Unlimited Release
SAND2018-5930 R
Printed June 2018

Calendar Year 2017

Annual Groundwater Monitoring Report

Prepared by
Sandia National Laboratories, Albuquerque, New Mexico

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Unlimited Release
SAND2018-5930 R
Printed June 2018

Annual Groundwater Monitoring Report
Calendar Year 2017

Groundwater Monitoring Program
Sandia National Laboratories, New Mexico
June 2018

Prepared by:
Long-Term Stewardship in coordination with
Environmental Restoration Operations

Long-Term Stewardship
Sandia National Laboratories, New Mexico
Albuquerque, New Mexico 87185-1103

This page intentionally left blank.

Acknowledgments

The production of this document is a joint effort between the Sandia National Laboratories, New Mexico Long-Term Stewardship Program and Environmental Restoration Operations.

Contributing Authors

Copland, John
Jackson, Tim
Mitchell, Michael
Skelly, Michael

Abstract

Sandia National Laboratories, New Mexico (SNL/NM) is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's (DOE) National Nuclear Security Administration (NNSA) under contract DE-NA0003525. The DOE/NNSA Sandia Field Office administers the contract and oversees contractor operations at the site.

This Annual Groundwater Monitoring Report summarizes data through December 31, 2017 from groundwater monitoring samples collected at the Chemical Waste Landfill, Mixed Waste Landfill, and Groundwater Monitoring Program locations, as well as the following SNL/NM Areas of Concern (AOCs): Burn Site Groundwater AOC, Technical Area-V Groundwater AOC, and the Tijeras Arroyo Groundwater AOC. Reporting the results of environmental monitoring and surveillance programs is required by the New Mexico Environment Department (NMED) and DOE Order 231.1B, *Environment, Safety, and Health Reporting*.

This page intentionally left blank

Chapter Tables

Chapter Tables (continued)

Chapter Figures

Chapter Figures (continued)

Table

Plate

Abbreviations and Acronyms

ABCWUA	Albuquerque Bernalillo County Water Utility Authority
AGMR	Annual Groundwater Monitoring Report
amsl	above mean sea level
AOC	Area of Concern
AOP	Administrative Operating Procedure
ARG	Ancestral Rio Grande
AVN	Area-V (North)
BFF	Bulk Fuels Facility
BGW	Balleau Groundwater, Inc.
bgs	below ground surface
BSG	Burn Site Groundwater (AOC)
btoc	below top of casing
BW	background well
$CaCO_3$	calcium carbonate
CAC	Corrective Action Complete
CCM	Current Conceptual Model
CFR	Code of Federal Regulations
CME	Corrective Measures Evaluation
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COA	City of Albuquerque
COC	constituent of concern
Consent Order	Compliance Order on Consent
CSM	Conceptual Site Model
CWL	Chemical Waste Landfill
CY	Calendar Year
DI	deionized
DO	dissolved oxygen
DOE	U.S. Department of Energy
DP	Discharge Permit
DRO	diesel range organics
DSS	Drain and Septic System
dup	duplicate (environmental or laboratory duplicate)
EB	equipment blank
ECP	Environmental Compliance Program
EDMS	Environmental Data Management System
EHD	Environmental Health Department
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ET	evapotranspirative
FB	field blank

Abbreviations and Acronyms (continued)

Final Closure Plan	*Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application*
FOP	Field Operating Procedure
FY	Fiscal Year
GEL	GEL Laboratories LLC
GMP	Groundwater Monitoring Program
GRO	gasoline range organics
GWQB	Ground Water Quality Bureau
HASL	Health and Safety Laboratory
HE	high explosive
HPT	High Performing Team
HSWA	Hazardous and Solid Waste Amendments
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HWB	Hazardous Waste Bureau
ID	identifier
IMWP	Interim Measures Work Plan
IRP	Installation Restoration Program (USAF)
IRR	Internal Remedy Reviews
ISB	in-situ bioremediation
IT	IT Corporation
JP-4	jet propellant, fuel grade 4
JP-8	jet propellant, fuel grade 8
KAFB	Kirtland Air Force Base
LCS	laboratory control sample
LRRI	Lovelace Respiratory Research Institute
LTMM	Long-Term Monitoring and Maintenance
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
MW	monitoring well
MWL	Mixed Waste Landfill
N	nitrogen
NA	not applicable
NAVD 88	North American Vertical Datum of 1988
NC	Not Contoured
ND	not detected
NE	not established
NFA	No Further Action
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department

Abbreviations and Acronyms (continued)

NMOSE	New Mexico Office of the State Engineer
NMWQCC	New Mexico Water Quality Control Commission
NNSA	National Nuclear Security Administration
No.	number
NOD	Notice of Disapproval or Notice of Deficiency
NPN	nitrate plus nitrite
NW	northwest
O	oxygen
OB	Oversight Bureau
ORP	oxidation-reduction potential
OU	Operable Unit
PCCP	Post-Closure Care Permit
Permit	Resource Conservation and Recovery Act Facility Operating Permit
PGS	Parade Ground South
PGWS	Perched Groundwater System, only used on figures and tables
PQL	practical quantitation limit
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RPD	relative percent difference
RSI	Request for Supplemental Information
SAP	Sampling and Analysis Plan
SC	specific conductivity
SFG	Santa Fe Group
SFO	Sandia Field Office
SM	standard method
SMO	Sample Management Office
SNL/NM	Sandia National Laboratories, New Mexico
SRNL	Savannah River National Laboratory
SU	standard unit(s)
SVOC	semivolatile organic compound
SW	solid waste
SWHC	Site-Wide Hydrogeologic Characterization
SWMU	solid waste management unit
TA	Technical Area
TAG	Tijeras Arroyo Groundwater (AOC)
TAL	Target Analyte List
TAV	Technical Area-V
TAVG	Technical Area-V Groundwater (AOC)
TB	trip blank
TCE	trichloroethene (equivalent to trichlorethylene)
Tetryl	methyl 2,4,6-trinitrophenylnitramine
TOC	total organic carbon

Abbreviations and Acronyms (concluded)

TOX	total organic halogens
TPH	total petroleum hydrocarbons
TSWP	Treatability Study Work Plan
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USGS	U.S. Geological Survey
VA	Veterans Administration
VCM	voluntary corrective measure
VOC	volatile organic compound
WL	water level
WQ	water quality

Units

%	percent
% Sat	percent saturation
°C	degrees Celsius.
µg/L	micrograms per liter (equivalent to ppb)
µmhos/cm	micromhos per centimeter
AF/yr	acre-feet per year
CF/yr	cubic-feet per year
ft	foot (feet)
ft/day	feet per day
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 (million years)
Meq/L	milliequivalents per liter
mg/L	milligrams per liter (equivalent to ppm)
mrem/yr	millirems per year
mV	millivolts
NTU	nephelometric turbidity units
pCi/L	picocuries per liter
pH	potential of hydrogen (negative logarithm of the hydrogen ion concentration)
ppb	parts per billion
ppm	parts per million
rem	roentgen equivalent man
sq mi	square miles
SU	standard units
yr	years

Well Location Descriptions

ASL PD	Albuquerque Seismological Laboratory Production (well)
AVN-#	Area-V (North)
CCBA-#	Coyote Canyon Blast Area
CTF-#	Coyote Test Field
CWL-#	Chemical Waste Landfill
CYN-#	Lurance Canyon
EOD	Explosive Ordnance Disposal
EX	Well proposed for extraction purposes, but used for monitoring purposes only. This applies to the well number for ST105-EX01.
Ext	Extraction well used for remediating groundwater at the BFF and the KAFB Tijeras Arroyo Golf Course.
Greystone-#	Greystone
HERTF	High Energy Research Test Facility
IP	Isleta Pueblo
Inj	Injection well
ITRI	Inhalation Toxicology Research Institute
KAFB	Kirtland Air Force Base
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
VA	Veterans Administration
12AUP-#	ER Site 12A Underflow Piezometer

Meteorological Towers

SC1	School House
A-21	TA-I
A-36	TA-III and TA-V
KABQ	Albuquerque International Sunport (National Weather Service)

This page intentionally left blank.

Annual Groundwater Monitoring Report

Executive Summary

Sandia National Laboratories, New Mexico (SNL/NM) conducts groundwater surveillance monitoring for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). The SNL/NM facility is located on Kirtland Air Force Base (KAFB) in central New Mexico. Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the DOE's NNSA under contract DE-NA-0003525.

This Annual Groundwater Monitoring Report (AGMR) documents the results of the groundwater monitoring activities at SNL/NM for Calendar Year (CY) 2017. This report has been prepared to meet the environmental reporting requirements for the CY 2017 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.

Chapter 1.0 provides the general site description for the SNL/NM facility and describes the regulatory criteria and sample collection methods for both SNL/NM site-specific and site-wide groundwater monitoring tasks. The Regional Aquifer supplying the Albuquerque Bernalillo County Water Utility Authority, Veterans Administration, 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. 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 Spring Fault. The Tijeras Fault, a strike-slip fault that trends northeast-southwest, intersects the Sandia and Hubbell Spring 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).

The remaining chapters focus on the activities at each of the following monitoring networks maintained at SNL/NM: Groundwater Monitoring Program (GMP) site-wide surveillance (Chapter 2.0), Chemical Waste Landfill (CWL) (Chapter 3.0), Mixed Waste Landfill (MWL) (Chapter 4.0), Technical Area (TA)-V Groundwater (TAVG) Area of Concern (AOC) (Chapter 5.0), Tijeras Arroyo Groundwater (TAG) AOC (Chapter 6.0), and Burn Site Groundwater (BSG) AOC (Chapter 7.0).

At SNL/NM, Solid Waste Management Units (SWMUs) are regulated under the Resource Conservation and Recovery Act (RCRA) Facility Operating Permit (RCRA Permit). In the RCRA Permit, 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 (Consent Order) governs corrective actions for these sites and, accordingly, monitoring performed at the TAVG AOC, TAG AOC, and BSG AOC. The MWL is a SWMU that underwent corrective action in accordance with the Consent Order, and in March 2016, the New Mexico Environment Department (NMED) Final Order became effective, granting Corrective Action Complete with Controls status to the MWL. Groundwater monitoring requirements for the MWL are defined in the Long-Term Monitoring and Maintenance Plan (LTMMP). The CWL is a closed, regulated unit undergoing post-closure care in accordance with the CWL Post-Closure Care Permit

(PCCP) that became effective on June 2, 2011. The CWL PCCP Attachment 2, Groundwater Sampling and Analysis Plan details the groundwater monitoring requirements, procedures, and protocols.

Groundwater Quality Monitoring Activities and Results

During CY 2017, groundwater samples were collected from monitoring wells for six investigations. 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 GMP monitoring wells were also compared with NMED maximum allowable concentrations (MACs) promulgated for groundwater by the State of New Mexico's Water Quality Control Commission. The activities and results are summarized for each location 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/NNSA and SNL/NM personnel. 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 Consent Order, as specified in Section III.A of the Consent Order.

Groundwater Monitoring Program

Chapter 2.0 discusses the annual groundwater surveillance monitoring activities conducted during January 2017 at wells that are part of the SNL/NM GMP. The GMP is part of the site-wide Environmental Management System at SNL/NM. GMP well locations are scattered throughout and along the perimeter of the base in areas that are not specifically affiliated with SWMUs or AOCs. During CY 2017, groundwater elevations were measured in 209 wells and groundwater samples were collected from 12 monitoring wells (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), and one surface water sample from Coyote Springs. Groundwater samples were analyzed for Safe Drinking Water Act list of volatile organic compounds (VOCs), total organic halogens, total phenols, nitrate plus nitrite (NPN), general chemistry, Target Analyte List (TAL) metals plus total uranium, mercury, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, radium-226, and radium-228. Additional samples were collected at selected monitoring wells for analysis of high explosive (HE) compounds and isotopic uranium. No analytes were detected at concentrations exceeding the associated MCLs or MACs, except for beryllium and fluoride. Fluoride was detected above the MAC of 1.6 milligrams per liter (mg/L) in Coyote Springs, monitoring well SFR-4T environmental and duplicate environmental samples, and monitoring well TRE-1 environmental and duplicate environmental samples at concentrations of 1.65 mg/L, 2.70 mg/L, 2.69 mg/L, 1.71 mg/L, and 1.72 mg/L, respectively. The results are similar to historical concentrations. Beryllium was detected above the MCL of 0.004 mg/L in the environmental surface water sample from Coyote Springs at a concentration of 0.0072 mg/L, which is similar to historical concentrations and is considered to be of natural origin.

Water levels were measured at monitoring wells by SNL/NM personnel either quarterly or annually depending on the response characteristics of the groundwater system. The water levels 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 within the city.

Chemical Waste Landfill

Chapter 3.0 discusses the semiannual groundwater monitoring activities conducted during January and July 2017 at the CWL. The site is a 1.9-acre former disposal site located in the southeastern corner of TA-III. The site was used for the disposal of chemical, radioactive, and solid waste generated by

SNL/NM research activities from 1962 to 1985. Two voluntary corrective measures (VCMs) were performed to remediate the CWL: the Vapor Extraction VCM, and the Landfill Excavation VCM. Since June 2, 2011, the CWL is a remediated, closed, regulated unit undergoing post-closure care in accordance with the CWL PCCP. During CY 2017, groundwater elevations were measured and groundwater samples were collected from four monitoring wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11). Groundwater samples during the January sampling event were analyzed for trichloroethene (TCE), 1,1,2-trichloro-1,2,2-trifluoroethane, tetrachloroethene, 1,1-dichloroethene, chloroform, trichlorofluoromethane, nickel, and chromium; groundwater samples during the July sampling event were analyzed for TCE, nickel, and chromium. No analytes were detected at concentrations exceeding the associated MCLs, or PCCP-defined hazardous concentration limits in the CWL groundwater samples. The analytical results are comparable to historical values. Other activities conducted at the CWL during CY 2017 include site inspections, cover maintenance, and soil-vapor sampling.

Mixed Waste Landfill

Chapter 4.0 discusses the semiannual groundwater monitoring activities conducted in May and October 2017 at the MWL (SWMU 76). The 2.6-acre site is located in the north-central portion of TA-III and was operational from March 1959 through December 1988. The MWL consists of a classified area and an unclassified area that received low-level radioactive, hazardous, and mixed waste. The NMED selected a final remedy, an evapotranspirative vegetative soil cover with a biointrusion barrier, which was installed in 2009. Since January 2014, activities at this site are conducted in accordance with the requirements of the MWL LTMMP. On March 13, 2016, the February 2016 NMED Final Order became effective, granting Corrective Action Complete with Controls status to the MWL and incorporating the MWL LTMMP into the RCRA Permit. During CY 2017, groundwater elevations were measured in seven wells (MWL-BW2, MWL-MW4, MWL-MW5, MWL-MW6, MWL-MW7, MWL-MW8, and MWL-MW9), and groundwater samples were collected from the four compliance monitoring wells (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) and analyzed for VOCs, metals (cadmium, chromium, nickel, and total uranium), radionuclides by gamma spectroscopy, gross alpha/beta activity, tritium, and radon-222. No analytes were detected at concentrations exceeding the associated MCLs or MWL-specific trigger levels, and the analytical results are comparable to historical values. Other activities conducted at the MWL during CY 2017 include cover maintenance, soil-vapor sampling, inspections, and other monitoring required by the MWL LTMMP.

Technical Area-V Groundwater Area of Concern

Chapter 5.0 discusses the quarterly groundwater monitoring activities conducted during February-March, May-June, July-August, and October-November 2017 at the TAVG AOC. The site is located in the northeast corner of TA-III. Several wastewater facilities were used at the site from the 1960s to the early 1990s. Both TCE and nitrate have been identified as constituents of concern in groundwater at the TAVG AOC based on detections above the MCLs. Activities at this AOC are regulated under the requirements of the Consent Order. During CY 2017, groundwater elevations were measured and groundwater samples were collected from 18 monitoring wells (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, TAV-MW14, TAV-MW15, and TAV-MW16). Groundwater samples were analyzed for VOCs, NPN, alkalinity, anions (bromide, chloride, fluoride, and sulfate), metals (arsenic, iron, and manganese), TAL metals plus total uranium, perchlorate, gross alpha/beta activity, radionuclides by gamma spectroscopy, and tritium. No analytes were detected at concentrations exceeding the associated MCLs except for nitrate and TCE. Nitrate concentrations exceeded the MCL of 10 mg/L in samples from monitoring wells LWDS-MW1, TAV-MW10, and TAV-MW14, with a maximum concentration of 12.2 mg/L in the sample from monitoring well TAV-MW10 collected in November. TCE concentrations exceeded the MCL of 5 micrograms per liter (μg/L) in samples from monitoring wells LWDS-MW1, TAV-MW6, TAV-MW10, and TAV-MW12 with a maximum concentration of 17.4 μg/L in the sample from monitoring well LWDS-MW1 collected in March. The analytical results of TCE in the other monitoring wells are below the MCL and are consistent with historical concentrations. Other activities conducted at TAVG AOC during CY 2017 include completing the installation of monitoring wells TAV-MW15 and TAV-MW16, obtaining Discharge Permit DP-1845 for the Treatability Study injection wells at TA-V, installing injection well TAV-INJ1, and implementing a pilot test of the Treatability Study.

Tijeras Arroyo Groundwater Area of Concern

Chapter 6.0 discusses the quarterly groundwater monitoring activities conducted during March, June, August-September, and December 2017 at the TAG AOC. This site is located in the north-central portion of KAFB and includes TA-I, TA-II, and TA-IV. Groundwater in the area has been impacted since the late 1940s and includes numerous potential SNL/NM and non-SNL/NM wastewater and septic-water sources. All SNL/NM discharges ceased in 1992. Activities at this AOC are regulated under the requirements of the Consent Order. During CY 2017, groundwater elevations were measured in 30 monitoring wells and groundwater samples were collected from 18 monitoring wells (TA1-W-01, TA1-W-02, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-08, TA2-NW1-595, TA2-W-01, TA2-W-19, TA2-W-26, TA2-W-27, TA2-W-28, TJA-2, TJA-3, TJA-4, TJA-6, TJA-7, and WYO-3). Groundwater samples were analyzed for VOCs, NPN, general chemistry, TAL metals plus total uranium, gross alpha/beta activity, radionuclides by gamma spectroscopy, and tritium. No analytes were detected at concentrations exceeding the associated MCLs except for nitrate. Nitrate concentrations exceeded the MCL of 10 mg/L in samples from monitoring wells TA2-W-19, TA2-W-28, TJA-2, TJA-4, and TJA-7, with a maximum concentration of 33.1 mg/L in the sample from monitoring well TJA-4 collected in December. Nitrate concentrations in monitoring wells TA2-W-28, TJA-4, and TJA-7 have generally exceeded the MCL for the life of the wells, whereas nitrate concentrations occasionally have exceeded the MCL in samples from monitoring wells TJA-2 and TA2-W-19.

Burn Site Groundwater Area of Concern

Chapter 7.0 discusses the semiannual groundwater monitoring activities conducted in April and October 2017 at the BSG AOC. This site is located around the active Lurance Canyon Burn Site facility in the far eastern portion of KAFB. The site was used in the 1960s through 1980s for explosives tests and burn tests, and groundwater investigations were initiated in 1997 at the request of the NMED after elevated nitrate levels were discovered in the Burn Site Production Well. Activities at this AOC are regulated under the requirements of the Consent Order. During CY 2017, groundwater elevations were measured in 12 wells and groundwater samples were collected from 10 wells (CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15). Samples were analyzed for VOCs, HE compounds, total petroleum hydrocarbons (TPH)-diesel range organics, TPH-gasoline range organics, NPN, general chemistry, TAL metals plus total uranium, perchlorate (at CYN-MW15 only), gross alpha/beta activity, radionuclides by gamma spectroscopy, isotopic uranium, and tritium. No analytes were detected at concentrations exceeding the associated MCLs, except for nitrate. Nitrate concentrations exceeded the MCL of 10 mg/L in samples from 7 monitoring wells (CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15) with a maximum concentration of 44.9 mg/L in the sample from monitoring well CYN-MW19, collected in April. The nitrate concentration trends in these wells are variable and have increased or decreased slightly over the past year. Other activities conducted at the BSG AOC include submitting the Aquifer Pumping Report.

Future Groundwater Monitoring Events

The groundwater monitoring events conducted on a site-wide basis as part of the SNL/NM GMP and at CWL, MWL, TAVG AOC, TAG AOC, and BSG AOC will continue during CY 2018, in accordance with regulatory requirements. The results for these monitoring events will be presented in the Annual Groundwater Monitoring Report for CY 2018.

1.0 Introduction

General groundwater surveillance monitoring is conducted for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) at Sandia National Laboratories, New Mexico (SNL/NM). The purpose of this document is to report to regulators and other stakeholders the results of the consolidated groundwater monitoring activities at SNL/NM for Calendar Year (CY) 2017.

Separate chapters focus on the investigation activities at each of the following monitoring networks maintained at SNL/NM:

- Groundwater Monitoring Program (GMP) (Chapter 2.0),
- Chemical Waste Landfill (CWL) (Chapter 3.0),
- Mixed Waste Landfill (MWL) (Chapter 4.0),
- Technical Area (TA)-V Groundwater (TAVG) Area of Concern (AOC) (Chapter 5.0),
- Tijeras Arroyo Groundwater (TAG) AOC (Chapter 6.0), and
- Burn Site Groundwater (BSG) AOC (Chapter 7.0).

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 an average elevation of 5,384 feet (ft) above mean sea level. The range of elevations is 5,162 to 7,986 ft above mean sea level. KAFB and SNL/NM are located adjacent to the City of Albuquerque, which borders KAFB on its north and west boundaries (Figure 1-1).

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 (National Oceanic and Atmospheric Administration National Weather Service station) is 9.45 inches (Chapter 2.6.2.1). Most precipitation falls between July and October, mainly in the form of brief, heavy rain showers. The evaporation potential is high because of low humidity and generally warm temperatures.

1.1.2 Geologic Setting

SNL/NM is located near the east-central edge of the Albuquerque Basin. 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); or million years before present. 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 south central Colorado across New Mexico, and into 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 buried Albuquerque Basin is more than 3 miles.

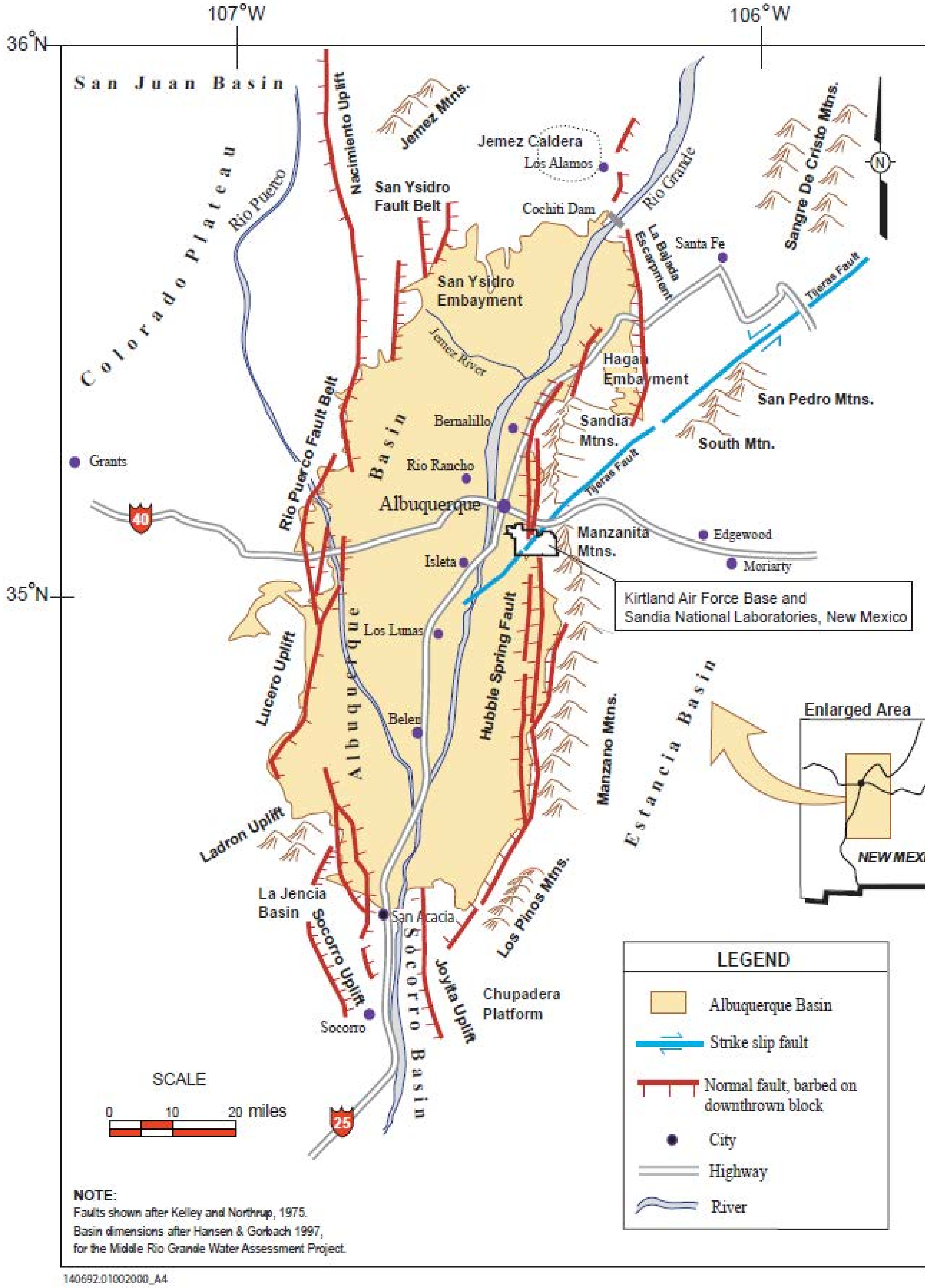


Figure 1-1. Albuquerque Basin, North-Central New Mexico

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 aeolian 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. Based on recent geophysical models, the Albuquerque Basin has been further divided into three, 2- to 4-mile deep, interconnected structural depressions from north to south: the Santo Domingo, Calabacillas, and Belen subbasins. KAFB lies near the intersection of the Calabacillas and Belen subbasins along a broad, northwest elongate structural high called the Mountainview prong that separates the two subbasins (Grauch and Connell 2013). These tectonic/sedimentation features contribute greatly to the complex structural setting described below.

As shown on Figures 1-2 and 1-3, four primary faults on the east side of KAFB are (1) the Sandia Fault, (2) the West Sandia Fault, (3) the Hubbell Spring 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 Spring Fault extends northward from Socorro County and terminates on KAFB near the Tijeras Fault. The Sandia and the Hubbell Spring 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 at locations northeast of KAFB (Kelson et al. September 1999, GRAM and Lettis December 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 to the 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. The Sandia, Hubbell Spring, 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.

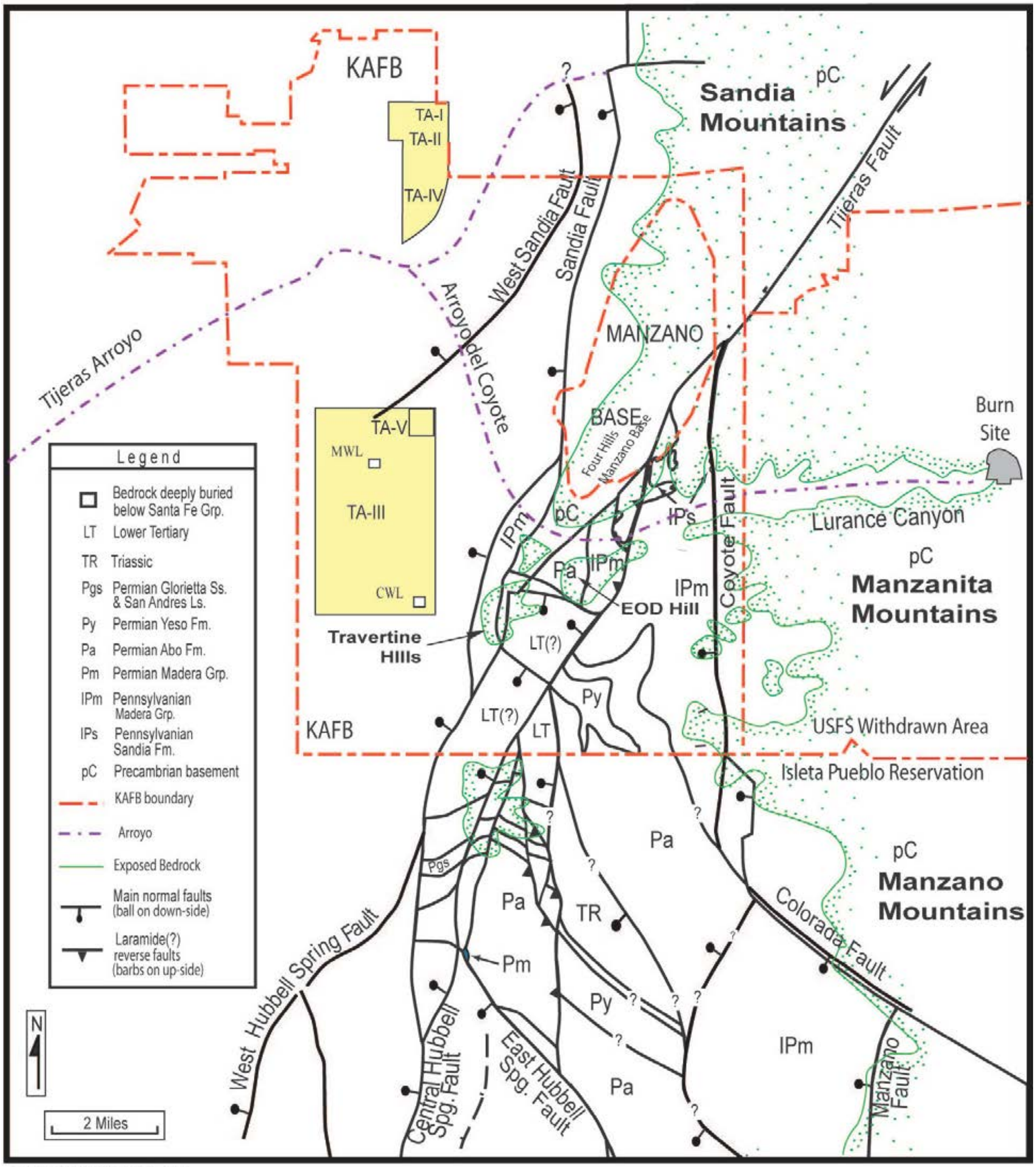


Figure 1-2. Generalized Geology in the Vicinity of SNL/NM and KAFB (Van Hart June 2003)

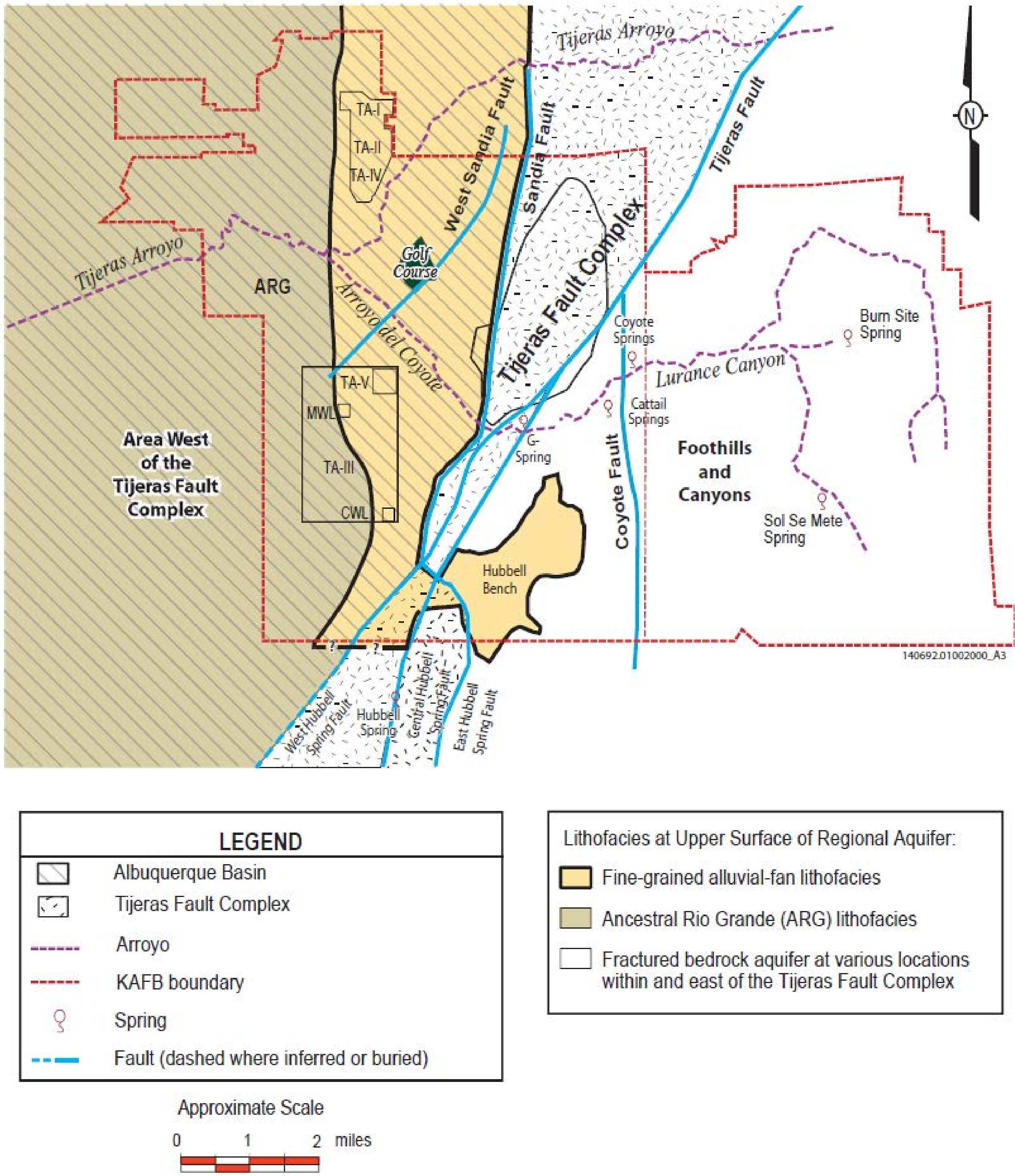


Figure 1-3. Hydrogeologically Distinct Areas Primarily Controlled by Faults (Modified from SNL March 1996)

1.1.3 Hydrogeology

Figure 1-3 shows three distinct hydrogeologic areas 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 Regional Aquifer and the fractured-bedrock system. 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. A Perched Groundwater System lies above the Regional Aquifer near TA-I, TA-II, and TA-IV in the TAG AOC. Figure 1-3 does not show the Perched Groundwater System, but Chapter 6.0 discusses it in detail. The Perched Groundwater System extends northward from the KAFB Golf Course area to TA-I, west of TA-II, and along the west side of the active KAFB Landfill. Possible recharge sources for the Perched Groundwater System are arroyo recharge, irrigation of the golf course, landscape watering, water leakage from utility distribution lines, former wastewater discharges, and infiltration from a former unlined KAFB sewage lagoon system (SNL February 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 below ground surface. Most 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 fractured bedrock system on the east portion 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 (feet of vertical change per foot of horizontal distance). The change in the groundwater elevation is 350 ft over 15,840 ft in crossing the Tijeras Fault Complex from east to west. 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 feet per foot in the more permeable sediments. 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, Veterans Administration, and Albuquerque Bernalillo County Water Utility Authority (ABCWUA) production wells, a depression in the Regional Aquifer has been created 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 minor 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 intersects 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 (U.S. Army Corps of Engineers [USACE] 1979). The total watershed for 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 floodplains of both Tijeras Arroyo and Arroyo del Coyote.

Several springs on KAFB are associated with the uplifts in the Tijeras Fault Complex and in the Foothills and Canyons hydrogeologic areas (Figure 1-3): (1) Coyote Springs, Cattail 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 Spring (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 near 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 approximately 2.2 million cubic feet per year (CF/yr) (50 acre-feet per year [AF/yr]) (SNL February 1998). The best estimate for the groundwater recharge associated with Arroyo del Coyote is 0.4 million CF/yr (9.2 AF/yr). Infiltration studies conducted by the 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 February 1998).

1.2 Groundwater Monitoring

Extensive groundwater monitoring is conducted on KAFB by two agencies (U.S. Air Force Installation Restoration Program and SNL/NM personnel). The U.S. Air Force Installation Restoration Program has a large monitoring well network associated with several closed landfills and a former sewage lagoon system. Additional KAFB wells are sited to monitor and characterize several nitrate plumes and an extensive KAFB aviation gasoline/jet fuel plume associated with the KAFB Bulk Fuels Facility. SNL/NM personnel monitor groundwater on KAFB at locations associated with DOE/NNSA-owned facilities and sites permitted by the U.S. Air Force for DOE/NNSA use. Groundwater monitoring is conducted by SNL/NM personnel on a site-wide and site-specific basis. Figure 1-4 illustrates the extensive monitoring well network at KAFB. Plate 1 more accurately portrays the monitoring well network and is presented after Chapter 7.0 of this Annual Groundwater Monitoring Report along with Table 1, which provides construction details for the groundwater monitoring, production, and remediation wells. Table 1-1 lists the CY 2017 sampling events conducted for groundwater quality monitoring at SNL/NM.

Table 1-2 summarizes the groundwater analytical results for monitoring activities. Table 1-3 lists detected analytes that exceed the U.S. Environmental Protection Agency (EPA) drinking water regulatory criteria (EPA May 2009) for samples collected by SNL/NM personnel during CY 2017.

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/NNSA and SNL/NM personnel. 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 (Consent Order) as specified in Section III.A of the Consent Order (New Mexico Environment Department [NMED] April 2004).

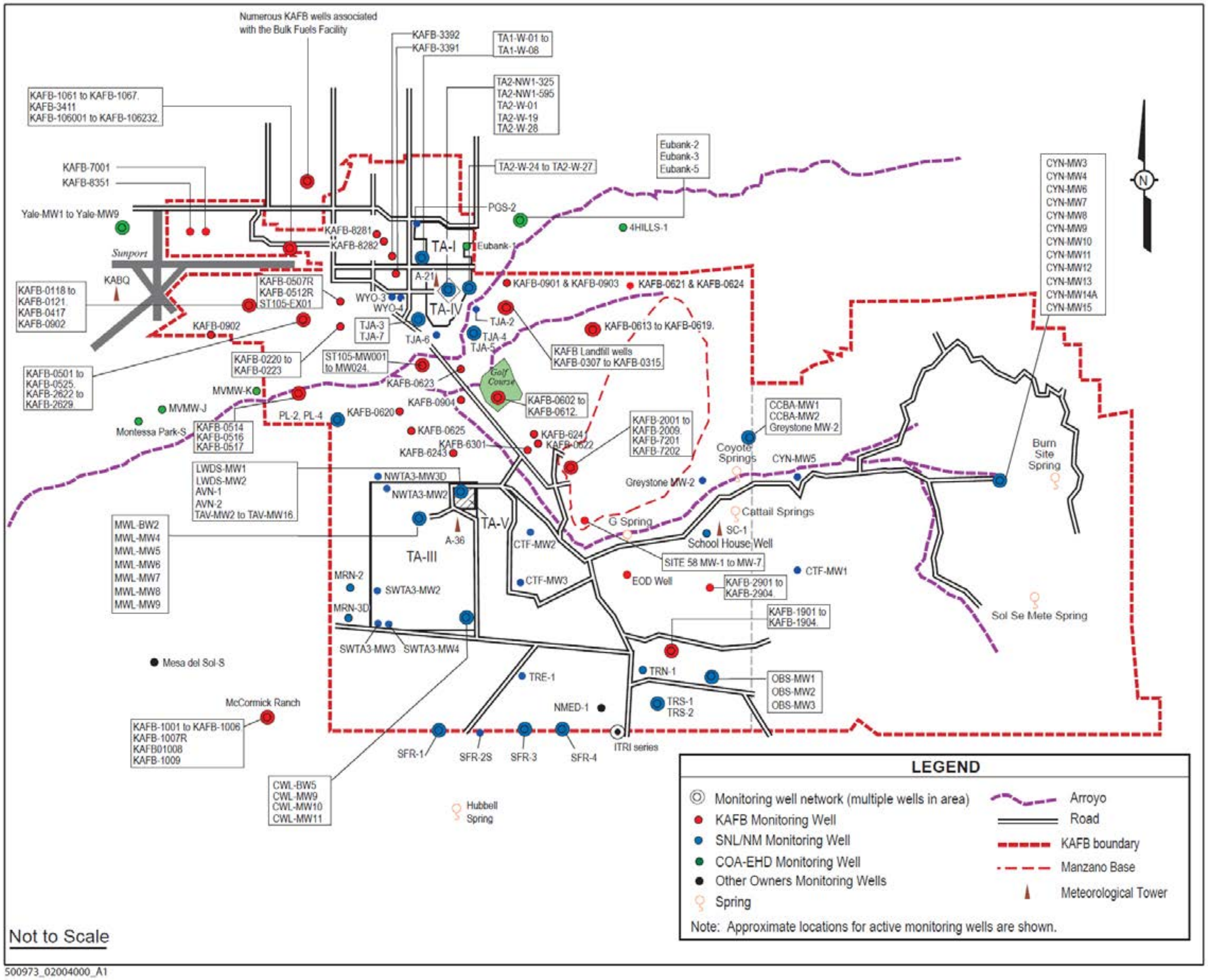


Figure 1-4. Wells and Springs within SNL/NM and KAFB

Table 1-1. Sample Collection Dates for Groundwater Quality Monitoring at SNL/NM for Calendar Year 2017

2017 Sampling Event	GMP[a]	CWL	MWL	TAVG	TAG	BSG
January	√	√				
February	√			√		
March				√	√	
April	√					√
May	√		√	√		
June	√			√	√	
July		√		√		
August				√	√	
September					√	
October			√	√		√
November				√		
December					√	

NOTES:

[a]Due to access issues for several GMP monitoring wells, sampling activities were delayed and completed during April, May, and June 2017.

BSG = Burn Site Groundwater (Area of Concern).
CWL = Chemical Waste Landfill.
GMP = Groundwater Monitoring Program.
MWL = Mixed Waste Landfill.
SNL/NM = Sandia National Laboratories, New Mexico.
TAG = Tijeras Area Groundwater (Area of Concern).
TAVG = Technical Area-V Groundwater (Area of Concern).

Table 1-2. Summary of SNL/NM Groundwater Monitoring Analytical Results for Calendar Year 2017

SNL/NM Groundwater Monitoring	
Number of Active Wells/Springs Monitored	67
Number of Analyses Performed	11,688
Percent of Non-detected Results	85 %

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Summary of Field Water Quality Parameters (units as indicated below)						
pH in SU	147	0	6.17	7.91	7.41	NE
Specific Conductivity in µmhos/cm	147	0	354.8	3817.1	732.0	NE
Temperature in °C	147	0	11.75	27.07	19.66	NE
Turbidity in NTU	147	0	0.11	12.8	1.39	NE
Detected Organic Compounds in µg/L						
Acetone	5	134	1.52	2.81	2.12	NE
Carbon Disulfide	1	138	1.77	1.77	1.77	NE
Chloroform	7	153	0.630	0.960	0.804	NE
Dichloroethane, 1,1-	6	149	0.310	0.450	0.377	NE
Dichloroethene, 1,1-	2	158	0.820	0.840	0.830	7.0
Dichloroethene, cis-1,2-	36	119	0.300	3.59	1.01	70
Methylene Chloride	2	153	1.04	1.49	1.27	5.0
Tetrachloroethene	11	149	0.360	1.59	0.867	5.0
Toluene	3	152	0.340	1.06	0.597	1000
Trichloroethene	78	87	0.340	17.4	3.91	5.0
Detected Metals in mg/L						
Aluminum	24	46	0.0212	0.221	0.0958	NE
Antimony	1	69	0.00116	0.00116	0.00116	0.006
Arsenic	53	81	0.00175	0.00777	0.00249	0.010
Barium	70	0	0.00871	0.219	0.0684	2.0
Beryllium	1	69	0.00722	0.00722	0.00722	0.004
Cadmium	1	79	0.00201	0.00201	0.00201	0.005
Calcium	73	0	36.5	332	91.4	NE
Chromium	5	85	0.00371	0.0255	0.0131	0.100
Cobalt	10	60	0.000127	0.00955	0.00140	NE
Copper	33	37	0.000316	0.00261	0.000741	NE
Iron	51	83	0.0341	0.800	0.129	NE
Magnesium	73	0	3.39	74.9	21.5	NE

Refer to footnotes on page 1-12.

Table 1-2. Summary of SNL/NM Groundwater Monitoring Results for Calendar Year 2017 *(Continued)*

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Detected Metals in mg/L						
Manganese	46	88	0.001	1.69	0.0609	NE
Mercury	1	85	0.000158	0.000158	0.000158	0.002
Nickel	28	62	0.000503	0.0245	0.00299	NE
Potassium	73	0	1.68	31.7	3.92	NE
Selenium	51	19	0.00203	0.0283	0.00507	0.050
Silver	6	64	0.000337	0.000480	0.000430	NE
Sodium	73	0	17.8	1290	88.5	NE
Thallium	1	69	0.00112	0.00112	0.00112	0.002
Uranium	69	2	0.000976	0.0183	0.00505	0.030
Vanadium	47	23	0.00354	0.00955	0.00609	NE
Zinc	23	47	0.00347	0.0492	0.0120	NE
Detected Inorganic Parameters in mg/L						
Nitrate plus nitrite	162	0	0.124	44.9	9.20	10
Bromide	72	1	0.142	2.63	0.593	NE
Chloride	73	0	9.93	497	66.3	NE
Fluoride	73	0	0.191	2.70	0.925	4.0
Sulfate	73	0	16.6	1880	141	NE
Total Organic Halogens	7	9	0.00350	0.015	0.00622	NE
Total Phenols	1	15	0.00182	0.00182	0.00182	NE
Alkalinity as $CaCO_3$	73	0	81.8	1050	223.1	NE
Perchlorate	4	11	0.004	3.19	0.801	NE

Refer to footnotes on page 1-12.

Table 1-2. Summary of SNL/NM Groundwater Monitoring Results for Calendar Year 2017 *(Concluded)*

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Detected Radiochemistry Activities in pCi/L (unless noted otherwise)						
Alpha, gross (corrected)	80	0	-11.66	13.66	3.62	15.0[a]
Beta, gross	77	3	1.06	28.7	4.96	4 mrem/yr
Potassium-40	4	70	54.7	81.1	66.9	NE
Radium-226	12	4	0.226	1.58	0.739	5.0[b]
Radium-228	2	14	0.542	0.850	0.696	5.0[b]
Radon-222	10	0	120	509	295	NE
Uranium-233/234	17	0	0.42	35.5	13.8	NE
Uranium-235/236	15	2	0.156	0.552	0.334	NE
Uranium-238	17	0	0.109	6.33	3.04	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 Radium-226 and Radium-228.

°C = Degree Celsius.
µg/L = Micrograms 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 carbonate.
corrected = Gross alpha results reported as corrected values (uranium activities subtracted out).
MCL = Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Drinking Water Regulations (Title 40 Code of Federal Regulations § 141.11[b]), National Primary Drinking Water Standards (EPA May 2009).
mg/L = Milligrams per liter.
mrem/yr = Millirem per year.
N/A = Not applicable.
NE = Not established.
NTU = Nephelometric turbidity units.
pCi/L = Picocuries per liter.
pH = Potential of hydrogen (negative logarithm of the hydrogen ion concentration).
rem = Roentgen equivalent man.
SNL/NM = Sandia National Laboratories, New Mexico.
SU = Standard units.

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells and Springs Sampled During Calendar Year 2017

Analyte	Well (Relevant Chapter)	Exceedance	Date
Beryllium MCL = 0.004 mg/L	Coyote Springs (Ch. 2)	0.00722 mg/L[a]	February 2017
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	CYN-MW9 (Ch. 7)	44.9 mg/L	April 2017
		35.8 mg/L	October 2017
	CYN-MW10 (Ch. 7)	18.5 mg/L	April 2017
		14.5 mg/L	October 2017
	CYN-MW10 (Duplicate) (Ch. 7)	15.5 mg/L	October 2017
	CYN-MW11 (Ch. 7)	25.4 mg/L	April 2017
		22.6 mg/L	October 2017
	CYN-MW11 (Duplicate) (Ch. 7)	18.4 mg/L	October 2017
	CYN-MW12 (Ch. 7)	20.2 mg/L	April 2017
		19.4 mg/L	October 2017
	CYN-MW13 (Ch. 7)	38.2 mg/L	April 2017
		36.9 mg/L	October 2017
	CYN-MW13 (Duplicate) (Ch. 7)	36.2 mg/L	April 2017
	CYN-MW14A (Ch. 7)	11.9 mg/L	April 2017
		15.0 mg/L	October 2017
	CYN-MW14A (Duplicate) (Ch. 7)	12.0 mg/L	April 2017
	CYN-MW15 (Ch. 7)	28.2 mg/L	April 2017
		22.9 mg/L	October 2017
	CYN-MW15 (Duplicate) (Ch. 7)	22.2 mg/L	October 2017
	LWDS-MW1 (Ch. 5)	11.8 mg/L	March 2017
		11.5 mg/L	June 2017
		12.0 mg/L	August 2017
		11.3 mg/L	November 2017
	TA2-W-19 (Ch. 6)	10.9 mg/L	March 2017
		11.2 mg/L	June 2017
		11.1 mg/L	September 2017
		11.4 mg/L	December 2017
	TA2-W-28 (Ch. 6)	21.4 mg/L	March 2017
		18.1 mg/L	June 2017
		16.4 mg/L	September 2017
		16.9 mg/L	December 2017
	TA2-W-28 (Duplicate) (Ch. 6)	17.0 mg/L	December 2017
	TAV-MW10 (Ch. 5)	11.2 mg/L	February 2017
		11.9 mg/L	June 2017
		11.4 mg/L	August 2017
		12.2 mg/L	November 2017
	TAV-MW10 (Duplicate) (Ch. 5)	11.5 mg/L	February 2017
	TAV-MW14 (Ch. 5)	11.7 mg/L	February 2017
	TJA-2 (Ch. 6)	11.1 mg/L	March 2017
		11.2 mg/L	June 2017
		11.0 mg/L	September 2017
		12.2 mg/L	December 2017
	TJA-2 (Duplicate) (Ch. 6)	10.6 mg/L	March 2017
	TJA-4 (Ch. 6)	31.1 mg/L	March 2017
		29.0 mg/L	June 2017
		29.9 mg/L	September 2017
		33.1 mg/L	December 2017
	TJA-4 (Duplicate) (Ch. 6)	29.2 mg/L	June 2017
	TJA-7 (Ch. 6)	25.5 mg/L	March 2017
		22.2 mg/L	June 2017
		23.4 mg/L	September 2017
		26.0 mg/L	December 2017

Refer to footnotes on page 1-14.

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells and Springs Sampled During Calendar Year 2017 *(Concluded)*

Analyte	Well (Relevant Chapter)	Exceedance	Date
Trichloroethene MCL = 5.0 µg/L	LWDS-MW1 (Ch. 5)	17.4 µg/L	March 2017
		10.2 µg/L	June 2017
		16.8 µg/L	August 2017
		15.0 µg/L	November 2017
	TAV-MW6 (Ch. 5)	12.3 µg/L	February 2017
		10.1 µg/L	June 2017
		9.15 µg/L	August 2017
		9.34 µg/L	November 2017
	TAV-MW10 (Ch. 5)	10.1 µg/L	February 2017
		8.63 µg/L	June 2017
		9.96 µg/L	August 2017
		7.48 µg/L	November 2017
	TAV-MW10 (Duplicate) (Ch. 5)	10.6 µg/L	February 2017
	TAV-MW12 (Ch. 5)	5.73 µg/L	February 2017
		5.13 µg/L	June 2017
		5.87 µg/L	November 2017

NOTES:

[a]Analytical result for filtered water sample. All other analytical results are for unfiltered water samples.

µg/L = Micrograms per liter.
Ch. = Chapter.
CYN = Canyons.
LWDS = Liquid Waste Disposal System.
MCL = Maximum contaminant level.
mg/L = Milligrams per liter.
MW = Monitoring well.
SNL/NM = Sandia National Laboratories, New Mexico.
TA2-W = Technical Area-II (Well) (monitoring well designation only).
TAV = Technical Area-V (monitoring well designation only).
TJA = Tijeras Arroyo (monitoring well designation only).

1.2.1 SNL/NM Groundwater Monitoring Requirements

Groundwater monitoring performed by SNL/NM personnel is directed based on three broad sets of requirements: DOE Directives, the Resource Conservation and Recovery Act (RCRA) Facility Operating Permit (RCRA Permit), and the Consent Order.

Groundwater surveillance conducted at the GMP network adheres to DOE Order 231.1B, *Environment, Safety, and Health Reporting* (DOE June 2011). GMP sampling also complies with the Consent Order requirement for Facility Investigation Background. Groundwater monitoring results at all sites are compared with federal and state water quality standards and DOE drinking water guidelines, where established.

In addition to the DOE Order, potential release sites at SNL/NM are identified, characterized, and remediated (if required) under the RCRA regulations. In 1984, RCRA was significantly amended by the Hazardous and Solid Waste Amendments, which specifically addressed remediation of legacy contamination, including groundwater at solid waste management units (SWMUs).

At SNL/NM, SWMUs are regulated under the RCRA Permit (NMED January 2015). In the RCRA Permit, 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 Consent Order became effective in 2004 and specified that corrective actions for releases of hazardous waste or hazardous constituents were to be conducted under the Consent 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 (CAC) with Controls” list; and any releases of hazardous waste or hazardous constituents that occur after the Consent Order is no longer effective.

The three groundwater AOCs at SNL/NM (TAVG, TAG, and BSG) are undergoing corrective action in accordance with the Consent Order. Each AOC complies with requirements set forth in the Consent Order for site characterization and the development of a Corrective Measures Evaluation. The NMED is the regulatory agency responsible for enforcing the requirements identified in the Consent Order for each of the three AOCs (SNL June 2004, July 2004, and December 2004). The Consent Order also includes requirements for the placement and installation of new groundwater monitoring wells and decommissioning of obsolete monitoring wells at SNL/NM. Applicable well installation and well decommissioning permits are obtained from the New Mexico Office of the State Engineer.

Closure of the CWL was approved by the NMED and the CWL Post-Closure Care Permit (PCCP) became effective on June 2, 2011 (Kieling June 2011). All groundwater monitoring at the CWL since June 2011 is performed in accordance with requirements specified in the PCCP. Required monitoring (groundwater and soil-gas), inspections, and maintenance activities are comprehensively documented in annual Post-Closure Care Reports submitted to NMED by March 31st of each year.

The MWL is a SWMU that underwent corrective action in accordance with the Consent Order. As of March 13, 2016, the February 2016 NMED Final Order (Flynn February 2016) became effective, granting CAC with Controls status to the MWL. All controls required for the MWL, including groundwater monitoring, are defined in the MWL Long-Term Monitoring and Maintenance Plan (LTMMP, SNL March 2012) that was approved by NMED on January 8, 2014 (Blaine January 2014). The MWL LTMMP defines all long-term monitoring, inspection, maintenance/repair, and reporting requirements that are applicable to the MWL and is included in the RCRA Permit (Kieling February 2016). Ongoing monitoring, inspection, and maintenance/repair are comprehensively documented in MWL Annual Long-Term Monitoring and Maintenance Reports submitted to the NMED by June 30th of each year.

1.3 Field Methods, Analytical Methods, and Quality Control Procedures

The monitoring procedures, as conducted by SNL/NM personnel, are consistent with procedures identified in the EPA's Technical Enforcement Guidance Document (EPA 1986a). This section discusses procedures that apply to all groundwater investigations. Chapters 2.0 through 7.0 present any site-specific variances from the procedures discussed in this section.

1.3.1 Field Methods and Measurements

The following sections provide an overview of the sampling and data collection procedures.

1.3.1.1 Groundwater Elevation

In CY 2017, water level measurements were obtained to determine groundwater flow directions, hydraulic gradients, and potentiometric surface elevations. Water levels are periodically measured in SNL/NM 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 April 2016a). Chapters 2.0 through 7.0 present the water level information used to create the potentiometric surface maps and hydrographs.

1.3.1.2 Well Purging and Water Quality Measurements

A portable Bennett™ groundwater sampling system was used to collect the groundwater samples from all wells. The minimum purge requirements for a portable piston pump are one saturated screen volume (including annulus). Field water quality parameters measured (Table 1-4) include temperature, specific conductivity (SC), oxidation-reduction potential (ORP), potential of hydrogen (pH), turbidity, and dissolved oxygen (DO). These were recorded for each well prior to collecting groundwater samples, according to SNL/NM FOP 05-01 (SNL January 2015a). Groundwater temperature, SC, ORP, pH, and DO were measured using a YSI™ EXO1 water quality meter. Turbidity was measured with a HACH™ Model 2100P turbidity meter.

Table 1-4. Field Water Quality Parameters Measured at Monitoring Wells

Field Parameter	Comments
Dissolved Oxygen	Percentage of saturation value and/or measured in mg/L.
Oxidation-Reduction Potential	Measured in mV.
pH	Stability measure: Four consecutive measures within 0.1 pH units.
Sample Flow Rate	Measured in gpm.
Specific Conductivity (µmhos/cm)	Stability measure: Four consecutive measurements within 5 percent.
Temperature (°C)	Stability measure: Four consecutive measures within 1°C.
Turbidity (NTU)	Stability measure: Four consecutive measurements within 10 percent or less than 5 NTU.

NOTES:
°C = Degrees Celsius.
µmhos/cm = Micromhos per centimeter.
gpm = Gallons per minute.
mg/L = Milligrams per liter.
mV = Millivolts.
NTU = Nephelometric turbidity units.
pH = Potential of hydrogen (negative logarithm of the hydrogen ion concentration).

The amount of water required to achieve stabilization of field parameters is fairly consistent for a particular monitoring well. However, the ability of the aquifer to produce water can vary greatly from well to well. In accordance with the site-specific Mini-Sampling and Analysis Plans (SAPs) (as identified in Chapters 2.0 through 7.0), purging continued until four stable measurements for temperature, SC, pH, and turbidity were obtained. Groundwater stability is considered acceptable (stable) when temperature is within 1.0 degree Celsius, SC is within 5 percent, pH is within 0.1 units, and turbidity measurements are less than 5 nephelometric turbidity units (NTU) or within 10 percent for turbidity values greater than 5 NTU. Associated field measurement logs documenting details of well purging and water quality measurements for each sampling event were submitted to the SNL/NM Customer Funded Record Center.

1.3.1.3 Pump Decontamination

The sampling pump and tubing bundle associated with the portable Bennett™ groundwater sampling system were decontaminated prior to installation into each monitoring well according to procedures described in SNL/NM FOP 05-03 (SNL January 2015b). An equipment blank (EB) is collected to verify the equipment decontamination process.

1.3.1.4 Sample Collection Sampling Procedures

Groundwater samples are collected using a nitrogen gas-powered portable piston pump (Bennett™) in accordance with SNL/NM FOP 05-01. Sample bottles are filled directly from the pump discharge line and water sampling manifold.

1.3.1.5 Sample Handling and Shipment

The SNL/NM Sample Management Office (SMO) processes environmental samples collected by SNL/NM personnel. The SMO staff obtains sample containers, issues sample control and tracking numbers, tracks the chain-of-custody forms, and reviews analytical data packages to determine method, contract, and regulatory project-specific compliance. All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols. Analytical laboratories report associated quality control (QC) data that are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract Verification Review, SMO-05-03, Revision 06* (SNL April 2016b) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data, Revision 4* (SNL June 2014).

1.3.1.6 Waste Management

Purge and decontamination wastewater generated from sampling activities were placed into 55-gallon polyethylene drums and stored at the Environmental Resources Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04 (SNL January 2015c). All wastewater was discharged to the sanitary sewer in accordance with ABCWUA and project-specific regulatory requirements after waste characterization data were compared to discharge limits.

1.3.2 Analytical Methods

The 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 and DOE methods (Tables 1-5 and 1-6).

Table 1-5. Chemical Analytical Methods

Analyte	Analytical Method[a]
Alkalinity (total, bicarbonate, carbonate)	SM2320B
Anions	SW846-9056
Filtered Metals (including Cations)	SW846-6020/7470
HE compounds	SW846-8330
NPN	EPA 353.2
Perchlorate	EPA 314.0
Metals	SW846-6020/7470
Total Cyanide	SW846-9012B
Total Organic Halogens	SW846-9020B
TPH Diesel Range Organics	SW846-8015D
TPH Gasoline Range Organics	SW846-8015A/B
Total Phenol	SW846-9066
VOCs	SW846-8260B

NOTES:
[a]**Analytical Method References**
EPA 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014.
EPA 1986b (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1, U.S. Environmental Protection Agency, Washington, D.C.
EPA 1984, *Methods for Chemical Analysis of Water and Wastes,* EPA 600-4-79-020.
Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, Washington, D.C.
EPA = U.S. Environmental Protection Agency.
HE = High explosives.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard Method.
SW = Solid Waste.
TPH = Total petroleum hydrocarbons.
VOC = Volatile organic compound.

Table 1-6. Radiochemical Analytical Methods

Analyte	Analytical Method[a]
Gamma Spectroscopy (short list[b])	EPA 901.1
Gross Alpha/Beta Activity	EPA 900.0
Isotopic Uranium	HASL-300
Radon-222	SM7500
Radium-226	EPA 903.1
Radium-228	EPA 904.0
Tritium	EPA 906.0

NOTES:
[a]**Analytical Method References**
DOE 1997, *EML [Environmental Measurements Laboratory] Procedures Manual,* 28th ed., Vol. 1, Rev. 0, HASL-300.
EPA 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., SM7500-Rn B Method, Washington, D.C.
[b]Gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40).
DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
HASL = Health and Safety Laboratory.
SM = Standard Method.

1.3.3 Quality Control Samples

Field and laboratory QC samples were prepared and analyzed along with the environmental samples to determine the accuracy and precision of the analytical methods, and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. Table 1-7 shows the types of QC samples that accompany groundwater quality samples in the sampling and analysis process. Upon receipt at SNL/NM, all chemical and radiochemical data are reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data, Revision 4.* Although some minor analytical results were qualified during the data validation process, no significant data quality issues were noted. Data validation qualifiers are provided with the analytical results in the data tables attached to Chapters 2.0 through 7.0. The data validation report associated with each sampling event is retained per the SNL/NM Records Retention and Disposition Schedule.

Table 1-7. Quality Control Sample Types for Groundwater Sampling and Analysis

QC Sample Type	Description
Field QC	
Duplicate samples	Establish the precision of the sampling process.
Equipment blanks	Determine the effectiveness of the decontamination process of the sampling pump and system to ensure that cross-contamination did not occur between wells.
Field blanks	Assess whether contamination of the VOC samples had resulted from ambient field conditions.
Trip blanks	Determine whether VOC contamination occurred during sample handling, shipment, or storage by submitting deionized water samples along with the environmental samples for VOC analysis.
Laboratory QC	
Batch matrix spike and matrix spike duplicate samples	Measure the percent recovery and RPD of chemical spikes added to an existing sample to determine the sample matrix effect. (The matrix is groundwater.)
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.
Method blanks	Determine if contaminants were inadvertently introduced during the sample preparation and handling process in the laboratory.
Sample replicate	Used to determine precision for non-organic analyses.

NOTES:
LCS = Laboratory control sample.
QC = Quality control.
RPD = Relative percent difference.
VOC = Volatile organic compound.

1.3.4 Field Quality Control Samples

Field QC samples included duplicate environmental, EB, field blank (FB), and trip blank (TB) samples. The field QC samples were submitted for analysis with the groundwater samples in accordance with QC procedures specified in site-specific Mini-SAPs (Chapters 2.0 through 7.0).

1.3.4.1 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 (for concentrations above detection limits only) are used to calculate relative percent difference values. The duplicate results are discussed in Chapters 2.0 through 7.0.

1.3.4.2 Equipment Blank Samples

The portable Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into each monitoring well according to procedures described in SNL/NM FOP 05-03. An EB is collected to verify the effectiveness of the equipment decontamination process. The results for the EB analyses are discussed in Chapters 2.0 through 7.0.

1.3.4.3 Field Blank Samples

FB samples are submitted to assess whether any contamination of the samples could have resulted from ambient field conditions. FB samples are prepared by pouring deionized water into sample containers at the sample point (i.e., inside the sampling truck at each well location) to simulate the transfer of water from the sampling system to the sample container. The FB samples are contained in 40-milliliter glass vials and are commonly analyzed for VOC and gasoline range organics analyses. Chapters 2.0 through 7.0 discusses the results for the FB analyses.

1.3.4.4 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC analysis. These samples are used to determine potential contamination during sampling, transportation, analysis, and storage. The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-milliliter glass vials. These containers are prepared by the analytical laboratory and accompany the empty sample containers supplied by the laboratory. TB samples accompanied each sample shipment. Chapters 2.0 through 7.0 discusses the results for the TB analyses.

1.3.5 Laboratory Quality Control Samples

Laboratory and method-required batch QC samples are prepared to determine potential contamination introduced by the laboratory processes. These are used to assist with data validation and data defensibility. These samples included laboratory control samples, replicates, matrix spikes, matrix spike duplicates, and surrogate spike samples. Internal laboratory QC samples were analyzed concurrently with all environmental samples. All chemical and radiochemical data are reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data, Revision 4*. Laboratory data qualifiers are provided with the analytical results in the tables attached to Chapters 2.0 through 7.0.

Chapter 1
Introduction
References

This page intentionally left blank.

Blaine January 2014	Blaine, T. (New Mexico Environment Department), January 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan, March 2012, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-12-007*. January 8, 2014.
DOE June 2011	U.S. Department of Energy (DOE), 2011. *Environment, Safety, and Health Reporting,* DOE Order 231.1B, U.S. Department of Energy, Washington, D.C., June 27, 2011.
DOE 1997	U.S. Department of Energy (DOE), 1997. *EML Procedures Manual,* 28th ed., Vol. 1, Rev. 0, HASL-300, Environmental Measurements Laboratory.
EPA May 2009	U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations*, EPA 816-F-09-0004, U.S. Environmental Protection Agency, Washington, D.C.
EPA 1999	U.S. Environmental Protection Agency (EPA), 1999. *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014, U.S. Environmental Protection Agency, Washington, D.C.
EPA 1986a	U.S. Environmental Protection Agency (EPA), 1986. *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document*, OSWER-9950.1. U.S. Environmental Protection Agency, Washington, D.C.
EPA 1986b	U.S. Environmental Protection Agency (EPA), 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed., (and updates), U.S. Environmental Protection Agency, Washington, D.C.
EPA 1984	U.S. Environmental Protection Agency (EPA), 1984. *Methods for Chemical Analysis of Water and Wastes.* EPA 600-4-79-020, U.S. Environmental Protection Agency, Washington, D.C.
EPA 1980	U.S. Environmental Protection Agency (EPA), 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA 600-4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
Flynn February 2016	Flynn, R. (New Mexico Environment Department), February 2016. *Final Order, State of New Mexico Before the Secretary of the Environment in the Matter of Proposed Permit Modification for Sandia National Laboratories, EPA ID # 5890110518, To Determine Corrective Action Complete with Controls at the Mixed Waste Landfill, No. HWB 15-18(P)*, February 12, 2016.
GRAM and Lettis December 1995	GRAM and Lettis, December 1995. *Conceptual Geological Model of the Sandia National Laboratories and Kirtland Air Force Base*, prepared for Site Wide Hydrogeologic Characterization Project, Sandia National Laboratories, New Mexico, by GRAM, Inc., Albuquerque NM and William Lettis & Associates, Inc., Walnut Creek CA, 2 volumes.

Grauch and Connell 2013 Grauch, V.J.S., and Connell, S.D., 2013. *New perspectives on the geometry of the Albuquerque Basin, Rio Grande rift, New Mexico: Insights from geophysical models of rift-fill thickness*, in Hudson, M.R., and Grauch, V.J.S., eds., New Perspectives on Rio Grande Basins: From Tectonics to Groundwater: Geological Society of America Special Paper 494, p. 427-462.

Hansen and Gorbach 1997 Hansen, S., and C. Gorbach, 1997. *Middle Rio Grande Water Assessment, Final Report*. U.S. Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico.

Hawley and Haase 1992 Hawley, J.W., and C.S. Haase, 1992. *Hydrogeologic Framework of the Northern Albuquerque Basin*, Open File Report 387, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.

Kelley 1977 Kelley, V.C., 1977. *Geology of Albuquerque Basin, New Mexico*, Memoir 33, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.

Kelley and Northrup 1975 Kelley, V. C., and S. A. Northrup, 1975. *Geology of Sandia Mountains and Vicinity, New Mexico*, Memoir 29, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.

Kelson et al. September 1999 Kelson, K.I., C.S. Hitchcock, and J.B.J. Harrison, 1999. *Paleoseismology of the Tijeras Fault Near Golden, New Mexico. Albuquerque Geology*, F.J. Pazzaglia and S. Lucas (eds.), *New Mexico Geological Society, Fiftieth Annual Field Conference*, New Mexico Geological Society, Socorro, New Mexico, September.

Kieling February 2016 Kieling, J.E. (New Mexico Environment Department), February 2016. Letter to J.P. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Final Decision on Proposal to Grant Corrective Action Complete with Controls Status for Mixed Waste Landfill, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-014*, February 18, 2016.

Kieling June 2011 Kieling, J.E. (New Mexico Environment Department), June 2011. Letter to P. Wagner (U.S. Department of Energy) and S.A. Orrell (Sandia Corporation), *Notice of Approval, Closure of Chemical Waste Landfill and Post-Closure Care Permit in Effect, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-10-013*, June 2.

Lozinsky 1994 Lozinsky, R.P., 1994. *Cenozoic stratigraphy, sandstone petrology, and depositional history of the Albuquerque basin, central New Mexico*, Geological Society of America, Special Paper 291, p. 73–82.

NMED January 2015 New Mexico Environment Department (NMED), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29.

Rice et al. 2012 Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri, 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Washington, D.C.

SNL April 2016a Sandia National Laboratories, New Mexico (SNL/NM), April 2016. *Groundwater Level Data Acquisition and Management*, FOP 03-02, Rev. 06, Sandia National Laboratories, Albuquerque, New Mexico, April 1, 2016.

SNL April 2016b Sandia National Laboratories, New Mexico (SNL/NM), April 2016. *Procedure for Completing the Contract Verification Review, SMO-05-03, Revision 06,* Sandia National Laboratories, Albuquerque, New Mexico, April 22, 2016.

SNL January 2015a Sandia National Laboratories, New Mexico (SNL/NM), January 2015. *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements,* FOP 05-01, Revision 05, Sandia National Laboratories, Albuquerque, New Mexico, January 23, 2015.

SNL January 2015b Sandia National Laboratories, New Mexico (SNL/NM), January 2015. *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination,* FOP 05-03, Revision 05, Sandia National Laboratories, Albuquerque, New Mexico, January 23, 2015.

SNL January 2015c Sandia National Laboratories, New Mexico (SNL/NM), January 2015. *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management,* FOP 05-04, Revision 05, Sandia National Laboratories, Albuquerque, New Mexico, January 23, 2015.

SNL June 2014 Sandia National Laboratories, New Mexico (SNL/NM), June 2014. *Data Validation Procedure for Chemical and Radiochemical Data*, AOP 00-03, Revision 4, Sample Management Office, Sandia National Laboratories, New Mexico, June 16, 2014.

SNL March 2012 Sandia National Laboratories, New Mexico (SNL/NM), March 2012. *Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2004 Sandia National Laboratories, New Mexico (SNL/NM), 2004. *Corrective Measures Evaluation Work Plan, Tijeras Arroyo Groundwater*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, July.

SNL December 2004 Sandia National Laboratories, New Mexico (SNL/NM), 2004. *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater, Revision 0*, SAND Report SAND2004-6113, Sandia National Laboratories, Albuquerque, New Mexico, December.

SNL June 2004 Sandia National Laboratories, New Mexico (SNL/NM), 2004. *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, June.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), 1998. *Revised Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report, Revised February 1998*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, February.

SNL March 1996 Sandia National Laboratories, New Mexico (SNL/NM), 1996. *Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report*, Sandia National Laboratories, Albuquerque, New Mexico, March.

Thorn et al. 1993 Thorn, C.R., D.P. McAda, and J.M. Kernodle, 1993. *Geohydrologic Framework and Hydrologic Conditions in the Albuquerque Basin, Central New Mexico*, USGS Water Resources Investigation Report 93-4149, U.S. Geological Survey, Albuquerque, New Mexico.

USACE 1979 U.S. Army Corps of Engineers (USACE), 1979. *Special Flood Hazard Information: Tijeras Arroyo and Arroyo del Coyote, Kirtland AFB, New Mexico*, U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, New Mexico.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico*, SAND Report SAND2003-1869, Sandia National Laboratories, Albuquerque, New Mexico.

2.0 Groundwater Monitoring Program

2.1 Introduction

This chapter documents the results for the calendar year (CY) 2017 monitoring activities conducted as part of the Sandia National Laboratories, New Mexico (SNL/NM) Groundwater Monitoring Program (GMP). The surveillance activities include the annual collection and analysis of groundwater samples from 12 monitoring wells and 1 surface water sample from a perennial spring. As part of the activities, SNL/NM personnel used groundwater elevation data from 209 monitoring wells. Groundwater elevation measurements were obtained either quarterly or annually 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 monitoring the GMP network is:

- To protect groundwater resources at SNL/NM and the surrounding area.
- To establish background quality and understanding of the general hydrogeologic system beneath the facility.
- To identify potential sources of contamination.
- To work with other SNL/NM organizations to prevent groundwater contamination.
- To implement effective groundwater surveillance to detect contamination if it should occur.
- To initiate abatement or remedial action, where necessary.

To accomplish this mission, SNL/NM personnel perform the following tasks:

- Evaluate the potential effects of SNL/NM operations on groundwater through groundwater quality sampling and analysis, and groundwater elevation measurements.
- Record and maintain groundwater information in a digital database.
- Maintain documents and records, and ensure that necessary reports are submitted to the appropriate agencies in a timely manner.
- Prepare and maintain administrative and field operating procedures for groundwater monitoring activities.
- Provide assistance to well owners in the areas of well installation, well inspection and maintenance, and well plugging and abandonment.
- Establish requirements for well registration and well construction data tracking.
- Coordinate with the Surface Water Discharge Program to prevent groundwater contamination.

- Develop groundwater education and community outreach programs.
- Provide stakeholders an annual update of SNL/NM groundwater data through this Annual Groundwater Monitoring Report.

The groundwater monitoring involves completing the following objectives:

- Establish baseline water quality and groundwater flow information for the Regional Aquifer, the Perched Groundwater System, and the fractured bedrock system at SNL/NM.
- Determine the impact, if any, of operations at SNL/NM on the quality and quantity of groundwater.
- Demonstrate compliance with federal, state, and local groundwater requirements.

The GMP is responsible for tracking information for wells operated by SNL/NM personnel. The GMP Well Registry and Oversight Task was established to ensure that 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 (NMOSE) in Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells (NMOSE August 2005). The GMP lead works with SNL/NM personnel to review new monitoring 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 monitoring well is required. The goal is to provide full life-cycle management of monitoring wells and boreholes.

2.2 Regulatory Criteria

The following actions ensure implementation of a successful GMP that includes relevant elements of the Environmental Management System at the facility:

- Identify possible sources of current and future groundwater contamination and evaluate the potential for future contamination.
- Meet applicable federal, state, and U.S. Department of Energy (DOE) requirements.
- Establish appropriate groundwater protection goals for affected or potentially affected groundwater consistent with water quality, and current or likely future use.
- Develop strategies for predicting and preventing future contamination and for controlling existing contamination.
- Document the history of GMP activities for future site management.
- Document the quality of baseline groundwater and vadose zone conditions.
- Describe environmental monitoring with surveillance program elements for the groundwater and the vadose zone, including baseline subsurface conditions.
- Establish a systematic approach for the monitoring program that provides the information needed to predict and respond to potential contamination associated with significant site activities, and to achieve groundwater protection goals.

In April 2004, the Compliance Order on Consent (Consent Order) (New Mexico Environment Department [NMED] April 2004) became effective. Among other sampling requirements, the Consent Order includes a requirement to conduct 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/National Nuclear Security Administration (NNSA) and SNL/NM personnel are required to assess the nature and extent of perchlorate contamination and incorporate the results of this assessment into a Corrective Measures Evaluation (CME). Sampling and analysis at the noncompliant well will continue on a quarterly basis until at least four consecutive nondetections are obtained. Section VII.C of the Consent Order clarifies that the CME process will be initiated where there is a documented release to the environment, and where corrective measures are necessary to protect human health and the environment.

The NMED DOE Oversight Bureau (OB) splits a percentage of groundwater samples collected by the GMP. 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 SNL/NM personnel on behalf of the DOE/NNSA Sandia Field Office. Table 2-1 presents additional requirements associated with groundwater quality regulations.

Table 2-1. Groundwater Quality Regulations

Regulation/Requirements	Standards and Guides	Regulating Agency
National Primary Drinking Water Regulations (40 CFR 141)	MCL	EPA (EPA May 2009)
NMWQCC [a] Standards for Groundwater (20 6.2.3103A NMAC Human Health Standards)	MAC	NMED (NMWQCC September 2004)

NOTES:

[a] 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 the direct human health risks used for promulgating MCLs.

CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
MAC = Maximum allowable concentration.
MCL = Maximum contaminant level.
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/NNSA and SNL/NM personnel. 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 Consent Order.

2.3 Scope of Activities

Activities performed during CY 2017 include sampling at designated wells (Figure 2-1), sample analysis, groundwater level measurements, and construction of hydrographs and a potentiometric surface map (Plate 1).

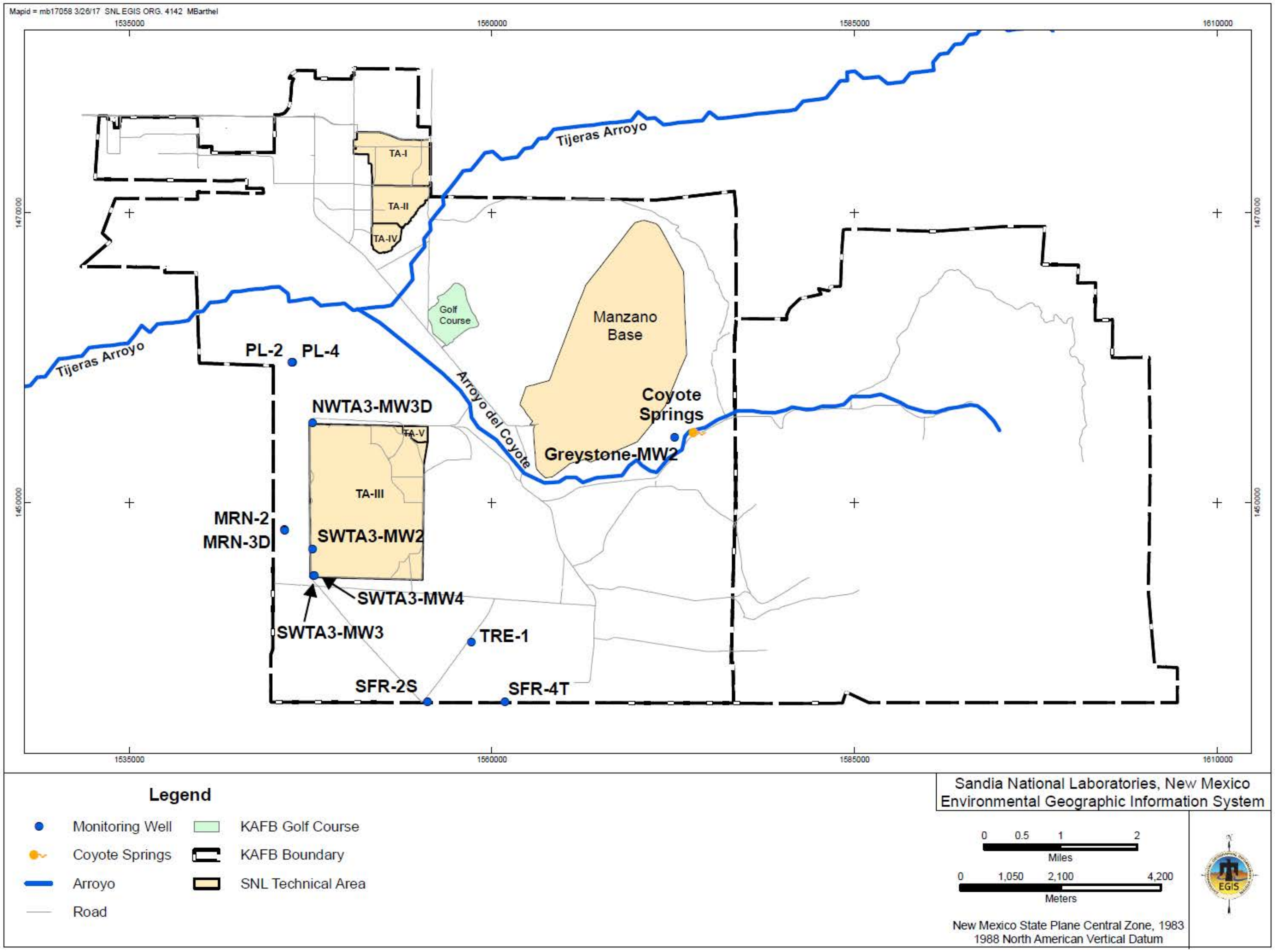


Figure 2-1. Groundwater Monitoring Program Water Quality Monitoring Network

2.3.1 Groundwater Quality Surveillance Monitoring

Annual sampling of groundwater was conducted during the period from January 24 to June 30, 2017. Samples were collected from 12 wells and 1 spring. GMP well locations are scattered throughout and along the perimeter of the base in areas that are not specifically affiliated with SWMUs or AOCs. Groundwater surveillance samples were collected from the following monitoring wells: 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. Due to SNL/NM testing near monitoring wells NWTA3-MW3D, SWTA3-MW2, and SWTA3-MW4, sampling activities were delayed and completed during April, May, and June 2017. A water sample was also collected from Coyote Springs using a portable peristaltic pump.

Samples collected from the 13 locations were analyzed for the following analytes:

- Safe Drinking Water Act list of volatile organic compounds (VOCs)
- Total organic halogens (TOX)
- Total phenols
- Total alkalinity
- Nitrate plus nitrite (NPN)
- Total cyanide
- High explosives (HE), select wells only
- Major anions (chloride, bromide, fluoride, and sulfate)
- Target Analyte List (TAL) metals plus total uranium
- Mercury
- Gamma spectroscopy (short list: americium-241, cesium-137, cobalt-60, and potassium-40)
- Gross Alpha/Beta activity
- Radium-226 and radium-228
- Isotopic uranium (uranium-233/234, uranium-235/236, and uranium-238), select wells only

Samples were filtered at the sampling location using in-line filters of 0.45-micron pore size, except those for VOC, HE, and mercury fractions. Analysis for HE compounds was only conducted on the groundwater samples collected from monitoring wells SFR-2S, SFR-4T, SWTA3-MW2, 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. Environmental duplicate samples from monitoring wells PL-4, SFR-4T, and TRE-1 were submitted for analyses.

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 GMP gathers groundwater information from a large network of wells within and in the vicinity of Kirtland Air Force Base (KAFB). In addition to wells owned by the DOE/NNSA, data are solicited from the U.S. Air Force (USAF) Installation Restoration Program, City of Albuquerque (COA) Environmental Health Department (EHD), and U.S. Geological Survey (USGS) (Figure 1-4 and Plate 1). Groundwater elevations in wells were measured quarterly or annually during CY 2017, depending on the owner's requirements and the well characteristics. Plate 1 depicts groundwater elevations at the wells and is used for preparing a base-wide potentiometric surface map of the Regional Aquifer (see discussion in Section 2.6.2.2).

Groundwater pumped from KAFB, Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and Veterans Administration water supply wells represent the primary groundwater withdrawal from the Regional Aquifer. From the potentiometric surface map (Plate 1), groundwater flow directions are identified and horizontal gradients are determined. Precipitation measurements are used as an indirect estimate of potential groundwater recharge. Available precipitation also impacts the demand on groundwater withdrawal. Section 2.6.2 discusses the specific results for annual precipitation, water production, and the impact on the groundwater elevations.

2.3.2 Monitoring Well Installation

No new monitoring wells were installed by the GMP during CY 2017.

2.4 Field Methods and Measurements

Section 1.3 describes in detail the monitoring procedures conducted for GMP groundwater monitoring.

2.5 Analytical Methods

Section 1.3.2 (Tables 1-5 and 1-6) describes the groundwater samples analyzed by off-site laboratories using U.S. Environmental Protection Agency (EPA)-specified protocols.

2.6 Summary of Monitoring Results

Results of the CY 2017 activities are discussed below and are presented in the following attachments. Attachment 2A, Tables 2A-1 through 2A-8, present the analytical results and water quality measurements for the groundwater samples. Attachment 2B, Figures 2B-1 through 2B-6, present the hydrographs that utilize the water level measurements collected, and Figures 2B-7 through 2B-11 present precipitation and production well data. Attachment 2C, Figures 2C-1 through 2C-4, present the time trend plots for specific parameters at Coyote Springs and for monitoring wells SFR-4T and TRE-1.

2.6.1 Analytical Results

Groundwater and surface water samples were submitted to GEL Laboratories LLC (GEL) for both chemical and radiological analysis. 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 May 2009) and NMED maximum allowable concentrations (MACs) for human health standards of groundwater as promulgated by the New Mexico Water Quality Control Commission (NMWQCC) in September 2004. Analytical reports from GEL, including certificates of analyses, analytical methods, MDLs, practical quantitation limits, minimum detectable activity values, and critical levels for radiochemistry analyses, dates of analyses, results of quality control (QC) analyses, and data validation findings are filed in the SNL/NM Customer Funded Record Center (CFRC) and are archived in the Environmental Data Management System (EDMS) electronic database. Analytical results, laboratory QC qualifiers, and third-party data validation qualifiers are also filed in the CFRC and archived in EDMS.

Table 2A-1 summarizes the detected VOC and HE compound results for groundwater samples collected in 2017. No HE compounds were detected above laboratory MDLs. No VOCs were detected at concentrations above established MCLs or MACs from any groundwater sample. The only VOCs detected above laboratory MDLs were chloroform, methylene chloride, and toluene. Chloroform was detected below the MAC of 100 μg/L in the TRE-1 environmental and environmental duplicate samples at a concentration of 0.650 and 0.630 μg/L, respectively. Methylene chloride was reported in the PL-2 sample at a concentration of 1.49 μg/L. The MCL and MAC for methylene chloride is 5.00 μg/L and 100 μg/L, respectively. Toluene was detected below the MCL (1,000 μg/L) and MAC (750 μg/L) in monitoring well SWTA3-MW3 at 0.340 μg/L, and well SWTA3-MW4 at 1.06 μg/L. Table 2A-2 lists the laboratory MDLs for VOC and HE compounds. Methylene chloride was qualified as not detected in samples listed below during data validation.

- Methylene chloride was detected at concentrations less than the practical quantitation limit (PQL) in trip blank (TB) samples associated with SFR-2S and SFR-4T environmental samples, and the SFR-4T environmental duplicate sample.

- Methylene chloride was detected at a concentration less than the PQL in the equipment blank (EB) sample associated with SFR-4T environmental and environmental duplicate samples.

Table 2A-3 summarizes NPN results. NPN was detected in water samples above associated MDLs, and ranged from 0.194 milligrams per liter (mg/L) to 5.03 mg/L. NPN results are below the MCL/MAC of 10 mg/L.

