SANDIA REPORT
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Calendar Year 2011

Annual Groundwater Monitoring Report

Prepared by
Sandia National Laboratories, Albuquerque, New Mexico

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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Groundwater Protection Program

Sandia National Laboratories, New Mexico

June 2012

Prepared by:
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Abstract

Sandia National Laboratories, New Mexico (SNL/NM) is a government-owned/contractor-operated laboratory. Sandia Corporation (Sandia), a wholly-owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). The DOE/NNSA Sandia Site Office administers the contract and oversees contractor operations at the site. Sandia conducts two types of groundwater surveillance monitoring at SNL/NM: (1) on a site-wide basis as part of the SNL/NM Groundwater Protection Program (GWPP) and (2) as site-specific groundwater monitoring at Long-Term Stewardship (LTS)/Environmental Restoration (ER) Operations sites with ongoing groundwater investigations. This Annual Groundwater Monitoring Report summarizes GWPP, LTS, and ER Operations data collected during groundwater monitoring events conducted at the following SNL/NM sites through December 31, 2011: Burn Site Groundwater study area; Chemical Waste Landfill; Mixed Waste Landfill; Solid Waste Management Units 8/58, 49, 68, 116, 149, and 154; Technical Area V study area; and the Tijeras Arroyo Groundwater study area. Environmental monitoring and surveillance programs are required by DOE Order 436.1, *Departmental Sustainability,* and DOE Order 231.1B, *Environmental, Safety, and Health Reporting*.

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Table

Plate

Abbreviations and Acronyms

ABCWUA	Albuquerque Bernalillo County Water Utility Authority
Airport	Albuquerque International Sunport
amsl	above mean sea level
AOC	area of concern
AOP	Administrative Operating Procedure
ARG	Ancestral Rio Grande
bgs	below ground surface
BSG	Burn Site Groundwater
BW	background well
CAC	Corrective Action Complete
CCBA	Coyote Canyon Blast Area
CFR	Code of Federal Regulations
CME	Corrective Measures Evaluation
CMI	Corrective Measures Implementation
CMIP	Corrective Measures Implementation Plan
CMS	Corrective Measures Study
COA	City of Albuquerque
COC	constituent of concern
CTF	Coyote Test Field
CWL	Chemical Waste Landfill
CY	Calendar Year
DCG	Derived Concentration Guide
DI	deionized
DO	dissolved oxygen
DOE	U.S. Department of Energy
DRO	diesel range organics
DSS	Drain and Septic System
EB	equipment blank
EDMS	Environmental Data Management System
EMS	Environmental Management System
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ET	evapotranspirative
FB	field blank
FIP	Field Implementation Plan
FOP	Field Operating Procedure
FSO	Field Support Operations
FY	Fiscal Year
GEL	GEL Laboratories LLC
GRO	gasoline range organics
GWPP	Groundwater Protection Program
HE	high explosive
HPT	High Performing Team
HSWA	Hazardous and Solid Waste Amendments

Abbreviations and Acronyms (continued)

ID	identification
IMWP	Interim Measures Work Plan
IRP	Installation Restoration Program (U.S. Air Force)
KAFB	Kirtland Air Force Base
LCS	laboratory control sample
LE	Landfill Excavation
LRRI	Lovelace Respiratory Research Institute
LTMMP	Long-Term Monitoring and Maintenance Plan
LWDS	Liquid Waste Disposal System
MAC	maximum allowable concentration (established by the NMED)
MCL	maximum contaminant level
MDA	minimum detectable activity
MDL	method detection limit
MNA	monitored natural attenuation
MS	matrix spike
MSD	matrix spike duplicate
MW	monitoring well
MWL	Mixed Waste Landfill
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NFA	No Further Action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
NNSA	National Nuclear Security Administration
NOD	Notice of Disapproval
NPN	nitrate plus nitrite
NTU	nephelometric turbidity units
OB	Oversight Bureau
ORP	oxidation-reduction potential
OU	Operable Unit
PCCP	Post-Closure Care Permit
PCE	tetrachloroethene
PGWS	perched groundwater system
PQL	practical quantitation limit
PVC	polyvinyl chloride
QC	quality control
QED™	QED Environmental Systems MicroPurge® low-flow sampling method
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-trinitro-triazine
RFI	RCRA Facility Investigation
RPD	relative percent difference

Abbreviations and Acronyms (concluded)

RSI	Request for Supplemental Information
Sandia	Sandia Corporation
SAP	Sampling and Analysis Plan
SC	specific conductance
SDWA	Safe Drinking Water Act
SMO	Sample Management Office
SNL/NM	Sandia National Laboratories, New Mexico
SVOC	semivolatile organic compound
SW	Solid Waste
SWMU	Solid Waste Management Unit
TA	Technical Area
TAG	Tijeras Arroyo Groundwater (Investigation)
TAL	Target Analyte List
TB	trip blank
TCE	trichloroethene (equivalent to trichlorethylene)
tetryl	methyl 2,4,6-trinitrophenylnitramine
TOC	total organic carbon
TOX	total organic halogens
TPH	total petroleum hydrocarbons
UCS	Underground Conduit System
USAF	U.S. Air Force
USGS	U.S. Geological Survey
VA	Veterans Administration
VCA	voluntary corrective action
VCM	voluntary corrective measure
VE	Vapor Extraction
VOC	volatile organic compound
WL	water level
WQ	water quality

Units

°C	degree Celsius
µg/L	microgram(s) per liter
µmhos/cm	micromho(s) per centimeter (unit of specific conductance)
ac-ft	acre feet
ft	foot (feet)
ft^3	cubic feet
ft^3/yr	cubic feet per year
ft/ft	feet per foot
ft/yr	feet per year
gal.	gallon(s)
gpm	gallons per minute
in./yr	inches per year
Ma	Mega Annum
mg/L	milligram(s) per liter
mL	milliliter(s)
mrem/yr	millirem per year
mV	millivolt(s)
NTU	nephelometric turbidity units
pCi/g	picocuries per gram
pCi/L	picocuries per liter
pH	potential of hydrogen
ppb	part(s) per billion, equivalent to µg/L in water
ppbv	part(s) per billion by volume
sq mi	square mile(s)
yr	year(s)

Monitoring Well Location Descriptions

AVN-#	Area V (North)
CCBA-#	Coyote Canyon Blast Area
CTF-#	Coyote Test Field
CWL-#	Chemical Waste Landfill
CYN-#	Lurance Canyon
EOD	Explosive Ordnance Disposal
HERTF	High Energy Research Test Facility
IP	Isleta Pueblo
ITRI	Inhalation Toxicology Research Institute
LMF	Large Melt Facility
LWDS-#	Liquid Waste Disposal System
MP-#	Montessa Park
MRN-#	Magazine Road North
MVMW#	Mountain View Monitoring Well
MWL-#	Mixed Waste Landfill
NMED-#	New Mexico Environment Department
NWTA3-#	Northwest Technical Area III
OBS-#	Old Burn Site
PGS-#	Parade Ground South
PL-#	Power Line Road, west
SFR-#	South Fence Road
STW-#	Solar Tower (West)
SWTA-#	Southwest Technical Area III
TA1-W-#	Technical Area I (Well)
TA2-NW-#	Technical Area II (Northwest)
TA2-SW-#	Technical Area II (Southwest)
TA2-W-#	Technical Area II (Well)
TAV-#	Technical Area V
TJA-#	Tijeras Arroyo
TRE-#	Thunder Road East
TRN-#	Target Road North
TRS-#	Target Road South
TSA-#	Transportation Safeguards Academy
WYO-#	Wyoming
12AUP-#	ER Site 12A Underflow Piezometer

**** Meteorological Towers***

* SC1	School House
* A-21	TA-I
* A-36	TA-III and TA-V

Annual Groundwater Monitoring Report

Executive Summary

Sandia Corporation (Sandia) conducts groundwater surveillance monitoring for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) at Sandia National Laboratories, New Mexico (SNL/NM) on a site-wide basis as part of the SNL/NM Groundwater Protection Program (GWPP) and on a site-specific basis at Long-Term Stewardship (LTS)/Environmental Restoration (ER) Operations (formerly ER Project) sites with ongoing groundwater investigations. The SNL/NM facility is located on Kirtland Air Force Base (KAFB) in central New Mexico.

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia, a wholly owned subsidiary of Lockheed Martin Corporation, for the DOE NNSA under Contract DE-AC04-94AL85000.

This Annual Groundwater Monitoring Report documents the results of the groundwater monitoring activities at SNL/NM for Calendar Year (CY) 2011. This report has been prepared to meet the environmental reporting requirements for the CY 2011 Annual Site Environmental Report, providing an annual update of groundwater data to regulators, stakeholders, and outside agencies. In addition, it serves as a valuable tool to inform the public about the groundwater quality at SNL/NM. This report includes both water quality sampling results and water level measurements. Separate chapters focus on the investigation activities at each of the following monitoring networks maintained at SNL/NM: GWPP site-wide surveillance (Chapter 2.0); Chemical Waste Landfill (CWL) (Chapter 3.0); Mixed Waste Landfill (MWL) (Chapter 4.0); Technical Area (TA)-V (Chapter 5.0); Tijeras Arroyo Groundwater (TAG) (Chapter 6.0); Burn Site Groundwater (BSG) (Chapter 7.0); Solid Waste Management Units (SWMUs) 8/58 (Chapter 8.0); SWMU 49 (Chapter 9.0); SWMU 68 (Chapter 10.0); SWMU 116 (Chapter 11.0); SWMU 149 (Chapter 12.0); and SWMU 154 (Chapter 13.0).

Chapter 1.0 provides the general site description for the SNL/NM facility and describes the regulatory criteria for SNL/NM groundwater monitoring tasks. The regional aquifer supplying the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) and KAFB production wells is located within the Albuquerque Basin. The regional aquifer is mostly contained within the upper unit and, to some extent, the middle unit of the Santa Fe Group. The edge of the basin on the east side is defined by the Sandia, Manzanita, and Manzano Mountains, which have uplifted along normal faults. KAFB straddles the east side of the basin and is divided approximately in half by basin-bounding faults. On KAFB, the basin is primarily defined by the north-south–trending Sandia fault and the Hubbell Springs fault. The Tijeras fault, a strike-slip fault that trends northeast-southwest, intersects the Sandia and Hubbell Springs faults forming a system of faults collectively referred to as the Tijeras fault complex. The faults form a distinct hydrogeological boundary between the regional aquifer within the basin (approximately 500 feet [ft] below ground surface [bgs]) and the more shallow bedrock aquifer systems within the uplifted areas (generally between 50 to 325 ft bgs).

Currently, SNL/NM LTS and ER Operations maintain 11 groundwater monitoring networks that consist of the following:

- CWL
- MWL
- TA-V
- TAG
- BSG
- SWMUs 8/58
- SWMU 49
- SWMU 68
- SWMU 116
- SWMU 149
- SWMU 154

At SNL/NM, SWMUs are regulated under the Hazardous and Solid Waste Amendment (HSWA) module of the SNL/NM Resource Conservation and Recovery Permit. In the HSWA module, a SWMU is defined as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste." Monitoring and/or corrective action requirements generally are determined on a SWMU-specific basis following a site investigation. A Compliance Order on Consent (the Order) between the New Mexico Environment Department (NMED), the DOE, and Sandia governs corrective actions for these sites and, accordingly, monitoring performed at the MWL, the TA-V, TAG, and BSG study areas, and SWMUs 8/58, 49, 68, 116, 149, and 154. The CWL has undergone closure in accordance with 20.4.1.600 New Mexico Administrative Code, incorporating Title 40, Code of Federal Regulations, Section 265, Subpart G, and the CWL Closure Plan and is regulated under a Post-Closure Care Permit.

Groundwater Quality Monitoring Activities and Results

During CY 2011, groundwater samples were collected from monitoring wells for the 12 investigations (GWPP and 11 LTS/ER Operations sites). The analytical results for samples from all monitoring wells were compared with maximum contaminant levels (MCLs) established by the U.S. Environmental Protection Agency (EPA). The results for GWPP monitoring wells were also compared with NMED maximum allowable concentrations (MACs) promulgated for groundwater by the State of New Mexico Water Quality Control Commission (NMWQCC). The results are summarized in the following sections, and the data are presented in the attachments following each chapter.

In this report groundwater monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order, as specified in Section III.A of the Order.

Groundwater Protection Program

Chapter 2.0 documents the results of the CY 2011 groundwater surveillance monitoring activities conducted as part of the SNL/NM GWPP. Water levels were measured at 102 monitoring wells. Water level measurements were obtained either monthly or quarterly depending on the response characteristics of the groundwater system at each well location to pumping or other stresses. The surveillance activities include the annual collection and analysis of groundwater samples from 14 monitoring wells and 1 surface water sample from a spring. Annual sampling of groundwater was conducted during March 2011. Samples collected from all locations were analyzed for Safe Drinking Water Act list volatile organic compounds (VOCs); total organic halogens; total phenols; total alkalinity; nitrate plus nitrite (NPN); total cyanide; major anions; Target Analyte List (TAL) metals plus uranium; mercury; radionuclides by gamma spectroscopy; gross alpha/beta activity; radium-226; and radium-228. Additional samples were collected at selected monitoring wells for analysis of high explosive (HE) compounds and isotopic uranium.

No analytical parameters exceed established MCLs or MACs, except for arsenic, beryllium, fluoride, uranium, and combined radium-226 and radium-228 activity. The concentrations of these analytes that exceed MCLs or MACs in groundwater samples are similar to the results reported for previous years, with the exception of uranium.

No VOCs or HE compounds were detected above established MCLs or MACs. The HE compound RDX [hexahydro-trinitro-triazine] was detected in the groundwater sample from monitoring well CTF-MW2 at a concentration of 0.391 micrograms per liter (μg/L).

Fluoride was detected above the NMWQCC groundwater protection MAC of 1.6 milligrams per liter (mg/L) at four sampling locations. The concentrations range from 1.66 to 2.41 mg/L. The EPA MCL for fluoride is 4.0 mg/L. Arsenic was detected above the MCL of 0.01 mg/L in the groundwater sample from CTF-MW2 at a concentration of 0.0501 mg/L. Beryllium was detected in the surface water sample from Coyote Springs at a concentration of 0.00654 mg/L. The MCL for beryllium is 0.004 mg/L. Beryllium has been consistently detected in the surface water samples from the springs and is considered to be of natural origin. Uranium was detected above the MCL of 0.030 mg/L in the sample from CTF-MW2 at a concentration of 0.0351 mg/L. The uranium result for CTF-MW2 is anomalously high compared to prior and subsequent monitoring data.

Combined radium-226 and radium-228 activity levels in the CTF-MW2 sample exceed the MCL of 5.0 picocuries per liter (pCi/L). Activity for radium-226 was reported in the sample from CTF-MW2 at 3.00 ± 1.12 pCi/L and for radium-228 at 6.78 ± 1.80 pCi/L.

Groundwater elevation measurements were obtained throughout CY 2011 at 102 locations on a monthly or quarterly basis. Groundwater elevation measurements obtained from representative monitoring wells were used to construct contours of the potentiometric surface. The contours display a pattern that reflects the impact of the groundwater withdrawal by water supply wells located in the northwestern portion of KAFB and ABCWUA wells located north of the base.

Groundwater elevations were also obtained from wells completed in the perched groundwater system (PGWS) to construct a groundwater elevation contour map. The contours indicate groundwater flow in the PGWS is toward the southeast. Water levels are declining in the northwest and increasing slightly in the east presumably due to the drainage of the system to the east and perhaps some additional recharge from the Tijeras Arroyo.

Chemical Waste Landfill

Chapter 3.0 discusses the CWL semiannual groundwater monitoring activities performed during July to August 2011. Groundwater samples were collected from four monitoring wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11) and analyzed for the three analytes (trichloroethene [TCE], chromium, and nickel), as specified in the Post-Closure Care Permit. No analytes were detected at concentrations exceeding the associated EPA MCLs in any of the CWL groundwater samples. The analytical results are comparable to historical values.

Mixed Waste Landfill

Chapter 4.0 discusses the MWL annual groundwater sampling activities conducted in June 2011. Groundwater samples were collected from seven monitoring wells (MWL-BW2, MWL-MW4, MWL-MW5, MWL-MW6, MWL-MW7, MWL-MW8, and MWL-MW9) and analyzed for VOCs, TAL metals plus uranium, anions (as bromide, chloride, fluoride, and sulfate), total alkalinity, NPN, radionuclides by gamma spectroscopy, gross alpha/beta activity, and tritium as specified in the Order. No analytes were detected at concentrations exceeding the associated EPA MCLs in any of the MWL groundwater samples. The analytical results are comparable to historical values.

Technical Area V Groundwater Study Area

Chapter 5.0 discusses the TA-V groundwater monitoring activities conducted during CY 2011. Both TCE and nitrate have been identified as constituents of concern (COCs) in groundwater at the TA-V study area based on detections above the EPA MCL in samples collected from monitoring wells. Currently 16 wells in the TA-V study area are monitored for water quality and water levels. Table XI-1 of the Order specifies that the sampling frequency for groundwater monitoring at TA-V is quarterly. Unique features of the TA-V study area include low concentrations of TCE and nitrate in a deep alluvial aquifer.

The conceptual site model of contaminant transport at TA-V includes release from the source term, migration through the vadose zone, and movement in groundwater. The potential sources of TCE and/or nitrate in the TA-V study area include wastewater disposal systems and seepage pits. Based on the historical use and disposal of chlorinated solvents, the extent of TCE in groundwater is probably associated with multiple aqueous releases of solvents and subsequent vapor-phase transport through the vadose zone. The slow rate of groundwater flow (4 to 20 feet per year) is responsible for the present distribution of TCE in the aquifer.

Only NPN and TCE were detected above the MCLs in groundwater samples from TA-V study area wells. NPN concentrations exceed the MCL of 10 mg/L in samples from AVN-1, LWDS-MW1, TAV-MW6, and TAV-MW10, with a maximum concentration of 14.5 mg/L in the sample collected from LWDS-MW1 in November 2011.

During CY 2011, TCE exceeded the MCL of 5 μg/L in samples from five wells (LWDS-MW1, TAV-MW6, TAV-MW10, TAV-MW12, and TAV-MW14). The maximum concentration of TCE detected during this reporting period is 17.1 μg/L in the sample from TAV-MW6 collected in July 2011.

The analytical results for this reporting period are consistent with historical concentrations. The current conceptual site model for the TA-V study area does not require modification based on the sampling results for CY 2011.

The following activities took place for the TA-V study area during CY 2011:

- Monthly or quarterly water level measurements were obtained for all TA-V study area wells.

- Semiannual and quarterly groundwater sampling events were conducted at 16 wells in January, April, July, and November 2011.

- Quarterly perchlorate screening groundwater sampling and reporting were performed for TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14.

- Soil-vapor monitoring wells TAV-SV01, TAV-SV02, and TAV-SV03 were installed.

- Quarterly soil-vapor sampling events were conducted at these three wells in April and May, July, and November 2011.

Tijeras Arroyo Groundwater Study Area

Chapter 6.0 addresses groundwater monitoring activities conducted during CY 2011 at the TAG study area. Currently, 21 wells in the TAG study area are monitored for water quality, and 30 wells are monitored for water levels. Two groundwater systems are present in the TAG study area: the PGWS at approximately 220 to 330 ft bgs and the regional aquifer groundwater system at approximately 440 to 570 ft bgs. Groundwater monitoring wells are completed within either the PGWS or regional aquifer. Unique features of the TAG study area include low concentrations of TCE at scattered locations in the PGWS and low concentrations of nitrate at scattered locations in the PGWS and regional aquifer.

For CY 2011, wells were sampled in February/March, May, August/September, and December. The samples were analyzed for VOCs, NPN, anions, TAL metals (plus uranium), gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. Depending on their locations and historical concentrations of COCs, wells were sampled quarterly, semiannually, or annually during this reporting period.

Both TCE and nitrate have been identified as COCs in groundwater at the TAG study area based on historical groundwater monitoring results. Only NPN and TCE were detected above MCLs in samples from TAG study area wells. In CY 2011, NPN concentrations exceeded the MCL of 10 mg/L in samples from TA2-SW1-320, TA2-W-19, TJA-2, TJA-4, and TJA-7, with a maximum concentration of 31.1 mg/L in the sample from TJA-4 collected during the December 2011 sampling event. NPN concentrations in wells TA2-SW1-320, TJA-4, and TJA-7 have generally exceeded the MCL for the life of the wells, whereas NPN concentrations occasionally have exceeded the MCL in samples from TJA-2 and TA2-W-19.

During CY 2011, TCE exceeded the MCL of 5 μg/L in the groundwater sample form one PGWS well, WYO-4. The maximum concentration of TCE detected during this reporting period is 8.17 μg/L in the sample from WYO-4 collected during the May 2011 sampling event. TCE concentrations in samples from WYO-4 slightly exceed the MCL, and trends are level to slightly increasing over time.

The analytical results for this reporting period are consistent with historical concentrations. The current conceptual site model for the TAG study area does not require modification based on the sampling results for CY 2011.

The following activities took place for the TAG study area during CY 2011:

- Monthly, quarterly, or annual water level measurements were obtained from TAG monitoring wells.
- Quarterly groundwater sampling events were conducted at seven wells (TA2-SW1-320, TA2-W-19, TA2-W-26, TJA-2, TJA-4, TJA-7, and WYO-4) in February/March, May, August/September, and December 2011.
- Semiannual groundwater sampling was conducted at four wells (TA2-W-01, TA2-W-27, TJA-3, and TJA-6) in February/March and August/September 2011.
- Annual groundwater sampling was conducted at 10 wells (PGS-2, TA1-W-01, TA1-W-02, TA1-W-03, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-08, TA2-NW1-595, and WYO-3) in August/September 2011.

Burn Site Groundwater Study Area

Chapter 7.0 discusses the groundwater monitoring activities conducted during CY 2011 at the BSG study area, which is located around the active Lurance Canyon Burn Site facility. Groundwater investigations were initiated in 1997 at the request of the NMED after elevated nitrate levels were discovered in the Burn Site Well (a nonpotable production well used for fire suppression). The study area consists of 10 monitoring wells, and samples were collected and analyzed for VOCs, semivolatile organic compounds (SVOCs), HE compounds, total petroleum hydrocarbons (TPH)-diesel range organics, TPH-gasoline range organics, anions, alkalinity, NPN, TAL metals (plus uranium), gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. As required by the NMED, semiannual sampling for perchlorate was conducted at CYN-MW6, and quarterly sampling for perchlorate was conducted at CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12.

Only NPN was detected above the MCL in samples from BSG study area wells. NPN results exceed the MCL of 10 mg/L in samples from CYN-MW1D, CYN-MW3, CYN-MW6, CYN-MW9, CYN-MW11, and CYN-MW12, with a maximum concentration of 34.5 mg/L in the sample from CYN-MW9 collected during the October 2011 sampling event.

Perchlorate was detected slightly above the screening level/method detection limit (MDL) of 4 μg/L only in samples collected from CYN-MW6. Perchlorate concentrations range from 6.26 J to 7.06 J μg/L, where "J" represents an estimated concentration. Currently, no MCL is established for perchlorate.

The analytical results for this reporting period are consistent with historical concentrations. The current conceptual site model does not require modification based on the sampling results for CY 2011.

The following activities took place for the BSG study area during CY 2011:

- Quarterly groundwater sampling events were conducted at four wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) in February, May, August, and October 2011.

- Semiannual groundwater sampling was conducted at six wells (CYN-MW1D, CYN-MW3, CYN-MW4, CYN-MW6, CYN-MW7, and CYN-MW8) in February, August, and October 2011.

- Quarterly perchlorate screening groundwater sampling and reporting were performed for CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12; semiannual perchlorate screening groundwater sampling and reporting were performed for CYN-MW6.

Solid Waste Management Units 8/58

Chapter 8.0 discusses the groundwater monitoring activities conducted during CY 2011 at SWMUs 8/58, which are located in the Arroyo del Coyote watershed that captures runoff from the western flank of the Manzanita Mountains. Monitoring wells CCBA-MW1 and CCBA-MW2 were installed in August 2011, and the first quarter of sampling for these two wells occurred in October and November 2011. The groundwater samples from each well were analyzed for VOCs; SVOCs; HE compounds; NPN; major anions (as bromide, chloride, fluoride, and sulfate); major cations (as calcium, magnesium, potassium, and sodium); alkalinity; TAL metals plus uranium; perchlorate; total cyanide; radionuclides by gamma spectroscopy; gross alpha/beta activity; and isotopic uranium.

No parameters were detected above established MCLs, except for fluoride. Fluoride exceeds the established MCL of 4.0 mg/L in the CCBA-MW1 sample at a concentration of 5.36 mg/L.

The following activities took place for SWMUs 8/58 during CY 2011:

- The Groundwater Characterization Work Plan for SWMUs 8/58 was approved by the NMED.

- Adjustments to the well locations for SWMUs 8/58 were proposed by DOE/Sandia and approved by the NMED.

- Two groundwater monitoring wells (CCBA-MW1 and CCBA-MW2) were installed at SWMUs 8/58 in August 2011.

- A report describing the well installation field activities was prepared and submitted to the NMED.

- Quarterly groundwater sampling was conducted at the newly installed wells in October and November 2011.

- Quarterly and annual reporting of chemical analyses for groundwater samples from CCBA-MW1 and CCBA-MW2 was initiated.

Solid Waste Management Unit 49

Chapter 9.0 discusses the SWMU 49 annual groundwater monitoring activities performed during CY 2011. SWMU 49 is located in Lurance Canyon and consists of a surface discharge area associated with a former trailer used as a darkroom and the area around a drainpipe outfall from Building 9820. The DOE/Sandia received a letter from the NMED on April 14, 2010, that lists SWMU 49 under the heading of "SWMUs/AOCs to be Subject to Groundwater Monitoring Controls" and further states that SWMU 49 requires long-term monitoring of groundwater on an annual basis as a site control. Annual sampling was completed in March 2011, and samples were analyzed for general chemistry, VOCs, HE compounds, perchlorate, metals, cyanide, NPN, gross alpha/beta activity, and radionuclides by gamma spectroscopy. No analytes were detected above their respective MCLs.

The following activities took place for SWMU 49 during CY 2011:

- Annual groundwater sampling was conducted at CYN-MW5 in March 2011.

- Periodic groundwater elevation data were obtained from CYN-MW5.

Solid Waste Management Unit 68

Chapter 10.0 discusses the quarterly groundwater monitoring activities performed during CY 2011 at SWMU 68, which is located in Coyote Test Field. Monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 were installed in August 2011, and the first quarter of sampling for these wells occurred in October 2011. The groundwater samples from each well were analyzed for VOCs; SVOCs; HE compounds; NPN; major anions (as bromide, chloride, fluoride, and sulfate); major cations (as calcium, magnesium, potassium, and sodium); alkalinity; TAL metals plus uranium; perchlorate; total cyanide; hexavalent chromium; gross alpha/beta activity; radionuclides by gamma spectroscopy; and isotopic uranium. No parameters were detected above established MCLs.

The following activities took place for SWMU 68 during CY 2011:

- The SWMU 68 Groundwater Characterization Work Plan was approved by the NMED.

- Three groundwater monitoring wells (OBS-MW1, OBS-MW2, and OBS-MW3) were installed at SWMU 68 in August 2011.

- A report describing the well installation field activities was prepared and submitted to the NMED.

- Quarterly groundwater sampling was conducted at the newly installed wells in October 2011.

- Quarterly and annual reporting of chemical analyses for groundwater samples from OBS-MW1, OBS-MW2, and OBS-MW3 was initiated.

Solid Waste Management Unit 116
Chapter 11.0 discusses the SWMU 116 annual groundwater monitoring activities performed during CY 2011. SWMU 116 is located on the western margin of the Manzanita Mountain foothills and includes the immediate area surrounding the five seepage pits and septic tank located south of Building 9990. The DOE/Sandia received a letter from the NMED on April 14, 2010, that lists SWMU 116 under the heading of "SWMUs/AOCs to be Subject to Groundwater Monitoring Controls" and further states that SWMU 116 requires long-term monitoring of groundwater on an annual basis as a site control. Annual sampling was completed in March 2011, and samples were analyzed for general chemistry, VOCs, HE compounds, perchlorate, TAL metals plus uranium, cyanide, and NPN. No analytes were detected above their respective MCLs.

The following activities took place for SWMU 116 during CY 2011:

- Annual groundwater sampling was conducted at CTF-MW1 in March 2011.
- Periodic groundwater elevation data were obtained from CTF-MW1.

Solid Waste Management Unit 149
Chapter 12.0 discusses the quarterly groundwater monitoring activities performed during CY 2011 at SWMU 149, which is located in the Coyote Test Field. Monitoring well CTF-MW3 was sampled in March, June, September, and December 2011. The samples were analyzed for VOCs, TAL metals (including selenium), general chemistry parameters, perchlorate, and NPN. No analytical results for the CTF-MW3 groundwater samples exceed the corresponding MCLs.

The following activities took place for monitoring well CTF-MW3 near SWMU 149 during CY 2011:

- Quarterly groundwater sampling was conducted at CTF-MW3 in March, June, September, and December 2011.
- Quarterly reporting of analytical results for CTF-MW3 was conducted.

Solid Waste Management Unit 154
Chapter 13.0 discusses the quarterly groundwater monitoring activities performed during CY 2011 at SWMU 154, which is located in Coyote Test Field. Monitoring well CTF-MW2 was sampled in March, May, September, and December 2011. Analytical parameters included VOCs, SVOCs, HE compounds, NPN, major anions, alkalinity, TAL total metals plus uranium, perchlorate, radionuclides by gamma spectroscopy, gross alpha/beta activity, and isotopic uranium.

For all four quarters, arsenic was detected above the established MCL. For the March 2011 sampling event, thallium was detected above the MCL in the unfiltered environmental sample but not in the associated duplicate environmental sample or dissolved sample fractions. For the May 2011 sampling event, gross alpha activity was reported above the MCL, but the result reported for the reanalysis was below the MCL.

The following activities took place for monitoring well CTF-MW2 near SWMU 154 during CY 2011:

- Quarterly groundwater sampling was conducted at CTF-MW2 in March, May, September, and December 2011.
- Quarterly reporting of analytical results for groundwater samples from CTF-MW2 was conducted.

Future Groundwater Monitoring Events

The groundwater monitoring events conducted on a site-wide basis as part of the SNL/NM GWPP and at site-specific LTS/ER Operations sites will continue on a quarterly, semiannual, annual, and biennial basis during CY 2012, as specified by regulatory guidance. The results for these monitoring events will be presented in the Annual Groundwater Monitoring Report for CY 2012.

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1.0 Introduction

Sandia Corporation (Sandia) conducts general groundwater surveillance monitoring for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) at Sandia National Laboratories, New Mexico (SNL/NM) on a site-wide basis as part of the SNL/NM Groundwater Protection Program (GWPP) and site-specific groundwater monitoring at Long-Term Stewardship (LTS)/Environmental Restoration (ER) Operations (formerly ER Project) sites with ongoing groundwater investigations. The purpose of this document is to report to regulators and other stakeholders the results of the groundwater monitoring activities at SNLNM for Calendar Year (CY) 2011. Separate chapters focus on the investigation activities at each of the following monitoring networks maintained at SNL/NM: GWPP site-wide surveillance (Chapter 2.0); Chemical Waste Landfill (CWL) (Chapter 3.0); Mixed Waste Landfill (MWL) (Chapter 4.0); Technical Area (TA)-V (Chapter 5.0); Tijeras Arroyo Groundwater (TAG) (Chapter 6.0); Burn Site Groundwater (BSG) (Chapter 7.0); Solid Waste Management Units (SWMUs) 8/58 (Chapter 8.0); SWMU 49 (Chapter 9.0); SWMU 68 (Chapter 10.0); SWMU 116 (Chapter 11.0); SWMU 149 (Chapter 12.0); and SWMU 154 (Chapter 13.0).

1.1 Site Description

The SNL/NM facility is located on Kirtland Air Force Base (KAFB), New Mexico. KAFB is a 51,559-acre (80.56 square miles (sq mi) military installation that includes 20,486 acres withdrawn from the Cibola National Forest through an agreement with the U.S. Forest Service. Located at the foot of the Manzanita Mountains, KAFB has a mean elevation of 5,384 feet (ft) above mean sea level (amsl) and a maximum elevation of 7,986 ft amsl. KAFB and SNL/NM are located adjacent to the City of Albuquerque, which borders KAFB on its north, northeast, west, and southwest boundaries (Figure 1-1).

SNL/NM is a multi-program laboratory managed and operated by Sandia, a wholly owned subsidiary of Lockheed Martin Corporation, for the DOE NNSA under Contract DE-AC04-94AL85000.

1.1.1 Climate

The Albuquerque area is characterized by low precipitation and wide temperature extremes that are typical of high-altitude, dry, continental climates. The average annual precipitation measured at Albuquerque International Sunport is 9.47 inches (National Oceanic and Atmospheric Administration National Weather Service station); half of this precipitation occurs from June through August in the form of brief but intense thunderstorms. Because of the low humidity and generally warm temperatures, the evaporation potential is high.

1.1.2 Geologic Setting

SNL/NM is located near the east-central edge of the Albuquerque Basin on KAFB. The Albuquerque Basin (also known as the Middle Rio Grande Basin) is one of a series of north-south–trending basins that was formed during the extension of the Rio Grande Rift. The basin is approximately 3,000 sq mi. Rift formation initiated in the late Oligocene and continued into the early Pleistocene, with the primary period of extension occurring between 30 and 5 Mega Annum (Ma). Tectonic activity, which began uplifting the Sandia, Manzanita, and Manzano Mountains, was most prevalent from about 15 to 5 Ma (Thorn et al. 1993). The rift today extends from southern Colorado to northern Mexico. The vertical displacement between the rock units exposed at the top of Sandia Crest and the equivalent units located at the bottom of the basin is more than 3 miles.

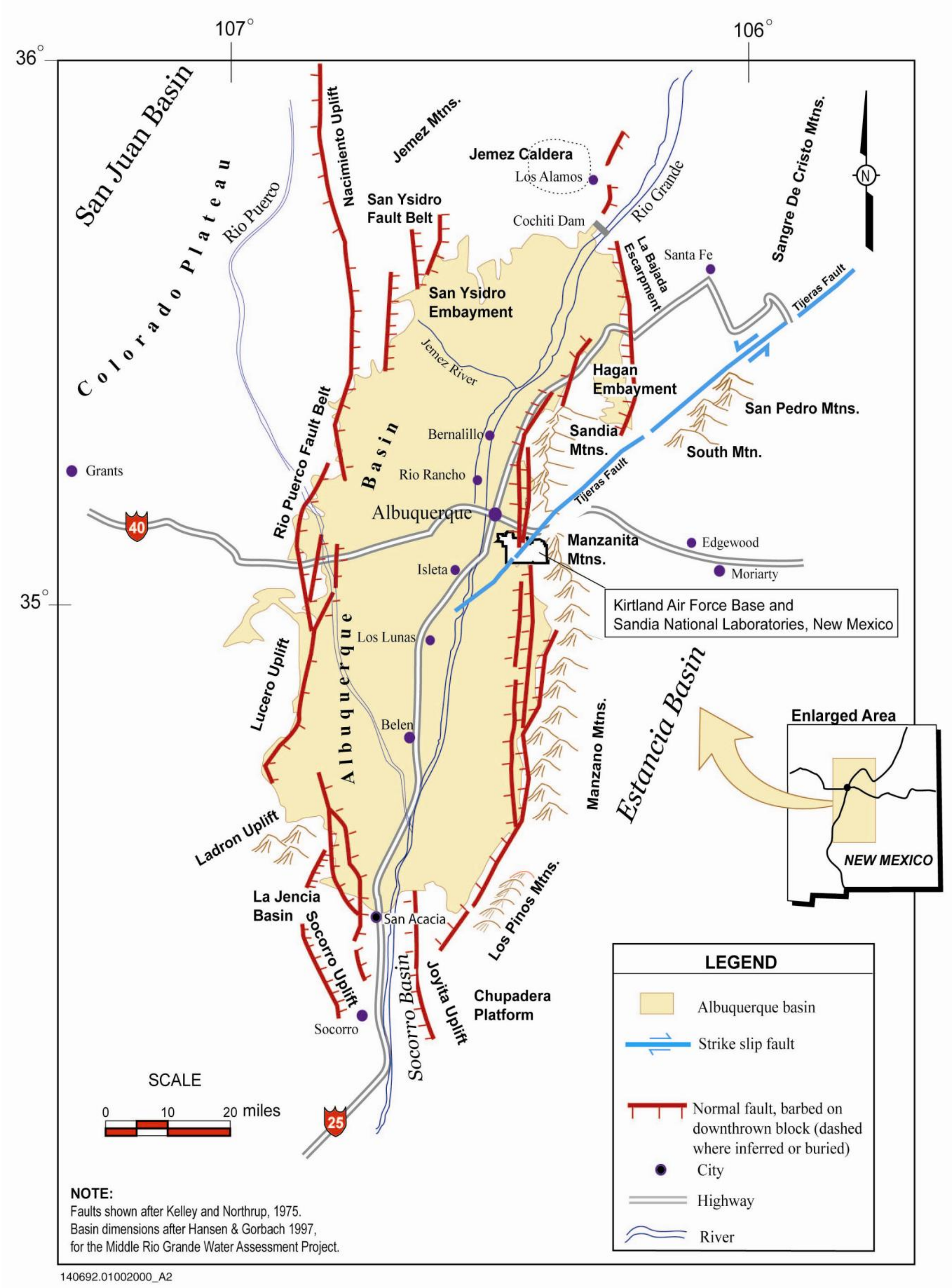

Figure 1-1. Albuquerque Basin, North-Central New Mexico

As shown on Figure 1-1, the structural boundaries of the Albuquerque Basin are as follows:

- Colorado Plateau on the west
- Nacimiento Uplift and the Jemez Mountains to the north
- La Bajada Escarpment to the northeast
- Sandia, Manzanita, Manzano, and Los Pinos mountains to the east
- Joyita and Socorro uplifts to the south
- Ladron and Lucero uplifts to the southwest

As the Rio Grande Rift continued to expand, the Albuquerque Basin subsided. Over the last 30 Ma, the Ancestral Rio Grande meandered across the valley formed by the subsidence and deposited sediments in broad stream channels and floodplains derived from sources to the north. The basin also filled with eolian deposits and alluvial materials shed from surrounding uplifts (Hawley and Haase 1992). This sequence of sediments is called the Santa Fe Group. The thickness of the Santa Fe Group is up to 16,400 ft at the deepest part of the basin (Lozinsky, 1994). The entire sequence consists of unconsolidated sediments, which thin toward the edge of the basin and are truncated by normal faults at the basin-bounding uplifts. Units overlying the Santa Fe Group include Pliocene Ortiz gravel and Rio Grande fluvial deposits, which are interbedded with Tertiary and Quaternary basaltic and pyroclastic materials.

As shown on Figures 1-2 and 1-3, the four primary faults on the east side of KAFB are (1) the Sandia fault, (2) the West Sandia fault, (3) the Hubbell Springs fault (West, Central, and East fault segments), and (4) the Tijeras fault. The Sandia fault is thought to be the primary boundary between the Sandia Mountains and the Albuquerque Basin. The Hubbell Springs fault extends northward from Socorro County and terminates on KAFB in the vicinity of the Tijeras fault. The Sandia and the Hubbell Springs faults are north-south–trending, down-to-the-west, en-echelon normal faults bounding the east side of the Albuquerque Basin.

The Tijeras fault is an ancient strike-slip fault that developed in the Precambrian or early Paleozoic (approximately 600 Ma) and was reactivated in association with the Laramide Orogeny during the Cretaceous period (Kelley 1977). The fault also demonstrates Quaternary movement (Kelson et al. 1999, GRAM 1995). This fault has been traced at least as far north as Madrid, New Mexico, and continues into the Sangre de Cristo Mountains as the Cañoncito fault. Preferential erosion along the fault formed Tijeras Canyon, which divides the Sandia and Manzanita Mountains. The fault trends southwest from Tijeras Canyon, intersects the northeast boundary of KAFB, and crosses KAFB east and south of Manzano Base. Manzano Base occupies an uplift of four peaks defined by the Tijeras fault on the east side and the Sandia fault on the west side. Strike-slip motion along the Tijeras fault is thought to be expressed by southwesterly movement of the northern block (left lateral). The Sandia, Hubbell Springs, and Tijeras faults converge near the southeast end of TA-III. This complicated system of faults, defining the east edge of the basin, is referred to collectively as the Tijeras fault complex.

1.1.3 Hydrogeology

Figure 1-3 shows the three distinct hydrogeologic regions for the KAFB area: (1) the Albuquerque Basin, (2) the Tijeras fault complex, and (3) the foothills and canyons region. The primary division is between the east and west sides of the Tijeras fault complex, which is the transitional zone. This division marks the boundary between the two regional aquifer systems. It is important to note that the boundaries shown on Figure 1-3 identify the approximate hydrologic settings. A deep aquifer is present within the Albuquerque Basin where the regional aquifer lies at approximately 500 ft below ground surface (bgs). A perched groundwater system (PGWS) also lies above the regional aquifer in the vicinity of TA-I, TA-II, and TA-IV in the TAG Area of Concern (AOC). The PGWS is not shown on Figure 1-3 but is discussed in detail in Chapter 6.0. The PGWS extends south to the KAFB Golf Course area, north to portions of TA-I, west of TA-II, and east of the KAFB Landfill. Possible explanations for the existence of a PGWS are

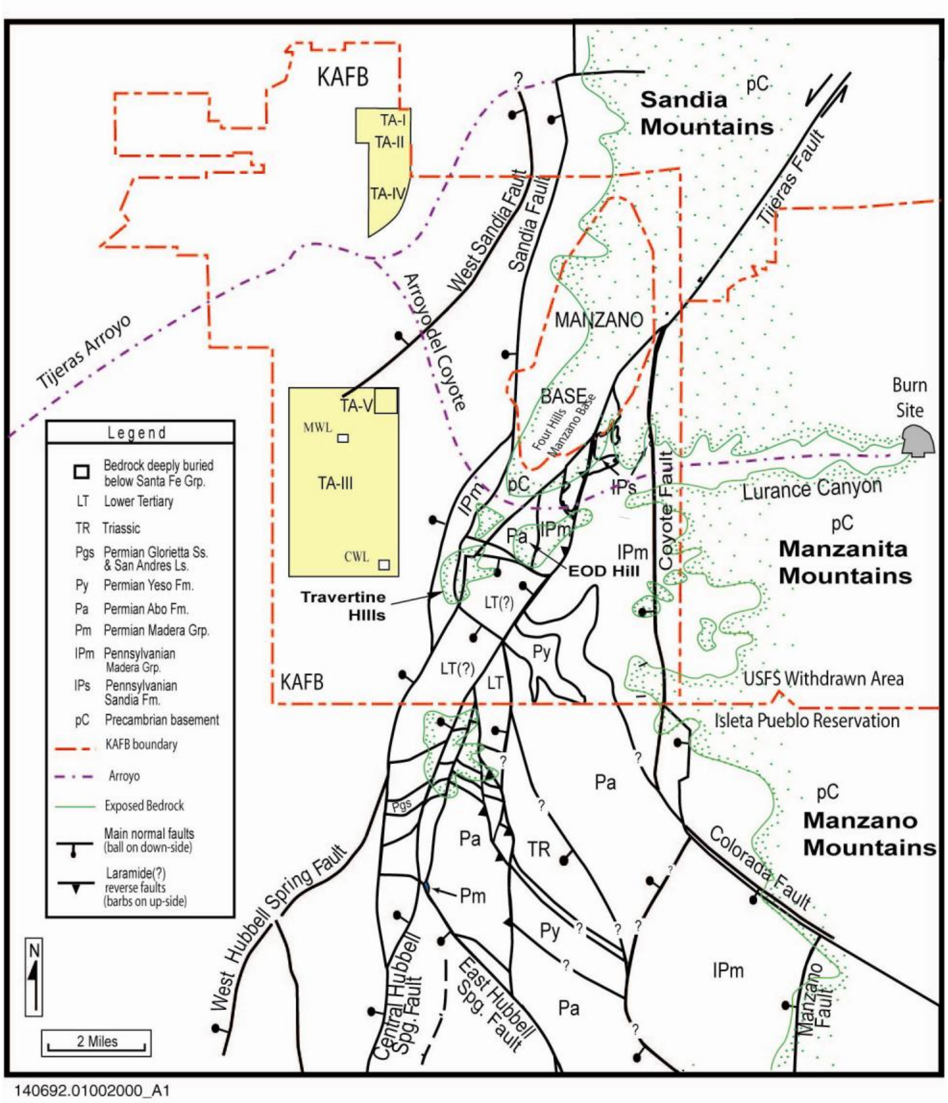

Figure 1-2. Generalized Geology in the Vicinity of SNL/NM and KAFB (Van Hart 2003)

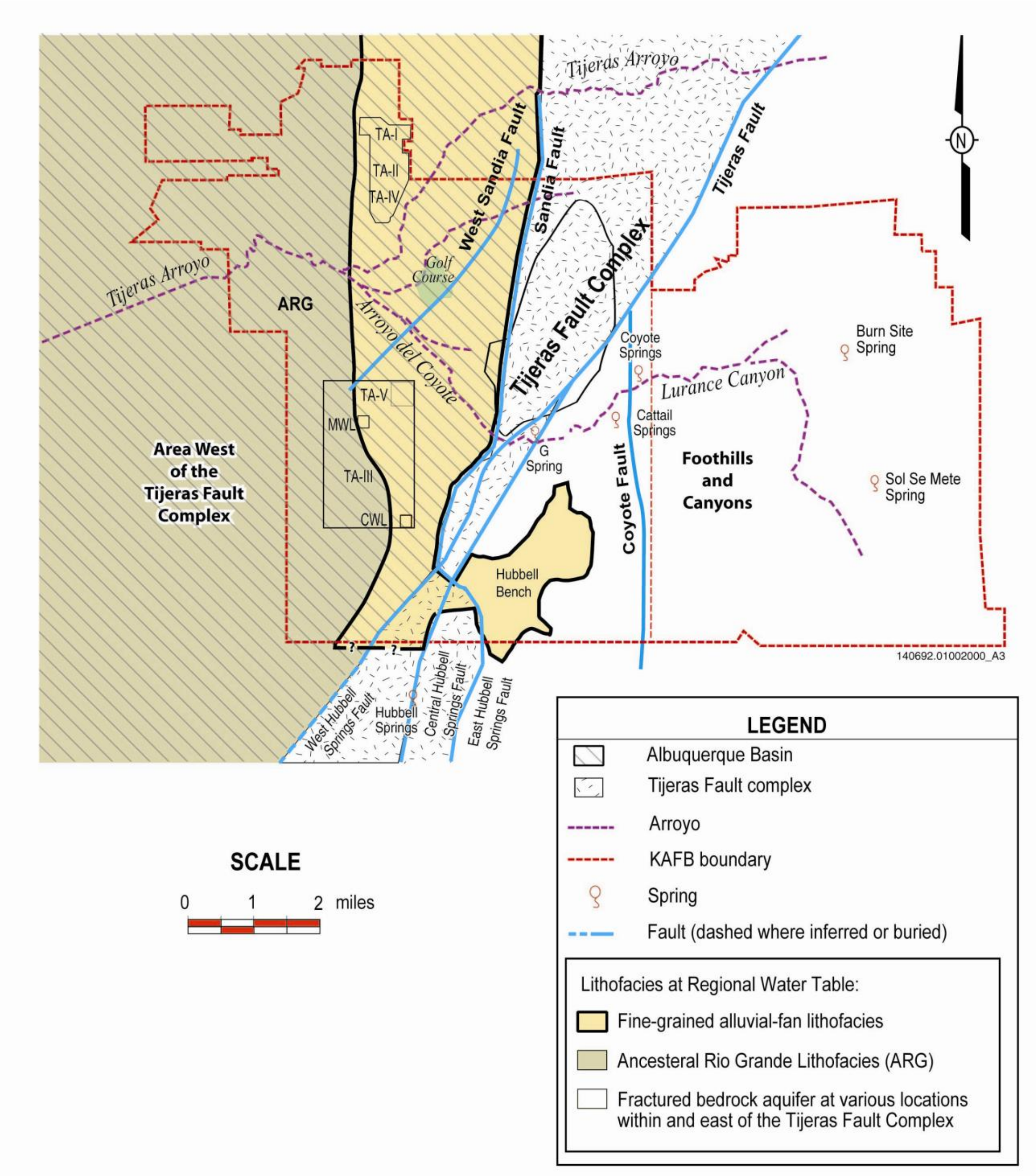

Figure 1-3. Hydrogeologically Distinct Areas Primarily Controlled by Faults (Modified from SNL 1995)

arroyo recharge, irrigation of the golf course and other vegetated areas, water leakage from utility distribution lines, and infiltration from an unlined KAFB sewage lagoon system (SNL 1998).

East of the Tijeras fault complex, a thin layer of alluvium covers the bedrock. The hydrogeology in this area is poorly understood due to the complex geology created by the fault systems. On the east side of the Tijeras fault complex the depth to groundwater ranges from about 45 to 325 ft bgs. Most of the nonpotable water supply and monitoring wells east of the faults are completed in fractured bedrock at relatively shallow depths and produce modest yields of groundwater.

Groundwater in the bedrock aquifers on the east side of KAFB generally flows west out of the canyons toward the Tijeras fault complex (Plate 1). The groundwater gradient is relatively steep, 0.03 feet per foot (ft/ft), in crossing the Tijeras fault complex from east to west. The change in the groundwater elevation is 350 ft over 15,840 ft. The steep gradient suggests that westward groundwater flow is retarded by the Tijeras fault complex. Within the sediments of the Albuquerque Basin, the gradient flattens out quickly to about 0.005 ft/ft. The historic direction of regional groundwater flow within the basin was westward from the mountains toward the Rio Grande. However, due to groundwater pumping at KAFB and Albuquerque Bernalillo County Water Utility Authority (ABCWUA) production wells, a depression in the regional aquifer has created a broad trough originating at the well fields near the northwest corner of KAFB. The impact of the seasonal variation in water production by both KAFB and ABCWUA wells can be observed as fluctuations in the groundwater elevations of some SNL/NM and KAFB monitoring wells as far to the southeast as TA-III.

1.1.4 Surface Water Hydrology

The Rio Grande, located approximately 3 miles west of KAFB, is the major surface hydrologic feature in central New Mexico. The Rio Grande originates in the San Juan Mountains of Colorado and terminates at the Gulf of Mexico, near Brownsville, Texas. The Rio Grande has a total length of 1,760 miles and is the third longest river system in North America. Surface water (with the exception of several springs) within the boundaries of KAFB is found only as ephemeral streams (arroyos) that flow for short periods from runoff after storm events or during the spring melt of mountain snowpack. The primary surface water feature that drains the eastern foothills on KAFB is the Tijeras Arroyo. The Arroyo del Coyote joins Tijeras Arroyo just south of TA-IV (about 1 mile west of the golf course [Figure 1-3]). Both Tijeras Arroyo and Arroyo del Coyote carry significant runoff after heavy thunderstorms that usually occur from June through August. The Tijeras Arroyo, above the confluence with Arroyo del Coyote, drains about 80 sq mi, while Arroyo del Coyote drains about 39 sq mi (USACE 1979). The total watershed for the Tijeras Arroyo, which includes the Sandia and Manzanita Mountains and portions of KAFB, is approximately 126 sq mi. All active SNL/NM facilities are located outside the 100-year floodplain of both Tijeras Arroyo and Arroyo del Coyote (USACE 1979).

Several springs on KAFB are associated with the uplifts in the Tijeras Fault Complex and Foothills and Canyons hydrogeologic areas: (1) Coyote Springs and G-Spring within Arroyo del Coyote, (2) Burn Site Spring in Lurance Canyon, and (3) Sol se Mete Spring within the Manzanita Mountains. Coyote Springs and Sol se Mete are perennial springs (continuously flowing), while the others are ephemeral springs. Hubbell Springs (a perennial spring) is located just south of KAFB on Isleta Pueblo. The wetland areas created by these springs, though very limited in extent, provide a unique ecological niche in an otherwise arid habitat.

Groundwater recharge in the vicinity of KAFB is primarily derived from the eastern mountain front and along the major arroyos. However, the amount of recharge occurring in the foothills and canyons is not well characterized. The estimated recharge for that portion of Tijeras Arroyo on KAFB is estimated to be up to 2.2 million cubic feet per year (ft^3/yr) (50 acre ft [ac-ft]/yr) (SNL 1998). The best estimate for the groundwater recharge associated with Arroyo del Coyote is 0.4 million ft^3/yr (9.2 ac-ft/yr). Infiltration studies conducted by the ER Site-Wide Hydrogeologic Characterization Project determined that recharge is negligible from direct precipitation due to the high rate of evapotranspiration for most other areas on KAFB, especially on alluvial-fan slopes and other relatively flat areas (SNL 1998).

1.2 Groundwater Monitoring

Extensive groundwater monitoring is conducted at KAFB. The U.S. Air Force (USAF) Installation Restoration Program has a large monitoring well network associated with several closed landfills and a closed sewage lagoon. Additional KAFB wells are sited to monitor and characterize several nitrate plumes and an extensive KAFB jet fuel/aviation gasoline plume associated with the KAFB Bulk Fuels Facility. SNL/NM personnel monitor groundwater on KAFB at locations associated with DOE-owned facilities and sites permitted by the USAF for DOE use. Groundwater monitoring is conducted by SNL/NM LTS/ER Operations and the GWPP. Figure 1-4 illustrates the extensive monitoring well network at KAFB. Plate 1 more accurately portrays the extensive monitoring well network and is presented at the end of this Annual Groundwater Monitoring Report with a table (Table 1) that provides construction details for the groundwater monitoring wells. Table 1-1 lists the CY 2011 sampling events conducted at the GWPP and LTS/ER Operations monitoring networks maintained at SNL/NM.

Table 1-1. Sample Collection Events for Groundwater Quality Monitoring at SNL/NM from January through December 2011

Sampling Event	GWPP	CWL	MWL	TA-V	TAG	BSG	SWMUs 8/58	SWMU 49	SWMU 68	SWMU 116	SWMU 149	SWMU 154
Jan 11				√		√						
Feb 11					√	√						
Mar 11	√				√			√		√	√	√
Apr 11	√			√								
May 11					√	√						√
Jun 11			√								√	
Jul 11		√		√								
Aug 11		√			√	√						
Sep 11					√						√	√
Oct 11						√	√		√			
Nov 11				√			√					
Dec 11					√						√	√

NOTES:
BSG = Burn Site Groundwater.
CWL = Chemical Waste Landfill.
GWPP = Groundwater Protection Program.
MWL = Mixed Waste Landfill.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid Waste Management Unit.
TA-V = Technical Area V.
TAG = Tijeras Area Groundwater.

Water quality and groundwater analytical results for the SNL/NM GWPP and LTS/ ER Operations monitoring activities are summarized in Table 1-2. Detected analytes that exceed the U.S. Environmental Protection Agency drinking water regulatory criteria (EPA May 2009) for samples collected by SNL/NM personnel during groundwater monitoring activities in CY 2011 are listed in Table 1-3.

In this report, groundwater monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy and gross alpha/beta activity) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Compliance Order on Consent (the Order) between the NMED, Sandia, and the DOE, as specified in Section III.A of the Order (NMED April 2004).

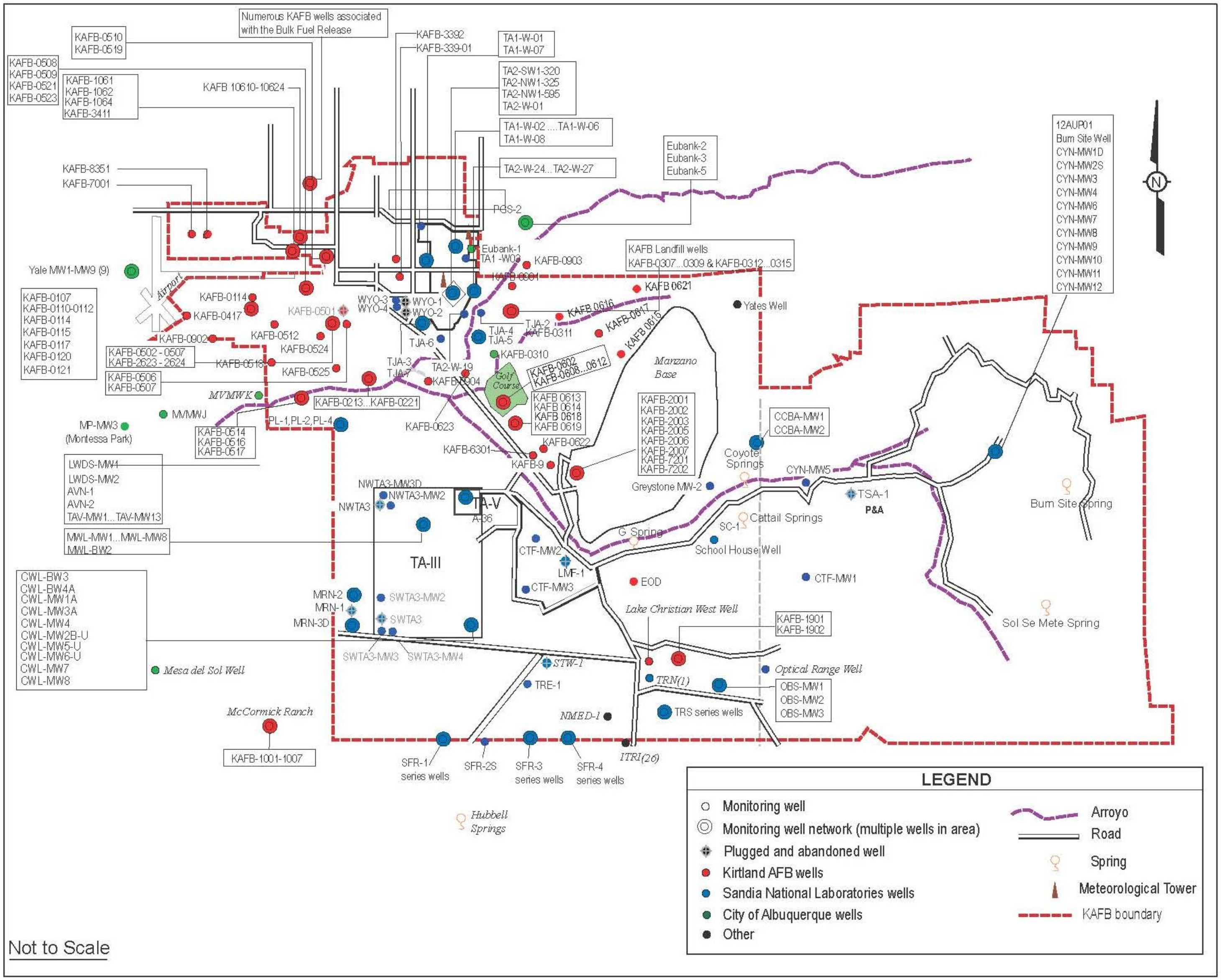

Figure 1-4. Wells and Springs within SNL/NM and KAFB

Table 1-2. Summary of SNL/NM Groundwater Monitoring Results for Calendar Year 2011

	SNL/NM Groundwater Monitoring
Number of Active Wells Monitored	80
Number of Analyses Performed	15,311
Percent of Nondetected Results	78.1 %

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
Summary of Field Water Quality Parameters (units as indicated below)							
pH in SU	177	0	5.44	8.01	7.25	0.3994	NE
Specific Conductivity in µmhos/cm	177	0	355	4041	852.4	640.9	NE
Temperature in °C	177	0	12.85	28.52	18.72	2.752	NE
Turbidity in NTU	177	0	0.08	94.0	2.98	11.219	NE
Detected Organic Compounds in µg/L							
Acetone	3	174	3.77	5.95	4.52	1.239	NE
Bromodichloromethane	5	187	0.48	2.94	1.886	1.247	NE
Bromoform	1	191	2.39	2.39	2.39	N/A	NE
Carbon disulfide	1	176	1.6	1.6	1.6	N/A	NE
Chloroform	14	178	0.26	6.88	1.446	2.207	NE
Dibromochloromethane	5	187	0.34	4.83	1.956	1.814	NE
Dichloroethane, 1,1-	13	179	0.39	1	0.5892	0.2236	NE
Dichloroethene, 1,1-	1	191	0.84	0.84	0.84	N/A	7.0
Dichloroethene, cis-1,2-	32	160	0.41	3.77	1.697	1.135	70
Gasoline Range Organics	1	40	80.1	80.1	80.1	N/A	NE
RDX	6	35	0.124	0.391	0.2585	0.1136	NE
Tetrachloroethene	10	182	0.35	1	0.737	0.2406	5.0
Toluene	3	189	0.25	0.97	0.647	0.366	1,000
Trichloroethene	72	125	0.33	17.1	5.112	5.207	5.0

Table 1-2. Summary of SNL/NM Groundwater Monitoring Results for Calendar Year 2011 *(Continued)*

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
Detected Metals in mg/L							
Aluminum	39	79	0.0157	0.451	0.0959	0.1045	NE
Antimony	2	116	0.00108	0.00125	0.001165	0.00012	0.006
Arsenic	31	87	0.00178	0.0651	0.01962	0.02442	0.010
Barium	118	0	0.00951	0.216	0.07159	0.04042	2.0
Beryllium	15	103	0.000221	0.00654	0.002198	0.001594	0.004
Cadmium	5	113	0.000119	0.000225	0.000156	0.000041	0.005
Calcium	174	0	34.6	406	104.25	88.21	NE
Chromium	5	118	0.0022	0.0795	0.0217	0.0333	0.100
Chromium VI	1	3	0.00317	0.00317	0.00317	N/A	NE
Cobalt	104	14	0.0001	0.0118	0.001249	0.002778	NE
Copper	78	40	0.000423	0.00455	0.001156	0.000784	NE
Iron	178	5	0.0583	7.25	0.4583	0.8588	NE
Lead	1	117	0.00103	0.00103	0.00103	N/A	NE
Magnesium	174	0	3.41	87.6	24.28	18.75	NE
Manganese	91	92	0.001	3.24	0.384	0.964	NE
Nickel	113	10	0.00059	0.13	0.00834	0.0183	NE
Potassium	174	0	1.51	57.3	6.989	11.641	NE
Selenium	87	31	0.00152	0.0362	0.007575	0.00843	0.050
Silver	2	116	0.000362	0.000389	0.000376	0.000019	NE
Sodium	174	0	15.5	1210	90.3	140.5	NE
Thallium	9	109	0.000483	0.00249	0.001314	0.00053	0.002
Uranium	108	0	0.00022	0.0351	0.007589	0.007699	0.030
Vanadium	70	48	0.00106	0.0147	0.004625	0.00235	NE
Zinc	51	67	0.0035	1.19	0.085	0.2414	NE

Table 1-2. Summary of SNL/NM Groundwater Monitoring Results for Calendar Year 2011 *(Concluded)*

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	Standard Deviation for Detected Values	MCL
Detected Inorganic Parameters in mg/L							
Nitrate plus nitrite as N	192	11	0.087	34.5	8.101	7.482	10
Bromide	97	2	0.13	3.32	0.6954	0.6277	NE
Chloride	145	0	9.07	522	69.71	96.74	NE
Fluoride	99	0	0.0822	5.36	1.1348	0.8177	4.0
Sulfate	145	0	14	2020	106.7	194.4	NE
Total Organic Halogens	2	13	0.0118	0.0364	0.0241	0.0174	NE
Total phenols	2	13	0.0017	0.0279	0.0148	0.0185	NE
Perchlorate	4	49	0.01	6.26	1.57	3.13	NE
Total Organic Carbon #1	29	36	0.342	0.937	0.6317	0.1653	NE
Total Organic Carbon #2	36	29	0.349	1.18	0.7385	0.2545	NE
Total Organic Carbon #3	27	38	0.431	1.13	0.7064	0.1819	NE
Total Organic Carbon #4	30	35	0.345	1.13	0.6915	0.2173	NE
Total Organic Carbon Average	31	34	0.348	1.08	0.6844	0.2079	NE
Alkalinity as $CaCO_3$	130	0	58.3	1590	262.6	300.6	NE
Alkalinity, Bicarbonate	94	0	111	1590	278.6	304.7	NE
Detected Radiochemistry Activities in pCi/L							
Alpha, gross (uncorrected)	85	8	0.88	70.30	13.27	17.95	15.0[a]
Beta, gross	83	10	1.54	88.7	9.58	16.95	4 mrem/yr
Cesium-137	1	92	4.26	4.26	4.26	N/A	NE
Potassium-40	9	76	58.1	93.3	76.33	12.81	NE
Radium-226	6	9	0.289	3	1.227	1.283	5.0[b]
Radium-228	13	5	0.394	6.78	1.391	1.937	5.0[b]
Uranium-233/234	33	0	0.38	59.8	21.3	18.92	NE
Uranium-235/236	30	3	0.036	1.38	0.3855	0.3439	NE
Uranium-238	33	0	0.094	10.4	3.863	2.726	NE

NOTES:

a = The 15.0 pCi/L MCL is for corrected gross alpha activity.
b = The 5.0 pCi/L MCL is for combined Ra-226 and Ra-228.
°C = Degree(s) Celsius.
µg/L = Microgram(s) per liter.
µmhos/cm = Micromhos per centimeter.
4 mrem/yr = Any combination of beta- and/or gamma-emitting radionuclides (as dose rate).
$CaCO_3$ = Calcium as carbon carbonate.
MCL = Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Drinking Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards (EPA May 2009).
mg/L = Milligram(s) per liter.
mrem/yr = Millirem per year.
N = Nitrogen.
N/A = Not applicable.
NE = Not established.
NTU = Nephelometric turbidity units.
pCi/L = Picocurie(s) per liter.
pH = Potential of hydrogen (negative logarithm of the hydrogen ion concentration).
uncorrected = Gross alpha results reported as uncorrected values (result includes the uranium and radon activities).
RDX = Hexahydro-trinitro-triazine.
SNL/NM = Sandia National Laboratories, New Mexico.
SU = Standard Unit(s).

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells Sampled During Calendar Year 2011

Analyte	Well	Exceedance	Date
Arsenic MCL = 0.010 mg/L	CTF-MW2	0.0501 mg/L	March 2011
		0.0595 mg/L	
		0.0544 mg/L	
		0.0496 mg/L	May 2011
		0.0528 mg/L	
		0.0651 mg/L	September 2011
		0.0610 mg/L	
		0.0469 mg/L	December 2011
		0.0495 mg/L	
	CTF-MW2 (Duplicate)	0.0530 mg/L	March 2011
		0.0521 mg/L	
Beryllium MCL = 0.004 mg/L	Coyote Springs	0.00654 mg/L	March 2011
Fluoride MCL = 4 mg/L	CCBA-MW1	5.36 mg/L	October 2011
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	AVN-1	10.1 mg/L	April 2011
	CYN-MW1D	10.5 mg/L	August 2011
		13.3 mg/L	October 2011
	CYN-MW3	10.6 mg/L	January 2011
		12.5 mg/L	August 2011
		14.0 mg/L	October 2011
	CYN-MW6	20.7 mg/L	February 2011
		21.6 mg/L	August 2011
		24.7 mg/L	October 2011
	CYN-MW9	29.1 mg/L	February 2011
		29.2 mg/L	May 2011
		31.8 mg/L	August 2011
		34.5 mg/L	October 2011
	CYN-MW9 (Duplicate)	31.5 mg/L	August 2011
	CYN-MW11	11.4 mg/L	May 2011
		11.3 mg/L	August 2011
		11.0 mg/L	October 2011
	CYN-MW12	10.8 mg/L	February 2011
		11.4 mg/L	May 2011
		12.7 mg/L	August 2011
		12.6 mg/L	October 2011
	CYN-MW12 (Duplicate)	11.9 mg/L	May 2011
	LWDS-MW1	11.1 mg/L	January 2011
		12.0 mg/L	April 2011
		11.6 mg/L	July 2011
		14.5 mg/L	November 2011
	TA2-SW1-320	23.2 mg/L	February 2011
		20.9 mg/L	May 2011
		23.5 mg/L	August 2011
		23.1 mg/L	December 2011
	TA2-W-19	10.6 mg/L	February 2011
		10.6 mg/L	May 2011
		10.6 mg/L	September 2011
		10.6 mg/L	December 2011
	TA2-W-19 (Duplicate)	10.6 mg/L	May 2011
	TJA-2	10.1 mg/L	February 2011
		11.0 mg/L	May 2011
		10.7 mg/L	September 2011
		10.8 mg/L	December 2011
	TJA-2 (Duplicate)	10.1 mg/L	February 2011

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells Sampled During Calendar Year 2011 *(Concluded)*

Analyte	Well	Exceedance	Date
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	TJA-4	26.4 mg/L	February 2011
		29.4 mg/L	May 2011
		31.0 mg/L	September 2011
		30.5 mg/L	December 2011
	TJA-4 (Duplicate)	31.1 mg/L	December 2011
	TJA-7	30.0 mg/L	March 2011
		21.9 mg/L	May 2011
		24.3 mg/L	September 2011
		22.5 mg/L	December 2011
	TAV-MW6 (Duplicate)	10.2 mg/L	November 2011
	TAV-MW10	10.3 mg/L	January 2011
		11.0 mg/L	April 2011
		11.3 mg/L	July 2011
		12.3 mg/L	November 2011
Thallium MCL = 0.002 mg/L	CTF-MW2	0.00249 mg/L	March 2011
Radium-226/228 MCL = 5.0 pCi/L	CTF-MW2	9.78 pCi/L	March 2011
Trichloroethene MCL = 5.0 µg/L	LWDS-MW1	12.8 µg/L	January 2011
		13.4 µg/L	April 2011
		16.0 µg/L	July 2011
		17.0 µg/L	November 2011
	TAV-MW6	9.75 µg/L	January 2011
		13.8 µg/L	April 2011
		17.1 µg/L	July 2011
		15.1 µg/L	November 2011
	TAV-MW6 (Duplicate)	13.1 µg/L	April 2011
		15.1 µg/L	November 2011
	TAV-MW10	14.9 µg/L	January 2011
		14.4 µg/L	April 2011
		17.0 µg/L	July 2011
		16.0 µg/L	November 2011
	TAV-MW12	5.13 µg/L	January 2011
		5.42 µg/L	April 2011
		6.32 µg/L	July 2011
		6.57 µg/L	November 2011
	TAV-MW12 (Duplicate)	5.30 µg/L	April 2011
	TAV-MW14	6.74 µg/L	January 2011
		6.37 µg/L	April 2011
		6.01 µg/L	July 2011
		7.04 µg/L	November 2011
	TAV-MW14 (Duplicate)	6.35 µg/L	July 2011
	WYO-4	7.50 µg/L	March 2011
		8.17 µg/L	May 2011
		6.87 µg/L	September 2011
		7.51 µg/L	December 2011
Uranium MCL = 0.030 mg/L	CTF-MW2	0.0351 mg/L	March 2011

NOTES:
µg/L = Microgram(s) per liter.
MCL = Maximum contaminant level.
mg/L = Milligram(s) per liter.
pCi/L = Picocuries per liter.
SNL/NM = Sandia National Laboratories, New Mexico.

1.2.1 Environmental Restoration Operations Monitoring

SNL/NM LTS/ER Operations conducts groundwater monitoring where groundwater contamination is documented or in areas where the potential exists for groundwater contamination from legacy surface or near-surface contamination. Currently there are 11 LTS/ER Operations groundwater monitoring networks: (1) CWL; (2) MWL; (3) TA-V; (4) TAG; (5) BSG; (6) SWMUs 8/58; (7) SWMU 49; (8) SWMU 68; (9) SWMU 116; (10) SWMU 149; and (11) SWMU 154. The LTS/ER Operations groundwater monitoring wells are located upgradient and downgradient of known legacy surface contamination sites with associated groundwater contamination.

1.2.2 Groundwater Protection Program Monitoring

The SNL/NM GWPP conducts groundwater surveillance monitoring through a network of wells on KAFB, most of which are located in areas near SNL/NM operational test facilities. Groundwater surveillance monitoring allows the detection and evaluation of the impacts (if any) of current SNL/NM operations on groundwater.

1.2.3 Groundwater Monitoring Regulatory Criteria and DOE Orders

Groundwater monitoring performed by SNL/NM GWPP and LTS/ER Operations are directed based on three different sets of regulations and requirements. Groundwater surveillance conducted by the GWPP is directed by DOE Order 436.1, *Departmental Sustainability* (DOE 2011a) and DOE Order 231.1B, *Environment, Safety, and Health Reporting* (DOE 2011b). Groundwater monitoring results for both GWPP and LTS/ER Operations are compared with federal and state water quality standards and DOE drinking water guidelines, where established.

In addition to the DOE Directives, ER sites at SNL/NM are identified, characterized, and remediated (if required) under the Resource Conservation and Recovery Act (RCRA) regulations. In 1984, RCRA was supplemented by the Hazardous and Solid Waste Amendments (HSWA), which specifically addressed remediation of legacy contamination including groundwater at SWMUs.

At SNL/NM, SWMUs are regulated under the HSWA module of the SNL/NM RCRA Permit. In the HSWA module, a SWMU is defined as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste." Monitoring and/or corrective action requirements generally are determined on a SWMU-specific basis following a site investigation. The Order became effective in 2004 and specified that corrective actions for releases of hazardous waste or hazardous constituents were to be conducted under the Order rather than under the RCRA Permit with the exception of new releases from operating units; closure and post-closure at operating units; implementation of controls for any SWMU on the Permit's Corrective Action Complete with Controls list; and, any releases of hazardous waste or hazardous constituents that occur after the Order is no longer effective.

The MWL, TA-V, TAG, and BSG are undergoing corrective action in accordance with the Order between the NMED, Sandia, and the DOE (NMED April 2004). Each of the TA-V, TAG, and BSG sites must comply with requirements set forth in the Order for site characterization and the development of a Corrective Measures Evaluation (CME) for each site. The NMED is the regulatory agency responsible for enforcing the requirements identified in the Order for each of the three CMEs (SNL 2004a, 2004b, and 2004c). The Order also extends NMED regulatory jurisdiction to the siting and installation of new groundwater monitoring wells and the abandonment of existing wells at SNL/NM.

In addition, SWMUs 8/58, 49, 68, 116, 149, and 154 are undergoing corrective action in accordance with the Order and addressed in a letter received from the NMED by the DOE and Sandia on April 14, 2010, entitled: *Class 3 Permit Modification Requests for Granting Corrective Action Complete Status for 26 SWMUs/AOCs (Request of March 1, 2006) and 5 Other SWMUs/AOCs (Request of January 7, 2008), Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-06-007 and HWB-SNL-08-001* (NMED April 2010). The NMED's letter lists these SWMUs under the heading of "SWMUs Requiring Additional Corrective Action" or "SWMUs/AOCs to be Subject to Groundwater Monitoring Controls," and further states that these SWMUs require long-term monitoring of groundwater on a quarterly or annual basis.

The CWL has undergone closure in accordance with 20.4.1.600 New Mexico Administrative Code, incorporating Title 40, Code of Federal Regulations, Section 265, Subpart G, and the CWL Closure Plan (SNL 1992). The CWL closure and Post-Closure Care Permit (PCCP) were approved by the NMED and became effective on June 2, 2011 (Kieling June 2011). The CWL PCCP supersedes the CWL Final Closure Plan (SNL 1992) as the enforceable regulatory document. Therefore, all groundwater monitoring at the CWL after June 2011 will be performed in accordance with requirements specified in the PCCP. The *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2011* is anticipated to be submitted to the NMED in March 2012.

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2.0 Groundwater Protection Program

2.1 Introduction

This chapter documents the results for the Calendar Year (CY) 2011 groundwater surveillance monitoring activities conducted as part of the Sandia National Laboratories, New Mexico (SNL/NM) Groundwater Protection Program (GWPP). The surveillance activities include the annual collection and analysis of groundwater samples from 14 monitoring wells and 1 surface water sample from a spring. As part of the activities, SNL/NM GWPP personnel also measured groundwater elevations at 102 monitoring wells owned by U.S. Department of Energy (DOE) and maintained/monitored by Sandia Corporation (Sandia), and 1 well (Eubank 1) owned by the City of Albuquerque (COA). Groundwater elevation measurements were obtained either monthly or quarterly depending on the response characteristics of the groundwater system at each well location due to climate, aquifer properties, pumping, or other stresses.

The purpose of the GWPP is to protect groundwater resources at SNL/NM and the surrounding area by identifying potential sources of contamination, working with other SNL/NM organizations to prevent groundwater contamination, implementing effective groundwater surveillance to detect contamination if it should occur, and initiating abatement or remedial action where necessary. To accomplish this mission, the GWPP performs the following tasks:

- Evaluates the potential effects of SNL/NM operations on groundwater through groundwater quality sampling and analysis and groundwater elevation measurements.
- Records and maintains groundwater information in a database.
- Maintains GWPP documents and records and ensures that all necessary reports are submitted to the appropriate agencies in a timely manner.
- Prepares and maintains Administrative (AOP) and Field Operating Procedures (FOPs) for groundwater monitoring activities.
- Provides assistance to well owners in the areas of well installation, well inspection and maintenance, and well plugging and abandonment.
- Establishes requirements for well registration and well construction data tracking.
- Coordinates with the Surface Water Discharge Program to prevent groundwater contamination.
- Develops groundwater education and community outreach programs.
- Provides stakeholders an annual update of groundwater data for SNL/NM through the *Annual Groundwater Monitoring Report*.

The groundwater surveillance monitoring involves completing the following objectives:

- Establishing baseline water quality and groundwater flow information for the regional aquifer and perched groundwater system (PGWS) at SNL/NM.

- Determining the impact, if any, of operations at SNL/NM on the quality and quantity of groundwater.

- Demonstrating compliance with all federal, state, and local groundwater requirements.

The GWPP is responsible for tracking information for all wells operated by SNL/NM personnel, including Long-Term Stewardship (LTS)/Environmental Restoration (ER) Operations (formerly ER Project) monitoring wells and characterization boreholes. The GWPP Well Registry and Oversight Task was established to ensure that all wells operated by SNL/NM personnel are properly constructed and maintained to protect groundwater resources in accordance with guidelines specified by the New Mexico Office of the State Engineer in *Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells* (NMOSE 2005). The GWPP Project Lead works with SNL/NM personnel to review new well installation plans, record construction information, track well ownership and maintenance records, perform annual well inspections, and consult with owners when plugging and abandoning or replacing a well or borehole is required. The goal is to provide full life-cycle management of monitoring wells and boreholes. Additional information for the GWPP is provided in the *SNL/NM Groundwater Protection Program Plan* (SNL 2009a).

2.2 Regulatory Criteria

Sandia is in compliance with the requirement to have a site-wide Environmental Management System (EMS) in accordance with the U.S. Department of Energy (DOE) Order 436.1 (DOE 2011). The following actions ensure the implementation of a successful GWPP that includes all relevant elements of an EMS at the facility:

- Possible sources of current and future groundwater contamination are identified and the potential for future contamination is evaluated.

- All applicable federal, state, and DOE requirements are met.

- Appropriate groundwater protection goals are established for all affected or potentially affected groundwater consistent with water quality and current or likely future use.

- Strategies for predicting and preventing future contamination and for controlling existing contamination are developed.

- The history of GWPP activities is documented for future site management.

- The quality of baseline groundwater and vadose zone conditions at the site are documented.

- Environmental monitoring with surveillance program elements for the groundwater and the vadose zone, including baseline subsurface conditions, are described.

- A systematic approach is established for the monitoring program that provides the information needed to predict and respond to potential contamination associated with significant site activities and to achieve the groundwater protection goals.

In April 2004, the Compliance Order on Consent (the Order) (NMED 2004) became effective between the DOE, Sandia, and the New Mexico Environment Department (NMED). Among other sampling requirements primarily affecting ER sites for a variety of potential contaminants, the Order mandates four continuous quarters of sampling and analysis for perchlorate for newly constructed monitoring wells. The protocol establishes a screening level/method detection limit (MDL) of 4 micrograms per liter (µg/L). If the sampling results indicate the presence of perchlorate either at or greater than 4 µg/L, then DOE/Sandia are required to evaluate the nature and extent of perchlorate contamination and report the results in a Resource Conservation and Recovery Act Corrective Measures Evaluation. Sampling and analysis of the noncompliant well will continue on a quarterly basis until at least four consecutive nondetections are obtained (NMED 2004).

The NMED DOE Oversight Bureau (OB) splits groundwater samples collected by the GWPP. The samples are analyzed by laboratories under contract to the NMED DOE OB. The NMED DOE OB provides independent verification of environmental monitoring results obtained by Sandia on behalf of the DOE National Nuclear Security Administration (NNSA) Sandia Site Office (SSO). Additional requirements associated with groundwater quality regulations are presented in Table 2-1.

Table 2-1. Groundwater Quality Regulations

Regulation/Requirements	Standards and Guides	Regulating Agency
National Primary Drinking Water Regulations (40 CFR 141)	MCL	EPA (2001 and 2009)
NMWQCC[1] Standards for Groundwater (20 6.2.3103A NMAC Human Health Standards) (NMED 2001)	MAC	NMWQCC
DOE Drinking Water Guidelines for Radioisotopes[2] (DOE Order 5400.5)	DCG	DOE (1993)

NOTES: [1] MACs for Human Health and Domestic Water Supply Standards are identified in the analytical results tables in Attachment 2A. Domestic water supply standards are based on aesthetic considerations, not on direct human health risks.

[2] DOE drinking water guidelines set allowable radionuclide levels in drinking water (DOE, 1993, *Drinking Water Guidelines for Radioisotopes*). The levels are calculated based on published DCGs and correspond to a 4 mrem/yr dose from chronic exposures. This is equivalent to 4 percent of the DCG for ingestion, which is based on an exposure of 100 mrem/yr. These may be different from the EPA standards, where established.

CFR = Code of Federal Regulations.
DCG = Derived Concentration Guide.
DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
MAC = Maximum allowable concentration.
MCL = Maximum contaminant level.
mrem/yr = Millirem per year.
NMAC = New Mexico Administrative Code.
NMED = New Mexico Environment Department.
NMWQCC = New Mexico Water Quality Control Commission.

Although radionuclides (gamma spectroscopy and gross alpha/beta activity) are being monitored, the information related to radionuclides is provided voluntarily by the DOE and Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements imposed by the NMED, as specified in Section III.A of the Order (NMED April 2004).

2.3 Scope of Activities

2.3.1 Groundwater Quality Surveillance Monitoring

Annual sampling of groundwater was conducted during the period from March 8 to March 29, 2011. Samples were collected from 14 wells and 1 spring. Groundwater surveillance samples were collected from the following monitoring wells: CTF-MW2, CTF-MW3, Greystone-MW2, MRN-2, MRN-3D, NWTA3-MW3D, PL-2, PL-4, SFR-2S, SFR-4T, SWTA3-MW2, SWTA3-MW3, SWTA3-MW4, and

TRE-1. A water sample was collected from Coyote Springs. Well locations are shown on Figure 2-1. The analytical results for the groundwater samples are presented in Tables 2A-1 through 2A-7 in Attachment 2A.

Samples collected from all locations were analyzed for the following analytes:

- Safe Drinking Water Act (SDWA) list volatile organic compounds (VOCs)
- Total organic halogens (TOX)
- Total phenols
- Total alkalinity
- Nitrate plus nitrite (NPN)
- Total cyanide
- High explosives (HE), selected wells only
- Major anions (chloride, bromide, fluoride, and sulfate)
- Target Analyte List (TAL) metals plus total uranium
- Mercury
- Gamma spectroscopy
- Gross alpha and beta activity
- Radium-226 and radium-228
- Isotopic uranium (U-234, U-235, and U-238), selected wells only

Analysis for HE compounds was conducted on groundwater samples collected from wells CTF-MW2, CTF-MW3, SFR-2S, SWTA3-MW3, SWTA3-MW4, and TRE-1. These wells are located in or downgradient of the Coyote Canyon Test Field and are associated with the Dynamic Explosives Test Site located in the Coyote Canyon Test Field. All samples were filtered in the field using in-line filters of 0.45-micron pore size, except those for VOC, HE, and mercury fractions. Duplicate environmental samples from Greystone-MW2, PL-2, and SFR-2S were submitted for all analyses.

The NMED DOE OB collected split samples with Sandia at Coyote Springs, CTF-MW2, and CTF-MW3. The NMED DOE OB analytical results are not reported in this document but are available through the DOE NNSA, SSO.

Groundwater elevation monitoring is a means to assess the physical changes of the groundwater system over time. This includes changes in the potentiometric surface, gradients, the quantity of water available, as well as the direction and velocity of groundwater movement. The GWPP gathers groundwater information from a large network of 217 wells within and in the vicinity of Kirtland Air Force Base (KAFB). In addition to wells owned by the DOE, data are solicited from the U.S. Air Force (USAF) Installation Restoration Program (IRP), Albuquerque Bernalillo County Water Utility Authority (ABCWUA), the Lovelace Respiratory Research Institute (LRRI), and U.S. Geological Service (USGS) (Figure 1-4 and Plate 1). Groundwater elevations in wells were measured quarterly or monthly during CY 2011, depending on the owner’s requirements and the well characteristics. Groundwater elevations at the wells are depicted on Plate 1 and were used for preparing a base-wide potentiometric surface map of the regional aquifer (see discussion in Section 2.6.2.2).

Groundwater recharge is difficult to measure directly. Precipitation can be used as an indirect measure of recharge potential. Available precipitation also impacts demand on groundwater withdrawal. Water quantities pumped by the KAFB and ABCWUA water supply wells represent the primary groundwater withdrawal from the regional aquifer. From the potentiometric surface map (Plate 1) groundwater flow directions can be identified and horizontal gradients can be determined. Specific results for annual precipitation, water production, and the impact on the groundwater elevations are discussed in Section 2.6.2.

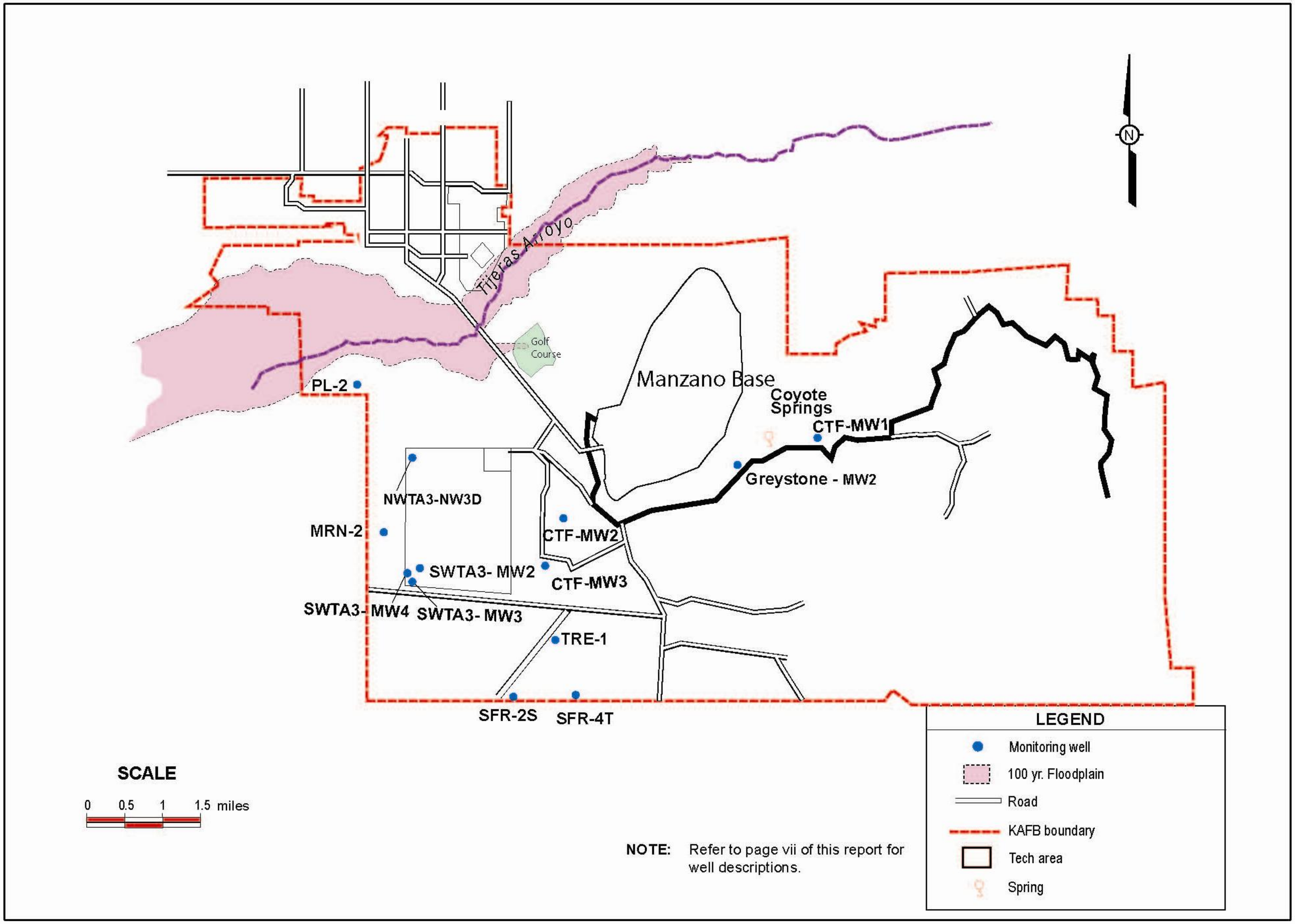

Figure 2-1. Groundwater Protection Program (GWPP) Water Quality Monitoring Network

2.3.2 Monitoring Well Installation

No new monitoring wells were installed by the GWPP during CY 2011.

2.4 Field Methods and Measurements

2.4.1 Groundwater Sampling

The GWPP monitoring procedures, as required by the Groundwater Surveillance Task, are consistent with procedures identified in the U.S. Environmental Protection Agency (EPA) technical enforcement guidance document (EPA 1986). The EPA procedures are included in the GWPP Sampling and Analysis Plan (SAP) (SNL 2006), which provides general requirements for data quality objectives, field operations, sample documentation and custody, quality control (QC), reporting, and data management. Specific sampling instructions for the annual surveillance monitoring event are conveyed to the SNL/NM Field Support Operations (FSO) and Sample Management Office (SMO) as provided in the Mini-SAP (SNL 2011a). The Mini-SAP is prepared by the Sampling Coordinator at the request of the GWPP Project Lead and provides detailed information on the wells to be sampled, the analyses to be conducted, the methods to be used, and any special conditions that may apply.

2.4.2 Sample Collection, Handling, and Analysis

Groundwater samples are collected using a nitrogen gas-powered, portable, piston pump (Bennett™). Surface water samples from Coyote Springs are collected using a peristaltic pump. With the exception of samples collected for HE compound, VOC, and mercury analyses, samples are filtered through a 0.45-micron cartridge inserted into the pump discharge line water sampling manifold. Samples are filtered to determine dissolved constituents in the groundwater to compare with New Mexico Water Quality Control Commission (NMWQCC) groundwater standards, which are based on dissolved contaminants (Section 20.6.2, New Mexico Administrative Code [NMED 2001]). Sampling is conducted annually. Sample collection is performed according to the instructions and requirements specified in FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements* (SNL 2009b).

The SNL/NM SMO processes environmental samples collected by both the GWPP and LTS/ER Operations. The SMO personnel order sample containers, issue sample control and tracking numbers, track the chain-of-custody, and review analytical results returned from the laboratories for laboratory contract compliance (SNL 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

2.4.3 Field Water Quality Measurements

Field water quality measurements are obtained at the time of sample collection. Groundwater is pumped to the surface and into a flow-through cell containing measurement probes for various field instruments. Table 2-2 lists the field parameters. Consecutive measurements of temperature, pH, turbidity, and specific conductance (SC) are collected until these values are within the acceptable ranges for the stabilization parameters shown in Table 2-2. Stability of the measured parameters indicates sufficient water has been removed from the well to replace water that may have stagnated in the well bore with formation water,

Table 2-2. Field Water Quality Parameters Measured at Groundwater Protection Program Monitoring Wells

Field Parameter	Comments
pH	Stability measure: Four consecutive measures within 0.1 pH units
Temperature (°C)	Stability measure: Four consecutive measures within 1°C
Specific Conductance (µmhos/cm)	Stability measure: Four consecutive measurements within 5%.
Turbidity (NTU)	Stability measure: Four consecutive measurements within 10% or <5 NTU.
Alkalinity[1]	Measured in mg/L $CaCO_3$. Alkalinity titrations are performed in the field at the time of sample collection.
Sample Flow Rate	Measured in gpm
Dissolved Oxygen	Percentage of saturation value and/or measured in mg/L
Oxidation-Reduction Potential	Measured in mV

NOTE: [1]Alkalinity results for field measurements are provided in Attachment 2A, Table 2A-8, and laboratory-derived alkalinity values are reported in Table 2A-3 for comparison.

°C = Degree(s) Celsius.
$CaCO_3$ = Calcium carbonate.
gpm = Gallon(s) per minute.
µmhos/cm = Microhm(s) per centimeter.
mg/L = Milligram(s) per liter.
mV = Millivolt(s).
NTU = Nephelometric turbidity units.

and a representative groundwater sample can be collected. In addition to groundwater stability measurements, other field parameters measured include alkalinity, dissolved oxygen (DO), and oxidation-reduction potential (ORP). All purge water is placed into 55-gallon (gal.) containers and stored at the FSO facility waste accumulation area pending analysis of groundwater samples and subsequent determination of the appropriate disposal path for the water.

2.4.4 Groundwater Elevation Measurements

Groundwater elevation measurements are conducted at a frequency of monthly or quarterly for a network of 103 SNL/NM monitoring wells located on DOE property and on permitted land from KAFB. Sampling frequency for each well is determined by the response of the aquifer to well pumping or other temporal stresses. Where seasonal pumping stresses impose a periodic response, the measurement frequency is monthly. If the groundwater elevation is relatively stable, the measurement frequency for such a well is quarterly. Groundwater elevation measurements are conducted according to the instructions and requirements specified in FOP 03-02, *Groundwater Level Data Acquisition and Management*, (SNL 2009c and 2011b).

2.5 Analytical Methods

Analytical methods for groundwater samples are identified in the Mini-SAP for the specific analytes for the CY 2011 sampling event (SNL 2011a). The methods are defined in EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Update IV of the Third Edition (EPA 2008). Other analyses are conducted using methods developed by the EPA Office of Groundwater and Drinking Water. The SMO provides oversight of the contract laboratories to ensure that proper methods are applied within SMO-specified performance criteria (SNL 2010).

2.6 Summary of Monitoring Results

2.6.1 Analytical Results

Groundwater and surface water samples were submitted to GEL Laboratories LLC (GEL) for both chemical and radiological analysis. In addition, SNL/NM FSO personnel performed field alkalinity measurements. Samples submitted to GEL were analyzed in accordance with applicable EPA analytical methods. Groundwater sampling results are compared with EPA maximum contaminant levels (MCLs) for drinking water supplies (EPA 2001 and 2009) and NMED maximum allowable concentrations (MACs) for human health standards of groundwater as promulgated by the NMWQCC (NMED 2001). Analytical reports from GEL, including certificates of analyses, analytical methods, MDLs, practical quantitation limits (PQLs), minimum detectable activity (MDA) values, critical levels, dates of analyses, results of QC analyses, and data validation findings are filed in the SNL/NM Records Center. Analytical results, laboratory QC qualifiers, and third-party validation qualifiers are posted to the Environmental Data Management System (EDMS) electronic database.

Table 2A-1 (Attachment 2A) summarizes detected VOC and HE compound results for groundwater samples collected in March 2011. No VOCs or HE compounds were detected at concentrations above established MCLs or MACs in any groundwater sample. Chloroform and bromodichloromethane were the only VOCs detected above the laboratory MDLs but below reporting limits or PQLs. Consequently the concentration values reported by the laboratory are qualified with "J" as estimated concentrations.

Chloroform was detected at a concentration of 0.650 μg/L in the sample from CTF-MW3. Chloroform was qualified as not detected during data validation in the sample from TRE-1 due to the presence of toluene in associated field blank (FB) sample. Therefore, a validation qualifier of "U" is assigned to the data. Bromodichloromethane was detected in the CTF-MW3 sample at a concentration of 0.470 μg/L.

The only HE compound detected was hexahydro-trinitro-triazine (RDX). The concentration of RDX detected in the sample from CTF-MW2 was reported at 0.391 μg/L; however, this value was qualified as estimated with a suspected positive bias, "J+," as detected but not reliably quantifiable. Table 2A-2 (Attachment 2A) lists the laboratory MDLs for VOC and HE compounds associated with the applied analytical methods.

Table 2A-3 (Attachment 2A) summarizes alkalinity, major anions (as bromide, chloride, fluoride, and sulfate), NPN, TOX, total phenols, and total cyanide results. None of the analytes listed were detected above established MCLs or MACs, except for fluoride. Fluoride was detected above the MAC of 1.6 milligrams per liter (mg/L) in samples from Coyote Springs, CTF-MW2, CTF-MW3, SFR-4T, and SWTA3-MW4 at concentrations ranging from 1.66 to 2.41 mg/L. The elevated fluoride concentrations routinely observed in Coyote Springs and monitoring wells CTF-MW2, CTF-MW3, SFR-4T are in areas of shallow groundwater and elevated bedrock containing fluoride-bearing minerals. The time trend plots for wells in which fluoride concentrations exceed the MCL are presented on Figures 2B-1 through 2B-5 (Attachment 2B).

Detections of TOX were reported in samples from nine wells and Coyote Springs. The results for TOX were qualified during data validation as not detected in eight of the samples due to contamination in initial calibration and continuing calibration blank samples. The surviving validated TOX detections were reported for CTF-MW2, CTF-MW3, and SFR-4T samples at concentrations of 0.0118, 0.0157, and 0.0364 mg/L, respectively.

Total phenol was detected in the samples from Coyote Springs, MRN-2, MRN-3D, and NWTA3-MW3D at "J" level concentrations. The results for Coyote Springs and NWTA3-MW3D were qualified as not detected during data validation due to the presence of total phenols in associated laboratory method blank samples. NPN was detected in all the well samples above associated MDLs, except for the sample obtained from CTF-MW2. All NPN results are below the MCL/MAC of 10 mg/L. Total cyanide was detected in the samples from SFR-2S and SFR-4T at "J" level concentrations. However, both these results were qualified as not detected during data validation due to contamination in initial calibration and continuing calibration blank samples.

Samples from GWPP monitoring wells were analyzed for TAL metals plus uranium. Dissolved TAL metal results are summarized in Table 2A-4 (Attachment 2A). No metal parameters, other than arsenic, beryllium, and uranium, were detected above established regulatory limits in any groundwater sample. Arsenic was detected above the MCL of 0.01 mg/L in the sample from CTF-MW2 at a concentration of 0.0501 mg/L. The time trend plot for arsenic concentrations in well CTF-MW2 is shown on Figure 2B-6 (Attachment 2B). Beryllium was detected above the MCL of 0.004 mg/L in the sample from Coyote Springs at a concentration of 0.00654 mg/L. The time trend plot for beryllium concentrations for Coyote Springs is shown on Figure 2B-7 (Attachment 2B).

Uranium was detected above the MCL of 0.030 mg/L in the sample from CTF-MW2 at a concentration of 0.0351 mg/L. The time trend plot for uranium concentrations in well CTF-MW2 is shown on Figure 2B-8 (Attachment 2B). In this region, groundwater contacts bedrock, which contains materials that are high in naturally occurring uranium. Both the arsenic result for CTF-MW2 and the beryllium result for Coyote Springs are consistent with prior years of monitoring data as is demonstrated in the trend plots. The uranium result for CTF-MW2 is anomalously high compared to prior and subsequent monitoring data, as is demonstrated in the trend plot.

Mercury was analyzed in unfiltered samples and reported as total mercury. Mercury was not detected above associated laboratory MDLs in any groundwater sample. Total mercury results are summarized in Table 2A-5 (Attachment 2A).

Gamma spectroscopy results for short-list gamma radiation-emitting radioisotopes (americium-241, cesium-137, cobalt-60, and potassium-40) are summarized in Table 2A-6 (Attachment 2A). All activity results for these isotopes are less than the associated MDA values, except for potassium-40. Potassium-40 was reported above the MDA in the samples from Coyote Springs, CTF-MW2, and SFR-2S at activity levels of 58.9 ± 47.4, 58.1 ± 43.9, and 82.4 ± 38.1 picocuries per liter (pCi/L), respectively. The result for potassium-40 in the MRN-3D sample was qualified as unusable during data validation as the laboratory did not meet minimum peak criteria. The result for americium-241 was qualified as unusable during data validation because the result was negative with an absolute value greater twice the associated MDA in the SFR-2S duplicate sample and TRE-1.

Radioisotopic results are summarized in Table 2A-7 (Attachment 2A). Analyses for alpha- and beta-emitting radioisotopes included gross alpha/beta activity, radium-226, and radium-228. Isotopic uranium (U-233/234, U-235/236, and U-238) analysis was conducted on those samples from wells that previously had high gross alpha activity or are located where groundwater is in contact with bedrock that contains minerals that are high in naturally occurring radioisotopes. The MCL value of 15 pCi/L for gross alpha activity does not include the contribution of the uranium or radon activity. The analytical procedure removes the radon from the sample; hence, the laboratory-reported gross alpha activity result must be corrected by removing only the uranium activity in the sample.

For wells where isotopic uranium activity was measured, the activity value was subtracted directly to correct the gross alpha activity results. For other wells, the uranium concentration obtained from the TAL metal analysis was converted to uranium activity using a conversion factor of 670 picocuries per milligram (EPA 2001). The corrected gross alpha activity results are all below the MCL of 15 pCi/L, with a maximum value of 5.48 pCi/L. Gross beta activity results do not exceed established MCLs. Combined radium-226 and radium-228 activity results from the CTF-MW2 sample exceed the MCL of 5.0 pCi/L. Activity for radium-226 was reported at 3.00 ± 1.12 pCi/L and for radium-228 at 6.78 ± 1.80 pCi/L in the sample from CTF-MW2. Figure 2B-9 (Attachment 2B) shows the time trend plot for radium-226 and radium-228 activity levels in CTF-MW2.

Table 2A-8 (Attachment 2A) summarizes field water quality measurements collected prior to sampling and field alkalinity titration results. Field water quality measurements include groundwater elevation, turbidity, pH, temperature, SC, ORP, and DO. The groundwater elevation was measured with a Solinst® water level indicator. Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

2.6.2 Groundwater Elevation Measurements

During CY 2011, SNL/NM GWPP personnel measured levels in 103 wells. Data were also provided by the USAF IRP, COA, and USGS for other wells on and near KAFB. The groundwater elevation data are maintained in the EDMS. Groundwater elevation data for CY 2011 for SNL/NM wells are provided in Table 2A-9 (Attachment 2A). The total number of wells represented in the database, listed by the respective organization, is provided in Table 2-3.

Table 2-3. Groundwater Elevations Measured in Monitoring Wells by SNL/NM and Other Organizations

Total Wells	Measuring Agency	Well Owner	Location
102	SNL/NM GWPP	DOE/NNSA	Site-wide surveillance network wells, CWL, MWL, TA-V, TAG Investigation, and Burn Site Groundwater Area
101	USAF IRP	KAFB	IRP Long-term Monitoring Program
7	COA	COA	Eubank Landfill north of KAFB and Yale Avenue Landfill west of KAFB
1	SNL/NM GWPP	COA	Eubank 1, West of Eubank Landfill
1	USGS	NMOSE	Mesa del Sol well
1	USGS	COA	MP-MW3 (Montessa Park) well
4	LRRI	DOE/NNSA	Southern boundary of KAFB

NOTES:
COA = City of Albuquerque.
CWL = Chemical Waste Landfill.
DOE = U.S. Department of Energy.
GWPP = Groundwater Protection Program.
IRP = Installation Restoration Program.
KAFB = Kirtland Air Force Base.
LRRI = Lovelace Respiratory Research Institute.
MWL = Mixed Waste Landfill.
NMOSE = New Mexico Office of the State Engineer.
NNSA = National Nuclear Security Administration.
SNL/NM = Sandia National Laboratories, New Mexico.
TA-V = Technical Area V.
TAG = Tijeras Arroyo Groundwater.
USAF = U.S. Air Force.
USGS = U.S. Geological Survey.

2.6.2.1 Groundwater Recharge and Withdrawal

Factors influencing groundwater elevation changes include potential recharge from precipitation and groundwater withdrawal by production wells.

Annual Precipitation

The regional climate for the Albuquerque Basin area is semiarid. Long-term average precipitation ranges from 9.0 inches per year (in./yr) (30-year norm) at Albuquerque International Sunport up to 35 in./yr at the crest of the Sandia Mountains. The normal seasonal distribution of precipitation in the Albuquerque area is for the majority to occur during the months of June through August. For CY 2011, the wettest months were August, October, and December. Precipitation data relevant to KAFB hydrogeology are available from four rain-gauge locations. Three meteorological towers are used to measure on-site precipitation at KAFB: the A21 tower located in Technical Area (TA)-II; the A36 tower located in TA-III; and the SC1 tower located near Schoolhouse Well in the foothills of the Manzanita Mountains (Figure 1-4). The fourth data source is the National Weather Service station at the Albuquerque International Sunport located at the northwest corner of KAFB.

Annual precipitation during CY 2011 at the four locations is shown in Table 2-4. Data for CY 2010 is also presented for comparison. The 4.72 inches of precipitation measured at the Albuquerque International Sunport during CY 2011 is 4.24 inches less than the corresponding period for the previous year; it is also 4.75 inches below the 30-year norm of 9.47 inches. Monthly distribution of precipitation during CY 2011 at the four locations is shown on Figure 2C-1 (Attachment 2C). Figure 2C-2 shows the annual distribution of precipitation at these four locations for the period from January 2002 to December 2011.

Table 2-4. Precipitation Data for Kirtland Air Force Base, Calendar Years 2010 and 2011

Site	A21	A36	SC1	Airport
CY 2010	9.47	9.67	11.17	8.96
CY 2011	5.45	6.88	8.43	4.72

NOTES: Data are in inches of rainfall.
Airport = Albuquerque International Sunport.
CY = Calendar Year.

Groundwater Withdrawal

The KAFB production wells are screened over a depth from about 500 to 2,000 feet (ft) below ground surface (bgs) and extract groundwater from the upper and middle unit of the Santa Fe Group. During CY 2011, KAFB pumped groundwater primarily from seven water supply wells.

KAFB supplies all the water for SNL/NM and other DOE facilities located on KAFB. Figure 2C-3 (Attachment 2C) shows the CY 2011 monthly production for KAFB water supply wells. The highest level of production was in July at 129,175,000 gal.; the lowest occurred in January at 35,222,000 gal. The variability in production in response to demand is reflected in the cyclic fluctuation of groundwater elevations in monitoring wells within the region of influence of these pumping wells and is evident when shown in hydrographs. Figure 2C-4 shows the CY 2011 monthly production for each KAFB water supply well. Figure 2C-5 shows the trend of total annual groundwater production at KAFB for all wells, starting with 2001. Table 2-5 provides a comparison of water pumped during CY 2011 to the previous year.

Table 2-5. Total Kirtland Air Force Base Groundwater Well Production

Units	CY 2010	CY 2011
Million gal.	900	912
Acre feet	2,763	2,800

NOTES:
Acre foot = 325,851 gal.
CY = Calendar Year.
gal. = Gallon(s).

2.6.2.2 Groundwater Elevations

Groundwater elevations were interpreted using potentiometric surface maps and hydrographs.

Base-Wide Potentiometric Surface Map

Groundwater elevation data for monitoring wells installed by Sandia, USAF IRP, COA, LRRI, and the State of New Mexico were used to construct the base-wide CY 2011 potentiometric surface map of the regional aquifer as shown on Plate 1. A total of 108 monitoring wells with water levels for October and November 2011 were used for interpreting the groundwater-elevation data and constructing the contours (Table 2A-9). These two months provided the most useful data set for CY 2011. Even though the various well owners measure water levels on differing schedules, the use of October and November data is considered temporally concordant because water levels are typically not seasonally affected across KAFB.

The base-wide map represents the potentiometric surface of the regional aquifer and incorporates wells completed at the water table west of the Tijeras Fault Zone and wells completed in bedrock east of the fault zone (Figure 1-3). West of the Tijeras Fault Zone, the regional aquifer is under unconfined (water table) conditions and is present within the Santa Fe Group, which consists of a fine-grained alluvial-fan lithofacies and the coarser Ancestral Rio Grande lithofacies (Figure 1-3). Within and east of the Tijeras Fault Zone, the regional aquifer is typically under confined conditions (positive pressure head) and is primarily present within fractured Paleozoic bedrock (primarily limestone and sandstone) and Precambrian bedrock (primarily granite and metamorphic rocks). The fault zone partially restricts groundwater underflow from the bedrock recharging the unconsolidated basin-fill deposits (the Santa Fe Group) of the Albuquerque Basin.

In general, groundwater flows generally westward away from the Manzanita Mountains and toward the Rio Grande. An extensive trough in the water table along the western edge of KAFB is due to drawdowns created by KAFB and ABCWUA water-supply wells. As a result, water levels across much of KAFB are steadily declining. This trough extends as far south as the Isleta Pueblo Reservation. The KAFB and ABCWUA Ridgecrest production well fields are located near the northern boundary of KAFB. The flat gradient in the middle of the trough is characteristic of flow through the highly permeable sediments of the Ancestral Rio Grande fluvial deposits, which are the most productive aquifer material in the area.

Relatively steeper gradients in the eastern portion of KAFB are due to (1) less permeable materials, (2) higher ground surface elevation along the eastern mountain front of the Albuquerque Basin, and (3) the presence of various faults (Plate 1).

Perched Groundwater System Potentiometric Surface Map

During the installation of monitoring wells for groundwater characterization at TA-II in 1993, a shallow water-bearing zone was encountered at a depth of 300 ft bgs. This was 200 ft above the regional aquifer. The installation of additional wells completed in this PGWS defined the lateral extent of the system, which is approximately 3.5 square miles. The western edge of the PGWS trends along the former KAFB sewage lagoons. The northern edge coincides with the northern boundary of TA-I. To the east, the PGWS has been confirmed in the USAF IRP monitoring wells east of the KAFB Landfill. The southern edge appears to be south of the golf course along the northeastern side of Pennsylvania Avenue. The area covered by the PGWS comprises much of the Tijeras Arroyo Groundwater study area, and the elevation data for wells completed in the PGWS were used to construct the potentiometric surface map that is presented and discussed in Chapter 6.0.

Monitoring Well Hydrographs

This section discusses historical and recent trends in groundwater elevations in the vicinity of SNL/NM, as demonstrated in the hydrographs for 12 GWPP wells (Figures 2C-6 through 2C-11). The groundwater elevation data for these wells are considered to be representative of groundwater across KAFB. Historical data from quarterly and monthly groundwater elevation measurements through CY 2011 were used for plotting the hydrographs.

Since 2006, all 12 monitoring wells had declining water levels due to limited recharge from precipitation and groundwater withdrawals in the regional aquifer. All but two of the wells had consistently declining trends. The hydrograph for well Greystone-MW2 (Figure 2C-6) shows seasonal effects of 1 to 2 ft that are mostly due to monsoonal thunderstorms; the well is located in Lurance Canyon and has a shallow screen set in alluvium. The other 11 wells have deeper screens and are not located in areas of significant groundwater recharge. The hydrograph for monitoring well SFR-4T (Figure 2C-10) shows a cyclical pattern with yearly fluctuations of 20 to 30 ft since 2001.

2.7 Quality Control Results

The QC samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, equipment blank (EB), trip blank (TB), and FB samples. Field QC samples are used to monitor the sampling process. Duplicate environmental samples are used to measure the precision of the sampling process. EB samples are used to verify sampling equipment decontamination procedures. TB samples are used to determine whether VOCs contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory. FB samples are used to assess whether contamination of the samples resulted from ambient field conditions.

2.7.1 Field Quality Control Samples

2.7.1.1 Duplicate Environmental Samples

Duplicate environmental samples were collected from Greystone-MW2, PL-2, and SFR-2S and analyzed for all parameters to estimate the overall reproducibility of the sampling and analytical process. The duplicate environmental sample was collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics.

Relative percent difference calculations of environmental samples and duplicate environmental samples were performed for detected chemical analytes only.

2.7.1.2 Equipment Blank Samples

The sampling pump and tubing bundle were decontaminated prior to insertion into monitoring wells. The following solutions were pumped through the sampling system: 5 gallons of deionized (DI) water mixed with 20 milliliters (mL) of nonphosphate laboratory detergent; 5 gallons of DI water; 5 gallons of DI water mixed with 20 mL reagent-grade nitric acid; and 15 gallons of DI water. In addition, the outside of the pump tubing was rinsed with DI water. The EB or rinsate samples are collected to verify the effectiveness of the equipment decontamination process.

EB samples were collected prior to well purging and sampling at Greystone-MW2, PL-2, and SFR-2S. Samples were analyzed for both chemical and radiological parameters. Bromodichloromethane, bromoform, chloroform, dibromochloromethane, chloride, copper, potassium, sodium, total phenol, and radium-226 were detected in the EB samples. No corrective action was required for organic compounds or total phenol, because these parameters were not detected in associated environmental samples. No corrective action was required for chloride, potassium, or sodium as these parameters were detected in the environmental sample at concentrations greater than five times the blank result. Copper was detected at concentrations less than five times the associated environmental sample results and the associated environmental sample results were qualified as not detected during data validation for Greystone-MW2, PL-2, and SFR-2S samples. Radium-226 was detected above the MDA in the EB sample associated with PL-2. The PL-2 duplicate sample was qualified with presumptive evidence of the material at an estimated quantity with a suspected positive bias.

2.7.1.3 Trip Blank Samples

The TB samples were submitted whenever samples were collected for VOC analysis to assess whether contamination of the samples had occurred during shipment and storage. The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-mL volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. TB samples were brought to the field and accompanied each sample shipment. A total of 18 TB samples were submitted with the March 2011 samples. No VOCs were detected above MDLs in any TB sample.

2.7.1.4 Field Blank Samples

Three FB samples were collected for VOCs to assess whether contamination of the samples resulted from ambient conditions during sample collection. FB samples were prepared by pouring DI water into sample containers at the MRN-3D, SWTA3-MW4, and TRE-1 sampling points to simulate the transfer of environmental samples from the sampling system to the sample container. No VOCs were detected in any FB sample, except bromodichloromethane, bromoform, chloroform, and dibromochloromethane. No corrective action was necessary as these compounds were not detected above laboratory MDLs in the associated environmental samples.

2.7.2 Laboratory Quality Control Samples

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced into laboratory processes and procedures. These include method blanks, laboratory control samples, matrix spike, matrix spike duplicate, and surrogate spike samples. Table 2-6 shows the types of QC samples that accompany groundwater quality samples in the sampling and analysis process. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in AOP-00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL 2007). Quality assurance validation is conducted on all laboratory-reported data by a third-party consultant. The validation process evaluates the laboratory analytical processes and laboratory QC results for consistency with the specified analytical methods and contract requirements.

2.8 Variances and Nonconformances

Variances or nonconformance issues from requirements specified in the GWPP Mini-SAP (SNL 2011a) were identified during the March 2011 sampling activities and are described as follows:

- In accordance with instruction from the GWPP Task Leader, samples for radon-222 analysis were not collected.

- The groundwater monitoring team mistakenly submitted the wrong container for anions and alkalinity analyses for monitoring well MRN-3D. A separate sample was submitted using sample volume from the field alkalinity container. No corrective action was required because the results are comparable to historical values for alkalinity, bromide, chloride, fluoride, and sulfate analyses.

Table 2-6. Quality Control Sample Types for Groundwater Sampling and Analysis

QC Sample Type	Description
Field QC	
Equipment blanks[(1)]	Determine the effectiveness of the decontamination process of the portable sampling pump (Bennett™) to ensure that cross-contamination did not occur between wells.
Duplicate samples	Establish the precision of sampling process.
Trip blanks	Determine whether contamination by VOCs occurred during sample handling, shipment, or storage by submitting deionized water samples with environmental samples for VOC analysis.
Field Blanks	Assess whether contamination of the VOC samples had resulted from ambient field conditions.
Laboratory QC	
Method blanks	Determine contaminants introduced during the sample preparation and handling process in the laboratory.
LCS	Monitor the accuracy and precision of the laboratory's analytical method using laboratory-prepared samples spiked with a known concentration of an analyte. These samples are analyzed in the same batch with the groundwater samples. LCS results are reported as a percent recovery.
Batch matrix spike and matrix spike duplicate samples	Measure the effects of chemical spikes added to an existing sample to determine the sample matrix effect. (The matrix is groundwater.)

NOTE: [(1)]Equipment blanks are collected for selected wells only.
LCS = Laboratory control sample.
QC = Quality control.
VOC = Volatile organic compound.

2.9 Summary and Conclusions

The annual groundwater surveillance monitoring sampling event was conducted during March 2011. Groundwater samples were collected from 14 monitoring wells and 1 spring. The analytical results for the groundwater samples are similar to the results reported for previous years. No VOCs or HE compounds were detected above established MCLs or MACs. The only HE compound detected was RDX. The concentration of RDX detected in the sample from CTF-MW2 was reported at 0.391 μg/L; however, this value was qualified as estimated with a suspected positive bias, “J+,” as detected but not reliably quantifiable.

Fluoride was detected above the NMWQCC groundwater protection standard of 1.6 mg/L (NMED 2001). The elevated fluoride concentrations were detected in samples from wells CTF-MW2, CTF-MW3, SFR-4T, and SWTA3-MW4. The water sample from Coyote Springs also contained elevated fluoride levels. The concentrations range from 1.66 to 2.41 mg/L. The EPA SDWA-regulated MCL for fluoride is 4.0 mg/L.

Arsenic was detected above the MCL of 0.01 mg/L in the groundwater sample from CTF-MW2 at a concentration of 0.0501 mg/L. Beryllium was detected in the surface water sample from Coyote Springs at a concentration of 0.00654 mg/L. The MCL for beryllium is 0.004 mg/L. Beryllium has been consistently detected in the surface water samples from the spring and is considered to be of natural origin. Uranium was detected above the MCL of 0.030 mg/L in the sample from CTF-MW2 at a concentration of 0.0351 mg/L. The uranium result for CTF-MW2 is anomalously high compared to prior and subsequent monitoring data.

Upon applying the appropriate correction for uranium to the gross alpha activity results, none of the sample results exceed the MCL of 15 pCi/L. Combined radium-226 and radium-228 activity for the

CTF-MW2 sample exceed the MCL of 5.0 pCi/L. Radium-226 was reported in the sample from CTF-MW2 at 3.00 ± 1.12 pCi/L, and radium-228 at 6.78 ± 1.80 pCi/L.

Groundwater elevations were obtained during CY 2011 at 102 SNL/NM monitoring wells on a monthly or quarterly basis. Groundwater elevations from SNL/NM wells and wells owned by other agencies were used to construct a base-wide potentiometric surface map of the regional aquifer. The contours display a pattern that reflects the impact of the groundwater withdrawal by water supply wells located in the northwestern portion of KAFB and ABCWUA production wells located north of the base.

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Attachment 2A
Groundwater Protection Program
Analytical Results Tables

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Attachment 2A Tables

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Table 2A-1
Summary of Detected Volatile Organic Compounds and High Explosive Compounds, Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL/MAC[d] (µg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2 08-Mar-11	RDX	0.391	0.104	0.325	NE	NE		J+	090273-024	SW846-8321A
CTF-MW3	Bromodichloromethane	0.470	0.250	1.00	NE	NE	J		090275-001	SW846-8260
09-Mar-11	Chloroform	0.650	0.250	1.00	NE	100	J		090275-001	SW846-8260
TRE-1 21-Mar-11	Chloroform	0.570	0.250	1.00	NE	100	J	1.0U	090265-001	SW846-8260

Refer to footnotes on page 2A-41.

Table 2A-2
Method Detection Limits for Volatile Organic Compounds and High Explosive Compounds, Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	Method Detection Limit (µg/L)	Analytical Method[g]	Analyte	Method Detection Limit (µg/L)	Analytical Method[g]
1,1,1,2-Tetrachloroethane	0.300	SW846-8260	Ethyl benzene	0.250	SW846-8260
1,1,1-Trichloroethane	0.325	SW846-8260	Hexachlorobutadiene	0.300	SW846-8260
1,1,2,2-Tetrachloroethane	0.250	SW846-8260	Isopropylbenzene	0.250	SW846-8260
1,1,2-Trichloroethane	0.250	SW846-8260	Methylene chloride	3.00	SW846-8260
1,1-Dichloroethane	0.300	SW846-8260	Naphthalene	0.250	SW846-8260
1,1-Dichloroethene	0.300	SW846-8260	Styrene	0.250	SW846-8260
1,1-Dichloropropene	0.250	SW846-8260	Tert-butyl methyl ether	0.250	SW846-8260
1,2,3-Trichlorobenzene	0.332	SW846-8260	Tetrachloroethene	0.300	SW846-8260
1,2,3-Trichloropropane	0.300	SW846-8260	Toluene	0.250	SW846-8260
1,2,4-Trichlorobenzene	0.300	SW846-8260	Trichloroethene	0.250	SW846-8260
1,2,4-Trimethylbenzene	0.250	SW846-8260	Trichlorofluoromethane	0.300	SW846-8260
1,2-Dibromo-3-chloropropane	0.300	SW846-8260	Vinyl chloride	0.500	SW846-8260
1,2-Dibromoethane	0.250	SW846-8260	cis-1,2-Dichloroethene	0.300	SW846-8260
1,2-Dichlorobenzene	0.250	SW846-8260	cis-1,3-Dichloropropene	0.250	SW846-8260
1,2-Dichloroethane	0.250	SW846-8260	m-, p-Xylene	0.500	SW846-8260
1,2-Dichloropropane	0.250	SW846-8260	n-Butylbenzene	0.250	SW846-8260
1,3,5-Trimethylbenzene	0.250	SW846-8260	n-Propylbenzene	0.250	SW846-8260
1,3-Dichlorobenzene	0.250	SW846-8260	o-Xylene	0.300	SW846-8260
1,3-Dichloropropane	0.300	SW846-8260	sec-Butylbenzene	0.250	SW846-8260
1,4-Dichlorobenzene	0.250	SW846-8260	tert-Butylbenzene	0.250	SW846-8260
2,2-Dichloropropane	0.300	SW846-8260	trans-1,2-Dichloroethene	0.300	SW846-8260
2-Chlorotoluene	0.250	SW846-8260	trans-1,3-Dichloropropene	0.250	SW846-8260
2-Hexanone	1.25	SW846-8260	1,3,5-Trinitrobenzene	0.104	SW846-8321A
4-Chlorotoluene	0.250	SW846-8260	1,3-Dinitrobenzene	0.104	SW846-8321A
4-Isopropyltoluene	0.250	SW846-8260	2,4,6-Trinitrotoluene	0.104	SW846-8321A
Benzene	0.300	SW846-8260	2,4-Dinitrotoluene	0.104	SW846-8321A
Bromobenzene	0.250	SW846-8260	2,6-Dinitrotoluene	0.0779 – 0.104	SW846-8321A
Bromochloromethane	0.300	SW846-8260	2-Amino-4,6-dinitrotoluene	0.104	SW846-8321A
Bromodichloromethane	0.250	SW846-8260	2-Nitrotoluene	0.104	SW846-8321A
Bromoform	0.250	SW846-8260	3-Nitrotoluene	0.104	SW846-8321A
Carbon tetrachloride	0.300	SW846-8260	4-Amino-2,6-dinitrotoluene	0.104	SW846-8321A
Chlorobenzene	0.250	SW846-8260	4-Nitrotoluene	0.104	SW846-8321A
Chloroethane	0.300	SW846-8260	HMX	0.104	SW846-8321A
Chloroform	0.250	SW846-8260	Nitro-benzene	0.104	SW846-8321A
Chloromethane	0.300	SW846-8260	Pentaerythritol tetranitrate	0.130	SW846-8321A
Dibromochloromethane	0.300	SW846-8260	RDX	0.104	SW846-8321A
Dibromomethane	0.300	SW846-8260	Tetryl	0.130	SW846-8321A
Dichlorodifluoromethane	0.300	SW846-8260			

Refer to footnotes on page 2A-41.

Table 2A-3
Summary of Alkalinity, Anions, Nitrate plus Nitrite, Total Organic Halogens, Total Phenols, and Total Cyanide Results Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Spring	Alkalinity as CaCO3	1100	0.725	1.00	NE	NE	B		090311-016	SM 2320B
28-Mar-11	Bromide	2.26	0.330	1.00	NE	NE			090311-016	SW846 9056
	Chloride	522	3.30	10.0	NE	NE			090311-016	SW846 9056
	Fluoride	**1.87**	0.165	0.500	4.00	1.60			090311-016	SW846 9056
	Sulfate	136	0.500	2.00	NE	NE			090311-016	SW846 9056
	Nitrate plus nitrite	0.430	0.050	0.250	10.0	10.0			090311-018	EPA 353.2
	Total Organic Halogens	0.0259	0.0033	0.010	NE	NE		0.040U	090311-003	SW846 9020
	Total Phenol	0.00714	0.0016	0.005	NE	NE	B	0.023UJ	090311-026	SW846 9066
	Total Cyanide	ND	0.0015	0.005	0.200	0.200	U	UJ	090311-027	SW846 9012
CTF-MW2	Alkalinity as CaCO3	1530	0.725	1.00	NE	NE	B		090273-016	SM 2320B
08-Mar-11	Bromide	ND	0.066	0.200	NE	NE	U		090273-016	SW846 9056
	Chloride	432	3.30	10.0	NE	NE			090273-016	SW846 9056
	Fluoride	**2.35**	0.132	0.400	4.00	1.60			090273-016	SW846 9056
	Sulfate	1.57	5.00	20.0	NE	NE	B		090273-016	SW846 9056
	Nitrate plus nitrite	ND	0.010	0.050	10.0	10.0	U		090273-018	EPA 353.2
	Total Organic Halogens	0.0118	0.0033	0.010	NE	NE			090273-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090273-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U	UJ	090273-027	SW846 9012
CTF-MW3	Alkalinity as CaCO3	332	0.725	1.00	NE	NE	B		090275-016	SM 2320B
09-Mar-11	Bromide	1.20	0.066	0.200	NE	NE			090275-016	SW846 9056
	Chloride	125	1.65	5.00	NE	NE			090275-016	SW846 9056
	Fluoride	**2.41**	0.033	0.100	4.00	1.60			090275-016	SW846 9056
	Sulfate	519	2.50	10.0	NE	NE	B		090275-016	SW846 9056
	Nitrate plus nitrite	5.25	0.100	0.500	10.0	10.0			090275-018	EPA 353.2
	Total Organic Halogens	0.0157	0.0033	0.010	NE	NE			090275-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090275-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U	UJ	090275-027	SW846 9012

Refer to footnotes on page 2A-41.

Table 2A-3 *(Continued)*
Summary of Alkalinity, Anions, Nitrate plus Nitrite,
Total Organic Halogens, Total Phenols, and Total Cyanide Results
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Greystone-MW2	Alkalinity as CaCO3	460	0.725	1.00	NE	NE	B		090300-016	SM 2320B
22-Mar-11	Bromide	0.609	0.066	0.200	NE	NE			090300-016	SW846 9056
	Chloride	110	0.660	2.00	NE	NE			090300-016	SW846 9056
	Fluoride	0.865	0.033	0.100	4.00	1.60			090300-016	SW846 9056
	Sulfate	49.4	1.00	4.00	NE	NE			090300-016	SW846 9056
	Nitrate plus nitrite	4.29	0.050	0.250	10.0	10.0			090300-018	EPA 353.2
	Total Organic Halogens	0.00874	0.0033	0.010	NE	NE	J	0.028U	090300-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090300-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090300-027	SW846 9012
Greystone-MW2 (Duplicate)	Alkalinity as CaCO3	466	0.725	1.00	NE	NE	B		090301-016	SM 2320B
22-Mar-11	Bromide	0.593	0.066	0.200	NE	NE			090301-016	SW846 9056
	Chloride	111	0.660	2.00	NE	NE			090301-016	SW846 9056
	Fluoride	0.889	0.033	0.100	4.00	1.60			090301-016	SW846 9056
	Sulfate	49.1	1.00	4.00	NE	NE			090301-016	SW846 9056
	Nitrate plus nitrite	4.92	0.050	0.250	10.0	10.0			090301-018	EPA 353.2
	Total Organic Halogens	0.0247	0.0033	0.010	NE	NE		0.028U	090301-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090301-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090301-027	SW846 9012
MRN-2	Alkalinity as CaCO3	155	0.725	1.00	NE	NE	B		090277-016	SM 2320B
11-Mar-11	Bromide	0.193	0.066	0.200	NE	NE	J		090277-016	SW846 9056
	Chloride	14.9	0.066	0.200	NE	NE			090277-016	SW846 9056
	Fluoride	0.504	0.033	0.100	4.00	1.60			090277-016	SW846 9056
	Sulfate	49.6	1.00	4.00	NE	NE			090277-016	SW846 9056
	Nitrate plus nitrite	4.74	0.100	0.500	10.0	10.0			090277-018	EPA 353.2
	Total Organic Halogens	ND	0.0033	0.010	NE	NE	U		090277-003	SW846 9020
	Total Phenol	0.00167	0.0016	0.005	NE	NE	J	NJ-	090277-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090277-027	SW846 9012

Refer to footnotes on page 2A-41.

Table 2A-3 *(Continued)*
Summary of Alkalinity, Anions, Nitrate plus Nitrite, Total Organic Halogens, Total Phenols, and Total Cyanide Results
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-3D	Alkalinity as CaCO3	163	0.725	1.00	NE	NE	B		090465-016	SM 2320B
25-Mar-11	Bromide	0.231	0.066	0.200	NE	NE			090465-016	SW846 9056
	Chloride	17.0	0.066	0.200	NE	NE			090465-016	SW846 9056
	Fluoride	0.550	0.033	0.100	4.00	1.60			090465-016	SW846 9056
	Sulfate	72.1	1.00	4.00	NE	NE			090465-016	SW846 9056
	Nitrate plus nitrite	2.15	0.050	0.250	10.0	10.0			090308-018	EPA 353.2
	Total Organic Halogens	ND	0.0033	0.010	NE	NE	U		090308-003	SW846 9020
	Total Phenol	0.0279	0.0016	0.005	NE	NE	B	J-	090308-026	SW846 9066
	Total Cyanide	ND	0.0015	0.005	0.200	0.200	U	UJ	090308-027	SW846 9012
NWTA3-MW3D	Alkalinity as CaCO3	142	0.725	1.00	NE	NE	B		090313-016	SM 2320B
29-Mar-11	Bromide	0.180	0.066	0.200	NE	NE	J		090313-016	SW846 9056
	Chloride	11.6	0.066	0.200	NE	NE			090313-016	SW846 9056
	Fluoride	0.738	0.033	0.100	4.00	1.60			090313-016	SW846 9056
	Sulfate	52.1	0.500	2.00	NE	NE			090313-016	SW846 9056
	Nitrate plus nitrite	1.01	0.050	0.250	10.0	10.0			090313-018	EPA 353.2
	Total Organic Halogens	ND	0.0033	0.010	NE	NE	U		090313-003	SW846 9020
	Total Phenol	0.00506	0.0016	0.005	NE	NE	B	0.023UJ	090313-026	SW846 9066
	Total Cyanide	ND	0.0015	0.005	0.200	0.200	U	UJ	090313-027	SW846 9012
PL-2	Alkalinity as CaCO3	153	0.725	1.00	NE	NE	B		090292-016	SM 2320B
18-Mar-11	Bromide	0.257	0.066	0.200	NE	NE			090292-016	SW846 9056
	Chloride	15.7	0.066	0.200	NE	NE			090292-016	SW846 9056
	Fluoride	0.489	0.033	0.100	4.00	1.60			090292-016	SW846 9056
	Sulfate	71.3	0.500	2.00	NE	NE			090292-016	SW846 9056
	Nitrate plus nitrite	2.23	0.050	0.250	10.0	10.0	B		090292-018	EPA 353.2
	Total Organic Halogens	ND	0.0033	0.010	NE	NE	U		090292-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U		090292-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090292-027	SW846 9012

Refer to footnotes on page 2A-41.

Table 2A-3 *(Continued)*
Summary of Alkalinity, Anions, Nitrate plus Nitrite, Total Organic Halogens, Total Phenols, and Total Cyanide Results
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-2 (Duplicate)	Alkalinity as CaCO3	153	0.725	1.00	NE	NE	B		090293-016	SM 2320B
18-Mar-11	Bromide	0.247	0.066	0.200	NE	NE			090293-016	SW846 9056
	Chloride	15.6	0.066	0.200	NE	NE			090293-016	SW846 9056
	Fluoride	0.482	0.033	0.100	4.00	1.60			090293-016	SW846 9056
	Sulfate	68.8	0.500	2.00	NE	NE			090293-016	SW846 9056
	Nitrate plus nitrite	2.40	0.050	0.250	10.0	10.0	B		090293-018	EPA 353.2
	Total Organic Halogens	0.007	0.0033	0.010	NE	NE	J	0.028U	090293-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U		090293-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090293-027	SW846 9012
PL-4	Alkalinity as CaCO3	180	0.725	1.00	NE	NE	B		090288-016	SM 2320B
17-Mar-11	Bromide	0.220	0.066	0.200	NE	NE			090288-016	SW846 9056
	Chloride	17.4	0.066	0.200	NE	NE			090288-016	SW846 9056
	Fluoride	0.322	0.033	0.100	4.00	1.60			090288-016	SW846 9056
	Sulfate	57.8	1.00	4.00	NE	NE			090288-016	SW846 9056
	Nitrate plus nitrite	3.94	0.050	0.250	10.0	10.0			090288-018	EPA 353.2
	Total Organic Halogens	0.00472	0.0033	0.010	NE	NE	J	0.035U	090288-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090288-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090288-027	SW846 9012
SFR-2S	Alkalinity as CaCO3	411	0.725	1.00	NE	NE	B		090283-016	SM 2320B
15-Mar-11	Bromide	0.300	0.066	0.200	NE	NE			090283-016	SW846 9056
	Chloride	128	0.660	2.00	NE	NE			090283-016	SW846 9056
	Fluoride	1.39	0.033	0.100	4.00	1.60			090283-016	SW846 9056
	Sulfate	68.7	1.00	4.00	NE	NE			090283-016	SW846 9056
	Nitrate plus nitrite	0.830	0.050	0.250	10.0	10.0			090283-018	EPA 353.2
	Total Organic Halogens	0.0146	0.0033	0.010	NE	NE		0.037U	090283-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090283-026	SW846 9066
	Total Cyanide	0.00173	0.0017	0.005	0.200	0.200	J	0.0087U	090283-027	SW846 9012

Refer to footnotes on page 2A-41.

Table 2A-3 *(Continued)*
Summary of Alkalinity, Anions, Nitrate plus Nitrite, Total Organic Halogens, Total Phenols, and Total Cyanide Results
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-2S (Duplicate)	Alkalinity as CaCO3	391	0.725	1.00	NE	NE	B		090284-016	SM 2320B
15-Mar-11	Bromide	0.341	0.066	0.200	NE	NE			090284-016	SW846 9056
	Chloride	127	0.660	2.00	NE	NE			090284-016	SW846 9056
	Fluoride	1.42	0.033	0.100	4.00	1.60			090284-016	SW846 9056
	Sulfate	68.4	1.00	4.00	NE	NE			090284-016	SW846 9056
	Nitrate plus nitrite	0.870	0.050	0.250	10.0	10.0			090284-018	EPA 353.2
	Total Organic Halogens	0.0188	0.0033	0.010	NE	NE		0.037U	090284-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090284-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090284-027	SW846 9012
SFR-4T	Alkalinity as CaCO3	109	0.725	1.00	NE	NE	B		090279-016	SM 2320B
14-Mar-11	Bromide	1.57	0.066	0.200	NE	NE			090279-016	SW846 9056
	Chloride	189	6.60	20.0	NE	NE			090279-016	SW846 9056
	Fluoride	**2.36**	0.033	0.100	4.00	1.60			090279-016	SW846 9056
	Sulfate	2020	10.0	40.0	NE	NE			090279-016	SW846 9056
	Nitrate plus nitrite	0.222	0.050	0.250	10.0	10.0	J		090279-018	EPA 353.2
	Total Organic Halogens	0.0364	0.0066	0.020	NE	NE			090279-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090279-026	SW846 9066
	Total Cyanide	0.00175	0.0017	0.005	0.200	0.200	J	0.0087U	090279-027	SW846 9012
SWTA3-MW2	Alkalinity as CaCO3	163	0.725	1.00	NE	NE	B		090306-016	SM 2320B
24-Mar-11	Bromide	0.168	0.066	0.200	NE	NE	J		090306-016	SW846 9056
	Chloride	14.5	0.066	0.200	NE	NE			090306-016	SW846 9056
	Fluoride	0.985	0.033	0.100	4.00	1.60			090306-016	SW846 9056
	Sulfate	59.3	0.200	0.800	NE	NE			090306-016	SW846 9056
	Nitrate plus nitrite	0.835	0.050	0.250	10.0	10.0			090306-018	EPA 353.2
	Total Organic Halogens	ND	0.0033	0.010	NE	NE	U		090306-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090306-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090306-027	SW846 9012

Refer to footnotes on page 2A-41.

Table 2A-3 *(Concluded)*
Summary of Alkalinity, Anions, Nitrate plus Nitrite,
Total Organic Halogens, Total Phenols, and Total Cyanide Results
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW3	Alkalinity as CaCO3	163	0.725	1.00	NE	NE	B		090286-016	SM 2320B
16-Mar-11	Bromide	0.191	0.066	0.200	NE	NE	J		090286-016	SW846 9056
	Chloride	15.1	0.066	0.200	NE	NE			090286-016	SW846 9056
	Fluoride	1.18	0.033	0.100	4.00	1.60			090286-016	SW846 9056
	Sulfate	63.0	1.00	4.00	NE	NE			090286-016	SW846 9056
	Nitrate plus nitrite	0.525	0.050	0.250	10.0	10.0			090286-018	EPA 353.2
	Total Organic Halogens	0.00484	0.0033	0.010	NE	NE	J	0.037U	090286-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090286-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090286-027	SW846 9012
SWTA3-MW4	Alkalinity as CaCO3	175	0.725	1.00	NE	NE	B		090303-016	SM 2320B
23-Mar-11	Bromide	0.190	0.066	0.200	NE	NE	J		090303-016	SW846 9056
	Chloride	15.9	0.066	0.200	NE	NE			090303-016	SW846 9056
	Fluoride	**1.66**	0.033	0.100	4.00	1.60			090303-016	SW846 9056
	Sulfate	53.0	0.200	0.800	NE	NE			090303-016	SW846 9056
	Nitrate plus nitrite	0.880	0.050	0.250	10.0	10.0			090303-018	EPA 353.2
	Total Organic Halogens	ND	0.0033	0.010	NE	NE	U		090303-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U	UJ	090303-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090303-027	SW846 9012
TRE-1	Alkalinity as CaCO3	501	0.725	1.00	NE	NE	B		090295-016	SM 2320B
21-Mar-11	Bromide	0.774	0.066	0.200	NE	NE			090295-016	SW846 9056
	Chloride	136	1.32	4.00	NE	NE			090295-016	SW846 9056
	Fluoride	1.59	0.033	0.100	4.00	1.60			090295-016	SW846 9056
	Sulfate	105	2.00	8.00	NE	NE			090295-016	SW846 9056
	Nitrate plus nitrite	2.14	0.050	0.250	10.0	10.0	B		090295-018	EPA 353.2
	Total Organic Halogens	0.0151	0.0033	0.010	NE	NE	B	0.022U	090295-003	SW846 9020
	Total Phenol	ND	0.0016	0.005	NE	NE	U		090295-026	SW846 9066
	Total Cyanide	ND	0.0017	0.005	0.200	0.200	U		090295-027	SW846 9012

Refer to footnotes on page 2A-41.

Table 2A-4
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Spring	Aluminum	0.161	0.015	0.050	NE	NE			090311-009	SW846 6020
28-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090311-009	SW846 6020
	Arsenic	0.00505	0.0017	0.005	0.010	0.100			090311-009	SW846 6020
	Barium	0.0361	0.0006	0.002	2.00	1.00			090311-009	SW846 6020
	Beryllium	**0.00654**	0.0002	0.0005	0.004	NE			090311-009	SW846 6020
	Cadmium	0.00014	0.00011	0.001	0.005	0.010	J	J+	090311-009	SW846 6020
	Calcium	267	0.600	2.00	NE	NE			090311-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090311-009	SW846 6020
	Cobalt	0.0083	0.0001	0.001	NE	NE			090311-009	SW846 6020
	Copper	0.00147	0.00035	0.001	NE	NE		J+	090311-009	SW846 6020
	Iron	0.478	0.033	0.100	NE	NE			090311-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090311-009	SW846 6020
	Magnesium	58.5	0.100	0.300	NE	NE			090311-009	SW846 6020
	Manganese	1.41	0.025	0.125	NE	NE			090311-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090311-009	SW846 7470
	Nickel	0.0262	0.0005	0.002	NE	NE		J+	090311-009	SW846 6020
	Potassium	28.2	0.080	0.300	NE	NE			090311-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090311-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090311-009	SW846 6020
	Sodium	381	0.800	2.50	NE	NE			090311-009	SW846 6020
	Thallium	0.00135	0.00045	0.002	0.002	NE	J	0.0036U	090311-009	SW846 6020
	Uranium	0.00593	0.000067	0.0002	0.030	0.030			090311-009	SW846 6020
	Uranium-235	0.000043	0.00001	0.00007	NE	NE	J		090311-009	SW846 6020
	Uranium-238	0.00589	0.000067	0.0002	NE	NE			090311-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090311-009	SW846 6020
	Zinc	0.0415	0.0035	0.010	NE	NE	B	J+	090311-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.0615	0.015	0.050	NE	NE	B	0.077U	090273-009	SW846 6020
08-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090273-009	SW846 6020
	Arsenic	**0.0501**	0.0017	0.005	0.010	0.100			090273-009	SW846 6020
	Barium	0.0827	0.0006	0.002	2.00	1.00			090273-009	SW846 6020
	Beryllium	0.00181	0.0002	0.0005	0.004	NE			090273-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090273-009	SW846 6020
	Calcium	383	0.600	2.00	NE	NE			090273-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090273-009	SW846 6020
	Cobalt	0.00741	0.0001	0.001	NE	NE			090273-009	SW846 6020
	Copper	0.00123	0.00035	0.001	NE	NE			090273-009	SW846 6020
	Iron	4.07	0.033	0.100	NE	NE			090273-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090273-009	SW846 6020
	Magnesium	84.3	0.100	0.300	NE	NE			090273-009	SW846 6020
	Manganese	2.92	0.010	0.050	NE	NE			090273-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090273-009	SW846 7470
	Nickel	0.0214	0.0005	0.002	NE	NE			090273-009	SW846 6020
	Potassium	40.1	0.080	0.300	NE	NE			090273-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090273-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090273-009	SW846 6020
	Sodium	448	0.800	2.50	NE	NE			090273-009	SW846 6020
	Thallium	0.000999	0.00045	0.002	0.002	NE	J		090273-009	SW846 6020
	Uranium	**0.0351**	0.000067	0.0002	0.030	0.030			090273-009	SW846 6020
	Uranium-235	0.000221	0.00001	0.00007	NE	NE		J+	090273-009	SW846 6020
	Uranium-238	0.0349	0.000067	0.0002	NE	NE			090273-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090273-009	SW846 6020
	Zinc	0.00389	0.0035	0.010	NE	NE	J		090273-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	ND	0.015	0.050	NE	NE	U		090275-009	SW846 6020
09-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090275-009	SW846 6020
	Arsenic	0.00203	0.0017	0.005	0.010	0.100	J		090275-009	SW846 6020
	Barium	0.0351	0.0006	0.002	2.00	1.00			090275-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090275-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090275-009	SW846 6020
	Calcium	210	6.00	20.0	NE	NE			090275-009	SW846 6020
	Chromium	ND	0.010	0.050	0.100	0.050	U		090275-009	SW846 6020
	Cobalt	ND	0.0005	0.005	NE	NE	U		090275-009	SW846 6020
	Copper	ND	0.00175	0.005	NE	NE	U		090275-009	SW846 6020
	Iron	1.54	0.033	0.100	NE	NE			090275-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090275-009	SW846 6020
	Magnesium	44.6	0.100	0.300	NE	NE			090275-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090275-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090275-009	SW846 7470
	Nickel	0.0054	0.0025	0.010	NE	NE	J		090275-009	SW846 6020
	Potassium	13.9	0.400	1.50	NE	NE			090275-009	SW846 6020
	Selenium	0.0247	0.0015	0.005	0.050	0.050			090275-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090275-009	SW846 6020
	Sodium	147	0.800	2.50	NE	NE			090275-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090275-009	SW846 6020
	Uranium	0.011	0.000067	0.0002	0.030	0.030			090275-009	SW846 6020
	Uranium-235	0.000082	0.00001	0.00007	NE	NE		J+	090275-009	SW846 6020
	Uranium-238	0.011	0.000067	0.0002	NE	NE			090275-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090275-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090275-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Greystone-MW2	Aluminum	ND	0.015	0.050	NE	NE	U		090300-009	SW846 6020
22-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090300-009	SW846 6020
	Arsenic	0.00474	0.0017	0.005	0.010	0.100	J		090300-009	SW846 6020
	Barium	0.133	0.0006	0.002	2.00	1.00			090300-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090300-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090300-009	SW846 6020
	Calcium	150	0.600	2.00	NE	NE			090300-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090300-009	SW846 6020
	Cobalt	0.000491	0.0001	0.001	NE	NE	J	J+	090300-009	SW846 6020
	Copper	0.000812	0.00035	0.001	NE	NE	J	0.0019U	090300-009	SW846 6020
	Iron	0.421	0.033	0.100	NE	NE			090300-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090300-009	SW846 6020
	Magnesium	28.2	0.010	0.030	NE	NE			090300-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090300-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090300-009	SW846 7470
	Nickel	0.00426	0.0005	0.002	NE	NE		J+	090300-009	SW846 6020
	Potassium	5.13	0.080	0.300	NE	NE			090300-009	SW846 6020
	Selenium	0.00195	0.0015	0.005	0.050	0.050	J		090300-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090300-009	SW846 6020
	Sodium	88.3	0.800	2.50	NE	NE			090300-009	SW846 6020
	Thallium	0.000508	0.00045	0.002	0.002	NE	J	0.0023U	090300-009	SW846 6020
	Uranium	0.00667	0.000067	0.0002	0.030	0.030			090300-009	SW846 6020
	Uranium-235	0.000049	0.00001	0.00007	NE	NE	J		090300-009	SW846 6020
	Uranium-238	0.00662	0.000067	0.0002	NE	NE			090300-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090300-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090300-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Greystone-MW2 (Duplicate) 22-Mar-11	Aluminum	ND	0.015	0.050	NE	NE	U		090301-009	SW846 6020
	Antimony	ND	0.001	0.003	0.006	NE	U		090301-009	SW846 6020
	Arsenic	0.00348	0.0017	0.005	0.010	0.100	J		090301-009	SW846 6020
	Barium	0.133	0.0006	0.002	2.00	1.00			090301-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090301-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090301-009	SW846 6020
	Calcium	148	0.600	2.00	NE	NE			090301-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090301-009	SW846 6020
	Cobalt	0.000458	0.0001	0.001	NE	NE	J	J+	090301-009	SW846 6020
	Copper	0.000832	0.00035	0.001	NE	NE	J	0.0019U	090301-009	SW846 6020
	Iron	0.433	0.033	0.100	NE	NE			090301-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090301-009	SW846 6020
	Magnesium	28.2	0.010	0.030	NE	NE			090301-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090301-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090301-009	SW846 7470
	Nickel	0.00451	0.0005	0.002	NE	NE		J+	090301-009	SW846 6020
	Potassium	5.07	0.080	0.300	NE	NE			090301-009	SW846 6020
	Selenium	0.00187	0.0015	0.005	0.050	0.050	J		090301-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090301-009	SW846 6020
	Sodium	89.7	0.800	2.50	NE	NE			090301-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090301-009	SW846 6020
	Uranium	0.00688	0.000067	0.0002	0.030	0.030			090301-009	SW846 6020
	Uranium-235	0.000053	0.00001	0.00007	NE	NE	J		090301-009	SW846 6020
	Uranium-238	0.00682	0.000067	0.0002	NE	NE			090301-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090301-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090301-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-2	Aluminum	ND	0.015	0.050	NE	NE	U		090277-009	SW846 6020
11-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090277-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090277-009	SW846 6020
	Barium	0.053	0.0006	0.002	2.00	1.00			090277-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090277-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090277-009	SW846 6020
	Calcium	49.8	0.060	0.200	NE	NE			090277-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090277-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		090277-009	SW846 6020
	Copper	0.000477	0.00035	0.001	NE	NE	J		090277-009	SW846 6020
	Iron	0.106	0.033	0.100	NE	NE			090277-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090277-009	SW846 6020
	Magnesium	16.1	0.010	0.030	NE	NE			090277-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090277-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090277-009	SW846 7470
	Nickel	0.00158	0.0005	0.002	NE	NE	J		090277-009	SW846 6020
	Potassium	3.77	0.080	0.300	NE	NE			090277-009	SW846 6020
	Selenium	0.00169	0.0015	0.005	0.050	0.050	J		090277-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090277-009	SW846 6020
	Sodium	24.9	0.080	0.250	NE	NE			090277-009	SW846 6020
	Thallium	0.000478	0.00045	0.002	0.002	NE	J	0.0033U	090277-009	SW846 6020
	Uranium	0.00262	0.000067	0.0002	0.030	0.030			090277-009	SW846 6020
	Uranium-235	0.000018	0.00001	0.00007	NE	NE	J		090277-009	SW846 6020
	Uranium-238	0.00261	0.000067	0.0002	NE	NE			090277-009	SW846 6020
	Vanadium	0.0043	0.003	0.010	NE	NE	J		090277-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090277-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-3D	Aluminum	ND	0.015	0.050	NE	NE	U		090308-009	SW846 6020
25-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090308-009	SW846 6020
	Arsenic	0.00295	0.0017	0.005	0.010	0.100	J		090308-009	SW846 6020
	Barium	0.119	0.0006	0.002	2.00	1.00			090308-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090308-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090308-009	SW846 6020
	Calcium	55.6	0.600	2.00	NE	NE			090308-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090308-009	SW846 6020
	Cobalt	0.000125	0.0001	0.001	NE	NE	J		090308-009	SW846 6020
	Copper	0.000605	0.00035	0.001	NE	NE	J		090308-009	SW846 6020
	Iron	0.118	0.033	0.100	NE	NE			090308-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090308-009	SW846 6020
	Magnesium	12.9	0.010	0.030	NE	NE			090308-009	SW846 6020
	Manganese	0.0735	0.001	0.005	NE	NE			090308-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090308-009	SW846 7470
	Nickel	0.00196	0.0005	0.002	NE	NE	J		090308-009	SW846 6020
	Potassium	4.21	0.080	0.300	NE	NE			090308-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090308-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090308-009	SW846 6020
	Sodium	25.6	0.080	0.250	NE	NE			090308-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090308-009	SW846 6020
	Uranium	0.00332	0.000067	0.0002	0.030	0.030			090308-009	SW846 6020
	Uranium-235	0.000024	0.00001	0.00007	NE	NE	J		090308-009	SW846 6020
	Uranium-238	0.0033	0.000067	0.0002	NE	NE			090308-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090308-009	SW846 6020
	Zinc	0.229	0.0035	0.010	NE	NE	B		090308-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
NWTA3-MW3D	Aluminum	ND	0.015	0.050	NE	NE	U		090313-009	SW846 6020
29-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090313-009	SW846 6020
	Arsenic	0.003	0.0017	0.005	0.010	0.100	J		090313-009	SW846 6020
	Barium	0.0796	0.0006	0.002	2.00	1.00			090313-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090313-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090313-009	SW846 6020
	Calcium	35.4	0.060	0.200	NE	NE			090313-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090313-009	SW846 6020
	Cobalt	0.000117	0.0001	0.001	NE	NE	J		090313-009	SW846 6020
	Copper	0.000561	0.00035	0.001	NE	NE	J		090313-009	SW846 6020
	Iron	0.0726	0.033	0.100	NE	NE	J		090313-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090313-009	SW846 6020
	Magnesium	7.51	0.010	0.030	NE	NE			090313-009	SW846 6020
	Manganese	0.00102	0.001	0.005	NE	NE	J		090313-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090313-009	SW846 7470
	Nickel	0.00122	0.0005	0.002	NE	NE	J		090313-009	SW846 6020
	Potassium	3.49	0.080	0.300	NE	NE			090313-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090313-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090313-009	SW846 6020
	Sodium	34.1	0.080	0.250	NE	NE			090313-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090313-009	SW846 6020
	Uranium	0.00294	0.000067	0.0002	0.030	0.030			090313-009	SW846 6020
	Uranium-235	0.00002	0.00001	0.00007	NE	NE	J		090313-009	SW846 6020
	Uranium-238	0.00292	0.000067	0.0002	NE	NE			090313-009	SW846 6020
	Vanadium	0.00307	0.003	0.010	NE	NE	J	0.020U	090313-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090313-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-2	Aluminum	ND	0.015	0.050	NE	NE	U		090292-009	SW846 6020
18-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090292-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090292-009	SW846 6020
	Barium	0.0831	0.0006	0.002	2.00	1.00			090292-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090292-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090292-009	SW846 6020
	Calcium	66.5	0.300	1.00	NE	NE			090292-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090292-009	SW846 6020
	Cobalt	0.000103	0.0001	0.001	NE	NE	J		090292-009	SW846 6020
	Copper	0.00155	0.00035	0.001	NE	NE		0.0018U	090292-009	SW846 6020
	Iron	0.203	0.033	0.100	NE	NE			090292-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090292-009	SW846 6020
	Magnesium	9.88	0.010	0.030	NE	NE			090292-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090292-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090292-009	SW846 7470
	Nickel	0.0059	0.0005	0.002	NE	NE	B		090292-009	SW846 6020
	Potassium	3.74	0.080	0.300	NE	NE			090292-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090292-009	SW846 6020
	Silver	0.000389	0.0002	0.001	NE	0.050	J		090292-009	SW846 6020
	Sodium	30.2	0.080	0.250	NE	NE			090292-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090292-009	SW846 6020
	Uranium	0.0036	0.000067	0.0002	0.030	0.030			090292-009	SW846 6020
	Uranium-235	0.000028	0.00001	0.00007	NE	NE	J		090292-009	SW846 6020
	Uranium-238	0.00357	0.000067	0.0002	NE	NE			090292-009	SW846 6020
	Vanadium	0.00399	0.003	0.010	NE	NE	J		090292-009	SW846 6020
	Zinc	0.0133	0.0035	0.010	NE	NE			090292-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-2 (Duplicate)	Aluminum	ND	0.015	0.050	NE	NE	U		090293-009	SW846 6020
18-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090293-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090293-009	SW846 6020
	Barium	0.0828	0.0006	0.002	2.00	1.00			090293-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090293-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090293-009	SW846 6020
	Calcium	63.4	0.300	1.00	NE	NE			090293-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090293-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		090293-009	SW846 6020
	Copper	0.00147	0.00035	0.001	NE	NE		0.0018U	090293-009	SW846 6020
	Iron	0.210	0.033	0.100	NE	NE			090293-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090293-009	SW846 6020
	Magnesium	10.8	0.010	0.030	NE	NE			090293-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090293-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090293-009	SW846 7470
	Nickel	0.00566	0.0005	0.002	NE	NE	B		090293-009	SW846 6020
	Potassium	3.79	0.080	0.300	NE	NE			090293-009	SW846 6020
	Selenium	0.00168	0.0015	0.005	0.050	0.050	J		090293-009	SW846 6020
	Silver	0.000362	0.0002	0.001	NE	0.050	J		090293-009	SW846 6020
	Sodium	31.4	0.080	0.250	NE	NE			090293-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090293-009	SW846 6020
	Uranium	0.00326	0.000067	0.0002	0.030	0.030			090293-009	SW846 6020
	Uranium-235	0.000023	0.00001	0.00007	NE	NE	J		090293-009	SW846 6020
	Uranium-238	0.00323	0.000067	0.0002	NE	NE			090293-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090293-009	SW846 6020
	Zinc	0.0133	0.0035	0.010	NE	NE			090293-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-4	Aluminum	ND	0.015	0.050	NE	NE	U		090288-009	SW846 6020
17-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090288-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090288-009	SW846 6020
	Barium	0.0627	0.0006	0.002	2.00	1.00			090288-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090288-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090288-009	SW846 6020
	Calcium	74.4	0.300	1.00	NE	NE			090288-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090288-009	SW846 6020
	Cobalt	0.000251	0.0001	0.001	NE	NE	J		090288-009	SW846 6020
	Copper	0.000678	0.00035	0.001	NE	NE	J		090288-009	SW846 6020
	Iron	0.183	0.033	0.100	NE	NE			090288-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090288-009	SW846 6020
	Magnesium	12.6	0.010	0.030	NE	NE			090288-009	SW846 6020
	Manganese	0.0836	0.001	0.005	NE	NE			090288-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090288-009	SW846 7470
	Nickel	0.00225	0.0005	0.002	NE	NE			090288-009	SW846 6020
	Potassium	5.40	0.080	0.300	NE	NE			090288-009	SW846 6020
	Selenium	0.00158	0.0015	0.005	0.050	0.050	J		090288-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090288-009	SW846 6020
	Sodium	25.4	0.080	0.250	NE	NE			090288-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090288-009	SW846 6020
	Uranium	0.00275	0.000067	0.0002	0.030	0.030			090288-009	SW846 6020
	Uranium-235	0.000019	0.00001	0.00007	NE	NE	J		090288-009	SW846 6020
	Uranium-238	0.00273	0.000067	0.0002	NE	NE			090288-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090288-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090288-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-2S	Aluminum	ND	0.015	0.050	NE	NE	U		090283-009	SW846 6020
15-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090283-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090283-009	SW846 6020
	Barium	0.056	0.0006	0.002	2.00	1.00			090283-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090283-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090283-009	SW846 6020
	Calcium	132	0.600	2.00	NE	NE			090283-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090283-009	SW846 6020
	Cobalt	0.000504	0.0001	0.001	NE	NE	J	J+	090283-009	SW846 6020
	Copper	0.00315	0.00035	0.001	NE	NE		0.0043U	090283-009	SW846 6020
	Iron	0.306	0.033	0.100	NE	NE			090283-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090283-009	SW846 6020
	Magnesium	35.5	0.010	0.030	NE	NE			090283-009	SW846 6020
	Manganese	0.00621	0.001	0.005	NE	NE		J+	090283-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090283-009	SW846 7470
	Nickel	0.0465	0.0005	0.002	NE	NE		J+	090283-009	SW846 6020
	Potassium	8.45	0.080	0.300	NE	NE			090283-009	SW846 6020
	Selenium	0.00233	0.0015	0.005	0.050	0.050	J		090283-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090283-009	SW846 6020
	Sodium	76.9	0.800	2.50	NE	NE			090283-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090283-009	SW846 6020
	Uranium	0.0132	0.000067	0.0002	0.030	0.030			090283-009	SW846 6020
	Uranium-235	0.000097	0.00001	0.00007	NE	NE			090283-009	SW846 6020
	Uranium-238	0.0131	0.000067	0.0002	NE	NE			090283-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090283-009	SW846 6020
	Zinc	0.00529	0.0035	0.010	NE	NE	J	J+	090283-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-2S (Duplicate)	Aluminum	ND	0.015	0.050	NE	NE	U		090284-009	SW846 6020
15-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090284-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090284-009	SW846 6020
	Barium	0.0572	0.0006	0.002	2.00	1.00			090284-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090284-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090284-009	SW846 6020
	Calcium	145	0.600	2.00	NE	NE			090284-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090284-009	SW846 6020
	Cobalt	0.000533	0.0001	0.001	NE	NE	J	J+	090284-009	SW846 6020
	Copper	0.00305	0.00035	0.001	NE	NE		0.0043U	090284-009	SW846 6020
	Iron	0.341	0.033	0.100	NE	NE			090284-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090284-009	SW846 6020
	Magnesium	39.2	0.010	0.030	NE	NE			090284-009	SW846 6020
	Manganese	0.00668	0.001	0.005	NE	NE		J+	090284-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090284-009	SW846 7470
	Nickel	0.0495	0.0005	0.002	NE	NE		J+	090284-009	SW846 6020
	Potassium	7.98	0.080	0.300	NE	NE			090284-009	SW846 6020
	Selenium	0.00236	0.0015	0.005	0.050	0.050	J		090284-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090284-009	SW846 6020
	Sodium	90.6	0.800	2.50	NE	NE			090284-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090284-009	SW846 6020
	Uranium	0.0138	0.000067	0.0002	0.030	0.030			090284-009	SW846 6020
	Uranium-235	0.000099	0.00001	0.00007	NE	NE			090284-009	SW846 6020
	Uranium-238	0.0137	0.000067	0.0002	NE	NE			090284-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090284-009	SW846 6020
	Zinc	0.00517	0.0035	0.010	NE	NE	J	J+	090284-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-4T	Aluminum	ND	0.015	0.050	NE	NE	U		090279-009	SW846 6020
14-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090279-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090279-009	SW846 6020
	Barium	0.00951	0.0006	0.002	2.00	1.00			090279-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090279-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090279-009	SW846 6020
	Calcium	66.3	0.300	1.00	NE	NE			090279-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090279-009	SW846 6020
	Cobalt	0.000105	0.0001	0.001	NE	NE	J		090279-009	SW846 6020
	Copper	0.00455	0.00035	0.001	NE	NE			090279-009	SW846 6020
	Iron	0.150	0.033	0.100	NE	NE			090279-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090279-009	SW846 6020
	Magnesium	3.41	0.010	0.030	NE	NE			090279-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090279-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090279-009	SW846 7470
	Nickel	0.00355	0.0005	0.002	NE	NE			090279-009	SW846 6020
	Potassium	2.77	0.080	0.300	NE	NE			090279-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090279-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090279-009	SW846 6020
	Sodium	1210	4.00	12.5	NE	NE			090279-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090279-009	SW846 6020
	Uranium	0.00022	0.000067	0.0002	0.030	0.030			090279-009	SW846 6020
	Uranium-235	ND	0.00001	0.00007	NE	NE	U		090279-009	SW846 6020
	Uranium-238	0.00022	0.000067	0.0002	NE	NE			090279-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090279-009	SW846 6020
	Zinc	0.0187	0.0035	0.010	NE	NE			090279-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW2	Aluminum	ND	0.015	0.050	NE	NE	U		090306-009	SW846 6020
24-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090306-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090306-009	SW846 6020
	Barium	0.0684	0.0006	0.002	2.00	1.00			090306-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090306-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090306-009	SW846 6020
	Calcium	43.1	0.060	0.200	NE	NE			090306-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090306-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		090306-009	SW846 6020
	Copper	0.000799	0.00035	0.001	NE	NE	J		090306-009	SW846 6020
	Iron	0.146	0.033	0.100	NE	NE			090306-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090306-009	SW846 6020
	Magnesium	13.8	0.010	0.030	NE	NE			090306-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090306-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090306-009	SW846 7470
	Nickel	0.00182	0.0005	0.002	NE	NE	J		090306-009	SW846 6020
	Potassium	4.12	0.080	0.300	NE	NE			090306-009	SW846 6020
	Selenium	0.00158	0.0015	0.005	0.050	0.050	J		090306-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090306-009	SW846 6020
	Sodium	33.1	0.080	0.250	NE	NE			090306-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090306-009	SW846 6020
	Uranium	0.00318	0.000067	0.0002	0.030	0.030			090306-009	SW846 6020
	Uranium-235	0.000024	0.00001	0.00007	NE	NE	J		090306-009	SW846 6020
	Uranium-238	0.00315	0.000067	0.0002	NE	NE			090306-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090306-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090306-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW3	Aluminum	ND	0.015	0.050	NE	NE	U		090286-009	SW846 6020
16-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090286-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090286-009	SW846 6020
	Barium	0.0568	0.0006	0.002	2.00	1.00			090286-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090286-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090286-009	SW846 6020
	Calcium	37.7	0.060	0.200	NE	NE			090286-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090286-009	SW846 6020
	Cobalt	0.000457	0.0001	0.001	NE	NE	J		090286-009	SW846 6020
	Copper	0.000627	0.00035	0.001	NE	NE	J		090286-009	SW846 6020
	Iron	0.107	0.033	0.100	NE	NE			090286-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090286-009	SW846 6020
	Magnesium	11.3	0.010	0.030	NE	NE			090286-009	SW846 6020
	Manganese	0.00109	0.001	0.005	NE	NE	J		090286-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090286-009	SW846 7470
	Nickel	0.00148	0.0005	0.002	NE	NE	J		090286-009	SW846 6020
	Potassium	5.24	0.080	0.300	NE	NE			090286-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090286-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090286-009	SW846 6020
	Sodium	53.7	0.400	1.25	NE	NE			090286-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090286-009	SW846 6020
	Uranium	0.00193	0.000067	0.0002	0.030	0.030			090286-009	SW846 6020
	Uranium-235	0.000014	0.00001	0.00007	NE	NE	J		090286-009	SW846 6020
	Uranium-238	0.00192	0.000067	0.0002	NE	NE			090286-009	SW846 6020
	Vanadium	0.00445	0.003	0.010	NE	NE	J		090286-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090286-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Continued)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW4	Aluminum	ND	0.015	0.050	NE	NE	U		090303-009	SW846 6020
23-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090303-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090303-009	SW846 6020
	Barium	0.0482	0.0006	0.002	2.00	1.00			090303-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		090303-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090303-009	SW846 6020
	Calcium	34.6	0.060	0.200	NE	NE			090303-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090303-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		090303-009	SW846 6020
	Copper	0.000689	0.00035	0.001	NE	NE	J		090303-009	SW846 6020
	Iron	0.118	0.033	0.100	NE	NE			090303-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090303-009	SW846 6020
	Magnesium	9.99	0.010	0.030	NE	NE			090303-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090303-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090303-009	SW846 7470
	Nickel	0.00162	0.0005	0.002	NE	NE	J		090303-009	SW846 6020
	Potassium	4.26	0.080	0.300	NE	NE			090303-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	0.050	U		090303-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090303-009	SW846 6020
	Sodium	56.9	0.800	2.50	NE	NE			090303-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090303-009	SW846 6020
	Uranium	0.00214	0.000067	0.0002	0.030	0.030			090303-009	SW846 6020
	Uranium-235	0.000017	0.00001	0.00007	NE	NE	J		090303-009	SW846 6020
	Uranium-238	0.00212	0.000067	0.0002	NE	NE			090303-009	SW846 6020
	Vanadium	0.0043	0.003	0.010	NE	NE	J		090303-009	SW846 6020
	Zinc	0.00406	0.0035	0.010	NE	NE	J		090303-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-4 *(Concluded)*
Summary of Filtered Metal Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TRE-1	Aluminum	ND	0.015	0.050	NE	NE	U		090295-009	SW846 6020
21-Mar-11	Antimony	ND	0.001	0.003	0.006	NE	U		090295-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		090295-009	SW846 6020
	Barium	0.0436	0.0006	0.002	2.00	1.00			090295-009	SW846 6020
	Beryllium	0.000221	0.0002	0.0005	0.004	NE	J		090295-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	0.010	U		090295-009	SW846 6020
	Calcium	171	0.600	2.00	NE	NE			090295-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	0.050	U		090295-009	SW846 6020
	Cobalt	0.000271	0.0001	0.001	NE	NE	J	J+	090295-009	SW846 6020
	Copper	0.00118	0.00035	0.001	NE	NE		J+	090295-009	SW846 6020
	Iron	0.528	0.033	0.100	NE	NE			090295-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		090295-009	SW846 6020
	Magnesium	38.4	0.010	0.030	NE	NE			090295-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		090295-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	0.002	U		090295-009	SW846 7470
	Nickel	0.00543	0.0005	0.002	NE	NE	B	J+	090295-009	SW846 6020
	Potassium	7.04	0.080	0.300	NE	NE			090295-009	SW846 6020
	Selenium	0.00234	0.0015	0.005	0.050	0.050	J		090295-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	0.050	U		090295-009	SW846 6020
	Sodium	107	0.800	2.50	NE	NE			090295-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	NE	U		090295-009	SW846 6020
	Uranium	0.0171	0.000067	0.0002	0.030	0.030			090295-009	SW846 6020
	Uranium-235	0.000126	0.00001	0.00007	NE	NE			090295-009	SW846 6020
	Uranium-238	0.0169	0.000067	0.0002	NE	NE			090295-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	NE	U		090295-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		090295-009	SW846 6020

Refer to footnotes on page 2A-41.

Table 2A-5
Summary of Total (Unfiltered) Mercury Results (EPA Method[g] SW846-7470), Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Mercury Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.
Coyote Spring	28-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090311-010
CTF-MW2	08-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090273-010
CTF-MW3	09-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090275-010
Greystone-MW2	22-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090300-010
Greystone-MW2 (Duplicate)	22-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090301-010
MRN-2	11-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090277-010
MRN-3D	25-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090308-010
NWTA3-MW3D	29-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090313-010
PL-2	18-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090292-010
PL-2 (Duplicate)	18-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090293-010
PL-4	17-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090288-010
SFR-2S	15-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090283-010
SFR-2S (Duplicate)	15-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090284-010
SFR-4T	14-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090279-010
SWTA3-MW2	24-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090306-010
SWTA3-MW3	16-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090286-010
SWTA3-MW4	23-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090303-010
TRE-1	21-Mar-11	ND	0.000066	0.0002	0.002	0.002	U		090295-010

Refer to footnotes on page 2A-41.

Table 2A-6
Summary of Gamma-Emitting Radionuclides/Short List (EPA Method[g] 901.0), Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/ MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.
Coyote Spring	Americium-241	-2.97 ± 6.53	9.24	4.62	NE	NE	U	BD	090311-033
28-Mar-11	Cesium-137	1.45 ± 1.62	2.58	1.29	NE	NE	U	BD	090311-033
	Cobalt-60	-0.154 ± 1.72	2.82	1.41	NE	NE	U	BD	090311-033
	Potassium-40	58.9 ± 47.4	25.6	12.8	NE	NE		J	090311-033
CTF-MW2	Americium-241	0.504 ± 8.41	13.1	6.56	NE	NE	U	BD	090273-033
08-Mar-11	Cesium-137	2.30 ± 2.11	3.28	1.64	NE	NE	U	BD	090273-033
	Cobalt-60	-0.249 ± 1.96	3.26	1.63	NE	NE	U	BD	090273-033
	Potassium-40	58.1 ± 43.9	32.8	16.4	NE	NE		J	090273-033
CTF-MW3	Americium-241	2.38 ± 11.7	18.5	9.25	NE	NE	U	BD	090275-033
09-Mar-11	Cesium-137	-0.579 ± 2.05	3.40	1.70	NE	NE	U	BD	090275-033
	Cobalt-60	0.610 ± 2.26	3.80	1.90	NE	NE	U	BD	090275-033
	Potassium-40	-48.9 ± 48.7	52.3	26.2	NE	NE	U	BD	090275-033
Greystone-MW2	Americium-241	7.60 ± 7.45	11.2	5.61	NE	NE	U	BD	090300-033
22-Mar-11	Cesium-137	2.71 ± 4.76	8.03	4.02	NE	NE	U	BD	090300-033
	Cobalt-60	-0.179 ± 4.70	7.95	3.98	NE	NE	U	BD	090300-033
	Potassium-40	7.40 ± 50.1	86.5	43.3	NE	NE	U	BD	090300-033
Greystone-MW2 (Duplicate)	Americium-241	1.30 ± 5.36	8.07	4.04	NE	NE	U	BD	090301-033
22-Mar-11	Cesium-137	-0.507 ± 1.57	2.62	1.31	NE	NE	U	BD	090301-033
	Cobalt-60	0.209 ± 1.71	2.94	1.47	NE	NE	U	BD	090301-033
	Potassium-40	-11.1 ± 43.5	38.8	19.4	NE	NE	U	BD	090301-033
MRN-2	Americium-241	6.95 ± 6.04	8.08	4.04	NE	NE	U	BD	090277-033
11-Mar-11	Cesium-137	0.457 ± 1.66	2.85	1.42	NE	NE	U	BD	090277-033
	Cobalt-60	0.118 ± 1.58	2.71	1.36	NE	NE	U	BD	090277-033
	Potassium-40	1.32 ± 46.2	25.8	12.9	NE	NE	U	BD	090277-033
MRN-3D	Americium-241	-0.217 ± 11.3	17.4	8.73	NE	NE	U	BD	090308-033
25-Mar-11	Cesium-137	0.532 ± 1.79	3.09	1.54	NE	NE	U	BD	090308-033
	Cobalt-60	-0.198 ± 1.81	3.04	1.52	NE	NE	U	BD	090308-033
	Potassium-40	85.9 ± 35.8	28.8	14.4	NE	NE	X	R	090308-033
NWTA3-MW3D	Americium-241	0.751 ± 5.72	9.75	4.88	NE	NE	U	BD	090313-033
29-Mar-11	Cesium-137	-0.599 ± 1.59	2.50	1.25	NE	NE	U	BD	090313-033
	Cobalt-60	0.141 ± 1.63	2.70	1.35	NE	NE	U	BD	090313-033
	Potassium-40	-47.3 ± 43.7	35.0	17.5	NE	NE	U	BD	090313-033
PL-2	Americium-241	0.866 ± 5.18	8.80	4.40	NE	NE	U	BD	090292-033
18-Mar-11	Cesium-137	0.981 ± 1.82	3.06	1.53	NE	NE	U	BD	090292-033
	Cobalt-60	-0.601 ± 1.77	2.84	1.42	NE	NE	U	BD	090292-033
	Potassium-40	3.62 ± 49.1	30.5	15.3	NE	NE	U	BD	090292-033

Refer to footnotes on page 2A-41.

Table 2A-6 *(Concluded)*
Summary of Gamma-Emitting Radionuclides/Short List (EPA Method[g] 901.0), Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/ MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.
PL-2 (Duplicate) 18-Mar-11	Americium-241	4.79 ± 6.54	9.42	4.71	NE	NE	U	BD	090293-033
	Cesium-137	0.532 ± 1.61	2.68	1.34	NE	NE	U	BD	090293-033
	Cobalt-60	1.46 ± 1.81	2.97	1.49	NE	NE	U	BD	090293-033
	Potassium-40	6.97 ± 41.2	23.6	11.8	NE	NE	U	BD	090293-033
PL-4 17-Mar-11	Americium-241	0.852 ± 6.60	9.79	4.90	NE	NE	U	BD	090288-033
	Cesium-137	0.136 ± 1.52	2.52	1.26	NE	NE	U	BD	090288-033
	Cobalt-60	0.481 ± 1.81	3.02	1.51	NE	NE	U	BD	090288-033
	Potassium-40	4.52 ± 44.3	26.7	13.4	NE	NE	U	BD	090288-033
SFR-2S 15-Mar-11	Americium-241	7.91 ± 8.77	12.6	6.31	NE	NE	U	BD	090283-033
	Cesium-137	0.927 ± 1.86	3.10	1.55	NE	NE	U	BD	090283-033
	Cobalt-60	0.514 ± 1.95	3.31	1.66	NE	NE	U	BD	090283-033
	Potassium-40	82.4 ± 38.1	28.6	14.3	NE	NE		J	090283-033
SFR-2S (Duplicate) 15-Mar-11	Americium-241	-38.3 ± 20.6	16.8	8.42	NE	NE	U	R	090284-033
	Cesium-137	-0.0216 ± 1.94	3.22	1.61	NE	NE	U	BD	090284-033
	Cobalt-60	1.01 ± 2.02	3.39	1.70	NE	NE	U	BD	090284-033
	Potassium-40	-11.3 ± 35.8	44.3	22.2	NE	NE	U	BD	090284-033
SFR-4T 14-Mar-11	Americium-241	-1.87 ± 5.93	9.88	4.94	NE	NE	U	BD	090279-033
	Cesium-137	-0.265 ± 1.60	2.59	1.29	NE	NE	U	BD	090279-033
	Cobalt-60	-0.324 ± 1.65	2.67	1.34	NE	NE	U	BD	090279-033
	Potassium-40	12.4 ± 37.8	40.3	20.2	NE	NE	U	BD	090279-033
SWTA3-MW2 24-Mar-11	Americium-241	-4.22 ± 11.7	17.2	8.60	NE	NE	U	BD	090306-033
	Cesium-137	0.208 ± 1.80	3.00	1.50	NE	NE	U	BD	090306-033
	Cobalt-60	2.28 ± 2.22	3.50	1.75	NE	NE	U	BD	090306-033
	Potassium-40	-35.7 ± 43.4	45.0	22.5	NE	NE	U	BD	090306-033
SWTA3-MW3 16-Mar-11	Americium-241	-5.48 ± 6.51	9.95	4.98	NE	NE	U	BD	090286-033
	Cesium-137	-1.39 ± 1.74	2.52	1.26	NE	NE	U	BD	090286-033
	Cobalt-60	-0.259 ± 1.79	2.92	1.46	NE	NE	U	BD	090286-033
	Potassium-40	-14.9 ± 37.8	37.3	18.7	NE	NE	U	BD	090286-033
SWTA3-MW4 23-Mar-11	Americium-241	7.67 ± 6.93	9.15	4.58	NE	NE	U	BD	090303-033
	Cesium-137	-0.00508 ± 1.54	2.63	1.32	NE	NE	U	BD	090303-033
	Cobalt-60	5.53 ± 3.86	5.53	1.78	NE	NE	U	BD	090303-033
	Potassium-40	13.7 ± 42.1	26.6	13.3	NE	NE	U	BD	090303-033
TRE-1 21-Mar-11	Americium-241	-57.2 ± 28.6	16.2	8.12	NE	NE	U	R	090295-033
	Cesium-137	1.87 ± 2.03	3.28	1.64	NE	NE	U	BD	090295-033
	Cobalt-60	-0.827 ± 1.92	3.10	1.55	NE	NE	U	BD	090295-033
	Potassium-40	21.0 ± 44.1	27.7	13.8	NE	NE	U	BD	090295-033

Refer to footnotes on page 2A-41.

+Table 2A-7
Summary of Radioisotopic Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/ MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Spring	Gross Alpha	-0.51	NA	NA	15	NE	NA	None	090311-034	EPA 900.0
28-Mar-11	Gross Beta	33.8 ± 9.79	12.5	6.13	4mrem/yr	NE		J	090311-034	EPA 900.0
	Radium-226	0.309 ± 0.246	0.262	0.0798	5	30		J	090311-038	EPA 903.1
	Radium-228	0.939 ± 0.434	0.483	0.214	5	30		J	090311-039	EPA 904.0
	Uranium-233/234	10.2 ± 1.51	0.0576	0.0232	NE	NE			090311-035	DOE HASL-300
	Uranium-235/236	0.149 ± 0.0581	0.0472	0.0166	NE	NE			090311-035	DOE HASL-300
	Uranium-238	2.26 ± 0.373	0.0638	0.0263	NE	NE			090311-035	DOE HASL-300
CTF-MW2	Gross Alpha	-1.18	NA	NA	15	NE	NA	None	090273-034	EPA 900.0
08-Mar-11	Gross Beta	51.0 ± 10.9	7.57	3.58	4mrem/yr	NE			090273-034	EPA 900.0
	Radium-226	**3.00 ± 1.12**	0.518	0.189	5	30			090273-038	EPA 903.1
	Radium-228	**6.78 ± 1.80**	0.400	0.190	5	30			090273-039	EPA 904.0
	Uranium-233/234	59.8 ± 8.49	0.182	0.0734	NE	NE			090273-035	DOE HASL-300
	Uranium-235/236	1.28 ± 0.340	0.149	0.0527	NE	NE			090273-035	DOE HASL-300
	Uranium-238	10.4 ± 1.61	0.202	0.0832	NE	NE			090273-035	DOE HASL-300
CTF-MW3	Gross Alpha	-6.43	NA	NA	15	NE	NA	None	090275-034	EPA 900.0
09-Mar-11	Gross Beta	11.6 ± 2.80	2.49	1.18	4mrem/yr	NE			090275-034	EPA 900.0
	Radium-226	0.617 ± 0.369	0.311	0.107	5	30		J	090275-038	EPA 903.1
	Radium-228	0.956 ± 0.423	0.513	0.242	5	30		J	090275-039	EPA 904.0
	Uranium-233/234	12.1 ± 1.86	0.0796	0.032	NE	NE			090275-035	DOE HASL-300
	Uranium-235/236	0.177 ± 0.0768	0.0652	0.023	NE	NE		J	090275-035	DOE HASL-300
	Uranium-238	3.14 ± 0.535	0.0882	0.0363	NE	NE			090275-035	DOE HASL-300
Greystone-MW2	Gross Alpha	1.95	NA	NA	15	NE	NA	None	090300-034	EPA 900.0
22-Mar-11	Gross Beta	8.92 ± 2.15	1.95	0.928	4mrem/yr	NE			090300-034	EPA 900.0
	Radium-226	2.98 ± 1.16	0.402	0.164	5	30			090300-038	EPA 903.1
	Radium-228	0.475 ± 0.339	0.515	0.245	5	30	U	BD	090300-039	EPA 904.0
	Uranium-233/234	10.4 ± 1.75	0.122	0.0491	NE	NE			090300-035	DOE HASL-300
	Uranium-235/236	0.141 ± 0.080	0.0999	0.0352	NE	NE		J	090300-035	DOE HASL-300
	Uranium-238	2.51 ± 0.496	0.135	0.0557	NE	NE			090300-035	DOE HASL-300
Greystone-MW2 (Duplicate)	Gross Alpha	1.71	NA	NA	15	NE	NA	None	090301-034	EPA 900.0
22-Mar-11	Gross Beta	5.43 ± 1.71	2.01	0.955	4mrem/yr	NE		J	090301-034	EPA 900.0
	Radium-226	1.50 ± 0.585	0.363	0.148	5	30			090301-038	EPA 903.1
	Radium-228	0.566 ± 0.287	0.384	0.182	5	30		J	090301-039	EPA 904.0
	Uranium-233/234	9.86 ± 1.51	0.0722	0.0291	NE	NE			090301-035	DOE HASL-300
	Uranium-235/236	0.109 ± 0.0572	0.0591	0.0209	NE	NE		J	090301-035	DOE HASL-300
	Uranium-238	2.12 ± 0.372	0.080	0.033	NE	NE			090301-035	DOE HASL-300

Refer to footnotes on page 2A-41.

Table 2A-7 *(Continued)*
Summary of Radioisotopic Results,
Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/ MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-2	Gross Alpha	4.72	NA	NA	15	NE	NA	None	090277-034	EPA 900.0
11-Mar-11	Gross Beta	4.47 ± 1.09	0.991	0.468	4mrem/yr	NE			090277-034	EPA 900.0
	Radium-226	0.578 ± 0.384	0.444	0.168	5	30		J	090277-038	EPA 903.1
	Radium-228	0.705 ± 0.334	0.425	0.201	5	30		J	090277-039	EPA 904.0
MRN-3D	Gross Alpha	0.58	NA	NA	15	NE	NA	None	090308-034	EPA 900.0
25-Mar-11	Gross Beta	2.03 ± 0.895	1.33	0.652	4mrem/yr	NE		J	090308-034	EPA 900.0
	Radium-226	0.193 ± 0.238	0.370	0.112	5	30	U	BD	090308-038	EPA 903.1
	Radium-228	0.531 ± 0.339	0.467	0.207	5	30		J	090308-039	EPA 904.0
NWTA3-MW3D	Gross Alpha	0.25	NA	NA	15	NE	NA	None	090313-034	EPA 900.0
29-Mar-11	Gross Beta	1.90 ± 0.861	1.30	0.634	4mrem/yr	NE		J	090313-034	EPA 900.0
	Radium-226	0.256 ± 0.287	0.451	0.170	5	30	U	BD	090313-038	EPA 903.1
	Radium-228	0.526 ± 0.344	0.482	0.216	5	30		J	090313-039	EPA 904.0
PL-2	Gross Alpha	1.98	NA	NA	15	NE	NA	None	090292-034	EPA 900.0
18-Mar-11	Gross Beta	3.78 ± 0.992	0.989	0.465	4mrem/yr	NE			090292-034	EPA 900.0
	Radium-226	0.167 ± 0.238	0.401	0.159	5	30	U	BD	090292-038	EPA 903.1
	Radium-228	0.359 ± 0.271	0.415	0.197	5	30	U	BD	090292-039	EPA 904.0
PL-2 (Duplicate)	Gross Alpha	2.30	NA	NA	15	NE	NA	None	090293-034	EPA 900.0
18-Mar-11	Gross Beta	3.66 ± 0.979	0.998	0.470	4mrem/yr	NE			090293-034	EPA 900.0
	Radium-226	0.289 ± 0.227	0.276	0.0949	5	30		NJ+	090293-038	EPA 903.1
	Radium-228	0.297 ± 0.405	0.672	0.325	5	30	U	BD	090293-039	EPA 904.0
PL-4	Gross Alpha	2.51	NA	NA	15	NE	NA	None	090288-034	EPA 900.0
17-Mar-11	Gross Beta	4.65 ± 1.13	0.996	0.466	4mrem/yr	NE			090288-034	EPA 900.0
	Radium-226	0.304 ± 0.360	0.583	0.234	5	30	U	BD	090288-038	EPA 903.1
	Radium-228	0.446 ± 0.262	0.364	0.169	5	30		J	090288-039	EPA 904.0
SFR-2S	Gross Alpha	3.10	NA	NA	15	NE	NA	None	090283-034	EPA 900.0
15-Mar-11	Gross Beta	8.72 ± 2.10	1.88	0.890	4mrem/yr	NE			090283-034	EPA 900.0
	Radium-226	0.0759 ± 0.184	0.363	0.125	5	30	U	BD	090283-038	EPA 903.1
	Radium-228	0.429 ± 0.242	0.342	0.163	5	30		J	090283-039	EPA 904.0
	Uranium-233/234	19.7 ± 2.99	0.0776	0.0312	NE	NE			090283-035	DOE HASL-300
	Uranium-235/236	0.387 ± 0.118	0.0635	0.0224	NE	NE			090283-035	DOE HASL-300
	Uranium-238	5.41 ± 0.870	0.086	0.0354	NE	NE			090283-035	DOE HASL-300

Refer to footnotes on page 2A-41.

Table 2A-7 *(Concluded)*
Summary of Radioisotopic Results, Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/ MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-2S (Duplicate)	Gross Alpha	5.48	NA	NA	15	NE	NA	None	090284-034	EPA 900.0
15-Mar-11	Gross Beta	10.1 ± 2.32	1.92	0.912	4mrem/yr	NE			090284-034	EPA 900.0
	Radium-226	0.00 ± 0.191	0.465	0.160	5	30	U	BD	090284-038	EPA 903.1
	Radium-228	0.050 ± 0.306	0.531	0.255	5	30	U	BD	090284-039	EPA 904.0
	Uranium-233/234	20.1 ± 3.20	0.104	0.0419	NE	NE			090284-035	DOE HASL-300
	Uranium-235/236	0.362 ± 0.126	0.0853	0.0301	NE	NE			090284-035	DOE HASL-300
	Uranium-238	5.36 ± 0.916	0.115	0.0475	NE	NE			090284-035	DOE HASL-300
SFR-4T	Gross Alpha	-0.19	NA	NA	15	NE	NA	None	090279-034	EPA 900.0
14-Mar-11	Gross Beta	0.741 ± 3.66	6.37	3.03	4mrem/yr	NE	U	BD	090279-034	EPA 900.0
	Radium-226	0.436 ± 0.306	0.348	0.120	5	30		J	090279-038	EPA 903.1
	Radium-228	0.699 ± 0.384	0.542	0.260	5	30		J	090279-039	EPA 904.0
	Uranium-233/234	0.383 ± 0.0877	0.0434	0.0175	NE	NE			090279-035	DOE HASL-300
	Uranium-235/236	0.00386 ± 0.0131	0.0355	0.0125	NE	NE	U	BD	090279-035	DOE HASL-300
	Uranium-238	0.0938 ± 0.036	0.0481	0.0198	NE	NE		J	090279-035	DOE HASL-300
SWTA3-MW2	Gross Alpha	2.96	NA	NA	15	NE	NA	None	090306-034	EPA 900.0
24-Mar-11	Gross Beta	3.94 ± 1.01	0.996	0.473	4mrem/yr	NE			090306-034	EPA 900.0
	Radium-226	2.75 ± 1.05	0.336	0.137	5	30			090306-038	EPA 903.1
	Radium-228	0.0725 ± 0.264	0.469	0.216	5	30		BD	090306-039	EPA 904.0
SWTA3-MW3	Gross Alpha	2.37	NA	NA	15	NE	NA	None	090286-034	EPA 900.0
16-Mar-11	Gross Beta	4.44 ± 1.06	0.993	0.472	4mrem/yr	NE			090286-034	EPA 900.0
	Radium-226	0.213 ± 0.352	0.614	0.243	5	30	U	BD	090286-038	EPA 903.1
	Radium-228	0.394 ± 0.233	0.332	0.157	5	30		J	090286-039	EPA 904.0
SWTA3-MW4	Gross Alpha	2.65	NA	NA	15	NE	NA	None	090303-034	EPA 900.0
23-Mar-11	Gross Beta	4.10 ± 1.24	1.60	0.780	4mrem/yr	NE		J	090303-034	EPA 900.0
	Radium-226	0.255 ± 0.212	0.271	0.0932	5	30	U	BD	090303-038	EPA 903.1
	Radium-228	0.686 ± 0.374	0.486	0.220	5	30		J	090303-039	EPA 904.0
TRE-1	Gross Alpha	0.13	NA	NA	15	NE	NA	None	090295-034	EPA 900.0
21-Mar-11	Gross Beta	10.0 ± 2.46	2.06	0.977	4mrem/yr	NE			090295-034	EPA 900.0
	Radium-226	0.148 ± 0.231	0.398	0.162	5	30	U	BD	090295-038	EPA 903.1
	Radium-228	4.42 ± 1.19	0.333	0.158	5	30			090295-039	EPA 904.0
	Uranium-233/234	22.9 ± 3.50	0.0848	0.0341	NE	NE			090295-035	DOE HASL-300
	Uranium-235/236	0.408 ± 0.128	0.0694	0.0245	NE	NE			090295-035	DOE HASL-300
	Uranium-238	6.16 ± 0.996	0.0939	0.0387	NE	NE			090295-035	DOE HASL-300

Refer to footnotes on page 2A-41.

Table 2A-8
Summary of Field Water Quality Measurements[h], Groundwater Protection Program Groundwater Surveillance Task, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (%Sat)	Alkalinity (mg/L $CaCO_3$ at 4.5 pH)
Coyote Spring	28-Mar-11	12.85	2939	269.92	5.94	0.80	22.5	2.37
CTF-MW2	08-Mar-11	14.12	3324	65.0	6.03	23.5	1.8	0.19
CTF-MW3	09-Mar-11	18.58	1605	423.7	6.91	0.20	73.3	6.83
Greystone-MW2	22-Mar-11	12.97	1093	427.5	7.04	0.17	68.0	7.11
MRN-2	11-Mar-11	19.23	414	402.0	7.63	0.72	75.0	6.92
MRN-3D	25-Mar-11	19.67	441	139.1	7.51	0.67	34.1	3.15
NWTA3-MW3D	29-Mar-11	19.02	355	279.3	7.71	2.30	46.1	4.28
PL-2	18-Mar-11	18.91	429	394.8	7.75	0.68	62.7	5.82
PL-4	17-Mar-11	18.86	463	354.1	7.46	0.53	70.3	6.54
SFR-2S	15-Mar-11	18.17	1073	369.8	6.87	11.0	81.7	7.68
SFR-4T	14-Mar-11	17.26	4041	377.7	8.00	0.26	12.2	1.16
SWTA3-MW2	24-Mar-11	18.68	414	345.6	7.63	0.78	49.9	4.65
SWTA3-MW3	16-Mar-11	20.12	426	392.8	7.73	0.66	47.5	4.29
SWTA3-MW4	23-Mar-11	17.80	427	324.4	7.69	0.45	50.7	4.83
TRE-1	21-Mar-11	17.89	1270	428.8	6.74	0.14	73.5	6.94

Refer to footnotes on page 2A-41.

Table 2A-9. Regional Groundwater Table Elevations[i], Calendar Year 2011

Well	Groundwater Elevation (feet above mean sea level)	Measurement Date
AVN-1	4921	October 2011
CCBA-MW1	5855	October 2011
CCBA-MW2	5868	October 2011
CTF-MW1	5845	October 2011
CTF-MW2	5535	October 2011
CTF-MW3	5216	October 2011
CWL-BW5	4926	October 2011
CWL-MW9	4924	October 2011
CYN-MW11	6272	October 2011
CYN-MW3	6182	October 2011
CYN-MW4	6232	October 2011
CYN-MW5	5877	October 2011
CYN-MW7	5915	October 2011
EOD	5688	November 2011
EUBANK-1	4909	October 2011
Eubank-2	4895	November 2011
Eubank-3	4891	November 2011
Eubank-5	4890	November 2011
GREYSTONE-MW2	5761	October 2011
ITRI-MW16	5555	October 2011
ITRI-MW17	5532	October 2011
ITRI-MW19	5535	October 2011
ITRI-MW4	5532	October 2011
KAFB-0119	4860	November 2011
KAFB-0120*	4865	November 2011
KAFB-0213	4863	November 2011
KAFB-0307	4934	November 2011
KAFB-0308	4934	November 2011
KAFB-0309	4930	November 2011
KAFB-0311	4932	November 2011
KAFB-0312	5014	November 2011
KAFB-0314	5041	November 2011
KAFB-0315	5027	November 2011
KAFB-0417	4860	November 2011
KAFB-0505	4857	November 2011
KAFB-0507	4857	November 2011
KAFB-0508	4855	November 2011
KAFB-0510	4852	November 2011
KAFB-0512	4857	November 2011
KAFB-0514	4860	November 2011
KAFB-0516	4860	November 2011
KAFB-0517	4863	November 2011
KAFB-0520	4853	November 2011
KAFB-0522	4857	November 2011
KAFB-0523	4860	November 2011
KAFB-0608	5066	November 2011
KAFB-0609	5066	November 2011
KAFB-0610	5065	November 2011
KAFB-0611	4924	November 2011
KAFB-0615	5441	November 2011
KAFB-0616	5039	November 2011
KAFB-0617	4945	November 2011
KAFB-0619	5023	November 2011
KAFB-0620	4891	November 2011

Refer to footnotes on page 2A-41.

Table 2A-9. Regional Groundwater Table Elevations[i], Calendar Year 2011 *(Concluded)*

Well	Groundwater Elevation (feet above mean sea level)	Measurement Date
KAFB-0622	4941	November 2011
KAFB-0624	4908	November 2011
KAFB-0901	4918	November 2011
KAFB-0904*	4940	November 2011
KAFB-1006	4878	November 2011
KAFB-1007	4877	November 2011
KAFB-1063	4856	November 2011
KAFB-2005	5514	November 2011
KAFB-2007	5290	November 2011
KAFB-3392	4854	November 2011
KAFB-3411	4856	November 2011
KAFB-6301	4923	November 2011
KAFB-8351	4860	November 2011
Mesa Del Sol-S	4879	November 2011
Montessa Park-S	4881	November 2011
MRN-2	4872	October 2011
MRN-3D	4873	October 2011
MWL-BW2	4912	October 2011
MWL-MW8	4894	October 2011
NWTA3-MW2	4869	October 2011
NWTA3-MW3D	4873	October 2011
OBS-MW1	5799	October 2011
OBS-MW2	5686	October 2011
OBS-MW3	5796	October 2011
Optical Range Well	5823	November 2011
PGS-2	4854	October 2011
PL-2	4866	October 2011
PL-4	4866	October 2011
SCHOOL HOUSE WELL	5700	October 2011
SFR-1D	5260	October 2011
SFR-2S	5333	October 2011
SFR-3D	5337	October 2011
SFR-3P	5338	October 2011
SFR-3S	5338	October 2011
SFR-3T*	5429	October 2011
SFR-4P	5421	October 2011
SFR-4T	5424	October 2011
SWTA3-MW2	4875	October 2011
SWTA3-MW3	4876	October 2011
SWTA3-MW4	4876	October 2011
TA1-W-01	4860	October 2011
TA1-W-02	4892	October 2011
TA1-W-04	4889	October 2011
TA1-W-05	4859	October 2011
TA2-NW1-595	4896	October 2011
TA2-W-25	4903	October 2011
TAV-MW3	4921	October 2011
TAV-MW5	4919	October 2011
TJA-3	4892	October 2011
TJA-6	4892	October 2011
TRE-1	5321	October 2011
TRN-1	5643	October 2011
TRS-2	5646	October 2011
WYO-3	4861	October 2011
Yale-MW9	4888	November 2011

Refer to footnotes on page 2A-41.

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Footnotes for Groundwater Protection Program Groundwater Surveillance Task Tables

[a]Result and/or Activity

- Values in bold exceed the established MCL and/or MAC.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Corrected gross alpha reported (uranium subtracted from gross alpha activity)
- µg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL/MAC

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]) and subsequent amendments or the New Mexico Environment Department in Title 20, Chapter 7, Part 1 of the New Mexico Administrative Code (20.7.1 NMAC).
- Maximum Allowable Concentration in groundwater for the contaminants specified in 20.6.2.3103 NMAC, Human Health Standards.
- NE = not established.
- 15 pCi/L = the maximum gross alpha activity, including radium-226, but excluding radon and total uranium.
- 4 mrem/yr = any combination of beta and/or gamma-emitting radionuclides (as dose rate).
- 5 pCi/L = combined radium-226 and radium-228 activities.
- 30 pCi/L = combined radium-226 and radium-228 activities.

[e]Laboratory Qualifier

B	=	Analyte is detected in associated laboratory method blank.
J	=	Amount detected is below the PQL.
U	=	Analyte is absent or below the method detection limit.
NA	=	Not applicable.
X	=	Data rejected due to peak not meeting identification criteria.

Footnotes for Groundwater Protection Program Groundwater Surveillance Task Tables *(Concluded)*

[f]Validation Qualifier

If cell is blank, then all quality control samples meet acceptance criteria with respect to submitted samples.

BD	=	Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	=	The associate value is an estimated quantity.
J+	=	The associated numerical value is an estimated quantity with suspected positive bias.
J-	=	The associated numerical value is an estimated quantity with suspected negative bias.
NJ+	=	Presumptive evidence of the presence of the material at an estimated quantity with a suspected positive bias.
NJ-	=	Presumptive evidence of the presence of the material at an estimated quantity with a suspected negative bias.
None	=	No data validation for corrected gross alpha activity.
U	=	The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	=	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	=	The data are unusable. Re-sampling and re-analysis are necessary for verification.

[g]Analytical Method

- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes*, EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0,* EPA-600/4-84-017.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
- U.S. Department of Energy, Environmental Measurements Laboratory, 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% Sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

[i]Regional Groundwater Table Elevations

*	= Groundwater table elevation was not contoured.

