	—	—	—	—	—	312	—	69.2	—	—	—	—	—	—
50-603472	MD50-12-12129	146–146	—	—	—	289	—	683	—	272	—	56.6	—	135	120	—
50-603472	MD50-12-12132	292–292	—	—	—	453	194	537	—	460	—	—	—	147	50.8	—
50-603472	MD50-12-12131	364–364	—	—	—	340	152	132	—	455	—	—	—	39.6	—	—
50-603472	MD50-12-12130	450–450	—	—	—	352	141	68.3	—	465	—	—	—	—	—	—

Table C-5.0-6 (continued)

Location ID	Field Sample ID	Depth (ft)	Benzene	Butadiene[1,3-]	Butanol[1-]	Carbon Tetrachloride	Chlorodifluoromethane	Chloroform	Cyclohexane	Dichlorodifluoromethane	Dichloroethane[1,1-]	Dichloroethane[1,2-]	Dichloroethene[1,1-]	Dichloroethene[cis-1,2-]	Dichloropropane[1,2-]	Ethanol
50-603503	MD50-12-12136	133–133	182	46.4	—	—	—	—	61.9	—	—	—	—	—	—	527
50-603503	MD50-12-12135	237–237	—	—	—	107	—	146	—	114	—	—	—	—	46.2	—
50-603503	MD50-12-12137	347–347	—	—	—	62.9	—	53.7	—	79.1	—	—	—	—	—	—
50-603503	MD50-12-12138	450–450	—	—	—	88	—	—	—	98.8	—	—	—	—	—	—
50-613182	MD50-12-12133	550–550	—	—	—	176	—	—	—	321	—	—	—	—	—	—
50-613182	MD50-12-12134	632–632	—	—	—	—	—	—	—	6.92	—	—	—	—	—	9.42 (J)
50-613183	MD50-12-12127	550–550	—	—	—	176	—	—	—	479	—	—	—	—	—	—
50-613183	MD50-12-12126	642.5–642.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-613184	MD50-12-12113	500–500	—	—	—	138	—	—	—	292	—	—	—	—	—	—
50-613184	MD50-12-12112	600–600	—	—	—	—	—	—	—	143	—	—	—	—	—	—
50-613184	MD50-12-12111	664.5–664.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50-613185	MD50-12-12143	145–145	—	—	—	113	—	112	—	158	—	—	—	—	—	—
50-613185	MD50-12-12139	235–235	—	—	—	163	—	107	—	222	—	—	—	39.2	—	—
50-613185	MD50-12-12140	350–350	—	—	—	113	—	—	—	203	—	—	—	—	—	—
50-613185	MD50-12-12141	450–450	—	—	—	69.2	—	—	—	138	—	—	—	—	—	—
50-613185	MD50-12-12142	600–600	—	—	—	—	—	—	—	79.1	—	—	—	—	—	—

Table C-5.0-6 (continued)

Location ID	Field Sample ID	Depth (ft)	Ethylbenzene	Hexane	Hexanone[2-]	Methylene Chloride	n-Heptane	Propylene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Xylene[1,3-]+Xylene[1,4-]
50-24784	MD50-12-12060	155–155	—	—	—	48.6	—	—	2300	—	—	168	54.5	3600	—	—
50-24784	MD50-12-12061	244–244	—	—	—	66	—	—	2100	—	—	115	—	4080	—	—
50-24784	MD50-12-12062	362–362	—	—	—	41.7	—	—	1360	—	—	—	—	2630	—	—
50-24784	MD50-12-12063	450–450	—	—	—	32.6	—	—	488	—	—	—	—	1020	—	—
50-24813	MD50-12-12067	25–25	—	—	—	—	—	—	481	—	—	—	—	14000	—	—
50-24813	MD50-12-12066	150–150	—	—	—	590	—	—	678	—	—	—	—	42400	—	—
50-24813	MD50-12-12065	241–241	—	—	—	1670	—	—	1080	—	—	—	—	85900	—	—
50-24813	MD50-12-12064	358–358	—	—	—	181	—	—	603	—	—	—	—	53700	—	—
50-24813	MD50-12-12068	450–450	—	—	—	160	—	—	258	—	—	—	—	24700	—	—
50-24813	MD50-12-12069	600–600	—	—	—	—	—	—	—	—	—	—	—	2630	—	—
50-24822	MD50-12-12074	25–25	—	—	—	—	—	—	163	—	—	72	—	8060	—	—
50-24822	MD50-12-12073	142–142	—	—	—	156	—	—	190	—	—	146	—	25200	—	—
50-24822	MD50-12-12072	235–235	—	—	—	337	—	—	230	—	—	199	—	40800	—	—
50-24822	MD50-12-12071	351–351	—	—	—	111	—	—	108	—	—	—	—	22000	—	—
50-24822	MD50-12-12070	450–450	—	—	—	—	—	—	—	—	—	—	—	10700	—	—
50-603061	MD50-12-12079	25–25	—	—	—	—	—	—	108	—	—	15300	1800	526	—	—
50-603061	MD50-12-12078	128–128	—	—	—	—	—	—	312	—	—	29100	5450	2790	—	—
50-603061	MD50-12-12077	228–228	—	—	—	—	—	—	—	—	—	3680	545	591	—	—
50-603061	MD50-12-12076	347–347	—	—	—	—	—	—	81.3	—	—	6740	409	1340	—	—
50-603061	MD50-12-12075	450–450	—	—	—	—	—	—	—	—	—	1460	—	483	—	—
50-603062	MD50-12-12087	122–122	—	—	—	—	—	—	—	—	—	429	54.5	6440	—	—
50-603062	MD50-12-12086	217–217	—	—	—	—	—	—	—	—	—	521	48	8060	—	—
50-603062	MD50-12-12085	337–337	—	—	—	—	—	—	—	—	—	123	—	2040	—	—
50-603062	MD50-12-12084	450–450	—	—	—	—	—	—	—	—	—	—	—	591	—	—
50-603063	MD50-12-12088	25–25	—	—	—	—	—	—	359	—	—	2680	354	1610	—	—
50-603063	MD50-12-12089	128–128	—	—	—	—	—	—	1080	—	—	5280	872	10700	—	—
50-603063	MD50-12-12090	228–228	—	—	—	93.7	—	—	1690	—	—	5510	763	25200	78.6	—
50-603063	MD50-12-12091	347–347	—	—	—	90.3	—	—	617	—	—	1300	52.3	12900	—	—
50-603063	MD50-12-12092	450–450	—	—	—	—	—	—	373	—	—	115	—	8590	—	—
50-603064	MD50-12-12096	113–113	—	—	—	104	—	—	596	—	—	9960	2290	24700	—	—
50-603064	MD50-12-12095	214–214	—	—	—	417	—	—	576	—	—	12300	2240	34900	56.1	—
50-603064	MD50-12-12094	332–332	—	—	—	62.5	—	—	197	—	—	3370	174	12900	—	—
50-603064	MD50-12-12093	500–500	—	—	—	—	—	—	—	—	—	146	—	1400	—	—

Table C-5.0-6 (continued)

Location ID	Field Sample ID	Depth (ft)	Ethylbenzene	Hexane	Hexanone[2-]	Methylene Chloride	n-Heptane	Propylene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Xylene[1,3-]+Xylene[1,4-]
50-603383	MD50-12-12101	26–26	—	—	—	—	—	—	278	—	—	268	48.5	698	—	—
50-603383	MD50-12-12097	139–139	—	—	—	48.6	—	—	1220	—	—	1300	224	4990	—	—
50-603383	MD50-12-12098	244–244	—	—	—	69.4	—	—	1220	—	—	551	153	5370	—	—
50-603383	MD50-12-12099	359–359	—	—	—	—	—	—	210	—	—	115	—	1400	—	—
50-603383	MD50-12-12100	450–450	—	—	—	—	—	—	271	38.3	—	—	—	1340	—	—
50-603467	MD50-12-12106	143–143	—	—	—	181	—	—	434	—	—	—	—	15000	—	—
50-603467	MD50-12-12102	244–244	—	—	—	132	—	—	678	—	—	—	—	25200	—	—
50-603467	MD50-12-12103	360–360	—	—	—	625	—	—	881	—	—	—	—	30600	—	—
50-603467	MD50-12-12104	500–500	—	—	—	—	—	—	176	—	—	—	—	6980	—	—
50-603467	MD50-12-12105	600–600	—	—	737	—	—	—	108	56	—	—	—	3380	—	—
50-603468	MD50-12-12108	142–142	—	—	—	97.2	—	—	197	—	—	—	—	10200	—	—
50-603468	MD50-12-12109	233–233	—	—	—	521	—	—	420	—	—	—	—	29000	—	—
50-603468	MD50-12-12110	354–354	—	—	—	382	—	—	420	—	—	—	—	32800	—	—
50-603468	MD50-12-12107	403–403	—	—	—	267	—	—	339	—	—	—	—	27900	—	—
50-603470	MD50-12-12114	83–83	—	—	—	59	—	—	813	—	—	329	70.9	15600	—	—
50-603470	MD50-12-12120	203–203	—	—	—	555	—	—	515	—	—	689	104	40800	—	—
50-603470	MD50-12-12119	278–278	—	—	—	937	—	—	617	—	—	919	104	64400	—	—
50-603470	MD50-12-12118	351–351	—	—	—	382	—	—	332	—	—	521	—	40300	51.7	—
50-603470	MD50-12-12115	450–450	—	—	—	83.3	—	—	136	—	—	161	—	17200	—	—
50-603470	MD50-12-12116	600–600	—	—	—	—	—	—	—	—	—	—	—	1720	—	—
50-603470	MD50-12-12117	650–650	—	—	—	—	—	—	—	—	—	—	—	80.6	—	—
50-603471	MD50-12-12124	90–90	—	—	—	295	—	—	1020	—	—	299	60	19900	—	—
50-603471	MD50-12-12125	209–209	—	—	—	2080	—	—	1290	—	—	505	—	53700	—	—
50-603471	MD50-12-12122	288–288	—	—	—	2430	—	—	1490	—	—	513	—	69800	—	—
50-603471	MD50-12-12123	360–360	—	—	—	1110	—	—	1080	—	—	322	—	53200	73	—
50-603471	MD50-12-12121	450–450	—	—	—	382	—	—	813	—	—	146	—	39700	—	—
50-603472	MD50-12-12128	27–27	—	—	—	—	—	—	596	—	—	—	52.9	3330	—	—
50-603472	MD50-12-12129	146–146	—	—	—	521	—	—	1080	—	—	123	—	17200	—	—
50-603472	MD50-12-12132	292–292	—	—	—	868	—	—	1560	—	—	99.6	—	28500	—	—
50-603472	MD50-12-12131	364–364	—	—	—	222	—	—	813	—	—	—	—	15600	—	—
50-603472	MD50-12-12130	450–450	—	—	—	86.8	—	—	671	—	—	—	—	12900	—	—
50-603503	MD50-12-12136	133–133	43.4	137	—	—	—	224	74.6	—	313	—	—	435	—	117
50-603503	MD50-12-12135	237–237	—	—	—	125	—	—	603	—	—	74.3	—	5370	—	—

Table C-5.0-6 (continued)

Location ID	Field Sample ID	Depth (ft)	Ethylbenzene	Hexane	Hexanone[2-]	Methylene Chloride	n-Heptane	Propylene	Tetrachloroethene	Tetrahydrofuran	Toluene	Trichloro-1,2,2-trifluoroethane[1,1,2-]	Trichloroethane[1,1,1-]	Trichloroethene	Trichlorofluoromethane	Xylene[1,3-]+Xylene[1,4-]
50-603503	MD50-12-12137	347–347	—	—	—	38.2	—	—	291	—	—	—	—	2630	—	—
50-603503	MD50-12-12138	450–450	—	—	—	—	—	—	264	—	—	—	—	3110	—	—
50-613182	MD50-12-12133	550–550	—	—	—	—	—	—	190	—	—	—	—	3490	—	—
50-613182	MD50-12-12134	632–632	—	—	—	—	—	18.9	—	—	—	—	—	6.98	—	—
50-613183	MD50-12-12127	550–550	—	—	—	—	—	—	88.1	—	—	—	—	3810	—	—
50-613183	MD50-12-12126	642.5–642.5	—	59.9	—	—	49.1	—	—	—	—	—	—	96.7	—	—
50-613184	MD50-12-12113	500–500	—	—	—	—	—	—	65.1	—	—	—	—	4300	—	—
50-613184	MD50-12-12112	600–600	—	—	—	—	—	—	—	—	—	—	—	698	—	—
50-613184	MD50-12-12111	664.5–664.5	—	—	—	—	—	—	—	—	—	—	—	102	—	—
50-613185	MD50-12-12143	145–145	—	—	—	41.7	—	—	81.3	—	—	—	—	5320	—	—
50-613185	MD50-12-12139	235–235	—	—	—	83.3	—	—	115	—	—	—	—	8590	—	—
50-613185	MD50-12-12140	350–350	—	—	—	—	—	—	66.4	—	—	—	—	4240	—	—
50-613185	MD50-12-12141	450–450	—	—	—	—	—	—	—	—	—	—	—	1720	—	—
50-613185	MD50-12-12142	600–600	—	—	—	—	—	—	—	—	—	—	—	145	—	—

Notes: Results are in µg/m3. Data qualifiers are defined in Appendix A.
*— = Not detected.

Table C-5.0-7
Tritium Detected in Vapor Samples at MDA C during
August 2011 Sampling Event

Location ID	Sample ID	Depth (ft)	Tritium
50-603383	MD50-11-23287	26–26	164864
50-603383	MD50-11-23288	85–85	772983
50-603383	MD50-11-23289	139–139	1065080
50-603383	MD50-11-23290	206–206	266573
50-603383	MD50-11-23291	244–244	309595
50-603383	MD50-11-23292	286–286	233642
50-603383	MD50-11-23295	359–359	248544
50-603383	MD50-11-23294	408–408	246503
50-603383	MD50-11-23293	450–450	177226
50-603470	MD50-11-23311	351–351	2451.28
50-603470	MD50-11-23312	450–450	1265.27
50-603470	MD50-11-23313	600–600	780.389
50-603470	MD50-11-23314	650–650	998.503
50-603471	MD50-11-23308	360–360	3970.95
50-603471	MD50-11-23310	410–410	2614.47
50-603471	MD50-11-23309	450–450	4649.73
50-603472	MD50-11-23307	364–364	4407.17
50-603472	MD50-11-23306	414–414	4110.57
50-603472	MD50-11-23305	450–450	5493.12
50-613182	MD50-11-23273	500–500	4322.8
50-613182	MD50-11-23276	550–550	2119.78
50-613182	MD50-11-23275	600–600	626077
50-613182	MD50-11-23274	620–620	5021.35
50-613182	MD50-11-23277	632.5–632.5	5679.9
50-613183	MD50-11-23282	500–500	1450.64
50-613183	MD50-11-23283	550–550	1942.16
50-613183	MD50-11-23284	600–600	1002.81
50-613183	MD50-11-23285	630–630	2596.7
50-613183	MD50-11-23286	642.5–642.5	1083.85
50-613185	MD50-11-23268	350–350	445.491
50-613185	MD50-11-23269	450–450	5230.83
50-613185	MD50-11-23270	675–675	5181.33

Note: Results are in pCi/L.

Table C-5.0-8
Tritium Detected in Vapor Samples at MDA C during
October 2011–November 2011 Sampling Event

Location ID	Sample ID	Depth (ft)	Tritium
50-24784	MD50-12-936	25–25	4041
50-24784	MD50-12-935	96–96	2332
50-24784	MD50-12-934	155–155	2636
50-24784	MD50-12-933	215–215	3289
50-24784	MD50-12-932	244–244	3454
50-24784	MD50-12-931	289–289	2537
50-24784	MD50-12-930	362–362	2149
50-24784	MD50-12-929	411–411	1217
50-24784	MD50-12-928	450–450	1075
50-24813	MD50-12-946	25–25	771.6
50-24813	MD50-12-945	99–99	54960
50-24813	MD50-12-944	150–150	190400
50-24813	MD50-12-943	207–207	3654
50-24813	MD50-12-942	241–241	3142
50-24813	MD50-12-941	286–286	1898
50-24813	MD50-12-940	358–358	687.6
50-24813	MD50-12-939	408–408	1017
50-24822	MD50-12-947	25–25	782.4
50-24822	MD50-12-948	81–81	720.6
50-24822	MD50-12-949	142–142	1016
50-24822	MD50-12-951	204–204	178600
50-24822	MD50-12-952	235–235	1381
50-24822	MD50-12-950	280–280	543.3
50-24822	MD50-12-953	351–351	1149
50-24822	MD50-12-954	402–402	696.4
50-24822	MD50-12-955	450–450	1158
50-603064	MD50-12-956	25–25	1152
50-603064	MD50-12-957	66–66	1440
50-603064	MD50-12-958	113–113	1642
50-603064	MD50-12-959	176–176	1528
50-603064	MD50-12-960	214–214	1636
50-603064	MD50-12-961	259–259	1533
50-603064	MD50-12-962	332–332	1139
50-603064	MD50-12-963	482–482	770.5
50-603064	MD50-12-964	500–500	1230
50-603383	MD50-12-982	26–26	243700

Table C-5.0-8 (continued)

Location ID	Sample ID	Depth (ft)	Tritium
50-603383	MD50-12-978	85–85	691700
50-603383	MD50-12-979	139–139	1390000
50-603383	MD50-12-980	206–206	136200
50-603383	MD50-12-981	244–244	103900
50-603383	MD50-12-977	286–286	74490
50-603383	MD50-12-976	359–359	63130
50-603383	MD50-12-975	408–408	116800
50-603383	MD50-12-974	450–450	89390
50-603468	MD49-12-967	92–92	716
50-603468	MD49-12-965	142–142	2004
50-603468	MD49-12-966	198–198	1006
50-603468	MD49-12-971	233–233	944.8
50-603468	MD49-12-969	282–282	1085
50-603468	MD49-12-970	354–354	1228
50-603468	MD49-12-972	403–403	2242
50-603468	MD49-12-973	450–450	1505
50-603470	MD50-12-983	30–30	60050
50-603470	MD50-12-984	83–83	2710000
50-603470	MD50-12-985	143–143	9507
50-603470	MD50-12-986	203–203	2003
50-603470	MD50-12-987	233–233	2724
50-603470	MD50-12-988	278–278	1730
50-603470	MD50-12-989	351–351	1177
50-603470	MD50-12-990	450–450	1352
50-603470	MD50-12-991	600–600	1264
50-603470	MD50-12-992	650–650	702.5
50-603471	MD50-12-1000	90–90	268400
50-603471	MD50-12-999	146–146	4859
50-603471	MD50-12-998	209–209	55540
50-603471	MD50-12-997	242–242	6121
50-603471	MD50-12-996	288–288	4923
50-603471	MD50-12-995	360–360	1127000
50-603471	MD50-12-994	410–410	13770
50-603471	MD50-12-993	450–450	2295
50-603472	MD50-12-1010	27–27	454100
50-603472	MD50-12-1007	93–93	9513
50-603472	MD50-12-1008	146–146	12710
50-603472	MD50-12-1006	210–210	33460000
50-603472	MD50-12-1009	247–247	38820

Table C-5.0-8 (continued)

Location ID	Sample ID	Depth (ft)	Tritium
50-603472	MD50-12-1005	292–292	20080
50-603472	MD50-12-1004	364–364	66580
50-603472	MD50-12-1003	414–414	1885
50-603472	MD50-12-1002	450–450	2170
50-613182	MD50-12-1015	500–500	1966
50-613182	MD50-12-1014	550–550	969.9
50-613182	MD50-12-1013	600–600	2111
50-613182	MD50-12-1011	632–632	561
50-613183	MD50-12-1020	30–30	2499000
50-613183	MD50-12-1021	500–500	994.7
50-613183	MD50-12-1022	550–550	29570
50-613183	MD50-12-1017	600–600	2221
50-613183	MD50-12-1018	630–630	2677
50-613184	MD50-12-1028	664.5–664.5	971.5
50-613185	MD50-12-1038	85–85	663
50-613185	MD50-12-1034	280–280	613.2
50-613185	MD50-12-1031	600–600	690.3
50-613185	MD50-12-1030	675–675	837.6
50-613185	MD50-12-1029	688–688	1773

Note: Results are in pCi/L.

Table C-5.0-9
Tritium Detected in Vapor Samples at MDA C during
March 2012–April 2012 Sampling Event

Location ID	Sample ID	Depth (ft)	Tritium
50-24784	MD50-12-12060	155–155	29900
50-24784	MD50-12-12061	244–244	3541
50-24784	MD50-12-12062	362–362	3822
50-24784	MD50-12-12063	450–450	1909
50-24813	MD50-12-12067	25–25	1094
50-24813	MD50-12-12066	150–150	195100
50-24813	MD50-12-12065	241–241	1917
50-24813	MD50-12-12064	358–358	1365
50-24813	MD50-12-12068	450–450	2339
50-24813	MD50-12-12069	600–600	693.2
50-24822	MD50-12-12074	25–25	641.8
50-24822	MD50-12-12073	142–142	362.1
50-24822	MD50-12-12072	235–235	6001000
50-24822	MD50-12-12070	450–450	1623
50-603061	MD50-12-12079	25–25	483.4
50-603061	MD50-12-12078	128–128	1976
50-603061	MD50-12-12077	228–228	1723
50-603061	MD50-12-12076	347–347	3821
50-603061	MD50-12-12075	450–450	1477
50-603062	MD50-12-12087	122–122	571.9
50-603062	MD50-12-12086	217–217	539.7
50-603062	MD50-12-12085	337–337	1185
50-603062	MD50-12-12084	450–450	751.5
50-603063	MD50-12-12088	25–25	1656
50-603063	MD50-12-12089	128–128	1972
50-603063	MD50-12-12090	228–228	3224
50-603063	MD50-12-12091	347–347	1489
50-603063	MD50-12-12092	450–450	1359
50-603064	MD50-12-12096	113–113	2715
50-603064	MD50-12-12095	214–214	21073
50-603064	MD50-12-12094	332–332	1148
50-603064	MD50-12-12093	500–500	47055
50-603383	MD50-12-12101	26–26	1624201
50-603383	MD50-12-12097	139–139	113404
50-603383	MD50-12-12098	244–244	204505
50-603383	MD50-12-12099	359–359	157375

Table C-5.0-9 (continued)

Location ID	Sample ID	Depth (ft)	Tritium
50-603383	MD50-12-12100	450–450	2227
50-603467	MD50-12-12106	143–143	1265
50-603467	MD50-12-12102	244–244	790.3
50-603467	MD50-12-12103	360–360	4294
50-603467	MD50-12-12104	500–500	1253
50-603467	MD50-12-12105	600–600	1606
50-603468	MD50-12-12108	142–142	840.8
50-603468	MD50-12-12109	233–233	585
50-603468	MD50-12-12110	354–354	491.8
50-603468	MD50-12-12107	403–403	1391
50-603470	MD50-12-12114	83–83	3166000
50-603470	MD50-12-12120	203–203	3552
50-603470	MD50-12-12119	278–278	4325
50-603470	MD50-12-12118	351–351	5140
50-603470	MD50-12-12115	450–450	4083
50-603470	MD50-12-12116	600–600	2533
50-603471	MD50-12-12124	90–90	49720
50-603471	MD50-12-12125	209–209	3731
50-603471	MD50-12-12122	288–288	2920
50-603471	MD50-12-12123	360–360	27070
50-603471	MD50-12-12121	450–450	2574
50-603472	MD50-12-12128	27–27	480200
50-603472	MD50-12-12129	146–146	3114
50-603472	MD50-12-12132	292–292	5246
50-603472	MD50-12-12131	364–364	1688
50-603472	MD50-12-12130	450–450	2116
50-603503	MD50-12-12136	133–133	199500
50-603503	MD50-12-12135	237–237	2194
50-603503	MD50-12-12137	347–347	1525
50-603503	MD50-12-12138	450–450	396.3
50-613182	MD50-12-12133	550–550	627.4
50-613182	MD50-12-12134	632–632	797.3
50-613183	MD50-12-12127	550–550	3223
50-613184	MD50-12-12112	600–600	2610
50-613185	MD50-12-12140	350–350	789.3

Note: Results are in pCi/L.

Appendix D

Characteristics of the Trichloroethene Vapor Plume

D-1.0 INTRODUCTION

This appendix describes the nature and extent of the vapor-phase trichloroethene (TCE) plume within the vadose zone beneath Material Disposal Area (MDA) C at Los Alamos National Laboratory. Specifically, it investigates the characteristics of the plume by assessing the current distribution of soil-vapor concentrations to answer questions such as the following:

- How stable is the plume? (Is it growing or receding?)
- Which sampling ports exceed the Tier II screening level (i.e., how large is the affected area?)
- What are the lateral and vertical extent of the plume? (Is it approaching the regional aquifer?)
- What is the calculated mass of the plume? (How large is the problem?)

This detailed plume analysis was warranted by the fact that numerous TCE samples exceeded the Tier I level (SL) of 2000 µg/m^3 and several exceeded depth-dependent Tier II SLs. A discussion of how both Tier I and Tier II levels were developed is presented in section 3.2.4 of the report.

The following sections detail how the analytical data (vapor samples collected with SUMMA canisters and analyzed at an analytical laboratory) from the 156 ports listed in Table C-4.1.1 in Appendix C of this report were used to develop a three-dimensional (3-D) model of the TCE vapor-phase plume and how this model was subsequently used to illustrate both the extent and mass of TCE contamination beneath MDA C.

D-2.0 METHODOLOGY

D-2.1 Data Evaluation

The evaluation began with an analysis of the data through time to determine the most appropriate technique for representing the current status of the vapor plume. The TCE data presented in Tables C-4.1-8 through C-4.1-13 and C-5.0-4 through C-5.0-6 in Appendix C of this report were recompiled in Table D-2.1.1, which juxtaposes for each sampling port the vapor phase TCE concentrations detected in each of the nine quarters between second quarter fiscal year (FY) 2010 and second quarter FY2012. This reorganization of the data revealed not all ports were sampled in all nine quarters because of the varying sampling strategies imposed during each event. Only half the ports were sampled in at least seven of the nine quarters. Sampling frequency was 80% to 95% for the majority of FY2010 and FY2011 but dropped to 30% to 80% during FY2012 and was only 50% during the most recent quarter.

Because the confidence in a model based on 50% sampling frequency would be much lower than that in one based on 95% sampling frequency, the data were inspected more closely to determine an alternative to using the most recent quarter of data while still accounting for the FY2012 samples. The data were analyzed to determine whether an average of all nine quarters could legitimately be used to include all 156 ports as input to the 3-D model. Of the regularly sampled ports mentioned above, approximately two-thirds have a coefficient of variation (CV) less than 0.5 (the dispersion in the data is relatively low compared with the mean). In other words, the concentrations at these locations appear relatively stable through time for the majority of sampling ports with an abundance of data. Some locations appear to have a subtle increasing trend through time, while others appear to have a subtle decreasing trend through time. Most locations exhibit small oscillations in the concentrations that may be the effect of seasonal influences. The magnitude of these oscillations is greater at locations for which the CV is greater than 0.5 and masks any temporal trends that might be present at these locations. Data from sampling ports with

fewer than seven rounds of data were more difficult to interpret. The initial analysis of the data suggests an average of all nine quarters may be an acceptable means of improving confidence in the model by increasing the sample population. However, a more rigorous statistical analysis is required to validate this assertion because of the variable sampling frequency and subtle indications of temporal trends.

It should be noted first, however, approximately 25% of the sampling ports exhibit concentrations during the first and second quarters of FY2011 that are more than an order of magnitude lower than concentrations in both the preceding and subsequent sampling rounds. This apparent bias is obvious in the 17 ports exhibiting this phenomenon that were sampled in at least seven of the nine quarters. All 47 samples exhibiting anomalously low concentrations were collected during the 2.5-mo period (November 5, 2010, to January 13, 2011) during which Phase III vapor-well drilling activities occurred. Dilution caused by loss of air into the subsurface during drilling is the suspected reason for the apparent bias in these results. These samples were omitted from the data set (a conservative measure to prevent a low bias) before analysis of the temporal trend.

A Mann-Kendall analysis was performed to confidently determine whether the vapor plume was stable enough over the last 9 quarters to allow the average concentrations at each port to be used as input to the 3-D model. The Mann-Kendall test is a nonparametric trend test developed to handle data exhibiting skewed distributions, irregular sampling frequency, data gaps, and even seasonal effects if enough years of data are available. With the exception of the biased samples noted above, the MDA C vapor-phase concentrations through time for all 156 sampling ports were used as input to the U.S. Environmental Protection Agency's ProUCL 4.1.00 software (http://www.epa.gov/osp/hstl/tsc/software.htm). ProUCL employs a modification to the Mann-Kendall trend tool designed to handle nondetect data. The primary output of the Mann-Kendall analysis is the standardized "S" statistic. The sign of this value indicates whether the trend at a particular port is increasing or decreasing, and the magnitude of the value is a measure of the strength of the trend. The program uses this value, along with a level of confidence based on the number of samples, to determine if the result is statistically significant. Table D-2.1.2 lists the results of the Mann-Kendall analysis based on a 95% level of confidence. At the 95% confidence level, only 14% of the sampling ports exhibited a statistically significant trend. Several of these ports exhibited an increasing trend, but the overall lack of ports exhibiting any trend is strong evidence the plume is relatively stable. The 9-quarter averages were consequently deemed sufficient representations of current conditions.

The 9 quarter averages were compared with their corresponding Tier II screening values, which are linearly related to the depth of the sample, as shown in Figure 3.2-3 of this report. The Tier II screening values and the ratio of the average concentration to the screening value are also presented in Table D-2.1.2. A third of the average sample concentrations are less than 10% of the screening value. These samples are primarily from vapor wells that form the perimeter of the monitoring network, and a few are from the shallowest and deepest depths of more centrally located wells. Two-thirds of the average concentrations are less than 50% of the screening value and are distributed across all site vapor wells and a variety of depths. Only 12 sampling ports have average concentrations greater than 80% of the screening value, and only 5 of these exceed the screening value. All 5 exceedances are located in the center of the site between 200 ft and 300 ft below ground surface (bgs). Three are from vapor-monitoring well 50-24813, and the remaining 2 are from wells 50-603470 and 50-603471. These ratios indicate a pattern of TCE concentrations that decrease radially from the center of the site outward as well as vertically away from the 200-ft- to 300-ft-depth zone. The average concentrations for each sampling port were used as input to a 3-D interpolation process to better visualize the horizontal and vertical extents of the vapor plume as well as the concentration gradients from the center of the site outward.

D-2.2 Plume Interpolation

The average sample concentrations from each port were interpolated to a 3-D representation of the vapor phase plume within the vadose zone beneath MDA C. The process of interpolation allows local trends in irregularly spaced data sets to be applied over short distances to fill in the gaps between samples using a regular grid. The result is a model that can be dissected and rendered in a variety of ways to create either planar or point-to-point profile views of the plume as well as plan views of the plume representing either discrete horizontal slices through it or maximum concentrations extracted from a range of depths of interest. The 3-D interpolated model plume can also be integrated to derive mass estimates for the plume as a whole or within discrete zones (e.g., geologic strata) of interest.

The interpolation was performed using the minimum tension option of the EarthVision 8 software package by Dynamic Graphics (2009). Previous vapor-plume modeling for MDA C utilized a stratified approach to interpolate the data from each geologic layer separately (LANL 2010, 109082). This technique can lead to extrapolation errors and discontinuities that are not consistent with the radial diffusion conceptual model of vapor transport at this site. The EarthVision's technique accounts for all data, regardless of geologic unit, in a single gridding pass. The resulting ellipsoidal plume does not have any discontinuities at layer contacts.

Sixty realizations were performed to examine the sensitivity of the estimated 3-D contaminant distribution to various interpolation settings. Each realization honors the data. These 60 distributions were averaged to derive the final estimated plume distribution. A standard deviation was also calculated from the 60 realizations and used along with the mean to derive estimated plume distributions representing the maximum and minimum plume extents as a measure of uncertainty.

D-2.3 Mass Estimation

The interpolated vapor phase plume model was used as the basis for TCE mass estimates beneath MDA C. Only that volume of plume defined by the Tier I SL of 2000 µg/m^3 (Table 3.2-10 of this report) was incorporated into the estimate. This plume volume was further discretized into a series of 3-D concentration isoshells defined for each geologic zone. The reason for the discretization is that the TCE dissolved into pore water and adsorbed onto solid media were also incorporated into the mass estimate based on chemical partitioning equations that assume phase equilibrium based on properties of both the contaminant and the solid media. The volume and concentration of each model isoshell were used along with the strata-specific physiogeochemical parameters listed in Table D-2.3-1 (and the appropriate unit conversions) as input to Equation D-2.3-1 to yield total contaminant mass in kilograms.

$$C_{bulk} = \frac{C_{air}\left(\theta_{air} + \theta_{water}/H' + \left(K_{oc}\, f_{oc}\, \rho_{soil}\right)/H'\right)}{\rho_{soil}} \qquad \textbf{Equation D-2.3-1}$$

where

C_{air} is the vapor-phase concentration for a given modeled TCE plume isoshell.

θ_{air} is the volumetric air-filled porosity, which depends on both the total porosity (*n*) and moisture content (θ_{water}) of the geologic stratum ($\theta_{air} = n - \theta_{water}$). The values presented in Table D-2.3-1 were selected as being representative of tuff at MDA C based on a large set of properties measured on samples collected at Technical Area 54 (Hollis et al. 1997, 063131).

H' and K_{oc} are the Henry's law constant and organic carbon distribution coefficient, respectively. These are physical properties of VOCs and were obtained from the New Mexico Environment

Department (NMED) risk assessment guidance document (NMED 2012, 219971). The NMED TCE values for H' and K_{oc} are 0.4 (dimensionless) and 67.7 L/kg, respectively.

f_{oc} is the fraction of organic carbon, which is a measure of the amount of organic matter present in the tuff and varies depending on the amount of weathering and biological activity. A single value of 0.0005 (0.05%) was assumed to be representative of tuff in the subsurface beneath MDA C. This value is a factor of 3 less than the representative value for soil presented in NMED (2012, 219971) and reflects the lower organic content of tuff.

ρ_{soil} is the bulk density of the stratum (dry mass divided by total volume). Table D-2.3-1 lists the strata-specific values used for MDA C (Hollis et al. 1997, 063131).

The remainder of this section presents the phase equilibrium theory behind the development of Equation D-2.3-1.

Volatile organic compounds (VOCs) present in subsurface media will be as vapors dissolved into pore water and adsorbed onto solid media. Detected concentrations of VOCs in vapor are orders of magnitude less than the vapor pressures of these chemicals, which is evidence that VOCs are not present as a separate, nonaqueous liquid phase. Several equilibrium-partitioning constants describe the relationship between the concentrations of chemicals in these various phases. These constants can be used to develop an expression for the overall concentration of VOC in the bulk medium (i.e., tuff) as a function of the concentration in the vapor phase. Measured vapor-phase concentrations can then be used to calculate the bulk concentration in tuff, which can be used to estimate the overall mass of the inventory based on an assumed volume of affected media.

The first partitioning constant used is the Henry's law constant. The dimensionless form of Henry's law constant describes the equilibrium relationship between the volumetric concentrations of chemicals in air and in water (Equation D-2.3-2).

$$H' = C_{air} / C_{water} \qquad \textbf{Equation D-2.3-2}$$

where C_{water} = the volumetric concentration of contaminant in water (M/L^3).

The second partitioning constant used is the distribution coefficient. The distribution coefficient describes the equilibrium relationship between the concentrations of chemicals dissolved in water and adsorbed on solids assuming a linear-sorption model:

$$K_d = C_{solid} / C_{water} \qquad \textbf{Equation D-2.3-3}$$

where Kd = the distribution coefficient (L^3/M) and

C_{solid} = the mass concentration of contaminant in soil or tuff (M/M).

For organic chemicals, the adsorption of chemicals onto the solid phase is strongly influenced by the amount of organic carbon present in the solid. The distribution coefficient can be estimated from the organic carbon distribution coefficient and the fraction of organic carbon in tuff:

$$K_d = K_{oc} f_{oc} \qquad \textbf{Equation D-2.3-4}$$

where K_{oc} is the organic carbon distribution coefficient (L^3/M) and

f_{oc} is the fraction of organic carbon in tuff (M/M).

Rearranging Equation D-2.3-3 and substituting Equation D-2.3-2 and Equation D-2.3-4 gives

$$C_{solid} = K_{oc} f_{oc} C_{air} / H' \qquad \textbf{Equation D-2.3-5}$$

The bulk concentration of chemical in tuff is equal to the total mass of chemical in all three phases per unit mass of tuff:

$$C_{bulk} = \frac{M_{air} + M_{water} + M_{solid}}{M_{soil}} \qquad \textbf{Equation D-2.3-6}$$

where C_{bulk} = the bulk concentration of chemical in tuff (M/M),

M_{air} = the mass of chemical present in the vapor phase in pore gas (M),

M_{water} = the mass of chemical present in the liquid phase in pore water (M),

M_{solid} = the mass of chemical present in the solid phase in tuff (M), and

M_{soil} = the mass of the soil or tuff (M).

The mass of chemical present in the vapor phase in pore gas is equal to the product of the concentration in air and the volume of air. The latter is equal to the product of the volumetric air-filled porosity and the volume of tuff. The mass of contaminant present in the liquid phase in pore water is equal to the product of the concentration in water and the volume of water. The latter is equal to the product of the volumetric water-filled porosity and the volume of tuff. The mass of contaminant present in the solid phase in tuff is equal to the product of the concentration in the solid phase and the mass of tuff. The latter is equal to the product of the volume of tuff and the bulk density of tuff. Using the relationships described above, Equation D-2.3-5 can be rewritten as

$$C_{bulk} = \frac{\left(C_{air} V_{soil} \theta_{air}\right) + \left(C_{air} V_{soil} \theta_{water} / H'\right) + \left(C_{air} K_{oc} f_{oc} V_{soil} \rho_{soil} / H'\right)}{V_{soil} \rho_{soil}} \qquad \textbf{Equation D-2.3-7}$$

where V_{soil} = the volume of tuff (L^3),

θ_{air} = the volumetric air-filled porosity (L^3/L^3),

θ_{water} = the volumetric water-filled porosity (L^3/L^3), and

ρ_{soil} = the bulk density of tuff (M/L^3).

Equation D-2.3-7 can be simplified to

$$C_{bulk} = \frac{C_{air}\left(\theta_{air} + \theta_{water}/H' + \left(K_{oc} f_{oc} \rho_{soil}\right)/H'\right)}{\rho_{soil}} \qquad \textbf{Equation D-2.3-8}$$

D-3.0 RESULTS

This section includes several illustrations of the modeled 3-D vapor-plume distributions for TCE vapor concentrations as well as the mass estimates derived from the combination of those distributions with the overlapping geologic framework. Plan-view maps illustrating the lateral extent of TCE within several geologic layers, both separate and combined, are presented in Figures D-3.0-1 through D-3.0-5. These maps depict the maximum extent of the vapor plumes within the entire thickness of the geologic unit of interest. Each map also illustrates the locations of three section lines used to produce orthogonal cross-sections passing through the highest observed average concentrations. The cross-sections illustrate the vertical extent of the plume and are presented in Figures D-3.0-6 through D-3.0-8.

Figure D-3.0-1, which represents the maximum extent of TCE within the Bandelier Tuff, shows concentrations elevated to approximately 25 times the Tier I SL of 2000 µg/m^3 over an area that is approximately 485 ft (147 m) wide and centered on the disposal pits. The concentrations decrease in a radial fashion away from this central area over a distance of approximately 450 ft. The similarity between Figure D-3.0-2, which shows the portion of the plume within unit 1g of the Bandelier Tuff, and Figure D-3.0-1 shows that unit 1g is where the center of mass resides. Figures D-3.0-3 through D-3.0-5 show decreasing plume extent with depth depicted for different geologic strata; the Tschicoma dacite is almost devoid of contamination. Figures D-3.0-6 through D-3.0-8 show the distributions of TCE vapor concentrations in cross-section. The TCE plume is ellipsoidal, with lateral extent being greater than vertical. The plume is almost entirely contained within the Bandelier Tuff, with the majority constrained to the Tshirege Member that makes up the upper 300 ft of the Bandelier Tuff at MDA C. The center of plume mass resides in unit 1g, which represents a transition zone from extremely dry tuff within unit 1g and units above to slightly wetter conditions in the underlying Cerro Toledo interval and Otowi Member units (Table-D-3.0-1). This finding suggests the elevated moisture in the Cerro Toledo interval and the Otowi Member may hinder vapor transport vertically downward, resulting in a greater extent in the Tshirege Member tuff units than in underlying units. The plume is asymmetric with greater extent parallel to the axis of the mesa.

Figures D-3.0-9 and D-3.0-10 are structure contour maps that show the elevation of the top surfaces of the Otowi Member and the Tschicoma dacite, respectively. The surface of each of the units dips to the east-southeast near the eastern end of MDA C, where the respective highest TCE vapor concentrations are located in each of these units (Figures D-3.0-4 and D-3.0-5). Visual inspection of the TCE plumes with respect to the dip of these surfaces indicates the dip of the units does not impose stratigraphic controls on the plume shape. This analysis supports the proposed source areas at the water table assumed for the monitoring network evaluation presented in Appendix G of the Phase III investigation report (LANL 2011, 204370).

Mass estimates were calculated for the final estimated plume extent as well as the minimum and maximum extents depicted in Figure D-3.0-11. The mass estimates are broken down by geologic unit and contaminant phase (gas, aqueous, and adsorbed) and are presented in Table D-3.0-1. These estimates exclude regions where the vapor-phase plume was predicted to be less than the Tier I vapor-phase SL of 2000 µg/m^3. The estimated total subsurface TCE mass is 182 kg with approximately 25% uncertainty based on the minimum and maximum values determined from analysis of 60 realizations. The breakdown by geologic zone indicates that approximately two-thirds of the mass resides above the Cerro Toledo interval. The breakdown by phase indicates that TCE is predominantly present in the vapor phase (65%) in the drier units above the Cerro Toledo interval and is equally divided between the gas and aqueous phases within the deeper wetter units.

D-4.0 SUMMARY

TCE data collected from vapor-monitoring wells within and around MDA C were screened using a two-tiered process to evaluate potential for contamination of groundwater. The results of this screening indicate levels of contamination currently found in the subsurface at MDA C do not present a risk to groundwater. This conclusion is consistent with the results of groundwater sampling performed at regional wells R-46 and R-60, both downgradient of MDA C. Concentrations of TCE within the center of the TCE plume exceed Tier I and Tier II SLs, but these high concentration levels are not found in the lower stratigraphic units through which transport to the regional aquifer would have to occur.

The subsurface TCE data were also evaluated to estimate the dimensions and mass of the subsurface plume. This evaluation shows the lateral and vertical extent of the TCE plume to be defined by the existing vapor-monitoring well network. The total mass of TCE in the subsurface is estimated to be in the range of 134 kg to 239 kg (equivalent to 24 to 43 gal. as liquid). Most of the TCE mass is present in the upper stratigraphic units (i.e., above the Cerro Toledo interval). This distribution of mass is consistent with the conceptual model of vapor diffusion through the lower units being impeded by the relatively higher moisture content of these units (see section 4.4).

D-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. This information is also included in text citations. ER IDs 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 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), March 2009. "Completion Report for Regional Aquifer Well R-46," Los Alamos National Laboratory document LA-UR-09-1338, Los Alamos, New Mexico. (LANL 2009, 105592)

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Springer, E.P., 2005. "Statistical Exploration of Matrix Hydrologic Properties for the Bandelier Tuff, Los Alamos, New Mexico," *Vadose Zone Journal,* Vol. 4, pp. 505–521. (Springer 2005, 098534)

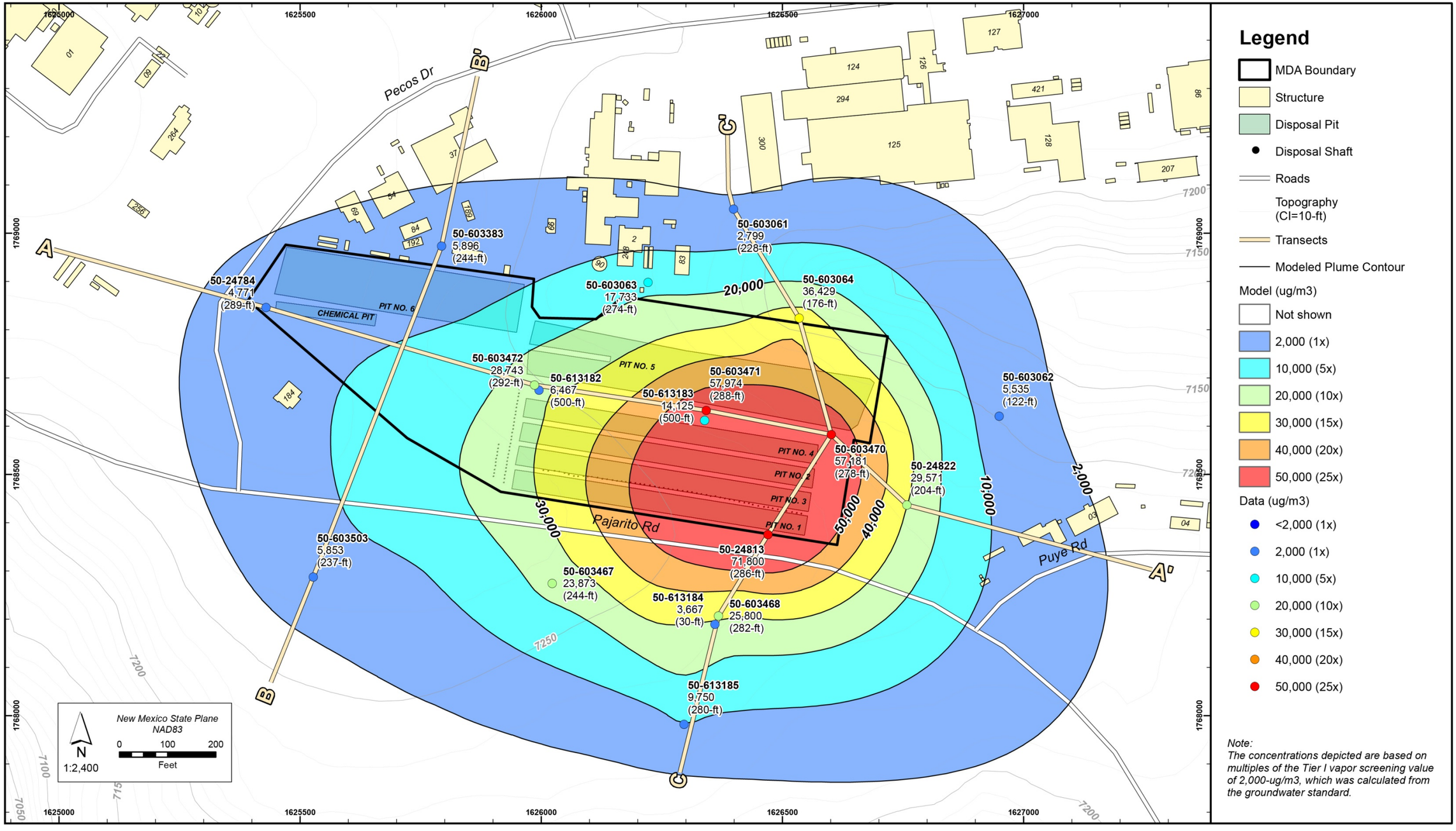

Figure D-3.0-1 Plan view of maximum extent of TCE plume tuff units

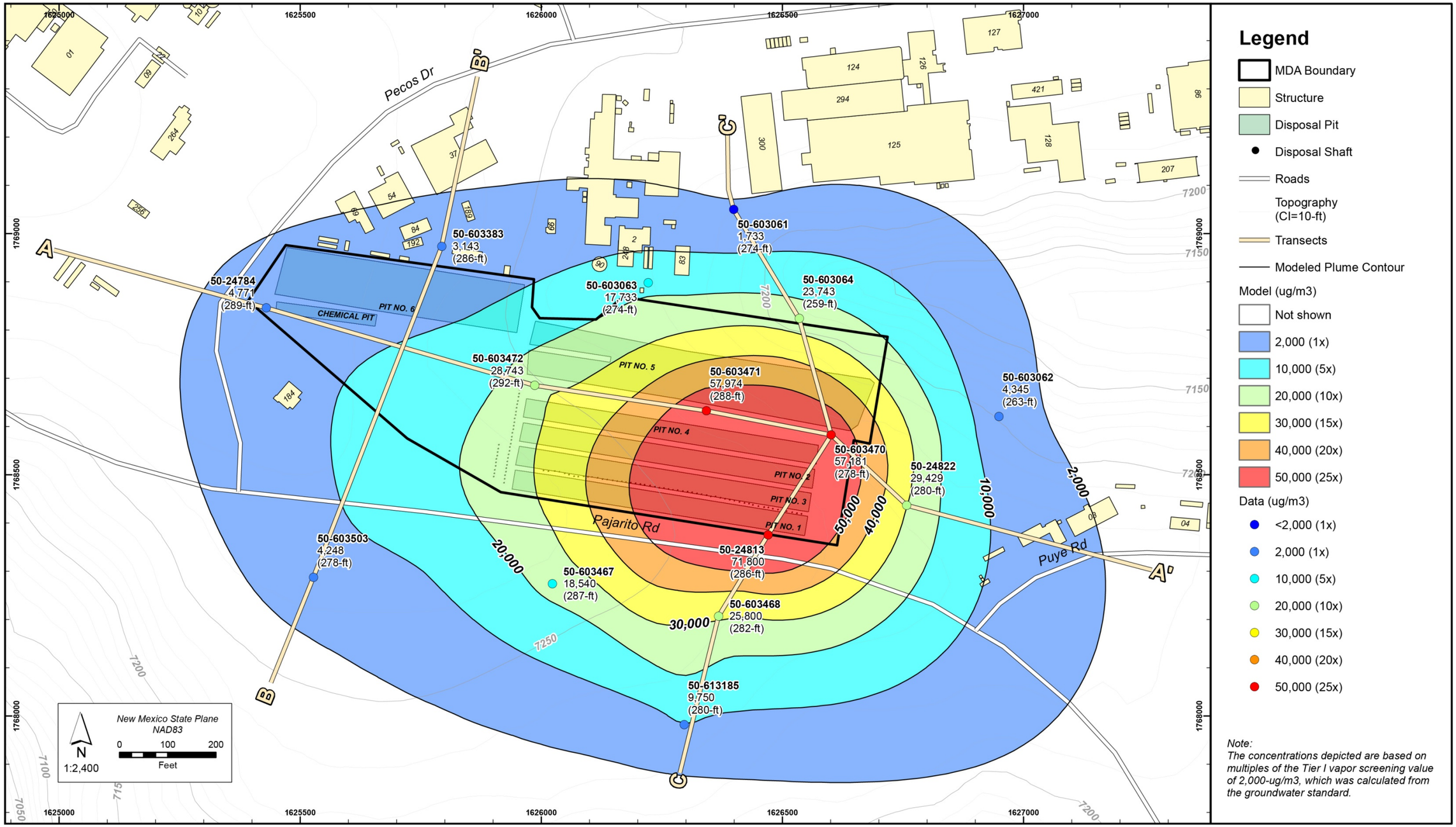

Figure D-3.0-2 Plan view of TCE plume in unit tuff Qbt 1g

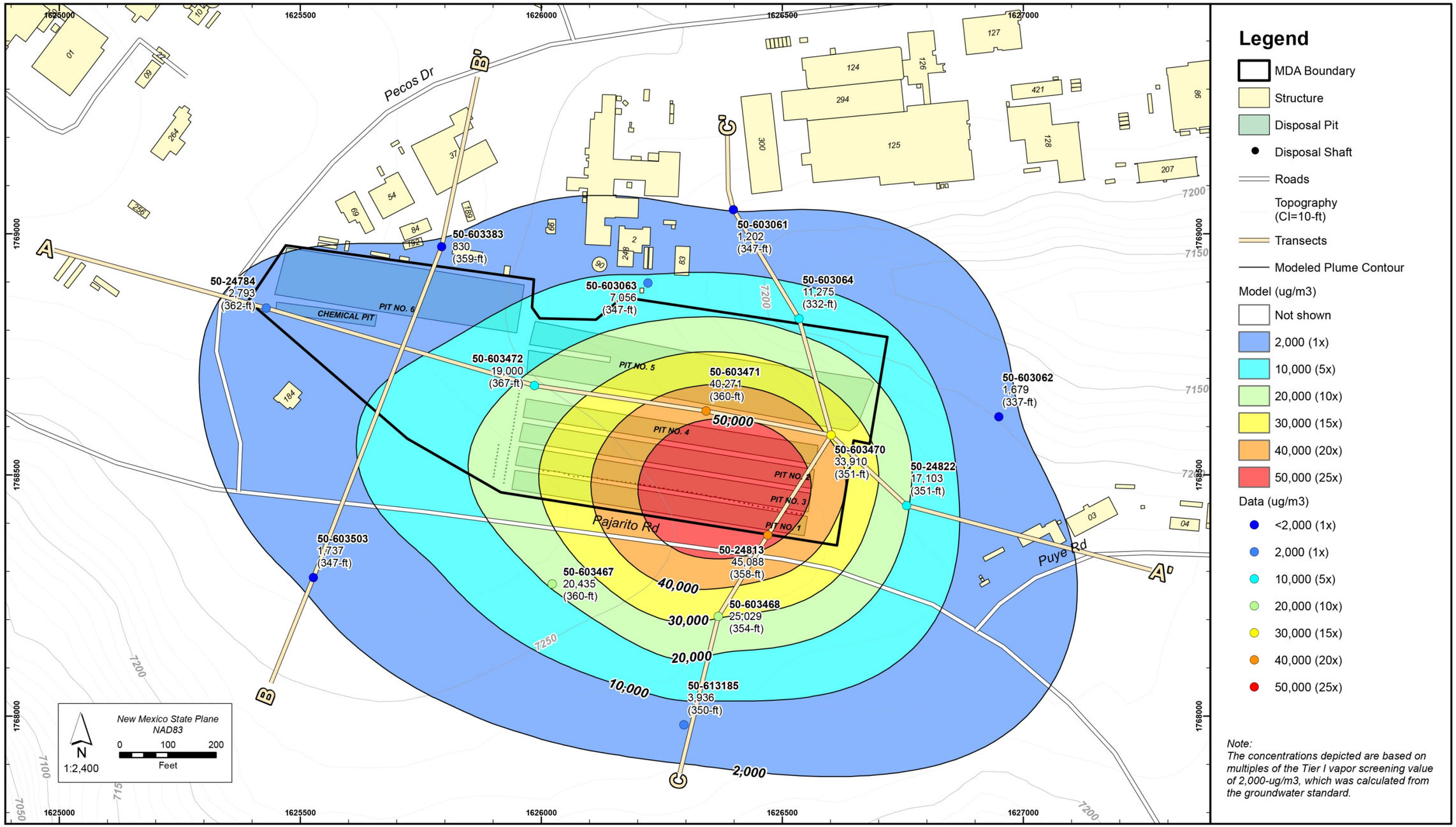

Figure D-3.0-3 Plan view of TCE plume in unit Cerro Toledo interval

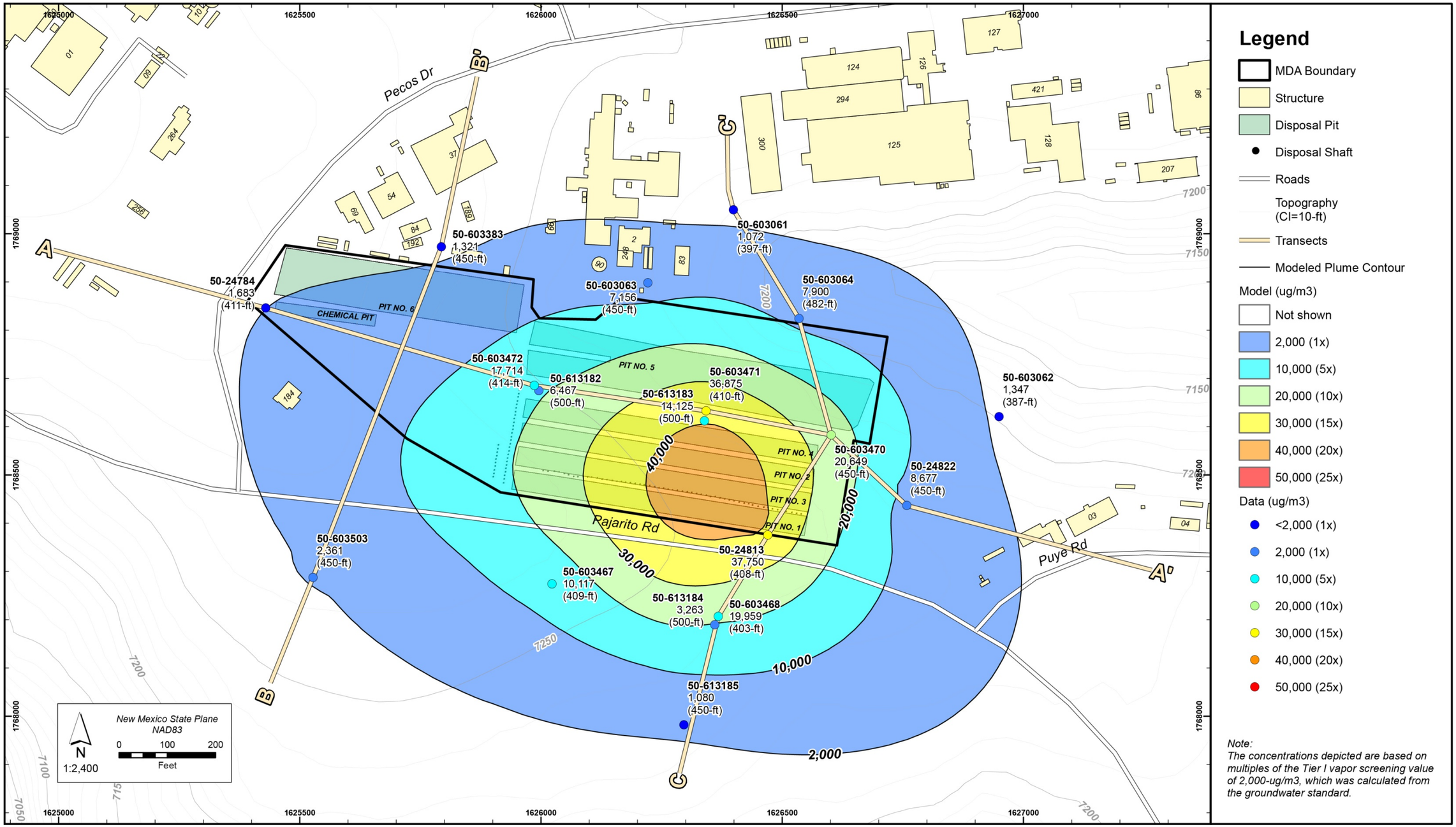

Figure D-3.0-4 Plan view of TCE plume in tuff unit Qbof

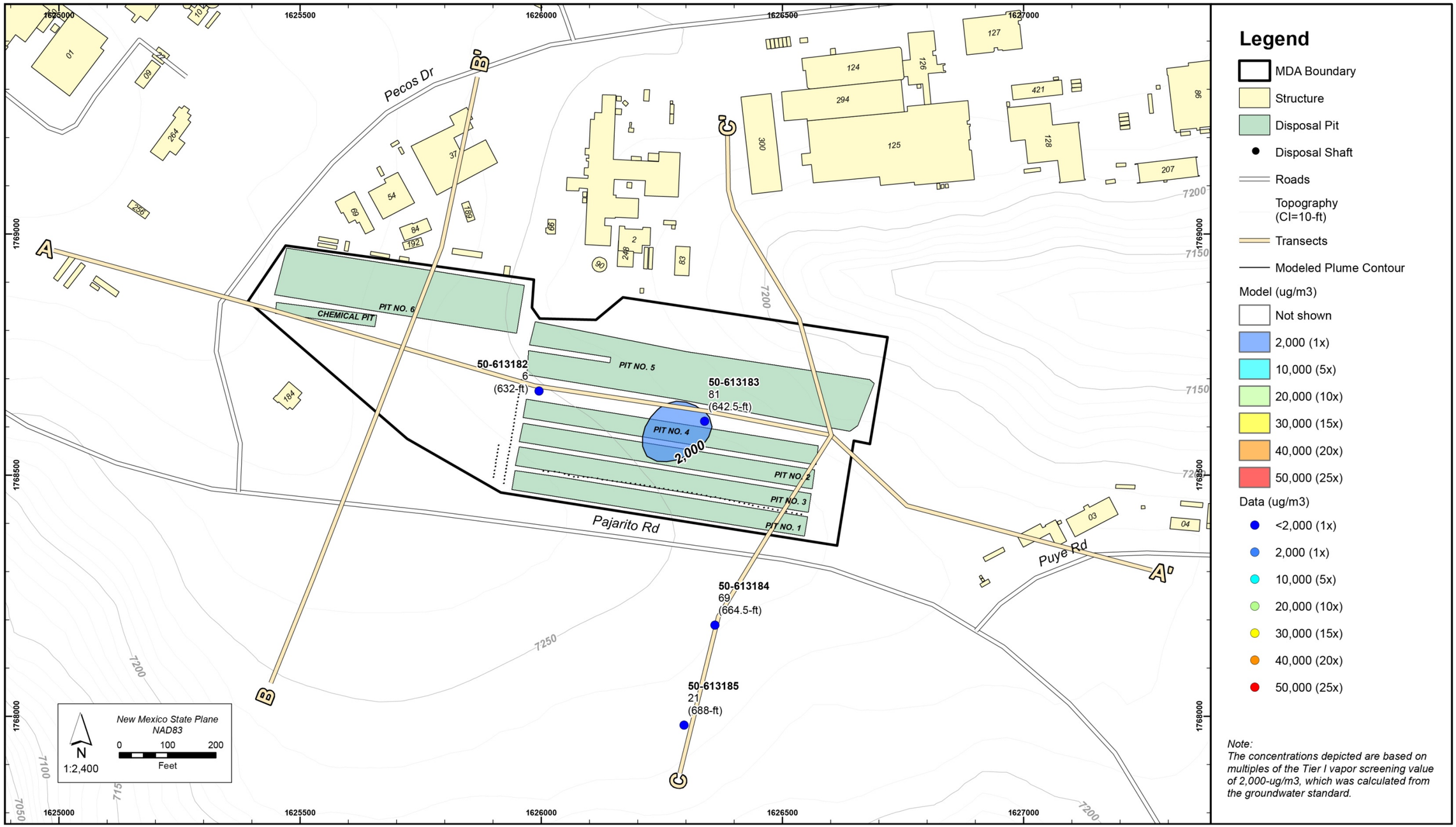

Figure D-3.0-5 Plan view of TCE plume in Tschicoma dacite

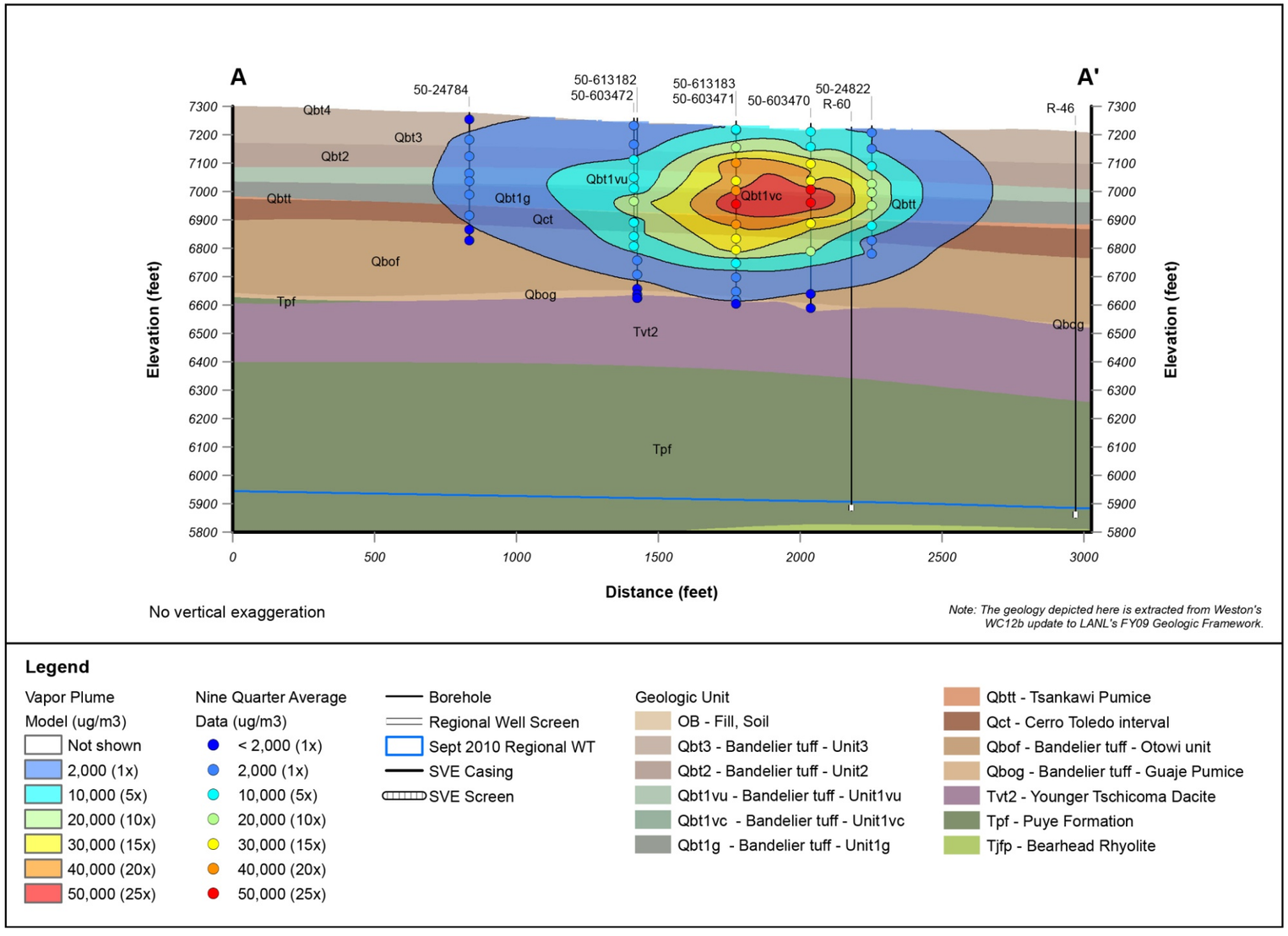

Figure D-3.0-6 Cross-section of TCE plume along section A–A'

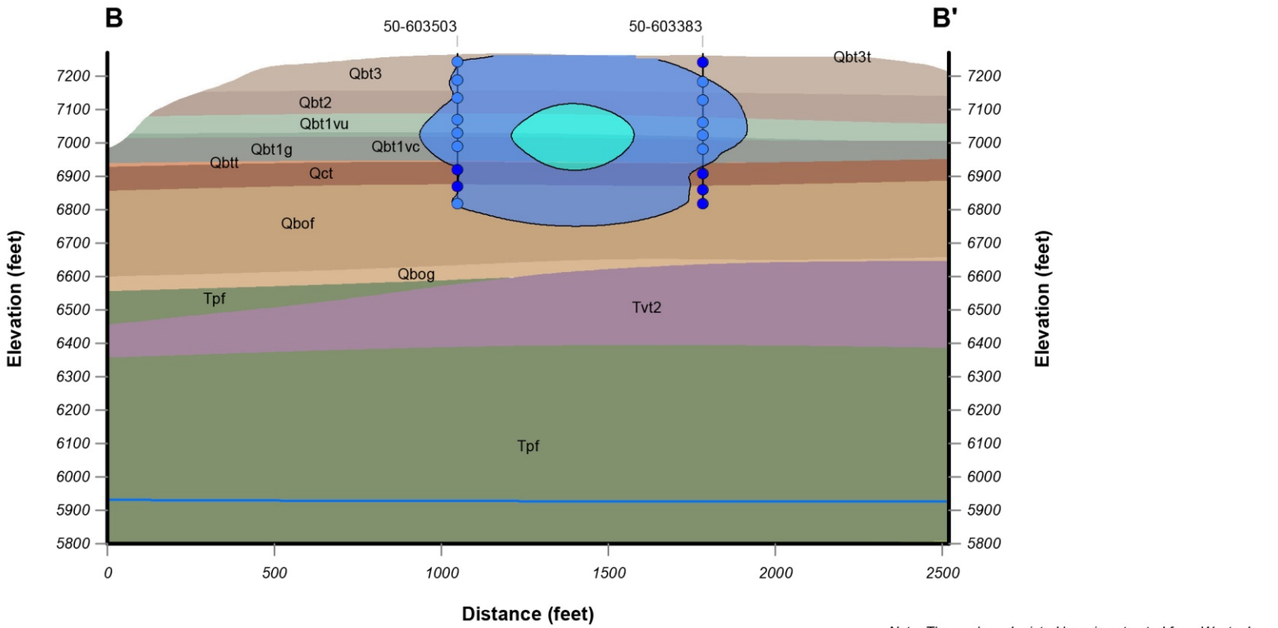

Figure D-3.0-7 Cross-section of TCE plume along section B–B'

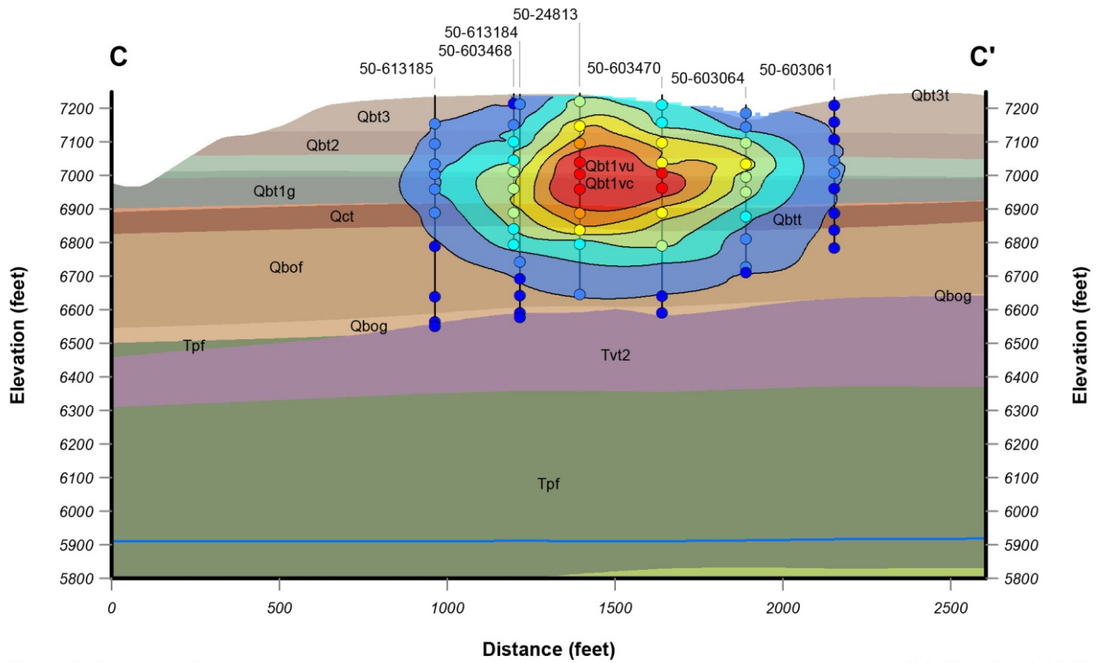

Figure D-3.0-8 Cross-section of TCE plume along section C–C'