Table 2A-4 summarizes alkalinity, major anions (as bromide, chloride, fluoride, and sulfate), TOX, total phenols, and total cyanide results. No analytes were detected above established MCLs or MACs, except for fluoride. Fluoride was detected above the MAC of 1.6 mg/L in Coyote Springs, monitoring well SFR-4T environmental and duplicate environmental samples, and monitoring well TRE-1 environmental and duplicate environmental samples at concentrations of 1.65 mg/L, 2.70 mg/L, 2.69 mg/L, 1.71 mg/L, and 1.72 mg/L, respectively. Fluoride in groundwater is suspected to be naturally occurring (geogenic). Figures 2C-1 through 2C-3 present the time trend plots for fluoride for Coyote Springs, and monitoring wells SFR-4T and TRE-1.

Detected concentrations for alkalinity, major anions, TOX, and total phenols are consistent with historical GMP groundwater monitoring data. The following parameters were qualified as not detected during data validation due to associated blank contamination.

- TOX was qualified as not detected during data validation in samples from monitoring wells NWTA3-MW3D and SWTA3-MW2 because TOX was detected in associated laboratory calibration blank samples.

- Total phenol was qualified as not detected during data validation in the sample from SWTA3-MW4 because the initial calibration intercept was outside acceptance criteria.

Total cyanide was not detected in any of the samples from Coyote Springs or the 12 monitoring wells.

Mercury was analyzed using unfiltered samples and is reported as total mercury. Mercury was not detected above associated laboratory MDLs in samples from Coyote Springs or the monitoring wells (Table 2A-5).

Table 2A-6 summarizes dissolved TAL metals and total uranium results. No metal parameters, other than beryllium, were detected above established regulatory limits in any groundwater samples. Beryllium was detected above the MCL of 0.004 mg/L in the sample from Coyote Springs at a concentration of 0.00722 mg/L. Beryllium in groundwater at Coyote Springs is suspected to be naturally occurring (geogenic). Figure 2C-4 presents the trend for beryllium concentrations at Coyote Springs and demonstrates that the 2017 beryllium result is consistent with prior years. Thallium, uranium, and vanadium were qualified as not detected in samples listed below during data validation.

- Thallium was reported in the PL-4 sample at concentrations less than five times the initial calibration blank sample.

- Uranium was reported in the SFR-4T samples at concentrations less than five times the associated laboratory method blank sample.

- Vanadium was reported in the SWTA3-MW2 sample at concentrations less than five times the associated laboratory method blank sample.

Table 2A-7 summarizes the radiological analyses results. This includes analyses for alpha- and beta-emitting radioisotopes (gross alpha/beta activities), radium-226, radium-228, isotopic uranium, and gamma spectroscopy results for short list gamma radiation-emitting radioisotopes (americium-241, cesium-137, cobalt-60, and potassium-40). Reported activities were below established MCLs or MACs. The analytical laboratory rejected potassium-40 results for Coyote Springs sample because the peak did not meet the minimum peak identification criteria.

Isotopic uranium (uranium-233/234, uranium-235/236, and uranium-238) analyses were conducted on samples from wells that previously had high gross alpha activity, or are located where groundwater is in contact with bedrock that contains minerals high in naturally occurring radioisotopes. Isotopic uranium was collected at Coyote Springs and monitoring wells Greystone-MW2, SFR-2S, SFR-4T, and TRE-1 because groundwater contacts bedrock, which contains minerals high in naturally occurring uranium.

Gross alpha activity is measured as a radiological screening tool and in accordance with Title 40 of the Code of Federal Regulations Part 141. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements were corrected by subtracting the uranium activity. Radiological results were reviewed by an SNL/NM Health Physicist and were determined to be nonradioactive. The corrected gross alpha activity results were below the MCL of 15 picocuries per liter.

Table 2A-8 summarizes the field water quality measurements collected prior to sampling. These measurements are used to evaluate water chemistry stability and include turbidity, pH, temperature, specific conductivity, oxidation-reduction potential, and dissolved oxygen.

2.6.2 Groundwater Elevation Measurements

Table 1 lists construction details for monitoring wells located on or near KAFB. During CY 2017, SNL/NM GMP personnel measured groundwater elevations in 101 SNL/NM monitoring wells (Table 2). The groundwater elevations were measured with an electric well sounder (water level meter). Data were also available for 108 additional monitoring wells owned by KAFB, COA, Lovelace Respiratory Research Institute, and NMOSE. The groundwater elevation data are maintained in the corporate EDMS. Table 2 provides the groundwater elevation data for CY 2017. Table 2-2 provides the total number of wells listed by the respective organization.

2.6.2.1 Groundwater Recharge and Withdrawal

Factors influencing fluctuations in groundwater elevation primarily include potential recharge from precipitation and groundwater withdrawals by production wells.

Annual Precipitation

The Albuquerque Basin’s climate is semiarid. Long-term average precipitation ranges from 9.45 inches per year (in/yr) (30-year norm based on 1981-2010 data) at Albuquerque International Sunport up to 35 in/yr at the crest of the Sandia Mountains. Most precipitation falls between July and October, mainly in the form of brief, heavy rain showers. For CY 2017, the wettest months were July and August.

Table 2-2. Groundwater Elevations Measured in Monitoring Wells by SNL/NM and Other Organizations during 2017

Total Wells	Measuring Agency	Well Owner	Location
101	SNL/NM GMP	DOE/NNSA	Site-wide surveillance network wells: BSG, CWL, MWL, TAG, and TAVG
101	KAFB	KAFB	ECP Long-term Monitoring Program
4	COA EHD	COA	Eubank Landfill north of KAFB and Yale Avenue Landfill west of KAFB
1	SNL/NM GMP	COA	Eubank-1, West of Eubank Landfill
1	USGS	NMOSE	Mesa Del Sol-S well
1	USGS	COA	Montessa Park-S well

NOTES:

BSG = Burn Site Groundwater.
COA = City of Albuquerque.
CWL = Chemical Waste Landfill.
DOE = U.S. Department of Energy.
ECP = Environmental Compliance Program.
EHD = Environmental Health Department.
GMP = Groundwater Monitoring Program.
KAFB = Kirtland Air Force Base.
MWL = Mixed Waste Landfill.
NMOSE = New Mexico Office of the State Engineer.
NNSA = National Nuclear Security Administration.
SNL/NM = Sandia National Laboratories, New Mexico.
TAG = Tijeras Arroyo Groundwater.
TAVG = Technical Area-V Groundwater.
USGS = U.S. Geological Survey.

Precipitation data relevant to the KAFB hydrogeologic setting are available from four rain gauge locations. Three on-site and one off-site meteorological towers are used to evaluate the precipitation pattern for KAFB:

- A21 tower located in Technical Area (TA)-II (Figure 1-4);
- A36 tower located in TA-III/V (Figure 1-4);
- SC1 tower located near the Schoolhouse Well in the foothills of the Manzanita Mountains (Figure 1-4);
- National Weather Service meteorological station "KABQ" at the Albuquerque International Sunport located at the northwest corner of KAFB.

Table 2-3 shows annual precipitation during CY 2017 at four locations. CY 2016 data are also presented for comparison. The differences in precipitation totals from the four locations show the isolated nature of rain showers in the Albuquerque area. The 7.67 inches of precipitation measured at KABQ during CY 2017 is 0.99 inches more than the corresponding period for the previous year; and it is 1.78 inches below the 30-year (1981-2010) norm of 9.45 inches. Figure 2B-7 shows monthly distribution of precipitation during CY 2017 at the four locations. Figure 2B-8 shows the annual distribution of precipitation at these four locations for the period from January 2007 to December 2017.

Table 2-3. Precipitation Data for Kirtland Air Force Base, Calendar Years 2016 and 2017

Year	Meteorological Station			
	A21	A36	SC1	KABQ
CY 2016	8.02	8.42	8.24	6.68
CY 2017	7.40	6.79	10.15	7.67

NOTES:
Data are in inches of rainfall.
A21 = SNL/NM meteorological station in Technical Area-II.
A36 = SNL/NM meteorological station in Technical Area-III/V.
CY = Calendar Year.
KABQ = National Weather Service meteorological station at the Albuquerque International Sunport.
SC1 = SNL/NM meteorological station in the foothills of the Manzanita Mountains.

Groundwater Withdrawal

The KAFB production wells are screened over a depth from about 500 to 2,000 feet (ft) below ground surface and extract groundwater from the Regional Aquifer in the upper and middle unit of the Santa Fe Group. During CY 2017, KAFB pumped groundwater primarily from four water supply wells.

KAFB supplies the water for SNL/NM and other DOE/NNSA facilities located on KAFB. Figure 2B-9 shows the CY 2017 monthly production for KAFB water supply wells. The highest level of production was in July at 102 million gallons (gal.); the lowest occurred in February at 32 million gal. The variability in production is in response to demand as reflected in the cyclic fluctuation of groundwater elevations in monitoring wells and is evident on the hydrographs. Figure 2B-10 shows the CY 2017 monthly production for each KAFB water supply well. Figure 2B-11 shows the trend of total annual groundwater production at KAFB since 2007. Table 2-4 provides a comparison of water pumped during CY 2017 to the previous year.

Table 2-4. Total Kirtland Air Force Base Groundwater Well Production

Units	CY 2016	CY 2017
Million gallons	737	744
Acre-feet	2,263	2,285

NOTES:
Acre-feet = 325,851 gallons.
CY = Calendar Year.

2.6.2.2 Groundwater Elevations

Groundwater elevations were used for preparing the potentiometric surface maps and hydrographs.

Base-Wide Potentiometric Surface Map

Groundwater elevation data for monitoring wells installed by SNL/NM personnel, USAF Installation Restoration Program, COA EHD, USGS, and NMOSE were used to construct the base-wide CY 2017 potentiometric surface map of the Regional Aquifer as shown on Plate 1. Water level measurements for October through December 2017 were used for interpreting the groundwater elevation data and constructing the contours (Table 2). Even though various well owners measure water levels on differing schedules, the use of several months of data is considered temporally concordant because water levels are typically not seasonally affected across KAFB.

The base-wide map (Plate 1) 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 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 near the northern boundary of KAFB. As a result, water levels across much of KAFB were steadily declining until 2008. Since 2008, hydrographs for Regional Aquifer wells in the northern part of KAFB show an increasing trend in groundwater elevations. Presumably, this is in response to the ABCWUA transitioning to surface water withdrawals for potable water supplies and decreasing dependence on ABCWUA production wells. The water table trough extends as far south as the Isleta Pueblo Reservation. The flat gradient in the middle of the trough is indicative 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 less permeable materials, higher ground surface elevations along the eastern mountain front of the Albuquerque Basin, and 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 below ground surface. This was 200 ft above the Regional Aquifer. The installation of additional wells completed in this Perched Groundwater System defined the lateral extent of the system, which is approximately 4.4 square miles. The western edge trends along the west side of former KAFB sewage lagoons. The northern edge coincides with the northern boundary of TA-I. To the east, the Perched Groundwater System is defined using USAF monitoring wells along the west side of the active KAFB Landfill; and the southern tip appears to be south of the Tijeras Arroyo Golf Course along the northeastern side of Pennsylvania Avenue. The area covered by the Perched Groundwater System comprises much of the Tijeras Arroyo Groundwater Area of Concern, and the elevation data for wells completed in the Perched Groundwater System 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 GMP monitoring wells (Figures 2B-1 through 2B-6). The groundwater elevation data for these wells are considered to be representative of groundwater in the Regional Aquifer across KAFB. Historical data from quarterly and annual groundwater elevation measurements through CY 2017 were used for plotting the hydrographs. Specific information gleaned from the hydrographs includes the following:

- **Greystone-MW2 (Figure 2B-1)**—Overall declining trend with superimposed seasonal effects of 1 to 2 ft that have a maximum water table elevation in the spring; the well is located in Lurance Canyon and has a shallow screen set in alluvium.

- **MRN-2 and MRN-3D (Figure 2B-2)**—Declining trend until early 2011; since then groundwater elevations have stabilized with a slight increasing trend since 2014.

- **NWTA3-MW3D, PL-2, and PL-4 (Figure 2B-3)**—Declining trend until late 2010/early 2011; since then groundwater elevations have stabilized and show a slight to moderate increasing trend.

- **SFR-2S and TRE-1 (Figure 2B-4)**—Slight declining trend since 2004.

- **SFR-4T (Figure 2B-5)**—Cyclical pattern with yearly fluctuations of 20 to 30 ft since 2001, but less pronounced cyclical pattern with yearly fluctuations of approximately 5 ft in 2011 through 2017.

- **SWTA3-MW2, SWTA3-MW3, and SWTA3-MW4 (Figure 2B-6)**—Moderate declining trend until late 2011; since then, groundwater elevations stabilized for several years and show a slight increasing trend in 2015 through 2017.

2.7 Quality Control Results

The QC samples are collected in the field at the time of environmental sample collection. Field QC samples are described in Section 1.3 and include environmental duplicate sample, EB, TB, and field blank (FB) samples.

Environmental duplicate samples were collected to estimate the overall reproducibility of the sampling and analytical process. Environmental duplicate samples from monitoring wells PL-4, SFR-4T, and TRE-1 were analyzed for all parameters. Relative percent difference (RPD) calculations of environmental samples and environmental duplicate samples were performed for detected chemical analytes only. The environmental duplicate sample results show good agreement (RPD values less than 35 for inorganic analyses) for calculated parameters, except selenium. The RPD for selenium in PL-4 samples was calculated at 38, and is an estimated value because selenium was reported below the PQL in both environmental and duplicate samples.

EB samples were collected prior to well purging and sampling at monitoring wells PL-4, SFR-4T, and TRE-1 and submitted for analyses. EB samples detected calcium, chloride, copper, and methylene chloride. No corrective action was required for calcium, chloride, or copper because these parameters were not detected in associated environmental samples, or were detected at concentrations greater than five times the EB result. Methylene chloride was detected in EB sample associated with PL-4. The associated environmental sample results were qualified as nondetect during data validation because methylene chloride was reported less than 10 times the EB value.

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 deionized (DI) water into sample containers at the monitoring wells Greystone-MW2, MRN-2, and MRN-3D sampling points to simulate the transfer of environmental samples from the sampling system to the sample container. No VOCs were detected above laboratory MDLs. On February 8, 2017, an additional FB sample was collected from the source DI water used during the equipment decontamination process prior to sampling monitoring well TRE-1. Chloride and radium-228 were the only detected parameters in the source DI water.

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. A total of 17 TBs were submitted with the CY 2017 samples. No VOCs were detected above associated laboratory MDLs in any TB sample, except methylene chloride. Methylene chloride was reported in two TB samples at similar concentrations to associated environmental samples. The associated environmental sample results were qualified as not detect during data validation because methylene chloride was reported less than 10 times the TB values.

QC samples are 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. Although some minor analytical results were qualified during the data validation process, the data were deemed acceptable and the reported QC measures were deemed adequate, except for one occurrence of potassium-40. The potassium-40 activity in the sample from Coyote Springs was qualified as unusable during data validation because GEL was unable to meet minimum peak identification criteria.

2.8 Variances and Nonconformances

No modifications or issues of field activities from requirements in the GMP Mini-Sampling and Analysis Plan (SNL January 2017) were identified during CY 2017 sampling activities.

2.9 Summary and Conclusions

The annual groundwater surveillance monitoring sampling event was conducted between January 24 and June 30, 2017. Groundwater samples were collected from 12 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 at concentrations above established MCLs or MACs in any groundwater sample.

- NPN was detected in well samples above associated MDLs, and ranged from 0.194 to 5.03 mg/L. NPN results are below the MCL/MAC of 10 mg/L.

- Fluoride was detected above the MAC of 1.6 mg/L (NMWQCC September 2004) in the sample from Coyote Springs, monitoring well SFR-4T environmental and duplicate environmental samples, and monitoring well TRE-1 environmental and duplicate environmental samples at a concentration of 1.65 mg/L, 2.70 mg/L, 2.69 mg/L, 1.71 mg/L, and 1.72 mg/L, respectively. The MCL for fluoride is 4.0 mg/L.

- No metals, other than beryllium, were detected above established regulatory limits in any groundwater sample. Beryllium was detected above the MCL of 0.004 mg/L in the sample from Coyote Springs at a concentration of 0.00722 mg/L.

Groundwater elevations were obtained during CY 2017 at 101 SNL/NM monitoring wells on a quarterly basis. Groundwater elevations from the SNL/NM wells and wells owned by other agencies (Table 2) were used to construct a base-wide potentiometric surface map of the Regional Aquifer (Plate 1). Overall, 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 adjacent parts of Albuquerque.

This page intentionally left blank.

Attachment 2A
Groundwater Monitoring Program
Analytical Results Tables

This page intentionally left blank.

Attachment 2A Tables

This page intentionally left blank.

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

Calendar Year 2017

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]
PL-2 26-Jan-17	Methylene chloride	1.49	1.00	10.0	5.00	100	J		101657-001	SW846-8260
SFR-2S 24-Jan-17	Methylene chloride	1.02	1.00	10.0	5.00	100	J	10U	101637-001	SW846-8260
SFR-4T 25-Jan-17	Methylene chloride	1.38	1.00	10.0	5.00	100	J	10U	101651-001	SW846-8260
SFR-4T (Duplicate) 25-Jan-17	Methylene chloride	1.53	1.00	10.0	5.00	100	J	10U	101652-001	SW846-8260
SWTA3-MW3 24-Feb-17	Toluene	0.340	0.300	1.00	1000	750	J		101724-001	SW846-8260
SWTA3-MW4 30-Jun-17	Toluene	1.06	0.300	1.00	1000	750			101719-001	SW846-8260
TRE-1 08-Feb-17	Chloroform	0.650	0.300	1.00	NE	100	J		101685-001	SW846-8260
TRE-1 (Duplicate) 08-Feb-17	Chloroform	0.630	0.300	1.00	NE	100	J		101686-001	SW846-8260

Refer to footnotes on page 2A-35.

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

Calendar Year 2017

Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]
1,1,1,2-Tetrachloroethane	0.300	SW846 8260	Ethyl benzene	0.300	SW846 8260
1,1,1-Trichloroethane	0.300	SW846 8260	Hexachlorobutadiene	0.300	SW846 8260
1,1,2,2-Tetrachloroethane	0.300	SW846 8260	Isopropylbenzene	0.300	SW846 8260
1,1,2-Trichloroethane	0.300	SW846 8260	Methylene chloride	1.00	SW846 8260
1,1-Dichloroethane	0.300	SW846 8260	Naphthalene	0.300	SW846 8260
1,1-Dichloroethene	0.300	SW846 8260	Styrene	0.300	SW846 8260
1,1-Dichloropropene	0.300	SW846 8260	Tert-butyl methyl ether	0.300	SW846 8260
1,2,3-Trichlorobenzene	0.300	SW846 8260	Tetrachloroethene	0.300	SW846 8260
1,2,3-Trichloropropane	0.300	SW846 8260	Toluene	0.300	SW846 8260
1,2,4-Trichlorobenzene	0.300	SW846 8260	Trichloroethene	0.300	SW846 8260
1,2,4-Trimethylbenzene	0.300	SW846 8260	Trichlorofluoromethane	0.300	SW846 8260
1,2-Dibromo-3-chloropropane	0.500	SW846 8260	Vinyl chloride	0.300	SW846 8260
1,2-Dibromoethane	0.300	SW846 8260	cis-1,2-Dichloroethene	0.300	SW846 8260
1,2-Dichlorobenzene	0.300	SW846 8260	cis-1,3-Dichloropropene	0.300	SW846 8260
1,2-Dichloroethane	0.300	SW846 8260	m-, p-Xylene	0.300	SW846 8260
1,2-Dichloropropane	0.300	SW846 8260	n-Butylbenzene	0.300	SW846 8260
1,3,5-Trimethylbenzene	0.300	SW846 8260	n-Propylbenzene	0.300	SW846 8260
1,3-Dichlorobenzene	0.300	SW846 8260	o-Xylene	0.300	SW846 8260
1,3-Dichloropropane	0.300	SW846 8260	sec-Butylbenzene	0.300	SW846 8260
1,4-Dichlorobenzene	0.300	SW846 8260	tert-Butylbenzene	0.300	SW846 8260
2,2-Dichloropropane	0.300	SW846 8260	trans-1,2-Dichloroethene	0.300	SW846 8260
2-Chlorotoluene	0.300	SW846 8260	trans-1,3-Dichloropropene	0.300	SW846 8260
4-Chlorotoluene	0.300	SW846 8260	1,3,5-Trinitrobenzene	0.0808 – 0.0879	SW846 8321A
4-Isopropyltoluene	0.300	SW846 8260	1,3-Dinitrobenzene	0.0808 – 0.0879	SW846 8321A
Benzene	0.300	SW846 8260	2,4,6-Trinitrotoluene	0.0808 – 0.0879	SW846 8321A
Bromobenzene	0.300	SW846 8260	2,4-Dinitrotoluene	0.0808 – 0.0879	SW846 8321A
Bromochloromethane	0.300	SW846 8260	2,6-Dinitrotoluene	0.0808 – 0.0879	SW846 8321A
Bromodichloromethane	0.300	SW846 8260	2-Amino-4,6-dinitrotoluene	0.0808 – 0.0879	SW846 8321A
Bromoform	0.300	SW846 8260	2-Nitrotoluene	0.0828 – 0.0901	SW846 8321A
Carbon tetrachloride	0.300	SW846 8260	3-Nitrotoluene	0.0808 – 0.0879	SW846 8321A
Chlorobenzene	0.300	SW846 8260	4-Amino-2,6-dinitrotoluene	0.0808 – 0.0879	SW846 8321A
Chloroethane	0.300	SW846 8260	4-Nitrotoluene	0.152 – 0.165	SW846 8321A
Chloroform	0.300	SW846 8260	HMX	0.0808 – 0.0879	SW846 8321A
Chloromethane	0.300	SW846 8260	Nitro-benzene	0.0808 – 0.0879	SW846 8321A
Dibromochloromethane	0.300	SW846 8260	Pentaerythritol tetranitrate	0.101 – 0.110	SW846 8321A
Dibromomethane	0.300	SW846 8260	RDX	0.0808 – 0.0879	SW846 8321A
Dichlorodifluoromethane	0.300	SW846 8260	Tetryl	0.0808 – 0.0879	SW846 8321A

Refer to footnotes on page 2A-35.

Table 2A-3
Summary of Nitrate Plus Nitrite Results,
Groundwater Monitoring Program Groundwater Surveillance Task,
Sandia National Laboratories, New Mexico

Calendar Year 2017

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 Springs 02-Feb-17	Nitrate plus nitrite	0.542	0.017	0.050	10.0		J	101699-006	EPA 353.2
Greystone-MW2 30-Jan-17	Nitrate plus nitrite	3.86	0.170	0.500	10.0			101677-006	EPA 353.2
MRN-2 31-Jan-17	Nitrate plus nitrite	3.09	0.170	0.500	10.0			101694-006	EPA 353.2
MRN-3D 10-Feb-17	Nitrate plus nitrite	2.80	0.085	0.250	10.0			101704-006	EPA 353.2
NWTA3-MW3D 05-May-17	Nitrate plus nitrite	1.13	0.085	0.250	10.0			101727-006	EPA 353.2
PL-2 26-Jan-17	Nitrate plus nitrite	2.83	0.085	0.250	10.0			101657-006	EPA 353.2
PL-4 27-Jan-17	Nitrate plus nitrite	4.65	0.170	0.500	10.0		J	101665-006	EPA 353.2
PL-4 (Duplicate) 27-Jan-17	Nitrate plus nitrite	5.03	0.170	0.500	10.0		J	101666-006	EPA 353.2
SFR-2S 24-Jan-17	Nitrate plus nitrite	0.912	0.017	0.050	10.0			101637-007	EPA 353.2
SFR-4T 25-Jan-17	Nitrate plus nitrite	0.201	0.017	0.050	10.0			101651-006	EPA 353.2
SFR-4T (Duplicate) 25-Jan-17	Nitrate plus nitrite	0.194	0.017	0.050	10.0			101652-006	EPA 353.2
SWTA3-MW2 21-Apr-17	Nitrate plus nitrite	0.903	0.017	0.050	10.0			101690-006	EPA 353.2
SWTA3-MW3 24-Feb-17	Nitrate plus nitrite	0.568	0.017	0.050	10.0		J	101724-006	EPA 353.2
SWTA3-MW4 30-Jun-17	Nitrate plus nitrite	1.12	0.017	0.050	10.0			101719-006	EPA 353.2
TRE-1 08-Feb-17	Nitrate plus nitrite	2.27	0.085	0.250	10.0			101685-006	EPA 353.2
TRE-1 (Duplicate) 08-Feb-17	Nitrate plus nitrite	2.27	0.085	0.250	10.0			101686-006	EPA 353.2

Refer to footnotes on page 2A-35.

Table 2A-4
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 Springs	Total Organic Halogens	0.015	0.00333	0.010	NE	NE			101699-002	SW846 9020
02-Feb-17	Bromide	2.08	0.268	0.800	NE	NE			101699-005	SW846 9056
	Chloride	497	6.70	20.0	NE	NE			101699-005	SW846 9056
	Fluoride	**1.65**	0.132	0.400	4.0	1.60			101699-005	SW846 9056
	Sulfate	128	13.3	40.0	NE	NE			101699-005	SW846 9056
	Alkalinity as CaCO3	1050	1.45	4.00	NE	NE			101699-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101699-008	SW846 9066
	Total Cyanide	ND	0.00835	0.025	0.200	0.200	U	UJ	101699-009	SW846 9012
Greystone-MW2	Total Organic Halogens	0.00372	0.00333	0.010	NE	NE	J		101677-002	SW846 9020
30-Jan-17	Bromide	0.633	0.067	0.200	NE	NE			101677-005	SW846 9056
	Chloride	116	1.34	4.00	NE	NE			101677-005	SW846 9056
	Fluoride	0.881	0.033	0.100	4.0	1.60			101677-005	SW846 9056
	Sulfate	50.8	2.66	8.00	NE	NE			101677-005	SW846 9056
	Alkalinity as CaCO3	455	1.45	4.00	NE	NE			101677-007	SM2320B
	Total Phenol	0.00182	0.00167	0.005	NE	NE	J	J-	101677-008	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	UJ	101677-009	SW846 9012
MRN-2	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		101694-002	SW846 9020
31-Jan-17	Bromide	0.185	0.067	0.200	NE	NE	J		101694-005	SW846 9056
	Chloride	13.0	0.335	1.00	NE	NE		J	101694-005	SW846 9056
	Fluoride	0.636	0.033	0.100	4.0	1.60			101694-005	SW846 9056
	Sulfate	50.2	0.665	2.00	NE	NE		J	101694-005	SW846 9056
	Alkalinity as CaCO3	158	1.45	4.00	NE	NE			101694-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101694-008	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	UJ	101694-009	SW846 9012
MRN-3D	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		101704-002	SW846 9020
10-Feb-17	Bromide	0.215	0.067	0.200	NE	NE			101704-005	SW846 9056
	Chloride	14.8	0.335	1.00	NE	NE			101704-005	SW846 9056
	Fluoride	0.503	0.033	0.100	4.0	1.60			101704-005	SW846 9056
	Sulfate	72.7	0.665	2.00	NE	NE			101704-005	SW846 9056
	Alkalinity as CaCO3	168	1.45	4.00	NE	NE			101704-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U		101704-008	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	UJ	101704-009	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-4 *(Continued)*
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Total Organic Halogens	0.00624	0.00333	0.010	NE	NE	J	0.022U	101727-002	SW846 9020
05-May-17	Bromide	0.167	0.067	0.200	NE	NE	J		101727-005	SW846 9056
	Chloride	11.9	0.335	1.00	NE	NE			101727-005	SW846 9056
	Fluoride	0.776	0.033	0.100	4.0	1.60			101727-005	SW846 9056
	Sulfate	56.5	0.665	2.00	NE	NE			101727-005	SW846 9056
	Alkalinity as CaCO3	139	1.45	4.00	NE	NE			101727-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101727-008	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101727-009	SW846 9012
PL-2	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		101657-002	SW846 9020
26-Jan-17	Bromide	0.201	0.067	0.200	NE	NE			101657-005	SW846 9056
	Chloride	14.0	0.335	1.00	NE	NE			101657-005	SW846 9056
	Fluoride	0.497	0.033	0.100	4.0	1.60			101657-005	SW846 9056
	Sulfate	70.1	0.665	2.00	NE	NE			101657-005	SW846 9056
	Alkalinity as CaCO3	158	1.45	4.00	NE	NE			101657-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101657-008	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101657-009	SW846 9012
PL-4	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		101665-002	SW846 9020
27-Jan-17	Bromide	0.221	0.067	0.200	NE	NE			101665-005	SW846 9056
	Chloride	15.4	0.335	1.00	NE	NE			101665-005	SW846 9056
	Fluoride	0.363	0.033	0.100	4.0	1.60			101665-005	SW846 9056
	Sulfate	69.0	0.665	2.00	NE	NE			101665-005	SW846 9056
	Alkalinity as CaCO3	169	1.45	4.00	NE	NE			101665-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101665-008	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101665-009	SW846 9012
PL-4 (Duplicate)	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		101666-002	SW846 9020
27-Jan-17	Bromide	0.215	0.067	0.200	NE	NE			101666-005	SW846 9056
	Chloride	15.5	0.335	1.00	NE	NE			101666-005	SW846 9056
	Fluoride	0.345	0.033	0.100	4.0	1.60			101666-005	SW846 9056
	Sulfate	69.0	0.665	2.00	NE	NE			101666-005	SW846 9056
	Alkalinity as CaCO3	172	1.45	4.00	NE	NE			101666-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101666-008	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101666-009	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-4 *(Continued)*
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		101637-002	SW846 9020
24-Jan-17	Bromide	0.644	0.067	0.200	NE	NE			101637-005	SW846 9056
	Chloride	125	1.34	4.00	NE	NE			101637-005	SW846 9056
	Fluoride	1.54	0.033	0.100	4.0	1.60			101637-005	SW846 9056
	Sulfate	69.0	2.66	8.00	NE	NE			101637-005	SW846 9056
	Alkalinity as CaCO3	408	1.45	4.00	NE	NE			101637-008	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101637-006	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101637-010	SW846 9012
SFR-4T	Total Organic Halogens	0.00624	0.00333	0.010	NE	NE	J		101651-002	SW846 9020
25-Jan-17	Bromide	1.53	0.067	0.200	NE	NE			101651-005	SW846 9056
	Chloride	194	13.4	40.0	NE	NE		J	101651-005	SW846 9056
	Fluoride	**2.70**	0.165	0.500	4.0	1.60			101651-005	SW846 9056
	Sulfate	1880	26.6	80.0	NE	NE		J	101651-005	SW846 9056
	Alkalinity as CaCO3	114	1.45	4.00	NE	NE			101651-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101651-009	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101651-010	SW846 9012
SFR-4T (Duplicate)	Total Organic Halogens	0.00554	0.00333	0.010	NE	NE	J		101652-002	SW846 9020
25-Jan-17	Bromide	1.52	0.067	0.200	NE	NE			101652-005	SW846 9056
	Chloride	191	13.4	40.0	NE	NE		J	101652-005	SW846 9056
	Fluoride	**2.69**	0.165	0.500	4.0	1.60			101652-005	SW846 9056
	Sulfate	1880	26.6	80.0	NE	NE		J	101652-005	SW846 9056
	Alkalinity as CaCO3	113	1.45	4.00	NE	NE			101652-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101652-009	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101652-010	SW846 9012
SWTA3-MW2	Total Organic Halogens	0.0035	0.00333	0.010	NE	NE	J	0.022U	101690-002	SW846 9020
21-Apr-17	Bromide	0.172	0.067	0.200	NE	NE	J		101690-005	SW846 9056
	Chloride	17.5	0.335	1.00	NE	NE			101690-005	SW846 9056
	Fluoride	1.08	0.033	0.100	4.0	1.60			101690-005	SW846 9056
	Sulfate	59.8	0.665	2.00	NE	NE			101690-005	SW846 9056
	Alkalinity as CaCO3	173	1.45	4.00	NE	NE			101690-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U		101690-009	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101690-010	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-4 *(Concluded)*
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Total Organic Halogens	0.00512	0.00333	0.010	NE	NE	J		101724-002	SW846 9020
24-Feb-17	Bromide	0.182	0.067	0.200	NE	NE	J		101724-005	SW846 9056
	Chloride	13.1	0.335	1.00	NE	NE			101724-005	SW846 9056
	Fluoride	1.25	0.033	0.100	4.0	1.60			101724-005	SW846 9056
	Sulfate	64.3	0.665	2.00	NE	NE			101724-005	SW846 9056
	Alkalinity as CaCO3	161	1.45	4.00	NE	NE			101724-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101724-009	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		101724-010	SW846 9012
SWTA3-MW4	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		101719-002	SW846 9020
30-Jun-17	Bromide	0.183	0.067	0.200	NE	NE	J		101719-005	SW846 9056
	Chloride	20.4	0.335	1.00	NE	NE			101719-005	SW846 9056
	Fluoride	1.54	0.033	0.100	4.0	1.60			101719-005	SW846 9056
	Sulfate	49.8	0.665	2.00	NE	NE			101719-005	SW846 9056
	Alkalinity as CaCO3	183	1.45	4.00	NE	NE			101719-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	UJ	101719-009	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	101719-010	SW846 9012
TRE-1	Total Organic Halogens	0.0035	0.00333	0.010	NE	NE	J, N	J+	101685-002	SW846 9020
08-Feb-17	Bromide	0.813	0.067	0.200	NE	NE			101685-005	SW846 9056
	Chloride	173	3.35	10.0	NE	NE		J	101685-005	SW846 9056
	Fluoride	**1.71**	0.033	0.100	4.0	1.60			101685-005	SW846 9056
	Sulfate	116	6.65	20.0	NE	NE		J	101685-005	SW846 9056
	Alkalinity as CaCO3	501	1.45	4.00	NE	NE			101685-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U		101685-009	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	UJ	101685-010	SW846 9012
TRE-1 (Duplicate)	Total Organic Halogens	0.00444	0.00333	0.010	NE	NE	J, N	J+	101686-002	SW846 9020
08-Feb-17	Bromide	0.789	0.067	0.200	NE	NE			101686-005	SW846 9056
	Chloride	138	3.35	10.0	NE	NE		J	101686-005	SW846 9056
	Fluoride	**1.72**	0.033	0.100	4.0	1.60			101686-005	SW846 9056
	Sulfate	117	6.65	20.0	NE	NE		J	101686-005	SW846 9056
	Alkalinity as CaCO3	500	1.45	4.00	NE	NE			101686-007	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U		101686-009	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	UJ	101686-010	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-5
Summary of Mercury Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	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.	Analytical Method[g]
Coyote Springs 02-Feb-17	ND	0.000067	0.0002	0.002	U		101699-004	SW846 7470A
Greystone-MW2 30-Jan-17	ND	0.000067	0.0002	0.002	U		101677-004	SW846 7470A
MRN-2 31-Jan-17	ND	0.000067	0.0002	0.002	U		101694-004	SW846 7470A
MRN-3D 10-Feb-17	ND	0.000067	0.0002	0.002	U		101704-004	SW846 7470A
NWTA3-MW3D 05-May-17	ND	0.000067	0.0002	0.002	U		101727-004	SW846 7470A
PL-2 26-Jan-17	ND	0.000067	0.0002	0.002	U	UJ	101657-004	SW846 7470A
PL-4 27-Jan-17	ND	0.000067	0.0002	0.002	U		101665-004	SW846 7470A
PL-4 (Duplicate) 27-Jan-17	ND	0.000067	0.0002	0.002	U		101666-004	SW846 7470A
SFR-2S 24-Jan-17	ND	0.000067	0.0002	0.002	U	UJ	101637-004	SW846 7470A
SFR-4T 25-Jan-17	ND	0.000067	0.0002	0.002	U	UJ	101651-004	SW846 7470A
SFR-4T (Duplicate) 25-Jan-17	ND	0.000067	0.0002	0.002	U	UJ	101652-004	SW846 7470A
SWTA3-MW2 21-Apr-17	ND	0.000067	0.0002	0.002	U		101690-004	SW846 7470A
SWTA3-MW3 24-Feb-17	ND	0.000067	0.0002	0.002	U		101724-004	SW846 7470A
SWTA3-MW4 30-Jun-17	ND	0.000067	0.0002	0.002	U		101719-004	SW846 7470A
TRE-1 08-Feb-17	ND	0.000067	0.0002	0.002	U		101685-004	SW846 7470A
TRE-1 (Duplicate) 08-Feb-17	ND	0.000067	0.0002	0.002	U		101686-004	SW846 7470A

Refer to footnotes on page 2A-35.

Table 2A-6
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 Springs	Aluminum	0.217	0.015	0.050	NE	NE			101699-003	SW846 6020
02-Feb-17	Antimony	ND	0.001	0.003	0.006	NE	U		101699-003	SW846 6020
	Arsenic	0.00777	0.0017	0.005	0.010	0.100			101699-003	SW846 6020
	Barium	0.0416	0.0006	0.002	2.00	1.00			101699-003	SW846 6020
	Beryllium	**0.00722**	0.0002	0.0005	0.004	NE			101699-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101699-003	SW846 6020
	Calcium	328	0.800	2.00	NE	NE			101699-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101699-003	SW846 6020
	Cobalt	0.00955	0.0001	0.001	NE	NE			101699-003	SW846 6020
	Copper	ND	0.00035	0.001	NE	NE	U		101699-003	SW846 6020
	Iron	0.101	0.033	0.100	NE	NE			101699-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101699-003	SW846 6020
	Magnesium	74.9	0.100	0.300	NE	NE			101699-003	SW846 6020
	Manganese	1.69	0.010	0.050	NE	NE			101699-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101699-003	SW846 7470
	Nickel	0.0245	0.0005	0.002	NE	NE			101699-003	SW846 6020
	Potassium	31.7	0.080	0.300	NE	NE			101699-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101699-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101699-003	SW846 6020
	Sodium	486	0.800	2.50	NE	NE			101699-003	SW846 6020
	Thallium	0.00112	0.0006	0.002	0.002	NE	J		101699-003	SW846 6020
	Uranium	0.00698	0.000067	0.0002	0.03	0.03			101699-003	SW846 6020
	Vanadium	ND	0.0045	0.010	NE	NE	U		101699-003	SW846 6020
	Zinc	0.0492	0.0035	0.010	NE	NE			101699-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101677-003	SW846 6020
30-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101677-003	SW846 6020
	Arsenic	0.00467	0.0017	0.005	0.010	0.100	J		101677-003	SW846 6020
	Barium	0.144	0.0006	0.002	2.00	1.00			101677-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101677-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101677-003	SW846 6020
	Calcium	158	0.800	2.00	NE	NE			101677-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101677-003	SW846 6020
	Cobalt	0.000375	0.0001	0.001	NE	NE	J		101677-003	SW846 6020
	Copper	0.000374	0.00035	0.001	NE	NE	J		101677-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101677-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101677-003	SW846 6020
	Magnesium	32.8	0.010	0.030	NE	NE			101677-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101677-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101677-003	SW846 7470
	Nickel	ND	0.0005	0.002	NE	NE	U		101677-003	SW846 6020
	Potassium	5.45	0.080	0.300	NE	NE			101677-003	SW846 6020
	Selenium	0.00216	0.002	0.005	0.050	0.050	J		101677-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101677-003	SW846 6020
	Sodium	107	0.800	2.50	NE	NE			101677-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101677-003	SW846 6020
	Uranium	0.00695	0.000067	0.0002	0.03	0.03			101677-003	SW846 6020
	Vanadium	0.00592	0.0045	0.010	NE	NE	J		101677-003	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		101677-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101694-003	SW846 6020
31-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101694-003	SW846 6020
	Arsenic	0.00244	0.0017	0.005	0.010	0.100	J		101694-003	SW846 6020
	Barium	0.060	0.0006	0.002	2.00	1.00			101694-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101694-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101694-003	SW846 6020
	Calcium	60.4	0.800	2.00	NE	NE			101694-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101694-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101694-003	SW846 6020
	Copper	ND	0.00035	0.001	NE	NE	U		101694-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101694-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101694-003	SW846 6020
	Magnesium	18.3	0.010	0.030	NE	NE			101694-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101694-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101694-003	SW846 7470
	Nickel	ND	0.0005	0.002	NE	NE	U		101694-003	SW846 6020
	Potassium	3.48	0.080	0.300	NE	NE			101694-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101694-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101694-003	SW846 6020
	Sodium	28.9	0.080	0.250	NE	NE			101694-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101694-003	SW846 6020
	Uranium	0.00315	0.000067	0.0002	0.03	0.03			101694-003	SW846 6020
	Vanadium	0.00955	0.0045	0.010	NE	NE	J		101694-003	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		101694-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101704-003	SW846 6020
10-Feb-17	Antimony	ND	0.001	0.003	0.006	NE	U		101704-003	SW846 6020
	Arsenic	0.00239	0.0017	0.005	0.010	0.100	J		101704-003	SW846 6020
	Barium	0.123	0.0006	0.002	2.00	1.00			101704-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101704-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101704-003	SW846 6020
	Calcium	64.9	0.800	2.00	NE	NE			101704-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101704-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101704-003	SW846 6020
	Copper	ND	0.00035	0.001	NE	NE	U		101704-003	SW846 6020
	Iron	0.0367	0.033	0.100	NE	NE	J		101704-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101704-003	SW846 6020
	Magnesium	14.5	0.010	0.030	NE	NE			101704-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101704-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101704-003	SW846 7470
	Nickel	ND	0.0005	0.002	NE	NE	U		101704-003	SW846 6020
	Potassium	4.36	0.080	0.300	NE	NE			101704-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101704-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101704-003	SW846 6020
	Sodium	28.0	0.080	0.250	NE	NE			101704-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101704-003	SW846 6020
	Uranium	0.004	0.000067	0.0002	0.03	0.03			101704-003	SW846 6020
	Vanadium	0.00603	0.0045	0.010	NE	NE	J		101704-003	SW846 6020
	Zinc	0.0325	0.0035	0.010	NE	NE			101704-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	NE	U		101727-003	SW846 6020
05-May-17	Antimony	ND	0.001	0.003	0.006	NE	U		101727-003	SW846 6020
	Arsenic	0.00201	0.002	0.005	0.010	0.100	J		101727-003	SW846 6020
	Barium	0.0946	0.00067	0.002	2.00	1.00			101727-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101727-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101727-003	SW846 6020
	Calcium	37.2	0.080	0.200	NE	NE			101727-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101727-003	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	NE	U		101727-003	SW846 6020
	Copper	ND	0.0003	0.001	NE	NE	U		101727-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101727-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101727-003	SW846 6020
	Magnesium	7.61	0.010	0.030	NE	NE	N		101727-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101727-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101727-003	SW846 7470
	Nickel	ND	0.0006	0.002	NE	NE	U		101727-003	SW846 6020
	Potassium	3.43	0.080	0.300	NE	NE			101727-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101727-003	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		101727-003	SW846 6020
	Sodium	33.9	0.080	0.250	NE	NE			101727-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101727-003	SW846 6020
	Uranium	0.00361	0.000067	0.0002	0.03	0.03			101727-003	SW846 6020
	Vanadium	0.00642	0.0033	0.010	NE	NE	J		101727-003	SW846 6020
	Zinc	0.00981	0.0033	0.010	NE	NE	J		101727-003	SW846 6020

Refer to footnotes on page 2A-XX

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101657-003	SW846 6020
26-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101657-003	SW846 6020
	Arsenic	0.00233	0.0017	0.005	0.010	0.100	J		101657-003	SW846 6020
	Barium	0.0783	0.0006	0.002	2.00	1.00			101657-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101657-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101657-003	SW846 6020
	Calcium	68.3	0.800	2.00	NE	NE			101657-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101657-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101657-003	SW846 6020
	Copper	0.00258	0.00035	0.001	NE	NE			101657-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101657-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101657-003	SW846 6020
	Magnesium	10.2	0.010	0.030	NE	NE			101657-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101657-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	UJ	101657-003	SW846 7470
	Nickel	0.00265	0.0005	0.002	NE	NE			101657-003	SW846 6020
	Potassium	3.75	0.080	0.300	NE	NE			101657-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101657-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101657-003	SW846 6020
	Sodium	35.1	0.080	0.250	NE	NE		J	101657-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101657-003	SW846 6020
	Uranium	0.00359	0.000067	0.0002	0.03	0.03	B		101657-003	SW846 6020
	Vanadium	0.00758	0.0045	0.010	NE	NE	J		101657-003	SW846 6020
	Zinc	0.0154	0.0035	0.010	NE	NE			101657-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101665-003	SW846 6020
27-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101665-003	SW846 6020
	Arsenic	0.00175	0.0017	0.005	0.010	0.100	J		101665-003	SW846 6020
	Barium	0.0734	0.0006	0.002	2.00	1.00			101665-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101665-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101665-003	SW846 6020
	Calcium	70.5	0.400	1.00	NE	NE			101665-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101665-003	SW846 6020
	Cobalt	0.000127	0.0001	0.001	NE	NE	J		101665-003	SW846 6020
	Copper	0.000411	0.00035	0.001	NE	NE	J		101665-003	SW846 6020
	Iron	0.121	0.033	0.100	NE	NE			101665-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101665-003	SW846 6020
	Magnesium	12.8	0.010	0.030	NE	NE			101665-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101665-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101665-003	SW846 7470
	Nickel	0.00123	0.0005	0.002	NE	NE	J		101665-003	SW846 6020
	Potassium	4.98	0.080	0.300	NE	NE			101665-003	SW846 6020
	Selenium	0.00397	0.002	0.005	0.050	0.050	J		101665-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101665-003	SW846 6020
	Sodium	24.3	0.080	0.250	NE	NE			101665-003	SW846 6020
	Thallium	0.000775	0.0006	0.002	0.002	NE	J	0.003U	101665-003	SW846 6020
	Uranium	0.0041	0.000067	0.0002	0.03	0.03			101665-003	SW846 6020
	Vanadium	0.00549	0.0045	0.010	NE	NE	J		101665-003	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		101665-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 (Duplicate)	Aluminum	ND	0.015	0.050	NE	NE	U		101666-003	SW846 6020
27-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101666-003	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		101666-003	SW846 6020
	Barium	0.0754	0.0006	0.002	2.00	1.00			101666-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101666-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101666-003	SW846 6020
	Calcium	70.0	0.400	1.00	NE	NE			101666-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101666-003	SW846 6020
	Cobalt	0.000127	0.0001	0.001	NE	NE	J		101666-003	SW846 6020
	Copper	0.000432	0.00035	0.001	NE	NE	J		101666-003	SW846 6020
	Iron	0.109	0.033	0.100	NE	NE			101666-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101666-003	SW846 6020
	Magnesium	12.7	0.010	0.030	NE	NE			101666-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101666-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101666-003	SW846 7470
	Nickel	0.00118	0.0005	0.002	NE	NE	J		101666-003	SW846 6020
	Potassium	4.93	0.080	0.300	NE	NE			101666-003	SW846 6020
	Selenium	0.0027	0.002	0.005	0.050	0.050	J		101666-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101666-003	SW846 6020
	Sodium	24.1	0.080	0.250	NE	NE			101666-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101666-003	SW846 6020
	Uranium	0.00405	0.000067	0.0002	0.03	0.03			101666-003	SW846 6020
	Vanadium	0.00556	0.0045	0.010	NE	NE	J		101666-003	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		101666-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101637-003	SW846 6020
24-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101637-003	SW846 6020
	Arsenic	0.00307	0.0017	0.005	0.010	0.100	J		101637-003	SW846 6020
	Barium	0.0578	0.0006	0.002	2.00	1.00			101637-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101637-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101637-003	SW846 6020
	Calcium	151	0.800	2.00	NE	NE			101637-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101637-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101637-003	SW846 6020
	Copper	0.00261	0.00035	0.001	NE	NE			101637-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101637-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101637-003	SW846 6020
	Magnesium	37.9	0.010	0.030	NE	NE			101637-003	SW846 6020
	Manganese	0.00133	0.001	0.005	NE	NE	J		101637-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	UJ	101637-003	SW846 7470
	Nickel	0.00557	0.0005	0.002	NE	NE			101637-003	SW846 6020
	Potassium	7.84	0.080	0.300	NE	NE			101637-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101637-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101637-003	SW846 6020
	Sodium	101	0.800	2.50	NE	NE		J	101637-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101637-003	SW846 6020
	Uranium	0.016	0.000067	0.0002	0.03	0.03	B		101637-003	SW846 6020
	Vanadium	0.00508	0.0045	0.010	NE	NE	J		101637-003	SW846 6020
	Zinc	0.00459	0.0035	0.010	NE	NE	J		101637-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101651-003	SW846 6020
25-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101651-003	SW846 6020
	Arsenic	0.00329	0.0017	0.005	0.010	0.100	J		101651-003	SW846 6020
	Barium	0.00894	0.0006	0.002	2.00	1.00			101651-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101651-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101651-003	SW846 6020
	Calcium	70.9	0.800	2.00	NE	NE			101651-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101651-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101651-003	SW846 6020
	Copper	ND	0.00035	0.001	NE	NE	U		101651-003	SW846 6020
	Iron	0.0341	0.033	0.100	NE	NE	J		101651-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101651-003	SW846 6020
	Magnesium	3.39	0.010	0.030	NE	NE			101651-003	SW846 6020
	Manganese	0.00449	0.001	0.005	NE	NE	J		101651-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	UJ	101651-003	SW846 7470
	Nickel	0.000976	0.0005	0.002	NE	NE	J		101651-003	SW846 6020
	Potassium	2.55	0.080	0.300	NE	NE			101651-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101651-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101651-003	SW846 6020
	Sodium	1220	8.00	25.0	NE	NE		J	101651-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101651-003	SW846 6020
	Uranium	0.000237	0.000067	0.0002	0.03	0.03	B	0.00042U	101651-003	SW846 6020
	Vanadium	ND	0.0045	0.010	NE	NE	U		101651-003	SW846 6020
	Zinc	0.0177	0.0035	0.010	NE	NE			101651-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 (Duplicate)	Aluminum	ND	0.015	0.050	NE	NE	U		101652-003	SW846 6020
25-Jan-17	Antimony	ND	0.001	0.003	0.006	NE	U		101652-003	SW846 6020
	Arsenic	0.00364	0.0017	0.005	0.010	0.100	J		101652-003	SW846 6020
	Barium	0.00871	0.0006	0.002	2.00	1.00			101652-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101652-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101652-003	SW846 6020
	Calcium	73.4	0.800	2.00	NE	NE			101652-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101652-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101652-003	SW846 6020
	Copper	ND	0.00035	0.001	NE	NE	U		101652-003	SW846 6020
	Iron	0.0344	0.033	0.100	NE	NE	J		101652-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101652-003	SW846 6020
	Magnesium	3.44	0.010	0.030	NE	NE			101652-003	SW846 6020
	Manganese	0.00473	0.001	0.005	NE	NE	J		101652-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	UJ	101652-003	SW846 7470
	Nickel	0.00109	0.0005	0.002	NE	NE	J		101652-003	SW846 6020
	Potassium	2.57	0.080	0.300	NE	NE			101652-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101652-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101652-003	SW846 6020
	Sodium	1290	8.00	25.0	NE	NE		J	101652-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101652-003	SW846 6020
	Uranium	0.000221	0.000067	0.0002	0.03	0.03	B	0.00042U	101652-003	SW846 6020
	Vanadium	ND	0.0045	0.010	NE	NE	U		101652-003	SW846 6020
	Zinc	0.0224	0.0035	0.010	NE	NE			101652-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	NE	U		101690-003	SW846 6020
21-Apr-17	Antimony	ND	0.001	0.003	0.006	NE	U		101690-003	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.100	U		101690-003	SW846 6020
	Barium	0.0772	0.00067	0.002	2.00	1.00			101690-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101690-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101690-003	SW846 6020
	Calcium	47.3	0.080	0.200	NE	NE			101690-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101690-003	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	NE	U		101690-003	SW846 6020
	Copper	ND	0.0003	0.001	NE	NE	U		101690-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101690-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101690-003	SW846 6020
	Magnesium	14.9	0.010	0.030	NE	NE			101690-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101690-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101690-003	SW846 7470
	Nickel	0.000886	0.0006	0.002	NE	NE	J		101690-003	SW846 6020
	Potassium	4.41	0.080	0.300	NE	NE			101690-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101690-003	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		101690-003	SW846 6020
	Sodium	37.9	0.080	0.250	NE	NE			101690-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101690-003	SW846 6020
	Uranium	0.00364	0.000067	0.0002	0.03	0.03			101690-003	SW846 6020
	Vanadium	0.00786	0.0033	0.010	NE	NE	B, J	0.018U	101690-003	SW846 6020
	Zinc	ND	0.0033	0.010	NE	NE	U		101690-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101724-003	SW846 6020
24-Feb-17	Antimony	ND	0.001	0.003	0.006	NE	U		101724-003	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	0.100	U		101724-003	SW846 6020
	Barium	0.0587	0.0006	0.002	2.00	1.00	B		101724-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101724-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101724-003	SW846 6020
	Calcium	39.5	0.800	2.00	NE	NE			101724-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101724-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101724-003	SW846 6020
	Copper	0.000358	0.00035	0.001	NE	NE	J		101724-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101724-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101724-003	SW846 6020
	Magnesium	9.27	0.100	0.300	NE	NE			101724-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101724-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101724-003	SW846 7470
	Nickel	ND	0.0005	0.002	NE	NE	U		101724-003	SW846 6020
	Potassium	4.79	0.080	0.300	NE	NE			101724-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101724-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101724-003	SW846 6020
	Sodium	49.5	0.800	2.50	NE	NE			101724-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101724-003	SW846 6020
	Uranium	0.00257	0.000067	0.0002	0.03	0.03			101724-003	SW846 6020
	Vanadium	0.00904	0.0045	0.010	NE	NE	J		101724-003	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		101724-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	NE	U		101719-003	SW846 6020
30-Jun-17	Antimony	ND	0.001	0.003	0.006	NE	U		101719-003	SW846 6020
	Arsenic	0.00211	0.002	0.005	0.010	0.100	J		101719-003	SW846 6020
	Barium	0.056	0.00067	0.002	2.00	1.00			101719-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101719-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101719-003	SW846 6020
	Calcium	36.5	0.080	0.200	NE	NE			101719-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101719-003	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	NE	U		101719-003	SW846 6020
	Copper	ND	0.0003	0.001	NE	NE	U		101719-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101719-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101719-003	SW846 6020
	Magnesium	10.4	0.010	0.030	NE	NE			101719-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101719-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101719-003	SW846 7470
	Nickel	ND	0.0006	0.002	NE	NE	U		101719-003	SW846 6020
	Potassium	4.35	0.080	0.300	NE	NE			101719-003	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		101719-003	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		101719-003	SW846 6020
	Sodium	56.2	0.400	1.25	NE	NE			101719-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101719-003	SW846 6020
	Uranium	0.00227	0.000067	0.0002	0.03	0.03			101719-003	SW846 6020
	Vanadium	0.00952	0.0033	0.010	NE	NE	J		101719-003	SW846 6020
	Zinc	ND	0.0033	0.010	NE	NE	U		101719-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results,
Groundwater Monitoring Program Groundwater Surveillance Task,
Sandia National Laboratories, New Mexico

Calendar Year 2017

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		101685-003	SW846 6020
08-Feb-17	Antimony	ND	0.001	0.003	0.006	NE	U		101685-003	SW846 6020
	Arsenic	0.00301	0.0017	0.005	0.010	0.100	J		101685-003	SW846 6020
	Barium	0.0461	0.0006	0.002	2.00	1.00			101685-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101685-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101685-003	SW846 6020
	Calcium	174	0.800	2.00	NE	NE			101685-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101685-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101685-003	SW846 6020
	Copper	ND	0.00035	0.001	NE	NE	U		101685-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101685-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101685-003	SW846 6020
	Magnesium	38.2	0.010	0.030	NE	NE			101685-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101685-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101685-003	SW846 7470
	Nickel	0.000506	0.0005	0.002	NE	NE	J		101685-003	SW846 6020
	Potassium	7.22	0.080	0.300	NE	NE			101685-003	SW846 6020
	Selenium	0.00318	0.002	0.005	0.050	0.050	J		101685-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101685-003	SW846 6020
	Sodium	110	0.800	2.50	NE	NE			101685-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101685-003	SW846 6020
	Uranium	0.0178	0.000067	0.0002	0.03	0.03			101685-003	SW846 6020
	Vanadium	ND	0.0045	0.010	NE	NE	U		101685-003	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		101685-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Concluded)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 (Duplicate)	Aluminum	ND	0.015	0.050	NE	NE	U		101686-003	SW846 6020
08-Feb-17	Antimony	ND	0.001	0.003	0.006	NE	U		101686-003	SW846 6020
	Arsenic	0.00322	0.0017	0.005	0.010	0.100	J		101686-003	SW846 6020
	Barium	0.048	0.0006	0.002	2.00	1.00			101686-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	NE	U		101686-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.010	U		101686-003	SW846 6020
	Calcium	178	0.800	2.00	NE	NE			101686-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		101686-003	SW846 6020
	Cobalt	ND	0.0001	0.001	NE	NE	U		101686-003	SW846 6020
	Copper	ND	0.00035	0.001	NE	NE	U		101686-003	SW846 6020
	Iron	ND	0.033	0.100	NE	NE	U		101686-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.050	U		101686-003	SW846 6020
	Magnesium	38.9	0.010	0.030	NE	NE			101686-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	NE	U		101686-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		101686-003	SW846 7470
	Nickel	ND	0.0005	0.002	NE	NE	U		101686-003	SW846 6020
	Potassium	7.41	0.080	0.300	NE	NE			101686-003	SW846 6020
	Selenium	0.00305	0.002	0.005	0.050	0.050	J		101686-003	SW846 6020
	Silver	ND	0.0004	0.001	NE	0.050	U		101686-003	SW846 6020
	Sodium	112	0.800	2.50	NE	NE			101686-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	NE	U		101686-003	SW846 6020
	Uranium	0.0183	0.000067	0.0002	0.03	0.03			101686-003	SW846 6020
	Vanadium	ND	0.0045	0.010	NE	NE	U		101686-003	SW846 6020
	Zinc	ND	0.0035	0.010	NE	NE	U		101686-003	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-7
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Springs	Americium-241	-0.165 ± 8.19	13.9	6.72	NE	NE	U	BD	101699-010	EPA 901.1
02-Feb-17	Cesium-137	0.0367 ± 1.59	2.54	1.20	NE	NE	U	BD	101699-010	EPA 901.1
	Cobalt-60	-0.44 ± 1.43	2.55	1.18	NE	NE	U	BD	101699-010	EPA 901.1
	Potassium-40	42.7 ± 43.1	23.3	10.7	NE	NE	X	R	101699-010	EPA 901.1
	Gross Alpha	4.26	NA	NA	15 pCi/L	NE	NA	None	101699-011	EPA 900.0
	Gross Beta	28.7 ± 7.93	9.63	4.70	4mrem/yr	NE		J	101699-011	EPA 900.0
	Uranium-233/234	11.1 ± 1.10	0.0969	0.0443	NE	NE			101701-001	HASL-300
	Uranium-235/236	0.203 ± 0.0611	0.0768	0.0333	NE	NE		J	101701-001	HASL-300
	Uranium-238	2.44 ± 0.286	0.0709	0.0314	NE	NE			101701-001	HASL-300
	Radium-226	0.397 ± 0.265	0.357	0.141	5 pCi/L	30 pCi/L		J	101699-012	EPA 903.1
	Radium-228	0.237 ± 0.307	0.511	0.230	5 pCi/L	30 pCi/L	U	BD	101701-002	EPA 904.0
Greystone-MW2	Americium-241	-6.58 ± 9.00	14.3	7.00	NE	NE	U	BD	101677-010	EPA 901.1
30-Jan-17	Cesium-137	-0.123 ± 2.24	3.38	1.63	NE	NE	U	BD	101677-010	EPA 901.1
	Cobalt-60	-1.91 ± 2.23	3.41	1.60	NE	NE	U	BD	101677-010	EPA 901.1
	Potassium-40	-24.5 ± 41.0	49.6	23.8	NE	NE	U	BD	101677-010	EPA 901.1
	Gross Alpha	7.13	NA	NA	15 pCi/L	NE	NA	None	101677-011	EPA 900.0
	Gross Beta	6.42 ± 2.37	3.29	1.60	4mrem/yr	NE		J	101677-011	EPA 900.0
	Uranium-233/234	10.8 ± 1.10	0.103	0.0469	NE	NE			101679-001	HASL-300
	Uranium-235/236	0.286 ± 0.0789	0.0813	0.0353	NE	NE			101679-001	HASL-300
	Uranium-238	2.68 ± 0.315	0.0751	0.0332	NE	NE			101679-001	HASL-300
	Radium-226	0.0823 ± 0.144	0.263	0.0903	5 pCi/L	30 pCi/L	U	BD	101677-012	EPA 903.1
	Radium-228	0.0779 ± 0.277	0.493	0.226	5 pCi/L	30 pCi/L	U	BD	101679-002	EPA 904.0
MRN-2	Americium-241	-0.858 ± 10.9	17.2	8.33	NE	NE	U	BD	101694-010	EPA 901.1
31-Jan-17	Cesium-137	0.384 ± 1.84	3.15	1.50	NE	NE	U	BD	101694-010	EPA 901.1
	Cobalt-60	1.53 ± 2.06	3.64	1.71	NE	NE	U	BD	101694-010	EPA 901.1
	Potassium-40	-30.8 ± 38.2	43.7	20.7	NE	NE	U	BD	101694-010	EPA 901.1
	Gross Alpha	3.79	NA	NA	15 pCi/L	NE	NA	None	101694-011	EPA 900.0
	Gross Beta	4.03 ± 1.05	1.17	0.571	4mrem/yr	NE			101694-011	EPA 900.0
	Radium-226	1.01 ± 0.469	0.529	0.215	5 pCi/L	30 pCi/L		J	101694-012	EPA 903.1
	Radium-228	0.447 ± 0.333	0.485	0.213	5 pCi/L	30 pCi/L	U	BD	101696-001	EPA 904.0

Refer to footnotes on page 2A-XX

Table 2A-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-3D	Americium-241	1.90 ± 4.95	7.90	3.84	NE	NE	U	BD	101704-010	EPA 901.1
10-Feb-17	Cesium-137	-0.845 ± 1.63	2.67	1.26	NE	NE	U	BD	101704-010	EPA 901.1
	Cobalt-60	1.24 ± 1.79	3.25	1.52	NE	NE	U	BD	101704-010	EPA 901.1
	Potassium-40	-23.1 ± 34.8	40.7	19.3	NE	NE	U	BD	101704-010	EPA 901.1
	Gross Alpha	0.77	NA	NA	15 pCi/L	NE	NA	None	101704-011	EPA 900.0
	Gross Beta	3.52 ± 1.02	1.27	0.619	4mrem/yr	NE		J	101704-011	EPA 900.0
	Radium-226	0.497 ± 0.311	0.397	0.157	5 pCi/L	30 pCi/L		J	101704-012	EPA 903.1
	Radium-228	0.300 ± 0.313	0.503	0.227	5 pCi/L	30 pCi/L	U	BD	101706-001	EPA 904.0
NWTA3-MW3D	Americium-241	1.45 ± 5.76	9.46	4.58	NE	NE	U	BD	101727-010	EPA 901.1
05-May-17	Cesium-137	-0.537 ± 1.54	2.65	1.25	NE	NE	U	BD	101727-010	EPA 901.1
	Cobalt-60	-0.18 ± 1.49	2.75	1.26	NE	NE	U	BD	101727-010	EPA 901.1
	Potassium-40	-20 ± 38.2	42.2	20.0	NE	NE	U	BD	101727-010	EPA 901.1
	Gross Alpha	-2.72	NA	NA	15 pCi/L	NE	NA	None	101727-011	EPA 900.0
	Gross Beta	3.52 ± 0.955	1.14	0.555	4mrem/yr	NE			101727-011	EPA 900.0
	Radium-226	0.925 ± 0.316	0.222	0.081	5 pCi/L	30 pCi/L			101727-012	EPA 903.1
	Radium-228	0.287 ± 0.304	0.487	0.211	5 pCi/L	30 pCi/L	U	BD	101727-013	EPA 904.0
PL-2	Americium-241	-1.26 ± 8.56	13.8	6.68	NE	NE	U	BD	101657-010	EPA 901.1
26-Jan-17	Cesium-137	-0.289 ± 1.84	2.79	1.32	NE	NE	U	BD	101657-010	EPA 901.1
	Cobalt-60	-0.761 ± 1.66	2.80	1.29	NE	NE	U	BD	101657-010	EPA 901.1
	Potassium-40	27.4 ± 46.4	33.0	15.4	NE	NE	U	BD	101657-010	EPA 901.1
	Gross Alpha	-1.80	NA	NA	15 pCi/L	NE	NA	None	101657-011	EPA 900.0
	Gross Beta	3.01 ± 0.842	0.940	0.451	4mrem/yr	NE		J	101657-011	EPA 900.0
	Radium-226	0.226 ± 0.169	0.192	0.0585	5 pCi/L	30 pCi/L		J	101657-012	EPA 903.1
	Radium-228	0.170 ± 0.293	0.504	0.228	5 pCi/L	30 pCi/L	U	BD	101659-001	EPA 904.0
PL-4	Americium-241	-5.81 ± 9.71	13.9	6.76	NE	NE	U	BD	101665-010	EPA 901.1
27-Jan-17	Cesium-137	-0.158 ± 1.93	3.48	1.67	NE	NE	U	BD	101665-010	EPA 901.1
	Cobalt-60	3.57 ± 3.19	3.58	1.60	NE	NE	U	BD	101665-010	EPA 901.1
	Potassium-40	-32.8 ± 39.5	42.2	19.9	NE	NE	U	BD	101665-010	EPA 901.1
	Gross Alpha	3.30	NA	NA	15 pCi/L	NE	NA	None	101665-011	EPA 900.0
	Gross Beta	5.02 ± 1.30	1.39	0.677	4mrem/yr	NE		J	101665-011	EPA 900.0
	Radium-226	0.641 ± 0.406	0.518	0.211	5 pCi/L	30 pCi/L		J	101665-012	EPA 903.1
	Radium-228	0.446 ± 0.341	0.511	0.232	5 pCi/L	30 pCi/L	U	BD	101668-001	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-4 (Duplicate)	Americium-241	1.58 ± 5.21	8.16	3.96	NE	NE	U	BD	101666-010	EPA 901.1
27-Jan-17	Cesium-137	1.87 ± 1.82	2.99	1.42	NE	NE	U	BD	101666-010	EPA 901.1
	Cobalt-60	-2.09 ± 2.89	2.29	1.04	NE	NE	U	BD	101666-010	EPA 901.1
	Potassium-40	54.7 ± 31.3	23.6	10.8	NE	NE		J	101666-010	EPA 901.1
	Gross Alpha	2.07	NA	NA	15 pCi/L	NE	NA	None	101666-011	EPA 900.0
	Gross Beta	3.90 ± 1.11	1.03	0.493	4mrem/yr	NE		J	101666-011	EPA 900.0
	Radium-226	0.655 ± 0.331	0.336	0.127	5 pCi/L	30 pCi/L		J	101666-012	EPA 903.1
	Radium-228	0.405 ± 0.343	0.519	0.226	5 pCi/L	30 pCi/L	U	BD	101669-001	EPA 904.0
SFR-2S	Americium-241	10.6 ± 12.6	18.8	9.19	NE	NE	U	BD	101651-012	EPA 901.1
24-Jan-17	Cesium-137	0.937 ± 2.08	3.77	1.81	NE	NE	U	BD	101655-001	EPA 901.1
	Cobalt-60	0.500 ± 2.12	3.37	1.56	NE	NE	U	BD	101655-001	EPA 901.1
	Potassium-40	19.8 ± 50.9	38.4	18.0	NE	NE	U	BD	101655-001	EPA 901.1
	Gross Alpha	3.90	NA	NA	15 pCi/L	NE	NA	None	101651-013	EPA 900.0
	Gross Beta	9.60 ± 2.49	2.63	1.28	4mrem/yr	NE		J	101655-002	EPA 900.0
	Uranium-233/234	19.5 ± 1.94	0.110	0.0503	NE	NE			101666-010	HASL-300
	Uranium-235/236	0.418 ± 0.0934	0.0871	0.0378	NE	NE			101666-010	HASL-300
	Uranium-238	5.58 ± 0.601	0.0804	0.0355	NE	NE			101666-010	HASL-300
	Radium-226	0.902 ± 0.492	0.583	0.237	5 pCi/L	30 pCi/L		J	101666-010	EPA 903.1
	Radium-228	0.179 ± 0.301	0.515	0.234	5 pCi/L	30 pCi/L	U	BD	101666-011	EPA 904.0
SFR-4T	Americium-241	-0.438 ± 15.4	23.0	11.2	NE	NE	U	BD	101651-011	EPA 901.1
25-Jan-17	Cesium-137	3.10 ± 2.59	3.20	1.52	NE	NE	U	BD	101651-011	EPA 901.1
	Cobalt-60	0.0953 ± 1.80	3.28	1.52	NE	NE	U	BD	101651-011	EPA 901.1
	Potassium-40	-28.5 ± 39.3	36.6	17.1	NE	NE	U	BD	101651-011	EPA 901.1
	Gross Alpha	-11.66	NA	NA	15 pCi/L	NE	NA	None	101651-012	EPA 900.0
	Gross Beta	-0.663 ± 6.33	10.9	5.32	4mrem/yr	NE	U	BD	101651-012	EPA 900.0
	Uranium-233/234	0.486 ± 0.098	0.120	0.0549	NE	NE			101655-001	HASL-300
	Uranium-235/236	0.0698 ± 0.0403	0.0951	0.0413	NE	NE	U	BD	101655-001	HASL-300
	Uranium-238	0.109 ± 0.0449	0.0878	0.0388	NE	NE		J	101655-001	HASL-300
	Radium-226	0.604 ± 0.327	0.385	0.150	5 pCi/L	30 pCi/L		J	101651-013	EPA 903.1
	Radium-228	0.295 ± 0.315	0.507	0.221	5 pCi/L	30 pCi/L	U	BD	101655-002	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-4T (Duplicate)	Americium-241	2.61 ± 7.44	12.4	6.00	NE	NE	U	BD	101652-011	EPA 901.1
25-Jan-17	Cesium-137	-0.176 ± 1.44	2.56	1.20	NE	NE	U	BD	101652-011	EPA 901.1
	Cobalt-60	-0.684 ± 1.59	2.77	1.27	NE	NE	U	BD	101652-011	EPA 901.1
	Potassium-40	7.39 ± 49.1	26.2	11.9	NE	NE	U	BD	101652-011	EPA 901.1
	Gross Alpha	-5.36	NA	NA	15 pCi/L	NE	NA	None	101652-012	EPA 900.0
	Gross Beta	-0.0621 ± 5.04	8.64	4.17	4mrem/yr	NE	U	BD	101652-012	EPA 900.0
	Uranium-233/234	0.424 ± 0.0862	0.104	0.0475	NE	NE			101656-001	HASL-300
	Uranium-235/236	0.0362 ± 0.038	0.0823	0.0357	NE	NE	U	BD	101656-001	HASL-300
	Uranium-238	0.150 ± 0.0507	0.076	0.0336	NE	NE		J	101656-001	HASL-300
	Radium-226	1.12 ± 0.523	0.547	0.223	5 pCi/L	30 pCi/L		J	101652-013	EPA 903.1
	Radium-228	0.397 ± 0.336	0.508	0.224	5 pCi/L	30 pCi/L	U	BD	101656-002	EPA 904.0
SWTA3-MW2	Americium-241	-2.74 ± 8.45	13.7	6.67	NE	NE	U	BD	101690-011	EPA 901.1
21-Apr-17	Cesium-137	0.337 ± 1.86	3.39	1.62	NE	NE	U	BD	101690-011	EPA 901.1
	Cobalt-60	0.574 ± 1.77	3.21	1.49	NE	NE	U	BD	101690-011	EPA 901.1
	Potassium-40	0.237 ± 56.1	28.7	13.2	NE	NE	U	BD	101690-011	EPA 901.1
	Gross Alpha	3.99	NA	NA	15 pCi/L	NE	NA	None	101690-012	EPA 900.0
	Gross Beta	5.74 ± 1.29	1.23	0.601	4mrem/yr	NE			101690-012	EPA 900.0
	Radium-226	0.316 ± 0.223	0.276	0.0947	5 pCi/L	30 pCi/L		J	101690-013	EPA 903.1
	Radium-228	0.150 ± 0.265	0.465	0.198	5 pCi/L	30 pCi/L	U	BD	101690-014	EPA 904.0
SWTA3-MW3	Americium-241	0.373 ± 2.84	4.58	2.23	NE	NE	U	BD	101724-011	EPA 901.1
24-Feb-17	Cesium-137	-2.46 ± 2.74	3.43	1.61	NE	NE	U	BD	101724-011	EPA 901.1
	Cobalt-60	1.39 ± 2.17	4.00	1.84	NE	NE	U	BD	101724-011	EPA 901.1
	Potassium-40	15.0 ± 53.7	36.6	16.7	NE	NE	U	BD	101724-011	EPA 901.1
	Gross Alpha	3.10	NA	NA	15 pCi/L	NE	NA	None	101724-012	EPA 900.0
	Gross Beta	6.04 ± 1.40	0.995	0.459	4mrem/yr	NE		J	101724-012	EPA 900.0
	Radium-226	1.58 ± 0.531	0.449	0.183	5 pCi/L	30 pCi/L			101724-013	EPA 903.1
	Radium-228	0.00607 ± 0.268	0.505	0.224	5 pCi/L	30 pCi/L	U	BD	101726-001	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-7 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW4	Americium-241	3.88 ± 5.97	9.05	4.38	NE	NE	U	BD	101719-011	EPA 901.1
30-Jun-17	Cesium-137	0.836 ± 2.33	2.93	1.39	NE	NE	U	BD	101719-011	EPA 901.1
	Cobalt-60	0.807 ± 2.58	2.74	1.24	NE	NE	U	BD	101719-011	EPA 901.1
	Potassium-40	7.42 ± 42.5	28.1	12.8	NE	NE	U	BD	101719-011	EPA 901.1
	Gross Alpha	1.34	NA	NA	15 pCi/L	NE	NA	None	101719-012	EPA 900.0
	Gross Beta	5.27 ± 1.35	1.52	0.742	4mrem/yr	NE			101719-012	EPA 900.0
	Radium-226	0.194 ± 0.167	0.232	0.0797	5 pCi/L	30 pCi/L	U	BD	101719-013	EPA 903.1
	Radium-228	0.158 ± 0.257	0.444	0.193	5 pCi/L	30 pCi/L	U	BD	101719-014	EPA 904.0
TRE-1	Americium-241	11.8 ± 16.2	26.8	13.0	NE	NE	U	BD	101685-011	EPA 901.1
08-Feb-17	Cesium-137	-0.363 ± 1.96	3.31	1.56	NE	NE	U	BD	101685-011	EPA 901.1
	Cobalt-60	0.072 ± 2.65	4.16	1.93	NE	NE	U	BD	101685-011	EPA 901.1
	Potassium-40	24.6 ± 52.9	36.0	16.4	NE	NE	U	BD	101685-011	EPA 901.1
	Gross Alpha	4.89	NA	NA	15 pCi/L	NE	NA	None	101685-012	EPA 900.0
	Gross Beta	9.45 ± 2.42	2.32	1.11	4mrem/yr	NE		J	101685-012	EPA 900.0
	Uranium-233/234	21.8 ± 2.08	0.128	0.0586	NE	NE			101688-001	HASL-300
	Uranium-235/236	0.517 ± 0.111	0.102	0.044	NE	NE			101688-001	HASL-300
	Uranium-238	5.89 ± 0.617	0.0937	0.0414	NE	NE			101688-001	HASL-300
	Radium-226	0.198 ± 0.244	0.407	0.161	5 pCi/L	30 pCi/L	U	BD	101685-013	EPA 903.1
	Radium-228	0.850 ± 0.424	0.508	0.227	5 pCi/L	30 pCi/L		NJ+	101688-002	EPA 904.0
TRE-1 (Duplicate)	Americium-241	0.812 ± 10.1	15.5	7.53	NE	NE	U	BD	101686-011	EPA 901.1
08-Feb-17	Cesium-137	-0.0624 ± 2.47	3.94	1.89	NE	NE	U	BD	101686-011	EPA 901.1
	Cobalt-60	1.24 ± 2.05	3.70	1.73	NE	NE	U	BD	101686-011	EPA 901.1
	Potassium-40	-2.18 ± 41.0	47.8	22.7	NE	NE	U	BD	101686-011	EPA 901.1
	Gross Alpha	10.62	NA	NA	15 pCi/L	NE	NA	None	101686-012	EPA 900.0
	Gross Beta	13.8 ± 3.38	3.12	1.51	4mrem/yr	NE		J	101686-012	EPA 900.0
	Uranium-233/234	23.8 ± 2.24	0.0857	0.0392	NE	NE			101689-001	HASL-300
	Uranium-235/236	0.552 ± 0.100	0.0679	0.0295	NE	NE			101689-001	HASL-300
	Uranium-238	6.33 ± 0.634	0.0627	0.0277	NE	NE			101689-001	HASL-300
	Radium-226	0.0924 ± 0.203	0.373	0.152	5 pCi/L	30 pCi/L	U	BD	101686-013	EPA 903.1
	Radium-228	0.542 ± 0.362	0.498	0.217	5 pCi/L	30 pCi/L		NJ+	101689-002	EPA 904.0

Refer to footnotes on page 2A-35.

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

Calendar Year 2017

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
Coyote Springs	02-Feb-17	11.75	2495.8	207.3	6.17	0.59	17.9	1.95
Greystone-MW2	30-Jan-17	15.52	1034.4	265.9	7.00	0.36	71.0	7.05
MRN-2	31-Jan-17	17.79	394.3	276.1	7.59	0.56	71.8	6.82
MRN-3D	10-Feb-17	20.13	470.0	51.2	7.66	1.88	38.6	3.44
NWTA3-MW3D	05-May-17	20.14	354.8	58.0	7.71	0.79	46.9	4.24
PL-2	26-Jan-17	17.46	420.6	249.7	7.60	0.54	69.7	6.64
PL-4	27-Jan-17	15.48	440.3	256.2	7.34	0.96	78.5	7.79
SFR-2S	24-Jan-17	12.77	931.3	148.8	6.88	3.68	74.2	7.78
SFR-4T	25-Jan-17	15.83	3817.1	-35.0	7.91	1.05	0.2	0.02
SWTA3-MW2	21-Apr-17	20.40	420.5	146.3	7.68	0.67	42.7	3.84
SWTA3-MW3	24-Feb-17	18.95	430.4	70.3	7.75	0.61	46.9	4.35
SWTA3-MW4	30-Jun-17	23.36	471.4	138.6	7.74	0.48	54.4	4.61
TRE-1	08-Feb-17	17.09	1244.7	174.3	6.77	0.16	73.2	7.02

Refer to footnotes on page 2A-35.

Footnotes for Groundwater Monitoring Program Groundwater Surveillance Task Analytical Results Tables

%	= Percent.
CaCO3	= Calcium carbonate.
CFR	= Code of Federal Regulations.
EPA	= U.S. Environmental Protection Agency.
HMX	= Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID	= Identifier.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
mrem/yr	= Millirem per year.
No.	= Number.
pCi/L	= Picocuries per liter.
RDX	= Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Tetryl	= Methyl-2,4,6-trinitrophenylnitramine.

[a]Result or Activity

Result applies to Tables 2A-1 through 2A-6. Activity applies to Table 2A-7.

Activity = Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Part 141). Activities of zero or less are considered not detected.

Bold = Value exceeds the established MCL or MAC.

ND = Not detected (at method detection limit).

[b]MDL or MDA

The MDL applies to Tables 2A-1 through 2A-6. MDA applies to Table 2A-7.

MDA = The minimal 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.

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 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

The PQL applies to Tables 2A-1 through 2A-6. Critical Level applies to Table 2A-7.

Critical Level = 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.

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 or MAC

Regulatory limits: The MCL is listed first, followed by the MAC. A single value is listed when the MCL and MAC are equal (for example, nitrate plus nitrite). If no value exists, NE is used.

MAC = Maximum allowable concentration. MACs were established by the New Mexico Water Quality Control Commission (NMWQCC September 2004).

MCL = Maximum contaminant level. MCLs were established by the EPA Office of Water, National Primary Water Standards (EPA May 2009).

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 Part 141).
- 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Groundwater Monitoring Program Groundwater Surveillance Task Analytical Results Tables (Concluded)

[e]Lab Qualifier

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

B	= The analyte was found in the blank above the effective MDL.
J	= Estimated value; the analyte concentration fell above the effective MDL and below the effective PQL.
N	= Results associated with a spike analysis that was outside control limits.
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 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.
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

DOE, 1997, *EML [Environmental Measurements Laboratory] Procedures Manual,* 28th ed., Vol. 1, Rev. 0, HASL-300, Environmental Measurements Laboratory.

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

EPA, 1984, *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.

Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri, 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Standard Method 2320B, Washington, D.C.

DOE	= U.S. Department of Energy.
EPA	= U.S. Environmental Protection Agency.
HASL	= Health and Safety Laboratory.
SM	= Standard Method.

[h]Field Water Quality Measurements

Field measurements were 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 2B
Groundwater Monitoring Program
Hydrographs and Charts

This page intentionally left blank.

Attachment 2B Hydrographs and Charts

This page intentionally left blank.