Attachment 2B
Groundwater Protection Program
Plots

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Attachment 2B Plots

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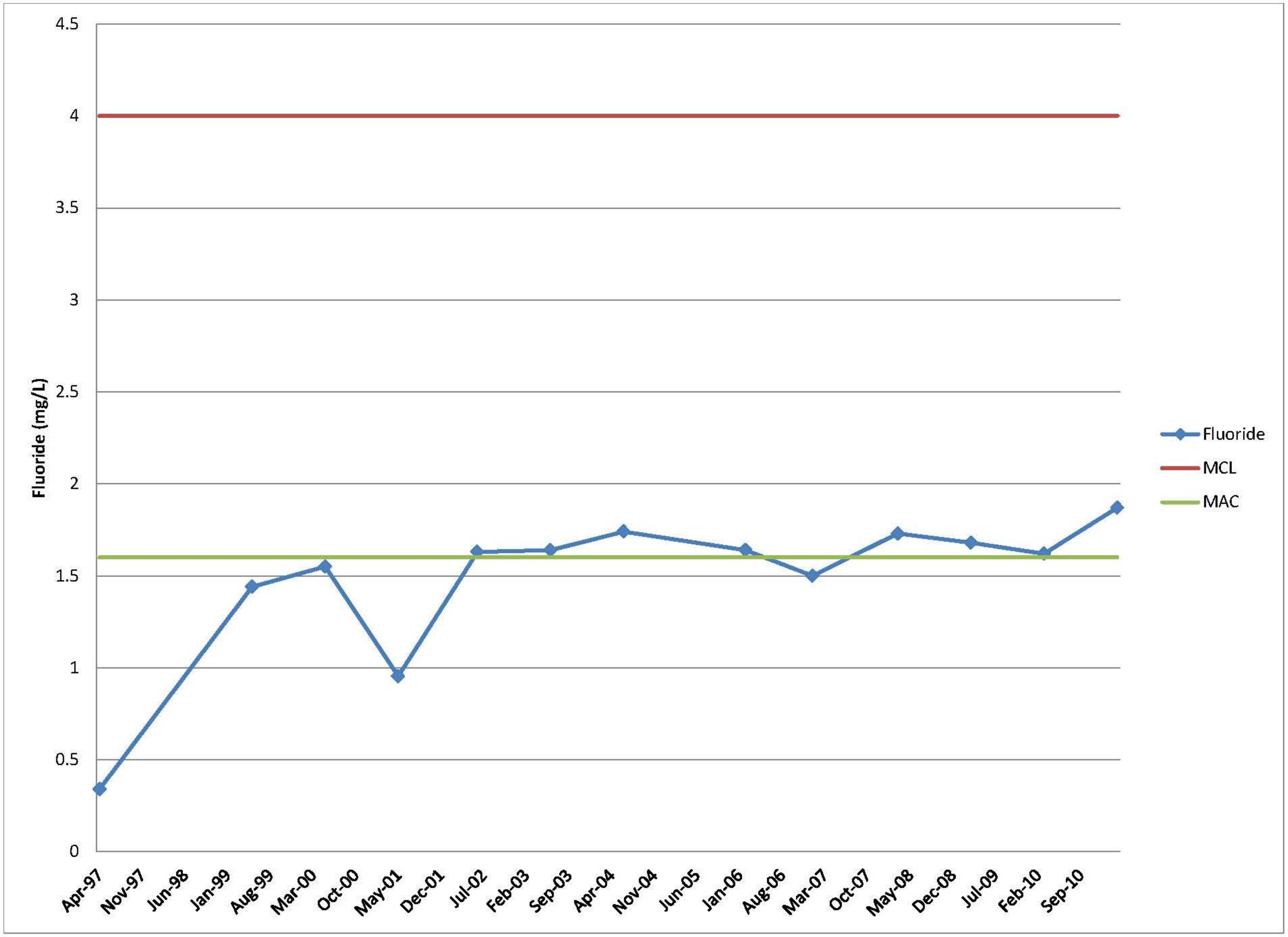

Figure 2B-1. Fluoride Concentrations, Coyote Springs

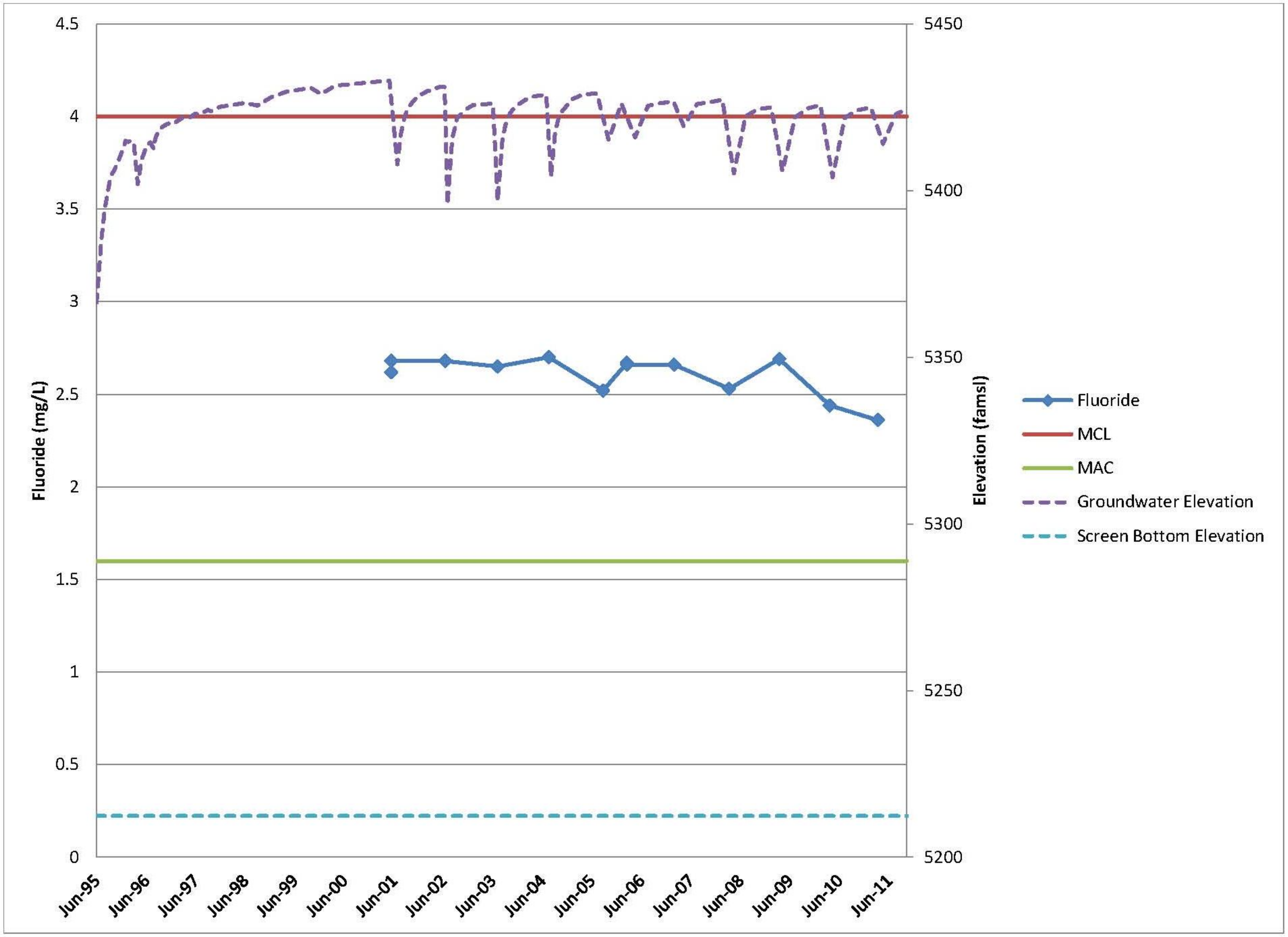

Figure 2B-2. Fluoride Concentrations, SFR-4T

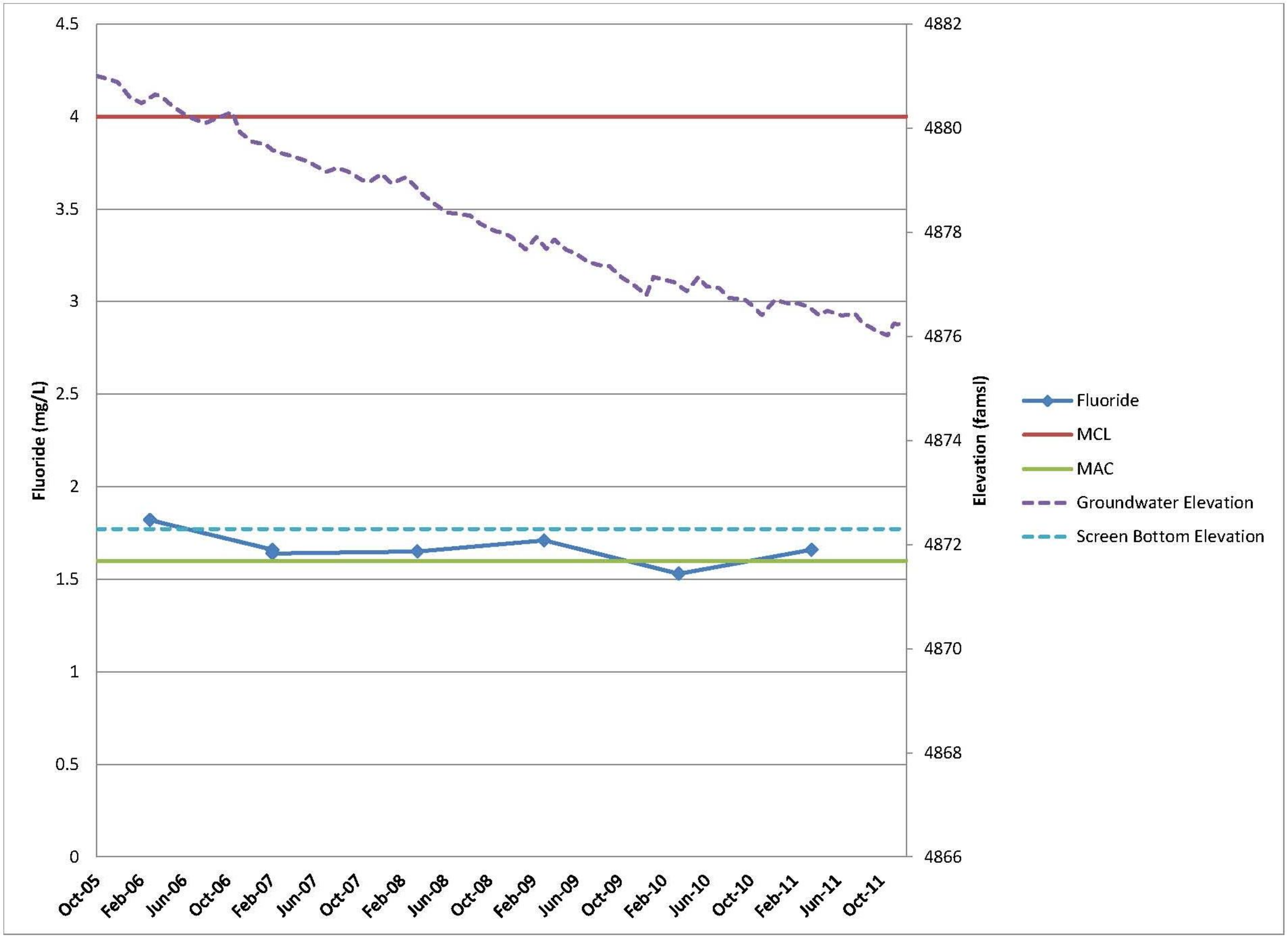

Figure 2B-3. Fluoride Concentrations, SWTA3-MW4

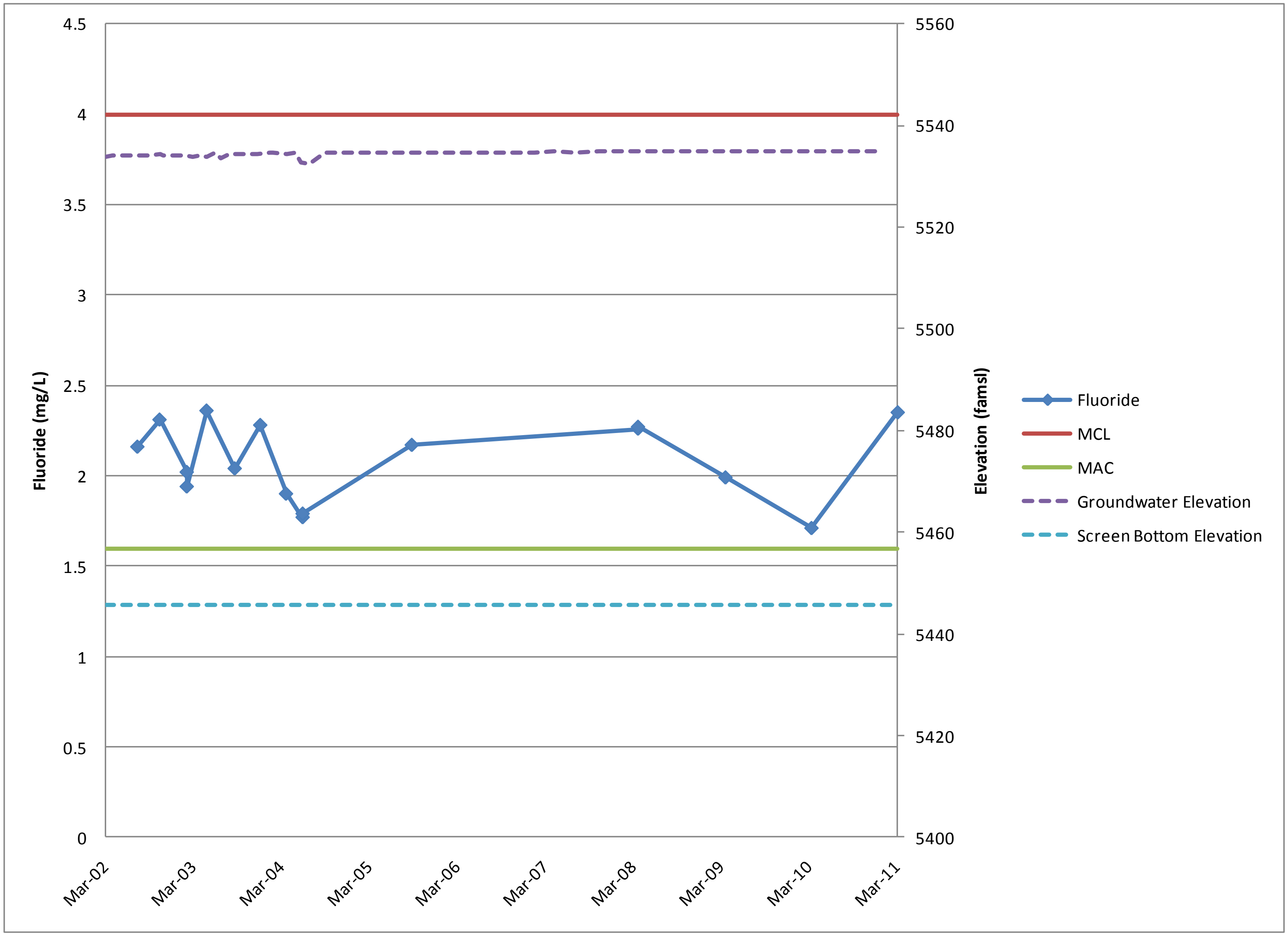

Figure 2B-4. Fluoride Concentrations, CTF-MW2

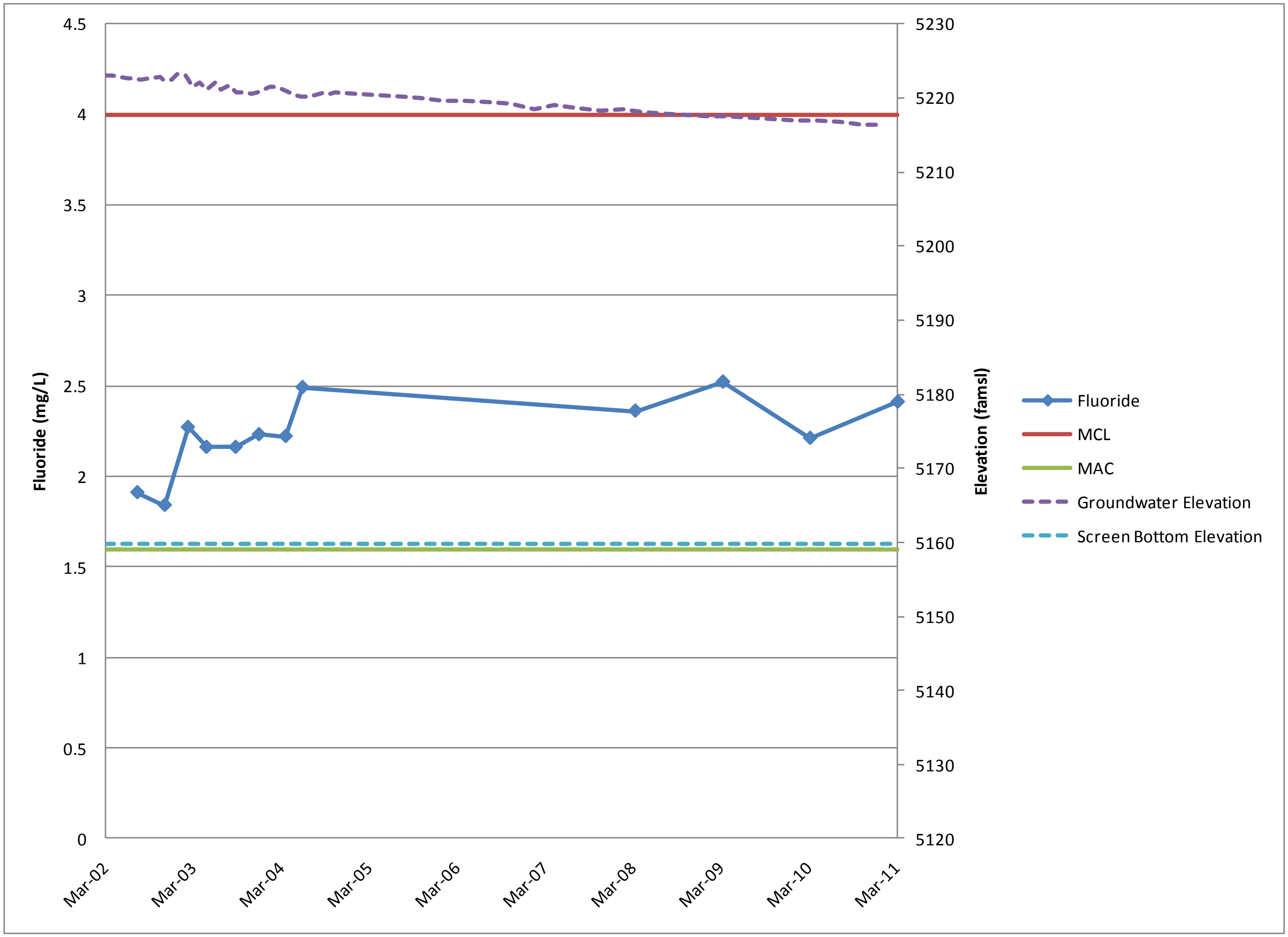

Figure 2B-5. Fluoride Concentrations, CTF-MW3

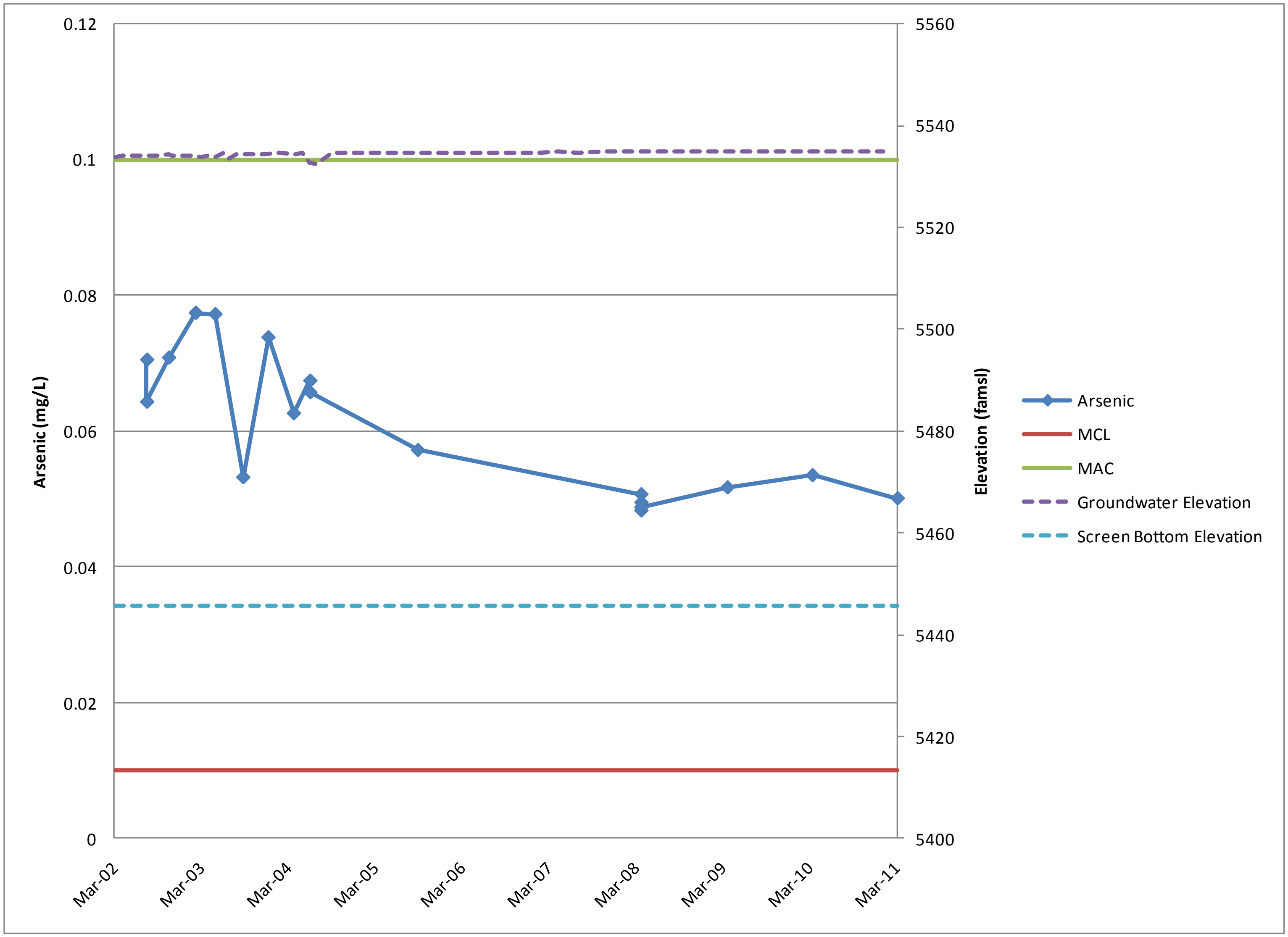

Figure 2B-6. Arsenic Concentrations, CTF-MW2

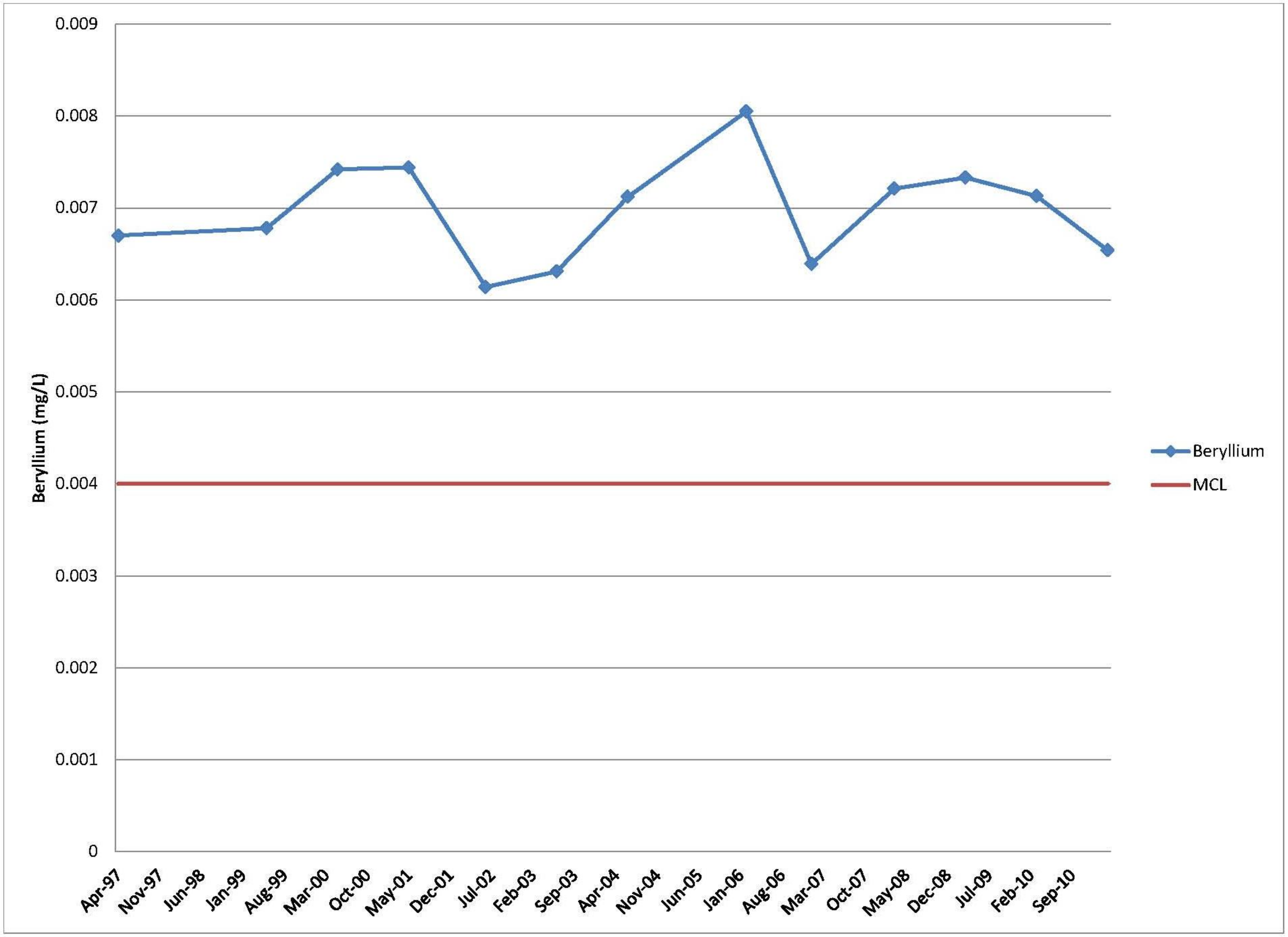

Figure 2B-7. Beryllium Concentrations, Coyote Springs

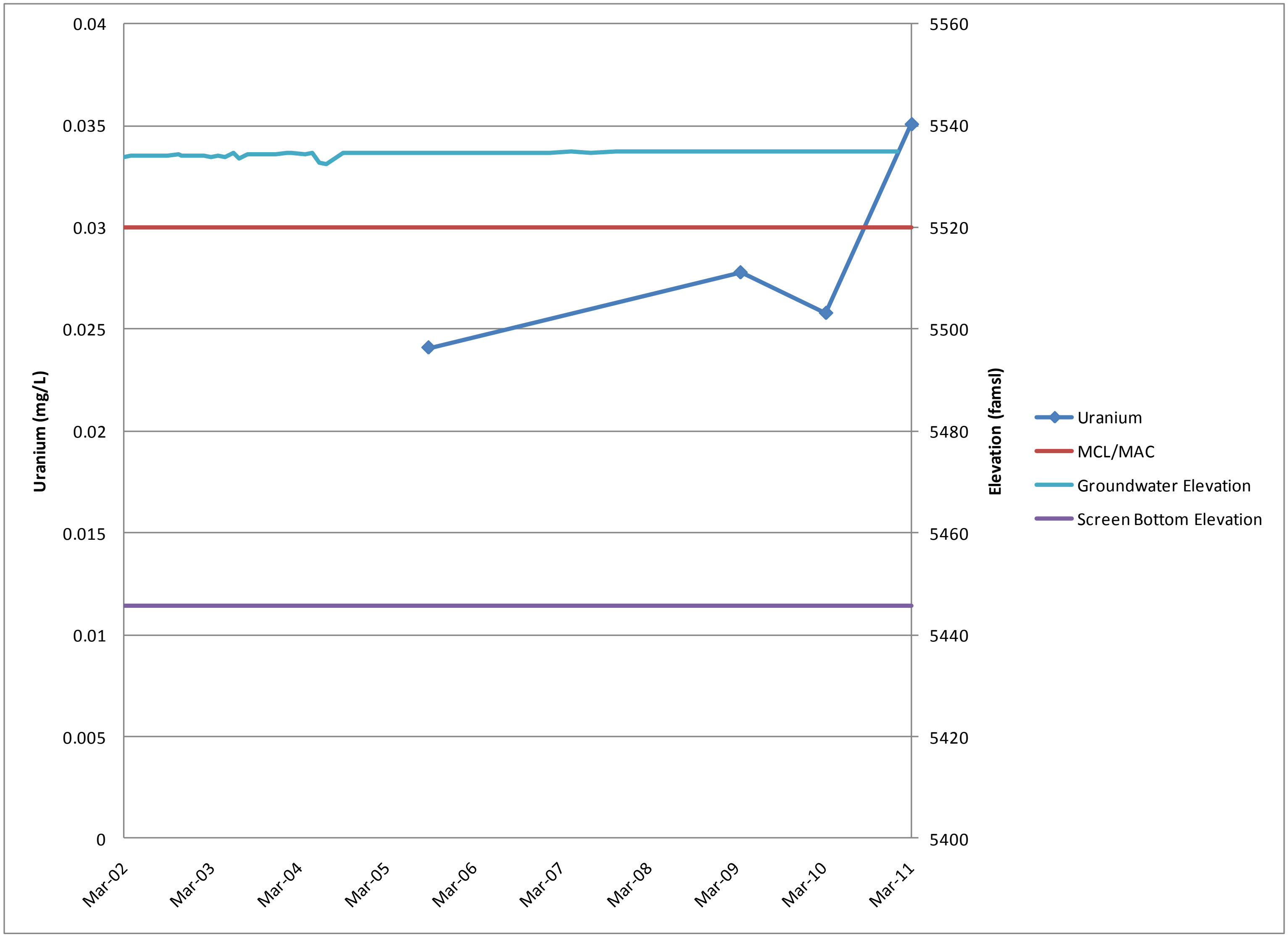

Figure 2B-8. Uranium Concentrations, CTF-MW2

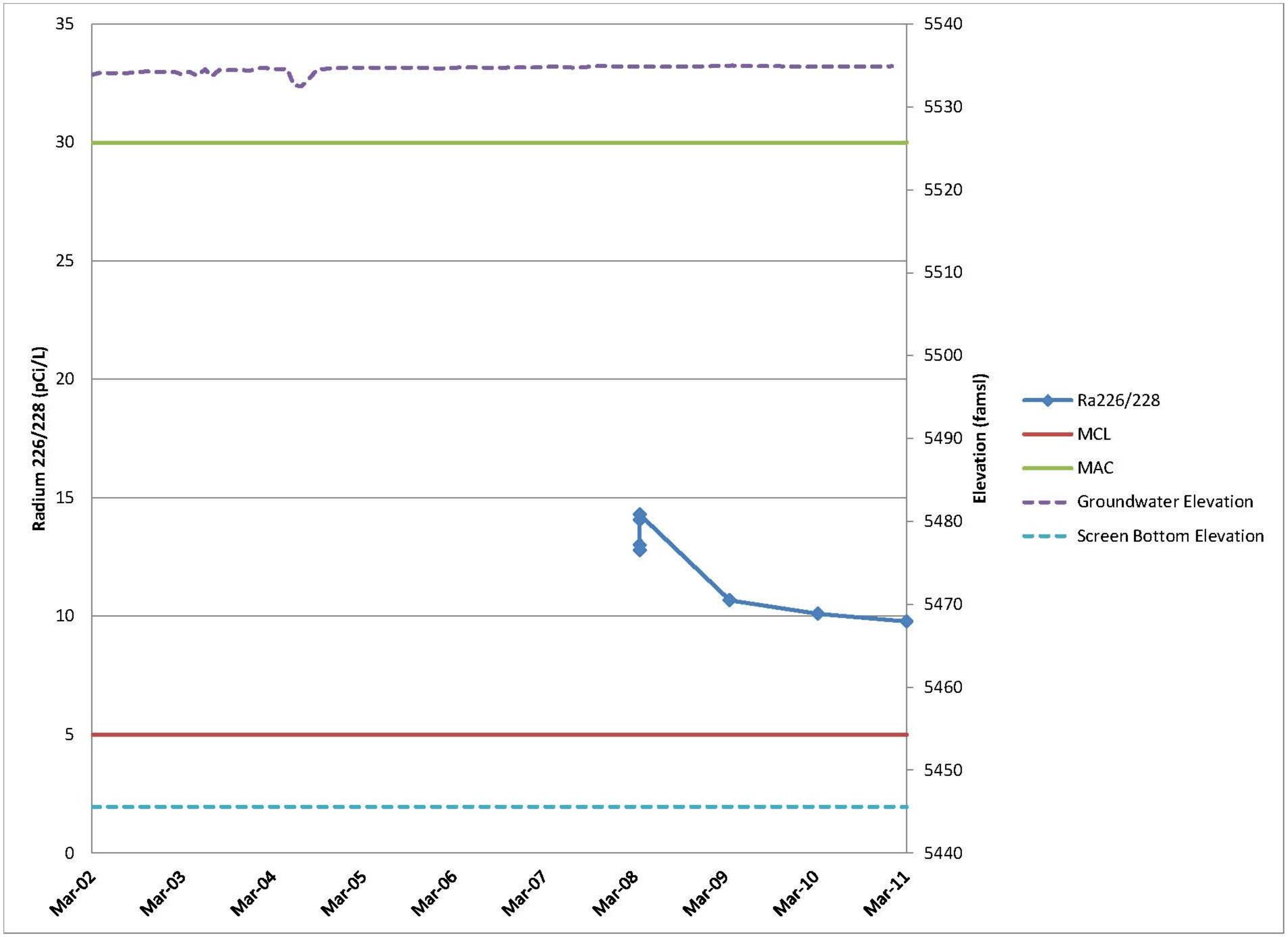

Figure 2B-9. Combined Radium-226 and Radium-228 Activities, CTF-MW2

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Attachment 2C
Groundwater Protection Program
Charts and Hydrographs

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Attachment 2C Charts and Hydrographs

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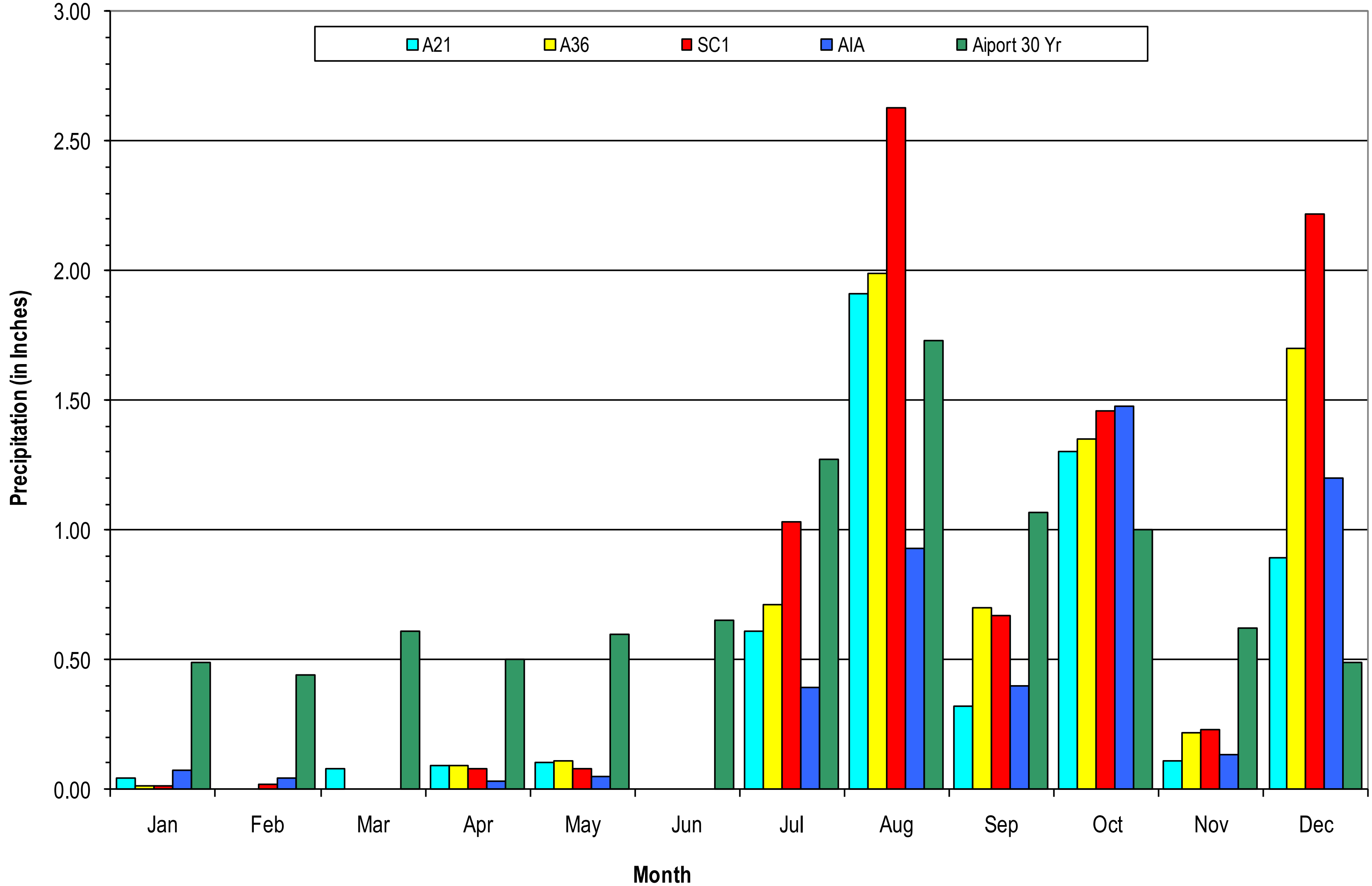

Figure 2C-1. Precipitation Data for SNL/NM, Calendar Year 2011

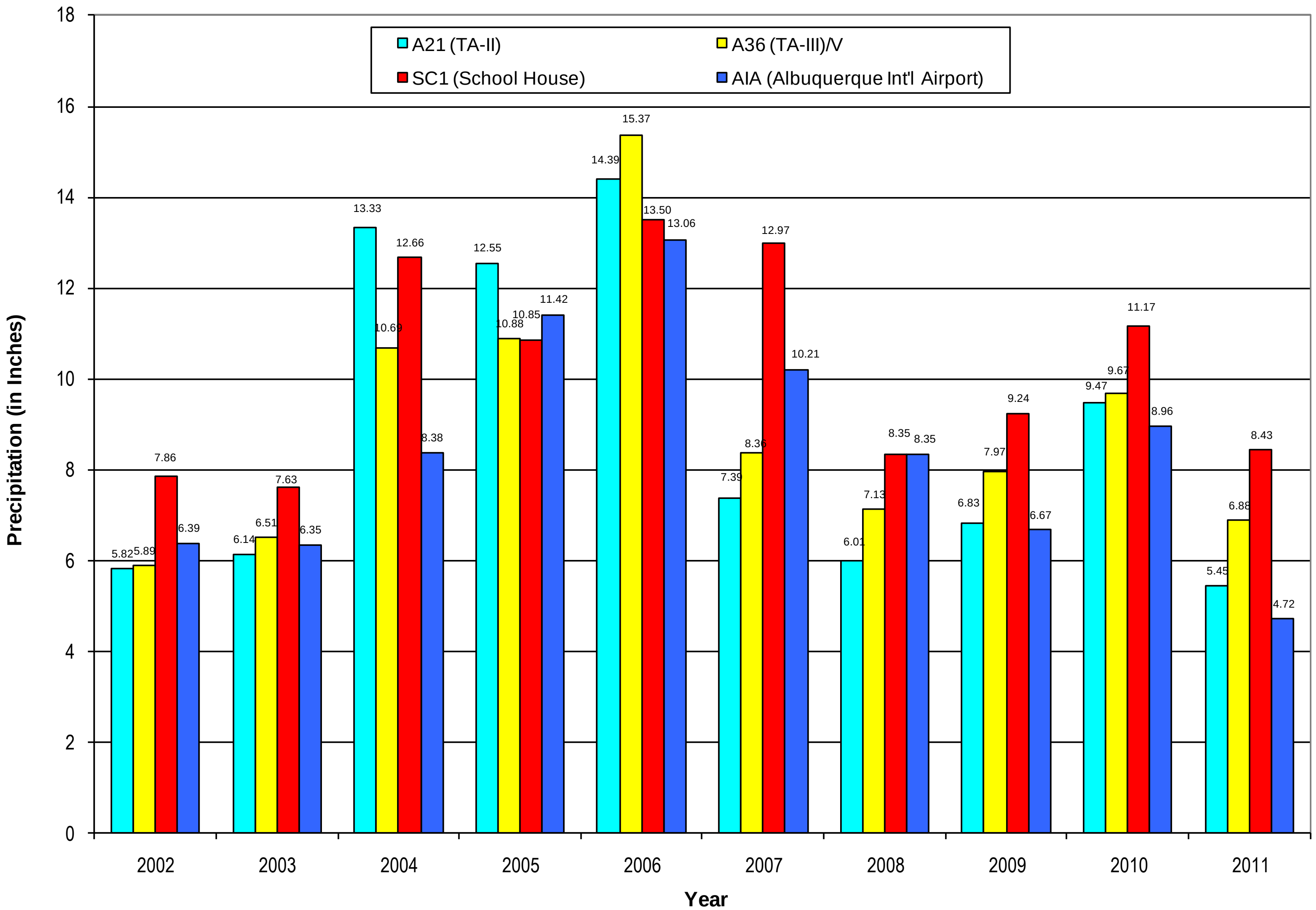

Figure 2C-2. Annual Precipitation Data for SNL/NM, January 2002 to December 2011

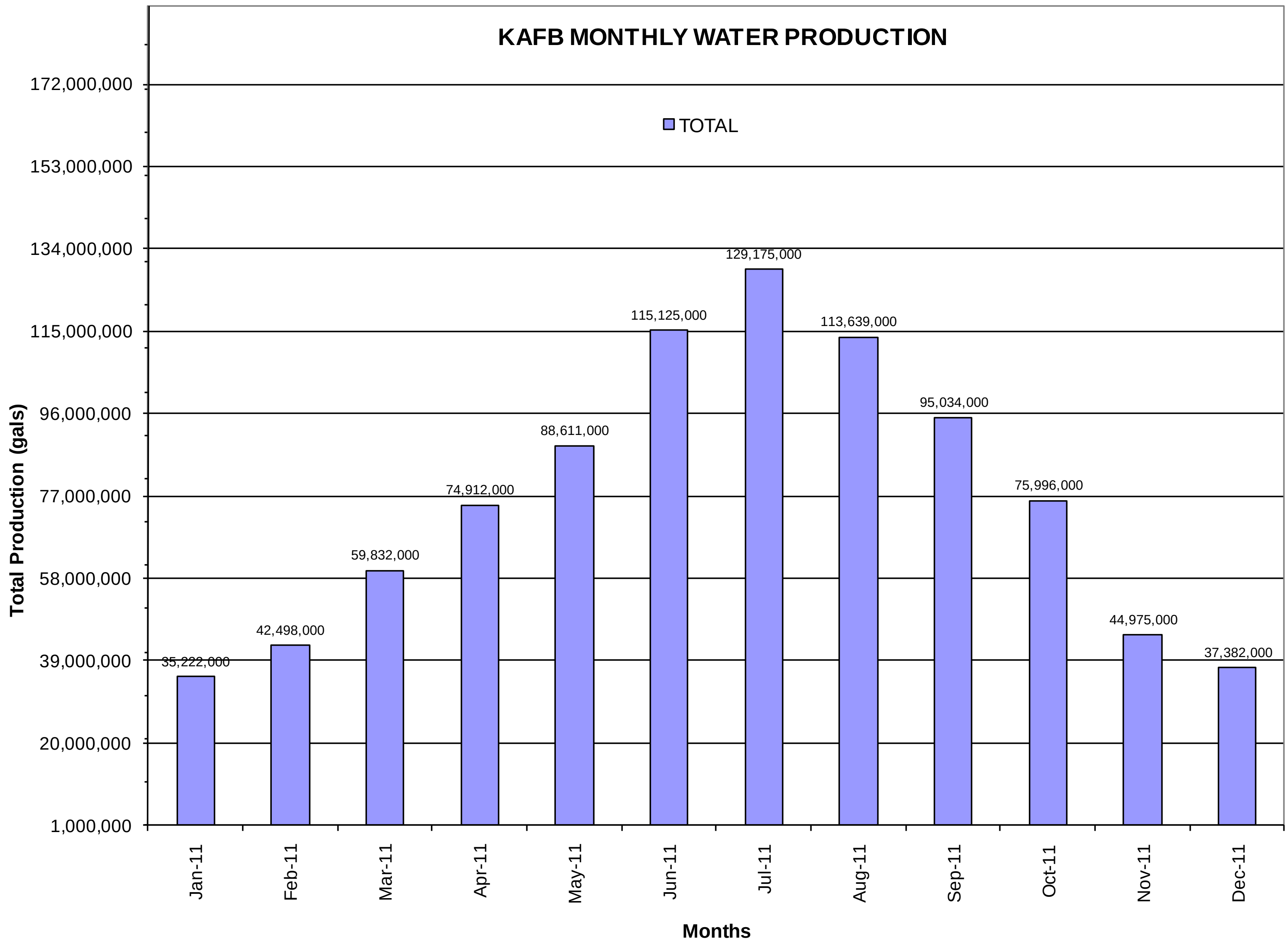

Figure 2C-3. Monthly Groundwater Pumped by KAFB Water Supply Wells, Calendar Year 2011

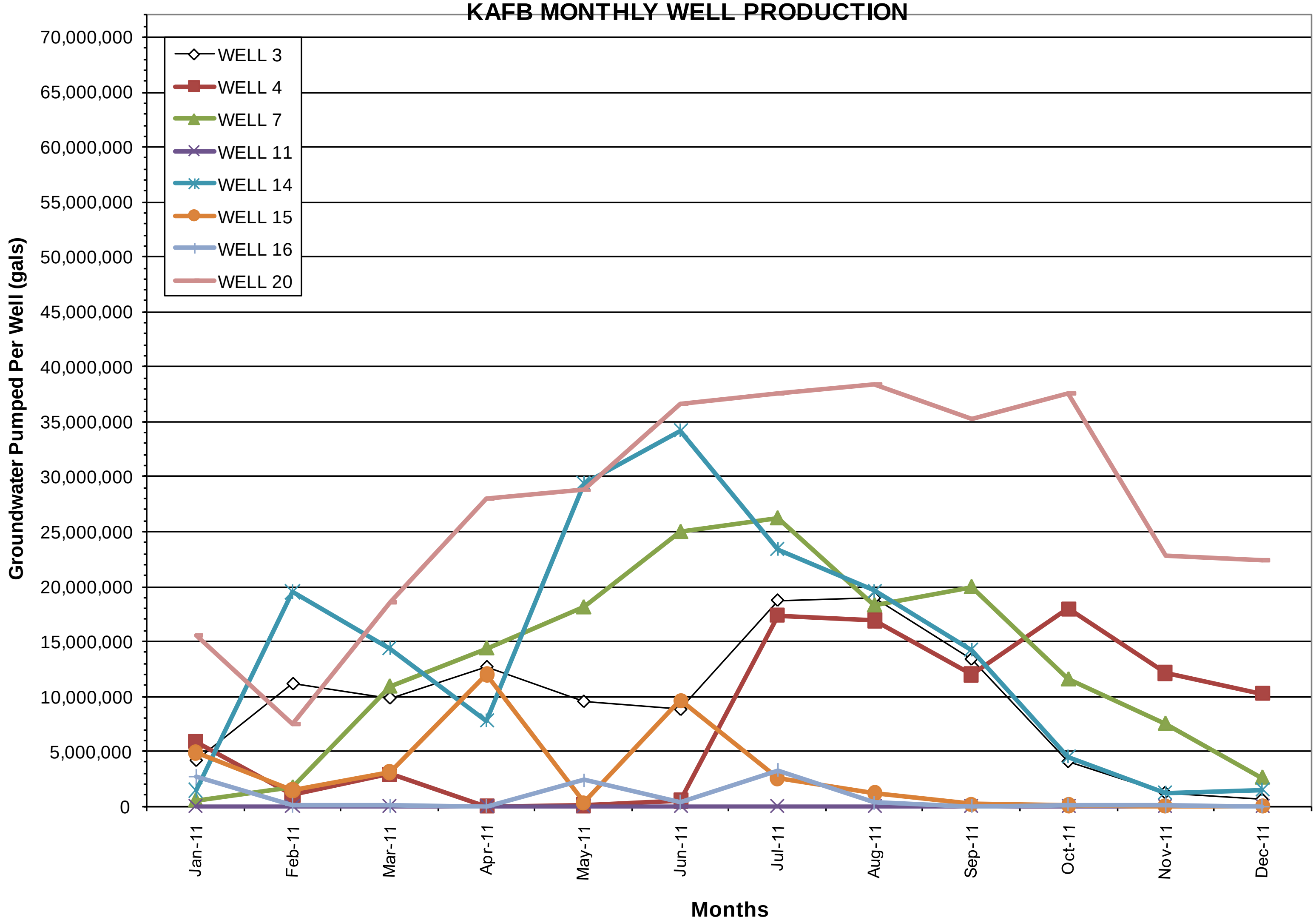

Figure 2C-4. Groundwater Pumped by KAFB Water Supply Wells, Calendar Year 2011

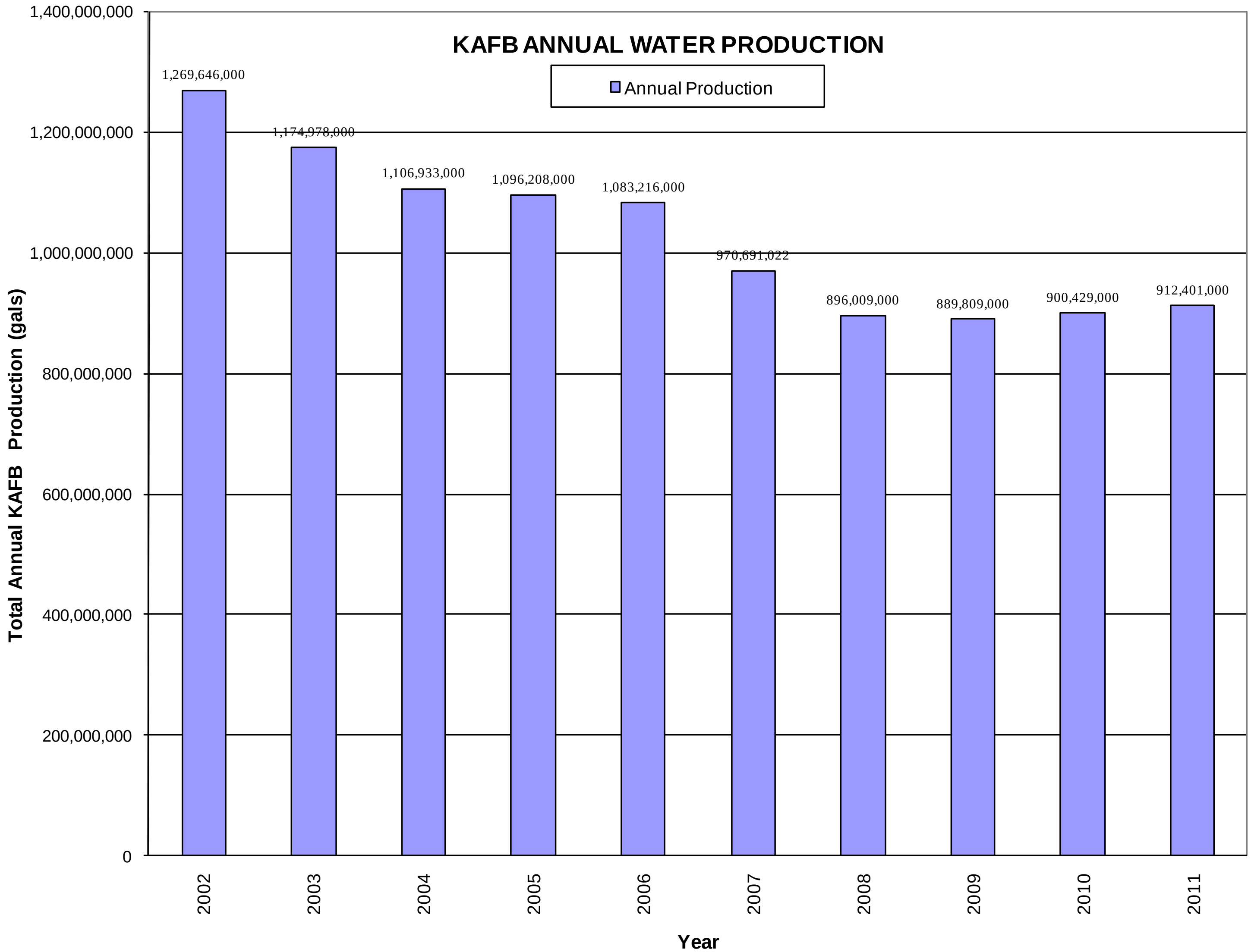

Figure 2C-5. Annual Groundwater Pumped by KAFB Water Supply Wells, 2002 to 2011

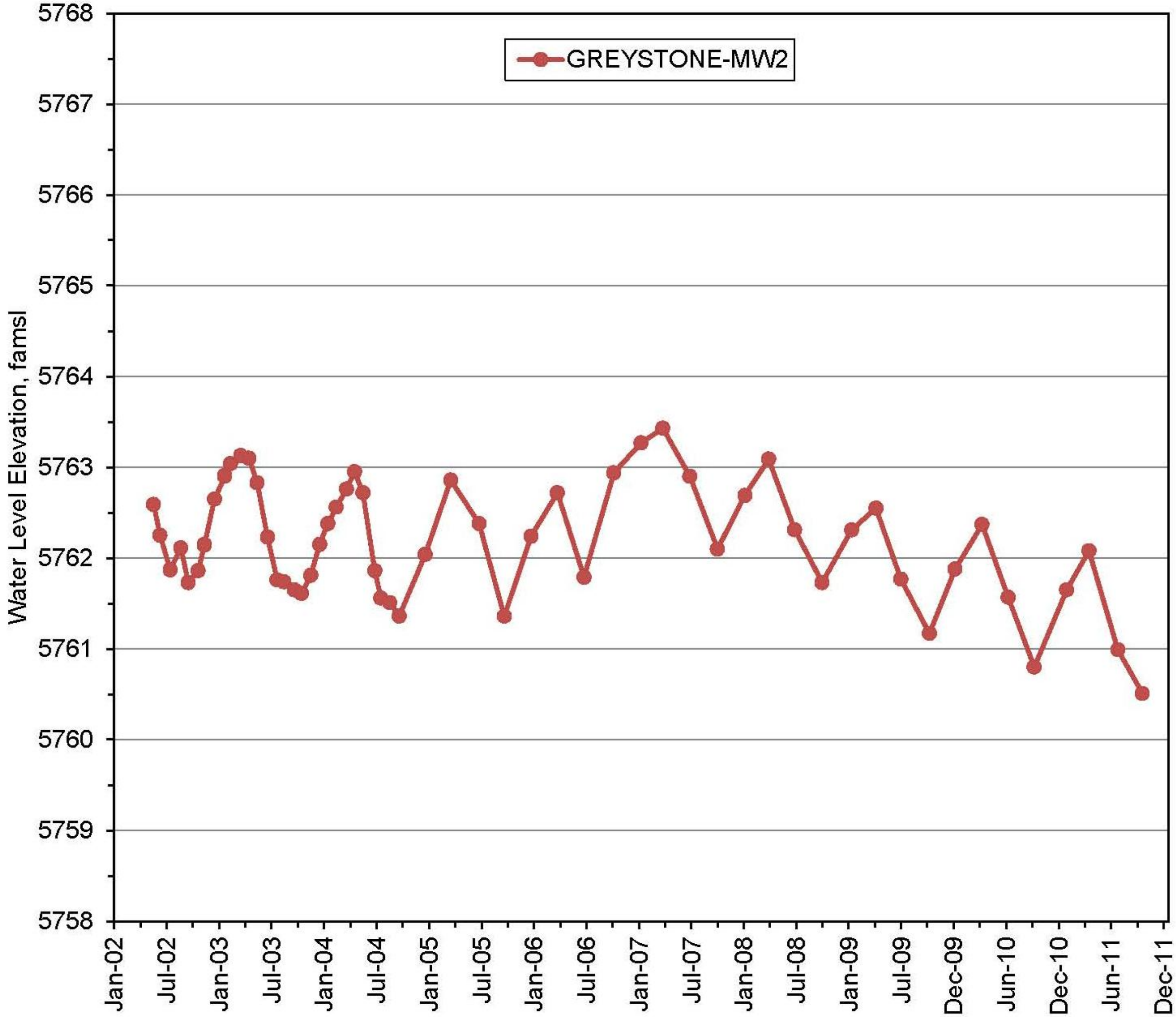

Figure 2C-6. GWPP Study Area Wells (1 of 6)

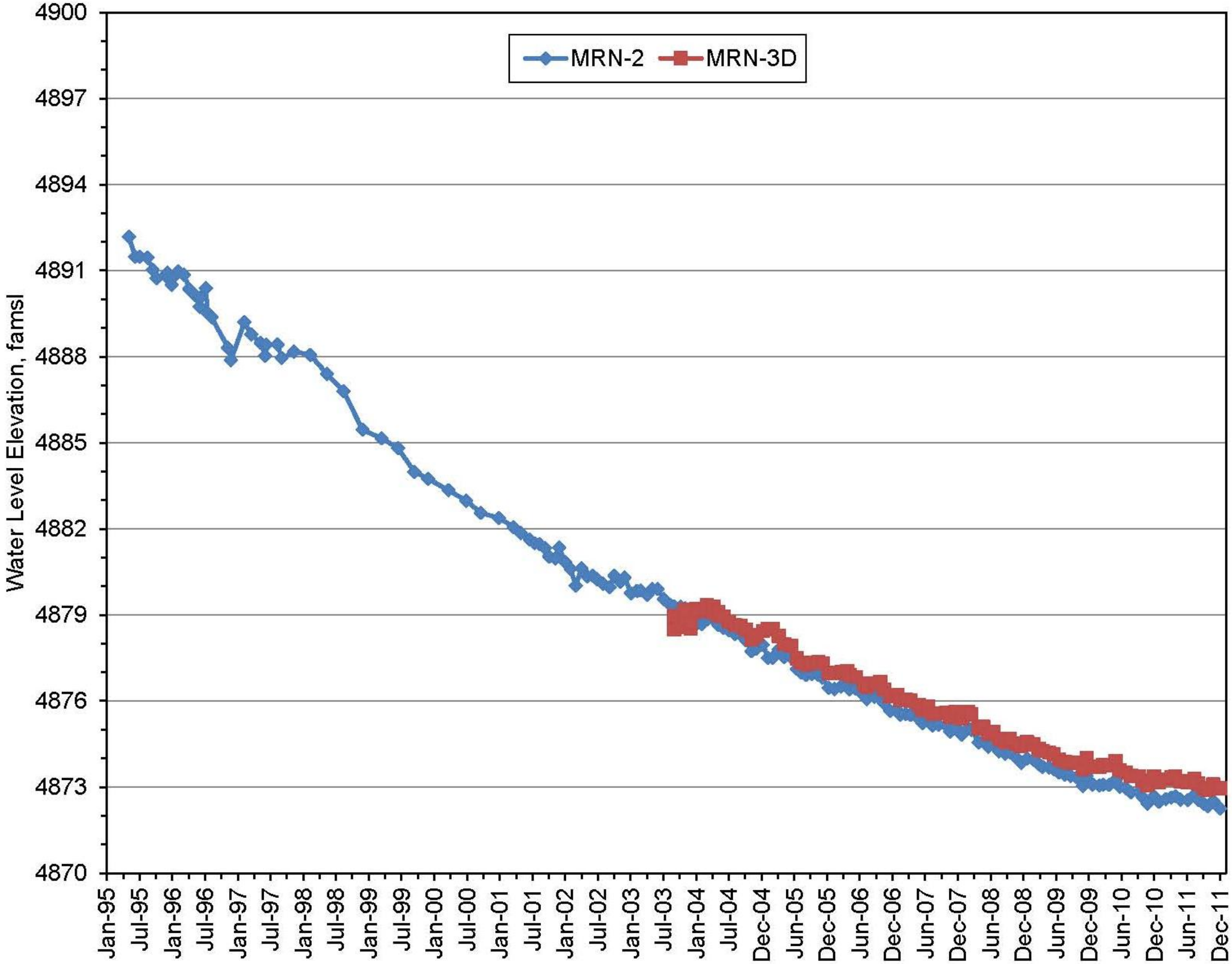

Figure 2C-7. GWPP Study Area Wells (2 of 6)

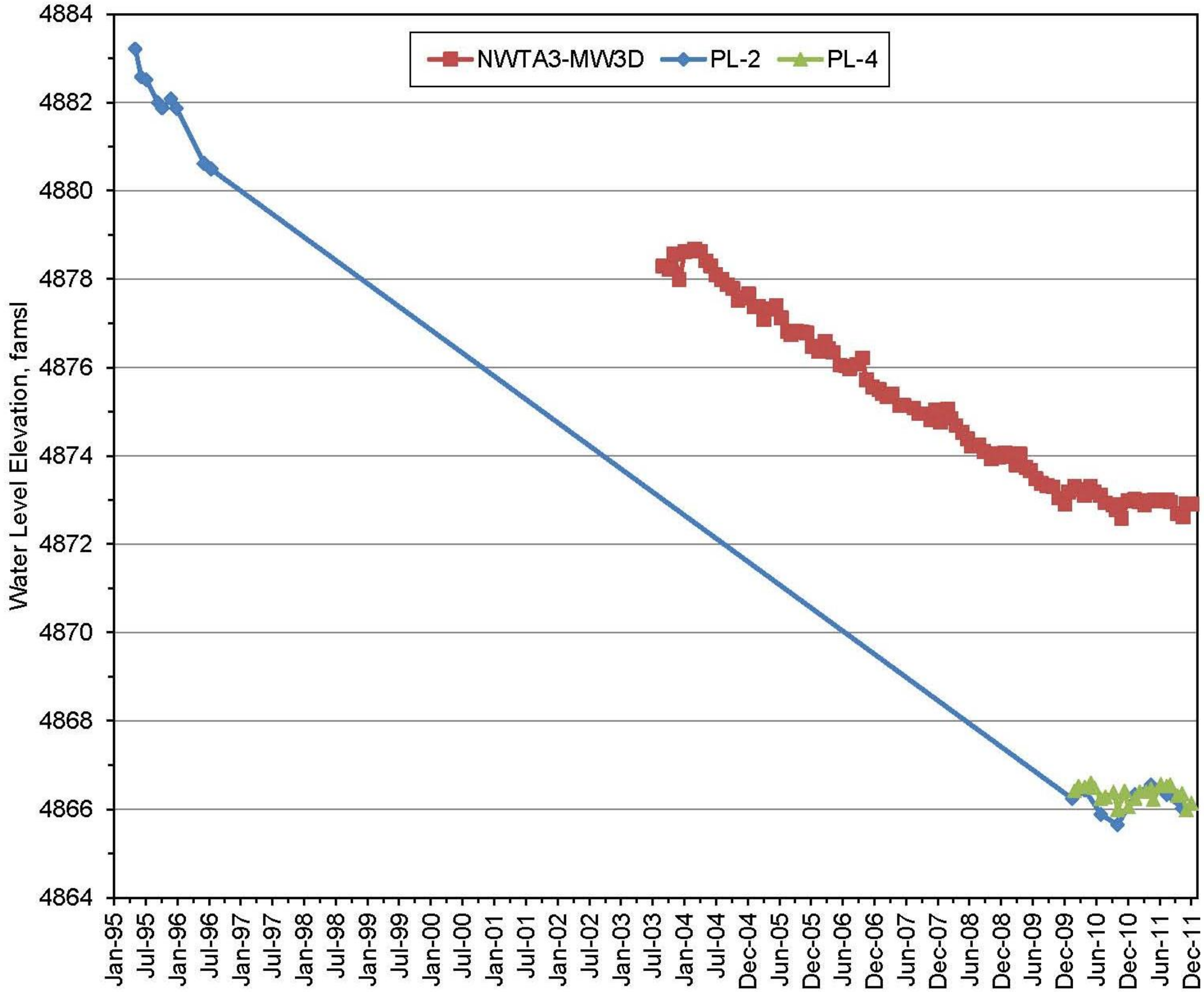

Figure 2C-8. GWPP Study Area Wells (3 of 6)

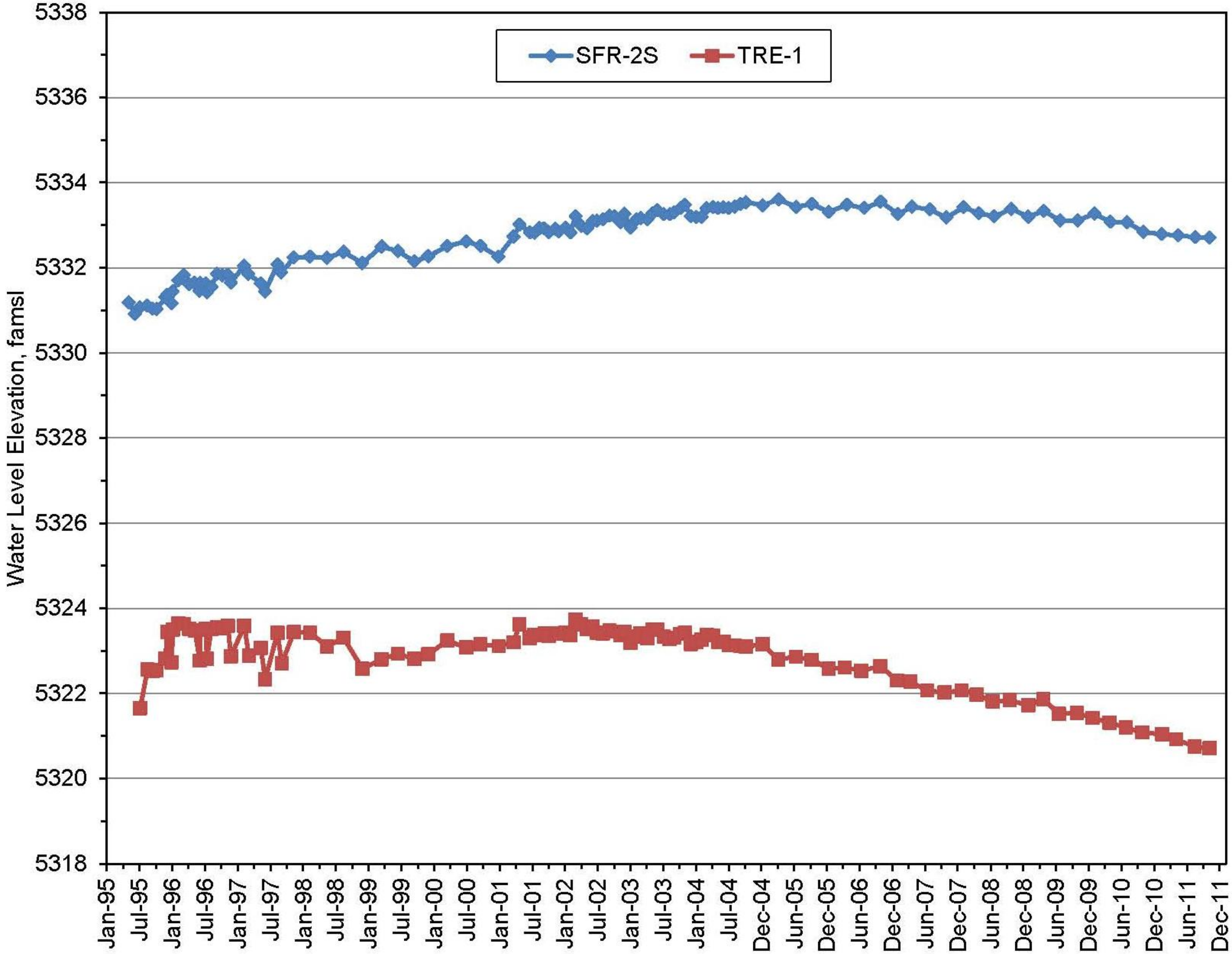

Figure 2C-9. GWPP Study Area Wells (4 of 6)

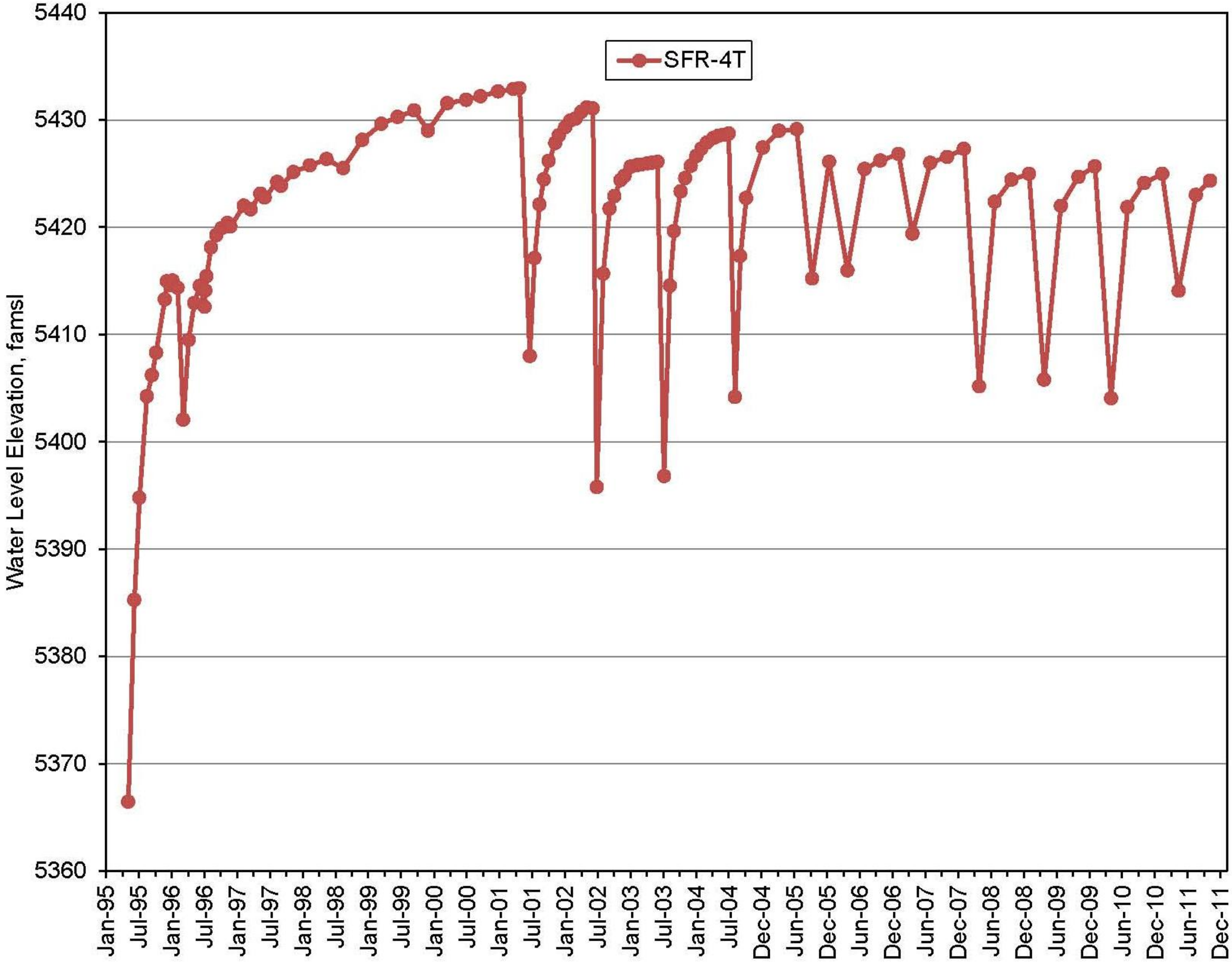

Figure 2C-10. GWPP Study Area Wells (5 of 6)

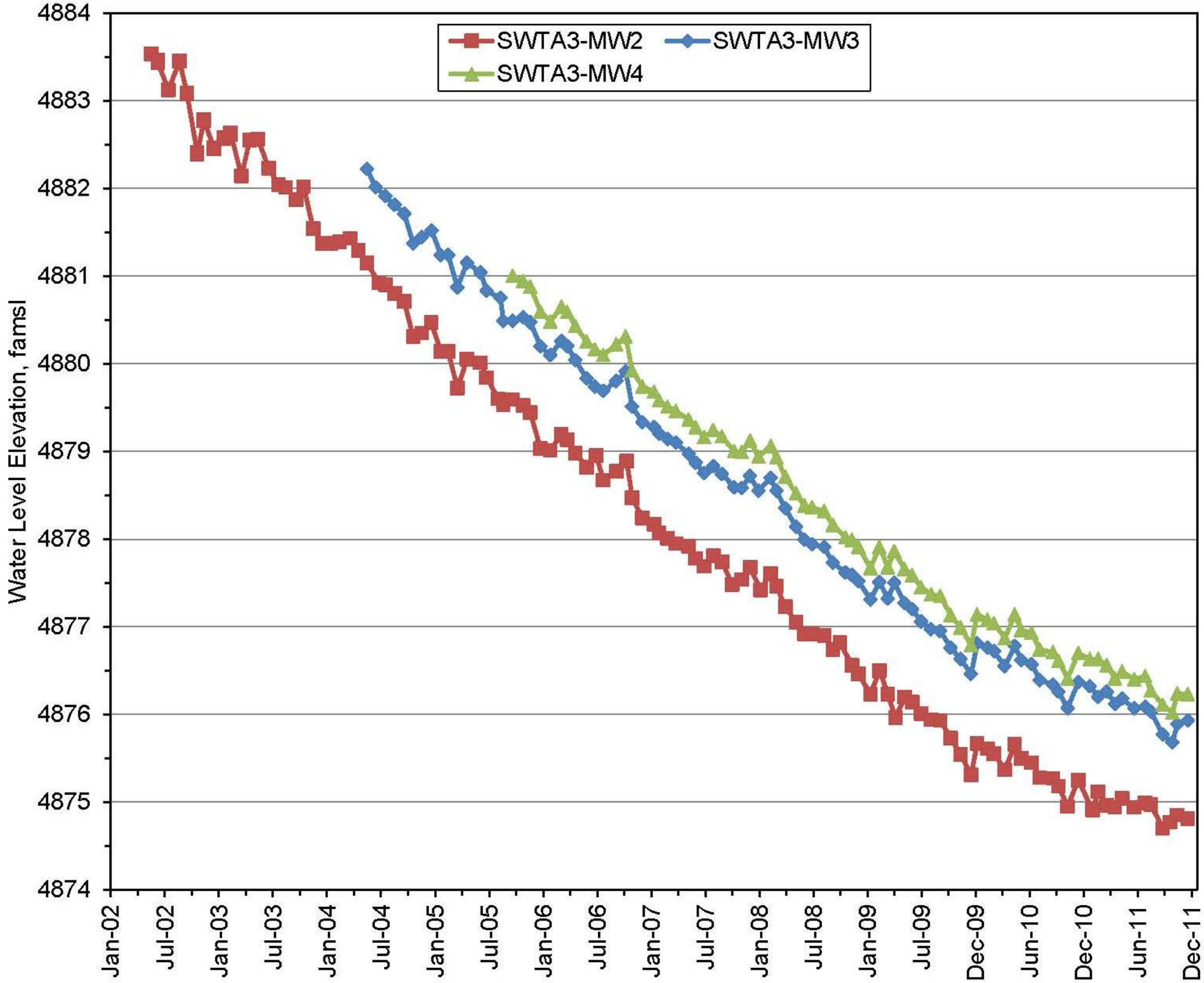

Figure 2C-11. GWPP Study Area Wells (6 of 6)

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3.0 Chemical Waste Landfill

3.1 Introduction

The Chemical Waste Landfill (CWL) is a 1.9-acre former disposal site located in the southeastern corner of Technical Area III at Sandia National Laboratories, New Mexico (SNL/NM) (Figure 3-1). From 1962 until 1981, the CWL was used for the disposal of chemical, radioactive, and solid waste generated by SNL/NM research activities. From 1982 through 1985, only solid waste was disposed of at the CWL. In addition, the CWL was used as a hazardous waste drum storage facility from 1981 to 1989.

In 1990, trichloroethene (TCE) was identified in groundwater at a concentration exceeding the regulatory limit of 5 micrograms per liter (µg/L). This finding led to the development and incorporation of a corrective action program into the *Chemical Waste Landfill Final Closure Plan and Postclosure Care Permit Application* (Final Closure Plan; SNL December 1992). The SNL/NM Environmental Restoration Project implemented two voluntary corrective measures (VCMs), the Vapor Extraction (VE) and Landfill Excavation (LE) VCMs. As part of the VE VCM that was conducted from 1996 through 1998, the volatile organic compound (VOC) soil-gas plume was reduced and controlled, further degradation of groundwater beneath the CWL was prevented, and TCE concentrations in groundwater were reduced to levels below the regulatory limit. As part of the LE VCM, the CWL was excavated from September 1998 through February 2002. More than 52,000 cubic yards of contaminated soil and debris were removed from this former disposal area (SNL April 2003).

In April 2004, the U.S. Department of Energy (DOE) and Sandia Corporation (Sandia) requested approval to install an at-grade vegetative soil cover as an interim measure (Wagner April 2004) while New Mexico Environment Department (NMED) comments on the April 2003 CWL Corrective Measure Study (CMS) Report were being resolved. On September 22, 2004, the NMED approved this request with conditions (Kieling September 2004). The conditions of approval were addressed in the subsequent revised Remedial Action Proposal that was submitted as Annex I of the revised CWL CMS Report (SNL December 2004). Construction of the at-grade evapotranspirative (ET) cover began in March 2005 and was completed in September 2005.

On May 21, 2007, the NMED issued the CWL CMS Report (SNL December 2004), Draft Post-Closure Care Permit (PCCP) (NMED May 2007), and a Closure Plan amendment for a 60-day public comment period that was completed on August 20, 2007. The DOE and Sandia submitted comments to the NMED (Wagner July 2007) and requested a public hearing. Several citizens also provided comments and requested a public hearing. Informal negotiations were initiated by the NMED in August 2008 with all parties requesting a public hearing. On October 15, 2009, the NMED Secretary signed the *Final Order In the Matter of Application for a Post-Closure Care Hazardous Waste Permit for the Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890110518* (Final Order), issuing the CWL PCCP (NMED October 2009a). On October 16, 2009, the NMED issued the *Notice of Approval, Final Remedy and Closure Plan Amendment, Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890115018, NMED-HWB-05-016* (NMED October 2009b). The NMED-approved CWL Closure Plan amendment addressed changes to both Chapter 12 (closure process) and Appendix G (Groundwater Sampling and Analysis Plan). Appendix G changes were established during the 2008 through 2009 informal negotiations and included the replacement of four groundwater monitoring wells and a reduction in the number of wells required for semiannual sampling.

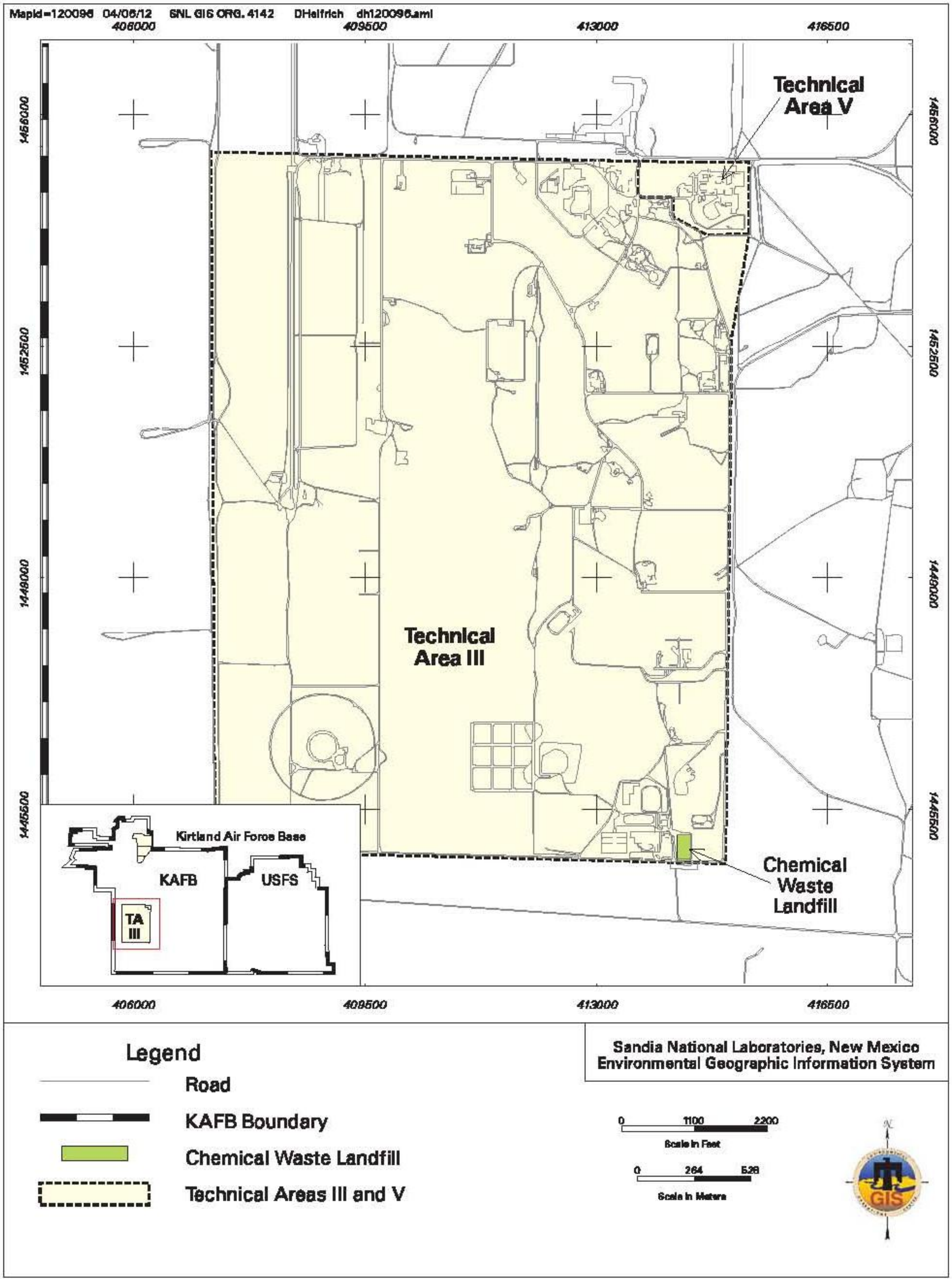

Figure 3-1. Location of the Chemical Waste Landfill within Technical Area III

From April through August 2010, monitoring wells CWL-MW4, CWL-MW5L, CWL-MW5U, CWL-MW6L, CWL-MW6U, and CWL-BW4A were decommissioned, and new monitoring wells CWL-MW9, CWL-MW10, CWL-MW11, and CWL-BW5 were installed. As documented in the Closure Plan amendment (NMED October 2009b), after the new monitoring wells were installed, the wells became the exclusive groundwater monitoring network for the CWL. The Final Resource Conservation and Recovery Act (RCRA) Closure Report documenting closure in accordance with all CWL Closure Plan requirements was submitted to the NMED on September 27, 2010 (SNL September 2010). The Well Installation and Decommissioning Report was submitted as an appendix to the CWL Final RCRA Closure Report.

CWL closure was approved by the NMED and the CWL PCCP became effective on June 2, 2011 (Kieling June 2011), transitioning monitoring activities from Environmental Restoration Operations to Long-Term Stewardship (LTS). The CWL PCCP supersedes the CWL Closure Plan (SNL December 1992) as the enforceable regulatory document. Therefore, all groundwater monitoring at the CWL after June 2011 will be performed by the LTS Program in accordance with requirements specified in the PCCP. The *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2011* will be submitted to the NMED in March 2012 as required by the PCCP.

3.1.1 Monitoring History

In 1985, groundwater monitoring began at the CWL (IT December 1985) as required by Section 20.4.1.600 of the New Mexico Administrative Code (NMAC), incorporating Title 40, Code of Federal Regulations (CFR), Part 265, Subpart F. In 1988, four additional monitoring wells were installed. In 1990, an additional downgradient well was installed. In 1994, seven more monitoring wells were installed. In response to a Notice of Violation from the NMED with regard to the inadequate design and construction of the 1985 wells, four of these wells were plugged and abandoned in 1997. To complete the ongoing chromium assessment, the NMED requested the installation of two additional deep monitoring wells to be monitored for eight quarters. These wells were installed in March and April 2003 with NMED direction regarding location, construction, and well screen placement in the regional aquifer. The results for the eight sampling events and completion of the chromium investigation were documented in the August 2005 *Chemical Waste Landfill Quarterly Closure Progress Report* (SNL August 2005). Monitoring well CWL-MW2A was plugged and abandoned in June 2004 due to well integrity issues (SNL July 2004). As discussed in the previous section, from April through August 2010 new monitoring wells CWL-MW9, CWL-MW10, CWL-MW11, and CWL-BW5 were installed, and monitoring wells CWL-MW4, CWL-MW5L, CWL-MW5U, CWL-MW6L, CWL-MW6U, and CWL-BW4A were decommissioned based on agreements reached during PCCP negotiations with the NMED. Two of the decommissioned wells, CWL-MW5U/L and CWL-MW6U/L, were nested well pairs consisting of two wells installed in the same borehole.

Until 1990, all groundwater sampling at the CWL was conducted on a quarterly basis in accordance with 40 CFR 265.92(c)(1). In 1990, the NMED granted a reduction in the sampling frequency from quarterly to semiannually for groundwater contamination indicator parameters and annually for groundwater quality parameters, as allowed by 40 CFR 265.92(d)(2), as no contaminants had been detected above U.S. Environmental Protection Agency (EPA) drinking water standards in samples from any well. During the following sampling quarter in March 1990, TCE was detected above the drinking water standard of 5 µg/L in the sample from CWL-MW2A. Additionally, two indicator parameters (specific conductance [SC] and pH) also exceeded state guidelines. Two months later, resampling for VOCs confirmed the presence of TCE. The NMED reinstated the quarterly sampling requirement and, thereafter, all indicator parameters have been sampled in accordance with 40 CFR 265.93(c)(2).

In 1995, Appendix G of the CWL Closure Plan (SNL December 1992) was revised and updated as part of a Closure Plan Amendment Request submitted to the NMED on June 30, 1995. In May 2000, the NMED approved the following changes to Appendix G of the CWL Closure Plan (Bearzi May 2000):

- Biennial frequency (every other year) for agreed upon Appendix IX constituents including VOCs, semivolatile organic compounds, chlorinated herbicides, polychlorinated biphenyls, total cyanide, sulfides, dissolved chromium, and total metals plus iron.

- Semiannual frequency (twice a year) for Appendix IX VOCs and metals.

As part of its review of the CWL CMS Report, the NMED presented general groundwater characterization requirements in December 2003 (Kieling December 2003). In March 2004, these requirements were further discussed, and it was agreed that seven sampling events using the conventional sampling method for all CWL monitoring wells with a diameter large enough to accommodate the conventional method equipment would be sufficient for the revised CMS Report. The original NMED comments and the negotiated agreements regarding the required number of events are documented in the CWL CMS comment response document (SNL October 2004) and in the revised CWL CMS Report (SNL December 2004).

A comprehensive summary of the CWL disposal history is presented in the NMED-approved CWL Closure Plan (SNL December 1992) and the LE VCM Final Report (SNL April 2003). Groundwater and other site investigation results from 1992 through 1995 are documented in both the *Chemical Waste Landfill Unsaturated Zone Contaminant Characterization Report* (SNL November 1993) and the *CWL Groundwater Assessment Report* (SNL October 1995). A comprehensive investigation history of the CWL is presented and summarized in the CWL CMS Report (SNL December 2004), including pre-VCM, VCM, and post-VE VCM soil, soil-gas, and groundwater monitoring results that establish current conditions.

3.1.2 Monitoring Network

The CWL groundwater monitoring network transitioned in Calendar Year (CY) 2011 from the previous networks to the PCCP network that consists of the four wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11) that were installed in 2010. These four wells are shown on Figure 3-2 and listed in Table 3-1. The first semiannual sampling event was conducted from July 27 to August 2, 2011, in accordance with the PCCP.

3.1.3 Summary of Activities

The CY 2011 semiannual groundwater monitoring activities for the CWL were performed during July and August 2011. Groundwater samples were collected from four groundwater monitoring wells and analyzed for the three analytes (TCE, chromium, and nickel), as specified in the PCCP. Attachment 3A presents tables showing the analytical results for the CWL monitoring wells sampled during CY 2011.

A comprehensive presentation of all required monitoring, inspections, maintenance, and repair activities will be presented in the *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2011* that will be submitted to the NMED in March 2012.

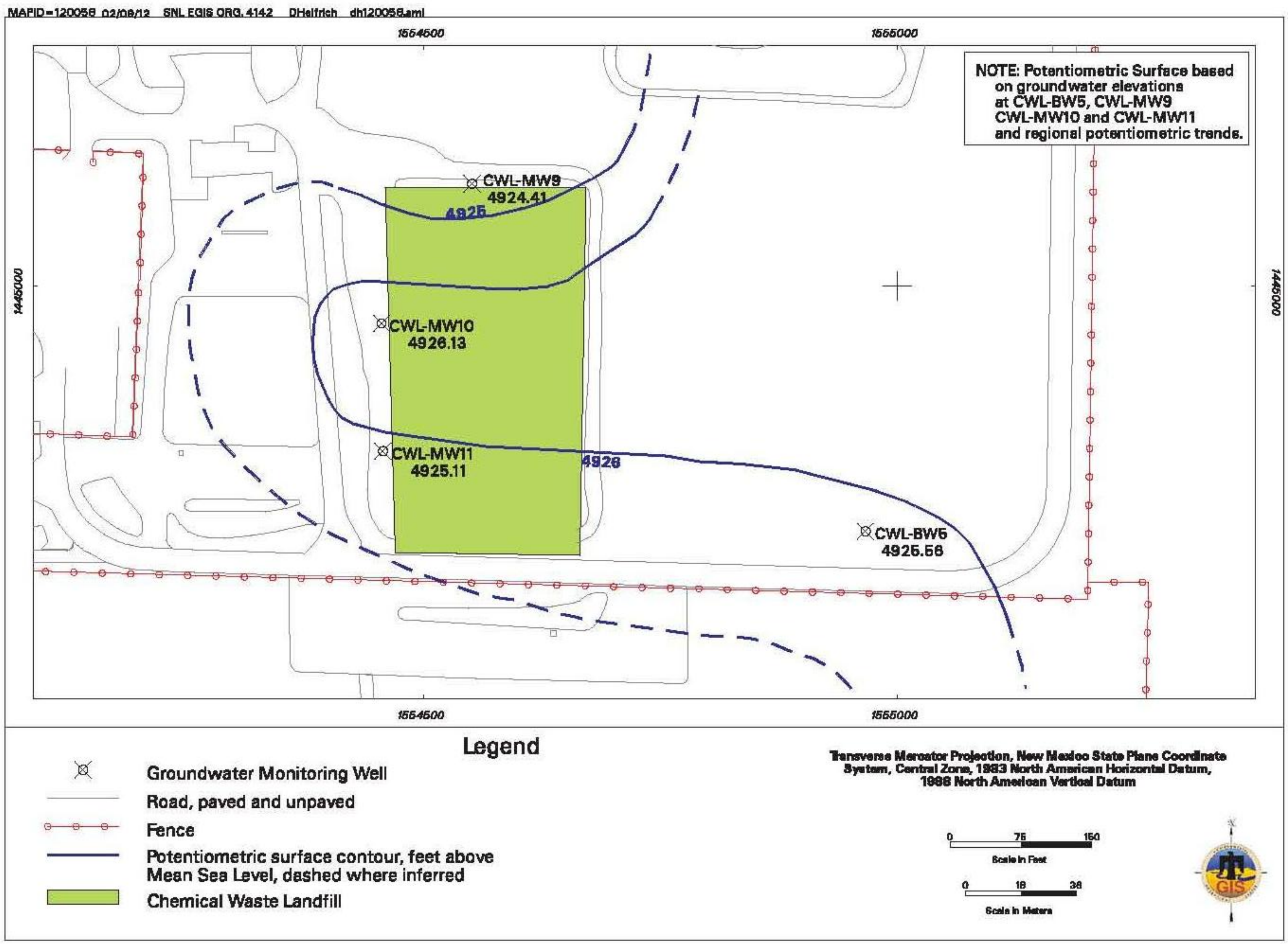

Figure 3-2. Chemical Waste Landfill Monitoring Well Locations and Potentiometric Surface Map, October 2011

Table 3-1. CWL Post-Closure Care Permit Monitoring Well Network and Calendar Year 2011 Compliance Activities

Well ID	WQ	WL	Comment
PCCP Monitoring Well Network, July–August 2011 Sampling Event			
CWL-BW5	✓	✓	Upgradient well
CWL-MW9	✓	✓	Downgradient well
CWL-MW10	✓	✓	Downgradient well
CWL-MW11	✓	✓	Downgradient well

NOTES:

Check marks in the WQ and WL columns indicate the WQ sampling and WL measurements that were conducted from January to December 2011.

BW = Background Well.
CWL = Chemical Waste Landfill.
ID = Identification.
MW = Monitoring Well.
PCCP = Post-Closure Care Permit.
WL = Water level.
WQ = Water quality.

3.1.4 Summary of Future Activities

As required by 20.4.1.500 NMAC, incorporating 40 CFR 264.117(a)(1), the post-closure care period for the CWL is 30 years. The NMED may shorten or extend this period under 20.4.1.500 NMAC, incorporating 40 CFR 264.117(a)(2). Because the CWL PCCP became effective in June 2011, only one semiannual groundwater monitoring event was conducted during CY 2011. The two semiannual groundwater monitoring events scheduled for CY 2012 will represent the first full year of groundwater monitoring under the CWL PCCP. The first groundwater monitoring event for CY 2012 will include analyses for the enhanced list of constituents comprised of 1,1,2-trichloro-1,2,2-trifluoroethane (Freon-113), tetrachloroethene, 1,1-dichloroethene, chloroform, and trichlorofluoromethane (Freon-11), in addition to TCE, chromium, and nickel.

3.1.5 Conceptual Site Model

As documented in the NMED-approved CWL PCCP (Kieling June 2011), the constituents of concern in groundwater are TCE, chromium, and nickel. For understanding the hydrogeologic regime at the CWL, a detailed conceptual site model is provided in Annex E of the CWL CMS Report (SNL December 2004). The model is summarized as follows.

Groundwater at the CWL is contained within the regional aquifer, which consists of unconsolidated Santa Fe Group deposits (i.e., fine-grained alluvial-fan deposits). The depth to water is approximately 500 feet (ft) below ground surface. Groundwater flows generally westward away from the Manzanita Mountains and toward the Rio Grande. Several water-supply wells operated by Kirtland Air Force Base (KAFB) and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) have profoundly modified the natural groundwater flow regime near the CWL by creating a trough in the water table in the western and northern portions of KAFB. As a result, water levels at the CWL have been steadily declining.

Since monitoring began at the CWL in 1985, the average rate of decline has been somewhat variable, but typically in the range of 0.4 to 0.8 feet per year (ft/yr). For the period from July 2010 to October 2011, groundwater levels in the four wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11) declined at similar rates that varied from 0.62 to 0.98 ft/yr (Figure 3B-1). Recharge from the infiltration of direct precipitation at the CWL is negligible due to high evapotranspiration, low precipitation, the thick sequence of unsaturated Santa Fe Group deposits above the water table, and the ET cover that was installed in 2005. Groundwater recharge of the regional aquifer primarily occurs by the infiltration of precipitation in the Manzanita Mountains located approximately 5 miles to the east.

The CWL potentiometric surface map for October 2011 is presented on Figure 3-2. The map is consistent with the conceptual site model and the base-wide potentiometric surface map presented on Plate 1. As shown on Plate 1, the potentiometric surface contours beneath Technical Area III generally trend north to south with the inferred groundwater flow direction being generally westward. The localized deflection in the potentiometric surface immediately beneath the CWL (Figure 3-2) probably reflects site-specific geologic controls (i.e., vertical and lateral changes in hydraulic conductivity associated with the anisotropic alluvial-fan sediments).

Based on the potentiometric surface map, the horizontal gradient at the CWL ranged from approximately 0.006 to 0.013 ft/ft in October 2011. Using this gradient range and representative hydraulic conductivity and porosity data cited in the *CWL Groundwater Assessment Report* (SNL October 1995), an estimate of groundwater velocity was calculated. The groundwater velocity at the CWL is estimated to range from approximately 5.8×10^{-4} to 1.3×10^{-3} ft/day (2.0×10^{-7} to 4.4×10^{-7} centimeters per second). This is equivalent to approximately 0.22 to 0.47 ft/yr. This considerably low range of groundwater velocity is consistent with previous CWL estimates for horizontal groundwater flow. Groundwater travel times from the CWL to the KAFB and ABCWUA water supply wells are on the order of hundreds to thousands of years (SNL February 2001).

3.2 Regulatory Criteria

The CWL has undergone closure in accordance with 20.4.1.600 NMAC, incorporating Title 40, CFR, Section 265, Subpart G, and the CWL Closure Plan (SNL December 1992 and subsequent revisions). The CWL PCCP became effective on June 2, 2011, and addresses applicable 40 CFR 264 groundwater monitoring, corrective action, and post-closure requirements. Monitoring details, such as specific analytes and sampling frequencies, are defined in the PCCP (NMED October 2009a).

3.3 Scope of Activities

The groundwater monitoring performed at the CWL during CY 2011 is summarized in Section 3.1.3. Table 3-2 lists the parameters and CWL monitoring wells sampled.

Table 3-2. Analytical Parameters for the CWL Monitoring Wells, Calendar Year 2011

Parameter	July–August 2011
TCE	CWL-BW5, CWL-MW9, CWL-MW10, CWL-MW10 dup, and CWL-MW11
Chromium	CWL-BW5, CWL-MW9, CWL-MW10, CWL-MW10 dup, and CWL-MW11
Nickel	CWL-BW5, CWL-MW9, CWL-MW10, CWL-MW10 dup, and CWL-MW11

NOTES:
BW = Background Well.
CWL = Chemical Waste Landfill.
dup = Duplicate.
MW = Monitoring Well.
TCE = Trichloroethene.

Groundwater samples collected for chemical analyses were submitted to GEL Laboratories LLC (GEL) in Charleston, South Carolina. All chemical analytical results are compared with EPA maximum contaminant levels (MCLs) for drinking water supplies (EPA 2009). The analytical results are summarized in Attachment 3A, Tables 3A-1 and 3A-2.

Field and laboratory quality control (QC) samples were used to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process as discussed in Section 3.7. Field QC samples included duplicate environmental, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Laboratory QC samples included method blank, laboratory control, matrix spike, matrix spike duplicate, and surrogate spike samples.

3.4 Field Methods and Measurements

Groundwater sampling and depth-to-groundwater measurements were conducted in conformance with procedures specified in the CWL PCCP (NMED October 2009a). Groundwater elevation and water quality field measurements were obtained during groundwater sampling activities. Field water quality parameters are presented in Table 3A-3 (Attachment 3A). Depth-to-groundwater measurements were obtained using a Solinst™ depth-to-water meter prior to purging activities. Groundwater elevation measurements at the CWL monitoring wells from CY 2010 through CY 2011 are presented in Attachment 3B, Figure 3B-1.

A modified Bennett™ groundwater sampling system equipped with a flow meter valve located along the water discharge line and small-diameter tubing was used to collect groundwater samples from all wells at the lowest flow rate achievable. Prior to sample collection, each monitoring well was purged to remove stagnant well casing water. Groundwater temperature, SC, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a Hach™ Model 2100P portable turbidity meter. Groundwater stability is considered acceptable when measurements are less than 5 nephelometric units for turbidity, ± 0.1 pH units, and ± 1.0 degrees Celsius for temperature, and ± 5% for SC. Field water quality measurements are presented in Attachment 3A, Table 3A-3.

Minimum purge requirements were satisfied at all four monitoring wells, except at monitoring well CWL-MW10. This well was purged to dryness, allowed to recover, and then sampled to collect the most representative groundwater sample possible given the low yield of this well. The modified Bennett™ groundwater sampling system was operated to achieve the lowest possible flow rate. Monitoring well CWL-MW10 was purged for 261 minutes (4.35 hours), and slightly more than 23 gallons of water were purged prior to the well going dry. The average flow rate during this purging is estimated at 0.088 gallons per minute (equivalent of 0.33 liters per minute).

Groundwater samples were collected after the purging process and submitted to the off-site laboratory (GEL) following the analysis request/chain-of-custody protocol.

3.5 Analytical Methods

The analytical laboratory analyzed samples using EPA-approved analytical methods and specified performance criteria in accordance with the *SNL/NM Statement of Work for Analytical Laboratories, Revision 5* (SNL March 2011). The analytical laboratory provided appropriate sample containers prepared with the required sample preservative. Table 3-3 summarizes analytical requirements and EPA Methods (EPA 1986) applicable to groundwater sampling at the CWL during CY 2011.

Table 3-3. CWL Groundwater Sample Analyses, Methods, Sample Containers, Preservatives, and Holding Times

Analysis	Method[a]	Container Type/ Volume/Preservative	Holding Time
TCE	SW846-8260B	Glass; 3 x 40 mL; HCl; 4°C	14 days
Metals: Nickel and Chromium	SW846-6020/7470A	Polyethylene; 500 mL; HNO_3; 4°C	180 days

NOTES:
[a]U.S. Environmental Protection Agency, November 1986. *Test Methods for Evaluating Solid, Physical/Chemical Methods,* 3rd ed., (and updates), SW-846, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.
°C = Degree(s) Celsius.
CWL = Chemical Waste Landfill.
HCl = Hydrochloric acid.
HNO_3 = Nitric acid.
mL = Milliliter(s).
SW = Solid Waste.
TCE = Trichloroethene.

3.6 Summary of Analytical Results

The analytical results and water quality parameters are presented in Attachment 3A, Tables 3A-1 through 3A-3. Groundwater samples and field QC samples were submitted to GEL for analyses. Samples were analyzed in accordance with applicable EPA analytical methods. Analytical results that are above the analytical laboratory method detection limit (MDL) but below the practical quantitation limit (PQL) are qualified as estimated values and designated with a “J” qualifier. Analytical laboratory reports, including certificates of analyses, analytical methods, MDLs, PQLs, dates of analyses, results of QC analyses, and data validation findings are filed in the SNL/NM Records Center. Data qualifiers based on the data validation process are presented with the associated results in the Attachment 3A tables. Data validation and QC sample results are discussed in Section 3.7.

3.6.1 TCE

The analytical results for TCE are summarized in Attachment 3A, Table 3A-1. No TCE was detected above the laboratory MDL in any CWL groundwater samples except for the sample from CWL-MW10. TCE was detected in the environmental and duplicate environmental samples at concentrations of 1.47 and 1.61 µg/L, respectively, which are below the MCL of 5.0 µg/L.

3.6.2 Metals

The analytical results for nickel and chromium are summarized in Attachment 3A, Table 3A-2. No chromium concentrations above the laboratory MDL of 0.002 milligrams per liter (mg/L) were detected in any of the samples. Nickel was detected in each sample at concentrations ranging from 0.00347 mg/L in the CWL-MW11 sample to 0.00431 mg/L in the CWL-MW10 sample. No MCL has been established for nickel.

3.6.3 Water Quality Parameters

The water quality parameters measured immediately prior to sample collection are listed in Attachment-3A, Table 3A-3. These field parameters consist of temperature, SC, oxidation-reduction potential, pH, turbidity, and dissolved oxygen.

3.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. All data were reviewed in accordance with AOP [Administrative Operating Procedure] 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011). The results for each QC analysis and the impact on data quality are discussed in the following sections.

3.7.1 Field Quality Control Samples

Field QC samples included duplicate environmental samples, FBs, TBs, and EBs. Duplicate environmental samples are collected immediately after the environmental sample to provide information about sampling variability and overall reproducibility. FB samples provide a check for potential ambient sources of sample contamination during the sampling process and/or sampling error. TB samples are submitted whenever samples are collected for VOC analysis to assess whether contamination of the samples occurred during shipment and storage. EB samples are collected to verify the effectiveness of the sampling equipment decontamination process. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the PCCP (NMED October 2009a). The following sections discuss the analytical results for each QC sample type.

3.7.1.1 Duplicate Environmental Samples

A duplicate environmental sample was collected from well CWL-MW10, and the results were compared to the results for the corresponding environmental sample to estimate the overall reproducibility of the sampling and analytical process. The duplicate environmental sample was collected immediately after the environmental sample to reduce variability caused by time and/or sampling mechanics. Relative percent difference (RPD) values were calculated for the detected parameters. The CY 2011 duplicate environmental sample results show good correlation with RPD values of 9 for TCE and 7 for nickel. The agreement between duplicate environmental and environmental sample results are within the acceptable range for RPD values of less than 20 for organic compounds and less than 35 for metals (NMED October 2009a).

3.7.1.2 Field Blank Samples

One FB sample was collected and analyzed for TCE to assess whether contamination of the samples resulted from ambient field conditions. The FB sample was prepared by pouring deionized water into sample containers at the CWL-MW11 sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. TCE was not detected above the laboratory MDL.

3.7.1.3 Trip Blank Samples

The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-milliliter volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. The TBs were brought to the field and accompanied each TCE sample shipment. Five TBs were submitted with the CY 2011 samples for TCE analysis. TCE was not detected above the laboratory MDL in any of the TB samples.

3.7.1.4 Equipment Blank Samples

One EB sample (also referred to as a rinsate blank) was collected prior to sampling well CWL-MW10 to verify the effectiveness of the equipment decontamination process. This sample was submitted for all analyses. The sampling pump and tubing bundle used to collect groundwater samples were decontaminated prior to sampling each monitoring well according to procedures described in SNL/NM FOP [Field Operating Procedure] 05-03, *Long-Term Environmental Stewardship General Sampling Equipment Decontamination* (SNL November 2009). TCE, chromium, and nickel were not detected above associated laboratory MDLs.

3.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate laboratory control samples, were analyzed concurrently with the groundwater samples. Additionally, batch matrix spike, matrix spike duplicate, and surrogate spike samples were analyzed. All laboratory data were reviewed and qualified in accordance with AOP 00-03, Revision 2, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011). Internal laboratory QC samples, including method blanks and duplicate laboratory control samples, were analyzed concurrently with all groundwater samples.

All analytical data were determined acceptable, and reported QC measures are adequate. The results for nickel in samples from CWL-BW5 and CWL-MW9 were qualified as estimated values during data validation as nickel was detected in the associated interference check sample. The data validation reports are filed in the SNL/NM Records Center.

3.8 Variances and Nonconformances

No variances or nonconformances from specified sampling and analysis requirements or project-specific issues were identified during the July to August 2011 sampling activities at the CWL.

3.9 Summary and Conclusions

During CY 2011, groundwater samples were collected from four CWL PCCP monitoring wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11) and analyzed for TCE, nickel, and chromium. No analytes were detected at concentrations exceeding the EPA MCLs.

Based on the field and laboratory QC sample and data validation results, the CY 2011 groundwater monitoring data are defensible and representative.

3.10 References

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Attachment 3A
Chemical Waste Landfill
Analytical Results Tables

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Attachment 3A Tables

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Table 3A-1
Summary of Trichloroethene Results,
Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CWL-BW5 27-Jul-11	Trichloroethene	ND	0.250	1.00	5.00	U		090964-001	SW846-8260B
CWL-MW9 28-Jul-11	Trichloroethene	ND	0.250	1.00	5.00	U		090968-001	SW846-8260B
CWL-MW10 01-Augl-11	Trichloroethene	1.47	0.250	1.00	5.00			090974-001	SW846-8260B
CWL-MW10 (Duplicate) 01-Aug-11	Trichloroethene	1.61	0.250	1.00	5.00			090975-001	SW846-8260B
CWL-MW11 02-Aug-11	Trichloroethene	ND	0.250	1.00	5.00	U		090979-001	SW846-8260B

Refer to footnotes on page 3A-9.

Table 3A-2
Summary of Chromium and Nickel Results,
Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CWL-BW5	Chromium	ND	0.002	0.010	0.100	U		090964-013	SW846-6020
27-Jul-11	Nickel	0.0039	0.0005	0.002	NE		J+	090964-013	SW846-6020
CWL-MW9	Chromium	ND	0.002	0.010	0.100	U		090968-013	SW846-6020
28-Jul-11	Nickel	0.00408	0.0005	0.002	NE		J+	090968-013	SW846-6020
CWL-MW10	Chromium	ND	0.002	0.010	0.100	U		090974-013	SW846-6020
01-Aug-11	Nickel	0.00431	0.0005	0.002	NE			090974-013	SW846-6020
CWL-MW10 (Duplicate)	Chromium	ND	0.002	0.010	0.100	U		090975-013	SW846-6020
01-Aug-11	Nickel	0.00402	0.0005	0.002	NE			090975-013	SW846-6020
CWL-MW11	Chromium	ND	0.002	0.010	0.100	U		090979-013	SW846-6020
02-Aug-11	Nickel	0.00347	0.0005	0.002	NE			090979-013	SW846-6020

Refer to footnotes on page 3A-9.

Table 3A-3
Summary of Field Water Quality Measurements[h],
Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CWL-BW5	27-Jul-11	25.72	1221	397.0	6.58	0.35	88.6	7.20
CWL-MW9	28-Jul-11	23.23	1072	-26.3	6.67	0.59	16.1	1.37
CWL-MW10	01-Aug-11	22.90	990	386.2	6.70	4.18	46.6	3.99
CWL-MW11	02-Aug-11	28.52	1121	392.9	6.71	0.76	64.7	4.99

Refer to footnotes on page 3A-9.

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Footnotes for Chemical Waste Landfill Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- µg/L = micrograms per liter
- mg/L = milligrams per liter

[b]MDL

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

[c]PQL

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009.
- NE = not established.

[e]Laboratory Qualifier

U = Analyte is absent or below the method detection limit.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

J+ = The associated numerical value is an estimated quantity with a suspected positive bias.

[g]Analytical Method

- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C = degrees Celsius.
% Sat = percent saturation.
µmho/cm = micromhos per centimeter.
mg/L = milligrams per liter.
mV = millivolts.
NTU = nephelometric turbidity units.
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration).

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Attachment 3B
Chemical Waste Landfill
Hydrographs

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Attachment 3B Hydrographs

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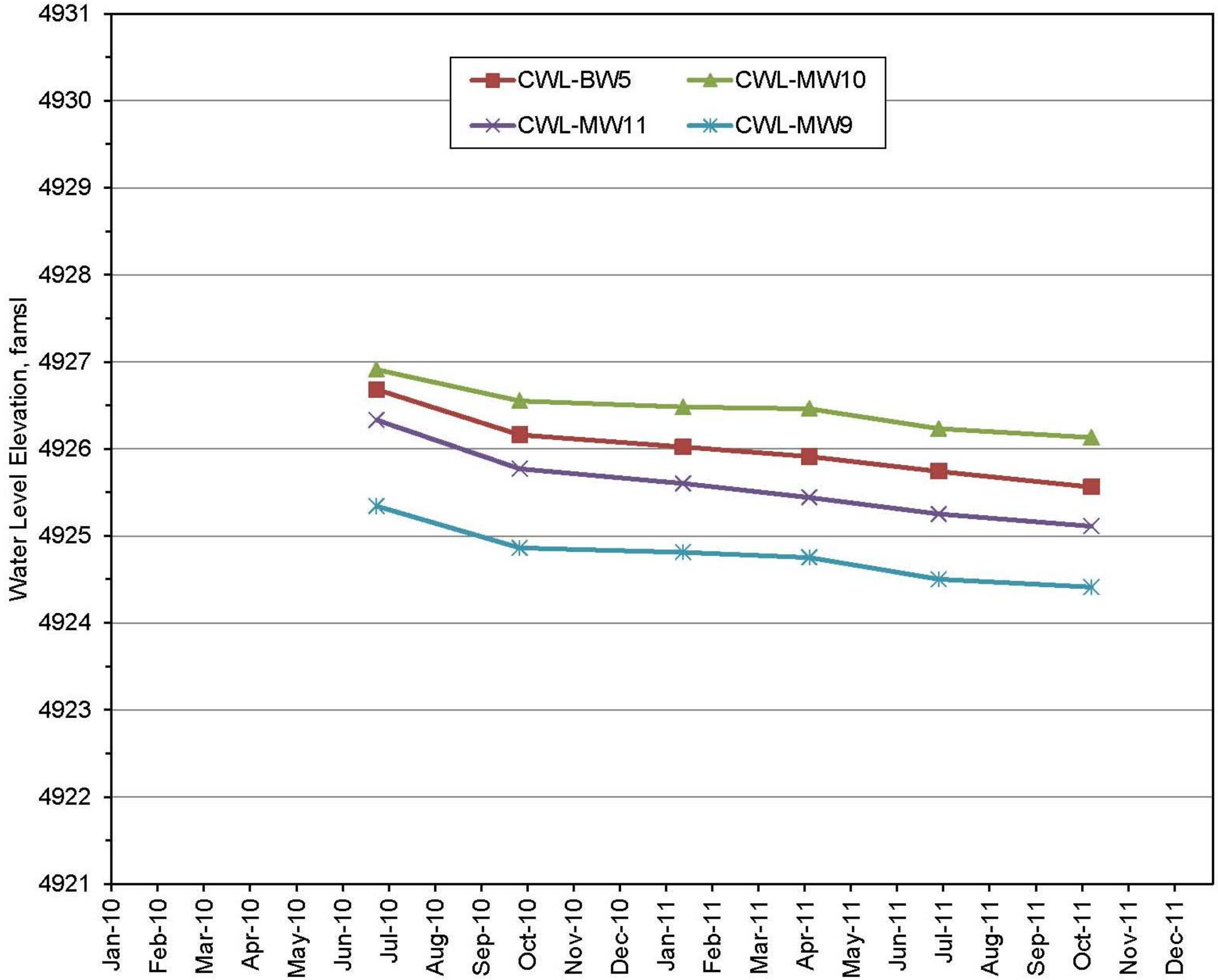

Figure 3B-1. CWL Study Area Wells

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4.0 Mixed Waste Landfill

4.1 Introduction

The Mixed Waste Landfill (MWL) is a 2.6-acre site in the north-central portion of Technical Area III at Sandia National Laboratories, New Mexico (SNL/NM) (Figure 4-1). The MWL consists of two distinct disposal areas: the classified area (occupying 0.6 acres) and the unclassified area (occupying 2.0 acres). Approximately 100,000 cubic feet of low-level radioactive and mixed waste containing approximately 6,300 curies (at the time of disposal) of activity were disposed of in the MWL from March 1959 through December 1988. Classified wastes were buried in cylindrical pits in the classified area and unclassified wastes were buried in shallow trenches in the unclassified area.

The Phase 1 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was conducted in 1989 and 1990 to determine whether a release of RCRA contaminants had occurred at the MWL (SNL September 1990). The Phase 1 RFI indicated that tritium had been released to the environment. A Phase 2 RFI was conducted from 1992 to 1995 to determine the contaminant source, define the nature and extent of contamination, identify potential contaminant transport pathways, evaluate potential risks, and provide remedial action alternatives for the MWL (Peace et al. 2002).

The Phase 2 RFI confirmed tritium as the constituent of concern (COC) in soil at the MWL. Tritium occurs in surface and near-surface soil in and around the classified area. Tritium levels range from 1,100 picocuries per gram (pCi/g) in surface soil to 206 pCi/g in subsurface soil. The highest tritium levels have been found within 30 feet (ft) below ground surface (bgs) in soil adjacent to and directly below the classified area disposal pits. At depths greater than 30 ft bgs, tritium levels decrease rapidly. At approximately 100 ft bgs, the highest tritium level detected has been 0.074 pCi/g, and at 120 to 140 ft bgs, maximum tritium levels have been 0.029 pCi/g.

On October 11, 2001, the New Mexico Environment Department (NMED) directed the U.S. Department of Energy (DOE) and Sandia Corporation (Sandia) to conduct a Corrective Measures Study (CMS) for the MWL (SNL December 2001a). The MWL CMS Report (SNL May 2003) was submitted to the NMED on May 21, 2003, for technical review and comment and recommended that an alternative vegetative soil cover (i.e., evapotranspirative [ET] cover) be deployed as the preferred corrective measure for the MWL. The NMED held a public comment period on the MWL CMS from August 11 to December 9, 2004, and a public hearing was held from December 2 to December 3 and December 8 to December 9, 2004. On May 26, 2005, the Secretary of the NMED selected a vegetative ET cover with a biointrusion barrier as the final remedy for the MWL. The selection was documented in the NMED *Final Order, State of New Mexico Before the Secretary of the Environment in the Matter of Request for a Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill* (NMED May 2005), which also required a Corrective Measures Implementation Plan (CMIP). The MWL CMIP (SNL November 2005) was submitted to the NMED in November 2005. The NMED conditionally approved the CMIP in December 2008 after resolution of two Notices of Disapproval (NODs) (Bearzi December 2008). The MWL ET cover construction was completed from May through September 2009.

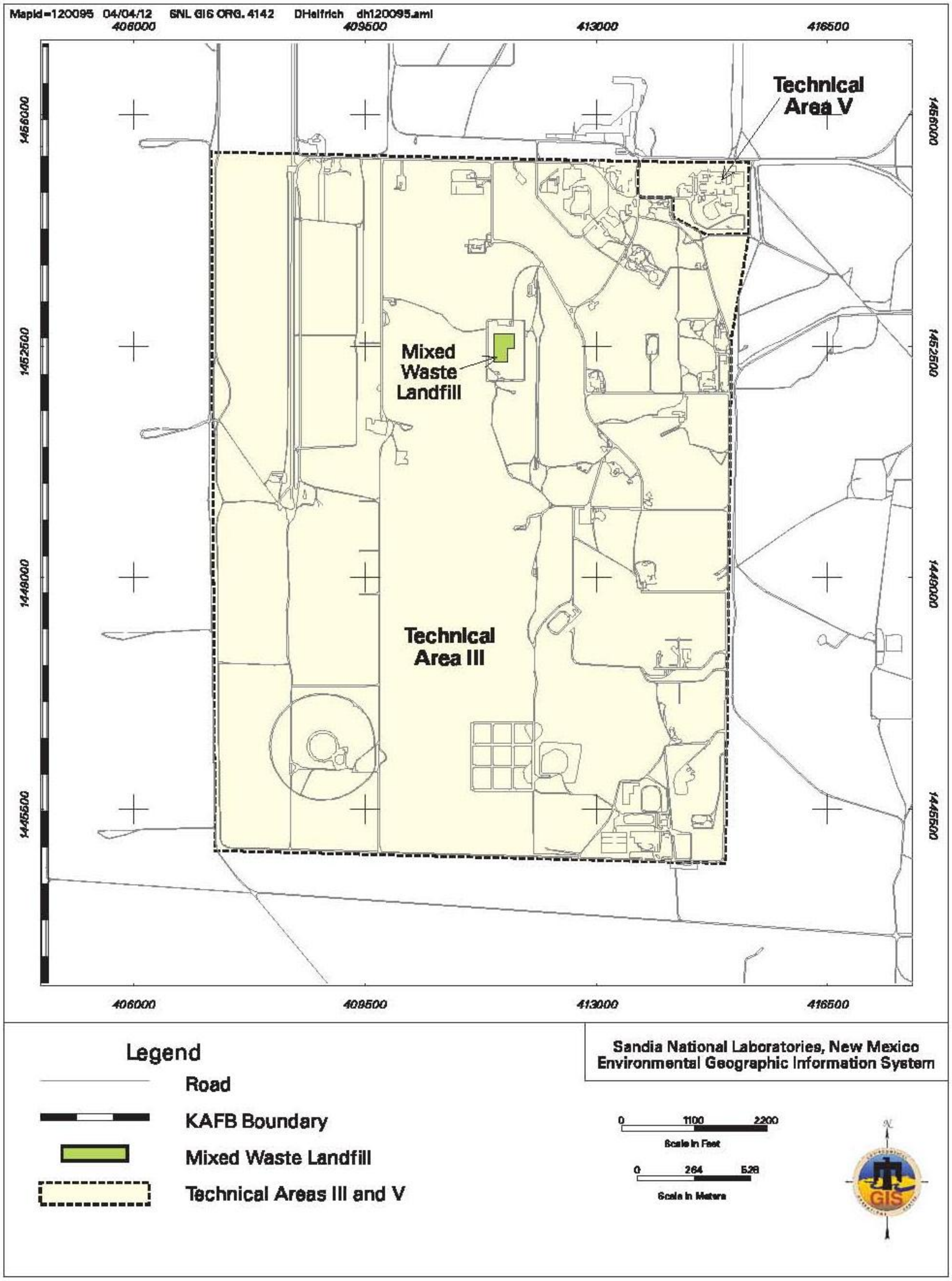

Figure 4-1. Location of the Mixed Waste Landfill within Technical Area III

4.1.1 Monitoring History

The original groundwater monitoring well network at the MWL (wells MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3) was installed in 1989. In 1993, MWL-MW4 was completed at an angle of 6 degrees from vertical and was screened at two discrete intervals 20 ft apart to evaluate vertical potentiometric gradients and changes in aquifer parameters with depth. An inflatable packer separates the screened intervals, and nitrogen-gas pressure is maintained in the packer to prevent commingling water from the two screened sections of the aquifer. Monitoring wells MWL-MW5 and MWL-MW6 were installed in 2000 at a distance of approximately 200 and 500 ft west of the MWL, respectively, with the screened intervals placed below the top of the regional water table in the coarse-grained Ancestral Rio Grande (ARG) deposits.

The MWL groundwater monitoring network was modified in 2008 (SNL May 2009). Due to the declining water table and corrosion of stainless-steel well screens, four monitoring wells were plugged and abandoned (MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3) and four new monitoring wells were installed (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) (SNL April 2008 and September 2008). The four wells installed in 2008 comprise the MWL groundwater monitoring network for the uppermost part of the regional aquifer and were approved by the NMED (Bearzi October 2008 and January 2009).

Wells MWL-MW7, MWL-MW8, MWL-MW9, and MWL-BW2 were considered new wells and, as required by the Compliance Order on Consent (the Order) (NMED April 2004), were sampled a minimum of eight consecutive quarters for a defined suite of parameters in addition to sampling for perchlorate for at least four consecutive quarters. The four consecutive quarters of perchlorate sampling were completed in Calendar Year (CY) 2009 with no detections at or above the screening level of 4 micrograms per liter (µg/L); therefore, these wells have been removed from the perchlorate monitoring network. The required eight quarterly sampling events were completed in CY 2010. Wells MWL-MW4, MWL-MW5, and MWL-MW6 are preexisting wells and are sampled on an annual basis. All seven MWL wells are now sampled annually as required by the Order.

Figure 4-2 shows the current groundwater monitoring well network consisting of seven wells completed within the interfingering, fine-grained, alluvial-fan deposits (MWL-BW2, MWL-MW4 uppermost screened interval, MWL-MW7, MWL-MW8, and MWL-MW9) and coarse-grained ARG deposits (MWL-MW5 and MWL-MW6). The lower screened interval of MWL-MW4 is completed within the coarse-grained ARG deposits, but is not part of the current monitoring network. The seven MWL wells are constructed of 5-inch diameter, Schedule 80 polyvinyl chloride (PVC) casing and have screens composed of slotted Schedule 80 PVC.

During construction of the ET cover, the packer at MWL-MW4 was removed on May 27, 2009 to allow for the well casing to be extended upwards. The packer was serviced and reinstalled on March 4, 2010. References in this report to groundwater samples and water levels from MWL-MW4 refer to groundwater withdrawn or measured from the upper screened interval, and references made to the bottom of this well refer to the depth to the top of the packer.

In April 2010 the DOE and Sandia received a letter from the NMED entitled *Toluene Detections in Groundwater*, which required further investigation to determine the source of very low toluene concentrations in some groundwater samples collected from the MWL in 2008 through early 2010, including conducting a purging/sampling study of the groundwater along with any other studies necessary to determine the source (Bearzi April 2010). The DOE and Sandia submitted the *Mixed Waste Landfill Toluene Investigation Report* in August 2010 and received an NOD with two comments from the NMED in September 2010 (Bearzi September 2010). The DOE/Sandia NOD response (Wagner October 2010)

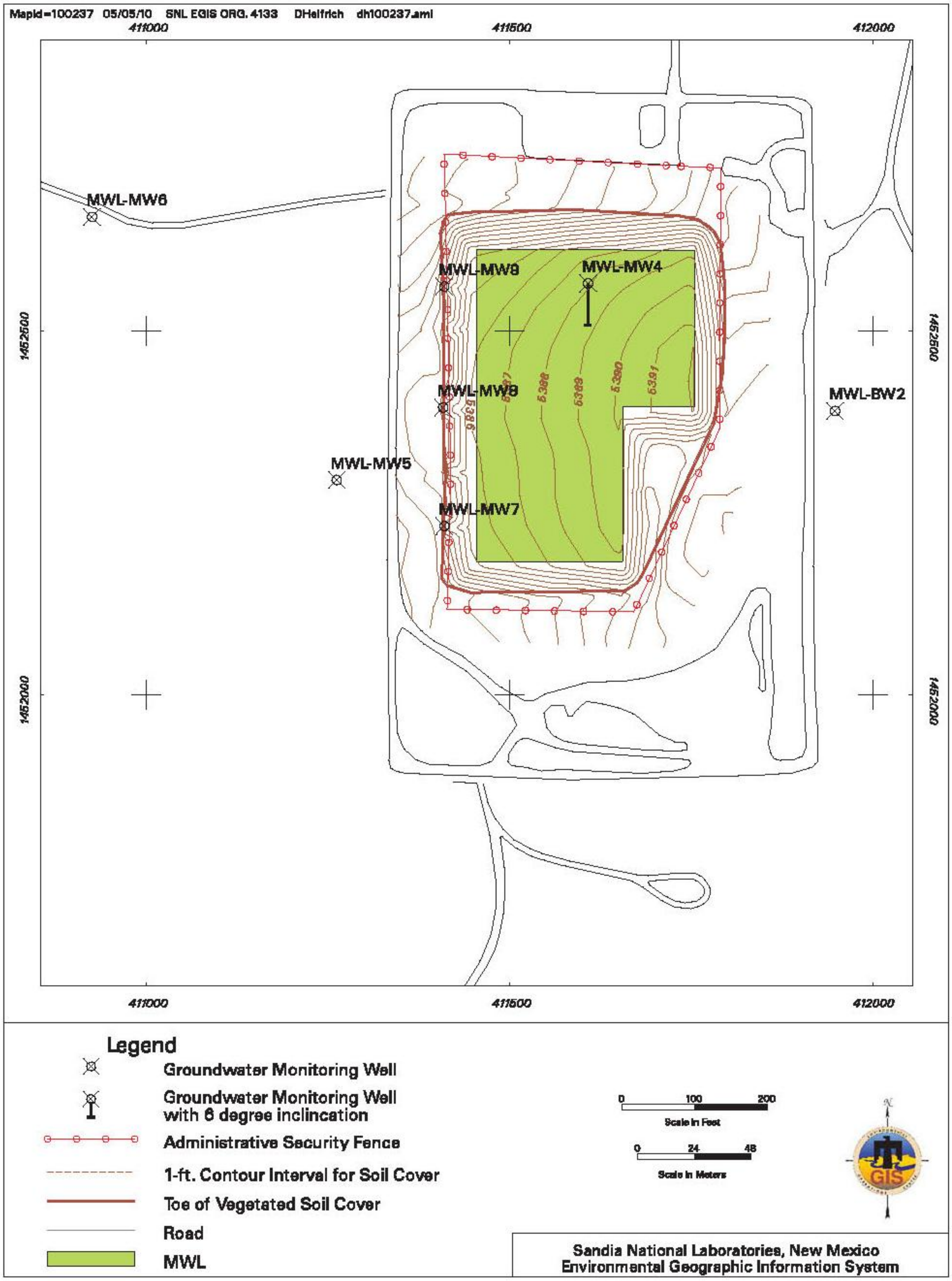

Figure 4-2. Location of Groundwater Monitoring Wells at the Mixed Waste Landfill

that included a revised version of the report (SNL October 2010) was submitted to the NMED in October 2010 and was approved in January 2011 (Bearzi January 2011).

Groundwater at the MWL has been extensively characterized since 1990 for major ion chemistry, volatile organic compounds (VOCs), semivolatile organic compounds, nitrate, metals, radionuclides, and perchlorate. Twenty years of data indicate that groundwater has not been contaminated by the MWL (Goering et al. 2002; SNL December 2001b, January 2002, July 2002, October 2002, June 2003, September 2003, July 2004; Lyon and Goering 2006; SNL November 2006, January 2008, May 2009, June 2010, October 2010, and September 2011).

4.1.2 Monitoring Network

The current groundwater monitoring network at the MWL consists of seven wells, as shown on Figure 4-2 and listed in Table 4-1. A single annual sampling event was conducted at the MWL in CY 2011.

Table 4-1. MWL Annual Groundwater Sampling Event, Calendar Year 2011

Well ID	Installation Year	WQ	WL	June 2011
MWL-BW2	2008	✓	✓	Annual
MWL-MW4*	1993	✓	✓	Annual
MWL-MW5	2000	✓	✓	Annual
MWL-MW6	2000	✓	✓	Annual
MWL-MW7	2008	✓	✓	Annual
MWL-MW8	2008	✓	✓	Annual
MWL-MW9	2008	✓	✓	Annual

NOTES:
Check marks in the WQ and WL columns indicate WQ sampling and WL measurements.
*Upper screen of MWL-MW4 is monitored and represents uppermost portion of regional aquifer.
BW = Background Well.
ID = Identification.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
WL = Water level.
WQ = Water quality.

4.1.3 Summary of Activities

Annual groundwater sampling was conducted in June 2011 at the MWL as summarized in Table 4-1. Groundwater samples were collected from the seven monitoring wells (MWL-BW2, MWL-MW4, MWL-MW5, MWL-MW6, MWL-MW7, MWL-MW8, and MWL-MW9) and analyzed for VOCs, Target Analyte List (TAL) metals plus uranium, anions (as bromide, chloride, fluoride, and sulfate), alkalinity, nitrate plus nitrite (NPN), gamma spectroscopy, gross alpha/beta activity, and tritium. Duplicate environmental samples were collected at monitoring wells MWL-MW6 and MWL-MW8. Attachment 4A provides summary tables for the CY 2011 analytical results.

4.1.4 Summary of Future Activities

The MWL Corrective Measures Implementation (CMI) Report (SNL January 2010) documents the construction of the MWL ET cover and was submitted to the NMED on January 26, 2010. The topography of the ET cover and side slopes is shown on Figure 4-2. On October 14, 2011, the DOE and Sandia received NMED approval of the MWL CMI Report (Bearzi October 2011), and revision of the 2007 MWL Long-Term Monitoring and Maintenance Plan (LTMMP) was initiated. The revised LTMMP will be submitted to the NMED within 180 days of the NMED CMI Report approval, dated October 14, 2011 (anticipated submittal in March 2012). The LTMMP defines the long-term monitoring, maintenance, inspection, and repair requirements for the MWL.

4.1.5 Conceptual Site Model

Tritium and VOCs were identified as the COCs in groundwater at the MWL based on the Phase 2 RFI, CMIP, and more than 20 years of groundwater monitoring. A detailed conceptual site model is provided in the MWL Phase 2 RFI Report (Peace et al. 2002) and the *Mixed Waste Landfill Groundwater Report, 1990 through 2001* (Goering et al. 2002).

Groundwater at the MWL is contained within the regional aquifer, which consists of unconsolidated Santa Fe Group deposits (fine-grained alluvial-fan deposits and coarse-grained ARG deposits). The depth to water is approximately 500 ft bgs. Groundwater flows generally westward away from the Manzanita Mountains and towards the Rio Grande. Several water-supply wells operated by Kirtland Air Force Base (KAFB) and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) have profoundly modified the natural groundwater flow regime near the MWL and have created a trough in the water table in the western and northern portions of KAFB (Plate 1). As a result, water levels at the MWL have been steadily declining since monitoring began in 1990.

Due to the declining water level, the original groundwater monitoring well network (MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3 installed in 1988 and 1989) was replaced, and four new wells were installed in 2008 (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9). The completion intervals of the four 2008 wells are deeper, with the well screens set across the uppermost part of the regional aquifer. The aquifer hydraulic conductivity, based on slug test results performed in the 2008 wells, range from 1.95×10^{-1} to 1.48×10^{-2} ft/day, with an average of 8.58×10^{-2} ft/day. The hydraulic conductivity for the 2008 wells is generally higher than that for the original MWL groundwater monitoring wells, indicating an increase in hydraulic conductivity with depth and proximity to the highly conductive ARG deposits.

Water levels were lower than expected in the 2008 monitoring wells relative to the water levels in the older wells. The lower groundwater elevations in MWL-MW7 through MWL-MW9 appear to be related to the following two major factors:

- Variations in hydraulic conductivity in the upper part of the regional aquifer (showing increasing hydraulic conductivities with depth)

- Ongoing large-scale pumping of groundwater by the KAFB and ABCWUA production wells, which has created a strong downward vertical gradient at the MWL.

The completion intervals of the new wells are deeper and within a higher hydraulic conductivity layer than the shallower wells that were replaced (MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3). Thus, the vertical gradient and drawdown of the regional aquifer have greater impact in the new wells, resulting in a lower groundwater elevation relative to the previous monitoring well network.

An updated conceptual site model integrating the findings from the four monitoring wells installed in 2008 is presented in the *Mixed Waste Landfill Annual Groundwater Monitoring Report, Calendar Year 2009* (SNL June 2010). In summary, the geology of the upper portion of the regional aquifer, a stratified system, varies with depth from a low hydraulic conductivity layer (in which MWL-MW2 and former MWL-MW3 were screened) to a medium conductivity layer (in which the deeper screens of MWL-MW7, MWL-MW8, and MWL-MW9 reside) to a high conductivity layer corresponding to the ARG deposits (in which at least part of the screen intervals of MWL-MW4 [lower screen], MWL-MW5, and MWL-MW6 are located). The uppermost surface of the regional aquifer continues to decline as a result of historic and ongoing large-scale pumping of groundwater by the KAFB and ABCWUA production wells. The overall effect at the MWL is that groundwater flow has a strong vertically downward component in the lower and medium conductivity layers in response to this regional drawdown from pumping (i.e., a draining system).

Figure 4-3 shows the October 2011 potentiometric surface of the regional aquifer beneath the MWL. Groundwater flows towards the west and northwest. Based on the contours, the horizontal gradient varies from approximately 0.02 to 0.08 feet/foot. The map is consistent with the conceptual site model and the base-wide potentiometric surface map presented on Plate 1. As shown on Plate 1, the potentiometric surface contours beneath Technical Area III generally trend north to south with the inferred groundwater flow direction being generally westward.

For the period from July 2008 to October 2011, groundwater levels in the four wells installed in 2008 (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) declined less than 2 ft (Figures 4B-1 and 4B-2). Monitoring wells MWL-MW7, MWL-MW8, and MWL-MW9 declined at rates ranging from 0.18 to 0.27 feet per year (ft/yr). Upgradient well MWL-BW2 showed a greater rate of decline at 0.47 ft/yr. Recharge from infiltration of direct precipitation at the MWL is negligible due to high evapotranspiration, low precipitation, the thick sequence of unsaturated Santa Fe Group deposits above the water table, and the presence of the ET cover. Groundwater recharge of the regional aquifer occurs by the infiltration of precipitation in the Manzanita Mountains located approximately 5 miles to the east.

4.2 Regulatory Criteria

Historically, the NMED Hazardous Waste Bureau has provided regulatory oversight of the MWL as Solid Waste Management Unit (SWMU) 76 under the Hazardous and Solid Waste Amendments module of the SNL/NM RCRA Permit. The NMED confirmed that the MWL is properly designated as a SWMU (Dinwiddie June 1998) and, as such, must comply with the corrective action program defined in Title 20, New Mexico Administrative Code, Section 4.1.50, incorporating Title 40, Code of Federal Regulations (CFR), Section 264.101. The requirements for corrective action at the MWL, including those for groundwater monitoring, are established through the corrective measures process.

The NMED issued the Order in April 2004, which transferred the regulatory authority for corrective action at the MWL to the Order (NMED April 2004). This report has been formatted to address the content criteria set forth in the Order for Periodic Monitoring Reports.

Although radionuclides are being monitored and screened at the MWL, the information related to radionuclides is provided voluntarily by the DOE and Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements imposed by the NMED, as specified in Section III.A of the Order (NMED April 2004).

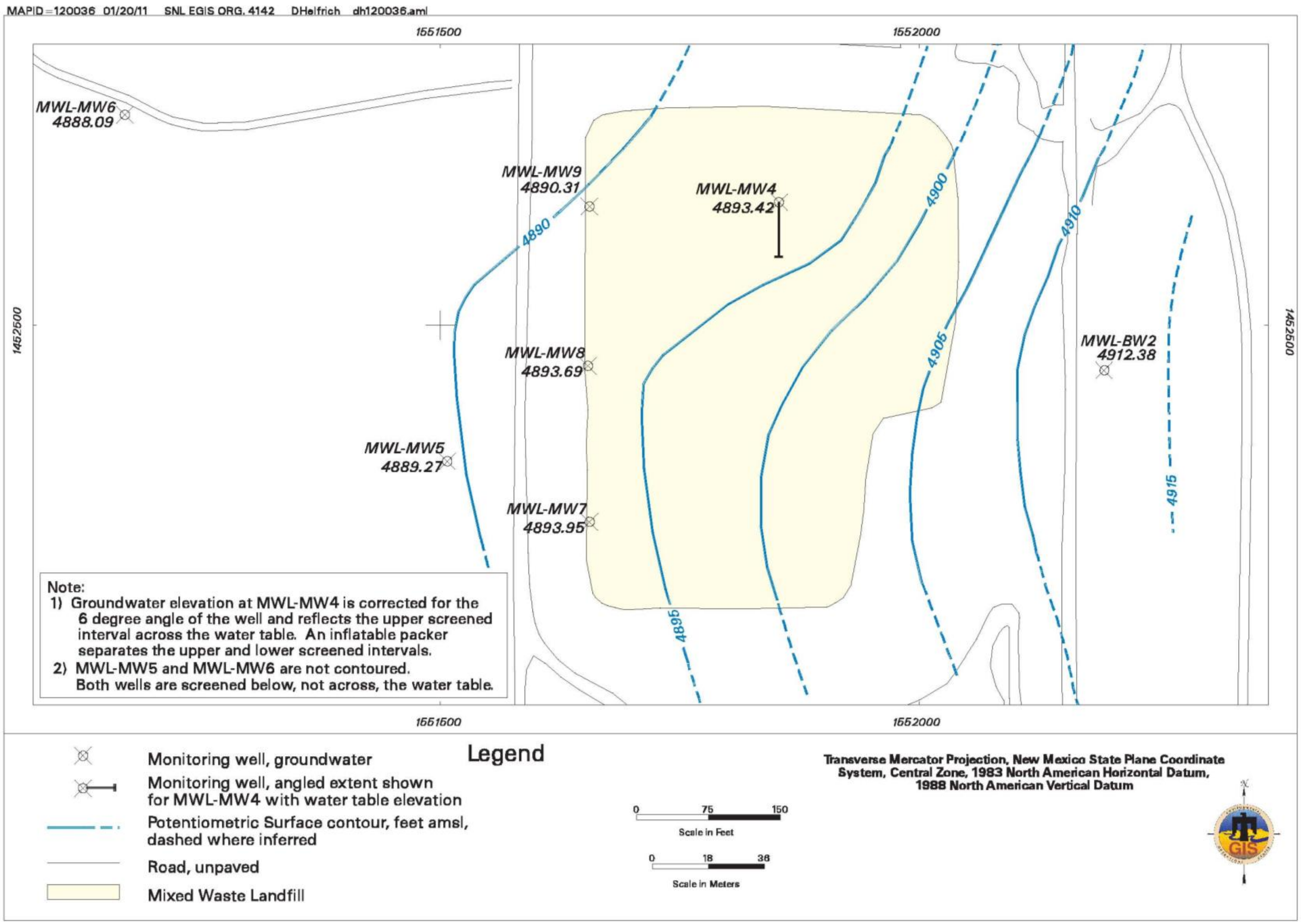

Figure 4-3. Localized Potentiometric Surface of the Basin Fill Aquifer at the Mixed Waste Landfill, October 2011

4.3 Scope of Activities

The CY 2011 annual groundwater sampling is summarized in Section 4.1.3. Table 4-2 lists the analytical parameters and MWL wells sampled. SNL/NM field personnel conducted the sampling from June 14 to June 28, 2011. Groundwater sampling activities were conducted in conformance with procedures outlined in the *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2011 Annual Sampling* (SNL January 2011).

Table 4-2. Analytical Parameters for the MWL Monitoring Wells, Calendar Year 2011

Analytical Parameter	June 2011
Volatile Organic Compounds	MWL–BW2 MWL–MW4 MWL–MW5 MWL–MW6 MWL–MW6 (dup) MWL–MW7 MWL–MW8 MWL–MW8 (dup) MWL–MW9
TAL metals plus Uranium	
Nitrate plus Nitrite (as nitrogen)	
Major Anions (Bromide, Fluoride, Chloride, and Sulfate)	
Total Alkalinity as Calcium Carbonate	
Radionuclides: Gamma-Emitting Radionuclides Gross Alpha Activity Gross Beta Activity Tritium	

NOTES:

BW = Background Well.
dup = Duplicate.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
TAL = Target Analyte List.

The MWL groundwater samples were submitted for analysis to GEL Laboratories LLC (GEL) in Charleston, South Carolina. All groundwater sampling results are compared with U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) for drinking water supplies (EPA 2001 and 2009). The analytical results are summarized in Attachment 4A, Tables 4A-1 through 4A-7.

Field and laboratory quality control (QC) samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. Field QC samples included duplicate environmental, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Laboratory QC analyses performed included method blank, laboratory control sample, matrix spike, matrix spike duplicate, and surrogate spike analyses.

Water quality parameters were measured in the field for temperature, specific conductance (SC), oxidation-reduction potential, pH, and dissolved oxygen using an YSI™ Model 6920 Water Quality Meter during the purging process. Turbidity was measured with a Hach™ Model 2100P turbidity meter.

The NMED DOE Oversight Bureau (OB) was on site during the sampling activities and collected split samples for VOCs, metals, anions, NPN, gamma spectroscopy, gross alpha/beta activity, and tritium analyses. Additional samples were collected for isotopic uranium. SNL/NM personnel did not collect comparison samples during this annual sampling event. The NMED DOE OB split sampling results are presented in a separate report and are not discussed in this annual report.

4.4 Field Methods and Measurements

Groundwater elevation and water quality field measurements were obtained during groundwater sampling activities. Field water quality parameters are presented in Table 4A-8 (Attachment 4A). Depth-to-groundwater measurements were obtained using a Solinst™ depth-to-water meter prior to purging activities. Depth-to-groundwater measurements were performed in accordance with the Field Operating Procedure (FOP), *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements*, FOP 05-01 (SNL November 2009a).

Groundwater elevation measurements at the MWL monitoring wells from CY 2007 through CY 2011 are presented in Attachment 4B, Figures 4B-1 and 4B-2.

A Bennett™ sampling system was used to collect the groundwater samples from all MWL monitoring wells. The pump intake was set near or at the bottom of the screened interval. In accordance with procedures described in SNL/NM FOP 05-01 (SNL November 2009a), purging is conducted to remove stagnant water from the well so that a representative groundwater sample can be obtained. In accordance with the MWL Mini-Sampling and Analysis Plan (SAP) (SNL January 2011), the minimum purge requirement for the portable piston pump is one saturated screen volume (the volume of one length of the saturated screen plus the borehole annulus around the saturated screen interval). Purging continues until four stable water quality measurements for turbidity, pH, temperature, and SC were obtained from the well prior to the collection of groundwater samples. Groundwater stability is considered acceptable when measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, pH is within 0.1 standard units, temperature is within 1.0 degree Celsius, and SC is within 5 percent.

The purging requirement was achieved for four of the monitoring wells (MWL-BW2, MWL-MW5, MWL-MW6, and MWL-MW7) in June 2011. The minimum purge requirements were not met at three monitoring wells (MWL-MW4, MWL-MW8, and MWL-MW9). These three monitoring wells were purged to dryness, allowed to recover, and then sampled to collect the most representative groundwater sample possible given the low yield of these wells.

Groundwater samples were submitted to the off-site laboratory (GEL) following analysis request/chain of custody protocol.

4.5 Analytical Methods

The analytical laboratory analyzed the groundwater samples using EPA-approved analytical methods (EPA 1979, 1980, and 1986) and specified performance criteria in accordance with the *SNL/NM Statement of Work for Analytical Laboratories, Revision 5* (SNL March 2011). Prior to each sampling event, the analytical laboratory provided appropriate sample containers prepared with the required sample preservative. Table 4-3 summarizes analytical parameters, EPA Methods (EPA 1986), container types, and holding times applicable to groundwater sampling at the MWL during CY 2011.

4.6 Summary of Analytical Results

The analytical results for chemical, general chemistry, and radiological constituents are presented in Attachment 4A, Tables 4A-1 through 4A-7. Field water quality measurements are presented in Attachment 4A, Table 4A-8. Data qualifiers based on the data validation process are presented with the associated results in the Attachment 4A tables. Data validation and QC sample results associated with each sampling event are discussed in Section 4.7.

All the CY 2011 analytical results were compared with established EPA MCLs where applicable. None of the detected constituents exceed the respective MCLs. The analytical results are discussed in greater detail in the following sections.

Table 4-3. MWL Groundwater Sample Analyses, Methods, Sample Containers, Preservatives, and Holding Times

Analysis	Method[a]	Container Type/ Volume/Preservative	Holding Time
Total Metals (TAL and Uranium)	SW846-6010/6020/7470A	Polyethylene; 500 mL; HNO_3; 4°C	180 days and 28 days for mercury
Volatile Organic Compounds	SW846-8260B	Glass; 3 x 40 mL; HCl; 4°C	14 days
Nitrate plus Nitrite (as nitrogen)	EPA 353.2	Polyethylene; 250 mL; H_2SO_4; 4°C	28 days
Major Anions Total Alkalinity	EPA 353.2 SM2320B	Polyethylene; 500 mL; None; 4°C	28 days for anions 14 days for alkalinity
Gamma-Emitting Radionuclides	EPA 901.1	Polyethylene; 1 L; HNO_3	180 days
Gross Alpha/Beta Activity	EPA 900.0	Polyethylene; 1 L; HNO_3	180 days
Tritium	EPA 906.0	Amber Glass; 250 mL; None	180 days

NOTES:

[a]EPA, 1979, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

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°C = Degree(s) Celsius.
EPA = U.S. Environmental Protection Agency.
H_2SO_4 = Sulfuric acid.
HCl = Hydrochloric acid.
HNO_3 = Nitric acid.
L = Liter(s).
mL = Milliliter(s).
MWL = Mixed Waste Landfill.
SM = Standard Method.
SW = Solid waste.
TAL = Target Analyte List.

4.6.1 Volatile Organic Compounds

Detected VOCs are presented in Attachment 4A, Table 4A-1. No VOCs were detected at concentrations above established MCLs in any groundwater sample. Chloroform was detected in the sample from MWL-MW4 at a concentration of 1.29 µg/L; no MCL is established for this compound. Toluene was qualified as not detected during data validation in both the MWL-MW8 environmental and duplicate environmental samples because the detected concentration is less than 10 times the associated FB sample result. Laboratory method detection limits (MDLs) for all VOCs are presented in Attachment 4A, Table 4A-2.

4.6.2 General Chemistry Parameters

The general chemistry analytical results are presented in Attachment 4A, Tables 4A-3 and 4A-4. NPN was not detected above the nitrate MCL of 10 milligrams per liter (mg/L) in any groundwater sample. NPN was detected at concentrations ranging from 1.04 mg/L in the sample from MWL-MW5 to 3.17 mg/L in the sample from MWL-MW7. The NPN results are summarized in Table 4A-3. Table 4A-4 summarizes the alkalinity and major anions (bromide, chloride, fluoride, and sulfate) results. No parameters were detected above established MCLs.

4.6.3 Metals

Metal analysis includes two sets of analyses and results, filtered and unfiltered. Groundwater samples obtained for total metal analyses are collected without filtering. Dissolved metal samples are collected by filtering the sample prior to analysis (SNL November 2009a). The difference in concentrations between the total and dissolved fraction may be attributed to the original metallic ion content of the particles and any sorption of ions to the suspended particles.

Table 4A-5 (Attachment 4A) summarizes the metal results, including total uranium, for all unfiltered groundwater samples collected during the CY 2011 annual monitoring event at the MWL. Samples were analyzed for TAL metals according to EPA Method 6020 (EPA 1986). Table 4A-6 (Attachment 4A) summarizes the metal results, including total uranium, for the filtered samples collected during the CY 2011 annual groundwater monitoring event.

TAL metals plus uranium were analyzed for each MWL monitoring well sample, in both unfiltered and filtered fractions. No metal parameters were detected above established MCLs in any groundwater sample.

4.6.4 Radiological Parameters

Groundwater samples from the MWL monitoring wells were screened for gamma-emitting radionuclides, gross alpha/beta activity, and tritium (Table 4A-7, Attachment 4A) and are compared with the established EPA MCLs (no MCL has been established for tritium).

Gross alpha activity is measured as a screening tool and according to 40 CFR, Parts 9, 141, and 142, Table I-4 and does not include uranium, which is measured independently. Therefore, gross alpha activity measurements were corrected by subtracting the total uranium activity. Corrected gross alpha activity results are all below the MCL of 15 picocuries per liter (pCi/L) and range from 0.32 to 7.24 pCi/L. Gross beta results do not exceed established MCLs. Tritium activity results are below the laboratory minimum detectable activity levels in all groundwater samples. All radiological parameter results are summarized in Table 4A-7 (Attachment 4A).

4.6.5 Water Quality Parameters

The field water quality parameters represent measurements obtained immediately before sampling. The CY 2011 results for MWL wells are presented in Attachment 4A, Table 4A-8.

4.7 Quality Control Results

Field and laboratory QC samples were used to determine the accuracy of the methods used and to monitor for inadvertent sample contamination that can occur during the sampling and analysis process. All data were reviewed in accordance with AOP [Administrative Operating Procedure] 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011). The results for each QC analysis and the impact on data quality are discussed in the following sections.

4.7.1 Field Quality Control Samples

The QC samples collected in the field included duplicate environmental, EB, FB, and TB samples. Duplicate environmental samples are collected immediately after the environmental sample to provide information about sampling variability. EB samples are collected to verify the effectiveness of the sampling equipment decontamination process. FB samples provide a check for potential ambient sources of sample contamination during the sampling process and/or sampling error. TB samples are submitted whenever samples are collected for VOC analysis to assess whether contamination of the samples occurred during shipment and storage. The field QC samples were submitted to GEL for analysis along with the groundwater samples in accordance with the MWL Mini-SAP (SNL January 2011). The following sections discuss the analytical results for each QC sample type.

4.7.1.1 Duplicate Environmental Samples

Duplicate environmental samples were collected from MWL-MW6 and MWL-MW8 to estimate the overall reproducibility of the sampling and analytical process. The duplicate samples were collected immediately after the environmental samples to reduce variability caused by time and/or sampling mechanics. The duplicate environmental samples were analyzed for all analytical parameters.

Relative percent difference (RPD) calculations between duplicate and environmental sample results were performed for the detected chemical analytes. CY 2011 duplicate environmental sample results show good correlation with RPD values less than 20 for organic compounds and less than 35 for metals for all calculated parameters, except vanadium in the samples from MWL-MW8. The RPD values for unfiltered and filtered vanadium results were calculated at 38 and 52, respectively. The RPD values for vanadium are considered estimated values, as the reported concentrations are below the associated practical quantitation limits.

4.7.1.2 Equipment Blank Samples

A total of two EB samples (also referred to as a rinsate blanks) were collected during the CY 2011 sampling event at the MWL to verify the effectiveness of the equipment decontamination process. A portable Bennett™ groundwater sampling system was used to collect groundwater samples in all wells. The sampling pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in SNL/NM FOP 05-03, *Long-Term Environmental Stewardship General Sampling Equipment Decontamination* (SNL November 2009b). In accordance with SNL/NM FOP 05-03, the following solutions were pumped through the sampling system: 5 gallons of deionized (DI) water mixed with 20 milliliters (mL) of nonphosphate laboratory detergent; 5 gallons of DI water; 5 gallons of DI water mixed with 20 mL of reagent-grade nitric acid; and 15 gallons of DI water. In addition, the outside of the pump tubing was rinsed with DI water. Two EB samples were collected prior to sampling monitoring wells MWL-MW6 and MWL-MW8 and submitted for all analyses.

Arsenic, bromodichloromethane, chloroform, chloride, copper, dibromochloromethane, magnesium, and sodium were detected in the EB samples. No corrective action was required for arsenic, bromodichloromethane, chloroform, or dibromochloromethane because these analytes were not detected in the associated environmental samples. No corrective action was required for chloride, magnesium, or sodium because these parameters were detected in environmental samples at concentrations greater than five times the blank result. All environmental sample results for copper were qualified as not detected during data validation because the associated environmental sample results are less than five times the EB result.

4.7.1.3 Field Blank Samples

FB samples were collected at the various sampling locations, stored with the associated environmental samples throughout the sampling process, and returned to the laboratory for VOC analyses with the associated environmental samples to assess whether contamination of the samples resulted from ambient field conditions. The FB samples are prepared by pouring DI water into sample containers at the sampling point (i.e., in the sampling truck at the well location) to simulate the transfer of environmental samples from the sampling system to the sample container.

A total of seven FB samples were collected during the June 2011 sampling event and submitted for VOC analysis to assess whether contamination of the samples resulted from ambient field conditions. Bromodichloromethane, carbon disulfide, chloroform, dibromochloromethane, and toluene were detected in the FB samples. No corrective action was required for bromodichloromethane, carbon disulfide, chloroform, or dibromochloromethane because these compounds were not detected in the associated environmental samples. Toluene was detected in the FB sample from MWL-MW8 at a concentration greater than the result for the associated environmental sample. As a result, toluene in the MWL-MW8 environmental sample was qualified as not detected during data validation.

4.7.1.4 Trip Blank Samples

TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-mL volatile organic analysis vials prepared by the analytical laboratory. These samples accompany the empty sample containers supplied by the laboratory and are brought to the field and accompany each VOC sample shipment. Nine TB samples were submitted with the June 2011 samples. No VOCs were detected above associated laboratory MDLs.

4.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate laboratory control samples, were analyzed concurrently with the groundwater samples. Additionally, batch matrix spike, matrix spike duplicate, and surrogate spike samples were analyzed. All environmental sample, field QC sample, and laboratory QC sample results were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011).

Although some analytical results were qualified as not detected or as estimated values during the data validation process, no significant data quality problems were noted for any CY 2011 MWL groundwater monitoring samples. Data validation reports and findings associated with MWL groundwater monitoring are filed in the SNL/NM Records Center.

4.8 Variances and Nonconformances

All analytical and field methods were performed according to the requirements specified in the MWL groundwater monitoring Mini-SAP for FY 2011 (SNL January 2011). No variances and/or nonconformances from requirements in the MWL Mini-SAP were identified during June 2011 sampling activities, and there were no variances from the plans.

4.9 Summary and Conclusions

During June 2011, environmental groundwater samples were collected from seven MWL groundwater monitoring wells. Sample parameters included VOCs, unfiltered and filtered fractions for TAL metals plus uranium, anions (as bromide, chloride, fluoride, and sulfate), alkalinity, NPN, gamma spectroscopy, gross alpha/beta activity, and tritium analyses. Groundwater monitoring results were compared with established EPA MCLs for drinking water (EPA 2009). No parameters were detected above established MCLs in any groundwater sample.

The groundwater monitoring results for the CY 2011 sampling event are consistent with data from previous sampling events, remain within the range of historical MWL groundwater data, and indicate that the MWL has not impacted groundwater beneath the site. Based on the field and laboratory QC sample and data validation results, the CY 2011 groundwater monitoring data are defensible and representative.

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Attachment 4A
Mixed Waste Landfill
Analytical Results Tables

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Attachment 4A Tables

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Table 4A-1
Summary of Detected Volatile Organic Compounds,
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW4 22-Jun-11	Chloroform	1.29	0.250	1.00	NE			090750-001	SW846-8260B
MWL-MW8 20-Jun-11	Toluene	0.300	0.250	1.00	1000	J	1.0U	090746-001	SW846-8260B
MWL-MW8 (Duplicate) 20-Jun-11	Toluene	0.320	0.250	1.00	1000	J	1.0U	090747-001	SW846-8260B

Refer to footnotes on page 4A-33.

Table 4A-2
Method Detection Limits for Volatile Organic Compounds (Method[g] SW846-8260B), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.325
1,1,2,2-Tetrachloroethane	0.250
1,1,2-Trichloroethane	0.250
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.250
1,2-Dichloropropane	0.250
2-Butanone	1.25
2-Hexanone	1.25
4-methyl-, 2-Pentanone	1.25
Acetone	3.50
Benzene	0.300
Bromodichloromethane	0.250
Bromoform	0.250
Bromomethane	0.300
Carbon disulfide	1.25
Carbon tetrachloride	0.300
Chlorobenzene	0.250
Chloroethane	0.300
Chloroform	0.250
Chloromethane	0.300
Dibromochloromethane	0.300
Ethyl benzene	0.250
Methylene chloride	3.00
Styrene	0.250
Tetrachloroethene	0.300
Toluene	0.250
Trichloroethene	0.250
Vinyl acetate	1.50
Vinyl chloride	0.500
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.250
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.250

Refer to footnotes on page 4A-33.

Table 4A-3
Summary of Nitrate plus Nitrite Results,
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2 16-Jun-11	Nitrate plus nitrite as N	1.96	0.100	0.500	10.0			090741-018	EPA 353.2
MWL-MW4 22-Jun-11	Nitrate plus nitrite as N	1.92	0.100	0.500	10.0			090750-018	EPA 353.2
MWL-MW5 14-Jun-11	Nitrate plus nitrite as N	1.04	0.100	0.500	10.0			090732-018	EPA 353.2
MWL-MW6 15-Jun-11	Nitrate plus nitrite as N	1.49	0.100	0.500	10.0			090737-018	EPA 353.2
MWL-MW6 (Duplicate) 15-Jun-11	Nitrate plus nitrite as N	1.49	0.100	0.500	10.0			090738-018	EPA 353.2
MWL-MW7 28-Jun-11	Nitrate plus nitrite as N	3.17	0.100	0.500	10.0			090753-018	EPA 353.2
MWL-MW8 20-Jun-11	Nitrate plus nitrite as N	1.13	0.100	0.500	10.0			090746-018	EPA 353.2
MWL-MW8 (Duplicate) 20-Jun-11	Nitrate plus nitrite as N	1.16	0.100	0.500	10.0			090747-018	EPA 353.2
MWL-MW9 27-Jun-11	Nitrate plus nitrite as N	1.93	0.100	0.500	10.0			090729-018	EPA 353.2

Refer to footnotes on page 4A-33.

Table 4A-4
Summary of Alkalinity and Anion Results,
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2 16-Jun-11	Bicarbonate alkalinity	253	0.725	1.00	NE	B		090741-022	SM 2320B
	Carbonate alkalinity	ND	0.725	1.00	NE	U		090741-022	SM 2320B
	Bromide	0.397	0.066	0.200	NE			090741-016	SW846 9056
	Chloride	70.6	0.330	1.00	NE			090741-016	SW846 9056
	Fluoride	0.678	0.033	0.100	4.0			090741-016	SW846 9056
	Sulfate	49.0	0.500	2.00	NE			090741-016	SW846 9056
MWL-MW4 22-Jun-11	Bicarbonate alkalinity	216	0.725	1.00	NE	B		090750-022	SM 2320B
	Carbonate alkalinity	ND	0.725	1.00	NE	U		090750-022	SM 2320B
	Bromide	0.367	0.066	0.200	NE			090750-016	SW846 9056
	Chloride	54.2	0.330	1.00	NE			090750-016	SW846 9056
	Fluoride	0.987	0.033	0.100	4.0			090750-016	SW846 9056
	Sulfate	37.0	0.500	2.00	NE			090750-016	SW846 9056
MWL-MW5 14-Jun-11	Bicarbonate alkalinity	327	0.725	1.00	NE	B		090732-022	SM 2320B
	Carbonate alkalinity	ND	0.725	1.00	NE	U		090732-022	SM 2320B
	Bromide	0.511	0.066	0.200	NE			090732-016	SW846 9056
	Chloride	82.8	0.660	2.00	NE			090732-016	SW846 9056
	Fluoride	0.736	0.033	0.100	4.0			090732-016	SW846 9056
	Sulfate	55.2	1.00	4.00	NE			090732-016	SW846 9056
MWL-MW6 15-Jun-11	Bicarbonate alkalinity	314	0.725	1.00	NE	B		090737-022	SM 2320B
	Carbonate alkalinity	ND	0.725	1.00	NE	U		090737-022	SM 2320B
	Bromide	0.474	0.066	0.200	NE			090737-016	SW846 9056
	Chloride	82.7	0.660	2.00	NE			090737-016	SW846 9056
	Fluoride	0.702	0.033	0.100	4.0			090737-016	SW846 9056
	Sulfate	55.2	1.00	4.00	NE			090737-016	SW846 9056
MWL-MW6 (Duplicate) 15-Jun-11	Bicarbonate alkalinity	322	0.725	1.00	NE	B		090738-022	SM 2320B
	Carbonate alkalinity	ND	0.725	1.00	NE	U		090738-022	SM 2320B
	Bromide	0.457	0.066	0.200	NE			090738-016	SW846 9056
	Chloride	82.6	0.660	2.00	NE			090738-016	SW846 9056
	Fluoride	0.685	0.033	0.100	4.0			090738-016	SW846 9056
	Sulfate	55.7	1.00	4.00	NE			090738-016	SW846 9056

Refer to footnotes on page 4A-33.

Table 4A-4 *(Concluded)*
Summary of Alkalinity and Anion Results,
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW7	Bicarbonate alkalinity	215	0.725	1.00	NE	B		090753-022	SM 2320B
28-Jun-11	Carbonate alkalinity	ND	0.725	1.00	NE	U		090753-022	SM 2320B
	Bromide	0.296	0.066	0.200	NE			090753-016	SW846 9056
	Chloride	40.4	0.660	2.00	NE			090753-016	SW846 9056
	Fluoride	1.10	0.033	0.100	4.0			090753-016	SW846 9056
	Sulfate	38.3	0.100	0.400	NE			090753-016	SW846 9056
MWL-MW8	Bicarbonate alkalinity	225	0.725	1.00	NE	B		090746-022	SM 2320B
20-Jun-11	Carbonate alkalinity	ND	0.725	1.00	NE	U		090746-022	SM 2320B
	Bromide	0.318	0.066	0.200	NE			090746-016	SW846 9056
	Chloride	48.6	0.330	1.00	NE			090746-016	SW846 9056
	Fluoride	1.09	0.033	0.100	4.0			090746-016	SW846 9056
	Sulfate	36.2	0.100	0.400	NE			090746-016	SW846 9056
MWL-MW8 (Duplicate)	Bicarbonate alkalinity	225	0.725	1.00	NE	B		090747-022	SM 2320B
20-Jun-11	Carbonate alkalinity	ND	0.725	1.00	NE	U		090747-022	SM 2320B
	Bromide	0.296	0.066	0.200	NE			090747-016	SW846 9056
	Chloride	47.7	0.330	1.00	NE			090747-016	SW846 9056
	Fluoride	1.07	0.033	0.100	4.0			090747-016	SW846 9056
	Sulfate	36.2	0.100	0.400	NE			090747-016	SW846 9056
MWL-MW9	Bicarbonate alkalinity	229	0.725	1.00	NE	B		090729-022	SM 2320B
27-Jun-11	Carbonate alkalinity	ND	0.725	1.00	NE	U		090729-022	SM 2320B
	Bromide	0.295	0.066	0.200	NE			090729-016	SW846 9056
	Chloride	38.5	0.660	2.00	NE			090729-016	SW846 9056
	Fluoride	1.07	0.033	0.100	4.0			090729-016	SW846 9056
	Sulfate	39.5	0.100	0.400	NE			090729-016	SW846 9056

Refer to footnotes on page 4A-33.

Table 4A-5
Summary of Total Metal Results (Unfiltered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2	Aluminum	ND	0.015	0.050	NE	U		090741-009	SW846 6020
16-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090741-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090741-009	SW846 6020
	Barium	0.0984	0.0006	0.002	2.00			090741-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090741-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090741-009	SW846 6020
	Calcium	76.0	0.600	2.00	NE			090741-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090741-009	SW846 6020
	Cobalt	0.000188	0.0001	0.001	NE	J		090741-009	SW846 6020
	Copper	0.00072	0.00035	0.001	NE	J		090741-009	SW846 6020
	Iron	0.285	0.033	0.100	NE			090741-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090741-009	SW846 6020
	Magnesium	21.9	0.010	0.030	NE			090741-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090741-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090741-009	SW846 7470
	Nickel	0.00226	0.0005	0.002	NE			090741-009	SW846 6020
	Potassium	3.71	0.080	0.300	NE			090741-009	SW846 6020
	Selenium	0.00241	0.0015	0.005	0.050	J		090741-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090741-009	SW846 6020
	Sodium	63.6	0.800	2.50	NE			090741-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090741-009	SW846 6020
	Uranium	0.00725	0.000067	0.0002	0.030			090741-009	SW846 6020
	Vanadium	0.00623	0.001	0.005	NE			090741-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090741-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Continued)*
Summary of Total Metal Results (Unfiltered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW4	Aluminum	ND	0.015	0.050	NE	U		090750-009	SW846 6020
22-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090750-009	SW846 6020
	Arsenic	0.00308	0.0017	0.005	0.010	J		090750-009	SW846 6020
	Barium	0.0911	0.0006	0.002	2.00			090750-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090750-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090750-009	SW846 6020
	Calcium	61.7	0.300	1.00	NE			090750-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090750-009	SW846 6020
	Cobalt	0.00023	0.0001	0.001	NE	J		090750-009	SW846 6020
	Copper	0.00326	0.00035	0.001	NE			090750-009	SW846 6020
	Iron	0.261	0.033	0.100	NE			090750-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090750-009	SW846 6020
	Magnesium	19.8	0.010	0.030	NE			090750-009	SW846 6020
	Manganese	0.007	0.001	0.005	NE			090750-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090750-009	SW846 7470
	Nickel	0.130	0.0005	0.002	NE			090750-009	SW846 6020
	Potassium	5.16	0.080	0.300	NE			090750-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090750-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090750-009	SW846 6020
	Sodium	49.8	0.080	0.250	NE			090750-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090750-009	SW846 6020
	Uranium	0.00575	0.000067	0.0002	0.030			090750-009	SW846 6020
	Vanadium	0.00892	0.001	0.005	NE			090750-009	SW846 6010
	Zinc	0.0649	0.0035	0.010	NE			090750-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Continued)*
Summary of Total Metal Results (Unfiltered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW5	Aluminum	ND	0.015	0.050	NE	U		090732-009	SW846 6020
14-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090732-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090732-009	SW846 6020
	Barium	0.121	0.0006	0.002	2.00			090732-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090732-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090732-009	SW846 6020
	Calcium	98.0	0.600	2.00	NE			090732-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090732-009	SW846 6020
	Cobalt	0.00027	0.0001	0.001	NE	J		090732-009	SW846 6020
	Copper	0.000898	0.00035	0.001	NE	J		090732-009	SW846 6020
	Iron	0.371	0.033	0.100	NE			090732-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090732-009	SW846 6020
	Magnesium	30.2	0.010	0.030	NE			090732-009	SW846 6020
	Manganese	0.0214	0.001	0.005	NE			090732-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090732-009	SW846 7470
	Nickel	0.00317	0.0005	0.002	NE			090732-009	SW846 6020
	Potassium	5.74	0.080	0.300	NE			090732-009	SW846 6020
	Selenium	0.00154	0.0015	0.005	0.050	J		090732-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090732-009	SW846 6020
	Sodium	71.8	0.800	2.50	NE			090732-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090732-009	SW846 6020
	Uranium	0.00924	0.000067	0.0002	0.030			090732-009	SW846 6020
	Vanadium	0.00422	0.001	0.005	NE	J		090732-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090732-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Continued)*
Summary of Total Metal Results (Unfiltered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW6	Aluminum	ND	0.015	0.050	NE	U		090737-009	SW846 6020
15-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090737-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090737-009	SW846 6020
	Barium	0.115	0.0006	0.002	2.00			090737-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090737-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090737-009	SW846 6020
	Calcium	96.4	0.600	2.00	NE			090737-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090737-009	SW846 6020
	Cobalt	0.000237	0.0001	0.001	NE	J		090737-009	SW846 6020
	Copper	0.000949	0.00035	0.001	NE	J	0.0022U	090737-009	SW846 6020
	Iron	0.331	0.033	0.100	NE			090737-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090737-009	SW846 6020
	Magnesium	27.7	0.010	0.030	NE			090737-009	SW846 6020
	Manganese	0.00108	0.001	0.005	NE	J		090737-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090737-009	SW846 7470
	Nickel	0.00266	0.0005	0.002	NE			090737-009	SW846 6020
	Potassium	5.61	0.080	0.300	NE			090737-009	SW846 6020
	Selenium	0.0022	0.0015	0.005	0.050	J		090737-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090737-009	SW846 6020
	Sodium	65.9	0.800	2.50	NE			090737-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090737-009	SW846 6020
	Uranium	0.00979	0.000067	0.0002	0.030			090737-009	SW846 6020
	Vanadium	0.00615	0.001	0.005	NE			090737-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090737-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Continued)*
Summary of Total Metal Results (Unfiltered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW6 (Duplicate)	Aluminum	ND	0.015	0.050	NE	U		090738-009	SW846 6020
15-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090738-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090738-009	SW846 6020
	Barium	0.115	0.0006	0.002	2.00			090738-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090738-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090738-009	SW846 6020
	Calcium	95.5	0.600	2.00	NE			090738-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090738-009	SW846 6020
	Cobalt	0.000223	0.0001	0.001	NE	J		090738-009	SW846 6020
	Copper	0.000936	0.00035	0.001	NE	J	0.0022U	090738-009	SW846 6020
	Iron	0.329	0.033	0.100	NE			090738-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090738-009	SW846 6020
	Magnesium	27.9	0.010	0.030	NE			090738-009	SW846 6020
	Manganese	0.00106	0.001	0.005	NE	J		090738-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090738-009	SW846 7470
	Nickel	0.00267	0.0005	0.002	NE			090738-009	SW846 6020
	Potassium	5.35	0.080	0.300	NE			090738-009	SW846 6020
	Selenium	0.0022	0.0015	0.005	0.050	J		090738-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090738-009	SW846 6020
	Sodium	71.5	0.800	2.50	NE			090738-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090738-009	SW846 6020
	Uranium	0.0097	0.000067	0.0002	0.030			090738-009	SW846 6020
	Vanadium	0.00648	0.001	0.005	NE			090738-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090738-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Continued)*
Summary of Total Metal Results (Unfiltered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW7	Aluminum	ND	0.015	0.050	NE	U		090753-009	SW846 6020
28-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090753-009	SW846 6020
	Arsenic	0.00231	0.0017	0.005	0.010	J		090753-009	SW846 6020
	Barium	0.100	0.0006	0.002	2.00			090753-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090753-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090753-009	SW846 6020
	Calcium	59.0	0.300	1.00	NE			090753-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090753-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090753-009	SW846 6020
	Copper	0.000447	0.00035	0.001	NE	J		090753-009	SW846 6020
	Iron	0.146	0.033	0.100	NE			090753-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090753-009	SW846 6020
	Magnesium	19.8	0.010	0.030	NE			090753-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090753-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090753-009	SW846 7470
	Nickel	0.00174	0.0005	0.002	NE	B, J	0.0028U	090753-009	SW846 6020
	Potassium	5.17	0.080	0.300	NE			090753-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090753-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090753-009	SW846 6020
	Sodium	48.5	0.080	0.250	NE			090753-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090753-009	SW846 6020
	Uranium	0.00816	0.000067	0.0002	0.030			090753-009	SW846 6020
	Vanadium	0.00644	0.001	0.005	NE			090753-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090753-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Continued)*
Summary of Total Metal Results (Unfiltered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW8	Aluminum	ND	0.015	0.050	NE	U		090746-009	SW846 6020
20-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090746-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090746-009	SW846 6020
	Barium	0.122	0.0006	0.002	2.00			090746-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090746-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090746-009	SW846 6020
	Calcium	57.8	0.300	1.00	NE			090746-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090746-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090746-009	SW846 6020
	Copper	0.000687	0.00035	0.001	NE	J	0.0019U	090746-009	SW846 6020
	Iron	0.163	0.033	0.100	NE			090746-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090746-009	SW846 6020
	Magnesium	18.6	0.010	0.030	NE			090746-009	SW846 6020
	Manganese	0.00284	0.001	0.005	NE	J		090746-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090746-009	SW846 7470
	Nickel	0.00177	0.0005	0.002	NE	J		090746-009	SW846 6020
	Potassium	4.40	0.080	0.300	NE			090746-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090746-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090746-009	SW846 6020
	Sodium	49.0	0.080	0.250	NE			090746-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090746-009	SW846 6020
	Uranium	0.00712	0.000067	0.0002	0.030			090746-009	SW846 6020
	Vanadium	0.00165	0.001	0.005	NE	J		090746-009	SW846 6010
	Zinc	0.00391	0.0035	0.010	NE	J		090746-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Continued)*
Summary of Total Metal Results (Unfiltered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW8 (Duplicate) 20-Jun-11	Aluminum	ND	0.015	0.050	NE	U		090747-009	SW846 6020
	Antimony	ND	0.001	0.003	0.006	U		090747-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090747-009	SW846 6020
	Barium	0.126	0.0006	0.002	2.00			090747-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090747-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090747-009	SW846 6020
	Calcium	59.3	0.300	1.00	NE			090747-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090747-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090747-009	SW846 6020
	Copper	0.000585	0.00035	0.001	NE	J	0.0019U	090747-009	SW846 6020
	Iron	0.175	0.033	0.100	NE			090747-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090747-009	SW846 6020
	Magnesium	18.9	0.010	0.030	NE			090747-009	SW846 6020
	Manganese	0.00287	0.001	0.005	NE	J		090747-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090747-009	SW846 7470
	Nickel	0.00173	0.0005	0.002	NE	J		090747-009	SW846 6020
	Potassium	4.51	0.080	0.300	NE			090747-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090747-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090747-009	SW846 6020
	Sodium	46.7	0.080	0.250	NE			090747-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090747-009	SW846 6020
	Uranium	0.0075	0.000067	0.0002	0.030			090747-009	SW846 6020
	Vanadium	0.00112	0.001	0.005	NE	J		090747-009	SW846 6010
	Zinc	0.00474	0.0035	0.010	NE	J		090747-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-5 *(Concluded)*
Summary of Total Metal Results (Unfiltered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW9	Aluminum	ND	0.015	0.050	NE	U		090729-009	SW846 6020
27-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090729-009	SW846 6020
	Arsenic	0.00375	0.0017	0.005	0.010	J		090729-009	SW846 6020
	Barium	0.0947	0.0006	0.002	2.00			090729-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090729-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090729-009	SW846 6020
	Calcium	58.9	0.300	1.00	NE			090729-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090729-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090729-009	SW846 6020
	Copper	0.000631	0.00035	0.001	NE	J		090729-009	SW846 6020
	Iron	0.151	0.033	0.100	NE			090729-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090729-009	SW846 6020
	Magnesium	20.7	0.010	0.030	NE			090729-009	SW846 6020
	Manganese	0.00142	0.001	0.005	NE	J		090729-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090729-009	SW846 7470
	Nickel	0.00156	0.0005	0.002	NE	B, J	0.0028U	090729-009	SW846 6020
	Potassium	5.11	0.080	0.300	NE			090729-009	SW846 6020
	Selenium	0.00152	0.0015	0.005	0.050	J		090729-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090729-009	SW846 6020
	Sodium	47.1	0.080	0.250	NE			090729-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090729-009	SW846 6020
	Uranium	0.00926	0.000067	0.0002	0.030			090729-009	SW846 6020
	Vanadium	0.00833	0.001	0.005	NE			090729-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090729-009	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6
Summary of Total Metal Results (Filtered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2	Aluminum	ND	0.015	0.050	NE	U		090741-010	SW846 6020
16-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090741-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090741-010	SW846 6020
	Barium	0.0985	0.0006	0.002	2.00			090741-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090741-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090741-010	SW846 6020
	Calcium	75.3	0.600	2.00	NE			090741-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090741-010	SW846 6020
	Cobalt	0.00021	0.0001	0.001	NE	J		090741-010	SW846 6020
	Copper	0.000729	0.00035	0.001	NE	J		090741-010	SW846 6020
	Iron	0.272	0.033	0.100	NE			090741-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090741-010	SW846 6020
	Magnesium	22.6	0.010	0.030	NE			090741-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090741-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090741-010	SW846 7470
	Nickel	0.00213	0.0005	0.002	NE			090741-010	SW846 6020
	Potassium	3.69	0.080	0.300	NE			090741-010	SW846 6020
	Selenium	0.0021	0.0015	0.005	0.050	J		090741-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090741-010	SW846 6020
	Sodium	62.3	0.800	2.50	NE			090741-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090741-010	SW846 6020
	Uranium	0.00717	0.000067	0.0002	0.030			090741-010	SW846 6020
	Vanadium	0.00625	0.001	0.005	NE			090741-010	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090741-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Continued)*
Summary of Total Metal Results (Filtered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW4	Aluminum	ND	0.015	0.050	NE	U		090750-010	SW846 6020
22-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090750-010	SW846 6020
	Arsenic	0.00263	0.0017	0.005	0.010	J		090750-010	SW846 6020
	Barium	0.0934	0.0006	0.002	2.00			090750-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090750-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090750-010	SW846 6020
	Calcium	60.0	0.300	1.00	NE			090750-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090750-010	SW846 6020
	Cobalt	0.000235	0.0001	0.001	NE	J		090750-010	SW846 6020
	Copper	0.00171	0.00035	0.001	NE			090750-010	SW846 6020
	Iron	0.157	0.033	0.100	NE			090750-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090750-010	SW846 6020
	Magnesium	19.1	0.010	0.030	NE			090750-010	SW846 6020
	Manganese	0.00619	0.001	0.005	NE			090750-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090750-010	SW846 7470
	Nickel	0.128	0.0005	0.002	NE			090750-010	SW846 6020
	Potassium	5.29	0.080	0.300	NE			090750-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090750-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090750-010	SW846 6020
	Sodium	50.9	0.400	1.25	NE			090750-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090750-010	SW846 6020
	Uranium	0.00571	0.000067	0.0002	0.030			090750-010	SW846 6020
	Vanadium	0.00892	0.001	0.005	NE			090750-010	SW846 6010
	Zinc	0.0609	0.0035	0.010	NE			090750-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Continued)*
Summary of Total Metal Results (Filtered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW5	Aluminum	ND	0.015	0.050	NE	U		090732-010	SW846 6020
14-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090732-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090732-010	SW846 6020
	Barium	0.126	0.0006	0.002	2.00			090732-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090732-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090732-010	SW846 6020
	Calcium	98.6	0.600	2.00	NE			090732-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090732-010	SW846 6020
	Cobalt	0.000277	0.0001	0.001	NE	J		090732-010	SW846 6020
	Copper	0.000858	0.00035	0.001	NE	J		090732-010	SW846 6020
	Iron	0.351	0.033	0.100	NE			090732-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090732-010	SW846 6020
	Magnesium	29.4	0.010	0.030	NE			090732-010	SW846 6020
	Manganese	0.00238	0.001	0.005	NE	J		090732-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090732-010	SW846 7470
	Nickel	0.00285	0.0005	0.002	NE			090732-010	SW846 6020
	Potassium	6.39	0.080	0.300	NE			090732-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090732-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090732-010	SW846 6020
	Sodium	78.1	0.800	2.50	NE			090732-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090732-010	SW846 6020
	Uranium	0.00908	0.000067	0.0002	0.030			090732-010	SW846 6020
	Vanadium	0.0044	0.001	0.005	NE	J		090732-010	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090732-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Continued)*
Summary of Total Metal Results (Filtered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW6	Aluminum	0.0159	0.015	0.050	NE	J		090737-010	SW846 6020
15-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090737-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090737-010	SW846 6020
	Barium	0.117	0.0006	0.002	2.00			090737-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090737-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090737-010	SW846 6020
	Calcium	98.1	0.600	2.00	NE			090737-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090737-010	SW846 6020
	Cobalt	0.000234	0.0001	0.001	NE	J		090737-010	SW846 6020
	Copper	0.000973	0.00035	0.001	NE	J	0.0024U	090737-010	SW846 6020
	Iron	0.340	0.033	0.100	NE			090737-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090737-010	SW846 6020
	Magnesium	29.4	0.010	0.030	NE			090737-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090737-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090737-010	SW846 7470
	Nickel	0.00269	0.0005	0.002	NE			090737-010	SW846 6020
	Potassium	5.67	0.080	0.300	NE			090737-010	SW846 6020
	Selenium	0.00171	0.0015	0.005	0.050	J		090737-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090737-010	SW846 6020
	Sodium	73.1	0.800	2.50	NE			090737-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090737-010	SW846 6020
	Uranium	0.0096	0.000067	0.0002	0.030			090737-010	SW846 6020
	Vanadium	0.00633	0.001	0.005	NE			090737-010	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090737-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Continued)*
Summary of Total Metal Results (Filtered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW6 (Duplicate) 15-Jun-11	Aluminum	ND	0.015	0.050	NE	U		090738-010	SW846 6020
	Antimony	ND	0.001	0.003	0.006	U		090738-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090738-010	SW846 6020
	Barium	0.117	0.0006	0.002	2.00			090738-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090738-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090738-010	SW846 6020
	Calcium	96.6	0.600	2.00	NE			090738-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090738-010	SW846 6020
	Cobalt	0.000232	0.0001	0.001	NE	J		090738-010	SW846 6020
	Copper	0.000891	0.00035	0.001	NE	J	0.0024U	090738-010	SW846 6020
	Iron	0.324	0.033	0.100	NE			090738-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090738-010	SW846 6020
	Magnesium	28.9	0.010	0.030	NE			090738-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090738-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090738-010	SW846 7470
	Nickel	0.00261	0.0005	0.002	NE			090738-010	SW846 6020
	Potassium	5.65	0.080	0.300	NE			090738-010	SW846 6020
	Selenium	0.00215	0.0015	0.005	0.050	J		090738-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090738-010	SW846 6020
	Sodium	67.7	0.800	2.50	NE			090738-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090738-010	SW846 6020
	Uranium	0.00979	0.000067	0.0002	0.030			090738-010	SW846 6020
	Vanadium	0.00612	0.001	0.005	NE			090738-010	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090738-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Continued)*
Summary of Total Metal Results (Filtered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW7	Aluminum	ND	0.015	0.050	NE	U		090753-010	SW846 6020
28-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090753-010	SW846 6020
	Arsenic	0.00302	0.0017	0.005	0.010	J		090753-010	SW846 6020
	Barium	0.104	0.0006	0.002	2.00			090753-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090753-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090753-010	SW846 6020
	Calcium	59.3	0.300	1.00	NE			090753-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090753-010	SW846 6020
	Cobalt	0.000127	0.0001	0.001	NE	J		090753-010	SW846 6020
	Copper	0.000447	0.00035	0.001	NE	J		090753-010	SW846 6020
	Iron	0.146	0.033	0.100	NE			090753-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090753-010	SW846 6020
	Magnesium	19.9	0.010	0.030	NE			090753-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090753-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090753-010	SW846 7470
	Nickel	0.00167	0.0005	0.002	NE	B, J	0.0028U	090753-010	SW846 6020
	Potassium	5.24	0.080	0.300	NE			090753-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090753-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090753-010	SW846 6020
	Sodium	48.5	0.080	0.250	NE			090753-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090753-010	SW846 6020
	Uranium	0.00818	0.000067	0.0002	0.030			090753-010	SW846 6020
	Vanadium	0.00618	0.001	0.005	NE			090753-010	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090753-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Continued)*
Summary of Total Metal Results (Filtered), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW8	Aluminum	ND	0.015	0.050	NE	U		090746-010	SW846 6020
20-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090746-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090746-010	SW846 6020
	Barium	0.122	0.0006	0.002	2.00			090746-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090746-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090746-010	SW846 6020
	Calcium	60.5	0.300	1.00	NE			090746-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090746-010	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090746-010	SW846 6020
	Copper	0.00052	0.00035	0.001	NE	J		090746-010	SW846 6020
	Iron	0.159	0.033	0.100	NE			090746-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090746-010	SW846 6020
	Magnesium	19.9	0.010	0.030	NE			090746-010	SW846 6020
	Manganese	0.00129	0.001	0.005	NE	J		090746-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090746-010	SW846 7470
	Nickel	0.00169	0.0005	0.002	NE	J		090746-010	SW846 6020
	Potassium	4.98	0.080	0.300	NE			090746-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090746-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090746-010	SW846 6020
	Sodium	47.7	0.080	0.250	NE			090746-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090746-010	SW846 6020
	Uranium	0.00722	0.000067	0.0002	0.030			090746-010	SW846 6020
	Vanadium	0.00228	0.001	0.005	NE	J		090746-010	SW846 6010
	Zinc	0.00352	0.0035	0.010	NE	J		090746-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Continued)*
Summary of Total Metal Results (Filtered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW8 (Duplicate)	Aluminum	ND	0.015	0.050	NE	U		090747-010	SW846 6020
20-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090747-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090747-010	SW846 6020
	Barium	0.123	0.0006	0.002	2.00			090747-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090747-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090747-010	SW846 6020
	Calcium	57.6	0.300	1.00	NE			090747-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090747-010	SW846 6020
	Cobalt	0.000119	0.0001	0.001	NE	J		090747-010	SW846 6020
	Copper	0.000551	0.00035	0.001	NE	J		090747-010	SW846 6020
	Iron	0.150	0.033	0.100	NE			090747-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090747-010	SW846 6020
	Magnesium	18.8	0.010	0.030	NE			090747-010	SW846 6020
	Manganese	0.00138	0.001	0.005	NE	J		090747-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090747-010	SW846 7470
	Nickel	0.00163	0.0005	0.002	NE	J		090747-010	SW846 6020
	Potassium	4.84	0.080	0.300	NE			090747-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090747-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090747-010	SW846 6020
	Sodium	46.5	0.080	0.250	NE			090747-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090747-010	SW846 6020
	Uranium	0.00746	0.000067	0.0002	0.030			090747-010	SW846 6020
	Vanadium	0.00134	0.001	0.005	NE	J		090747-010	SW846 6010
	Zinc	0.00392	0.0035	0.010	NE	J		090747-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-6 *(Concluded)*
Summary of Total Metal Results (Filtered),
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW9	Aluminum	ND	0.015	0.050	NE	U		090729-010	SW846 6020
27-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090729-010	SW846 6020
	Arsenic	0.00362	0.0017	0.005	0.010	J		090729-010	SW846 6020
	Barium	0.100	0.0006	0.002	2.00			090729-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090729-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090729-010	SW846 6020
	Calcium	60.2	0.300	1.00	NE			090729-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090729-010	SW846 6020
	Cobalt	0.000127	0.0001	0.001	NE	J		090729-010	SW846 6020
	Copper	0.000628	0.00035	0.001	NE	J		090729-010	SW846 6020
	Iron	0.154	0.033	0.100	NE			090729-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090729-010	SW846 6020
	Magnesium	19.7	0.010	0.030	NE			090729-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090729-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090729-010	SW846 7470
	Nickel	0.00159	0.0005	0.002	NE	B, J	0.0028U	090729-010	SW846 6020
	Potassium	4.90	0.080	0.300	NE			090729-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090729-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090729-010	SW846 6020
	Sodium	44.0	0.080	0.250	NE			090729-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090729-010	SW846 6020
	Uranium	0.00898	0.000067	0.0002	0.030			090729-010	SW846 6020
	Vanadium	0.00698	0.001	0.005	NE			090729-010	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		090729-010	SW846 6020

Refer to footnotes on page 4A-33.

Table 4A-7
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2	Americium-241	-3.24 ± 5.39	8.64	4.32	NE	U	BD	090741-033	EPA 901.1
16-Jun-11	Cesium-137	-0.391 ± 3.40	3.71	1.85	NE	U	BD	090741-033	EPA 901.1
	Cobalt-60	2.04 ± 2.09	3.37	1.69	NE	U	BD	090741-033	EPA 901.1
	Potassium-40	-5.58 ± 38.3	45.1	22.6	NE	U	BD	090741-033	EPA 901.1
	Gross Alpha	4.24	NA	NA	15	NA	None	090741-034	EPA 900.0
	Gross Beta	2.57 ± 1.10	1.53	0.734	4mrem/yr		J	090741-034	EPA 900.0
	Tritium	26.8 ± 89.7	153	74.4	NE	U	BD	090741-036	EPA 906.0 M
MWL-MW4	Americium-241	8.69 ± 8.44	11.4	5.69	NE	U	BD	090750-033	EPA 901.1
22-Jun-11	Cesium-137	1.79 ± 2.15	3.41	1.71	NE	U	BD	090750-033	EPA 901.1
	Cobalt-60	-0.222 ± 1.93	3.20	1.60	NE	U	BD	090750-033	EPA 901.1
	Potassium-40	9.18 ± 59.4	26.6	13.3	NE	U	BD	090750-033	EPA 901.1
	Gross Alpha	0.50	NA	NA	15	NA	None	090750-034	EPA 900.0
	Gross Beta	5.18 ± 1.18	0.999	0.476	4mrem/yr			090750-034	EPA 900.0
	Tritium	-34.3 ± 71.1	141	63.4	NE	U	BD	090750-036	EPA 906.0 M
MWL-MW5	Americium-241	-5.27 ± 11.0	16.0	8.03	NE	U	BD	090732-033	EPA 901.1
14-Jun-11	Cesium-137	1.59 ± 1.94	3.22	1.61	NE	U	BD	090732-033	EPA 901.1
	Cobalt-60	1.25 ± 2.06	3.53	1.77	NE	U	BD	090732-033	EPA 901.1
	Potassium-40	8.26 ± 40.3	34.0	17.0	NE	U	BD	090732-033	EPA 901.1
	Gross Alpha	5.51	NA	NA	15	NA	None	090732-034	EPA 900.0
	Gross Beta	4.45 ± 2.17	3.24	1.57	4mrem/yr		J	090732-034	EPA 900.0
	Tritium	-40.8 ± 86.8	152	74.0	NE	U	BD	090732-036	EPA 906.0 M
MWL-MW6	Americium-241	7.81 ± 13.6	20.6	10.3	NE	U	BD	090737-033	EPA 901.1
15-Jun-11	Cesium-137	1.99 ± 4.31	2.77	1.38	NE	U	BD	090737-033	EPA 901.1
	Cobalt-60	3.32 ± 2.69	4.13	2.07	NE	U	BD	090737-033	EPA 901.1
	Potassium-40	-2.87 ± 40.9	45.6	22.8	NE	U	BD	090737-033	EPA 901.1
	Gross Alpha	7.24	NA	NA	15	NA	None	090737-034	EPA 900.0
	Gross Beta	6.58 ± 2.99	4.46	2.18	4mrem/yr		J	090737-034	EPA 900.0
	Tritium	-88.8 ± 85.2	152	74.0	NE	U	BD	090737-036	EPA 906.0 M

Refer to footnotes on page 4A-33.

Table 4A-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW6 (Duplicate)	Americium-241	3.58 ± 11.2	17.1	8.55	NE	U	BD	090738-033	EPA 901.1
15-Jun-11	Cesium-137	-0.198 ± 2.00	3.35	1.67	NE	U	BD	090738-033	EPA 901.1
	Cobalt-60	0.385 ± 2.25	3.79	1.90	NE	U	BD	090738-033	EPA 901.1
	Potassium-40	29.3 ± 43.5	31.0	15.5	NE	U	BD	090738-033	EPA 901.1
	Gross Alpha	6.10	NA	NA	15	NA	None	090738-034	EPA 900.0
	Gross Beta	6.28 ± 1.94	2.24	1.07	4mrem/yr		J	090738-034	EPA 900.0
	Tritium	-27.5 ± 84.5	148	71.7	NE	U	BD	090738-036	EPA 906.0 M
MWL-MW7	Americium-241	-0.42 ± 13.9	20.9	10.5	NE	U	BD	090753-033	EPA 901.1
28-Jun-11	Cesium-137	2.47 ± 2.26	3.49	1.75	NE	U	BD	090753-033	EPA 901.1
	Cobalt-60	2.20 ± 2.47	4.00	2.00	NE	U	BD	090753-033	EPA 901.1
	Potassium-40	20.6 ± 47.5	33.1	16.5	NE	U	BD	090753-033	EPA 901.1
	Gross Alpha	3.26	NA	NA	15	NA	None	090753-034	EPA 900.0
	Gross Beta	5.03 ± 1.46	1.75	0.843	4mrem/yr		J	090753-034	EPA 900.0
	Tritium	39.0 ± 78.0	137	61.1	NE	U	BD	090753-036	EPA 906.0 M
MWL-MW8	Americium-241	-49.2 ± 30.5	31.8	15.9	NE	U	BD	090746-033	EPA 901.1
20-Jun-11	Cesium-137	-1.77 ± 2.23	3.34	1.67	NE	U	BD	090746-033	EPA 901.1
	Cobalt-60	1.32 ± 2.21	3.75	1.88	NE	U	BD	090746-033	EPA 901.1
	Potassium-40	-23.7 ± 39.8	44.5	22.2	NE	U	BD	090746-033	EPA 901.1
	Gross Alpha	0.32	NA	NA	15	NA	None	090746-034	EPA 900.0
	Gross Beta	6.78 ± 1.59	1.62	0.788	4mrem/yr			090746-034	EPA 900.0
	Tritium	44.0 ± 81.1	141	63.0	NE	U	BD	090746-036	EPA 906.0 M
MWL-MW8 (Duplicate)	Americium-241	0.372 ± 5.87	9.44	4.73	NE	U	BD	090747-033	EPA 901.1
20-Jun-11	Cesium-137	0.116 ± 1.57	2.60	1.30	NE	U	BD	090747-033	EPA 901.1
	Cobalt-60	0.313 ± 1.87	3.11	1.56	NE	U	BD	090747-033	EPA 901.1
	Potassium-40	2.80 ± 29.2	38.5	19.3	NE	U	BD	090747-033	EPA 901.1
	Gross Alpha	3.20	NA	NA	15	NA	None	090747-034	EPA 900.0
	Gross Beta	7.83 ± 1.85	1.95	0.954	4mrem/yr			090747-034	EPA 900.0
	Tritium	19.5 ± 77.8	141	63.2	NE	U	BD	090747-036	EPA 906.0 M

Refer to footnotes on page 4A-33.

Table 4A-7 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW9	Americium-241	1.16 ± 2.73	4.06	2.03	NE	U	BD	090729-033	EPA 901.1
27-Jun-11	Cesium-137	-4.58 ± 5.54	5.73	2.87	NE	U	BD	090729-033	EPA 901.1
	Cobalt-60	4.08 ± 3.08	4.54	2.27	NE	U	BD	090729-033	EPA 901.1
	Potassium-40	17.3 ± 43.9	30.3	15.2	NE	U	BD	090729-033	EPA 901.1
	Gross Alpha	4.50	NA	NA	15	NA	None	090729-034	EPA 900.0
	Gross Beta	6.91 ± 1.61	1.47	0.701	4mrem/yr			090729-034	EPA 900.0
	Tritium	0.00 ± 72.8	1.37	61.1	NE	U	BD	090729-036	EPA 906.0 M

Refer to footnotes on page 4A-33.

Table 4A-8
Summary of Field Water Quality Measurements[i],
Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
MWL-BW2	16-Jun-11	23.16	669	373.5	7.28	0.21	8.2	0.70
MWL-MW4	22-Jun-11	20.09	564	367.2	7.69	1.38	28.7	2.69
MWL-MW5	14-Jun-11	23.05	812	404.7	7.18	0.73	30.0	2.56
MWL-MW6	15-Jun-11	24.04	802	397.5	7.29	0.25	33.0	2.76
MWL-MW7	28-Jun-11	25.85	554	391.0	7.49	0.26	48.0	3.91
MWL-MW8	20-Jun-11	21.48	554	398.4	7.56	0.48	42.4	3.74
MWL-MW9	27-Jun-11	23.86	555	382.7	7.53	2.00	13.3	1.11

Refer to footnotes on page 4A-33.

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Footnotes for Mixed Waste Landfill Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table 1-4)
- µg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems: 15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table I-4). 4 mrem/yr = any combination of beta and/or gamma-emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B = Analyte is detected in associated laboratory method blank.
J = Estimated value, the analyte concentration is below the practical quantitation limit (PQL).
NA = Not applicable.
U = Analyte is absent or below the method detection limit.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.
BD = Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J = The associated value is an estimated quantity.
None = No data validation for corrected gross alpha activity.
U = The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

Footnotes for Mixed Waste Landfill Groundwater Monitoring Tables (Concluded)

[g]Analytical Method

- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes*, EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
- U.S. Environmental Protection Agency, Washington, D.C.; or Clesceri, Greenburg, and Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% Sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 4B
Mixed Waste Landfill
Hydrographs

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Attachment 4B Hydrographs

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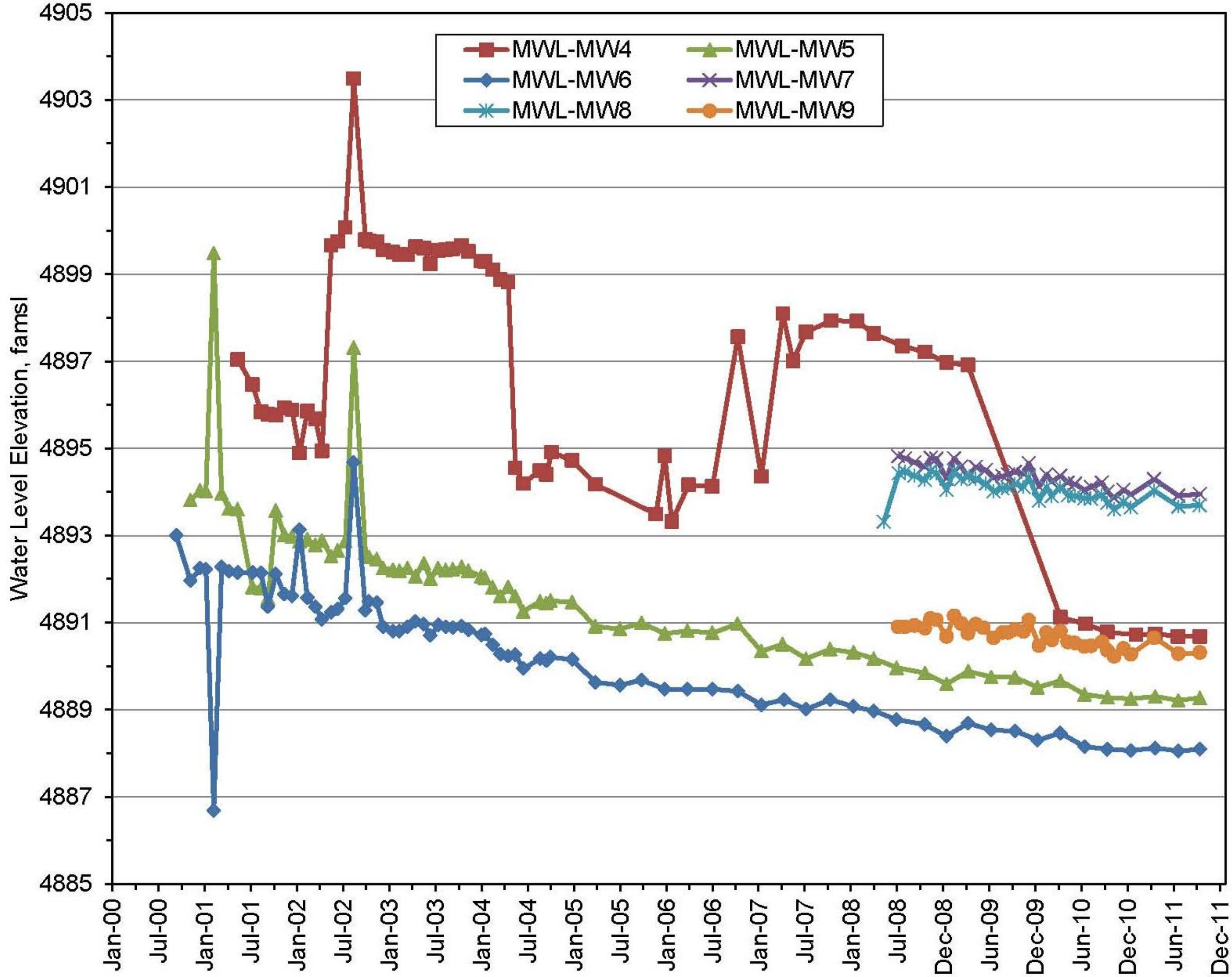

Figure 4B-1. MWL Study Area Wells (1 of 2)

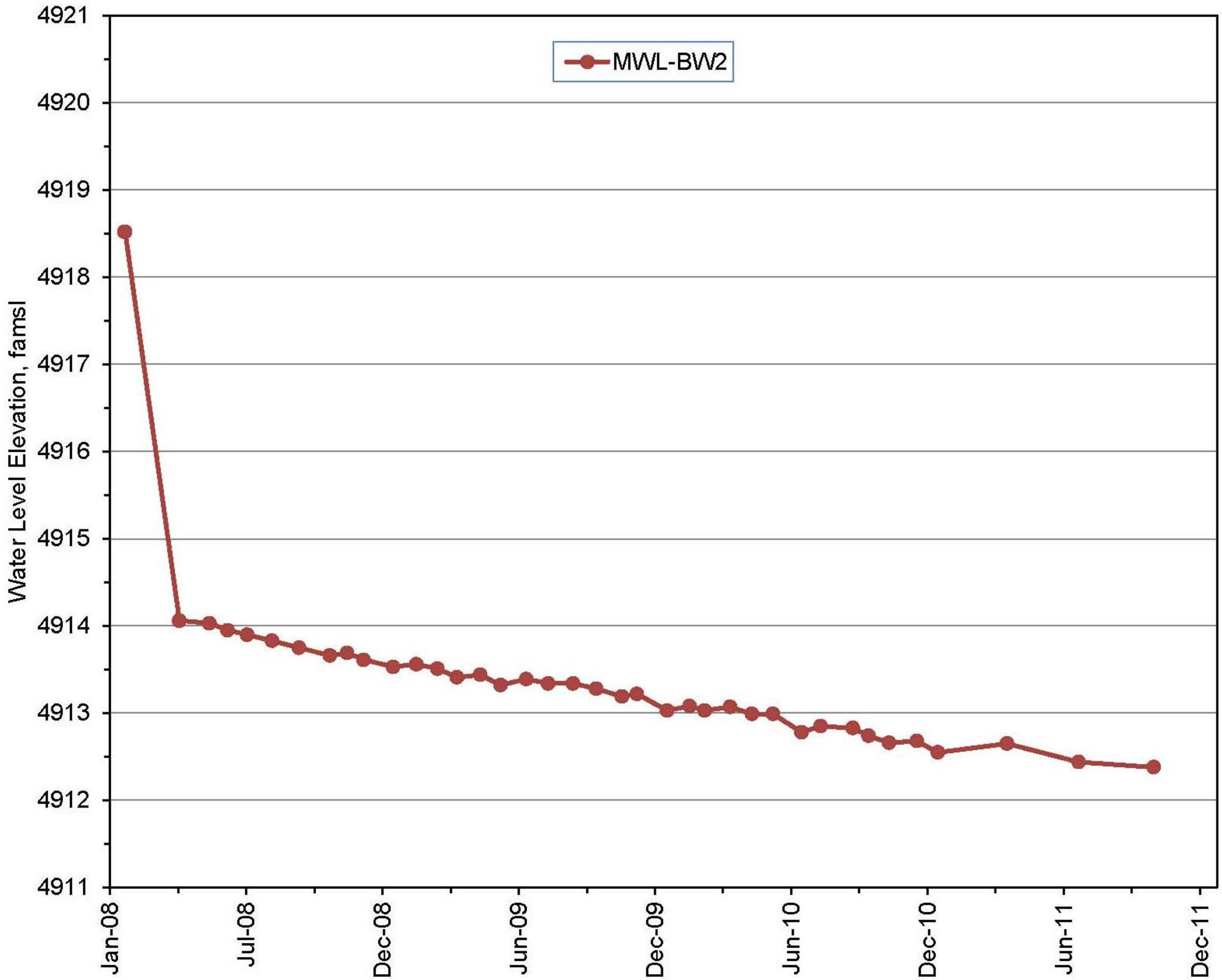

Figure 4B-2. MWL Study Area Wells (2 of 2)

5.0 Technical Area V Groundwater

5.1 Introduction

Trichloroethene (TCE) and nitrate have been identified as constituents of concern (COCs) in groundwater at the Technical Area (TA)-V Groundwater Investigation Study Area (TA-V study area) based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) in samples collected from monitoring wells. Since 1993, the maximum concentrations detected in the study area have been 26 micrograms per liter (µg/L) of TCE and 19 milligrams per liter (mg/L) of nitrate. The EPA MCLs and State of New Mexico drinking water standards for TCE and nitrate are 5 µg/L and 10 mg/L (as nitrogen), respectively. Unique features of the TA-V study area include low concentrations of TCE and nitrate in a deep alluvial aquifer.

5.1.1 Location

TA-V occupies approximately 35 acres in the northeastern corner of TA-III (Figure 5-1) at Sandia National Laboratories, New Mexico (SNL/NM). TA-V is located in the north-central portion of Kirtland Air Force Base (KAFB), south of the City of Albuquerque (Figure 5-1). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE), National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

TA-V is situated within the Albuquerque Basin, and the vadose zone at TA-V is approximately 500 feet (ft) in thickness and consists of heterogeneous, lenticular, coarse- to fine-grained deposits. The underlying aquifer at TA-V consists of unconsolidated fine-grained, clay-rich, alluvial-fan sediments. Groundwater in the vicinity of TA-V flows generally from east to west. To the west of TA-V, groundwater flow paths turn to the north in response to pumping from municipal well fields located north of KAFB and from water supply wells located in the northern portion of KAFB.

5.1.2 Site History

TA-V facilities are designed to test radiation effects on components and include two research reactors (the Annular Core Research Reactor and the Sandia Pulsed Reactor), as well as the Gamma Irradiation Facility and Hot Cell Facility. Historically, wastewater containing contaminants derived from TA-V facilities was disposed of to drain fields, seepage pits, and unlined surface impoundments. SNL/NM Environmental Restoration (ER) Operations (formerly ER Project) personnel have conducted numerous groundwater investigations in the TA-V study area since 1992 (Table 5-1). Many of these investigations were site-specific and conducted in support of various Solid Waste Management Unit (SWMU) assessments. Other investigations in the TA-V study area were more regional studies conducted by the SNL/NM Site-Wide Hydrogeologic Characterization Project (SNL February 1998).

5.1.3 Monitoring History

Investigations of groundwater quality in the TA-V study area have been conducted by SNL/NM over the past 19 years (Table 5-1). Groundwater monitoring at TA-V began in October 1992. TCE was first detected in monitoring well LWDS-MW1 in October 1993 and was later detected in TAV-MW1 in September 1995. Since then, low concentrations of TCE have been consistently detected during quarterly sampling events. Potential sources for TCE in groundwater include the Liquid Waste Disposal System (LWDS) drain field and surface impoundments and the TA-V seepage pits (Section 5.1.7).

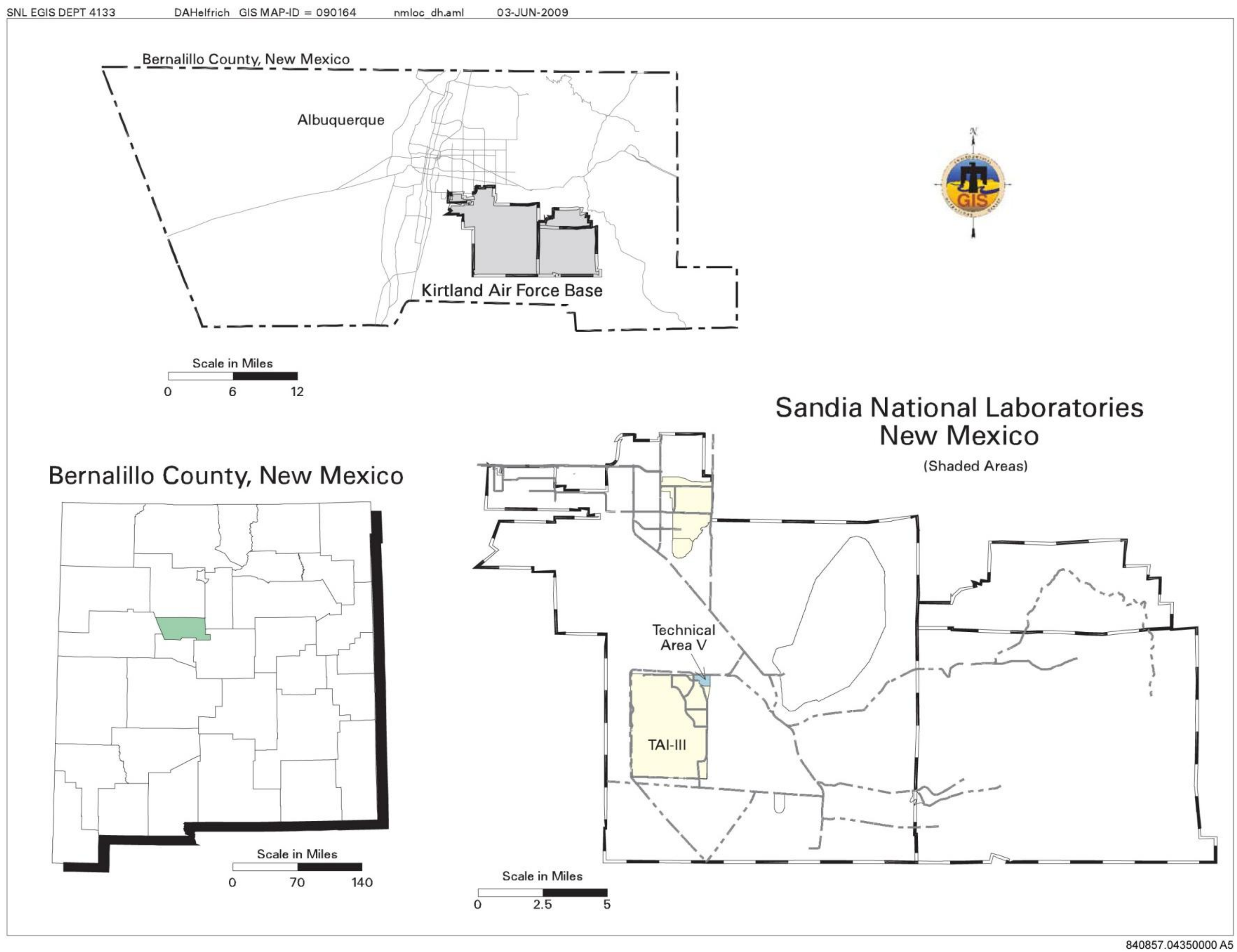

Figure 5-1. Location of the TA-V Study Area

Table 5-1. Historical Timeline of the TA-V Study Area

Month	Year	Event	Reference
May	1959	KAFB water supply well KAFB-10 is installed west of TA-V and north of TA-III. Water from the well was used as auxiliary water for fire protection.	NMOSE May 1959
April	1992	The LWDS RFI Work Plan is submitted. The investigation will examine SWMUs 4, 5, and 52.	SNL March 1993
	1992–1993	Two groundwater monitoring wells are installed as part of the LWDS investigation. LWDS-MW2 installed October 1992, and LWDS-MW1 installed May 1993.	SNL September 1995
November	1993	LWDS-MW1 and LWDS-MW2 are sampled. The first sampling event of LWDS-MW1 in November 1993 reveals TCE near the method detection limit, and the detection is confirmed during a later sampling event at values exceeding the MCL of 5 µg/L.	SNL March 1995
June	1994	Submit notification letter from DOE to EPA regarding TCE detection in LWDS-MW1.	DOE June 1994
March	1995	Groundwater sample analytical results for TA-V wells LWDS-MW1 and LWDS-MW2 reported in the Calendar Year 1994 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1995
June	1995	Report submitted discussing water quality issues reported in the Calendar Year 1994 SNL/NM Annual Groundwater Monitoring Report. TCE was consistently detected during 1994 in LWDS-MW1.	IT June 1995
January–June	1995	Wells AVN-1 and AVN-2 installed.	SNL 1995
April	1995	Wells TAV-MW1 and TAV-MW2 installed.	SNL March 1996
	1995	The LWDS RFI is performed and completed.	SNL September 1995
March	1996	Groundwater sampling analytical results for TA-V wells reported in the Calendar Year 1995 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1996
March	1996	DOE submits a letter to the NMED with notification of a single elevated nitrate detection for groundwater monitoring well LWDS-MW1. The result is 10.1 mg/L, exceeding the MCL of 10 mg/L.	DOE March 1996
April	1996	KAFB-10 is plugged and abandoned as there is a potential for the ungrouted borehole for this production well to act as a conduit for contaminant transport into the groundwater.	SNL April 1996
March	1997	Groundwater sampling analytical results for TA-V wells reported in the Calendar Year 1996 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1997
April	1997	Wells TAV-MW3, TAV-MW4, and TAV-MW5 installed.	SNL March 1999a
September	1997	NMED issues an RSI stating that additional characterization at TA-V is needed. Numerous other issues are discussed pertaining to each of the LWDS sites (SWMUs 4, 5, and 52).	NMED September 1997
January	1998	DOE/Sandia provide responses to the NMED September 1997 RSI.	SNL January 1998
March	1998	Groundwater sampling analytical results for TA-V wells reported in the Calendar Year 1997 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1998

Table 5-1. Historical Timeline of the TA-V Study Area *(Continued)*

Month	Year	Event	Reference
October	1998	DOE/Sandia provide cross sections to NMED for the LWDS as required in the September 1997 RSI from NMED.	DOE October 1998
March	1999	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 1998 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1999b
March	1999	DOE/Sandia submits a summary report detailing groundwater conditions for the TA-III/V area that includes sites from OU 1306 (TA-III) and OU 1307 (LWDS).	SNL March 1999a
March	2000	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 1999 SNL/NM Annual Groundwater Monitoring Report	SNL March 2000
April	2001	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2000 SNL/NM Annual Groundwater Monitoring Report.	SNL April 2001
March - May	2001	Wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 installed.	SNL October 2001
November	2001	A summary of groundwater sampling results from TA-V wells for Fiscal Years 1999 and 2000 are compiled into a report. This is an update of the March 1999 summary report.	SNL November 2001
March	2002	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2001 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2002
March	2003	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2002 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2003
June	2003	Subsurface geology at KAFB, including the TA-V area, is updated.	Van Hart June 2003
March	2004	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2003 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2004
April	2004	The NMED issues the Compliance Order on Consent (the Order) to the DOE/Sandia, which identified TA-V as an area with groundwater contamination requiring a CME.	NMED April 2004
May	2004	DOE/Sandia submit the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V*. This document was required by the Order.	SNL April 2004a
May	2004	DOE/Sandia submit the *Corrective Measures Evaluation Work Plan, Technical Area V Groundwate*r. This document was required by the Order.	SNL April 2004b
October	2004	The NMED issues an approval with modifications to the TA-V CME Work Plan and the Current Conceptual Model of Groundwater Flow and Contaminant Transport.	NMED October 2004

Table 5-1. Historical Timeline of the TA-V Study Area *(Continued)*

Month	Year	Event	Reference
December	2004	DOE/Sandia submit responses to the NMED request of October 2004. The responses are included in the revised *Corrective Measures Evaluation Work Plan, Technical Area V Groundwater, Revision 0*.	SNL December 2004
July	2005	DOE/Sandia submit the *Corrective Measures Evaluation Report for Technical Area V Groundwater*. The report details the selection of a preferred remedial alternative, cleanup goals, and the corrective measures implementation plan.	SNL July 2005
October	2005	DOE/Sandia submit request to NMED for change in sampling frequency for TA-V wells.	DOE October 2005
October	2005	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2004 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2005
March	2006	DOE/Sandia request the removal of well AVN-2 from the TA-V monitoring network due to insufficient water for sampling caused by declining water levels. The well would be returned to service if water levels in the well recover.	DOE March 2006
November	2006	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2005 SNL/NM Annual Groundwater Monitoring Report.	SNL November 2006
March	2007	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2006 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2007
January–March	2008	Well TAV-MW1 plugged and abandoned, and well TAV-MW10 installed as replacement for TAV-MW1.	SNL June 2008
March	2008	Groundwater sampling analytical results for TA-V wells reported in the Fiscal Year 2007 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2008
July	2008	NMED issues an NOD on the July 2005 CME Report for TA-V Groundwater.	NMED July 2008
September	2008	The 13 TA-V monitoring wells are resurveyed to establish new northing and easting coordinates and elevations for each well.	SNL October 2008
December	2008	Sandia, DOE, and NMED personnel attend an MNA seminar presented by Savannah River National Laboratory personnel and also discuss technical issues and the need for additional characterization work at TA-V.	SRNL December 2008
April	2009	NMED requires characterization of perchlorate in groundwater in one well in the TA-V study area.	NMED April 2009
April	2009	DOE/Sandia submit a response to the NOD on the July 2005 CME Report for TA-V Groundwater.	SNL April 2009
June	2009	Groundwater sampling analytical results for TA-V wells reported in the Calendar Year 2008 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2009
August	2009	NMED issues a second NOD on the July 2005 CME Report for TA-V Groundwater.	NMED August 2009

Table 5-1. Historical Timeline of the TA-V Study Area *(Concluded)*

Month	Year	Event	Reference
November	2009	DOE/Sandia submit a response to the second NOD on the July 2005 CME Report for TA-V Groundwater.	SNL November 2009a
December	2009	NMED issues a third NOD on the July 2005 CME Report for TA-V Groundwater.	NMED December 2009
February	2010	DOE/Sandia submit a response to the third NOD on the July 2005 CME Report for TA-V Groundwater.	SNL February 2010
May	2010	NMED issues a notice of conditional approval for the TA-V Groundwater Investigation Work Plan associated with July 2005 TA-V Groundwater CME Report.	NMED May 2010
October	2010	DOE/Sandia begin installation of groundwater monitoring wells TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14.	SNL February 2010
November	2010	DOE/Sandia complete installation of groundwater monitoring wells TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14.	SNL June 2011a
October	2010	Groundwater sampling analytical results for TA-V wells reported in the Calendar Year 2009 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2010
November	2010	DOE/Sandia submit a report on the geophysical log and slug test results for the new TA-V wells.	SNL November 2010
December	2010	NMED issues approval for the modification of soil-vapor monitoring well design.	NMED December 2010
March	2011	DOE/Sandia complete installation of soil vapor monitoring wells TAV-SV01, TAV-SV02, and TAV-SV03.	SNL June 2011a
June	2011	DOE/Sandia submit a Summary Report for TA-V Groundwater and Soil-Vapor Monitoring Well Installation.	SNL June 2011a
July	2011	DOE/Sandia meet with NMED to discuss the results from the first quarter of groundwater and soil vapor monitoring.	SNL July 2011

NOTES:

CME = Corrective Measures Evaluation.
DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
KAFB = Kirtland Air Force Base.
LWDS = Liquid Waste Disposal System.
MCL = Maximum Contaminant Level.
µg/L = Microgram(s) per liter.
mg/L = Milligram(s) per liter.
MNA = Monitored Natural Attenuation.
MW = Monitoring well.
NMED = New Mexico Environment Department.
NMOSE = New Mexico Office of the State Engineer.
NOD = Notice of Disapproval.
OU = Operable Unit.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA Facility Investigation.
RSI = Request for Supplemental Information.
Sandia = Sandia Corporation.
SNL = Sandia National Laboratories.
SNL/NM = Sandia National Laboratories/New Mexico.
SRNL = Savannah River National Laboratory.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
TCE = Trichloroethene.