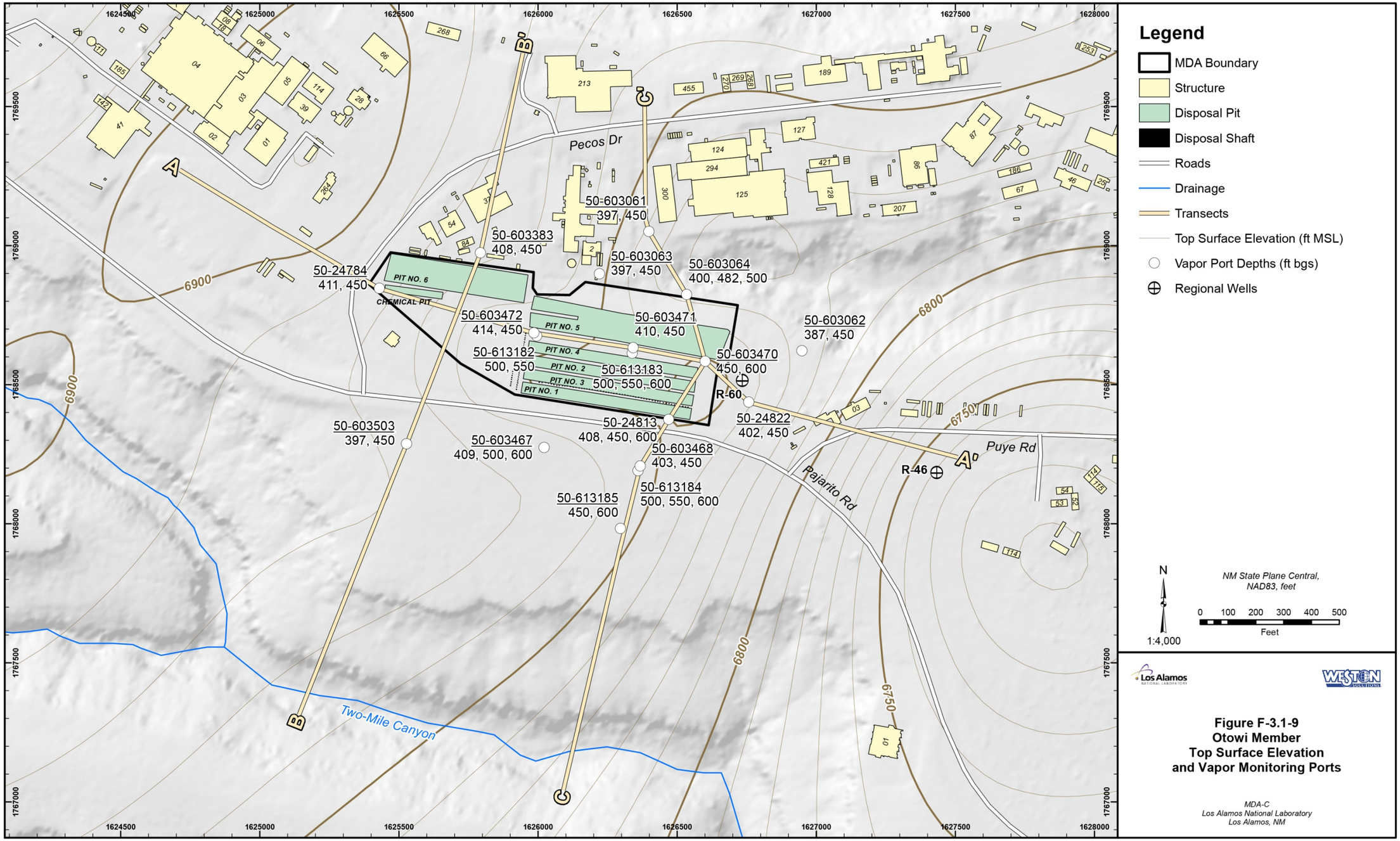

Figure D-3.0-9 Structure contour map along top of Otowi Member

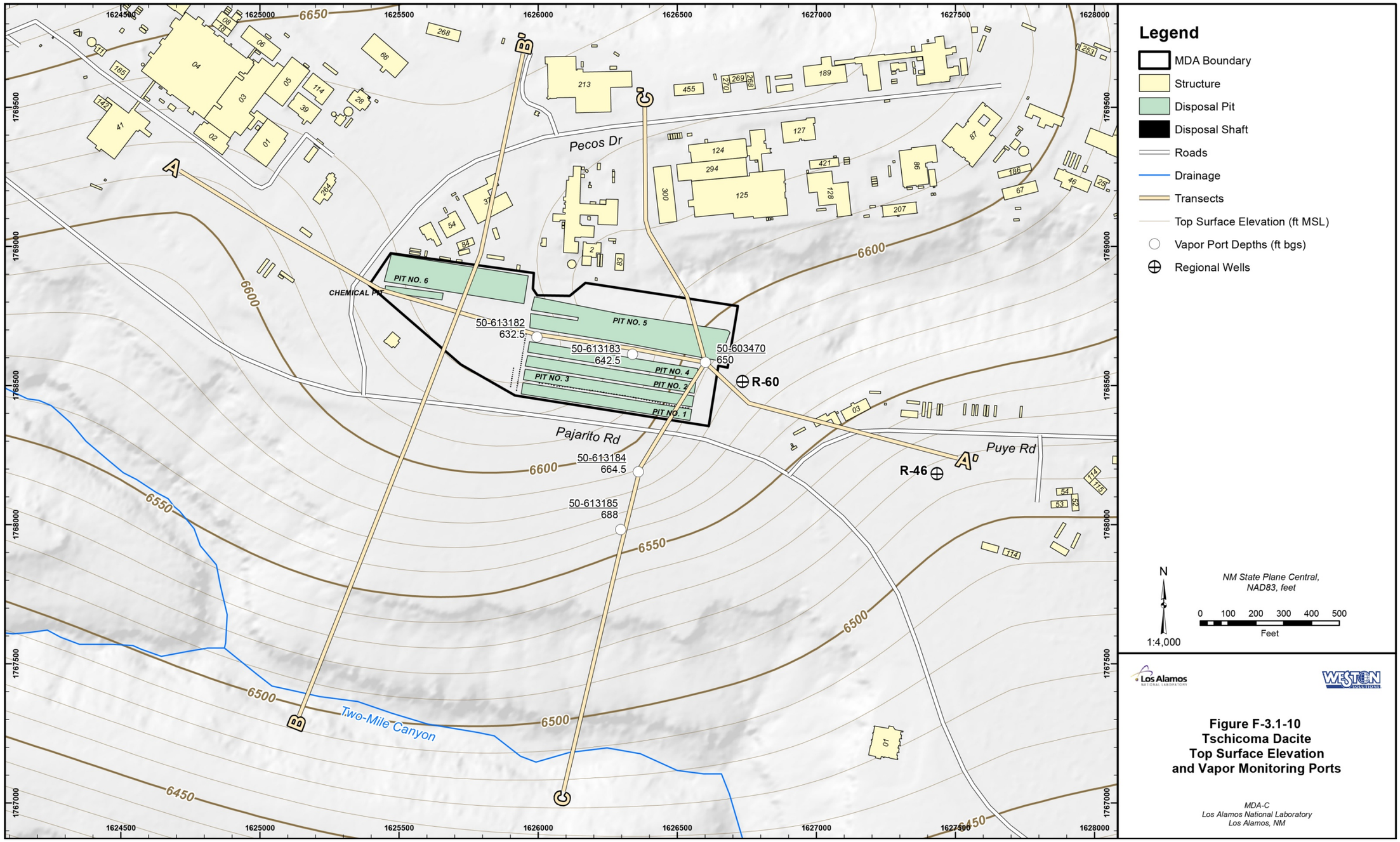

Figure D-3.0-10 Structure contour map along top of Tschicoma dacite

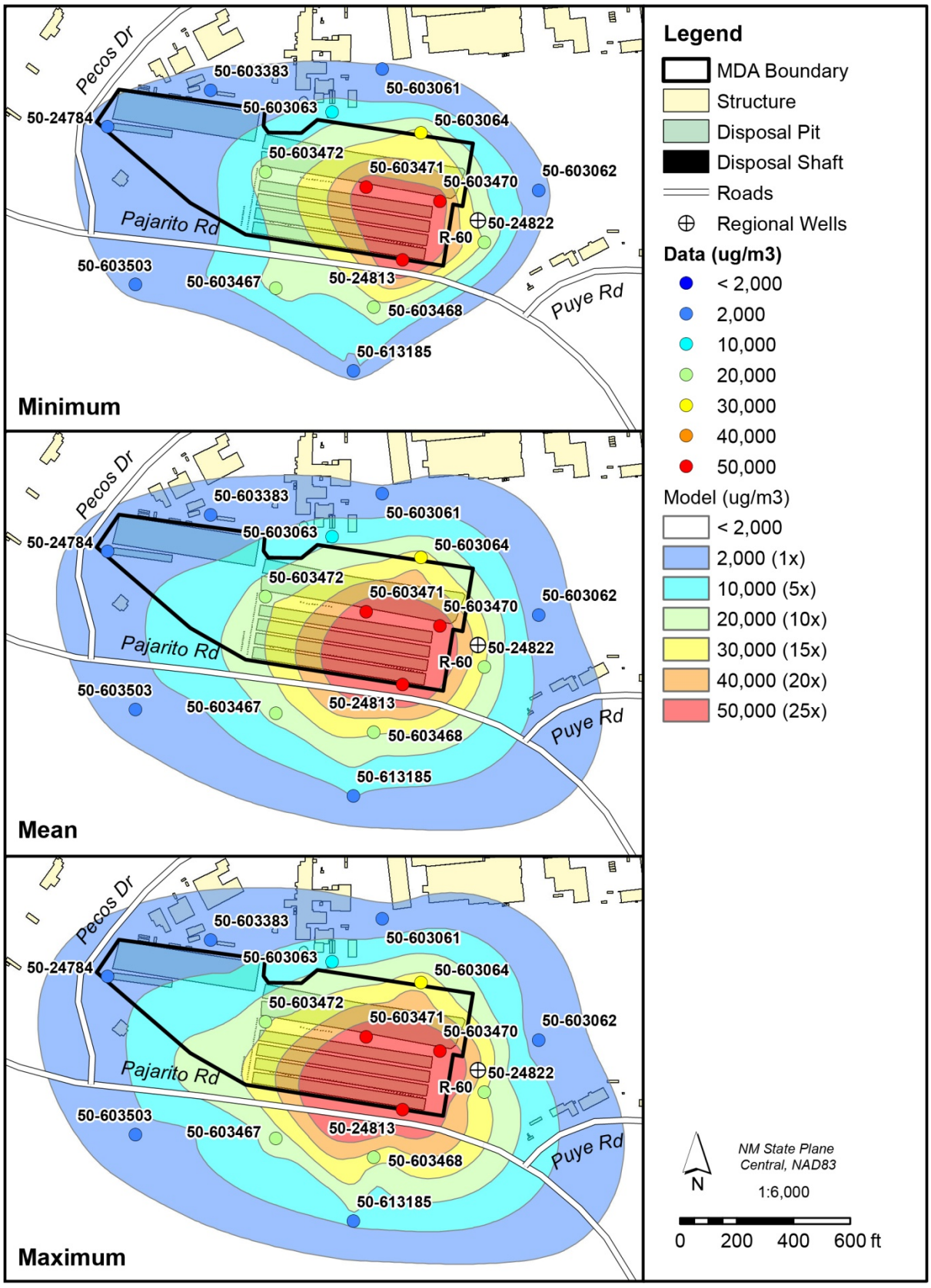

Figure D-3.0-11 Minimum, mean, and maximum estimated extent of TCE plume

Table D-2.1-1
TCE Time-Series Data and Statistics for Each Sample Port

Location ID	Depth (ft bgs)	Results									Statistics						
		FY10Q2	FY10Q3	FY10Q4	FY11Q1	FY11Q2	FY11Q3	FY11Q4	FY12Q1	FY12Q2	Count	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation
50-24784	25	1100	1300	900	990	920	1100	—[a]	1100	—	7	900	1300	1100	1059	137	0.13
50-24784	96	3700	2500	2700	2800	2600	3200	—	3300	—	7	2500	3700	2800	2971	439	0.15
50-24784	155	3800	2600	3200	3700	3000	2300	—	4400	3598	8	2300	4400	3399	3325	686	0.21
50-24784	215	5200	4700	4900	5400	5000	3600	—	320	—	7	320	5400	4900	4160	1790	0.43
50-24784	244	6800	4300	4500	5100	4600	630	—	5000	4082	8	630	6800	4550	4377	1731	0.4
50-24784	289	4000	4500	4600	4800	5000	5000	—	5500	—	7	4000	5500	4800	4771	472	0.1
50-24784	362	4300	3900	1800	3000	2600	510	—	3600	2632	8	510	4300	2816	2793	1222	0.44
50-24784	411	1400	1600	1700	2100	1500 (U)	1400	—	1900	—	6	1400	2100	1650	1683	279	0.17
50-24784	450	1000	1200	630	1200	550 (U)	1200	—	1100	1020	7	630	1200	1100	1050	204	0.19
50-24813	25	13,000	12,000	11000	13,000	37,000	93,000	—	19,000	13,960	8	11,000	93,000	13,480	26,495	28,186	1.06
50-24813	99	31,000	32,000	37 (U)	26,000	42,000	93,000	—	52,000	—	7	0	93,000	32,000	39,429	28,565	0.72
50-24813	150	44,000	37,000	41,000	31,000	39,000	48,000	—	68,000	42,430	8	31,000	68,000	41,715	43,804	10,995	0.25
50-24813	207	67,000	50,000	62,000	1200	1100	39,000	—	130,000	—	5	39,000	130,000	62,000	69,600	35,473	0.51
50-24813	241	67,000	70,000	62,000	15,000	360	15,000	—	120,000	85,930	6	15,000	120,000	68500	69,988	34,210	0.49
50-24813	286	62,000	33,000	75,000	1300	9900	79,000	—	110,000	—	5	33,000	110,000	75,000	71,800	27,941	0.39
50-24813	358	19,000	46,000	45,000	120	43,000	52,000	32,000	70,000	53,700	8	19,000	70,000	45,500	45,088	15,117	0.34
50-24813	408	35,000	60,000	43,000	32,000	15,000	36,000	31,000	50,000	—	8	15,000	60,000	35,500	37,750	13,520	0.36
50-24813	450	6000	23,000	3900	5300	13,000	16,000	3800	27,000	24,700	9	3800	27,000	13000	13,633	9447	0.69
50-24813	600	430	2400	2400	12	170	3100	2100	3600	2632	7	430	3600	2400	2380	996	0.42
50-24822	25	4100	32000	6100	7000	6100	1500	—	8900	8056	8	1500	32,000	6550	9220	9491	1.03
50-24822	81	12,000	11,000	11,000	11,000	—	2400	—	9900	—	6	2400	12,000	11,000	9550	3565	0.37
50-24822	142	29,000	14,000	19,000	9000	500	1100	—	28,000	25,240	7	1100	29,000	19,000	17,906	10,464	0.58
50-24822	204	17,000	33,000	32,000	28,000	28,000	33,000	—	36,000	—	7	17,000	36,000	32,000	29,571	62,41	0.21
50-24822	235	27,000	6000	32,000	32,000	32,000	6900	—	50,000	40,820	8	6000	50,000	32,000	28,340	15,239	0.54
50-24822	280	30,000	27,000	30,000	32,000	17,000	28,000	—	42,000	—	7	17,000	42,000	30,000	29,429	7390	0.25
50-24822	351	5700	17,000	17,000	14,000	11	18,000	—	26,000	22,020	7	5700	26,000	17,000	17,103	6375	0.37
50-24822	402	11,000	14,000	3.2 (U)	—	—	2.1 (U)	—	6900	—	5	0	14,000	6900	6380	6346	0.99
50-24822	450	2400	10,000	9300	11,000	—	4300	—	13,000	10,740	7	2400	13,000	10,000	8677	3852	0.44
50-603061	25	160	250	370	290	380	390	—	—	526.3	7	160	526.3	370	338	117	0.35
50-603061	76	1800	1900	1200	1900	1900	5.1	—	—	—	6	5.1	1900	1850	1451	759	0.52
50-603061	128	42	2400	1700	2500	2500	580	—	—	2793	7	42	2793	2400	1788	1073	0.6
50-603061	190	2100	1800	2000	4000	3700	38	—	—	—	6	38	4000	2050	2273	1438	0.63
50-603061	228	3300	2800	3400	3200	2700	3600	—	—	590.8	7	590.8	3600	3200	2799	1025	0.37
50-603061	274	1100	2100	2100	2000	1500	1600	—	—	—	6	1100	2100	1800	1733	403	0.23
50-603061	347	470	1100	1200	1200	1000	2100	—	—	1343	7	470	2100	1200	1202	485	0.4

Table D-2.1-1 (continued)

Location ID	Depth (ft bgs)	Results									Statistics						
		FY10Q2	FY10Q3	FY10Q4	FY11Q1	FY11Q2	FY11Q3	FY11Q4	FY12Q1	FY12Q2	Count	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation
50-603061	397	610	1600	1200	960	1300	760	—	—	—	6	610	1600	1080	1072	366	0.34
50-603061	450	180	500	620	550	390	650	—	—	483.3	7	180	650	500	482	159	0.33
50-603062	25	1700	1700	1600	1200	1400	1500	—	—	—	6	1200	1700	1550	1517	194	0.13
50-603062	64	890	2100	2900	2400	7400	2400	—	—	—	6	890	7400	2400	3015	2252	0.75
50-603062	122	2700	3900	6700	7200 (J)	6100	5700	—	—	6445	7	2700	7200	6100	5535	1634	0.3
50-603062	184	1800	8300	8000	5900	6000	85 (U)	—	—	—	6	0	8300	5950	5000	3375	0.67
50-603062	217	2300	8400	4800	5700	1100	5800	—	—	8056	7	1100	8400	5700	5165	2720	0.53
50-603062	263	970	4400	4000	6300	5700	4700	—	—	—	6	970	6300	4550	4345	1860	0.43
50-603062	337	14	2400	2000	1900	1400	2000	—	—	2041	7	14	2400	2000	1679	791	0.47
50-603062	387	680	1100	1700	1900	1700	1000	—	—	—	6	680	1900	1400	1347	486	0.36
50-603062	450	140	500	660	700	320	580	—	—	590.8	7	140	700	580	499	201	0.4
50-603063	25	1000	1800	960	2100	1700	6300	—	—	1611	7	960	6300	1700	2210	1851	0.84
50-603063	76	4200	7200	5600	5400	6500	7400	—	—	—	6	4200	7400	6050	6050	1216	0.2
50-603063	128	3500	5700	2700	9600	8700	11,000	—	—	10,740	7	2700	11,000	8700	7420	3436	0.46
50-603063	190	9400	16,000	18,000	22,000	20,000	220	—	—	—	6	220	22,000	17,000	14,270	8132	0.57
50-603063	228	7400	17,000	5500	22,000	3.3	9700	—	—	25,240	6	5500	25,240	13,350	14,473	8152	0.56
50-603063	274	7400	20,000	18,000	25,000	22,000	14,000	—	—	—	6	7400	25,000	19,000	17,733	6276	0.35
50-603063	347	2900	8700	2900	9900	4600	7500	—	—	12,890	7	2900	12,890	7500	7056	3777	0.54
50-603063	397	2400	9300	—	—	910	5800	—	—	—	3	2400	9300	5800	5833	3450	0.59
50-603063	450	1700	8600	6700	8200	8400	7900	—	—	8593	7	1700	8600	8200	7156	2494	0.35
50-603064	25	4600	3300	3700	3600	3900	2600	—	4100	—	7	2600	4600	3700	3686	631	0.17
50-603064	66	5100	3300	9000	7300	3700	7000	—	8400	—	7	3300	9000	7000	6257	2250	0.36
50-603064	113	2900	18,000	23,000	28,000	31,000	32,000	—	29,000	24,700	8	2900	32,000	26,350	23,575	9526	0.4
50-603064	176	20,000	45,000	24,000	40,000	34,000	39,000	—	53,000	—	7	20,000	53,000	39,000	36,429	11,530	0.32
50-603064	214	11,000	5700	32,000	36,000	3800	37,000	—	34,000	34,900	8	3800	37,000	33,000	24,300	14,673	0.6
50-603064	259	8200	17,000	28,000	27,000	21,000	30,000	—	35,000	—	7	8200	35,000	27,000	23,743	9029	0.38
50-603064	332	8600	9500	12,000	13,000	11,000	7200	—	16,000	12,900	8	7200	16,000	11,500	11,275	2815	0.25
50-603064	482	3600	2000	8200	8700	4800	6500	—	9000	—	7	2000	9000	6500	6114	2723	0.45
50-603064	500	290	1200	1200	1600	1500	600	—	1500	1400	8	290	1600	1300	1161	471	0.41
50-603383	26	180	1100	910	690	2000	2400	1100	1800	698	9	180	2400	1100	1209	716	0.59
50-603383	85	1200	2200	2400	2600	1900	2800	2700	3100	—	8	1200	3100	2500	2363	597	0.25
50-603383	139	3600	4500	4100	5200	250	1100	3700	4900	4990	8	1100	5200	4300	4011	1317	0.33
50-603383	206	2100	4800	7100	6700	4600	2.1 (U)	3100	8700	—	8	0	8700	4700	4638	2858	0.62
50-603383	244	2200	6500	6700	510	5900	6400	4800	9300	5370	8	2200	9300	6150	5896	2000	0.34
50-603383	286	1100	2700	3900	3300	190 (U)	1300	4600	5100	—	7	1100	5100	3300	3143	1545	0.49
50-603383	359	80	18 (J-)	29	4000	300	1500	91	55	1400	9	18	4000	91	830	1328	1.6
50-603383	408	520	1100	1800	1400	1500	1600	140	1300	—	8	140	1800	1350	1170	567	0.48

Table D-2.1-1 (continued)

Location ID	Depth (ft bgs)	Results									Statistics						
		FY10Q2	FY10Q3	FY10Q4	FY11Q1	FY11Q2	FY11Q3	FY11Q4	FY12Q1	FY12Q2	Count	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation
50-603383	450	110	220	2000	—	1500	2700	1200	1500	1340	8	110	2700	1420	1321	855	0.65
50-603467	26	3500	2700	5900	9400	9400 (U)	6300	—	—	—	5	2700	9400	5900	5560	2638	0.47
50-603467	91	4900	12,000	13,000	7400	12000	12,000	—	—	—	6	4900	13,000	12,000	10,217	3271	0.32
50-603467	143	12,000	12,000	15,000	18,000	18,000 (U)	16,000	—	—	15,040	6	12000	18,000	15,020	14,673	2339	0.16
50-603467	206	7700	25,000	24,000	25,000	11,000	25,000	—	—	—	6	7700	25,000	24,500	19,617	8030	0.41
50-603467	244	8000	24,000	31,000	26,000	20,000 (U)	29,000	—	—	25,240	6	8000	31,000	25,620	23,873	8191	0.34
50-603467	287	7900	—	33,000	22,000	8800 (J-)	21,000	—	—	—	5	7900	33,000	21,000	18,540	10,431	0.56
50-603467	360	12,000	19,000	24,000	26,000	12,000 (U)	11,000	—	—	30,610	6	11,000	30,610	21,500	20,435	7867	0.38
50-603467	409	1900	7600	18,000	15,000	7200	11,000	—	—	—	6	1900	18,000	9300	10,117	5816	0.57
50-603467	500	1000	5500	8100	8100	6000	3300	—	—	6982	7	1000	8100	6000	5569	2615	0.47
50-603467	600	530	1500	8500	3700	3400 (J-)	4300	—	—	3383	7	530	8500	3400	3616	2531	0.7
50-603468	30	28	—	—	—	—	—	—	—	—	1	28	28	28	28	na[b]	na
50-603468	92	2900	9200	6400	5700	33	5300	—	12,000	—	6	2900	12,000	6050	6917	3211	0.46
50-603468	142	1500	6400	3900	5500	55	12,000	—	37,000	10,200	7	1500	37,000	6400	10,929	12,039	1.1
50-603468	198	6400	18,000	19,000	20,000	11,000	24,000	—	35,000	—	7	6400	35,000	19,000	19,057	9181	0.48
50-603468	233	7600	27,000	23,000	23,000	21	26,000	—	37,000	29,000	7	7600	37,000	26,000	24,657	8897	0.36
50-603468	282	5600	23,000	22,000	23,000	23,000	29,000	—	55,000	—	7	5600	55,000	23,000	25,800	14,770	0.57
50-603468	354	7600	24,000	25,000	20,000	38,000	34,000	900	43,000	32,760	9	900	43,000	25,000	25,029	13,891	0.56
50-603468	403	4000	19,000	25,000	22,000	19,000	20,000	3700	39,000	27,930	9	3700	39,000	20,000	19,959	11,049	0.55
50-603468	450	6700	12,000	15,000	12,000	15,000	10,000	21,000	23,000	—	8	6700	23,000	13,500	14,338	5456	0.38
50-603470	30	9700	12,000	13,000	14,000	—	13,000	—	17,000	—	6	9700	17,000	13,000	13,117	2400	0.18
50-603470	83	19,000	18,000	18,000	13,000	6000	13,000	—	26,000	15,570	8	6000	26,000	16,785	16,071	5796	0.36
50-603470	143	35,000	32,000	29,000	33,000	41,000	34,000	—	40,000	—	7	29,000	41,000	34,000	34,857	4298	0.12
50-603470	203	48,000	34,000	44,000	9200	12,000	55,000	—	59,000	40,820	8	9200	59,000	42,410	37,753	18,497	0.49
50-603470	233	49,000	53,000	46,000	50,000	2.1 (U)	32,000	—	83,000	—	6	32,000	83,000	49,500	52,167	16,798	0.32
50-603470	278	52,000	61,000	48,000	55,000	39,000	58,000	—	80,000	64,450	8	39,000	80,000	56,500	57,181	12,161	0.21
50-603470	351	10,000	29,000	31,000	37,000	32	25,000	42,000	57,000	40,280	8	10,000	57,000	34,000	33,910	13,796	0.41
50-603470	450	11,000	47,000	17,000	12,000	120	16,000	18,000	27,000	17,190	8	11,000	47,000	17,095	20,649	11,690	0.57
50-603470	600	1200	1400	1800	1700	19	1800	1800	1700	1719	8	1200	1800	1709.5	1640	221	0.13
50-603470	650	14	120 (U)	94	12	13 (U)	35	120	190	80.56	9	0	190	35	61	65	1.08
50-603471	30	18,000	—	—	20,000	5900	—	—	—	—	3	5900	20,000	18,000	14,633	7629	0.52
50-603471	90	27,000	17,000	19,000	28,000	3700	20,000	—	34,000	19,870	7	17,000	34,000	20,000	23,553	6200	0.26
50-603471	146	47,000	27,000	38,000	4300	46,000	63,000	—	68,000	—	6	27,000	68,000	46,500	48,167	15,303	0.32
50-603471	209	41,000	44,000	51,000	48,000	11,000	1800	—	69,000	53,700	8	1800	69,000	46,000	39,938	22,459	0.56
50-603471	242	62,000	50,000	52,000	72,000	12,000	890	—	100,000	—	7	890	100,000	52,000	49,841	34,126	0.68
50-603471	288	48,000	58,000	50,000	70,000	37,000	—	—	73,000	69,820	7	37,000	73,000	58,000	57,974	13,624	0.24
50-603471	360	45,000	43,000	51,000	34,000	24,000	15,000	57,000	—	53,170	8	15,000	57,000	44,000	40,271	14,803	0.37

Table D-2.1-1 (continued)

Location ID	Depth (ft bgs)	Results									Statistics						
		FY10Q2	FY10Q3	FY10Q4	FY11Q1	FY11Q2	FY11Q3	FY11Q4	FY12Q1	FY12Q2	Count	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation
50-603471	410	36,000	40,000	38,000	34,000	23,000	21,000	44,000	59,000	—	8	21,000	59,000	37,000	36,875	11981	0.32
50-603471	450	30,000	42,000	35,000	23,000	31,000	31,000	26,000	50,000	39,740	9	23,000	50,000	31,000	34,193	8460	0.25
50-603472	27	4800	4400	4100	3000	3200	3200	—	2300	3330	8	2300	4800	3265	3541	823	0.23
50-603472	93	7400	6000	4600	19	2200	3800	—	9700	—	6	2200	9700	5300	5617	2684	0.48
50-603472	146	13,000	7700	9100	29	11,000	6900	—	7600	17,190	7	6900	17,190	9100	10,356	3703	0.36
50-603472	210	20,000	15,000	17,000	110	7100	14,000	—	6200	—	6	6200	20,000	14,500	13217	5491	0.42
50-603472	247	12,000	9400	9500	7100	3700	10,000	—	41,000	—	7	3700	41,000	9500	13,243	12,517	0.95
50-603472	292	35,000	39,000	31,000	240	—	18,000	—	21,000	28,460	6	18,000	39,000	29,730	28,743	8061	0.28
50-603472	364	17,000	20,000	19,000	910	310	10,000	10,000	17,000	15,570	7	10,000	20000	17,000	15,510	4031	0.26
50-603472	414	17,000	17,000	15,000	20	15,000	12,000	21,000	27,000	—	7	12,000	27000	17,000	17,714	4923	0.28
50-603472	450	12,000	14,000	14,000	56	11,000	14,000	5900	17,000	12,890	8	5900	17,000	13,445	12,599	3232	0.26
50-603503	25	2800	4200	660	1300	1900	1300	—	—	—	6	660	4200	1600	2027	1285	0.63
50-603503	80	2000	4300	1900	2000	1900	2300	—	—	—	6	1900	4300	2000	2400	942	0.39
50-603503	133	990	4200	1500	2300	2600	2500	—	—	435	7	435	4200	2300	2075	1240	0.6
50-603503	198	1000	4400	4500	2200	5600	3400	—	—	—	6	1000	5600	3900	3517	1683	0.48
50-603503	237	2000	4600	4700	12,000	6600	5700	—	—	5370	7	2000	12,000	5370	5853	3064	0.52
50-603503	278	3200	490	5900	5600	4000	6300	—	—	—	6	490	6300	4800	4248	2193	0.52
50-603503	347	530	2600	1600	1200	1800	1800	—	—	2632	7	530	2632	1800	1737	744	0.43
50-603503	397	70	5200	1300	1100	2100	1600	—	—	—	6	70	5200	1450	1895	1753	0.93
50-603503	450	910	1500	3200	2000	2400	3400	—	—	3115	7	910	3400	2400	2361	943	0.4
50-613182	500	—	—	—	—	—	4500	6100	8800	—	3	4500	8800	6100	6467	2173	0.34
50-613182	550	—	—	—	—	31	3600	4700	4100	3491	4	3491	4700	3850	3973	553	0.14
50-613182	600	—	—	—	—	2.2	5.2	110	48	—	3	5.2	110	48	54	53	0.97
50-613182	620	—	—	—	—	290	2.1 (U)	1200	1500	—	4	0	1500	745	748	716	0.96
50-613182	632.5	—	—	—	—	23 (U)	4.6	2.1 (U)	4.9	6.98	3	4.6	6.98	4.9	5.49	1.30	0.24
50-613183	30	—	—	—	—	14,000	11,000	—	13,000	—	3	11,000	14,000	13,000	12,667	1528	0.12
50-613183	500	—	—	—	—	16,000 (J-)	1500	19,000	20,000	—	4	1500	20,000	17,500	14,125	8587	0.61
50-613183	550	—	—	—	—	6500	15,000	2600	4500	3813	5	2600	15,000	4500	6483	4967	0.77
50-613183	600	—	—	—	—	1400	7000	8300	10,000	—	4	1400	10,000	7650	6675	3725	0.56
50-613183	630	—	—	—	—	1400	7500	2800	3200	—	4	1400	7500	3000	3725	2632	0.71
50-613183	642.5	—	—	—	—	58 (U)	39	93	94	96.67	4	39	96.67	93.5	81	28	0.34
50-613184	30	—	—	—	—	2700 (J-)	2100	—	6200	—	3	2100	6200	2700	3667	2214	0.6
50-613184	500	—	—	—	—	3400	3000	720	4900	4296	5	720	4900	3400	3263	1605	0.49
50-613184	550	—	—	—	—	2000 (J-)	1800	220	2200	—	4	220	2200	1900	1555	905	0.58
50-613184	600	—	—	—	—	680 (J-)	580	1100	880	698.2	5	580	1100	698.2	788	205	0.26
50-613184	652	—	—	—	—	150 (J-)	160	17	320	—	4	17	320	155	162	124	0.77
50-613184	664.5	—	—	—	—	31 (J-)	61	33	120	102	5	31	120	61	69	40	0.58

Table D-2.1-1 (continued)

Location ID	Depth (ft bgs)	Results									Statistics						
		FY10Q2	FY10Q3	FY10Q4	FY11Q1	FY11Q2	FY11Q3	FY11Q4	FY12Q1	FY12Q2	Count	Minimum	Maximum	Median	Mean	Standard Deviation	Coefficient of Variation
50-613185	85	—	—	—	—	—	460	—	4100	—	2	460	4100	2280	2280	2574	1.13
50-613185	145	—	—	—	—	3500	3700	—	5600	5317	4	3500	5600	4508.5	4529	1082	0.24
50-613185	205	—	—	—	—	2.1 (U)	2900	—	9600	—	2	2900	9600	6250	6250	4738	0.76
50-613185	235	—	—	—	—	9.1 (U)	7100	—	10,000	8593	3	7100	10,000	8593	8564	1450	0.17
50-613185	280	—	—	—	—	27	4500	—	15,000	—	2	4500	15,000	9750	9750	7425	0.76
50-613185	350	—	—	—	—	29	3100	3900	4500	4243	4	3100	4500	4071.5	3936	609	0.15
50-613185	450	—	—	—	—	930	1400	1300	52	1719	5	52	1719	1300	1080	640	0.59
50-613185	600	—	—	—	—	110	120	110	140	145	5	110	145	120	125	17	0.13
50-613185	675	—	—	—	—	2.1 (U)	26	37	42	—	3	26	42	37	35	8	0.23
50-613185	688	—	—	—	—	18	16	10	38	—	4	10	38	17	21	12	0.59

Note: Units are µg/m^3. Data qualifiers are defined in Appendix A. Shading indicates results omitted from analysis because of suspected low bias from drilling effects.

[a] — = Not sampled.

[b] na = Not available.

Table D-2.1-2
Mann-Kendall Trend Analysis and Tier II Screening Results

Location ID	Depth (ft bgs)	Mann-Kendall Results			Tier II Screening Results		
		S Statistic	Confidence	Trend	Mean	Tier II SL	Ratio[a]
50-24784	25	na[b]	na	No Trend	1059	62,946	0.02
50-24784	96	0.601	73	No Trend	2971	59794	0.05
50-24784	155	na	na	No Trend	3325	57,174	0.06
50-24784	215	-1.202	89	No Trend	4160	54,510	0.08
50-24784	244	-0.866	81	No Trend	4377	53,223	0.08
50-24784	289	2.886	100	Increasing	4771	51,225	0.09
50-24784	362	-1.113	87	No Trend	2793	47,984	0.06
50-24784	411	0.956	83	No Trend	1683	45,808	0.04
50-24784	450	na	na	No Trend	1050	44,077	0.02
50-24813	25	1.247	89	No Trend	26,495	62,946	0.42
50-24813	99	1.502	93	No Trend	39,429	59,661	0.66
50-24813	150	0.866	81	No Trend	43,804	57,396	0.76
50-24813	207	na	na	No Trend	69,600	54,866	1.27
50-24813	241	0.3	62	No Trend	69,988	53,356	1.31
50-24813	286	1.715	96	Increasing	71,800	51,358	1.4
50-24813	358	1.361	91	No Trend	45,088	48,162	0.94
50-24813	408	-0.371	65	No Trend	37,750	45,942	0.82
50-24813	450	0.938	83	No Trend	13,633	44,077	0.31
50-24813	600	1.367	91	No Trend	2380	37,417	0.06
50-24822	25	0.249	60	No Trend	9220	62,946	0.15
50-24822	81	-1.812	97	Decreasing	9550	60,460	0.16
50-24822	142	-0.3	62	No Trend	17,906	57,752	0.31
50-24822	204	1.23	89	No Trend	29571	54,999	0.54
50-24822	235	1.528	94	No Trend	28,340	53,623	0.53

Table D-2.1-2 (continued)

Location ID	Depth (ft bgs)	Mann-Kendall Results			Tier II Screening Results		
		S Statistic	Confidence	Trend	Mean	Tier II SL	Ratio[a]
50-24822	280	0.456	68	No Trend	29,429	51,625	0.57
50-24822	351	1.975	98	Increasing	17,103	48,472	0.35
50-24822	402	−0.735	77	No Trend	6380	46,208	0.14
50-24822	450	1.202	89	No Trend	8677	44,077	0.2
50-603061	25	2.703	100	Increasing	338	62,946	0.01
50-603061	76	−0.201	58	No Trend	1451	60,682	0.02
50-603061	128	1.367	91	No Trend	1788	58,373	0.03
50-603061	190	0	50	No Trend	2273	55,620	0.04
50-603061	228	−0.601	73	No Trend	2799	53,933	0.05
50-603061	274	−0.191	58	No Trend	1733	51,891	0.03
50-603061	347	1.671	95	Increasing	1202	48,650	0.02
50-603061	397	0	50	No Trend	1072	46,430	0.02
50-603061	450	0.601	73	No Trend	482	44,077	0.01
50-603062	25	−1.339	91	No Trend	1517	62,946	0.02
50-603062	64	1.339	91	No Trend	3015	61,215	0.05
50-603062	122	0.901	82	No Trend	5535	58,639	0.09
50-603062	184	−0.751	77	No Trend	5000	55,887	0.09
50-603062	217	0.601	73	No Trend	5165	54,422	0.09
50-603062	263	1.127	87	No Trend	4345	52,379	0.08
50-603062	337	0.456	68	No Trend	1679	49,094	0.03
50-603062	387	0.574	72	No Trend	1347	46,874	0.03
50-603062	450	0.901	82	No Trend	499	44,077	0.01
50-603063	25	0.601	73	No Trend	2210	62,946	0.04
50-603063	76	1.127	87	No Trend	6050	60,682	0.1
50-603063	128	1.802	96	Increasing	7420	58,373	0.13
50-603063	190	0.376	65	No Trend	14,270	55,620	0.26

Table D-2.1-2 (continued)

Location ID	Depth (ft bgs)	Mann-Kendall Results			Tier II Screening Results		
		S Statistic	Confidence	Trend	Mean	Tier II SL	Ratio[a]
50-603063	228	1.127	87	No Trend	14,473	53,933	0.27
50-603063	274	0.376	65	No Trend	17,733	51,891	0.34
50-603063	347	1.367	91	No Trend	7056	48,650	0.15
50-603063	397	0	50	No Trend	5833	46,430	0.13
50-603063	450	0.901	82	No Trend	7156	44,077	0.16
50-603064	25	0	50	No Trend	3686	62,946	0.06
50-603064	66	0.601	73	No Trend	6257	61,126	0.1
50-603064	113	1.856	97	Increasing	23,575	59,039	0.4
50-603064	176	1.202	89	No Trend	36,429	56,242	0.65
50-603064	214	1.113	87	No Trend	24,300	54,555	0.45
50-603064	259	2.103	98	Increasing	23,743	52,557	0.45
50-603064	332	1.113	87	No Trend	11,275	49,316	0.23
50-603064	482	0.34	63	No Trend	6114	42,656	0.14
50-603064	500	0.88	81	No Trend	1161	41,857	0.03
50-603383	26	0.839	80	No Trend	1209	62,902	0.02
50-603383	85	2.351	99	Increasing	2363	60,282	0.04
50-603383	139	0.866	81	No Trend	4011	57,885	0.07
50-603383	206	0.124	55	No Trend	4638	54,910	0.08
50-603383	244	0.124	55	No Trend	5896	53,223	0.11
50-603383	286	1.802	96	Increasing	3143	51,358	0.06
50-603383	359	0.73	77	No Trend	830	48,117	0.02
50-603383	408	0.124	55	No Trend	1170	45,942	0.03
50-603383	450	0.748	77	No Trend	1321	44,077	0.03
50-603467	26	1.225	89	No Trend	5560	62,902	0.09
50-603467	91	1.098	86	No Trend	10,217	60,016	0.17
50-603467	143	1.339	91	No Trend	14,673	57,707	0.25

Table D-2.1-2 (continued)

Location ID	Depth (ft bgs)	Mann-Kendall Results			Tier II Screening Results		
		S Statistic	Confidence	Trend	Mean	Tier II SL	Ratio[a]
50-603467	206	0.604	73	No Trend	19,617	54,910	0.36
50-603467	244	0.751	77	No Trend	23,873	53,223	0.45
50-603467	287	na	na	No Trend	18,540	51,314	0.36
50-603467	360	1.127	87	No Trend	20,435	48,073	0.43
50-603467	409	0.376	65	No Trend	10,117	45,897	0.22
50-603467	500	0.456	68	No Trend	5569	41,857	0.13
50-603467	600	0.601	73	No Trend	3616	37,417	0.1
50-603468	30	na	na	No Trend	28	62,724	0.0004
50-603468	92	0.376	65	No Trend	6917	59,971	0.12
50-603468	142	1.802	96	Increasing	10,929	57,752	0.19
50-603468	198	2.103	98	Increasing	19,057	55,265	0.34
50-603468	233	1.671	95	Increasing	24,657	53,711	0.46
50-603468	282	2.352	99	Increasing	25,800	51,536	0.5
50-603468	354	1.147	87	No Trend	25,029	48,339	0.52
50-603468	403	1.527	94	No Trend	19,959	46,164	0.43
50-603468	450	1.885	97	Increasing	14,338	44,077	0.33
50-603470	30	2.104	98	Increasing	13,117	62,724	0.21
50-603470	83	−0.628	74	No Trend	16071	60371	0.27
50-603470	143	0.901	82	No Trend	34,857	57,707	0.6
50-603470	203	0.371	65	No Trend	37,753	55,043	0.69
50-603470	233	0	50	No Trend	52,167	53,711	0.97
50-603470	278	1.113	87	No Trend	57181	51,713	1.11
50-603470	351	2.103	98	Increasing	33910	48,472	0.7
50-603470	450	0.866	81	No Trend	20,649	44,077	0.47
50-603470	600	1.155	88	No Trend	1640	37,417	0.04
50-603470	650	0.839	80	No Trend	61	35,197	0.002

Table D-2.1-2 (continued)

Location ID	Depth (ft bgs)	Mann-Kendall Results			Tier II Screening Results		
		S Statistic	Confidence	Trend	Mean	Tier II SL	Ratio[a]
50-603471	30	0	50	No Trend	14,633	62,724	0.23
50-603471	90	0.601	73	No Trend	23,553	60,060	0.39
50-603471	146	1.503	93	No Trend	48,167	57,574	0.84
50-603471	209	0.619	73	No Trend	39,938	54,777	0.73
50-603471	242	0	50	No Trend	49,841	53,312	0.93
50-603471	288	0.901	82	No Trend	57,974	51,269	1.13
50-603471	360	na	na	No Trend	40,271	48,073	0.84
50-603471	410	0.124	55	No Trend	36,875	45,853	0.8
50-603471	450	0.419	66	No Trend	34,193	44,077	0.78
50-603472	27	−1.745	96	No Trend	3541	62,857	0.06
50-603472	93	−0.901	82	No Trend	5617	59,927	0.09
50-603472	146	0	50	No Trend	10,356	57,574	0.18
50-603472	210	−1.879	97	Decreasing	13,217	54,732	0.24
50-603472	247	0	50	No Trend	13,243	53,090	0.25
50-603472	292	−1.127	87	No Trend	28,743	51,092	0.56
50-603472	364	−0.39	65	No Trend	15,510	47,762	0.32
50-603472	414	0.307	62	No Trend	17,714	45,675	0.39
50-603472	450	0	50	No Trend	12,599	44,077	0.29
50-603503	25	−0.574	72	No Trend	2027	62,946	0.03
50-603503	80	0	50	No Trend	2400	60,504	0.04
50-603503	133	0	50	No Trend	2075	58,151	0.04
50-603503	198	0.751	77	No Trend	3517	55,265	0.06
50-603503	237	1.202	89	No Trend	5853	53,534	0.11
50-603503	278	1.127	87	No Trend	4248	51,713	0.08
50-603503	347	1.367	91	No Trend	1737	48,650	0.04
50-603503	397	0.376	65	No Trend	1895	46,430	0.04

Table D-2.1-2 (continued)

Location ID	Depth (ft bgs)	Mann-Kendall Results			Tier II Screening Results		
		S Statistic	Confidence	Trend	Mean	Tier II SL	Ratio[a]
50-603503	450	1.802	96	Increasing	2361	44,077	0.05
50-613182	500	1.044	85	No Trend	6467	41,857	0.15
50-613182	550	−0.34	63	No Trend	3973	39,637	0.1
50-613182	600	0	50	No Trend	54	37,417	0.001
50-613182	620	1.019	85	No Trend	748	36,529	0.02
50-613182	632.5	−1.044	85	No Trend	3.3	35,974	0.00009
50-613183	30	0	50	No Trend	12,667	62,724	0.2
50-613183	500	1.019	85	No Trend	14,125	41,857	0.34
50-613183	550	−0.735	77	No Trend	6483	39,637	0.16
50-613183	600	1.698	96	Increasing	6675	37,417	0.18
50-613183	630	0.34	63	No Trend	3725	36,085	0.1
50-613183	642.5	1.698	96	Increasing	81	35,530	0.002
50-613184	30	0	50	No Trend	3667	62,724	0.06
50-613184	500	0.245	60	No Trend	3263	41,857	0.08
50-613184	550	na	na	No Trend	1555	39,637	0.04
50-613184	600	0.245	60	No Trend	788	37,417	0.02
50-613184	652	0.34	63	No Trend	162	35,109	0.004
50-613184	664.5	1.225	89	No Trend	69	34,554	0.002
50-613185	85	0	50	No Trend	2280	60,282	0.04
50-613185	145	1.019	85	No Trend	4529	57,618	0.08
50-613185	205	0	50	No Trend	6250	54,954	0.11
50-613185	235	0	50	No Trend	8564	53,623	0.16
50-613185	280	0	50	No Trend	9750	51,625	0.19
50-613185	350	1.019	85	No Trend	3936	48,517	0.08
50-613185	450	0.245	60	No Trend	1080	44,077	0.02
50-613185	600	1.516	94	No Trend	125	37,417	0.003

Table D-2.1-2 (continued)

Location ID	Depth (ft bgs)	Mann-Kendall Results			Tier II Screening Results		
		S Statistic	Confidence	Trend	Mean	Tier II SL	Ratio[a]
50-613185	675	1.044	85	No Trend	35	34,087	0.001
50-613185	688	na	na	No Trend	21	33,510	0.0006

Note: Concentrations in µg/m^3.

[a] Ratio = Mean concentration / Tier II screening level.

[b] na = Not available.

Table D-2.3-1
MDA C Strata-Specific Properties Affecting Mass Estimates

Geologic Zone	Porosity[a]	Volumetric Water Contents[b]	Air-Filled Porosity	Bulk Density[a] (g/cm^3)	Fraction Organic Carbon[c]
Soil	0.4	0.05	0.35	1.5	0.0005
Qbt 3	0.41	0.02	0.39	1.4	0.0005
Qbt 2	0.41	0.02	0.39	1.4	0.0005
Qbt 1vu	0.49	0.01	0.48	1.2	0.0005
Qbt 1vc	0.49	0.1	0.39	1.1	0.0005
Qbt 1g	0.46	0.08	0.38	1.2	0.0005
Qbtt	0.45	0.14	0.31	1.2	0.0005
Qct	0.45	0.14	0.31	1.2	0.0005
Qbof	0.44	0.11	0.33	1.2	0.0005
Qbog	0.67	0.2	0.47	0.8	0.0005
Tvt2	0.001	0.0005	0.0005	2.7	0.0005

[a] Mean values from Springer (2005, 098534).

[b] Mean values from Hollis et al. (1997, 063131).

[c] Estimate.

Table D-3.0-1
MDA C TCE Mass Estimates by Geologic Zone

Geologic Unit		Gas	Aqueous	Sorbed	Total
		kg (%)	kg (%)	kg (%)	kg (min–max)
Shallow	Soil	0.1 (58)	0 (21)	0 (21)	0 (0–0)
	Qbt 3	11.2 (70)	1.4 (9)	3.4 (21)	16 (11–22)
	Qbt 2	17.1 (70)	2.2 (9)	5.2 (21)	24 (18–32)
	Qbt 1vu	21.4 (79)	1.1 (4)	4.5 (17)	27 (20–35)
	Qbt 1vc	4.5 (53)	2.9 (34)	1.1 (13)	8 (6–11)
	Qbt 1g	24.3 (56)	12.8 (29)	6.5 (15)	44 (32–57)
	Qbtt	0.8 (41)	0.9 (46)	0.3 (13)	2 (1–3)
	Subtotal	**79.4 (65)**	**21.4 (18)**	**21 (17)**	**122 (89–160)**
Deep	Qct	12.8 (41)	14.5 (46)	4.2 (13)	32 (23–41)
	Qbof	13.6 (47)	11.3 (39)	4.2 (14)	29 (22–38)
	Qbog	0 (45)	0 (48)	0 (7)	0 (0–0)
	Tvt 2	0 (0)	0 (1)	0 (99)	0 (0–0)
	Subtotal	**26.4 (44)**	**25.8 (43)**	**8.4 (14)**	**61 (45–79)**
Grand Total		**105.8 (58)**	**47.2 (26)**	**29.4 (16)**	**182 (134–239)**

Appendix E

Constituents Detected in Deep Wells
in the Material Disposal Area C Monitoring Group

E-1.0 INTRODUCTION

This appendix discusses constituents detected during the monitoring of groundwater in wells assigned to the monitoring group for Material Disposal Area (MDA) C in Technical Area 50 (TA-50). Groundwater monitoring at Los Alamos National Laboratory (LANL or the Laboratory) is currently conducted in accordance with the 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1 (hereafter, the 2011 IFGMP, Revision 1) (LANL 2011, 208811). Wells assigned to the MDA C monitoring group include three regional (hereafter, "deep") wells: R-14, R-46, and R-60. No perched-intermediate water has been encountered in boreholes advanced to approximately 600 ft below ground surface (bgs) at this site (LANL 2007, 099128; LANL 2011, 204370). R-17 is also included in this discussion as a nonimpacted well that provides a point of comparison for wells at MDA C. R-17 is part of the general surveillance monitoring group in the 2011 IFGMP, Revision 1, with a stated purpose of monitoring MDA C and other potential sources in the upper Pajarito watershed. Table E-1.0-1 summarizes information about screened intervals and sampling systems installed in these wells and the range of sampling dates for which water-quality data are available.

- Section E-2.0 outlines an approach for conducting reliability assessments of deep monitoring wells to determine their capability for producing reliable water-quality samples and to identify any potential effects of well installation, rehabilitation, or sampling protocol on data quality.
- Section E-3.0 summarizes the results of reliability assessments of the deep wells and addresses the capability of each screen to provide reliable data for potential contaminants. Geochemical trend plots and tritium data are included here to support these assessments.
- Section E-4.0 summarizes chemicals of potential concern (COPCs) detected in water-quality samples from these wells. COPC detections in groundwater are then compared with those known or potentially expected to be present in the vadose zone below MDA C, and potential sources of the COPCs detected in groundwater are discussed.
- Section E-5.0 presents conclusions concerning the transport of COPCs from the vadose zone below MDA C to the deep groundwater downgradient based on the data evaluations in sections E-3.0 and E-4.0.

E-2.0 RELIABILITY ASSESSMENT PROTOCOL

The specific objective of a reliability assessment is to determine the current effectiveness of a deep well (including its sampling system) as it relates to the water-quality data objectives of the specific monitoring group to which it is assigned, which, in this case, is MDA C. Data examined for the assessment include field parameters monitored during purging before sample collection, field parameters associated with samples at the time of collection, major ion concentrations, trace metal concentrations, and detections of organic constituents. These data have previously been reported in periodic monitoring reports for Mortandad and Sandia watersheds (e.g., LANL 2012, 211398), Pajarito watershed (e.g., LANL 2012, 209530), and the MDA C Monitoring Group (e.g., LANL 2012, 218416). The assessments are based on site-specific geochemical criteria and generally focus on data collected for the most recent sampling events. Each category of data is described below in greater detail.

Field parameters. Time-series data for field parameters monitored during purging before sample collection are examined for attaining stable values by the end of purging, and time-series trends are also compared for a sequence of events at the same location. Stabilization criteria are prescribed in Standard Operating Procedure (SOP) 20032, Groundwater Sampling, and are derived from the stabilization criteria

recommended by the U.S. Environmental Protection Agency (EPA) (Yeskis and Zavala 2002, 204429) and from the Compliance Order on Consent (the Consent Order). The most sensitive indicator parameters are dissolved oxygen (DO) and turbidity (in nephelometric turbidity units [NTU]). Other parameters such as water temperature, specific conductance, pH, and oxidation-reduction potential (ORP) are also monitored but are considered less sensitive indicators of formation water.

Inorganic analytes. Analytical data for common inorganic ions and trace metals are examined for stability and for excursions from background concentrations, including the following:

- trends in concentrations of key indicators for the presence of residual drilling or construction products used in the screened interval, such as sodium (Na), chloride (Cl), sulfate (SO_4), and total organic carbon (TOC);
- trends in relative concentrations of major ions for identifying mixing of waters with different compositions; and
- comparison of concentrations for major ions and selected trace metals with concentration ranges for plateau-scale and site-specific background groundwater, as described below, to identify possible excursions from expected geochemical conditions.

Concentration trends may be depicted using time-series plots, standard trilinear diagrams, or modified Schoeller plots.

- Trilinear diagrams, also called Piper plots, show major ions as percentages of milliequivalents (meq) in two base triangles. The total cations and the total anions are set equal to 100%, and the data points in the two triangles are projected onto an adjacent grid. The main purpose of the Piper diagram is to show clustering of data points to indicate samples with similar compositions.
- Schoeller plots are semilogarithmic diagrams originally developed to represent major ion analyses in meq/L and to show different hydrochemical water types on the same diagram. This type of graphical representation has the advantage that, unlike the trilinear diagrams, actual sample concentrations are displayed and compared. The modified Schoeller plot used for the reliability assessment represents analyses as mg/L or µg/L to avoid the need to make assumptions about ion speciation, which may be particularly problematic for trace metals.

Organic analytes. Detections of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) are compiled for examination of temporal trends, evidence for the presence of residual organic drilling materials, and detections of area-specific COPCs.

Field documentation. As appropriate, field notes, groundwater sampling logs, and sample collection logs for each sampling event also may be examined for observations about unusual odors, colors, or other indications of impacted water samples.

Tritium. Tritium activities in groundwater are commonly used to evaluate the presence of a component of modern water or a contaminant plume in the screened interval. The presence or absence of tritium at a location may provide a useful tracer of flow and transport pathways because it travels conservatively in groundwater.

Stable isotopes. Stable Isotopes can act as groundwater tracers (nitrogen) and provide information about the source of waters, recharge elevations, and evaporation trends (deuterium and oxygen). Analytical uncertainties are ±0.20‰ for $\delta^{18}O$, ±1.00‰ for δD, ±0.25‰ for $\delta^{15}N$, and ±0.90‰ for $\delta^{18}O\text{-}NO_3$ on replicate analyses.

Plateau-scale background values for assessment. For naturally occurring analytes, statistical summaries of water-quality data for background groundwater locations establish an upper bound of concentrations against which data from the assessed wells are compared as a preliminary assessment step. Upper bounds of plateau-scale background values used in the reliability assessments are established by the upper tolerance limit (UTL) in the Groundwater Background Investigation Report, Revision 3 (hereafter, GBIR, R3) (LANL 2007, 095817), the most recent NMED-approved background report (LANL 2007, 095817). Some naturally occurring constituents do not have numerical background values that are based on UTLs in GBIR, R3 because the data do not meet the statistical criteria for UTL calculations.

Site-specific background values for assessment. Reliability may be assessed with greater specificity by comparing analytical concentrations with those in groundwater from other deep wells in sufficiently similar hydrogeologic settings and at which effects from downhole materials or local contaminants are known to be absent or negligible. The approach allows for the inclusion of wells not hydraulically upgradient of the well being assessed. This is similar to the interwell comparison approach described in sections 5.2.4 and 6.3.2 of the EPA guidance document, "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities" (also known as the "Unified Guidance") (EPA 2009, 110369).

The site-specific background values developed and used in the Reliability Assessment for Well R-47i (LANL 2011, 201564) are considered appropriate for the MDA C monitoring group as well. In that report, groundwater background values were derived from data for deep wells screened in the Puye Formation (Tpf) or the Cerro Toledo interval (Qct). This set of background values can be viewed as representative of deep groundwater in these lithologic units where they underlie the central Pajarito Plateau in an area bounded approximately by Mortandad and Water Canyons between NM 4 and NM 501. The 5^{th} and 95^{th} percentile concentrations calculated from the Tpf-Qct data set are included on the Schoeller plots in section E-3.0 to facilitate quick visual identification of possible excursions from background geochemical conditions.

E-3.0 GEOCHEMICAL PERFORMANCE OF MONITORING WELLS

This section applies the reliability assessment protocol described in section E-2.0 to assess the geochemical performance of the three monitoring wells for MDA C and R-17 using the most recent water-quality samples from each well. Key observations are summarized below, focusing on the capability of each well to provide reliable data for COPCs known to be present in the vadose zone beneath MDA C based on core samples and vapor monitoring. As discussed in section 3.2.4 and Appendix D of this report, the primary vapor-phase contaminants present beneath MDA C are trichloroethene (TCE) and tritium. No evidence of groundwater contamination was found in the regional aquifer. All the monitoring wells for MDA C are deep regional wells that are screened in the Puye Formation at elevations between 5830 ft and 5900 ft above mean sea level. These wells have similar groundwater chemistries that are typical of deep groundwater on the Pajarito Plateau (Figure E-3.0-1).

For convenience, most water-quality data used in these assessments are compiled into the following tables:

- Purge volumes and final field parameters (Table E-3.0-1)
- General inorganic constituents (Table E-3.0-2)
- Trace metals (Table E-3.0-3)
- Tritium and stable isotopes (Table E-3.0-4)

E-3.1 Well R-14

Well R-14, completed in December 2002, includes one interval screened in the regional aquifer in the Puye Formation at the contact with Miocene-age pumiceous sediments. This well is located northeast of MDA C, upgradient of supply well PM-5. It is downgradient of the Radioactive Liquid Waste Treatment Facility at TA-50 and former radioactive liquid waste and septic facilities at TA-35 (LANL 2003, 076062). Well R-14 monitors for potential contaminants from Ten Site Canyon or upper Mortandad Canyon.

R-14 was equipped with a nonpurgeable Westbay sampling system until 2008 (Table E-1.0-1). The well was recompleted to a single screen well and converted to a purgeable sampling configuration in May 2008 (LANL 2008, 101462). Its lower screen was plugged and abandoned at that time. These actions were recommended in the Mortandad Canyon Groundwater Monitoring Well Network Evaluation, Revision 1 (LANL 2007, 099128) because both screens showed reducing conditions. The assessments presented below apply to the current sampling configuration.

R-14 is capable of providing reliable water-quality data for COPCs detected in the vadose zone beneath MDA C based on the following observations for recent sampling events.

- Field parameters meet stability criteria when the screen is purged in accordance with SOP-20032 (Figure E-3.1-1).
- Oxic conditions are present as indicated, for example, by consistent detections of DO >2 mg/L, NO_3+NO_2-N >0.2 mg/L, and ClO_4 >0.2 µg/L (Tables E-3.0-1 and E-3.0-2).
- No evidence is observed of the presence of residual organic materials. TOC <1 mg/L (Table E-3.0-2), NH_3-N ≤0.1 mg/L, total Kjeldahl nitrogen (TKN) ≤0.1 mg/L, and acetone is not detected.
- No evidence is observed of the presence of residual inorganic drilling or construction products. Concentrations of Na, Cl, SO_4, and total dissolved solids (TDS) (Table E-3.0-2; Figure E-3.1-2) are stable and below UTLs for regional background groundwater.
- No evidence is observed of the presence of a significant quantity of formation solids in water-quality samples. Turbidity is stable and <5 NTU (Table E-3.0-1). Al and Fe concentrations are nondetect or below the practical quantitation limit (PQL) in filtered and unfiltered samples (Table E-3.0-3; Figure E-3.1-2).
- Stable isotopes for NO_3 are within groundwater background values, and stable isotope values for water ($\delta^{18}O$ and $\delta^{2}H$) are stable within analytical uncertainties (Table E-3.0-4).
- No evidence is observed of the presence of local contamination at this location. TCE and tritium are not detected (Table E-3.0-4; section E-4.2).

E-3.2 Well R-46

Well R-46, installed in February 2009, consists of a single screen in the regional aquifer within the Puye Formation. It is located on a mesa between Mortandad and Pajarito Canyons, upgradient of supply well PM-5 and 880 ft downgradient of MDA C.

R-46 is capable of providing reliable water-quality data for COPCs detected in the vadose zone beneath MDA C based on the following observations.

- Field parameters meet stability criteria when the screen is purged in accordance with SOP-20032 (Figure E-3.2-1).
- Oxic conditions are present as indicated, for example, by consistent detections of DO >2 mg/L, NO_3+NO_2-N >0.2 mg/L, and ClO_4 >0.2 µg/L (Tables E-3.0-1 and E-3.0-2).
- No evidence is observed of the presence of residual organic materials in the most recent samples although they appear to have been present in earlier sampling events based on slightly elevated TOC concentrations (Table E-3.0-2) and detections of acetone and/or toluene in samples through July 2010. In addition, NH_3-N <0.1 mg/L and TKN ≤0.1 mg/L for all sampling events.
- No evidence is observed of the presence of residual inorganic drilling or construction products. Concentrations of Na, Cl, SO_4, and TDS are stable and below UTLs for regional background groundwater (Table E-3.0-2; Figure E-3.2-2).
- No evidence is observed of the presence of a significant quantity of formation solids in water-quality samples. Turbidity is stable and <5 NTU (Table E-3.0-1). Aluminum and iron concentrations are nondetect in filtered and unfiltered samples (Table E-3.0-3; Figure E-3.2-2).
- Stable isotopes for NO_3 are within groundwater background values, and stable isotope values for water ($\delta^{18}O$ and $\delta^{2}H$) are stable within analytical uncertainties (Table E-3.0-4).
- No evidence is observed of the presence of local contamination at this location. TCE is not detected, nor has tritium been detected in recent samples (Table E-3.0-4; section E-4.2).

E-3.3 Well R-60

Well R-60, installed in October 2010, consists of a single screen in the regional aquifer within the Puye Formation. It is located on a mesa between Mortandad and Pajarito Canyons, 100 ft downgradient of MDA C and upgradient of well R-46.

R-60 is capable of providing reliable water-quality data for COPCs detected in the vadose zone beneath MDA C based on the following observations.

- Field parameters meet stability criteria when the screen is purged in accordance with SOP-20032 (Figure E-3.3-1).
- Oxic conditions are present as indicated, for example, by consistent detections of DO >2 mg/L, NO_3+NO_2-N >0.2 mg/L, and ClO_4 >0.2 µg/L by the end of purging 3 casing volumes (Tables E-3.0-1 and E-3.0-2).
- No evidence is observed of the presence of residual organic materials in the most recent samples although they appear to have been present in the screened interval in earlier sampling events based on slightly elevated TOC concentrations (Table E-3.0-2) and the detection of acetone (section E-4.2). In addition, NH_3-N <0.1 mg/L and TKN ≤0.1 mg/L for all sampling events.
- No evidence is observed of the presence of residual inorganic drilling or construction products. Concentrations of Na, Cl, SO_4, and TDS (Table E-3.0-2; Figure E-3.3-2) are stable and below UTLs for regional background groundwater.
- Formation solids are not present in any significant quantity. Aluminum and iron concentrations are nondetect or below the PQL in filtered and unfiltered samples (Table E-3.0-3; Figure E-3.3-2) for recent sampling events. Turbidity is stable and <5 NTU (Table E-3.0-1).

- The average stable isotope values for NO_3 are generally within regional aquifer background values although slightly more variable than is typical, similar to the variability observed in NO_3+NO_3 concentrations at this well (Tables E-3.0-2 and E-3.0-4). Stable isotope values for water ($\delta^{18}O$ and $\delta^{2}H$) are stable within analytical uncertainties (Table E-3.0-4).
- No evidence is observed of the presence of local contamination at this location. TCE and tritium are not detected (Table E-3.0-4; section E-4.2).

E-3.4 Well R-17

Well R-17 was completed on January 4, 2006. It has two screens in the regional aquifer within the Puye Formation. R-17 is located in the middle of Pajarito Canyon below the confluence with Twomile Canyon about 1 mi southwest of supply well PM-5.

Both screens in R-17 are capable of providing reliable water-quality data for COPCs relevant to the vadose zone beneath MDA C based on the following observations.

- Oxic conditions are present in both screens as indicated, for example, by consistent detections of DO >2 mg/L, NO_3+NO_2-N ≥0.2 mg/L, and ClO_4 >0.2 µg/L by the end of purging 3 casing volumes (Tables E-3.0-1 and E-3.0-2; Figures E-3.4-1 and E-3.4-2).
- No evidence is observed of the presence of residual organic materials in either screen. TOC <1 mg/L (Table E-3.0-2), NH_3-N ≤0.1 mg/L, TKN ≤0.1 mg/L, and acetone is not detected.
- No evidence is observed of the presence of residual inorganic drilling or construction products in either screen. Concentrations of Na, Cl, SO_4, and TDS (Table E-3.0-2; Figure E-3.4-3 and E-3.4-4) are stable and below UTLs for regional background groundwater.
- No evidence is observed of the presence of a significant quantity of formation solids in water-quality samples from either screen. Turbidity is stable and <5 NTU (Table E-3.0-1). Aluminum and iron concentrations are nondetect or sporadically detected near or below the PQL in filtered and unfiltered samples (Table E-3.0-3; Figures E-3.4-3 and E-3.4-4).
- Stable isotopes for NO_3 are within groundwater background values, and stable isotope values for water ($\delta^{18}O$ and $\delta^{2}H$) are stable within analytical uncertainties for both screens (Table E-3.0-4).
- No evidence is observed of the presence of local contamination in either screen at this location. TCE has not been detected, and tritium has not been detected in samples collected since July 2007 (Table E-3.0-4; section E-4.2).

E-4.0 COPC DETECTIONS IN MDA C MONITORING WELLS

E-4.1 Screening Protocol

Sampling of the monitoring network wells for MDA C began in 2003 following the completion of well R-14. Well R-14 was drilled to characterize groundwater in Mortandad Canyon. Wells R-46 and R-60 were drilled in 2009 and 2010, respectively, with the specific objective of monitoring MDA C. Water-quality data from these wells are screened against the Laboratory's groundwater background values. For screening purposes, groundwater sampling results are also compared with the groundwater cleanup levels specified in Section VIII.A.1 of the Consent Order and described in section 5.1.2 of this report.

The outcome of the screening protocol is presented in frequency of detection tables that summarize detections of organic compounds as well as inorganic constituents detected above groundwater

background concentrations. The detection status for an analytical result is established using the combined set of laboratory-assigned validation qualifiers and reason codes assigned during data validation. For detected constituents, the screening tables include summary information such as the total number of samples collected for each analyte at the location where it was detected; the numbers of detections; the mean and maximum detected values; the number of detections exceeding groundwater background values (for naturally occurring inorganic constituents); the number of detections exceeding the lowest applicable regulatory or risk-based screening levels; and the number of detections exceeding one-half the lowest applicable screening levels. Analytical data for field duplicates are included in the statistics presented in the frequency of detection tables.

E-4.2 Organic COPC Detections

Table E-4.2-1 presents a summary of organic COPCs detected in MDA C wells. As shown in Table E-4.2-1, 12 organic constituents have been detected at least once in wells R-14, R-46, and/or R-60, including 9 SVOCs, 3 VOCs, and 1 explosive compound.

The majority of these cases are sporadic detections at low concentrations at or below the PQL of the analytical method. Of the 12 organic constituents, 6 have been detected more than once in the same screened interval, and it is important to note this statistic includes analytes detected in field duplicates such that 2 detections of a given analyte may occur in a single sampling event. Table E-4.2-2 summarizes the occurrences of the 6 organic constituents detected more than once at the same location for more than 1 sampling event. Table E-4.2-3 shows detected and nondetected organic analytes with PQLs greater than applicable regulatory standards or other screening levels.

Among the detected organic compounds, five have been detected at concentrations that exceed one-half the lowest applicable groundwater cleanup level (standard) determined following the approach in Section VIII of the Consent Order: benzo(a)anthracene (R-60); benzo(a)pyrene (R-60); benzo(b)fluoranthene (R-60); bis(2-ethylhexyl)phthalate (R-14 and R-46); and dibenz(a,h)anthracene (R-60) (Table E-4.2-1).

Among the detected organic compounds, four have been detected at concentrations that exceed the lowest applicable groundwater cleanup level (standard): benzo(a)pyrene (R-60); benzo(b)fluoranthene (R-60); and bis(2-ethylhexyl)phthalate (R-46); and dibenz(a,h)anthracene (R-60) (Table E-4.2-1).

Review of the data provided in Table E-4.2-1 show the following.

Benzo(a)anthracene

At well R-60, benzo(a)anthracene was detected at 0.29 µg/L in the field duplicate sample collected during the first sampling event in December 2010. This value is at the EPA tap water screening level of 0.29 µg/L and below the PQL of 1 µg/L. It was not detected in the regular sample for this same event, nor was it detected in any of the five subsequent samples.

Benzo(a)pyrene

At well R-60, benzo(a)pyrene was detected at 0.8 µg/L in both the regular and field duplicate samples collected at the first sample event in December 2010. This value is above the EPA maximum contaminant level (MCL) of 0.20 µg/L and below the PQL of 1 µg/L. It was not detected in any of the five subsequent samples.

Benzo(b)fluoranthene

The detections of benzo(b)fluoranthene at 0.8 µg/L above the EPA tap standard of 0.29 µg/L were from the regular and field duplicate samples collected at the first sample event in December 2010 at well R-60. This detection is below the PQL of 1 µg/L. It was not detected in any of the five subsequent samples.

Benzo(g,h,i)perylene

The detections of benzo(g,h,i)perylene at 0.4 µg/L were from the regular and field duplicate samples collected at the first sampling event in December 2010 at well R-60. This detection is below the PQL of 1 µg/L. It was not detected in any of the five subsequent samples.

Benzo(k)fluoranthene

Benzo(k)fluoranthene was detected at 0.4 µg/L at the first sampling event in December 2010 at well R-60. This value is below half of the EPA tap standard of 2.9 µg/L and the PQL of 1 µg/L. It was not detected in any of the five subsequent samples.

Bis(2-ethylhexyl)phthalate

The detections of bis(2-ethylhexyl)phthalate above the EPA MCL standard of 6 µg/L were from samples collected at R-46. Bis(2-ethylhexyl)phthalate has been detected in every sample from this well since it was installed, but the concentrations have been steadily decreasing. The highest concentrations of 96.4 µg/L and 77.4 µg/L were detected in two samples collected during the first sampling event in May 2009. Since then, concentrations have been steadily decreasing with the most recent sampling event in November 2011 having a concentration of 7.5 µg/L, which is above the EPA MCL standard but below the PQL of 10 µg/L.

E-4.3 Inorganic COPC Detections

All detections of trace metals were less than the applicable groundwater screening level (Table E-3.0-3).

E-4.4 Tritium Detections

Tritium was detected once at well R-46 in May 2010 at 37 pCi/L. It has not been detected in either of the two subsequent samples.

E-4.5 COPC Sources

The primary vapor-phase contaminants beneath MDA C are TCE and tritium. Of these COPCs, only tritium has been detected. A value of 37 pCi/L was detected in Well R-46 in May 2010. No tritium was detected in this well before May 2010, and tritium has not been detected in the two sampling events that have occurred since May 2010 for this well (July 2010 and November 2011).

Organic Chemicals from Residual Products or Materials Introduced Downhole

The detections of VOCs and SVOCs during first-year sampling events for wells R-46 and R-60 likely result from materials or chemical compounds introduced downhole during drilling and construction

activities and not from contaminants in the local groundwater. These organic compounds have not been detected during recent sampling events and all other geochemical indicators are good.

VOC and SVOC detections are often observed during the initial year of sampling or in the first year following screen rehabilitation and sampling-system conversion activities. In these cases, the analyte typically shows a maximum concentration in the first one or two sampling rounds and decreases steadily thereafter because of its gradual removal from the screen interval via advective flow, purging, and biodegradation. VOC detections frequently occur along with elevated concentrations of TOC, acetone, or other common indicators of residual organic products. Organic analytes that may be present as a result of products or materials introduced downhole include acetone, toluene, benzene, and the plasticizers bis(2-ethylhexyl)phthalate and diethylphthalate.

Sporadic Low-Level Detections

Some of the sporadic low-level detections may be the result of field or laboratory contamination or analytical errors. For example, acetone, 2-butanone, chloromethane, and toluene are among the VOCs detected with the greatest frequency in equipment blanks, field blanks, and field trip blanks collected during groundwater sampling events.

E-5.0 CONCLUSIONS

The analysis of existing groundwater monitoring data presented in this appendix shows no evidence of groundwater contamination in the regional aquifer below or downgradient of MDA C. In addition, the reliability assessment indicates the three deep monitoring wells in the MDA C monitoring group, R-14, R-46, and R-60, as well as nearby well R-17, are capable of producing reliable water-quality samples.

E-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. This information is also included in text citations. ER IDs 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 New Mexico Environment Department Hazardous Waste Bureau 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), August 2010. "Groundwater Background Investigation Report, Revision 4," Los Alamos National Laboratory document LA-UR-10-4827, Los Alamos, New Mexico. (LANL 2010, 110535)

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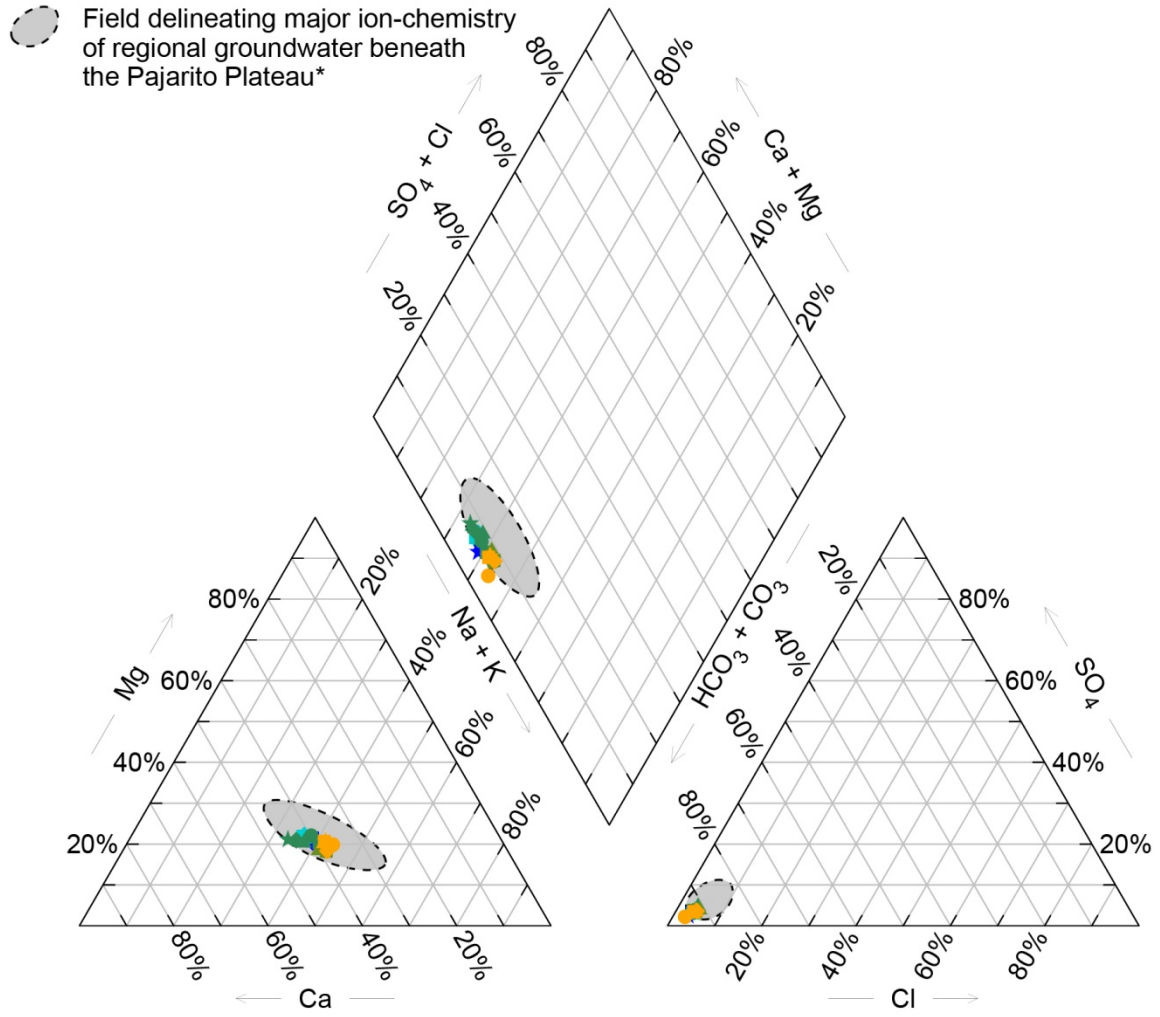
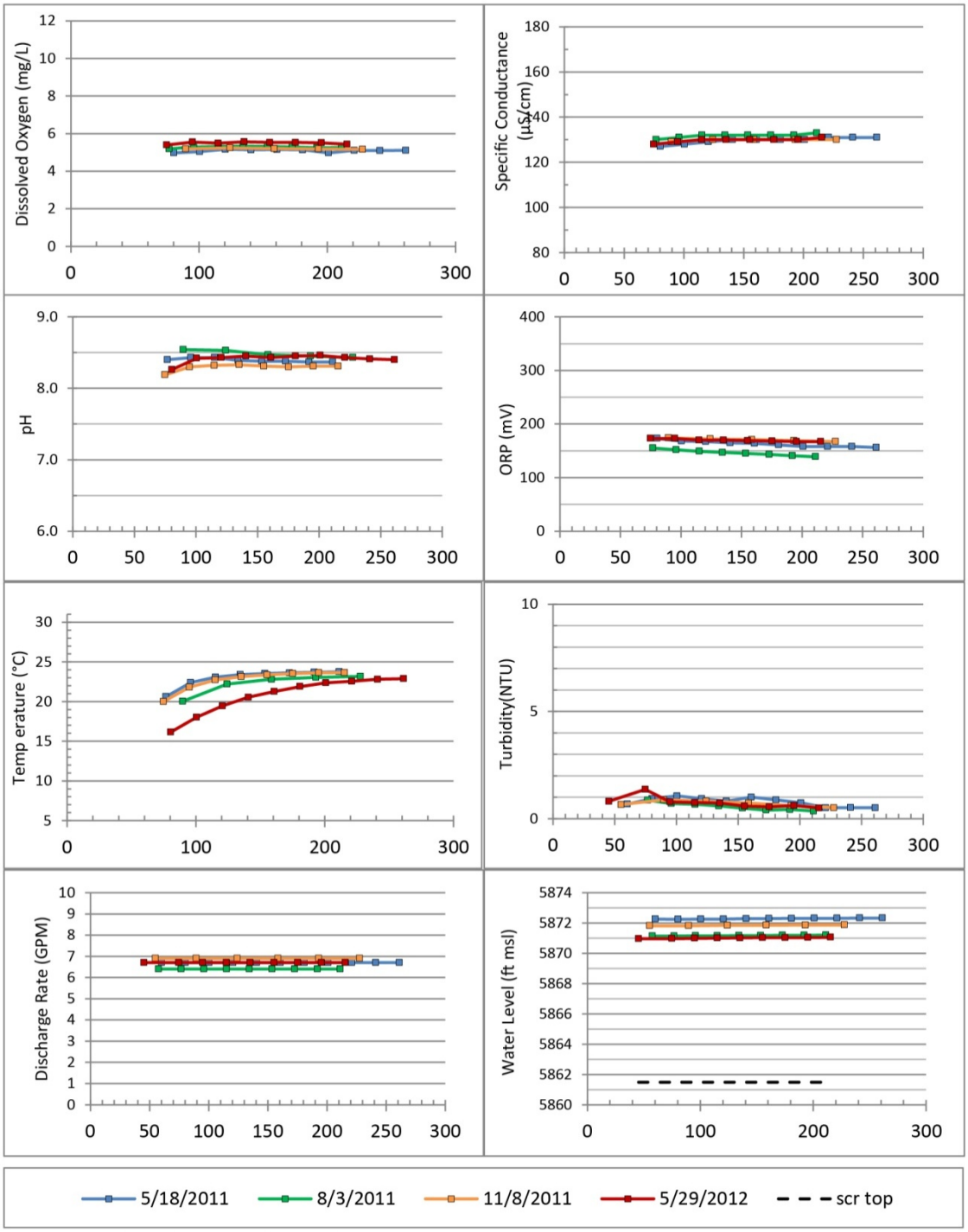


*Background location data for regional groundwater are from the Groundwater Background Investigation Report (GBIR R3 and GBIR R4), 2005–2010.