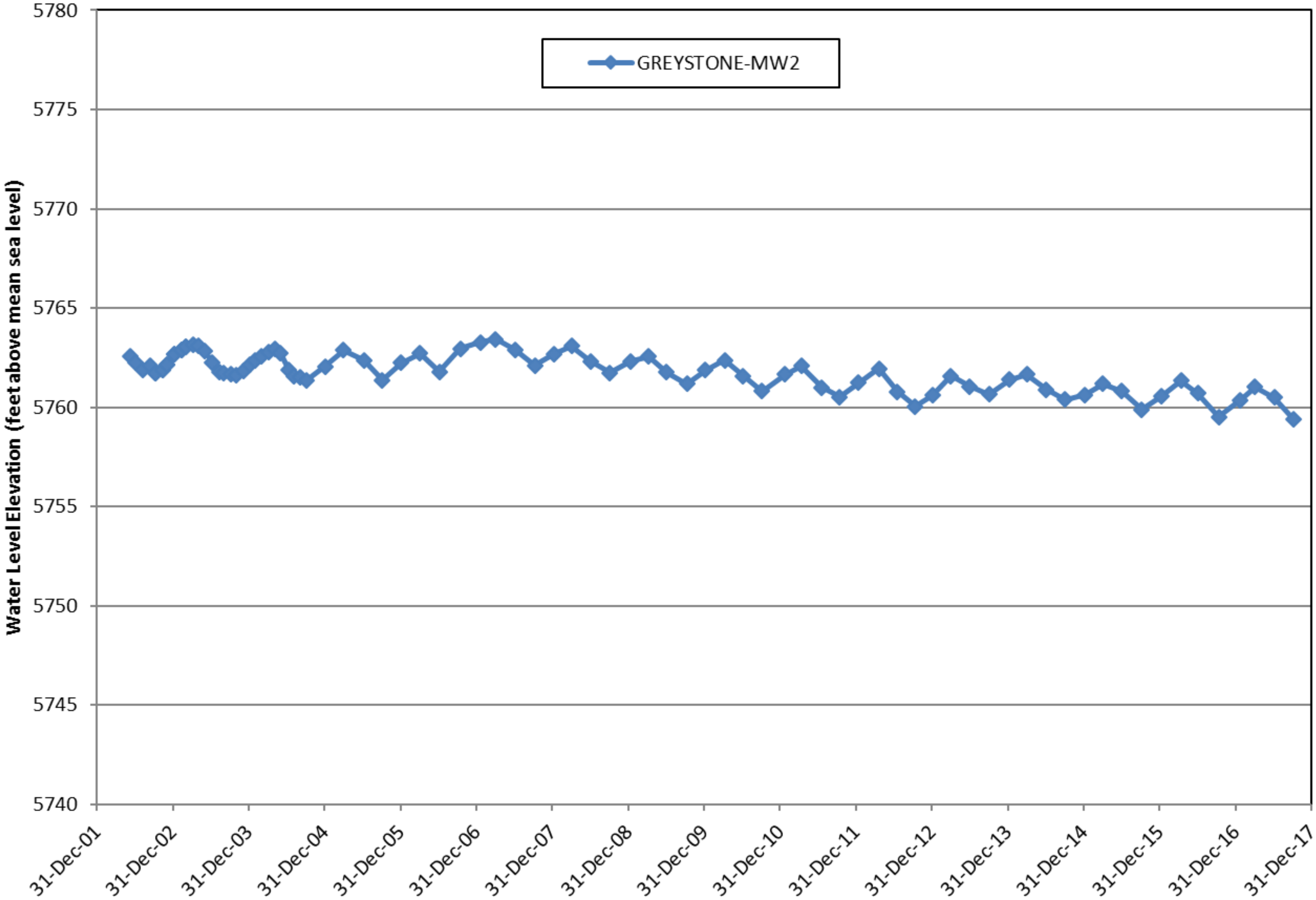


Figure 2B-1. GMP Study Wells (1 of 6)

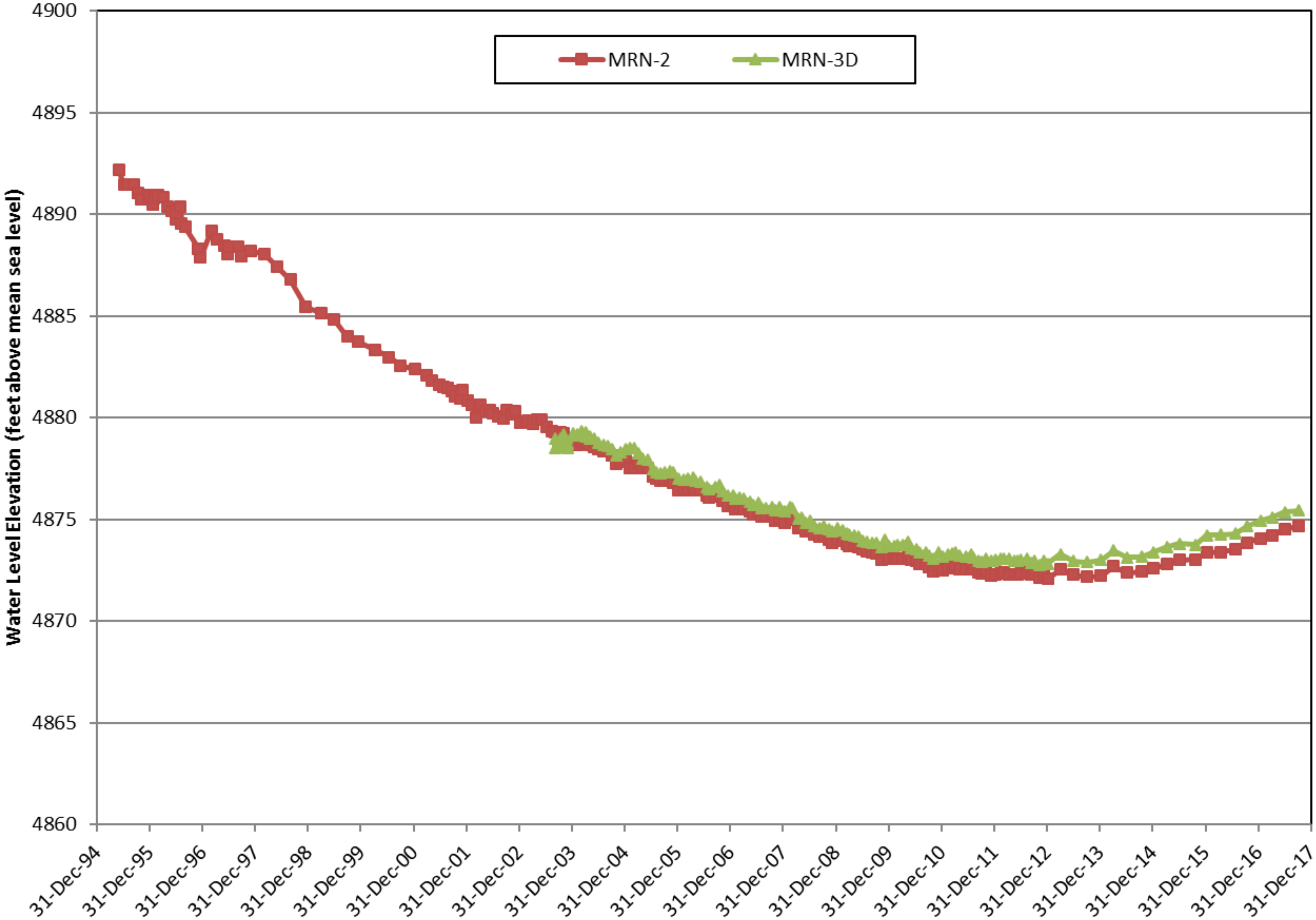


Figure 2B-2. GMP Study Wells (2 of 6)

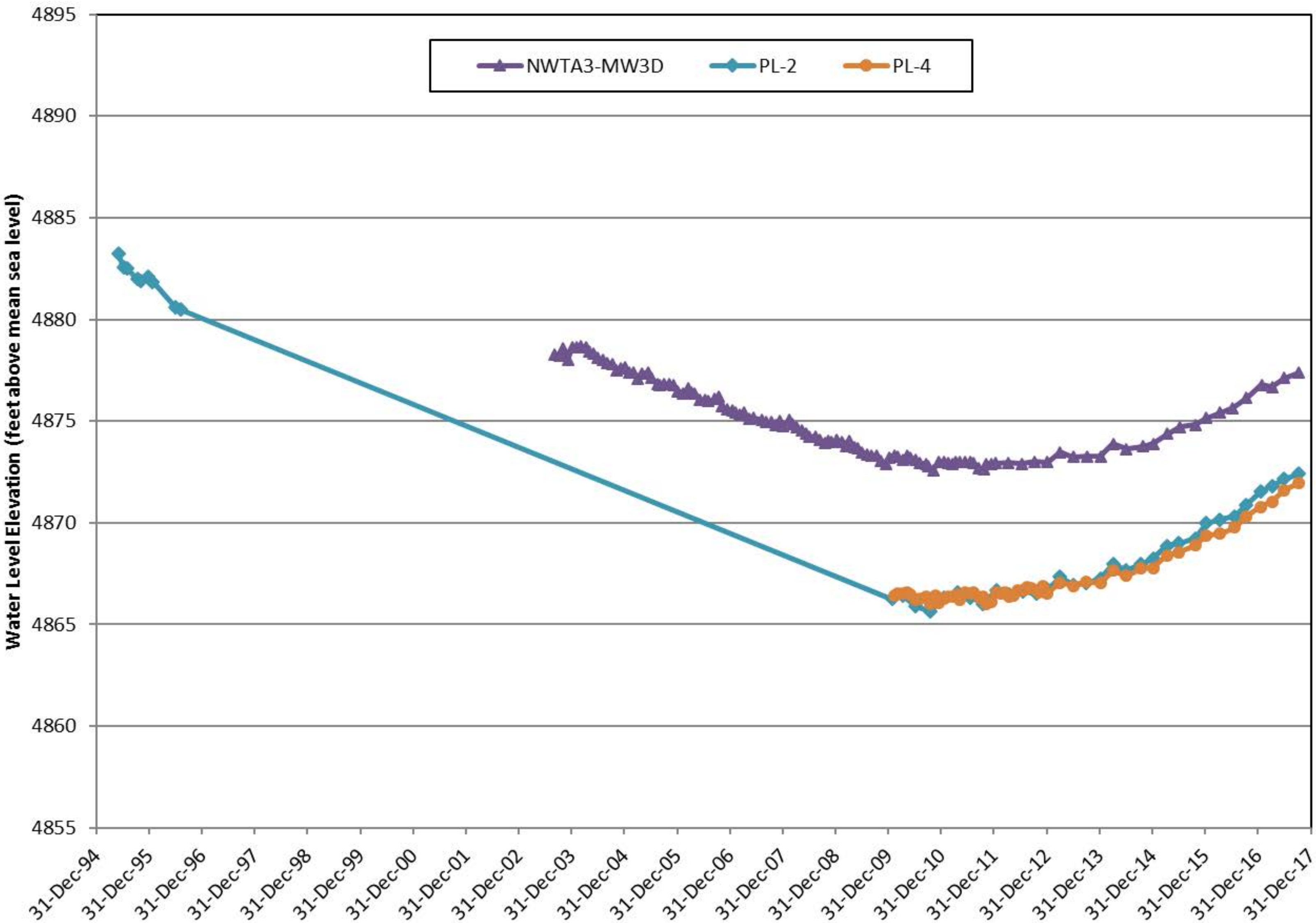


Figure 2B-3. GMP Study Wells (3 of 6)

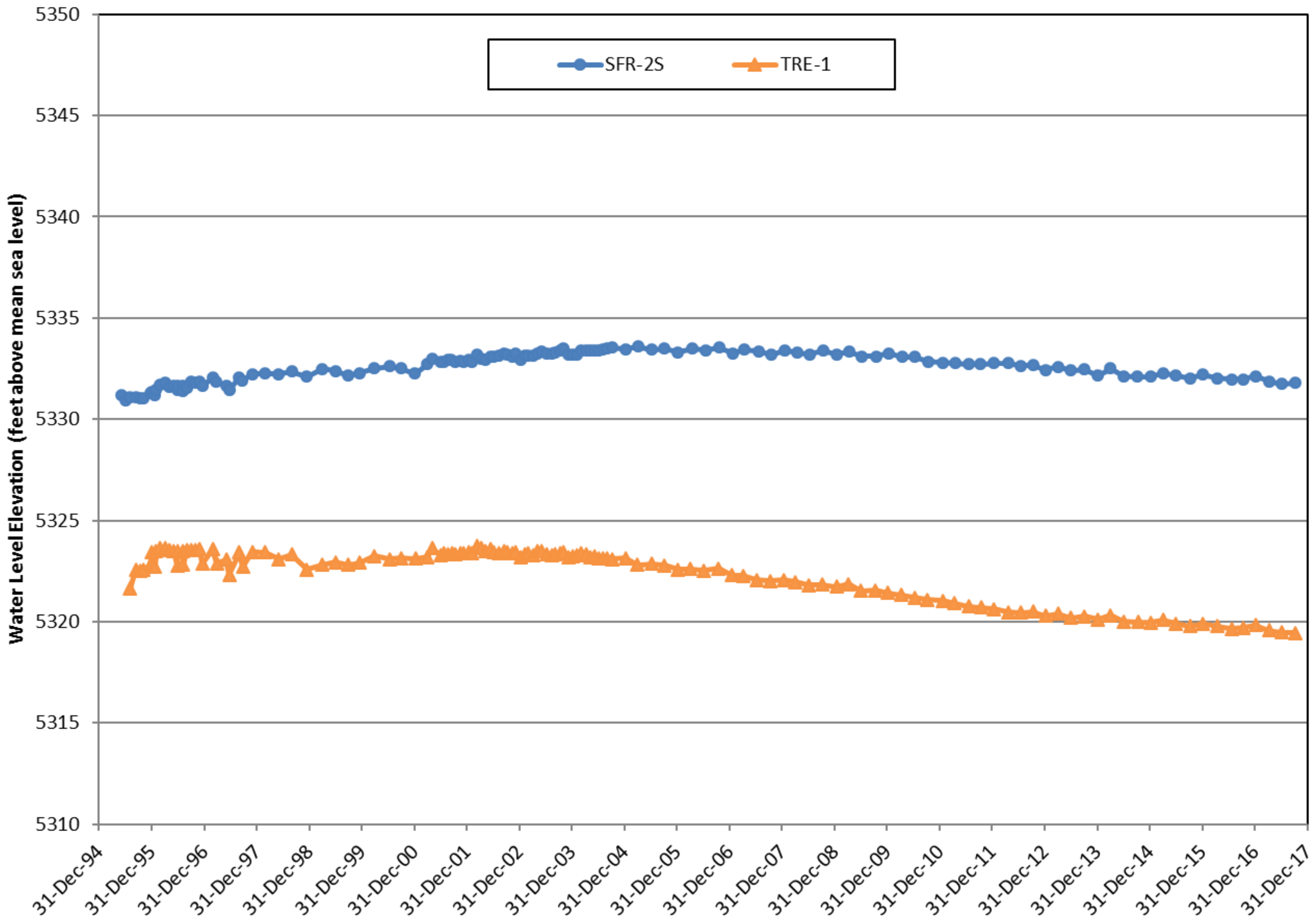


Figure 2B-4. GMP Study Wells (4 of 6)

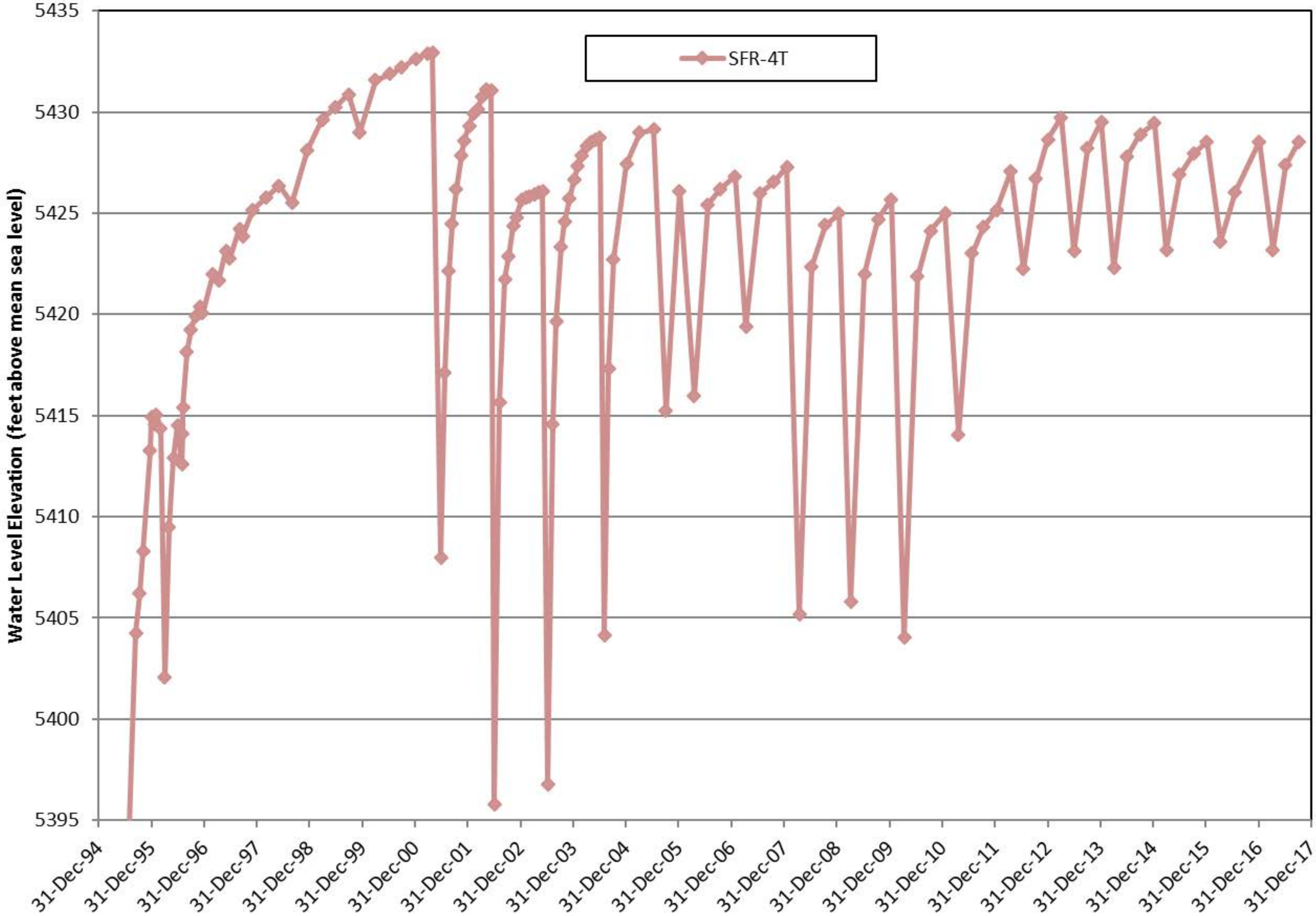


Figure 2B-5. GMP Study Wells (5 of 6)

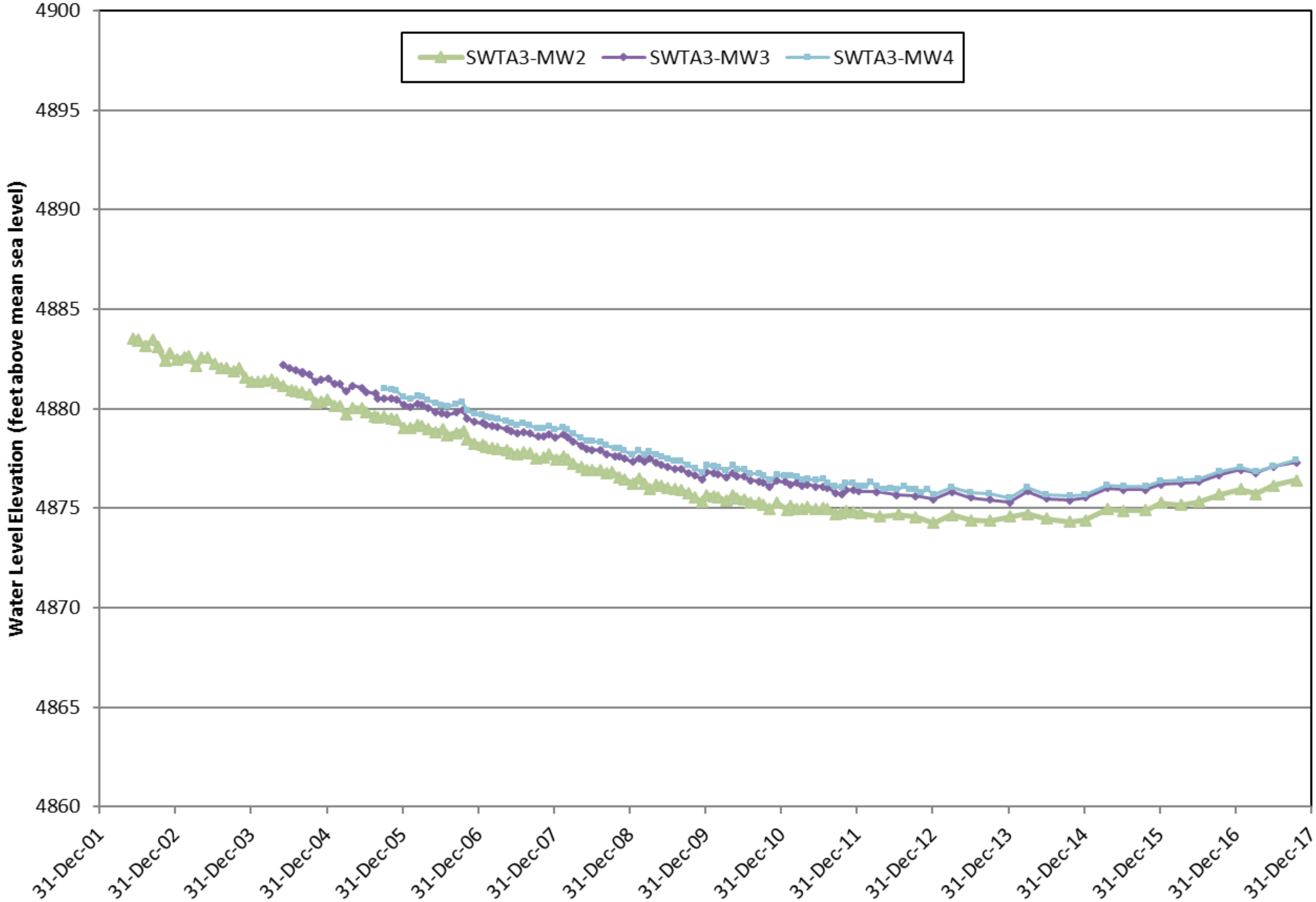


Figure 2B-6. GMP Study Wells (6 of 6)

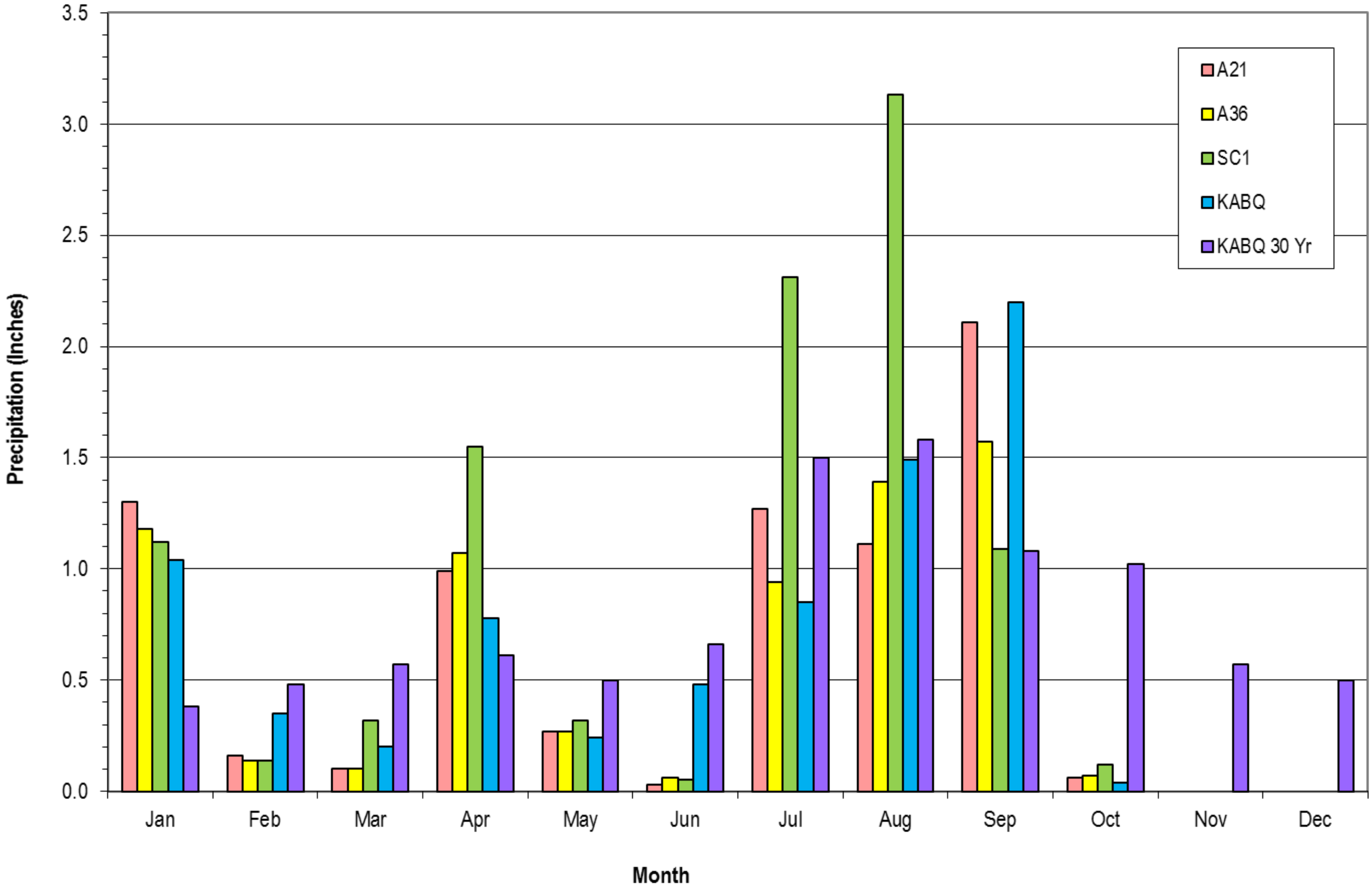


Figure 2B-7. Precipitation Data for SNL/NM, CY 2017

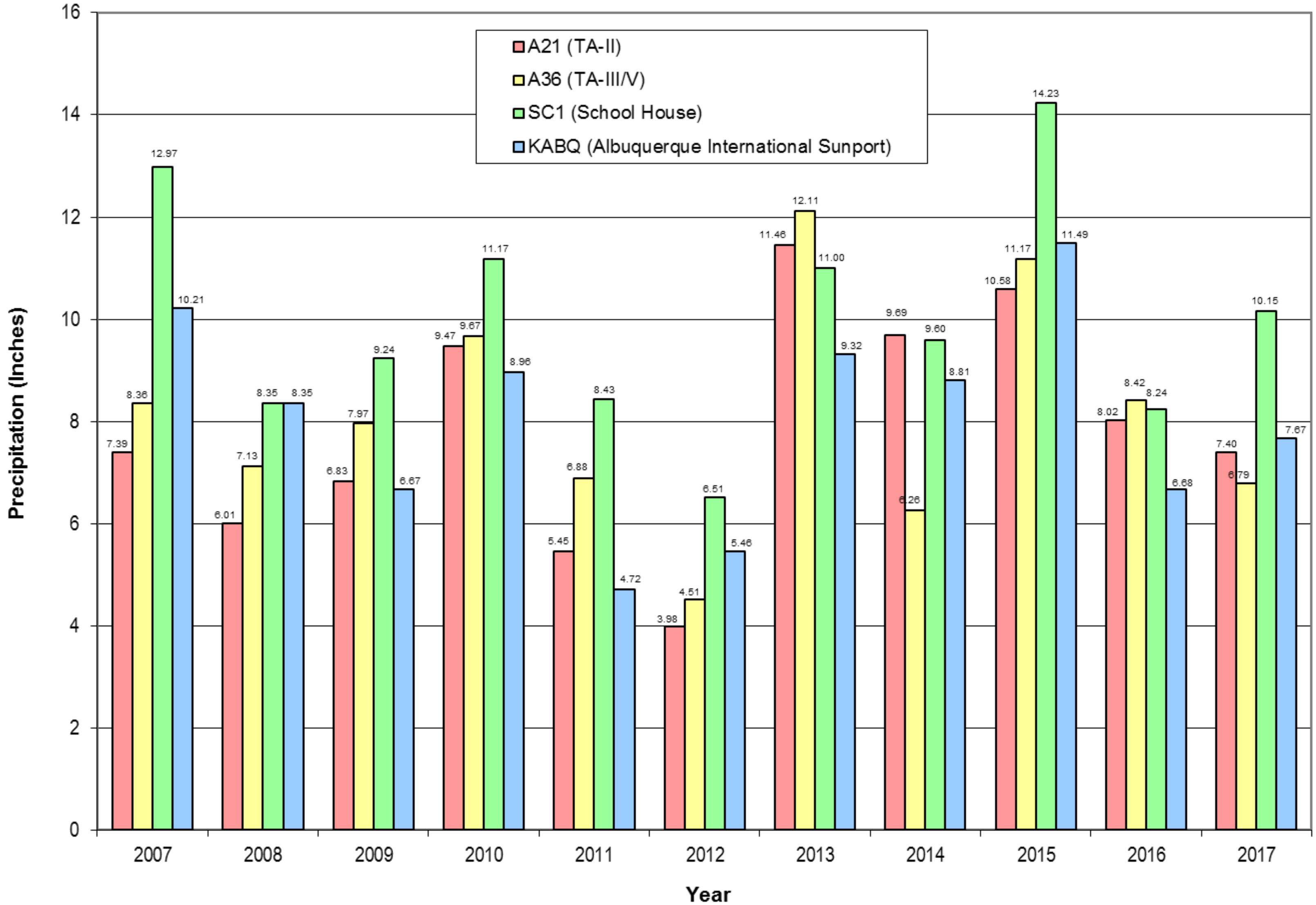


Figure 2B-8. Annual Precipitation Data for SNL/NM, January 2007 to December 2017

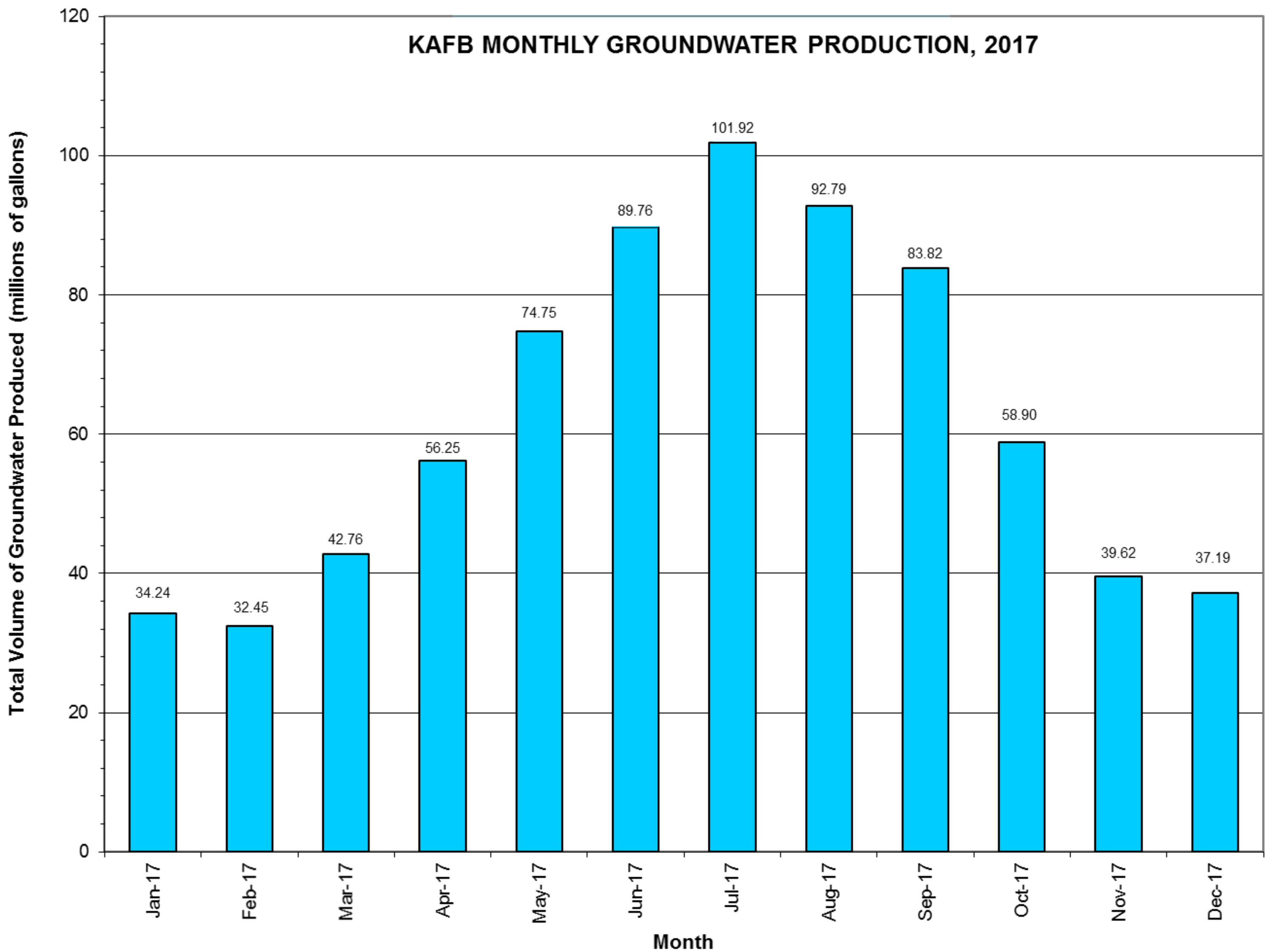


Figure 2B-9. Monthly Groundwater Pumped by KAFB Water Supply Wells, CY 2017

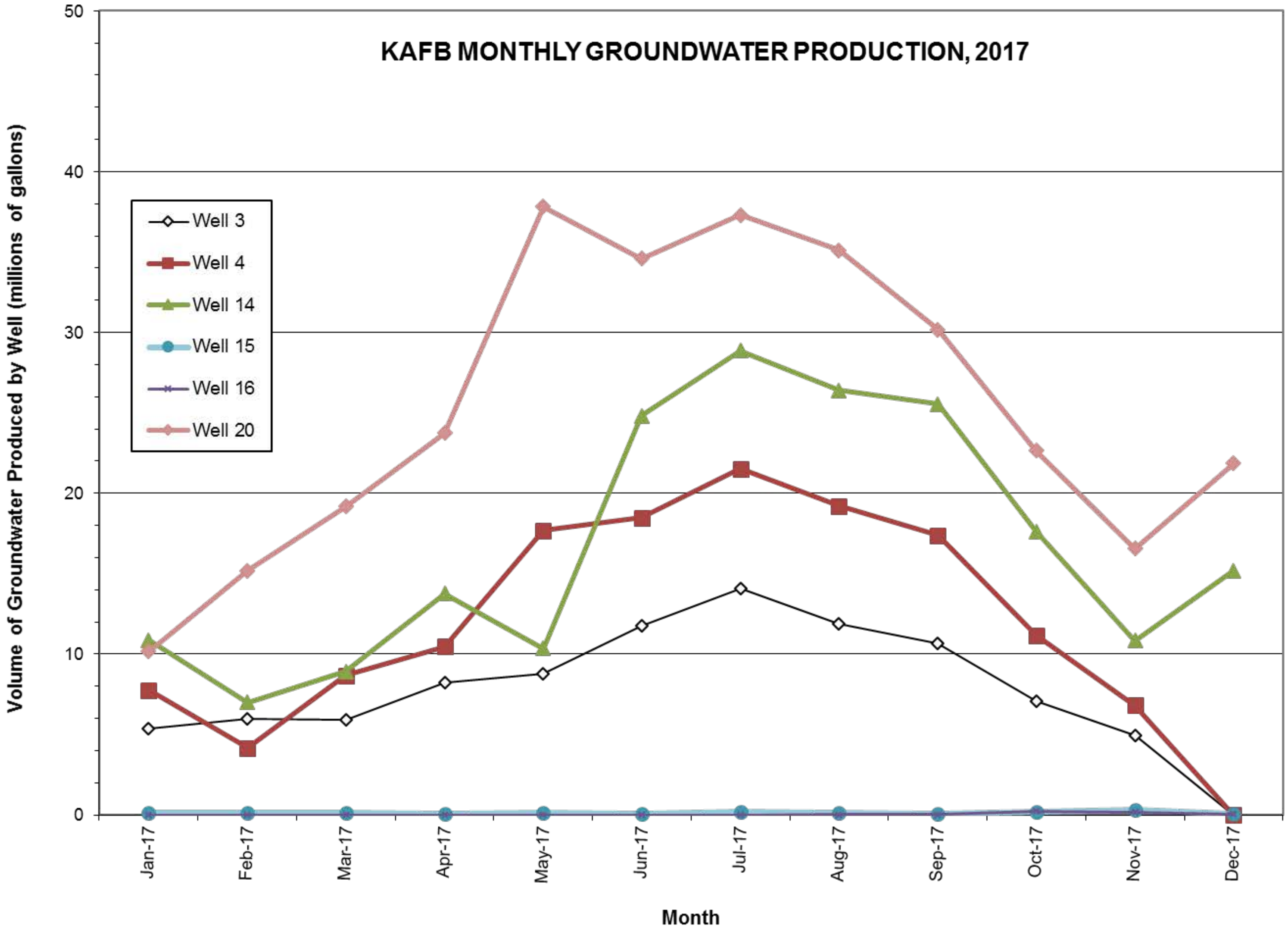


Figure 2B-10. Groundwater Pumped by KAFB Water Supply Wells, CY 2017

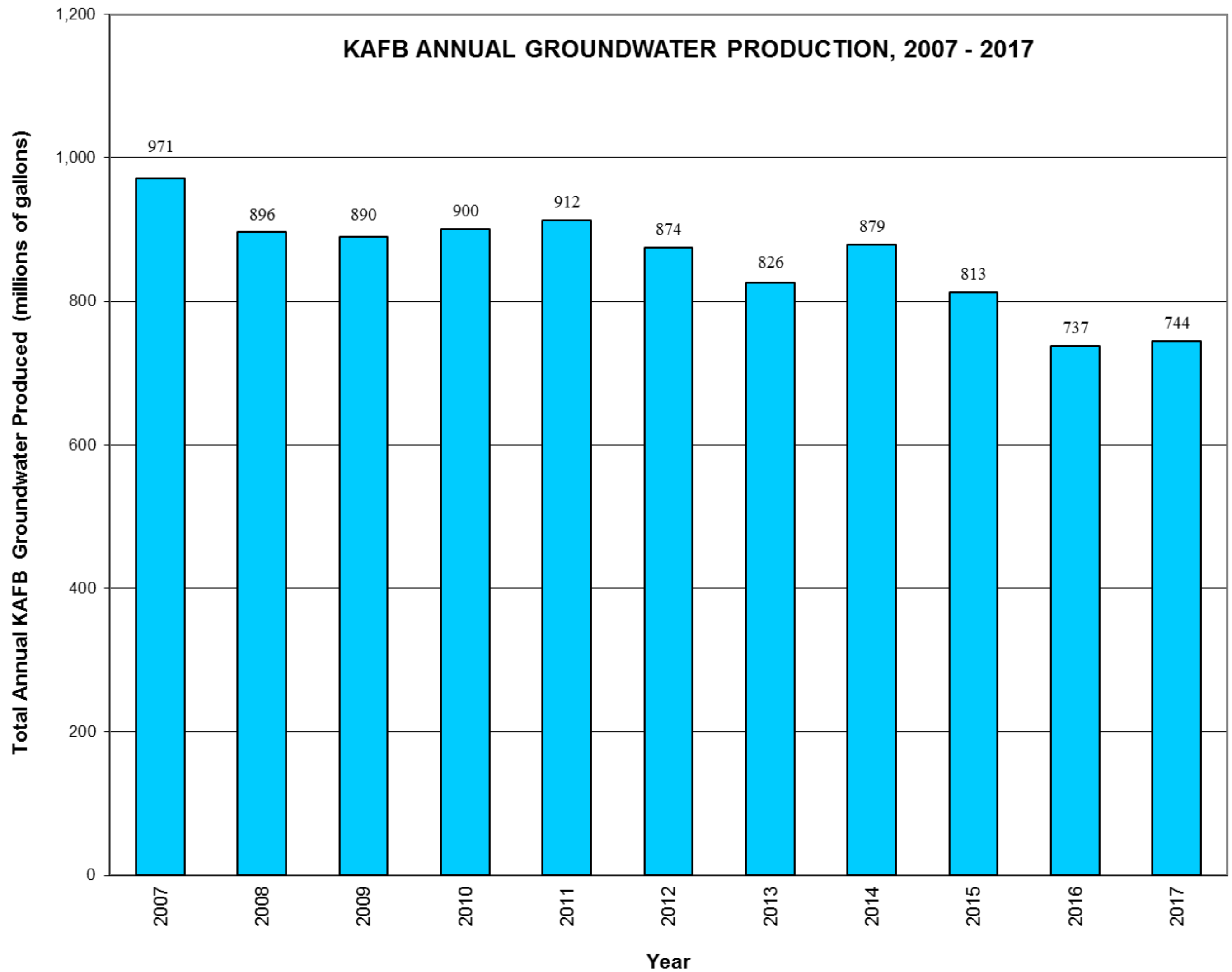


Figure 2B-11. Annual Groundwater Pumped by KAFB Water Supply Wells, 2007 to 2017

This page intentionally left blank.

Attachment 2C
Groundwater Monitoring Program
Plots

This page intentionally left blank.

Attachment 2C Plots

This page intentionally left blank.

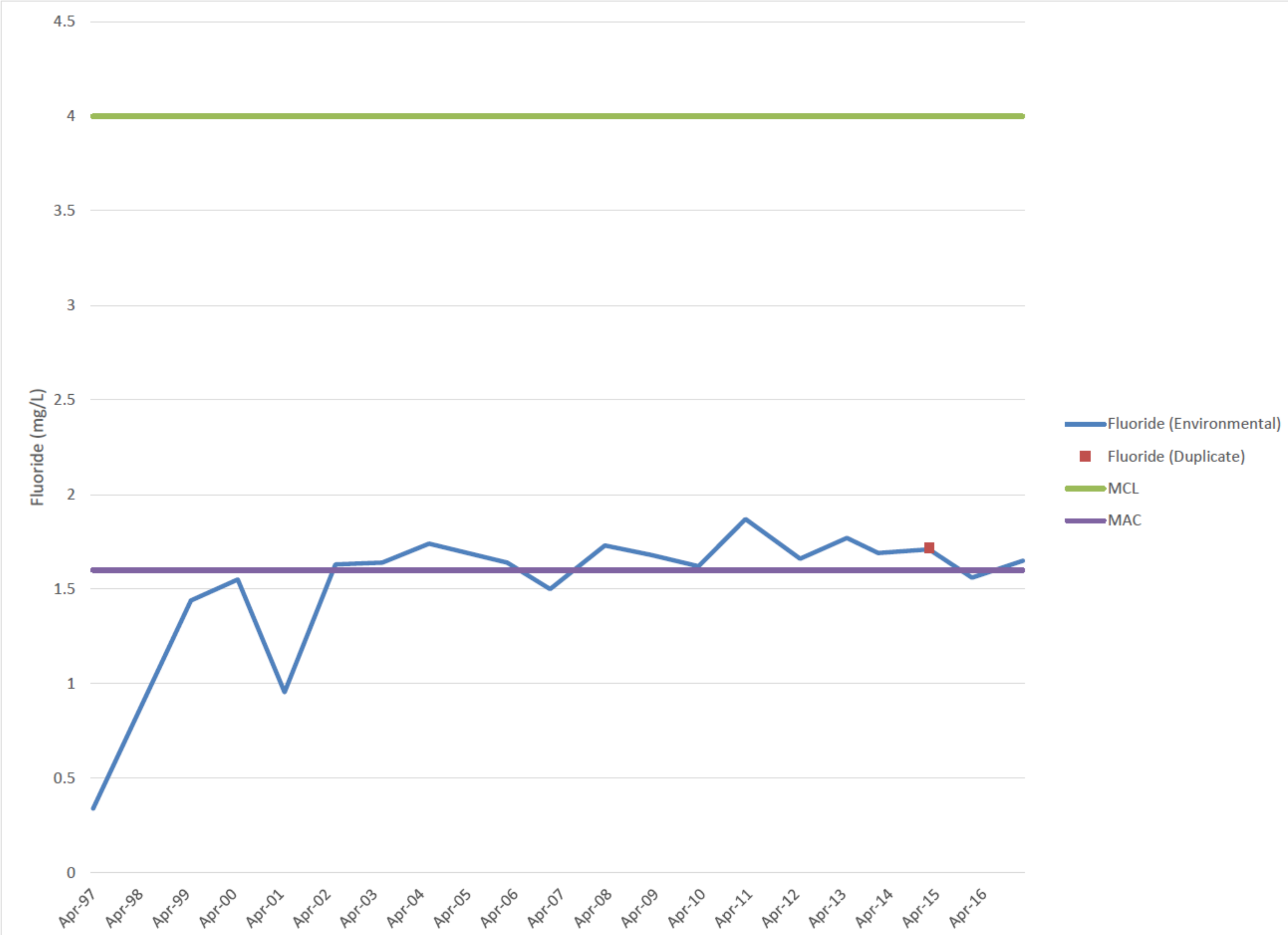


Figure 2C-1. Fluoride Concentrations, Coyote Springs

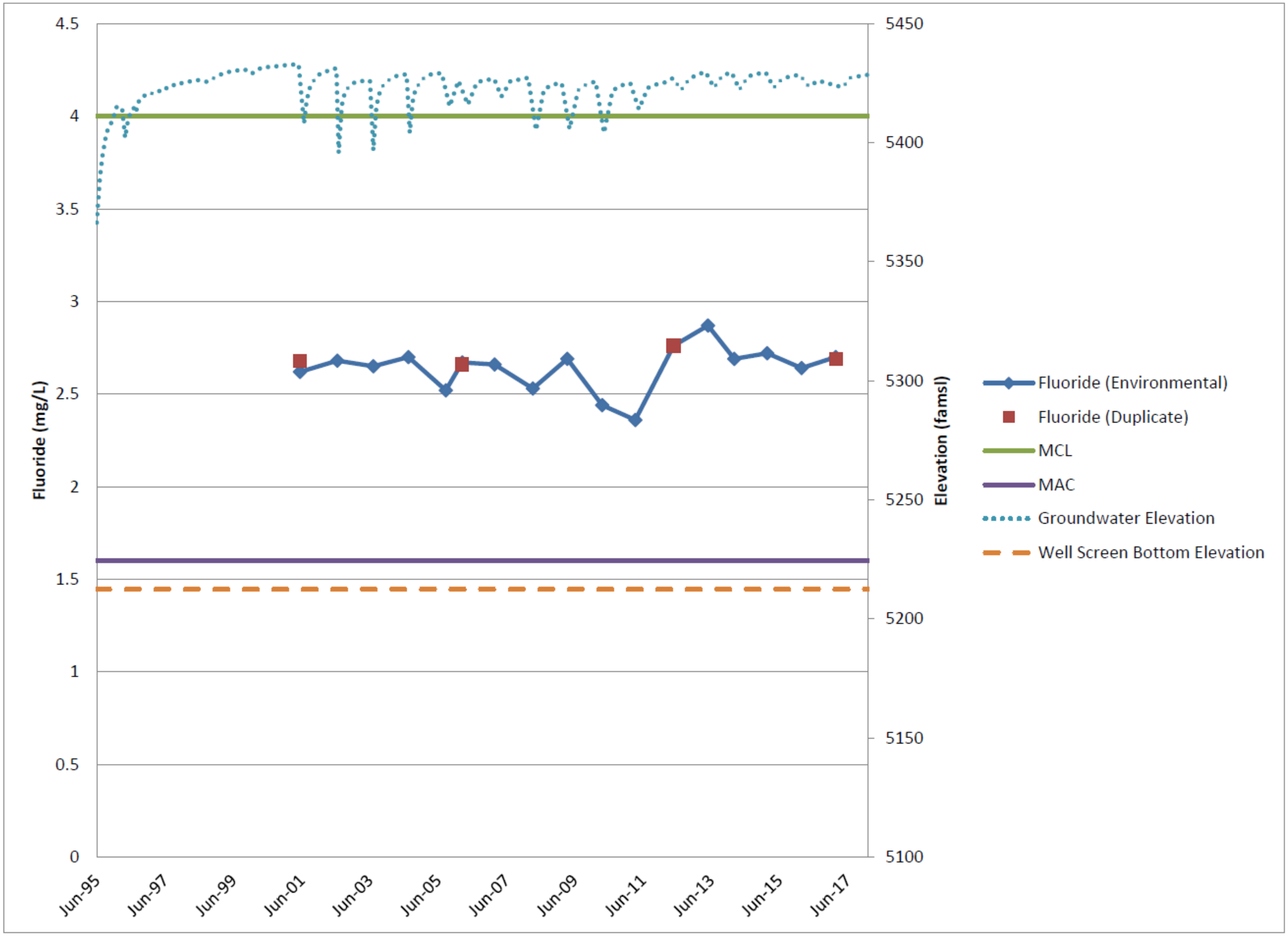


Figure 2C-2. Fluoride Concentrations, SFR-4T

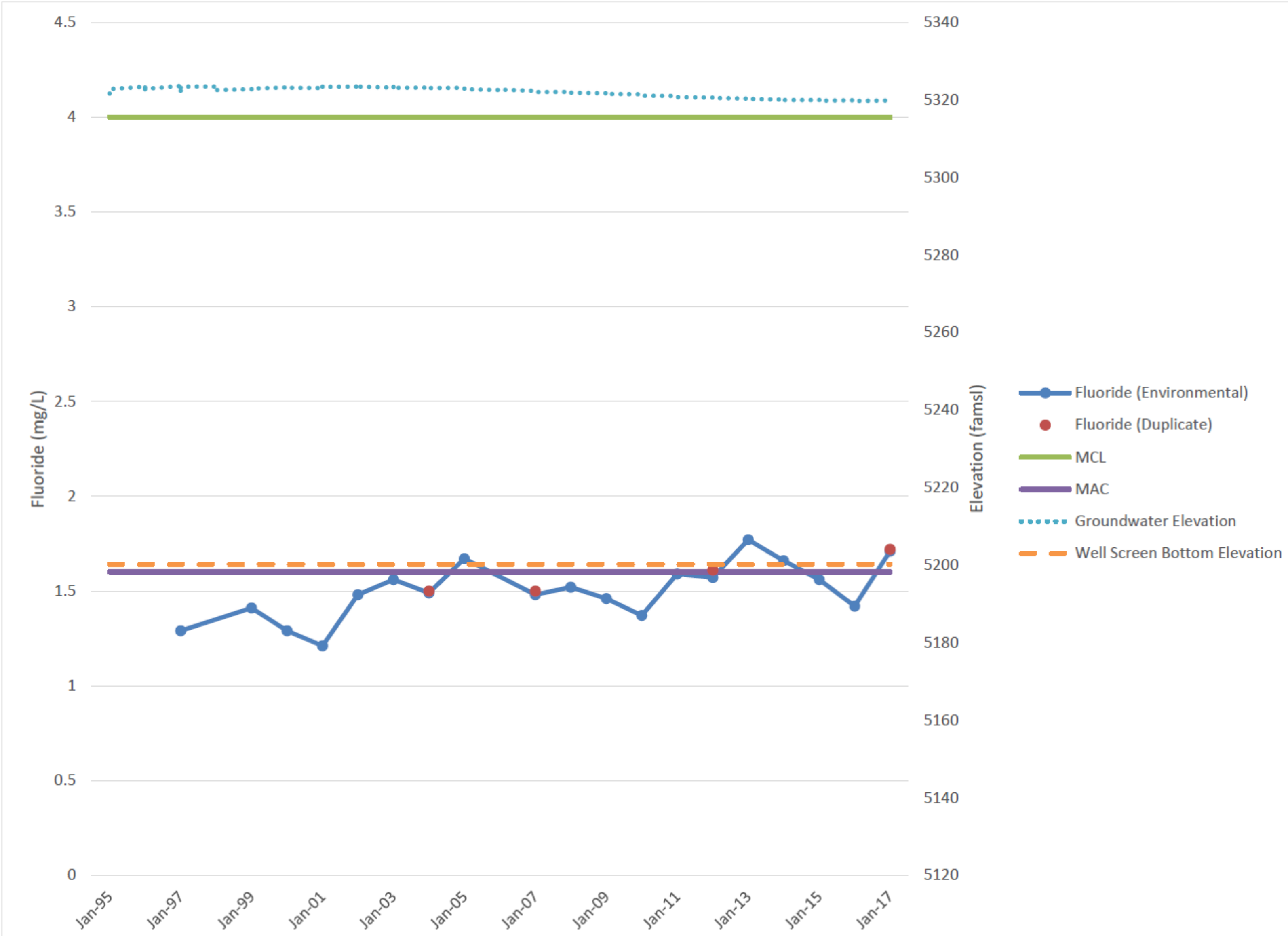


Figure 2C-3. Fluoride Concentrations, TRE-1

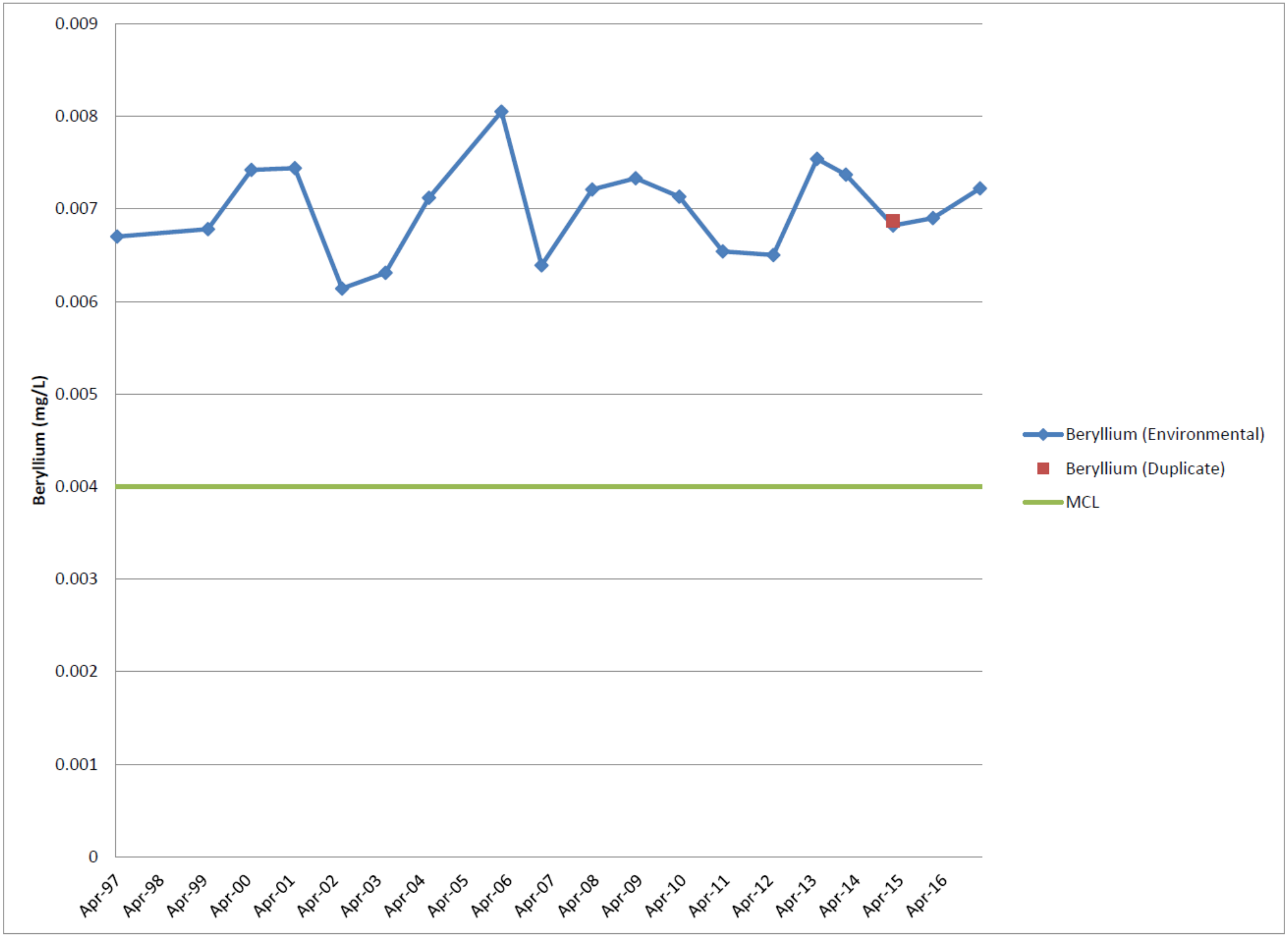


Figure 2C-4. Beryllium Concentrations, Coyote Springs

Chapter 2
Groundwater Monitoring Program
References

This page intentionally left blank.

40 CFR 141 Code of Federal Regulations, Title 40 - Protection of the Environment, Part 141 - National Primary Drinking Water Regulations.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. National Primary Drinking Water Regulations, EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

NMOSE August 2005 New Mexico Office of the State Engineer (NMOSE), August 2005. Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells, Office of the State Engineer, Santa Fe, New Mexico, August 31, 2005.

NMWQCC September 2004 New Mexico Water Quality Control Commission (NMWQCC), September 2004. Environmental Protection, Water Quality, Ground and Surface Water Protection Regulations, Section 20.6.2 of the New Mexico Administrative Code, Santa Fe, New Mexico, September 26, 2004.

SNL January 2017 Sandia National Laboratories, New Mexico (SNL/NM), January 2017. *LTS Consolidated Groundwater Monitoring Program Mini-SAP for FY17 Groundwater Surveillance Task*, Sandia National Laboratories, Albuquerque, New Mexico.

This page intentionally left blank.

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 (TA)-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. Additionally, the CWL was used as an above ground, hazardous waste drum storage facility from 1981 to 1989.

In 1990, trichloroethene (TCE) was identified in groundwater at a concentration exceeding the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) 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 Permit Application*, hereafter referred to as the *Final Closure Plan* (SNL December 1992). The SNL/NM Environmental Restoration Project implemented two voluntary corrective measures (VCMs); the Vapor Extraction and the Landfill Excavation VCMs. As part of the Vapor Extraction VCM 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 MCL. As part of the Landfill Excavation VCM, the CWL was excavated from September 1998 through February 2002. The removal of all former disposal areas was confirmed by geophysical surveys and the results of final verification soil samples demonstrated that end-state conditions met industrial risk-based standards approved by the New Mexico Environment Department (NMED). More than 52,000 cubic yards of contaminated soil and debris were removed from this former disposal area (SNL April 2003).

In April 2004 after completion of backfilling activities, the U.S. Department of Energy/National Nuclear Security Administration and SNL/NM personnel requested approval to install an at-grade vegetative soil cover as an interim measure (Wagner April 2004) while NMED comments on the May 2003 CWL Corrective Measures Study (CMS) Report (SNL December 2004) were being resolved. In September 2004, the NMED approved this request (Kieling September 2004) and construction of the at-grade evapotranspirative cover (i.e., vegetative soil cover) was completed in September 2005.

In May 2007, the NMED issued a Notice of Public Comment Period (Kieling May 2007) for three documents: the CWL CMS Report, the Draft Post-Closure Care Permit (PCCP) (NMED May 2007), and the Closure Plan Amendment (SNL February 2006). In 2009, the NMED issued the final CWL PCCP (NMED October 2009a), approved the CWL CMS Report, and approved the Closure Plan Amendment (NMED October 2009b).

In 2010, monitoring wells CWL-MW4, CWL-MW5L, CWL-MW5U, CWL-MW6L, CWL-MW6U, and CWL-BW4A were decommissioned, and new monitoring wells CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11 were installed. The new monitoring wells became the groundwater monitoring network for the CWL in accordance with the approved Closure Plan Amendment. The *Chemical Waste Landfill Final Resource Conservation and Recovery Act Closure Report* (SNL September 2010) documenting closure in accordance with all CWL Closure Plan requirements was submitted to the NMED after completion of well installation and decommissioning activities.

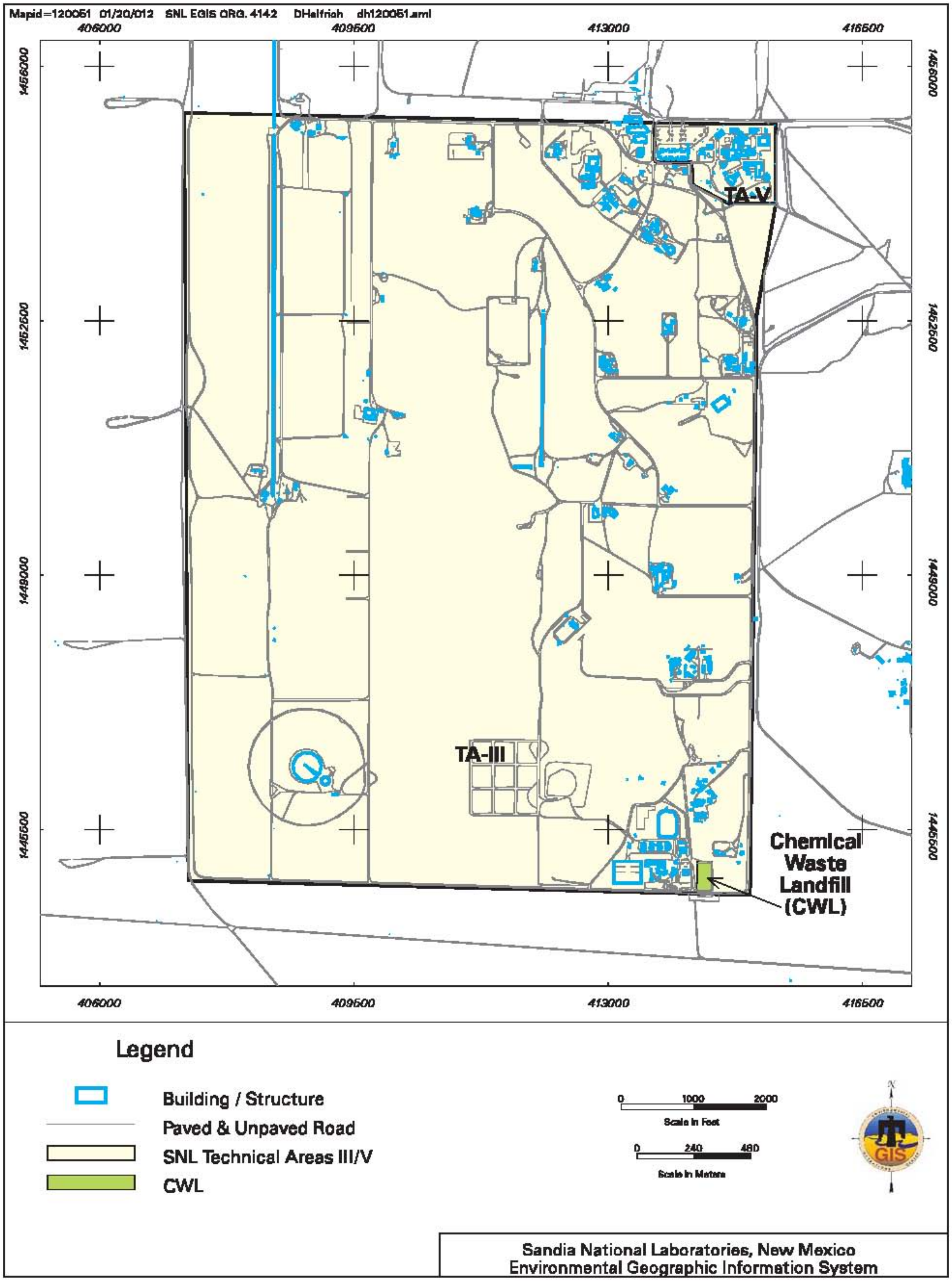


Figure 3-1. Location of the Chemical Waste Landfill within Technical Area-III

Upon NMED approval of CWL closure (Kieling June 2011), the CWL PCCP became the enforceable regulatory document. All groundwater monitoring activities at the CWL since June 2011 are performed in accordance with requirements specified in the CWL PCCP. Required monitoring (groundwater and soil-gas), inspections, and maintenance activities are comprehensively documented in annual Post-Closure Care Reports submitted to NMED in March of each year. During calendar year (CY) 2017, the *Chemical Waste Landfill Annual Post-Closure Care Report for Calendar Year 2016* (SNL March 2017) was submitted to NMED and approved (Kieling July 2017). The *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2017* will be submitted to NMED in March 2018.

As stipulated in the CWL PCCP, the only regulatory standards that apply to CWL groundwater monitoring results are the PCCP-defined hazardous concentration limits. These NMED-defined regulatory standards apply only to a statistical evaluation of the constituent data set from a given monitoring well (i.e., the 95th percentile lower confidence limit of the mean for a particular constituent), not to individual results. The *Chemical Waste Landfill Annual Post-Closure Care Report for Calendar Year 2017* will present a comprehensive statistical evaluation of CWL CY 2017 groundwater monitoring results.

3.1.1 Monitoring History

Groundwater monitoring began in 1985 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. Monitoring under the *Final Closure Plan* was conducted until June 2, 2011; since then, groundwater monitoring has been performed in accordance with the CWL PCCP.

3.1.2 Monitoring Network

The CWL compliance groundwater monitoring network includes monitoring wells CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11. These four wells are listed in Table 3-1 and shown on Figure 3-2.

Table 3-1. Chemical Waste Landfill Post-Closure Care Permit Monitoring Well Network and Calendar Year 2017 Compliance Activities

Well ID	WQ	WL	Comment
CWL-BW5	✓	✓	Upgradient well, sampled semiannually
CWL-MW9	✓	✓	Downgradient well, sampled semiannually
CWL-MW10	✓	✓	Downgradient well, sampled semiannually
CWL-MW11	✓	✓	Downgradient well, sampled semiannually

NOTES:

Check marks indicate WQ sampling and WL measurements were completed.

BW = Background Well.
CWL = Chemical Waste Landfill.
ID = Identifier.
MW = Monitoring Well.
WL = Water level.
WQ = Water quality.

3.1.3 Conceptual Site Model

The constituents of concern in groundwater at the CWL are TCE, chromium, and nickel. A detailed Conceptual Site Model (CSM) is provided in Annex E of the CWL CMS Report. The current CSM is summarized as follows.

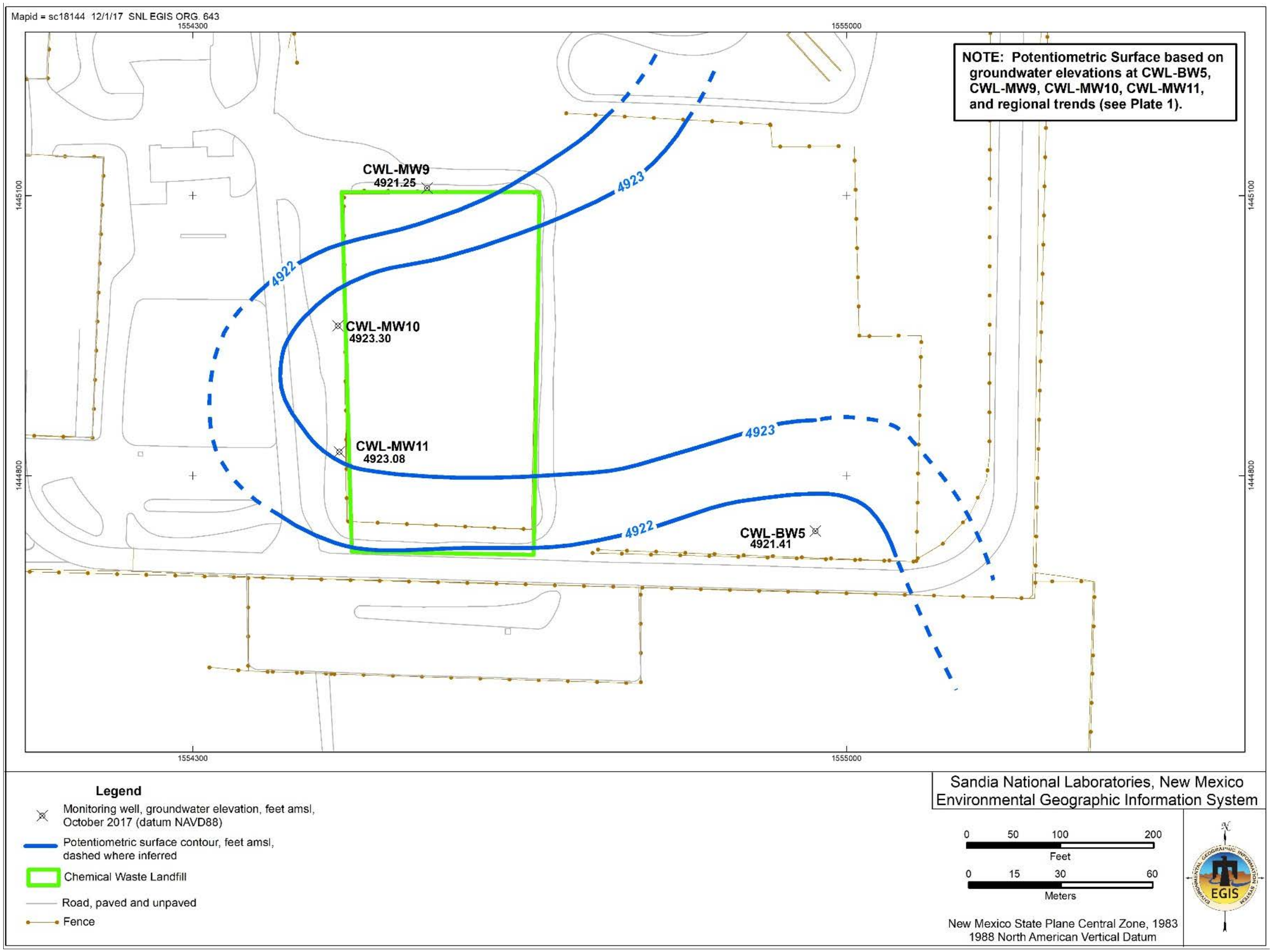


Figure 3-2. Localized Potentiometric Surface of the Regional Aquifer at the Chemical Waste Landfill, October 2017

The Regional Aquifer beneath the CWL occurs within unconsolidated Santa Fe Group deposits (i.e., fine-grained alluvial-fan deposits). The depth to water is approximately 500 feet 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 to the west and north of 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 in 1985. The nearest water supply well, KAFB-4, is located approximately 4.6 miles north-northwest of the CWL.

In Attachment 3A, Figure 3A-1 (hydrographs) shows the rate of groundwater elevation decline at the existing CWL monitoring wells. Since groundwater monitoring began at the CWL in 1985, the average rate of water table decline has been somewhat variable, but typically in the range of 0.4 to 0.8 feet per year (ft/yr). Over the past two years the rate of decline has significantly slowed. The groundwater elevation decline between October 2016 and October 2017 ranged from 0.38 (CWL-MW10 and CWL-MW11) to 0.54 (CWL-BW5) feet; however, CWL-MW10 showed an increase in elevation of 0.26. The average rate of decline factoring in all four monitoring wells was 0.26 feet. This rate of decline was similar to the change from 2015 to 2016, and has significantly decreased from the 2014 to 2015 average decline rate, which was 0.72 feet. 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 evapotranspirative 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.

Table 3-2 presents the data used to construct the October 2017 potentiometric surface map shown in Figure 3-2 for the CWL groundwater monitoring network.

Table 3-2. Groundwater Elevations Measured in October 2017 at Monitoring Wells Completed in the Regional Aquifer at the Chemical Waste Landfill

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)
CWL-BW5	5,434.79	2-Oct-2017	513.38	4,921.41
CWL-MW9	5,426.12	2-Oct-2017	504.87	4,921.25
CWL-MW10	5,424.58	2-Oct-2017	501.28	4,923.30
CWL-MW11	5,423.24	2-Oct-2017	500.16	4,923.08

NOTES:

amsl = Above mean sea level.
btoc = Below top of casing.
BW = Background Well.
CWL = Chemical Waste Landfill.
ID = Identifier.
MW = Monitoring Well.
NAVD 88 = North American Vertical Datum of 1988.

Figure 3-2 is consistent with the CSM and the base-wide potentiometric surface map presented on Plate 1. As shown on Plate 1, the potentiometric surface contours beneath TA-III generally trend north to south with the inferred groundwater flow direction being generally westward. The westward deflection of the potentiometric surface is a localized salient in the potentiometric surface (i.e., a very gentle ridge or localized high) of the Regional Aquifer beneath the CWL (Figure 3-2) that reflects site-specific geologic controls. These controls are related to lateral and vertical changes in the hydraulic conductivity of the saturated, anisotropic, Santa Fe Group alluvial-fan sediments that were predominantly deposited in an east to west direction. Slug testing of the four groundwater monitoring wells completed in 2012 indicates CWL-MW10 has the lowest average hydraulic conductivity (5 ft/yr) relative to the other wells. CWL-MW9 has the highest average hydraulic conductivity at 16 ft/yr, and both CWL-MW11 and CWL-BW5 tested at 12 ft/yr. While actual flow paths in laterally discontinuous alluvial sediments are complex and highly dependent upon horizontal permeability, hydraulic conductivity testing indicates CWL-MW10 is installed within tighter, lower permeability sediments than CWL-MW9 to the north and CWL-BW5/CWL-MW11 to the south. This information is consistent with groundwater purging data; CWL-MW10 is the only well that purges dry during routine sampling. As the Regional Aquifer potentiometric surface (i.e., water table) declines and groundwater flows from the east to the west, the central part of the site (i.e., in the vicinity of CWL-MW10) reacts more slowly and in 2017 showed a small increase, creating a localized salient in the potentiometric surface. Previous groundwater monitoring wells installed in this area (west of the central part of the CWL) have also exhibited these characteristics (low yield, low hydraulic conductivity).

Based on the potentiometric surface map, the horizontal gradient at the CWL was approximately 0.013 feet per foot in October 2017. Groundwater velocities were calculated using:

- The current potentiometric surface gradient,
- The hydraulic conductivity range (i.e., high and low values) from slug tests conducted on the four groundwater monitoring wells, and
- A porosity of 29 percent as determined from the laboratory analyses of CWL sediment samples (SNL October 1995).

The 2017 calculated velocities ranged from approximately 1.8 x 10^{-4} to 2.8 x 10^{-3} feet per day. This is equivalent to approximately 0.07 to 1.02 ft/yr. These very low values are consistent with previous estimates for horizontal groundwater flow at the water table in the CWL vicinity. Estimated 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 is a remediated, closed, regulated unit undergoing post-closure care in accordance with the CWL PCCP that became effective on June 2, 2011. Groundwater monitoring requirements, procedures, and protocols are detailed in the CWL PCCP, Attachment 1, Section 1.8.1 and Attachment 2, Groundwater Sampling and Analysis Plan.

3.3 Scope of Activities

Semiannual groundwater sampling activities were conducted in January and July 2017 at the CWL in accordance with Attachment 2 of the CWL PCCP. In January, groundwater samples were analyzed for the enhanced list of VOCs, chromium, and nickel. The enhanced list of VOCs includes 1,1-dichloroethene; 1,1,2-trichloro-1,2,2-trifluoroethane; chloroform; tetrachloroethene; TCE; and trichlorofluoromethane. In July, groundwater samples were analyzed for TCE, chromium, and nickel.

Table 3-3 lists the analytical parameters and CWL monitoring wells sampled. Attachment 3B contains the analytical results (Tables 3B-1 and 3B-2). In January and July, groundwater sampling activities were conducted in conformance with the CWL PCCP and procedures outlined in the *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2017, 2nd Quarter Sampling* (SNL December 2016) and the *Chemical Waste Landfill Groundwater Monitoring Mini-Sampling and Analysis Plan for Fiscal Year 2016, 4th Quarter Sampling* (SNL June 2017a).

Table 3-3. Analytical Parameters for the Chemical Waste Landfill Monitoring Wells, Calendar Year 2017

Parameters	Semiannual Event	Monitoring Wells
VOCs: TCE 1,1,2-Trichloro-1,2,2-trifluoroethane Tetrachloroethene 1,1-Dichloroethene Chloroform Trichlorofluoromethane	January	CWL-BW5 CWL-MW9 CWL-MW10 CWL-MW11 CWL-MW11 duplicate
Metals: Chromium Nickel		
VOCs: TCE	July	CWL-BW5 CWL-MW9 CWL-MW10 CWL-MW10 duplicate CWL-MW11
Metals: Chromium Nickel		

NOTES:
BW = Background Well.
CWL = Chemical Waste Landfill.
MW = Monitoring Well.
TCE = Trichloroethene.
VOC = Volatile organic compound.

The CWL groundwater samples were submitted for analysis to GEL Laboratories, LLC in Charleston, South Carolina. All groundwater sampling results are compared with EPA MCLs for drinking water (EPA May 2009).

Field and laboratory quality control (QC) samples are discussed in Section 1.3.3. Field QC samples included environmental duplicate, 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 the CWL PCCP and procedures specified in the *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plans*, which are consistent with the methods described in Section 1.3. Water quality parameters measured in the field during the purging process included temperature, specific conductivity, oxidation-reduction potential (ORP), pH, and dissolved oxygen using an YSI™ EXO1 Water Quality Meter. Turbidity was measured with a Hach™ Model 2100Q turbidity meter. Attachment 3B, Table 3B-3 presents field water quality parameters and Attachment 3A, Figure 3A-1 (hydrographs) presents groundwater elevation measurements at the CWL monitoring wells.

As specified in CWL PCCP Attachment 2, Section 2.12, purging requirements at the CWL include specifications for making a “best faith effort” to decrease flow rates such that low yield wells do not purge dry. These specifications include equipping the portable Bennett™ groundwater sampling system with small diameter tubing and a flow meter valve located along the discharge line. In addition, during the purging process at wells prone to purging dry, the flow rate is continually adjusted to achieve as low a flow rate as possible without causing the pump to be damaged or fail due to overheating. This represents a “best faith effort” to purge the wells at the slowest rate possible given equipment limitations.

The minimum purging volume requirement was satisfied at three of the four monitoring wells (CWL-BW5, CWL-MW9, and CWL-MW11). Monitoring well CWL-MW10 purged dry prior to removal of the minimum volume. This well was purged to dryness during both the January and July monitoring events, allowed to recover, and then sampled to collect the most representative groundwater sample possible given the low yield of this well. During January, approximately 15 gallons were purged from CWL-MW10 prior to the well going dry (purge volume requirement was approximately 27 gallons). The average flow rate for the entire purging event was 0.14 gallons per minute (gpm), and the estimated flow rate during the final four gallons was 0.10 gpm (equivalent to 0.52 and 0.38 liters per minute, respectively). During July, approximately 14 gallons were purged from CWL-MW10 prior to the well going dry (purge volume requirement was approximately 26 gallons). The average flow rate for the entire purging event was 0.09 gpm, and the estimated flow rate during the final four gallons was 0.08 gpm (equivalent to 0.34 and 0.30 liters per minute, respectively).

3.5 Analytical Methods

All groundwater samples were analyzed by the off-site laboratory using EPA-specified protocols described in Section 1.3.2.

3.6 Summary of Analytical Results

The analytical results and water quality parameters are presented in Tables 3B-1 through 3B-3. Data qualifiers assigned by the analytical laboratory and the data validation process (SNL June 2014 and SNL June 2017b) are presented with the associated results in Tables 3B-1 and 3B-2.

For the purposes of this report, the CY 2017 analytical results were compared with established EPA MCLs where applicable. No detected constituents exceeded the respective MCLs or the PCCP-defined hazardous concentration limits. The analytical results are discussed in detail in the following sections.

3.6.1 Volatile Organic Compounds

Table 3B-1 summarizes the CY 2017 analytical results for the enhanced list of VOCs (January) and TCE (July). TCE was detected above the method detection limit (MDL) in all samples from monitoring well CWL-MW10 at concentrations of 0.780 µg/L (January), and 0.490 µg/L and 0.530 µg/L (July environmental sample and environmental duplicate sample, respectively). These results are below the practical quantitation limit of 1.0 µg/L and the MCL of 5.0 µg/L. No other VOCs were detected.

3.6.2 Metals

Table 3B-2 summarizes the CY 2017 analytical results for chromium and nickel. Chromium was not detected above the MDL in any of the CY 2017 samples. This result was below the chromium MCL of 0.10 milligrams per liter (mg/L). Nickel was detected in various samples (including one January sample and three July samples) at concentrations from 0.000503 mg/L to 0.00276 mg/L. There is no established MCL for nickel.

3.6.3 Water Quality Parameters

Table 3B-3 lists the water quality parameters measured immediately prior to sample collection at each well. These field parameters consist of temperature, specific conductivity, ORP, pH, turbidity, and dissolved oxygen.

3.7 Quality Control Results

Section 1.3.3 presents the purpose of each field and laboratory QC sample type. Field and laboratory QC sample results for the CWL are discussed in the following sections.

3.7.1 Field Quality Control Samples

Field QC samples included environmental duplicate samples, EBs, FBs, and TBs. The following sections discuss the analytical results for each QC sample type.

3.7.1.1 Environmental Duplicate Samples

One environmental duplicate sample was collected from monitoring well CWL-MW11 in January and one environmental duplicate sample was collected from monitoring well CWL-MW10 in July. The results were compared to the results for the corresponding environmental samples and relative percent difference (RPD) values were calculated for the detected parameters. For the sample pair (environmental sample and environmental duplicate sample) collected at CWL-MW11 in January, no constituents were detected. The RPD value for the sample pair collected at CWL-MW10 in July show good correlation, with an RPD value of 8 for TCE. The RPD value is within the acceptable range of less than or equal to 20 for VOCs, as defined in Attachment 2 of the CWL PCCP.

3.7.1.2 Equipment Blank Samples

One EB sample was collected in January and analyzed for the enhanced list of VOCs, chromium, and nickel. One EB sample was collected in July and analyzed for TCE, chromium, and nickel. No constituents were detected in the EB samples.

3.7.1.3 Field Blank Samples

Three FB samples were collected in January and analyzed for the enhanced list of VOCs. Three FB samples were collected in July and analyzed for TCE only. There were no detections in the FB samples.

3.7.1.4 Trip Blank Samples

Five TB samples were submitted with the January samples and analyzed for the enhanced list of VOCs, and six TB samples were submitted with the July samples and analyzed for TCE. No VOCs were detected in the TB samples.

3.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples were analyzed concurrently with the groundwater samples and included method blanks, laboratory control samples, matrix spike and matrix spike duplicate samples, and surrogate spike samples. There were no significant issues identified with the laboratory QC sample results associated with the January and July sampling events; all results met the laboratory control sample requirements in Attachment 2 of the PCCP.

3.8 Variances and Nonconformances

All analytical and field methods were performed according to the requirements specified in the CWL PCCP and associated *Mini-Sampling and Analysis Plans*. Variances and nonconformances are defined in the CWL PCCP Attachment 2, Section 2.22 for groundwater monitoring. There were no variances or nonconformances during the CY 2017 sampling activities.

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 June 2014 and SNL June 2017b). The data were in compliance with analytical methods and laboratory procedures.

3.9 Summary and Conclusions

During CY 2017, groundwater samples were collected from the four CWL monitoring wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11) in January and July and analyzed for TCE, 1,1,2-trichloro-1,2,2-trifluoroethane, tetrachloroethene, 1,1-dichloroethene, chloroform, trichlorofluoromethane, nickel, and chromium (January), and TCE, nickel, and chromium (July). Based on field and laboratory QC sample and data validation results, the CY 2017 groundwater monitoring data meet data quality objectives and are in compliance with analytical methods and laboratory procedures. No analytes were detected at concentrations exceeding established MCLs or the PCCP hazardous concentration limits.

3.10 Summary of Future Activities

As defined in the CWL PCCP, the post-closure care period for the CWL is 30 years and the compliance period for which the groundwater protection standard applies is 47 years; both periods began on June 2, 2011 when NMED approved closure. The NMED may shorten or extend the post-closure care period under 20.4.1.500 NMAC, incorporating 40 CFR 264.117(a)(2).

In accordance with the CWL PCCP, groundwater monitoring will continue on a semiannual basis. Results will be documented in both the comprehensive CWL Annual Post-Closure Care Reports (submitted to NMED in March of each year) and in future Annual Groundwater Monitoring Reports.

Attachment 3A
Chemical Waste Landfill
Hydrographs

This page intentionally left blank.

Attachment 3A Hydrographs

This page intentionally left blank.

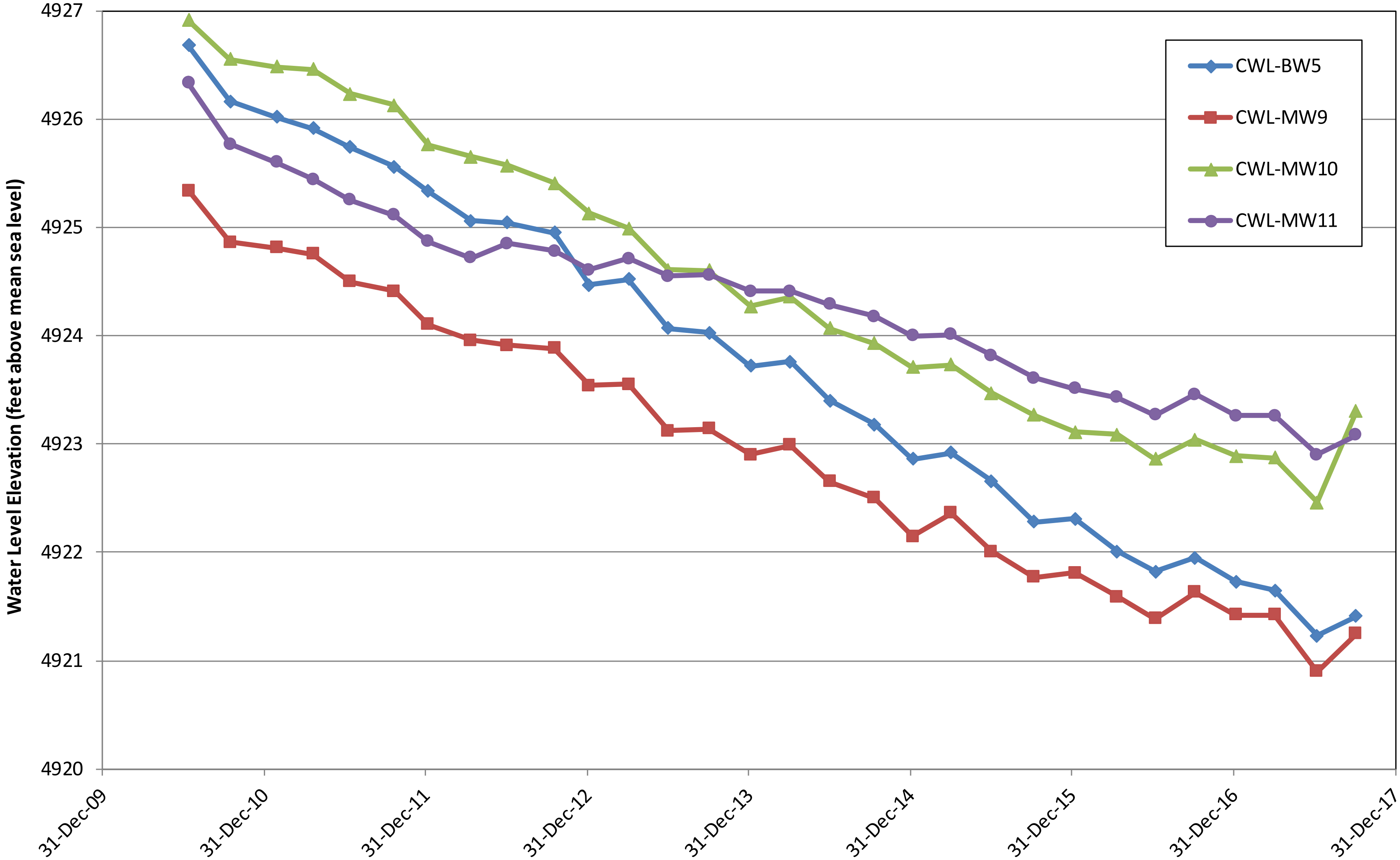


Figure 3A-1. CWL Groundwater Monitoring Wells

This page intentionally left blank.

Attachment 3B
Chemical Waste Landfill
Analytical Results Tables

This page intentionally left blank.

Attachment 3B Tables

This page intentionally left blank.

Table 3B-1
Summary of Volatile Organic Compound Results,
Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		101432-001	SW846-8260
11-Jan-17	Chloroform	ND	0.300	1.00	NE	U		101432-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		101432-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		101432-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		101432-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		101432-001	SW846-8260
CWL-MW9	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		101437-001	SW846-8260
12-Jan-17	Chloroform	ND	0.300	1.00	NE	U		101437-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		101437-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		101437-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		101437-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		101437-001	SW846-8260
CWL-MW10	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		101453-001	SW846-8260
17-Jan-17	Chloroform	ND	0.300	1.00	NE	U		101453-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		101453-001	SW846-8260
	Trichloroethene	0.780	0.300	1.00	5.00	J		101453-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		101453-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		101453-001	SW846-8260
CWL-MW11	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		101446-001	SW846-8260
13-Jan-17	Chloroform	ND	0.300	1.00	NE	U		101446-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		101446-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		101446-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		101446-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		101446-001	SW846-8260
CWL-MW11 (Duplicate)	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		101447-001	SW846-8260
13-Jan-17	Chloroform	ND	0.300	1.00	NE	U		101447-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		101447-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		101447-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		101447-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		101447-001	SW846-8260

Refer to footnotes on page 3B-9.

Table 3A-1 *(Concluded)*
Summary of Volatile Organic Compound Results, Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 18-Jul-17	Trichloroethene	ND	0.300	1.00	5.00	U		103149-001	SW846-8260
CWL-MW9 19-Jul-17	Trichloroethene	ND	0.300	1.00	5.00	U		103154-001	SW846-8260
CWL-MW10 24-Jul-17	Trichloroethene	0.490	0.300	1.00	5.00	J		103171-001	SW846-8260
CWL-MW10 (Duplicate) 24-Jul-17	Trichloroethene	0.530	0.300	1.00	5.00	J		103172-001	SW846-8260
CWL-MW11 20-Jul-17	Trichloroethene	ND	0.300	1.00	5.00	U		103159-001	SW846-8260

Refer to footnotes on page 3B-9.

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

Calendar Year 2017

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	0.003	0.010	0.100	U		101432-002	SW846-6020
11-Jan-17	Nickel	ND	0.0005	0.002	NE	U		101432-002	SW846-6020
CWL-MW9	Chromium	ND	0.003	0.010	0.100	U		101437-002	SW846-6020
12-Jan-17	Nickel	ND	0.0005	0.002	NE	U		101437-002	SW846-6020
CWL-MW10	Chromium	ND	0.003	0.010	0.100	U		101453-002	SW846-6020
17-Jan-17	Nickel	0.000503	0.0005	0.002	NE	J		101453-002	SW846-6020
CWL-MW11	Chromium	ND	0.003	0.010	0.100	U		101446-002	SW846-6020
13-Jan-17	Nickel	ND	0.0005	0.002	NE	U		101446-002	SW846-6020
CWL-MW11 (Duplicate)	Chromium	ND	0.003	0.010	0.100	U		101447-002	SW846-6020
13-Jan-17	Nickel	ND	0.0005	0.002	NE	U		101447-002	SW846-6020
CWL-BW5	Chromium	ND	0.003	0.010	0.100	U		103149-002	SW846-6020
18-Jul-17	Nickel	0.00276	0.0006	0.002	NE			103149-002	SW846-6020
CWL-MW9	Chromium	ND	0.003	0.010	0.100	U		103154-002	SW846-6020
19-Jul-17	Nickel	0.00246	0.0006	0.002	NE			103154-002	SW846-6020
CWL-MW10	Chromium	ND	0.003	0.010	0.100	U		103171-002	SW846-6020
24-Jul-17	Nickel	ND	0.0006	0.002	NE	U		103171-002	SW846-6020
CWL-MW10 (Duplicate)	Chromium	ND	0.003	0.010	0.100	U		103172-002	SW846-6020
24-Jul-17	Nickel	ND	0.0006	0.002	NE	U		103172-002	SW846-6020
CWL-MW11	Chromium	ND	0.003	0.010	0.100	U		103159-002	SW846-6020
20-Jul-17	Nickel	0.00207	0.0006	0.002	NE			103159-002	SW846-6020

Refer to footnotes on page 3B-9.

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

Calendar Year 2017

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	11-Jan-17	17.39	1022.4	199.4	7.03	0.23	77.6	7.20
CWL-MW9	12-Jan-17	18.94	943.2	163.8	7.12	0.22	43.5	3.99
CWL-MW10	17-Jan-17	17.98	917.6	-7.3	7.21	2.78	29.5	2.78
CWL-MW11	13-Jan-17	15.81	928.1	200.2	7.13	0.59	56.5	5.54
CWL-BW5	18-Jul-17	23.51	1101.0	-89.5	6.82	0.65	82.9	6.83
CWL-MW9	19-Jul-17	23.85	983.3	198.9	7.10	0.25	49.9	4.30
CWL-MW10	24-Jul-17	23.10	954.8	1.1	7.26	2.89	29.9	2.55
CWL-MW11	20-Jul-17	27.07	1099.0	241.2	7.13	0.36	64.7	5.16

Refer to footnotes on page 3B-9.

Footnotes for Chemical Waste Landfill Groundwater Analytical Results Tables

%	= Percent.
EPA	= U.S. Environmental Protection Agency.
ID	= Identifier.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
No.	= Number.

[a]Result

ND = Not detected (at method detection limit).

[b]MDL

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

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

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).
NE = Not established.

[e]Lab Qualifier

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.

[g]Analytical Method

EPA, 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).

This page intentionally left blank.