In April 2004, the Compliance Order on Consent (the Order) became effective between the New Mexico Environment Department (NMED), DOE, and Sandia and the Order specifies TA-V as an area of groundwater contamination (NMED April 2004). Since the initial discoveries of TCE and nitrate at the TA-V study area, numerous characterization activities have been conducted (Table 5-1), which are summarized in the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V* (SNL April 2004a). In response to the Order, this document was submitted to the NMED along with the *Corrective Measures Evaluation Work Plan, Technical Area V Groundwater* (SNL April 2004b) by DOE and Sandia in April 2004. The Current Conceptual Model provides a comprehensive list of groundwater monitoring data sources used to support the summary of investigations. After fulfilling the requirements of the Corrective Measures Evaluation (CME) Work Plan, DOE and Sandia submitted the CME Report to the NMED in July 2005 (SNL July 2005).

5.1.4 Current Monitoring Network

In Calendar Year (CY) 2011, 16 wells in the TA-V study area were being monitored for water quality and water levels (Figure 5-2; Table 5-2). Table XI-1 of the Order (NMED April 2004) specifies that the sampling frequency for groundwater monitoring at TA-V is quarterly.

5.1.5 Summary of Calendar Year 2011 Activities

The following activities took place for the TA-V study area during CY 2011:

- Obtained monthly or quarterly water level measurements for all TA-V study area wells.
- Conducted semiannual and quarterly groundwater sampling events at 16 wells (Table 5-2) in January, April, July, and November 2011 (SNL December 2010, March 2011, June 2011b, and October 2011).
- Performed quarterly perchlorate screening groundwater sampling and reporting for TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14.
- Installed soil-vapor monitoring wells TAV-SV01, TAV-SV02, and TAV-SV03 (SNL June 2011a).
- Submitted the *Summary Report for Technical Area-V Groundwater and Soil-Vapor Monitoring Well Installation* (SNL June 2011a).
- Discussed results of groundwater and soil-vapor sampling analytical results from newly installed wells with the NMED (SNL June 2011b).
- Prepared tables of analytical results (Attachment 5A), concentration versus time plots (Attachment 5B), and hydrographs (Attachment 5C) in support of this report.
- Conducted quarterly soil-vapor sampling events at three wells in April and May, July, and November 2011. The analytical results for these three sampling events are presented in the report entitled *Technical Area V Soil-Vapor Monitoring, Calendar Year 2011 Activities* (Attachment 5D), which includes analytical tables and concentration versus time plots.

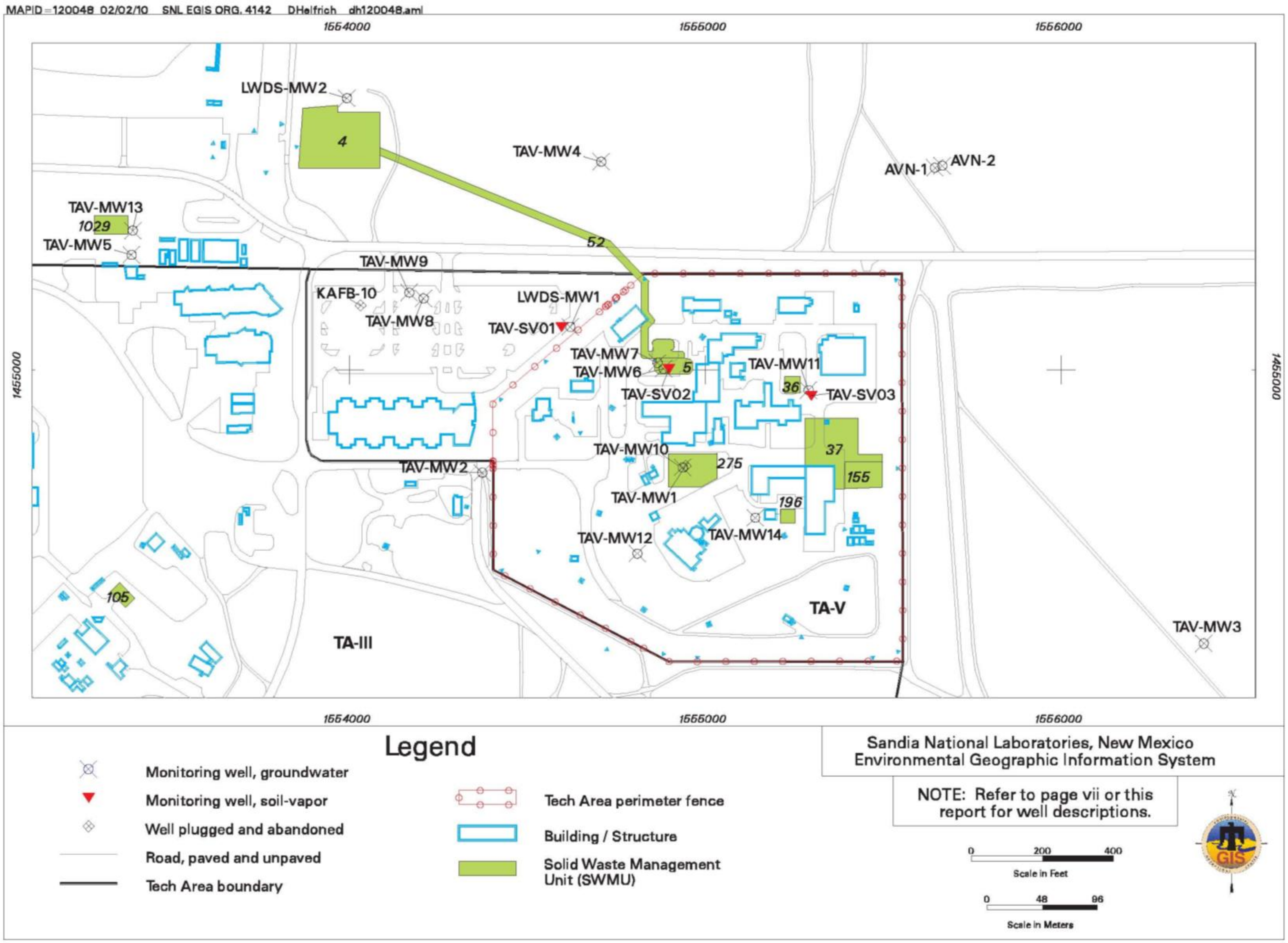

Figure 5-2. TA-V Monitoring Well Locations (16 Active Groundwater Monitoring Wells)

Table 5-2. Groundwater Monitoring Wells at the TA-V Study Area

Well	Installation Year	WQ	WL	Comments
LWDS-MW1	1993	√	√	Regional aquifer
LWDS-MW2	1992	√	√	Regional aquifer
AVN-1	1995	√	√	Regional aquifer
AVN-2	1995			Regional aquifer; currently dry
TAV-MW1	1995			Regional aquifer, plugged and abandoned February 2008
TAV-MW2	1995	√	√	Regional aquifer
TAV-MW3	1997	√	√	Regional aquifer
TAV-MW4	1997	√	√	Regional aquifer
TAV-MW5	1997	√	√	Regional aquifer
TAV-MW6	2001	√	√	Regional aquifer, water table completion
TAV-MW7	2001	√	√	Regional aquifer, deep completion (597–617 ft bgs)
TAV-MW8	2001	√	√	Regional aquifer, water table completion
TAV-MW9	2001	√	√	Regional aquifer, deep completion (582–602 ft bgs)
TAV-MW10	2008	√	√	Regional aquifer, replaced TAV-MW1
TAV-MW11	2010	√	√	Regional aquifer, water table completion
TAV-MW12	2010	√	√	Regional aquifer, water table completion
TAV-MW13	2010	√	√	Regional aquifer, deep completion (525–545 ft bgs)
TAV-MW14	2010	√	√	Regional aquifer, water table completion

NOTES: Check marks in the WQ and WL columns indicate WQ sampling and WL measurements were obtained during this reporting period.
bgs = Below ground surface.
ft = Foot (feet).
TA-V = Technical Area V.
WL = Water level.
WQ = Water quality.

5.1.6 Summary of Future Activities

The following activities are anticipated for the TA-V study area during CY 2012:

- Obtain periodic water level measurements for TA-V study area wells.
- Conduct quarterly or semiannual groundwater sampling at 16 TA-V study area wells.
- Conduct quarterly soil-vapor sampling at three TA-V study area wells.

5.1.7 Current Conceptual Model

The conceptual site model of contaminant transport at TA-V includes release from the source term, migration through the vadose zone, and movement in groundwater.

TCE and other organic chemicals were presumably present in wastewater that was discharged to the LWDS drain field from 1962 to 1967 and to the TA-V seepage pits from the 1960s until the early 1980s, when disposal practices were modified to protect the environment. Wastewater was disposed of at the surface impoundments from 1967 to 1972. Wastewater continued to be discharged to the seepage pits from the early 1980s until 1992, but it contained no TCE.

Water containing dissolved concentrations of TCE and other organic chemicals moved rapidly through the alluvial-fan lithofacies into the aquifer. Upon cessation of disposal, vertical pathways to the aquifer drained rapidly. Continued flushing of the vadose zone beneath the seepage pits until 1992 likely removed significant sources of secondary contaminants.

Low concentrations of TCE present in the aquifer today are a result of these initial releases. The slow rate of groundwater flow (4 to 20 feet per year [ft/yr]) is responsible for the present distribution of TCE in the aquifer.

Nitrate concentrations in groundwater at TA-V, which are presumably derived from unknown upgradient sources, have exceeded MCLs in the two upgradient AVN wells that are currently being studied by KAFB. Concentrations have also exceeded MCLs in samples from wells located in TA-V (LWDS-MW1 and TAV-MW10), suggesting an additional local source of nitrate. However, septic waste was not discharged or disposed of to the three SWMUs (4, 5, and 275) at TA-V.

5.1.7.1 Regional Hydrogeologic Conditions

SNL/NM TA-V is located within the Albuquerque Basin of the Rio Grande Rift in north-central New Mexico. The Rio Grande Rift is marked by a series of sediment-filled structural basins and adjoining uplifted mountain ranges. One of these basins, the Albuquerque Basin (also known as the Middle Rio Grande Basin), covers about 3,060 square miles in central New Mexico and extends from Cochiti Reservoir on the north to San Acacia, New Mexico, on the south. The Albuquerque Basin includes KAFB and TA-V.

The sedimentary deposits of the Santa Fe Group and overlying alluvium that fill the Albuquerque Basin contain the Santa Fe Group aquifer system. This aquifer system provides the primary source of municipal, domestic, and industrial water in the Albuquerque area. The structure of the aquifer system within the Middle Rio Grande Basin today is complex (Bartolino and Cole 2002). The major hydrostratigraphic units in the aquifer are tabular and wedge-shaped bodies that are truncated and displaced by numerous faults. Few of the major units are present continuously throughout all three subbasins, and most “pinch out” against the subsurface basement blocks that separate the subbasins. These major units are hundreds to thousands of feet thick, extend over tens of square miles, and primarily consist of unconsolidated and partially cemented deposits that interfinger in complex arrangements.

Prior to development of water resources in the Albuquerque area, groundwater flow direction in the Albuquerque Basin generally was from the north to the south, with a westward component of flow from recharge areas along mountain-front boundaries to the east (Bartolino and Cole 2002). As the Santa Fe Group aquifer has been developed as a source for municipal and industrial water supplies, groundwater flow directions have been altered toward pumping centers to the north of TA-V. Regional discharge occurs as groundwater moves out of the Albuquerque Basin into downgradient basins on the Rio Grande Rift as underflow or through discharge to the Rio Grande.

Contaminant transport at TA-V is constrained by geologic features. The stratigraphic units of hydrologic significance consist of the alluvial-fan lithofacies and Ancestral Rio Grande (ARG) lithofacies. TA-V is largely underlain by a thick section of alluvial-fan deposits. These deposits consist of the alluvial-fan lithofacies of the Santa Fe Group overlain by post-Santa Fe Group alluvial-fan deposits. The deepest monitoring well in the study area (AVN-1) penetrated 650 ft of these deposits. The total thickness of deposits at TA-V is not known.

The alluvial-fan lithofacies is further subdivided into lower and upper sections. The lower section consists of a fine-grained, clay-rich unit. This unit has been identified as low-energy piedmont deposits derived from upland soil that developed during a preglacial humid climate. The upper section consists of relatively coarse-grained sediments deposited in a higher-energy environment. The water table of the Santa Fe Group aquifer at TA-V is located in the fine-grained lower unit of alluvial-fan deposits. The post-Santa Fe Group alluvial-fan deposits blanket the area around TA-V and compose the upper few tens of feet of the vadose zone. These deposits were derived primarily from alluvial fans that developed from Coyote Canyon to the east.

The ARG deposits interfinger with alluvial-fan deposits west of TA-V. These deposits consist predominantly of uniformly coarse sand and gravel that were deposited with the integration of the Rio Grande drainage system.

5.1.7.2 Hydrologic Conditions at the TA-V Study Area

Direct precipitation may provide one possible source of local recharge. The average annual precipitation at TA-V is 8.7 inches (SNL April 2004a). Much of this precipitation is derived from summer thunderstorms that occur between July and October. Because the rate of evapotranspiration in the Albuquerque area greatly exceeds precipitation, this source of recharge is considered to be minimal as a mechanism for transporting contaminants through the thick vadose zone at TA-V. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

The Tijeras Arroyo and Arroyo del Coyote are located north and northeast of TA-V, respectively. The flow of surface water in the arroyo consists of brief ephemeral flows from mountainous drainages to the east. Part of the recharge derived from infiltration of these flows is returned to the atmosphere through processes of evapotranspiration. Some water that infiltrates the arroyo channels may move past the root zone and provide some local recharge. But the distances between these ephemeral channels and TA-V precludes a significant effect on local groundwater flow and potential contaminant transport.

The vadose zone at TA-V, consisting of approximately 500 ft of unconsolidated to semiconsolidated alluvial-fan sediments, forms the potential pathway for COC transport from contaminant sources to the aquifer. Upper sections of the alluvial-fan sediments are relatively coarse-grained, becoming fine-grained and clay-rich with depth.

The unsaturated and saturated hydraulic properties of the vadose zone at TA-V are highly variable and anisotropic because of the heterogeneous textures, lenticularity, layering, and variations in carbonate cementation. Disposal of large volumes of wastewater from the LWDS drain field, the LWDS surface impoundments, and the TA-V seepage pits may occur along preferential pathways of saturated or nearly saturated flow through the thick vadose zone to the aquifer. Rapid vertical flow through the discontinuous, layered, lenticular sediments in the vadose zone may be somewhat attenuated or diverted at horizons of contrasting hydraulic properties. Discharge of wastewater to the drain field was discontinued in 1967. Discharge to the surface impoundments and seepage pits was discontinued in 1972 and 1992, respectively.

No evidence of groundwater perching has been observed at TA-V. Based on moisture content measurements in vadose-zone sediment samples, drainage of residual water from the vadose zone to the aquifer was rapid after discharge ceased; minimal moisture from wastewater discharge at TA-V probably remains in the vadose zone.

The wide range of hydraulic conductivity estimates derived from aquifer tests at TA-V is attributed to the textural heterogeneities associated with the alluvial-fan lithofacies. The average horizontal hydraulic conductivity for these sediments is estimated to be about 1.24×10^{-4} ft per minute (SNL March 1999a).

Vertical hydraulic conductivity is estimated to be one-tenth to one-hundredth the horizontal hydraulic conductivity.

5.1.7.3 Local Direction of Flow

Water levels measured in 13 monitoring wells were used to construct a map of the regional-aquifer potentiometric surface at TA-V (Figure 5-3). Groundwater elevations presented on this map reflect revised survey coordinates. Until recently, ER Operations survey coordinates were based on the New Mexico State Plane Coordinate System, Central Zone, North American Datum of 1927 and Northern Geographic Vertical Datum of 1929 for elevations. In order to be consistent with current SNL/NM Facilities and KAFB surveying practices, ER Operations survey data now are based on New Mexico State Plane Coordinate System, Central Zone, North American Datum of 1983 (NAD83) and North American Vertical Datum of 1988 (NAVD88). Location data for wells surveyed before August 2010 has been mathematically converted to the new NAD83/NAVD88 coordinates using National Geodetic Survey-approved software.

The potentiometric surface indicates that the regional groundwater flow beneath TA-V is generally to the northwest. Localized flow paths are to the west and southwest. The horizontal gradient ranges from approximately 0.0007 to 0.002 feet per foot. Calculated groundwater flow velocities based on aquifer testing range from 4 to 10 ft/yr (SNL March 1999a). Water-table contours for October 2011 suggest that a subtle groundwater mound is present at TA-V. This apparent groundwater mound is considered to be an artifact of regional water level declines within a heterogeneous aquifer and does not represent residual mounding from wastewater disposal that was discontinued in the early 1990s (SNL March 1999a).

Water-level data indicate that groundwater flow to the west of TA-V turns sharply to the north, moving toward Albuquerque Bernalillo County Water Utility Authority (ABCWUA) pumping centers located north of KAFB and KAFB water-supply wells. The sharp change in flow direction coincides with the location of coarse, uniformly sorted ARG sediments. These sediments are much more permeable than the fine-grained sediments of the alluvial-fan lithofacies at TA-V and permit more rapid flow.

Vertical flow gradients in the regional aquifer within the TA-V study area are strongly downward. Historically, water levels in the regional aquifer have been declining at a rate approaching 1.3 ft/yr (Attachment 5C, Figures 5C-1 and 5C-2).

5.1.7.4 Contaminant Sources

Contaminant migration in the subsurface at TA-V is controlled by local recharge to the Santa Fe Group aquifer and by the permeability of the sedimentary units in the vadose zone and aquifer. Possible sources of recharge include infiltration of wastewater disposed of at TA-V, areal precipitation, and ephemeral flows in nearby arroyos.

The majority of wastewater discharged at TA-V occurred at SWMUs 4, 5, and 275. Table 5-3 identifies the dates of disposal and estimated disposal volumes. After 1992, wastewater was diverted to the ABCWUA sanitary sewer system.

Sampling and analysis have been conducted in the vadose zone to characterize the presence of COCs. Locations of investigations are based on possible source terms (Table 5-3). Overall, the presence of COCs in the vadose zone is minimal. Movement of water and contaminant transport through the vadose zone occurred rapidly, and vadose zone drainage occurred soon after cessation of wastewater disposal.

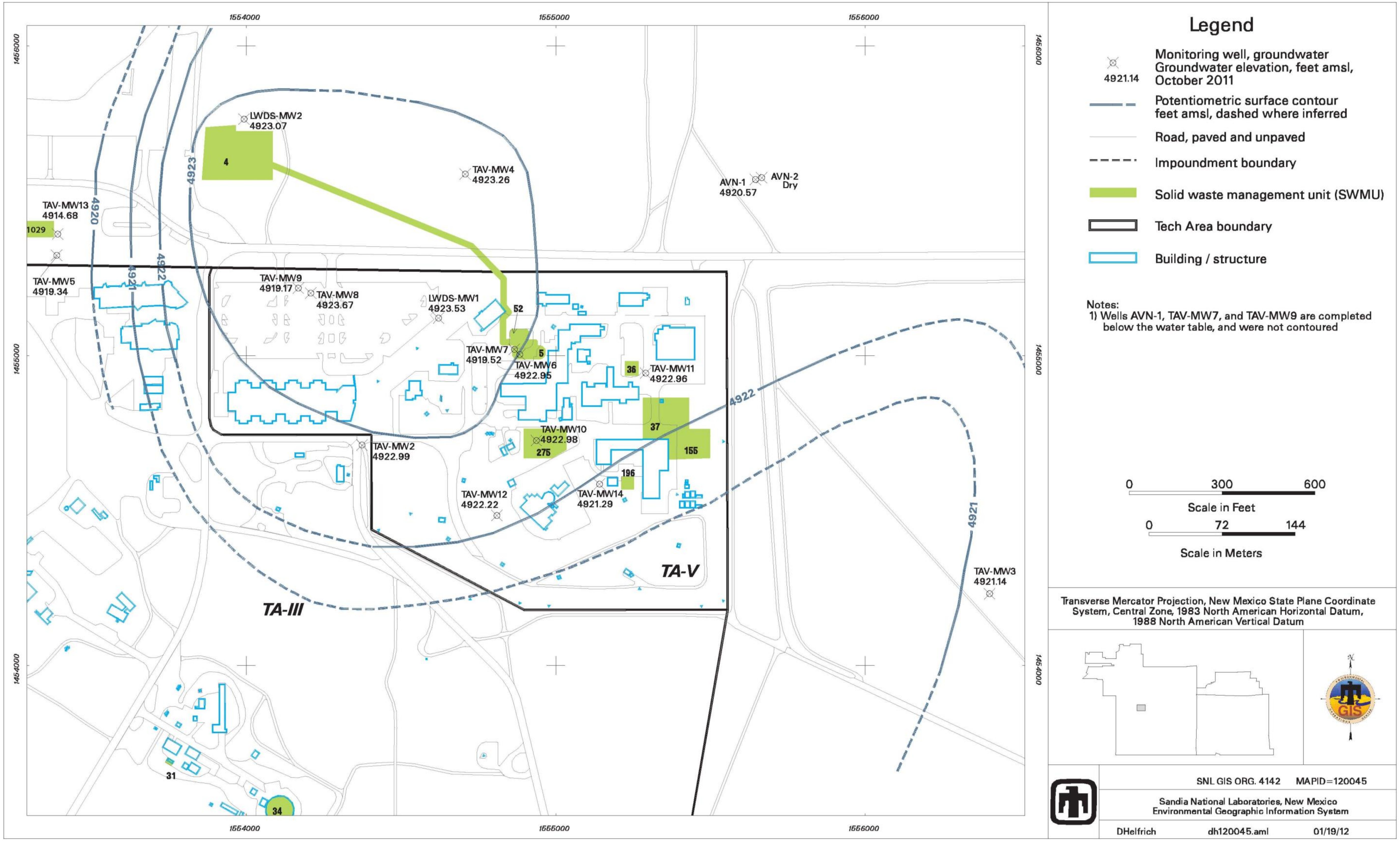

Figure 5-3. TA-V Study Area Potentiometric Surface Map (October 2011)

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Table 5-3. Wastewater Disposal History at TA-V

Disposal Site	Dates	Estimated Volume of Wastewater (gal.)
SWMU 275 – TA-V Seepage Pits	1960s–1992	30 to 50 million
SWMU 5 – LWDS Drain Field	1962–1967	6.5 million
SWMU 4 – LWDS Surface Impoundments	1967–1972	12 million

NOTES:
gal. = Gallon(s).
LWDS = Liquid Waste Disposal System.
SWMU = Solid Waste Management Unit.
TA-V = Technical Area V.

Within the LWDS drain field, trace quantities of TCE, tetrachloroethene (PCE), and benzene were detected in shallow borehole soil-vapor samples collected during 1994 (SNL March 1999a). The possibility of vadose zone contamination was further investigated with the installation of wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 in March and April 2001. The results for soil and soil-vapor samples show no significant residual soil contamination in the vadose zone. Also, no results have shown evidence of excessive moisture in the vadose zone sediments; therefore, no significant residual contaminated water is present in the vadose zone beneath the LWDS drain field (SNL October 2001).

In the vicinity of the TA-V seepage pits, trace quantities of TCE, PCE, benzene, toluene, and total xylene were detected in shallow and deep vadose-zone borehole soil-vapor samples collected during passive, surficial characterization studies conducted during 1994 and 1995. Vapor-phase TCE was detected at 44 parts per billion (by volume) at a depth of 80 ft below ground surface in TAV-BH-01 (SNL March 1999a). Solvent disposals to the seepage pits were most likely reduced in the early 1980s (SNL March 1999a), but wastewater disposal continued. This likely flushed into the aquifer any residual COCs that may have been present in the vapor and aqueous phase in the vadose zone.

Other surface contamination sites have been investigated at TA-V. Investigations have included surficial and subsurficial passive and active vapor-phase sampling for COCs. Sampling results have shown that these other sites probably have not contributed to groundwater contamination. For example, only trace quantities of TCE, methylene chloride, trichloroethane, benzene, and toluene were detected in shallow soil samples collected at SWMU 196 (Building 6597 cistern).

Because TCE is volatile and the vapors are denser than ambient air, the physical properties of TCE are conducive to vapor transport; therefore, vapor transport in the vadose zone is a possible mechanism for the presence of TCE in the aquifer. Some TCE will typically be retained in the vadose zone due to adsorption onto fine-grained materials and capillary forces.

Three physical processes, occurring in the vadose zone, affect the potential migration of TCE into the regional aquifer as follows:

- Vaporization from the water source
- Transport to and through the capillary fringe
- Adsorption onto fine-grained materials below the water table

Nitrate is present primarily in the aqueous phase in both the vadose zone and aquifer. It is nonsorptive and, for the most part, does not exchange on sediment surfaces in the vadose zone or groundwater.

Therefore, any locally derived nitrate most likely was transported through the vadose zone with the initial discharges of wastewater.

5.1.7.5 Contaminant Distribution and Transport in Groundwater

Distribution and transport of COCs and aquifer parameters are discussed in this section. TCE is present in low concentrations in the Santa Fe Group aquifer beneath TA-V. The highest TCE concentrations are not directly under the drain field source; rather, the highest concentrations have migrated in the localized direction of groundwater flow. The TCE distribution depicted in Figure 5-4 shows that the center of the TCE mass is located about 100 ft west of the SWMU 5 drain field and about 150 ft northwest of the SWMU 275 seepage pits.

Maximum historical TCE concentrations reported at TA-V were 23 to 26 μg/L for LWDS-MW1 on November 13, 2000. TCE has consistently exceeded the MCL at LWDS-MW1 since 1993, and concentrations at TAV-MW6, TAV-MW10, TAV-MW12, and TAV-MW14 have exceeded the MCL during recent sampling events (Section 5.6). TCE has been found only in water-table completion wells and has not been detected 100 ft below the water table based on data collected from deep wells TAV-MW7, TAV-MW9, and TAV-MW13.

Nitrate is present in groundwater in all wells at TA-V, generally at concentrations ranging from less than 5 to more than 10 mg/L (Figure 5-5). Nitrate concentrations have exceeded the MCL in samples from AVN-1, AVN-2, LWDS-MW1, TAV-MW5, and TAV-MW10, although concentrations do not appear to be increasing over time. The highest reported concentrations for TA-V wells include the following:

- 13 mg/L for AVN-1 on May 14, 2001
- 16 mg/L for AVN-2 on October 27, 1999
- 13 mg/L for TAV-MW5 on August 18, 1999
- 13.7 mg/L for TAV-MW10 on October 20, 2010
- 19 mg/L for LWDS-MW1 on November 13, 2000, and February 16, 2001

Upgradient wells AVN-1 and AVN-2 were completed at different depths and show relatively consistent nitrate concentrations with depth and over time.

The source of nitrate in water from TA-V wells is unknown. Some nitrate may have been disposed of to the subsurface in TA-V sanitary wastes; however, nitrate concentrations exceeding the MCL in the AVN wells suggests that the source of nitrate is regionally upgradient and to the northeast of TA-V. The background nitrate concentration is 4 mg/L.

5.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM ER Operations as well as implements and enforces federal regulations mandated by the Resource Conservation and Recovery Act (RCRA). All ER SWMUs and Areas of Concern (AOCs) are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA for Sandia National Laboratories* (NMED 1993).

All corrective action requirements pertaining to the TA-V study area are contained in the Order (NMED April 2004). Groundwater characterization for TA-V was initiated to satisfy the requirements of the SNL/NM HSWA Permit for characterization of SWMUs. The groundwater monitoring activities for the TA-V study area are not associated with a single SWMU but are more regional in nature and have historically been voluntarily conducted by SNL/NM ER Operations.

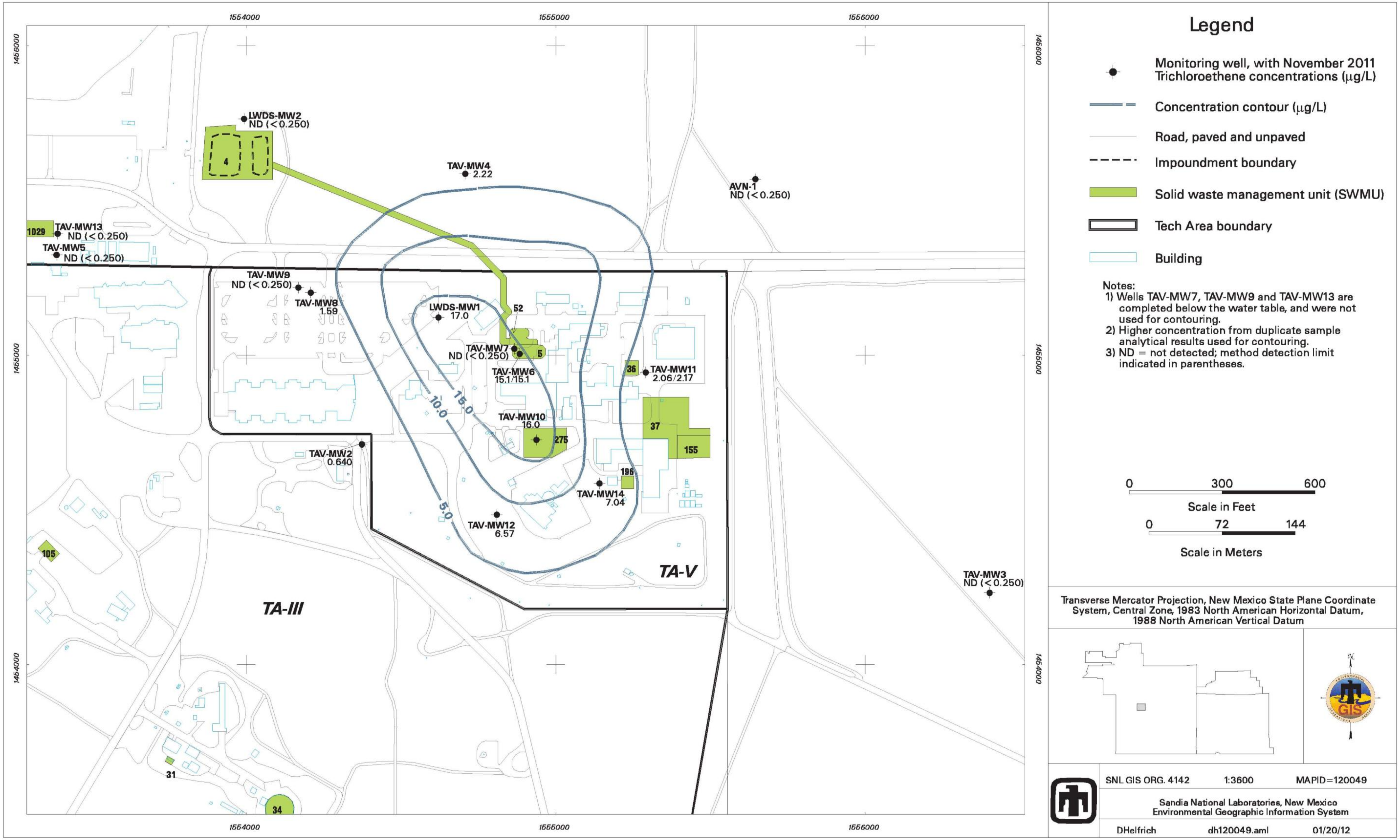

Figure 5-4. Distribution of TCE in Groundwater at SNL/NM TA-V, November 2011

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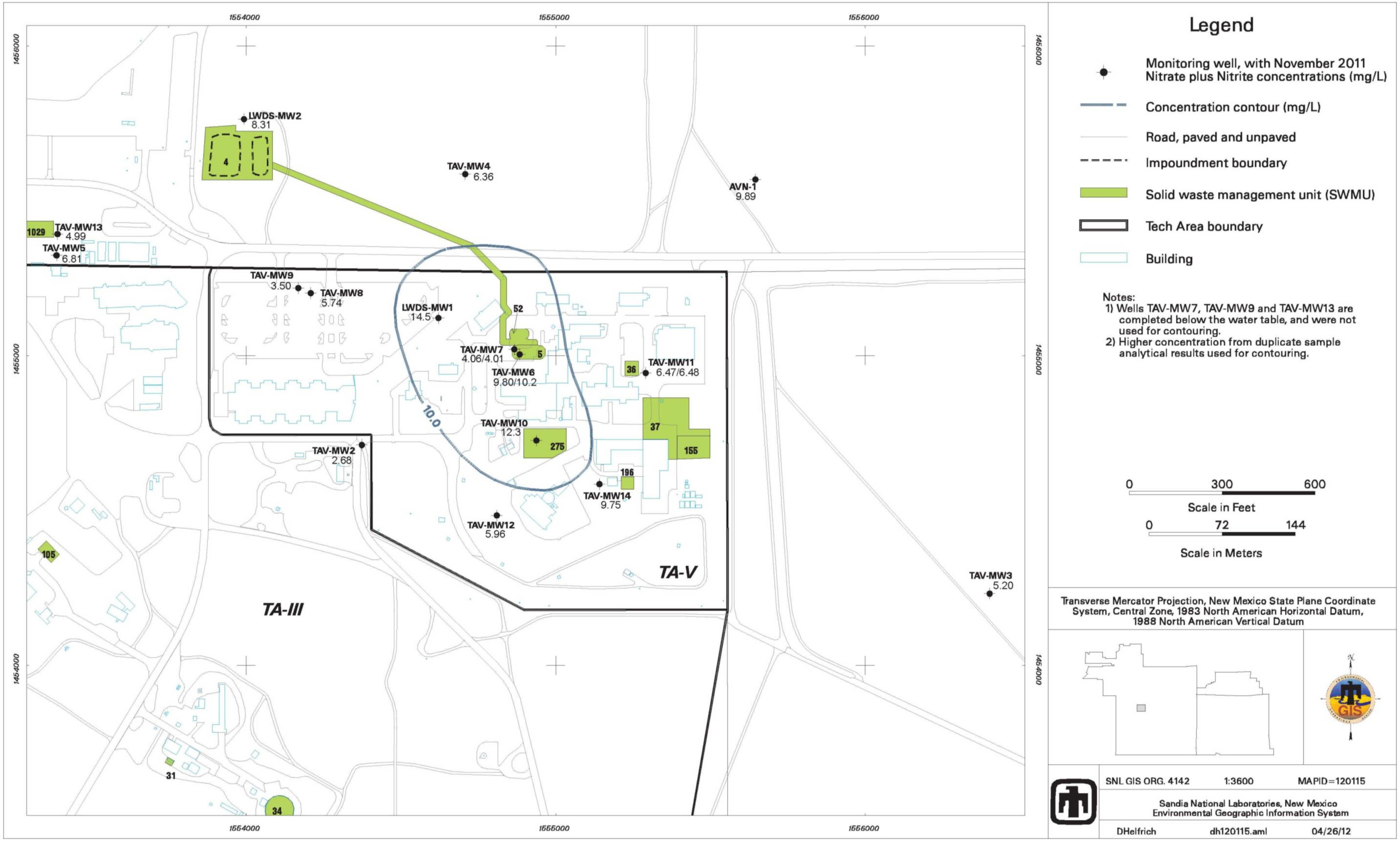

Figure 5-5. Distribution of Nitrate plus Nitrite Results in Groundwater at SNL/NM TA-V, November 2011

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The Order, which became effective in April 2004, transferred regulatory authority for corrective action requirements from the HSWA Module of the SNL/NM RCRA permit to the Order (NMED April 2004). The TA-V investigations must comply with requirements set forth in the Order for site characterization and development of a CME. The Order also contains schedules that define dates for the delivery of plans and reports related to TA-V.

Although the Order requires that the DOE and Sandia evaluate the nature and extent of contamination in the TA-V study area, no specific reporting requirements are prescribed in the Order. Sandia continues to present TA-V data with the data from other groundwater sites in the SNL/NM Annual Groundwater Monitoring Report. The outline of this report is based on the required elements of a "Periodic Monitoring Report" described in Section X.D. of the Order (NMED April 2004).

In this report TA-V groundwater monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE and Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order. Additional information on radionuclides and the scope of the Order is available in Section III.A of the Order (NMED April 2004).

5.3 Scope of Activities

The activities for the TA-V investigation for CY 2011, including plans and reports, are listed in Section 5.1.5. The field activities completed in the study area include soil-vapor monitoring well installation, groundwater level measurements, and soil-vapor and groundwater monitoring. The CY 2011 sampling events (four quarterly events) are summarized in Table 5-4, and the analytical parameters for each well for each sampling event are listed in Table 5-5.

Table 5-4. Groundwater Monitoring Well Network and Sampling Dates for the TA-V Study Area, Calendar Year 2011

Date of Sampling Event	Wells Sampled	SAP
January 2011	AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW4, TAV-MW6, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14	*TA-V Groundwater Monitoring Mini-SAP for Second Quarter, Fiscal Year 2011* (SNL December 2010)
April 2011	AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW3, TAV-MW4, TAV-MW5, TAV-MW6, TAV-MW7, TAV-MW8, TAV-MW9, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14	*TA-V Groundwater Monitoring Mini-SAP for Third Quarter, Fiscal Year 2011* (SNL March 2011)
July 2011	AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW4, TAV-MW6, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14	*TA-V Groundwater Monitoring Mini-SAP for Fourth Quarter, Fiscal Year 2011* (SNL June 2011b)
November 2011	AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW3, TAV-MW4, TAV-MW5, TAV-MW6, TAV-MW7, TAV-MW8, TAV-MW9, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14	*TA-V Groundwater Monitoring Mini-SAP for First Quarter, Fiscal Year 2012* (SNL October 2011)

NOTES:
SAP = Sampling and Analysis Plan.
TA-V = Technical Area V.

Table 5-5. Parameters Sampled at TA-V Wells for Each Sampling Event, Calendar Year 2011

Parameter	January 2011	Parameter	April 2011
Alkalinity Calcium, total Chloride Iron, dissolved Magnesium, total Manganese, dissolved NPN Potassium, total Sodium, total Sulfate Sulfides Total Organic Carbon VOCs	AVN-1 LWDS-MW1 LWDS-MW2 LWDS-MW2 (dup) TAV-MW2 TAV-MW4 TAV-MW6 TAV-MW8 TAV-MW10 TAV-MW11 TAV-MW12 TAV-MW13 TAV-MW13 (dup) TAV-MW14	Alkalinity Anions Gamma Spec* Gross Alpha Gross Beta Iron, dissolved Manganese, dissolved NPN Sulfides TAL Metals, plus Total Uranium Total Organic Carbon Tritium VOCs	AVN-1 LWDS-MW1 LWDS-MW2 TAV-MW2 TAV-MW3 TAV-MW4 TAV-MW5 TAV-MW6 TAV-MW6 (dup) TAV-MW7 TAV-MW7 (dup) TAV-MW8 TAV-MW9 TAV-MW10 TAV-MW11 TAV-MW12 TAV-MW12 (dup) TAV-MW13 TAV-MW14
Perchlorate	TAV-MW11 TAV-MW12 TAV-MW13 TAV-MW13 (dup) TAV-MW14	Perchlorate	TAV-MW11 TAV-MW12 TAV-MW12 (dup) TAV-MW13 TAV-MW14

Parameter	June 2011	Parameter	November 2011
Alkalinity Calcium, total Chloride Iron, dissolved Magnesium, total Manganese, dissolved NPN Potassium, total Sodium, total Sulfate Sulfides Total Organic Carbon VOCs	AVN-1 LWDS-MW1 LWDS-MW2 TAV-MW2 TAV-MW2 (dup) TAV-MW4 TAV-MW6 TAV-MW8 TAV-MW10 TAV-MW11 TAV-MW12 TAV-MW13 TAV-MW13 (dup) TAV-MW14	Alkalinity Calcium, total Chloride Iron, dissolved Magnesium, total Manganese, dissolved NPN Potassium, total Sodium, total Sulfate Sulfides Total Organic Carbon VOCs	AVN-1 LWDS-MW1 LWDS-MW2 TAV-MW2 TAV-MW3 TAV-MW4 TAV-MW5 TAV-MW6 TAV-MW6 (dup) TAV-MW7 TAV-MW7 (dup) TAV-MW8 TAV-MW9 TAV-MW10 TAV-MW11 TAV-MW11 (dup) TAV-MW12 TAV-MW13 TAV-MW14
Perchlorate	TAV-MW11 TAV-MW12 TAV-MW13 TAV-MW14 TAV-MW14 (dup)	Perchlorate	TAV-MW11 TAV-MW11 (dup) TAV-MW12 TAV-MW13 TAV-MW14

NOTES:

dup = Duplicate sample.
Gamma Spec* = Gamma spectroscopy short list (Americium-241, Cesium-137, Cobalt-60, and Potassium-40).
NPN = Nitrate plus nitrite (reported as nitrogen).
TAL = Target Analyte List.
TA-V = Technical Area V.
VOC = Volatile organic compound.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, split, equipment blank (EB), and trip blank (TB) samples. Field QC samples are used to monitor the sampling process. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. TB samples are used to determine whether volatile organic compounds (VOCs) contaminated the sample during preparation, transportation, or handling prior to receipt by the analytical laboratory.

5.4 Field Methods and Measurements

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

5.4.1 Groundwater Elevation

Throughout CY 2011, water level measurements were obtained to determine groundwater flow directions, hydraulic gradients, and changes in water table elevations. Water levels are periodically measured in TA-V groundwater monitoring wells according to the instructions and requirements of SNL/NM Field Operating Procedure (FOP) 03-02, *Groundwater Level Data Acquisition and Management*, (SNL November 2009b and February 2011). The water level information was used to develop the potentiometric surface map presented in Figure 5-3 and the hydrographs presented in Figures 5C-1 through 5C-3 (Attachment 5C).

5.4.2 Well Purging and Water Quality Measurements

A Bennett™ groundwater sampling system (a nitrogen gas-powered portable piston pump) was used to collect the groundwater samples from TA-V wells. The wells are purged a minimum of one saturated screen volume. Field water quality measurements for turbidity, pH, temperature, specific conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO) were recorded for each well prior to the collection of groundwater samples, according to SNL/NM FOP 05-01 (SNL November 2009c). Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

The amount of water required to achieve stability of field parameters is fairly consistent. However, the ability of the aquifer to produce water varies greatly from well to well. In accordance with the Mini-Sampling and Analysis Plans (SAPs) (Table 5-4), purging continues until four stable measurements for temperature, SC, pH, and turbidity are obtained.

Groundwater stability is considered acceptable when measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, pH is within 0.1 units, temperature is within 1.0 degree Celsius, and SC is within 5 percent. Associated Field Measurement Logs documenting details of well purging and water quality measurements for each sampling event have been submitted to the SNL/NM Records Center.

5.4.3 Pump Decontamination

The Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in *Long-Term Environmental Stewardship (LTES) Groundwater Sampling Equipment Decontamination,* SNL/NM FOP 05-03 (SNL November 2009d). An EB or rinsate sample was collected to verify the effectiveness of the equipment decontamination process.

5.4.4 Sample Collection Sampling Procedures

Groundwater samples are collected using the Bennett™ pump in accordance with SNL/NM FOP 05-01 (SNL November 2009c). Sample bottles are filled directly from the pump discharge line and water sampling manifold, with the VOC samples collected at the lowest achievable discharge rate.

5.4.5 Sample Handling and Shipment

The SNL/NM Sample Management Office (SMO) processes environmental samples collected by LTS/ER Operations personnel. The SMO staff reviews the Mini-SAPs, orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced into laboratory processes and procedures. These include method blanks, laboratory control samples (LCSs), matrix spike, matrix spike duplicate, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review, SMO-05-03, Issue 04,* (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data*, (SNL July 2007 and May 2011).

5.4.6 Waste Management

Purge and decontamination water generated from sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04 (SNL November 2009e) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Associated environmental sampling results provide supplemental data for approval to discharge water to the sanitary sewer. All data were compared with ABCWUA discharge limits.

5.5 Analytical Methods

All groundwater samples were analyzed by off-site laboratories using EPA-specified protocols. Groundwater samples were submitted to GEL Laboratories LLC for analysis. Samples were analyzed in accordance with applicable EPA analytical methods (Tables 5-6 and 5-7).

5.6 Summary of Analytical Results

This section discusses monitoring results, exceedances of standards, and pertinent trends in concentrations for COCs in the TA-V study area that exceed standards. The analytical results and field measurements for all TA-V sampling events are presented in Attachment 5A, Tables 5A-1 through 5A-10; concentration trend plots for COCs that exceed the MCLs are presented in Attachment 5B, Figures 5B-1 through 5B-9. A summary of detected VOC results are presented in Table 5A-1. The method detection limits (MDLs) for all analyzed VOCs are listed in Table 5A-2.

The VOCs detected at low concentrations in groundwater samples from TA-V study area monitoring wells include the following:

- Chloroform
- cis-1,2-Dichloroethene
- TCE

Table 5-6. TA-V Study Area Chemical Analytical Methods

Analyte	Analytical Method[a,b,c,d,e]
Alkalinity	SM2320B
Anions	SW846-9056
NPN	EPA 353.2
Perchlorate	EPA 314.0
Sulfide	SW846-9034
TAL Metals, plus Uranium	SW846-6020/7470
Total Organic Carbon	SW846-9060
VOCs	SW846-8260

NOTES: [a]EPA, 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1 (and all updates), U.S. Environmental Protection Agency, Washington, D.C.
[b]EPA, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.
[c]EPA, 1999, *Perchlorate in Drinking Water Using Ion Chromatography*, EPA 815/R-00-014.
[d]EPA, 1984, *Methods for Chemical Analysis of Water and Wastes,* EPA 600-4-79-020.
[e]EPA, Washington, D.C.; or Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater, 20th ed., Method 2320B.*
EPA = U.S. Environmental Protection Agency.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard Method.
SW = Solid Waste.
TAL = Target analyte list.
TA-V = Technical Area V.
VOC = Volatile organic compound.

Table 5-7. TA-V Study Area Radiochemical Analytical Methods

Analyte	Analytical Method[a]
Gamma Spectroscopy (short list)	EPA 901.0
Gross Alpha/Beta Activity	EPA 900.0
Tritium	EPA 906.0

NOTES: [a]EPA, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
EPA = U.S. Environmental Protection Agency.
TA-V = Technical Area V.

Three VOCs were detected during CY 2011. Two of these VOCs have promulgated MCLs. Only TCE exceeds its corresponding MCL, which is 5 µg/L (Table 5A-1). TCE was detected above the MCL in samples from five wells: LWDS-MW1, TAV-MW6, TAV-MW10, TAV-MW12, and TAV-MW14. The maximum concentration of TCE detected during this reporting period is 17.1 µg/L in the sample from TAV-MW6 collected in July 2011. Figures 5B-3, 5B-5, 5B-7, 5B-8, and 5B-9 (Attachment 5B) show that, over the lifetime of the wells, the TCE concentrations are decreasing over time in LWDS-MW1 and increasing over time in TAV-MW6, TAV-MW10, TAV-MW12, and TAV-MW14.

The analytical results for nitrate plus nitrite (NPN) (reported as nitrogen) are presented in Table 5A-3 (Attachment 5A). During this reporting period, NPN results exceed the MCL of 10 mg/L in samples from AVN-1, LWDS-MW1, TAV-MW6, and TAV-MW10. The maximum concentration of NPN detected during this reporting period is 14.5 mg/L in the sample collected from LWDS-MW1 in November 2011. Figure 5B-1 (Attachment 5B) shows that NPN concentrations in AVN-1 have exceeded the MCL only rarely with the trend increasing over time. Figure 5B-2 (Attachment 5B) shows that the NPN concentrations in LWDS-MW1 typically have exceeded the MCL, with stable concentrations to slightly decreasing concentrations over time. Figure 5B-4 (Attachment 5B) shows that NPN concentrations in TAV-MW6 first exceeded the MCL in 2011 with the trend increasing over time. Figure 5B-6

(Attachment 5B) shows that NPN concentrations in TAV-MW10 have slightly exceeded the MCL with the trend increasing over time.

The analytical results for anions (bromide, chloride, fluoride, and sulfate) are presented in Table 5A-4 (Attachment 5A). Only fluoride has a promulgated MCL, and none of the results exceed the fluoride MCL.

Total organic carbon (TOC) results are presented in Table 5A-5; no MCLs are established for TOC.

The analytical results for perchlorate are presented in Table 5A-6; no perchlorate was detected in any of the groundwater samples analyzed in CY 2011.

Total metal results are presented in Table 5A-7, and filtered total metal results are presented in Table 5A-8; no metal results exceed established primary or secondary MCLs.

Tritium, gross alpha/beta activity, and gamma spectroscopy results are presented in Table 5A-9; all radionuclide results are below established MCLs.

Field water quality parameters were measured during purging of each well prior to sampling and included temperature, SC, ORP, pH, turbidity, and DO. The parameter measurements obtained immediately before sample collection are presented in Table 5A-10.

5.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011). Although some analytical results were qualified during the data validation process, no significant data quality problems were noted for TA-V COCs during CY 2011 sampling events. Data validation qualifiers are presented with the analytical results in Tables 5A-1 through 5A-9 (Attachment 5A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center. The results for each QC sample and the impact on data quality for the TA-V quarterly sampling events are discussed in the following sections.

5.7.1 Field Quality Control Samples

Field QC samples included environmental duplicate, EB, and TB samples. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAPs (SNL December 2010, March 2011, June 2011b, and October 2011).

5.7.1.1 Duplicate Environmental Samples

Duplicate environmental samples were analyzed to estimate the overall reproducibility of the sampling and analytical process. A duplicate environmental sample is collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The results for duplicate environmental sample analyses (detected parameters only) are used to calculate relative percent difference (RPD) values. Duplicate sampling results for all wells and all sampling periods show good correlation (RPD values of less than 20) for all calculated parameters except for two analytes. The RPD for bromide in samples from TAV-MW12 was calculated at 51 during the April sampling event, and the RPD for bicarbonate alkalinity in samples from TAV-MW7 was calculated at 59 during the November sampling event.

5.7.1.2 Equipment Blank Samples

The Bennett™ pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in SNL/NM FOP 05-03 (SNL November 2009d). An EB or rinsate sample was collected to verify the effectiveness of the equipment decontamination process. The results for the EB analyses are as follows:

- **January 2011 Sampling Event—**EB samples were collected prior to sampling LWDS-MW2 and TAV-MW13 and submitted for all analyses. Alkalinity, bromodichloromethane, carbon disulfide, chloride, chloroform, chloromethane, dibromochloromethane, sulfate, and TOC were detected in the EB samples. No corrective action was required, with the exception of carbon disulfide and TOC, because these analytes were either not detected in environmental samples or detected at concentrations greater than five times the blank result. Carbon disulfide was detected in the TAV-MW13 EB sample at a concentration of 1.66 μg/L. The result for carbon disulfide was qualified as not detected during data validation in the TAV-MW13 duplicate sample, because the associated result is less than five times the EB sample result. TOC was detected in both EB samples at concentrations similar to the environmental sample results. The results for TOC in samples from LWDS-MW2 and TAV-MW13 were qualified as not detected during data validation because the environmental results are less than five times the EB sample results. TOC in EB samples can be attributed to the deionized water purification process.

- **April 2011 Sampling Event—**EB samples were collected prior to sampling TAV-MW6, TAV-MW7, and TAV-MW12 and submitted for all analyses. Arsenic, bicarbonate alkalinity, bromodichloromethane, bromoform, chloride, chloroform, copper, dibromochloromethane, sodium, sulfate, and TOC were detected in the EB samples. No corrective action was required, with the exceptions of arsenic, copper, and TOC, because these analytes were either not detected in environmental samples or detected at concentrations greater than five times the blank result. Arsenic was detected in the TAV-MW12 EB sample at a concentration of 0.00198 mg/L. The result for arsenic was qualified as not detected during data validation in the TAV-MW12 environmental sample only, because the associated result is less than five times the EB sample result. Copper and TOC were detected in all EB samples at concentrations similar to those reported for the environmental sample results. The results for copper and TOC in the TAV-MW6, TAV-MW7, and TAV-MW12 samples were qualified as not detected during data validation because environmental results are less than five times the EB sample results.

- **July 2011 Sampling Event—**EB samples were collected prior to sampling TAV-MW2 and TAV-MW14 and submitted for all analyses. Alkalinity, bromodichloromethane, carbon disulfide, chloride, chloroform, dibromochloromethane, sodium, and sulfate were detected in EB samples. No corrective action was required, because these analytes were either not detected in the environmental samples or detected at concentrations greater than five times the blank result.

- **November 2011 Sampling Event—**EB samples were collected prior to sampling TAV-MW6, TAV-MW7, and TAV-MW11 and submitted for all analyses. Alkalinity, bromodichloromethane, bromoform, chloride, chloroform, dibromochloromethane, iron, and sulfate were detected in the EB samples. No corrective action was required for these parameters, with the exception of iron. The results for iron in both the TAV-MW11 environmental and duplicate environmental samples were qualified as not detected during data validation, because the reported values are less than five times the EB concentration.

5.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analysis to assess whether contamination of the samples has occurred during shipment and storage. TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-milliliter volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. TBs were brought to the field and accompanied each sample shipment. No VOCs were detected above laboratory MDLs in any TB sample, except methylene chloride in two TB samples associated with April 2011 environmental samples. No corrective action was necessary, as methylene chloride was not detected in the associated environmental samples.

5.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate LCSs were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011). Laboratory data qualifiers are provided with the analytical results in Tables 5A-1 through 5A-9 (Attachment 5A).

5.8 Variances and Nonconformances

No variances or nonconformances from requirements specified in the TA-V Mini-SAPs were identified during CY 2011 sampling activities. However, a project-specific issue associated with these sampling events was noted during all sampling events. Monitoring well LWDS-MW1 was purged dry prior to minimum volume and stability requirements. This well was allowed to recover and then sampled to collect a representative groundwater sample given the low yield of this well. Also, previous to the July 2011 sampling event, TOC was detected in EB samples at concentrations similar to those reported for environmental sample results. In July 2011, a field blank sample for TOC was requested to test the quality of the deionized water, and no TOC was detected above the MDL in this sample.

5.9 Summary and Conclusions

The conceptual site model of contaminant transport at TA-V includes release from the two primary sources, migration through the vadose zone, and movement into and along with groundwater. TCE and other organic chemicals were present in wastewater that was discharged to the underground LWDS drain field during the period from 1962 to 1967, and to the TA-V seepage pits from the 1960s until the early 1980s when disposal practices were modified to protect the environment. Wastewater discharged to the seepage pits from the early 1980s until 1992 contained no TCE.

Wastewater containing dissolved concentrations of TCE and other organic chemicals moved rapidly through the alluvial-fan lithofacies into the aquifer. Upon cessation of disposal, vertical pathways to the aquifer drained rapidly. Continued flushing of the vadose zone beneath the seepage pits that occurred until 1992 removed a significant portion of residual COCs present in the vadose zone. Rapid drainage and continued flushing removed significant secondary contaminant sources. Low concentrations of TCE present in the aquifer today represent these initial wastewater releases. The combined effect of low groundwater velocities, dispersion, and dilution are responsible for the current distribution of TCE in the regional aquifer.

Nitrate concentrations in groundwater at TA-V are primarily derived from unknown upgradient sources. During this reporting period, NPN results exceed the MCL of 10 mg/L in samples from AVN-1, LWDS-MW1, TAV-MW6, and TAV-MW10. The maximum concentration of NPN detected during this reporting period is 14.5 mg/L in the sample collected from LWDS-MW1 in November 2011. TCE results exceed the MCL of 5 μg/L in samples from LWDS-MW1, TAV-MW6, TAV-MW10, TAV-MW12, and TAV-MW14. The maximum concentration of TCE detected during this reporting period is 17.1 μg/L in the sample from TAV-MW6 collected in July 2011.

The analytical results for this reporting period are consistent with historical detections. The following conclusions are based on a comprehensive review of available information for current groundwater contamination conditions in the TA-V study area:

- The primary COCs for the TA-V study area are TCE and nitrate.
- Based on the historical use and disposal of chlorinated solvents, the extent of TCE in groundwater is associated with multiple TA-V wastewater releases containing VOCs and the subsequent vapor-phase transport of these VOCs through the vadose zone to the water table.
- The distribution of low concentrations of TCE in the regional aquifer is principally attributed to the combined effect of low groundwater velocities, dispersion, and dilution.
- The distribution of nitrate above the background level is laterally widespread in the study area, but the lateral extent of nitrate above the MCL is limited.
- The primary sources of TCE and possibly nitrate in the TA-V study area consist of two wastewater disposal systems (SWMUs 5 and 275). An upgradient source of nitrate may be present.
- The current conceptual site model described in Section 5.1.7 does not require modification based on the analytical results for this reporting period.

Ongoing environmental studies of the TA-V study area include the following:

- Continue collecting groundwater samples at the 16 TA-V groundwater and 3 soil-vapor monitoring wells on a quarterly basis. At a minimum, the analytes for groundwater sampling will consist of VOCs and NPN.
- Continue obtaining periodic measurements of groundwater elevations in all TA-V monitoring wells.
- Continue reporting future TA-V investigation results in the SNL/NM Annual Groundwater Monitoring Report.

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Attachment 5A
Technical Area V
Analytical Results Tables

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Attachment 5A Tables

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Table 5A-1
Summary of Detected Volatile Organic Compounds, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW1	Trichloroethene	**12.8**	0.250	1.00	5.00			089940-001	SW846-8260B
24-Jan-11	cis-1,2-Dichloroethene	3.21	0.300	1.00	70.0			089940-001	SW846-8260B
TAV-MW2 12-Jan-11	Trichloroethene	1.06	0.250	1.00	5.00			089926-001	SW846-8260B
TAV-MW4	Chloroform	0.620	0.250	1.00	NE	J	1.0U	089928-001	SW846-8260B
13-Jan-11	Trichloroethene	2.17	0.250	1.00	5.00		J+	089928-001	SW846-8260B
TAV-MW6	Trichloroethene	**9.75**	0.250	1.00	5.00			089931-001	SW846-8260B
17-Jan-11	cis-1,2-Dichloroethene	1.78	0.300	1.00	70.0			089931-001	SW846-8260B
TAV-MW8 11-Jan-11	Trichloroethene	1.27	0.250	1.00	5.00			089924-001	SW846-8260B
TAV-MW10	Trichloroethene	**14.9**	0.250	1.00	5.00			089933-001	SW846-8260B
18-Jan-11	cis-1,2-Dichloroethene	2.23	0.300	1.00	70.0			089933-001	SW846-8260B
TAV-MW11 06-Jan-11	Trichloroethene	1.95	0.250	1.00	5.00			089917-001	SW846-8260B
TAV-MW12 19-Jan-11	Trichloroethene	**5.13**	0.250	1.00	5.00			089935-001	SW846-8260B
TAV-MW13 (Duplicate) 10-Jan-11	Carbon Disulfide	3.65	1.25	5.00	NE	J	5.00U	089922-001	SW846-8260B
TAV-MW14	Trichloroethene	**6.74**	0.250	1.00	5.00			089938-001	SW846-8260B
20-Jan-11	cis-1,2-Dichloroethene	0.560	0.300	1.00	70.0	J		089938-001	SW846-8260B
LWDS-MW1	Trichloroethene	**13.4**	0.250	1.00	5.00			090448-001	SW846-8260B
25-Apr-11	cis-1,2-Dichloroethene	3.10	0.300	1.00	70.0			090448-001	SW846-8260B
TAV-MW2 11-Apr-11	Trichloroethene	1.02	0.250	1.00	5.00			090427-001	SW846-8260B
TAV-MW4	Chloroform	0.600	0.250	1.00	NE	J		090438-001	SW846-8260B
19-Apr-11	Trichloroethene	1.99	0.250	1.00	5.00			090438-001	SW846-8260B
TAV-MW6	Trichloroethene	**13.8**	0.250	1.00	5.00			090452-001	SW846-8260B
26-Apr-11	cis-1,2-Dichloroethene	2.68	0.300	1.00	70.0			090452-001	SW846-8260B
TAV-MW6 (Duplicate)	Trichloroethene	**13.1**	0.250	1.00	5.00			090453-001	SW846-8260B
26-Apr-11	cis-1,2-Dichloroethene	2.54	0.300	1.00	70.0			090453-001	SW846-8260B
TAV-MW8 12-Apr-11	Trichloroethene	1.16	0.250	1.00	5.00			090429-001	SW846-8260B
TAV-MW10	Trichloroethene	**14.4**	0.250	1.00	5.00			090455-001	SW846-8260B
27-Apr-11	cis-1,2-Dichloroethene	2.63	0.300	1.00	70.0			090455-001	SW846-8260B

Refer to footnotes on page 5A-73.

Table 5A-1 *(Continued)*
Summary of Detected Volatile Organic Compounds,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11 18-Apr-11	Trichloroethene	2.04	0.250	1.00	5.00			090435-001	SW846-8260B
TAV-MW12 20-Apr-11	Trichloroethene	**5.42**	0.250	1.00	5.00			090442-001	SW846-8260B
TAV-MW12 (Duplicate) 20-Apr-11	Trichloroethene	**5.30**	0.250	1.00	5.00			090443-001	SW846-8260B
TAV-MW14	Trichloroethene	**6.37**	0.250	1.00	5.00			090445-001	SW846-8260B
21-Apr-11	cis-1,2-Dichloroethene	0.670	0.300	1.00	70.0	J		090445-001	SW846-8260B
LWDS-MW1	Chloroform	0.300	0.250	1.00	NE	J		090843-001	SW846-8260B
21-Jul-11	Trichloroethene	**16.0**	0.250	1.00	5.00			090843-001	SW846-8260B
	cis-1,2-Dichloroethene	3.44	0.300	1.00	70.0			090843-001	SW846-8260B
TAV-MW2 06-Jul-11	Trichloroethene	0.820	0.250	1.00	5.00	J		090817-001	SW846-8260B
TAV-MW2 (Duplicate) 06-Jul-11	Trichloroethene	0.810	0.250	1.00	5.00	J		090818-001	SW846-8260B
TAV-MW4	Chloroform	0.560	0.250	1.00	NE	J		090825-001	SW846-8260B
11-Jul-11	Trichloroethene	2.01	0.250	1.00	5.00			090825-001	SW846-8260B
TAV-MW6	Trichloroethene	**17.1**	0.250	1.00	5.00			090839-001	SW846-8260B
18-Jul-11	cis-1,2-Dichloroethene	3.16	0.300	1.00	70.0			090839-001	SW846-8260B
TAV-MW8 07-Jul-11	Trichloroethene	1.13	0.250	1.00	5.00			090820-001	SW846-8260B
TAV-MW10	Trichloroethene	**17.0**	0.250	1.00	5.00			090841-001	SW846-8260B
19-Jul-11	cis-1,2-Dichloroethene	2.94	0.300	1.00	70.0			090841-001	SW846-8260B
TAV-MW11 08-Jul-11	Trichloroethene	2.25	0.250	1.00	5.00			090822-001	SW846-8260B
TAV-MW12 15-Jul-11	Trichloroethene	**6.32**	0.250	1.00	5.00			090837-001	SW846-8260B
TAV-MW14	Trichloroethene	**6.01**	0.250	1.00	5.00			090834-001	SW846-8260B
14-Jul-11	cis-1,2-Dichloroethene	0.620	0.300	1.00	70.0	J		090834-001	SW846-8260B
TAV-MW14 (Duplicate)	Trichloroethene	**6.35**	0.250	1.00	5.00			090835-001	SW846-8260B
14-Jul-11	cis-1,2-Dichloroethene	0.680	0.300	1.00	70.0	J		090835-001	SW846-8260B
LWDS-MW1	Trichloroethene	**17.0**	0.250	1.00	5.00			091431-001	SW846-8260B
21-Nov-11	cis-1,2-Dichloroethene	3.77	0.300	1.00	70.0			091431-001	SW846-8260B

Refer to footnotes on page 5A-73.

Table 5A-1 *(Concluded)*
Summary of Detected Volatile Organic Compounds,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW2 09-Nov-11	Trichloroethene	0.640	0.250	1.00	5.00	J		091412-001	SW846-8260B
TAV-MW4	Chloroform	0.590	0.250	1.00	NE	J	1.0U	091421-001	SW846-8260B
14-Nov-11	Trichloroethene	2.22	0.250	1.00	5.00			091421-001	SW846-8260B
TAV-MW6	Trichloroethene	**15.1**	0.250	1.00	5.00			091429-001	SW846-8260B
17-Nov-11	cis-1,2-Dichloroethene	2.30	0.300	1.00	70.0			091429-001	SW846-8260B
TAV-MW6 (Duplicate)	Trichloroethene	**15.1**	0.250	1.00	5.00			091430-001	SW846-8260B
17-Nov-11	cis-1,2-Dichloroethene	2.27	0.300	1.00	70.0			091430-001	SW846-8260B
TAV-MW8 11-Nov-11	Trichloroethene	1.59	0.250	1.00	5.00			091419-001	SW846-8260B
TAV-MW10	Trichloroethene	**16.0**	0.250	1.00	5.00			091438-001	SW846-8260B
29-Nov-11	cis-1,2-Dichloroethene	3.09	0.300	1.00	70.0			091438-001	SW846-8260B
TAV-MW11 10-Nov-11	Trichloroethene	2.06	0.250	1.00	5.00			091416-001	SW846-8260B
TAV-MW11 (Duplicate) 10-Nov-11	Trichloroethene	2.17	0.250	1.00	5.00			091417-001	SW846-8260B
TAV-MW12 28-Nov-11	Trichloroethene	**6.57**	0.250	1.00	5.00			091436-001	SW846-8260B
TAV-MW14	Trichloroethene	**7.04**	0.250	1.00	5.00			091433-001	SW846-8260B
22-Nov-11	cis-1,2-Dichloroethene	0.850	0.300	1.00	70.0	J		091433-001	SW846-8260B

Refer to footnotes on page 5A-73.

Table 5A-2
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] 8260), Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.325
1,1,2,2-Tetrachloroethane	0.250
1,1,2-Trichloroethane	0.250
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.250
1,2-Dichloropropane	0.250
2-Butanone	1.25
2-Hexanone	1.25
4-methyl-, 2-Pentanone	1.25
Acetone	3.50
Benzene	0.300
Bromodichloromethane	0.250
Bromoform	0.250
Bromomethane	0.300
Carbon disulfide	1.25
Carbon tetrachloride	0.300
Chlorobenzene	0.250
Chloroethane	0.300
Chloroform	0.250
Chloromethane	0.300
Dibromochloromethane	0.300
Ethyl benzene	0.250
Methylene chloride	3.00
Styrene	0.250
Tetrachloroethene	0.300
Toluene	0.250
Trichloroethene	0.250
Vinyl acetate	1.50
Vinyl chloride	0.500
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.250
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.250

Refer to footnotes on page 5A-73.

Table 5A-3
Summary of Nitrate plus Nitrite Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1 04-Jan-11	Nitrate plus nitrite as N	8.05	0.500	2.50	10.0			089910-018	EPA 353.2
LWDS-MW1 24-Jan-11	Nitrate plus nitrite as N	**11.1**	0.250	1.25	10.0			089940-018	EPA 353.2
LWDS-MW2 05-Jan-11	Nitrate plus nitrite as N	6.75	0.500	2.50	10.0			089914-018	EPA 353.2
LWDS-MW2 (Duplicate) 05-Jan-11	Nitrate plus nitrite as N	7.20	0.500	2.50	10.0			089915-018	EPA 353.2
TAV-MW2 12-Jan-11	Nitrate plus nitrite as N	2.71	0.100	0.500	10.0			089926-018	EPA 353.2
TAV-MW4 13-Jan-11	Nitrate plus nitrite as N	5.18	0.250	1.25	10.0			089928-018	EPA 353.2
TAV-MW6 17-Jan-11	Nitrate plus nitrite as N	8.03	0.250	1.25	10.0			089931-018	EPA 353.2
TAV-MW8 11-Jan-11	Nitrate plus nitrite as N	5.15	0.250	1.25	10.0			089924-018	EPA 353.2
TAV-MW10 18-Jan-11	Nitrate plus nitrite as N	**10.3**	0.250	1.25	10.0			089933-018	EPA 353.2
TAV-MW11 06-Jan-11	Nitrate plus nitrite as N	5.85	0.500	2.50	10.0			089917-018	EPA 353.2
TAV-MW12 19-Jan-11	Nitrate plus nitrite as N	4.23	0.250	1.25	10.0			089935-018	EPA 353.2
TAV-MW13 10-Jan-11	Nitrate plus nitrite as N	4.35	0.250	1.25	10.0			089921-018	EPA 353.2
TAV-MW13 (Duplicate) 10-Jan-11	Nitrate plus nitrite as N	4.33	0.250	1.25	10.0			089922-018	EPA 353.2
TAV-MW14 20-Jan-11	Nitrate plus nitrite as N	6.30	0.250	1.25	10.0			089938-018	EPA 353.2
AVN-1 14-Apr-11	Nitrate plus nitrite as N	**10.1**	0.500	2.50	10.0			090433-018	EPA 353.2
LWDS-MW1 25-Apr-11	Nitrate plus nitrite as N	**12.0**	0.100	0.500	10.0			090448-018	EPA 353.2
LWDS-MW2 13-Apr-11	Nitrate plus nitrite as N	8.30	0.500	2.50	10.0			090431-018	EPA 353.2
TAV-MW2 11-Apr-11	Nitrate plus nitrite as N	3.52	0.100	0.500	10.0			090427-018	EPA 353.2

Refer to footnotes on page 5A-73.

Table 5A-3 *(Continued)*
Summary of Nitrate plus Nitrite Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW3 05-Apr-11	Nitrate plus nitrite as N	5.51	0.100	0.500	10.0	B		090413-018	EPA 353.2
TAV-MW4 19-Apr-11	Nitrate plus nitrite as N	6.31	0.100	0.500	10.0			090438-018	EPA 353.2
TAV-MW5 08-Apr-11	Nitrate plus nitrite as N	7.15	0.500	2.50	10.0			090415-018	EPA 353.2
TAV-MW6 26-Apr-11	Nitrate plus nitrite as N	8.53	0.100	0.500	10.0			090452-018	EPA 353.2
TAV-MW6 (Duplicate) 26-Apr-11	Nitrate plus nitrite as N	8.68	0.100	0.500	10.0			090453-018	EPA 353.2
TAV-MW7 07-Apr-11	Nitrate plus nitrite as N	4.32	0.100	0.500	10.0	B		090422-018	EPA 353.2
TAV-MW7 (Duplicate) 07-Apr-11	Nitrate plus nitrite as N	4.37	0.100	0.500	10.0	B		090423-018	EPA 353.2
TAV-MW8 12-Apr-11	Nitrate plus nitrite as N	6.25	0.500	2.50	10.0			090429-018	EPA 353.2
TAV-MW9 15-Apr-11	Nitrate plus nitrite as N	3.38	0.100	0.500	10.0			090425-018	EPA 353.2
TAV-MW10 27-Apr-11	Nitrate plus nitrite as N	**11.0**	0.100	0.500	10.0			090455-018	EPA 353.2
TAV-MW11 18-Apr-11	Nitrate plus nitrite as N	6.77	0.100	0.500	10.0			090435-018	EPA 353.2
TAV-MW12 20-Apr-11	Nitrate plus nitrite as N	3.84	0.100	0.500	10.0			090442-018	EPA 353.2
TAV-MW12 (Duplicate) 20-Apr-11	Nitrate plus nitrite as N	4.19	0.100	0.500	10.0			090443-018	EPA 353.2
TAV-MW13 06-Apr-11	Nitrate plus nitrite as N	5.13	0.100	0.500	10.0	B		090417-018	EPA 353.2
TAV-MW14 21-Apr-11	Nitrate plus nitrite as N	6.48	0.100	0.500	10.0			090445-018	EPA 353.2
AVN-1 13-Jul-11	Nitrate plus nitrite as N	8.60	0.500	2.50	10.0	B		090829-018	EPA 353.2
LWDS-MW1 21-Jul-11	Nitrate plus nitrite as N	**11.6**	0.500	2.50	10.0	B		090843-018	EPA 353.2
LWDS-MW2 12-Jul-11	Nitrate plus nitrite as N	7.20	0.500	2.50	10.0	B		090827-018	EPA 353.2

Refer to footnotes on page 5A-73.

Table 5A-3 *(Continued)*
Summary of Nitrate plus Nitrite Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW2 06-Jul-11	Nitrate plus nitrite as N	2.77	0.100	0.500	10.0	B		090817-018	EPA 353.2
TAV-MW2 (Duplicate) 06-Jul-11	Nitrate plus nitrite as N	2.72	0.100	0.500	10.0	B		090818-018	EPA 353.2
TAV-MW4 11-Jul-11	Nitrate plus nitrite as N	5.50	0.500	2.50	10.0	B		090825-018	EPA 353.2
TAV-MW6 18-Jul-11	Nitrate plus nitrite as N	8.58	0.100	0.500	10.0	B		090839-018	EPA 353.2
TAV-MW8 07-Jul-11	Nitrate plus nitrite as N	5.01	0.100	0.500	10.0	B		090820-018	EPA 353.2
TAV-MW10 19-Jul-11	Nitrate plus nitrite as N	**11.3**	0.500	2.50	10.0	B		090841-018	EPA 353.2
TAV-MW11 08-Jul-11	Nitrate plus nitrite as N	5.95	0.500	2.50	10.0	B		090822-018	EPA 353.2
TAV-MW12 15-Jul-11	Nitrate plus nitrite as N	5.10	0.500	2.50	10.0	B		090837-018	EPA 353.2
TAV-MW13 05-Jul-11	Nitrate plus nitrite as N	5.20	0.500	2.50	10.0	B		090813-018	EPA 353.2
TAV-MW14 14-Jul-11	Nitrate plus nitrite as N	7.05	0.500	2.50	10.0	B		090834-018	EPA 353.2
TAV-MW14 (Duplicate) 14-Jul-11	Nitrate plus nitrite as N	6.95	0.500	2.50	10.0	B		090835-018	EPA 353.2
AVN-1 16-Nov-11	Nitrate plus nitrite as N	9.89	0.100	0.500	10.0			091426-018	EPA 353.2
LWDS-MW1 21-Nov-11	Nitrate plus nitrite as N	**14.5**	0.100	0.500	10.0			091431-018	EPA 353.2
LWDS-MW2 15-Nov-11	Nitrate plus nitrite as N	8.31	0.100	0.500	10.0			091424-018	EPA 353.2
TAV-MW2 09-Nov-11	Nitrate plus nitrite as N	2.68	0.100	0.500	10.0			091412-018	EPA 353.2
TAV-MW3 02-Nov-11	Nitrate plus nitrite as N	5.20	0.100	0.500	10.0			091399-018	EPA 353.2
TAV-MW4 14-Nov-11	Nitrate plus nitrite as N	6.36	0.100	0.500	10.0			091421-018	EPA 353.2
TAV-MW5 04-Nov-11	Nitrate plus nitrite as N	6.81	0.100	0.500	10.0			091406-018	EPA 353.2

Refer to footnotes on page 5A-73.

Table 5A-3 *(Concluded)*
Summary of Nitrate plus Nitrite Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6 17-Nov-11	Nitrate plus nitrite as N	9.80	0.100	0.500	10.0			091429-018	EPA 353.2
TAV-MW6 (Duplicate) 17-Nov-11	Nitrate plus nitrite as N	**10.2**	0.100	0.500	10.0			091430-018	EPA 353.2
TAV-MW7 03-Nov-11	Nitrate plus nitrite as N	4.06	0.100	0.500	10.0	B		091403-018	EPA 353.2
TAV-MW7 (Duplicate) 03-Nov-11	Nitrate plus nitrite as N	4.01	0.100	0.500	10.0	B		091404-018	EPA 353.2
TAV-MW8 11-Nov-11	Nitrate plus nitrite as N	5.74	0.100	0.500	10.0			091419-018	EPA 353.2
TAV-MW9 08-Nov-11	Nitrate plus nitrite as N	3.50	0.100	0.500	10.0			091410-018	EPA 353.2
TAV-MW10 29-Nov-11	Nitrate plus nitrite as N	**12.3**	0.100	0.500	10.0	B		091438-018	EPA 353.2
TAV-MW11 10-Nov-11	Nitrate plus nitrite as N	6.47	0.100	0.500	10.0			091416-018	EPA 353.2
TAV-MW11 (Duplicate) 10-Nov-11	Nitrate plus nitrite as N	6.48	0.100	0.500	10.0			091417-018	EPA 353.2
TAV-MW12 28-Nov-11	Nitrate plus nitrite as N	5.96	0.100	0.500	10.0	B		091436-018	EPA 353.2
TAV-MW13 07-Nov-11	Nitrate plus nitrite as N	4.99	0.100	0.500	10.0			091408-018	EPA 353.2
TAV-MW14 22-Nov-11	Nitrate plus nitrite as N	9.75	0.100	0.500	10.0			091433-018	EPA 353.2

Refer to footnotes on page 5A-73.

Table 5A-4
Summary of Anions, Sulfide, and Alkalinity Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Chloride	9.35	0.066	0.200	NE			089910-016	SW846 9056
04-Jan-11	Sulfate	32.7	0.100	0.400	NE			089910-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089910-023	SW846 9034
	Bicarbonate Alkalinity	155	0.906	1.25	NE			089910-022	SM 2320B
	Carbonate Alkalinity	ND	0.906	1.25	NE	U		089910-022	SM 2320B
LWDS-MW1	Chloride	72.3	0.660	2.00	NE			089940-016	SW846 9056
24-Jan-11	Sulfate	38.3	1.00	4.00	NE			089940-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089940-023	SW846 9034
	Bicarbonate Alkalinity	200	1.04	1.43	NE			089940-022	SM 2320B
	Carbonate Alkalinity	ND	1.04	1.43	NE	U		089940-022	SM 2320B
LWDS-MW2	Chloride	13.7	0.066	0.200	NE			089914-016	SW846 9056
05-Jan-11	Sulfate	40.2	0.200	0.800	NE			089914-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089914-023	SW846 9034
	Bicarbonate Alkalinity	182	0.725	1.00	NE			089914-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089914-022	SM 2320B
LWDS-MW2 (Duplicate)	Chloride	13.7	0.066	0.200	NE			089915-016	SW846 9056
05-Jan-11	Sulfate	39.7	0.200	0.800	NE			089915-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089915-023	SW846 9034
	Bicarbonate Alkalinity	181	0.725	1.00	NE			089915-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089915-022	SM 2320B
TAV-MW2	Chloride	60.6	0.330	1.00	NE			089926-016	SW846 9056
12-Jan-11	Sulfate	53.9	0.500	2.00	NE			089926-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089926-023	SW846 9034
	Bicarbonate Alkalinity	249	0.725	1.00	NE	B		089926-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089926-022	SM 2320B
TAV-MW4	Chloride	36.9	0.198	0.600	NE			089928-016	SW846 9056
13-Jan-11	Sulfate	35.9	0.100	0.400	NE			089928-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089928-023	SW846 9034
	Bicarbonate Alkalinity	186	0.725	1.00	NE	B		089928-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089928-022	SM 2320B
TAV-MW6	Chloride	60.8	0.660	2.00	NE			089931-016	SW846 9056
17-Jan-11	Sulfate	42.5	1.00	4.00	NE			089931-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089931-023	SW846 9034
	Bicarbonate Alkalinity	204	1.45	2.00	NE	B		089931-022	SM 2320B
	Carbonate Alkalinity	ND	1.45	2.00	NE	U		089931-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Chloride	37.9	0.198	0.600	NE			089924-016	SW846 9056
11-Jan-11	Sulfate	53.6	0.300	1.20	NE			089924-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089924-023	SW846 9034
	Bicarbonate Alkalinity	191	1.45	2.00	NE	B		089924-022	SM 2320B
	Carbonate Alkalinity	ND	1.45	2.00	NE	U		089924-022	SM 2320B
TAV-MW10	Chloride	47.9	0.330	1.00	NE			089933-016	SW846 9056
18-Jan-11	Sulfate	43.7	0.500	2.00	NE			089933-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089933-023	SW846 9034
	Bicarbonate Alkalinity	223	0.725	1.00	NE	B		089933-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089933-022	SM 2320B
TAV-MW11	Chloride	35.2	0.330	1.00	NE			089917-016	SW846 9056
06-Jan-11	Sulfate	43.2	0.500	2.00	NE			089917-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089917-023	SW846 9034
	Bicarbonate Alkalinity	188	0.725	1.00	NE			089917-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089917-022	SM 2320B
TAV-MW12	Chloride	34.8	0.330	1.00	NE			089935-016	SW846 9056
19-Jan-11	Sulfate	45.8	0.500	2.00	NE			089935-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089935-023	SW846 9034
	Bicarbonate Alkalinity	213	1.45	2.00	NE	B		089935-022	SM 2320B
	Carbonate Alkalinity	ND	1.45	2.00	NE	U		089935-022	SM 2320B
TAV-MW13	Chloride	17.7	0.066	0.200	NE	B		089921-016	SW846 9056
10-Jan-11	Sulfate	51.1	0.300	1.20	NE			089921-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089921-023	SW846 9034
	Bicarbonate Alkalinity	209	0.725	1.00	NE			089921-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089921-022	SM 2320B
TAV-MW13 (Duplicate)	Chloride	17.8	0.066	0.200	NE	B		089922-016	SW846 9056
10-Jan-11	Sulfate	50.9	0.300	1.20	NE			089922-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089922-023	SW846 9034
	Bicarbonate Alkalinity	208	0.725	1.00	NE			089922-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089922-022	SM 2320B
TAV-MW14	Chloride	51.4	0.330	1.00	NE			089938-016	SW846 9056
20-Jan-11	Sulfate	52.2	0.500	2.00	NE			089938-016	SW846 9056
	Acid Soluble Sulfides	ND	0.550	2.50	NE	U		089938-023	SW846 9034
	Bicarbonate Alkalinity	215	0.725	1.00	NE			089938-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		089938-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Bromide	0.204	0.066	0.200	NE			090433-016	SW846 9056
14-Apr-11	Chloride	9.17	0.066	0.200	NE			090433-016	SW846 9056
	Fluoride	1.09	0.033	0.100	4.0			090433-016	SW846 9056
	Sulfate	31.0	0.100	0.400	NE			090433-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090433-023	SW846 9034
	Bicarbonate Alkalinity	151	0.725	1.00	NE	B		090433-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090433-022	SM 2320B
LWDS-MW1	Bromide	0.798	0.066	0.200	NE			090448-016	SW846 9056
25-Apr-11	Chloride	74.8	0.660	2.00	NE			090448-016	SW846 9056
	Fluoride	0.644	0.033	0.100	4.0			090448-016	SW846 9056
	Sulfate	39.9	1.00	4.00	NE			090448-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090448-023	SW846 9034
	Bicarbonate Alkalinity	194	0.725	1.00	NE	B		090448-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090448-022	SM 2320B
LWDS-MW2	Bromide	0.151	0.066	0.200	NE	J		090431-016	SW846 9056
13-Apr-11	Chloride	13.2	0.066	0.200	NE			090431-016	SW846 9056
	Fluoride	1.11	0.033	0.100	4.0			090431-016	SW846 9056
	Sulfate	37.3	1.00	4.00	NE			090431-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090431-023	SW846 9034
	Bicarbonate Alkalinity	175	0.725	1.00	NE	B		090431-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090431-022	SM 2320B
TAV-MW2	Bromide	0.351	0.066	0.200	NE			090427-016	SW846 9056
11-Apr-11	Chloride	54.4	0.660	2.00	NE			090427-016	SW846 9056
	Fluoride	0.890	0.033	0.100	4.0			090427-016	SW846 9056
	Sulfate	51.3	1.00	4.00	NE			090427-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090427-023	SW846 9034
	Bicarbonate Alkalinity	247	0.725	1.00	NE	B		090427-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090427-022	SM 2320B
TAV-MW3	Bromide	0.236	0.066	0.200	NE			090413-016	SW846 9056
05-Apr-11	Chloride	20.5	0.660	2.00	NE			090413-016	SW846 9056
	Fluoride	1.52	0.033	0.100	4.0			090413-016	SW846 9056
	Sulfate	64.7	1.00	4.00	NE			090413-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090413-023	SW846 9034
	Bicarbonate Alkalinity	187	0.725	1.00	NE	B		090413-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090413-022	SM 2320B

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Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW4	Bromide	0.452	0.066	0.200	NE			090438-016	SW846 9056
19-Apr-11	Chloride	37.6	0.330	1.00	NE			090438-016	SW846 9056
	Fluoride	1.24	0.033	0.100	4.0			090438-016	SW846 9056
	Sulfate	34.5	0.500	2.00	NE			090438-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090438-023	SW846 9034
	Bicarbonate Alkalinity	171	0.725	1.00	NE	B		090438-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090438-022	SM 2320B
TAV-MW5	Bromide	0.215	0.066	0.200	NE			090415-016	SW846 9056
08-Apr-11	Chloride	19.4	0.066	0.200	NE			090415-016	SW846 9056
	Fluoride	1.19	0.033	0.100	4.0			090415-016	SW846 9056
	Sulfate	42.6	1.00	4.00	NE			090415-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090415-023	SW846 9034
	Bicarbonate Alkalinity	190	0.725	1.00	NE	B		090415-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090415-022	SM 2320B
TAV-MW6	Bromide	0.763	0.066	0.200	NE			090452-016	SW846 9056
26-Apr-11	Chloride	64.2	0.660	2.00	NE			090452-016	SW846 9056
	Fluoride	1.12	0.033	0.100	4.0			090452-016	SW846 9056
	Sulfate	43.2	1.00	4.00	NE			090452-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090452-023	SW846 9034
	Bicarbonate Alkalinity	200	0.725	1.00	NE	B		090452-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090452-022	SM 2320B
TAV-MW6 (Duplicate)	Bromide	0.773	0.066	0.200	NE			090453-016	SW846 9056
26-Apr-11	Chloride	64.2	0.660	2.00	NE			090453-016	SW846 9056
	Fluoride	1.09	0.033	0.100	4.0			090453-016	SW846 9056
	Sulfate	43.0	1.00	4.00	NE			090453-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090453-023	SW846 9034
	Bicarbonate Alkalinity	195	0.725	1.00	NE	B		090453-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090453-022	SM 2320B
TAV-MW7	Bromide	0.298	0.066	0.200	NE			090422-016	SW846 9056
07-Apr-11	Chloride	26.1	0.660	2.00	NE			090422-016	SW846 9056
	Fluoride	1.12	0.033	0.100	4.0			090422-016	SW846 9056
	Sulfate	63.3	1.00	4.00	NE			090422-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090422-023	SW846 9034
	Bicarbonate Alkalinity	226	0.725	1.00	NE	B		090422-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090422-022	SM 2320B

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Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW7 (Duplicate)	Bromide	0.277	0.066	0.200	NE			090423-016	SW846 9056
07-Apr-11	Chloride	26.4	0.660	2.00	NE			090423-016	SW846 9056
	Fluoride	1.08	0.033	0.100	4.0			090423-016	SW846 9056
	Sulfate	63.5	1.00	4.00	NE			090423-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090423-023	SW846 9034
	Bicarbonate Alkalinity	224	0.725	1.00	NE	B		090423-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090423-022	SM 2320B
TAV-MW8	Bromide	0.319	0.066	0.200	NE			090429-016	SW846 9056
12-Apr-11	Chloride	33.7	0.660	2.00	NE			090429-016	SW846 9056
	Fluoride	1.25	0.033	0.100	4.0			090429-016	SW846 9056
	Sulfate	49.9	1.00	4.00	NE			090429-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090429-023	SW846 9034
	Bicarbonate Alkalinity	188	0.725	1.00	NE	B		090429-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090429-022	SM 2320B
TAV-MW9	Bromide	0.348	0.066	0.200	NE			090425-016	SW846 9056
15-Apr-11	Chloride	36.0	0.330	1.00	NE			090425-016	SW846 9056
	Fluoride	0.996	0.033	0.100	4.0			090425-016	SW846 9056
	Sulfate	60.3	0.500	2.00	NE			090425-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090425-023	SW846 9034
	Bicarbonate Alkalinity	226	0.725	1.00	NE	B		090425-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090425-022	SM 2320B
TAV-MW10	Bromide	0.395	0.066	0.200	NE			090455-016	SW846 9056
27-Apr-11	Chloride	46.4	0.660	2.00	NE			090455-016	SW846 9056
	Fluoride	1.35	0.033	0.100	4.0			090455-016	SW846 9056
	Sulfate	44.1	1.00	4.00	NE			090455-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090455-023	SW846 9034
	Bicarbonate Alkalinity	195	0.725	1.00	NE	B		090455-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090455-022	SM 2320B
TAV-MW11	Bromide	0.411	0.066	0.200	NE			090435-016	SW846 9056
18-Apr-11	Chloride	38.4	0.330	1.00	NE			090435-016	SW846 9056
	Fluoride	1.37	0.033	0.100	4.0			090435-016	SW846 9056
	Sulfate	44.9	0.500	2.00	NE			090435-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090435-023	SW846 9034
	Bicarbonate Alkalinity	188	0.725	1.00	NE	B		090435-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090435-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW12	Bromide	0.261	0.066	0.200	NE			090442-016	SW846 9056
20-Apr-11	Chloride	37.9	0.330	1.00	NE			090442-016	SW846 9056
	Fluoride	1.30	0.033	0.100	4.0			090442-016	SW846 9056
	Sulfate	48.0	0.500	2.00	NE			090442-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090442-023	SW846 9034
	Bicarbonate Alkalinity	216	0.725	1.00	NE	B		090442-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090442-022	SM 2320B
TAV-MW12 (Duplicate)	Bromide	0.439	0.066	0.200	NE			090443-016	SW846 9056
20-Apr-11	Chloride	36.9	0.330	1.00	NE			090443-016	SW846 9056
	Fluoride	1.31	0.033	0.100	4.0			090443-016	SW846 9056
	Sulfate	48.1	0.500	2.00	NE			090443-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090443-023	SW846 9034
	Bicarbonate Alkalinity	217	0.725	1.00	NE	B		090443-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090443-022	SM 2320B
TAV-MW13	Bromide	0.192	0.066	0.200	NE	J		090417-016	SW846 9056
06-Apr-11	Chloride	18.9	0.066	0.200	NE			090417-016	SW846 9056
	Fluoride	1.24	0.033	0.100	4.0			090417-016	SW846 9056
	Sulfate	52.6	1.00	4.00	NE			090417-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090417-023	SW846 9034
	Bicarbonate Alkalinity	207	0.725	1.00	NE	B		090417-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090417-022	SM 2320B
TAV-MW14	Bromide	1.98	0.066	0.200	NE			090445-016	SW846 9056
21-Apr-11	Chloride	52.7	0.330	1.00	NE			090445-016	SW846 9056
	Fluoride	1.31	0.033	0.100	4.0			090445-016	SW846 9056
	Sulfate	55.2	0.500	2.00	NE			090445-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090445-023	SW846 9034
	Bicarbonate Alkalinity	210	0.725	1.00	NE	B		090445-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090445-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Chloride	9.35	0.066	0.200	NE			090829-016	SW846 9056
13-Jul-11	Sulfate	30.3	0.100	0.400	NE			090829-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090829-023	SW846 9034
	Bicarbonate Alkalinity	154	0.725	1.00	NE	B		090829-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090829-022	SM 2320B
LWDS-MW1	Chloride	73.7	0.660	2.00	NE			090843-016	SW846 9056
21-Jul-11	Sulfate	37.5	1.00	4.00	NE			090843-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090843-023	SW846 9034
	Bicarbonate Alkalinity	200	0.725	1.00	NE	B		090843-022	SM 2320B
	Carbonate Alkalinity	U	0.725	1.00	NE	U		090843-022	SM 2320B
LWDS-MW2	Chloride	13.3	0.066	0.200	NE			090827-016	SW846 9056
12-Jul-11	Sulfate	39.7	0.100	0.400	NE			090827-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090827-023	SW846 9034
	Bicarbonate Alkalinity	177	0.725	1.00	NE	B		090827-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090827-022	SM 2320B
TAV-MW2	Chloride	58.2	0.660	2.00	NE			090817-016	SW846 9056
06-Jul-11	Sulfate	52.1	1.00	4.00	NE			090817-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090817-023	SW846 9034
	Bicarbonate Alkalinity	247	0.725	1.00	NE	B		090817-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090817-022	SM 2320B
TAV-MW2 (Duplicate)	Chloride	57.4	0.066	0.200	NE			090818-016	SW846 9056
06-Jul-11	Sulfate	51.6	1.00	4.00	NE			090818-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090818-023	SW846 9034
	Bicarbonate Alkalinity	245	0.725	1.00	NE	B		090818-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090818-022	SM 2320B
TAV-MW4	Chloride	36.3	0.330	1.00	NE			090825-016	SW846 9056
11-Jul-11	Sulfate	34.7	0.100	0.400	NE			090825-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090825-023	SW846 9034
	Bicarbonate Alkalinity	175	0.725	1.00	NE	B		090825-022	SM 2320B
	Carbonate Alkalinity	U	0.725	1.00	NE	U		090825-022	SM 2320B
TAV-MW6	Chloride	64.9	0.660	2.00	NE			090839-016	SW846 9056
18-Jul-11	Sulfate	41.0	1.00	4.00	NE			090839-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090839-023	SW846 9034
	Bicarbonate Alkalinity	199	0.725	1.00	NE	B		090839-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090839-022	SM 2320B

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Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Chloride	37.5	0.330	1.00	NE			090820-016	SW846 9056
07-Jul-11	Sulfate	50.1	0.500	2.00	NE			090820-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090820-023	SW846 9034
	Bicarbonate Alkalinity	187	0.725	1.00	NE	B		090820-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090820-022	SM 2320B
TAV-MW10	Chloride	48.4	0.330	1.00	NE			090841-016	SW846 9056
19-Jul-11	Sulfate	42.5	0.500	2.00	NE			090841-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090841-023	SW846 9034
	Bicarbonate Alkalinity	200	0.725	1.00	NE	B		090841-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090841-022	SM 2320B
TAV-MW11	Chloride	38.3	0.330	1.00	NE			090822-016	SW846 9056
08-Jul-11	Sulfate	40.6	0.500	2.00	NE			090822-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090822-023	SW846 9034
	Bicarbonate Alkalinity	191	0.725	1.00	NE	B		090822-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090822-022	SM 2320B
TAV-MW12	Chloride	35.0	0.330	1.00	NE			090837-016	SW846 9056
15-Jul-11	Sulfate	42.8	0.500	2.00	NE			090837-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090837-023	SW846 9034
	Bicarbonate Alkalinity	222	0.725	1.00	NE	B		090837-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090837-022	SM 2320B
TAV-MW13	Chloride	18.6	0.066	0.200	NE			090813-016	SW846 9056
05-Jul-11	Sulfate	50.8	0.200	0.800	NE			090813-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090813-023	SW846 9034
	Bicarbonate Alkalinity	203	0.725	1.00	NE	B		090813-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090813-022	SM 2320B
TAV-MW14	Chloride	50.7	0.330	1.00	NE			090834-016	SW846 9056
14-Jul-11	Sulfate	49.2	0.500	2.00	NE			090834-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090834-023	SW846 9034
	Bicarbonate Alkalinity	213	0.725	1.00	NE	B		090834-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090834-022	SM 2320B
TAV-MW14 (Duplicate)	Chloride	51.1	0.330	1.00	NE			090835-016	SW846 9056
14-Jul-11	Sulfate	49.7	0.500	2.00	NE			090835-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		090835-023	SW846 9034
	Bicarbonate Alkalinity	211	0.725	1.00	NE	B		090835-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090835-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Chloride	9.07	0.066	0.200	NE	B		091426-016	SW846 9056
16-Nov-11	Sulfate	30.5	0.100	0.400	NE			091426-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091426-023	SW846 9034
	Bicarbonate Alkalinity	151	0.725	1.00	NE	B		091426-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091426-022	SM 2320B
LWDS-MW1	Chloride	73.6	0.660	2.00	NE			091431-016	SW846 9056
21-Nov-11	Sulfate	39.4	1.00	4.00	NE			091431-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091431-023	SW846 9034
	Bicarbonate Alkalinity	193	0.725	1.00	NE	B		091431-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091431-022	SM 2320B
LWDS-MW2	Chloride	12.8	0.066	0.200	NE	B		091424-016	SW846 9056
15-Nov-11	Sulfate	39.9	0.100	0.400	NE			091424-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091424-023	SW846 9034
	Bicarbonate Alkalinity	172	0.725	1.00	NE	B		091424-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091424-022	SM 2320B
TAV-MW2	Chloride	62.4	0.330	1.00	NE			091412-016	SW846 9056
09-Nov-11	Sulfate	53.1	0.500	2.00	NE			091412-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091412-023	SW846 9034
	Bicarbonate Alkalinity	245	0.725	1.00	NE	B		091412-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091412-022	SM 2320B
TAV-MW3	Chloride	20.6	0.132	0.400	NE			091399-016	SW846 9056
02-Nov-11	Sulfate	64.1	0.200	0.800	NE			091399-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091399-023	SW846 9034
	Bicarbonate Alkalinity	190	0.725	1.00	NE	B		091399-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091399-022	SM 2320B
TAV-MW4	Chloride	33.9	0.660	2.00	NE	B		091421-016	SW846 9056
14-Nov-11	Sulfate	34.8	0.100	0.400	NE			091421-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091421-023	SW846 9034
	Bicarbonate Alkalinity	169	0.725	1.00	NE	B, H	J	091421-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	H, U	UJ	091421-022	SM 2320B
TAV-MW5	Chloride	18.0	0.066	0.200	NE			091406-016	SW846 9056
04-Nov-11	Sulfate	40.1	0.200	0.800	NE			091406-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091406-023	SW846 9034
	Bicarbonate Alkalinity	185	0.725	1.00	NE	B		091406-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091406-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-4 *(Continued)*
Summary of Anions, Sulfide, and Alkalinity Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6	Chloride	64.3	0.660	2.00	NE	B		091429-016	SW846 9056
17-Nov-11	Sulfate	41.7	1.00	4.00	NE			091429-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091429-023	SW846 9034
	Bicarbonate Alkalinity	195	0.725	1.00	NE	B		091429-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091429-022	SM 2320B
TAV-MW6 (Duplicate)	Chloride	65.6	0.660	2.00	NE	B		091430-016	SW846 9056
17-Nov-11	Sulfate	42.4	1.00	4.00	NE			091430-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091430-023	SW846 9034
	Bicarbonate Alkalinity	194	0.725	1.00	NE	B		091430-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091430-022	SM 2320B
TAV-MW7	Chloride	28.5	0.132	0.400	NE			091403-016	SW846 9056
03-Nov-11	Sulfate	64.9	0.200	0.800	NE			091403-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091403-023	SW846 9034
	Bicarbonate Alkalinity	122	0.725	1.00	NE	B		091403-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091403-022	SM 2320B
TAV-MW7 (Duplicate)	Chloride	28.3	0.132	0.400	NE			091404-016	SW846 9056
03-Nov-11	Sulfate	64.7	0.200	0.800	NE			091404-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091404-023	SW846 9034
	Bicarbonate Alkalinity	225	0.725	1.00	NE	B		091404-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091404-022	SM 2320B
TAV-MW8	Chloride	35.1	0.066	0.200	NE			091419-016	SW846 9056
11-Nov-11	Sulfate	51.3	1.00	4.00	NE			091419-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091419-023	SW846 9034
	Bicarbonate Alkalinity	189	0.725	1.00	NE	B		091419-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091419-022	SM 2320B
TAV-MW9	Chloride	30.4	0.330	1.00	NE			091410-016	SW846 9056
08-Nov-11	Sulfate	53.8	0.500	2.00	NE			091410-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091410-023	SW846 9034
	Bicarbonate Alkalinity	226	0.725	1.00	NE	B		091410-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	B		091410-022	SM 2320B
TAV-MW10	Chloride	44.7	0.660	2.00	NE			091438-016	SW846 9056
29-Nov-11	Sulfate	42.7	1.00	4.00	NE			091438-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091438-023	SW846 9034
	Bicarbonate Alkalinity	195	0.725	1.00	NE	B		091438-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091438-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-4 *(Concluded)*
Summary of Anions, Sulfide, and Alkalinity Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Chloride	37.2	0.330	1.00	NE			091416-016	SW846 9056
10-Nov-11	Sulfate	41.2	0.500	2.00	NE			091416-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091416-023	SW846 9034
	Bicarbonate Alkalinity	182	0.725	1.00	NE	B		091416-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091416-022	SM 2320B
TAV-MW11 (Duplicate)	Chloride	37.2	0.330	1.00	NE			091417-016	SW846 9056
10-Nov-11	Sulfate	41.1	0.500	2.00	NE			091417-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091417-023	SW846 9034
	Bicarbonate Alkalinity	186	0.725	1.00	NE	B		091417-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091417-022	SM 2320B
TAV-MW12	Chloride	33.0	0.660	2.00	NE			091436-016	SW846 9056
28-Nov-11	Sulfate	42.7	1.00	4.00	NE			091436-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091436-023	SW846 9034
	Bicarbonate Alkalinity	213	0.725	1.00	NE	B		091436-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091436-022	SM 2320B
TAV-MW13	Chloride	18.6	0.660	0.200	NE			091408-016	SW846 9056
07-Nov-11	Sulfate	51.3	0.200	0.800	NE			091408-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091408-023	SW846 9034
	Bicarbonate Alkalinity	113	0.725	1.00	NE	B		091408-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091408-022	SM 2320B
TAV-MW14	Chloride	51.3	0.330	1.00	NE			091433-016	SW846 9056
22-Nov-11	Sulfate	52.5	0.500	2.00	NE			091433-016	SW846 9056
	Acid Soluble Sulfides	ND	0.650	2.50	NE	U		091433-023	SW846 9034
	Bicarbonate Alkalinity	102	0.725	1.00	NE	B		091433-022	SM 2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091433-022	SM 2320B

Refer to footnotes on page 5A-73.

Table 5A-5
Summary of Total Organic Carbon Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Total Organic Carbon #1	0.714	0.330	1.00	NE	J		089910-004	SW846 9060
04-Jan-11	Total Organic Carbon #2	0.780	0.330	1.00	NE	J		089910-004	SW846 9060
	Total Organic Carbon #3	0.747	0.330	1.00	NE	J		089910-004	SW846 9060
	Total Organic Carbon #4	0.727	0.330	1.00	NE	J		089910-004	SW846 9060
	Total Organic Carbon Average	0.742	0.330	1.00	NE	J		089910-004	SW846 9060
LWDS-MW1	Total Organic Carbon #1	0.829	0.330	1.00	NE	J		089940-004	SW846 9060
24-Jan-11	Total Organic Carbon #2	1.02	0.330	1.00	NE			089940-004	SW846 9060
	Total Organic Carbon #3	0.890	0.330	1.00	NE	J		089940-004	SW846 9060
	Total Organic Carbon #4	0.925	0.330	1.00	NE	J		089940-004	SW846 9060
	Total Organic Carbon Average	0.916	0.330	1.00	NE	J		089940-004	SW846 9060
LWDS-MW2	Total Organic Carbon #1	0.716	0.330	1.00	NE	J	3.0U	089914-004	SW846 9060
05-Jan-11	Total Organic Carbon #2	0.811	0.330	1.00	NE	J	3.0U	089914-004	SW846 9060
	Total Organic Carbon #3	0.720	0.330	1.00	NE	J	3.0U	089914-004	SW846 9060
	Total Organic Carbon #4	0.785	0.330	1.00	NE	J	3.0U	089914-004	SW846 9060
	Total Organic Carbon Average	0.758	0.330	1.00	NE	J	3.0U	089914-004	SW846 9060
LWDS-MW2 (Duplicate)	Total Organic Carbon #1	0.691	0.330	1.00	NE	J	3.0U	089915-004	SW846 9060
05-Jan-11	Total Organic Carbon #2	0.840	0.330	1.00	NE	J	3.0U	089915-004	SW846 9060
	Total Organic Carbon #3	0.766	0.330	1.00	NE	J	3.0U	089915-004	SW846 9060
	Total Organic Carbon #4	0.775	0.330	1.00	NE	J	3.0U	089915-004	SW846 9060
	Total Organic Carbon Average	0.768	0.330	1.00	NE	J	3.0U	089915-004	SW846 9060
TAV-MW2	Total Organic Carbon #1	0.841	0.330	1.00	NE	J		089926-004	SW846 9060
12-Jan-11	Total Organic Carbon #2	1.05	0.330	1.00	NE			089926-004	SW846 9060
	Total Organic Carbon #3	0.873	0.330	1.00	NE	J		089926-004	SW846 9060
	Total Organic Carbon #4	0.942	0.330	1.00	NE	J		089926-004	SW846 9060
	Total Organic Carbon Average	0.925	0.330	1.00	NE	J		089926-004	SW846 9060
TAV-MW4	Total Organic Carbon #1	0.735	0.330	1.00	NE	J		089928-004	SW846 9060
13-Jan-11	Total Organic Carbon #2	0.975	0.330	1.00	NE	J		089928-004	SW846 9060
	Total Organic Carbon #3	0.759	0.330	1.00	NE	J		089928-004	SW846 9060
	Total Organic Carbon #4	0.800	0.330	1.00	NE	J		089928-004	SW846 9060
	Total Organic Carbon Average	0.817	0.330	1.00	NE	J		089928-004	SW846 9060
TAV-MW6	Total Organic Carbon #1	0.727	0.330	1.00	NE	J		089931-004	SW846 9060
17-Jan-11	Total Organic Carbon #2	1.06	0.330	1.00	NE			089931-004	SW846 9060
	Total Organic Carbon #3	0.825	0.330	1.00	NE	J		089931-004	SW846 9060
	Total Organic Carbon #4	0.870	0.330	1.00	NE	J		089931-004	SW846 9060
	Total Organic Carbon Average	0.870	0.330	1.00	NE	J		089931-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Total Organic Carbon #1	0.711	0.330	1.00	NE	J		089924-004	SW846 9060
11-Jan-11	Total Organic Carbon #2	0.854	0.330	1.00	NE	J		089924-004	SW846 9060
	Total Organic Carbon #3	0.849	0.330	1.00	NE	J		089924-004	SW846 9060
	Total Organic Carbon #4	0.848	0.330	1.00	NE	J		089924-004	SW846 9060
	Total Organic Carbon Average	0.815	0.330	1.00	NE	J		089924-004	SW846 9060
TAV-MW10	Total Organic Carbon #1	0.837	0.330	1.00	NE	J		089933-004	SW846 9060
18-Jan-11	Total Organic Carbon #2	1.18	0.330	1.00	NE			089933-004	SW846 9060
	Total Organic Carbon #3	0.879	0.330	1.00	NE	J		089933-004	SW846 9060
	Total Organic Carbon #4	0.972	0.330	1.00	NE	J		089933-004	SW846 9060
	Total Organic Carbon Average	0.967	0.330	1.00	NE	J		089933-004	SW846 9060
TAV-MW11	Total Organic Carbon #1	0.878	0.330	1.00	NE	J		089917-004	SW846 9060
06-Jan-11	Total Organic Carbon #2	1.11	0.330	1.00	NE			089917-004	SW846 9060
	Total Organic Carbon #3	0.907	0.330	1.00	NE	J		089917-004	SW846 9060
	Total Organic Carbon #4	0.976	0.330	1.00	NE	J		089917-004	SW846 9060
	Total Organic Carbon Average	0.969	0.330	1.00	NE	J		089917-004	SW846 9060
TAV-MW12	Total Organic Carbon #1	0.937	0.330	1.00	NE	J		089935-004	SW846 9060
19-Jan-11	Total Organic Carbon #2	1.14	0.330	1.00	NE			089935-004	SW846 9060
	Total Organic Carbon #3	1.13	0.330	1.00	NE			089935-004	SW846 9060
	Total Organic Carbon #4	1.13	0.330	1.00	NE			089935-004	SW846 9060
	Total Organic Carbon Average	1.08	0.330	1.00	NE			089935-004	SW846 9060
TAV-MW13	Total Organic Carbon #1	0.775	0.330	1.00	NE	J	4.0U	089921-004	SW846 9060
10-Jan-11	Total Organic Carbon #2	0.936	0.330	1.00	NE	J	4.0U	089921-004	SW846 9060
	Total Organic Carbon #3	0.830	0.330	1.00	NE	J	4.0U	089921-004	SW846 9060
	Total Organic Carbon #4	0.844	0.330	1.00	NE	J	4.0U	089921-004	SW846 9060
	Total Organic Carbon Average	0.846	0.330	1.00	NE	J	4.0U	089921-004	SW846 9060
TAV-MW13 (Duplicate)	Total Organic Carbon #1	0.857	0.330	1.00	NE	J	4.0U	089922-004	SW846 9060
10-Jan-11	Total Organic Carbon #2	0.958	0.330	1.00	NE	J	4.0U	089922-004	SW846 9060
	Total Organic Carbon #3	0.922	0.330	1.00	NE	J	4.0U	089922-004	SW846 9060
	Total Organic Carbon #4	0.951	0.330	1.00	NE	J	4.0U	089922-004	SW846 9060
	Total Organic Carbon Average	0.922	0.330	1.00	NE	J	4.0U	089922-004	SW846 9060
TAV-MW14	Total Organic Carbon #1	0.866	0.330	1.00	NE	J		089938-004	SW846 9060
20-Jan-11	Total Organic Carbon #2	1.17	0.330	1.00	NE			089938-004	SW846 9060
	Total Organic Carbon #3	1.03	0.330	1.00	NE			089938-004	SW846 9060
	Total Organic Carbon #4	1.09	0.330	1.00	NE			089938-004	SW846 9060
	Total Organic Carbon Average	1.04	0.330	1.00	NE			089938-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Total Organic Carbon #1	0.562	0.330	1.00	NE	J		090433-004	SW846 9060
14-Apr-11	Total Organic Carbon #2	0.647	0.330	1.00	NE	J		090433-004	SW846 9060
	Total Organic Carbon #3	0.599	0.330	1.00	NE	J		090433-004	SW846 9060
	Total Organic Carbon #4	0.590	0.330	1.00	NE	J		090433-004	SW846 9060
	Total Organic Carbon Average	0.600	0.330	1.00	NE	J		090433-004	SW846 9060
LWDS-MW1	Total Organic Carbon #1	0.743	0.330	1.00	NE	J		090448-004	SW846 9060
25-Apr-11	Total Organic Carbon #2	1.03	0.330	1.00	NE			090448-004	SW846 9060
	Total Organic Carbon #3	0.806	0.330	1.00	NE	J		090448-004	SW846 9060
	Total Organic Carbon #4	0.820	0.330	1.00	NE	J		090448-004	SW846 9060
	Total Organic Carbon Average	0.850	0.330	1.00	NE	J		090448-004	SW846 9060
LWDS-MW2	Total Organic Carbon #1	0.342	0.330	1.00	NE	J		090431-004	SW846 9060
13-Apr-11	Total Organic Carbon #2	0.417	0.330	1.00	NE	J		090431-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090431-004	SW846 9060
	Total Organic Carbon #4	0.345	0.330	1.00	NE	J		090431-004	SW846 9060
	Total Organic Carbon Average	0.353	0.330	1.00	NE	J		090431-004	SW846 9060
TAV-MW2	Total Organic Carbon #1	0.567	0.330	1.00	NE	J		090427-004	SW846 9060
11-Apr-11	Total Organic Carbon #2	0.669	0.330	1.00	NE	J		090427-004	SW846 9060
	Total Organic Carbon #3	0.632	0.330	1.00	NE	J		090427-004	SW846 9060
	Total Organic Carbon #4	0.583	0.330	1.00	NE	J		090427-004	SW846 9060
	Total Organic Carbon Average	0.613	0.330	1.00	NE	J		090427-004	SW846 9060
TAV-MW3	Total Organic Carbon #1	0.564	0.330	1.00	NE	J		090413-004	SW846 9060
05-Apr-11	Total Organic Carbon #2	0.687	0.330	1.00	NE	J		090413-004	SW846 9060
	Total Organic Carbon #3	0.649	0.330	1.00	NE	J		090413-004	SW846 9060
	Total Organic Carbon #4	0.691	0.330	1.00	NE	J		090413-004	SW846 9060
	Total Organic Carbon Average	0.648	0.330	1.00	NE	J		090413-004	SW846 9060
TAV-MW4	Total Organic Carbon #1	0.544	0.330	1.00	NE	J		090438-004	SW846 9060
19-Apr-11	Total Organic Carbon #2	0.671	0.330	1.00	NE	J		090438-004	SW846 9060
	Total Organic Carbon #3	0.553	0.330	1.00	NE	J		090438-004	SW846 9060
	Total Organic Carbon #4	0.621	0.330	1.00	NE	J		090438-004	SW846 9060
	Total Organic Carbon Average	0.597	0.330	1.00	NE	J		090438-004	SW846 9060
TAV-MW5	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090415-004	SW846 9060
08-Apr-11	Total Organic Carbon #2	0.349	0.330	1.00	NE	J		090415-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090415-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090415-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090415-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6	Total Organic Carbon #1	0.724	0.330	1.00	NE	J	2.9U	090452-004	SW846 9060
26-Apr-11	Total Organic Carbon #2	1.01	0.330	1.00	NE		2.9U	090452-004	SW846 9060
	Total Organic Carbon #3	0.832	0.330	1.00	NE	J	2.9U	090452-004	SW846 9060
	Total Organic Carbon #4	0.780	0.330	1.00	NE	J	2.9U	090452-004	SW846 9060
	Total Organic Carbon Average	0.836	0.330	1.00	NE	J	2.9U	090452-004	SW846 9060
TAV-MW6 (Duplicate)	Total Organic Carbon #1	0.471	0.330	1.00	NE	J	2.9U	090453-004	SW846 9060
26-Apr-11	Total Organic Carbon #2	0.675	0.330	1.00	NE	J	2.9U	090453-004	SW846 9060
	Total Organic Carbon #3	0.428	0.330	1.00	NE	J	2.9U	090453-004	SW846 9060
	Total Organic Carbon #4	0.505	0.330	1.00	NE	J	2.9U	090453-004	SW846 9060
	Total Organic Carbon Average	0.520	0.330	1.00	NE	J	2.9U	090453-004	SW846 9060
TAV-MW7	Total Organic Carbon #1	0.389	0.330	1.00	NE	J	2.6U	090422-004	SW846 9060
07-Apr-11	Total Organic Carbon #2	0.682	0.330	1.00	NE	J	2.6U	090422-004	SW846 9060
	Total Organic Carbon #3	0.487	0.330	1.00	NE	J	2.6U	090422-004	SW846 9060
	Total Organic Carbon #4	0.459	0.330	1.00	NE	J	2.6U	090422-004	SW846 9060
	Total Organic Carbon Average	0.504	0.330	1.00	NE	J	2.6U	090422-004	SW846 9060
TAV-MW7 (Duplicate)	Total Organic Carbon #1	0.743	0.330	1.00	NE	J	2.6U	090423-004	SW846 9060
07-Apr-11	Total Organic Carbon #2	0.847	0.330	1.00	NE	J	2.6U	090423-004	SW846 9060
	Total Organic Carbon #3	0.781	0.330	1.00	NE	J	2.6U	090423-004	SW846 9060
	Total Organic Carbon #4	0.775	0.330	1.00	NE	J	2.6U	090423-004	SW846 9060
	Total Organic Carbon Average	0.787	0.330	1.00	NE	J	2.6U	090423-004	SW846 9060
TAV-MW8	Total Organic Carbon #1	0.428	0.330	1.00	NE	J		090429-004	SW846 9060
12-Apr-11	Total Organic Carbon #2	0.527	0.330	1.00	NE	J		090429-004	SW846 9060
	Total Organic Carbon #3	0.431	0.330	1.00	NE	J		090429-004	SW846 9060
	Total Organic Carbon #4	0.444	0.330	1.00	NE	J		090429-004	SW846 9060
	Total Organic Carbon Average	0.458	0.330	1.00	NE	J		090429-004	SW846 9060
TAV-MW9	Total Organic Carbon #1	0.620	0.330	1.00	NE	J		090425-004	SW846 9060
15-Apr-11	Total Organic Carbon #2	0.758	0.330	1.00	NE	J		090425-004	SW846 9060
	Total Organic Carbon #3	0.709	0.330	1.00	NE	J		090425-004	SW846 9060
	Total Organic Carbon #4	0.702	0.330	1.00	NE	J		090425-004	SW846 9060
	Total Organic Carbon Average	0.697	0.330	1.00	NE	J		090425-004	SW846 9060
TAV-MW10	Total Organic Carbon #1	0.741	0.330	1.00	NE	J		090455-004	SW846 9060
27-Apr-11	Total Organic Carbon #2	1.08	0.330	1.00	NE			090455-004	SW846 9060
	Total Organic Carbon #3	0.866	0.330	1.00	NE	J		090455-004	SW846 9060
	Total Organic Carbon #4	0.931	0.330	1.00	NE	J		090455-004	SW846 9060
	Total Organic Carbon Average	0.904	0.330	1.00	NE	J		090455-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Total Organic Carbon #1	0.530	0.330	1.00	NE	J		090435-004	SW846 9060
18-Apr-11	Total Organic Carbon #2	0.723	0.330	1.00	NE	J		090435-004	SW846 9060
	Total Organic Carbon #3	0.564	0.330	1.00	NE	J		090435-004	SW846 9060
	Total Organic Carbon #4	0.602	0.330	1.00	NE	J		090435-004	SW846 9060
	Total Organic Carbon Average	0.605	0.330	1.00	NE	J		090435-004	SW846 9060
TAV-MW12	Total Organic Carbon #1	0.615	0.330	1.00	NE	J	2.3U	090442-004	SW846 9060
20-Apr-11	Total Organic Carbon #2	0.827	0.330	1.00	NE	J	2.3U	090442-004	SW846 9060
	Total Organic Carbon #3	0.662	0.330	1.00	NE	J	2.3U	090442-004	SW846 9060
	Total Organic Carbon #4	0.627	0.330	1.00	NE	J	2.3U	090442-004	SW846 9060
	Total Organic Carbon Average	0.683	0.330	1.00	NE	J	2.3U	090442-004	SW846 9060
TAV-MW12 (Duplicate)	Total Organic Carbon #1	0.635	0.330	1.00	NE	J	2.3U	090443-004	SW846 9060
20-Apr-11	Total Organic Carbon #2	0.833	0.330	1.00	NE	J	2.3U	090443-004	SW846 9060
	Total Organic Carbon #3	0.667	0.330	1.00	NE	J	2.3U	090443-004	SW846 9060
	Total Organic Carbon #4	0.738	0.330	1.00	NE	J	2.3U	090443-004	SW846 9060
	Total Organic Carbon Average	0.718	0.330	1.00	NE	J	2.3U	090443-004	SW846 9060
TAV-MW13	Total Organic Carbon #1	0.586	0.330	1.00	NE	J		090417-004	SW846 9060
06-Apr-11	Total Organic Carbon #2	0.739	0.330	1.00	NE	J		090417-004	SW846 9060
	Total Organic Carbon #3	0.610	0.330	1.00	NE	J		090417-004	SW846 9060
	Total Organic Carbon #4	0.645	0.330	1.00	NE	J		090417-004	SW846 9060
	Total Organic Carbon Average	0.645	0.330	1.00	NE	J		090417-004	SW846 9060
TAV-MW14	Total Organic Carbon #1	0.505	0.330	1.00	NE	J		090445-004	SW846 9060
21-Apr-11	Total Organic Carbon #2	0.706	0.330	1.00	NE	J		090445-004	SW846 9060
	Total Organic Carbon #3	0.578	0.330	1.00	NE	J		090445-004	SW846 9060
	Total Organic Carbon #4	0.595	0.330	1.00	NE	J		090445-004	SW846 9060
	Total Organic Carbon Average	0.596	0.330	1.00	NE	J		090445-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090829-004	SW846 9060
13-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090829-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090829-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090829-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090829-004	SW846 9060
LWDS-MW1	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090843-004	SW846 9060
21-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090843-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090843-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090843-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090843-004	SW846 9060
LWDS-MW2	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090827-004	SW846 9060
12-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090827-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090827-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090827-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090827-004	SW846 9060
TAV-MW2	Total Organic Carbon #1	0.363	0.330	1.00	NE	J		090817-004	SW846 9060
06-Jul-11	Total Organic Carbon #2	0.603	0.330	1.00	NE	J		090817-004	SW846 9060
	Total Organic Carbon #3	0.494	0.330	1.00	NE	J		090817-004	SW846 9060
	Total Organic Carbon #4	0.466	0.330	1.00	NE	J		090817-004	SW846 9060
	Total Organic Carbon Average	0.482	0.330	1.00	NE	J		090817-004	SW846 9060
TAV-MW2 (Duplicate)	Total Organic Carbon #1	0.597	0.330	1.00	NE	J		090818-004	SW846 9060
06-Jul-11	Total Organic Carbon #2	0.856	0.330	1.00	NE	J		090818-004	SW846 9060
	Total Organic Carbon #3	0.523	0.330	1.00	NE	J		090818-004	SW846 9060
	Total Organic Carbon #4	0.463	0.330	1.00	NE	J		090818-004	SW846 9060
	Total Organic Carbon Average	0.610	0.330	1.00	NE	J		090818-004	SW846 9060
TAV-MW4	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090825-004	SW846 9060
11-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090825-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090825-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090825-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090825-004	SW846 9060
TAV-MW6	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090839-004	SW846 9060
18-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090839-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090839-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090839-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090839-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090820-004	SW846 9060
07-Jul-11	Total Organic Carbon #2	0.571	0.330	1.00	NE	J		090820-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090820-004	SW846 9060
	Total Organic Carbon #4	0.420	0.330	1.00	NE	J		090820-004	SW846 9060
	Total Organic Carbon Average	0.391	0.330	1.00	NE	J		090820-004	SW846 9060
TAV-MW10	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090841-004	SW846 9060
19-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090841-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090841-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090841-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090841-004	SW846 9060
TAV-MW11	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090822-004	SW846 9060
08-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090822-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090822-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090822-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090822-004	SW846 9060
TAV-MW12	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090837-004	SW846 9060
15-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090837-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090837-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090837-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090837-004	SW846 9060
TAV-MW13	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090813-004	SW846 9060
05-Jul-11	Total Organic Carbon #2	0.624	0.330	1.00	NE	J		090813-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090813-004	SW846 9060
	Total Organic Carbon #4	0.411	0.330	1.00	NE	J		090813-004	SW846 9060
	Total Organic Carbon Average	0.412	0.330	1.00	NE	J		090813-004	SW846 9060
TAV-MW14	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090834-004	SW846 9060
14-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090834-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090834-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090834-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090834-004	SW846 9060
TAV-MW14 (Duplicate)	Total Organic Carbon #1	ND	0.330	1.00	NE	U		090835-004	SW846 9060
14-Jul-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		090835-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		090835-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		090835-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		090835-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Total Organic Carbon #1	ND	0.330	1.00	NE	U	UJ	091426-004	SW846 9060
16-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U	UJ	091426-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U	UJ	091426-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U	UJ	091426-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U	UJ	091426-004	SW846 9060
LWDS-MW1	Total Organic Carbon #1	0.444	0.330	1.00	NE	J		091431-004	SW846 9060
21-Nov-11	Total Organic Carbon #2	0.575	0.330	1.00	NE	J		091431-004	SW846 9060
	Total Organic Carbon #3	0.467	0.330	1.00	NE	J		091431-004	SW846 9060
	Total Organic Carbon #4	0.472	0.330	1.00	NE	J		091431-004	SW846 9060
	Total Organic Carbon Average	0.489	0.330	1.00	NE	J		091431-004	SW846 9060
LWDS-MW2	Total Organic Carbon #1	ND	0.330	1.00	NE	U	UJ	091424-004	SW846 9060
15-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U	UJ	091424-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U	UJ	091424-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U	UJ	091424-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U	UJ	091424-004	SW846 9060
TAV-MW2	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091412-004	SW846 9060
09-Nov-11	Total Organic Carbon #2	0.371	0.330	1.00	NE	J		091412-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091412-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091412-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091412-004	SW846 9060
TAV-MW3	Total Organic Carbon #1	0.370	0.330	1.00	NE	J		091399-004	SW846 9060
02-Nov-11	Total Organic Carbon #2	0.438	0.330	1.00	NE	J		091399-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091399-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091399-004	SW846 9060
	Total Organic Carbon Average	0.348	0.330	1.00	NE	J		091399-004	SW846 9060
TAV-MW4	Total Organic Carbon #1	ND	0.330	1.00	NE	U	UJ	091421-004	SW846 9060
14-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U	UJ	091421-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U	UJ	091421-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U	UJ	091421-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U	UJ	091421-004	SW846 9060
TAV-MW5	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091406-004	SW846 9060
04-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		091406-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091406-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091406-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091406-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Continued)*
Summary of Total Organic Carbon Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6	Total Organic Carbon #1	ND	0.330	1.00	NE	U	UJ	091429-004	SW846 9060
17-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U	UJ	091429-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U	UJ	091429-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U	UJ	091429-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U	UJ	091429-004	SW846 9060
TAV-MW6 (Duplicate)	Total Organic Carbon #1	ND	0.330	1.00	NE	U	UJ	091430-004	SW846 9060
17-Nov-11	Total Organic Carbon #2	0.445	0.330	1.00	NE	J	UJ	091430-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U	UJ	091430-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U	UJ	091430-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U	UJ	091430-004	SW846 9060
TAV-MW7	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091403-004	SW846 9060
03-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		091403-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091403-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091403-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091403-004	SW846 9060
TAV-MW7 (Duplicate)	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091404-004	SW846 9060
03-Nov-11	Total Organic Carbon #2	0.350	0.330	1.00	NE	J		091404-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091404-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091404-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091404-004	SW846 9060
TAV-MW8	Total Organic Carbon #1	0.501	0.330	1.00	NE	J		091419-004	SW846 9060
11-Nov-11	Total Organic Carbon #2	0.613	0.330	1.00	NE	J		091419-004	SW846 9060
	Total Organic Carbon #3	0.486	0.330	1.00	NE	J		091419-004	SW846 9060
	Total Organic Carbon #4	0.473	0.330	1.00	NE	J		091419-004	SW846 9060
	Total Organic Carbon Average	0.518	0.330	1.00	NE	J		091419-004	SW846 9060
TAV-MW9	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091410-004	SW846 9060
08-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		091410-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091410-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091410-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091410-004	SW846 9060
TAV-MW10	Total Organic Carbon #1	0.570	0.330	1.00	NE	J		091438-004	SW846 9060
29-Nov-11	Total Organic Carbon #2	0.604	0.330	1.00	NE	J		091438-004	SW846 9060
	Total Organic Carbon #3	0.586	0.330	1.00	NE	J		091438-004	SW846 9060
	Total Organic Carbon #4	0.584	0.330	1.00	NE	J		091438-004	SW846 9060
	Total Organic Carbon Average	0.586	0.330	1.00	NE	J		091438-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-5 *(Concluded)*
Summary of Total Organic Carbon Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091416-004	SW846 9060
10-Nov-11	Total Organic Carbon #2	0.403	0.330	1.00	NE	J		091416-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091416-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091416-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091416-004	SW846 9060
TAV-MW11 (Duplicate)	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091417-004	SW846 9060
10-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		091417-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091417-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091417-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091417-004	SW846 9060
TAV-MW12	Total Organic Carbon #1	0.666	0.330	1.00	NE	J		091436-004	SW846 9060
28-Nov-11	Total Organic Carbon #2	0.792	0.330	1.00	NE	J		091436-004	SW846 9060
	Total Organic Carbon #3	0.632	0.330	1.00	NE	J		091436-004	SW846 9060
	Total Organic Carbon #4	0.608	0.330	1.00	NE	J		091436-004	SW846 9060
	Total Organic Carbon Average	0.674	0.330	1.00	NE	J		091436-004	SW846 9060
TAV-MW13	Total Organic Carbon #1	ND	0.330	1.00	NE	U		091408-004	SW846 9060
07-Nov-11	Total Organic Carbon #2	ND	0.330	1.00	NE	U		091408-004	SW846 9060
	Total Organic Carbon #3	ND	0.330	1.00	NE	U		091408-004	SW846 9060
	Total Organic Carbon #4	ND	0.330	1.00	NE	U		091408-004	SW846 9060
	Total Organic Carbon Average	ND	0.330	1.00	NE	U		091408-004	SW846 9060
TAV-MW14	Total Organic Carbon #1	0.395	0.330	1.00	NE	J		091433-004	SW846 9060
22-Nov-11	Total Organic Carbon #2	0.558	0.330	1.00	NE	J		091433-004	SW846 9060
	Total Organic Carbon #3	0.372	0.330	1.00	NE	J		091433-004	SW846 9060
	Total Organic Carbon #4	0.419	0.330	1.00	NE	J		091433-004	SW846 9060
	Total Organic Carbon Average	0.439	0.330	1.00	NE	J		091433-004	SW846 9060

Refer to footnotes on page 5A-73.

Table 5A-6
Summary of Perchlorate Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11 06-Jan-11	ND	0.004	0.012	NE	U		089917-020	EPA 314.0
TAV-MW12 19-Jan-11	ND	0.004	0.012	NE	U		089935-020	EPA 314.0
TAV-MW13 10-Jan-11	ND	0.004	0.012	NE	U		089921-020	EPA 314.0
TAV-MW13 (Duplicate) 10-Jan-11	ND	0.004	0.012	NE	U		089922-020	EPA 314.0
TAV-MW14 20-Jan-11	ND	0.004	0.012	NE	U		089938-020	EPA 314.0
TAV-MW11 18-Apr-11	ND	0.004	0.012	NE	U		090435-020	EPA 314.0
TAV-MW12 20-Apr-11	ND	0.004	0.012	NE	U		090442-020	EPA 314.0
TAV-MW12 (Duplicate) 20-Apr-11	ND	0.004	0.012	NE	U		090443-020	EPA 314.0
TAV-MW13 06-Apr-11	ND	0.004	0.012	NE	U		090417-020	EPA 314.0
TAV-MW14 21-Apr-11	ND	0.004	0.012	NE	U		090445-020	EPA 314.0
TAV-MW11 08-Jul-11	ND	0.004	0.012	NE	U		090822-020	EPA 314.0
TAV-MW12 15-Jul-11	ND	0.004	0.012	NE	U		090837-020	EPA 314.0
TAV-MW13 05-Jul-11	ND	0.004	0.012	NE	U		090813-020	EPA 314.0
TAV-MW14 14-Jul-11	ND	0.004	0.012	NE	U		090834-020	EPA 314.0
TAV-MW14 (Duplicate) 14-Jul-11	ND	0.004	0.012	NE	U		090835-020	EPA 314.0
TAV-MW11 10-Nov-11	ND	0.004	0.012	NE	U		091416-020	EPA 314.0

Refer to footnotes on page 5A-73.

Table 5A-6 *(Concluded)*
Summary of Perchlorate Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11 (Duplicate) 10-Nov-11	ND	0.004	0.012	NE	U		091417-020	EPA 314.0
TAV-MW12 28-Nov-11	ND	0.004	0.012	NE	U		091436-020	EPA 314.0
TAV-MW13 07-Nov-11	ND	0.004	0.012	NE	U		091408-020	EPA 314.0
TAV-MW14 22-Nov-11	ND	0.004	0.012	NE	U		091433-020	EPA 314.0

Refer to footnotes on page 5A-73.

Table 5A-7
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Calcium	41.5	0.060	0.200	NE			089910-017	SW846 6020
04-Jan-11	Magnesium	9.58	0.010	0.030	NE			089910-017	SW846 6020
	Potassium	3.53	0.080	0.300	NE			089910-017	SW846 6020
	Sodium	36.3	0.080	0.250	NE			089910-017	SW846 6020
LWDS-MW1	Calcium	65.8	0.300	1.00	NE			089940-017	SW846 6020
24-Jan-11	Magnesium	19.0	0.010	0.030	NE		J	089940-017	SW846 6020
	Potassium	2.93	0.080	0.300	NE			089940-017	SW846 6020
	Sodium	62.0	0.400	1.25	NE			089940-017	SW846 6020
LWDS-MW2	Calcium	42.9	0.060	0.200	NE			089914-017	SW846 6020
05-Jan-11	Magnesium	12.8	0.010	0.030	NE			089914-017	SW846 6020
	Potassium	2.86	0.080	0.300	NE			089914-017	SW846 6020
	Sodium	40.0	0.080	0.250	NE			089914-017	SW846 6020
LWDS-MW2 (Duplicate)	Calcium	42.2	0.060	0.200	NE			089915-017	SW846 6020
05-Jan-11	Magnesium	12.6	0.010	0.030	NE			089915-017	SW846 6020
	Potassium	2.75	0.080	0.300	NE			089915-017	SW846 6020
	Sodium	39.1	0.080	0.250	NE			089915-017	SW846 6020
TAV-MW2	Calcium	65.1	0.300	1.00	NE			089926-017	SW846 6020
12-Jan-11	Magnesium	20.5	0.010	0.030	NE			089926-017	SW846 6020
	Potassium	3.78	0.080	0.300	NE			089926-017	SW846 6020
	Sodium	65.3	0.800	2.50	NE			089926-017	SW846 6020
TAV-MW4	Calcium	45.6	0.060	0.200	NE			089928-017	SW846 6020
13-Jan-11	Magnesium	13.6	0.010	0.030	NE			089928-017	SW846 6020
	Potassium	3.46	0.080	0.300	NE			089928-017	SW846 6020
	Sodium	48.4	0.800	2.50	NE			089928-017	SW846 6020
TAV-MW6	Calcium	63.0	0.300	1.00	NE			089931-017	SW846 6020
17-Jan-11	Magnesium	17.0	0.010	0.030	NE		J	089931-017	SW846 6020
	Potassium	3.78	0.080	0.300	NE			089931-017	SW846 6020
	Sodium	59.6	0.400	1.25	NE			089931-017	SW846 6020
TAV-MW8	Calcium	47.9	0.060	0.200	NE			089924-017	SW846 6020
11-Jan-11	Magnesium	15.5	0.010	0.030	NE			089924-017	SW846 6020
	Potassium	4.90	0.080	0.300	NE			089924-017	SW846 6020
	Sodium	54.1	0.080	0.250	NE			089924-017	SW846 6020
TAV-MW10	Calcium	64.1	0.300	1.00	NE			089933-017	SW846 6020
18-Jan-11	Magnesium	15.5	0.010	0.030	NE		J	089933-017	SW846 6020
	Potassium	4.22	0.080	0.300	NE			089933-017	SW846 6020
	Sodium	56.9	0.400	1.25	NE			089933-017	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Calcium	50.0	0.060	0.200	NE			089917-017	SW846 6020
06-Jan-11	Magnesium	13.6	0.010	0.030	NE			089917-017	SW846 6020
	Potassium	3.71	0.080	0.300	NE			089917-017	SW846 6020
	Sodium	47.6	0.080	0.250	NE			089917-017	SW846 6020
TAV-MW12	Calcium	46.6	0.060	0.200	NE			089935-017	SW846 6020
19-Jan-11	Magnesium	15.9	0.010	0.030	NE		J	089935-017	SW846 6020
	Potassium	3.78	0.080	0.300	NE			089935-017	SW846 6020
	Sodium	49.1	0.080	0.250	NE			089935-017	SW846 6020
TAV-MW13	Calcium	43.2	0.060	0.200	NE		J	089921-017	SW846 6020
10-Jan-11	Magnesium	12.5	0.010	0.030	NE		J	089921-017	SW846 6020
	Potassium	3.11	0.080	0.300	NE			089921-017	SW846 6020
	Sodium	48.8	0.080	0.250	NE		J	089921-017	SW846 6020
TAV-MW13 (Duplicate)	Calcium	42.5	0.060	0.200	NE		J	089922-017	SW846 6020
10-Jan-11	Magnesium	13.0	0.010	0.030	NE		J	089922-017	SW846 6020
	Potassium	3.05	0.080	0.300	NE			089922-017	SW846 6020
	Sodium	49.0	0.080	0.250	NE		J	089922-017	SW846 6020
TAV-MW14	Calcium	63.1	0.300	1.00	NE			089938-017	SW846 6020
20-Jan-11	Magnesium	17.5	0.010	0.030	NE		J	089938-017	SW846 6020
	Potassium	4.07	0.080	0.300	NE			089938-017	SW846 6020
	Sodium	60.3	0.400	1.25	NE			089938-017	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Aluminum	0.0227	0.015	0.050	NE	J		090433-010	SW846 6020
14-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090433-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090433-010	SW846 6020
	Barium	0.0731	0.0006	0.002	2.00			090433-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090433-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090433-010	SW846 6020
	Calcium	40.8	0.060	0.200	NE			090433-010	SW846 6020
	Chromium	0.0795	0.002	0.010	0.100			090433-010	SW846 6020
	Cobalt	0.000116	0.0001	0.001	NE	J		090433-010	SW846 6020
	Copper	0.00148	0.00035	0.001	NE			090433-010	SW846 6020
	Iron	0.482	0.033	0.100	NE			090433-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090433-010	SW846 6020
	Magnesium	9.19	0.010	0.030	NE			090433-010	SW846 6020
	Manganese	0.00147	0.001	0.005	NE	J		090433-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090433-010	SW846 7470
	Nickel	0.00445	0.0005	0.002	NE			090433-010	SW846 6020
	Potassium	3.14	0.080	0.300	NE			090433-010	SW846 6020
	Selenium	0.00196	0.0015	0.005	0.050	J		090433-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090433-010	SW846 6020
	Sodium	35.9	0.080	0.250	NE			090433-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090433-010	SW846 6020
	Uranium	0.00205	0.000067	0.0002	0.030			090433-010	SW846 6020
	Vanadium	0.0147	0.003	0.010	NE			090433-010	SW846 6020
	Zinc	0.00428	0.0035	0.010	NE	J		090433-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW1	Aluminum	ND	0.015	0.050	NE	U		090448-010	SW846 6020
25-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090448-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090448-010	SW846 6020
	Barium	0.0807	0.0006	0.002	2.00			090448-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090448-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090448-010	SW846 6020
	Calcium	66.3	0.300	1.00	NE			090448-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090448-010	SW846 6020
	Cobalt	0.000132	0.0001	0.001	NE	J		090448-010	SW846 6020
	Copper	0.00102	0.00035	0.001	NE			090448-010	SW846 6020
	Iron	0.195	0.033	0.100	NE			090448-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090448-010	SW846 6020
	Magnesium	18.8	0.010	0.030	NE		J	090448-010	SW846 6020
	Manganese	0.00122	0.001	0.005	NE	J		090448-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090448-010	SW846 7470
	Nickel	0.00158	0.0005	0.002	NE	J		090448-010	SW846 6020
	Potassium	3.02	0.080	0.300	NE			090448-010	SW846 6020
	Selenium	0.00671	0.0015	0.005	0.050			090448-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090448-010	SW846 6020
	Sodium	56.9	0.400	1.25	NE		J	090448-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090448-010	SW846 6020
	Uranium	0.00376	0.000067	0.0002	0.030			090448-010	SW846 6020
	Vanadium	0.00345	0.003	0.010	NE	J		090448-010	SW846 6020
	Zinc	0.020	0.0035	0.010	NE			090448-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW2	Aluminum	ND	0.015	0.050	NE	U		090431-010	SW846 6020
13-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090431-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090431-010	SW846 6020
	Barium	0.066	0.0006	0.002	2.00			090431-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090431-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090431-010	SW846 6020
	Calcium	44.2	0.060	0.200	NE			090431-010	SW846 6020
	Chromium	0.00227	0.002	0.010	0.100	J		090431-010	SW846 6020
	Cobalt	0.000102	0.0001	0.001	NE	J		090431-010	SW846 6020
	Copper	0.00127	0.00035	0.001	NE			090431-010	SW846 6020
	Iron	0.135	0.033	0.100	NE			090431-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090431-010	SW846 6020
	Magnesium	12.7	0.010	0.030	NE			090431-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090431-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090431-010	SW846 7470
	Nickel	0.00138	0.0005	0.002	NE	J		090431-010	SW846 6020
	Potassium	2.68	0.080	0.300	NE			090431-010	SW846 6020
	Selenium	0.00194	0.0015	0.005	0.050	J		090431-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090431-010	SW846 6020
	Sodium	40.1	0.080	0.250	NE			090431-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090431-010	SW846 6020
	Uranium	0.00292	0.000067	0.0002	0.030			090431-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090431-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090431-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW2	Aluminum	ND	0.015	0.050	NE	U		090427-010	SW846 6020
11-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090427-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090427-010	SW846 6020
	Barium	0.0577	0.0006	0.002	2.00			090427-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090427-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090427-010	SW846 6020
	Calcium	72.1	0.300	1.00	NE			090427-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090427-010	SW846 6020
	Cobalt	0.000167	0.0001	0.001	NE	J		090427-010	SW846 6020
	Copper	0.000647	0.00035	0.001	NE	J		090427-010	SW846 6020
	Iron	0.177	0.033	0.100	NE			090427-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090427-010	SW846 6020
	Magnesium	21.0	0.010	0.030	NE			090427-010	SW846 6020
	Manganese	0.00109	0.001	0.005	NE	J		090427-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090427-010	SW846 7470
	Nickel	0.00165	0.0005	0.002	NE	J		090427-010	SW846 6020
	Potassium	3.66	0.080	0.300	NE			090427-010	SW846 6020
	Selenium	0.00267	0.0015	0.005	0.050	J		090427-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090427-010	SW846 6020
	Sodium	64.6	0.400	1.25	NE			090427-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090427-010	SW846 6020
	Uranium	0.00587	0.000067	0.0002	0.030			090427-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090427-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090427-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW3	Aluminum	ND	0.015	0.050	NE	U		090413-010	SW846 6020
05-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090413-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090413-010	SW846 6020
	Barium	0.0459	0.0006	0.002	2.00			090413-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090413-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090413-010	SW846 6020
	Calcium	57.7	0.600	2.00	NE		J	090413-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090413-010	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090413-010	SW846 6020
	Copper	0.000854	0.00035	0.001	NE	J		090413-010	SW846 6020
	Iron	0.121	0.033	0.100	NE			090413-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090413-010	SW846 6020
	Magnesium	14.7	0.010	0.030	NE			090413-010	SW846 6020
	Manganese	0.00141	0.001	0.005	NE	J		090413-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090413-010	SW846 7470
	Nickel	0.000929	0.0005	0.002	NE	J	NJ-	090413-010	SW846 6020
	Potassium	4.66	0.080	0.300	NE			090413-010	SW846 6020
	Selenium	0.00222	0.0015	0.005	0.050	J		090413-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090413-010	SW846 6020
	Sodium	58.4	0.800	2.50	NE		J	090413-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090413-010	SW846 6020
	Uranium	0.00339	0.000067	0.0002	0.030	B		090413-010	SW846 6020
	Vanadium	0.00322	0.003	0.010	NE	J		090413-010	SW846 6020
	Zinc	0.00405	0.0035	0.010	NE	J		090413-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW4	Aluminum	0.0372	0.015	0.050	NE	J		090438-010	SW846 6020
19-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090438-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090438-010	SW846 6020
	Barium	0.0851	0.0006	0.002	2.00			090438-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090438-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090438-010	SW846 6020
	Calcium	57.1	0.300	1.00	NE			090438-010	SW846 6020
	Chromium	0.0213	0.002	0.010	0.100			090438-010	SW846 6020
	Cobalt	0.000118	0.0001	0.001	NE	J		090438-010	SW846 6020
	Copper	0.000562	0.00035	0.001	NE	J		090438-010	SW846 6020
	Iron	0.161	0.033	0.100	NE			090438-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090438-010	SW846 6020
	Magnesium	13.6	0.010	0.030	NE		J	090438-010	SW846 6020
	Manganese	0.00138	0.001	0.005	NE	J		090438-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090438-010	SW846 7470
	Nickel	0.00149	0.0005	0.002	NE	J		090438-010	SW846 6020
	Potassium	3.36	0.080	0.300	NE			090438-010	SW846 6020
	Selenium	0.0039	0.0015	0.005	0.050	J		090438-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090438-010	SW846 6020
	Sodium	43.4	0.080	0.250	NE			090438-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090438-010	SW846 6020
	Uranium	0.00319	0.000067	0.0002	0.030			090438-010	SW846 6020
	Vanadium	0.00583	0.003	0.010	NE	J		090438-010	SW846 6020
	Zinc	0.00393	0.0035	0.010	NE	J		090438-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW5	Aluminum	0.0211	0.015	0.050	NE	B, J	0.10U	090415-010	SW846 6020
08-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090415-010	SW846 6020
	Arsenic	0.00221	0.0017	0.005	0.010	J		090415-010	SW846 6020
	Barium	0.0643	0.0006	0.002	2.00			090415-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090415-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090415-010	SW846 6020
	Calcium	46.9	0.060	0.200	NE			090415-010	SW846 6020
	Chromium	0.00222	0.002	0.010	0.100	J		090415-010	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090415-010	SW846 6020
	Copper	0.000729	0.00035	0.001	NE	J		090415-010	SW846 6020
	Iron	0.114	0.033	0.100	NE			090415-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090415-010	SW846 6020
	Magnesium	15.0	0.010	0.030	NE			090415-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090415-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090415-010	SW846 7470
	Nickel	ND	0.0005	0.002	NE	U	UJ	090415-010	SW846 6020
	Potassium	2.85	0.080	0.300	NE			090415-010	SW846 6020
	Selenium	0.00229	0.0015	0.005	0.050	J		090415-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090415-010	SW846 6020
	Sodium	47.3	0.080	0.250	NE			090415-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090415-010	SW846 6020
	Uranium	0.00355	0.000067	0.0002	0.030	B		090415-010	SW846 6020
	Vanadium	0.00406	0.003	0.010	NE	J		090415-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090415-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6	Aluminum	ND	0.015	0.050	NE	U		090452-010	SW846 6020
26-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090452-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090452-010	SW846 6020
	Barium	0.0611	0.0006	0.002	2.00			090452-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090452-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090452-010	SW846 6020
	Calcium	64.3	0.300	1.00	NE			090452-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090452-010	SW846 6020
	Cobalt	0.00012	0.0001	0.001	NE	J		090452-010	SW846 6020
	Copper	0.000543	0.00035	0.001	NE	J	0.0023U	090452-010	SW846 6020
	Iron	0.192	0.033	0.100	NE			090452-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090452-010	SW846 6020
	Magnesium	19.1	0.010	0.030	NE		J	090452-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090452-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090452-010	SW846 7470
	Nickel	0.00131	0.0005	0.002	NE	J		090452-010	SW846 6020
	Potassium	3.59	0.080	0.300	NE			090452-010	SW846 6020
	Selenium	0.00356	0.0015	0.005	0.050	J		090452-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090452-010	SW846 6020
	Sodium	62.0	0.400	1.25	NE		J	090452-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090452-010	SW846 6020
	Uranium	0.00404	0.000067	0.0002	0.030			090452-010	SW846 6020
	Vanadium	0.00357	0.003	0.010	NE	J		090452-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090452-010	SW846 6020

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Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6 (Duplicate) 26-Apr-11	Aluminum	ND	0.015	0.050	NE	U		090453-010	SW846 6020
	Antimony	ND	0.001	0.003	0.006	U		090453-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090453-010	SW846 6020
	Barium	0.063	0.0006	0.002	2.00			090453-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090453-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090453-010	SW846 6020
	Calcium	66.2	0.300	1.00	NE			090453-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090453-010	SW846 6020
	Cobalt	0.000116	0.0001	0.001	NE	J		090453-010	SW846 6020
	Copper	0.000579	0.00035	0.001	NE	J	0.0023U	090453-010	SW846 6020
	Iron	0.192	0.033	0.100	NE			090453-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090453-010	SW846 6020
	Magnesium	18.5	0.010	0.030	NE		J	090453-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090453-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090453-010	SW846 7470
	Nickel	0.0013	0.0005	0.002	NE	J		090453-010	SW846 6020
	Potassium	3.72	0.080	0.300	NE			090453-010	SW846 6020
	Selenium	0.00402	0.0015	0.005	0.050	J		090453-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090453-010	SW846 6020
	Sodium	61.4	0.400	1.25	NE		J	090453-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090453-010	SW846 6020
	Uranium	0.00414	0.000067	0.0002	0.030			090453-010	SW846 6020
	Vanadium	0.00471	0.003	0.010	NE	J		090453-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090453-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW7	Aluminum	0.0327	0.015	0.050	NE	B, J	0.10U	090442-010	SW846 6020
07-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090442-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090442-010	SW846 6020
	Barium	0.0538	0.0006	0.002	2.00			090442-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090442-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090442-010	SW846 6020
	Calcium	62.1	0.600	2.00	NE		J	090442-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090442-010	SW846 6020
	Cobalt	0.000125	0.0001	0.001	NE	J		090442-010	SW846 6020
	Copper	0.000952	0.00035	0.001	NE	J	0.0018U	090442-010	SW846 6020
	Iron	0.139	0.033	0.100	NE			090442-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090442-010	SW846 6020
	Magnesium	18.8	0.010	0.030	NE			090442-010	SW846 6020
	Manganese	0.00229	0.001	0.005	NE	J		090442-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090442-010	SW846 7470
	Nickel	0.000951	0.0005	0.002	NE	J	NJ-	090442-010	SW846 6020
	Potassium	4.04	0.080	0.300	NE			090442-010	SW846 6020
	Selenium	0.00227	0.0015	0.005	0.050	J		090442-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090442-010	SW846 6020
	Sodium	60.1	0.800	2.50	NE		J	090442-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090442-010	SW846 6020
	Uranium	0.00502	0.000067	0.0002	0.030	B		090442-010	SW846 6020
	Vanadium	0.00328	0.003	0.010	NE	J		090442-010	SW846 6020
	Zinc	0.00717	0.0035	0.010	NE	J		090442-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW7 (Duplicate)	Aluminum	0.0313	0.015	0.050	NE	B, J	0.10U	090423-010	SW846 6020
07-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090423-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090423-010	SW846 6020
	Barium	0.0563	0.0006	0.002	2.00			090423-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090423-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090423-010	SW846 6020
	Calcium	62.0	0.600	2.00	NE		J	090423-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090423-010	SW846 6020
	Cobalt	0.000128	0.0001	0.001	NE	J		090423-010	SW846 6020
	Copper	0.000982	0.00035	0.001	NE	J	0.0018U	090423-010	SW846 6020
	Iron	0.143	0.033	0.100	NE			090423-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090423-010	SW846 6020
	Magnesium	19.1	0.010	0.030	NE			090423-010	SW846 6020
	Manganese	0.00219	0.001	0.005	NE	J		090423-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090423-010	SW846 7470
	Nickel	0.000988	0.0005	0.002	NE	J	NJ-	090423-010	SW846 6020
	Potassium	4.17	0.080	0.300	NE			090423-010	SW846 6020
	Selenium	0.00219	0.0015	0.005	0.050	J		090423-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090423-010	SW846 6020
	Sodium	59.8	0.800	2.50	NE		J	090423-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090423-010	SW846 6020
	Uranium	0.00507	0.000067	0.0002	0.030	B		090423-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090423-010	SW846 6020
	Zinc	0.00608	0.0035	0.010	NE	J		090423-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Aluminum	0.0326	0.015	0.050	NE	J		090429-010	SW846 6020
12-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090429-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090429-010	SW846 6020
	Barium	0.0485	0.0006	0.002	2.00			090429-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090429-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090429-010	SW846 6020
	Calcium	56.5	0.300	1.00	NE			090429-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090429-010	SW846 6020
	Cobalt	0.000103	0.0001	0.001	NE	J		090429-010	SW846 6020
	Copper	0.000577	0.00035	0.001	NE	J		090429-010	SW846 6020
	Iron	0.149	0.033	0.100	NE			090429-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090429-010	SW846 6020
	Magnesium	15.4	0.010	0.030	NE			090429-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090429-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090429-010	SW846 7470
	Nickel	0.00131	0.0005	0.002	NE	J		090429-010	SW846 6020
	Potassium	3.45	0.080	0.300	NE			090429-010	SW846 6020
	Selenium	0.00252	0.0015	0.005	0.050	J		090429-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090429-010	SW846 6020
	Sodium	49.0	0.080	0.250	NE			090429-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090429-010	SW846 6020
	Uranium	0.00317	0.000067	0.0002	0.030			090429-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090429-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090429-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW9	Aluminum	0.0856	0.015	0.050	NE			090425-010	SW846 6020
15-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090425-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090425-010	SW846 6020
	Barium	0.061	0.0006	0.002	2.00			090425-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090425-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090425-010	SW846 6020
	Calcium	64.1	0.300	1.00	NE			090425-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090425-010	SW846 6020
	Cobalt	0.000171	0.0001	0.001	NE	J		090425-010	SW846 6020
	Copper	0.00129	0.00035	0.001	NE			090425-010	SW846 6020
	Iron	0.231	0.033	0.100	NE			090425-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090425-010	SW846 6020
	Magnesium	17.3	0.010	0.030	NE		J	090425-010	SW846 6020
	Manganese	0.00441	0.001	0.005	NE	J		090425-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090425-010	SW846 7470
	Nickel	0.00208	0.0005	0.002	NE			090425-010	SW846 6020
	Potassium	4.33	0.080	0.300	NE			090425-010	SW846 6020
	Selenium	0.00195	0.0015	0.005	0.050	J		090425-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090425-010	SW846 6020
	Sodium	60.4	0.400	1.25	NE			090425-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090425-010	SW846 6020
	Uranium	0.0055	0.000067	0.0002	0.030			090425-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090425-010	SW846 6020
	Zinc	0.0219	0.0035	0.010	NE			090425-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW10	Aluminum	ND	0.015	0.050	NE	U		090455-010	SW846 6020
27-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090455-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090455-010	SW846 6020
	Barium	0.0614	0.0006	0.002	2.00			090455-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090455-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090455-010	SW846 6020
	Calcium	65.0	0.300	1.00	NE			090455-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090455-010	SW846 6020
	Cobalt	0.000111	0.0001	0.001	NE	J		090455-010	SW846 6020
	Copper	0.000549	0.00035	0.001	NE	J		090455-010	SW846 6020
	Iron	0.189	0.033	0.100	NE			090455-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090455-010	SW846 6020
	Magnesium	16.5	0.010	0.030	NE		J	090455-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090455-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090455-010	SW846 7470
	Nickel	0.0013	0.0005	0.002	NE	J		090455-010	SW846 6020
	Potassium	4.58	0.080	0.300	NE			090455-010	SW846 6020
	Selenium	0.00304	0.0015	0.005	0.050	J		090455-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090455-010	SW846 6020
	Sodium	69.5	0.400	1.25	NE		J	090455-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090455-010	SW846 6020
	Uranium	0.00386	0.000067	0.0002	0.030			090455-010	SW846 6020
	Vanadium	0.00485	0.003	0.010	NE	J		090455-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090455-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Aluminum	0.0207	0.015	0.050	NE	J		090435-010	SW846 6020
18-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090435-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090435-010	SW846 6020
	Barium	0.0759	0.0006	0.002	2.00			090435-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090435-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090435-010	SW846 6020
	Calcium	61.4	0.300	1.00	NE			090435-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090435-010	SW846 6020
	Cobalt	0.000149	0.0001	0.001	NE	J		090435-010	SW846 6020
	Copper	0.000689	0.00035	0.001	NE	J		090435-010	SW846 6020
	Iron	0.183	0.033	0.100	NE			090435-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090435-010	SW846 6020
	Magnesium	15.8	0.010	0.030	NE		J	090435-010	SW846 6020
	Manganese	0.0116	0.001	0.005	NE			090435-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090435-010	SW846 7470
	Nickel	0.00144	0.0005	0.002	NE	J		090435-010	SW846 6020
	Potassium	4.30	0.080	0.300	NE			090435-010	SW846 6020
	Selenium	0.00347	0.0015	0.005	0.050	J		090435-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090435-010	SW846 6020
	Sodium	55.0	0.400	1.25	NE			090435-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090435-010	SW846 6020
	Uranium	0.00321	0.000067	0.0002	0.030			090435-010	SW846 6020
	Vanadium	0.00804	0.003	0.010	NE	J		090435-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090435-010	SW846 6020

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Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW12	Aluminum	0.0288	0.015	0.050	NE	J		090442-010	SW846 6020
20-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090442-010	SW846 6020
	Arsenic	0.00218	0.0017	0.005	0.010	J	0.0099U	090442-010	SW846 6020
	Barium	0.0812	0.0006	0.002	2.00			090442-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090442-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090442-010	SW846 6020
	Calcium	68.8	0.300	1.00	NE			090442-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090442-010	SW846 6020
	Cobalt	0.000166	0.0001	0.001	NE	J		090442-010	SW846 6020
	Copper	0.000737	0.00035	0.001	NE	J	0.0023U	090442-010	SW846 6020
	Iron	0.208	0.033	0.100	NE			090442-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090442-010	SW846 6020
	Magnesium	19.6	0.010	0.030	NE		J	090442-010	SW846 6020
	Manganese	0.0293	0.001	0.005	NE			090442-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090442-010	SW846 7470
	Nickel	0.0019	0.0005	0.002	NE	J		090442-010	SW846 6020
	Potassium	4.17	0.080	0.300	NE			090442-010	SW846 6020
	Selenium	0.00319	0.0015	0.005	0.050	J		090442-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090442-010	SW846 6020
	Sodium	78.0	0.400	1.25	NE			090442-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090442-010	SW846 6020
	Uranium	0.00535	0.000067	0.0002	0.030			090442-010	SW846 6020
	Vanadium	0.00496	0.003	0.010	NE	J		090442-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090442-010	SW846 6020

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Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW12 (Duplicate) 20-Apr-11	Aluminum	0.0223	0.015	0.050	NE	J		090443-010	SW846 6020
	Antimony	ND	0.001	0.003	0.006	U		090443-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090443-010	SW846 6020
	Barium	0.082	0.0006	0.002	2.00			090443-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090443-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090443-010	SW846 6020
	Calcium	65.7	0.300	1.00	NE			090443-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090443-010	SW846 6020
	Cobalt	0.000175	0.0001	0.001	NE	J		090443-010	SW846 6020
	Copper	0.000688	0.00035	0.001	NE	J	0.0023U	090443-010	SW846 6020
	Iron	0.181	0.033	0.100	NE			090443-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090443-010	SW846 6020
	Magnesium	18.5	0.010	0.030	NE		J	090443-010	SW846 6020
	Manganese	0.0284	0.001	0.005	NE			090443-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090443-010	SW846 7470
	Nickel	0.00209	0.0005	0.002	NE			090443-010	SW846 6020
	Potassium	4.39	0.080	0.300	NE			090443-010	SW846 6020
	Selenium	0.0029	0.0015	0.005	0.050	J		090443-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090443-010	SW846 6020
	Sodium	66.0	0.400	1.25	NE			090443-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090443-010	SW846 6020
	Uranium	0.00536	0.000067	0.0002	0.030			090443-010	SW846 6020
	Vanadium	0.00419	0.003	0.010	NE	J		090443-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090443-010	SW846 6020

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Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW13	Aluminum	0.0247	0.015	0.050	NE	B, J	0.10U	090417-010	SW846 6020
06-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090417-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090417-010	SW846 6020
	Barium	0.0607	0.0006	0.002	2.00			090417-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090417-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090417-010	SW846 6020
	Calcium	48.0	0.060	0.200	NE			090417-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090417-010	SW846 6020
	Cobalt	0.000121	0.0001	0.001	NE	J		090417-010	SW846 6020
	Copper	0.000786	0.00035	0.001	NE	J		090417-010	SW846 6020
	Iron	0.120	0.033	0.100	NE			090417-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090417-010	SW846 6020
	Magnesium	15.1	0.010	0.030	NE			090417-010	SW846 6020
	Manganese	0.0121	0.001	0.005	NE			090417-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090417-010	SW846 7470
	Nickel	0.000593	0.0005	0.002	NE	J	NJ-	090417-010	SW846 6020
	Potassium	3.33	0.080	0.300	NE			090417-010	SW846 6020
	Selenium	0.00212	0.0015	0.005	0.050	J		090417-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090417-010	SW846 6020
	Sodium	54.8	0.800	2.50	NE			090417-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090417-010	SW846 6020
	Uranium	0.00399	0.000067	0.0002	0.030	B		090417-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090417-010	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090417-010	SW846 6020

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Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW14	Aluminum	0.092	0.015	0.050	NE			090445-010	SW846 6020
21-Apr-11	Antimony	ND	0.001	0.003	0.006	U		090445-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090445-010	SW846 6020
	Barium	0.0689	0.0006	0.002	2.00			090445-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090445-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090445-010	SW846 6020
	Calcium	70.5	0.300	1.00	NE			090445-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090445-010	SW846 6020
	Cobalt	0.000216	0.0001	0.001	NE	J		090445-010	SW846 6020
	Copper	0.00094	0.00035	0.001	NE	J		090445-010	SW846 6020
	Iron	0.312	0.033	0.100	NE			090445-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090445-010	SW846 6020
	Magnesium	19.6	0.010	0.030	NE		J	090445-010	SW846 6020
	Manganese	0.00724	0.001	0.005	NE			090445-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090445-010	SW846 7470
	Nickel	0.00192	0.0005	0.002	NE	J		090445-010	SW846 6020
	Potassium	4.82	0.080	0.300	NE			090445-010	SW846 6020
	Selenium	0.00286	0.0015	0.005	0.050	J		090445-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090445-010	SW846 6020
	Sodium	74.4	0.400	1.25	NE			090445-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090445-010	SW846 6020
	Uranium	0.00484	0.000067	0.0002	0.030			090445-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090445-010	SW846 6020
	Zinc	0.00559	0.0035	0.010	NE	J		090445-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Calcium	44.2	0.060	0.200	NE			090829-009	SW846 6020
13-Jul-11	Magnesium	10.3	0.010	0.030	NE			090829-009	SW846 6020
	Potassium	3.61	0.080	0.300	NE			090829-009	SW846 6020
	Sodium	41.5	0.080	0.250	NE			090829-009	SW846 6020
LWDS-MW1	Calcium	66.7	0.300	1.00	NE			090843-009	SW846 6020
21-Jul-11	Magnesium	20.6	0.010	0.030	NE		J	090843-009	SW846 6020
	Potassium	2.97	0.080	0.300	NE			090843-009	SW846 6020
	Sodium	64.6	0.400	1.25	NE			090843-009	SW846 6020
LWDS-MW2	Calcium	47.7	0.060	0.200	NE			090827-009	SW846 6020
12-Jul-11	Magnesium	14.1	0.010	0.030	NE			090827-009	SW846 6020
	Potassium	3.06	0.080	0.300	NE			090827-009	SW846 6020
	Sodium	49.1	0.080	0.250	NE			090827-009	SW846 6020
TAV-MW2	Calcium	70.3	0.300	1.00	NE			090817-009	SW846 6020
06-Jul-11	Magnesium	21.7	0.010	0.030	NE			090817-009	SW846 6020
	Potassium	3.64	0.080	0.300	NE			090817-009	SW846 6020
	Sodium	66.7	0.400	1.25	NE			090817-009	SW846 6020
TAV-MW2 (Duplicate)	Calcium	74.1	0.300	1.00	NE		J	090818-009	SW846 6020
06-Jul-11	Magnesium	21.7	0.010	0.030	NE		J	090818-009	SW846 6020
	Potassium	3.73	0.080	0.300	NE		J	090818-009	SW846 6020
	Sodium	70.7	0.400	1.25	NE		J	090818-009	SW846 6020
TAV-MW4	Calcium	55.8	0.300	1.00	NE			090825-009	SW846 6020
11-Jul-11	Magnesium	15.2	0.010	0.030	NE			090825-009	SW846 6020
	Potassium	3.36	0.080	0.300	NE			090825-009	SW846 6020
	Sodium	49.1	0.080	0.250	NE			090825-009	SW846 6020
TAV-MW6	Calcium	62.1	0.300	1.00	NE			090839-009	SW846 6020
18-Jul-11	Magnesium	19.0	0.010	0.030	NE		J	090839-009	SW846 6020
	Potassium	3.82	0.080	0.300	NE			090839-009	SW846 6020
	Sodium	59.3	0.400	1.25	NE			090839-009	SW846 6020
TAV-MW8	Calcium	49.8	0.060	0.200	NE			090820-009	SW846 6020
07-Jul-11	Magnesium	15.5	0.010	0.030	NE			090820-009	SW846 6020
	Potassium	3.42	0.080	0.300	NE			090820-009	SW846 6020
	Sodium	55.2	0.400	1.25	NE			090820-009	SW846 6020
TAV-MW10	Calcium	64.2	0.300	1.00	NE			090841-009	SW846 6020
19-Jul-11	Magnesium	18.1	0.010	0.030	NE		J	090841-009	SW846 6020
	Potassium	4.49	0.080	0.300	NE			090841-009	SW846 6020
	Sodium	59.1	0.400	1.25	NE			090841-009	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Calcium	57.8	0.300	1.00	NE			090822-009	SW846 6020
08-Jul-11	Magnesium	15.0	0.010	0.030	NE			090822-009	SW846 6020
	Potassium	3.76	0.080	0.300	NE			090822-009	SW846 6020
	Sodium	58.0	0.400	1.25	NE			090822-009	SW846 6020
TAV-MW12	Calcium	56.8	0.300	1.00	NE			090837-009	SW846 6020
15-Jul-11	Magnesium	18.6	0.010	0.030	NE		J	090837-009	SW846 6020
	Potassium	3.95	0.080	0.300	NE			090837-009	SW846 6020
	Sodium	57.9	0.400	1.25	NE			090837-009	SW846 6020
TAV-MW13	Calcium	47.2	0.060	0.200	NE			090813-009	SW846 6020
05-Jul-11	Magnesium	13.7	0.010	0.030	NE			090813-009	SW846 6020
	Potassium	3.41	0.080	0.300	NE			090813-009	SW846 6020
	Sodium	46.1	0.080	0.250	NE			090813-009	SW846 6020
TAV-MW14	Calcium	60.6	0.300	1.00	NE			090834-009	SW846 6020
14-Jul-11	Magnesium	20.0	0.010	0.030	NE			090834-009	SW846 6020
	Potassium	4.34	0.080	0.300	NE			090834-009	SW846 6020
	Sodium	62.2	0.400	1.25	NE			090834-009	SW846 6020
TAV-MW14 (Duplicate)	Calcium	64.9	0.300	1.00	NE			090835-009	SW846 6020
14-Jul-11	Magnesium	19.3	0.010	0.030	NE			090835-009	SW846 6020
	Potassium	4.28	0.080	0.300	NE			090835-009	SW846 6020
	Sodium	66.5	0.400	1.25	NE			090835-009	SW846 6020
AVN-1	Calcium	41.0	0.060	0.200	NE	B		091426-017	SW846 6020
16-Nov-11	Magnesium	9.30	0.010	0.030	NE		J	091426-017	SW846 6020
	Potassium	3.23	0.080	0.300	NE			091426-017	SW846 6020
	Sodium	34.9	0.080	0.250	NE		J	091426-017	SW846 6020
LWDS-MW1	Calcium	64.4	0.300	1.00	NE	B		091431-017	SW846 6020
21-Nov-11	Magnesium	18.7	0.050	0.150	NE		J	091431-017	SW846 6020
	Potassium	2.59	0.080	0.300	NE			091431-017	SW846 6020
	Sodium	64.6	0.400	1.25	NE			091431-017	SW846 6020
LWDS-MW2	Calcium	44.6	0.060	0.200	NE	B		091424-017	SW846 6020
15-Nov-11	Magnesium	13.0	0.010	0.030	NE		J	091424-017	SW846 6020
	Potassium	2.81	0.080	0.300	NE			091424-017	SW846 6020
	Sodium	40.3	0.080	0.250	NE		J	091424-017	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW2	Calcium	74.2	0.300	1.00	NE	B	J	091412-017	SW846 6020
09-Nov-11	Magnesium	20.9	0.010	0.030	NE			091412-017	SW846 6020
	Potassium	3.85	0.080	0.300	NE			091412-017	SW846 6020
	Sodium	71.7	0.400	1.25	NE			091412-017	SW846 6020
TAV-MW3	Calcium	59.8	0.300	1.00	NE	B		091399-017	SW846 6020
02-Nov-11	Magnesium	15.3	0.010	0.030	NE		J	091399-017	SW846 6020
	Potassium	4.36	0.080	0.300	NE			091399-017	SW846 6020
	Sodium	56.7	0.400	1.25	NE			091399-017	SW846 6020
TAV-MW4	Calcium	45.9	0.060	0.200	NE	B		091421-017	SW846 6020
14-Nov-11	Magnesium	12.7	0.010	0.030	NE		J	091421-017	SW846 6020
	Potassium	2.95	0.080	0.300	NE			091421-017	SW846 6020
	Sodium	41.7	0.080	0.250	NE		J	091421-017	SW846 6020
TAV-MW5	Calcium	44.5	0.060	0.200	NE	B	J	091406-017	SW846 6020
04-Nov-11	Magnesium	12.5	0.010	0.030	NE			091406-017	SW846 6020
	Potassium	2.81	0.080	0.300	NE			091406-017	SW846 6020
	Sodium	42.3	0.080	0.250	NE			091406-017	SW846 6020
TAV-MW6	Calcium	60.1	0.300	1.00	NE	B		091429-017	SW846 6020
17-Nov-11	Magnesium	19.0	0.010	0.030	NE		J	091429-017	SW846 6020
	Potassium	3.51	0.080	0.300	NE			091429-017	SW846 6020
	Sodium	62.7	0.400	1.25	NE		J	091429-017	SW846 6020
TAV-MW6 (Duplicate)	Calcium	61.4	0.300	1.00	NE	B		091430-017	SW846 6020
17-Nov-11	Magnesium	19.1	0.010	0.030	NE		J	091430-017	SW846 6020
	Potassium	3.53	0.080	0.300	NE			091430-017	SW846 6020
	Sodium	62.0	0.400	1.25	NE		J	091430-017	SW846 6020
TAV-MW7	Calcium	63.6	0.300	1.00	NE	B		091403-017	SW846 6020
03-Nov-11	Magnesium	18.8	0.010	0.030	NE		J	091403-017	SW846 6020
	Potassium	4.14	0.080	0.300	NE			091403-017	SW846 6020
	Sodium	62.1	0.400	1.25	NE			091403-017	SW846 6020
TAV-MW7 (Duplicate)	Calcium	63.6	0.300	1.00	NE	B		091404-017	SW846 6020
03-Nov-11	Magnesium	18.3	0.010	0.030	NE		J	091404-017	SW846 6020
	Potassium	3.88	0.080	0.300	NE			091404-017	SW846 6020
	Sodium	62.8	0.400	1.25	NE			091404-017	SW846 6020
TAV-MW8	Calcium	56.3	0.300	1.00	NE	B		091419-017	SW846 6020
11-Nov-11	Magnesium	16.7	0.010	0.030	NE		J	091419-017	SW846 6020
	Potassium	3.71	0.080	0.300	NE			091419-017	SW846 6020
	Sodium	56.0	0.400	1.25	NE		J	091419-017	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-7 *(Concluded)*
Summary of Unfiltered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW9	Calcium	61.1	0.300	1.00	NE	B	J	091410-017	SW846 6020
08-Nov-11	Magnesium	17.6	0.010	0.030	NE			091410-017	SW846 6020
	Potassium	3.97	0.080	0.300	NE			091410-017	SW846 6020
	Sodium	59.6	0.400	1.25	NE			091410-017	SW846 6020
TAV-MW10	Calcium	67.0	0.300	1.00	NE			091438-017	SW846 6020
29-Nov-11	Magnesium	16.0	0.010	0.030	NE			091438-017	SW846 6020
	Potassium	4.39	0.080	0.300	NE			091438-017	SW846 6020
	Sodium	66.1	0.400	1.25	NE			091438-017	SW846 6020
TAV-MW11	Calcium	57.1	0.300	1.00	NE	B	J	091416-017	SW846 6020
10-Nov-11	Magnesium	14.5	0.010	0.030	NE			091416-017	SW846 6020
	Potassium	3.57	0.080	0.300	NE			091416-017	SW846 6020
	Sodium	52.7	0.400	1.25	NE			091416-017	SW846 6020
TAV-MW11 (Duplicate)	Calcium	55.6	0.300	1.00	NE	B	J	091417-017	SW846 6020
10-Nov-11	Magnesium	14.2	0.010	0.030	NE			091417-017	SW846 6020
	Potassium	3.66	0.080	0.300	NE			091417-017	SW846 6020
	Sodium	52.8	0.400	1.25	NE			091417-017	SW846 6020
TAV-MW12	Calcium	61.6	0.300	1.00	NE			091436-017	SW846 6020
28-Nov-11	Magnesium	17.9	0.010	0.030	NE			091436-017	SW846 6020
	Potassium	3.91	0.080	0.300	NE			091436-017	SW846 6020
	Sodium	61.5	0.400	1.25	NE			091436-017	SW846 6020
TAV-MW13	Calcium	48.0	0.060	0.200	NE	B	J	091408-017	SW846 6020
07-Nov-11	Magnesium	14.6	0.010	0.030	NE			091408-017	SW846 6020
	Potassium	3.40	0.080	0.300	NE			091408-017	SW846 6020
	Sodium	52.2	0.400	1.25	NE			091408-017	SW846 6020
TAV-MW14	Calcium	58.5	0.300	1.00	NE	B		091433-017	SW846 6020
22-Nov-11	Magnesium	17.1	0.010	0.030	NE			091433-017	SW846 6020
	Potassium	4.26	0.080	0.300	NE			091433-017	SW846 6020
	Sodium	57.7	0.400	1.25	NE			091433-017	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-8
Summary of Filtered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Iron	0.153	0.033	0.100	NE			089910-010	SW846 6020
04-Jan-11	Manganese	ND	0.001	0.005	NE	U		089910-010	SW846 6020
LWDS-MW1	Iron	0.117	0.033	0.100	NE		J+	089940-010	SW846 6020
24-Jan-11	Manganese	ND	0.001	0.005	NE	U		089940-010	SW846 6020
LWDS-MW2	Iron	0.160	0.033	0.100	NE			089914-010	SW846 6020
05-Jan-11	Manganese	ND	0.001	0.005	NE	U		089914-010	SW846 6020
LWDS-MW2 (Duplicate)	Iron	0.153	0.033	0.100	NE			089915-010	SW846 6020
05-Jan-11	Manganese	ND	0.001	0.005	NE	U		089915-010	SW846 6020
TAV-MW2	Iron	0.116	0.033	0.100	NE			089926-010	SW846 6020
12-Jan-11	Manganese	ND	0.001	0.005	NE	U		089926-010	SW846 6020
TAV-MW4	Iron	0.0918	0.033	0.100	NE	J		089928-010	SW846 6020
13-Jan-11	Manganese	ND	0.001	0.005	NE	U		089928-010	SW846 6020
TAV-MW6	Iron	0.128	0.033	0.100	NE		J+	089931-010	SW846 6020
17-Jan-11	Manganese	ND	0.001	0.005	NE	U		089931-010	SW846 6020
TAV-MW8	Iron	0.091	0.033	0.100	NE	J		089924-010	SW846 6020
11-Jan-11	Manganese	ND	0.001	0.005	NE	U		089924-010	SW846 6020
TAV-MW10	Iron	0.105	0.033	0.100	NE		J+	089933-010	SW846 6020
18-Jan-11	Manganese	ND	0.001	0.005	NE	U		089933-010	SW846 6020
TAV-MW11	Iron	0.180	0.033	0.100	NE			089917-010	SW846 6020
06-Jan-11	Manganese	0.0436	0.001	0.005	NE			089917-010	SW846 6020
TAV-MW12	Iron	0.0909	0.033	0.100	NE	J	J+	089935-010	SW846 6020
19-Jan-11	Manganese	0.0848	0.001	0.005	NE			089935-010	SW846 6020
TAV-MW13	Iron	0.135	0.033	0.100	NE			089921-010	SW846 6020
10-Jan-11	Manganese	0.0184	0.001	0.005	NE			089921-010	SW846 6020
TAV-MW13 (Duplicate)	Iron	0.136	0.033	0.100	NE			089922-010	SW846 6020
10-Jan-11	Manganese	0.0192	0.001	0.005	NE			089922-010	SW846 6020
TAV-MW14	Iron	0.105	0.033	0.100	NE		J+	089938-010	SW846 6020
20-Jan-11	Manganese	0.0281	0.001	0.005	NE			089938-010	SW846 6020
AVN-1	Iron	0.0962	0.033	0.100	NE	J		090433-017	SW846 6020
14-Apr-11	Manganese	ND	0.001	0.005	NE	U		090433-017	SW846 6020
LWDS-MW1	Iron	0.191	0.033	0.100	NE			090448-017	SW846 6020
25-Apr-11	Manganese	ND	0.001	0.005	NE	U		090448-017	SW846 6020
LWDS-MW2	Iron	0.107	0.033	0.100	NE			090431-017	SW846 6020
13-Apr-11	Manganese	ND	0.001	0.005	NE	U		090431-017	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-8 *(Continued)*
Summary of Filtered Total Metal Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW2	Iron	0.169	0.033	0.100	NE			090427-017	SW846 6020
11-Apr-11	Manganese	ND	0.001	0.005	NE	U		090427-017	SW846 6020
TAV-MW3	Iron	0.112	0.033	0.100	NE			090413-017	SW846 6020
05-Apr-11	Manganese	ND	0.001	0.005	NE	U		090413-017	SW846 6020
TAV-MW4	Iron	0.117	0.033	0.100	NE			090438-017	SW846 6020
19-Apr-11	Manganese	ND	0.001	0.005	NE	U		090438-017	SW846 6020
TAV-MW5	Iron	0.0924	0.033	0.100	NE	J		090415-017	SW846 6020
08-Apr-11	Manganese	ND	0.001	0.005	NE	U		090415-017	SW846 6020
TAV-MW6	Iron	0.171	0.033	0.100	NE			090452-017	SW846 6020
26-Apr-11	Manganese	ND	0.001	0.005	NE	U		090452-017	SW846 6020
TAV-MW6 (Duplicate)	Iron	0.183	0.033	0.100	NE			090453-017	SW846 6020
26-Apr-11	Manganese	ND	0.001	0.005	NE	U		090453-017	SW846 6020
TAV-MW7	Iron	0.119	0.033	0.100	NE			090422-017	SW846 6020
07-Apr-11	Manganese	ND	0.001	0.005	NE	U		090422-017	SW846 6020
TAV-MW7 (Duplicate)	Iron	0.114	0.033	0.100	NE			090423-017	SW846 6020
07-Apr-11	Manganese	ND	0.001	0.005	NE	U		090423-017	SW846 6020
TAV-MW8	Iron	0.125	0.033	0.100	NE			090429-017	SW846 6020
12-Apr-11	Manganese	ND	0.001	0.005	NE	U		090429-017	SW846 6020
TAV-MW9	Iron	0.137	0.033	0.100	NE			090425-017	SW846 6020
15-Apr-11	Manganese	ND	0.001	0.005	NE	U		090425-017	SW846 6020
TAV-MW10	Iron	0.180	0.033	0.100	NE			090455-017	SW846 6020
27-Apr-11	Manganese	ND	0.001	0.005	NE	U		090455-017	SW846 6020
TAV-MW11	Iron	0.148	0.033	0.100	NE			090435-017	SW846 6020
18-Apr-11	Manganese	0.0103	0.001	0.005	NE			090435-017	SW846 6020
TAV-MW12	Iron	0.172	0.033	0.100	NE			090442-017	SW846 6020
20-Apr-11	Manganese	0.0249	0.001	0.005	NE			090442-017	SW846 6020
TAV-MW12 (Duplicate)	Iron	0.162	0.033	0.100	NE			090443-017	SW846 6020
20-Apr-11	Manganese	0.0244	0.001	0.005	NE			090443-017	SW846 6020
TAV-MW13	Iron	0.103	0.033	0.100	NE			090417-017	SW846 6020
06-Apr-11	Manganese	0.002	0.001	0.005	NE	J		090417-017	SW846 6020
TAV-MW14	Iron	0.202	0.033	0.100	NE			090445-017	SW846 6020
21-Apr-11	Manganese	0.003	0.001	0.005	NE	J		090445-017	SW846 6020
AVN-1	Iron	0.105	0.033	0.100	NE			090829-010	SW846 6020
13-Jul-11	Manganese	ND	0.001	0.005	NE	U		090829-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-8 *(Continued)*
Summary of Filtered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW1	Iron	0.134	0.033	0.100	NE			090843-010	SW846 6020
21-Jul-11	Manganese	ND	0.001	0.005	NE	U		090843-010	SW846 6020
LWDS-MW2	Iron	0.106	0.033	0.100	NE			090827-010	SW846 6020
12-Jul-11	Manganese	ND	0.001	0.005	NE	U		090827-010	SW846 6020
TAV-MW2	Iron	0.161	0.033	0.100	NE			090817-010	SW846 6020
06-Jul-11	Manganese	ND	0.001	0.005	NE	U		090817-010	SW846 6020
TAV-MW2 (Duplicate)	Iron	0.213	0.033	0.100	NE			090818-010	SW846 6020
06-Jul-11	Manganese	0.0416	0.001	0.005	NE			090818-010	SW846 6020
TAV-MW4	Iron	0.119	0.033	0.100	NE			090825-010	SW846 6020
11-Jul-11	Manganese	ND	0.001	0.005	NE	U		090825-010	SW846 6020
TAV-MW6	Iron	0.125	0.033	0.100	NE			090839-010	SW846 6020
18-Jul-11	Manganese	ND	0.001	0.005	NE	U		090839-010	SW846 6020
TAV-MW8	Iron	0.128	0.033	0.100	NE			090820-010	SW846 6020
07-Jul-11	Manganese	ND	0.001	0.005	NE	U		090820-010	SW846 6020
TAV-MW10	Iron	0.127	0.033	0.100	NE			090841-010	SW846 6020
19-Jul-11	Manganese	ND	0.001	0.005	NE	U		090841-010	SW846 6020
TAV-MW11	Iron	0.133	0.033	0.100	NE			090822-010	SW846 6020
08-Jul-11	Manganese	0.00688	0.001	0.005	NE			090822-010	SW846 6020
TAV-MW12	Iron	0.101	0.033	0.100	NE			090837-010	SW846 6020
15-Jul-11	Manganese	0.00684	0.001	0.005	NE			090837-010	SW846 6020
TAV-MW13	Iron	0.136	0.033	0.100	NE			090813-010	SW846 6020
05-Jul-11	Manganese	0.00138	0.001	0.005	NE	J		090813-010	SW846 6020
TAV-MW14	Iron	0.146	0.033	0.100	NE			090834-010	SW846 6020
14-Jul-11	Manganese	ND	0.001	0.005	NE	U		090834-010	SW846 6020
TAV-MW14 (Duplicate)	Iron	0.156	0.033	0.100	NE			090835-010	SW846 6020
14-Jul-11	Manganese	ND	0.001	0.005	NE	U		090835-010	SW846 6020
AVN-1	Iron	0.0857	0.033	0.100	NE	J		091426-010	SW846 6020
16-Nov-11	Manganese	0.00144	0.001	0.005	NE	J		091426-010	SW846 6020
LWDS-MW1	Iron	0.104	0.033	0.100	NE			091431-010	SW846 6020
21-Nov-11	Manganese	ND	0.001	0.005	NE	U		091431-010	SW846 6020
LWDS-MW2	Iron	0.0848	0.033	0.100	NE	J		091424-010	SW846 6020
15-Nov-11	Manganese	ND	0.001	0.005	NE	U		091424-010	SW846 6020
TAV-MW2	Iron	0.136	0.033	0.100	NE			091412-010	SW846 6020
09-Nov-11	Manganese	ND	0.001	0.005	NE	U		091412-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-8 *(Concluded)*
Summary of Filtered Total Metal Results,
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW3	Iron	0.141	0.033	0.100	NE			091399-010	SW846 6020
02-Nov-11	Manganese	ND	0.001	0.005	NE	U		091399-010	SW846 6020
TAV-MW4	Iron	0.0921	0.033	0.100	NE	J		091421-010	SW846 6020
14-Nov-11	Manganese	ND	0.001	0.005	NE	U		091421-010	SW846 6020
TAV-MW5	Iron	0.120	0.033	0.100	NE			091406-010	SW846 6020
04-Nov-11	Manganese	ND	0.001	0.005	NE	U		091406-010	SW846 6020
TAV-MW6	Iron	0.106	0.033	0.100	NE			091429-010	SW846 6020
17-Nov-11	Manganese	ND	0.001	0.005	NE	U		091429-010	SW846 6020
TAV-MW6 (Duplicate)	Iron	0.121	0.033	0.100	NE			091430-010	SW846 6020
17-Nov-11	Manganese	ND	0.001	0.005	NE	U		091430-010	SW846 6020
TAV-MW7	Iron	0.145	0.033	0.100	NE			091403-010	SW846 6020
03-Nov-11	Manganese	ND	0.001	0.005	NE	U		091403-010	SW846 6020
TAV-MW7 (Duplicate)	Iron	0.166	0.033	0.100	NE			091404-010	SW846 6020
03-Nov-11	Manganese	0.00256	0.001	0.005	NE	J		091404-010	SW846 6020
TAV-MW8	Iron	0.122	0.033	0.100	NE			091419-010	SW846 6020
11-Nov-11	Manganese	ND	0.001	0.005	NE	U		091419-010	SW846 6020
TAV-MW9	Iron	0.126	0.033	0.100	NE			091410-010	SW846 6020
08-Nov-11	Manganese	ND	0.001	0.005	NE	U		091410-010	SW846 6020
TAV-MW10	Iron	0.129	0.033	0.100	NE			091438-010	SW846 6020
29-Nov-11	Manganese	ND	0.001	0.005	NE	U		091438-010	SW846 6020
TAV-MW11	Iron	0.108	0.033	0.100	NE		0.33U	091416-010	SW846 6020
10-Nov-11	Manganese	0.00209	0.001	0.005	NE	J		091416-010	SW846 6020
TAV-MW11 (Duplicate)	Iron	0.132	0.033	0.100	NE		0.33U	091417-010	SW846 6020
10-Nov-11	Manganese	0.00216	0.001	0.005	NE	J		091417-010	SW846 6020
TAV-MW12	Iron	0.0583	0.033	0.100	NE	J		091436-010	SW846 6020
28-Nov-11	Manganese	ND	0.001	0.005	NE	U		091436-010	SW846 6020
TAV-MW13	Iron	0.101	0.033	0.100	NE			091408-010	SW846 6020
07-Nov-11	Manganese	ND	0.001	0.005	NE	U		091408-010	SW846 6020
TAV-MW14	Iron	0.0687	0.033	0.100	NE	J		091433-010	SW846 6020
22-Nov-11	Manganese	ND	0.001	0.005	NE	U		091433-010	SW846 6020

Refer to footnotes on page 5A-73.

Table 5A-9
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[b] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Americium-241	2.62 ± 10.2	17.3	8.65	NE	U	BD	090433-033	EPA 901.1
14-Apr-11	Cesium-137	-0.95 ± 2.09	3.36	1.68	NE	U	BD	090433-033	EPA 901.1
	Cobalt-60	1.12 ± 2.24	3.79	1.89	NE	U	BD	090433-033	EPA 901.1
	Potassium-40	-37 ± 43.7	42.4	21.2	NE	U	BD	090433-033	EPA 901.1
	Gross Alpha	2.85	NA	NA	15	NA	None	090433-034	EPA 900.0
	Gross Beta	4.21 ± 1.04	0.987	0.468	4mrem/yr			090433-034	EPA 900.0
	Tritium	51.3 ± 103	176	84.6	NE	U	BD	090433-036	EPA 906.0 M
LWDS-MW1	Americium-241	3.08 ± 5.91	8.91	4.46	NE	U	BD	090448-033	EPA 901.1
25-Apr-11	Cesium-137	0.285 ± 1.84	3.13	1.57	NE	U	BD	090448-033	EPA 901.1
	Cobalt-60	0.477 ± 1.97	3.34	1.67	NE	U	BD	090448-033	EPA 901.1
	Potassium-40	-33.8 ± 42.6	43.9	22.0	NE	U	BD	090448-033	EPA 901.1
	Gross Alpha	1.13	NA	NA	15	NA	None	090448-034	EPA 900.0
	Gross Beta	4.15 ± 1.32	1.68	0.807	4mrem/yr		J	090448-034	EPA 900.0
	Tritium	29.3 ± 59.5	104	47.2	NE	U	BD	090448-036	EPA 906.0 M
LWDS-MW2	Americium-241	0.0375 ± 6.20	9.18	4.59	NE	U	BD	090431-033	EPA 901.1
13-Apr-11	Cesium-137	-1.56 ± 1.70	2.40	1.20	NE	U	BD	090431-033	EPA 901.1
	Cobalt-60	0.310 ± 1.67	2.78	1.39	NE	U	BD	090431-033	EPA 901.1
	Potassium-40	-46.5 ± 41.2	37.2	18.6	NE	U	BD	090431-033	EPA 901.1
	Gross Alpha	3.83	NA	NA	15	NA	None	090431-034	EPA 900.0
	Gross Beta	2.73 ± 0.828	0.995	0.474	4mrem/yr		J	090431-034	EPA 900.0
	Tritium	63.4 ± 104	176	84.7	NE	U	BD	090431-036	EPA 906.0 M
TAV-MW2	Americium-241	10.8 ± 11.7	16.5	8.25	NE	U	BD	090427-033	EPA 901.1
11-Apr-11	Cesium-137	0.489 ± 1.88	3.14	1.57	NE	U	BD	090427-033	EPA 901.1
	Cobalt-60	1.20 ± 2.02	3.37	1.69	NE	U	BD	090427-033	EPA 901.1
	Potassium-40	-30.8 ± 40.8	41.8	20.9	NE	U	BD	090427-033	EPA 901.1
	Gross Alpha	7.07	NA	NA	15	NA	None	090427-034	EPA 900.0
	Gross Beta	4.74 ± 1.36	1.56	0.751	4mrem/yr			090427-034	EPA 900.0
	Tritium	-25.8 ± 100	177	85.0	NE	U	BD	090427-036	EPA 906.0 M

Refer to footnotes on page 5A-73.

Table 5A-9 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[b] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW3	Americium-241	-5.16 ± 11.3	16.8	8.41	NE	U	BD	090413-033	EPA 901.1
05-Apr-11	Cesium-137	2.28 ± 2.05	3.21	1.61	NE	U	BD	090413-033	EPA 901.1
	Cobalt-60	-0.403 ± 1.92	3.19	1.60	NE	U	BD	090413-033	EPA 901.1
	Potassium-40	0.104 ± 40.8	44.6	22.3	NE	U	BD	090413-033	EPA 901.1
	Gross Alpha	1.38	NA	NA	15	NA	None	090413-034	EPA 900.0
	Gross Beta	2.50 ± 0.887	1.22	0.594	4mrem/yr		J	090413-034	EPA 900.0
	Tritium	-10.3 ± 101	176	84.8	NE	U	BD	090413-036	EPA 906.0 M
TAV-MW4	Americium-241	11.5 ± 9.27	11.8	5.90	NE	U	BD	090438-033	EPA 901.1
19-Apr-11	Cesium-137	0.779 ± 1.89	3.13	1.57	NE	U	BD	090438-033	EPA 901.1
	Cobalt-60	2.16 ± 2.43	3.94	1.97	NE	U	BD	090438-033	EPA 901.1
	Potassium-40	12.8 ± 41.0	30.4	15.2	NE	U	BD	090438-033	EPA 901.1
	Gross Alpha	5.01	NA	NA	15	NA	None	090438-034	EPA 900.0
	Gross Beta	3.28 ± 0.913	0.990	0.469	4mrem/yr			090438-034	EPA 900.0
	Tritium	17.2 ± 105	105	48.0	NE	U	BD	090438-036	EPA 906.0 M
TAV-MW5	Americium-241	-6.58 ± 6.71	9.51	4.76	NE	U	BD	090415-033	EPA 901.1
08-Apr-11	Cesium-137	0.937 ± 1.72	2.84	1.42	NE	U	BD	090415-033	EPA 901.1
	Cobalt-60	-0.618 ± 1.81	2.89	1.44	NE	U	BD	090415-033	EPA 901.1
	Potassium-40	20.6 ± 46.4	27.6	13.8	NE	U	BD	090415-033	EPA 901.1
	Gross Alpha	0.35	NA	NA	15	NA	None	090415-034	EPA 900.0
	Gross Beta	1.72 ± 0.871	1.33	0.650	4mrem/yr		J	090415-034	EPA 900.0
	Tritium	10.1 ± 99.3	173	83.0	NE	U	BD	090415-036	EPA 906.0 M
TAV-MW6	Americium-241	6.17 ± 11.5	17.9	8.98	NE	U	BD	090452-033	EPA 901.1
26-Apr-11	Cesium-137	3.38 ± 2.63	3.76	1.88	NE	U	BD	090452-033	EPA 901.1
	Cobalt-60	0.622 ± 2.23	3.75	1.87	NE	U	BD	090452-033	EPA 901.1
	Potassium-40	-15.8 ± 49.1	56.9	28.5	NE	U	BD	090452-033	EPA 901.1
	Gross Alpha	0.03	NA	NA	15	NA	None	090452-034	EPA 900.0
	Gross Beta	11.0 ± 2.27	1.72	0.830	4mrem/yr			090452-034	EPA 900.0
	Tritium	45.5 ± 62.6	106	48.2	NE	U	BD	090452-036	EPA 906.0 M

Refer to footnotes on page 5A-73.

Table 5A-9 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[b] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6 (Duplicate)	Americium-241	5.69 ± 11.2	16.9	8.45	NE	U	BD	090453-033	EPA 901.1
26-Apr-11	Cesium-137	4.26 ± 3.29	3.52	1.76	NE		J	090453-033	EPA 901.1
	Cobalt-60	1.15 ± 2.22	3.75	1.88	NE	U	BD	090453-033	EPA 901.1
	Potassium-40	32.9 ± 43.6	47.4	23.7	NE	U	BD	090453-033	EPA 901.1
	Gross Alpha	0.57	NA	NA	15	NA	None	090453-034	EPA 900.0
	Gross Beta	7.68 ± 1.85	1.82	0.879	4mrem/yr			090453-034	EPA 900.0
	Tritium	43.3 ± 63.6	108	49.2	NE	U	BD	090453-036	EPA 906.0 M
TAV-MW7	Americium-241	5.24 ± 8.31	12.7	6.35	NE	U	BD	090422-033	EPA 901.1
07-Apr-11	Cesium-137	2.82 ± 2.21	3.28	1.64	NE	U	BD	090422-033	EPA 901.1
	Cobalt-60	0.189 ± 1.93	3.26	1.63	NE	U	BD	090422-033	EPA 901.1
	Potassium-40	-21.9 ± 37.9	42.5	21.3	NE	U	BD	090422-033	EPA 901.1
	Gross Alpha	-0.08	NA	NA	15	NA	None	090422-034	EPA 900.0
	Gross Beta	2.80 ± 1.10	1.56	0.756	4mrem/yr		J	090422-034	EPA 900.0
	Tritium	105 ± 108	177	85.1	NE	U	BD	090422-036	EPA 906.0 M
TAV-MW7 (Duplicate)	Americium-241	0.879 ± 3.41	4.99	2.49	NE	U	BD	090423-033	EPA 901.1
07-Apr-11	Cesium-137	2.13 ± 2.50	3.95	1.98	NE	U	BD	090423-033	EPA 901.1
	Cobalt-60	0.948 ± 2.33	4.03	2.02	NE	U	BD	090423-033	EPA 901.1
	Potassium-40	37.1 ± 30.1	46.6	23.3	NE	U	BD	090423-033	EPA 901.1
	Gross Alpha	2.10	NA	NA	15	NA	None	090423-034	EPA 900.0
	Gross Beta	4.17 ± 1.22	1.51	0.735	4mrem/yr		J	090423-034	EPA 900.0
	Tritium	24.2 ± 103	178	85.5	NE	U	BD	090423-036	EPA 906.0 M
TAV-MW8	Americium-241	-13.1 ± 11.8	16.7	8.35	NE	U	BD	090429-033	EPA 901.1
12-Apr-11	Cesium-137	2.20 ± 2.02	3.18	1.59	NE	U	BD	090429-033	EPA 901.1
	Cobalt-60	-0.46 ± 1.94	3.21	1.61	NE	U	BD	090429-033	EPA 901.1
	Potassium-40	-33.1 ± 40.4	44.3	22.2	NE	U	BD	090429-033	EPA 901.1
	Gross Alpha	5.85	NA	NA	15	NA	None	090429-034	EPA 900.0
	Gross Beta	4.09 ± 1.10	1.19	0.566	4mrem/yr			090429-034	EPA 900.0
	Tritium	-6.85 ± 101	176	84.8	NE	U	BD	090429-036	EPA 906.0 M

Refer to footnotes on page 5A-73.

Table 5A-9 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[b] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW9	Americium-241	2.38 ± 10.9	17.3	8.66	NE	U	BD	090425-033	EPA 901.1
15-Apr-11	Cesium-137	2.45 ± 2.27	3.23	1.62	NE	U	BD	090425-033	EPA 901.1
	Cobalt-60	1.38 ± 2.35	3.91	1.96	NE	U	BD	090425-033	EPA 901.1
	Potassium-40	-64.9 ± 55.9	53.4	26.7	NE	U	BD	090425-033	EPA 901.1
	Gross Alpha	7.72	NA	NA	15	NA	None	090425-034	EPA 900.0
	Gross Beta	5.90 ± 1.47	1.51	0.723	4mrem/yr			090425-034	EPA 900.0
	Tritium	90.2 ± 108	179	85.8	NE	U	BD	090425-036	EPA 906.0 M
TAV-MW10	Americium-241	3.18 ± 8.00	11.8	5.88	NE	U	BD	090455-033	EPA 901.1
27-Apr-11	Cesium-137	0.503 ± 1.69	2.80	1.40	NE	U	BD	090455-033	EPA 901.1
	Cobalt-60	0.000446 ± 1.70	2.78	1.39	NE	U	BD	090455-033	EPA 901.1
	Potassium-40	-14.8 ± 34.9	40.5	20.3	NE	U	BD	090455-033	EPA 901.1
	Gross Alpha	-0.06	NA	NA	15	NA	None	090455-034	EPA 900.0
	Gross Beta	11.3 ± 2.36	1.81	0.874	4mrem/yr			090455-034	EPA 900.0
	Tritium	26.4 ± 59.7	105	47.6	NE	U	BD	090455-036	EPA 906.0 M
TAV-MW11	Americium-241	2.07 ± 4.09	5.94	2.97	NE	U	BD	090435-033	EPA 901.1
18-Apr-11	Cesium-137	1.15 ± 2.87	4.73	2.37	NE	U	BD	090435-033	EPA 901.1
	Cobalt-60	1.27 ± 2.79	4.84	2.42	NE	U	BD	090435-033	EPA 901.1
	Potassium-40	26.6 ± 31.3	52.8	26.4	NE	U	BD	090435-033	EPA 901.1
	Gross Alpha	3.48	NA	NA	15	NA	None	090435-034	EPA 900.0
	Gross Beta	3.80 ± 1.03	1.16	0.558	4mrem/yr			090435-034	EPA 900.0
	Tritium	47.9 ± 62.1	104	47.4	NE	U	BD	090435-036	EPA 906.0 M
TAV-MW12	Americium-241	8.31 ± 11.6	16.8	8.43	NE	U	BD	090442-033	EPA 901.1
20-Apr-11	Cesium-137	0.928 ± 1.89	3.14	1.57	NE	U	BD	090442-033	EPA 901.1
	Cobalt-60	3.76 ± 2.59	3.77	1.80	NE	U	BD	090442-033	EPA 901.1
	Potassium-40	-12.2 ± 38.8	43.7	21.9	NE	U	BD	090442-033	EPA 901.1
	Gross Alpha	1.12	NA	NA	15	NA	None	090442-034	EPA 900.0
	Gross Beta	4.44 ± 1.20	1.27	0.603	4mrem/yr			090442-034	EPA 900.0
	Tritium	35.5 ± 60.5	104	47.4	NE	U	BD	090442-036	EPA 906.0 M

Refer to footnotes on page 5A-73.

Table 5A-9 *(Concluded)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[b] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW12 (Duplicate)	Americium-241	4.08 ± 6.90	10.4	5.19	NE	U	BD	090443-033	EPA 901.1
20-Apr-11	Cesium-137	1.43 ± 1.76	2.79	1.40	NE	U	BD	090443-033	EPA 901.1
	Cobalt-60	6.20 ± 3.83	6.20	1.79	NE	U	BD	090443-033	EPA 901.1
	Potassium-40	-25.1 ± 34.8	37.8	18.9	NE	U	BD	090443-033	EPA 901.1
	Gross Alpha	5.86	NA	NA	15	NA	None	090443-034	EPA 900.0
	Gross Beta	3.99 ± 1.20	1.34	0.639	4mrem/yr		J	090443-034	EPA 900.0
	Tritium	48.5 ± 62.8	105	48.0	NE	U	BD	090443-036	EPA 906.0 M
TAV-MW13	Americium-241	2.50 ± 2.86	4.05	2.03	NE	U	BD	090417-033	EPA 901.1
06-Apr-11	Cesium-137	23.1 ± 3.97	23.1	1.60	NE	U	BD	090417-033	EPA 901.1
	Cobalt-60	1.09 ± 2.15	3.66	1.83	NE	U	BD	090417-033	EPA 901.1
	Potassium-40	59.8 ± 36.7	30.5	15.3	NE	X	R	090417-033	EPA 901.1
	Gross Alpha	-0.16	NA	NA	15	NA	None	090417-034	EPA 900.0
	Gross Beta	1.78 ± 0.844	1.27	0.617	4mrem/yr		J	090417-034	EPA 900.0
	Tritium	54.5 ± 103	175	84.3	NE	U	BD	090417-036	EPA 906.0 M
TAV-MW14	Americium-241	-7.21 ± 8.04	12.0	5.99	NE	U	BD	090445-033	EPA 901.1
21-Apr-11	Cesium-137	1.56 ± 2.53	4.26	2.13	NE	U	BD	090445-033	EPA 901.1
	Cobalt-60	0.680 ± 2.80	4.78	2.39	NE	U	BD	090445-033	EPA 901.1
	Potassium-40	9.43 ± 64.9	36.9	18.5	NE	U	BD	090445-033	EPA 901.1
	Gross Alpha	5.25	NA	NA	15	NA	None	090445-034	EPA 900.0
	Gross Beta	4.47 ± 1.26	1.39	0.666	4mrem/yr			090445-034	EPA 900.0
	Tritium	60.4 ± 63.7	104	47.5	NE	U	BD	090445-036	EPA 906.0 M

Refer to footnotes on page 5A-73.

Table 5A-10
Summary of Field Water Quality Measurements[h], Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
AVN-1	4-Jan-11	19.09	396	285.0	7.60	1.45	43.0	3.98
LWDS-MW1	24-Jan-11	15.73	684	354.4	7.38	1.06	76.9	7.63
LWDS-MW2	5-Jan-11	16.92	446	285.4	7.51	0.70	47.8	4.62
TAV-MW2	12-Jan-11	17.16	680	189.8	7.24	1.58	56.4	5.42
TAV-MW4	13-Jan-11	16.32	492	228.5	7.49	0.66	70.0	6.79
TAV-MW6	17-Jan-11	18.98	649	211.1	7.36	0.45	76.4	7.07
TAV-MW8	11-Jan-11	15.34	549	216.8	7.42	2.78	72.9	7.28
TAV-MW10	18-Jan-11	18.29	622	214.1	7.34	0.08	76.5	7.19
TAV-MW11	6-Jan-11	17.51	525	257.5	7.44	0.65	75.9	7.25
TAV-MW12	19-Jan-11	16.95	561	214.4	7.37	1.85	56.1	5.43
TAV-MW13	10-Jan-11	16.31	504	176.0	7.41	0.50	28.6	2.80
TAV-MW14	20-Jan-11	17.89	628	247.2	7.36	2.03	72.6	6.88
AVN-1	14-Apr-11	18.12	392	373.5	7.65	1.85	42.0	3.96
LWDS-MW1	25-Apr-11	18.20	678	379.9	7.51	0.49	75.9	7.15
LWDS-MW2	13-Apr-11	19.65	443	372.9	7.55	0.44	48.7	4.46
TAV-MW2	11-Apr-11	19.72	677	390.5	7.29	0.69	57.8	5.27
TAV-MW3	05-Apr-11	19.97	513	372.7	7.47	0.90	68.1	6.22
TAV-MW4	19-Apr-11	19.77	489	388.7	7.54	1.50	71.1	6.48
TAV-MW5	08-Apr-11	20.32	471	378.4	7.48	0.42	53.6	4.83
TAV-MW6	26-Apr-11	19.96	645	400.0	7.43	0.59	76.6	6.92
TAV-MW7	07-Apr-11	18.99	571	346.0	7.32	1.76	4.0	0.37
TAV-MW8	12-Apr-11	19.61	548	380.0	7.49	0.88	68.4	6.27
TAV-MW9	15-Apr-11	19.81	600	380.5	7.29	2.59	15.3	1.39
TAV-MW10	27-Apr-11	18.01	615	393.8	7.42	0.16	75.1	7.09
TAV-MW11	18-Apr-11	21.35	531	393.4	7.50	0.75	75.9	6.72
TAV-MW12	20-Apr-11	21.57	568	379.8	7.41	1.25	64.8	5.70
TAV-MW13	06-Apr-11	20.18	502	369.5	7.41	0.87	34.7	3.11
TAV-MW14	21-Apr-11	19.85	624	382.3	7.41	2.22	74.7	6.80
AVN-1	13-Jul-11	23.14	458	337.4	7.44	3.27	47.3	4.12
LWDS-MW1	21-Jul-11	21.96	794	373.1	7.08	0.50	75.6	6.60
LWDS-MW2	12-Jul-11	22.41	515	346.7	7.30	0.30	54.4	4.72

Refer to footnotes on page 5A-73.

Table 5A-10 *(Concluded)*
Summary of Field Water Quality Measurements[h],
Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
TAV-MW2	06-Jul-11	24.09	789	381.1	7.04	0.40	66.1	5.54
TAV-MW4	11-Jul-11	24.48	570	345.9	7.30	0.65	79.1	6.65
TAV-MW6	18-Jul-11	23.78	755	364.7	7.15	6.27	84.9	7.17
TAV-MW8	07-Jul-11	23.59	638	370.0	7.22	0.96	77.5	6.56
TAV-MW10	19-Jul-11	24.00	720	372.8	7.15	0.34	82.0	6.90
TAV-MW11	08-Jul-11	24.06	621	365.5	7.22	0.43	80.6	6.77
TAV-MW12	15-Jul-11	22.60	660	358.4	7.16	1.98	65.8	5.68
TAV-MW13	05-Jul-11	23.01	586	366.0	7.23	0.63	24.7	2.12
TAV-MW14	14-Jul-11	22.42	727	338.8	7.13	1.14	82.7	7.13
AVN-1	16-Nov-11	19.97	459	370.0	7.51	7.40	34.1	3.10
LWDS-MW1	21-Nov-11	16.50	789	373.6	7.50	0.56	72.5	7.06
LWDS-MW2	15-Nov-11	18.94	515	383.7	7.43	0.21	48.5	4.48
TAV-MW2	09-Nov-11	17.84	791	393.5	7.17	1.04	53.6	5.05
TAV-MW3	02-Nov-11	18.31	599	383.0	7.31	1.13	69.6	6.54
TAV-MW4	14-Nov-11	18.90	565	383.4	7.42	2.42	64.2	5.96
TAV-MW5	04-Nov-11	19.86	550	381.2	7.37	0.27	51.0	4.64
TAV-MW6	17-Nov-11	18.75	753	389.9	7.24	2.71	73.1	6.80
TAV-MW7	03-Nov-11	18.61	667	365.1	7.21	4.21	4.8	0.46
TAV-MW8	11-Nov-11	18.15	639	384.6	7.36	5.01	632	5.96
TAV-MW9	08-Nov-11	18.38	668	387.3	7.11	2.61	18.3	1.71
TAV-MW10	29-Nov-11	18.97	718	389.6	7.24	0.48	64.1	5.94
TAV-MW11	10-Nov-11	18.91	622	385.9	7.35	0.51	70.4	6.51
TAV-MW12	28-Nov-11	19.66	663	388.8	7.27	0.66	58.3	5.32
TAV-MW13	07-Nov-11	19.68	583	377.2	7.33	1.08	23.2	2.12
TAV-MW14	22-Nov-11	19.11	729	387.9	7.28	0.61	67.0	6.18

Refer to footnotes on page 5A-73.

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Footnotes for Technical Area V Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table I-4)
- µg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems:
  15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table I-4).
  4 mrem/yr = any combination of beta and/or gamma-emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B = Analyte is detected in associated laboratory method blank.
H = Analytical holding time was exceeded.
J = Amount detected is below the PQL.
NA = Not applicable.
U = Analyte is absent or below the method detection limit.
X = Data rejected due to peak not meeting identification criteria.

Footnotes for Technical Area V Groundwater Monitoring Tables *(Concluded)*

[f]**Validation Qualifier**

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	=	Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	=	The associated value is an estimated quantity.
J+	=	The associated numerical value is an estimated quantity with a suspected positive bias.
NJ-	=	Presumptive evidence of the presence of the material at an estimated quantity with a suspected negative bias.
None	=	No data validation for corrected gross alpha activity.
U	=	The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	=	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	=	The data are unusable. Resampling and reanalysis are necessary for verification.

[g]**Analytical Method**

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes*, EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio
- U.S. Environmental Protection Agency, Washington, D.C.; or Clesceri, Greenburg, and Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B.