R–14 2/3/10	R–46 5/7/10	R–60 12/16/10	R–17 S1 3/8/10	R–17 S2 3/8/10
R–14 5/3/10	R–46 11/12/10	R–60 1/24/11	R–17 S1 6/14/10	R–17 S2 6/14/10
R–14 11/12/10	R–46 5/17/11	R–60 4/27/11	R–17 S1 10/22/10	R–17 S2 10/22/10
R–14 5/18/11	R–46 11/8/11	R–60 7/26/11	R–17 S1 4/27/11	R–17 S2 4/27/11
R–14 11/8/11		R–60 11/22/11	R–17 S1 5/2/12	R–17 S2 5/2/12

Figure E-3.0-1 Trilinear plot for MDA C wells

R-14	Top of Screen: 1315.6 ft bgs		Formation: Tjfp
Volumes (gal.) (approx):	1CV = **50.51**	3CV+DP = **200.06**	DP = **48.53**
			Install Date: **Feb-08**



x-axis = cumulative volume purged (gal.) including drop pipe
DP = drop pipe; CV = casing volume

Figure E-3.1-1 Time-series plots of field parameters monitored during purging of R-14 (single screen)

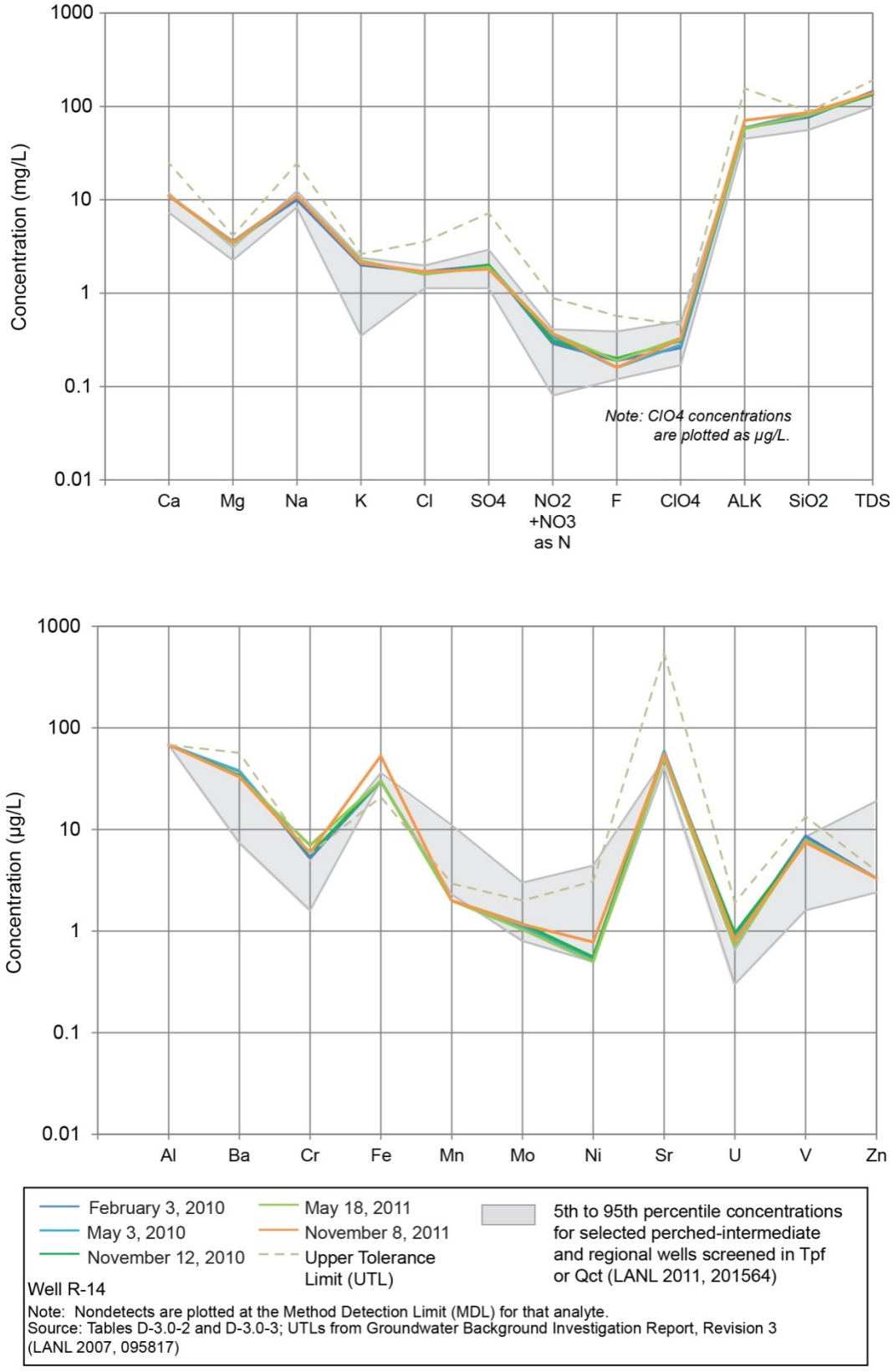
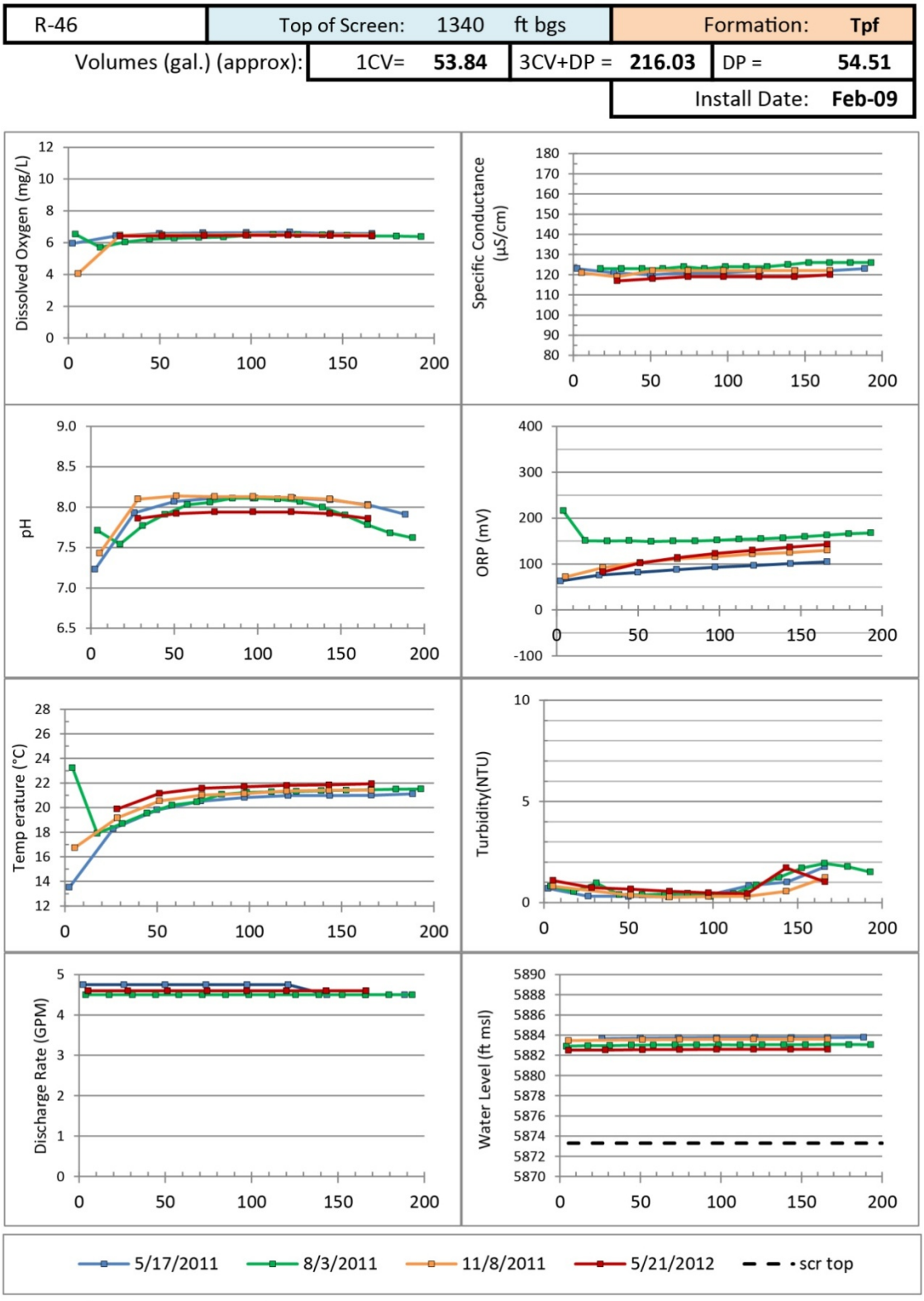


Figure E-3.1-2 Concentrations of major ions, silica, and TDS (upper graph) and trace metals (lower graph) in filtered groundwater from well R-14 for recent sampling events



x-axis = cumulative volume purged (gal.) including drop pipe
DP= drop pipe; CV = casing volume

Figure E-3.2-1 Time-series plots of field parameters monitored during purging of R-46 (single screen)

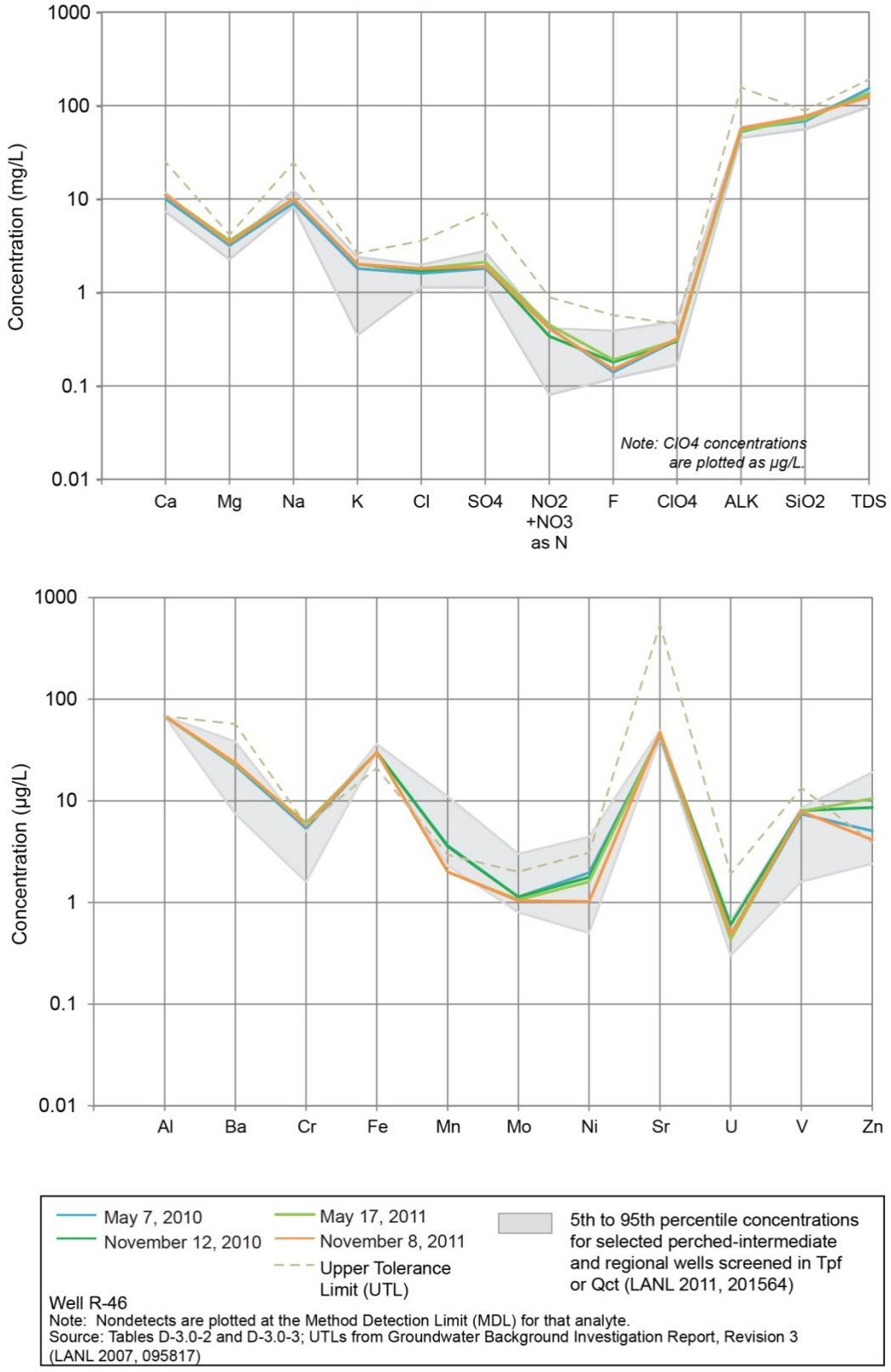
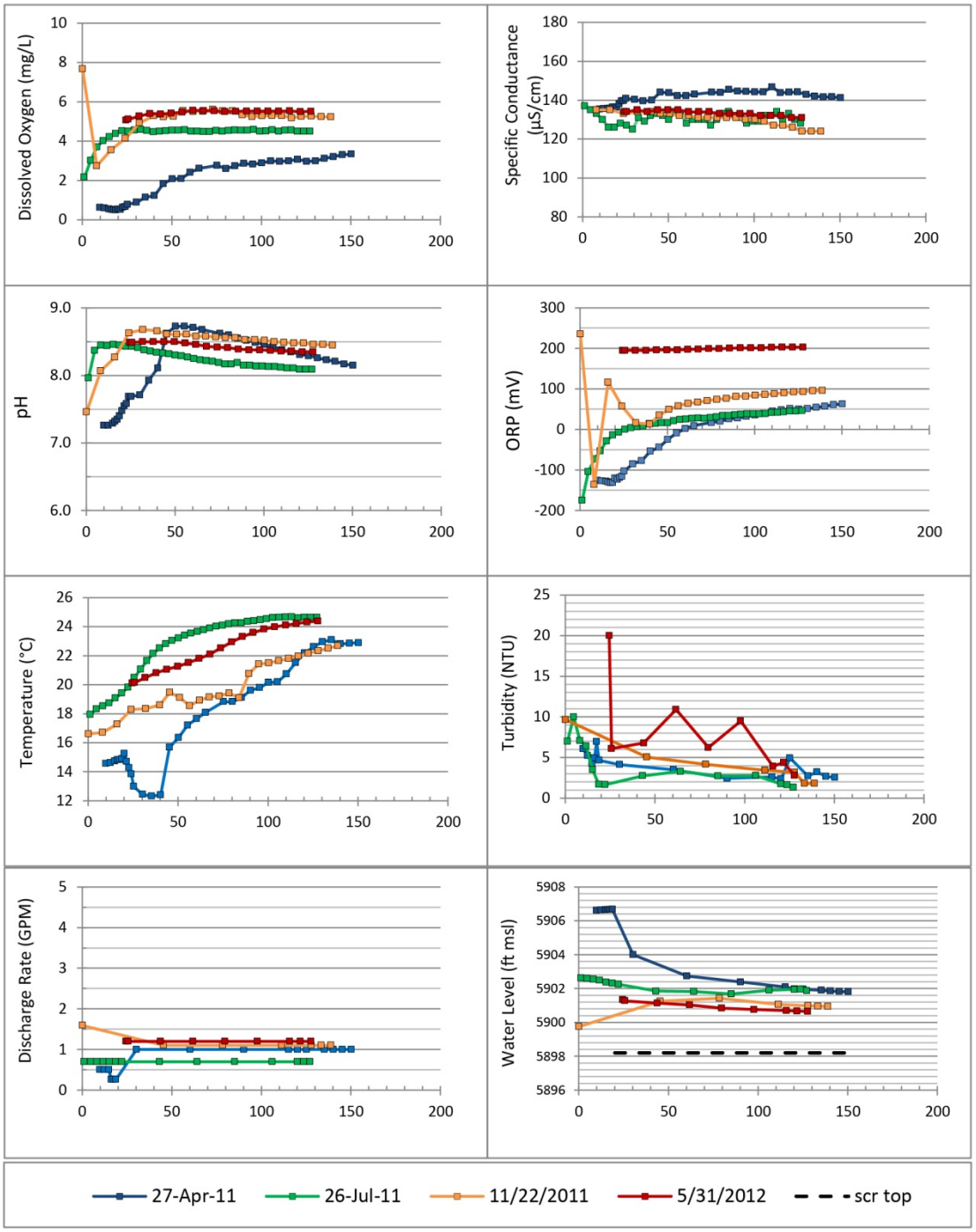


Figure E-3.2-2 Concentrations of major ions, silica, and TDS (upper graph) and trace metals (lower graph) in filtered groundwater from well R-46 for recent sampling events

R-60	Top of Screen:	1330	ft bgs	Formation: **Tpf**
Volumes (gal.) (approx):	1CV = **42.1**	3CV+DP = **180.3**	DP = **54.1**	
			Install Date:	**Oct-10**



x-axis = cumulative volume purged (gal.)
DP= drop pipe; CV = casing volume

Figure E-3.3-1 Time-series plots of field parameters monitored during purging of R-60 (single screen)

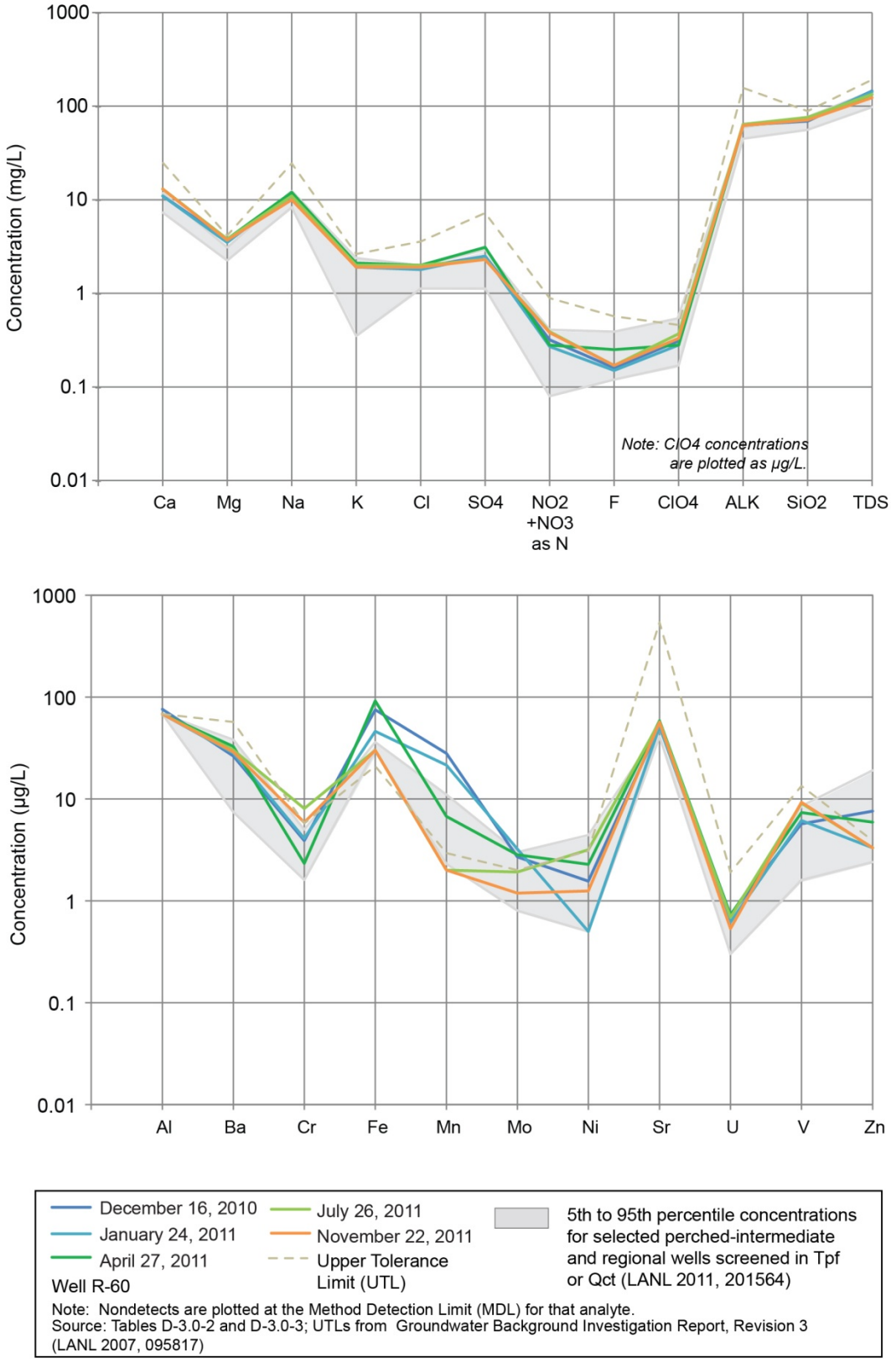
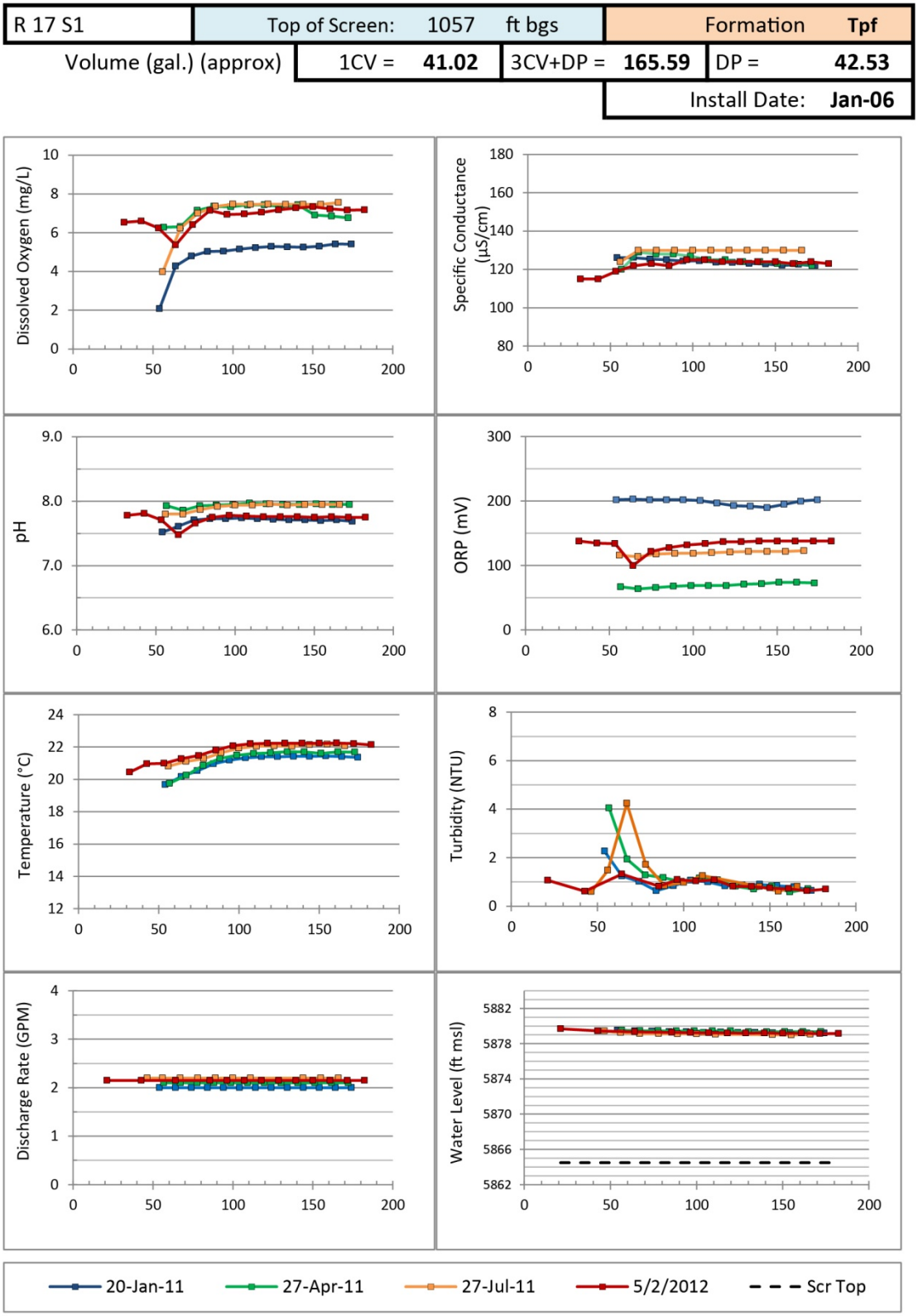


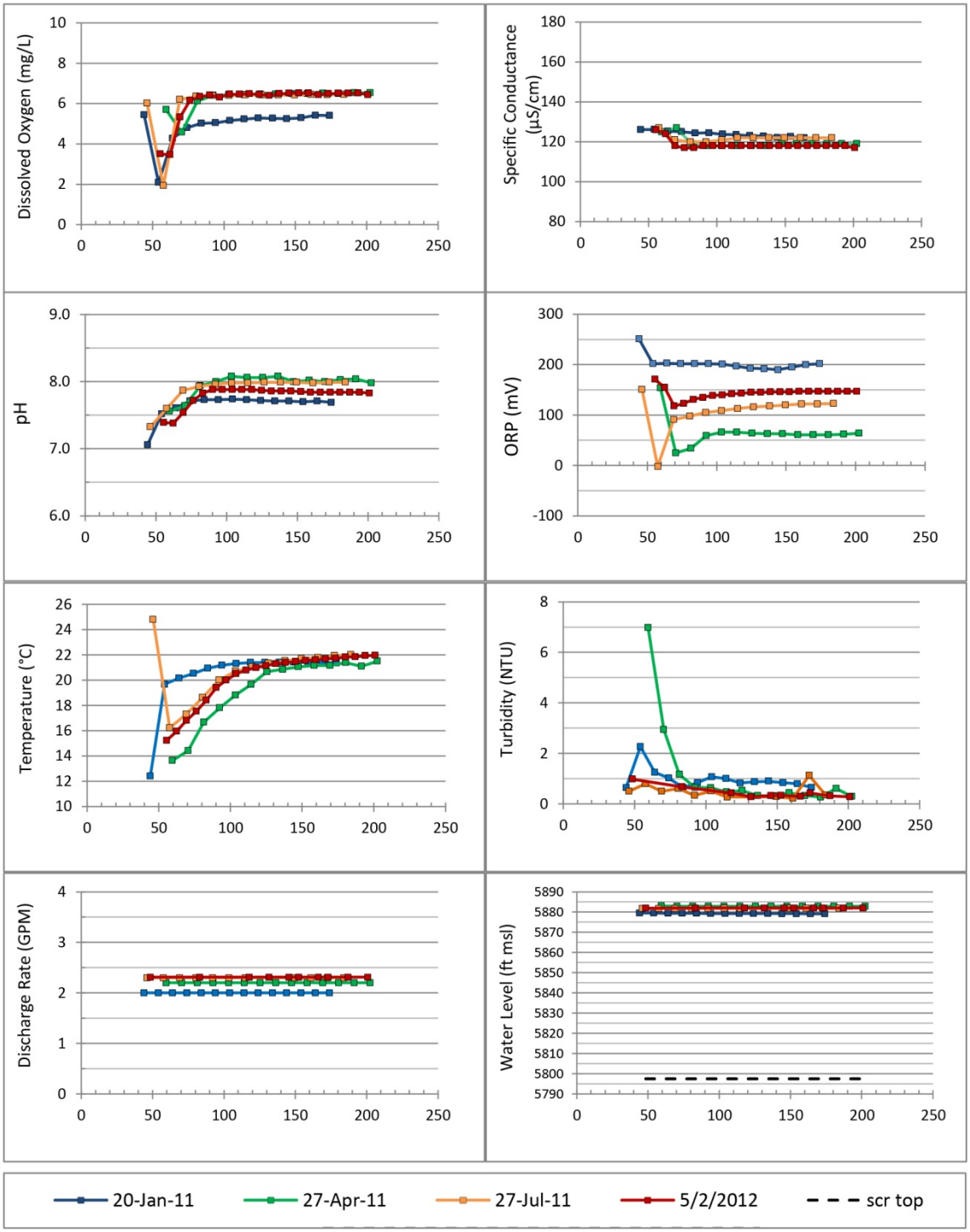
Figure E-3.3-2 Concentrations of major ions, silica, and TDS (upper graph) and trace metals (lower graph) in filtered groundwater from well R-60 for recent sampling events



x-axis = cumulative volume purged (gal.) including drop pipe
DP= drop pipe; CV = casing volume

Figure E-3.4-1 Time-series plots of field parameters monitored during purging of R-17 screen 1

R-17 S2	Top of Screen: 1057 ft bgs	Formation: **Tpf**
Vol. (gal.) (approx):	1CV = 42.9	3CV+DP = **173.3**
		DP = **44.7**
		Install Date: **Jan-06**



x-axis = cumulative volume purged (gal.) including drop pipe
DP= drop pipe; CV = casing volume

Figure E-3.4-2 Time-series plots of field parameters monitored during purging of R-17 screen 2

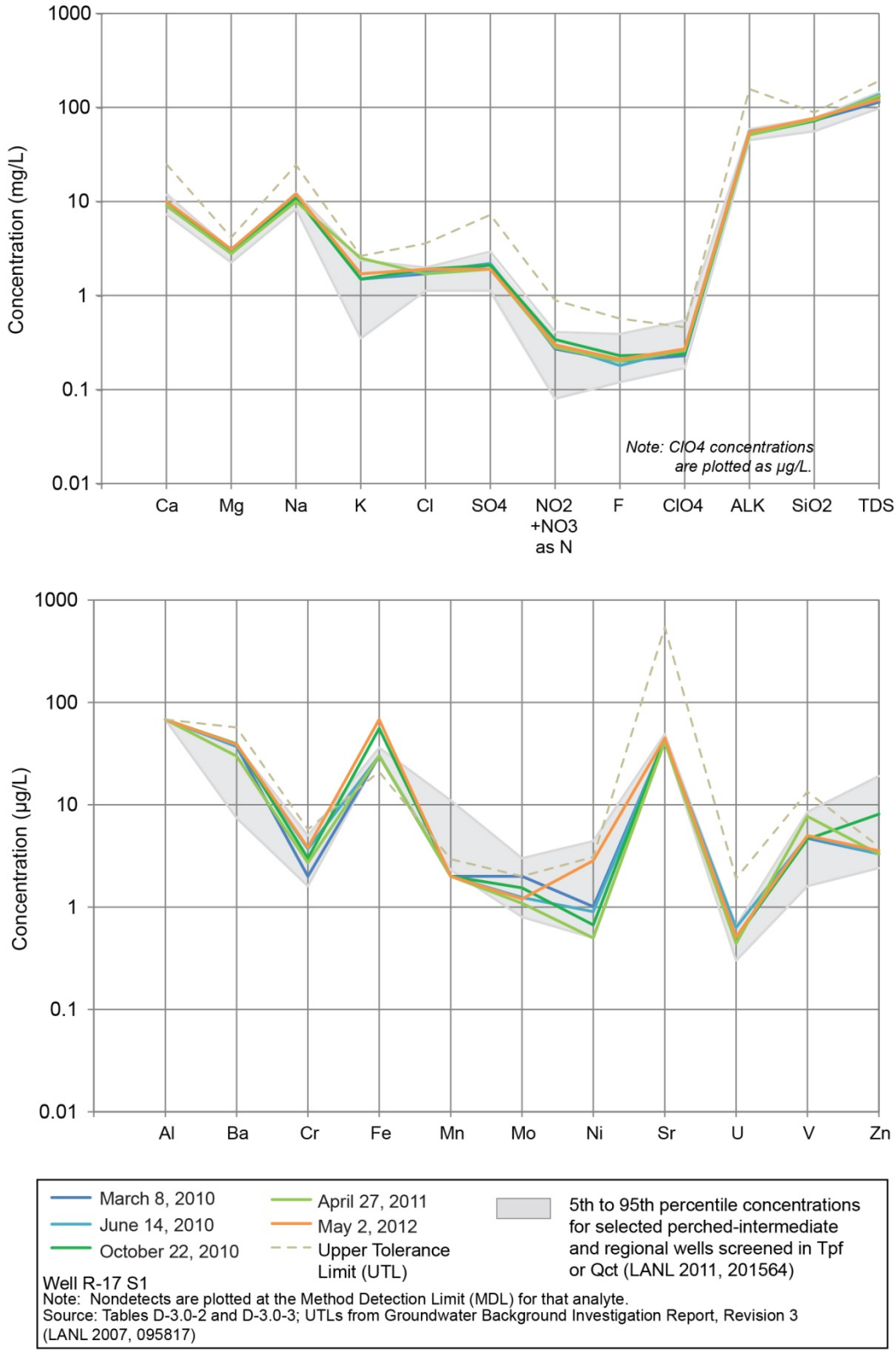


Figure E-3.4-3 Concentrations of major ions, silica, and TDS (upper graph) and trace metals (lower graph) in filtered groundwater from well R-17 screen 1 for recent sampling events

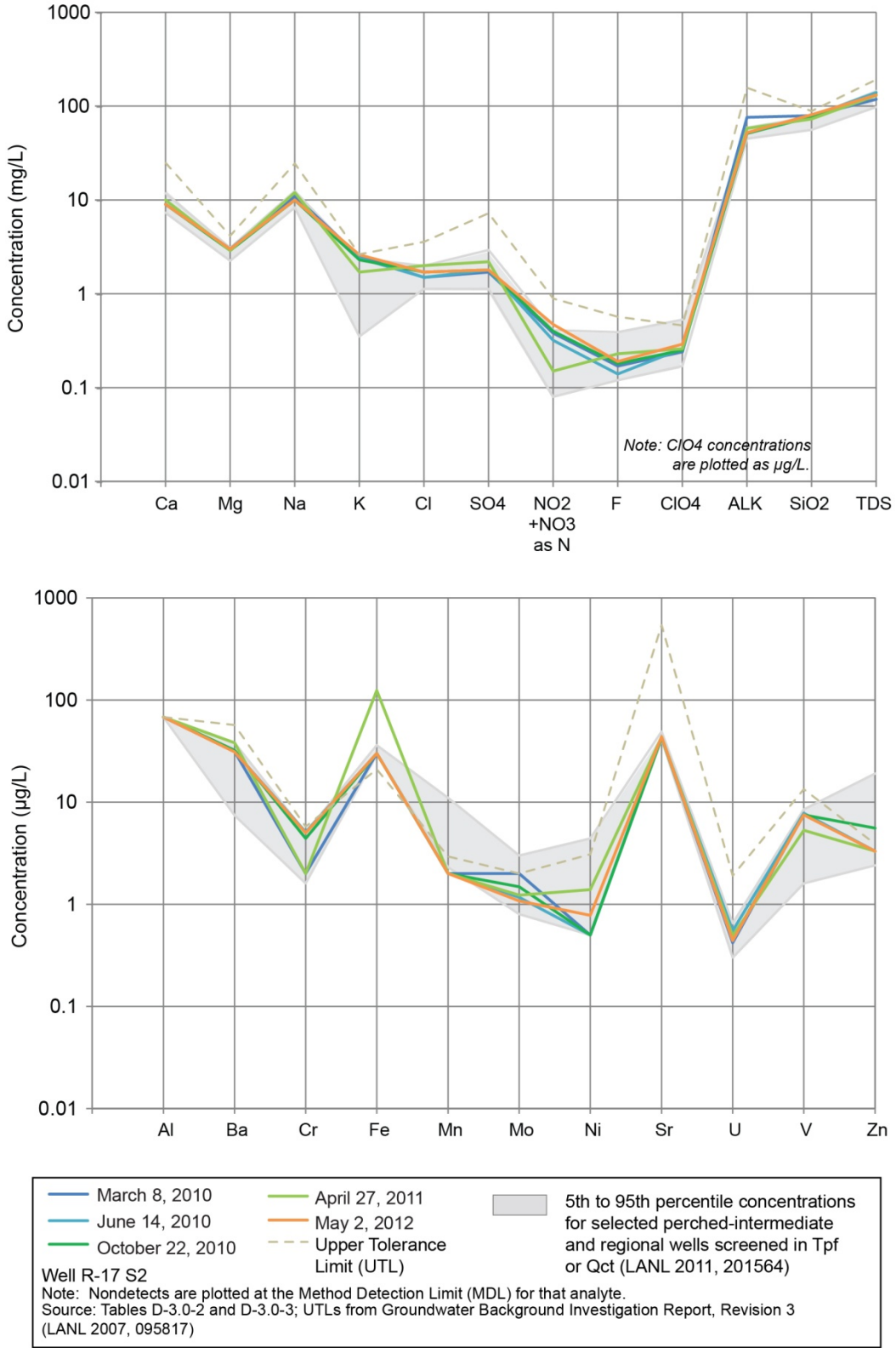


Figure E-3.4-4 Concentrations of major ions, silica, and TDS (upper graph) and trace metals (lower graph) in filtered groundwater from well R-17 screen 2 for recent sampling events

Table E-1.0-1
Regional Wells in the MDA C Monitoring Group

Well	Screen	Depth (ft bgs)	Hydro-stratigraphic Unit	Total No. of Sampling Events[a]	Earliest Sampling Event	Most Recent Sampling Event	Sampling System	Chronology of Events Relevant to Groundwater Sampling
R-14	Screen 1 MP1A	1204	Puye Fm	11	9-Feb-04	8-Nov-07	Westbay system	Multiple-screened regional well was completed on 19-Dec-02. Westbay multiport sampling system was installed on 20-Feb-03. Westbay system was removed 10-Feb-08. Screen 2 was plugged and abandoned 20-Feb-08. Redeveloped and completed as single screen well 12-May-08. Dedicated pump installed 14-May-08.
	Screen 2 MP2A	1286.5	Puye Fm	12	11-Feb-04	8-Nov-07	Westbay system	
	Single	1201	Puye Fm	21	14-May-08	29-May-12	Dedicated Grundfos pump	
R-46	Single	1340	Puye Fm	17	13-May-09	1-Jun-12	Dedicated Grundfos pump	Single-screen regional well was completed on 26-Feb-09. Dedicated submersible pump installed on 13-May-09.
R-60	Single	1330	Puye Fm	9	16-Dec-10	31-May-12	Dedicated Grundfos pump	Single-screen regional well was completed on 18-Oct-10. Dedicated submersible pump installed on 4-Dec-10.
R-17[b]	Screen 1	1057	Puye Fm	22	19-Oct-06	2-May-12	Baski Dual Valve system	Multiple screened regional well was completed on 4-Jan-06. Baski dual valve sampling system was installed on 12-Dec-06
	Screen 2	1124	Puye Fm	22	17-Oct-06	2-May-12	Baski Dual Valve system	

Sources: Well completion reports for R-14 (LANL 2010, 109828); R-17 (Kleinfelder 2006, 092493); R-46 (LANL 2009, 105592); and R-60 (LANL 2011, 111798). Well rehabilitation and conversion summary report for R-14 (LANL 2009, 106796). Well Screen Analysis Report, Revision 2 (LANL 2007, 096330).

[a] Sampling events for analyses by off-site laboratories. This total includes samples submitted for limited analytical suites.

[b] R-17 is included here for comparison as a background well. It is assigned to the General Surveillance monitoring group (LANL 2011, 208811).

Table E-3.0-1
Purge Volumes and Final Field Parameters for Recent Sampling Events

Location	Port Name	Depth (ft bgs)	Date	Purge Volume (gal.)	Purged Casing Volumes	DO (mg/L)	ORP (mV)	Field pH	Specific Conductance (µS/cm)	Temperature (°C)	Turbidity (NTU)	Alkalinity[a] (mg/L as $CaCO_3$)	Field Notes at Start of Purge	Field Notes at End of Purge
R-14	Single	1201	3-Feb-10	448	7.8	4.2	235	8.0	131	19	0.6	—[b]	Clear, no odor	Clear, no odor
R-14	Single	1201	3-May-10	329	5.5	4.1	20	8.0	132	22	1.0	—	Clear, odorless	Clear, odorless
R-14	Single	1201	12-Nov-10	412	7.1	4.4	429	8.1	133	22	0.5	82	Clear, no odor	Clear, no odor
R-14	Single	1201	18-May-11	215	4.2	5.1	156	8.4	131	23	0.5	79	Clear, very slight odor	Clear
R-14	Single	1201	3-Aug-11	154	3.0	5.3	139	8.4	133	24	0.4	81	Clear, odorless	Clear, odorless
R-14	Single	1201	8-Nov-11	179	3.5	5.2	167	8.4	130	23	0.5	81	Clear, odorless	Clear, odorless
R-14	Single	1201	29-May-12	174	3.5	5.4	167	8.3	131	24	0.5	—	Clear, odorless	Clear, odorless
R-46	Single	1340	7-May-10	174	3.1	5.0	25	7.5	117	21	0.9	—	Clear	Clear
R-46	Single	1340	12-Nov-10	190	3.3	5.5	179	7.9	126	20	1.6	76	Clear, odorless	Clear, odorless
R-46	Single	1340	17-May-11	170	3.1	6.6	105	7.9	123	21	1.8	54	Clear, slight odor	Clear, slight odor
R-46	Single	1340	3-Aug-11	194	3.6	6.4	168	7.6	126	22	1.5	—	Clear, odorless	Clear, odorless
R-46	Single	1340	8-Nov-11	165	3.0	6.5	130	8.0	122	21	1.2	57	Clear, odorless	Clear, odorless
R-46	Single	1340	21-May-12	166	3.0	6.4	143	7.9	120	22	1.0	—	Clear, no odor	Clear, no odor
R-46	Single	1340	1-Jun-12	162	3.0	6.4	187	8.0	123	21	0.4	—	Clear, no odor	Clear, no odor
R-60	Single	1330	16-Dec-10	—	—	4.1	77	7.9	137	22	17	85	—	—
R-60	Single	1330	24-Jan-11	180	4.3	3.7	207	7.4	137	23	3.7	64	Effervescent, no odor	Little effervescence, no odor
R-60	Single	1330	27-Apr-11	130	3.1	3.3	63	8.2	141	23	1.6	62	No odor, clear, effervescent	Clear, little effervescence
R-60	Single	1330	26-Jul-11	126	3.0	4.5	46	8.1	128	25	1.3	64	Yellowish, sulfur odor	Effervescent
R-60	Single	1330	22-Nov-11	128	3.0	5.2	96	8.5	124	23	1.8	62	Effervescent, clear, odor	Effervescent, clear, odorless
R-60	Single	1330	31-May-12	127	3.0	5.5	203	8.4	131	24	2.8	—	Very effervescent, no odor	Very effervescent, no odor
R-17	S1	1057	8-Mar-10	126	3.0	7.3	252	7.9	129	19	1.5	—	Clear, no odor	Clear, no odor
R-17	S1	1057	14-Jun-10	124	3.0	5.9	209	7.7	117	21	1.7	—	Clear, odorless	Clear, odorless
R-17	S1	1057	22-Oct-10	196	4.7	7.4	395	7.7	129	19	0.7	75	Clear, odorless	Clear, odorless
R-17	S1	1057	20-Jan-11	124	3.0	5.4	202	7.7	122	21	0.7	75	Clear	Clear
R-17	S1	1057	27-Apr-11	130	3.1	6.8	73	8.0	122	22	0.7	68	Clear, odorless	Clear, odorless
R-17	S1	1057	27-Jul-11	123	3.0	7.6	123	8.0	130	22	0.8	77	Clear, odorless	Clear, odorless
R-17	S1	1057	2-May-12	130	3.2	7.2	138	7.0	123	22	0.7	—	Clear, odorless	Clear, odorless
R-17	S2	1124	8-Mar-10	145	3.0	6.6	233	8.0	120	19	0.4	—	Clear, odorless	Clear, odorless
R-17	S2	1124	14-Jun-10	143	3.0	5.6	102	7.8	109	22	0.2	—	Clear, odorless	Clear, odorless
R-17	S2	1124	22-Oct-10	203	4.2	8.6	508	7.8	274	15	0.6	69	Clear	Clear, no odor

Table E-3.0-1 (continued)

Location	Port Name	Depth (ft bgs)	Date	Purge Volume (gal.)	Purged Casing Volumes	DO (mg/L)	ORP (mV)	Field pH	Specific Conductance (µS/cm)	Temperature (°C)	Turbidity (NTU)	Alkalinity[a] (mg/L as $CaCO_3$)	Field Notes at Start of Purge	Field Notes at End of Purge
R-17	S2	1124	20-Jan-11	124	3.0	5.4	214	7.8	118	21	0.3	69	Clear	Clear
R-17	S2	1124	27-Apr-11	158	3.3	6.5	64	8.0	119	22	0.3	74	Clear, odorless	Clear, odorless
R-17	S2	1124	27-Jul-11	144	3.0	6.5	123	8.0	122	22	0.4	71	Clear, odorless	Clear, odorless
R-17	S2	1124	2-May-12	130	3.0	6.5	147	7.8	118	22	0.3	—	Clear, odorless	Clear, odorless

[a] Alkalinity measured at on-site analytical laboratory.

[b] — = No data.

Table E-3.0-2
General Inorganic Constituents and TOC in Filtered Groundwater Samples

Location	Port Name	Depth (ft bgs)	Date	Purged Casing Volumes[a]	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate + Nitrite Nitrogen (mg/L)	Perchlorate (µg/L)	Silica (mg/L)	TDS (mg/L)	TOC (mg/L)	Alkalinity[b] (mg/L as CaCO3)	Lab pH[b]
UTL – Regional Groundwater[c]					**24.5**	**2.63**	**24.88**	**4.15**	**7.20**	**3.57**	**0.57**	**0.89**	**0.46**	**88.5**	**191.68**	**0.33**	**156.6**	**na[d]**
Deep Groundwater (Tpf-Qct) 5th percentile[e]					**8.3**	**0.35**	**7.3**	**2.25**	**1.13**	**1.13**	**0.12**	**0.08**	**0.17**	**56**	**98**	**na**	**45**	**na**
Deep Groundwater (Tpf-Qct) 95th percentile[e]					**12.4**	**2.39**	**11.8**	**3.09**	**2.93**	**1.98**	**0.39**	**0.41**	**0.52**	**77**	**144**	**na**	**59**	**na**
PQL[f]					**0.3**	**0.15**	**0.2**	**0.3**	**0.4**	**0.2**	**0.1**	**0.05**	**0.2**	**0.213**	**10**	**1**	**1**	**na**
MDL[f]					**0.1**	**0.05**	**0.05**	**0.085**	**0.1**	**0.066**	**0.033**	**0.01**	**0.05**	**0.053**	**2.4**	**0.33**	**0.73**	**na**
R-14	Single	1201	3-Feb-10	7.8	10	2.0	11	3.5	2.0	1.7	0.19	0.29	0.26	77	145	0.4	59	8.2
R-14	Single	1201	3-May-10	5.5	11	2.2	11	3.6	2.0	1.6	0.16	0.34	0.28	86	134	<1	59	8.3
R-14	Single	1201	12-Nov-10	7.1	11	2.2	11	3.4	2.0	1.6	0.20	0.31	0.31	81	134	0.9	58	8.3
R-14	Single	1201	18-May-11	4.2	11	2.2	11	3.4	1.9	1.6	0.19	0.37	0.33	81	140	0.5	58	8.0
R-14	Single	1201	3-Aug-11	3.0	—[g]	—	—	—	—	—	—	—	—	—	—	—	—	—
R-14	Single	1201	8-Nov-11	3.5	11	2.1	11	3.5	1.8	1.7	0.16	0.37	0.32	86	140	0.3	71	8.4
R-14	Single	1201	29-May-12	3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-46	Single	1340	7-May-10	3.1	9	1.8	10	3.2	1.8	1.6	0.14	0.42	0.31	68	153	2.2	56	8.0
R-46	Single	1340	12-Nov-10	3.3	10	2.0	11	3.4	1.9	1.7	0.18	0.34	0.30	75	135	2.2	53	7.8
R-46	Single	1340	17-May-11	3.1	10	2.0	11	3.6	2.1	1.8	0.19	0.45	0.31	72	136	1.2	54	7.8
R-46	Single	1340	3-Aug-11	3.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-46	Single	1340	8-Nov-11	3.0	10	2.0	11	3.4	1.9	1.8	0.15	0.41	0.32	77	124	1.1	57	7.9
R-46	Single	1340	21-May-12	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-46	Single	1340	1-Jun-12	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-60	Single	1330	16-Dec-10	—	11	1.9	11	3.7	2.5	1.9	0.16	0.32	0.31	69	145	4.5	63	7.8
R-60	Single	1330	24-Jan-11	4.3	12	1.9	11	3.5	2.5	1.8	0.15	0.27	0.28	73	142	0.5	64	7.8
R-60	Single	1330	27-Apr-11	3.1	12	2.1	13	3.8	3.1	2.0	0.25	0.28	0.28	71	134	2.2	62	8.0
R-60	Single	1330	26-Jul-11	3.0	11	2.0	13	3.8	2.3	2.0	0.17	0.39	0.37	76	134	0.7	64	8.1
R-60	Single	1330	22-Nov-11	3.0	10	1.9	13	3.7	2.3	1.9	0.17	0.38	0.33	71	123	0.4	62	8.6
R-60	Single	1330	31-May-12	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S1	1057	8-Mar-10	3.0	12	1.5	10	2.9	2.1	1.7	0.20	<0.27	0.23	73	114	0.4	55	8.0
R-17	S1	1057	14-Jun-10	3.0	12	1.5	10	2.9	2.2	1.8	0.18	0.30	0.27	73	137	<1	56	8.0
R-17	S1	1057	22-Oct-10	4.7	11	1.5	10	2.8	2.1	1.9	0.23	0.34	0.24	72	130	0.4	51	7.9
R-17	S1	1057	20-Jan-11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S1	1057	27-Apr-11	3.1	10	2.5	9	2.8	1.9	1.7	0.20	0.28	0.26	74	133	<1	51	7.9
R-17	S1	1057	27-Jul-11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S1	1057	2-May-12	3.2	12	1.7	10	3.1	1.9	1.9	0.21	0.30	0.27	77	121	0.5	55	8.0

Table E-3.0-2 (continued)

Location	Port Name	Depth (ft bgs)	Date	Purged Casing Volumes[a]	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Nitrate + Nitrite Nitrogen (mg/L)	Perchlorate (µg/L)	Silica (mg/L)	Total Dissolved Solids (mg/L)	Total Organic Carbon (mg/L)	Alkalinity[b] (mg/L as CaCO3)	Lab pH[b]
UTL – Regional Groundwater[c]					**24.5**	**2.63**	**24.88**	**4.15**	**7.20**	**3.57**	**0.57**	**0.89**	**0.46**	**88.5**	**191.68**	**0.33**	**156.6**	**na[d]**
Deep Groundwater (Tpf-Qct) 5th percentile[e]					**8.3**	**0.35**	**7.3**	**2.25**	**1.13**	**1.13**	**0.12**	**0.08**	**0.17**	**56**	**98**	**na**	**45**	**na**
Deep Groundwater (Tpf-Qct) 95th percentile[e]					**12.4**	**2.39**	**11.8**	**3.09**	**2.93**	**1.98**	**0.39**	**0.41**	**0.52**	**77**	**144**	**na**	**59**	**na**
PQL[f]					**0.3**	**0.15**	**0.2**	**0.3**	**0.4**	**0.2**	**0.1**	**0.05**	**0.2**	**0.213**	**10**	**1**	**1**	**na**
MDL[f]					**0.1**	**0.05**	**0.05**	**0.085**	**0.1**	**0.066**	**0.033**	**0.01**	**0.05**	**0.053**	**2.4**	**0.33**	**0.73**	**na**
R-17	S2	1124	8-Mar-10	3.0	11	2.5	9	3.0	1.7	1.5	0.17	0.38	0.24	79	118	0.7	76	8.0
R-17	S2	1124	14-Jun-10	3.0	10	2.4	9	3.0	1.8	1.5	0.14	0.32	0.26	78	139	<1	51	8.0
R-17	S2	1124	22-Oct-10	4.2	10	2.3	9	2.9	1.8	1.7	0.18	0.40	0.25	77	132	<1	51	7.9
R-17	S2	1124	20-Jan_11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S2	1124	27-Apr-11	3.3	12	1.7	10	2.9	2.2	2.0	0.23	0.15	0.26	73	130	0.5	58	7.9
R-17	S2	1124	27-Jul-11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S2	1124	2-May-12	3.0	10	2.6	9	3.0	1.8	1.7	0.19	0.47	0.29	81	131	<1	52	7.9

[a] Purged casing volumes from Table E-3.0-1.

[b] Alkalinity and pH measured at offsite analytical laboratory.

[c] UTL from Groundwater Background Investigation Report, Revision 3 (GBIR R3) (LANL 2007, 095817)

[d] na = Not available.

[e] Percentiles from Table A-3.0-2, Reliability Assessment for Well R-47i, (LANL 2011, 201564).

[f] MDL = method detection limit. PQLs and MDLs from Table C-4.1-1 in 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1 (LANL 2011, 208811).

[g] — = No data.

Table E-3.0-3
Trace Metals in Groundwater Samples

Location	Port Name	Depth (ft bgs)	Date	Purged Casing Volumes[a]	Filtered (µg/L)											Unfiltered (µg/L)	
					Aluminum	Barium	Chromium	Iron	Manganese	Molybdenum	Nickel	Strontium	Uranium	Vanadium	Zinc	Aluminum	Iron
UTL – Regional Groundwater[b]					**68**	**56.83**	**5.75**	**21**	**2.94**	**2.0**	**3.09**	**540.0**	**1.9**	**13.4**	**3.89**	**na[c]**	**na**
Deep Groundwater (Tpf-Qct) 5th percentile[d]					**68**	**7.4**	**1.6**	**30**	**2.3**	**0.8**	**0.5**	**41**	**0.3**	**1.6**	**2.4**	**68**	**24**
Deep Groundwater (Tpf-Qct) 95th percentile[d]					**68**	**38**	**5**	**36**	**11**	**3**	**4.4**	**49**	**0.65**	**8.5**	**19**	**212**	**341**
PQL[e]					**200**	**5**	**10**	**100**	**10**	**0.5**	**2**	**5**	**0.2**	**5**	**10**	**200**	**100**
MDL[e]					**68**	**1**	**2.5**	**30**	**2**	**0.1**	**0.5**	**1**	**0.05**	**1**	**3.3**	**68**	**30**
Standard used for Screening[f]					**5000**	**1000**	**50**	**1000**	**200**	**1000**	**200**	**9300[g]**	**30[h]**	**78[g]**	**10000**	**na**	**na**
R-14	Single	1201	3-Feb-10	7.8	< 200	37	5.3	< 100	< 10	1.1	< 2	56	0.84	8.6	< 10	< 200	< 100
R-14	Single	1201	3-May-10	5.5	< 200	38	5.7	< 100	< 10	1.1	0.5	59	0.84	8.0	< 10	< 200	< 100
R-14	Single	1201	12-Nov-10	7.1	< 200	34	5.7	< 100	< 10	1.2	0.6	54	0.95	7.7	< 10	< 200	< 100
R-14	Single	1201	18-May-11	4.2	< 200	33	7.0	< 100	< 10	1.0	< 2	52	0.71	7.8	< 10	< 200	32
R-14	Single	1201	3-Aug-11	3.0	—[i]	—	—	—	—	—	—	—	—	—	—	—	—
R-14	Single	1201	8-Nov-11	3.5	< 200	33	5.9	53	< 10	1.2	0.8	55	0.81	7.4	< 10	< 200	< 100
R-14	Single	1201	29-May-12	3.5	—	—	—	—	—	—	—	—	—	—	—	—	—
R-46	Single	1340	7-May-10	3.1	< 200	22	5.4	< 100	4	1.1	2.0	44	0.45	7.4	5	< 200	41
R-46	Single	1340	12-Nov-10	3.3	< 200	23	5.7	< 100	4	1.1	1.8	45	0.60	8.0	9	< 200	41.9
R-46	Single	1340	17-May-11	3.1	< 200	23	6.0	< 100	< 10	1.1	1.6	45	0.43	7.9	11	< 200	< 100
R-46	Single	1340	3-Aug-11	3.6	—	—	—	—	—	—	—	—	—	—	—	—	—
R-46	Single	1340	8-Nov-11	3.0	< 200	24	5.7	< 100	< 10	1.0	1.0	47	0.48	7.8	4	< 200	< 100
R-46	Single	1340	21-May-12	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—
R-46	Single	1340	1-Jun-12	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—
R-60	Single	1330	16-Dec-10	—	76	26	3.9	75	28	2.7	1.6	52	0.73	5.7	8	312	472
R-60	Single	1330	24-Jan-11	4.3	< 200	28	4.1	46	21	3.2	< 2	51	0.62	6.1	< 10	175	201
R-60	Single	1330	27-Apr-11	3.1	< 200	33	2.3	92	7	2.8	2.3	58	0.72	7.3	6	100	111
R-60	Single	1330	26-Jul-11	3.0	< 200	30	8.1	< 100	< 10	1.9	3.2	57	0.69	9.0	< 10	< 200	63
R-60	Single	1330	22-Nov-11	3.0	< 200	29	5.9	< 100	< 10	1.2	1.3	56	0.53	9.2	< 10	< 200	37
R-60	Single	1330	31-May-12	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S1	1057	8-Mar-10	3.0	< 200	37	< 10	< 100	< 10	< 2	1.0	43	0.49	4.7	3	< 200	56
R-17	S1	1057	14-Jun-10	3.0	< 200	38	3.7	< 100	< 10	1.2	0.9	43	0.63	4.9	< 10	< 200	47
R-17	S1	1057	22-Oct-10	4.7	< 200	39	3.0	56	< 10	1.5	0.7	45	0.50	4.6	8	< 200	72
R-17	S1	1057	20-Jan-11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S1	1057	27-Apr-11	3.1	< 200	30	2.7	< 100	< 10	1.1	< 2	41	0.44	7.7	< 10	< 200	< 100

Table 3.0-3 (continued)

Location	Port Name	Depth (ft bgs)	Date	Purged Casing Volume[a]	Filtered (µg/L)											Unfiltered (µg/L)	
					Aluminum	Barium	Chromium	Iron	Manganese	Molybdenum	Nickel	Strontium	Uranium	Vanadium	Zinc	Aluminum	Iron
UTL – Regional Groundwater[b]					**68**	**56.83**	**5.75**	**21**	**2.94**	**2.0**	**3.09**	**540.0**	**1.9**	**13.4**	**3.89**	**na[c]**	**na**
Deep Groundwater (Tpf-Qct) 5th percentile[d]					**68**	**7.4**	**1.6**	**30**	**2.3**	**0.8**	**0.5**	**41**	**0.3**	**1.6**	**2.4**	**na**	**na**
Deep Groundwater (Tpf-Qct) 95th percentile[d]					**68**	**38**	**5**	**36**	**11**	**3**	**4.4**	**49**	**0.65**	**8.5**	**19**	**na**	**na**
PQL[e]					**200**	**5**	**10**	**100**	**10**	**0.5**	**2**	**5**	**0.2**	**5**	**10**	**200**	**100**
MDL[e]					**68**	**1**	**2.5**	**30**	**2**	**0.1**	**0.5**	**1**	**0.05**	**1**	**3.3**	**na**	**na**
Standard Used for Screening[f]					**5000**	**1000**	**50**	**1000**	**200**	**1000**	**200**	**9300[g]**	**30[h]**	**78[g]**	**10000**	**na**	**na**
R-17	S1	1057	27-Jul-11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S1	1057	2-May-12	3.2	< 200	39	3.8	68	< 10	1.2	2.8	45	0.51	5.0	4	—	—
R-17	S2	1124	8-Mar-10	3.0	< 200	31	< 10	< 100	< 10	< 2	< 2	43	0.42	7.6	< 10	< 200	< 100
R-17	S2	1124	14-Jun-10	3.0	< 200	31	5.1	< 100	< 10	1.2	< 2	43	0.55	7.8	< 10	< 200	< 100
R-17	S2	1124	22-Oct-10	4.2	< 200	32	4.4	< 100	< 10	1.5	< 2	43	0.45	7.5	6	< 200	39
R-17	S2	1124	20-Jan-11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S2	1124	27-Apr-11	3.3	< 200	38	< 10	124	< 10	1.2	1.4	44	0.49	5.3	< 10	< 200	76
R-17	S2	1124	27-Jul-11	3.0	—	—	—	—	—	—	—	—	—	—	—	—	—
R-17	S2	1124	2-May-12	3.0	< 200	31	5.0	< 100	< 10	1.1	0.8	44	0.44	7.5	< 10	—	—

[a] Purged casing volumes from Table E-3.0-1.

[b] UTL from Groundwater Background Investigation Report, Revision 3 (GBIR R3) (LANL 2007, 095817).

[c] na = Not available.

[d] Percentiles from Table A-3.0-2, Reliability Assessment for Well R-47i (LANL 2011, 201564).

[e] PQLs and MDLs from Table C-4.1-1, 2011 Interim Facility-Wide Groundwater Monitoring Plan, Revision 1 (LANL 2011, 208811).

[f] New Mexico Groundwater Human Health Standards (New Mexico Administrative Code 20.6.2) unless otherwise noted.

[g] EPA regional screening level for tap water (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

[h] EPA MCL (Title 40 Code of Federal Regulations Part 141).

[i] — = No data.

Table E-3.0-4
Tritium and Stable Isotopes

Location	Port Name	Depth (ft bgs)	Date	Tritium (pCi/L)	δ15N-NO_3 (per mil)	δ18O-NO_3 (per mil)	δ18O (per mil)	δ2H (per mil)
Screening Value				**0.32**[a]	**+2 – +6**[b]	**-5.5 – +1.5**[b]	**-11.2 – -10**[b]	**-72 – -79**[b]
R-14	single	1201	1-Jul-10	—[c]	4.1	-2.8	-10.5	-78.0
R-14	single	1201	8-Nov-11	—	4.9	-4.8	-11.2	-77.4
R-46	single	1340	7-May-10	37.1	5.5	-4.9	-11.3	-76.0
R-46	single	1340	8-Nov-11	—	5.1	-4.5	-11.6	-77.5
R-60	single	1330	16-Dec-10	—	1.0	-6.9	-11.2	-77.1
R-60	single	1330	24-Jan-11	—	3.7	-4.4	-11.2	-78.7
R-60	single	1330	27-Apr-11	—	1.3	-9.2	-11.4	-78.0
R-60	single	1330	26-Jul-11	—	—	—	-11.2	-78.0
R-60	single	1330	22-Nov-11	—	5.0	-5.0	-11.4	-75.2
R-17	S1	1057	4-Aug-10	—	4.1	-4.0	-10.8	-78.4
R-17	S2	1124	8-Mar-10	—	3.9	-3.7	-11.2	-81.5
R-17	S2	1124	4-Aug-10	—	4.3	-3.8	-11.3	-78.1

Note: Stable isotope samples for nitrogen isotopes are filtered; stable isotope samples for deuterium and oxygen isotopes are not filtered.

[a] Screening value from Groundwater Background Investigation Report, Revision 3 (GBIR R3) (LANL 2007, 095817).

[b] Regional background value range from the Laboratory's Earth and Environmental Science geochemistry laboratory data.

[c] — = Not detected.

Table E-4.2-1
Statistical Summary of Organic Chemicals Detected in Groundwater Samples from MDA C Groundwater Monitoring Network Wells for the Period Extending from May 2009 to May 2012

Chemical	Well	Port Name	Port Depth (ft)	Number of Analyses	Number of Detects	Average Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	PQL[a] (µg/L)	Standard Used for Screening[b] (µg/L)	Standard Source[c]	Value > Standard	1/2 Standard	Value >1/2 Standard	Comment
Nitrotoluene[4-]	R-60	Single	1330	5	1	0.327	0.327	0.65	37	EPA Tap SL	0	21	0	Detected once below the PQL
Benzo(a)anthracene	R-60	Single	1330	7	1	0.29	0.29	1	0.29	EPA Tap SL	0	0.145	1	Detected once below the PQL in FD[d] sample
Benzo(a)pyrene	R-60	Single	1330	7	2	0.81	0.85	1	0.2	EPA MCL	1	0.1	1	Detected below the PQL in the FD and REG[e] samples for the first sample event
Benzo(b)fluoranthene	R-60	Single	1330	7	2	0.78	0.84	1	0.29	EPA Tap SL	1	0.145	1	Detected below the PQL in the FD and REG samples for the first sample event
Benzo(g,h,i)perylene	R-60	Single	1330	7	2	0.42	0.44	1	—[f]	—	—	—	—	Detected below the PQL in the FD and REG samples for the first sample event
Benzo(k)fluoranthene	R-60	Single	1330	7	1	0.38	0.38	1	2.9	EPA Tap SL	0	1.45	0	Detected once below the PQL
Bis(2-ethylhexyl)phthalate	R-14	S1	1200.6	13	1	4.8	4.8	10	6	EPA MCL	0	3	1	Detected once below the PQL on 5/7/2009
	R-46	Single	1340	10	10	39.7	96.4	10	6	EPA MCL	10	3	10	Includes both REG and FD samples—decreasing over time. Most recent sample is below the PQL with an estimated concentration of 7.48 µg/L.
Dibenz(a,h)anthracene	R-60	Single	1330	7	1	1.35	1.35	1	0.029	EPA Tap SL	1	0.0145	1	Detected in FD, non-detect in REG sample
Diethylphthalate	R-60	Single	1330	7	1	22.7	22.7	10	11000	EPA Tap	0	14500	0	REG
Di-n-octylphthalate	R-46	Single	1340	10	1	3.1	3.1	10	—	—	—	—	—	Detected once below the PQL
Acetone	R-46	Single	1340	15	8	29.1	64.1	5	12000	EPA Tap SL	0	11000	0	Includes both REG and FD samples - no detects in 2010 or 2011.
	R-60	Single	1330	7	3	50.4	68.6	5	12000	EPA Tap SL	0	11000	0	Detected at 69 µg/L in REG and FD samples during the first sampling event. Most recent value from April 2011 has an estimated concentration of 14 µg/L.
Chloromethane	R-14	S1	1200.6	14	1	0.78	0.78	1	190	EPA Tap SL	0	95	0	Detected once below the PQL
Toluene	R-46	Single	1340	15	11	1.5	3.2	1	750	NM GW Std	0	375	0	Concentrations decreasing over time. The most recent sample from November 2010 is below the PQL at an estimated concentration of 0.4 µg/L.

Source: Attachment E-1.

[a] PQLs from LANL 2011, 208811, Table C-4.1-1.

[b] Lowest applicable regulatory standard or other type of screening level.

[c] Reference for standard used for screening:
EPA MCL = EPA maximum contaminant level (40 Code of Federal Regulations Part 141).
EPA Tap SL = EPA regional screening level for tap water (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).
NM GW Std = New Mexico Groundwater Human Health Standards (New Mexico Administrative Code 20.6.2).

[d] FD = Field duplicate.

[e] REG = Regular sample.

[f] — = None.

Table E-4.2-2
Number of Sampling Events for Organic COPCs
Detected at Least Twice in the Same Screened Interval

Suite	Analyte	Well		
		R-14 S1	R-46	R-60
SVOC	Benzo(a)pyrene	—*	—	2
	Benzo(b)fluoranthene	—	—	2
	Benzo(g,h,i)perylene	—	—	2
	Bis(2-ethylhexyl)phthalate	—	10	—
VOC	Acetone	—	8	3
	Toluene	—	11	—

Source: Table E-4.2-1.

* — = Not detected or only detected once.

Table E-4.2-3
Detected and Nondetected Organic Analytes
with PQLs Greater Than Applicable Regulatory Standards

Suite	Analyte	Units	Standard Used for Screening[a]	Standard Source[b]	PQL[c]
Detected Analytes with PQLs Greater Than Standards					
SVOC	Benzo(a)pyrene	µg/L	0.2	EPA MCL	1
SVOC	Benzo(b)fluoranthene	µg/L	0.29	EPA Tap SL	1
SVOC	Bis(2-ethylhexyl)phthalate	µg/L	6	EPA MCL	10
Nondetected Analytes with PQLs Greater Than Standards					
SVOC	Atrazine	µg/L	3	EPA MCL	10
SVOC	Azobenzene	µg/L	1	EPA Tap SL	10
SVOC	Benzidine	µg/L	0.00092	EPA Tap SL	50
SVOC	Benzo(a)anthracene	µg/L	0.29	EPA Tap SL	1
SVOC	Benzo(a)pyrene	µg/L	0.2	EPA MCL	1
SVOC	Benzo(b)fluoranthene	µg/L	0.29	EPA Tap SL	1
SVOC	Bis(2-chloroethyl)ether	µg/L	0.12	EPA Tap SL	10
SVOC	Bis(2-ethylhexyl)phthalate	µg/L	6	EPA MCL	10
SVOC	Chloroaniline[4-]	µg/L	3.2	EPA Tap SL	10
SVOC	Dibenz(a,h)anthracene	µg/L	0.029	EPA Tap SL	1
SVOC	Dichlorobenzidine[3,3'-]	µg/L	1.1	EPA Tap SL	10
SVOC	Dinitro-2-methylphenol[4,6-]	µg/L	1.2	EPA Tap SL	10
SVOC	Dinitrotoluene[2,4-]	µg/L	2.0	EPA Tap SL	10

Table E-4.3-3 (continued)

Suite	Analyte	Units	Standard used for Screening[a]	Standard Source[b]	PQL[c]
SVOC	Dioxane[1,4-]	µg/L	6.7	EPA Tap SL	10
SVOC	Hexachlorobenzene	µg/L	1	EPA MCL	10
SVOC	Hexachlorobutadiene	µg/L	2.6	EPA Tap SL	10
SVOC	Indeno(1,2,3-cd)pyrene	µg/L	0.29	EPA Tap SL	1
SVOC	Nitrobenzene	µg/L	1.2	EPA Tap SL	10
SVOC	Nitrosodiethylamine[N-]	µg/L	0.0014	EPA Tap SL	10
SVOC	Nitrosodimethylamine[N-]	µg/L	0.0042	EPA Tap SL	10
SVOC	Nitroso-di-n-butylamine[N-]	µg/L	0.024	EPA Tap SL	10
SVOC	Nitroso-di-n-propylamine[N-]	µg/L	0.093	EPA Tap SL	10
SVOC	Nitrosopyrrolidine[N-]	µg/L	0.32	EPA Tap SL	10
SVOC	Oxybis(1-chloropropane)[2,2'-]	µg/L	3.1	EPA Tap SL	10
SVOC	Pentachlorophenol	µg/L	1	EPA MCL	10
SVOC	Phenol	µg/L	5	NM GW Std	10
VOC	Acrolein	µg/L	0.041	EPA Tap SL	5
VOC	Acrylonitrile	µg/L	0.45	EPA Tap SL	5
VOC	Chloro-1,3-butadiene[2-]	µg/L	0.16	EPA Tap SL	1
VOC	Dibromo-3-Chloropropane[1,2-]	µg/L	0.2	EPA MCL	1
VOC	Dibromoethane[1,2-]	µg/L	0.05	EPA MCL	1
VOC	Dioxane[1,4-]	µg/L	6.7	EPA Tap SL	10
VOC	Hexachlorobutadiene	µg/L	2.6	EPA Tap SL	10
VOC	Methacrylonitrile	µg/L	0.75	EPA Tap SL	5
VOC	Trichloropropane[1,2,3-]	µg/L	0.0065	EPA Tap SL	1

Source: Attachment E-1.

[a] Lowest applicable regulatory standard or other type of screening level.

[b] Reference for standard used for screening:

EPA MCL = EPA maximum contaminant level (Title 40 Code of Federal Regulations Part 141).

EPA Tap SL = EPA regional screening level for tap water (http://www.epa.gov/region06/6pd/rcra_c/pd-n/screen.htm).

NM GW Std = New Mexico Groundwater Human Health Standards (New Mexico Administrative Code 20.6.2).

[c] PQLs from LANL 2011, 208811, section C-4.1.

Appendix F

Evaluation of the Locations of Existing Monitoring Wells for Detecting Potential Contaminants in the Regional Aquifer from Material Disposal Area C

F-1.0 INTRODUCTION

This appendix discusses an assessment of the existing groundwater monitoring well network's ability to confidently detect potential contaminant arrival in the regional aquifer from contaminant sources within Material Disposal Area (MDA) C at Los Alamos National Laboratory (LANL or the Laboratory). The current groundwater monitoring network at MDA C includes regional wells R-46 and R-60, both located to the east of MDA C (Figure F-1.0-1). A network evaluation was performed as part of the Phase III investigation work plan for MDA C (LANL 2010, 109260, Appendix C). At that time, only well R-46 had been installed near MDA C. The purpose of that initial network evaluation was to identify the locations for two proposed regional wells near MDA C (R-59 and R-60). Because of construction activities at the proposed location of R-59 to the southeast of MDA C, only well R-60 was installed. The Laboratory submitted a drilling work plan for well R-59 while well R-60 was being installed. The drilling work plan did not specify a location for R-59 but instead recommended proposing a location for R-59 after R-60 was completed and water-level data from R-60 were available (LANL 2010, 110868). Following discussions with the New Mexico Environment Department, the Laboratory recommended deferring decisions related to well R-59 until after the Phase III investigation report had been submitted. The Laboratory presented an updated network evaluation in the Phase III investigation report (LANL 2011, 204370) that incorporated water-level data from R-60. The network evaluation in the Phase III investigation report evaluated the effectiveness of wells R-46 and R-60 in detecting releases of trichloroethene (TCE) and tritium from source locations within the footprint of MDA C. The evaluation of the monitoring effectiveness of wells R-46 and R-60 in this appendix is a continuation of the previous analysis that includes two additional potential source locations outside the footprint of MDA C. The results of this evaluation will help inform the decision of the need for, and location of, well R-59.

F-2.0 CONTAMINANT TRANSPORT THROUGH THE VADOSE ZONE

Contaminant transport through the vadose zone is not explicitly considered in the modeling analyses presented below. Instead, the existing data about spatial distribution of vapor-phase contaminants from vapor samples collected in the vadose zone adjacent to MDA C are applied to evaluate the area of potential contaminant arrival at the top of the regional aquifer. This evaluation considers 2-hexanone detected at vapor-monitoring well 50-603467 and tritium detected at vapor-monitoring well 50-603383 (Figure 1.0-1). The network efficiency is evaluated assuming the contaminants are already within the regional aquifer in hypothesized arrival areas illustrated in Figure F-1.0-1.

The conceptual site model of vapor-phase contaminant transport in the vadose zone is discussed in section 4.0 of this corrective measures evaluation (CME) report. Because TCE is the principal vapor-phase contaminant detected at MDA C, the conceptual model discussion focuses on TCE. The behavior of other vapor-phase contaminants, however, should be similar.

The spatial distribution of TCE within the vadose zone is consistent with radial diffusion from belowground sources. The vertical extent of the TCE plume in excess of screening levels based on groundwater cleanup levels is bounded by the lower portion of the Otowi Member of the Bandelier tuff (Qbof) and the underlying Guaje Pumice Bed (Qbog). Transport through the underlying Tschicoma dacite (Tvt 2) would occur by diffusion through fractures and fracture orientation would affect the lateral transport of the plume. Once below Tvt 2, TCE would continue to diffuse through the Puye Formation sediments (Tpf) to the regional aquifer. The distributions of 2-hexanone and tritium are more localized near the wells where they are observed because these two constituents are less volatile than TCE. Transport from these localized areas of detected concentrations would, however, occur similarly to TCE.

The evaluation presented in this appendix assumes transport of these constituents to the water table is predominantly vertical and downward from the existing source areas near the ground surface at MDA C. However, there is also a potential component of upward and lateral diffusion driven by concentration gradients toward the adjacent canyons and the mesa top because of the continuous removal by atmospheric air flow. In the deeper sections of the vadose zone (at elevations lower than the elevation of the adjacent canyons bottoms), the transport is expected to be predominantly radial and driven by diffusion. This model also assumes the infiltration recharge from the surface-water flow along the canyon bottoms to the north and to the south of MDA C does not affect contaminant transport.