Chapter 3
Chemical Waste Landfill
References

This page intentionally left blank.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations*, EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

IT December 1985 IT Corporation (IT), December 1985. *RCRA Interim Status Groundwater Monitoring Plan, Chemical Waste Landfill*, IT Corporation, Albuquerque, New Mexico prepared for Environmental Impacts and Restoration Division, Sandia National Laboratories, New Mexico.

Kieling July 2017 Kieling, J.E. (New Mexico Environment Department), July 2017. Letter to J. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and J. Moya (National Technology & Engineering Solutions of Sandia, LLC), *Approval, Chemical Waste Landfill Post-Closure Care Report, Calendar Year 2016, March 2017, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-17-004*, July 21, 2017.

Kieling June 2011 Kieling, J.E. (New Mexico Environment Department), June 2011. Letter to P. Wagner (U.S. Department of Energy NNSA/Sandia Field Office) and S.A. Orrell (Sandia Corporation), *Notice of Approval, Closure of Chemical Waste Landfill and Post-Closure Care Permit in Effect, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-10-013*, June 2, 2011.

Kieling May 2007 Kieling, J.E. (New Mexico Environment Department), May 2007. *Notice of Public Comment Period and Opportunity to Request a Public Hearing on a Closure Plan Amendment, Corrective Measures Study, and Draft Post-Closure Care Permit for the Chemical Waste Landfill at Sandia National Laboratories*, May 21, 2007.

Kieling September 2004 Kieling, J.E. (New Mexico Environment Department), September 2004. Letter to P. Wagner (U.S. Department of Energy) and P.B. Davies (Sandia Corporation), *Approval with Conditions of the Landfill Cover Interim Measure at the Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-04-027*, September 22, 2004.

NMED October 2009a New Mexico Environment Department (NMED), October 2009. *Final Permit Decision and Response to Comments, Post-Closure Care Permit for the Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890110518, SNL-06-002*, New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico, October 15, 2009.

NMED October 2009b New Mexico Environment Department (NMED), October 2009. *Notice of Approval, Final Remedy and Closure Plan Amendment, Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890110518, NMED-HWB-05-016*, New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico, October 16, 2009.

NMED May 2007 New Mexico Environment Department (NMED), May 2007. *Resource Conservation and Recovery Act, Post-Closure Care Operating Permit, EPA ID No. NM5890110518, to the U.S. Department of Energy/Sandia Corporation, for the Sandia National Laboratories Chemical Waste Landfill*, New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico, May 21, 2007.

SNL June 2017a Sandia National Laboratories, New Mexico (SNL/NM), June 2017. *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2017, 4th Quarter Sampling*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2017b Sandia National Laboratories, New Mexico (SNL/NM), June 2017. *Data Validation Procedure for Chemical and Radiochemical Data*, AOP 00-03, Revision 5, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2017 Sandia National Laboratories, New Mexico (SNL/NM), March 2017. *Chemical Waste Landfill Annual Post-Closure Care Report*, *Calendar Year 2016*, Sandia National Laboratories, Albuquerque, New Mexico, March 2017.

SNL December 2016 Sandia National Laboratories, New Mexico (SNL/NM), December 2016. *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2017, 2nd Quarter Sampling,* Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2014 Sandia National Laboratories, New Mexico (SNL/NM), June 2014. *Data Validation Procedure for Chemical and Radiochemical Data*, AOP 00-03, Revision 4, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2010 Sandia National Laboratories, New Mexico (SNL/NM), September 2010. *Chemical Waste Landfill Final Resource Conservation and Recovery Act Closure Report*, Sandia National Laboratories, Albuquerque, New Mexico, September 27, 2010.

SNL February 2006 Sandia National Laboratories, New Mexico (SNL/NM), February 2006. *Chemical Waste Landfill Final Closure Plan – Chapter 12 Revision*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2004 Sandia National Laboratories, New Mexico (SNL/NM), December 2004. *Chemical Waste Landfill Corrective Measures Study Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2003 Sandia National Laboratories, New Mexico (SNL/NM), April 2003. *Chemical Waste Landfill – Landfill Excavation Voluntary Corrective Measure – Final Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2001 Sandia National Laboratories, New Mexico (SNL/NM), February 2001. *Draft Long-Term Monitoring Strategy for Groundwater*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 1995 Sandia National Laboratories, New Mexico (SNL/NM), October 1995. *Chemical Waste Landfill Groundwater Assessment Report,* Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 1992 Sandia National Laboratories, New Mexico (SNL/NM), December 1992. *Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application*, Sandia National Laboratories, Albuquerque, New Mexico, amended January 2003.

Wagner April 2004 Wagner, P. (U.S. Department of Energy), April 2004. Letter to J. Kieling (New Mexico Environment Department), *Request for Approval of an Interim Measure (Cover) at the Chemical Waste Landfill,* April 19, 2004.

This page intentionally left blank.

4.0 Mixed Waste Landfill

4.1 Introduction

The Mixed Waste Landfill (MWL) is a 2.6-acre Solid Waste Management Unit (SWMU) in the north-central portion of Technical Area (TA)-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). Low-level radioactive, hazardous, and mixed waste was disposed in the MWL from March 1959 through December 1988.

The Phase 1 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was completed in 1990 (SNL September 1990), and the Phase 2 RFI was completed in 1995 (Peace et al. 2002). The Phase 2 RFI confirmed tritium as the primary constituent of concern at the MWL. As directed by the New Mexico Environment Department (NMED), the MWL Corrective Measures Study (SNL May 2003) was submitted to the NMED. The NMED Secretary selected a vegetative cover with a biointrusion barrier (i.e., evapotranspirative [ET] cover) as the final remedy (NMED May 2005) and required a Corrective Measures Implementation (CMI) Plan (SNL November 2005). The MWL CMI Plan was approved by the NMED (Bearzi December 2008) and construction of the MWL ET cover was completed in 2009. The MWL CMI Report documenting cover construction in accordance with the CMI Plan was submitted to NMED (SNL January 2010) and approved (Bearzi October 2011).

As required by the NMED Final Order (NMED May 2005), the MWL Long-Term Monitoring and Maintenance Plan (LTMMP) (SNL March 2012) was submitted to the NMED and approved (Blaine January 2014). All LTMMP monitoring, maintenance, and reporting requirements were implemented upon NMED approval, including the installation of three multi-port soil-vapor monitoring wells (SNL January 2014) required to complete the LTMMP monitoring systems. After the Soil-Vapor Monitoring Well Installation Report (SNL September 2014) was approved by NMED (Kieling September 2014), the U.S. Department of Energy (DOE) and SNL/NM personnel requested a Certification of Completion for the MWL (Beausoleil September 2014) that was granted by the NMED (Cobrain October 2014).

In October 2014, DOE and SNL/NM personnel submitted a request to NMED for a Class 3 Permit Modification for Corrective Action Complete (CAC) with Controls at the MWL (Beausoleil October 2014). The associated regulatory process included two public comment periods, a public meeting held by DOE and SNL/NM personnel in November 2014, and a four-day public hearing held by NMED in July 2015. On March 13, 2016, the February 2016 NMED Final Order became effective (Flynn February 2016; Kieling February 2016), granting CAC with Controls status to the MWL and incorporating the MWL LTMMP into the RCRA Facility Operating Permit ([Permit], NMED January 2015). All controls required for the MWL, including groundwater monitoring, are defined in the MWL LTMMP and are comprehensively documented in MWL Annual Long-Term Monitoring and Maintenance (LTMM) Reports submitted to the NMED in June of each year. In Calendar Year (CY) 2017, the fourth MWL Annual LTMM Report (SNL June 2017a) was submitted to the NMED.

MWL groundwater monitoring results are directly compared to trigger levels defined in Table 5.2.4-1 of the MWL LTMMP, and subject to the trigger evaluation process defined in Figure 5.1-1 of the MWL LTMMP. The evaluation of MWL CY 2017 groundwater monitoring results will be presented in the *Mixed Waste Landfill Annual LTMM Report, April 2017 – March 2018*, which will be submitted to the NMED in June 2018.

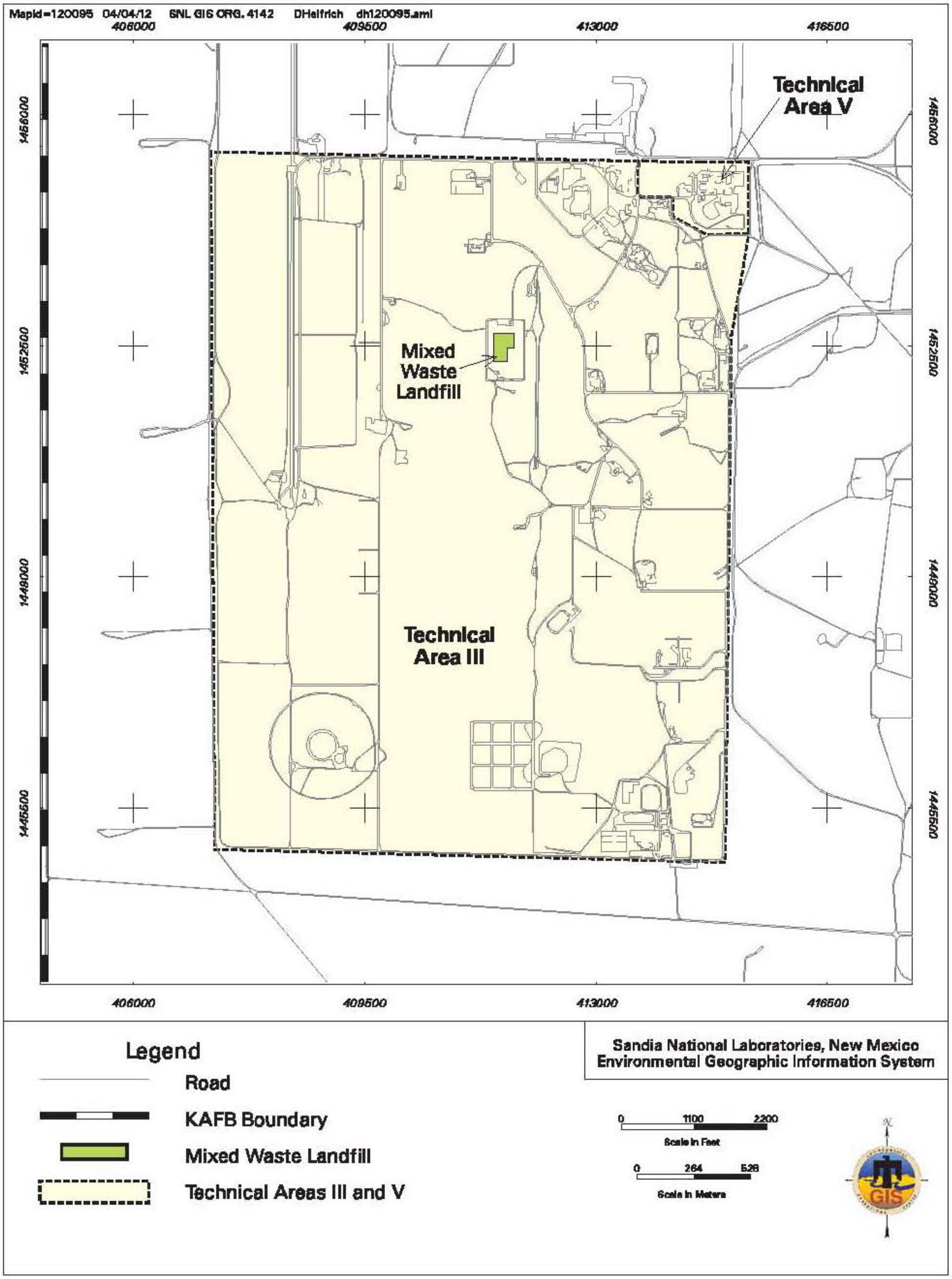


Figure 4-1. Location of the Mixed Waste Landfill within Technical Area-III

4.1.1 Monitoring History

The original MWL groundwater monitoring network was modified in 2008 due to the declining water table and corrosion of stainless steel well screens. Four original monitoring wells were plugged and abandoned (MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3), and four monitoring wells were installed (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9). The 2008 wells were constructed with Schedule 80 Polyvinyl chloride screens set across the water table of the Regional Aquifer and represent the NMED-approved groundwater monitoring network under the MWL LTMMP. Well MWL-MW4 was part of the original monitoring network, was completed at an angle of six degrees from vertical, and has two discrete screened intervals isolated by an inflatable packer. Wells MWL-MW5 and MWL-MW6 were also part of the original monitoring well network; their screen intervals are below the top of the Regional Aquifer.

Groundwater at the MWL has been extensively characterized and monitored since 1990 for major ion chemistry, volatile organic compounds (VOCs), semivolatile organic compounds, nitrate, metals, radionuclides, and perchlorate. More than 25 years of analytical data indicate that groundwater has not been contaminated by the MWL.

4.1.2 Monitoring Network

The current groundwater monitoring network at the MWL consists of seven wells listed in Table 4-1 and shown on Figure 4-2. In accordance with the MWL LTMMP, four of these wells comprise the MWL compliance groundwater monitoring network for the uppermost part of the Regional Aquifer (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9), and are sampled semiannually for various constituents. The remaining groundwater monitoring wells (MWL-MW4, MWL-MW5, and MWL-MW6) are retained for monitoring groundwater elevations; sampling of these deeper wells is not required under the MWL LTMMP.

Table 4-1. Mixed Waste Landfill Monitoring Well Network and Calendar Year 2017 Compliance Activities

Well ID	Installation Year	WQ[a]	WL[a]	Comment[b]
MWL-BW2	2008	✓	✓	Compliance well, sampled semiannually
MWL-MW4 [c]	1993		✓	Groundwater elevation only
MWL-MW5	2000		✓	Groundwater elevation only
MWL-MW6	2000		✓	Groundwater elevation only
MWL-MW7	2008	✓	✓	Compliance well, sampled semiannually
MWL-MW8	2008	✓	✓	Compliance well, sampled semiannually
MWL-MW9	2008	✓	✓	Compliance well, sampled semiannually

NOTES:

[a]Check marks indicate WQ sampling and WL measurements were completed.

[b]Requirements defined in the MWL LTMMP (SNL March 2012). Semiannual groundwater monitoring of compliance wells was conducted in April and October.

[c]Upper screen of monitoring well MWL-MW4 is monitored and represents uppermost portion of Regional Aquifer.

BW = Background Well.
ID = Identifier.
LTMMP = Long-Term Monitoring and Maintenance Plan.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
SNL = Sandia National Laboratories.
WL = Water level.
WQ = Water quality.

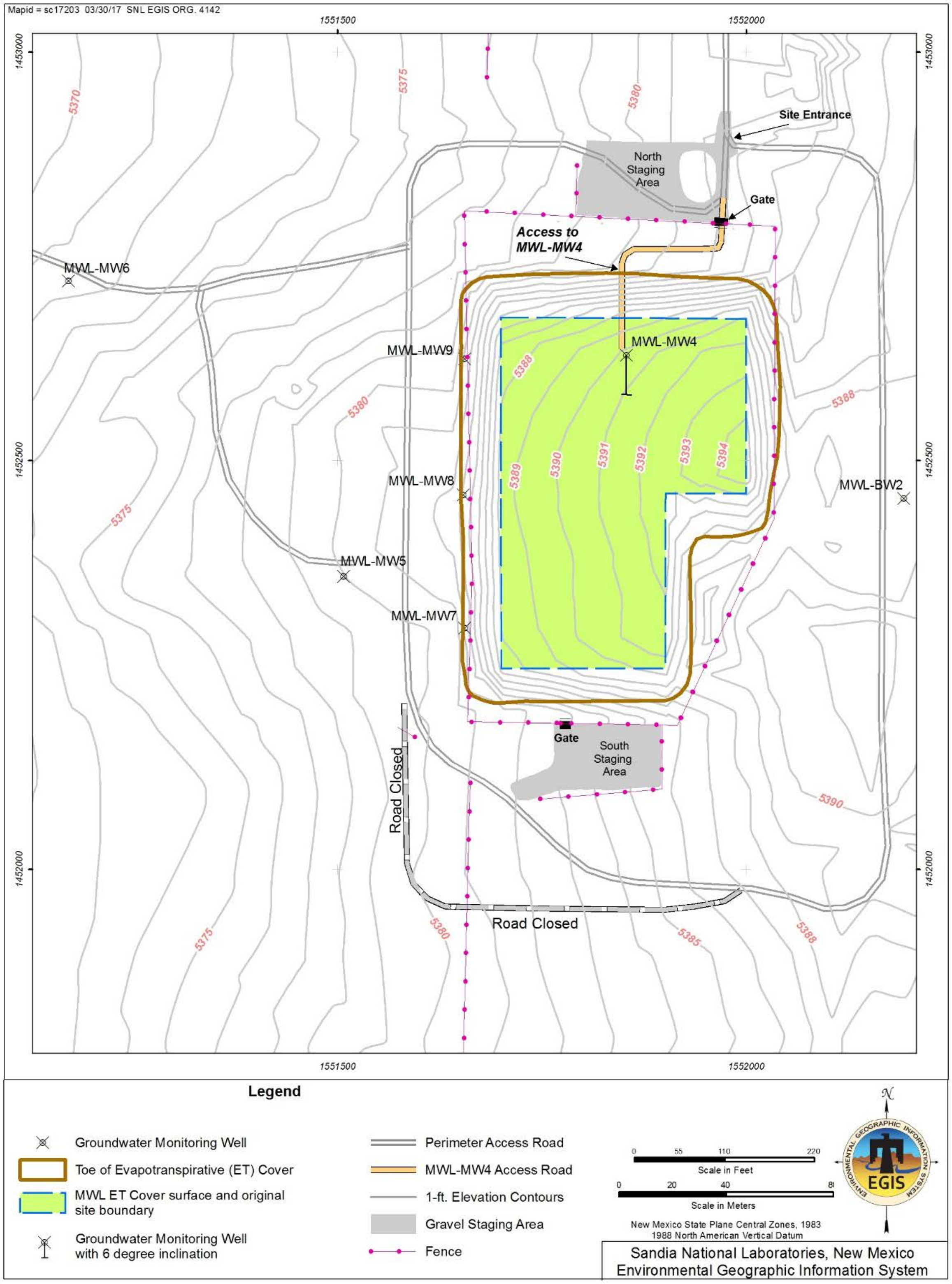


Figure 4-2. Location of Groundwater Monitoring Wells at the Mixed Waste Landfill

4.1.3 Conceptual Site Model

A detailed Conceptual Site Model (CSM) 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). An update to the CSM 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).

The upper surface of the Regional Aquifer (i.e., water table) at the MWL is contained within the interfingering, unconsolidated, fine-grained alluvial-fan deposits of the Santa Fe Group. The depth to water is approximately 500 feet (ft) below ground surface. The more transmissive, coarser-grained Ancestral Rio Grande sediments underlie the fine-grained alluvial deposits beneath the MWL.

Table 4-2 presents the data used to construct the October 2017 potentiometric surface map shown in Figure 4-3 for the MWL groundwater monitoring network. The groundwater elevation used for the upper screen interval of monitoring well MWL-MW4 was measured on November 6, 2017 after replacement of the inflatable packer on November 3, 2017. The general direction of groundwater flow beneath the MWL is to the west and northwest, towards the Rio Grande and away from the Manzanita Mountains. Figure 4-3 is consistent with the base-wide potentiometric surface map presented on Plate 1, which shows the potentiometric surface contours beneath TA-III generally trend north to south with the inferred groundwater flow direction being generally westward. 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 by creating 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 historically declined until 2016 as shown in Attachment 4A, Figures 4A-1 and 4A-2. The nearest water supply well, KAFB-4, is located approximately 3 miles north-northwest of the MWL.

Table 4-2. Groundwater Elevations Measured in October 2017 at Monitoring Wells Completed in the Regional Aquifer at the Mixed Waste Landfill

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)
MWL-BW2	5,391.02	2-Oct-2017	481.03	4,909.99
MWL-MW4[a]	5,391.70	6-Nov-2017	503.75	4,890.71[b]
MWL-MW5[c]	5,382.56	2-Oct-2017	493.55	4,889.01
MWL-MW6[c]	5,375.31	2-Oct-2017	487.20	4,888.11
MWL-MW7	5,383.30	2-Oct-2017	490.12	4,893.18
MWL-MW8	5,384.67	2-Oct-2017	491.69	4,892.98
MWL-MW9	5,381.91	2-Oct-2017	491.88	4,890.03

NOTES:

[a]Upper screen of monitoring well MWL-MW4 is monitored and represents the uppermost portion of Regional Aquifer.
[b]The groundwater elevation is calculated using a correction for the 6-degree angle of the well casing.
[c]MWL-MW5 and MWL-MW6 are screened below the water table and are not used for contouring.

amsl = Above mean sea level.
btoc = Below top of casing.
BW = Background Well.
ID = Identifier.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
NAVD = North American Vertical Datum of 1988.

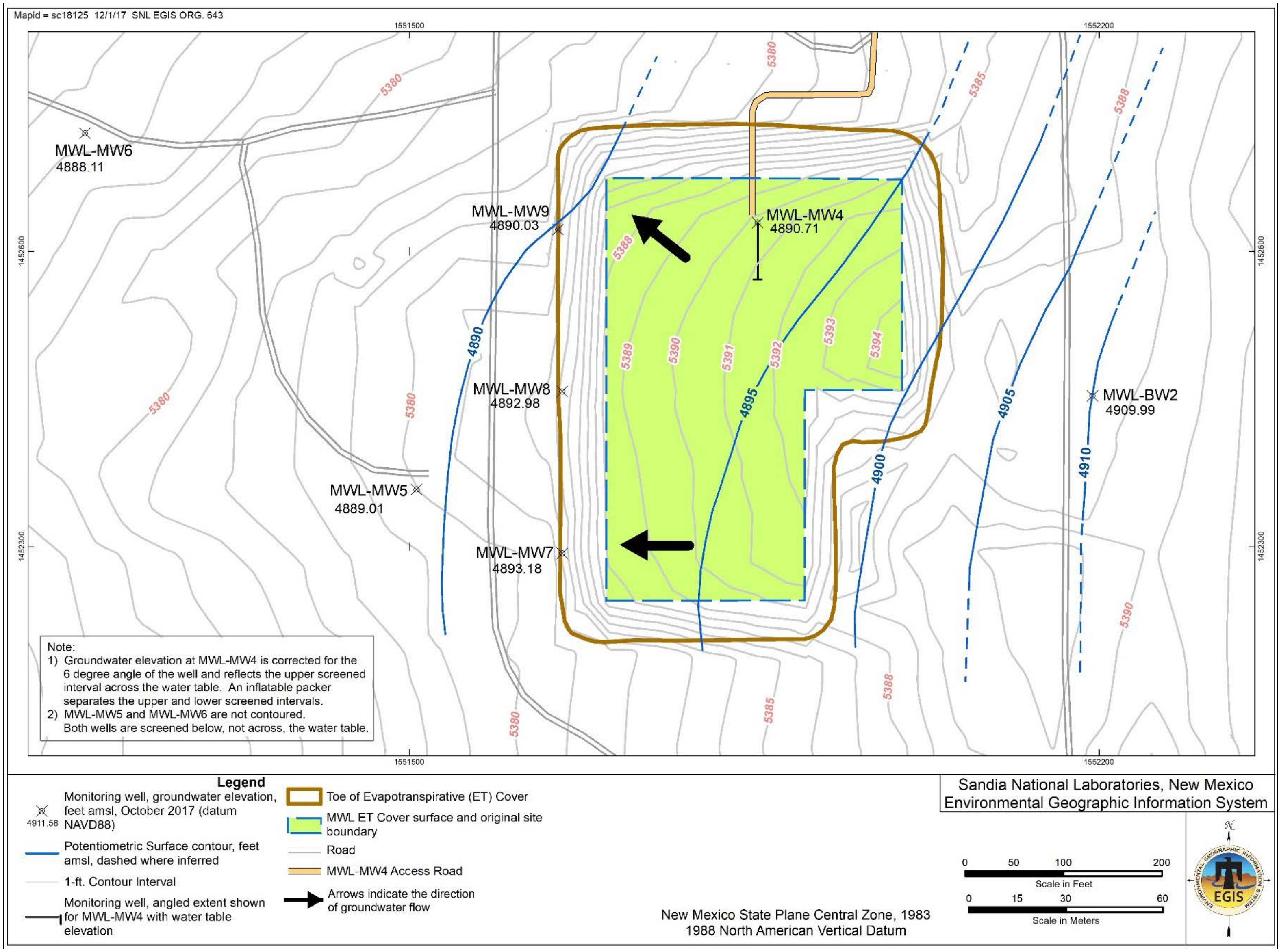


Figure 4-3. Localized Potentiometric Surface of the Regional Aquifer at the Mixed Waste Landfill, October 2017

In Attachment 4A, Figures 4A-1 and 4A-2 (hydrographs) show the rate of groundwater elevation decline at the existing MWL monitoring wells. Over the past two years the rate of decline has significantly slowed, and between 2015 and 2017 all wells except MWL-BW2 and MWL-MW4 showed an increase ranging from 0.11 to 0.53 ft. From October 2015 to October 2017, the groundwater elevation declined in well MWL-BW2 only 0.52 feet, and the groundwater elevation decline in well MWL-MW4 was 1.60 ft. This subtle water table rebound measured in the monitoring wells on the west side of the MWL has been observed in wells located farther north on KAFB and is most likely related to a relaxation in groundwater removal from the Regional Aquifer by the ABCWUA. 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 MWL 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

The MWL is regulated as SWMU 76 under the RCRA Permit, and corrective action at the MWL has been performed in accordance with the Compliance Order on Consent ([Consent Order] NMED April 2004). On March 13, 2016, the MWL corrective action process under the Consent Order was completed (i.e., the February 2016 NMED Final Order granting CAC with Controls status to the MWL became effective). All controls applicable to the MWL, including groundwater monitoring, are documented in the MWL LTMMP of the Permit.

Although radionuclides are being monitored and screened at the MWL, the information related to radionuclides is provided voluntarily by the DOE/National Nuclear Security Administration and SNL/NM personnel. 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 Consent Order.

4.3 Scope of Activities

Semiannual groundwater sampling was conducted in May and October 2017 at the MWL. Groundwater samples were collected from four monitoring wells (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) and analyzed for VOCs; metals including cadmium, chromium, nickel, and total uranium; specific radionuclides by gamma spectroscopy; gross alpha and gross beta activities; tritium; and radon-222.

Table 4-3 lists the analytical parameters and the MWL monitoring wells sampled. The CY 2017 sampling was conducted in accordance with MWL LTMMP requirements and procedures outlined in the *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2017, 3rd Quarter Sampling* (SNL April 2017) and the *Mixed Waste Landfill Groundwater Monitoring Mini-Sampling and Analysis Plan for Fiscal Year 2018, 1st Quarter Sampling* (SNL September 2017).

The MWL groundwater samples were submitted for analysis to GEL Laboratories, LLC 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 May 2009).

Field and laboratory quality control (QC) samples are discussed in Section 1.3.3. Field QC samples included duplicate environmental, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Laboratory QC analyses included method blank, laboratory control sample, matrix spike, matrix spike duplicate, and surrogate spike analyses.

Table 4-3. Analytical Parameters for the Mixed Waste Landfill Monitoring Wells, Calendar Year 2017

Analytical Parameter	Semiannual Event	
	May	**October**
VOCs	MWL-BW2 MWL-MW7 MWL-MW8 MWL-MW9 MWL-MW9 (duplicate)	MWL-BW2 MWL-MW7 MWL-MW8 MWL-MW8 (duplicate) MWL-MW9
Metals: Cadmium Chromium Nickel Uranium, total		
Radionuclides: Gamma Spectroscopy (short list[a]) Gross Alpha/Beta Activity Tritium Radon-222		

NOTES:
[a]Gamma spectroscopy short list includes americium-241, cesium-137, cobalt-60, and potassium-40.
BW = Background Well.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
VOC = Volatile organic compound.

4.4 Field Methods and Measurements

Groundwater sampling and depth-to-groundwater measurements were conducted in conformance with the MWL LTMMP and procedures specified in the *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plans* (SNL April 2017 and SNL September 2017), which are consistent with the methods described in Section 1.3. Water quality parameters measured in the field during the purging process include temperature, specific conductivity, oxidation-reduction potential (ORP), pH, and dissolved oxygen using an YSI™ Model EXO1 Water Quality Meter. Turbidity was measured with a Hach™ Model 2100Q turbidity meter. Attachment 4B, Table 4B-5 presents field water quality parameters and Attachment 4A, Figures 4A-1 and 4A-2 (hydrographs) present groundwater elevation measurements at the MWL monitoring wells.

As specified in MWL LTMMP, Appendix F, Section 3.4, purging requirements at the MWL include specifications for making a "best faith effort" to decrease flow rates such that low yield wells do not purge dry. These specifications include equipping the portable Bennett™ groundwater sampling system with small diameter tubing and a flow meter valve located along the discharge line. In addition, during the purging process at wells prone to purging dry, the flow rate is continually adjusted to achieve as low a flow rate as possible without causing the pump to be damaged or fail due to overheating. The purging volume requirement was achieved for all monitoring wells during CY 2017 sampling activities; no wells purged dry.

4.5 Analytical Methods

All groundwater samples were analyzed by the off-site laboratory using EPA-specified protocols as described in Section 1.3.2.

4.6 Summary of Analytical Results

Tables 4B-1, 4B-3, and 4B-4, present the analytical results for VOCs, metals, and radiological constituents, respectively. Table 4B-2 presents the laboratory method detection limits (MDLs) for the VOCs. Field water quality measurements are presented in Table 4B-5. Data qualifiers assigned by the analytical laboratory and the data validation process (SNL June 2014 and SNL June 2017b) are presented with the associated results in Tables 4B-1, 4B-3, and 4B-4.

For the purposes of this report, the CY 2017 analytical results were compared with established EPA MCLs where applicable. No detected constituents exceeded the respective MCLs. In addition, no results exceeded respective MWL trigger levels defined in Table 5.2.4-1 of the MWL LTMMP. The analytical results are discussed in detail in the following sections.

4.6.1 Volatile Organic Compounds

Table 4B-1 summarizes the CY 2017 analytical results for VOCs. Acetone was the only VOC detected above the MDL in any of the groundwater samples; it was detected in the October duplicate sample from MWL-MW8 at a concentration of 1.70 micrograms per liter. This result was qualified as not detected during data validation since this common laboratory contaminant was also detected in the associated EB sample; acetone was not detected in the associated MWL-MW8 environmental sample. Table 4B-2 presents the laboratory MDLs for VOCs.

4.6.2 Metals

Table 4B-3 summarizes the CY 2017 analytical results for cadmium, chromium, nickel, and total uranium. No metal concentrations were reported above established MCLs and all results are consistent with historical ranges.

4.6.3 Radiological Parameters

Table 4B-4 summarizes the CY 2017 analytical results for gamma-emitting radionuclides, gross alpha/beta activity, tritium, and radon-222. No radiological activities were reported above established EPA MCLs and all results are consistent with historical ranges.

Gross alpha activity is measured in accordance with 40 Code of Federal Regulations Part 141 and used as a radiological screening tool. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements are corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. MWL radiological results are further reviewed by an SNL/NM health physicist to screen results for radiological anomalies that could indicate potential contamination and to assure that the samples are nonradioactive prior to shipment. Corrected gross alpha activity results are below the MCL of 15 picocuries per liter. Gross beta results are used as a radiological screening tool; results do not indicate the presence of a beta-emitting radionuclide that would exceed the established MCL of 4 millirems per year. Tritium and gamma spectroscopy radionuclides activities were below the laboratory minimum detectable activity levels in all groundwater samples. All samples were determined as nonradioactive.

4.6.4 Water Quality Parameters

Table 4B-5 presents the field water quality parameters measured immediately before sampling at each well. These field parameters consist of temperature, specific conductivity, ORP, pH, turbidity, and dissolved oxygen.

4.7 Quality Control Results

Section 1.3.3 presents the purpose of each field and laboratory QC sample type. Field and laboratory QC sample results for MWL wells are discussed in the following sections.

4.7.1 Field Quality Control Samples

The QC samples collected in the field included environmental duplicate, EB, FB, and TB samples. Analytical results are discussed for each QC sample type in the following sections.

4.7.1.1 Environmental Duplicate Samples

Environmental duplicate samples were collected from monitoring wells MWL-MW9 (May) and MWL-MW8 (October) and analyzed for all constituents. The results for the environmental sample were compared to the results for the corresponding environmental duplicate sample. The relative percent difference (RPD) was calculated for constituents that were detected above the laboratory MDL in both samples.

CY 2017 sample pair (environmental sample and environmental duplicate sample) results show good correlation, with calculated RPD values ranging from 3 to 6. Total uranium was the only constituent detected above the laboratory MDL in both sample pairs. Calculated RPD values are within the acceptable range of less than or equal to 35 for metals as defined in Appendix F of the MWL LTMMP.

4.7.1.2 Equipment Blank Samples

One EB sample (also referred to as a rinsate blank) associated with monitoring well MWL-MW7 (May) and one EB sample associated with monitoring well MWL-MW8 (October) were collected during the CY 2017 sampling events and submitted for all analyses.

No constituents were detected in the May EB sample. Acetone and toluene were detected in the October EB sample at low concentrations. Acetone in the MWL-MW8 environmental duplicate sample result was qualified as not detected during data validation since the acetone concentration was less than 10 times the EB concentration. No corrective action was required for toluene because it was not detected in the associated MWL-MW8 environmental samples. Both acetone and toluene are common laboratory contaminants.

4.7.1.3 Field Blank Samples

Ten FB samples (five in May, five in October) were collected during the CY 2017 sampling events and submitted for VOC analysis. No VOCs were detected in the May FB samples. For the October FB samples, acetone was detected in the FB sample associated with MWL-MW7. No corrective action was required for the October FB sample result because acetone was not detected in the associated MWL-MW7 environmental sample.

4.7.1.4 Trip Blank Samples

Twelve TB samples (six in April, six in October) were submitted with the CY 2017 samples for analysis of VOCs. No VOCs were detected in these TB samples.

4.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including laboratory control samples, replicates, matrix spikes, matrix spike duplicates, and surrogate spike samples were analyzed concurrently with the groundwater samples. There were no significant data quality issues identified with the laboratory QC sample results associated with the May and October sampling events.

4.8 Variances and Nonconformances

All analytical and field methods were performed according to the requirements specified in the MWL LTMMP and associated Mini-Sampling and Analysis Plans. There were no variances and/or nonconformances from requirements during CY 2017 sampling activities as defined in the MWL LTMMP, Appendix F, Section 6.

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 June 2014 and SNL June 2017b). All data were in compliance with analytical methods and laboratory procedures.

4.9 Summary and Conclusions

During CY 2017, groundwater samples were collected from the MWL compliance groundwater monitoring wells (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) in May and October in conformance with the MWL LTMMP. Groundwater samples were analyzed for VOCs; metals including cadmium, chromium, nickel, and total uranium; specific radionuclides by gamma spectroscopy; gross alpha and gross beta activities; tritium; and radon-222. Based on the field and laboratory QC sample and data validation results, the CY 2017 groundwater monitoring data meet data quality objectives and are in compliance with analytical methods and laboratory procedures. No analytes were detected at concentrations exceeding established MCLs or MWL trigger levels defined in Table 5.2.4-1 of the MWL LTMMP.

4.10 Summary of Future Activities

All monitoring, inspection, and maintenance requirements will continue to be performed and documented as required by the MWL LTMMP. Groundwater monitoring of the four compliance wells will continue on a semiannual basis and results will be documented in both comprehensive MWL Annual LTMM Reports (submitted to NMED in June of each year) and in future Annual Groundwater Monitoring Reports.

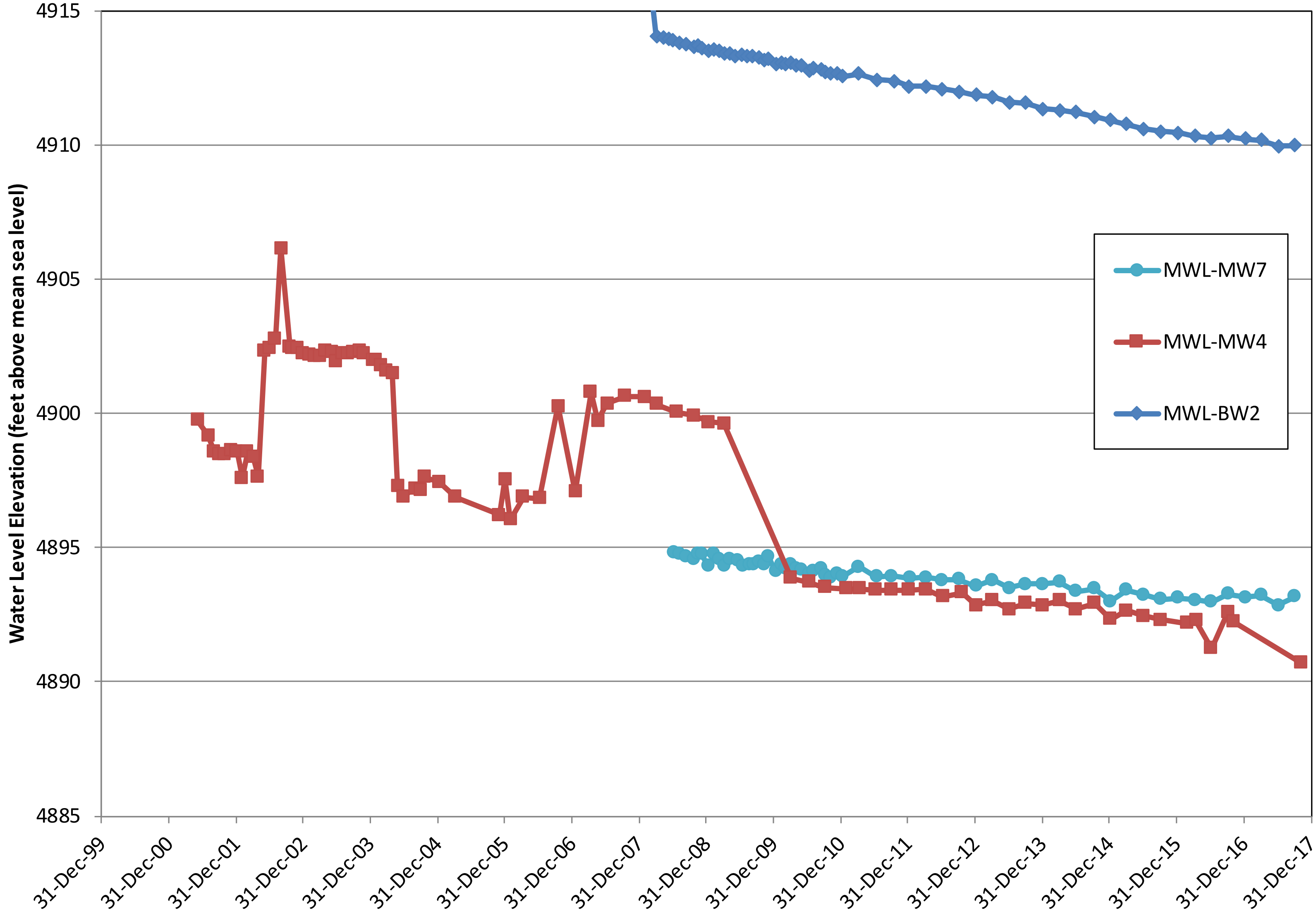
This page intentionally left blank.

Attachment 4A
Mixed Waste Landfill
Hydrographs

This page intentionally left blank.

Attachment 4A Hydrographs

This page intentionally left blank.



Note: GW Elevation corrected for 6°angle for MWL-MW4

Figure 4A-1. MWL Groundwater Monitoring Wells (1 of 2)

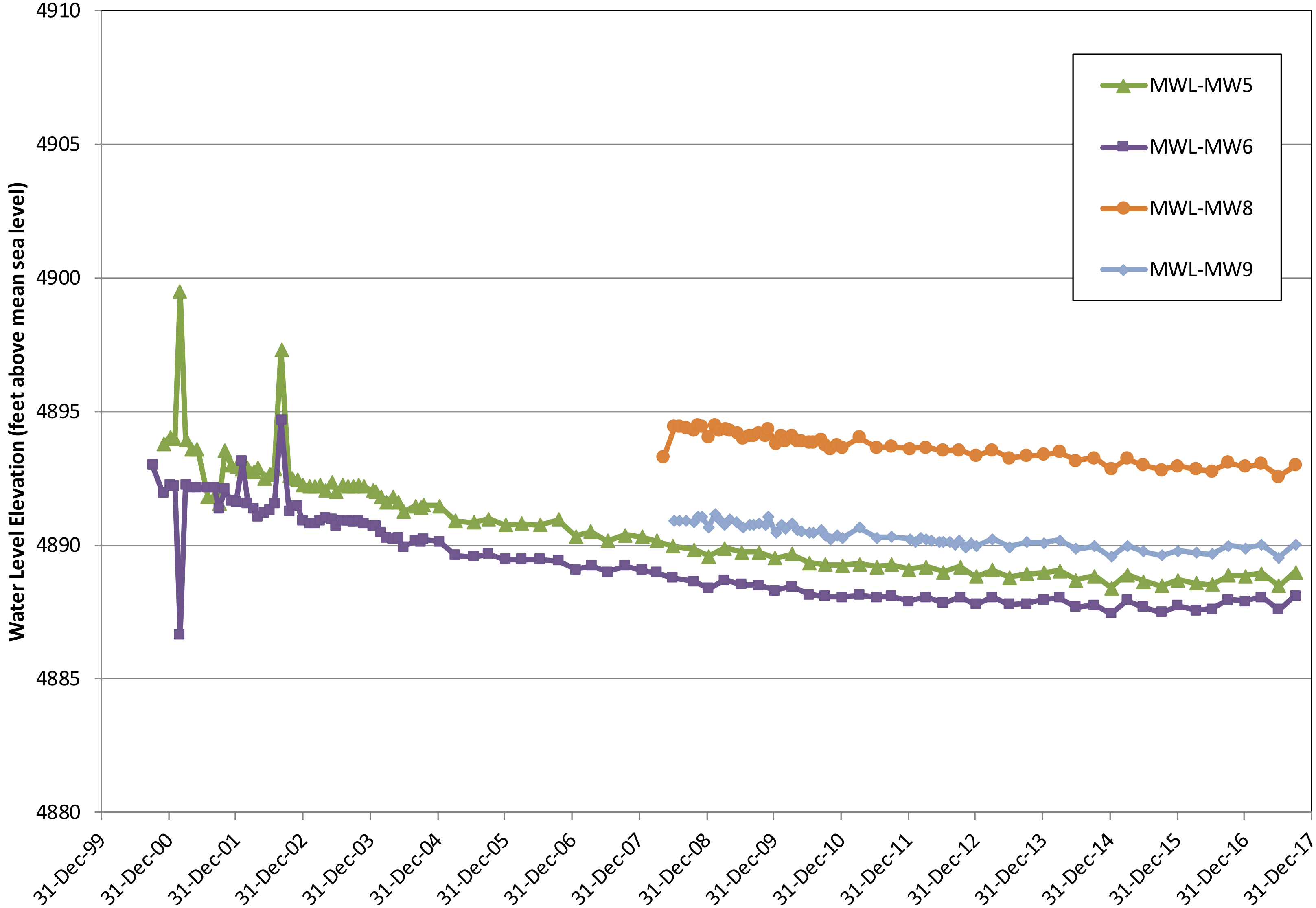


Figure 4A-2. MWL Groundwater Monitoring Wells (2 of 2)

Attachment 4B
Mixed Waste Landfill
Analytical Results Tables

This page intentionally left blank.

Attachment 4B Tables

This page intentionally left blank.

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

Calendar Year 2017

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-MW8 (duplicate) 24-Oct-17	Acetone	1.70	1.50	10.0	NE	J	10U	103895-001	SW846-8260B

Refer to footnotes on page 4B-13.

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

Calendar Year 2017

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300
1,1,2,2-Tetrachloroethane	0.300
1,1,2-Trichloroethane	0.300
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.300
1,2-Dichloropropane	0.300
2-Butanone	1.50
2-Hexanone	1.50
4-methyl-, 2-Pentanone	1.50
Acetone	1.50
Benzene	0.300
Bromodichloromethane	0.300
Bromoform	0.300
Bromomethane	0.300
Carbon disulfide	1.50
Carbon tetrachloride	0.300
Chlorobenzene	0.300
Chloroethane	0.300
Chloroform	0.300
Chloromethane	0.300
Dibromochloromethane	0.300
Dichlorodifluoromethane	0.300
Ethyl benzene	0.300
Methylene chloride	1.00
Styrene	0.300
Tetrachloroethene	0.300
Toluene	0.300
Trichloroethene	0.300
Vinyl acetate	1.50
Vinyl chloride	0.300
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.300
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 4B-13.

Table 4B-3
Summary of Cadmium, Chromium, Nickel, and Uranium Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Cadmium	ND	0.0003	0.001	0.005	U		102593-002	SW846-6020
02-May-17	Chromium	ND	0.003	0.010	0.10	U		102593-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		102593-002	SW846-6020
	Uranium	0.00675	0.000067	0.0002	0.030			102593-002	SW846-6020
MWL-MW7	Cadmium	ND	0.0003	0.001	0.005	U		102602-002	SW846-6020
04-May-17	Chromium	ND	0.003	0.010	0.10	U		102602-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		102602-002	SW846-6020
	Uranium	0.00759	0.000067	0.0002	0.030			102602-002	SW846-6020
MWL-MW8	Cadmium	ND	0.0003	0.001	0.005	U		102609-002	SW846-6020
08-May-17	Chromium	ND	0.003	0.010	0.10	U		102609-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		102609-002	SW846-6020
	Uranium	0.0071	0.000067	0.0002	0.030			102609-002	SW846-6020
MWL-MW9	Cadmium	ND	0.0003	0.001	0.005	U		102598-002	SW846-6020
03-May-17	Chromium	ND	0.003	0.010	0.10	U		102598-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		102598-002	SW846-6020
	Uranium	0.00932	0.000067	0.0002	0.030			102598-002	SW846-6020
MWL-MW9 (Duplicate)	Cadmium	ND	0.0003	0.001	0.005	U		102599-002	SW846-6020
03-May-17	Chromium	ND	0.003	0.010	0.10	U		102599-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		102599-002	SW846-6020
	Uranium	0.00902	0.000067	0.0002	0.030			102599-002	SW846-6020
MWL-BW2	Cadmium	ND	0.0003	0.001	0.005	U		103885-002	SW846-6020
17-Oct-17	Chromium	ND	0.003	0.010	0.10	U		103885-002	SW846-6020
	Nickel	0.00157	0.0006	0.002	NE	J		103885-002	SW846-6020
	Uranium	0.00697	0.000067	0.0002	0.030			103885-002	SW846-6020
MWL-MW7	Cadmium	ND	0.0003	0.001	0.005	U		103888-002	SW846-6020
23-Oct-17	Chromium	ND	0.003	0.010	0.10	U		103888-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		103888-002	SW846-6020
	Uranium	0.00745	0.000067	0.0002	0.030			103888-002	SW846-6020
MWL-MW8	Cadmium	ND	0.0003	0.001	0.005	U		103894-002	SW846-6020
24-Oct-17	Chromium	ND	0.003	0.010	0.10	U		103894-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		103894-002	SW846-6020
	Uranium	0.00733	0.000067	0.0002	0.030			103894-002	SW846-6020

Refer to footnotes on page 4B-13.

Table 4B-3 *(Concluded)*
Summary of Cadmium, Chromium, Nickel, and Uranium Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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) 24-Oct-17	Cadmium	ND	0.0003	0.001	0.005	U		103895-002	SW846-6020
	Chromium	ND	0.003	0.010	0.10	U		103895-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		103895-002	SW846-6020
	Uranium	0.00776	0.000067	0.0002	0.030			103895-002	SW846-6020
MWL-MW9 18-Oct-17	Cadmium	ND	0.0003	0.001	0.005	U		103891-002	SW846-6020
	Chromium	ND	0.003	0.010	0.10	U		103891-002	SW846-6020
	Nickel	0.00143	0.0006	0.002	NE	J		103891-002	SW846-6020
	Uranium	0.00925	0.000067	0.0002	0.030			103891-002	SW846-6020

Refer to footnotes on page 4B-13.

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

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2	Americium-241	-5.44 ± 16.4	19.0	9.25	NE	U	BD	102593-003	EPA 901.1
02-May-17	Cesium-137	-1.2 ± 3.30	3.74	1.78	NE	U	BD	102593-003	EPA 901.1
	Cobalt-60	0.609 ± 3.02	3.94	1.84	NE	U	BD	102593-003	EPA 901.1
	Potassium-40	14.8 ± 60.3	33.0	15.2	NE	U	BD	102593-003	EPA 901.1
	Gross Alpha	6.38	NA	NA	15 pCi/L	NA	None	102593-004	EPA 900.0
	Gross Beta	5.54 ± 1.26	1.17	0.564	4mrem/yr			102593-004	EPA 900.0
	Tritium	7.93 ± 82.4	147	68.6	4mrem/yr	U	BD	102593-005	EPA 906.0
	Radon-222	412 ± 105	59.0	27.8	1000 pCi/L			102593-006	SM7500 Rn B
MWL-MW7	Americium-241	0.0778 ± 7.43	12.9	6.27	NE	U	BD	102602-003	EPA 901.1
04-May-17	Cesium-137	0.487 ± 1.55	2.79	1.32	NE	U	BD	102602-003	EPA 901.1
	Cobalt-60	2.09 ± 1.83	3.07	1.43	NE	U	BD	102602-003	EPA 901.1
	Potassium-40	8.59 ± 36.8	26.4	12.2	NE	U	BD	102602-003	EPA 901.1
	Gross Alpha	8.01	NA	NA	15 pCi/L	NA	None	102602-004	EPA 900.0
	Gross Beta	5.93 ± 1.58	1.37	0.662	4mrem/yr			102602-004	EPA 900.0
	Tritium	-5.79 ± 82.6	150	69.7	4mrem/yr	U	BD	102602-005	EPA 906.0
	Radon-222	205 ± 58.9	47.7	22.4	1000 pCi/L			102602-006	SM7500 Rn B
MWL-MW8	Americium-241	0.579 ± 15.4	23.8	11.5	NE	U	BD	102609-003	EPA 901.1
08-May-17	Cesium-137	1.08 ± 1.87	3.26	1.55	NE	U	BD	102609-003	EPA 901.1
	Cobalt-60	0.338 ± 1.77	3.10	1.42	NE	U	BD	102609-003	EPA 901.1
	Potassium-40	24.4 ± 45.4	29.3	13.4	NE	U	BD	102609-003	EPA 901.1
	Gross Alpha	4.36	NA	NA	15 pCi/L	NA	None	102609-004	EPA 900.0
	Gross Beta	5.04 ± 1.32	1.36	0.657	4mrem/yr			102609-004	EPA 900.0
	Tritium	24.2 ± 83.5	147	68.4	4mrem/yr	U	BD	102609-005	EPA 906.0
	Radon-222	120 ± 60.6	84.5	39.9	1000 pCi/L		J	102609-006	SM7500 Rn B
MWL-MW9	Americium-241	4.10 ± 10.0	16.8	8.13	NE	U	BD	102598-003	EPA 901.1
03-May-17	Cesium-137	-1.3 ± 1.86	2.93	1.37	NE	U	BD	102598-003	EPA 901.1
	Cobalt-60	1.21 ± 2.06	3.85	1.77	NE	U	BD	102598-003	EPA 901.1
	Potassium-40	12.2 ± 49.2	31.4	14.1	NE	U	BD	102598-003	EPA 901.1
	Gross Alpha	4.06	NA	NA	15 pCi/L	NA	None	102598-004	EPA 900.0
	Gross Beta	6.62 ± 1.39	1.10	0.532	4mrem/yr			102598-004	EPA 900.0
	Tritium	-1.18 ± 79.8	144	67.1	4mrem/yr	U	BD	102598-005	EPA 906.0
	Radon-222	509 ± 125	56.8	26.7	1000 pCi/L			102598-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

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

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW9 (Duplicate)	Americium-241	-0.414 ± 6.48	11.2	5.44	NE	U	BD	102599-003	EPA 901.1
03-May-17	Cesium-137	-0.365 ± 1.77	3.00	1.41	NE	U	BD	102599-003	EPA 901.1
	Cobalt-60	-0.181 ± 1.68	3.02	1.38	NE	U	BD	102599-003	EPA 901.1
	Potassium-40	-39.2 ± 46.1	47.3	22.4	NE	U	BD	102599-003	EPA 901.1
	Gross Alpha	6.46	NA	NA	15 pCi/L	NA	None	102599-004	EPA 900.0
	Gross Beta	6.59 ± 1.39	1.14	0.551	4mrem/yr			102599-004	EPA 900.0
	Tritium	30.2 ± 81.6	142	66.3	4mrem/yr	U	BD	102599-005	EPA 906.0
	Radon-222	450 ± 112	56.9	26.7	1000 pCi/L			102599-006	SM7500 Rn B
MWL-BW2	Americium-241	-5.66 ± 15.9	25.7	12.4	NE	U	BD	103885-003	EPA 901.1
17-Oct-17	Cesium-137	-1.29 ± 2.23	3.63	1.69	NE	U	BD	103885-003	EPA 901.1
	Cobalt-60	-1.08 ± 3.71	4.06	1.82	NE	U	BD	103885-003	EPA 901.1
	Potassium-40	5.27 ± 54.9	65.1	30.5	NE	U	BD	103885-003	EPA 901.1
	Gross Alpha	4.57	NA	NA	15 pCi/L	NA	None	103885-004	EPA 900.0
	Gross Beta	4.13 ± 0.959	0.794	0.377	4mrem/yr		J	103885-004	EPA 900.0
	Tritium	-80.3 ± 98.3	175	84.8	4mrem/yr	U	BD	103885-005	EPA 906.0
	Radon-222	379 ± 92.7	47.2	22.5	1000 pCi/L			103885-006	SM7500 Rn B
MWL-MW7	Americium-241	-7.34 ± 15.6	23.4	11.3	NE	U	BD	103888-003	EPA 901.1
23-Oct-17	Cesium-137	0.250 ± 1.95	3.38	1.59	NE	U	BD	103888-003	EPA 901.1
	Cobalt-60	0.0962 ± 1.93	3.53	1.61	NE	U	BD	103888-003	EPA 901.1
	Potassium-40	-9.0 ± 37.4	49.9	23.4	NE	U	BD	103888-003	EPA 901.1
	Gross Alpha	3.39	NA	NA	15 pCi/L	NA	None	103888-004	EPA 900.0
	Gross Beta	5.66 ± 1.18	0.781	0.371	4mrem/yr		J	103888-004	EPA 900.0
	Tritium	-89.1 ± 104	185	89.6	4mrem/yr	U	BD	103888-005	EPA 906.0
	Radon-222	174 ± 62.5	69.2	32.4	1000 pCi/L		J	103888-006	SM7500 Rn B
MWL-MW8	Americium-241	0.311 ± 14.7	23.9	11.6	NE	U	BD	103894-003	EPA 901.1
24-Oct-17	Cesium-137	-0.0501 ± 2.05	3.51	1.66	NE	U	BD	103894-003	EPA 901.1
	Cobalt-60	0.261 ± 1.83	3.43	1.57	NE	U	BD	103894-003	EPA 901.1
	Potassium-40	-70.7 ± 54.7	40.5	18.8	NE	U	BD	103894-003	EPA 901.1
	Gross Alpha	10.99	NA	NA	15 pCi/L	NA	None	103894-004	EPA 900.0
	Gross Beta	4.71 ± 1.02	0.767	0.365	4mrem/yr		J	103894-004	EPA 900.0
	Tritium	61.4 ± 106	179	86.9	4mrem/yr	U	BD	103894-005	EPA 906.0
	Radon-222	145 ± 52.3	58.0	27.2	1000 pCi/L		J	103894-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

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

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW8 (Duplicate)	Americium-241	1.06 ± 8.95	14.7	7.10	NE	U	BD	103895-003	EPA 901.1
24-Oct-17	Cesium-137	1.39 ± 1.76	3.04	1.43	NE	U	BD	103895-003	EPA 901.1
	Cobalt-60	0.895 ± 1.92	3.55	1.64	NE	U	BD	103895-003	EPA 901.1
	Potassium-40	-14.1 ± 35.9	46.1	21.7	NE	U	BD	103895-003	EPA 901.1
	Gross Alpha	6.40	NA	NA	15 pCi/L	NA	None	103895-004	EPA 900.0
	Gross Beta	5.06 ± 1.09	0.760	0.361	4mrem/yr		J	103895-004	EPA 900.0
	Tritium	12.3 ± 104	180	87.1	4mrem/yr	U	BD	103895-005	EPA 906.0
	Radon-222	201 ± 62.6	58.1	27.2	1000 pCi/L			103895-006	SM7500 Rn B
MWL-MW9	Americium-241	-9.68 ± 16.6	24.5	11.8	NE	U	BD	103891-003	EPA 901.1
18-Oct-17	Cesium-137	0.856 ± 2.32	4.05	1.91	NE	U	BD	103891-003	EPA 901.1
	Cobalt-60	-0.898 ± 2.61	4.10	1.87	NE	U	BD	103891-003	EPA 901.1
	Potassium-40	-5.04 ± 40.2	52.3	24.3	NE	U	BD	103891-003	EPA 901.1
	Gross Alpha	0.54	NA	NA	15 pCi/L	NA	None	103891-004	EPA 900.0
	Gross Beta	5.54 ± 1.19	0.895	0.428	4mrem/yr		J	103891-004	EPA 900.0
	Tritium	-47.7 ± 104	182	88.4	4mrem/yr	U	BD	103891-005	EPA 906.0
	Radon-222	356 ± 85.7	39.5	18.9	1000 pCi/L			103891-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

Table 4B-5
Summary of Field Water Quality Measurements[h], Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	02-May-17	21.35	705.9	132.9	7.42	3.62	39.9	3.52
MWL-MW7	04-May-17	21.22	592.3	187.1	7.64	1.22	71.6	6.35
MWL-MW8	08-May-17	22.19	629.3	148.5	7.56	1.63	22.6	2.00
MWL-MW9	03-May-17	21.36	598.4	132.1	7.55	0.49	13.7	1.20
MWL-BW2	17-Oct-17	20.85	675.0	140.2	7.29	3.72	38.0	3.39
MWL-MW7	23-Oct-17	20.91	561.4	107.7	7.48	1.18	73.6	6.54
MWL-MW8	24-Oct-17	19.20	550.0	175.1	7.42	0.91	23.1	2.15
MWL-MW9	18-Oct-17	22.91	599.1	253.9	7.28	0.46	15.9	1.34

Refer to footnotes on page 4B-13.

Footnotes for Mixed Waste Landfill Groundwater Analytical Results Tables

%	= Percent.
BW	= Background well.
CFR	= Code of Federal Regulations.
EPA	= U.S. Environmental Protection Agency.
ID	= Identifier.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
mrem/yr	= Millirem per year.
MW	= Monitoring well.
MWL	= Mixed Waste Landfill.
No.	= Number.
pCi/L	= Picocuries per liter.

[a]Result or Activity

Result applies to Table 4B-1 through 4B-3.

Activity applies to Table 4B-4. Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Part 141). Activities of zero or less are considered to be not detected.

Bold = Value exceed the established MCL.

ND = not detected (at method detection limit).

[b]MDL or MDA

The MDL applies to Table 4B-1 through 4B-3. MDA applies to Table 4B-4.

MDA = The minimal 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.

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 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

The PQL applies to Table 4B-1 through 4B-3. Critical Level applies to Table 4B-4.

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

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 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

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).

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 Part 141).
- 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

[e]Lab Qualifier

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

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.

Footnotes for Mixed Waste Landfill Groundwater Analytical Results 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.

[g]Analytical Method

EPA, 1986, (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed.

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

Standard Methods for the Examination of Water and Wastewater, SM7500-Rn B Method, 22nd Edition, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C., 1988.

SM = Standard Method.

[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).

Chapter 4
Mixed Waste Landfill
References

This page intentionally left blank.

Bearzi October 2011 Bearzi, J.P. (New Mexico Environment Department), October 2011. Letter to P. Wagner (U.S. Department of Energy NNSA/Sandia Site Office) and S.A. Orrell (Sandia National Laboratories, New Mexico), *Notice of Approval, Mixed Waste Landfill Corrective Measures Implementation Report, January 2010, Sandia National Laboratories, EPA ID# NM5890110518, SNL-10-005,* October 14, 2011.

Bearzi December 2008 Bearzi, J.P. (New Mexico Environment Department), December 2008. Letter to K. Davis (U.S. Department of Energy) and F. Nimick (Sandia Corporation), *Conditional Approval, Mixed Waste Landfill Corrective Measures Implementation Plan, November 2005, Sandia National Laboratories NM5890110518, SNL-05-025,* December 22, 2008.

Beausoleil October 2014 Beausoleil, G. L. (U.S. Department of Energy), October 2014. Letter to J.E. Kieling (New Mexico Environment Department Hazardous Waste Bureau), *Request for Class 3 Modification to Module IV of Hazardous Waste Permit for Sandia National Laboratories/New Mexico, EPA ID NM5890110518, New Mexico*, October 17, 2014.

Beausoleil September 2014 Beausoleil, G. L. (U.S. Department of Energy), September 2014. Letter to J.E. Kieling (New Mexico Environment Department Hazardous Waste Bureau), *Department of Energy/National Nuclear Security Administration Sandia Corporation Request for Certificate of Completion for the Mixed Waste Landfill at Sandia National Laboratories, New Mexico,* September 25, 2014.

Blaine January 2014 Blaine, T. (New Mexico Environment Department), January 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan, March 2012, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-12-007,* January 8, 2014.

Cobrain October 2014 Cobrain, D. (New Mexico Environment Department), October 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and S.A. Orrell (Sandia National Laboratories, New Mexico), *Certificate of Completion for the Mixed Waste Landfill, September 25, 2014, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-MISC,* October 8, 2014.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations,* EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C..

Flynn February 2016 Flynn, R. (New Mexico Environment Department), February 2016. *Final Order, State of New Mexico Before the Secretary of the Environment in the Matter of Proposed Permit Modification for Sandia National Laboratories, EPA ID # 5890110518, To Determine Corrective Action Complete with Controls at the Mixed Waste Landfill, No. HWB 15-18(P),* February 12, 2016.

Goering et al. 2002 Goering, T.J., G.M. Haggerty, D. Van Hart, and J.L. Peace, 2002. *Mixed Waste Landfill Groundwater Report, 1990 through 2001, Sandia National Laboratories, Albuquerque, New Mexico,* SAND2002-4098, Sandia National Laboratories, Albuquerque, New Mexico.

Kieling February 2016 Kieling, J.E. (New Mexico Environment Department), February 2016. Letter to J.P. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Final Decision on Proposal to Grant Corrective Action Complete with Controls Status for Mixed Waste Landfill, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-014,* February 18, 2016.

Kieling September 2014 Kieling, J.E. (New Mexico Environment Department), September 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Installation of Three FLUTe™ Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill, September 2014, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-012,* September 25, 2014.

NMED January 2015 New Mexico Environment Department (NMED), January 2015. *Resource Conservation and Recovery Act Facility Operating Permit EPA ID Number NM5890110518 Issued to the U.S. Department of Energy/Sandia Corporation for the Sandia National Laboratories Hazardous and Mixed Waste Treatment and Storage Units and Post-Closure Care of the Corrective Action Management Unit*, New Mexico Environment Department, Santa Fe, New Mexico, January 27, 2015.

NMED May 2005 New Mexico Environment Department (NMED), May 2005. *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, Sandia National Laboratories, Bernalillo County, New Mexico, EPA ID #5890110518,* New Mexico Environment Department, Santa Fe, New Mexico, May 26, 2005.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

Peace et al. 2002 Peace, J.L., T.J. Goering, and M.D. McVey, 2002. *Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation, Sandia National Laboratories, Albuquerque, New Mexico,* SAND Report SAND2002-2997, prepared by Sandia National Laboratories, Albuquerque, New Mexico for the U.S. Department of Energy under Contract DE-AC04-94AL85000, September.

SNL September 2017 Sandia National Laboratories, New Mexico (SNL/NM), September 2017. *Mixed Waste Landfill Groundwater Monitoring Mini-Sampling and Analysis Plan for Fiscal Year 2018, 1st Quarter Sampling*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2017a Sandia National Laboratories, New Mexico (SNL/NM), June 2017a. *Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, April 2016 – March 2017,* Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2017b Sandia National Laboratories, New Mexico (SNL/NM), June 2017b. *Data Validation Procedure for Chemical and Radiochemical Data,* AOP 00-03, Revision 5, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2017 Sandia National Laboratories, New Mexico (SNL/NM), March 2017. *Mixed Waste Landfill Groundwater Monitoring Mini-Sampling and Analysis Plan for Fiscal Year 2017, 3rd Quarter Sampling,* Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2014 Sandia National Laboratories, New Mexico (SNL/NM), September 2014. *Installation of Three FLUTe™ Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2014 Sandia National Laboratories, New Mexico (SNL/NM), June 2014. *Data Validation Procedure for Chemical and Radiochemical Data*, AOP 00-03, Revision 4, Sample Management Office, Sandia National Laboratories, Albuquerque, New Mexico, June 16, 2014.

SNL January 2014 Sandia National Laboratories, New Mexico (SNL/NM), January 2014. *Work Plan for the Installation of Three Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2012 Sandia National Laboratories/New Mexico (SNL/NM), March 2012. *Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2010 Sandia National Laboratories, New Mexico (SNL/NM), June 2010. *Mixed Waste Landfill Annual Groundwater Monitoring Report, Calendar Year 2009*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2010 Sandia National Laboratories, New Mexico (SNL/NM), January 2010, Revision 1, *Mixed Waste Landfill Corrective Measures Implementation Report,* Environmental Restoration Project, Sandia National Laboratories, New Mexico.

SNL November 2005 Sandia National Laboratories, New Mexico (SNL/NM), November 2005. *Mixed Waste Landfill Corrective Measures Implementation Plan*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL May 2003 Sandia National Laboratories, New Mexico (SNL/NM), May 2003. *Mixed Waste Landfill Corrective Measures Study*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, May 21, 2003.

SNL September 1990 Sandia National Laboratories, New Mexico (SNL/NM), September 1990. *Report of the Phase 1 RCRA Facility Investigation of the Mixed Waste Landfill*, Environmental Impact and Restoration Division, Sandia National Laboratories, Albuquerque, New Mexico.

5.0 Technical Area-V Groundwater Area of Concern

5.1 Introduction

Trichloroethene (TCE) and nitrate have been identified as constituents of concern (COCs) in groundwater at the Technical Area-V Groundwater (TAVG) Area of Concern (AOC) based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) in samples collected from monitoring wells. The EPA MCLs and State of New Mexico drinking water standards for TCE and nitrate are 5 micrograms per liter (μg/L) and 10 milligrams per liter (mg/L) (as nitrogen), respectively. Since 1993, the maximum concentrations detected in groundwater at the TAVG AOC have been 26 μg/L of TCE and 19 mg/L of nitrate (as nitrogen). Unique features of the TAVG AOC include low concentrations of TCE and nitrate in an alluvial aquifer that is approximately 500 feet (ft) below ground surface (bgs).

5.1.1 Location

Technical Area (TA)-V is located in the west-central portion of Kirtland Air Force Base (KAFB), south of the City of Albuquerque (Figure 5-1; Plate 1). TA-V occupies approximately 35 acres in the northeast corner of TA-III at Sandia National Laboratories, New Mexico (SNL/NM).

The vadose zone at TA-V is approximately 500 ft thick and consists of heterogeneous, lenticular, coarse- to fine-grained deposits. The underlying aquifer consists of unconsolidated fine-grained, clay-rich, alluvial fan sediments. Groundwater flows predominantly from east to west. To the west of TA-V, groundwater flow turns north in response to pumping from the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) supply wells located north of KAFB, and from the KAFB water supply wells located in the northern portion of KAFB.

5.1.2 Site History

TA-V was established in 1961 to test radiation effects on components and has hosted multiple generations of research reactors, the Gamma Irradiation Facilities, and the Hot Cell Facilities. Historically, wastewater derived from TA-V facilities was disposed at the Liquid Waste Disposal System (LWDS) drain field, two unlined LWDS surface impoundments, and TA-V seepage pits. Since the discovery of groundwater contamination in 1992, SNL/NM Environmental Restoration (ER) Operations personnel have conducted numerous groundwater investigations in the TAVG AOC (Attachment 5A). Many of these investigations were site-specific and conducted supporting various solid waste management unit (SWMU) assessments. Other investigations in the TAVG AOC 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 TAVG AOC have been conducted by SNL/NM personnel over the past 25 years. Groundwater monitoring at TA-V began in October 1992. TCE was first detected in monitoring well LWDS-MW1 in November 1993 and first detected above the MCL of 5 μg/L in the same well in September 1995. Since then, low concentrations of TCE have been consistently detected during quarterly sampling events. Nitrate was first detected above the MCL of 10 mg/L in monitoring well LWDS-MW1 in December 1995. The New Mexico Environment Department (NMED)-specified background concentration for nitrate in groundwater is 4 mg/L (Dinwiddie September 1997).

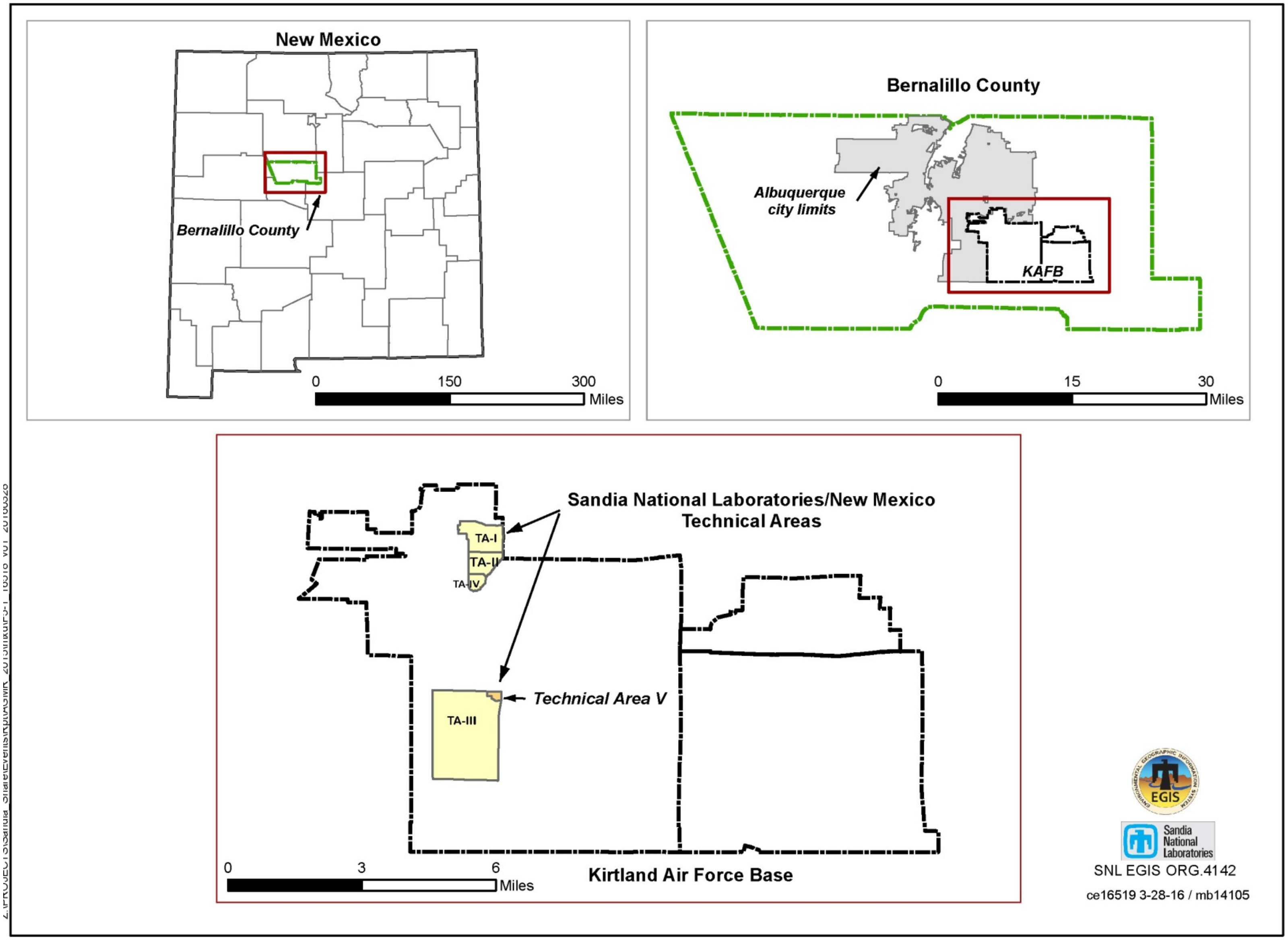


Figure 5-1. Location of SNL/NM and TA-V

Attachment 5A provides the historical timeline of the TAVG AOC investigation. Since the initial discoveries of TCE and nitrate, numerous characterization activities have been conducted at the TAVG AOC. The TAVG AOC monitoring network has been expanded to 18 groundwater monitoring wells and three soil-vapor monitoring wells.

Soil-vapor samples were collected from the three soil-vapor monitoring wells for eight consecutive quarters starting in May 2011 and concluding in March 2013. Samples were analyzed for volatile organic compounds (VOCs), including TCE. All eight quarters' analytical results were reported in Attachment 5D of the Calendar Year (CY) 2013 Annual Groundwater Monitoring Report (SNL June 2014).

In 2015, U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA) and SNL/NM personnel proposed installation of two new groundwater monitoring wells south of the TA-V boundary (DOE October 2015) to help define the extent of the TCE plume and the local potentiometric surface. NMED approved the installation of these two new monitoring wells (NMED May 2016a).

Installation of two new groundwater monitoring wells designated TAV-MW15 and TAV-MW16 began in December 2016 and was completed in January 2017. Groundwater monitoring results for the TAVG AOC monitoring network continue to be summarized in the annual groundwater monitoring reports.

5.1.4 Current Monitoring Network

In CY 2017, 18 wells in the TAVG AOC were monitored for water quality and water levels (Figure 5-2; Table 5-1). Table XI-1 of the Compliance Order on Consent (Consent Order) specifies that the sampling frequency for groundwater monitoring at TA-V is quarterly (NMED April 2004). However, as proposed in the Revised Treatability Study Work Plan (TSWP) (DOE March 2016a) and approved by NMED (NMED May 2016b), a new sampling protocol was implemented starting in CY 2017. Details on the new sampling protocol are provided in Section 5.3.

5.1.5 Summary of Calendar Year 2017 Activities

The following activities took place for the TAVG AOC during CY 2017:

- Obtained quarterly water level measurements for all TAVG AOC wells.
- Prepared sampling and analysis plans (SAPs) and conducted either semiannual or quarterly groundwater sampling at up to 18 wells per sampling event (Table 5-1) in February/March, May/June, July/August, and October/November 2017 (SNL January 2017, April 2017, July 2017c, and September 2017).
- Prepared tables of analytical results (Attachment 5B), concentration versus time plots (Attachment 5C), and hydrographs (Attachment 5D) in support of this report.
- Completed the installation and development of groundwater monitoring wells TAV-MW15 and TAV-MW16 in January 2017 (SNL July 2017a; NMED August 2017).
- Redeveloped monitoring wells ANV-1, LWDS-MW2, TAV-MW2, TAV-MW9, TAV-MW11, and TAV-MW12 (Lum May 2017).

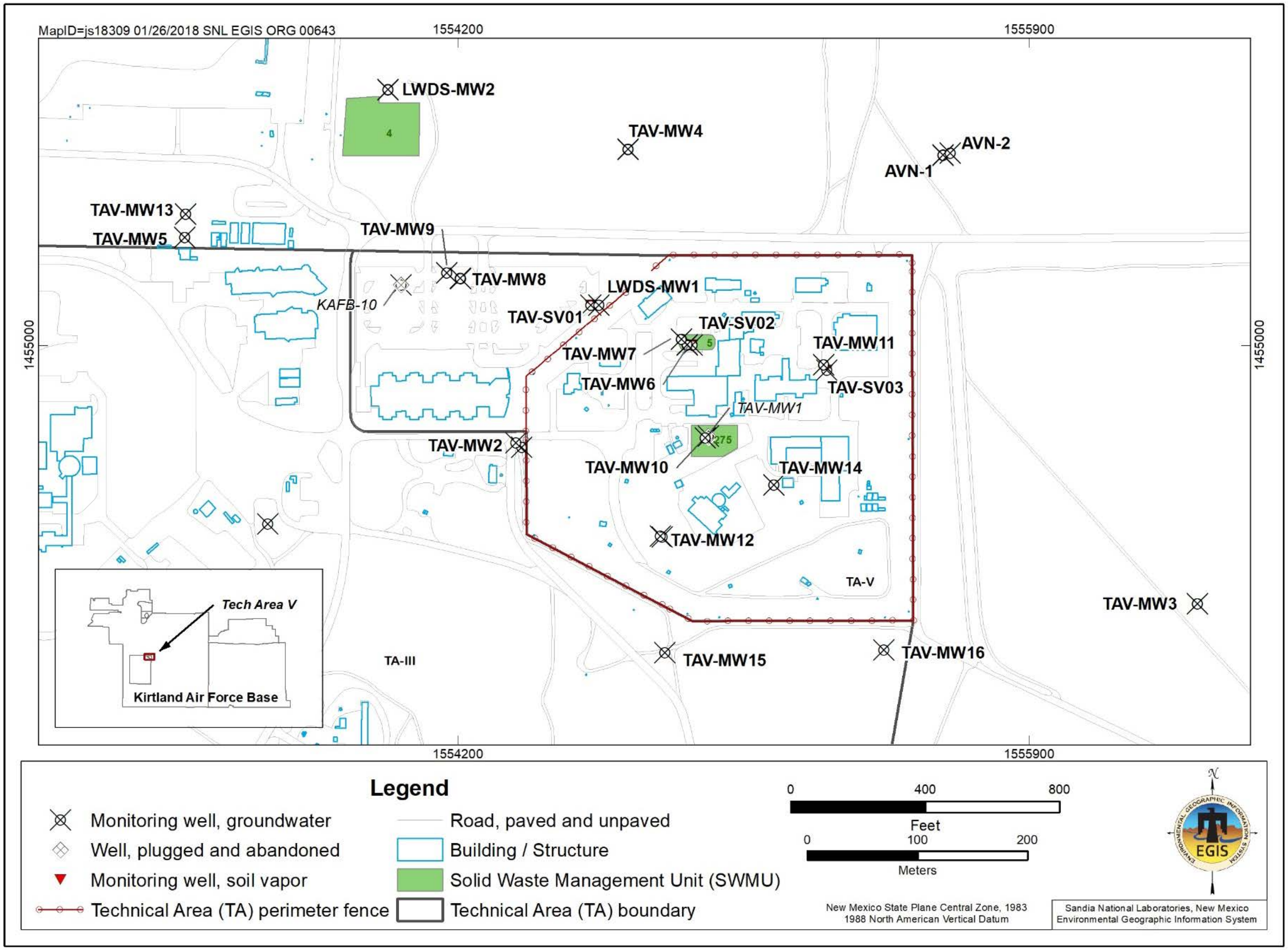


Figure 5-2. TAVG Monitoring Well Locations

Table 5-1. Groundwater Monitoring Wells at the TAVG AOC

Well ID	Installation Year	WQ	WL	Comments
LWDS-MW1	1993	√	√	Regional Aquifer, water table completion
LWDS-MW2	1992	√	√	Regional Aquifer, water table completion
AVN-1	1995	√	√	Regional Aquifer, deep completion (570–590 ft bgs)
AVN-2	1995	NA	NA	Regional Aquifer; water table completion (currently dry)
TAV-MW1	1995	NA	NA	Regional Aquifer, plugged and abandoned February 2008
TAV-MW2	1995	√	√	Regional Aquifer, water table completion
TAV-MW3	1997	√	√	Regional Aquifer, water table completion
TAV-MW4	1997	√	√	Regional Aquifer, water table completion
TAV-MW5	1997	√	√	Regional Aquifer, water table completion
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
TAV-MW15	2017	√	√	Regional Aquifer, water table completion
TAV-MW16	2017	√	√	Regional Aquifer, water table completion

NOTES: Check marks indicate water quality sampling and water level measurements were obtained during this reporting period.

AOC = Area of Concern.
AVN = Area-V (North).
bgs = Below ground surface.
ft = Foot (feet).
ID = Identifier.
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
NA = Not applicable.
TAV = Technical Area-V (monitoring well designation).
TAVG = Technical Area-V Groundwater.
WL = Water level.
WQ = Water quality.

- Completed installation of groundwater injection well TAV-INJ1 in October 2017.
- Began pilot scale study of in-situ bioremediation in November 2017, which included frequent sampling of TAV-INJ1, TAV-MW6, and TAV-MW7.

5.1.6 Conceptual Site Model

This section presents a summary of the updated conceptual site model (SNL September 2015) that characterizes the geological and hydrogeological framework, contaminant source terms, and the distribution and migration of contaminants in the subsurface at TA-V.

5.1.6.1 Regional Hydrogeologic Conditions

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 TA-V and the western portion of KAFB.

The sedimentary deposits of the Santa Fe Group and overlying alluvium that fill the Albuquerque Basin contain the regional 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 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 the basin, and most "pinch out" against the subsurface basement blocks. 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.

TA-V is largely underlain by a thick section of alluvial fan deposits. The alluvial fan lithofacies are 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 total thickness of the alluvial fan deposits are typically thousands of feet thick. The water table of the Santa Fe Group aquifer 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.

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 supply wells 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.

5.1.6.2 Hydrologic Conditions at the TAVG AOC

Average annual precipitation is approximately 9.45 inches for the Albuquerque area (Chapter 2.6.2.1). Most precipitation falls between July and October, mainly in the form of brief, heavy rain showers. The rate of evapotranspiration in the Albuquerque area greatly exceeds precipitation. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall. Precipitation as a source of recharge is considered minimal as a mechanism for transporting contaminants through the 500-ft-thick vadose zone.

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

The vadose zone, consisting of approximately 500 ft of unconsolidated to semiconsolidated alluvial fan sediments, forms the potential pathway for COC transport from surface and shallow subsurface contaminant sources to the aquifer. The upper section of the alluvial fan sediments is relatively coarse-grained, becoming fine-grained and clay-rich with depth. The hydraulic properties of the vadose zone 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 have occurred along preferential pathways through the thick vadose zone to the aquifer. Vertical flow through the discontinuous, layered, lenticular sediments in the vadose zone was most likely attenuated or diverted at horizons of varying hydraulic properties.

No evidence of groundwater perching has been observed at TA-V. Based on moisture content measurements of vadose zone sediment samples, minimal moisture remains in the vadose zone from historical wastewater disposal at TA-V.

Values of horizontal hydraulic conductivity for the alluvial fan sediments were determined using aquifer pumping tests and slug tests. Aquifer pumping (and recovery) data were collected at two monitoring wells, AVN-1 and TAV-MW2, and the calculated hydraulic conductivities were 38.3 and 0.09 feet per day (ft/day), respectively. Slug tests were conducted at 18 of the 20 monitoring wells when the wells were installed (Table 5-1). Horizontal hydraulic conductivities ranged from 0.04 to 30.82 ft/day. The wide range of hydraulic conductivities derived from the aquifer tests at TA-V is attributed to the textural heterogeneities associated with the alluvial fan lithofacies. Vertical hydraulic conductivity is typically estimated to be one-tenth to one-hundredth the horizontal hydraulic conductivity.

5.1.6.3 Local Direction of Groundwater Flow

Table 5-2 presents the water levels measured in the current 18 monitoring wells that were used to construct a map of the local aquifer potentiometric surface (Figure 5-3). Figure 5-3 is consistent with the base-wide potentiometric surface map on Plate 1. The potentiometric surface indicates that the groundwater flow is generally to the west, with localized flow paths to the south and southwest. The Regional Aquifer at TA-V demonstrates unconfined conditions. The horizontal gradient ranges from approximately 0.004 to 0.01 feet per foot (ft/ft) based on the October 2017 potentiometric surface map (Figure 5-3). The horizontal groundwater flow velocity at TA-V can be calculated from the range of horizontal hydraulic conductivities (0.04 to 30.8 ft/day), a representative horizontal hydraulic gradient of 0.005 ft/ft, and an assumed effective porosity of 0.25. The estimates for linear groundwater flow velocity range from 0.29 to 225 feet per year (ft/yr).

Water table contours for previous years suggested that a subtle groundwater mound was present at monitoring wells TAV-MW8 and LWDS-MW1 with approximately 0.6 to 0.8 ft of additional head relative to nearby wells (for example, SNL June 2014). The groundwater mound is most likely an artifact of laterally variable water level declines within a heterogeneous and anisotropic aquifer. This residual elevated hydraulic head was still evident in 2017 at wells TAV-MW8 and LWDS-MW1 relative to nearby wells (Figure 5-3).

Figures 5D-1 through 5D-3 present water level fluctuations shown in hydrographs for the current 18-well groundwater monitoring network at TA-V. Groundwater elevations have steadily declined at all TAVG monitoring wells. The declines are due to the combined pumping of the Regional Aquifer by the KAFB and ABCWUA water supply wells. The rates of decline range from 0.51 to 0.88 ft/yr with an average decline rate of 0.75 ft/yr. In general, the rates of decline are higher to the east than to the west, with the groundwater elevation declining fastest in monitoring well TAV-MW3 and slowest in monitoring well TAV-MW5. The dewatering of the aquifer is expected to continue as long as pumping of water supply wells in the region continues.