[h]**Field Water Quality Measurements**

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 5B
Technical Area V
Plots

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Attachment 5B Plots

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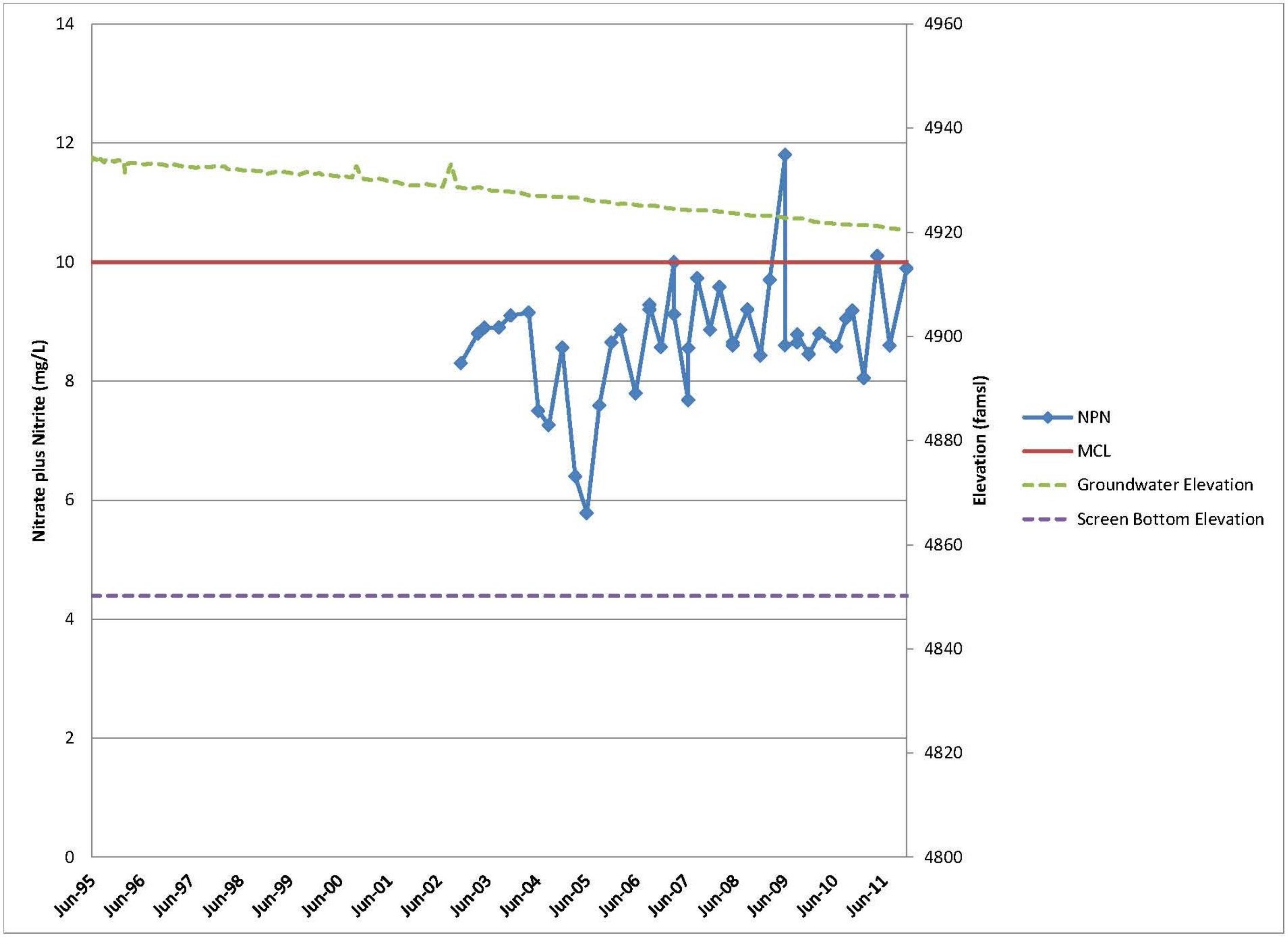

Figure 5B-1. Nitrate Plus Nitrite Concentrations, AVN-1

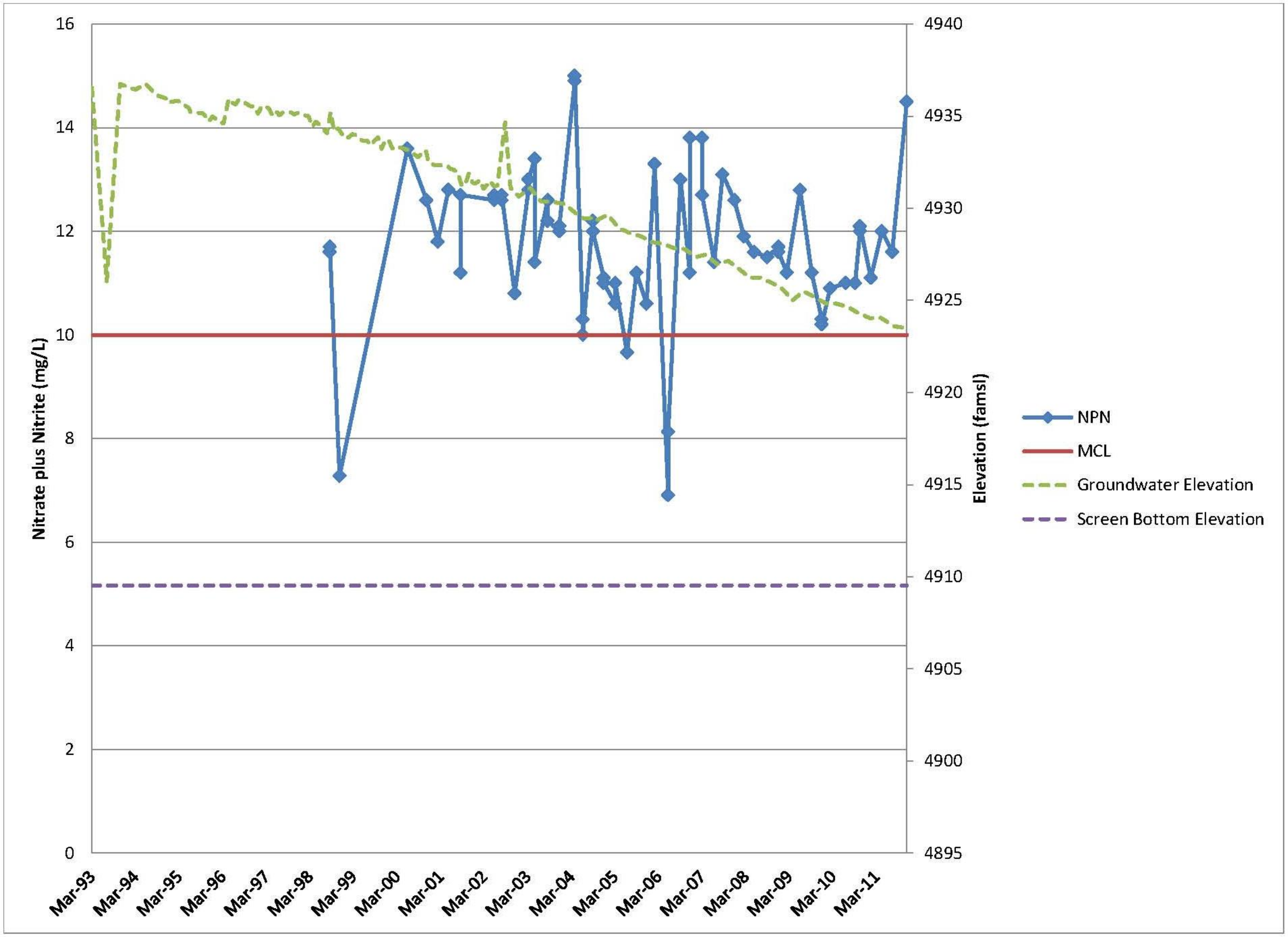

Figure 5B-2. Nitrate Plus Nitrite Concentrations, LWDS-MW1

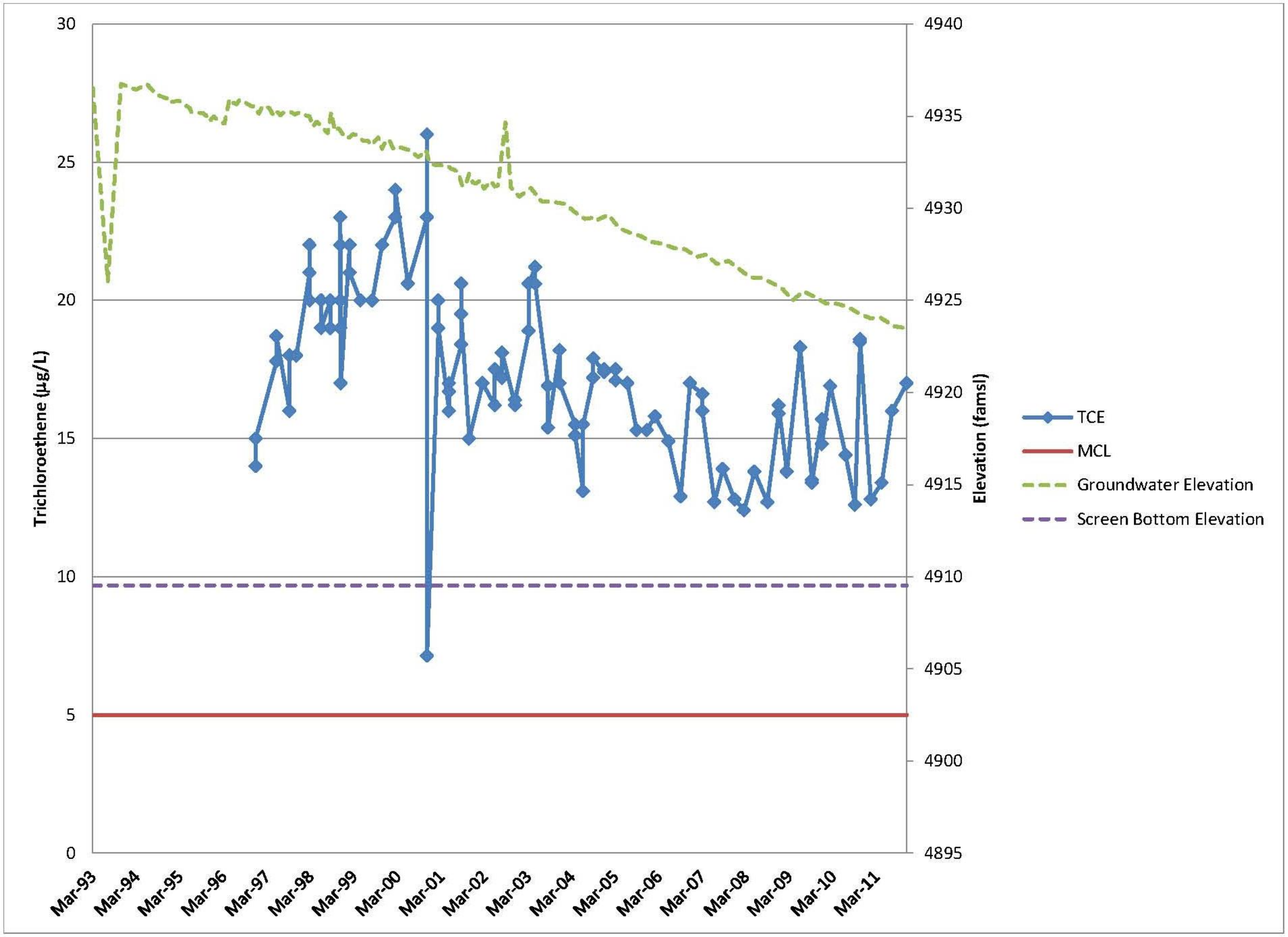

Figure 5B-3. Trichloroethene Concentrations, LWDS-MW1

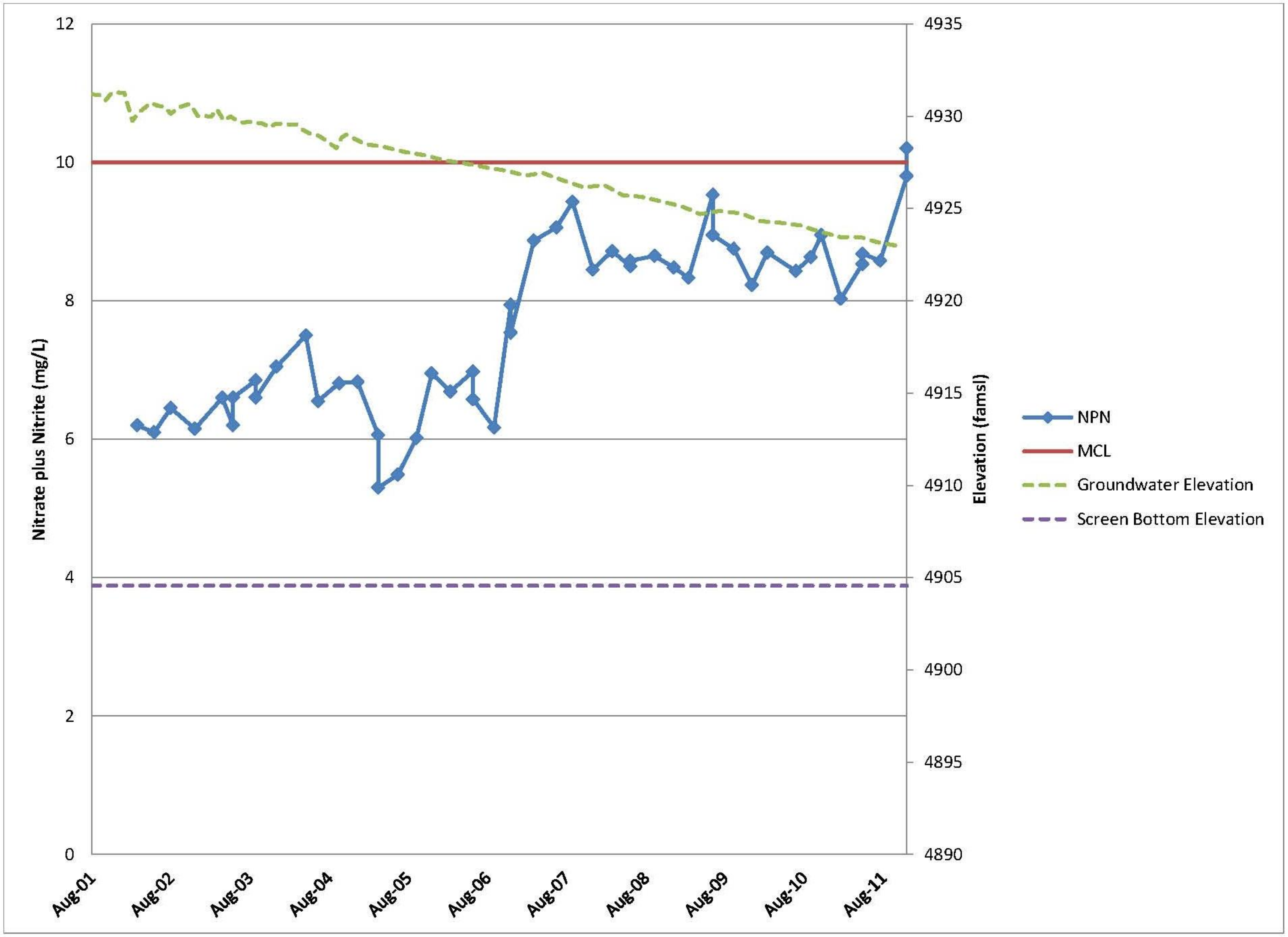

Figure 5B-4. Nitrate Plus Nitrite Concentrations, TAV-MW6

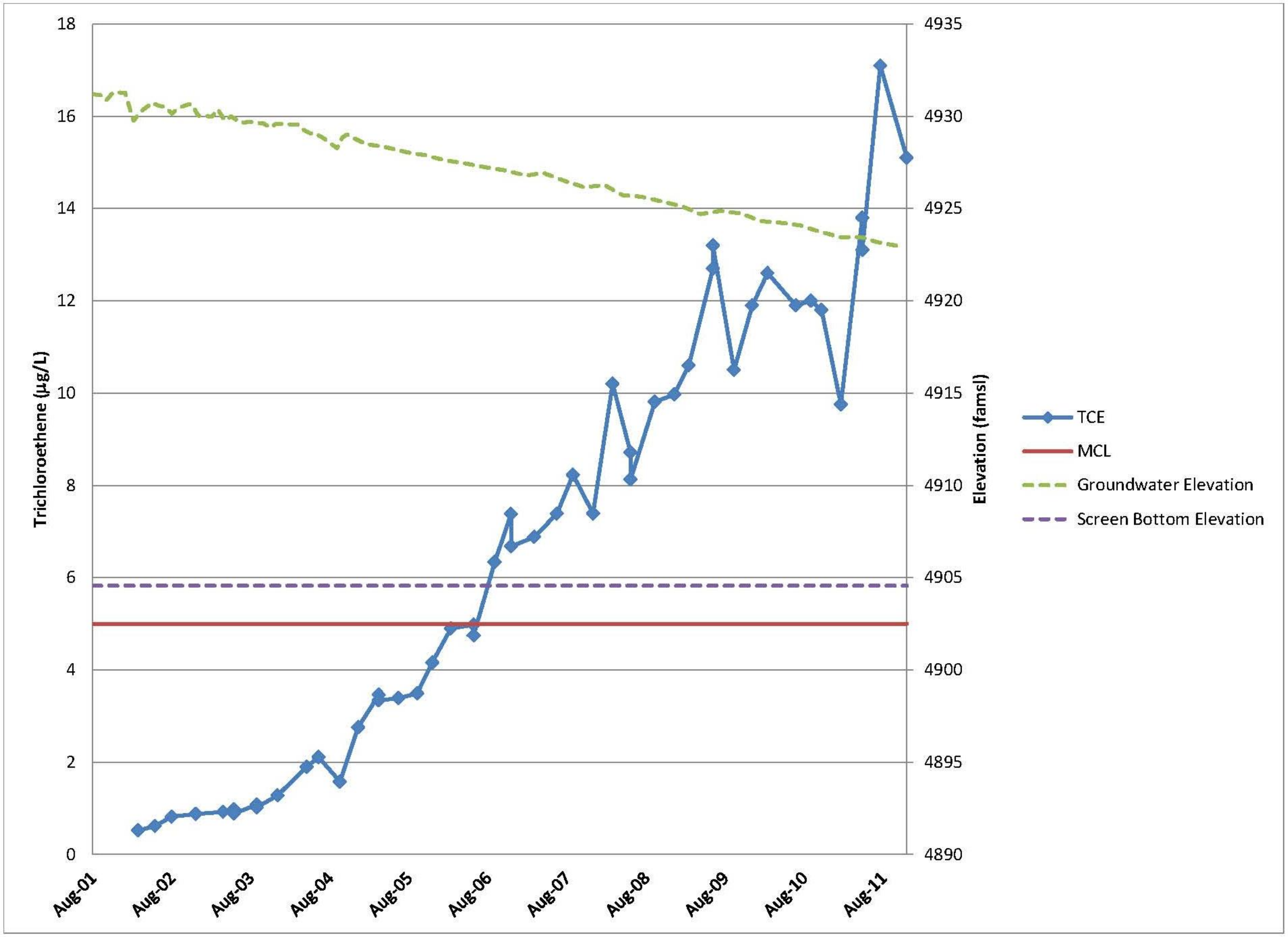

Figure 5B-5. Trichloroethene Concentrations, TAV-MW6

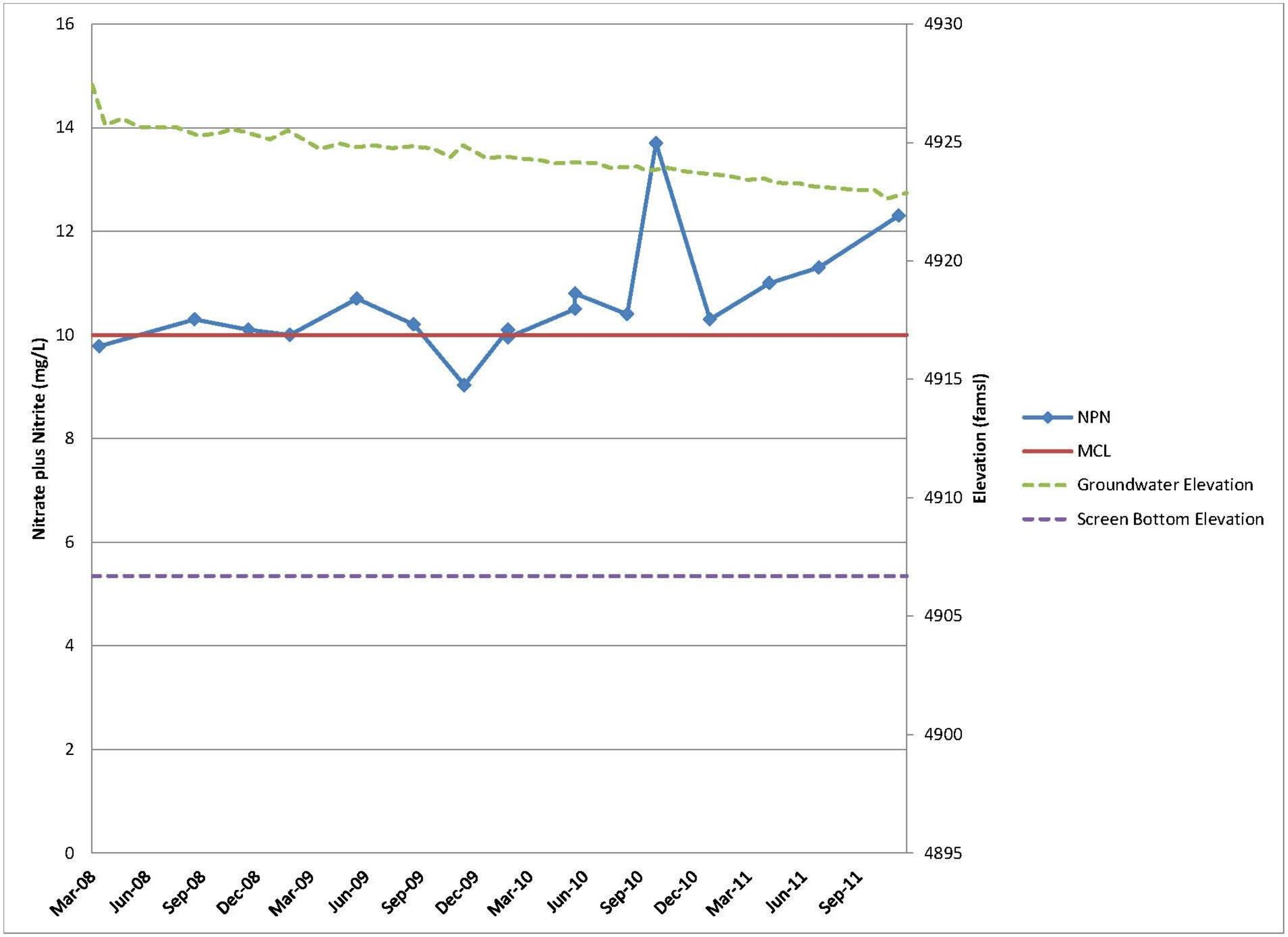

Figure 5B-6. Nitrate Plus Nitrite Concentrations, TAV-MW10

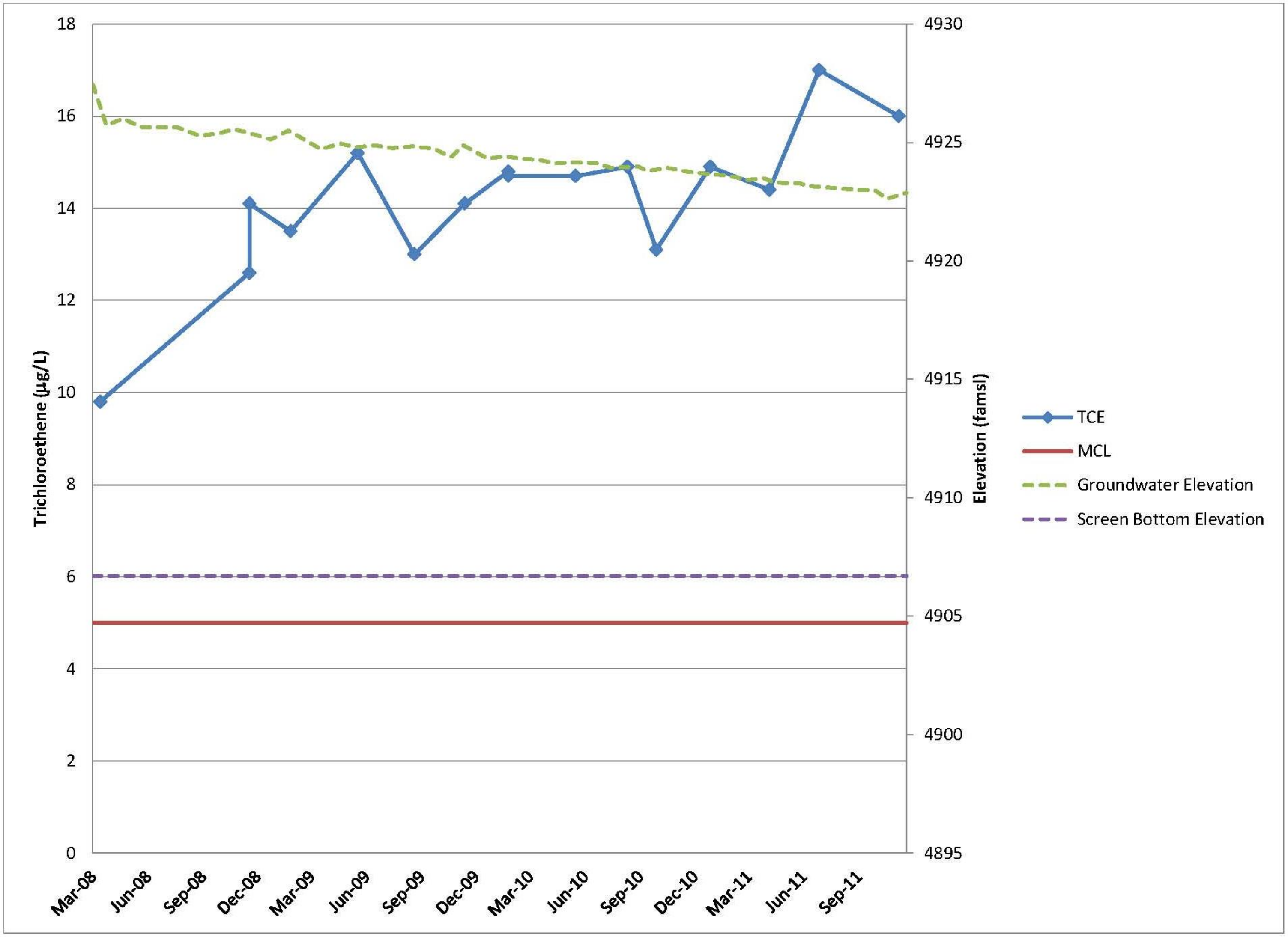

Figure 5B-7. Trichloroethene Concentrations, TAV-MW10

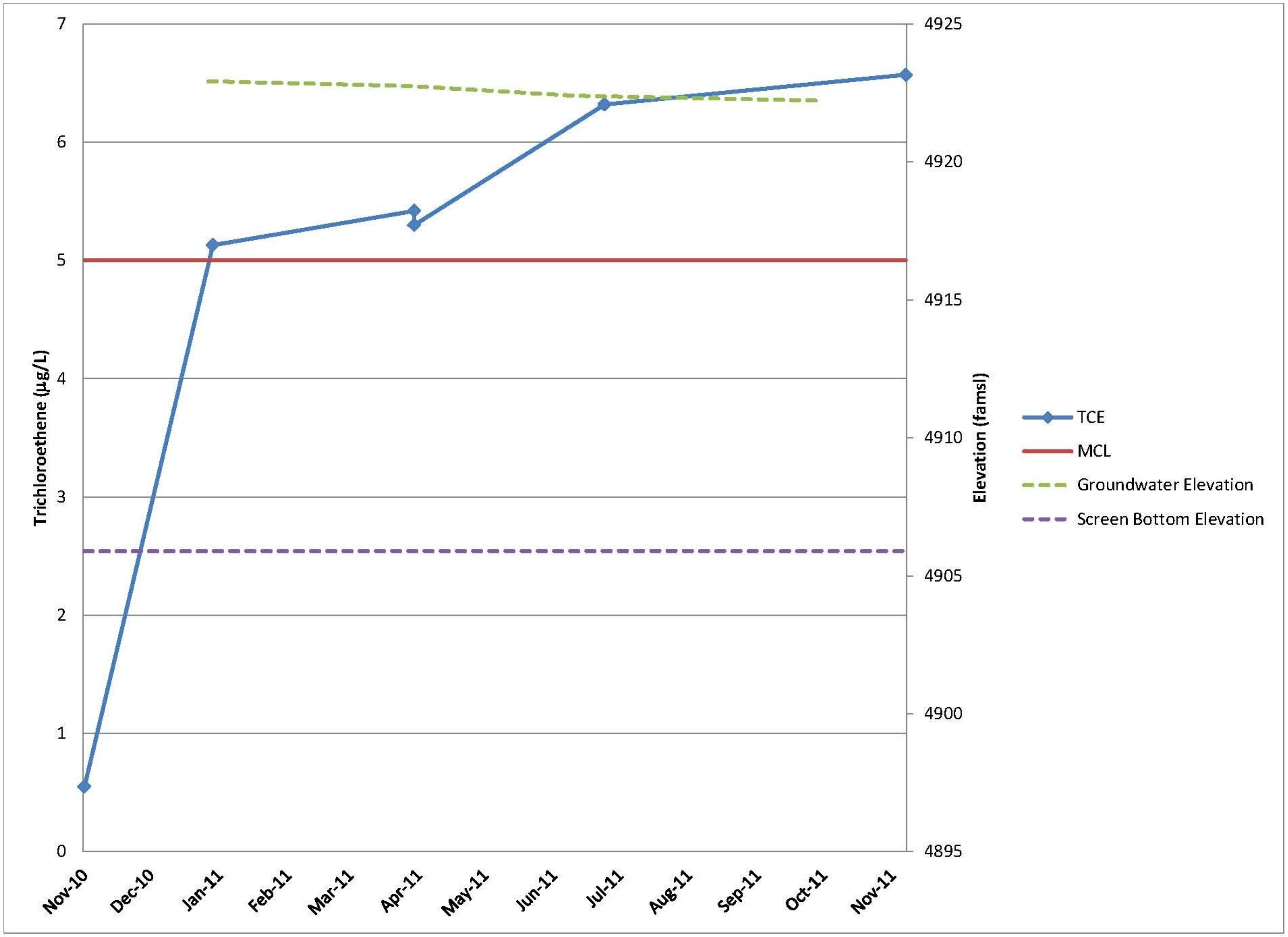

Figure 5B-8. Trichloroethene Concentrations, TAV-MW12

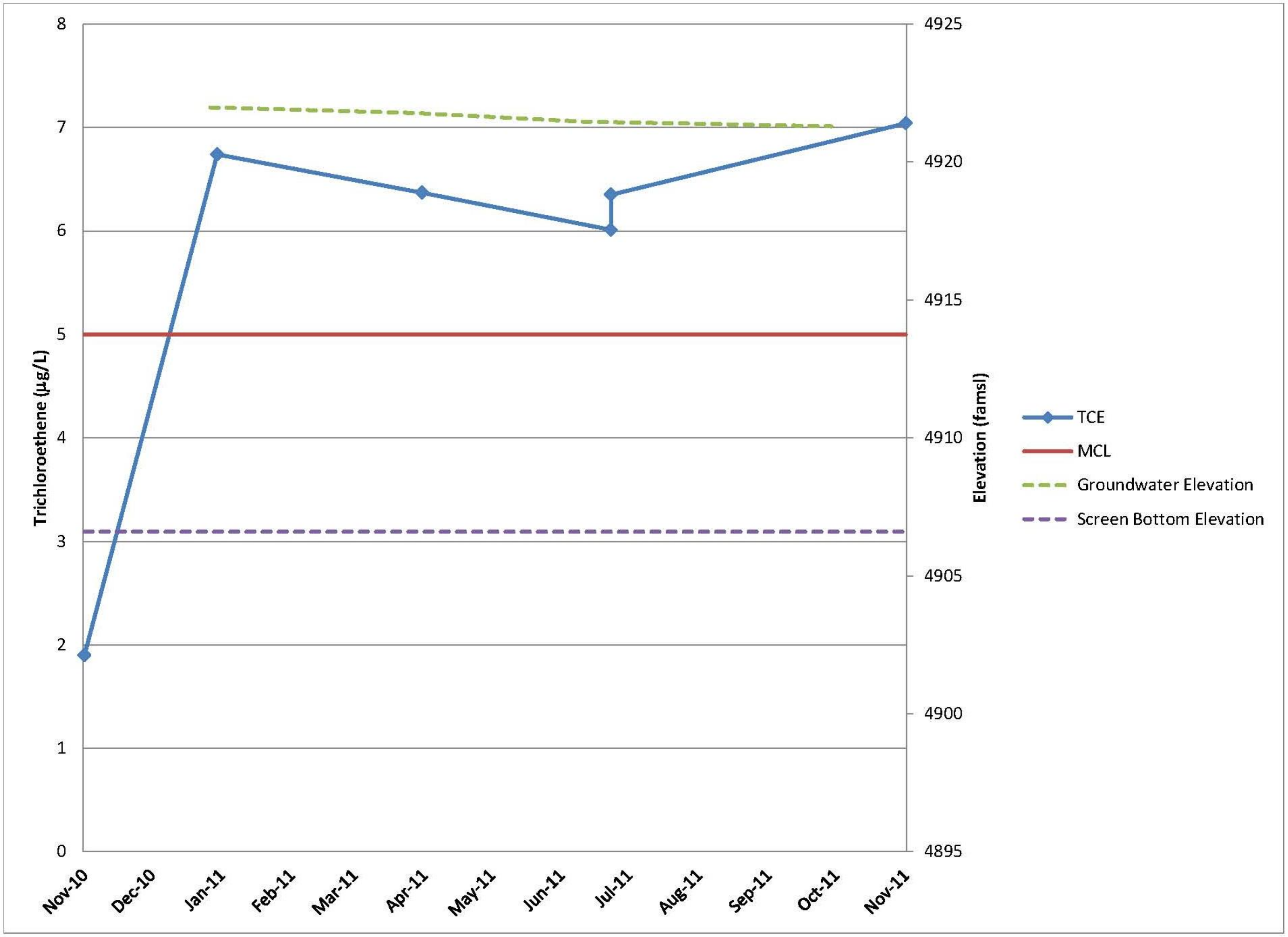

Figure 5B-9. Trichloroethene Concentrations, TAV-MW14

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Attachment 5C
Technical Area V
Hydrographs

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Attachment 5C Hydrographs

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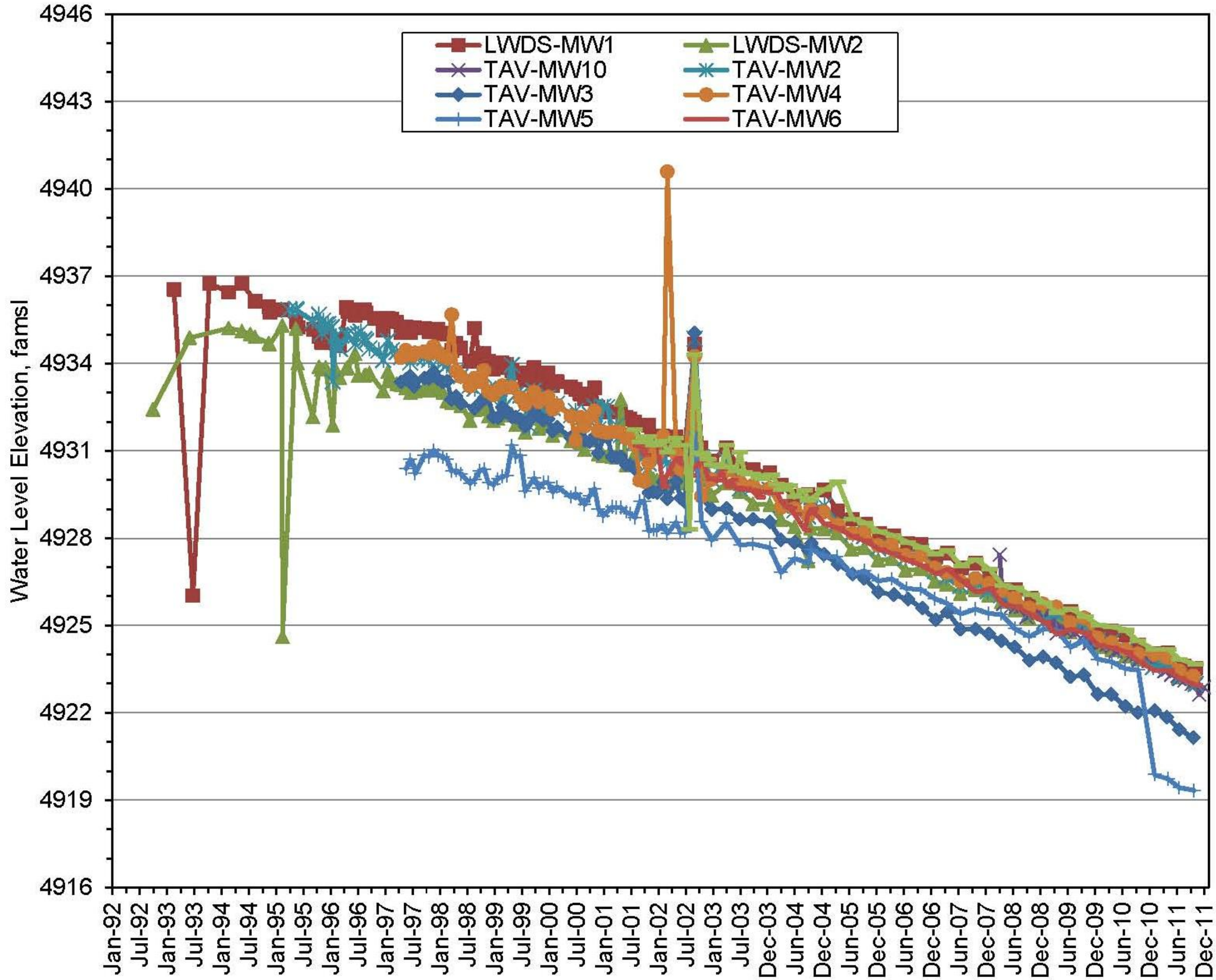

Figure 5C-1. TA-V Study Area Wells (1 of 3)

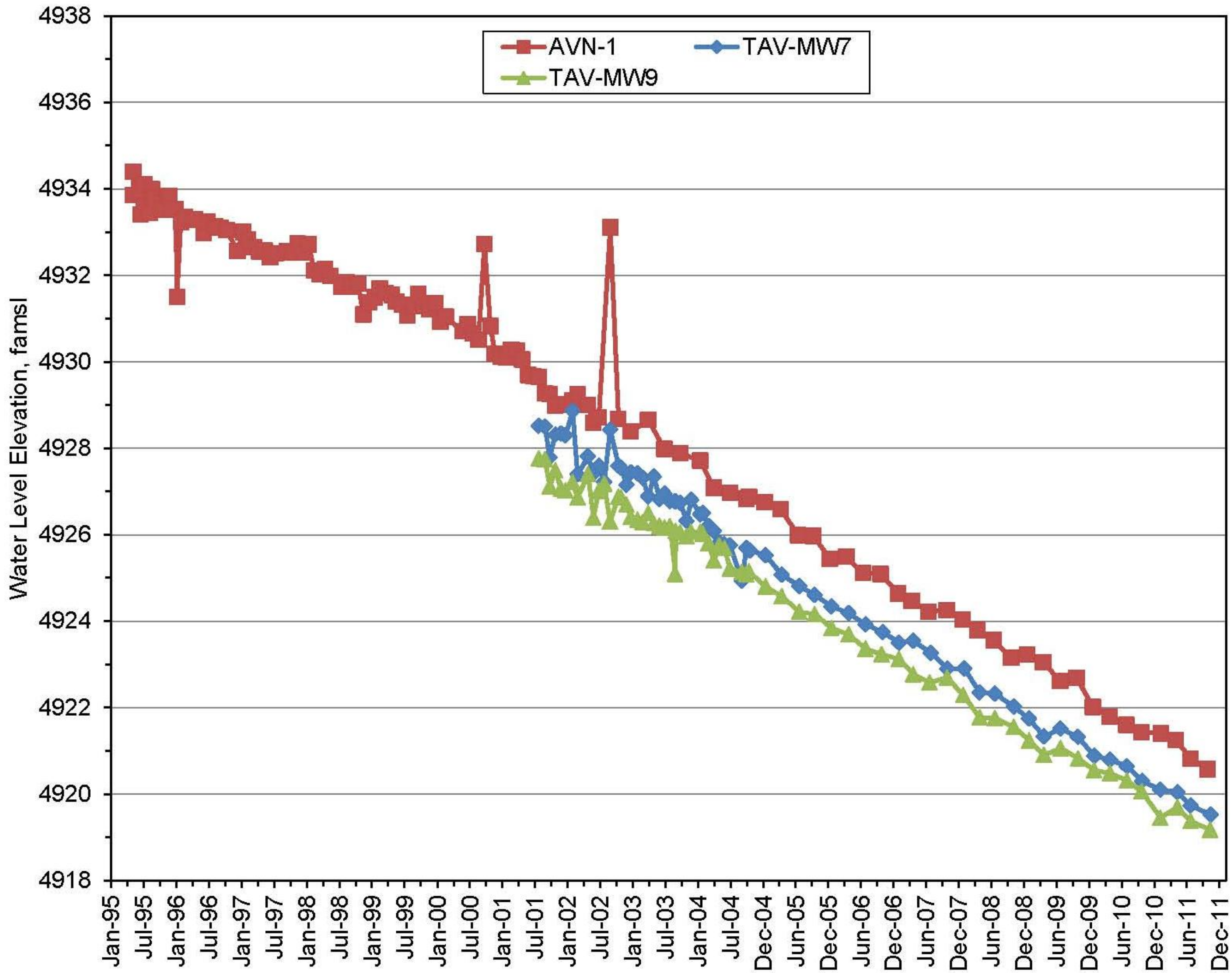

Figure 5C-2. TA-V Study Area Wells (2 of 3)

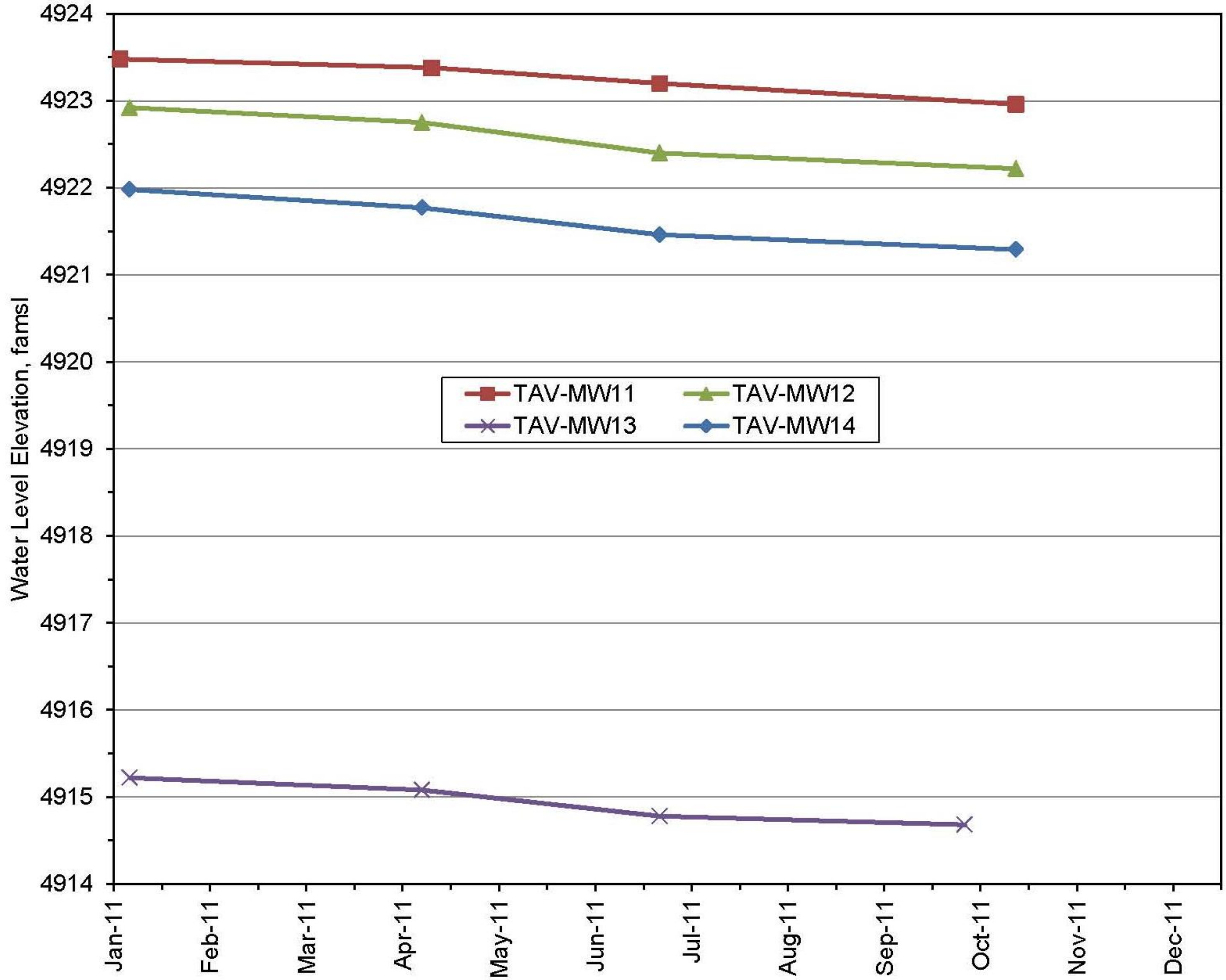

Figure 5C-3. TA-V Study Area Wells (3 of 3)

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Attachment 5D
Technical Area V
Soil-Vapor Monitoring
Calendar Year 2011 Activities

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Attachment 5D Tables

Attachment 5D Figures

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Technical Area V Soil-Vapor Monitoring Calendar Year 2011 Activities

Sandia National Laboratories, New Mexico (SNL/NM) personnel performed soil-vapor sampling at areas inside and near Technical Area (TA)-V during three sampling events in 2011. Soil-vapor sampling activities were conducted to meet requirements established in the *Technical Area V Groundwater Investigation Work Plan, Revision 2*, which was submitted as Appendix A of the responses to the New Mexico Environment Department Notice of Disapproval (SNL February 2010), and in conformance with procedures outlined in the event-specific Mini-Sampling and Analysis Plans (SAPs) listed in Table 5D-1.

The report entitled *Summary Report for Technical Area-V Groundwater and Soil-Vapor Monitoring Well Installation* (SNL/NM June 2011b) documents the field activities performed during the installation of three soil-vapor monitoring wells in and around TA-V at SNL/NM (Figure 5D-1). Table 5D-2 summarizes the soil-vapor monitoring wells that were installed at TA-V from January through March 2011, and the well completion diagrams are provided in Figures 5D-2 through 5D-4.

This summary describes sampling activities and presents analytical results for the three 2011 sampling events. Environmental samples were collected from soil-vapor monitoring wells TAV-SV01, TAV-SV02, and TAV-SV03 at each sampling port (Table 5D-2). Samples collected from all wells were analyzed for volatile organic compounds (VOCs) by analytical method U.S. Environmental Protection Agency (EPA) TO-14A for the first two quarterly sampling events and by EPA TO-15 for the last quarterly sampling event. A duplicate sample was collected at each monitoring well from a selected sampling depth.

Well Evacuation

Purging removes stagnant air from each tube and draws representative soil vapor from the soil pore space surrounding the sampling port in the subsurface. In accordance with the Mini-SAPs (Table 5D-1), the minimum purge requirement is three tubing volumes. Purging continued until field measurements for VOCs stabilized. VOCs were measured by attaching a VOC monitoring instrument to the exhaust port of the vacuum pump.

The TA-V soil-vapor sampling equipment includes a vacuum pump, a sampling manifold assembly, and a multiport-purging chamber. The multiport-purging chamber is equipped with individual valves, fittings, and tubing, which can be connected to up to 10 individual sampling ports. The multiport-purging chamber allows up to 10 sampling locations to be purged at the same time. During sampling, valves were connected to each sampling port and purged until minimum purge requirements were satisfied. After the purge was complete, vapor samples were collected in SUMMA® canisters.

Analytical Results

Soil-vapor samples were submitted to TestAmerica California for chemical analyses by EPA Method TO-14A/TO-15. Analytical reports from the laboratory, including certificates of analyses, analytical methods, method detection limits (MDLs), practical quantitation limits, dates of analyses, results of quality control (QC) analyses, and data validation findings are filed in the SNL/NM Records Center.

Table 5D-3 summarizes detected VOCs in soil vapor samples collected during the three 2011 sampling events. Table 5D-4 lists the MDLs for associated VOCs. Table 5D-5 summarizes field measurements collected prior to, and after sample collection. Field measurements included organic vapor readings obtained from each sampling port and vacuum pressure readings for each sample container.

VOCs detected during these three sampling events include the following constituents:

- 1,1,2-Trichloro-1,2,2-trifluoroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2,-Dichlorobenzene
- 2-Butanone
- 2-Hexanone
- 4-Methyl-2-pentanone
- Acetone
- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- Carbon disulfide
- Carbon tetrachloride
- Chloroform
- Chloromethane
- cis-1,2-Dichloroethene
- Dibromochloromethane
- Dichlorodifluoromethane
- m,p-Xylene
- Methylene chloride
- Tetrachloroethene
- Toluene
- Total xylenes
- Trichloroethene (TCE)
- Trichlorofluoromethane

TCE was detected in almost all samples at all depths at concentrations ranging up to a maximum detection of 2,500 parts per billion by volume (ppbv) in the 350-foot-depth sample collected from TAV-SV03 during the November 2011 sampling event. The concentrations of all VOCs have been added together to provide the Total VOC concentration. The maximum concentration of Total VOCs is 2,868 ppbv in the 350-foot-depth sample collected from TAV-SV03 during the November 2011 sampling event. The concentrations of TCE and Total VOCs versus depth have been plotted for the three sampling events on Figures 5D-5 through 5D-10. The concentrations of VOCs appear to be stable to slightly increasing over time. It is suspected that the soil-vapor concentrations in the vadose zone are recovering from disequilibrium conditions brought on by the drilling and installation of the soil-vapor monitoring wells. It is anticipated that future sampling events will exhibit more consistent concentrations.

Field Quality Control Samples

Field QC samples included duplicate environmental and field QC blank samples. The field QC samples were submitted for analysis along with the soil-vapor samples in accordance with QC procedures specified in the Mini-SAPs (SNL April 2011, June 2011a, and October 2011).

Duplicate Environmental Samples

Duplicate environmental samples are collected to estimate the overall reproducibility of the sampling and analytical process. Duplicate samples were collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. Duplicate environmental samples were analyzed for all analytical parameters. The Mini-SAPs do not specify QC acceptance criteria for duplicate sample data; however, relative percent difference (RPD) calculations were performed for detected analytes. Table 5D-6 summarizes the results of duplicate sample analyses and calculated RPD values.

Field Quality Control Blank Samples

Field QC blank samples are submitted whenever samples are collected for VOC analysis to assess whether contamination of the samples occurred during shipment and storage. The sample is prepared in the field by collecting an ultra-pure nitrogen gas sample. Three field QC blank samples were submitted during each of the three sampling events. During the July 2011 sampling event, acetone was detected in the TAV-SV03 field QC blank sample at a concentration of 4.8 ppbv. During the November 2011 sampling event, acetone was detected in all TA-V field QC blank samples at concentrations ranging from 0.73 to 1.9 ppbv, and TCE was detected at a concentration of 0.29 ppbv in the TAV-SV01 field QC blank sample. No other VOCs were detected above the MDLs in field QC blank samples for these three sampling events.

Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate laboratory control samples were analyzed concurrently with all soil-vapor samples. The chemical and radiological data were reviewed and qualified in accordance with Administrative Operating Procedure 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011).

Although some analytical results were qualified during the data validation process, no significant data quality problems were noted for project constituents of concern.

Variances and Nonconformances

No variances or nonconformances from requirements in the TA-V Mini-SAPs (SNL April 2011, June 2011a, and October 2011) were identified during the sampling activities for these three soil-vapor sampling events. One project-specific issue occurred. On July 26, 2011, during the second quarterly sampling event, the field VOC monitoring instrument measured ambient conditions at 0.1 parts per million. This reading is attributed to smoke in the air from a fire located in south Albuquerque.

Summary

During 2011, environmental samples were collected from soil-vapor monitoring wells TAV-SV01, TAV-SV02, and TAV-SV03 at multiple depths during three sampling events. The soil-vapor samples were analyzed for VOCs by analytical method EPA TO-14A (April/May and July 2011 sampling events) or EPA TO-15 (November 2011 sampling event). TCE was detected in almost all samples at all depths at concentrations ranging up to 2,500 ppbv. The maximum concentration of Total VOCs is 2,868 ppbv. The concentrations appear to be stable to slightly increasing over time.

References

SNL October 2011 Sandia National Laboratories/New Mexico (SNL/NM), October 2011. *TA-V Soil-Vapor Monitoring Mini-SAP for First Quarter, Fiscal Year 2012*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, October 14.

SNL June 2011a Sandia National Laboratories/New Mexico (SNL/NM), June 2011. *TA-V Soil-Vapor Monitoring Mini-SAP for Fourth Quarter, Fiscal Year 2011*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, June 6.

SNL June 2011b Sandia National Laboratories/New Mexico (SNL/NM), June 2011. *Summary Report for Technical Area-V Groundwater and Soil-Vapor Monitoring Well Installation*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, June 30.

SNL May 2011 Sandia National Laboratories/New Mexico (SNL/NM), May 2011. *Data Validation Procedure for Chemical and Radiochemical Data,* AOP 00-03, Revision 3, Sandia National Laboratories, Albuquerque, New Mexico, May 11.

SNL April 2011 Sandia National Laboratories/New Mexico (SNL/NM), April 2011. *TA-V Soil-Vapor Monitoring Mini-SAP for Third Quarter, Fiscal Year 2011*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, April 13.

SNL February 2010 Sandia National Laboratories/New Mexico (SNL/NM), February 2010. *DOE/Sandia Responses to NMED's Comments in Notice of Disapproval: Corrective Measures Evaluation Report for Technical Area V Groundwater, July 2005—November 2009 Response to Notice of Deficiency, Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, February 22.

Attachment 5D
Tables

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Table 5D-1. Soil-Vapor Monitoring Sampling Dates for the TA-V Study Area, Calendar Year 2011

Dates of Sampling Event	SAP
April 28 to May 2, 2011	*TA-V Soil-Vapor Monitoring Mini-SAP for Third Quarter, Fiscal Year 2011* (SNL April 2011)
July 22 to 26, 2011	*TA-V Soil-Vapor Monitoring Mini-SAP for Fourth Quarter, Fiscal Year 2011* (SNL June 2011a)
November 30 2011	*TA-V Soil-Vapor Monitoring Mini-SAP for First Quarter, Fiscal Year 2012* (SNL October 2011)

Refer to footnotes on page 5D-47.

Table 5D-2. Summary of Soil-Vapor Monitoring Wells Installed at TA-V from January through March 2011

Well	Approximate Location	Sampling Intervals (ft bgs)	
TAV-SV01	Adjacent to Groundwater Monitoring Well LWDS-MW1	49.5–50.5 99.5–100.5 149.5–150.5 199.5–200.5 249.5–250.5	299.5–300.5 349.5–350.5 399.5–400.5 449.5–450.5 499.5–500.5
TAV-SV02	Adjacent to Groundwater Monitoring Wells TAV-MW6 and TAV-MW7	49.5–50.5 99.5–100.5 149.5–150.5 199.5–200.5 249.5–250.5	299.5–300.5 349.5–350.5 399.5–400.5 449.5–450.5 499.5–500.5
TAV-SV03	Adjacent to Groundwater Monitoring Well TAV-MW11	49.5–50.5 99.5–100.5 149.5–150.5 199.5–200.5 249.5–250.5	299.5–300.5 349.5–350.5 399.5–400.5 449.5–450.5 499.5–500.5

Refer to footnotes on page 5D-47.

Table 5D-3
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-50	Acetone	14	4.0	10			090570-001	EPA TO14A
02-May-11	Carbon disulfide	7.2	4.0	10	J		090570-001	EPA TO14A
	Methylene chloride	2.9	1.0	2.0		J	090570-001	EPA TO14A
	Toluene	1.2	1.0	2.0	J		090570-001	EPA TO14A
TAV-SV01-050 (Duplicate)	Acetone	15	4.0	10			090571-001	EPA TO14A
02-May-11	2-Butanone	3.6	3.0	10	J		090571-001	EPA TO14A
	Carbon disulfide	7.8	4.0	10	J		090571-001	EPA TO14A
	Methylene chloride	2.4	1.0	2.0	B	13UJ	090571-001	EPA TO14A
	Toluene	1.5	1.0	2.0	J		090571-001	EPA TO14A
TAV-SV01-100	Acetone	14	4.0	10			090572-001	EPA TO14A
02-May-11	Carbon disulfide	13	4.0	10			090572-001	EPA TO14A
	Methylene chloride	2.0	1.0	2.0	B	13UJ	090572-001	EPA TO14A
	Trichloroethene	2.6	1.0	2.0			090572-001	EPA TO14A
TAV-SV01-150	Acetone	18	4.0	10			090573-001	EPA TO14A
02-May-11	Chloroform	2.0	1.0	2.0			090573-001	EPA TO14A
	Methylene chloride	2.4	1.0	2.0	B	13UJ	090573-001	EPA TO14A
	Trichloroethene	11	1.0	2.0			090573-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	2.2	1.0	2.0			090573-001	EPA TO14A
TAV-SV01-200	Acetone	15	4.0	10			090574-001	EPA TO14A
02-May-11	Bromodichloromethane	1.8	1.0	2.0	J		090574-001	EPA TO14A
	2-Butanone	3.8	3.0	10	J		090574-001	EPA TO14A
	Chloroform	5.3	1.0	2.0			090574-001	EPA TO14A
	Dibromochloromethane	1.3	1.0	2.0	J		090574-001	EPA TO14A
	1,1-Dichloroethane	1.7	1.0	2.0	J		090574-001	EPA TO14A
	Methylene chloride	3.8	1.0	2.0	B	13UJ	090574-001	EPA TO14A
	Trichloroethene	33	1.0	2.0			090574-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	3.8	1.0	2.0			090574-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-250	Acetone	5.5	4.0	10	J		090575-001	EPA TO14A
02-May-11	Bromodichloromethane	1.4	1.0	2.0	J		090575-001	EPA TO14A
	Chloroform	7.5	1.0	2.0			090575-001	EPA TO14A
	Dibromochloromethane	2.0	1.0	2.0			090575-001	EPA TO14A
	1,1-Dichloroethane	1.7	1.0	2.0	J		090575-001	EPA TO14A
	cis-1,2-Dichloroethene	2.4	0.80	2.0			090575-001	EPA TO14A
	1,1-Dichloroethene	1.6	1.0	2.0	J		090575-001	EPA TO14A
	Tetrachloroethene	1.1	1.0	2.0	J		090575-001	EPA TO14A
	Trichloroethene	54	1.0	2.0			090575-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	4.1	1.0	2.0			090575-001	EPA TO14A
TAV-SV01-300	Acetone	56	4.0	10			090576-001	EPA TO14A
02-May-11	Chloroform	7.5	1.0	2.0			090576-001	EPA TO14A
	Dibromochloromethane	1.2	1.0	2.0	J		090576-001	EPA TO14A
	1,1-Dichloroethane	2.2	1.0	2.0			090576-001	EPA TO14A
	cis-1,2-Dichloroethene	3.0	0.80	2.0			090576-001	EPA TO14A
	1,1-Dichloroethene	1.9	1.0	2.0	J		090576-001	EPA TO14A
	Methylene chloride	3.7	1.0	2.0	B	13UJ	090576-001	EPA TO14A
	Trichloroethene	54	1.0	2.0			090576-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	1.8	1.0	2.0	J		090576-001	EPA TO14A
TAV-SV01-350	Acetone	18	4.0	10			090577-001	EPA TO14A
02-May-11	Bromodichloromethane	1.5	1.0	2.0	J		090577-001	EPA TO14A
	Bromoform	0.55	0.50	2.0	J		090577-001	EPA TO14A
	Chloroform	8.0	1.0	2.0			090577-001	EPA TO14A
	Dibromochloromethane	2.3	1.0	2.0			090577-001	EPA TO14A
	cis-1,2-Dichloroethene	5.5	0.80	2.0			090577-001	EPA TO14A
	1,1-Dichloroethene	1.1	1.0	2.0	J		090577-001	EPA TO14A
	Methylene chloride	3.7	1.0	2.0	B	13UJ	090577-001	EPA TO14A
	Trichloroethene	41	1.0	2.0			090577-001	EPA TO14A
TAV-SV01-400	Acetone	11	4.0	10			090578-001	EPA TO14A
02-May-11	Chloroform	2.7	1.0	2.0			090578-001	EPA TO14A
	Dibromochloromethane	1.1	1.0	2.0	J		090578-001	EPA TO14A
	1,1-Dichloroethane	1.4	1.0	2.0	J		090578-001	EPA TO14A
	cis-1,2-Dichloroethene	29	0.80	2.0			090578-001	EPA TO14A
	Methylene chloride	2.5	1.0	2.0	B	13UJ	090578-001	EPA TO14A
	Tetrachloroethene	1.1	1.0	2.0	J		090578-001	EPA TO14A
	Trichloroethene	130	1.0	2.0			090578-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-450	cis-1,2-Dichloroethene	56	1.4	3.5			090579-001	EPA TO14A
02-May-11	Methylene chloride	3.1	1.7	3.5	B, J	22UJ	090579-001	EPA TO14A
	Trichloroethene	220	1.7	3.5			090579-001	EPA TO14A
TAV-SV01-500	Acetone	14	8.0	20	J		090580-001	EPA TO14A
02-May-11	cis-1,2-Dichloroethene	16	1.6	4.0			090580-001	EPA TO14A
	Methylene chloride	3.5	2.0	4.0	B, J	26UJ	090580-001	EPA TO14A
	Toluene	3.9	2.0	4.0	J		090580-001	EPA TO14A
	Trichloroethene	290	2.0	4.0			090580-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	4.2	2.0	4.0			090580-001	EPA TO14A
TAV-SV02-50	Acetone	10	4.0	10			090558-001	EPA TO14A
29-Apr-11	Bromodichloromethane	4.8	1.0	2.0			090558-001	EPA TO14A
	Chloroform	20	1.0	2.0			090558-001	EPA TO14A
	Methylene chloride	3.3	1.0	2.0	B	10UJ	090558-001	EPA TO14A
	Trichloroethene	5.2	1.0	2.0			090558-001	EPA TO14A
	Trichlorofluoromethane	1.3	1.0	2.0	J		090558-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	57	1.0	2.0			090558-001	EPA TO14A
TAV-SV02-100	Acetone	17	4.0	10			090559-001	EPA TO14A
29-Apr-11	Bromodichloromethane	26	1.0	2.0			090559-001	EPA TO14A
	Chloroform	63	1.0	2.0			090559-001	EPA TO14A
	Dibromochloromethane	4.9	1.0	2.0			090559-001	EPA TO14A
	1,1-Dichloroethene	2.1	1.0	2.0			090559-001	EPA TO14A
	Methylene chloride	3.8	1.0	2.0	B	10UJ	090559-001	EPA TO14A
	Tetrachloroethene	3.6	1.0	2.0			090559-001	EPA TO14A
	Trichloroethene	28	1.0	2.0			090559-001	EPA TO14A
	Trichlorofluoromethane	2.7	1.0	2.0			090559-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	320	1.0	2.0			090559-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-150	Acetone	39	4.0	10			090560-001	EPA TO14A
29-Apr-11	Bromodichloromethane	23	1.0	2.0			090560-001	EPA TO14A
	2-Butanone	3.6	3.0	10	J		090560-001	EPA TO14A
	Chloroform	57	1.0	2.0			090560-001	EPA TO14A
	Dibromochloromethane	6.9	1.0	2.0			090560-001	EPA TO14A
	1,2-Dichlorobenzene	0.98	0.90	2.0	J		090560-001	EPA TO14A
	1,1-Dichloroethene	3.0	1.0	2.0			090560-001	EPA TO14A
	Methylene chloride	2.8	1.0	2.0	B	10UJ	090560-001	EPA TO14A
	Tetrachloroethene	3.7	1.0	2.0			090560-001	EPA TO14A
	Trichloroethene	37	1.0	2.0			090560-001	EPA TO14A
	Trichlorofluoromethane	2.1	1.0	2.0			090560-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	370	1.0	2.0			090560-001	EPA TO14A
TAV-SV02-200	Acetone	28	7.4	18			090561-001	EPA TO14A
29-Apr-11	Bromodichloromethane	17	1.8	3.7			090561-001	EPA TO14A
	Chloroform	39	1.8	3.7			090561-001	EPA TO14A
	Dibromochloromethane	9.8	1.8	3.7			090561-001	EPA TO14A
	1,1-Dichloroethane	2.7	1.8	3.7	J		090561-001	EPA TO14A
	cis-1,2-Dichloroethene	4.5	1.5	3.7			090561-001	EPA TO14A
	1,1-Dichloroethene	3.0	1.8	3.7	J		090561-001	EPA TO14A
	Methylene chloride	5.5	1.8	3.7		J	090561-001	EPA TO14A
	Tetrachloroethene	4.3	1.8	3.7			090561-001	EPA TO14A
	Trichloroethene	210	1.8	3.7			090561-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	270	1.8	3.7			090561-001	EPA TO14A
TAV-SV02-250	Bromodichloromethane	5.8	1.8	3.6			090562-001	EPA TO14A
29-Apr-11	Chloroform	14	1.8	3.6			090562-001	EPA TO14A
	Dibromochloromethane	2.2	1.8	3.6	J		090562-001	EPA TO14A
	1,1-Dichloroethane	3.1	1.8	3.6	J		090562-001	EPA TO14A
	cis-1,2-Dichloroethene	5.1	1.4	3.6			090562-001	EPA TO14A
	1,1-Dichloroethene	3.4	1.8	3.6	J		090562-001	EPA TO14A
	Methylene chloride	4.7	1.8	3.6		J	090562-001	EPA TO14A
	Tetrachloroethene	4.4	1.8	3.6			090562-001	EPA TO14A
	Trichloroethene	250	1.8	3.6			090562-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	180	1.8	3.6			090562-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-300	Acetone	24	7.9	20			090563-001	EPA TO14A
29-Apr-11	Bromodichloromethane	3.9	2.0	3.9			090563-001	EPA TO14A
	Chloroform	20	2.0	3.9			090563-001	EPA TO14A
	1,1-Dichloroethane	4.3	2.0	3.9			090563-001	EPA TO14A
	cis-1,2-Dichloroethene	8.7	1.6	3.9			090563-001	EPA TO14A
	1,1-Dichloroethene	3.0	2.0	3.9	J		090563-001	EPA TO14A
	Methylene chloride	5.0	2.0	3.9	B	21UJ	090563-001	EPA TO14A
	Tetrachloroethene	4.2	2.0	3.9			090563-001	EPA TO14A
	Trichloroethene	290	2.0	3.9			090563-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	190	2.0	3.9			090563-001	EPA TO14A
TAV-SV02-350	Acetone	14	7.4	18	J		090564-001	EPA TO14A
29-Apr-11	Bromodichloromethane	7.5	1.8	3.7			090564-001	EPA TO14A
	Carbon disulfide	16	7.4	18	J		090564-001	EPA TO14A
	Chloroform	19	1.8	3.7			090564-001	EPA TO14A
	Dibromochloromethane	3.7	1.8	3.7			090564-001	EPA TO14A
	1,1-Dichloroethane	4.1	1.8	3.7			090564-001	EPA TO14A
	cis-1,2-Dichloroethene	6.6	1.5	3.7			090564-001	EPA TO14A
	1,1-Dichloroethene	3.6	1.8	3.7	J		090564-001	EPA TO14A
	Methylene chloride	2.0	1.8	3.7	J	J	090564-001	EPA TO14A
	Tetrachloroethene	4.4	1.8	3.7			090564-001	EPA TO14A
	Trichloroethene	280	1.8	3.7			090564-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	180	1.8	3.7			090564-001	EPA TO14A
TAV-SV02-400	Acetone	14	7.4	19	J		090565-001	EPA TO14A
29-Apr-11	Bromodichloromethane	3.5	1.9	3.7	J		090565-001	EPA TO14A
	Chloroform	15	1.9	3.7			090565-001	EPA TO14A
	1,1-Dichloroethane	3.4	1.9	3.7	J		090565-001	EPA TO14A
	cis-1,2-Dichloroethene	9.2	1.5	3.7			090565-001	EPA TO14A
	1,1-Dichloroethene	2.2	1.9	3.7	J		090565-001	EPA TO14A
	Methylene chloride	2.6	1.9	3.7	B, J	20UJ	090565-001	EPA TO14A
	Tetrachloroethene	4.0	1.9	3.7			090565-001	EPA TO14A
	Trichloroethene	290	1.9	3.7			090565-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	140	1.9	3.7			090565-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-450	Acetone	11	7.2	18	J		090566-001	EPA TO14A
29-Apr-11	Chloroform	9.6	1.8	3.6			090566-001	EPA TO14A
	1,1-Dichloroethane	1.9	1.8	3.6	J		090566-001	EPA TO14A
	cis-1,2-Dichloroethene	8.8	1.4	3.6			090566-001	EPA TO14A
	Methylene chloride	2.6	1.8	3.6	B, J	19UJ	090566-001	EPA TO14A
	Tetrachloroethene	4.2	1.8	3.6			090566-001	EPA TO14A
	Trichloroethene	230	1.8	3.6			090566-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	96	1.8	3.6			090566-001	EPA TO14A
TAV-SV02-450 (Duplicate)	Acetone	18	7.3	18			090567-001	EPA TO14A
29-Apr-11	Bromodichloromethane	3.2	1.8	3.6	J		090567-001	EPA TO14A
	Chloroform	12	1.8	3.6			090567-001	EPA TO14A
	Dichlorodifluoromethane	1.9	1.8	5.4	J		090567-001	EPA TO14A
	1,1-Dichloroethane	3.2	1.8	3.6	J		090567-001	EPA TO14A
	cis-1,2-Dichloroethene	9.6	1.5	3.6			090567-001	EPA TO14A
	Methylene chloride	3.1	1.8	3.6	B, J	23UJ	090567-001	EPA TO14A
	Tetrachloroethene	5.4	1.8	3.6			090567-001	EPA TO14A
	Trichloroethene	270	1.8	3.6			090567-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	130	1.8	3.6			090567-001	EPA TO14A
TAV-SV02-500	Acetone	190	15	37			090568-001	EPA TO14A
29-Apr-11	cis-1,2-Dichloroethene	85	2.9	7.3			090568-001	EPA TO14A
	Methylene chloride	5.4	3.7	7.3	B, J	10UJ	090568-001	EPA TO14A
	Trichloroethene	540	3.7	7.3			090568-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	45	3.7	7.3			090568-001	EPA TO14A
TAV-SV03-050	Acetone	15	4.0	10			090546-001	EPA TO14A
28-Apr-11	Methylene chloride	2.2	1.0	2.0		J-	090546-001	EPA TO14A
	Tetrachloroethene	2.9	1.0	2.0			090546-001	EPA TO14A
	Trichloroethene	2.9	1.0	2.0			090546-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	150	1.0	2.0			090546-001	EPA TO14A
TAV-SV03-100	1,1-Dichloroethene	3.0	2.0	4.0	J		090547-001	EPA TO14A
28-Apr-11	Methylene chloride	2.9	2.0	4.0	B, J	21UJ	090547-001	EPA TO14A
	Trichloroethene	22	2.0	4.0			090547-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	380	2.0	4.0			090547-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV03-150	Acetone	29	16	40	J		090548-001	EPA TO14A
28-Apr-11	4-Methyl-2-pentanone	8.0	8.0	40	J		090548-001	EPA TO14A
	Trichloroethene	45	4.0	8.0			090548-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	520	4.0	8.0			090548-001	EPA TO14A
TAV-SV03-200	Benzene	6.4	1.5	3.0			090549-001	EPA TO14A
28-Apr-11	1,1-Dichloroethene	2.6	1.0	2.0			090549-001	EPA TO14A
	Methylene chloride	1.1	1.0	2.0	J	J-	090549-001	EPA TO14A
	Tetrachloroethene	2.0	1.0	2.0			090549-001	EPA TO14A
	Trichloroethene	140	1.0	2.0			090549-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	400	1.0	2.0			090549-001	EPA TO14A
TAV-SV03-250	Benzene	37	3.0	6.0			090550-001	EPA TO14A
28-Apr-11	Chloroform	5.4	2.0	4.0			090550-001	EPA TO14A
	1,1-Dichloroethene	4.1	2.0	4.0			090550-001	EPA TO14A
	Methylene chloride	4.3	2.0	4.0		J-	090550-001	EPA TO14A
	Toluene	5.7	2.0	4.0			090550-001	EPA TO14A
	Trichloroethene	400	2.0	4.0			090550-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	520	2.0	4.0			090550-001	EPA TO14A
TAV-SV03-250 (Duplicate)	Acetone	27	8.0	20			090551-001	EPA TO14A
28-Apr-11	Benzene	37	3.0	6.0			090551-001	EPA TO14A
	Chloroform	4.5	2.0	4.0			090551-001	EPA TO14A
	Methylene chloride	4.0	2.0	4.0		J-	090551-001	EPA TO14A
	Toluene	5.6	2.0	4.0			090551-001	EPA TO14A
	Trichloroethene	370	2.0	4.0			090551-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	440	2.0	4.0			090551-001	EPA TO14A
TAV-SV03-300	Acetone	10	8.0	20	J		090552-001	EPA TO14A
28-Apr-11	Benzene	22	3.0	6.0			090552-001	EPA TO14A
	Chloroform	4.6	2.0	4.0			090552-001	EPA TO14A
	Methylene chloride	3.6	2.0	4.0	J	J-	090552-001	EPA TO14A
	Trichloroethene	1100	11	22			090552-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	180	2.0	4.0			090552-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV03-350	Acetone	23	8.0	20			090553-001	EPA TO14A
28-Apr-11	Benzene	10	3.0	6.0			090553-001	EPA TO14A
	Chloroform	5.2	2.0	4.0			090553-001	EPA TO14A
	Methylene chloride	2.3	2.0	4.0	J	J-	090553-001	EPA TO14A
	Trichloroethene	1600	11	21			090553-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	140	2.0	4.0			090553-001	EPA TO14A
TAV-SV03-400	Acetone	21	18	45	J		090554-001	EPA TO14A
28-Apr-11	Methylene chloride	5.8	4.5	8.9	B, J	46UJ	090554-001	EPA TO14A
	Trichloroethene	790	4.5	8.9			090554-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	32	4.5	8.9			090554-001	EPA TO14A
TAV-SV03-450	Acetone	37	7.6	19			090555-001	EPA TO14A
28-Apr-11	Methylene chloride	2.8	1.9	3.8	B, J	20UJ	090555-001	EPA TO14A
	Trichloroethene	260	1.9	3.8			090555-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	25	1.9	3.8			090555-001	EPA TO14A
TAV-SV03-500	Acetone	14	4.0	10			090556-001	EPA TO14A
28-Apr-11	2-Butanone	4.0	3.0	10	J		090556-001	EPA TO14A
	Methylene chloride	2.9	1.0	2.0	B	10UJ	090556-001	EPA TO14A
	Trichloroethene	19	1.0	2.0			090556-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	5.2	1.0	2.0			090556-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-50	Acetone	13	4.0	10			090870-001	EPA TO14A
26-Jul-11	Carbon disulfide	3.1	2.0	10	J		090870-001	EPA TO14A
	Total Organics	16.1	NA	NA	NA	NA	090870-001	EPA TO14A
TAV-SV01-100	Acetone	34	4.0	10			090871-001	EPA TO14A
26-Jul-11	Carbon disulfide	2.3	2.0	10	J		090871-001	EPA TO14A
	Methylene chloride	3.9	2.0	4.0	J		090871-001	EPA TO14A
	Trichloroethene	5.0	2.0	4.0			090871-001	EPA TO14A
	Total Organics	45.2	NA	NA	NA	NA	090871-001	EPA TO14A
TAV-SV01-150	Acetone	8.0	4.0	10	J		090872-001	EPA TO14A
26-Jul-11	Chloroform	2.9	2.0	4.0	J		090872-001	EPA TO14A
	Methylene chloride	4.8	2.0	4.0			090872-001	EPA TO14A
	Trichloroethene	17	2.0	4.0			090872-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	3.3	2.0	4.0	J		090872-001	EPA TO14A
	Total Organics	36	NA	NA	NA	NA	090872-001	EPA TO14A
TAV-SV01-150 (Duplicate)	Chloroform	2.0	2.0	4.0	J		090873-001	EPA TO14A
26-Jul-11	Trichloroethene	17	2.0	4.0			090873-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	3.4	2.0	4.0	J		090873-001	EPA TO14A
	Total Organics	22.4	NA	NA	NA	NA	090873-001	EPA TO14A
TAV-SV01-200	Acetone	22	4.0	10			090874-001	EPA TO14A
26-Jul-11	Chloroform	4.5	2.0	4.0			090874-001	EPA TO14A
	Trichloroethene	43	2.0	4.0			090874-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	2.9	2.0	4.0	J		090874-001	EPA TO14A
	Total Organics	72.4	NA	NA	NA	NA	090874-001	EPA TO14A
TAV-SV01-250	Acetone	12	4.0	10			090875-001	EPA TO14A
26-Jul-11	Chloroform	4.6	2.0	4.0			090875-001	EPA TO14A
	Trichloroethene	72	2.0	4.0			090875-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	2.1	2.0	4.0	J		090875-001	EPA TO14A
	Total Organics	90.7	NA	NA	NA	NA	090875-001	EPA TO14A
TAV-SV01-300	Acetone	5.6	4.0	10	J		090876-001	EPA TO14A
26-Jul-11	Trichloroethene	71	2.0	4.0			090876-001	EPA TO14A
	Total Organics	76.6	NA	NA	NA	NA	090876-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-350	Acetone	11	4.0	10			090877-001	EPA TO14A
26-Jul-11	Bromomethane	2.1	2.0	4.0	J		090877-001	EPA TO14A
	Chloroform	6.5	2.0	4.0			090877-001	EPA TO14A
	cis-1,2-Dichloroethene	3.8	2.0	4.0	J		090877-001	EPA TO14A
	Trichloroethene	60	2.0	4.0			090877-001	EPA TO14A
	Total Organics	83.4	NA	NA	NA	NA	090877-001	EPA TO14A
TAV-SV01-400	Acetone	53	7.2	18			090878-001	EPA TO14A
26-Jul-11	2-Butanone	21	7.2	18			090878-001	EPA TO14A
	Chloroform	5.8	3.6	7.2	J		090878-001	EPA TO14A
	cis-1,2-Dichloroethene	44	3.6	7.2			090878-001	EPA TO14A
	Methylene chloride	5.4	3.6	7.2	J		090878-001	EPA TO14A
	Trichloroethene	260	3.6	7.2			090878-001	EPA TO14A
	Total Organics	389.2	NA	NA	NA	NA	090878-001	EPA TO14A
TAV-SV01-450	Acetone	18	12	31	J		090879-001	EPA TO14A
26-Jul-11	cis-1,2-Dichloroethene	130	6.2	12			090879-001	EPA TO14A
	Methylene chloride	12	6.2	12			090879-001	EPA TO14A
	Trichloroethene	640	6.2	12			090879-001	EPA TO14A
	Total Organics	800	NA	NA	NA	NA	090879-001	EPA TO14A
TAV-SV01-500	Acetone	22	12	30	J		090880-001	EPA TO14A
26-Jul-11	cis-1,2-Dichloroethene	27	6.1	12			090880-001	EPA TO14A
	Methylene chloride	12	6.1	12			090880-001	EPA TO14A
	Trichloroethene	540	6.1	12			090880-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	10	6.1	12	J		090880-001	EPA TO14A
	Total Organics	611	NA	NA	NA	NA	090880-001	EPA TO14A
TAV-SV02-50	Acetone	14	4.0	10			090846-001	EPA TO14A
22-Jul-11	Bromodichloromethane	7.9	2.0	4.0			090846-001	EPA TO14A
	Carbon disulfide	2.8	2.0	10	J		090846-001	EPA TO14A
	Chloroform	16	2.0	4.0			090846-001	EPA TO14A
	Trichloroethene	5.9	2.0	4.0			090846-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	56	2.0	4.0			090846-001	EPA TO14A
	Total Organics	102.6	NA	NA	NA	NA	090846-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-100	Bromodichloromethane	22	2.0	4.0			090847-001	EPA TO14A
22-Jul-11	Chloroform	48	2.0	4.0			090847-001	EPA TO14A
	Dibromochloromethane	4.6	2.0	4.0			090847-001	EPA TO14A
	Dichlorodifluoromethane	2.1	2.0	4.0	J		090847-001	EPA TO14A
	Methylene chloride	3.1	2.0	4.0	J		090847-001	EPA TO14A
	Tetrachloroethene	3.2	2.0	4.0	J		090847-001	EPA TO14A
	Trichloroethene	27	2.0	4.0			090847-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	420	4.7	9.3			090847-001	EPA TO14A
	Total Organics	530	NA	NA	NA	NA	090847-001	EPA TO14A
TAV-SV02-150	Bromodichloromethane	24	4.1	8.3			090848-001	EPA TO14A
22-Jul-11	Chloroform	44	4.1	8.3			090848-001	EPA TO14A
	Dibromochloromethane	8.6	4.1	8.3			090848-001	EPA TO14A
	Methylene chloride	5.4	4.1	8.3	J		090848-001	EPA TO14A
	Tetrachloroethene	4.8	4.1	8.3	J		090848-001	EPA TO14A
	Trichloroethene	46	4.1	8.3			090848-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	480	4.1	8.3			090848-001	EPA TO14A
	Total Organics	612.8	NA	NA	NA	NA	090848-001	EPA TO14A
TAV-SV02-200	Acetone	17	7.6	19	J		090849-001	EPA TO14A
22-Jul-11	Bromodichloromethane	15	3.8	7.6			090849-001	EPA TO14A
	Chloroform	27	3.8	7.6			090849-001	EPA TO14A
	Dibromochloromethane	8.6	3.8	7.6			090849-001	EPA TO14A
	Methylene chloride	12	3.8	7.6	B	12U	090849-001	EPA TO14A
	Tetrachloroethene	5.4	3.8	7.6	J		090849-001	EPA TO14A
	Trichloroethene	250	3.8	7.6			090849-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	350	3.8	7.6			090849-001	EPA TO14A
	Total Organics	673	NA	NA	NA	NA	090849-001	EPA TO14A
TAV-SV02-250	Acetone	43	8.3	21			090850-001	EPA TO14A
22-Jul-11	Bromodichloromethane	4.8	4.2	8.3	J		090850-001	EPA TO14A
	Chloroform	12	4.2	8.3			090850-001	EPA TO14A
	cis-1,2-Dichloroethene	4.7	4.2	8.3	J		090850-001	EPA TO14A
	Methylene chloride	5.7	4.2	8.3	J		090850-001	EPA TO14A
	Tetrachloroethene	5.1	4.2	8.3	J		090850-001	EPA TO14A
	Trichloroethene	300	4.2	8.3			090850-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	220	4.2	8.3			090850-001	EPA TO14A
	Total Organics	595.3	NA	NA	NA	NA	090850-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-300	Acetone	33	7.7	19			090851-001	EPA TO14A
22-Jul-11	Bromodichloromethane	6.9	3.9	7.7	J		090851-001	EPA TO14A
	2-Butanone	9.1	7.7	19	J		090851-001	EPA TO14A
	Chloroform	17	3.9	7.7			090851-001	EPA TO14A
	cis-1,2-Dichloroethene	5.6	3.9	7.7	J		090851-001	EPA TO14A
	Methylene chloride	5.2	3.9	7.7	J		090851-001	EPA TO14A
	Tetrachloroethene	5.7	3.9	7.7	J		090851-001	EPA TO14A
	Trichloroethene	330	3.9	7.7			090851-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	250	3.9	7.7			090851-001	EPA TO14A
	Total Organics	662.5	NA	NA	NA	NA	090851-001	EPA TO14A
TAV-SV02-350	Bromodichloromethane	12	2.0	4.0			090852-001	EPA TO14A
22-Jul-11	Bromomethane	3.3	2.0	4.0	J	J-	090852-001	EPA TO14A
	Chloroform	36	2.0	4.0			090852-001	EPA TO14A
	Dibromochloromethane	4.2	2.0	4.0			090852-001	EPA TO14A
	1,1-Dichloroethane	5.7	2.0	4.0			090852-001	EPA TO14A
	cis-1,2-Dichloroethene	8.7	2.0	4.0			090852-001	EPA TO14A
	Methylene chloride	4.7	2.0	4.0	B	4.7U	090852-001	EPA TO14A
	Tetrachloroethene	5.4	2.0	4.0			090852-001	EPA TO14A
	Trichloroethene	320	2.0	4.0			090852-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	340	2.0	4.0			090852-001	EPA TO14A
	Total Organics	735.3	NA	NA	NA	NA	090852-001	EPA TO14A
TAV-SV02-400	Chloroform	15	4.2	8.4			090853-001	EPA TO14A
22-Jul-11	Methylene chloride	4.8	4.2	8.4	J		090853-001	EPA TO14A
	Tetrachloroethene	5.7	4.2	8.4	J		090853-001	EPA TO14A
	Trichloroethene	420	4.2	8.4			090853-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	230	4.2	8.4			090853-001	EPA TO14A
	Total Organics	675.5	NA	NA	NA	NA	090853-001	EPA TO14A
TAV-SV02-450	Chloroform	12	3.8	7.5			090854-001	EPA TO14A
22-Jul-11	cis-1,2-Dichloroethene	7.0	3.8	7.5	J		090854-001	EPA TO14A
	Methylene chloride	8.8	3.8	7.5	B	8.8U	090854-001	EPA TO14A
	Tetrachloroethene	6.0	3.8	7.5	J		090854-001	EPA TO14A
	Trichloroethene	300	3.8	7.5			090854-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	280	3.8	7.5			090854-001	EPA TO14A
	Total Organics	605	NA	NA	NA	NA	090854-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-500	Acetone	140	16	41			090855-001	EPA TO14A
22-Jul-11	cis-1,2-Dichloroethene	120	8.2	16			090855-001	EPA TO14A
	Trichloroethene	870	8.2	16			090855-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	120	8.2	16			090855-001	EPA TO14A
	Total Organics	1250	NA	NA	NA	NA	090855-001	EPA TO14A
TAV-SV02-500 (Duplicate)	cis-1,2-Dichloroethene	130	8.6	17			090856-001	EPA TO14A
22-Jul-11	Methylene chloride	17	8.6	17			090856-001	EPA TO14A
	Trichloroethene	950	8.6	17			090856-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	180	8.6	17			090856-001	EPA TO14A
	m,p-Xylene	13	8.6	17	J		090856-001	EPA TO14A
	Xylenes, total	13	8.6	17	J		090856-001	EPA TO14A
	Total Organics	1303	NA	NA	NA	NA	090856-001	EPA TO14A
TAV-SV03-050	Acetone	7.9	4.0	10	J	10UJ	090858-001	EPA TO14A
25-Jul-11	Trichloroethene	3.6	2.0	4.0	J		090858-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	120	2.0	4.0		J+	090858-001	EPA TO14A
	Total Organics	123.6	NA	NA	NA	NA	090858-001	EPA TO14A
TAV-SV03-100	Trichloroethene	18	5.2	10		J+	090859-001	EPA TO14A
25-Jul-11	1,1,2-Trichloro-1,2,2-trifluoroethane	420	5.2	10			090859-001	EPA TO14A
	Total Organics	438	NA	NA	NA	NA	090859-001	EPA TO14A
TAV-SV03-150	Acetone	59	4.0	10			090860-001	EPA TO14A
25-Jul-11	Trichloroethene	45	2.0	4.0			090860-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	890	4.7	9.4			090860-001	EPA TO14A
	Total Organics	994	NA	NA	NA	NA	090860-001	EPA TO14A
TAV-SV03-200	Acetone	31	10	26		31UJ	090861-001	EPA TO14A
25-Jul-11	Trichloroethene	130	5.1	10			090861-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	410	5.1	10			090861-001	EPA TO14A
	Total Organics	540	NA	NA	NA	NA	090861-001	EPA TO14A
TAV-SV03-250	Acetone	38	4.0	10		38UJ	090862-001	EPA TO14A
25-Jul-11	Benzene	18	2.0	4.0			090862-001	EPA TO14A
	Chloroform	2.2	2.0	4.0	J		090862-001	EPA TO14A
	Trichloroethene	310	5.3	11			090862-001	EPA TO14A
	Total Organics	330	NA	NA	NA	NA	090862-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV03-300 25-Jul-11	Acetone	48	22	55	J		090863-001	EPA TO14A
	Benzene	28	11	22			090863-001	EPA TO14A
	Bromomethane	14	11	22	B, J	J-	090863-001	EPA TO14A
	Methylene chloride	13	11	22	B, J	22U	090863-001	EPA TO14A
	Trichloroethene	1000	11	22			090863-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	290	11	22			090863-001	EPA TO14A
	Total Organics	1380	NA	NA	NA	NA	090863-001	EPA TO14A
TAV-SV03-350 25-Jul-11	Methylene chloride	15	12	24	B, J	24U	090864-001	EPA TO14A
	Trichloroethene	1400	12	24			090864-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	230	12	24			090864-001	EPA TO14A
	Total Organics	1630	NA	NA	NA	NA	090864-001	EPA TO14A
TAV-SV03-400 25-Jul-11	Trichloroethene	1200	11	21			090865-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	180	11	21			090865-001	EPA TO14A
	Total Organics	1380	NA	NA	NA	NA	090865-001	EPA TO14A
TAV-SV03-400 (Duplicate) 25-Jul-11	Methylene chloride	27	17	34	B, J		090866-001	EPA TO14A
	Trichloroethene	1900	17	34			090866-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	300	17	34			090866-001	EPA TO14A
	Total Organics	2227	NA	NA	NA	NA	090866-001	EPA TO14A
TAV-SV03-450 25-Jul-11	Acetone	40	12	30		40UJ	090867-001	EPA TO14A
	Bromomethane	11	6.1	12	B, J	J	090867-001	EPA TO14A
	Carbon disulfide	43	6.1	30		J+	090867-001	EPA TO14A
	Trichloroethene	710	6.1	12			090867-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	180	6.1	12		J+	090867-001	EPA TO14A
	Total Organics	944	NA	NA	NA	NA	090867-001	EPA TO14A
TAV-SV03-500 25-Jul-11	Acetone	43	4.0	10		43UJ	090868-001	EPA TO14A
	Carbon disulfide	3.1	2.0	10	J		090868-001	EPA TO14A
	Trichloroethene	60	2.0	4.0			090868-001	EPA TO14A
	1,1,2-Trichloro-1,2,2-trifluoroethane	14	2.0	4.0			090868-001	EPA TO14A
	Total Organics	77.1	NA	NA	NA	NA	090868-001	EPA TO14A

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-50	Acetone	4.5	0.30	0.80		4.5U	091480-001	EPA TO15
30-Nov-11	2-Butanone	0.46	0.40	0.80	J		091480-001	EPA TO15
	Carbon disulfide	1.2	0.20	0.80			091480-001	EPA TO15
	Chloroform	0.12	0.10	0.30	J		091480-001	EPA TO15
	Chloromethane	0.21	0.20	0.80	J		091480-001	EPA TO15
	Dichlorodifluoromethane	0.51	0.15	0.40			091480-001	EPA TO15
	Tetrachloroethene	0.40	0.20	0.40			091480-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	0.65	0.20	0.40			091480-001	EPA TO15
	Trichloroethene	2.4	0.20	0.40			091480-001	EPA TO15
	Trichlorofluoromethane	0.25	0.15	0.40	J		091480-001	EPA TO15
	Total Organics	6.2	NA	NA	NA	NA	091480-001	EPA TO15
TAV-SV01-100	Acetone	22	0.30	0.80		J	091481-001	EPA TO15
30-Nov-11	Benzene	0.19	0.15	0.30	J		091481-001	EPA TO15
	Bromodichloromethane	0.35	0.15	0.30			091481-001	EPA TO15
	2-Butanone	1.6	0.40	0.80			091481-001	EPA TO15
	Carbon disulfide	1.1	0.20	0.80			091481-001	EPA TO15
	Carbon tetrachloride	0.49	0.25	0.80	J		091481-001	EPA TO15
	Chloroform	0.61	0.10	0.30			091481-001	EPA TO15
	Chloromethane	0.25	0.20	0.80	J		091481-001	EPA TO15
	Dibromochloromethane	0.27	0.10	0.40	J		091481-001	EPA TO15
	Dichlorodifluoromethane	0.48	0.15	0.40			091481-001	EPA TO15
	Tetrachloroethene	0.73	0.20	0.40			091481-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	1.3	0.20	0.40			091481-001	EPA TO15
	Trichloroethene	7.0	0.20	0.40			091481-001	EPA TO15
	Trichlorofluoromethane	0.26	0.15	0.40	J		091481-001	EPA TO15
	Total Organics	36.6	NA	NA	NA	NA	091481-001	EPA TO15

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Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-150	Acetone	7.3	0.30	0.80		J	091482-001	EPA TO15
30-Nov-11	Benzene	0.25	0.15	0.30	J		091482-001	EPA TO15
	Bromodichloromethane	2.3	0.15	0.30			091482-001	EPA TO15
	2-Butanone	1.6	0.40	0.80			091482-001	EPA TO15
	Carbon tetrachloride	0.83	0.25	0.80			091482-001	EPA TO15
	Chloroform	3.9	0.10	0.30			091482-001	EPA TO15
	Dibromochloromethane	1.2	0.10	0.40			091482-001	EPA TO15
	Dichlorodifluoromethane	0.46	0.15	0.40			091482-001	EPA TO15
	1,1-Dichloroethane	0.27	0.15	0.30	J		091482-001	EPA TO15
	2-Hexanone	0.32	0.25	0.40	J		091482-001	EPA TO15
	Tetrachloroethene	0.80	0.20	0.40			091482-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	2.2	0.20	0.40			091482-001	EPA TO15
	Trichloroethene	21.0	0.20	0.40			091482-001	EPA TO15
	Trichlorofluoromethane	0.27	0.15	0.40	J		091482-001	EPA TO15
	Total Organics	42.7	NA	NA	NA	NA	091482-001	EPA TO15
TAV-SV01-200	Acetone	7.5	0.30	0.80		J	091483-001	EPA TO15
30-Nov-11	Benzene	0.69	0.15	0.30			091483-001	EPA TO15
	Bromodichloromethane	4.9	0.15	0.30			091483-001	EPA TO15
	Bromoform	0.42	0.20	0.40			091483-001	EPA TO15
	2-Butanone	1.2	0.40	0.80			091483-001	EPA TO15
	Carbon disulfide	0.23	0.20	0.80	J		091483-001	EPA TO15
	Carbon tetrachloride	1.9	0.25	0.80			091483-001	EPA TO15
	Chloroform	7.1	0.10	0.30			091483-001	EPA TO15
	Dibromochloromethane	3.5	0.10	0.40			091483-001	EPA TO15
	Dichlorodifluoromethane	0.37	0.15	0.40	J		091483-001	EPA TO15
	1,1-Dichloroethane	1.4	0.15	0.30			091483-001	EPA TO15
	1,1-Dichloroethene	0.83	0.20	0.80			091483-001	EPA TO15
	cis-1,2-Dichloroethene	0.61	0.20	0.40			091483-001	EPA TO15
	Methylene chloride	0.24	0.20	0.40	J		091483-001	EPA TO15
	Tetrachloroethene	0.93	0.20	0.40			091483-001	EPA TO15
	Toluene	0.30	0.20	0.40	J		091483-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	3.4	0.20	0.40			091483-001	EPA TO15
	Trichloroethene	56.0	0.92	1.8			091483-001	EPA TO15
	Trichlorofluoromethane	0.26	0.15	0.40	J		091483-001	EPA TO15
	Total Organics	91.8	NA	NA	NA	NA	091483-001	EPA TO15

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Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-250	Acetone	23.0	0.30	0.80		J	091484-001	EPA TO15
30-Nov-11	Benzene	0.97	0.15	0.30			091484-001	EPA TO15
	Bromodichloromethane	5.3	0.15	0.30			091484-001	EPA TO15
	Bromoform	0.61	0.20	0.40			091484-001	EPA TO15
	2-Butanone	2.3	0.40	0.80			091484-001	EPA TO15
	Carbon disulfide	0.26	0.20	0.80	J		091484-001	EPA TO15
	Carbon tetrachloride	3.0	0.25	0.80			091484-001	EPA TO15
	Chloroform	8.3	0.10	0.30			091484-001	EPA TO15
	Dibromochloromethane	4.2	0.10	0.40			091484-001	EPA TO15
	Dichlorodifluoromethane	0.27	0.15	0.40	J		091484-001	EPA TO15
	1,1-Dichloroethane	2.0	0.15	0.30			091484-001	EPA TO15
	1,1-Dichloroethene	1.6	0.20	0.80			091484-001	EPA TO15
	cis-1,2-Dichloroethene	1.8	0.20	0.40			091484-001	EPA TO15
	2-Hexanone	0.27	0.25	0.40	J		091484-001	EPA TO15
	Methylene chloride	0.58	0.20	0.40			091484-001	EPA TO15
	Tetrachloroethene	1.3	0.20	0.40			091484-001	EPA TO15
	Toluene	0.30	0.20	0.40	J		091484-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	3.4	0.20	0.40			091484-001	EPA TO15
	Trichloroethene	96.0	1.5	3.0			091484-001	EPA TO15
	Trichlorofluoromethane	0.23	0.15	0.40	J		091484-001	EPA TO15
	Total Organics	155.7	NA	NA	NA	NA	091484-001	EPA TO15

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Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-300	Acetone	8.3	0.30	0.80		J	091485-001	EPA TO15
30-Nov-11	Benzene	0.83	0.15	0.30			091485-001	EPA TO15
	Bromodichloromethane	4.3	0.15	0.30			091485-001	EPA TO15
	Bromoform	0.62	0.20	0.40			091485-001	EPA TO15
	Carbon disulfide	0.52	0.20	0.80	J		091485-001	EPA TO15
	Carbon tetrachloride	2.9	0.25	0.80			091485-001	EPA TO15
	Chloroform	7.5	0.10	0.30			091485-001	EPA TO15
	Chloromethane	0.28	0.20	0.80	J		091485-001	EPA TO15
	Dibromochloromethane	3.1	0.10	0.40			091485-001	EPA TO15
	Dichlorodifluoromethane	0.28	0.15	0.40	J		091485-001	EPA TO15
	1,1-Dichloroethane	1.5	0.15	0.30			091485-001	EPA TO15
	1,1-Dichloroethene	1.5	0.20	0.80			091485-001	EPA TO15
	cis-1,2-Dichloroethene	1.9	0.20	0.40			091485-001	EPA TO15
	Methylene chloride	1.3	0.20	0.40			091485-001	EPA TO15
	Tetrachloroethene	1.2	0.20	0.40			091485-001	EPA TO15
	Toluene	0.65	0.20	0.40			091485-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	1.6	0.20	0.40			091485-001	EPA TO15
	Trichloroethene	81.0	1.2	2.30			091485-001	EPA TO15
	Trichlorofluoromethane	0.19	0.15	0.40	J		091485-001	EPA TO15
	Xylene	0.26	0.20	0.40	J		091485-001	EPA TO15
	Xylene, M.P	0.26	0.20	0.80	J		091485-001	EPA TO15
	Total Organics	120.0	NA	NA	NA	NA	091485-001	EPA TO15

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Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV01-350	Acetone	5.0	0.30	0.80		5.0U	091486-001	EPA TO15
30-Nov-11	Benzene	0.73	0.15	0.30			091486-001	EPA TO15
	Bromodichloromethane	5.2	0.15	0.30			091486-001	EPA TO15
	Bromoform	1.0	0.20	0.40			091486-001	EPA TO15
	2-Butanone	0.72	0.40	0.80	J		091486-001	EPA TO15
	Carbon disulfide	0.34	0.20	0.80	J		091486-001	EPA TO15
	Carbon tetrachloride	2.8	0.25	0.80			091486-001	EPA TO15
	Chloroform	8.1	0.10	0.30			091486-001	EPA TO15
	Dibromochloromethane	4.2	0.10	0.40			091486-001	EPA TO15
	Dichlorodifluoromethane	0.23	0.15	0.40	J		091486-001	EPA TO15
	1,1-Dichloroethane	0.90	0.15	0.30			091486-001	EPA TO15
	1,1-Dichloroethene	1.3	0.20	0.80			091486-001	EPA TO15
	cis-1,2-Dichloroethene	3.8	0.20	0.40			091486-001	EPA TO15
	Methylene chloride	0.90	0.20	0.40			091486-001	EPA TO15
	Tetrachloroethene	1.3	0.20	0.40			091486-001	EPA TO15
	Toluene	0.27	0.20	0.40	J		091486-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	2.0	0.20	0.40			091486-001	EPA TO15
	Trichloroethene	81.0	1.1	2.3			091486-001	EPA TO15
	Trichlorofluoromethane	0.20	0.15	0.40	J		091486-001	EPA TO15
	Total Organics	115.0	NA	NA	NA	NA	091486-001	EPA TO15
TAV-SV01-400	Acetone	55.0	4.0	11.0		55U	091487-001	EPA TO15
30-Nov-11	Bromodichloromethane	4.2	2.0	4.0			091487-001	EPA TO15
	2-Butanone	24.0	5.3	11.0			091487-001	EPA TO15
	Chloroform	7.3	1.3	4.0			091487-001	EPA TO15
	Dibromochloromethane	3.5	1.3	5.3	J		091487-001	EPA TO15
	cis-1,2-Dichloroethene	29.0	2.6	5.3			091487-001	EPA TO15
	Tetrachloroethene	3.1	2.6	5.3	J		091487-001	EPA TO15
	Trichloroethene	300	2.6	5.3			091487-001	EPA TO15
	Total Organics	371.1	NA	NA	NA	NA	091487-001	EPA TO15

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Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
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TAV-SV01-450	Acetone	52.0	8.3	22.0		52U	091488-001	EPA TO15
30-Nov-11	2-Butanone	19.0	11.0	22.0	J		091488-001	EPA TO15
	Chloroform	5.8	2.8	8.3	J		091488-001	EPA TO15
	cis-1,2-Dichloroethene	130	5.5	11.0			091488-001	EPA TO15
	Tetrachloroethene	5.9	5.5	11.0	J		091488-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	9.8	5.5	11.0	J		091488-001	EPA TO15
	Trichloroethene	1100	5.5	11.0			091488-001	EPA TO15
	Total Organics	1270.5	NA	NA	NA	NA	091488-001	EPA TO15
TAV-SV01-450 (Duplicate)	Chloroform	6.1	2.8	8.4	J		091489-001	EPA TO15
30-Nov-11	cis-1,2-Dichloroethene	130	5.6	11.0			091489-001	EPA TO15
	Tetrachloroethene	6.3	5.6	11.0	J		091489-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	12.0	5.6	11.0			091489-001	EPA TO15
	Trichloroethene	1100	5.6	11.0			091489-001	EPA TO15
	Total Organics	1254.4	NA	NA	NA	NA	091489-001	EPA TO15
TAV-SV01-500	Acetone	19.0	8.3	22.0	J	22U	091490-001	EPA TO15
30-Nov-11	Chloroform	3.6	2.8	8.3	J		091490-001	EPA TO15
	cis-1,2-Dichloroethene	24.0	5.5	11.0			091490-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	9.8	5.5	11.0	J		091490-001	EPA TO15
	Trichloroethene	790	5.5	11.0			091490-001	EPA TO15
	Total Organics	827.4	NA	NA	NA	NA	091490-001	EPA TO15
TAV-SV02-050	Acetone	4.3	0.30	0.80		4.3UJ	091468-001	EPA TO15
30-Nov-11	Benzene	0.27	0.15	0.30	J		091468-001	EPA TO15
	Bromodichloromethane	21.0	0.15	0.30			091468-001	EPA TO15
	2-Butanone	0.46	0.40	0.80	J		091468-001	EPA TO15
	Chloroform	15.0	0.10	0.30			091468-001	EPA TO15
	Dibromochloromethane	1.8	0.10	0.40			091468-001	EPA TO15
	Dichlorodifluoromethane	0.55	0.15	0.40			091468-001	EPA TO15
	Methylene chloride	0.86	0.20	0.40			091468-001	EPA TO15
	Tetrachloroethene	0.97	0.20	0.40			091468-001	EPA TO15
	Toluene	0.27	0.20	0.40	J		091468-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	63.0	0.71	1.4			091468-001	EPA TO15
	Trichloroethene	11.0	0.20	0.40			091468-001	EPA TO15
	Trichlorofluoromethane	1.6	0.15	0.40			091468-001	EPA TO15
	Total Organics	116.8	NA	NA	NA	NA	091468-001	EPA TO15

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TAV-SV02-100	Acetone	23	0.30	0.80		J	091469-001	EPA TO15
30-Nov-11	Benzene	0.36	0.15	0.30			091469-001	EPA TO15
	Bromodichloromethane	48.0	0.43	0.87			091469-001	EPA TO15
	Bromoform	0.32	0.20	0.40	J		091469-001	EPA TO15
	2-Butanone	1.3	0.40	0.80			091469-001	EPA TO15
	Carbon tetrachloride	0.62	0.25	0.80	J		091469-001	EPA TO15
	Chloroform	46.0	0.29	0.87			091469-001	EPA TO15
	Chloromethane	0.24	0.20	0.80	J		091469-001	EPA TO15
	Dibromochloromethane	8.5	0.10	0.40			091469-001	EPA TO15
	Dichlorodifluoromethane	0.60	0.15	0.40			091469-001	EPA TO15
	Methylene chloride	2.2	0.20	0.40			091469-001	EPA TO15
	Tetrachloroethene	3.7	0.20	0.40			091469-001	EPA TO15
	Toluene	0.44	0.20	0.40			091469-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	290	2.9	5.8			091469-001	EPA TO15
	Trichloroethene	38.0	0.58	1.2			091469-001	EPA TO15
	Trichlorofluoromethane	4.7	0.15	0.40			091469-001	EPA TO15
	Xylene	0.27	0.20	0.40	J		091469-001	EPA TO15
	Xylene, M.P	0.27	0.20	0.80	J		091469-001	EPA TO15
	Total Organics	468.5	NA	NA	NA	NA	091469-001	EPA TO15
TAV-SV02-150	Acetone	3.9	2.1	5.5	J	5.5UJ	091470-001	EPA TO15
30-Nov-11	Bromodichloromethane	46.0	1.0	2.1			091470-001	EPA TO15
	Chloroform	46.0	0.69	2.1			091470-001	EPA TO15
	Dibromochloromethane	12.0	0.69	2.8			091470-001	EPA TO15
	Tetrachloroethene	3.8	1.4	2.8			091470-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	390	2.8	5.5			091470-001	EPA TO15
	Trichloroethene	46.0	1.4	2.8			091470-001	EPA TO15
	Trichlorofluoromethane	3.9	1.0	2.8			091470-001	EPA TO15
	Total Organics	547.7	NA	NA	NA	NA	091470-001	EPA TO15

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-200	Acetone	16.0	4.2	11.0		16UJ	091471-001	EPA TO15
30-Nov-11	Bromodichloromethane	37.0	2.1	4.2			091471-001	EPA TO15
	Chloroform	34.0	1.4	4.2			091471-001	EPA TO15
	Dibromochloromethane	15.0	1.4	5.6			091471-001	EPA TO15
	Tetrachloroethene	4.2	2.8	5.6	J		091471-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	250	2.8	5.6			091471-001	EPA TO15
	Trichloroethene	240	2.8	5.6			091471-001	EPA TO15
	Trichlorofluoromethane	2.8	2.1	5.6	J		091471-001	EPA TO15
	Total Organics	583.0	NA	NA	NA	NA	091471-001	EPA TO15
TAV-SV02-250	Acetone	72	4.4	12		72UJ	091472-001	EPA TO15
30-Nov-11	Bromodichloromethane	11	2.2	4.4			091472-001	EPA TO15
	Chloroform	16	1.5	4.4			091472-001	EPA TO15
	Dibromochloromethane	2.9	1.5	5.9	J		091472-001	EPA TO15
	1,1-Dichloroethane	2.5	2.2	4.4	J		091472-001	EPA TO15
	Tetrachloroethene	4.3	2.9	5.9	J		091472-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	200	2.9	5.9			091472-001	EPA TO15
	Trichloroethene	350	2.9	5.9			091472-001	EPA TO15
	Trichlorofluoromethane	2.7	2.2	5.9	J		091472-001	EPA TO15
	Total Organics	589.4	NA	NA	NA	NA	091472-001	EPA TO15
TAV-SV02-300	Acetone	62.0	4.3	11.0		62UJ	091473-001	EPA TO15
30-Nov-11	Bromodichloromethane	17.0	2.1	4.3			091473-001	EPA TO15
	2-Butanone	26.0	5.7	11.0			091473-001	EPA TO15
	Chloroform	23.0	1.4	4.3			091473-001	EPA TO15
	Dibromochloromethane	5.7	1.4	5.7			091473-001	EPA TO15
	1,1-Dichloroethane	2.8	2.1	4.3	J		091473-001	EPA TO15
	cis-1,2-Dichloroethene	2.9	2.8	5.7	J		091473-001	EPA TO15
	Tetrachloroethene	4.6	2.8	5.7	J		091473-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	220	2.8	5.7			091473-001	EPA TO15
	Trichloroethene	330	2.8	5.7			091473-001	EPA TO15
	Trichlorofluoromethane	2.7	2.1	5.7	J		091473-001	EPA TO15
	Total Organics	634.7	NA	NA	NA	NA	091473-001	EPA TO15

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-300 (Duplicate)	Acetone	3.8	2.2	6.0	J	6.0UJ	091474-001	EPA TO15
30-Nov-11	Bromodichloromethane	19.0	1.1	2.2			091474-001	EPA TO15
	Carbon tetrachloride	2.7	1.9	6.0	J	J+	091474-001	EPA TO15
	Chloroform	23.0	0.75	2.2			091474-001	EPA TO15
	Dibromochloromethane	6.5	0.75	3.0			091474-001	EPA TO15
	1,1-Dichloroethane	2.7	1.1	2.2			091474-001	EPA TO15
	cis-1,2-Dichloroethene	3.0	1.5	3.0			091474-001	EPA TO15
	Tetrachloroethene	4.5	1.5	3.0			091474-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	250	1.5	3.0			091474-001	EPA TO15
	Trichloroethene	330	3.0	6.0			091474-001	EPA TO15
	Trichlorofluoromethane	2.9	1.1	3.0	J		091474-001	EPA TO15
	Total Organics	641.4	NA	NA	NA	NA	091474-001	EPA TO15
TAV-SV02-350	Bromodichloromethane	26.0	2.2	4.4			091475-001	EPA TO15
30-Nov-11	Chloroform	29.0	1.5	4.4			091475-001	EPA TO15
	Dibromochloromethane	9.7	1.5	5.9			091475-001	EPA TO15
	1,1-Dichloroethane	2.8	2.2	4.4	J		091475-001	EPA TO15
	Tetrachloroethene	4.3	2.9	5.9	J		091475-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	250	2.9	5.9			091475-001	EPA TO15
	Trichloroethene	340	2.9	5.9			091475-001	EPA TO15
	Trichlorofluoromethane	3.0	2.2	5.9	J		091475-001	EPA TO15
	Total Organics	667.7	NA	NA	NA	NA	091475-001	EPA TO15
TAV-SV02-400	Acetone	9.8	4.4	12.0	J	12UJ	091476-001	EPA TO15
30-Nov-11	Bromodichloromethane	14.0	2.2	4.4			091476-001	EPA TO15
	Chloroform	20.0	1.5	4.4			091476-001	EPA TO15
	Dibromochloromethane	5.3	1.5	5.9	J		091476-001	EPA TO15
	1,1-Dichloroethane	4.2	2.2	4.4	J		091476-001	EPA TO15
	cis-1,2-Dichloroethene	5.4	3.0	5.9	J		091476-001	EPA TO15
	Tetrachloroethene	4.8	3.0	5.9	J		091476-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	180	3.0	5.9			091476-001	EPA TO15
	Trichloroethene	550	3.0	5.9			091476-001	EPA TO15
	Trichlorofluoromethane	2.8	2.2	5.9	J		091476-001	EPA TO15
	Total Organics	786.5	NA	NA	NA	NA	091476-001	EPA TO15

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV02-450	Acetone	5.1	4.4	12.0	J	12UJ	091477-001	EPA TO15
30-Nov-11	Bromodichloromethane	22.0	2.2	4.4			091477-001	EPA TO15
	Chloroform	25.0	1.5	4.4			091477-001	EPA TO15
	Dibromochloromethane	7.9	1.5	5.9			091477-001	EPA TO15
	1,1-Dichloroethane	2.3	2.2	4.4	J		091477-001	EPA TO15
	cis-1,2-Dichloroethene	3.1	2.9	5.9	J		091477-001	EPA TO15
	Tetrachloroethene	4.2	2.9	5.9	J		091477-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	230	2.9	5.9			091477-001	EPA TO15
	Trichloroethene	310	2.9	5.9			091477-001	EPA TO15
	Trichlorofluoromethane	2.7	2.2	5.9	J		091477-001	EPA TO15
	Total Organics	607.2	NA	NA	NA	NA	091477-001	EPA TO15
TAV-SV02-500	Acetone	73.0	11.0	30.0		73UJ	091478-001	EPA TO15
30-Nov-11	Chloroform	9.3	3.7	11.0	J		091478-001	EPA TO15
	cis-1,2-Dichloroethene	80.0	7.5	15.0			091478-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	120	7.5	15.0			091478-001	EPA TO15
	Trichloroethene	1100	7.5	15.0			091478-001	EPA TO15
	Total Organics	1309.3	NA	NA	NA	NA	091478-001	EPA TO15
TAV-SV03-050	Acetone	18.0	0.30	0.80		18UJ	091456-001	EPA TO15
30-Nov-11	2-Butanone	3.0	0.40	0.80			091456-001	EPA TO15
	Dichlorodifluoromethane	0.65	0.15	0.40			091456-001	EPA TO15
	Tetrachloroethene	1.3	0.20	0.40			091456-001	EPA TO15
	Toluene	0.32	0.20	0.40	J		091456-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	130	1.4	2.8			091456-001	EPA TO15
	Trichloroethene	6.30	0.20	0.40			091456-001	EPA TO15
	Trichlorofluoromethane	0.49	0.15	0.40			091456-001	EPA TO15
	Total Organics	142.1	NA	NA	NA	NA	091456-001	EPA TO15

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV03-100	Acetone	5.6	0.30	0.80		5.6UJ	091457-001	EPA TO15
30-Nov-11	2-Butanone	0.90	0.40	0.80			091457-001	EPA TO15
	Chloroform	0.45	0.10	0.30			091457-001	EPA TO15
	Chloromethane	2.0	0.20	0.80			091457-001	EPA TO15
	Dichlorodifluoromethane	0.90	0.15	0.40			091457-001	EPA TO15
	Tetrachloroethene	1.9	0.20	0.40			091457-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	530	14.0	28.0			091457-001	EPA TO15
	Trichloroethene	35.0	0.20	0.40			091457-001	EPA TO15
	Trichlorofluoromethane	1.2	0.15	0.40			091457-001	EPA TO15
	Total Organics	572.4	NA	NA	NA	NA	091457-001	EPA TO15
TAV-SV03-100 (Duplicate)	Acetone	2.9	0.30	0.80		2.9UJ	091458-001	EPA TO15
30-Nov-11	2-Butanone	0.51	0.40	0.80	J		091458-001	EPA TO15
	Chloroform	0.45	0.10	0.30			091458-001	EPA TO15
	Chloromethane	2.0	0.20	0.80			091458-001	EPA TO15
	Dichlorodifluoromethane	0.90	0.15	0.40			091458-001	EPA TO15
	Tetrachloroethene	1.9	0.20	0.40			091458-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	540	15.0	29.0			091458-001	EPA TO15
	Trichloroethene	35.0	0.20	0.40			091458-001	EPA TO15
	Trichlorofluoromethane	1.2	0.15	0.40			091458-001	EPA TO15
	Total Organics	582.0	NA	NA	NA	NA	091458-001	EPA TO15
TAV-SV03-150	Acetone	2.2	0.30	0.80		2.2UJ	091459-001	EPA TO15
30-Nov-11	Benzene	1.9	0.15	0.30			091459-001	EPA TO15
	Chloroform	0.90	0.10	0.30			091459-001	EPA TO15
	Dichlorodifluoromethane	0.97	0.15	0.40			091459-001	EPA TO15
	Tetrachloroethene	2.0	0.20	0.40			091459-001	EPA TO15
	Toluene	0.26	0.20	0.40	J		091459-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	570	6.0	12.0			091459-001	EPA TO15
	Trichloroethene	82.0	1.2	2.4			091459-001	EPA TO15
	Trichlorofluoromethane	1.7	0.15	0.40			091459-001	EPA TO15
	Total Organics	659.7	NA	NA	NA	NA	091459-001	EPA TO15

Refer to footnotes on page 5D-47.

Table 5D-3 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV03-200	Acetone	9.9	1.6	4.2		9.9UJ	091460-001	EPA TO15
30-Nov-11	Benzene	3.1	0.79	1.6			091460-001	EPA TO15
	2-Butanone	3.1	2.1	4.2	J		091460-001	EPA TO15
	Chloroform	1.6	0.52	1.6			091460-001	EPA TO15
	Toluene	1.1	1.0	2.1	J		091460-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	280	2.1	4.2			091460-001	EPA TO15
	Trichloroethene	140	1.0	2.1			091460-001	EPA TO15
	Trichlorofluoromethane	0.85	0.79	2.1	J		091460-001	EPA TO15
	Total Organics	429.8	NA	NA	NA	NA	091460-001	EPA TO15
TAV-SV03-250	Acetone	59.0	8.4	22.0		59UJ	091461-001	EPA TO15
30-Nov-11	Benzene	39.0	4.2	8.4			091461-001	EPA TO15
	Chloroform	5.1	2.8	8.4	J		091461-001	EPA TO15
	Toluene	6.2	5.6	11.0	J		091461-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	520	5.6	11.0			091461-001	EPA TO15
	Trichloroethene	580	5.6	11.0			091461-001	EPA TO15
	Total Organics	1150.3	NA	NA	NA	NA	091461-001	EPA TO15
TAV-SV03-300	Benzene	42	11.0	22.0			091462-001	EPA TO15
30-Nov-11	1,1,2-Trichloro-1,2,2-trifluoroethane	380	15.0	30.0			091462-001	EPA TO15
	Trichloroethene	1900	15.0	30.0			091462-001	EPA TO15
	Total Organics	2322.0	NA	NA	NA	NA	091462-001	EPA TO15
TAV-SV03-350	Benzene	28.0	12.0	24.0			091463-001	EPA TO15
30-Nov-11	1,1,2-Trichloro-1,2,2-trifluoroethane	340	16.0	31.0			091463-001	EPA TO15
	Trichloroethene	2500	16.0	31.0			091463-001	EPA TO15
	Total Organics	2868.0	NA	NA	NA	NA	091463-001	EPA TO15
TAV-SV03-400	Acetone	48.0	21.0	57.0	J	57UJ	091464-001	EPA TO15
30-Nov-11	Benzene	24.0	11.0	21.0			091464-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	300	14.0	29.0			091464-001	EPA TO15
	Trichloroethene	2000	14.0	29.0			091464-001	EPA TO15
	Total Organics	2324.0	NA	NA	NA	NA	091464-001	EPA TO15

Refer to footnotes on page 5D-47.

Table 5D-3 *(Concluded)*
Summary of Detected Volatile Organic Compounds
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Analyte	Result[a] (ppbv)	MDL[b] (ppbv)	PQL[c] (ppbv)	Laboratory Qualifier[d]	Validation Qualifier[e]	Sample No.	Analytical Method[f]
TAV-SV03-450	Acetone	75.0	19.0	50.0		75UJ	091465-001	EPA TO15
30-Nov-11	Benzene	12.0	9.4	19.0	J		091465-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	250	12.0	25.0			091465-001	EPA TO15
	Trichloroethene	1600	12.0	25.0			091465-001	EPA TO15
	Total Organics	1862.0	NA	NA	NA	NA	091465-001	EPA TO15
TAV-SV03-500	Acetone	30.0	2.2	5.9		30UJ	091466-001	EPA TO15
30-Nov-11	2-Butanone	7.2	3.0	5.9			091466-001	EPA TO15
	Carbon disulfide	1.9	1.5	5.9	J		091466-001	EPA TO15
	1,1,2-Trichloro-1,2,2-trifluoroethane	60.0	1.5	3.0			091466-001	EPA TO15
	Trichloroethene	220	1.5	3.0			091466-001	EPA TO15
	Total Organics	289.1	NA	NA	NA	NA	091466-001	EPA TO15

Refer to footnotes on page 5D-47.

Table 5D-4
Method Detection Limits for Volatile Organic Compounds (EPA Method[f] TO-14A/TO-15)
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Analyte (TO-15)	MDL[b] (ppbv)
1,1,1-Trichloroethane	0.15 – 17.0
1,1,2,2-Tetrachloroethane	0.10 – 17.0
1,1,2-Trichloroethane	0.20 – 17.0
1,1-Dichloroethane	0.15 – 17.0
1,1-Dichloroethene	0.20 – 17.0
1,2,2-tetrafluoroethane, 1,2-Dichloro-1	0.20 – 17.0
1,2,4-Trichlorobenzene	1.0 – 78.0
1,2,4-Trimethylbenzene	0.25 – 20.0
1,2-Dibromoethane	0.20 – 17.0
1,2-Dichlorobenzene	0.15 – 17.0
1,2-Dichloroethane	0.30 – 24.0
1,2-Dichloropropane	0.20 – 17.0
1,3,5-Trimethylbenzene	0.25 – 20.0
1,3-Dichlorobenzene	0.15 – 17.0
1,4-Dichlorobenzene	0.15 – 17.0
2,2-trifluoroethane, 1,1,2-Trichloro-1	0.20 – 17.0
2-Butanone	0.40 – 34.0
2-Hexanone	0.25 – 20.0
4-Ethyltoluene	0.20 – 17.0
4-methyl-, 2-Pentanone	0.20 – 17.0
Acetone	0.30 – 34.0
Benzene	0.15 – 17.0
Benzyl chloride	0.25 – 34.0
Bromodichloromethane	0.15 – 17.0
Bromoform	0.20 – 17.0
Bromomethane	0.20 – 17.0
Carbon disulfide	0.20 – 17.0
Carbon tetrachloride	0.25 – 34.0
Chlorobenzene	0.10 – 17.0
Chloroethane	0.20 – 17.0
Chloroform	0.10 – 17.0
Chloromethane	0.20 – 17.0
Dibromochloromethane	0.10 – 17.0
Dichlorodifluoromethane	0.15 – 17.0
Ethyl benzene	0.15 – 17.0
Hexachlorobutadiene	0.20 – 17.0
Methylene chloride	0.20 – 17.0
Styrene	0.20 – 17.0
Tetrachloroethene	0.20 – 17.0
Toluene	0.20 – 17.0
Trichloroethene	0.20 – 17.0
Trichlorofluoromethane	0.15 – 17.0
Vinyl acetate	0.20 – 34.0
Vinyl chloride	0.10 – 17.0
Xylene	0.20 – 17.0
cis-1,2-Dichloroethene	0.20 – 17.0
cis-1,3-Dichloropropene	0.20 – 17.0
m-, p-Xylene	0.20 – 17.0
o-Xylene	0.20 – 17.0
trans-1,2-Dichloroethene	0.20 – 17.0
trans-1,3-Dichloropropene	0.20 – 34.0

Refer to footnotes on page 5D-47.

Table 5D-5
Summary of Photoionization Detector and Vacuum Pressure Field Measurements[g]
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Sample Date	PID Model	PID (ppm)	Canister Number	Starting Vacuum Pressure (inHg)	Ending Vacuum Pressure (inHg)
TAV-SV01-050	02-May-11	ToxiRae model PGM-30 Serial # 000831	0.0	C8402	-24	-8
TAV-SV01-050 (Duplicate)			0.0	C8427	-24	-8
TAV-SV01-100			0.0	C8515	-24	-8
TAV-SV01-150			0.0	C8451	-24	-7
TAV-SV01-200			0.0	C8536	-24	-8
TAV-SV01-250			0.0	C8329	-22	-8
TAV-SV01-300			0.0	3573	-22	-6
TAV-SV01-350			0.0	6280	-22	-8
TAV-SV01-400			0.0	C8500	-22	-7
TAV-SV01-450			0.0	6108	-22	-7
TAV-SV01-500			0.0	6548	-22	-7
TAV-SV02-050	29-Apr-11		0.0	7908	-24	-7
TAV-SV02-100			0.0	C8523	-24	-6
TAV-SV02-150			0.0	C8483	-24	-8
TAV-SV02-200			0.0	C8399	-24	-8
TAV-SV02-250			0.0	7991	-24	-8
TAV-SV02-300			0.0	7946	-24	-8
TAV-SV02-350			0.0	12607	-24	-8
TAV-SV02-400			0.0	6096	-24	-8
TAV-SV02-450			0.0	C8415	-24	-8
TAV-SV02-450 (Duplicate)			0.0	C8300	-24	-8
TAV-SV02-500			0.0	C8438	-24	-8
TAV-SV03-050	28-Apr-11		0.0	C8354	-24	-8
TAV-SV03-100			0.0	C8504	-24	-8
TAV-SV03-150			0.0	7983	-24	-8
TAV-SV03-200			0.0	C8324	-24	-8
TAV-SV03-250			0.0	7922	-24	-8
TAV-SV03-250 (Duplicate)			0.0	C8403	-24	-8
TAV-SV03-300			0.0	6114	-24	-8
TAV-SV03-350			0.0	6561	-24	-7
TAV-SV03-400			0.0	6274	-24	-8
TAV-SV03-450			0.0	C8505	-24	-7
TAV-SV03-500			0.0	7228	-24	-8

Refer to footnotes on page 5D-47.

Table 5D-5 *(Continued)*
Summary of Photoionization Detector and Vacuum Pressure Field Measurements[g]
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Sample Date	PID Model	PID (ppm)	Canister Number	Starting Vacuum Pressure (inHg)	Ending Vacuum Pressure (inHg)
TAV-SV01-050	26-Jul-11	ToxiRae model PGM-30 Serial # 000831	0.1	1291	-26	-8
TAV-SV01-100			0.1	1187C	-26	-8
TAV-SV01-150			0.1	3273	-26	-8
TAV-SV01-150 (Duplicate)			0.1	2328	-26	-8
TAV-SV01-200			0.0	3181	-26	-8
TAV-SV01-250			0.0	3587	-26	-8
TAV-SV01-300			0.0	1230A	-26	-8
TAV-SV01-350			0.0	C8429	-26	-8
TAV-SV01-400			0.0	3567	-27	-8
TAV-SV01-450			0.0	3414	-27	-8
TAV-SV01-500			0.0	6536	-27	-8
TAV-SV02-050	22-Jul-11		0.0	063245	-26	-8
TAV-SV02-100			0.0	12833	-26	-8
TAV-SV02-150			0.0	063248	-27	-8
TAV-SV02-200			0.0	04424	-26	-8
TAV-SV02-250			0.0	7874	-26	-8
TAV-SV02-300			0.0	6267	-26	-8
TAV-SV02-350			0.0	C8461	-27	-8
TAV-SV02-400			0.0	A187	-27	-8
TAV-SV02-450			0.0	1273	-27	-8
TAV-SV02-500			0.0	9152B	-27	-8
TAV-SV02-500 (Duplicate)			0.0	GL0416	-27	-8
TAV-SV03-050	25-Jul-11		0.0	C8414	-27	-8
TAV-SV03-100			0.0	C8395	-27	-8
TAV-SV03-150			0.0	6555	-27	-8
TAV-SV03-200			0.0	1285	-27	-8
TAV-SV03-250			0.0	6143	-27	-8
TAV-SV03-300			0.0	C8481	-26	-8
TAV-SV03-350			0.0	7860	-27	-8
TAV-SV03-400			0.0	C8443	-27	-8
TAV-SV03-400 (Duplicate)			0.0	C8322	-27	-8
TAV-SV03-450			0.0	12645	-27	-8
TAV-SV03-500			0.0	2243	-27	-8

Refer to footnotes on page 5D-47.

Table 5D-5 *(Concluded)*
Summary of Photoionization Detector and Vacuum Pressure Field Measurements[g]
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Sample Port	Sample Date	PID Model	PID (ppm)	Canister Number	Starting Vacuum Pressure (inHg)	Ending Vacuum Pressure (inHg)
TAV-SV01-050	30-Nov-11	ToxiRae model PGM-30 Serial # 000831	0.0	7244	-25	-10
TAV-SV01-100			0.0	C8476	-24	-10
TAV-SV01-150			0.0	7867	-25	-10
TAV-SV01-200			0.0	7993	-25	-10
TAV-SV01-250			0.0	6273	-25	-10
TAV-SV01-300			0.0	3053	-25	-10
TAV-SV01-350			0.0	2742	-25	-10
TAV-SV01-400			0.0	1094C	-25	-10
TAV-SV01-450			0.0	92001	-25	-10
TAV-SV01-450 (Duplicate)			0.0	1049C	-25	-10
TAV-SV01-500			0.0	A134	-25	-10
TAV-SV02-050	30-Nov-11		0.0	6551	-24	-10
TAV-SV02-100			0.0	C8535	-25	-10
TAV-SV02-150			0.0	6141	-24	-10
TAV-SV02-200			0.0	6267	-24	-10
TAV-SV02-250			0.0	3118	-24	-10
TAV-SV02-300			0.0	1063C	-24	-10
TAV-SV02-300 (Duplicate)			0.0	A292	-24	-10
TAV-SV02-350			0.0	93147	-24	-10
TAV-SV02-400			0.0	7995	-24	-10
TAV-SV02-450			0.0	A268	-24	-10
TAV-SV02-500			0.0	7853	-24	-10
TAV-SV03-050	30-Nov-11		0.0	C8387	-25	-10
TAV-SV03-100			0.0	C8509	-25	-10
TAV-SV03-100 (Duplicate)			0.0	6276	-25	-10
TAV-SV03-150			0.0	2339	-25	-10
TAV-SV03-200			0.0	3456	-25	-10
TAV-SV03-250			0.0	1229	-25	-10
TAV-SV03-300			0.0	3478	-25	-10
TAV-SV03-350			0.0	3033	-25	-10
TAV-SV03-400			0.0	12819	-26	-10
TAV-SV03-450			0.0	1102C	-25	-10
TAV-SV03-500			0.0	C8514	-24	-10

Refer to footnotes on page 5D-47.

Table 5D-6
Summary of Duplicate Samples
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID / Parameter	Environmental Sample (R_1)	Duplicate Sample (R_2)	RPD[h]
	ppbv unless otherwise noted		
April/May 2011 Sampling Event			
TAV-SV01-50			
Acetone	14	15	7
2-Butanone	ND	3.6	NC
Carbon disulfide	7.2	7.8	8
Methylene chloride	2.9	ND	NC
Toluene	1.2	1.5	22
TAV-SV02-450			
Acetone	11	18	48
Bromodichloromethane	ND	3.2	NC
Chloroform	9.6	12	22
Dichlorodifluoromethane	ND	1.9	NC
1,1-Dichloroethane	1.9	3.2	51
cis-1,2-Dichloroethene	8.8	9.6	9
Tetrachloroethene	4.2	5.4	25
Trichloroethene	230	270	16
1,1,2-Trichloro-1,2,2-trifluoroethane	96	130	30
TAV-SV03-250			
Acetone	ND	27	NC
Benzene	37	37	< 1
Chloroform	5.4	4.5	18
1,1-Dichloroethene	4.1	ND	NC
Methylene chloride	4.3	4.0	7
Toluene	5.7	5.6	2
Trichloroethene	400	370	8
1,1,2-Trichloro-1,2,2-trifluoroethane	520	440	17

Refer to footnotes on page 5D-47.

Table 5D-6 *(Continued)*
Summary of Duplicate Samples
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Parameter	Environmental Sample (R_1)	Duplicate Sample (R_2)	RPD[h]
	ppbv unless otherwise noted		
July 2011 Sampling Event			
TAV-SV01-150			
Acetone	8.0	ND	NC
Chloroform	2.9	2.0	37
Methylene chloride	4.8	ND	NC
Trichloroethene	17	17	< 1
1,1,2-Trichloro-1,2,2-trifluoroethane	3.3	3.4	3
TAV-SV02-500			
Acetone	140	ND	NC
cis-1,2-Dichloroethene	120	130	8
Methylene chloride	ND	17	NC
Trichloroethene	870	950	9
1,1,2-Trichloro-1,2,2-trifluoroethane	120	180	40
m,p-Xylene	ND	13	NC
Xylenes, total	ND	13	NC
TAV-SV03-400			
Methylene chloride	ND	27	NC
Trichloroethene	1200	1900	45
1,1,2-Trichloro-1,2,2-trifluoroethane	180	300	50

Refer to footnotes on page 5D-47.

Table 5D-6 *(Concluded)*
Summary of Duplicate Samples
Technical Area V Soil-Vapor Monitoring

Calendar Year 2011

Well ID/Parameter	Environmental Sample (R_1)	Duplicate Sample (R_2)	RPD[h]
	ppbv unless otherwise noted		
November 2011 Sampling Event			
TAV-SV01-450			
2-Butanone	19.0	ND	NC
Chloroform	5.8	6.1	5
cis-1,2-Dichloroethene	130	130	< 1
Tetrachloroethene	5.9	6.3	7
1,1,2-Trichloro-1,2,2-trifluoroethane	9.8	12.0	20
Trichloroethene	1100	1100	< 1
TAV-SV02-300			
Bromodichloromethane	17.0	19.0	11
2-Butanone	26.0	ND	NC
Carbon tetrachloride	ND	2.7	NC
Chloroform	23.0	23.0	< 1
Dibromochloromethane	5.7	6.5	13
1,1-Dichloroethane	2.8	2.7	4
cis-1,2-Dichloroethene	2.9	3.0	3
Tetrachloroethene	4.6	4.5	2
1,1,2-Trichloro-1,2,2-trifluoroethane	220	250	13
Trichloroethene	330	330	< 1
Trichlorofluoromethane	2.7	2.9	7
TAV-SV03-100			
2-Butanone	0.90	0.51	55
Chloroform	0.45	0.45	< 1
Chloromethane	2.0	2.0	< 1
Dichlorodifluoromethane	0.90	0.90	< 1
Tetrachloroethene	1.9	1.9	< 1
1,1,2-Trichloro-1,2,2-trifluoroethane	530	540	2
Trichloroethene	35.0	35.0	< 1
Trichlorofluoromethane	1.2	1.2	< 1

Refer to footnotes on page 5D-47.

Footnotes for Technical Area V Soil-Vapor Monitoring Tables

bgs = Below ground surface.
ft = Foot (feet).
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
SAP = Sampling and Analysis Plan.
SV = Soil vapor.
TA-V = Technical Area V.

[a]Result

- ppbv = parts per billion by volume.
- Total Organics = sum of validated detected organic compounds.

[b]MDL

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.
NA = Not applicable.
ppbv = parts per billion by volume.

[c]PQL

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.
NA = Not applicable.
ppbv = parts per billion by volume.

[d]Laboratory Qualifier

B = Analyte is detected in associated laboratory method blank.
J = Estimated value. Analyte detected at a level below the PQL and greater than or equal to the MDL.
NA = Not applicable.

[e]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.
J = The associated value is an estimated quantity.
J+ = The associated numerical value is an estimated quantity with a suspected positive bias.
J- = The associated numerical value is an estimated quantity with a suspected negative bias.
NA = Not applicable.
U = The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ = The analyte was analyzed for but was not detected. The associated numerical value is an estimate and may be inaccurate or imprecise.

[f]Analytical Method

- U.S. Environmental Protection Agency, 1999, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Compendium Method TO-14A, Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using Specifically Prepared Canisters with Subsequent Analysis by Gas Chromatography,* Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio.
- U.S. Environmental Protection Agency, 1999, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS),* Center for Environmental Research Information, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio.

[g]Field Measurements

- Field measurements collected prior to and after sampling.

inHg = inches of mercury.
PID = photoionization detector.
ppm = parts per million.

Footnotes for Technical Area V Soil-Vapor Monitoring Tables *(Concluded)*

[h]**RPD**

RPD = Relative percent difference is calculated with the following equation and rounded to nearest whole number.

$$RPD = \frac{|R_1 - R_2|}{[(R_1 + R_2)/2]} x\ 100$$

where: R_1 = analytical result
R_2 = duplicate analytical result
NC = not calculated
ND = analyte not detected at the MDL

Attachment 5D
Figures

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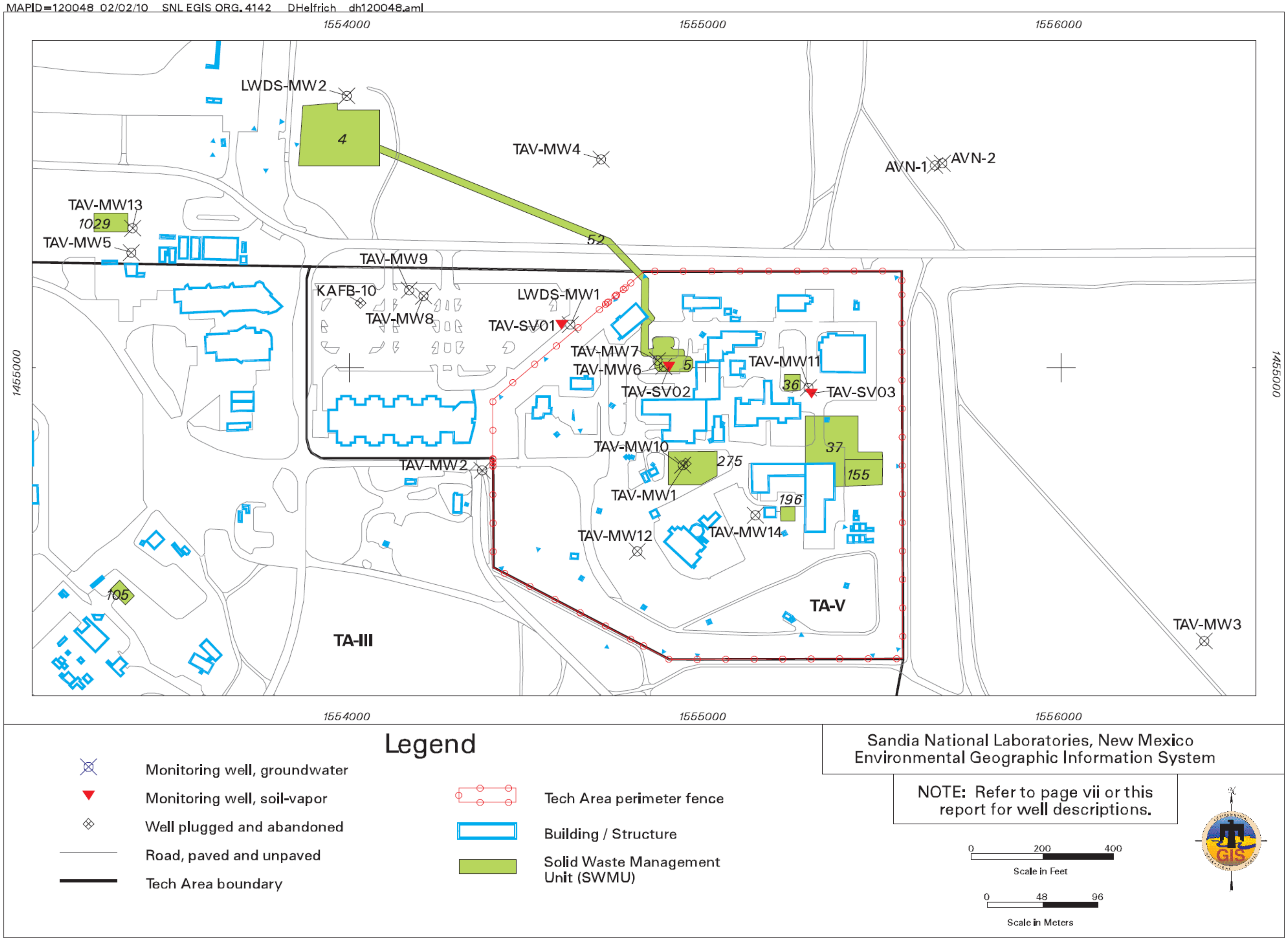


Figure 5D-1. TA-V Soil-Vapor Monitoring Well Locations

Well Name: TAV-SV01
Project Name: TAV SOIL VAPOR WELLS
NMOSE Well File Code: N/A
Owner Name: SNL/NM
Date Drilling Started: 1/27/2011
Date Well Dev. Completed: 3/17/2011

Drilling Contractor: WDC EXPLORATION & WELLS
Drilling Method: ARCH
Borehole Depth (FBGS): 506
Casing Depth (FBGS):
Geo Location: TA-V
Completion Zone: ALLUVIAL FAN FACIES
Completion Formation: SANTA FE

Survey Data

Survey Date: 3/29/2011
Surveyed By: SURVEYING CONTROL, INC.

State Plane Coordinates: NAD 83
(X) Easting: 1554596.11
(Y) Northing: 1455120.73

Surveyed Evaluations (FAMSL) NAVD 88

Protective Casing: 5423.48
Top of Inner Well Casing:
Concrete Pad: 5423.43
Ground Surface: 5423.4

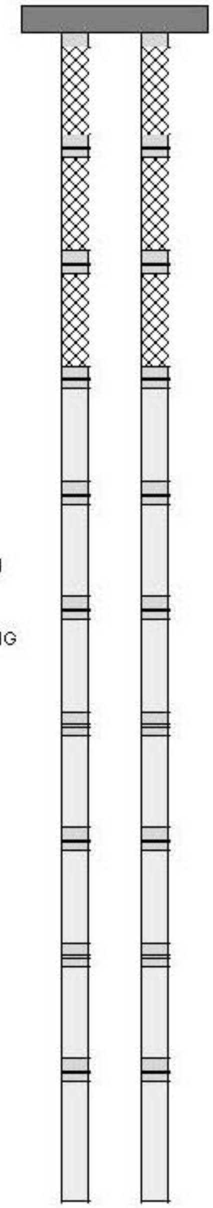
Calculated Depths and Elevations

Initial Depth to Water (FBGS):
Date Initial Depth Measured:
Last Measured Water Elevation (FAMSL):
Date Last Measured:

Miscellaneous Information

Screen Slot Size (in.): n/a
Date Updated: 02-MAY-2011
Date Printed from EDMS: 4/17/2012 11:03:20 AM

Comments:
SV = SOIL VAPOR. SVSS=SOIL VAPOR SAMPLING SCREEN.



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Material	Start	Stop	Length	ID/OD(in.)
BOREHOLE		0	506	506	/ 9.625
VAULT		0	6	6	
SEAL	BENTONITE CHIPS	6	44	38	
SV SAMPLING ZONE	10/20 SILICA SAND	44	54	10	
SVSS 50	STAINLESS STEEL	49.5	50.5	1	/ 0.375
SEAL	BENTONITE CHIPS	54	94	40	
SV SAMPLING ZONE	10/20 SILICA SAND	94	104	10	
SVSS 100	STAINLESS STEEL	99.5	100.5	1	/ 0.375
SEAL	BENTONITE CHIPS	104	144	40	
SV SAMPLING ZONE	10/20 SILICA SAND	144	154	10	
SVSS 150	STAINLESS STEEL	149.5	150.5	1	/ 0.375
SEAL	BENTONITE CHIPS	154	194	40	
SV SAMPLING ZONE	10/20 SILICA SAND	194	204	10	
SVSS 200	STAINLESS STEEL	199.5	200.5	1	/ 0.375
SEAL	BENTONITE CHIPS	204	244	40	
SV SAMPLING ZONE	10/20 SILICA SAND	244	254	10	
SVSS 250	STAINLESS STEEL	249.5	250.5	1	/ 0.375
SEAL	BENTONITE CHIPS	254	294	40	
SV SAMPLING ZONE	10/20 SILICA SAND	294	304	10	
SVSS 300	STAINLESS STEEL	299.5	300.5	1	/ 0.375
SEAL	BENTONITE CHIPS	304	344	40	
SV SAMPLING ZONE	10/20 SILICA SAND	344	354	10	
SVSS 350	STAINLESS STEEL	349.5	350.5	1	/ 0.375
SEAL	BENTONITE CHIPS	354	394	40	
SV SAMPLING ZONE	10/20 SILICA SAND	394	404	10	
SVSS 400	STAINLESS STEEL	399.5	400.5	1	/ 0.375
SEAL	BENTONITE CHIPS	404	444	40	
SV SAMPLING ZONE	10/20 SILICA SAND	444	454	10	
SVSS 450	STAINLESS STEEL	449.5	450.5	1	/ 0.375
SEAL	BENTONITE CHIPS	454	494	40	
SV SAMPLING ZONE	10/20 SILICA SAND	494	506	12	
SVSS 500	STAINLESS STEEL	499.5	500.5	1	/ 0.375

Some well diagram info truncated due to numeric constraints.

Figure 5D-2. Soil-Vapor Monitoring Well Completion Information for TAV-SV01

Well Name:	TAV-SV02	**Drilling Contractor:**	WDC EXPLORATION & WELLS
Project Name:	TAV SOIL VAPOR WELLS	**Drilling Method:**	ARCH
NMOSE Well File Code:	N/A	**Borehole Depth (FBGS):**	506
Owner Name:	SNL/NM	**Casing Depth (FBGS):**	
Date Drilling Started:	3/3/2011	**Geo Location:**	TA-V
Date Well Dev. Completed:	3/17/2011	**Completion Zone:**	ALLUVIAL FAN FACIES
		Completion Formation:	SANTA FE

Survey Data

Survey Date: 3/29/2011
Surveyed By: SURVEYING CONTROL, INC.

State Plane Coordinates: NAD 83

(X) Easting: 1554898.53
(Y) Northing: 1455002.42

Surveyed Evaluations (FAMSL) NAVD 88

Protective Casing: 5431.91
Top of Inner Well Casing:
Concrete Pad: 5431.88
Ground Surface: 5431.9

Calculated Depths and Elevations

Initial Depth to Water (FBGS):

Date Initial Depth Measured:

Last Measured Water Elevation (FAMSL):

Date Last Measured:

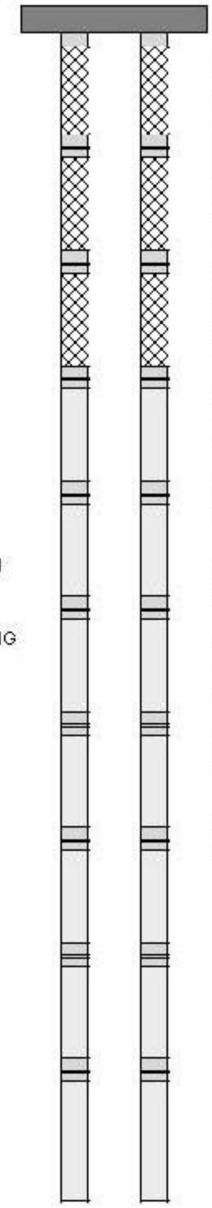
Miscellaneous Information

Screen Slot Size (in.): n/a

Date Updated: 02-MAY-2011

Date Printed from EDMS: 4/17/2012 11:04:53 AM

Comments:
SV = SOIL VAPOR. SVSS=SOIL VAPOR SAMPLING SCREEN.



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Material	Start	Stop	Length	ID/OD(in.)
BOREHOLE		0	506	506	/ 9.625
VAULT		0	6	6	
SEAL	BENTONITE CHIPS	6	44	38	
SV SAMPLING ZONE	10/20 SILICA SAND	44	54	10	
SVSS 50	STAINLESS STEEL	49.5	50.5	1	/ 0.375
SEAL	BENTONITE CHIPS	54	94	40	
SV SAMPLING ZONE	10/20 SILICA SAND	94	104	10	
SVSS 100	STAINLESS STEEL	99.5	100.5	1	/ 0.375
SEAL	BENTONITE CHIPS	104	144	40	
SV SAMPLING ZONE	10/20 SILICA SAND	144	154	10	
SVSS 150	STAINLESS STEEL	149.5	150.5	1	/ 0.375
SEAL	BENTONITE CHIPS	154	194	40	
SV SAMPLING ZONE	10/20 SILICA SAND	194	204	10	
SVSS 200	STAINLESS STEEL	199.5	200.5	1	/ 0.375
SEAL	BENTONITE CHIPS	204	244	40	
SV SAMPLING ZONE	10/20 SILICA SAND	244	254	10	
SVSS 250	STAINLESS STEEL	249.5	250.5	1	/ 0.375
SEAL	BENTONITE CHIPS	254	294	40	
SV SAMPLING ZONE	10/20 SILICA SAND	294	304	10	
SVSS 300	STAINLESS STEEL	299.5	300.5	1	/ 0.375
SEAL	BENTONITE CHIPS	304	344	40	
SV SAMPLING ZONE	10/20 SILICA SAND	344	354	10	
SVSS 350	STAINLESS STEEL	349.5	350.5	1	/ 0.375
SEAL	BENTONITE CHIPS	354	394	40	
SV SAMPLING ZONE	10/20 SILICA SAND	394	404	10	
SVSS 400	STAINLESS STEEL	399.5	400.5	1	/ 0.375
SEAL	BENTONITE CHIPS	404	444	40	
SV SAMPLING ZONE	10/20 SILICA SAND	444	454	10	
SVSS 450	STAINLESS STEEL	449.5	450.5	1	/ 0.375
SEAL	BENTONITE CHIPS	454	494	40	
SV SAMPLING ZONE	10/20 SILICA SAND	494	506	12	
SVSS 500	STAINLESS STEEL	499.5	500.5	1	/ 0.375

Some well diagram info truncated due to numeric constraints.

Figure 5D-3. Soil-Vapor Monitoring Well Completion Information for TAV-SV02

Well Name:	TAV-SV03	**Drilling Contractor:**	WDC EXPLORATION & WELLS
Project Name:	TAV SOIL VAPOR WELLS	**Drilling Method:**	ARCH
NMOSE Well File Code:	N/A	**Borehole Depth (FBGS):**	506
Owner Name:	SNL/NM	**Casing Depth (FBGS):**	
Date Drilling Started:	2/22/2011	**Geo Location:**	TA-V
Date Well Dev. Completed:	3/17/2011	**Completion Zone:**	ALLUVIAL FAN FACIES
		Completion Formation:	SANTA FE

Survey Data

Survey Date: 3/29/2011

Surveyed By: SURVEYING CONTROL, INC.

State Plane Coordinates: NAD 83

(X) Easting: 1555298.42

(Y) Northing: 1454927.34

Surveyed Evaluations (FAMSL) NAVD 88

Protective Casing: 5440.19

Top of Inner Well Casing:

Concrete Pad: 5440.20

Ground Surface: 5440.2

Calculated Depths and Elevations

Initial Depth to Water (FBGS):

Date Initial Depth Measured:

Last Measured Water Elevation (FAMSL):

Date Last Measured:

Miscellaneous Information

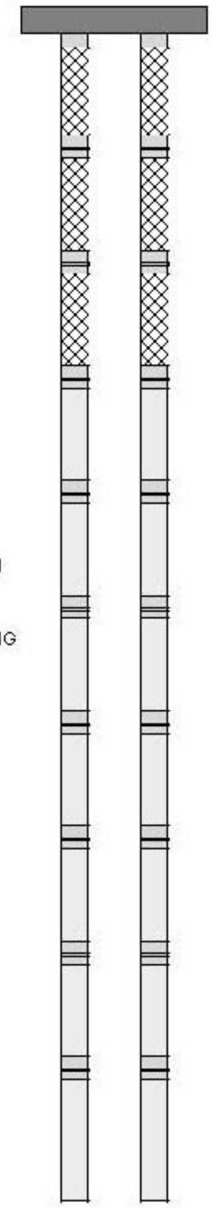
Screen Slot Size (in.): n/a

Date Updated: 02-MAY-2011

Date Printed from EDMS: 4/17/2012 11:06:11 AM

Comments:

SV = SOIL VAPOR. SVSS=SOIL VAPOR SAMPLING SCREEN.



Completion Data Measured Depths (FBGS)

Casing Stickup:

Interval	Material	Start	Stop	Length	ID/OD(in.)
BOREHOLE		0	100	100	/ 11.75
VAULT		0	6	6	
SEAL	BENTONITE CHIPS	6	44	38	
SV SAMPLING ZONE	10/20 SILICA SAND	44	54	10	
SVSS 50	STAINLESS STEEL	49.5	50.5	1	/ 0.375
SEAL	BENTONITE CHIPS	54	94	40	
SV SAMPLING ZONE	10/20 SILICA SAND	94	104	10	
SVSS 100	STAINLESS STEEL	99.5	100.5	1	/ 0.375
BOREHOLE		100	507	407	/ 9.625
SEAL	BENTONITE CHIPS	104	144	40	
SV SAMPLING ZONE	10/20 SILICA SAND	144	154	10	
SVSS 150	STAINLESS STEEL	149.5	150.5	1	/ 0.375
SEAL	BENTONITE CHIPS	154	194	40	
SV SAMPLING ZONE	10/20 SILICA SAND	194	204	10	
SVSS 200	STAINLESS STEEL	199.5	200.5	1	/ 0.375
SEAL	BENTONITE CHIPS	204	244	40	
SV SAMPLING ZONE	10/20 SILICA SAND	244	254	10	
SVSS 250	STAINLESS STEEL	249.5	250.5	1	/ 0.375
SEAL	BENTONITE CHIPS	254	294	40	
SV SAMPLING ZONE	10/20 SILICA SAND	294	304	10	
SVSS 300	STAINLESS STEEL	299.5	300.5	1	/ 0.375
SEAL	BENTONITE CHIPS	304	344	40	
SV SAMPLING ZONE	10/20 SILICA SAND	344	354	10	
SVSS 350	STAINLESS STEEL	349.5	350.5	1	/ 0.375
SEAL	BENTONITE CHIPS	354	394	40	
SV SAMPLING ZONE	10/20 SILICA SAND	394	404	10	
SVSS 400	STAINLESS STEEL	399.5	400.5	1	/ 0.375
SEAL	BENTONITE CHIPS	404	444	40	
SV SAMPLING ZONE	10/20 SILICA SAND	444	454	10	
SVSS 450	STAINLESS STEEL	449.5	450.5	1	/ 0.375
SEAL	BENTONITE CHIPS	454	494	40	
SV SAMPLING ZONE	10/20 SILICA SAND	494	507	13	
SVSS 500	STAINLESS STEEL	499.5	500.5	1	

Some well diagram info truncated due to numeric constraints.

Figure 5D-4. Soil-Vapor Monitoring Well Completion Information for TAV-SV03

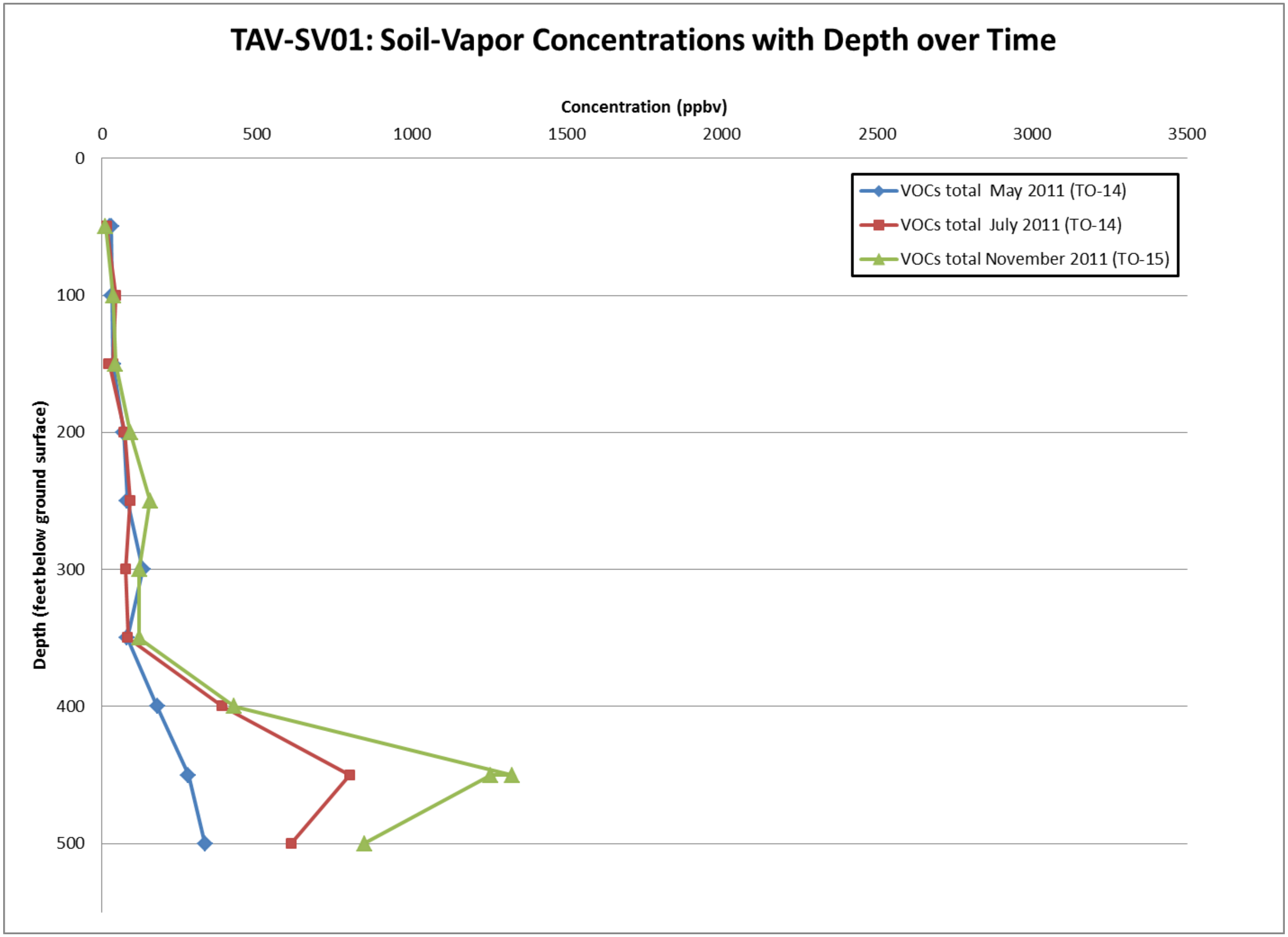


Figure 5D-5. TA-V Soil-Vapor Monitoring Total VOC Results (ppbv) at TAV-SV01

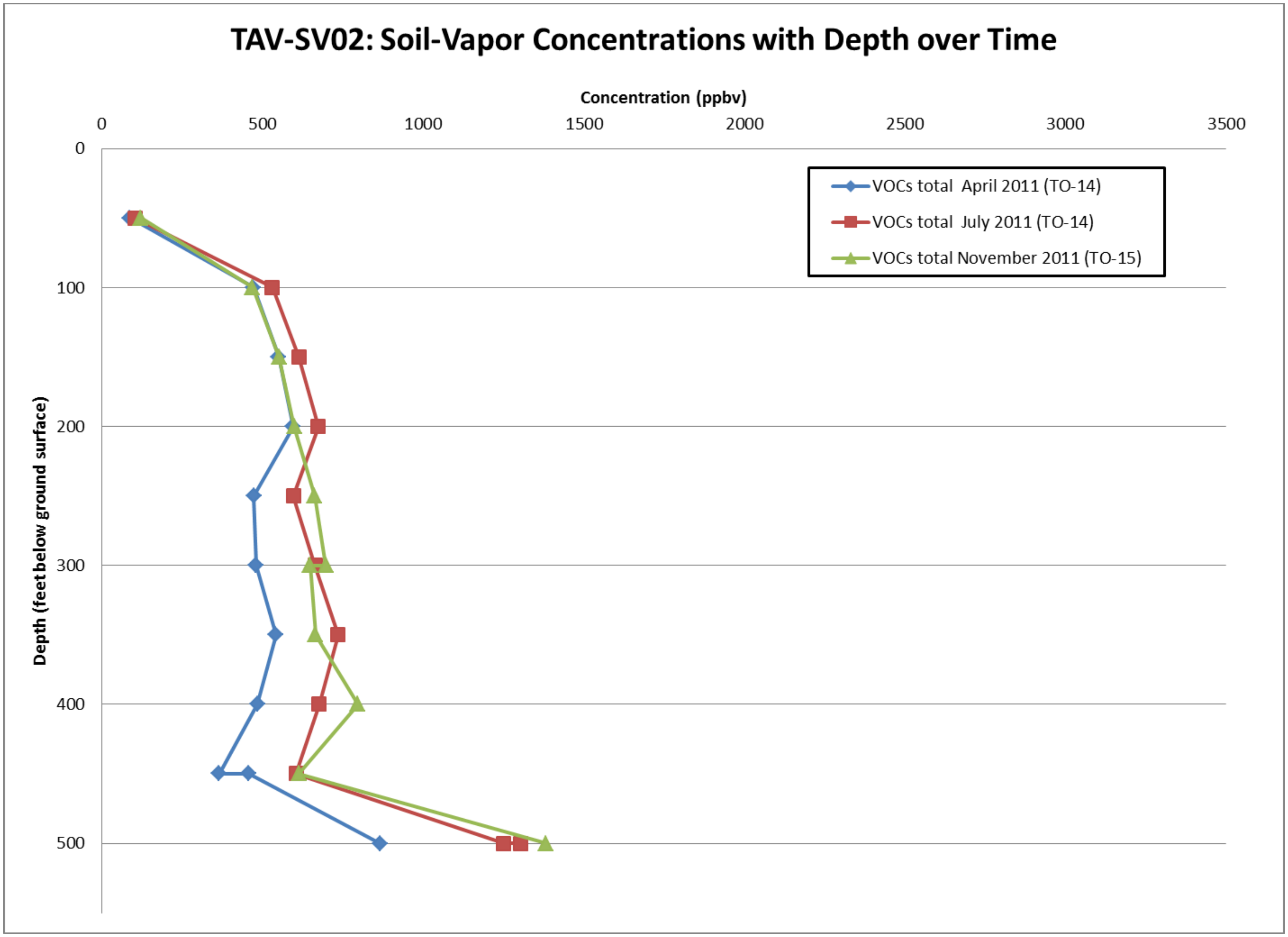


Figure 5D-6. TA-V Soil-Vapor Monitoring Total VOC Results (ppbv) at TAV-SV02

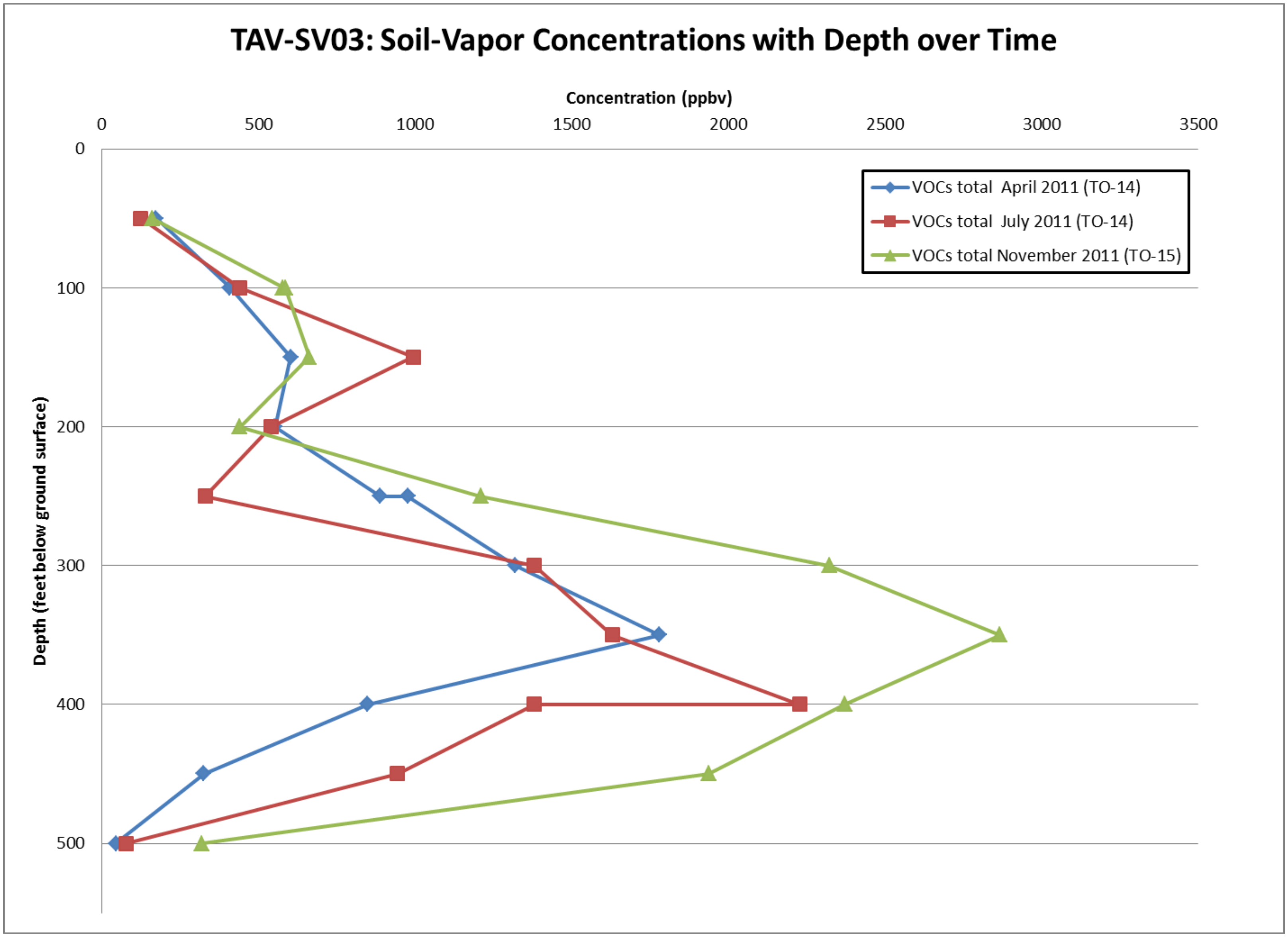


Figure 5D-7. TA-V Soil-Vapor Monitoring Total VOC Results (ppbv) at TAV-SV03

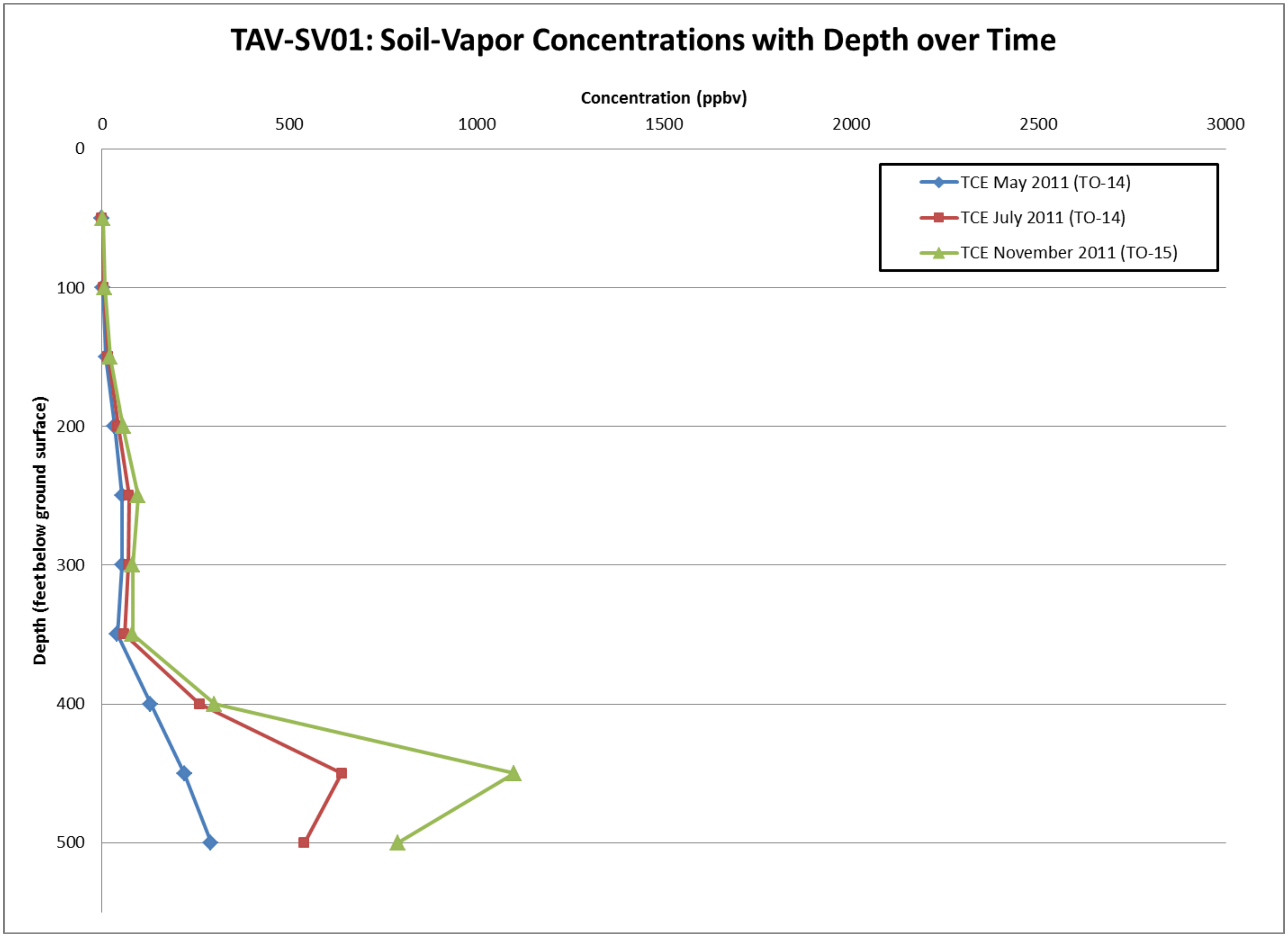


Figure 5D-8. TA-V Soil-Vapor Monitoring TCE Results (ppbv) at TAV-SV01

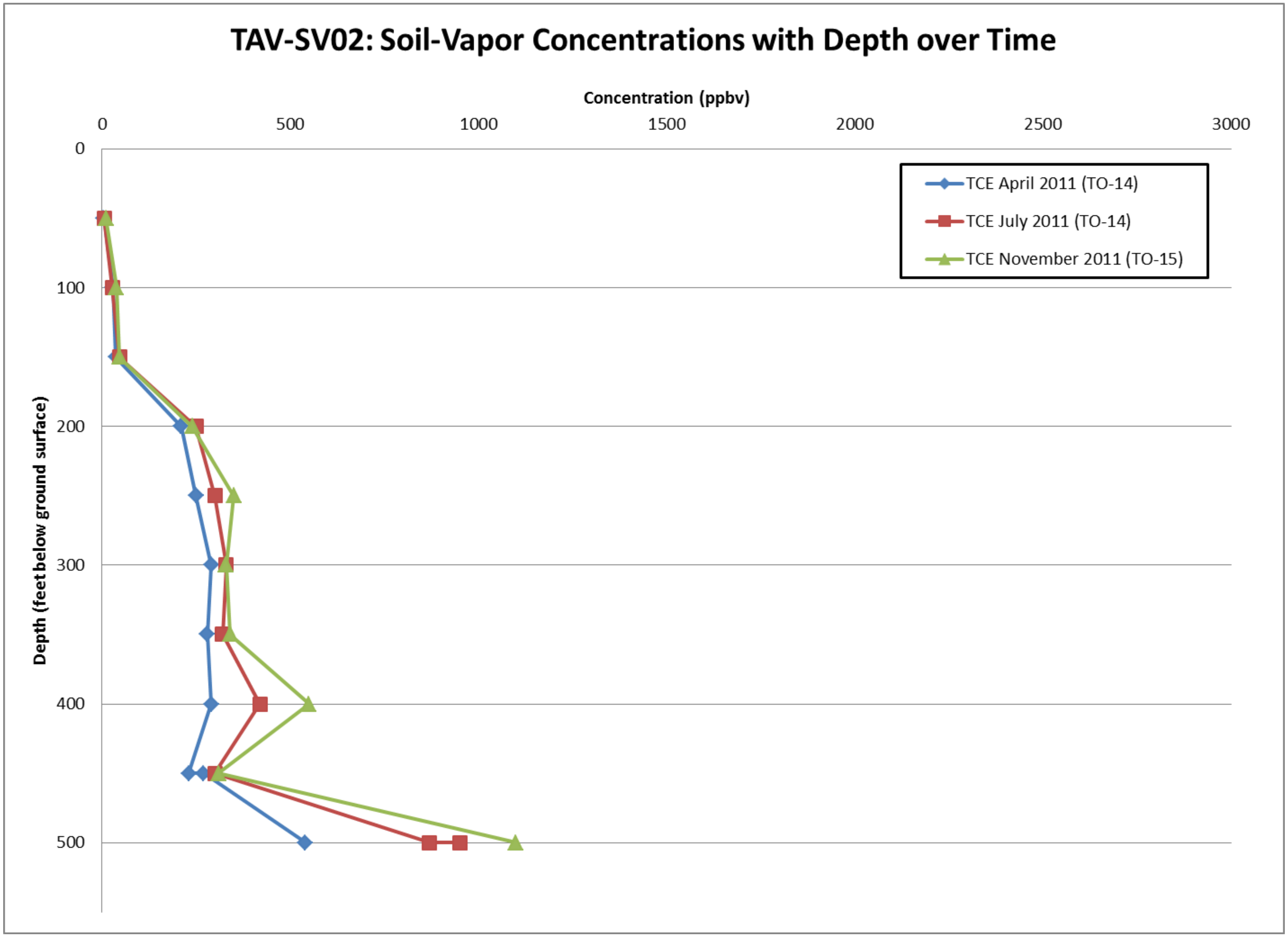


Figure 5D-9. TA-V Soil-Vapor Monitoring TCE Results (ppbv) at TAV-SV02

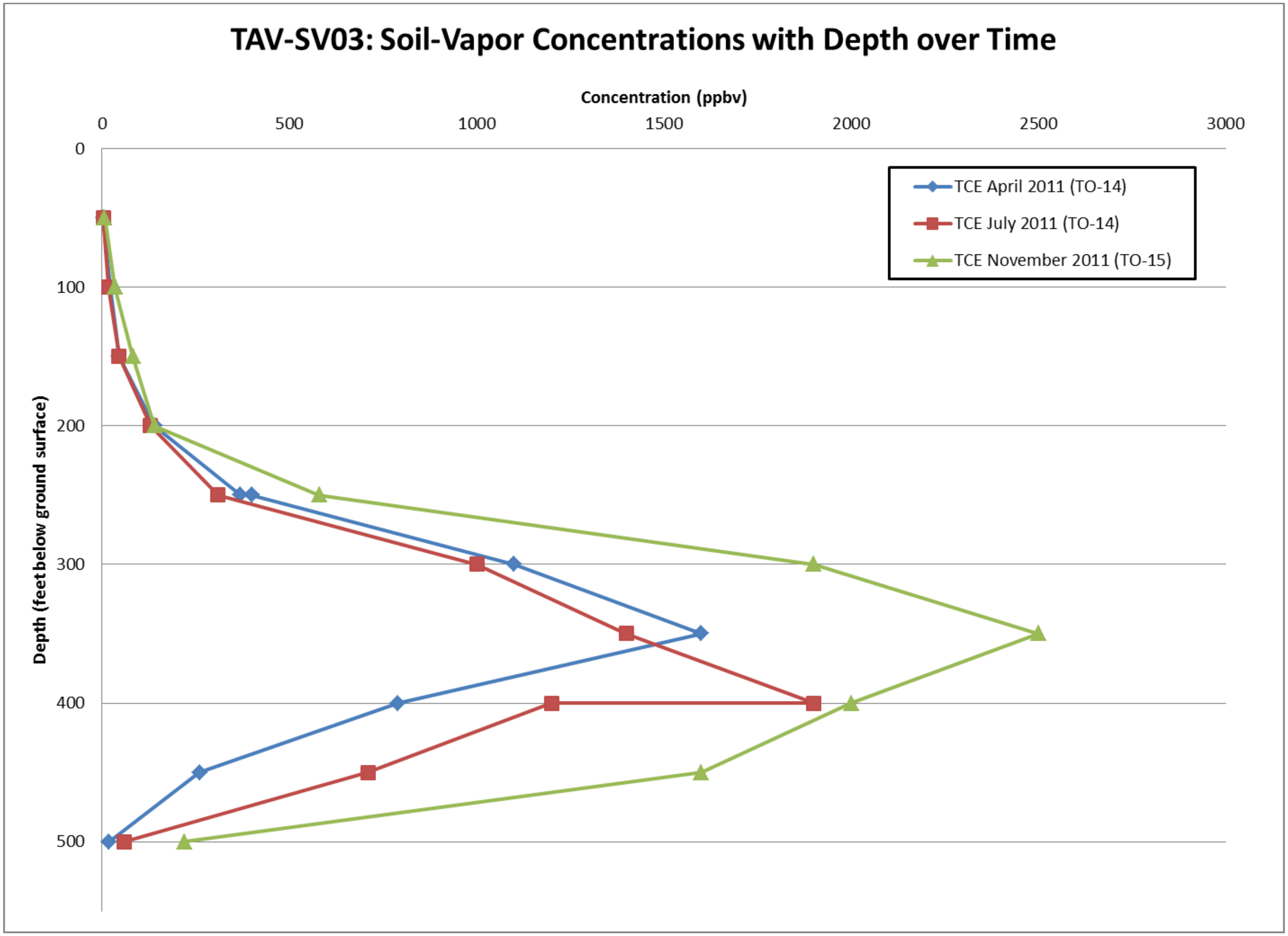


Figure 5D-10. TA-V Soil-Vapor Monitoring TCE Results (ppbv) at TAV-SV03

6.0 Tijeras Arroyo Groundwater Study Area

6.1 Introduction

Trichloroethene (TCE) and nitrate have been identified as constituents of concern (COCs) in groundwater at the Tijeras Arroyo Groundwater (TAG) study area based on historical groundwater monitoring results. Detections of these COCs exceed the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) in samples collected from the TAG study area monitoring wells. Since August 1996, the historical maximum TCE concentration detected at the site has been 9.6 micrograms per liter (µg/L), and the maximum nitrate detection has been 49 milligrams per liter (mg/L). The EPA MCLs and State of New Mexico drinking water standards for TCE and nitrate are 5 µg/L and 10 mg/L (as nitrogen), respectively.

Unique features of the TAG study area include low concentrations of TCE at scattered locations in the perched groundwater system (PGWS) and low concentrations of nitrate at scattered locations in the PGWS and regional aquifer.

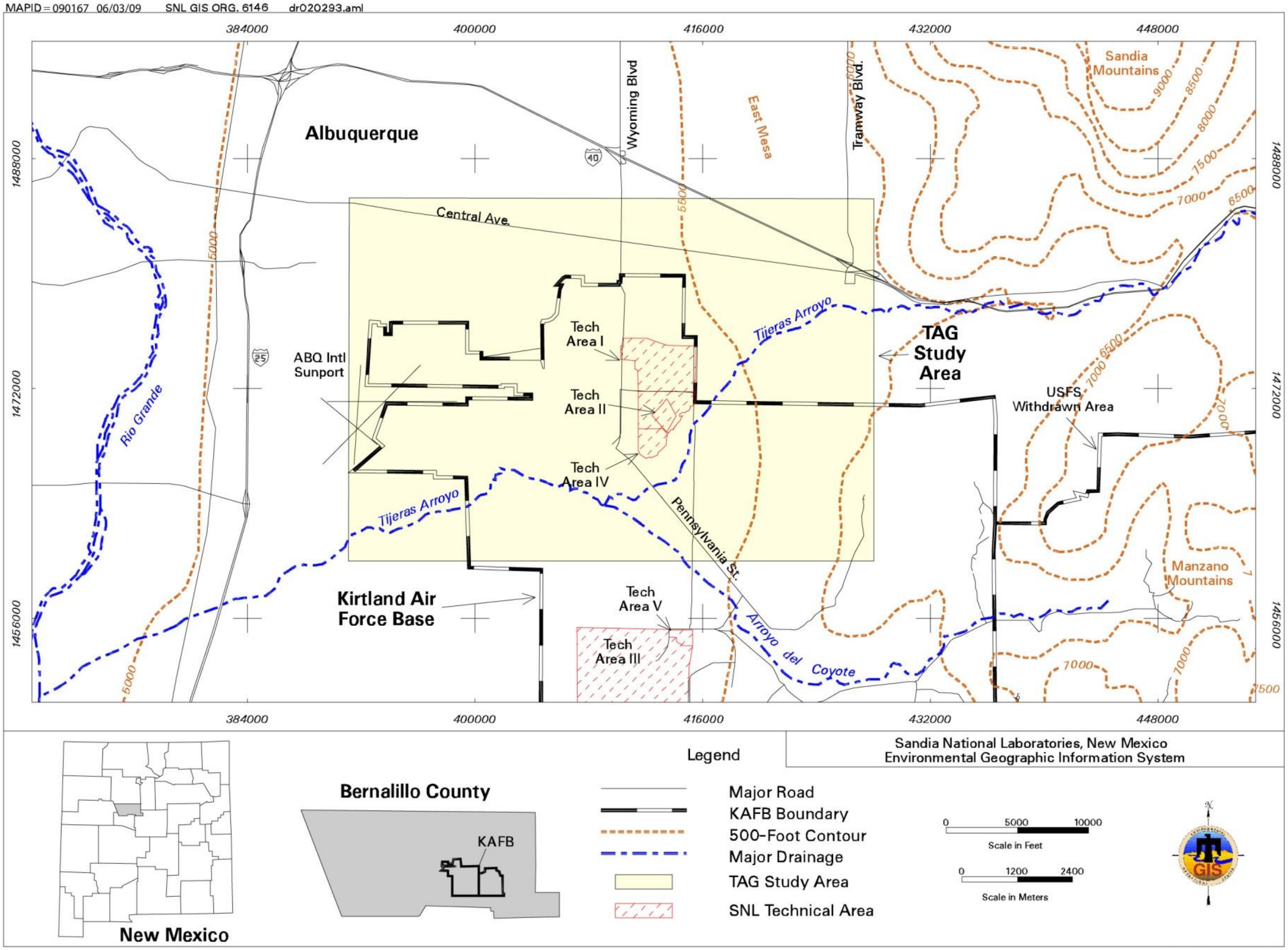
6.1.1 Location

The TAG study area encompasses approximately 40 square miles (sq mi) in the north-central portion of Kirtland Air Force Base (KAFB) (Figure 6-1). Three of the five Technical Areas (TAs) managed by Sandia National Laboratories, New Mexico (SNL/NM) are located in the TAG study area. Together, the three TAs (TA-I, TA-II, and TA-IV) encompass approximately 641 acres. The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE), National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

The three parties identified as potentially responsible for groundwater contamination within the TAG area include DOE/Sandia, KAFB, and the City of Albuquerque (COA). KAFB controls facilities and properties with a variety of land uses along the north, west, south, and southeast boundaries of TA-I, TA-II, and TA-IV. The area located along the northern and western boundaries of the three TAs contains KAFB housing, office buildings, a fire station, training schools, machine workshops, storage yards, a brig, a diesel-fuel tank farm, an electromagnetic research facility, and inactive sewage lagoons. Bordering the southern and southeastern edges of the three TAs are undeveloped open spaces, active landfills, closed landfills, emergency-response training areas, and the Tijeras Arroyo Golf Course. The COA residential areas are located along most of the northern boundary of KAFB.

6.1.2 Site History

In early 1928, the first airport in Albuquerque was constructed where TA-I and TA-II are currently located. In the spring of 1946, during a dismantling operation, 2,250 military aircraft were dismantled adjacent to the taxiways. In July 1945, the “Z Division” of the Manhattan Engineers District, an extension of the original Los Alamos Laboratory, was established as the forerunner of SNL/NM. At that time, the primary mission of the Z Division was to provide engineering, production, stockpiling, and testing support for nuclear weapon components and systems. In the summer of 1949, the major weapons production was transferred to other manufacturing facilities and the early work of SNL/NM concentrated on prototype research and manufacturing of experimental devices. Since 1949, SNL/NM has grown from a factory-style ordnance facility to a national laboratory dedicated to research, development, and testing of both defense and nondefense components. The current work performed in TA-I and TA-II can be



840857.04350000 A6

Figure 6-1. Location of the TAG Study Area

divided into four main types: nuclear weapon, nonnuclear weapon, technical support, and special research and development. Numerous SNL/NM facilities may have potentially released hazardous materials to the soil and groundwater; however, the current research-oriented mission of most SNL/NM operations has resulted in an inventory of numerous chemicals, which are generally stored and used indoors in small quantities.

SNL/NM Environmental Restoration (ER) Operations (formerly ER Project) has conducted numerous groundwater investigations in the TAG study area since 1992 (SNL November 2005) (Table 6-1). Many of these investigations were site-specific and conducted in support of various Solid Waste Management Unit (SWMU) assessments. Other investigations in the TAG study area were more regional studies conducted by the SNL/NM Site-Wide Hydrogeologic Characterization Project (SNL February 1998). Both KAFB and COA have also completed numerous groundwater investigations in the TAG study area, the results of which are presented in the *Tijeras Arroyo Groundwater Investigation Report* (SNL November 2005).

6.1.3 Monitoring History

Investigations of groundwater quality in the TAG study area have been conducted by SNL/NM personnel over the past 20 years (Table 6-1). In 1992, SNL/NM personnel began to investigate groundwater quality as part of the overall TA-II investigation with the installation of three groundwater monitoring wells. During this initial investigation, the PGWS was discovered at a depth of approximately 320 feet (ft) below ground surface (bgs). In October 1994, the analytical results for a groundwater sample from the PGWS showed TCE at a concentration of 1 µg/L, which caused SNL/NM personnel to further investigate groundwater contamination in the study area.

Beginning in October 2000, meetings of the TAG High Performing Team (HPT) served as a forum for discussing TAG issues. During these meetings, members of the HPT debated the validity of using groundwater analytical results previously collected using low-flow sampling devices. Based on the perceived inadequacy of the sampling method, TAG quarterly groundwater sampling was temporarily suspended by SNL/NM personnel until an alternative sampling method could be implemented. In June 2003, DOE/Sandia submitted the *Tijeras Arroyo Groundwater Investigation Work Plan* (SNL June 2003) to the New Mexico Environment Department (NMED). This work plan presented a comprehensive scope of work for groundwater investigations that are being jointly conducted by SNL/NM personnel, KAFB, and COA. Based on the requirements of the work plan, SNL/NM personnel resumed quarterly groundwater sampling in July 2003 using conventional groundwater purging/sampling techniques. The NMED approved the TAG Investigation Work Plan in September 2003 (NMED September 2003).

Since the initial discoveries of TCE and nitrate at the TAG study area, numerous characterization activities have been conducted (Table 6-1). The results of these characterization activities are summarized in the *Tijeras Arroyo Groundwater Investigation Report* (SNL November 2005). The November 2005 report presents a conceptual model that provides a comprehensive list of groundwater monitoring data sources used to support the investigations.

In April 2004, the Compliance Order on Consent (the Order) became effective between the DOE, Sandia, and the NMED, and the Order specifies TAG as an area of groundwater contamination (NMED April 2004). In response to the Order, DOE/Sandia submitted the *Tijeras Arroyo Groundwater Corrective Measures Evaluation Work Plan* to the NMED in July 2004 (SNL July 2004). After fulfilling the requirements of the Corrective Measures Evaluations (CME) Work Plan, DOE/Sandia submitted the CME Report to the NMED (SNL August 2005).

Table 6-1. Historical Timeline of the TAG Study Area

Month	Year	Event	Reference
November–July	1992–1993	SNL/NM personnel began investigation of TA-II groundwater. PGWS discovered as first wells were installed (TA2-SW1-320, TA2-NW1-325, and TA2-NW1-595).	SNL March 1995a
March	1994	Groundwater sampling analytical results for TA-II wells reported in the Calendar Year 1993 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1994
March–July	1994	Installed monitoring wells TA2-W-01 and TJA-2.	SNL March 1995a
October	1994	Analytical results for groundwater sampling first detected TCE.	SNL March 1996a
March	1995	Groundwater sampling analytical results for TA-II wells reported in the Calendar Year 1994 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1995b
August–September	1995	Installed monitoring wells WYO-1, WYO-2, and PGS-2.	SNL March 1996b
November	1995	Analytical results for groundwater sampling first detected TCE above the EPA MCL of 5 µg/L.	SNL March 1996b
November	1995	Installed monitoring well TA2-W-19.	SNL March 1996b
March	1996	Groundwater sampling analytical results for TA-II wells reported in the Calendar Year 1995 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1996a
March	1996	Sandia North Groundwater Investigation Plan submitted to the NMED.	SNL March 1996b
September	1996	Shallow Water-Bearing Zone Hydrologic Evaluation prepared.	Wolford September 1996
November	1996	Pressure transducer program initiated for select monitoring wells.	SNL March 1998a
November–December	1996	Installed TA-II soil-vapor monitoring wells TA2-VW-20 and TA2-VW-21.	IT January 1997
March	1997	Groundwater sampling analytical results for Sandia North wells in TA-I and TA-II reported in the Calendar Year 1996 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1997
March	1997	Sandia North Geological Investigation Project Report prepared.	Fritts and Van Hart March 1997
March–April	1997	Installed monitoring wells TAI-W-01 and TA2-W-25.	SNL March 1998a
August	1997	Borehole geophysical investigation (electromagnetic induction, neutron, and natural gamma) completed on 21 SNL/NM and KAFB monitoring wells.	SNL March 1998a
January–February	1998	Installed monitoring wells TAI-W-02, TAI-W-03, TAI-W-06, TA2-W-24, TA2-W-26, and TA2-W-27.	SNL June 2000
March	1998	Groundwater sampling analytical results for Sandia North wells in TA-I and TA-II reported in the Calendar Year 1997 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1998b
March	1998	Fiscal Year 1997 Sandia North Groundwater Investigation Annual Report submitted to the NMED.	SNL March 1998a
August–December	1998	Installed monitoring wells TAI-W-04, TAI-W-05, TAI-W-07, TJA-3, TJA-4, and TJA-5.	SNL June 2000
March	1999	Groundwater sampling analytical results for Sandia North wells in TA-I and TA-II reported in the Fiscal Year 1998 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1999
May–June	1999	Colloidal borescope investigation performed on 18 SNL/NM and KAFB monitoring wells.	AquaVISION 1999
October	1999	Analysis of the USGS aeromagnetic survey performed to revise the interpretation of the SNL/NM and KAFB area geologic structure.	Van Hart et al. October 1999
March	2000	Groundwater sampling analytical results for Sandia North wells in TA-I and TA-II reported in the Fiscal Year 1999 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2000
June	2000	Fiscal Year 1998 Sandia North Groundwater Investigation Annual Report submitted to the NMED.	SNL June 2000

Table 6-1. Historical Timeline of the TAG Study Area *(Continued)*

Month	Year	Event	Reference
October	2000	TAG High Performing Team convened for the first time.	SNL June 2003
December	2000	Project name changed from the Sandia North to the Tijeras Arroyo Groundwater Investigation.	Collins 2000
January–March	2001	Installed groundwater monitoring wells TJA-6 and TJA-7, and soil-vapor monitoring wells 46-VW-01, 46-VW-02, and 227-VW-01.	SNL November 2002
February	2001	Preliminary model of the PGWS updated.	BGW February 2001
April	2001	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2000 SNL/NM Annual Groundwater Monitoring Report.	SNL April 2001
June	2001	Geologic model of the PGWS updated.	Van Hart June 2001
July	2001	Monitoring wells WYO-1 and WYO-2 plugged and abandoned, replaced by WYO-3 and WYO-4.	SNL June 2003
October	2001	Monitoring well TA1-W-08 installed.	SNL November 2002
March	2002	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2001 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2002
November	2002	TAG Continuing Investigation Report submitted to the NMED.	SNL November 2002
March	2003	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2002 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2003
June	2003	Subsurface geology at KAFB, including the TAG area, updated.	Van Hart June 2003
June	2003	TAG Investigation Work Plan submitted to the NMED.	SNL June 2003
September	2003	TAG Investigation Work Plan approved by the NMED.	NMED September 2003
December–January	2003–2004	ER Project conducts slug (hydraulic conductivity) tests at groundwater monitoring wells.	Collins 2004
March	2004	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2003 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2004
April	2004	NMED issues the Compliance Order on Consent (the Consent Order), which identified TAG as an area with groundwater contamination requiring a CME.	NMED April 2004
July	2004	TAG CME Work Plan submitted to the NMED.	SNL July 2004
July-August	2004	Monitoring wells TAG-SV-01 through TAG-SV-05 were installed.	SNL November 2005
October	2004	TAG CME Work Plan for the SNL/NM Area of Responsibility approved by the NMED.	NMED October 2004
September	2005	CME Report for TAG submitted to NMED.	SNL August 2005
October	2005	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2004 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2005
November	2005	TAG Investigation Report submitted to the NMED.	SNL November 2005
November	2006	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2005 SNL/NM Annual Groundwater Monitoring Report.	SNL November 2006
March	2007	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2006 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2007
March	2008	Groundwater sampling analytical results for TAG wells reported in the Fiscal Year 2007 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2008
August	2008	NMED issues Notice of Disapproval on November 2005 TAG Investigation Report.	NMED August 2008
February	2009	DOE/Sandia submit Response to NMED's August 2008 Notice of Disapproval on November 2005 TAG Investigation Report.	SNL February 2009

Table 6-1. Historical Timeline of the TAG Study Area *(Concluded)*

Month	Year	Event	Reference
June	2009	Groundwater sampling analytical results for TAG wells reported in the Calendar Year 2008 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2009
April	2009	NMED requires characterization of perchlorate in groundwater in five wells in the TAG study area.	NMED April 2009
August	2009	NMED issues Second Notice of Disapproval on November 2005 TAG Investigation Report.	NMED August 2009
January	2010	DOE/Sandia submit Response to NMED's August 2009 Second Notice of Disapproval on November 2005 TAG Investigation Report	SNL January 2010
February	2010	NMED issues Notice of Approval for the November 2005 TAG Investigation Report.	NMED February 2010
October	2010	Groundwater sampling analytical results for TAG wells reported in the Calendar Year 2009 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2010
September	2011	Groundwater sampling analytical results for TAG wells reported in the Calendar Year 2010 SNL/NM Annual Groundwater Monitoring Report.	SNL September 2011

NOTES:
BGW = Balleau Groundwater, Inc.
CME = Corrective Measures Evaluation.
DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
IT = IT Corporation.
KAFB = Kirtland Air Force Base.
MCL = Maximum Contaminant Level.
µg/L = Microgram(s) per liter.
NMED = New Mexico Environment Department.
PGWS = Perched Groundwater System.
Sandia = Sandia Corporation.
SNL = Sandia National Laboratories.
SNL/NM = Sandia National Laboratories, New Mexico.
TA = Technical Area.
TAG = Tijeras Arroyo Groundwater.
TCE = Trichloroethene.
USGS = U.S. Geological Survey.

Table XI-1 of the Order (NMED April 2004) specifies the minimum sampling frequency for the groundwater monitoring and sampling schedule for TAG as: "Six events – after the TAG HPT Characterization Plans approved by the Department and starting no later than first quarter of Calendar Year 2004 . . . ." The six quarterly sampling events required by the work plan were completed at the end of Fiscal Year 2005. Having fulfilled these requirements, DOE and Sandia have continued groundwater monitoring on a voluntary basis, and TAG wells have been sampled quarterly, semiannually, or annually. All sampling continues to follow the procedures outlined in the NMED-approved work plan (SNL June 2003).

6.1.4 Current Monitoring Network

Currently, 21 wells in the TAG study area are monitored for water quality, and 30 wells are monitored for water levels (Figure 6-2; Table 6-2). Two groundwater systems are present in the TAG study area: the PGWS at approximately 220 to 330 ft bgs, and the regional aquifer groundwater system at approximately 440 to 570 ft bgs. Groundwater monitoring wells are completed within either the PGWS or regional aquifer (Table 6-2).

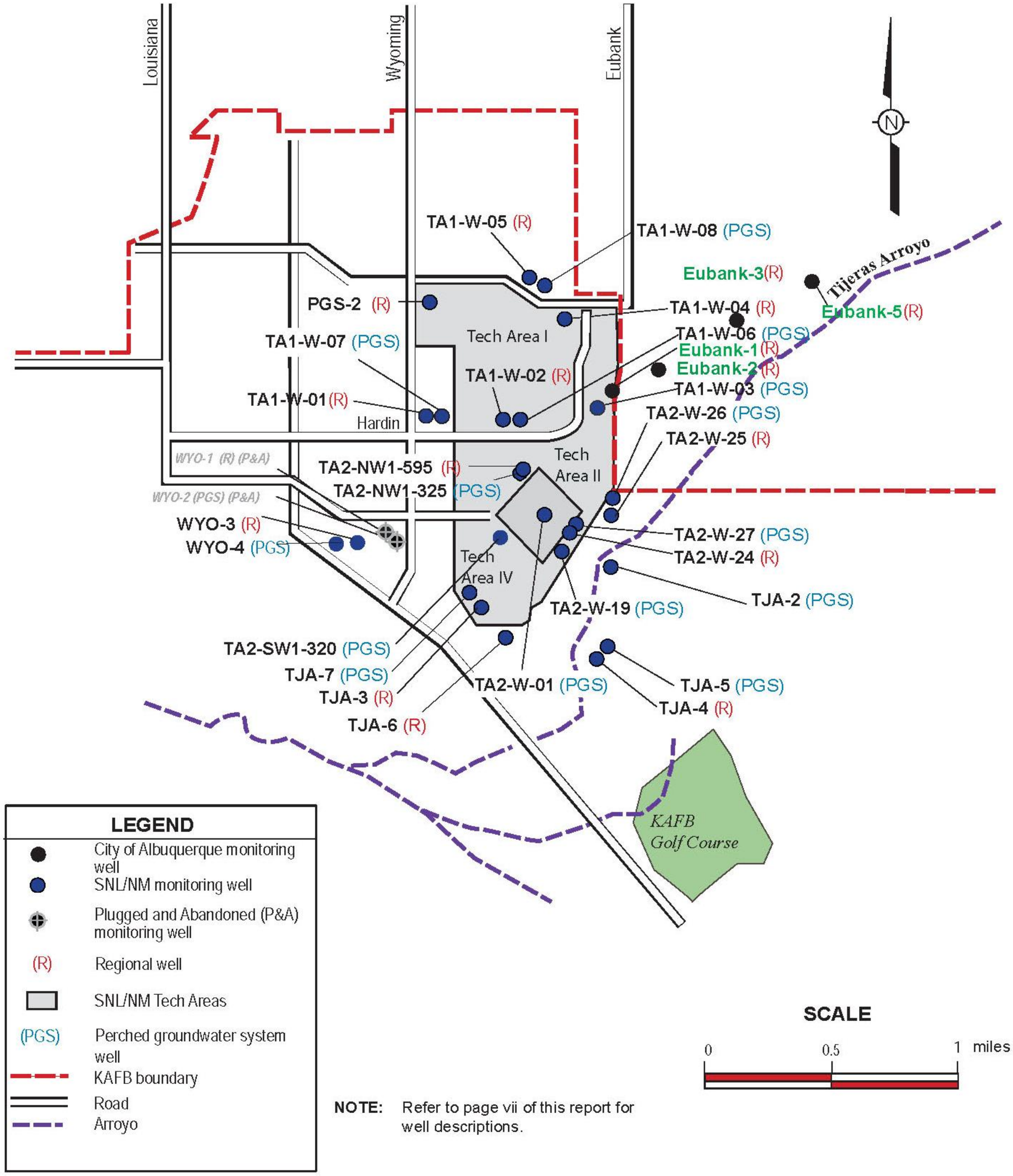


Figure 6-2. Tijeras Arroyo Groundwater (TAG) Investigation Monitoring Well Locations

Table 6-2. Groundwater Monitoring Wells in the TAG Study Area

Well	Installation Year	WQ	WL	Comments
Eubank-1	1988		✓	Regional aquifer (COA well)
Eubank-2	1997		✓	Regional aquifer (COA well)[a]
Eubank-3	1997		✓	Regional aquifer (COA well)[a]
Eubank-5	1997		✓	Regional aquifer (COA well)[a]
PGS-2	1995	✓	✓	Regional aquifer
TA1-W-01	1997	✓	✓	Regional aquifer
TA1-W-02	1998	✓	✓	Regional aquifer
TA1-W-03	1998	✓	✓	PGWS
TA1-W-04	1998	✓	✓	Regional aquifer
TA1-W-05	1998	✓	✓	Regional aquifer
TA1-W-06	1998	✓	✓	PGWS
TA1-W-07	1998		✓	PGWS
TA1-W-08	2001	✓	✓	PGWS
TA2-NW1-595	1993	✓	✓	Regional aquifer
TA2-NW1-325	1993		✓	PGWS
TA2-SW1-320	1992	✓	✓	PGWS
TA2-W-01	1994	✓	✓	PGWS
TA2-W-19	1995	✓	✓	PGWS
TA2-W-24	1998		✓	PGWS
TA2-W-25	1997		✓	Regional aquifer
TA2-W-26	1998	✓	✓	PGWS
TA2-W-27	1998	✓	✓	PGWS
TJA-2	1994	✓	✓	PGWS
TJA-3	1998	✓	✓	Regional aquifer
TJA-4	1998	✓	✓	Regional aquifer
TJA-5	1998		✓	PGWS
TJA-6	2001	✓	✓	Regional aquifer
TJA-7	2001	✓	✓	PGWS
WYO-3	2001	✓	✓	Regional aquifer
WYO-4	2001	✓	✓	PGWS

NOTES: Check marks in the WQ and WL columns indicate WQ sampling and WL measurements were obtained during this reporting period.

[a]WL data for Eubank-2, Eubank-3, and Eubank- 5 provided by J. Daugherty, Environmental Service Division of the City of Albuquerque Environmental Health Department.

COA = City of Albuquerque.
PGWS = Perched Groundwater System.
TAG = Tijeras Arroyo Groundwater.
WL = Water level.
WQ = Water quality.

6.1.5 Summary of Calendar Year 2011 Activities

The following activities took place for the TAG investigation during Calendar Year (CY) 2011:

- Monthly, quarterly, or annual water level measurements were obtained from TAG wells.
- Quarterly groundwater sampling events were conducted at seven wells (TA2-SW1-320, TA2-W-19, TA2-W-26, TJA-2, TJA-4, TJA-7, and WYO-4) in February/March, May, August/September, and December 2011 (SNL January 2011, April 2011, July 2011, and November 2011).

- Semiannual groundwater sampling was conducted at four wells (TA2-W-01, TA2-W-27, TJA-3, and TJA-6) in February/March 2011 and August/September 2011 (SNL January 2011 and July 2011).

- Annual groundwater sampling was conducted at 10 wells (PGS-2, TA1-W-01, TA1-W-02, TA1-W-03, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-08, TA2-NW1-595, and WYO-3) in August/September 2011 (SNL July 2011).

- Tables of analytical results (Attachment 6A), concentration versus time graphs (Attachment 6B), and hydrographs (Attachment 6C) were prepared in support of this report.

6.1.6 Summary of Future Activities

The following activities are anticipated for the TAG Investigation during the next reporting period (CY 2012):

- Monthly, quarterly, or annual water level measurements for TAG wells.

- Quarterly groundwater sampling at seven wells: TA2-SW1-320, TA2-W-19, TA2-W-26, TJA-2, TJA-4, TJA-7, and WYO-4.

- Semiannual groundwater sampling at four wells: TA2-W-01, TA2-W-27, TJA-3, and TJA-6.

- Annual groundwater sampling at 10 wells: PGS-2, TA1-W-01, TA1-W-02, TA1-W-03, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-08, TA2-NW1-595, and WYO-3.

6.1.7 Current Conceptual Model

Two groundwater systems are present in the TAG study area: the PGWS at approximately 220 to 330 ft bgs, and the regional aquifer groundwater system at approximately 440 to 570 ft bgs. The uppermost saturated interval of the PGWS is between 10 and 30 ft in thickness. Water in the PGWS moves toward the southeast and is assumed to merge with the underlying regional aquifer southeast of Tijeras Arroyo. Figure 6-3 presents a diagram of the TAG conceptual model.

Data pertaining to the hydrogeologic setting have been synthesized into the TAG conceptual model. The hydrogeologic setting for the TAG study area is well understood based on a significant number of monitoring wells. Groundwater occurs in both the PGWS and regional aquifer. However, the PGWS has a limited lateral extent that encompasses approximately 3.8 sq mi of north-central KAFB. The PGWS may extend northward across the KAFB boundary. In the TAG study area, the depth to groundwater for the PGWS ranges from 220 to 330 ft bgs. The uppermost saturated zone in the PGWS varies from approximately 10 to 30 ft in thickness, depending on the well location. Borehole geophysical surveys indicate that a few relatively damp intervals are present below the uppermost saturated zone, but borehole-yield testing has revealed that most of these deeper intervals are too thin to yield volumes of water sufficient for the construction of monitoring wells. The PGWS is not used as a water supply source.

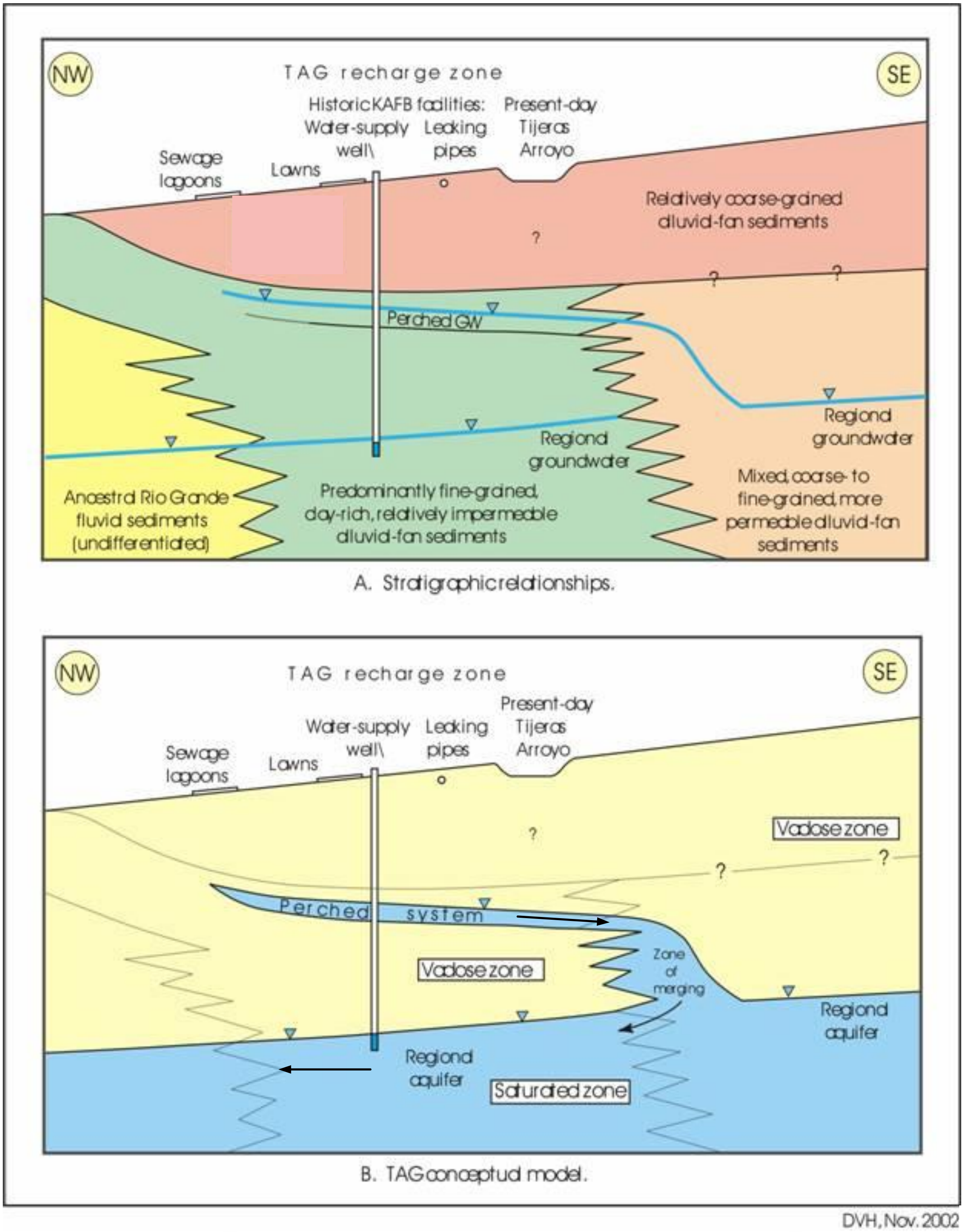


Figure 6-3. TAG Conceptual Model Illustration

The direction of groundwater flow in the PGWS is to the southeast. Groundwater flows through low-yield, alluvial-fan sediments with an average hydraulic gradient of approximately 0.008 feet per foot (ft/ft). Groundwater elevations in the PGWS are decreasing in the northwestern portion of the study area but are increasing in the southeastern area. The PGWS is recharged by both artificial (leaking water supply/sewer lines and the former sewage lagoons) and natural sources (Tijeras Arroyo and possibly ancestral Tijeras Creek). Principal hydrogeologic controls on the PGWS include: (1) eastward bedding-plane dip attributed to the western limb of an inferred syncline; (2) stratigraphic variations (such as braided paleochannels); and (3) multiple recharge locations in the northwestern portion of the TAG study area.