The vapor monitoring performed at MDA C identified concentrations of 2-hexanone consistently above the Tier I screening level and occasionally approaching the Tier II screening level in the 600-ft-deep port at vapor-monitoring well 50-603467 (Easting 1626022.62 ft; Northing 1768273.74 ft) (Figure F-1.0-1). In addition, tritium was frequently detected above the Tier II screening level at vapor-monitoring well 50-603383 (Easting 1625793.32 ft; Northing 1768973.35 ft) (Figure F-1.0-1). Both of these locations are outside the potential source locations evaluated in the previous network evaluations. Location 50-603467 is south of MDA C, to the south of Pajarito Road, and location 50-603383 is to the north of the west end of MDA C. This network evaluation evaluates the efficiency of R-46 and R-60 in detecting releases from these two locations. The source areas being used are similar to those used in the previous evaluations (LANL 2010, 109260, Appendix C; LANL 2011, 204370, Appendix G).

F-3.0 NETWORK EVALUATION OF THE REGIONAL MONITORING WELLS

A major objective of the numerical simulations is to analyze flow and contaminant transport directions near potential breakthrough locations at the regional aquifer beneath MDA C. Through this analysis, the effectiveness of existing wells R-46 and R-60 to detect potential contamination in the regional aquifer originating from MDA C can be evaluated.

The numerical simulation of contaminant transport in the regional aquifer is performed using an analytical model. The model simulates three-dimensional advective-dispersive contaminant transport in the regional aquifer from a contaminant source with a given volume (cf., Wexler 1992, 106994; Wang and Wu 2009, 109751). Previously, this model has been applied to simulate transport in the regional aquifer of chromium beneath Sandia Canyon (LANL 2007, 098938) and high explosives in the Technical Area 16 (TA-16) area (LANL 2012, 213573). Various hydrogeological parameters characterize the potential contaminant transport in the regional aquifer, and a distribution of values is used for each of the parameters. In the analyses presented below, the parameters include (1) groundwater flow directions, (2) the hydraulic gradient, (3) aquifer permeability and porosity, (4) longitudinal and transverse dispersivities, and (5) the size and location of the breakthrough location at the top of the regional. The model parameters are also listed in Table F-3.0-1. The model analysis incorporates the distribution of possible values for each of the parameters, as discussed below. The analytical simulation of contaminant transport is performed using the code MADS (http://mads.lanl.gov).

Groundwater flow directions and magnitudes that control contaminant transport in the aquifer are generally dictated by the shape of the regional water table (Freeze and Cherry 1979, 088742, Chapter 5; Vesselinov 2004, 090040). However, the groundwater flow directions in the regional aquifer beneath MDA C are uncertain because of the low density of existing wells in the vicinity of MDA C; more specifically, the water-level data for defining regional flow directions west and north of MDA C are limited (Figure F-1.0-1). To the southwest of MDA C near R-47 and to the south near R-17, flow directions appear to be to the northeast. To the east of MDA C near R-1 and R-14, groundwater flow appears to be to the south-southeast. The differences in the water levels observed at monitoring wells R-60 and R-46 downgradient of MDA C confirm the relatively high hydraulic gradients in the regional aquifer beneath

MDA C (Table F-3.0-1); the hydraulic gradients decline downgradient of MDA C (Figure F-1.0-1). The relatively high gradients upgradient of MDA C are thought to be caused by mountain-front recharge of the regional aquifer to the west of MDA C. Based on the geologic contact information shown in Figure F-1.0-1, the contact of the Puye Formation sediments (Tpf) and Miocene Pumiceous sediments (Tjfp) near and along the regional water table to the northeast of R-60 potentially impacts the flow direction downgradient of MDA C. It is also possible the flow directions are influenced by water-supply pumping at PM-5; however, the current data regarding water-level transients caused by the water-supply pumping (PM-5, PM-4, PM-2, and O-4) suggest the pumping does not cause a pronounced effect on the groundwater flow direction near the top of the regional aquifer. In conclusion, the existing water-level data indicate a relatively complex structure of the regional flow that may be caused by (1) aquifer recharge, (2) aquifer heterogeneity and anisotropy (stratification) and (3) the influence of water-supply pumping. Based on the current data, the regional flow downgradient of MDA C may be in directions varying between east-northeast and east-southeast, as presented in Figure F-1.0-1. Uncertainties in the flow directions and hydraulic gradients are incorporated in the evaluation of network efficiency (Table F-3.0-1).

Puye Formation sediments within the regional aquifer appear to be highly heterogeneous. Estimates of Puye Formation permeability in the regional aquifer at the monitoring wells downgradient of MDA C vary between 0.3 and 20 m/d (~1–60 ft/d) (Table F-3.0-1). The uncertainty in porosity values for the Puye Formation sediments within regional aquifer units is based on data from the literature (Freeze and Cherry 1979, 088742) and site-specific knowledge (Keating et al. 2001, 095399) (Table F-3.0-1). Dispersion of potential contaminant plumes in the aquifer is represented in the model by longitudinal and transverse dispersivities (cf. Lichtner et al. 2002, 095397). Site-specific data supporting dispersivity values are not available. Based on data from literature, the selected range of values is reasonable for the spatial scale of simulated contaminant transport ([on the order of hundreds of meters] Neuman 1990, 090184) and the properties of the flow medium (Table F-3.0-1).

Contaminant transport in the regional aquifer is modeled from two potential breakthrough locations (Figure F-1.0-1). The selection of the breakthrough locations is based on locations where 2-hexanone and tritium are measured in the upper several hundred feet below the ground surface. Locations 50-603383 and 50-603467 represent vapor-monitoring wells where elevated concentrations of tritium and 2-hexanone, respectively, have consistently been detected in the vadose zone (Figure F-1.0-1). In the simulations, contaminants migrate in the regional aquifer downgradient of these breakthrough locations. In addition, the analysis takes into account the uncertainty associated with the potential size of the breakthrough locations; the uncertainty ranges are presented in Table F-3.0-1.

To estimate uncertainty in the model predictions, a Monte Carlo analysis is performed. A set of 1000 uncorrelated, equally probable, random realizations are generated using a Latin Hypercube sampling technique with the software MADS (http://mads.lanl.gov). Each realization includes eight random variables representing various model parameters listed in Table F-3.0-1.

Simulated contaminant migration is based on a unit concentration at the potential arrival location for each of the two breakthrough areas. Therefore, the model produces concentrations at the monitoring wells that are relative to the original unit concentration at the breakthrough areas. Transport within the regional aquifer of a nonsorbing, conservative contaminant is then simulated. No analytical detection limits or regulatory limits are used in this analysis because the predicted concentrations are relative, not absolute. Therefore, the modeling results do not indicate whether either of the contaminants would have concentrations that could exceed regulatory standards or detection limits. However, the simulations yield information about flow directions and about relative magnitudes of concentrations at monitoring wells that are evaluated to determine the efficiency of the network.

This network analysis evaluates the existing R-60 and R-46 monitoring well locations. The well locations are presented in Figure F-1.0-1 and Table F-3.0-2. The distance from the potential contaminant arrival locations and the monitoring wells are listed in Table F-3.0-2.

F-4.0 MONITORING METRICS

The groundwater monitoring metric set for MDA C for this network evaluation is that the monitoring network must detect potential contaminants in the regional aquifer with detection efficiency higher than 95%. In the model, successful detections are contaminants detected by either of the existing monitoring wells near MDA C or a combination of those two wells. The detection efficiency is calculated as the number of successfully detected contaminant distributions divided by the number of simulations. An additional metric is that the wells are located sufficiently close to the assumed breakthrough locations to support early detection (within approximately 5 yr) in the event that a contaminant arrives at the regional aquifer.

F-5.0 RESULTS

The detection efficiency of the regional monitoring wells to detect plumes potentially originating from MDA C is presented in Table F-5.0-1. Average pore (linear) velocity and travel times from the potential sources to the wells are also presented in the table. For the potential 2-hexanone and tritium breakthrough locations, the results indicate that the combination of the existing monitoring wells R-60 and R-46 is capable of detecting potential contaminants from the assumed breakthrough locations with detection efficiency above 95%. This efficiency is based on the assumed areas of breakthrough located below the two vapor-monitoring wells considered in this analysis.

The average pore (linear) velocities from the two potential source areas to the two wells are listed in Table F-5.0-1. Also presented are the average travel times in the aquifer. The peak-arrival travel times from the two potential source locations to R-60 are less than 8 yr and to R-46 are less than 13 yr. The first arrival times to the both locations are less than 5 years.

The combination of wells R-46 and R-60 meets the monitoring metrics for both detection efficiency and early detection for 2-hexanone and tritium detected outside the MDA C footprint. The previous analysis presented in the MDA C Phase III investigation report showed that the combination of these two wells also meets the objectives for monitoring the TCE and tritium plumes located within the MDA C footprint. Based on these two analyses, no additional regional monitoring wells are required for the successful detection of contaminants migrating from MDA C.

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. This information is also included in text citations. ER IDs 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 New Mexico Environment Department Hazardous Waste Bureau 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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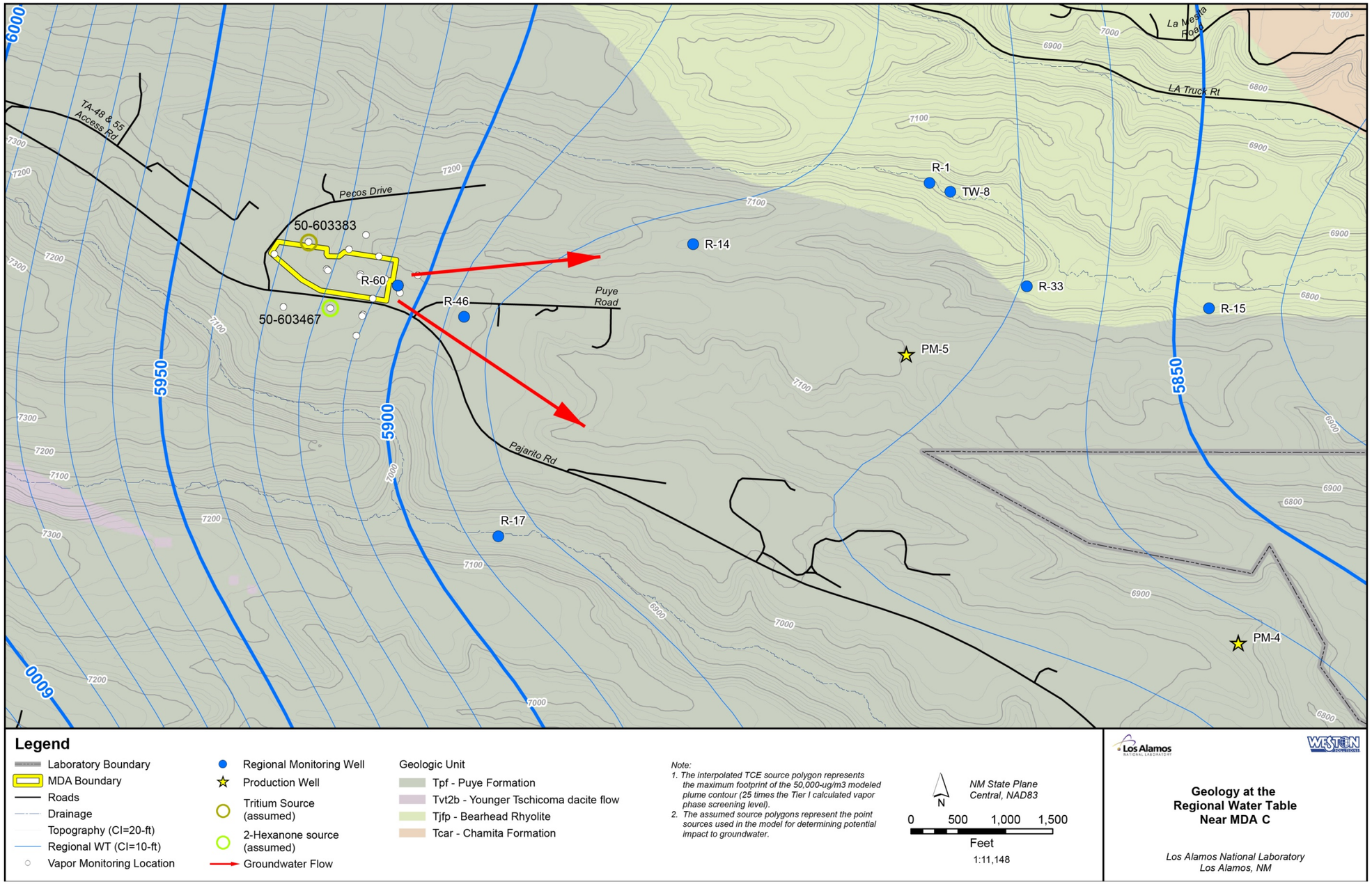

Source: LANL 2011, 201568.

Figure F-1.0-1 Locations of the existing regional monitoring wells near MDA C, including the elevation of the regional water table representative of September 2010, the hydrostratigraphic units along the regional water table near MDA C, and two potential source areas

Table F-3.0-1
Model Parameters Evaluating the
Monitoring Network of Regional Aquifer Wells near MDA C

Parameter	Estimate	Range	
		Minimum	Maximum
Source x location 50-603383	495541.8	Fixed	
Source y location 50-603838	539183.0	Fixed	
Source x location 50-603467	495611.7	Fixed	
Source y location 50-603467	538969.8	Fixed	
Source x dimension [m]	50	10	100
Source y dimension [m]	50	10	100
Porosity [m^3/m^3]	0.1	0.05	0.15
Flow Angle [degrees]	−5	−40	10
Hydraulic gradient [m/m]	0.014	0.011	0.022
Permeability [m/d]	2.3	0.3	20
Effective Pore (linear; advective transport) velocity [m/yr]	100	8	3200
Dispersivity longitudinal [m]	10	1	100
Dispersivity transverse [m]	1	1	10

Note: Each parameter has a range of values used in the model runs.

Table F-3.0-2
Locations of Existing Regional Aquifer
Monitoring Wells Near MDA C and Distance from Potential Source Locations

Well	x (m)	y (m)	Distance (m) to Location 50-603383 (Tritium)	Distance (m) to Location 50-603467 (2-Hexanone)
R-60	495859.6	539036.1	350.1	256.6
R-46	496041.8	538942.2	555.0	431.0

Table F-5.0-1
Detection Efficiency of Monitoring Wells R-60 and R-46

Wells	Location 50-603467 (2-Hexanone)			Location 50-603383 (Tritium)		
	Detection Efficiency	Average Velocity (m/yr)	Average Travel Time (yr)	Detection Efficiency	Average Velocity (m/yr)	Average Travel Time (yr)
R-60	95.6%	37.2	8.0	93.6%	43.8	6.9
R-46	88.8%	43.5	12.6	98.8%	44.0	9.9
R-60 + R-46	98.3%	38.2	8.3	99.3%	43.9	7.0

Note: Detection efficiency related to two potential source areas is shown in Figure F-1.0-1. Average pore (linear) velocity and travel time from the potential source areas to the monitoring wells are also presented.

Appendix G

U.S. Department of Energy Requirements for Corrective Measures at Material Disposal Area C

G-1.0 INTRODUCTION

This appendix addresses U.S. Department of Energy (DOE) requirements applicable to corrective measures to be implemented at Los Alamos National Laboratory (LANL or the Laboratory), Material Disposal Area (MDA) C. Major DOE regulatory requirements applicable to the radionuclide inventory at MDA C are described as are the nature and extent of radiological contamination at MDA C. This appendix also presents the results of a preliminary radiological dose assessment to demonstrate that the corrective measure for MDA C recommended in accordance with the corrective measures evaluation (CME) process specified in the March 1, 2005, Compliance Order on Consent (Consent Order), as modified, would comply with DOE radiological protection requirements.

The DOE requirements described in this appendix apply to radioactive contamination at MDA C and the radioactive materials present in the wastes disposed of at MDA C. The corrective measures to be implemented at MDA C are being selected in accordance with the CME process specified in the Consent Order. Radionuclides and radioactive materials are not subject to regulation under the Consent Order, but are regulated solely by DOE under the authority of the Atomic Energy Act (AEA) and its implementing orders and regulations. Although the CME process does not specifically address radionuclides or radioactive materials, any corrective measure selected and implemented under the Consent Order to address nonradiological contamination and risk must comply with, and be consistent with, DOE requirements for radionuclides and radioactive materials. In the event a corrective measure selected under the Consent Order does not comply with or is inconsistent with DOE requirements for radionuclides and radioactive materials, DOE will revise the corrective measure to assure compliance with DOE requirements. Such revisions would be identified during the corrective measures implementation (CMI) phase of the corrective action process.

Section G-2.0 describes the major DOE radiological protection requirements applicable to corrective measures at MDA C. Section G-3.0 describes the nature and extent of radiological contamination at the MDA C based on the results of past investigations. Section G-4.0 and Attachments G-1 and G-2 present a preliminary radiological dose assessment based on the radiological inventory present in the waste disposal units at MDA C. The purpose of the dose assessment is to demonstrate the corrective measure alternative recommended as a result of the CME process under the Consent Order is capable of meeting DOE requirements for long-term radiological protection of industrial workers and the public.

G-2.0 MAJOR DOE REGULATORY REQUIREMENTS

G-2.1 DOE Order 458.1, Radiation Protection of the Public and the Environment

The primary objective of Order 458.1 is to operate facilities and conduct activities so radiation exposures to members of the public are maintained within limits (established in the order) that control radioactive contamination and are as low as reasonably achievable (ALARA). The order requires DOE facilities to have the capabilities, consistent with the types of operations conducted, to monitor routine and nonroutine releases and to assess radiological doses to members of the public and the environment.

Order 458.1 requires that exposure of members of the public to radiation sources as a consequence of routine DOE activities must not cause, in a year, an effective dose equivalent greater than 100 mrem. The limit of 100 mrem is the sum of the effective dose equivalent from exposures to radiation sources external to the body during the year plus the committed effective dose equivalent from radionuclides taken into the body during the year. The dose limits apply to both operational facilities and those that have been closed. If a facility is removed, but radioactive contamination remains, then the dose limits in DOE Order 458.1

remain applicable to the property. DOE cannot release the property from its control unless it can be demonstrated the exposure to a member of the public will be below 100 mrem/yr. In accordance with DOE Policy 454.1, Use of Institutional Controls, DOE will implement institutional controls and maintain them into the future as long as necessary to protect human health and the environment.

Any corrective measure implemented at MDA C that results in a radionuclide inventory remaining on site (e.g., capping) must comply with the DOE Order 458.1 dose limits. Compliance with dose limits may require the use of more robust barriers than needed for protection of human health and the environment from releases of nonradioactive hazardous constituents. Similarly, any corrective measure that involves removing the radionuclide inventory from MDA C (e.g., excavation) must comply with dose limits during implementation of the corrective measure. Compliance with the dose limits is demonstrated by monitoring and surveillance and conducting dose evaluations. Activities necessary to demonstrate long-term compliance would be performed following implementation of the corrective measure as part of long-term stewardship activities.

G-2.2 Code of Federal Regulations, Title 10, Part 830, Nuclear Safety Management

DOE regulations governing the safety of DOE nuclear facilities are contained in 10 CFR 830. In accordance with the requirements of 10 Code of Federal Regulations (CFR) 830, Subpart B, MDA C was initially categorized as a Hazard Category (HC) 2 nuclear facility based on its estimated gross radioactive inventory. In 2010, a Final Hazard Categorization (FHC) was performed based on a hazard analysis that considered material form, dispersibility, and interaction with energy sources but excluded consideration of engineered safety features (LANL 2010, 227720). Based on this analysis, MDA C was categorized as a radiological facility. A facility safety plan (FSP) (LANL 2010, 227721) was developed specifying the activities that can be performed at MDA C that are consistent with the hazard analysis and radiological facility categorization. These activities are limited to site maintenance (i.e., removal of vegetation to ground level) and sampling and characterization activities, including drilling (drilling into waste pits and shafts is prohibited, however).

DOE approved the FHC (DOE 2010, 227719) and its approval requires that a new hazard analysis be performed if remediation activities are to be implemented that are inconsistent with the assumptions used in the FHC. Therefore, remedial alternatives that include intrusive activities (e.g., waste excavation) will require a new hazard analysis. Based on the results of the hazard analysis, safety requirements will need to be established to maintain the material at risk (MAR) available for dispersion from a worst-case accident below HC-3 limits. Alternately, if the hazard analysis indicates that remediation activities will result in categorization of MDA C as a HC-2 or HC-3 nuclear facility, a documented safety analysis (DSA) must be performed, as required by 10 CFR 830, Subpart B. Based on the results of the DSA, technical safety requirements for remediation activities will be established.

G-2.3 10 CFR 835, Occupational Radiation Protection

DOE regulations governing radiation protection of occupational workers are contained in 10 CFR 835. These regulations include requirements for radiation protection programs, dose limits and exposure standards for workers, and requirements for monitoring, posting and labeling, recordkeeping and reporting, training, and design and control. At the Laboratory, the requirements of 10 CFR 835 are implemented through a radiation protection program contained in Laboratory Procedure 121, Radiation Protection.

Any corrective measure implemented at MDA C would have to comply with the requirements of 10 CFR 835 and Procedure 121. Work procedures and controls would need to be established to ensure

worker exposure complied with the dose limits contained in 10 CFR 835 and was ALARA. The requirements of 10 CFR 835 would most impact corrective measure alternatives that include excavation of buried radioactive waste because these alternatives would present the potential for significant worker exposure.

G-3.0 NATURE AND EXTENT OF RADIONUCLIDE CONTAMINATION

Potential radionuclide contamination at MDA C consists of contamination of surface and shallow subsurface soil and tuff from past operational releases or biointrusion into buried wastes, contamination of subsurface tuff from leaching from buried wastes, and contamination of pore gas (and associated pore water) from diffusion of tritium from buried wastes. Radionuclides released to the subsurface could also potentially migrate to the regional aquifer and result in groundwater contamination. The nature and extent of radionuclide contamination based on the results of the Consent Order investigations is discussed in the following subsections.

G-3.1 Radionuclides in Soil and Tuff

As described in section 2.4.3 and Appendix C of the CME report, the Consent Order investigation data indicate very limited and minor radionuclide contamination of surface and shallow subsurface soil and tuff. All sampling results for radionuclides in surface and shallow subsurface soil and tuff were below residential and industrial screening action levels (SALs) for radionuclides.

As described in section 2.4.3 and Appendix C of the CME report, the Consent Order investigation data indicate very limited and minor releases of radionuclides from the MDA C disposal units into underlying tuff. All sampling results for radionuclides in subsurface tuff samples were below residential and industrial SALs for radionuclides.

G-3.2 Tritium in Pore Gas

Tritium was detected at every sampling location and was detected in 82% of the MDA C vapor samples analyzed for tritium. The frequency of detection for tritium for each sampling event is summarized in Table G-3.2-1. The locations where tritium was detected most frequently are 50-24784 (99% of samples), 50-603063 (96% of samples), 50-603383 (100% of samples), 50-603471 (100% of samples), and 50-603472 (99% of samples). These locations are in the central part of MDA C and to the north of MDA C. The lowest frequencies of detection were to the south of MDA C at locations 50-603468 and 50-613184 (55% of the combined samples for the two collocated wells) and location 50-613185 (30% of samples).

G-3.2.1 Tier I Screening

The Clean Water Act maximum contaminant level (MCL) of 20,000 pCi/L was used as the Tier I screening level for tritium in vapor samples. The results of the Tier I screening are presented in Table G-3.2-2. Tritium was detected above the Tier I screening level in 15% of the MDA C vapor samples analyzed for tritium. Tritium results from during and after the Phase III investigation for locations where Tier I screening levels were exceeded are presented in Figures G-3.2-1 through 3.2-10. The highest frequency of detection above the Tier I screening level was at location 50-603383 where 99% of the sample results exceeded the Tier I screening level. No other location had greater than 25% of results exceeding the Tier I screening level. Six locations at or outside the MDA C boundary (50-603061, 50-603062, 50-603063, 50-603467, 50-613184, and 50-613185) had no detections above the Tier I screening level.

Three other locations at or outside the boundary (50-603064, 50-603468, and 50-603503) had tritium activities greater than the Tier I screening level in only one sample. The one-time detections above the Tier I screening level at these locations are anomalous and were not repeated in any of the other sampling events.

Tritium was detected above the Tier I screening level in more than 1 sample at locations 50-24784 (2 samples at 2 depths), 50-24813 (15 samples at 3 depths), 50-24822 (3 samples at 3 depths), 50-603383 (76 samples at 9 depths), 50-603470 (14 samples at 2 depths), 50-603471 (16 samples at 7 depths), 50-603472 (18 samples at 7 depths), and 50-613183 (4 samples at 2 depths). As discussed below, the tritium results show consistently elevated levels at several locations and depths and sporadic elevated detections at other locations.

At location 50-24784, tritium was detected above the Tier I screening level at 96 ft below ground surface (bgs) for one sampling event and at 155 ft bgs for another sampling event. At location 50-24813, tritium was detected above the Tier I screening level at 25 ft bgs for one sampling event, at 99 ft bgs for all but one sampling event, and at 150 ft bgs for all sampling events. No results from deeper than 150 ft bgs exceeded the Tier I screening level. At location 50-24822, tritium was detected above the Tier I screening level in 1 sample each at depths of 204 ft, 235 ft, and 351 ft bgs. These detections above the Tier I screening level occurred during three different sampling events, and the results were several orders of magnitude greater than previous or subsequent samples at these same depths. At location 50-603383, the maximum detected activity was generally about 1,000,000 pCi/L and was detected at 85 ft bgs or 139 ft bgs for all but one sampling event, where the maximum detection was at 26 ft bgs. Activities from 200 ft bgs to total depth (450 ft bgs) were variable and showed no clear trend with depth but were generally within the range of 100,000 pCi/L to 500,000 pCi/L. At location 50-603470, all samples collected at depths of 30 ft and 83 ft bgs exceeded the Tier I screening level, but tritium did not exceed the Tier I screening level in any samples collected from deeper depths. At location 50-603471, tritium activities exceeded the Tier I screening level in all samples collected from 90 ft bgs. The Tier I screening level was exceeded in all but two samples from 30 ft bgs at this location and adjacent location 50-613183. The Tier I screening level was exceeded in samples from 146 ft, 410 ft, and 450 ft bgs in the January–March 2011 sampling event; in samples from 360 ft bgs in the January–March 2011, October–November 2011, and March–April 2012 sampling events, and in the sample from 209 ft bgs for the October–November 2011 sampling event. Results for the one-time detections above the Tier I screening level at 30 ft, 146 ft, 209 ft, 410 ft, and 450 ft bgs showed increases in tritium activities of 1 to 2 orders of magnitude over previous or subsequent results. At location 50-603472, tritium exceeded the Tier I screening level at 27 ft bgs for all sampling events. The Tier I screening level was also exceeded at 93 ft and 146 ft bgs only for the July–September 2010 event; at 210 ft and 247 ft bgs for the April–July 2010 and July–September 2010; and at 292 ft and 364 ft bgs only for the October–November 2011 sampling event. No results from deeper than 364 ft bgs exceeded the Tier I screening level, except for an anomalous result at location 50-613182, next to location 50-603472, from 600 ft bgs for the August 2011 event. The tritium activity in this sample was more than 2 orders of magnitude greater than previous or subsequent results.

G-3.2.2 Tier II Screening

As described in section 3.2.4.2 of the CME report, a preliminary Tier II screening level for tritium (288,800 pCi/L) was calculated as the product of the Tier I screening level (20,000 pCi/L) and the aquifer dilution factor for fracture flow (14.44). Table G-3.2-2 presents the results of the Tier II screening. The Tier II screening level was exceeded for most samples collected at location 50-603383, all samples collected at 83 ft bgs at location 50-603470, all but one sample collected at 27 ft bgs at location 50-603472, and all samples collected at 30 ft bgs at location 50-613183. Several anomalous detections of

tritium were also above the Tier II screening level at activities orders of magnitude greater than previous or subsequent samples. These detections occurred at locations 50-24822 (235 ft bgs for March–April 2012 event), 50-603468 (403 ft bgs for January–March 2011 event), 50-603471 (146 ft and 410 ft bgs for January–March 2011 event and 360 ft bgs for January–March 2011 and October–November 2011 events), 50-603472 (210 ft bgs for October–November 2011 event), and 50-613182 (600 ft bgs for August 2011 event).

With the exception of location 50-603383, tritium detections above the Tier II screening level are limited to depth intervals near the surface within the central area of MDA C or are anomalous, one- or two-time detections. The detections above Tier II screening levels in the central area of MDA C are consistent with the distribution of volatile organic chemicals (VOCs) above Tier II screening levels. Detections at location 50-603383 are uniformly higher than the Tier II screening level, with the maximum activities generally detected in the samples from 85 ft and 139 ft bgs.

G-3.3 Radionuclides in Groundwater

Radionuclides detected in samples collected from the MDA C monitoring wells during 2010 and 2011 are presented in Table G-3.3-1. Tritium was not detected in any samples from wells R-14 or R-60 and was detected in only one sample from well R-46. The other detected radionuclides (radium-226, radium-228, uranium-234, uranium-235/236, and uranium-238) are naturally occurring and are not associated with releases from MDA C. A detailed evaluation of data from the MDA C monitoring wells is presented in Appendix E of this CME report.

G-4.0 PRELIMINARY RADIOLOGICAL DOSE ASSESSMENT

The CME process resulted in identifying a recommended corrective measure alternative for MDA C. Under the Consent Order, the recommended corrective measure alternative must protect human health and the environment from releases of nonradioactive hazardous constituents disposed of at MDA C. As described in section G-2.0, any corrective measure implemented at MDA C must also meet DOE requirements for radiological protection of workers and the public. Therefore, a preliminary radiological dose assessment was conducted to evaluate the dose to on-site industrial workers and members of the public from the radionuclide inventory present in the MDA C waste disposal units, assuming the recommended corrective measure under the Consent Order was implemented.

The corrective measure recommended for MDA C under the Consent Order consists of an evapotranspiration (ET) cover, soil-vapor extraction (SVE), and institutional controls. The remedial action objectives (RAOs) addressed by the recommended corrective measure include the following:

- Prevent human and ecological exposure to the waste through excavation, biointrusion, and erosion;
- Prevent human and ecological exposure to the contaminated surface soils and/or subsurface soils through excavation and biointrusion;
- Prevent groundwater from being impacted above a regulatory standard by the transport of VOCs through soil vapor; and
- Prevent the creation of contaminated leachate by restricting the infiltration of water into the waste.

The above RAOs would also apply to radionuclides, although the third RAO would apply to tritium rather than VOCs. The ET cover component of the alternative is designed to address the first, second, and

fourth RAOs by preventing exposure to waste constituents by direct contact or biointrusion, and controlling infiltration of moisture into the waste inventory. The ET cover is also designed to prevent exposure of the waste inventory from erosion and the institutional control component of the alternative includes inspection and maintenance of the cover to prevent erosion. The institutional control component also includes site access controls to prevent inadvertent intrusion into the waste inventory. These exposure pathways are also applicable to the radionuclide inventory present at MDA C, and the ET cover and institutional controls would provide an identical function for radionuclides.

The SVE component of the recommended corrective measure alternative is designed to remove the inventory of vapor-phase VOCs from the vadose zone to prevent migration to the regional aquifer via vapor-phase diffusion. Tritium (in the form of tritiated water) is also present in the vapor phase in the vadose zone beneath MDA C. Some vapor-phase tritium would be removed by operation of the recommended SVE system. Because of the very low Henry's law constant for tritiated water, however, SVE would have a very low tritium removal efficiency. Stauffer et al. (2002, 097387) report a dimensionless Henry's law constant for tritiated water of approximately 0.00001. The Federal Remediation Technologies Roundtable recommends that a contaminant have a dimensionless Henry's law constant of at least 0.01 for SVE to be effective (http://www.frtr.gov/matrix2/section4/4-7.html). Therefore, it was assumed that SVE would not be effective in removing the tritium inventory from the vadose zone, and the preliminary radiological dose assessment evaluated migration of tritium to the regional aquifer with no removal by the SVE system.

Although SVE has a low removal efficiency for tritium, some tritium will be captured by the SVE extraction wells and potentially released to the atmosphere with the SVE off gas. The tritium release rate was estimated as the product of the SVE extraction rate and the average tritium activity in pore gas in the extraction zone. The proposed SVE extraction rate is 640 ft^3/min (Appendix H). The average tritium activity in pore gas was calculated as the product of the moisture content of saturated air at an assumed temperature of 20 °C (17.3 g/m^3) and the average tritium activity measured in pore water captured from vapor samples collected in the proposed extraction zone (23,000 pCi/L). The resulting tritium release rate is 0.0104 mCi/d and the total release over the proposed 360 d extraction period is 3.8 mCi. This minor release rate is not expected to require an air emission permit, but the need for a permit will be evaluated during the CMI.

The preliminary radiological dose assessment was performed using the RESidual RADioactivity (RESRAD) computer code. RESRAD was used to evaluate the dose to an on-site industrial worker and an off-site resident under two scenarios: (1) the ET cover recommended by the CME was in place over the MDA C waste disposal units and (2) the current operational cover was in place. The off-site residential receptor was assumed to be at the Royal Crest Trailer Park, which is approximately 0.75 mi north of MDA C and is the location of the nearest resident. Consistent with the requirements of DOE Order 435.1, Radioactive Waste Management (which does not apply to MDA C because of its period of operation), doses were evaluated over a period of 1000 yr. Details on the exposure scenarios and input data used in the RESRAD simulations are provided in Attachment G-1.

The results of the preliminary radiological dose assessment are summarized in Attachment G-1 and detailed results from the RESRAD simulations are presented in Attachment G-2. These results show the estimated dose to the on-site industrial worker and off-site resident meets the DOE dose limits for the scenario where the ET cover is in place. Therefore, the recommended corrective measure alternative would comply with DOE radiological protection requirements. A more detailed radiological dose assessment will be performed during the CMI to ensure the final design meets radiological protection requirements.

G-5.0 SUMMARY

Conditions at MDA C currently comply with applicable DOE radiological protection requirements. Extensive surface and subsurface sampling performed at MDA C has shown limited radiological contamination of environmental media or migration of radionuclides, with the exception of tritium in pore vapor and pore water in the vadose zone. Radionuclides detected in soil and tuff samples were all below residential and industrial SALs. Tritium exceeds Tier I and Tier II screening levels in subsurface vapor samples from some of the vapor-monitoring wells, but tritium does not currently appear to pose a threat of groundwater contamination.

A preliminary radiological dose assessment indicates the corrective measure alternative recommended under the Consent Order would meet DOE radiological protection requirements provided the cover over the waste inventory remains intact. The cover design will be finalized during the CMI. Final design activities will address cover longevity and long-term performance requirements.

G-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. This information is also included in text citations. ER IDs 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 New Mexico Environment Department Hazardous Waste Bureau 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.

DOE (U.S. Department of Energy), July 2, 2010. "Response to Final Categorization for Material Disposal Area C," U.S. Department of Energy memorandum (COR-SO-6.30.2010-264748) to R.L. McQuinn (LANL), from J.C. Vozella (DOE-LASO) and D.L. Winchell, Jr. (DOE-LASO), Los Alamos, New Mexico. (DOE 2010, 227719)

LANL (Los Alamos National Laboratory), May 2007. "Groundwater Background Investigation Report, Revision 3," Los Alamos National Laboratory document LA-UR-07-2853, Los Alamos, New Mexico. (LANL 2007, 095817)

LANL (Los Alamos National Laboratory), June 2010. "Material Disposal Area (MDA C) Final Hazard Categorization," NES-ABD-0700, R.2, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2010, 227720)

LANL (Los Alamos National Laboratory), October 2010. "Facility Safety Plan for Material Disposal Area C," TA-21 Document No. TA21-MDAC-FSP-00001, R.0, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2010, 227721)

Stauffer, P., G. Lopez, and R. Budd, July 2002. "Tritium Transport Beneath Surface Impoundments at TA-53, Modeling and Analysis in Support of Data Needs," Los Alamos National Laboratory document LA-UR-02-5321, Los Alamos, New Mexico. (Stauffer et al. 2002, 097387)

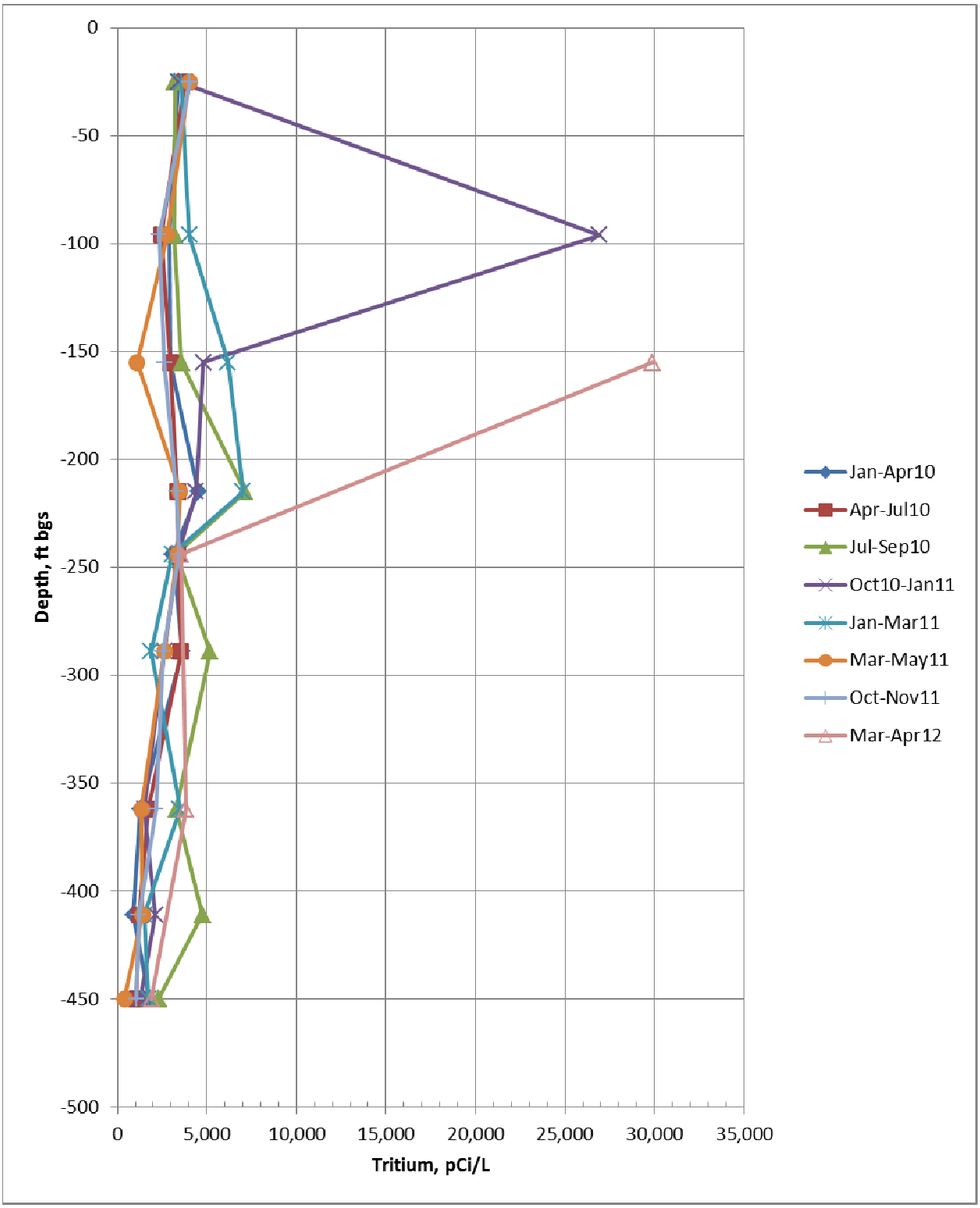

Figure G-3.2-1 Tritium vapor-sampling results for location 50-24784

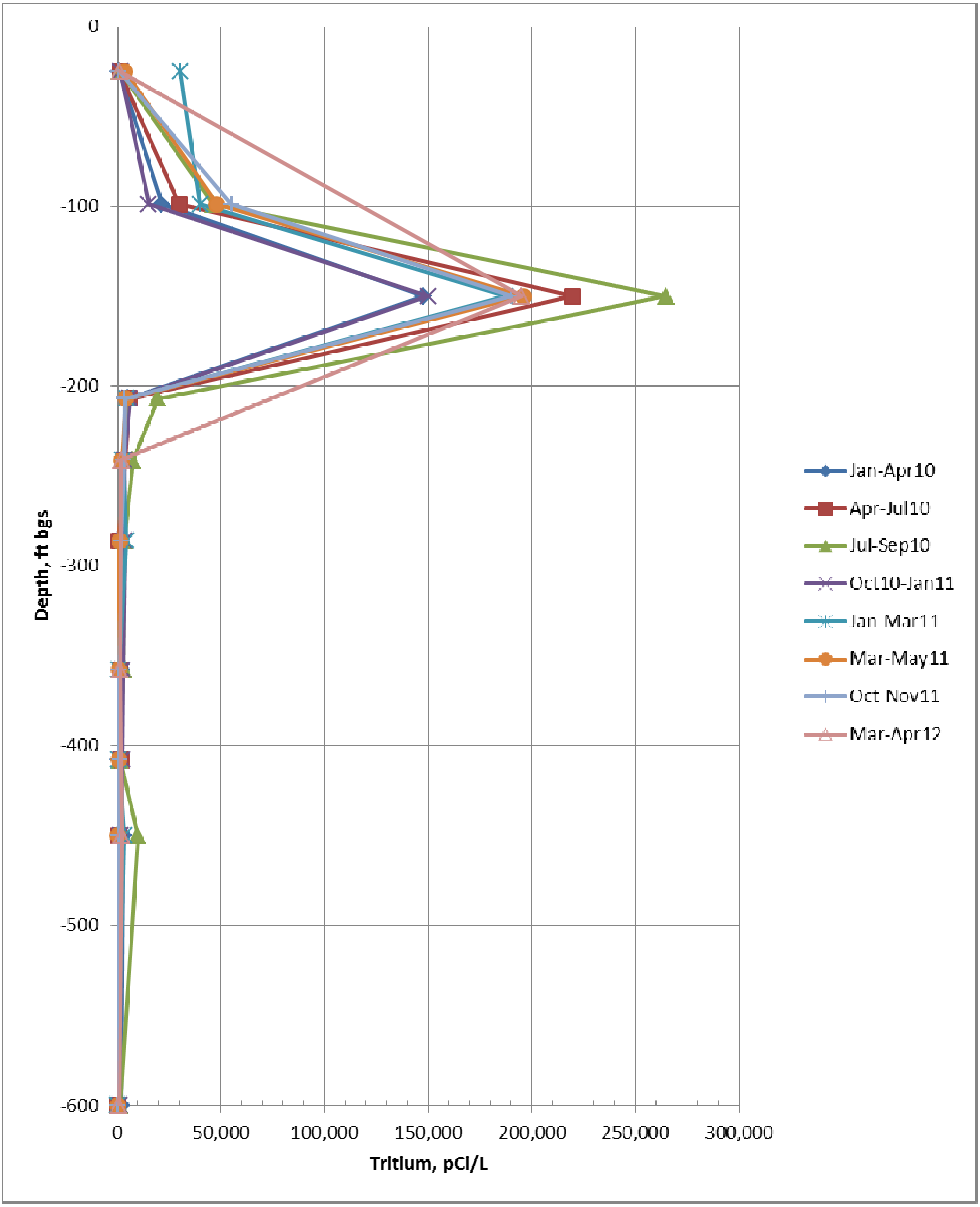

Figure G-3.2-2 Tritium vapor-sampling results for location 50-24813

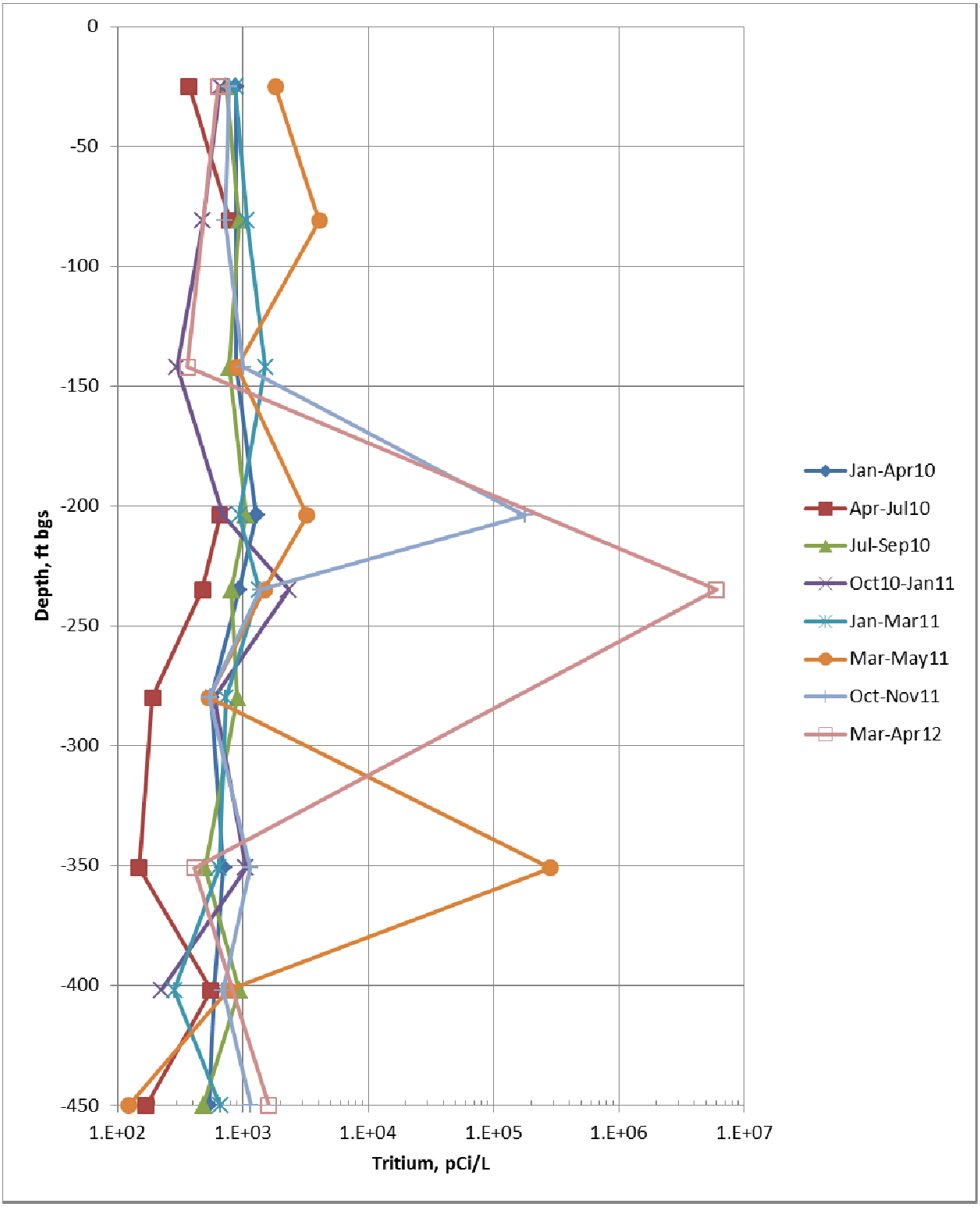

Figure G-3.2-3 Tritium vapor-sampling results for location 50-24822

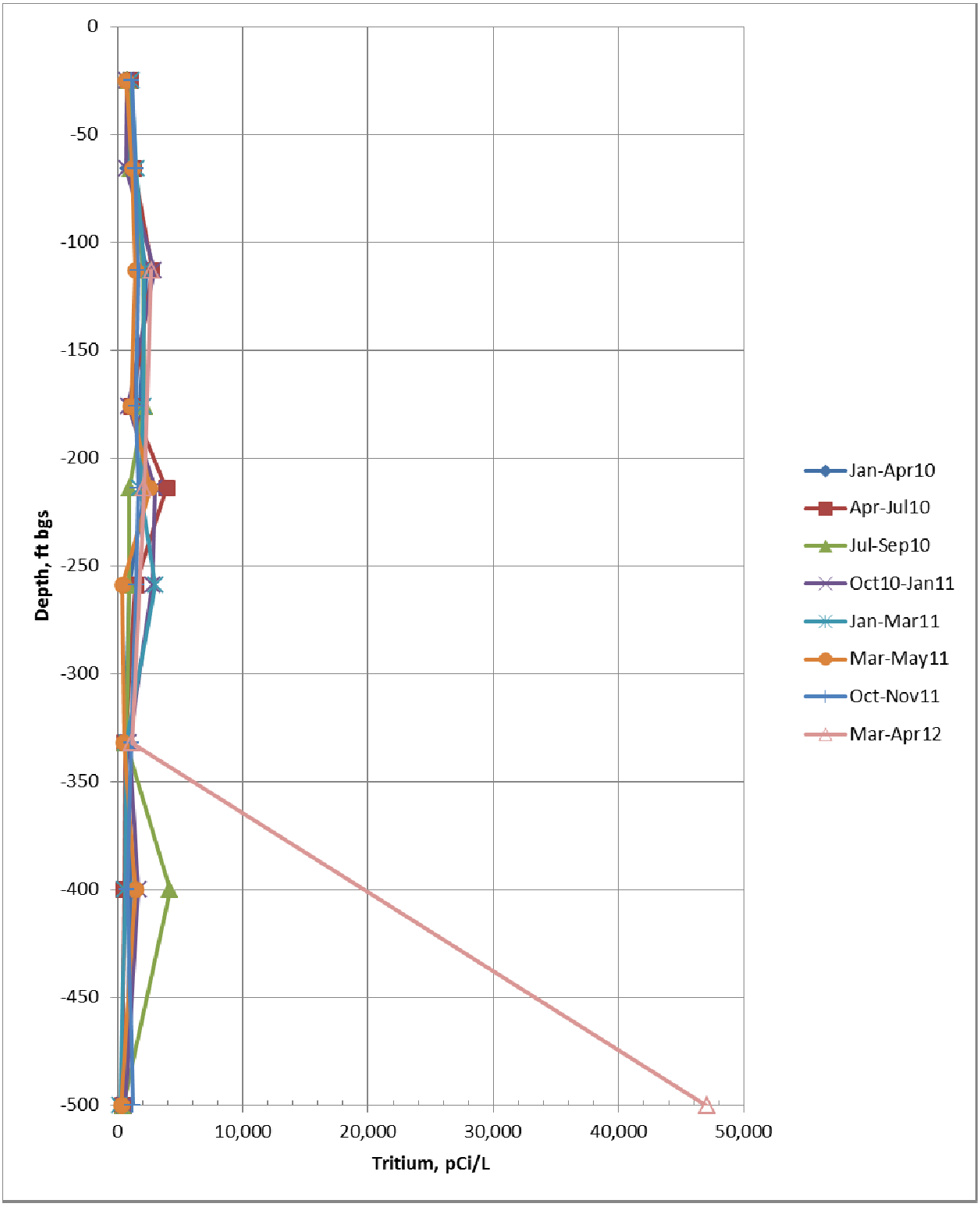

Figure G-3.2-4 Tritium vapor-sampling results for location 50-603064

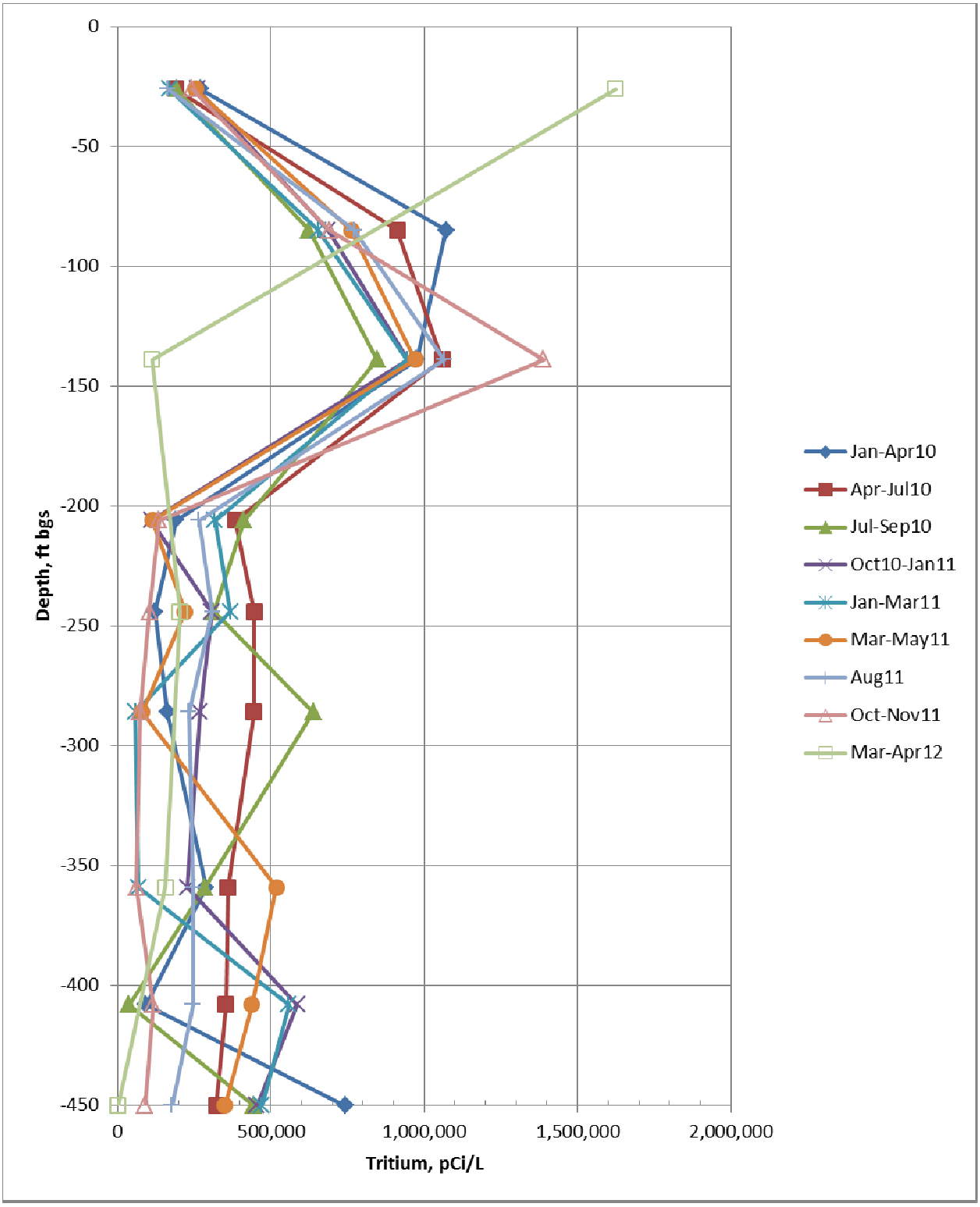

Figure G-3.2-5 Tritium vapor-sampling results for location 50-603383

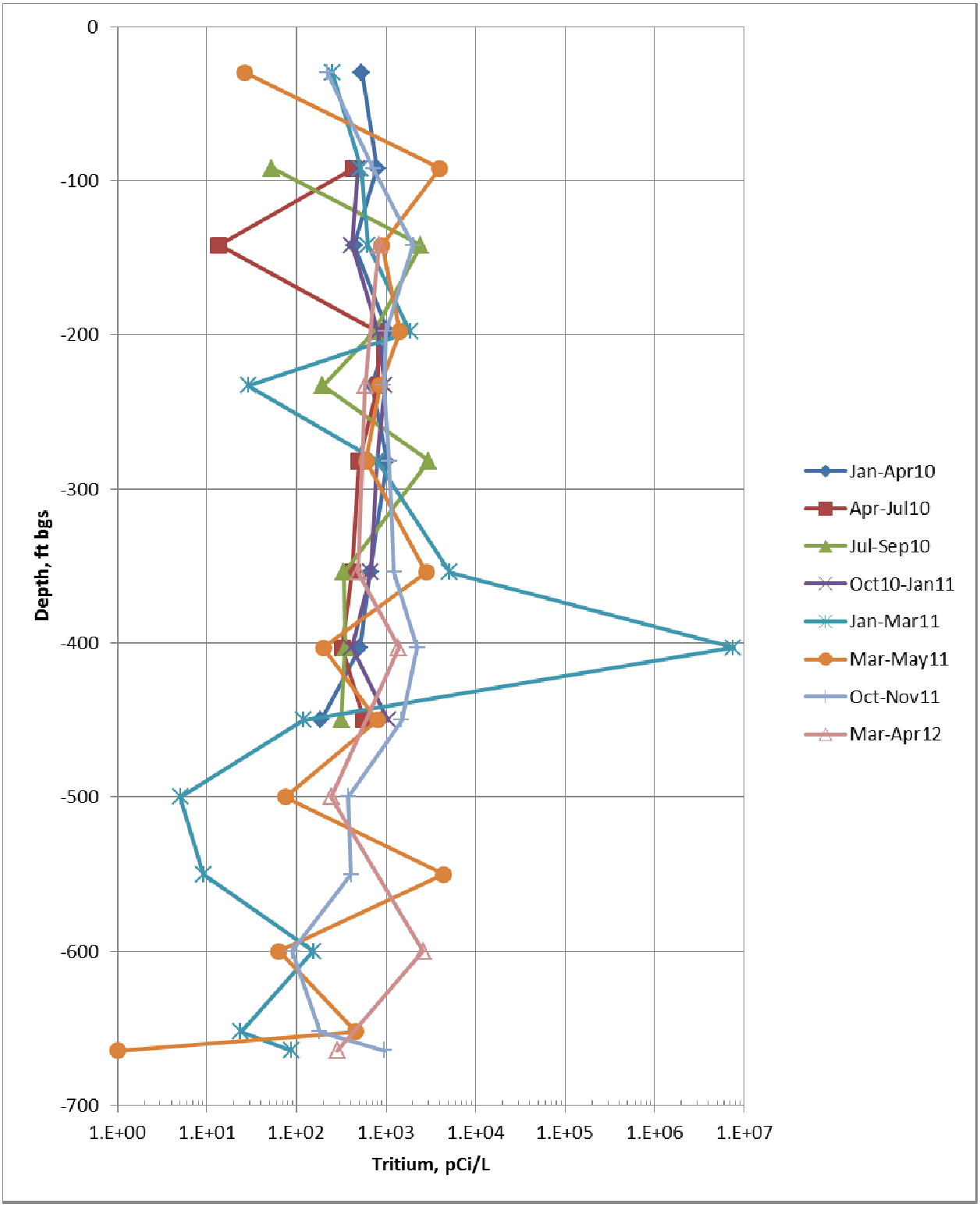

Figure G-3.2-6 Tritium vapor-sampling results for locations 50-603468 and 50-613184

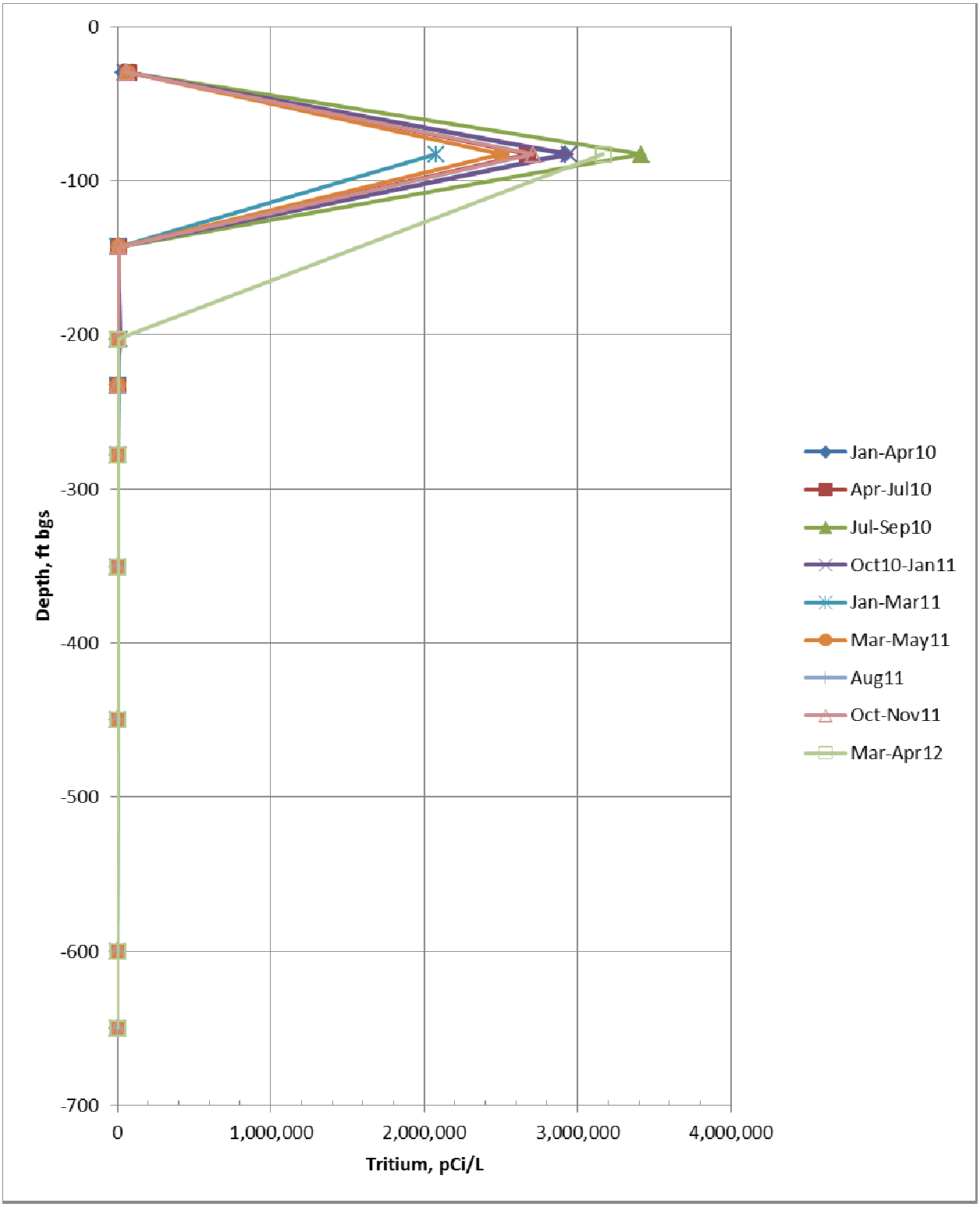

Figure G-3.2-7 Tritium vapor-sampling results for location 50-603470

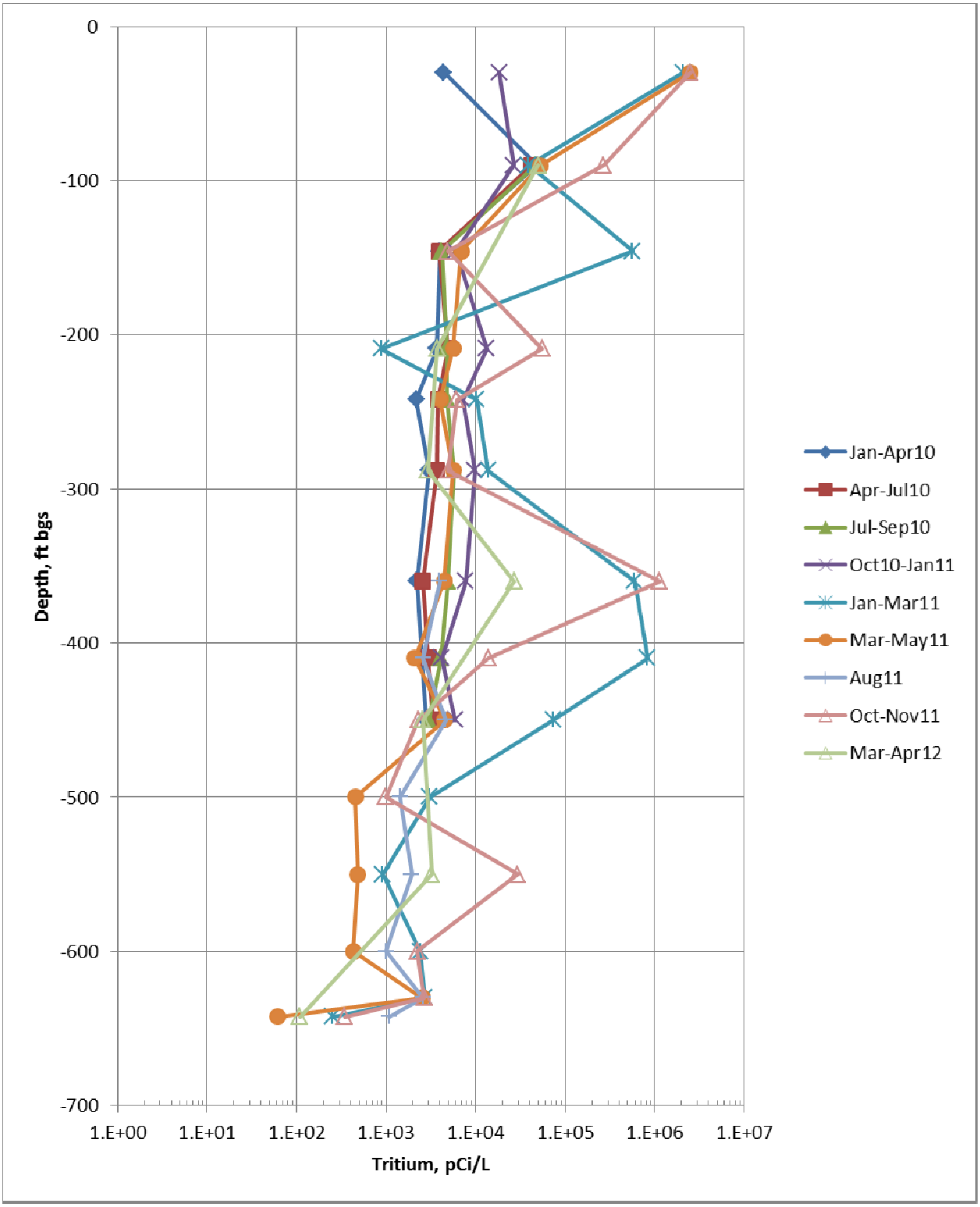

Figure G-3.2-8 Tritium vapor-sampling results for locations 50-603471 and 50-613183

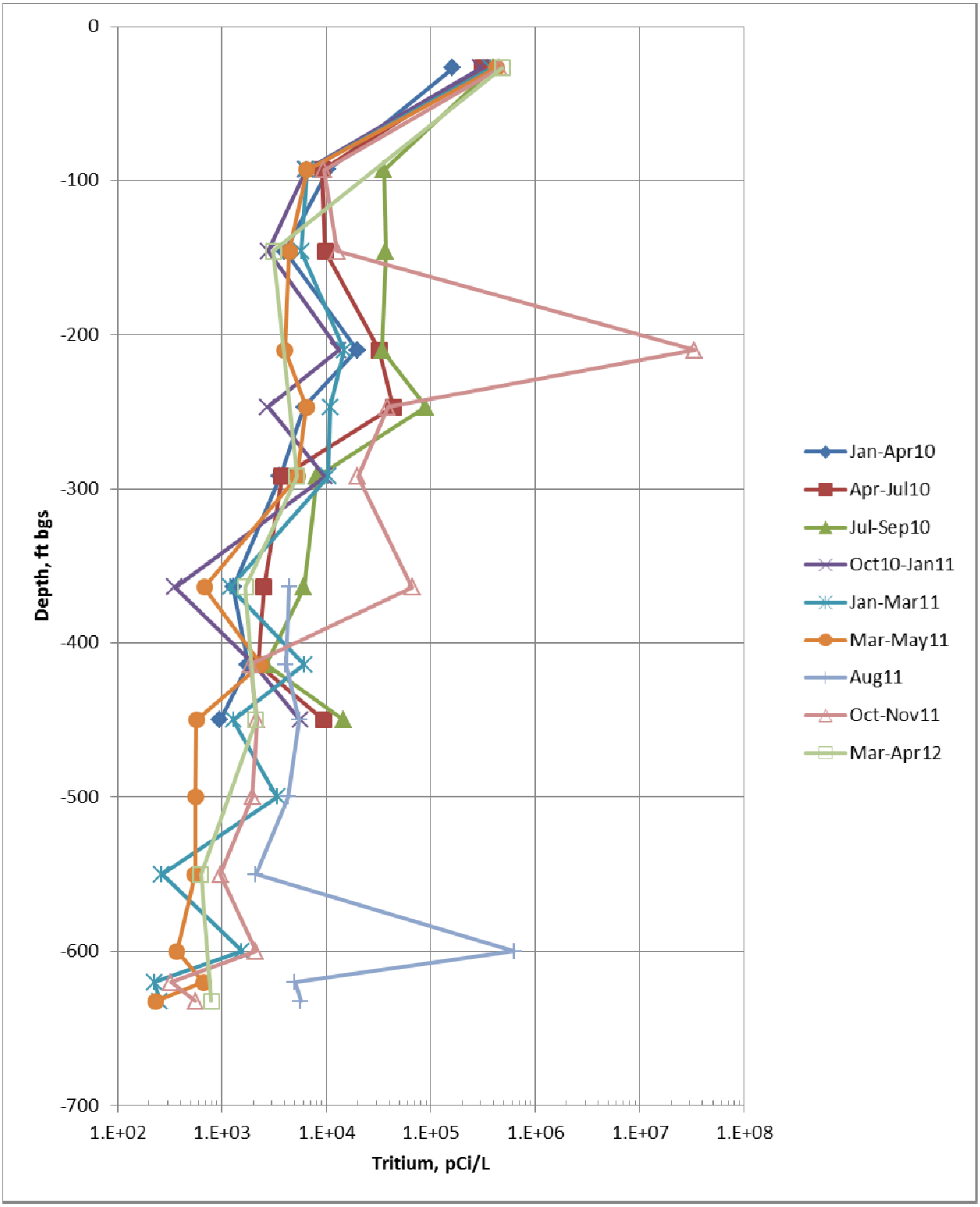

Figure G-3.2-9 Tritium vapor-sampling results for locations 50-603472 and 50-613182

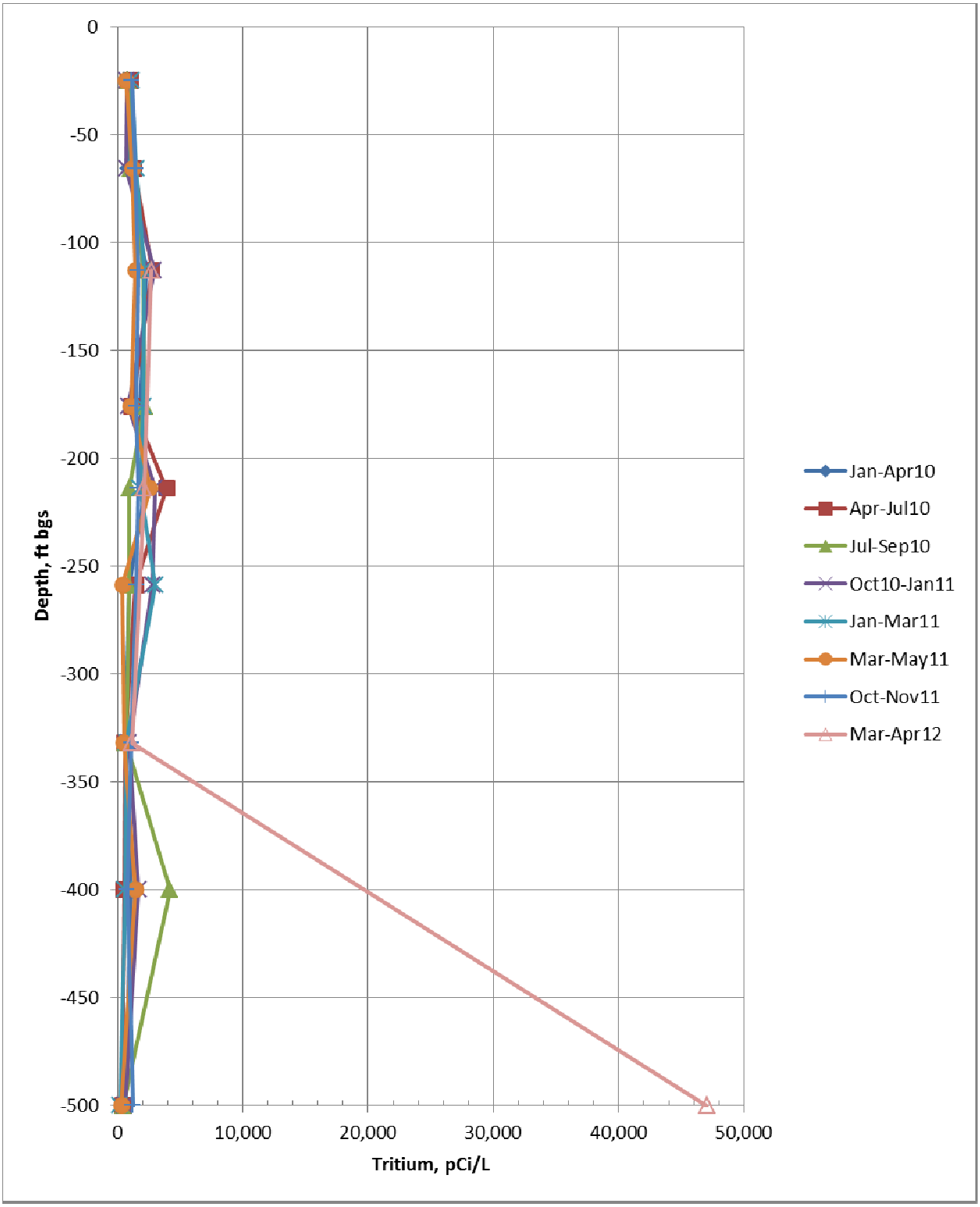

Figure G-3.2-10 Tritium vapor-sampling results for location 50-603503

Table G-3.2-1
Summary of Pore-Gas Detection Status for Tritium

Analyte	Number of Analyses	Number of Detects	Number of Detected Locations	Activity Range	Location and Depth of Maximum Detection	Maximum Detected Result	Tier I Screening Level
January 2010–April 2010	132	115	14	[−235.585] to 2,920,220	50-603470 (83 ft)	**2,920,220**	20,000
April 2010–July 2010	127	98	14	[−608.563] to 2,675,700	50-603470 (83 ft)	**2,675,700**	20,000
July 2010–September 2010	126	108	14	[53.0427] to 3,417,920	50-603470 (83 ft)	**3,417,920**	20,000
October 2010–January 2011	127	104	14	[−102.488] to 2,948,440	50-603470 (83 ft)	**2,948,440**	20,000
January 2011–March 2011	154	119	17	[−100.384] to 7,596,950	50-603468 (403 ft)	**7,596,950**	20,000
March 2011–May 2011	154	117	17	[−117.41] to 2,525,710	50-613183 (30 ft)	**2,525,710**	20,000
August 2011	34	32	7	[201.063] to 1,065,080	50-603383 (139 ft)	**1,065,080**	20,000
October 2011–November 2011	108	94	13	[90] to 33,460,000	50-603472 (210 ft)	**33,460,000**	20,000
March 2012–April 2012	80	71	18	[109] to 6,001,000	50-24822 (235 ft)	**6,001,000**	20,000

Notes: Units in pCi/L. Brackets indicate nondetected result. Bold indicates maximum concentration greater than Tier I screening level.