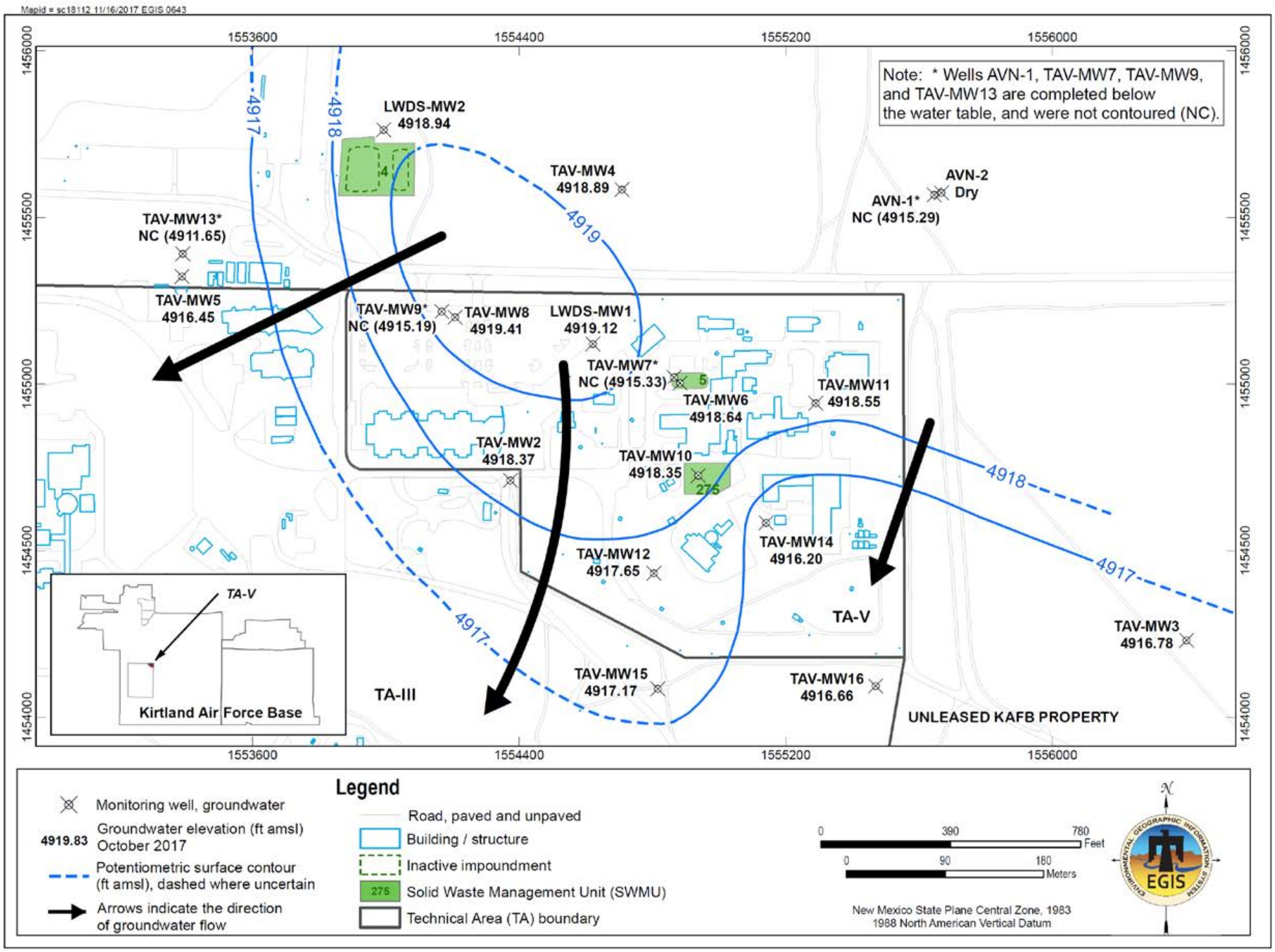


Figure 5-3. Localized Potentiometric Surface of the Regional Aquifer at the TAVG AOC (October 2017)

Table 5-2. Groundwater Elevations Measured in October 2017 at the TAVG AOC

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Water Elevation (feet amsl)
AVN-1	5443.00	04-Oct-17	527.71	4915.29
LWDS-MW1	5423.83	05-Oct-17	504.71	4919.12
LWDS-MW2	5412.41	04-Oct-17	493.47	4918.94
TAV-MW2	5427.33	05-Oct-17	508.96	4918.37
TAV-MW3	5464.30	05-Oct-17	547.48	4916.82
TAV-MW4	5427.89	04-Oct-17	509.00	4918.89
TAV-MW5	5408.71	04-Oct-17	492.26	4916.45
TAV-MW6	5431.17	04-Oct-17	512.53	4918.64
TAV-MW7	5430.40	23-Oct-17	515.07	4915.33
TAV-MW8	5417.00	05-Oct-17	497.59	4919.41
TAV-MW9	5416.27	05-Oct-17	501.08	4915.19
TAV-MW10	5437.03	04-Oct-17	518.68	4918.35
TAV-MW11	5440.12	04-Oct-17	521.57	4918.55
TAV-MW12	5435.72	04-Oct-17	518.07	4917.65
TAV-MW13	5409.02	04-Oct-17	497.37	4911.65
TAV-MW14	5441.52	04-Oct-17	525.32	4916.20
TAV-MW15	5437.32	04-Oct-17	520.15	4917.17
TAV-MW16	5448.34	04-Oct-17	531.68	4916.66

NOTES:
amsl = Above mean sea level.
AOC = Area of Concern.
AVN = Area-V (North).
btoc = Below top of casing.
ID = Identifier.
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
NAVD 88 = North American Vertical Datum of 1988.
TAV = Technical Area-V.
TAVG = Technical Area-V Groundwater.

Since late 2008, groundwater levels for Regional Aquifer wells in the northern part of KAFB show an increasing trend. Presumably, this is in response to the ABCWUA transitioning to surface water for potable water supplies and the decreased dependence on water supply wells immediately north of KAFB. However, this effect has not been seen as far south as TA-V.

5.1.6.4 Contaminant Sources

Contaminant migration in the subsurface is primarily controlled by infiltration of wastewater historically disposed of at TA-V and by the low permeability of the sedimentary units in the vadose zone and the Regional Aquifer. Limited amounts of natural recharge are a minor factor, with possible sources including precipitation and ephemeral flows in nearby arroyos.

Prior to 1993, the majority of wastewater disposed at TA-V occurred at SWMUs 4, 5, and 275 (Figure 5-2). Table 5-3 identifies the dates of disposal and the estimated disposal volumes. Small volumes of TCE and other organic solvents were presumably present in wastewater that was disposed to the LWDS drain field from 1962 to 1967, to the LWDS surface impoundments from 1967 to 1972, and to the TA-V seepage pits from the 1960s until the early 1980s, when disposal practices were modified to protect the environment. Wastewater continued to be disposed at the TA-V seepage pits from the early 1980s until 1992, but contained no organic solvents such as TCE. After 1992, wastewater was diverted to the ABCWUA sanitary sewer system.

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

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

NOTES:
LWDS = Liquid Waste Disposal System.
SWMU = Solid waste management unit.
TA-V = Technical Area-V.

Wastewater containing dissolved concentrations of TCE and other solvents moved through the vadose zone into the aquifer. Low concentrations of TCE present in the aquifer today are a result of these initial releases. Continued flushing of wastewater from early 1980s until 1992 likely removed significant sources of secondary contaminants and contained no solvents. Upon cessation of wastewater disposal, vertical pathways to the aquifer were drained by gravity.

Soil and soil-vapor sampling and analyses were conducted in the vadose zone to characterize the presence of VOCs. Locations of investigations focused on possible release sites (SWMUs 4, 5, and 275). Groundwater sample results from monitoring well LWDS-MW2, located to the immediate north of the LWDS surface impoundments (SWMU 4) (Figure 5-2), indicated that wastewater disposed at the surface impoundments did not impact groundwater. TCE has never been detected in groundwater samples from monitoring well LWDS-MW2, and nitrate concentrations have never exceeded its MCL in this well. The large surface area of the surface impoundments could facilitate sufficient VOC and wastewater evaporation, which minimized the depth of VOC and wastewater percolation.

Within the LWDS drain field (SWMU 5), trace quantities of TCE, tetrachloroethene, and benzene were detected in shallow soil-vapor samples collected during 1994 (SNL March 1999a). The possibility of vadose zone contamination was further investigated with the installation of groundwater monitoring wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 in March and April 2001. The results of soil-core and soil-vapor samples collected during well installation showed no significant residual VOCs in the vadose zone. Also, there was no evidence of excessive moisture in the vadose zone sediments; therefore, no significant residual wastewater was present in the vadose zone beneath the LWDS drain field (SNL October 2001).

In the vicinity of the TA-V seepage pits (SWMU 275), trace quantities of TCE, tetrachloroethene, benzene, toluene, and total xylene were detected in soil-vapor samples collected during passive, surficial characterization studies conducted in 1994 and 1995 (SNL March 1999a). Solvent disposals to the seepage pits were eliminated in the early 1980s, but wastewater disposal continued until 1992. This likely flushed into the aquifer any residual COCs that may have been present in the vadose zone.

Nitrate in groundwater at TA-V may be derived from sanitary waste disposals to the subsurface. Sanitary waste disposals continued until 1992 when the disposals were routed to the ABCWUA sanitary sewer system. Nitrate is considered a conservative constituent with regard to transport because it is highly soluble in water, is not typically sorbed to sediments, and is not biotransformed under aerobic conditions. Therefore, any locally derived nitrate most likely was transported through the vadose zone with wastewater and sanitary discharges into the aquifer.

Nitrate concentrations in groundwater have exceeded the MCL in two upgradient wells (AVN-1 and AVN-2) northeast of TA-V (AVN-2 is currently dry). Nitrate in these wells is presumably derived from upgradient sources. Nitrate in groundwater could also be attributed to leaching of naturally occurring nitrate in the vadose zone by infiltration of large volumes of wastewater through nitrate-bearing soils.

5.1.6.5 Contaminant Distribution and Transport in Groundwater

Distribution and transport of COCs are discussed in this section. Vapor migration of VOCs in the vadose zone is a possible transport mechanism. VOC concentrations in soil-vapor were measured at three soil-vapor monitoring wells (TAV-SV01, TAV-SV02, and TAV-SV03) for eight quarters from April 2011 to March 2013. At each well (shown in Figure 5-2), soil-vapor samples were collected from 10, 1-foot long stainless-steel screens, set at 50-ft intervals from 50 to 500 ft bgs, and analyzed for VOCs. All eight quarters' analytical results have been reported in Attachment 5D of the CY 2013 Annual Groundwater Monitoring Report (SNL June 2014). TCE is the most prevalent VOC in the vadose zone. The soil-vapor results showed that the vapor concentrations have stabilized in the vadose zone. Without an active driving force (such as wastewater disposal), it is unlikely for the TCE in the vadose zone to act as an ongoing contaminant source to groundwater. TCE is also hydrophobic with a water solubility of 1,100 mg/L at 20 degrees Celsius. Some TCE will be retained in the vadose zone due to sorption to fine-grained materials, as well as dissolution in pore water.

TCE is present in low concentrations in the Regional Aquifer beneath TA-V. The highest TCE concentrations are present in three groundwater monitoring wells: LWDS-MW1, TAV-MW6, and TAV-MW10 (Figure 5-4). Monitoring well TAV-MW6 is located at the LWDS drain field (SWMU 5) and monitoring well TAV-MW10 is located at the TA-V seepage pits (SWMU 275). Even though monitoring well LWDS-MW1 is not located at a potential source, maximum concentrations of TCE have occurred in well LWDS-MW1, suggesting TCE contamination has migrated westward in the localized direction of groundwater flow. The variability in hydraulic conductivities in saturated sediments has most likely influenced the distribution of TCE in groundwater. The hydraulic conductivities measured by slug tests at monitoring wells TAV-MW6 and TAV-MW10 were 1.14 and 4.12 ft/day, respectively. The lowest hydraulic conductivity (0.04 ft/day) was measured at monitoring well LWDS-MW1, where the highest COC concentrations were detected in groundwater. It is possible that the localized low conductivity zone near well LWDS-MW1 has acted as a barrier for contaminant transport in groundwater.

Using the hydraulic conductivities, a representative horizontal hydraulic gradient of 0.005 ft/ft, and an assumed effective porosity of 0.25, the linear groundwater flow velocities are calculated as 0.29, 8.3, and 30 ft/yr at the locations of monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10, respectively.

TCE has been consistently detected above the MCL of 5 μg/L in the following four monitoring wells: LWDS-MW1, TAV-MW6, TAV-MW10, and TAV-MW12. TCE has also been detected near or below the MCL at six other monitoring wells TAV-MW2, TAV-MW4, TAV-MW8, TAV-MW11, TAV-MW14, and TAV-MW16. TCE has never been detected in the remaining eight monitoring wells.

Figure 5-4 shows the 5 and 10 µg/L TCE isoconcentration contours in groundwater for the second quarter of CY 2017. With the implementation of the new sampling protocol, the second quarter is the only quarter that all 18 wells are sampled in a calendar year. The 10 µg/L concentration contour enclosed monitoring wells LWDS-MW1 and TAV-MW6. TCE concentrations in well LWDS-MW1 were mostly above 15 µg/L as seen in CY 2017, except in the second quarter of CY 2017 when TCE concentration dropped to below 15 µg/L (Figure 5C-1 in Attachment 5C). TCE concentrations in well TAV-MW6 and TAV-MW10 have been above 15 µg/L in the past, but have been below15 µg/L over the last several years (Figures 5C-2 and 5C-3). TCE concentrations in well TAV-MW12 have been between 5 and 12 µg/L since the well installation (Figure 5C-4). Figure 5-4 also shows that the concentrations of TCE decrease laterally from these wells.

Two groundwater monitoring wells, TAV-MW7 and TAV-MW9, are co-located with TAV-MW6 and TAV-MW8, respectively, but are screened approximately 90 ft deeper. TCE has not been detected in these two deeper wells indicating VOCs have not migrated significantly deeper into the Regional Aquifer.

Nitrate is present in groundwater in all monitoring wells at TA-V, generally at concentrations ranging from less than 5 mg/L to more than 10 mg/L. Nitrate concentrations have exceeded the MCL of 10 mg/L in samples from monitoring wells AVN-1, AVN-2 (currently dry), LWDS-MW1, TAV-MW6, TAV-MW10, and TAV-MW14. Nitrate was also detected once above the MCL at TAV-MW5 in a split sample collected in November 1998 and has not been detected above the MCL since.

Figure 5-5 shows the 10 mg/L nitrate isoconcentration contour in the TAVG AOC for the second quarter of CY 2017; the 10 mg/L nitrate contour is located within the 5 µg/L TCE contour of Figure 5-4. The general location of the 10 mg/L contour has not changed significantly over the past several years. It encloses wells LWDS-MW1 and TAV-MW10, but not well TAV-MW6. Concentrations of nitrate in wells LWDS-MW1 and TAV-MW10 have mostly exceeded the MCL of 10 mg/L, and have seldom exceeded the MCL in well TAV-MW14 (Figures 5C-5 through 5C-7).

Nitrate that may be higher than naturally occurring background concentrations has also been detected in groundwater monitoring wells outside the TA-V boundary. Concentrations of nitrate at LWDS-MW2 have been slightly below the MCL of 10 mg/L. Concentrations of nitrate in upgradient monitoring well AVN-1 have occasionally exceeded the MCL. AVN-1 and AVN-2 are co-located with AVN-1 screened 75 ft deeper than AVN-2 (currently dry), but showed similar nitrate concentrations. Monitoring well AVN-2 has been dry since 2005.

Contaminant transport mechanisms in groundwater include advection, dispersion, diffusion, sorption, and biodegradation. Groundwater monitoring results over the past two decades indicate that advection is not the main force driving contamination migration, most likely because of the low localized groundwater flow velocities. With limited advection, dispersion and diffusion become important transport mechanisms. While nitrate does not tend to sorb to sediment, TCE is a hydrophobic organic compound and sorbs to the organic matter in the aquifer matrix. Sorption is also a reversible process. As the dissolved contaminant concentration in groundwater decreases due to advection (although limited), dilution, or biodegradation, the sorbed TCE portion will tend to desorb and reenter groundwater through equilibration processes. The comparatively stable TCE concentration contours can be attributed to the relatively slow processes of dispersion and diffusion, and the reversible sorption process.

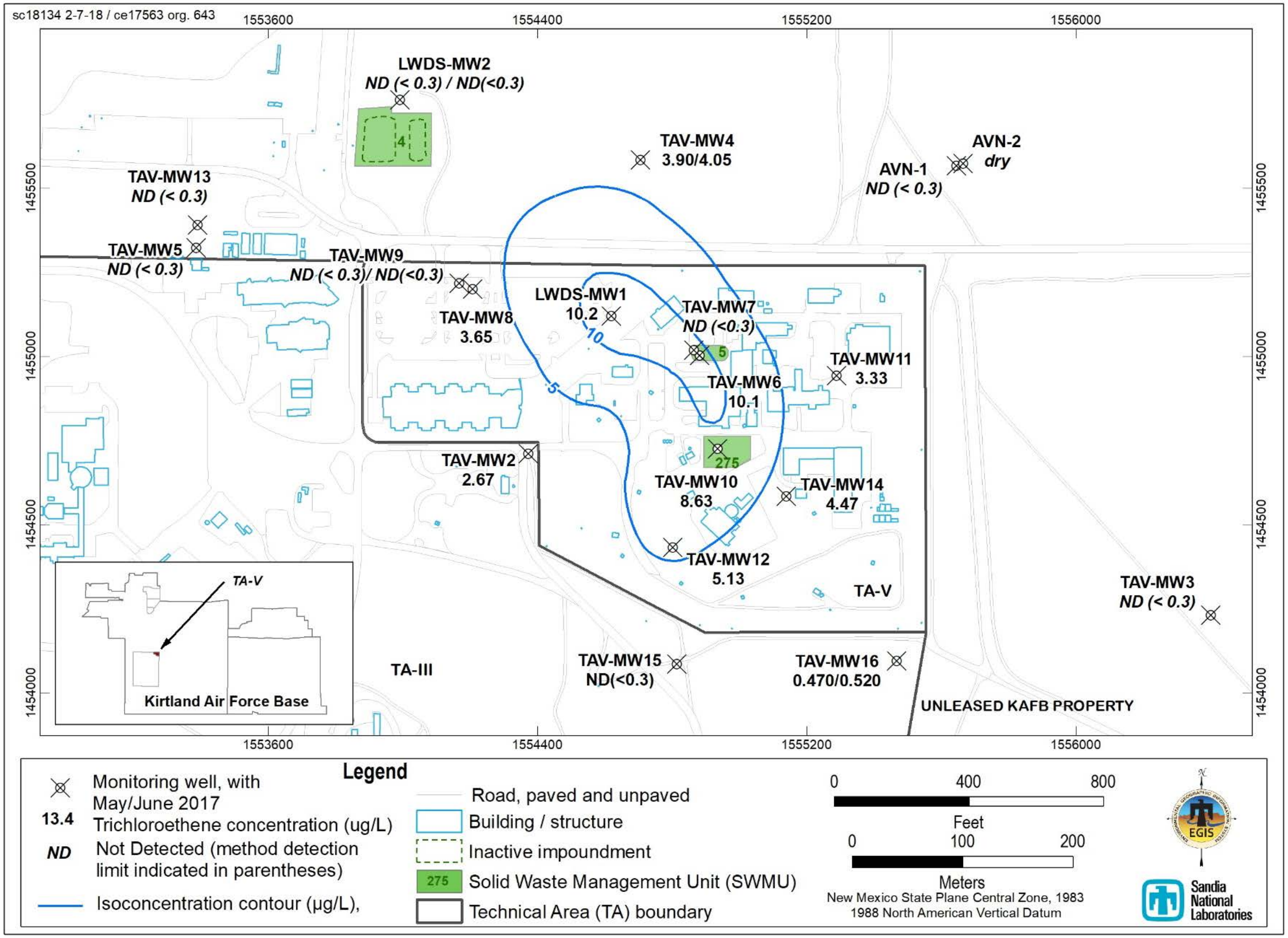


Figure 5-4. Distribution of TCE in Groundwater at TAVG AOC, May/June 2017

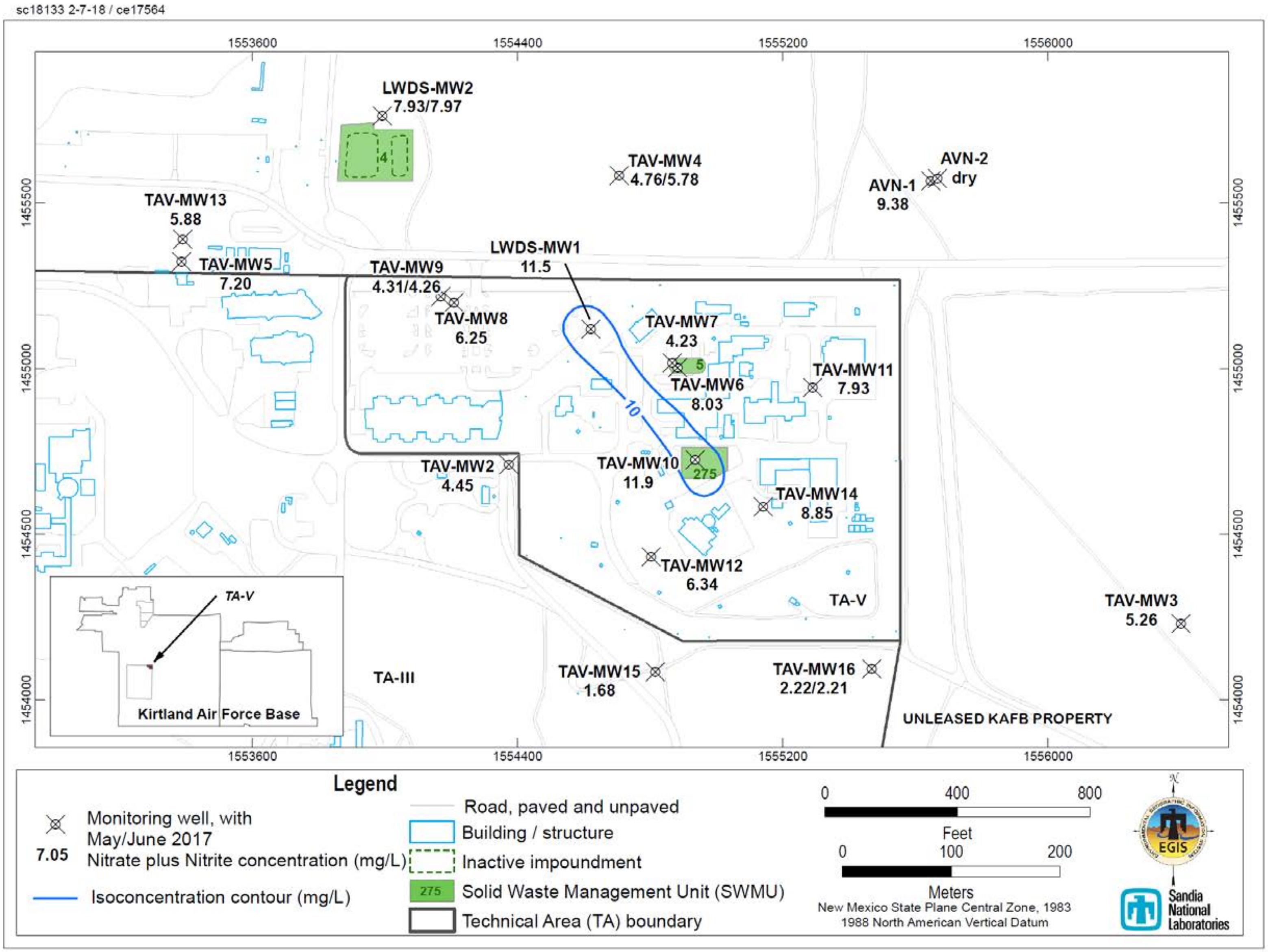


Figure 5-5. Distribution of Nitrate plus Nitrite in Groundwater at TAVG AOC, May/June 2017

Biodegradation of TCE was evaluated in 2005 (SNL July 2005). The anaerobic biodegradation assessment indicated that anaerobic reductive dechlorination is not occurring in groundwater at TA-V, nor is biologically mediated transformation of nitrate. This is likely due to the relatively high concentration of dissolved oxygen and low concentration of dissolved organic carbon as carbon and energy sources. A study of denitrification parameters and isotopic signatures conducted in 2013 also indicated that natural denitrification was insignificant (Madrid et al. June 2013).

5.1.7 Treatability Study of In-Situ Bioremediation

In 2015, personnel from the DOE/NNSA, DOE Headquarters Office of Environmental Management, SNL/NM, and NMED worked together to address the groundwater contamination at TAVG AOC. All parties agreed on a phased Treatability Study of in-situ bioremediation (ISB) to evaluate the effectiveness of ISB as a potential technology to treat the groundwater contamination at TAVG AOC.

5.1.7.1 In-Situ Bioremediation

The technical approach for the proposed Treatability Study is to induce biodegradation of TCE and nitrate by gravity injecting a nutrient-amended substrate solution and biodegradation bacteria into groundwater at one to three locations with the highest COC concentrations. The intent of this action is to reduce nitrate concentrations through denitrification followed by reductive dechlorination of TCE that is dissolved in groundwater and sorbed to solids in the aquifer. Biodegradation will ultimately convert these contaminants into innocuous breakdown products.

5.1.7.2 Treatability Study Work Plan

DOE/NNSA and SNL/NM personnel submitted a TSWP to NMED on October 20, 2015 (DOE October 2015) and it was disapproved by NMED on December 3, 2015 (NMED December 2015). A Revised TSWP and response to the disapproval letter was submitted to NMED in March 2016 (DOE March 2016a). NMED approved the Revised TSWP in May 2016 (NMED May 2016b).

For the phased Treatability Study, up to three injection wells (TAV-INJ1, TAV-INJ2, and TAV-INJ3) will be installed in the vicinity of monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10 where the highest contaminant concentrations in groundwater has been detected. A substrate solution containing essential food and nutrients for biostimulation will be prepared in aboveground tanks and gravity-injected into groundwater via the injection wells.

5.1.7.3 Discharge Permit

The NMED Ground Water Quality Bureau (GWQB) required a Discharge Permit (DP) to install and operate the TA-V Treatability Study injection wells (NMED June 2016). The DP Application (DP-1845) was submitted in July 2016 (DOE July 2016a). After the application was determined administratively complete, NMED GWQB posted the Public Notice 1 on their website on August 26, 2016 and directed DOE/NNSA and SNL/NM personnel to proceed with the public notice requirements (NMED September 2016). The public notice requirements were completed and the affidavit of public notice completion was submitted to the NMED GWQB on November 16, 2016 (DOE November 2016). The DP Application was approved by the NMED GWQB on May 26, 2017 (NMED May 2017). The DP-1845 term started on May 30, 2017 and ends on May 30, 2022.

5.1.7.4 Treatability Study Pilot Test

The pilot test of the Treatability Study started in November 2017 at injection well TAV-INJ1 and two nearby monitoring wells TAV-MW6 and TAV-MW7. Two injections of approximately 4,500 gallons each were conducted. The first injection was substrate solution without the dechlorinating bacteria; the second injection was substrate solution combined with six liters of dechlorinating bacteria. The pilot test injections were completed successfully by the end of November 2017. Performance monitoring of the pilot test is ongoing with monitoring of in-situ water quality parameters and groundwater sampling at wells TAV-INJ1, TAV-MW6, and TAV-MW7.

The pilot test started after the fourth quarterly monitoring activities described in Section 5.3. Wells TAV-MW6 and TAV-MW7 became performance monitoring wells for the Treatability Study, and they are subject to the monitoring plan (sampled at higher frequency than quarterly) described in the Revised TSWP (DOE March 2016a). Groundwater sampling results of wells TAV-INJ1, TAV-MW6, and TAV-MW7 for the pilot test will be provided in the DP-1845 quarterly report and submitted to NMED GWQB, and are not included in this report.

5.2 Regulatory Criteria

The NMED Hazardous Waste Bureau (HWB) provides regulatory oversight of SNL/NM ER Operations, as well as implements and enforces regulatory standards mandated by the Resource Conservation and Recovery Act (RCRA). All SWMUs and AOCs are listed in the *RCRA Facility Operating Permit, NM5890110518* (NMED January 2015a). Groundwater characterization at TA-V was initiated to satisfy the requirements of the SNL/NM RCRA Permit for characterization of SWMUs associated with TA-V activities. The groundwater monitoring activities are not associated with a single SWMU, but are more regional in nature and have historically been voluntarily conducted by SNL/NM ER Operations.

In April 2004, the Consent Order became effective (NMED April 2004). The Consent Order transfers regulatory authority for corrective action requirements from the SNL/NM RCRA Permit to the Consent Order. The Consent Order identifies contamination in TA-V groundwater as a groundwater AOC. All corrective action requirements pertaining to the TAVG AOC are contained in the Consent Order. The TAVG AOC investigations must comply with requirements set forth in the Consent Order for site characterization and development of a Corrective Measures Evaluation (CME).

The DOE/NNSA and SNL/NM personnel submitted the Current Conceptual Model (CCM) and the CME Work Plan to the NMED in April 2004 (SNL April 2004a and April 2004b). After fulfilling the requirements of the CME Work Plan, a CME Report was submitted to the NMED in July 2005 (SNL July 2005). NMED subsequently issued three Notices of Disapproval (NODs) for the CME Report in July 2008, August 2009, and December 2009, respectively (NMED July 2008, August 2009, and December 2009). Responses were submitted to the three NODs in April 2009, November 2009, and February 2010, respectively (SNL April 2009, November 2009, and February 2010). These NOD responses contained an attachment entitled “Technical Area-V Groundwater Investigation Work Plan,” which included the installation of four additional groundwater monitoring wells and three soil-vapor monitoring wells to meet NMED's characterization requirements (see Section 5.1.3). In May 2010, NMED issued a notice of conditional approval for the TA-V Groundwater Investigation Work Plan (NMED May 2010).

Since the 2005 CME Report, a substantial body of information has become available with more groundwater monitoring wells and soil-vapor monitoring wells installed. Accordingly, DOE/NNSA and SNL/NM personnel requested that the 2005 CME Report be withdrawn from review, and replaced with an updated CCM and CME Report by November 21, 2014 (DOE December 2013). NMED approved the request (NMED December 2013). Thereafter, a phased Treatability Study of ISB to address the groundwater contamination at TA-V was agreed upon (see Section 5.1.7). In order to allow development of the technical approach and preparation of the associated work plan, a two-year extension of the due date for the CME Report and CCM were requested (DOE November 2014a). NMED approved the request (NMED January 2015b). An updated CCM was submitted to NMED on October 20, 2015 (DOE October 2015) and was approved by NMED on November 30, 2015 (NMED November 2015).

With the approval of the Revised TSWP in May 2016 (see Section 5.1.7.2) and to allow for implementation of the Treatability Study, DOE/NNSA and SNL/NM personnel requested, and NMED agreed to a milestone extension of the CME Report (DOE March 2016b; NMED April 2016). The results of the Treatability Study will be used to refine the CCM and CME reports for TAVG AOC, which are due by May 20, 2022 to NMED and are to replace all previous CCM and CME reports.

DOE/NNSA and SNL/NM personnel continue to present the TAVG monitoring data, along with data from other groundwater sites, in this SNL/NM Annual Groundwater Monitoring Report. The outline of this chapter is based on the required elements of a "Periodic Monitoring Report" described in Section X.D. of the Consent Order.

In this report, TAVG monitoring data are presented for both hazardous and radioactive constituents; however, the analytical data for radionuclides (gamma spectroscopy short list, gross alpha, gross beta, and tritium) are provided voluntarily by the DOE/NNSA and SNL/NM personnel. 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 Consent Order. Additional information on radionuclides and the scope of the Consent Order is available in Section III.A of the Consent Order.

5.3 Scope of Activities

Section 5.1.5 describes the activities for the TAVG monitoring in CY 2017, including plans and reports. The field activities included groundwater level measurements and groundwater sampling. Table 5-4 summarizes the CY 2017 groundwater sampling events (four quarterly events). Table 5-5 lists the analytical parameters for each well for each sampling event.

Quality control (QC) samples are collected in the field at the time of sample collection. Field QC samples are used to monitor the sampling process and include duplicate, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Section 1.3.4 provides the purposes and details of QC samples.

5.4 Field Methods and Measurements

Section 1.3 details the monitoring procedures conducted for TAVG monitoring. The water level measurements obtained in 2017 were used to develop the potentiometric surface map presented in Figure 5-3 and the hydrographs presented in Figures 5D-1 through 5D-3.

5.5 Analytical Methods

Section 1.3.2 (Tables 1-5 and 1-6) describes the EPA-specified protocols used by off-site laboratories for all groundwater samples.

5.6 Summary of Analytical Results

This section discusses monitoring results, exceedance of standards, and pertinent trends in concentrations for COCs in the TAVG AOC that exceed regulatory standards. Tables 5B-1 through 5B-9 present the analytical results and field measurements for all TAVG sampling events, and Figures 5C-1 through 5C-7 present concentration trend plots for COCs that exceed the MCLs.

Table 5-4. Groundwater Monitoring Well Network and Sampling Dates for the TAVG AOC, Calendar Year 2017

Date of Sampling Event	Wells Sampled	SAP
February/March 2017	LWDS-MW1, TAV-MW2, TAV-MW4, TAV-MW6, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for Second Quarter, Fiscal Year 2017* (SNL January 2017)
May/June 2017	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, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for Third Quarter, Fiscal Year 2017* (SNL April 2017)
July/August 2017	LWDS-MW1, TAV-MW2, TAV-MW4, TAV-MW6, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for Fourth Quarter, Fiscal Year 2017* (SNL July 2017c)
October/November 2017	LWDS-MW1, TAV-MW2, TAV-MW4, TAV-MW6, TAV-MW7, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for First Quarter, Fiscal Year 2018* (SNL September 2017)

NOTES:

AOC = Area of Concern.
AVN = Area-V (North).
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
TAV = Technical Area-V (monitoring well designation).
TAVG = Technical Area-V Groundwater.

Table 5-5. Parameters Sampled at TAVG Monitoring Wells for Each Sampling Event, Calendar Year 2017

February/March 2017		May/June 2017	
Parameter	**Well ID**	**Parameter**	**Well ID**
Alkalinity[a]	LWDS-MW1	Alkalinity	AVN-1
Anions (Bromide, Chloride, Fluoride, Sulfate)[a]	TAV-MW2	Anions (Bromide, Chloride, Fluoride, Sulfate)	LWDS-MW1
Arsenic, dissolved	TAV-MW4	Arsenic, dissolved	LWDS-MW2
Gamma Spectroscopy (short list[b])[a]	TAV-MW6	Gamma Spectroscopy (short list[b])	LWDS-MW2 (duplicate)
Gross Alpha/Beta Activity[a]	TAV-MW8	Gross Alpha/Beta Activity	TAV-MW2
Iron, dissolved	TAV-MW8 (duplicate)	Iron, dissolved	TAV-MW3
Manganese, dissolved	TAV-MW10	Manganese, dissolved	TAV-MW4
NPN	TAV-MW10 (duplicate)	NPN	TAV-MW4 (duplicate)
Perchlorate[a]	TAV-MW11	Perchlorate[a]	TAV-MW5
Tritium[a]	TAV-MW12	TAL Metals plus Total Uranium	TAV-MW6
VOCs	TAV-MW14	Tritium	TAV-MW7
	TAV-MW15	VOCs	TAV-MW8
	TAV-MW16		TAV-MW9
			TAV-MW9 (duplicate)
			TAV-MW10
			TAV-MW11
			TAV-MW12
			TAV-MW13
			TAV-MW14
			TAV-MW15
			TAV-MW16
			TAV-MW16 (duplicate)

July/August 2017		October/November 2017	
Parameter	**Well ID**	**Parameter**	**Well ID**
Alkalinity[a]	LWDS-MW1	Alkalinity[a]	LWDS-MW1
Anions (Bromide, Chloride, Fluoride, Sulfate)[a]	TAV-MW2	Anions (Bromide, Chloride, Fluoride, Sulfate)[a]	TAV-MW2
Arsenic, dissolved	TAV-MW2 (duplicate)	Arsenic, dissolved	TAV-MW4
Gamma Spectroscopy (short list[b])[a]	TAV-MW4	Gamma Spectroscopy (short list[b])[a]	TAV-MW6
Gross Alpha/Beta Activity[a]	TAV-MW6	Gross Alpha/Beta Activity[a]	TAV-MW7
Iron, dissolved	TAV-MW8	Iron, dissolved	TAV-MW7 (duplicate)
Manganese, dissolved	TAV-MW10	Manganese, dissolved	TAV-MW8
NPN	TAV-MW11	NPN	TAV-MW10
Perchlorate[a]	TAV-MW12	Perchlorate[a]	TAV-MW11
TAL Metals plus Total Uranium[a]	TAV-MW14	TAL Metals plus Total Uranium[a]	TAV-MW11 (duplicate)
Tritium[a]	TAV-MW14 (duplicate)	Tritium[a]	TAV-MW12
VOCs	TAV-MW15	VOCs	TAV-MW14
	TAV-MW15 (duplicate)		TAV-MW15
	TAV-MW16		TAV-MW16
			TAV-MW16 (duplicate)

NOTES:

[a]Analyses performed on monitoring wells TAV-MW15 and TAV-MW16 only for waste characterization purposes, except for perchlorate, which is required by the Consent Order for newly-installed monitoring wells.

[b]Gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40).

AVN = Area-V (North).
Consent Order = Compliance Order on Consent.
ID = Identifier.
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
NPN = Nitrate plus nitrite (reported as nitrogen).
TAL = Target Analyte List.
TAV = Technical Area-V (monitoring well designation).
TAVG = Technical Area-V Groundwater.
VOC = Volatile organic compound.

Table 5B-1 presents a summary of detected VOC results and Table 5B-2 lists the method detection limits (MDLs) for all analyzed VOCs. The VOCs detected at concentrations above the MDLs in groundwater samples from TAVG monitoring wells in CY 2017 include the following:

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

Four VOCs were detected during CY 2017. Two of these VOCs (cis-1,2-Dichloroethene and TCE) have promulgated MCLs. Only TCE exceeds its MCL of 5 μg/L (Table 5B-1). TCE was detected above the MCL in samples from four monitoring wells: LWDS-MW1, TAV-MW6, TAV-MW10, and TAV-MW12. The maximum concentration of TCE detected during this reporting period is 17.4 μg/L in the sample collected from monitoring well LWDS-MW1 in March 2017. Figures 5C-1 through 5C-4 present TCE concentrations over the lifetime of the four wells. The highest concentrations of TCE have been consistently detected in monitoring well LWDS-MW1, followed by TAV-MW6 and TAV-MW10, then by TAV-MW12.

Table 5B-3 presents the analytical results for nitrate plus nitrite (NPN) (reported as nitrogen). During this reporting period, NPN results exceed the MCL of 10 mg/L in samples from monitoring wells LWDS-MW1, TAV-MW10, and TAV-MW14. The maximum concentration of NPN detected during this reporting period is 12.2 mg/L in the sample collected from monitoring well TAV-MW10 in November 2017. Figures 5C-5 through 5C-7 present NPN concentrations over the lifetime of the three wells. The NPN concentrations in monitoring wells LWDS-MW1 and TAV-MW10 have typically exceeded the MCL, whereas NPN concentrations in monitoring well TAV-MW14 have only occasionally exceeded the MCL.

Table 5B-4 presents the analytical results for filtered metal results for arsenic, iron, and manganese; no metal results exceed established MCLs.

Table 5B-5 presents the analytical results for anions (bromide, chloride, fluoride, and sulfate) and alkalinity (bicarbonate and carbonate). Only fluoride has a promulgated MCL, and none of the results exceed the MCL.

Table 5B-6 presents the analytical results for perchlorate; no perchlorate was detected above the MDL. Perchlorate was not detected in four quarterly sampling events in CY 2017; therefore, it will not be analyzed in future sampling events in accordance with the Consent Order (NMED April 2004).

Table 5B-7 presents target analyte list metals plus uranium results; no metal results exceed established MCLs.

Table 5B-8 presents gamma spectroscopy short list, gross alpha, gross beta, and tritium results; all radionuclide results are below established MCLs. Gross alpha activity is measured as a radiological screening tool and in accordance with 40 Code of Federal Regulations Part 141. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements are corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. Radiological results are further reviewed by an SNL/NM Health Physicist to assure that the samples are nonradioactive.

Field water quality parameters were measured during purging of each well prior to sampling and included temperature, specific conductivity, oxidation-reduction potential, pH, turbidity, and dissolved oxygen. Table 5B-9 presents the measurements of these parameters.

5.7 Quality Control Results

Section 1.3 describes how field and laboratory QC samples were collected and prepared. Tables 5B-1 through 5B-8 presents data validation qualifiers with the analytical results. The following paragraphs discuss the results of the QC samples and impact on data quality for the quarterly sampling events.

Environmental duplicate sampling results for all wells and all sampling periods show good correlation (relative percent difference values of less than 20 for VOCs and less than 35 for inorganic constituents) for all calculated parameters.

The results for the EB analyses are as follows:

- **February/March 2017 Sampling Event**—EB samples were collected prior to sampling monitoring wells TAV-MW8 and TAV-MW10. No VOCs, metals, or NPN were detected in EB samples.

- **May/June 2017 Sampling Event**—EB samples were collected prior to sampling monitoring wells LWDS-MW2, TAV-MW4, TAV-MW9, and TAV-MW16 and submitted for all analyses. Acetone, 2-butanone, and chloride were detected above laboratory MDLs. No corrective action was necessary because these analytes were not detected above associated MDLs or detected in environmental samples at concentrations greater than five times the associated EB result.

- **July/August 2017 Sampling Event—**EB samples were collected prior to sampling monitoring wells TAV-MW2, TAV-MW14, and TAV-MW15. Acetone was detected in one EB sample, NPN in one EB sample, and chloride and sulfate in one EB sample. No corrective action was necessary because acetone was not detected in the associated environmental sample, and chloride, NPN, and sulfate were reported at concentrations < 10 times associated environmental samples.

- **October/November 2017 Sampling Event**—EB samples were collected prior to sampling monitoring wells TAV-MW7, TAV-MW11, and TAV-MW16. Acetone, 2-butanone, chloroform, and chloride were reported in one EB sample (TAV-MW16). Acetone was reported at a concentration greater than the associated environmental sample, and qualified as not detected during data validation. No corrective action was necessary for 2-butanone, chloroform, or chloride because these parameters were not detected in the associated environmental sample or reported at concentrations < 5 times the associated environmental sample.

The results for the FB analyses are as follows:

- **February/March 2017 Sampling Event**—FB samples were collected at monitoring TAV-MW10, TAV-MW11, and TAV-MW15. No VOCs were detected above laboratory MDLs.

- **May/June 2017 Sampling Event—**FB samples were collected at monitoring wells AVN-1, TAV-MW3, TAV-MW13, and TAV-MW15. No VOCs were detected above laboratory MDLs.

- **July/August 2017 Sampling Event**—FB samples were collected at monitoring wells TAV-MW4 and TAV-MW8. No VOCs were detected in FB samples.

- **October/November 2017 Sampling Event**—FB samples were collected at monitoring wells TAV-MW2, TAV-MW14, and TAV-MW15. No VOCs were detected in FB samples, except acetone. Acetone was reported in two FB samples, and no corrective action was required because acetone was not detected in associated environmental samples.

The results for the TB analyses are as follows:

- **February/March 2017 Sampling Event**—A total of 14 VOC TB samples were submitted with the environmental samples. No VOCs were detected above associated laboratory MDLs, except dichlorodifluoromethane. Dichlorodifluoromethane was detected in two TB samples, and no corrective action was necessary because this compound was not detected in the associated environmental sample. Acetone was reported in three TB samples but was qualified as not detected during data validation because this compound was detected in the associated laboratory method blank sample.

- **May/June 2017 Sampling Event**—A total of 23 VOC TB samples were submitted with the environmental samples. No VOCs were detected above associated laboratory MDLs.

- **July/August 2017 Sampling Event**—A total of 16 VOC TB samples were submitted with the environmental samples. No VOCs were detected above associated laboratory MDLs, except acetone and methylene chloride. Acetone was detected in six TB samples and methylene chloride in four TB samples. Acetone in the TAV-MW14 environmental sample, and methylene chloride in the TAV-MW10 and TAV-MW16 environmental samples were qualified as not detected during data validation because associated TB results were similar to environmental sample concentrations.

- **October/November 2016 Sampling Event**—A total of 17 VOC TB samples were submitted with the environmental samples. No VOCs were detected above associated laboratory MDLs.

5.8 Variances and Nonconformances

No variances or nonconformances from requirements specified in the TAVG monitoring mini-SAPs were identified during CY 2017 sampling activities. However, the following observations and activities associated with these sampling events were noted:

- **February/March 2017 Sampling Event**—Material (silt, sand, bentonite) accumulated on the tube bundle and sample pump after purging and sampling monitoring well TAV-MW15.

- **May/June 2017 Sampling Event**—Additional purge volume was required at monitoring wells TAV-MW2 (5-gallons), TAV-MW6 (2-gallons), and TAV-MW7 (2-gallons) to meet stability requirements for turbidity.

- **July/August 2017 Sampling Event**—The TAV-MW16 samples collected on July 28, 2017 were received by GEL Laboratories LLC outside temperature specifications for VOCs and general chemistry parameters. On August 14, 2017, TAV-MW16 was resampled for these analytical parameters. Material (silt, sand, bentonite) accumulated on the tube bundle and sample pump after purging and sampling monitoring well TAV-MW15.

5.9 Summary and Conclusions

The conceptual site model of contaminant transport at TA-V includes contaminant releases from the two primary sources, migration through the vadose zone and movement into and along with groundwater. TCE was presumably present in wastewater that was disposed at the underground LWDS drain field during the period from 1962 to 1967, and to the buried TA-V seepage pits from the 1960s until the early 1980s. Wastewater disposed at the seepage pits from the early 1980s until 1992 contained no TCE.

Wastewater containing dissolved TCE and other organic solvents moved downward through the alluvial fan lithofacies and into the Regional Aquifer. Wastewater containing no TCE continued to flush the vadose zone beneath the seepage pits until 1992, which most likely removed a significant portion of secondary contaminant sources. Upon cessation of wastewater disposal, drainage diminished through vertical pathways in the vadose zone. Low concentrations of TCE present in the Regional Aquifer today represent the wastewater releases before 1992. The combined effect of aquifer lithology, low groundwater flow velocities, dispersion, diffusion, and sorption are responsible for the current distribution of TCE in the Regional Aquifer.

TCE results in samples from monitoring wells LWDS-MW1, TAV-MW6, TAV-MW10, and TAV-MW12 exceeded the MCL of 5 μg/L. The maximum concentration of TCE detected during this reporting period was 17.4 μg/L in the sample collected from monitoring well LWDS-MW1 in March 2017.

During this reporting period, NPN results in samples from monitoring wells LWDS-MW1, TAV-MW10, and TAV-MW14 exceeded the MCL of 10 mg/L. The maximum concentration of NPN detected during this reporting period is 12.2 mg/L in the sample collected from monitoring well TAV-MW10 in November 2017.

The analytical results for this reporting period are consistent with historical values. The following conclusions are based on a comprehensive review of available information on current groundwater contamination in the TAVG AOC:

- The COCs for the TAVG AOC are TCE and nitrate.
- The primary sources of TCE and possibly nitrate in the TAVG AOC consist of two wastewater disposal systems; the LWDS drain field (SWMU 5) and the TA-V seepage pits (SWMU 275). An upgradient source of nitrate may also be present.
- Based on historical use and disposal of organic solvents at TA-V, the extent of TCE in groundwater is attributed to wastewater releases containing TCE and the subsequent transport of TCE through the vadose zone into the groundwater.
- The distribution of low concentrations of TCE in the Regional Aquifer has remained relatively stable and is attributed to the combined effect of aquifer lithology, low groundwater flow velocities, dispersion, diffusion, and sorption.

- The distribution of nitrate concentrations is laterally widespread in the area, both inside and outside the TA-V boundary. The extent of the 10 mg/L concentration contour, which accounts for the nitrate contamination, has remained relatively stable. An upgradient source probably contributes to the nitrate in the two AVN wells to the northeast of TA-V.

Ongoing groundwater monitoring activities of the TAVG AOC include the following:

- Continue obtaining periodic measurements of groundwater elevations in all active TAVG monitoring wells.

- Continue collecting groundwater samples at 18 TAVG monitoring wells. At a minimum, the analytes for groundwater sampling will consist of VOCs and NPN.

- Complete land survey of injection well TAV-INJ1.

- Submit a well installation report for TAV-INJ1 to NMED HWB.

- Continue reporting TAVG monitoring results in future SNL/NM Annual Groundwater Monitoring Reports.

- Continue implementing a phased Treatability Study of ISB to address the groundwater contamination at TAVG AOC.

- Provide a summary of the phased Treatability Study of ISB at TAVG AOC in DP-1845 quarterly reports to NMED GWQB.

Attachment 5A
Historical Timeline of the Technical Area-V Groundwater Area of Concern

This page intentionally left blank.

Table 5A-1. Historical Timeline of the TAVG AOC

Month	Year	Event	Reference
May	1959	KAFB water supply well KAFB-10 is installed in the northwest corner of TA-V. Water from the well was used occasionally for fire protection and maintenance.	NMOSE May 1959
April	1992	The LWDS RFI Work Plan (SWMUs 4, 5, and 52) is submitted.	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 then-method detection limit of 5 µg/L, 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 TAVG monitoring wells LWDS-MW1 and LWDS-MW2 reported in the CY 1994 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1995
June	1995	Report submitted discussing water quality issues reported in the CY 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 TAVG monitoring wells reported in the CY 1995 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1996
March	1996	Submit letter to the NMED with notification of 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 was plugged and abandoned due to the potential for the ungrouted annulus of this production well to act as a conduit.	SNL April 1996
March	1997	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 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	Provide responses to the NMED September 1997 RSI.	SNL January 1998
March	1998	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 1997 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1998
October	1998	Provide cross sections to NMED for the LWDS as required in the September 1997 RSI from NMED.	DOE October 1998

Refer to footnotes on page 5A-8.

Table 5A-1. Historical Timeline of the TAVG AOC *(Continued)*

Month	Year	Event	Reference
March	1999	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 1998 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1999b
March	1999	Submit 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 TAVG monitoring wells reported in the FY 1999 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2000
April	2001	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 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 TAVG monitoring wells for FYs 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 TAVG monitoring wells reported in the FY 2001 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2002
March	2003	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2002 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2003
June	2003	Subsurface geology at KAFB, including the TAVG monitoring area, is updated.	Van Hart June 2003
March	2004	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2003 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2004
April	2004	The NMED issues the Consent Order to the DOE/Sandia, which identified the TAVG as an AOC with groundwater contamination requiring a CME and a CCM.	NMED April 2004
May	2004	Submitted 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 Consent Order.	SNL April 2004a
May	2004	Submitted the *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwate*r. This document was required by the Consent Order.	SNL April 2004b
October	2004	The NMED issued an approval with modifications to the TA-V CME Work Plan and the CCM of Groundwater Flow and Contaminant Transport.	NMED October 2004
December	2004	Submitted responses to the NMED approval with modifications 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	Submitted 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

Refer to footnotes on page 5A-8.

Table 5A-1. Historical Timeline of the TAVG AOC *(Continued)*

Month	Year	Event	Reference
October	2005	Submitted request to NMED for change in sampling frequency for TAVG monitoring wells.	DOE October 2005
October	2005	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2004 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2005
March	2006	Requested the removal of well AVN-2 from the TAVG monitoring network due to insufficient water for sampling caused by declining water levels. Well AVN-2 is currently dry; it would be returned to service if water levels in the well recover.	DOE March 2006
November	2006	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2005 SNL/NM Annual Groundwater Monitoring Report.	SNL November 2006
March	2007	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 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 TAVG monitoring wells reported in the FY 2007 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2008
July	2008	NMED issued a NOD on the July 2005 CME Report for TAVG AOC.	NMED July 2008
September	2008	The 13 TAVG monitoring wells are resurveyed to establish new northing and easting coordinates and elevations for each well.	SNL October 2008
December	2008	Sandia, DOE/NNSA, 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 required characterization of perchlorate in groundwater in one well (LWDS-MW1) at TA-V.	NMED April 2009
April	2009	Submitted a response to the NOD on the July 2005 CME Report for TAVG AOC.	SNL April 2009
June	2009	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2008 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2009
August	2009	NMED issues a second NOD on the July 2005 CME Report for TAVG AOC.	NMED August 2009
November	2009	Submitted a response to the second NOD on the July 2005 CME Report for TAVG AOC.	SNL November 2009
December	2009	NMED issued a third NOD on the July 2005 CME Report for TAVG AOC.	NMED December 2009
February	2010	Submitted a response to the third NOD on the July 2005 CME Report for TAVG AOC.	SNL February 2010
May	2010	NMED issued a notice of conditional approval for the TA-V Groundwater Investigation Work Plan associated with the responses to the NODs.	NMED May 2010
October	2010	Began installation of groundwater monitoring wells TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14.	SNL February 2010

Refer to footnotes on page 5A-8.

Table 5A-1. Historical Timeline of the TAVG AOC *(Continued)*

Month	Year	Event	Reference
November	2010	Completed installation of groundwater monitoring wells TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14.	SNL June 2011
October	2010	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2009 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2010
November	2010	Submitted a report on the geophysical log and slug test results for the new TAVG monitoring wells.	SNL November 2010
December	2010	NMED issued approval for the modification of soil-vapor monitoring well design.	NMED December 2010
March	2011	Complete installation of soil-vapor monitoring wells TAV-SV01, TAV-SV02, and TAV-SV03.	SNL June 2011
June	2011	Submitted a Summary Report for TA-V Groundwater and Soil-Vapor Monitoring Well Installation.	SNL June 2011
July	2011	DOE/NNSA and Sandia meet with NMED to discuss the results from the first quarter of groundwater and soil-vapor monitoring.	SNL July 2011
September	2011	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2010 SNL/NM Annual Groundwater Monitoring Report.	SNL September 2011
September	2012	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2011 SNL/NM Annual Groundwater Monitoring Report.	SNL September 2012
June	2013	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2012 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2013
September	2013	NMED approved the *Summary Report for TA-V Groundwater and Soil-Vapor Monitoring Well Installation.*	NMED September 2013
December	2013	DOE/NNSA and Sandia requested the 2005 CME Report be withdrawn and replaced with an updated CCM and CME Report.	DOE December 2013
December	2013	NMED approved the extension request for an updated CCM and CME report due by November 21, 2014.	NMED December 2013
June	2014	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2013 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2014
September	2014	DOE Office of Environmental Management IRR issued a memorandum to DOE/NNSA Sandia Field Office providing the review team's comments and recommendations on the proposed corrective measures for TAVG AOC based on a multi-agency meeting with NMED on July 17, 2014.	DOE September 2014
November	2014	DOE/NNSA and Sandia submitted a two-year extension request for the CCM and CME Report.	DOE November 2014a
November	2014	DOE/IRR shared a memorandum that was submitted to the Deputy Assistant Secretary of the Office of Environmental Compliance regarding IRR team's recommendations for TAVG AOC.	DOE November 2014b

Refer to footnotes on page 5A-8.

Table 5A-1. Historical Timeline of the TAVG AOC *(Continued)*

Month	Year	Event	Reference
January	2015	NMED approved the extension request for an updated CCM and CME report. Due date revised to November 30, 2016.	NMED January 2015b
June	2015	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2014 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2015
October	2015	DOE/NNSA and Sandia submitted the CCM and a TSWP for In Situ Bioremediation at TAVG AOC.	DOE October 2015
November	2015	NMED approved the CCM for TAVG AOC.	NMED November 2015
December	2015	NMED disapproved the TSWP and requests a revised TSWP and a response letter that addresses the disapproval comments by January 29, 2016.	NMED December 2015
January	2016	DOE/NNSA and Sandia requested a two-month extension request for the revised TSWP and the response letter to NMED's disapproval letter.	DOE January 2016
March	2016	DOE/NNSA and Sandia submitted the revised TSWP and the response to NMED's disapproval letter.	DOE March 2016a
March	2016	DOE/NNSA and Sandia requested a milestone extension to update the CCM and CME reports.	DOE March 2016b
April	2016	NMED stated the new due date for the CCM and CME reports for TAVG are May 20, 2022.	NMED April 2016
May	2016	NMED approved the Revised TSWP.	NMED May 2016b
May	2016	DOE/NNSA and Sandia submitted the Notice of Intent to Discharge for TA-V Treatability Study injection wells.	DOE May 2016
May	2016	NMED stated the TA-V Geophysical and Slug Test Results (SNL November 2010) will be superseded by the updated CCM and CME reports.	NMED May 2016a
June	2016	NMED required a Discharge Permit for TA-V Treatability Study injection wells.	NMED June 2016
June	2016	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2015 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2016
July	2016	DOE/NNSA and Sandia submitted the Discharge Permit Application for TA-V Treatability Study injection wells.	DOE July 2016a
July	2016	DOE/NNSA and Sandia submitted the Permit to Drill applications for installing two groundwater monitoring wells TAV-MW15 and TAV-MW16, and one injection well TAV-INJ1.	DOE July 2016b
August	2016	NMOSE approved the Permit to Drill applications for wells TAV-MW15, TAV-MW16, and TAV-INJ1.	NMOSE August 2016
September	2016	NMED determined the Discharge Permit Application is administratively complete.	NMED September 2016
November	2016	DOE/NNSA and Sandia completed the public notice requirements for the Discharge Permit.	DOE November 2016
January	2017	Completed installation and development of TAV-MW15 and TAV-MW16.	SNL July 2017a

Refer to footnotes on page 5A-8.

Table 5A-1. Historical Timeline of the TAVG AOC *(Concluded)*

Month	Year	Event	Reference
January	2017	Completed redevelopment of monitoring wells AVN-1, LWDS-MW2, TAV-MW2, TAV-MW9, TAV-MW11, and TAV-MW12.	Lum May 2017
February	2017	Implemented new quarterly sampling requirements per the NMED-approved Revised Treatability Study Work Plan.	DOE March 2016a NMED May 2016b
May	2017	NMED issued Discharge Permit, DP-1845 for TA-V Treatability Study injection wells.	NMED May 2017
July	2017	Submitted well installation report for TAV-MW15 and TAV-MW16.	SNL July 2017a
July	2017	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2016 SNL/NM Annual Groundwater Monitoring Report.	SNL July 2017b
August	2017	NMED approved the well installation report for TAV-MW15 and TAV-MW16.	NMED August 2017
September	2017	Began installation of injection well TAV-INJ1.	
November	2017	Pilot Study commenced with first injection of in situ bioremediation solution.	DOE November 2017

NOTES:

AOC	= Area of concern.
AVN	= Area-V (North).
CCM	= Current Conceptual Model.
CME	= Corrective Measures Evaluation.
Consent Order	= Compliance Order on Consent.
CY	= Calendar Year.
DOE	= U.S. Department of Energy.
EPA	= U.S. Environmental Protection Agency.
FY	= Fiscal Year.
IRR	= Internal Remedy Review.
IT	= IT Corporation.
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.
NNSA	= National Nuclear Security Administration.
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.
SV	= Soil vapor.
SWMU	= Solid Waste Management Unit.
TA	= Technical Area.
TAV	= Technical Area-V.
TAVG	= Technical Area-V Groundwater.
TCE	= Trichloroethene.
TSWP	= Treatability Study Work Plan.

Attachment 5B
Technical Area-V
Analytical Results Tables

This page intentionally left blank.

Attachment 5B Tables

This page intentionally left blank.

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

Calendar Year 2017

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	**17.4**	0.300	1.00	5.00			101782-001	SW846-8260
03-Mar-17	cis-1,2-Dichloroethene	3.59	0.300	1.00	70.0			101782-001	SW846-8260
TAV-MW2 14-Feb-17	Trichloroethene	2.17	0.300	1.00	5.00			101752-001	SW846-8260
TAV-MW4	Chloroform	0.830	0.300	1.00	NE	J		101759-001	SW846-8260
20-Feb-17	Trichloroethene	3.86	0.300	1.00	5.00			101759-001	SW846-8260
TAV-MW6	Trichloroethene	**12.3**	0.300	1.00	5.00			101770-001	SW846-8260
27-Feb-17	cis-1,2-Dichloroethene	2.04	0.300	1.00	70.0			101770-001	SW846-8260
TAV-MW8	Acetone	1.76	1.50	10.0	NE	B, J	10UJ	101763-001	SW846-8260
21-Feb-17	Trichloroethene	3.75	0.300	1.00	5.00			101763-001	SW846-8260
	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		101763-001	SW846-8260
TAV-MW8 (Duplicate)	Trichloroethene	3.64	0.300	1.00	5.00			101764-001	SW846-8260
21-Feb-17	cis-1,2-Dichloroethene	0.330	0.300	1.00	70.0	J		101764-001	SW846-8260
TAV-MW10	Trichloroethene	**10.1**	0.300	1.00	5.00			101779-001	SW846-8260
28-Feb-17	cis-1,2-Dichloroethene	1.70	0.300	1.00	70.0			101779-001	SW846-8260
TAV-MW10 (Duplicate)	Trichloroethene	**10.6**	0.300	1.00	5.00			101780-001	SW846-8260
28-Feb-17	cis-1,2-Dichloroethene	1.86	0.300	1.00	70.0			101780-001	SW846-8260
TAV-MW11	Trichloroethene	2.66	0.300	1.00	5.00			101755-001	SW846-8260
17-Feb-17	cis-1,2-Dichloroethene	0.360	0.300	1.00	70.0	J		101755-001	SW846-8260
TAV-MW12	Trichloroethene	**5.73**	0.300	1.00	5.00			101757-001	SW846-8260
22-Feb-17	cis-1,2-Dichloroethene	0.400	0.300	1.00	70.0	J		101757-001	SW846-8260
TAV-MW14	Acetone	1.52	1.50	10.0	NE	B, J	10UJ	101766-001	SW846-8260
23-Feb-17	Trichloroethene	4.68	0.300	1.00	5.00			101766-001	SW846-8260
	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		101766-001	SW846-8260
TAV-MW16	Carbon disulfide	1.77	1.50	5.00	NE	J		101788-001	SW846-8260
16-Feb-17	Trichloroethene	0.340	0.300	1.00	5.00	J		101788-001	SW846-8260
LWDS-MW1	Methylene chloride	1.46	1.00	10.0	5.00	B, J	10U	102696-001	SW846-8260
12-Jun-17	Trichloroethene	**10.2**	0.300	1.00	5.00			102696-001	SW846-8260
	cis-1,2-Dichloroethene	2.62	0.300	1.00	70.0			102696-001	SW846-8260
TAV-MW2 25-May-17	Trichloroethene	2.67	0.300	1.00	5.00			102675-001	SW846-8260

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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-MW4 01-Jun-17	Chloroform	0.830	0.300	1.00	NE	J		102679-001	SW846-8260
	Trichloroethene	3.90	0.300	1.00	5.00			102679-001	SW846-8260
	cis-1,2-Dichloroethene	0.330	0.300	1.00	70.0	J		102679-001	SW846-8260
TAV-MW4 (Duplicate) 01-Jun-17	Chloroform	0.860	0.300	1.00	NE	J		102680-001	SW846-8260
	Trichloroethene	4.05	0.300	1.00	5.00			102680-001	SW846-8260
	cis-1,2-Dichloroethene	0.330	0.300	1.00	70.0	J		102680-001	SW846-8260
TAV-MW6 07-Jun-17	Trichloroethene	**10.1**	0.300	1.00	5.00			102694-001	SW846-8260
	cis-1,2-Dichloroethene	1.73	0.300	1.00	70.0			102694-001	SW846-8260
TAV-MW8 02-Jun-17	Trichloroethene	3.65	0.300	1.00	5.00			102682-001	SW846-8260
	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		102682-001	SW846-8260
TAV-MW10 08-Jun-17	Trichloroethene	**8.63**	0.300	1.00	5.00			102692-001	SW846-8260
	cis-1,2-Dichloroethene	1.70	0.300	1.00	70.0			102692-001	SW846-8260
TAV-MW11 31-May-17	Trichloroethene	3.33	0.300	1.00	5.00			102677-001	SW846-8260
	cis-1,2-Dichloroethene	0.390	0.300	1.00	70.0	J		102677-001	SW846-8260
TAV-MW12 05-Jun-17	Trichloroethene	**5.13**	0.300	1.00	5.00			102690-001	SW846-8260
TAV-MW14 06-Jun-17	Trichloroethene	4.47	0.300	1.00	5.00			102686-001	SW846-8260
	cis-1,2-Dichloroethene	0.500	0.300	1.00	70.0	J		102686-001	SW846-8260
TAV-MW16 24-May-17	Trichloroethene	0.470	0.300	1.00	5.00	J		102715-001	SW846-8260
TAV-MW16 (Duplicate) 24-May-17	Trichloroethene	0.520	0.300	1.00	5.00	J		102716-001	SW846-8260
LWDS-MW1 07-Aug-17	Trichloroethene	**16.8**	0.300	1.00	5.00			103229-001	SW846-8260
	cis-1,2-Dichloroethene	3.46	0.300	1.00	70.0			103229-001	SW846-8260
TAV-MW2 31-Jul-17	Trichloroethene	2.76	0.300	1.00	5.00			103218-001	SW846-8260
TAV-MW2 (Duplicate) 31-Jul-17	Trichloroethene	2.73	0.300	1.00	5.00			103219-001	SW846-8260
TAV-MW4 02-Aug-17	Chloroform	0.870	0.300	1.00	NE	J		103224-001	SW846-8260
	Trichloroethene	4.13	0.300	1.00	5.00			103224-001	SW846-8260
TAV-MW6 10-Aug-17	Trichloroethene	**9.15**	0.300	1.00	5.00			103243-001	SW846-8260
	cis-1,2-Dichloroethene	1.44	0.300	1.00	70.0			103243-001	SW846-8260
TAV-MW8 03-Aug-17	Trichloroethene	4.00	0.300	1.00	5.00			103227-001	SW846-8260

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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-MW10	Methylene chloride	1.07	1.00	10.0	5.00	J	10U	103245-001	SW846-8260
11-Aug-17	Trichloroethene	**9.96**	0.300	1.00	5.00			103245-001	SW846-8260
	cis-1,2-Dichloroethene	1.65	0.300	1.00	70.0			103245-001	SW846-8260
TAV-MW11	Trichloroethene	3.04	0.300	1.00	5.00			103221-001	SW846-8260
01-Aug-17	cis-1,2-Dichloroethene	0.320	0.300	1.00	70.0	J		103221-001	SW846-8260
TAV-MW12 08-Aug-17	Trichloroethene	4.76	0.300	1.00	5.00			103231-001	SW846-8260
TAV-MW14	Acetone	1.79	1.50	10.0	NE	J	10UJ	103237-001	SW846-8260
09-Aug-17	Trichloroethene	4.88	0.300	1.00	5.00			103237-001	SW846-8260
	cis-1,2-Dichloroethene	0.520	0.300	1.00	70.0	J		103237-001	SW846-8260
TAV-MW14 (Duplicate)	Trichloroethene	4.63	0.300	1.00	5.00			103238-001	SW846-8260
09-Aug-17	cis-1,2-Dichloroethene	0.540	0.300	1.00	70.0	J		103238-001	SW846-8260
TAV-MW16	Methylene chloride	1.19	1.00	10.0	5.00	J	10U	103316-001	SW846-8260
14-Aug-17	Trichloroethene	0.450	0.300	1.00	5.00	J		103316-001	SW846-8260
LWDS-MW1	Trichloroethene	**15.0**	0.300	1.00	5.00			103942-001	SW846-8260
20-Nov-17	cis-1,2-Dichloroethene	3.19	0.300	1.00	70.0			103942-001	SW846-8260
TAV-MW2 02-Nov-17	Trichloroethene	2.73	0.300	1.00	5.00			103940-001	SW846-8260
TAV-MW4	Chloroform	0.960	0.300	1.00	NE	J		103944-001	SW846-8260
08-Nov-17	Trichloroethene	3.13	0.300	1.00	5.00			103944-001	SW846-8260
TAV-MW6	Trichloroethene	**9.34**	0.300	1.00	5.00			103946-001	SW846-8260
14-Nov-17	cis-1,2-Dichloroethene	1.19	0.300	1.00	70.0			103946-001	SW846-8260
TAV-MW8 08-Nov-17	Trichloroethene	3.28	0.300	1.00	5.00			103952-001	SW846-8260
TAV-MW10	Trichloroethene	**7.48**	0.300	1.00	5.00			103954-001	SW846-8260
27-Nov-17	cis-1,2-Dichloroethene	1.31	0.300	1.00	70.0			103954-001	SW846-8260
TAV-MW11	Trichloroethene	2.51	0.300	1.00	5.00			103956-001	SW846-8260
06-Nov-17	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		103956-001	SW846-8260
TAV-MW11 (Duplicate)	Trichloroethene	2.66	0.300	1.00	5.00			103957-001	SW846-8260
06-Nov-17	cis-1,2-Dichloroethene	0.300	0.300	1.00	70.0	J		103957-001	SW846-8260
TAV-MW12	Trichloroethene	**5.87**	0.300	1.00	5.00			103959-001	SW846-8260
13-Nov-17	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		103959-001	SW846-8260

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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-MW14	Trichloroethene	4.38	0.300	1.00	5.00			103962-001	SW846-8260
14-Nov-17	cis-1,2-Dichloroethene	0.380	0.300	1.00	70.0	J		103962-001	SW846-8260
TAV-MW16 01-Nov-17	Trichloroethene	0.520	0.300	1.00	5.00	J	J	103980-001	SW846-8260
TAV-MW16 (Duplicate)	Acetone	2.66	1.50	10.0	NE	J	10UJ	103981-001	SW846-8260
01-Nov-17	Trichloroethene	0.520	0.300	1.00	5.00	J	J	103981-001	SW846-8260

Refer to footnotes on page 5B-61.

Table 5B-2
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] SW846-8260), Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Analyte	MDL[b] (µg/L)	Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300	Chlorobenzene	0.300
1,1,2,2-Tetrachloroethane	0.300	Chloroethane	0.300
1,1,2-Trichloroethane	0.300	Chloroform	0.300
1,1-Dichloroethane	0.300	Chloromethane	0.300
1,1-Dichloroethene	0.300	Cyclohexane	0.300
1,2,3-Trichlorobenzene	0.300	Dibromochloromethane	0.300
1,2,4-Trichlorobenzene	0.300	Dichlorodifluoromethane	0.300
1,2-Dibromo-3-chloropropane	0.500	Ethyl benzene	0.300
1,2-Dibromoethane	0.300	Isopropylbenzene	0.300
1,2-Dichlorobenzene	0.300	Methyl acetate	1.50
1,2-Dichloroethane	0.300	Methylcyclohexane	0.300
1,2-Dichloropropane	0.300	Methylene chloride	1.00
1,3-Dichlorobenzene	0.300	Styrene	0.300
1,4-Dichlorobenzene	0.300	Tert-butyl methyl ether	0.300
2,2-trifluoroethane, 1,1,2-Trichloro-1	2.00	Tetrachloroethene	0.300
2-Butanone	1.50	Toluene	0.300
2-Hexanone	1.50	Trichloroethene	0.300
4-methyl-, 2-Pentanone	1.50	Trichlorofluoromethane	0.300
Acetone	1.50	Vinyl chloride	0.300
Benzene	0.300	Xylene	0.300
Bromochloromethane	0.300	cis-1,2-Dichloroethene	0.300
Bromodichloromethane	0.300	cis-1,3-Dichloropropene	0.300
Bromoform	0.300	m-, p-Xylene	0.300
Bromomethane	0.300	o-Xylene	0.300
Carbon disulfide	1.50	trans-1,2-Dichloroethene	0.300
Carbon tetrachloride	0.300	trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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 03-Mar-17	Nitrate plus nitrite	**11.8**	0.425	1.25	10.0			101782-002	EPA 353.2
TAV-MW2 14-Feb-17	Nitrate plus nitrite	4.63	0.170	0.500	10.0			101752-002	EPA 353.2
TAV-MW4 20-Feb-17	Nitrate plus nitrite	5.76	0.170	0.500	10.0			101759-002	EPA 353.2
TAV-MW6 27-Feb-17	Nitrate plus nitrite	7.81	0.170	0.500	10.0			101770-002	EPA 353.2
TAV-MW8 21-Feb-17	Nitrate plus nitrite	8.21	0.170	0.500	10.0			101763-002	EPA 353.2
TAV-MW8 (Duplicate) 21-Feb-17	Nitrate plus nitrite	7.57	0.170	0.500	10.0			101764-002	EPA 353.2
TAV-MW10 28-Feb-17	Nitrate plus nitrite	**11.2**	0.170	0.500	10.0			101779-002	EPA 353.2
TAV-MW10 (Duplicate) 28-Feb-17	Nitrate plus nitrite	**11.5**	0.170	0.500	10.0			101780-002	EPA 353.2
TAV-MW11 17-Feb-17	Nitrate plus nitrite	6.90	0.170	0.500	10.0			101755-002	EPA 353.2
TAV-MW12 22-Feb-17	Nitrate plus nitrite	8.59	0.170	0.500	10.0			101757-002	EPA 353.2
TAV-MW14 23-Feb-17	Nitrate plus nitrite	**11.7**	0.170	0.500	10.0			101766-002	EPA 353.2
TAV-MW15 15-Feb-17	Nitrate plus nitrite	1.75	0.085	0.250	10.0			101786-002	EPA 353.2
TAV-MW16 16-Feb-17	Nitrate plus nitrite	2.21	0.085	0.250	10.0			101788-002	EPA 353.2
AVN-1 23-May-17	Nitrate plus nitrite	9.38	0.170	0.500	10.0			102671-005	EPA 353.2
LWDS-MW1 12-Jun-17	Nitrate plus nitrite	**11.5**	0.850	2.50	10.0			102696-005	EPA 353.2
LWDS-MW2 18-May-17	Nitrate plus nitrite	7.93	0.170	0.500	10.0			102667-005	EPA 353.2
LWDS-MW2 (Duplicate) 18-May-17	Nitrate plus nitrite	7.97	0.170	0.500	10.0			102668-003	EPA 353.2
TAV-MW2 25-May-17	Nitrate plus nitrite	4.45	0.170	0.500	10.0			102675-005	EPA 353.2

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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 17-May-17	Nitrate plus nitrite	5.26	0.170	0.500	10.0			102663-005	EPA 353.2
TAV-MW4 01-Jun-17	Nitrate plus nitrite	4.76	0.170	0.500	10.0			102679-005	EPA 353.2
TAV-MW4 (Duplicate) 01-Jun-17	Nitrate plus nitrite	5.78	0.170	0.500	10.0			102680-003	EPA 353.2
TAV-MW5 11-May-17	Nitrate plus nitrite	7.20	0.170	0.500	10.0			102652-005	EPA 353.2
TAV-MW6 07-Jun-17	Nitrate plus nitrite	8.03	0.425	1.25	10.0			102694-005	EPA 353.2
TAV-MW7 16-May-17	Nitrate plus nitrite	4.23	0.170	0.500	10.0			102660-005	EPA 353.2
TAV-MW8 02-Jun-17	Nitrate plus nitrite	6.25	0.170	0.500	10.0			102682-005	EPA 353.2
TAV-MW9 15-May-17	Nitrate plus nitrite	4.31	0.170	0.500	10.0			102656-005	EPA 353.2
TAV-MW9 (Duplicate) 15-May-17	Nitrate plus nitrite	4.26	0.170	0.500	10.0			102657-003	EPA 353.2
TAV-MW10 08-Jun-17	Nitrate plus nitrite	**11.9**	0.425	1.25	10.0			102692-005	EPA 353.2
TAV-MW11 31-May-17	Nitrate plus nitrite	7.93	0.170	0.500	10.0			102677-005	EPA 353.2
TAV-MW12 05-Jun-17	Nitrate plus nitrite	6.34	0.170	0.500	10.0			102690-005	EPA 353.2
TAV-MW13 10-May-17	Nitrate plus nitrite	5.88	0.170	0.500	10.0			102641-005	EPA 353.2
TAV-MW14 06-Jun-17	Nitrate plus nitrite	8.85	0.425	1.25	10.0			102686-005	EPA 353.2
TAV-MW15 22-May-17	Nitrate plus nitrite	1.68	0.085	0.250	10.0			102711-002	EPA 353.2
TAV-MW16 24-May-17	Nitrate plus nitrite	2.22	0.085	0.250	10.0			102715-002	EPA 353.2
TAV-MW16 (Duplicate) 24-May-17	Nitrate plus nitrite	2.21	0.085	0.250	10.0			102716-002	EPA 353.2

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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 07-Aug-17	Nitrate plus nitrite	**12.0**	0.425	1.25	10.0			103229-003	EPA 353.2
TAV-MW2 31-Jul-17	Nitrate plus nitrite	4.41	0.170	0.500	10.0			103218-003	EPA 353.2
TAV-MW2 (Duplicate) 31-Jul-17	Nitrate plus nitrite	4.47	0.170	0.500	10.0			103219-003	EPA 353.2
TAV-MW4 02-Aug-17	Nitrate plus nitrite	4.62	0.085	0.250	10.0			103224-003	EPA 353.2
TAV-MW6 10-Aug-17	Nitrate plus nitrite	7.98	0.425	1.25	10.0			103243-003	EPA 353.2
TAV-MW8 03-Aug-17	Nitrate plus nitrite	6.49	0.170	0.500	10.0			103227-003	EPA 353.2
TAV-MW10 11-Aug-17	Nitrate plus nitrite	**11.4**	0.170	0.500	10.0			103245-003	EPA 353.2
TAV-MW11 01-Aug-17	Nitrate plus nitrite	6.50	0.170	0.500	10.0			103221-003	EPA 353.2
TAV-MW12 08-Aug-17	Nitrate plus nitrite	6.25	0.170	0.500	10.0			103231-003	EPA 353.2
TAV-MW14 09-Aug-17	Nitrate plus nitrite	8.48	0.425	1.25	10.0			103237-003	EPA 353.2
TAV-MW14 (Duplicate) 09-Aug-17	Nitrate plus nitrite	8.50	0.425	1.25	10.0			103238-003	EPA 353.2
TAV-MW15 27-Jul-17	Nitrate plus nitrite	1.69	0.085	0.250	10.0			103208-005	EPA 353.2
TAV-MW15 (Duplicate) 27-Jul-17	Nitrate plus nitrite	1.66	0.085	0.250	10.0			103209-005	EPA 353.2
TAV-MW16 14-Aug-17	Nitrate plus nitrite	2.12	0.170	0.500	10.0			103316-003	EPA 353.2
LWDS-MW1 20-Nov-17	Nitrate plus nitrite	**11.3**	0.170	0.500	10.0			103942-002	EPA 353.2
TAV-MW2 02-Nov-17	Nitrate plus nitrite	4.56	0.085	0.250	10.0			103940-002	EPA 353.2
TAV-MW4 08-Nov-17	Nitrate plus nitrite	6.52	0.170	0.500	10.0			103944-002	EPA 353.2

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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 14-Nov-17	Nitrate plus nitrite	8.15	0.425	1.25	10.0			103946-002	EPA 353.2
TAV-MW7 07-Nov-17	Nitrate plus nitrite	4.64	0.170	0.500	10.0			103948-002	EPA 353.2
TAV-MW7 (Duplicate) 07-Nov-17	Nitrate plus nitrite	4.41	0.170	0.500	10.0			103949-002	EPA 353.2
TAV-MW8 08-Nov-17	Nitrate plus nitrite	6.63	0.170	0.500	10.0			103952-002	EPA 353.2
TAV-MW10 27-Nov-17	Nitrate plus nitrite	**12.2**	0.425	1.25	10.0			103954-002	EPA 353.2
TAV-MW11 06-Nov-17	Nitrate plus nitrite	6.48	0.170	0.500	10.0			103956-002	EPA 353.2
TAV-MW11 (Duplicate) 06-Nov-17	Nitrate plus nitrite	7.85	0.170	0.500	10.0			103957-002	EPA 353.2
TAV-MW12 13-Nov-17	Nitrate plus nitrite	7.08	0.170	0.500	10.0			103959-002	EPA 353.2
TAV-MW14 14-Nov-17	Nitrate plus nitrite	8.05	0.425	1.25	10.0			103962-002	EPA 353.2
TAV-MW15 31-Oct-17	Nitrate plus nitrite	1.70	0.085	0.250	10.0			103984-002	EPA 353.2
TAV-MW16 01-Nov-17	Nitrate plus nitrite	2.26	0.085	0.250	10.0			103980-002	EPA 353.2
TAV-MW16 (Duplicate) 01-Nov-17	Nitrate plus nitrite	2.27	0.085	0.250	10.0			103981-002	EPA 353.2

Refer to footnotes on page 5B-61.