Multiple overlapping lenses of low conductivity, mostly unsaturated sediments, serve as a perching horizon beneath the PGWS. Beneath the central TAG study area, a layer of approximately 180 to 280 ft of these unsaturated sediments separates the PGWS from the regional aquifer. Groundwater in the PGWS merges with the regional aquifer southeast of Tijeras Arroyo where the alluvial-fan sediments are slightly more permeable.

The regional aquifer is more laterally extensive than the PGWS, underlying the entire TAG study area as well as the Albuquerque Basin. Across the TAG study area, the depth to the regional aquifer ranges from approximately 440 to 570 ft bgs. The regional aquifer is composed of both the Ancestral Rio Grande (ARG) fluvial lithofacies and alluvial-fan lithofacies. Locally, groundwater in the regional aquifer flows to the northwest, in a nearly opposite direction to that of the PGWS. The gradient in the regional aquifer averages approximately 0.009 ft/ft across the TAG study area, but is steeper near the KAFB, Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and Veterans Administration (VA) water-supply wells. The regional aquifer is recharged on the eastern side of the study area by natural sources including mountain-front flow, Tijeras Arroyo, and the PGWS. The mounding shown on the base-wide potentiometric surface map (Plate 1) approximately 1 mile east of TA-II indicates that underflow along Tijeras Arroyo is most likely recharging the regional aquifer to some degree. Groundwater elevations in the regional aquifer are generally decreasing in the northwestern portion of the study area but are increasing in the southeastern area. Seasonal pumping variations cause sporadic water-level fluctuations near the water-supply wells. The principal hydrogeologic control upon groundwater flow direction in the regional aquifer is the combined drawdown effect of the KAFB, ABCWUA, and VA water-supply wells.

The aqueous geochemical signatures of the PGWS and the regional aquifer are distinctive. The geochemical signatures of the PGWS vary between well locations but tend to exhibit higher concentrations of calcium, sulfate, and chloride than those for the regional aquifer. Groundwater in the regional aquifer exhibits higher bicarbonate/alkalinity concentrations.

6.1.7.1 Regional Hydrogeologic Conditions

Tijeras Arroyo is the most significant surface-water drainage feature on KAFB and trends southwest across KAFB and eventually drains into the Rio Grande, approximately 3 miles west of KAFB. Surface water flows in the arroyo several times per year as a result of significant thunderstorms. The average annual precipitation for the area, as measured at Albuquerque International Sunport, is 8.2 inches (SNL February 2001). During most rainfall events, rainfall quickly infiltrates into the soil in the study area. However, virtually all of the moisture subsequently undergoes evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

The TAG study area overlies the eastern margin of the Albuquerque Basin where the basin-bounding faults mostly trend parallel to the Sandia-Manzanita-Manzano mountain front. The stratigraphic unit of greatest interest is the Upper Santa Fe Group, which is primarily composed of two interfingering lithofacies: an alluvial-fan lithofacies and a fluvial lithofacies. Both lithofacies are less than 5 million years old and are composed of unconsolidated to poorly cemented gravel, sand, silt, and clay (Stone et al. February 2000). The alluvial-fan lithofacies consists of poorly sorted piedmont-slope deposits derived from the Sandia, Manzanita, and Manzano Mountains east of the study area. Fine-grained units within the alluvial-fan lithofacies produce low-permeability zones that are capable of perching groundwater. The fluvial lithofacies is derived from the ARG to the north and is typically well sorted and medium- to coarse-grained.

6.1.7.2 Hydrologic Conditions at the TAG Study Area

The thickness of the vadose zone is reduced in the central portion of the TAG study area where the PGWS is present. Discontinuous, yet overlapping multiple lenses of unsaturated alluvial-fan sediments serve as a perching horizon beneath the PGWS in that area. The PGWS is present at approximately 220 to 330 ft bgs, and the regional aquifer system is present at approximately 440 to 570 ft bgs. Groundwater in the PGWS most likely merges with the regional aquifer southeast of Tijeras Arroyo where the alluvial-fan sediments are slightly more permeable.

A comparison of aquifer characteristics for the PGWS and the regional aquifer in the TAG study area is provided in Table 6-3. The PGWS is presently understood to cover approximately 3.8 sq mi. Monitoring wells bound the PGWS on the western and southern margins. The northern margin of the PGWS has not been fully defined and may extend across the northern KAFB boundary (Figure 6-1). A southeastern margin is not discernible because the PGWS merges with the regional aquifer. The direction of groundwater flow in the PGWS is inferred to be principally to the southeast, with a variable horizontal gradient of approximately 0.008 ft/ft. The vertical gradient is approximately 0.95 ft/ft over most of the PGWS, and continuous vertical flow is suggested by the merging of the two groundwater systems to the southeast.

6.1.7.3 Local Direction of Flow

Figure 6-4 presents the October 2011 potentiometric surface for the PGWS. Groundwater elevations presented in this potentiometric surface map reflect revised survey coordinates. Until recently, ER Operations provided survey coordinates that were based on the New Mexico State Plane Coordinate System, Central Zone, North American Datum of 1927 and Northern Geographic Vertical Datum of 1929 for elevations. In order to be consistent with current SNL/NM Facilities and KAFB survey practices, ER Operations survey data now are based on New Mexico State Plane Coordinate System, Central Zone, North American Datum of 1983 (NAD83) and North American Vertical Datum of 1988 (NAVD88). Location information for wells surveyed before August 2010 has been mathematically converted to the new NAD83/NAVD88 coordinates using National Geodetic Survey-approved software.

The direction of groundwater flow in the PGWS is toward the southeast. The variable horizontal gradient of the PGWS is approximately 0.008 ft/ft. Historically, water levels in the PGWS have fluctuated across the study area (SNL November 2005). In the vicinity of the former sewage lagoons, water levels have been declining since 1987, apparently in response to the lagoons being removed from service. Conversely, water levels have increased southeast of Tijeras Arroyo (Attachment 6C, Figures 6C-1 through 6C-7).

Table 6-3. Comparison of the Perched Groundwater System and the Regional Aquifer in the Tijeras Arroyo Groundwater Study Area (SNL November 2005)

Characteristic	PGWS	Regional Aquifer
Pressure Head	Unconfined (water table) conditions	Unconfined to semiconfined conditions
Lithofacies Distribution	Restricted to the alluvial-fan lithofacies	Contained within both the alluvial-fan lithofacies and the ARG fluvial lithofacies
Flow Direction	Primarily to the southeast	Primarily to the northwest
Horizontal Gradient	Approximate average of 0.008 ft/ft	Approximate average of 0.009 ft/ft, but steeper near water-supply wells
Flow velocities	4 to 10 ft/yr	4 to 10 ft/yr
Usage	Not used for water supply purposes	Utilized for water supply by KAFB, ABCWUA, and VA
Lateral extent	Limited lateral extent across north-central KAFB	Laterally extensive across the Albuquerque Basin
Saturated Thickness	Uppermost saturated interval only about 10 to 30 ft in thickness	In excess of 1,000 ft in thickness across much of the study area
Geochemical Variability	Geochemical signatures variable between monitoring wells	Geochemical signatures consistent between monitoring wells
Geochemical	High chloride, nitrate, and sulfate concentrations	Low calcium concentrations but high bicarbonate/alkalinity concentrations
Water levels	Steadily declining water levels in the northwest, but increasing in the southeast part of the TAG study area	Steadily declining water levels in the northwest, but increasing in the southeast part of the TAG study area
Recharge	Recharged by both anthropogenic (leaking water supply/sewer lines, irrigated lawns, Tijeras Arroyo Golf Course), and natural sources such as Tijeras Arroyo	Recharged by natural sources including mountain front flow, the perched system, and Tijeras Arroyo
Principal Hydrologic Controls	Stratigraphic variations such as multiple overlapping lenses; several recharge locations; stratigraphic dip of the alluvial-fan sediments	Combined drawdown of KAFB, ABCWUA, and VA water-supply wells

NOTES:

ABCWUA = Albuquerque Bernalillo County Water Utility Authority.
ARG = Ancestral Rio Grande (lithofacies).
ft = Foot (feet).
ft/ft = Feet/foot.
ft/yr = Feet per year.
KAFB = Kirtland Air Force Base.
PGWS = Perched Groundwater System.
SNL = Sandia National Laboratories.
TAG = Tijeras Arroyo Groundwater.
VA = Veterans Administration.

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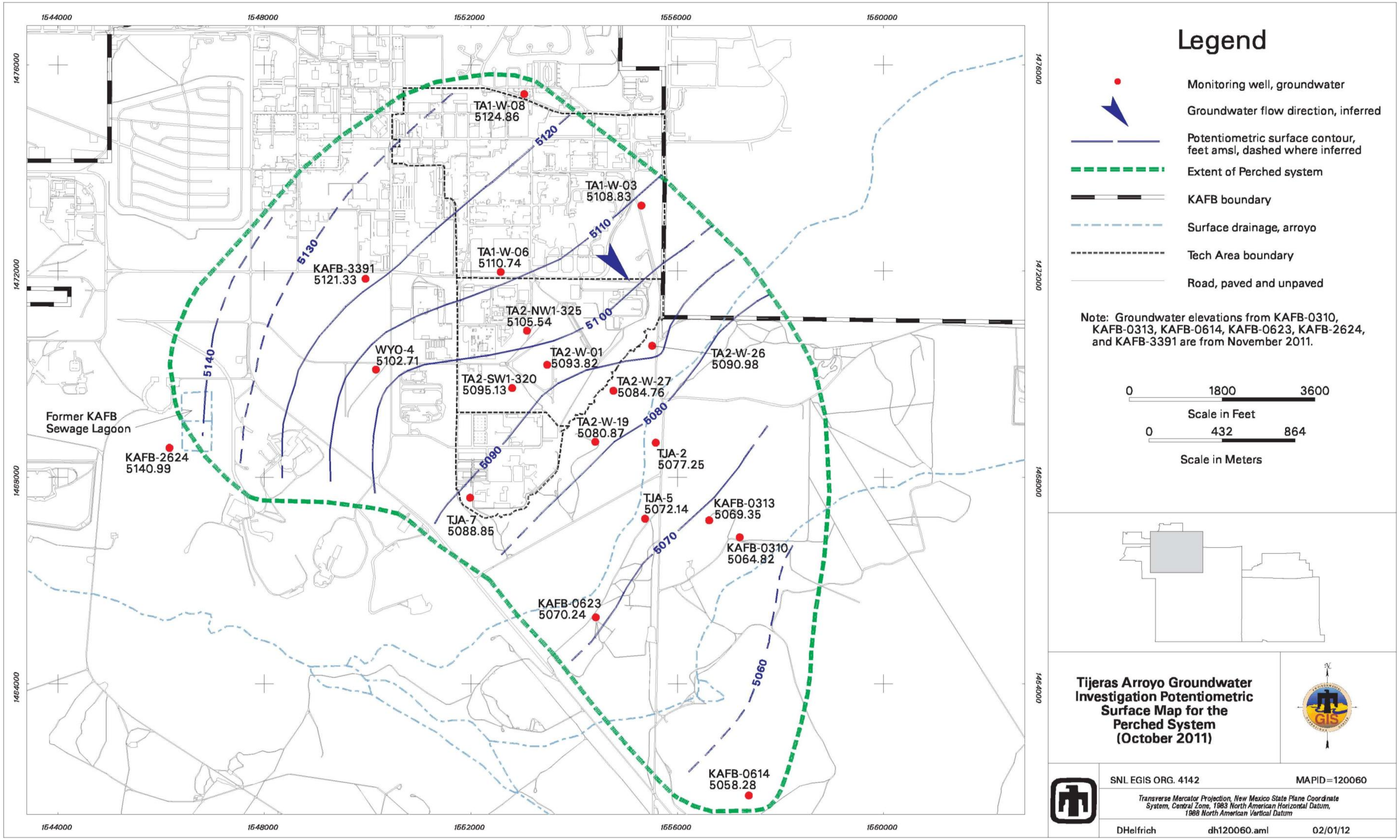

Figure 6-4. Tijeras Arroyo Groundwater Investigation Potentiometric Surface Map for the Perched Groundwater System (October 2011)

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Figure 6-5 presents the October 2011 potentiometric surface for the regional aquifer. The direction of groundwater flow in the regional aquifer is to the northwest toward the KAFB, ABCWUA, and VA water-supply wells. The horizontal gradient of the regional aquifer across the central portion of the study area is approximately 0.009 ft/ft. Vertical flow gradients within the TAG study area have not been measured but are inferred to be downward, consistent with TA-V groundwater studies.

Historically, water levels in the regional aquifer have fluctuated across the study area (SNL November 2005) (Attachment 6C, Figures 6C-8 through 6C-12). A line of demarcation between increasing and declining water levels is evident along the eastern extent of the ARG-fluvial lithofacies. Increases in groundwater elevations of up to 1.8 feet per year (ft/yr) in the southeast portion of the study area reflect recharge of the regional aquifer from the PGWS, Tijeras Arroyo, the golf course, and the mountain front. Until recently, declining water levels approaching 1.5 ft/yr were associated with long-term pumping of KAFB, ABCWUA, and VA water-supply wells. However, since late 2008, hydrographs for regional aquifer wells in the northern part of the TAG study area show an increasing trend in groundwater elevations. For example, hydrographs for wells TA1-W-01, TA1-W-02, TA1-W-04, and WYO-3 show recent increases in groundwater elevations. Presumably, this is in response to the ABCWUA transitioning to surface water withdrawals for potable water supplies and decreasing dependence on production wells immediately north of KAFB.

6.1.7.4 Contaminant Sources

DOE/Sandia, the KAFB Installation Restoration Program (IRP), and the COA have evaluated a variety of potentially contaminated sites. The TAG Investigation Report (SNL November 2005) presents a comprehensive summary of the environmental investigations that have been conducted by these three parties. As described in the report, two potential TCE and three potential nitrate sources are believed to be the responsibility of DOE/Sandia. A brief description of each potential release site is provided as follows.

SWMU 46 (Old Acid Waste Line Outfall)—TCE and Nitrate: An estimated 1.3 billion gallons of wastewater from six TA-I research/office buildings (839, 840, 841, 860, 863, and 892) discharged into the three outfall ditches at the south end of SWMU 226. Possible TCE and nitrate were present in the wastewater. Septic water from possible cross-connects between the SWMU 226 waste line and sewer lines may have discharged at SWMU 46. In 2000, two soil-vapor monitoring wells were installed at SWMU 46, and soil-vapor sampling was conducted quarterly. Well 46-VW-01 is located near the waste-line outfall, and sampling ports are set at 50-ft intervals from 15 to 265 ft bgs. The maximum TCE concentration to date is 46,000 parts per billion by volume (ppbv) from 115 ft bgs. Well 46-VW-02, located 900 ft farther southeast, has sampling ports set at 50-ft intervals from 46 to 296 ft bgs. The maximum TCE concentration to date at this well is 650 ppbv from 96 ft bgs.

SWMU 165 (Building 901 Septic System)—TCE and Nitrate: The septic system leach field is connected to a personnel shower/laundry facility (Building 901) and small research/machine shop (Building 902). Possible TCE and high explosive compounds were present in the wastewater. No significant contamination has been detected in soil samples. Groundwater samples from PGWS monitoring well TA2-SW1-320 have contained a maximum nitrate concentration of 44 mg/L.

SWMU 187 (TA-I Sanitary Sewer System)—Nitrate: The sanitary sewer system has sewer lines that possibly leaked in the past or had several cross-connects with wastewater lines. The system is connected to numerous research/office buildings in TA-I. No significant contamination has been detected in soil samples.

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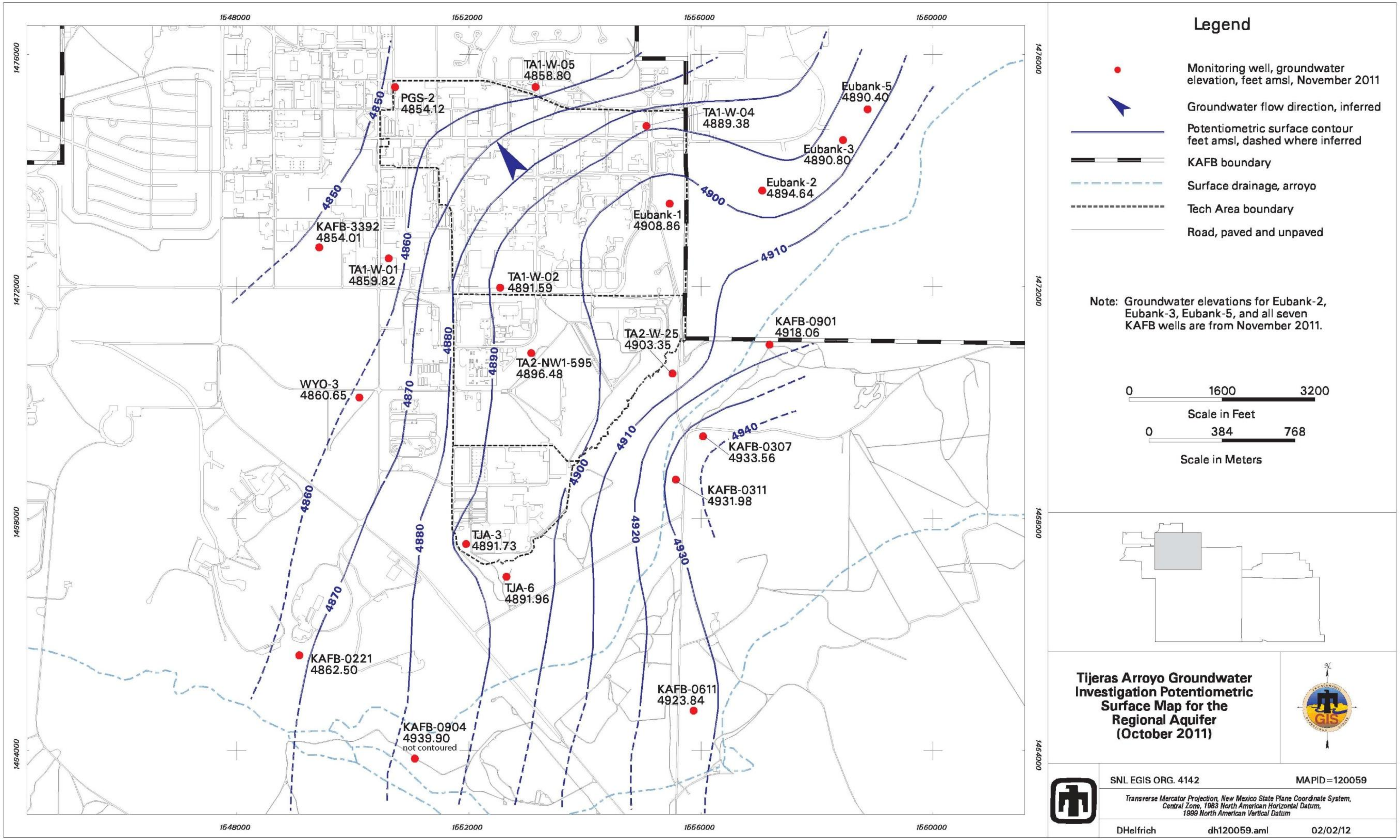

Figure 6-5. Tijeras Arroyo Groundwater Investigation Potentiometric Surface Map for the Regional Aquifer (October 2011)

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Soil-vapor and soil samples collected from the vadose zone (land surface to the water table) during drilling operations and from the vapor monitoring network have indicated evidence of vapor-phase contaminants. However, no free-phase TCE and no water-saturated core samples have been encountered in any of the soil samples collected from the boreholes. The original source of the TCE was the aqueous phase (i.e., wastewater), and the current vapor phase contaminants partitioned from the aqueous phase. All anthropogenic sources of recharge (i.e., wastewater) have been removed from service and no longer contribute water to the vadose zone.

Based on soil-vapor data (SNL November 2005), the mass of TCE that the vapor phase is contributing to the aquifer is minimal. In addition, the consistency of soil-vapor concentration measurements over time indicates that this TCE vapor plume is immobile. Therefore, the only potential mechanism for transporting these contaminants to the aquifer would be through partitioning back into the aqueous phase of additional recharge that might move through the system. Given that both current anthropogenic and natural recharge to the PGWS is minimal, it is extremely unlikely that significant transport of the vadose zone TCE into the aquifer will ever occur. Therefore, the vapor phase TCE in the vadose zone is not considered to be a continuing source of contamination to the groundwater that needs to be addressed under the source control criteria defined in the *RCRA [Resource Conservation and Recovery Act] Corrective Action Plan* (EPA May 1994).

Nitrate was present in sewage wastewater discharged to septic systems and sanitary sewer lines in the area. The nitrate was transported to the PGWS water table by high volumes of wastewater disposed of at the sites. Because nitrate is extremely soluble and cannot exist as a separate phase (i.e., vapor or nonaqueous phase liquid), and because no water-saturated core samples have been encountered in any of the soil samples collected from boreholes, a secondary source of anthropogenic nitrate contamination in the vadose zone does not exist.

6.1.7.5 Contaminant Distribution and Transport in Groundwater

Perched Groundwater System

The distribution of TCE is discontinuous across the PGWS and does not indicate a single release site. Based on the historic use of chlorinated solvents across SNL/NM and KAFB, the known extent of TCE in the PGWS is associated with multiple releases of aqueous-phase solvents and subsequent transport through the vadose zone.

The maximum historical concentration of TCE in the PGWS is 9.6 µg/L for well TA2-W-26; the results for samples from only three TAG study area wells (TA2-W-19, TA2-W-26, and WYO-4) have exceeded the MCL for TCE (5 µg/L).

The maximum historical concentration of nitrate in the PGWS within the TAG study area is 44 mg/L for well TA2-SW1-320. Concentrations of nitrate in the PGWS exceeding the MCL for nitrate (10 mg/L) are scattered across the TAG study area. Historically, two plumes have been identified in the PGWS, consisting of Plume 3 beneath SNL/NM TA-II and Plume 4 beneath the Tijeras Arroyo Golf Course (MWH Americas, Inc. July 2003). However, the subsequent installation and sampling of several monitoring wells failed to identify a boundary between Plumes 3 and 4. Therefore, the perched aquifer nitrate plume is now shown as one contiguous plume and is referred to as Plume 4 (CH2M HILL, Inc. June 2009).

Plume 4, which originates near monitoring well TA2-SW1-320, is located underneath the southwest portion of TA-II and extends southward to the Tijeras Arroyo Golf Course. The plume is 2 miles long and 0.8 miles wide (CH2M HILL, Inc. June 2009), and the upgradient portion is considered to emanate from SWMU 165, the Building 901 Septic System.

Regional Aquifer
The regional aquifer monitoring wells have generally yielded no samples with detectable TCE concentrations except for low-level detections in samples from TJA-3. No sample results for the SNL/NM TAG study area regional aquifer wells exceed the MCL of 5 µg/L for TCE.

In the regional aquifer, samples from nine SNL/NM TAG study area wells have exceeded the MCL for nitrate during at least one sampling event. The maximum historical concentration of nitrate for wells completed in the regional aquifer system is 49 mg/L for monitoring well TJA-4. The nitrate contamination in the regional aquifer southeast of TA-II forms what is referred to as Plume 2 (CH2M HILL, Inc. June 2009). Plume 2 is most likely responsible for the nitrate concentrations in samples from TJA-4, a well near where the PGWS and regional aquifer merge. Plume 2 is 3 miles long and 1.5 miles wide and the potential sources of nitrate contamination are not completely defined (CH2M HILL, Inc. June 2009).

Potential downgradient receptors for the TAG nitrate and TCE plumes are the ABCWUA and KAFB well fields to the north and northwest. Numerical simulations suggest that nitrate and TCE in the PGWS would migrate to the southeast, merge with the regional aquifer, and then travel back to the north and northwest. Additionally, downgradient nitrate and TCE concentrations are decreasing in groundwater to below levels of concern through dispersion and dilution as the plume moves into the more hydraulically conductive deposits at the ABCWUA and KAFB well fields.

6.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM ER Operations as well as implements and enforces federal regulations mandated by RCRA. All ER SWMUs and Areas of Concern (AOCs) are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993).

All corrective action requirements pertaining to the TAG study area are contained in the Order (NMED April 2004). The groundwater monitoring activities for the TAG investigation are not associated with a single SWMU but are more regional in nature. Groundwater characterization activities for TAG were originally conducted voluntarily as proposed in the Groundwater Investigation Plan (SNL March 1996b). More recently TAG activities have been conducted as required by the NMED-approved TAG Investigation Work Plan (SNL June 2003).

The Order, effective in April 2004, transferred regulatory authority for corrective action requirements from the HSWA module of the SNL/NM RCRA Permit to the Order. The TAG investigation must comply with requirements set forth in the Order for site characterization and the development of a CME. The Order also contains schedules that define dates for the delivery of plans and reports related to TAG. The NMED is the regulatory agency responsible for enforcing the requirements identified in the Order for the CME.

Although the Order requires that DOE/Sandia evaluate the nature and extent of contamination in the TAG study area, no specific reporting requirements are prescribed in the Order. However, the TAG Investigation Report (SNL November 2005) specifies that data would continue to be presented in annual reports such as this Annual Groundwater Monitoring Report. The outline of this report is based on the required elements of a "Periodic Monitoring Report" described in Section X.D. of the Order (NMED April 2004).

In this report TAG monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order. Additional information on radionuclides and the scope of the Order is available in Section III.A of the Order (NMED April 2004).

6.3 Scope of Activities

The CY 2011 activities for the TAG investigation, including plans and reports, are listed in Section 6.1.5. However, the only field activity completed in the study area was groundwater monitoring. The four groundwater sampling events are summarized in Table 6-4, and the analytical parameters for each well and each sampling event are listed in Table 6-5.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, equipment blank (EB), split, and trip blank (TB) samples. Field QC samples are used to monitor the sampling process. Duplicate environmental samples are used to measure the precision of the sampling process. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. Split samples are used to verify the performance of the analytical laboratory. TB samples are used to determine whether volatile organic compounds (VOCs) contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory.

6.4 Field Methods and Measurements

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

6.4.1 Groundwater Elevation

Throughout CY 2011, water level measurements were obtained to determine groundwater flow directions, hydraulic gradients, and changes in water table elevations. Water levels are periodically measured in TAG monitoring wells according to the instructions and requirements specified in SNL/NM Field Operating Procedure (FOP) 03-02, *Groundwater Level Data Acquisition and Management* (SNL November 2009a and February 2011). The water level information was used to create the potentiometric surface maps presented in Figures 6-4 and 6-5 and the hydrographs presented in Attachment 6C.

6.4.2 Well Purging and Water Quality Measurements

A portable Bennett™ groundwater sampling system was used to collect the groundwater samples from all TAG wells, except at monitoring wells PGS-2 and TA2-SW1-320. The minimum purge requirements for a portable piston pump is one saturated screen volume and two tubing volumes for a dedicated low-flow sampling system. Field water quality measurements for turbidity, pH, temperature, specific conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO) were recorded for the well prior to collecting groundwater samples, according to SNL/NM FOP 05-01 (SNL November 2009b). Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

Table 6-4. Groundwater Monitoring Well Network and Sampling Dates for the TAG Study Area, Calendar Year 2011

Date of Sampling Event	Wells Sampled		SAP
February/March 2011	TA2-SW1-320 TA2-W-01 TA2-W-19 TA2-W-26 TA2-W-27 TJA-2	TJA-3 TJA-4 TJA-6 TJA-7 WYO-4	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY11, 2nd Quarter Sampling, February/March 2011* (SNL January 2011)
May 2011	TA2-SW1-320 TA2-W-19 TA2-W-26 TJA-2	TJA-4 TJA-7 WYO-4	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY11, 3rd Quarter Sampling, May 2011* (SNL April 2011)
August/September 2011	PGS-2 TA1-W-01 TA1-W-02 TA1-W-03 TA1-W-04 TA1-W-05 TA1-W-06 TA1-W-08 TA2-NW1-595 TA2-SW1-320 TA2-W-01	TA2-W-19 TA2-W-26 TA2-W-27 TJA-2 TJA-3 TJA-4 TJA-6 TJA-7 WYO-3 WYO-4	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY11, 4th Quarter Sampling, August/September 2011* (SNL July 2011)
December 2011	TA2-SW1-320 TA2-W-19 TA2-W-26 TJA-2	TJA-4 TJA-7 WYO-4	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY12, 1st Quarter Sampling, December 2011* (SNL November 2011)

NOTES:
FY = Fiscal Year.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
TAG = Tijeras Arroyo Groundwater.

Table 6-5. Parameters Sampled at TAG Wells for Each Sampling Event, Calendar Year 2011

Parameter	February/March 2011		
NPN VOCs	TA2-SW1-320 (QED™) TA2-W-01 TA2-W-01 (dup) TA2-W-19 TA2-W-26	TA2-W-27 TJA-2 TJA-2 (dup) TJA-3 TJA-4	TJA-6 TJA-7 WYO-4
Parameter	**May 2011**		
NPN VOCs	TA2-SW1-320 (QED™) TA2-W-19 TA2-W-19 (dup) TA2-W-26	TJA-2 TJA-4 TJA-7 WYO-4	
Parameter	**August/September 2011**		
Alkalinity Anions Gamma Spec* Gross alpha/beta activity NPN TAL Metals, plus Total Uranium Tritium VOCs	PGS-2 (QED™) TA1-W-01 TA1-W-02 TA1-W-03 TA1-W-04 TA1-W-05 TA1-W-05 (dup) TA1-W-06	TA1-W-08 TA2-NW1-595 TA2-SW1-320 (QED™) TA2-W-01 TA2-W-19 TA2-W-26 TA2-W-26 (dup) TA2-W-27	TJA-2 TJA-3 TJA-4 TJA-6 TJA-6 (dup) TJA-7 WYO-3 WYO-4
Parameter	**December 2011**		
NPN VOCs	TA2-SW1-320 (QED™) TA2-W-19 TA2-W-26 TJA-2	TJA-4 TJA-4 (dup) TJA-7 WYO-4	

NOTES:

dup = Duplicate sample.
Gamma Spec* = Gamma spectroscopy short list (Americium-241, Cesium-137, Cobalt-60, and Potassium-40).
NPN = Nitrate plus nitrite (reported as nitrogen).
QED™ = QED Environmental Systems, Inc. (MicroPurge® low-flow sampling method).
TAG = Tijeras Arroyo Groundwater.
TAL = Target Analyte List.
VOC = Volatile organic compound.

The amount of water required to achieve stability of field parameters is fairly consistent. However, the ability of the aquifer to produce water varies greatly from well to well. In accordance with the Mini-Sampling and Analysis Plans (SAPs) (Table 6-4), purging continued until four stable measurements for temperature, SC, pH, and turbidity were obtained. Groundwater stability is considered acceptable when measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, 0.1 pH units, 1.0 degree Celsius, and SC is within 5 percent. Associated Field Measurement Logs documenting details of well purging and water quality measurements for each sampling event have been submitted to the SNL/NM Records Center.

6.4.3 Pump Decontamination

A portable Bennett™ groundwater sampling system was used to collect groundwater samples from all wells except PGS-2 and TA2-SW1-320. The sampling pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination*, SNL/NM FOP 05-03 (SNL November 2009c). An EB or rinsate sample was collected to verify the equipment decontamination process. Wells PGS-2 and TA2-SW1-320 are equipped with dedicated nitrogen gas-powered bladder pumps (QED Environmental Systems, Inc. MicroPurge® low-flow sampling method [QED™]); therefore pump decontamination is not required.

6.4.4 Sample Collection Sampling Procedures

Groundwater samples are collected using a nitrogen gas-powered portable piston pump (Bennett™) and/or a QED™ MicroPurge® system in accordance with SNL/NM FOP 05-01 (SNL November 2009b). Sample bottles are filled directly from the pump discharge line and water sampling manifold, with the VOC samples collected at the lowest achievable discharge rate.

6.4.5 Sample Handling and Shipment

The SNL/NM Sample Management Office (SMO) processes environmental samples collected by LTS/ER Operations personnel. The SMO staff reviews the Mini-SAPs, orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced into laboratory processes and procedures. These include method blanks, laboratory control samples, matrix spike, matrix spike duplicates, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review, SMO-05-03, Issue 04* (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data*, (SNL July 2007 and May 2011).

6.4.6 Waste Management

Purge and decontamination water generated from sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04 (SNL November 2009d) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Results for associated environmental samples provide supplemental data for approval to discharge water to the sanitary sewer. All data were compared with ABCWUA discharge limits.

6.5 Analytical Methods

All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols. Groundwater samples were submitted to GEL Laboratories, LLC for analysis. Samples were analyzed in accordance with applicable EPA methods (Tables-6-6 and 6-7).

6.6 Summary of Analytical Results

This section discusses monitoring results, exceedances of standards, and pertinent trends in concentrations for COCs in the TAG study area that exceed standards. The analytical results and field measurements for all TAG sampling events are presented in Attachment 6A, Tables 6A-1 through 6A-7; concentration trend plots for COCs that exceed the MCLs are presented in Attachment 6B, Figures 6B-1 through 6B-6. A summary of detected VOC results is presented in Table 6A-1. The method detection limits (MDLs) for all analyzed VOCs are listed in Table 6A-2.

The VOCs detected at low concentrations in groundwater samples from TAG study area monitoring wells include the following:

- 1,1-Dichloroethane
- 1,1-Dichloroethene
- Chloroform
- cis-1,2-Dichloroethene
- Tetrachloroethene
- TCE

Table 6-6. TAG Study Area Chemical Analytical Methods

Analyte	Analytical Method[a,b,c]
Anions	SW846-9056
Alkalinity	SM2320B
NPN	EPA 353.2
TAL Metals, plus Total Uranium	SW846-6020/7470
VOCs	SW846-8260

NOTES: [a]EPA, 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1 (and all updates), U.S. Environmental Protection Agency, Washington, D.C.
[b]EPA, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.
[c]EPA; or Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B.
EPA = U.S. Environmental Protection Agency.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard Method.
SW = Solid Waste.
TAG = Tijeras Arroyo Groundwater.
TAL = Target Analyte List.
VOC = Volatile organic compound.

Table 6-7. TAG Study Area Radiochemical Analytical Methods

Analyte	Analytical Method[a]
Gamma Spectroscopy (short list)	EPA 901.0
Gross Alpha/Beta Activity	EPA 900.0
Tritium	EPA 906.0

NOTES: [a]EPA, 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
EPA = U.S. Environmental Protection Agency.
TAG = Tijeras Arroyo Groundwater.

Six VOCs were detected during CY 2011. Four of these VOCs have promulgated MCLs. Only TCE exceeds its MCL of 5 µg/L (Table 6A-1). TCE was detected above the MCL in the sample from one PGWS well, WYO-4. The maximum concentration of TCE reported for WYO-4 during this reporting period is 8.17 µg/L in the sample collected during the May 2011 sampling event. Figure 6B-1 (Attachment 6B) shows that the TCE concentrations in samples from WYO-4 slightly exceed the MCL, and the trend is level to slightly increasing over time.

The analytical results for nitrate plus nitrite (NPN) (reported as nitrogen) are presented in Table 6A-3 (Attachment 6A). The NPN results exceed the MCL of 10 mg/L in samples from TA2-SW1-320, TA2-W-19, TJA-2, TJA-4, and TJA-7. The maximum concentration of NPN detected during this reporting period is 31.1 mg/L in the sample from TJA-4 (duplicate) collected during the December 2011 sampling event. Figures 6B-2 through 6B-6 (Attachment 6B) show that the NPN concentrations in wells TA2-SW1-320, TJA-4, and TJA-7 have generally exceeded the MCL for the life of the wells, and trends are slightly increasing to slightly decreasing over time. In contrast, NPN concentrations in TA2-W-19 and TJA-2 only occasionally exceed the MCL, and trends are slightly increasing over time.

Analytical results for anions and alkalinity are presented in Table 6A-4; no anion concentrations exceed established MCLs. Total metal analytical results are presented in Table 6A-5; no metal results exceed established MCLs. Groundwater samples were analyzed for tritium, gross alpha/beta activity, and radionuclides by gamma spectroscopy. The results are presented in Table 6A-6. All radionuclide activities are below MCLs, where established.

Field water quality parameters are measured during purging of each well prior to sampling and include temperature, SC, ORP, pH, turbidity, and DO. The parameter measurements obtained immediately before collecting the samples are presented in Table 6A-7.

6.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011). Although some analytical results were qualified during the data validation process, no significant data quality problems were noted for TAG study area COCs. Data validation qualifiers are provided with the analytical results in Tables 6A-1 through 6A-6 (Attachment 6A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center. The following sections discuss the results for each QC sample and the impact on data quality for the TAG quarterly sampling events.

6.7.1 Field Quality Control Samples

Field QC samples included duplicate environmental, EB, and TB samples. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAPs (SNL January 2011, April 2011, July 2011, and November 2011).

6.7.1.1 Duplicate Environmental Samples

Duplicate environmental samples were analyzed to estimate the overall reproducibility of the sampling and analytical process. A duplicate environmental sample is collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The results for duplicate environmental sample analyses (detected parameters only) are used to calculate relative percent difference (RPD) values. Duplicate sample results for all wells and all sampling periods show good correlation (RPD values less than 20 for organic compounds and less than 35 for inorganic analyses) for all calculated parameters, except for three analytes. During the August/September 2011 sampling event, the RPD for copper was 37 in TA2-W-26 samples, the RPD for alkalinity was 93 in TJA-6 samples, and the RPD for aluminum was 47 in TJA-6 samples.

6.7.1.2 Equipment Blank Samples

A portable Bennett™ groundwater sampling system was used to collect groundwater samples from all wells except PGS-2 and TA2-SW1-320, which are fitted with a dedicated QED™ MicroPurge® system. The portable Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in SNL/NM FOP 05-03 (SNL November 2009c). An EB or rinsate sample was collected to verify the effectiveness of the equipment decontamination process. The results for the EB analyses are as follows:

- **February/March 2011 Sampling Event—**The EB sample was collected prior to sampling wells TA2-W-01 and TJA-2 and submitted for analysis of VOCs and NPN. Bromodichloromethane, chloroform, and dibromochloromethane were detected in the EB samples. No corrective action was required, as these compounds were not detected in the associated environmental samples.

- **May 2011 Sampling Event—**An EB sample was collected prior to sampling well TA2-W-19 and submitted for analysis of VOCs and NPN. Bromodichloromethane and chloroform were detected in the EB sample. No corrective action was required, as these compounds were not detected in the associated environmental samples.

- **August/September 2011 Sampling Event—**EB samples were collected prior to sampling wells TA1-W-05, TA2-W-26, and TJA-6 and submitted for all analyses. Bromodichloromethane, bromoform, chloroform, dibromochloromethane, alkalinity, chloride, copper, and sodium were detected in EB samples. Chloroform was qualified as not detected during data validation in TA2-W-26 samples as this compound was reported at concentrations less than five times the associated EB result. The results for copper were qualified as not detected during data validation in TA1-W-05 and TJA-6 environmental and duplicate samples as copper was reported at concentrations less than five times the associated EB result. No corrective action was required for bromodichloromethane, bromoform, chloroform, dibromochloromethane, alkalinity, chloride, or sodium. These parameters were either not detected in environmental samples or detected at concentrations greater than five times the blank result.

- **December 2011 Sampling Event—**One EB sample was collected prior to sampling monitoring well TJA-4 and submitted for analysis of VOCs and NPN. Bromodichloromethane, chloroform, and dibromochloromethane were detected in the EB sample. No corrective action was required, as these compounds were not detected in the associated environmental samples.

6.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analysis to assess whether contamination of the samples has occurred during shipment and storage. The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-milliliter volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. TB samples were brought to the field and accompanied each sample shipment. No VOCs were detected above laboratory MDLs in any CY 2011 TB sample.

6.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate laboratory control samples were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011). Laboratory data qualifiers are provided with the analytical results in Tables 6A-1 through 6A-6 (Attachment 6A).

6.8 Variances and Nonconformances

No variances or nonconformances from field or sampling requirements specified in the TAG Investigation Mini-SAPs (SNL January 2011, April 2011, July 2011, and November 2011) were noted during sampling activities. However, project-specific issues associated with these sampling events are noted as follows:

- **All sampling events—**(1) WYO-4 was purged dry prior to sampling. This well was allowed to recover to a minimum of 80 percent of the original water level and then samples were collected. (2) A QED™ sampling system was used to collect a groundwater sample from PGS-2 and TA2-SW1-320. Conventional sampling equipment cannot be lowered to the proper sampling depth due to well construction issues.

- **February/March 2011 Sampling Event—** Additional VOC samples were collected at the Environmental Field Office to access both ambient field conditions inside and outside areas where the groundwater truck and sampling equipment are stored and the deionized water source. A total of eight samples, including duplicate samples, were collected from four separate deionized water bottle containers at four different Environmental Field Office locations. The compounds bromodichloromethane, bromoform, chloroform, and dibromochloromethane were detected in the samples. These results are consistent with the results for historical and February and March 2011 field blank samples.

6.9 Summary and Conclusions

This section provides a brief summary of activities, discussion of COCs that exceed standards, trends of concentrations versus time, the current conceptual model, and plans for studies to be completed during CY 2012 at the TAG study area.

The TAG study area encompasses an area of approximately 40 sq mi in the north-central portion of KAFB. Groundwater investigations were initiated in 1992, and the current monitoring network consists of 21 monitoring wells for water quality analysis and 30 wells for water level measurements. For this reporting period, wells were sampled in February/March, May, August/September, and December 2011. The samples were analyzed for VOCs, NPN, anions, alkalinity, Target Analyte List metals (plus uranium), gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. Depending on their locations and historical concentrations of COCs, wells were sampled quarterly, semiannually, or annually during this reporting period.

Only NPN and TCE were detected above MCLs in samples from TAG study area wells. NPN concentrations exceed the MCL of 10 mg/L in samples from TA2-SW1-320, TA2-W-19, TJA-2, TJA-4, and TJA-7, with a maximum concentration of 31.1 mg/L in the sample from TJA-4 (duplicate) collected during the December 2011 sampling event.

TCE exceeds the MCL of 5 µg/L in samples from well WYO-4, completed in the PGWS. The maximum concentration of TCE detected for WYO-4 during this reporting period is 8.17 µg/L in the sample collected during the May 2011 sampling event. TCE concentrations in WYO-4 have slightly exceeded the MCL for the life of the well, and the trend is level to slightly increasing over time.

The analytical results for this reporting period are consistent with historical concentrations. The following conclusions are based on a comprehensive review of available information for current groundwater contamination conditions in the TAG study area:

- The distribution of TCE in the PGWS is sporadic across the study area and reflects multiple release sites and the effect of subsurface heterogeneity.

- Based on the historical use and disposal of chlorinated solvents, the extent of TCE in groundwater is probably associated with multiple aqueous releases of solvents and subsequent vapor-phase transport through the vadose zone.

- The distribution of nitrate above the background level is laterally widespread in the PGWS.

- In the regional aquifer, concentrations of nitrate above the MCL occur in the western and southeastern portions of the TAG study area.

- The potential sources of TCE and/or nitrate in the TAG study area include sewage lagoons, wastewater outfalls, septic systems, landfills, sewer lines, and the golf course.

- The current conceptual model described in Section 6.1.7 does not require modification based on the analytical results for this reporting period.

Ongoing environmental studies of the TAG study area include the following:

- Continue collection of groundwater samples at the 21 TAG groundwater monitoring wells on a quarterly, semiannual, or annual basis. At a minimum, the analytes for groundwater sampling will consist of VOCs and nitrate.

- Continue periodic measurements of groundwater elevations in all TAG monitoring wells.

- Maintain contact with the KAFB IRP personnel with respect to the results of TCE and nitrate abatement studies.

- As available, obtain groundwater results from both KAFB and the COA.

- Continue to integrate SNL/NM, KAFB, and COA data into the CME process currently underway for the SNL/NM Area of Responsibility.

- Continue to report future TAG investigation results in the SNL/NM Annual Groundwater Monitoring Report.

- Upon NMED approval of the TAG CME Report (SNL August 2005), prepare a Corrective Measures Implementation Plan.

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Attachment 6A
Tijeras Arroyo Groundwater
Analytical Results Tables

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Attachment 6A Tables

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Table 6A-1
Summary of Detected Volatile Organic Compounds (Method[g] SW846-8260), Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.
TA2-W-01	Tetrachloroethene	0.460	0.300	1.00	5.00	J		090026-001
22-Feb-11	Trichloroethene	1.26	0.250	1.00	5.00			090026-001
TA2-W-01 (Duplicate)	Tetrachloroethene	0.390	0.300	1.00	5.00	J		090027-001
22-Feb-11	Trichloroethene	1.24	0.250	1.00	5.00			090027-001
TA2-W-19	Trichloroethene	3.45	0.250	1.00	5.00			090031-001
24-Feb-11	cis-1,2-Dichloroethene	0.590	0.300	1.00	70.0	J		090031-001
TA2-W-26	Chloroform	0.300	0.250	1.00	NE	J	1.0U	090029-001
23-Feb-11	Tetrachloroethene	0.870	0.300	1.00	5.00	J		090029-001
	Trichloroethene	0.900	0.250	1.00	5.00	J		090029-001
TA2-W-27	Tetrachloroethene	0.940	0.300	1.00	5.00	J		090017-001
17-Feb-11	Trichloroethene	0.870	0.250	1.00	5.00	J		090017-001
TJA-2	1,1-Dichloroethane	0.460	0.300	1.00	NE	J		090037-001
28-Feb-11	Trichloroethene	3.81	0.250	1.00	5.00			090037-001
	cis-1,2-Dichloroethene	0.580	0.300	1.00	70.0	J		090037-001
TJA-2 (Duplicate)	1,1-Dichloroethane	0.480	0.300	1.00	NE	J		090038-001
28-Feb-11	Trichloroethene	3.50	0.250	1.00	5.00			090038-001
	cis-1,2-Dichloroethene	0.530	0.300	1.00	70.0	J		090038-001
TJA-7 03-Mar-11	Trichloroethene	0.480	0.250	1.00	5.00	J		090042-001
WYO-4	1,1-Dichloroethane	0.830	0.300	1.00	NE	J		090040-001
02-Mar-11	Trichloroethene	**7.50**	0.250	1.00	5.00			090040-001
	cis-1,2-Dichloroethene	1.93	0.300	1.00	70.0			090040-001
TA2-W-19	1,1-Dichloroethane	0.430	0.300	1.00	NE	J		090627-001
17-May-11	Trichloroethene	3.22	0.250	1.00	5.00			090627-001
	cis-1,2-Dichloroethene	0.490	0.300	1.00	70.0	J		090627-001
TA2-W-19 (Duplicate)	1,1-Dichloroethane	0.440	0.300	1.00	NE	J		090628-001
17-May-11	Trichloroethene	3.23	0.250	1.00	5.00			090628-001
	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		090628-001
TA2-W-26	Chloroform	0.260	0.250	1.00	NE	J		090623-001
16-May-11	Tetrachloroethene	1.00	0.300	1.00	5.00			090623-001
	Trichloroethene	1.01	0.250	1.00	5.00			090623-001
TJA-2	1,1-Dichloroethane	0.390	0.300	1.00	NE	J		090633-001
19-May-11	Trichloroethene	3.02	0.250	1.00	5.00			090633-001
	cis-1,2-Dichloroethene	0.410	0.300	1.00	70.0	J		090633-001

Refer to footnotes on page 6A-47.

Table 6A-1 *(Continued)*
Summary of Detected Volatile Organic Compounds (Method[g] SW846-8260), Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.
TJA-7 24-May-11	Trichloroethene	0.400	0.250	1.00	5.00	J		090638-001
WYO-4 23-May-11	1,1-Dichloroethane	0.920	0.300	1.00	NE	J		090636-001
	Trichloroethene	**8.17**	0.250	1.00	5.00			090636-001
	cis-1,2-Dichloroethene	1.93	0.300	1.00	70.0			090636-001
TA1-W-03 29-Aug-11	Chloroform	0.380	0.250	1.00	NE	J		091101-001
TA1-W-06 06-Sep-11	1,1-Dichloroethene	0.840	0.300	1.00	7.00	J		091110-001
	Chloroform	0.260	0.250	1.00	NE	J		091110-001
TA2-W-01 20-Sep-11	Tetrachloroethene	0.350	0.300	1.00	5.00	J		091129-001
	Trichloroethene	1.41	0.250	1.00	5.00			091129-001
TA2-W-19 21-Sep-11	1,1-Dichloroethane	0.44	0.300	1.00	NE	J		091131-001
	Trichloroethene	2.92	0.250	1.00	5.00			091131-001
	cis-1,2-Dichloroethene	0.450	0.300	1.00	70.0	J	J+	091131-001
TA2-W-26 22-Sep-11	Chloroform	0.340	0.250	1.00	NE	J	1.0U	091135-001
	Tetrachloroethene	0.860	0.300	1.00	5.00	J		091135-001
	Trichloroethene	0.940	0.250	1.00	5.00	J		091135-001
TA2-W-26 (Duplicate) 22-Sep-11	Chloroform	0.290	0.250	1.00	NE	J	1.0U	091136-001
	Tetrachloroethene	0.860	0.300	1.00	5.00	J		091136-001
	Trichloroethene	1.02	0.250	1.00	5.00			091136-001
TA2-W-27 14-Sep-11	Tetrachloroethene	0.850	0.300	1.00	5.00	J		091122-001
	Trichloroethene	0.730	0.250	1.00	5.00	J		091122-001
TJA-2 26-Sep-11	1,1-Dichloroethane	0.440	0.300	1.00	NE	J		091138-001
	Trichloroethene	3.32	0.250	1.00	5.00			091138-001
	cis-1,2-Dichloroethene	0.460	0.300	1.00	70.0	J		091138-001
TJA-3 08-Sep-11	Trichloroethene	0.330	0.250	1.00	5.00	J		091114-001
TJA-7 28-Sep-11	Trichloroethene	0.640	0.250	1.00	5.00	J		091144-001

Refer to footnotes on page 6A-47.

Table 6A-1 *(Concluded)*
Summary of Detected Volatile Organic Compounds (Method[g] SW846-8260), Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.
WYO-4	1,1-Dichloroethane	1.00	0.300	1.00	NE			091142-001
19-Sep-11	Trichloroethene	**6.87**	0.250	1.00	5.00			091142-001
	cis-1,2-Dichloroethene	1.84	0.300	1.00	70.0		J+	091142-001
TA2-W-19	1,1-Dichloroethane	0.460	0.300	1.00	NE	J		091541-001
13-Dec-11	Trichloroethene	3.33	0.250	1.00	5.00			091541-001
	cis-1,2-Dichloroethene	0.470	0.300	1.00	70.0	J		091541-001
TA2-W-26	Chloroform	0.330	0.250	1.00	NE	J		091530-001
07-Dec-11	Tetrachloroethene	0.790	0.300	1.00	5.00	J		091530-001
	Trichloroethene	1.26	0.250	1.00	5.00			091530-001
TJA-2	1,1-Dichloroethane	0.500	0.300	1.00	NE	J		091544-001
15-Dec-11	Trichloroethene	3.88	0.250	1.00	5.00			091544-001
	cis-1,2-Dichloroethene	0.510	0.300	1.00	70.0	J		091544-001
TJA-7 20-Dec-11	Trichloroethene	0.740	0.250	1.00	5.00	J		091546-001
WYO-4	1,1-Dichloroethane	0.870	0.300	1.00	NE	J		091534-001
19-Dec-11	Trichloroethene	**7.51**	0.250	1.00	5.00			091534-001
	cis-1,2-Dichloroethene	1.97	0.300	1.00	70.0			091534-001

Refer to footnotes on page 6A-47.

Table 6A-2
Method Detection Limits for Volatile Organic Compounds (Method[g] SW846-8260), Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.325
1,1,2,2-Tetrachloroethane	0.250
1,1,2-Trichloroethane	0.250
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.250
1,2-Dichloropropane	0.250
2-Butanone	1.25
2-Hexanone	1.25
4-methyl-, 2-Pentanone	1.25
Acetone	3.50
Benzene	0.300
Bromodichloromethane	0.250
Bromoform	0.250
Bromomethane	0.300
Carbon disulfide	1.25
Carbon tetrachloride	0.300
Chlorobenzene	0.250
Chloroethane	0.300
Chloroform	0.250
Chloromethane	0.300
Dibromochloromethane	0.300
Ethyl benzene	0.250
Methylene chloride	3.00
Styrene	0.250
Tetrachloroethene	0.300
Toluene	0.250
Trichloroethene	0.250
Vinyl acetate	1.50
Vinyl chloride	0.500
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.250
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.250

Refer to footnotes on page 6A-47.

Table 6A-3
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-SW1-320 18-Feb-11	Nitrate plus nitrite as N	**23.2**	0.200	1.00	10			090019-018	EPA 353.2
TA2-W-01 22-Feb-11	Nitrate plus nitrite as N	4.63	0.100	0.500	10			090026-018	EPA 353.2
TA2-W-01 (Duplicate) 22-Feb-11	Nitrate plus nitrite as N	4.61	0.100	0.500	10			090027-018	EPA 353.2
TA2-W-19 24-Feb-11	Nitrate plus nitrite as N	**10.6**	0.100	0.500	10			090031-018	EPA 353.2
TA2-W-26 23-Feb-11	Nitrate plus nitrite as N	4.79	0.100	0.500	10			090029-018	EPA 353.2
TA2-W-27 17-Feb-11	Nitrate plus nitrite as N	4.06	0.100	0.500	10			090017-018	EPA 353.2
TJA-2 28-Feb-11	Nitrate plus nitrite as N	**10.1**	0.100	0.500	10			090037-018	EPA 353.2
TJA-2 (Duplicate) 28-Feb-11	Nitrate plus nitrite as N	**10.1**	0.100	0.500	10			090038-018	EPA 353.2
TJA-3 21-Feb-11	Nitrate plus nitrite as N	2.52	0.100	0.500	10			090022-018	EPA 353.2
TJA-4 25-Feb-11	Nitrate plus nitrite as N	**26.4**	1.00	5.00	10			090033-018	EPA 353.2
TJA-6 16-Feb-11	Nitrate plus nitrite as N	2.47	0.100	0.500	10			090015-018	EPA 353.2
TJA-7 03-Mar-11	Nitrate plus nitrite as N	**30.0**	0.500	2.50	10			090042-018	EPA 353.2
WYO-4 02-Mar-11	Nitrate plus nitrite as N	2.68	0.050	0.250	10		J	090040-018	EPA 353.2
TA2-SW1-320 12-May-11	Nitrate plus nitrite as N	**20.9**	0.500	2.50	10			090621-018	EPA 353.2
TA2-W-19 17-May-11	Nitrate plus nitrite as N	**10.6**	0.100	0.500	10			090627-018	EPA 353.2
TA2-W-19 (Duplicate) 17-May-11	Nitrate plus nitrite as N	**10.6**	0.100	0.500	10			090628-018	EPA 353.2
TA2-W-26 16-May-11	Nitrate plus nitrite as N	5.07	0.100	0.500	10			090623-018	EPA 353.2
TJA-2 19-May-11	Nitrate plus nitrite as N	**11.0**	0.100	0.500	10			090633-018	EPA 353.2

Refer to footnotes on page 6A-47.

Table 6A-3 *(Continued)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-4 18-May-11	Nitrate plus nitrite as N	**29.4**	0.500	2.50	10			090630-018	EPA 353.2
TJA-7 24-May-11	Nitrate plus nitrite as N	**21.9**	0.500	2.50	10			090638-018	EPA 353.2
WYO-4 23-May-11	Nitrate plus nitrite as N	1.92	0.500	2.50	10	J		090636-018	EPA 353.2
PGS-2 23-Aug-11	Nitrate plus nitrite as N	1.16	0.100	0.500	10	B	1.3U	091095-018	EPA 353.2
TA1-W-01 24-Aug-11	Nitrate plus nitrite as N	2.81	0.100	0.500	10	B		091097-018	EPA 353.2
TA1-W-02 26-Aug-11	Nitrate plus nitrite as N	0.835	0.050	0.250	10			091099-018	EPA 353.2
TA1-W-03 29-Aug-11	Nitrate plus nitrite as N	7.61	0.100	0.500	10		J	091101-018	EPA 353.2
TA1-W-04 30-Aug-11	Nitrate plus nitrite as N	1.82	0.100	0.500	10		J	091103-018	EPA 353.2
TA1-W-05 31-Aug-11	Nitrate plus nitrite as N	1.31	0.100	0.500	10		J	091107-018	EPA 353.2
TA1-W-05 (Duplicate) 31-Aug-11	Nitrate plus nitrite as N	1.37	0.050	0.250	10			091108-018	EPA 353.2
TA1-W-06 06-Sep-11	Nitrate plus nitrite as N	3.13	0.100	0.500	10			091110-018	EPA 353.2
TA1-W-08 07-Sep-11	Nitrate plus nitrite as N	7.02	0.100	0.500	10			091112-018	EPA 353.2
TA2-NW1-595 13-Sep-11	Nitrate plus nitrite as N	3.53	0.100	0.500	10			091119-018	EPA 353.2
TA2-SW1-320 22-Aug-11	Nitrate plus nitrite as N	**23.5**	1.00	5.00	10	B		091093-018	EPA 353.2
TA2-W-01 20-Sep-11	Nitrate plus nitrite as N	4.58	0.100	0.500	10			091129-018	EPA 353.2
TA2-W-19 21-Sep-11	Nitrate plus nitrite as N	**10.6**	0.100	0.500	10			091131-018	EPA 353.2
TA2-W-26 22-Sep-11	Nitrate plus nitrite as N	5.10	0.100	0.500	10			091135-018	EPA 353.2
TA2-W-26 (Duplicate) 22-Sep-11	Nitrate plus nitrite as N	5.16	0.100	0.500	10			091136-018	EPA 353.2

Refer to footnotes on page 6A-47.

Table 6A-3 *(Concluded)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-27 14-Sep-11	Nitrate plus nitrite as N	4.01	0.100	0.500	10			091122-018	EPA 353.2
TJA-2 26-Sep-11	Nitrate plus nitrite as N	**10.7**	0.100	0.500	10			091138-018	EPA 353.2
TJA-3 08-Sep-11	Nitrate plus nitrite as N	2.42	0.100	0.500	10			091114-018	EPA 353.2
TJA-4 27-Sep-11	Nitrate plus nitrite as N	**31.0**	0.500	2.50	10			091140-018	EPA 353.2
TJA-6 15-Sep-11	Nitrate plus nitrite as N	2.47	0.100	0.500	10			091126-018	EPA 353.2
TJA-6 (Duplicate) 15-Sep-11	Nitrate plus nitrite as N	2.51	0.100	0.500	10			091127-018	EPA 353.2
TJA-7 28-Sep-11	Nitrate plus nitrite as N	**24.3**	0.500	2.50	10			091144-018	EPA 353.2
WYO-3 12-Sep-11	Nitrate plus nitrite as N	1.90	0.100	0.500	10			091117-018	EPA 353.2
WYO-4 19-Sep-11	Nitrate plus nitrite as N	2.92	0.100	0.500	10			091142-018	EPA 353.2
TA2-SW1-320 12-Dec-11	Nitrate plus nitrite as N	**23.1**	0.500	2.50	10			091528-018	EPA 353.2
TA2-W-19 13-Dec-11	Nitrate plus nitrite as N	**10.6**	0.100	0.500	10			091541-018	EPA 353.2
TA2-W-26 07-Dec-11	Nitrate plus nitrite as N	5.04	0.100	0.500	10			091530-018	EPA 353.2
TJA-2 15-Dec-11	Nitrate plus nitrite as N	**10.8**	0.100	0.500	10			091544-018	EPA 353.2
TJA-4 14-Dec-11	Nitrate plus nitrite as N	**30.5**	0.500	2.50	10			091538-018	EPA 353.2
TJA-4 (Duplicate) 14-Dec-11	Nitrate plus nitrite as N	**31.1**	0.500	2.50	10			091539-018	EPA 353.2
TJA-7 20-Dec-11	Nitrate plus nitrite as N	**22.5**	1.00	5.00	10			091546-018	EPA 353.2
WYO-4 19-Dec-11	Nitrate plus nitrite as N	2.96	0.100	0.500	10			091534-018	EPA 353.2

Refer to footnotes on page 6A-47.

Table 6A-4
Summary of Anion and Alkalinity Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PGS-2	Bromide	0.221	0.066	0.200	NE			091095-016	SW846 9056
23-Aug-11	Chloride	15.8	0.066	0.200	NE			091095-016	SW846 9056
	Fluoride	0.0822	0.033	0.100	4.0	J		091095-016	SW846 9056
	Sulfate	71.4	0.500	2.00	NE			091095-016	SW846 9056
	Alkalinity, Total	187	0.725	1.00	NE	B		091095-016	SM 2320B
TA1-W-01	Bromide	0.203	0.066	0.200	NE			091097-016	SW846 9056
24-Sep-11	Chloride	15.8	0.066	0.200	NE			091097-016	SW846 9056
	Fluoride	0.399	0.033	0.100	4.0			091097-016	SW846 9056
	Sulfate	74.2	0.500	2.00	NE			091097-016	SW846 9056
	Alkalinity, Total	172	0.725	1.00	NE	B		091097-016	SM 2320B
TA1-W-02	Bromide	0.189	0.066	0.200	NE	J		091099-016	SW846 9056
26-Aug-11	Chloride	15.1	0.066	0.200	NE			091099-016	SW846 9056
	Fluoride	0.491	0.033	0.100	4.0			091099-016	SW846 9056
	Sulfate	78.8	0.500	2.00	NE			091099-016	SW846 9056
	Alkalinity, Total	167	0.725	1.00	NE	B		091099-016	SM 2320B
TA1-W-03	Bromide	3.32	0.066	0.200	NE			091101-016	SW846 9056
29-Aug-11	Chloride	260	1.32	4.00	NE			091101-016	SW846 9056
	Fluoride	0.285	0.033	0.100	4.0			091101-016	SW846 9056
	Sulfate	503	2.00	8.00	NE			091101-016	SW846 9056
	Alkalinity, Total	69.9	0.725	1.00	NE	B		091101-016	SM 2320B
TA1-W-04	Bromide	0.180	0.066	0.200	NE	J		091103-016	SW846 9056
30-Aug-11	Chloride	15.0	0.066	0.200	NE			091103-016	SW846 9056
	Fluoride	0.476	0.033	0.100	4.0			091103-016	SW846 9056
	Sulfate	60.2	0.500	2.00	NE			091103-016	SW846 9056
	Alkalinity, Total	167	0.725	1.00	NE	B		091103-016	SM 2320B
TA1-W-05	Bromide	0.130	0.066	0.200	NE	J		091107-016	SW846 9056
31-Aug-11	Chloride	11.2	0.066	0.200	NE			091107-016	SW846 9056
	Fluoride	0.358	0.033	0.100	4.0			091107-016	SW846 9056
	Sulfate	98.2	0.500	2.00	NE			091107-016	SW846 9056
	Alkalinity, Total	203	0.725	1.00	NE	B		091107-016	SM 2320B
TA1-W-05 (Duplicate)	Bromide	0.153	0.066	0.200	NE	J		091108-016	SW846 9056
31-Aug-11	Chloride	11.2	0.066	0.200	NE			091108-016	SW846 9056
	Fluoride	0.344	0.033	0.100	4.0			091108-016	SW846 9056
	Sulfate	99.2	0.500	2.00	NE			091108-016	SW846 9056
	Alkalinity, Total	203	0.725	1.00	NE	B		091108-016	SM 2320B

Refer to footnotes on page 6A-47.

Table 6A-4 *(Continued)*
Summary of Anion and Alkalinity Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-06	Bromide	1.30	0.066	0.200	NE			091110-016	SW846 9056
06-Sep-11	Chloride	95.4	0.660	2.00	NE			091110-016	SW846 9056
	Fluoride	0.374	0.033	0.100	4.0			091110-016	SW846 9056
	Sulfate	190	1.00	4.00	NE			091110-016	SW846 9056
	Alkalinity, Total	86.5	0.725	1.00	NE	B		091110-016	SM 2320B
TA1-W-08	Bromide	2.56	0.066	0.200	NE			091112-016	SW846 9056
07-Sep-11	Chloride	198	3.30	10.0	NE			091112-016	SW846 9056
	Fluoride	0.256	0.033	0.100	4.0			091112-016	SW846 9056
	Sulfate	706	5.00	20.0	NE			091112-016	SW846 9056
	Alkalinity, Total	79.8	0.725	1.00	NE	B		091112-016	SM 2320B
TA2-NW1-595	Bromide	1.25	0.066	0.200	NE			091119-016	SW846 9056
13-Sep-11	Chloride	94.4	0.660	2.00	NE			091119-016	SW846 9056
	Fluoride	0.327	0.033	0.100	4.0			091119-016	SW846 9056
	Sulfate	102	1.00	4.00	NE			091119-016	SW846 9056
	Alkalinity, Total	134	0.725	1.00	NE	B		091119-016	SM 2320B
TA2-SW1-320	Bromide	0.543	0.066	0.200	NE			091093-016	SW846 9056
22-Aug-11	Chloride	32.1	0.330	1.00	NE			091093-016	SW846 9056
	Fluoride	0.402	0.033	0.100	4.0			091093-016	SW846 9056
	Sulfate	14.0	0.100	0.400	NE			091093-016	SW846 9056
	Alkalinity, Total	114	0.725	1.00	NE	B		091093-016	SM 2320B
TA2-W-01	Bromide	1.39	0.066	0.200	NE			091129-016	SW846 9056
20-Sep-11	Chloride	90.4	0.660	2.00	NE			091129-016	SW846 9056
	Fluoride	0.399	0.033	0.100	4.0			091129-016	SW846 9056
	Sulfate	52.6	1.00	4.00	NE			091129-016	SW846 9056
	Alkalinity, Total	97.2	0.725	1.00	NE	B		091129-016	SM 2320B
TA2-W-19	Bromide	0.894	0.066	0.200	NE			091131-016	SW846 9056
21-Sep-11	Chloride	62.7	0.660	2.00	NE			091131-016	SW846 9056
	Fluoride	0.421	0.033	0.100	4.0			091131-016	SW846 9056
	Sulfate	52.1	1.00	4.00	NE			091131-016	SW846 9056
	Alkalinity, Total	106	0.725	1.00	NE	B		091131-016	SM 2320B
TA2-W-26	Bromide	2.20	0.066	0.200	NE			091135-016	SW846 9056
22-Sep-11	Chloride	172	0.660	2.00	NE			091135-016	SW846 9056
	Fluoride	0.362	0.033	0.100	4.0			091135-016	SW846 9056
	Sulfate	340	1.00	4.00	NE			091135-016	SW846 9056
	Alkalinity, Total	82.9	0.725	1.00	NE	B		091135-016	SM 2320B

Refer to footnotes on page 6A-47.

Table 6A-4 *(Continued)*
Summary of Anion and Alkalinity Results, Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-26 (Duplicate)	Bromide	2.19	0.066	0.200	NE			091136-016	SW846 9056
22-Sep-11	Chloride	172	0.660	2.00	NE			091136-016	SW846 9056
	Fluoride	0.318	0.033	0.100	4.0			091136-016	SW846 9056
	Sulfate	340	1.00	4.00	NE			091136-016	SW846 9056
	Alkalinity, Total	82.9	0.725	1.00	NE	B		091136-016	SM 2320B
TA2-W-27	Bromide	1.54	0.066	0.200	NE			091122-016	SW846 9056
14-Sep-11	Chloride	104	0.660	2.00	NE			091122-016	SW846 9056
	Fluoride	0.317	0.033	0.100	4.0			091122-016	SW846 9056
	Sulfate	139	1.00	4.00	NE			091122-016	SW846 9056
	Alkalinity, Total	96.7	0.725	1.00	NE	B		091122-016	SM 2320B
TJA-2	Bromide	0.865	0.066	0.200	NE			091138-016	SW846 9056
26-Sep-11	Chloride	65.2	0.330	1.00	NE			091138-016	SW846 9056
	Fluoride	0.362	0.033	0.100	4.0			091138-016	SW846 9056
	Sulfate	49.3	0.500	2.00	NE			091138-016	SW846 9056
	Alkalinity, Total	108	0.725	1.00	NE	B		091138-016	SM 2320B
TJA-3	Bromide	0.159	0.066	0.200	NE	J		091114-016	SW846 9056
08-Sep-11	Chloride	11.2	0.330	1.00	NE			091114-016	SW846 9056
	Fluoride	0.426	0.033	0.100	4.0			091114-016	SW846 9056
	Sulfate	70.3	0.500	2.00	NE			091114-016	SW846 9056
	Alkalinity, Total	163	0.725	1.00	NE	B		091114-016	SM 2320B
TJA-4	Bromide	0.333	0.066	0.200	NE			091140-016	SW846 9056
27-Sep-11	Chloride	19.9	0.132	0.400	NE			091140-016	SW846 9056
	Fluoride	0.394	0.033	0.100	4.0			091140-016	SW846 9056
	Sulfate	15.9	0.100	0.400	NE			091140-016	SW846 9056
	Alkalinity, Total	133	0.725	1.00	NE	B		091140-016	SM 2320B
TJA-6	Bromide	0.184	0.066	0.200	NE	J		091126-016	SW846 9056
15-Sep-11	Chloride	14.3	0.066	0.200	NE			091126-016	SW846 9056
	Fluoride	0.468	0.033	0.100	4.0			091126-016	SW846 9056
	Sulfate	56.9	0.500	2.00	NE			091126-016	SW846 9056
	Alkalinity, Total	159	0.725	1.00	NE	B		091126-016	SM 2320B
TJA-6 (Duplicate)	Bromide	0.216	0.066	0.200	NE			091127-016	SW846 9056
15-Sep-11	Chloride	14.4	0.066	0.200	NE			091127-016	SW846 9056
	Fluoride	0.460	0.033	0.100	4.0			091127-016	SW846 9056
	Sulfate	57.5	0.500	2.00	NE			091127-016	SW846 9056
	Alkalinity, Total	58.3	0.725	1.00	NE	B		091127-016	SM 2320B

Refer to footnotes on page 6A-47.

Table 6A-4 *(Concluded)*
Summary of Anion and Alkalinity Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-7	Bromide	0.425	0.066	0.200	NE			091144-016	SW846 9056
28-Sep-11	Chloride	23.3	0.132	0.400	NE			091144-016	SW846 9056
	Fluoride	0.383	0.033	0.100	4.0			091144-016	SW846 9056
	Sulfate	19.1	0.100	0.400	NE			091144-016	SW846 9056
	Alkalinity, Total	126	0.725	1.00	NE	B		091144-016	SM 2320B
WYO-3	Bromide	0.223	0.066	0.200	NE			091117-016	SW846 9056
12-Sep-11	Chloride	15.5	0.066	0.200	NE			091117-016	SW846 9056
	Fluoride	0.570	0.033	0.100	4.0			091117-016	SW846 9056
	Sulfate	85.3	0.500	2.00	NE			091117-016	SW846 9056
	Alkalinity, Total	116	0.725	1.00	NE	B		091117-016	SM 2320B
WYO-4	Bromide	1.28	0.066	0.200	NE			091142-016	SW846 9056
19-Sep-11	Chloride	101	0.660	2.00	NE			091142-016	SW846 9056
	Fluoride	0.374	0.033	0.100	4.0			091142-016	SW846 9056
	Sulfate	46.8	1.00	4.00	NE			091142-016	SW846 9056
	Alkalinity, Total	97.7	0.725	1.00	NE	B		091142-016	SM 2320B

Refer to footnotes on page 6A-47.

Table 6A-5
Summary of Total Metal Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PGS-2	Aluminum	ND	0.015	0.050	NE	U		091095-009	SW846 6020
23-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091095-009	SW846 6020
	Arsenic	0.0054	0.0017	0.005	0.010	B	0.015U	091095-009	SW846 6020
	Barium	0.0603	0.0006	0.002	2.00			091095-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091095-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091095-009	SW846 6020
	Calcium	59.0	0.600	2.00	NE	B	J	091095-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091095-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		091095-009	SW846 6020
	Copper	0.000569	0.00035	0.001	NE	J		091095-009	SW846 6020
	Iron	0.112	0.033	0.100	NE			091095-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091095-009	SW846 6020
	Magnesium	12.5	0.010	0.030	NE			091095-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091095-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091095-009	SW846 7470
	Nickel	0.0121	0.0005	0.002	NE			091095-009	SW846 6020
	Potassium	2.68	0.080	0.300	NE			091095-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		091095-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091095-009	SW846 6020
	Sodium	43.0	0.080	0.250	NE			091095-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091095-009	SW846 6020
	Uranium	0.000805	0.000067	0.0002	0.030			091095-009	SW846 6020
	Vanadium	0.00585	0.001	0.005	NE			091095-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091095-009	SW846 6020

Refer to footnotes on page 6A-47.

Table 6A-5 *(Continued)*
Summary of Total Metal Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-01	Aluminum	ND	0.015	0.050	NE	U		091097-009	SW846 6020
24-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091097-009	SW846 6020
	Arsenic	0.00183	0.0017	0.005	0.010	B, J	0.015U	091097-009	SW846 6020
	Barium	0.0474	0.0006	0.002	2.00			091097-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091097-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091097-009	SW846 6020
	Calcium	73.5	0.600	2.00	NE	B	J	091097-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091097-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		091097-009	SW846 6020
	Copper	0.000634	0.00035	0.001	NE	J		091097-009	SW846 6020
	Iron	0.129	0.033	0.100	NE			091097-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091097-009	SW846 6020
	Magnesium	13.7	0.010	0.030	NE			091097-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091097-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091097-009	SW846 7470
	Nickel	0.00186	0.0005	0.002	NE	J		091097-009	SW846 6020
	Potassium	2.28	0.080	0.300	NE			091097-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		091097-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091097-009	SW846 6020
	Sodium	27.4	0.080	0.250	NE			091097-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091097-009	SW846 6020
	Uranium	0.00337	0.000067	0.0002	0.030			091097-009	SW846 6020
	Vanadium	0.00468	0.001	0.005	NE	J		091097-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091097-009	SW846 6020

Refer to footnotes on page 6A-47.

Table 6A-5 *(Continued)*
Summary of Total Metal Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-02	Aluminum	0.0194	0.015	0.050	NE	J		091099-009	SW846 6020
26-Aug-11	Antimony	0.00125	0.001	0.003	0.006	J		091099-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091099-009	SW846 6020
	Barium	0.0479	0.0006	0.002	2.00			091099-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091099-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091099-009	SW846 6020
	Calcium	70.6	0.300	1.00	NE	B		091099-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091099-009	SW846 6020
	Cobalt	0.000109	0.0001	0.001	NE	J		091099-009	SW846 6020
	Copper	0.000826	0.00035	0.001	NE	J		091099-009	SW846 6020
	Iron	0.156	0.033	0.100	NE			091099-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091099-009	SW846 6020
	Magnesium	11.7	0.010	0.030	NE			091099-009	SW846 6020
	Manganese	0.00181	0.001	0.005	NE	J		091099-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091099-009	SW846 7470
	Nickel	0.00233	0.0005	0.002	NE	B	0.0027U	091099-009	SW846 6020
	Potassium	2.39	0.080	0.300	NE			091099-009	SW846 6020
	Selenium	0.00163	0.0015	0.005	0.050	J		091099-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091099-009	SW846 6020
	Sodium	22.1	0.080	0.250	NE		J	091099-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091099-009	SW846 6020
	Uranium	0.00342	0.000067	0.0002	0.030			091099-009	SW846 6020
	Vanadium	0.00467	0.001	0.005	NE	J		091099-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091099-009	SW846 6020

Refer to footnotes on page 6A-47.

Table 6A-5 *(Continued)*
Summary of Total Metal Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-03	Aluminum	ND	0.015	0.050	NE	U		091101-009	SW846 6020
29-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091101-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091101-009	SW846 6020
	Barium	0.0316	0.0006	0.002	2.00			091101-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091101-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091101-009	SW846 6020
	Calcium	303	0.600	2.00	NE	B	J	091101-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091101-009	SW846 6020
	Cobalt	0.000402	0.0001	0.001	NE	J	J+	091101-009	SW846 6020
	Copper	0.00229	0.00035	0.001	NE		J+	091101-009	SW846 6020
	Iron	0.597	0.033	0.100	NE			091101-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091101-009	SW846 6020
	Magnesium	31.5	0.010	0.030	NE			091101-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091101-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091101-009	SW846 7470
	Nickel	0.0081	0.0005	0.002	NE	B	J+	091101-009	SW846 6020
	Potassium	2.87	0.080	0.300	NE			091101-009	SW846 6020
	Selenium	0.0362	0.0015	0.005	0.050			091101-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091101-009	SW846 6020
	Sodium	54.4	0.800	2.50	NE		J	091101-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091101-009	SW846 6020
	Uranium	0.00138	0.000067	0.0002	0.030		J+	091101-009	SW846 6020
	Vanadium	0.0026	0.001	0.005	NE	J		091101-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091101-009	SW846 6020

Refer to footnotes on page 6A-47.

Table 6A-5 *(Continued)*
Summary of Total Metal Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-04	Aluminum	ND	0.015	0.050	NE	U		091103-009	SW846 6020
30-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091103-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091103-009	SW846 6020
	Barium	0.0544	0.0006	0.002	2.00			091103-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091103-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091103-009	SW846 6020
	Calcium	71.2	0.300	1.00	NE	B		091103-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091103-009	SW846 6020
	Cobalt	0.000118	0.0001	0.001	NE	J		091103-009	SW846 6020
	Copper	0.000919	0.00035	0.001	NE	J		091103-009	SW846 6020
	Iron	0.174	0.033	0.100	NE			091103-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091103-009	SW846 6020
	Magnesium	11.5	0.010	0.030	NE			091103-009	SW846 6020
	Manganese	0.00175	0.001	0.005	NE	J		091103-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091103-009	SW846 7470
	Nickel	0.00232	0.0005	0.002	NE	B	0.0027U	091103-009	SW846 6020
	Potassium	2.49	0.080	0.300	NE			091103-009	SW846 6020
	Selenium	0.00216	0.0015	0.005	0.050	J		091103-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091103-009	SW846 6020
	Sodium	26.2	0.080	0.250	NE		J	091103-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091103-009	SW846 6020
	Uranium	0.00329	0.000067	0.0002	0.030			091103-009	SW846 6020
	Vanadium	0.00517	0.001	0.005	NE			091103-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091103-009	SW846 6020

Refer to footnotes on page 6A-47.

Table 6A-5 *(Continued)*
Summary of Total Metal Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-05	Aluminum	ND	0.015	0.050	NE	U		091107-009	SW846 6020
31-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091107-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091107-009	SW846 6020
	Barium	0.0354	0.0006	0.002	2.00			091107-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091107-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091107-009	SW846 6020
	Calcium	86.3	0.300	1.00	NE	B		091107-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091107-009	SW846 6020
	Cobalt	0.0001	0.0001	0.001	NE	J		091107-009	SW846 6020
	Copper	0.000931	0.00035	0.001	NE	J	0.0021U	091107-009	SW846 6020
	Iron	0.184	0.033	0.100	NE			091107-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091107-009	SW846 6020
	Magnesium	11.2	0.010	0.030	NE			091107-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091107-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091107-009	SW846 7470
	Nickel	0.00243	0.0005	0.002	NE	B	0.0027U	091107-009	SW846 6020
	Potassium	2.26	0.080	0.300	NE			091107-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		091107-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091107-009	SW846 6020
	Sodium	32.6	0.080	0.250	NE		J	091107-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091107-009	SW846 6020
	Uranium	0.0035	0.000067	0.0002	0.030			091107-009	SW846 6020
	Vanadium	0.00381	0.001	0.005	NE	J		091107-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091107-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-05 (Duplicate)	Aluminum	ND	0.015	0.050	NE	U		091108-009	SW846 6020
31-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091108-009	SW846 6020
	Arsenic	0.00195	0.0017	0.005	0.010	J		091108-009	SW846 6020
	Barium	0.038	0.0006	0.002	2.00			091108-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091108-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091108-009	SW846 6020
	Calcium	89.6	0.300	1.00	NE	B		091108-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091108-009	SW846 6020
	Cobalt	0.000123	0.0001	0.001	NE	J		091108-009	SW846 6020
	Copper	0.000914	0.00035	0.001	NE	J	0.0021U	091108-009	SW846 6020
	Iron	0.186	0.033	0.100	NE			091108-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091108-009	SW846 6020
	Magnesium	12.0	0.010	0.030	NE			091108-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091108-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091108-009	SW846 7470
	Nickel	0.00268	0.0005	0.002	NE	B	0.0027U	091108-009	SW846 6020
	Potassium	2.36	0.080	0.300	NE			091108-009	SW846 6020
	Selenium	0.00178	0.0015	0.005	0.050	J		091108-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091108-009	SW846 6020
	Sodium	35.3	0.080	0.250	NE		J	091108-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091108-009	SW846 6020
	Uranium	0.00373	0.000067	0.0002	0.030			091108-009	SW846 6020
	Vanadium	0.00373	0.001	0.005	NE	J		091108-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091108-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-06	Aluminum	0.237	0.015	0.050	NE			091110-009	SW846 6020
06-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091110-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091110-009	SW846 6020
	Barium	0.0266	0.0006	0.002	2.00			091110-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091110-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091110-009	SW846 6020
	Calcium	123	0.300	1.00	NE			091110-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091110-009	SW846 6020
	Cobalt	0.000279	0.0001	0.001	NE	J	J+	091110-009	SW846 6020
	Copper	0.0012	0.00035	0.001	NE		J+	091110-009	SW846 6020
	Iron	0.543	0.033	0.100	NE			091110-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091110-009	SW846 6020
	Magnesium	14.4	0.010	0.030	NE		J	091110-009	SW846 6020
	Manganese	0.00348	0.001	0.005	NE	J	J+	091110-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091110-009	SW846 7470
	Nickel	0.00359	0.0005	0.002	NE		J+	091110-009	SW846 6020
	Potassium	2.14	0.080	0.300	NE			091110-009	SW846 6020
	Selenium	0.00912	0.0015	0.005	0.050			091110-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091110-009	SW846 6020
	Sodium	31.4	0.080	0.250	NE			091110-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091110-009	SW846 6020
	Uranium	0.00126	0.000067	0.0002	0.030		J+	091110-009	SW846 6020
	Vanadium	0.00468	0.001	0.005	NE	J		091110-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091110-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-08	Aluminum	ND	0.015	0.050	NE	U		091112-009	SW846 6020
07-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091112-009	SW846 6020
	Arsenic	0.00205	0.0017	0.005	0.010	J		091112-009	SW846 6020
	Barium	0.0206	0.0006	0.002	2.00			091112-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091112-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091112-009	SW846 6020
	Calcium	334	0.600	2.00	NE			091112-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091112-009	SW846 6020
	Cobalt	0.000535	0.0001	0.001	NE	J	J+	091112-009	SW846 6020
	Copper	0.00268	0.00035	0.001	NE		J+	091112-009	SW846 6020
	Iron	0.982	0.033	0.100	NE			091112-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091112-009	SW846 6020
	Magnesium	39.4	0.010	0.030	NE		J	091112-009	SW846 6020
	Manganese	0.00112	0.001	0.005	NE	J	J+	091112-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091112-009	SW846 7470
	Nickel	0.0108	0.0005	0.002	NE		J+	091112-009	SW846 6020
	Potassium	3.06	0.080	0.300	NE			091112-009	SW846 6020
	Selenium	0.0306	0.0015	0.005	0.050			091112-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091112-009	SW846 6020
	Sodium	80.2	0.800	2.50	NE			091112-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091112-009	SW846 6020
	Uranium	0.00196	0.000067	0.0002	0.030		J+	091112-009	SW846 6020
	Vanadium	0.00293	0.001	0.005	NE	J		091112-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091112-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-NW1-595	Aluminum	ND	0.015	0.050	NE	U		091119-009	SW846 6020
13-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091119-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091119-009	SW846 6020
	Barium	0.0442	0.0006	0.002	2.00			091119-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091119-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091119-009	SW846 6020
	Calcium	99.6	0.300	1.00	NE			091119-009	SW846 6020
	Chromium	0.00301	0.002	0.010	0.100	J	J+	091119-009	SW846 6020
	Cobalt	0.000125	0.0001	0.001	NE	J	J+	091119-009	SW846 6020
	Copper	0.000752	0.00035	0.001	NE	J	J+	091119-009	SW846 6020
	Iron	0.310	0.033	0.100	NE			091119-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091119-009	SW846 6020
	Magnesium	16.0	0.010	0.030	NE			091119-009	SW846 6020
	Manganese	0.00117	0.001	0.005	NE	B, J	0.0070U	091119-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091119-009	SW846 7470
	Nickel	0.0014	0.0005	0.002	NE	J	J+	091119-009	SW846 6020
	Potassium	2.38	0.080	0.300	NE			091119-009	SW846 6020
	Selenium	0.0087	0.0015	0.005	0.050			091119-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U	UJ	091119-009	SW846 6020
	Sodium	30.1	0.080	0.250	NE			091119-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091119-009	SW846 6020
	Uranium	0.00215	0.000067	0.0002	0.030		J+	091119-009	SW846 6020
	Vanadium	0.00368	0.001	0.005	NE	J		091119-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091119-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-SW1-320	Aluminum	0.451	0.015	0.050	NE			091093-009	SW846 6020
22-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091093-009	SW846 6020
	Arsenic	0.00369	0.0017	0.005	0.010	B, J	0.015U	091093-009	SW846 6020
	Barium	0.203	0.0006	0.002	2.00			091093-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091093-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091093-009	SW846 6020
	Calcium	65.4	0.600	2.00	NE	B	J	091093-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091093-009	SW846 6020
	Cobalt	0.000226	0.0001	0.001	NE	J		091093-009	SW846 6020
	Copper	0.000696	0.00035	0.001	NE	J		091093-009	SW846 6020
	Iron	0.429	0.033	0.100	NE			091093-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091093-009	SW846 6020
	Magnesium	11.6	0.010	0.030	NE			091093-009	SW846 6020
	Manganese	0.0107	0.001	0.005	NE			091093-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091093-009	SW846 7470
	Nickel	0.00158	0.0005	0.002	NE	J		091093-009	SW846 6020
	Potassium	1.97	0.080	0.300	NE			091093-009	SW846 6020
	Selenium	0.00345	0.0015	0.005	0.050	J		091093-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091093-009	SW846 6020
	Sodium	19.5	0.080	0.250	NE			091093-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091093-009	SW846 6020
	Uranium	0.00126	0.000067	0.0002	0.030			091093-009	SW846 6020
	Vanadium	0.00656	0.001	0.005	NE			091093-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091093-009	SW846 6020

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Table 6A-5 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-01	Aluminum	ND	0.015	0.050	NE	U		091129-009	SW846 6020
20-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091129-009	SW846 6020
	Arsenic	0.00178	0.0017	0.005	0.010	J		091129-009	SW846 6020
	Barium	0.109	0.003	0.010	2.00			091129-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091129-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091129-009	SW846 6020
	Calcium	96.9	0.300	1.00	NE			091129-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091129-009	SW846 6020
	Cobalt	0.000165	0.0001	0.001	NE	J	J+	091129-009	SW846 6020
	Copper	0.000423	0.00035	0.001	NE	J	J+	091129-009	SW846 6020
	Iron	0.323	0.033	0.100	NE			091129-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091129-009	SW846 6020
	Magnesium	12.1	0.100	0.300	NE			091129-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091129-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091129-009	SW846 7470
	Nickel	0.00254	0.0005	0.002	NE		J+	091129-009	SW846 6020
	Potassium	2.27	0.080	0.300	NE			091129-009	SW846 6020
	Selenium	0.00842	0.0015	0.005	0.050			091129-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091129-009	SW846 6020
	Sodium	22.5	0.800	2.50	NE			091129-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091129-009	SW846 6020
	Uranium	0.00109	0.000067	0.0002	0.030		J+	091129-009	SW846 6020
	Vanadium	0.00482	0.001	0.005	NE	J	0.0056U	091129-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091129-009	SW846 6020

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Table 6A-5 *(Continued)*
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TA2-W-19	Aluminum	ND	0.015	0.050	NE	U		091131-009	SW846 6020
21-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091131-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091131-009	SW846 6020
	Barium	0.0484	0.0006	0.002	2.00			091131-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091131-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091131-009	SW846 6020
	Calcium	86.5	0.300	1.00	NE			091131-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091131-009	SW846 6020
	Cobalt	0.000148	0.0001	0.001	NE	J		091131-009	SW846 6020
	Copper	0.000438	0.00035	0.001	NE	J		091131-009	SW846 6020
	Iron	0.274	0.033	0.100	NE			091131-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091131-009	SW846 6020
	Magnesium	11.9	0.100	0.300	NE			091131-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091131-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091131-009	SW846 7470
	Nickel	0.00263	0.0005	0.002	NE			091131-009	SW846 6020
	Potassium	1.89	0.080	0.300	NE			091131-009	SW846 6020
	Selenium	0.00553	0.0015	0.005	0.050			091131-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091131-009	SW846 6020
	Sodium	22.6	0.800	2.50	NE			091131-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091131-009	SW846 6020
	Uranium	0.00125	0.000067	0.0002	0.030			091131-009	SW846 6020
	Vanadium	0.0052	0.001	0.005	NE		0.0056U	091131-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091131-009	SW846 6020

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Table 6A-5 *(Continued)*
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TA2-W-26	Aluminum	0.084	0.015	0.050	NE			091135-009	SW846 6020
22-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091135-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091135-009	SW846 6020
	Barium	0.0767	0.0006	0.002	2.00			091135-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091135-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091135-009	SW846 6020
	Calcium	223	0.600	2.00	NE			091135-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091135-009	SW846 6020
	Cobalt	0.000361	0.0001	0.001	NE	J	J+	091135-009	SW846 6020
	Copper	0.00119	0.00035	0.001	NE		J+	091135-009	SW846 6020
	Iron	0.707	0.033	0.100	NE			091135-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091135-009	SW846 6020
	Magnesium	25.1	0.100	0.300	NE			091135-009	SW846 6020
	Manganese	0.0011	0.001	0.005	NE	J	J+	091135-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091135-009	SW846 7470
	Nickel	0.00509	0.0005	0.002	NE		J+	091135-009	SW846 6020
	Potassium	2.71	0.080	0.300	NE			091135-009	SW846 6020
	Selenium	0.0218	0.0015	0.005	0.050			091135-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091135-009	SW846 6020
	Sodium	37.2	0.800	2.50	NE			091135-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091135-009	SW846 6020
	Uranium	0.00129	0.000067	0.0002	0.030		J+	091135-009	SW846 6020
	Vanadium	0.00351	0.001	0.005	NE	J	0.0056U	091135-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091135-009	SW846 6020

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Table 6A-5 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-26 (Duplicate)	Aluminum	0.0704	0.015	0.050	NE			091136-009	SW846 6020
22-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091136-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091136-009	SW846 6020
	Barium	0.0761	0.0006	0.002	2.00			091136-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091136-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091136-009	SW846 6020
	Calcium	225	0.600	2.00	NE			091136-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091136-009	SW846 6020
	Cobalt	0.000359	0.0001	0.001	NE	J	J+	091136-009	SW846 6020
	Copper	0.00173	0.00035	0.001	NE		J+	091136-009	SW846 6020
	Iron	0.741	0.033	0.100	NE			091136-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091136-009	SW846 6020
	Magnesium	27.1	0.100	0.300	NE			091136-009	SW846 6020
	Manganese	0.0011	0.001	0.005	NE	J	J+	091136-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091136-009	SW846 7470
	Nickel	0.00506	0.0005	0.002	NE		J+	091136-009	SW846 6020
	Potassium	2.61	0.080	0.300	NE			091136-009	SW846 6020
	Selenium	0.0223	0.0015	0.005	0.050			091136-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091136-009	SW846 6020
	Sodium	40.4	0.800	2.50	NE			091136-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091136-009	SW846 6020
	Uranium	0.0013	0.000067	0.0002	0.030		J+	091136-009	SW846 6020
	Vanadium	0.00363	0.001	0.005	NE	J	0.0056U	091136-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091136-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-27	Aluminum	ND	0.015	0.050	NE	U		091122-009	SW846 6020
14-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091122-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091122-009	SW846 6020
	Barium	0.0547	0.0006	0.002	2.00	B		091122-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091122-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091122-009	SW846 6020
	Calcium	118	0.300	1.00	NE			091122-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091122-009	SW846 6020
	Cobalt	0.000184	0.0001	0.001	NE	J	J+	091122-009	SW846 6020
	Copper	0.000811	0.00035	0.001	NE	J	J+	091122-009	SW846 6020
	Iron	0.341	0.033	0.100	NE			091122-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091122-009	SW846 6020
	Magnesium	13.9	0.010	0.030	NE		J	091122-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091122-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091122-009	SW846 7470
	Nickel	0.00303	0.0005	0.002	NE		J+	091122-009	SW846 6020
	Potassium	1.98	0.080	0.300	NE		J-	091122-009	SW846 6020
	Selenium	0.0104	0.0015	0.005	0.050			091122-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091122-009	SW846 6020
	Sodium	30.7	0.400	1.25	NE			091122-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091122-009	SW846 6020
	Uranium	0.00116	0.000067	0.0002	0.030		J+	091122-009	SW846 6020
	Vanadium	0.0031	0.001	0.005	NE	J		091122-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091122-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-2	Aluminum	ND	0.015	0.050	NE	U		091138-009	SW846 6020
26-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091138-009	SW846 6020
	Arsenic	0.00296	0.0017	0.005	0.010	J		091138-009	SW846 6020
	Barium	0.0445	0.0006	0.002	2.00			091138-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091138-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091138-009	SW846 6020
	Calcium	85.0	0.300	1.00	NE	B		091138-009	SW846 6020
	Chromium	0.0043	0.002	0.010	0.100	B, J	0.016U	091138-009	SW846 6020
	Cobalt	0.000217	0.0001	0.001	NE	J		091138-009	SW846 6020
	Copper	0.000919	0.00035	0.001	NE	J		091138-009	SW846 6020
	Iron	0.575	0.033	0.100	NE			091138-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091138-009	SW846 6020
	Magnesium	11.6	0.010	0.030	NE		J	091138-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091138-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091138-009	SW846 7470
	Nickel	0.0034	0.0005	0.002	NE	B		091138-009	SW846 6020
	Potassium	1.80	0.080	0.300	NE			091138-009	SW846 6020
	Selenium	0.00622	0.0015	0.005	0.050			091138-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091138-009	SW846 6020
	Sodium	22.2	0.080	0.250	NE		J	091138-009	SW846 6020
	Thallium	0.000686	0.00045	0.002	0.002	J	0.0029U	091138-009	SW846 6020
	Uranium	0.0013	0.000067	0.0002	0.030			091138-009	SW846 6020
	Vanadium	0.00465	0.001	0.005	NE	J		091138-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091138-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-3	Aluminum	ND	0.015	0.050	NE	U		091114-009	SW846 6020
08-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091114-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091114-009	SW846 6020
	Barium	0.0467	0.0006	0.002	2.00			091114-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091114-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091114-009	SW846 6020
	Calcium	73.5	0.300	1.00	NE			091114-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091114-009	SW846 6020
	Cobalt	0.000126	0.0001	0.001	NE	J		091114-009	SW846 6020
	Copper	0.000669	0.00035	0.001	NE	J		091114-009	SW846 6020
	Iron	0.209	0.033	0.100	NE			091114-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091114-009	SW846 6020
	Magnesium	11.9	0.010	0.030	NE		J	091114-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091114-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091114-009	SW846 7470
	Nickel	0.00195	0.0005	0.002	NE	J		091114-009	SW846 6020
	Potassium	2.03	0.080	0.300	NE			091114-009	SW846 6020
	Selenium	0.00187	0.0015	0.005	0.050	J		091114-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091114-009	SW846 6020
	Sodium	25.4	0.080	0.250	NE			091114-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091114-009	SW846 6020
	Uranium	0.00291	0.000067	0.0002	0.030			091114-009	SW846 6020
	Vanadium	0.00452	0.001	0.005	NE	J		091114-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091114-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-4	Aluminum	ND	0.015	0.050	NE	U		091140-009	SW846 6020
27-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091140-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091140-009	SW846 6020
	Barium	0.175	0.0006	0.002	2.00			091140-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091140-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091140-009	SW846 6020
	Calcium	76.9	0.300	1.00	NE	B		091140-009	SW846 6020
	Chromium	0.00449	0.002	0.010	0.100	B, J	0.016U	091140-009	SW846 6020
	Cobalt	0.000224	0.0001	0.001	NE	J		091140-009	SW846 6020
	Copper	0.000716	0.00035	0.001	NE	J		091140-009	SW846 6020
	Iron	0.563	0.033	0.100	NE			091140-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091140-009	SW846 6020
	Magnesium	13.4	0.010	0.030	NE		J	091140-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091140-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091140-009	SW846 7470
	Nickel	0.00312	0.0005	0.002	NE	B		091140-009	SW846 6020
	Potassium	2.90	0.080	0.300	NE			091140-009	SW846 6020
	Selenium	0.00313	0.0015	0.005	0.050	J		091140-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091140-009	SW846 6020
	Sodium	24.4	0.080	0.250	NE		J	091140-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091140-009	SW846 6020
	Uranium	0.00301	0.000067	0.0002	0.030			091140-009	SW846 6020
	Vanadium	0.00533	0.001	0.005	NE			091140-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091140-009	SW846 6020

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Table 6A-5 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-6	Aluminum	0.105	0.015	0.050	NE			091126-009	SW846 6020
15-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091126-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091126-009	SW846 6020
	Barium	0.0638	0.0006	0.002	2.00	B		091126-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091126-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091126-009	SW846 6020
	Calcium	66.2	0.300	1.00	NE			091126-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091126-009	SW846 6020
	Cobalt	0.000152	0.0001	0.001	NE	J		091126-009	SW846 6020
	Copper	0.000804	0.00035	0.001	NE	J	0.0070U	091126-009	SW846 6020
	Iron	0.275	0.033	0.100	NE			091126-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091126-009	SW846 6020
	Magnesium	9.96	0.010	0.030	NE		J	091126-009	SW846 6020
	Manganese	0.00473	0.001	0.005	NE	J		091126-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091126-009	SW846 7470
	Nickel	0.00215	0.0005	0.002	NE			091126-009	SW846 6020
	Potassium	2.18	0.080	0.300	NE		J-	091126-009	SW846 6020
	Selenium	0.00157	0.0015	0.005	0.050	J		091126-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091126-009	SW846 6020
	Sodium	23.7	0.400	1.25	NE			091126-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091126-009	SW846 6020
	Uranium	0.00318	0.000067	0.0002	0.030			091126-009	SW846 6020
	Vanadium	0.0052	0.001	0.005	NE			091126-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091126-009	SW846 6020

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Table 6A-5 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-6 (Duplicate)	Aluminum	0.0647	0.015	0.050	NE			091127-009	SW846 6020
15-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091127-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091127-009	SW846 6020
	Barium	0.0634	0.0006	0.002	2.00	B		091127-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091127-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091127-009	SW846 6020
	Calcium	65.8	0.300	1.00	NE			091127-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091127-009	SW846 6020
	Cobalt	0.00014	0.0001	0.001	NE	J		091127-009	SW846 6020
	Copper	0.000795	0.00035	0.001	NE	J	0.0070U	091127-009	SW846 6020
	Iron	0.237	0.033	0.100	NE			091127-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091127-009	SW846 6020
	Magnesium	11.0	0.010	0.030	NE		J	091127-009	SW846 6020
	Manganese	0.00422	0.001	0.005	NE	J		091127-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091127-009	SW846 7470
	Nickel	0.00202	0.0005	0.002	NE			091127-009	SW846 6020
	Potassium	2.13	0.080	0.300	NE		J-	091127-009	SW846 6020
	Selenium	0.00178	0.0015	0.005	0.050	J		091127-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091127-009	SW846 6020
	Sodium	24.1	0.400	1.25	NE			091127-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091127-009	SW846 6020
	Uranium	0.00319	0.000067	0.0002	0.030			091127-009	SW846 6020
	Vanadium	0.0058	0.001	0.005	NE			091127-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091127-009	SW846 6020

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Table 6A-5 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-7	Aluminum	0.0366	0.015	0.050	NE	J		091144-009	SW846 6020
28-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091144-009	SW846 6020
	Arsenic	0.00195	0.0017	0.005	0.010	J		091144-009	SW846 6020
	Barium	0.205	0.0006	0.002	2.00			091144-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091144-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091144-009	SW846 6020
	Calcium	69.6	0.300	1.00	NE	B		091144-009	SW846 6020
	Chromium	0.00462	0.002	0.010	0.100	B, J	0.016U	091144-009	SW846 6020
	Cobalt	0.000719	0.0001	0.001	NE	J		091144-009	SW846 6020
	Copper	0.000516	0.00035	0.001	NE	J		091144-009	SW846 6020
	Iron	0.579	0.033	0.100	NE			091144-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091144-009	SW846 6020
	Magnesium	12.1	0.010	0.030	NE		J	091144-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091144-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091144-009	SW846 7470
	Nickel	0.00276	0.0005	0.002	NE	B	0.0029U	091144-009	SW846 6020
	Potassium	1.85	0.080	0.300	NE			091144-009	SW846 6020
	Selenium	0.0054	0.0015	0.005	0.050			091144-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091144-009	SW846 6020
	Sodium	18.0	0.080	0.250	NE		J	091144-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091144-009	SW846 6020
	Uranium	0.00172	0.000067	0.0002	0.030			091144-009	SW846 6020
	Vanadium	0.00518	0.001	0.005	NE			091144-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091144-009	SW846 6020

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Table 6A-5 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
WYO-3	Aluminum	0.0306	0.015	0.050	NE	J		091117-009	SW846 6020
12-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091117-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091117-009	SW846 6020
	Barium	0.0424	0.0006	0.002	2.00			091117-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091117-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091117-009	SW846 6020
	Calcium	65.4	0.300	1.00	NE			091117-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091117-009	SW846 6020
	Cobalt	0.00013	0.0001	0.001	NE	J		091117-009	SW846 6020
	Copper	0.000789	0.00035	0.001	NE	J		091117-009	SW846 6020
	Iron	0.186	0.033	0.100	NE			091117-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091117-009	SW846 6020
	Magnesium	11.2	0.010	0.030	NE			091117-009	SW846 6020
	Manganese	0.00124	0.001	0.005	NE	J		091117-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091117-009	SW846 7470
	Nickel	0.00209	0.0005	0.002	NE			091117-009	SW846 6020
	Potassium	2.27	0.080	0.300	NE			091117-009	SW846 6020
	Selenium	0.00185	0.0015	0.005	0.050	J		091117-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091117-009	SW846 6020
	Sodium	23.3	0.080	0.250	NE			091117-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091117-009	SW846 6020
	Uranium	0.0025	0.000067	0.0002	0.030			091117-009	SW846 6020
	Vanadium	0.00592	0.001	0.005	NE			091117-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U	UJ	091117-009	SW846 6020

Refer to footnotes on page 6A-47.

Table 6A-5 *(Concluded)*
Summary of Total Metal Results,
Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
WYO-4	Aluminum	0.0231	0.015	0.050	NE	J		091142-009	SW846 6020
19-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091142-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091142-009	SW846 6020
	Barium	0.170	0.003	0.010	2.00			091142-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091142-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091142-009	SW846 6020
	Calcium	89.2	0.300	1.00	NE			091142-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091142-009	SW846 6020
	Cobalt	0.000179	0.0001	0.001	NE	J		091142-009	SW846 6020
	Copper	0.000567	0.00035	0.001	NE	J		091142-009	SW846 6020
	Iron	0.292	0.033	0.100	NE			091142-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091142-009	SW846 6020
	Magnesium	15.0	0.100	0.300	NE			091142-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091142-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091142-009	SW846 7470
	Nickel	0.00234	0.0005	0.002	NE			091142-009	SW846 6020
	Potassium	1.95	0.080	0.300	NE			091142-009	SW846 6020
	Selenium	0.00664	0.0015	0.005	0.050			091142-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091142-009	SW846 6020
	Sodium	22.1	0.800	2.50	NE			091142-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091142-009	SW846 6020
	Uranium	0.00135	0.000067	0.0002	0.030			091142-009	SW846 6020
	Vanadium	0.00523	0.001	0.005	NE		0.0056U	091142-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091142-009	SW846 6020

Refer to footnotes on page 6A-47.

Table 6A-6
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PGS-2	Americium-241	5.62 ± 6.82	9.43	4.72	NE	U	BD	091095-033	EPA 901.1
23-Aug-11	Cesium-137	0.430 ± 1.75	2.93	1.46	NE	U	BD	091095-033	EPA 901.1
	Cobalt-60	-0.165 ± 1.70	2.80	1.40	NE	U	BD	091095-033	EPA 901.1
	Potassium-40	2.05 ± 42.5	28.1	14.0	NE	U	BD	091095-033	EPA 901.1
	Gross Alpha	1.06	NA	NA	15	NA	None	091095-034	EPA 900.0
	Gross Beta	4.54 ± 1.62	2.25	1.09	4mrem/yr		J	091095-034	EPA 900.0
	Tritium	11.1 ± 78.2	140	64.8	NE	U	BD	091095-036	EPA 906.0 M
TA1-W-01	Americium-241	-6.47 ± 8.67	11.5	5.77	NE	U	BD	091097-033	EPA 901.1
24-Aug-11	Cesium-137	0.607 ± 1.67	2.77	1.39	NE	U	BD	091097-033	EPA 901.1
	Cobalt-60	-0.789 ± 1.80	2.79	1.39	NE	U	BD	091097-033	EPA 901.1
	Potassium-40	-10.8 ± 31.7	38.2	19.1	NE	U	BD	091097-033	EPA 901.1
	Gross Alpha	1.98	NA	NA	15	NA	None	091097-034	EPA 900.0
	Gross Beta	2.49 ± 1.22	1.85	0.895	4mrem/yr		J	091097-034	EPA 900.0
	Tritium	22.0 ± 78.2	138	63.9	NE	U	BD	091097-036	EPA 906.0 M
TA1-W-02	Americium-241	-36.5 ± 22.5	17.1	8.55	NE	U	R	091099-033	EPA 901.1
26-Aug-11	Cesium-137	-0.465 ± 1.78	2.91	1.45	NE	U	BD	091099-033	EPA 901.1
	Cobalt-60	2.72 ± 2.25	3.41	1.71	NE	U	BD	091099-033	EPA 901.1
	Potassium-40	22.3 ± 50.5	26.2	13.1	NE	U	BD	091099-033	EPA 901.1
	Gross Alpha	1.44	NA	NA	15	NA	None	091099-034	EPA 900.0
	Gross Beta	5.55 ± 1.45	1.70	0.832	4mrem/yr			091099-034	EPA 900.0
	Tritium	7.55 ± 73.9	133	61.5	NE	U	BD	091099-036	EPA 906.0 M
TA1-W-03	Americium-241	-22.8 ± 23.5	34.1	17.1	NE	U	BD	091101-033	EPA 901.1
29-Aug-11	Cesium-137	0.866 ± 2.29	3.83	1.92	NE	U	BD	091101-033	EPA 901.1
	Cobalt-60	0.678 ± 2.15	3.70	1.85	NE	U	BD	091101-033	EPA 901.1
	Potassium-40	28.4 ± 48.5	50.2	25.1	NE	U	BD	091101-033	EPA 901.1
	Gross Alpha	1.82	NA	NA	15	NA	None	091101-034	EPA 900.0
	Gross Beta	0.936 ± 1.85	3.14	1.51	4mrem/yr	U	BD	091101-034	EPA 900.0
	Tritium	63.2 ± 81.1	136	62.8	NE	U	BD	091101-036	EPA 906.0 M
TA1-W-04	Americium-241	0.420 ± 8.15	12.0	6.00	NE	U	BD	091103-033	EPA 901.1
30-Aug-11	Cesium-137	0.579 ± 1.81	3.00	1.50	NE	U	BD	091103-033	EPA 901.1
	Cobalt-60	-0.0949 ± 1.92	3.13	1.57	NE	U	BD	091103-033	EPA 901.1
	Potassium-40	23.9 ± 38.7	27.3	13.7	NE	U	BD	091103-033	EPA 901.1
	Gross Alpha	1.38	NA	NA	15	NA	None	091103-034	EPA 900.0
	Gross Beta	2.79 ± 0.852	0.998	0.471	4mrem/yr		J	091103-034	EPA 900.0
	Tritium	42.6 ± 79.8	137	63.2	NE	U	BD	091103-036	EPA 906.0 M

Refer to footnotes on page 6A-47.

Table 6A-6 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-05	Americium-241	-5.11 ± 11.2	18.8	9.38	NE	U	BD	091107-033	EPA 901.1
31-Aug-11	Cesium-137	-6.1 ± 4.48	3.64	1.82	NE	U	BD	091107-033	EPA 901.1
	Cobalt-60	1.19 ± 2.18	3.64	1.82	NE	U	BD	091107-033	EPA 901.1
	Potassium-40	1.99 ± 51.5	36.1	18.0	NE	U	BD	091107-033	EPA 901.1
	Gross Alpha	1.28	NA	NA	15	NA	None	091107-034	EPA 900.0
	Gross Beta	2.17 ± 0.761	0.998	0.477	4mrem/yr		J	091107-034	EPA 900.0
	Tritium	8.10 ± 79.3	143	66.0	NE	U	BD	091107-036	EPA 906.0 M
TA1-W-05 (Duplicate)	Americium-241	-2.57 ± 12.1	20.3	10.2	NE	U	BD	091108-033	EPA 901.1
31-Aug-11	Cesium-137	-4.11 ± 4.16	4.09	2.05	NE	U	BD	091108-033	EPA 901.1
	Cobalt-60	-3.14 ± 4.06	4.01	2.01	NE	U	BD	091108-033	EPA 901.1
	Potassium-40	-32.2 ± 38.4	41.1	20.6	NE	U	BD	091108-033	EPA 901.1
	Gross Alpha	1.27	NA	NA	15	NA	None	091108-034	EPA 900.0
	Gross Beta	2.50 ± 0.811	1.02	0.489	4mrem/yr		J	091108-034	EPA 900.0
	Tritium	-24.8 ± 73.1	137	63.2	NE	U	BD	091108-036	EPA 906.0 M
TA1-W-06	Americium-241	-4.77 ± 6.29	9.43	4.72	NE	U	BD	091110-033	EPA 901.1
06-Sep-11	Cesium-137	-0.27 ± 1.73	2.85	1.42	NE	U	BD	091110-033	EPA 901.1
	Cobalt-60	-0.0886 ± 1.85	3.07	1.53	NE	U	BD	091110-033	EPA 901.1
	Potassium-40	-10.5 ± 39.0	41.3	20.7	NE	U	BD	091110-033	EPA 901.1
	Gross Alpha	2.01	NA	NA	15	NA	None	091110-034	EPA 900.0
	Gross Beta	2.71 ± 1.54	2.40	1.17	4mrem/yr		J	091110-034	EPA 900.0
	Tritium	36.5 ± 80.4	140	64.6	NE	U	BD	091110-036	EPA 906.0 M
TA1-W-08	Americium-241	0.992 ± 11.9	18.5	9.23	NE	U	BD	091112-033	EPA 901.1
07-Sep-11	Cesium-137	3.22 ± 2.59	3.82	1.91	NE	U	BD	091112-033	EPA 901.1
	Cobalt-60	1.82 ± 2.38	3.89	1.95	NE	U	BD	091112-033	EPA 901.1
	Potassium-40	-1.44 ± 54.4	54.3	27.1	NE	U	BD	091112-033	EPA 901.1
	Gross Alpha	-2.12	NA	NA	15	NA	None	091112-034	EPA 900.0
	Gross Beta	1.26 ± 1.94	3.27	1.56	4mrem/yr	U	BD	091112-034	EPA 900.0
	Tritium	33.0 ± 79.4	139	64.0	NE	U	BD	091112-036	EPA 906.0 M
TA2-NW1-595	Americium-241	9.32 ± 17.6	25.0	12.5	NE	U	BD	091119-033	EPA 901.1
13-Sep-11	Cesium-137	1.18 ± 1.90	3.19	1.59	NE	U	BD	091119-033	EPA 901.1
	Cobalt-60	-0.906 ± 2.07	3.29	1.65	NE	U	BD	091119-033	EPA 901.1
	Potassium-40	63.1 ± 35.0	63.2	17.5	NE	U	BD	091119-033	EPA 901.1
	Gross Alpha	1.20	NA	NA	15	NA	None	091119-034	EPA 900.0
	Gross Beta	1.75 ± 0.991	1.51	0.725	4mrem/yr		J	091119-034	EPA 900.0
	Tritium	-45.6 ± 83.8	166	74.9	NE	U	BD	091119-036	EPA 906.0 M

Refer to footnotes on page 6A-47.

Table 6A-6 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-SW1-320	Americium-241	-3.78 ± 4.40	5.14	2.57	NE	U	BD	091093-033	EPA 901.1
22-Aug-11	Cesium-137	-0.846 ± 2.36	3.72	1.86	NE	U	BD	091093-033	EPA 901.1
	Cobalt-60	0.424 ± 2.39	4.11	2.06	NE	U	BD	091093-033	EPA 901.1
	Potassium-40	45.7 ± 63.7	34.2	17.1	NE	X	R	091093-033	EPA 901.1
	Gross Alpha	2.36	NA	NA	15	NA	None	091093-034	EPA 900.0
	Gross Beta	2.23 ± 1.27	1.98	0.960	4mrem/yr		J	091093-034	EPA 900.0
	Tritium	74.5 ± 86.2	143	66.0	NE	U	BD	091093-036	EPA 906.0 M
TA2-W-01	Americium-241	-27.3 ± 24.0	33.2	16.6	NE	U	BD	091129-033	EPA 901.1
20-Sep-11	Cesium-137	-0.185 ± 2.05	3.42	1.71	NE	U	BD	091129-033	EPA 901.1
	Cobalt-60	0.620 ± 2.01	3.45	1.73	NE	U	BD	091129-033	EPA 901.1
	Potassium-40	-23.1 ± 38.2	46.4	23.2	NE	U	BD	091129-033	EPA 901.1
	Gross Alpha	0.39	NA	NA	15	NA	None	091129-034	EPA 900.0
	Gross Beta	1.75 ± 1.49	2.44	1.19	4mrem/yr	U	BD	091129-034	EPA 900.0
	Tritium	3.21 ± 88.5	164	74.0	NE	U	BD	091129-036	EPA 906.0 M
TA2-W-19	Americium-241	-40.7 ± 21.5	16.6	8.30	NE	U	R	091131-033	EPA 901.1
21-Sep-11	Cesium-137	0.257 ± 1.89	3.15	1.57	NE	U	BD	091131-033	EPA 901.1
	Cobalt-60	-2.88 ± 4.10	3.08	1.54	NE	U	BD	091131-033	EPA 901.1
	Potassium-40	-59.2 ± 46.8	43.6	21.8	NE	U	BD	091131-033	EPA 901.1
	Gross Alpha	0.05	NA	NA	15	NA	None	091131-034	EPA 900.0
	Gross Beta	3.40 ± 1.53	2.29	1.11	4mrem/yr		J	091131-034	EPA 900.0
	Tritium	-78.2 ± 77.9	163	73.5	NE	U	BD	091131-036	EPA 906.0 M
TA2-W-26	Americium-241	-31.5 ± 18.9	11.7	5.84	NE	U	R	091135-033	EPA 901.1
22-Sep-11	Cesium-137	0.974 ± 1.94	3.20	1.60	NE	U	BD	091135-033	EPA 901.1
	Cobalt-60	1.11 ± 2.00	3.36	1.68	NE	U	BD	091135-033	EPA 901.1
	Potassium-40	-39 ± 36.6	38.8	19.4	NE	U	BD	091135-033	EPA 901.1
	Gross Alpha	-0.87	NA	NA	15	NA	None	091135-034	EPA 900.0
	Gross Beta	3.16 ± 2.52	4.02	1.95	4mrem/yr	U	BD	091135-034	EPA 900.0
	Tritium	-45.4 ± 83.6	166	74.7	NE	U	BD	091135-036	EPA 906.0 M
TA2-W-26 (Duplicate)	Americium-241	3.06 ± 7.80	11.5	5.74	NE	U	BD	091136-033	EPA 901.1
22-Sep-11	Cesium-137	-0.0191 ± 1.55	2.55	1.27	NE	U	BD	091136-033	EPA 901.1
	Cobalt-60	0.304 ± 1.72	2.85	1.43	NE	U	BD	091136-033	EPA 901.1
	Potassium-40	-17.6 ± 35.3	40.5	20.3	NE	U	BD	091136-033	EPA 901.1
	Gross Alpha	0.77	NA	NA	15	NA	None	091136-034	EPA 900.0
	Gross Beta	5.97 ± 2.79	4.22	2.06	4mrem/yr		J	091136-034	EPA 900.0
	Tritium	-53.9 ± 77.9	157	70.9	NE	U	BD	091136-036	EPA 906.0 M

Refer to footnotes on page 6A-47.

Table 6A-6 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-27	Americium-241	2.82 ± 3.82	5.88	2.94	NE	U	BD	091122-033	EPA 901.1
14-Sep-11	Cesium-137	4.02 ± 3.26	4.82	2.41	NE	U	BD	091122-033	EPA 901.1
	Cobalt-60	1.59 ± 2.90	5.02	2.51	NE	U	BD	091122-033	EPA 901.1
	Potassium-40	2.35 ± 41.3	58.3	29.2	NE	U	BD	091122-033	EPA 901.1
	Gross Alpha	0.82	NA	NA	15	NA	None	091122-034	EPA 900.0
	Gross Beta	2.48 ± 1.14	1.62	0.777	4mrem/yr		J	091122-034	EPA 900.0
	Tritium	-1.61 ± 88.0	164	74.0	NE	U	BD	091122-036	EPA 906.0 M
TJA-2	Americium-241	0.402 ± 3.13	4.98	2.49	NE	U	BD	091138-033	EPA 901.1
26-Sep-11	Cesium-137	0.421 ± 2.35	3.86	1.93	NE	U	BD	091138-033	EPA 901.1
	Cobalt-60	1.74 ± 2.72	4.64	2.32	NE	U	BD	091138-033	EPA 901.1
	Potassium-40	2.29 ± 41.6	42.3	21.2	NE	U	BD	091138-033	EPA 901.1
	Gross Alpha	0.24	NA	NA	15	NA	None	091138-034	EPA 900.0
	Gross Beta	1.95 ± 1.06	1.65	0.801	4mrem/yr		J	091138-034	EPA 900.0
	Tritium	-40.4 ± 83.7	165	74.3	NE	U	BD	091138-036	EPA 906.0 M
TJA-3	Americium-241	14.0 ± 9.94	14.0	5.93	NE	U	BD	091114-033	EPA 901.1
08-Sep-11	Cesium-137	0.0717 ± 1.83	3.03	1.52	NE	U	BD	091114-033	EPA 901.1
	Cobalt-60	0.689 ± 2.04	3.46	1.73	NE	U	BD	091114-033	EPA 901.1
	Potassium-40	2.42 ± 47.1	32.9	16.4	NE	U	BD	091114-033	EPA 901.1
	Gross Alpha	1.33	NA	NA	15	NA	None	091114-034	EPA 900.0
	Gross Beta	1.80 ± 0.917	1.35	0.642	4mrem/yr		J	091114-034	EPA 900.0
	Tritium	-32.2 ± 75.3	142	65.6	NE	U	BD	091114-036	EPA 906.0 M
TJA-4	Americium-241	-3.8 ± 7.59	7.58	3.79	NE	U	BD	091140-033	EPA 901.1
27-Sep-11	Cesium-137	0.422 ± 2.75	2.80	1.40	NE	U	BD	091140-033	EPA 901.1
	Cobalt-60	2.32 ± 1.88	2.92	1.46	NE	U	BD	091140-033	EPA 901.1
	Potassium-40	6.77 ± 36.2	26.8	13.4	NE	U	BD	091140-033	EPA 901.1
	Gross Alpha	3.90	NA	NA	15	NA	None	091140-034	EPA 900.0
	Gross Beta	4.22 ± 1.25	1.55	0.749	4mrem/yr		J	091140-034	EPA 900.0
	Tritium	-58 ± 83.8	169	76.3	NE	U	BD	091140-036	EPA 906.0 M
TJA-6	Americium-241	14.8 ± 20.8	29.1	14.6	NE	U	BD	091126-033	EPA 901.1
15-Sep-11	Cesium-137	0.888 ± 2.13	3.63	1.82	NE	U	BD	091126-033	EPA 901.1
	Cobalt-60	1.39 ± 2.30	3.92	1.96	NE	U	BD	091126-033	EPA 901.1
	Potassium-40	5.97 ± 45.2	33.7	16.8	NE	U	BD	091126-033	EPA 901.1
	Gross Alpha	2.01	NA	NA	15	NA	None	091126-034	EPA 900.0
	Gross Beta	0.930 ± 0.980	1.61	0.772	4mrem/yr	U	BD	091126-034	EPA 900.0
	Tritium	76.3 ± 82.3	134	59.1	NE	U	BD	091126-036	EPA 906.0 M

Refer to footnotes on page 6A-47.

Table 6A-6 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-6 (Duplicate)	Americium-241	-6.73 ± 11.1	18.2	9.08	NE	U	BD	091127-033	EPA 901.1
15-Sep-11	Cesium-137	0.613 ± 2.05	3.47	1.74	NE	U	BD	091127-033	EPA 901.1
	Cobalt-60	-0.799 ± 2.13	3.38	1.69	NE	U	BD	091127-033	EPA 901.1
	Potassium-40	-39.2 ± 46.8	52.0	26.0	NE	U	BD	091127-033	EPA 901.1
	Gross Alpha	1.65	NA	NA	15	NA	None	091127-034	EPA 900.0
	Gross Beta	2.61 ± 1.36	1.99	0.957	4mrem/yr		J	091127-034	EPA 900.0
	Tritium	-79.7 ± 79.4	166	74.9	NE	U	BD	091127-036	EPA 906.0 M
TJA-7	Americium-241	-0.236 ± 2.81	4.17	2.09	NE	U	BD	091144-033	EPA 901.1
28-Sep-11	Cesium-137	0.0455 ± 5.12	3.32	1.66	NE	U	BD	091144-033	EPA 901.1
	Cobalt-60	0.429 ± 1.99	3.39	1.70	NE	U	BD	091144-033	EPA 901.1
	Potassium-40	73.8 ± 41.7	73.9	24.0	NE	U	BD	091144-033	EPA 901.1
	Gross Alpha	1.51	NA	NA	15	NA	None	091144-034	EPA 900.0
	Gross Beta	1.54 ± 0.764	1.14	0.545	4mrem/yr		J	091144-034	EPA 900.0
	Tritium	-51.3 ± 81.7	163	73.7	NE	U	BD	091144-036	EPA 906.0 M
WYO-3	Americium-241	1.12 ± 6.30	9.16	4.58	NE	U	BD	091117-033	EPA 901.1
12-Sep-11	Cesium-137	-1.4 ± 1.90	2.87	1.44	NE	U	BD	091117-033	EPA 901.1
	Cobalt-60	1.05 ± 1.88	3.13	1.57	NE	U	BD	091117-033	EPA 901.1
	Potassium-40	29.0 ± 42.7	25.3	12.6	NE	X	R	091117-033	EPA 901.1
	Gross Alpha	0.51	NA	NA	15	NA	None	091117-034	EPA 900.0
	Gross Beta	2.48 ± 1.03	1.46	0.700	4mrem/yr		J	091117-034	EPA 900.0
	Tritium	-14.1 ± 75.0	138	64.0	NE	U	BD	091117-036	EPA 906.0 M
WYO-4	Americium-241	2.40 ± 6.41	9.34	4.67	NE	U	BD	091142-033	EPA 901.1
19-Sep-11	Cesium-137	1.23 ± 1.60	2.66	1.33	NE	U	BD	091142-033	EPA 901.1
	Cobalt-60	-0.32 ± 2.46	2.97	1.49	NE	U	BD	091142-033	EPA 901.1
	Potassium-40	20.1 ± 29.9	24.3	12.2	NE	U	BD	091142-033	EPA 901.1
	Gross Alpha	0.87	NA	NA	15	NA	None	091142-034	EPA 900.0
	Gross Beta	4.15 ± 1.62	2.31	1.13	4mrem/yr		J	091142-034	EPA 900.0
	Tritium	-12.9 ± 87.2	165	74.5	NE	U	BD	091142-036	EPA 906.0 M

Refer to footnotes on page 6A-47.

Table 6A-7
Summary of Field Water Quality Measurements[h], Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% SAT)	Dissolved Oxygen (mg/L)
TA2-SW1-320	18-Feb-11	15.57	458	389.7	7.73	4.89	79.7	7.93
TA2-W-01	22-Feb-11	18.40	574	397.7	7.62	0.26	83.9	7.88
TA2-W-19	24-Feb-11	17.03	533	404.6	7.61	0.24	89.1	8.58
TA2-W-26	23-Feb-11	17.35	1145	404.3	7.46	0.46	80.6	7.71
TA2-W-27	17-Feb-11	18.28	760	400.4	7.53	0.47	88.7	8.37
TJA-2	28-Feb-11	16.36	536	406.0	7.62	0.28	81.5	7.97
TJA-3	21-Feb-11	18.47	457	408.8	7.48	0.49	73.9	6.92
TJA-4	25-Feb-11	17.92	508	406.3	7.54	0.24	52.7	5.12
TJA-6	16-Feb-11	18.61	428	405.2	7.49	4.30	61.4	5.74
TJA-7	03-Mar-11	19.20	478	397.8	7.60	2.43	86.4	7.96
WYO-4	02-Mar-11	15.97	578	395.4	7.74	0.29	83.4	8.24
TA2-SW1-320	12-May-11	16.18	456	387.7	7.70	10.5	79.8	7.84
TA2-W-19	17-May-11	17.88	528	389.2	7.62	0.47	87.4	8.29
TA2-W-26	16-May-11	19.50	1143	375.6	7.47	0.88	80.9	7.45
TJA-2	19-May-11	15.51	530	393.2	7.60	0.29	84.2	8.38
TJA-4	18-May-11	19.56	506	388.6	7.55	0.32	56.8	5.20
TJA-7	24-May-11	19.61	474	394.3	7.58	1.87	86.5	7.92
WYO-4	23-May-11	20.17	583	384.2	7.67	0.30	85.6	7.74
PGS-2	23-Aug-11	22.08	558	360.4	7.70	0.42	14.9	1.29
TA1-W-01	24-Aug-11	22.55	550	390.6	7.19	0.44	68.6	5.89
TA1-W-02	26-Aug-11	20.93	532	395.7	7.24	0.77	60.0	5.29
TA1-W-03	29-Aug-11	19.51	1796	402.2	7.21	0.24	87.6	7.99
TA1-W-04	30-Aug-11	21.53	584	397.8	7.22	0.72	66.6	5.82
TA1-W-05	31-Aug-11	21.45	620	406.8	7.03	0.17	82.5	7.27
TA1-W-06	06-Sep-11	19.67	912	393.8	7.40	3.56	83.7	7.65
TA1-W-08	07-Sep-11	19.37	2076	401.8	7.20	0.67	81.6	7.46
TA2-NW1-595	13-Sep-11	19.81	821	401.8	7.23	0.28	83.2	7.57
TA2-SW1-320	22-Aug-11	19.81	537	372.4	7.54	6.41	85.0	7.75
TA2-W-01	20-Sep-11	20.81	667	390.0	7.43	0.32	88.2	7.82
TA2-W-19	21-Sep-11	17.68	616	392.4	7.46	0.37	90.6	8.53
TA2-W-26	22-Sep-11	17.92	1351	399.1	7.29	2.42	80.5	7.60

Refer to footnotes on page 6A-47.

Table 6A-7 *(Concluded)*
Summary of Field Water Quality Measurements[h], Tijeras Arroyo Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% SAT)	Dissolved Oxygen (mg/L)
TA2-W-27	14-Sep-11	19.63	874	393.5	7.30	0.39	87.0	7.93
TJA-2	26-Sep-11	19.23	620	395.7	7.42	0.44	89.7	8.25
TJA-3	08-Sep-11	20.30	528	400.4	7.30	0.25	75.4	6.80
TJA-4	27-Sep-11	19.23	593	397.4	7.35	0.45	55.4	5.08
TJA-6	15-Sep-11	20.22	496	391.5	7.33	4.38	59.7	5.41
TJA-7	28-Sep-11	19.50	548	390.0	7.38	1.70	86.8	7.91
WYO-3	12-Sep-11	17.91	477	358.1	7.74	0.72	72.5	6.81
WYO-4	19-Sep-11	16.71	677	365.7	7.65	0.91	81.5	7.91
TA2-SW1-320	12-Dec-11	13.90	541	385.7	7.33	16.7	75.8	7.82
TA2-W-19	13-Dec-11	15.43	620	396.6	7.25	1.81	80.3	8.01
TA2-W-26	07-Dec-11	15.61	1360	391.6	7.36	3.00	75.4	7.44
TJA-2	15-Dec-11	13.98	618	386.9	7.43	0.56	76.0	7.78
TJA-4	14-Dec-11	15.60	590	390.2	7.30	0.48	50.7	5.04
TJA-7	20-Dec-11	15.30	551	382.9	7.39	1.74	77.1	7.71
WYO-4	19-Dec-11	14.07	676	369.8	7.71	0.58	75.0	7.71

Refer to footnotes on page 6A-47.

Footnotes for Tijeras Arroyo Groundwater Investigation Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- µg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Drinking Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems: 15 pCi/L = Gross alpha particle activity (including radium-226 but excluding radon and total uranium). 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B	=	Analyte is detected in associated laboratory method blank.
J	=	Amount detected is below the PQL.
NA	=	Not applicable.
U	=	Analyte is absent or below the method detection limit.
X	=	Data rejected due to peak not meeting identification criteria.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	=	Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	=	The associate value is an estimated quantity.
J+	=	The associated numerical value is an estimated quantity with suspected positive bias.
J-	=	The associated numerical value is an estimated quantity with a suspected negative bias.
None	=	No data validation for corrected gross alpha activity.
U	=	The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	=	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	=	The data are unusable. Resampling and reanalysis are necessary for verification.

Footnotes for Tijeras Arroyo Groundwater Investigation Tables *(Concluded)*

[g]Analytical Method

- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes*, EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0,* EPA-600/4-84-017.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*" EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio
- U.S. Environmental Protection Agency, Washington, D.C.; or Clesceri, Greenburg, and Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C = degrees Celsius.
% sat = percent saturation.
μmho/cm = micromhos per centimeter.
mg/L = milligrams per liter.
mV = millivolts.
NTU = nephelometric turbidity units.
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 6B
Tijeras Arroyo Groundwater
Plots

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Attachment 6B Plots

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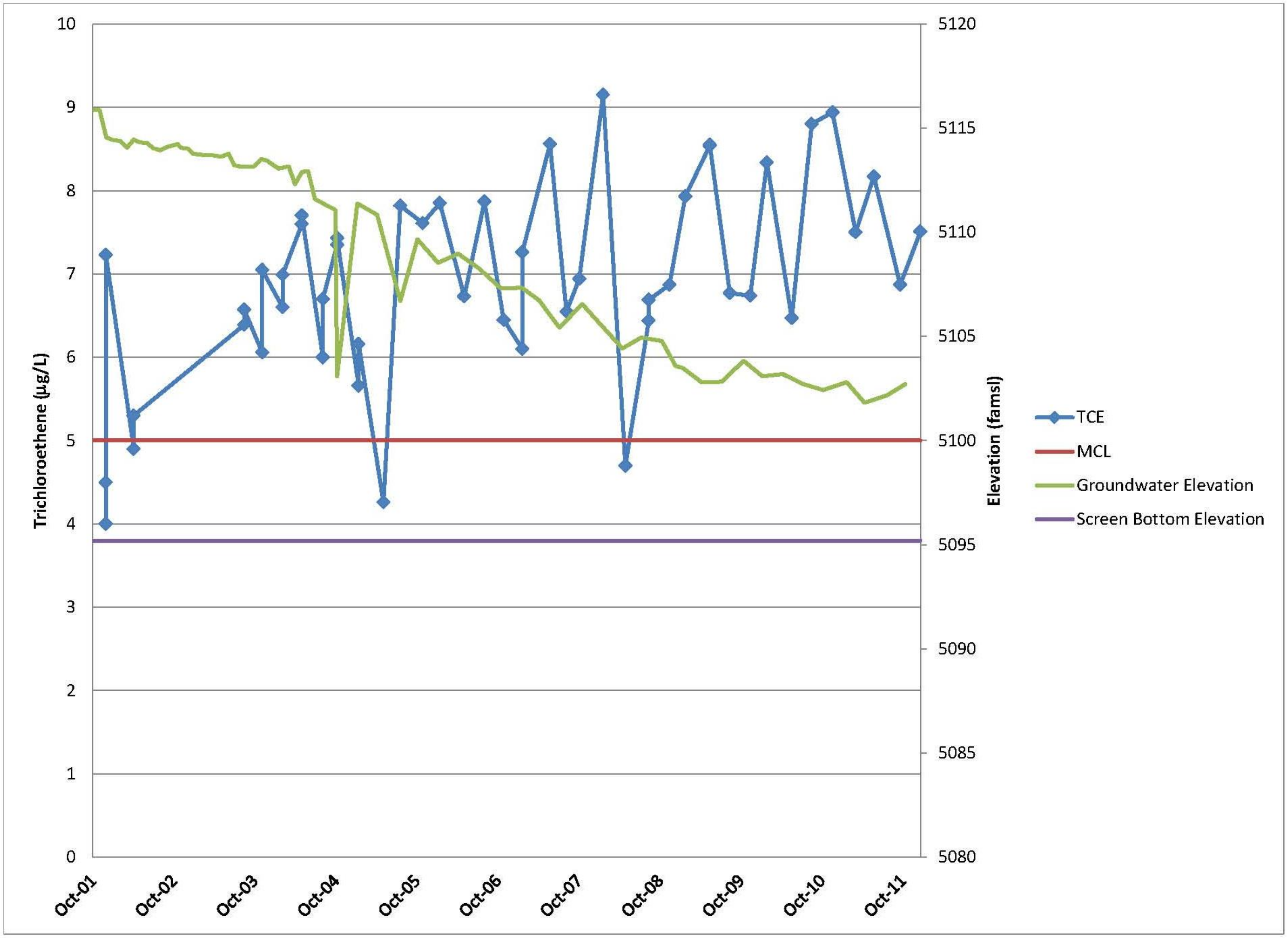

Figure 6B-1. Trichloroethene Concentrations, WYO-4

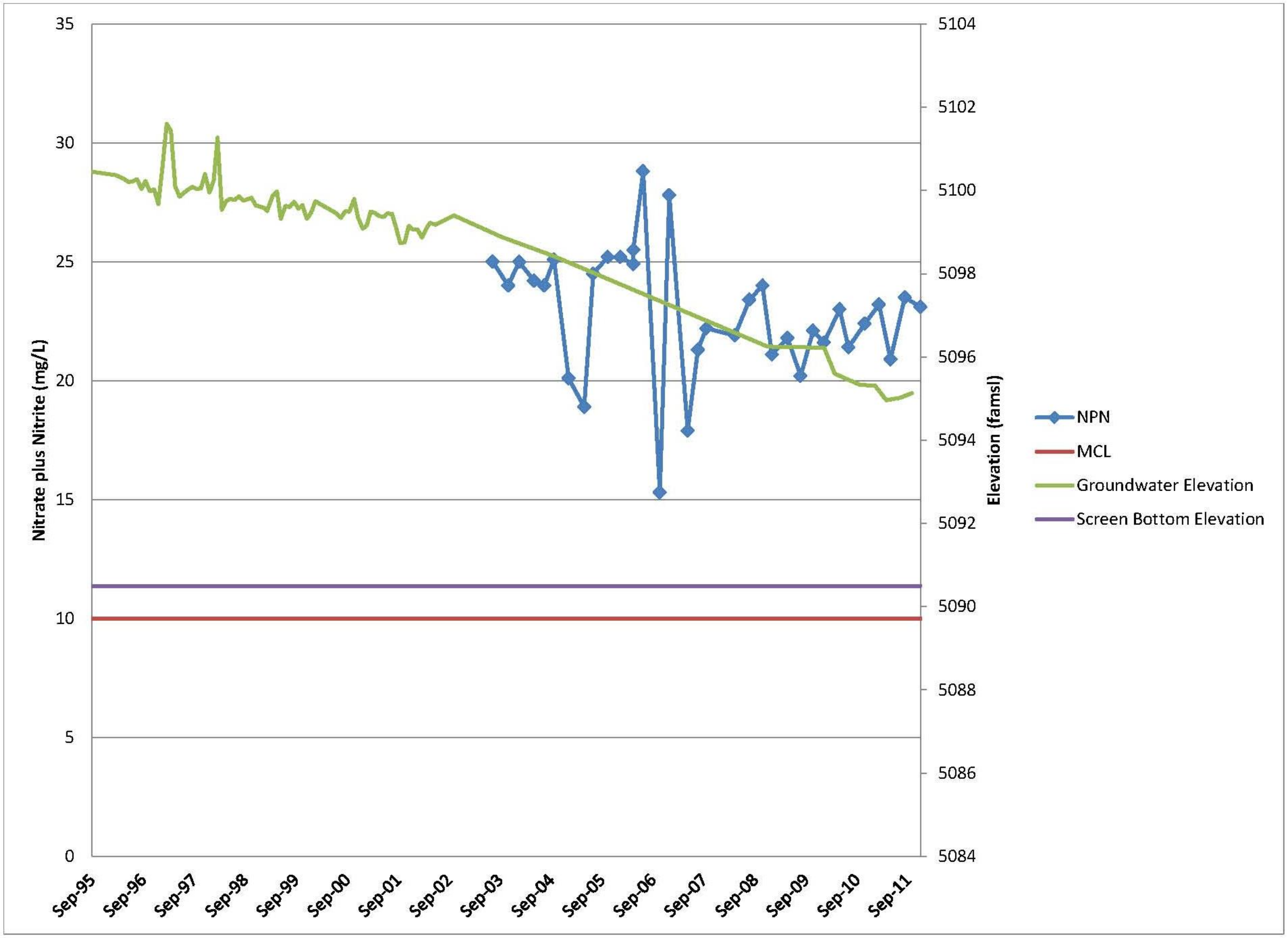

Figure 6B-2. Nitrate plus Nitrite Concentrations, TA2-SW1-320

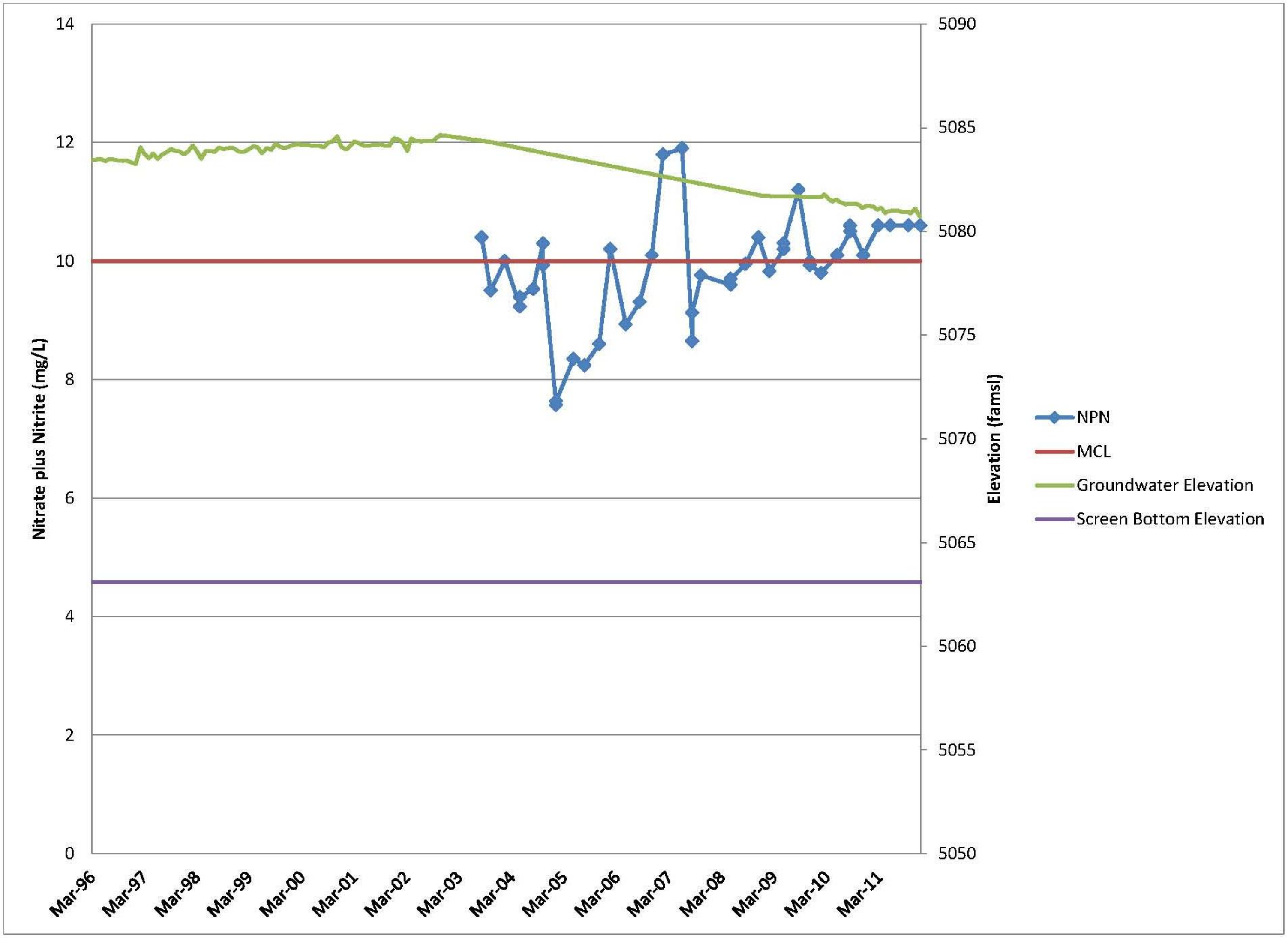

Figure 6B-3. Nitrate plus Nitrite Concentrations, TA2-W-19

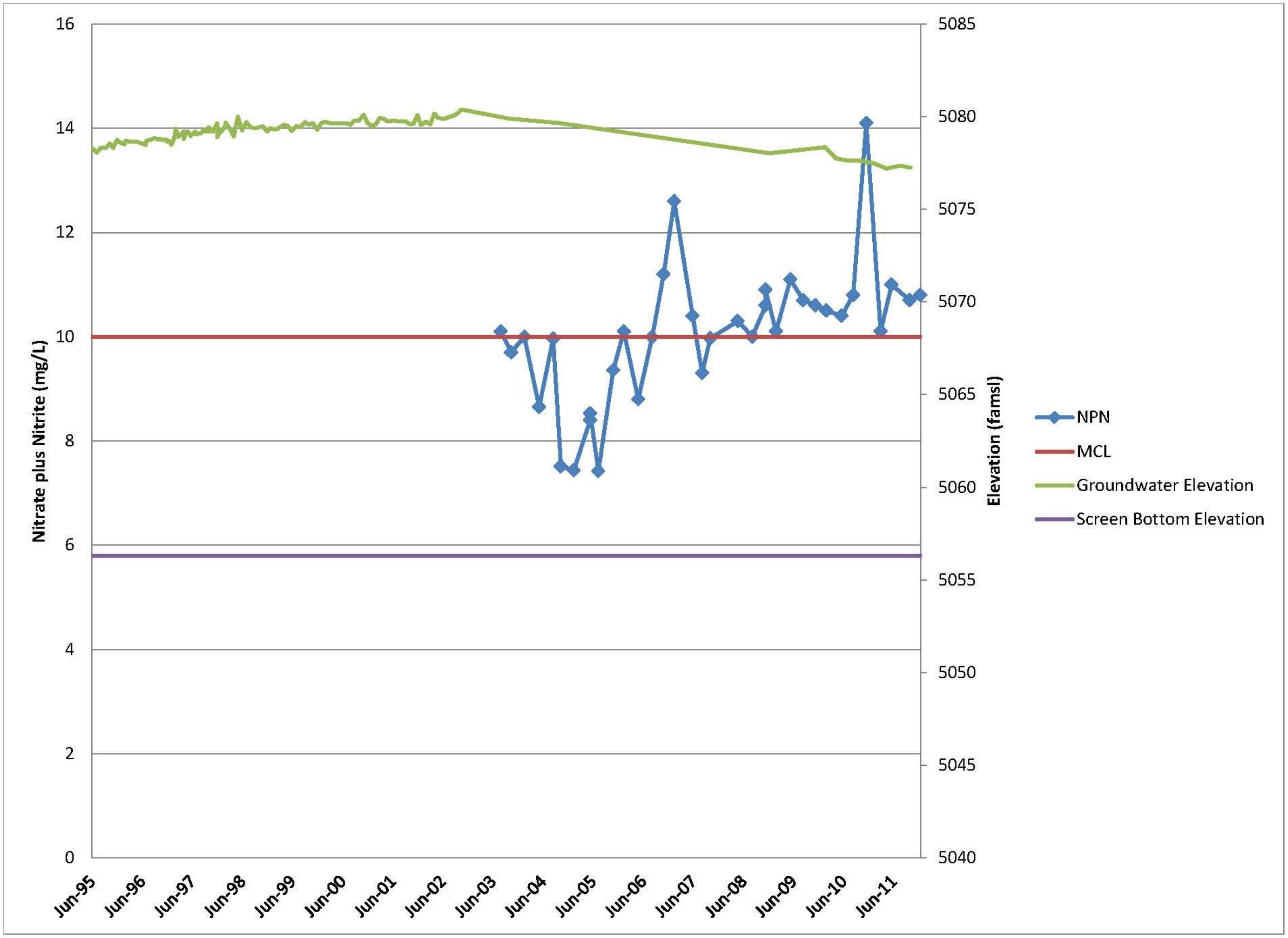

Figure 6B-4. Nitrate plus Nitrite Concentrations, TJA-2

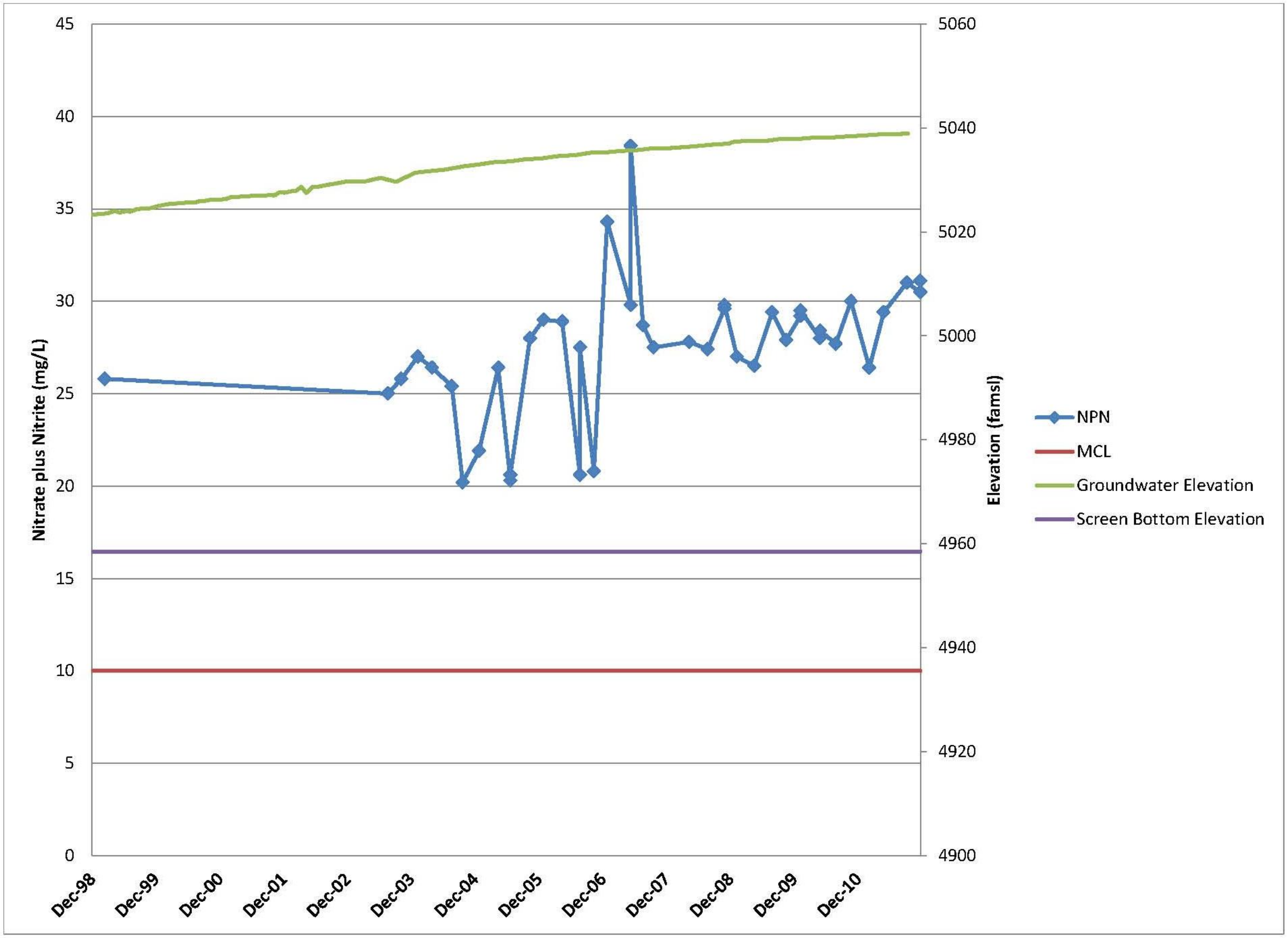

Figure 6B-5. Nitrate plus Nitrite Concentrations, TJA-4

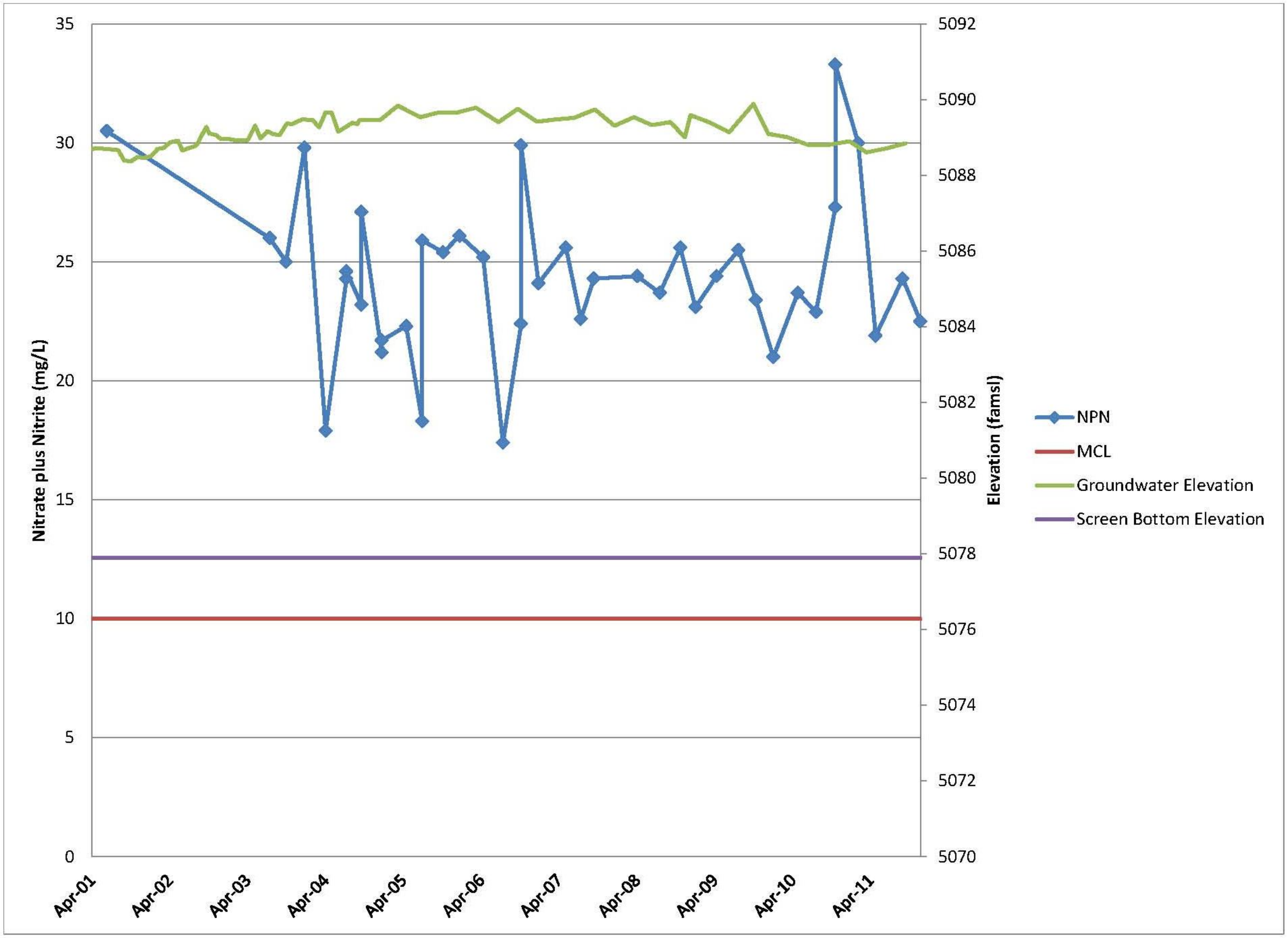

Figure 6B-6. Nitrate plus Nitrite Concentrations, TJA-7

Attachment 6C
Tijeras Arroyo Groundwater Hydrographs

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Attachment 6C Hydrographs

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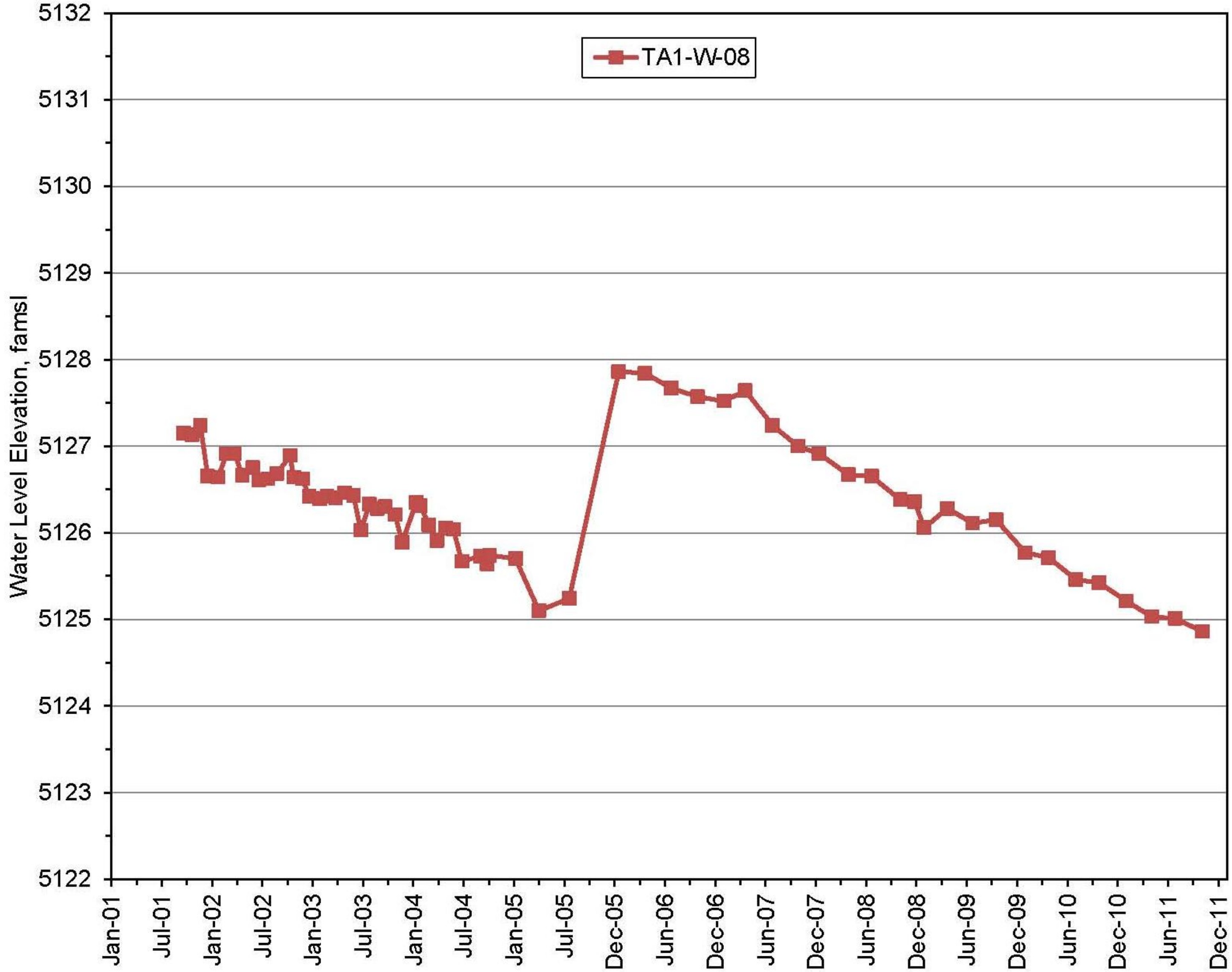

Figure 6C-1. TAG Study Area Wells – Perched Groundwater System (1 of 7)

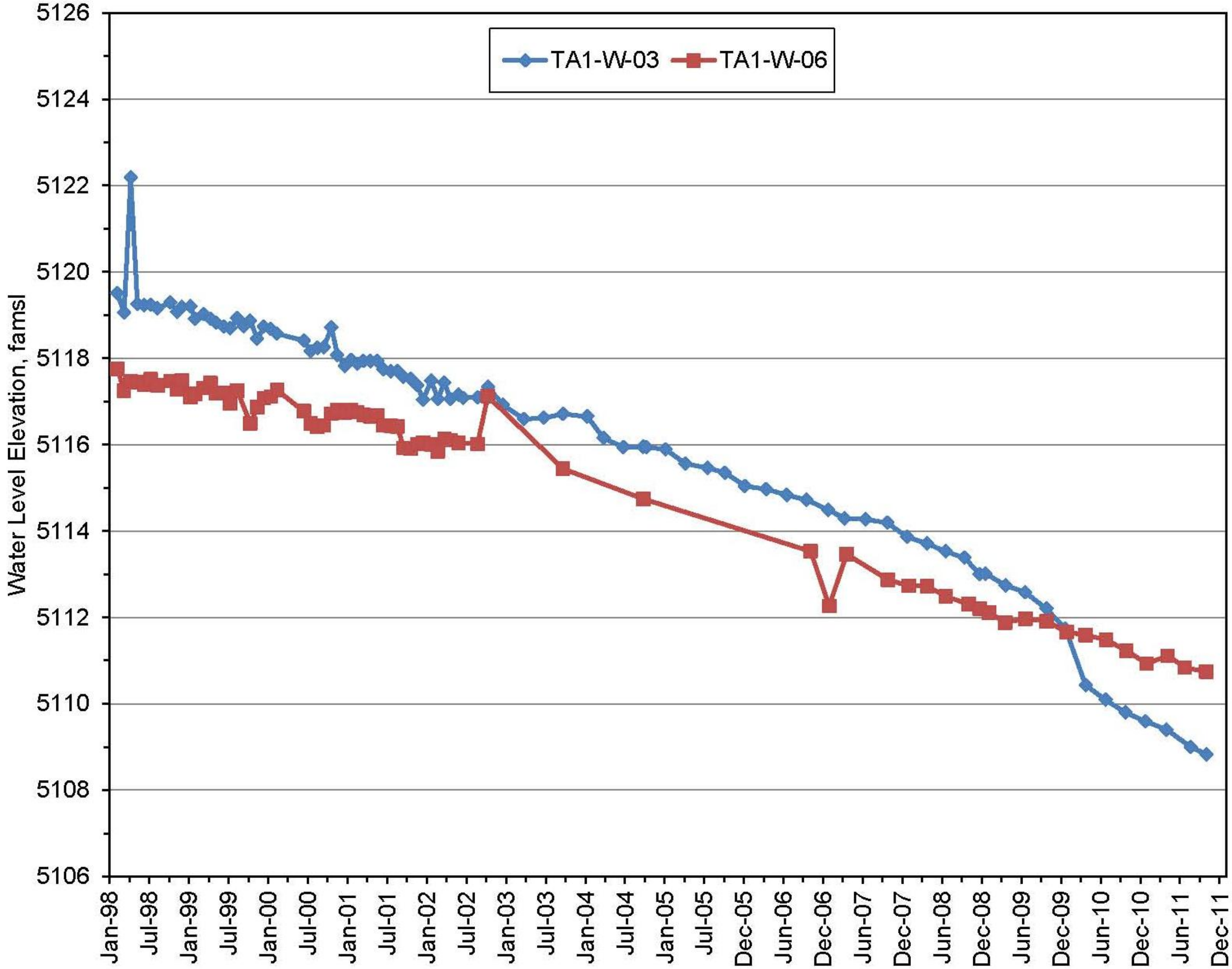

Figure 6C-2. TAG Study Area Wells – Perched Groundwater System (2 of 7)

Figure 6C-3. TAG Study Area Wells – Perched Groundwater System (3 of 7)

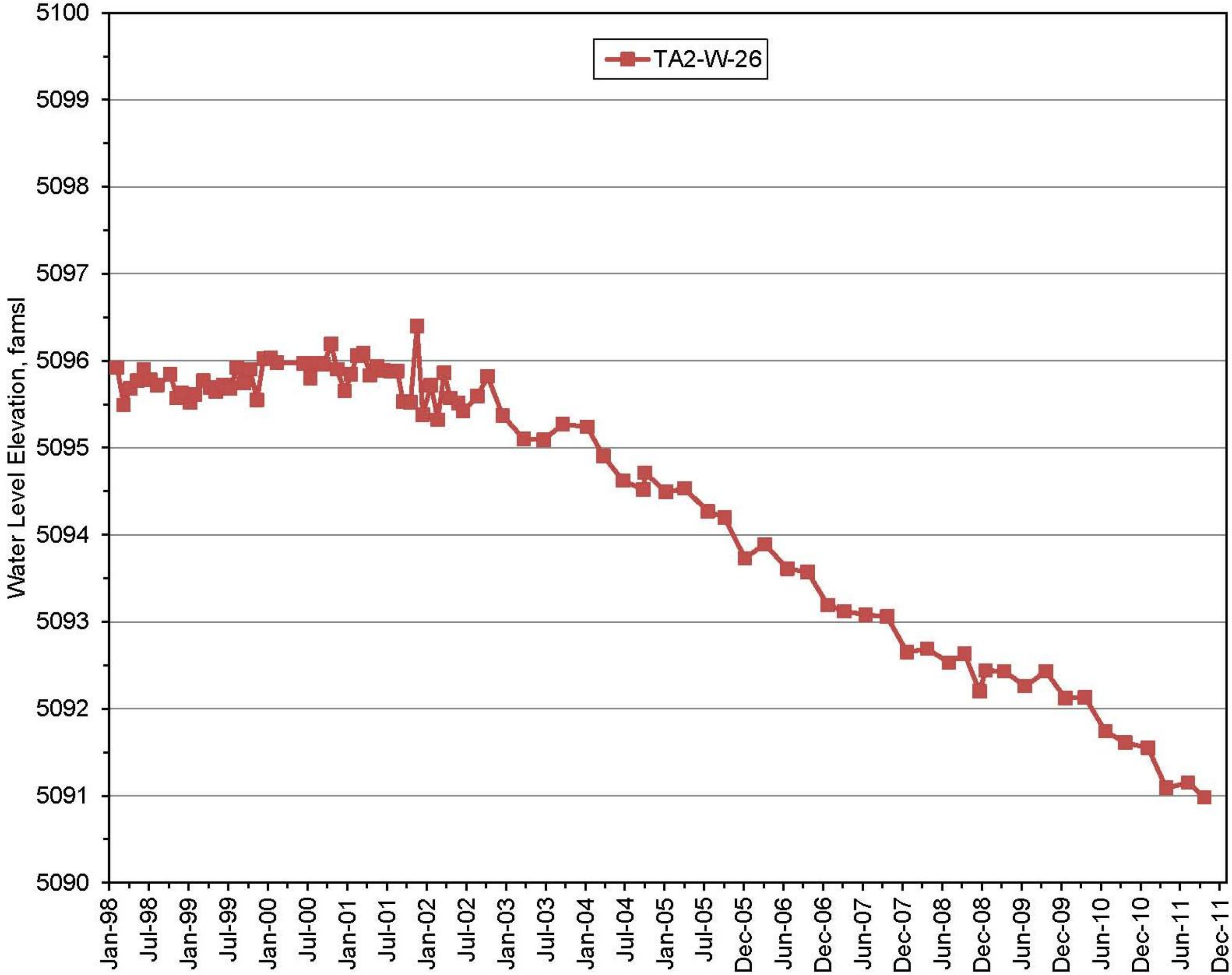

Figure 6C-4. TAG Study Area Wells – Perched Groundwater System (4 of 7)

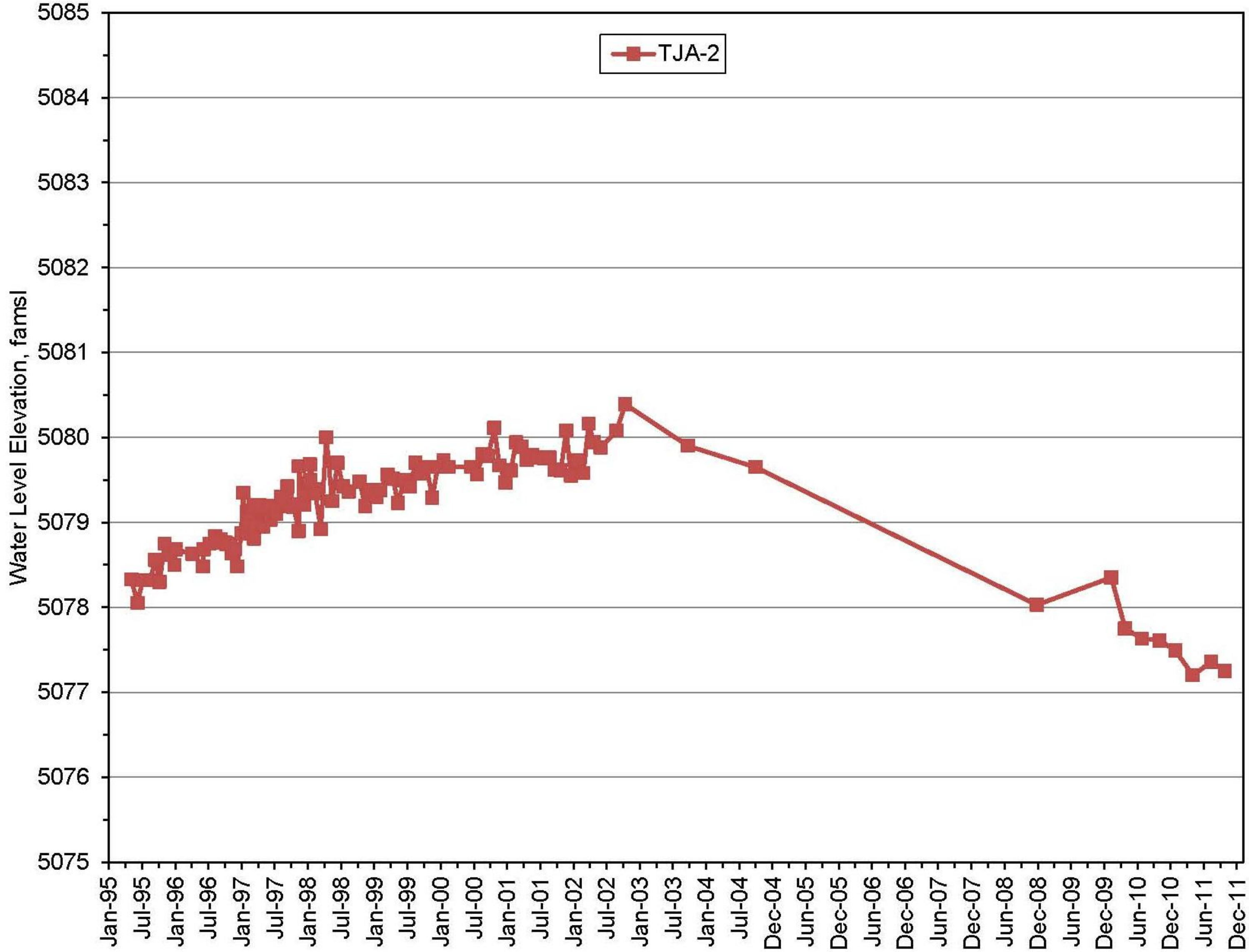

Figure 6C-5. TAG Study Area Wells – Perched Groundwater System (5 of 7)

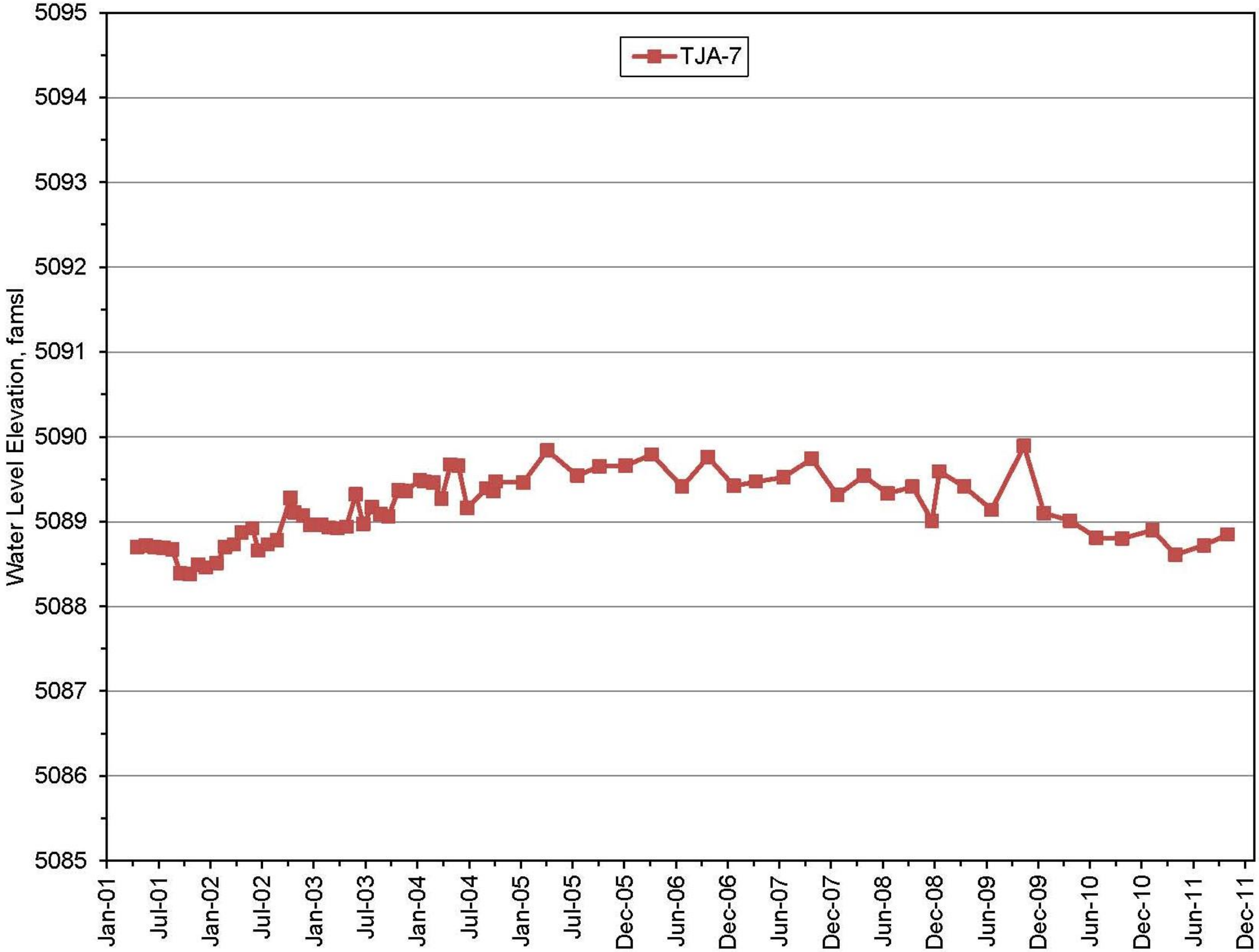

Figure 6C-6. TAG Study Area Wells – Perched Groundwater System (6 of 7)

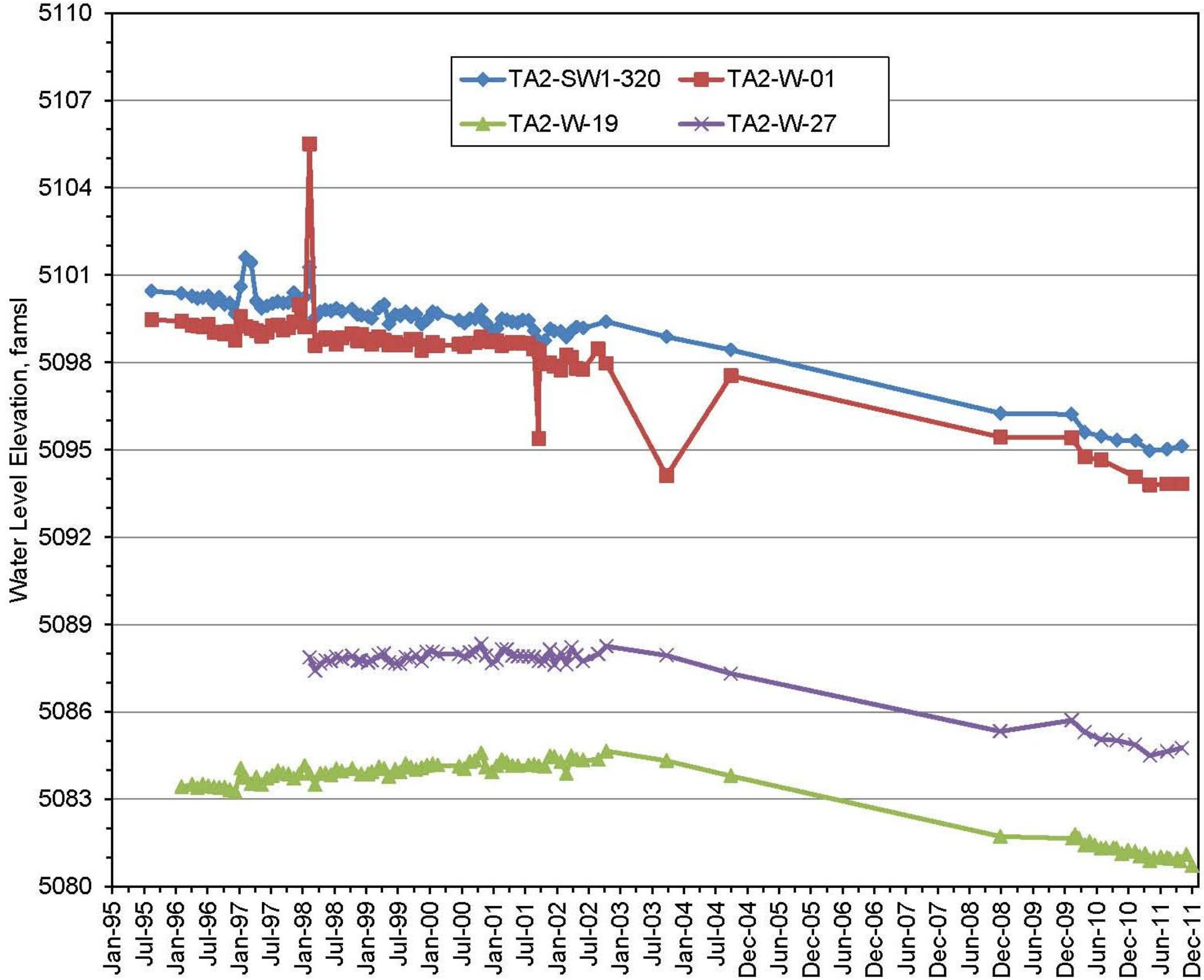

Figure 6C-7. TAG Study Area Wells – Perched Groundwater System (7 of 7)

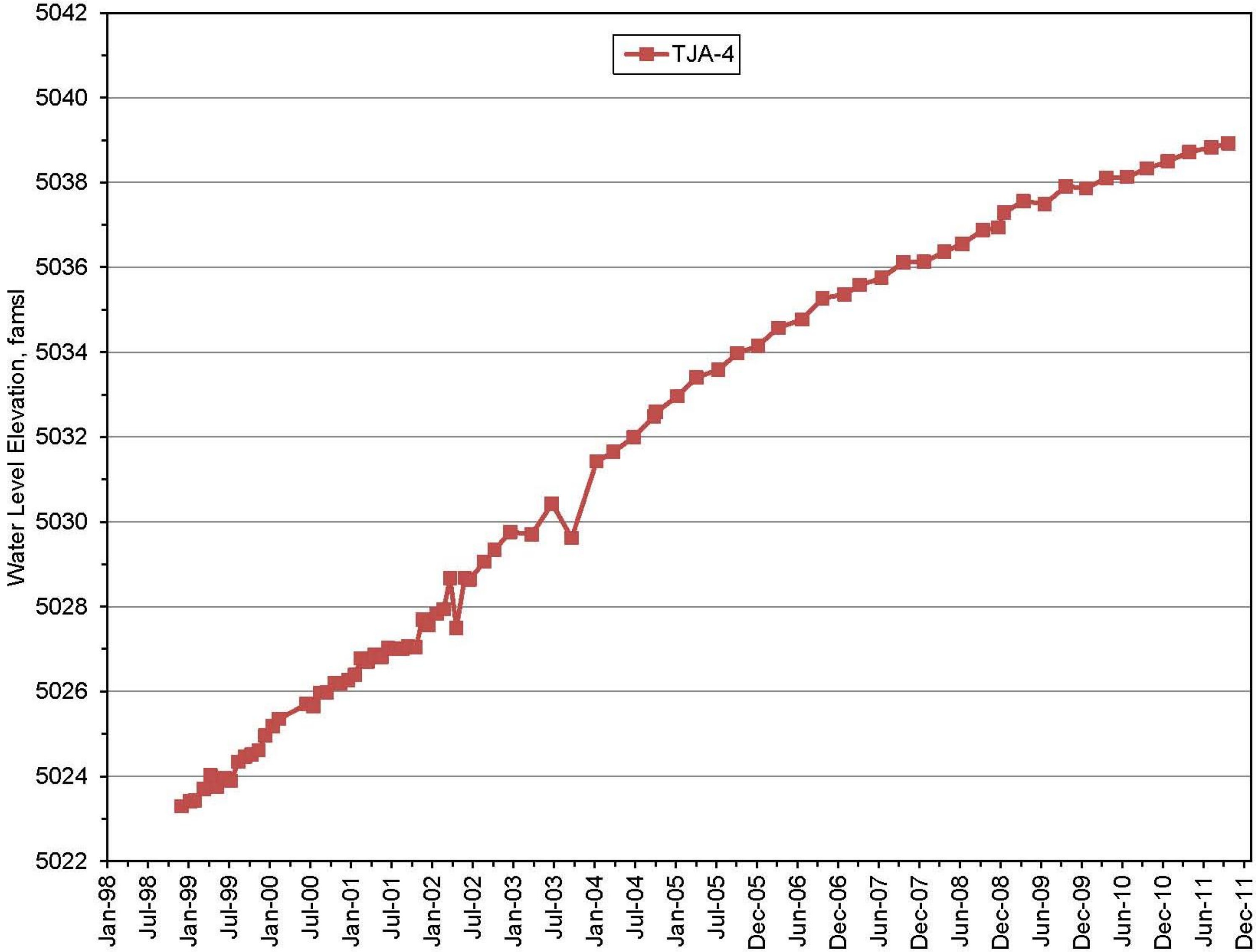

Figure 6C-8. TAG Study Area Wells – Regional Aquifer (1 of 5)

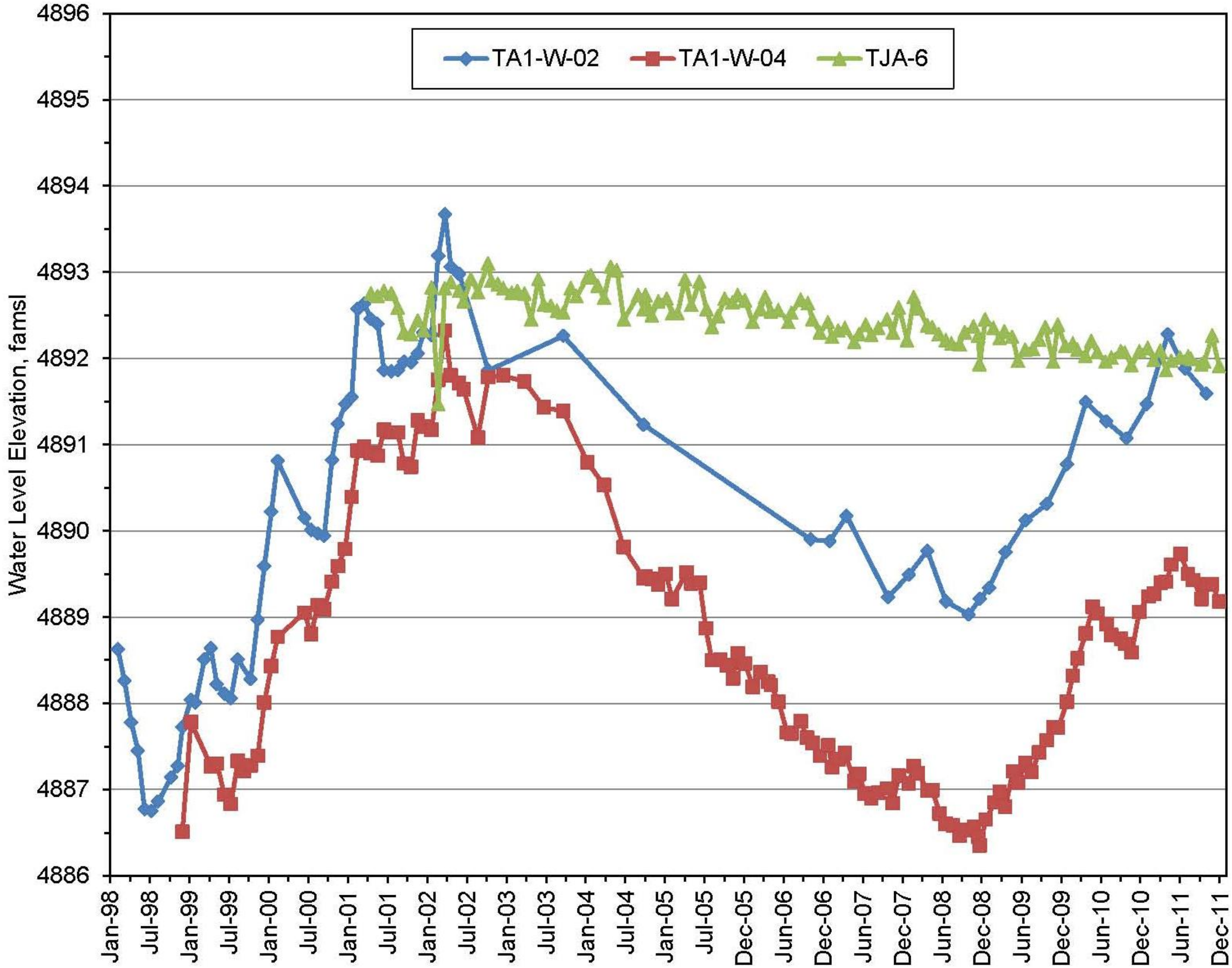

Figure 6C-9. TAG Study Area Wells – Regional Aquifer (2 of 5)

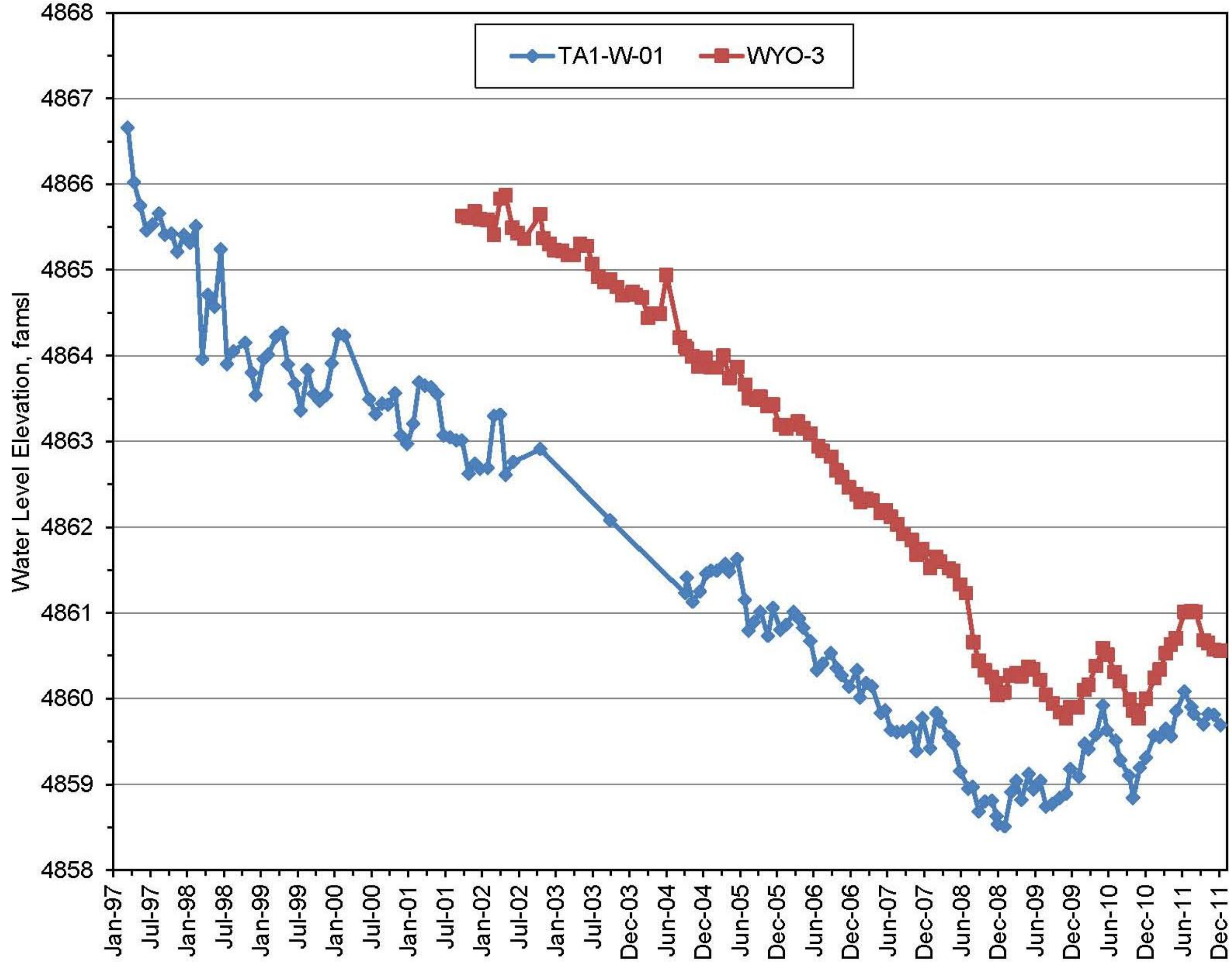

Figure 6C-10. TAG Study Area Wells – Regional Aquifer (3 of 5)

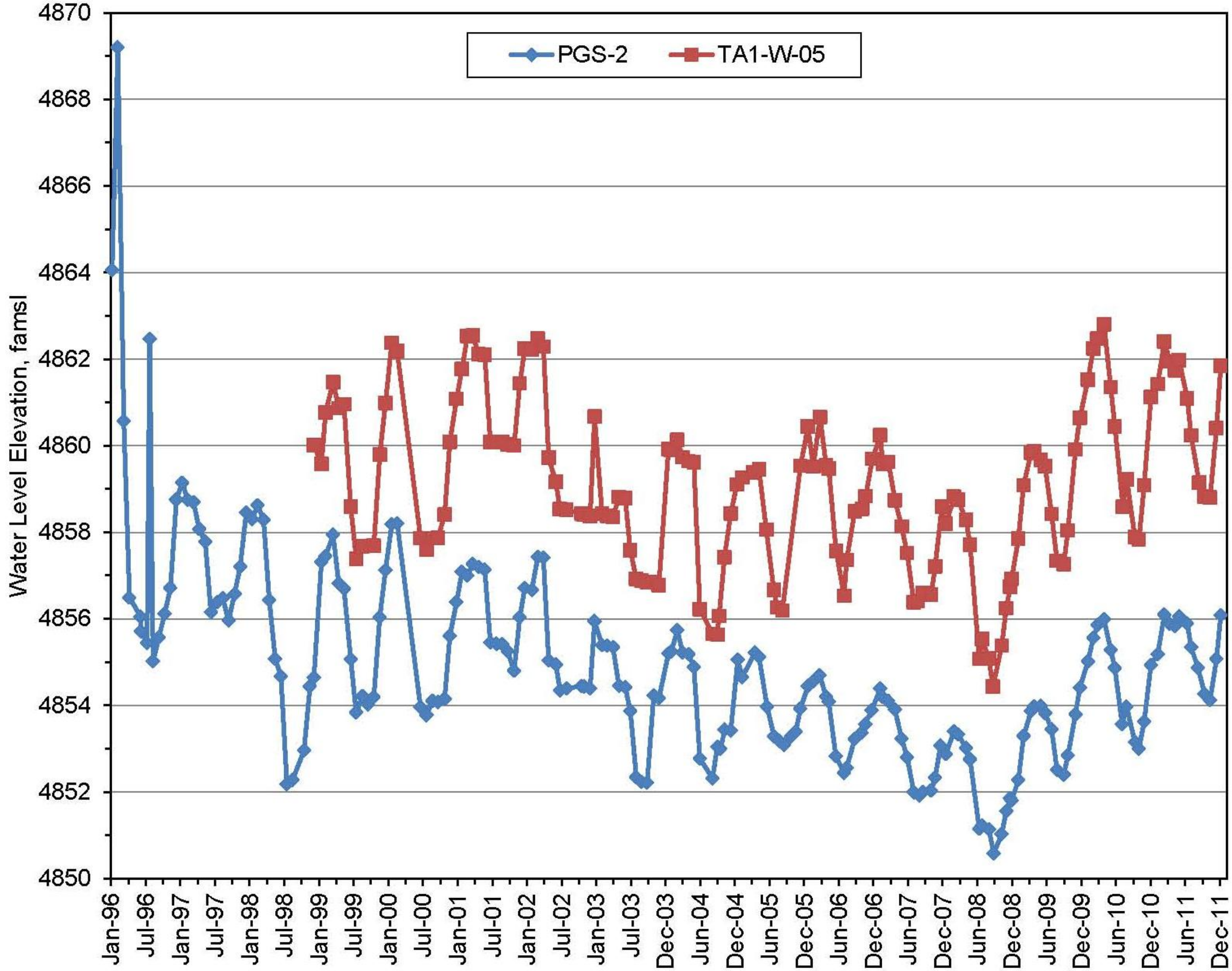

Figure 6C-11. TAG Study Area Wells – Regional Aquifer (4 of 5)

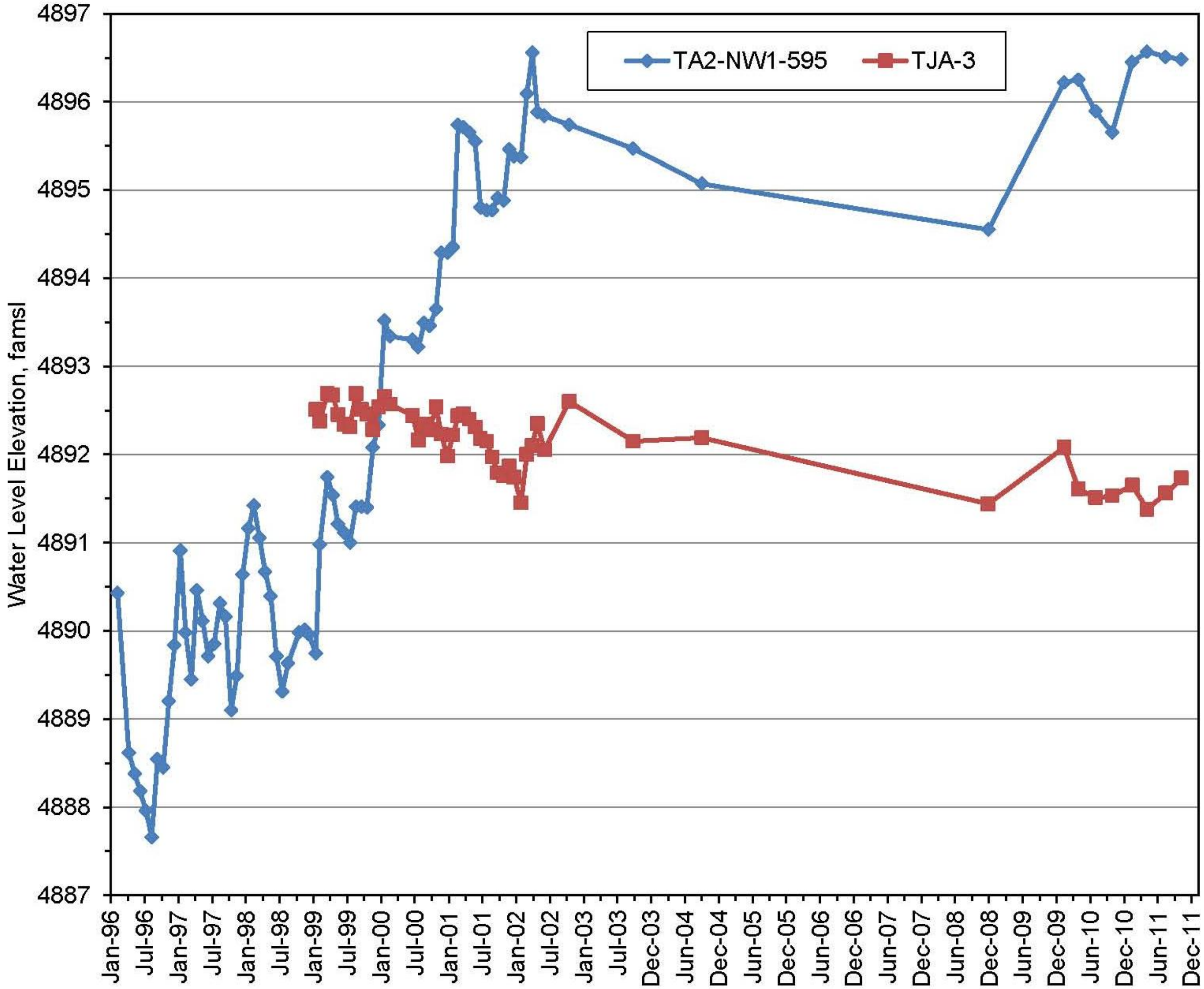

Figure 6C-12. TAG Study Area Wells – Regional Aquifer (5 of 5)

7.0 Burn Site Groundwater Study Area

7.1 Introduction

Unique features of the Burn Site Groundwater (BSG) study area, located in the Manzanita Mountains (Figure 7-1), include low concentrations of nitrate in a fractured bedrock aquifer. Nitrate has been identified as a constituent of concern (COC) in groundwater at the study area based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) in samples collected from monitoring wells. Since August 1998, the maximum concentration of nitrate detected in the study area has been 39.9 milligrams per liter (mg/L). The EPA MCL and State of New Mexico drinking water standard for nitrate is 10 mg/L (as nitrogen).

Perchlorate has been detected in one groundwater monitoring well in the BSG study area. Currently there is no EPA MCL or State of New Mexico drinking water standard for perchlorate. However, Section IV.B of the Compliance Order on Consent (the Order), between the New Mexico Environment Department (NMED), the U.S. Department of Energy (DOE), and Sandia Corporation (Sandia) stipulates that a select group of groundwater monitoring wells be sampled for perchlorate using a screening level/method detection limit (MDL) of 4 micrograms per liter (µg/L) (NMED April 2004). Furthermore, the Order requires that for detections equal to or greater than 4 µg/L, DOE/Sandia will evaluate the nature and extent of perchlorate contamination. Since March 2006, the maximum concentration of perchlorate in the study area has been 8.93 µg/L.

7.1.1 Location

Sandia National Laboratories, New Mexico (SNL/NM) manages the Coyote Canyon Test Area in the eastern portion of Kirtland Air Force Base (KAFB). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the DOE, National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia, a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

The Burn Site is located in Lurance Canyon, one of three canyons that are located on the eastern edge of the Coyote Canyon Test Area and within the Manzanita Mountains. Two other canyons, Madera Canyon and Sol se Mete Canyon, intersect Lurance Canyon to the west of the Burn Site. These three canyons are the headwaters of Arroyo del Coyote. Testing activities at the Lurance Canyon Burn Facility, which includes the Burn Site, began in 1967.

The BSG study area is located along the eastern margin of the Albuquerque Basin, and the terrain is characterized by large topographic relief, exceeding 500 feet (ft). Lurance Canyon, deeply incised into Paleozoic and Precambrian rocks, provides local westward drainage of ephemeral surface-water flows to Arroyo del Coyote.

7.1.2 Site History

The Lurance Canyon Burn Site (Solid Waste Management Unit [SWMU] 94) and the nearby Lurance Canyon Explosive Test Site (SWMU 65) have been used since 1967. Most research has involved testing the fire survivability of transportation containers, weapon components, simulated weapons, and satellite components. Historical operations also include open detonation of high explosive (HE) compounds (Table 7-1) and the open burning of HE compounds, liquid propellants, and solid propellants. Most HE compound testing occurred between 1967 and 1975 and was completely phased out by the 1980s.

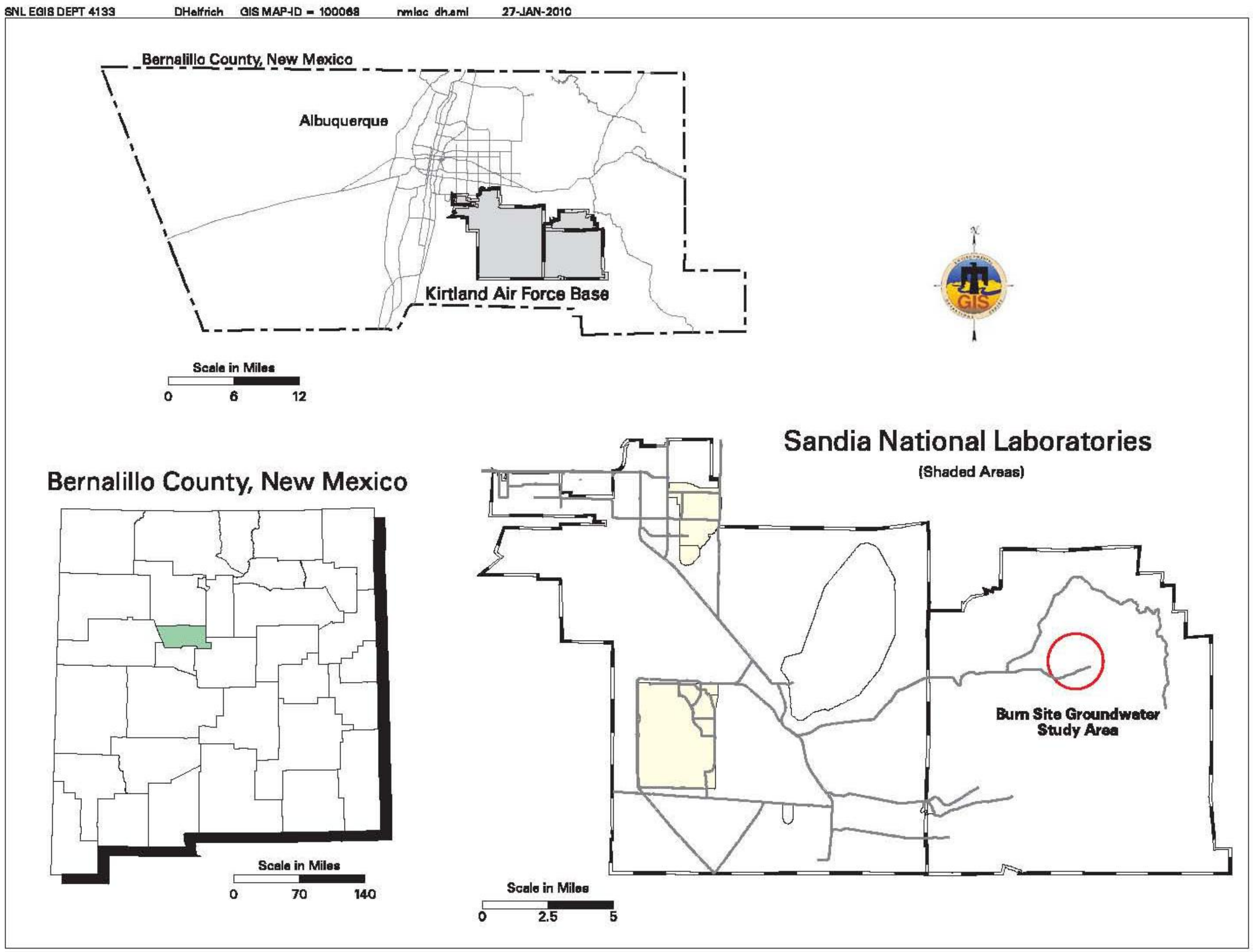

Figure 7-1. Location of the Burn Site Groundwater Study Area

Table 7-1. Historical Timeline of the Burn Site Groundwater Study Area

Month	Year	Event	Reference
	1967-early 1980s	HE testing at 18 SWMUs conducted within the BSG study area until early 1980s. Burn testing began in 1970s using excavation pits and portable burn pans with JP-4. Wastewater discharged into unlined pits. Nitrate and diesel range organics identified as potential COCs.	SNL November 2001
February	1998	Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report containing description of BSG hydrogeology submitted.	SNL February 1998
	1996	Burn Site Well showed elevated nitrate levels (25 mg/L).	SNL January 2005
July	1997	NMED/DOE/OB and SNL/NM ER Project agree on installation of deep and shallow monitoring wells and one year of quarterly sampling.	SNL July 1997
November	1997	Monitoring well CYN-MW1D and piezometers CYN-MW2S and 12AUP-01 installed.	SNL June 1998
March	1999	GWPP Fiscal Year 1998 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 1999
June	1999	Monitoring wells CYN-MW3 and CYN-MW4 installed.	SNL November 2001
	Various (e.g., 1994)	BSG study area SWMUs 94 and 65 proposed and approved for NFA/CAC.	Numerous references, for example: SNL February 2004
March	2000	GWPP Fiscal Year 1999 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2000
April	2001	GWPP Fiscal Year 2000 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL April 2001
November	2001	Comprehensive BSG Investigation Report documenting hydrogeologic characteristics of the study area prepared.	SNL November 2001
March	2002	GWPP Fiscal Year 2001 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2002
March	2003	GWPP Fiscal Year 2002 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2003
June	2003	Further refinements of the hydrogeologic setting of the BSG study area are presented.	Van Hart June 2003
March	2004	GWPP Fiscal Year 2003 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2004
April	2004	Compliance Order on Consent lists BSG as an Area of Concern that requires a CME.	NMED April 2004
June	2004	A revised conceptual site model of the BSG study area prepared.	SNL June 2004a
June	2004	A CME work plan for the BSG study area prepared.	SNL June 2004b
January	2005	Nitrate source evaluation of deep soil in the BSG study area performed.	SNL January 2005
February	2005	NMED requires additional site characterization and the preparation of an Interim Measures Work Plan.	NMED February 2005
May	2005	BSG Interim Measures Work Plan submitted.	SNL May 2005
July	2005	NMED requires supplemental information for the Interim Measures Work Plan.	NMED July 2005
August	2005	Response for RSI is submitted to NMED.	SNL August 2005
October	2005	GWPP Fiscal Year 2004 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL October 2005
October	2006	CYN-MW6, CYN-MW7, and CYN-MW8 installed.	SNL October 2006

Table 7-1. Historical Timeline of the Burn Site Groundwater Study Area *(Concluded)*

Month	Year	Event	Reference
March	2007	GWPP Fiscal Year 2006 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2007
April	2008	BSG Current Conceptual Site Model resubmitted.	SNL April 2008a
April	2008	BSG CME Work Plan resubmitted.	SNL April 2008b
March	2008	GWPP Fiscal Year 2007 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2008
April	2009	NMED requires supplemental characterization of soil and groundwater in the BSG study area.	NMED April 2009
November	2009	BSG Characterization Work Plan submitted.	SNL November 2009a
June	2009	GWPP Calendar Year 2008 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL June 2009a
February	2010	Received notice of conditional approval for the November 2009 BSG Characterization Work Plan.	NMED February 2010
July	2010	Completed subsurface soil sampling at 10 deep soil boring locations to determine contaminant sources.	SNL November 2009a
July	2010	Installed four groundwater monitoring wells to determine extent of groundwater contamination.	SNL November 2009a
September	2010	An extension request for the BSG CME Report submitted.	SNL September 2010
September	2010	Initial sampling at groundwater monitoring wells CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12.	SNL August 2010
October	2010	Received approval of a time extension for submittal of the BSG CME Report.	NMED October 2010
October	2010	GWPP Calendar Year 2009 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL October 2010
August	2011	Received approval of the March 2008 Corrective Measures Evaluation Work Plan, Burn Site Groundwater	NMED August 2011
September	2011	GWPP Calendar Year 2010 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL September 2011a

NOTES:
BSG = Burn Site Groundwater.
CAC = Corrective Action Complete.
CME = Corrective Measures Evaluation.
COC = Constituent of concern.
DOE = U.S. Department of Energy.
ER = Environmental Restoration.
GWPP = Groundwater Protection Program.
HE = High explosive.
JP-4 = Jet propellant fuel composition 4.
mg/L = Milligram(s) per liter.
NFA = No Further Action.
NMED = New Mexico Environment Department.
OB = Oversight Bureau.
RSI = Request for Supplemental Information.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid Waste Management Unit.

Burn testing began in the early 1970s and has continued to the present. Early burn testing was conducted in unlined pits excavated in native soil. By 1975, portable, steel, burn pans were used for open burning mostly using JP-4 (jet propellant fuel composition 4). The Light Air Transport Accident Resistant Container Unit was constructed in 1980, and other engineered burn units were constructed by 1983. These burn units used jet fuel, gasoline, and diesel for the burn tests.

7.1.3 Monitoring History

Groundwater samples collected during 1996 from the Burn Site Well (a nonpotable production well used for fire suppression) contained elevated concentrations of nitrate (24.3 mg/L in November 1996). In 1997, the NMED, DOE, and Sandia agreed to investigate the source of this contamination. Later in 1997, monitoring well CYN-MW1D and piezometer CYN-MW2S were installed downgradient of the Burn Site Well (Table 7-2). Samples from well CYN-MW1D contained nitrate concentrations exceeding the MCL. Two more wells, CYN-MW3 and CYN-MW4, were installed between 1999 and 2001 to further characterize the study area. Based on regulatory requirements (discussed further in Section 7.2), monitoring wells CYN-MW6, CYN-MW7, and CYN-MW8 were installed in 2006.

Table 7-2. Groundwater Monitoring Wells and Piezometers at the Burn Site Groundwater Study Area

Well	Installation Year	WQ	WL	Comments
2AUP-01	1996		√	Underflow piezometer (typically dry)
Burn Site Well	1986			Nonpotable production well
CYN-MW1D	1997	√	√	Bedrock groundwater well
CYN-MW2S	1997		√	Underflow piezometer (typically dry)
CYN-MW3	1999	√	√	Bedrock groundwater well
CYN-MW4	1999	√	√	Bedrock groundwater well
CYN-MW6	2006	√	√	Bedrock groundwater well
CYN-MW7	2006	√	√	Bedrock groundwater well
CYN-MW8	2006	√	√	Bedrock groundwater well
CYN-MW9	2010	√	√	Bedrock groundwater well
CYN-MW10	2010	√	√	Bedrock groundwater well
CYN-MW11	2010	√	√	Bedrock groundwater well
CYN-MW12	2010	√	√	Bedrock groundwater well

NOTES: Check marks in the WQ and WL columns indicate WQ sampling and WL measurements were obtained during this reporting period.
WL = Water level.
WQ = Water Quality.

Previous monitoring reports include analytical results for CYN-MW5. Groundwater monitoring well CYN-MW5 was installed in 2001 as part of the investigation of Drain and Septic System (DSS) sites. This well was sampled for eight quarters as part of the DSS investigation and was then incorporated into the BSG study area investigation as a downgradient well. However, in its February 2005 letter, the NMED stated that it "will not consider monitoring well CYN-MW5 as a downgradient well because it is located over two miles away from the Burn Site" (NMED February 2005). Based on the NMED determination, CYN-MW5 has not been sampled as part of the BSG investigation since the third quarter of Fiscal Year 2005. Most recently, sampling at CYN-MW5 has been incorporated into SNL/NM'S Long-Term Stewardship groundwater sampling program in response to NMED requirements (NMED April 2010). Results for recent sampling of CYN-MW5 are presented in Chapter 9.0 of this Annual Groundwater Monitoring Report.

Since the initial discovery of nitrate at the BSG study area, numerous characterization activities have been conducted (Table 7-1). The results of these characterization activities are summarized in two versions of the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site* (SNL June 2004a and April 2008a). These two versions of the BSG conceptual site model provide a comprehensive list of groundwater monitoring data sources used to support the summary of investigations.