Table G-3.2-2
Tier I and II Screening of Tritium Vapor Data at MDA C

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-24784	25	MD50-10-8677	3413.92	MD50-10-15742	3764.65	MD50-10-24362	3219.85	MD50-10-27179	3424.39	MD50-11-4012	3568.8
50-24784	96	MD50-10-8680	2882.38	MD50-10-15745	2475.55	MD50-10-24364	3185.58	MD50-10-27176	**26,930.3**	MD50-11-4010	4038.74
50-24784	155	MD50-10-8681	2970.67	MD50-10-15747	2962.82	MD50-10-24365	3572.22	MD50-10-27175	4811.13	MD50-11-4009	6174.87
50-24784	215	MD50-10-8679	4528.12	MD50-10-15744	3360.45	MD50-10-24361	7129.08	MD50-10-27181	4376.64	MD50-11-4006	7007.02
50-24784	244	MD50-10-8685	3110.35	MD50-10-15741	3393.56	MD50-10-24359	3292.81	MD50-10-27180	3410.01	MD50-11-4004	3074.5
50-24784	289	MD50-10-8683	3605.46	MD50-10-15748	3545.48	MD50-10-24366	5168.45	MD50-10-27178	2637.69	MD50-11-4008	1871.12
50-24784	362	MD50-10-8684	1299.08	MD50-10-15743	1698.46	MD50-10-24360	3307.05	MD50-10-27182	1527.11	MD50-11-4007	3507.55
50-24784	411	MD50-10-8682	908.698	MD50-10-15746	1237.12	MD50-10-24367	4743.38	MD50-10-27177	2133.35	MD50-11-4005	1516.3
50-24784	450	MD50-10-8678	1799.63	MD50-10-15740	1070.5	MD50-10-24363	2303.1	MD50-10-27183	1295.11	MD50-11-4003	1725.77
50-24813	25	MD50-10-8697	739.433	MD50-10-15902	936.928	MD50-10-24369	1240.01	MD50-10-27186	1461.9	MD50-11-4023	**30,450.9**
50-24813	99	MD50-10-8696	**21,617.4**	MD50-10-15906	**29,952.9**	MD50-10-24375	**46,402.7**	MD50-10-27189	15,322.2	MD50-11-4021	**40,040.7**
50-24813	150	MD50-10-8693	**147,992**	MD50-10-15903	**219,728**	MD50-10-24370	**264,844**	MD50-10-27185	**150,165**	MD50-11-4095	**187,502**
50-24813	207	MD50-10-8702	5173.99	MD50-10-15907	5757.71	MD50-10-24376	19,656.9	MD50-10-27190	6088.51	MD50-11-4019	4343.06
50-24813	241	MD50-10-8699	3325.24	MD50-10-15904	3991.23	MD50-10-24371	7621.74	MD50-10-27193	3376.21	MD50-11-4018	2738.5
50-24813	241	—*	—	—	—	—	—	MD50-10-27194	4271.92	—	—
50-24813	286	MD50-10-8694	1439.37	MD50-10-15909	663.914	MD50-10-24377	3329.36	MD50-10-27191	3649.94	MD50-11-4017	4468.2
50-24813	358	MD50-10-8700	2121.74	MD50-10-15905	1190.91	MD50-10-24372	3046.49	MD50-10-27343	2722	MD50-11-4014	686.167
50-24813	408	MD50-10-8695	674.658	MD50-10-15910	1574.73	MD50-10-24378	1292.16	MD50-10-27192	2592.53	MD50-11-4013	720.983
50-24813	450	MD50-10-8701	2992.26	MD50-10-15908	532.831	MD50-10-24374	10,075.6	MD50-10-27188	1793.02	MD50-11-4015	3375.43
50-24813	600	MD50-10-8698	2011.76	MD50-10-15911	367.733 (U)	MD50-10-24373	1328.82	MD50-10-27195	932.357	MD50-11-4016	166.876 (U)
50-24822	25	MD50-10-8703	881.043	MD50-10-15848	371.771 (U)	MD50-10-24413	736.749	MD50-10-27227	661.459	MD50-11-4058	873.3
50-24822	81	MD50-10-8704	891.68	MD50-10-15854	791.945	MD50-10-24419	944.627	MD50-10-27232	483.154 (U)	MD50-11-4059	1078.76
50-24822	142	MD50-10-8705	892.977	MD50-10-15850	−133.376 (U)	MD50-10-24416	780.527	MD50-10-27235	298.979 (U)	MD50-11-4057	1510.41
50-24822	204	MD50-10-8706	1279.38	MD50-10-15856	655.605	MD50-10-24414	1060.88	MD50-10-27229	702.357	MD50-11-4055	938.98
50-24822	235	MD50-10-8707	934.264	MD50-10-15849	477.997	MD50-10-24418	812.479	MD50-10-27233	2341.01	MD50-11-4060	1362.39
50-24822	280	MD50-10-8708	556.108	MD50-10-15855	190.312 (U)	MD50-10-24412	907.234	MD50-10-27231	587.23	MD50-11-4061	734.991
50-24822	351	MD50-10-8709	703.431	MD50-10-15852	148.996 (U)	MD50-10-24415	500.505	MD50-10-27230	1058.96	MD50-11-4056	645.717
50-24822	402	MD50-10-8710	591.561	MD50-10-15851	559.206	MD50-10-24411	938.747	—	—	MD50-11-4062	284.644 (U)
50-24822	450	MD50-10-8711	537.685	MD50-10-15853	168.849 (U)	MD50-10-24417	484.494	MD50-10-27228	224.112 (U)	MD50-11-4064	663.654
50-603061	25	MD50-10-8715	274.432 (U)	MD50-10-15840	190.081 (U)	MD50-10-26315	468.776 (U)	MD50-10-27249	1149.9	MD50-11-4080	480.376
50-603061	76	MD50-10-8716	1261.59	MD50-10-15837	971.678	MD50-10-24432	3217.63	MD50-10-27251	2314.69	MD50-11-4081	1890.98
50-603061	128	MD50-10-8717	1846.54	MD50-10-15841	798.725	MD50-10-24437	1734.72	MD50-10-27247	2606.74	MD50-11-4083	972.27
50-603061	190	MD50-10-8718	2744.4	MD50-10-15843	1135.27	MD50-10-24433	3286.56	MD50-10-27255	1941.01	MD50-11-4082	2034.15
50-603061	228	MD50-10-8719	2878.75	MD50-10-15839	981.272	MD50-10-24436	1048.97	MD50-10-27248	1504.95	MD50-11-4084	1536.53
50-603061	274	MD50-10-8720	2958.58	MD50-10-15844	2328.91	MD50-10-24434	1869.35	MD50-10-27253	3534.92	MD50-11-4076	3698.88
50-603061	347	MD50-10-8721	727.406	MD50-10-15842	2150.47	MD50-10-24438	2594.94	MD50-10-27252	2654.12	MD50-11-4077	3038.69

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603061	397	MD50-10-8722	1072.9	MD50-10-15838	513.967	MD50-10-26314	915.021	MD50-10-27254	839.172	MD50-11-4078	1269.1
50-603061	450	MD50-10-8724	344.844	MD50-10-15836	244.829 (U)	MD50-10-24439	268.643 (U)	MD50-10-27250	477.022 (U)	MD50-11-4079	280.486 (U)
50-603062	25	MD50-10-8727	298.807 (U)	MD50-10-15893	417.167 (U)	MD50-10-24441	468.336	MD50-10-27262	−35.4788 (U)	MD50-11-4092	310.845
50-603062	64	MD50-10-8728	883.372	MD50-10-15894	883.901	MD50-10-24446	1109.41	MD50-10-27265	914.559	MD50-11-4091	619.661
50-603062	122	MD50-10-8729	122.612 (U)	MD50-10-15891	1203.28	MD50-10-24443	3565.39	MD50-10-27257	5527.48	MD50-11-4093	328.876 (U)
50-603062	184	MD50-10-8730	440.13 (U)	MD50-10-15896	525.936 (U)	MD50-10-24445	409.331	MD50-10-27263	260.654 (U)	MD50-11-4090	492.612
50-603062	217	MD50-10-8731	215.094 (U)	MD50-10-15895	455.545 (U)	MD50-10-24447	589.846	MD50-10-27260	312.76 (U)	MD50-11-4089	425.561 (U)
50-603062	263	MD50-10-15366	272.151 (U)	MD50-10-15890	578.892	MD50-10-24442	718.044	MD50-10-27264	−15.6845 (U)	MD50-11-4087	218.311 (U)
50-603062	337	MD50-10-8733	38.6059 (U)	MD50-10-15898	97.0553 (U)	MD50-10-24448	692.259	MD50-10-27259	1850.9	MD50-11-4086	378.501 (U)
50-603062	387	MD50-10-8734	351.77 (U)	MD50-10-15892	372.405 (U)	MD50-10-24444	1286.86	MD50-10-27261	283.483 (U)	MD50-11-4088	377.146 (U)
50-603062	450	MD50-10-8735	201.417 (U)	MD50-10-15897	467.216 (U)	MD50-10-24449	629.448	MD50-10-27258	82.0344 (U)	MD50-11-4085	198.374 (U)
50-603063	25	MD50-10-8755	1280.25	MD50-10-15827	752.139	MD50-10-24451	285.097 (U)	MD50-10-27267	2260.32	MD50-11-4103	789.72
50-603063	76	MD50-10-8754	3139.59	MD50-10-15832	1219.12	MD50-10-24457	2458.27	MD50-10-27272	2094.8	MD50-11-4102	1669.9
50-603063	128	MD50-10-8753	3346.91	MD50-10-15825	−608.563 (U)	MD50-10-24453	538.263	MD50-10-27275	1262.6	MD50-11-4101	1050.58
50-603063	190	MD50-10-8752	6384.08	MD50-10-15830	1748.91	MD50-10-24454	1300.78	MD50-10-27268	2335.43	MD50-11-4100	2965.12
50-603063	228	MD50-10-8751	5796.61	MD50-10-15824	2622.81	MD50-10-24456	3074.86	MD50-10-27273	1491.42	MD50-11-4099	3672.71
50-603063	274	MD50-10-8749	4699.57	MD50-10-15829	3320.82	MD50-10-24458	1336.8	MD50-10-27269	4126.76	MD50-11-4098	2331.5
50-603063	347	MD50-10-8750	2994.43	MD50-10-15833	1116.01	MD50-10-24452	1966.42	MD50-10-27274	1338.88	MD50-11-4096	1785.02
50-603063	397	MD50-10-8748	2649.04	MD50-10-15826	1119.44	—	—	—	—	MD50-11-4104	1438.22
50-603063	450	MD50-10-8747	1513.08	MD50-10-15831	1245.91	MD50-10-24455	2648.4	MD50-10-27271	1640.14	MD50-11-4097	1488.64
50-603064	25	MD50-10-8759	857.69	MD50-10-15816	1066.59	MD50-10-24461	868.096	MD50-10-27280	761.357	MD50-11-4113	1124.85
50-603064	66	MD50-10-8760	946.6	MD50-10-15817	1328.17	MD50-10-24467	1070.76	MD50-10-27285	733.386	MD50-11-4112	1514.99
50-603064	113	MD50-10-8761	2332.13	MD50-10-15814	2771.77	MD50-10-24462	2047.61	MD50-10-27279	2930.26	MD50-11-4111	2126.53
50-603064	176	MD50-10-8762	1841.68	MD50-10-15812	1151.75	MD50-10-24465	2159.8	MD50-10-27283	906.704	MD50-11-4109	2070.25
50-603064	214	MD50-10-8763	2209.67	MD50-10-15819	3917.06	MD50-10-24463	975.676	MD50-10-27277	3015.69	MD50-11-4110	1795.68
50-603064	259	MD50-10-8764	978.864	MD50-10-15820	1464.48	MD50-10-24468	934.53	MD50-10-27281	2794.56	MD50-11-4105	3051.3
50-603064	332	MD50-10-8765	640.585	MD50-10-15813	597.171	MD50-10-24464	690.308	MD50-10-27278	938.64	MD50-11-4106	722.173
50-603064	482	MD50-10-8766	1107.09	MD50-10-15818	547.566 (U)	MD50-10-24469	4192.96	MD50-10-27282	1691.06	MD50-11-4107	620.817
50-603064	500	MD50-10-8767	641.273	MD50-10-15821	423.418 (U)	MD50-10-24466	473.773 (U)	MD50-10-27284	620.463	MD50-11-4108	229.861 (U)
50-603383	26	MD50-10-8771	**271,227**	MD50-10-15871	**190,110**	MD50-10-24380	**192,102**	MD50-10-27199	**260,604**	MD50-11-4024	**170,258**
50-603383	85	MD50-10-8772	**1,071,870**	MD50-10-15866	**913,258**	MD50-10-24384	**623,832**	MD50-10-27197	**686,091**	MD50-11-4029	**655,179**
50-603383	139	MD50-10-8773	**975,749**	MD50-10-15873	**1,058,670**	MD50-10-24388	**847,514**	MD50-10-27205	**949,038**	MD50-11-4025	**945,513**
50-603383	206	MD50-10-8774	**190,809**	MD50-10-15867	**385,358**	MD50-10-24382	**411,937**	MD50-10-27204	**111,487**	MD50-11-4030	**317,623**
50-603383	244	MD50-10-8775	**121,865**	MD50-10-15874	**447,327**	MD50-10-24387	**314,516**	MD50-10-27203	**307,955**	MD50-11-4026	**368,727**
50-603383	286	MD50-10-8776	**163,640**	MD50-10-15869	**445,718**	MD50-10-24385	**638,249**	MD50-10-27201	**269,984**	MD50-11-4031	**59,677.4**
50-603383	359	MD50-10-8777	**288,105**	MD50-10-15872	**360,249**	MD50-10-24381	**285,660**	MD50-10-27202	**228,848**	MD50-11-4027	**69,096.1**
50-603383	408	MD50-10-8778	**93,553**	MD50-10-15870	**353,883**	MD50-10-24386	**37,651.4**	MD50-10-27200	**587,105**	MD50-11-4032	**559,319**
50-603383	450	MD50-10-8779	**742,303**	MD50-10-15875	**322,214**	MD50-10-24383	**445,698**	MD50-10-27196	**455,279**	MD50-11-4028	**471,537**

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603467	26	MD50-10-8785	253.621 (U)	MD50-10-15805	362.886	MD50-10-24394	335.316 (U)	MD50-10-27214	297.52 (U)	MD50-11-4034	1200.31
50-603467	91	MD50-10-8783	861.219	MD50-10-15801	827.762	MD50-10-24398	345.702 (U)	MD50-10-27210	1308.37	MD50-11-4038	1439.81
50-603467	91	MD50-10-8784	729.879	—	—	—	—	—	—	—	—
50-603467	143	MD50-10-8786	1062.23	MD50-10-15807	1231.16	MD50-10-24395	450.755 (U)	MD50-10-27211	837.86	MD50-11-4035	1637.15
50-603467	206	MD50-10-8787	701.597	MD50-10-15809	685.236	MD50-10-24396	976.308	MD50-10-27215	553.942	MD50-11-4039	1620.96
50-603467	244	MD50-10-8788	1149.74	MD50-10-15804	304.772 (U)	MD50-10-24399	698.227	MD50-10-27207	420.402 (U)	MD50-11-4036	822.644
50-603467	287	MD50-10-8793	846.848	MD50-10-15800	877.304	MD50-10-24393	839.743	MD50-10-27213	718.525	MD50-11-4042	1818.76
50-603467	360	MD50-10-8790	557.354	MD50-10-15808	992.175	MD50-10-24397	302.365 (U)	MD50-10-27212	1515.59	MD50-11-4037	2881.15
50-603467	409	MD50-10-8789	−210.222 (U)	MD50-10-15802	528.116	MD50-10-24391	63.4188 (U)	MD50-10-27208	358.464 (U)	MD50-11-4040	1354.94
50-603467	500	MD50-10-8791	−63.7668 (U)	MD50-10-15803	116.674 (U)	MD50-10-24392	209.994 (U)	MD50-10-27206	329.836 (U)	MD50-11-4043	283.998 (U)
50-603467	600	MD50-10-8852	−235.585 (U)	MD50-10-15806	366.283 (U)	MD50-10-24390	259.49 (U)	MD50-10-27209	−102.488 (U)	MD50-11-4041	5444.75
50-603468	30	MD50-10-8795	539.438	—	—	—	—	—	—	—	—
50-603468	92	MD50-10-8796	798.1	MD50-10-15879	345.055 (U)	MD50-10-24402	53.0427 (U)	MD50-10-27220	482.727 (U)	MD50-11-4047	519.456 (U)
50-603468	142	MD50-10-8797	441.855	MD50-10-15882	13.7681 (U)	MD50-10-24407	2438.71	MD50-10-27217	413.007 (U)	MD50-11-4046	628.408 (U)
50-603468	198	MD50-10-8798	1039.21	MD50-10-15884	806.555	MD50-10-24401	741.918	MD50-10-27218	821.823	MD50-11-4045	1866.98
50-603468	233	MD50-10-8799	705.943	MD50-10-15878	815.777	MD50-10-24405	196.551 (U)	MD50-10-27219	966.29	MD50-11-4054	28.9181 (U)
50-603468	282	MD50-10-8800	1024.01	MD50-10-15885	496.725	MD50-10-24403	2997.11	MD50-10-27226	788.433	MD50-11-4050	798.412
50-603468	354	MD50-10-8801	670.351	MD50-10-15881	417.774 (U)	MD50-10-24404	337.733 (U)	MD50-10-27223	676.651	MD50-11-4051	5156.85
50-603468	403	MD50-10-8803	186.334 (U)	MD50-10-15883	323.522 (U)	MD50-10-24408	349.711 (U)	MD50-10-27221	415.335 (U)	MD50-11-4052	**7,596,950**
50-603468	403	MD50-10-8802	508.821	—	—	—	—	—	—	—	—
50-603468	450	MD50-10-8804	268.142 (U)	MD50-10-15880	565.508 (U)	MD50-10-24406	316.854 (U)	MD50-10-27222	1056.93	MD50-11-4053	119.334 (U)
50-603470	30	MD50-10-8807	**43,866.4**	MD50-10-15752	**73,252.2**	MD50-10-24328	**57,621.7**	MD50-10-27145	**56,635.6**	—	—
50-603470	83	MD50-10-8809	**2,920,220**	MD50-10-15760	**2,675,700**	MD50-10-24333	**3,417,920**	MD50-10-27149	**2,948,440**	MD50-11-3980	**2,079,590**
50-603470	143	MD50-10-8811	14,233.9	MD50-10-15753	10,685.3	MD50-10-24329	11,481.6	MD50-10-27144	9032.82	MD50-11-3975	3086.77 (J)
50-603470	203	MD50-10-8810	2008.19	MD50-10-15761	1010.81	MD50-10-24334	3622	MD50-10-27151	15,685.5	MD50-11-3973	5540.36 (J)
50-603470	233	MD50-10-8813	1622.02	MD50-10-15756	2210.48	MD50-10-24330	2478.02	MD50-10-27147	2004.08	MD50-11-3972	9826.54
50-603470	278	MD50-10-8808	1867.56	MD50-10-15758	1764.75	MD50-10-24335	1925.93	MD50-10-27153	2597.51	MD50-11-3974	6310.42 (J)
50-603470	351	MD50-10-8814	866.655	MD50-10-15754	979.648	MD50-10-24331	3810.13	MD50-10-27146	2016.49	MD50-11-3979	856.608 (U)
50-603470	450	MD50-10-8816	433.323 (U)	MD50-10-15757	631.799	MD50-10-24336	769.462	MD50-10-27152	802.788	MD50-11-3978	3167.54 (J)
50-603470	600	MD50-10-8815	694.592	MD50-10-15755	1078.57	MD50-10-24332	2220.85	MD50-10-27148	423.679 (U)	MD50-11-3977	1015.37 (U)
50-603470	650	MD50-10-8812	933.968	MD50-10-15759	225.526 (U)	MD50-10-24337	2211.73	MD50-10-27115	506.787 (U)	MD50-11-3976	609.684 (U)
50-603471	30	MD50-10-8826	4390.82	—	—	—	—	MD50-10-27158	18,442.4	MD50-11-3983	**48,419.2**
50-603471	90	MD50-10-8822	**48,744.9**	MD50-10-15769	**42,368.1**	MD50-10-24339	**47,123.1**	MD50-10-27155	**26,565.2**	MD50-11-3992	**38,944.5**
50-603471	146	MD50-10-8823	3972.93	MD50-10-15768	3918.26	MD50-10-24344	4169.12	MD50-10-27157	6009.75	MD50-11-3990	**563,784**
50-603471	209	MD50-10-8825	3668.15	MD50-10-15766	4922.22	MD50-10-24340	4739.53	MD50-10-27162	13,236.6	MD50-11-3988	885.424
50-603471	242	MD50-10-8819	2180.59	MD50-10-15771	3828.08	MD50-10-24345	4826.24	MD50-10-27161	7222.64	MD50-11-3989	10,224.1
50-603471	288	MD50-10-8821	2982.84	MD50-10-15765	3688.75	MD50-10-24341	5754.39	MD50-10-27160	9746.33	MD50-11-3987	13,906.1
50-603471	360	MD50-10-8827	2200.64	MD50-10-15772	2582.09	MD50-10-24343	4875.38	MD50-10-27156	7716.89	MD50-11-3986	**598,709**

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603471	410	MD50-10-8824	2500.71	MD50-10-15764	2969.11	MD50-10-24342	4077.15	MD50-10-27163	4170.76	MD50-11-3984	**836,701**
50-603471	450	MD50-10-8820	2775.99	MD50-10-15770	3383.5	MD50-10-24346	2996.96	MD50-10-27159	5956.37	MD50-11-3985	**73,835**
50-603472	27	MD50-10-8834	**161,836**	MD50-10-15779	**310,290**	MD50-10-24354	**393,217**	MD50-10-27165	**299,759**	MD50-11-4002	**375,685**
50-603472	93	MD50-10-8837	5989.77	MD50-10-15782	9139.35	MD50-10-24357	**35,557**	MD50-10-27168	6351.23	MD50-11-4000	6535.31
50-603472	93	MD50-10-8833	10,356.8	—	—	—	—	—	—	—	—
50-603472	146	MD50-10-8838	4012.92	MD50-10-15780	9809.85	MD50-10-24352	**37,130.5**	MD50-10-27170	2794.7	MD50-11-4001	5783.15
50-603472	210	MD50-10-8831	19,800.7	MD50-10-15783	**32,039.2**	MD50-10-24356	**34,469**	MD50-10-27172	13,209.7	MD50-11-3998	14,784.1
50-603472	247	MD50-10-8835	6174.24	MD50-10-15776	**43,787.5**	MD50-10-24350	**89,300.9**	MD50-10-27166	2747.59	MD50-11-3999	10,880.1
50-603472	292	MD50-10-8840	3597.1	MD50-10-15778	3765.53	MD50-10-24353	8092.06	MD50-10-27174	9694.81	MD50-11-3996	10,481.8
50-603472	364	MD50-10-8839	1294.59	MD50-10-15777	2519.06	MD50-10-24349	6119.3	MD50-10-27169	354.572 (U)	MD50-11-3993	1204.52
50-603472	414	MD50-10-8836	1777.75	MD50-10-15781	2220.2	MD50-10-24355	2653.9	MD50-10-27167	2046.2	MD50-11-3994	6132.84
50-603472	450	MD50-10-8832	954.058	MD50-10-15784	9466.29	MD50-10-24351	14,755.2	MD50-10-27173	5655.52	MD50-11-3995	1283.42
50-603503	25	MD50-10-8843	2362.64	MD50-10-15793	1249.95	MD50-10-24423	1414.06	MD50-10-27243	769.383	MD50-11-4071	3187.04
50-603503	80	MD50-10-8844	2861.2	MD50-10-15791	1364.72	MD50-10-24426	1881.49	MD50-10-27237	1015.89	MD50-11-4072	1799.89
50-603503	133	MD50-10-8845	2471.27	MD50-10-15792	0 (U)	MD50-10-24422	1262.32	MD50-10-27244	1486.69	MD50-11-4069	2876.99
50-603503	198	MD50-10-8846	2554.8	MD50-10-15788	1731.95	MD50-10-24425	935.445	MD50-10-27238	2338.17	MD50-11-4073	2567.89
50-603503	237	MD50-10-8847	3268.24	MD50-10-15794	1470.72	MD50-10-24421	1501.24	MD50-10-27245	1326.68	MD50-11-4070	1914.86
50-603503	278	MD50-10-8848	2632.5	MD50-10-15795	205.812 (U)	MD50-10-24427	1259.8	MD50-10-27239	980.152	MD50-11-4067	1834.19
50-603503	347	MD50-10-8849	1003.58	MD50-10-15790	660.954	MD50-10-24424	968.564	MD50-10-27241	256.174 (U)	MD50-11-4066	1553.13
50-603503	397	MD50-10-8850	1021.83	MD50-10-15796	523.323 (U)	MD50-10-24428	154.484 (U)	MD50-10-27240	128.717 (U)	MD50-11-4068	2823.19
50-603503	450	MD50-10-8851	0.332731 (U)	MD50-10-15789	881.392	MD50-10-24429	202.624 (U)	MD50-10-27242	1326.62	MD50-11-4065	2377.86
50-613182	500	—	—	—	—	—	—	—	—	MD50-11-3944	3407.76
50-613182	550	—	—	—	—	—	—	—	—	MD50-11-3943	266.899 (U)
50-613182	600	—	—	—	—	—	—	—	—	MD50-11-3942	1549.87
50-613182	620	—	—	—	—	—	—	—	—	MD50-11-3953	226.291 (U)
50-613182	632.5	—	—	—	—	—	—	—	—	MD50-11-3941	255.618 (U)
50-613183	30	—	—	—	—	—	—	—	—	MD50-11-3947	**2,092,660**
50-613183	500	—	—	—	—	—	—	—	—	MD50-11-3948	3082.7
50-613183	550	—	—	—	—	—	—	—	—	MD50-11-3949	917.003
50-613183	600	—	—	—	—	—	—	—	—	MD50-11-3950	2402.05
50-613183	630	—	—	—	—	—	—	—	—	MD50-11-3951	2702.14
50-613183	642.5	—	—	—	—	—	—	—	—	MD50-11-3952	253.894 (U)
50-613184	30	—	—	—	—	—	—	—	—	MD50-11-3959	252.014 (U)
50-613184	500	—	—	—	—	—	—	—	—	MD50-11-3956	5.07098 (U)
50-613184	550	—	—	—	—	—	—	—	—	MD50-11-3958	9.18998 (U)
50-613184	600	—	—	—	—	—	—	—	—	MD50-11-3954	155.106 (U)
50-613184	652	—	—	—	—	—	—	—	—	MD50-11-3957	23.8255 (U)
50-613184	664.5	—	—	—	—	—	—	—	—	MD50-11-3955	88.8754 (U)

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	January–April 2010		April–July 2010		July–September 2010		October 2010–January 2011		January–March 2011	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-613185	85	—	—	—	—	—	—	—	—	MD50-11-3961	334.103 (U)
50-613185	145	—	—	—	—	—	—	—	—	MD50-11-3962	438.704 (U)
50-613185	205	—	—	—	—	—	—	—	—	MD50-11-3963	885.976
50-613185	235	—	—	—	—	—	—	—	—	MD50-11-3964	4551.9
50-613185	280	—	—	—	—	—	—	—	—	MD50-11-3965	390.784 (U)
50-613185	350	—	—	—	—	—	—	—	—	MD50-11-3966	−100.384 (U)
50-613185	450	—	—	—	—	—	—	—	—	MD50-11-3967	153.408 (U)
50-613185	600	—	—	—	—	—	—	—	—	MD50-11-3969	1468.83
50-613185	675	—	—	—	—	—	—	—	—	MD50-11-3968	342.354 (U)
50-613185	688	—	—	—	—	—	—	—	—	MD50-11-3970	350.444 (U)

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October 2011–November 2011		March 2012–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-24784	25	MD50-11-6010	4015.08	—	—	MD50-12-936	4041	—	—
50-24784	96	MD50-11-6007	2759.61	—	—	MD50-12-935	2332	—	—
50-24784	155	MD50-11-6011	1096.21	—	—	MD50-12-934	2636	MD50-12-12060	**29,900**
50-24784	215	MD50-11-6005	3507.57	—	—	MD50-12-933	3289	—	—
50-24784	244	MD50-11-6009	3346.95	—	—	MD50-12-932	3454	MD50-12-12061	3541
50-24784	289	MD50-11-6006	2628.94	—	—	MD50-12-931	2537	—	—
50-24784	362	MD50-11-6008	1352.25	—	—	MD50-12-930	2149	MD50-12-12062	3822
50-24784	411	MD50-11-6004	1407.69	—	—	MD50-12-929	1217	—	—
50-24784	450	MD50-11-6003	404.803 (U)	—	—	MD50-12-928	1075	MD50-12-12063	1909
50-24813	25	MD50-11-6022	3587.27	—	—	MD50-12-946	771.6	MD50-12-12067	1094
50-24813	99	MD50-11-6021	**48,049.3**	—	—	MD50-12-945	**54,960**	—	—
50-24813	150	MD50-11-6019	**195,977**	—	—	MD50-12-944	**190,400**	MD50-12-12066	**195,100**
50-24813	207	MD50-11-6020	4138.01	—	—	MD50-12-943	3654	—	—
50-24813	241	MD50-11-6018	2289.83	—	—	MD50-12-942	3142	MD50-12-12065	1917
50-24813	286	MD50-11-6017	1081.82	—	—	MD50-12-941	1898	—	—
50-24813	358	MD50-11-6013	463.481	—	—	MD50-12-940	687.6	MD50-12-12064	1365
50-24813	408	MD50-11-6015	623.879	—	—	MD50-12-939	1017	—	—
50-24813	450	MD50-11-6016	342.731 (U)	—	—	MD50-12-938	471.8 (U)	MD50-12-12068	2339
50-24813	600	MD50-11-6014	199.304 (U)	—	—	MD50-12-937	126.7 (U)	MD50-12-12069	693.2
50-24822	25	MD50-11-6062	1816.19	—	—	MD50-12-947	782.4	MD50-12-12074	641.8
50-24822	81	MD50-11-6059	4098.9	—	—	MD50-12-948	720.6	—	—
50-24822	142	MD50-11-6061	896.287	—	—	MD50-12-949	1016	MD50-12-12073	362.1
50-24822	204	MD50-11-6058	3233.39	—	—	MD50-12-951	**178,600**	—	—
50-24822	235	MD50-11-6060	1491.71	—	—	MD50-12-952	1381	MD50-12-12072	**6,001,000**
50-24822	280	MD50-11-6055	535.226	—	—	MD50-12-950	543.3	—	—
50-24822	351	MD50-11-6056	**286,691**	—	—	MD50-12-953	1149	MD50-12-12071	410.3 (U)
50-24822	402	MD50-11-6063	769.023 (U)	—	—	MD50-12-954	696.4	—	—
50-24822	450	MD50-11-6057	122.6 (U)	—	—	MD50-12-955	1158	MD50-12-12070	1623
50-603061	25	MD50-11-6083	70.2869 (U)	—	—	—	—	MD50-12-12079	483.4
50-603061	76	MD50-11-6080	936.944	—	—	—	—	—	—
50-603061	128	MD50-11-6079	929.158	—	—	—	—	MD50-12-12078	1976
50-603061	190	MD50-11-6078	3186.9	—	—	—	—	—	—
50-603061	228	MD50-11-6081	1013.65	—	—	—	—	MD50-12-12077	1723
50-603061	274	MD50-11-6077	3994.15	—	—	—	—	—	—
50-603061	347	MD50-11-6082	2192.69	—	—	—	—	MD50-12-12076	3821
50-603061	397	MD50-11-6076	1094.76	—	—	—	—	—	—
50-603061	450	MD50-11-6075	1833.15	—	—	—	—	MD50-12-12075	1477

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October 2011–November 2011		March 2012–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603062	25	MD50-11-6088	212.145 (U)	—	—	—	—	—	—
50-603062	64	MD50-11-6085	3661.06	—	—	—	—	—	—
50-603062	122	MD50-11-6087	1046.93	—	—	—	—	MD50-12-12087	571.9
50-603062	184	MD50-11-6092	2461.43	—	—	—	—	—	—
50-603062	217	MD50-11-6086	591.543	—	—	—	—	MD50-12-12086	539.7
50-603062	263	MD50-11-6090	1154.53	—	—	—	—	—	—
50-603062	337	MD50-11-6094	729.532	—	—	—	—	MD50-12-12085	1185
50-603062	387	MD50-11-6091	2412.41	—	—	—	—	—	—
50-603062	450	MD50-11-6089	5192.59	—	—	—	—	MD50-12-12084	751.5
50-603063	25	MD50-11-6102	3219.01	—	—	—	—	MD50-12-12088	1656
50-603063	76	MD50-11-6100	8294.67	—	—	—	—	—	—
50-603063	128	MD50-11-6099	1158.67	—	—	—	—	MD50-12-12089	1972
50-603063	190	MD50-11-6097	4292.39	—	—	—	—	—	—
50-603063	228	MD50-11-6098	3825.28	—	—	—	—	MD50-12-12090	3224
50-603063	274	MD50-11-6103	5154.91	—	—	—	—	—	—
50-603063	347	MD50-11-6095	5913.95	—	—	—	—	MD50-12-12091	1489
50-603063	397	MD50-11-6101	3133.2	—	—	—	—	—	—
50-603063	450	MD50-11-6096	2119.51	—	—	—	—	MD50-12-12092	1359
50-603064	25	MD50-11-6108	676.519	—	—	MD50-12-956	1152	—	—
50-603064	66	MD50-11-6107	1192.13	—	—	MD50-12-957	1440	—	—
50-603064	113	MD50-11-6105	1443.41	—	—	MD50-12-958	1642	MD50-12-12096	2715
50-603064	176	MD50-11-6110	1094.69	—	—	MD50-12-959	1528	—	—
50-603064	214	MD50-11-6111	2587.17	—	—	MD50-12-960	1636	MD50-12-12095	2107
50-603064	259	MD50-11-6112	395.201 (U)	—	—	MD50-12-961	1533	—	—
50-603064	332	MD50-11-6113	546.866 (U)	—	—	MD50-12-962	1139	MD50-12-12094	1148
50-603064	482	MD50-11-6109	1428.95	—	—	MD50-12-963	770.5	—	—
50-603064	500	MD50-11-6106	321.3 (U)	—	—	MD50-12-964	1230	MD50-12-12093	**47,055**
50-603383	26	MD50-11-6027	**254,478**	MD50-11-23287	**164,864**	MD50-12-982	**243,700**	MD50-12-12101	**1,624,201**
50-603383	85	MD50-11-6025	**761,943**	MD50-11-23288	**772,983**	MD50-12-978	**691,700**	—	—
50-603383	139	MD50-11-6024	**971,640**	MD50-11-23289	**1,065,080**	MD50-12-979	**1,390,000**	MD50-12-12097	**113,405**
50-603383	206	MD50-11-6032	**113,930**	MD50-11-23290	**266,573**	MD50-12-980	**136,200**	—	—
50-603383	244	MD50-11-6026	**219,669**	MD50-11-23291	**309,595**	MD50-12-981	**103,900**	MD50-12-12098	**204,505**
50-603383	286	MD50-11-6029	**80,416.5**	MD50-11-23292	**233,642**	MD50-12-977	**74,490**	—	—
50-603383	359	MD50-11-6028	**518,598**	MD50-11-23295	**248,544**	MD50-12-976	**63,130**	MD50-12-12099	**157,376**
50-603383	408	MD50-11-6030	**439,230**	MD50-11-23294	**246,503**	MD50-12-975	**116,800**	—	—
50-603383	450	MD50-11-6031	**350,433**	MD50-11-23293	**177,226**	MD50-12-974	**89,390**	MD50-12-12100	2228
50-603467	26	MD50-11-6041	411.024	—	—	—	—	—	—

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October 2011–November 2011		March 2012–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603467	91	MD50-11-6043	1005.32	—	—	—	—	—	—
50-603467	143	MD50-11-6038	1192.99	—	—	—	—	MD50-12-12106	1265
50-603467	206	MD50-11-6042	1372.98	—	—	—	—	—	—
50-603467	244	MD50-11-6037	1670.36	—	—	—	—	MD50-12-12102	790.3
50-603467	287	MD50-11-6039	647.931	—	—	—	—	—	—
50-603467	360	MD50-11-6040	550.912	—	—	—	—	MD50-12-12103	4294
50-603467	409	MD50-11-6036	252.334 (U)	—	—	—	—	—	—
50-603467	500	MD50-11-6035	573.867	—	—	—	—	MD50-12-12104	1253
50-603467	600	MD50-11-6034	547.748	—	—	—	—	MD50-12-12105	1606
50-603468	92	MD50-11-6051	3980.49	—	—	MD49-12-967	716	—	—
50-603468	142	MD50-11-6050	900.385	—	—	MD49-12-965	2004	MD50-12-12108	840.8
50-603468	198	MD50-11-6052	1420.04	—	—	MD49-12-966	1006	—	—
50-603468	233	MD50-11-6049	853.235	—	—	MD49-12-971	944.8	MD50-12-12109	585
50-603468	282	MD50-11-6047	604.306	—	—	MD49-12-969	1085	—	—
50-603468	354	MD50-11-6046	2795.39	—	—	MD49-12-970	1228	MD50-12-12110	491.8
50-603468	403	MD50-11-6045	199.901 (U)	—	—	MD49-12-972	2242	MD50-12-12107	1391
50-603468	450	MD50-11-6048	793.816	—	—	MD49-12-973	1505	—	—
50-603470	30	MD50-11-5978	**64,701.4**	—	—	MD50-12-983	**60,050**	—	—
50-603470	83	MD50-11-5980	**2,502,750**	—	—	MD50-12-984	**2,710,000**	MD50-12-12114	**3,166,000**
50-603470	143	MD50-11-5982	9259.65	—	—	MD50-12-985	9507	—	—
50-603470	203	MD50-11-5977	2180.77	—	—	MD50-12-986	2003	MD50-12-12120	3552
50-603470	233	MD50-11-5976	3224.03	—	—	MD50-12-987	2724	—	—
50-603470	278	MD50-11-5979	1137.7	—	—	MD50-12-988	1730	MD50-12-12119	4325
50-603470	351	MD50-11-5973	1039.58	MD50-11-23311	2451.28	MD50-12-989	1177	MD50-12-12118	5140
50-603470	450	MD50-11-5972	406.611 (U)	MD50-11-23312	1265.27	MD50-12-990	1352	MD50-12-12115	4083
50-603470	600	MD50-11-5975	255.129 (U)	MD50-11-23313	780.389	MD50-12-991	1264	MD50-12-12116	2533
50-603470	650	MD50-11-5974	73.7895 (U)	MD50-11-23314	998.503	MD50-12-992	702.5	MD50-12-12117	121.9 (U)
50-603471	90	MD50-11-5990	**53,054.6**	—	—	MD50-12-1000	**268,400**	MD50-12-12124	**49,720**
50-603471	146	MD50-11-5989	6877.24	—	—	MD50-12-999	4859	—	—
50-603471	209	MD50-11-5988	5606.71	—	—	MD50-12-998	**55,540**	MD50-12-12125	3731
50-603471	242	MD50-11-5987	4053.82	—	—	MD50-12-997	6121	—	—
50-603471	288	MD50-11-5984	5638.55	—	—	MD50-12-996	4923	MD50-12-12122	2920
50-603471	360	MD50-11-5986	4461.89	MD50-11-23308	3970.95	MD50-12-995	**1,127,000**	MD50-12-12123	**27,070**
50-603471	410	MD50-11-5983	2093.01	MD50-11-23310	2614.47	MD50-12-994	13,770	—	—
50-603471	450	MD50-11-5985	4506.41	MD50-11-23309	4649.73	MD50-12-993	2295	MD50-12-12121	2574
50-603472	27	MD50-11-6000	**420,066**	—	—	MD50-12-1010	**454,100**	MD50-12-12128	**480,200**
50-603472	93	MD50-11-5998	6523.26	—	—	MD50-12-1007	9513	—	—

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October 2011–November 2011		March 2012–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-603472	146	MD50-11-6001	4411.23	—	—	MD50-12-1008	12,710	MD50-12-12129	3114
50-603472	210	MD50-11-5997	3990.94	—	—	MD50-12-1006	**33,460,000**	—	—
50-603472	247	MD50-11-5999	6414.21	—	—	MD50-12-1009	**38,820**	—	—
50-603472	292	MD50-11-5995	5292.12	—	—	MD50-12-1005	**20,080**	MD50-12-12132	5246
50-603472	364	MD50-11-5994	681.137	MD50-11-23307	4407.17	MD50-12-1004	**66,580**	MD50-12-12131	1688
50-603472	414	MD50-11-5993	2371.69	MD50-11-23306	4110.57	MD50-12-1003	1885	—	—
50-603472	450	MD50-11-5996	568.81	MD50-11-23305	5493.12	MD50-12-1002	2170	MD50-12-12130	2116
50-603503	25	MD50-11-6072	934.732	—	—	—	—	—	—
50-603503	80	MD50-11-5992	1136.84	—	—	—	—	—	—
50-603503	133	MD50-11-6073	1512.3	—	—	—	—	MD50-12-12136	**199,500**
50-603503	198	MD50-11-6069	1746.6	—	—	—	—	—	—
50-603503	237	MD50-11-6068	1922.34	—	—	—	—	MD50-12-12135	2194
50-603503	278	MD50-11-6070	1418.69	—	—	—	—	—	—
50-603503	347	MD50-11-6065	410.807 (U)	—	—	—	—	MD50-12-12137	1525
50-603503	397	MD50-11-6066	625.523	—	—	—	—	—	—
50-603503	450	MD50-11-6067	375.352 (U)	—	—	—	—	MD50-12-12138	396.3
50-613182	500	MD50-11-5933	555.9	MD50-11-23273	4322.8	MD50-12-1015	1966	—	—
50-613182	550	MD50-11-5934	555.569	MD50-11-23276	2119.78	MD50-12-1014	969.9	MD50-12-12133	627.4
50-613182	600	MD50-11-5936	373.568 (U)	MD50-11-23275	**626,077**	MD50-12-1013	2111	—	—
50-613182	620	MD50-11-5937	669.695	MD50-11-23274	5021.35	MD50-12-1012	325.1 (U)	—	—
50-613182	632.5	MD50-11-5935	233.956 (U)	MD50-11-23277	5679.9	MD50-12-1011	561	MD50-12-12134	797.3
50-613183	30	MD50-11-5942	**2,525,710**	—	—	MD50-12-1020	**2,499,000**	—	—
50-613183	500	MD50-11-5939	451.04 (U)	MD50-11-23282	1450.64	MD50-12-1021	994.7	—	—
50-613183	550	MD50-11-5943	484.208 (U)	MD50-11-23283	1942.16	MD50-12-1022	**29,570**	MD50-12-12127	3223
50-613183	600	MD50-11-5941	431.214	MD50-11-23284	1002.81	MD50-12-1017	2221	—	—
50-613183	630	MD50-11-5944	2524.53	MD50-11-23285	2596.7	MD50-12-1018	2677	—	—
50-613183	642.5	MD50-11-5940	62.3063 (U)	MD50-11-23286	1083.85	MD50-12-1019	344.6 (U)	MD50-12-12126	108.8 (U)
50-613184	30	MD50-11-5948	26.0488 (U)	—	—	MD50-12-1023	220.4 (U)	—	—
50-613184	500	MD50-11-5951	75.275 (U)	—	—	MD50-12-1024	381.3 (U)	MD50-12-12113	243.5 (U)
50-613184	550	MD50-11-5946	4429.21	—	—	MD50-12-1025	410.8 (U)	—	—
50-613184	600	MD50-11-5947	63.7681 (U)	—	—	MD50-12-1026	89.82 (U)	MD50-12-12112	2610
50-613184	652	MD50-11-5950	460.484 (U)	—	—	MD50-12-1027	181.2 (U)	—	—
50-613184	664.5	MD50-11-5949	−93.3372 (U)	—	—	MD50-12-1028	971.5	MD50-12-12111	285.3 (U)
50-613185	85	MD50-11-5960	85.9534 (U)	—	—	MD50-12-1038	663	—	—
50-613185	145	MD50-11-5961	168.051 (U)	—	—	MD50-12-1035	389.6 (U)	MD50-12-12143	252.5 (U)
50-613185	205	MD50-11-5957	−67.9942 (U)	—	—	MD50-12-1036	434.7 (U)	—	—
50-613185	235	MD50-11-5962	259.122 (U)	—	—	MD50-12-1037	416.9 (U)	MD50-12-12139	244.6 (U)

Table G-3.2-2 (continued)

Location ID	Depth (ft bgs)	March–May 2011		August 2011		October 2011–November 2011		March 2012–April 2012	
		Sample ID	Result	Sample ID	Result	Sample ID	Result	Sample ID	Result
50-613185	280	MD50-11-5959	240.014 (U)	—	—	MD50-12-1034	613.2	—	—
50-613185	350	MD50-11-5955	112.998 (U)	MD50-11-23268	445.491	MD50-12-1033	581.1 (U)	MD50-12-12140	789.3
50-613185	450	MD50-11-5954	21.4588 (U)	MD50-11-23269	5230.83	MD50-12-1032	353.2 (U)	MD50-12-12141	324.9 (U)
50-613185	600	MD50-11-5953	−117.41 (U)	MD50-11-23271	388.801 (U)	MD50-12-1031	690.3	MD50-12-12142	166.8 (U)
50-613185	675	MD50-11-5958	−56.287 (U)	MD50-11-23270	5181.33	MD50-12-1030	837.6	—	—
50-613185	688	MD50-11-5956	181.087 (U)	MD50-11-23272	201.063 (U)	MD50-12-1029	1773	—	—

Note: Units are pCi/L. Data qualifiers are defined in Appendix A. Bold indicates result exceeds Tier I screening level. Shading indicates value exceeds Tier II screening level.
* — = Not sampled.

Table G-3.3-1
Radionuclides Detected in MDA C Monitoring Wells

Sample ID	Sample Date	Radium-226	Radium-228	Tritium	Uranium-234	Uranium-235/236	Uranium-238
Screening Value[a]		**na**[b]	**na**	**0.32**	**2.17**	**na**	**1.2**
R-14							
CAMO-10-9333	2/3/2010	—[c]	—	—	0.51	—	0.335
CAMO-10-22851	7/1/2010	—	—	—	0.534	—	0.263
CAMO-12-1526	11/8/2011	0.458	0.751	—	0.45 (J+)	—	0.225 (J+)
R-46							
CAMO-10-9358	2/5/2010	—	—	—	0.304	—	0.155
CAMO-10-16830	5/7/2010	—	—	37.0622	0.32	—	0.165
CAMO-10-22890	7/1/2010	—	—	—	0.364	—	0.146
CAMO-12-1530	11/8/2011	—	—	—	0.323 (J+)	—	0.157 (J+)
R-60							
CAPA-11-2810	12/16/2010	—	—	—	0.555	0.0356	0.3
CAPA-11-3055	1/24/2011	—	—	—	0.468	—	0.211
CAPA-11-9591	4/27/2011	—	—	—	0.441	—	0.218
CAPA-11-23020	7/26/2011	—	—	—	0.505	—	0.209
CAMO-12-1522	11/22/2011	—	0.764	—	0.526	—	0.206

Note: Units are pCi/L. Data qualifiers are defined in Appendix A.

[a] Screening values from LANL (2007, 095817).

[b] na = Not available.

[c] — = Not detected.

Attachment G-1

Preliminary Radiological Dose Assessment
for Material Disposal Area C Waste Inventory

EXECUTIVE SUMMARY

Material Disposal Area (MDA) C was used for disposal of radioactively contaminated waste at Los Alamos National Laboratory (LANL or the Laboratory) from 1948 to 1974. After it was closed, the site was covered with fill dirt and vegetated. The Laboratory has performed a corrective measures evaluation (CME) to evaluate corrective measure alternatives associated with the nonradioactive hazardous constituents disposed of at MDA C. This report presents the results of a preliminary radiological dose assessment performed to evaluate whether the corrective action alternative recommended by the CME would meet U.S. Department of Energy radiological protection requirements. Two covers were analyzed: (1) an operational cover with 1 m of fill dirt over the buried waste, and (2) an operational cover comprised of the 1 m of fill dirt plus an additional 2-m-thick evapotranspiration (ET) cover. The former represents the operational cover that is currently at the site and the latter represents the cover recommended by the CME for MDA C.

Radiation dose rates for the two cover designs were calculated using RESidual RADioactivity (RESRAD) dose assessment models and were based on two exposure scenarios. The first exposure scenario calculated dose rates for a child receptor located at the Royal Crest Trailer Park, which is the nearest (~1.3 km) downwind portion of the city of Los Alamos. The second exposure scenario was an industrial adult worker who worked on top of the buried waste at the MDA C site. Exposure pathways for both scenarios included inhalation, soil ingestion, external gamma exposure, and groundwater ingestion from a nearby well. Site-specific model parameters were used to capture local geology and meteorology. The dose assessment analyzed potential dose rates out to 1000 yr to capture the impacts for longer-lived radionuclides. The results showed the radionuclide inventory at MDA C presents little hazard to the child receptor at the Royal Crest Trailer Park regardless of cover design over the 1000-yr assessment period. Similarly, industrial workers would receive very little radiation dose over the 1000-yr assessment period, all of it from the external gamma exposure pathway, with either cover. Groundwater was not a dose pathway for either the public receptor or the industrial worker.

The results indicate that some type of cover over the wastes in the MDA C disposal units is necessary to meet radiological-protection requirements beyond 1000 yr. The cover functions primarily as a physical barrier to provide the necessary shielding and confinement from external penetrating radiation emissions, inhalation and soil ingestion hazards, and exposure to wastes. Because exposure via the groundwater pathway does not occur, the ET cover's function to minimize infiltration does not result in greater performance than the operational cover. The ET cover should be less susceptible to erosion, however, and should provide greater reliability over long periods of time.

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Acronyms and Abbreviations

AEA	Atomic Energy Act
CA	composite analysis
CME	corrective measures evaluation
Consent Order	Compliance Order on Consent
DCF	dose conversion factor
DOE	Department of Energy (U.S.)
EFH	Exposure Factors Handbook
ET	evapotranspiration
FGR	Federal Guidance Report
ICRP	International Commission on Radiation Protection
LANL	Los Alamos National Laboratory
MDA	material disposal area
PA	performance assessment
RCRA	Resource Conservation and Recovery Act
RCTP	Royal Crest Trailer Park
RESRAD	RESidual RADioactivity
RME	reasonable maximum exposure
TA	technical area

G1-1.0 INTRODUCTION

Material Disposal Area (MDA) C is an inactive waste disposal site located in Technical Area 50 (TA-50) at Los Alamos National Laboratory (LANL or the Laboratory). MDA C was used to dispose of wastes containing hazardous constituents regulated by the Resource Conservation and Recovery Act (RCRA), as well as radionuclides regulated under the Atomic Energy Act (AEA). MDA C is subject to the corrective action requirements of RCRA for hazardous constituents, as implemented through a Compliance Order on Consent (Consent Order) with the State of New Mexico. The Laboratory has prepared a corrective measures evaluation (CME), as required by the Consent Order, to evaluate alternatives for corrective actions needed to protect human health and the environment from risks from the hazardous constituents disposed of at MDA C. RCRA does not regulate radionuclides, and the CME does not consider radiological exposure or risk.

The U.S. Department of Energy (DOE) is required under the AEA and its implementing regulations and orders to protect occupational workers, the public, and the environment from radiological exposure from DOE facilities and operations. Any corrective measure alternative implemented at MDA C under the Consent Order, therefore, must also comply with DOE radiological-protection requirements. The purpose of this preliminary radiological-dose assessment is to evaluate the corrective measure alternative recommended for MDA C to determine whether it would be capable of meeting dose limits for workers and the public. The assessment also considers long-term dose based on current conditions.

G1-2.0 BACKGROUND

MDA C was established in May 1948 as a disposal area for radioactively contaminated waste and was decommissioned in April 1974. It consists of 7 pits and 108 shafts. Information regarding the dimensions of each pit and shaft, as well as dates of operations, is presented in the RCRA facility investigation work plan for Operable Unit 1147 (LANL 1992, 007672) and the approved investigation work plan (LANL 2005, 091493). In 1984, a surface cover was emplaced, and the area was recontoured and seeded.

G1-2.1 Site Description

The site was used for Laboratory waste management activities and has been decommissioned since 1974. The waste disposal activities conducted from 1948 to 1974 at MDA C are the source of existing surface soil contamination. Contaminants may have been released to the surface during deposition of the wastes into the pits and shafts, to the subsurface once wastes were deposited within the pits and shafts, and to the surface from waste fires and subsequent deposition of airborne particles. Waste previously emplaced remains, and no additional waste has been added since decommissioning. The site is fenced, posted as a soil contamination area, and only Laboratory employees or contractors enter for management operations, such as emplacing erosion controls or collecting environmental samples.

The topography at MDA C slopes gently from west to northeast, gradually becoming steeper across the northeastern quadrant of the site toward Ten Site Canyon. The surface vegetation at MDA C consists of a native grama grass mixture that was established starting in 1984, after fill and a topsoil cover was placed over the pits and shafts, along with various native forbs and shrubs.

G1-2.2 Waste Inventory Determination

To assess potential radiological dose to on site personnel and members of the public from the release of waste buried at MDA C over time, it is necessary to estimate, to the extent possible, the waste inventory

of the pits and shafts by radionuclide. Appendix J of the MDA C investigation report (LANL 2006, 094688) provided these inventory estimates and was used as the radionuclide activity basis in this dose assessment. Shaft inventories are based on MDA C disposal logbooks and a draft inventory report. Furthermore, because of limited information in the disposal logbooks for the pits, activity estimates for the pits were developed by extrapolating early waste disposal activities at TA-54, Area G, to MDA C. In addition, shaft disposal inventories for early reactor experiments were estimated using historical information for the MDA C shaft disposals for the Omega West Reactor and the Los Alamos Molten Plutonium Reactor Experiment.

The shafts are divided into three spatially separate groups. Present-day (decay-corrected from "as disposed of" activities to January 2005) estimated activities for Shaft Groups 1 through 3 are 57 Ci, 620 Ci, and 7100 Ci, respectively. In this preliminary assessment, no attempt has been made to further decay correct these activities to 2012. In Shaft Group 1, 67% of present-day activity consists of strontium-90 and 28% of cesium-137. Sixty-three percent of present-day activity in Shaft Group 2 consists of cesium-137 and strontium-90, with aluminum-26 and tritium contributing another 28%. In Shaft Group 3, tritium (which has a radioactive half-life of 12 yr) accounts for 94% of present-day activity. Table J-3.3-3 in Appendix J of the MDA C investigation report (LANL 2006, 094688) lists the present-day isotopic inventory of the MDA C shafts.

The radioactive waste inventory projections for MDA C pits are categorized as (1) surface-contaminated waste, (2) soil, and (3) concrete and sludge. Present-day radionuclide inventories in the MDA C pits were estimated to be 5600 Ci, 0.75 Ci, and 320 Ci for surface-contaminated waste, soil, and concrete and sludge, respectively. The majority of the activity in surface-contaminated waste and concrete and sludge is attributable to plutonium isotopes. The majority of the activity for soil is attributable to uranium isotopes. For surface-contaminated waste, which contains the bulk of the estimated radioactivity for the MDA C pits, plutonium isotopes are responsible for approximately 90% of the disposed activity. Table J-4.2-7 of the MDA C investigation report (LANL 2006, 094688) lists the present-day radionuclide specific inventory projections for the MDA C pits. Further information on how the shaft inventories and pit projections were developed may be obtained in Appendix J of the MDA C investigation report (LANL 2006, 094688).

Because the RESidual RADioactivity (RESRAD) model (Yu et al. 2001, 076874; Yu et al. 2007, 227832) requires a radionuclide activity input in terms of concentration, pCi/g, rather than Curies as presented in Appendix J of the MDA C investigation report (LANL 2006, 094688), it was necessary to average the present-day activity (circa 2005) of each radionuclide over the entire volume of all the shafts and pits. The dimensions of the pits and shafts used to determine the overall volume were obtained from Table J-1.0-1 in Appendix J of the MDA C investigation report (LANL 2006, 094688). The sum of activities from the "present day" shafts inventory and "present day" pits inventory is presented in Table G1-2.2-1. The volumes and areas of the shafts and pits are presented in Tables G1-2.2-2 and G1-2.2-3, respectively. Finally, the activity concentrations of each radionuclide are presented in Table G1-2.2-4. These concentrations are based on a total shafts and pits volume of 1.45×10^5 m^3, a bulk density for soil, surface contaminated waste, sludge, and concrete of 1.24 g/cm^3, thus resulting in a total mass of 1.79×10^{11} g of fill in the shafts and pits.

G1-3.0 CONCEPTUAL EXPOSURE PATHWAY MODEL

G1-3.1 Receptors and Exposure Pathways

The conceptual site model for human receptors is based on both an industrial and an off-site residential scenario. The industrial scenario assumes the exposure of human receptors directly on site through direct contact with contaminated soil or suspended particulate material by ingestion, inhalation, and external

irradiation pathways. In addition, a drinking-water exposure pathway is included for this particular exposure scenario by virtue of assuming that contaminants migrate through the contaminated zone, through the vadose zone, and then into the regional aquifer. Water is then pumped to the surface from the regional aquifer via the Los Alamos County PM-5 drinking water supply well and ingested.

The residential scenario assumes exposure through similar mechanisms as well as ingestion of homegrown produce, all at the closest residential location off site and downwind from MDA C at the southeast corner of the Royal Crest Trailer Park (RCTP).

G1-3.2 Comparison of Proposed Corrective Measures

The recommended corrective measure alternative for MDA C in the CME is to leave the waste in place and construct and maintain an evapotranspiration (ET) cover with an erosion-resistant surface treatment and biobarrier along with soil vapor extraction, and institutional controls. The ET cover acts to retain moisture in the shallow soil profile until it is removed through evapotranspiration, thereby minimizing the movement of water down through the waste and into the underlying vadose zone. In addition, native vegetation would be maintained on the surface treatment of the cover to minimize erosion and promote ET. The ET cover would consist of several layers: a surface treatment comprised of a rock/soil admixture, a fine grain cover soil, a coarse grain filter media, a biota barrier consisting of cobble, and finally an operational cover directly above the emplaced waste. The ET cover would be 2.0 m thick and the operational cover would be approximately 1 m thick. Further information regarding the design of the ET cover proposed for MDA C may be found in Appendix J of the CME report.

G1-4.0 RESRAD MODELING APPROACH

G1-4.1 Introduction

The modeling approach uses the RESRAD-OFFSITE 2.6 version of the RESRAD code, which was developed at Argonne National Laboratory as an integrated site-assessment model to determine soil contamination cleanup criteria and radiation dose and excess lifetime cancer risks to an on- or off-site human receptor (Yu et al. 2007, 277832). The code considers all pathways from the contaminated soil to the receptor, including external radiation exposure, internal radiation dose from inhalation, and internal radiation dose from the ingestion of drinking water (surface and/or groundwater), produce, meat, and milk, fish, and soil. The RESRAD-OFFSITE 2.6 allows a receptor to be located within the contaminated area, or at a location off-site from the contaminated area. It should be mentioned that the code has been successfully benchmarked against a variety of radiation exposure pathway models (Yu et al. 2006, 227833). By varying the input parameters of the code, it is possible to construct different exposure scenarios. For this particular dose assessment, an on-site industrial scenario and an off-site residential scenario were assessed. A 1000-yr exposure period was considered for consistency with the performance assessment requirements of DOE Order 435.1, Radioactive Waste Management (MDA C is not subject to regulation under DOE Order 435.1 based on its dates of operation).

G1-4.2 Industrial Scenario

The industrial scenario assumes that a Laboratory employee spends their entire working time outdoors on the MDA C site. The worker ingests drinking water from water-supply well PM-5, which is downgradient of MDA C (Figure G1-4.2-1) but otherwise ingests foodstuffs obtained from off-site sources. This scenario is therefore based on the inhalation of local dust, the ingestion of drinking water, the ingestion of soil, and direct penetrating radiation exposure from radionuclides within the contaminated zone.

G1-4.3 Residential Scenario

The residential scenario assumes that a family resides within a home located on the southeast corner of the RCTP, located off of East Jemez Road. This location is downwind of MDA C at approximately 1350 m almost directly due north (353 degrees). The family gardens and eats entirely homegrown produce. Drinking water is obtained from the PM-5 well. All meat and other foodstuffs are obtained from off-site sources. This scenario is therefore based on the inhalation of dust blown downwind from the MDA C site, the ingestion of homegrown produce, the ingestion of drinking water, the ingestion of soil, and direct penetrating radiation exposure from contaminated dust again transported from the MDA C site and deposited at the residential location.

G1-4.4 Dose Conversion Factor Selection

RESRAD-OFFSITE 2.6 allows the selection of appropriate dose conversion factor (DCF) libraries, which are primarily drawn from Federal Guidance Report (FGR) 11 (EPA 1988, 050123) and International Commission on Radiation Protection (ICRP) Publication 72 (ICRP 1996, 223038) for internal exposure from the inhalation and ingestion of radionuclides, and from FGR-12 (EPA 1993, 062798) for direct-penetrating radiation exposure. FGR 11 provides internal dose conversion factors for only the adult, whereas ICRP-72 provides internal dose conversion factors for children of five age categories (3 mo, 1 yr, 5 yr, 10 yr, and 15 yr) as well as for an adult. Recently, DOE rescinded requirements specifying the use of only FGR-11 dose conversion factors, and the Laboratory has begun the transition to the age-dependent, more biokinetically realistic DCFs found in ICRP-72. It is therefore appropriate to use these DCFs for both the industrial and residential scenarios. The industrial scenario uses the ICRP-72 adult DCFs for internal dose and the FGR-12 DCFs for external dose. The residential scenario uses the ICRP-72 5-yr old child DCFs for internal dose and the FGR-12 DCFs for external dose. The ICRP-72 5-yr child DCFs are higher, and thus more conservative, than the ICRP-72 adult DCFs and the FGR-11 DCFs.

G1-4.5 Exposure Factor Selection

Receptor exposure factors, such as annual ingestion and inhalation rates, differ between adults and children and are required inputs into the RESRAD model, depending on the pathways selected. EPA recently issued a new Exposure Factors Handbook (EFH) (EPA 2011, 208374) that updates the previous EPA guidance with age-specific values that are based on more recent research and literature reviews. The Laboratory has developed 0 to < 6 yr old composite child-specific exposure factors using the 2011 EFH (EPA 2011, 208374) and NMED risk-assessment guidance (NMED 2012, 219971) to address indoor and outdoor time fractions, inhalation rate, mass loading, plant ingestion rate, and soil ingestion rate used in the residential scenario. These factors are presented in Table G1-4.5-1. The Laboratory has also updated the industrial exposure parameters using the EFH (EPA 2011, 208374) and NMED guidance (NMED 2012, 219971). These factors are presented in Table G1-4.5-2.

The exposure factors used in this assessment are generally upper-bound values used to obtain a reasonable maximum exposure (RME) dose outcome. When available, 95th percentile age-weighted means are used for both the industrial and residential scenario.

G1-4.6 Site Parameter Selection

For both the industrial and residential scenarios, site-specific parameters are used to the extent possible. These parameters control the transport of radionuclides through all defined pathways and environmental media within user-specified time spans. These parameters include such things as contaminated zone area, soil density, element-specific partition coefficients for the contaminated zone, unsaturated zones,

and saturated zone, local meteorological conditions, evapotranspiration rates, hydrogeologic factors, and erosivity factors. RESRAD parameters used in these assessments are presented in Tables G1-4.6-1 and G1-4.6-2.

To date, most RESRAD modeling at the Laboratory has used site parameters that maximize retention of contaminants in the contaminated zone because it has been assumed that drinking water is obtained from uncontaminated sources. This approach is conservative for those pathways that include direct-penetrating radiation exposure, inhalation of local dust, ingestion of local produce, and ingestion of soil. This involves setting the evapotranspiration rate to its maximum value of 0.999, using an historic 5% cumulative frequency rainfall rate of 0.29 m/yr (Bowen 1990, 006899), and setting the runoff coefficient to its near allowed maximum value. Thus, the selection of these parameter values in the simulations promotes the retention of radionuclides in the contaminated zone and they are not transported through infiltration of water down into the vadose and saturated zones. The use of these parameters results in the "base" RESRAD case.

However, because the drinking water pathway is included in both the industrial and residential scenarios, there is a need to separately assess the dose impacts from varying the above parameters to minimize retention of radionuclides in the contaminated zone and maximize transport through the vadose and saturated zones. This has been accomplished by running another RESRAD case with these parameters set to promote the infiltration of water and is known as the "hydro" case. In particular, the "hydro" case without the ET cover uses an ET coefficient of 0.99, which represents a realistic value for crushed tuff with vegetation, uses a realistic runoff coefficient of 0.25, but also uses a precipitation rate of 0.49 m/yr, which is the historical 50% cumulative frequency annual rainfall value (Bowen 1990, 006899). The "hydro" case with an ET cover uses the same parameters, except that the evapotranspiration coefficient is increased to the near maximum value allowed of 0.998, which is realistic for an engineered ET cover. The parameters for the "base" and "hydro" cases with and without the ET cover are described in Table G1-4.6-3.

Previous RESRAD modeling efforts at the Laboratory also usually set the erosion rate to zero to maximize retention of radionuclides in the contaminated zone. It should be noted, however, that the soil erodibility factor for the contaminated zone and cover is set to the default of 0.4 tons/acre for all cases to allow for erosion of the operational cover and ET cover over the assessment period.

G1-5.0 HUMAN DOSE ASSESSMENT RESULTS

G1-5.1 Interpretation

In all, eight separate RESRAD cases were developed, run, and the results analyzed. There were four industrial scenario RESRAD cases for the "base" and "hydro" conditions with and without an ET cover over the waste. There were also four residential scenario RESRAD cases for the "base" and "hydro" conditions with and without an ET cover over the waste. The numerical dose results for each of these cases are provided in Table G1-5.1-1 for the industrial scenario and Table G1-5.1-2 for the residential scenario (RESRAD summary reports are included on CD with this report). In addition, the plots of dose over the 1000-yr assessment period are provided in Figures G1-5.1-1 through G1-5.1-8.

The dose limits considered in this assessment were the 100-mrem/yr dose limit for members of the public and nonradiological workers contained in DOE Order 458.1, the 25-mrem/yr waste disposal site dose limit in DOE Order 458.1 (although not applicable to MDA C), and the EPA 4-mrem/yr drinking water dose limit for the public (40 Code of Federal Regulations 141.66). These dose limits were not exceeded out to 1000 yr for the four industrial scenario cases. The lack of an ET cover for both the "base" and "hydro"

cases resulted in an estimated peak dose of approximately 0.1 mrem/yr at approximately 1000 yr for an industrial worker on-site. This dose was primarily because of penetrating external radiation from aluminum-26, a radionuclide with an extremely long half-life of 740,000 yr that emits an energetic gamma photon of 1.8 MeV. The presence of the ET cover reduced the estimated dose for this particular scenario by virtue of its external radiation shielding effect for both cases. There was no dose impact from the water-related pathways for all four industrial scenario cases over the 1000-yr evaluation period.

The four residential scenario cases presented no dose impacts for receptors in RCTP over the 1000-yr evaluation period. RCTP is downwind from MDA C, but any clean cover over the waste is sufficient to prevent the resuspension and transport of contaminated dust from MDA C to RCTP. Therefore, there are no dose impacts from the summed contributions of the direct-penetrating radiation pathway, the inhalation pathway, the soil-ingestion pathway, or plant-ingestion pathway (from foliar deposition). Additionally, there was no dose impact from the water-related pathways for these cases.

While the assessment period only covered 1000 yr to demonstrate equivalence with DOE Order 435.1 (although not a requirement for this site), it is important to note that estimated doses would continue to increase over time for the industrial scenario with an on-site receptor. This is obvious from examining the plots in Figures G1-5.1-1 through G1-5.1-4 and is solely because of the gradual removal of the ET cover and operational cover from erosion with concomitant loss of external radiation shielding. Doses would not increase for the residential scenario until the waste was exposed and dispersed downwind toward RCTP. This would be on the order of at least 100,000 yr with the default soil erodibility factor.

G1-5.2 Sensitivity Analysis

Because this dose assessment is site-specific, it is not necessary to perform a sensitivity analysis for those parameters that are fixed and known quantities for the site, such as the contaminated zone area and thickness. However, certain parameters are not as well characterized and can potentially drastically change the dose outcome for specific pathways, particularly those parameters that either minimize or maximize retention of radionuclides in the contaminated zone or those that affect the transport rate of radionuclides in the vadose zone. Aside from the ET coefficient, runoff coefficient, and precipitation rate, which were evaluated via the “base” case and “hydro” case as described above for both the industrial and residential scenarios, the parameters that most likely affect retention or transport through the vadose zone and the saturated zone are the element-specific distribution coefficients (also known as K_d values). These values are widely reported in the literature and have wide ranges depending on soil type and certain chemical attributes associated with the soil type (such as pH, and oxidizing versus reducing environments) as well as the compound associated with the radionuclide (e.g., salts versus oxides).

Because of the need to evaluate the infiltration of water with subsequent transport of radionuclides through the vadose and saturated zones for the drinking water pathway in lieu of retaining radionuclides in the contaminated zone, a sensitivity analysis was performed on those element-specific distribution coefficients associated with those radionuclides resulting in the highest doses for the water-related pathways. The sensitive radionuclides (plutonium and uranium isotopes) and pathways (drinking water and water uptake by plants) were identified from earlier runs with higher infiltration rates not associated with this report.

The distribution coefficients used for all RESRAD runs are those found in Appendix K, Table 12, of the MDA G performance assessment and composite analysis (French et al. 2008, 106890). Most of these distribution coefficients are presented as single values in the table. However, when a distribution is presented in lieu of a single value, either the central tendency value was used, such as for a triangular

distribution, or the highest value was used, such as for a uniform distribution. When appropriate, a sensitivity analysis was performed to ensure the range of the distribution was included.

The results of the sensitivity analysis demonstrated that the dose outcomes for each case and the water-specific pathways were not sensitive to varying the distribution coefficients because the water-specific pathways do not contribute any appreciable dose. Additionally, the external gamma pathway was also examined for distribution coefficient sensitivity, particularly for aluminum-26, and was found not to be sensitive.

G1-6.0 CONCLUSIONS

The dose results in Tables G1-5.1-1 and G1-5.1-2 and Figures G1-5.1-1 through G1-5.1-8 indicate that the presence of an operational cover alone is sufficient for protection of both industrial workers at the MDA C site and residents at RCTP during the evaluation period of 1000 yr. The industrial scenario doses are approximately 0.1 mrem/yr without the ET cover and essentially zero for all pathways with an ET cover. The peak dose time is a function of the erosion rate coupled with the depth of the cover over the waste. Based on the assumption that the radioactive material is uniformly distributed throughout the contaminated zone, it would be necessary to maintain at least the operational cover throughout the assessed 1000 yr time period to avoid the peak doses for each case on site.

With regard to the residential scenario, there are no doses at RCTP at any time during the evaluation period of 1000 yr with the presence of a 1-m operational cover alone or with the ET cover.

The results of the assessment show that the presence of a cover over the waste in MDA C is necessary to meet dose limits beyond 1000 yr, particularly for the industrial scenario because of the presence of the very long-lived aluminum-26 coupled with the potential for erosion of the cover. In reducing dose, the primary function of the cover is to act as a radiation-shielding barrier, thus the operational cover and ET cover achieve similar results. Because dose from water-related pathways is nonexistent, the ability of the ET cover to minimize infiltration does not result in a dose reduction compared with the operational cover. Because the ET cover is specifically engineered to retain moisture and support vegetation, however, it should be less susceptible to erosion and, therefore, is more reliable than the operational soil cover over long periods of time. Although institutional controls, including inspections and maintenance, are assumed to be in place for an indefinite period, the ET cover would provide greater assurance of meeting dose limits in the event that institutional controls are no longer in place.

In conclusion, the ET cover recommended as the corrective measure alternative in the MDA C CME report appears capable of meeting DOE requirements for radiological protection of occupational workers and the public.