Table 5B-4
Summary of Filtered Metals Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Arsenic	0.00297	0.0017	0.005	0.010	J		101782-003	SW846 6020
03-Mar-17	Iron	ND	0.033	0.100	NE	U		101782-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101782-003	SW846 6020
TAV-MW2	Arsenic	ND	0.0017	0.005	0.010	U		101752-003	SW846 6020
14-Feb-17	Iron	0.0752	0.033	0.100	NE	J		101752-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101752-003	SW846 6020
TAV-MW4	Arsenic	0.00227	0.0017	0.005	0.010	J		101759-003	SW846 6020
20-Feb-17	Iron	ND	0.033	0.100	NE	U		101759-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101759-003	SW846 6020
TAV-MW6	Arsenic	ND	0.0017	0.005	0.010	U		101770-003	SW846 6020
27-Feb-17	Iron	0.0825	0.033	0.100	NE	J		101770-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101770-003	SW846 6020
TAV-MW8	Arsenic	0.00207	0.0017	0.005	0.010	J		101763-003	SW846 6020
21-Feb-17	Iron	ND	0.033	0.100	NE	U		101763-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101763-003	SW846 6020
TAV-MW8 (Duplicate)	Arsenic	0.00215	0.0017	0.005	0.010	J		101764-003	SW846 6020
21-Feb-17	Iron	ND	0.033	0.100	NE	U		101764-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101764-003	SW846 6020
TAV-MW10	Arsenic	ND	0.0017	0.005	0.010	U		101779-003	SW846 6020
28-Feb-17	Iron	0.0871	0.033	0.100	NE	J		101779-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101779-003	SW846 6020
TAV-MW10 (Duplicate)	Arsenic	ND	0.0017	0.005	0.010	U		101780-003	SW846 6020
28-Feb-17	Iron	0.0901	0.033	0.100	NE	J		101780-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101780-003	SW846 6020
TAV-MW11	Arsenic	ND	0.0017	0.005	0.010	U		101755-003	SW846 6020
17-Feb-17	Iron	0.0581	0.033	0.100	NE	J		101755-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101755-003	SW846 6020
TAV-MW12	Arsenic	ND	0.0017	0.005	0.010	U		101757-003	SW846 6020
22-Feb-17	Iron	ND	0.033	0.100	NE	U		101757-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101757-003	SW846 6020
TAV-MW14	Arsenic	ND	0.0017	0.005	0.010	U		101766-003	SW846 6020
23-Feb-17	Iron	ND	0.033	0.100	NE	U		101766-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		101766-003	SW846 6020
TAV-MW15	Arsenic	ND	0.0017	0.005	0.010	U	UJ	101786-005	SW846 6020
15-Feb-17	Iron	0.0752	0.033	0.100	NE	J	J	101786-005	SW846 6020
	Manganese	0.309	0.001	0.005	NE		J	101786-005	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-4 *(Continued)*
Summary of Filtered Metals Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW16	Arsenic	ND	0.0017	0.005	0.010	U	UJ	101788-005	SW846 6020
16-Feb-17	Iron	0.0861	0.033	0.100	NE	J	J	101788-005	SW846 6020
	Manganese	0.119	0.001	0.005	NE		J	101788-005	SW846 6020
AVN-1	Arsenic	0.00201	0.002	0.005	0.010	B, J	0.005U	102671-003	SW846 6020
23-May-17	Iron	ND	0.033	0.100	NE	U		102671-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102671-003	SW846 6020
LWDS-MW1	Arsenic	0.00314	0.002	0.005	0.010	J		102696-003	SW846 6020
12-Jun-17	Iron	ND	0.033	0.100	NE	U		102696-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102696-003	SW846 6020
LWDS-MW2	Arsenic	0.00214	0.002	0.005	0.010	J		102667-003	SW846 6020
18-May-17	Iron	ND	0.033	0.100	NE	U		102667-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102667-003	SW846 6020
LWDS-MW2 (Duplicate)	Arsenic	0.00217	0.002	0.005	0.010	J		102668-002	SW846 6020
18-May-17	Iron	ND	0.033	0.100	NE	U		102668-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102668-002	SW846 6020
TAV-MW2	Arsenic	ND	0.002	0.005	0.010	U		102675-003	SW846 6020
25-May-17	Iron	ND	0.033	0.100	NE	U		102675-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102675-003	SW846 6020
TAV-MW3	Arsenic	0.00204	0.002	0.005	0.010	J		102663-003	SW846 6020
17-May-17	Iron	ND	0.033	0.100	NE	U		102663-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102663-003	SW846 6020
TAV-MW4	Arsenic	0.00223	0.002	0.005	0.010	J		102679-003	SW846 6020
01-Jun-17	Iron	ND	0.033	0.100	NE	U		102679-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102679-003	SW846 6020
TAV-MW4 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		102680-002	SW846 6020
01-Jun-17	Iron	ND	0.033	0.100	NE	U		102680-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102680-002	SW846 6020
TAV-MW5	Arsenic	0.00208	0.002	0.005	0.010	J		102652-003	SW846 6020
11-May-17	Iron	ND	0.033	0.100	NE	U		102652-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102652-003	SW846 6020
TAV-MW6	Arsenic	0.00205	0.002	0.005	0.010	J		102694-003	SW846 6020
07-Jun-17	Iron	ND	0.033	0.100	NE	U		102694-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102694-003	SW846 6020
TAV-MW7	Arsenic	ND	0.002	0.005	0.010	U		102660-003	SW846 6020
16-May-17	Iron	ND	0.033	0.100	NE	U		102660-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102660-003	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-4 *(Continued)*
Summary of Filtered Metals Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Arsenic	0.00202	0.002	0.005	0.010	J		102682-003	SW846 6020
02-Jun-17	Iron	ND	0.033	0.100	NE	U		102682-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102682-003	SW846 6020
TAV-MW9	Arsenic	ND	0.002	0.005	0.010	U		102656-003	SW846 6020
15-May-17	Iron	ND	0.033	0.100	NE	U		102656-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102656-003	SW846 6020
TAV-MW9 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		102657-002	SW846 6020
15-May-17	Iron	ND	0.033	0.100	NE	U		102657-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102657-002	SW846 6020
TAV-MW10	Arsenic	ND	0.002	0.005	0.010	U		102692-003	SW846 6020
08-Jun-17	Iron	ND	0.033	0.100	NE	U		102692-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102692-003	SW846 6020
TAV-MW11	Arsenic	0.00223	0.002	0.005	0.010	J		102677-003	SW846 6020
31-May-17	Iron	ND	0.033	0.100	NE	U		102677-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102677-003	SW846 6020
TAV-MW12	Arsenic	ND	0.002	0.005	0.010	U		102690-003	SW846 6020
05-Jun-17	Iron	ND	0.033	0.100	NE	U		102690-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102690-003	SW846 6020
TAV-MW13	Arsenic	0.00211	0.002	0.005	0.010	J		102641-003	SW846 6020
10-May-17	Iron	ND	0.033	0.100	NE	U		102641-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102641-003	SW846 6020
TAV-MW14	Arsenic	ND	0.002	0.005	0.010	U		102686-003	SW846 6020
06-Jun-17	Iron	ND	0.033	0.100	NE	U		102686-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102686-003	SW846 6020
TAV-MW15	Arsenic	ND	0.002	0.005	0.010	U		102711-005	SW846 6020
22-May-17	Iron	ND	0.033	0.100	NE	U		102711-005	SW846 6020
	Manganese	0.0247	0.001	0.005	NE			102711-005	SW846 6020
TAV-MW16	Arsenic	ND	0.002	0.005	0.010	U		102715-005	SW846 6020
24-May-17	Iron	ND	0.033	0.100	NE	U		102715-005	SW846 6020
	Manganese	0.00271	0.001	0.005	NE	J		102715-005	SW846 6020
TAV-MW16 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		102716-004	SW846 6020
24-May-17	Iron	ND	0.033	0.100	NE	U		102716-004	SW846 6020
	Manganese	0.00247	0.001	0.005	NE	J		102716-004	SW846 6020
LWDS-MW1	Arsenic	0.00303	0.002	0.005	0.010	J		103229-002	SW846 6020
07-Aug-17	Iron	ND	0.033	0.100	NE	U		103229-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103229-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-4 *(Continued)*
Summary of Filtered Metals Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Arsenic	ND	0.002	0.005	0.010	U		103218-002	SW846 6020
31-Jul-17	Iron	ND	0.033	0.100	NE	U		103218-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103218-002	SW846 6020
TAV-MW2 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		103219-002	SW846 6020
31-Jul-17	Iron	ND	0.033	0.100	NE	U		103219-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103219-002	SW846 6020
TAV-MW4	Arsenic	0.00237	0.002	0.005	0.010	J		103224-002	SW846 6020
02-Aug-17	Iron	ND	0.033	0.100	NE	U		103224-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103224-002	SW846 6020
TAV-MW6	Arsenic	0.0022	0.002	0.005	0.010	J		103243-002	SW846 6020
10-Aug-17	Iron	ND	0.033	0.100	NE	U		103243-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103243-002	SW846 6020
TAV-MW8	Arsenic	0.00231	0.002	0.005	0.010	J		103227-002	SW846 6020
03-Aug-17	Iron	ND	0.033	0.100	NE	U		103227-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103227-002	SW846 6020
TAV-MW10	Arsenic	ND	0.002	0.005	0.010	U		103245-002	SW846 6020
11-Aug-17	Iron	0.108	0.033	0.100	NE			103245-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103245-002	SW846 6020
TAV-MW11	Arsenic	0.00232	0.002	0.005	0.010	J		103221-002	SW846 6020
01-Aug-17	Iron	ND	0.033	0.100	NE	U		103221-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103221-002	SW846 6020
TAV-MW12	Arsenic	ND	0.002	0.005	0.010	U		103231-002	SW846 6020
08-Aug-17	Iron	ND	0.033	0.100	NE	U		103231-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103231-002	SW846 6020
TAV-MW14	Arsenic	ND	0.002	0.005	0.010	U		103237-002	SW846 6020
09-Aug-17	Iron	ND	0.033	0.100	NE	U		103237-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103237-002	SW846 6020
TAV-MW14 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		103238-002	SW846 6020
09-Aug-17	Iron	ND	0.033	0.100	NE	U		103238-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103238-002	SW846 6020
TAV-MW15	Arsenic	ND	0.002	0.005	0.010	U		103208-003	SW846 6020
27-Jul-17	Iron	0.134	0.033	0.100	NE			103208-003	SW846 6020
	Manganese	0.00976	0.001	0.005	NE			103208-003	SW846 6020
TAV-MW15 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		103209-003	SW846 6020
27-Jul-17	Iron	0.134	0.033	0.100	NE			103209-003	SW846 6020
	Manganese	0.00963	0.001	0.005	NE			103209-003	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-4 *(Continued)*
Summary of Filtered Metals Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW16	Arsenic	ND	0.002	0.005	0.010	U		103214-003	SW846 6020
28-Jul-17	Iron	ND	0.033	0.100	NE	U		103214-003	SW846 6020
	Manganese	0.00109	0.001	0.005	NE	J		103214-003	SW846 6020
LWDS-MW1	Arsenic	ND	0.002	0.005	0.010	U		103942-003	SW846 6020
20-Nov-17	Iron	0.106	0.033	0.100	NE			103942-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103942-003	SW846 6020
TAV-MW2	Arsenic	ND	0.002	0.005	0.010	U		103940-003	SW846 6020
02-Nov-17	Iron	0.132	0.033	0.100	NE			103940-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103940-003	SW846 6020
TAV-MW4	Arsenic	0.00222	0.002	0.005	0.010	J		103944-003	SW846 6020
08-Nov-17	Iron	ND	0.033	0.100	NE	U		103944-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103944-003	SW846 6020
TAV-MW6	Arsenic	ND	0.002	0.005	0.010	U		103988-008	SW846 6020
14-Nov-17	Iron	0.0902	0.033	0.100	NE	J		103988-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103988-008	SW846 6020
TAV-MW7	Arsenic	0.00202	0.002	0.005	0.010	J		103990-008	SW846 6020
07-Nov-17	Iron	ND	0.033	0.100	NE	U		103990-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103990-008	SW846 6020
TAV-MW7 (Duplicate)	Arsenic	0.002	0.002	0.005	0.010	J		103991-008	SW846 6020
07-Nov-17	Iron	ND	0.033	0.100	NE	U		103991-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103991-008	SW846 6020
TAV-MW8	Arsenic	0.00219	0.002	0.005	0.010	J		103952-003	SW846 6020
08-Nov-17	Iron	ND	0.033	0.100	NE	U		103952-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103952-003	SW846 6020
TAV-MW10	Arsenic	ND	0.002	0.005	0.010	U		103954-003	SW846 6020
27-Nov-17	Iron	0.0636	0.033	0.100	NE	J		103954-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103954-003	SW846 6020
TAV-MW11	Arsenic	0.00224	0.002	0.005	0.010	J		103956-003	SW846 6020
06-Nov-17	Iron	ND	0.033	0.100	NE	U		103956-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103956-003	SW846 6020
TAV-MW11 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		103957-003	SW846 6020
06-Nov-17	Iron	ND	0.033	0.100	NE	U		103957-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103957-003	SW846 6020
TAV-MW12	Arsenic	ND	0.002	0.005	0.010	U		103959-003	SW846 6020
13-Nov-17	Iron	0.0841	0.033	0.100	NE	J		103959-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103959-003	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-4 *(Concluded)*
Summary of Filtered Metals Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 14-Nov-17	Arsenic	ND	0.002	0.005	0.010	U		103962-003	SW846 6020
	Iron	0.323	0.033	0.100	NE			103962-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103962-003	SW846 6020
TAV-MW15 31-Oct-17	Arsenic	ND	0.002	0.005	0.010	U		103984-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103984-005	SW846 6020
	Manganese	0.00174	0.001	0.005	NE	J		103984-005	SW846 6020
TAV-MW16 01-Nov-17	Arsenic	ND	0.002	0.005	0.010	U		103980-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103980-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103980-005	SW846 6020
TAV-MW16 (Duplicate) 01-Nov-17	Arsenic	ND	0.002	0.005	0.010	U		103981-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103981-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103981-005	SW846 6020

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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-MW15	Bromide	0.410	0.067	0.200	NE			101786-006	SW846 9056
15-Feb-17	Chloride	71.8	1.34	4.00	NE			101786-006	SW846 9056
	Fluoride	0.905	0.033	0.100	4.0			101786-006	SW846 9056
	Sulfate	56.1	2.66	8.00	NE			101786-006	SW846 9056
	Bicarbonate Alkalinity	260	1.45	4.00	NE			101786-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		101786-007	SM 2320B
TAV-MW16	Bromide	0.453	0.067	0.200	NE			101788-006	SW846 9056
16-Feb-17	Chloride	83.0	1.34	4.00	NE			101788-006	SW846 9056
	Fluoride	0.922	0.033	0.100	4.0			101788-006	SW846 9056
	Sulfate	57.9	2.66	8.00	NE			101788-006	SW846 9056
	Bicarbonate Alkalinity	291	1.45	4.00	NE			101788-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		101788-007	SM 2320B
AVN-1	Bromide	0.142	0.067	0.200	NE	J		102671-004	SW846 9056
23-May-17	Chloride	9.93	0.067	0.200	NE			102671-004	SW846 9056
	Fluoride	1.23	0.033	0.100	4.0			102671-004	SW846 9056
	Sulfate	30.3	0.266	0.800	NE			102671-004	SW846 9056
	Bicarbonate Alkalinity	159	1.45	4.00	NE			102671-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102671-006	SM 2320B
LWDS-MW1	Bromide	0.869	0.067	0.200	NE			102696-004	SW846 9056
12-Jun-17	Chloride	81.2	1.34	4.00	NE			102696-004	SW846 9056
	Fluoride	0.567	0.033	0.100	4.0			102696-004	SW846 9056
	Sulfate	40.7	2.66	8.00	NE			102696-004	SW846 9056
	Bicarbonate Alkalinity	207	1.45	4.00	NE			102696-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102696-006	SM 2320B
LWDS-MW2	Bromide	0.158	0.067	0.200	NE	J		102667-004	SW846 9056
18-May-17	Chloride	12.9	0.335	1.00	NE			102667-004	SW846 9056
	Fluoride	1.33	0.033	0.100	4.0			102667-004	SW846 9056
	Sulfate	41.5	0.665	2.00	NE			102667-004	SW846 9056
	Bicarbonate Alkalinity	180	1.45	4.00	NE			102667-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102667-006	SM 2320B
TAV-MW2	Bromide	0.359	0.067	0.200	NE			102675-004	SW846 9056
25-May-17	Chloride	54.7	0.670	2.00	NE			102675-004	SW846 9056
	Fluoride	0.957	0.033	0.100	4.0			102675-004	SW846 9056
	Sulfate	56.3	1.33	4.00	NE			102675-004	SW846 9056
	Bicarbonate Alkalinity	256	1.45	4.00	NE			102675-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102675-006	SM 2320B

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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	Bromide	0.265	0.067	0.200	NE			102663-004	SW846 9056
17-May-17	Chloride	30.0	0.335	1.00	NE			102663-004	SW846 9056
	Fluoride	1.60	0.033	0.100	4.0			102663-004	SW846 9056
	Sulfate	71.1	0.665	2.00	NE			102663-004	SW846 9056
	Bicarbonate Alkalinity	198	1.45	4.00	NE			102663-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102663-006	SM 2320B
TAV-MW4	Bromide	0.424	0.067	0.200	NE			102679-004	SW846 9056
01-Jun-17	Chloride	38.6	0.335	1.00	NE			102679-004	SW846 9056
	Fluoride	1.19	0.033	0.100	4.0			102679-004	SW846 9056
	Sulfate	33.2	0.665	2.00	NE			102679-004	SW846 9056
	Bicarbonate Alkalinity	181	1.45	4.00	NE			102679-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102679-006	SM 2320B
TAV-MW5	Bromide	0.206	0.067	0.200	NE			102652-004	SW846 9056
11-May-17	Chloride	19.1	0.335	1.00	NE			102652-004	SW846 9056
	Fluoride	1.28	0.033	0.100	4.0			102652-004	SW846 9056
	Sulfate	44.7	0.665	2.00	NE			102652-004	SW846 9056
	Bicarbonate Alkalinity	192	1.45	4.00	NE			102652-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102652-006	SM 2320B
TAV-MW6	Bromide	0.866	0.067	0.200	NE			102694-004	SW846 9056
07-Jun-17	Chloride	73.7	1.34	4.00	NE			102694-004	SW846 9056
	Fluoride	1.13	0.033	0.100	4.0			102694-004	SW846 9056
	Sulfate	43.8	2.66	8.00	NE			102694-004	SW846 9056
	Bicarbonate Alkalinity	196	1.45	4.00	NE			102694-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102694-006	SM 2320B
TAV-MW7	Bromide	0.267	0.067	0.200	NE			102660-004	SW846 9056
16-May-17	Chloride	30.4	0.335	1.00	NE			102660-004	SW846 9056
	Fluoride	1.12	0.033	0.100	4.0			102660-004	SW846 9056
	Sulfate	69.8	0.665	2.00	NE			102660-004	SW846 9056
	Bicarbonate Alkalinity	235	1.45	4.00	NE			102660-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102660-006	SM 2320B
TAV-MW8	Bromide	0.366	0.067	0.200	NE			102682-004	SW846 9056
02-Jun-17	Chloride	42.5	0.670	2.00	NE			102682-004	SW846 9056
	Fluoride	1.37	0.033	0.100	4.0			102682-004	SW846 9056
	Sulfate	50.3	1.33	4.00	NE			102682-004	SW846 9056
	Bicarbonate Alkalinity	201	1.45	4.00	NE			102682-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102682-006	SM 2320B

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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	Bromide	0.291	0.067	0.200	NE			102656-004	SW846 9056
15-May-17	Chloride	36.7	0.335	1.00	NE			102656-004	SW846 9056
	Fluoride	1.04	0.033	0.100	4.0			102656-004	SW846 9056
	Sulfate	68.6	0.665	2.00	NE			102656-004	SW846 9056
	Bicarbonate Alkalinity	260	1.45	4.00	NE			102656-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102656-006	SM 2320B
TAV-MW10	Bromide	0.411	0.067	0.200	NE			102692-004	SW846 9056
08-Jun-17	Chloride	49.4	0.670	2.00	NE			102692-004	SW846 9056
	Fluoride	1.50	0.033	0.100	4.0			102692-004	SW846 9056
	Sulfate	46.4	1.33	4.00	NE			102692-004	SW846 9056
	Bicarbonate Alkalinity	178	1.45	4.00	NE			102692-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102692-006	SM 2320B
TAV-MW11	Bromide	0.564	0.067	0.200	NE			102677-004	SW846 9056
31-May-17	Chloride	51.8	0.670	2.00	NE			102677-004	SW846 9056
	Fluoride	1.35	0.033	0.100	4.0			102677-004	SW846 9056
	Sulfate	40.2	1.33	4.00	NE			102677-004	SW846 9056
	Bicarbonate Alkalinity	178	1.45	4.00	NE			102677-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102677-006	SM 2320B
TAV-MW12	Bromide	0.276	0.067	0.200	NE			102690-004	SW846 9056
05-Jun-17	Chloride	40.9	0.670	2.00	NE			102690-004	SW846 9056
	Fluoride	1.32	0.033	0.100	4.0			102690-004	SW846 9056
	Sulfate	48.6	1.33	4.00	NE			102690-004	SW846 9056
	Bicarbonate Alkalinity	212	1.45	4.00	NE			102690-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102690-006	SM 2320B
TAV-MW13	Bromide	0.183	0.067	0.200	NE			102641-004	SW846 9056
10-May-17	Chloride	20.7	0.335	1.00	NE			102641-004	SW846 9056
	Fluoride	1.23	0.033	0.100	4.0			102641-004	SW846 9056
	Sulfate	52.8	0.665	2.00	NE			102641-004	SW846 9056
	Bicarbonate Alkalinity	199	1.45	4.00	NE			102641-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102641-006	SM 2320B
TAV-MW14	Bromide	0.361	0.067	0.200	NE			102686-004	SW846 9056
06-Jun-17	Chloride	52.1	0.670	2.00	NE			102686-004	SW846 9056
	Fluoride	1.40	0.033	0.100	4.0			102686-004	SW846 9056
	Sulfate	54.0	1.33	4.00	NE			102686-004	SW846 9056
	Bicarbonate Alkalinity	199	1.45	4.00	NE			102686-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102686-006	SM 2320B

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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-MW15	Bromide	0.435	0.067	0.200	NE			102711-006	SW846 9056
22-May-17	Chloride	73.1	1.34	4.00	NE			102711-006	SW846 9056
	Fluoride	0.914	0.033	0.100	4.0			102711-006	SW846 9056
	Sulfate	56.7	2.66	8.00	NE			102711-006	SW846 9056
	Bicarbonate Alkalinity	265	1.45	4.00	NE			102711-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102711-007	SM 2320B
TAV-MW16	Bromide	0.471	0.067	0.200	NE			102715-006	SW846 9056
24-May-17	Chloride	85.6	1.34	4.00	NE			102715-006	SW846 9056
	Fluoride	0.890	0.033	0.100	4.0			102715-006	SW846 9056
	Sulfate	59.2	2.66	8.00	NE			102715-006	SW846 9056
	Bicarbonate Alkalinity	286	1.45	4.00	NE			102715-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102715-007	SM 2320B
TAV-MW15	Bromide	0.424	0.067	0.200	NE			103208-004	SW846 9056
27-Jul-17	Chloride	72.6	1.34	4.00	NE		J	103208-004	SW846 9056
	Fluoride	0.857	0.033	0.100	4.0			103208-004	SW846 9056
	Sulfate	56.8	2.66	8.00	NE		J	103208-004	SW846 9056
	Bicarbonate Alkalinity	264	1.45	4.00	NE			103208-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103208-007	SM 2320B
TAV-MW15 (Duplicate)	Bromide	0.412	0.067	0.200	NE			103209-004	SW846 9056
27-Jul-17	Chloride	73.0	1.34	4.00	NE		J	103209-004	SW846 9056
	Fluoride	0.845	0.033	0.100	4.0			103209-004	SW846 9056
	Sulfate	56.7	2.66	8.00	NE		J	103209-004	SW846 9056
	Bicarbonate Alkalinity	267	1.45	4.00	NE			103209-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103209-007	SM 2320B
TAV-MW16	Bromide	0.473	0.067	0.200	NE			103316-002	SW846 9056
14-Aug-17	Chloride	89.1	1.34	4.00	NE			103316-002	SW846 9056
	Fluoride	0.909	0.033	0.100	4.0			103316-002	SW846 9056
	Sulfate	61.4	2.66	8.00	NE			103316-002	SW846 9056
	Bicarbonate Alkalinity	286	1.45	4.00	NE			103316-005	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103316-005	SM 2320B

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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-MW15	Bromide	0.438	0.067	0.200	NE			103984-006	SW846 9056
31-Oct-17	Chloride	75.5	1.34	4.00	NE			103984-006	SW846 9056
	Fluoride	0.850	0.033	0.100	4.0			103984-006	SW846 9056
	Sulfate	58.4	2.66	8.00	NE			103984-006	SW846 9056
	Bicarbonate Alkalinity	263	1.45	4.00	NE			103984-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103984-007	SM 2320B
TAV-MW16	Bromide	0.452	0.067	0.200	NE			103980-006	SW846 9056
01-Nov-17	Chloride	85.2	1.34	4.00	NE			103980-006	SW846 9056
	Fluoride	0.835	0.033	0.100	4.0			103980-006	SW846 9056
	Sulfate	59.6	2.66	8.00	NE			103980-006	SW846 9056
	Bicarbonate Alkalinity	284	1.45	4.00	NE			103980-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103980-007	SM 2320B
TAV-MW16 (Duplicate)	Bromide	0.458	0.067	0.200	NE			103981-006	SW846 9056
01-Nov-17	Chloride	85.7	1.34	4.00	NE			103981-006	SW846 9056
	Fluoride	0.831	0.033	0.100	4.0			103981-006	SW846 9056
	Sulfate	59.3	2.66	8.00	NE			103981-006	SW846 9056
	Bicarbonate Alkalinity	286	1.45	4.00	NE			103981-007	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103981-007	SM 2320B

Refer to footnotes on page 5B-61.

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

Calendar Year 2017

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-MW15 15-Feb-17	ND	0.004	0.012	NE	U		101786-003	EPA 314.0
TAV-MW16 16-Feb-17	ND	0.004	0.012	NE	U		101788-003	EPA 314.0
TAV-MW15 22-May-17	ND	0.004	0.012	NE	U		102711-003	EPA 314.0
TAV-MW16 24-May-17	ND	0.004	0.012	NE	U		102715-003	EPA 314.0
TAV-MW16 (Duplicate) 24-May-17	ND	0.004	0.012	NE	U		102716-003	EPA 314.0
TAV-MW15 27-Jul-17	ND	0.004	0.012	NE	U		103208-006	EPA 314.0
TAV-MW15 (Duplicate) 27-Jul-17	ND	0.004	0.012	NE	U		103209-006	EPA 314.0
TAV-MW16 14-Aug-17	ND	0.004	0.012	NE	U		103316-004	EPA 314.0
TAV-MW15 31-Oct-17	ND	0.004	0.012	NE	H, U	UJ	103984-003	EPA 314.0
TAV-MW16 01-Nov-17	ND	0.004	0.012	NE	U		103980-003	EPA 314.0
TAV-MW16 (Duplicate) 01-Nov-17	ND	0.004	0.012	NE	U		103981-003	EPA 314.0

Refer to footnotes on page 5B-61.

Table 5B-7
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW15	Aluminum	0.114	0.015	0.050	NE			101786-R04	SW846 6020
15-Feb-17	Antimony	ND	0.001	0.003	0.006	U		101786-R04	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		101786-R04	SW846 6020
	Barium	0.0833	0.0006	0.002	2.00	B		101786-R04	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		101786-R04	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		101786-R04	SW846 6020
	Calcium	69.8	0.800	2.00	NE	N		101786-R04	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		101786-R04	SW846 6020
	Cobalt	0.000702	0.0001	0.001	NE	J		101786-R04	SW846 6020
	Copper	0.000356	0.00035	0.001	NE	J		101786-R04	SW846 6020
	Iron	0.208	0.033	0.100	NE			101786-R04	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		101786-R04	SW846 6020
	Magnesium	25.3	0.010	0.030	NE			101786-R04	SW846 6020
	Manganese	0.326	0.001	0.005	NE			101786-R04	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	H, h, U	UJ	101786-R04	SW846 7470
	Nickel	0.00193	0.0005	0.002	NE	B, J	0.0029U	101786-R04	SW846 6020
	Potassium	4.11	0.080	0.300	NE			101786-R04	SW846 6020
	Selenium	0.00244	0.002	0.005	0.050	J		101786-R04	SW846 6020
	Silver	ND	0.0004	0.001	NE	U		101786-R04	SW846 6020
	Sodium	67.7	0.800	2.50	NE	N		101786-R04	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		101786-R04	SW846 6020
	Uranium	0.00616	0.000067	0.0002	0.030			101786-R04	SW846 6020
	Vanadium	ND	0.0045	0.010	NE	U		101786-R04	SW846 6020
	Zinc	0.0103	0.0035	0.010	NE			101786-R04	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW16	Aluminum	0.117	0.015	0.050	NE			101788-R04	SW846 6020
16-Feb-17	Antimony	ND	0.001	0.003	0.006	U		101788-R04	SW846 6020
	Arsenic	ND	0.0017	0.005	0.010	U		101788-R04	SW846 6020
	Barium	0.075	0.0006	0.002	2.00	B		101788-R04	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		101788-R04	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		101788-R04	SW846 6020
	Calcium	80.4	0.800	2.00	NE	N		101788-R04	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		101788-R04	SW846 6020
	Cobalt	0.000388	0.0001	0.001	NE	J		101788-R04	SW846 6020
	Copper	ND	0.00035	0.001	NE	U		101788-R04	SW846 6020
	Iron	0.147	0.033	0.100	NE			101788-R04	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		101788-R04	SW846 6020
	Magnesium	28.8	0.010	0.030	NE			101788-R04	SW846 6020
	Manganese	0.114	0.001	0.005	NE			101788-R04	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	H, h, U	UJ	101788-R04	SW846 7470
	Nickel	0.00121	0.0005	0.002	NE	B, J	0.0029U	101788-R04	SW846 6020
	Potassium	4.55	0.080	0.300	NE			101788-R04	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		101788-R04	SW846 6020
	Silver	ND	0.0004	0.001	NE	U		101788-R04	SW846 6020
	Sodium	74.0	0.800	2.50	NE	N		101788-R04	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		101788-R04	SW846 6020
	Uranium	0.00614	0.000067	0.0002	0.030			101788-R04	SW846 6020
	Vanadium	ND	0.0045	0.010	NE	U		101788-R04	SW846 6020
	Zinc	ND	0.0035	0.010	NE	U		101788-R04	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.162	0.0193	0.050	NE			102671-002	SW846 6020
23-May-17	Antimony	ND	0.001	0.003	0.006	U	UJ	102671-002	SW846 6020
	Arsenic	0.00255	0.002	0.005	0.010	B, J	0.005U	102671-002	SW846 6020
	Barium	0.081	0.00067	0.002	2.00			102671-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102671-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102671-002	SW846 6020
	Calcium	43.0	0.080	0.200	NE			102671-002	SW846 6020
	Chromium	0.0202	0.003	0.010	0.100			102671-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102671-002	SW846 6020
	Copper	0.000648	0.0003	0.001	NE	J		102671-002	SW846 6020
	Iron	0.212	0.033	0.100	NE			102671-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102671-002	SW846 6020
	Magnesium	9.92	0.010	0.030	NE			102671-002	SW846 6020
	Manganese	0.00372	0.001	0.005	NE	J		102671-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102671-002	SW846 7470
	Nickel	0.00317	0.0006	0.002	NE			102671-002	SW846 6020
	Potassium	3.40	0.080	0.300	NE			102671-002	SW846 6020
	Selenium	0.00277	0.002	0.005	0.050	J		102671-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102671-002	SW846 6020
	Sodium	39.7	0.080	0.250	NE			102671-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102671-002	SW846 6020
	Uranium	0.0022	0.000067	0.0002	0.030			102671-002	SW846 6020
	Vanadium	0.0057	0.0033	0.010	NE	B, J	0.010U	102671-002	SW846 6020
	Zinc	0.00869	0.0033	0.010	NE	J		102671-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0436	0.0193	0.050	NE	J		102696-002	SW846 6020
12-Jun-17	Antimony	ND	0.001	0.003	0.006	U	UJ	102696-002	SW846 6020
	Arsenic	0.00308	0.002	0.005	0.010	J		102696-002	SW846 6020
	Barium	0.0886	0.00067	0.002	2.00			102696-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102696-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102696-002	SW846 6020
	Calcium	66.4	0.400	1.00	NE			102696-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102696-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102696-002	SW846 6020
	Copper	0.000357	0.0003	0.001	NE	J		102696-002	SW846 6020
	Iron	0.0519	0.033	0.100	NE	J		102696-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102696-002	SW846 6020
	Magnesium	21.5	0.010	0.030	NE			102696-002	SW846 6020
	Manganese	0.00144	0.001	0.005	NE	J		102696-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102696-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102696-002	SW846 6020
	Potassium	3.39	0.080	0.300	NE			102696-002	SW846 6020
	Selenium	0.00519	0.002	0.005	0.050			102696-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102696-002	SW846 6020
	Sodium	75.3	0.400	1.25	NE			102696-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102696-002	SW846 6020
	Uranium	0.00265	0.000067	0.0002	0.030			102696-002	SW846 6020
	Vanadium	0.00531	0.0033	0.010	NE	J		102696-002	SW846 6020
	Zinc	0.00591	0.0033	0.010	NE	J		102696-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.114	0.0193	0.050	NE			102667-002	SW846 6020
18-May-17	Antimony	ND	0.001	0.003	0.006	U		102667-002	SW846 6020
	Arsenic	0.00252	0.002	0.005	0.010	J		102667-002	SW846 6020
	Barium	0.0715	0.00067	0.002	2.00			102667-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102667-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102667-002	SW846 6020
	Calcium	46.4	0.080	0.200	NE			102667-002	SW846 6020
	Chromium	0.00371	0.003	0.010	0.100	J		102667-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102667-002	SW846 6020
	Copper	0.000798	0.0003	0.001	NE	J		102667-002	SW846 6020
	Iron	0.0964	0.033	0.100	NE	J		102667-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102667-002	SW846 6020
	Magnesium	13.0	0.010	0.030	NE			102667-002	SW846 6020
	Manganese	0.00198	0.001	0.005	NE	J		102667-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102667-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102667-002	SW846 6020
	Potassium	2.76	0.080	0.300	NE			102667-002	SW846 6020
	Selenium	0.00255	0.002	0.005	0.050	J		102667-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102667-002	SW846 6020
	Sodium	46.2	0.080	0.250	NE			102667-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102667-002	SW846 6020
	Uranium	0.00312	0.000067	0.0002	0.030			102667-002	SW846 6020
	Vanadium	0.00787	0.0033	0.010	NE	J		102667-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102667-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.181	0.0193	0.050	NE			102675-002	SW846 6020
25-May-17	Antimony	ND	0.001	0.003	0.006	U	UJ	102675-002	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102675-002	SW846 6020
	Barium	0.0602	0.00067	0.002	2.00			102675-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102675-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102675-002	SW846 6020
	Calcium	69.9	0.800	2.00	NE			102675-002	SW846 6020
	Chromium	0.00598	0.003	0.010	0.100	J		102675-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102675-002	SW846 6020
	Copper	0.000346	0.0003	0.001	NE	J		102675-002	SW846 6020
	Iron	0.133	0.033	0.100	NE			102675-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102675-002	SW846 6020
	Magnesium	21.7	0.010	0.030	NE			102675-002	SW846 6020
	Manganese	0.00302	0.001	0.005	NE	J		102675-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102675-002	SW846 7470
	Nickel	0.0026	0.0006	0.002	NE			102675-002	SW846 6020
	Potassium	3.70	0.080	0.300	NE			102675-002	SW846 6020
	Selenium	0.00281	0.002	0.005	0.050	J		102675-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102675-002	SW846 6020
	Sodium	65.2	0.800	2.50	NE			102675-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102675-002	SW846 6020
	Uranium	0.00625	0.000067	0.0002	0.030			102675-002	SW846 6020
	Vanadium	0.00334	0.0033	0.010	NE	B, J	0.010U	102675-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102675-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.121	0.0193	0.050	NE			102663-002	SW846 6020
17-May-17	Antimony	ND	0.001	0.003	0.006	U		102663-002	SW846 6020
	Arsenic	0.00216	0.002	0.005	0.010	J		102663-002	SW846 6020
	Barium	0.0464	0.00067	0.002	2.00			102663-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102663-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102663-002	SW846 6020
	Calcium	58.0	0.800	2.00	NE			102663-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102663-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102663-002	SW846 6020
	Copper	0.000468	0.0003	0.001	NE	J		102663-002	SW846 6020
	Iron	0.0915	0.033	0.100	NE	J		102663-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102663-002	SW846 6020
	Magnesium	14.7	0.010	0.030	NE			102663-002	SW846 6020
	Manganese	0.00623	0.001	0.005	NE			102663-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102663-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102663-002	SW846 6020
	Potassium	4.45	0.080	0.300	NE			102663-002	SW846 6020
	Selenium	0.0027	0.002	0.005	0.050	J		102663-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102663-002	SW846 6020
	Sodium	56.2	0.800	2.50	NE			102663-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102663-002	SW846 6020
	Uranium	0.00343	0.000067	0.0002	0.030			102663-002	SW846 6020
	Vanadium	0.00692	0.0033	0.010	NE	J		102663-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102663-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0446	0.0193	0.050	NE	J		102679-002	SW846 6020
01-Jun-17	Antimony	ND	0.001	0.003	0.006	U	UJ	102679-002	SW846 6020
	Arsenic	0.00241	0.002	0.005	0.010	J		102679-002	SW846 6020
	Barium	0.0906	0.00067	0.002	2.00			102679-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102679-002	SW846 6020
	Cadmium	0.00201	0.0003	0.001	0.005			102679-002	SW846 6020
	Calcium	49.9	0.080	0.200	NE			102679-002	SW846 6020
	Chromium	0.0255	0.003	0.010	0.100			102679-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102679-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102679-002	SW846 6020
	Iron	0.0486	0.033	0.100	NE	J		102679-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102679-002	SW846 6020
	Magnesium	14.5	0.010	0.030	NE			102679-002	SW846 6020
	Manganese	0.00135	0.001	0.005	NE	J		102679-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102679-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102679-002	SW846 6020
	Potassium	3.18	0.080	0.300	NE			102679-002	SW846 6020
	Selenium	0.00402	0.002	0.005	0.050	J		102679-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102679-002	SW846 6020
	Sodium	49.3	0.080	0.250	NE			102679-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102679-002	SW846 6020
	Uranium	0.00316	0.000067	0.0002	0.030			102679-002	SW846 6020
	Vanadium	0.00738	0.0033	0.010	NE	J		102679-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102679-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0212	0.0193	0.050	NE	J		102652-002	SW846 6020
11-May-17	Antimony	ND	0.001	0.003	0.006	U		102652-002	SW846 6020
	Arsenic	0.00216	0.002	0.005	0.010	J		102652-002	SW846 6020
	Barium	0.0628	0.00067	0.002	2.00			102652-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102652-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102652-002	SW846 6020
	Calcium	48.3	0.080	0.200	NE			102652-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102652-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102652-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102652-002	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102652-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102652-002	SW846 6020
	Magnesium	13.8	0.010	0.030	NE			102652-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102652-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102652-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102652-002	SW846 6020
	Potassium	2.79	0.080	0.300	NE			102652-002	SW846 6020
	Selenium	0.00229	0.002	0.005	0.050	J		102652-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102652-002	SW846 6020
	Sodium	47.7	0.080	0.250	NE			102652-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102652-002	SW846 6020
	Uranium	0.0034	0.000067	0.0002	0.030			102652-002	SW846 6020
	Vanadium	0.00756	0.0033	0.010	NE	J		102652-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102652-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.201	0.0193	0.050	NE			102694-002	SW846 6020
07-Jun-17	Antimony	ND	0.001	0.003	0.006	U		102694-002	SW846 6020
	Arsenic	0.00221	0.002	0.005	0.010	J		102694-002	SW846 6020
	Barium	0.0713	0.00067	0.002	2.00			102694-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102694-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102694-002	SW846 6020
	Calcium	66.5	0.800	2.00	NE			102694-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102694-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102694-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102694-002	SW846 6020
	Iron	0.170	0.033	0.100	NE			102694-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102694-002	SW846 6020
	Magnesium	19.9	0.010	0.030	NE			102694-002	SW846 6020
	Manganese	0.00345	0.001	0.005	NE	J		102694-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102694-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102694-002	SW846 6020
	Potassium	3.80	0.080	0.300	NE			102694-002	SW846 6020
	Selenium	0.00417	0.002	0.005	0.050	J		102694-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102694-002	SW846 6020
	Sodium	65.8	0.800	2.50	NE			102694-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102694-002	SW846 6020
	Uranium	0.00374	0.000067	0.0002	0.030			102694-002	SW846 6020
	Vanadium	0.00742	0.0033	0.010	NE	J		102694-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102694-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.127	0.0193	0.050	NE			102660-002	SW846 6020
16-May-17	Antimony	ND	0.001	0.003	0.006	U		102660-002	SW846 6020
	Arsenic	0.00217	0.002	0.005	0.010	J		102660-002	SW846 6020
	Barium	0.0532	0.00067	0.002	2.00			102660-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102660-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102660-002	SW846 6020
	Calcium	61.7	0.800	2.00	NE			102660-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102660-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102660-002	SW846 6020
	Copper	0.000316	0.0003	0.001	NE	J		102660-002	SW846 6020
	Iron	0.124	0.033	0.100	NE			102660-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102660-002	SW846 6020
	Magnesium	17.7	0.010	0.030	NE			102660-002	SW846 6020
	Manganese	0.0111	0.001	0.005	NE			102660-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102660-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102660-002	SW846 6020
	Potassium	3.86	0.080	0.300	NE			102660-002	SW846 6020
	Selenium	0.00213	0.002	0.005	0.050	J		102660-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102660-002	SW846 6020
	Sodium	58.0	0.800	2.50	NE			102660-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102660-002	SW846 6020
	Uranium	0.00485	0.000067	0.0002	0.030			102660-002	SW846 6020
	Vanadium	0.00746	0.0033	0.010	NE	J		102660-002	SW846 6020
	Zinc	0.00521	0.0033	0.010	NE	J		102660-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0556	0.0193	0.050	NE			102682-002	SW846 6020
02-Jun-17	Antimony	ND	0.001	0.003	0.006	U		102682-002	SW846 6020
	Arsenic	0.00219	0.002	0.005	0.010	J		102682-002	SW846 6020
	Barium	0.0559	0.00067	0.002	2.00			102682-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102682-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102682-002	SW846 6020
	Calcium	57.0	0.800	2.00	NE			102682-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102682-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102682-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102682-002	SW846 6020
	Iron	0.0461	0.033	0.100	NE	J		102682-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102682-002	SW846 6020
	Magnesium	16.5	0.010	0.030	NE			102682-002	SW846 6020
	Manganese	0.00101	0.001	0.005	NE	J		102682-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102682-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102682-002	SW846 6020
	Potassium	3.83	0.080	0.300	NE			102682-002	SW846 6020
	Selenium	0.00283	0.002	0.005	0.050	J		102682-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102682-002	SW846 6020
	Sodium	56.2	0.800	2.50	NE			102682-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102682-002	SW846 6020
	Uranium	0.00332	0.000067	0.0002	0.030			102682-002	SW846 6020
	Vanadium	0.00736	0.0033	0.010	NE	J		102682-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102682-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	ND	0.0193	0.050	NE	U		102656-002	SW846 6020
15-May-17	Antimony	ND	0.001	0.003	0.006	U		102656-002	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102656-002	SW846 6020
	Barium	0.0652	0.00067	0.002	2.00			102656-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102656-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102656-002	SW846 6020
	Calcium	66.0	0.800	2.00	NE			102656-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102656-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102656-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102656-002	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102656-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102656-002	SW846 6020
	Magnesium	20.1	0.010	0.030	NE			102656-002	SW846 6020
	Manganese	0.00208	0.001	0.005	NE	J		102656-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102656-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102656-002	SW846 6020
	Potassium	4.16	0.080	0.300	NE			102656-002	SW846 6020
	Selenium	0.00247	0.002	0.005	0.050	J		102656-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102656-002	SW846 6020
	Sodium	64.8	0.800	2.50	NE			102656-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102656-002	SW846 6020
	Uranium	0.00557	0.000067	0.0002	0.030			102656-002	SW846 6020
	Vanadium	0.00693	0.0033	0.010	NE	J		102656-002	SW846 6020
	Zinc	0.00701	0.0033	0.010	NE	J		102656-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		102692-002	SW846 6020
08-Jun-17	Antimony	ND	0.001	0.003	0.006	U		102692-002	SW846 6020
	Arsenic	0.00214	0.002	0.005	0.010	J		102692-002	SW846 6020
	Barium	0.0562	0.00067	0.002	2.00			102692-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102692-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102692-002	SW846 6020
	Calcium	56.6	0.800	2.00	NE			102692-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102692-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102692-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102692-002	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102692-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102692-002	SW846 6020
	Magnesium	16.2	0.010	0.030	NE			102692-002	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102692-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102692-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102692-002	SW846 6020
	Potassium	4.16	0.080	0.300	NE			102692-002	SW846 6020
	Selenium	0.00259	0.002	0.005	0.050	J		102692-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102692-002	SW846 6020
	Sodium	57.6	0.800	2.50	NE			102692-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102692-002	SW846 6020
	Uranium	0.00287	0.000067	0.0002	0.030			102692-002	SW846 6020
	Vanadium	0.0073	0.0033	0.010	NE	J		102692-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102692-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0275	0.0193	0.050	NE	J		102677-002	SW846 6020
31-May-17	Antimony	ND	0.001	0.003	0.006	U	UJ	102677-002	SW846 6020
	Arsenic	0.0024	0.002	0.005	0.010	J		102677-002	SW846 6020
	Barium	0.072	0.00067	0.002	2.00			102677-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102677-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102677-002	SW846 6020
	Calcium	53.0	0.400	1.00	NE			102677-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102677-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102677-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102677-002	SW846 6020
	Iron	0.0648	0.033	0.100	NE	J		102677-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102677-002	SW846 6020
	Magnesium	15.0	0.010	0.030	NE			102677-002	SW846 6020
	Manganese	0.00228	0.001	0.005	NE	J		102677-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102677-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102677-002	SW846 6020
	Potassium	3.74	0.080	0.300	NE			102677-002	SW846 6020
	Selenium	0.00435	0.002	0.005	0.050	J		102677-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102677-002	SW846 6020
	Sodium	57.5	0.400	1.25	NE			102677-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102677-002	SW846 6020
	Uranium	0.00282	0.000067	0.0002	0.030			102677-002	SW846 6020
	Vanadium	0.00679	0.0033	0.010	NE	J		102677-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102677-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.151	0.0193	0.050	NE			102690-002	SW846 6020
05-Jun-17	Antimony	ND	0.001	0.003	0.006	U		102690-002	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102690-002	SW846 6020
	Barium	0.0764	0.00067	0.002	2.00			102690-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102690-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102690-002	SW846 6020
	Calcium	61.6	0.800	2.00	NE			102690-002	SW846 6020
	Chromium	0.0101	0.003	0.010	0.100			102690-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102690-002	SW846 6020
	Copper	0.000473	0.0003	0.001	NE	J		102690-002	SW846 6020
	Iron	0.185	0.033	0.100	NE			102690-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102690-002	SW846 6020
	Magnesium	18.4	0.010	0.030	NE			102690-002	SW846 6020
	Manganese	0.00597	0.001	0.005	NE			102690-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102690-002	SW846 7470
	Nickel	0.00488	0.0006	0.002	NE			102690-002	SW846 6020
	Potassium	3.77	0.080	0.300	NE			102690-002	SW846 6020
	Selenium	0.00214	0.002	0.005	0.050	J		102690-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102690-002	SW846 6020
	Sodium	61.7	0.080	2.50	NE			102690-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102690-002	SW846 6020
	Uranium	0.00486	0.000067	0.0002	0.030			102690-002	SW846 6020
	Vanadium	0.00448	0.0033	0.010	NE	J		102690-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102690-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	ND	0.0193	0.050	NE	U		102641-002	SW846 6020
10-May-17	Antimony	ND	0.001	0.003	0.006	U		102641-002	SW846 6020
	Arsenic	0.00214	0.002	0.005	0.010	J		102641-002	SW846 6020
	Barium	0.0583	0.00067	0.002	2.00			102641-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102641-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102641-002	SW846 6020
	Calcium	51.4	0.800	2.00	NE			102641-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102641-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102641-002	SW846 6020
	Copper	0.000403	0.0003	0.001	NE	J		102641-002	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102641-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102641-002	SW846 6020
	Magnesium	14.7	0.010	0.030	NE			102641-002	SW846 6020
	Manganese	0.00113	0.001	0.005	NE	J		102641-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102641-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102641-002	SW846 6020
	Potassium	3.34	0.080	0.300	NE			102641-002	SW846 6020
	Selenium	0.00222	0.002	0.005	0.050	J		102641-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102641-002	SW846 6020
	Sodium	49.2	0.800	2.50	NE			102641-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102641-002	SW846 6020
	Uranium	0.00357	0.000067	0.0002	0.030			102641-002	SW846 6020
	Vanadium	0.00706	0.0033	0.010	NE	J		102641-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102641-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.221	0.0193	0.050	NE			102686-002	SW846 6020
06-Jun-17	Antimony	0.00116	0.001	0.003	0.006	J		102686-002	SW846 6020
	Arsenic	0.00206	0.002	0.005	0.010	J		102686-002	SW846 6020
	Barium	0.0587	0.00067	0.002	2.00			102686-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102686-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102686-002	SW846 6020
	Calcium	60.4	0.800	2.00	NE			102686-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102686-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102686-002	SW846 6020
	Copper	0.000333	0.0003	0.001	NE	J		102686-002	SW846 6020
	Iron	0.204	0.033	0.100	NE			102686-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102686-002	SW846 6020
	Magnesium	18.9	0.010	0.030	NE			102686-002	SW846 6020
	Manganese	0.00744	0.001	0.005	NE			102686-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102686-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102686-002	SW846 6020
	Potassium	4.26	0.080	0.300	NE			102686-002	SW846 6020
	Selenium	0.00231	0.002	0.005	0.050	J		102686-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102686-002	SW846 6020
	Sodium	61.4	0.800	2.50	NE			102686-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102686-002	SW846 6020
	Uranium	0.00406	0.000067	0.0002	0.030			102686-002	SW846 6020
	Vanadium	0.00699	0.0033	0.010	NE	J		102686-002	SW846 6020
	Zinc	0.00634	0.0033	0.010	NE	J		102686-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW15	Aluminum	ND	0.0193	0.050	NE	U		102711-004	SW846 6020
22-May-17	Antimony	ND	0.001	0.003	0.006	U	UJ	102711-004	SW846 6020
	Arsenic	0.00222	0.002	0.005	0.010	B, J	0.005U	102711-004	SW846 6020
	Barium	0.0778	0.00067	0.002	2.00			102711-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102711-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102711-004	SW846 6020
	Calcium	73.0	0.800	2.00	NE			102711-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102711-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102711-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102711-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102711-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102711-004	SW846 6020
	Magnesium	24.1	0.010	0.030	NE			102711-004	SW846 6020
	Manganese	0.0274	0.001	0.005	NE			102711-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102711-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102711-004	SW846 6020
	Potassium	4.12	0.080	0.300	NE			102711-004	SW846 6020
	Selenium	0.0025	0.002	0.005	0.050	J		102711-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102711-004	SW846 6020
	Sodium	68.5	0.800	2.50	NE			102711-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102711-004	SW846 6020
	Uranium	0.00783	0.000067	0.0002	0.030			102711-004	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102711-004	SW846 6020
	Zinc	0.00347	0.0033	0.010	NE	J		102711-004	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW16	Aluminum	0.0223	0.0193	0.050	NE	J		102715-004	SW846 6020
24-May-17	Antimony	ND	0.001	0.003	0.006	U	UJ	102715-004	SW846 6020
	Arsenic	0.00214	0.002	0.005	0.010	B, J	0.005U	102715-004	SW846 6020
	Barium	0.0691	0.00067	0.002	2.00			102715-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102715-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102715-004	SW846 6020
	Calcium	85.0	0.800	2.00	NE			102715-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102715-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102715-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102715-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102715-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102715-004	SW846 6020
	Magnesium	27.0	0.010	0.030	NE			102715-004	SW846 6020
	Manganese	0.00347	0.001	0.005	NE	J		102715-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102715-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102715-004	SW846 6020
	Potassium	4.63	0.080	0.300	NE			102715-004	SW846 6020
	Selenium	0.00208	0.002	0.005	0.050	J		102715-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102715-004	SW846 6020
	Sodium	74.9	0.800	2.50	NE			102715-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102715-004	SW846 6020
	Uranium	0.00741	0.000067	0.0002	0.030			102715-004	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102715-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102715-004	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW15	Aluminum	ND	0.0193	0.050	NE	U		103208-002	SW846 6020
27-Jul-17	Antimony	ND	0.001	0.003	0.006	U		103208-002	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103208-002	SW846 6020
	Barium	0.0707	0.00067	0.002	2.00			103208-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103208-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103208-002	SW846 6020
	Calcium	68.2	0.400	1.00	NE	B		103208-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103208-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103208-002	SW846 6020
	Copper	0.000531	0.0003	0.001	NE	J		103208-002	SW846 6020
	Iron	0.132	0.033	0.100	NE			103208-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103208-002	SW846 6020
	Magnesium	24.2	0.010	0.030	NE			103208-002	SW846 6020
	Manganese	0.0106	0.001	0.005	NE			103208-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103208-002	SW846 7470
	Nickel	0.0017	0.0006	0.002	NE	J		103208-002	SW846 6020
	Potassium	4.16	0.080	0.300	NE			103208-002	SW846 6020
	Selenium	0.00258	0.002	0.005	0.050	J		103208-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103208-002	SW846 6020
	Sodium	62.7	0.400	1.25	NE			103208-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103208-002	SW846 6020
	Uranium	0.00692	0.000067	0.0002	0.030			103208-002	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		103208-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103208-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW15 (Duplicate) 27-Jul-17	Aluminum	ND	0.0193	0.050	NE	U		103209-002	SW846 6020
	Antimony	ND	0.001	0.003	0.006	U		103209-002	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103209-002	SW846 6020
	Barium	0.0725	0.00067	0.002	2.00			103209-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103209-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103209-002	SW846 6020
	Calcium	73.8	0.400	1.00	NE	B		103209-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103209-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103209-002	SW846 6020
	Copper	0.000574	0.0003	0.001	NE	J		103209-002	SW846 6020
	Iron	0.150	0.033	0.100	NE			103209-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103209-002	SW846 6020
	Magnesium	25.6	0.010	0.030	NE			103209-002	SW846 6020
	Manganese	0.0115	0.001	0.005	NE			103209-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103209-002	SW846 7470
	Nickel	0.00165	0.0006	0.002	NE	J		103209-002	SW846 6020
	Potassium	4.25	0.080	0.300	NE			103209-002	SW846 6020
	Selenium	0.00231	0.002	0.005	0.050	J		103209-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103209-002	SW846 6020
	Sodium	68.5	0.400	1.25	NE			103209-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103209-002	SW846 6020
	Uranium	0.00681	0.000067	0.0002	0.030			103209-002	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		103209-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103209-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results,
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW16	Aluminum	ND	0.0193	0.050	NE	U		103214-002	SW846 6020
28-Jul-17	Antimony	ND	0.001	0.003	0.006	U	UJ	103214-002	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103214-002	SW846 6020
	Barium	0.0661	0.00067	0.002	2.00			103214-002	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103214-002	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103214-002	SW846 6020
	Calcium	80.6	0.800	2.00	NE			103214-002	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103214-002	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103214-002	SW846 6020
	Copper	ND	0.0003	0.001	NE	U	UJ	103214-002	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103214-002	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103214-002	SW846 6020
	Magnesium	26.2	0.010	0.030	NE			103214-002	SW846 6020
	Manganese	0.00198	0.001	0.005	NE	J		103214-002	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103214-002	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103214-002	SW846 6020
	Potassium	4.37	0.080	0.300	NE			103214-002	SW846 6020
	Selenium	0.00203	0.002	0.005	0.050	J		103214-002	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103214-002	SW846 6020
	Sodium	71.9	0.800	2.50	NE			103214-002	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103214-002	SW846 6020
	Uranium	0.00656	0.000067	0.0002	0.030			103214-002	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U	0.01UJ	103214-002	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103214-002	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW15	Aluminum	0.0385	0.0193	0.050	NE	J		103984-004	SW846 6020
31-Oct-17	Antimony	ND	0.001	0.003	0.006	U		103984-004	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103984-004	SW846 6020
	Barium	0.0704	0.00067	0.002	2.00			103984-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103984-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103984-004	SW846 6020
	Calcium	69.3	0.800	2.00	NE			103984-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103984-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103984-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103984-004	SW846 6020
	Iron	0.0677	0.033	0.100	NE	J		103984-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103984-004	SW846 6020
	Magnesium	24.7	0.010	0.030	NE			103984-004	SW846 6020
	Manganese	0.00423	0.001	0.005	NE	J		103984-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103984-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103984-004	SW846 6020
	Potassium	4.08	0.080	0.300	NE			103984-004	SW846 6020
	Selenium	0.00293	0.002	0.005	0.050	J		103984-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103984-004	SW846 6020
	Sodium	64.3	0.800	2.50	NE			103984-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103984-004	SW846 6020
	Uranium	0.00665	0.000067	0.0002	0.030			103984-004	SW846 6020
	Vanadium	0.00441	0.0033	0.010	NE	J		103984-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103984-004	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Continued)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW16	Aluminum	0.0269	0.0193	0.050	NE	J		103980-004	SW846 6020
01-Nov-17	Antimony	ND	0.001	0.003	0.006	U		103980-004	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103980-004	SW846 6020
	Barium	0.0661	0.00067	0.002	2.00			103980-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103980-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103980-004	SW846 6020
	Calcium	83.5	0.800	2.00	NE			103980-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103980-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103980-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103980-004	SW846 6020
	Iron	0.0369	0.033	0.100	NE	J		103980-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103980-004	SW846 6020
	Magnesium	27.1	0.010	0.030	NE			103980-004	SW846 6020
	Manganese	0.00152	0.001	0.005	NE	J		103980-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103980-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103980-004	SW846 6020
	Potassium	4.45	0.080	0.300	NE			103980-004	SW846 6020
	Selenium	0.00248	0.002	0.005	0.050	J		103980-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103980-004	SW846 6020
	Sodium	75.0	0.800	2.50	NE			103980-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103980-004	SW846 6020
	Uranium	0.00637	0.000067	0.0002	0.030			103980-004	SW846 6020
	Vanadium	0.00617	0.0033	0.010	NE	J		103980-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103980-004	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-7 *(Concluded)*
Summary of TAL Metals Plus Uranium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW16 (Duplicate)	Aluminum	0.0271	0.0193	0.050	NE	J		103981-004	SW846 6020
01-Nov-17	Antimony	ND	0.001	0.003	0.006	U		103981-004	SW846 6020
	Arsenic	0.00202	0.002	0.005	0.010	J		103981-004	SW846 6020
	Barium	0.0683	0.00067	0.002	2.00			103981-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103981-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103981-004	SW846 6020
	Calcium	85.0	0.800	2.00	NE			103981-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103981-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103981-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103981-004	SW846 6020
	Iron	0.0414	0.033	0.100	NE	J		103981-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103981-004	SW846 6020
	Magnesium	27.9	0.010	0.030	NE			103981-004	SW846 6020
	Manganese	0.00176	0.001	0.005	NE	J		103981-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103981-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103981-004	SW846 6020
	Potassium	4.61	0.080	0.300	NE			103981-004	SW846 6020
	Selenium	0.00269	0.002	0.005	0.050	J		103981-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103981-004	SW846 6020
	Sodium	76.3	0.800	2.50	NE			103981-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103981-004	SW846 6020
	Uranium	0.00652	0.000067	0.0002	0.030			103981-004	SW846 6020
	Vanadium	0.0076	0.0033	0.010	NE	J		103981-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103981-004	SW846 6020

Refer to footnotes on page 5B-61.

Table 5B-8
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Americium-241	0.888 ± 7.17	8.68	4.21	NE	U	BD	101786-008	EPA 901.1
15-Feb-17	Cesium-137	0.700 ± 1.55	2.74	1.30	NE	U	BD	101786-008	EPA 901.1
	Cobalt-60	0.470 ± 1.62	3.01	1.40	NE	U	BD	101786-008	EPA 901.1
	Potassium-40	-32.3 ± 35.5	35.0	16.4	NE	U	BD	101786-008	EPA 901.1
	Gross Alpha	6.47	NA	NA	15 pCi/L	NA	None	101786-009	EPA 900.0
	Gross Beta	3.79 ± 1.50	2.06	0.999	4 mrem/yr		J	101786-009	EPA 900.0
	Tritium	-10.3 ± 82.8	151	70.2	NE	U	BD	101786-010	EPA 906.0
TAV-MW16	Americium-241	0.739 ± 9.59	14.7	7.16	NE	U	BD	101788-008	EPA 901.1
16-Feb-17	Cesium-137	2.88 ± 2.42	3.94	1.89	NE	U	BD	101788-008	EPA 901.1
	Cobalt-60	2.66 ± 2.24	3.77	1.76	NE	U	BD	101788-008	EPA 901.1
	Potassium-40	-32.5 ± 37.1	45.2	21.4	NE	U	BD	101788-008	EPA 901.1
	Gross Alpha	8.49	NA	NA	15 pCi/L	NA	None	101788-009	EPA 900.0
	Gross Beta	5.82 ± 1.50	1.46	0.700	4 mrem/yr		J	101788-009	EPA 900.0
	Tritium	-35.3 ± 80.8	151	70.2	NE	U	BD	101788-010	EPA 906.0
AVN-1	Americium-241	3.22 ± 13.3	21.6	10.5	NE	U	BD	102671-007	EPA 901.1
23-May-17	Cesium-137	1.10 ± 1.75	2.99	1.43	NE	U	BD	102671-007	EPA 901.1
	Cobalt-60	0.0581 ± 1.62	2.95	1.37	NE	U	BD	102671-007	EPA 901.1
	Potassium-40	-38.5 ± 49.3	40.9	19.4	NE	U	BD	102671-007	EPA 901.1
	Gross Alpha	2.76	NA	NA	15 pCi/L	NA	None	102671-008	EPA 900.0
	Gross Beta	2.22 ± 0.848	1.17	0.566	4 mrem/yr		J	102671-008	EPA 900.0
	Tritium	28.8 ± 77.6	139	62.0	NE	U	BD	102671-009	EPA 906.0
LWDS-MW1	Americium-241	0.360 ± 9.87	15.2	7.36	NE	U	BD	102696-007	EPA 901.1
12-Jun-17	Cesium-137	0.764 ± 3.02	3.74	1.79	NE	U	BD	102696-007	EPA 901.1
	Cobalt-60	4.12 ± 3.25	4.12	1.67	NE	U	BD	102696-007	EPA 901.1
	Potassium-40	21.4 ± 55.0	36.0	16.7	NE	U	BD	102696-007	EPA 901.1
	Gross Alpha	3.43	NA	NA	15 pCi/L	NA	None	102696-008	EPA 900.0
	Gross Beta	4.94 ± 1.40	1.62	0.782	4 mrem/yr			102696-008	EPA 900.0
	Tritium	30.1 ± 85.7	151	69.5	NE	U	BD	102696-009	EPA 906.0

Refer to footnotes on page 5B-61.

Table 5B-8 *(Continued)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW2	Americium-241	8.43 ± 13.5	20.9	10.2	NE	U	BD	102667-007	EPA 901.1
18-May-17	Cesium-137	-0.00438 ± 1.57	2.73	1.29	NE	U	BD	102667-007	EPA 901.1
	Cobalt-60	0.866 ± 2.96	3.47	1.62	NE	U	BD	102667-007	EPA 901.1
	Potassium-40	-24 ± 38.6	41.8	19.8	NE	U	BD	102667-007	EPA 901.1
	Gross Alpha	3.28	NA	NA	15 pCi/L	NA	None	102667-008	EPA 900.0
	Gross Beta	3.04 ± 0.662	0.547	0.264	4 mrem/yr			102667-008	EPA 900.0
	Tritium	36.3 ± 90.9	160	73.1	NE	U	BD	102667-009	EPA 906.0
TAV-MW2	Americium-241	0.700 ± 8.45	12.9	6.31	NE	U	BD	102675-007	EPA 901.1
25-May-17	Cesium-137	1.03 ± 1.77	3.17	1.52	NE	U	BD	102675-007	EPA 901.1
	Cobalt-60	1.57 ± 1.78	3.11	1.46	NE	U	BD	102675-007	EPA 901.1
	Potassium-40	-28.1 ± 40.6	38.3	18.2	NE	U	BD	102675-007	EPA 901.1
	Gross Alpha	5.22	NA	NA	15 pCi/L	NA	None	102675-008	EPA 900.0
	Gross Beta	6.84 ± 1.79	1.86	0.901	4 mrem/yr			102675-008	EPA 900.0
	Tritium	108 ± 92.0	144	63.9	NE	U	BD	102675-009	EPA 906.0
TAV-MW3	Americium-241	-0.723 ± 6.21	10.7	5.21	NE	U	BD	102663-007	EPA 901.1
17-May-17	Cesium-137	0.576 ± 1.39	2.48	1.18	NE	U	BD	102663-007	EPA 901.1
	Cobalt-60	-0.899 ± 2.80	2.68	1.26	NE	U	BD	102663-007	EPA 901.1
	Potassium-40	-15.3 ± 35.9	36.5	17.4	NE	U	BD	102663-007	EPA 901.1
	Gross Alpha	5.59	NA	NA	15 pCi/L	NA	None	102663-008	EPA 900.0
	Gross Beta	3.61 ± 0.922	0.952	0.457	4 mrem/yr			102663-008	EPA 900.0
	Tritium	4.21 ± 88.8	162	74.2	NE	U	BD	102663-009	EPA 906.0
TAV-MW4	Americium-241	6.90 ± 15.6	25.3	12.3	NE	U	BD	102679-007	EPA 901.1
01-Jun-17	Cesium-137	-0.538 ± 2.12	3.54	1.67	NE	U	BD	102679-007	EPA 901.1
	Cobalt-60	1.28 ± 2.00	3.74	1.73	NE	U	BD	102679-007	EPA 901.1
	Potassium-40	-39.7 ± 41.7	44.7	20.9	NE	U	BD	102679-007	EPA 901.1
	Gross Alpha	4.64	NA	NA	15 pCi/L	NA	None	102679-008	EPA 900.0
	Gross Beta	3.61 ± 1.10	1.40	0.680	4 mrem/yr		J	102679-008	EPA 900.0
	Tritium	99.3 ± 91.3	145	64.3	NE	U	BD	102679-009	EPA 906.0
TAV-MW5	Americium-241	0.466 ± 1.91	3.51	1.70	NE	U	BD	102652-007	EPA 901.1
11-May-17	Cesium-137	-0.312 ± 1.83	3.10	1.48	NE	U	BD	102652-007	EPA 901.1
	Cobalt-60	-2.14 ± 2.01	2.77	1.28	NE	U	BD	102652-007	EPA 901.1
	Potassium-40	-34.4 ± 48.2	49.0	23.4	NE	U	BD	102652-007	EPA 901.1
	Gross Alpha	3.21	NA	NA	15 pCi/L	NA	None	102652-008	EPA 900.0
	Gross Beta	2.45 ± 0.973	1.37	0.664	4 mrem/yr		J	102652-008	EPA 900.0
	Tritium	94.9 ± 102	167	76.0	NE	U	BD	102652-009	EPA 906.0

Refer to footnotes on page 5B-61.

Table 5B-8 *(Continued)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW6	Americium-241	-2.63 ± 7.99	13.7	6.62	NE	U	BD	102694-007	EPA 901.1
07-Jun-17	Cesium-137	-0.0709 ± 1.65	2.85	1.34	NE	U	BD	102694-007	EPA 901.1
	Cobalt-60	0.990 ± 1.68	3.11	1.44	NE	U	BD	102694-007	EPA 901.1
	Potassium-40	11.8 ± 48.7	28.2	12.9	NE	U	BD	102694-007	EPA 901.1
	Gross Alpha	2.47	NA	NA	15 pCi/L	NA	None	102694-008	EPA 900.0
	Gross Beta	3.49 ± 1.39	1.97	0.953	4 mrem/yr		J	102694-008	EPA 900.0
	Tritium	3.41 ± 81.4	148	68.1	NE	U	BD	102694-009	EPA 906.0
TAV-MW7	Americium-241	1.66 ± 8.76	13.6	6.60	NE	U	BD	102660-007	EPA 901.1
16-May-17	Cesium-137	-0.885 ± 1.40	2.33	1.11	NE	U	BD	102660-007	EPA 901.1
	Cobalt-60	-0.244 ± 1.44	2.48	1.15	NE	U	BD	102660-007	EPA 901.1
	Potassium-40	-32.2 ± 35.7	38.0	18.1	NE	U	BD	102660-007	EPA 901.1
	Gross Alpha	5.37	NA	NA	15 pCi/L	NA	None	102660-008	EPA 900.0
	Gross Beta	4.86 ± 1.32	1.37	0.663	4 mrem/yr			102660-008	EPA 900.0
	Tritium	80.5 ± 98.5	164	74.9	NE	U	BD	102660-009	EPA 906.0
TAV-MW8	Americium-241	-0.148 ± 10.1	15.6	7.54	NE	U	BD	102682-007	EPA 901.1
02-Jun-17	Cesium-137	-0.892 ± 1.58	2.67	1.26	NE	U	BD	102682-007	EPA 901.1
	Cobalt-60	-0.0747 ± 1.68	2.98	1.37	NE	U	BD	102682-007	EPA 901.1
	Potassium-40	-28.7 ± 36.8	45.6	21.6	NE	U	BD	102682-007	EPA 901.1
	Gross Alpha	4.03	NA	NA	15 pCi/L	NA	None	102682-008	EPA 900.0
	Gross Beta	2.89 ± 0.905	1.10	0.532	4 mrem/yr		J	102682-008	EPA 900.0
	Tritium	58.9 ± 89.5	152	70.0	NE	U	BD	102682-009	EPA 906.0
TAV-MW9	Americium-241	10.5 ± 8.14	8.86	4.35	NE	X	R	102656-007	EPA 901.1
15-May-17	Cesium-137	0.110 ± 1.84	2.79	1.34	NE	U	BD	102656-007	EPA 901.1
	Cobalt-60	0.868 ± 1.70	3.00	1.42	NE	U	BD	102656-007	EPA 901.1
	Potassium-40	3.21 ± 45.9	29.0	13.7	NE	U	BD	102656-007	EPA 901.1
	Gross Alpha	5.15	NA	NA	15 pCi/L	NA	None	102656-008	EPA 900.0
	Gross Beta	4.87 ± 1.32	1.44	0.702	4 mrem/yr			102656-008	EPA 900.0
	Tritium	-62.5 ± 80.8	161	73.4	NE	U	BD	102656-009	EPA 906.0
TAV-MW10	Americium-241	3.00 ± 4.65	7.89	3.84	NE	U	BD	102692-007	EPA 901.1
08-Jun-17	Cesium-137	-1.03 ± 1.71	2.70	1.28	NE	U	BD	102692-007	EPA 901.1
	Cobalt-60	2.34 ± 2.03	3.14	1.47	NE	U	BD	102692-007	EPA 901.1
	Potassium-40	23.7 ± 49.0	26.2	12.1	NE	U	BD	102692-007	EPA 901.1
	Gross Alpha	3.65	NA	NA	15 pCi/L	NA	None	102692-008	EPA 900.0
	Gross Beta	4.58 ± 1.43	1.76	0.852	4 mrem/yr		J	102692-008	EPA 900.0
	Tritium	56.7 ± 86.1	146	67.4	NE	U	BD	102692-009	EPA 906.0

Refer to footnotes on page 5B-61.

Table 5B-8 *(Continued)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Americium-241	-6.06 ± 14.0	20.4	9.87	NE	U	BD	102677-007	EPA 901.1
31-May-17	Cesium-137	-0.0917 ± 2.20	3.86	1.82	NE	U	BD	102677-007	EPA 901.1
	Cobalt-60	-0.786 ± 1.93	3.43	1.55	NE	U	BD	102677-007	EPA 901.1
	Potassium-40	-51.9 ± 56.9	56.7	26.7	NE	U	BD	102677-007	EPA 901.1
	Gross Alpha	2.64	NA	NA	15 pCi/L	NA	None	102677-008	EPA 900.0
	Gross Beta	5.06 ± 1.14	1.00	0.481	4 mrem/yr			102677-008	EPA 900.0
	Tritium	140 ± 96.7	143	63.7	NE	U	BD	102677-009	EPA 906.0
TAV-MW12	Americium-241	-11.4 ± 15.7	13.7	6.63	NE	U	BD	102690-007	EPA 901.1
05-Jun-17	Cesium-137	1.25 ± 1.77	3.14	1.48	NE	U	BD	102690-007	EPA 901.1
	Cobalt-60	-1.42 ± 1.72	2.68	1.20	NE	U	BD	102690-007	EPA 901.1
	Potassium-40	-42.6 ± 41.7	43.0	20.1	NE	U	BD	102690-007	EPA 901.1
	Gross Alpha	5.28	NA	NA	15 pCi/L	NA	None	102690-008	EPA 900.0
	Gross Beta	4.37 ± 1.26	1.54	0.746	4 mrem/yr		J	102690-008	EPA 900.0
	Tritium	2.76 ± 81.2	147	67.9	NE	U	BD	102690-009	EPA 906.0
TAV-MW13	Americium-241	-2.07 ± 5.48	9.24	4.48	NE	U	BD	102641-007	EPA 901.1
10-May-17	Cesium-137	-1.38 ± 1.71	2.58	1.22	NE	U	BD	102641-007	EPA 901.1
	Cobalt-60	0.113 ± 1.58	2.85	1.33	NE	U	BD	102641-007	EPA 901.1
	Potassium-40	21.6 ± 46.2	25.6	11.8	NE	U	BD	102641-007	EPA 901.1
	Gross Alpha	4.29	NA	NA	15 pCi/L	NA	None	102641-008	EPA 900.0
	Gross Beta	2.11 ± 0.770	0.933	0.447	4 mrem/yr		J	102641-008	EPA 900.0
	Tritium	19.7 ± 92.6	167	76.0	NE	U	BD	102641-009	EPA 906.0
TAV-MW14	Americium-241	3.76 ± 15.4	24.5	11.8	NE	U	BD	102686-007	EPA 901.1
06-Jun-17	Cesium-137	-1.04 ± 1.86	3.01	1.41	NE	U	BD	102686-007	EPA 901.1
	Cobalt-60	1.11 ± 2.15	4.06	1.87	NE	U	BD	102686-007	EPA 901.1
	Potassium-40	9.85 ± 57.7	32.0	14.4	NE	U	BD	102686-007	EPA 901.1
	Gross Alpha	4.86	NA	NA	15 pCi/L	NA	None	102686-008	EPA 900.0
	Gross Beta	5.11 ± 1.28	1.25	0.600	4 mrem/yr			102686-008	EPA 900.0
	Tritium	94.3 ± 91.1	148	68.0	NE	U	BD	102686-009	EPA 906.0
TAV-MW15	Americium-241	1.66 ± 12.8	19.8	9.63	NE	U	BD	102711-008	EPA 901.1
22-May-17	Cesium-137	0.670 ± 1.61	2.81	1.34	NE	U	BD	102711-008	EPA 901.1
	Cobalt-60	1.07 ± 1.52	2.81	1.30	NE	U	BD	102711-008	EPA 901.1
	Potassium-40	0.887 ± 41.3	24.6	11.3	NE	U	BD	102711-008	EPA 901.1
	Gross Alpha	4.95	NA	NA	15 pCi/L	NA	None	102711-009	EPA 900.0
	Gross Beta	5.14 ± 1.57	1.91	0.925	4 mrem/yr		J	102711-009	EPA 900.0
	Tritium	67.0 ± 85.2	143	63.6	NE	U	BD	102711-010	EPA 906.0

Refer to footnotes on page 5B-61.

Table 5B-8 *(Continued)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW16	Americium-241	7.50 ± 10.8	16.4	8.02	NE	U	BD	102715-008	EPA 901.1
24-May-17	Cesium-137	1.11 ± 2.09	3.35	1.61	NE	U	BD	102715-008	EPA 901.1
	Cobalt-60	-0.684 ± 1.90	3.18	1.49	NE	U	BD	102715-008	EPA 901.1
	Potassium-40	-45.3 ± 48.2	55.3	26.6	NE	U	BD	102715-008	EPA 901.1
	Gross Alpha	8.64	NA	NA	15 pCi/L	NA	None	102715-009	EPA 900.0
	Gross Beta	3.84 ± 1.17	1.26	0.603	4 mrem/yr			102715-009	EPA 900.0
	Tritium	12.8 ± 77.7	143	63.7	NE	U	BD	102715-010	EPA 906.0
TAV-MW15	Americium-241	2.69 ± 5.06	8.67	4.22	NE	U	BD	103208-008	EPA 901.1
27-Jul-17	Cesium-137	-0.682 ± 1.82	3.00	1.43	NE	U	BD	103208-008	EPA 901.1
	Cobalt-60	-0.077 ± 1.57	2.81	1.30	NE	U	BD	103208-008	EPA 901.1
	Potassium-40	10.2 ± 40.4	29.3	13.6	NE	U	BD	103208-008	EPA 901.1
	Gross Alpha	4.24	NA	NA	15 pCi/L	NA	None	103208-009	EPA 900.0
	Gross Beta	4.77 ± 1.31	1.47	0.707	4 mrem/yr			103208-009	EPA 900.0
	Tritium	-29.5 ± 84.6	154	72.7	NE	U	BD	103208-010	EPA 906.0
TAV-MW15 (Duplicate)	Americium-241	1.23 ± 6.24	9.59	4.65	NE	U	BD	103209-008	EPA 901.1
27-Jul-17	Cesium-137	0.464 ± 1.65	2.89	1.37	NE	U	BD	103209-008	EPA 901.1
	Cobalt-60	0.124 ± 1.61	2.98	1.37	NE	U	BD	103209-008	EPA 901.1
	Potassium-40	-29.6 ± 39.6	40.9	19.2	NE	U	BD	103209-008	EPA 901.1
	Gross Alpha	3.54	NA	NA	15 pCi/L	NA	None	103209-009	EPA 900.0
	Gross Beta	4.97 ± 1.38	1.59	0.768	4 mrem/yr			103209-009	EPA 900.0
	Tritium	-76.3 ± 80.5	153	71.9	NE	U	BD	103209-010	EPA 906.0
TAV-MW16	Americium-241	-2.75 ± 5.90	9.37	4.55	NE	U	BD	103214-008	EPA 901.1
28-Jul-17	Cesium-137	0.138 ± 1.59	2.77	1.30	NE	U	BD	103214-008	EPA 901.1
	Cobalt-60	2.59 ± 2.12	3.61	1.68	NE	U	BD	103214-008	EPA 901.1
	Potassium-40	-19.8 ± 38.2	41.8	19.6	NE	U	BD	103214-008	EPA 901.1
	Gross Alpha	1.23	NA	NA	15 pCi/L	NA	None	103214-009	EPA 900.0
	Gross Beta	5.16 ± 1.68	2.00	0.966	4 mrem/yr		J	103214-009	EPA 900.0
	Tritium	3.93 ± 83.7	149	70.1	NE	U	BD	103214-010	EPA 906.0

Refer to footnotes on page 5B-61.

Table 5B-8 *(Concluded)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Americium-241	5.15 ± 10.8	16.5	8.00	NE	U	BD	103984-008	EPA 901.1
31-Oct-17	Cesium-137	1.76 ± 3.10	3.79	1.81	NE	U	BD	103984-008	EPA 901.1
	Cobalt-60	0.583 ± 2.06	3.36	1.54	NE	U	BD	103984-008	EPA 901.1
	Potassium-40	16.3 ± 46.6	30.1	13.7	NE	U	BD	103984-008	EPA 901.1
	Gross Alpha	10.54	NA	NA	15 pCi/L	NA	None	103984-009	EPA 900.0
	Gross Beta	4.91 ± 1.30	1.35	0.647	4 mrem/yr			103984-009	EPA 900.0
	Tritium	38.3 ± 77.4	133	62.1	NE	U	BD	103984-010	EPA 906.0
TAV-MW16	Americium-241	-0.342 ± 2.67	4.41	2.13	NE	U	BD	103980-008	EPA 901.1
01-Nov-17	Cesium-137	-1.02 ± 2.10	3.39	1.60	NE	U	BD	103980-008	EPA 901.1
	Cobalt-60	3.34 ± 1.96	3.68	1.69	NE	U	BD	103980-008	EPA 901.1
	Potassium-40	67.6 ± 52.4	35.1	16.0	NE		J	103980-008	EPA 901.1
	Gross Alpha	6.73	NA	NA	15 pCi/L	NA	None	103980-009	EPA 900.0
	Gross Beta	6.94 ± 2.28	3.05	1.49	4 mrem/yr		J	103980-009	EPA 900.0
	Tritium	-9.7 ± 72.9	133	61.9	NE	U	BD	103980-010	EPA 906.0
TAV-MW16 (Duplicate)	Americium-241	-2.91 ± 8.64	14.8	7.12	NE	U	BD	103981-008	EPA 901.1
01-Nov-17	Cesium-137	0.227 ± 1.61	2.84	1.34	NE	U	BD	103981-008	EPA 901.1
	Cobalt-60	1.20 ± 1.56	2.94	1.34	NE	U	BD	103981-008	EPA 901.1
	Potassium-40	64.2 ± 44.1	29.7	13.6	NE		J	103981-008	EPA 901.1
	Gross Alpha	9.83	NA	NA	15 pCi/L	NA	None	103981-009	EPA 900.0
	Gross Beta	3.70 ± 1.51	1.74	0.836	4 mrem/yr		J	103981-009	EPA 900.0
	Tritium	-6.24 ± 73.6	134	62.2	NE	U	BD	103981-010	EPA 906.0

Refer to footnotes on page 5B-61.

Table 5B-9
Summary of Field Water Quality Measurements[h],
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
LWDS-MW1	03-Mar-17	19.26	708.4	206.2	7.66	0.42	80.3	7.38
TAV-MW2	14-Feb-17	16.69	640.6	264.3	7.36	1.78	60.5	5.83
TAV-MW4	20-Feb-17	18.75	494.1	240.0	7.47	1.67	72.4	6.72
TAV-MW6	27-Feb-17	19.00	669.1	224.9	7.51	4.48	75.3	6.96
TAV-MW8	21-Feb-17	18.35	565.8	257.2	7.43	4.46	68.6	6.41
TAV-MW10	28-Feb-17	18.67	591.2	261.3	7.53	0.22	77.5	7.22
TAV-MW11	17-Feb-17	18.90	561.7	250.0	7.60	1.00	77.0	7.13
TAV-MW12	22-Feb-17	19.85	601.8	268.2	7.38	2.76	68.6	6.25
TAV-MW14	23-Feb-17	19.36	621.1	256.4	7.52	1.56	77.7	7.14
TAV-MW15	15-Feb-17	20.21	745.7	236.4	7.46	4.89	59.7	5.38
TAV-MW16	16-Feb-17	20.04	830.2	239.7	7.23	2.72	61.0	5.49
AVN-1	23-May-17	20.61	421.3	121.8	7.85	3.83	40.3	3.60
LWDS-MW1	12-Jun-17	23.07	725.6	163.2	7.49	0.52	87.7	7.50
LWDS-MW2	18-May-17	18.86	446.0	221.7	7.78	1.46	49.1	4.61
TAV-MW2	25-May-17	21.99	733.7	237.1	7.40	3.35	63.9	5.58
TAV-MW3	17-May-17	18.80	546.1	218.5	7.74	3.51	62.8	5.85
TAV-MW4	01-Jun-17	20.71	518.8	250.4	7.74	1.54	74.1	6.62
TAV-MW5	11-May-17	20.56	500.9	233.9	7.69	0.57	55.5	4.96
TAV-MW6	07-Jun-17	21.42	698.2	160.4	7.54	5.71	78.1	6.89
TAV-MW7	16-May-17	20.47	608.6	119.4	7.55	3.93	1.4	0.13
TAV-MW8	02-Jun-17	21.94	614.5	256.9	7.64	1.19	72.9	6.35
TAV-MW9	15-May-17	20.48	654.4	152.4	7.48	2.14	15.0	1.35
TAV-MW10	08-Jun-17	23.73	622.0	179.3	7.57	0.27	85.6	7.24
TAV-MW11	31-May-17	21.14	597.1	233.0	7.71	1.35	80.1	7.11
TAV-MW12	05-Jun-17	22.62	642.6	214.9	7.59	4.40	60.3	5.10
TAV-MW13	10-May-17	19.95	523.3	135.7	7.64	0.41	26.7	2.42
TAV-MW14	06-Jun-17	21.71	658.9	209.4	7.64	2.81	73.9	6.48
TAV-MW15	22-May-17	21.05	773.3	211.8	7.41	1.41	70.1	6.18
TAV-MW16	24-May-17	22.20	875.7	185.9	7.33	0.86	53.0	4.61

Refer to footnotes on page 5B-61.

Table 5B-9 *(Concluded)*
Summary of Field Water Quality Measurements[h], Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
LWDS-MW1	07-Aug-17	23.41	805.0	228.1	7.54	0.89	87.5	7.43
TAV-MW2	31-Jul-17	21.53	746.6	283.6	7.39	2.95	69.8	6.14
TAV-MW4	02-Aug-17	21.04	539.9	253.0	7.67	0.40	75.6	6.70
TAV-MW6	10-Aug-17	22.03	707.5	294.7	7.26	1.83	80.8	7.03
TAV-MW8	03-Aug-17	22.68	651.2	250.1	7.59	4.99	74.9	6.45
TAV-MW10	11-Aug-17	22.58	646.5	302.5	7.37	0.27	86.3	7.45
TAV-MW11	01-Aug-17	23.01	641.3	262.2	7.66	0.22	86.5	7.40
TAV-MW12	08-Aug-17	23.44	667.2	288.7	7.59	3.49	66.3	5.43
TAV-MW14	09-Aug-17	22.91	682.2	328.9	7.34	3.86	84.1	7.20
TAV-MW15	27-Jul-17	21.26	808.1	200.1	7.33	1.60	72.3	6.38
TAV-MW16	28-Jul-17	22.41	906.3	271.3	7.26	0.61	53.7	4.65
	14-Aug-17	21.57	852.7	257.3	7.13	0.67	54.3	4.76
LWDS-MW1	20-Nov-17	16.89	677.2	270.2	7.58	0.33	76.84	11.53
TAV-MW2	02-Nov-17	19.96	665.9	326.8	7.26	12.8	70.0	6.36
TAV-MW4	08-Nov-17	19.22	507.6	303.2	7.49	4.20	74.0	6.82
TAV-MW6	14-Nov-17	20.87	726.9	282.8	7.42	4.44	75.9	6.82
TAV-MW7	07-Nov-17	20.34	615.8	141.2	7.33	2.30	3.6	0.32
TAV-MW8	08-Nov-17	17.50	498.6	351.8	7.49	1.37	87.1	8.31
TAV-MW10	27-Nov-17	20.84	625.8	277.5	7.68	0.45	80.7	7.22
TAV-MW11	06-Nov-17	20.87	562.3	299.9	7.52	0.16	87.7	7.84
TAV-MW12	13-Nov-17	21.54	533.6	359.2	7.51	3.76	87.3	7.59
TAV-MW14	14-Nov-17	18.85	633.7	346.1	7.49	1.07	76.1	7.06
TAV-MW15	31-Oct-17	19.31	714.7	292.7	7.21	1.26	78.4	7.23
TAV-MW16	01-Nov-17	20.27	796.3	274.0	7.13	0.48	51.8	4.67

Refer to footnotes on page 5B-61.

This page intentionally left blank.

Footnotes for Technical Area-V Analytical Results Tables

% = Percent.
AVN = Area-V (North).
CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
ID = Identifier.
LWDS = Liquid Waste Disposal System.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.
mrem/yr = Millirem per year.
MW = Monitoring well.
No. = Number.
pCi/L = Picocuries per liter.
TAV = Technical Area-V (well).

[a]Result or Activity

Result applies to Tables 5B-1 through 5B-7. Activity applies to Table 5B-8.
Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Part 141).
Activities of zero or less are considered to be not detected.
Bold = Value exceeds the established MCL.
ND = Not detected (at MDL).

[b]MDL or MDA

The MDL applies to Tables 5B-1 through 5B-7. MDA applies to Table 5B-8.
MDA = The minimal 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.
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 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

The PQL applies to Table 5B-1 through 5B-7. Critical Level applies to Table 5B-8.
Critical Level = 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.
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

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).

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 Part 141).
- 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Technical Area-V Analytical Results Tables (Concluded)

[e]Lab Qualifier

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

B	= Analyte was found in the blank above the effective MDL.
h	= Prep holding time was exceeded.
H	= Analytical holding time was exceeded.
J	= Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
N	= Results associated with a spike analysis that was outside control limits.
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 associated value is an estimated quantity.
None	= No data validation for corrected gross alpha activity.
R	= The data are unusable, and resampling or reanalysis are necessary for verification.
U	= The analyte was analyzed for, but not detected. The associated numerical value is the sample quantitation limit.
UJ	= The analyte was analyzed for, but not detected. The associated value is an estimate and may be inaccurate or imprecise.

[g]Analytical Method

EPA, 1986 (and updates), “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” SW-846, 3rd ed.

EPA, 1984, “Methods for Chemical Analysis of Water and Wastes.” EPA 600-4-79-020.

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

Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, Washington, D.C.

SM = Standard Method.

[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 5C
Technical Area-V
Plots

This page intentionally left blank.

Attachment 5C Plots

This page intentionally left blank.

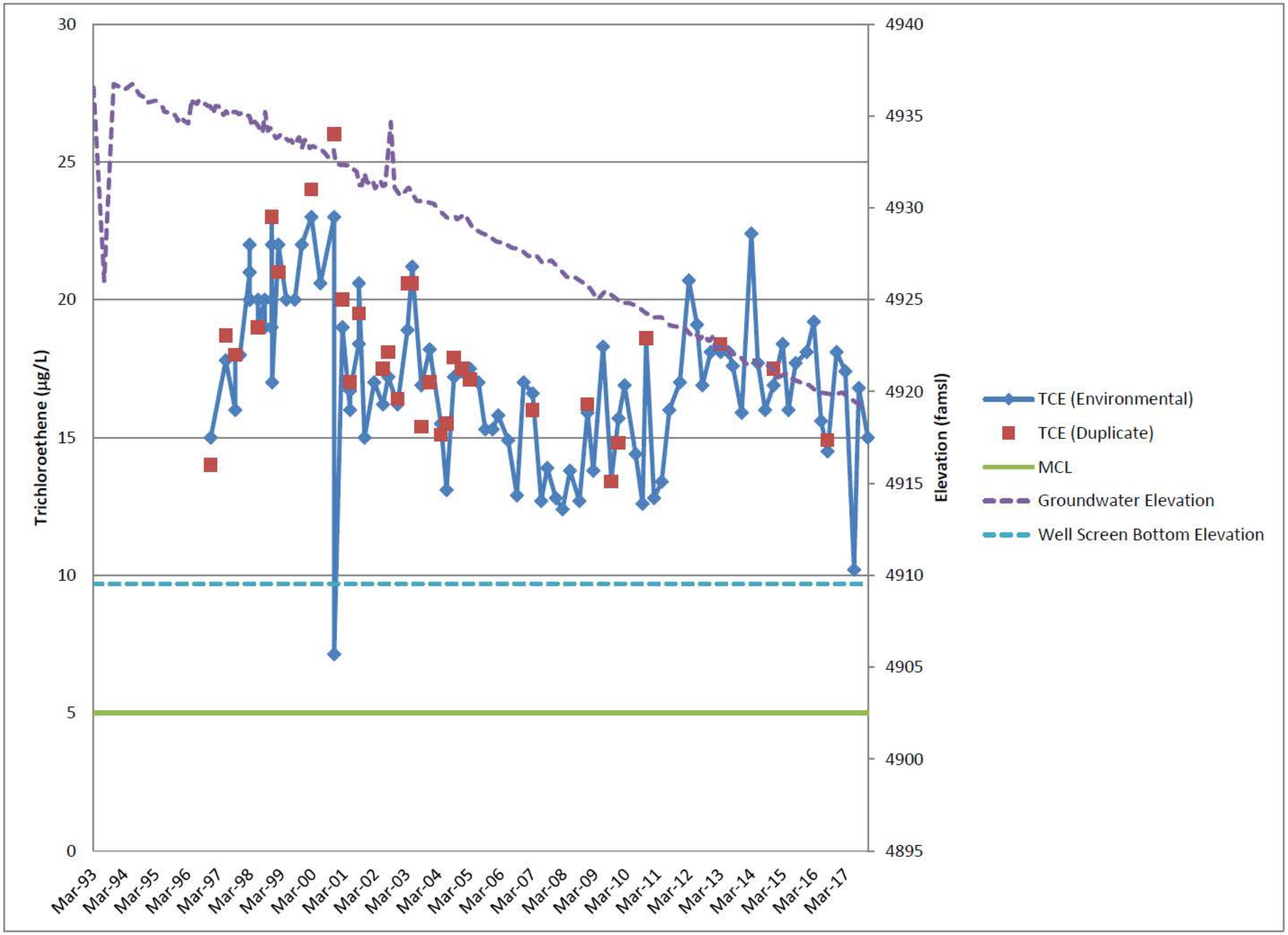
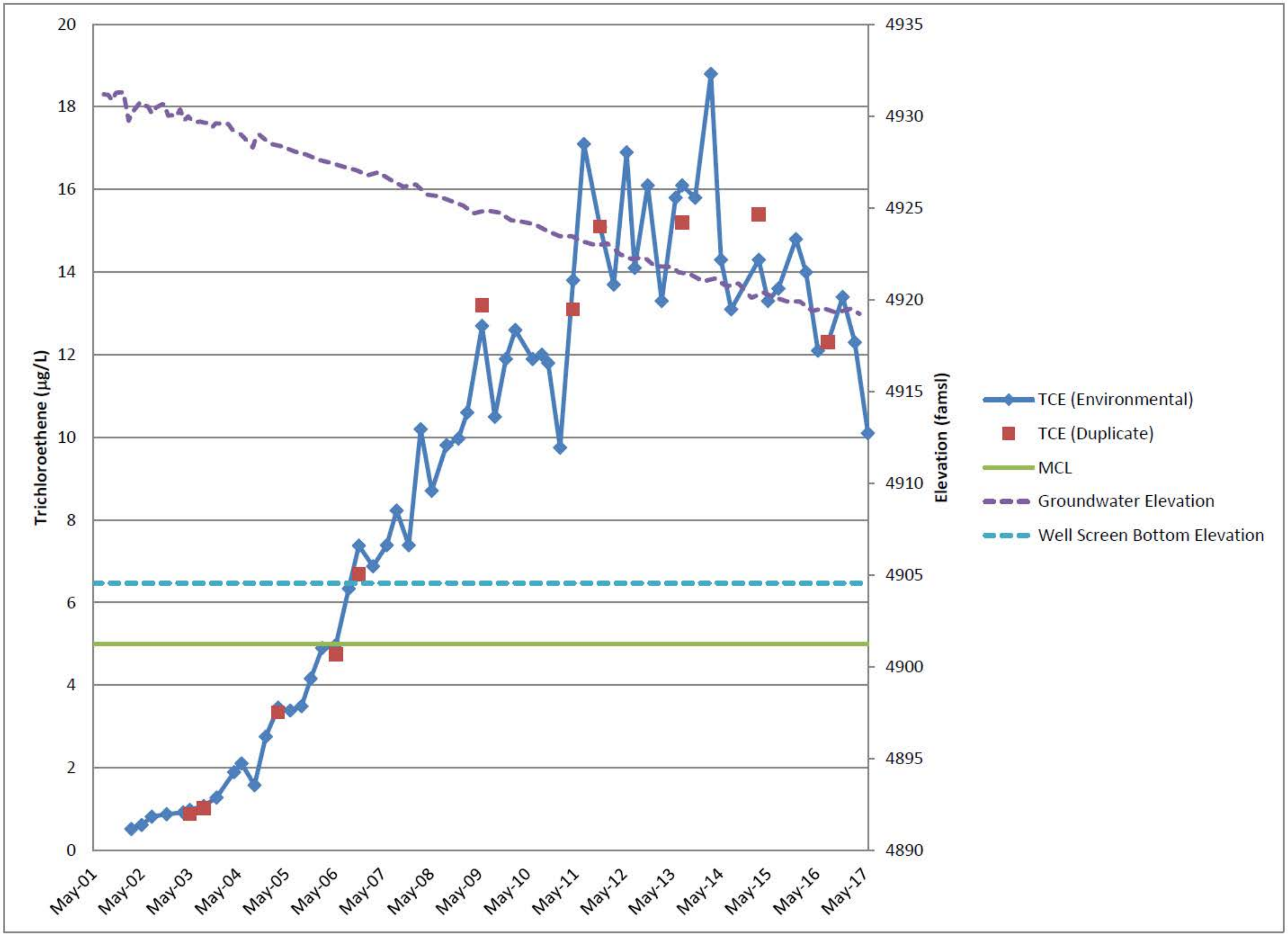


Figure 5C-1. Trichloroethene Concentrations, LWDS-MW1



Note: TCE was not detected in the sample collected in November 2014.