In April 2004, the Compliance Order on Consent (the Order) became effective between the DOE, Sandia, and the NMED and the Order specifies the Burn Site as an area of groundwater contamination (NMED April 2004). In response to the Order, DOE/Sandia submitted the Corrective Measures Evaluation (CME)

Work Plan for the BSG study area to the NMED in June 2004 (SNL June 2004b). Based on requirements stipulated by the NMED (discussed in Section 7.2), DOE/Sandia submitted the BSG Interim Measures Work Plan (IMWP) (SNL May 2005) on May 30, 2005. As detailed in the IMWP, three monitoring wells (CYN-MW6, CYN-MW7, and CYN-MW8) were installed near the Burn Site during December 2005 to January 2006 at locations shown on Figure 7-2. Quarterly sampling for eight quarters began for these three monitoring wells in March 2006 and was completed in December 2007. Samples from the wells downgradient of CYN-MW1D (CYN-MW7 and CYN-MW8) were analyzed for nitrate.

Samples from the newly installed well adjacent to SWMU 94F (CYN-MW6) were analyzed for nitrate, total petroleum hydrocarbons (TPH) as gasoline range organics (GRO) and diesel range organics (DRO), and other parameters. Groundwater monitoring programs have continued as outlined in the IMWP (SNL May 2005).

Based on a letter received from the NMED (April 2009), DOE/Sandia are required to further characterize the nature and extent of the perchlorate contamination at the BSG study area. DOE/Sandia prepared the BSG Characterization Work Plan (SNL November 2009a) that was approved by the NMED (NMED February 2010). In July 2010, DOE/Sandia implemented the requirements of the work plan and installed four new groundwater monitoring wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) to determine the extent of groundwater contamination (Section 7.1.5). These four new wells were sampled for the first time in September 2010.

7.1.4 Current Monitoring Network

Currently 10 wells in the BSG study area are monitored for water quality, including CYN-MW1D, CYN-MW3, CYN-MW4, CYN-MW6, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12 (Figure 7-2). Two shallow piezometers (12AUP-01 and CYN-MW2S) were installed in 1997 to determine whether any ephemeral flow was occurring at the alluvium-bedrock interface. Both piezometers have been predominately dry since installation.

7.1.5 Summary of Calendar Year 2011 Activities

The following activities were performed for the BSG study area investigation during Calendar Year (CY) 2011:

- Semiannual groundwater sampling was conducted at six wells (CYN-MW1D, CYN-MW3, CYN-MW4, CYN-MW6, CYN-MW7, and CYN-MW8) in February, August, and October 2011.

- Quarterly groundwater sampling was conducted at four wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) in February, May, August, and October 2011.

- Semiannual reporting of perchlorate analyses for CYN-MW6 was conducted.

- Quarterly reporting of perchlorate analyses for CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12 was conducted.

- CYN-MW7 was redeveloped in September 2011 to remove fine-grained material that was causing anomalously high turbidity measurements during groundwater sampling (Watenpaugh and Sanders 2011).

- Tables of analytical results (Attachment 7A), concentration versus time graphs (Attachment 7B), and hydrographs (Attachment 7C) were prepared in support of this report.

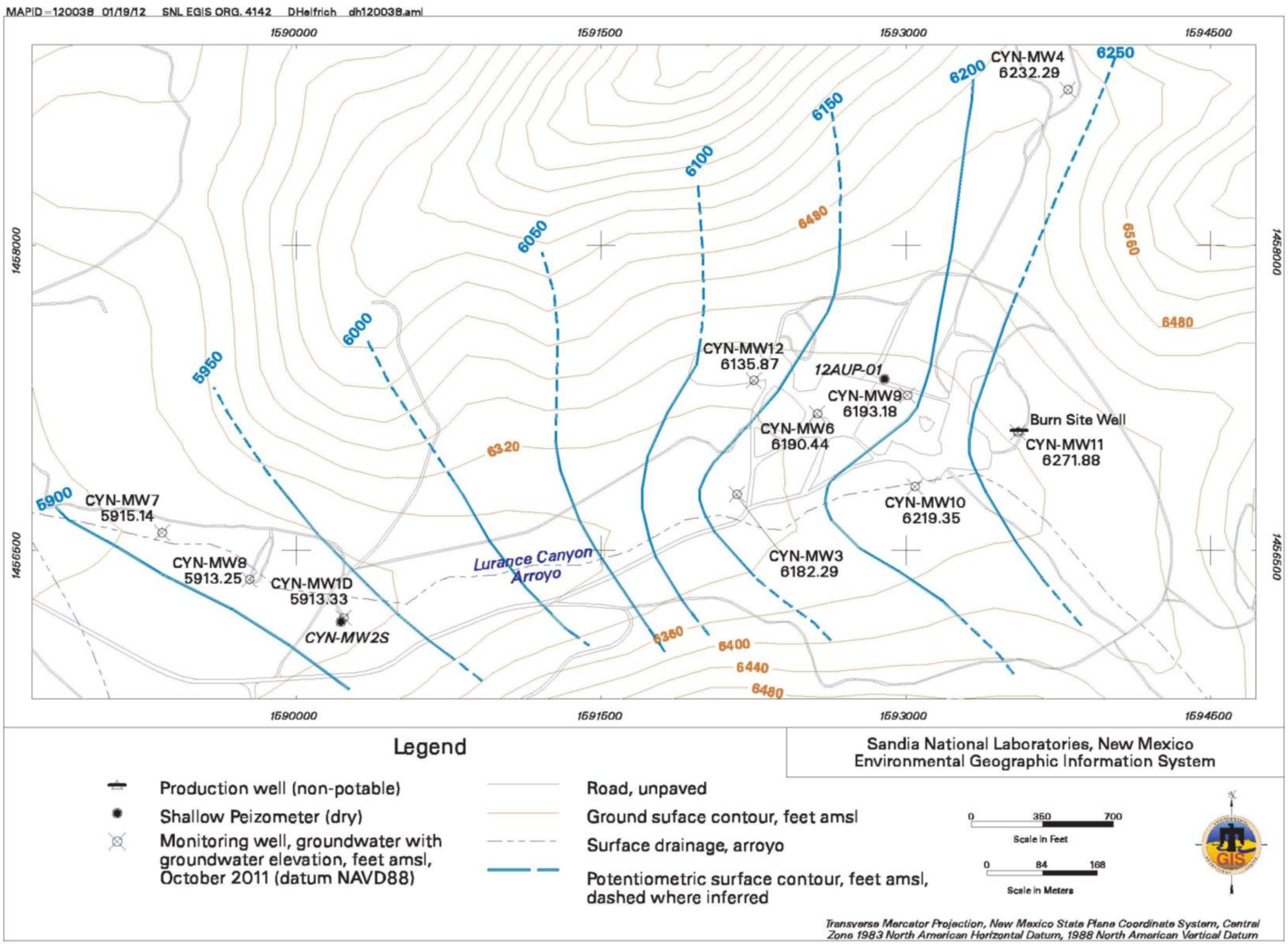

Figure 7-2. Burn Site Groundwater Study Area Potentiometric Surface Map (October 2011)

7.1.6 Summary of Future Activities

The following activities are anticipated for the BSG study area investigation during CY 2012:

- Semiannual groundwater sampling will be conducted at 10 wells (CYN-MW1D, CYN-MW3, CYN-MW4, CYN-MW6, CYN-MW7, and CYN-MW8 CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) during the second and fourth quarters of CY 2012.

- Quarterly groundwater sampling will be conducted at four wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) during the first and second quarters of CY 2012.

- A report describing the subsurface soil sampling and well installation field activities will be prepared and submitted to the NMED.

- A work plan describing proposed modifications to the groundwater monitoring well network through plug and abandonment and replacement will be prepared and submitted to the NMED.

- Semiannual reporting of perchlorate analyses for CYN-MW6 will be performed.

7.1.7 Current Conceptual Model

Groundwater flow in the BSG study area is controlled by the local geologic framework and structural features described in the following sections.

7.1.7.1 Regional Hydrogeologic Conditions

The Manzanita Mountains are composed of a complex sequence of uplifted Precambrian metamorphic and granitic units that were subjected to significant deformation. These units are capped by Paleozoic sandstones, shales, and limestones of the Sandia Formation and Madera Group. The geologic history of the Manzanita Mountains is thoroughly described in the *Groundwater Investigation, Canyons Test Area, Operable Unit 1333, Burn Site, Lurance Canyon* (SNL November 2001) and utilizes the model presented by Brown et al. (1999). The local geology is also summarized in the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site* (SNL June 2004a and April 2008a).

Groundwater in the Manzanita Mountains predominantly occurs in fractured metamorphic and intrusive units that consist of metavolcanics, quartzite, metasediments (schists and phyllites), and the Manzanita Granite. Groundwater migrates through bedrock fractures in a generally westward direction. The only perennial spring in the area, the Burn Site Spring, is located upgradient of the testing facilities at a limestone outcrop. The permeability of the fractured bedrock units is low and well yields are minimal. Groundwater discharges to small ephemeral springs located at the base of the Manzanita Mountains approximately 3 miles west of the Burn Site. Additionally, some groundwater may discharge as underflow to unconsolidated sedimentary deposits of the Albuquerque Basin.

The Precambrian metamorphic rocks typically are fractured as a result of the long and complex history of regional deformation. Drill core data and exposures indicate that the fractures in shallow bedrock are filled with chemical precipitates such as calcium carbonate. The carbonate precipitation likely occurred when the water table was elevated prior to the development of the Rio Grande. As chemical precipitates filled the fractures, permeability was effectively reduced, creating a semiconfined unit above underlying bedrock with open fractures.

The Burn Site is bisected by a north-south–trending system of faults, consisting locally of several high-angle normal faults that are downfaulted to the east. Faults (where exposed) are characterized by zones of crushing and brecciation. The Burn Site fault trends north to south in the vicinity of the Burn Site Well and well CYN-MW4. Nearby outcrops indicate that the fault displacement is approximately 160 ft.

The canyon floor at the BSG study area consists of unconsolidated alluvial fill deposits over bedrock. These deposits typically are sand and gravel derived from erosion of upslope colluvium and bedrock. These alluvial deposits range in thickness from 21 to 55 ft as evidenced in borings drilled at the BSG study area.

7.1.7.2 Hydrogeologic Conditions at the BSG Study Area

When the Burn Site Well was drilled in 1986, the depth to groundwater-bearing strata was approximately 222 ft below ground surface. Following completion of the well in fractured bedrock, the water level rose approximately 150 ft due to positive head. The fractured rocks of the Manzanita Mountains are recharged by infiltration of precipitation, largely occurring from summer thundershowers and, to a lesser degree, winter snowfall on the higher elevations. Groundwater recharge is restricted by high evapotranspiration rates (losses to the atmosphere by evaporation and plant transpiration) and low permeability of the fractured bedrock.

Regionally, groundwater in the western Manzanita Mountains flows generally toward the west from a groundwater flow divide located east of the BSG study area (SNL November 2001). Westward groundwater flow across Lurance Canyon discharges primarily as direct underflow to the unconsolidated basin-fill deposits of the Albuquerque Basin. Based on field observations, some discharge also occurs at springs along the mountain front. Much of the flow that discharges from these springs undergoes evapotranspiration. Some flow from the springs infiltrates nearby alluvial deposits.

Annual precipitation in the Manzanita Mountains is in the form of rainfall and minor snowfall. July and August are typically the wettest months; 45 to 62 percent of annual precipitation falls during summer thunderstorms from July to October (National Weather Service 2002). The average annual precipitation in this drainage basin is estimated to range between 12 and 16 inches (SNL April 2008a). Annual potential evapotranspiration in the Albuquerque area greatly exceeds annual precipitation. Because much of the rainfall in the Lurance Canyon drainage occurs during the summer, losses to evapotranspiration are high. A small percentage of precipitation may infiltrate into the exposed bedrock or into alluvial deposits along the canyon floor.

Ephemeral surface-water flows occur in response to precipitation in the drainage basin. In 1997, two piezometers (CYN-MW2S and 12AUP-01 [Figure 7-2]) were constructed in Lurance Canyon to monitor moisture within the channel deposits at the contact with underlying Precambrian bedrock. No water was detected in either piezometer until September 2, 2004. After a series of rain events, between 1 and 2 inches of water were measured in 12AUP-01. The water level remained fairly constant through September 2004. However, more recent water level measurements show no measurable water in 12AUP-01. It is likely that significant saturation in the vadose zone occurs only after a series of significant rain events. Episodic accumulation of precipitation, as evidenced by the occurrence of water in the piezometer, may provide a mechanism for recharging the brecciated fault zones and uncemented fractures in the underlying bedrock.

7.1.7.3 Local Direction of Flow

Figure 7-2 presents the October 2011 potentiometric surface for the BSG monitoring well network. Groundwater elevations used for this potentiometric surface map reflect revised survey coordinates. Until recently, Environmental Restoration (ER) Operations (formerly ER Project) survey coordinates were based on the New Mexico State Plane Coordinate System, Central Zone, North American Datum of 1927 and Northern Geographic Vertical Datum of 1929 for elevations. In order to be consistent with current SNL/NM Facilities and KAFB survey practices, ER Operations survey data now are based on New Mexico State Plane Coordinate System, Central Zone, North American Datum of 1983 (NAD83) and North American Vertical Datum of 1988 (NAVD88) coordinates. Location information for wells surveyed before August 2010 has been mathematically converted to the new NAD83/NAVD88 coordinates using National Geodetic Survey-approved software.

The general direction of groundwater flow beneath the BSG study area is to the west-southwest as indicated by the potentiometric surface. No water-supply wells are located near the BSG study area, except for the Burn Site Well that is used only rarely (last pumped in 2003) for nonpotable applications such as fire suppression. Groundwater levels in the Paleozoic and Precambrian bedrock near the BSG study area are not influenced by regional water-supply well pumping from the basin-fill deposits of the Albuquerque Basin.

The apparent horizontal groundwater gradient based on BSG monitoring wells, piezometers, and springs varies from approximately 0.004 to 0.14 feet per foot (SNL April 2008a). The hydraulic gradient west of the BSG study area flattens substantially (Plate 1).

The wide range of hydraulic gradients in Lurance Canyon indicate that localized groundwater systems associated with brecciated fault zones in the low-permeability fractured bedrock at the BSG study area are poorly connected and are effectively compartmentalized. Limited groundwater flow velocity information is based on COC first-arrival estimates. Based on contaminant releases from SWMU 94F arriving at well CYN-MW1D, the minimum apparent velocity of the COCs is estimated to be approximately 160 feet per year (ft/yr) (SNL April 2008a). No information is available about vertical flow velocity within the fractured rocks at the BSG study area. However, vertical movement of water to the water table within the brecciated fault zones probably occurs as rapid, partially saturated to saturated flow. Filled fractures within the upper portion of metamorphic rock act as a semiconfined unit restricting vertical flow.

Water levels have been routinely monitored in BSG wells since 1999. Figures 7C-1 through 7C-5 (Attachment 7C) show groundwater levels in BSG wells that are completed in bedrock. No substantial seasonal variation in water levels is evident in these wells. The wide range of hydraulic gradients in Lurance Canyon and the lack of correlation between water level fluctuations in these wells support the assessment that the low-permeability fractured groundwater system at the BSG study area is poorly interconnected. Water level fluctuations may be a result of local heterogeneities in hydraulic properties related to the fractured system. The BSG monitoring wells have shown significant groundwater declines over the past three to four years, with decreases in water levels ranging from 0.7 to 2.8 ft/yr. Declining water levels may be due to reduced amounts of precipitation.

7.1.7.4 Contaminant Sources

Nitrate in the BSG study area may be derived from both natural and anthropogenic sources. The NMED-specified background concentration for nitrate in groundwater is 4 mg/L (Dinwiddie 1997). Potential natural sources include the weathering of sedimentary rocks and atmospheric deposition. Evaporation and transpiration of rainwater that has infiltrated canyon alluvial sediments can increase nitrate concentrations. Potential anthropogenic nitrate sources include septic systems and the degradation of HE compounds. SNL/NM personnel have conducted several sampling events in the BSG study area to identify the source of nitrate in site soil; however, no source as been identified (SNL May 2005).

Some evidence indicates that evaporation and transpiration may concentrate nitrate in sediments beneath ephemeral drainages in the vicinity of the Manzanita Mountains. This evidence includes nitrate concentrations that exceed the MCL in groundwater beneath these drainages and a chloride to nitrate ratio in groundwater that is similar to the chloride to nitrate ratio in rainfall (McQuillan and Space 1995).

SWMU 65 is located in the center of the BSG study area and contains open-air detonation areas where nitrate-based explosives were used. The detonations may have dispersed HE compounds across the ground surface, and subsequent degradation (weathering) of these HE materials most likely released nitrate. SWMU 94 testing also involved burning HE compounds and propellants. Nitrate is highly soluble in water, and precipitation can enhance the migration of nitrate to groundwater. In addition to nitrate, petroleum products were detected in soil samples; therefore, the potential for petroleum products in groundwater was evaluated.

7.1.7.5 Contaminant Distribution and Transport in Groundwater

Nitrate was first detected above the MCL of 10 mg/L in groundwater samples from the Burn Site Well. Since the completion of wells CYN-MW1D (December 1997), CYN-MW3 (June 1999), CYN-MW6 (February 2006), CYN-MW9, and CYN-MW12 (July 2010), nitrate concentrations that exceed the MCL have been consistently detected in samples from these wells. Nitrate concentrations in samples from CYN-MW10 and CYN-MW11 are near or just above the MCL (Table 7-3). Nitrate concentrations in groundwater samples from wells CYN-MW4, CYN-MW7, and CYN-MW8 have not exceeded the MCL.

Table 7-3. Summary of Historical Nitrate Concentrations in Groundwater Monitoring Wells that Exceed the MCL at the Burn Site Groundwater Study Area

Well	Historical Maximum NPN Concentration (mg/L)	Distance and Direction from Burn Site Well
Burn Site Well	24.3	0
CYN-MW1D	28.0	3,400 ft south southwest
CYN-MW3	14.7	1,400 ft west
CYN-MW6	39.9	1,000 ft west
CYN-MW9	36.6	600 ft west northwest
CYN-MW10	11.4	600 ft west southwest
CYN-MW11	11.4	30 ft south
CYN-MW12	14.4	1,300 ft west northwest

NOTES:
ft = Feet.
MCL = Maximum Contaminant Level.
mg/L = Milligrams per liter.
NPN = Nitrate plus nitrite.

Potential downgradient receptors for the nitrate plume are Coyote Springs, approximately 3 miles west of the study area, and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) and KAFB well fields, approximately 12 miles to the west-northwest of the study area. Numerical simulations suggest nitrate concentrations will be decreasing in groundwater to below the MCL at Coyote Springs, and to below MDLs in the regional aquifer through dispersion and dilution as the plume moves into the more hydraulically conductive alluvial-fan and Ancestral Rio Grande deposits west of Coyote Springs. Numerical simulations also show that contaminant travel times exceed 600 years from the study area to the ABCWUA and KAFB well fields (SNL May 2005).

7.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM ER Operations as well as implements and enforces federal regulations mandated by the Resource Conservation and Recovery Act (RCRA). All ER SWMUs and Areas of Concern (AOCs) are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993).

All corrective action requirements pertaining to the BSG study area are contained in the Order (NMED April 2004). The groundwater monitoring activities for BSG are not associated with a single SWMU but are more regional in nature. Before the Order became effective in April 2004, groundwater investigations at the BSG study area had been conducted voluntarily by SNL/NM ER Operations.

Initially, groundwater monitoring for the BSG was initiated to satisfy the requirements of the SNL/NM HSWA permit for characterization of SWMUs. The Order transferred regulatory authority for corrective action requirements from the HSWA module to the Order. The BSG investigation must comply with requirements set forth in the Order for site characterization and the development of a CME.

In response to the Order, DOE/Sandia submitted the following two documents to the NMED: (1) *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site* (SNL June 2004a), and (2) *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site* (SNL June 2004b). The current conceptual site model provides site-specific characteristics by which remedial alternatives were evaluated. The CME Work Plan provides a description and justification of which remedial alternatives were considered and the methods and criteria to be used in the evaluation. The CME Work Plan was completed to comply with requirements set forth in the Order and with the guidance of the RCRA Corrective Action Plan (EPA 1994).

On March 1, 2005, DOE/Sandia received a letter from the NMED that rejected the CME Work Plan and stipulated the following requirements (NMED February 2005):

- DOE/Sandia must prepare and submit an IMWP within 90 days from the receipt of the letter (by May 30, 2005).
- The NMED requires additional characterization of the nitrate-contaminated groundwater near the BSG study area. Specifically, the downgradient extent of groundwater with nitrate concentrations greater than 10 mg/L shall be determined.
- The NMED does not accept the *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site* (SNL June 2004b) because it is not satisfied with the existing characterization of nitrate-contaminated groundwater near the BSG study area.
- The NMED also requires the installation of one additional monitoring well "adjacent to SWMU-94F in order to establish groundwater conditions in this petroleum-contamination source area."

In May 2005, DOE/Sandia submitted an IMWP to the NMED that proposed the installation of additional groundwater monitoring wells to characterize the extent of nitrate contamination in the bedrock aquifer downgradient of CYN-MW1D and fuel-related compounds downgradient of SWMU 94F (SNL May 2005). The selected interim measures described in the IMWP include additional well installation, groundwater monitoring, and institutional controls. These interim measures were proposed to serve three purposes: (1) provide data to support the CME; (2) monitor the migration of the nitrate plume to provide an early warning system to trigger an action if a danger to downgradient ecological receptors (Coyote Springs) becomes apparent; and (3) protect human health and the environment by limiting exposure to contaminated groundwater by restricting access to the monitoring wells.

In support of the selected interim measures, the IMWP included the following reports as attachments: (1) Remedial Alternatives Data Gaps Review, (2) Nitrate Source Evaluation, and (3) Evaluation of Contaminant Transport. The Data Gaps Review document included detailed definitions of remedial alternatives and a preliminary evaluation of remedial alternatives with the purpose of identifying data gaps. One of the data gaps identified included determining background nitrate concentrations and evaluating the potential for a residual source of nitrate in the vadose zone. The investigation initiated to fill this data gap and the analytical results were presented in the Nitrate Source Evaluation. The Evaluation of Contaminant Transport consisted of a simplified cross-sectional modeling approach to simulate transport and dilution of nitrate between the current location of nitrate in BSG and potential human and ecological receptors (SNL May 2005).

Data collected as part of additional characterization required by the IMWP were incorporated into an updated version of the conceptual site model (SNL April 2008a). The updated conceptual site model provides the basis for a technically defensible remediation program that was developed and documented in the CME Work Plan (SNL April 2008b), the results of which will eventually be documented in the CME Report. The April 2008 CME Work Plan was developed to address the concerns outlined in the letter from the NMED (February 2005) and to comply with requirements of the Order (NMED April 2004). The work plan provides information and data gathered during interim measures and performance and compliance goals and objectives for the remediation of the BSG.

On April 30, 2009, DOE/Sandia received a letter was from the NMED entitled, *Perchlorate Contamination in Groundwater, Sandia National Laboratories, EPA ID #NM5890110518* (NMED April 2009). The NMED's letter discussed the occurrence of perchlorate in groundwater at concentrations at or greater than 1 µg/L at various locations at SNL/NM. The letter also stated that DOE/Sandia must characterize the nature and extent of the perchlorate contamination at the BSG study area and submit to the NMED a plan for such characterization. DOE/Sandia met with the NMED in June and July 2009 (SNL June 2009b and July 2009) and submitted a letter requesting an extension to November 30, 2009 (DOE July 2009). The results of the discussions at the June and July meetings (SNL June 2009b and July 2009) have been incorporated into the BSG Characterization Work Plan (SNL November 2009a), which included such items as number and locations of wells and boreholes.

In February 2010, DOE/Sandia received notice of conditional approval for the November 2009 BSG Characterization Work Plan (NMED February 2010). In July 2010, DOE/Sandia implemented the requirements of the work plan and completed subsurface soil sampling at 10 deep soil boring locations to determine contaminant sources and installed four groundwater monitoring wells to determine the extent of groundwater contamination. Based on an outstanding schedule commitment, DOE/Sandia submitted an extension request for the BSG CME Report in September 2010 (SNL September 2010), which was approved by the NMED (October 2010).

In this report BSG monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order. Additional information on radionuclides and the scope of the Order is available in Section III.A of the Order (NMED April 2004).

7.3 Scope of Activities

The activities for the BSG investigation conducted during this reporting period, including plans and reports, are listed in Section 7.1.5. The only field activity completed in the study area during 2011 was groundwater monitoring (Table 7-4). The analytical parameters for each well and each sampling event are listed in Table 7-5.

Table 7-4. Groundwater Monitoring Well Network and Sampling Dates for the Burn Site Groundwater Study Area, Calendar Year 2011

Date of Sampling Event	Wells Sampled		SAP
January and February 2011	CYN-MW1D CYN-MW3 CYN-MW4 CYN-MW6 CYN-MW7	CYN-MW8 CYN-MW9 CYN-MW10 CYN-MW11 CYN-MW12	*Burn Site Groundwater Monitoring, Mini-SAP for Second Quarter Fiscal Year 2011* (SNL January 2011)
May 2011	CYN-MW9 CYN-MW10 CYN-MW11 CYN-MW12		*Burn Site Groundwater Monitoring, Mini-SAP for Third Quarter Fiscal Year 2011* (SNL April 2011)
August 2011	CYN-MW1D CYN-MW3 CYN-MW4 CYN-MW6 CYN-MW7	CYN-MW8 CYN-MW9 CYN-MW10 CYN-MW11 CYN-MW12	*Burn Site Groundwater Monitoring, Mini-SAP for Fourth Quarter Fiscal Year 2010* (SNL July 2011)
October 2011	CYN-MW1D CYN-MW3 CYN-MW4 CYN-MW6 CYN-MW7	CYN-MW8 CYN-MW9 CYN-MW10 CYN-MW11 CYN-MW12	*Burn Site Groundwater Monitoring, Mini-SAP for First Quarter Fiscal Year 2012* (SNL September 2011b)

NOTES:
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.

Table 7-5. Parameters Sampled at Burn Site Groundwater Study Area Wells for Each Sampling Event, Calendar Year 2011

Parameter	January/February 2011	
NPN TPH-DRO TPH-GRO	CYN-MW1D CYN-MW1D (dup) CYN-MW3 CYN-MW4 CYN-MW6 CYN-MW7	CYN-MW8 CYN-MW9 CYN-MW10 CYN-MW11 CYN-MW11 (dup) CYN-MW12
HE compounds SVOCs VOCs	CYN-MW9 CYN-MW10 CYN-MW11	CYN-MW11 (dup) CYN-MW12
Perchlorate	CYN-MW6 CYN-MW9 CYN-MW10	CYN-MW11 CYN-MW11 (dup) CYN-MW12
Parameter	**May 2011**	
HE compounds NPN Perchlorate SVOCs TPH-DRO TPH-GRO VOCs	CYN-MW9 CYN-MW10 CYN-MW11 CYN-MW12 CYN-MW12 (dup)	
Parameter	**August 2011**	
Anions Gamma Spec* Gross Alpha Gross Beta Isotopic Uranium NPN TAL Metals, plus Total Uranium TPH-DRO TPH-GRO Tritium VOCs	CYN-MW1D CYN-MW3 CYN-MW4 CYN-MW6 CYN-MW7 CYN-MW8	CYN-MW8 (dup) CYN-MW9 CYN-MW9 (dup) CYN-MW10 CYN-MW11 CYN-MW12
HE compounds SVOCs	CYN-MW9 CYN-MW9 (dup) CYN-MW10	CYN-MW11 CYN-MW12
Perchlorate	CYN-MW6	
Parameter	**October 2011**	
NPN TPH-DRO TPH-GRO	CYN-MW1D CYN-MW3 CYN-MW4 CYN-MW6 CYN-MW7 CYN-MW7 (dup)	CYN-MW8 CYN-MW9 CYN-MW10 CYN-MW10 (dup) CYN-MW11 CYN-MW12
HE compounds SVOCs VOCs	CYN-MW9 CYN-MW10 CYN-MW10 (dup)	CYN-MW11 CYN-MW12
Perchlorate	CYN-MW6	

NOTES:

DRO = Diesel range organics.
dup = Duplicate sample.
Gamma Spec* = Gamma spectroscopy short list (Americium-241, Cesium-137, Cobalt-60, and Potassium-40).
GRO = Gasoline range organics.
HE = High explosive.
NPN = Nitrate plus nitrate (reported as nitrogen).
SVOC = Semivolatile organic compound.
TAL = Target Analyte List.
TPH = Total petroleum hydrocarbons.
VOC = Volatile organic compound.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental samples, split samples, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. FB samples provide a check for potential ambient sources of sample contamination during the sampling process and/or sampling error. TB samples are used to determine whether volatile organic compounds (VOCs) contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory.

7.4 Field Methods and Measurements

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

7.4.1 Groundwater Elevation

Throughout CY 2011, water level measurements were obtained to determine groundwater flow directions, hydraulic gradients, and changes in water table elevations. Water levels are periodically measured in BSG monitoring wells according to the instructions and requirements specified in SNL/NM Field Operating Procedure (FOP) 03-02, *Groundwater Level Data Acquisition and Management* (SNL November 2009b and February 2011). The water level information was used to create the potentiometric surface map presented in Figure 7-2 and the hydrographs presented in Figures 7C-1 through 7C-5 (Attachment 7C).

7.4.2 Well Purging and Water Quality Measurements

A portable Bennett™ groundwater sampling system was used to collect the groundwater samples from BSG wells. The wells are purged a minimum of one saturated screen volume. Field water quality measurements for turbidity, pH, temperature, specific conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO) were recorded for the well prior to the collection of groundwater samples, according to SNL/NM FOP 05-01 (SNL November 2009c). Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

The amount of water required to achieve stability of field parameters is fairly consistent. However, the ability of the bedrock units to produce water varies greatly from well to well. In accordance with the Mini-Sampling and Analysis Plans (SAPs) (Table 7-4), purging continued until four stable measurements for temperature, SC, pH, and turbidity were obtained.

Groundwater stability is considered acceptable when turbidity measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, pH is within 0.1 units, temperature is within 1.0 degrees Celsius, and SC is within 5 percent. Associated Field Measurement Logs documenting details of well purging and water quality measurements for each sampling event have been submitted to the SNL/NM Records Center.

7.4.3 Pump Decontamination

A portable Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination*, SNL/NM FOP 05-03 (SNL November 2009d). An EB or rinsate sample was collected to verify the effectiveness of the equipment decontamination process.

7.4.4 Sample Collection Sampling Procedures

Groundwater samples are collected using the Bennett™ nitrogen gas-powered portable piston pump. Sample bottles are filled directly from the pump discharge line and water sampling manifold, with the VOC samples collected at the lowest achievable discharge rate. The alluvial piezometers have continued to be dry, and no groundwater samples have ever been collected from these piezometers.

7.4.5 Sample Handling and Shipment

The SNL/NM Sample Management Office (SMO) processes environmental samples collected by LTS/ER Operations personnel. The SMO staff reviews the Mini-SAPs, orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced in laboratory processes and procedures. These include method blanks, laboratory control samples, matrix spike, matrix spike duplicate, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review*, SMO-05-03, Issue 04 (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011).

7.4.6 Waste Management

Purge and decontamination water generated from sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management*, and (SNL November 2009e) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Results for associated environmental samples provide supplemental data for approval to discharge water to the sanitary sewer. All data were compared with ABCWUA discharge limits.

7.5 Analytical Methods

Groundwater samples were submitted to GEL Laboratories, LLC (GEL) for analysis. Samples were analyzed in accordance with applicable EPA analytical methods (Tables 7-6 and 7-7).

7.6 Summary of Analytical Results

This section discusses analytical results, exceedances of regulatory standards, and pertinent trends in COC concentrations. The analytical results and field measurements for the CY 2011 BSG sampling events are presented in Tables 7A-1 through 7A-10 (Attachment 7A). Data qualifiers are explained in the footnotes following Table 7A-10.

A summary of detected VOC, semivolatile organic compound (SVOC), and HE results is presented in Table 7A-1. The MDLs for all analyzed VOCs and SVOCs are listed in Table 7A-2. The only VOC detected was acetone (Table 7A-1). Acetone was reported at concentrations of 3.77 J and 5.95 J (where "J" is an estimated value below the laboratory practical quantitation limit) for samples from monitoring well CYN-MW12. No SVOCs or HE compounds were detected. The MDLs for all analyzed HE compounds are listed in Table 7A-3.

Table 7-6. Burn Site Groundwater Study Area Chemical Analytical Methods

Analyte	Analytical Method[a,b,c]
Anions	SW846-9056
HE	SW846-8321A Mod
NPN	EPA 353.2
Perchlorate	EPA 314.0
SVOC	SW846-8270
TAL Metals, plus Total Uranium	SW846-6020/7470
TPH Diesel Range Organics	SW846-8015
TPH Gasoline Range Organics	SW846-8015
VOC	SW846-8260

NOTES:

[a]EPA, 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1, U.S. Environmental Protection Agency, Washington, D.C.

[b]EPA, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.

[c]EPA, 1999, *Perchlorate in Drinking Water Using Ion Chromatography*, EPA 815/R-00-014.

EPA = U.S. Environmental Protection Agency.
HE = High explosive.
NPN = Nitrate plus nitrite (reported as nitrogen).
SW = Solid waste.
SVOC = Semivolatile organic compound.
TAL = Target Analyte List.
TPH = Total petroleum hydrocarbons.
VOC = Volatile organic compound.

Table 7-7. Burn Site Groundwater Study Area Radiochemical Analytical Methods

Analyte	Analytical Method[a,b]
Gamma Spectroscopy (short list)	EPA 901.0
Gross Alpha/Beta	EPA 900.0
Isotopic Uranium	HASL-300
Tritium	EPA 906.0

NOTES:

[a]EPA, 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

[b]U.S. Department of Energy, Environmental Measurements Laboratory, 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.

EPA = U.S. Environmental Protection Agency.
HASL = Health and Safety Laboratory.

The analytical results for nitrate plus nitrite (NPN) (reported as nitrogen) are presented in Table 7A-4, and Figure 7-3 presents NPN concentration contours for the BSG study area. NPN results exceed the MCL of 10 mg/L in samples from CYN-MW1D, CYN-MW3, CYN-MW6, CYN-MW9, CYN-MW11, and CYN-MW12. NPN concentrations in samples from the other BSG wells are less than the MCL (Table A-4). For CY 2011, the NPN concentrations for wells exceeding the MCL are summarized as follows:

- CYN-MW1D had reported concentrations of 10.5 mg/L (August 2011) and 13.3 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW1D is less than 1 to 28 mg/L with highly variable fluctuations in concentrations and a slightly decreasing trend (Figure 7B-1).

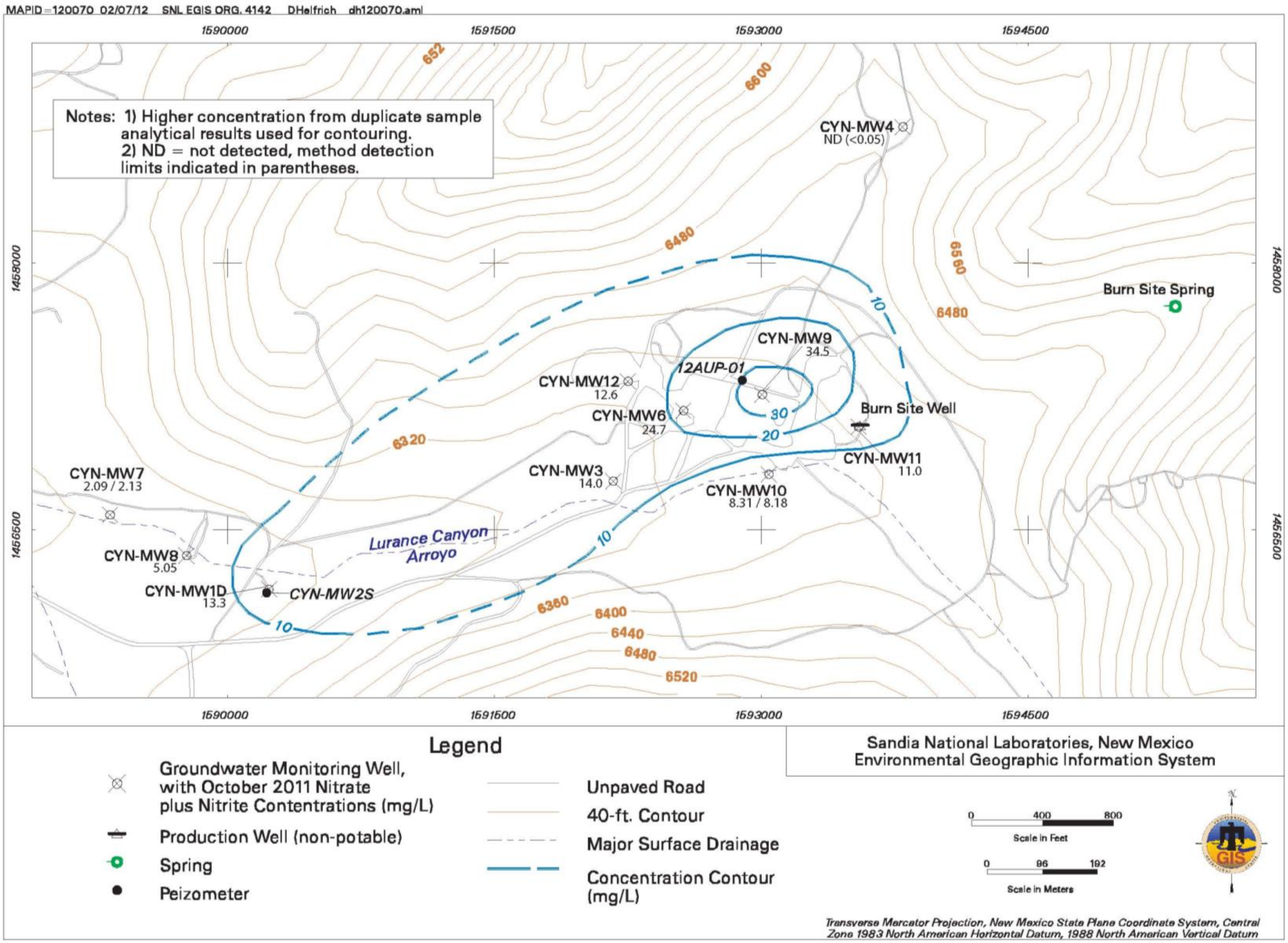

Figure 7-3. Nitrate plus Nitrite Concentration Contour Map for the Burn Site Groundwater Study Area

- CYN-MW3 had reported concentrations of 10.6 mg/L (February 2011), 12.5 mg/L (August 2011), and 14.0 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW3 is approximately 4 to 15 mg/L with a slightly decreasing trend (Figure 7B-2).

- CYN-MW6 had reported concentrations of 20.7 mg/L (February 2011), 21.6 mg/L (August 2011), and 24.7 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW6 is approximately 21 to 40 mg/L with a slightly increasing trend (Figure 7B-3).

- CYN-MW9 had reported concentrations of 29.1 mg/L (February 2011), 29.2 mg/L (May 2011), 31.8 mg/L (August 2011), 31.5 mg/L (August 2011, duplicate), and 34.5 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW9 is approximately 29 to 37 mg/L with a consistent trend (Figure 7B-4).

- CYN-MW11 had reported concentrations of 11.4 mg/L (May 2011), 11.3 mg/L (August 2011), and 11.0 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW11 is approximately 9 to 11 mg/L with a slightly increasing trend (Figure 7B-5).

- CYN-MW12 had reported concentrations of 10.8 mg/L (February 2011), 11.4 mg/L (May 2011), 11.9 mg/L (May 2011, duplicate), 12.7 mg/L (August 2011), and 12.6 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW12 is approximately 11 to 14 mg/L with a slightly decreasing trend (Figure 7B-6).

The results for TPH are listed for TPH-DRO and TPH-GRO in Table 7A-5. No MCLs have been established for TPH-DRO or TPH-GRO. No detections of TPH-GRO were reported for any of the samples collected during the CY 2011 sampling events. One detection of TPH-DRO was reported in the sample collected from CYN-MW12 during the August sampling event at a concentration of 80.1 μg/L. However, this TPH–DRO result was qualified with "J" by the laboratory and "J+" during data validation (the associated numerical value is an estimated quantity with suspected positive bias) (Table 7A-5).

Perchlorate was not detected above the screening level/MDL of 4 μg/L in any of the samples collected from the new wells CYN-MW9, CYN-MW10, CYN-MW11, or CYN-MW12. Perchlorate was detected above the MDL of 4 μg/L in samples collected from CYN-MW6 (Table 7A-6). Perchlorate concentrations for the samples from CYN-MW6 for CY 2011 range from 6.26 to 7.06 J μg/L. Currently, no MCL is established for perchlorate. Figure 7B-7 (Attachment 7B) shows that the perchlorate concentration in this well has historically exceeded the screening level/MDL of 4 μg/L, but exhibits a slightly decreasing trend.

The analytical results for anions are presented in Table 7A-7. None of the analytes exceed MCLs, where established. Total metal results are presented in Table 7A-8. No metals exceed established MCLs.

Groundwater samples were analyzed for tritium, gross alpha/beta activity, and radionuclides by gamma spectroscopy. The results are presented in Table 7A-9. All radionuclide activity results are below the MCLs, where established. Gamma spectroscopy analysis detected no isotopes above the associated minimum detectable activity.

Field water quality parameters are measured during sample purging of each well prior to sampling and include temperature, SC, ORP, pH, turbidity, and DO. The parameter measurements obtained immediately prior to sample collection are presented in Table 7A-10.

7.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011). Although some analytical results were qualified during the data validation process, no significant data quality problems were noted for BSG. Data validation qualifiers are provided with the analytical results in Tables 7A-1 through 7A-9 (Attachment 7A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center. The following sections discuss site-specific QC results for the BSG quarterly sampling events.

7.7.1 Field Quality Control Samples

Field QC samples included duplicate environmental, EB, and TB, and FB samples. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAPs (SNL January 2011, April 2011, July 2011, and September 2011b).

7.7.1.1 Duplicate Environmental Samples

Duplicate environmental samples were analyzed to estimate the overall reproducibility of the sampling and analytical process. A duplicate environmental sample is collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The results of duplicate sample analyses (detected parameters only) are used to calculate relative percent difference (RPD) values. Duplicate environmental sample results show good correlation (RPD values less than 20 for organic analyses and less than 35 for inorganic analyses) for all calculated parameters.

7.7.1.2 Equipment Blank Samples

A portable Bennett™ groundwater sampling system was used to collect groundwater samples in all wells. The sampling pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in SNL/NM FOP 05-03 (SNL November 2009d). An EB or rinsate sample was collected to verify the effectiveness of the equipment decontamination process. The results of the EB sample analyses are as follows:

- **January/February 2011 Sampling Event at CYN-MW1D and CYN-MW11**—Two EB samples were collected prior to sampling these monitoring wells and analyzed for all parameters. Bromodichloromethane, chloroform, and dibromochloromethane were detected above the laboratory MDLs. No corrective action was necessary as these compounds were not detected in the associated environmental samples.

- **May 2011 Sampling Event at CYN-MW12—**The EB sample was collected prior to sampling this well and analyzed for all parameters. Bromodichloromethane, chloroform, and dibromochloromethane were detected above the laboratory MDLs. No corrective action was necessary as these compounds were not detected in the associated environmental sample.

- **August 2011 Sampling Events at CYN-MW8 and CYN-MW9**—The EB samples were collected prior to sampling these wells and analyzed for all parameters. Acetone, barium, bromodichloromethane, chloride, chloroform, copper, dibromochloromethane, magnesium, sodium, and sulfate were detected above the laboratory MDLs. No corrective action was necessary for barium, bromodichloromethane, chloride, chloroform, dibromochloromethane, magnesium, sodium, or sulfate as these analytes were either not detected in environmental samples or detected at concentrations greater than five times the blank result. Acetone and copper were detected in CYN-MW9 environmental samples at concentrations less than five times the associated EB result, and the results were qualified as not detected during data validation.

- **October 2011 Sampling Events at CYN-MW7 and CYN-MW10**—The EB samples were collected prior to sampling these wells and analyzed for all parameters. Bromodichloromethane, bromoform, chloroform, and dibromochloromethane were detected above the laboratory MDLs in the EB sample associated with CYN-MW10. No corrective action was necessary as these compounds were not detected in the CYN-MW10 environmental or duplicate environmental samples.

7.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC and TPH-GRO analysis to assess whether contamination of the samples has occurred during shipment and storage. The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative, and TPH-GRO TBs consist of laboratory reagent-grade water only. The TB samples are contained in 40-milliliter volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. The TB samples were brought to the field and accompanied each sample shipment.

- **January/February 2011 Sampling Event**—5 VOC and 11 TPH-GRO TB samples were submitted during this sampling event. No VOCs or TPH-GRO were detected above laboratory MDLs in any TB sample.

- **May 2011 Sampling Event**—5 VOC and 5 TPH-GRO TB samples were submitted during this sampling event. No VOCs or TPH-GRO were detected above laboratory MDLs in any TB sample.

- **August 2011 Sampling Event**—A total of 12 VOC and 12 TPH-GRO TB samples were submitted during this sampling event. No TPH-GRO was detected above laboratory MDLs in any TB sample. Acetone was detected in the TB samples associated with CYN-MW3 and CYN-MW10 environmental samples. Acetone was detected in the environmental samples at concentrations less than 10 times the associated TB results and qualified as not detected during data validation.

- **October 2011 Sampling Event—**A total of 5 VOC and 12 TPH-GRO TB samples were submitted during this sampling event. No VOCs or TPH-GRO were detected above laboratory MDLs in any TB sample.

7.7.1.4 Field Blank Samples

FB samples were collected and analyzed for VOCs and TPH-GRO to assess whether contamination of the samples resulted from ambient field conditions. The FB samples were prepared by pouring deionized water into sample containers at a sampling point to simulate the transfer of environmental samples from the sampling system to the sample container.

- **January/February Sampling Events at CYN-MW3 and CYN-MW9**—TPH-GRO was not detected in any FB sample. The VOC compounds bromodichloromethane, chloroform, dibromochloromethane, and trichloroethene were detected above laboratory MDLs in the CYN-MW9 FB sample. No corrective action was necessary as these compounds were not detected in the associated environmental sample.

- **May 2011 Sampling Event at CYN-MW9**—The VOC compounds bromodichloromethane, chloroform, and dibromochloromethane were detected above laboratory MDLs. No corrective action was necessary as these compounds were not detected in the associated environmental sample.

- **August 2011 Sampling Event at CYN-MW6 and CYN-MW11**—TPH-GRO was not detected in any FB sample. The VOC compounds bromodichloromethane, bromoform, chloroform, and dibromochloromethane were detected above laboratory MDLs. No corrective action was necessary as these compounds were not detected in associated environmental samples.

- **October 2011 Sampling Event at CYN-MW4 and CYN-MW9**—TPH-GRO was not detected in any FB sample. The VOC compounds bromodichloromethane, bromoform, chloroform, and dibromochloromethane were detected above laboratory MDLs. No corrective action was necessary as these compounds were not detected in associated environmental samples.

7.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate laboratory control samples were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011). Laboratory data qualifiers are provided with the analytical results in Tables 7A-1 through 7A-9 (Attachment 7A).

7.8 Variances and Nonconformances

No variances or nonconformances from field or sampling requirements specified in the BSG monitoring Mini-SAPs (SNL January 2011, April 2011, July 2011, and September 2011b) occurred during sampling activities. The following project-specific issues associated with the CY 2011 sampling events for BSG occurred:

- **January/February 2011 Sampling Event**—GEL performed a verification analysis on the CYN-MW6 perchlorate sample. SNL/NM personnel did not request the analysis. The result is comparable to the initial analysis, and the data package was validated and reported. BSG activities were delayed due to cold weather and the State of Emergency declaration in New Mexico.

- **May 2011 Sampling Event**—An FB sample for GRO was not collected. The field team overlooked the analysis as listed in the Mini-SAP. No additional corrective action was necessary as TPH-GRO was not detected in the associated environmental sample.

- **August 2011 Sampling Event**—Turbidity readings prior to sampling CYN-MW1D were greater than 90 NTU. A camera survey performed in September 2011 observed a significant amount of corrosion of the low-carbon steel well materials.

- **October 2011 Sampling Event**—Turbidity readings prior to sampling CYN-MW1D were greater than 60 NTU. A camera survey performed in September 2011 observed a considerable amount of corrosion of the low-carbon steel well materials. The depth-to-water measurement at CYN-MW3 prior to purging indicated that 0.43 ft of water is present above the well screen bottom.

7.9 Summary and Conclusions

This section provides a brief summary of activities, discussion of COC concentrations, trends of concentrations versus time, the current conceptual site model, and plans for studies to be completed during CY 2012 at the BSG study area.

The BSG study area is located in the vicinity of the active Lurance Canyon Burn Site facility. Groundwater investigations were initiated in 1997 at the request of the NMED after elevated nitrate levels were discovered in the nonpotable Burn Site Well. The study area currently consists of 10 monitoring wells. Wells were sampled during January/February, May, August, and October 2011. The samples were analyzed for VOCs, SVOCs, HE compounds, TPH-DRO, TPH-GRO, NPN, Target Analyte List metals (plus uranium), anions, alkalinity, gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy.

As required by the NMED, semiannual sampling for perchlorate was conducted at CYN-MW6, and quarterly sampling for perchlorate was conducted at the four new monitoring wells CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12. In May 2011, the requirements of the Order (NMED April 2004) were achieved for these four new wells, based on four consecutive monitoring events with nondetected perchlorate results; therefore, no samples for perchlorate analysis were collected from CYN-MW9, CYN-MW10, CYN-MW11, or CYN-MW12 in August or October 2011.

Only NPN was detected at concentrations exceeding the MCL of 10 mg/L in samples from the following BSG study area wells: CYN-MW1D, CYN-MW3, CYN-MW6, CYN-MW9, CYN-MW11, and CYN-MW12. The maximum concentration reported is 34.5 mg/L in the sample collected from CYN-MW9 during the October 2011 sampling event. For CY 2011, the NPN concentrations for samples from wells exceeding the MCL are summarized as follows:

- CYN-MW1D had reported concentrations of 10.5 mg/L (August 2011) and 13.3 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW1 is less than 1 to 28 mg/L with highly variable fluctuations in concentrations and a slightly decreasing trend (Figure 7B-1).

- CYN-MW3 had reported concentrations of 10.6 mg/L (February 2011), 12.5 mg/L (August 2011), and 14.0 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW3 is approximately 4 to 15 mg/L with a slightly decreasing trend (Figure 7B-2).

- CYN-MW6 had reported concentrations of 20.7 mg/L (February 2011), 21.6 mg/L (August 2011), and 24.7 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW6 is approximately 21 to 40 mg/L with a slightly increasing trend (Figure 7B-3).

- CYN-MW9 had reported concentrations of 29.1 mg/L (February 2011), 29.2 mg/L (May 2011), 31.8 mg/L (August 2011), 31.5 mg/L (August 2011, duplicate), and 34.5 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW9 is approximately 29 to 37 mg/L with a consistent trend (Figure 7B-4).

- CYN-MW11 had reported concentrations of 11.4 mg/L (May 2011), 11.3 mg/L (August 2011), and 11.0 mg/L (October 2011). The historical range of NPN concentrations for CYN-MW11 is approximately 9 to 11 mg/L with a slightly increasing trend (Figure 7B-5).

- CYN-MW12 had reported concentrations of 10.8 mg/L (February 2011), 11.4 mg/L (May 2011), 11.9 mg/L (May 2011, duplicate), 12.7 mg/L (August 2011), and 12.6 mg/L

(October 2011). The historical range of NPN concentrations for CYN-MW12 is approximately 11 to 14 mg/L with a slightly decreasing trend (Figure 7B-6).

The analytical results for this reporting period are consistent with historical concentrations. The current conceptual model described in Section 7.1.7 does not require modification based on the analytical results for this reporting period.

During CY 2012, semiannual groundwater sampling will continue at six of the BSG study area wells (CYN-MW1D, CYN-MW3, CYN-MW4, CYN-MW6, CYN-MW7, and CYN-MW8) during the first and third quarters. Quarterly groundwater sampling will continue at the four new BSG study area wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) during CY 2012. In addition, the Subsurface Soil Sampling and Well Installation Field Report and Monitoring Well Plug and Abandonment/Replacement Work Plan will be submitted to the NMED.

7.10 References

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Attachment 7A
Burn Site Groundwater
Analytical Results Tables

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Attachment 7A Tables

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Table 7A-1
Summary of Detected Volatile Organic, Semivolatile Organic, and High Explosive Compounds, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D 10-Aug-11	Acetone	3.84	3.50	10.0	NE	J	J-	091014-001	SW846-8260B
CYN-MW3 11-Aug-11	Acetone	3.72	3.50	10.0	NE	J	10UJ	091017-001	SW846-8260B
CYN-MW9 16-Aug-11	Acetone	3.65	3.50	10.0	NE	J	10U	091031-001	SW846-8260B
CYN-MW10 09-Aug-11	Acetone	3.74	3.50	10.0	NE	J	10U	091011-001	SW846-8260B
CYN-MW12 15-Aug-11	Acetone	3.77	3.50	10.0	NE	J		091025-001	SW846-8260B
CYN-MW12 13-Oct-11	Acetone	5.95	3.50	10.0	NE	J		091318-001	SW846-8260B

Refer to footnotes on page 7A-35.

Table 7A-2
Method Detection Limits for Volatile and Semivolatile Organic Compounds, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]
1,1,1-Trichloroethane	0.325	8260B	1,2,4-Trichlorobenzene	2.00 - 3.26	8270C	Di-n-butyl phthalate	2.00 - 3.26	8270C
1,1,2,2-Tetrachloroethane	0.250	8260B	1,2-Dichlorobenzene	2.00 - 3.26	8270C	Di-n-octyl phthalate	3.00 - 3.26	8270C
1,1,2-Trichloroethane	0.250	8260B	1,3-Dichlorobenzene	2.00 - 3.26	8270C	Dibenz[a,h]anthracene	0.200 - 0.326	8270C
1,1-Dichloroethane	0.300	8260B	1,4-Dichlorobenzene	2.00 - 3.26	8270C	Dibenzofuran	2.00 - 3.26	8270C
1,1-Dichloroethene	0.300	8260B	2,4,5-Trichlorophenol	2.00 - 3.26	8270C	Diethylphthalate	2.00 - 3.26	8270C
1,2-Dichloroethane	0.250	8260B	2,4,6-Trichlorophenol	2.00 - 3.26	8270C	Dimethylphthalate	2.00 - 3.26	8270C
1,2-Dichloropropane	0.250	8260B	2,4-Dichlorophenol	2.00 - 3.26	8270C	Dinitro-o-cresol	3.00 - 3.26	8270C
2-Butanone	1.25	8260B	2,4-Dimethylphenol	2.00 - 3.26	8270C	Diphenyl amine	3.00 - 3.26	8270C
2-Hexanone	1.25	8260B	2,4-Dinitrophenol	5.00 - 5.43	8270C	Fluoranthene	0.200 - 0.326	8270C
4-methyl-, 2-Pentanone	1.25	8260B	2,4-Dinitrotoluene	2.00 - 3.26	8270C	Fluorene	0.200 - 0.326	8270C
Acetone	3.50	8260B	2,6-Dinitrotoluene	2.00 - 3.26	8270C	Hexachlorobenzene	2.00 - 3.26	8270C
Benzene	0.300	8260B	2-Chloronaphthalene	0.300 - 0.326	8270C	Hexachlorobutadiene	2.00 - 3.26	8270C
Bromodichloromethane	0.250	8260B	2-Chlorophenol	2.00 - 3.26	8270C	Hexachlorocyclopentadiene	3.00 - 3.26	8270C
Bromoform	0.250	8260B	2-Methylnaphthalene	0.300 - 0.326	8270C	Hexachloroethane	2.00 - 3.26	8270C
Bromomethane	0.300	8260B	2-Nitroaniline	2.00 - 3.26	8270C	Indeno(1,2,3-c,d)pyrene	0.200 - 0.326	8270C
Carbon disulfide	1.25	8260B	2-Nitrophenol	2.00 - 3.26	8270C	Isophorone	3.00 - 3.26	8270C
Carbon tetrachloride	0.300	8260B	3,3'-Dichlorobenzidine	2.00 - 3.26	8270C	Naphthalene	0.300 - 0.326	8270C
Chlorobenzene	0.250	8260B	3-Nitroaniline	2.00 - 3.26	8270C	Nitro-benzene	3.00 - 3.26	8270C
Chloroethane	0.300	8260B	4-Bromophenyl phenyl ether	2.00 - 3.26	8270C	Pentachlorophenol	2.00 - 3.26	8270C
Chloroform	0.250	8260B	4-Chloro-3-methylphenol	2.00 - 3.26	8270C	Phenanthrene	0.200 - 0.326	8270C
Chloromethane	0.300	8260B	4-Chlorobenzenamine	2.00 - 3.26	8270C	Phenol	1.00 - 3.26	8270C
Dibromochloromethane	0.300	8260B	4-Chlorophenyl phenyl ether	2.00 - 3.26	8270C	Pyrene	0.300 - 0.326	8270C
Ethyl benzene	0.250	8260B	4-Nitroaniline	3.00 - 3.26	8270C	bis(2-Chloroethoxy)methane	3.00 - 3.26	8270C
Methylene chloride	3.00	8260B	4-Nitrophenol	2.00 - 3.26	8270C	bis(2-Chloroethyl)ether	2.00 - 3.26	8270C
Styrene	0.250	8260B	Acenaphthene	0.310 - 0.333	8270C	bis(2-Ethylhexyl)phthalate	2.00 - 3.26	8270C
Tetrachloroethene	0.300	8260B	Acenaphthylene	0.200 - 0.326	8270C	bis-Chloroisopropyl ether	2.00 - 3.26	8270C
Toluene	0.250	8260B	Anthracene	0.200 - 0.326	8270C	m,p-Cresol	2.00 - 3.26	8270C
Trichloroethene	0.250	8260B	Benzo(a)anthracene	0.200 - 0.326	8270C	n-Nitrosodipropylamine	2.00 - 3.26	8270C
Vinyl acetate	1.50	8260B	Benzo(a)pyrene	0.200 - 0.326	8270C	o-Cresol	2.00 - 3.26	8270C
Vinyl chloride	0.500	8260B	Benzo(b)fluoranthene	0.200 - 0.326	8270C			
Xylene	0.300	8260B	Benzo(ghi)perylene	0.200 - 0.326	8270C			
cis-1,2-Dichloroethene	0.300	8260B	Benzo(k)fluoranthene	0.200 - 0.326	8270C			
cis-1,3-Dichloropropene	0.250	8260B	Butylbenzyl phthalate	2.00 - 3.26	8270C			
trans-1,2-Dichloroethene	0.300	8260B	Carbazole	0.200 - 0.326	8270C			
trans-1,3-Dichloropropene	0.250	8260B	Chrysene	0.200 - 0.326	8270C			

Refer to footnotes on page 7A-35.

Table 7A-3
Method Detection Limits for High Explosives Compounds (EPA Method[g] SW846-8321A), Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.104
1,3-Dinitrobenzene	0.104
2,4,6-Trinitrotoluene	0.104
2,4-Dinitrotoluene	0.104
2,6-Dinitrotoluene	0.0779 - 0.104
2-Amino-4,6-dinitrotoluene	0.104
2-Nitrotoluene	0.104 - 0.106
3-Nitrotoluene	0.104
4-Amino-2,6-dinitrotoluene	0.104
4-Nitrotoluene	0.104 - 0.195
HMX	0.104
Nitro-benzene	0.104
Pentaerythritol tetranitrate	0.130
RDX	0.104
Tetryl	0.104 – 0.130

Refer to footnotes on pages 7A-30.

Table 7A-4
Summary of Nitrate plus Nitrite Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D 07-Feb-11	Nitrate plus nitrite as N	8.10	0.250	1.25	10.0			089984-018	EPA 353.2
CYN-MW1D (Duplicate) 07-Feb-11	Nitrate plus nitrite as N	7.65	0.250	1.25	10.0			089985-018	EPA 353.2
CYN-MW3 31-Jan-11	Nitrate plus nitrite as N	**10.6**	0.500	2.50	10.0			089979-018	EPA 353.2
CYN-MW4 27-Jan-11	Nitrate plus nitrite as N	0.087	0.050	0.250	10.0	J		089977-018	EPA 353.2
CYN-MW6 14-Feb-11	Nitrate plus nitrite as N	**20.7**	0.500	2.50	10.0			090000-018	EPA 353.2
CYN-MW7 26-Jan-11	Nitrate plus nitrite as N	1.95	0.100	0.500	10.0			089975-018	EPA 353.2
CYN-MW8 25-Jan-11	Nitrate plus nitrite as N	4.88	0.250	1.25	10.0			089973-018	EPA 353.2
CYN-MW9 15-Feb-11	Nitrate plus nitrite as N	**29.1**	0.500	2.50	10.0			090006-018	EPA 353.2
CYN-MW10 09-Feb-11	Nitrate plus nitrite as N	9.33	0.100	0.500	10.0			089994-018	EPA 353.2
CYN-MW11 08-Feb-11	Nitrate plus nitrite as N	9.10	0.500	2.50	10.0			089990-018	EPA 353.2
CYN-MW11 (Duplicate) 08-Feb-11	Nitrate plus nitrite as N	9.00	0.500	2.50	10.0			089991-018	EPA 353.2
CYN-MW12 10-Feb-11	Nitrate plus nitrite as N	**10.8**	0.100	0.500	10.0			089997-018	EPA 353.2
CYN-MW9 11-May-11	Nitrate plus nitrite as N	**29.2**	0.500	2.50	10.0			090613-018	EPA 353.2
CYN-MW10 10-May-11	Nitrate plus nitrite as N	9.10	0.500	2.50	10.0			090610-018	EPA 353.2
CYN-MW11 04-May-11	Nitrate plus nitrite as N	**11.4**	0.100	0.500	10.0			090600-018	EPA 353.2
CYN-MW12 05-May-11	Nitrate plus nitrite as N	**11.4**	0.100	0.500	10.0			090606-018	EPA 353.2
CYN-MW12 (Duplicate) 05-May-11	Nitrate plus nitrite as N	**11.9**	0.100	0.500	10.0			090607-018	EPA 353.2

Refer to footnotes on page 7A-35.

Table 7A-4 *(Continued)*
Summary of Nitrate plus Nitrite Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D 10-Aug-11	Nitrate plus nitrite as N	**10.5**	0.500	2.50	10.0			091014-018	EPA 353.2
CYN-MW3 11-Aug-11	Nitrate plus nitrite as N	**12.5**	0.500	2.50	10.0			091017-018	EPA 353.2
CYN-MW4 08-Aug-11	Nitrate plus nitrite as N	ND	0.100	0.500	10.0	U		091008-018	EPA 353.2
CYN-MW6 18-Aug-11	Nitrate plus nitrite as N	**21.6**	1.00	5.00	10.0	B		091035-018	EPA 353.2
CYN-MW7 03-Aug-11	Nitrate plus nitrite as N	1.98	0.100	0.500	10.0			091057-018	EPA 353.2
CYN-MW8 04-Aug-11	Nitrate plus nitrite as N	5.00	0.100	0.500	10.0			091063-018	EPA 353.2
CYN-MW8 (Duplicate) 04-Aug-11	Nitrate plus nitrite as N	5.12	0.100	0.500	10.0			091064-018	EPA 353.2
CYN-MW9 16-Aug-11	Nitrate plus nitrite as N	**31.8**	1.00	5.00	10.0	B	J	091031-018	EPA 353.2
CYN-MW9 (Duplicate) 16-Aug-11	Nitrate plus nitrite as N	**31.5**	1.00	5.00	10.0	B	J	091032-018	EPA 353.2
CYN-MW10 09-Aug-11	Nitrate plus nitrite as N	9.55	0.500	2.50	10.0			091011-018	EPA 353.2
CYN-MW11 12-Aug-11	Nitrate plus nitrite as N	**11.3**	0.500	2.50	10.0			091020-018	EPA 353.2
CYN-MW12 15-Aug-11	Nitrate plus nitrite as N	**12.7**	0.100	0.500	10.0	B		091025-018	EPA 353.2
CYN-MW1D 19-Oct-11	Nitrate plus nitrite as N	**13.3**	0.500	2.50	10.0			091325-018	EPA 353.2
CYN-MW3 10-Oct-11	Nitrate plus nitrite as N	**14.0**	0.500	2.50	10.0			091309-018	EPA 353.2
CYN-MW4 07-Oct-11	Nitrate plus nitrite as N	ND	0.050	0.250	10.0	U		091306-018	EPA 353.2
CYN-MW6 17-Oct-11	Nitrate plus nitrite as N	**24.7**	0.500	2.50	10.0			091320-018	EPA 353.2
CYN-MW7 06-Oct-11	Nitrate plus nitrite as N	2.09	0.100	0.500	10.0			091303-018	EPA 353.2
CYN-MW7 (Duplicate) 06-Oct-11	Nitrate plus nitrite as N	2.13	0.100	0.500	10.0			091304-018	EPA 353.2

Refer to footnotes on page 7A-35.

Table 7A-4 *(Concluded)*
Summary of Nitrate plus Nitrite Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW8 04-Oct-11	Nitrate plus nitrite as N	5.05	0.100	0.500	10.0			091299-018	EPA 353.2
CYN-MW9 18-Oct-11	Nitrate plus nitrite as N	**34.5**	0.500	2.50	10.0			091322-018	EPA 353.2
CYN-MW10 11-Oct-11	Nitrate plus nitrite as N	8.31	0.100	0.500	10.0			091313-018	EPA 353.2
CYN-MW10 (Duplicate) 11-Oct-11	Nitrate plus nitrite as N	8.18	0.100	0.500	10.0			091314-018	EPA 353.2
CYN-MW11 12-Oct-11	Nitrate plus nitrite as N	**11.0**	0.100	0.500	10.0			091316-018	EPA 353.2
CYN-MW12 13-Oct-11	Nitrate plus nitrite as N	**12.6**	0.100	0.500	10.0			091318-018	EPA 353.2

Refer to footnotes on page 7A-35.

Table 7A-5
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D	Diesel Range Organics	ND	67.7	208	NE	U		089984-005	SW846 8015A/B
07-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089984-006	SW846 8015B
CYN-MW1D (Duplicate)	Diesel Range Organics	ND	66.3	204	NE	U		089985-005	SW846 8015A/B
07-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089985-006	SW846 8015B
CYN-MW3	Diesel Range Organics	ND	65.0	200	NE	U		089979-005	SW846 8015A/B
31-Jan-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089979-006	SW846 8015B
CYN-MW4	Diesel Range Organics	ND	63.7	196	NE	U		089977-005	SW846 8015A/B
27-Jan-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089977-006	SW846 8015B
CYN-MW6	Diesel Range Organics	ND	65.0	200	NE	U		090000-005	SW846 8015A/B
14-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		090000-006	SW846 8015B
CYN-MW7	Diesel Range Organics	ND	63.7	196	NE	U		089975-005	SW846 8015A/B
26-Jan-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089975-006	SW846 8015B
CYN-MW8	Diesel Range Organics	ND	65.0	200	NE	U		089973-005	SW846 8015A/B
25-Jan-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089973-006	SW846 8015B
CYN-MW9	Diesel Range Organics	ND	66.3	204	NE	U		090006-005	SW846 8015A/B
15-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		090006-006	SW846 8015B
CYN-MW10	Diesel Range Organics	ND	73.9	227	NE	U		089994-005	SW846 8015A/B
09-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089994-006	SW846 8015B
CYN-MW11	Diesel Range Organics	ND	66.3	204	NE	U		089990-005	SW846 8015A/B
08-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089990-006	SW846 8015B
CYN-MW11 (Duplicate)	Diesel Range Organics	ND	68.4	211	NE	U		089991-005	SW846 8015A/B
08-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089991-006	SW846 8015B
CYN-MW12	Diesel Range Organics	ND	66.3	204	NE	U		089997-005	SW846 8015A/B
10-Feb-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		089997-006	SW846 8015B
CYN-MW9	Diesel Range Organics	ND	65.7	202	NE	U	UJ	090613-005	SW846 8015A/B
11-May-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		090613-006	SW846 8015B
CYN-MW10	Diesel Range Organics	ND	65.0	200	NE	U	UJ	090610-005	SW846 8015A/B
10-May-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		090610-006	SW846 8015B
CYN-MW11	Diesel Range Organics	ND	73.0	225	NE	U		090600-005	SW846 8015A/B
04-May-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		090600-006	SW846 8015B
CYN-MW12	Diesel Range Organics	ND	67.0	206	NE	U		090606-005	SW846 8015A/B
05-May-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		090606-006	SW846 8015B
CYN-MW12 (Duplicate)	Diesel Range Organics	ND	66.3	204	NE	U		090607-005	SW846 8015A/B
05-May-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		090607-006	SW846 8015B

Refer to footnotes on page 7A-35.

Table 7A-5 *(Continued)*
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D	Diesel Range Organics	ND	65.0	200	NE	U		091014-005	SW846 8015A/B
10-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091014-006	SW846 8015B
CYN-MW3	Diesel Range Organics	ND	67.7	208	NE	U		091017-005	SW846 8015A/B
11-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091017-006	SW846 8015B
CYN-MW4	Diesel Range Organics	ND	65.0	200	NE	U		091008-005	SW846 8015A/B
08-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091008-006	SW846 8015B
CYN-MW6	Diesel Range Organics	ND	66.3	204	NE	U		091035-005	SW846 8015A/B
18-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091035-006	SW846 8015B
CYN-MW7	Diesel Range Organics	ND	72.2	222	NE	U	UJ	091057-005	SW846 8015A/B
03-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091057-006	SW846 8015B
CYN-MW8	Diesel Range Organics	ND	70.7	217	NE	U	UJ	091063-005	SW846 8015A/B
04-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091063-006	SW846 8015B
CYN-MW8 (Duplicate)	Diesel Range Organics	ND	71.4	220	NE	U	UJ	091064-005	SW846 8015A/B
04-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091064-006	SW846 8015B
CYN-MW9	Diesel Range Organics	ND	69.1	213	NE	U		091031-005	SW846 8015A/B
16-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091031-006	SW846 8015B
CYN-MW9 (Duplicate)	Diesel Range Organics	ND	72.2	222	NE	U		091032-005	SW846 8015A/B
16-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091032-006	SW846 8015B
CYN-MW10	Diesel Range Organics	ND	68.4	211	NE	U		091011-005	SW846 8015A/B
09-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091011-006	SW846 8015B
CYN-MW11	Diesel Range Organics	ND	69.1	213	NE	U		091020-005	SW846 8015A/B
12-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091020-006	SW846 8015B
CYN-MW12	Diesel Range Organics	80.1	65.0	200	NE	J	J+	091025-005	SW846 8015A/B
15-Aug-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091025-006	SW846 8015B
CYN-MW1D	Diesel Range Organics	ND	65.0	200	NE	U		091325-005	SW846 8015A/B
19-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091325-006	SW846 8015B
CYN-MW3	Diesel Range Organics	ND	75.6	233	NE	U		091309-005	SW846 8015A/B
10-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091309-006	SW846 8015B
CYN-MW4	Diesel Range Organics	ND	68.4	211	NE	U		091306-005	SW846 8015A/B
07-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091306-006	SW846 8015B
CYN-MW6	Diesel Range Organics	ND	65.0	200	NE	U		091320-005	SW846 8015A/B
17-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091320-006	SW846 8015B
CYN-MW7	Diesel Range Organics	ND	68.4	211	NE	U		091303-005	SW846 8015A/B
06-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091303-006	SW846 8015B

Refer to footnotes on page 7A-35.

Table 7A-5 *(Concluded)*
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW7 (Duplicate)	Diesel Range Organics	ND	68.4	211	NE	U		091304-005	SW846 8015A/B
06-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091304-006	SW846 8015B
CYN-MW8	Diesel Range Organics	ND	65.0	200	NE	U		091299-005	SW846 8015A/B
04-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091299-006	SW846 8015B
CYN-MW9	Diesel Range Organics	ND	65.0	200	NE	U		091322-005	SW846 8015A/B
18-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091322-006	SW846 8015B
CYN-MW10	Diesel Range Organics	ND	65.7	202	NE	U		091313-005	SW846 8015A/B
11-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091313-006	SW846 8015B
CYN-MW10 (Duplicate)	Diesel Range Organics	ND	67.0	206	NE	U		091314-005	SW846 8015A/B
11-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091314-006	SW846 8015B
CYN-MW11	Diesel Range Organics	ND	65.0	200	NE	U		091316-005	SW846 8015A/B
12-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091316-006	SW846 8015B
CYN-MW12	Diesel Range Organics	ND	66.3	204	NE	U		091318-005	SW846 8015A/B
13-Oct-11	Gasoline Range Organics	ND	10.5	50.0	NE	U		091318-006	SW846 8015B

Refer to footnotes on page 7A-35.

Table 7A-6
Summary of Perchlorate Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW6 14-Feb-11	0.00695	0.004	0.012	NE	J	J-	090000-020	EPA 314.0
	0.00626	0.0005	0.002	NE	H, h		090000-R20	SW846-6850M
CYN-MW9 15-Feb-11	ND	0.004	0.012	NE	U		090006-020	EPA 314.0
CYN-MW10 09-Feb-11	ND	0.004	0.012	NE	U		089994-020	EPA 314.0
CYN-MW11 08-Feb-11	ND	0.004	0.012	NE	U		089990-020	EPA 314.0
CYN-MW11 (Duplicate) 08-Feb-11	ND	0.004	0.012	NE	U		089991-020	EPA 314.0
CYN-MW12 10-Feb-11	ND	0.004	0.012	NE	U		089997-020	EPA 314.0
CYN-MW9 11-May-11	ND	0.004	0.012	NE	U		090613-020	EPA 314.0
CYN-MW10 10-May-11	ND	0.004	0.012	NE	U		090610-020	EPA 314.0
CYN-MW11 04-May-11	ND	0.004	0.012	NE	U		090600-020	EPA 314.0
CYN-MW12 05-May-11	ND	0.004	0.012	NE	U		090606-020	EPA 314.0
CYN-MW12 (Duplicate) 05-May-11	ND	0.004	0.012	NE	U		090607-020	EPA 314.0
CYN-MW6 18-Aug-11	0.00706	0.004	0.012	NE	J		091035-020	EPA 314.0
CYN-MW6 17-Oct-11	0.00638	0.004	0.012	NE	J		091320-020	EPA 314.0

Refer to footnotes on page 7A-35.

Table 7A-7
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D	Bromide	0.449	0.066	0.200	NE			091014-016	SW846 9056
10-Aug-11	Chloride	27.7	0.330	1.00	NE			091014-016	SW846 9056
	Fluoride	1.83	0.033	0.100	4.0			091014-016	SW846 9056
	Sulfate	111	0.500	2.00	NE			091014-016	SW846 9056
CYN-MW3	Bromide	0.851	0.066	0.200	NE			091017-016	SW846 9056
11-Aug-11	Chloride	65.2	0.660	2.00	NE			091017-016	SW846 9056
	Fluoride	0.616	0.033	0.100	4.0			091017-016	SW846 9056
	Sulfate	182	1.00	4.00	NE			091017-016	SW846 9056
CYN-MW4	Bromide	0.365	0.066	0.200	NE			091008-016	SW846 9056
08-Aug-11	Chloride	24.3	0.330	1.00	NE			091008-016	SW846 9056
	Fluoride	0.749	0.033	0.100	4.0			091008-016	SW846 9056
	Sulfate	132	0.500	2.00	NE			091008-016	SW846 9056
CYN-MW6	Bromide	0.878	0.066	0.200	NE			091035-016	SW846 9056
18-Aug-11	Chloride	57.9	0.660	2.00	NE			091035-016	SW846 9056
	Fluoride	0.706	0.033	0.100	4.0			091035-016	SW846 9056
	Sulfate	123	1.00	4.00	NE			091035-016	SW846 9056
CYN-MW7	Bromide	0.620	0.066	0.200	NE			091057-016	SW846 9056
03-Aug-11	Chloride	42.0	0.330	1.00	NE			091057-016	SW846 9056
	Fluoride	1.18	0.033	0.100	4.0			091057-016	SW846 9056
	Sulfate	80.1	0.500	2.00	NE			091057-016	SW846 9056
CYN-MW8	Bromide	0.767	0.066	0.200	NE			091063-016	SW846 9056
04-Aug-11	Chloride	60.7	0.330	1.00	NE			091063-016	SW846 9056
	Fluoride	1.27	0.033	0.100	4.0			091063-016	SW846 9056
	Sulfate	118	0.500	2.00	NE			091063-016	SW846 9056
CYN-MW8 (Duplicate)	Bromide	0.780	0.066	0.200	NE			091064-016	SW846 9056
04-Aug-11	Chloride	60.2	0.330	1.00	NE			091064-016	SW846 9056
	Fluoride	1.29	0.033	0.100	4.0			091064-016	SW846 9056
	Sulfate	117	0.500	2.00	NE			091064-016	SW846 9056
CYN-MW9	Bromide	1.09	0.066	0.200	NE			091031-016	SW846 9056
16-Aug-11	Chloride	78.6	0.660	2.00	NE			091031-016	SW846 9056
	Fluoride	0.539	0.033	0.100	4.0			091031-016	SW846 9056
	Sulfate	168	1.00	4.00	NE			091031-016	SW846 9056
CYN-MW9 (Duplicate)	Bromide	1.12	0.066	0.200	NE			091032-016	SW846 9056
16-Aug-11	Chloride	78.8	0.660	2.00	NE			091032-016	SW846 9056
	Fluoride	0.548	0.033	0.100	4.0			091032-016	SW846 9056
	Sulfate	169	1.00	4.00	NE			091032-016	SW846 9056

Refer to footnotes on page 7A-35.

Table 7A-7 *(Concluded)*
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW10	Bromide	0.735	0.066	0.200	NE			091011-016	SW846 9056
09-Aug-11	Chloride	50.2	0.660	2.00	NE			091011-016	SW846 9056
	Fluoride	0.677	0.033	0.100	4.0			091011-016	SW846 9056
	Sulfate	169	1.00	4.00	NE			091011-016	SW846 9056
CYN-MW11	Bromide	1.01	0.066	0.200	NE			091020-016	SW846 9056
12-Aug-11	Chloride	71.2	0.660	2.00	NE			091020-016	SW846 9056
	Fluoride	0.671	0.033	0.100	4.0			091020-016	SW846 9056
	Sulfate	164	1.00	4.00	NE			091020-016	SW846 9056
CYN-MW12	Bromide	0.963	0.066	0.200	NE			091025-016	SW846 9056
15-Aug-11	Chloride	81.4	0.660	2.00	NE			091025-016	SW846 9056
	Fluoride	0.982	0.033	0.100	4.0			091025-016	SW846 9056
	Sulfate	200	1.00	4.00	NE			091025-016	SW846 9056

Refer to footnotes on page 7A-35.

Table 7A-8
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D	Aluminum	ND	0.015	0.050	NE	U		091014-009	SW846 6020
10-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091014-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091014-009	SW846 6020
	Barium	0.0408	0.0006	0.002	2.00			091014-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091014-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091014-009	SW846 6020
	Calcium	55.8	0.300	1.00	NE			091014-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091014-009	SW846 6020
	Cobalt	0.000294	0.0001	0.001	NE	J	J+	091014-009	SW846 6020
	Copper	0.000962	0.00035	0.001	NE	J	J+	091014-009	SW846 6020
	Iron	7.25	0.033	0.100	NE			091014-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091014-009	SW846 6020
	Magnesium	11.1	0.010	0.030	NE		J	091014-009	SW846 6020
	Manganese	0.0581	0.001	0.005	NE			091014-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091014-009	SW846 7470
	Nickel	0.00245	0.0005	0.002	NE		J+	091014-009	SW846 6020
	Potassium	2.20	0.080	0.300	NE			091014-009	SW846 6020
	Selenium	0.00191	0.0015	0.005	0.050	J		091014-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091014-009	SW846 6020
	Sodium	29.5	0.080	0.250	NE			091014-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091014-009	SW846 6020
	Uranium	0.000821	0.000067	0.0002	0.030	B	J+	091014-009	SW846 6020
	Vanadium	0.0043	0.001	0.005	NE	J		091014-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091014-009	SW846 6020

Refer to footnotes on page 7A-35.

Table 7A-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW3	Aluminum	ND	0.015	0.050	NE	U		091017-009	SW846 6020
11-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091017-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091017-009	SW846 6020
	Barium	0.0561	0.0006	0.002	2.00			091017-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091017-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091017-009	SW846 6020
	Calcium	142	0.300	1.00	NE			091017-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091017-009	SW846 6020
	Cobalt	0.000418	0.0001	0.001	NE	J	J+	091017-009	SW846 6020
	Copper	0.00205	0.00035	0.001	NE		J+	091017-009	SW846 6020
	Iron	0.535	0.033	0.100	NE			091017-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091017-009	SW846 6020
	Magnesium	39.2	0.010	0.030	NE		J	091017-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091017-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091017-009	SW846 7470
	Nickel	0.00622	0.0005	0.002	NE		J+	091017-009	SW846 6020
	Potassium	2.41	0.080	0.300	NE			091017-009	SW846 6020
	Selenium	0.0102	0.0015	0.005	0.050			091017-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091017-009	SW846 6020
	Sodium	45.2	0.080	0.250	NE			091017-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091017-009	SW846 6020
	Uranium	0.00675	0.000067	0.0002	0.030	B	J+	091017-009	SW846 6020
	Vanadium	0.00243	0.001	0.005	NE	J		091017-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091017-009	SW846 6020

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Table 7A-8 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Aluminum	ND	0.015	0.050	NE	U		091008-009	SW846 6020
08-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091008-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091008-009	SW846 6020
	Barium	0.0517	0.0006	0.002	2.00			091008-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091008-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091008-009	SW846 6020
	Calcium	76.1	0.600	2.00	NE			091008-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091008-009	SW846 6020
	Cobalt	0.000153	0.0001	0.001	NE	J		091008-009	SW846 6020
	Copper	0.000914	0.00035	0.001	NE	J		091008-009	SW846 6020
	Iron	0.130	0.033	0.100	NE			091008-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091008-009	SW846 6020
	Magnesium	38.9	0.010	0.030	NE			091008-009	SW846 6020
	Manganese	0.00163	0.001	0.005	NE	J		091008-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091008-009	SW846 7470
	Nickel	0.00233	0.0005	0.002	NE			091008-009	SW846 6020
	Potassium	7.42	0.080	0.300	NE			091008-009	SW846 6020
	Selenium	0.0167	0.0015	0.005	0.050			091008-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091008-009	SW846 6020
	Sodium	50.3	0.800	2.50	NE			091008-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091008-009	SW846 6020
	Uranium	0.0146	0.000067	0.0002	0.030			091008-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091008-009	SW846 6010
	Zinc	0.00728	0.0035	0.010	NE	J		091008-009	SW846 6020

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Table 7A-8 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW6	Aluminum	0.021	0.015	0.050	NE	J		091035-009	SW846 6020
18-Aug-11	Antimony	0.00108	0.001	0.003	0.006	J		091035-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091035-009	SW846 6020
	Barium	0.0622	0.0006	0.002	2.00			091035-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091035-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091035-009	SW846 6020
	Calcium	146	0.600	2.00	NE			091035-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091035-009	SW846 6020
	Cobalt	0.000271	0.0001	0.001	NE	J	J+	091035-009	SW846 6020
	Copper	0.00207	0.00035	0.001	NE			091035-009	SW846 6020
	Iron	0.355	0.033	0.100	NE			091035-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091035-009	SW846 6020
	Magnesium	40.4	0.010	0.030	NE			091035-009	SW846 6020
	Manganese	0.00168	0.001	0.005	NE	J		091035-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091035-009	SW846 7470
	Nickel	0.00476	0.0005	0.002	NE			091035-009	SW846 6020
	Potassium	2.29	0.080	0.300	NE			091035-009	SW846 6020
	Selenium	0.0146	0.0015	0.005	0.050			091035-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091035-009	SW846 6020
	Sodium	39.4	0.080	0.250	NE		J	091035-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091035-009	SW846 6020
	Uranium	0.00758	0.000067	0.0002	0.030		J+	091035-009	SW846 6020
	Vanadium	0.00106	0.001	0.005	NE	J		091035-009	SW846 6010
	Zinc	0.0218	0.0035	0.010	NE		J+	091035-009	SW846 6020

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Table 7A-8 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW7	Aluminum	0.0206	0.015	0.050	NE	J		091057-009	SW846 6020
03-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091057-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091057-009	SW846 6020
	Barium	0.104	0.0006	0.002	2.00			091057-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091057-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091057-009	SW846 6020
	Calcium	109	0.300	1.00	NE			091057-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091057-009	SW846 6020
	Cobalt	0.0001	0.0001	0.001	NE	J	J+	091057-009	SW846 6020
	Copper	0.000586	0.00035	0.001	NE	J	J+	091057-009	SW846 6020
	Iron	0.172	0.033	0.100	NE			091057-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091057-009	SW846 6020
	Magnesium	19.4	0.010	0.030	NE		J	091057-009	SW846 6020
	Manganese	0.00312	0.001	0.005	NE	J	J+	091057-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091057-009	SW846 7470
	Nickel	0.00373	0.0005	0.002	NE		J+	091057-009	SW846 6020
	Potassium	2.39	0.080	0.300	NE			091057-009	SW846 6020
	Selenium	0.00388	0.0015	0.005	0.050	J	J-	091057-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091057-009	SW846 6020
	Sodium	44.2	0.400	1.25	NE			091057-009	SW846 6020
	Thallium	0.000483	0.00045	0.002	0.002	J		091057-009	SW846 6020
	Uranium	0.00657	0.000067	0.0002	0.030		J+	091057-009	SW846 6020
	Vanadium	0.00699	0.001	0.005	NE			091057-009	SW846 6010
	Zinc	0.00399	0.0035	0.010	NE	J	J+	091057-009	SW846 6020

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Table 7A-8 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW8	Aluminum	ND	0.015	0.050	NE	U		091063-009	SW846 6020
04-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091063-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091063-009	SW846 6020
	Barium	0.0546	0.0006	0.002	2.00	B		091063-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091063-009	SW846 6020
	Cadmium	0.000139	0.00011	0.001	0.005	J	J+	091063-009	SW846 6020
	Calcium	111	0.300	1.00	NE			091063-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091063-009	SW846 6020
	Cobalt	0.000291	0.0001	0.001	NE	J	J+	091063-009	SW846 6020
	Copper	0.000946	0.00035	0.001	NE	J	J+	091063-009	SW846 6020
	Iron	0.200	0.033	0.100	NE			091063-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091063-009	SW846 6020
	Magnesium	22.8	0.010	0.030	NE			091063-009	SW846 6020
	Manganese	0.00462	0.001	0.005	NE	J	J+	091063-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091063-009	SW846 7470
	Nickel	0.00361	0.0005	0.002	NE		J+	091063-009	SW846 6020
	Potassium	2.16	0.080	0.300	NE			091063-009	SW846 6020
	Selenium	0.00593	0.0015	0.005	0.050			091063-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091063-009	SW846 6020
	Sodium	44.7	0.080	0.250	NE			091063-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091063-009	SW846 6020
	Uranium	0.00685	0.000067	0.0002	0.030		J+	091063-009	SW846 6020
	Vanadium	0.00391	0.001	0.005	NE	J	J+	091063-009	SW846 6010
	Zinc	0.0063	0.0035	0.010	NE	J	J+	091063-009	SW846 6020

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Table 7A-8 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW8 (Duplicate)	Aluminum	ND	0.015	0.050	NE	U		091064-009	SW846 6020
04-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091064-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091064-009	SW846 6020
	Barium	0.055	0.0006	0.002	2.00	B		091064-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091064-009	SW846 6020
	Cadmium	0.000156	0.00011	0.001	0.005	J	J+	091064-009	SW846 6020
	Calcium	108	0.300	1.00	NE			091064-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091064-009	SW846 6020
	Cobalt	0.000291	0.0001	0.001	NE	J	J+	091064-009	SW846 6020
	Copper	0.00105	0.00035	0.001	NE		J+	091064-009	SW846 6020
	Iron	0.227	0.033	0.100	NE			091064-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091064-009	SW846 6020
	Magnesium	22.4	0.010	0.030	NE			091064-009	SW846 6020
	Manganese	0.00488	0.001	0.005	NE	J	J+	091064-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091064-009	SW846 7470
	Nickel	0.00362	0.0005	0.002	NE		J+	091064-009	SW846 6020
	Potassium	2.23	0.080	0.300	NE			091064-009	SW846 6020
	Selenium	0.00641	0.0015	0.005	0.050			091064-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091064-009	SW846 6020
	Sodium	44.9	0.080	0.250	NE			091064-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091064-009	SW846 6020
	Uranium	0.00698	0.000067	0.0002	0.030		J+	091064-009	SW846 6020
	Vanadium	0.00385	0.001	0.005	NE	J	J+	091064-009	SW846 6010
	Zinc	0.00706	0.0035	0.010	NE	J	J+	091064-009	SW846 6020

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Table 7A-8 *(Continued)*
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CYN-MW9	Aluminum	ND	0.015	0.050	NE	U		091031-009	SW846 6020
16-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091031-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091031-009	SW846 6020
	Barium	0.0515	0.0006	0.002	2.00			091031-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091031-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091031-009	SW846 6020
	Calcium	152	0.600	2.00	NE			091031-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091031-009	SW846 6020
	Cobalt	0.000152	0.0001	0.001	NE	J	J+	091031-009	SW846 6020
	Copper	0.000853	0.00035	0.001	NE	J	0.020U	091031-009	SW846 6020
	Iron	0.293	0.033	0.100	NE			091031-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091031-009	SW846 6020
	Magnesium	44.2	0.010	0.030	NE			091031-009	SW846 6020
	Manganese	0.00101	0.001	0.005	NE	J	J+	091031-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091031-009	SW846 7470
	Nickel	0.00405	0.0005	0.002	NE		J+	091031-009	SW846 6020
	Potassium	2.29	0.080	0.300	NE			091031-009	SW846 6020
	Selenium	0.00911	0.0015	0.005	0.050			091031-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091031-009	SW846 6020
	Sodium	37.9	0.080	0.250	NE			091031-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091031-009	SW846 6020
	Uranium	0.00627	0.000067	0.0002	0.030		J+	091031-009	SW846 6020
	Vanadium	0.00241	0.001	0.005	NE	J		091031-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091031-009	SW846 6020

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Table 7A-8 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW9 (Duplicate)	Aluminum	ND	0.015	0.050	NE	U		091032-009	SW846 6020
16-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091032-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091032-009	SW846 6020
	Barium	0.0525	0.0006	0.002	2.00			091032-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091032-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091032-009	SW846 6020
	Calcium	154	0.600	2.00	NE			091032-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091032-009	SW846 6020
	Cobalt	0.000169	0.0001	0.001	NE	J	J+	091032-009	SW846 6020
	Copper	0.000921	0.00035	0.001	NE	J	0.020U	091032-009	SW846 6020
	Iron	0.346	0.033	0.100	NE			091032-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091032-009	SW846 6020
	Magnesium	43.7	0.010	0.030	NE			091032-009	SW846 6020
	Manganese	0.00103	0.001	0.005	NE	J	J+	091032-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091032-009	SW846 7470
	Nickel	0.00413	0.0005	0.002	NE		J+	091032-009	SW846 6020
	Potassium	2.28	0.080	0.300	NE			091032-009	SW846 6020
	Selenium	0.0098	0.0015	0.005	0.050			091032-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091032-009	SW846 6020
	Sodium	37.9	0.080	0.250	NE			091032-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091032-009	SW846 6020
	Uranium	0.0066	0.000067	0.0002	0.030		J+	091032-009	SW846 6020
	Vanadium	0.00187	0.001	0.005	NE	J		091032-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091032-009	SW846 6020

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Table 7A-8 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW10	Aluminum	ND	0.015	0.050	NE	U		091011-009	SW846 6020
09-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091011-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091011-009	SW846 6020
	Barium	0.0632	0.0006	0.002	2.00			091011-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091011-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091011-009	SW846 6020
	Calcium	133	0.600	2.00	NE			091011-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091011-009	SW846 6020
	Cobalt	0.000187	0.0001	0.001	NE	J	J+	091011-009	SW846 6020
	Copper	0.00107	0.00035	0.001	NE		J+	091011-009	SW846 6020
	Iron	0.203	0.033	0.100	NE			091011-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091011-009	SW846 6020
	Magnesium	38.8	0.010	0.030	NE			091011-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		091011-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091011-009	SW846 7470
	Nickel	0.0033	0.0005	0.002	NE		J+	091011-009	SW846 6020
	Potassium	2.20	0.080	0.300	NE			091011-009	SW846 6020
	Selenium	0.00954	0.0015	0.005	0.050			091011-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091011-009	SW846 6020
	Sodium	41.3	0.800	2.50	NE			091011-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091011-009	SW846 6020
	Uranium	0.00615	0.000067	0.0002	0.030		J+	091011-009	SW846 6020
	Vanadium	0.00278	0.001	0.005	NE	J		091011-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091011-009	SW846 6020

Refer to footnotes on page 7A-35.

Table 7A-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW11	Aluminum	ND	0.015	0.050	NE	U		091020-009	SW846 6020
12-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091020-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091020-009	SW846 6020
	Barium	0.0879	0.0006	0.002	2.00			091020-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091020-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091020-009	SW846 6020
	Calcium	140	0.300	1.00	NE		J	091020-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091020-009	SW846 6020
	Cobalt	0.000814	0.0001	0.001	NE	J	J+	091020-009	SW846 6020
	Copper	0.00187	0.00035	0.001	NE		J+	091020-009	SW846 6020
	Iron	0.544	0.033	0.100	NE			091020-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091020-009	SW846 6020
	Magnesium	44.7	0.010	0.030	NE		J	091020-009	SW846 6020
	Manganese	0.454	0.001	0.005	NE			091020-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091020-009	SW846 7470
	Nickel	0.00657	0.0005	0.002	NE		J+	091020-009	SW846 6020
	Potassium	3.66	0.080	0.300	NE			091020-009	SW846 6020
	Selenium	0.0065	0.0015	0.005	0.050			091020-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091020-009	SW846 6020
	Sodium	47.8	0.080	0.250	NE			091020-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091020-009	SW846 6020
	Uranium	0.00616	0.000067	0.0002	0.030	B	J+	091020-009	SW846 6020
	Vanadium	0.00215	0.001	0.005	NE	J		091020-009	SW846 6010
	Zinc	0.0901	0.0035	0.010	NE		J+	091020-009	SW846 6020

Refer to footnotes on page 7A-35.

Table 7A-8 *(Concluded)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW12	Aluminum	ND	0.015	0.050	NE	U		091025-009	SW846 6020
15-Aug-11	Antimony	ND	0.001	0.003	0.006	U		091025-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091025-009	SW846 6020
	Barium	0.0366	0.0006	0.002	2.00			091025-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091025-009	SW846 6020
	Cadmium	0.000225	0.00011	0.001	0.005	J	J+	091025-009	SW846 6020
	Calcium	149	0.600	2.00	NE			091025-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091025-009	SW846 6020
	Cobalt	0.00043	0.0001	0.001	NE	J	J+	091025-009	SW846 6020
	Copper	0.0011	0.00035	0.001	NE		J+	091025-009	SW846 6020
	Iron	0.293	0.033	0.100	NE			091025-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091025-009	SW846 6020
	Magnesium	42.5	0.010	0.030	NE			091025-009	SW846 6020
	Manganese	0.137	0.001	0.005	NE			091025-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091025-009	SW846 7470
	Nickel	0.00441	0.0005	0.002	NE		J+	091025-009	SW846 6020
	Potassium	3.80	0.080	0.300	NE			091025-009	SW846 6020
	Selenium	0.0091	0.0015	0.005	0.050			091025-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091025-009	SW846 6020
	Sodium	44.9	0.080	0.250	NE			091025-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091025-009	SW846 6020
	Uranium	0.00807	0.000067	0.0002	0.030		J+	091025-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091025-009	SW846 6010
	Zinc	0.023	0.0035	0.010	NE		J+	091025-009	SW846 6020

Refer to footnotes on page 7A-35.

Table 7A-9
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW1D	Americium-241	0.00372 ± 10.9	18.8	9.42	NE	U	BD	091014-033	EPA 901.1
10-Aug-11	Cesium-137	0.173 ± 2.05	3.47	1.74	NE	U	BD	091014-033	EPA 901.1
	Cobalt-60	-0.738 ± 3.39	3.81	1.91	NE	U	BD	091014-033	EPA 901.1
	Potassium-40	-33.3 ± 49.6	51.1	25.6	NE	U	BD	091014-033	EPA 901.1
	Gross Alpha	0.94	NA	NA	15	NA	None	091014-034	EPA 900.0
	Gross Beta	3.53 ± 1.02	1.26	0.610	4mrem/yr		J	091014-034	EPA 900.0
	Uranium-233/234	1.81 ± 0.325	0.101	0.0438	NE			091014-035	HASL-300
	Uranium-235/236	0.0122 ± 0.0294	0.0626	0.023	NE	U	BD	091014-035	HASL-300
	Uranium-238	0.252 ± 0.0784	0.0786	0.0326	NE			091014-035	HASL-300
	Tritium	27.8 ± 89.2	160	71.9	NE	U	BD	091014-036	EPA 906.0 M
CYN-MW3	Americium-241	1.39 ± 3.08	4.86	2.43	NE	U	BD	091017-033	EPA 901.1
11-Aug-11	Cesium-137	0.956 ± 2.33	3.83	1.92	NE	U	BD	091017-033	EPA 901.1
	Cobalt-60	1.55 ± 2.56	4.39	2.20	NE	U	BD	091017-033	EPA 901.1
	Potassium-40	-24.6 ± 46.0	49.4	24.7	NE	U	BD	091017-033	EPA 901.1
	Gross Alpha	-0.43	NA	NA	15	NA	None	091017-034	EPA 900.0
	Gross Beta	4.84 ± 1.93	2.76	1.34	4mrem/yr		J	091017-034	EPA 900.0
	Uranium-233/234	6.68 ± 0.998	0.0812	0.0352	NE			091017-035	HASL-300
	Uranium-235/236	0.113 ± 0.0525	0.0503	0.0185	NE		J	091017-035	HASL-300
	Uranium-238	2.19 ± 0.360	0.0632	0.0262	NE			091017-035	HASL-300
	Tritium	26.7 ± 85.9	155	69.3	NE	U	BD	091017-036	EPA 906.0 M
CYN-MW4	Americium-241	5.18 ± 8.05	12.0	5.99	NE	U	BD	091008-033	EPA 901.1
08-Aug-11	Cesium-137	-0.47 ± 3.74	4.42	2.21	NE	U	BD	091008-033	EPA 901.1
	Cobalt-60	1.37 ± 3.14	5.36	2.68	NE	U	BD	091008-033	EPA 901.1
	Potassium-40	93.3 ± 46.8	39.6	19.8	NE		J	091008-033	EPA 901.1
	Gross Alpha	9.32	NA	NA	15	NA	None	091008-034	EPA 900.0
	Gross Beta	8.31 ± 2.09	2.34	1.14	4mrem/yr			091008-034	EPA 900.0
	Uranium-233/234	32.0 ± 4.37	0.0489	0.0212	NE			091008-035	HASL-300
	Uranium-235/236	0.870 ± 0.154	0.0303	0.0111	NE			091008-035	HASL-300
	Uranium-238	4.11 ± 0.589	0.0381	0.0158	NE			091008-035	HASL-300
	Tritium	10.1 ± 71.3	133	58.7	NE	U	BD	091008-036	EPA 906.0 M

Refer to footnotes on page 7A-35.

Table 7A-9 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW6	Americium-241	-1.86 ± 7.40	11.6	5.81	NE	U	BD	091035-033	EPA 901.1
18-Aug-11	Cesium-137	-0.475 ± 1.64	2.62	1.31	NE	U	BD	091035-033	EPA 901.1
	Cobalt-60	0.828 ± 1.64	2.74	1.37	NE	U	BD	091035-033	EPA 901.1
	Potassium-40	32.6 ± 37.6	27.8	13.9	NE	X	R	091035-033	EPA 901.1
	Gross Alpha	5.16	NA	NA	15	NA	None	091035-034	EPA 900.0
	Gross Beta	5.19 ± 2.20	3.24	1.58	4mrem/yr		J	091035-034	EPA 900.0
	Uranium-233/234	9.74 ± 1.36	0.0696	0.0302	NE			091035-035	HASL-300
	Uranium-235/236	0.628 ± 0.132	0.0431	0.0159	NE			091035-035	HASL-300
	Uranium-238	2.77 ± 0.420	0.0542	0.0225	NE			091035-035	HASL-300
	Tritium	16.3 ± 85.9	157	70.4	NE	U	BD	091035-036	EPA 906.0 M
CYN-MW7	Americium-241	-34.5 ± 19.2	17.4	8.68	NE	U	BD	091057-033	EPA 901.1
03-Aug-11	Cesium-137	-1.12 ± 1.99	3.11	1.56	NE	U	BD	091057-033	EPA 901.1
	Cobalt-60	1.91 ± 4.35	4.09	2.04	NE	U	BD	091057-033	EPA 901.1
	Potassium-40	1.42 ± 40.5	43.5	21.8	NE	U	BD	091057-033	EPA 901.1
	Gross Alpha	-2.40	NA	NA	15	NA	None	091057-034	EPA 900.0
	Gross Beta	5.01 ± 1.50	1.88	0.911	4mrem/yr		J	091057-034	EPA 900.0
	Uranium-233/234	18.5 ± 2.62	0.0953	0.0413	NE			091057-036	HASL-300
	Uranium-235/236	0.242 ± 0.0837	0.0591	0.0217	NE			091057-036	HASL-300
	Uranium-238	2.56 ± 0.414	0.0742	0.0308	NE			091057-036	HASL-300
	Tritium	30.1 ± 73.7	132	58.2	NE	U	BD	091057-035	EPA 906.0 M
CYN-MW8	Americium-241	-4.89 ± 18.6	26.2	13.1	NE	U	BD	091063-033	EPA 901.1
04-Aug-11	Cesium-137	-0.826 ± 1.99	3.26	1.63	NE	U	BD	091063-033	EPA 901.1
	Cobalt-60	-0.18 ± 2.07	3.45	1.72	NE	U	BD	091063-033	EPA 901.1
	Potassium-40	44.6 ± 30.4	44.7	14.2	NE	U	BD	091063-033	EPA 901.1
	Gross Alpha	4.25	NA	NA	15	NA	None	091063-034	EPA 900.0
	Gross Beta	8.51 ± 2.68	3.56	1.74	4mrem/yr		J	091063-034	EPA 900.0
	Uranium-233/234	24.1 ± 3.40	0.0675	0.0293	NE			091063-036	HASL-300
	Uranium-235/236	0.401 ± 0.0969	0.0419	0.0154	NE			091063-036	HASL-300
	Uranium-238	2.75 ± 0.426	0.0526	0.0218	NE			091063-036	HASL-300
	Tritium	44.9 ± 75.6	131	58.0	NE	U	BD	091063-035	EPA 906.0 M

Refer to footnotes on page 7A-35.

Table 7A-9 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW8 (Duplicate)	Americium-241	-1.75 ± 8.67	12.9	6.47	NE	U	BD	091064-033	EPA 901.1
04-Aug-11	Cesium-137	-2.07 ± 2.81	4.27	2.14	NE	U	BD	091064-033	EPA 901.1
	Cobalt-60	1.10 ± 2.68	4.61	2.30	NE	U	BD	091064-033	EPA 901.1
	Potassium-40	-54.7 ± 52.4	53.7	26.9	NE	U	BD	091064-033	EPA 901.1
	Gross Alpha	10.23	NA	NA	15	NA	None	091064-034	EPA 900.0
	Gross Beta	7.67 ± 2.24	2.78	1.35	4mrem/yr		NJ+	091064-034	EPA 900.0
	Uranium-233/234	23.6 ± 3.24	0.0508	0.022	NE			091064-036	HASL-300
	Uranium-235/236	0.384 ± 0.0852	0.0315	0.0116	NE			091064-036	HASL-300
	Uranium-238	2.79 ± 0.413	0.0395	0.0164	NE			091064-036	HASL-300
	Tritium	49.1 ± 75.1	129	57.1	NE	U	BD	091064-035	EPA 906.0 M
CYN-MW9	Americium-241	-54.6 ± 32.2	31.0	15.5	NE	U	BD	091031-033	EPA 901.1
16-Aug-11	Cesium-137	-0.748 ± 2.17	3.52	1.76	NE	U	BD	091031-033	EPA 901.1
	Cobalt-60	-0.492 ± 2.06	3.41	1.71	NE	U	BD	091031-033	EPA 901.1
	Potassium-40	21.0 ± 48.7	32.4	16.2	NE	U	BD	091031-033	EPA 901.1
	Gross Alpha	-9.63	NA	NA	15	NA	None	091031-034	EPA 900.0
	Gross Beta	0.275 ± 0.183	0.285	0.137	4mrem/yr	U	BD	091031-034	EPA 900.0
	Uranium-233/234	8.22 ± 1.23	0.0867	0.0376	NE			091031-035	HASL-300
	Uranium-235/236	0.184 ± 0.0662	0.0537	0.0198	NE			091031-035	HASL-300
	Uranium-238	2.36 ± 0.390	0.0674	0.028	NE			091031-035	HASL-300
	Tritium	-16.3 ± 81.9	157	70.4	NE	U	BD	091031-036	EPA 906.0 M
CYN-MW9 (Duplicate)	Americium-241	9.34 ± 18.1	25.7	12.9	NE	U	BD	091032-033	EPA 901.1
16-Aug-11	Cesium-137	0.648 ± 1.84	3.14	1.57	NE	U	BD	091032-033	EPA 901.1
	Cobalt-60	1.20 ± 2.10	3.55	1.78	NE	U	BD	091032-033	EPA 901.1
	Potassium-40	36.2 ± 46.3	33.7	16.9	NE	X	R	091032-033	EPA 901.1
	Gross Alpha	-9.34	NA	NA	15	NA	None	091032-034	EPA 900.0
	Gross Beta	0.0904 ± 0.255	0.433	0.210	4mrem/yr	U	BD	091032-034	EPA 900.0
	Uranium-233/234	8.07 ± 1.16	0.0647	0.028	NE			091032-035	HASL-300
	Uranium-235/236	0.145 ± 0.0519	0.0401	0.0147	NE			091032-035	HASL-300
	Uranium-238	2.35 ± 0.367	0.0503	0.0209	NE			091032-035	HASL-300
	Tritium	16.3 ± 85.7	157	70.2	NE	U	BD	091032-036	EPA 906.0 M

Refer to footnotes on page 7A-35.

Table 7A-9 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW10	Americium-241	7.95 ± 11.8	17.5	8.73	NE	U	BD	091011-033	EPA 901.1
09-Aug-11	Cesium-137	-0.687 ± 2.06	3.38	1.69	NE	U	BD	091011-033	EPA 901.1
	Cobalt-60	-0.0994 ± 2.26	3.75	1.88	NE	U	BD	091011-033	EPA 901.1
	Potassium-40	-9.64 ± 41.2	43.5	21.8	NE	U	BD	091011-033	EPA 901.1
	Gross Alpha	0.68	NA	NA	15	NA	None	091011-034	EPA 900.0
	Gross Beta	2.74 ± 1.31	1.97	0.958	4mrem/yr		J	091011-034	EPA 900.0
	Uranium-233/234	5.47 ± 0.835	0.107	0.0466	NE			091011-035	HASL-300
	Uranium-235/236	0.0651 ± 0.0451	0.0666	0.0245	NE	U	BD	091011-035	HASL-300
	Uranium-238	2.06 ± 0.354	0.0836	0.0347	NE			091011-035	HASL-300
	Tritium	38.9 ± 90.7	160	71.9	NE	U	BD	091011-036	EPA 906.0 M
CYN-MW11	Americium-241	3.24 ± 13.9	20.9	10.5	NE	U	BD	091020-033	EPA 901.1
12-Aug-11	Cesium-137	1.70 ± 2.11	3.43	1.72	NE	U	BD	091020-033	EPA 901.1
	Cobalt-60	0.869 ± 2.22	3.74	1.87	NE	U	BD	091020-033	EPA 901.1
	Potassium-40	47.7 ± 32.3	47.7	22.8	NE	U	BD	091020-033	EPA 901.1
	Gross Alpha	-7.00	NA	NA	15	NA	None	091020-034	EPA 900.0
	Gross Beta	0.186 ± 0.170	0.274	0.131	4mrem/yr	U	BD	091020-034	EPA 900.0
	Uranium-233/234	5.66 ± 0.837	0.0702	0.0305	NE			091020-035	HASL-300
	Uranium-235/236	0.0765 ± 0.0388	0.0435	0.016	NE		J	091020-035	HASL-300
	Uranium-238	2.14 ± 0.342	0.0547	0.0227	NE			091020-035	HASL-300
	Tritium	44.0 ± 90.6	159	71.2	NE	U	BD	091020-036	EPA 906.0 M
CYN-MW12	Americium-241	-5.11 ± 6.40	9.50	4.75	NE	U	BD	091025-033	EPA 901.1
15-Aug-11	Cesium-137	-0.232 ± 1.82	3.01	1.51	NE	U	BD	091025-033	EPA 901.1
	Cobalt-60	-0.125 ± 1.91	3.16	1.58	NE	U	BD	091025-033	EPA 901.1
	Potassium-40	-12.2 ± 35.3	43.5	21.8	NE	U	BD	091025-033	EPA 901.1
	Gross Alpha	-12.70	NA	NA	15	NA	None	091025-034	EPA 900.0
	Gross Beta	0.307 ± 0.258	0.413	0.201	4mrem/yr	U	BD	091025-034	EPA 900.0
	Uranium-233/234	11.9 ± 1.71	0.0973	0.0422	NE			091025-035	HASL-300
	Uranium-235/236	0.182 ± 0.069	0.0603	0.0222	NE			091025-035	HASL-300
	Uranium-238	2.56 ± 0.416	0.0757	0.0314	NE			091025-035	HASL-300
	Tritium	-16.5 ± 82.9	159	71.3	NE	U	BD	091025-036	EPA 906.0 M

Refer to footnotes on page 7A-35.

Table 7A-10
Summary of Field Water Quality Measurements[h], Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CYN-MW1D	02-Feb-11	15.47	422	104.8	8.01	93.3	6.7	0.67
CYN-MW3	31-Jan-11	14.21	907	411.1	7.25	0.99	62.8	6.44
CYN-MW4	27-Jan-11	13.93	661	394.4	7.32	0.26	41.1	4.11
CYN-MW6	14-Feb-11	17.57	1003	395.7	7.04	0.57	19.9	1.89
CYN-MW7	26-Jan-11	15.28	695	396.3	7.12	1.28	37.0	3.70
CYN-MW8	25-Jan-11	15.47	796	381.6	7.13	0.29	47.1	4.69
CYN-MW9	15-Feb-11	16.97	1067	415.9	7.01	0.33	52.1	5.03
CYN-MW10	09-Feb-11	13.35	868	407.8	7.33	0.38	66.7	6.95
CYN-MW11	08-Feb-11	14.41	944	281.0	7.24	0.88	5.4	0.55
CYN-MW12	10-Feb-11	14.82	1024	385.6	7.09	0.88	7.2	0.73
CYN-MW9	11-May-11	14.31	1050	419.9	7.01	2.44	56.4	5.75
CYN-MW10	10-May-11	17.23	853	412.9	7.35	0.22	71.8	6.88
CYN-MW11	04-May-11	18.83	958	316.1	7.28	0.28	5.5	0.57
CYN-MW12	05-May-11	18.07	1011	395.0	7.06	0.54	9.1	0.85
CYN-MW1D	10-Aug-11	20.86	493	263.8	7.96	94.0	8.2	0.73
CYN-MW3	11-Aug-11	18.76	1064	391.3	7.04	0.51	67.9	6.31
CYN-MW4	08-Aug-11	20.50	774	396.4	7.11	0.59	38.0	3.28
CYN-MW6	18-Aug-11	19.10	1126	391.8	6.92	0.87	17.6	1.62
CYN-MW7	03-Aug-11	21.19	810	403.9	6.85	1.14	41.8	3.84
CYN-MW8	04-Aug-11	19.85	921	403.6	6.89	0.56	50.4	4.64
CYN-MW9	16-Aug-11	18.20	1231	418.6	6.76	0.17	50.7	4.75
CYN-MW10	09-Aug-11	17.96	987	405.5	7.11	0.58	74.3	6.96
CYN-MW11	12-Aug-11	18.25	1097	367.2	7.03	0.56	7.7	0.72
CYN-MW12	15-Aug-11	19.95	1186	391.3	6.83	0.24	10.3	0.93
CYN-MW1D	19-Oct-11	17.47	537	275.3	7.88	63.9	12.3	1.17
CYN-MW3	10-Oct-11	13.53	1109	386.3	6.88	1.84	65.9	6.65
CYN-MW4	07-Oct-11	16.20	758	392.6	7.26	0.23	35.7	3.57
CYN-MW6	17-Oct-11	15.36	1145	391.5	7.15	1.27	18.9	1.89

Refer to footnotes on page 7A-35.

Table 7A-10 *(Concluded)*
Summary of Field Water Quality Measurements[h],
Burn Site Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CYN-MW7	06-Oct-11	19.12	804	395.3	7.04	1.79	40.0	3.67
CYN-MW8	04-Oct-11	17.97	913	401.9	6.93	0.30	47.3	4.47
CYN-MW9	18-Oct-11	17.25	1233	410.0	6.83	3.14	53.8	5.13
CYN-MW10	11-Oct-11	15.87	970	397.0	7.23	0.21	71.7	7.02
CYN-MW11	12-Oct-11	17.85	1111	336.8	7.01	0.35	7.3	0.68
CYN-MW12	13-Oct-11	18.96	1178	390.9	6.82	0.35	10.4	0.96

Refer to footnotes on page 7A-35.

Footnotes for Burn Site Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table 1-4).
- µg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems:
  15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table I-4).
  4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B = Analyte is detected in associated laboratory method blank.
H = Analytical holding time was exceeded.
h = Prep holding time exceeded.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
J = Amount detected is below the PQL.
NA = Not applicable.
U = Analyte is absent or below the method detection limit.
X = Uncertain identification for gamma spectroscopy analysis and/or peak not meeting identification criteria.

Footnotes for Burn Site Groundwater Monitoring Tables (Concluded)

[f]**Validation Qualifier**

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	=	Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	=	The associate value is an estimated quantity.
J+	=	The associated numerical value is an estimated quantity with suspected positive bias.
J-	=	The associated numerical value is an estimated quantity with suspected negative bias.
NJ+	=	Presumptive evidence of the presence of the material at an estimated quantity with a suspected positive bias.
None	=	No data validation for corrected gross alpha activity.
U	=	The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	=	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	=	The data are unusable, and resampling or reanalysis are necessary for verification.

[g]**Analytical Method**

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatograph*y, EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes,* EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.
- EPA, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600/4-80-032, U.S Environmental Protection Agency, Cincinnati, Ohio.
- U.S. Department of Energy, Environmental Measurements Laboratory, 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.

[h]**Field Water Quality Measurements**

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% Sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 7B
Burn Site Groundwater
Plots

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Attachment 7B Plots

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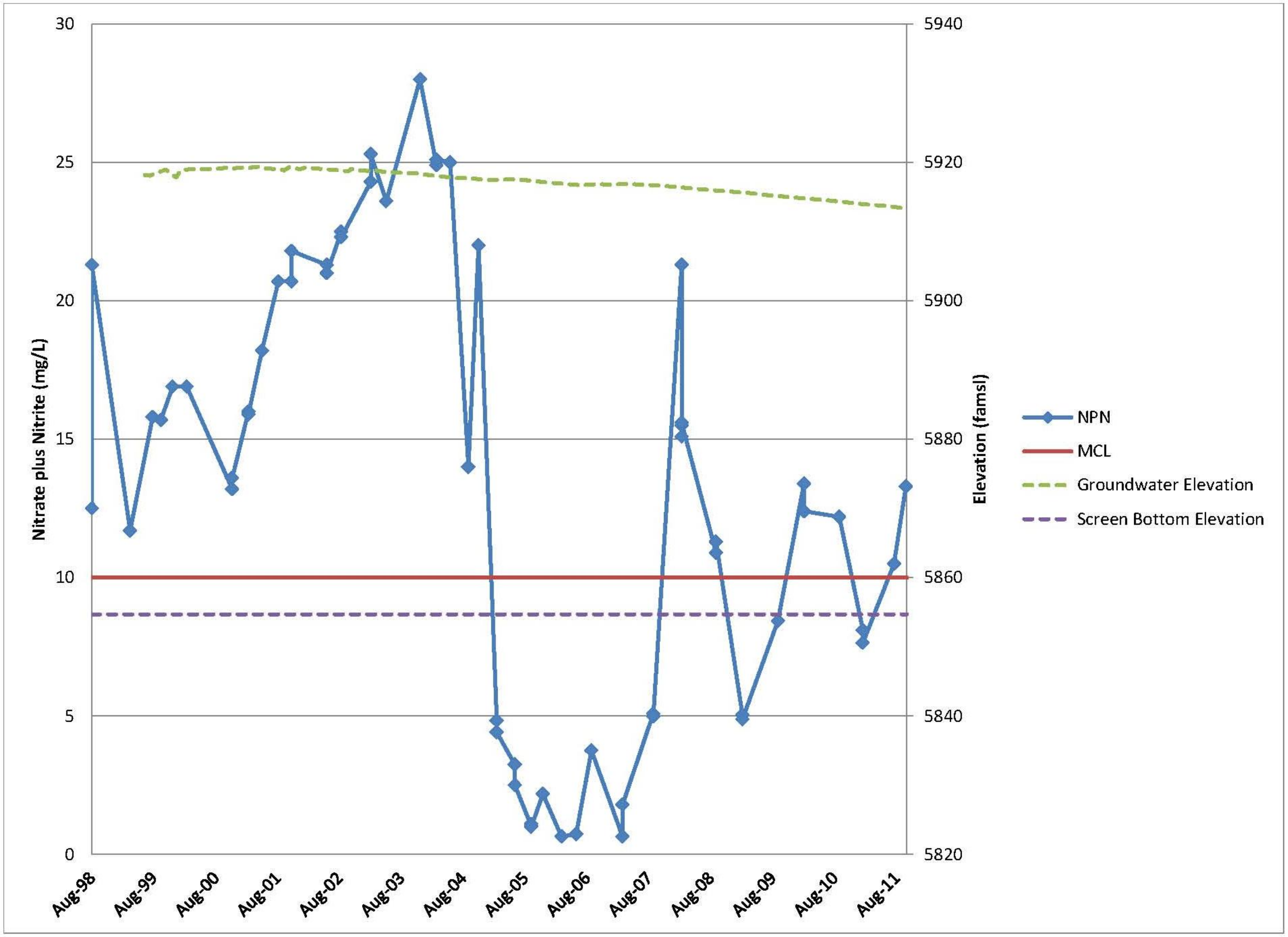

Figure 7B-1. Nitrate plus Nitrite Concentrations, CYN-MW1D

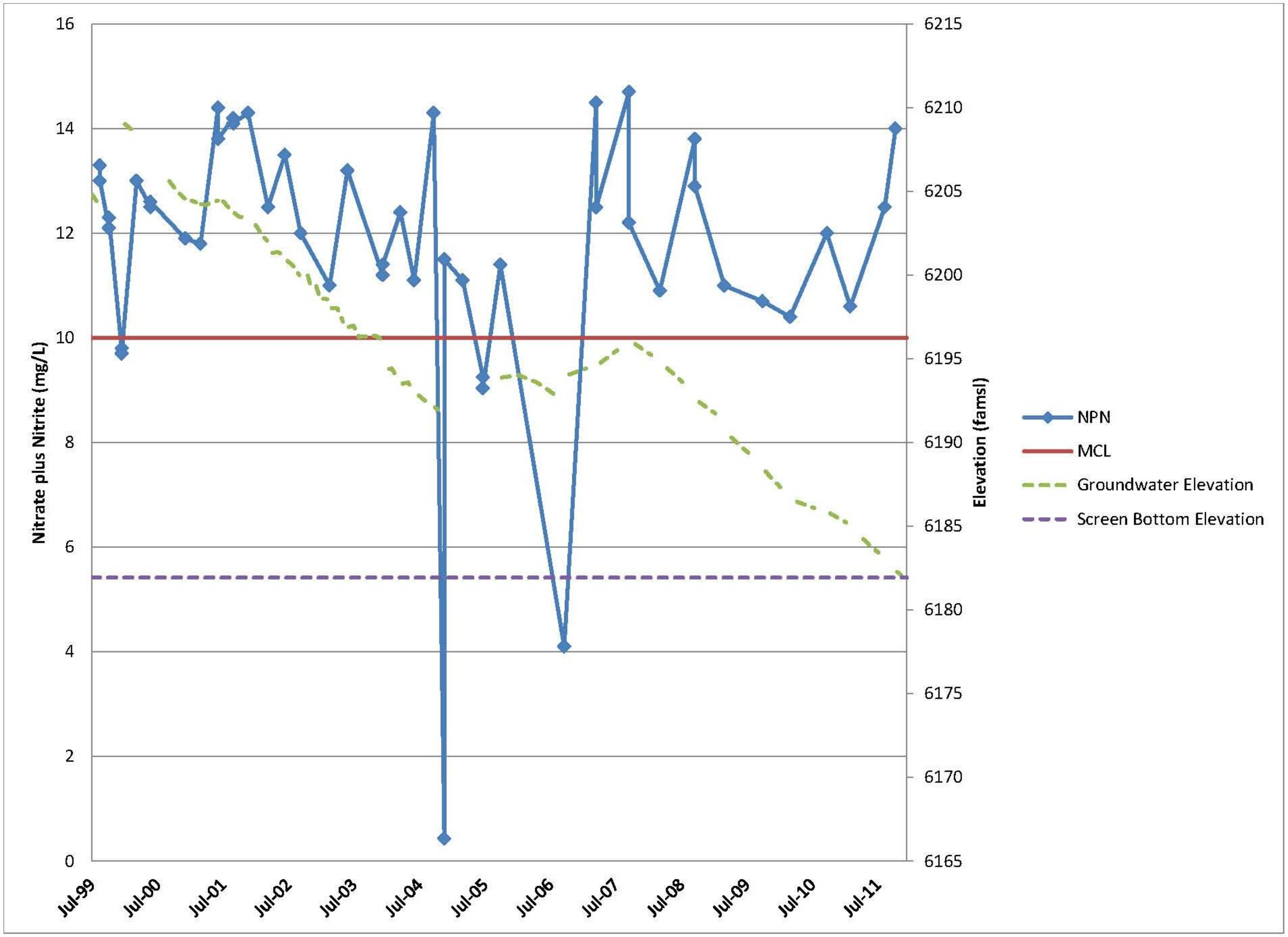

Figure 7B-2. Nitrate plus Nitrite Concentrations, CYN-MW3

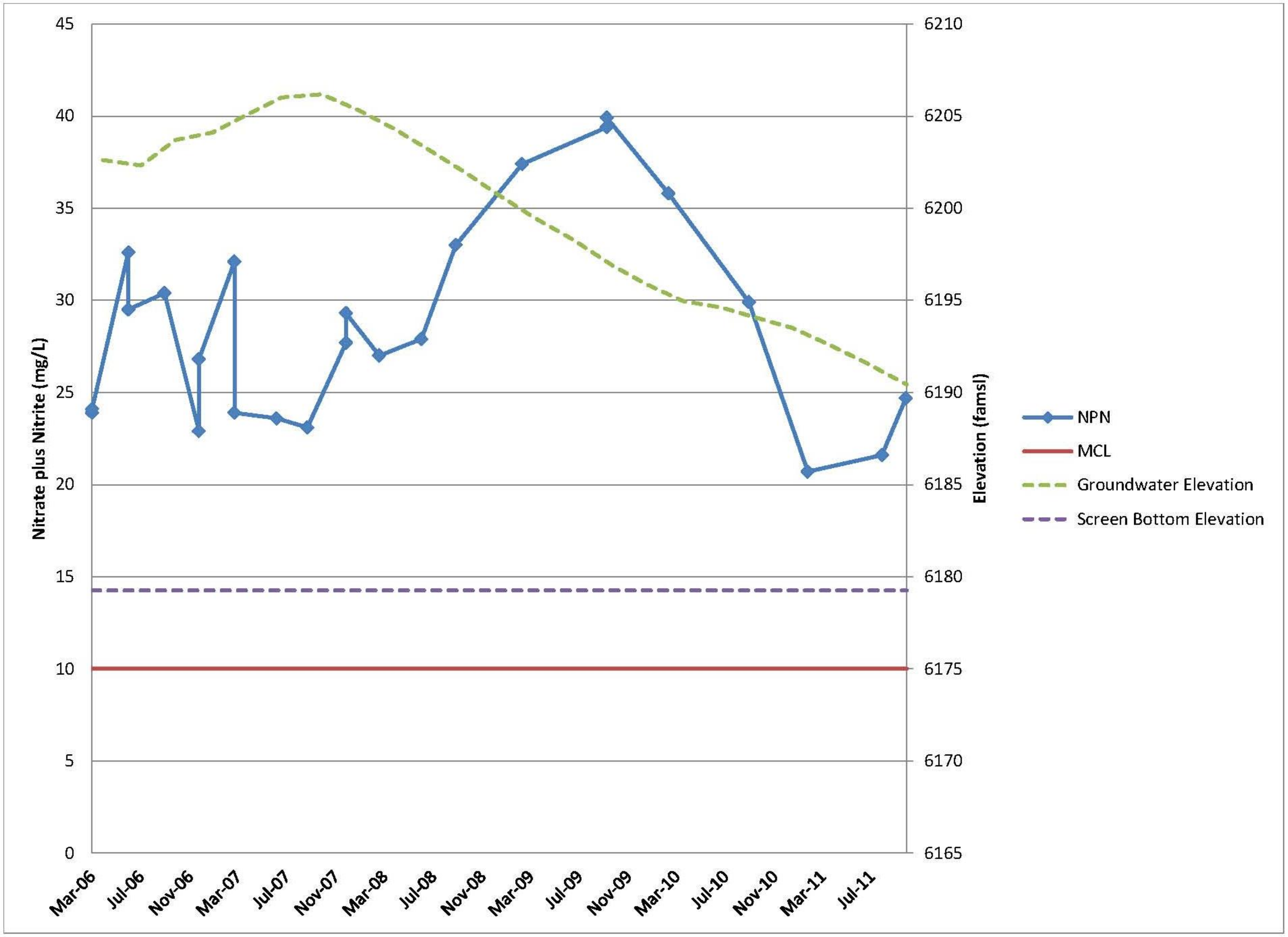

Figure 7B-3. Nitrate plus Nitrite Concentrations, CYN-MW6

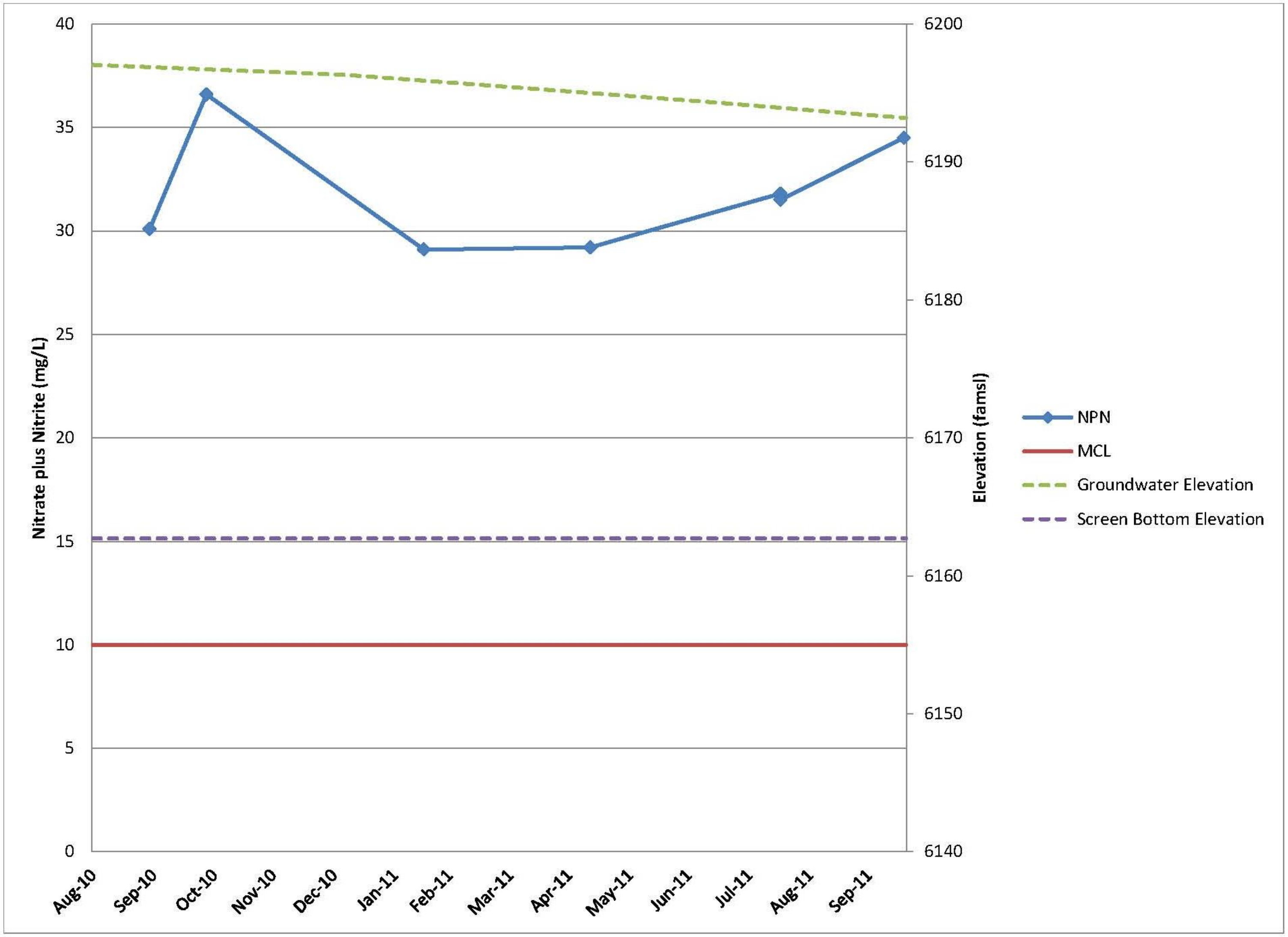

Figure 7B-4. Nitrate plus Nitrite Concentrations, CYN-MW9

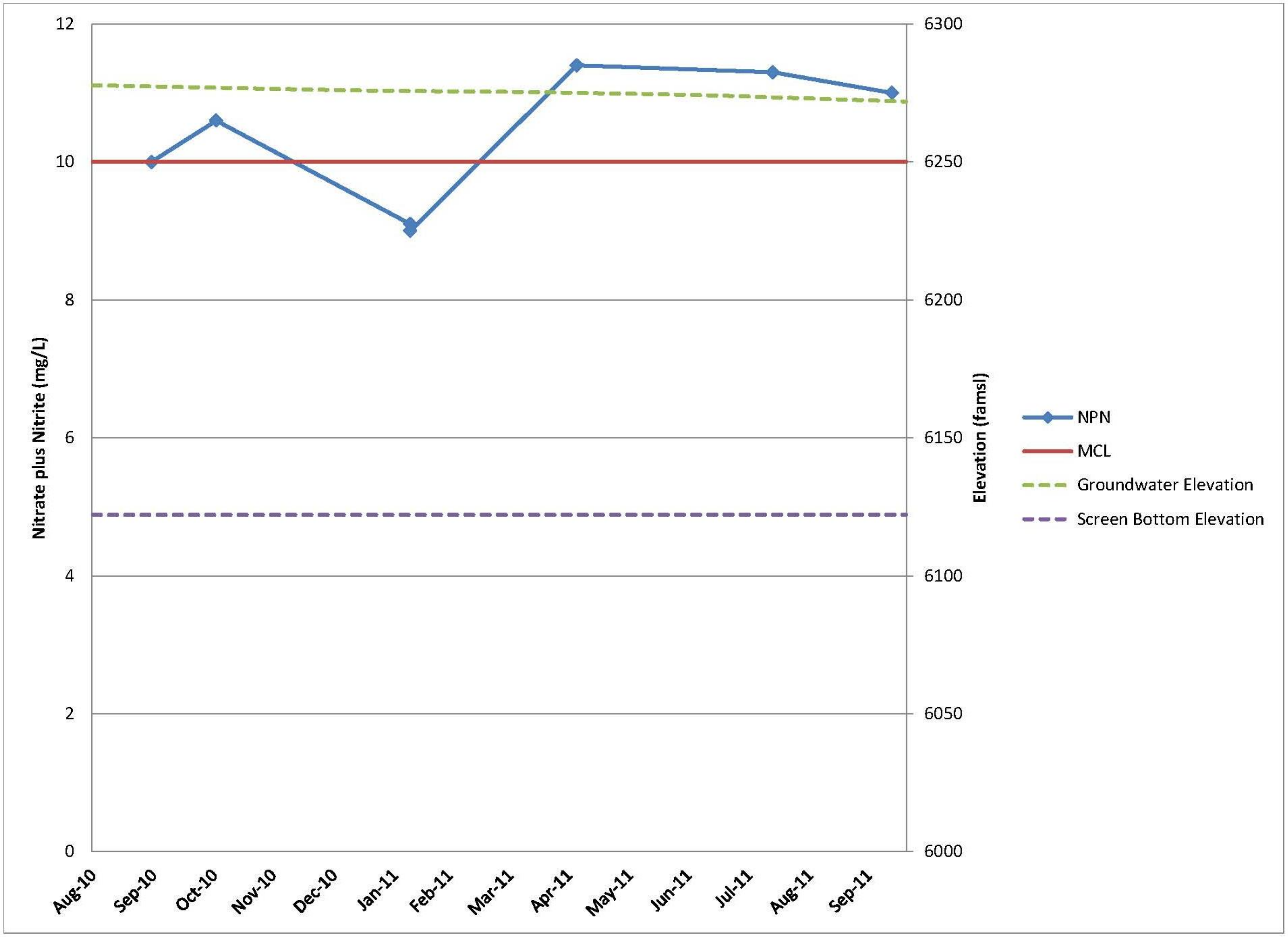

Figure 7B-5. Nitrate plus Nitrite Concentrations, CYN-MW11

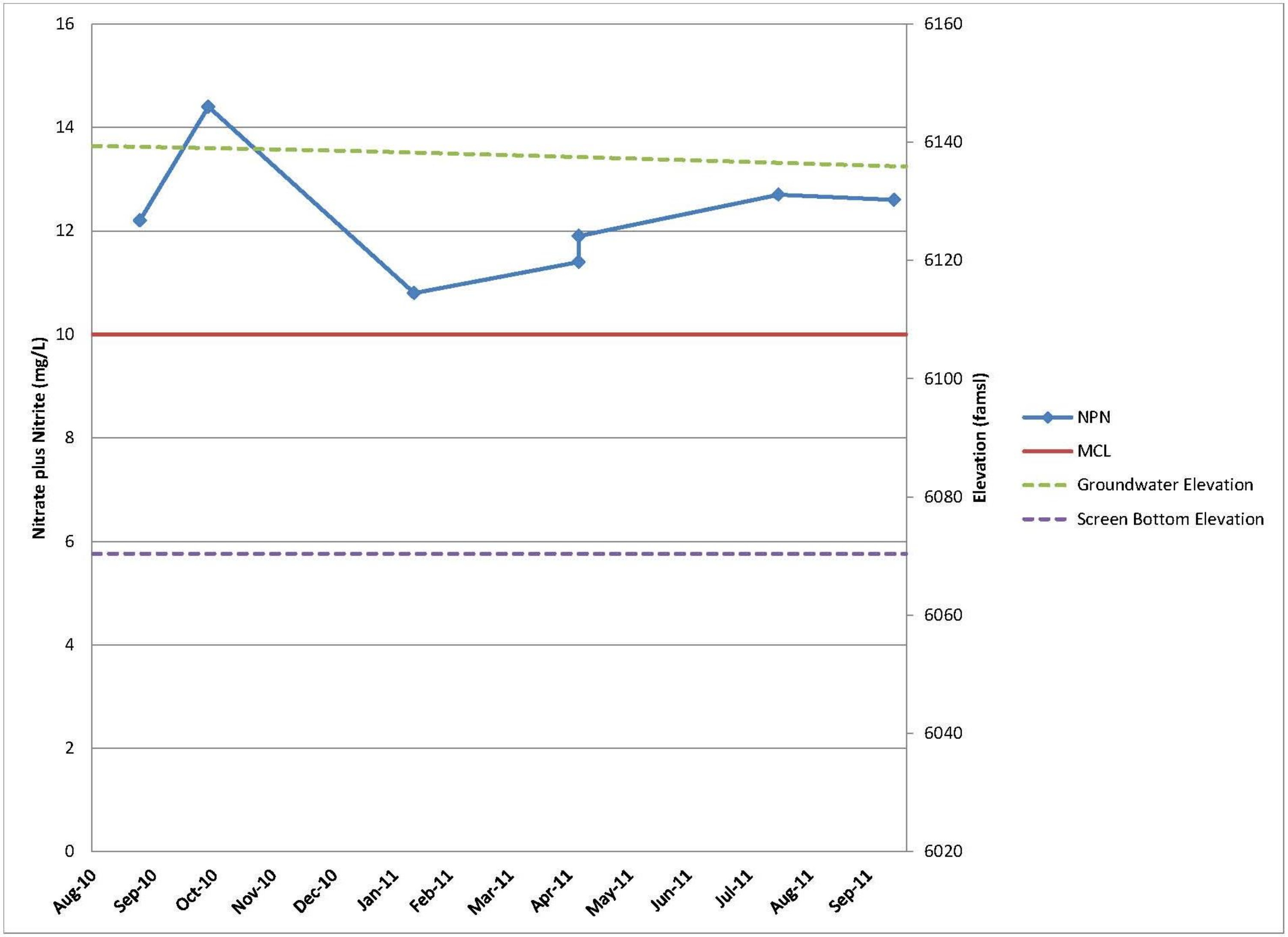

Figure 7B-6. Nitrate plus Nitrite Concentrations, CYN-MW12

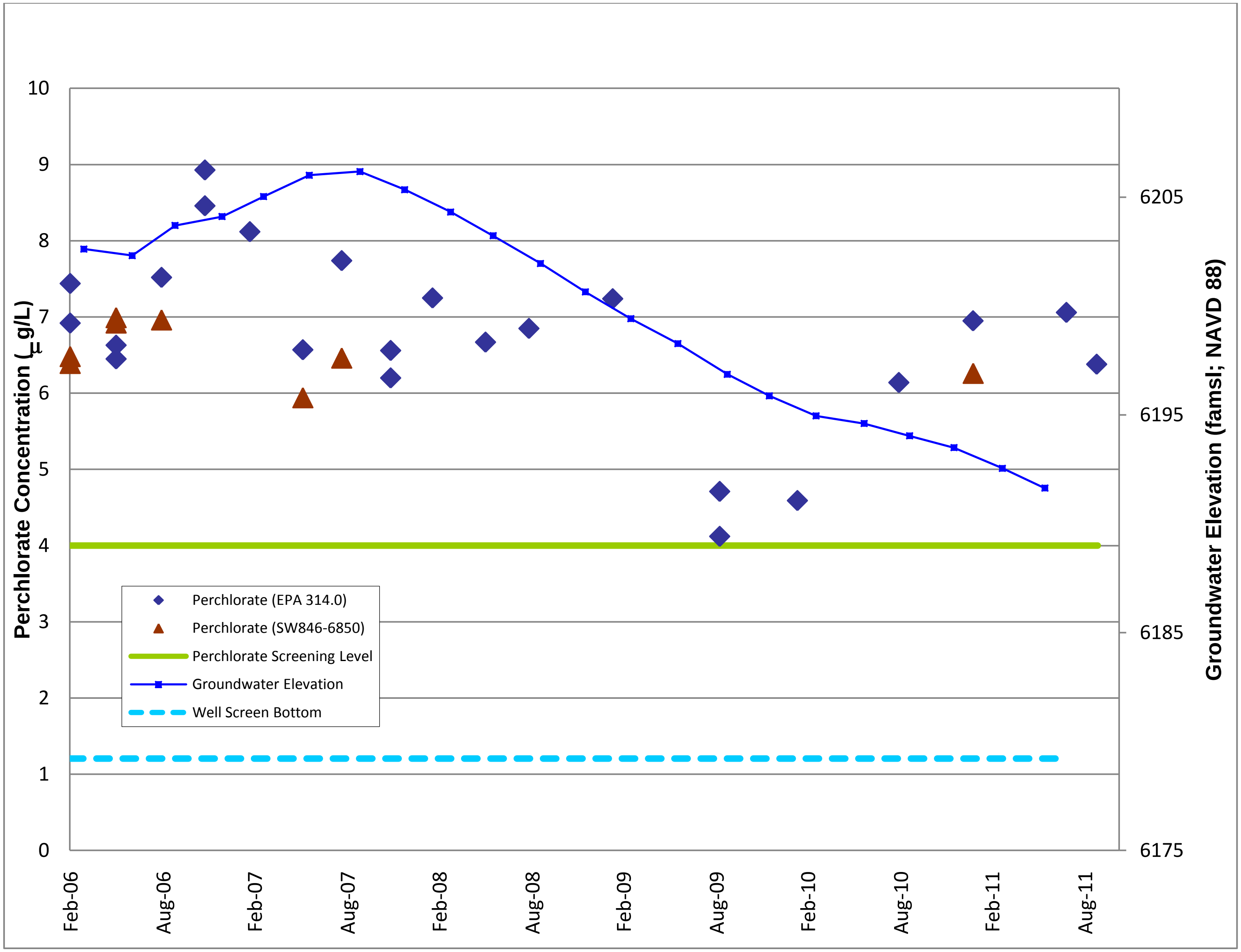

Figure 7B-7. Perchlorate Concentrations, CYN-MW6

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Attachment 7C
Burn Site Groundwater
Hydrographs

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Attachment 7C Hydrographs

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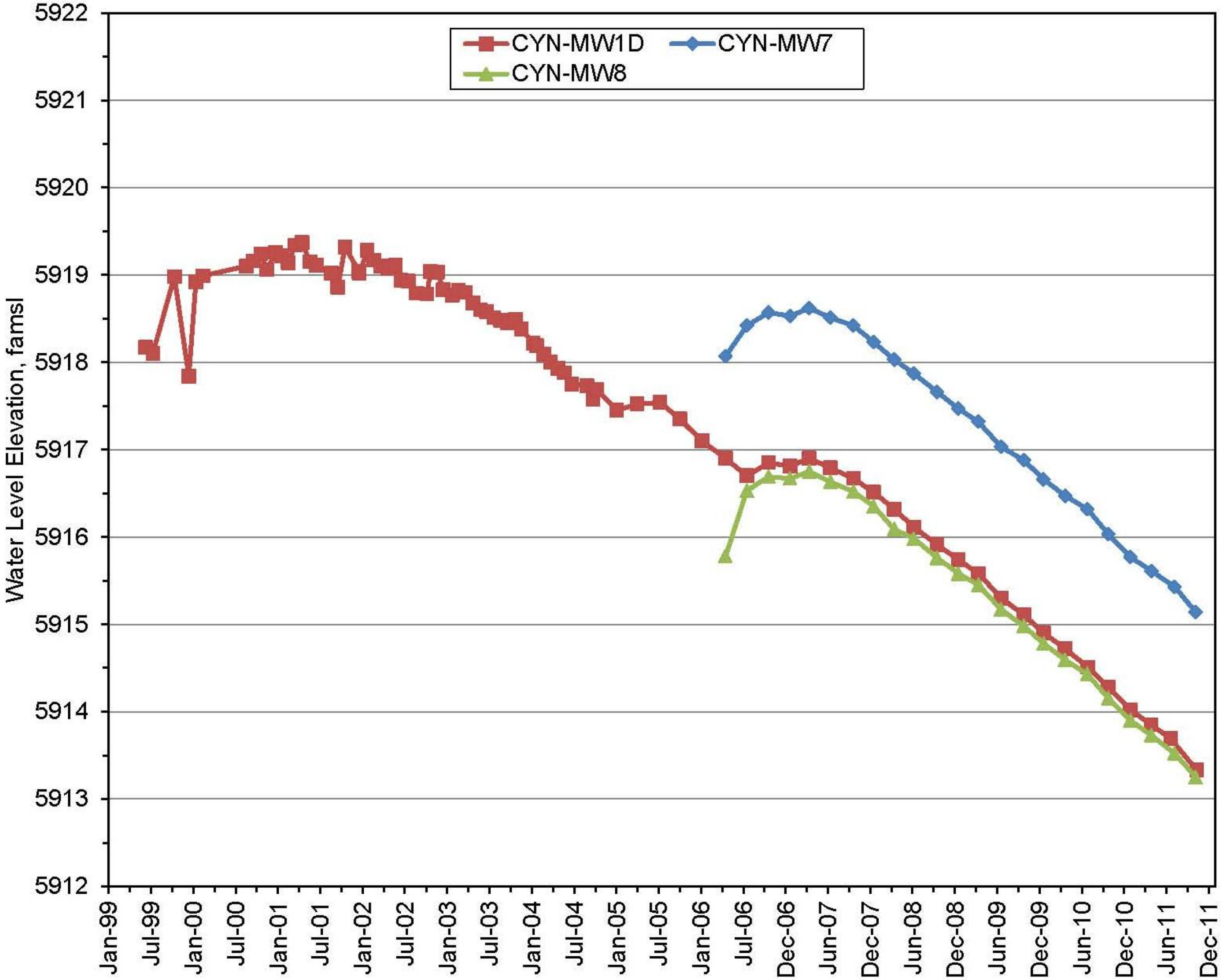

Figure 7C-1. BSG Study Area Wells (1 of 5)

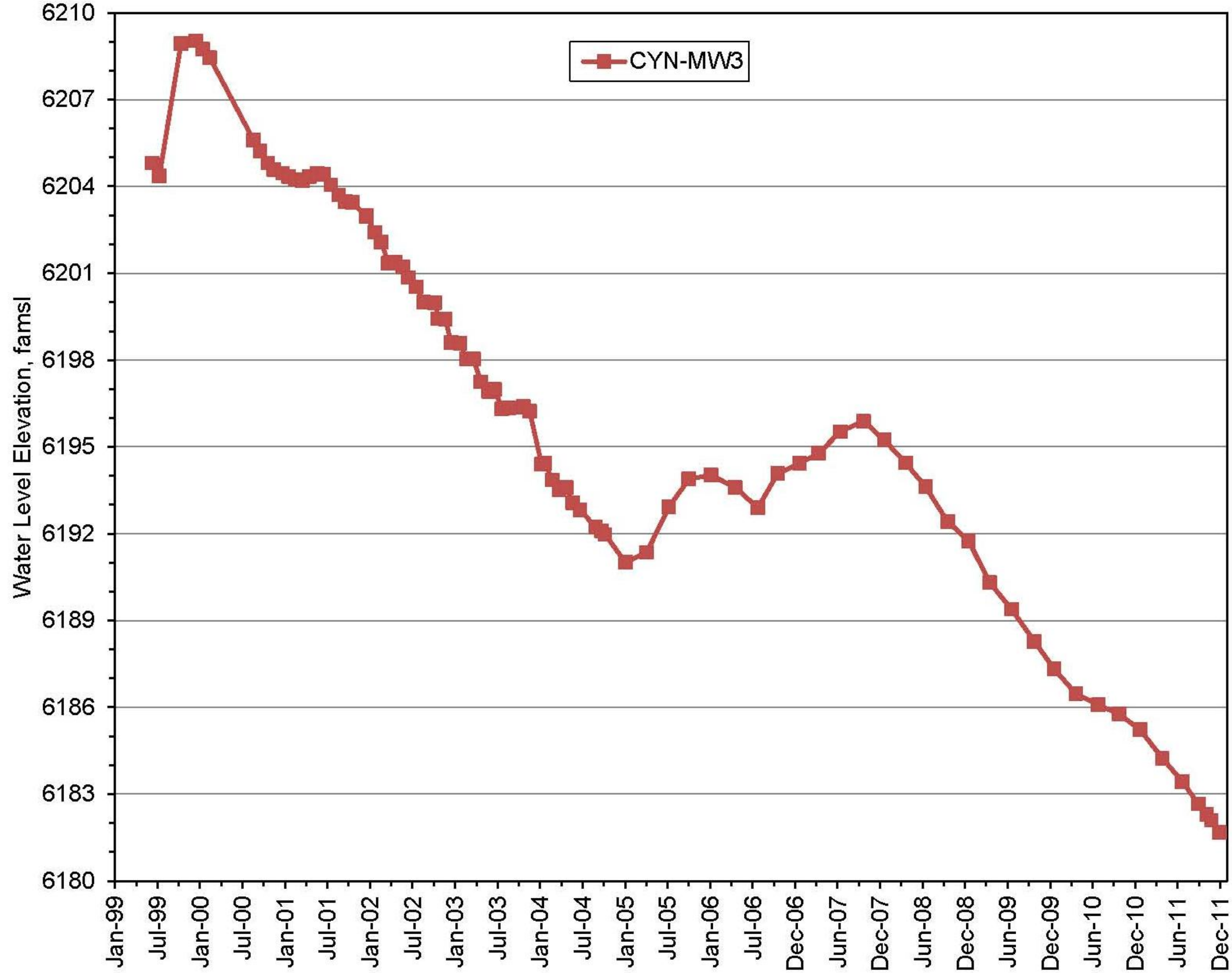

Figure 7C-2. BSG Study Area Wells (2 of 5)

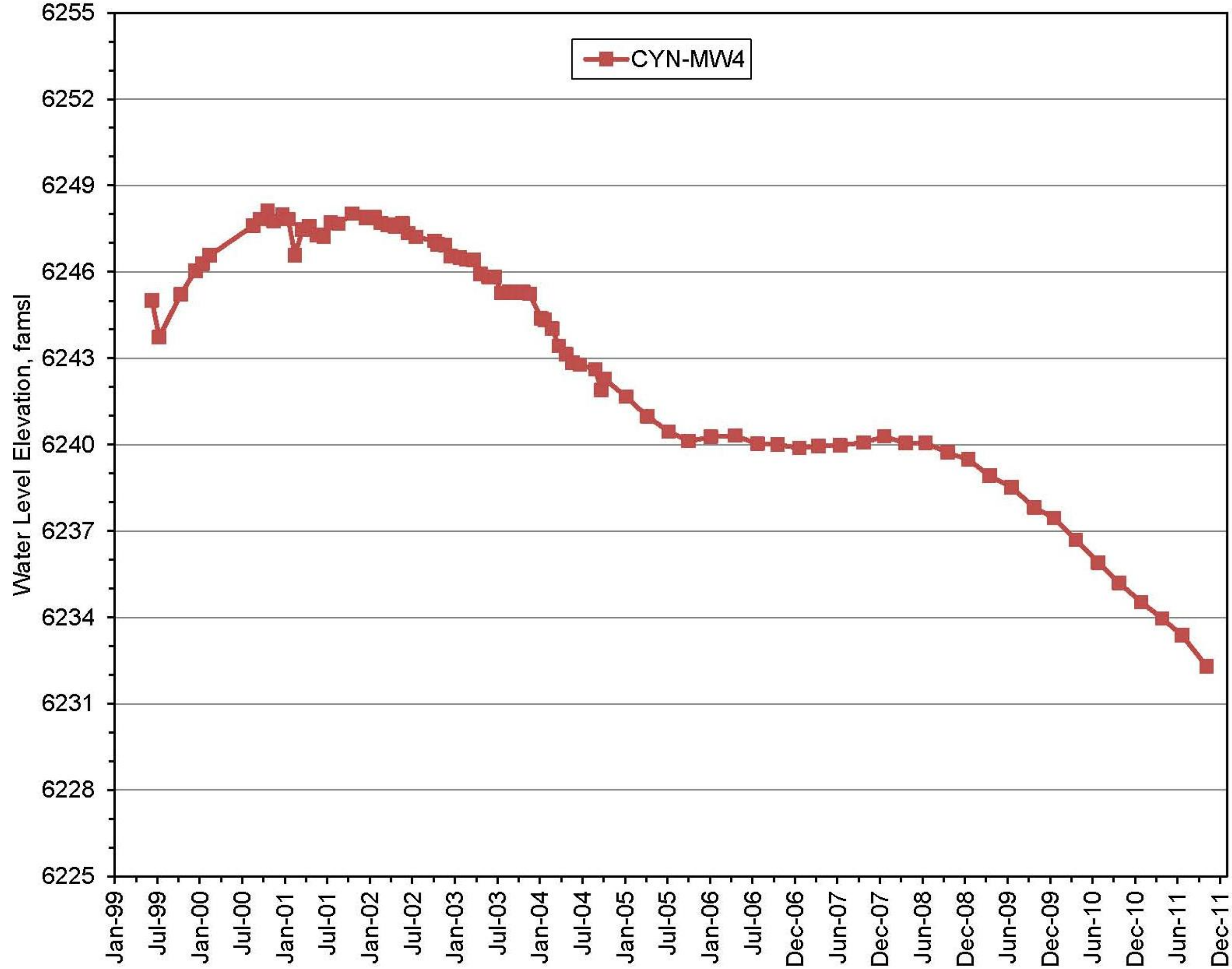

Figure 7C-3. BSG Study Area Wells (3 of 5)

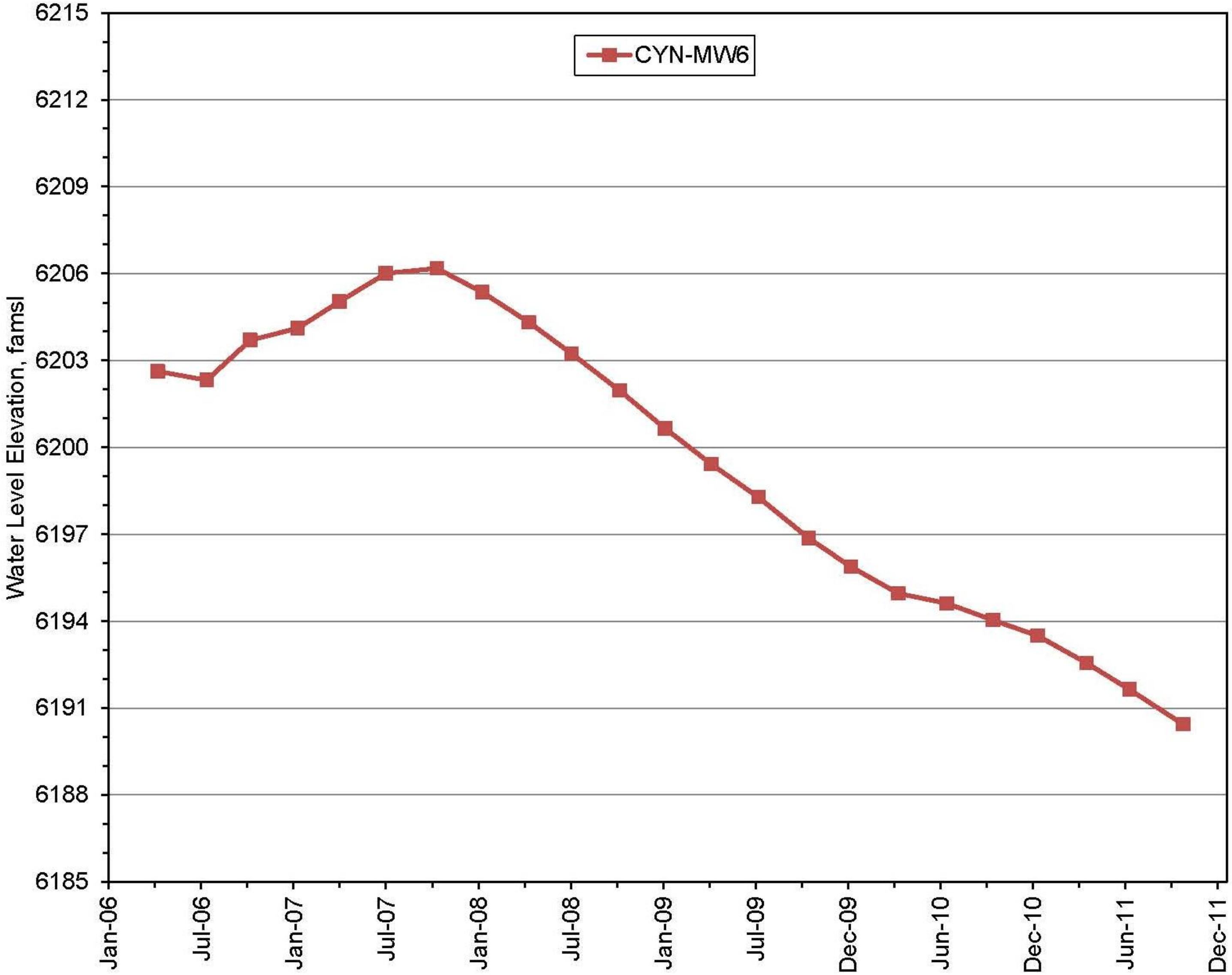

Figure 7C-4. BSG Study Area Wells (4 of 5)

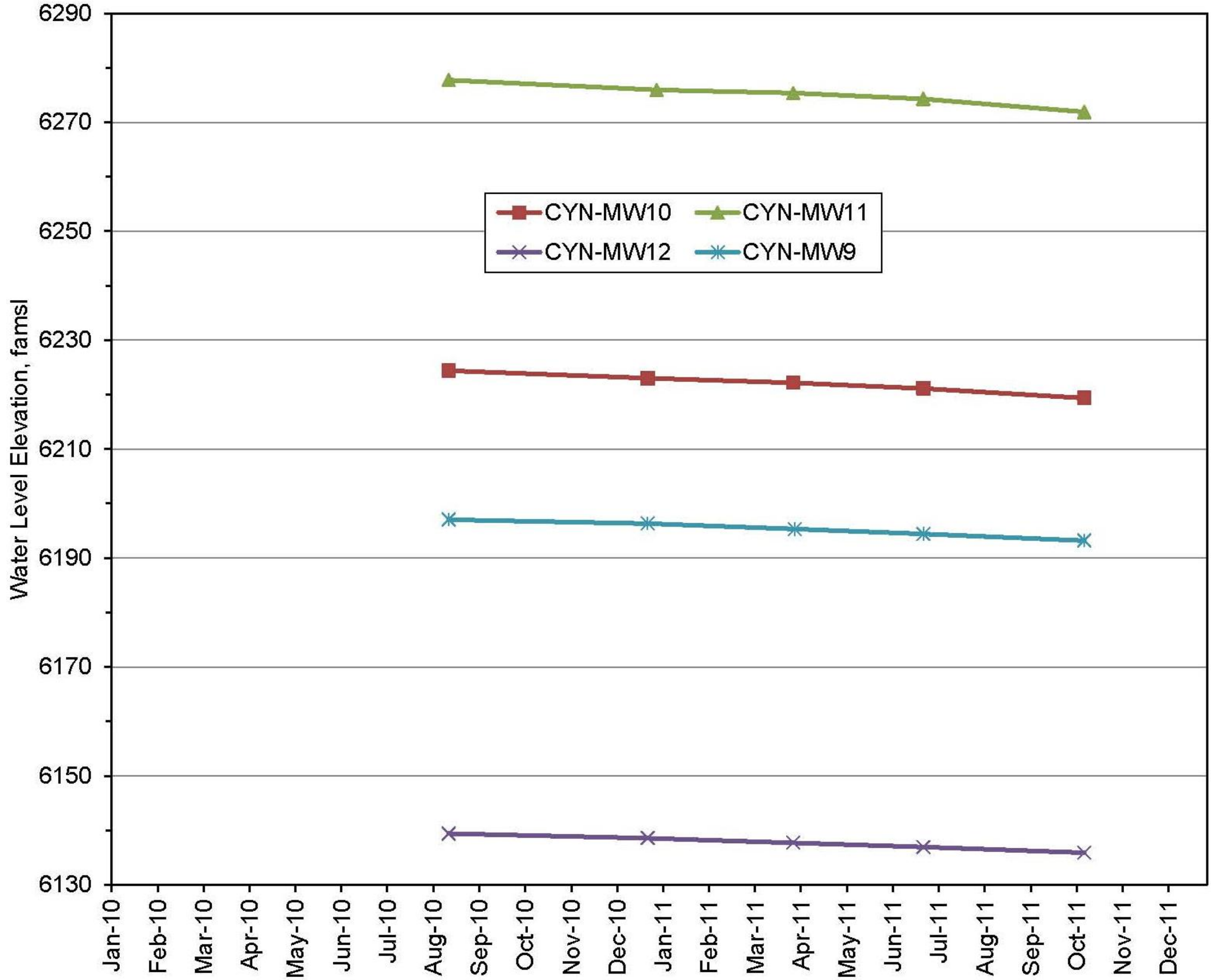

Figure 7C-5. BSG Study Area Wells (5 of 5)

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8.0 Solid Waste Management Units 8/58

8.1 Introduction

This chapter summarizes the Calendar Year (CY) 2011 quarterly groundwater sampling events for Coyote Canyon Blast Area (CCBA) monitoring wells CCBA-MW1 and CCBA-MW2, located within Solid Waste Management Units (SWMUs) 8/58 at Sandia National Laboratories, New Mexico (SNL/NM). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE) National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

Monitoring wells CCBA-MW1 and CCBA-MW2 were installed at SWMUs 8/58 in August 2011. The installation and monitoring of these wells are designed to address the requirements of Section VII.D.6 of the Compliance Order on Consent (the Order) between the New Mexico Environment Department (NMED), DOE, and Sandia (NMED April 2004) and the NMED letter dated April 8, 2010, from the NMED Hazardous Waste Bureau requiring additional corrective action at SWMUs 8/58 (NMED April 2010).

Monitoring well CCBA-MW1 was sampled on October 31, 2011, and CCBA-MW2 was sampled on October 31 and November 1, 2011. The groundwater samples were collected in accordance with the NMED-approved Groundwater Characterization Work Plan (SNL September 2010) and Mini-Sampling and Analysis Plan (SAP) (SNL October 2011). The groundwater samples from each well were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, nitrate plus nitrite (NPN), major anions (as bromide, chloride, fluoride, and sulfate), major cations (as calcium, magnesium, potassium, and sodium), alkalinity, Target Analyte List (TAL) metals plus uranium, perchlorate, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

Analytical results for the CY 2011 groundwater samples were compared with the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) for drinking water (EPA 2009). No constituents were detected above established MCLs, except for fluoride. Fluoride exceeds the established MCL of 4.0 milligrams per liter (mg/L) in the CCBA-MW1 sample at a concentration of 5.36 mg/L.

During CY 2012, quarterly groundwater sampling and reporting will continue at groundwater monitoring wells CCBA-MW1 and CCBA-MW2 located at SWMUs 8/58.

8.1.1 Location

SWMUs 8/58 are located on Kirtland Air Force Base (KAFB) near the eastern boundary between U.S. Air Force land and the Withdrawn Area, a 22,500-acre area of the Cibola National Forest that has been withdrawn from the public domain for the exclusive use of KAFB and the DOE (Figure 8-1). The sites are located north of Coyote Springs Road, approximately 2.7 miles east of the intersection of Coyote Springs and Lovelace Roads.

SWMUs 8/58 are located in the Arroyo del Coyote watershed, which captures runoff from the western flank of the Manzanita Mountains. No surface-water bodies are located at either site. The nearest surface water is Coyote Springs, a perennial spring located approximately 1,400 feet (ft) southwest of SWMU 58 in Arroyo del Coyote. Arroyo del Coyote intersects Tijeras Arroyo approximately 7 miles west of the two sites. Tijeras Arroyo eventually drains into the Rio Grande, approximately 16 miles west of the two sites (SNL September 2003).

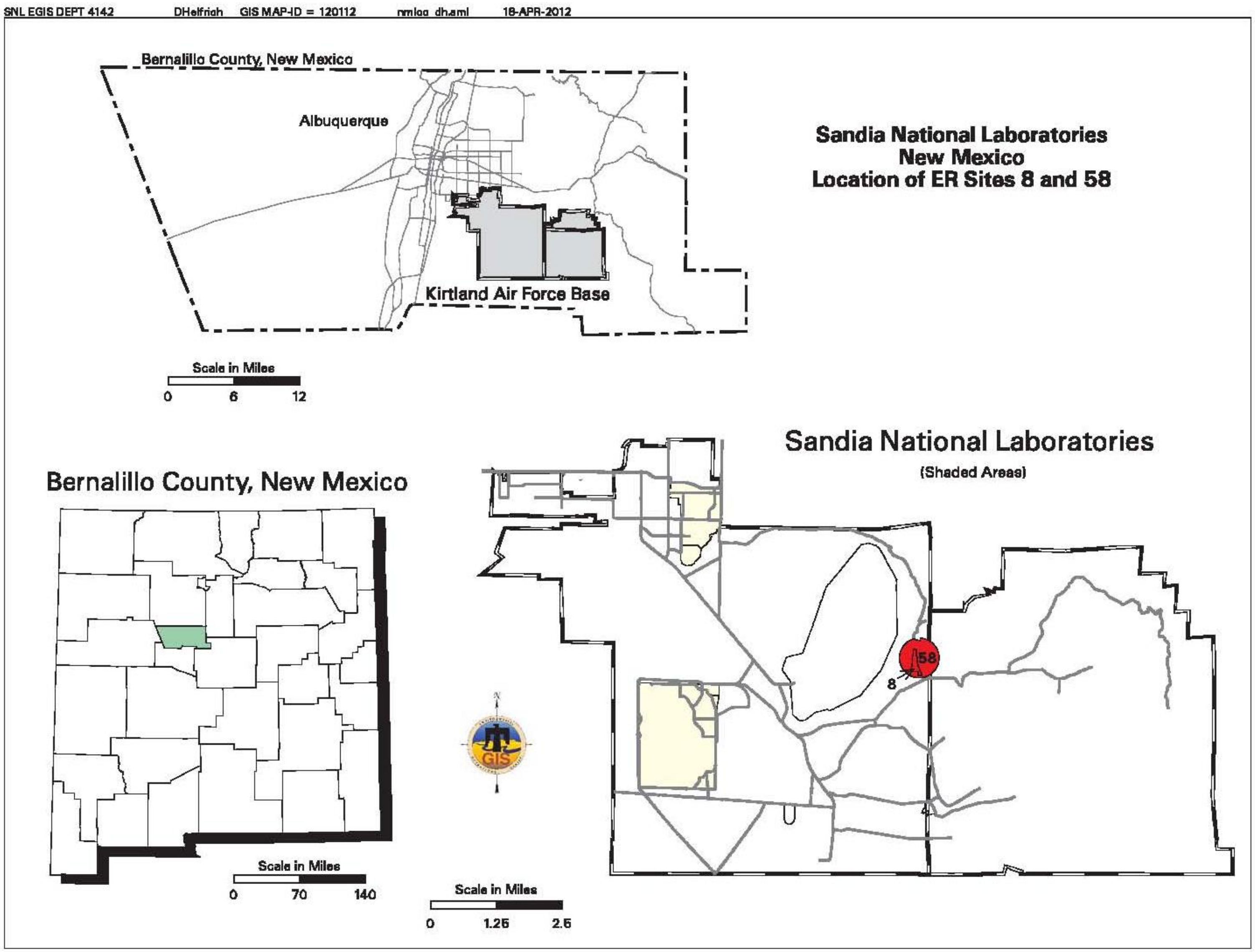

Figure 8-1. Location of SWMUs 8/58

SWMU 58 encompasses approximately 258 acres and is the site of the former CCBA where extensive explosive testing was conducted (Figure 8-2). A blast radius of 2,000 ft defines the boundary of SWMU 58. This boundary was based on the visual distribution of fragments (shrapnel) and the surrounding topography.

SWMU 8 is fully contained within the blast radius of SWMU 58 and consists of approximately 30 acres (Figure 8-2). A north-south road that bisects SWMU 58 provides access to the site. The boundaries of SWMU 8 are defined by this road to the east, by the end of debris and test fixtures to the north (approximately 3,200 ft north of Coyote Springs Road), by the base of the steep ridge to the west, and by the end of debris and test fixtures to the south. The debris and the majority of the test fixtures have been removed.

8.1.2 Site History

SWMUs 8/58 are interrelated by the nature of the tests conducted and their geographic locations. More than a hundred tests have occurred at SWMUs 8/58, and test debris and fixtures remain at numerous locations. Neither site is currently being used for test activities. From 1950 to the late 1960s, at various locations within SWMU 58, numerous SNL/NM research groups conducted tests involving at-ground or aboveground explosive detonations (SNL June 1995). Penetration tests commenced after this time but did not involve any hazardous materials. Other unknown tests were conducted at SWMU 58, which may have dispersed other materials onto the site.

Prior to the penetration tests, the primary materials dispersed at the sites from the HE compound combustion by-products and associated testing materials were metals and radionuclides. Chunks of partially combusted HE compounds were found. Emissions from the combustion of explosives would have been primarily gaseous and would have dissipated. Solid residues may have been produced by explosives containing metals, such as barium from Baratol. Carbon tetrachloride was alleged to have been poured into the Underground Conduit System (UCS) to displace water before the tests were performed. Jet propellant, fuel grade 4 (JP-4) was released to the ground during burn tests. Metals also were dispersed during some tests. Asbestos-containing material was found at various locations scattered throughout SWMUs 8/58. Gaseous argon was released during some experiments and readily dispersed into the atmosphere during the testing.

Debris from the SWMU 58 tests and possibly other sources was disposed of at SWMU 8. Documented tests at SWMU 58 involved large quantities of bulk explosives, which were typically shipped in wooden crates. These wooden crates, along with scrap metals from the tests, comprised most of the solid waste found at SWMU 8.

SWMU 8 and portions of SWMU 58 are located within the Manzano Combat Range, an area where KAFB military training is periodically conducted. Most of the unexploded ordnance occasionally found on site results from this ongoing activity rather than past SNL/NM research activities.

SWMU 58 originally contained two control bunkers, an instrument shelter, a three-sided earthen bunker with concrete inner walls clad with metal armor plate, numerous concrete pads and rubble, a UCS for running test wires, and numerous other test structures. Many of these features have been removed (SNL April 2005).

SWMU 8 primarily contained general refuse (cardboard, paper, wood, etc.) and demolition debris. All the SWMU 8 debris was removed during a series of investigations and remedial activities conducted from 1996 to 2004, listed in Table 8-1 (SNL April 2005).

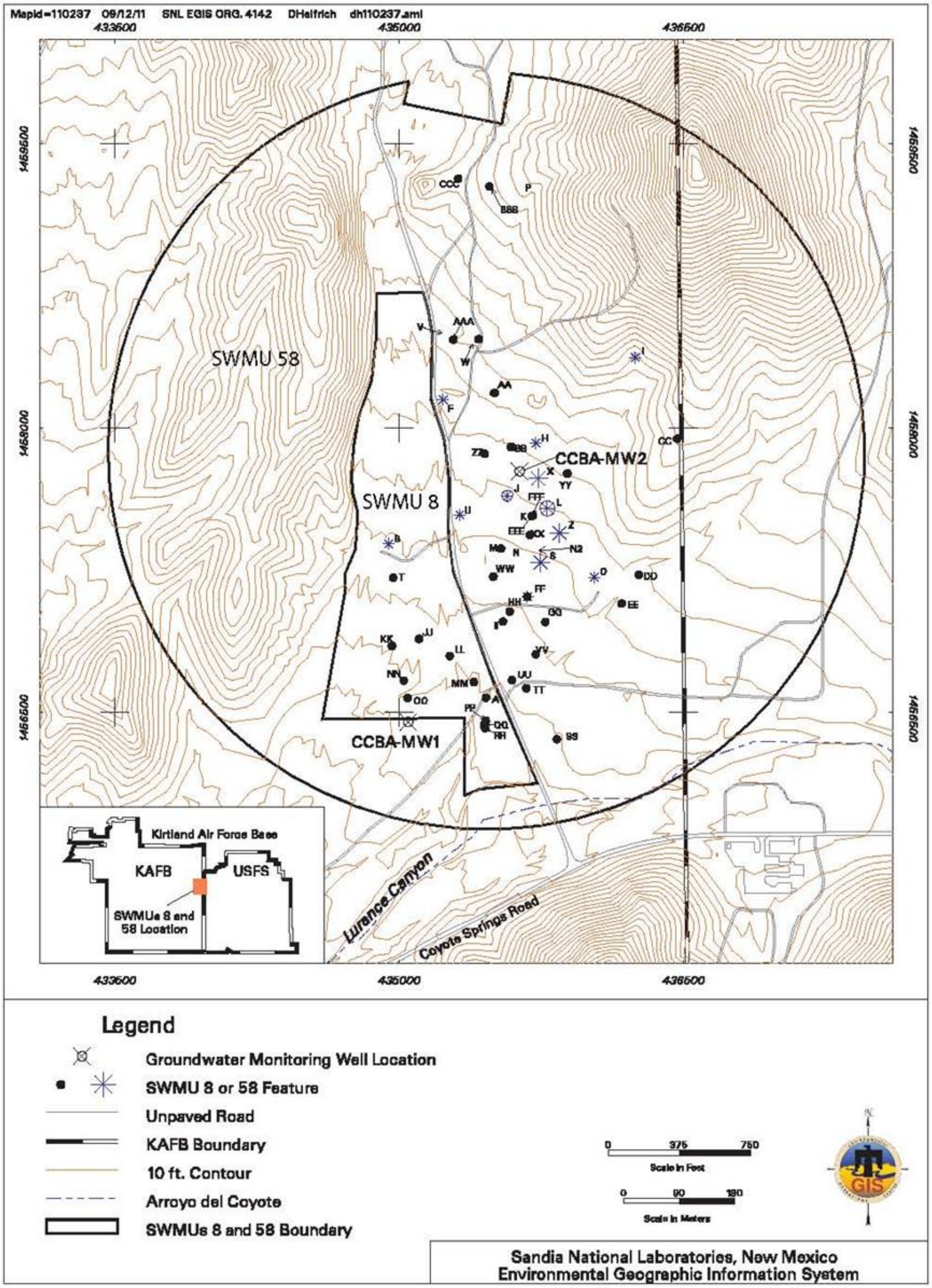

Figure 8-2. Groundwater Monitoring Wells CCBA-MW1 and CCBA-MW2 Installed at SWMUs 8/58

Table 8-1. Historical Timeline of SWMUs 8/58

Month	Year	Event	Reference
	1950 - 1960's	More than 100 tests performed at SWMUs 8/58.	DOE September 1987
	1987	Identified as potential SWMUs in Comprehensive Environmental Assessment and Response Program Investigation due to the extensive testing done in these areas.	DOE September 1987
February	1992	Boundaries for the Radioactive Material Management Areas at SWMUs 8/58 are delineated.	SNL February 1992
October	1993	KAFB EOD conducted a visual UXO/HE survey of military debris. Material related to military training exercises was identified and removed.	Young and Byrd 1994
October	1993	RUST Geotech conducted surface gamma radiation survey across both sites. Point and area anomalies were detected and identified and removed during the 1995 VCM.	RUST Geotech, Inc. 1994
	1994	Sensitive species survey was conducted. Three sensitive species were identified for SWMU 58 (including SWMU 8). Since the survey, the three species have been removed from the New Mexico endangered plant species list and are no longer considered sensitive.	NMFRCD August 1995
	1994	Cultural Resources survey conducted seven discrete cultural resource areas were identified.	SNL February 1995a
	1994 - 2004	VCM and VCA conducted from 1994 until 2004 to remove surface and buried contaminated soil and wastes. Housekeeping activities conducted during same time to remove debris such as concrete, wood, metal, and shrapnel.	SNL April 1994 SNL February 1995b SNL August 1998 SNL October 2000 SNL January 2004
	1995-2004	RFI sampling activities conducted at SWMUs 8/58 to characterize the sites.	SNL August 1996 SNL November 1998
	1996-2004	UXO/HE visual surface surveys were conducted by SNL/NM personnel. Material identified was subsequently removed by KAFB EOD personnel.	SNL September 1994
February	1996	Housekeeping activities for removal of surface debris in preparation for soil sampling during the RFI activities.	SNL May 1997
March	1997	Soil sampling at Burn Test feature and contingency borehole sampling at site 58OO	SNL April 2005
October	1998	RAD survey of UCS	SNL April 2005
November	1998	SAP submitted for collecting additional RFI samples at SWMUs 8/58	SNL November 1998
August	1999	SAP submitted to NMED for Feature 58FF	SNL August 1999
February	2000	Meeting with NMED and SNL/NM personnel to discuss cleanup levels for lead at SWMU 8. It was proposed that the cleanup level for lead should be 750 mg/kg at surface and subsurface depths.	Olson and Moats 2000
October	2000	SNL/NM personnel prepare VCA plan for UCS at SWMU 58.	SNL October 2000
October	2000	Debris removal from UCS; RAD survey results.	SNL December 2000
January	2004	VCA plan submitted to NMED. Plan is to remove remaining debris and metal-contaminated (mainly lead) surface and subsurface soil at various features at SWMU 8.	SNL January 2004
April	2005	CAC Proposal for SWMUs 8/58 submitted to NMED. DOE requests a determination of CAC without controls for SWMUs 8/58 as a whole.	SNL April 2005

Table 8-1. Historical Timeline of SWMUs 8/58 *(Continued)*

Month	Year	Event	Reference
June	2005	SWMU 8 is designated as "CAC without controls" from NMED. NMED also issues an RSI for seven features of SWMU 58. Additional sampling and analysis is requested for these features to characterize the depth and lateral extent of contamination.	NMED June 2005
June	2005	Response to RSI submitted. Additional sampling will take place at the features under discussion. A SAP is included as an appendix to the response.	SNL June 2005
September	2005	NMED states the additional sampling is adequate to complete the CAC proposal pending the outcome of the sampling results. Additional field sampling begins.	NMED September 2005
March	2006	The first supplemental response and proposal for CAC for SWMUs 8/58 submitted. The new sampling analysis reveals no COCs present at levels considered hazardous to human health. DOE requests CAC without controls for SWMUs 8/58.	SNL March 2006
June	2006	NMED RSI states that elevated levels of lead and nickel at Feature 58FF were not sufficiently defined horizontally or vertically, therefore, additional sampling is needed.	NMED June 2006
August	2006	A SAP is submitted to NMED outlining additional sampling to be completed at Feature 58FF. Boreholes will be drilled and sampled for lead and nickel only.	SNL August 2006
September	2006	Lead and nickel samples collected from five boreholes at Feature 58FF.	SNL January 2007
October	2006	NMED officially approves the SAP for Fall 2006 sampling (after the sampling has already been completed).	NMED October 2006
January	2007	A second supplemental response and proposal for CAC submitted to NMED for SWMUs 8/58. The September 2006 sampling for lead and nickel reveals no COCs present at levels considered hazardous to human health. DOE again requests CAC without controls for SWMUs 8/58.	SNL January 2007
June	2007	NMED approves the second RSI response and issues a Certificate of Completion for CAC with Controls for SWMUs 8/58.	NMED June 2007
January	2008	Justification for Class III Permit Modification SWMUs 8/58, Volumes 1 through 4. Includes CAC Proposal (Volumes 1–3) and RSI and NOD (Volume 4).	SNL January 2008
June	2009	NMED Comments that Influence Outyear Planning for the ER Project. E-mail documenting important comments from a meeting with NMED including the decision to remove SWMUs 8/58 from the CAC process.	SNL June 2009
April	2010	Letter from NMED formally stating that additional corrective action is needed at SWMUs 8/58, and the specific requirements for what the additional corrective action should entail.	NMED April 2010
September	2010	Groundwater Characterization Work Plan for SWMUs 8/58 submitted to NMED (in response to April 8, 2010 letter).	SNL September 2010
January	2011	NMED approves SWMUs 8/58 Groundwater Characterization Work Plan.	NMED January 2011

Table 8-1. Historical Timeline of SWMUs 8/58 *(Concluded)*

Month	Year	Event	Reference
May	2011	Proposed Groundwater Monitoring Well Location Adjustment for SWMUs 8/58 submitted to NMED.	SNL May 2011a
June	2011	NMED approves SWMUs 8/58 Proposed Groundwater Monitoring Well Location Adjustment.	NMED June 2011
June	2011	Request for Extension to Complete the Final Well Installation Report for five Groundwater Monitoring Wells at SWMUs 8/58.	SNL June 2011
August	2011	Monitoring wells CCBA-MW1 and CCBA-MW2 are installed.	SNL November 2011
August	2011	NMED approves the Request for Extension to Complete Well Installation Report for Groundwater Monitoring Wells at SWMUs 8/58.	NMED August 2011
October/ November	2011	First quarterly sampling event conducted for monitoring wells CCBA-MW1 and CCBA-MW2 at SWMUs 8/58.	Annual Groundwater Monitoring Report, Calendar Year 2011, Chapter 8.0
November	2011	Groundwater Monitoring Well Installation Report for SWMUs 8/58 submitted.	SNL November 2011

NOTES:

CAC = Corrective Action Complete.
CCBA = Coyote Canyon Blast Area.
COC = Constituent of concern.
DOE = U.S. Department of Energy.
EOD = Explosive Ordnance Disposal.
ER = Environmental Restoration.
HE = High explosive.
KAFB = Kirtland Air Force Base.
mg/kg = Milligrams per kilogram.
NMED = New Mexico Environment Department.
NMFRCD = New Mexico Forestry and Resources Conservation Division.
NOD = Notice of Disapproval.
RAD = Radiological.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA Facility Investigation.
RSI = Request for Supplemental Information.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid Waste Management Unit.
UCS = Underground Conduit System.
UXO = Unexploded ordnance.
VCA = Voluntary Corrective Action.
VCM = Voluntary Corrective Measure.

SWMUs 8/58 contain identical constituents of concern (COCs) consisting of HE compounds, metals (arsenic, barium, beryllium, lead, mercury, and nickel), VOCs, SVOCs, asbestos, petroleum fuels, and radionuclides (DOE September 1987).

8.1.3 Monitoring History

In 2011, SNL/NM personnel installed two groundwater monitoring wells at SWMUs 8/58 (SNL November 2011) as shown on Figure 8-2. These two new wells were sampled for the first time in October and November 2011.

8.1.4 Current Monitoring Network

Currently two groundwater monitoring wells are installed at SWMUs 8/58 (Figure 8-2). Monitoring well CCBA-MW1 is located approximately 0.2 miles north of the ephemeral channel in Lurance Canyon and approximately 0.7 miles east of Coyote Springs. Lurance Canyon is the eastern extension of Arroyo del Coyote. Monitoring well CCBA-MW2 is located approximately 0.4 miles north of the ephemeral channel in Lurance Canyon and approximately 1 mile northeast of Coyote Springs.

CCBA-MW1 and CCBA-MW2 are monitored quarterly for VOCs, SVOCs, HE compounds, NPN, major anions (as bromide, chloride, fluoride, and sulfate), major cations (as calcium, magnesium, potassium, and sodium), alkalinity, TAL metals plus uranium, perchlorate, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

8.1.5 Summary of Calendar Year 2011 Activities

The following activities occurred for SWMUs 8/58 during CY 2011:

- NMED approved the Groundwater Characterization Work Plan for SWMUs 8/58 (NMED January 2011).
- Adjustments to the well locations for SWMUs 8/58 (SNL May 2011a) were proposed and approved by the NMED (June 2011).
- Two groundwater monitoring wells were installed (CCBA-MW1 and CCBA-MW2) at SWMUs 8/58 in August 2011 (SNL November 2011).
- A report describing the well installation field activities for SWMUs 8/58 was prepared and submitted to the NMED (SNL November 2011).
- Quarterly groundwater sampling was conducted at the newly installed wells in October and November 2011.
- Quarterly and annual reporting of results for chemical analyses of groundwater samples from CCBA-MW1 and CCBA-MW2 was initiated.
- Tables of analytical results (Attachment 8A) and a hydrograph (Attachment 8B) were prepared in support of this report.

8.1.6 Summary of Future Activities

The following activities are anticipated for SWMUs 8/58 during CY 2012:

- Quarterly groundwater sampling will be conducted at monitoring wells CCBA-MW1 and CCBA-MW2 during all four quarters of CY 2012.
- Quarterly reporting of results for chemical analyses for CCBA-MW1 and CCBA-MW2 groundwater samples will be performed.

8.1.7 Current Conceptual Model

With the installation of the first monitoring wells at SWMUs 8/58 in 2011 (Figure 8-2), understanding of the hydrogeologic regime significantly improved. The following sections present a comprehensive discussion of the hydrogeologic regime, conceptual site model, and contaminant findings for SWMUs 8/58.

8.1.7.1 Regional Hydrogeologic Conditions

SWMUs 8/58 are located in the Arroyo del Coyote watershed that captures runoff from the western flank of the Manzanita Mountains. The elevation at SWMUs 8/58 ranges from approximately 5,880 to 6,280 ft above mean sea level (amsl). SWMU 8 and the central portion of SWMU 58 are generally flat with a moderate slope to the south-southwest towards the ephemeral channel of Lurance Canyon. SWMU 58 is bordered on the northwest and northeast by ridges. No surface-water bodies are located at either site. A small arroyo runs from the north to the south through the western portion of the sites and is a tributary of Arroyo del Coyote. Both arroyos are dry except during and immediately following significant thunderstorms. The sites are sparsely vegetated by bunch grasses, cacti, junipers, and pine trees.

Alluvium fills the canyon floor and a veneer of weathered bedrock (colluvium) covers the surrounding slopes. Where present, soil types across the two sites consist of Gila sandy loam, the Tesajo-Millet gravelly loam, and the Salas Complex (clayey to gravelly loam) (SNL December 1995). The soil is poorly developed. The central portion of SWMUs 8/58 is covered with alluvium derived from the surrounding outcrops of Precambrian units (quartzite, greenstone, metarhyolite, and granite) and from Paleozoic sedimentary units (limestone, sandstone, and conglomerate). A thin veneer of colluvium covers the steeper slopes that surround the western and northern portions of SWMU 58.

The depth to bedrock is variable across the sites. The northern portion of SWMU 58 is underlain by Precambrian granite (SNL December 1995). Subsurface bedrock beneath the central and southern portions of SWMUs 8/58 consists of Precambrian quartzite. Fractured and moderately dipping quartzite is exposed on the steep hillside south of the sites (Karlstrom et al. April 2000).

The regional potentiometric surface map (Plate 1) shows that groundwater flow is generally toward the west in the vicinity of SWMUs 8/58. Topographic features and faults modify the flow direction at various locations. Faults to the west of the sites may serve as hydraulic barriers or conduits depending on the type and amount of fault gouge.

8.1.7.2 Hydrogeologic Conditions at SWMUs 8/58

The amount of precipitation available for groundwater recharge is minimal due to scant rainfall and high evapotranspiration rates. Summer (monsoonal) thunderstorms are responsible for the majority of rainfall. The average rainfall, as measured at the nearest active rain gauge (the National Weather Service station at the Albuquerque International Sunport) during the period from 1915 through 2005 was 8.67 inches per year (in./yr) (WRCC-DRI 2012). The station is located 8.7 miles northwest of SWMUs 8/58 at an elevation of 5,310 ft amsl. By extrapolation of the precipitation model presented in SNL/NM conceptual model of groundwater flow and contaminant transport at the canyon area (SNL May 2004), the average annual precipitation for SWMUs 8/58, where the elevation averages approximately 6,000 ft amsl, is estimated to be approximately 11.5 in./yr. Intense sunlight and low humidity throughout much of the year creates high rates of evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

Two recently installed monitoring wells provide useful information for determining the local direction of groundwater flow for the two sites. Monitoring wells CCBA-MW1 and CCBA-MW2 were installed by the air-rotary casing hammer drilling method at SWMUs 8/58 in August 2011. Monitoring well CCBA-MW1 is located at the southwestern edge of SWMU 8 and approximately 0.2 miles north of the ephemeral channel in Lurance Canyon (Figure 8-2). Well CCBA-MW2 is located near the center of SWMU 58 and approximately 1,446 ft northeast of well CCBA-MW1.

At the CCBA-MW1 borehole, Quaternary alluvium comprised mostly of poorly sorted sands and gravels was encountered from the ground surface to a depth of approximately 70 ft below ground surface (bgs). Saturated alluvium was encountered at 62 ft bgs, but the quantity of produced water was low. From approximately 65 to 70 ft bgs, the sand and gravel contained a significant amount of cobbles. The borehole was advanced to a total depth of 90 ft bgs to accommodate the NMED-required 20-foot-long well screen, a 5-foot-long sump, and additional rathole to deal with the severe borehole sloughing problem. Approximately 8 ft of saturated alluvium was encountered.

Quartzite bedrock was encountered at a depth of approximately 70 ft bgs. The well is screened across the water table from 60 to 80 ft bgs (Table 8-2). After installation, the water level in the well rose to 45 ft bgs, which indicates that the borehole most likely intercepted a saturated bedrock fracture zone with a positive pressure head. A significant amount of borehole sloughing resulted in erratic returns of drill cuttings. The uppermost saturated fracture is inferred to have been encountered at a depth of approximately 75 ft bgs in fractured quartzite, which produced a greater volume of water than the alluvium.

An unusually large volume of sand pack was required for building well CCBA-MW1. A total of 118 bags of sand were used to fill the annulus from the bottom of the sump to the required height above the screen. Typically, a monitoring well of similar design would be expected to require approximately 25 bags of sand. The large annular volume for well CCBA-MW1 indicates that a borehole with a much larger than normal diameter was created during the drilling process due to the significant amount of borehole sloughing. This large amount of sand pack will need to be considered when slug tests are interpreted.

At the CCBA-MW2 location, dry alluvium consisting of poorly sorted sand and gravel was encountered from the ground surface to a depth of 30 ft bgs. Precambrian granite and gneiss were penetrated from 30 ft bgs to the borehole total depth of 123 ft bgs. The uppermost saturated fracture was encountered at a depth of 100 ft bgs, and the well was screened in fractured bedrock from 98 to 118 ft bgs. Competent bedrock was encountered from 30 ft bgs to the total depth of 123 ft bgs; borehole sloughing was not a factor in constructing the well.

Figure 8-3 depicts the potentiometric surface for SWMUs 8/58. The apparent hydraulic gradient between the two wells (CCBA-MW1 and CCBA-MW2) is steep. The water-level elevation in well CCBA-MW2 was 13.39 ft higher than it was in well CCBA-MW1 in October 2011. The distance between the wells is 1,446 ft. The resulting gradient between the two wells was therefore approximately 0.01 feet per foot (ft/ft) to the southwest. The potentiometric surface map is based on the assumptions that (1) the two wells are screened in the same fractured bedrock zone and are hydraulically connected; (2) the fractured bedrock system is isotropic (the series of fractures is uniformly distributed and interconnected); and (3) the contribution of water from the saturated alluvium at well CCBA-MW2 is negligible.

Groundwater in the fractured bedrock system is inferred to flow to the southwest. However, if the fractured bedrock system were anisotropic, groundwater would tend to follow the orientation of the fractures and not necessarily migrate normal to the potentiometric surface contours. The potentiometric surfaces represented by the groundwater elevations measured in both wells are above the top of each screen. This indicates that the groundwater in the saturated bedrock fractures is under semiconfined or confined conditions at both wells.

Geochemical analyses of major cations and anions are depicted on the Piper trilinear diagram shown on Figure 8-4. The groundwater composition for both wells is of the bicarbonate type dominated by the calcium cation. The slight difference in geochemical signatures between the two wells is possibly due to the mixing of alluvial with bedrock water and also the differing bedrock lithology for the sample collected at well CCBA-MW1. Groundwater from well CCBA-MW2 is derived solely from fractured granite and gneiss.

During sampling, the drawdown in both wells was not excessive. The quantity of water produced by each well was clearly adequate for low-flow sampling purposes. Groundwater samples were collected using pneumatic (nitrogen gas) Bennett™ piston pumps. Hydraulic conductivity values will be calculated after slug testing is completed.

Table 8-2. Lithologic and Hydrogeologic Elevation Data for Monitoring Wells at SWMUs 8/58

Monitoring Well	Ground Surface Elevation (ft amsl)	Depth to Bedrock (ft bgs)	Depth to Uppermost Saturated Fracture (ft bgs[a])	Elevation of Uppermost Saturated Fracture (ft amsl)	Depth of Screened Interval (ft bgs)	Potentiometric Surface, October 2011 (ft amsl)	Mid-Point Screen Elevation (ft amsl)	Approximate Pressure Head (ft[b])	Completion Zone
CCBA-MW1	5899.89	70	75	5,825	60 - 80	5,854.56	5829.90	25	Alluvium and quartzite
CCBA-MW2	5936.95	30	100	5,837	98 - 118	5,867.95	5829.00	39	Granite and gneiss

NOTES:
[a]Observed during drilling.
[b]From mid-point of screen.
amsl = Above mean sea level.
bgs = Below ground surface.
CCBA = Coyote Canyon Blast Area.
ft = Foot (feet).
MW = Monitoring Well.
SWMU = Solid Waste Management Unit.

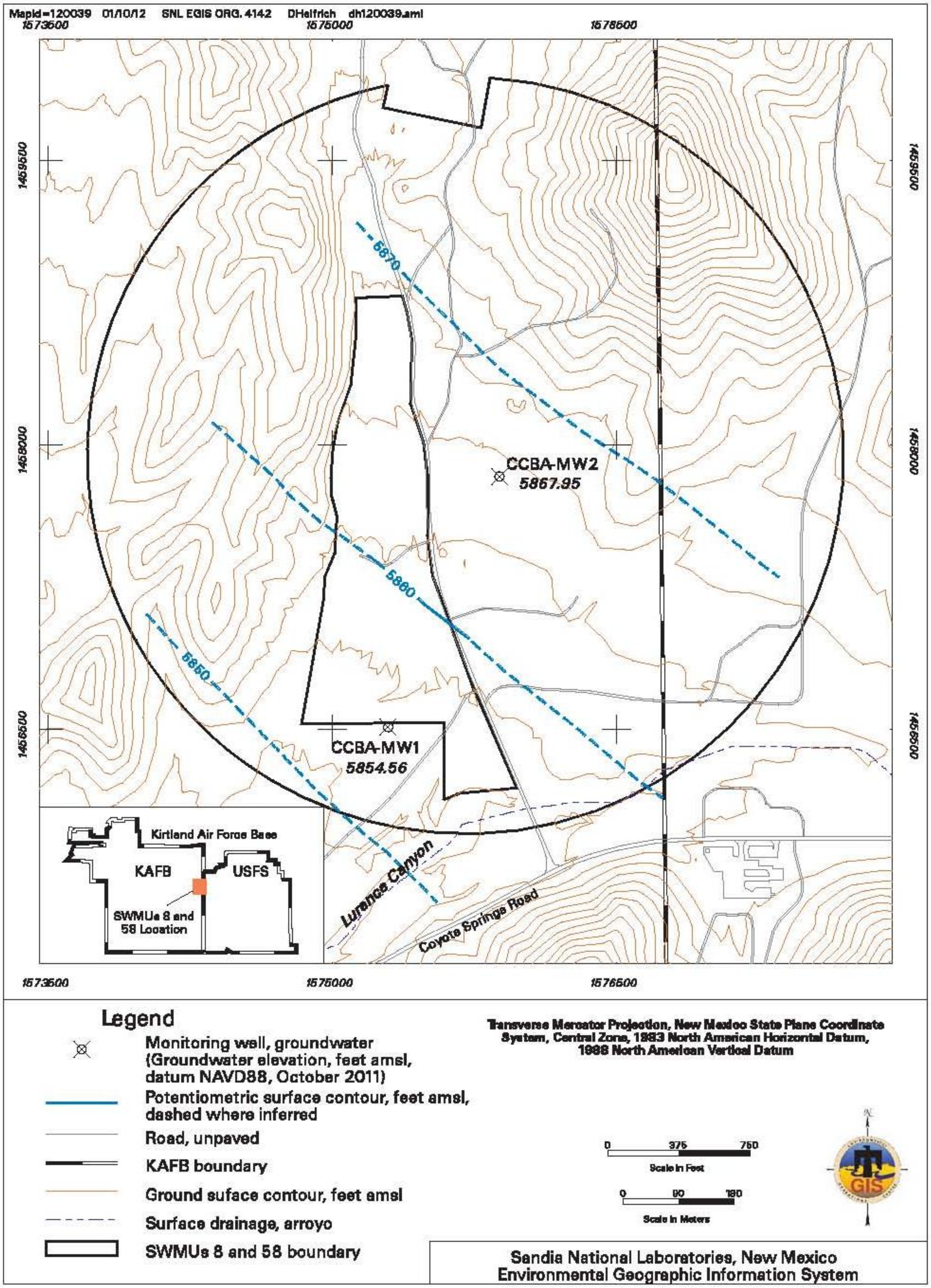

Figure 8-3. SWMUs 8/58 Potentiometric Surface Map

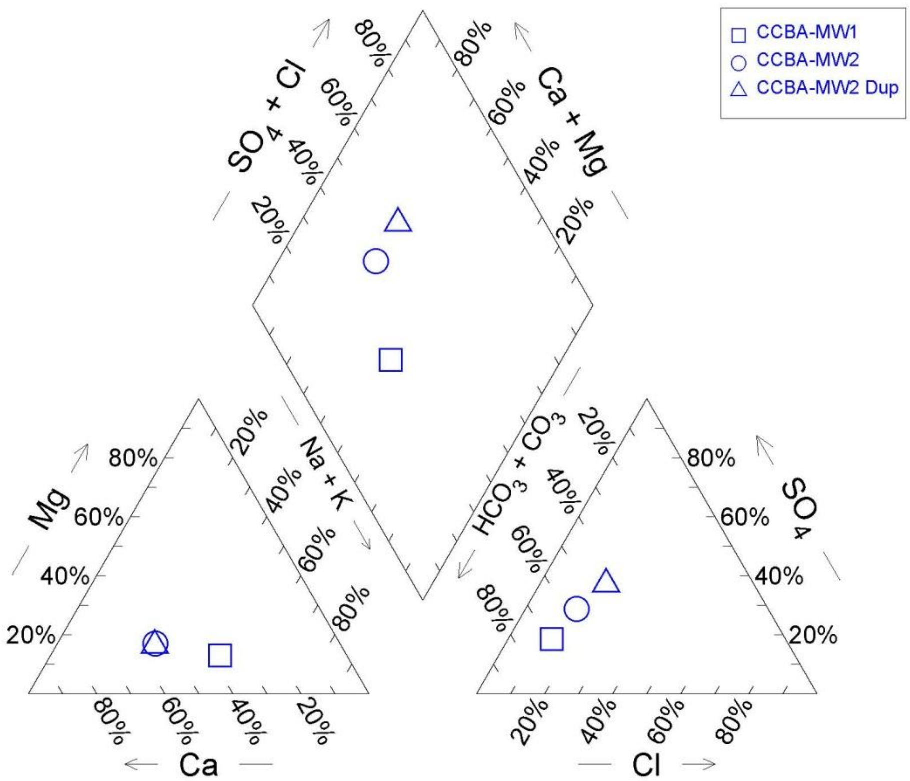

Figure 8-4. Piper Trilinear Diagram of Major Ion Chemistry for Monitoring Wells CCBA-MW1 and CCBA-MW2 at SWMUs 8/58, October 2011

8.1.7.3 Conceptual Site Model for SWMUs 8/58

The conceptual site model for SWMUs 8/58 is based on the findings from two on-site monitoring wells (CCBA-MW1 and CCBA-MW2), several nearby monitoring wells located upgradient and downgradient of the site in Lurance Canyon (Plate 1), and extensive field-mapping conducted by the Site-Wide Hydrogeologic Characterization Project (GRAM and Lettis 1995). Lurance Canyon is deeply incised into Paleozoic and Precambrian bedrock and drains westward toward Arroyo del Coyote. No perennial surface-water bodies are located at the site. Coyote Springs is located approximately 0.25 miles to the west and downslope of the site.

Groundwater in the area of SWMUs 8/58 predominantly occurs in a fractured bedrock system under semiconfined or confined conditions. Drilling indicates that the depth to groundwater in the fractured Precambrian quartzite and granite is approximately 75 to 100 ft bgs across the site and is dependent on the depth to the uppermost water-bearing fracture. A minor amount of groundwater was encountered in alluvium at 62 ft bgs during the drilling for well CCBA-MW1. However, the extent of saturated alluvium is most likely restricted to a thin, narrow area in the immediate vicinity of well CCBA-MW1.

Groundwater in the bedrock predominantly moves through a low-permeability fracture system. The geochemical signature is of the bicarbonate type dominated by the calcium cation. Naturally filled fractures in the overlying bedrock probably serve as a confining unit. Groundwater flows to the southwest. The hydraulic gradient in the fractured bedrock system is approximately 0.01 ft/ft. Groundwater underflow from the site probably discharges to the unconsolidated basin-fill deposits (primarily the Santa Fe Group) of the Albuquerque Basin after crossing the Sandia Fault and the Tijeras Fault. No potable water-supply wells are located within 4 miles of the site.

The amount of precipitation available for groundwater recharge is minimal due to the scant rainfall, high evapotranspiration rates, and the shallow sequence of bedrock. The annual precipitation is estimated to be 11.5 in./yr. Most rainfall occurs during summer thunderstorms. Seasonal effects probably do not significantly influence groundwater levels in the fractured bedrock system near the site.

8.1.7.4 Contaminant Sources

Sixty localized areas of interest, known as features, were investigated at SWMUs 8/58. The features consisted of test devices, various apparatus, debris piles, communication cable systems, and shrapnel. Numerous radiological and ordnance surveys were conducted and hazardous materials were removed. Additional remedial activities were conducted and approximately 1,390 cubic yards of testing debris were removed. Several phases of confirmatory soil sampling were conducted. Human-health and ecological risk assessments show that remaining COC concentrations in soil are acceptable for both industrial and residential land-use scenarios.

8.1.7.5 Contaminant Distribution and Transport in Groundwater

No groundwater contamination is suspected at SWMUs 8/58. Fluoride is the only analyte that exceeds the MCL in groundwater samples collected at SWMUs 8/58. Fluoride was detected above the MCL of 4.0 mg/L in the CCBA-MW1 groundwater sample at a concentration of 5.36 mg/L. However, this detection is most likely attributable to localized hydrothermal mineralization in faults and fractures within the quartzite bedrock in which the well is completed and not associated with SNL/NM testing activities. The fluoride concentration reported for well CCBA-MW2 is 1.74 mg/L.

8.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM Environmental Restoration (ER) Operations (formerly ER Project) and implements and enforces federal regulations mandated by the Resource Conservation and Recovery Act (RCRA). All ER Operations SWMUs are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993).

In April 2004, the NMED issued the Order (NMED April 2004) between the NMED, DOE, and Sandia, which specifically identifies SWMUs 8/58 as requiring investigation. All corrective action requirements pertaining to SWMUs 8/58 are contained in the Order (NMED April 2004).

A proposal for Corrective Action Complete (CAC) for SWMUs 8/58 was submitted to the NMED in April 2005 (SNL April 2005). The NMED responded to the CAC proposal with a Request for Supplemental Information (RSI) in June 2005 and required additional characterization at the site (NMED June 2005). DOE/Sandia responded to this RSI in June 2005 (SNL June 2005) and agreed to complete the additional site characterization work. The NMED approved the RSI response contingent on the results of field investigations proposed in the response (NMED September 2005). SNL/NM personnel completed the fieldwork in September and October 2005, and the results of the field investigations were submitted to the NMED in March 2006 (SNL March 2006). The NMED reviewed the March 2006 supplemental response and issued a second RSI (which required additional site characterization work) in June 2006 (NMED June 2006). DOE/Sandia responded to the second RSI in August 2006 (SNL August 2006), and again agreed to complete the additional site characterization work. The second RSI response was verbally approved by the NMED in early August 2006, and the additional fieldwork was completed in September 2006. The NMED officially approved the second RSI response in October 2006 (NMED October 2006), after fieldwork had been completed. The NMED approved SWMUs 8/58 for CAC with controls in June 2007 (NMED June 2007).

In a meeting with the NMED and participating members of the public held on June 9, 2009, the NMED decided that characterization of SWMUs 8/58 had not satisfied the requirements for CAC and that additional corrective actions were required due to insufficient information about the site hydrogeology and insufficient information about the contaminant source terms. The NMED required DOE/Sandia to submit a Groundwater Characterization Work Plan for SWMUs 8/58 (NMED April 2010).

The Groundwater Characterization Work Plan for SWMUs 8/58 was submitted to the NMED in September 2010 (SNL September 2010) and described the activities and procedures to install and sample groundwater monitoring wells to comply with the NMED requirements and guidance of the New Mexico Office of the State Engineer (NMOSE August 2005). The Work Plan was approved by the NMED in January 2011 (NMED January 2011). Due to the presence of cultural resources in the area and land-use permit issues with KAFB, the locations of the proposed monitoring wells were adjusted (SNL May 2011a and NMED June 2011).

The monitoring wells CCBA-MW1 and CCBA-MW2 were installed in August 2011 and quarterly sampling began in October 2011. The well installation report describing field activities was submitted to the NMED in November 2011 (SNL November 2011).

In this report monitoring data for SWMUs 8/58 are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order, as specified in Section III.A of the Order (NMED April 2004).

8.3 Scope of Activities

The activities for the investigations conducted at SWMUs 8/58 during this reporting period, including plans and reports, are listed in Section 8.1.5. The only field activity completed during CY 2011 in the study area was groundwater monitoring (Table 8-3). The analytical parameters for monitoring wells CCBA-MW1 and CCBA-MW2 are listed in Tables 8-4 and 8-5.

Table 8-3. Groundwater Monitoring Well Network and Sampling Dates for SWMUs 8/58, Calendar Year 2011

Date of Sampling Event	Wells Sampled	SAP
October and November 2011	CCBA-MW1 CCBA-MW2	*SWMU 8 and 58 Groundwater Monitoring Mini-SAP for First Quarter Fiscal Year 2012* (SNL October 2011)

NOTES:

CCBA = Coyote Canyon Blast Area.
MW = Monitoring well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
SWMU = Solid Waste Management Unit.

Table 8-4. SWMUs 8/58 Chemical Analytical Methods

Analyte	Analytical Method[a,b,c,d,e]
Anions	SW846 9056
Alkalinity	SM2320B
Filtered Cations	SW846 6020
HE compounds	SW846 8321A
NPN	EPA 353.2
Perchlorate	EPA 314.0
SVOC	SW846 8270C
TAL Metals	SW846 6010/6020/7470
Total Cyanide	SW846 9012
VOC	SW846 8260B

NOTES:

[a]EPA, 1999, *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
[b]EPA, 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed., Rev. 1 (and all updates), U.S. Environmental Protection Agency, Washington, D.C.
[c]EPA,1984, *Methods for Chemical Analysis of Water and Wastes,* EPA 600-4-79-020.
[d]EPA, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0,* EPA-600/4-84-017
[e]Clesceri, et al., 1998, *Standard Methods for the Examination of Water and Wastewater,* 20th ed., Method 2320B.
Beckman LS5000TD Liquid Scintillation System Operation Manual, May 1988.
EPA = U.S. Environmental Protection Agency.
HE = High explosive(s).
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard method.
SVOC = Semivolatile organic compound.
SW = Solid Waste.
SWMU = Solid Waste Management Unit.
TAL = Target Analyte List.
VOC = Volatile organic compound.

Table 8-5. SWMUs 8/58 Radiochemical Analytical Methods

Analyte	Analytical Method[a,b]
Gamma Spectroscopy (short list)	EPA 901.0
Gross Alpha/Beta	EPA 900.0
Isotopic Uranium	HASL-300

NOTES:
[a]EPA, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032
[b]U.S. Department of Energy, Environmental Measurements Laboratory (EML), 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.
EPA = U.S. Environmental Protection Agency.
HASL = Health and Safety Laboratory.
SWMU = Solid Waste Management Unit.

8.4 Field Methods and Measurements

According to the requirements of the Order (NMED April 2004) addressing Section VII.D.6 and the NMED letter of April 8, 2010 (NMED April 2010), SNL/NM personnel will perform groundwater sampling at SWMUs 8/58. The CY 2011 sampling events were conducted in conformance with appropriate SNL/NM Field Operating Procedures (FOPs) for groundwater sampling activities and the site-specific Mini-SAP for SWMUs 8/58 (SNL October 2011).

Environmental groundwater samples were collected from monitoring wells CCBA-MW1 and CCBA-MW2 in October and November 2011. Samples were submitted to GEL Laboratories LLC (GEL) for all chemical analyses. Groundwater samples were analyzed for VOCs, SVOCs, HE compounds, NPN, major anions (as bromide, chloride, fluoride, and sulfate), major cations (as calcium, magnesium, potassium, and sodium), alkalinity, TAL metals plus uranium, perchlorate, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, split, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. FB samples provide a check for potential ambient sources of sample contamination during the sampling process and/or sampling error. TB samples are used to determine whether VOCs contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory.

The NMED DOE Oversight Bureau (OB) was on site at the time of groundwater sampling and collected split samples for VOCs, SVOCs, HE compounds, NPN, major anions, major cations, total metals plus uranium, perchlorate, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium at both monitoring wells. The NMED DOE OB split sampling results are presented in a separate report and are not included in this report.

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

8.4.1 Groundwater Elevation

During the October 2011, water levels were measured at monitoring wells CCBA-MW1 and CCBA-MW2. The groundwater flow direction and hydraulic gradient are discussed in Section 8.1.7.2. Water levels will continue to be periodically measured in the monitoring wells at SWMUs 8/58 according to the instructions and requirements specified in SNL/NM FOP 03-02, *Groundwater Level Data*

Acquisition and Management (SNL November 2009a and February 2011). The October 2011 water level information was used to create the potentiometric surface map presented on Figure 8-3. The October 2011 water level information was used to create the potentiometric surface map presented on Figure 8-3 and the hydrograph presented on Figure 8B 1 (Attachment 8B).

8.4.2 Well Purging and Water Quality Measurements

Purging removes stagnant water from the well so that a representative groundwater sample can be obtained. The wells are purged a minimum of one saturated casing volume. Purging continued until four stable field measurements for temperature, specific conductance (SC), pH, and turbidity were obtained. Groundwater stability is considered acceptable when measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, 0.1 pH units, 1.0 degrees Celsius, and SC is within 5 percent as micromhos per centimeter.