G1-7.0 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. This information is also included in text citations. ER IDs 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 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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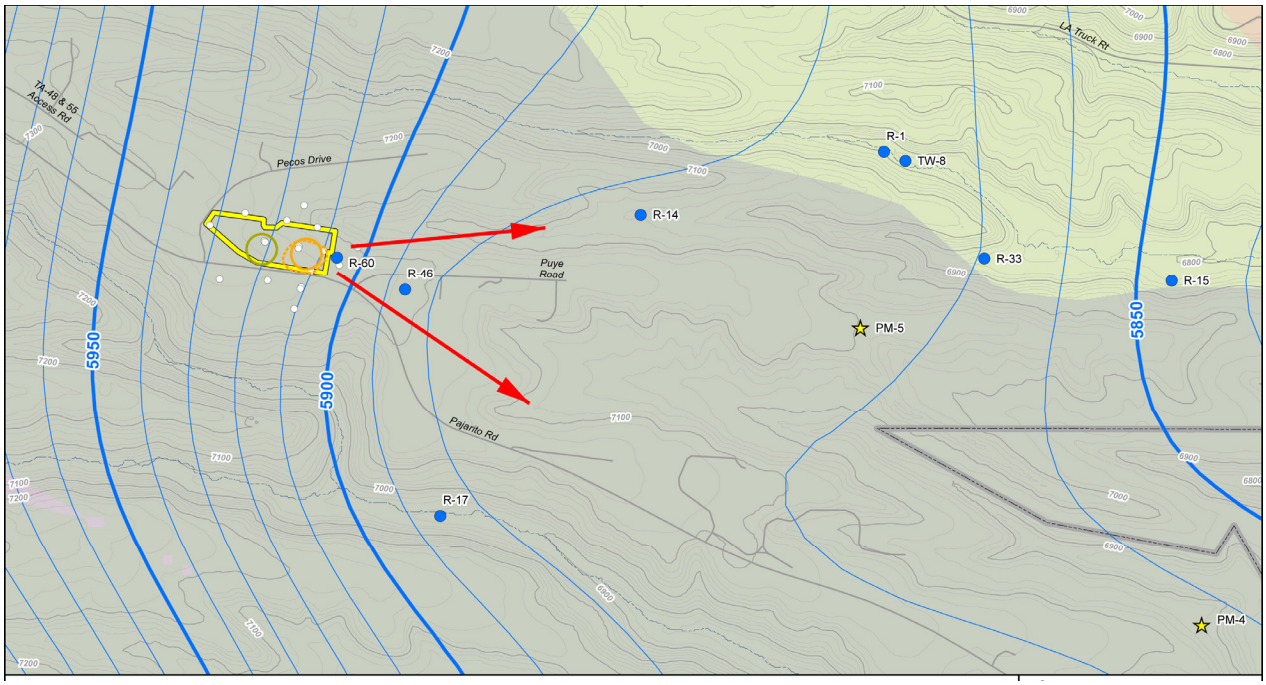


Figure G1-4.2-1 Groundwater flow direction from MDA C to production well PM-5

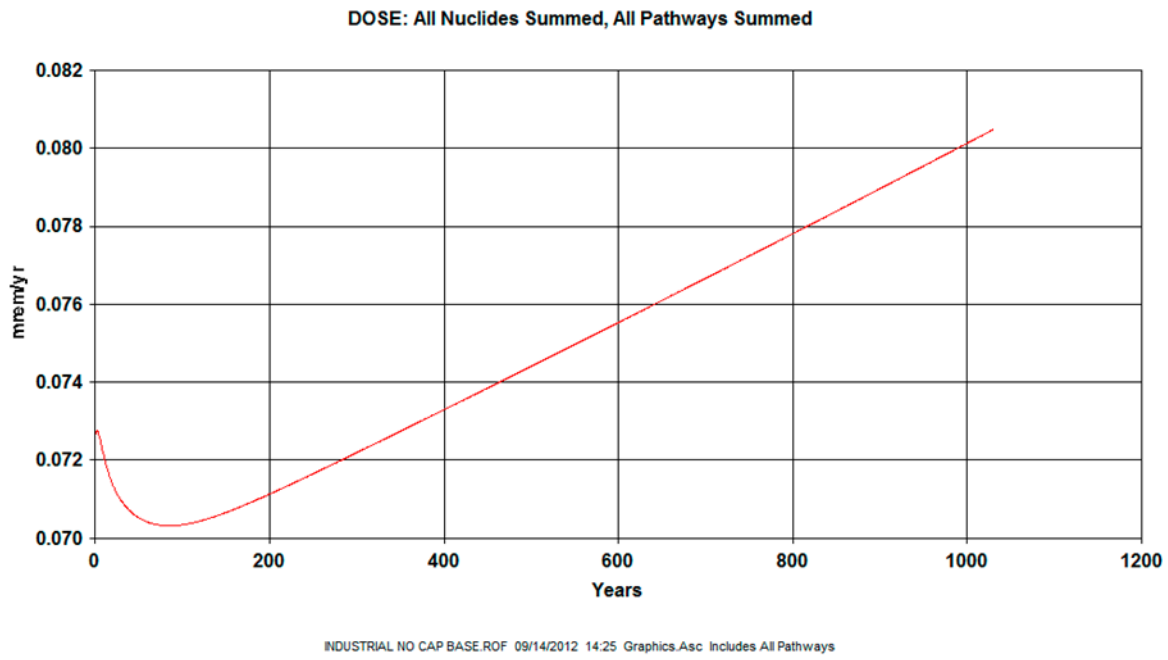


Figure G1-5.1-1 Industrial, no ET cover, base case

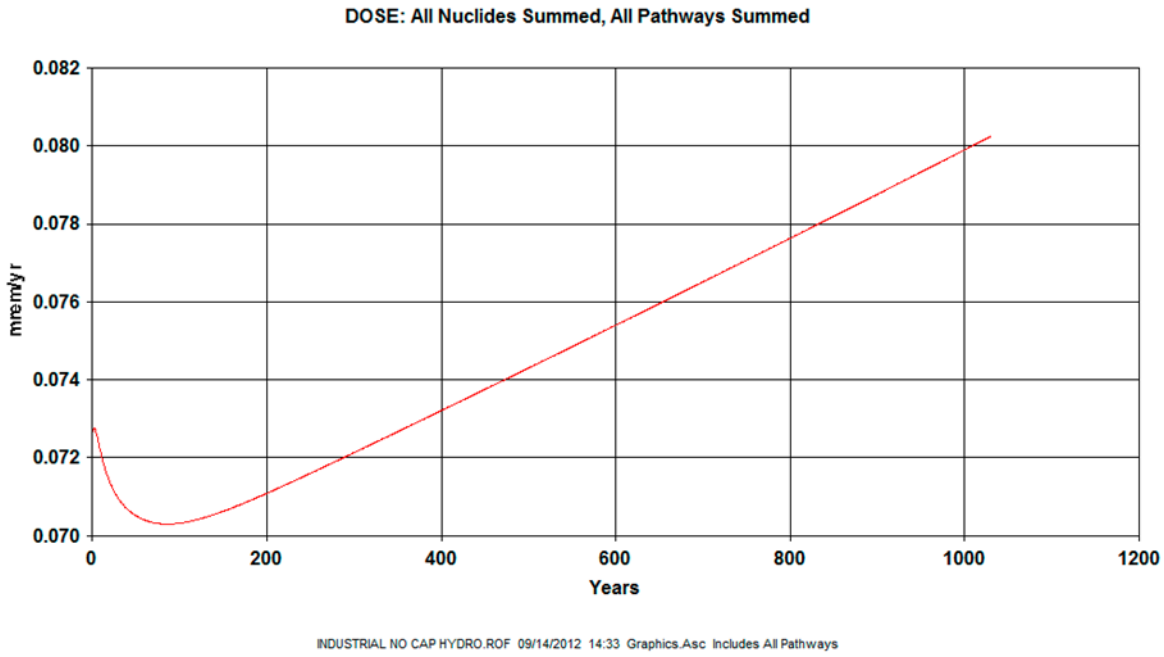


Figure G1-5.1-2 Industrial, no ET cover, hydro case

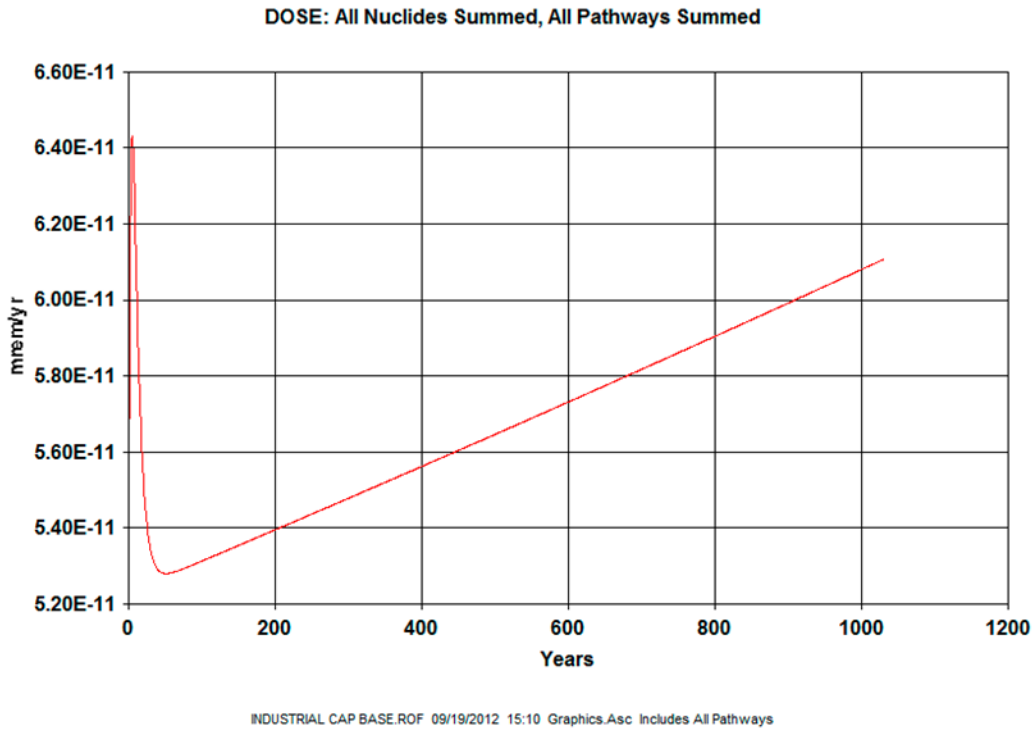


Figure G1-5.1-3 Industrial, ET cover, base case

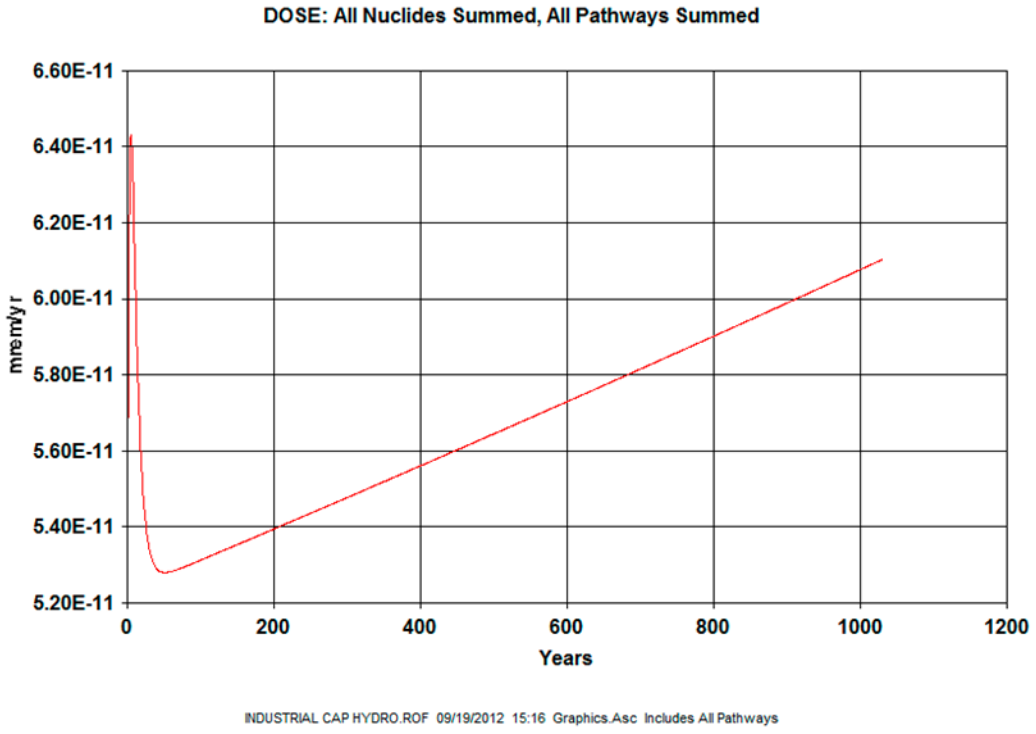


Figure G1-5.1-4 Industrial, ET cover, hydro case

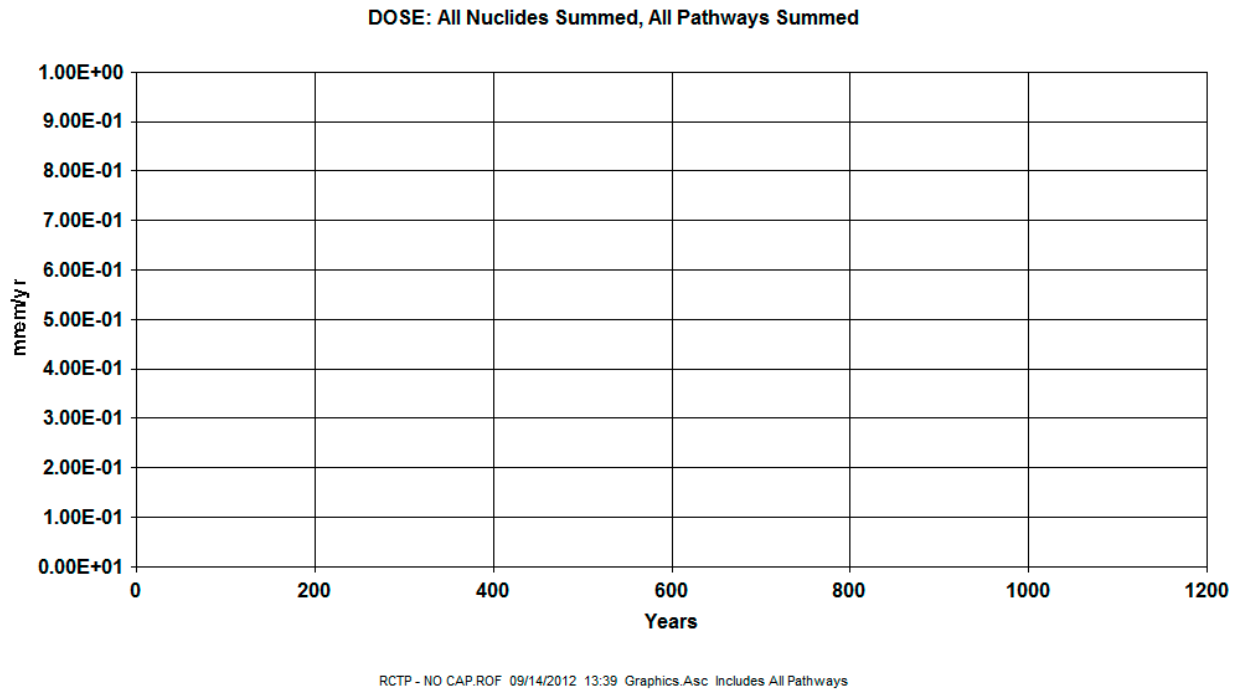


Figure G1-5.1-5 Residential (RCTP), no ET cover, base case (Note: This graph shows no dose consequence for this case)

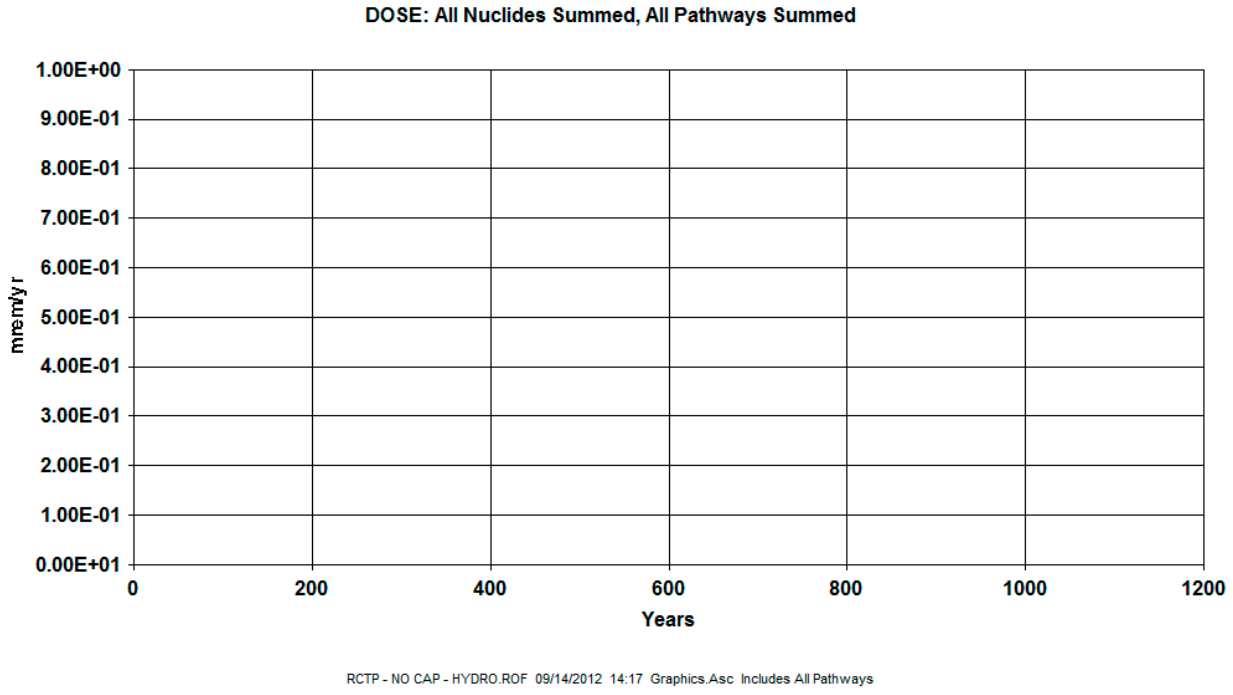


Figure G1-5.1-6 Residential (RCTP), no ET cover, hydro case (Note: This graph shows no dose consequence for this case)

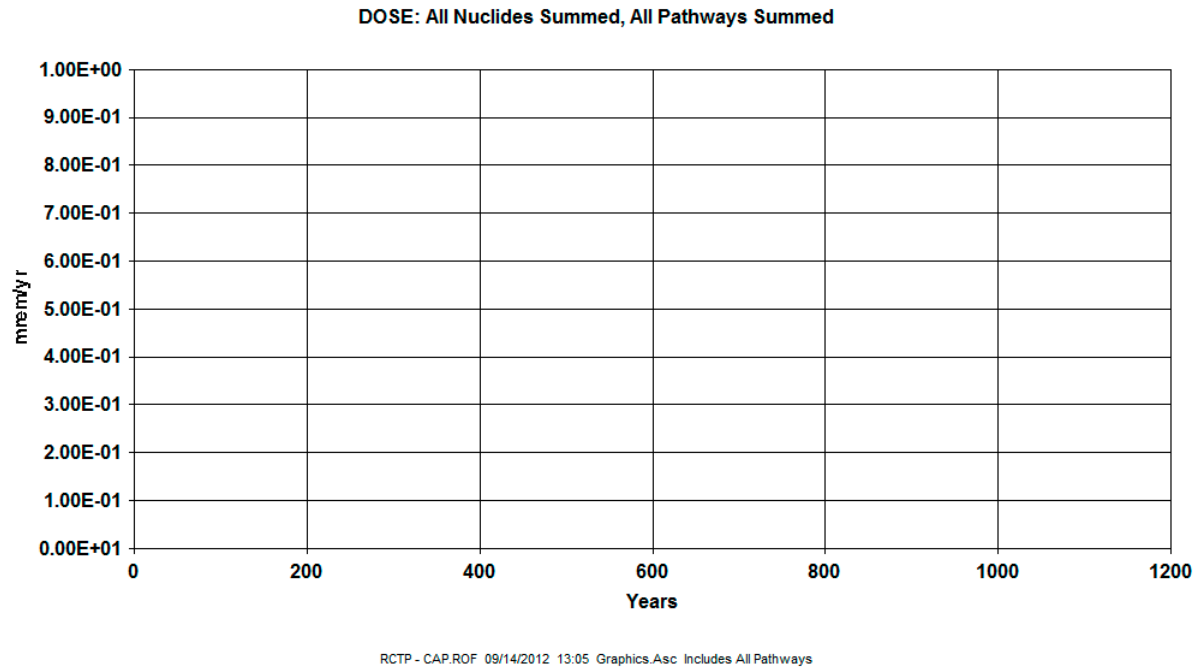


Figure G1-5.1-7 Residential (RCTP), ET cover, base case (Note: This graph shows no dose consequence for this case)

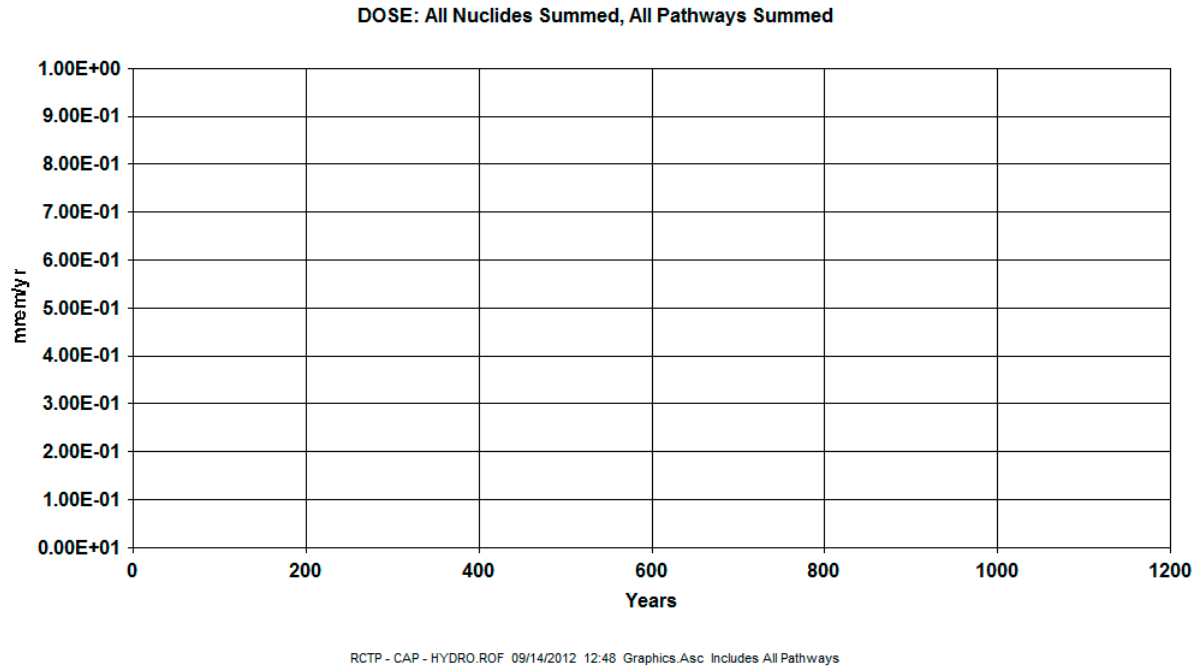


Figure G1-5.1-8 Residential (RCTP), ET cover, hydro case (Note: This graph shows no dose consequence for this case)

Table G1-2.2-1
Present Day (circa 2005) Radionuclide Activities for MDA C Shafts and Pits

Shaft Analytes	Shafts Total (Ci)	Pit Radionuclides	Total Ci	Radionuclide	Shaft + Pit (Ci)
Ac-227	2.60E-01	Ac-227	1.60E-01	Ac-227	4.20E-01
Ag-105	< 1 pCi	—*	—	Ag-105	< 1 pCi
Al-26	1.17E+02	Al-26	2.00E+01	Al-26	1.37E+02
Am-241	9.20E-01	Am-241	2.52E+02	Am-241	2.53E+02
Am-242m	< 1 pCi	—	—	Am-242m	< 1 pCi
Ba-132	7.10E-05	—	—	Ba-132	7.10E-05
—	—	Be-7	< 1 pCi	Be-7	< 1 pCi
Ce-134	0.00E+00	—	—	Ce-134	0.00E+00
Ce-137	< 1 pCi	—	—	Ce-137	< 1 pCi
Ce-141	< 1 pCi	—	—	Ce-141	< 1 pCi
Ce-144	< 1 pCi	Ce-144	< 1 pCi	Ce-144	< 1 pCi
—	—	Cf-249	5.80E-04	Cf-249	5.80E-04
—	—	Cf-251	2.40E-03	Cf-251	2.40E-03
—	—	Cf-252	2.70E-08	Cf-252	2.70E-08
Cl-36	5.00E-02	—	—	Cl-36	5.00E-02
Cm-244	< 1 pCi	—	—	Cm-244	< 1 pCi
Co-54m	< 1 pCi	—	—	Co-54m	< 1 pCi
Co-57	< 1 pCi	Co-57	< 1 pCi	Co-57	< 1 pCi
Co-60	8.42E-01	Co-60	2.90E-02	Co-60	8.71E-01
Cs-134	4.70E-07	—	—	Cs-134	4.70E-07
Cs-137	3.96E+02	Cs-137	1.50E+02	Cs-137	5.46E+02
Cs-144	< 1 pCi	—	—	Cs-144	< 1 pCi
Cu-64	< 1 pCi	Cu-64	< 1 pCi	Cu-64	< 1 pCi
Eu-154	1.39E-03	Eu-154	3.90E-04	Eu-154	1.78E-03
Eu-155	1.36E-03	Eu-155	2.00E-04	Eu-155	1.56E-03
Fe-59	< 1 pCi	—	—	Fe-59	< 1 pCi
H-3	6.77E+03	H-3	7.80E-01	H-3	6.77E+03
Ho-166m	3.90E-02	Ho-166m	5.10E-02	Ho-166m	9.00E-02
I-131	< 1 pCi	—	—	I-131	< 1 pCi
In-114	< 1 pCi	—	—	In-114	< 1 pCi
Ir-192	< 1 pCi	—	—	Ir-192	< 1 pCi
Kr-85	4.60E+00	Kr-85	3.00E+00	Kr-85	7.60E+00
Mn-54	< 1 pCi	Mn-54	< 1 pCi	Mn-54	< 1 pCi
Na-22	1.90E-04	Na-22	1.10E-05	Na-22	2.01E-04
Np-237	< 1 pCi	Np-237	2.90E-04	Np-237	2.90E-04
Pb-210	5.10E-01	—	—	Pb-210	5.10E-01
Pm-147	2.39E-09	Pm-147	6.80E-11	Pm-147	2.46E-09

Table G1-2.2-1 (continued)

Shaft Analytes	Shafts Total (Ci)	Pit Radionuclides	Total Ci	Radionuclide	Shaft + Pit (Ci)
Po-210	< 1 pCi	Po-210	< 1 pCi	Po-210	< 1 pCi
Pu-238	2.01E-01	Pu-238	2.64E+03	Pu-238	2.64E+03
Pu-239	1.09E+01	Pu-239	1.65E+03	Pu-239	1.66E+03
Pu-240	2.22E+00	Pu-240	4.24E+02	Pu-240	4.26E+02
Pu-241	5.00E+00	Pu-241	6.80E+02	Pu-241	6.85E+02
Pu-242	1.30E-04	Pu-242	4.50E-02	Pu-242	4.51E-02
Ra-226	6.90E-01	—	—	Ra-226	6.90E-01
Ra-228	7.50E-01	Ra-228	1.60E-03	Ra-228	7.52E-01
Ru-106	1.39E-09	Ru-106	< 1 pCi	Ru-106	1.39E-09
Sb-124	< 1 pCi	Sb-124	< 1 pCi	Sb-124	< 1 pCi
Sb-125	8.93E-05	Sb-125	7.40E-06	Sb-125	9.67E-05
Sm-151	1.78E-03	Sm-151	2.00E-03	Sm-151	3.78E-03
Sn-119m	< 1 pCi	Sn-119m	< 1 pCi	Sn-119m	< 1 pCi
Sn-121m	8.00E-03	Sn-121m	8.20E-02	Sn-121m	9.00E-02
Sn-123	< 1 pCi	Sn-123	< 1 pCi	Sn-123	< 1 pCi
Sn-126	1.90E-03	Sn-126	2.00E-02	Sn-126	2.19E-02
Sr-89	< 1 pCi	Sr-89	< 1 pCi	Sr-89	< 1 pCi
Sr-90	3.80E+01	Sr-90	3.90E+01	Sr-90	7.70E+01
Ta-182	< 1 pCi	—	—	Ta-182	< 1 pCi
—	—	Th-228	1.60E-03	Th-228	1.60E-03
—	—	Th-230	1.50E+01	Th-230	1.50E+01
—	—	Th-232	1.77E-03	Th-232	1.77E-03
U-233	5.00E-01	—	—	U-233	5.00E-01
U-234	1.40E+00	U-234	6.23E+00	U-234	7.63E+00
U-235	5.50E-02	U-235	3.90E+01	U-235	3.91E+01
U-236	1.70E-02	U-236	5.60E-02	U-236	7.30E-02
U-238	9.00E-02	U-238	9.49E+00	U-238	9.58E+00
Y-91	< 1 pCi	Y-91	< 1 pCi	Y-91	< 1 pCi
		Zn-65	< 1 pCi	Zn-65	< 1 pCi
Zr-95	< 1 pCi	Zr-95	< 1 pCi	Zr-95	< 1 pCi

*— = No inventory reported.

Table G1-2.2-2
MDA C Pit and Shaft Dimensions and Volumes

Disposal Unit	Dimensions (ft)	Volume (ft^3)	Volume (m^3)
Pit 1	610 × 40 × 25	6.10E+05	1.73E+04
Pit 2	610 × 40 × 25	6.10E+05	1.73E+04
Pit 3	610 × 40 × 25	6.10E+05	1.73E+04
Pit 4	610 × 40 × 25	6.10E+05	1.73E+04
Pit 5	705 × 110 × 18	1.40E+06	3.96E+04
Pit 6	505 × 100 × 25	1.26E+06	3.57E+04
Chemical Pit	180 × 25 × 12	5.4E+04	1.53E+03
Shaft Group 1 (12 [Shafts 56–67])	2 × 10	3.14E+01	1.07E+01
Shaft Group 2 (55 [Shafts 1–55])	2 × 15	4.71E+01	7.34E+01
Shaft Group 3 (40 [Shafts 68–107])	1–2[b] × 20–25	1.96E+01	2.22E+01
Shaft 108 (Strontium-90 Disposal Shaft)	4 × 4 × 4	6.40E+01	1.81E+00
		Total	1.45E+05 m^3

Table G1-2.2-3
MDA C Pits and Shafts Areas

Disposal Unit	Dimensions (ft)	Area (ft^2)	Area (m^2)
Pit 1	610 × 40 × 25	2.44E+04	2.27E+03
Pit 2	610 × 40 × 25	2.44E+04	2.27E+03
Pit 3	610 × 40 × 25	2.44E+04	2.27E+03
Pit 4	610 × 40 × 25	2.44E+04	2.27E+03
Pit 5	705 × 110 × 18	7.76E+04	7.21E+03
Pit 6	505 × 100 × 25	5.05E+04	4.69E+03
Chemical Pit	180 × 25 × 12	4.50E+03	4.18E+02
Shaft Group 1 (12 [Shafts 56–67])	2 × 10	3.14E+00	3.50E+00
Shaft Group 2 (55 [Shafts 1–55])	2 × 15	3.14E+00	1.61E+01
Shaft Group 3 (40 [Shafts 68–107])	1–2[b] × 20–25	7.90E-01	2.94E+00
Shaft 108 (Strontium-90 Disposal Shaft)	4 × 4 × 4	1.60E+01	1.49E+00
		Pits & Shafts Area	2.10E+04 m^2

Table G1-2.2-4
MDA C Pits and Shafts Radionuclide Concentrations

Radionuclide*	Shaft + Pit (Ci)	Concentration (pCi/g)
Ac-227	4.20E-01	2.34E+00
Al-26	1.37E+02	7.64E+02
Am-241	2.53E+02	1.41E+03
Ba-132	7.10E-05	3.96E-04
Cf-249	5.80E-04	3.24E-03
Cf-251	2.40E-03	1.34E-02
Cf-252	2.70E-08	1.51E-07
Cl-36	5.00E-02	2.79E-01
Co-60	8.71E-01	4.86E+00
Cs-134	4.70E-07	2.62E-06
Cs-137	5.46E+02	3.05E+03
Eu-154	1.78E-03	9.92E-03
Eu-155	1.56E-03	8.72E-03
Fe-59	2.00E-12	1.12E-11
H-3	6.77E+03	3.78E+04
Ho-166m	9.00E-02	5.02E-01
Kr-85	7.60E+00	4.24E+01
Na-22	2.01E-04	1.12E-03
Np-237	2.90E-04	1.62E-03
Pb-210	5.10E-01	2.85E+00
Pm-147	2.46E-09	1.37E-08
Pu-238	2.64E+03	1.47E+04
Pu-239	1.66E+03	9.25E+03
Pu-240	4.26E+02	2.38E+03
Pu-241	6.85E+02	3.82E+03
Pu-242	4.51E-02	2.52E-01
Ra-226	6.90E-01	3.85E+00
Ra-228	7.52E-01	4.19E+00
Ru-106	1.39E-09	7.77E-09
Sb-125	9.67E-05	5.40E-04
Sm-151	3.78E-03	2.11E-02
Sn-121m	9.00E-02	5.02E-01
Sn-126	2.19E-02	1.22E-01
Sr-90	7.70E+01	4.30E+02
Th-228	1.60E-03	8.93E-03
Th-230	1.50E+01	8.37E+01
Th-232	1.77E-03	9.88E-03

Table G1-2.2-4 (continued)

Radionuclide*	Shaft + Pit (Ci)	Concentration (pCi/g)
U-233	5.00E-01	2.79E+00
U-234	7.63E+00	4.26E+01
U-235	3.91E+01	2.18E+02
U-236	7.30E-02	4.07E-01
U-238	9.58E+00	5.35E+01

*Radionuclides with waste inventories less than 1 pCi as shown in Table G1-2.2-1, are not included in this table, and are not used in the RESRAD modeling.

Table G1-4.5-1
Residential Scenario: Exposure Factors from 2011 EFH

Parameters	Residential, Child	Residential, Adult
Outdoor time fraction	0.0926[a]	0.0934[b]
Indoor time fraction	0.8656[c]	0.8648[d]
Inhalation rate (m^3/yr)	4,712[e]	7,780[f]
Mass loading (g/m^3)	1.51×10^{-7} [g]	1.51×10^{-7} [g]
Soil ingestion (g/yr)	73[h]	36.5[i]
Produce ingestion (kg/yr)	14[j]	22.1[k]

[a] Calculated as (2.32 h/d × 350 d/yr) / 8766 h/yr, where 2.32 h/d (139 min) is the largest amount of time spent outdoors for child age groups between 1 to <3 mo and 3 to <6 yr (EPA 2011, 208374; Table 16-1) and is comparable with the adult time spent outdoors at a residence.

[b] Calculated as (2.34 h/d × 350 d/yr) / 8766 h/yr. 4.68 h/d is the average total time spent outdoors for adults age 18 to <65 yr in all environments (EPA 2011, 208374; Table 16-1); 50% of this value (2.34 h/d) was applied to time spent outdoors at a residence and is similar to mean time outdoors at a residence for this age group (Table 16-22).

[c] Calculated as [(24 – 2.32 h/d) × 350 d/yr] / 8766 h/yr.

[d] Calculated as [(24 – 2.34 h/d) × 350 d/yr] / 8766 h/yr.

[e] Calculated as 12.9 m^3/d × 365.25 d/yr, where 12.9 m^3/d is the age-weighted daily inhalation rate of a child age 0 to <6 yr (EPA 2011; Table 6-1).

[f] Calculated as 21.3 m^3/d × 365.25 d/yr, where 21.3 m^3/d is the age-weighted daily inhalation rate of an adult age 21 to <61 yr (EPA 2011, 208374; Table 6-1).

[g] Calculated as (1 / 6.61×10^9 m^3/kg) × 1000 g/kg; where 6.61×10^9 m^3/kg is particulate emission factor from NMED (2012, 219971).

[h] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.2 g/d × 350 d/yr] / [indoor + outdoor time fractions]; where 0.2 g/d is the 3 to <6 yr child upper percentile soil ingestion rate (EPA 2011, 208374; Table 5-1).

[i] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil ingestion pathway. Calculated as [0.1 g/d × 350 d/yr] / [indoor + outdoor time fractions]; where 0.1 g/d is a central tendency soil ingestion rate for ages 6 to <21 yr and is 2× the adult central tendency soil ingestion rate (EPA 2011, 208374; Table 5-1).

[j] Calculated as the age-weighted body-weight normalized sum of mean per capita fruit and vegetable ingestion rates for populations that garden; child age 1 to <21 yr (EPA 2011, 208374; Tables 13-1 and 8-10).

[k] Calculated as the age-weighted body-weight normalized sum of mean per capita fruit and vegetable ingestion rates for populations that garden; adult age 21 to 65 yr (EPA 2011, 208374; Tables 13-1 and 8-1).

Table G1-4.5-2
Industrial Scenario Exposure Factors

Parameters	Commercial/Industrial, Adult
Inhalation rate (m^3/yr)	7780[a]
Mass loading (g/m^3)	1.5×10^{-7} [b]
Outdoor time fraction	0.2053[c]
Indoor time fraction	0[d]
Soil ingestion (g/yr)	109.6[e]

[a] Calculated as [21.3 m^3/d × 365.25 d/yr], where 21.3 m^3/d is the upper percentile daily inhalation rate of an adult from 21 to less than 61 yr old (EPA 2011, 208374, Table 6-1).

[b] Calculated as (1 / $6.6 \times 10^{+9}$ m^3/kg) × 1000 g/kg, where $6.6 \times 10^{+9}$ m^3/kg is the particulate emission factor (NMED 2012, 219971).

[c] Calculated as (8 h/d × 225 d/yr) / 8766 h/yr, where 8 h/d is an estimate of the average length of the work day.

[d] The commercial/industrial worker is defined as someone who "spends most of the work day conducting maintenance or manual labor activities outdoors" (NMED 2012, 219971).

[e] The soil-ingestion rate compensates for the time-based occupancy factor applied by RESRAD in calculating exposure from the soil-ingestion pathway. Calculated as [0.1 g/d × 225 d/yr] / [indoor + outdoor time fractions], where 0.1 g/d is the adult soil-ingestion rate (NMED 2012, 219971).

Table G1-4.6-1
RESRAD Parameters for MDA C Dose Assessment

Parameter	Default Value	User Input Value	Units	Comments	Reference
Pathway Selections					
External gamma	Active	Active	n/a*	Credible pathway	Part of exposure scenario
Inhalation (w/o radon)	Active	Active	n/a	Credible pathway	Part of exposure scenario
Plant ingestion	Active	Active	n/a	Credible pathway	Part of exposure scenario
Meat ingestion	Active	Suppressed	n/a	No credible sources at site	Not part of exposure scenario
Milk ingestion	Active	Suppressed	n/a	No credible sources at site	Not part of exposure scenario
Aquatic foods	Active	Suppressed	n/a	No credible sources at site	Not part of exposure scenario
Drinking water	Active	Active	n/a	Credible pathway	Part of exposure scenario
Soil ingestion	Active	Active	n/a	Credible pathway	Part of exposure scenario
Radon	Suppressed	Suppressed	n/a	No credible sources at site	Not part of exposure scenario
Contaminated Zone Parameters					
Area of contaminated zone	10,000	21,000	m^2	Based on area of MDA C pits and shafts	Table G1-2.2-3
Thickness of contaminated zone	2	7.26	m	Average depth of MDA C pits	Derived from Table G1-2.2-3
Length parallel to aquifer	100	175	m	Length of total area of MDA C pits and shafts	Derived from Table G1-2.2-3
Times for Calculation	User defined	User defined	yr	User defined	n/a
Cover and Contaminated Zone Hydrological Data					
Cover Depth	0	1 for operational cover 1.5 for ET cover	m	None	Appendix J of the CME
Density of cover material	1.5	1.4	g/cm^3	Crushed tuff	French (2008, 106890) Table 11
Soil erodibility factor	0.4	0.4	tons/acre	Default. This results in a 1.248×10^{-5} m/yr erosion rate for the operational and ET covers.	Yu et al. 2007, 227832
Density of contaminated zone	1.5	1.24	g/cm^3	Table G1-4.6-2	Table G1-4.6-2

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Contaminated zone total porosity	0.4	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Contaminated zone field capacity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Contaminated zone b parameter	5.3	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Humidity in air	8	5.55	g/m^3	Range is 2.4 (January) to 8.7 g/m^3 (July-August) over a yr; 5.55 g/m^3 is range midpoint.	(source: http://www.weather.lanl.gov/documentation.asp)
Evapotranspiration coefficient	0.5	Varies	unitless	Table G1-4.6-3	n/a
Wind speed	2	~3.2	m/s	Calculated from TA-06 meteorological tower data from 2007 to 2011.	source: http://www.weather.lanl.gov/documentation.asp
Precipitation	1	Varies	m/yr	Table G1-4.6-3	Bowen 1990, 006899
Irrigation	0.2	Varies	m/yr	0 for all but residential scenario offsite locations	n/a*
Irrigation mode	Overhead	Overhead	unitless	RESRAD default	Yu et al. (2001, 076874)
Runoff coefficient	0.2	Varies	unitless	Table G1-4.6-3	n/a
Watershed area for nearby stream or pond	1,000,000	1,000,000	m^2	RESRAD default	Yu et al. (1993, 059177.1, Section 17)
Accuracy for water/ soil computations	0.001	0.001	unitless	RESRAD default	Yu et al. (2001, 076874)
Saturated Zone Hydraulic Parameters					
Density of saturated zone	1.5	Table G1-4.6-2	g/cm^3	Table G1-4.6-2	Table G1-4.6-2
Saturated zone total porosity	0.4	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Saturated zone effective porosity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Saturated zone field capacity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Saturated zone hydraulic conductivity	100	Table G1-4.6-	m/yr	Table G1-4.6-2	Table G1-4.6-2
Saturated zone hydraulic gradient	0.02	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Saturated zone b parameter	5.3	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Water table drop rate	0.001	Table G1-4.6-2	m/yr	Table G1-4.6-2	Table G1-4.6-2

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Model for water transport parameters [nondispersion (ND) or mass balance (MB)]	ND	ND	unitless	RESRAD default	NRC 2006, 227831
Well pumping rate	250	Table G1-4.6-2	m^3/yr	Table G1-4.6-2	Table G1-4.6-2
Uncontaminated Unsaturated Zone Parameters					
Number of unsaturated zone strata	1	4	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 1 thickness	4	Table G1-4.6-2	m	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 1 soil density	1.5	Table G1-4.6-2	g/cm^3	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 1 total porosity	0.4	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 1 effective porosity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 1 field capacity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 1 hydraulic conductivity	100	Table G1-4.6-2	m/yr	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 1 b parameter	5.3	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 2 thickness	4	Table G1-4.6-2	m	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 2 soil density	1.5	Table G1-4.6-2	g/cm^3	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 2 total porosity	0.4	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 2 effective porosity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 2 field capacity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 2 hydraulic conductivity	100	Table G1-4.6-2	m/yr	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 2 b parameter	5.3	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 3 thickness	4	Table G1-4.6-2	m	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 3 soil density	1.5	Table G1-4.6-2	g/cm^3	Table G1-4.6-2	Table G1-4.6-2

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Unsaturated zone 3 total porosity	0.4	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 3 effective porosity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 3 field capacity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 3 hydraulic conductivity	100	Table G1-4.6-2	m/yr	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 3 b parameter	5.3	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 4 thickness	4	Table G1-4.6-2	m	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 4 soil density	1.5	Table G1-4.6-2	g/cm^3	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 4 total porosity	0.4	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 4 effective porosity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 4 field capacity	0.2	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 4 hydraulic conductivity	100	Table G1-4.6-2	m/yr	Table G1-4.6-2	Table G1-4.6-2
Unsaturated zone 4 b parameter	5.3	Table G1-4.6-2	unitless	Table G1-4.6-2	Table G1-4.6-2
Industrial inhalation rate	8400	7780	m^3/yr	Calculated as [21.3 m^3/d × 365.25 d/yr], where 21.3 m^3/d is the upper percentile daily inhalation rate of an adult from 21 to less than 61 yr old	EPA 2011, 208374, Table 6-1
Residential Inhalation rate	8400	4712	m^3/yr	Calculated as 12.9 m^3/d × 365.25 d/yr, where 12.9 m^3/d is the mean of 95^{th} percentile values from 0 to <6 yr old.	EPA 2011, 208374, Table 6-1
Mass loading for inhalation	0.0001	0.00000015	g/m^3	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.	NMED 2012, 219971
Industrial exposure duration	30	30	yr	RESRAD default	Yu et al. (2001, 076874)
Residential exposure duration	30	6	yr	Young child exposure 0 to <6 yr	NMED 2012, 219971

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Inhalation shielding factor	0.4	1.0	unitless	No attenuation of outdoor dust concentration for indoors	n/a
External shielding factor	0.7	0.7	unitless	RESRAD default	Yu et al. (2001, 076874)
Occupancy, Inhalation, and External Gamma Parameters					
Industrial indoor time fraction	0.5	0	unitless	n/a	The industrial worker is defined as someone who "spends most of the work day conducting maintenance or manual labor activities outdoors."
Residential indoor time fraction	0.5	0.8656	unitless	Calculated as [(24–2.32 h/d) × 350 d/yr] / 8766 h/yr.	n/a
Industrial outdoor time fraction	0.25	0.2053	unitless	Calculated as (8 h/d × 225 d/yr) / 8766 h/yr, where 8 h/d is an estimate of the average length of the work day and 225 d/yr is the exposure frequency.	NMED 2012, 219971
Residential outdoor time fraction	0.25	0.0926	unitless	Calculated as (2.32 h/d × 350 d/yr) / 8766 h/yr, where 2.32 h/d is the largest amount of time spent outdoors for child age groups between 1–<3 mo and 3–<6 yr.	EPA 2011, 208374, Table 16-20
Shape of contaminated zone	Circular	Circular	unitless	RESRAD default	Yu et al. (1993, 059177.1, Section 50)
Radon Data					
Cover total porosity	0.4	Not used	unitless	n/a	n/a
Cover volumetric water content	0.05	Not used	unitless	n/a	n/a
Cover radon diffusion coefficient	0.000002	Not used	m^2/s	n/a	n/a
Bldg foundation thickness	0.15	Not used	m	n/a	n/a
Bldg foundation density	2.4	Not used	g/cm^3	n/a	n/a
Bldg foundation volumetric water content	0.03	Not used	unitless	n/a	n/a
Bldg foundation radon diffusion coefficient	0.0000003	Not used	m^2/s	n/a	n/a

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Contaminated radon diffusion coefficient	0.000002	Not used	m^2/s	n/a	n/a
Radon vertical dimension of mixing	2	Not used	m	n/a	n/a
Bldg air exchange rate	0.5	Not used	1/h	n/a	n/a
Bldg room height	2.5	Not used	m	n/a	n/a
Building Indoor Area factor	0	Not used	unitless	n/a	n/a
Foundation depth below ground surface	1	Not used	m	n/a	n/a
Rn-222 Emanation Coefficient	0.25	Not used	unitless	n/a	n/a
Rn-220 Emanation Coefficient	0.15	Not used	unitless	n/a	n/a
Ingestion Pathway (Dietary Data)					
Fruits, vegetables, and grains consumption (residential only)	160	14	kg/yr	Age-weighted body-weight normalized sum of mean per capita fruit and vegetable ingestion rates for populations that garden; child age 1–<21 yr [(fruits+vegetables per age group × body weight per age group × 365.25 ÷ 1000) then sum age group totals × age weight over 20 yr]	EPA 2011, 208374, Table 13-1 and Table 8-10
Leafy vegetable consumption (residential only)	14	0	kg/yr	Assumes that home production of leafy vegetables is negligible	n/a
Milk consumption	92	Not used	L/yr	Pathway suppressed	n/a
Meat and poultry consumption	63	Not used	kg/yr	Pathway suppressed	n/a
Fish consumption	5.4	Not used	kg/yr	Pathway suppressed	n/a
Other seafood consumption	0.9	Not used	kg/yr	Pathway suppressed	n/a
Industrial soil ingestion rate	36.5	109.6	g/yr	Calculated as [0.1 g/d × 225 d/yr] / [indoor + outdoor time fractions], where 0.1 g/d is the adult soil ingestion rate.	NMED 2012, 219971

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Residential soil ingestion rate	36.5	73	g/yr	Calculated as [0.2 g/d × 350 d/yr] / [indoor + outdoor time fractions], where 0.2 g/d is the child soil ingestion rate.	NMED 2012, 219971; EPA 2011, 208374, Table 5-1
Contamination fraction of household water	1	1	unitless	RESRAD default	Yu et al. (1993, 059177.1)
Contamination fraction of livestock water	1	Not used	unitless	Pathway suppressed	n/a
Contamination fraction of irrigation water	1	Not used	unitless	Pathway suppressed	n/a
Contamination fraction of plant food	1	1	unitless	RESRAD default	Yu et al. (1993, 059177.1)
Contamination fraction of meat	1	Not used	unitless	Pathway suppressed	n/a
Contamination fraction of milk	1	Not used	unitless	Pathway suppressed	n/a
Ingestion Pathway (Non-Dietary Data)					
Livestock fodder intake for meat	68	Not used	kg/d	Pathway suppressed	n/a
Livestock fodder intake for milk	55	Not used	kg/d	Pathway suppressed	n/a
Livestock water intake for meat	50	Not used	L/d	Pathway suppressed	n/a
Livestock water intake for milk	160	Not used	L/d	Pathway suppressed	n/a
Livestock intake of soil	0.5	Not used	kg/d	Pathway suppressed	n/a
Mass loading for foliar deposition	0.0001	0.0001	g/m^3	RESRAD default	Yu et al. (1993, 059177.1)
Depth of soil mixing layer	0.15	0.15	m	RESRAD default	Yu et al. (1993, 059177.1)
Depth of roots	0.9	0.9	m	RESRAD default	Yu et al. (1993, 059177.1)
Groundwater fractional usage: drinking water	1	1	unitless	RESRAD default	Yu et al. (1993, 059177.1)
Groundwater fractional usage: household water	1	Not used	unitless	RESRAD default	Yu et al. (1993, 059177.1)

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Plant Transport Factors					
Wet weight crop yield: nonleafy vegetables	0.7	0.7	kg/m^2	RESRAD default	Yu et al. 1993, 059177.1 NRC 2000, 227830
Wet weight crop yield: leafy vegetables	1.5	1.5	kg/m^2	RESRAD default	Yu et al. 1993, 059177.1); NRC 2000, 227830
Wet weight crop yield: fodder	1.1	Not used	kg/m^2	Pathway suppressed	n/a
Length of growing season: nonleafy vegetables	0.17	0.17	yr	RESRAD default	Yu et al. 1993, 059177.1 NRC 2000, 227830
Length of growing season: leafy vegetables	0.25	0.25	yr	RESRAD default	Yu et al. 1993, 059177.1; NRC 2000, 227830
Length of growing season: fodder	0.08	Not used	yr	Pathway suppressed	n/a
Translocation factor: nonleafy vegetables	0.1	0.1	unitless	RESRAD default	Yu et al. 1993, 059177.1; NRC 2000, 227830
Translocation factor: leafy vegetables	1	1	unitless	RESRAD default	Yu et al. 1993, 059177.1; NRC 2000, 227830
Translocation factor: fodder	1	Not used	unitless	Pathway suppressed	n/a
Weather removal constant	20	20	1/yr	RESRAD default	Yu et al. 1993, 059177.1; NRC 2000, 227830
Wet foliar interception fraction: nonleafy vegetables	0.25	0.25	unitless	RESRAD default	Yu et al. 1993, 059177.1; NRC 2000, 227830
Wet foliar interception fraction: leafy vegetables	0.25	0.25	unitless	RESRAD default	Yu et al. 1993, 059177.1; NRC 2000, 227830
Wet foliar interception fraction: fodder	0.25	Not used	unitless	Pathway suppressed	n/a
Dry foliar interception fraction: nonleafy vegetables	0.25	0.25	unitless	RESRAD default	Yu et al. (1993, 059177.1); NRC 2000, 227830
Dry foliar interception fraction: leafy vegetables	0.25	0.25	unitless	RESRAD default	Yu et al. (1993, 059177.1); NRC 2000, 227830

Table G1-4.6-1 (continued)

Parameter	Default Value	User Input Value	Units	Comments	Reference
Storage Times Before Use					
Fruits, non-leafy vegetables, and grain	14	1	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874, model assumption for home-grown produce
Leafy vegetables	1	1	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874
Milk	1	1	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874
Meat	20	20	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874
Fish	7	7	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874
Crustacea and mollusks	7	7	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874
Well water	1	1	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874
Surface water	1	1	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874
Livestock fodder	45	45	days	RESRAD default	Yu et al. 1993, 059177.1; Yu et al. 2001, 076874

*n/a = Not applicable.

Table G1-4.6-2
Hydrogeologic Parameter Definitions for RESRAD 6.5
and RESRAD-OFFSITE 2.6 Calculation of Groundwater Dose from MDA C Waste

Parameter	Value	Notes
Primary Contamination Zone		
Area of primary contamination	21,000 m^2	Use MDA C waste area footprint
Length of contamination parallel to aquifer flow	175 m	Use MDA C waste area length in along E-W line
Evapotranspiration coefficient	(a) 0.99; (b) 0.998	Assumes vegetated cover is in place. Can be either (1.a) crushed tuff (like existing) or (1.b) a formal ET cover. Note: Need a combination of precipitation, evaporation, and runoff to get the equivalent of 1–10 mm/yr infiltration for 1a. It can be < 1 mm/yr for 1b.
Runoff coefficient	(a) 0.9 (b) 0.25	(a) for scenarios that require conservation of contaminants in contamination zone (base cases) (b) for scenarios that require migration of contaminants into vadose and saturated zones (hydro model)
Rainfall and runoff factor	20	Natural Resources Conservation Service value
Slope-length-steepness factor	3.25	Length of final slope divided by total drop (calculated from GIS)
Contaminated zone – thickness (m)	7.26	Average depth of pits
Total porosity (assumed crushed tuff)	0.41	French (2008, 106890) Table 1
Dry bulk density (g/cm^3)	1.24	Assume like unsaturated zone unit 1
b parameter	1	Assume like unsaturated zone unit 1
Hydraulic conductivity (m/yr)	33.4	Assume like unsaturated zone unit 1
Unsaturated Zone Hydrology		
Number of unsaturated zones	4 – Qbt (Unit 1), Qct (Unit 2), Qbo (Unit 3), Puye, Tpf (Unit 4)	Ignore thickness of the dacite unit; fractured and may have rapid transport time
Unit 1, Qbt – THICKNESS (m)	94.8	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet/ (in Attachment G-2)
Unit 1, Qbt – Dry bulk density (g/cm^3)	1.24	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet (in Attachment G-2)
Unit 1, Qbt – Total porosity	0.44	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet (in Attachment G-2)

Table G1-4.6-2 (continued)

Parameter	Value	Notes
Unit 1, Qbt – Effective Porosity	0.44	Assume same as total
Unit 1, Qbt – Field Capacity	0.0088	Assume Sr/porosity from Table 4, App E, 2008 Area G performance assessment (PA)/composite analysis (CA); using 2E-2 × 0.44
Unit 1, Qbt – K_{sat}t (m/yr)	33.4	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 1, Qbt – b parameter	1.0	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 1, Qbt – Long dispersivity (m)	1.0	Common value used in Area G PA previous calculations
Unit 2, Qct – thickness (m)	32.0	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 2, Qct – Dry bulk density (g/cm^3)	1.20	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 2, Qct – Total Porosity	0.50	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 2, Qct – Effective Porosity	0.50	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 2, Qct – Field Capacity	0.0035	Assume Sr/porosity from Table 4, App E, 2008 Area G PA/CA; using 7E-3 × 0.50
Unit 2, Qct – K_{sat} (m/yr)	41.0	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 2, Qct – b parameter	2.6	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 2, Qct – Long dispersivity (m)	1.0	Common value used in Area G PA previous calculations
Unit 3, Qbo – thickness (m)	56.7	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 3, Qbo – Dry bulk density (g/cm^3)	1.17	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 3, Qbo– Total porosity	0.46	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 3, Qbo – Effective porosity	0.46	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 3, Qbo – Field capacity	0.02	Assume Sr/porosity from Table 4, App E, 2008 Area G PA/CA; using 4.3e-2 × 0.46
Unit 3, Qbo – K_{sat} (m/yr)	66.9	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 3, Qbo – b Parameter	1.5	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 3, Qbo – Long dispersivity (m)	1.0	Common value used in Area G PA previous calculations
Unit 4, Tpf – Thickness (m)	136	This is thickness above water table

Table G1-4.6-2 (continued)

Parameter	Value	Notes
		based on water level reported in the R-60 well completion report.
Unit 4, Tpf – Dry bulk density (g/cm^3)	1.61	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 4, Tpf – Total porosity	0.21	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 4, Tpf – Effective porosity	0.21	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 4, Tpf – Field capacity	0.02	Assume Sr/porosity from Table 4, App E, 2008 Area G PA/CA; using 0.097 × 0.21
Unit 4, Tpf – K_{sat} (m/yr)	12.7	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 4, Tpf – b parameter	0.9	See "Hydro Props for MDA C RESRAD run.xls" spreadsheet
Unit 4, Tpf – Long dispersivity (m)	1.0	Common value used in Area G PA previous calculations
Saturated Zone Hydrology		
Thickness of saturated zone (m); This unit is Tpf.	936	Assume thickness = distance between water table and bottom of screened interval of PM-5; from Table XXI-D of Purtymun (1995, 045344). PM-5 louvers are from 1440 to 3072 ft below ground surface.
Dry bulk density (g/cm3)	1.61	Not available, so use from unsaturated zone (unit 4)
Total porosity of saturated zone	0.1	MDA C Phase III report, Table G-3.0-1
Effective porosity of saturated zone	0.1	Assume = total porosity
Saturated zone field capacity	0.02	Assume same as for unsaturated zone Tpf
Hydraulic conductivity (m/yr)	840	MDA C Phase III report, Table G-3.0-1 (2.3 m/d)
Hydraulic gradient of saturated zone to well	0.014	MDA C Phase III report, Table G-3.0-1
Hydraulic gradient of saturated zone to surface water	Not used.	No surface water body
Depth of aquifer contributing (m below water table)	378	Assume thickness = distance between water table and top of regional water table. Water level is about 200 ft above the top of screened interval of PM-5; from Table XXI-D of (Purtymun 1995, 045344). PM-5 louvers are from 1440 to 3072 ft below ground surface. Assume 1440–200 ft.

Table G1-4.6-2 (continued)

Parameter	Value	Notes
Longitudinal dispersivity of saturated zone (m)	10	MDA C Phase III report, Table G-3.0-1
Horizontal dispersivity of saturated zone (m)	1	MDA C Phase III report, Table G-3.0-1; assume they mean transverse here
Groundwater Transport		
Distance parallel to well (m)	1680	From Google Earth map measurement
Distance parallel to surface water body (m)	Not used.	No surface water body
Distance perpendicular to well (m)	219	From Google Earth map measurement
Distance perpendicular to surface water body (m); right	Not used.	No surface water body
Distance perpendicular to surface water body (m); left	Not used.	No surface water body
Anticlockwise angle from x to direction of flow (degrees)	-5 degrees from a due east line. See black arrow in figure below.	MDA C Phase III report, Table G-3.0-1
Water Use		
Well pumping rate (m^3/yr)	6.15E+05 Note: This exceeds the maximum allowed value for this parameter in the code; therefore, the maximum of 1.0E+05 is used.	PM-5 pumping records for 2005–2011. PM-5 produced ~163 million gal./yr, ranging from 95 to 230 million gal./yr." Assume the average for the calculations.
K_ds		
Tuff (Units 1, 2, 3)	Use values from 2008 Area G PA, Appendix K, Table 12	None
Tpf (in unsaturated zone and in regional aquifer)	0	Conservative for transport in unsaturated zone and regional aquifer

Table G1-4.6-3
RESRAD Modeling Cases

Case	No ET Cover (1 m operation cover)	ET Cover (1.5 m ET cover + 1 m operational cover)
Base Case (maximizing retention of contaminants in the contaminated zone)	• 0.999 Evapotranspiration Coefficient • 0.9 Runoff Coefficient • 0.29 m/yr Precipitation	• 0.999 Evapotranspiration Coefficient • 0.9 Runoff Coefficient • 0.29 m/yr Precipitation
"Hydro" Case (maximizing transport of contaminants through contaminated and vadose zones)	• 0.99 Evapotranspiration Coefficient • 0.25 Runoff Coefficient • 0.49 m/yr Precipitation	• 0.998 Evapotranspiration Coefficient • 0.25 Runoff Coefficient • 0.49 m/yr Precipitation

Table G1-5.1-1
Industrial Scenario, with and without ET Cover, Results

	Industrial "Base" Case Peak Dose (mrem/yr)	Peak Dose Year	Reason	Industrial "Hydro" Case Peak Dose (mrem/yr)	Peak Dose Year	Reason
No ET Cover	0.08048	1030	Primarily direct penetrating radiation from aluminum-26	0.08024	1030	Primarily direct penetrating radiation from aluminum-26
ET Cover	6.431E-11	4.02	Primarily direct penetrating radiation from aluminum-26	6.431E-11	4.02	Primarily direct penetrating radiation from aluminum-26

Table G1-5.1-2
Residential Scenario, with and without ET Cover, Results

	Residential "Base" Case Peak Dose (mrem/yr)	Peak Dose Year	Reason	Residential "Hydro" Case Peak Dose (mrem/yr)	Peak Dose Year	Reason
No ET Cover	0	0	No viable pathways to receptor	0	0	No viable pathways to receptor
ET Cover	0	0	No viable pathways to receptor	0	0	No viable pathways to receptor

Attachment G-2

RESRAD Output Files
(on CD included with this document)

Appendix H

Conceptual Design for Soil-Vapor Extraction and Long-Term Vapor-Monitoring Plan for Material Disposal Area C

H-1.0 INTRODUCTION

This appendix describes the conceptual soil-vapor extraction (SVE) design and operations plan, and the long-term vapor-monitoring plan for the vadose zone in and around Material Disposal Area (MDA) C in Technical Area 50 at Los Alamos National Laboratory (LANL or the Laboratory).

H-2.0 CONCEPTUAL SVE DESIGN

This section presents a preliminary conceptual design of an SVE system to be implemented as part of the corrective measures alternatives for MDA C. The final design of the system will be provided as part of the corrective measures implementation (CMI) plan.

H-2.1 Performance Objectives

SVE will be performed to remove volatile organic compound (VOC) vapors from the subsurface. The objective of removing VOCs is to prevent their migration to the regional aquifer at concentrations that could result in groundwater contamination in excess of the groundwater-quality standards in Section VIII.A of the Compliance Order on Consent (the Consent Order).

The Consent Order does not specify any screening or cleanup levels for VOCs in pore gas. For this corrective measures evaluation (CME), a two-tiered approach to evaluate vapor-phase VOCs and the potential impact to groundwater has been applied. The approach and screening values are discussed in section 3.2 of the report. For the Tier I screen, Henry's law is used to identify the VOC vapor-phase concentration threshold that has to be exceeded for a given VOC to potentially impact groundwater above the applicable standard. The Tier II evaluation is less conservative than the Tier I screen. The Tier II evaluation considers the migration of the VOCs to the water table and their subsequent mixing with groundwater. As described in section 3.2 of this report, Tier II screening levels (SLs) were developed based on vadose zone transport through fractures as well as vadose zone transport through porous media. The Tier II SLs based on porous media transport, while less conservative, are more representative of conditions at MDA C. The SVE performance objective is to reduce VOC pore-gas concentrations to less than Tier II SLs based on porous media transport, which defines the target plume for remediation.

As discussed in section 3.2 of this report, six VOCs [benzene; 1,2-dichloropropane; 2-hexanone; methylene chloride; tetrachloroethene (PCE); and trichloroethene (TCE)] have been detected at concentrations exceeding Tier I SLs in samples collected from January 2010 to April 2012. The only VOC detected at concentrations greater than Tier II SLs is TCE. TCE was detected above the Tier II porous media SL in four locations (50-24813, 50-603468, 50-603470, and 50-603471). The Tier II SL was exceeded at location 50-603468 at one depth for one sampling event. The Tier II SL was exceeded at the other locations at multiple depths for most sampling events. Table H-2.1-1 shows the locations and depths where the Tier II SL was exceeded, along with the frequency of exceedance.

Appendix D presents an evaluation of the TCE data collected during the nine vapor sampling events during 2010 through 2012. The data evaluation presented in Appendix D included development of a three-dimensional (3-D) model of the TCE plume (Figure H-2.1-1). This model was used to identify the zones where average TCE concentrations exceed or approach the Tier II SL, thus defining the SVE treatment zone.

H-2.2 Extraction-Well Specifications

Based on the data evaluation presented in Appendix D of this CME, average TCE vapor concentrations exceed the Tier II SL in units Qbt1v and Qbt 1g and approach the Tier II SL in unit Qct, with the majority of the mass in units Qbt 1v and Qbt 1g. SVE boreholes are proposed to remediate these units. The Tier II SL was occasionally exceeded in samples collected from overlying units Qbt 3 and Qbt 2 and underlying unit Qbo, although average concentrations in these units were less than the Tier II SL. Operation of the proposed SVE system should also draw vapors downward from units Qbt 3 and Qbt 2 and upward from unit Qbo. Permeability testing during previous pilot tests at MDAs G and L (LANL 2006, 094152; LANL 2010, 109657) demonstrated the permeability of the Qct unit is much higher than the overlying units. To avoid a preferential flow pathway in the Qct unit, two sets of SVE boreholes will be installed. One set will be screened in units Qbt 1v, Qbt 1vc, and Qbt 1g, and the second set will be screened in Qct. Each SVE borehole will be logged in accordance with Laboratory standard operating procedures (SOPs) to determine the geologic units and identify any significant fracturing in the subsurface. As recommended in the SVE pilot test report for MDA G (LANL 2010, 109657), air-permeability testing will be performed at each borehole to verify design assumptions. Based on the borehole logs for locations 50-24813, 50-603470, and 50-603471, it is assumed the top of unit Qbt 1v is 180 ft below ground surface (bgs), the bottom of unit Qbt 1g is 325 ft bgs, the top of unit Qct is 325 ft bgs, and the bottom of unit Qct is 395 ft bgs.

The Qbt unit extraction borehole design is as follows:

- total depth (TD) of 315 ft bgs
- drilled with 10-in-outside diameter hollow-stem auger
- 4-in. polyvinyl chloride (PVC) slotted well screen from 185 ft to 315 ft bgs
- 4-in. PVC solid casing from the surface to 185 ft bgs
- sand filter pack outside the well screen in the borehole annulus from 183 ft to 315 ft bgs
- bentonite seal from 180 ft to 183 ft bgs
- grout from the surface to 180 ft bgs

The initial design of the Qct unit extraction boreholes is as follows:

- TD of 395 ft bgs
- drilled with 10-in.-outside diameter hollow-stem auger
- 4-in. PVC slotted well screen from 325 ft to 395 ft bgs
- 4-in. PVC solid casing from the surface to 325 ft bgs
- sand filter pack outside the well screen in the borehole annulus from 323 ft to 395 ft bgs
- bentonite seal from 320 ft to 323 ft bgs,
- grout from the surface to 320 ft

H-2.3 Number of Extraction Wells

For the previous SVE pilot test at MDA G conducted in 2008, a radius of influence (ROI) of 150 ft was estimated for the shallow extraction boreholes, which will be screened over units Qbt 1v, Qbt 1vc, and Qbt 1g (LANL 2009, 105112). To be conservative, an ROI of 125 ft is used in the layout design for the

315-ft-deep Qbt extraction boreholes associated with primary VOC mass removal. Because of the higher permeability of the Qct, a 150-ft ROI is assumed for initial design purpose for the deeper extraction wells that will extract from the Qct unit. The 125-ft and 150-ft design ROIs are used to space the proposed SVE wells; however, the actual spacing will depend on drilling locations, which cannot be above disposal pits or shafts.

Four SVE wells for primary VOC mass removal in the Qbt units are included in the initial design for the MDA C alternatives. The proposed location of these extraction wells is shown in Figure H-2.3-1; the configuration is arranged to remediate the combined target vapor plume that has concentrations exceeding the Tier II limits based on porous media flow. The initial proposed well locations assume the pits and shafts will not be excavated. Based on the 2004–2007 site investigation, it is assumed that SVE wells could be installed between Pits 2 and 3 but not between Pits 1 and 3 or Pits 2 and 4. The well locations, therefore, are around the perimeter of Pits 1 through 4 and between Pits 2 and 3. Depending on the performance of the system after operations begin, additional wells may be added as necessary.

Four additional extraction wells in the Qct unit will reduce TCE concentrations to below the Tier II SL in that unit as well as act as a barrier to downward migration. Although these wells will have a higher ROI, because of constraints on drilling locations and for operational convenience, these wells would be installed at the same locations as the Qbt wells (Figure H-2.3-1). Depending on the performance of the system after operations begin, additional wells may be added as necessary.

Figure H-2.3-2 shows the screened intervals for all of the proposed SVE wells laid atop the A-A' cross-section geology and target vapor plume. Some of the wells are located outside the cross-section, but the figure illustrates that the wells cover the plume extent.

H-2.4 SVE Unit and Off-Gas Treatment Specifications

The proposed SVE system is similar in features to the system used during the supplemental SVE pilot test at MDA G (LANL 2010, 109657). The SVE systems will be portable, skid-mounted units utilizing a 15-horsepower blower motor, providing up to 320 standard cubic ft per minute (scfm) at a vacuum of 120 in. of water. Based on the air permeabilities observed in previous SVE pilot tests, the extraction rate from the thicker, less permeable Qbt units is expected to be approximately the same as that from the thinner, more permeable Qct unit (approximately 160 (scfm per well). Rotation of two SVE units is proposed for extraction at the eight SVE wells. Extracted air will be directed from the boreholes through a liquid/vapor separator, an in-line filter, a vacuum blower, and a heat exchanger to the off-gas treatment system. It is assumed granular activated carbon (GAC) will be used for off-gas treatment. Each SVE unit will have two GAC filters connected in series.

The GAC usage rate is assumed to be controlled by TCE breakthrough with an assumed TCE loading rate of 0.05 lb TCE per lb GAC. Final loading rates and breakthrough will be determined during the CMI using adsorption isotherm modeling for all detected VOCs. The total inventory of TCE in the vadose zone was estimated to be 182 kg (400 lb) (Appendix D). Based on the assumed loading rate, the total required GAC would be 8000 lb. Each SVE unit would have two 1000-lb capacity GAC filters and would require three changeouts for a total GAC use of 8000 lb.

H-2.5 Monitoring Requirements

Performance monitoring will be carried out in several ways.

- Differential pressure values will be collected from selected pore-gas monitoring borehole sampling ports using an OMEGA pressure sensor, a Dwyer Series 475 Mark III Digital manometer, or equivalent. Differential pressure will be recorded at the select monitoring boreholes with a Campbell Scientific data logger Model CR1000 or equivalent.
- Extraction air flow will be determined using a Dwyer Series PE in-line orifice plate flow meter and a Dwyer model 677-8 differential pressure transducer or equivalent. The air flow rate will be established by closing the SVE system's dilution valve to the differential pressure corresponding with the desired flow rate (calculated per equations provided by Dwyer).
- Extracted air temperature and relative humidity will be collected using a Viasala HMP45AC humidity and temperature probe or equivalent. Vacuum at the top of the extraction borehole will be monitored using a 0–150 in. water vacuum gauge or equivalent.
- Differential pressure, extraction air temperature, and relative humidity measured at the extraction wellhead will be recorded using a Campbell Scientific CR1000 data logger or equivalent.
- A Brüel and Kjær photoacoustic multigas analyzer, or equivalent, will be used to monitor concentrations of PCE, TCE, carbon dioxide, oxygen, and water vapor in the extracted air.
- A vapor sample will be collected from the extracted air using a SUMMA canister for VOC analysis. All samples will be collected in accordance with the current version of SOP-5074, Sampling for Subsurface Vapor. These samples will be collected weekly during the SVE operational cycle.

Extracted air will be directed through GAC canisters for treatment and the effluent monitored for emissions compliance. Waste GAC containers will be managed in accordance with an approved waste management plan. All waste generated from sampling activities will be handled in accordance with SOP-5238, Characterization and Management of Environmental Program Wastes.

To evaluate the effectiveness of the shallow and deep extraction intervals, vapor monitoring for rebound effects for Alternatives 3A and 3B will be performed at vapor-monitoring wells 50-24813, 50-603470, and 50-603471 (Figure H-2.1-1). The selected rebound monitoring wells and sampling ports are provided in Table H-2.5-1. These wells and ports were chosen for rebound sampling because they are located within the extraction zone and average TCE concentrations exceeded or approached the depth-dependent, porous-media Tier II screening levels. Sampling will include field screening and VOC sample collection with SUMMA canisters. For Alternative 4, it is assumed that the wells in Table H-2.5-1 will be removed during waste excavation. Replacement wells will be installed as close as possible to the original locations with identical sample port depths.

H-2.6 Operational Schedule—Alternatives 3A and 3B

The following operational schedule is proposed after the installation of the extraction wells, installation and connection of the SVE systems, and connection of the monitoring systems:

- baseline data collection of rebound monitoring wells,
- 90-d SVE operations at the four Qbt SVE wells,
- 90-d SVE operations at the four Qct SVE wells,
    - ❖ concurrent rebound monitoring of the Qbt ports every 30 d during operation of the Qct wells,

- 90-d SVE operations at the four Qbt SVE wells,
    - ❖ concurrent rebound monitoring of the Qct ports every 30 d during operation of the Qbt wells,
- 90-d SVE operations at the four Qct SVE wells,
    - ❖ concurrent rebound monitoring of the Qbt ports every 30 d during operation of the Qct wells, and
- rebound monitoring of the Qct ports 30, 60, and 90 d after shutdown.

After approximately 12 mo, 2 SVE extraction cycles will have been conducted on both extraction zones (Qbt and Qct). The 90-d extraction period is thought to be sufficient to maximize the operational ROI, and two cycles are thought to be sufficient to remove the VOC inventory, assuming no active source input. Performance monitoring will provide important information to validate these assumptions and adjust the operating schedule, as necessary.

H-2.7 Operational Schedule—Alternative 4

For Alternative 4, it is assumed that SVE will be implemented following completion of waste excavation. This schedule will preclude the possibility of additional VOC releases to the vadose zone once SVE has been started. The following operational schedule is proposed after the excavation of the pits and shafts; installation of the extraction wells; installation and connection of the SVE systems; and connection of the monitoring systems:

- baseline data collection of rebound monitoring wells,
- 90-d SVE operations at the four Qbt SVE wells,
- 90-d SVE operations at the four Qct SVE wells,
    - ❖ concurrent rebound monitoring of the Qbt ports every 30 d during operation of the Qct wells,
- 90-d SVE operations at the four Qbt SVE wells,
    - ❖ rebound monitoring of the Qct ports every 30 d during operation of the Qbt wells,
- 90-d SVE operations at the four Qct SVE wells,
    - ❖ rebound monitoring of the Qbt ports every 30 d during operation of the Qct wells, and
- rebound monitoring of the Qct ports 30, 60, and 90 d after shutdown.

After approximately 12 mo, 2 SVE extraction cycles will have been conducted on both extraction zones (Qbt and Qct). The 90-d extraction period is thought to be sufficient to maximize the operational ROI, and two cycles are thought to be sufficient to remove the VOC inventory, assuming no active source input. Performance monitoring will provide important information to validate these assumptions and adjust the operating schedule, as necessary.

H-2.8 Shutdown Parameters

The following shutdown parameters are proposed for the operation of the SVE system.

- The first parameter is the depth-dependent, porous-media Tier II screening limit for TCE. Remedial activities are considered successful as concentrations are reduced below these limits.
- The second parameter is a follow-up to the first parameter. Mass removed during operational intervals can be calculated using vapor concentrations and flow-rate measurements taken at the manifold. The continuous and cumulative mass removal is plotted versus time. As the mass is depleted, these curves begin to exhibit asymptotic behavior. This behavior is an indicator that the retrievable VOC mass has been removed.
- After the first two parameters have been met, a 6-mo rebound period will be observed. If sampling indicates that concentrations have rebounded to above Tier II limits, operations will continue. If sampling indicates that key VOC concentrations are still below their respective Tier II evaluation limits, then primary operations will be considered complete and long-term vapor monitoring will be initiated for Alternatives 3A and 3B. Long-term vapor monitoring will not be required for Alternative 4 because no additional releases will occur following excavation.
- The SVE extraction boreholes will be maintained for Alternatives 3A and 3B in the event long-term vapor monitoring identifies a postremedy release from the disposal units. Additional operation of SVE will be performed as necessary.

H-2.9 Reporting

SVE activities and results will be detailed in an annual report. Interim status and results can be provided as necessary. The report format will be provided with the CMI plan.

H-3.0 LONG-TERM VAPOR MONITORING

Vapor-monitoring activities have been conducted at MDA C since completion of the Phase III investigation in 2011. The existing vapor-monitoring program has been successful in defining the nature and extent of the vapor-phase VOC plume at MDA C. The conceptual SVE design described above is intended to remove VOC vapors from the subsurface. The long-term vapor-monitoring program is designed to ensure the active SVE system has performed as planned and to provide a monitoring system for Alternatives 3A and 3B in the event an additional release of VOCs from the source areas occurs. Long-term vapor monitoring will also be implemented for Alternative 2, which includes natural attenuation of the VOC plume rather than SVE.

Long-term monitoring is not a component of Alternative 4. Extraction wells and vapor-monitoring wells will be abandoned after the shutdown parameters have been met.

H-3.1 Monitoring Distribution and Frequency—Alternatives 2, 3A and 3B

The long-term monitoring distribution and frequency have been developed to identify potential new releases from the source regions (i.e., disposal units) following completion of the active SVE period and to assess the long-term performance of SVE. If evaluation of vapor-monitoring data indicates changes to the nature and extent of the vapor plume (e.g., increasing VOC concentrations), the New Mexico Environment Department (NMED) will be informed of the change. The long-term monitoring distribution

and frequency may be modified if VOC concentrations are found to be increasing during the monitoring period.

Long-term subsurface vapor-monitoring activities will be conducted for a total of 100 yr for Alternatives 2, 3A, and 3B. Vapor monitoring will be conducted once per year at the monitoring borehole locations and sampling ports identified in Table H-3.1-1. These locations and ports correspond to those specified by NMED in the approval of the Phase III investigation report for MDA C (LANL 2011, 204370; NMED 2011, 208797).

H-3.2 Monitoring Methods—Alternatives 2, 3A, and 3B

Monitoring activities will be conducted in accordance with the Laboratory's current revision of SOP-5074, Sampling Subsurface Vapor, or equivalent.

H-3.3 Reporting—Alternatives 2, 3A, and 3B

Pore-gas monitoring activities and results will be provided in an annual report in accordance with the requirements of Section XI.D of the Consent Order.

H-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. This information is also included in text citations. ER IDs 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 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.