Figure 5C-2. Trichloroethene Concentrations, TAV-MW6

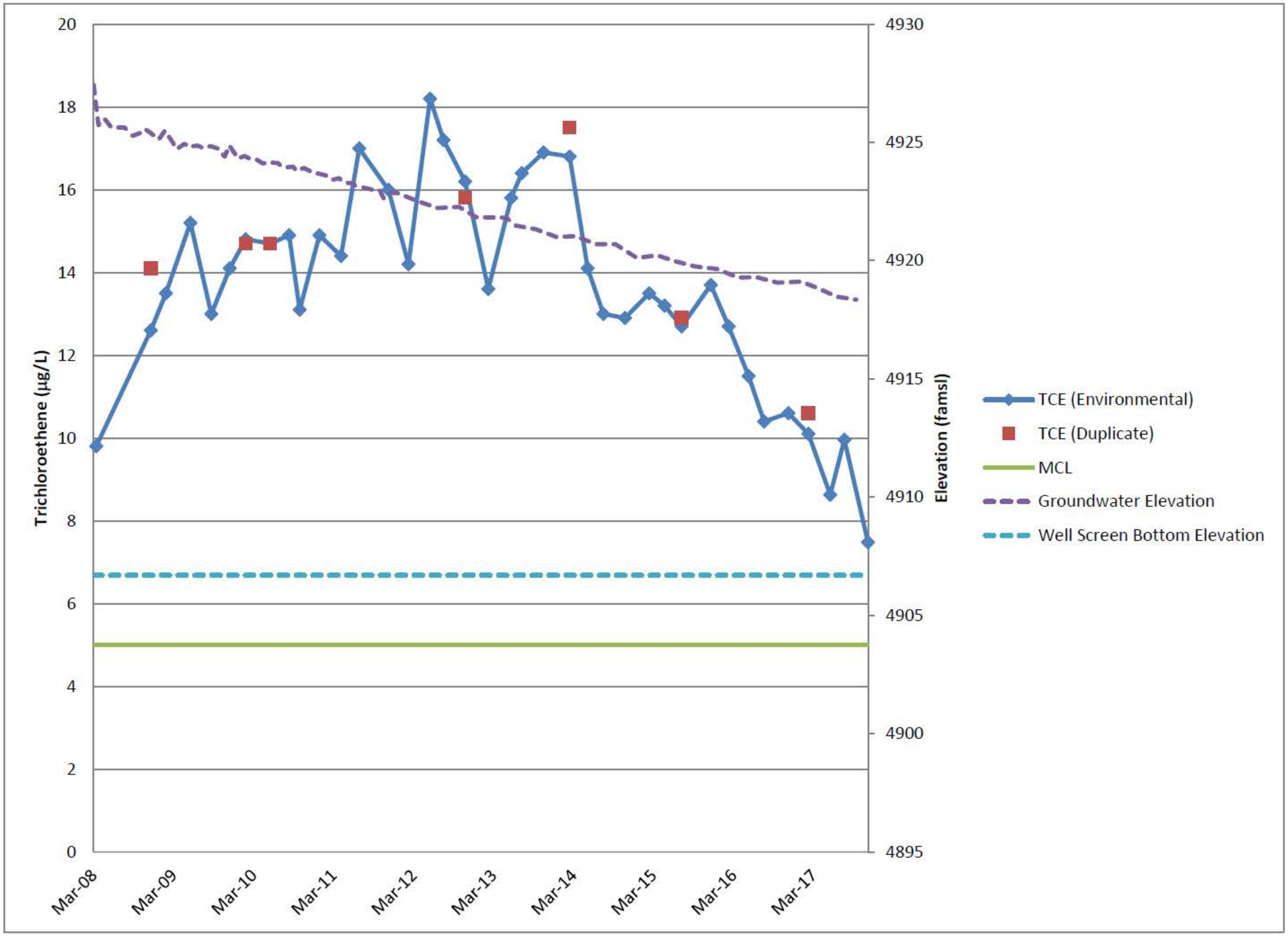


Figure 5C-3. Trichloroethene Concentrations, TAV-MW10

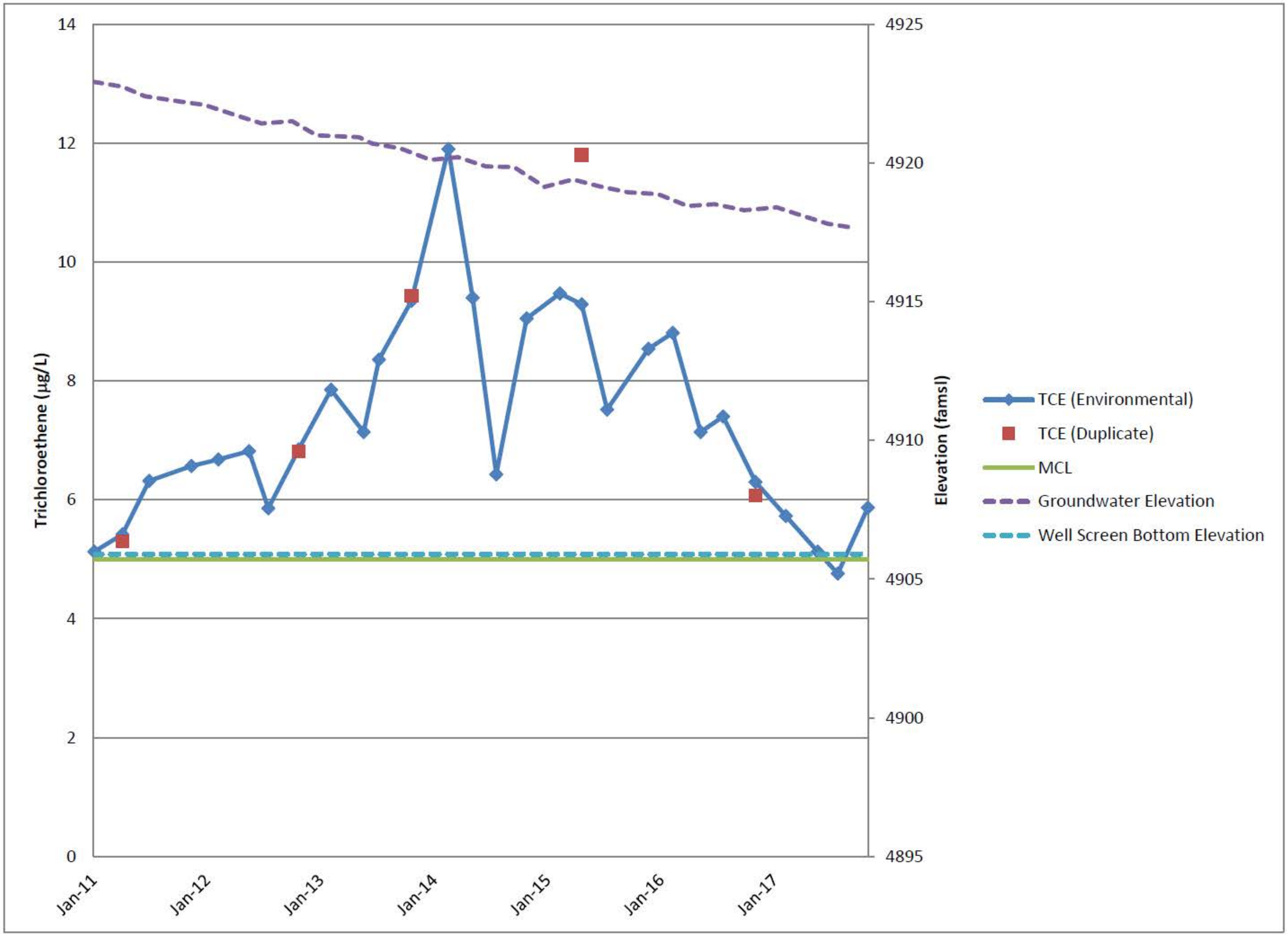


Figure 5C-4. Trichloroethene Concentrations, TAV-MW12

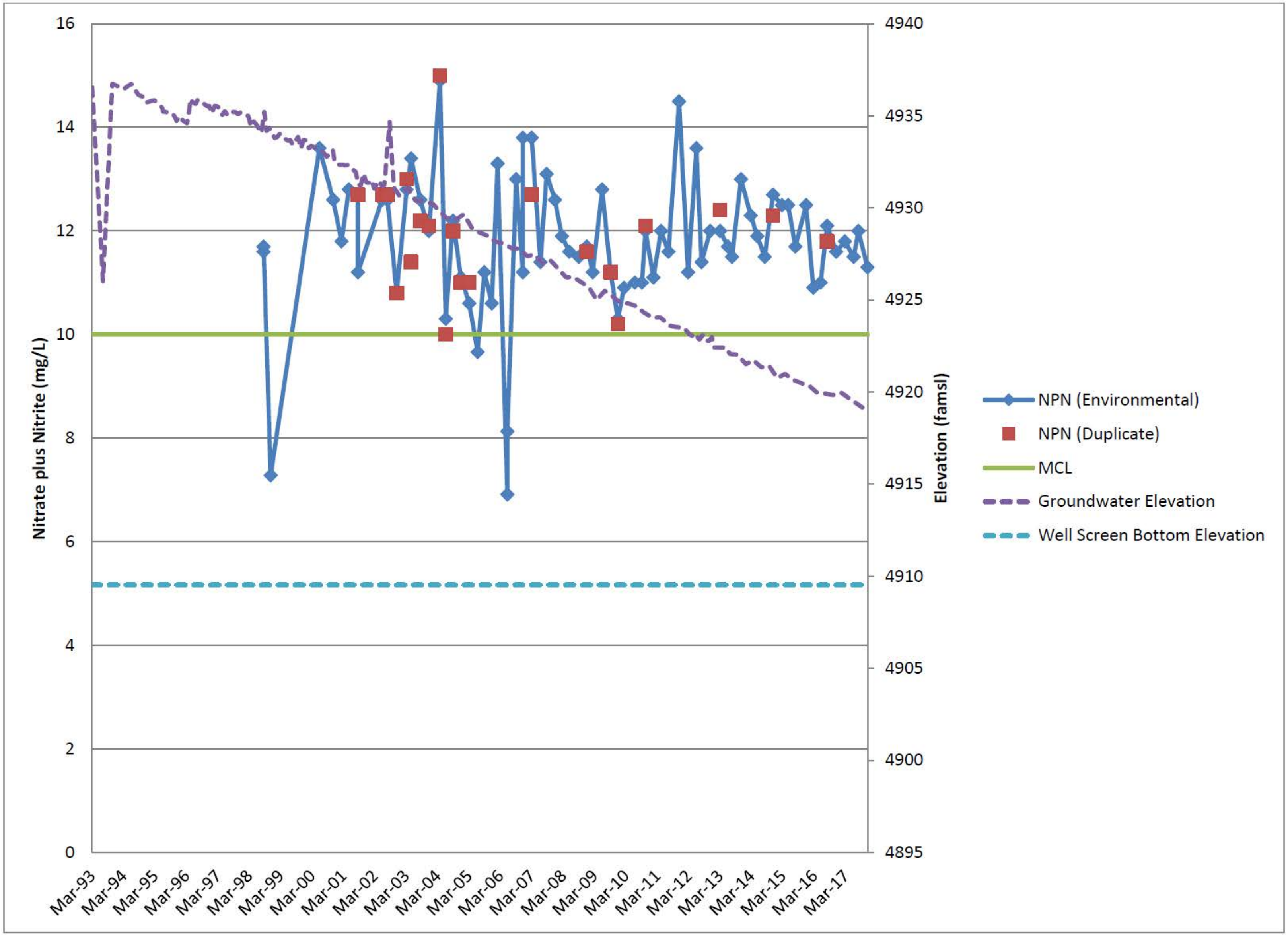


Figure 5C-5. Nitrate Plus Nitrite Concentrations, LWDS-MW1

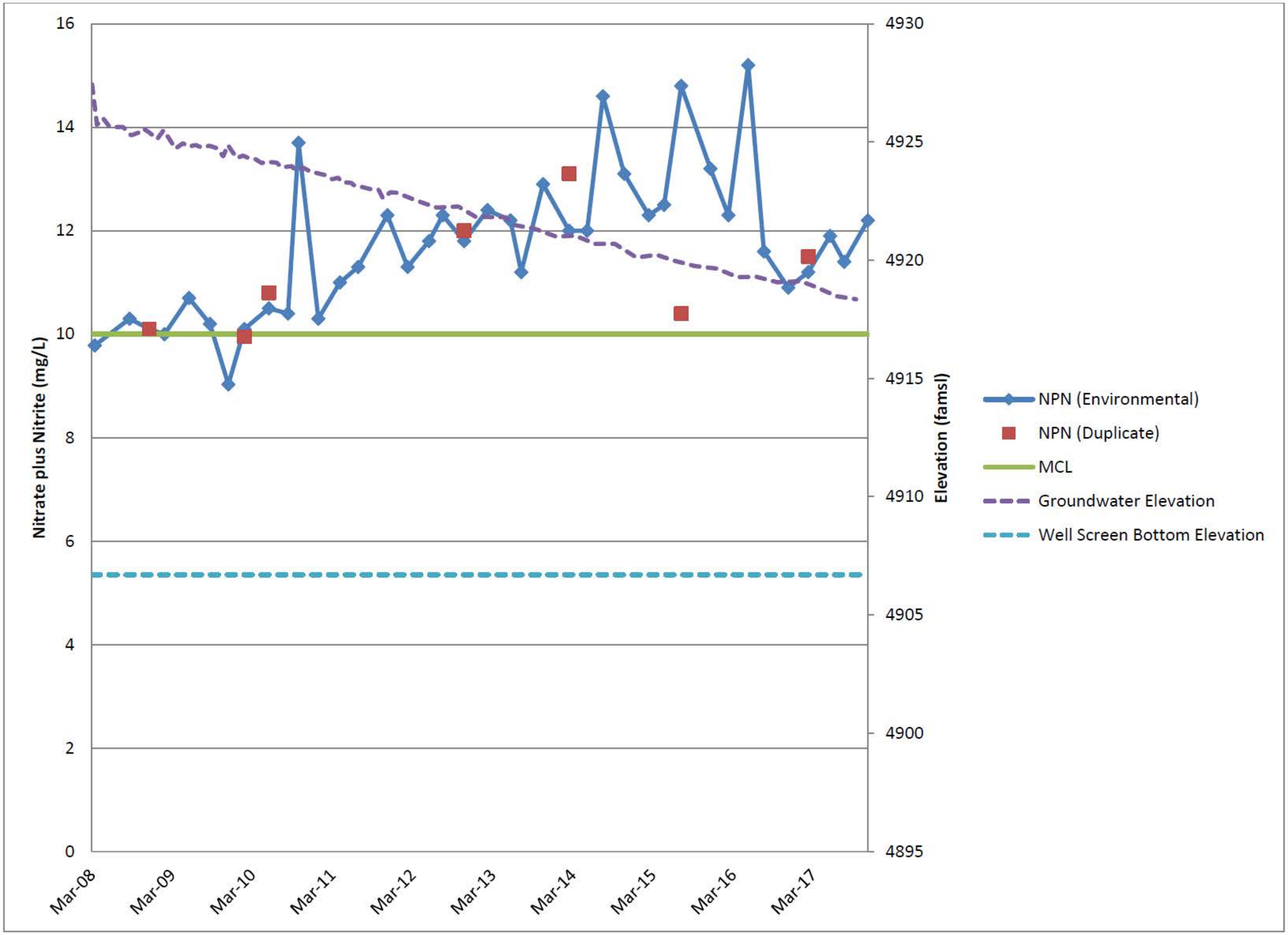


Figure 5C-6. Nitrate Plus Nitrite Concentrations, TAV-MW10

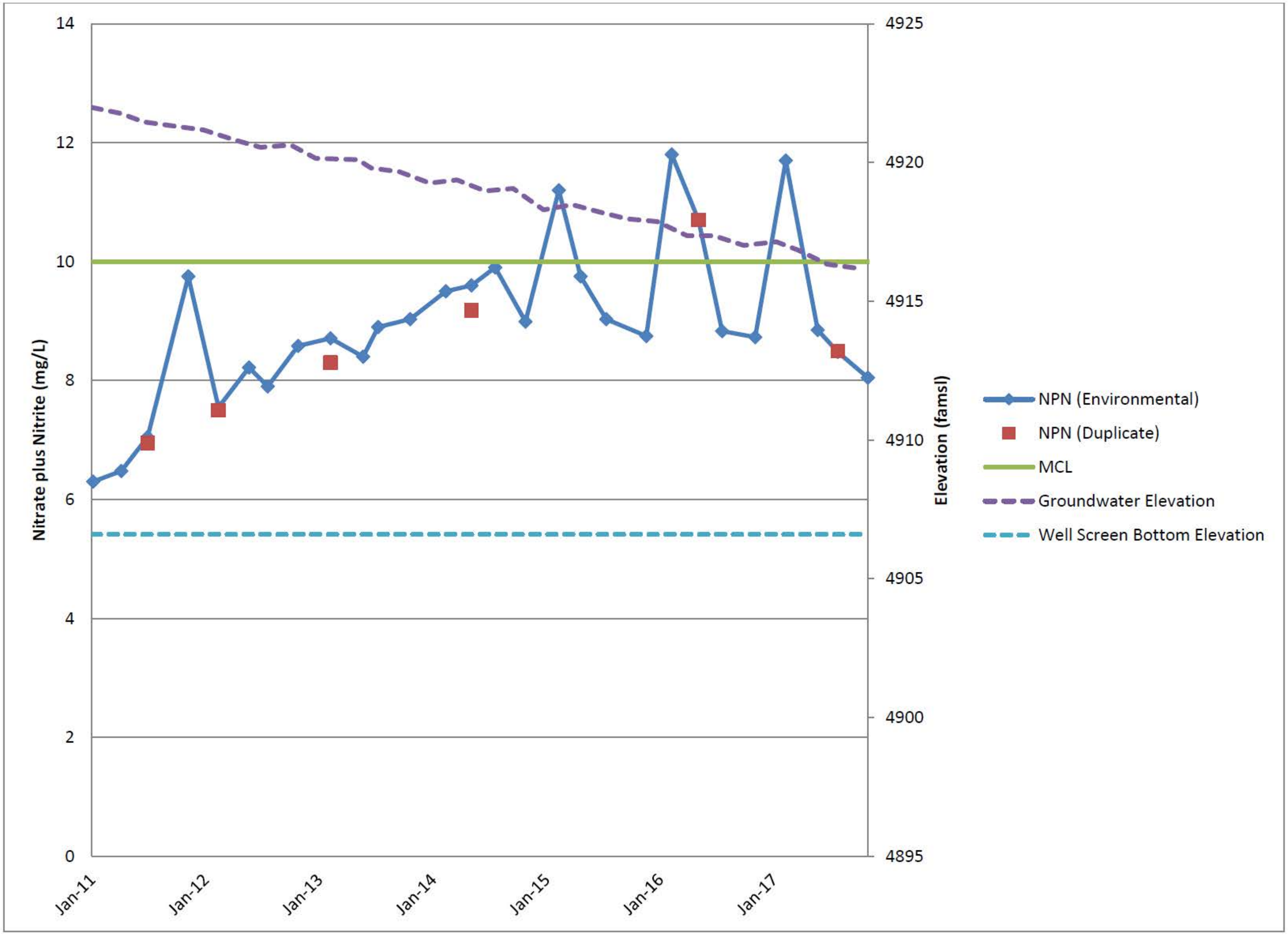


Figure 5C-7. Nitrate Plus Nitrite Concentrations, TAV-MW14

This page intentionally left blank.

Attachment 5D
Technical Area-V
Hydrographs

This page intentionally left blank.

Attachment 5D Hydrographs

This page intentionally left blank.

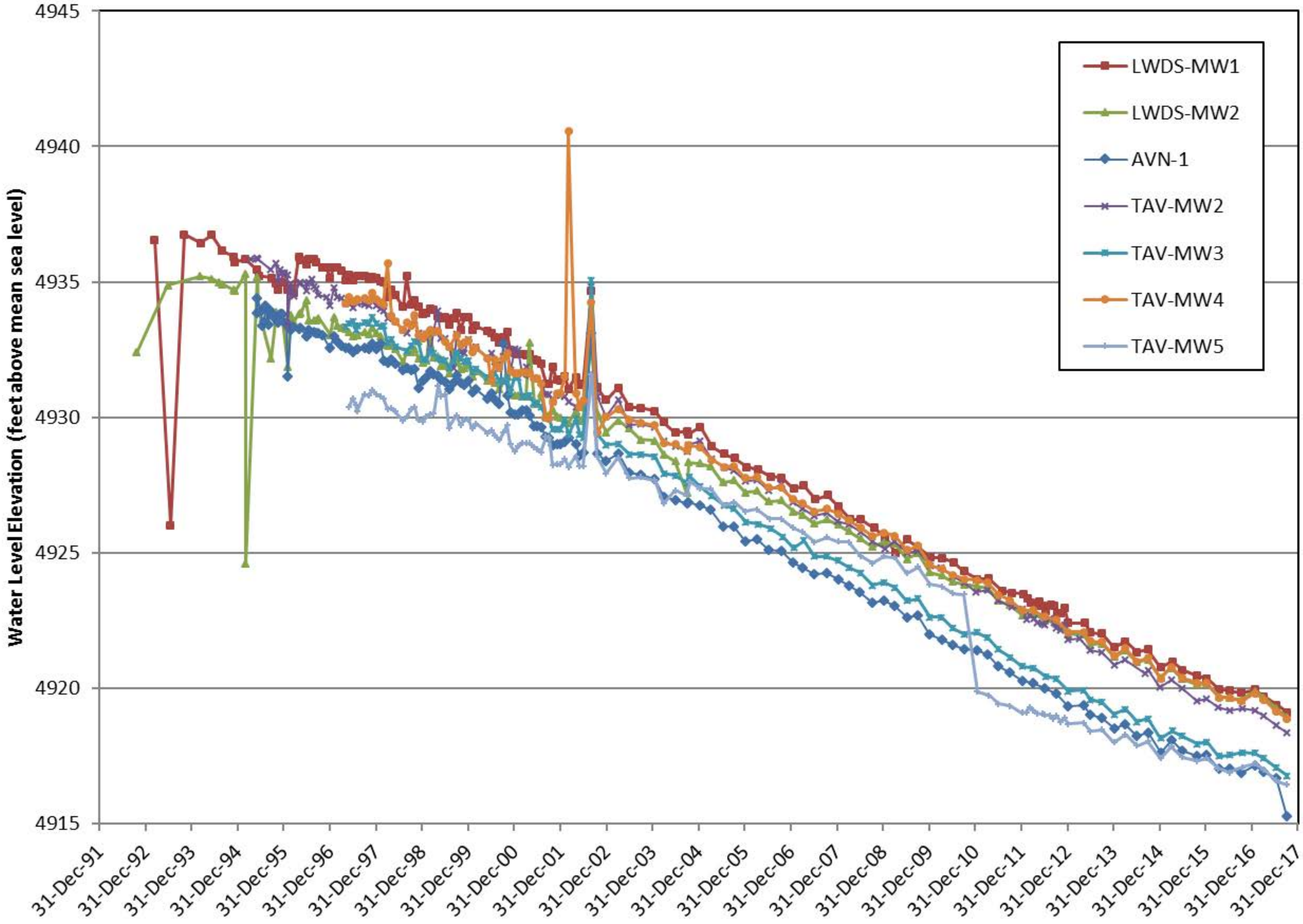


Figure 5D-1. TAVG AOC Wells (1 of 3)

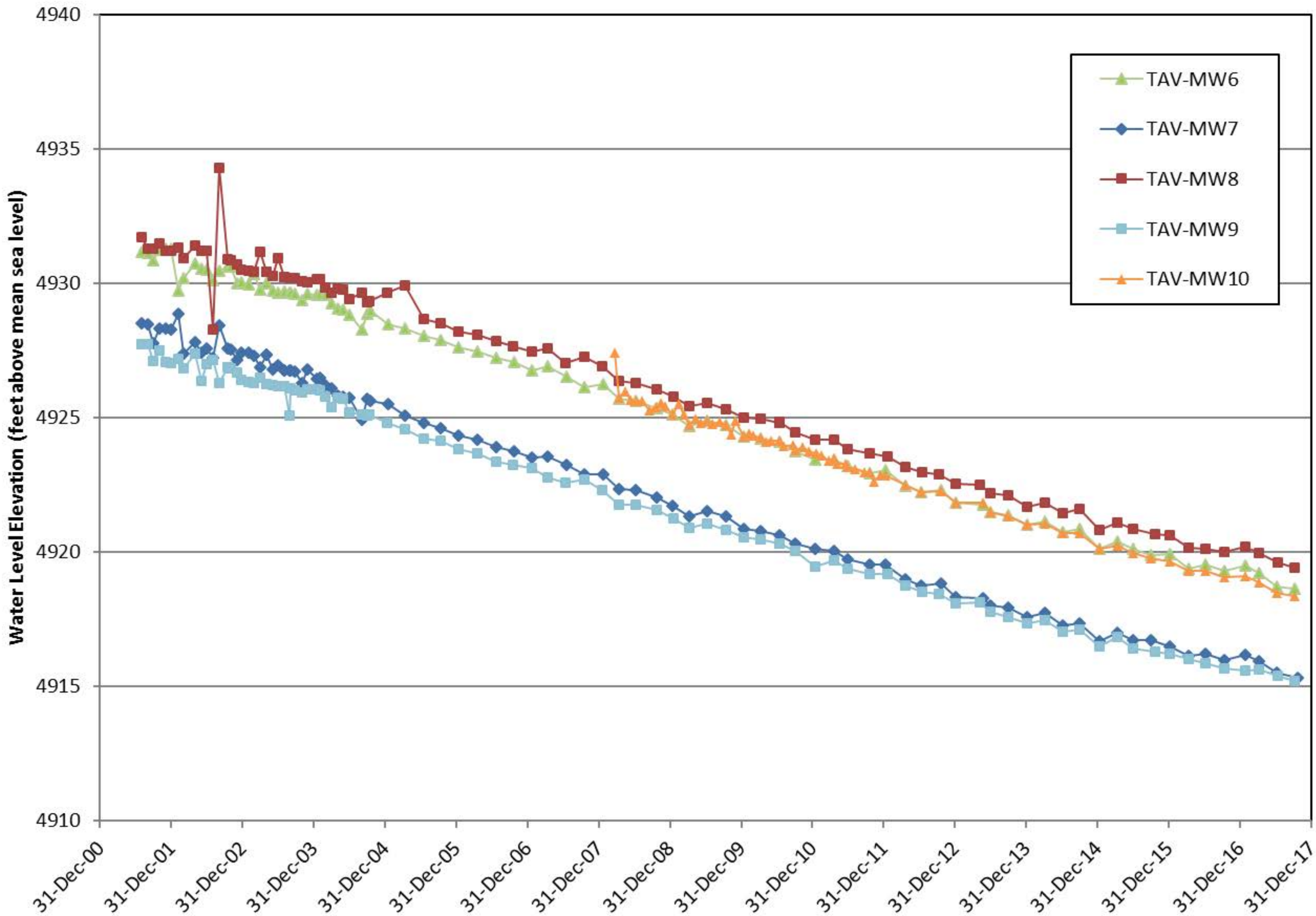


Figure 5D-2. TAVG AOC Wells (2 of 3)

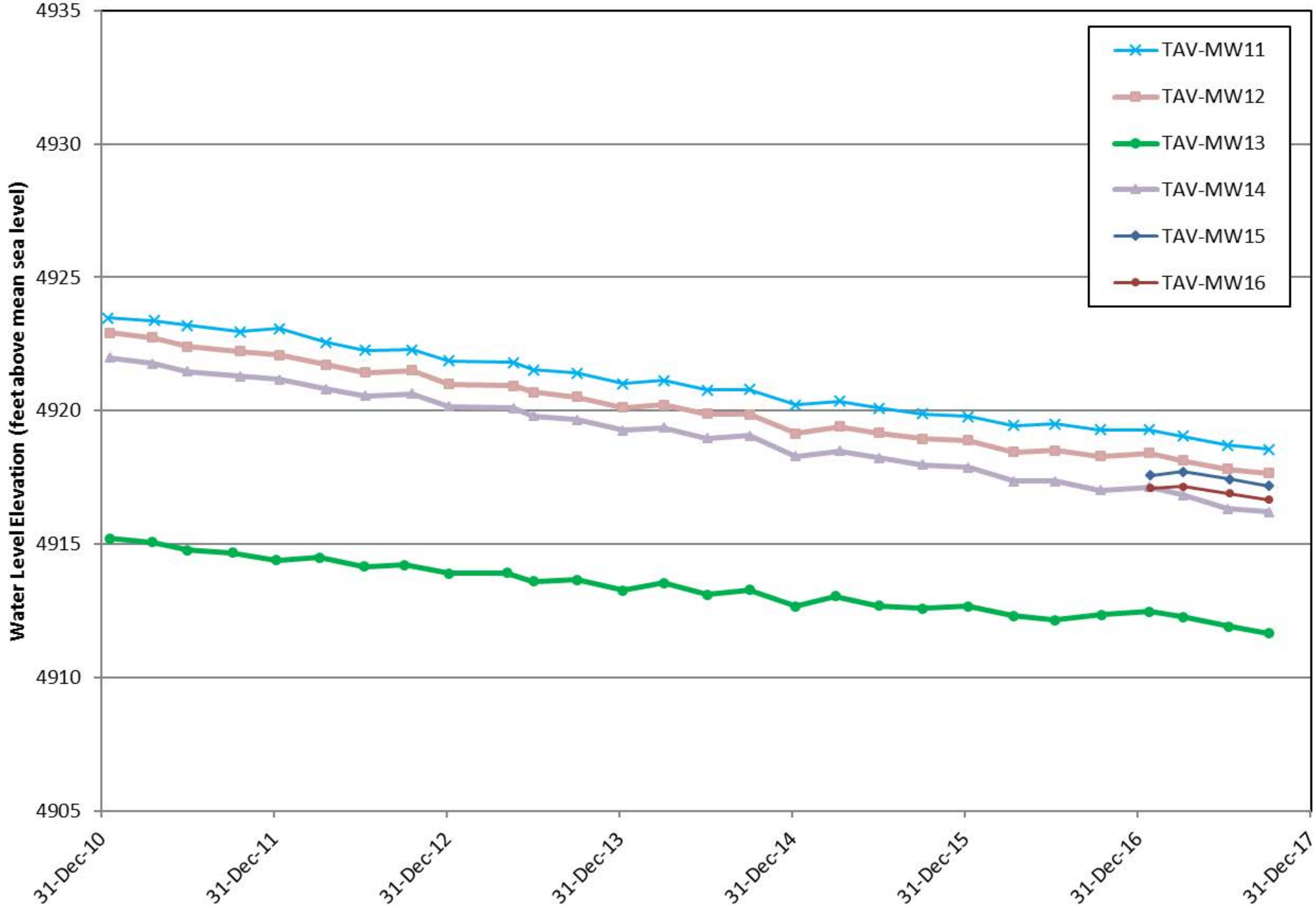


Figure 5D-3. TAVG AOC Wells (3 of 3)

This page intentionally left blank.

Chapter 5
Technical Area-V
References

This page intentionally left blank.

Bartolino and Cole 2002 Bartolino, J.R., and J.C. Cole, 2002. *Groundwater Resources of the Middle Rio Grande Basin,* U.S. Geological Survey, Circular 1222, http://water.usgs.gov/pubs/circ/2002/circ1222/.

Dinwiddie September 1997 Dinwiddie, R.S., September 1997. Letter to M.J. Zamorski (U.S. Department of Energy, Kirtland Area Office), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB," New Mexico Environment Department, Hazardous & Radioactive Materials Bureau, Santa Fe, New Mexico, September 24, 1997.

DOE November 2017 U.S. Department of Energy (DOE), November 2017. Letter to K. Jones (New Mexico Environment Department), *Aboveground Injection System Mechanical Integrity Test Results and Proposed Date to Commence Discharge under Discharge Permit-1845,* U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 15, 2017.

DOE November 2016 U.S. Department of Energy (DOE), November 2016. *DP-1845, Technical Area-V Treatability Study Injection Wells Affidavit of Public Notice Completion*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 16, 2016.

DOE July 2016a U.S. Department of Energy (DOE), July 2016. *Discharge Permit Application for Sandia National Laboratories/New Mexico Technical Area-V Treatability Study Injection Wells, DP-1845*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, July 25, 2016.

DOE July 2016b U.S. Department of Energy (DOE), July 2016. Letter to W. Canon (New Mexico Office of the State Engineer), "New Mexico Office of the State Engineer Permit Applications for the Installation of Groundwater Monitoring Wells TAV-MW15 and TAV-MW16, and Groundwater Injection Well TAV-INJ1 at Sandia National Laboratories/New Mexico," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, July 15, 2016.

DOE May 2016 U.S. Department of Energy (DOE), May 2016. Letter to S. Huddleson (New Mexico Environment Department), "Notice of Intent to Discharge for Sandia National Laboratories/New Mexico Technical Area-V Groundwater Remediation Treatability Study Injection Wells," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, May 16, 2016.

DOE March 2016a U.S. Department of Energy (DOE), March 2016. *Response to NMED Disapproval Letter, HWB-SNL-15-020, Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, September 2015, Sandia National Laboratories, EPA ID NM5890110518, dated December 3, 2015, and Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, March 18, 2016.

DOE March 2016b U.S. Department of Energy (DOE), March 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, March 30, 2016.

DOE January 2016 U.S. Department of Energy (DOE), January 2016. Letter to J.E. Keiling (New Mexico Environment Department), "Request for Extension for Submittal of Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern and Response to the Notice of Disapproval dated December 3, 2015," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, January 15, 2016.

DOE October 2015 U.S. Department of Energy (DOE), October 2015. *Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, and Current Conceptual Model for Technical Area-V Groundwater Area of Concern at Sandia National Laboratories, New Mexico,* U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, October 20, 2015.

DOE November 2014a U.S. Department of Energy (DOE), November 2014. *Request for Extension for Submittal of the Technical Area-V Groundwater Corrective Measures Evaluation Report and the Current Conceptual Model, Sandia National Laboratories, EPA ID# NM5890110518*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 24, 2014.

DOE November 2014b U.S. Department of Energy (DOE), November 2014. *Internal Remedy Review Team Recommendations regarding the Burn Site and Technical Area-V Groundwater Areas of Concern, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Management Internal Remedy Reviews, Office of Environmental Compliance, to Mark Gilbertson, Deputy Assistant Secretary, Office of Environmental Compliance, Washington DC, November 18, 2014.

DOE September 2014 U.S. Department of Energy (DOE), September 2014. *Internal Remedy Review of the Technical Area-V Groundwater Study Site, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Management Internal Remedy Reviews, Office of Environmental Compliance, to Geoffrey Beausoleil, Manager, National Nuclear Security Administration, Sandia Field Office, Washington DC, September 11, 2014.

DOE December 2013 U.S. Department of Energy (DOE), December 2013. *Notification on the Status of the Technical Area-V Groundwater Corrective Measures Evaluation Report and the Current Conceptual Model, Sandia National Laboratories, EPA ID# NM5890110518*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, December 5, 2013.

DOE March 2006 U.S. Department of Energy (DOE), March 2006. Letter to the New Mexico Environment Department requesting permission to remove well AVN-2 from the TA-V monitoring well network, U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, March 26, 2006.

DOE October 2005 U.S. Department of Energy (DOE), October 2005. Letter to the New Mexico Environment Department requesting change of sampling frequency for TA-V groundwater monitoring wells, U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, October 28, 2005.

DOE October 1998 U.S. Department of Energy (DOE), October 1998. *Liquid Waste Disposal System Cross Sections in Response to the NMED September 1997 LWDS Request for Supplemental Information*, U.S. Department of Energy, Albuquerque Operations Office, Kirtland Area Office, Albuquerque, New Mexico.

DOE March 1996 U.S. Department of Energy (DOE), March 1996. Letter to the New Mexico Environment Department regarding detection of nitrate in well LWDS-MW1, U.S. Department of Energy, Albuquerque Operations Office, Kirtland Area Office, Albuquerque, New Mexico.

DOE June 1994 U.S. Department of Energy (DOE), June 1994. Letter to the U.S. Environmental Protection Agency regarding detection of trichloroethylene in well LWDS-MW1, U.S. Department of Energy, Albuquerque Operations Office, Kirtland Area Office, Albuquerque, New Mexico, June 10, 1994.

IT June 1995 IT Corporation (IT), June 1995. *1994 Water Quality Study for Technical Area-V, Sandia National Laboratories/New Mexico*, prepared for Sandia National Laboratories, Albuquerque, New Mexico by IT Corporation, Albuquerque, New Mexico.

Lum May 2017 Lum, C. May 2017. *Redevelopment of Technical Area V Groundwater Monitoring Wells ANV-1, LWDS-MW2, TAV-MW2, TAV-MW9, TAV-MW11, and TAV-MW12,* internal memorandum to S. Sanborn, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, May 11, 2017.

Madrid et al. June 2013 Madrid, V., M.J. Singleton, A. Visser, and B.K. Esser, June 2013. *Summary of Isotopic Data and Preliminary Interpretation of Denitrification and Age-dating for Groundwater Samples from Three Sites at Sandia National Laboratories, New Mexico*, a report to Sandia National Laboratories, New Mexico, Lawrence Livermore National Laboratory, LLNL-SR-636381.

NMED August 2017 New Mexico Environment Department (NMED), August 2017. *Approval: Installation of Groundwater Monitoring Wells TAV-MW15 and TAV-MW16, May 2017, Sandia National Laboratory, EPA ID#NM5890110518, HWB-SNL-17-012,* New Mexico Environment Department, Santa Fe, New Mexico, August 29, 2017.

NMED May 2017 New Mexico Environment Department (NMED), May 2017. *Discharge Permit, DP-1845, Sandia National Laboratories/New Mexico,* New Mexico Environment Department Ground Water Quality Bureau, Santa Fe, New Mexico, May 26, 2017.

NMED September 2016 New Mexico Environment Department (NMED), September 2016. *Administrative Completeness Determination and Applicant's Public Notice Requirements, DP-1845, Sandia National Laboratories/New Mexico, Technical Area-V Treatability Study Injection Wells*, New Mexico Environment Department Ground Water Quality Bureau, Santa Fe, New Mexico, September 27, 2016.

NMED June 2016 New Mexico Environment Department (NMED), June 2016. *Discharge Permit Required for Sandia National Laboratories, Technical Area-V Groundwater Remediation Treatability Study Injection Wells, DP-1845,* New Mexico Environment Department, Santa Fe, New Mexico, June 29, 2016.

NMED May 2016a New Mexico Environment Department (NMED), May 2016a. Letter to J.P. Harrell (U.S. Department of Energy, NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval: Environmental Operations Consolidated Quarterly Report, October-December 2015, April 2016, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-16-008*, NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, May 20, 2016.

NMED May 2016b New Mexico Environment Department (NMED), May 2016b. *Approval Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, Sandia National Laboratories, EPA ID# NM5890110518, HWB SNL-15-020,* New Mexico Environment Department, Santa Fe, New Mexico, May 10, 2016.

NMED April 2016 New Mexico Environment Department (NMED), April 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015, March 30, 2016, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-16-MISC,* New Mexico Environment Department, Santa Fe, New Mexico, April 14, 2016.

NMED December 2015 New Mexico Environment Department (NMED), December 2015. *Disapproval Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, September 2015, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-15-020*, New Mexico Environment Department, Santa Fe, New Mexico, December 3, 2015.

NMED November 2015 New Mexico Environment Department (NMED), November 2015. *Approval Current Conceptual Model for Technical Area-V Groundwater Area of Concern at Sandia National Laboratories, September 2015, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-15-021*, New Mexico Environment Department, Santa Fe, New Mexico, November 30, 2015.

NMED January 2015a New Mexico Environment Department (NMED), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED January 2015b New Mexico Environment Department (NMED), January 2015. *Approval Request for Extension to Submit the Technical Area-V Groundwater Corrective Measures Evaluation Report and the Current Conceptual Model, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-05-027,* New Mexico Environment Department, Santa Fe, New Mexico, January 12, 2015.

NMED December 2013 New Mexico Environment Department (NMED), December 2013. *Technical Area-V Groundwater Corrective Measures Evaluation Report and Current Conceptual Model, Letter of December 5, 2013, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, December 17, 2013.

NMED September 2013 New Mexico Environment Department (NMED), September 2013. *Notice of Approval: Summary Report for Technical Area-V Installation of Groundwater Monitoring Wells TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14 and Installation of Soil Vapor Monitoring Wells TAV-SV01, TAV-SV02, and TAV-SV03, June 2011*, New Mexico Environment Department, Santa Fe, New Mexico, September 3, 2013.

NMED December 2010 New Mexico Environment Department (NMED), December 2010. *Notice of Approval, Modification of Soil-Vapor Monitoring Well Design, TA-V Groundwater Investigation Work Plan, February 2010, Sandia National Laboratories EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, December 23, 2010.

NMED May 2010 New Mexico Environment Department (NMED), May 2010. *Notice of Conditional Approval, SNL Responses to NMED December 2009 NOD issued for TA-V Groundwater Investigation Work Plan Associated with TA-V Groundwater CME Report, July 2005, Sandia National Laboratories EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED December 2009 New Mexico Environment Department (NMED), December 2009. *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*, New Mexico Environment Department, Santa Fe, New Mexico, December 22, 2009.

NMED August 2009 New Mexico Environment Department (NMED), August 2009. *Notice of Disapproval: DOE/Sandia Responses to NMED's Notice of Disapproval for Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005, Sandia National Laboratories EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, August 12, 2009.

NMED April 2009 New Mexico Environment Department (NMED), April 2009. *RE: Perchlorate Contamination in Groundwater, Sandia National Laboratories, EPA ID#NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico. April 30, 2009.

NMED July 2008 New Mexico Environment Department (NMED), July 2008. *Notice of Disapproval: Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005, Sandia National Laboratories NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, July 28, 2008.

NMED October 2004 New Mexico Environment Department (NMED), October 2004. *Approval With Modifications: Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater, April 2004; and Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V, April 2004, Sandia National Laboratories NM5890110518, HWB-SNL-03-009*, New Mexico Environment Department, Santa Fe, New Mexico, October 22, 2004.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

NMED September 1997 New Mexico Environment Department (NMED), September 1997. *Request For Supplemental Information, Liquid Waste Disposal System RFI Report, Sandia National Laboratories, March 1996*, New Mexico Environment Department, Santa Fe, New Mexico.

NMOSE August 2016 New Mexico Office of the State Engineer (NMOSE), August 2016. Permit to Explore/ Remediate (Permit Number RG-90065), POD# 126, 127, 128 for well ID# TAV-MW15, TAV-MW16, and TAV-INJ1, respectively. NMOSE, Albuquerque, New Mexico, August 2, 2016.

NMOSE May 1959 New Mexico Office of the State Engineer (NMOSE), May 1959. State Engineer Office Well Record for Well KAFB-10, drilled for the U.S. Atomic Energy Commission at Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2017 Sandia National Laboratories, New Mexico (SNL/NM), September 2017. *TA-V Groundwater Monitoring Mini-SAP for First Quarter, Fiscal Year 2018*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2017a Sandia National Laboratories, New Mexico (SNL/NM), July 2017. *Installation of Groundwater Monitoring Wells TAV-MW16 and TAV-MW16*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, July 13, 2017.

SNL July 2017b Sandia National Laboratories, New Mexico (SNL/NM), July 2017. *Annual Groundwater Monitoring Report, Calendar Year 2016, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship and Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2017c Sandia National Laboratories, New Mexico (SNL/NM), July 2017. *TA-V Groundwater Monitoring Mini-SAP for Fourth Quarter, Fiscal Year 2017*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2017 Sandia National Laboratories, New Mexico (SNL/NM), April 2017. *TA-V Groundwater Monitoring Mini-SAP for Third Quarter, Fiscal Year 2017*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2017 Sandia National Laboratories, New Mexico (SNL/NM), January 2017. *TA-V Groundwater Monitoring Mini-SAP for Second Quarter, Fiscal Year 2017*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2016 Sandia National Laboratories, New Mexico (SNL/NM), June 2016. *Annual Groundwater Monitoring Report, Calendar Year 2015, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship and Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2015 Sandia National Laboratories, New Mexico (SNL/NM), September 2015. *Current Conceptual Model for Technical Area-V Groundwater Area of Concern at Sandia National Laboratories*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2015 Sandia National Laboratories, New Mexico (SNL/NM), June 2015. *Annual Groundwater Monitoring Report, Calendar Year 2014, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship and Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2014 Sandia National Laboratories, New Mexico (SNL/NM), June 2014. *Annual Groundwater Monitoring Report, Calendar Year 2013, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship and Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2013 Sandia National Laboratories, New Mexico (SNL/NM), June 2013. *Annual Groundwater Monitoring Report, Calendar Year 2012, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship and Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2012 Sandia National Laboratories, New Mexico (SNL/NM), September 2012. *Annual Groundwater Monitoring Report, Calendar Year 2011 Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2011 Sandia National Laboratories, New Mexico (SNL/NM), September 2011. *Annual Groundwater Monitoring Report, Calendar Year 2010 Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2011 Sandia National Laboratories, New Mexico (SNL/NM), July 2011. *Meeting Notes from Technical Discussions with the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), July 6, 2011, 9:00 – 10:30 at NMED Region 1 Office*. Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, July 6, 2011.

SNL June 2011 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, 2011.

SNL November 2010 Sandia National Laboratories, New Mexico (SNL/NM), November 2010. *Slug Test Results and Geophysical Logs for the Four New Technical Area-V (TA-V) Ground Water Monitoring Wells*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, November 24, 2010.

SNL October 2010 Sandia National Laboratories, New Mexico (SNL/NM), October 2010. *Annual Groundwater Monitoring Report, Calendar Year 2009 Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

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, 2010.

SNL November 2009 Sandia National Laboratories, New Mexico (SNL/NM), November 2009. *DOE/Sandia Responses to NMED's Notice of Disapproval: DOE/Sandia Responses to NMED's Notice of Disapproval for Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, November 16, 2009.

SNL June 2009 Sandia National Laboratories, New Mexico (SNL/NM), June 2009. *Annual Groundwater Monitoring Report Calendar Year 2008, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2009 Sandia National Laboratories, New Mexico (SNL/NM), April 2009. *DOE/Sandia Responses to NMED's Notice of Disapproval for Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, April 14, 2009.

SNL October 2008 Sandia National Laboratories, New Mexico (SNL/NM), October 2008. Memo from M. Sanders (GRAM, Inc.) to T. Jackson and S. Ricketson (GRAM, Inc.), *Subject: TA-V Groundwater Monitor Well Re-Survey*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, October 22, 2008.

SNL June 2008 Sandia National Laboratories, New Mexico (SNL/NM), June 2008. *Summary Report for Technical Area-V Monitoring Well Plug and Abandonment and Installation, Decommissioning Monitoring Well TAV-MW1, Installation of Groundwater Monitoring Well TAV-MW10*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2008 Sandia National Laboratories, New Mexico (SNL/NM), March 2008. *Annual Groundwater Monitoring Report, Fiscal Year 2007*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2007 Sandia National Laboratories, New Mexico (SNL/NM), March 2007. *Annual Groundwater Monitoring Report, Fiscal Year 2006*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL November 2006 Sandia National Laboratories, New Mexico (SNL/NM), November 2006. *Annual Groundwater Monitoring Report, Burn Site Groundwater, Tijeras Arroyo Groundwater, and Technical Area-V Groundwater Areas of Concern, Fiscal Year 2005*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2005 Sandia National Laboratories, New Mexico (SNL/NM), October 2005. *Annual Groundwater Monitoring Report*, *Fiscal Year 2004*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2005 Sandia National Laboratories, New Mexico (SNL/NM), July 2005. *Corrective Measures Evaluation Report for Technical Area-V Groundwater*, SAND Report SAND2005-4492, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2004 Sandia National Laboratories, New Mexico (SNL/NM), December 2004. *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater, Revision 0*, SAND Report SAND2004-6113, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2004a Sandia National Laboratories, New Mexico (SNL/NM), April 2004. *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V*, SAND Report SAND2004-1470, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2004b Sandia National Laboratories, New Mexico (SNL/NM), April 2004. *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater*, SAND Report SAND2004-1471, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2004 Sandia National Laboratories, New Mexico (SNL/NM), March 2004. *Annual Groundwater Monitoring Report*, *Fiscal Year 2003*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2003 Sandia National Laboratories, New Mexico (SNL/NM), March 2003. *Annual Groundwater Monitoring Report*, *Fiscal Year 2002*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2002 Sandia National Laboratories, New Mexico (SNL/NM), March 2002. *Annual Groundwater Monitoring Report*, *Fiscal Year 2001*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL November 2001 Sandia National Laboratories, New Mexico (SNL/NM), November 2001. *TA-V Groundwater Investigation, Fiscal Years 1999 and 2000*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2001 Sandia National Laboratories, New Mexico (SNL/NM), October 2001. *Summary of Monitoring Well Drilling Activities, TA-V Groundwater Investigation*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2001 Sandia National Laboratories, New Mexico (SNL/NM), April 2001. *Annual Groundwater Monitoring Report, Fiscal Year 2000*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2000 Sandia National Laboratories, New Mexico (SNL/NM), March 2000, *Annual Groundwater Monitoring Report, Fiscal Year 1999*, Groundwater Protection Program, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1999a Sandia National Laboratories, New Mexico (SNL/NM), March 1999. *Summary Report of Groundwater Investigations at Technical Area-V Operable Units 1306 and 1307 (2 Volumes)*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1999b Sandia National Laboratories, New Mexico (SNL/NM), March 1999. *Groundwater Protection Program, Fiscal Year 1998, Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1998 Sandia National Laboratories, New Mexico (SNL/NM), March 1998. *Groundwater Protection Program, Calendar Year 1997 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), February 1998. *Revised Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 1998 Sandia National Laboratories, New Mexico (SNL/NM), January 1998. *Response to the NMED Request For Supplemental Information Liquid Waste Disposal System RFI Report, Sandia National Laboratories March 1996*, Sandia National Laboratories, Environmental Restoration Project, Albuquerque, New Mexico, January 15, 1998.

SNL March 1997 Sandia National Laboratories, New Mexico (SNL/NM), March 1997. *Groundwater Protection Program, Calendar Year 1996 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Environmental Restoration Project, Albuquerque, New Mexico.

SNL April 1996 Sandia National Laboratories, New Mexico (SNL/NM), April 1996. *Site-Wide Hydrogeologic Characterization Project, KAFB-10 Well Abandonment Plan*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1996 Sandia National Laboratories, New Mexico (SNL/NM), March 1996. *Groundwater Protection Program, Calendar Year 1995 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 1995 Sandia National Laboratories, New Mexico (SNL/NM), September 1995. *Results of The Liquid Waste Disposal System RCRA Facility Investigation, Sandia National Laboratories Albuquerque New Mexico*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1995 Sandia National Laboratories, New Mexico (SNL/NM), March 1995. *Groundwater Protection Program, Calendar Year 1994 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL 1995 Sandia National Laboratories, New Mexico (SNL/NM), 1995. *Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1993 Sandia National Laboratories, New Mexico (SNL/NM), March 1993. *RCRA Facility Investigation Work Plan For The Liquid Waste Disposal System (LWDS), ER Program Sites 4, 5 and 52*, Environmental Impact and Restoration Division, Sandia National Laboratories, Albuquerque, New Mexico.

SRNL December 2008 Savannah River National Laboratory (SRNL), December 2008. *Course Agenda for "Natural and Enhanced Attenuation for Chlorinated Solvents: New Developments and Tools," Agenda and Speakers*, Seminar held in Albuquerque, New Mexico, from December 11 to December 12, 2008.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico*, SAND Report SAND2003-1869, Sandia National Laboratories, Albuquerque, New Mexico.

6.0 Tijeras Arroyo Groundwater Area of Concern

6.1 Introduction

The Tijeras Arroyo Groundwater (TAG) Area of Concern (AOC) was identified by the New Mexico Environment Department (NMED) in the Compliance Order on Consent (the Consent Order) (NMED April 2004) because two chemicals, nitrate and trichloroethene (TCE), had groundwater concentrations that exceeded the respective maximum contaminant levels (MCLs). Groundwater monitoring in the TAG AOC has been conducted since 1992. Figure 6-1 shows the TAG AOC at Sandia National Laboratories, New Mexico (SNL/NM). When the Consent Order was issued, nitrate and TCE were specified as constituents of concern (COCs) because (1) the Perched Groundwater System contained concentrations of nitrate and TCE that exceeded the corresponding MCLs, and (2) the Regional Aquifer contained nitrate concentrations that exceeded the MCL. TCE did not exceed the MCL in the Regional Aquifer.

In the TAG AOC, the historical maximum nitrate concentration has been 38.4 milligrams per liter (mg/L) and the maximum TCE concentration has been 9.6 micrograms per liter (µg/L). The U.S. Environmental Protection Agency (EPA) MCLs and State of New Mexico drinking water standards for nitrate (as nitrogen) and TCE are 10 mg/L and 5 µg/L, respectively. In 2017, the maximum nitrate concentration in the Perched Groundwater System was 26.0 mg/L. The maximum nitrate concentration in the Regional Aquifer exclusive of the merging zone was 3.84 mg/L. In the merging zone above the Regional Aquifer, the maximum nitrate concentration was 33.1 mg/L. TCE concentrations in the Perched Groundwater System have been below the MCL since October 2007. TCE concentrations in the Regional Aquifer have never exceeded the MCL.

In response to the Consent Order, the TAG Corrective Measures Evaluation (CME) Work Plan was submitted to the NMED Hazardous Waste Bureau (HWB) in July 2004 (SNL July 2004). In April 2005, U.S. Department of Energy (DOE) and the SNL management and operating contractor at the time, Sandia Corporation (Sandia), hereinafter collectively referred to as DOE/Sandia, submitted a CME Report, but the NMED HWB did not finalize its review of that document. In December 2016, DOE/Sandia submitted a combined Tijeras Arroyo Groundwater Current Conceptual Model (CCM) and CME Report, referred hereafter as the TAG CCM/CME Report. NMED HWB issued a disapproval letter in May 2017 that included comments on the December 2016 TAG CCM/CME Report. On May 1, 2017, the SNL management and operating contractor name changed to National Technology & Engineering Solutions of Sandia, LLC (NTESS). In August 2017, a meeting was held between NMED HWB and DOE/NTESS staff to discuss and clarify the outstanding issues for preparing a report revision. The Revised TAG CCM/CME Report was scheduled for submittal to NMED HWB in February 2018. The revised report would address (1) the issues presented in the NMED HWB May 2017 disapproval letter and (2) findings from the August 2017 meeting.

6.1.1 Location

The TAG AOC covers approximately 1.82 square miles (sq mi) and three Technical Areas (TAs) (TA-I, TA-II, and TA-IV). The TAG AOC is analogous with the previously used term TAG Area of Responsibility as discussed in the CME Work Plan (SNL August 2005). Figure 6-1 shows the surrounding TAG Study Area of approximately 40 sq mi that is situated in the north-central portion of Kirtland Air Force Base (KAFB) and the southern portion of the City of Albuquerque (COA). From October 2000 to October 2003, the NMED HWB directed a series of twenty High Performing Team (HPT) meetings that served as a forum for discussing groundwater issues for the study area. The facilities identified then as potentially responsible for groundwater contamination within the TAG Study Area included the DOE/National Nuclear Security Administration (NNSA), SNL/NM, KAFB, the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and the COA.

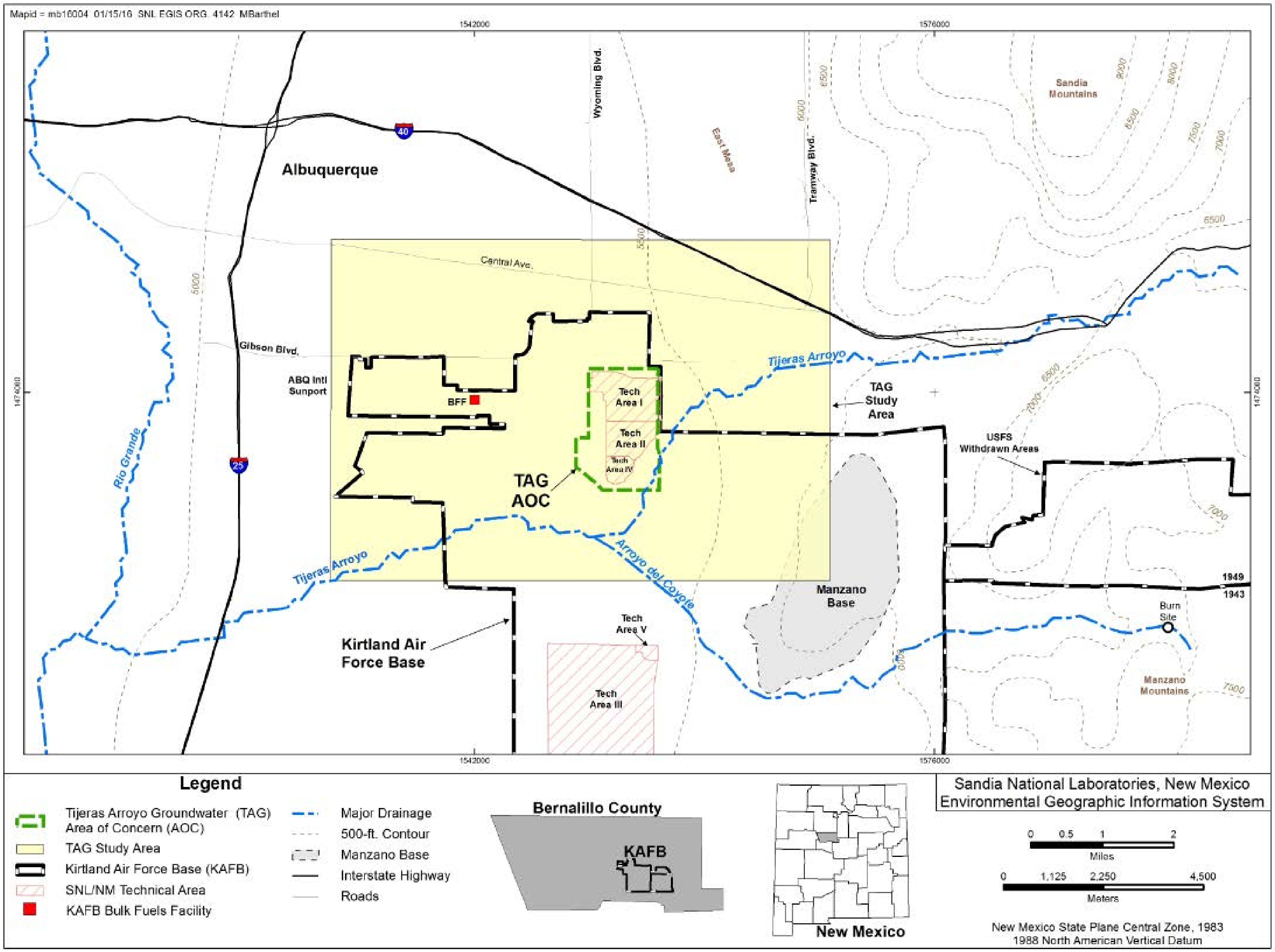


Figure 6-1. Location of the TAG AOC

KAFB operations utilize numerous 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 facilities consisting of base housing, office buildings, a fire station, training schools, machine workshops, storage yards, a detention facility, an electromagnetic research facility, and the former sewage lagoons. Bordering the southern and southeastern edges of the three TAs are KAFB undeveloped open spaces, an active landfill, closed landfills, emergency response training areas, and the Tijeras Arroyo Golf Course. COA residential areas are located along the northern boundary of KAFB, and a major sanitary sewer line operated by the ABCWUA trends along the floor of Tijeras Arroyo and across the southeast corner of the TAG AOC.

6.1.2 Site History

The facilities at TA-I, TA-II, and TA-IV were built on land that had been previously developed by commercial airline operators and to a much larger degree by the military. Land use development began in 1928 when the public Albuquerque Airport was built on the East Mesa. Renamed Oxnard Field in 1929, the airport was used until late 1939 when the vicinity of Oxnard Field was purchased by the federal government for use as an Army Air Depot Training Station, later to be known as Sandia Base. After World War II, the old Oxnard Field runways and an extensive grid of taxiways were used for parking aircraft. Starting in 1946, the War Assets Administration managed the sale or dismantlement of approximately 2,250 surplus military aircraft. Approximately 1,500 planes were dismantled and smelted down adjacent to the Oxnard taxiways. In addition to the smelter, numerous maintenance and machine shops were operated for several years.

In 1939, public airline service was moved approximately four miles to the west of Oxnard Field where the Albuquerque Municipal Airport was built. Using the municipal set of runways, the Albuquerque Army Air Base began operations in 1941. The air base was later dedicated as Kirtland Army Air Field and subsequently renamed as KAFB. In 1971, the operations of KAFB, Sandia Base, and Manzano Base were combined under the Air Force Materiel Command (KAFB March 2013). The municipal airfield is now identified as the Albuquerque International Sunport.

In July 1945, the “Z Division” of the Manhattan Engineers District, an extension of the original Los Alamos Laboratory, was established at Sandia Base in the area that would become known as TA-I (Furman April 1988). The primary mission of the Z Division was to provide engineering, production, stockpiling, and testing support for nuclear weapon systems. In 1949, the independent Sandia Laboratory was established at TA-I and TA-II. The primary management and administrative operations have historically been conducted at several TA-I office buildings. Construction of TA-IV began in 1977. Over the years, operations at the three TAs have evolved to include a wide variety of research and development activities including weapons design, component production, high-performance computing, and energy research programs.

6.1.3 Monitoring History

Since 1992, SNL/NM Environmental Restoration (ER) Operations has conducted numerous environmental and groundwater investigations in the TAG AOC. The historic timeline (Attachment 6A, Table 6A-1) lists the field investigations concerning groundwater quality in the TAG AOC. The majority of the ER Operations efforts have consisted of site-specific investigations that were conducted in support of solid waste management unit (SWMU) assessments involving potential soil contamination. Where required, contaminated soil and debris were excavated and removed. The NMED HWB has granted Corrective Action Complete status to all SWMUs in the TAG AOC. Only the groundwater issue remains.

Both KAFB and COA have also completed numerous groundwater investigations near the TAG AOC. Their initial findings were incorporated in the TAG Investigation Report. KAFB has issued a nitrate abatement report (KAFB December 2015) describing potential nitrate release sites and recent groundwater monitoring data. As a separate endeavor, KAFB is remediating the Bulk Fuels Facility (BFF) that is located approximately 1.6 miles west of the TAG AOC (Figure 6-1). Petroleum hydrocarbons (primarily aviation gasoline and jet fuel), associated with the BFF do not affect groundwater quality beneath the TAG AOC.

Beginning in 1992, groundwater quality has been evaluated as part of the TA-II investigation with the installation of groundwater monitoring wells in the central portion of the TAG AOC. During this initial investigation, the Perched Groundwater System was discovered at a depth of approximately 320 feet (ft) below ground surface (bgs). The Regional Aquifer was present at approximately 500 ft bgs. In October 1994, the first detection of TCE in a groundwater sample from a SNL/NM well near Tijeras Arroyo was reported at monitoring well TA2-W-01, which is screened in the Perched Groundwater System. This detection prompted further groundwater investigations.

6.1.4 Current Monitoring Network

For 2017, 21 monitoring wells were scheduled for sampling in the TAG AOC. Samples were collected at 18 monitoring wells (Table 6-1). Variances from the sampling frequency are discussed in Section 6.8. As shown on Figure 6-2, water levels are measured at 30 monitoring wells near the TAG AOC. Additional monitoring wells owned by KAFB and the COA are utilized by the TAG investigation for understanding the hydrogeologic setting.

6.1.5 Summary of Calendar Year 2017 Activities

The following activities were conducted for the TAG AOC during Calendar Year (CY) 2017:

- Quarterly water level measurements were obtained from the TAG monitoring wells.
- Quarterly groundwater samples were collected at seven wells (TA2-W-19, TA2-W-26, TA2-W-28, TJA-2, TJA-3, TJA-4, and TJA-7) in March, June, August/September, and December 2017. Water sample collection at well WYO-4 was not successful.
- Semiannual groundwater samples were collected at four wells (TA1-W-06, TA2-W-01, TA2-W-27, and TJA-6) in March 2017 and August/September 2017.
- Annual groundwater samples were collected at eight wells (TA1-W-01, TA1-W-02, TA1-W-04, TA1-W-05, TA1-W-08, TA2-NW1-595, and WYO-3) in August/September 2017. Water sample collection at wells TA1-W-03 and PGS-2 was not successful.

6.1.6 Summary of Future Activities

The following activities are anticipated for the TAG AOC during the next reporting period (CY 2018) unless the NMED HWB requests otherwise after reviewing the Revised TAG CCM/CME Report that was scheduled for submittal in February 2018:

- Measurement of water levels on a quarterly schedule at 30 wells near the TAG AOC.
- Table 6-1 shows the collection of groundwater samples at 18 monitoring wells in the TAG AOC using the sampling frequency. This sampling frequency has been in use for over ten years.

Table 6-1. Groundwater Monitoring Conducted by SNL/NM and the COA near the TAG AOC during CY 2017

Well ID	Installation Year	Sampling Frequency	WQ	WL	Comments
Eubank-1	1988			✓	Regional Aquifer (COA well)
Eubank-2	1996			✓	Regional Aquifer (COA well)
Eubank-3	1996			✓	Regional Aquifer (COA well)
Eubank-5	1996			✓	Regional Aquifer (COA well)
PGS-2	1995	A		✓	Regional Aquifer
TA1-W-01	1997	A	✓	✓	Regional Aquifer
TA1-W-02	1998	A	✓	✓	Regional Aquifer
TA1-W-03	1998	A		✓	Perched Groundwater System
TA1-W-04	1998	A	✓	✓	Regional Aquifer
TA1-W-05	1998	A	✓	✓	Regional Aquifer
TA1-W-06	1998	SA	✓	✓	Perched Groundwater System
TA1-W-07	1998			✓	Perched Groundwater System
TA1-W-08	2001	A	✓	✓	Perched Groundwater System
TA2-NW1-325	1993			✓	Perched Groundwater System
TA2-NW1-595	1993	A	✓	✓	Regional Aquifer
TA2-W-01	1994	SA	✓	✓	Perched Groundwater System
TA2-W-19	1995	Q	✓	✓	Perched Groundwater System
TA2-W-24	1998			✓	Regional Aquifer
TA2-W-25	1997			✓	Regional Aquifer
TA2-W-26	1998	Q	✓	✓	Perched Groundwater System
TA2-W-27	1998	SA	✓	✓	Perched Groundwater System
TA2-W-28	2014	Q	✓	✓	Perched Groundwater System, replaced TA2-SW1-320
TJA-2	1994	Q	✓	✓	Perched Groundwater System
TJA-3	1998	Q	✓	✓	Regional Aquifer
TJA-4	1998	Q	✓	✓	Regional Aquifer – merging (intermediate) zone
TJA-5	1998			✓	Perched Groundwater System
TJA-6	2001	SA	✓	✓	Regional Aquifer
TJA-7	2001	Q	✓	✓	Perched Groundwater System
WYO-3	2001	A	✓	✓	Regional Aquifer, replaced WYO-1
WYO-4	2001	Q		✓	Perched Groundwater System, replaced WYO-2
Total	----	21	18	30	Both water-bearing units

NOTES:

Wells screened in the Perched Groundwater System are highlighted with green shading.
Check mark indicates water quality (WQ) sample or water level (WL) measurement was obtained.
Sampling frequency used by SNL/NM: Q = quarterly, SA = Semiannual, A = annual.

AOC = Area of Concern.
COA = City of Albuquerque ownership.
CY = Calendar Year.
ID = Identifier.
PGS = Parade Ground South.
SNL/NM = Sandia National Laboratories, New Mexico.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TAG = Tijeras Arroyo Groundwater.
TJA = Tijeras Arroyo.
W = Well.
WL = Water level.
WQ = Water quality.
WYO = Wyoming.

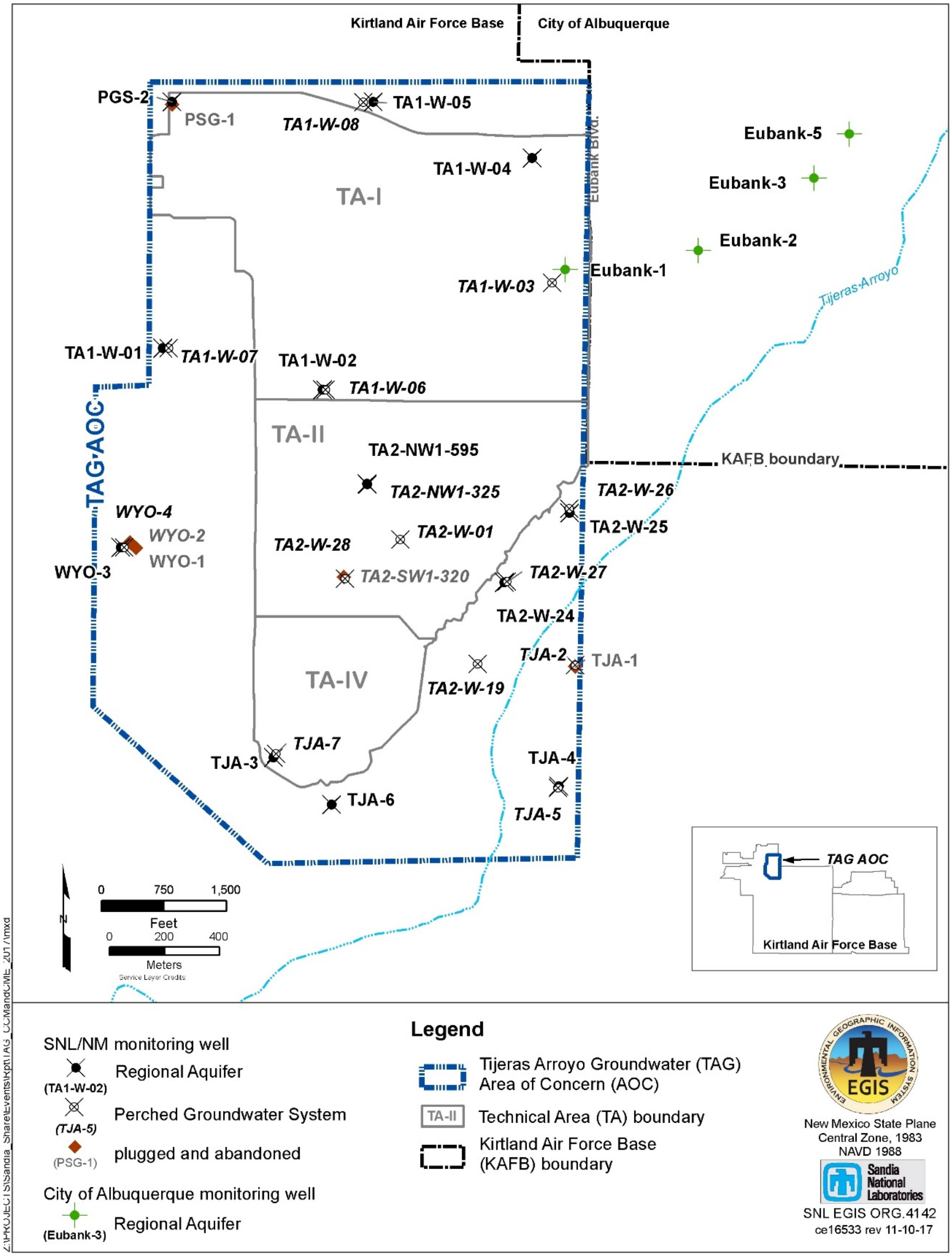


Figure 6-2. Groundwater Monitoring Wells Maintained by SNL/NM and the COA near the TAG AOC

6.1.7 Conceptual Site Model

The TAG CCM/CME Report (SNL December 2016) presented a Conceptual Site Model (CSM) for the vicinity of the TAG AOC that describes the contaminant release sites, the geological and hydrogeological setting, and the distribution and migration of contaminants in the subsurface. The CSM incorporated previous studies conducted by Van Hart (June 2001 and June 2003). The TAG AOC is underlain by two primary water-bearing units of interest: 1) a Perched Groundwater System, and 2) the underlying Regional Aquifer. Figure 6-3 depicts a revised TAG CSM, and Table 6-2 summarizes the hydrogeologic characteristics of the two water-bearing units. A merging zone that partially extends under the southeast corner of the TAG AOC appears to connect these two units.

The Perched Groundwater System has a limited lateral extent that encompasses approximately 4.43 sq mi across the TAG AOC and adjacent north-central KAFB. Across the TAG AOC, the saturated thickness of the Perched Groundwater System ranges from approximately 7 to 20 ft across the northern and central portions on the TAG AOC. In the far southeast corner, the saturated thickness reaches approximately 40 ft. The thickness values are based upon October 2015 water levels and the interpretation of downhole geophysical logs. The Perched Groundwater System is not used for any type of water supply. The Perched Groundwater System is a thin, dissipating water-bearing unit that mostly formed as a result of historical anthropogenic discharges of wastewater and septic water. Groundwater in the Perched Groundwater System migrates toward the southeast and merges with the underlying Regional Aquifer southeast of Tijeras Arroyo near Powerline Road. Approximately 25 percent of the total groundwater loss from the Perched Groundwater System is due to lateral flow toward the southeast where it merges with the underlying Regional Aquifer. The remaining 75 percent likely flows vertically downward through the Perching Horizon and dissipates in the upper portion of over 200 feet of unsaturated sediments present between the Perched Groundwater System and the Regional Aquifer. There is no geochemical indication that groundwater flowing downward through the Perching Horizon has reached the Regional Aquifer, except in the merging zone southeast of the TAG AOC. Declining water level trends indicate that nearly the entire extent of the Perched Groundwater System will naturally dewater in the TAG AOC by the year 2059. Some areas in the TAG AOC will dewater much sooner. Nitrate concentrations in the Perched Groundwater System are expected to decrease to background concentrations and below regulatory standards due to natural groundwater transport mechanisms (advection, dispersion, and diffusion).

The original sources of nitrate from historical SNL/NM operations (wastewater outfall ditches and sanitary waste leach fields/seepage pits) are no longer in operation (the greatest discharge ceased in 1974 and all discharges ceased as of 1992). A driving force for downward migration of nitrate through the vadose zone to groundwater no longer exists. There is no current or anticipated use of groundwater from the Perched Groundwater System near the TAG AOC.

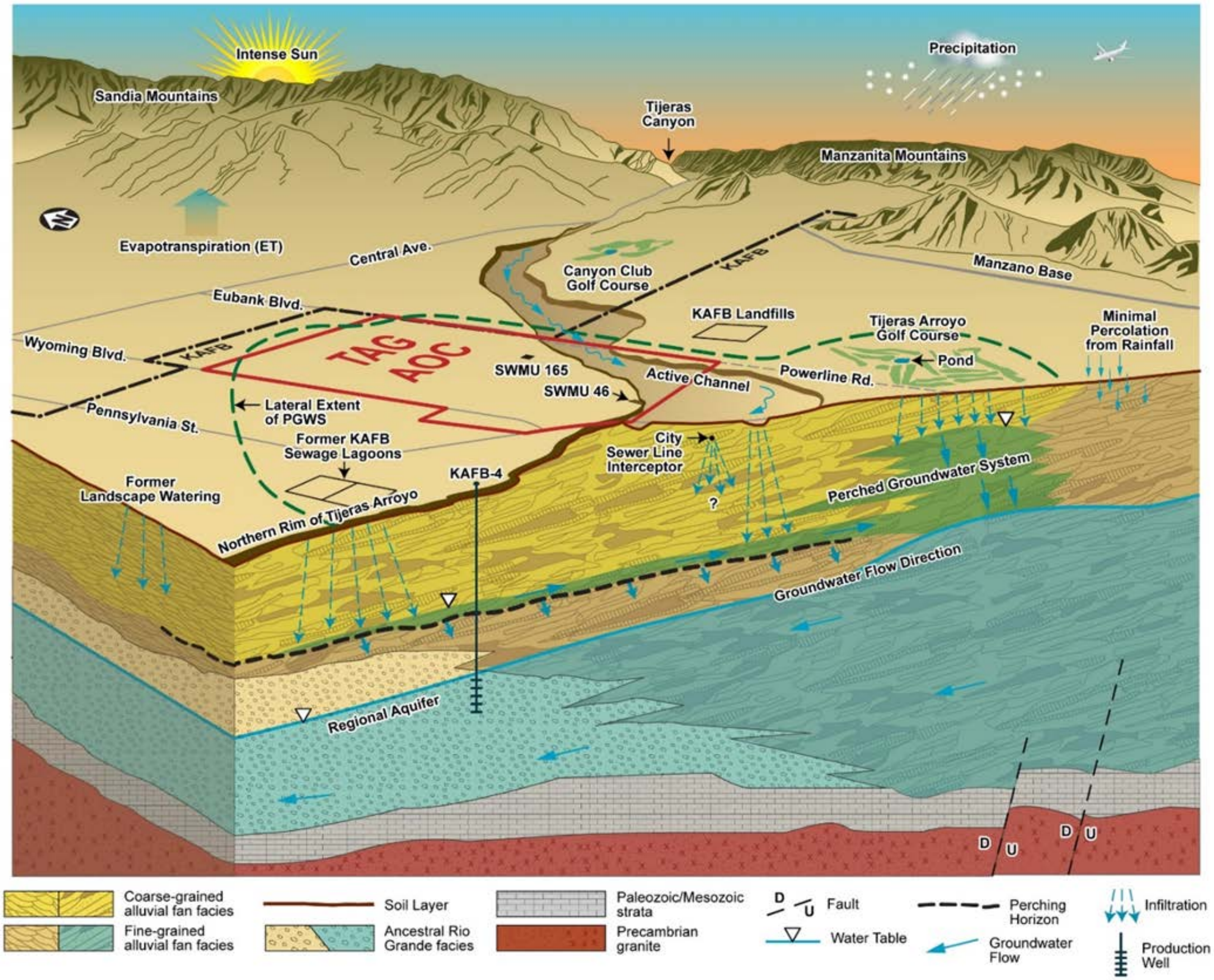


Figure 6-3. TAG Conceptual Site Model

Table 6-2. Comparison of Hydrogeologic Characteristics for the Perched Groundwater System and the Regional Aquifer in the TAG AOC

Characteristic	Perched Groundwater System	Regional Aquifer
Potentiometric Surface	Surface is inferred to slope primarily to the southeast.	Surface is inferred to slope primarily to the west and northwest.
Pressure Head	Unconfined (water table) conditions.	Unconfined to semi-confined 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 east and southeast.	Primarily to the west and northwest.
Horizontal Gradient	Varies from approximately 0.004 to 0.0125 ft/ft across the TAG AOC with an average of 0.01 ft/ft.	Varies from approximately 0.006 to 0.0125 ft/ft across the TAG AOC with an average of 0.01 ft/ft. Much steeper east of Powerline Road at 0.03 to 0.045 ft/ft. Nearly flat to the west of Wyoming Boulevard.
Horizontal hydraulic conductivity (Kh)	A wide range from 0.0532 ft/day to 3.06 ft/day, with an average of 1.63 ft/day.	A narrow range of 1.66 to 7.75 ft/day, with an average of 3.77 ft/day.
Vertical hydraulic conductivity (Kv)	0.0163 ft/day.	0.0377 ft/day.
Effective porosity	0.25 (25 percent)	0.25 (25 percent)
Groundwater velocity, horizontal	0.002 to 0.122 ft/day. Equivalent to 0.778 to 44.68 ft/yr.	0.066 to 0.310 ft/day. Equivalent to 24.24 to 113.15 ft/yr.
Groundwater velocity, horizontal average	Approximately 24 ft/yr, based on five monitoring wells screened in the Perched Groundwater System.	Approximately 55 ft/yr, based on five monitoring wells screened in the Regional Aquifer.
Usage	Not used for water supply purposes.	Utilized for water supply by KAFB, ABCWUA, and VA.
Lateral extent	Approximately 4.43 sq mi across north-central KAFB.	Laterally extensive across the Albuquerque Basin.
Saturated Thickness	Estimated from geophysical logs to range from approximately 7 to 20 ft across the northern and central portions of the TAG AOC. In the far southeast corner, the saturated thickness reaches approximately 40 ft.	In excess of 1,000 ft in thickness across much of the TAG AOC vicinity.
Geochemical Variability	Geochemical signatures variable between monitoring wells.	Geochemical signatures consistent between monitoring wells.
Geochemical Uniqueness	High chloride, nitrate, and sulfate concentrations.	Low calcium concentrations, but high bicarbonate/alkalinity concentrations.

Refer to footnotes on page 6-10.

Table 6-2. Comparison of Hydrogeologic Characteristics for the Perched Groundwater System and the Regional Aquifer in the TAG AOC *(Concluded)*

Characteristic	Perched Groundwater System	Regional Aquifer
Water Levels	Steadily declining groundwater elevations across the entire TAG AOC ranging from 0.06 to 1.17 ft/yr, except in southeast corner at well TJA-5.	Increasing groundwater elevations across the entire TAG AOC, except at the southwest corner. Variable rate ranges from a declining 0.07 to an increasing 2.65 ft/yr.
Recharge Sources	Historically recharged by anthropogenic sources (leaking water supply/sewer lines, landscape watering, the Tijeras Arroyo Golf Course, former outfalls, the former KAFB Sewage Lagoons), and ongoing natural sources such as Tijeras Arroyo.	Historically recharged by anthropogenic sources (leaking water supply/sewer lines, irrigated lawns, the Tijeras Arroyo Golf Course, the former KAFB Sewage Lagoons), and natural sources such as Tijeras Arroyo.
Principal Hydrologic Controls	Stratigraphic dip of Perching Horizon to the southeast coupled with lesser effect of the depositional fabric trending westward from mountain front.	Combined drawdown of KAFB, ABCWUA, and VA production wells. North to south trending paleochannels with high conductivities to the west of Wyoming Boulevard. Low conductivity east to west trending alluvial fan deposits east of Wyoming Boulevard.

NOTES:

Table was updated using the Revised TAG CCM/CME Report, *in progress.*

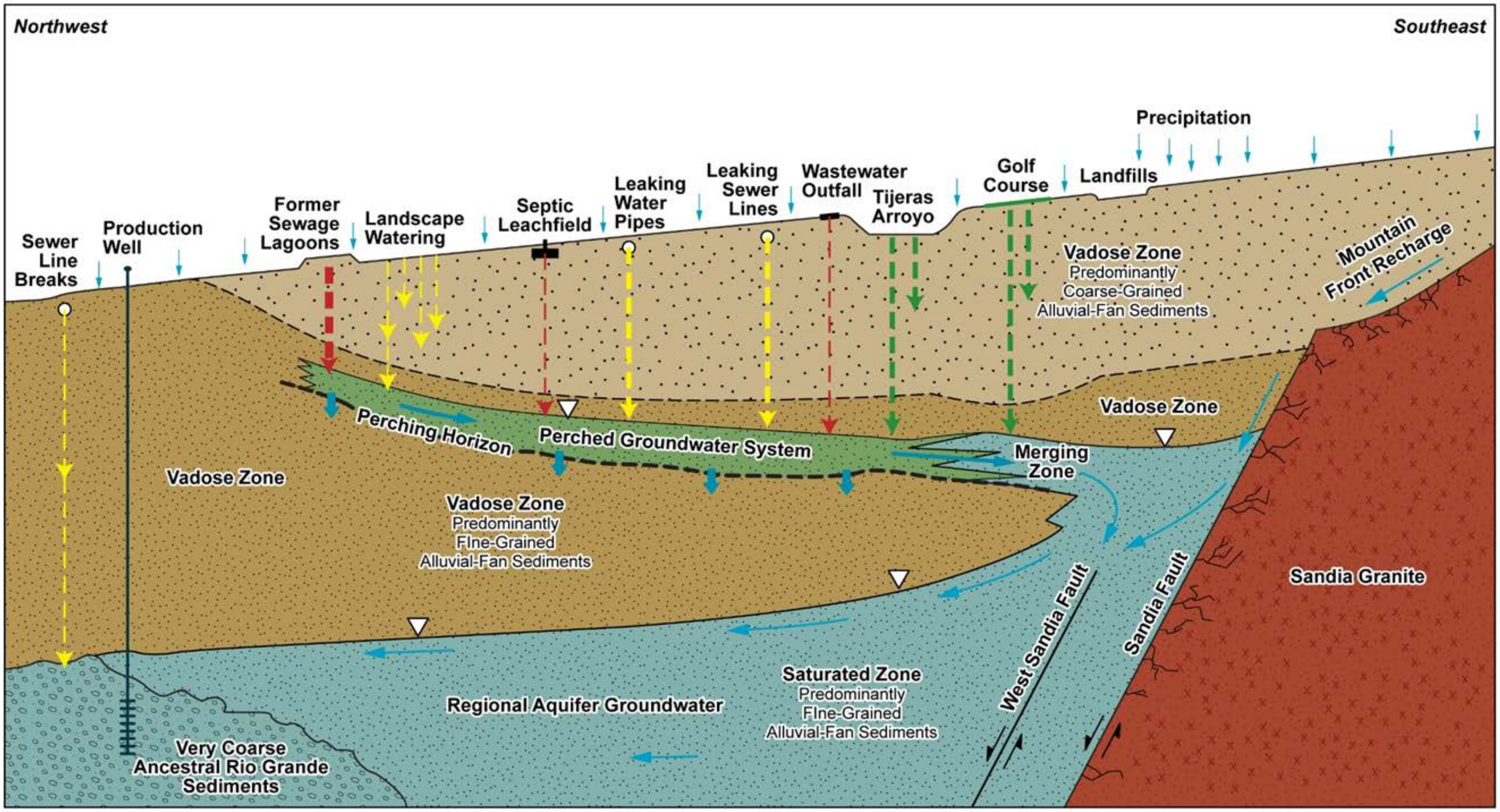
ABCWUA = Albuquerque Bernalillo County Water Utility Authority.
AOC = Area of Concern.
ARG = Ancestral Rio Grande (lithofacies).
ft = Foot (feet).
ft/day = Feet per day.
ft/ft = Feet per foot.
ft/yr = Feet per year.
KAFB = Kirtland Air Force Base.
sq mi = Square mile(s).
TAG = Tijeras Arroyo Groundwater.
TJA = Tijeras Arroyo.
VA = Veterans Administration.

Figure 6-4 shows the variety of recharge sources (active and inactive) that are located near the TAG AOC. These recharge sources likely impacted the Perched Groundwater System:

- Landscape watering of grassy areas such as the Parade Ground north of TA-I,
- A buried ancestral Tijeras Arroyo channel with relatively older groundwater, flowing from Tijeras Canyon,
- Ongoing surface water and base flow along Tijeras Arroyo,
- Possible leaking water lines and sewer lines,
- Wastewater outfalls (now inactive),
- Buried septic systems (now inactive),
- KAFB landfills (active and inactive),
- The KAFB former Sewage Lagoons (now inactive), and
- The Tijeras Arroyo Golf Course operated by KAFB.

The Regional Aquifer is more laterally extensive than the Perched Groundwater System, underlying the entire TAG AOC as well as the Albuquerque Basin. The Regional Aquifer is composed of both the Ancestral Rio Grande (ARG) fluvial lithofacies and the alluvial fan lithofacies. Locally, groundwater in the Regional Aquifer flows to the northwest, in a nearly opposite direction to that of the Perched Groundwater System. The gradient in the Regional Aquifer averages approximately 0.018 feet per foot (ft/ft) across the TAG AOC, but is steeper near production wells operated by KAFB, the ABCWUA, and the Veterans Administration (VA). The Regional Aquifer is recharged on the eastern side of the study area by natural sources including mountain front recharge, Tijeras Arroyo, and the Perched Groundwater System. The principal hydrogeologic control upon groundwater flow direction in the Regional Aquifer is the combined drawdown effect of the KAFB, ABCWUA, and VA production wells.