Field water quality measurements for turbidity, pH, temperature, SC, oxidation-reduction potential (ORP), and dissolved oxygen (DO) were recorded for the well prior to the collection of groundwater samples according to SNL/NM FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements* (SNL November 2009b). Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

8.4.3 Pump Decontamination

The sampling pump and tubing bundle were decontaminated prior to installation in monitoring wells according to procedures described in SNL/NM FOP 05-03, *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination* (SNL November 2009c). An EB sample was collected to verify the effectiveness of the equipment decontamination process prior to sampling CCBA-MW2.

8.4.4 Sample Collection Sampling Procedures

Groundwater sampling was performed in strict accordance with SNL/NM FOP 05-01 (SNL November 2009b) and SNL/NM Sample Management Office (SMO) procedures and protocols. Sample container types depend on the analytical parameters.

Groundwater samples were collected using the Bennett™ nitrogen gas-powered portable piston pump. Sample bottles were filled directly from the pump discharge line and water sampling manifold into laboratory-prepared sample containers, with the VOC samples collected at the lowest achievable discharge rate. The groundwater samples were submitted to GEL for chemical analysis using methods outlined in Table 8-4.

8.4.5 Sample Handling and Shipment

The SNL/NM SMO processes environmental samples collected by LTS/ER Operations personnel. The SMO staff reviews the Mini-SAPs, orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced in laboratory processes and procedures. These include method blanks, laboratory control samples (LCSs), matrix spike, matrix spike duplicate, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review*, SMO-05-03 (SNL May 2010) and Administrative

Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011b).

8.4.6 Waste Management

Purge and decontamination water generated from all sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management*, (SNL November 2009d) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Associated environmental sample results provide supplemental data for approval to discharge water to the sanitary sewer. All data are compared with Albuquerque Bernalillo County Water Utility Authority discharge limits.

8.5 Analytical Methods

Groundwater samples were submitted to GEL for chemical and radiological analyses. Samples were analyzed in accordance with applicable EPA and DOE analytical methods (EPA 1980, 1983, 1984, 1996, and 1999; DOE 1990; and Clesceri et al. 1998). Groundwater sampling results are compared with established EPA MCLs for drinking water (EPA 2009). Tables 8A-1 and 8A-2 in Attachment 8A present the method detection limits (MDLs) for the VOC, SVOC, and HE compound analyses. The analytical results and field measurements for samples collected from monitoring wells CCBA-MW1 and CCBA-MW2 are shown in tabulated form in Tables 8A-3 through 8A-9 (Attachment 8A). Analytical reports, including certificates of analyses, analytical methods, MDLs, minimum detectable activity (MDA), critical level, practical quantitation limits, dates of analyses, results of QC analyses, and data validation findings are filed in the SNL/NM Records Center.

8.6 Summary of Analytical Results

This section discusses analytical results and field measurements for the CY 2011 sampling event at SWMUs 8/58. Data are presented in Tables 8A-3 through 8A-9 (Attachment 8A). Data qualifiers are explained in the footnotes following Table 8A-9.

The analytical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data, Revision 3* (SNL May 2011b). No problems were identified with the analytical data that resulted in qualification of the data as unusable. The data are acceptable, and reported QC measures are adequate.

No VOCs, SVOCs, or HE compounds were detected above laboratory MDLs in any groundwater samples collected from SWMUs 8/58. Table 8A-1 lists the MDLs for associated VOCs and SVOCs, and Table 8A-2 presents the MDLs for HE compounds.

Table 8A-3 summarizes NPN results. NPN values were compared with the nitrate MCL of 10 mg/L. NPN was not detected above the MCL in any groundwater sample. NPN was reported at concentrations of 3.24 mg/L in the CCBA-MW2 environmental sample and 3.31 mg/L in the CCBA-MW2 duplicate environmental sample. NPN was qualified as not detected during data validation in the CCBA-MW1 sample as NPN was also detected in the associated laboratory method blank sample.

Table 8A-4 summarizes alkalinity, major anion (as bromide, chloride, fluoride, and sulfate), and total cyanide results. Fluoride was detected above the established MCL of 4.0 mg/L in the sample from CCBA-MW1 at a concentration of 5.36 mg/L. Fluoride was reported in CCBA-MW2 samples at concentrations of 1.72 and 1.74 mg/L. No other anions or total cyanide were detected above established MCLs.

Perchlorate was not detected above the screening level/MDL of 0.004 mg/L in any groundwater sample. Table 8A-5 presents perchlorate results.

TAL metals plus uranium were analyzed for all samples from monitoring wells at SWMUs 8/58. No metal parameters were detected above established regulatory limits in any groundwater sample. Metal results are summarized in Table 8A-6.

Filtered fractions for major cations as calcium, magnesium, potassium, and sodium were analyzed for all samples. The results are presented in Table 8A-7. These parameters have no established MCLs.

All groundwater samples were screened for gamma-emitting radionuclides, gross alpha activity, and gross beta activity. An additional sample for isotopic uranium was collected to support evaluation of gross alpha activity results. The results for gamma spectroscopy, gross alpha/beta activity, and isotopic uranium are presented in Table 8A-8. Gamma spectroscopy activities for short-list radionuclides are less than the associated MDAs for all groundwater samples. Radioisotopic analyses included gross alpha, gross beta, and isotopic uranium analyses. All radionuclide activity results are below MCLs, where established.

Table 8A-9 summarizes field water quality measurements collected prior to sampling. Field water quality measurements include turbidity, pH, temperature, SC, ORP, and DO.

8.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011b). Data validation qualifiers are provided with the analytical results in Tables 8A-3 through 8A-8 (Attachment 8A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center. The following sections discuss site-specific QC results for the SWMUs 8/58 quarterly sampling events.

8.7.1 Field Quality Control Samples

Field QC samples are used to document data quality and identify any potential errors that may be introduced by field conditions, in sample collection, storage, transportation, and equipment decontamination. Field QC samples submitted to the analytical laboratory are handled and analyzed in an identical manner as environmental samples.

Field QC samples included duplicate environmental, EB, TB, and FB samples. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAP (SNL October 2011).

8.7.1.1 Duplicate Environmental Samples

A duplicate environmental sample was collected from CCBA-MW2 and analyzed to estimate the overall reproducibility of the sampling and analytical process. The duplicate environmental sample was collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The duplicate environmental sample was analyzed for all parameters.

8.7.1.2 Equipment Blank Samples

A portable Bennett™ groundwater sampling system was used to collect groundwater samples from both wells. The sampling pump and tubing bundle were decontaminated prior to installation into the monitoring wells according to procedures described in SNL/NM FOP 05-03 (SNL November 2009c). An EB sample was collected to verify the effectiveness of the equipment decontamination process and monitor the cleanliness of the sampling system. After sampling equipment decontamination has been completed, an EB sample is prepared by pumping deionized water through the portable sampling equipment and collecting a sample of this water. An EB sample was collected prior to sampling monitoring well CCBA-MW2 and submitted for all analyses.

Alkalinity, antimony, bromodichloromethane, chloride, copper, and dibromochloromethane were detected above the laboratory MDLs in the EB sample. No corrective action was necessary for alkalinity, antimony, bromodichloromethane, chloride, or dibromochloromethane as these analytes were either not detected in the environmental sample or detected at a concentration greater than five times the blank result. Copper was detected in the CCBA-MW2 environmental and duplicate environmental samples at concentrations less than five times the associated EB result. The results for copper were qualified as not detected during data validation.

8.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analyses to assess whether contamination of the samples has occurred during shipment and storage. The analytical laboratory prepares the TB sample by filling a volatile organic analysis sample vial with deionized water and using the same sample preservation method designated for VOC environmental samples. Each vial is sealed with custody tape and dated when it is prepared. The TB samples accompany the empty sample containers when they are shipped to SNL/NM prior to the start of sample collection. The TB samples are taken into the field during sample collection and are included in the shipment of environmental samples to the laboratory. The TB samples must remain sealed during this entire cycle and may be opened only for analysis on return to the analytical laboratory.

Each batch of groundwater samples to be analyzed for VOCs was accompanied by at least one TB during shipping. A total of three TB samples were submitted with the October/November 2011 CCBA-MW1 and CCBA-MW2 samples. The TB samples were analyzed for VOCs only. No VOCs were detected above associated laboratory MDLs, except 2-butanone and chloroform. No corrective action was necessary as these compounds were not detected in the associated environmental sample. These compounds were qualified as not detected in the EB sample due to associated TB sample contamination.

8.7.1.4 Field Blank Samples

FB samples were collected and analyzed for VOCs to assess whether contamination of the samples resulted from ambient field conditions. The FB samples were prepared by pouring deionized water into sample containers at the CCBA-MW2 sampling point to simulate the transfer of environmental samples from the sampling system to the sample container.

The VOC compounds bromodichloromethane, chloroform, and dibromochloromethane were detected above laboratory MDLs. No corrective action was necessary as these compounds were not detected in the associated environmental samples.

8.7.2 Laboratory Quality Control Samples

The analytical laboratory is required to have established procedures that demonstrate the analytical process is always in control during each sample analysis step. These procedures are used for all samples including environmental samples, method blank samples, and matrix spike samples.

An LCS consists of a control matrix (e.g., deionized water) spiked with known concentrations of analytes representative of the target analytes. An LCS was prepared and analyzed for each analytical procedure and batch to determine the accuracy of the data. The laboratory evaluates the precision of the data by performing duplicate analysis of either the environmental samples, LCSs, or matrix spike samples and calculating the relative percent difference between corresponding results.

Method blank samples are used to check for contamination in the laboratory during sample preparation and analysis. Method blank samples are concurrently prepared and analyzed with each analytical batch. Method blank results are reported in the same units as those for the corresponding environmental samples, and the results are included with each analytical report.

Surrogate spike analysis is performed for all samples analyzed by gas chromatography/mass spectroscopy. The surrogate compounds added to the sample are those specified in the applicable EPA analytical method procedure. Recovery values for surrogate compounds that are outside specified control limits require corrective action.

The analytical process is systematically evaluated for the effects of naturally occurring constituents present in the environmental sample matrix. The matrix spike/matrix spike duplicate analyses are performed in accordance with the specified analytical procedures.

Internal laboratory QC samples, including method blanks and duplicate LCSs were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011b). Laboratory data qualifiers are provided with the analytical results in Tables 8A-3 through 8A-8 (Attachment 8A).

Although some analytical results were qualified during the data validation process, no significant data quality problems were noted. The data validation reports are filed in the SNL/NM Records Center.

8.8 Variances and Nonconformances

No variances or nonconformances from requirements specified in the Mini-SAP for SWMUs 8/58 (SNL October 2011) or project-specific issues were identified during the October and November 2011 sampling activities.

8.9 Summary and Conclusions

Two new groundwater monitoring wells were installed at SWMUs 8/58 in August 2011. During October and November 2011, groundwater samples were collected from CCBA-MW1 and CCBA-MW2. Analytical parameters included VOCs, SVOCs, HE compounds, NPN, major anions, major cations, alkalinity, TAL metals plus uranium, perchlorate, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium. No parameters were detected above established MCLs, except for fluoride. Fluoride was detected above the established MCL of 4.0 mg/L in the CCBA-MW1 sample at a concentration of 5.36 mg/L. This detection is most likely attributable to the quartzite bedrock in which the well is completed and not associated with SNL/NM testing activities.

The current conceptual model described in Section 8.1.7 does not require modification based on the analytical results for this reporting period.

During CY 2012, quarterly groundwater sampling and reporting will continue for the groundwater monitoring wells (CCBA-MW1 and CCBA-MW2) located at SWMUs 8/58.

8.10 References

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Attachment 8A
Solid Waste Management Units 8/58
Analytical Results Tables

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Attachment 8A Tables

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Table 8A-1
Method Detection Limits for Volatile and Semivolatile Organic Compounds, Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]
1,1,1-Trichloroethane	0.325	8260B	1,2,4-Trichlorobenzene	3.00 - 3.33	8270C	Di-n-butyl phthalate	3.00 - 3.33	8270C
1,1,2,2-Tetrachloroethane	0.250	8260B	1,2-Dichlorobenzene	3.00 - 3.33	8270C	Di-n-octyl phthalate	3.00 - 3.33	8270C
1,1,2-Trichloroethane	0.250	8260B	1,3-Dichlorobenzene	3.00 - 3.33	8270C	Dibenz[a,h]anthracene	0.300 - 0.333	8270C
1,1-Dichloroethane	0.300	8260B	1,4-Dichlorobenzene	3.00 - 3.33	8270C	Dibenzofuran	3.00 - 3.33	8270C
1,1-Dichloroethene	0.300	8260B	2,4,5-Trichlorophenol	3.00 - 3.33	8270C	Diethylphthalate	3.00 - 3.33	8270C
1,2-Dichloroethane	0.250	8260B	2,4,6-Trichlorophenol	3.00 - 3.33	8270C	Dimethylphthalate	3.00 - 3.33	8270C
1,2-Dichloropropane	0.250	8260B	2,4-Dichlorophenol	3.00 - 3.33	8270C	Dinitro-o-cresol	3.00 - 3.33	8270C
2-Butanone	1.25	8260B	2,4-Dimethylphenol	3.00 - 3.33	8270C	Diphenyl amine	3.00 - 3.33	8270C
2-Hexanone	1.25	8260B	2,4-Dinitrophenol	5.00 - 5.56	8270C	Fluoranthene	0.300 - 0.333	8270C
4-methyl-, 2-Pentanone	1.25	8260B	2,4-Dinitrotoluene	3.00 - 3.33	8270C	Fluorene	0.300 - 0.333	8270C
Acetone	3.50	8260B	2,6-Dinitrotoluene	3.00 - 3.33	8270C	Hexachlorobenzene	3.00 - 3.33	8270C
Benzene	0.300	8260B	2-Chloronaphthalene	0.300 - 0.333	8270C	Hexachlorobutadiene	3.00 - 3.33	8270C
Bromodichloromethane	0.250	8260B	2-Chlorophenol	3.00 - 3.33	8270C	Hexachlorocyclopentadiene	3.00 - 3.33	8270C
Bromoform	0.250	8260B	2-Methylnaphthalene	0.300 - 0.333	8270C	Hexachloroethane	3.00 - 3.33	8270C
Bromomethane	0.300	8260B	2-Nitroaniline	3.00 - 3.33	8270C	Indeno(1,2,3-c,d)pyrene	0.300 - 0.333	8270C
Carbon disulfide	1.25	8260B	2-Nitrophenol	3.00 - 3.33	8270C	Isophorone	3.00 - 3.33	8270C
Carbon tetrachloride	0.300	8260B	3,3'-Dichlorobenzidine	3.00 - 3.33	8270C	Naphthalene	0.300 - 0.333	8270C
Chlorobenzene	0.250	8260B	3-Nitroaniline	3.00 - 3.33	8270C	Nitro-benzene	3.00 - 3.33	8270C
Chloroethane	0.300	8260B	4-Bromophenyl phenyl ether	3.00 - 3.33	8270C	Pentachlorophenol	3.00 - 3.33	8270C
Chloroform	0.250	8260B	4-Chloro-3-methylphenol	3.00 - 3.33	8270C	Phenanthrene	0.3 - 0.333	8270C
Chloromethane	0.300	8260B	4-Chlorobenzenamine	3.00 - 3.33	8270C	Phenol	3.00 - 3.33	8270C
Dibromochloromethane	0.300	8260B	4-Chlorophenyl phenyl ether	3.00 - 3.33	8270C	Pyrene	0.3 00- 0.333	8270C
Ethyl benzene	0.250	8260B	4-Nitroaniline	3.00 - 3.33	8270C	bis(2-Chloroethoxy)methane	3.00 - 3.33	8270C
Methylene chloride	3.00	8260B	4-Nitrophenol	3.00 - 3.33	8270C	bis(2-Chloroethyl)ether	3.00 - 3.33	8270C
Styrene	0.250	8260B	Acenaphthene	0.300 - 0.333	8270C	bis(2-Ethylhexyl)phthalate	3.00 - 3.33	8270C
Tetrachloroethene	0.300	8260B	Acenaphthylene	0.300 - 0.333	8270C	bis-Chloroisopropyl ether	3.00 - 3.33	8270C
Toluene	0.250	8260B	Anthracene	0.300 - 0.333	8270C	m,p-Cresol	3.00 - 3.33	8270C
Trichloroethene	0.250	8260B	Benzo(a)anthracene	0.300 - 0.333	8270C	n-Nitrosodipropylamine	3.00 - 3.33	8270C
Vinyl acetate	1.50	8260B	Benzo(a)pyrene	0.300 - 0.333	8270C	o-Cresol	3.00 - 3.33	8270C
Vinyl chloride	0.500	8260B	Benzo(b)fluoranthene	0.300 - 0.333	8270C			
Xylene	0.300	8260B	Benzo(ghi)perylene	0.300 - 0.333	8270C			
cis-1,2-Dichloroethene	0.300	8260B	Benzo(k)fluoranthene	0.300 - 0.333	8270C			
cis-1,3-Dichloropropene	0.250	8260B	Butylbenzyl phthalate	3.00 - 3.33	8270C			
trans-1,2-Dichloroethene	0.300	8260B	Carbazole	0.300 - 0.333	8270C			
trans-1,3-Dichloropropene	0.250	8260B	Chrysene	0.300 - 0.333	8270C			

Refer to footnotes on page 8A-17.

Table 8A-2
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8321A), Solid Waste Management Units 8/58 Groundwater Investigation, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.104
1,3-Dinitrobenzene	0.104
2,4,6-Trinitrotoluene	0.104
2,4-Dinitrotoluene	0.104
2,6-Dinitrotoluene	0.104
2-Amino-4,6-dinitrotoluene	0.104
2-Nitrotoluene	0.106
3-Nitrotoluene	0.104
4-Amino-2,6-dinitrotoluene	0.104
4-Nitrotoluene	0.195
HMX	0.104
Nitro-benzene	0.104
Pentaerythritol tetranitrate	0.130
RDX	0.104
Tetryl	0.104

Refer to footnotes on page 8A-17.

Table 8A-3
Summary of Nitrate plus Nitrite Results,
Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW1 31-Oct-11	Nitrate plus nitrite as N	0.0518	0.010	0.050	10.0	B	0.069U	091345-018	EPA 353.2
CCBA-MW2 01-Nov-11	Nitrate plus nitrite as N	3.24	0.100	0.500	10.0	B		091349-018	EPA 353.2
CCBA-MW2 (Duplicate) 01-Nov-11	Nitrate plus nitrite as N	3.31	0.100	0.500	10.0	B		091350-018	EPA 353.2

Refer to footnotes on page 8A-17.

Table 8A-4
Summary of Alkalinity, Anion, and Total Cyanide Results, Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW1 31-Oct-11	Bicarbonate Alkalinity	181	0.725	1.00	NE	B		091345-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091345-022	SM2320B
	Bromide	0.339	0.066	0.200	NE			091345-016	SW846 9056
	Chloride	24.0	0.660	2.00	NE			091345-016	SW846 9056
	Fluoride	**5.36**	0.033	0.100	4.0			091345-016	SW846 9056
	Sulfate	46.5	1.00	4.00	NE			091345-016	SW846 9056
	Total Cyanide	ND	0.0015	0.005	0.200	U		091345-027	SW846 9012
CCBA-MW2 01-Nov-11	Bicarbonate Alkalinity	185	0.725	1.00	NE	B		091349-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091349-022	SM2320B
	Bromide	0.567	0.066	0.200	NE			091349-016	SW846 9056
	Chloride	35.1	0.660	2.00	NE			091349-016	SW846 9056
	Fluoride	1.72	0.033	0.100	4.0			091349-016	SW846 9056
	Sulfate	90.5	1.00	4.00	NE			091349-016	SW846 9056
	Total Cyanide	ND	0.0015	0.005	0.200	U		091349-027	SW846 9012
CCBA-MW2 (Duplicate) 01-Nov-11	Bicarbonate Alkalinity	111	0.725	1.00	NE	B		091350-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091350-022	SM2320B
	Bromide	0.539	0.066	0.200	NE			091350-016	SW846 9056
	Chloride	35.4	0.660	2.00	NE			091350-016	SW846 9056
	Fluoride	1.74	0.033	0.100	4.0			091350-016	SW846 9056
	Sulfate	91.3	1.00	4.00	NE			091350-016	SW846 9056
	Total Cyanide	ND	0.0015	0.005	0.200	U		091350-027	SW846 9012

Refer to footnotes on page 8A-17.

Table 8A-5
Summary of Perchlorate Results,
Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW1 31-Oct-11	ND	0.004	0.012	NE	U		091345-020	EPA 314.0
CCBA-MW2 01-Nov-11	ND	0.004	0.012	NE	U		091349-020	EPA 314.0
CCBA-MW2 (Duplicate) 01-Nov-11	ND	0.004	0.012	NE	U		091350-020	EPA 314.0

Refer to footnotes on page 8A-17.

Table 8A-6
Summary of Unfiltered Total Metal Results,
Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW1	Aluminum	0.0642	0.015	0.050	NE			091345-009	SW846 6020
31-Oct-11	Antimony	ND	0.001	0.003	0.006	U		091345-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091345-009	SW846 6020
	Barium	0.0133	0.0006	0.002	2.00			091345-009	SW846 6020
	Beryllium	0.000594	0.0002	0.0005	0.004			091345-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091345-009	SW846 6020
	Calcium	42.4	0.060	0.200	NE	B		091345-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091345-009	SW846 6020
	Cobalt	0.000153	0.0001	0.001	NE	J		091345-009	SW846 6020
	Copper	0.000697	0.00035	0.001	NE	J		091345-009	SW846 6020
	Iron	0.103	0.033	0.100	NE			091345-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091345-009	SW846 6020
	Magnesium	8.98	0.010	0.030	NE			091345-009	SW846 6020
	Manganese	0.0219	0.001	0.005	NE			091345-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	091345-009	SW846 7470
	Nickel	0.00135	0.0005	0.002	NE	J		091345-009	SW846 6020
	Potassium	4.20	0.080	0.300	NE			091345-009	SW846 6020
	Selenium	0.00286	0.0015	0.005	0.050	J		091345-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091345-009	SW846 6020
	Sodium	67.6	0.400	1.25	NE		J	091345-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091345-009	SW846 6020
	Uranium	0.00187	0.000067	0.0002	0.03	B		091345-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091345-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091345-009	SW846 6020

Refer to footnotes on page 8A-17.

Table 8A-6 *(Continued)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW2	Aluminum	0.0638	0.015	0.050	NE			091349-009	SW846 6020
01-Nov-11	Antimony	ND	0.001	0.003	0.006	U		091349-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091349-009	SW846 6020
	Barium	0.0481	0.0006	0.002	2.00			091349-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091349-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091349-009	SW846 6020
	Calcium	78.4	0.300	1.00	NE	B		091349-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091349-009	SW846 6020
	Cobalt	0.000115	0.0001	0.001	NE	J		091349-009	SW846 6020
	Copper	0.00192	0.00035	0.001	NE		0.0023U	091349-009	SW846 6020
	Iron	0.215	0.033	0.100	NE			091349-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091349-009	SW846 6020
	Magnesium	15.6	0.010	0.030	NE			091349-009	SW846 6020
	Manganese	0.012	0.001	0.005	NE			091349-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	091349-009	SW846 7470
	Nickel	0.00114	0.0005	0.002	NE	J		091349-009	SW846 6020
	Potassium	1.51	0.080	0.300	NE			091349-009	SW846 6020
	Selenium	0.00452	0.0015	0.005	0.050	J		091349-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091349-009	SW846 6020
	Sodium	49.0	0.080	0.250	NE		J	091349-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091349-009	SW846 6020
	Uranium	0.00586	0.000067	0.0002	0.03	B		091349-009	SW846 6020
	Vanadium	0.00826	0.001	0.005	NE			091349-009	SW846 6010
	Zinc	0.0432	0.0035	0.010	NE			091349-009	SW846 6020

Refer to footnotes on page 8A-17.

Table 8A-6 *(Concluded)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW2 (Duplicate)	Aluminum	0.061	0.015	0.050	NE			091350-009	SW846 6020
01-Nov-11	Antimony	ND	0.001	0.003	0.006	U		091350-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091350-009	SW846 6020
	Barium	0.0478	0.0006	0.002	2.00			091350-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091350-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091350-009	SW846 6020
	Calcium	78.7	0.300	1.00	NE	B		091350-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091350-009	SW846 6020
	Cobalt	0.000124	0.0001	0.001	NE	J		091350-009	SW846 6020
	Copper	0.00195	0.00035	0.001	NE		0.0023U	091350-009	SW846 6020
	Iron	0.349	0.033	0.100	NE			091350-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091350-009	SW846 6020
	Magnesium	14.9	0.010	0.030	NE			091350-009	SW846 6020
	Manganese	0.0124	0.001	0.005	NE			091350-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	091350-009	SW846 7470
	Nickel	0.0013	0.0005	0.002	NE	J		091350-009	SW846 6020
	Potassium	1.52	0.080	0.300	NE			091350-009	SW846 6020
	Selenium	0.00477	0.0015	0.005	0.050	J		091350-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091350-009	SW846 6020
	Sodium	46.7	0.080	0.250	NE		J	091350-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091350-009	SW846 6020
	Uranium	0.00581	0.000067	0.0002	0.03	B		091350-009	SW846 6020
	Vanadium	0.00814	0.001	0.005	NE			091350-009	SW846 6010
	Zinc	0.0455	0.0035	0.010	NE			091350-009	SW846 6020

Refer to footnotes on page 8A-17.

Table 8A-7
Summary of Filtered Cation Results,
Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW1 31-Oct-11	Calcium	43.7	0.060	0.200	NE	B		091345-017	SW846 6020
	Magnesium	9.16	0.010	0.030	NE			091345-017	SW846 6020
	Potassium	4.48	0.080	0.300	NE			091345-017	SW846 6020
	Sodium	64.3	0.400	1.25	NE		J	091345-017	SW846 6020
CCBA-MW2 01-Nov-11	Calcium	79.9	0.300	1.00	NE	B		091349-017	SW846 6020
	Magnesium	15.2	0.010	0.030	NE			091349-017	SW846 6020
	Potassium	1.53	0.080	0.300	NE			091349-017	SW846 6020
	Sodium	47.7	0.080	0.250	NE		J	091349-017	SW846 6020
CCBA-MW2 (Duplicate) 01-Nov-11	Calcium	81.3	0.300	1.00	NE	B		091350-017	SW846 6020
	Magnesium	14.7	0.010	0.030	NE			091350-017	SW846 6020
	Potassium	1.52	0.080	0.300	NE			091350-017	SW846 6020
	Sodium	48.2	0.080	0.250	NE		J	091350-017	SW846 6020

Refer to footnotes on page 8A-17.

Table 8A-8
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Isotopic Uranium Results, Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CCBA-MW1	Americium-241	4.06 ± 7.14	10.4	5.10	NE	U	BD	091345-033	EPA 901.1
31-Oct-11	Cesium-137	-0.718 ± 1.90	3.16	1.53	NE	U	BD	091345-033	EPA 901.1
	Cobalt-60	-0.0847 ± 1.92	3.35	1.59	NE	U	BD	091345-033	EPA 901.1
	Potassium-40	-35.3 ± 39.8	43.9	21.1	NE	U	BD	091345-033	EPA 901.1
	Gross Alpha	1.84	NA	NA	15	NA	None	091345-034	EPA 900.0
	Gross Beta	6.07 ± 1.32	1.15	0.557	4mrem/yr			091345-034	EPA 900.0
	Uranium-233/234	1.62 ± 0.248	0.0569	0.0254	NE			091345-035	HASL-300
	Uranium-235/236	0.036 ± 0.0201	0.0298	0.0111	NE		J	091345-035	HASL-300
	Uranium-238	0.593 ± 0.107	0.0252	0.00956	NE			091345-035	HASL-300
CCBA-MW2	Americium-241	5.34 ± 7.13	10.8	5.27	NE	U	BD	091349-033	EPA 901.1
01-Nov-11	Cesium-137	-1.3 ± 1.77	2.73	1.31	NE	U	BD	091349-033	EPA 901.1
	Cobalt-60	0.064 ± 1.62	2.86	1.34	NE	U	BD	091349-033	EPA 901.1
	Potassium-40	-26.4 ± 35.1	40.6	19.4	NE	U	BD	091349-033	EPA 901.1
	Gross Alpha	0.36	NA	NA	15	NA	None	091349-034	EPA 900.0
	Gross Beta	3.94 ± 1.25	1.56	0.760	4mrem/yr		J	091349-034	EPA 900.0
	Uranium-233/234	7.31 ± 1.04	0.0708	0.0316	NE			091349-035	HASL-300
	Uranium-235/236	0.169 ± 0.0526	0.0371	0.0139	NE			091349-035	HASL-300
	Uranium-238	1.80 ± 0.282	0.0313	0.0119	NE			091349-035	HASL-300
CCBA-MW2 (Duplicate)	Americium-241	3.43 ± 7.90	13.6	6.62	NE	U	BD	091350-033	EPA 901.1
01-Nov-11	Cesium-137	-0.83 ± 2.43	4.19	1.99	NE	U	BD	091350-033	EPA 901.1
	Cobalt-60	1.49 ± 2.81	5.17	2.40	NE	U	BD	091350-033	EPA 901.1
	Potassium-40	-21.2 ± 54.3	64.4	30.4	NE	U	BD	091350-033	EPA 901.1
	Gross Alpha	3.41	NA	NA	15	NA	None	091350-034	EPA 900.0
	Gross Beta	4.66 ± 1.25	1.49	0.728	4mrem/yr			091350-034	EPA 900.0
	Uranium-233/234	6.78 ± 1.01	0.0982	0.0438	NE			091350-035	HASL-300
	Uranium-235/236	0.100 ± 0.054	0.0514	0.0192	NE		J	091350-035	HASL-300
	Uranium-238	1.61 ± 0.274	0.0434	0.0165	NE			091350-035	HASL-300

Refer to footnotes on page 8A-17.

Table 8A-9
Summary of Field Water Quality Measurements[h], Solid Waste Management Units 8/58 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CCBA-MW1	31-Oct-11	15.16	564	420.7	6.51	0.35	25.3	2.52
CCBA-MW2	01-Nov-11	16.84	694	386.6	7.34	3.91	53.8	5.17

Refer to footnotes on page 8A-17.

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Footnotes for Solid Waste Management Units 8/58 Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table I-4)
- µg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA816-F-09-0004, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems:
  15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table I-4).
  4 mrem/yr = any combination of beta and/or gamma-emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B = The analyte was detected in the blank above the effective MDL.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
NA = Not applicable.
U = Analyte is absent or below the method detection limit.

Footnotes for Solid Waste Management Units 8/58 Groundwater Monitoring Tables (Concluded)

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	=	Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	=	The associated value is an estimated quantity.
None	=	No data validation for corrected gross alpha activity.
U	=	The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	=	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

[g]Analytical Method

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes*, EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio
- U.S. Department of Energy, Environmental Measurements Laboratory, 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.
- Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater,* Method SM2320, 20th ed., 1998.
  Beckman LS5000TD Liquid Scintillation System Operation Manual, May 1988.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% Sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 8B
Solid Waste Management Units 8/58
Hydrographs

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Attachment 8B Hydrographs

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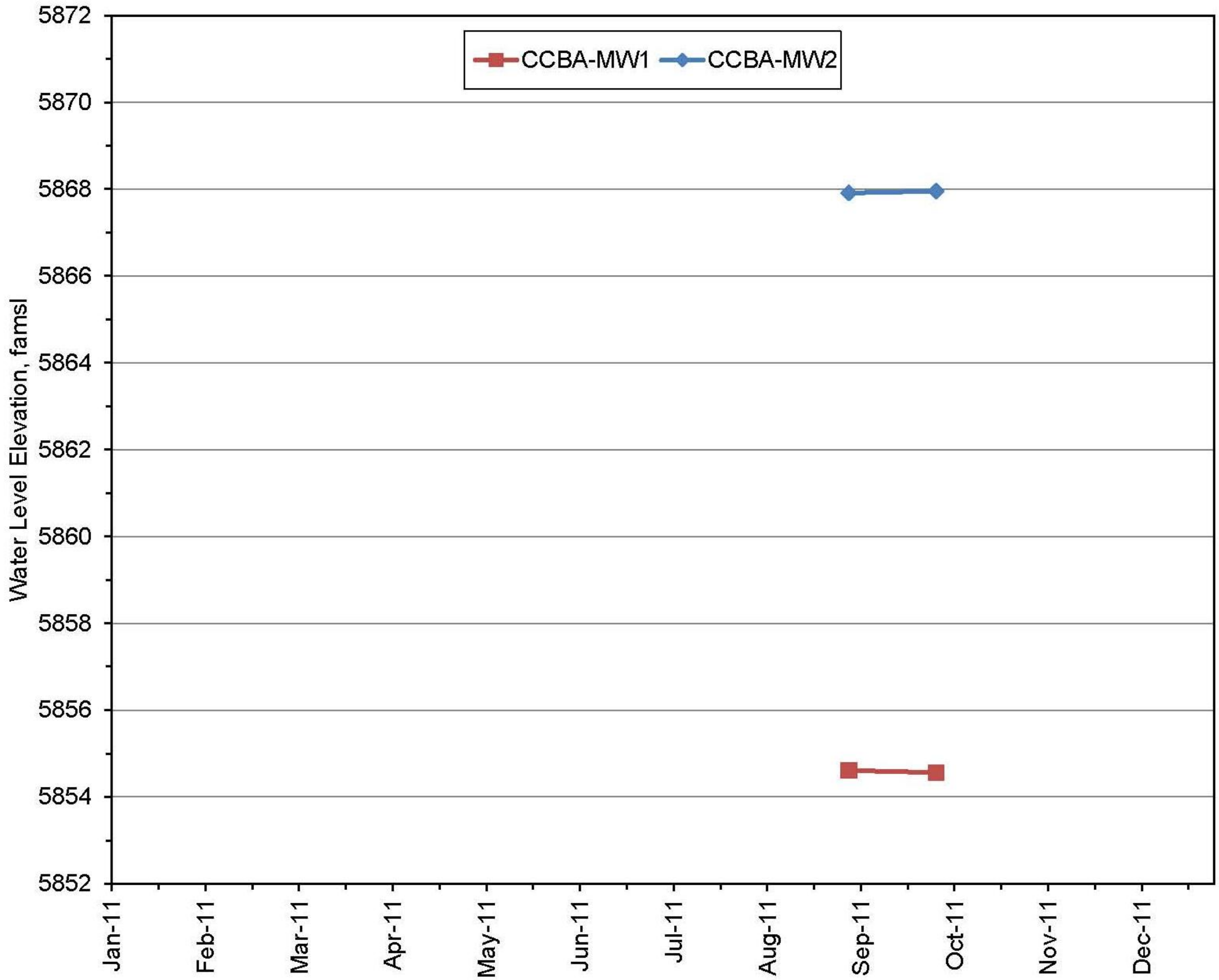

Figure 8B-1. SWMUs 8/58 Study Area Wells

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9.0 Solid Waste Management Unit 49

9.1 Introduction

Drain and Septic System (DSS) Solid Waste Management Unit (SWMU) 49 is located in Lurance Canyon of the Manzanita Mountains (Plate 1). Results for groundwater samples from the fractured bedrock have historically been reported as nondetected or detected at background concentrations for constituents of concern (COCs).

9.1.1 Location

Sandia National Laboratories, New Mexico (SNL/NM) manages the Coyote Canyon Test Area in the eastern portion of Kirtland Air Force Base (KAFB). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE) National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

SWMU 49, the Building 9820 Drains, is located within the boundaries of the U.S. Forest Service Withdrawn Area on federally owned land controlled by KAFB and permitted to the DOE. The site is located in Lurance Canyon, one of three canyons that are located on the eastern edge of the Coyote Canyon Test Area and within the Manzanita Mountains. Two other canyons, Madera Canyon and Sol se Mete Canyon, intersect Lurance Canyon to the east of SWMU 49. These three canyons form the headwaters of Arroyo del Coyote. The Manzanita Mountains border the eastern margin of the Albuquerque Basin, and the terrain near the site is characterized by large topographic relief exceeding 500 feet (ft). Lurance Canyon, deeply incised into Paleozoic and Precambrian rocks, provides local westward drainage of ephemeral surface-water flows to Arroyo del Coyote.

9.1.2 Site History

SWMU 49 consists of two former ground-surface discharge areas that cover a combined 1,584 square feet (approximately 0.04 acres) near inactive Building 9820 (Figure 9-1). The first area (SWMU 49A) is located on the west side of the building where a former trailer was used as a darkroom. Photo-processing chemicals may have been discharge there. The second area (SWMU 49B) is located approximately 80 ft south of the building where a drainpipe discharged. Wastewater from the building floor drains and a sink discharged there. Building 9820 was constructed in 1958 and used until 1988 (Table 9-1) (SNL June 1996). Due to its remote location, Building 9820 was not connected to the base-wide water supply or sanitary waste systems. A tanker truck was used to haul nonpotable water to a 1,000-gallon storage tank at the building.

Environmental concern about SWMU 49 is based on the potential release of COCs in wastewater discharged to the ground surface at the trailer and the drainpipe outfall. The site is located in a side canyon that slopes to the northwest and drains into the ephemeral channel of Lurance Canyon approximately 1,750 ft north of the site. Coyote Springs is located approximately 6,000 ft northwest of the site. The surrounding area is unpaved and sparsely vegetated by bunch grasses, cacti, junipers, and pine trees. No storm sewers are used to direct surface water away from the site.

Building 9820 is a small, one-story building that was used for the synthesis of high explosive (HE) compounds, photo-processing, woodworking, and metal machining in support of weapons testing. Five floor drains and a hand sink were connected to a 4-inch-diameter drain line. The machine shop opened in

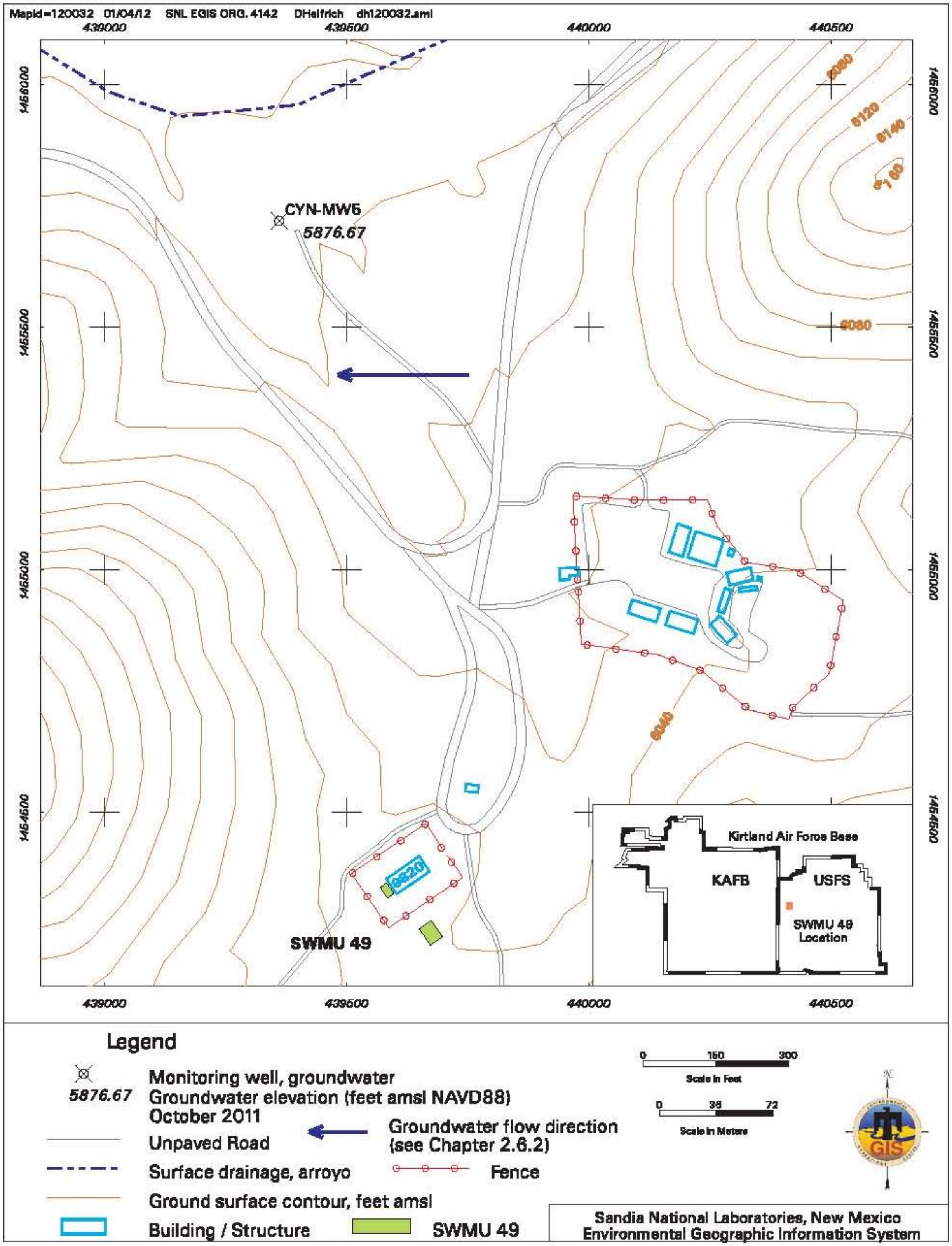

Figure 9-1. Location and Groundwater Elevation at SWMU 49

Table 9-1. Historical Timeline of SWMU 49

Month	Year	Event	Reference
--	1958	Building 9820 and drainpipe constructed.	SNL June 1996
September	1987	DSS SWMU 49 first identified as a potential release site in the September 1987 Comprehensive Environmental Assessment and Response Program report.	SNL June 1996
--	1988	Use of Building 9820 discontinued.	SNL June 1996
March	1993	Septic Tanks and Drainfields (OU 1295) RCRA Facility Investigation Work Plan submitted to the EPA.	SNL March 1993
--	1993 -1995	Field Investigations completed at SWMU 49.	SNL June 1996
June	1996	NFA proposal for SWMU 49 submitted to the NMED.	SNL June 1996
June	1998	NMED responded with an RSI on the SWMU 49 NFA proposal.	NMED June 1998
November	1998	Response submitted to the first NMED RSI for SWMU 49.	SNL November 1998
October	1998	A SAP describing technical procedures to be used to complete environmental investigations at the SWMU and AOC sites submitted to the NMED.	SNL October 1999
January	2000	October 1999 SAP approved by the NMED.	NMED January 2000
June	2000	NMED issued a second RSI on the SWMU 49 NFA proposal and the first SNL/NM response for SWMU 49.	NMED June 2000
September	2000	Response submitted to the second NMED RSI for SWMU 49.	SNL September 2000
August	2001	Groundwater monitoring well CYN-MW5 installed near SWMU 49.	SNL June 2005
November	2001	FIP documenting specific investigation procedures to be completed at DSS AOC sites submitted to the NMED.	SNL November 2001
February	2002	The DSS FIP approved by the NMED.	NMED February 2002
April	2004	Completion of eight quarters of groundwater sampling for monitoring well CYN-MW5.	SNL June 2005
May	2004	Well CYN-MW5 incorporated into the Burn Site Groundwater Study Area.	SNL October 2005
June	2005	A third RSI response submitted to the NMED that included the results of fieldwork completed at SWMU 49 since the June 1996 NFA report and an updated risk assessment.	SNL June 2005
September	2005	NMED issues Certificate of Completion for CAC without Controls for SWMU 49.	NMED September 2005
March	2006	Request for Class III Permit Modification submitted. Public Notice meeting published. Documents supporting NFA (CAC) for DSS SWMU 49 compiled.	SNL March 2006
February	2005	NMED states that well CYN-MW5 is too distant to be considered part of the Burn Site Groundwater Study Area. Sampling discontinued.	NMED February 2005

Table 9-1. Historical Timeline of SWMU 49 *(Concluded)*

Month	Year	Event	Reference
April	2010	NMED requires that well CYN-MW5 be sampled annually as part of LTS requirements for SWMU 49.	NMED April 2010
March	2011	Well CYN-MW5 sampled as part of LTS.	SNL February 2011a

NOTES:
AOC = Area of Concern.
CAC = Corrective Action Complete.
CYN = Canyons.
DSS = Drain and Septic System.
EPA = U.S. Environmental Protection Agency.
FIP = Field Implementation Plan.
LTS = Long-Term Stewardship.
MW = Monitoring Well.
NFA = No Further Action.
NMED = New Mexico Environment Department.
OU = Operable Unit.
RCRA = Resource Conservation and Recovery Act.
RSI = Request for Supplemental Information.
SAP = Sampling and Analysis Plan.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid Waste Management Unit.

the mid-1960s and may have discharged solvents into the floor drains. Small quantities of film were processed from the mid-1970s to 1988 inside the building and also in the darkroom trailer. Occasional washing of nickel-cadmium batteries with dilute acetic acid may have discharged up to 1 gallon of wastewater into the building floor drains or sink. Based on the activities performed at the building and trailer, the primary COCs for SWMU 49 are HE compounds (such as Baratol), photo-processing chemicals such as fixers and developers, various metals (cadmium, hexavalent chromium, cyanide, and silver), and volatile organic compounds (VOCs) such as methanol, toluene, and trichloroethene.

Groundwater monitoring well CYN-MW5 is located approximately 1,350 ft to the north and downslope of Building 9820. The ground surface at the wellhead is approximately 60 ft lower than the elevation near the building. The well is located near a small arroyo that directs storm water from the site into the channel in Lurance Canyon. The well is screened in fractured Precambrian quartzite at a depth of 135 to 155 ft below ground surface (bgs). The primary channel of the Lurance Canyon arroyo is located about 350 ft to the north of the well.

9.1.3 Monitoring History

Groundwater monitoring well CYN-MW5 was installed in August 2001 as part of the DSS investigation of SWMU 49. Eight sampling events occurred during the initial DSS investigation (July 2002 through April 2004) and the results were submitted to the New Mexico Environment Department (NMED) in the SNL/NM Environmental Restoration (ER) Project's response to the third Request for Supplemental Information (SNL June 2005). The well has been sampled sporadically since then.

Following the April 2004 sampling event, well CYN-MW5 was incorporated into the Burn Site Groundwater (BSG) monitoring network as a downgradient well. The analytical results for well CYN-MW5 were reported in the BSG chapter of the Annual Groundwater Monitoring Reports for several years (SNL April 2004). However, in its February 2005 letter, the NMED stated that it "will not consider monitoring well CYN-MW5 as a downgradient well because it is located over two miles away from the Burn Site" (NMED February 2005). Based on the NMED determination, well CYN-MW5 has not been sampled as part of the BSG investigation since June 2005. Most recently, sampling at well CYN-MW5 has been incorporated into the SNL/NM Long-Term Stewardship groundwater sampling program in response to other NMED requirements (NMED April 2010).

9.1.4 Current Monitoring Network

Well CYN-MW5 is the only groundwater monitoring well in the SWMU 49 study area. This well was installed in August 2001 and is screened from 135 to 155 ft bgs in fractured Precambrian quartzite.

9.1.5 Summary of Calendar Year 2011 Activities

The following activities took place for the SWMU 49 investigation during Calendar Year (CY) 2011 (January through December 2011):

- Annual groundwater sampling was conducted at well CYN-MW5 in March 2011.
- Periodic groundwater elevation data were obtained from well CYN-MW5.
- Tables of analytical results (Attachment 9A) and a hydrograph (Attachment 9B) were prepared in support of this report.

9.1.6 Summary of Future Activities

The following activities are planned for SWMU 49 during CY 2012:

- Annual groundwater sampling will be conducted at well CYN-MW5.
- Periodic groundwater elevation data will be obtained from well CYN-MW5.

9.1.7 Current Conceptual Model

The following sections present an updated discussion of the hydrogeologic regime, conceptual site model, and contaminant findings for SWMU 49.

9.1.7.1 Regional Hydrogeologic Conditions

SWMU 49 is located in a side canyon on the south side of Lurance Canyon (Plate 1). Alluvium covers the canyon floor. The surrounding ridges consist of Precambrian outcrops (granite, gneiss, and quartzite) and Paleozoic outcrops (limestone, sandstone, and conglomerate). The outcrops are sporadically covered by colluvium. The base-wide potentiometric surface map (Plate 1) shows that groundwater flow in fractured bedrock is generally toward the west. No potable water-supply wells are located within 5 miles of the site.

9.1.7.2 Hydrogeologic Conditions at SWMU 49

SWMU 49 consists of two small areas (SWMUs 49A and 49B) near Building 9820 where wastewater discharged from 1958 to 1988 (Figure 9-1). The site is covered by colluvium that is underlain by bedrock. Building 9820 is situated at an elevation of approximately 6,040 ft above mean sea level (amsl). Overall, the terrain slopes northwest and west. No perennial surface-water features such as springs are located within 1 mile of SWMU 49. Monitoring well CYN-MW5 is located approximately 1,350 ft to the north and downslope of Building 9820. The ground surface at the wellhead is approximately 60 ft lower than at the building.

The amount of precipitation available for groundwater recharge at SWMU 49 is minimal due to scant rainfall and high evapotranspiration rates. Summer (monsoonal) thunderstorms are responsible for the majority of rainfall. The average rainfall, as measured at the nearest active rain gauge (the National Weather Service station at the Albuquerque International Sunport) during the period from 1915 through 2005 was 8.67 inches per year (in./yr) (WRCC-DRI 2012). The station is located 10 miles northwest of

SWMU 49 at an elevation of 5,310 ft amsl. By extrapolation of the precipitation model presented in SNL/NM conceptual model of groundwater flow and contaminant transport at the canyon area (SNL May 2004), the average annual precipitation for SWMU 49, where the elevation is approximately 6,040 ft amsl, is estimated to be approximately 11.5 in./yr. Intense sunlight and low humidity throughout much of the year creates high rates of evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

In 2001, a location downslope and downgradient of SWMU 49 was selected for the installation of groundwater monitoring well CYN-MW5. The well was installed in August 2001 using the air-rotary casing hammer technique, and the borehole was temporarily cased to 50 ft bgs. Dry alluvium consisting of silty sand and fine to coarse gravel was encountered from the ground surface to 90 ft bgs. Fractured Precambrian quartzite was encountered from 90 ft bgs to the borehole total depth of 190 ft bgs. During drilling, groundwater was encountered at a depth of 140 ft bgs. The most productive zone in the borehole was 140 to 160 ft bgs and corresponded to the most highly fractured interval. The borehole was blown dry and allowed to recover overnight. The water level was at 102 ft bgs on the following morning, which indicates that groundwater in the area is mostly likely under confined condition. The well was screened from 135 to 155 ft bgs in fractured quartzite (Table 9-2).

Table 9-2. Lithologic and Hydrogeologic Elevation Data for Monitoring Well CYN-MW5 at SWMU 49

Monitoring Well	Ground Surface Elevation (ft amsl)	Depth of Screened Interval (ft bgs)	Elevation for Top of Screen (ft amsl)	Potentiometric Surface, October 2011 (ft amsl)	Mid-Point Screen Elevation (ft amsl)	Approximate Pressure Head (ft[a])
CYN-MW5	5981.30	135 – 155	5846.30	5876.67	5836.30	40

NOTES:
[a]From mid-point of screen.
amsl = Above mean sea level
bgs = Below ground surface.
CYN = Canyons.
ft = Foot (feet).
MW = Monitoring Well.
SWMU = Solid Waste Management Unit.

The October 2011 groundwater elevation at well CYN-MW5 was 5876.67 ft amsl. Compared to the mid-point elevation of the screen, the pressure head was approximately 40 ft and indicative of confined conditions. Groundwater flows to the west through a fractured bedrock system. Based on the potentiometric surface depicted on Plate 1, the horizontal gradient is steep and approximately 0.01 feet per foot (ft/ft).

During sampling, the drawdown in well CYN-MW5 is not excessive and the quantity of water produced is clearly adequate for low-flow sampling purposes. Groundwater samples are collected using pneumatic (nitrogen-gas activated) Bennett™ piston pumps.

The conceptual hydrogeologic model for SWMU 49 is based on data and findings obtained from monitoring well CYN-MW5, several nearby monitoring wells located upgradient and downgradient in Lurance Canyon, (Plate 1), and hydrogeologic investigations conducted at the Burn Site (SNL May 2004) and at SWMU 58 (Chapter 8.0). Groundwater in the SWMU 49 area occurs in a fractured bedrock system under confined conditions. The depth to groundwater at well CYN-MW5 is approximately 140 ft bgs in a fractured interval of Precambrian quartzite. Groundwater in the bedrock predominantly moves through a confined low-permeability fracture system. A series of naturally filled fractures in the upper bedrock probably serves as a confining unit. The potentiometric surface at well CYN-MW5 in October 2011 has an elevation of approximately 5,877 ft amsl and a depth to water of approximately 105 ft bgs. The amount of precipitation available for groundwater recharge at SWMU 49 is minimal due to the scant rainfall and high evapotranspiration. Historical water level data indicate that seasonal effects, primarily due to thunderstorms, rarely occur. The hydrograph (Figure 9B-1) shows that significant water level increases only occurred twice in the last 10 years. During 2002 through 2011, the overall trend has been downward. For the last four years, the water level in well CYN-MW5 has declined at approximately 0.5 feet per year. Groundwater underflow along Lurance Canyon probably discharges to the unconsolidated basin-fill deposits (primarily the Santa Fe Group) of the Albuquerque Basin after crossing the Tijeras and Sandia faults. The hydraulic gradient is approximately 0.01 ft/ft near the well. No potable water-supply wells are located within 5 miles of the site.

9.1.7.3 Contaminant Sources

From 1958 to 1988, wastewater discharged to the ground surface at two locations at SWMU 49. The water possibly contained photo-processing chemicals, HE compounds, and VOCs. The areas around the discharge points were characterized by soil sampling as part of the DSS investigation.

9.1.7.4 Contaminant Distribution and Transport in Groundwater

No COCs exceed the applicable U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) (EPA 2009) in the CY 2011 groundwater samples collected from well CYN-MW5. No groundwater contamination is suspected at SWMU 49.

9.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM ER Operations (formerly ER Project) as well as implements and enforces federal regulations mandated by the Resource Conservation and Recovery Act (RCRA). All ER Operations SWMUs and Areas of Concern (AOCs) are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993). All corrective action requirements pertaining to SWMUs and AOCs are contained in the Compliance Order on Consent (the Order) (NMED April 2004)between the DOE, Sandia, and NMED.

The DOE/Sandia received a letter from the NMED on April 14, 2010, entitled *Class 3 Permit Modification Requests for Granting Corrective Action Complete Status for 26 SWMUs/AOCs (Request of March 1, 2006) and 5 Other SWMUs/AOCs (Request of January 7, 2008), Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-06-007 and HWB-SNL-08-001* (NMED April 2010). The NMED letter lists SWMU 49 under the heading of "SWMUs/AOCs to be Subject to Groundwater Monitoring Controls" and further stated that pursuant to Section III.W.3.b of the Order, SWMU 49 requires long-term monitoring of groundwater on an annual basis as a site control. The NMED specified that for SWMU 49, the following analytes were to be monitored: general chemistry, VOCs, HE compounds, perchlorate, metals, cyanide, nitrate plus nitrite (NPN), gross alpha/beta activity, and radionuclides by gamma spectroscopy.

In this report SWMU 49 groundwater monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy and gross alpha/beta activity) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order, as specified in Section III.A of the Order (NMED April 2004).

9.3 Scope of Activities

The activities conducted for SWMU 49 during this reporting period are listed in Section 9.1.5 and involved groundwater monitoring that consisted of water level measurements and sampling and analysis as summarized in Table 9-3.

Table 9-3. Groundwater Monitoring Well Network and Sampling Date for SWMU 49, Calendar Year 2011

Date of Sampling Event	Wells Sampled	SAP
March 2011	CYN-MW5	*SWMU 49 and 116 Groundwater Monitoring, Mini-SAP for Fiscal Year 2011* (SNL February 2011a)

NOTES:
CYN = Canyons.
MW = Monitoring Well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
SWMU = Solid Waste Management Unit.

The analytical parameters are listed in Table 9-4. Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, split, equipment blank (EB), and trip blank (TB) samples. Field QC samples are used to monitor the sampling process. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. TB samples are used to determine whether VOCs had inadvertently contaminated any samples during preparation, transportation, and handling prior to receipt by the analytical laboratory.

Table 9-4. Parameters Sampled at SWMU 49

Parameter	March 2011
Alkalinity (total, bicarbonate, carbonate) Anions Cations Gamma Spec* Gross Alpha Activity Gross Beta Activity High Explosive Compounds NPN Perchlorate TAL Metals, plus Total Uranium Total Cyanide VOCs	CYN-MW5 CYN-MW5 (dup)

NOTES:
CYN = Canyons.
dup = Duplicate sample.
Gamma Spec* = Gamma spectroscopy short list (Americium-241, Cesium-137, Cobalt-60, and Potassium-40).
MW = Monitoring well.
NPN = Nitrate plus nitrate (reported as nitrogen).
TAL = Target Analyte List.
VOC = Volatile organic compound.

9.4 Field Methods and Measurements

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986) and SNL/NM procedures. The following sections provide an overview of the sampling and data collection procedures.

9.4.1 Groundwater Elevation

During CY 2011, water level measurements were obtained and used to evaluate the groundwater flow direction, hydraulic gradient, and fluctuations in the potentiometric surface. Water levels were periodically measured at well CYN-MW5 according to the instructions and requirements specified in SNL/NM Field Operating Procedure (FOP) 03-02, *Groundwater Level Data Acquisition and Management* (SNL November 2009a and February 2011b). The groundwater elevation is shown on Figure 9-1 and depicted on the hydrograph presented in Figure 9B-1 (Attachment 9B).

9.4.2 Well Purging and Water Quality Measurements

A portable Bennett™ groundwater sampling system was used to collect the groundwater samples from well CYN-MW5. The well was purged a minimum of one saturated screen volume. Field water quality measurements for turbidity, pH, temperature, specific conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO) were recorded for the well prior to the collection of groundwater samples, according to SNL/NM FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements*, (SNL November 2009b). Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 Water Quality Meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

The amount of water typically required to achieve stability of field parameters is fairly consistent at a given well. However, the ability of the screened interval to produce useful quantities of water varies greatly from well to well. In accordance with the Mini-Sampling and Analysis Plan (SAP) (SNL February 2011a), purging continues until four stable measurements for temperature, SC, pH, and turbidity are obtained. Groundwater stability is considered acceptable when turbidity measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, pH is within 0.1 units, temperature is within 1.0 degrees Celsius, and SC is within 5 percent. The associated Field Measurement Logs documenting details of well purging and water quality measurements for each sampling event are submitted to the SNL/NM Records Center.

9.4.3 Pump Decontamination

The portable Bennett™ sampling pump and tubing bundle are decontaminated prior to installation into each monitoring well according to procedures described in *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination*, SNL/NM FOP 05-03 (SNL November 2009c). An EB (rinsate) sample was collected immediately before sampling well CYN-MW5 to verify the effectiveness of the equipment decontamination process.

9.4.4 Sample Collection Sampling Procedures

Groundwater samples are collected using the Bennett™ nitrogen gas-powered portable piston pump. Sample bottles are filled directly from the pump discharge line, with the VOC samples collected at the lowest achievable discharge rate.

9.4.5 Sample Handling and Shipment

The SNL/NM Sample Management Office (SMO) processes environmental samples collected by LTS/ER Operations. The SMO reviews the mini-SAP (Table 9-3), orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are inadvertently introduced in laboratory processes and procedures. These include method blanks, laboratory control samples, matrix spike, matrix spike duplicate, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review,* SMO-05-03, Issue 04 (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007).

9.4.6 Waste Management

Purge and decontamination water generated from sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management*, (SNL November 2009d) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Results for associated environmental samples provide supplemental data for approval to discharge the purge water to the sanitary sewer. All data were compared with Albuquerque Bernalillo County Water Utility Authority discharge limits.

9.5 Analytical Methods

Groundwater samples were submitted to GEL Laboratories LLC. for analysis. Samples were analyzed in accordance with applicable EPA analytical methods (Tables 9-5 and 9-6).

Table 9-5. SWMU 49 Chemical Analytical Methods

Analyte	Analytical Method[a,b,c,d]
Alkalinity (total, bicarbonate, carbonate)	SM2320B
Anions	SW846-9056
Cations	SW846-6020/7470
High Explosive Compounds	SW846-8321A
NPN	EPA 353.2
Perchlorate	EPA 314.0
TAL Metals, plus Total Uranium	SW846-6020/7470
Total Cyanide	SW846-9012
VOCs	SW846-8260B

NOTES:

[a]EPA, 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1 (and all updates), U.S. Environmental Protection Agency, Washington, D.C.

[b]EPA, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.

[c]EPA, 1999, *Perchlorate in Drinking Water Using Ion Chromatography*, EPA 815/R-00-014.

[d]Clesceri, et al., 1998, *Standard Methods for the Examination of Water and Wastewater,* 20th ed., Method 2320B.

EPA = U.S. Environmental Protection Agency.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard methods.
SW = Solid Waste.
SWMU = Solid Waste Management Unit.
TAL = Target Analyte List.
VOC = Volatile organic compound.

Table 9-6. SWMU 49 Radiochemical Analytical Methods

Analyte	Analytical Method[a]
Gamma Spectroscopy (short list)	EPA 901.0
Gross Alpha/Beta Activity	EPA 900.0

NOTES:
[a]EPA, 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
EPA = U.S. Environmental Protection Agency.
SWMU = Solid Waste Management Unit.

9.6 Summary of Analytical Results

This section discusses analytical results, exceedances of regulatory standards, and pertinent trends in COC concentrations. The analytical results and field measurements for the CY 2011 SWMU 49 sampling event are presented in Tables 9A-1 through 9A-9 (Attachment 9A). Data qualifiers are explained in the footnotes following Table 9A-9.

- No VOCs were detected. The method detection limits (MDLs) for all analyzed VOCs are listed in Table 9A-1.
- No HE compounds were detected. The MDLs for all analyzed HE compounds are listed in Table 9A-2.
- The analytical results for NPN (reported as nitrogen) are presented in Table 9A-3. No NPN results exceed the MCL of 10 milligrams per liter (mg/L) in either sample. For CY 2011, the maximum NPN concentration is 2.56 mg/L in the environmental sample, whereas the duplicate environmental sample had a reported NPN concentration of 1.92 mg/L.
- The results for alkalinity, anion, cation, and total cyanide results are provided in Table 9A-4. No detections of these constituents exceed MCLs, where established.
- The analytical results for perchlorate are presented in Table 9A-5. Currently, no MCL is established for perchlorate. Perchlorate results do not exceed the NMED-specified screening level/MDL of 4 micrograms per liter (NMED April 2004).
- Total metal results are presented in Table 9A-6. No metals exceed established MCLs.

Groundwater samples were analyzed for gross alpha/beta activity and radionuclides by gamma spectroscopy. The results are presented in Table 9A-7. All gross alpha/beta activity results are below MCLs, where established. Gamma spectroscopy analysis detected no isotopes above the associated minimum detectable activity.

Field water quality parameters are measured during purging of the well prior to sampling and include temperature, SC, ORP, pH, turbidity, and DO. The parameter measurements obtained immediately prior to sample collection are presented in Table 9A-8.

9.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. The following sections discuss site-specific QC results for the SWMU 49 annual sampling event.

9.7.1 Field Quality Control Samples

Field QC samples included a duplicate environmental sample and an EB sample. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAP (SNL February 2011a).

9.7.1.1 Duplicate Environmental Samples

Duplicate environmental samples were analyzed to estimate the overall reproducibility of the sampling and analytical process. A duplicate environmental sample is collected immediately after the original environmental sample to evaluate possible variability caused by time and/or sampling mechanics. The results of duplicate environmental sample analyses (detected parameters only) are used to calculate relative percent difference (RPD) values (Table 9A-9). Duplicate environmental sample results show good correlation (RPD values less than 20 for organic compounds and less than 35 for inorganic analyses) for all calculated parameters.

9.7.1.2 Equipment Blank Samples

A portable Bennett™ groundwater sampling system was used to collect groundwater samples. The sampling pump and tubing bundle were decontaminated prior to installation into the monitoring well according to procedures described in SNL/NM FOP 05-03 (SNL November 2009c). An EB or rinsate sample was collected to verify the effectiveness of the equipment decontamination process.

The results for the EB sample analyses show that bromodichloromethane, bromoform, chloroform, dibromochloromethane, chloride, copper, and sodium were detected in the EB sample. No corrective action was required for bromodichloromethane, bromoform, chloroform, chloride, dibromochloromethane, or sodium as these parameters were either not detected in the associated environmental samples or detected at concentrations greater than five times the blank result. The analytical results for copper in the CYN-MW5 environmental and duplicate environmental samples were qualified as not detected during data validation as associated results are less than five times the EB result.

9.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analysis to assess whether contamination of the samples has occurred during shipment and storage. The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-milliliter volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. The TB samples were brought to the field and accompanied each sample shipment.

9.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate laboratory control samples were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007). Although some analytical results were qualified during the data validation process, no significant data quality problems were noted. Laboratory data validation qualifiers are provided with the analytical results in Tables 9A-1 through 9A-7 (Attachment 9A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center.

9.8 Variances and Nonconformances

No variances or nonconformances from field or sampling requirements as specified in the SWMU 49 groundwater monitoring Mini-SAP (SNL February 2011a) occurred during CY 2011 sampling activities.

9.9 Summary and Conclusions

This section provides a brief summary of activities, discussion of COCs, if any, that exceed standards, trends of concentrations versus time, the current conceptual site model, and plans for studies to be completed during CY 2012 at SWMU 49.

SWMU 49 is located in western Lurance Canyon. The DSS groundwater investigation was initiated in 2001 at the request of the NMED to evaluate the discharge areas associated with Building 9820. The one groundwater monitoring well in the study area (CYN-MW5) is located downgradient of the site and was sampled in March 2011. The samples were analyzed for alkalinity (total, bicarbonate, carbonate), anions, cations, HE compounds, NPN, perchlorate, Target Analyte List metals (plus total uranium), total cyanide, VOCs, gross alpha/beta activity, and radionuclides by gamma spectroscopy. Analytical results were compared with EPA MCL guidelines for drinking water (EPA 2009). No parameters were detected above established MCLs in the groundwater samples.

The analytical results for this reporting period are consistent with historical concentrations. The conceptual model described in Section 9.1.7 was updated to more accurately discuss the hydrogeologic regime. The model does not require modification based on the analytical results for this reporting period.

Annual groundwater sampling will be conducted at well CYN-MW5 during the first quarter of CY 2012. Periodic monitoring of groundwater elevations will also be completed during the year.

9.10 References

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Attachment 9A
Solid Waste Management Unit 49
Analytical Results Tables

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Attachment 9A Tables

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Table 9A-1
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] 8260), Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.325
1,1,2,2-Tetrachloroethane	0.250
1,1,2-Trichloroethane	0.250
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.250
1,2-Dichloropropane	0.250
2-Butanone	1.25
2-Hexanone	1.25
4-methyl-, 2-Pentanone	1.25
Acetone	3.50
Benzene	0.300
Bromodichloromethane	0.250
Bromoform	0.250
Bromomethane	0.300
Carbon disulfide	1.25
Carbon tetrachloride	0.300
Chlorobenzene	0.250
Chloroethane	0.300
Chloroform	0.250
Chloromethane	0.300
Dibromochloromethane	0.300
Ethyl benzene	0.250
Methylene chloride	3.00
Styrene	0.250
Tetrachloroethene	0.300
Toluene	0.250
Trichloroethene	0.250
Vinyl acetate	1.50
Vinyl chloride	0.500
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.250
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.250

Refer to footnotes on page 9A-15.

Table 9A-2
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8321A), Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.104
1,3-Dinitrobenzene	0.104
2,4,6-Trinitrotoluene	0.104
2,4-Dinitrotoluene	0.104
2,6-Dinitrotoluene	0.0779
2-Amino-4,6-dinitrotoluene	0.104
2-Nitrotoluene	0.104
3-Nitrotoluene	0.104
4-Amino-2,6-dinitrotoluene	0.104
4-Nitrotoluene	0.104
HMX	0.104
Nitro-benzene	0.104
Pentaerythritol tetranitrate	0.130
RDX	0.104
Tetryl	0.130

Refer to footnotes on page 9A-15.

Table 9A-3
Summary of Nitrate plus Nitrite Results,
Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW5 10-Mar-11	Nitrate plus nitrite as N	2.56	0.050	0.250	10.0			090232-018	EPA 353.2
CYN-MW5 (Duplicate) 10-Mar-11	Nitrate plus nitrite as N	1.92	0.050	0.250	10.0			090233-018	EPA 353.2

Refer to footnotes on page 9A-15.

Table 9A-4
Summary of Alkalinity, Anion, Cation, and Total Cyanide Results, Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW5	Bicarbonate Alkalinity	161	0.725	1.00	NE	B		090232-022	SM2320B
10-Mar-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090232-022	SM2320B
	Bromide	0.162	0.066	0.200	NE	J		090232-016	SW846 9056
	Chloride	18.8	0.066	0.200	NE			090232-016	SW846 9056
	Fluoride	0.384	0.033	0.100	4.0			090232-016	SW846 9056
	Sulfate	25.5	0.100	0.400	NE	B		090232-016	SW846 9056
	Calcium (filtered)	63.6	0.600	2.00	NE			090232-017	SW846 6020
	Magnesium (filtered)	11.0	0.010	0.030	NE			090232-017	SW846 6020
	Potassium (filtered)	2.31	0.080	0.300	NE			090232-017	SW846 6020
	Sodium (filtered)	16.5	0.080	0.250	NE			090232-017	SW846 6020
	Total Cyanide	ND	0.0017	0.005	0.200	U		090232-027	SW846 9012A
CYN-MW5 (Duplicate)	Bicarbonate Alkalinity	161	0.725	1.00	NE	B		090233-022	SM2320B
10-Mar-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090233-022	SM2320B
	Bromide	0.173	0.066	0.200	NE	J		090233-016	SW846 9056
	Chloride	18.8	0.066	0.200	NE			090233-016	SW846 9056
	Fluoride	0.359	0.033	0.100	4.0			090233-016	SW846 9056
	Sulfate	25.6	0.100	0.400	NE	B		090233-016	SW846 9056
	Calcium (filtered)	68.1	0.600	2.00	NE			090233-017	SW846 6020
	Magnesium (filtered)	10.9	0.010	0.030	NE			090233-017	SW846 6020
	Potassium (filtered)	2.47	0.080	0.300	NE			090233-017	SW846 6020
	Sodium (filtered)	15.5	0.080	0.250	NE			090233-017	SW846 6020
	Total Cyanide	ND	0.0017	0.005	0.200	U		090233-027	SW846 9012A

Refer to footnotes on page 9A-15.

Table 9A-5
Summary of Perchlorate Results,
Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW5 10-Mar-11	ND	0.004	0.012	NE	U		090232-020	EPA 314.0
CYN-MW5 (Duplicate) 10-Mar-11	ND	0.004	0.012	NE	U		090233-020	EPA 314.0

Refer to footnotes on page 9A-15.

Table 9A-6
Summary of Total Metal Results,
Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW5	Aluminum	0.027	0.015	0.050	NE	B, J	0.077U	090232-009	SW846 6020
10-Mar-11	Antimony	ND	0.001	0.003	0.006	U		090232-009	SW846 6020
	Arsenic	0.00532	0.0017	0.005	0.010			090232-009	SW846 6020
	Barium	0.215	0.0006	0.002	2.00			090232-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090232-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090232-009	SW846 6020
	Calcium	63.2	0.600	2.00	NE			090232-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090232-009	SW846 6020
	Cobalt	0.000104	0.0001	0.001	NE	J		090232-009	SW846 6020
	Copper	0.000633	0.00035	0.001	NE	J	0.0024U	090232-009	SW846 6020
	Iron	0.520	0.033	0.100	NE			090232-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090232-009	SW846 6020
	Magnesium	10.1	0.010	0.030	NE			090232-009	SW846 6020
	Manganese	0.00103	0.001	0.005	NE	J		090232-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090232-009	SW846 7470
	Nickel	0.00309	0.0005	0.002	NE		J	090232-009	SW846 6020
	Potassium	2.46	0.080	0.300	NE			090232-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090232-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090232-009	SW846 6020
	Sodium	15.9	0.080	0.250	NE			090232-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090232-009	SW846 6020
	Uranium	0.000928	0.000067	0.0002	0.03			090232-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090232-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090232-009	SW846 6020

Refer to footnotes on page 9A-15.

Table 9A-6 *(Concluded)*
Summary of Total Metal Results,
Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW5 (Duplicate)	Aluminum	0.0374	0.015	0.050	NE	B, J	0.077U	090233-009	SW846 6020
10-Mar-11	Antimony	ND	0.001	0.003	0.006	U		090233-009	SW846 6020
	Arsenic	0.00506	0.0017	0.005	0.010			090233-009	SW846 6020
	Barium	0.216	0.0006	0.002	2.00			090233-009	SW846 6020
	Beryllium	0.000247	0.0002	0.0005	0.004	J		090233-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090233-009	SW846 6020
	Calcium	63.4	0.600	2.00	NE			090233-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090233-009	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	U		090233-009	SW846 6020
	Copper	0.000612	0.00035	0.001	NE	J	0.0024U	090233-009	SW846 6020
	Iron	0.516	0.033	0.100	NE			090233-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090233-009	SW846 6020
	Magnesium	13.0	0.010	0.030	NE			090233-009	SW846 6020
	Manganese	0.00101	0.001	0.005	NE	J		090233-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090233-009	SW846 7470
	Nickel	0.00291	0.0005	0.002	NE		J	090233-009	SW846 6020
	Potassium	2.29	0.080	0.300	NE			090233-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090233-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090233-009	SW846 6020
	Sodium	18.3	0.080	0.250	NE			090233-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090233-009	SW846 6020
	Uranium	0.000906	0.000067	0.0002	0.03			090233-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090233-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090233-009	SW846 6020

Refer to footnotes on page 9A-15.

Table 9A-7
Summary of Gamma Spectroscopy, Gross Alpha, and Gross Beta Results, Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[f]	Validation Qualifier[g]	Sample No.	Analytical Method[h]
CYN-MW5	Americium-241	-3.81 ± 5.70	9.04	4.52	NE	U	BD	090232-033	EPA 901.1
10-Mar-11	Cesium-137	-0.389 ± 1.84	3.07	1.54	NE	U	BD	090232-033	EPA 901.1
	Cobalt-60	0.762 ± 1.89	3.20	1.60	NE	U	BD	090232-033	EPA 901.1
	Potassium-40	2.99 ± 37.1	29.2	14.6	NE	U	BD	090232-033	EPA 901.1
	Gross Alpha	8.08	NA	NA	15		None	090232-034	EPA 900.0
	Gross Beta	7.59 ± 1.57	1.00	0.470	4mrem/yr			090232-034	EPA 900.0
CYN-MW5 (Duplicate)	Americium-241	11.2 ± 15.0	21.8	10.9	NE	U	BD	090233-033	EPA 901.1
10-Mar-11	Cesium-137	-0.784 ± 2.03	3.28	1.64	NE	U	BD	090233-033	EPA 901.1
	Cobalt-60	-1.14 ± 2.37	3.68	1.84	NE	U	BD	090233-033	EPA 901.1
	Potassium-40	-9.64 ± 42.0	46.3	23.2	NE	U	BD	090233-033	EPA 901.1
	Gross Alpha	4.29	NA	NA	15		None	090233-034	EPA 900.0
	Gross Beta	5.21 ± 1.21	0.997	0.468	4mrem/yr			090233-034	EPA 900.0

Refer to footnotes on page 9A-15.

Table 9A-8
Summary of Field Water Quality Measurements[h],
Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CYN-MW5	10-Mar-11	15.93	366	439.2	6.06	0.54	48.8	4.82

Refer to footnotes on page 9A-15.

Table 9A-9
Summary of Environmental and Duplicate Analyses, Solid Waste Management Unit 49 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Parameter	Environmental Sample (R_1)	Duplicate Sample (R_2)	RPD[i]
	mg/L unless otherwise noted		
CYN-MW5			
Nitrate plus Nitrite	2.56	1.92	29
Bicarbonate Alkalinity	161	161	< 1
Bromide	0.162	0.173	7
Chloride	18.8	18.8	< 1
Fluoride	0.384	0.359	7
Sulfate	25.5	25.6	< 1
Calcium (filtered)	63.6	68.1	7
Magnesium (filtered)	11.0	10.9	1
Potassium (filtered)	2.31	2.47	7
Sodium (filtered)	16.5	15.5	6
Arsenic	0.00532	0.00506	5
Barium	0.215	0.216	< 1
Beryllium	ND	0.000247	NC
Calcium	63.2	63.4	< 1
Colbalt	0.000104	ND	NC
Iron	0.520	0.516	1
Magnesium	10.1	13.0	25
Manganese	0.00103	0.00101	2
Nickel	0.00309	0.00291	6
Potassium	2.46	2.29	7
Sodium	15.9	18.3	14
Uranium	0.000928	0.000906	2

Refer to footnotes on page 9A-15.

Footnotes for Solid Waste Management Unit 49 Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table I-4)
- µg/L = micrograms per liter.
- mg/L = milligrams per liter.
- pCi/L = picocuries per liter.

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems: 15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table I-4). 4 mrem/yr = any combination of beta and/or gamma-emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B = The analyte was detected in the blank above the effective MDL.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = Analyte is absent or below the method detection limit.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD = Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J = The associated value is an estimated quantity.
None = No data validation for corrected gross alpha activity.
U = The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

Footnotes for Solid Waste Management Unit 49 Groundwater Monitoring Tables (Concluded)

[g]Analytical Method

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes,* EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio
- U.S. Department of Energy, Environmental Measurements Laboratory, 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.
- Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater,* Method 2320B, 20th ed. *Beckman LS5000TD Liquid Scintillation System Operation Manual*, May 1988.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% Sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

[i]RPD

RPD = Relative percent difference is calculated with the following equation and rounded to nearest whole number.

$$RPD = \frac{|R_1 - R_2|}{[(R_1 + R_2)/2]} \times 100$$

where:	R_1	= analysis result
	R_2	= duplicate analysis result
	NC	= Not calculated

Attachment 9B
Solid Waste Management Unit 49
Hydrographs

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Attachment 9B Hydrographs

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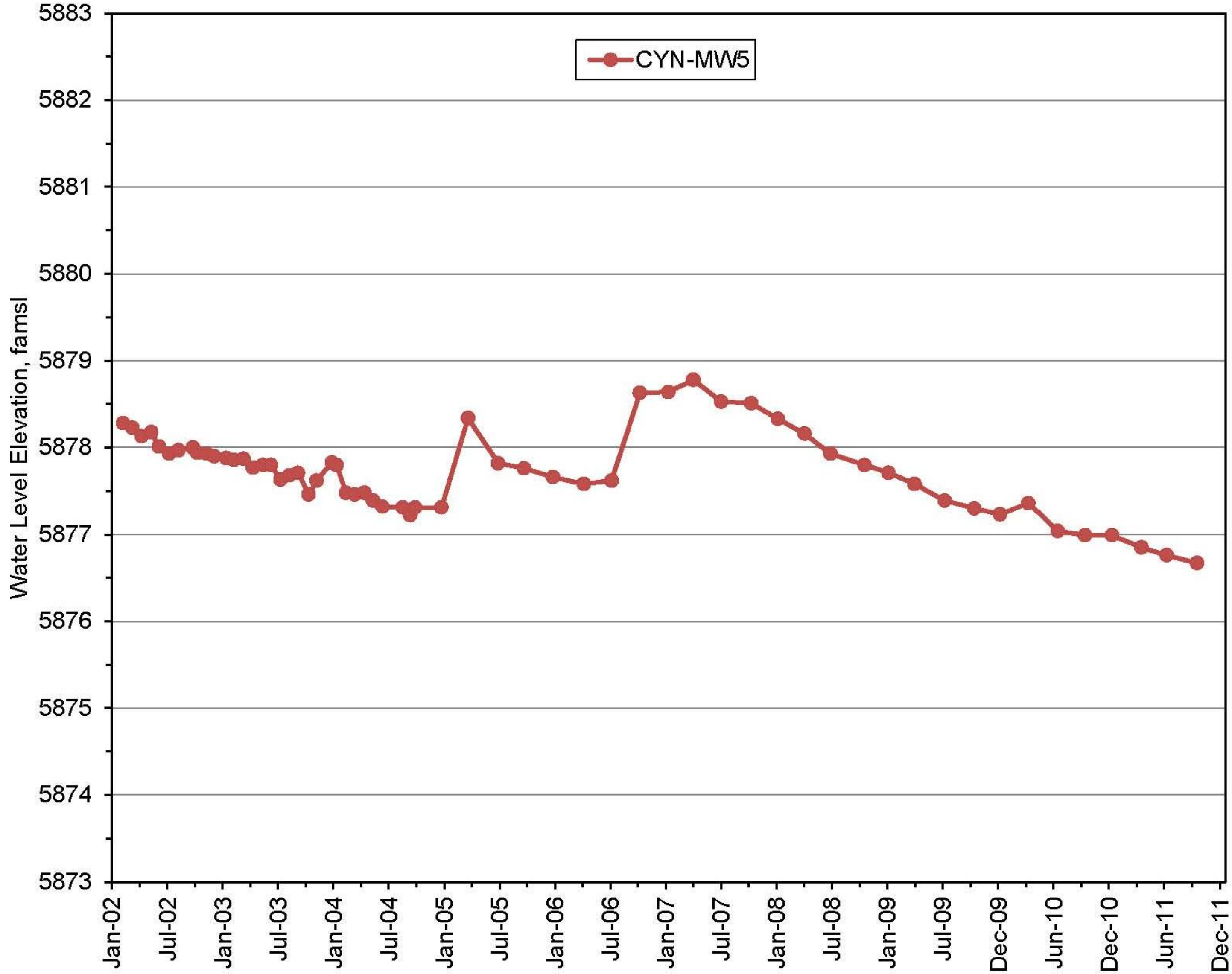

Figure 9B-1. SWMU 49 Study Area Well

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10.0 Solid Waste Management Unit 68

10.1 Introduction

This chapter summarizes the Calendar Year (CY) 2011 quarterly groundwater sampling events for the Old Burn Site monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3, located within Solid Waste Management Unit (SWMU) 68 at Sandia National Laboratories, New Mexico (SNL/NM). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE) National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

Monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 were installed at SWMU 68 in August 2011. The installation and monitoring of these wells are designed to address the requirements of Section VII.D.6 of the Compliance Order on Consent (the Order) (NMED April 2004) between the New Mexico Environment Department (NMED), DOE, and Sandia and the NMED letter dated April 8, 2010, from the NMED Hazardous Waste Bureau requiring additional corrective action at SWMU 68 (NMED April 2010).

Monitoring well OBS-MW1 was sampled on October 25, 2011; OBS-MW2 on October 26, 2011; and OBS-MW3 on October 24, 2011. The groundwater samples were collected in accordance with the NMED-approved Groundwater Characterization Work Plan (SNL September 2010) and Mini-Sampling and Analysis Plan (SAP) (SNL October 2011). The groundwater samples from each well were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, nitrate plus nitrite (NPN), major anions (as bromide, chloride, fluoride, and sulfate), major cations (as calcium, magnesium, potassium, and sodium), alkalinity, Target Analyte List (TAL) metals plus uranium, perchlorate, total cyanide, hexavalent chromium, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

Analytical results for the CY 2011 groundwater samples were compared with the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) for drinking water (EPA 2009). No parameters were detected above established MCLs.

During CY 2012, quarterly groundwater sampling and reporting will continue at SWMU 68 groundwater monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3.

10.1.1 Location

SWMU 68 is located in the Coyote Test Field, approximately 0.8 miles north of the southern boundary of Kirtland Air Force Base (KAFB) and approximately 0.6 miles to the west of the U.S. Forest Service Withdrawn Area (Figure 10-1). SWMU 68 encompasses approximately 6.5 acres of generally flat and gently westerly sloping terrain at an average elevation of approximately 5,860 feet (ft) above mean sea level (amsl).

10.1.2 Site History

From 1965 to 1978, pool fire tests were conducted at SWMU 68 to study the effects of fire on weapons components and to determine the potential for release of radioactive material in case of a transportation (air, truck, and rail) accident. The primary fuel used for the pool fire tests was jet fuel. Prior to investigative and remedial activities that were completed in 2004 (Table 10-1), SWMU 68 consisted of an aboveground, approximately 3-ft-deep, steel burn pool; a drainage ditch; an overflow basin; a rectangular burn pit that was once lined with plastic; three debris piles; and two irregularly shaped borrow pits.

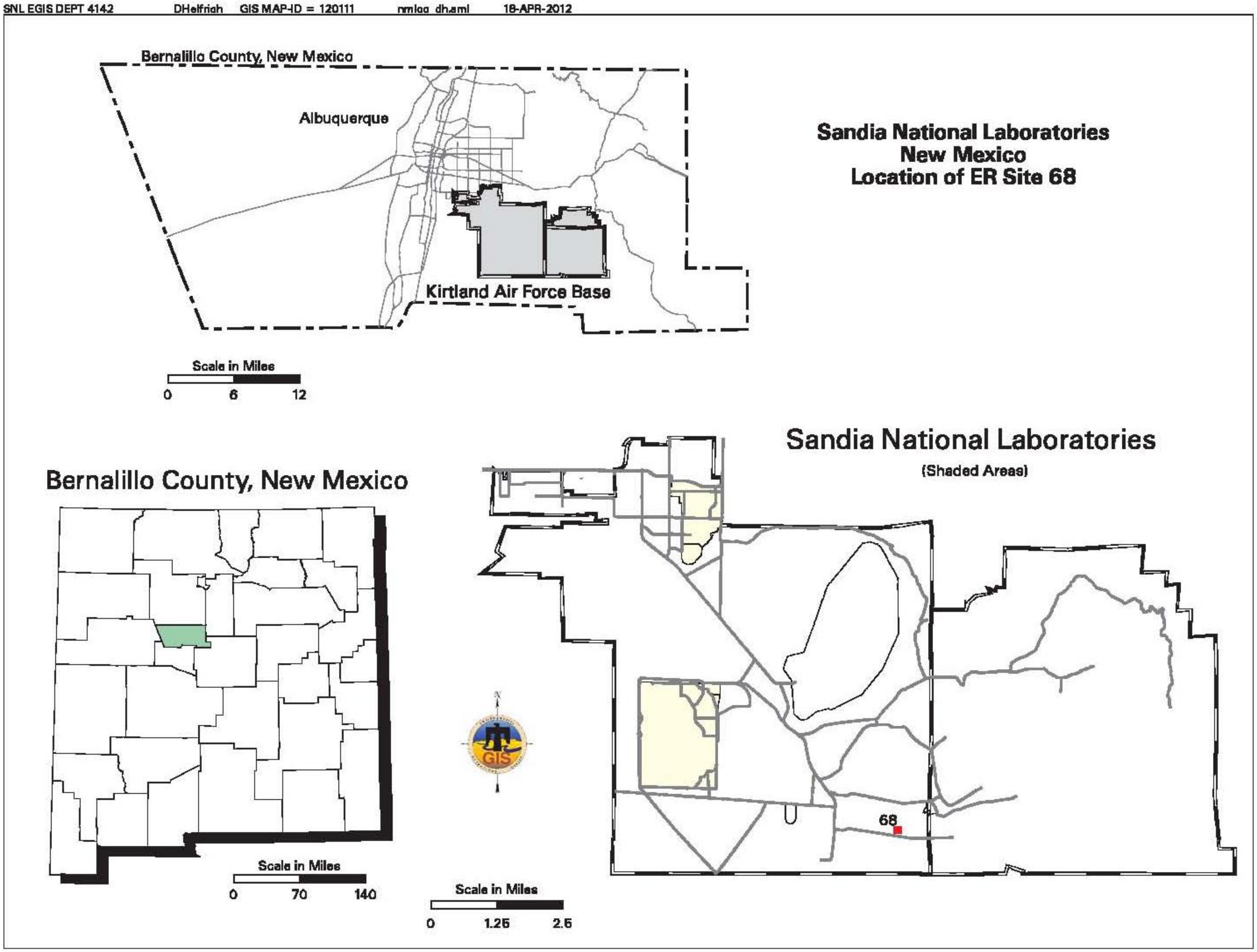

Figure 10-1. Location of SWMU 68

Table 10-1. Historical Timeline of SWMU 68

Month	Year	Event	Reference
	Mid 1950s	The site was used for pool fire tests. Features at this testing site consisted of an aboveground earthen-bermed burn pan, drainage ditch and overflow basin, rectangular burn pit once lined with plastic, three debris piles, and two irregularly shaped borrow pits. Constituents of concern are metals, VOCs, SVOCs, and radionuclides.	SNL September 2005
	1981 1983	Cultural resources surveys were conducted at SWMU 68 in 1981 and again in 1983. No cultural resources were identified in either survey.	SNL February 1995
April	1987	SWMU 68 identified in the RCRA Facility Assessment Report.	EPA 1987
September	1987	SWMU 68 located and documented during Comprehensive Environmental Assessment and Response Program.	DOE September 1987
September	1992	SWMU 68 added to Hazardous and Solid Waste Amendments module of the RCRA permit.	SNL September 1992
November	1993	KAFB EOD personnel conducted a visual survey for the presence of UXO/HE compounds. No live ordnance found; only empty shells and shell fragments were found.	SNL September 1994
	1993-1994	Phase I surface radiation survey was conducted at SWMU 68. Gamma anomalies were identified. The response of the survey instruments indicates that these anomalies are likely caused by fragments of radioactive material buried just beneath the soil surface.	RUST Geotech, Inc. 1994
	1993-1994	Los Alamos National Laboratory conducts alpha radiation survey at SWMU 68. No readings above background detected.	Bounds 1994
June	1994	Sensitive species survey performed. No sensitive species were found.	IT Corporation 1995
October	1994	Draft RFI Work Plan submitted to NMED.	SNL October 1994
January-March	1995	Surface radiological VCM remediation conducted at SWMU 68**.** Point and small area sources identified during the 1993 Phase I survey were removed.	RUST Geotech, Inc. 1994
March	1995	NMED comments on RFI Work Plan received.	NMED March 1995
May	1995	SNL/NM ER responds to NMED comments on RFI Work Plan.	SNL May 1995
June	1995	SWMU 68 investigated as part of a site-wide scoping sampling program	Chain of custody
October	1995	SNL/NM ER performs a Housekeeping VCM and removes steel test stands and piping from the site (screening of three debris mounds).	SNL November 1995
November	1995	EPA's NOD on Work Plan received. Additional sampling required at SWMU 68; sample beneath debris piles for total constituents (metals and SVOCs); collect VOC samples at 3 ft beneath the overflow basin and plastic lined pit.	EPA 1995
January-March	1996	Resurveying of SWMU 68 performed. Point and area sources identified during this survey were removed during cleanup activities.	Lambert et. al. 1997
February	1996	Response to EPA NOD on RFI Work Plan submitted.	SNL February 1996
August	1996	SNL/NM ER conducts RFI sampling. A buried concrete slab is discovered while trenching across the overflow basin. No elevated readings are measured on its surface. A large mound (68A Mound) discovered.	Field logs

Table 10-1. Historical Timeline of SWMU 68 *(Continued)*

Month	Year	Event	Reference
August	1997	NMED issues RSI on the Work Plan. Additional sampling for VOCs, SVOCs, total metals, gross alpha/beta, and gamma spectroscopy needed at and below various features including below arroyo channel sediment locations. The newly discovered mound, 68A, was administratively added as a sub-site of SWMU 68.	NMED August 1997
November	1997	RSI responses submitted to NMED, agreeing to conduct additional sampling.	SNL November 1997
March	1998	NMED issues NOD on the Work Plan. Additional soil sampling must be conducted and the large debris mound (68A) must be investigated.	NMED March 1998
May-June	1998	Surface radiological VCM activities continued to complete remediation of three area source anomalies. During the remediation of the single area source, buried debris and other materials were discovered. An area approximately 30 by 36 by 4 ft was excavated.	SNL July 1998
July	1998	Responses submitted to NMED on the Work Plan NOD.	SNL July 1998
August	1998	Soil vapor survey conducted at SWMU 68. Insignificant, trace concentrations of VOC soil gas were detected.	
November/ December	1998	Geophysical surveys conducted at SWMU 68 around the burn pan and surrounding area to detect possible locations of additional buried waste; 68A Mound also surveyed. No anomalies indicative of buried waste are identified at either site.	Hyndman 1998
December	1998	Soil sampling conducted at SWMU 68. Additional sampling specified in the NOD is performed.	NMED March 1998
February	1999	Another soil mound discovered; this mound was trenched and sampled. No evidence for waste disposal was detected with field screening instruments or visually observed. No contamination was detected in the soil samples submitted. Following regulator inspection and approval, the mound was knocked down and the area graded.	Chain of Custody
August	2001	The soil piles and scrap materials are removed from the site and disposed of at appropriate off-site facilities.	Photos
April	2004	NMED issued the Compliance Order on Consent, which specifically identified SWMU 68 as requiring investigation.	NMED April 2004
May	2004	SNL/NM ER requests radiological restrictions removed from SWMU 68.	SNL May 2004a
July	2004	Removal of radiological restrictions approved by Sandia Site Office.	NNSA July 2004
October	2004	VCA Plan for SWMU 68; excavation of lead-contaminated soil. Conducted confirmatory sampling and removed debris from other areas at SWMU 68.	SNL October 2004
January	2005	Sampling of the earthen berm conducted. The soil used to create the earthen berm surrounding the burn pan assembly at SWMU 68 is the last remaining area at the site that has the potential for radiological contamination. Removal of the earthen berm completed in order to remove the burn pan assembly and restore the site to acceptable conditions for closure.	SNL January 2005
September	2005	Final investigation report and proposal for CAC submitted to NMED.	SNL September 2005
October	2005	Letter received approving CAC without controls for SWMU 68.	NMED October 2005
March	2006	Request for Class III Permit Modification submitted.	SNL March 2006
June	2009	NMED decision to remove SWMU 68 from the CAC process.	SNL June 2009

Table 10-1. Historical Timeline of SWMU 68 *(Concluded)*

Month	Year	Event	Reference
April	2010	Letter from NMED formally stating that additional corrective action is needed at SWMU 68, and the specific requirements for what the additional corrective action should entail.	NMED April 2010
September	2010	SWMU 68 Groundwater Characterization Work Plan submitted to NMED (in response to April 8, 2010 letter).	SNL September 2010
January	2011	NMED approves SWMU 68 Work Plan.	NMED January 2011
June	2011	Request for Extension to Complete the Final Well Installation Report for Five Groundwater Monitoring Wells at SWMU 68 submitted.	SNL June 2011
August	2011	Monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 installed.	SNL November 2011
August	2011	NMED approves the Request for Extension to Complete Well Installation Report for Groundwater Monitoring Wells at SWMU 68.	NMED August 2011
October	2011	First quarterly sampling event for monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 at SWMU 68 conducted.	Chain of Custody
November	2011	Groundwater Monitoring Well Installation Report for SWMU 68 submitted.	SNL November 2011

NOTES:

CAC = Corrective Action Complete.
EOD = Explosive Ordnance Disposal.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive.
KAFB = Kirtland Air Force Base.
NMED = New Mexico Environment Department.
NOD = Notice of Disapproval.
OBS = Old Burn Site.
RCRA = Resource Conservation and Recovery Act.
RFI = RCRA Facility Investigation.
RSI = Request for Supplemental Information.
SNL/NM = Sandia National Laboratories, New Mexico.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
UXO = Unexploded ordnance.
VCA = Voluntary Corrective Action.
VCM = Voluntary Corrective Measure.
VOC = Volatile organic compound.

From 1995 to 2004, multiple surveys and remediation projects were conducted at SWMU 68 to identify and remove nonhazardous and hazardous materials from the site. Wastes removed from SWMU 68 included soil contaminated with radionuclides and metals (primarily lead) and assorted metal fragments, scrap metal, concrete, wire, scrap wood, cardboard, plastic fencing, and burn debris. All testing materials and features were removed. As a final measure, the disturbed areas were graded and reseeded in 2004.

A total of 499 confirmatory soil samples were collected at SWMU 68 from 1996 to 2004, and these sample analyses were used in the final risk assessment for SWMU 68. Soil samples were collected from the plastic-lined pit, the overflow basin, the drainage ditch running from the burn pan to the overflow basin, the soil underneath the burn pan, and other remediated areas of the site.

In April 2004, the NMED issued the Order (NMED April 2004), which specifically identifies SWMU 68 as requiring investigation. All corrective action requirements pertaining to SWMUs are contained in the Order (NMED April 2004).

In September 2005, DOE/Sandia submitted a letter to the NMED requesting a Corrective Action Complete (CAC) status determination for SWMU 68 (SNL September 2005). The NMED approved SWMU 68 as CAC without controls in October 2005 (NMED October 2005).

In March 2006, DOE/Sandia submitted a letter to the NMED justifying a Class III Permit Modification Request for SWMU 68 (SNL March 2006). In April 2010, the NMED responded to the SNL/NM Permit Modification Request, stating that SWMU 68 required additional site characterization work, including the installation of three groundwater monitoring wells near the previous location of the burn pan and associated ditch/surface impoundment. The NMED also required the submittal of a well installation work plan (NMED April 2010).

DOE/Sandia submitted a groundwater characterization work plan for the installation of three monitoring wells at SWMU 68 (SNL September 2010), which was approved by the NMED (January 2011). Three groundwater monitoring wells (OBS-MW1, OBS-MW2, and OBS-MW3) were installed at SWMU 68 in August 2011 (SNL November 2011) and the first of eight quarterly groundwater sampling events occurred in October 2011.

10.1.3 Monitoring History

In 2011, SNL/NM personnel installed three groundwater monitoring wells at SWMU 68 (SNL November 2011) as shown on Figure 10-2. These three new wells were sampled for the first time in October 2011.

10.1.4 Current Monitoring Network

Currently there are three groundwater monitoring wells installed at SWMU 68 (Figure 10-2). OBS-MW1, OBS-MW2, and OBS-MW3 are monitored quarterly for VOCs, SVOCs, HE compounds, NPN, major anions (as bromide, chloride, fluoride, and sulfate), major cations (as calcium, magnesium, potassium, and sodium), alkalinity, TAL metals plus uranium, perchlorate, total cyanide, hexavalent chromium, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

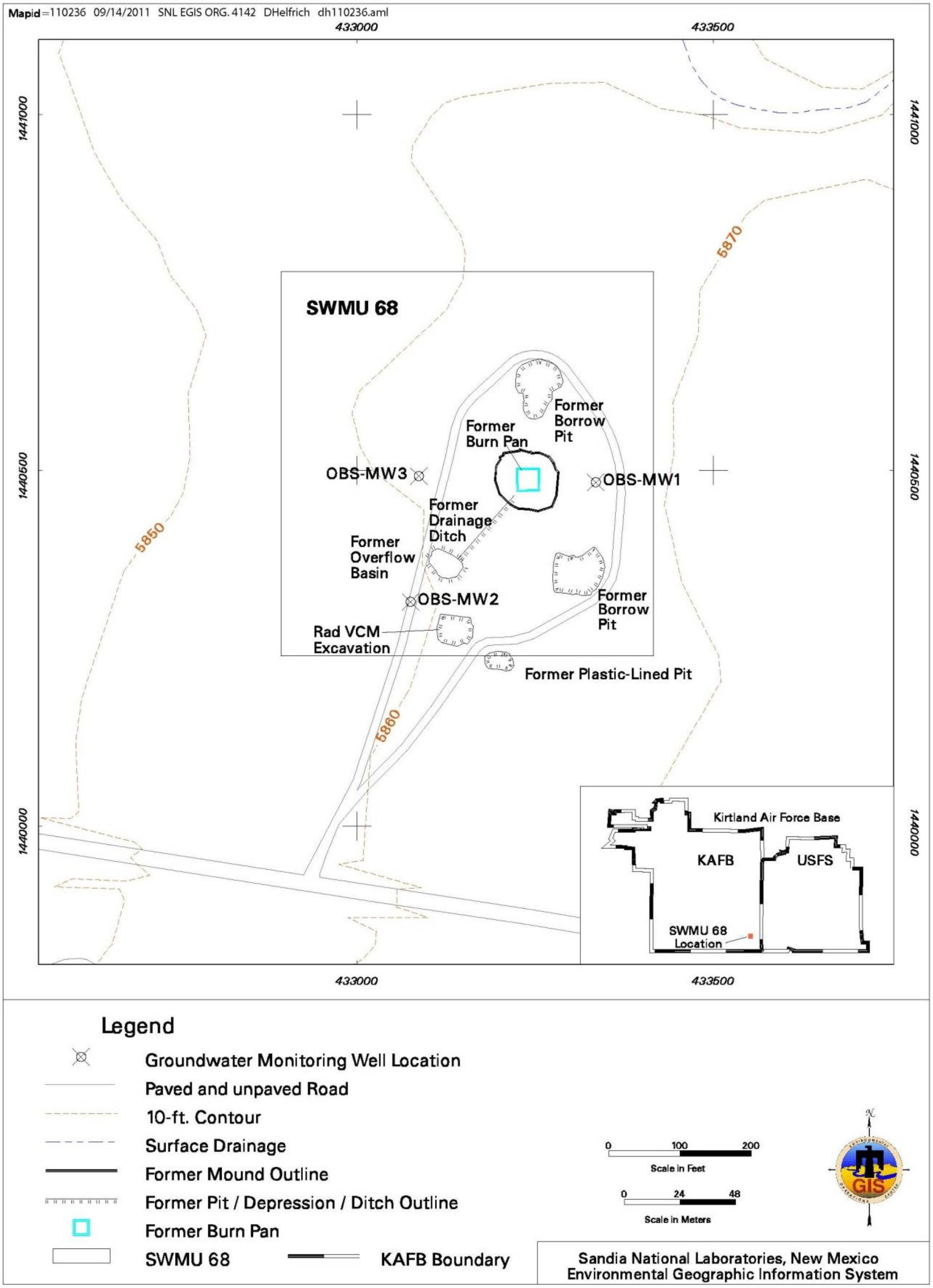

Figure 10-2. Groundwater Monitoring Wells OBS-MW1, OBS-MW2, and OBS-MW3 Installed at SWMU 68

10.1.5 Summary of Calendar Year 2011 Activities

The following activities occurred for SWMU 68 in CY 2011 (January through December 2011):

- NMED approved the SWMU 68 Groundwater Characterization Work Plan (NMED January 2011).
- Three groundwater monitoring wells were installed (OBS-MW1, OBS-MW2, and OBS-MW3) at SWMU 68 in August 2011 (SNL November 2011).
- A report describing the well installation field activities was prepared and submitted to the NMED (SNL November 2011).
- Quarterly groundwater sampling was conducted at the newly installed wells in October 2011.
- Quarterly and annual reporting of chemical analyses for groundwater samples from OBS-MW1, OBS-MW2, and OBS-MW3 was initiated.
- Tables of analytical results (Attachment 10A) and hydrographs (Attachment 10B) were prepared in support of this report.

10.1.6 Summary of Future Activities

The following activities are anticipated for SWMU 68 during CY 2012:

- Quarterly groundwater sampling will be conducted at monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 during all four quarters of CY 2012.
- Quarterly and annual reporting of chemical analyses for OBS-MW1, OBS-MW2, and OBS-MW3 groundwater samples will be performed.

10.1.7 Current Conceptual Model

With the installation of the first monitoring wells at the site in 2011 (Figure 10-2), understanding of the hydrogeologic regime significantly improved. The following sections present a comprehensive discussion of the hydrogeologic regime, conceptual site model, and contaminant findings for SWMU 68.

10.1.7.1 Regional Hydrogeologic Conditions

SWMU 68 is located in the central portion of the Coyote Test Field, approximately 7 miles southeast of Technical Area I and 0.5 miles southwest of the Starfire Optical Range. SWMU 68 covers approximately 6.5 acres of generally flat and gently westerly sloping terrain at an average elevation of approximately 5,860 ft amsl. The site is sparsely vegetated by bunch grasses, cacti, and a few junipers. No perennial surface-water features such as springs are located within 1 mile of SWMU 68. A minor arroyo is located approximately 300 ft north of SWMU 68 but trends from east to west and does not cross the site.

In the mid-1990s, the Site-Wide Hydrogeologic Characterization Project conducted extensive mapping of the surface geology in the Coyote Test Field (GRAM and Lettis 1995). SWMU 68 is located approximately 1 to 2 miles to the west of the mountain front that undulates along the western edge of the Manzanita Mountains. The mountain front is defined as the slope break between the nearly horizontal alluvial fan sediments and the bedrock outcrops that comprise the mountains. Most of SWMU 68 is covered with a thin veneer of soil and unconsolidated alluvial fan sediments that have a combined maximum thickness of approximately 5 ft. Paleozoic limestone of the Madera Group outcrops at the northwest portion of the site. The Coyote Fault trends across the eastern edge of the site and is buried by soil and sediment. At KAFB, the Coyote Fault consists of a series of high-angle faults and splays with a composite down-to-the-west displacement of approximately 700 to 1,000 ft.

The regional potentiometric surface map (Plate 1) shows that groundwater flow is generally toward the west in the vicinity of SWMU 68. Topographic features and faults modify the flow direction at various locations. Faults to the west of the site may serve as hydraulic barriers or conduits depending on the type and amount of fault gouge.

10.1.7.2 Hydrogeologic Conditions at SWMU 68

The amount of precipitation available for groundwater recharge is minimal due to scant rainfall and high evapotranspiration. Summer (monsoonal) thunderstorms are responsible for the majority of rainfall. The average rainfall, as measured at the nearest active rain gauge (the National Weather Service station at the Albuquerque International Sunport), during the period from 1915 through 2005 was 8.67 inches per year (in./yr) (WRCC-DRI 2012). The station is located 10 miles northwest of SWMU 68 at an elevation of 5,310 ft amsl. By extrapolation of the precipitation model presented in SNL/NM conceptual model of groundwater flow and contaminant transport at the canyon area (SNL May 2004b), the average annual precipitation for SWMU 68, where the elevation averages approximately 5,860 ft amsl, is estimated to be approximately 11 in./yr. Intense sunlight and low humidity throughout much of the year creates high rates of evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

Three monitoring wells (OBS-MW1, OBS-MW2, and OBS-MW3) were installed at SWMU 68 by the air-rotary casing hammer drilling method in August 2011 (SNL November 2011). No petroleum odors, stains, or sheens were observed. During drilling of the three boreholes, groundwater was encountered at depths ranging from approximately 135 to 240 ft below ground surface (bgs), and was dependent on the depth of the uppermost water-bearing fracture at a particular borehole (Table 10-2). Wells OBS-MW1 and OBS-MW3 are located closest to the former location of the burn pan and are most similar. Therefore, these two wells are discussed first as follows.

At the OBS-MW1 borehole, poorly sorted sand was encountered from the ground surface to a depth of approximately 3 ft bgs. Hard limestone, most likely of the Sandia Formation, was encountered from 3 to 18 ft bgs. The Precambrian granite contact was at 18 ft bgs. Saturated granitic cuttings were encountered at 135 ft bgs, and well OBS-MW1 was screened in granite at 135 to 155 ft bgs (Table 10-2).

At the OBS-MW3 borehole, soil and silty gravelly sand were encountered from the ground surface to a depth of approximately 2 ft bgs. Hard cherty limestone, most likely of the Madera Group, was encountered from 2 to 102 ft bgs. A conglomerate layer extended from 102 to 105 ft bgs. A sequence of the Sandia Formation consisting of coarse sandstone, claystone, black shale, and limestone was encountered from 105 to 120 ft bgs. The Precambrian granite contact was at 120 ft bgs. Saturated granitic cuttings were encountered at 190 ft bgs. Well OBS-MW3 was screened in Precambrian granite at an interval of 190 to 210 ft bgs (Table 10-2).

Table 10-2. Lithologic and Hydrogeologic Elevation Data for Monitoring Wells at SWMU 68

Monitoring Well	Ground Surface Elevation (ft amsl)	Depth to Granite (ft bgs)	Top Granite Elevation (ft amsl)	Depth to Uppermost Saturated Fracture (ft bgs[a])	Elevation of Uppermost Saturated Fracture (ft amsl[a])	Depth of Screened Interval (ft bgs)	Potentiometric Surface October 2011 (ft amsl)	Mid-Point Screen Elevation (ft amsl)	Pressure Head (ft[b])
OBS-MW1	5869.08	18	5851	135	5734	135 - 155	5799.41	5724.10	75
OBS-MW2	5860.75	230	5631	240	5621	234 - 254	5685.98	5616.80	69
OBS-MW3	5863.31	120	5743	190	5673	190 - 210	5796.12	5663.30	133

NOTES:
[a]Observed during drilling.
[b]From mid-point of screen.
amsl = Above mean sea level.
bgs = Below ground surface.
ft = Foot (feet).
MW = Monitoring Well.
OBS = Old Burn Site.
SWMU = Solid Waste Management Unit.

At the OBS-MW2 borehole, poorly sorted sand was encountered from the ground surface to a depth of approximately 3 ft bgs. Hard cherty limestone, most likely of the Madera Group, was encountered from 3 to 184 ft bgs. From 184 to 190 ft bgs, sandstone of the Sandia Formation was encountered. Limestone was encountered from 190 to 205 ft bgs. No drill cuttings were returned from 205 to 305 ft bgs where the borehole apparently intercepted a splay of the Coyote Fault. Saturated granitic cuttings were returned starting at 305 ft bgs. Video logging of the borehole was used for selecting the screen depth. The flowing groundwater visible on the video log from approximately 240 to 250 ft bgs represents the uppermost saturated fracture zone. The well was screened across the flowing zone at 234 to 254 ft bgs.

Because cloudy water obscured the borehole lithology below a depth of 182 ft bgs and no drill cuttings were returned from 205 to 305 ft bgs, the lithology of the screened interval has been inferred using the geochemical composition of water samples that were collected in October 2011. As shown on the Piper diagram (Figure 10-3), the geochemical composition is similar, nearly identical, for groundwater samples collected from all three of the wells. The similar geochemical signature is indicative of a single water source and hydrofacies. Because the completion zones are well known for wells OBS-MW1 and OBS-MW3, it is postulated that well OBS-MW2 is also screened in fractured granite. The groundwater composition for all three wells is of the bicarbonate type and dominated by the calcium cation.

An unusually large volume of sand pack was required for building well OBS-MW2. A total of 125 bags of sand were used to fill the annulus from the bottom of the sump to the required height above the screen. Typically, a monitoring well of similar design would be expected to require approximately 25 bags of sand. The large annular volume for well OBS-MW2 indicates that a borehole with a much larger than normal diameter was created during the drilling process and/or a void exists along the fault zone. This large amount of sand pack will need to be considered when slug tests are interpreted.

Structure contours for the granite subcrop are shown on Figure 10-4 with the corresponding elevations listed in Table 10-2. The amount of throw on the fault splay is estimated to be approximately 110 ft. The orientation of the fault splay and the structure contours are interpreted to mimic the north-south structural grain of the Manzanita Mountains and associated faults. The fault splay is probably high-angle with a down-to-the-west offset.

The potentiometric surface map for SWMU 68 is shown on Figure 10-4. The water-level elevation in well OBS-MW1 was 3.29 ft higher than well OBS-MW3 in October 2011. The distance between the two wells is 248 ft. The horizontal gradient between wells OBS-MW1 and OBS-MW3 is approximately 0.01 feet per foot (ft/ft) to the west. The groundwater elevation at well OBS-MW2 is much lower by approximately 115 ft and indicates that the fault splay is a hydraulic barrier between OBS-MW2 and the other two wells (OBS-MW1 and OBS-MW3). The potentiometric surface at each well is above the top of each respective screen and is indicative of semiconfined or confined conditions for the SWMU 68 area.

During sampling, the drawdown in each of the three wells was not excessive. The quantity of water produced by each well was clearly adequate for low-flow sampling purposes. Groundwater samples were collected using pneumatic (nitrogen gas) Bennett™ piston pumps. Hydraulic conductivity values will be calculated after slug testing is completed.

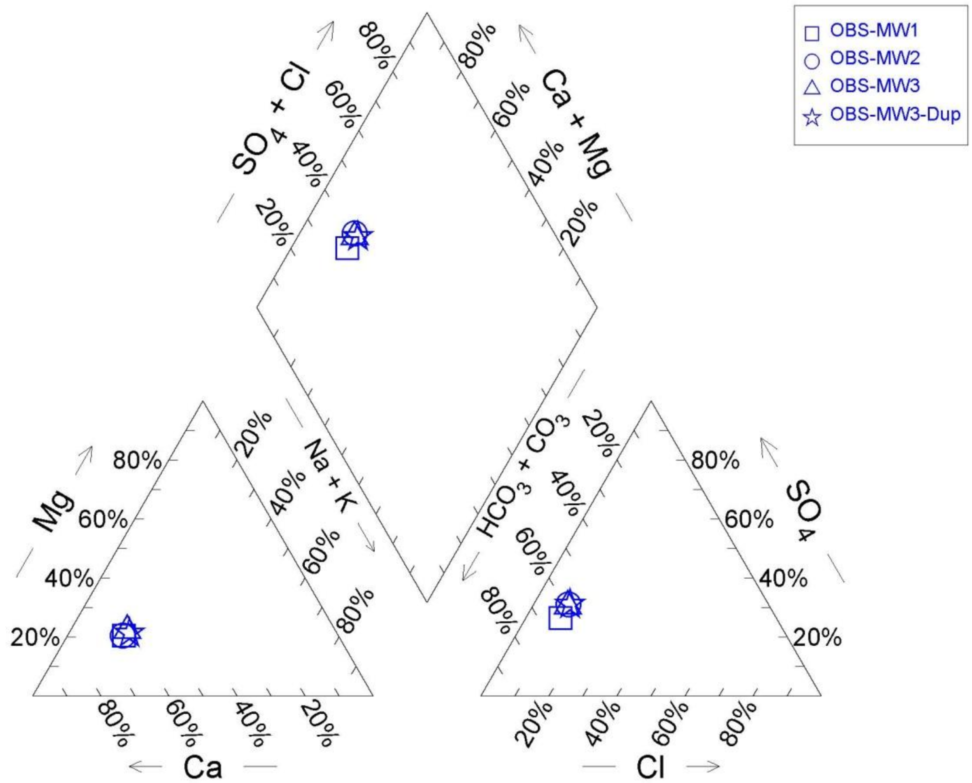

Figure 10-3. Piper Trilinear Diagram of Major Ion Chemistry for Monitoring Wells OBS-MW1, OBS-MW2, and OBS-MW3 at SWMU 68, October 2011.

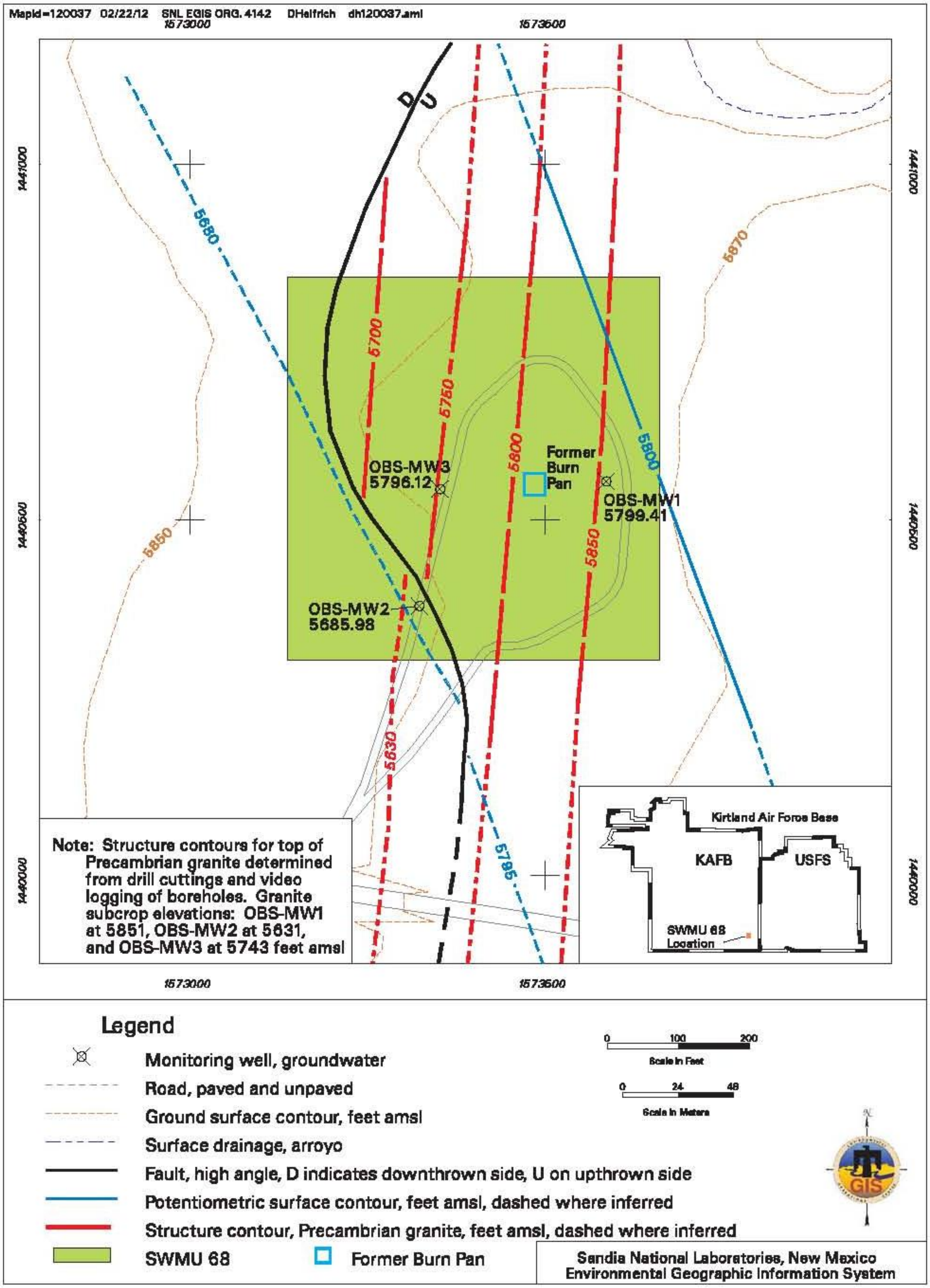

Figure 10-4. SWMU 68 Potentiometric Surface Map (October 2011)

10.1.7.3 Conceptual Site Model for SWMU 68

The conceptual site model for SWMU 68 is based on the findings from three on-site monitoring wells (OBS-MW1, OBS-MW2, and OBS-MW3), several nearby monitoring wells located across the Coyote Test Field (Plate 1), and extensive field mapping conducted by the Site-Wide Hydrogeologic Characterization Project (GRAM and Lettis 1995). The site is relatively flat and slopes gently to the west. No arroyos or perennial surface water bodies are located near the site. The infrequent storm water drains westward across the site and typically dissipates nearby on the flat terrain. Most of the site is covered by a thin layer of soil. Madera Group limestone outcrops at the northwest corner of the site.

The August 2011 drilling encountered Paleozoic units (limestone, sandstone, claystone, and shale) overlying Precambrian granite. Groundwater was encountered in fractured granite at depths ranging from approximately 135 to 240 ft bgs, and was dependent on the depth of the uppermost water-bearing fracture at a particular borehole. Groundwater in the SWMU 68 area occurs in a fractured bedrock system under semiconfined or confined conditions. The geochemical signature is of the bicarbonate type dominated by the calcium cation.

Naturally filled fractures in the overlying bedrock probably serve as a confining unit. A buried splay of the Coyote Fault trends across the western side of the site and restricts the migration rate of groundwater. The amount of throw is estimated to be 110 ft. The hydraulic gradient on the east side of the fault is approximately 0.01 ft/ft to the west. The amount of precipitation available for groundwater recharge is minimal due to the scant rainfall (approximately 11 in./yr), high evapotranspiration rates, and the shallow sequence of bedrock. Seasonal effects probably do not influence groundwater levels near the site. Groundwater underflow from the site probably discharges to the unconsolidated basin-fill deposits (primarily the Santa Fe Group) of the Albuquerque Basin after crossing the Sandia and Tijeras faults. No potable water-supply wells are located within 6 miles of the site.

10.1.7.4 Contaminant Sources

At SWMU 68, soil contamination was suspected at the burn pan, the overflow basin, a plastic-lined pit, and three shallow earthen pits. During 1995 to 2004, radiological and ordnance surveys were conducted and hazardous materials were removed. Additional remedial activities were conducted in 2004, and all the testing features were removed. Approximately 425 cubic yards of lead-contaminated soil and 3 cubic ft of radiologically contaminated soil were removed along with approximately 120 cubic yards of construction debris. Confirmatory soil sampling was conducted in 2004. Human health and ecological risk assessments show that remaining constituent of concern concentrations in soil are acceptable for both industrial and residential land-use scenarios.

10.1.7.5 Contaminant Distribution and Transport in Groundwater

Three groundwater monitoring wells were installed at SWMU 68 in August 2011. In October 2011, groundwater samples were collected from wells OBS-MW1, OBS-MW2, and OBS-MW3. Analytical parameters included VOCs, SVOCs, HE compounds, NPN, major anions, major cations, alkalinity, TAL metals plus uranium, hexavalent chromium, perchlorate, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium. No parameters were detected above established MCLs.

10.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM Environmental Restoration (ER) Operations (formerly ER Project) and implements and enforces federal regulations mandated by the Resource Conservation and Recovery Act (RCRA). All ER Operations SWMUs are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous* *and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993).

In April 2004, the NMED issued the Order (NMED April 2004), which specifically identified SWMU 68 as requiring investigation. All corrective action requirements pertaining to SWMU 68 are contained in the Order (NMED April 2004).

In September 2005, DOE/Sandia submitted a letter to the NMED requesting a CAC status determination for SWMU 68 (SNL September 2005). The NMED approved SWMU 68 as CAC without controls in October 2005 (NMED October 2005).

On March 1, 2006, DOE/Sandia submitted a letter to the NMED justifying a Class III Permit Modification Request for SWMU 68 (SNL March 2006). On April 8, 2010, the NMED responded to the Permit Modification request, stating that SWMU 68 required additional site characterization work, including the installation of three groundwater monitoring wells near the previous location of the burn pan and associated ditch/surface impoundment. The NMED also required the submittal of a well installation work plan (NMED April 2010). On September 23, 2010, DOE/Sandia responded to the NMED by submitting a groundwater characterization work plan for the installation of three monitoring wells at SWMU 68 (SNL September 2010). The NMED responded to the SNL/NM September 2010 submittal in January 2011, and approved the SWMU 68 well installation work plan (NMED January 2011).

Eight consecutive quarters of groundwater monitoring are required at the newly installed wells. The first sampling event occurred in October 2011. In this report monitoring data for SWMU 68 are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order, as specified in Section III.A of the Order (NMED April 2004).

10.3 Scope of Activities

The activities for the SWMU 68 investigation conducted during this reporting period, including plans and reports, are listed in Section 10.1.5. The field activity discussed in this section is groundwater monitoring sampling and analysis during CY 2011 sampling events (Table 10-3). The analytical parameters for monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 are listed in Tables 10-4 and 10-5.

Table 10-3. Groundwater Monitoring Well Network and Sampling Dates for SWMU 68, Calendar Year 2011

Date of Sampling Event	Wells Sampled	SAP
October 25, 2011 October 26, 2011 October 24, 2011	OBS-MW1 OBS-MW2 OBS-MW3	*SWMU 68 Groundwater Monitoring Mini-SAP for First Quarter Fiscal Year 2012* (SNL October 2011)

NOTES:
MW = Monitoring well.
OBS = Old Burn Site.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
SWMU = Solid Waste Management Unit.

Table 10-4. SWMU 68 Chemical Analytical Methods

Analyte	Analytical Method[a,b,c,d,e]
Anions	SW846 9056
Alkalinity	SM2320B
Filtered Cations	SW846 6020
HE compounds	SW846 8321A
Hexavalent Chromium	SW846 7196A
NPN	EPA 353.2
Perchlorate	EPA 314.0
SVOC	SW846 8270C
TAL Metals	SW846 6010/6020/7470
Total Cyanide	SW846 9012
VOC	SW846 8260B

NOTES:
[a]EPA, 1999, *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
[b]EPA, 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed., Rev. 1 (and all updates), U.S. Environmental Protection Agency, Washington, D.C.
[c]EPA, 1984, *Methods for Chemical Analysis of Water and Wastes.* EPA 600-4-79-020.
[d]EPA, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0,* EPA-600/4-84-017
[e]Clesceri, et al, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B.
EPA = U.S. Environmental Protection Agency.
HE = High explosive.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard method.
SVOC = Semivolatile organic compound.
SW = Solid Waste.
SWMU = Solid Waste Management Unit.
TAL = Target Analyte List.
VOC = Volatile organic compound.

Table 10-5. SWMU 68 Radiochemical Analytical Methods

Analyte	Analytical Method[a,b]
Gamma Spectroscopy (short list)	EPA 901.0
Gross Alpha/Beta	EPA 900.0
Isotopic Uranium	HASL-300

NOTES:
[a]EPA, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032.
[b]U.S. Department of Energy, Environmental Measurements Laboratory (EML), 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.
EPA = U.S. Environmental Protection Agency.
HASL = Health and Safety Laboratory.
SWMU = Solid Waste Management Unit.

10.4 Field Methods and Measurements

According to the requirements of the Order (NMED April 2004) addressing Section VII.D.6 and the NMED letter of April 8, 2010 (NMED April 2010), SNL/NM personnel performed groundwater sampling at SWMU 68. The CY 2011 sampling events were conducted in conformance with appropriate SNL/NM Field Operating Procedures (FOPs) for groundwater sampling activities and the SWMU 68 site-specific Mini-SAP (SNL October 2011).

Environmental groundwater samples were collected from monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 in October 2011. Samples were submitted to GEL Laboratories, LLC (GEL) for all chemical analyses. All samples were analyzed for VOCs, SVOCs, HE compounds, NPN, major anions (as bromide, chloride, fluoride, and sulfate), major cations (as calcium, magnesium, potassium, and sodium), alkalinity, TAL metals plus uranium, hexavalent chromium, perchlorate, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental samples, split samples, equipment blank (EB), trip blank (TB), and field blank (FB) samples. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. TB samples are used to determine whether VOCs contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory. FB samples provide a check for potential ambient sources of sample contamination during the sampling process and/or sampling error.

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

10.4.1 Groundwater Elevation

During the October 2011 sampling events, water level measurements were obtained to determine groundwater flow directions, hydraulic gradients, and changes in water table elevations during subsequent sampling events. Water levels will be periodically measured in SWMU 68 monitoring wells according to the instructions and requirements specified in SNL/NM FOP 03-02, *Groundwater Level Data Acquisition and Management* (SNL November 2009a and February 2011). The water level information was used to create the potentiometric surface map presented on Figure 10-4 and the hydrographs presented on Figure 10B-1 and 10B-2 (Attachment 10B).

10.4.2 Well Purging and Water Quality Measurements

Purging removes stagnant water from the well so that a representative groundwater sample can be obtained. The wells are purged a minimum of one saturated casing volume. Purging continued until four stable field measurements for temperature, specific conductance (SC), pH, and turbidity were obtained. Groundwater stability is considered acceptable when measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, 0.1 pH units, 1.0 degrees Celsius, and SC is within 5 percent as micromhos per centimeter.

Field water quality measurements for turbidity, pH, temperature, SC, oxidation-reduction potential (ORP), and dissolved oxygen (DO) were recorded for each well, prior to the collection of groundwater samples according to SNL/NM FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements* (SNL November 2009b). Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

10.4.3 Pump Decontamination

The sampling pump and tubing bundle were decontaminated prior to installation in monitoring wells according to procedures described in SNL/NM FOP 05-03, *Long-Term Environmental Stewardship General Sampling Equipment Decontamination* (SNL November 2009c). An EB sample was collected prior to sampling monitoring well OBS-MW3.

10.4.4 Sample Collection Sampling Procedures

Groundwater sampling was performed in strict accordance with SNL/NM FOP 05-01 (SNL November 2009b) and SNL/NM Sample Management Office (SMO) procedures and protocols. Sample container types depend on the analytical parameters.

Groundwater samples were collected using the Bennett™ nitrogen gas-powered portable piston pump. Sample bottles were filled directly from the pump discharge line and water sampling manifold into laboratory-prepared sample containers, with the VOC samples collected at the lowest achievable discharge rate. The groundwater samples were submitted to GEL for chemical analysis using methods outlined in Table 10-4.

10.4.5 Sample Handling and Shipment

The SNL/NM SMO processes environmental samples collected by LTS/ER Operations personnel. The SMO staff reviews the Mini-SAPs, orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced in laboratory processes and procedures. These include method blanks, laboratory control samples (LCSs), matrix spike, matrix spike duplicate, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review*, SMO-05-03 (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL May 2011).

10.4.6 Waste Management

Purge and decontamination water generated from sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management*, (SNL November 2009d) as nonregulated waste, based on historical sampling results and process knowledge of monitoring well locations. Associated environmental sample results provide supplemental data for approval to discharge water to the sanitary sewer. All data are compared with Albuquerque Bernalillo County Water Utility Authority discharge limits.

10.5 Analytical Methods

Groundwater samples were submitted to GEL for chemical and radiological analyses. Samples were analyzed in accordance with applicable EPA and DOE analytical methods (EPA 1980, 1983, 1984, 1996, and 1999; Clesceri, et al. 1998; DOE 1990). Groundwater sampling results are compared with established EPA MCLs for drinking water (EPA 2009). Analytical reports, including certificates of analyses, analytical methods, method detection limits (MDLs), minimum detectable activity (MDA), critical level, practical quantitation limits, dates of analyses, results of QC analyses, and data validation findings are filed in the SNL/NM Records Center. Tables 10A-1 and 10A-2 in Attachment 10A list the MDLs for the VOC, SVOC, and HE compound analyses. The analytical results and field measurements for samples collected from monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 are shown in tabulated form in Tables 10A-3 through 10A-10 (Attachment 10A).

10.6 Summary of Analytical Results

This section discusses analytical results and field measurements for the CY 2011 SWMU 68 sampling event. Data are presented in Tables 10A-3 through 10A-10 (Attachment 10A). Data qualifiers are explained in the footnotes following Table 10A-10.

The analytical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL May 2011). No problems were identified with the analytical data that resulted in qualification of the data as unusable. The data are acceptable, and reported QC measures are adequate.

No VOCs, SVOCs, or HE compounds were detected in any SWMU 68 groundwater samples above laboratory MDLs. Table 10A-1 lists the MDLs for associated VOCs and SVOCs, and the MDLs for HE compounds are presented in Table 10A-2.

Table 10A-3 summarizes NPN results. NPN values were compared with the nitrate MCL of 10 milligrams per liter (mg/L). NPN was not detected above the MCL in any groundwater sample. NPN was reported at a maximum concentration of 1.92 mg/L in the sample from OBS-MW1.

Table 10A-4 summarizes alkalinity, major anion (as bromide, chloride, fluoride, and sulfate) and total cyanide results. No parameters were detected above established MCLs.

Perchlorate was not detected above the screening level/MDL of 0.004 mg/L (NMED April 2004) in any SWMU 68 groundwater sample. Table 10A-5 presents perchlorate results.

Hexavalent chromium results are summarized in Table 10A-6. No hexavalent chromium was detected above laboratory MDLs, except in the OBS-MW3 duplicate environmental sample. Hexavalent chromium was reported at a concentration of 0.00317 mg/L for OBS-MW3. No MCL is established for this analyte.

TAL metals plus uranium were analyzed in samples from all SWMU 68 monitoring wells. No metal parameters were detected above established regulatory limits in any groundwater sample. Metal results are summarized in Table 10A-7.

Filtered fractions for major cations as calcium, magnesium, potassium, and sodium were analyzed in all SWMU 68 samples. The results are summarized in Table 10A-8. No MCLs are established for these analytes.

All SWMU 68 groundwater samples were screened for gamma-emitting radionuclides and gross alpha/beta activity. An additional sample for isotopic uranium was collected to support evaluation of gross alpha activity results. The results for gamma spectroscopy, gross alpha, gross beta, and isotopic uranium are presented in Table 10A-9. Gamma spectroscopy activities for short-list radionuclides are less than the associated MDAs, except potassium-40. Potassium-40 activity in the sample from OBS-MW1 was qualified as unusable during data validation because the analytical laboratory was unable to meet identification criteria. Potassium-40 was qualified as an estimated value in the OBS-MW2 sample, because the result was less than three times the MDA. All radionuclide activity results are below MCLs, where established.

Table 10A-10 summarizes field water quality measurements collected prior to sampling. Field water quality measurements include turbidity, pH, temperature, SC, ORP, and DO.

10.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. All chemical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL May 2011). Data validation qualifiers are provided with the analytical results in Tables 10A-3 through 10A-9 (Attachment 10A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center. The following sections discuss site-specific QC results for the SWMU 68 quarterly sampling event.

10.7.1 Field Quality Control Samples

Field QC samples are used to document data quality and identify any potential errors that may be introduced by field conditions, in sample collection, storage, transportation, and equipment decontamination. Field QC samples submitted to the analytical laboratory are handled and analyzed in an identical manner as environmental samples.

Field QC samples included duplicate environmental, EB, TB, and FB samples. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAP (SNL October 2011).

10.7.1.1 Duplicate Environmental Samples

A duplicate environmental sample was collected from OBS-MW3 and analyzed to estimate the overall reproducibility of the sampling and analytical process. The duplicate environmental sample was collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The duplicate environmental sample was analyzed for all parameters. The results show that sampling and analysis precision was in conformance with SWMU 68 SAP requirements for all measured parameters.

10.7.1.2 Equipment Blank Samples

A portable Bennett™ groundwater sampling system was used to collect groundwater samples in all wells. The sampling pump and tubing bundle were decontaminated prior to installation into monitoring wells according to procedures described in SNL/NM FOP 05-03 (SNL November 2009c). An EB sample was collected to verify the effectiveness of the equipment decontamination process and monitor the cleanliness of the sampling system. After sampling equipment decontamination has been completed, an EB sample is prepared by pumping deionized water through the portable sampling equipment and collecting a sample of this water. An EB sample was collected prior to sampling monitoring well OBS-MW3 and submitted for all analyses.

Bromodichloromethane, calcium (filtered), chloride, chloroform, dibromochloromethane, manganese, and thallium were detected in the EB sample above the laboratory MDLs. No corrective action was necessary for bromodichloromethane, calcium (filtered), chloride, chloroform, dibromochloromethane, or thallium as these analytes were either not detected in environmental samples or detected at concentrations greater than five times the blank result. Manganese was detected in the OBS-MW3 environmental sample at a concentration less than five times the associated EB, and the result for manganese was qualified as not detected during data validation.

10.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analyses to assess whether contamination of the samples has occurred during shipment and storage. The analytical laboratory prepares the TB sample by filling a volatile organic analysis sample vial with deionized water and using the same sample preservation method designated for VOC environmental samples. Each vial is sealed with custody tape and dated when it is prepared. The TB samples accompany the empty sample containers when they are shipped to SNL/NM prior to the start of sample collection. The TB samples are taken into the field during sample collection and are included in the shipment of environmental samples to the laboratory. The TB samples must remain sealed during this entire cycle and may be opened only for analysis on return to the analytical laboratory.

A total of four TB samples were submitted with the October 2011 samples. No VOCs were detected in the TB samples above associated laboratory MDLs.

10.7.1.4 Field Blank Samples

FB samples were collected for VOCs to assess whether contamination of the samples resulted from ambient field conditions. The FB sample was prepared by pouring deionized water into sample containers at the OBS-MW2 sampling point to simulate the transfer of environmental samples from the sampling system to the sample container.

The VOC compounds bromodichloromethane, chloroform, and dibromochloromethane were detected in the FB sample above the laboratory MDLs. No corrective action was necessary as these compounds were not detected in the associated environmental samples.

10.7.2 Laboratory Quality Control Samples

The analytical laboratory is required to have established procedures that demonstrate the analytical process is always in control during each sample analysis step. These procedures are used for all samples including environmental samples, method blank samples, and matrix spike samples.

An LCS consists of a control matrix (e.g., deionized water) spiked with known concentrations of analytes representative of the target analytes. An LCS was prepared and analyzed for each analytical procedure and batch to determine accuracy of the data. The laboratory evaluates the precision of the data by performing duplicate analysis of either the environmental samples, LCSs, or matrix spike samples and calculating the relative percent difference between corresponding results.

Method blank samples are used to check for contamination in the laboratory during sample preparation and analysis. Method blank samples are concurrently prepared and analyzed with each analytical batch. Method blanks are reported in the same units as corresponding environmental samples, and the results are included with each analytical report.

Surrogate spike analysis is performed for all samples analyzed by gas chromatography/mass spectroscopy. The surrogate compounds added to the sample are those specified in the applicable EPA analytical method procedure. Recovery values for surrogate compounds that are outside specified control limits require corrective action.

The analytical process is systematically evaluated for the effects of naturally occurring constituents present in the environmental sample matrix. The matrix spike/matrix spike duplicate analyses are performed in accordance with the specified analytical procedures.

Internal laboratory QC samples, including method blanks and duplicate LCSs were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with AOP 00-03 (SNL May 2011). Laboratory data qualifiers are provided with the analytical results in Tables 10A-3 through 10A-9 (Attachment 10A). Although some analytical results were qualified during the data validation process, no significant data quality problems were noted. The data validation reports are filed in the SNL/NM Records Center.

10.8 Variances and Nonconformances

No variances or nonconformances from requirements specified in the SWMU 68 Groundwater Monitoring Mini-SAP (SNL October 2011) or project-specific issues were identified during the October 2011 sampling activities.

10.9 Summary and Conclusions

Three new groundwater monitoring wells were installed at SWMU 68 in August 2011. In October 2011, groundwater samples were collected from OBS-MW1, OBS-MW2, and OBS-MW3. Analytical parameters included VOCs, SVOCs, HE compounds, NPN, major anions, major cations, alkalinity, TAL metals plus uranium, hexavalent chromium, perchlorate, total cyanide, gross alpha beta activity, radionuclides by gamma spectroscopy, and isotopic uranium. No parameters were detected above established MCLs.

The current conceptual model described in Section 10.1.7 does not require modification based on the analytical results for this reporting period.

During CY 2012, quarterly groundwater sampling and reporting will continue at the SWMU 68 groundwater monitoring wells (OBS-MW1, OBS-MW2, and OBS-MW3).

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Attachment 10A
Solid Waste Management Unit 68
Analytical Results Tables

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Attachment 10A Tables

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Table 10A-1
Method Detection Limits for Volatile Organic and Semivolatile Organic Compounds, Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]
1,1,1-Trichloroethane	0.325	8260B	1,2,4-Trichlorobenzene	3.00 - 3.16	8270C	Di-n-butyl phthalate	3.00 - 3.16	8270C
1,1,2,2-Tetrachloroethane	0.250	8260B	1,2-Dichlorobenzene	3.00 - 3.16	8270C	Di-n-octyl phthalate	3.00 - 3.16	8270C
1,1,2-Trichloroethane	0.250	8260B	1,3-Dichlorobenzene	3.00 - 3.16	8270C	Dibenz[a,h]anthracene	0.300 - 0.316	8270C
1,1-Dichloroethane	0.300	8260B	1,4-Dichlorobenzene	3.00 - 3.16	8270C	Dibenzofuran	3.00 - 3.16	8270C
1,1-Dichloroethene	0.300	8260B	2,4,5-Trichlorophenol	3.00 - 3.16	8270C	Diethylphthalate	3.00 - 3.16	8270C
1,2-Dichloroethane	0.250	8260B	2,4,6-Trichlorophenol	3.00 - 3.16	8270C	Dimethylphthalate	3.00 - 3.16	8270C
1,2-Dichloropropane	0.250	8260B	2,4-Dichlorophenol	3.00 - 3.16	8270C	Dinitro-o-cresol	3.00 - 3.16	8270C
2-Butanone	1.25	8260B	2,4-Dimethylphenol	3.00 - 3.16	8270C	Diphenyl amine	3.00 - 3.16	8270C
2-Hexanone	1.25	8260B	2,4-Dinitrophenol	5.00 - 5.26	8270C	Fluoranthene	0.300 - 0.316	8270C
4-methyl-, 2-Pentanone	1.25	8260B	2,4-Dinitrotoluene	3.00 - 3.16	8270C	Fluorene	0.300 - 0.316	8270C
Acetone	3.50	8260B	2,6-Dinitrotoluene	3.00 - 3.16	8270C	Hexachlorobenzene	3.00 - 3.16	8270C
Benzene	0.300	8260B	2-Chloronaphthalene	0.300 - 0.316	8270C	Hexachlorobutadiene	3.00 - 3.16	8270C
Bromodichloromethane	0.250	8260B	2-Chlorophenol	3.00 - 3.16	8270C	Hexachlorocyclopentadiene	3.00 - 3.16	8270C
Bromoform	0.250	8260B	2-Methylnaphthalene	0.300 - 0.316	8270C	Hexachloroethane	3.00 - 3.16	8270C
Bromomethane	0.300	8260B	2-Nitroaniline	3.00 - 3.16	8270C	Indeno(1,2,3-c,d)pyrene	0.300 - 0.316	8270C
Carbon disulfide	1.25	8260B	2-Nitrophenol	3.00 - 3.16	8270C	Isophorone	3.00 - 3.16	8270C
Carbon tetrachloride	0.300	8260B	3,3'-Dichlorobenzidine	3.00 - 3.16	8270C	Naphthalene	0.300 - 0.316	8270C
Chlorobenzene	0.250	8260B	3-Nitroaniline	3.00 - 3.16	8270C	Nitro-benzene	3.00 - 3.16	8270C
Chloroethane	0.300	8260B	4-Bromophenyl phenyl ether	3.00 - 3.16	8270C	Pentachlorophenol	3.00 - 3.16	8270C
Chloroform	0.250	8260B	4-Chloro-3-methylphenol	3.00 - 3.16	8270C	Phenanthrene	0.300 - 0.316	8270C
Chloromethane	0.300	8260B	4-Chlorobenzenamine	3.00 - 3.16	8270C	Phenol	3.00 - 3.16	8270C
Dibromochloromethane	0.300	8260B	4-Chlorophenyl phenyl ether	3.00 - 3.16	8270C	Pyrene	0.300 - 0.316	8270C
Ethyl benzene	0.250	8260B	4-Nitroaniline	3.00 - 3.16	8270C	bis(2-Chloroethoxy)methane	3.00 - 3.16	8270C
Methylene chloride	3.00	8260B	4-Nitrophenol	3.00 - 3.16	8270C	bis(2-Chloroethyl)ether	3.00 - 3.16	8270C
Styrene	0.250	8260B	Acenaphthene	0.300 - 0.316	8270C	bis(2-Ethylhexyl)phthalate	3.00 - 3.16	8270C
Tetrachloroethene	0.300	8260B	Acenaphthylene	0.300 - 0.316	8270C	bis-Chloroisopropyl ether	3.00 - 3.16	8270C
Toluene	0.250	8260B	Anthracene	0.300 - 0.316	8270C	m,p-Cresol	3.00 - 3.16	8270C
Trichloroethene	0.250	8260B	Benzo(a)anthracene	0.300 - 0.316	8270C	n-Nitrosodipropylamine	3.00 - 3.16	8270C
Vinyl acetate	1.50	8260B	Benzo(a)pyrene	0.300 - 0.316	8270C	o-Cresol	3.00 - 3.16	8270C
Vinyl chloride	0.500	8260B	Benzo(b)fluoranthene	0.300 - 0.316	8270C			
Xylene	0.300	8260B	Benzo(ghi)perylene	0.300 - 0.316	8270C			
cis-1,2-Dichloroethene	0.300	8260B	Benzo(k)fluoranthene	0.300 - 0.316	8270C			
cis-1,3-Dichloropropene	0.250	8260B	Butylbenzyl phthalate	3.00 - 3.16	8270C			
trans-1,2-Dichloroethene	0.300	8260B	Carbazole	0.300 - 0.316	8270C			
trans-1,3-Dichloropropene	0.250	8260B	Chrysene	0.300 - 0.316	8270C			

Refer to footnotes on page 10A-19.

Table 10A-2
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8321A),
Solid Waste Management Unit 68 Groundwater Investigation,
Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.104
1,3-Dinitrobenzene	0.104
2,4,6-Trinitrotoluene	0.104
2,4-Dinitrotoluene	0.104
2,6-Dinitrotoluene	0.104
2-Amino-4,6-dinitrotoluene	0.104
2-Nitrotoluene	0.106
3-Nitrotoluene	0.104
4-Amino-2,6-dinitrotoluene	0.104
4-Nitrotoluene	0.195
HMX	0.104
Nitro-benzene	0.104
Pentaerythritol tetranitrate	0.130
RDX	0.104
Tetryl	0.104

Refer to footnotes on pages 10A-15.

Table 10A-3
Summary of Nitrate plus Nitrite Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1 25-Oct-11	Nitrate plus nitrite as N	1.92	0.100	0.500	10.0	B		091335-018	EPA 353.2
OBS-MW2 26-Oct-11	Nitrate plus nitrite as N	0.0319	0.010	0.050	10.0	B, J	0.069U	091337-018	EPA 353.2
OBS-MW3 24-Oct-11	Nitrate plus nitrite as N	1.56	0.100	0.500	10.0	B		091342-018	EPA 353.2
OBS-MW3 (Duplicate) 24-Oct-11	Nitrate plus nitrite as N	1.61	0.100	0.500	10.0	B		091343-018	EPA 353.2

Refer to footnotes on page 10A-19.

Table 10A-4
Summary of Alkalinity, Anion, and Total Cyanide Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1	Bicarbonate Alkalinity	187	0.725	1.00	NE			091335-022	SM2320B
25-Oct-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091335-022	SM2320B
	Bromide	0.350	0.066	0.200	NE			091335-016	SW846 9056
	Chloride	21.4	0.330	1.00	NE			091335-016	SW846 9056
	Fluoride	2.17	0.033	0.100	4.0			091335-016	SW846 9056
	Sulfate	74.5	0.500	2.00	NE			091335-016	SW846 9056
	Total Cyanide	ND	0.0015	0.005	0.200	U		091335-027	SW846 9012
OBS-MW2	Bicarbonate Alkalinity	175	0.725	1.00	NE			091337-022	SM2320B
26-Oct-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091337-022	SM2320B
	Bromide	0.351	0.066	0.200	NE			091337-016	SW846 9056
	Chloride	21.6	0.330	1.00	NE			091337-016	SW846 9056
	Fluoride	2.26	0.033	0.100	4.0			091337-016	SW846 9056
	Sulfate	88.8	0.500	2.00	NE			091337-016	SW846 9056
	Total Cyanide	ND	0.0015	0.005	0.200	U		091337-027	SW846 9012
OBS-MW3	Bicarbonate Alkalinity	178	0.725	1.00	NE			091342-022	SM2320B
24-Oct-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091342-022	SM2320B
	Bromide	0.369	0.066	0.200	NE			091342-016	SW846 9056
	Chloride	21.8	0.330	1.00	NE			091342-016	SW846 9056
	Fluoride	2.29	0.033	0.100	4.0			091342-016	SW846 9056
	Sulfate	87.7	0.500	2.00	NE			091342-016	SW846 9056
	Total Cyanide	ND	0.0015	0.005	0.200	U		091342-027	SW846 9012
OBS-MW3 (Duplicate)	Bicarbonate Alkalinity	171	0.725	1.00	NE			091343-022	SM2320B
24-Oct-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091343-022	SM2320B
	Bromide	0.373	0.066	0.200	NE			091343-016	SW846 9056
	Chloride	22.2	0.330	1.00	NE			091343-016	SW846 9056
	Fluoride	2.32	0.033	0.100	4.0			091343-016	SW846 9056
	Sulfate	87.4	0.500	2.00	NE			091343-016	SW846 9056
	Total Cyanide	ND	0.0015	0.005	0.200	U		091343-027	SW846 9012

Refer to footnotes on page 10A-19.

Table 10A-5
Summary of Perchlorate Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1 25-Oct-11	ND	0.004	0.012	NE	U		091335-020	EPA 314.0
OBS-MW1 26-Oct-11	ND	0.004	0.012	NE	U		091337-020	EPA 314.0
OBS-MW1 24-Oct-11	ND	0.004	0.012	NE	U		091342-020	EPA 314.0
OBS-MW1 (Duplicate) 24-Oct-11	ND	0.004	0.012	NE	U		091343-020	EPA 314.0

Refer to footnotes on page 10A-19.

Table 10A-6
Summary of Hexavalent Chromium Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Hexavalent Chromium Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1 25-Oct-11	ND	0.003	0.010	NE	U		091335-014	SW846 7196A
OBS-MW2 26-Oct-11	ND	0.003	0.010	NE	U		091337-014	SW846 7196A
OBS-MW3 24-Oct-11	ND	0.003	0.010	NE	U		091342-014	SW846 7196A
OBS-MW3 (Duplicate) 24-Oct-11	0.00317	0.003	0.010	NE	J		091343-014	SW846 7196A

Refer to footnotes on page 10A-19.

Table 10A-7
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1	Aluminum	0.105	0.015	0.050	NE			091335-009	SW846 6020
25-Oct-11	Antimony	ND	0.001	0.003	0.006	U		091335-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091335-009	SW846 6020
	Barium	0.0249	0.0006	0.002	2.00			091335-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091335-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091335-009	SW846 6020
	Calcium	84.9	0.600	2.00	NE	B		091335-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091335-009	SW846 6020
	Cobalt	0.000175	0.0001	0.001	NE	J		091335-009	SW846 6020
	Copper	0.00177	0.00035	0.001	NE	B	0.0019U	091335-009	SW846 6020
	Iron	0.270	0.033	0.100	NE	B		091335-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091335-009	SW846 6020
	Magnesium	15.9	0.010	0.030	NE			091335-009	SW846 6020
	Manganese	0.0175	0.001	0.005	NE			091335-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	091335-009	SW846 7470
	Nickel	0.00222	0.0005	0.002	NE			091335-009	SW846 6020
	Potassium	2.57	0.080	0.300	NE			091335-009	SW846 6020
	Selenium	0.00424	0.0015	0.005	0.050	J		091335-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091335-009	SW846 6020
	Sodium	24.5	0.800	2.50	NE			091335-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091335-009	SW846 6020
	Uranium	0.0111	0.000067	0.0002	0.03	B		091335-009	SW846 6020
	Vanadium	0.00124	0.001	0.005	NE	J		091335-009	SW846 6010
	Zinc	0.0571	0.0035	0.010	NE			091335-009	SW846 6020

Refer to footnotes on page 10A-19.

Table 10A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW2	Aluminum	0.0248	0.015	0.050	NE	J		091337-009	SW846 6020
26-Oct-11	Antimony	ND	0.001	0.003	0.006	U		091337-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091337-009	SW846 6020
	Barium	0.0224	0.0006	0.002	2.00			091337-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091337-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091337-009	SW846 6020
	Calcium	81.3	0.600	2.00	NE	B		091337-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091337-009	SW846 6020
	Cobalt	0.000156	0.0001	0.001	NE	J		091337-009	SW846 6020
	Copper	0.00114	0.00035	0.001	NE	B	0.0019U	091337-009	SW846 6020
	Iron	0.236	0.033	0.100	NE	B	0.24U	091337-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091337-009	SW846 6020
	Magnesium	16.6	0.010	0.030	NE			091337-009	SW846 6020
	Manganese	0.00141	0.001	0.005	NE	J		091337-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	091337-009	SW846 7470
	Nickel	0.00221	0.0005	0.002	NE			091337-009	SW846 6020
	Potassium	1.88	0.080	0.300	NE			091337-009	SW846 6020
	Selenium	0.00418	0.0015	0.005	0.050	J		091337-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091337-009	SW846 6020
	Sodium	23.3	0.800	2.50	NE			091337-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091337-009	SW846 6020
	Uranium	0.0147	0.000067	0.0002	0.03	B		091337-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091337-009	SW846 6010
	Zinc	ND	0.0035	0.010	NE	U		091337-009	SW846 6020

Refer to footnotes on page 10A-19.

Table 10A-7 *(Continued)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW3	Aluminum	0.0426	0.015	0.050	NE	J		091342-009	SW846 6020
24-Oct-11	Antimony	ND	0.001	0.003	0.006	U		091342-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091342-009	SW846 6020
	Barium	0.0302	0.0006	0.002	2.00			091342-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091342-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091342-009	SW846 6020
	Calcium	86.1	0.600	2.00	NE	B		091342-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091342-009	SW846 6020
	Cobalt	0.00023	0.0001	0.001	NE	J		091342-009	SW846 6020
	Copper	0.00158	0.00035	0.001	NE	B	0.0019U	091342-009	SW846 6020
	Iron	0.216	0.033	0.100	NE	B	0.24U	091342-009	SW846 6020
	Lead	0.00103	0.0005	0.002	NE	J		091342-009	SW846 6020
	Magnesium	18.9	0.010	0.030	NE			091342-009	SW846 6020
	Manganese	0.00417	0.001	0.005	NE	J	0.0053U	091342-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	091342-009	SW846 7470
	Nickel	0.00225	0.0005	0.002	NE			091342-009	SW846 6020
	Potassium	1.83	0.080	0.300	NE			091342-009	SW846 6020
	Selenium	0.00428	0.0015	0.005	0.050	J		091342-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091342-009	SW846 6020
	Sodium	24.2	0.080	0.250	NE			091342-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091342-009	SW846 6020
	Uranium	0.0136	0.000067	0.0002	0.03	B		091342-009	SW846 6020
	Vanadium	0.00161	0.001	0.005	NE	J		091342-009	SW846 6010
	Zinc	0.0055	0.0035	0.010	NE	J		091342-009	SW846 6020

Refer to footnotes on page 10A-19.

Table 10A-7 *(Concluded)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW3 (Duplicate)	Aluminum	0.0273	0.015	0.050	NE	J		091343-009	SW846 6020
24-Oct-11	Antimony	ND	0.001	0.003	0.006	U		091343-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091343-009	SW846 6020
	Barium	0.0296	0.0006	0.002	2.00			091343-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091343-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091343-009	SW846 6020
	Calcium	82.4	0.600	2.00	NE	B		091343-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091343-009	SW846 6020
	Cobalt	0.000205	0.0001	0.001	NE	J		091343-009	SW846 6020
	Copper	0.00127	0.00035	0.001	NE	B	0.0019U	091343-009	SW846 6020
	Iron	0.218	0.033	0.100	NE	B	0.24U	091343-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091343-009	SW846 6020
	Magnesium	17.1	0.010	0.030	NE			091343-009	SW846 6020
	Manganese	0.00433	0.001	0.005	NE	J	0.0053U	091343-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	091343-009	SW846 7470
	Nickel	0.00171	0.0005	0.002	NE	J		091343-009	SW846 6020
	Potassium	1.75	0.080	0.300	NE			091343-009	SW846 6020
	Selenium	0.00369	0.0015	0.005	0.050	J		091343-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091343-009	SW846 6020
	Sodium	24.8	0.080	0.250	NE			091343-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091343-009	SW846 6020
	Uranium	0.0129	0.000067	0.0002	0.03	B		091343-009	SW846 6020
	Vanadium	0.00151	0.001	0.005	NE	J		091343-009	SW846 6010
	Zinc	0.00544	0.0035	0.010	NE	J		091343-009	SW846 6020

Refer to footnotes on page 10A-19.

Table 10A-8
Summary of Filtered Cation Results,
Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1	Calcium	80.5	0.600	2.00	NE	B		091335-017	SW846 6020
25-Oct-11	Magnesium	15.8	0.010	0.030	NE			091335-017	SW846 6020
	Potassium	1.97	0.080	0.300	NE			091335-017	SW846 6020
	Sodium	23.0	0.800	2.50	NE			091335-017	SW846 6020
OBS-MW2	Calcium	82.0	0.600	2.00	NE	B		091337-017	SW846 6020
26-Oct-11	Magnesium	16.1	0.010	0.030	NE			091337-017	SW846 6020
	Potassium	1.88	0.080	0.300	NE			091337-017	SW846 6020
	Sodium	22.9	0.800	2.50	NE			091337-017	SW846 6020
OBS-MW3	Calcium	81.7	0.600	2.00	NE	B		091342-017	SW846 6020
24-Oct-11	Magnesium	17.9	0.010	0.030	NE			091342-017	SW846 6020
	Potassium	1.80	0.080	0.300	NE			091342-017	SW846 6020
	Sodium	24.7	0.080	0.250	NE			091342-017	SW846 6020
OBS-MW3 (Duplicate)	Calcium	77.9	0.600	2.00	NE	B		091343-017	SW846 6020
24-Oct-11	Magnesium	16.3	0.010	0.030	NE			091343-017	SW846 6020
	Potassium	1.64	0.080	0.300	NE			091343-017	SW846 6020
	Sodium	25.0	0.080	0.250	NE			091343-017	SW846 6020

Refer to footnotes on page 10A-19.

Table 10A-9
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Isotopic Uranium Results, Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1	Americium-241	0.498 ± 17.4	25.5	12.5	NE	U	BD	091335-033	EPA 901.1
25-Oct-11	Cesium-137	-1.16 ± 1.84	3.02	1.45	NE	U	BD	091335-033	EPA 901.1
	Cobalt-60	-0.198 ± 1.93	3.42	1.61	NE	U	BD	091335-033	EPA 901.1
	Potassium-40	72.0 ± 28.3	33.1	15.5	NE	X	R	091335-033	EPA 901.1
	Gross Alpha	0.03	NA	NA	15	NA	None	091335-034	EPA 900.0
	Gross Beta	6.11 ± 1.73	2.02	0.978	4mrem/yr			091335-034	EPA 900.0
	Uranium-233/234	18.0 ± 2.53	0.109	0.0486	NE			091335-035	HASL-300
	Uranium-235/236	0.201 ± 0.074	0.0569	0.0213	NE			091335-035	HASL-300
	Uranium-238	3.40 ± 0.523	0.0481	0.0183	NE			091335-035	HASL-300
OBS-MW2	Americium-241	15.8 ± 13.8	19.1	9.34	NE	U	BD	091337-033	EPA 901.1
26-Oct-11	Cesium-137	0.781 ± 1.94	3.36	1.62	NE	U	BD	091337-033	EPA 901.1
	Cobalt-60	1.08 ± 2.05	3.71	1.76	NE	U	BD	091337-033	EPA 901.1
	Potassium-40	73.3 ± 40.2	34.5	16.2	NE		J	091337-033	EPA 901.1
	Gross Alpha	6.69	NA	NA	15	NA	None	091337-034	EPA 900.0
	Gross Beta	6.95 ± 1.86	2.03	0.983	4mrem/yr			091337-034	EPA 900.0
	Uranium-233/234	21.7 ± 3.02	0.0762	0.0341	NE			091337-035	HASL-300
	Uranium-235/236	0.260 ± 0.0727	0.0399	0.0149	NE			091337-035	HASL-300
	Uranium-238	3.95 ± 0.584	0.0337	0.0128	NE			091337-035	HASL-300
OBS-MW3	Americium-241	2.81 ± 3.21	4.64	2.27	NE	U	BD	091342-033	EPA 901.1
24-Oct-11	Cesium-137	-4.49 ± 5.06	5.64	2.75	NE	U	BD	091342-033	EPA 901.1
	Cobalt-60	1.06 ± 2.13	3.85	1.82	NE	U	BD	091342-033	EPA 901.1
	Potassium-40	18.6 ± 64.9	35.3	16.6	NE	U	BD	091342-033	EPA 901.1
	Gross Alpha	8.60	NA	NA	15	NA	None	091342-034	EPA 900.0
	Gross Beta	7.22 ± 2.09	2.39	1.16	4mrem/yr			091342-034	EPA 900.0
	Uranium-233/234	20.4 ± 2.83	0.0691	0.0309	NE			091342-035	HASL-300
	Uranium-235/236	0.296 ± 0.0744	0.0362	0.0135	NE			091342-035	HASL-300
	Uranium-238	3.80 ± 0.556	0.0306	0.0116	NE			091342-035	HASL-300

Refer to footnotes on page 10A-19.

Table 10A-9 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Isotopic Uranium Results, Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW3	Americium-241	0.555 ± 5.06	7.84	3.84	NE	U	BD	091343-033	EPA 901.1
24-Oct-11	Cesium-137	-0.372 ± 2.53	2.84	1.37	NE	U	BD	091343-033	EPA 901.1
	Cobalt-60	-1.36 ± 4.03	3.30	1.57	NE	U	BD	091343-033	EPA 901.1
	Potassium-40	-16.6 ± 37.6	37.7	18.1	NE	U	BD	091343-033	EPA 901.1
	Gross Alpha	6.52	NA	NA	15	NA	None	091343-034	EPA 900.0
	Gross Beta	5.82 ± 1.52	1.38	0.658	4mrem/yr			091343-034	EPA 900.0
	Uranium-233/234	19.8 ± 2.79	0.0839	0.0375	NE			091343-035	HASL-300
	Uranium-235/236	0.200 ± 0.0634	0.0439	0.0164	NE			091343-035	HASL-300
	Uranium-238	3.48 ± 0.527	0.0371	0.0141	NE			091343-035	HASL-300

Refer to footnotes on page 10A-19.

Table 10A-10
Summary of Field Water Quality Measurements[h], Solid Waste Management Unit 68 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
OBS-MW1	25-Oct-11	17.63	598	384.7	7.26	2.78	38.2	3.58
OBS-MW2	26-Oct-11	17.37	606	384.4	7.29	0.79	37.3	3.57
OBS-MW3	24-Oct-11	16.74	602	388.4	7.25	0.55	40.7	3.94

Refer to footnotes on page 10A-19.

Footnotes for Solid Waste Management Unit 68 Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table I-4)
- μg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-000, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems:
  15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table I-4).
  4 mrem/yr = any combination of beta and/or gamma-emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B = The analyte was detected in the blank above the effective MDL.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
NA = Not applicable.
U = Analyte is absent or below the method detection limit.
X = Uncertain identification for gamma spectroscopy analysis and/or peak not meeting identification criteria.

Footnotes for Solid Waste Management Unit 68 Groundwater Monitoring Tables (Concluded)

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	=	Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	=	The associated value is an estimated quantity.
None	=	No data validation for corrected gross alpha activity.
U	=	The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	=	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	=	The data are unusable, and resampling or reanalysis are necessary for verification.

[g]Analytical Method

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes,* EPA 600-4-79-020.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
- U.S. Department of Energy, Environmental Measurements Laboratory, 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.
- Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B.

Beckman LS5000TD Liquid Scintillation System Operation Manual, May 1988.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% Sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 10B
Solid Waste Management Unit 68
Hydrographs

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Attachment 10B Hydrographs

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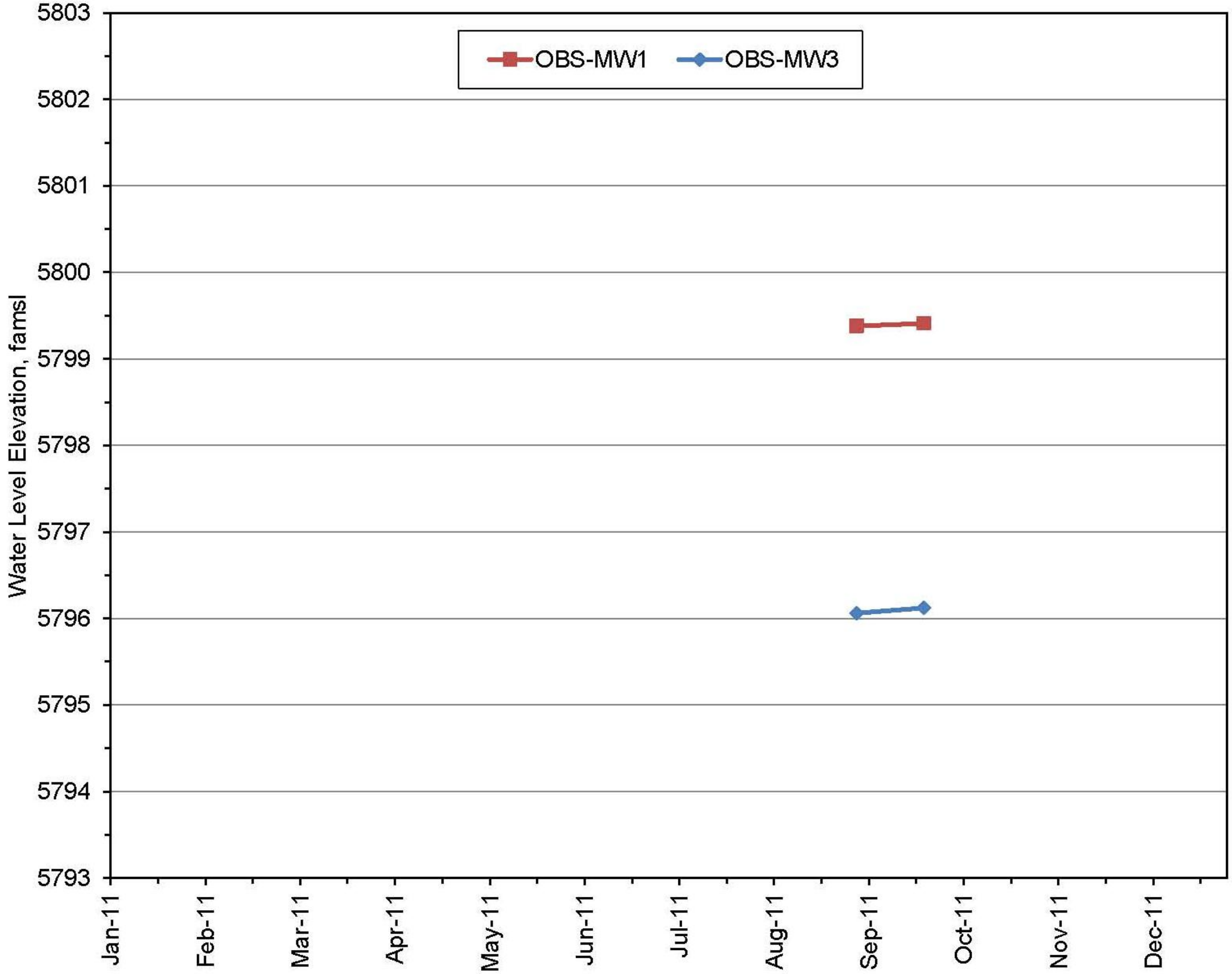

Figure 10B-1. SWMU 68 Study Area Wells (1 of 2)

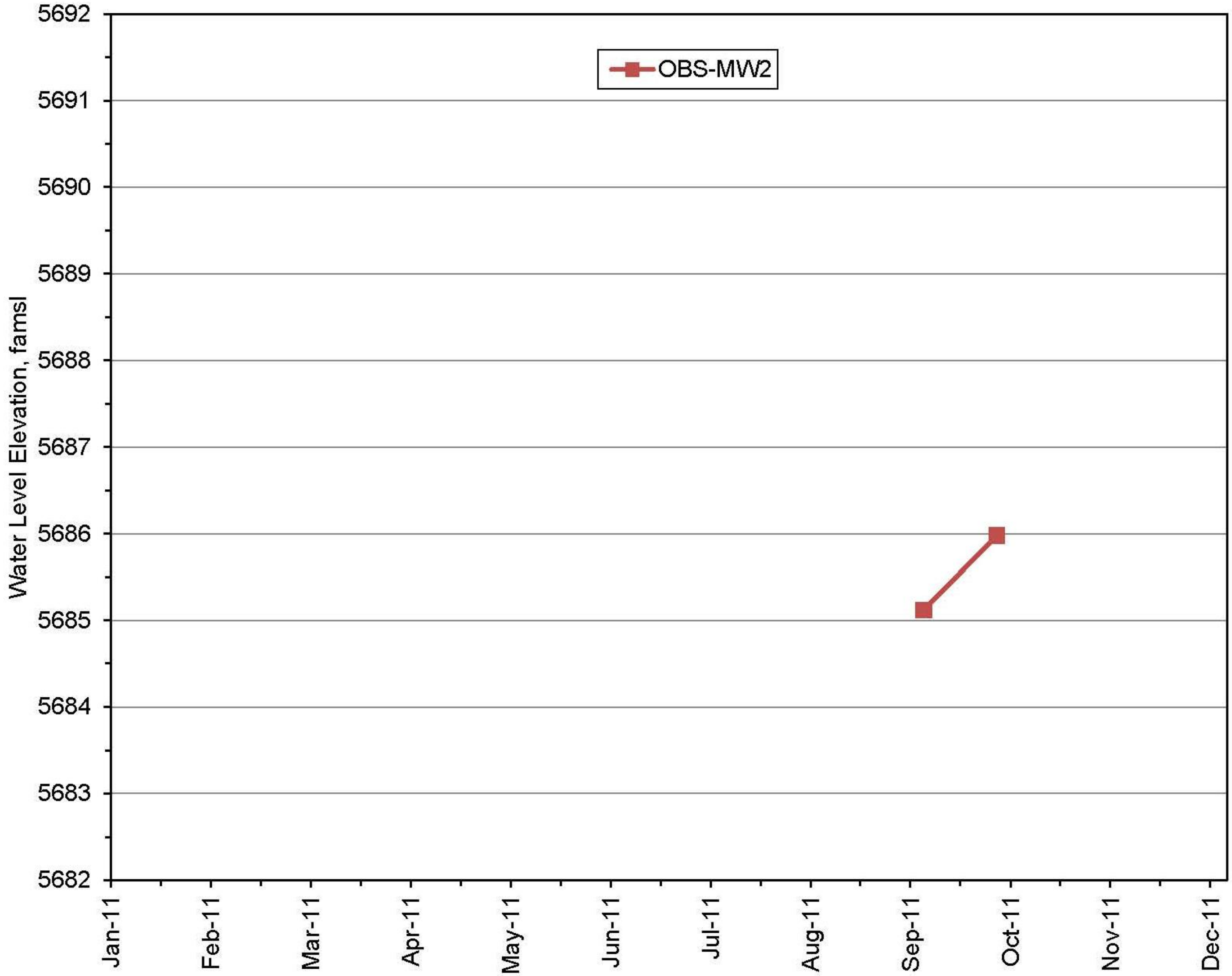

Figure 10B-2. SWMU 68 Study Area Wells (2 of 2)

11.0 Solid Waste Management Unit 116

11.1 Introduction

The Drain and Septic System (DSS) Solid Waste Management Unit (SWMU) 116 is located on the western margin of the Manzanita Mountains. Results for groundwater samples from the fractured bedrock have historically been reported as nondetected or detected at background concentrations for constituents of concern (COCs).

11.1.1 Location

Sandia National Laboratories, New Mexico (SNL/NM) manages the Coyote Canyon Test Area in the eastern portion of Kirtland Air Force Base (KAFB). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE) National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM.

SWMU 116 is located on the western margin of the Manzanita Mountain foothills within the U.S. Forest Service Withdrawn Area. The site lies in a minor southwesterly-sloping tributary that drains to the alluvial fan along the mountain front. This short tributary drains mountainous terrain immediately north and east of the site. Outcrops in the immediate area include Precambrian granite, gneiss, metarhyolite, and amphibolites that are unconformably overlain by Pennsylvanian limestone, sandstone, and conglomerate (SNL March 1993). Recent sediments include a thin discontinuous veneer of stream-deposited alluvium along the floor of the tributary and also colluvium on nearby hillsides. Vegetation in the vicinity consists predominantly of sparse juniper and pinon woodlands, low-lying shrubs (including sand sage, winter fat, saltbush, and rabbitbush), cacti (cholla, pincushion, strawberry, and prickly pear), and bunch grasses (grama, muhly, dropseed, and galleta) (SNL March 1993).

SWMU 116 contains five seepage pits on the south side of Building 9990. Four of the seepage pits were connected to a septic tank. A fifth seepage pit was connected directly to floor drains and a sink in the building. The site is located approximately 50 feet (ft) south of Building 9990 and covers 2,473 square feet (approximately 0.06 acres). The site elevation is 6,120 ft above mean sea level (amsl).

11.1.2 Site History

Building 9990, the Electroexplosive Research Facility, was constructed in 1969 and was used as an explosive test facility from 1969 to 1986 (Table 11-1). Explosive testing was discontinued in 1986 and no significant research activity has occurred there since 1994. Tests were conducted north of the building, and debris from the blasts, which often used depleted uranium, were dispersed over the nearby hillside.

Environmental concern about SWMU 116 is based on the potential release of COCs in sanitary waste or wastewater that discharged at the Building 9990 seepage pits. While in operation, the drain and septic system is estimated to have discharged approximately 60 to 600 gallons per day of sanitary waste and industrial wastewater. The DSS at SWMU 116 was removed from service in 1989, but remains in place. The 750-gallon septic tank is connected to a distribution box and four seepage pits, each 5 ft in diameter. Three of the four seepage pits are 13 ft deep, and the fourth is 11 ft deep. The septic system received sanitary waste from restrooms and possibly wastewater from floor drains (SNL March 1993).

Table 11-1. Historical Timeline of SWMU 116

Month	Year	Event	Reference
--	1969	Building 9990 and septic system constructed.	SNL June 1996
September	1987	SWMU 116 first identified as a potential release site.	SNL June 1996
--	1989	SWMU 116 septic tank pumped for the last time.	SNL June 1996
June	1992	Waste characterization samples collected from SWMU 116 septic tank.	SNL June 1996
March	1993	Septic Tanks and Drainfields (OU 1295) RCRA Facility Investigation Work plan submitted to the EPA.	SNL March 1993
March	1994	OU 1295 SAP prepared.	IT March 1994
--	1993-1995	Field Investigations and Voluntary Corrective Measures completed at SWMU 116.	SNL June 1996
June	1996	NFA proposal for SWMU 116 submitted to the NMED.	SNL June 1996
June	1998	NMED responded with an RSI on the SWMU 116 NFA proposal.	NMED June 1998
November	1998	Response submitted to the first NMED RSI for SWMU 116.	SNL November 1998
October	1999	A SAP describing technical procedures to be used for environmental investigations at DSS sites and AOCs submitted to the NMED.	SNL October 1999
January	2000	October 1999 DSS SAP approved by the NMED.	NMED January 2000
June	2000	NMED issued a second RSI on the SWMU 116 NFA proposal, and the first SNL/NM response for SWMU 116.	NMED June 2000
September	2000	Response submitted to the second NMED RSI for SWMU 116.	SNL September 2000
August	2001	Groundwater monitoring well CTF-MW1 installed near SWMU 116.	SNL June 2005
November	2001	Follow-up FIP documenting specific investigation procedures to be completed at DSS AOC sites submitted to the NMED.	SNL November 2001
February	2002	The DSS FIP approved by the NMED.	NMED February 2002
May	2004	Completion of eight quarters of groundwater sampling from monitoring well CTF-MW1.	SNL June 2005
June	2005	A third RSI response submitted to the NMED describing the results of environmental investigation work completed at SWMU 116 since the June 1996 NFA report that also included an updated risk assessment evaluation.	SNL June 2005
September	2005	NMED issues Certificate of Completion for CAC without Controls for SWMU 116.	NMED September 2005
March	2006	Request for Class III Permit Modification submitted. Public Notice meeting published. Documents supporting NFA (CAC) for DSS SWMU 116 compiled.	SNL March 2006
April	2010	NMED requires that CTF-MW1 be sampled annually as part of LTS requirements for SWMU 116.	NMED April 2010
March	2011	Well CTF-MW1 is sampled as part of LTS.	SNL February 2011a

NOTES:

AOC = Area of Concern.
CAC = Corrective Action Complete.
CTF = Coyote Test Field.
DSS = Drain and Septic System.
EPA = U.S. Environmental Protection Agency.
FIP = Field Implementation Plan.
LTS = Long Term Stewardship.
MW = monitoring well.
NFA = No Further Action.
NMED = New Mexico Environment Department.
OU = Operable Unit.
RCRA = Resource Conservation and Recovery Act.
RSI = Request for Supplemental Information.
SAP = Sampling and Analysis Plan.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid Waste Management Unit.

A fifth seepage pit received wastewater from the upstairs darkroom sink and from floor drains on the west side of the building. This seepage pit probably received the largest volume of contaminated wastewater. The pit is 13 ft deep and received photo-processing chemicals from an upstairs sink. Floor drains connected to the fifth seepage pit may have received polychlorinated biphenyl -contaminated capacitor oil that leaked from a bank of 72 capacitors. The floor drains may have also received methylene chloride that leaked from drums stored in the building. Small quantities of dilute copper sulfate from high-voltage water resistors may have been discharged to either the septic system or the fifth seepage pit.

11.1.3 Monitoring History

For the DSS investigation, Coyote Test Field (CTF) groundwater monitoring well CTF-MW1 (Figure 11-1) was installed in 2001. The well is located approximately 500 ft to the south and downslope of Building 9990. The ground surface at the wellhead is approximately 40 ft lower than the elevation at the site. The well is located along a small arroyo that directs storm water southwestward from the site to an alluvial fan adjoining the mountain front. The well is screened in fractured Precambrian granite at a depth of 240 to 260 ft below ground surface (bgs).

Monitoring well CTF-MW1 was sampled on a quarterly basis from July 2002 to May 2004 to acquire the eight quarters of groundwater data as required by the New Mexico Environment Department (NMED) in the June 2000 Request for Supplemental Information (NMED June 2000). After the eight quarters of data were collected, the well became part of the Groundwater Protection Program monitoring network and was sampled sporadically. Most recently, annual sampling at well CTF-MW1 has been reinstated based on NMED requirements (NMED April 2010).

11.1.4 Current Monitoring Network

Monitoring well CTF-MW1 is the only well in the SWMU 116 area. This well was installed in 2001 and monitors groundwater that migrates through fractured Precambrian granite.

11.1.5 Summary of Calendar Year 2011 Activities

The following activities were conducted for the SWMU 116 monitoring effort during Calendar Year (CY) 2011 (January through December 2011):

- Annual groundwater sampling was conducted at well CTF-MW1 in March 2011.
- Periodic groundwater elevation data were obtained from well CTF-MW1.
- Tables of analytical results (Attachment 11A) and a hydrograph (Attachment 11B) were prepared in support of this report.

11.1.6 Summary of Future Activities

The following activities are anticipated for SWMU 116 during CY 2012:

- Annual groundwater sampling will be conducted at well CTF-MW1.
- Periodic groundwater elevation data will be obtained from well CTF-MW1.

11.1.7 Current Conceptual Model

The following sections present an updated discussion of the hydrogeologic regime, conceptual site model, and contaminant findings for SWMU 116.

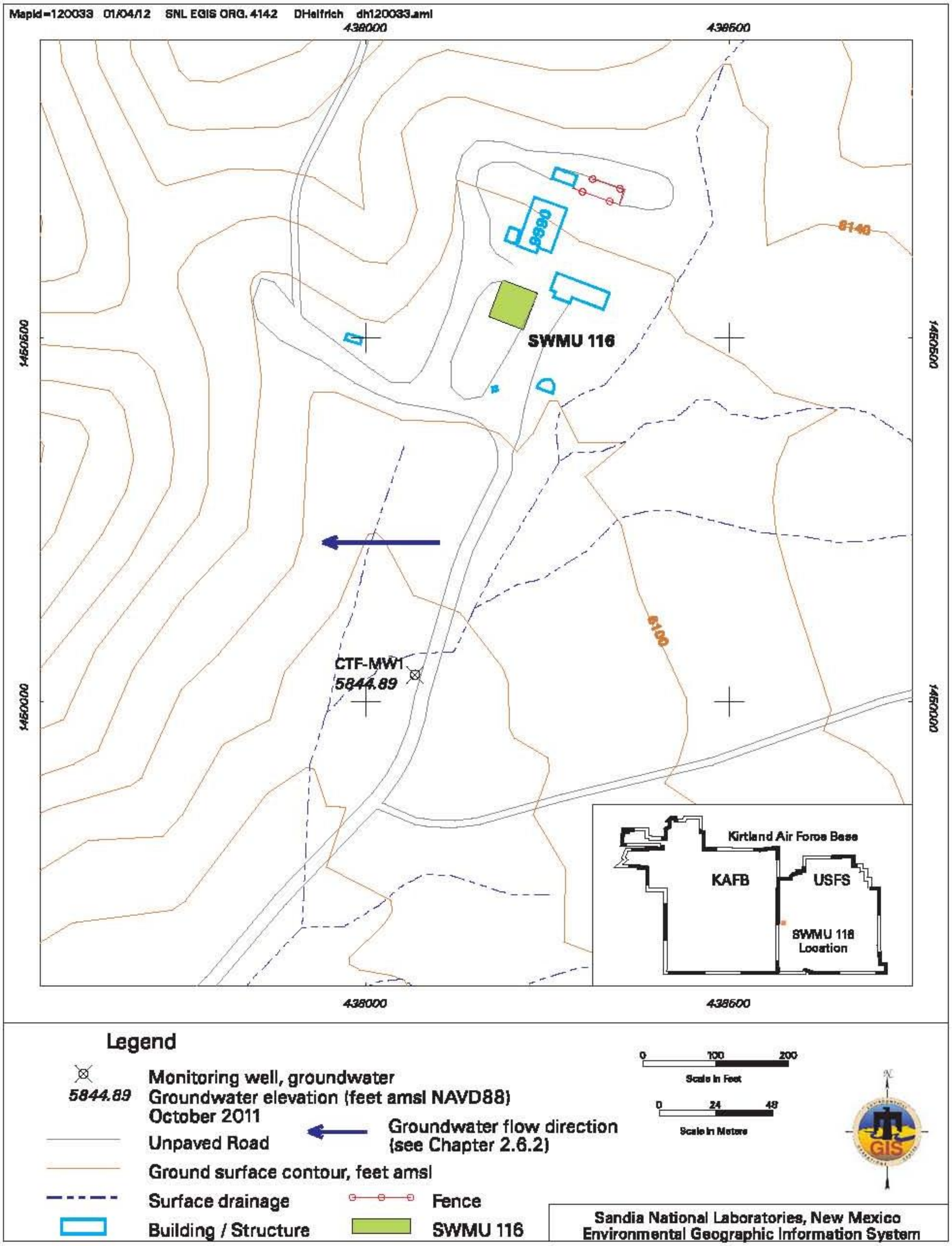

Figure 11-1. Location and Groundwater Elevation at SWMU 116

11.1.7.1 Regional Hydrogeologic Conditions

SWMU 116 is located on the western margin of the Manzanita Mountains (Plate 1). Alluvium covers the canyon floor where Building 9990 is located. The surrounding ridges consist of Precambrian outcrops (granite, gneiss, metarhyolite, and amphibolites) that are unconformably overlain by Paleozoic limestone, sandstone, and conglomerate. The outcrops are sporadically covered by colluvium. The base-wide potentiometric surface map (Plate 1) shows that groundwater flow in fractured bedrock is generally toward the west. No potable water-supply wells are located within 5 miles of the site.

11.1.7.2 Hydrogeologic Conditions at SWMU 116

SWMU 116 consists of five seepage pits near Building 9990 where sanitary waste and wastewater discharged from 1969 to 1989. The site is covered by colluvium that is underlain by bedrock. The site elevation is approximately 6,120 ft amsl (Figure 11-1). Overall, the terrain slopes to the southwest (Plate 1). No perennial surface-water features such as springs are located within 1 mile of SWMU 116. Monitoring well CTF-MW1 is located approximately 500 ft downslope of Building 9990. The ground surface at the wellhead is approximately 40 ft lower than at the site.

The amount of precipitation available for groundwater recharge at SWMU 116 is minimal due to scant rainfall and high evapotranspiration rates. Summer (monsoonal) thunderstorms are responsible for the majority of rainfall. The average rainfall, as measured at the nearest active rain gauge (the National Weather Service station at the Albuquerque International Sunport) during the period from 1915 through 2005 was 8.67 inches per year (in./yr) (WRCC-DRI 2012). The station is located 10 miles northwest of the SWMU 116 at an elevation of 5,310 ft amsl. By extrapolation of the precipitation model presented in SNL/NM conceptual model of groundwater flow and contaminant transport at the canyon area (SNL May 2004), the average annual precipitation for SWMU 116, where the elevation is approximately 6,120 ft amsl, is estimated to be approximately 11.5 in./yr. Intense sunlight and low humidity throughout much of the year creates high rates of evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

In 2001, a location downslope and downgradient of SWMU 116 was selected for the installation of groundwater monitoring well CTF-MW1. The well was installed in August 2001 using the air-rotary casing hammer drilling technique; the borehole was temporarily cased to 8 ft bgs. Dry alluvium consisting of silty sand and fine- to medium-gravel was encountered from the ground surface to 12 ft bgs. Competent (unfractured) Precambrian granite was encountered from 16 to 240 ft bgs. Groundwater was encountered at 240 bgs in slightly fractured granite. Water production increased steadily to the borehole total depth of 270 ft bgs. The well was screened from 240 to 260 ft bgs in fractured granite (Table 11-2).

Table 11-2. Lithologic and Hydrogeologic Elevation Data for Monitoring Well CTF-MW1 at SWMU 116

Monitoring Well	Ground Surface Elevation (ft amsl)	Depth of Screened Interval (ft bgs)	Elevation for Top of Screen (ft amsl)	Potentiometric Surface, October 2011 (ft amsl)	Mid-Point Screen Elevation (ft amsl)	Approximate Pressure Head (ft[a])
CTF-MW1	6079.70	240 – 260	5839.70	5844.89	5829.70	15

NOTES:
[a]From mid-point of screen.
amsl = Above mean sea level.
bgs = Below ground surface.
CTF = Coyote Test Field.
ft = Foot (feet).
MW = Monitoring Well.
SWMU = Solid Waste Management Unit.

The October 2011 groundwater elevation at well CTF-MW1 was 5844.89 ft amsl. Compared to the mid-point elevation of the screen, the pressure head was approximately 15 ft and is indicative of confined conditions. Based on the potentiometric surface depicted on Plate 1, the horizontal gradient is steep and on the order of approximately 0.02 feet per foot (ft/ft) near the well. Groundwater flows to the west through a fractured bedrock system.

During sampling, the drawdown in well CTF-MW1 is not excessive and the quantity of water produced is clearly adequate for low-flow sampling purposes. Groundwater samples are collected using a portable pneumatic (nitrogen-gas activated) Bennett™ piston pump.

The conceptual hydrogeologic model for SWMU 116 is based on the findings for monitoring well CTF-MW1, other wells located along the mountain front (Plate 1), and extensive field mapping conducted by the Site-Wide Hydrogeologic Characterization Project (GRAM and Lettis 1995). Groundwater in the SWMU 116 area occurs in a fractured bedrock system under confined conditions. During drilling, the depth to groundwater at well CTF-MW1 was approximately 240 ft bgs in a fractured interval of Precambrian quartzite. Groundwater in the bedrock predominantly moves through a confined low-permeability fracture system. A series of naturally filled fractures in the upper bedrock probably serves as a confining unit.

The potentiometric surface at well CTF-MW1 in October 2011 was approximately 5,845 ft amsl with approximately 15 ft of head. The amount of precipitation available for groundwater recharge at SWMU 116 is minimal due to the scant rainfall and high evapotranspiration rates. Historical water level data indicate that seasonal effects, primarily due to thunderstorms, rarely occur. The hydrograph (Figure 11B-1) shows that significant water level increases occurred only twice in the last 10 years. During 2002 through 2011, the overall trend was downward. For the last four years, the water level in well CTF-MW1 has declined at approximately 0.4 feet per year. Groundwater probably discharges to the unconsolidated basin-fill deposits (primarily the Santa Fe Group) of the Albuquerque Basin after crossing the Coyote, Tijeras, and Sandia Faults. The hydraulic gradient may be on the order of approximately 0.02 ft/ft near the well. No potable water-supply wells are located within 5 miles of the site.

11.1.7.3 Contaminant Sources

From 1969 to 1989, sanitary waste and wastewater discharged to five buried seepage pits near Building 9990. The sanitary waste and wastewater possibly contained photo-processing chemicals, high-explosive (HE) compounds, and volatile organic compounds (VOCs). The areas around the seepage pits were characterized by soil sampling as part of the DSS investigation.

11.1.7.4 Contaminant Distribution and Transport in Groundwater

No COCs exceeded applicable U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) (EPA 2009) in the CY 2011 groundwater samples collected from well CTF-MW1. No groundwater contamination is suspected at SWMU 116.

11.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM Environmental Restoration (ER) Operations (formerly ER Project) as well as implements and enforces federal regulations mandated by the Resource Conservation and Recovery Act (RCRA). All ER Operations SWMUs and Areas of Concern (AOCs) are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993). All corrective action requirements pertaining to SWMUs and AOCs are contained in the Compliance Order on Consent (the Order) between the DOE, Sandia, and NMED (April 2004).

The DOE/Sandia received a letter from the NMED on April 14, 2010, entitled *Class 3 Permit Modification Requests for Granting Corrective Action Complete status for 26 SWMUs/AOCs (Request of March 1, 2006) and 5 Other SWMUs/AOCs (Request of January 7, 2008), Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-06-007 and HWB-SNL-08-001* (NMED April 2010). The NMED's letter lists SWMU 116 under the heading of "SWMUs/AOCs to be Subject to Groundwater Monitoring Controls" and further states that pursuant to Section III.W.3.b of the Order, SWMU 116 requires long-term monitoring of groundwater on an annual basis as a site control. The NMED specified that for SWMU 116 the following analytes are to be monitored: general chemistry, VOCs, HE compounds, perchlorate, metals, cyanide, and nitrate plus nitrite (NPN).

11.3 Scope of Activities

The groundwater monitoring activities for SWMU 116 conducted during this reporting period consisted of the measurement of water levels and sampling and analysis as summarized in Table 11-3.

Table 11-3. Groundwater Monitoring Well Network and Sampling Dates for SWMU 116, Calendar Year 2011

Date of Sampling Event	Wells Sampled	SAP
March 2011	CTF-MW1	*SWMU 49 and 116 Groundwater Monitoring, Mini-SAP for Fiscal Year 2011* (SNL February 2011a)

NOTES:
CTF = Coyote Test Field.
MW = Monitoring Well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
SWMU = Solid Waste Management Unit.

The analytical parameters are listed in Table 11-4. Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, split, equipment blank (EB), and trip blank (TB) samples. (No duplicate environmental or EB sample was collected at well CTF-MW1 during the CY 2011 sampling event. Chapter 9.0, Section 9.3 discusses the results for these QC sample analyses performed for the associated sampling at CYN-MW5.) Field QC samples are used to monitor the sampling process. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. TB samples are used to determine whether VOCs inadvertently contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory.

11.4 Field Methods and Measurements

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

11.4.1 Groundwater Elevation

During CY 2011, water level measurements were obtained and used to evaluate the groundwater flow direction, hydraulic gradient, and fluctuations in the potentiometric surface. Water levels were periodically measured at well CTF-MW1, according to the instructions and requirements specified in

Table 11-4. Parameters Sampled at SWMU 116

Parameter	March 2011
Alkalinity (total, bicarbonate, carbonate) Anions Cations High Explosive Compounds NPN Perchlorate TAL Metals, plus Total Uranium Total Cyanide VOCs	CTF-MW1

NOTES:
CTF = Coyote Test Field.
MW = Monitoring Well.
NPN = Nitrate plus nitrate (reported as nitrogen).
SWMU = Solid Waste Management Unit.
TAL = Target Analyte List.
VOC = Volatile organic compound.

SNL/NM Field Operating Procedure (FOP) 03-02, *Groundwater Level Data Acquisition and Management* (SNL November 2009a and February 2011b). The groundwater elevation is shown on Figure 11-1 and depicted in the hydrograph presented on Figure 11B-1 (Attachment 11B).

11.4.2 Well Purging and Water Quality Measurements

A portable Bennett™ groundwater sampling system was used to collect the groundwater samples from well CTF-MW1. The well was purged a minimum of one saturated screen volume. Field water quality measurements for turbidity, pH, temperature, specific conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO) were recorded for the well, prior to the collection of groundwater samples according to SNL/NM FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements*, (SNL November 2009b). Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 Water Quality Meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter. In accordance with the Mini-Sampling and Analysis Plan (SAP) (Table 11-3), purging continued until four stable measurements for temperature, SC, pH, and turbidity were obtained.

Groundwater stability is typically considered acceptable when turbidity measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, pH is within 0.1 units, temperature is within 1.0 degrees Celsius, and SC is within 5 percent. The associated Field Measurement Logs documenting details of well purging and water quality measurements for each sampling event were submitted to the SNL/NM Records Center.

11.4.3 Pump Decontamination

The portable Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into the monitoring well in accordance with procedures described in *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination,* SNL/NM FOP 05-03 (SNL November 2009c).

11.4.4 Sample Collection Sampling Procedures

Groundwater samples are collected using the Bennett™ nitrogen gas-powered portable piston pump. Sample bottles are filled directly from the pump discharge line, with the VOC samples collected at the lowest achievable discharge rate.

11.4.5 Sample Handling and Shipment

The SNL/NM Sample Management Office (SMO) processes environmental samples collected by LTS/ER Operations. The SMO staff reviews the Mini-SAP (Table 11-3), orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminants are inadvertently introduced in laboratory processes and procedures. These include method blanks, laboratory control samples, matrix spike, matrix spike duplicate, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review,* SMO-05-03, Issue 03 (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007).

11.4.6 Waste Management

Purge and decontamination water generated from sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management*, (SNL November 2009d) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Results for associated environmental samples provide supplemental data for approval to discharge the purge water to the sanitary sewer. All data were compared with Albuquerque Bernalillo County Water Utility Authority discharge limits.

11.5 Analytical Methods

Groundwater samples were submitted to GEL Laboratories LLC for analysis. Samples were analyzed in accordance with applicable EPA analytical methods (Table 11-5).

Table 11-5. SWMU 116 Chemical Analytical Methods

Analyte	Analytical Method[a,b,c,d]
Alkalinity (total, bicarbonate, carbonate)	SM2320B
Anions	SW846-9056
Cations	SW846-6020/7470
High Explosive Compounds	SW846-8321A
NPN	EPA 353.2
Perchlorate	EPA 314.0
TAL Metals, plus Total Uranium	SW846-6020/7470
Total Cyanide	SW846-9012
VOCs	SW846-8260B

NOTES:

[a]EPA, 1990, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

[b]EPA, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.

[c]EPA, 1999, *Perchlorate in Drinking Water Using Ion Chromatography*, EPA 815/R-00-014.

[d]Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater,* 20th ed., Method 2320B.

EPA = U.S. Environmental Protection Agency.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard methods.
SW = Solid waste.
SWMU = Solid Waste Management Unit.
TAL = Target Analyte List.
VOC = Volatile organic compound.

11.6 Summary of Analytical Results

The following section discusses analytical results, exceedances of regulatory standards, and pertinent trends in COC concentrations. The analytical results and field measurements for the CY 2011 SWMU 116 sampling event are presented in Tables 11A-3 through 11A-7 (Attachment 11A). Data qualifiers are explained in the footnotes following Table 11A-7.

No VOCs were detected. The method detection limits (MDLs) for all analyzed VOCs are listed in Table 11A-1. No HE compounds were detected. The MDLs for all analyzed HE compounds are listed in Table 11A-2.

The analytical result for NPN (reported as nitrogen) is presented in Table 11A-3. NPN was detected at a concentration of 8.85 milligrams per liter (mg/L), which does not exceed the MCL of 10 mg/L.

The results for alkalinity, anion, cation, and total cyanide results are provided in Table 11A-4. No detections of the constituents exceed applicable MCLs.

The analytical result for perchlorate is presented in Table 11A-5. Currently, no MCL is established for perchlorate and perchlorate does not exceed the NMED-specified screening level/MDL of 4 micrograms per liter (NMED April 2004).

Total metal results are presented in Table 11A-6. No metals exceed established MCLs.

Field water quality parameters are measured during purging of the well prior to sampling and include temperature, SC, ORP, pH, turbidity, and DO. The parameter measurements obtained immediately prior to sample collection are presented in Table 11A-7.

11.7 Quality Control Results

Field and laboratory QC samples were prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. The following sections discuss site-specific QC results for the SWMU 116 annual sampling event.

11.7.1 Field Quality Control Samples

Field QC samples included a TB sample. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAP (SNL February 2011a).

11.7.1.1 Duplicate Environmental Samples

A duplicate environmental sample was not collected at well CTF-MW1 during this sampling event. (See discussion in Chapter 9.0, Sections 9.3 and 9.7.1 for the results for the duplicate environmental sample collected for the associated sampling at well CYN-MW5.)

11.7.1.2 Equipment Blank Samples

An EB sample was not collected at well CTF-MW1 during the CY 2011 sampling event. (See discussion in Chapter 9.0, Sections 9.3 and 9.7.1 for the results for the EB sample collected for the associated sampling at well CYN-MW5.)

11.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analysis to assess whether contamination of the samples has inadvertently occurred during shipment and storage. The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-milliliter volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. The TB sample was brought to the field and accompanied the sample shipment.

11.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including method blanks and duplicate laboratory control samples were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007). Laboratory data qualifiers are provided with the analytical results in Tables 11A-3 through 11A-6 (Attachment 11A).

11.8 Variances and Nonconformances

The following sections describe differences between planned work and actual work, findings of the data validation process, and any impacts to the schedule.

11.8.1 Variances and Nonconformances

No variances or nonconformances from field or sampling requirements as specified in the SWMU 116 groundwater monitoring Mini-SAP (SNL February 2011a) occurred during sampling activities.

11.8.2 Data Validation

Although some analytical results were qualified during the data validation process, no significant data quality problems were noted. Data validation qualifiers are provided with the analytical results in Tables 11A-3 through 11A-6 (Attachment 11A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center.

11.9 Summary and Conclusions

This section provides a brief summary of activities, discussion of COCs that exceed MCLs, trends of concentrations versus time, the current conceptual site model, and plans for studies to be completed during CY 2012 at the SWMU 116.

SWMU 116 is located in the western Manzanita Mountains. Groundwater investigations were initiated in 2001 at the request of the NMED to evaluate the DSS associated with Building 9990. The one monitoring well at SWMU 116 (CTF-MW1) was sampled in March 2011, and the sample was analyzed for VOCs, HE compounds, NPN, alkalinity (total, bicarbonate, carbonate), anions, cations, perchlorate, Target Analyte List metals (plus total uranium), and total cyanide. Analytical results were compared with EPA MCL guidelines for drinking water (EPA 2009). No parameters were detected above established MCLs in the groundwater sample.

The analytical results for CY 2011 are consistent with historical concentrations. The conceptual model described in Section 11.1.7 was updated to more accurately discuss the hydrogeologic regime. The model does not require modification based on the analytical results for this reporting period.

During CY 2012, annual groundwater sampling will continue at well CTF-MW1 during the first quarter of CY 2012. Periodic monitoring of groundwater elevations will also be conducted.

11.10 References

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Attachment 11A
Solid Waste Management Unit 116
Analytical Results Tables

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Attachment 11A Tables

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Table 11A-1
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] SW846-8260), Solid Waste Management Unit 116 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.325
1,1,2,2-Tetrachloroethane	0.250
1,1,2-Trichloroethane	0.250
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.250
1,2-Dichloropropane	0.250
2-Butanone	1.25
2-Hexanone	1.25
4-methyl-, 2-Pentanone	1.25
Acetone	3.50
Benzene	0.300
Bromodichloromethane	0.250
Bromoform	0.250
Bromomethane	0.300
Carbon disulfide	1.25
Carbon tetrachloride	0.300
Chlorobenzene	0.250
Chloroethane	0.300
Chloroform	0.250
Chloromethane	0.300
Dibromochloromethane	0.300
Ethyl benzene	0.250
Methylene chloride	3.00
Styrene	0.250
Tetrachloroethene	0.300
Toluene	0.250
Trichloroethene	0.250
Vinyl acetate	1.50
Vinyl chloride	0.500
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.250
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.250

Refer to footnotes on page 11A-13.

Table 11A-2
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8321A), Solid Waste Management Unit 116 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.104
1,3-Dinitrobenzene	0.104
2,4,6-Trinitrotoluene	0.104
2,4-Dinitrotoluene	0.104
2,6-Dinitrotoluene	0.0779
2-Amino-4,6-dinitrotoluene	0.104
2-Nitrotoluene	0.104
3-Nitrotoluene	0.104
4-Amino-2,6-dinitrotoluene	0.104
4-Nitrotoluene	0.104
HMX	0.104
Nitro-benzene	0.104
Pentaerythritol tetranitrate	0.130
RDX	0.104
Tetryl	0.130

Refer to footnotes on page 11A-13.

Table 11A-3
Summary of Nitrate plus Nitrite Results,
Solid Waste Management Unit 116 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW1 07-Mar-11	Nitrate plus nitrite as N	8.85	0.100	0.500	10.0			090227-018	EPA 353.2

Refer to footnotes on page 11A-13.

Table 11A-4
Summary of Alkalinity, Anion, Cation, and Total Cyanide Results, Solid Waste Management Unit 116 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW1	Bicarbonate Alkalinity	198	0.725	1.00	NE	B		090227-022	SM2320B
07-Mar-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090227-022	SM2320B
	Bromide	0.619	0.066	0.200	NE			090227-016	SW846 9056
	Chloride	44.4	0.330	1.00	NE			090227-016	SW846 9056
	Fluoride	1.43	0.033	0.100	4.0			090227-016	SW846 9056
	Sulfate	85.9	0.500	2.00	NE	B		090227-016	SW846 9056
	Calcium (filtered)	99.8	0.600	2.00	NE			090227-017	SW846 6020
	Magnesium (filtered)	20.6	0.010	0.030	NE			090227-017	SW846 6020
	Potassium (filtered)	1.81	0.080	0.300	NE			090227-017	SW846 6020
	Sodium (filtered)	30.4	0.080	0.250	NE			090227-017	SW846 6020
	Total Cyanide	ND	0.0017	0.005	0.200			090227-027	SW846 9012A

Refer to footnotes on page 11A-13.

Table 11A-5
Summary of Perchlorate Results,
Solid Waste Management Unit 116 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW1 07-Mar-11	ND	0.004	0.012	NE	U		090227-020	EPA 314.0

Refer to footnotes on page 11A-13.

Table 11A-6
Summary of Total Metal Results,
Solid Waste Management Unit 116 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW1	Aluminum	0.0179	0.015	0.050	NE	B, J	0.077U	090227-009	SW846 6020
07-Mar-11	Antimony	ND	0.001	0.003	0.006	U		090227-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090227-009	SW846 6020
	Barium	0.0512	0.0006	0.002	2.00			090227-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090227-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090227-009	SW846 6020
	Calcium	101	0.600	2.00	NE			090227-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090227-009	SW846 6020
	Cobalt	0.000415	0.0001	0.001	NE	J		090227-009	SW846 6020
	Copper	0.000821	0.00035	0.001	NE	J		090227-009	SW846 6020
	Iron	0.688	0.033	0.100	NE			090227-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090227-009	SW846 6020
	Magnesium	20.9	0.010	0.030	NE			090227-009	SW846 6020
	Manganese	0.00147	0.001	0.005	NE	J		090227-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090227-009	SW846 7470
	Nickel	0.00309	0.0005	0.002	NE		J	090227-009	SW846 6020
	Potassium	1.78	0.080	0.300	NE			090227-009	SW846 6020
	Selenium	0.00534	0.0015	0.005	0.050			090227-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090227-009	SW846 6020
	Sodium	31.0	0.080	0.250	NE			090227-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090227-009	SW846 6020
	Uranium	0.0112	0.000067	0.0002	0.03			090227-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090227-009	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		090227-009	SW846 6020

Refer to footnotes on page 11A-13.

Table 11A-7
Summary of Field Water Quality Measurements[h], Solid Waste Management Unit 116 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CTF-MW1	07-Mar-11	16.31	634	411.0	7.38	0.43	71.7	7.02

Refer to footnotes on page 11A-13.

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Footnotes for Solid Waste Management Unit 116 Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- µg/L = micrograms per liter.
- mg/L = milligrams per liter.

[b]MDL

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

[c]PQL

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-000, May 2009.
- NE = not established.

[e]Laboratory Qualifier

B = The analyte was detected in the blank above the effective MDL.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = Analyte is absent or below the method detection limit.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.
J = The associated value is an estimated quantity.
U = The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

[g]Analytical Method

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1984, *Methods for Chemical Analysis of Water and Wastes*, EPA 600-4-79-020.
- Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C = degrees Celsius.
% Sat = percent saturation.
µmho/cm = micromhos per centimeter.
mg/L = milligrams per liter.
mV = millivolts.
NTU = nephelometric turbidity units.
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration).

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Attachment 11B
Solid Waste Management Unit 116
Hydrographs

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Attachment 11B Hydrographs

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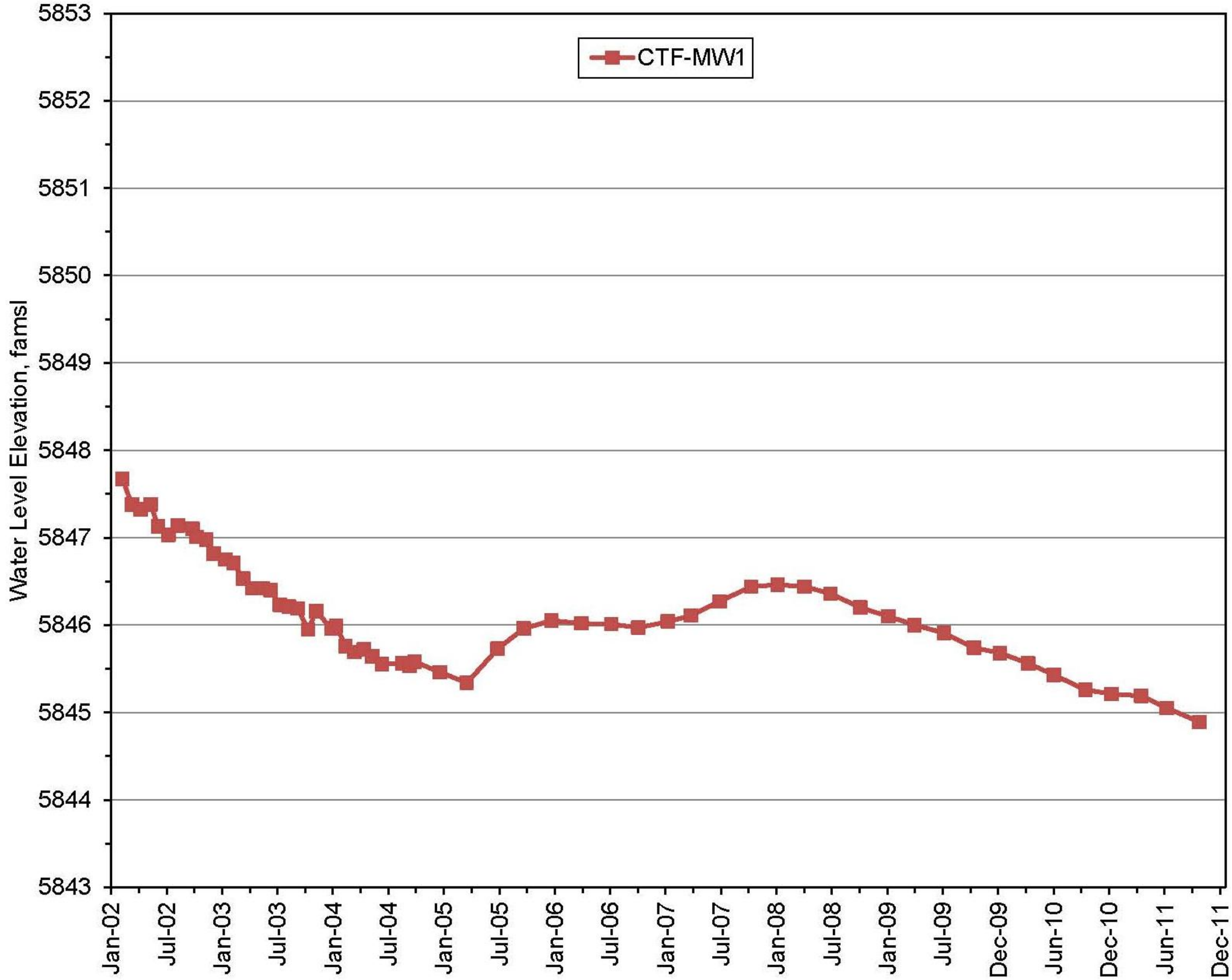

Figure 11B-1. SWMU 116 Study Area Well

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12.0 Solid Waste Management Unit 149

12.1 Introduction

This chapter summarizes Calendar Year (CY) 2011 quarterly groundwater sampling events for Coyote Test Field (CTF) monitoring well CTF-MW3, located near Solid Waste Management Unit (SWMU) 149 at Sandia National Laboratories, New Mexico (SNL/NM). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE) National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

This supplemental groundwater monitoring at CTF-MW3 is designed to address the requirements of Section VII.D.6 of the Compliance Order on Consent (the Order) (NMED April 2004) and the letter dated April 8, 2010, from the New Mexico Environment Department (NMED) Hazardous Waste Bureau (NMED April 2010).

Monitoring well CTF-MW3 was sampled on March 9, June 3, September 23, and December 8, 2011. The CY 2011 groundwater samples were collected in accordance with the NMED-approved Sampling and Analysis Plan (SAP) (SNL June 2010). The samples from CTF-MW3 were analyzed for all required constituents, consisting of volatile organic compounds (VOCs), Target Analyte List (TAL) metals (including selenium), general chemistry parameters, perchlorate, and nitrate plus nitrite (NPN).

Analytical results for the CY 2011 groundwater samples were compared with the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) for drinking water (EPA 2009). No analytical results for the CTF-MW3 groundwater samples exceed the corresponding MCLs. Detailed results for all quarterly sampling events are discussed in Section 12.6. During CY 2012, quarterly groundwater sampling of monitoring well CTF-MW3 will continue at SWMU 149.

12.1.1 Location

SWMU 149, the Building 9930 Septic System at SNL/NM, is located in the CTF on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the DOE. Monitoring well CTF-MW3 (Figure 12-1) is located approximately 290 feet (ft) to the west and downgradient of SWMU 149 and is screened in Precambrian bedrock.