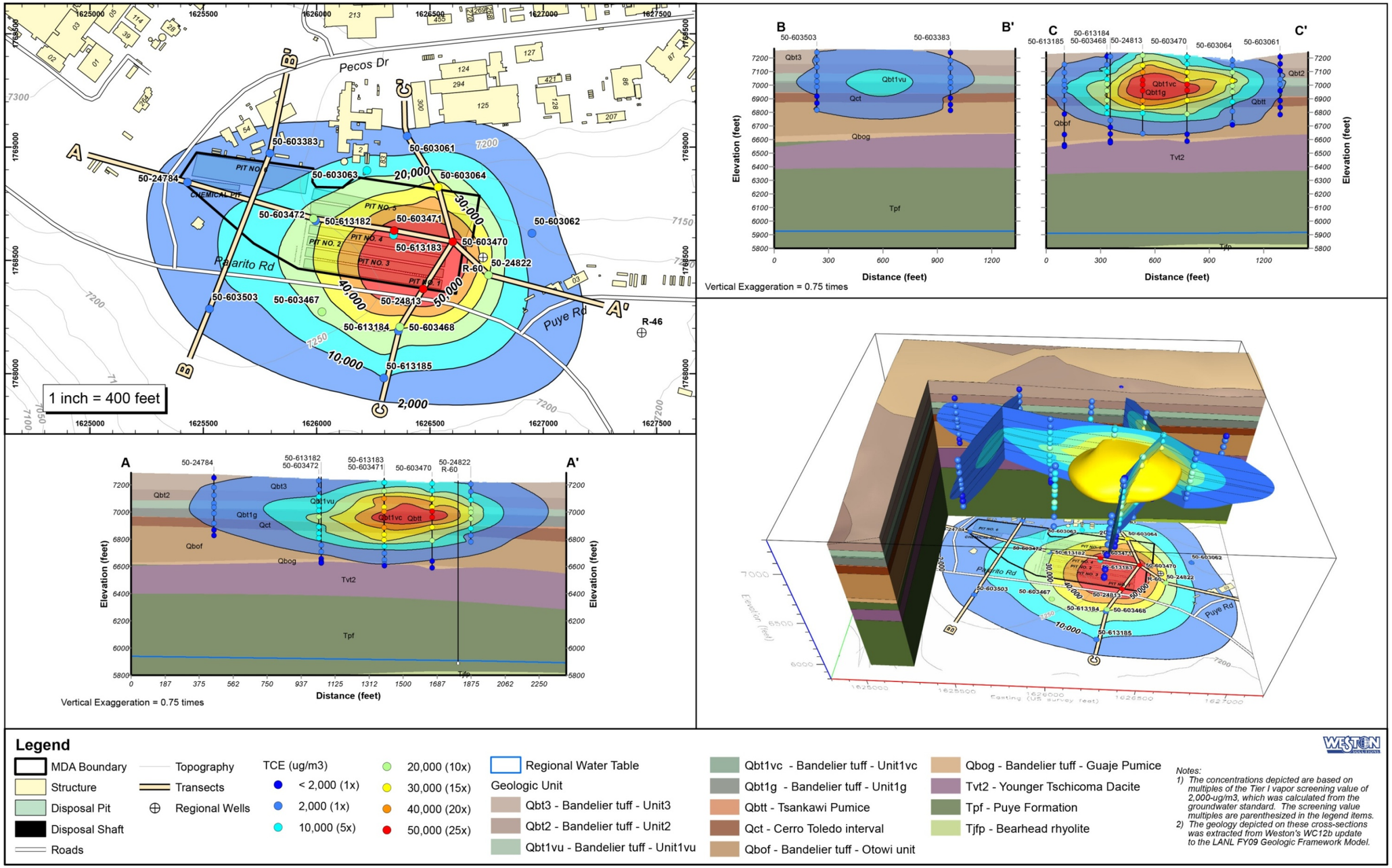
LANL (Los Alamos National Laboratory), November 2006. "Summary Report: 2006 In Situ Soil Vapor Extraction Pilot Study at Material Disposal Area L, Technical Area 54, Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-06-7900, Los Alamos, New Mexico. (LANL 2006, 094152)

LANL (Los Alamos National Laboratory), January 2009. "Pilot Test Report for Evaluating Soil-Vapor Extraction at Material Disposal Area G at Technical Area 54, Revision 1," Los Alamos National Laboratory document LA-UR-09-0565, Los Alamos, New Mexico. (LANL 2009, 105112)

LANL (Los Alamos National Laboratory), May 2010. "Report for Supplemental Soil-Vapor Extraction Pilot Test at Material Disposal Area G, Technical Area 54," Los Alamos National Laboratory document LA-UR-10-3409, Los Alamos, New Mexico. (LANL 2010, 109657)

LANL (Los Alamos National Laboratory), June 2011. "Phase III Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50," Los Alamos National Laboratory document LA-UR-11-3429, Los Alamos, New Mexico. (LANL 2011, 204370)

NMED (New Mexico Environment Department), December 8, 2011. “Approval, Phase III Investigation Report for Material Disposal Area C, Solid Waste Management Unit 50-009, at Technical Area 50,” New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 208797)



Legend

- MDA Boundary
- Structure
- Disposal Pit
- Disposal Shaft
- Roads
- Topography
- Transects
- Regional Wells

TCE (ug/m3)

- < 2,000 (1x)
- 2,000 (1x)
- 10,000 (5x)
- 20,000 (10x)
- 30,000 (15x)
- 40,000 (20x)
- 50,000 (25x)

- Regional Water Table

Geologic Unit

- Qbt3 - Bandelier tuff - Unit3
- Qbt2 - Bandelier tuff - Unit2
- Qbt1vu - Bandelier tuff - Unit1vu
- Qbt1vc - Bandelier tuff - Unit1vc
- Qbt1g - Bandelier tuff - Unit1g
- Qbtt - Tsankawi Pumice
- Qct - Cerro Toledo interval
- Qbof - Bandelier tuff - Otowi unit
- Qbog - Bandelier tuff - Guaje Pumice
- Tvt2 - Younger Tschicoma Dacite
- Tpf - Puye Formation
- Tjfp - Bearhead rhyolite

Notes:

1) *The concentrations depicted are based on multiples of the Tier I vapor screening value of 2,000-ug/m3, which was calculated from the groundwater standard. The screening value multiples are parenthesized in the legend items.*
2) *The geology depicted on these cross-sections was extracted from Weston's WC12b update to the LANL FY09 Geologic Framework Model.*

Figure H-2.1-1 3-D representation of TCE vapor plume beneath MDA C

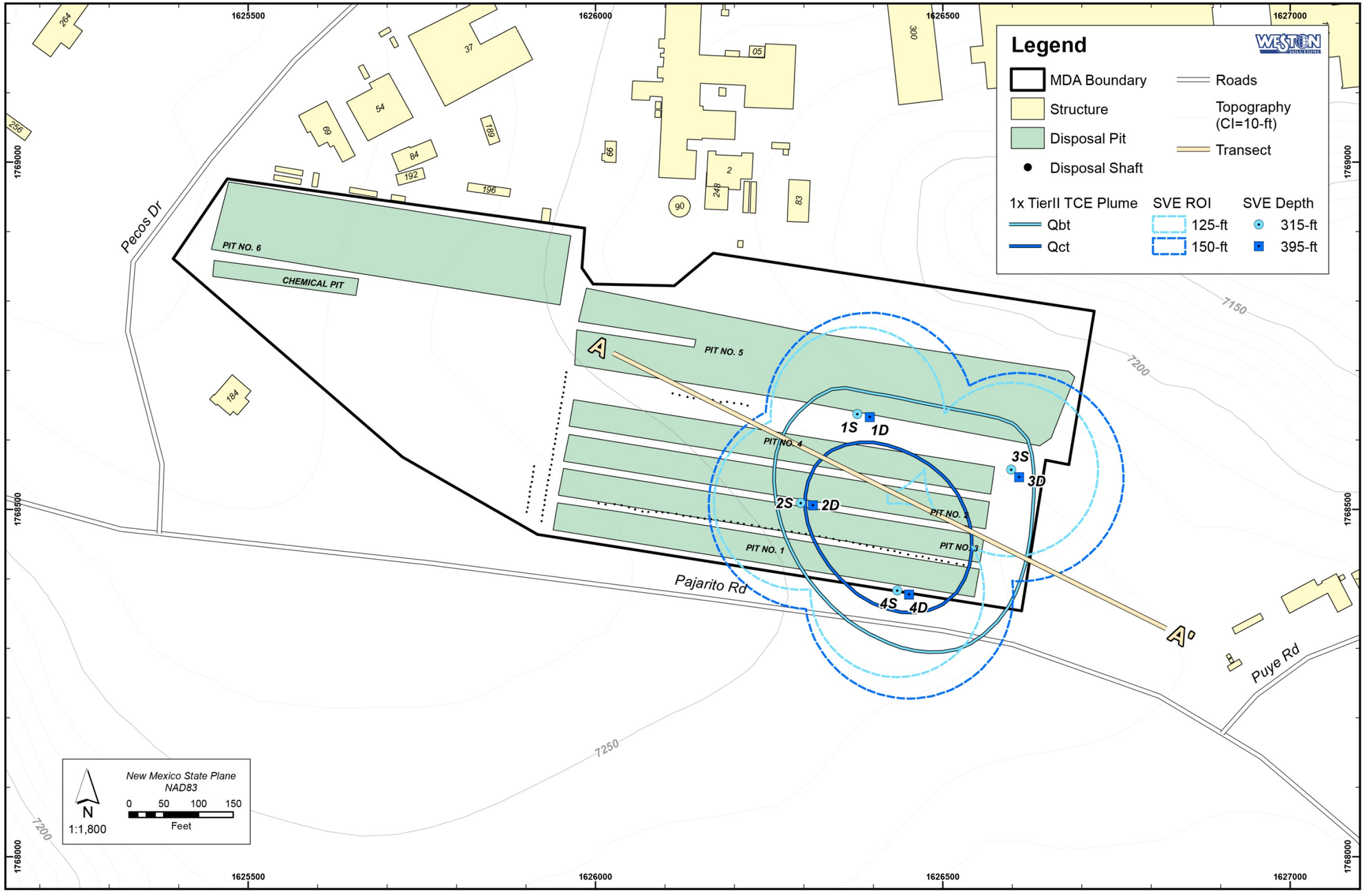


Figure H-2.3-1 Plan view map of proposed placement for SVE wells

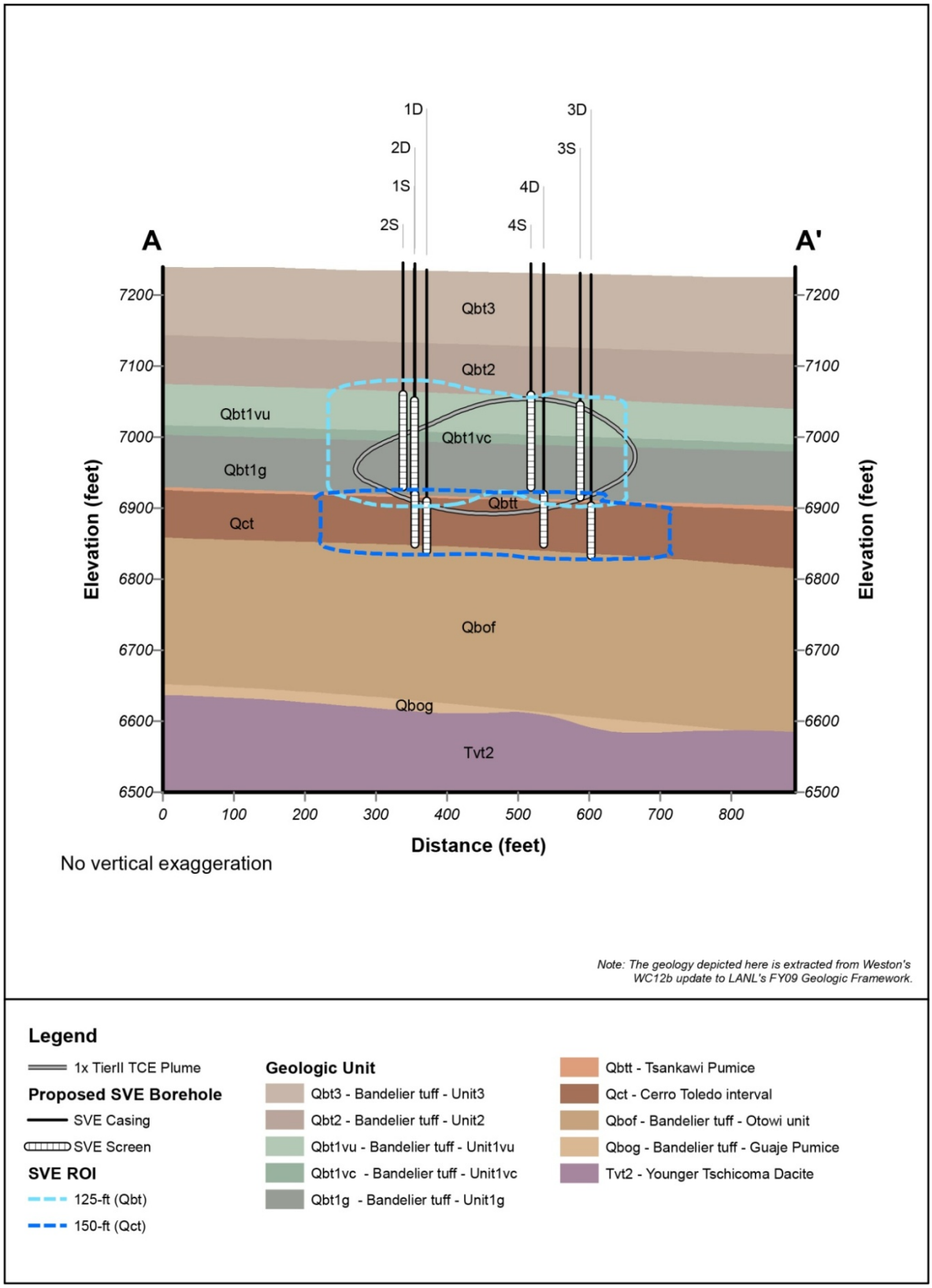


Figure H-2.3-2 Cross-sectional view of proposed placement and screened intervals for SVE wells

Table H-2.1-1
Well Locations and Depths Exceeding Tier II Screening Level for TCE

Well ID	Depth (ft bgs)	Stratigraphic Unit	Tier II Screening Level[a] (µg/m^3)	Frequency of Exceedance[b]
50-24813	25	Qbt 3	62,900	1 / 8
	99	Qbt 3	59,700	1 / 7
	150	Qbt 2	57,400	1 / 8
	207	Qbt 1v	54,900	3 / 7
	241	Qbt 1vc	53,400	5 / 8
	286	Qbt 1g	51,400	4 / 7
	358	Qct	48,200	3 / 9
	408	Qbo	45,900	2 / 8
50-603468	282	Qbt 1g	51,500	1 / 7
50-603470	203	Qbt 1v	55,000	1 / 8
	233	Qbt 1vc	53,700	1 / 7
	278	Qbt 1g	51,700	6 / 8
	351	Qct	48,500	1 / 9
	450	Qbo	44100	1 / 9
50-603471	146	Qbt 2	57,600	2 / 7
	209	Qbt 1v	54,800	1 / 8
	242	Qbt 1vc	53,300	3 / 7
	288	Qbt 1g	51,300	4 / 7
	360	Qct	48,100	3 / 8
	410	Qbo	45,900	1 / 8
	450	Qbo	44,100	1 / 9

[a] Depth-dependent Tier II screening level based on porous-medial transport.

[b] Number of sampling events exceeding Tier II screening level / total number of sampling events.

Table H-2.5-1
Proposed Rebound Monitoring Boreholes and Ports

Well ID	VOC Rebound Monitoring Port Depths (ft bgs)
50-24813	207 (Qbt 1v), 241 (Qbt 1vc), 286 (Qbt 1g), 358 (Qct)
50-603470	203 (Qbt 1v), 233 (Qbt 1vc), 278 (Qbt 1g), 351 (Qct)
50-603471	209 (Qbt 1v), 242 (Qbt 1vc), 288 (Qbt 1g), 360 (Qct)

Table H-3.1-1
Proposed MDA C Long-Term Subsurface
Vapor-Monitoring Locations, Borehole Status, and Port Depths

Borehole ID	Borehole Status	Port Depths
50-24784	Annual Vapor-Monitoring Program	155, 244, 362, 450
50-24813	Annual Vapor-Monitoring Program; SVE Rebound Monitoring	25, 150, 241, 358, 450, 600
50-24822	Annual Vapor-Monitoring Program	25, 142, 235, 351, 450
50-603061	Annual Vapor-Monitoring Program	25, 128, 228, 347, 450
50-603062	Annual Vapor-Monitoring Program	122, 217, 337, 450
50-603063	Annual Vapor-Monitoring Program	25, 128, 228, 347, 450
50-603064	Annual Vapor-Monitoring Program	113, 214, 332, 500
50-603383	Annual Vapor-Monitoring Program	26, 139, 244, 359, 450
50-603467	Annual Vapor-Monitoring Program	143, 244, 360, 500, 600
50-603468/50-613184	Annual Vapor-Monitoring Program	142, 233, 354, 403, 500, 600, 664.5
50-603470	Annual Vapor-Monitoring Program; SVE Rebound Monitoring	83, 203, 278, 351, 450, 600, 650
50-603471/50-613183	Annual Vapor-Monitoring Program; SVE Rebound Monitoring	90, 209, 288, 360, 450, 550, 642.5
50-603472/50-613182	Annual Vapor-Monitoring Program	27, 146, 292, 364, 450, 550, 632.5
50-603503	Annual Vapor-Monitoring Program	133, 237, 347, 450
50-613185	Annual Vapor-Monitoring Program	142, 235, 350, 450, 600

Appendix I

Supporting Information for
Cost Estimates for Material Disposal Area C

I-1.0 INTRODUCTION

This appendix provides the basis for the cost estimates, summary cost information, assumptions, estimate details, and material and labor pricing data used in developing the cost estimates for corrective measures evaluation (CME) alternatives for the Material Disposal Area (MDA) C at Technical Area 50 (TA-50) at Los Alamos National Laboratory (LANL or the Laboratory). The estimates are intended to be consistent with U.S. Environmental Protection Agency (EPA) guidance on developing and documenting costs estimated during feasibility studies (EPA 2000, 071540). Cost estimates are expected to be within the accepted standard accuracy range of +50% to –30% established by EPA for remedial alternative estimates at the alternatives screening stage (EPA 2000, 071540, p. 2-4).

In addition to the no-action alternative, four corrective measures alternatives were retained and have been brought forward for cost estimating purposes.

I-1.1 Compliance Order on Consent Requirements

Section VII.D.4.b.v of the Compliance Order on Consent (hereafter, the Consent Order) requires the following: capital costs shall include, without limitation, construction and installation costs; equipment costs; land development costs; and indirect costs, including engineering costs, legal fees, permitting fees, startup and shakedown costs, and contingency allowances. Operations and maintenance (O&M) costs shall include, without limitation, operating labor and materials costs; maintenance labor and materials costs; replacement costs; utilities; monitoring and reporting costs; administrative costs; indirect costs; and contingency allowances. All costs shall be calculated based on their net present value (PV).

As presented in guidance documents, confusion often exists with the terms “direct” and “indirect” costs. Therefore, in this report the term “capital” costs includes planning, design, construction, management-related activities, and both labor and professional services for installing the remedial alternative. Recurring operations, maintenance, and monitoring costs, including regular annual costs and periodic costs, are separated out from capital costs. Periodic costs include 5-yr reviews, equipment replacement, and major repairs.

I-2.0 METHOD

The cost estimates have been developed based on a bottom-up approach using WINEST cost estimating software. The assumptions used in the calculations are discussed in section I-3.0. The construction pricing is based on the 2012 RS Means Database for equipment and materials, quotes from outside vendors, and the current Davis Bacon wage rates for construction in Los Alamos. RS Means is a comprehensive database of industry averages for materials, labor, and equipment. Line items contain descriptions of appropriate materials, labor, and equipment to successfully perform particular tasks. These costs are then burdened with applicable taxes, including New Mexico gross receipts tax (NMGRT), general and administrative (G&A) tax, infrastructure tax, and Associate Director (AD) tax.

A labor factor was used to increase the project cost on labor because of the remote location of the site or for additional rigor for a site. The basic estimating units generally reflect a normal standard for construction costs. Many special work situations and job conditions may require additional material or labor work hours. The actual design and operations costs will likely vary from these estimates when the corrective measures implementation (CMI) is completed.

I-2.1 Capital Costs

Capital costs include both direct and indirect costs. The capital costs consist of construction and installation costs; equipment costs; land development costs; and indirect costs, including engineering design costs, legal fees, permitting fees, professional management startup and shakedown costs, and contingency allowances. Detailed estimates of capital costs in calendar year 2012 dollars are provided below and in tables in section 8 of the CME report.

The distributable costs include craft distributable-labor and craft distributable-materials. For the cover alternatives, craft distributable-labor was calculated as 25% of direct job hour cost. Craft distributable-materials was calculated as a $7 per direct job hour cost to account for the nonlabor costs associated with temporary utilities/services, small tools, consumables, construction equipment not specifically identified in direct work line items, and training costs. For the excavation alternative, a lump sum of $5,000,000 was assumed for total craft distributable costs.

The design costs were calculated as 6% of the total direct capital costs for the cover alternatives and 3% of total direct capital costs for the excavation alternative.

Professional management costs include project management and construction management. Project management costs were calculated as 5% of the total direct capital costs and design costs. Construction management costs were calculated as 6% of total direct capital costs.

Management reserve costs were calculated as 50.8%–50.9% of the total direct capital costs, plus design and professional management costs, depending on the results of the cost and schedule uncertainty analysis.

I-2.2 Operations and Maintenance Costs

The O&M costs include both direct and indirect costs. The O&M costs include operating labor and materials costs; maintenance labor and materials costs; replacement costs; utilities; monitoring and reporting costs; administrative costs; and O&M associated indirect costs. Estimates of O&M costs in 2012 dollars are provided below and in tables in section 8 of the CME report.

Professional management costs include project management and construction management. These costs were calculated as 5% and 6% of the total direct O&M costs, respectively, before PV analysis. The costs are then discounted based on the PV analysis discussed below in section I-2.3.

I-2.3 PV Analysis

To compare one alternative's costs with other alternative's costs over different time periods, the costs were discounted to a 2012 PV, as recommended in A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA 2000, 071540). PV costs for a technology are the sum of all capital costs and continuing costs. Presentation of capital and O&M costs as PV is consistent with the CME requirements contained in Section VII.D.4.b.v of the Consent Order. The principle is also embraced for federal programs. The Office of Management and Budget circular A-94 states, "The standard criterion for deciding whether a government program can be justified on economic principles is net present value" (Office of Management and Budget 1992, 094804, p. 3). Consistent with U.S. Environmental Protection Agency EPA guidance, a discount rate of 7% was used (EPA 2000, 071540).

Net PV was calculated according to the following formula:

$$PV_{total} = \sum_{t=1}^{t=n} \frac{1}{(1+i)^t} \cdot C_t$$

where PV_{total} = present single sum of money,
t = specific year,
n = final project year,
i = the discounted interest rate, and
C_t = cost in year t in base -year dollars.

The PV analyses are presented in the cost estimate tables in section 8 of the CME report.

I-2.4 General Assumptions

The estimates are based on an 8-h work day and 5-d work week. No overtime is included. On-site activities will be conducted under Hazardous Waste Operations and Emergency Response requirements. Safety levels are based on the Occupational Safety and Health Administration regulations in 29 Code of Federal Regulations Part 1910. Most activities are set to safety level D. All appropriate site-related plans (e.g., general safety plan, quality assurance plan, waste management plan, work plan, hoisting and rigging plan, and health and safety plan) will be prepared and submitted by the subcontractor. All plans will be reviewed and approved by the Laboratory as necessary so as not to adversely impact the project schedule.

Twelve months of soil-vapor extraction (SVE) and 15 mo of rebound vapor monitoring are assumed for cost estimation purposes for Alternatives 2, 3A, 3B, and 4. However, SVE operations will continue until shutdown parameters are achieved, as described in Appendix H. Attachment I-1 is the detailed cost assembly report for Alternatives 3A, 3B, and 4. The costs associated with Alternative 2 consist only of O&M costs, which are identical to those for Alternatives 3A and 3B. A detailed cost assembly for Alternative 2, therefore, is not needed as the O&M costs were taken from the estimates for Alternatives 3A and 3B.

Labor rates, waste disposal rates, and material pricing were based on 2012 RS Means rates.

The burdens included NMGRT applied to total costs at a defined recovery rate of 5.5%, G&A at 18%, Infrastructure at 22.5%, and AD support at 26%.

The project was assumed to be a DOE on-site and not a Defense Program project, and escalation was not accounted for due to the uncertainties of schedule.

I-3.0 MDA C ALTERNATIVES

Four corrective measures alternatives, plus the no-action alternative, are described below.

I-3.1 Alternative 1: No Action

This alternative involves leaving the site as is. No costs are involved with this alternative.

I-3.2 Alternative 2: Soil Barrier and Institutional Controls

This technology includes the following tasks:

- vapor and groundwater monitoring for 100 yr
- maintenance of the cover and institutional controls for 100 yr
- preparation of an annual long-term monitoring report for 100 yr

Assumptions

The following assumptions were used to develop the cost estimate for this technology:

- Site maintenance, including visual inspection, removal of debris and large woody plants, and erosion control for the entire site, will continue for 100 yr.
- Site maintenance includes periodic revegetation of bare areas.
- Yearly vapor and groundwater monitoring will be performed as part of the Laboratory's long-term stewardship program and are not included in the cost estimate.

I-3.3 Alternative 3A: Multilayer Cover, SVE, and Institutional Controls

This technology includes the following tasks:

- site preparation of the existing soil surface and installation of a multilayer cover (Resource Conservation and Recovery Act [RCRA] Subtitle C cover) over the shafts and pits
- SVE to remove volatile organic compounds (VOCs)
- vapor and groundwater monitoring for 100 yr
- maintenance of the cover and institutional controls for 100 yr
- preparation of an annual long-term monitoring report for 100 yr

Assumptions

The following assumptions were used to develop the cost estimate for this technology:

- Area to be covered by the multilayer (RCRA) cover is 11 acres.
- Construction of the multilayer (RCRA) cover will consist of
  - ❖ site preparation of the existing soil surface and cover preparation, which includes 3 ft of operational cover above the waste material;
  - ❖ a 2-ft layer of compacted natural or amended soil with a maximum saturated hydraulic conductivity of 1×10^{-7} cm/s;
  - ❖ a 40-mil flexible geomembrane liner, such as high-density polyethylene, to limit downward moisture movement;
  - ❖ a 1-ft drainage layer of sand having a minimum saturated hydraulic conductivity of 1×10^{-2} cm/s;

  - ❖ a 2-ft soil and vegetation layer graded at slopes between 3% and 5%; and
  - ❖ 1400 linear ft of retaining walls along the northwest and southeast sides of the site, reaching to the top of the cover.
- Time to complete construction will be 18 mo; irrigation will continue for 1 yr.
- Time-domain reflectometers (TDRs) will be installed to monitor moisture.
- Site maintenance, including visual inspection, removal of debris and large woody plants, and erosion control for the entire site, will continue for 100 yr.
- Site maintenance includes periodic revegetation of bare areas.
- SVE will operate for 1 yr.
- Four 10-in.-diameter SVE boreholes will be installed to a depth of 315 ft.
- Four 10-in.-diameter SVE boreholes will be installed to a depth of 395 ft.
- Four existing vapor-monitoring wells around the extraction area will be replaced.
- Construction of each borehole will require 2 wk.
- SVE operations will involve 2 SVE units operating 90 d at each of the 8 boreholes twice per yr for 1 yr.
- VOC monitoring of extraction boreholes during operations will include 8 samples (at startup plus once per month during operation) at 8 boreholes (64 samples).
- Rebound monitoring will include samples at 9 shallow and 3 deep ports at startup and monthly after each extraction cycle (111 samples—81 shallow and 30 deep).
- Yearly vapor and groundwater monitoring will be performed as part of the Laboratory's long-term stewardship program and are not included in the cost estimate.
- Materials for 5 ft of clay, drainage soil, and topsoil are obtained from within a 25-mi radius (50-mi roundtrip). Over 11 acres, a total of 5916 trucks (assuming 15 yd^3/truck) are required. Total mileage is approximately 296,000 mi.

I-3.4 Alternative 3B: ET Cover, SVE, and Institutional Controls

This technology includes the following tasks:

- site preparation of the existing soil surface and installation of an evapotranspiration (ET) cover over the shafts and pits
- SVE to remove VOCs
- vapor and groundwater monitoring for 100 yr
- maintenance of the cover and institutional controls for 100 yr
- preparation of an annual long-term monitoring report for 100 yr

Assumptions

The following assumptions were used to develop the cost estimate for this technology:

- Area to be covered by the ET cover is 11 acres.
- Construction of the ET cover will consist of
    - ❖ site preparation of the existing soil surface and cover preparation, which includes 3 ft of operational cover above the waste material;
    - ❖ a 1-ft layer of angular cobbles with a minimum diameter of 4 to 6 in. to act as a biointrusion barrier;
    - ❖ a 0.5-ft layer of sand and gravel mixture to prevent the mixing of soil layers;
    - ❖ a 3.5-ft layer of natural or amended soil meeting the water storage capacity of a typical sandy loam;
    - ❖ a 1.5-ft layer of natural or amended soil and vegetation; and
    - ❖ 1400 linear ft of retaining walls along the northwest and southeast sides of the site, reaching to the top of the cover.
- Time to complete construction will be 18 mo; irrigation will continue for 1 yr.
- TDRs will be installed for moisture monitoring.
- Site maintenance, including visual inspection, removal of debris and large woody plants, and erosion control for the entire site, will continue for 100 yr.
- Site maintenance includes periodic revegetation of bare areas and mowing of the entire site.
- SVE will operate for 1 yr.
- Four 10-in.-diameter SVE extraction boreholes will be installed to a depth of 315 ft.
- Four 10-in.-diameter SVE extraction boreholes will be installed to a depth of 395 ft.
- Four existing vapor-monitoring wells around the extraction area will be replaced.
- Construction of each borehole will require 2 wk.
- SVE operations will involve two SVE units operating 90 d at each of the 8 boreholes twice per yr for 1 yr.
- VOC monitoring of extraction boreholes during operations will include 8 samples (at startup plus once per month during operation) at 8 boreholes (64 samples).
- Rebound monitoring will include samples at 9 shallow and 3 deep ports at startup and monthly after each extraction cycle (111 samples—81 shallow and 30 deep).
- Yearly vapor and groundwater monitoring will be performed as part of the Laboratory's long-term stewardship program and are not included in the cost estimate.
- Source of material for 3.5-ft sandy loam layer assumed to be crushed tuff from TA-61 (16-mi roundtrip). Material for 1.5 ft of gravel admixture and topsoil assumed to be from within a 25-mi radius (50-mi roundtrip). Over 11 acres, a total of 5916 trucks (assuming 15-yd^3/truck) are required. Total mileage is approximately 155,000 mi.

I-3.5 Alternative 4: Excavation, SVE, and Institutional Controls

This technology includes the following tasks:

- excavation, analysis, and segregation of the waste in the MDA C pits and shafts using standard excavation methods
- construction of three temporary excavation enclosures with supplied air and high-efficiency particulate air filters to control releases and for weather protection
- construction of an on-site waste analysis, and segregation facility
- on-site treatment of corrosive wastes by elementary neutralization
- off-site disposal of wastes
- SVE to remove VOCs
- institutional controls for 100 yr

I-3.5.1 Assumptions

The following assumptions were used to develop the cost estimate for this technology:

- Excavation of both pits and shafts will use standard excavation equipment.
- Excavation is assumed to be performed under an enclosure (three total for estimating purposes) to maintain control of airborne particulates, avoid stormwater infiltration, and reduce downtime because of the weather. The scope to erect and move these structures is captured in the excavation site preparation portion of the detailed estimate in Attachment I-1.
- Excavation, segregation, analysis, treatment, and disposal activities will be complete within a 3-yr period.
- Backfilling the excavation will require clean fill to be imported from TA-61 to complete filling the excavation. At 16-mi roundtrip with a 15-yd^3 truck capacity, truck miles are 307,800.
- Estimated excavation and waste quantities are presented in Table I-3.5-1.
- For purposes of the cost estimate, all wastes excavated from MDA C are assumed to be low-level radioactive waste (LLW). Based on the characteristics of the waste excavated during the remediation of MDA B (LANL 2012, 215119), only very minor amounts of RCRA hazardous waste and mixed LLW (MLLW) are expected to be generated.
- Transporting the excavated LLW to Clive, Utah (1450-mi roundtrip) and assuming 15-yd^3 truck capacity would result in 23,643,000 truck miles.
- Overburden material will be suitable for backfill.
- All waste is assumed to be disposed of off-site.
- Corrosive waste will be treated on-site using elementary neutralization. All other waste treatment will be off-site.
- The excavated area will be graded and seeded.
- SVE will operate for 1 yr.
- Four 10-in.-diameter SVE extraction boreholes will be installed to a depth of 315 ft.

- Four 10-in.-diameter SVE extraction boreholes will be installed to a depth of 395 ft.
- Four existing vapor-monitoring wells around the extraction area will be replaced.
- Construction of each borehole will require 2 wk.
- SVE operations will involve 2 SVE units operating 90 d at each of the 8 boreholes twice per yr for 1 yr.
- VOC monitoring of extraction boreholes during operations will include 8 samples (at startup plus once per month during operation) at 8 boreholes (64 samples).
- Rebound monitoring will include samples at 9 shallow and 3 deep ports at startup and monthly after each extraction cycle (111 samples—81 shallow and 30 deep).

I-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. This information is also included in text citations. ER IDs 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 New Mexico Environment Department Hazardous Waste Bureau 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.

EPA (U.S. Environmental Protection Agency), July 2000. "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study," EPA 540-R-00-002, prepared by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency Office of Emergency and Remedial Response, Washington, D.C. (EPA 2000, 071540)

LANL (Los Alamos National Laboratory), April 2012. "Investigation/Remediation Report for Material Disposal Area B, Solid Waste Management Unit 21-015, Revision 1," Los Alamos National Laboratory document LA-UR-12-20089, Los Alamos, New Mexico. (LANL 2012, 215119)

Office of Management and Budget, October 29, 1992. "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," Circular No. A-94, Washington, D.C. (Office of Management and Budget 1992, 094804)

Table I-3.5-1
Excavation and Waste Volumes for Pits and Shafts

Pit/Shaft No.	Dimensions (ft)	Pit/Shaft Volume (yd^3)	Excavated Volume* (yd^3)	Estimated Total Waste Volume (yd^3)	Estimated Overburden Volume (yd^3)
Pits	**(Length × Width × Depth)**				
1	610 × 40 × 25	22,590	30,750	28,700	2050
2	610 × 40 × 25	22,590	30,750	28,700	2050
3	610 × 40 × 25	22,590	30,750	28,700	2050
4	610 × 40 × 25	22,590	30,750	28,700	2050
5	705 × 110 × 18	51,700	69,560	63,510	6050
6	505 × 100 × 25	46,760	59,500	55,530	3970
Chemical	180 × 25 × 12	2000	3490	3080	410
Shafts	**(Diameter × Depth)**				
1–55	2 × 15	96	1567	1564	3
56–67	2 × 10	14	256	253	3
68–107	2 × 25	116	1710	1707	3
Sr-90	4 × 4	2	27	21	6
Total		**191,048**	**259,110**	**240,465**	**18,645**

* Assumes 5-ft overexcavation on sides and bottom.

Appendix J

Conceptual Design and Preliminary Specifications for Evapotranspiration Cover at Material Disposal Area C

J-1.0 INTRODUCTION

This appendix presents a preliminary conceptual design of the evapotranspiration (ET) cover for Material Disposal Area (MDA) C and preliminary specifications of the cover components. This material presented in this appendix includes descriptions of the general site grading plan, the purpose of each layer of the proposed ET cover, the design methodology used, and the results of calculations and modeling that validate the design.

The general methodology for developing the conceptual design of the ET cover is the same as that presented in the conceptual cover design report for MDA G (Dwyer 2007, 098276). Some of the calculations and modeling used for the MDA G ET cover are directly applicable to MDA C, and these results were used without modification. Other modeling and calculations were updated to reflect site-specific conditions at MDA C that are different than at MDA G.

The conceptual profile of the ET cover for MDA C is shown in Figure J-1.0-1. It is assumed that borrow soil with amendments will be used to construct the ET cover at MDA C. The conceptual design includes a 3.5 ft (1 m) cover depth with 1.5 ft (0.45 m) of soil-gravel admixture to reduce flux through the cover to less than 0.04 in./yr (1 mm/yr), which is the Resource Conservation and Recovery Act (RCRA) Subtitle C–equivalent infiltration rate. Burrowing animals and plant roots in the area will be deterred by the biobarrier consisting of a thin filter layer and a cobble layer. These cover layers will be placed on the existing subgrade of interim (operational) cover. The existing subgrade will be scarified to promote adhesion to the final cover and will be highly compacted to reduce possible subsidence. All necessary precautions will be taken during the subgrade preparation process not to impact in place waste.

Site-grading and stormwater-management considerations are discussed in section J-2.0. Brief descriptions of each layer in the cover profile are presented in Table J-1.0-1. More complete descriptions, preliminary specifications, and placement methods are presented in section J-3.0.

J-2.0 SITE GRADING AND STORMWATER MANAGEMENT

J-2.1 Preliminary Grading Plan

The preliminary cover grading plan is presented in Figure J-2.1-1. This grading plan was developed based on the goals of minimizing erosion and promoting cover longevity. Erosion from stormwater runoff is one of the primary factors affecting the longevity of the ET cover. As discussed in Appendix G, a cover over the disposed waste is needed to meet long-term U.S. Department of Energy (DOE) radiation protection requirements. For consistency with DOE requirements for operational low-level radioactive waste disposal facilities, a 1000-yr performance period was assumed.

Developing a cover layout that provides for dispersed overland flow of stormwater presents advantages in assuring the longevity of the ET cover. Eliminating conventional stormwater control systems that use conveyance channels on the cover to route stormwater to detention basins precludes the need to address the following stormwater issues, all of which represent potential obstacles to meeting the 1000-yr criterion:

- Conveyance channels and detention basins must be sized for a 1000-yr or greater design storm.
- Synthetic materials for piping and channel liners cannot be used under the longevity criteria.
- Concrete structures cannot be used because exposed concrete will degrade over time.

- Structures must be oversized to the extent necessary to accommodate sedimentation.
- Routine maintenance, typical of most engineered stormwater systems, cannot be planned for the 1000-yr time frame.

The preliminary cover layout provides general accommodation of existing stormwater drainage features. The layout preserves existing drainage ditches outside the waste disposal areas and provides sufficient areas at the cover perimeter to allow future design of stormwater diversion systems.

The cover is sloped to shed stormwater relatively uniformly around the entire ET cover, eliminating focused or channelized flow. Since the ET cover promotes infiltration of precipitation at the surface of the cover to minimize runoff, conventional runoff channels and detention basins are not part of the preliminary cover layouts. The cover grading provides for overland flow from the cover that is dispersed to surrounding areas without contacting waste materials or residual contaminants. Overall, the ET cover design should provide runoff characteristics similar to undisturbed native areas at Los Alamos National Laboratory (LANL or the Laboratory).

The cover layout assumes other Laboratory facilities, such as buildings, roadways, and utilities, are maintained in their current locations and configurations. The cover layout at MDA C requires setbacks from existing roads, drainage channels, from the radioactive liquid waste line, and from the pump house and influent storage facility.

MDA C has an existing vegetated soil cover that gently slopes toward the northeast. The existing slopes range from approximately 3% to 12%. The slopes are graded on relatively uniform planes, with distinct slope breaks over different portions of the waste trenches. The existing soil cover at MDA C contains moderate vegetation and does not show evidence of significant erosion or gully development. The existing grades generally meet the slope criteria for the ET cover, and the cover can be constructed by placing soil over the existing grades.

To plan a cover profile that disperses stormwater away from the cover and avoids channelized flow, the MDA C cover grading plan includes a single cover that extends across the eastern and western waste disposal areas. In the southwest portion of the site, the natural topography slopes to the northeast, toward the waste disposal areas. The run-on directed toward the waste disposal areas is directed toward an unfilled area, approximately 30 ft wide, between the eastern and western waste trenches. Rather than allowing run-on toward the waste disposal areas, with stormwater focused in a channelized area where erosion control would be difficult, the preliminary cover layout plans for a wedge of soil spanning the area between the eastern and western trenches, to shed stormwater away from the waste disposal areas. The slopes are crowned outward to disperse the overland flow.

Several constraints exist at the perimeter of the cover, including buildings, roadways, existing drainage channels, temporary storage containers, and buried utilities. To provide a cover layout meeting the proposed criteria of full cover thickness extending two times the cover thickness outside the waste boundary, these facilities would need to be relocated or covered to maintain moderate side slopes of 25% to 33%. To preserve the existing infrastructure, retaining walls that terminate the cover edge to provide a setback from existing facilities are proposed. The retaining wall locations are shown in Figure J-2.1-1, and cross-sections showing the retaining wall height are shown in Figure J-2.1-2. The following perimeter facilities are addressed in the preliminary cover layouts:

- *TA-50 pump house and influent storage facility*. This building is located approximately 30 ft north of the MDA C boundary. A retaining wall is provided at a 10-ft setback inside the fence line.

- *Radioactive liquid waste line*. A buried radioactive liquid waste line is located approximately 10 ft outside the western half of the northern MDA C boundary (Figure J-2.1-1). A retaining wall is provided at a 5-ft setback from the radioactive liquid waste line.
- *TA-50 roadways*. Roads to TA-50 facilities are located within approximately 10 ft to 20 ft of the MDA C western and northern boundaries. The cover layout provides retaining walls to maintain these existing roadways. Retaining walls are provided at a 10-ft setback from existing roadways.
- *Pajarito Road*. Along the southern boundary of MDA C, the cover potentially encroaches on Pajarito Road. To avoid impacting this primary roadway, the preliminary layout sets the cover limit north of Pajarito Road, preserving an existing drainage ditch that runs between MDA C and the roadway, a retaining wall is provided at a 10-ft setback from the existing roadway.
- *MDA C boundaries*. Around portions of the MDA C perimeter, waste trenches and shafts are located very near the site boundary fence line. As a result, the cover extends beyond the existing boundary by up to 80 ft (Figure J-2.1-1). To minimize the cover's extension beyond the boundary, side slopes were set at 20% to 25% in these areas. At the northeast corner of the site, the cover extends just to the TA-50 boundary with TA-63.

The design issues related to perimeter facilities will need to be addressed during future cover design efforts. In particular, the impacts of retaining walls on cover longevity and stormwater runoff will need to be evaluated.

J-2.2 Retaining Walls

Retaining walls planned for portions of the MDA C cover perimeter may be constructed of reinforced concrete or durable rock materials. Other retaining wall types may also be considered, and more than one type may be appropriate to meet the design needs for retaining walls with various heights and grade slopes. The retaining wall design will need to be integrated with all of the existing facilities at the MDA C perimeter in areas where retaining walls are needed. In particular, the retaining walls will need to be designed to allow stormwater conveyance at the perimeter of the cover.

The materials used for retaining walls will be commercially available construction materials meeting the necessary design specifications. Material requirements will need to be determined through a design evaluation to consider alternatives and select the preferred design.

J-3.0 PRELIMINARY SPECIFICATIONS FOR COVER COMPONENTS

The following sections describe the preliminary specifications for components of the ET cover, including materials and placement methods. The cover components consist of vegetation, surface treatment, cover soil, filter medium, biobarrier, and operational cover.

J-3.1 Vegetation

J-3.1.1 Vegetation Type

Seed and/or live plants used to revegetate disturbed areas at the Laboratory will be native to the Los Alamos vicinity. Table J-3.1-1 lists the seed mix proposed for use for the cover system at MDA C.

J-3.1.2 Seed Application

Seeding of native vegetation on the cover systems will be performed in the spring after the last frost of the season and before the arrival of the summer rains that typically occur in July and August. Seeding will not be done after August 1 to avoid germination too close to the first frost, which can kill the new seedlings.

Revegetation will be done by first preparing the soil by tilling and applying fertilizer. Care will be taken to ensure the rock-soil surface treatment maintains the desired ratio during this activity. Care will also be taken to ensure the rock-soil surface treatment layer is not mixed deeper into the cover profile.

Slow-release organic fertilizers will be applied as necessary to eliminate any deficiencies of the topsoil. Table J-3.1-2 lists the recommended levels of available plant nutrients. Bio-Sol or a similar fertilizer will be applied at rates up to 1500 lb/acre. Analyses of cover soils used will dictate the actual fertilizer rate required. Granular humate can be applied at 400 lb/acre to 500 lb/acre if it is in a hydroseeding slurry and up to 1800 lb/acre if it is incorporated into the top 4 in. of the soil. Application rates of composted manure vary depending on the source (chicken, horse, etc.) and the type of materials (wood chips, paper, soil, etc.) used to compost. If composted manure is to be applied, the nutrient content will be tested and interpreted before it is used.

Drill seeding will be the method used to apply the seed mix. Drilling introduces seed directly into the prepared seedbed by machine. Seeding will be performed by drilling at a minimum rate of 25 pure live seed (PLS) lb/acre. In areas that limit equipment access, broadcast seeding may be used at a rate of 40 PLS lb/acre.

J-3.2 Surface Treatment

J-3.2.1 Surface Treatment Material Description

To address potential erosion of the cover system, a surface treatment composed of a mixture of gravel and cover soil will be used. The approach to designing the admixture is presented in Appendix A to the conceptual cover design report for MDA G (Dwyer 2007, 098276), which is included in Attachment J-1 to this appendix. This design procedure is also described in Dwyer et al. (1999, 099309, p. 9; 2007, 096232, pp. 5-19–5-25).

The gravel-to-soil ratio and gravel size were determined based on the most critical drainage section of the proposed cover for MDA C. With the addition of the gravel-soil admixture to the surface, annual soil loss because of both wind and runoff was estimated to be minimal. The gravel-soil admixture will include a mixture of 33% gravel by weight. The cover soil will exhibit the storage capacity and soil nutrients described in section J-3.3. Salts in this soil will also be limited in the cover soil as described in section J-3.4.

The technical approach presented in Attachment J-1 was applied using site-specific slopes and slope lengths for MDA C, which were taken from the proposed cover grading plan (Figure J-2.1-1). The runoff coefficient and rainfall intensity were the same as used for MDA G (1.0 and 2.46 in./h, respectively). The soil bulk density and percentage of silt/clay in the soil were estimated based on soil-amendment requirements. A summary of the gravel admixture calculations is presented in Table J-3.2-1. The critical gravel size was determined to be 2.25 in. (5.72 cm) (gravel size between 2.25 in. [5.72 cm] and 3 in. [7.6 cm] in diameter to be used), and the total gravel-soil admixture thickness is to be no less than 18 in. (0.46 m). The admixture design will be updated during final design in the corrective measures implementation (CMI) phase of the project.

Because the gravel is used to control erosion and is subject to weathering, weathering may affect the longevity of the cover. It is proposed that the gravel meet the durability requirements described in U.S. Nuclear Regulatory Commission Regulation (NRC 2002, 097900, Appendix D) (see Table J-3.2-2).

J-3.2-2 Surface Material Placement

The gravel-soil admixture used as a surface treatment will be placed in one uncompacted lift, if practical. Two lifts are also acceptable provided the bottom lift is not overcompacted because of placement of the top lift. This surface treatment layer will be placed as dry as possible but no wetter than the optimum moisture content as determined by American Society for Testing and Materials (ASTM) D698. Any excessive compaction this layer receives during placement will be scarified. The loose placement is to provide the best means for vegetation establishment. Overcompaction is one of the primary causes of unsuccessful revegetation efforts.

J-3.3 Cover Soil

J-3.3.1 Cover Soil Material Description

The approach to specifying the thickness of cover soil needed to control infiltration is presented in Appendix C to the conceptual cover design report for MDA G (Dwyer 2007, 098276), which is included as Attachment J-1 to this appendix. The climate, vegetation, and soil property data used to specify the cover soil for MDA G are also representative of MDA C. Therefore, the results of the analysis for MDA G presented in Attachment J-1 were also used to specify the cover soil for the MDA C ET cover.

The cover soil layer beneath the gravel-soil admixture will be a minimum of 3.5 ft (1 m) of amended soil meeting the water storage capacity properties of a typical sandy loam soil, based on the U.S. Salinity Laboratory's ROSETTA model (http://www.ars.usda.gov/Services/docs.htm?docid=8953). The cover soil, including the soil in the surface treatment (gravel admixture), must have adequate storage capacity to retain infiltrated water until that water can be removed via ET. This soil must provide a quality rooting medium to maintain native vegetation; therefore, the soil must have acceptable levels of available plant nutrients, and its salt content must be below acceptable levels.

The depth of the cover soil was determined based on water storage requirements to meet RCRA equivalency of less than 1 mm/yr. Modeling using UNSAT-H (Fayer 2000, 072734) was performed to determine the minimum thickness required to provide adequate storage capacity for an upper boundary condition consisting of the wettest decade in recorded history in Los Alamos (1985 to 1994). Average hydraulic properties (Shaw Environmental Inc. 2006, 091368, Appendix D) from the TA-61 soil borrow site were used as input parameters. The modeling output determined that a depth greater than 6.6 ft (2 m) would be required to minimize flux largely because of the lack of water storage capacity in the TA-61 soils (Figure J-3.3-1). The TA-61 soils consist of crushed tuff and were classified as a sandy loam but are on the coarser side of sandy loam soils. The ROSETTA software (http://www.ars.usda.gov/Services/docs.htm?docid=8953) was used to perform another modeling exercise using typical sandy loam hydraulic properties to ascertain if this soil type would decrease the soil depth requirement. This output (Figure J-3.3-1) determined that approximately 5 ft (1.5 m) of typical sandy loam soil would minimize flux to a point of diminishing returns (Dwyer et al. 2007, 096232, pp. 3-10–3-11).

The depth of the surface treatment was determined to be a minimum of 1.5 ft (0.5 m). Therefore, the additional cover soil depth required to minimize flux is 3.5 ft (1 m). This depth provides for a minimum cover soil depth of 5 ft (1.5 m). A third modeling exercise was performed to capture the entire conceptual design that includes all layers above the existing subgrade. This modeling output determined that flux

through the cover will be negligible with the conditions modeled. It is important to note the inclusion of a filter medium above the biobarrier and the inclusion of a biobarrier create a capillary barrier. Details of the modeling performed, including specific input and output parameters, are included in Attachment J-1. The amendments will ensure the cover soil is capable of maintaining a desired stand of native vegetation. The plant nutrients should allow for the final amended soil to meet the requirements listed in Table J-3.1-2. Additionally, the salt content in the soils must be below levels that would hinder the establishment and growth of native vegetation. The final amended soils will comply with the requirements outlined in Table J-3.3-2.

J-3.3.2 Soil Placement

An important aspect involved with the construction of a soil cover system is that the soils are placed in a uniform manner to help limit preferential flow through the cover. Dwyer (2003, 097902, p. 32) describes the impact of preferential flow in landfill covers. Preferential flow cannot be avoided, but necessary precautions will be taken to ensure it is minimized. An important feature of the design specifications will involve determining an acceptable density range for installation of the cover soils. To increase the initial storage capacity of the cover system and mitigate the potential for desiccation cracking, the soils will be placed as dry as possible but no greater than the optimum moisture content as determined by ASTM D698. The acceptable density and moisture content placement range is described as the acceptable compaction zone (ACZ).

The ACZ (Figure J-3.3-2) is unknown as of the date of this report because the desired soil will require amendment to meet the performance objectives of the cover system. Therefore, the process involved in determining this ACZ is briefly described here. Further details may be found in Dwyer et al. (2007, 096232, pp. 3-7–3-8).

The determination of the ACZ for placement of cover soil follows.

1. Cover soil shall be placed at the goal density. The goal density is best determined from the borrow soil's in situ density. That is, over an extended period of time, a given soil will move toward its "natural" density state. Therefore, it is the goal of the soil installation to place the soil at a density that is as close to that "goal" density as possible from the onset. In this case, because the soil will be amended, the goal density shall be assumed to be between 85% to 90% of the maximum dry density (MDD), as determined by ASTM D698.

2. A standard proctor curve must be determined for the amended soil used per ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to obtain the respective MDD and optimum moisture content.

3. The allowable dry unit weight or soil density during construction shall be the goal density, plus or minus 5 lb/ft^3 (80.1 g/L).

4. The cover soils shall be placed as dry as possible not to exceed the optimum moisture content per ASTM D698 derived for each borrow soil used. Installing soil dry will provide for a maximum initial water storage capacity in the cover and minimize the potential for desiccation cracking, particularly when clays are used (Dwyer 2003, 097902). This moisture content is applicable for all soils in the cover system, including the upper 1 ft (31 cm) of the interim (operational) cover or subgrade.

J-3.4 Filter Medium

A filter medium composed of sand and/or gravel will be placed above the biobarrier, between the biobarrier and the overlying cover soil layer. This layer is designed to prevent the mixing of soil layers and meet specified filter criteria. The depth of this layer is to be determined in the field and will be the minimum depth required to completely cover the biobarrier layer and provide a smooth, continuous surface layer for placement of the cover soil. For estimating purposes, this layer is assumed to be 6 in. (15 cm) thick.

Two primary mechanisms of concern for transport of contaminants from the MDA C site are biointrusion and erosion. Both burrowing animals and roots are of concern because they can bring contaminants to the surface. A biobarrier of cobbles is included in the conceptual design to minimize the potential for burrowing animals and roots from accessing the buried source materials. To prevent the mixing of finer cover soil into the cobble layer, a filter layer is included.

The filter medium will be composed of coarse material (sand and/or gravel) that meets specific filter criteria to prevent the mixing of materials. These criteria are as follows:

$$d_{15}/ d_{85} \leq 5 \qquad \textbf{Equation J-3.4-1}$$

where

d_{15} = particle size of the coarse soil for which 15% of the particles are finer,

d_{85} = particle size of the fine soil for which 85% of the particles are finer.

The filter design criteria, summarized in a U.S. Department of Energy technical report (DOE 1989, 099296, Table 4.2-3), and the following requirements will also be used. The filter material must pass the 3-in. sieve for minimizing particle segregation and bridging during placement. Smaller maximum particle sizes may be specified if practical. Also, filters must not have more than 5% passing the No. 200 mesh sieve to prevent excessive movement of fines in the filter. Filter material needs to be reasonably well graded throughout the in-place layer thickness.

A capillary barrier will be formed with the inclusion of the filter medium beneath the fine cover soils. A second capillary barrier may also be formed between the filter medium and the cobble biobarrier. Consequently, all requirements for a capillary barrier must be followed, as outlined in Dwyer et al. (2007, 096232). Of particular concern are long slope lengths and consequently the diversion capacity of the capillary barrier. The interface between the materials forming the capillary barrier(s) must be a smooth and continuous interface. Discontinuities in this interface may result in significant preferential flow and must be prevented.

J-3.5 Biobarrier

As stated in section J-3.4, a biobarrier is included in the cover profile to minimize the intrusion of flora and fauna into the buried source materials. A minimum 1-ft- (0.3-m-) thick layer of cobble with a minimum diameter of 6 in. (15 cm) will be included in the cover profile. This layer will minimize the potential burrowing of the animal of most concern at the site (gophers) as well as the intrusion of woody roots from plants such as shrubs, piñon, and juniper.

Biointrusion in a landfill cover system refers to the flora and fauna (including insects) interactions or intrusion into the cover system. Biointrusion is important in that it can represent a mechanism leading to vertical transport of contaminants to the ground surface via plant root uptake or soil excavation by

burrowing animals and insects. Biointrusion can also lead to increased infiltration and preferential flow of surface water through the cover system and contribute to a change in the soil layer's hydraulic properties. However, the increased soil moisture resulting from burrowing effects on infiltration can actually stimulate increased plant growth, leading to an increase in plant transpiration (Gonzales et al. 1995, 073708; Hakonson 2002, 099469) and a net decrease in flux.

Vertical transport by biota may be small over a short time scale; however, over many decades these processes may become dominant in mobilizing buried waste or contaminated soil (Dwyer et al. 2007, 096232, p. 4-7). Burrowing by animals and insects has the potential to access buried waste several meters below the ground surface, which may lead to chemical and radiation exposures to organisms and physical transport of waste upward in the soil profile to ground surface, to biota, and across the landfill surface to off-site areas. These processes are enhanced by erosion (wind/water), transport of animals moving on/off the landfill, deposition of soil particles on biological surfaces from rain splash and wind resuspension, and wind transport of senescent vegetation to off-site areas.

J-3.6 Subgrade/Interim (Operational) Cover Preparation

MDA C currently has an interim (operational) soil cover over it. This site will require clearing, grubbing, and some regrading before emplacement of the final cover system. The elevations and grades will comply with those shown on the project drawings. At a minimum, the upper 1 ft (31 cm) of the interim (operational) cover or subgrade will be scarified and recompacted before the biobarrier is emplaced. This recompaction is expected to produce a density not less than 95% of the maximum dry density as determined by ASTM D698. The moisture content will be placed dry of the optimum moisture content as determined by ASTM D698.

J-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. This information is also included in text citations. ER IDs 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 New Mexico Environment Department Hazardous Waste Bureau 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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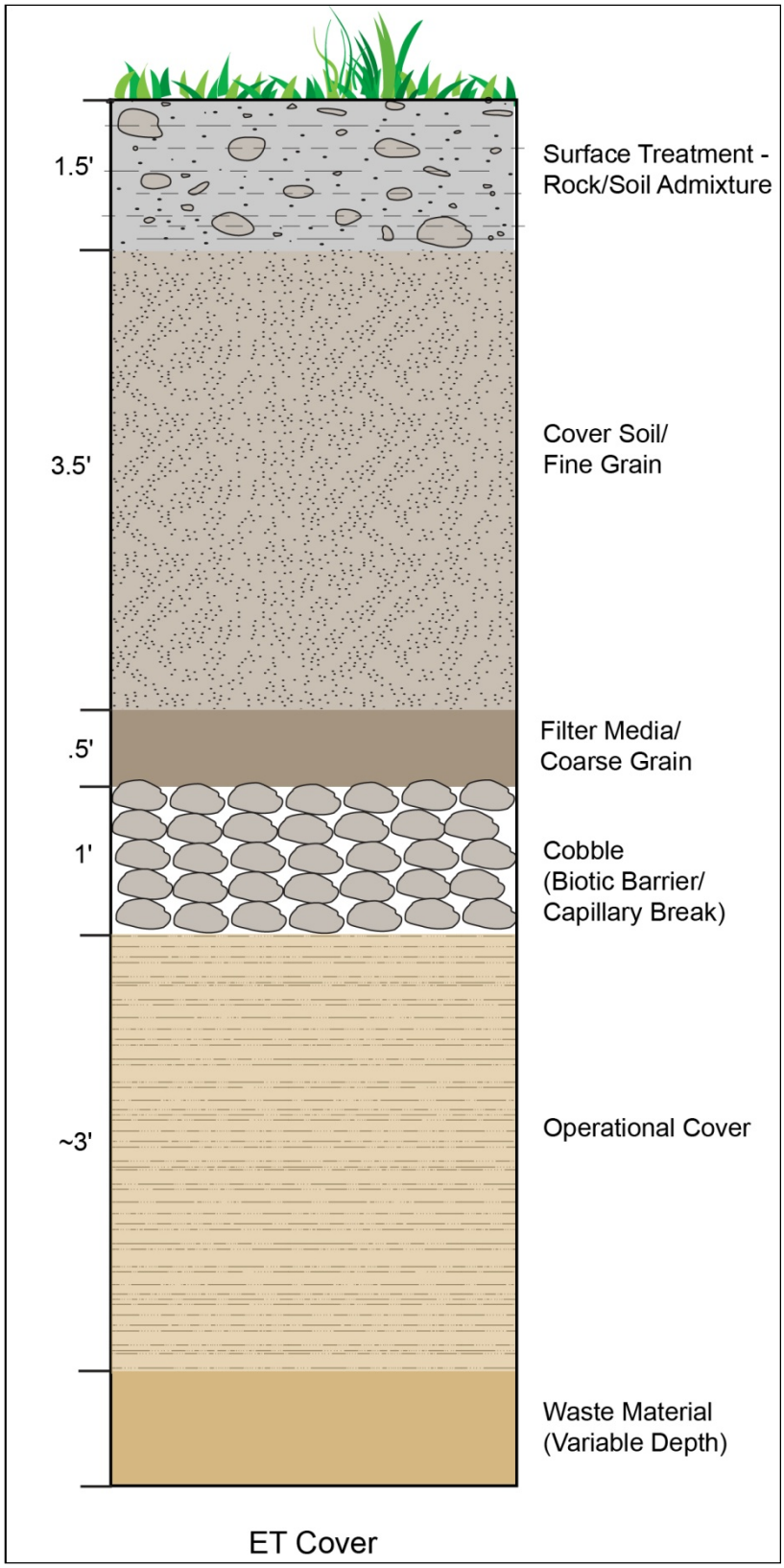


Figure J-1.0-1 MDA C CME conceptual ET cover profile

Figure J-2.1-1 Preliminary grading plan for MDA C ET cover

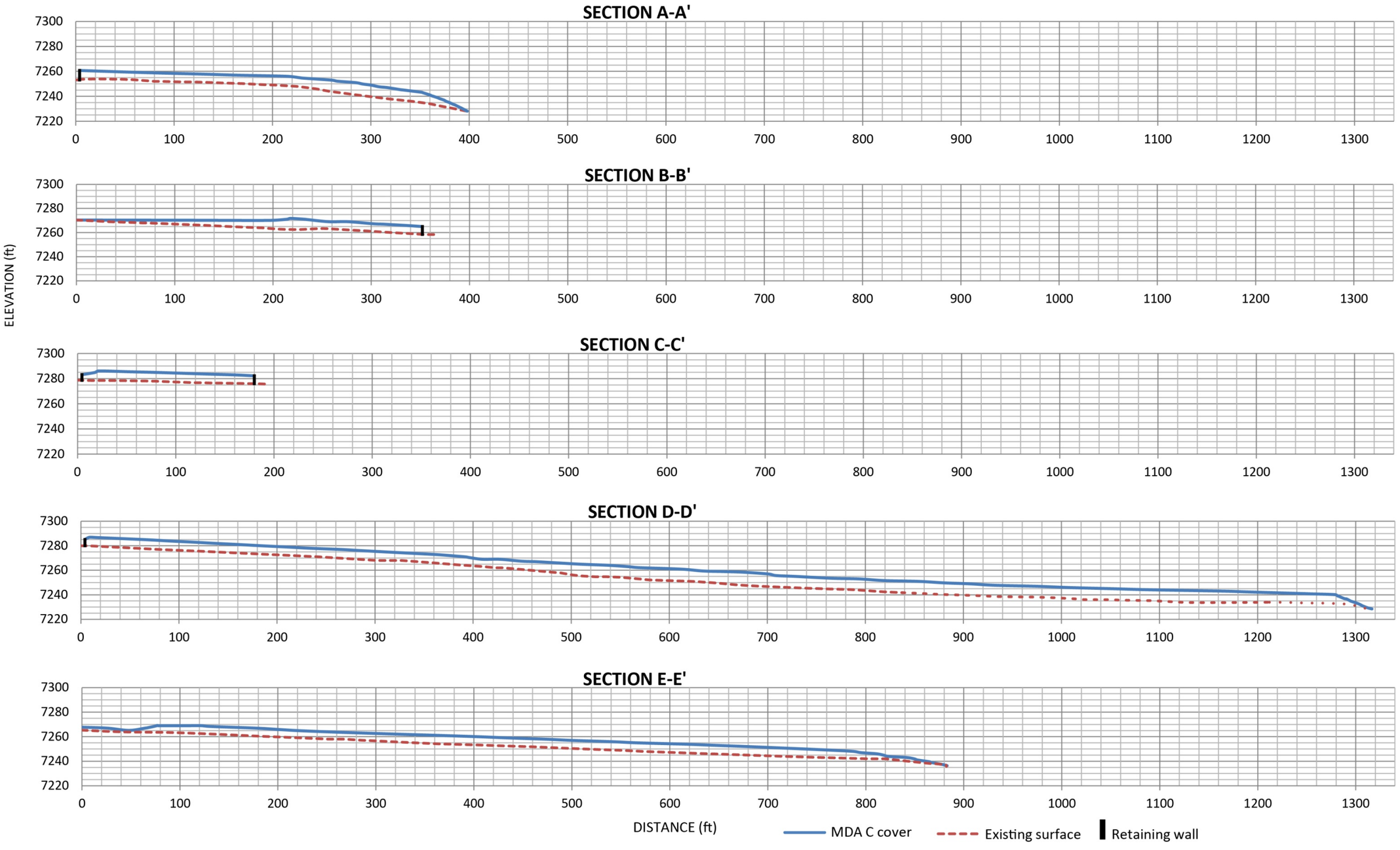


Figure J-2.1-2 Preliminary cross-section of MDA C ET cover

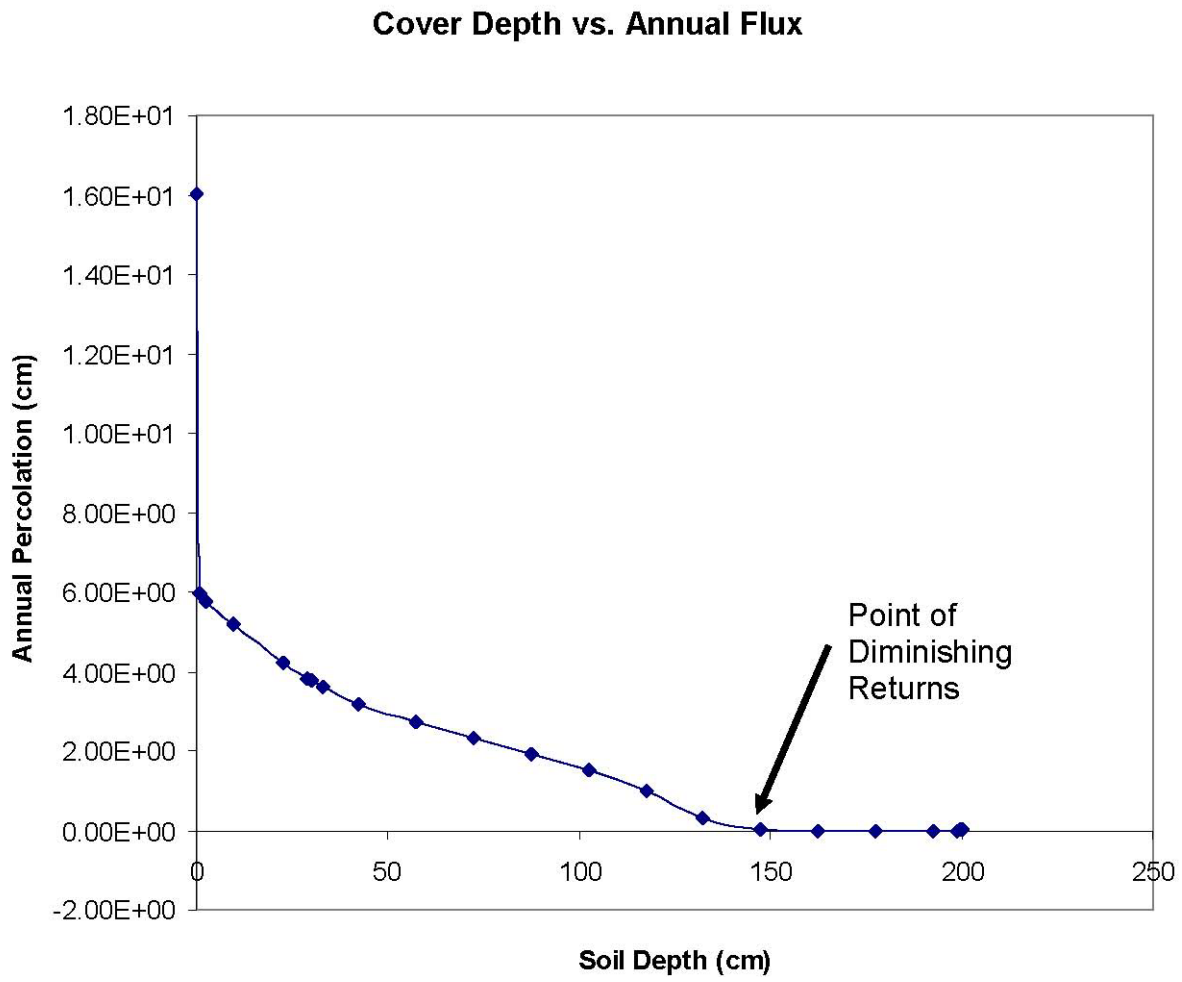


Figure J-3.3-1 Typical sandy loam soil: point of diminishing returns (1.5 m)

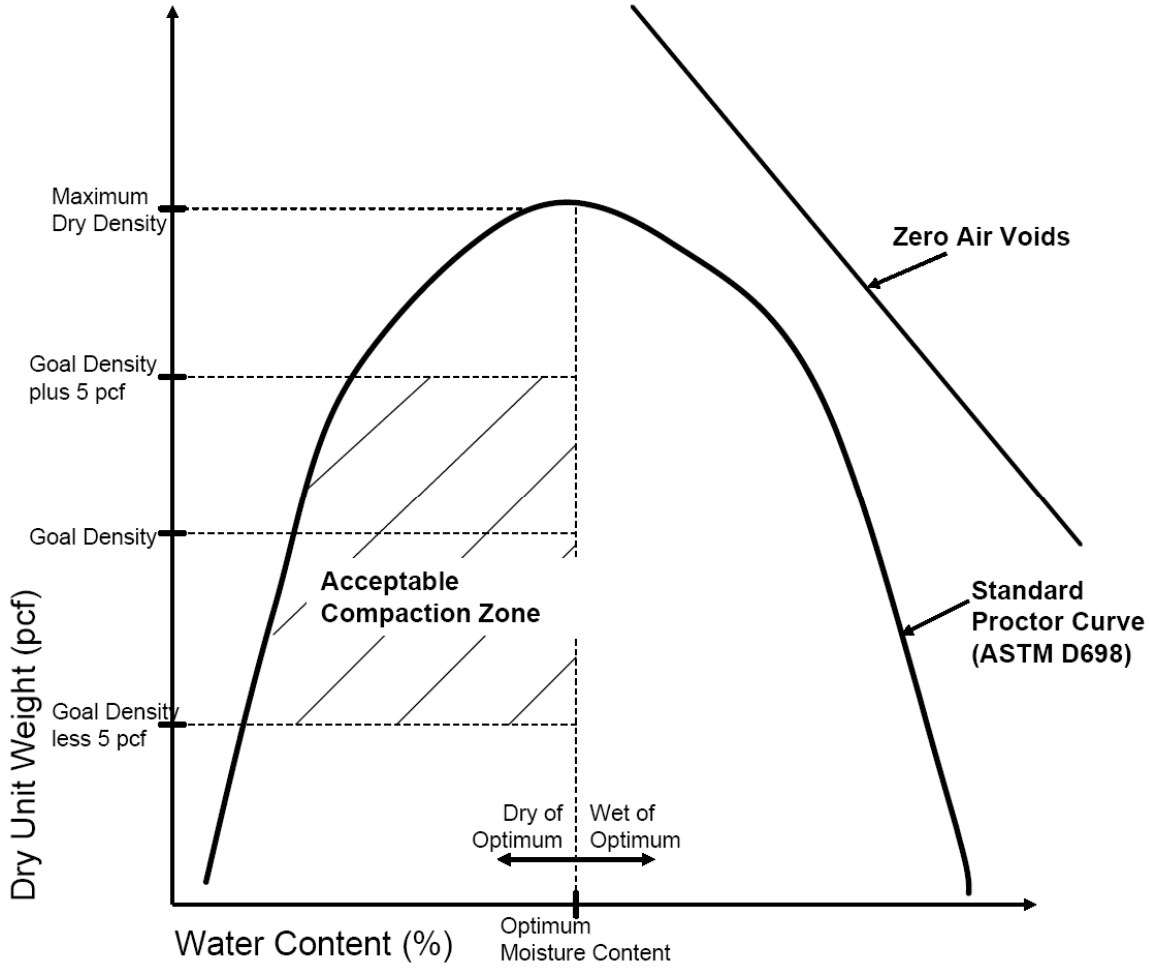


Figure J-3.3-2 Acceptable compaction zone for soil placement

Table J-1.0-1
MDA C CME Conceptual Cover Profile Layer Specifics and Justification

Cover System Layer	Design Specifics	Design Justification
Vegetation	The site is to be seeded with native vegetation composed of both cool and warm weather species (grasses). Table J-3.1-1 lists the recommended seed mix.	The vegetation will help stabilize the cover surface, minimize erosion, and remove infiltrated water via transpiration.
Surface Treatment	Mixture of cover soil and gravel. The gravel is to be mixed into the cover soil at a rate of 33% by weight. The gravel will be 1.75 in. (4.4 cm) to 3 in. (7.6 cm) in diameter. The cover soil will be capable of maintaining native vegetation with adequate storage capacity and nutrient availability. This layer will be a minimum of 18 in. (0.5 m) thick.	The gravel-soil admixture is designed to minimize erosion because of both wind and surface runoff.
Cover Soil	The cover soil depth will be a minimum of 3.5 ft (1 m). The layer will consist of soil from TA-61 with a determined mix of soil amendments. The cover soil will be capable of maintaining native vegetation with adequate storage capacity and nutrient availability.	Hydraulic characteristics of a typical sandy loam were used to determine the required soil depth because it is recommended that the TA-61 borrow soils be amended to possess the storage capacity of this soil type. The soil depth was determined using modeling where a depth of soil was determined to minimize flux. The modeling used the wettest decade on record as the upper boundary condition. However, because the site requires a 100-yr performance period, it was estimated the added storage capacity offered by the inclusion of a biobarrier that creates a capillary barrier was more than adequate to store any infiltration events that would occur over this return period.
Filter Layer	This layer is composed of sand and gravel that meet determined filter criteria to prevent the overlying finer cover soils from migrating into the underlying biobarrier.	A thin layer placed directly on the biobarrier to serve as a filter medium to prevent the overlying finer soils from migrating into the underlying biobarrier.
Biobarrier	A layer of minimum 6-in.- (15-cm-) diameter cobble composed of rock or concrete. The layer is to be a minimum of 1 ft (0.3 m) thick.	The layer prevents biointrusion (burrowing animals and plant roots) from entering the underlying source material.
Subgrade	The upper foot of existing interim cover soil will be scarified and recompacted to a minimum of 95% of the maximum dry density and dry of the optimum moisture content as determined per ASTM D698.	The subgrade provides a firm foundation for the construction of the cover profile and the final grades and slopes for installation of a uniform cover profile.

Table J-3.1-1
Seed Mix

Common Name	Scientific Name	% of Mix	PLS (lb/acre)
Sideoats grama	Bouteloua curtipendula	15%	3.75
Blue grama	Bouteloua gracilis	15%	3.75
Indian ricegrass	Oryzopsis hymenoides	10%	2.5
Western wheatgrass	Agropyron smithii	15%	3.75
Sand dropseed	Sporobolus cryptandrus	10%	2.5
Sheep fescue	Festuca ovina	20%	5
Firewheel	Gaillardia pulchella	3%	.75
Western yarrow	Achillea millefoium	2%	.5
Prairie coneflower	Ratibida columnifera	4%	1
Blue flax	Linum perenne lewisii	6%	1.5
Total			**25**

Source: Dwyer et al. 2007, 096232.

Table J-3.1-2
Recommended Available Plant Nutrients for Cover Soil

Test	Limits
CEC	Greater than 15
Percent organic matter	Greater than 2% (g/g)
N	Greater than 6 ppm
P	4 to 7 ppm
K	61 to 120 ppm

Table J-3.2-1
Summary of Gravel Admixture Calculations

Cover Section	Runoff Coefficient	Rainfall Intensity (in./h)	Cover Slope (%)	Slope Length (ft)	Peak Flow (cfs[a])	Mean Annual Flow (cfs)	Percentage Silt/Clay[b]	Bulk Density[b] (lb/ft^3)	Critical Gravel Size[c] (in.)	Percentage Gravel	Total Required Depth (in.)
1-South	1.0	2.46	3.4	770	8.37	1.67	20	115	1.75	33	16
2-East	1.0	2.46	14.5	110	0.17	0.03	20	115	1.5	33	14
3-Northeast	1.0	2.46	15	260	0.95	0.19	20	115	3.25	33	18
4-Northwest	1.0	2.46	5.5	550	4.27	0.85	20	115	2.25	33	18
5-Northeast	1.0	2.46	24.4	90	0.11	0.02	20	115	2.25	33	18
6-Northeast	1.0	2.46	11.5	300	1.27	0.25	20	115	2.75	33	18

[a] cfs = Cubic feet per second.

[b] Assumed values based on soil amendments and gravel mixture.

[c] Value rounded up to nearest quarter inch.

Table J-3.2-2
Scoring Criteria for Determining Rock Quality

	Weighting Factor			Score										
	Limestone	**Sandstone**	**Igneous**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Specific Gravity (SSD*)	12	6	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.40	2.25
Absorption (%)	13	5	2	0.1	0.3	0.5	0.67	0.83	1.0	1.5	2.0	2.5	3.0	3.5
Sodium Sulfate (%)	4	3	11	1	3	5	6.7	8.3	10	12.5	15	20	25	30
Abrasion (%)	1	8	1	1	3	5	6.7	8.3	10	12.5	15	20	25	30
Schmidt Hammer	11	13	1	70	65	60	54	47	40	32	24	16	8	0
Tensile Strength (psi)	5	4	10	1400	1200	1000	833	666	500	400	300	200	100	<100

Source: Modified from NUREG (NRC 2002, 097900).

* SSD = Saturated surface dry.

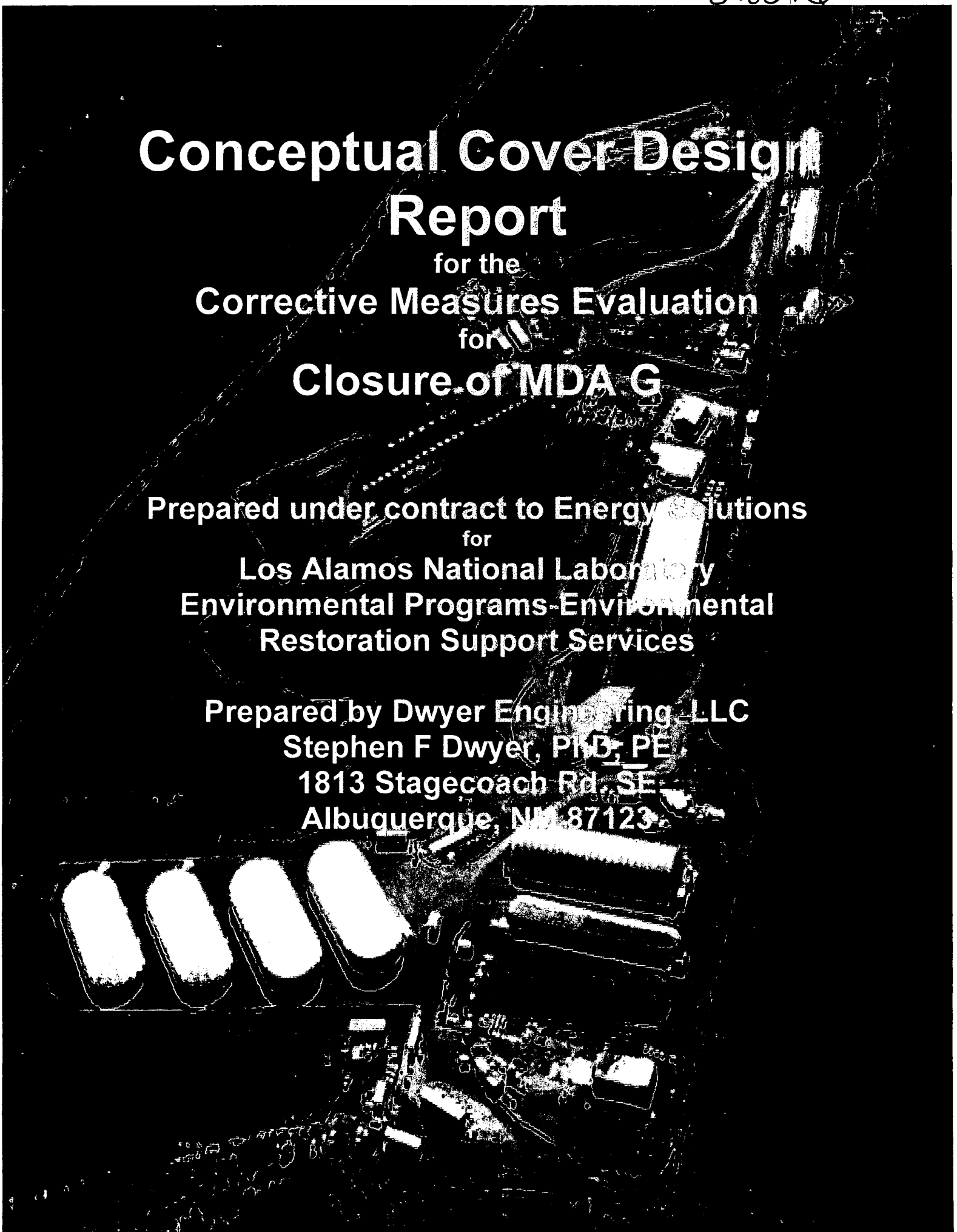
Table J-3.3-1
Recommended Limitations of Salt in Cover Soil

Test	Limits
Electrical Conductivity	Less than 8 µS/cm
Sodium Adsorption Ratio	Less than 6
Exchangeable Sodium Percentage	Less than 15% (g/g)
Calcium Carbonate	Less than 15% (g/g) – to 3-ft (91-cm) depth of cover; no limit below 3 ft (91 cm)

Attachment J-1

Conceptual Cover Design Report for Material Disposal Area G

098276



Conceptual Cover Design Report

for the

Corrective Measures Evaluation

for

Closure of MDA G

Prepared under contract to Energy Solutions

for

Los Alamos National Laboratory

Environmental Programs-Environmental Restoration Support Services

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1.0 EXECUTIVE SUMMARY

Dwyer Engineering, LLC was tasked to provide engineering input into the development of a conceptual cover profile for final closure of the Material Disposal Area (MDA) G site located at Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. Specifically, Dwyer Engineering was to provide a recommended cover profile based on storage capacity, erosion, and biointrusion considerations. Other considerations such as radon attenuation were completed by others. This conceptual profile was determined based on the best available information including assumptions required to overcome data gaps.

A conceptual cover profile was derived for the Corrective Measures Evaluation to remediate and close MDA G. The conceptual cover profile (Figure 3.1), consists of a soil profile referred to as an Evapotranspiration (ET) Cover. This cover is designed to store infiltrated water until it is removed by the combination of plant transpiration and surface evaporation (collectively referred to as ET). The cover system will use locally available soils and native vegetation to create a long-lasting cover that has a performance and design life commensurate with the projected hazardous life of the contained wastes. The Performance Assessment (PA) for MDA G indicated that the primary contaminant release vectors from the site are erosion and biointrusion. To minimize erosion, the cover surface was enhanced with a gravel admixture. A bio-barrier was placed beneath the soil cover to minimize the intrusion of flora and fauna into the underlying waste.

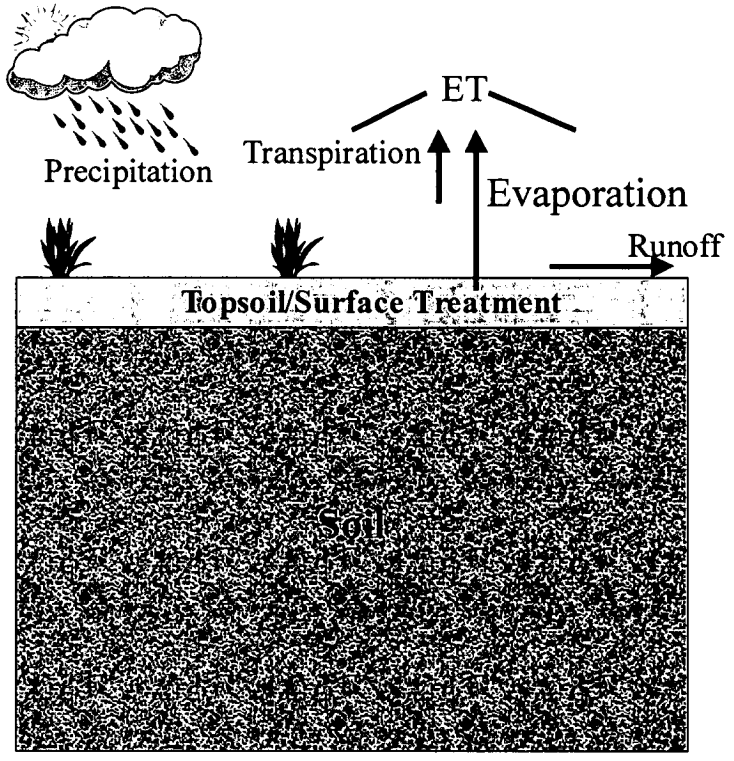
Unsaturated flow modeling of the proposed conceptual cover design determined that flux through the profile would essentially be zero thus satisfying the DOE Order 435.1 and RCRA-equivalence. The MDA G PA suggested a flux less than 1 mm/yr would limit the migration of contaminants due to surface infiltration. However, because MDA G contains Resource Conservation and Recovery Act (RCRA) wastes, regulations governing RCRA require the flux through a cover to be minimized. Soil from the TA61 proposed borrow site were modeled to determine their effectiveness in an ET Cover. The modeling revealed that a soil depth greater than 6.6 ft (2m) would be required to minimize flux. The TA61 soils were classified as a sandy loam (Shaw 2006), but have marginal storage capacity. Consequently, hydraulic properties of a typical sandy loam were modeled to verify if the soil depth requirement could be reduced. The modeling output showed that the typical sandy loam would minimize flux with a depth of about 5 ft (1.5 m). It is therefore recommended a soil amendment be included with the TA61 borrow soils to increase the storage capacity and soil nutrient availability. This site is also governed by Department of Energy (DOE) Order 435.1 which states that the cover should be designed to perform for 1000 year time period; the upper boundary condition should ideally be expanded to include climate scenarios that are expanded beyond the available weather data. However, this data is not available at this time. Engineering judgment was used to determine that 5 ft (1.5 m) of cover soil would offer adequate storage capacity even under an enhanced set of climate scenarios representative of a 1000 year return period to reduce infiltration to less than 1 mm/year. Especially considering that the inclusion of a bio-barrier in the cover profile introduced a capillary barrier that further enhances the storage capacity of the cover soil.

2.0 INTRODUCTION

MDA G is located within Technical Area (TA) 54 at the Los Alamos National Laboratory in Los Alamos, New Mexico. TA-54 is located on Mesita del Buey and spans the boundary of the Cañada del Buey and Pajarito Canyon watersheds. TA-54 ranges in elevation between 6700 and 6800 ft with a depth to groundwater ranging between 900 and 980 ft. The major industrial activity at TA-54 has been waste storage and disposal. MDA G is a 100-acre site that has served as the Laboratory's principal radioactive solid waste storage and disposal site since routine operations began in 1959. The majority of stormwater runoff from MDA G enters the Pajarito Canyon watershed with a much smaller portion draining into Cañada del Buey, which is located within the Mortandad Canyon watershed.

This report provides a summary of the basis for the conceptual cover design for MDA G as part of the Corrective Measures Evaluation (CME) for remediation of the site. An ET Cover with an erosion resistant surface treatment and a bio-barrier will be constructed to provide adequate protection and risk reduction. The ET Cover consists of a single, vegetated soil layer constructed to represent an optimum mix of soil texture, soil thickness, and vegetation cover (Figure 2.1).

Figure 2.1
TYPICAL ET COVER PROFILE

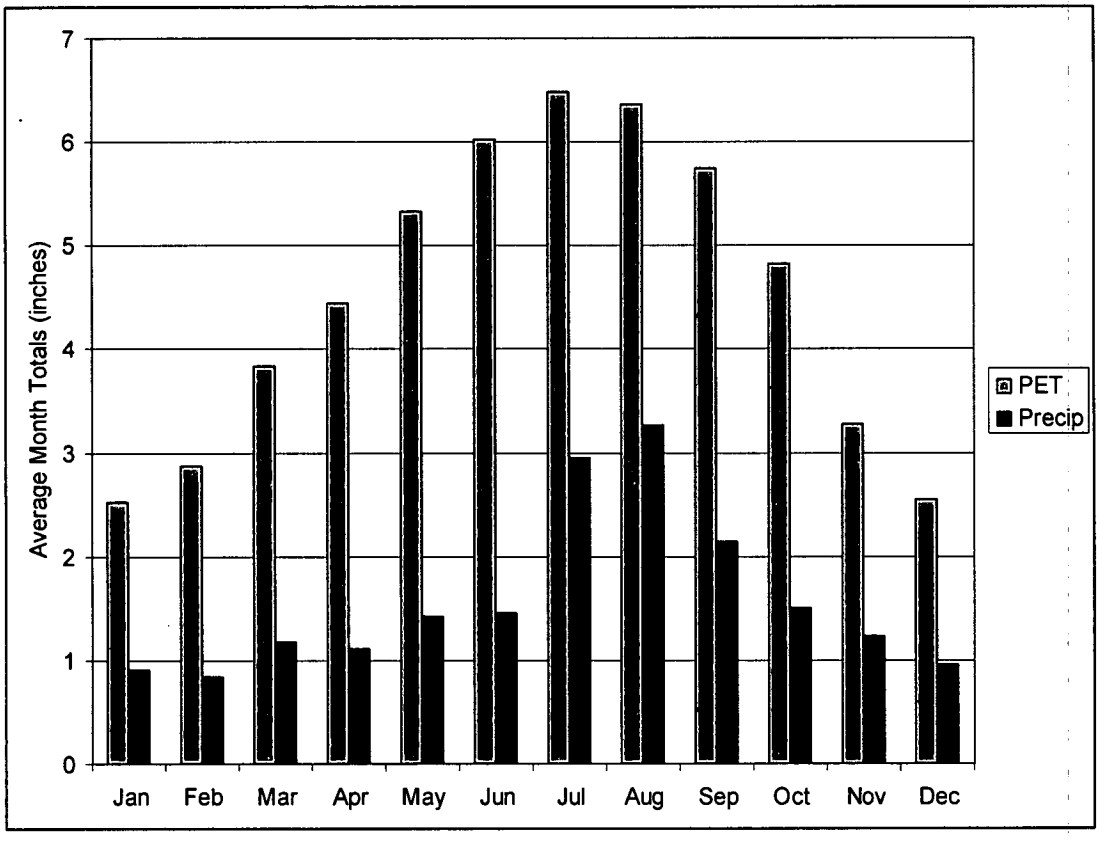


The ET Cover concept relies on the soil to act like a sponge (Dwyer 2003). Infiltrated water is held in this "sponge" until it can be removed via ET. ET is defined as the

combination of water removal due to both evaporation from the surface and transpiration through vegetation. Previous research has shown that a simple soil cover can be very effective at minimizing percolation and erosion, particularly in dry environments (http://www.clu-in.org/download/remed /epa542f03015.pdf#search ='evapotranspiration%20epa%20fact%20sheet).

The MDA G site is an ideal site for an ET Cover. First, it contains long-lived waste and source material such as radionuclides. Prescriptive covers that depend on geosynthetics cannot effectively be used for these sites because the geosynthetics will not last as long as the waste poses a significant risk nor will they meet the 1000 year performance period dictated under DOE Order 435.1. Additionally, the climate's demand for water or potential evapotranspiration (PET) far exceeds the actual supply of water (precipitation) as shown in Figure 2.2. The ET Cover offers another important advantage in that it provides for a deeper rooting medium that will provide an opportunity for native vegetation to survive lengthy drought periods because the water storage of the ET Cover is greater than that of a prescriptive cover.

Figure 2.2
Climate's demand for water (PET) vs. supply of water (precipitation) for Los Alamos, NM



3.0 CONCEPTUAL DESIGN

The cover system proposed for final closure as part of the CME for MDA G located at Los Alamos National laboratory in Los Alamos, NM is shown in figure 3.1. A brief description of each layer in the cover profile is contained in Table 3.1 with expanded descriptions contained in sections 3.1 to 3.5.

Figure 3.1
MDA G CME Conceptual Cover Profile

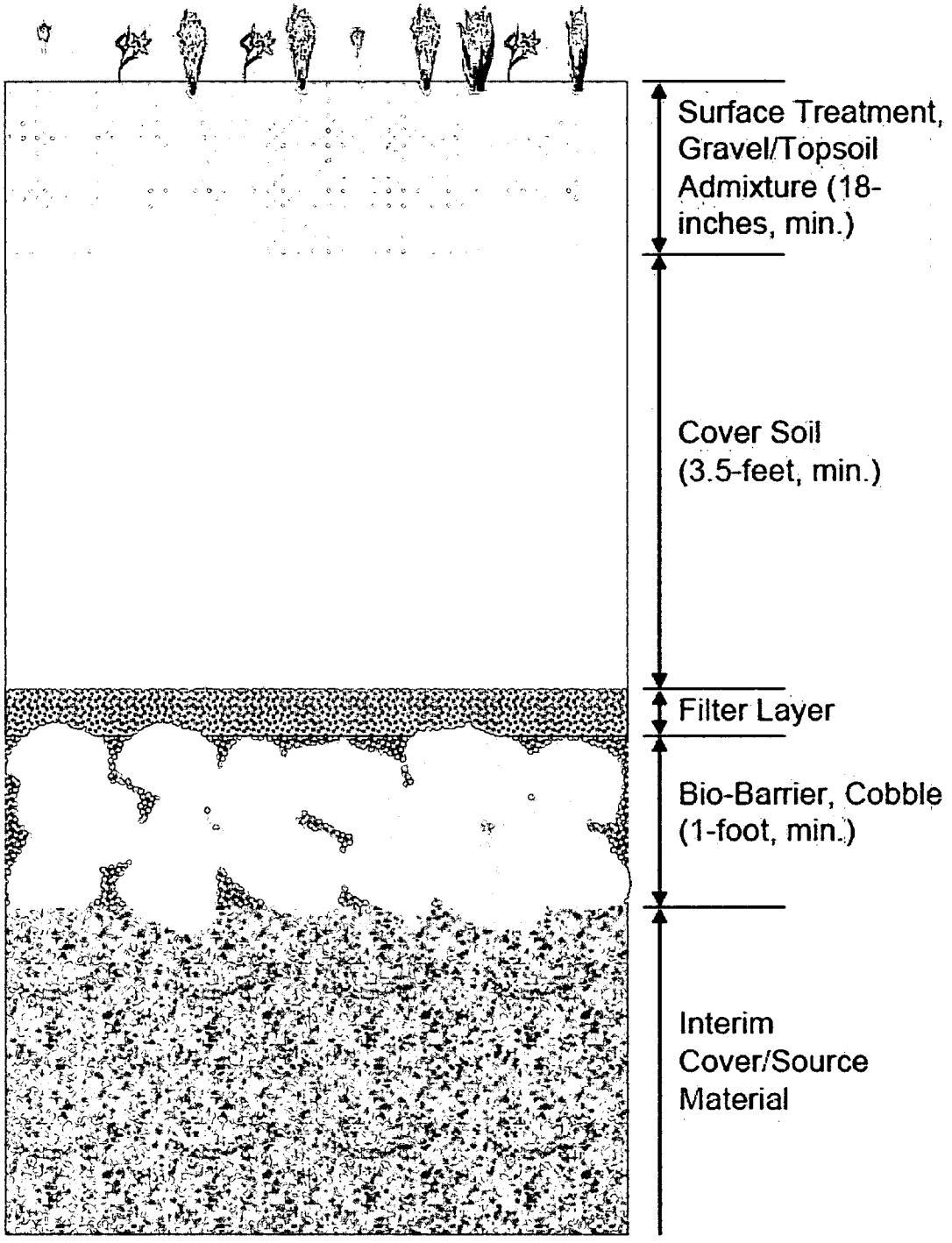


Table 3.1
MDA G CME Conceptual Cover Profile Layer Specifics and Justification

Cover System Layer	Design Specifics	Design Justification
Vegetation	The site is to be seeded with native vegetation composed of both cool and warm weather species (grasses). Refer to Table 3.1 for a recommended seed mix.	The vegetation will help stabilize the cover surface, minimize erosion, and remove infiltrated water via transpiration.
Surface Treatment	Mixture of cover soil and gravel. The gravel is to be mixed into the cover soil at a rate of 33% by weight. The gravel will be 1.75-inch (4.4 cm) to 3-inches (7.6 cm) in diameter. The cover soil will be capable of maintaining native vegetation with adequate storage capacity and nutrient availability. This layer will be a minimum of 18-inches thick (0.5 m).	The gravel/soil admixture is designed to minimize erosion due to both wind and surface runoff.
Cover Soil	The cover soil depth will be a minimum of 3.5-feet (1 m). The layer will consist of soil from TA61 with a determined mix of soil amendments. The cover soil will be capable of maintaining native vegetation with adequate storage capacity and nutrient availability.	Hydraulic characteristics of a typical sandy loam were used to determine the required soil depth because it is recommended that the TA 61 borrow soils be amended to possess the storage capacity of this soil type. The soil depth was determined using modeling where a depth of soil was determined to minimize flux. The modeling utilized the wettest decade on record as the upper boundary condition. However, because the site requires a 1000-year performance period, it was estimated that the added storage capacity offered by the inclusion of a bio-barrier that creates a capillary barrier was more than adequate to store any infiltration events that would occur over a

		1000-year return period.
Filter Layer	This layer is composed of sand and gravel that meet determined filter criteria to prevent the overlying finer cover soils from migrating into the underlying bio-barrier.	A thin layer placed directly on the bio-barrier to serve as a filter medium to prevent the overlying finer soils from migrating into the underlying bio-barrier.
Bio-barrier	A layer of minimum 6-inch (15 cm) diameter cobble composed of rock or concrete. The layer is to be a minimum of 1-foot thick (0.3 m).	The layer prevents biointrusion (burrowing animals and plant roots) from entering the underlying source material.
Subgrade	The upper foot of existing interim cover soil shall be scarified and recompacted to a minimum of 95% of the maximum dry density and dry of the optimum moisture content as determined per ASTM D698.	Provide a firm foundation for the construction of the cover profile. Provide the final grades and slopes for installation of a uniform cover profile.

3.1 VEGETATION

Seed and/or live plants used to revegetate disturbed areas at LANL shall be native to the Los Alamos vicinity. The following is the seed mix to be employed for the cover system at MDA G (Table 3.2).

Table 3.2
Seed Mix

Common Name	Scientific Name	% of mix	PLS (lbs/acre)
Sideoats grama	Bouteloua curtipendula	15%	3.75
Blue grama	Bouteloua gracilis	15%	3.75
Indian ricegrass	Oryzopsis hymenoides	10%	2.5
Western wheatgrass	Agropyron smithii	15%	3.75
Sand dropseed	Sporobolus cryptandrus	10%	2.5
Sheep fescue	Festuca ovina	20%	5
Firewheel	Gaillardia pulchella	3%	.75
Western yarrow	Achillea millefoium	2%	.5
Prairie coneflower	Ratibida columnifera	4%	1
Blue flax	Linum perenne lewisii	6%	1.5
TOTAL			**25 (drilled)**

SEED APPLICATION

Seeding of native vegetation on the cover systems shall be performed in the spring, after the last frost of the season and prior to the arrival of the summer rains that typically occur in July and August. Seeding shall not be done August 1 to September 30 to avoid germination too close to the first frost, as this can kill the new seedlings.

Revegetation shall be done by first preparing the soil by tilling and applying fertilizer. Care must be taken to ensure the rock/soil surface treatment maintains the desired ratio during this activity. Care must also be taken to ensure the rock/soil surface treatment layer is not mixed deeper into the cover profile. Slow-release organic fertilizers shall be applied as necessary to eliminate any deficiencies of the topsoil. Refer to Table 3.3 for recommended levels of available plant nutrients. Bio-Sol or similar fertilizer shall be applied at up to 1500 lbs/acre. Analyses of cover soils used will dictate the actual fertilizer rate required. Granular humate can be applied at 400-500 lbs/acre if in a hydroseeding slurry and up to 1800 lbs/acre if it is incorporated into the top 4 inches of the soil. Application rates of composted manure vary depending on the source (chicken, horse, etc.) and the type of materials (wood chips, paper, soil, etc.) used to compost. If composted manure is to be applied, nutrient content shall be tested and interpreted before it is used.

Drill seeding shall be the method used to apply the seed mix. Drilling introduces seed directly into the prepared seedbed by machine. Seeding shall be performed by drilling at a minimum rate of 25 Pure Live Seed (PLS) pounds per acre. In areas that limit equipment access, broadcast seeding may be used at a rate of 40 PLS pounds per acre.

3.2 SURFACE TREATMENT

The Performance Assessment for MDA G states that biointrusion and erosion are the two primary mechanisms to control contaminant releases from the site. To address the potential erosion of the cover system, a surface treatment is to be used composed of a mixture of gravel and cover soil. This admixture was designed following the procedure described in Dwyer et al (1999), and Dwyer et al (2006).

The gravel to soil mixture and gravel size was determined based on the most critical drainage section (north-south). With the addition of the gravel/soil admixture to the surface, annual soil loss due to both wind and runoff was estimated to be minimal. The gravel admixture shall include a mixture of 33% gravel by weight. The cover soil shall exhibit the storage capacity and soil nutrients described in section 3.3. Salts in this soil shall also be limited in the cover soil as described in section 3.3. The critical gravel size was determined to be 1.5 inches (3.8 cm) [use gravel between 1.5 inches (3.8 cm) to 3 inches (7.6 cm) in diameter] and the total gravel/soil admixture thickness is to be no less than 18 (0.5 m) inches. The design methodology and procedure with input and output specifics are included in Appendix A. Many of the input parameters required to calculate the specifics of this gravel admixture, surface treatment such as bulk density and percentage of silt/clay in the soil were estimated based on soil amendment

requirements. Furthermore, slopes and slope lengths were estimated based on preliminary contours provided by PRO2SERVE. These estimates will be replaced with measured values during the final design phase as uncertainties are overcome.

Because the gravel is used to control erosion and is subject to weathering, it shall meet the durability requirements described in NUREG (1999). Refer to table 3.2 below.

Table 3.2
Scoring Criteria for Determining Rock Quality (NUREG 1999)

	Weighting Factor			Score										
	Limestone	Sandstone	Igneous	10	9	8	7	6	5	4	3	2	1	0
Specific Gravity (SSD)	12	6	9	2.75	2.70	2.65	2.60	2.55	2.50	2.45	2.40	2.35	2.40	2.25
Absorption (%)	13	5	2	0.1	0.3	0.5	0.67	0.83	1.0	1.5	2.0	2.5	3.0	3.5
Sodium Sulfate (%)	4	3	11	1	3	5	6.7	8.3	10	12.5	15	20	25	30
Abrasion (%)[1]	1	8	1	1	3	5	6.7	8.3	10	12.5	15	20	25	30
Schmidt Hammer	11	13	1	70	65	60	54	47	40	32	24	16	8	0
Tensile Strength (psi)	5	4	10	1400	1200	1000	833	666	500	400	300	200	100	<100

[1] 100 revolutions. Use only ASTM C131 for scoring purposes for consistency with basis for scoring system (DePuy 1965).

Notes:

1. Scores derived from Tables 6.2 and 6.7 of NUREG/CR-2642.
2. Any rock to be used must be qualitatively rated at least "fair" in a petrographic examination conducted by a geologist experienced in petrographic analysis.
3. Weighting Factors are derived from Table 7 of DePuy (1965), based on inverse of ranking of test methods for each rock type.
4. Test methods shall be standardized (e.g., ASTM) and shall be those described in DePuy (1965).

SOIL PLACEMENT

The gravel/soil admixture used as a surface treatment shall be placed in one uncompacted lift if practical. Two lifts are also acceptable provided the bottom lift is not overcompacted due to placement of the top lift. This surface treatment layer shall be placed as dry as possible, but no wetter than the optimum moisture content as determined by ASTM D698. Any excessive compaction this layer receives during placement shall be scarified. The loose-state of placement is to provide the best means for vegetation establishment. Over-compaction is one of the primary problems with revegetation efforts.

3.3 COVER SOIL

The cover soil layer beneath the gravel/soil admixture shall be a minimum of 3.5 feet (1 m) of amended soil meeting the water storage capacity properties of a typical sandy loam soil (ROSETTA 2000). The cover soil including the soil in the surface treatment (gravel admixture) must possess adequate storage capacity to retain infiltrated water until that water can be removed via ET. Furthermore, this soil must be able to provide a quality rooting medium to maintain native vegetation. This involves ensuring the soil has acceptable levels of plant available nutrients and its salt content is below acceptable levels.

The depth of the cover soil was determined based on water storage requirements to meet RCRA-equivalency. That is, the depth of soil required to minimize flux per 40CFR264.310. The MDA G PA stated that as long as the flux through the cover was less than 1 mm/year, significant risk due to radionuclides would be mitigated and thus DOE Order 435.1 would be satisfied. Modeling using UNSAT H (Fayer 2000) was performed to determine the minimum thickness required to provide adequate storage capacity for an upper boundary condition consisting of the wettest decade in recorded history in Los Alamos (1985 to 1994).

Average hydraulic properties (Shaw 2006) from the TA61 soil borrow site were used as input parameters. The modeling output determined that a depth greater than 6.6 ft (2 m) would be required to minimize flux largely due to the lack of water storage capacity in the TA61 soils (Figure 3.2). The TA61 soils consist of crushed tuff and were classified as a sandy loam, but are on the coarser side of sandy loam soils. Another modeling exercise was performed utilizing typical sandy loam hydraulic properties (ROSETTA 2000) to ascertain if this soil type would decrease the soil depth requirement. This output (Figure 3.3) determined that approximately 1.5 m (5ft) of typical sandy loam soil would minimize flux to a point of diminishing returns (Dwyer et al 2006).

The depth of the surface treatment was determined to be a minimum of 1.5 ft (0.5 m). Therefore the additional cover soil depth required to minimize flux is 3.5 ft (1 m). This

provides for a minimum cover soil depth of 5 ft (1.5 m). A third modeling exercise was performed to capture the entire conceptual design that includes all layers above the existing subgrade. This modeling output determined that flux through the cover will be negligible with the conditions modeled. It is important to note that the inclusion of a filter medium above the bio-barrier and the inclusion of a bio-barrier create a capillary barrier. Details of the modeling performed including specific input and output parameters are included in Appendix C.

Figure 3.2
TA 61 Soil: Point of Diminishing Returns (greater than 200 cm)

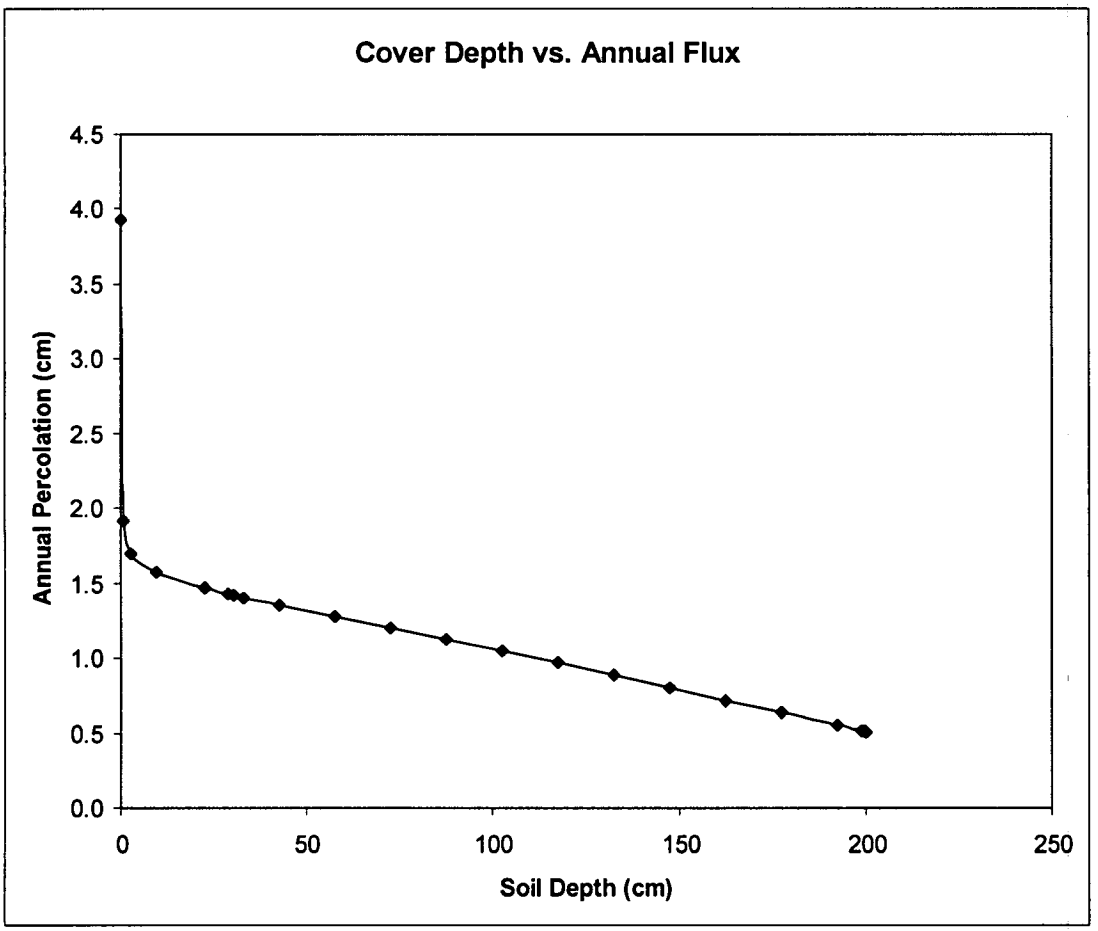
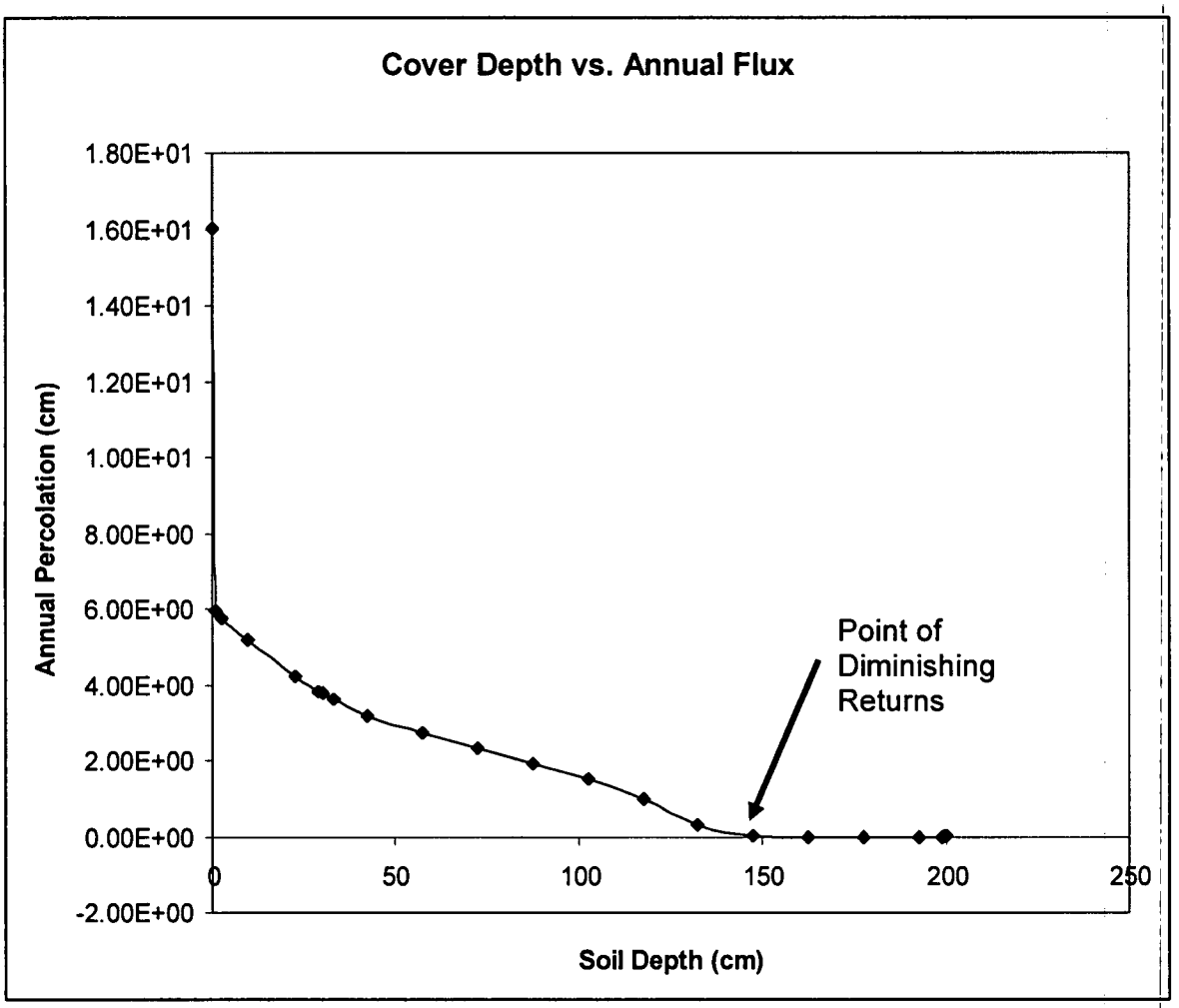


Figure 3.3
Typical Sandy Loam Soil: Point of Diminishing Returns (1.5 m)



The amendments shall ensure the cover soil is capable of maintaining a desired stand of native vegetation. The plant nutrients should allow for the final amended soil to meet the requirements listed in the following table.

Table 3.3
Recommended Available Plant Nutrients for Cover Soil

Test	Limits
CEC	Greater than 15
Percent organic matter	Greater than 2% (g/g)
N	Greater than 6 parts per million (ppm)
P	4 to 7ppm
K	61 to 120 ppm

Because it is unknown at this time where the amendments to the TA 61 will come from, it is also important to verify that the cover soils have tolerable quantities of salts. That is, the salt content in the soils shall be below levels that would hinder the establishment and growth of native vegetation. The final amended soils shall comply with the requirements outlined in the following table.

Table 3.4
Recommended Limitations of Salt in Cover Soil

Test	Limits
EC	Less than 8 µS/cm
SAR	Less than 6
ESP	Less than 15% (g/g)
$CaCO_3$	Less than 15% (g/g) – to 3-ft (91 cm) depth of cover; No limit below 3 ft (91 cm)

SOIL PLACEMENT

An important aspect involved with the construction of a soil cover system is that the soils are placed in a uniform manner. This will help limit preferential flow through the cover. Dwyer (2003) describes the impact of preferential flow in landfill covers. Preferential flow cannot be avoided, but necessary precautions shall be employed to ensure it is minimized. An important feature of the design specifications will involve determining an acceptable density range for installation of the cover soils. Furthermore, to increase the initial storage capacity of the cover system and mitigate the potential for desiccation cracking, the soils will be placed as dry as possible, but no greater than the optimum moisture content as determined by ASTM D698. The acceptable density and moisture content placement range is described as the acceptable compaction zone (ACZ).

The ACZ (Figure 3.4) is unknown as of the date of this report because the desired soil will require amendment to meet the performance objectives of the cover system. Therefore, the process involved in determining this ACZ is briefly described here. For further details refer to Dwyer et al (2006).

Determination of the ACZ for placement of cover soil:

1. Cover soil shall be placed at the goal density. The goal density is best determined from the borrow soil's in situ density. That is, over an extended period of time, a given soil will move toward its "natural" density state. Therefore, it is the goal of the soil installation to place the soil at a density that is as close to that "goal" density as possible from the onset. In this case because the soil will be amended, the goal density shall be assumed to be between 85 to 90% of the maximum dry density (MDD) as determined by ASTM D698.

2. Determine a standard proctor curve for the amended soil used per ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to obtain the respective maximum dry density (MDD) and optimum moisture content.

3. The allowable dry unit weight or soil density during construction shall then be the goal density plus or minus 5 pounds per cubic foot (pcf) (metric units).

4. The cover soils shall be placed as dry as possible not to exceed the optimum moisture content per ASTM D 698 derived for each borrow soil used. Installing soil dry will provide for a maximum initial water storage capacity in the cover and minimize the potential for desiccation cracking. This is particularly important when using clays (Suter et al. 1993, Dwyer 2003). This moisture

content is applicable for all soils in the cover system, including the upper foot (31 cm) of the interim cover or subgrade.

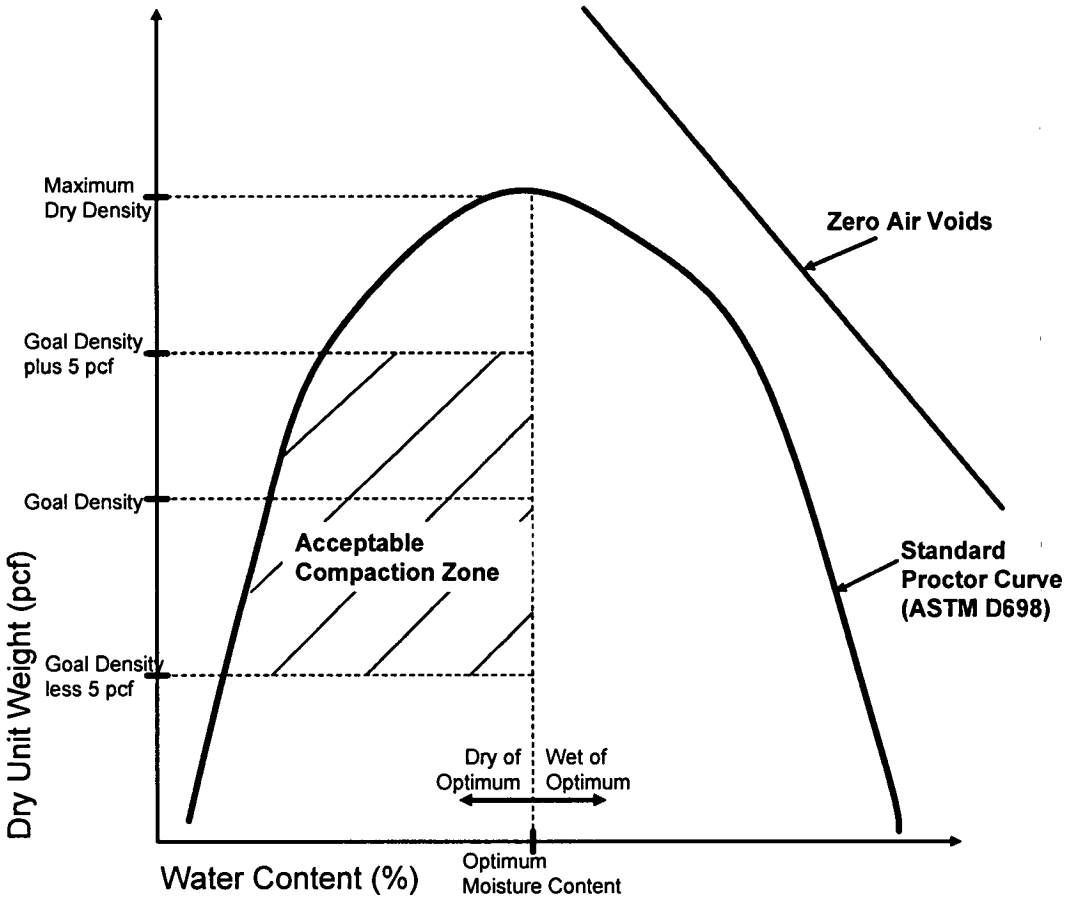


Figure 3.4. ACZ for Soil Placement shown in Hatch Marks

3.4 FILTER MEDIUM

A filter medium composed of sand and /or gravel shall be placed above the bio-barrier, between the bio-barrier and the overlying cover soil layer. This layer is designed to prevent the mixing of soil layers and meet specified filter criteria. The depth of this layer is to be determined in the field and will be the minimum depth required to completely cover the bio-barrier layer and provide a smooth and continuous surface layer for placement of the cover soil. For estimating purposes, this layer shall be assumed to be 6-inches (15 cm) thick.

The Performance Assessment performed for MDA G stated that the two primary mechanisms of concern for transport of contaminants from the site were biointrusion and erosion. There was significant uncertainty with regard to the analysis of

biointrusion and erosion in the PA as well. Burrowing animals and roots are both of concern because they can bring contaminants to the surface. A bio-barrier is included in the conceptual design to minimize the potential for burrowing animals and roots from accessing the buried source materials. The bio-barrier is composed of large cobble. To prevent the mixing of finer cover soil into the cobble layer, a filter layer is included. A geotextile or other geosynthetics were not used as a filter fabric because they have limited performance lives that are significantly less than the 1000 year performance criteria (DOE Order 435.1) applied to the site.

The filter medium will be composed of coarse material (sand and/or gravel) that meet specific filter criteria to prevent the mixing of materials. These criteria are as follows:

$$\frac{D_{15}}{d_{85}} \leq 5 \qquad \textbf{Equation 3.1}$$

where:

D_{15} = particle size of the coarse soil for which 15% of the particles are finer,

d_{85} = particle size of the fine soil for which 85% of the particles are finer.

The filter design criteria summarized in Table 4.2-3 (DOE 1989) as well as the following requirements shall also be used:

- The filter material shall pass the three-inch sieve for minimizing particle segregation and bridging during placement. Smaller maximum particle sizes may be specified if practical. Also, filters must not have more than 5% passing the No. 200 mesh sieve to prevent excessive movement of fines in the filter.

- Filter material shall be reasonably well graded throughout the in-place layer thickness.

A capillary barrier will be formed with the inclusion of the filter medium beneath the fine cover soils. A second capillary barrier may also be formed between the filter medium and the cobble bio-barrier. Consequently, all requirements for a capillary barrier must be followed as outlined in Dwyer et al (2006). Of particular concern are long slope lengths and consequently the diversion capacity of the capillary barrier. The interface between the materials forming the capillary barrier(s) shall maintain a smooth and continuous interface. Discontinuities in this interface may result in significant preferential flow and must be prevented.

3.5 BIO-BARRIER

As stated in section 3.4, a bio-barrier is included in the cover profile to minimize the intrusion of flora and fauna into the buried source materials. The Performance Assessment for MDA G stated that biointrusion is a significant concern as a transport vector for contaminant release from the site. It is of particular concern for radionuclides that pose a risk to the surrounding environment for longer periods of time. A minimum 1-foot (0.3 m) thick layer of cobble with a minimum diameter of 6-inches (15 cm) will be included in the cover profile. This layer will minimize the potential burrowing of the animal of most concern at the site - gophers; as well as the intrusion of woody roots from plants such as shrubs, pinon, and juniper.

Biointrusion in a landfill cover system refers to the flora and fauna (including insects) interactions or intrusion into the cover system. Biointrusion is important in that it can represent a mechanism leading to vertical transport of contaminants to the ground surface via plant root uptake or soil excavation by burrowing animals and insects. Furthermore, biointrusion can lead to increased infiltration and preferential flow of surface water through the cover system as well as contribute to the change in the soil layer's hydraulic properties. However, the increased soil moisture resulting from burrowing effects on infiltration can actually stimulate increased plant growth, leading to an increase in plant transpiration (Hakonson 2000, Gonzales et al. 1995) and a resulting net decrease in flux.

Vertical transport by biota may be small over a short time scale; however, over many decades these processes may become dominant in mobilizing buried waste (Hakonson 1998). Burrowing by animals and insects have the potential to access buried waste several meters below ground surface, which may lead to chemical and radiation exposures to organisms and physical transport of waste upward in the soil profile to ground surface, to biota, and across the landfill surface to offsite areas. These processes are enhanced by erosion (wind/water), transport of animals moving on/off the landfill, deposition of soil particles on biological surfaces from rain splash and wind re-suspension, and wind transport of senescent vegetation to offsite areas.

There are many studies, many of which are summarized in Dwyer et al (2006) that discuss the effects of biointrusion on cover systems and waste sites. Several specifically applicable to MDA G are summarized in Appendix B.

3.6 SUBGRADE/INTERIM COVER PREPARATION

MDA G currently has an interim soil cover over it. This site will require being cleared and grubbed as well as some regrading including cut/fill operations to bring the site to grade prior to placement of the final cover system. The elevations and grades shall comply with those shown on the project drawings provided by others. At a minimum depth, the upper foot (31 cm) of the interim cover or subgrade shall be scarified and recompacted prior to placement of the bio-barrier. This recompacion shall produce a density not less than 95% of the maximum dry density as determined by ASTM D698.

Furthermore, the moisture content shall be placed dry of the optimum moisture content as determined by ASTM D698.

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47.

APPENDIX A
GRAVEL ADMIXTURE DESIGN

DESIGN RAINFALL EVENT

The rainfall intensity value used to calculate the runoff volume was determined using data supplied by the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) Hydrometerological Design Studies Center and is available on the internet on NOAA's Precipitation Frequency Data Server (http://hdsc.nws.noaa.gov/hdsc/pfds/sa/nm_pfds.html). The data from NOAA Atlas 14 for Los Alamos, NM was used whereby the 30 minute precipitation frequency estimate for a 1000 return period is 2.46 inches (6.25 cm). The 30 minute time of concentration is conservative for any contributory area less than 50 acres (20 hectares) (Lindeburg 1989).

RUNOFF PREDICTION

The "rational method" was used to estimate runoff volumes. This method is commonly used in civil engineering applications and is a method approved by DOE (1989) for design of cover systems for sites regulated by the Uranium Mill Tailings Radiation Control Act of 1978 (i.e., UMTRA sites). Refer to "LANL Engineering Standards Manual," Section G20 (http://engstandards.lanl.gov/engrman/3civ/pdfs/Ch3_G20-R1.pdf). The rational method is based on the assumption that rainfall occurs uniformly over the watershed at a constant intensity for a duration equal to the time of concentration.

Using the rational method, the peak rate of runoff, (Q), in cubic feet per second (cfs) (runoff is actually in acre-inches/hour but is rounded to cfs is given by the following expression:

$$Q = C\ I\ A \qquad \textbf{Equation A.1}$$

where:

C = Runoff coefficient (dimensionless)

I = Rainfall intensity (in/hr)

A = Surface area that contributes to runoff (acres)

The value for "I" in this case was 2.46 inches/hour (6.25 cm/hr). For storms with return periods longer than 100 years, DOE recommends the use of C = 1.0 (DOE 1989). The surface area was calculated based on the assumed configuration shown in figure A.1 where L is the critical slope length. Slopes and slope lengths were estimated from proposed contoured plans of the MDA G conceptual cover. Because most of the drainage areas from the cover were irregularly shaped, the slopes and slope lengths were estimated to match the area configuration described here.

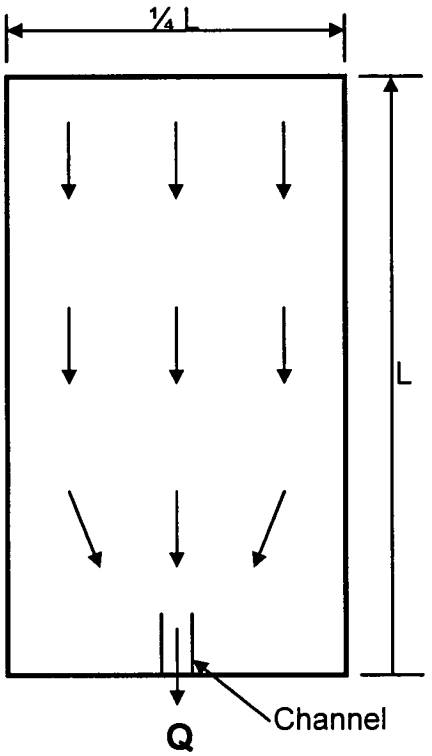


Figure A.1
Contributory area for gully formation

Channel Geometry

The channel geometry shown in Figure A.2 is that assumed for the gully formation.

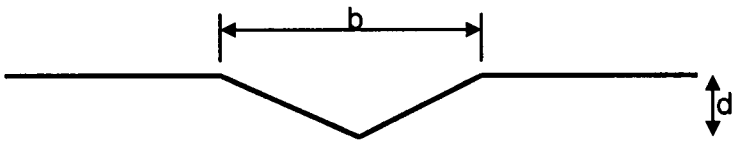


Figure A.2
Channel geometry

The geometry of the channel that forms is based on regression equations developed from analysis of a large number of channels (Simon, Li & Assoc. 1982). The channel width is given by:

$$b = 37 (Q_m^{0.38} / M^{0.39})$$ **Equation A.2**

where:

b = width of flow (ft);

Q_m = mean annual flow (cfs);

M = percentage of silts and clays in soils.

The mean annual flow (Q_m) is assumed to be between 10% and 20% of the peak rate of runoff (Q) (Dwyer et al. 1999). In this case 20% was conservatively used.

For the given discharge point of geometry, the hydraulic depth (d_h), defined as the flow cross-sectional area divided by the width of water surface, is half of the gully depth (d).

For flows at the critical slope:

$$b = 0.5\, F^{0.6}\, F_r^{-0.4} Q^{0.4} \qquad \textbf{Equation A.3}$$

where:

F = width to depth ratio = b/dh;

F_r = Froude Number ≈ 1.0.

These equations were solved simultaneously to yield the channel width and depth for the given peak flow rate and percentage of silt and clay. Refer to Table A.1 for the summary of calculations performed.

Incipient Particle Size

The incipient particle size is the particle that is on the brink of movement at the assumed conditions. Any increase in the erosional forces acting on the particle, due to an increase in velocity or slope, for example, will cause its movement. This incipient particle size (D_c) was calculated using the Shield's Equation:

$$D_c = \tau / F_s(\gamma_s - \gamma) \qquad \textbf{Equation A.4}$$

where:

τ = total average shear stress (pcf);

F_s = Shield's dimensionless shear stress = 0.047;

γ_s = specific weight of soil (pcf);

γ = water density = 62.4 pcf.

The total average shear stress is given by:

$$\tau = \gamma\, d_h\, S \qquad \textbf{Equation A.5}$$

where:

S = slope (ft/ft).

d_h = hydraulic depth (ft)

Depth of Scour and Armoring Required

The incipient particle size defines the maximum size of particle that will be eroded for a given set of conditions. The material larger than the incipient particle size will not be displaced or eroded, and can form an armoring that will protect the channel from further erosion from similar or lesser storm events.

The depth of scour (Ys) (Figure A.3) to establish an armor layer is given by (Pemberton and Lara 1984):

$$Y_s = Y_a [(1/P_c)-1] \qquad \textbf{Equation A.6}$$

where:

Y_s = scour depth;

Y_a = armor layer thickness;

P_c = decimal fraction of material coarser than the incipient particle size.

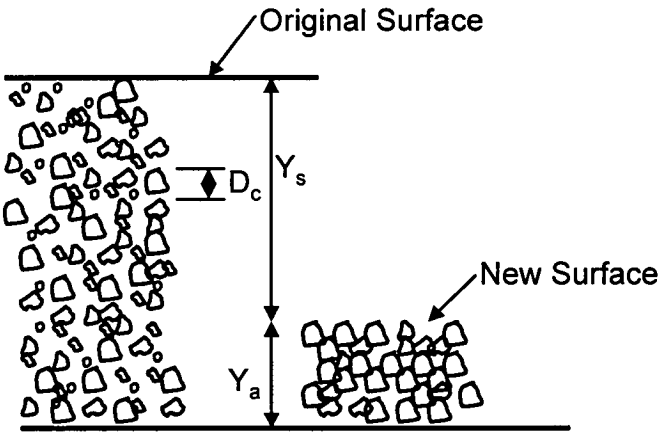


Figure A.3
"Desert Pavement" development

Table A.1 summarizes the gravel admixture calculations performed including critical input and output parameters. The slopes and slope lengths were estimated based on approximate drainage paths and contributory areas as they relate to that assumed in this set of calculations. The first column describes the section that is related to the project drawings produced by PRO2SERVE (not part of this report).

TABLE A.1
GRAVEL ADMIXTURE CALCULATIONS SUMMARY

Section	C Value	I (in/hr)	S (%)	Slope Length (ft)	Q (cfs)	Q_m (cfs)	% silt/clay[1]	Bulk Density[1] (pcf)	Critical Gravel Size [2] (in)	Ratio	Total depth req'd (inches)
DA1	1.0	2.46	2.7	350	1.73	0.17	20	115	0.75	33%	9
DA2	1.0	2.46	3	500	3.53	0.35	20	115	1.25	33%	15
DA3	1.0	2.46	4	375	1.99	0.20	20	115	1.25	33%	15
DA4	1.0	2.46	2.8	800	9.04	0.90	20	115	1.50	33%	18
DA5	1.0	2.46	3.5	500	3.53	0.35	20	115	1.25	33%	15
DA6	1.0	2.46	2	750	7.94	0.79	20	115	1.00	33%	12
DA7	1.0	2.46	2	750	7.94	0.79	20	115	1.00	33%	12

[1] assumed values based on amendments and gravel mixture
[2] value rounded up to nearest quarter inch

APPENDIX B
BIOINTRUSION STUDIES

Plutonium is the best example of a radionuclide whose transport to animals in arid ecosystems is dominated by physical processes. Data from many field sites and source conditions show that gut availability of plutonium and other contaminants bound to soil in a variety of animals including rodents, deer and cattle is very low (gut to blood transfer $<10^{-5}$) leading to very low concentrations of contaminant in internal tissues and organs (Smith, 1977; Moore et al., 1977; Hakonson and Nyhan, 1980; Arthur et al., 1987). Highest concentrations of most soil contaminants in dry, dusty environments are usually found in tissues exposed to the external environment. Those tissues include the pelt, gastro-intestinal tract, and lungs. At Los Alamos, about 96% of the plutonium body burden in rodents from the canyon liquid waste disposal areas was in the pelt and gastro-intestinal tract (Hakonson and Nyhan, 1980).

Because soil passes through the gastro-intestinal tract of free-ranging animals on a daily basis, there is a potential to redistribute soil radionuclides across the landscape. Studies at Nevada Test Site with cattle (Moore et al., 1977), at Rocky Flats Plant with mule deer and small mammals (Little, 1980; Arthur, 1979), and at Idaho National Engineering Laboratory with small mammals and coyotes (Arthur and Markham, 1983; Arthur et al., 1980) demonstrate that horizontal (and vertical in the case of burrowing animals) redistribution of soil plutonium does occur as animals move within and outside contaminated areas. However, the magnitude of this transport was shown to be very small over the short-term (Arthur, 1979; Arthur and Markham, 1983; Arthur et al., 1980).

There are circumstances where animal transport of soil contaminants can assume more importance. For example, fission product sludge containing 90Sr and 137Cs in a salt form was released to unlined cribs at Hanford and the cribs were backfilled with clean soil. A large animal, probably a coyote or badger then burrowed down to the sludge and created direct access for other animals seeking the salts including jackrabbits (O'Farrell and Gilbert, 1975). Jackrabbits ingested the radioactive salts, became contaminated and then excreted 90Sr on the ground surface. Levels of 90Sr in excreta were found over a 15 km^2 surface area (O'Farrell and Gilbert, 1975). This incident with 90Sr and jackrabbits was a special case that involved liquid waste sludge disposal trenches that were not adequately covered.

Potentially more soluble strontium and cesium transport to animals in arid ecosystems involves a combination of physical and physiological processes. The more tightly bound these radionuclides are to soil (related to clay content of soil and local climate); the more their transport will be governed by soil particle transport. Data on Sr90 and Cs137 in small mammals from the Nevada Test Site (Romney et al., 1983) and at a burial ground at Idaho National Engineering Laboratory (Arthur et al., 1987) show relatively high concentrations of these radionuclides in lung, pelt and gastro-intestinal tract similar to plutonium. This suggests that physical transport of these more "soluble" radionuclides is also important as with plutonium. The bioavailability of radionuclides such as cesium and strontium will depend on chemical form, local environmental conditions, and the structure and function of the relevant food webs.

Tritium would be one of the few exceptions to the general observation that physical transport mechanisms dominate in the transport of soil surface contaminants to biota. Uptake by roots or sorption through the leaf surface would dominate in tritium transport to vegetation. Levels of tritium in animals would reflect levels in the source (i.e.,

concentration ratios are 1 or less) since tritium is not concentrated as it moves through abiotic and biotic pathways. Furthermore, tritium in vegetation is available to nectivorous organisms such as honeybees as well as herbivores. While tritium is readily transported through ecosystems, it is rapidly turned over in biological systems at rates corresponding to water turnover in these systems. In humans, body water turnover is about 3 days (RHH, 1970).

Although vegetation is very important in controlling erosion and percolation in landfill covers (Nyhan et al., 1984), deeply penetrating plant roots have the potential to access buried waste and bring plant available constituents including landfill contaminants to the surface of the site (Klepper et al., 1979; Foxx et al., 1984; Tierney and Foxx, 1987). Contaminants such as tritium can be incorporated within plant tissue and enter the food web of herbivorous or nectivorous organisms. For example, at Los Alamos National Laboratory tritium transport away from a controlled low-level waste site occurred via the soil moisture/plant nectar/honey bee/ honey pathway (Hakonson and Bostick, 1976). As another example, deep-rooted Russian Thistle (Salsola kali) growing over the waste burial cribs at Hanford penetrated into the waste, mobilized 90Sr, and then transferred it to the ground surface. The contaminated surface foliage was transferred away from the cribs when the matured Thistle (tumbleweeds) blew away from the site (Klepper et al., 1979). Two mechanisms for soil contaminant transport to terrestrial plants are absorption by roots and deposition of contaminated soil particles on foliage surfaces. Field studies suggest that deposition of soil particles on foliage surfaces is a major transport mechanism for soil associated contaminants under many arid site and contaminant source conditions (Romney and Wallace, 1976; Romney et al., 1987; White et al., 1981; Arthur and Alldredge, 1982).

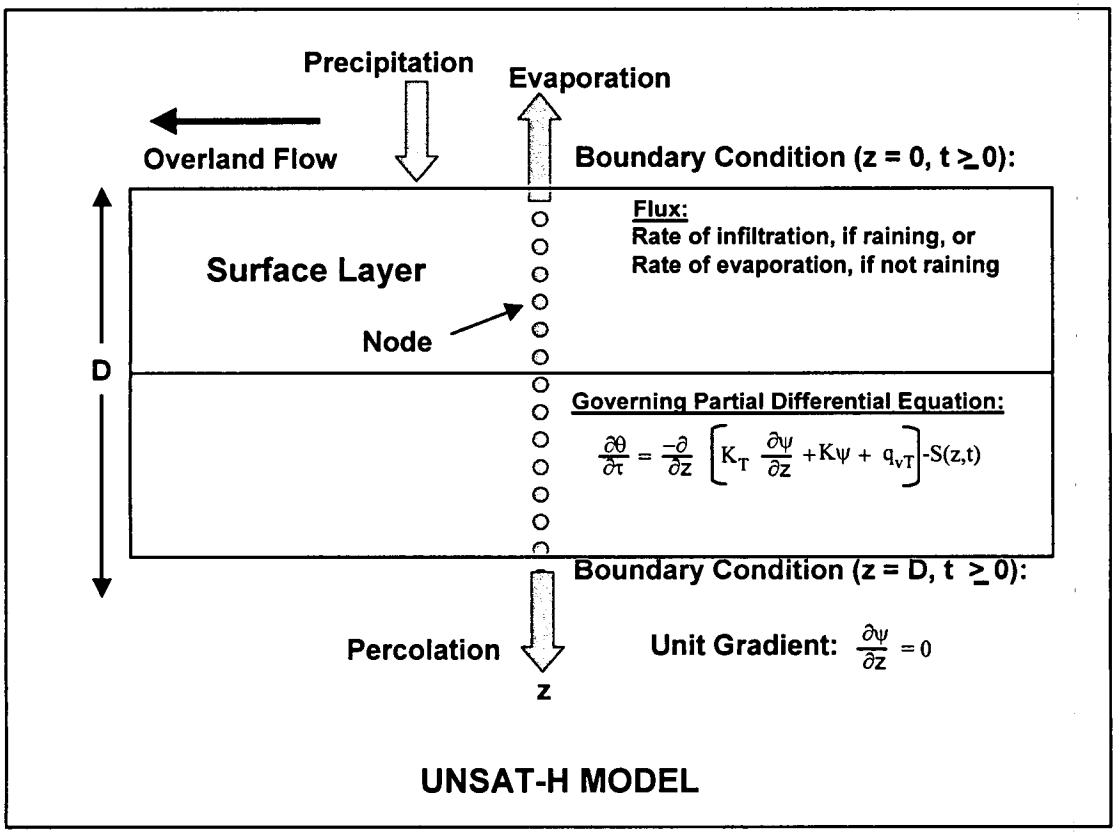
APPENDIX C
MODELING

Overview of UNSAT-H

UNSAT-H has been used to design many recent alternative earthen cover designs (Dwyer 2003). Unlike most unsaturated flow programs, UNSAT-H was specifically developed for the evaluation of earthen covers. UNSAT-H is a one-dimensional, finite-difference computer program developed at the Pacific Northwest National Laboratory by Fayer and Jones (1990). UNSAT-H can be used to simulate the water balance of earthen covers as well as soil heat flow (Fayer 2000). UNSAT-H simulates water flow through soils by solving Richards' equation and simulates heat flow by solving Fourier's heat conduction equation.

A schematic illustration showing how UNSAT-H computes the water balance is shown in Figure C.1. UNSAT-H separates precipitation falling on an earthen cover into infiltration and overland flow. The quantity of water that infiltrates depends on the infiltration capacity of the soil profile immediately prior to rainfall (e.g., total available porosity). Thus, the fraction of precipitation shed as overland flow depends on the saturated and unsaturated hydraulic conductivities of the soils characteristic of the final cover. If the rate of precipitation exceeds the soil's infiltration capacity, the extra water is shed as surface runoff. UNSAT-H does not consider absorption and interception of water by the plant canopy, or the effect of slope and slope-length when computing surface runoff.

Figure C.1
SCHEMATIC REPRESENTATION OF WATER BALANCE COMPUTATION BY UNSAT-H (modified from Khire 1995)



Water that has infiltrated a soil profile during an UNSAT-H simulation moves upward or downward as a consequence of gravity and matric potential. Evaporation from the cover surface is computed using Fick's law. Water removal by transpiration of plants is treated as a sink term in Richards' equation. Potential evapotranspiration (PET) is computed from the daily wind speed, relative humidity, net solar radiation, and daily minimum and maximum air temperatures using a modified form of Penman's equation given by Doorenbos and Pruitt (1977). Soil water storage is computed by integrating the water content profile. Flux from the lower boundary is via percolation. UNSAT-H, being a one-dimensional program, does not compute lateral drainage.

UNSAT-H Input Parameters

A set of input parameters were developed for simulations using UNSAT-H for the given cover profiles. These parameters were developed based on field and laboratory measurements, values from the literature, and expert opinion.

Model Geometry

The model geometry was based on the depth of the cover profile modeled.

Boundary Conditions

The MDA G site in Los Alamos, NM is located in a dry environment where the climate's demand for water referred to as PET far exceeds the actual supply of water or precipitation (Figure 2.2). These are ideal conditions for deployment of an earthen soil cover such as an ET Cover.

The flow of water across the surface and lower boundary of the cover profile is determined by boundary condition specifications. The UNSAT-H program partitions PET into potential evaporation (E_p) and potential transpiration (T_p). Potential evaporation is estimated or derived from daily weather parameters (Fayer 2000). Potential transpiration is calculated using a function (Equation C.1) that is based on the value of the assigned leaf area index (LAI) and an equation developed by Ritchie and Burnett (1971) as follows:

$$T_p = PET\,[a + b(LAI)^c] \text{ where } d \leq LAI \leq e \qquad \textbf{Equation C.1}$$

Where:

a,b,c,d, and e are fitting parameters;
a = 0.0, b = 0.52, and c = 0.5, d = 0.1, and e = 2.7 (Fayer 2000)

The UNSAT-H program partitioned PET into E_p and T_p. PET was derived from daily weather parameters obtained from this weather data. T_p was calculated using a function developed by Equation 1 above.

The lower boundary condition was a unit gradient. With the unit gradient, the calculated drainage flux depended upon the hydraulic conductivity of the lower boundary node. The unit gradient corresponded to gravity-induced drainage and was most appropriate when drainage was not impeded.

Upper Boundary Condition - Climate Data

The surface boundary condition during evaporation was modeled as a flux that required daily weather data. The wettest decade on record was used (1985 to 1994) from Los Alamos National Laboratory (weather.lanl.gov). The annual precipitation totals for this decade are summarized in Tables C.2 to C.4. Because the RCRA requirements to minimize flux was the regulatory driver for determining the storage capacity requirements of the cover profile, it was determined that the wettest decade on record would provide a conservative measure to evaluate the RCRA-equivalency of the cover profile.

VEGETATION DATA

Vegetation will generally increase ET from the cover because a plant's matric potential or suction is orders of magnitude higher than that of the soil (Figure C.2). The input parameters representing vegetation include the LAI, rooting depth and density, root growth rate, the suction head values that corresponds to the soil's field capacity, wilting point, and water content above which plants do not transpire because of anaerobic conditions. The onset and termination of the growing season for the site are defined in terms of Julian days. The root length density (RLD) is assumed to follow an exponential function such as that defined in Equation C.2:

$$RLD = a \exp(-bz) + c \qquad \textbf{Equation C.2}$$

where:
a,b, and c are fitting parameters
z = depth below surface

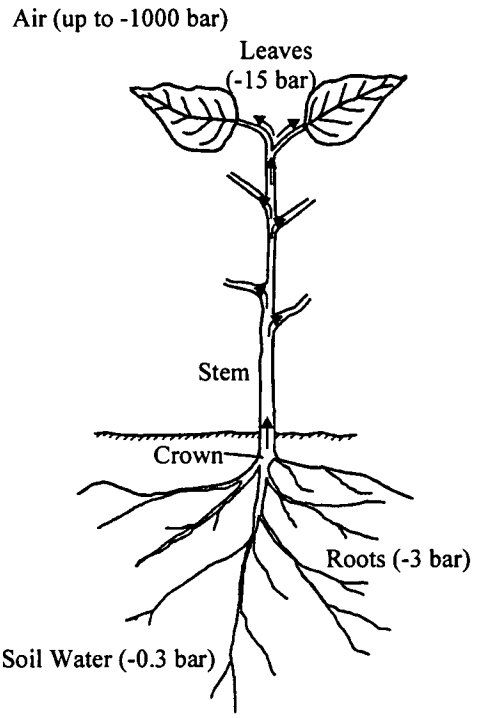
The parameters used for the RLD functions in Equation C.2 were: a = 0.315, b=0.0073, and c = 0.076 (Fayer 2000). The time required for maximum rooting depth establishment was set at full depth beginning on day 1. The rooting depth was set at 6.6-feet (200 cm) (Foxx et al 1984). An average LAI of 0.65 was used (McDowell et al 2005). This value represents an average of values reported for the site of 0.3 and 1.0. The onset and termination of the growing season for the site were Julian days 74 and 288, respectively (EIS, Appendix E). The LAI was transitioned from 0 to 0.65 starting with Julian day 74 to 90. Day 91 through 270, the full LAI equal to 0.65 was utilized. The LAI was then transitioned down from 0.65 to 0 from Julian day 271 to 288. This was conservative since it is realistic that plants can transpire longer than indicated at this site. An average percent bare area of 84.4% was used. This value represents an average of reported values for the area of 91.5% and 77.3 % (Tierney and Foxx 1982). The relative humidity for the site was set at 51% based on the average conditions for Los Alamos (Los Alamos Climatology internet site).

SOIL PROPERTIES RELATED TO VEGETATION

Suction head values corresponding to the wilting point, field capacity, and a head value corresponding to the water content above which plants do not transpire because of anaerobic conditions were defined. Matric potential or suction heads are generally written as positive numbers, but in reality are negative values. Consequently, the higher the value, the greater the soil suction. The maximum water content a soil can hold after all downward drainage resulting from gravitational forces is referred to as its field capacity. Field capacity is often arbitrarily reported as the water content at about 330 cm of matric potential head (Jury et al, 1991). Below field capacity, the hydraulic conductivity is assumed to be so low that gravity drainage becomes negligible and the soil moisture is held in place by suction or matric potential.

Not all of the water stored in the soil can be removed via transpiration. Vegetation is generally assumed to reduce the soil moisture content to the permanent wilting point. The wilting point was conservatively assumed to be 20,000 cm (typical for native grasses) used although the shrubs present at the site could remove water from the soil to a suction of 100,000 cm (Figure C.2). Evaporation from the soil surface can further reduce the soil moisture below the wilting point toward the residual saturation, which is the water content at an infinite matric potential.

Figure C.2
TYPICAL SOIL-PLANT-ATMOSPHERE WATER POTENTIAL VARIATION
(Hillel 1998)



Soil Properties

Soil hydraulic properties were obtained from laboratory testing of soil samples collected from the TA61 borrow site (Shaw 2006). The saturated hydraulic conductivity of the soils were obtained using flexible wall permeameters in accordance with ASTM D 5084. Unsaturated soil properties were obtained from data using pressure plates and water columns (depending on the suction values) to develop values of water content as a function of pressure head (ASTM D 6836). These data were then used as input into the RETC code (van Genuchten et al 1991) to compute curve fitting parameters used to estimate the moisture characteristic curve (van Genuchten 1980). The Mualem conductivity function was used to describe the unsaturated hydraulic conductivity of the soils. The van Genuchten 'm' parameter for this function is assumed to be'1-1/n'; 'n' being one of the established van Genuchten parameters. The initial soil conditions are expressed in terms of suction head values that correspond to the average moisture

content between each soil layer's field capacity and permanent wilting point determined from each respective soil layer's moisture characteristic curve. The soil properties used as input parameters are summarized in Table C.1.

Table C.1
COVER SOIL PROPERTIES

Cover Profile	Soil Layer Type	Soil Layer Depth	van Genuchten Parameters				Sat. Hydr. Cond. (cm/hr)
			θ_s	θ_r	α	n	
TA61 BORROW SOILS USED (BH1 @ 15 TO 25-FT DEPTH)							
Cover Soil Only	Cover Soil	6.6 ft (200 cm)	0.2454	0	0.0027	1.6175	17.64
TYPICAL SANDY LOAM (ROSETTA 2000)							
Cover Soil Only	Cover Soil	6.6 ft (200 cm)	0.387	0.039	0.0267	1.4488	1.5951
CONCEPTUAL COVER DESIGN WITH TYPICAL SANDY LOAM							
Conceptual Cover Profile	Gravel/ Soil Admixture	1.5 ft (46 cm)	0.383	0.039	0.0267	1.4488	1.5951
	Cover Soil	3.5 ft (108 cm)	0.383	0.039	0.0267	1.4488	1.5951
	Filter Layer	6 in (15 cm)	0.34	0.026	0.0597	2.81	65.52
	Bio-barrier	1 ft (31 cm)	0.374	0.017	2.5075	2.47	15912.0

Modeled Percolation

Percolation results from the redistribution of water through a soil profile in response to gradients formed by differences in the energy state of the water. Flux is defined as the volume flow rate per unit area (Jury et al 1991) through a given soil profile. Other mechanisms that might induce water redistribution, such as geothermal gradients and barometric pressure fluctuations, have been shown to be minor contributors to water flow in most instances (Jones 1978, Gee and Simmons 1979). Tables C.2 TO C.4 present predicted annual flux values for the modeled cover profiles under the typical or average annual precipitation volumes.

Table C.2 summarizes a monolithic soil profile modeled with hydraulic soil properties from the TA61 borrow site. The soil sample that possessed a saturated hydraulic conductivity closest to the overall average of all soil samples tested form the site was used. The overall average was calculated to be 6.6E-03 cm/sec. This soil sample was BH1 taken from a depth of 15 to 25-ft. The saturated hydraulic conductivity for sample BH1 was 4.9E-03 cm/sec. As seen in figure 3.2, the Point of Diminishing Returns (Dwyer et al 2006) was greater than 6.6 ft (200 cm). Consequently, it was determined that the soil would require amendment to improve its water storage capacity and thus decrease the soil depth required. The soil amendment will also provide for adequate plant available nutrients.

The TA61 soils were characterized as sandy loams. However, they were relatively coarse sandy loams. Table C.3 summarizes a monolithic soil profile that used a typical sandy loam with somewhat better storage capacity than the TA61 soils. This value was obtained from ROSETTA (2000). These soils are commonly found throughout New Mexico. These soils significantly improved the cover performance by producing a Point of Diminishing Returns at about 5 ft (1.5 m).

Table C.4 summarizes the output from the actual conceptual cover profile that includes all layers. The addition of the bio-barrier created a capillary barrier. The final predicted flux through the cover profile utilizing a sandy loam soil overlying a coarse material was zero.

Table C.2.
WETTEST DECADE CLIMATE DATA WITH TA61 SOILS

Cover Depth (cm)	Annual Flux (cm/year)										
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
50	5.53	4.11	3.14	4.68	3.17	3.92	6.01	0.98	2.05	4.43	3.80
100	2.84	1.70	1.42	2.37	1.31	1.51	3.06	0.47	1.22	2.04	1.79
150	1.12	0.56	0.71	0.95	0.40	0.06	1.19	0.30	0.49	0.72	0.65
200	.05	0.03	0.03	0.03	0.29	0.26	0.03	0.04	0.02	0.02	0.08
Precipitation (cm)	49.76	47.48	40.34	42.55	35.74	43.31	47.78	32.11	32.54	43.05	41.47

Table C.3.
WETTEST DECADE CLIMATE DATA WITH TYPICAL SOILS FOR SANDY LOAM (ROSETTA 2000)

Cover Depth (cm)	Annual Flux (cm/year)										
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
50	4.31	3.37	2.94	4.28	1.69	3.03	5.39	1.19	2.07	3.64	3.20
100	7.16E-2	1.13	1.59	1.94	8.43E-1	8.17E-1	2.31	1.37	6.15E-1	7.31E-1	1.14
150	0	0	5.41E-4	9.12E-2	5.33E-1	1.69E-1	1.96E-1	7.70E-1	2.29E-1	9.21E-2	2.08E-1
200	0	0	0	0	0	6.93E-6	6.72E-6	7.25E-6	9.14E-6	1.71E-5	4.71E-6
Precipitation (cm)	49.76	47.48	40.34	42.55	35.74	43.31	47.78	32.11	32.54	43.05	41.47

Table C.4.
WETTEST DECADE CLIMATE DATA WITH CONCEPTUAL COVER PROFILE THAT UTILIZED TYPICAL SOILS FOR SANDY LOAM (ROSETTA 2000)

Cover Depth (cm)	Annual Flux (cm/year)[1]										
	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
Base of Cover	0	0	0	0	0	0	0	0	0	0	0
Precipitation (cm)	49.76	47.48	40.34	42.55	35.74	43.31	47.78	32.11	32.54	43.05	41.47

[1] values less than 1E-10 cm/year were approximated to be zero

Appendix K

Vapor-Monitoring Data Collected
after the Phase III Investigation at Material Disposal Area C
(on CD included with this document)