12.1.2 Site History

Building 9930 was constructed in 1961 (SNL March 1993), and it is assumed that the septic system was constructed at the same time. The building included a darkroom, laboratory and shop area, bathroom, and a compressor room. These areas were served by a septic system consisting of one 750-gallon septic tank and a 4-ft-diameter seepage pit with a gravel bottom that is 7 ft below ground surface (bgs).

In the past, the following operations contributed to the waste at Building 9930 and may have resulted in uncontrolled releases of waste to the environment from Building 9930: photographic reproduction, explosives testing, and general laboratory operations. Photographic chemicals, including alkaline-based developers, acetic acid, ammonium thiosulfate fixer, and small quantities of sulfuric acid associated with photographic reproduction, were disposed of directly into the septic system. Explosives testing was performed adjacent to the building in a concrete-bunkered area that contains no drains. SWMU 149 was first listed as a potential release site in 1987 (SNL June 1996) because sanitary and industrial wastes may have been discharged to septic tanks and drain fields during past operations.

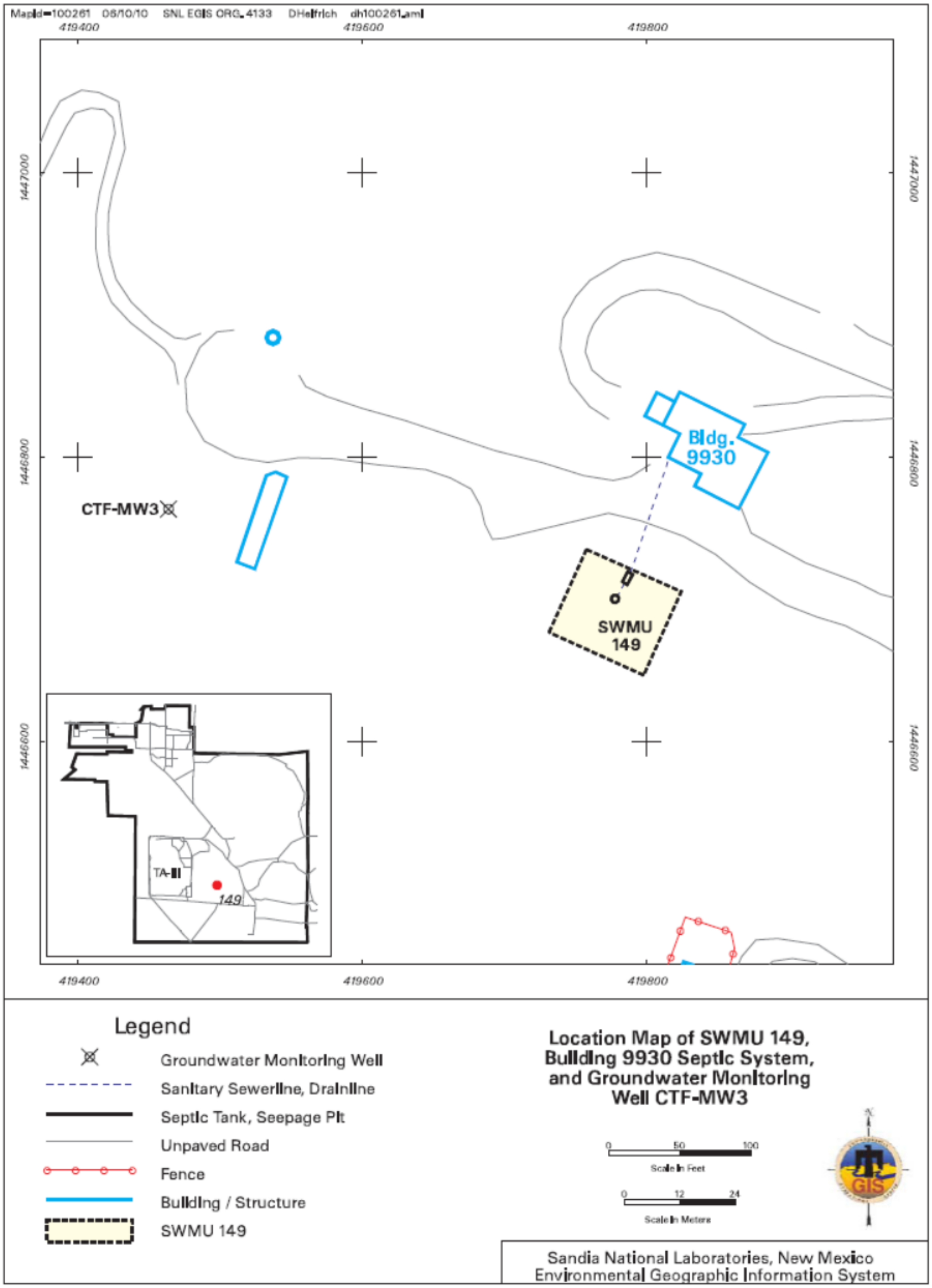

Figure 12-1. Location of Monitoring Well CTF-MW3 near SWMU 149

By 1993, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones July 1993). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003). Waste in the septic tank was removed and managed according to SNL/NM policy. The empty and decontaminated septic tank was inspected by the NMED and a closure form was signed (SNL November 1995). The septic tank and seepage pit were then backfilled with clean, native soil from the area in early 1996 (Table 12-1).

Table 12-1. Historical Timeline of SWMU 149

Month	Year	Event	Reference
	1961	Building 9930 was constructed, and it is assumed that the septic system was constructed at the same time.	SNL June 1996
April	1987	SWMU 149 first identified as a potential release site.	SNL June 1996
June	1992	Waste characterization samples collected from SWMU 149 septic tank.	SNL June 1996
	1993	Building 9930 connected to the City of Albuquerque sanitary sewer system. The old septic system line was disconnected and capped, and the system was abandoned in place. Waste in the septic tank was removed and managed according to SNL/NM policy.	Jones July 1993, Romero September 2003, SNL June 1996
March	1993	Septic Tanks and Drainfields (OU 1295) RCRA Facility Investigation Work Plan submitted.	SNL March 1993
March	1994	OU 1295 SAP prepared.	IT March 1994
April	1994	Additional waste characterization samples collected from SWMU 149 septic tank.	SNL June 1996
July	1994	A PETREX™ passive soil vapor survey completed in the septic system at SWMU 149 to identify any releases of VOCs and SVOCs from the seepage pit that may have occurred.	SNL June 1996
September	1994	EPA provided comments on the March 1993 OU 1295 work plan as an NOD.	EPA September 1994
October	1994	Backhoe used at SWMU 149 to determine depth to shallow bedrock at the site.	SNL June 1996
November	1994	Response to the September 1994 EPA NOD submitted.	SNL November 1994
November	1994	Additional waste characterization samples collected from SWMU 149 septic tank.	SNL June 1996
January	1995	Confirmatory soil samples collected from four borings next to the septic tank and seepage pit at SWMU 149.	Field logs
November	1995	The empty and decontaminated septic tank was inspected by the NMED, and a closure form was signed.	SNL November 1995
June	1996	Proposal for NFA ER Project Site 149, Building 9930 Septic System OU 1295 submitted.	SNL June 1996
June	1998	NMED responded with RSI on the SWMU 149 NFA proposal.	NMED June 1998
November	1998	SNL/NM ER Project submitted the first response to the first NMED RSI for SWMU 149.	SNL November 1998
October	1999	A SAP describing technical procedures to be used to complete environmental investigations at SWMU 149 submitted to the NMED for review and approval.	SNL October 1999
January	2000	SAP approved by NMED.	NMED January 2000
June	2000	NMED issued a second RSI.	NMED June 2000
September	2000	SNL/NM ER Project response to the second RSI submitted to NMED.	SNL September 2000
August	2001	Groundwater monitoring well CTF-MW3 installed near SWMU 149.	SNL June 2005
November	2001	An FIP documenting specific investigation procedure to be completed at SWMU 149 submitted to the NMED.	SNL November 2001
February	2002	The FIP approved by the NMED.	NMED February 2002

Table 12-1. Historical Timeline of SSWMU 149 *(Concluded)*

Month	Year	Event	Reference
	2002-2004	Monitoring well CTF-MW3 was sampled on a quarterly basis from July 2002 to June 2004 to acquire the eight quarters of groundwater data required by the NMED.	SNL June 2005
October	2002	One additional high explosive compound soil sample collected from one boring beneath the former seepage pit at SWMU 149.	SNL June 2005
June	2005	Third RSI response to RSI and CAC Proposal submitted to NMED.	SNL June 2005
September	2005	NMED issues Certificate of Completion for CAC without Controls for SWMU 149.	NMED September 2005
March	2006	Request for Class III Permit Modification submitted.	SNL March 2006
April	2010	Letter from NMED formally stating that additional corrective action is needed at SWMU 149 and the specific requirements for what the additional corrective action should entail.	NMED April 2010
June	2010	SWMU 149 SAP submitted to NMED.	SNL June 2010
December	2010	SAP approved by the NMED.	NMED December 2010
March	2011	Quarterly sampling of CTF-MW3 reinitiated.	

NOTES:

CAC = Corrective Action Complete.
CTF = Coyote Test Field.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
FIP = Field Implementation Plan.
MW = Monitoring Well.
NFA = No Further Action.
NMED = New Mexico Environment Department.
NOD = Notice of Deficiency.
OU = Operable Unit.
RCRA = Resource Conservation and Recovery Act.
RSI = Request for Supplemental Information.
SAP = Sampling and Analysis Plan.
SNL/NM = Sandia National Laboratories, New Mexico.
SVOC = Semivolatile organic compound.
SWMU = Solid Waste Management Unit.
VOC = Volatile organic compound.

In June 1996, a No Further Action proposal was submitted to the NMED for SWMU 149 (SNL June 1996) to which the NMED responded with a Request for Supplemental Information (RSI) (NMED June 1998). The general and site-specific comments were addressed in the Environmental Restoration (ER) Project Responses to the RSI in November 1998 (SNL November 1998). Negotiations were in process after the RSI response submittal, and a SAP (SNL October 1999) was prepared that documented investigations planned for SWMU 149. The plan was approved by the NMED in January 2000 (NMED January 2000).

After the October 1999 SAP was submitted, the NMED issued a second RSI (NMED June 2000) that required additional samples for high explosive (HE) compound analysis be collected. If these samples could not be collected as specified in the SAP (SNL October 1999), a downgradient groundwater monitoring well would be required. The SNL/NM ER Project responded to this second RSI (SNL September 2000) and agreed to collect additional samples for HE compound analysis, as well as install a groundwater monitoring well at a location agreed upon by the NMED. Groundwater samples would be collected from this well for a minimum of eight quarters and analyzed for VOCs, Resource Conservation and Recovery Act (RCRA) metals, cyanide, and HE compounds.

Technical details for soil sampling procedures, soil sampling locations, laboratory analytical methods, and passive soil-vapor sampling requirements at SWMU 149 were specified in a follow-up Field Implementation Plan (SNL November 2001) that was approved by the NMED (February 2002).

Groundwater monitoring well CTF-MW3 was installed near SWMU 149 in August 2001 and sampled on a quarterly basis from July 2002 to June 2004 to acquire the eight quarters of groundwater data required by the NMED. Analytical results for these sampling events were included in a third RSI response and Corrective Action Complete (CAC) proposal submitted to the NMED (SNL June 2005).

In September 2005, the NMED issued a Certificate of Completion for CAC without Controls for SWMU 149 (NMED September 2005). In March 2006, DOE/Sandia requested a Class III Permit Modification (SNL March 2006). In April 2010, the NMED responded to the Permit Modification Request with a letter requiring further corrective action at SWMU 149 (NMED April 2010) in the form of an additional eight quarters of groundwater monitoring at CTF-MW3. In June 2010, DOE/Sandia submitted a SAP for CTF-MW3 (SNL June 2010), which the NMED approved (NMED December 2010). Quarterly groundwater sampling was reinitiated at CTF-MW3 in CY 2011, and the analytical results are presented in this report (Section 12.6).

12.1.3 Monitoring History

Groundwater monitoring well CTF-MW3 was installed in August 2001 and sampled on a quarterly basis from July 2002 to June 2004 to acquire the eight quarters of groundwater data required by the NMED. The groundwater samples were analyzed for VOCs, HE compounds, RCRA metals, and cyanide. Although not required by the NMED, additional samples were also collected and analyzed for NPN and anions and cations. These additional samples were collected to further characterize the general ion chemistry of groundwater in this well and for purge-water waste characterization purposes. Results for the eight quarters of groundwater sampling are as follows:

- **VOCs:** Trace amounts of five VOCs were detected in the groundwater samples collected. Acetone was detected in the July 2002 sample. Bromodichloromethane was detected in two samples collected in March and June 2004. Dibromochloromethane was detected during three of the eight sampling events. Chloroform was detected in samples collected during six of the eight sampling events. Toluene was detected in the sample collected in June 2004 and the associated trip blank (TB) sample. No other VOCs were detected in the TB samples associated with these samples.

- **HE Compounds:** A trace amount of 2-amino-4,6-dinitrotoluene was detected in the sample collected in July 2002. No HE compounds were detected in any subsequent groundwater sample collected from this well.

- **RCRA Metals:** Selenium was detected in all eight groundwater samples, slightly above background levels. All other metal concentrations were below both background levels and promulgated regulatory limits.

- **Total Cyanide, NPN, Anions, and Cations:** Cyanide was detected in one of the eight samples collected. NPN was detected at concentrations slightly above background in the first five samples collected. The fluoride detected is most likely naturally occurring. None of the known activities conducted at Building 9930 would have produced a discharge of fluoride contamination to the environment.

12.1.4 Current Monitoring Network

Currently, one groundwater monitoring well is installed at SWMU 149 (Figure 12-1). CTF-MW3 is being monitored quarterly for VOCs, TAL metals, general chemistry parameters, perchlorate, and NPN.

12.1.5 Summary of Calendar Year 2011 Activities

The following activities occurred for monitoring well CTF-MW3 near SWMU 149 during CY 2011 (January through December 2011):

- Quarterly groundwater sampling was conducted at CTF-MW3 in March, June, September, and December 2011.
- Quarterly reporting of analytical results for CTF-MW3 was conducted.
- Tables of analytical results (Attachment 12A) and a hydrograph (Attachment 12B) were prepared in support of this report.

12.1.6 Summary of Future Activities

The following activities are anticipated for monitoring well CTF-MW3 near SWMU 149 during CY 2012:

- Quarterly groundwater sampling will be conducted at CTF-MW3, thus completing the regulatory requirement for groundwater characterization.
- Quarterly and annual reporting of analytical results for CTF-MW3 will be performed.

12.1.7 Current Conceptual Model

For the resumption of quarterly groundwater sampling at well CTF-MW3, this section presents a revised discussion of the hydrogeologic regime, conceptual site model, and contaminant findings for SWMU 149.

12.1.7.1 Regional Hydrogeologic Conditions

SWMU 149 is located in the Travertine Hills within the western portion of the CTF. The site is located between the Sandia and Tijeras faults. One splay of the Tijeras Fault is exposed about 800 ft south of the site. Nearby outcrops are composed of the Sandia Formation (carbonate cemented sandstone and conglomerate), Madera Group limestone, and Precambrian quartzite and granite (GRAM and Lettis 1995). The base-wide potentiometric surface map (Plate 1) shows that groundwater flow in the regional aquifer is generally toward the west. Faults in the vicinity of the site may serve as hydraulic barriers or conduits depending on the type and amount of fault gouge. No potable water-supply wells are located within 4 miles of the site.

12.1.7.2 Hydrogeologic Conditions at SWMU 149

SWMU 149 covers 4,686 square feet (approximately 0.1 acres) and is located approximately 70 ft southwest of Building 9930 and approximately 0.8 miles east of Technical Area III. The site is covered with an approximately 12- to 16-foot-thick layer of soil and colluvium that is underlain by caliche and bedrock. SWMU 149 consists of an inactive septic system that was used from 1961 to 1993. Building 9930 is located in a notch of the Travertine Hills at an elevation of approximately 5,520 ft above mean sea level (amsl). The surrounding area is moderately rugged and sparsely vegetated by bunch grasses, cacti, and a few junipers. Monitoring well CTF-MW3 is located approximately 290 ft west of the site on the floor of a shallow arroyo. The arroyo channel slopes down to the west. No perennial surface-water features such as springs are located within 1 mile of SWMU 149.

The amount of precipitation available for groundwater recharge is minimal due to scant rainfall and high evapotranspiration. Summer (monsoonal) thunderstorms are responsible for the majority of rainfall. The average rainfall, as measured at the nearest active rain gauge (the National Weather Service station at the Albuquerque International Sunport), during the period from 1915 through 2005 was 8.67 inches per year (in./yr) (WRCC-DRI 2012). The station is located 7.2 miles northwest of the site at an elevation of 5,310 ft amsl, which is similar enough to the site elevation to infer that the annual rainfall at SWMU 149 is approximately 8.7 inches. Intense sunlight and low humidity throughout much of the year creates high rates of evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

In 2001, a drilling location downgradient of SWMU 149 was selected for the installation of groundwater monitoring well CTF-MW3. The location was selected using the historical potentiometric surface for the regional aquifer. The well was installed in August 2001 using the air-rotary casing hammer drilling technique. Alluvium consisting of silty fine-grained sand was encountered from the ground surface to 28 ft bgs. Precambrian granite and gneiss were encountered from 28 to 345 ft bgs. From 345 ft bgs to the borehole total depth of 430 ft bgs, Precambrian quartzite was encountered. The drilling rate from 28 to 430 ft bgs was relatively consistent and no significantly fractured zones were encountered. Drilling was paused at several depths and the borehole blown dry and allowed to recover. However, due to the low yield of the borehole, the water-bearing zone was not initially apparent. Geophysical logging (temperature and neutron) and drilling observations were used to select the screen interval. The caliper log recorded a fairly consistent borehole diameter that did not reflect any significantly fractured intervals. The depth to groundwater was estimated to be approximately 345 ft bgs. The well was screened from 340 to 360 ft bgs in Precambrian quartzite (Table 12-2).

Table 12-2. Lithologic and Hydrogeologic Elevation Data for Monitoring Well CTF-MW3 near SWMU 149

Monitoring Well	Ground Surface Elevation (ft amsl)	Depth of Screened Interval (ft bgs)	Elevation for Top of Screen (ft amsl)	Potentiometric Surface, October 2011 (ft amsl)	Mid-Point Screen Elevation (ft amsl)	Pressure Head (ft[a])
CTF-MW3	5519.80	340 – 360	5179.80	5216.01	5169.80	46

NOTES:
[a]From mid-point of screen.
amsl = Above mean sea level.
bgs = Below ground surface.
CTF = Coyote Test Field.
ft = Foot (feet).
MW = Monitoring Well.
SWMU = Solid Waste Management Unit.

The October 2011 groundwater elevation was 5216.01 ft amsl. Compared to the mid-point elevation of the screen, the pressure head was approximately 46 ft and indicative of confined conditions. Based on the potentiometric surface depicted on Plate 1, the horizontal gradient is steep and approximately 0.15 feet per foot (ft/ft) westward in the vicinity of the well. Groundwater in the bedrock most likely migrates through a confined low-permeability fracture system. The groundwater composition is of the bicarbonate type and dominated by the calcium cation.

During sampling, the drawdown in well CTF-MW3 is not excessive and the quantity of water produced is clearly adequate for low-flow sampling purposes. Groundwater samples are collected using pneumatic (nitrogen gas) Bennett™ piston pumps.

The conceptual hydrogeologic model for SWMU 149 is based on the findings for monitoring well CTF-MW3, several nearby monitoring wells located across CTF (Plate 1), and extensive field mapping conducted by the Site-Wide Hydrogeologic Characterization Project (GRAM and Lettis 1995). Groundwater in the SWMU 149 area occurs in the fractured bedrock system under confined conditions. The depth to groundwater at well CTF-MW3 at the time of installation was approximately 345 ft bgs in a slightly fractured interval of Precambrian quartzite. Naturally filled fractures in the overlying granite probably serve as a confining unit. The amount of precipitation available for groundwater recharge is minimal due to the scant rainfall, high evapotranspiration rates, and the shallow sequence of competent bedrock. Hydrographs of historical water level data (Figure 12B-1 in Attachment 12B) indicate that seasonal effects, primarily due to thunderstorms, do not influence groundwater levels near the site. Groundwater underflow from the site probably discharges to the unconsolidated basin-fill deposits (primarily the Santa Fe Group) of the Albuquerque Basin after crossing the Sandia Fault. The steep hydraulic gradient, approximately 0.15 ft/ft, near the well indicates that the fault limits the rate of groundwater migration near the site. No potable water-supply wells are located within 4 miles of the site.

12.1.7.3 Contaminant Sources

From 1961 to 1993, wastewater from the SWMU 149 septic system discharged to the subsurface via a single seepage pit. The septic water contained photo-processing chemicals and sanitary waste. The area around the seepage pit and septic tank was characterized using soil-vapor samplers and soil samples collected from five boreholes.

12.1.7.4 Contaminant Distribution and Transport in Groundwater

The first phase of quarterly groundwater sampling for monitoring well CTF-MW3 was conducted from July 2002 to June 2004. Trace amounts of VOCs, cyanide, nitrate, and one HE compound (2-amino-4,6-dinitrotoluene) were detected. Concentrations decreased over time. Selenium and fluoride were reported at concentrations slightly above background and are mostly likely attributable to the local bedrock. The second phase of quarterly groundwater sampling began in March 2011. For CY 2011, no metals, VOCs, nitrate, alkalinity, or major ions exceed the respective MCLs. Perchlorate was not detected.

12.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM ER Operations as well as implements and enforces federal regulations mandated by RCRA. All ER Operations SWMUs are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518* (NMED 1993). All corrective action requirements pertaining to SWMUs are contained in the Order (NMED April 2004).

In September 2005, the NMED issued a Certificate of Completion for CAC without Controls for SWMU 149 (NMED September 2005). In response, DOE/Sandia requested a Class III Permit Modification (SNL March 2006). In April 2010, the NMED responded to the Permit Modification Request with a letter requiring further corrective action at SWMU 149 (NMED April 2010) in the form of an additional eight quarters of groundwater monitoring at CTF-MW3. In June 2010, DOE/Sandia submitted a SAP for groundwater monitoring at CTF-MW3 (SNL June 2010), which the NMED approved (NMED December 2010). Quarterly groundwater sampling was reinitiated at CTF-MW3 in CY 2011, and the analytical results are presented in this report (Section 12.6).

12.3 Scope of Activities

The activities for monitoring well CTF-MW3 near SWMU 149 conducted during this reporting period are listed in Section 12.1.5. The field activity discussed in this section is groundwater monitoring sampling and analysis during 2011 sampling events (Table 12-3). The analytical parameters for each sampling event are listed in Table 12-4.

Table 12-3. Sampling Dates and SAPs for Monitoring Well CTF-MW3 near SWMU 149, Calendar Year 2011

Date of Sampling Event	SAP
March 9, 2011	*SWMU 149 Groundwater Monitoring Mini-SAP for Second Quarter Fiscal Year 2011* (SNL March 2011)
June 3, 2011	*SWMU 149 Groundwater Monitoring Mini-SAP for Third Quarter Fiscal Year 2011* (SNL June 2011)
September 23, 2011	*SWMU 149 Groundwater Monitoring Mini-SAP for Fourth Quarter Fiscal Year 2011* (SNL September 2011)
December 8, 2011	*SWMU 149 Groundwater Monitoring Mini-SAP for First Quarter Fiscal Year 2012* (SNL December 2011)

NOTES:
CTF = Coyote Test Field.
MW = Monitoring Well.
SAP = Sampling and Analysis Plan.
SWMU = Solid Waste Management Unit.

Table 12-4. SWMU 149 Chemical Analytical Methods

Analyte	Analytical Method[a,b,c,d]
Anions	SW846-9056
Alkalinity	SM2320B
NPN	EPA 353.2
Perchlorate	EPA 314.0
TAL Metals	SW846-6010/6020/7470
VOC	SW846-8260B

NOTES:
[a]EPA 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1, U.S. Environmental Protection Agency, Washington, D.C.
[b]EPA 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.
[c]EPA 1999, *Perchlorate in Drinking Water Using Ion Chromatography*, EPA 815/R-00-014.
[d]Clesceri, et al., 1998, *Standard Methods for the Examination of Water and Wastewater,* 20th ed., Method 2320B.
EPA = U.S. Environmental Protection Agency.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard Method.
SW = Solid Waste.
SWMU = Solid Waste Management Unit.
TAL = Target Analyte List.
VOC = Volatile organic compound.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, split, equipment blank (EB), TB, and field blank (FB) samples. (No EB samples were required for well CTF-MW3 during the June, September, and December 2011 sampling events.) Field QC samples are used to monitor the sampling process. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. TB samples are used to determine whether VOCs inadvertently contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory. FB samples provide a check for potential ambient sources of sample contamination during the sampling process and/or sampling error.

12.4 Field Methods and Measurements

According to the requirements of the Order (NMED April 2004) and the NMED letter of April 8, 2010 (NMED April 2010), SNL/NM personnel performed groundwater sampling at SWMU 149. The CY 2011 sampling events were conducted in conformance with appropriate SNL/NM Field Operating Procedures (FOPs) for groundwater sampling activities and the SWMU 149 site-specific SAP (SNL June 2010).

Environmental groundwater samples were collected from monitoring well CTF-MW3. Samples were submitted to GEL Laboratories LLC (GEL) for all chemical analyses. Groundwater samples were analyzed for VOCs, NPN, major anions (as bromide, chloride, fluoride, and sulfate), alkalinity, TAL metals, and perchlorate.

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

12.4.1 Groundwater Elevation

Throughout CY 2011, water level measurements were obtained to determine changes in water table elevations. Water levels are periodically measured in CTF-MW3 according to the instructions and requirements specified in SNL/NM FOP 03-02, *Groundwater Level Data Acquisition and Management*, (SNL November 2009a and February 2011). The water level information was used to create the map showing groundwater flow direction presented on Figure 12-2 and the hydrograph presented on Figure 12B-1 (Attachment 12B).

12.4.2 Well Purging and Water Quality Measurements

Purging removes stagnant water from the well so that a representative groundwater sample can be obtained. In accordance with procedures described in SNL/NM FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements* (SNL November 2009b), all wells were purged a minimum of one saturated casing volume (the volume of one length of the saturated screen plus the borehole annulus around the saturated screen interval). Purging continued until four stable measurements for turbidity, pH, temperature, and specific conductance (SC) were obtained from the well prior to the collection of groundwater samples. Groundwater stability is considered acceptable when measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, 0.1 pH units, 1.0 degrees Celsius, and SC is within 5 percent as micromhos per centimeter. Additional field parameters collected included oxidation reduction potential (ORP), dissolved oxygen (DO), and water level measurements. Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter.

All purged water was placed into a 55-gallon container and stored at the Environmental Field Office waste accumulation area. Associated Field Measurement Logs documenting details of well purging and water quality measurements are filed in the SNL/NM Records Center.

12.4.3 Pump Decontamination

The Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into the monitoring well in accordance with the procedures described in SNL/NM FOP 05-03, *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination* (SNL November 2009c). An EB sample was collected in March 2011 to verify the effectiveness of the equipment decontamination process. EB samples were not required during the June, September, and December 2011 sampling events.

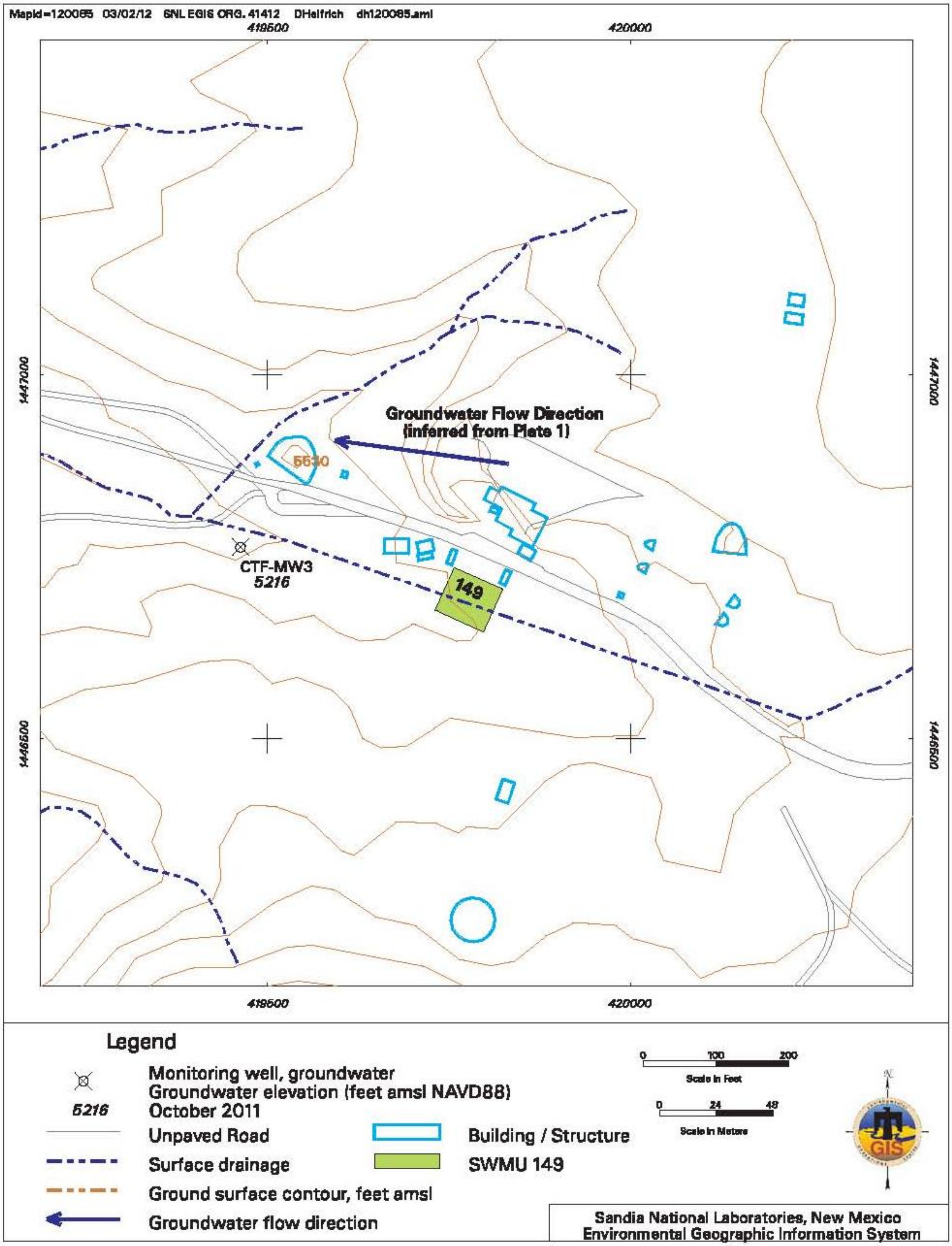

Figure 12-2. SWMU 149 Groundwater Flow Direction (October 2011)

12.4.4 Sample Collection Sampling Procedures

Groundwater sampling was performed in strict accordance with SNL/NM FOP 05-01 (SNL November 2009b), and SNL/NM Sample Management Office (SMO) procedures and protocols. Sample container types depend on the analytical parameters.

Groundwater samples were collected using the Bennett™ nitrogen gas-powered portable piston pump. Sample bottles were filled directly from the pump discharge line and water sampling manifold into laboratory-prepared sample containers, with the VOC samples collected at the lowest achievable discharge rate. The groundwater samples were submitted to GEL for chemical analysis using methods outlined in Table 12-4.

12.4.5 Sample Handling and Shipment

The SNL/NM SMO processes environmental samples collected by LTS/ER Operations personnel. The SMO staff reviews the Mini-SAPs, orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced in laboratory processes and procedures. These include method blanks, laboratory control samples (LCSs), matrix spike, matrix spike duplicate, and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review*, SMO-05-03 (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011).

12.4.6 Waste Management

Purge and decontamination water generated from all sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management* (SNL November 2009d) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Associated environmental sample results provide supplemental data for approval to discharge water to the sanitary sewer. All data are compared with Albuquerque Bernalillo County Water Utility Authority discharge limits.

12.5 Analytical Methods

Groundwater samples were submitted to GEL for chemical analyses. Samples were analyzed in accordance with applicable EPA analytical methods (EPA 1983, 1996, and 1999; Clesceri, et al. 1998). Groundwater sampling results are compared with established EPA MCLs for drinking water (EPA 2009). Analytical results and field measurements for samples collected from monitoring well CTF-MW3 are shown in tabulated form in Tables 12A-1 through 12A-8 (Attachment 12A). Analytical reports, including certificates of analyses, analytical methods, method detection limits (MDLs), practical quantitation limits (PQLs), dates of analyses, results of QC analyses, and data validation findings are filed in the SNL/NM Records Center.

12.6 Summary of Analytical Results

This section discusses analytical results and field measurements for the CY 2011 SWMU 149 sampling events. Data are presented in Tables 12A-1 through 12A-8 (Attachment 12A). Data qualifiers are explained in the footnotes following Table 12A-8.

The analytical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL July 2007 and May 2011). No problems were identified with the analytical data that resulted in qualification of the data as unusable. The data are acceptable, and reported QC measures are adequate.

No VOCs were detected at concentrations above established MCLs from any CTF-MW3 groundwater sample. In March 2011, the compounds bromodichloromethane, chloroform, and dibromochloromethane were qualified as not detected during data validation, as these compounds were detected at concentrations less than five times the associated EB sample result. In June 2011, the compound chloroform was detected above the laboratory MDL and below the laboratory PQL. All VOC results in June 2011 were qualified as estimated during data validation, because the laboratory performed analysis outside the method-specific holding time. In September and December 2011, the compounds bromodichloromethane, chloroform, and dibromochloromethane were detected at concentrations above laboratory MDLs and below laboratory PQLs. No MCLs are established for these compounds. Table 12A-1 summarizes detected VOCs in environmental groundwater samples, and Table 12A-2 lists the MDLs for associated VOCs analyzed.

Table 12A-3 summarizes NPN results. NPN values were compared with the nitrate MCL of 10 milligrams per liter. NPN was not detected above the MCL.

Table 12A-4 summarizes alkalinity and major anion (as bromide, chloride, fluoride, and sulfate) results. No parameters were detected above established MCLs.

Perchlorate was not detected above the NMED-specified screening level/MDL of 4 micrograms per liter (NMED April 2004) in CTF-MW3 samples. Table 12A-5 presents perchlorate results.

TAL metals both in unfiltered and filtered fractions were analyzed in CTF-MW3 samples. No metal parameters were detected above established MCLs in any groundwater sample. In March 2011, the result for chromium was qualified as not detected during data validation because chromium was detected at less than five times the associated laboratory method blank sample. Also in March 2011, the results for copper and manganese were qualified as not detected during data validation because these metals were detected at less than five times the associated EB sample. In June 2011, the result for antimony (filtered fraction) was qualified as not detected during data validation because antimony was detected at less than five times the associated laboratory calibration blank sample. Metal results for both unfiltered and filtered samples are summarized in Tables 12A-6 and 12A-7, respectively.

Table 12A-8 summarizes field water quality measurements collected prior to sampling. Field water quality measurements include turbidity, pH, temperature, SC, ORP, and DO.

12.7 Quality Control Results

Field and laboratory QC samples are prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. The following sections discuss site-specific QC results for the SWMU 149 quarterly sampling event.

All chemical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL July 2007 and May 2011). Although some analytical results were qualified during the data validation process, no significant data quality problems were noted. Data validation qualifiers are provided with the analytical results in Tables 12A-1 through 12A-7 (Attachment 12A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center. The following sections discuss site-specific QC results for the SWMU 149 quarterly sampling events.

12.7.1 Field Quality Control Samples

Field QC samples for the March 2011 sampling event included a duplicate environmental sample, an EB sample, TB samples, and an FB sample. Field QC samples for all other sampling events (June, September, and December 2011) included a TB sample only. According to the approved SAP (SNL June 2010), duplicate environmental, EB, and FB samples were not required during these sampling events. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the Mini-SAPs (SNL March 2011, June 2011, September 2011, and December 2011).

12.7.1.1 Duplicate Environmental Samples

A duplicate environmental sample was collected in March 2011 and analyzed to estimate the overall reproducibility of the sampling and analytical process. The duplicate sample was collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The duplicate sample was analyzed for all parameters. The results show that sampling and analysis precision was in conformance with SWMU 149 SAP requirements for all measured parameters.

12.7.1.2 Equipment Blank Samples

The Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into CTF-MW3 according to procedures described in SNL/NM FOP 05-03 (SNL November 2009c). In accordance with SNL/NM FOP 05-03, the following solutions were pumped through the sampling system: 5 gallons of deionized (DI) water mixed with 20 milliliters (mL) nonphosphate laboratory detergent; 5 gallons of DI water; 5 gallons of DI water mixed with 20 mL reagent-grade nitric acid; and 15 gallons of DI water. In addition, the outside of the pump tubing was rinsed with DI water. EB samples are collected to verify the effectiveness of the equipment decontamination process. An EB sample was collected prior to sampling monitoring well CTF-MW3 in March 2011 and submitted for all analyses.

Antimony, bromodichloromethane, chloroform, chloride, copper, dibromochloromethane, manganese, and sodium were detected in the March 2011 EB sample. No corrective action was required for antimony as this metal was not detected in the associated environmental sample. No corrective action was required for chloride or sodium as these parameters were detected in the environmental samples at concentrations greater than five times the blank result. The March 2011 environmental sample results for bromodichloromethane, chloroform, copper, dibromochloromethane, and manganese were qualified as not detected during data validation, because associated environmental sample results are less than five times the EB result.

12.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analyses to assess whether contamination of the samples has occurred during shipment and storage. TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-mL volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. TBs were brought to the field and accompanied each sample shipment. TBs were submitted for all quarterly sampling events in CY 2011. No VOCs were detected in the TB samples above associated laboratory MDLs.

12.7.1.4 Field Blank Samples

One FB sample was collected during the March 2011 sampling event and analyzed for VOCs to assess whether contamination of the samples resulted from ambient field conditions. The FB sample was prepared by pouring DI water into sample containers at the sampling point (i.e., inside the sampling truck at the well location) to simulate the transfer of environmental samples from the sampling system to the sample container. Bromodichloromethane, chloroform, and dibromochloromethane were detected in the

FB sample. The environmental sample results for bromodichloromethane, chloroform, and dibromochloromethane were qualified as not detected during data validation because associated environmental sample results are less than five times the blank result.

12.7.2 Laboratory Quality Control Samples

The analytical laboratory is required to have established procedures that demonstrate the analytical process is always in control during each sample analysis step. These procedures are used for all samples including environmental samples, method blank samples, and matrix spike samples.

An LCS consists of a control matrix (e.g., DI water) spiked with known concentrations of analytes representative of the target analytes. An LCS was prepared and analyzed for each analytical procedure and batch to determine accuracy of the data. The laboratory evaluates the precision of the data by performing duplicate analyses for either the environmental samples, LCSs, or matrix spike samples and calculating the relative percent difference between corresponding results.

Method blank samples are used to check for contamination in the laboratory during sample preparation and analysis. Method blank samples are concurrently prepared and analyzed with each analytical batch. Method blanks are reported in the same units as corresponding environmental samples, and the results are included with each analytical report.

Surrogate spike analysis is performed for all samples analyzed by gas chromatography/mass spectroscopy. The surrogate compounds added to the sample are those specified in the applicable EPA analytical method procedure (EPA 1996). Recovery values for surrogate compounds that are outside specified control limits require corrective action.

The analytical process is systematically evaluated for the effects of naturally occurring constituents present in the environmental sample matrix. Matrix spike/matrix spike duplicate analyses are performed in accordance with the specified analytical procedures.

Internal laboratory QC samples, including method blanks and duplicate LCSs were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL July 2007 and May 2011). Laboratory data qualifiers are provided with the analytical results in Tables 12A-1 through 12A-7 (Attachment 12A).

No significant data quality problems for any of the sampling events were noted during the data validation process. Due to laboratory error, VOC analysis was performed outside holding time limits for the June 2011 sample. Because the analysis was performed within two times the method-specific holding time requirement, all VOC results were qualified during data validation as estimated values. The interference check sample and serial dilution percent differences for several metals were outside acceptance criteria for the September 2011 samples. These were qualified during data validation as estimated values. The data validation reports are filed in the SNL/NM Records Center.

12.8 Variances and Nonconformances

No variances or nonconformances from requirements in the SWMU 149 Groundwater Monitoring SAP (SNL June 2010) or Mini-SAPs (SNL March 2011, June 2011, September 2011, and December 2011) were identified during any of the CY 2011 sampling events.

12.9 Summary and Conclusions

Four quarterly sampling events occurred in CY 2011 at monitoring well CTF-MW3 near SWMU 149. Groundwater samples were collected in March, June, September, and December of 2011. Analytical parameters included VOCs, NPN, major anions, alkalinity, TAL total metals, and perchlorate. Results were compared with EPA MCL guidelines for drinking water (EPA 2009). No parameters were detected above established MCLs. The analytical results for this reporting period are consistent with historical concentrations. The current conceptual model described in Section 12.1.7 does not require modification based on the analytical results for this reporting period. During CY 2012, quarterly groundwater sampling and reporting will continue at CTF-MW3 near SWMU 149.

12.10 References

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Attachment 12A
Solid Waste Management Unit 149
Analytical Results Tables

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Attachment 12A Tables

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Table 12A-1
Summary of Detected Volatile Organic Compounds,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3 09-Mar-11	Bromodichloromethane	0.330	0.250	1.00	NE	J	1.0U	090243-001	SW846-8260B
	Chloroform	0.570	0.250	1.00	NE	J	1.0U	090243-001	SW846-8260B
	Dibromochloromethane	0.960	0.300	1.00	NE	J	1.0U	090243-001	SW846-8260B
CTF-MW3 (Duplicate) 09-Mar-11	Chloroform	0.540	0.250	1.00	NE	J	1.0U	090244-001	SW846-8260B
	Dibromochloromethane	0.960	0.300	1.00	NE	J	1.0U	090244-001	SW846-8260B
CTF-MW3 03-Jun-11	Chloroform	0.670	0.250	1.00	NE	H, J	J	090672-001	SW846-8260B
CTF-MW3 23-Sep-11	Bromodichloromethane	0.570	0.250	1.00	NE	J		091257-001	SW846-8260B
	Chloroform	0.770	0.250	1.00	NE	J		091257-001	SW846-8260B
	Dibromochloromethane	0.460	0.300	1.00	NE	J		091257-001	SW846-8260B
CTF-MW3 08-Dec-11	Bromodichloromethane	0.480	0.250	1.00	NE	J		091523-001	SW846-8260B
	Chloroform	0.730	0.250	1.00	NE	J		091523-001	SW846-8260B
	Dibromochloromethane	0.340	0.300	1.00	NE	J		091523-001	SW846-8260B

Refer to footnotes on page 12A-21.

Table 12A-2
Method Detection Limits for Volatile Organic Compounds (Method[g] SW846-8260),
Solid Waste Management Unit 149 Groundwater Monitoring,
Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.325
1,1,2,2-Tetrachloroethane	0.250
1,1,2-Trichloroethane	0.250
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.250
1,2-Dichloropropane	0.250
2-Butanone	1.25
2-Hexanone	1.25
4-methyl-, 2-Pentanone	1.25
Acetone	3.50
Benzene	0.300
Bromodichloromethane	0.250
Bromoform	0.250
Bromomethane	0.300
Carbon disulfide	1.25
Carbon tetrachloride	0.300
Chlorobenzene	0.250
Chloroethane	0.300
Chloroform	0.250
Chloromethane	0.300
Dibromochloromethane	0.300
Ethyl benzene	0.250
Methylene chloride	3.00
Styrene	0.250
Tetrachloroethene	0.300
Toluene	0.250
Trichloroethene	0.250
Vinyl acetate	1.50
Vinyl chloride	0.500
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.250
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.250

Refer to footnotes on page 12A-21.

Table 12A-3
Summary of Nitrate plus Nitrite Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3 09-Mar-11	Nitrate plus nitrite as N	5.17	0.100	0.500	10.0			090243-018	EPA 353.2
CTF-MW3 (Duplicate) 09-Mar-11	Nitrate plus nitrite as N	5.54	0.100	0.500	10.0			090244-018	EPA 353.2
CTF-MW3 03-Jun-11	Nitrate plus nitrite as N	5.51	0.100	0.500	10.0			090672-018	EPA 353.2
CTF-MW3 23-Sep-11	Nitrate plus nitrite as N	5.70	0.100	0.500	10.0			091257-018	EPA 353.2
CTF-MW3 08-Dec-11	Nitrate plus nitrite as N	5.30	0.100	0.500	10.0			091523-018	EPA 353.2

Refer to footnotes on page 12A-21.

Table 12A-4
Summary of Anion and Alkalinity Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Bicarbonate Alkalinity	339	0.725	1.00	NE	B		090243-022	SM2320B
09-Mar-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090243-022	SM2320B
	Bromide	1.15	0.066	0.200	NE			090243-016	SW846 9056
	Chloride	114	1.32	4.00	NE			090243-016	SW846 9056
	Fluoride	2.34	0.033	0.100	4.0			090243-016	SW846 9056
	Sulfate	483	2.00	8.00	NE			090243-016	SW846 9056
CTF-MW3 (Duplicate)	Bicarbonate Alkalinity	341	0.725	1.00	NE	B		090244-022	SM2320B
09-Mar-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090244-022	SM2320B
	Bromide	1.17	0.066	0.200	NE			090244-016	SW846 9056
	Chloride	114	1.32	4.00	NE			090244-016	SW846 9056
	Fluoride	2.35	0.033	0.100	4.0			090244-016	SW846 9056
	Sulfate	487	2.00	8.00	NE			090244-016	SW846 9056
CTF-MW3	Bicarbonate Alkalinity	328	0.725	1.00	NE	B		090672-022	SM2320B
03-Jun-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090672-022	SM2320B
	Bromide	1.22	0.066	0.200	NE			090672-016	SW846 9056
	Chloride	124	1.32	4.00	NE			090672-016	SW846 9056
	Fluoride	2.37	0.033	0.100	4.0			090672-016	SW846 9056
	Sulfate	521	2.00	8.00	NE			090672-016	SW846 9056
CTF-MW3	Bicarbonate Alkalinity	329	0.725	1.00	NE	B		091257-022	SM2320B
23-Sep-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091257-022	SM2320B
	Bromide	1.15	0.066	0.200	NE			091257-016	SW846 9056
	Chloride	123	0.660	2.00	NE			091257-016	SW846 9056
	Fluoride	2.60	0.165	0.500	4.0			091257-016	SW846 9056
	Sulfate	466	2.00	8.00	NE			091257-016	SW846 9056
CTF-MW3	Bicarbonate Alkalinity	330	0.725	1.00	NE	B		091523-022	SM2320B
08-Dec-11	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091523-022	SM2320B
	Bromide	1.18	0.066	0.200	NE			091523-016	SW846 9056
	Chloride	118	1.32	4.00	NE			091523-016	SW846 9056
	Fluoride	2.34	0.033	0.100	4.0			091523-016	SW846 9056
	Sulfate	491	2.00	8.00	NE			091523-016	SW846 9056

Refer to footnotes on page 12A-21.

Table 12A-5
Summary of Perchlorate Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3 09-Mar-11	ND	0.004	0.012	NE	U		090243-020	EPA 314.0
CTF-MW3 (Duplicate) 09-Mar-11	ND	0.004	0.012	NE	U		090244-020	EPA 314.0
CTF-MW3 03-Jun-11	ND	0.004	0.012	NE	U		090672-020	EPA 314.0
CTF-MW3 23-Sep-11	ND	0.004	0.012	NE	U		091257-020	EPA 314.0
CTF-MW3 08-Dec-11	ND	0.004	0.012	NE	U		091523-020	EPA 314.0

Refer to footnotes on page 12A-21.

Table 12A-6
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	ND	0.015	0.050	NE	U		090243-009	SW846 6020
09-Mar-11	Antimony	ND	0.001	0.003	0.006	U		090243-009	SW846 6020
	Arsenic	0.00232	0.0017	0.005	0.010	J		090243-009	SW846 6020
	Barium	0.0303	0.0006	0.002	2.00			090243-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090243-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090243-009	SW846 6020
	Calcium	178	0.300	1.00	NE			090243-009	SW846 6020
	Chromium	0.00371	0.002	0.010	0.100	B, J	0.022U	090243-009	SW846 6020
	Cobalt	0.00126	0.0001	0.001	NE			090243-009	SW846 6020
	Copper	0.00158	0.00035	0.001	NE		0.0020U	090243-009	SW846 6020
	Iron	1.26	0.033	0.100	NE	B		090243-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	ND		090243-009	SW846 6020
	Magnesium	43.4	0.010	0.030	NE			090243-009	SW846 6020
	Manganese	0.00144	0.001	0.005	NE	J	0.0063U	090243-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090243-009	SW846 7470
	Nickel	0.0106	0.0005	0.002	NE	B		090243-009	SW846 6020
	Potassium	10.3	0.080	0.300	NE			090243-009	SW846 6020
	Selenium	0.0209	0.0015	0.005	0.050			090243-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090243-009	SW846 6020
	Sodium	149	0.400	1.25	NE			090243-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090243-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090243-009	SW846 6020
	Zinc	0.00571	0.0035	0.010	NE	J		090243-009	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-6 *(Continued)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3 (Duplicate)	Aluminum	ND	0.015	0.050	NE	U		090244-009	SW846 6020
09-Mar-11	Antimony	ND	0.001	0.003	0.006	U		090244-009	SW846 6020
	Arsenic	0.00265	0.0017	0.005	0.010	J		090244-009	SW846 6020
	Barium	0.0309	0.0006	0.002	2.00			090244-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090244-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090244-009	SW846 6020
	Calcium	172	0.300	1.00	NE			090244-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090244-009	SW846 6020
	Cobalt	0.000967	0.0001	0.001	NE	J		090244-009	SW846 6020
	Copper	0.00182	0.00035	0.001	NE		0.0020U	090244-009	SW846 6020
	Iron	1.30	0.033	0.100	NE	B		090244-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090244-009	SW846 6020
	Magnesium	46.5	0.010	0.030	NE			090244-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090244-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090244-009	SW846 7470
	Nickel	0.00949	0.0005	0.002	NE	B		090244-009	SW846 6020
	Potassium	10.5	0.080	0.300	NE			090244-009	SW846 6020
	Selenium	0.0236	0.0015	0.005	0.050			090244-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090244-009	SW846 6020
	Sodium	144	0.400	1.25	NE			090244-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090244-009	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090244-009	SW846 6020
	Zinc	0.00416	0.0035	0.010	NE	J		090244-009	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-6 *(Continued)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	ND	0.015	0.050	NE	U		090672-009	SW846 6020
03-Jun-11	Antimony	ND	0.001	0.003	0.006	U		090672-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090672-009	SW846 6020
	Barium	0.0291	0.0006	0.002	2.00			090672-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090672-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090672-009	SW846 6020
	Calcium	202	0.600	2.00	NE			090672-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090672-009	SW846 6020
	Cobalt	0.000227	0.0001	0.001	NE	J		090672-009	SW846 6020
	Copper	0.00169	0.00035	0.001	NE		J+	090672-009	SW846 6020
	Iron	0.310	0.033	0.100	NE			090672-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090672-009	SW846 6020
	Magnesium	49.5	0.010	0.030	NE			090672-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090672-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090672-009	SW846 7470
	Nickel	0.00612	0.0005	0.002	NE		J+	090672-009	SW846 6020
	Potassium	11.0	0.080	0.300	NE			090672-009	SW846 6020
	Selenium	0.0255	0.0015	0.005	0.050			090672-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090672-009	SW846 6020
	Sodium	177	0.800	2.50	NE			090672-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090672-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		090672-009	SW846 6010
	Zinc	0.00383	0.0035	0.010	NE	J	J+	090672-009	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-6 *(Continued)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	ND	0.015	0.050	NE	U		091257-009	SW846 6020
23-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091257-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091257-009	SW846 6020
	Barium	0.0345	0.0006	0.002	2.00			091257-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091257-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091257-009	SW846 6020
	Calcium	211	0.600	2.00	NE			091257-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091257-009	SW846 6020
	Cobalt	0.000429	0.0001	0.001	NE	J	J+	091257-009	SW846 6020
	Copper	0.00207	0.00035	0.001	NE		J+	091257-009	SW846 6020
	Iron	0.663	0.033	0.100	NE			091257-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091257-009	SW846 6020
	Magnesium	51.8	0.100	0.300	NE		J	091257-009	SW846 6020
	Manganese	0.00183	0.001	0.005	NE	J	J+	091257-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091257-009	SW846 7470
	Nickel	0.00518	0.0005	0.002	NE		J+	091257-009	SW846 6020
	Potassium	11.4	0.080	0.300	NE			091257-009	SW846 6020
	Selenium	0.027	0.0015	0.005	0.050		J-	091257-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091257-009	SW846 6020
	Sodium	197	0.800	2.50	NE		J	091257-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091257-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091257-009	SW846 6010
	Zinc	0.00461	0.0035	0.010	NE	J	J+	091257-009	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-6 *(Concluded)*
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2012

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	0.0157	0.015	0.050	NE	J		091523-009	SW846 6020
08-Dec-11	Antimony	ND	0.001	0.003	0.006	U		091523-009	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091523-009	SW846 6020
	Barium	0.0286	0.0006	0.002	2.00			091523-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091523-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091523-009	SW846 6020
	Calcium	197	0.600	2.00	NE	B		091523-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091523-009	SW846 6020
	Cobalt	0.000293	0.0001	0.001	NE	J	J+	091523-009	SW846 6020
	Copper	0.00306	0.00035	0.001	NE		J+	091523-009	SW846 6020
	Iron	0.384	0.033	0.100	NE			091523-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091523-009	SW846 6020
	Magnesium	44.0	0.010	0.030	NE		J	091523-009	SW846 6020
	Manganese	0.00239	0.001	0.005	NE	J	J+	091523-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091523-009	SW846 7470
	Nickel	0.00364	0.0005	0.002	NE		J+	091523-009	SW846 6020
	Potassium	10.8	0.080	0.300	NE			091523-009	SW846 6020
	Selenium	0.0238	0.0015	0.005	0.050			091523-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091523-009	SW846 6020
	Sodium	172	0.800	2.50	NE			091523-009	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091523-009	SW846 6020
	Vanadium	0.00156	0.001	0.005	NE	J		091523-009	SW846 6010
	Zinc	0.00845	0.0035	0.010	NE	J	J+	091523-009	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-7
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	ND	0.015	0.050	NE	U		090243-010	SW846 6020
09-Mar-11	Antimony	ND	0.001	0.003	0.006	U		090243-010	SW846 6020
	Arsenic	0.00418	0.0017	0.005	0.010	J		090243-010	SW846 6020
	Barium	0.0307	0.0006	0.002	2.00			090243-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090243-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090243-010	SW846 6020
	Calcium	171	0.300	1.00	NE			090243-010	SW846 6020
	Chromium	0.00466	0.002	0.010	0.100	B,J	0.022U	090243-010	SW846 6020
	Cobalt	0.00119	0.0001	0.001	NE			090243-010	SW846 6020
	Copper	0.00166	0.00035	0.001	NE			090243-010	SW846 6020
	Iron	1.38	0.033	0.100	NE	B		090243-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090243-010	SW846 6020
	Magnesium	45.9	0.010	0.030	NE			090243-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090243-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090243-010	SW846 7470
	Nickel	0.0102	0.0005	0.002	NE	B		090243-010	SW846 6020
	Potassium	9.98	0.080	0.300	NE			090243-010	SW846 6020
	Selenium	0.0206	0.0015	0.005	0.050			090243-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090243-010	SW846 6020
	Sodium	145	0.400	1.25	NE			090243-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090243-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090243-010	SW846 6020
	Zinc	0.00381	0.0035	0.010	NE	J		090243-010	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-7 *(Continued)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3 (Duplicate)	Aluminum	ND	0.015	0.050	NE	U		090244-010	SW846 6020
09-Mar-11	Antimony	ND	0.001	0.003	0.006	U		090244-010	SW846 6020
	Arsenic	0.00543	0.0017	0.005	0.010			090244-010	SW846 6020
	Barium	0.0309	0.0006	0.002	2.00			090244-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090244-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090244-010	SW846 6020
	Calcium	179	0.300	1.00	NE			090244-010	SW846 6020
	Chromium	0.00416	0.002	0.010	0.100	B, J	0.022U	090244-010	SW846 6020
	Cobalt	0.00121	0.0001	0.001	NE			090244-010	SW846 6020
	Copper	0.00179	0.00035	0.001	NE			090244-010	SW846 6020
	Iron	1.35	0.033	0.100	NE	B		090244-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090244-010	SW846 6020
	Magnesium	48.8	0.010	0.030	NE			090244-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090244-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090244-010	SW846 7470
	Nickel	0.0104	0.0005	0.002	NE	B		090244-010	SW846 6020
	Potassium	10.4	0.080	0.300	NE			090244-010	SW846 6020
	Selenium	0.0203	0.0015	0.005	0.050			090244-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090244-010	SW846 6020
	Sodium	154	0.400	1.25	NE			090244-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090244-010	SW846 6020
	Vanadium	ND	0.003	0.010	NE	U		090244-010	SW846 6020
	Zinc	0.00406	0.0035	0.010	NE	J		090244-010	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-7 *(Continued)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	0.0282	0.015	0.050	NE	J		090672-010	SW846 6020
03-Jun-11	Antimony	0.00138	0.001	0.003	0.006	J	0.0064U	090672-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		090672-010	SW846 6020
	Barium	0.0283	0.0006	0.002	2.00			090672-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		090672-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090672-010	SW846 6020
	Calcium	193	0.600	2.00	NE			090672-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		090672-010	SW846 6020
	Cobalt	0.000245	0.0001	0.001	NE	J		090672-010	SW846 6020
	Copper	0.00184	0.00035	0.001	NE		J+	090672-010	SW846 6020
	Iron	0.389	0.033	0.100	NE			090672-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090672-010	SW846 6020
	Magnesium	41.4	0.010	0.030	NE			090672-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		090672-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U	UJ	090672-010	SW846 7470
	Nickel	0.00618	0.0005	0.002	NE		J+	090672-010	SW846 6020
	Potassium	10.2	0.080	0.300	NE			090672-010	SW846 6020
	Selenium	0.0251	0.0015	0.005	0.050			090672-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090672-010	SW846 6020
	Sodium	181	0.800	2.50	NE			090672-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		090672-010	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		090672-010	SW846 6010
	Zinc	0.00408	0.0035	0.010	NE	J	J+	090672-010	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-7 *(Continued)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	ND	0.015	0.050	NE	U		091257-010	SW846 6020
23-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091257-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091257-010	SW846 6020
	Barium	0.034	0.0006	0.002	2.00			091257-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091257-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091257-010	SW846 6020
	Calcium	215	0.600	2.00	NE			091257-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091257-010	SW846 6020
	Cobalt	0.000476	0.0001	0.001	NE	J	J+	091257-010	SW846 6020
	Copper	0.00228	0.00035	0.001	NE		J+	091257-010	SW846 6020
	Iron	0.686	0.033	0.100	NE			091257-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091257-010	SW846 6020
	Magnesium	55.4	0.100	0.300	NE		J	091257-010	SW846 6020
	Manganese	ND	0.001	0.005	NE	U	J+	091257-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091257-010	SW846 7470
	Nickel	0.0054	0.0005	0.002	NE		J+	091257-010	SW846 6020
	Potassium	11.7	0.080	0.300	NE			091257-010	SW846 6020
	Selenium	0.029	0.0015	0.005	0.050		J-	091257-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091257-010	SW846 6020
	Sodium	183	0.800	2.50	NE		J	091257-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091257-010	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091257-010	SW846 6010
	Zinc	0.00519	0.0035	0.010	NE	J	J+	091257-010	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-7 *(Concluded)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2012

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW3	Aluminum	ND	0.015	0.050	NE	U		091523-010	SW846 6020
08-Dec-11	Antimony	ND	0.001	0.003	0.006	U		091523-010	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		091523-010	SW846 6020
	Barium	0.0299	0.0006	0.002	2.00			091523-010	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		091523-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091523-010	SW846 6020
	Calcium	207	0.600	2.00	NE	B		091523-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091523-010	SW846 6020
	Cobalt	0.000366	0.0001	0.001	NE	J	J+	091523-010	SW846 6020
	Copper	0.00359	0.00035	0.001	NE		J+	091523-010	SW846 6020
	Iron	0.403	0.033	0.100	NE			091523-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091523-010	SW846 6020
	Magnesium	48.9	0.010	0.030	NE		J	091523-010	SW846 6020
	Manganese	0.00114	0.001	0.005	NE	J	J+	091523-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091523-010	SW846 7470
	Nickel	0.00367	0.0005	0.002	NE		J+	091523-010	SW846 6020
	Potassium	11.8	0.080	0.300	NE			091523-010	SW846 6020
	Selenium	0.0249	0.0015	0.005	0.050			091523-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091523-010	SW846 6020
	Sodium	184	0.800	2.50	NE			091523-010	SW846 6020
	Thallium	ND	0.00045	0.002	0.002	U		091523-010	SW846 6020
	Vanadium	0.00141	0.001	0.005	NE	J		091523-010	SW846 6010
	Zinc	0.00682	0.0035	0.010	NE	J	J+	091523-010	SW846 6020

Refer to footnotes on page 12A-21.

Table 12A-8
Summary of Field Water Quality Measurements[h], Solid Waste Management Unit 149 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CTF-MW3	09-Mar-11	18.58	1605	423.7	6.91	0.20	73.3	6.83
CTF-MW3	03-Jun-11	21.49	1587	414.2	6.86	0.33	78.6	6.95
CTF-MW3	23-Sep-11	20.76	1850	417.5	6.70	0.46	70.8	6.26
CTF-MW3	08-Dec-11	17.07	1847	414.8	6.72	0.54	70.4	6.69

Refer to footnotes on page 12A-21.

Footnotes for Solid Waste Management Unit 149 Groundwater Monitoring Tables

[a]Result

- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- µg/L = micrograms per liter
- mg/L = milligrams per liter

[b]MDL

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

[c]PQL

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

[d]MCL

- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-000, May 2009.
- NE = not established.

[e]Laboratory Qualifier

B = The analyte was detected in the blank above the effective MDL.
H = Analytical holding time was exceeded.
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
U = Analyte is absent or below the method detection limit.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.
J = The associated value is an estimated quantity.
J+ = The associated value is an estimated quantity with a suspected positive bias.
J- = The associated value is an estimated quantity with a suspected negative bias.
U = The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ = The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

[g]Analytical Method

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C = degrees Celsius.
% Sat = percent saturation.
µmho/cm = micromhos per centimeter.
mg/L = milligrams per liter.
mV = millivolts.
NTU = nephelometric turbidity units.
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration).

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Attachment 12B
Solid Waste Management Unit 149
Hydrographs

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Attachment 12B Hydrographs

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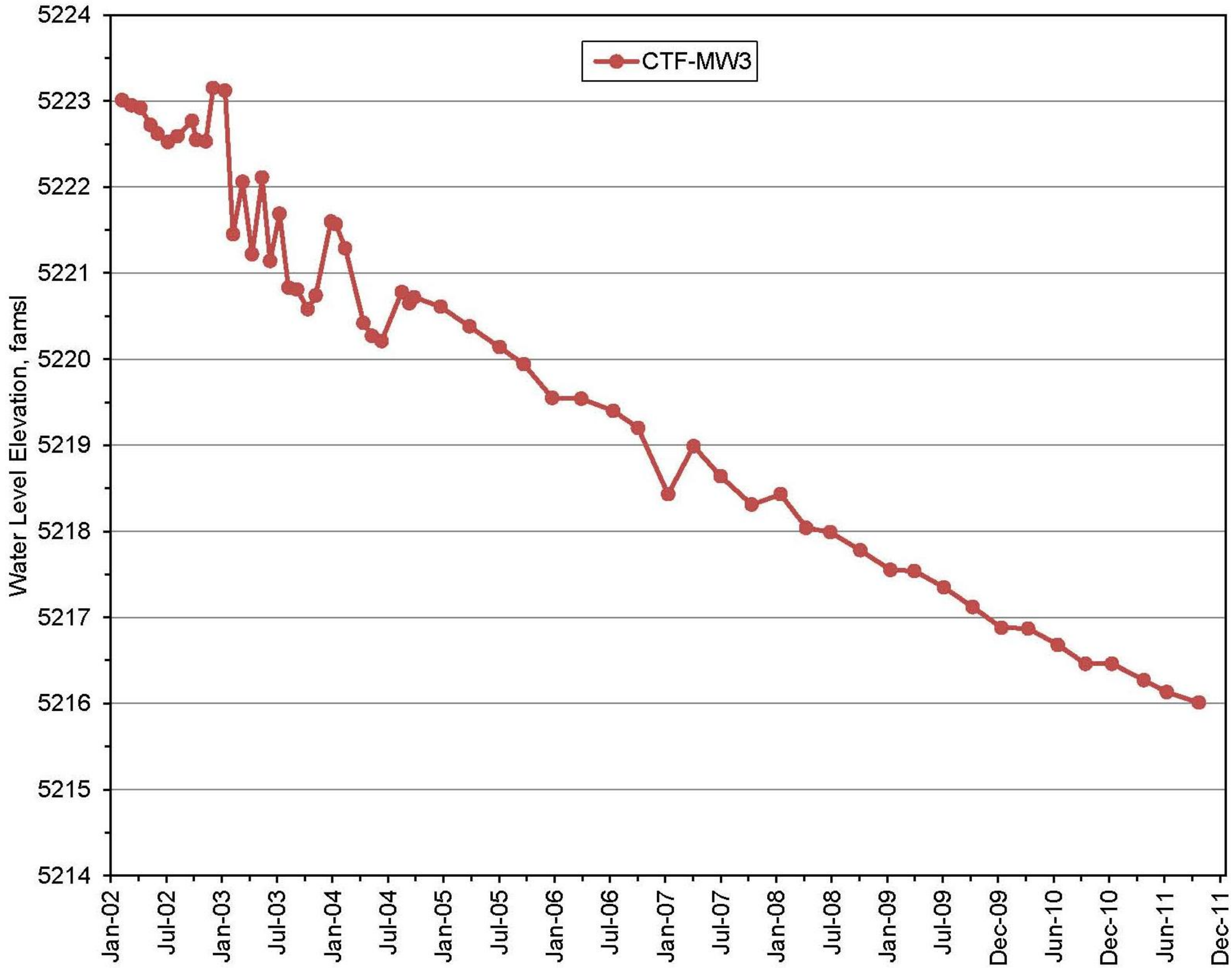

Figure 12B-1. SWMU 149 Study Area Well

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13.0 Solid Waste Management Unit 154

13.1 Introduction

This chapter summarizes Calendar Year (CY) 2011 quarterly groundwater sampling events for Coyote Test Field (CTF) monitoring well CTF-MW2, located near Solid Waste Management Unit (SWMU) 154 at Sandia National Laboratories, New Mexico (SNL/NM). The SNL/NM facility is a government-owned, contractor-operated, multi-program laboratory overseen by the U.S. Department of Energy (DOE) National Nuclear Security Administration through the Sandia Site Office in Albuquerque, New Mexico. Sandia Corporation (Sandia), a wholly owned subsidiary of Lockheed Martin Corporation, manages and operates SNL/NM under Contract DE-AC04-94AL85000.

The supplemental groundwater monitoring at SWMU 154 is designed to address the requirements of Section VII.D.6 of the Compliance Order on Consent (the Order) (NMED April 2004) and the letter dated April 8, 2010, from the New Mexico Environment Department (NMED) Hazardous Waste Bureau (NMED April 2010).

During CY 2011 four quarterly groundwater samples were collected from CTF-MW2 on March 8, May 31, September 29, and December 9, 2011. The groundwater samples were collected in accordance with the NMED-approved Sampling and Analysis Plan (SAP) (SNL June 2010). Analytical parameters included volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, nitrate plus nitrite (NPN), major anions, alkalinity, Target Analyte List (TAL) total metals plus uranium, perchlorate, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

Analytical results were compared with U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) for drinking water (EPA 2009). During all four quarters, arsenic was detected above the established MCL and is most likely attributable to background as monitoring well CTF-MW2 is screened in a highly fractured interval of Precambrian granite and gneiss. For the March 2011 sampling event, thallium was detected above the MCL in the unfiltered environmental sample, but not in the associated duplicate environmental sample or dissolved sample fractions. For the May 2011 sampling event, gross alpha activity was reported above the MCL, but the result for the reanalysis was reported below the MCL. Detailed results for all quarterly sampling events are discussed in Section 13.6.

Quarterly groundwater sampling and reporting for monitoring well CTF-MW2 near SWMU 154 will continue during CY 2012.

13.1.1 Location

SWMU 154, the Building 9960 Septic Systems at SNL/NM, is located in the CTF on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the DOE. It is approximately 1.3 miles east of SNL/NM Technical Area III, 0.4 miles west of Lovelace Road, and 1.3 miles north of the Solar Power Tower, a prominent landmark in the area (Figure 13-1). Building 9960 is accessed by traveling southeast on Lovelace Road, and then turning onto a dirt road that runs south for about 0.5 miles.

13.1.2 Site History

SWMU 154 was first identified as a potential release site in 1987 (SNL August 1997; Table 13-1) and is composed of two adjacent but separate systems. The east septic system lies north of Building 9960 and consists of a 900-gallon septic tank that discharged to a 5-foot (ft)-diameter, 10-ft-deep seepage pit. The west septic system consists of a pair of HE compound seepage pits located southwest of Building 9960.

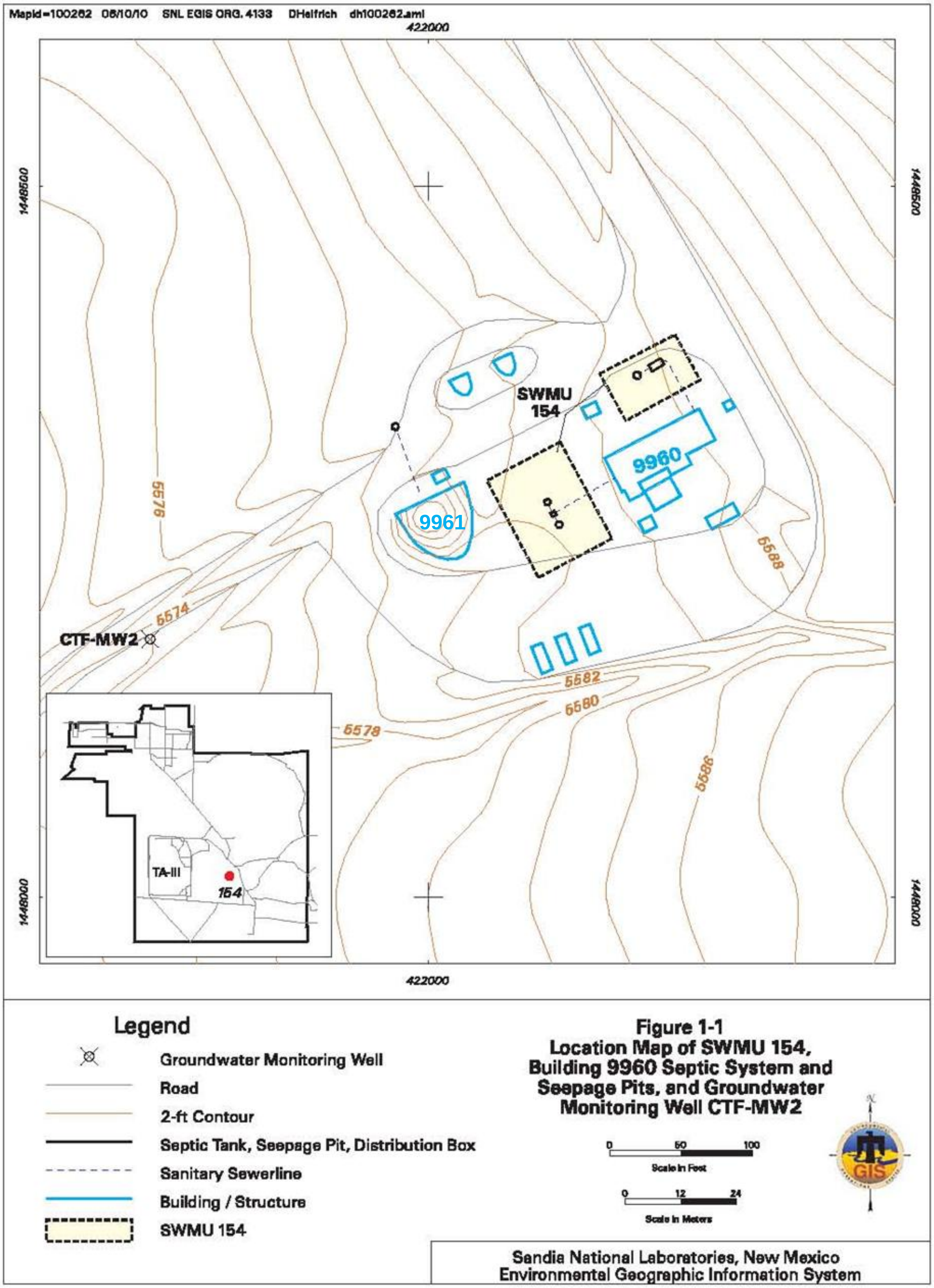

Figure 13-1. Location of Monitoring Well CTF-MW2 near SWMU 154

Table 13-1. Historical Timeline of SWMU 154

Month	Year	Event	Reference
	1965	Building 9960 and septic system, the two HE compound seepage pits, and Building 9961 and associated seepage pit constructed.	SNL August 1997
April	1987	SWMU 154 first identified as a potential release site.	SNL August 1997
June	1992	Waste characterization samples collected from SWMU 154 septic tank.	SNL August 1997
	1993	Building 9960 connected to the City of Albuquerque sanitary sewer system.	SNL August 1997
March	1993	Septic Tanks and Drainfields (OU 1295) RCRA Facility Investigation Work Plan submitted.	SNL March 1993
March	1994	OU 1295 SAP prepared.	IT March 1994
	1994	Cultural Resources and Sensitive Species Surveys conducted at SMWU 154.	SNL August 1997
May	1994	Additional waste characterization samples collected from SWMU 154 septic tank.	SNL August 1997
May-June	1994	A PETREX™ passive soil vapor survey completed in the septic system area at SWMU 154.	SNL August 1997
September	1994	EPA comments on the March 1993 OU 1295 work plan received as a NOD.	EPA September 1994
November	1994	Response to the September 1994 EPA NOD submitted.	SNL November 1994
October	1994	Confirmatory soil samples collected from SWMU 154.	SNL August 1997
October	1995	A second round of soil samples collected from two borings next to the two HE compound seepage pits at SWMU 154.	Chain of custody
January	1996	Remaining waste removed from SWMU 154 septic system septic tank, and the tank was decontaminated and backfilled in place with clean soil. The septic system seepage pit was also backfilled in place with clean fill at that time.	SNL January 1996
June-July	1996	A third round of soil samples collected from four previous and six new boring locations around the HE compound seepage pits at SWMU 154.	Chain of Custody
March	1997	A fourth round of soil samples collected from four additional boring locations in the HE compound seepage pits area at SWMU 154.	Chain of Custody
August	1997	NFA proposal for SWMU 154 submitted to the NMED.	SNL August 1997
January	1998	SWMU 154 was one of five OU 1295 SWMUs selected by the NMED for additional soil sampling through the center of, and beneath seepage pits at the sites.	NMED January 1998
January	1998	SNL/NM personnel collected samples down through the center of and beneath the two HE seepage pits at SWMU 154.	Chain of Custody
June	1999	The NMED responded with an RSI on the SWMU 154 NFA proposal. Installation of a groundwater monitoring well downgradient of SWMU 154 was requested in this RSI.	NMED June 1999
September	1999	First response submitted to the June 1999 NMED RSI for SWMU 154.	SNL September 1999a
October	1999	A SAP describing technical procedures to be used to complete environmental investigations submitted to the NMED for review and approval.	SNL September 1999b
January	2000	SAP approved by the NMED.	NMED January 2000
August	2001	Groundwater monitoring well CTF-MW2 installed near SWMU 154.	SNL June 2005
November	2001	A follow-up FIP documenting specific investigation procedure to be completed submitted to the NMED for review and approval.	SNL November 2001

Table 13-1. Historical Timeline of SWMU 154 *(Concluded)*

Month	Year	Event	Reference
February	2002	The FIP approved by the NMED.	NMED February 2002
June	2004	Completion of eight quarters of groundwater sampling for groundwater monitoring well CTF-MW2 near SWMU 154.	SNL June 2005
June	2005	A third RSI response submitted to the NMED. This document described the results of environmental investigation work completed at SWMU 154 since the August 1997 NFA report was written and also included an updated risk assessment evaluation for the site.	SNL June 2005
August	2005	As required by the NMED, additional soil samples collected and analyzed from beneath a fourth seepage pit associated with Building 9961 near SWMU 154.	Chain-of-Custody
September	2005	The NMED issues NOD. Soil sampling required at an additional seepage pit (Building 9961 seepage pit) at the site.	NMED September 2005
January	2006	Response to NOD submitted, consisting of a report summarizing results of soil sampling beneath the Building 9961 seepage pit.	SNL January 2006
March	2006	The NMED issues a Certificate of Completion for CAC.	NMED March 2006
March	2006	Request for Class III Permit Modification submitted.	SNL March 2006
April	2010	Letter from the NMED formally stating that additional corrective action is needed at SWMU 154, and the specific requirements for what the additional corrective action should entail.	NMED April 2010
June	2010	SAP for SWMU 154 submitted to the NMED.	SNL June 2010
December	2010	SAP approved by the NMED.	NMED December 2010
March	2011	Quarterly sampling of CTF-MW2 reinitiated.	

NOTES:

CAC = Corrective Action Complete.
CTF = Coyote Test Field.
EPA = U.S. Environmental Protection Agency.
FIP = Field Implementation Plan.
HE = High explosive.
MW = Monitoring Well.
NFA = No Further Action.
NMED = New Mexico Environment Department.
NOD = Notice of Deficiency.
OU = Operable Unit.
RCRA = Resource Conservation and Recovery Act.
RSI = Request for Supplemental Information.
SAP = Sampling and Analysis Plan.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid Waste Management Unit.

The two HE compound seepage pits are 5 ft in diameter and were installed to approximately 23 ft below ground surface (bgs). These two SWMU 154 septic systems encompass approximately 0.15 acres of essentially flat-lying land at an average mean elevation of 5,585 ft above mean sea level (amsl).

Available information indicates that Building 9960 was constructed in 1965, and it is assumed that the septic and HE compound drain systems were also constructed at that time. By 1993, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones July 1993). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003). Waste in the septic tank was removed and managed according to SNL/NM policy. The empty and decontaminated septic tank was inspected by the NMED on January 26, 1996, and a closure form was signed by the NMED (SNL January 1996). The septic tank and associated seepage pit were then backfilled with clean, native soil from the area in early 1996. The HE compound drain system seepage pits are inactive, have not been backfilled, and rinse water from HE compound machining operations at the facility is currently directed to large, polypropylene tanks that are routinely tested and drained.

Environmental concern about SWMU 154 was based upon the potential for the release of constituents of concern in effluent discharged to the environment via the septic and HE compound drains system seepage pits at this site. Because operational records were not available, the initial investigation was planned to be consistent with other Drain and Septic System site investigations and to sample for possible constituents of concern that may have been released during facility operations.

In August 1997, a No Further Action (NFA) proposal was submitted to the NMED for SWMU 154 (SNL August 1997). The NMED stated that no septic system NFA proposal would be approved without groundwater characterization. Subsequently, groundwater monitoring well, CTF-MW2, was installed in August 2001, and groundwater samples were collected for the required minimum of eight quarters. Groundwater samples were analyzed for VOCs, Resource Conservation and Recovery Act (RCRA) metals, and HE compounds. Analytical results for these sampling events were presented in the third Request for Supplemental Information (RSI) responses and Corrective Action Complete (CAC) proposal submitted to the NMED (SNL June 2005). In September 2005, the NMED issued a Notice of Disapproval (NOD) (NMED September 2005) requiring DOE/Sandia to characterize an uninvestigated seepage pit associated with Building 9961 in accordance with the approved SAP (SNL October 1999). In January 2006, the NOD response summarizing the results of the soil sampling was submitted (SNL January 2006), and the NMED then issued a Certificate of Completion for CAC (NMED March 2006).

In March 2006, a request for Class III Permit Modification was submitted to the NMED (SNL March 2006). In April 2010, the NMED responded to the Permit Modification Request with a letter requiring further corrective action at SWMU 154 (NMED April 2010), in the form of an additional eight quarters of groundwater monitoring at CTF-MW2. In June 2010, the SAP for CTF-MW2 was submitted (SNL June 2010), which was approved by the NMED (December 2010). Quarterly groundwater sampling was reinitiated at CTF-MW2 in CY 2011, and the analytical results are presented in Section 13.6.

13.1.3 Monitoring History

Groundwater monitoring well CTF-MW2 was installed in August 2001 and was sampled on a quarterly basis from July 2002 to June 2004 to acquire the eight quarters of groundwater data required by the NMED. The groundwater samples were analyzed for VOCs, HE compounds, and RCRA metals. Although not required by the NMED, additional samples were also collected and analyzed for NPN and anions and cations. These additional samples were collected to further characterize the general ion chemistry of groundwater in this well and for purge-water waste characterization purposes. Results for these eight quarters of groundwater sampling are as follows:

- **VOCs:** Acetone was detected only in the first groundwater sample collected in July 2002 as well as in the August 2003 trip blank (TB) and equipment blank (EB) samples. Bromoform was detected only in the December 2003 EB sample and dibromochloromethane was detected in the February and April 2003 EB samples. Methylene chloride and toluene were detected only in TB samples.

- **HE Compounds:** The compound 1,3,5-trinitrobenzene was detected in the February 2003 groundwater sample. No other HE compounds were detected in the groundwater samples associated with this monitoring well. The result for hexahydro-trinitro-triazine (RDX) was rejected during data validation for the October 2002 groundwater sample because the second column confirmation relative percent difference (RPD) exceeded acceptance criteria. No RDX was detected during reanalysis of this sample. A trace of methyl 2,4,6-

trinitrophenylnitramine (tetryl) and 4 amino 2,6-dinitrotoluene were detected in separate EB samples associated with sampling of this well.

- **RCRA Metals:** Arsenic exceeded the EPA MCL in all groundwater samples collected and analyzed. SNL/NM personnel identified that the arsenic concentrations were greater than background values and promulgated limits, as well as explained that these concentrations were likely due to natural origin and not caused by a release at SWMU 154 (SNL September 2002). All other metal concentrations were below regulatory limits.

- **NPN, Anions, and Cations:** Fluoride was detected in all eight primary and two duplicate environmental samples collected but, in all cases, were less than the MCL of 4.0 milligrams per liter (mg/L). The fluoride detected was most likely naturally occurring. None of the known activities conducted at Building 9960 would have produced a discharge of fluoride contamination to the environment.

13.1.4 Current Monitoring Network

Currently one groundwater monitoring well (CTF-MW2) is installed near SWMU 154 (Figure 13-1). CTF-MW2 is monitored quarterly for VOCs, SVOCs, HE compounds, NPN, major anions, alkalinity, TAL total metals plus uranium, perchlorate, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

13.1.5 Summary of Calendar Year 2011 Activities

The following activities took place for monitoring well CTF-MW2 near SWMU 154 during CY 2011 (January through December 2011):

- Quarterly groundwater sampling was conducted at CTF-MW2 in March, May, September, and December 2011.

- Quarterly reporting of analytical results for CTF-MW2 was conducted.

- CTF-MW2 was redeveloped in September 2011 to remove fine-grained material that was causing anomalously high turbidity measurements during groundwater sampling (Watenpaugh and Sanders 2011).

- Tables of analytical results (Attachment 13A), a concentration plot for arsenic (Attachment 13B), and a hydrograph (Attachment 13C) were prepared in support of this report.

13.1.6 Summary of Future Activities

The following activities are anticipated for monitoring well CTF-MW2 near SWMU 154 during CY 2012:

- Quarterly groundwater sampling will be conducted at CTF-MW2, thus completing the regulatory requirement for groundwater characterization.

- Quarterly and annual reporting of analytical results for CTF-MW2 will be performed.

13.1.7 Current Conceptual Model

For the resumption of quarterly groundwater sampling at well CTF-MW2, this section presents a revised discussion of the hydrogeologic regime, conceptual site model, and contaminant findings for SWMU 154.

13.1.7.1 Regional Hydrogeologic Conditions

SWMU 154 is located in the Travertine Hills within the western portion of CTF. The site is located approximately 1,000 ft east of the Tijeras Fault (Plate 1). Nearby outcrops are composed of the Sandia Formation (carbonate cemented sandstone and conglomerate), Madera Group limestone, and Precambrian quartzite and granite (GRAM and Lettis 1995). The base-wide potentiometric surface map (Plate 1) shows that groundwater flow in the regional aquifer is generally towards the west. Faults in the vicinity of the site may serve as hydraulic barriers or conduits depending on the type and amount of fault gouge. No potable water-supply wells are located within 4 miles of the site.

13.1.7.2 Hydrogeologic Conditions at SWMU 154

SWMU 154 consists of two septic systems (SWMUs 154-1 and 154-2) located near Building 9960. SWMU 154-1 is located approximately 20 ft to the west of the building, and SWMU 154-2 is located approximately 20 ft to the north of the building (Figure 13-1). The combined area of SWMU 154 comprises 6,710 square ft (approximately 0.15 acres). The site is covered by colluvium that is underlain by caliche and bedrock. The septic systems were used from 1965 to 1993. Building 9960 is located on the northeastern edge of the Travertine Hills at an elevation of approximately 5,585 ft amsl. The area surrounding Building 9960 consists of rolling hills and is sparsely vegetated by bunch grasses, cacti, and junipers. Overall, the terrain slopes gently to the southwest. No perennial surface-water features such as springs are located within 1 mile of SWMU 154. Monitoring well CTF-MW2 is located approximately 330 ft to the southwest and slightly downslope of Building 9960.

The amount of precipitation available for groundwater recharge is minimal due to scant rainfall and high evapotranspiration rates. Summer (monsoonal) thunderstorms are responsible for the majority of rainfall. The average rainfall, as measured at the nearest active rain gauge (the (National Weather Service station at the Albuquerque International Sunport), during the period from 1915 through 2005 was 8.67 inches per year (WRCC-DRI 2012). The station is located 7.2 miles northwest of the site at an elevation of 5,310 ft amsl, which is similar enough to the site elevation to infer that the annual rainfall at SWMU 154 is approximately 8.7 inches. Intense sunlight and low humidity throughout much of the year creates high rates of evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

In 2001, a location downgradient of SWMU 154 was selected for the installation of groundwater monitoring well CTF-MW2. The location was selected using the historical potentiometric surface for the regional aquifer. The well was installed in August 2001 using the air-rotary casing hammer drilling technique. Alluvium consisting of silty fine- to medium-grained sand was encountered from the ground surface to 10 ft bgs. Silty gravel extended from 10 to 17 ft bgs. A hard layer of caliche with a gravel matrix was encountered from 17 to 32 ft bgs. From 32 to 44 ft bgs, the strata consisted of silty gravel and Abo Formation siltstone. Clayey fine gravel was encountered from 44 to 110 ft bgs. Fractured granite and gneiss was encountered from 110 ft bgs to the borehole total depth of 190 ft bgs. Groundwater was encountered at a depth of 120 ft bgs. Borehole sloughing, especially below 135 ft bgs, in the highly fractured Precambrian granite and gneiss made for difficult drilling. Fault breccia (indicated by manganese and iron cementation) was possibly encountered at 145 ft bgs. The most productive zone in the borehole was 120 to 135 ft bgs. The well was screened from 110 to 130 ft bgs in fractured Precambrian granite and gneiss (Table 13-2).

Table 13-2. Lithologic and Hydrogeologic Elevation Data for Monitoring Well CTF-MW2 near SWMU 154

Monitoring Well	Ground Surface Elevation (ft amsl)	Depth of Screened Interval (ft bgs)	Elevation for Top of Screen (ft amsl)	Potentiometric Surface, October 2011 (ft amsl)	Mid-Point Screen Elevation (ft amsl)	Pressure Head (ft[a])
CTF-MW2	5575.60	110 – 130	5465.60	5534.78	5455.60	79

NOTES:
[a]From mid-point of screen.
amsl = Above mean sea level.
bgs = Below ground surface.
CTF = Coyote Test Field.
ft = Foot (feet).
MW = Monitoring Well.
SWMU = Solid Waste Management Unit.

The October 2011 groundwater elevation was 5534.78 ft amsl (Figure 13-2). Compared to the mid-point elevation of the screen, the pressure head was approximately 79 ft and indicative of confined conditions. Groundwater flows to the west. Groundwater in the bedrock most likely migrates through a confined fracture system. Based on the potentiometric surface depicted on Plate 1, the horizontal gradient is steep and approximately 0.15 feet per foot (ft/ft) on the west side of the well near the Tijeras Fault. Between well CTF-MW2 and the EOD [Explosive Ordnance Disposal] Well to the east, the gradient is much less at approximately 0.03 ft/ft. The geochemical signature for well CTF-MW2 is of the bicarbonate type dominated by the calcium cation.

During sampling, the drawdown in well CTF-MW2 is not excessive and the quantity of water produced is clearly adequate for low-flow sampling purposes. Groundwater samples are collected using pneumatic (nitrogen-gas activated) Bennett™ piston pumps.

The conceptual hydrogeologic model for SWMU 154 is based on the findings for monitoring well CTF-MW2, several nearby monitoring wells located across the CTF (Plate 1), and extensive field mapping conducted by the Site-Wide Hydrogeologic Characterization Project (GRAM and Lettis 1995). Groundwater in the SWMU 154 area occurs in the fractured bedrock system under confined conditions. The depth to groundwater at well CTF-MW2 at the time of installation was approximately 120 ft bgs in a severely fractured interval of Precambrian granite and gneiss. A thick sequence of clayey fine gravel overlying the fractured granite probably serves as a confining unit. The borehole possibly intercepted a splay of Tijeras Fault at 145 ft bgs that yielded only a minor amount of groundwater.

The amount of precipitation available for groundwater recharge at SWMU 154 is minimal due to the scant rainfall, high evapotranspiration rates, and the shallow sequence of competent bedrock. Historical water level data indicate that seasonal effects, primarily due to thunderstorms, do not influence groundwater levels near the site. Groundwater underflow from the site probably discharges to the unconsolidated basin-fill deposits (primarily the Santa Fe Group) of the Albuquerque Basin after crossing the Tijeras and Sandia faults. The steep hydraulic gradient, approximately 0.15 ft/ft, near the well indicates that the Tijeras Fault limits the rate of groundwater migration near the site. No potable water-supply wells are located within 4 miles of the site.

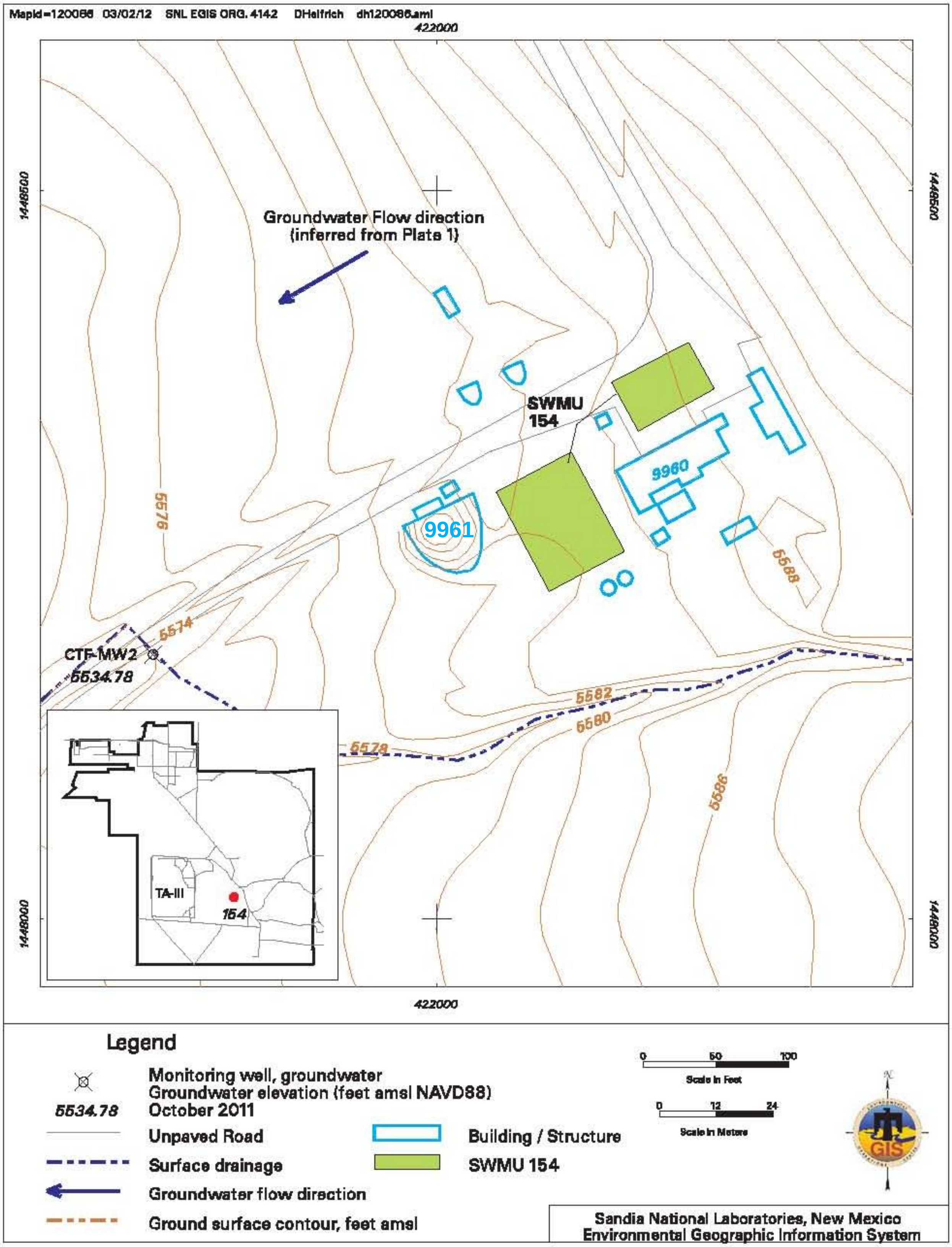

Figure 13-2. SWMU 154 Groundwater Flow Direction (October 2011)

13.1.7.3 Contaminant Sources

From 1965 to 1993, water from the two SWMU 154 septic systems discharged to the subsurface via a pair seepage pits. The septic water contained photo-processing chemicals, HE compounds, and sanitary waste. The areas around the seepage pits and septic tanks were characterized using soil-vapor samplers and soil samples collected from 14 boreholes.

13.1.7.4 Contaminant Distribution and Transport in Groundwater

The first phase of quarterly groundwater sampling for monitoring well CTF-MW2 was conducted from July 2002 to June 2004. Trace amounts of VOCs and one HE compound (1,3,5-trinitrobenzene) were detected. Concentrations decreased over time. NPN and fluoride concentrations reported were less than the MCLs. Except for arsenic, no metals exceeded the MCLs. Arsenic exceeded the MCL in all of the first-phase groundwater samples and was attributed to the natural occurrence of arsenic in bedrock, and not to research activities conducted at Building 9960.

The second phase of quarterly groundwater sampling began in March 2011. During CY 2011 four quarterly groundwater events were conducted at well CTF-MW2. The analytical parameters included VOCs, SVOCs, HE compounds, NPN, major anions, alkalinity, TAL total metals plus uranium, perchlorate, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium. Except for arsenic, no constituents conclusively exceed the respective MCLs. The occurrence of arsenic in groundwater samples from well CTF-MW2 is mostly likely attributable to naturally occurring arsenic in the bedrock where the well is screened.

13.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM Environmental Restoration (ER) Operations (formerly ER Project) as well as implements and enforces federal regulations mandated by RCRA. All ER Operations SWMUs are listed in Module IV of the SNL/NM RCRA Permit, *Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments (HSWA) Portion for Solid Waste Management Units to the RCRA Part B Permit (Module IV), Sandia National Laboratories, NM5890110518,* (NMED 1993). All corrective action requirements pertaining to SWMUs are contained in the Order (NMED April 2004).

In August 1997, an NFA proposal was submitted to the NMED for SWMU 154 (SNL August 1997). In January 1998, as part of a five-site sampling comparison study required by the NMED (January 1998), additional samples were collected at SWMU 154 from boreholes drilled through the center of, and beneath, the two HE compound seepage pits. The analytical results were submitted to the NMED, and in June 1999, the NMED responded with an RSI on the NFA proposal (NMED June 1999). The NMED also stated that no septic system NFA proposal would be approved without groundwater characterization unless the NMED gained confidence that such approvals would be protective of human health and the environment.

The general and site-specific comments were addressed in a response to the RSI submitted in September 1999 (SNL September 1999a). As specified in the subsequently approved SAP (SNL October 1999), DOE/Sandia agreed to install a groundwater monitoring well. The SAP was approved by the NMED in January 2000 (NMED January 2000). Technical details for soil sampling procedures, soil sampling locations, laboratory analytical methods, and passive soil-vapor sampling requirements at these sites were specified in a follow-up Field Implementation Plan (SNL November 2001), which was also approved by the NMED (February 2002). DOE/Sandia were required to collect groundwater samples for a minimum of eight quarters and analyze the samples for VOCs, RCRA metals, and HE compounds.

Analytical results for these sampling events were included in a third RSI response and CAC proposal to the NMED (SNL June 2005). In September 2005, the NMED issued an NOD (NMED September 2005) requiring DOE/Sandia to characterize an uninvestigated seepage pit associated with Building 9961 in accordance with the approved SAP (SNL October 1999). In January 2006, a response summarizing the results of the soil sampling was submitted (SNL January 2006), and the NMED then issued a Certificate of Completion for CAC (NMED March 2006).

In March 2006, a Class III Permit Modification Request was submitted to the NMED (SNL March 2006). In April 2010, the NMED responded to the Permit Modification Request with a letter requiring further corrective action at SWMU 154 (NMED April 2010) in the form of an additional eight quarters of groundwater monitoring at CTF-MW2. In June 2010, a SAP for CTF-MW2 was submitted (SNL June 2010), which the NMED approved (NMED December 2010).

Quarterly groundwater sampling was reinitiated at CTF-MW2 in CY 2011, and the analytical results are presented in Section 13.6. In this report SWMU 154 groundwater monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy and gross alpha/beta activity) are provided voluntarily by the DOE/Sandia. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Order, as specified in Section III.A of the Order (NMED April 2004).

13.3 Scope of Activities

The activities for monitoring well CTF-MW2 near SWMU 154 conducted during this reporting period are listed in Section 13.1.5. The field activity discussed in this section is groundwater monitoring sampling and analysis during CY 2011 sampling events (Table 13-3). The analytical parameters for each sampling event are listed in Tables 13-4 and 13-5.

Table 13-3. Sampling Dates and SAPs for Monitoring Well CTF-MW2 near SWMU 154, Calendar Year 2011

Date of Sampling Event	SAP
March 8, 2011	*SWMU 154 Groundwater Monitoring Mini-SAP for Second Quarter Fiscal Year 2011* (SNL March 2011)
May 31, 2011	*SWMU 154 Groundwater Monitoring Mini-SAP for Third Quarter Fiscal Year 2011* (SNL May 2011a)
September 29, 2011	*SWMU 154 Groundwater Monitoring Mini-SAP for Fourth Quarter Fiscal Year 2011* (SNL September 2011)
December 9, 2011	*SWMU 154 Groundwater Monitoring Mini-SAP for First Quarter Fiscal Year 2012* (SNL December 2011)

NOTES:
CTF = Coyote Test Field.
MW = Monitoring Well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
SWMU = Solid Waste Management Unit.

Table 13-4. SWMU 154 Chemical Analytical Methods

Analyte	Analytical Method[a,b,c,d]
Anions	SW846 9056
Alkalinity	SM2320B
HE Compounds	SW846 8321A
NPN	EPA 353.2
Perchlorate	EPA 314.0
SVOC	SW846 8270C
TAL Metals	SW846 6010/6020/7470
VOC	SW846 8260B

NOTES:

[a]EPA 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1, U.S. Environmental Protection Agency, Washington, D.C.

[b]EPA 1983, *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0*, EPA-600/4-84-017.

[c]EPA 1999, *Perchlorate in Drinking Water Using Ion Chromatography*, EPA 815/R-00-014.

[d]Clesceri, et al., 1998, *Standard Methods for the Examination of Water and Wastewater,* 20th ed., Method 2320B.

EPA = U.S. Environmental Protection Agency.
HE = High explosive.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard Method.
SVOC = Semivolatile organic compound.
SW = Solid Waste.
SWMU = Solid Waste Management Unit.
TAL = Target Analyte List.
VOC = Volatile organic compound.

Table 13-5. SWMU 154 Radiochemical Analytical Methods

Analyte	Analytical Method[a,b]
Gamma Spectroscopy (short list)	EPA 901.0
Gross Alpha/Beta	EPA 900.0
Isotopic Uranium	HASL-300

NOTES:

[a]EPA 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032

[b]U.S. Department of Energy, Environmental Measurements Laboratory (EML), 1990, *EML Procedures Manual,* 27th ed., Vol. 1, Rev. 1992, HASL-300.

EPA = U.S. Environmental Protection Agency.
HASL = Health and Safety Laboratory.
SWMU = Solid Waste Management Unit.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. QC samples are prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. Field QC samples include duplicate environmental, split, EB, TB, and field blank (FB) samples. Duplicate environmental samples are used to measure the precision of the sampling process. Split samples are used to verify the performance of the analytical laboratory. EB samples are used to verify the effectiveness of sampling equipment decontamination procedures. TB samples are used to determine whether VOCs contaminated the sample during preparation, transportation, and handling prior to receipt by the analytical laboratory. FB samples provide a check for potential ambient sources of sample contamination during the sampling process and/or sampling error.

13.4 Field Methods and Measurements

According to the requirements of the Order (NMED April 2004) addressing Section VII.D.6 and the NMED letter of April 8, 2010 (NMED April 2010), SNL/NM personnel performed groundwater sampling at SWMU 154. The CY 2011 sampling events were conducted in conformance with appropriate SNL/NM Field Operating Procedures (FOPs) for groundwater sampling activities and the SWMU 154 site-specific SAP (SNL June 2010).

Environmental groundwater samples were collected from monitoring well CTF-MW2. Samples were submitted to GEL Laboratories LLC (GEL) for all chemical analyses. Groundwater samples were analyzed for VOCs, SVOCs, HE compounds, NPN, major anions (as bromide, chloride, fluoride, and sulfate), alkalinity, TAL metals plus uranium, perchlorate, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

The monitoring procedures, as conducted by Long-Term Stewardship (LTS)/ER Operations personnel, are consistent with procedures identified in the EPA technical enforcement guidance document (EPA 1986). The following sections provide an overview of the sampling and data collection procedures.

13.4.1 Groundwater Elevation

Throughout CY 2011, water level measurements were obtained to determine groundwater flow directions, hydraulic gradients, and changes in water table elevations. Water levels are periodically measured at CTF-MW2 according to the instructions and requirements specified in SNL/NM FOP 03-02, *Groundwater Level Data Acquisition and Management* (SNL November 2009a and February 2011). The water level information was used to create the map showing groundwater flow direction presented on Figure 13-2 and the hydrograph presented on Figure 13C-1 (Attachment 13C).

13.4.2 Well Purging and Water Quality Measurements

Purging removes stagnant water from the well so that a representative groundwater sample can be obtained. In accordance with procedures described in SNL/NM FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements* (SNL November 2009b), all wells were purged a minimum of one saturated casing volume (the volume of one length of the saturated screen plus the borehole annulus around the saturated screen interval). Purging continued until four stable measurements for turbidity, pH, temperature, and specific conductance (SC) were obtained from the well prior to the collection of groundwater samples. Groundwater stability is considered acceptable when measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU, 0.1 pH units, 1.0 degrees Celsius, and SC is within 5 percent as micromhos per centimeter.

Additional field parameters collected included oxidation reduction potential (ORP), dissolved oxygen (DO), and water level measurements. Groundwater temperature, SC, ORP, DO, and pH were measured using a YSI™ Model 6920 water quality meter. Turbidity was measured with a HACH™ Model 2100P portable turbidity meter. Associated Field Measurement Logs documenting details of well purging and water quality measurements are filed in the SNL/NM Records Center.

During the March 2011 sampling event, turbidity measurements were higher than typical sampling events, and the final four turbidity readings ranged from 23.5 to 53.7 NTU. A video camera survey was performed at CTF-MW2 in May 2011, and silt and very fine sand were observed within the well screen. As a result, the sampling pump intake was positioned at a higher elevation within the screen interval. Subsequently, CTF-MW2 was redeveloped in September 2011 to remove the fine-grained material that was causing the high turbidity (Watenpaugh and Sanders 2011).

13.4.3 Pump Decontamination

The Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into the monitoring well in accordance with the procedures described in SNL/NM FOP 05-03, *Long-Term*

Environmental Stewardship Groundwater Sampling Equipment Decontamination (SNL November 2009c). An EB sample was collected in March 2011 to verify the effectiveness of the equipment decontamination process. EB samples were not required during the May, September, and December 2011 sampling events.

13.4.4 Sample Collection Sampling Procedures

Groundwater sampling was performed in strict accordance with SNL/NM FOP 05-01 (SNL November 2009b) and SNL/NM Sample Management Office (SMO) procedures and protocols. Sample container types depend on the analytical parameters.

Groundwater samples were collected using the Bennett™ nitrogen gas-powered portable piston pump. Sample bottles were filled directly from the pump discharge line and water sampling manifold into laboratory-prepared sample containers, with the VOC samples collected at the lowest achievable discharge rate. The groundwater samples were submitted to GEL for chemical analysis using methods outlined in Tables 13-4 and 13-5.

13.4.5 Sample Handling and Shipment

The SNL/NM SMO processes environmental samples collected by LTS/ER Operations personnel. The SMO reviews the Mini-SAPs, orders sample containers, issues sample control and tracking numbers, tracks the chain-of-custody, and reviews analytical results returned from the laboratories for laboratory contract compliance (SNL May 2010). All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols.

QC samples are also prepared at the laboratory to determine whether contaminant chemicals are introduced in laboratory processes and procedures. These include method blanks, laboratory control samples (LCSs), matrix spike (MS)/matrix spike duplicate (MSD), and surrogate spike samples. Reported laboratory analytical and QC data are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review*, SMO-05-03 (SNL May 2010) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL July 2007 and May 2011b).

13.4.6 Waste Management

Purge and decontamination water generated from all sampling activities were placed into 55-gallon containers and stored at the Environmental Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management*, (SNL November 2009d) as nonregulated waste, based on historical sampling results and process knowledge of the monitoring well location. Associated environmental sample results provide supplemental data for approval to discharge water to the sanitary sewer. All data is compared to Albuquerque Bernalillo County Water Utility Authority discharge limits.

13.5 Analytical Methods

Groundwater samples were submitted to GEL for chemical analyses. Samples were analyzed in accordance with applicable EPA and DOE analytical methods (EPA 1980, 1983, 1996, and 1999; Clesceri, et al. 1998; DOE 1990). Groundwater sampling results are compared with established EPA MCLs for drinking water (EPA 2009). Analytical results and field measurements for samples collected from monitoring well CTF-MW2 are shown in tabulated form in Tables 13A-1 through 13A-10 (Attachment 13A). Analytical reports, including certificates of analyses, analytical methods, method detection limits (MDLs), minimum detectable activity, critical level, practical quantitation limits (PQLs), dates of analyses, results of QC analyses, and data validation findings are filed in the SNL/NM Records Center.

13.6 Summary of Analytical Results

This section discusses analytical results and field measurements for the CY 2011 SWMU 154 sampling events. Data are presented in Tables 13A-1 through 13A-10 (Attachment 13A). Data qualifiers are explained in the footnotes following Table 13A-10.

The analytical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL July 2007 and May 2011b). No problems were identified with the analytical data that resulted in qualification of the data as unusable. The data are acceptable, and reported QC measures are adequate.

No VOCs, SVOCs, or HE compounds were detected at concentrations exceeding established MCLs in any CTF-MW2 groundwater sample. No SVOCs were reported above laboratory MDLs. Table 13A-1 summarizes detected VOCs, SVOCs, and HE compounds for CTF-MW2 environmental groundwater samples. Table 13A-2 lists the MDLs for associated VOCs and SVOCs; the MDLs for HE compounds are presented in Table 13A-3. Detected compounds for the CY 2011 sampling events are summarized as follows:

- **March 2011 Sampling Event:** The VOC toluene was detected in the duplicate environmental sample at a concentration of 0.250 micrograms per liter (µg/L). Toluene was not detected above the laboratory MDL in the associated environmental sample. The result for SVOC di-n-octylphthalate was qualified as unusable during data validation, because the initial calibration intercept for this compound did not meet acceptance criteria. The HE compound RDX was detected in CTF-MW2 environmental and duplicate environmental samples at concentrations of 0.298 and 0.372 µg/L, respectively.

- **May 2011 Sampling Event:** The VOC carbon disulfide was detected at a concentration of 1.60 µg/L. The HE compound RDX was detected at a concentration of 0.124 µg/L.

- **September 2011 Sampling Event:** The VOC toluene was detected at a concentration of 0.97 µg/L. The HE compound RDX was detected at a concentration of 0.144 µg/L.

- **December 2011 Sampling Event:** The VOC toluene was detected at a concentration of 0.720 µg/L. The HE compound RDX was detected at a concentration of 0.222 µg/L.

Table 13A-4 summarizes NPN results. NPN values were compared with the nitrate MCL of 10 mg/L. No NPN was detected above the laboratory MDL in CTF-MW2 samples.

Table 13A-5 summarizes major anion (as bromide, chloride, fluoride, and sulfate) and alkalinity results. No parameters were detected above established MCLs in CTF-MW2 samples for CY 2011.

Perchlorate was not detected above the NMED screening level/MDL of 4 µg/L in CY 2011 CTF-MW2 samples. Table 13A-6 presents the perchlorate results.

Metal analysis includes two sets of analyses and results. Samples were collected as both filtered and unfiltered fractions. One sample was filtered, using an in-line disposable filter, to remove suspended solids. Unfiltered and filtered metal results are summarized in Tables 13A-7 and 13A-8, respectively. The only metals detected above established MCLs in CTF-MW2 CY 2011 groundwater samples are arsenic and thallium, discussed as follows:

- **March 2011 Sampling Event**: Arsenic was detected above the MCL of 0.010 mg/L in both unfiltered and filtered environmental and duplicate environmental samples. Unfiltered arsenic was reported at concentrations of 0.0595 and 0.053 mg/L, and filtered arsenic at 0.0544 and 0.0521 mg/L. The result for unfiltered arsenic in the duplicate environmental sample was qualified as not detected during data validation because the result reported was less than five times the EB result. Unfiltered thallium was detected above the MCL of 0.002 mg/L in the environmental sample at a concentration of 0.00249 mg/L. Thallium was not detected above the laboratory MDL in the associated duplicate environmental sample or in filtered sample fractions. The results for unfiltered copper and filtered aluminum in the environmental samples were qualified as not detected during data validation because these metals were detected at concentrations less than five times the associated EB result.

- **May 2011 Sampling Event:** Arsenic was detected above the MCL of 0.010 mg/L in both unfiltered and filtered groundwater samples. Unfiltered arsenic was reported at a concentration of 0.0496 mg/L, and filtered arsenic at 0.0528 mg/L.

- **September 2011 Sampling Event:** Arsenic was detected above the MCL of 0.010 mg/L in both unfiltered and filtered groundwater samples. Unfiltered arsenic was reported at a concentration of 0.0651 mg/L, and filtered arsenic at 0.061 mg/L.

- **December 2011 Sampling Event:** Arsenic was detected above the MCL of 0.010 mg/L in both unfiltered and filtered groundwater samples. Unfiltered arsenic was reported at a concentration of 0.0469 mg/L, and filtered arsenic at 0.0495 mg/L.

Arsenic concentrations since March 2002 are plotted on Figure 13B-1 (Attachment 13B).

CTF-MW2 groundwater samples were screened for gamma-emitting radionuclides, gross alpha, and gross beta activity. Additional samples for isotopic uranium were collected to support evaluation of gross alpha activity results. The results for gamma spectroscopy, gross alpha/beta activity, and isotopic uranium analyses are presented in Table 13A-9. All radionuclide activity results are below the MCLs, where established, except for gross alpha. During May 2011, the gross alpha activity was reported above the MCL of 15 picocuries per liter (pCi/L) at 23.38 pCi/L in the environmental sample. Although this activity is comparable to historical values, SNL/NM personnel requested reanalysis. The gross alpha reanalysis result reported is below the MCL at 1.18 pCi/L. In addition, March, September, and December 2011 gross alpha activity results reported are below the MCL.

Table 13A-10 summarizes field water quality measurements collected prior to sampling. Field water quality measurements include turbidity, pH, temperature, SC, ORP, and DO.

13.7 Quality Control Results

Field and laboratory QC samples are prepared to determine the accuracy of the methods used and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. The following sections discuss site-specific QC results for the SWMU 154 annual sampling event.

All chemical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL July 2007 and May 2011b). Although some analytical results were qualified during the data validation process, no significant data quality problems were noted. Data validation qualifiers are provided with the analytical results in Tables 13A-1 through 13A-9 (Attachment 13A). The data validation report associated with each sampling event has been submitted to the SNL/NM Records Center. The following sections discuss site-specific QC results for the SWMU 154 quarterly sampling events.

13.7.1 Field Quality Control Samples

Field QC samples for March 2011 included one duplicate environmental sample, one EB sample, two TB samples, and one FB sample. Field QC samples for May, September, and December 2011events included one TB sample only per event. In accordance with the approved SAP (SNL June 2010), duplicate environmental, EB, and FB samples are not required during these sampling events. The field QC samples were submitted for analysis along with the groundwater samples in accordance with QC procedures specified in the mini-SAPs (SNL March 2011, May 2011a, September 2011, and December 2011)

13.7.1.1 Duplicate Environmental Samples

A duplicate environmental sample was collected in March 2011 and analyzed to estimate the overall reproducibility of the sampling and analytical process. The duplicate environmental sample was collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The duplicate environmental sample was analyzed for all parameters. The results show that sampling and analysis precision are in conformance with the SWMU 154 SAP requirements for all measured VOCs and metals. The RPD for the HE compound RDX was calculated at 22 and is considered an estimated value because the reported RDX concentrations are below associated PQLs.

13.7.1.2 Equipment Blank Samples

The Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into CTF-MW2 according to procedures described in SNL/NM FOP 05-03 (SNL November 2009c). In accordance with SNL/NM FOP 05-03, the following solutions were pumped through the sampling system: 5 gallons of deionized (DI) water mixed with 20 milliliters (mL) nonphosphate laboratory detergent; 5 gallons of DI water; 5 gallons of DI water mixed with 20 mL reagent-grade nitric acid; and 15 gallons of DI water. In addition, the outside of the pump tubing was rinsed with DI water. EB samples are collected to verify the effectiveness of the equipment decontamination process. An EB sample was collected prior to sampling monitoring well CTF-MW2 in March 2011 and submitted for all analyses.

Aluminum, arsenic, bromodichloromethane, chloroform, chloride, chromium, copper, dibromochloromethane, sodium, and zinc were detected in the EB sample. No corrective action was required for bromodichloromethane, chloroform, chloride, chromium, dibromochloromethane, sodium, or zinc as these parameters were either not detected in the associated environmental samples or detected at concentrations greater than five times the blank result. Various metal results were qualified as not detected during data validation, because the results reported are at concentrations less than five times the associated EB result. These metals include unfiltered fractions for arsenic and copper and filtered fractions for aluminum.

13.7.1.3 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analyses to assess whether contamination of the samples had occurred during shipment and storage. TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-mL volatile organic analysis vials prepared by the analytical laboratory, which accompany the empty sample containers supplied by the laboratory. TB samples were brought to the field and accompanied each sample shipment.

A total of two TB samples were submitted with the March 2011 samples. No VOCs were detected above associated laboratory MDLs, except for toluene. Toluene was detected in the TB sample associated with the EB sample. No corrective action was necessary as this compound was not detected in the EB sample.

TB samples were submitted with the May, September, and December 2011 samples. No VOCs were detected above associated laboratory MDLs.

13.7.1.4 Field Blank Samples

An FB sample was collected in March 2011 and analyzed for VOCs to assess whether contamination of the samples resulted from ambient field conditions. The FB sample was prepared by pouring DI water into sample containers at the sampling point (i.e., inside the sampling truck at the well location) to simulate the transfer of environmental samples from the sampling system to the sample container. Bromodichloromethane, chloroform, and dibromochloromethane were detected in the FB sample. No corrective action was necessary as these compounds were not detected in CTF-MW2 environmental or duplicate environmental samples.

13.7.2 Laboratory Quality Control Samples

The analytical laboratory is required to have established procedures that demonstrate the analytical process is always in control during each sample analysis step. These procedures are used for all samples including environmental samples, method blank samples, and MS samples.

An LCS consists of a control matrix (e.g., DI water) spiked with known concentrations of analytes representative of the target analytes. An LCS was prepared and analyzed for each analytical procedure and batch to determine accuracy of the data. The laboratory evaluates the precision of the data by performing duplicate analyses for either the environmental samples, LCSs, or MS samples and calculating the RPD between corresponding results.

Method blank samples are used to check for contamination in the laboratory during sample preparation and analysis. Method blank samples are concurrently prepared and analyzed with each analytical batch. Method blanks are reported in the same units as corresponding environmental samples, and the results are included with each analytical report.

Surrogate spike analysis is performed for all samples analyzed by gas chromatography/mass spectroscopy. The surrogate compounds added to the sample are those specified in the applicable EPA analytical method procedure (EPA 1996). Recovery values for surrogate compounds that are outside specified control limits require corrective action.

The analytical process is systematically evaluated for the effects of naturally occurring constituents present in the environmental sample matrix. MS/MSD analyses are performed in accordance with the specified analytical procedures.

Internal laboratory QC samples, including method blanks and duplicate LCSs were analyzed concurrently with all groundwater samples. All chemical data were reviewed and qualified in accordance with SNL/NM AOP 00-03 (SNL July 2007 and May 2011b). Laboratory data qualifiers are provided with the analytical results in Tables 13A-1 through 13A-9 (Attachment 13A).

- **March 2011 Sampling Event:** No significant data quality problems were noted during the data validation process, except for the SVOC di-n-octylphthalate. The result for this compound was qualified as unusable during data validation because the initial calibration intercept for this compound did not meet acceptance criteria.

- **May 2011 Sampling Event:** No significant data quality problems were noted during the data validation processes.

- **September 2011 Sampling Event:** The interference check sample, MS recoveries, or serial dilution percent differences for several metals were outside acceptance criteria, and the results were qualified during data validation as estimated values. The result for the HE compound tetryl was qualified during validation as unusable because the MS/MSD sample recovery was outside acceptance criteria. The potassium-40 activity result was qualified as unusable during data validation because the laboratory was unable to meet identification criteria.

- **December 2011 Sampling Event:** No significant data quality problems were noted during the data validation processes.

The data validation reports are filed in the SNL/NM Records Center.

13.8 Variances and Nonconformances

Variances and nonconformances from requirements in the SWMU 154 SAP (SNL June 2010) and project-specific issues during the CY 2011 sampling activities are identified as follows:

- **March 2011 Sampling Event:** The result for the SVOC di-n-octylphthalate was qualified as unusable during data validation because the initial calibration intercept for this compound did not meet acceptance criteria. Turbidity measurements were higher than previous sampling events, and the final four turbidity readings ranged from 23.5 to 23.8 NTU.

- **May 2011 Sampling Event**: GEL revised its processes for vanadium analysis. Due to inconsistencies exhibited by the instrumentation, GEL has decided to analyze vanadium using SW846 6010 for all sample matrices. SNL/NM requested that GEL rerun the gross alpha analysis. The reanalysis result correlates with the initial data and both results are reported.

- **September 2011 Sampling Event**: The result for the HE compound tetryl was qualified during validation as unusable because the MS/MSD sample recovery was outside acceptance criteria. No additional corrective action was performed as the holding time requirement has been exceeded, and the compound has not been detected in historical samples.

- **December 2011 Sampling Event:** No variances, nonconformances, or project-specific issues occurred.

13.9 Summary and Conclusions

During CY 2011 four quarterly groundwater samples were collected from CTF-MW2. Analytical parameters included VOCs, SVOCs, HE compounds, NPN, major anions, alkalinity, TAL total metals plus uranium, perchlorate, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium. Results were compared with MCL guidelines for drinking water (EPA 2009) and are summarized as follows:

- **March 2011 Sampling Event:** No parameters were detected above established MCLs, except for arsenic and thallium. Arsenic exceeded the MCL of 0.010 mg/L in all CTF-MW2 groundwater samples at concentrations of 0.0595 and 0.053 mg/L in unfiltered samples and 0.0544 and 0.0521 mg/L in filtered samples. Total thallium was detected above the MCL of 0.002 mg/L in the unfiltered environmental sample at a concentration of

0.00249 mg/L. Thallium was not detected above the laboratory MDL in the associated duplicate environmental sample or dissolved sample fractions.

- **May 2011 Sampling Event**: No parameters were detected above established MCLs, except for arsenic and gross alpha activity. Arsenic exceeds the MCL of 0.010 mg/L in both unfiltered and filtered CTF-MW2 groundwater samples. Unfiltered arsenic was reported at a concentration of 0.0496 mg/L, and filtered arsenic at 0.0528 mg/L. The corrected gross alpha activity reported is above the MCL of 15 pCi/L at 23.38 pCi/L in the environmental sample. The result reported for the gross alpha activity reanalysis is below the MCL.

- **September 2011 Sampling Event**: No parameters were detected above established MCLs, except for arsenic. Arsenic exceeded the MCL of 0.010 mg/L in both unfiltered and filtered CTF-MW2 groundwater samples. Unfiltered arsenic was reported at a concentration of 0.0651 mg/L, and filtered arsenic at 0.061 mg/L.

- **December 2011 Sampling Event:** No parameters were detected above established MCLs, except for arsenic. Arsenic exceeded the MCL of 0.010 mg/L in both unfiltered and filtered CTF-MW2 groundwater samples. Unfiltered arsenic was reported at a concentration of 0.0469 mg/L, and filtered arsenic at 0.0495 mg/L.

The analytical results for this reporting period are consistent with historical concentrations. The current conceptual model described in Section 13.1.7 does not require modification based on the analytical results for this reporting period.

During CY 2012, quarterly groundwater sampling will continue at monitoring well CTF-MW2 near SWMU 154.

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Attachment 13A
Solid Waste Management Unit 154
Analytical Results Tables

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Attachment 13A Tables

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Table 13A-1
Summary of Detected Volatile Organic, Semivolatile Organic, and High Explosive Compounds, Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2 08-Mar-11	RDX	0.298	0.104	0.325	NE	J	J+	090237-024	SW846-8321A
CTF-MW2 (Duplicate)	Toluene	0.250	0.250	1.00	1000	J		090238-001	SW846-8260B
08-Mar-11	RDX	0.372	0.104	0.325	NE		J+	090238-024	SW846-8321A
CTF-MW2	Carbon disulfide	1.60	1.25	5.00	NE	J		090670-001	SW846-8260B
31-May-11	RDX	0.124	0.104	0.325	NE	J		090670-024	SW846-8321A
CTF-MW2	Toluene	0.970	0.250	1.00	1000	J		091259-001	SW846-8260B
29-Sep-11	RDX	0.144	0.104	0.325	NE	J		091259-024	SW846-8321A
CTF-MW2	Toluene	0.720	0.250	1.00	1000	J		091525-001	SW846-8260B
09-Dec-11	RDX	0.222	0.104	0.325	NE	J		091525-024	SW846-8321A

Refer to footnotes on page 13A-25.

Table 13A-2
Method Detection Limits for Volatile Organic and Semivolatile Organic Compounds, Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]
1,1,1-Trichloroethane	0.325	8260B	1,2,4-Trichlorobenzene	2.00 - 3.00	8270C	Di-n-butyl phthalate	2.00 - 3.00	8270C
1,1,2,2-Tetrachloroethane	0.250	8260B	1,2-Dichlorobenzene	2.00 - 3.00	8270C	Di-n-octyl phthalate	3.00 - 3.16	8270C
1,1,2-Trichloroethane	0.250	8260B	1,3-Dichlorobenzene	2.00 - 3.00	8270C	Dibenz[a,h]anthracene	0.200 - 0.300	8270C
1,1-Dichloroethane	0.300	8260B	1,4-Dichlorobenzene	2.00 - 3.00	8270C	Dibenzofuran	2.00 - 3.00	8270C
1,1-Dichloroethene	0.300	8260B	2,4,5-Trichlorophenol	2.00 - 3.00	8270C	Diethylphthalate	2.00 - 3.00	8270C
1,2-Dichloroethane	0.250	8260B	2,4,6-Trichlorophenol	2.00 - 3.00	8270C	Dimethylphthalate	2.00 - 3.00	8270C
1,2-Dichloropropane	0.250	8260B	2,4-Dichlorophenol	2.00 - 3.00	8270C	Dinitro-o-cresol	3.00 - 3.16	8270C
2-Butanone	1.25	8260B	2,4-Dimethylphenol	2.00 - 3.00	8270C	Diphenyl amine	3.00 - 3.16	8270C
2-Hexanone	1.25	8260B	2,4-Dinitrophenol	5.00 - 5.26	8270C	Fluoranthene	0.200 - 0.300	8270C
4-methyl-, 2-Pentanone	1.25	8260B	2,4-Dinitrotoluene	2.00 - 3.00	8270C	Fluorene	0.200 - 0.300	8270C
Acetone	3.50	8260B	2,6-Dinitrotoluene	2.00 - 3.00	8270C	Hexachlorobenzene	2.00 - 3.00	8270C
Benzene	0.300	8260B	2-Chloronaphthalene	0.300 - 0.316	8270C	Hexachlorobutadiene	2.00 - 3.00	8270C
Bromodichloromethane	0.250	8260B	2-Chlorophenol	2.00 - 3.00	8270C	Hexachlorocyclopentadiene	3.00 - 3.16	8270C
Bromoform	0.250	8260B	2-Methylnaphthalene	0.300 - 0.316	8270C	Hexachloroethane	2.00 - 3.00	8270C
Bromomethane	0.300	8260B	2-Nitroaniline	2.00 - 3.00	8270C	Indeno(1,2,3-c,d)pyrene	0.200 - 0.300	8270C
Carbon disulfide	1.25	8260B	2-Nitrophenol	2.00 - 3.00	8270C	Isophorone	3.00 - 3.16	8270C
Carbon tetrachloride	0.300	8260B	3,3'-Dichlorobenzidine	2.00 - 3.00	8270C	Naphthalene	0.300 - 0.316	8270C
Chlorobenzene	0.250	8260B	3-Nitroaniline	2.00 - 3.00	8270C	Nitro-benzene	3.00 - 3.16	8270C
Chloroethane	0.300	8260B	4-Bromophenyl phenyl ether	2.00 - 3.00	8270C	Pentachlorophenol	2.00 - 3.00	8270C
Chloroform	0.250	8260B	4-Chloro-3-methylphenol	2.00 - 3.00	8270C	Phenanthrene	0.200 - 0.300	8270C
Chloromethane	0.300	8260B	4-Chlorobenzenamine	2.00 - 3.00	8270C	Phenol	1.00 - 3.00	8270C
Dibromochloromethane	0.300	8260B	4-Chlorophenyl phenyl ether	2.00 - 3.00	8270C	Pyrene	0.300 - 0.316	8270C
Ethyl benzene	0.250	8260B	4-Nitroaniline	3.00 - 3.16	8270C	bis(2-Chloroethoxy)methane	3.00 - 3.16	8270C
Methylene chloride	3.00	8260B	4-Nitrophenol	2.00 - 3.00	8270C	bis(2-Chloroethyl)ether	2.00 - 3.00	8270C
Styrene	0.250	8260B	Acenaphthene	0.300 - 0.326	8270C	bis(2-Ethylhexyl)phthalate	2.00 - 2.11	8270C
Tetrachloroethene	0.300	8260B	Acenaphthylene	0.200 - 0.300	8270C	bis-Chloroisopropyl ether	3.00	8270C
Toluene	0.250	8260B	Anthracene	0.200 - 0.300	8270C	m,p-Cresol	3.00 - 3.16	8270C
Trichloroethene	0.250	8260B	Benzo(a)anthracene	0.200 - 0.300	8270C	n-Nitrosodipropylamine	2.00 - 3.00	8270C
Vinyl acetate	1.50	8260B	Benzo(a)pyrene	0.200 - 0.300	8270C	o-Cresol	2.00 - 3.00	8270C
Vinyl chloride	0.500	8260B	Benzo(b)fluoranthene	0.200 - 0.300	8270C			
Xylene	0.300	8260B	Benzo(ghi)perylene	0.200 - 0.300	8270C			
cis-1,2-Dichloroethene	0.300	8260B	Benzo(k)fluoranthene	0.200 - 0.300	8270C			
cis-1,3-Dichloropropene	0.250	8260B	Butylbenzyl phthalate	2.00 - 3.00	8270C			
trans-1,2-Dichloroethene	0.300	8260B	Carbazole	0.200 - 0.300	8270C			
trans-1,3-Dichloropropene	0.250	8260B	Chrysene	0.200 - 0.300	8270C			

Refer to footnotes on page 13A-25.

Table 13A-3
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8321A), Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.104
1,3-Dinitrobenzene	0.104
2,4,6-Trinitrotoluene	0.104
2,4-Dinitrotoluene	0.104
2,6-Dinitrotoluene	0.0779 - 0.104
2-Amino-4,6-dinitrotoluene	0.104
2-Nitrotoluene	0.104 - 0.106
3-Nitrotoluene	0.104
4-Amino-2,6-dinitrotoluene	0.104
4-Nitrotoluene	0.104 - 0.195
HMX	0.104
Nitro-benzene	0.104
Pentaerythritol tetranitrate	0.130
RDX	0.104
Tetryl	0.104 - 0.130

Refer to footnotes on page 13A-25.

Table 13A-4
Summary of Nitrate plus Nitrite Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2 08-Mar-11	Nitrate plus nitrite as N	ND	0.010	0.050	10.0	U		090237-018	EPA 353.2
CTF-MW2 (Duplicate) 08-Mar-11	Nitrate plus nitrite as N	ND	0.010	0.050	10.0	U		090238-018	EPA 353.2
CTF-MW2 31-May-11	Nitrate plus nitrite as N	ND	0.050	0.250	10.0	U		090670-018	EPA 353.2
CTF-MW2 29-Sep-11	Nitrate plus nitrite as N	ND	0.050	0.250	10.0	U		091259-018	EPA 353.2
CTF-MW2 09-Dec-11	Nitrate plus nitrite as N	ND	0.050	0.250	10.0	U		091525-018	EPA 353.2

Refer to footnotes on page 13A-25.

Table 13A-5
Summary of Anion and Alkalinity Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2 08-Mar-11	Bicarbonate Alkalinity	1550	0.725	1.00	NE	B		090237-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090237-022	SM2320B
	Bromide	1.51	0.264	0.800	NE			090237-016	SW846 9056
	Chloride	475	1.65	5.00	NE			090237-016	SW846 9056
	Fluoride	2.32	0.132	0.400	4.0			090237-016	SW846 9056
	Sulfate	152	2.50	10.0	NE			090237-016	SW846 9056
CTF-MW2 (Duplicate) 08-Mar-11	Bicarbonate Alkalinity	1540	0.725	1.00	NE	B		090238-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090238-022	SM2320B
	Bromide	1.58	0.264	0.800	NE			090238-016	SW846 9056
	Chloride	477	1.65	5.00	NE			090238-016	SW846 9056
	Fluoride	2.60	0.132	0.400	4.0			090238-016	SW846 9056
	Sulfate	153	2.50	10.0	NE			090238-016	SW846 9056
CTF-MW2 31-May-11	Bicarbonate Alkalinity	1590	0.725	1.00	NE	B		090670-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		090670-022	SM2320B
	Bromide	1.82	0.330	1.00	NE			090670-016	SW846 9056
	Chloride	404	6.60	20.0	NE			090670-016	SW846 9056
	Fluoride	2.08	0.033	0.100	4.0			090670-016	SW846 9056
	Sulfate	162	10.0	40.0	NE			090670-016	SW846 9056
CTF-MW2 29-Sep-11	Bicarbonate Alkalinity	1460	0.725	1.00	NE	B		091259-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091259-022	SM2320B
	Bromide	1.86	0.330	1.00	NE			091259-016	SW846 9056
	Chloride	448	3.30	10.0	NE			091259-016	SW846 9056
	Fluoride	2.75	0.165	0.500	4.0			091259-016	SW846 9056
	Sulfate	147	0.500	2.00	NE			091259-016	SW846 9056
CTF-MW2 09-Dec-11	Bicarbonate Alkalinity	1570	0.725	1.00	NE	B		091525-022	SM2320B
	Carbonate Alkalinity	ND	0.725	1.00	NE	U		091525-022	SM2320B
	Bromide	ND	0.066	0.200	NE	U		091525-016	SW846 9056
	Chloride	432	3.30	10.0	NE			091525-016	SW846 9056
	Fluoride	2.23	0.033	0.100	4.0			091525-016	SW846 9056
	Sulfate	149	5.00	20.0	NE			091525-016	SW846 9056

Refer to footnotes on page 13A-25.

Table 13A-6
Summary of Perchlorate Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Perchlorate Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2 08-Mar-11	ND	0.004	0.012	NE	U		090237-020	EPA 314.0
CTF-MW2 (Duplicate) 08-Mar-11	ND	0.004	0.012	NE	U		090238-020	EPA 314.0
CTF-MW2 31-May-11	ND	0.004	0.012	NE	U		090670-020	EPA 314.0
CTF-MW2 29-Sep-11	ND	0.004	0.012	NE	U		091259-020	EPA 314.0
CTF-MW2 09-Dec-11	ND	0.004	0.012	NE	U		091525-020	EPA 314.0

Refer to footnotes on page 13A-25.

Table 13A-7
Summary of Unfiltered Total Metal Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.381	0.075	0.250	NE			090237-009	SW846 6020
08-Mar-11	Antimony	ND	0.005	0.015	0.006	U		090237-009	SW846 6020
	Arsenic	**0.0595**	0.0085	0.025	0.010			090237-009	SW846 6020
	Barium	0.0848	0.003	0.010	2.00			090237-009	SW846 6020
	Beryllium	0.00175	0.001	0.0025	0.004	J		090237-009	SW846 6020
	Cadmium	ND	0.00055	0.005	0.005	U		090237-009	SW846 6020
	Calcium	381	3.00	10.0	NE	B		090237-009	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		090237-009	SW846 6020
	Cobalt	0.00772	0.0005	0.005	NE			090237-009	SW846 6020
	Copper	0.00182	0.00175	0.005	NE	J	0.017U	090237-009	SW846 6020
	Iron	3.18	0.165	0.500	NE			090237-009	SW846 6020
	Lead	ND	0.0025	0.010	NE	U		090237-009	SW846 6020
	Magnesium	87.2	0.050	0.150	NE			090237-009	SW846 6020
	Manganese	3.24	0.005	0.025	NE		J	090237-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090237-009	SW846 7470
	Nickel	0.0215	0.0025	0.010	NE			090237-009	SW846 6020
	Potassium	50.2	0.400	1.50	NE			090237-009	SW846 6020
	Selenium	ND	0.0075	0.025	0.050	U		090237-009	SW846 6020
	Silver	ND	0.001	0.005	NE	U		090237-009	SW846 6020
	Sodium	463	4.00	12.5	NE			090237-009	SW846 6020
	Thallium	**0.00249**	0.00225	0.010	0.002	J		090237-009	SW846 6020
	Uranium	0.0292	0.000335	0.001	0.03			090237-009	SW846 6020
	Vanadium	ND	0.015	0.050	NE			090237-009	SW846 6020
	Zinc	ND	0.0175	0.050	NE	U		090237-009	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-7 *(Continued)*
Summary of Unfiltered Total Metal Results
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2 (Duplicate)	Aluminum	0.312	0.075	0.250	NE			090238-009	SW846 6020
08-Mar-11	Antimony	ND	0.005	0.015	0.006	U		090238-009	SW846 6020
	Arsenic	**0.053**	0.0085	0.025	0.010		0.058U	090238-009	SW846 6020
	Barium	0.0765	0.003	0.010	2.00			090238-009	SW846 6020
	Beryllium	0.00132	0.001	0.0025	0.004	J		090238-009	SW846 6020
	Cadmium	ND	0.00055	0.005	0.005	U		090238-009	SW846 6020
	Calcium	406	3.00	10.0	NE	B		090238-009	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		090238-009	SW846 6020
	Cobalt	0.00726	0.0005	0.005	NE			090238-009	SW846 6020
	Copper	ND	0.00175	0.005	NE	U		090238-009	SW846 6020
	Iron	2.86	0.165	0.500	NE			090238-009	SW846 6020
	Lead	ND	0.0025	0.010	NE	U		090238-009	SW846 6020
	Magnesium	81.8	0.050	0.150	NE			090238-009	SW846 6020
	Manganese	3.08	0.005	0.025	NE		J	090238-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090238-009	SW846 7470
	Nickel	0.0194	0.0025	0.010	NE			090238-009	SW846 6020
	Potassium	47.4	0.400	1.50	NE			090238-009	SW846 6020
	Selenium	ND	0.0075	0.025	0.050	U		090238-009	SW846 6020
	Silver	ND	0.001	0.005	NE	U		090238-009	SW846 6020
	Sodium	482	4.00	12.5	NE			090238-009	SW846 6020
	Thallium	ND	0.00225	0.010	0.002	U		090238-009	SW846 6020
	Uranium	0.0264	0.000335	0.001	0.03			090238-009	SW846 6020
	Vanadium	ND	0.015	0.050	NE	U		090238-009	SW846 6020
	Zinc	ND	0.0175	0.050	NE	U		090238-009	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-7 *(Continued)*
Summary of Unfiltered Total Metal Results
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.0807	0.075	0.250	NE	J		090670-009	SW846 6020
31-May-11	Antimony	ND	0.001	0.003	0.006	U		090670-009	SW846 6020
	Arsenic	**0.0496**	0.0017	0.005	0.010			090670-009	SW846 6020
	Barium	0.0702	0.0006	0.002	2.00			090670-009	SW846 6020
	Beryllium	0.00231	0.0002	0.0005	0.004			090670-009	SW846 6020
	Cadmium	0.000119	0.00011	0.001	0.005	J	J+	090670-009	SW846 6020
	Calcium	392	0.600	2.00	NE			090670-009	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		090670-009	SW846 6020
	Cobalt	0.00869	0.0005	0.005	NE			090670-009	SW846 6020
	Copper	ND	0.00175	0.005	NE	U		090670-009	SW846 6020
	Iron	2.51	0.165	0.500	NE			090670-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090670-009	SW846 6020
	Magnesium	84.9	0.050	0.150	NE			090670-009	SW846 6020
	Manganese	2.99	0.005	0.025	NE		J	090670-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090670-009	SW846 7470
	Nickel	0.0253	0.0025	0.010	NE			090670-009	SW846 6020
	Potassium	50.9	0.400	1.50	NE			090670-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090670-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090670-009	SW846 6020
	Sodium	488	0.800	2.50	NE			090670-009	SW846 6020
	Thallium	0.00146	0.00045	0.002	0.002	J		090670-009	SW846 6020
	Uranium	0.0274	0.000335	0.001	0.03			090670-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		090670-009	SW846 6010
	Zinc	0.0106	0.0035	0.010	NE		J+	090670-009	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-7 *(Continued)*
Summary of Unfiltered Total Metal Results
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.150	0.015	0.050	NE			091259-009	SW846 6020
29-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091259-009	SW846 6020
	Arsenic	**0.0651**	0.0017	0.005	0.010			091259-009	SW846 6020
	Barium	0.0833	0.0006	0.002	2.00		J	091259-009	SW846 6020
	Beryllium	0.00355	0.0002	0.0005	0.004			091259-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091259-009	SW846 6020
	Calcium	377	1.50	5.00	NE			091259-009	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091259-009	SW846 6020
	Cobalt	0.0118	0.0001	0.001	NE		J+	091259-009	SW846 6020
	Copper	0.00164	0.00035	0.001	NE		J+	091259-009	SW846 6020
	Iron	3.55	0.033	0.100	NE		J-	091259-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091259-009	SW846 6020
	Magnesium	83.4	0.050	0.150	NE			091259-009	SW846 6020
	Manganese	2.58	0.005	0.025	NE		J	091259-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091259-009	SW846 7470
	Nickel	0.0222	0.0005	0.002	NE		J	091259-009	SW846 6020
	Potassium	57.3	0.400	1.50	NE			091259-009	SW846 6020
	Selenium	0.00298	0.0015	0.005	0.050	J	J-	091259-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091259-009	SW846 6020
	Sodium	491	2.00	6.25	NE			091259-009	SW846 6020
	Thallium	0.00126	0.00045	0.002	0.002	J		091259-009	SW846 6020
	Uranium	0.0277	0.000067	0.0002	0.03			091259-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091259-009	SW846 6010
	Zinc	0.588	0.0035	0.010	NE		J-	091259-009	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-7 *(Concluded)*
Summary of Unfiltered Total Metal Results
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.230	0.075	0.250	NE	J		091525-009	SW846 6020
09-Dec-11	Antimony	ND	0.001	0.003	0.006	U		091525-009	SW846 6020
	Arsenic	**0.0469**	0.0017	0.005	0.010			091525-009	SW846 6020
	Barium	0.0755	0.0006	0.002	2.00		J	091525-009	SW846 6020
	Beryllium	0.00315	0.001	0.0025	0.004			091525-009	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091525-009	SW846 6020
	Calcium	388	0.600	2.00	NE	B		091525-009	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		091525-009	SW846 6020
	Cobalt	0.00987	0.0005	0.005	NE			091525-009	SW846 6020
	Copper	ND	0.00175	0.005	NE	U		091525-009	SW846 6020
	Iron	2.51	0.165	0.500	NE			091525-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091525-009	SW846 6020
	Magnesium	85.7	0.050	0.150	NE			091525-009	SW846 6020
	Manganese	2.93	0.010	0.050	NE		J	091525-009	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091525-009	SW846 7470
	Nickel	0.0206	0.0025	0.010	NE		J+	091525-009	SW846 6020
	Potassium	53.8	0.400	1.50	NE			091525-009	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		091525-009	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091525-009	SW846 6020
	Sodium	493	1.60	5.00	NE			091525-009	SW846 6020
	Thallium	0.00111	0.00045	0.002	0.002	J		091525-009	SW846 6020
	Uranium	0.0276	0.000067	0.0002	0.03			091525-009	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091525-009	SW846 6010
	Zinc	1.19	0.035	0.100	NE			091525-009	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-8
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.0838	0.075	0.250	NE	J	1.5UJ	090237-010	SW846 6020
08-Mar-11	Antimony	ND	0.005	0.015	0.006	U		090237-010	SW846 6020
	Arsenic	**0.0544**	0.0085	0.025	0.010			090237-010	SW846 6020
	Barium	0.0797	0.003	0.010	2.00			090237-010	SW846 6020
	Beryllium	0.00168	0.001	0.0025	0.004	J		090237-010	SW846 6020
	Cadmium	ND	0.00055	0.005	0.005	U		090237-010	SW846 6020
	Calcium	389	3.00	10.0	NE	B		090237-010	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		090237-010	SW846 6020
	Cobalt	0.00774	0.0005	0.005	NE			090237-010	SW846 6020
	Copper	ND	0.00175	0.005	NE	U		090237-010	SW846 6020
	Iron	2.43	0.165	0.500	NE			090237-010	SW846 6020
	Lead	ND	0.0025	0.010	NE	U		090237-010	SW846 6020
	Magnesium	87.6	0.050	0.150	NE			090237-010	SW846 6020
	Manganese	3.23	0.005	0.025	NE		J	090237-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090237-010	SW846 7470
	Nickel	0.0207	0.0025	0.010	NE			090237-010	SW846 6020
	Potassium	50.6	0.400	1.50	NE			090237-010	SW846 6020
	Selenium	ND	0.0075	0.025	0.050	U		090237-010	SW846 6020
	Silver	ND	0.001	0.005	NE	U		090237-010	SW846 6020
	Sodium	477	4.00	12.5	NE			090237-010	SW846 6020
	Thallium	ND	0.00225	0.010	0.002	U		090237-010	SW846 6020
	Uranium	0.0281	0.000335	0.001	0.03			090237-010	SW846 6020
	Vanadium	ND	0.015	0.050	NE	U		090237-010	SW846 6020
	Zinc	ND	0.0175	0.050	NE	U		090237-010	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-8 *(Continued)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2 (Duplicate)	Aluminum	ND	0.075	0.250	NE	U	1.5UJ	090238-010	SW846 6020
08-Mar-11	Antimony	ND	0.005	0.015	0.006	U		090238-010	SW846 6020
	Arsenic	**0.0521**	0.0085	0.025	0.010			090238-010	SW846 6020
	Barium	0.0768	0.003	0.010	2.00			090238-010	SW846 6020
	Beryllium	0.00139	0.001	0.0025	0.004	J		090238-010	SW846 6020
	Cadmium	ND	0.00055	0.005	0.005	U		090238-010	SW846 6020
	Calcium	398	3.00	10.0	NE	B		090238-010	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		090238-010	SW846 6020
	Cobalt	0.0077	0.0005	0.005	NE			090238-010	SW846 6020
	Copper	ND	0.00175	0.005	NE	U		090238-010	SW846 6020
	Iron	2.63	0.165	0.500	NE			090238-010	SW846 6020
	Lead	ND	0.0025	0.010	NE	U		090238-010	SW846 6020
	Magnesium	85.3	0.050	0.150	NE			090238-010	SW846 6020
	Manganese	3.23	0.005	0.025	NE		J	090238-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090238-010	SW846 7470
	Nickel	0.0207	0.0025	0.010	NE			090238-010	SW846 6020
	Potassium	49.9	0.400	1.50	NE			090238-010	SW846 6020
	Selenium	ND	0.0075	0.025	0.050	U		090238-010	SW846 6020
	Silver	ND	0.001	0.005	NE	U		090238-010	SW846 6020
	Sodium	495	4.00	12.5	NE			090238-010	SW846 6020
	Thallium	ND	0.00225	0.010	0.002	U		090238-010	SW846 6020
	Uranium	0.0266	0.000335	0.001	0.03			090238-010	SW846 6020
	Vanadium	ND	0.015	0.050	NE	U		090238-010	SW846 6020
	Zinc	ND	0.0175	0.050	NE	U		090238-010	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-8 *(Continued)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.111	0.075	0.250	NE	J		090670-010	SW846 6020
31-May-11	Antimony	ND	0.001	0.003	0.006	U		090670-010	SW846 6020
	Arsenic	**0.0528**	0.0017	0.005	0.010			090670-010	SW846 6020
	Barium	0.0696	0.0006	0.002	2.00			090670-010	SW846 6020
	Beryllium	0.00232	0.0002	0.0005	0.004			090670-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		090670-010	SW846 6020
	Calcium	395	0.600	2.00	NE			090670-010	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		090670-010	SW846 6020
	Cobalt	0.00886	0.0005	0.005	NE			090670-010	SW846 6020
	Copper	ND	0.00175	0.005	NE	U		090670-010	SW846 6020
	Iron	2.68	0.165	0.500	NE			090670-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		090670-010	SW846 6020
	Magnesium	81.8	0.050	0.150	NE			090670-010	SW846 6020
	Manganese	2.99	0.005	0.025	NE		J	090670-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		090670-010	SW846 7470
	Nickel	0.0258	0.0025	0.010	NE			090670-010	SW846 6020
	Potassium	51.3	0.400	1.50	NE			090670-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		090670-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		090670-010	SW846 6020
	Sodium	478	1.60	5.00	NE			090670-010	SW846 6020
	Thallium	0.00137	0.00045	0.002	0.002	J		090670-010	SW846 6020
	Uranium	0.0271	0.000335	0.001	0.03			090670-010	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		090670-010	SW846 6010
	Zinc	0.00978	0.0035	0.010	NE	J	J+	090670-010	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-8 *(Continued)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.123	0.015	0.050	NE			091259-010	SW846 6020
29-Sep-11	Antimony	ND	0.001	0.003	0.006	U		091259-010	SW846 6020
	Arsenic	**0.061**	0.0017	0.005	0.010			091259-010	SW846 6020
	Barium	0.081	0.0006	0.002	2.00		J	091259-010	SW846 6020
	Beryllium	0.00334	0.0002	0.0005	0.004			091259-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091259-010	SW846 6020
	Calcium	348	1.50	5.00	NE			091259-010	SW846 6020
	Chromium	ND	0.002	0.010	0.100	U		091259-010	SW846 6020
	Cobalt	0.00976	0.0001	0.001	NE		J+	091259-010	SW846 6020
	Copper	0.0014	0.00035	0.001	NE		J+	091259-010	SW846 6020
	Iron	3.04	0.033	0.100	NE		J-	091259-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091259-010	SW846 6020
	Magnesium	70.0	0.050	0.150	NE			091259-010	SW846 6020
	Manganese	2.25	0.005	0.025	NE		J	091259-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091259-010	SW846 7470
	Nickel	0.0187	0.0005	0.002	NE		J	091259-010	SW846 6020
	Potassium	46.8	0.080	0.300	NE			091259-010	SW846 6020
	Selenium	0.00207	0.0015	0.005	0.050	J	J-	091259-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091259-010	SW846 6020
	Sodium	509	2.00	6.25	NE			091259-010	SW846 6020
	Thallium	0.00129	0.00045	0.002	0.002	J		091259-010	SW846 6020
	Uranium	0.0239	0.000067	0.0002	0.03			091259-010	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091259-010	SW846 6010
	Zinc	0.561	0.0035	0.010	NE		J-	091259-010	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-8 *(Concluded)*
Summary of Filtered Total Metal Results,
Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CTF-MW2	Aluminum	0.239	0.075	0.250	NE	J		091525-010	SW846 6020
09-Dec-11	Antimony	ND	0.001	0.003	0.006	U		091525-010	SW846 6020
	Arsenic	**0.0495**	0.0017	0.005	0.010			091525-010	SW846 6020
	Barium	0.0745	0.0006	0.002	2.00		J	091525-010	SW846 6020
	Beryllium	0.00275	0.001	0.0025	0.004			091525-010	SW846 6020
	Cadmium	ND	0.00011	0.001	0.005	U		091525-010	SW846 6020
	Calcium	359	0.600	2.00	NE	B		091525-010	SW846 6020
	Chromium	ND	0.010	0.050	0.100	U		091525-010	SW846 6020
	Cobalt	0.0102	0.0005	0.005	NE			091525-010	SW846 6020
	Copper	ND	0.00175	0.005	NE	U		091525-010	SW846 6020
	Iron	2.54	0.165	0.500	NE			091525-010	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		091525-010	SW846 6020
	Magnesium	85.7	0.050	0.150	NE			091525-010	SW846 6020
	Manganese	2.71	0.010	0.050	NE		J	091525-010	SW846 6020
	Mercury	ND	0.000066	0.0002	0.002	U		091525-010	SW846 7470
	Nickel	0.0206	0.0025	0.010	NE		J+	091525-010	SW846 6020
	Potassium	53.6	0.400	1.50	NE			091525-010	SW846 6020
	Selenium	ND	0.0015	0.005	0.050	U		091525-010	SW846 6020
	Silver	ND	0.0002	0.001	NE	U		091525-010	SW846 6020
	Sodium	475	1.60	5.00	NE			091525-010	SW846 6020
	Thallium	0.00136	0.00045	0.002	0.002	J		091525-010	SW846 6020
	Uranium	0.0256	0.000067	0.0002	0.03			091525-010	SW846 6020
	Vanadium	ND	0.001	0.005	NE	U		091525-010	SW846 6010
	Zinc	1.06	0.035	0.100	NE			091525-010	SW846 6020

Refer to footnotes on page 13A-25.

Table 13A-9
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Isotopic Uranium Results, Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[f]	Validation Qualifier[g]	Sample No.	Analytical Method[h]
CTF-MW2	Americium-241	7.56 ± 8.62	12.0	6.02	NE	U	BD	090237-033	EPA 901.1
08-Mar-11	Cesium-137	-0.642 ± 1.66	2.64	1.32	NE	U	BD	090237-033	EPA 901.1
	Cobalt-60	0.737 ± 1.75	2.93	1.47	NE	U	BD	090237-033	EPA 901.1
	Potassium-40	69.9 ± 43.1	28.5	14.3	NE		J	090237-033	EPA 901.1
	Gross Alpha	-0.08	NA	NA	15		None	090237-034	EPA 900.0
	Gross Beta	88.7 ± 17.3	11.9	5.79	4mrem/yr			090237-034	EPA 900.0
	Uranium-233/234	58.1 ± 8.18	0.111	0.0484	NE			090237-035	HASL-300
	Uranium-235/236	1.38 ± 0.267	0.071	0.0268	NE			090237-035	HASL-300
	Uranium-238	9.20 ± 1.35	0.0756	0.0308	NE			090237-035	HASL-300
CTF-MW2 (Duplicate)	Americium-241	-1.95 ± 3.56	4.91	2.46	NE	U	BD	090238-033	EPA 901.1
08-Mar-11	Cesium-137	4.15 ± 3.13	4.41	2.20	NE	U	BD	090238-033	EPA 901.1
	Cobalt-60	0.890 ± 2.33	4.02	2.01	NE	U	BD	090238-033	EPA 901.1
	Potassium-40	84.6 ± 32.9	35.5	17.8	NE		J	090238-033	EPA 901.1
	Gross Alpha	-1.71	NA	NA	15		None	090238-034	EPA 900.0
	Gross Beta	75.2 ± 14.6	9.32	4.51	4mrem/yr			090238-034	EPA 900.0
	Uranium-233/234	55.5 ± 8.13	0.107	0.0465	NE			090238-035	HASL-300
	Uranium-235/236	0.906 ± 0.197	0.0683	0.0258	NE			090238-035	HASL-300
	Uranium-238	8.60 ± 1.31	0.0726	0.0296	NE			090238-035	HASL-300
CTF-MW2	Americium-241	11.5 ± 22.4	31.7	15.9	NE	U	BD	090670-033	EPA 901.1
31-May-11	Cesium-137	-0.418 ± 2.15	3.55	1.77	NE	U	BD	090670-033	EPA 901.1
	Cobalt-60	-1.08 ± 2.26	3.62	1.81	NE	U	BD	090670-033	EPA 901.1
	Potassium-40	91.4 ± 48.6	33.7	16.8	NE		J	090670-033	EPA 901.1
	Gross Alpha	**23.38**	NA	NA	15	NA	None	090670-034	EPA 900.0
	Gross Alpha (re-analysis)	1.18	NA	NA	15	NA	None	090670-R34	EPA 900.0
	Gross Beta	54.0 ± 12.6	11.3	5.44	4mrem/yr			090670-034	EPA 900.0
	Uranium-233/234	58.5 ± 8.38	0.159	0.0714	NE			090670-035	HASL-300
	Uranium-235/236	0.690 ± 0.172	0.122	0.0508	NE			090670-035	HASL-300
	Uranium-238	8.93 ± 1.35	0.083	0.0332	NE			090670-035	HASL-300

Refer to footnotes on page 13A-25.

Table 13A-9 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Isotopic Uranium Results, Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[f]	Validation Qualifier[g]	Sample No.	Analytical Method[h]
CTF-MW2	Americium-241	0.0886 ± 10.7	11.7	5.83	NE	U	BD	091259-033	EPA 901.1
29-Sep-11	Cesium-137	0.466 ± 1.93	3.21	1.61	NE	U	BD	091259-033	EPA 901.1
	Cobalt-60	0.478 ± 1.99	3.35	1.68	NE	U	BD	091259-033	EPA 901.1
	Potassium-40	41.6 ± 44.8	30.9	15.5	NE	X	R	091259-033	EPA 901.1
	Gross Alpha	4.20	NA	NA	15	NA	None	091259-034	EPA 900.0
	Gross Beta	63.7 ± 13.0	9.74	4.71	4mrem/yr			091259-034	EPA 900.0
	Uranium-233/234	56.1 ± 8.93	0.187	0.0765	NE			091259-035	HASL-300
	Uranium-235/236	0.437 ± 0.176	0.140	0.049	NE			091259-035	HASL-300
	Uranium-238	7.76 ± 1.36	0.219	0.0922	NE			091259-035	HASL-300
CTF-MW2	Americium-241	-1.92 ± 5.93	10.1	4.95	NE	U	BD	091525-033	EPA 901.1
09-Dec-11	Cesium-137	-2.77 ± 2.05	2.48	1.18	NE	U	BD	091525-033	EPA 901.1
	Cobalt-60	0.586 ± 1.79	3.18	1.50	NE	U	BD	091525-033	EPA 901.1
	Potassium-40	75.4 ± 45.8	25.6	11.9	NE		J	091525-033	EPA 901.1
	Gross Alpha	2.85	NA	NA	15	NA	None	091525-034	EPA 900.0
	Gross Beta	69.6 ± 12.9	6.19	2.96	4mrem/yr			091525-034	EPA 900.0
	Uranium-233/234	58.0 ± 8.17	0.191	0.0785	NE			091525-035	HASL-300
	Uranium-235/236	0.652 ± 0.221	0.168	0.063	NE			091525-035	HASL-300
	Uranium-238	8.00 ± 1.27	0.162	0.064	NE			091525-035	HASL-300

Refer to footnotes on page 13A-25.

Table 13A-10
Summary of Field Water Quality Measurements[h], Solid Waste Management Unit 154 Groundwater Monitoring, Sandia National Laboratories/New Mexico

Calendar Year 2011

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CTF-MW2	08-Mar-11	14.12	3324	65.0	6.03	23.5	1.8	0.19
CTF-MW2	31-May-11	19.51	3404	71.2	5.89	1.16	1.8	0.17
CTF-MW2	29-Sep-11	18.66	4036	52.2	5.58	2.72	2.2	0.20
CTF-MW2	09-Dec-11	14.85	4021	135.3	5.44	1.96	2.3	0.23

Refer to footnotes on page 13A-25.

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Footnotes for Solid Waste Management Unit 154 Groundwater Monitoring Tables

[a]Result
- Values in bold exceed the established MCL.
- ND = not detected (at method detection limit).
- Activities of zero or less are considered to be not detected.
- Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table I-4)
- µg/L = micrograms per liter
- mg/L = milligrams per liter
- pCi/L = picocuries per liter

[b]MDL or MDA

Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

The minimum detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

NA = not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix-specific.

NA = not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL
- Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11[b]), National Primary Drinking Water Standards, EPA 816-F-09-000, May 2009.
- NE = not established.
- The following are the MCLs for gross alpha particles and beta particles in community water systems:
  15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table I-4).
  4 mrem/yr = any combination of beta and/or gamma-emitting radionuclides (as dose rate).

[e]Laboratory Qualifier

B	=	The analyte was detected in the blank above the effective MDL.
J	=	Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
NA	=	Not applicable.
U	=	Analyte is absent or below the method detection limit.
X	=	Uncertain identification for gamma spectroscopy analysis and/or peak not meeting identification criteria.

Footnotes for Solid Waste Management Unit 154 Groundwater Monitoring Tables (Concluded)

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	=	Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	=	The associated value is an estimated quantity.
J+	=	The associated numerical value is an estimated quantity with a suspected positive bias.
J-	=	The associated numerical value is an estimated quantity with a suspected negative bias.
None	=	No data validation for corrected gross alpha activity.
U	=	The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	=	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	=	The data are unusable, and resampling or reanalysis are necessary for verification.

[g]Analytical Method

- U.S. Environmental Protection Agency, 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
- U.S. Environmental Protection Agency, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed.
- U.S. Environmental Protection Agency, 1983. *The Determination of Inorganic Anions in Water by Ion Chromatography-Method 300.0,* EPA-600/4-84-017.
- U.S. Environmental Protection Agency, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio
- U.S. Department of Energy, Environmental Measurements Laboratory, 1990, *EML Procedures Manual*, 27th ed., Vol. 1, Rev. 1992, HASL-300.
- Clesceri, L.S., A.E. Greenburg, and A.D. Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater,* 20th ed., Method 2320B.
  Beckman LS5000TD Liquid Scintillation System Operation Manual, May 1988.

[h]Field Water Quality Measurements

- Field measurements collected prior to sampling.

°C	= degrees Celsius.
% Sat	= percent saturation.
µmho/cm	= micromhos per centimeter.
mg/L	= milligrams per liter.
mV	= millivolts.
NTU	= nephelometric turbidity units.
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 13B
Solid Waste Management Unit 154
Plots

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Attachment 13B Plots

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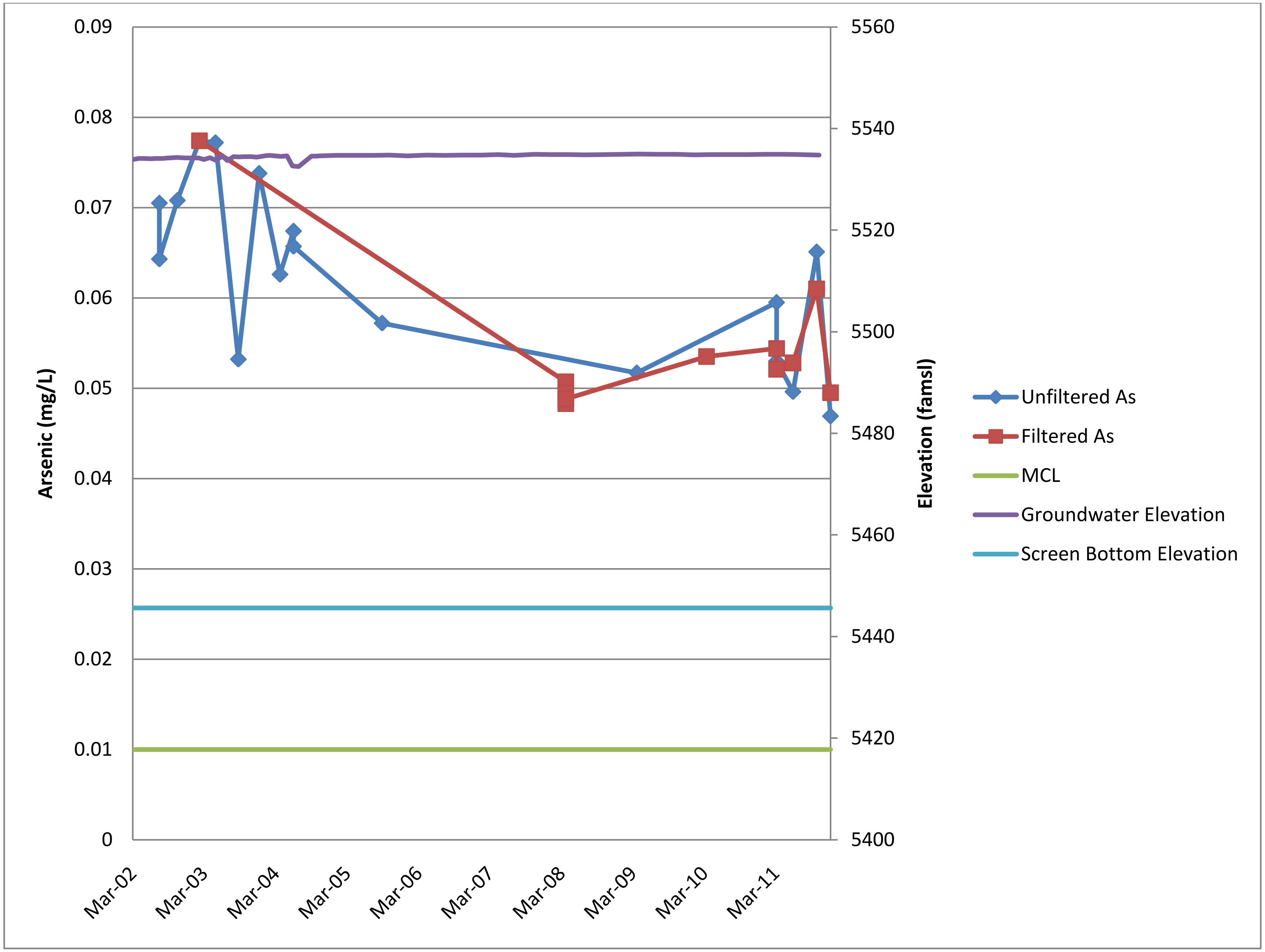

Figure 13B-1. Arsenic Concentrations, CTF-MW2

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Attachment 13C
Solid Waste Management Unit 154
Hydrographs

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Attachment 13C Hydrographs

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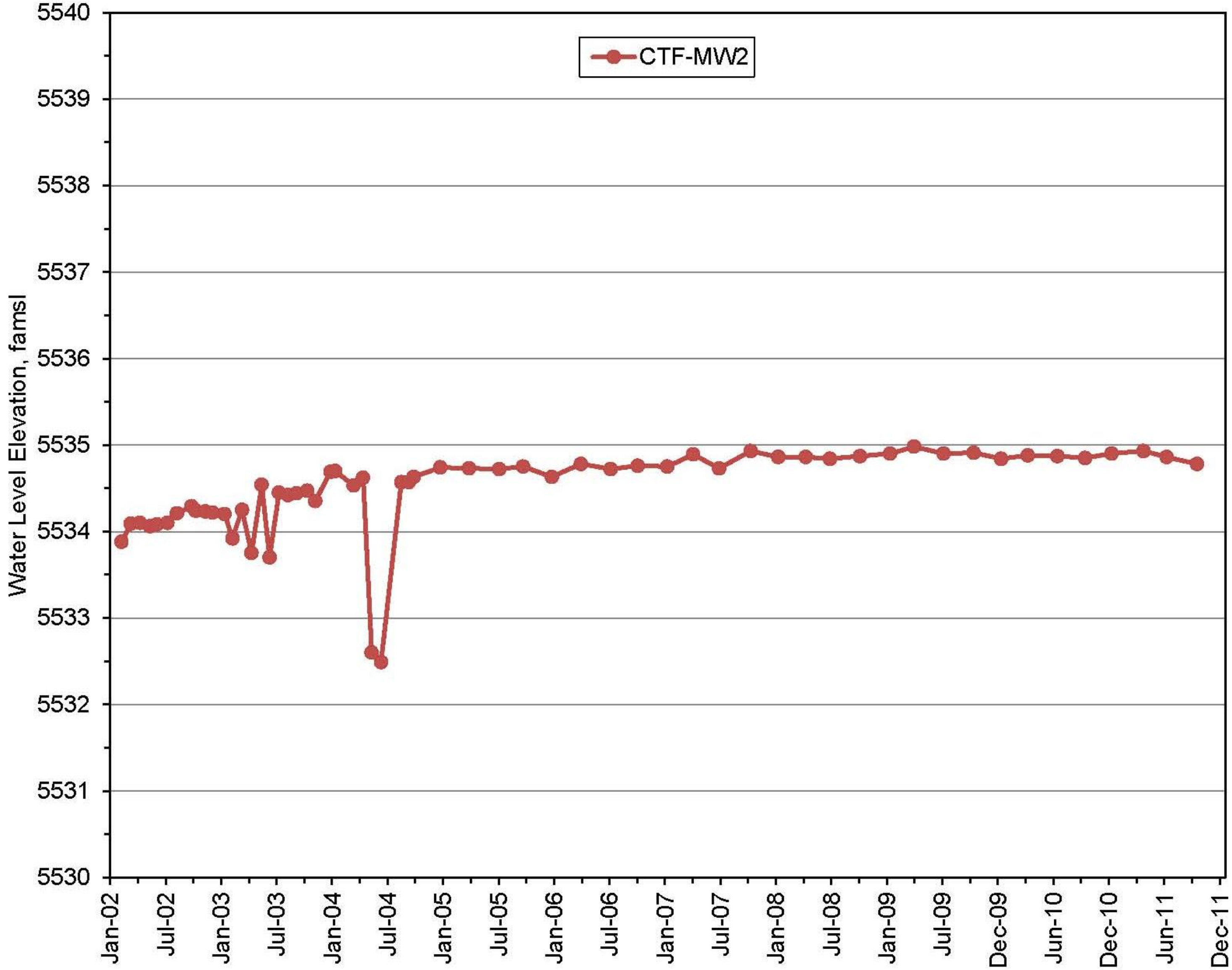

Figure 13C-1. SWMU 154 Study Area Well

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Table 1. Inventory of Groundwater Monitoring Wells Located at SNL/NM and Surrounding Areas

Well	Measuring Point (feet amsl)	Ground Surface (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Top of Screen (feet amsl)	Bottom of Screen (feet amsl)	Casing Total Depth (feet bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Chemical Waste Landfill and Vicinity												
CWL-BW1	5437.95	5436.0	445.0	495.0	4991.0	4941.0	495.0	2.1	SS	Santa Fe Group sediments	8-Jul-85	Aug-03
CWL-BW2	5436.21	5434.3	490.0	980.0	4944.3	4454.3	980.0	5.6	S/SS	Santa Fe Group sediments	17-Sep-85	2003
CWL-BW3	5432.76	5431.6	485.0	505.0	4946.6	4926.6	507.5	4.8	PVC	Santa Fe Group sediments	22-Sep-88	
CWL-BW4		5431.7	485.0	505.0	4946.7	4926.7	510.0	4.8	PVC	Santa Fe Group sediments	6-May-1994	Jan-97
CWL-BW4A	5434.03	5431.84**	485.0	505.0	4946.8	4926.8	510.0	4.8	PVC	Santa Fe Group sediments	16-May-94	14-Apr-10
CWL-BW5	5434.79	5432.2	500.0	520.0	4932.2	4912.2	525.0	4.8	PVC	Santa Fe Group sediments	11-May-10	
CWL-MW1	5425.88	5423.7	535.0	575.0	4888.7	4848.7	610.0	2.1	SS	Santa Fe Group sediments	1-Sep-85	Sep-97
CWL-MW1A	5424.16	5423.1	474.0	494.0	4949.1	4929.1	495.0	4.8	PVC	Santa Fe Group sediments	31-Jul-88	
CWL-MW2	5421.22	5419.1	520.0	650.0	4899.1	4769.1	650.0	2.1	SS	Santa Fe Group sediments	22-Sep-85	Sep-97
CWL-MW2A	5421.25	5419.8	473.0	493.0	4946.8	4926.8	495.0	5.0	PVC	Santa Fe Group sediments	1-Aug-88	Jun-04
CWL-MW2BL	5421.85	5420.1	532.5	552.5	4887.6	4867.6	557.5	4.8	PVC	Santa Fe Group sediments	5-Jun-94	
CWL-MW2BU	5421.88	5420.1	476.0	496.0	4944.1	4924.1	501.0	1.9	PVC	Santa Fe Group sediments	5-Jun-94	
CWL-MW3	5421.50	5419.5	525.0	565.0	4894.5	4854.5	615.0	2.1	SS	Santa Fe Group sediments	26-Sep-85	Sep-97
CWL-MW3A	5420.45	5419.1	470.0	490.0	4949.1	4929.1	492.0	4.8	PVC/SS	Santa Fe Group sediments	11-Aug-88	
CWL-MW4	5423.00	5420.99**	478.0	498.0	4943.0	4923.0	503.0	3.8	PVC/SS	Santa Fe Group sediments	4-May-90	14-Apr-10
CWL-MW5L	5418.47	5416.7	533.0	553.0	4883.7	4863.7	558.0	1.9	PVC	Santa Fe Group sediments	19-Apr-94	14-Apr-10
CWL-MW5U	5418.68	5416.7	477.0	497.0	4939.7	4919.7	502.0	4.8	PVC	Santa Fe Group sediments	19-Apr-94	14-Apr-10
CWL-MW6L	5419.80	5417.3	539.0	559.0	4878.3	4858.3	564.0	1.9	PVC	Santa Fe Group sediments	4-May-94	14-Apr-10
CWL-MW6U	5419.45	5417.3	477.0	497.0	4940.3	4920.3	502.0	4.8	PVC	Santa Fe Group sediments	4-May-94	14-Apr-10
CWL-MW7	5421.98	5419.9	618.0	638.0	4801.9	4781.9	643.0	4.8	PVC	Santa Fe Group sediments	20-Mar-03	
CWL-MW8	5421.71	5419.8	612.0	632.0	4807.8	4787.8	637.0	4.8	PVC	Santa Fe Group sediments	2-Apr-03	
CWL-MW9	5426.12	5423.5	495.0	515.0	4928.5	4908.5	520.0	4.8	PVC	Santa Fe Group sediments	13-May-10	
CWL-MW10	5424.58	5422.2	493.0	513.0	4929.2	4909.2	518.0	4.8	PVC	Santa Fe Group sediments	27-May-10	
CWL-MW11	5423.24	5420.8	491.0	511.0	4929.8	4909.8	516.0	4.8	PVC	Santa Fe Group sediments	27-May-10	
MRN-1	5308.54	5306.4	546.7	586.7	4759.7	4719.7	606.7	4.8	SS	Santa Fe Group sediments	22-Jan-95	Aug-01
MRN-2	5308.18	5306.2	410.0	440.0	4896.2	4866.2	450.0	3.7	PVC	Santa Fe Group sediments	28-Jan-95	
MRN-3D	5309.34	5306.8	660.3	680.3	4646.5	4626.5	685.3	4.8	PVC	Santa Fe Group sediments	20-Jul-03	
SWTA-3	5323.24	5321.6	407.2	427.2	4914.4	4894.4	432.2	4.8	PVC/SS	Santa Fe Group sediments	6-Sep-89	Apr-98
SWTA3-MW2	5325.60	5323.2	455.0	475.0	4868.2	4848.2	480.0	4.8	PVC	Santa Fe Group sediments	7-May-02	
SWTA3-MW3	5323.94	5321.4	619.0	639.0	4702.4	4682.4	659.4	4.8	PVC	Santa Fe Group sediments	20-Feb-04	
SWTA3-MW4	5324.81	5322.3	430.0	450.0	4892.3	4872.3	460.0	4.7	PVC	Santa Fe Group sediments	26-Aug-05	
Lurance Canyon and Vicinity												
CCBA-MW1	5902.34	5899.9	60.0	80.0	5839.9	5819.9	85.0	4.7	PVC	Alluvium and bedrock (granite)	1-Sep-11	
CCBA-MW2	5939.28	5937.0	98.0	118.0	5839.0	5819.0	123.0	4.7	PVC	Bedrock (granite)	31-Aug-11	
Burn Site Well	6374.52	6373.7**	231.0	341.0	6142.7	6032.7	341.0	4.0	PVC	Bedrock (schist and granite)	20-Feb-86	
CYN-MW1D	6239.59	6236.7	372.0	382.0	5864.7	5854.7	392.0	5.1	S	Bedrock (granite)	22-Dec-97	
CYN-MW2S	6239.41	6236.7	23.6	28.6	6213.1	6208.1	34.2	4.0	PVC	Alluvium and bedrock (granite)	22-Dec-97	
CYN-MW3	6313.26	6311.9	120.0	130.0	6191.9	6181.9	135.0	5.0	PVC	Bedrock (metamorphics)	18-Jun-99	
CYN-MW4	6455.48	6454.7	260.0	280.0	6194.7	6174.7	290.0	5.0	PVC	Bedrock (metamorphics)	18-Jun-99	
CYN-MW5	5984.23	5981.3	135.0	155.0	5846.3	5826.3	160.0	5.0	PVC	Bedrock (quartzite)	15-Aug-01	
CYN-MW6	6343.37	6340.5	141.5	161.3	6199.0	6179.2	161.7	5.0	PVC	Bedrock (metamorphics)	9-Dec-05	
CYN-MW7	6216.35	6213.7	315.0	334.2	5898.7	5879.5	339.9	5.0	PVC	Bedrock (granite)	6-Dec-05	
CYN-MW8	6230.11	6227.8	338.5	358.3	5889.3	5869.5	363.4	5.0	PVC	Bedrock (granite)	12-Jan-06	
CYN-MW9	6360.67	6358.5	175.8	195.8	6182.7	6162.7	200.8	4.8	PVC	Bedrock (metamorphics)	27-Jul-10	
CYN-MW10	6345.45	6342.8	150.4	170.4	6192.4	6172.4	175.4	4.8	PVC	Bedrock (metamorphics)	28-Jul-10	
CYN-MW11	6374.41	6371.9	229.8	249.8	6142.1	6122.1	254.8	4.8	PVC	Bedrock (metamorphics)	29-Jul-10	
CYN-MW12	6345.16	6342.9	252.5	272.5	6090.4	6070.4	277.5	4.8	PVC	Bedrock (metamorphics)	29-Jul-10	
Greystone Well	5822.87	5820.8	44.0	54.0	5776.8	5766.8	54.0	4.0	PVC/S	Alluvium	1-Jan-02	12-Sep-02
Greystone-MW2	5814.20	5811.4	60.0	80.0	5751.4	5731.4	85.0	4.8	PVC	Alluvium	25-Apr-02	
HERTF		6229.7	449.0*	500.0*	5780.7*	5729.7*	449.0?*	5.0	OH?	Bedrock (granite)	13-Jul-1990	
TSA-1	6063.68	6060.2	190.0	210.0	5870.2	5850.2	300.0	6.0	S	Bedrock (metamorphics)	10-Nov-87	Aug-01

Table 1. Inventory of Groundwater Monitoring Wells Located at SNL/NM and Surrounding Areas *(Continued)*

Well	Measuring Point (feet amsl)	Ground Surface (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Top of Screen (feet amsl)	Bottom of Screen (feet amsl)	Casing Total Depth (feet bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Mixed Waste Landfill and Vicinity												
MWL-BW1	5387.18	5385.4	452.2	472.2	4933.2	4913.2	477.2	5.0	PVC	Santa Fe Group sediments	1-Jul-89	24-Jan-08
MWL-BW2	5391.02	5388.7	467.0	497.0	4921.7	4891.7	502.0	4.8	PVC	Santa Fe Group sediments	22-Jan-08	
MWL-MW1	5384.21	5381.8	456.0	476.0	4925.8	4905.8	478.0	5.0	PVC/S	Santa Fe Group sediments	1-Oct-88	Jul-08
MWL-MW2	5379.93	5378.4	452.0	472.0	4926.4	4906.4	477.0	5.0	PVC/SS	Santa Fe Group sediments	1-Aug-89	Jul-08
MWL-MW3	5383.99	5381.7	451.3	471.3	4930.4	4910.4	476.3	4.8	PVC/SS	Santa Fe Group sediments	22-Aug-89	Jul-08
MWL-MW4	5391.70	5390.2	488.4	508.4	4901.8	4881.8	553.9	4.8	PVC	Santa Fe Group sediments	10-Feb-93	
MWL-MW5	5382.56	5380.4	496.5	516.5	4883.9	4863.9	521.5	4.8	PVC	Santa Fe Group sediments	19-Nov-00	
MWL-MW6	5375.31	5372.7	505.5	525.5	4867.2	4847.2	505.5	4.8	PVC	Santa Fe Group sediments	19-Oct-00	
MWL-MW7	5383.30	5380.9	464.7	494.0	4916.2	4886.9	498.8	4.8	PVC	Santa Fe Group sediments	24-Jun-08	
MWL-MW8	5384.67	5382.4	465.0	495.0	4917.4	4887.4	500.0	4.8	PVC	Santa Fe Group sediments	26-Jun-08	
MWL-MW9	5381.91	5379.3	465.0	495.0	4914.3	4884.3	500.0	4.8	PVC	Santa Fe Group sediments	30-Jun-08	
NWTA3-MW1	5336.48	5332.9	434.9	454.9	4898.0	4878.0	460.4	4.8	PVC	Santa Fe Group sediments	20-Sep-89	12-Sep-02
NWTA3-MW2	5337.49	5335.5	455.0	475.0	4880.5	4860.5	505.0	4.8	PVC	Santa Fe Group sediments	25-Aug-00	
NWTA3-MW3D	5340.80	5335.7	654.4	674.4	4681.3	4661.3	679.4	4.8	PVC	Santa Fe Group sediments	9-Jul-03	
PL-1	5334.99	5333.4	440.0	470.0	4893.4	4863.4	480.0	2.0	PVC	Santa Fe Group sediments	28-Oct-94	12-Sep-09
PL-2	5336.01	5333.0	577.0	597.0	4756.0	4736.0	617.0	4.8	SS	Santa Fe Group sediments	18-Nov-94	
PL-3	5334.64	5332.8	445.0	465.0	4887.8	4867.8	475.0	3.8	PVC	Santa Fe Group sediments	4-Dec-94	12-Sep-09
PL-4	5334.98	5332.7	464.0	494.0	4868.7	4838.7	499.0	4.8	PVC	Santa Fe Group sediments	28-Sep-09	
Coyote Test Field and Vicinity												
OBS-MW1	5871.42	5869.1	135.0	155.0	5734.1	5714.1	160.0	4.7	PVC	Bedrock (granite)	31-Aug-11	
OBS-MW2	5863.16	5860.8	234.0	254.0	5626.8	5606.8	259.0	4.7	PVC	Bedrock (granite)	30-Aug-11	
OBS-MW3	5865.50	5863.3	190.0	210.0	5673.3	5653.3	215.0	4.7	PVC	Bedrock (granite)	30-Aug-11	
CTF-MW1	6082.63	6079.7	240.0	260.0	5839.7	5819.7	265.0	5.0	PVC	Bedrock (granite)	16-Aug-01	
CTF-MW2	5578.60	5575.6	110.0	130.0	5465.6	5445.6	135.0	5.0	PVC	Bedrock (granite)	18-Aug-01	
CTF-MW3	5522.82	5519.8	340.0	360.0	5179.8	5159.8	365.0	5.0	PVC	Bedrock (granite)	21-Aug-01	
LMF-1	5628.60	5626.5	310.0	350.0	5316.5	5276.5	360.0	4.1	PVC	Bedrock (limestone)	11-Aug-95	Yes
Schoolhouse Well	5796.33	5799.0	103.0*	107.0*	5696.0*	5692.0*	103.0*	6.0	S	Bedrock (Sandia Formation)		
SFR-1D	5399.13	5396.9	348.0	368.0	5048.9	5028.9	378.0	3.8	PVC	Santa Fe Group sediments	6-Aug-92	
SFR-1S	5399.16	5396.9	152.0	172.0	5244.9	5224.9	182.0	1.9	PVC	Santa Fe Group sediments	8-Aug-92	
SFR-2S	5432.77	5430.3	97.0	117.0	5333.3	5313.3	122.0	3.8	PVC	Santa Fe Group sediments	20-Aug-92	
SFR-3D	5497.94	5496.1	311.5	351.5	5184.6	5144.6	361.5	1.9	PVC	Santa Fe Group sediments	5-Nov-92	
SFR-3P	5499.63	5497.2	175.0	195.0	5322.2	5302.2	205.0	3.8	PVC	Santa Fe Group sediments	12-Jul-93	
SFR-3S	5498.24	5496.1	182.0	212.0	5314.1	5284.1	222.0	1.9	PVC	Santa Fe Group sediments	10-Nov-92	
SFR-3T	5498.66	5496.9	713.0	733.0	4783.9	4763.9	753.0	5.4	SS	Bedrock (sandstone)	23-Sep-93	
SFR-4P	5573.33	5571.3	344.0	354.0	5227.3	5217.3	364.0	1.9	PVC	Bedrock (sandstone)	29-Jul-93	
SFR-4T	5573.95	5572.4	340.0	360.0	5232.4	5212.4	380.0	4.8	PVC/SS	Bedrock (sandstone)	30-Sep-93	
STW-1	5535.53	5533.3	149.8	169.8	5383.5	5363.5	179.8	4.3	PVC	Santa Fe Group sediments	18-Jun-95	Yes
TRE-1	5497.25	5495.2	255.0	295.0	5240.2	5200.2	305.0	4.3	PVC	Santa Fe Group sediments	31-Jul-95	
TRE-2	5497.20	5495.2	150.0	170.0	5345.2	5325.2	190.0	2.0	PVC	Santa Fe Group sediments	31-Jul-95	
TRN-1	5735.62	5733.6	320.0	340.0	5413.6	5393.6	350.0	3.8	PVC	Bedrock (sandstone)	12-Oct-94	
TRS-1	5780.18	5777.5	134.0*	500.0*	5643.5*	5277.5*	134.0	6.4	OH	Bedrock (limestone)	4-Sep-94	converted
TRS-1D	5779.80	5777.5	266.4	306.4	5511.1	5471.1	316.4	1.9	PVC	Bedrock (limestone)	6-Sep-95	
TRS-1S	5780.07	5777.5	164.0	204.0	5613.5	5573.5	214.8	1.9	PVC	Bedrock (limestone)	6-Sep-95	
TRS-2	5780.76	5778.3	165.0	205.0	5613.3	5573.3	210.0	4.5	S	Bedrock (limestone)	9-Sep-95	

Table 1. Inventory of Groundwater Monitoring Wells Located at SNL/NM and Surrounding Areas *(Continued)*

Well	Measuring Point (feet amsl)	Ground Surface (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Top of Screen (feet amsl)	Bottom of Screen (feet amsl)	Casing Total Depth (feet bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Tijeras Arroyo Groundwater												
TA1-W-01	5403.82	5401.8	575.0	595.0	4826.8	4806.8	600.0	4.8	PVC	Santa Fe Group sediments	22-Mar-97	
TA1-W-02	5416.62	5416.9	540.0	560.0	4876.9	4856.9	565.6	5.0	PVC	Santa Fe Group sediments	27-Feb-98	
TA1-W-03	5457.03	5454.9	337.0	357.0	5117.9	5097.9	362.6	5.0	PVC	Santa Fe Group sediments	27-Jan-98	
TA1-W-04	5460.98	5458.3	576.0	596.0	4882.3	4862.3	601.7	5.0	PVC	Santa Fe Group sediments	6-Oct-98	
TA1-W-05	5433.84	5434.2	597.5	617.5	4836.7	4816.7	623.2	5.0	PVC	Santa Fe Group sediments	16-Nov-98	
TA1-W-06	5417.10	5417.4	300.0	320.0	5117.4	5097.4	325.6	5.0	PVC	Santa Fe Group sediments	27-Feb-98	
TA1-W-07	5404.92	5402.8	268.6	288.6	5134.2	5114.2	289.1	5.0	PVC	Santa Fe Group sediments	13-Aug-98	
TA1-W-08	5434.19	5434.7	302.0	322.0	5132.7	5112.7	327.0	4.5	PVC	Santa Fe Group sediments	3-Aug-01	
TA2-NW1-325	5421.94	5420.0	295.0	325.0	5125.0	5095.0	330.3	4.8	PVC	Santa Fe Group sediments	1-Apr-93	
TA2-NW1-595	5421.26	5420.0	535.0	555.0	4885.0	4865.0	598.0	4.8	PVC	Santa Fe Group sediments	27-Jul-93	
TA2-SW1-320	5411.85	5410.1	299.6	319.6	5110.5	5090.5	324.6	3.8	PVC	Santa Fe Group sediments	30-Nov-92	
TA2-W-01	5419.99	5417.4	312.0	332.0	5105.4	5085.4	332.0	4.8	PVC	Santa Fe Group sediments	27-Jun-94	
TA2-W-19	5351.21	5349.0	265.9	285.9	5083.1	5063.1	285.9	4.8	PVC	Santa Fe Group sediments	9-Nov-95	
TA2-W-24	5363.66	5361.8	465.0	485.0	4896.8	4876.8	490.6	5.0	PVC	Santa Fe Group sediments	9-Feb-98	
TA2-W-25	5374.86	5372.5	492.0	512.0	4880.5	4860.5	517.8	4.8	PVC	Santa Fe Group sediments	1-Apr-97	
TA2-W-26	5375.77	5373.8	276.0	296.0	5097.8	5077.8	301.6	5.0	PVC	Santa Fe Group sediments	19-Jan-98	
TA2-W-27	5362.85	5360.8	275.0	295.0	5085.8	5065.8	300.6	5.0	PVC	Santa Fe Group sediments	9-Feb-98	
TJA-2	5353.20	5351.3	275.0	295.0	5076.3	5056.3	305.0	3.8	PVC	Santa Fe Group sediments	12-Jul-94	
TJA-3	5390.56	5387.8	496.0	516.0	4891.8	4871.8	521.7	5.0	PVC	Santa Fe Group sediments	31-Aug-98	
TJA-4	5341.16	5338.5	360.0	380.0	4978.5	4958.5	385.7	5.0	PVC	Santa Fe Group sediments	4-Aug-98	
TJA-5	5341.33	5338.5	267.0	287.0	5071.5	5051.5	292.7	5.0	PVC	Santa Fe Group sediments	7-Aug-98	
TJA-6	5343.16	5340.6	454.9	474.9	4885.7	4865.7	480.7	5.0	PVC	Santa Fe Group sediments	4-Feb-01	
TJA-7	5391.27	5388.4	290.5	310.5	5097.9	5077.9	316.3	5.0	PVC	Santa Fe Group sediments	7-Mar-01	
WYO-1	5392.50	5390.4	510.0	560.0	4880.4	4830.4	570.0	4.3	PVC	Santa Fe Group sediments	27-Aug-95	Jul-01
WYO-2	5392.50	5390.4	265.0	285.0	5125.4	5105.4	295.0	2.0	PVC	Santa Fe Group sediments	27-Aug-95	Jul-01
WYO-3	5392.09	5390.0	520.0	540.0	4870.0	4850.0	545.0	4.5	PVC	Santa Fe Group sediments	31-Jul-01	
WYO-4	5392.57	5390.2	275.0	295.0	5115.2	5095.2	300.0	4.5	PVC	Santa Fe Group sediments	22-Jul-01	
EUBANK-1	5460.02	5458.1	550.0	610.0	4908.1	4848.1	615.0	4.0	SS	Santa Fe Group sediments	16-Jul-88	
PGS-1	5407.41	5407.9	503.0	513.0	4904.9	4894.9	538.0	5.0	SS	Santa Fe Group sediments	9-Aug-94	Apr-98
PGS-2	5408.29	5407.9	535.0	565.0	4872.9	4842.9	655.0	5.0	SS	Santa Fe Group sediments	22-Sep-95	
Technical Area V												
AVN-1	5443.00	5440.2	570.0	590.0	4870.2	4850.2	600.0	5.0	SS	Santa Fe Group sediments	23-May-95	
AVN-2	5442.39	5440.6	495.0	515.0	4945.6	4925.6	520.0	3.8	PVC	Santa Fe Group sediments	5-Jun-95	
TAV-MW1	5437.81	5435.2	489.5	509.5	4945.7	4925.7	509.5	5.0	PVC	Santa Fe Group sediments	28-Feb-95	5-Feb-08
TAV-MW2	5427.33	5424.3	497.0	513.5	4927.3	4910.8	513.5	4.8	PVC	Santa Fe Group sediments	30-Mar-95	
TAV-MW3	5464.26	5461.6	532.0	552.0	4929.6	4909.6	557.7	4.8	PVC	Santa Fe Group sediments	11-Apr-97	
TAV-MW4	5427.89	5425.4	495.0	515.0	4930.4	4910.4	520.7	4.8	PVC	Santa Fe Group sediments	18-Apr-97	
TAV-MW5	5408.71	5406.6	487.0	507.0	4919.6	4899.6	512.7	4.8	PVC	Santa Fe Group sediments	26-Apr-97	
TAV-MW6	5431.17	5431.5**	507.0	527.0	4924.5	4904.5	532.0	4.8	PVC	Santa Fe Group sediments	24-Apr-01	
TAV-MW7	5430.40	5430.9**	597.0	617.0	4833.9	4813.9	622.0	4.8	PVC	Santa Fe Group sediments	6-Apr-01	
TAV-MW8	5417.00	5417.4**	491.0	511.0	4926.4	4906.4	516.0	4.8	PVC	Santa Fe Group sediments	11-Apr-01	
TAV-MW9	5416.27	5416.9**	582.0	602.0	4834.9	4814.9	607.0	4.8	PVC	Santa Fe Group sediments	17-Mar-01	
TAV-MW10	5437.03	5434.7	508.0	528.0	4926.7	4906.7	533.0	4.8	PVC	Santa Fe Group sediments	6-Feb-08	
TAV-MW11	5440.12	5440.4**	512.0	532.0	4928.4	4908.4	537.0	4.8	PVC	Santa Fe Group sediments	19-Nov-10	
TAV-MW12	5435.72	5432.9	507.0	527.0	4925.9	4905.9	532.0	4.8	PVC	Santa Fe Group sediments	16-Nov-10	
TAV-MW13	5409.02	5406.0	525.0	545.0	4881.0	4861.0	550.0	4.8	PVC	Santa Fe Group sediments	12-Nov-10	
TAV-MW14	5441.52	5438.6	512.0	532.0	4926.6	4906.6	538.0	4.8	PVC	Santa Fe Group sediments	9-Nov-10	
LWDS-MW1	5423.83	5424.5**	495.0	515.0	4929.5	4909.5	520.3	3.9	PVC	Santa Fe Group sediments	3-May-93	
LWDS-MW2	5412.41	5411.5	506.0	526.0	4905.5	4885.5	531.0	3.9	PVC	Santa Fe Group sediments	30-Oct-92	

Table 1. Inventory of Groundwater Monitoring Wells Located at SNL/NM and Surrounding Areas *(Continued)*

Well	Measuring Point (feet amsl)	Ground Surface (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Top of Screen (feet amsl)	Bottom of Screen (feet amsl)	Casing Total Depth (feet bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Inhalation Toxicology Research Institute												
ITRI MW-4	5624.47	5622.7	100.0	110.0	5522.7	5512.7	110.0	4.0	SS	Santa Fe Group sediments	1-May-88	
ITRI MW-16	5668.84	5667.6	100.0	120.0	5567.6	5547.6	120.0	4.0	PVC	Bedrock (sandstone)	13-Jan-93	
ITRI MW-17	5615.11	5613.7	88.6	108.6	5525.1	5505.1	109.0	4.0	PVC	Santa Fe Group sediments	28-Jul-94	
ITRI MW-19	5652.08	5648.9	115.1	125.1	5533.8	5523.8	125.5	4.0	PVC	Santa Fe Group sediments	2-Aug-94	
IP-1	5622.18	5620.7	78.0	98.0	5542.7	5422.7	98.0	2.0	PVC	Santa Fe Group Sediments	18-Jul-94	
NMED-1	5623.44	5620.7	90.0	110.0	5530.7	5510.7	115.0	4.0	PVC	Santa Fe Group Sediments	13-Jul-95	
City of Albuquerque / Albuquerque Bernalillo County Water Utility Authority												
MESA DEL SOL - S	5302.67	5302.7	420.0	520.0	4882.7	4782.7	525.0	2.2	PVC	Santa Fe Group sediments	14-May-97	
MONTESSA PARK - S	5102.67	5102.7	260.0	320.0	4842.7	4782.7	330.0	2.2	PVC	Santa Fe Group sediments	10-Sep-97	
YALE-MW9	5271.06		382.0	422.0			427.0	4.0	PVC	Santa Fe Group sediments	19-May-97	
EUBANK-2	5474.39		552.0	592.0			597.0	4.0	PVC	Santa Fe Group sediments	15-Nov-96	
EUBANK-3	5498.73		590.0	650.0			655.0	4.0	PVC	Santa Fe Group sediments	15-Nov-96	
EUBANK-4			454.0	514.0			519.0	4.0	PVC	Santa Fe Group sediments	15-Nov-96	
EUBANK-5	5507.40		605.0	665.0			670.0	4.0	PVC	Santa Fe Group sediments		
MVMWJ	5118.04	5118.6	200.0	220.0	4918.6	4898.6	225.0	2.0	PVC	Santa Fe Group sediments	1-Oct-88	
Kirtland Air Force Base												
EOD	5829.70	5828.7	206.0*	247.0*	5622.7*	5581.7*	206.0*	6.0	OH	Bedrock (limestone and granite)	1970?	
KAFB-0119							482.0			Santa Fe Group sediments		
KAFB-0120	5292.29	5288.7	429.0	459.0	4859.7	4829.7	461.5	4.0	PVC	Santa Fe Group sediments		
KAFB-0213	5282.00	5297.3	378.0	428.0	4919.3	4869.3	438.0		PVC	Santa Fe Group sediments		
KAFB-0307	5364.53	5362.7	405.0	450.0	4957.7	4912.7	460.0	3.8	PVC	Santa Fe Group sediments		
KAFB-0308	5381.65	5380.7	463.0	488.0	4917.7	4892.7	498.0	3.8	PVC	Santa Fe Group sediments		
KAFB-0309	5411.80	5410.7	500.0	525.0	4910.7	4885.7	535.0	3.8	PVC	Santa Fe Group sediments		
KAFB-0311	5353.29	5351.7	433.0	458.0	4918.7	4893.7	468.0	3.8	PVC	Santa Fe Group sediments		
KAFB-0312	5432.17	5430.2	503.0	528.0	4927.2	4902.2	533.0	4.5	PVC	Santa Fe Group sediments		
KAFB-0314	5455.75	5453.9	428.0	448.0	5025.9	5005.9	453.0	4.5	PVC	Santa Fe Group sediments		
KAFB-0315	5466.11	5464.1	447.0	472.0	5017.1	4992.1	477.0	4.5	PVC	Santa Fe Group sediments		
KAFB-0417	5313.07		430.0	455.0			465.0	3.8	PVC	Santa Fe Group sediments		
KAFB-0505	5362.81	5360.8	495.4	520.5	4865.4	4840.3	521.3	4.5	PVC	Santa Fe Group sediments		
KAFB-0507	5358.82		482.3	507.3			512.3	3.5	PVC	Santa Fe Group sediments		
KAFB-0508	5351.88		481.0	506.0			507.0	3.5	PVC	Santa Fe Group sediments		
KAFB-0510	5367.10		511.0	536.0			537.0	3.5	PVC	Santa Fe Group sediments		
KAFB-0512	5304.07	5301.1	424.0	449.0	4877.1	4852.1	450.0	3.5	PVC	Santa Fe Group sediments		
KAFB-0514	5206.41		340.0	365.0			366.0	3.5	PVC	Santa Fe Group sediments		
KAFB-0516	5205.64		332.0	357.0			358.0	3.5	PVC	Santa Fe Group sediments		
KAFB-0517	5197.10		325.0	350.0			352.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0520	5247.90	5246.2	379.5	404.5	4866.7	4841.7	410.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0522	5267.48	5265.7	405.0	430.0	4860.7	4835.7	432.5	4.0	PVC	Santa Fe Group sediments		
KAFB-0523	5352.62	5350.5					625.0			Santa Fe Group sediments		
KAFB-0608	5361.17	5359.9	307.0	327.0	5052.9	5032.9	338.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0609	5365.87	5364.7	316.0	336.0	5048.7	5028.7	345.0	4.0	PVC/SS	Santa Fe Group sediments		
KAFB-0610	5359.47	5357.3	333.0	353.0	5024.3	5004.3	363.0	4.0	PVC/SS	Santa Fe Group sediments		
KAFB-0611	5386.09		498.0	508.0			513.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0615	5638.43		300.0	325.0			327.0	4.0	PVC	Bedrock (granite)		
KAFB-0616	5481.07		472.0	497.0			499.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0617	5505.78	5503.3	565.0	590.0	4938.3	4913.3	592.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0619	5410.78	5409.0	389.0	404.0	5020.0	5005.0	406.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0620	5334.64	5332.0	447.0	472.0	4885.0	4860.0	474.5		PVC	Santa Fe Group sediments		
KAFB-0622	5488.64	5486.2	529.0	554.0	4957.2	4932.2	555.0	4.0	PVC	Santa Fe Group sediments		
KAFB-0624	5676.45	5671.1	765.0	790.0	4906.1	4881.1	792.5	3.8	PVC	Santa Fe Group sediments		
KAFB-0901	5390.07	5389.8	465.0	527.0	4924.8	4862.8	537.0	4.0	PVC	Santa Fe Group sediments		
KAFB-1006	5257.01	5257.0	363.0	383.0	4894.0	4874.0	383.0	4.0	SS	Santa Fe Group sediments		

Table 1. Inventory of Groundwater Monitoring Wells Located at SNL/NM and Surrounding Areas *(Concluded)*

Well	Measuring Point (feet amsl)	Ground Surface (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Top of Screen (feet amsl)	Bottom of Screen (feet amsl)	Casing Total Depth (feet bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Kirtland Air Force Base (Continued)												
KAFB-1007	5260.11	5260.1	362.0	382.0	4898.1	4878.1	382.0	4.0	SS	Santa Fe Group sediments		
KAFB-1063	5339.52						501.0			Santa Fe Group sediments		
KAFB-2005	5624.27	5624.6	126.0	156.0	5498.6	5468.6	158.5	4.0	PVC	Santa Fe Group sediments		
KAFB-2007	5567.18	5564.8	273.0	303.0	5291.8	5261.8	305.5	4.0	PVC	Santa Fe Group sediments		
KAFB-3392	5394.51	5393.4	536.0	561.0	4857.4	4832.4	562.0	4.0	PVC	Santa Fe Group sediments		
KAFB-3411	5342.81	5340.5	477.0	502.0	4863.5	4838.5	503.0		PVC	Santa Fe Group sediments		
KAFB-6301	5459.64	5457.3	535.0	560.0	4922.3	4897.3	561.0	3.5	PVC	Santa Fe Group sediments		
KAFB-8351	5325.51		474.0	499.0			500.0	4.0	PVC	Santa Fe Group sediments		
Optical Range Well		5965.7	160.0	320.0	5805.7	5645.7	320.0	5	PVC	Bedrock (metarhyolite)	19-Aug-87	

Acronyms for Wells Numbers

AVN	Area V (North)
CCBA	Coyote Canyon Blast Area
CTF	Coyote Test Field
CWL	Chemical Waste Landfill
CYN	Lurance Canyon
EOD	Explosive Ordnance Disposal
HERTF	High Energy Research Test Facility
IP	Iselta Pueblo
ITRI	Inhalation Toxicology Research Institute
KAFB	Kirtland Air Force Base
LMF	Large Melt Facility
LWDS	Liquid Waste Disposal System
MRN	Magazine Road North
MVMW	Mountain View Monitoring Well
MWL	Mixed Waste Landfill
NMED	New Mexico Environment Department
NWTA3	Northwest Technical Area III
OBS	Old Burn Site
PGS	Parade Ground South
PL	Power Line Road, west of TA-III
SFR	South Fence Road
STW	Solar Tower (West)
SWTA	Southwest Technical Area III
TA1-W	Technical Area I (Well)
TA2-NW	Technical Area II (Northwest)
TA2-SW	Technical Area II (Southwest)
TA2-W	Technical Area II (Well)
TAV	Technical Area V
TJA	Tijeras Arroyo
TRE	Thunder Road East
TRN	Target Road North
TRS	Target Road South
TSA	Transportation Safeguards Academy
WYO	Wyoming

Notes:

A blank cell indicates that the corresponding data were either not available or not applicable.
Measuring point is the top of casing elevation used for calculating groundwater elevations.
Yes indicates that the well was plugged and abandoned, but the date is not known.
Survey coordinates are relative to the North American Datum of 1983 (NAD83), New Mexico State Plane Coordinate System, Central Zone. Previously reported data were converted as necessary.
Elevations are relative to the North American Vertical Datum of 1988 (NAVD88), New Mexico State Plane Coordinate System, Central Zone. Previously reported data were converted as necessary. Conversion was 2.672 ft.

Acronyms for Well Features

*indicates that depth or elevation corresponds to open-hole completion, no screen is present
**indicates elevation of concrete pad
amsl = elevation above mean sea level
bgs = below ground surface
ft = feet
L = lower
OH = open hole completion (no well screen)
P&A = plugged and abandoned
PVC = polyvinyl chloride
PCV/SS = composition of blank well casing is PVC and composition of well screen is stainless steel.
S = Steel (carbon steel)
SS = Stainless steel
S/SS = composition of blank well casing is carbon steel and composition of well screen is stainless steel
U = upper

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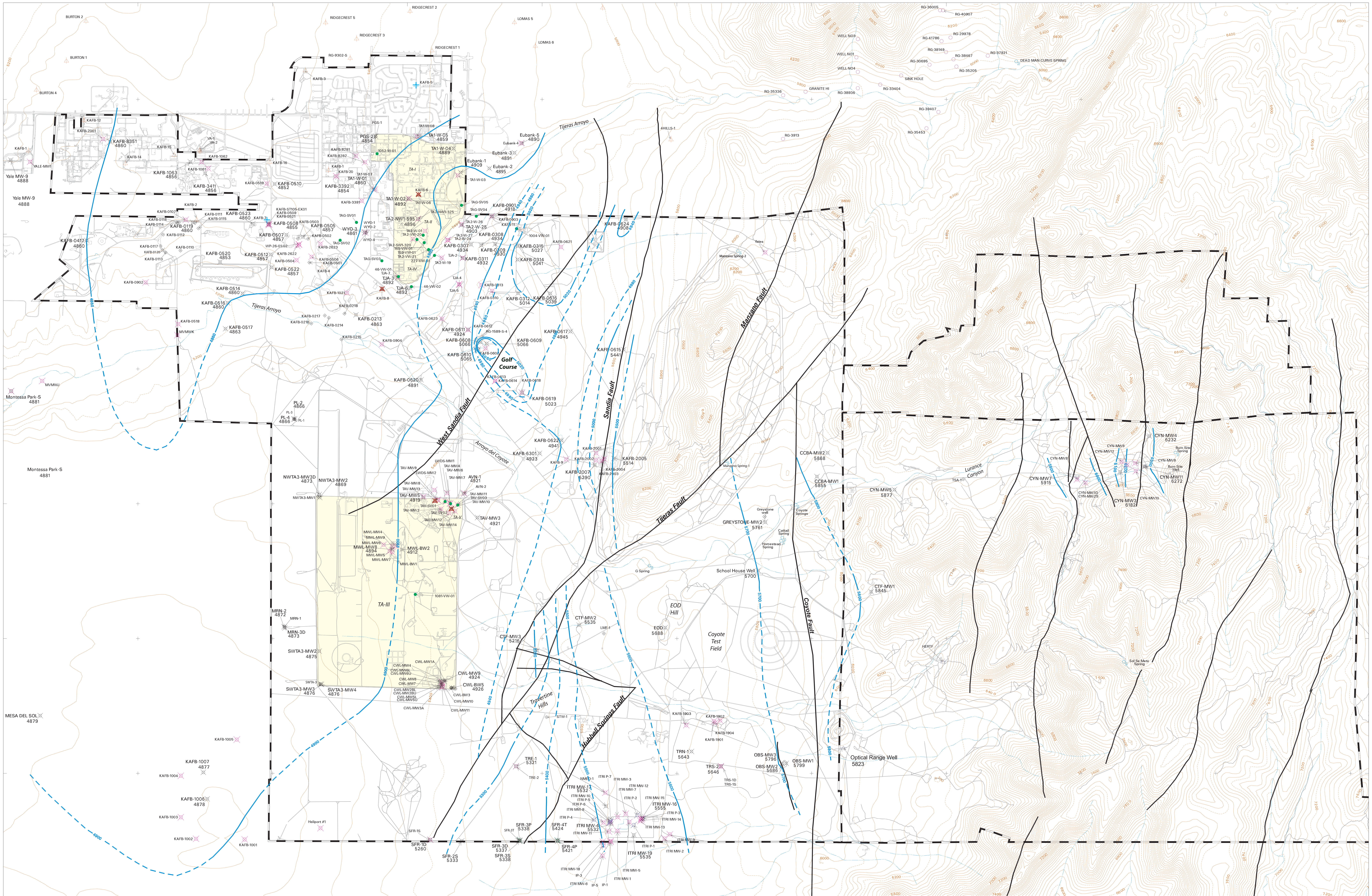
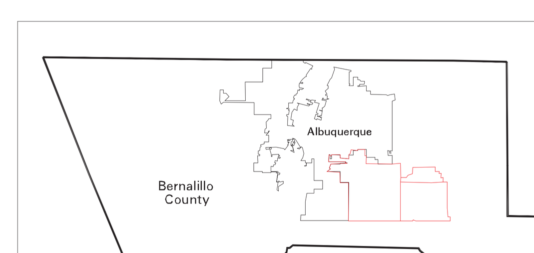


Legend

- KAFB Boundary
- 40-Foot Contour, feet amsl
- Road
- Drainage Feature
- Fault
- Potentiometric Surface Contour (dashed where inferred, feet amsl)
- SNL Technical Area
- Monitoring Well - contoured
- Monitoring Well - not contoured
- Observation Well
- Test Well
- Production Well
- Production Well (Potable)
- Production Well (Out of Commission)
- Production Well (Abandoned)
- Production Well (Non-Potable)
- Plugged and Abandoned Well
- Spring
- Vapor Well
- Unknown

NOTE:
1. Contours for the potentiometric surface are shown using two intervals: below 5000 feet amsl the contour interval is 40 feet, and above 5000 feet amsl the contour interval is 100 feet.
2. Fault locations are from GRAM and Lettis (1995), Karlstrom et al., (2000), and Van Hart (2003). The West Sandia Fault does not affect the alluvial-fan sediments at the water table.
3. West of the Sandia Fault, the regional aquifer is present within the unconsolidated Santa Fe Group sediments. Groundwater within and east of the Tijeras Fault Zone (bounded by the Sandia and Tijeras Faults) is primarily present in Paleozoic and Precambrian bedrock.
4. Water levels in SNL/NM wells were measured in October 2011. Water levels in KAFB wells were measured in November, 2011.
5. Contoured wells and associated groundwater elevations are shown in larger font.



0 2000 4000
Scale in Feet

0 480 960
Scale in Meters

0 0.48 0.96
Scale in Kilometers

0 0.379 0.758
Scale in Miles

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Plate 1
SNL/NM Monitoring Well Locations and Base-Wide Potentiometric Surface Map for the Kirtland Air Force Base Vicinity October 1, 2011

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1983 North American Horizontal Datum, 1988 North American Vertical Datum

1"=2000'	1:24000	MAPID=120098
D Helfrich	dh120098.aml	SNL GIS ORG. 4142
		04/11/12