The geochemical signatures of the Perched Groundwater System and the Regional Aquifer are distinctive. Figure 6-5 presents two Piper diagrams depicting the most comprehensive set of geochemical data for the Perched Groundwater System and the Regional Aquifer. The geochemical signature of the Perched Groundwater System exhibits a wide range of geochemistry that as a group does not correspond to a dominant type. This variability appears to indicate several sources of recharge. The Perched Groundwater System exhibits relatively higher concentrations of chloride and sulfate than the Regional Aquifer. Groundwater samples from the Regional Aquifer exhibit a more consistent chemistry that is classified as a calcium bicarbonate type. The Regional Aquifer also exhibits higher bicarbonate concentrations. The tight group of the Regional Aquifer data points indicates that the wells are screened in the same hydrostratigraphic interval (groundwater from all wells is chemically similar; therefore, in direct hydraulic communication). This water appears to have a single source such as mountain front recharge.



Recharge Schematic for TAG Area Showing Principal Recharge and Discharge Features, View to Northeast, Not to Scale. Width of recharge arrow signifies relative volume. Color signifies the duration: green arrow denotes ongoing recharge, yellow arrow denotes a reduced rate of discharge, red arrow signifies that recharge was eliminated. (Precipitation and groundwater arrows are not scaled.)

Figure 6-4. Recharge Features near the TAG AOC

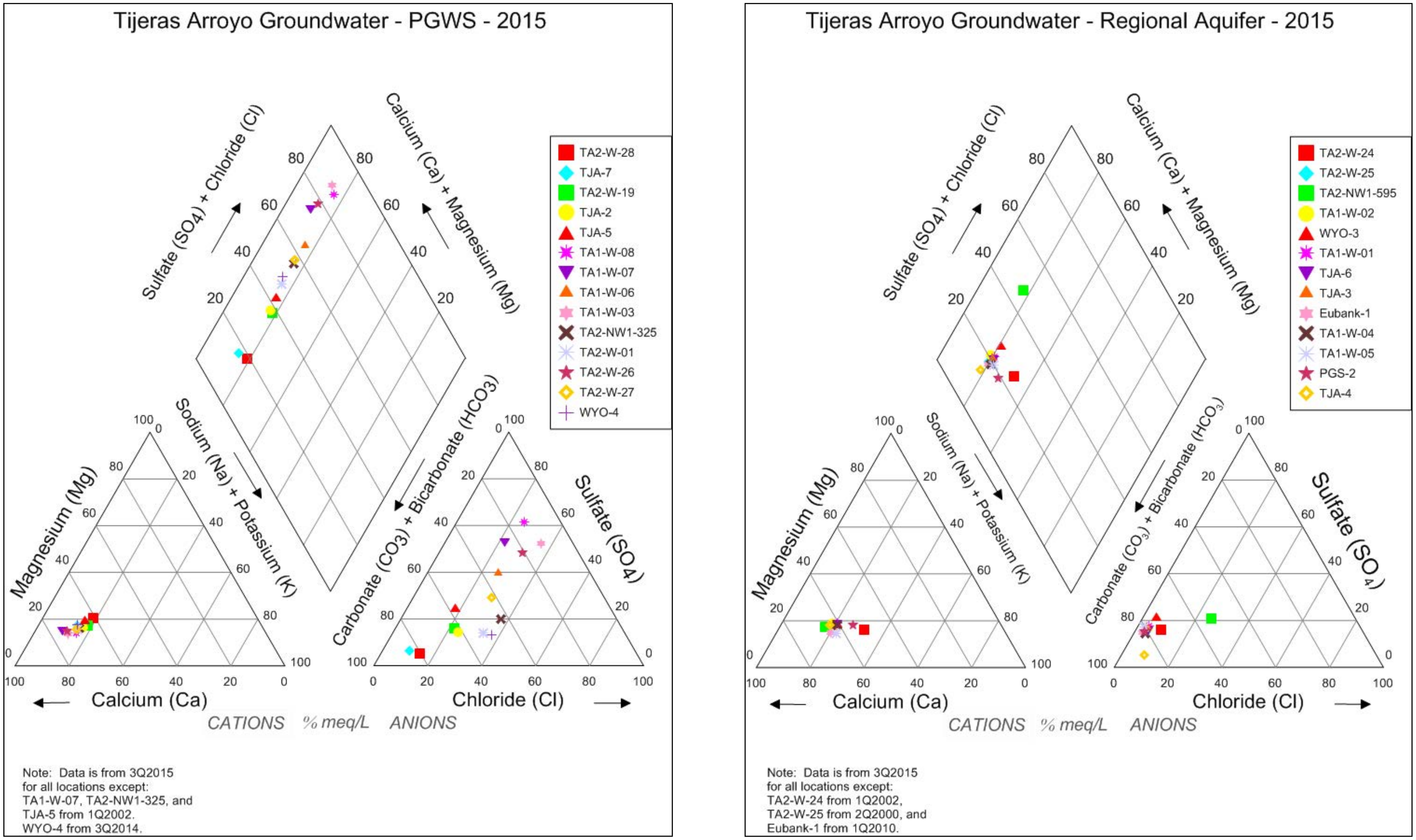


Figure 6-5. Piper Diagrams for Groundwater Samples Collected from Monitoring Wells Screened in the Perched Groundwater System and the Regional Aquifer (SNL December 2016)

6.1.7.1 Regional Hydrogeologic Conditions

Tijeras Arroyo is the most significant surface water drainage feature on KAFB and trends westward across the norther portion of KAFB and eventually drains into the Rio Grande, approximately 5.6 miles west of KAFB. 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 9.45 inches (Chapter 2.6.2.1). During most rainfall events, rainfall quickly infiltrates into the soil. 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 AOC 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: alluvial-fan lithofacies and the ARG fluvial lithofacies. Both lithofacies are less than 5 Mega Annum (millions of years) 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 ARG fluvial lithofacies are derived from northern sources and are typically composed of well sorted, medium- to coarse-grained sands with higher hydraulic conductivities.

6.1.7.2 Hydrogeologic Conditions at the TAG AOC

Across the TAG AOC, the Perched Groundwater System is encountered at approximately 270 to 340 ft bgs, and the Regional Aquifer system is encountered at approximately 440 to 570 ft bgs. A review of lithologic borehole descriptions and geophysical logs indicates that the sediments sandwiched between the base of the Perching Horizon and the Regional Aquifer are mostly composed of moist sediments that will not yield groundwater to a well. Based on data collected in October 2015, this unsaturated thickness of sediments below the Perching Horizon averaged approximately 202 ft thick, decreasing from approximately 258 ft in the northwest corner of the TAG AOC to 177 ft in the southeast corner near the merging zone. Groundwater in the Perched Groundwater System mixes with the Regional Aquifer southeast of Tijeras Arroyo in a merging zone where the alluvial fan sediments are slightly more permeable and/or a fault is present. As noted earlier, Table 6-2 presents a comparison of the hydrogeologic characteristics for the two water-bearing units.

6.1.7.3 Local Direction of Groundwater Flow

Figure 6-6 presents the October 2017 potentiometric surface for the Perched Groundwater System, which has an estimated lateral extent of approximately 4.43 sq mi (SNL December 2016). Table 6-3 lists October 2017 groundwater elevations. The direction of groundwater flow in the Perched Groundwater System is inferred from the potentiometric surface to be principally to the east and southeast, with an average horizontal gradient of approximately 0.01 ft/ft. The horizontal gradient of the Perched Groundwater System is variable across the TAG AOC. Beneath TA-I, TA-II, and TA-IV, the horizontal gradient varies from 0.004 to 0.0125 ft/ft. The vertical gradient is downward as indicated by the merging of the two water-bearing units near the southeast corner of the TAG AOC.

Figure 6-7 presents the October 2017 potentiometric surface for the Regional Aquifer. The direction of groundwater flow in the Regional Aquifer is inferred from the potentiometric surface to be principally to the west and northwest toward the KAFB, ABCWUA, and VA production wells. The horizontal gradient of the Regional Aquifer beneath the TAG AOC varies from approximately 0.006 to 0.0125 ft/ft, with an average of approximately 0.01 ft/ft. The horizontal gradient is steeper to the east of the TAG AOC at 0.03 to 0.045 ft/ft. Vertical flow gradients in the Regional Aquifer are inferred to be mostly downward in response to pumping of the production wells.

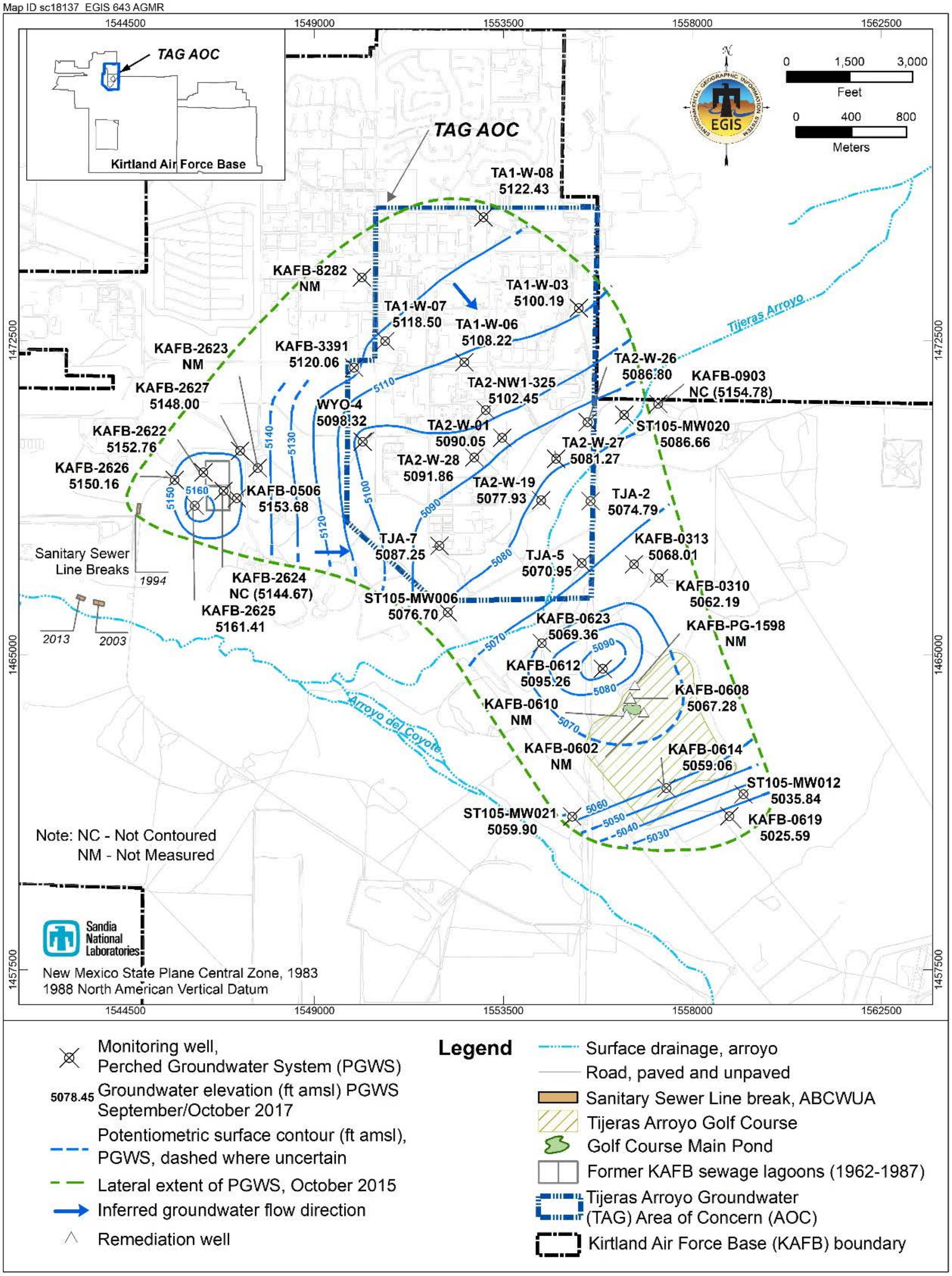


Figure 6-6. TAG AOC Potentiometric Surface Map for the Perched Groundwater System (October 2017)

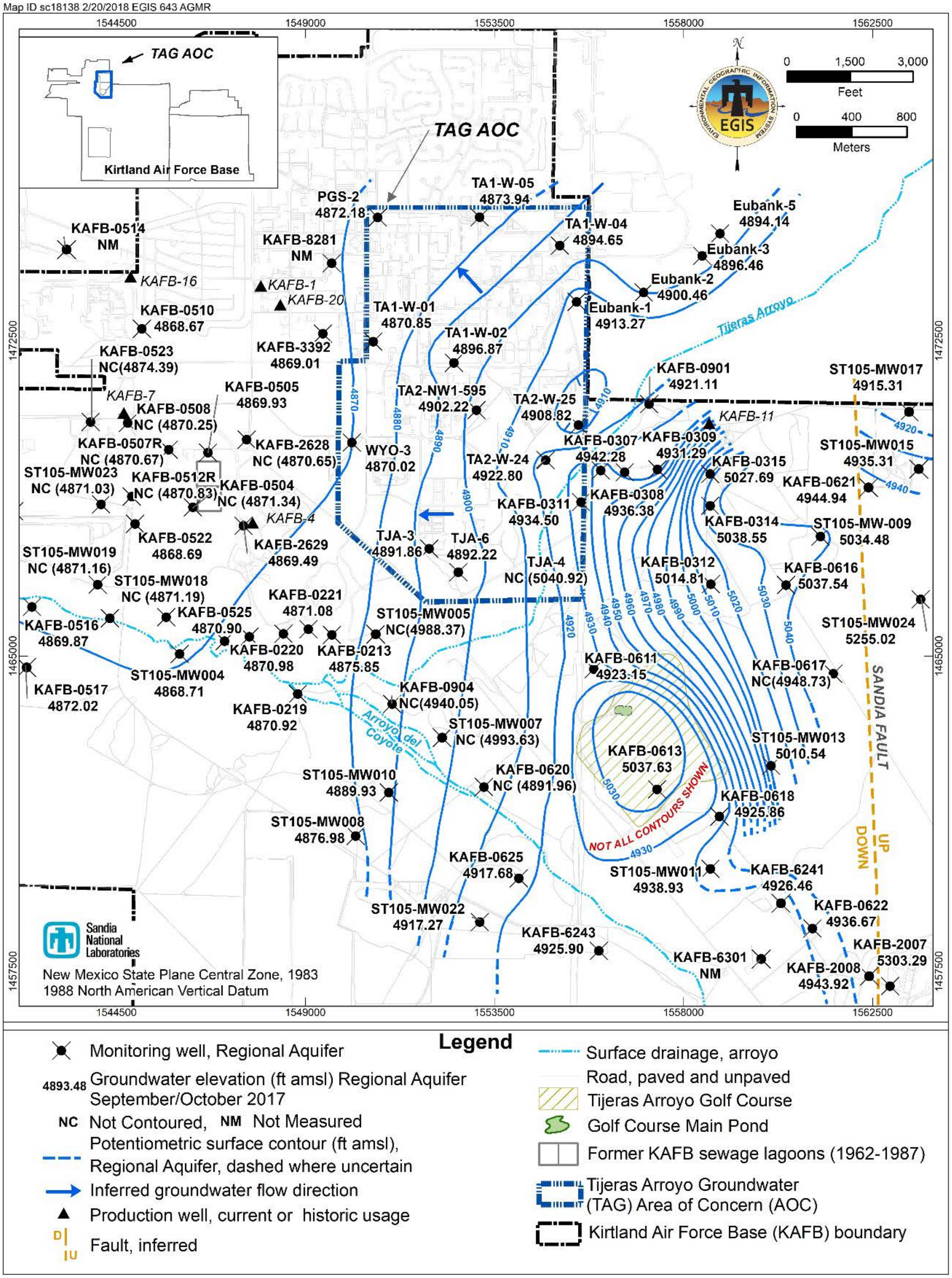


Figure 6-7. Localized Potentiometric Surface Map of the TAG AOC Regional Aquifer (October 2017)

Table 6-3. Groundwater Elevations Measured in 2017 at Monitoring Wells near the TAG AOC

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Screened Unit in SFG sediments
Eubank-1	5460.02	2-Oct-2017	546.75	4913.27	Regional Aquifer
Eubank-2	5474.39	14-Sep-2017	573.93	4900.46	Regional Aquifer
Eubank-3	5498.73	14-Sep-2017	602.27	4896.46	Regional Aquifer
Eubank-5	5507.40	14-Sep-2017	611.26	4896.14	Regional Aquifer
PGS-2	5408.29	4-Oct-2017	536.11	4872.18	Regional Aquifer
TA1-W-01	5403.82	2-Oct-2017	533.24	4870.58	Regional Aquifer
TA1-W-02	5416.62	3-Oct-2017	519.75	4896.87	Regional Aquifer
TA1-W-03	5457.03	2-Oct-2017	356.84	5100.19	PGWS
TA1-W-04	5460.98	2-Oct-2017	566.33	4894.65	Regional Aquifer
TA1-W-05	5433.84	3-Oct-2017	559.90	4873.94	Regional Aquifer
TA1-W-06	5417.10	3-Oct-2017	308.88	5108.22	PGWS
TA1-W-07	5404.92	2-Oct-2017	286.42	5118.50	PGWS
TA1-W-08	5434.19	3-Oct-2017	311.76	5122.43	PGWS
TA2-NW1-325	5421.94	2-Oct-2017	319.49	5102.45	PGWS
TA2-NW1-595	5421.26	2-Oct-2017	519.04	4902.22	Regional Aquifer
TA2-W-01	5419.99	2-Oct-2017	329.94	5090.05	PGWS
TA2-W-19	5351.21	2-Oct-2017	273.28	5077.93	PGWS
TA2-W-24	5363.66	2-Oct-2017	440.86	4922.80	Regional Aquifer
TA2-W-25	5374.86	2-Oct-2017	466.04	4908.82	Regional Aquifer
TA2-W-26	5375.77	2-Oct-2017	288.97	5086.80	PGWS
TA2-W-27	5362.85	2-Oct-2017	281.58	5081.27	PGWS
TA2-W-28	5412.41	2-Oct-2017	320.55	5091.86	PGWS
TJA-2	5353.20	2-Oct-2017	278.41	5074.79	PGWS
TJA-3	5390.56	2-Oct-2017	498.70	4891.86	Regional Aquifer
TJA-4	5341.16	2-Oct-2017	300.24	5040.92	merging zone
TJA-5	5341.33	2-Oct-2017	270.38	5070.95	PGWS
TJA-6	5343.16	2-Oct-2017	450.94	4892.22	Regional Aquifer
TJA-7	5391.27	2-Oct-2017	304.02	5087.25	PGWS
WYO-3	5392.09	2-Oct-2017	522.07	4870.02	Regional Aquifer
WYO-4	5392.57	2-Oct-2017	294.25	5098.32	PGWS
KAFB-0213	5281.50	18-Oct-2017	411.10	4875.85	Regional Aquifer
KAFB-0219	5263.69	17-Oct-2017	392.77	4870.92	Regional Aquifer
KAFB-0220	5265.10	17-Oct-2017	394.12	4870.98	Regional Aquifer
KAFB-0221	5274.36	18-Oct-2017	403.28	4871.08	Regional Aquifer
KAFB-0307	5364.53	16-Oct-2017	422.25	4942.28	Regional Aquifer
KAFB-0308	5381.65	16-Oct-2017	445.27	4936.38	Regional Aquifer
KAFB-0309	5411.80	16-Oct-2017	480.51	4931.29	Regional Aquifer
KAFB-0310	5416.48	16-Oct-2017	354.29	5062.19	PGWS
KAFB-0311	5353.29	16-Oct-2017	418.79	4934.50	Regional Aquifer
KAFB-0312	5432.17	16-Oct-2017	417.36	5014.81	Regional Aquifer
KAFB-0313	5418.98	16-Oct-2017	350.97	5068.01	PGWS
KAFB-0314	5455.75	16-Oct-2017	417.20	5038.55	Regional Aquifer
KAFB-0315	5466.11	16-Oct-2017	438.42	5027.69	Regional Aquifer
KAFB-0504	5357.87	17-Oct-2017	486.53	4871.34	Regional Aquifer

Refer to footnotes on page 6-19.

Table 6-3. Groundwater Elevations Measured in 2017 at Monitoring Wells near the TAG AOC *(Continued)*

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Screened Unit in SFG sediments
KAFB-0505	5362.81	17-Oct-2017	492.88	4869.93	Regional Aquifer
KAFB-0506	5363.47	17-Oct-2017	209.79	5153.68	PGWS
KAFB-0507R	5358.21	17-Oct-2017	n.m.	n.m.	Regional Aquifer
KAFB-0508	5351.88	17-Oct-2017	481.63	4870.25	Regional Aquifer
KAFB-0510	5367.10	17-Oct-2017	498.43	4868.67	Regional Aquifer
KAFB-0512R	5302.73	17-Oct-2017	n.m.	n.m.	Regional Aquifer
KAFB-0514	5206.41	17-Oct-2017	336.52	4869.89	Regional Aquifer
KAFB-0516	5205.64	17-Oct-2017	335.77	4869.87	Regional Aquifer
KAFB-0517	5197.10	17-Oct-2017	325.08	4872.02	Regional Aquifer
KAFB-0522	5267.48	17-Oct-2017	398.79	4868.69	Regional Aquifer
KAFB-0523	5352.62	17-Oct-2017	478.23	4874.39	Regional Aquifer
KAFB-0525	5229.75	17-Oct-2017	358.85	4870.90	Regional Aquifer
KAFB-0602	5365.47	17-Oct-2017	n.m.	n.m.	PGWS
KAFB-0608	5361.17	18-Oct-2017	293.89	5067.28	PGWS
KAFB-0610	5359.47	17-Oct-2017	n.m.	n.m.	PGWS
KAFB-0611	5386.09	18-Oct-2017	462.94	4923.15	Regional Aquifer
KAFB-0612	5385.45	18-Oct-2017	290.19	5095.26	PGWS
KAFB-0613	5390.78	18-Oct-2017	353.15	5037.63	Regional Aquifer
KAFB-0614	5390.89	18-Oct-2017	331.83	5059.06	PGWS
KAFB-0616	5481.07	18-Oct-2017	443.53	5037.54	Regional Aquifer
KAFB-0617	5505.78	18-Oct-2017	557.05	4948.73	Regional Aquifer
KAFB-0618	5410.05	18-Oct-2017	484.19	4925.86	Regional Aquifer
KAFB-0619	5410.78	18-Oct-2017	385.19	5025.59	PGWS
KAFB-0620	5334.64	18-Oct-2017	442.68	4891.96	Regional Aquifer
KAFB-0621	5569.89	16-Oct-2017	624.95	4944.94	Regional Aquifer
KAFB-0622	5488.64	18-Oct-2017	551.97	4936.67	Regional Aquifer
KAFB-0623	5328.94	16-Oct-2017	259.58	5069.36	PGWS
KAFB-0625	5392.90	16-Oct-2017	769.65	4904.13	Regional Aquifer
KAFB-0901	5390.07	16-Oct-2017	468.96	4921.11	Regional Aquifer
KAFB-0903	5391.63	16-Oct-2017	236.85	5154.78	merging zone
KAFB-0904	5291.75	18-Oct-2017	351.70	4940.05	Regional Aquifer
KAFB-2007	5564.48	18-Oct-2017	261.19	5303.29	Regional Aquifer
KAFB-2008	5541.74	18-Oct-2017	597.82	4943.92	Regional Aquifer
KAFB-2622	5358.14	17-Oct-2017	205.38	5152.76	PGWS
KAFB-2624	5362.27	17-Oct-2017	217.60	5144.67	PGWS
KAFB-2625	5359.26	17-Oct-2017	197.85	5161.41	PGWS
KAFB-2626	5357.51	17-Oct-2017	207.35	5150.16	PGWS
KAFB-2627	5367.47	17-Oct-2017	219.47	5148.00	PGWS
KAFB-2628	5369.64	17-Oct-2017	498.99	4870.65	Regional Aquifer
KAFB-2629	5361.53	17-Oct-2017	492.04	4869.49	Regional Aquifer
KAFB-3391	5396.60	19-Oct-2017	276.54	5120.06	PGWS
KAFB-3392	5394.51	19-Oct-2017	525.50	4869.01	Regional Aquifer
KAFB-6241	5466.50	18-Oct-2017	540.04	4926.46	Regional Aquifer
KAFB-6243	5426.22	18-Oct-2017	500.32	4925.90	Regional Aquifer

Refer to footnotes on page 6-19.

Table 6-3. Groundwater Elevations Measured in 2017 at Monitoring Wells near the TAG AOC *(Concluded)*

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Screened Unit in SFG sediments
KAFB-6301	5459.64	17-Oct-2017	n.m.	n.m.	Regional Aquifer
KAFB-8281	5401.03	19-Oct-2017	n.m.	n.m.	Regional Aquifer
KAFB-8282	5402.92	19-Oct-2017	n.m.	n.m.	PGWS
ST105-MW004	5234.61	17-Oct-2017	365.90	4868.71	Regional Aquifer
ST105-MW005	5287.57	18-Oct-2017	299.20	4988.37	Regional Aquifer
ST105-MW006	5313.26	16-Oct-2017	236.56	5076.70	PGWS
ST105-MW007	5311.18	18-Oct-2017	317.50	4993.68	Regional Aquifer
ST105-MW008	5358.94	18-Oct-2017	481.96	4876.98	Regional Aquifer
ST105-MW009	5519.71	18-Oct-2017	485.23	5034.48	Regional Aquifer
ST105-MW010	5334.70	18-Oct-2017	444.77	4889.93	Regional Aquifer
ST105-MW011	5422.66	18-Oct-2017	483.73	4938.93	Regional Aquifer
ST105-MW012	5419.90	18-Oct-2017	384.06	5035.84	PGWS
ST105-MW013	5447.27	18-Oct-2017	436.73	5010.54	Regional Aquifer
ST105-MW015	5623.95	16-Oct-2017	688.64	4935.31	Regional Aquifer
ST105-MW017	5621.97	16-Oct-2017	706.66	4915.31	Regional Aquifer
ST105-MW018	5221.68	17-Oct-2017	350.49	4871.19	Regional Aquifer
ST105-MW019	5217.94	17-Oct-2017	346.78	4871.16	Regional Aquifer
ST105-MW020	5383.72	18-Oct-2017	297.06	5086.66	PGWS
ST105-MW021	5390.90	18-Oct-2017	331.00	5059.90	PGWS
ST105-MW022	5386.66	18-Oct-2017	469.39	4917.27	Regional Aquifer
ST105-MW023	5275.86	17-Oct-2017	404.83	4871.03	Regional Aquifer
ST105-MW024	5595.67	18-Oct-2017	340.65	5255.02	Regional Aquifer

NOTES:

amsl = Above mean sea level.
AOC = Area of Concern.
btoc = Below top of casing (the measurement point).
ID = Identifier.
KAFB = Kirtland Air Force Base.
NAVD 88 = North American Vertical Datum of 1988.
n.m. = Not measured.
PGS = Parade Ground South.
PGWS = Perched Groundwater System.
SFG = Santa Fe Group
ST105-MW = KAFB Site ST-105 Monitoring Well.
TAG = Tijeras Arroyo Groundwater.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TJA = Tijeras Arroyo.
WYO = Wyoming.

6.1.7.4 Groundwater Elevations

The hydrographs (Attachment 6B, Figures 6B-1 through 6B-10) depict the historical trends of groundwater elevations in the TAG AOC. No seasonality such as a response to the summer monsoon season is apparent for either the Perched Groundwater System or the Regional Aquifer.

Historically, water levels in the Perched Groundwater System have fluctuated across the TAG AOC. Near the KAFB former sewage lagoons, water levels have been declining since 1987, apparently in response to the lagoons being removed from service. Within the TAG AOC, recharge to the Perched Groundwater has been nearly eliminated; SNL/NM wastewater outfall ditches and sanitary waste leach fields/seepage pits are no longer in operation (the greatest discharge ceased in 1974 and all discharges ceased as of 1992). Declining water level trends indicate that nearly the entire extent of the Perched Groundwater System will naturally dewater in the TAG AOC in approximately 2059. Some areas in the TAG AOC will dewater much sooner. Since 2010, the greatest decline in groundwater elevations occurred in the northern and central parts of the TAG AOC at approximately 0.4 to 1.2 ft per year. Monitoring well TA1-W-03 exhibits the greatest rate of decline.

Some Regional Aquifer monitoring wells such as TA1-W-05 and PGS-2 show a cycle related to the pumping of production wells operated by KAFB and ABCWUA. Increased demand occurs in the summer months. Since late 2008, hydrographs for the Regional Aquifer wells in the TAG AOC show an increasing trend in groundwater elevations. Presumably, this is in response to the ABCWUA transitioning to surface water withdrawals for potable water supplies and a decreasing dependence on production wells immediately north of KAFB. Since 2010, the overall trend in groundwater elevations in the northern and central parts of the TAG AOC increased at approximately 0.5 to 2.7 ft per year. Water levels at the southwest corner of the TAG AOC at monitoring wells TJA-3 and TJA-6 have been stable since 2000. Increases southeast of Tijeras Arroyo in some Regional Aquifer monitoring wells owned by KAFB may result from golf course watering (Balleau Groundwater, Inc. [BGW] February 2001).

6.1.7.5 Contaminant Sources

Environmental investigations for potential release sites were summarized in the TAG Investigation Report. The potential release sites were again evaluated in the TAG CCM/CME Report. Historical discharges of wastewater and septic waters from SWMU 46 (Old Acid Waste Line Outfall) and nine SWMUs at TA-II with lesser discharges are the most likely sites to have impacted groundwater in the TAG AOC. As shown in Table 6-4, discharges at SWMU 46 were curtailed in 1974. Discharges at the TA-II SWMUs were curtailed in 1992.

Stable (nonradioactive) isotopes for nitrogen (N) and oxygen (O) were used to evaluate the genesis of nitrate in groundwater for the TAG AOC. In 2004, $\delta^{15}N$ analyses were conducted for five Perched Groundwater System monitoring wells. The $\delta^{15}N$ values in water ranged from 3.6 to 7.0 (SNL November 2004), which is indicative of natural soil and septic waste. In 2012, groundwater samples for dual isotopes analyses ($\delta^{15}N$ versus $\delta^{18}O$) were collected from five Regional Aquifer monitoring wells. The isotopic results predominantly indicated that the nitrate in the Regional Aquifer was likely derived from natural (unfertilized) soil and/or manure/septic waste; denitrification was not evident (Madrid et al. June 2013).

Table 6-4. SNL/NM SWMUs in the TAG AOC with the Greatest Potential for Having Impacted Groundwater (SNL December 2016)

SWMU	SWMU Name	Years of Discharge	Wastewater Source	Septic Water Source
46	SWMU 46, Old Acid Waste Line Outfall	1948–1974	TA-I	TA-I, possibly
48	SWMU 48, Building 904 Septic System	1947–1992	TA-II	TA-II
135	SWMU 135, Building 906 Septic System	1950–1992	TA-II	TA-II
136	SWMU 136, Building 907 Septic System	1948–1992	TA-II	TA-II
159	SWMU 159, Building 935 Septic System	1963–1991	TA-II	TA-II
165	SWMU 165, Building 901 Septic System	1948–1992	TA-II	TA-II
166	SWMU 166, Building 919 Septic System	1969–1990	TA-II	TA-II
167	SWMU 167, Building 940 Septic System	1965–1990	TA-II	TA-II
227	SWMU 227, Building 904 Outfall	1947–1992	TA-II	None
229	SWMU 229, Storm Drain System Outfall (Building 904)	1947–1992	TA-II	None

NOTES:
AOC = Area of Concern.
SNL = Sandia National Laboratories.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid waste management unit.
TA = Technical Area.
TAG = Tijeras Arroyo Groundwater.

6.1.7.6 Contaminant Behavior

Soil and soil vapor samples collected from the vadose zone (land surface to the Perched Groundwater System) during drilling operations and from the soil vapor monitoring network have indicated evidence of vapor phase volatile organic compounds (VOCs). Fourteen soil vapor monitoring wells were installed in the TAG AOC. However, no free-phase TCE and no water-saturated core samples were encountered in any of the soil samples collected from the boreholes. The original source of the TCE was the aqueous phase (former wastewater outfalls). All anthropogenic sources of SNL/NM recharge (wastewater and septic water) have been removed from service and no longer contribute water to the vadose zone.

Based on soil vapor data, the residual mass of TCE that may reside in the overlying unsaturated sediments is minimal and is not a continuing source of groundwater contamination. Therefore, the only significant potential mechanism for transporting TCE to groundwater would be through partitioning back into the aqueous phase if additional recharge occurred. Given that both current anthropogenic and natural recharge to the Perched Groundwater System is minimal, it is unlikely that significant transport of TCE in the vadose zone to groundwater could occur. Therefore, the vapor phase TCE in the vadose zone is not considered a continuing source of potential contamination to groundwater.

Nitrate was present in septic waters discharged at SNL/NM, KAFB, and ABCWUA septic systems and sanitary sewer lines in the area. The nitrate was transported to the Perched Groundwater System by the high volumes of septic water and wastewater disposed of at various locations. Nitrate is extremely soluble in water and cannot exist in dry soil. Absence of water saturation in core samples collected in the vadose zone above the Perched Groundwater System coupled with cessation of significant recharge activities indicates there are no residual sources of anthropogenic nitrate contamination in the vadose zone.

6.1.7.7 Contaminant Distribution and Transport in Groundwater

The distribution of low nitrate concentrations is discontinuous in the Perched Groundwater System and does not indicate a single contaminant release site. Based on the historic disposal of septic waters at SNL/NM, the occurrence of nitrate is most likely associated with multiple release sites. The maximum historical concentration of nitrate plus nitrite (NPN) in the Perched Groundwater System within the TAG AOC is 27.8 mg/L and corresponds to monitoring well TA2-SW1-320, which is located in the central part of TA-II. Due to declining groundwater levels and a damaged well casing, this well was replaced by well TA2-W-28 in December 2014. The replacement well is approximately 10 ft deeper (Table 1) and coincidentally has had a maximum NPN concentration of 27.8 mg/L occurring at in November 2015.

In 2015, KAFB issued an updated nitrate abatement report that described their potential nitrate release sites and the distribution of nitrate in groundwater. In a cooperative effort, KAFB and SNL/NM personnel are studying the distribution of nitrate in the Perched Groundwater System. Higher NPN concentrations (up to 70 mg/L) have been detected in KAFB wells located immediately to the south of the TAG AOC. These elevated nitrate concentrations may be related to the KAFB golf course or to the ABCWUA sanitary sewer line. Off base and farther upgradient sources of nitrate are being investigated.

Historically, only three Perched Groundwater System monitoring wells (TA2-W-19, TA2-W-26, and WYO-4) have yielded groundwater samples that exceeded the TCE MCL. The maximum historical concentration of TCE in the Perched Groundwater System was 10.5 µg/L, which corresponds to a sample collected from monitoring well WYO-4 in November 2014. However, NMED HWB management stated in the August 2017 meeting that well WYO-4 and the surrounding area no longer need to be considered as the responsibility of DOE/NTESS. Responsibility for well WYO-4 is anticipated to be transferred to the KAFB ER Program. Well WYO-4 is located west of Wyoming Boulevard on land managed by the U.S. Air Force (not leased or owned by DOE). The well was not installed for investigating SNL SWMUs. The latest sample (October 2015) from well WYO-4 had a TCE concentration of 3.82 µg/L, which is below the MCL. The steadily declining water level in the well indicates that the thin zone of saturation in the Perched Groundwater System is decreasing near well WYO-4. As a result, the collection of a representative groundwater sample at WYO-4 has not been possible since October 2015 (see Section 6.3). Video logging conducted in June 2016 showed that the well was in good condition with no significant biofouling or silting.

Monitoring wells TA2-W-19 and TA2-W-26 are located on the Tijeras Arroyo floodplain in the south-central portion of the TAG AOC. The historical maximum TCE concentration for well TA2-W-19 was 6.23 µg/L, occurring in October 2007. This is the last exceedance of the TCE MCL at well TA2-W-19. At well TA2-W-26, the historical maximum TCE concentration was 9.6 µg/L, occurring in March 1998. The last exceedance of the TCE MCL at well TA2-W-26 was 9.2 J µg/L in May 2000.

For the Regional Aquifer in the TAG AOC, the historical maximum NPN concentration of 38.4 mg/L is associated with monitoring well TJA-4. This well is located in the extreme southeast corner of the TAG AOC and is screened in the merging zone. Because groundwater migrates to the northwest in the Regional Aquifer, the occurrence of nitrate at this well is likely associated with the ABCWUA sanitary sewer line or KAFB operations such as the Tijeras Arroyo Golf Course.

Potential downgradient receptors in the Regional Aquifer are production wells operated by KAFB, ABCWUA, and the VA. These wells are located to the north and northwest of the TAG AOC. Three numerical modeling efforts have been conducted for the vicinity of the TAG AOC:

- Capture zone analysis for production wells (SNL February 2001),
- Contaminant transport modeling (SNL August 2005), and
- Conceptual groundwater modeling incorporating recharge features and stratigraphic controls (BGW September 2002).

The nearest receptor for the potential contaminants in the Regional Aquifer is the ABCWUA Ridgecrest Well Field. The computer modeling predicts that elevated nitrate in the TAG AOC could potentially reach the well field after a travel time of 130 years and would be attenuated to 0.24 µg/L, which is well below the MCL. Thus, there is no foreseeable risk to human health or a threat to beneficial use of groundwater from historic SNL/NM operations.

6.2 Regulatory Criteria

The NMED HWB provides regulatory oversight of SNL/NM ER Operations, as well as implements and enforces regulations mandated by the Resource Conservation and Recovery Act (RCRA). All SWMUs and AOCs are listed in the *RCRA Facility Operating Permit, NM5890110518* (NMED January 2015).

All corrective action requirements pertaining to the TAG AOC are contained in the Consent Order. The groundwater monitoring activities for the TAG AOC are not associated with a single SWMU, but have a broader scope. Groundwater characterization activities for TAG were originally conducted voluntarily as proposed in the Groundwater Investigation Plan (SNL March 1996a). During the TAG HPT meetings, participants (staff from SNL/NM, KAFB, COA, the NMED HWB, and the EPA) 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 until an alternative sampling method could be implemented. In June 2003, DOE/NNSA and SNL/NM personnel submitted the TAG Investigation Work Plan (SNL June 2003) to the NMED HWB. The work plan presented a comprehensive scope of work for groundwater investigations that would be jointly conducted by SNL/NM, KAFB, and the COA. Based on the requirements of the work plan, groundwater sampling at SNL/NM resumed in July 2003 using conventional low-flow groundwater purging/sampling techniques.

As mentioned above, the Consent Order became effective in April 2004. The six quarterly sampling events required by the TAG CME Work Plan were completed in Fiscal Year 2005. Since then, groundwater sampling has continued using a variety of frequencies (quarterly, semiannually, and annually) according to the NMED HWB approved work plans. The TAG Investigation Report specifies that data would continue to be presented in annual reports, such as this Annual Groundwater Monitoring Report. The outline of this chapter for the TAG AOC is based on the required elements of a "Periodic Monitoring Report" as described in Section X.D of the Consent Order.

In this Annual Groundwater Monitoring Report, the TAG analytical data include both hazardous and radioactive constituents; however, the analytical data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/NTESS. 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 Consent Order. Additional information on radionuclides, and the scope of the Consent Order, is available in Section III.A of the Consent Order.

6.3 Scope of Activities

Section 6.1.5 lists the CY 2017 activities for the TAG AOC including the measurement of groundwater levels and the collection of groundwater samples. Table 6-5 summarizes the four groundwater sampling events with the corresponding analytical parameters for each well, which are listed in Table 6-6. During CY 2017, a total of eighteen monitoring wells were sampled. These wells consisted of eight Perched Groundwater System wells and ten Regional Aquifer wells. The list of wells sampled in CY 2017 was previously summarized in Table 6-1. Monitoring wells PGS-2, TA1-W-03, and WYO-4 were not sampled; Section 6.8 discusses these variances.

Table 6-5. Groundwater Monitoring Well Network and Sampling Dates for the TAG AOC in CY 2017

Date of Sampling Event	Wells Sampled		SAP
March 2017	TA1-W-06 TA2-W-01 TA2-W-19 TA2-W-26 TA2-W-27 TA2-W-28	TJA-2 TJA-3 TJA-4 TJA-6 TJA-7	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY16, 2nd Quarter Sampling* (SNL February 2017)
June 2017	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2	TJA-3 TJA-4 TJA-7	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY16, 3rd Quarter Sampling* (SNL May 2017)
August/September 2017	TA1-W-01 TA1-W-02 TA1-W-04 TA1-W-05 TA1-W-06 TA1-W-08 TA2-NW1-595 TA2-W-01 TA2-W-19	TA2-W-26 TA2-W-27 TA2-W-28 TJA-2 TJA-3 TJA-4 TJA-6 TJA-7 WYO-3	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY16, 4th Quarter Sampling* (SNL July 2017)
December 2017	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2	TJA-3 TJA-4 TJA-7	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY17, 1st Quarter Sampling* (SNL October 2017)

NOTES:

Wells screened in the Perched Groundwater System are highlighted with green shading.

AOC = Area of Concern.
CY = Calendar Year.
FY = Fiscal Year.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
TAG = Tijeras Arroyo Groundwater.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TJA = Tijeras Arroyo.
WYO = Wyoming.

Table 6-6. Parameters Sampled at TAG AOC Monitoring Wells for Each Sampling Event in CY 2017

Parameter	March 2017	
NPN VOCs	TA1-W-06 TA2-W-01 TA2-W-01 (duplicate) TA2-W-19 TA2-W-26 TA2-W-27 TA2-W-27 (duplicate)	TA2-W-28 TJA-2 TJA-2 (duplicate) TJA-3 TJA-4 TJA-6 TJA-7
Parameter	**June 2017**	
NPN VOCs	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2 TJA-3	TJA-3 (duplicate) TJA-4 TJA-4 (duplicate) TJA-7
Parameter	**August/September 2017**	
Alkalinity Anions Gamma Spectroscopy (short list[a]) Gross Alpha/Beta activity NPN TAL Metals, plus Total Uranium Tritium VOCs	TA1-W-01 TA1-W-01 (duplicate) TA1-W-02 TA1-W-02 (duplicate) TA1-W-04 TA1-W-04 (duplicate) TA1-W-05 TA1-W-05 (duplicate) TA1-W-06 TA1-W-08 TA1-W-08 (duplicate) TA2-NW1-595	TA2-W-01 TA2-W-19 TA2-W-26 TA2-W-27 TA2-W-28 TJA-2 TJA-3 TJA-4 TJA-6 TJA-7 WYO-3 WYO-3 (duplicate)
Parameter	**December 2017**	
NPN VOCs	TA2-W-19 TA2-W-26 TA2-W-26 (duplicate) TA2-W-28 TA2-W-28 (duplicate)	TJA-2 TJA-3 TJA-4 TJA-7

NOTES:
Wells screened in the Perched Groundwater System are highlighted with green shading.
[a] Gamma spectroscopy shortlist (americium-241, cesium-137, cobalt-60, and potassium-40).
AOC = Area of Concern.
CY = Calendar Year.
NPN = Nitrate plus nitrite (reported as nitrogen).
TAG = Tijeras Arroyo Groundwater.
TAL = Target Analyte List.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TJA = Tijeras Arroyo.
VOC = Volatile organic compound.
WYO = Wyoming.

Quality control (QC) samples were collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Section 1.3 discusses the utility of QC samples.

6.4 Field Methods and Measurements

Section 1.3 describes in detail the procedures used for groundwater monitoring. Specific information is discussed below.

6.5 Analytical Methods

Section 1.3.2 describes EPA-specified protocols utilized for groundwater samples analyzed by the offsite laboratories (Tables 1-5 and 1-6).

6.6 Summary of Analytical Results

This section discusses the 2017 analytical results and pertinent trends in COC concentrations in the TAG AOC. Attachment 6C (Tables 6C-1 through 6C-7) presents the analytical results and field measurements for all TAG sampling events; Attachment 6D (Figures 6D-1 through 6D-5) presents the NPN concentration trend plots.

Table 6C-1 presents a summary of detected VOC results and Table 6C-2 lists the method detection limits (MDLs) for all VOCs. Eight VOCs were detected during CY 2017 in the TAG AOC with all being reported at low concentrations near the respective detection limits and below the respective MCLs. The VOCs detected in the CY 2017 groundwater samples were:

- 1,1-Dichloroethane,
- 1,1-Dichloroethene,
- Acetone,
- cis-1,2-Dichloroethene,
- Methylene chloride,
- Tetrachloroethene,
- Toluene, and
- TCE.

Figure 6-8 shows the monitoring well locations with the corresponding maximum TCE concentrations in CY 2017 for the Perched Groundwater System and the Regional Aquifer. Figure 6-9 shows the monitoring well locations with the corresponding maximum NPN concentrations in CY 2017 for the Perched Groundwater System and the Regional Aquifer.

Table 6-7 lists the monitoring wells where MCLs were exceeded in 2017. For the Perched Groundwater System, four monitoring wells exceeded the MCL for nitrate (measured as NPN) while none of the monitoring wells exceeded the TCE MCL. For the merging zone in the Regional Aquifer, one monitoring well exceeded the MCL for nitrate, but no wells exceeded the TCE MCL. Additional details for contaminant values and trends are discussed below.

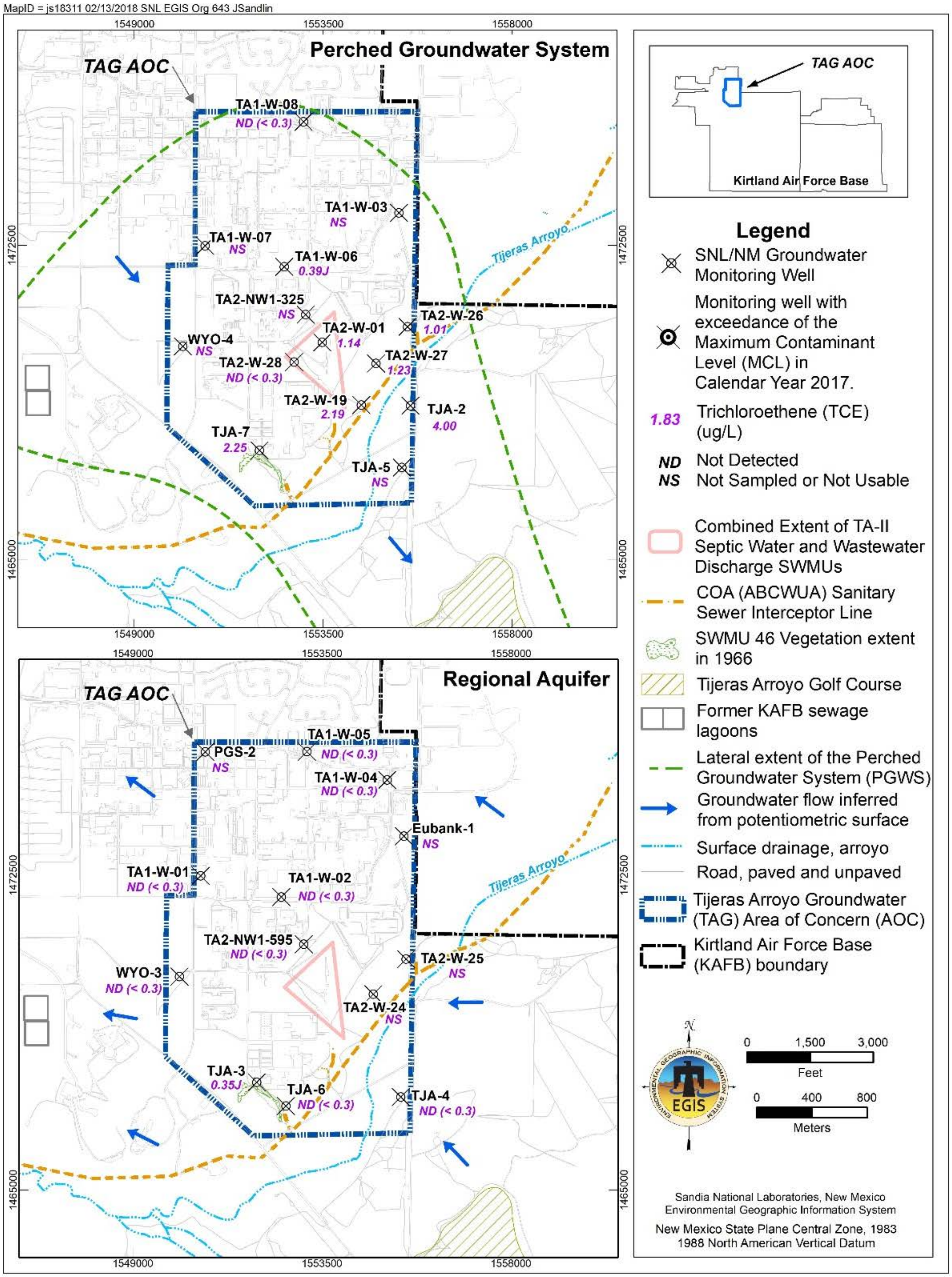


Figure 6-8. Maximum Concentrations of TCE in the Perched Groundwater System and the Regional Aquifer at the TAG AOC for CY 2017

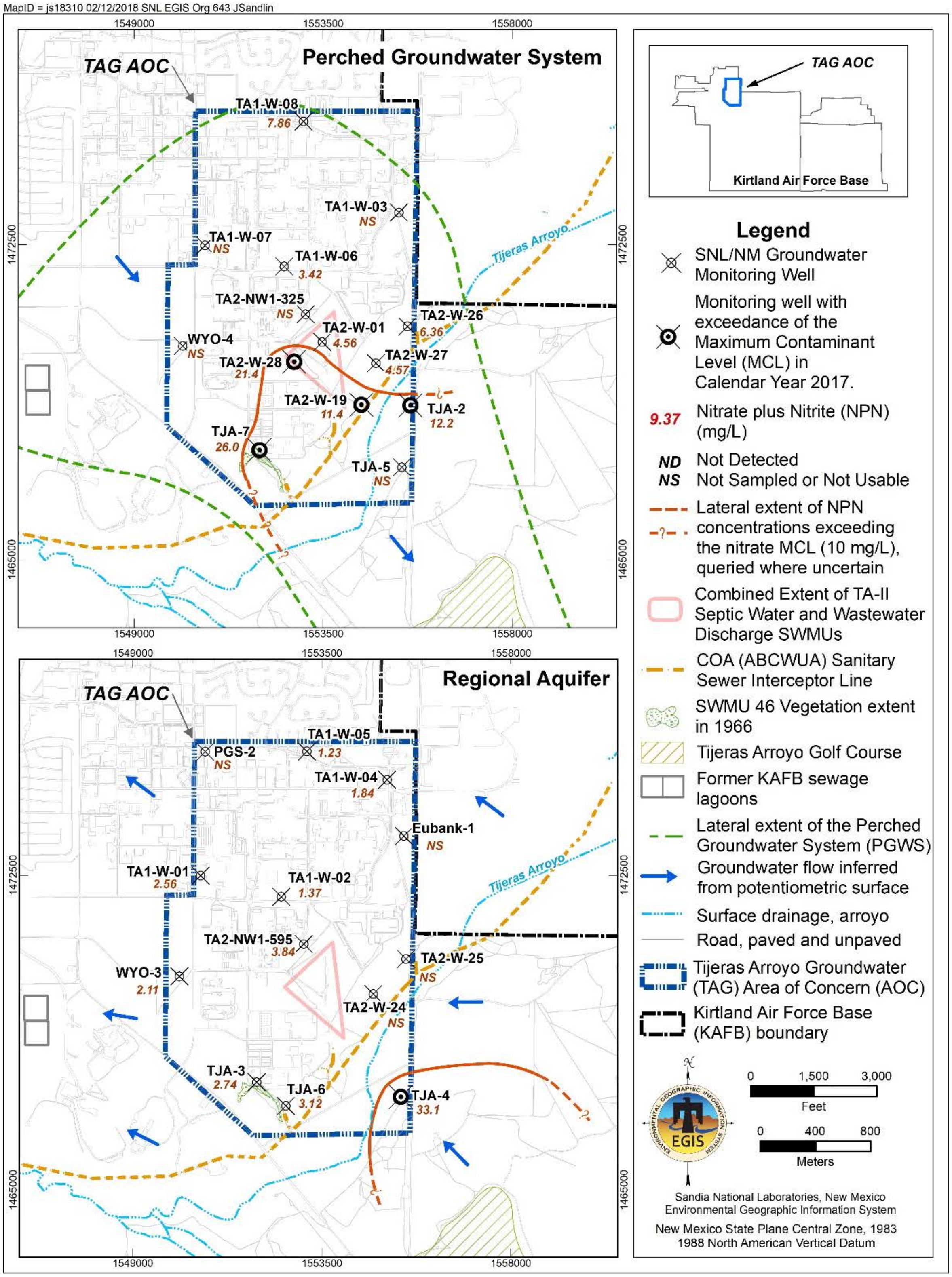


Figure 6-9. Maximum Concentrations of NPN in the Perched Groundwater System and the Regional Aquifer at the TAG AOC for CY 2017

Table 6-7. Matrix Summarizing the Monitoring Wells where Contaminant Concentrations in Groundwater Samples Exceeded the Respective MCLs for CY 2017

Aquifer	Number of Monitoring Wells Exceeding the TCE MCL of 5 µg/L	Maximum TCE Concentration in CY 2017 (µg/L)	Number of Monitoring Wells Exceeding the Nitrate MCL of 10 mg/L	Maximum NPN Concentration in CY 2017 (mg/L)
Perched Groundwater System	None	4.00	4 wells (TA2-W-19, TA2-W-28, TJA-2, and TJA-7)	26.0
Regional Aquifer	None	0.35 J	1 well (TJA-4, merging zone)	33.1

NOTES:
µg/L = Microgram(s) per liter.
CY = Calendar Year.
J = The associated value is an estimated quantity.
MCL = Maximum Contaminant Level.
mg/L = Milligram(s) per liter.
NPN = Nitrate plus nitrite (reported as nitrogen).
TA2-W = Technical Area-II (Well).
TCE = Trichloroethene.
TJA = Tijeras Arroyo.

Groundwater monitoring has been conducted in the TAG AOC since 1992. NMED identified the TAG AOC in the Consent Order because nitrate and TCE had concentrations in groundwater that exceeded the respective MCLs. When the Consent Order was issued, nitrate and TCE were specified as COCs because 1) the Perched Groundwater System contained concentrations of nitrate and TCE that exceeded the corresponding MCLs, and 2) the Regional Aquifer contained nitrate concentrations that exceeded the MCL. TCE did not exceed the MCL in the Regional Aquifer when the Consent Order was issued and has not exceeded the MCL since then. TCE has not exceeded the MCL in the Perched Groundwater System since March 2002, except at upgradient background monitoring well WYO-4. The Perched Groundwater System has been gradually dewatering and the water level in well WYO-4 has declined to the point where collecting a representative sample is no longer feasible.

DOE/NTESS and NMED HWB discussed the status of monitoring well WYO-4 in the August 2017 meeting. NMED HWB management stated the well no longer needs to be considered the responsibility of DOE/NTESS for groundwater sampling or remedial purposes. Responsibility for well WYO-4 will transfer to the KAFB ER Program.

In CY 2017, no TCE concentrations in groundwater samples from the Perched Groundwater System exceeded the MCL of 5 µg/L. The maximum TCE concentration was 4.00 µg/L and corresponded to Perched Groundwater System monitoring well TJA-2 (Table 6C-1). Only one of the Regional Aquifer monitoring wells had a TCE concentration that exceeded the detection limit of 0.3 µg/L in CY 2017. Monitoring well TJA-3 had a J-qualified TCE concentration of 0.35 µg/L (an estimated value above the detection limit but below the practical quantitation limit). This well has had sporadic detections of TCE since 2001 but never above the MCL.

Four Perched Groundwater System monitoring wells (TA2-W-19, TA2-W-28, TJA-2, and TJA-7) had NPN results exceeding the nitrate MCL of 10 mg/L in CY 2017 (Table 6C-3) ranging from 10.9 to 26.0 mg/L. Figures 6D-1 through 6D-3, and 6D-5 show the NPN concentration trend plots for these four wells, respectively. NPN concentrations have generally exceeded the MCL in these wells for the duration of the four wells. Findings for the NPN trends since 2013 are as follows:

- The NPN concentrations for monitoring wells TA2-W-19 and TJA-2 have been stable or slightly increasing for the last five years. Groundwater levels have consistently declined at the two wells since 2002.

- Monitoring well TA2-W-28 (the replacement well for TA2-SW1-320) shows a generally decreasing NPN trend for the last five years. The groundwater level has steadily declined since 2000. Well TA2-W-28 is the most upgradient well in the TAG AOC with concentrations exceeding the MCL.

- The NPN plot for monitoring well TJA-7 shows a stable NPN concentration trend for the last five years. The groundwater level has consistently declined since 2010.

Monitoring well (TJA-4) had the greatest NPN concentration (33.1 mg/L) of all the TAG AOC wells in CY 2017. This well is located at the southeast corner of the TAG AOC and is screened in the merging zone above the Regional Aquifer. Figure 6D-4 shows that the general trend of NPN concentrations is relatively stable or slightly increasing since 2013. Monitoring well TJA-4 has historically been categorized as a Regional Aquifer well because its water level continues to increase in a manner similar to other monitoring wells that are clearly screened in the Regional Aquifer. Monitoring well TJA-4 is screened in a merging (intermediate) zone between the two water-bearing units and its potentiometric surface cannot be reasonably contoured with the potentiometric surfaces for either the Perched Groundwater System or the Regional Aquifer. Saturation of this merging zone is most likely related to groundwater recharge from the nearby Tijeras Arroyo Golf Course that is located approximately 0.6 miles to the southeast. It is likely that elevated nitrate in this well reflects contribution from sources outside the TAG AOC.

Table 6C-4 presents the analytical results for anions and alkalinity; no anion concentrations exceeded the established MCLs. Table 6C-5 presents the analytical results for Target Analyte List (TAL) metals; no metal results exceeded the established MCLs.

Table 6C-6 presents the analytical results for tritium, gross alpha, gross beta, and gamma spectroscopy. The gross alpha activity was measured as a radiological screening tool in accordance with 40 Code of Federal Regulations Part 141. Naturally occurring uranium was measured independently. The total uranium concentration was measured in conjunction with the metals analysis described above. The gross alpha activity measurements were corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. Radiological results were reviewed by a Health Physicist to verify that the samples were nonradioactive prior to shipment to the analytical laboratories. All reported radionuclide activities were below MCLs, where established.

Table 6C-7 presents the field parameter measurements obtained during purging and immediately before collecting a groundwater sample at each well to confirm stabilization prior to sample collection. The parameters were temperature, specific conductivity, oxidation-reduction potential, pH, turbidity, and dissolved oxygen.

6.7 Quality Control Results

Section 1.3 describes field and laboratory QC samples collected and prepared for analysis. Tables 6C-1 through 6C-6 provide data validation qualifiers and analytical results. The results of QC samples and the influence on data quality for the TAG sampling events are discussed below.

For CY 2017, the duplicate sample results for all monitoring wells in each sampling events showed good correlation as based on the calculated relative percent difference (RPD) unit-less values. As discussed below, the calculated RPD values for the NPN sample pairs ranged from <1 to 22; thus, are less than the goal of 35. The calculated RPD values for the TCE sample pairs ranged from 1 to 5; thus, are less than the goal of 20.

The calculated RPD values for the duplicate analyses per quarter are as follows:

- **March 2017 Sampling Event**—Environmental duplicate samples for NPN and TCE analyses were collected from three monitoring wells (TA2-W-01, TA2-W-27, and TJA-2). The NPN RPD values were 2, 4, and 5, respectively. The TCE RPD values were 4, 2, and 1, respectively.

- **June 2017 Sampling Event**—Environmental duplicate samples for NPN analyses were collected from two monitoring wells (TJA-3 and TJA-4). The NPN RPD values were <1 and 1, respectively.

- **August/September 2017 Sampling Event**—Environmental duplicate samples for NPN analyses were collected from five monitoring wells (TA1-W-01, TA1-W-04, TA1-W-08, and WYO-3). The NPN RPD values for four of the wells (TA1-W-01, TA1-W-04, TA1-W-08, and WYO-3) ranged from 2 to 4, respectively. The NPN RPD value for well TA1-W-02 was 22.

- **December 2017 Sampling Event**—Environmental duplicate samples for NPN analyses were collected from two monitoring wells (TA2-W-26 and TA2-W-28). The NPN RPD values were 2 and 1, respectively. A duplicate for VOC analyses was also collected from at TA2-W-26. Two VOCs were detected at both wells. The TCE RPD value was 5. The tetrachloroethene RPD value was 3.

The results for the EB analyses per quarter are as follows:

- **March 2017 Sampling Event**—EB samples were collected prior to sampling wells TA2-W-01, TA2-W-27, and TJA-2. The three EB samples were submitted for VOC and NPN analysis. Acetone was detected in one EB sample. No corrective action was required since acetone was not detected in the associated environmental samples. NPN was not detected in the EB samples.

- **June 2017 Sampling Event**—EB samples were collected prior to sampling wells TJA-3 and TJA-4. The two EB samples were submitted for VOC and NPN analysis. Except for acetone, no VOCs were detected above laboratory MDLs in the EB samples. Acetone was detected in the EB sample for well TJA-4. However, no corrective action was necessary because this compound was not detected in the associated environmental samples. NPN was not detected in the EB samples.

- **August/September 2017 Sampling Event**—EB samples were collected prior to sampling wells TA1-W-01, TA1-W-02, TA1-W-04, TA1-W-08, and WYO-3. The five EB samples were submitted for VOC, metals, and NPN analysis. Acetone, aluminum, 2-butanone, calcium, chloride, copper, sodium, and sulfate, were detected above laboratory MDLs in various EB samples. No corrective action was required for 2-butanone, calcium, chloride, sodium, or sulfate because these parameters were not detected in the corresponding environmental samples or the reported values in the environmental samples were greater than five times the EB concentration. Acetone was reported in three EB samples at concentrations greater than the associated environmental samples, and was qualified as not detected during data validation for the associated environmental samples. Aluminum was detected in two EB samples (TA1-W-08 and WYO-3) and copper in one EB sample

(TA1-W-08); the associated environmental sample results were qualified as not detected during data validation since these compounds were reported less than five times the EB value. NPN was not detected in the EB samples.

- **December 2017 Sampling Event**—EB samples were collected prior to the sampling of monitoring wells TA2-W-26 and TA2-W-28. The two EB samples were submitted for VOC and NPN analysis. No NPN or VOCs were detected above laboratory MDLs in the EB samples.

The results for the FB analyses per quarter are as follows:

- **March 2017 Sampling Event**—FB samples for VOC analysis were collected at monitoring wells TA1-W-06 and TJA-4 by pouring deionized (DI) water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. An additional FB sample was collected from the source-DI water used during the equipment decontamination process prior to sampling monitoring well TJA-2. No VOCs were detected above the associated laboratory MDLs for any of the FB samples.

- **June 2017 Sampling Event**—FB samples were collected at monitoring wells TA2-W-26 and TJA-7 by pouring DI water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. An additional FB sample was collected from the source-DI water used during the equipment decontamination process after to sampling monitoring well TJA-4. No VOCs were detected above the associated laboratory MDLs for any of the FB samples.

- **August/September 2017 Sampling Event**—FB samples were collected at monitoring wells TA2-NW1-595 and TJA-7 by pouring DI water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. Acetone was detected in the FB associated with well TA2-NW1-595, and chloroform in the FB associated with well TJA-7. Acetone was detected at a concentration greater than the environmental sample; therefore, the environmental sample was qualified as not detected during data validation. No corrective action for chloroform was necessary, since chloroform was not detected in the associated environmental sample. An additional FB sample was collected from the source-DI water used during the equipment decontamination process prior to sampling monitoring well TA1-W-08. Aluminum and sodium was reported in the FB sample. These metals were also detected in the EB and associated environmental samples at similar concentrations. No corrective action was required.

- **December 2017 Sampling Event**—FB samples were collected at monitoring wells TA2-W-26 and TJA-3 by pouring DI water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. An additional FB sample was collected from the source-DI water used during the equipment decontamination process after sampling monitoring well TJA-7. No VOCs were detected above the associated laboratory MDLs for any of the FB samples.

The results for the TB analyses per quarter are as follows:

- **March 2017 Sampling Event**—A total of 15 TBs were submitted. Acetone was detected in one TB sample and carbon disulfide was detected in another TB sample. Acetone in the TA2-W-27 environmental and duplicate environmental samples was qualified as not detected during data validation because acetone was detected in the associated TB sample at a similar concentration. No corrective action was necessary for carbon disulfide because the compound was not detected in the associated environmental sample.

- **June 2017 Sampling Event**—No VOCs were detected above laboratory MDLs in any of the 10 TB samples, except methylene chloride. Methylene chloride was detected in TBs associated with wells TA2-W-26 and TJA-3, and the EB sample associated with well TJA-3. Methylene chloride in wells TA2-W-26 and TJA-3 samples was qualified as not detected during data validation because this compound was detected in the associated TB sample at a similar concentration.

- **August/September 2017 Sampling Event**—No VOCs were detected above laboratory MDLs in any of the 24 TB samples, except methylene chloride. Methylene chloride was reported in two TB samples at similar concentrations to associated environmental samples. The associated environmental sample results were qualified as not detect during data validation since methylene chloride was reported less than 10 times the TB values.

- **December 2017 Sampling Event**—No VOCs were detected above laboratory MDLs in any of the 10 TB samples, except for 2-butanone. No corrective action was necessary because 2-butanone was not detected in the associated environmental sample.

6.8 Variances and Nonconformances

Variances (nonconformances) from field or sampling requirements as specified in the TAG Investigation Mini-Sampling and Analysis Plans (SAPs) (SNL February 2017, May 2017, July 2017, and October 2017) were noted as follows:

- **All Quarterly Events in 2017**—Monitoring well WYO-4 was not sampled because the water column in the well was not sufficient. Previous sampling events had shown that a water column of less than 5 ft did not produce enough water for filling any sample containers. This criterion was established in late 2015 using the lowest possible sample rate for the portable Bennett pump system with the pump intake set at 0.5 ft above the lowest slot. However, it should be noted that the dry out (purged dry) issue at well WYO-4 was anticipated for CY 2017 and is therefore not considered a variance. The previous AGMR (SNL June 2017) noted that the well was not sampled in 2016 because of the dry out issue.

- **March 2017 Sampling Event**—No variances with the TAG Mini-SAP were identified.

- **June 2017 Sampling Event**—No variances with the TAG Mini-SAP were identified.

- **August/September 2017 Sampling Event**—Two variances from the TAG Mini-SAP were identified. The first variance involved Perched Groundwater System monitoring well TA1-W-03. In August 2017, well TA1-W-03 was purged to dryness before groundwater reached the surface. Approximately 3.5 gallons was purged before the well went dry. The flow rate was 0.22 gallons per minute (the lowest possible given equipment limitations). All water remained in the tubing bundle and no water quality readings could be measured. Previously in July 2017, the water column within the well screen interval was calculated at 2.97 ft. The second variance involved Regional Aquifer monitoring well PGS-2. All sampling results for well PGS-2 were qualified as unusable because the field measurements for turbidity (exceeding 600 nephelometric turbidity units) showed that the water samples were not representative of the aquifer. Video logging was conducted in

October 2017 and showed that significant grout intrusion had reoccurred in the well screens. However, the well continues to be useful for measuring water levels.

- **December 2016 Sampling Event**—No variances or nonconformances with the TAG Mini-SAP were identified.

6.9 Summary and Conclusions

This section provides a brief summary of activities, contaminants, the CSM, and CY 2017 plans for the TAG AOC.

The TAG AOC encompasses an area of approximately 1.82 sq mi in the north-central portion of KAFB. Groundwater investigations were initiated in 1992 and the current groundwater network consists of 21 monitoring wells for water quality analysis and 30 monitoring wells for groundwater level measurements. For this reporting period, monitoring wells were sampled in March, June, August/September, and December 2017. The groundwater samples for each event were analyzed for VOCs and NPN. Additional analytes (anions, alkalinity, TAL metals [plus total uranium,] gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy) were analyzed for the August/September event. Analytical results were compared with EPA MCLs for drinking water (EPA May 2009).

In CY 2017, NPN was the only analyte that exceeded an MCL in TAG AOC groundwater samples. NPN concentrations exceeded the nitrate MCL of 10 mg/L in samples from four monitoring wells (TA2-W-19, TA2-W-28, TJA-2, and TJA-7) that are screened in the Perched Groundwater System and from one monitoring well (TJA-4) screened in the merging zone above the Regional Aquifer. The maximum NPN concentration in groundwater samples collected from the Perched Groundwater System was 26.0 mg/L. The maximum NPN concentration in the Regional Aquifer exclusive of the merging zone was 3.84 mg/L. In the merging zone above the Regional Aquifer, the maximum NPN concentration was 33.1 mg/L.

In CY 2017, no exceedances of the TCE MCL (5 µg/L) were detected in groundwater samples collected from the TAG AOC monitoring wells. The maximum TCE concentration for the Perched Groundwater System was 4.00 µg/L and corresponds to monitoring well TJA-2. The only detected TCE concentration for the Regional Aquifer was 0.35 J µg/L and corresponded to the sample from well TJA-3.

The following conclusions are based on a comprehensive review of available information for current and historical groundwater analyses for the TAG AOC:

- In the Perched Groundwater System, the distribution of NPN concentrations exceeding the nitrate MCL is restricted to the southeast corner of the TAG AOC and likely reflects multiple release sites from several organizations.

- In the Regional Aquifer, the distribution of NPN concentrations exceeding the nitrate MCL is restricted to the merging zone in the extreme southeast corner of the TAG AOC and is probably attributable to release sites that are located outside of the TAG AOC.

- In the Perched Groundwater System, TCE concentrations do not exceed the MCL in the TAG AOC.

- In the Regional Aquifer, TCE has historically not been detected above the MCL in the TAG AOC.

- The potential sources of nitrate and TCE are located both within and outside the TAG AOC. The potential sources include the former sewage lagoons, wastewater outfalls, buried septic systems, landfills, sewer lines, and the golf course. SNL/NM operations involving the release of septic and wastewater that could affect groundwater were eliminated in 1992.

- The CSM was updated using preliminary findings from the Revised TAG CCM/CME Report, *in progress*.

- Nitrate concentrations in the Perched Groundwater System are expected to decrease to background concentrations and far below regulatory standards because of natural groundwater transport mechanisms (advection, dispersion, and diffusion).

- The Perched Groundwater System is a thin, artificially created water-bearing unit that was mostly created by historic anthropogenic sources (septic and wastewater discharges). These types of recharge were curtailed prior to 1993.

- Water levels continue to decline in the Perched Groundwater System as the system naturally dewaters.

- Groundwater from the Perched Groundwater System is not pumped for any type of beneficial use near the TAG AOC.

- There is no foreseeable risk to human health involving production wells completed in the Regional Aquifer.

Ongoing environmental studies in the TAG AOC include the following:

- Groundwater sampling at up to 21 monitoring wells on a quarterly, semiannual, or annual basis. At a minimum, the analytes for groundwater sampling per well will consist of NPN and VOCs.

- Quarterly measurements of groundwater elevations in 30 monitoring wells.

- Maintaining contact with the KAFB Environmental Compliance Program personnel with respect to the results of their nitrate abatement studies.

- Obtaining groundwater results relevant to the TAG AOC from KAFB, U.S. Geological Survey, and the COA, as available.

- Reporting future results in the CY 2018 SNL/NM Annual Groundwater Monitoring Report.

- If required, prepare a Corrective Measures Implementation Plan upon receiving NMED HWB approval of the Revised TAG CCM/CME Report that was scheduled for submittal in February 2018.

This page intentionally left blank.

Attachment 6A
Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern

This page intentionally left blank.

Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern

Year	Event	Reference
1928	Land-use development on the East Mesa began in 1928 when the public Albuquerque Airport was built. Renamed Oxnard Field in 1929, the airport was used until late 1939 when the vicinity of Oxnard Field was purchased by the federal government for use as an Army Air Depot Training Station, later to be known as Sandia Base.	www.airfields-freeman.com 2016; CE2 Corporation September 2016
1939	In 1939, public airline service was moved approximately four miles to the west of Oxnard Field where the Albuquerque Municipal Airport was built. Using the municipal set of runways, the Albuquerque Army Air Base began operations in 1941.	www.econtent.unm.edu 2016, en.wikipedia.org 2016
1945	"Z Division" of the Manhattan Engineers District, an extension of the original Los Alamos Laboratory, was established at Sandia Base in the area that would become known as TA-I.	Furman April 1988
1946	After World War II, the old Oxnard Field runways and a new extensive grid of taxiways were used for parking military aircraft. Starting in 1946, the War Assets Administration managed the sale or the dismantlement and smelting of approximately 2,250 surplus military aircraft.	www.militarymediainc.com 2016
1947	Wastewater and septic-water discharges begin at TA-II. (All discharges to the ground surface or buried leach fields ended in 1992.)	SNL November 2005
1948	Wastewater and possibly septic-water discharges associated with TA-I begin at SWMU 46. (All discharges to ground surface at the outfall ditches ceased in 1974.)	SNL November 2005
1949	The independent Sandia Laboratory was established. Existing buildings in TA-I were remodeled. New buildings in TA-I and TA-II were constructed.	Furman 1990
1977	Construction of TA-IV accelerator facilities began in 1977. All buildings use modern wastewater and septic disposal systems. No discharges to the ground are allowed.	SNL November 2005
1984	DOE created CEARP to evaluate potential release sites at SNL/NM.	DOE September 1987
1988	The SNL/NM ER Project was created and begins conducting investigations using the CEARP list of sites.	SNL March 1995a
1992	ER Project starts to investigate groundwater at TA-II. The Perched Groundwater System was discovered with the installation of monitoring wells TA2-SW1-320, TA2-NW1-325, and TA2-NW1-595. The presence of the Regional Aquifer was previously known from base-wide studies.	SNL March 1995a
1993	Installed groundwater monitoring wells TA2-NW1-325 and TA2-NW1-595.	SNL March 1995a
1994	Installed groundwater monitoring wells TA2-W-01 and TJA-2.	SNL March 1995a
1994	First detection of TCE in a groundwater sample from a SNL/NM well near Tijeras Arroyo. The October 1994 sample from monitoring well TA2-W-01 contained TCE at 1 µg/L.	SNL March 1995b, GWPP annual
1995	Installed nested groundwater monitoring wells WYO-1 and WYO-2 in a single borehole. Installed groundwater monitoring wells PGS-2 and TA2-W-19.	SNL March 1996a
1995	First TCE exceedance of the U.S. Environmental Protection Agency MCL of 5 µg/L. The November 1995 groundwater sample from monitoring well TA2-W-19 contained TCE at 8.1 µg/L.	SNL March 1996b, GWPP annual
1995	Comprehensive study of the geologic and hydrogeologic setting for SNL/NM and KAFB area completed.	GRAM and Lettis December 1995
1996	Sandia North Groundwater Investigation Plan submitted to the NMED-HWB.	SNL March 1996b

Refer to footnotes on page 6A-6.

Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern *(Continued)*

Year	Event	Reference
1996	Shallow (Perched Groundwater System) Water-Bearing Zone Hydrologic Evaluation report prepared for aquifer parameters.	Wolford September 1996
1996	Pressure transducer program conducted at four Perched Groundwater System monitoring wells (TA2-NW1-325, TA2-SW1-320, and TA2-W-01, and TA2-W-19), three Regional Aquifer monitoring wells (PGS-2, TA2-NW1-595), and one production well (KAFB-5).	SNL March 1998
1996	Installed soil vapor monitoring wells TA2-VW-20 and TA2-VW-21.	IT January 1997
1997	Sandia North Geological Investigation Project Report was submitted to NMED-HWB.	Fritts and Van Hart March 1997
1997	Installed groundwater monitoring wells TA1-W-01 and TA2-W-25.	SNL March 1998
1997	Downhole geophysical surveying (electromagnetic induction, neutron, and natural gamma) was conducted on 21 SNL/NM and KAFB monitoring wells near Tijeras Arroyo.	SNL March 1998
1998	Installed groundwater monitoring wells TA1-W-02, TA1-W-03, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-07, TA2-W-24, TA2-W-26, TA2-W-27, TJA-3, TJA-4, and TJA-5.	SNL June 2000
1998	Revision of the 1995 comprehensive study of the geologic and hydrogeologic setting for SNL/NM and KAFB area was completed.	SNL February 1998
1999	Colloidal borescope investigation was performed on 18 Perched Groundwater System monitoring wells.	AquaVISION July 1999
1999	Structural interpretation was conducted using USGS aeromagnetic survey.	Van Hart et al. October 1999
2000	Project name at SNL/NM was changed from the “Sandia North Groundwater Investigation” to the “Tijeras Arroyo Groundwater” or TAG Investigation.	Collins December 2000
2000	At NMED direction, the TAG HPT held its first meeting in Albuquerque, New Mexico.	SNL June 2003
2001	Installed groundwater monitoring wells TA1-W-08, TJA-6, and TJA-7.	SNL November 2002
2001	Installed soil vapor monitoring wells 46-VW-01, 46-VW-02 and 227-VW-01.	SNL November 2002
2001	Geologic model of the Perched Groundwater System was updated.	Van Hart June 2001
2001	Geochemical modeling of the Perched Groundwater System was conducted.	Brady and Domski 2001
2001	Capture zone analysis conducted for production wells located outside the TAG investigation area.	SNL February 2001
2001	Pressure transducer study was conducted using 19 monitoring wells (11 wells are screened in Perched Groundwater System and 8 wells are screened in Regional Aquifer).	SNL August 2001
2001	Installed replacement groundwater monitoring wells WYO-3 and WYO-4. Plugged and abandoned wells WYO-1 and WYO-2.	SNL June 2003
2002	Completed the calibration of the three-dimensional groundwater flow modeling of the TAG vicinity using the numerical code FEMWATER.	BGW September 2002
2002	TAG Continuing Investigation Report was submitted to the NMED-HWB.	SNL November 2002
2003	Updated the interpretation of the subsurface geology at KAFB, including the TAG area.	Van Hart June 2003
2003	TAG Investigation Work Plan submitted to the NMED-HWB. The plan discussed the tasks that SNL/NM proposed to conduct.	SNL June 2003
2003	TAG Investigation Work Plan was approved by the NMED-HWB.	NMED September 2003
2003	Installed soil vapor wells 159-VW-01, 165-VW-01, 1004-VW-01, and 1052-VW-01.	SNL October 2003
2003	Last meeting of TAG HPT was held in October 2003. Twenty meetings were held during the three-year period (2000 to 2003).	Copland and Skelly October 2003

Refer to footnotes on page 6A-6.

Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern *(Continued)*

Year	Event	Reference
2004	Slug testing was conducted at five Perched Groundwater System monitoring wells and five Regional Aquifer monitoring wells.	Skelly et al. May 2004
2004	The Compliance Order on Consent identified the TAG investigation as an AOC, and required the preparation of a CME report for the TAG AOC.	NMED April 2004
2004	TAG CME Work Plan was submitted to the NMED-HWB.	SNL July 2004
2004	Installed soil vapor monitoring wells TAG-SV-01, TAG-SV-02, TAG-SV-03, TAG-SV-04, and TAG-SV-05.	SNL November 2005
2004	Stable isotope ($\delta^{15}N$) analyses conducted for five Perched Groundwater System monitoring wells.	SNL November 2004
2004	TAG CME Work Plan was approved by the NMED-HWB.	NMED October 2004
2005	TAG CME Report was submitted to NMED-HWB. Report includes contaminant transport modeling for groundwater.	SNL August 2005
2005	TAG Investigation Report (analogous to a CCM) was submitted to the NMED-HWB.	SNL November 2005
2006	Plugged and abandoned soil vapor monitoring well TAG-SV-03.	Skelly November 2006
2008	NMED-HWB issued a NOD on the TAG Investigation Report.	NMED August 2008
2009	Response for the August 2008 NOD for the TAG Investigation Report submitted to NMED-HWB.	SNL February 2009
2009	NMED-HWB issued a second NOD concerning the TAG Investigation Report.	NMED August 2009
2010	Response to the second NOD concerning the TAG Investigation Report submitted to NMED-HWB.	SNL January 2010
2010	NMED-HWB issued a Notice of Approval for the TAG Investigation Report.	NMED February 2010
2012	Decommissioned soil vapor monitoring wells 159-VW-01, 165-VW-01, 1004-VW-01, and 1052-VW-01.	SNL March 2013
2012	Groundwater samples for dual isotopes analyses ($\delta^{15}N$ versus $\delta^{18}O$) were collected from five Regional Aquifer monitoring wells.	Madrid et al. June 2013
2014	Installed replacement groundwater monitoring well TA2-W-28. Plugged and abandoned nearby groundwater monitoring well TA2-SW1-320.	SNL April 2015
2015	Meeting was held between personnel from SNL/NM, DOE/NNSA, and NMED-HWB for discussing the schedule (milestones) for report submittals concerning the TAG AOC, the TA-V Groundwater AOC, and the Burn Site Groundwater AOC.	DOE March 2016
2016	NMED-HWB milestones letter requires that an “Updated CCM and CME Report” for the TAG AOC be submitted in December 2016.	NMED April 2016
2016	A combined and updated TAG CCM/CME Report (dated December 2016) was submitted to NMED-HWB. The DOE/NNSA transmittal letter was dated November 23, 2016.	DOE December 2016, DOE November 2016
2017	NMED issued a disapproval letter for the TAG CCM/CME Report. NMED requested submittal of a revised report before November 30, 2017.	NMED May 2017
2017	Meeting held between SNL/NM, DOE/NNSA, and NMED-HWB personnel to discuss the disapproval letter issues.	none

Refer to footnotes on page 6A-6.

Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern *(Concluded)*

Year	Event	Reference
2017	DOE/NNSA requested a time extension for submittal of the Revised TAG CCM/CME Report.	DOE September 2017
2017	NMED approved the time extension request. Submittal date for the Revised TAG CCM/CME Report was set for February 15, 2018.	NMED October 2017
2017	Ongoing preparation of the Revised TAG CCM/CME Report.	none
2017	SNL/NM continues to conduct groundwater monitoring across the TAG AOC.	This report

NOTES:

µg/L	= Microgram(s) per liter.
AOC	= Area of Concern.
BGW	= Balleau Groundwater Inc.
CCM	= Current Conceptual Model.
CEARP	= Comprehensive Environmental Assessment and Response Program.
CME	= Corrective Measures Evaluation.
DOE	= U.S. Department of Energy.
ER	= Environmental Restoration.
FEMWATER	= Finite Element Model of Water.
GRAM	= GRAM, Inc.
GWPP	= Groundwater Protection Program.
HPT	= High Performing Team.
HWB	= Hazardous Waste Bureau.
IT	= IT Corporation.
KAFB	= Kirtland Air Force Base.
Lettis	= William Lettis & Associates, Inc.
MCL	= Maximum Contaminant Level.
NMED	= New Mexico Environment Department.
NNSA	= National Nuclear Security Administration.
NOD	= Notice of Disapproval.
PGS	= Parade Ground South.
SNL	= Sandia National Laboratories.
SNL/NM	= Sandia National Laboratories, New Mexico.
SV	= Soil vapor.
SWMU	= Solid Waste Management Unit.
TA	= Technical Area.
TA1-W	= Technical Area-I (Well).
TA2-NW	= Technical Area-II (Northwest).
TA2-SW	= Technical Area-II (Southwest).
TA2-W	= Technical Area-II (Well).
TAG	= Tijeras Arroyo Groundwater.
TCE	= Trichloroethene.
TJA	= Tijeras Arroyo.
USGS	= U.S. Geological Survey.
VW	= Vapor Well.
WYO	= Wyoming.

Attachment 6B
Tijeras Arroyo Groundwater
Hydrographs

This page intentionally left blank.

Attachment 6B Hydrographs

This page intentionally left blank.

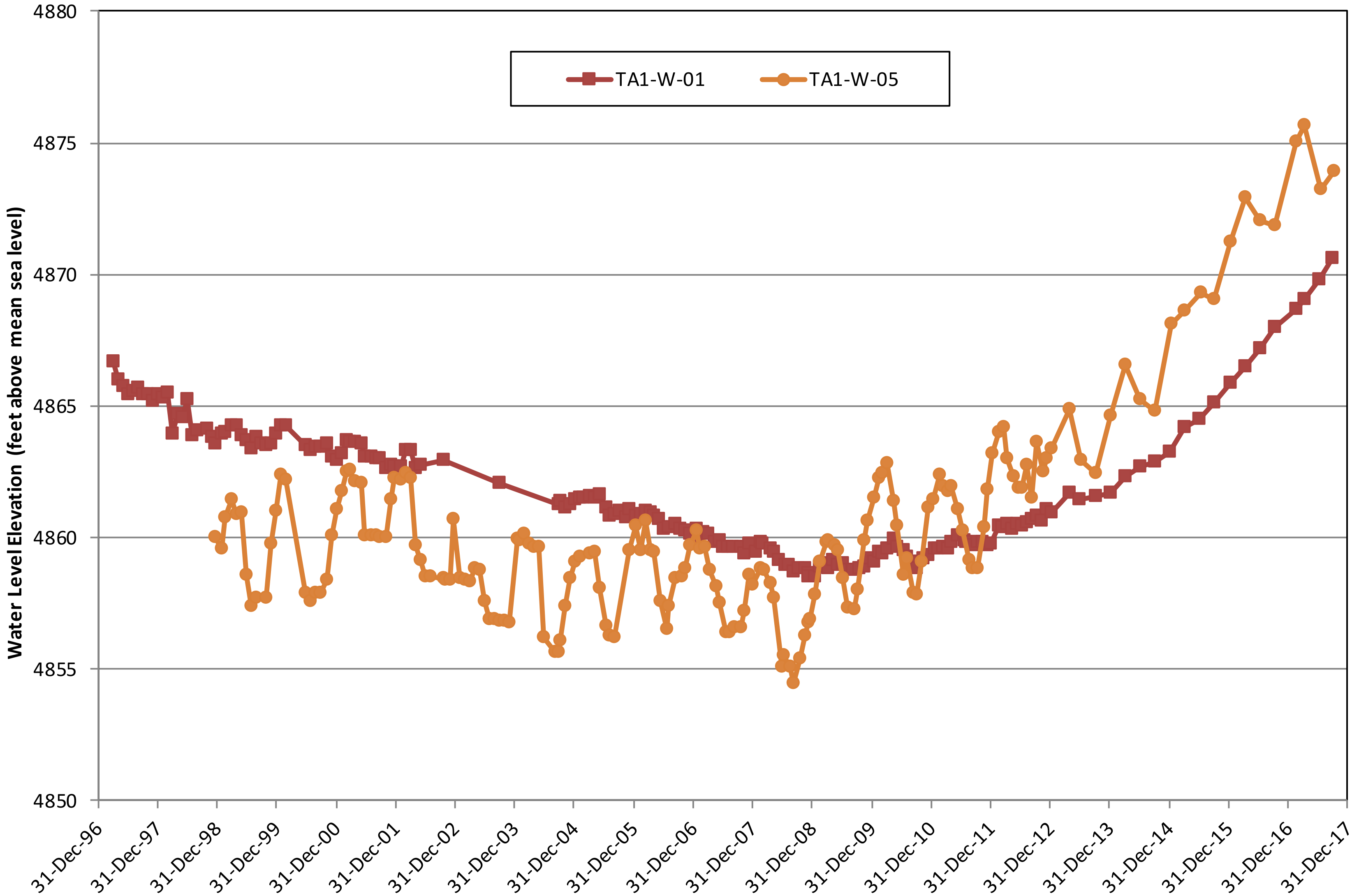


Figure 6B-1. TAG AOC Monitoring Wells (1 of 10)

Figure 6B-2. TAG AOC Monitoring Wells (2 of 10)

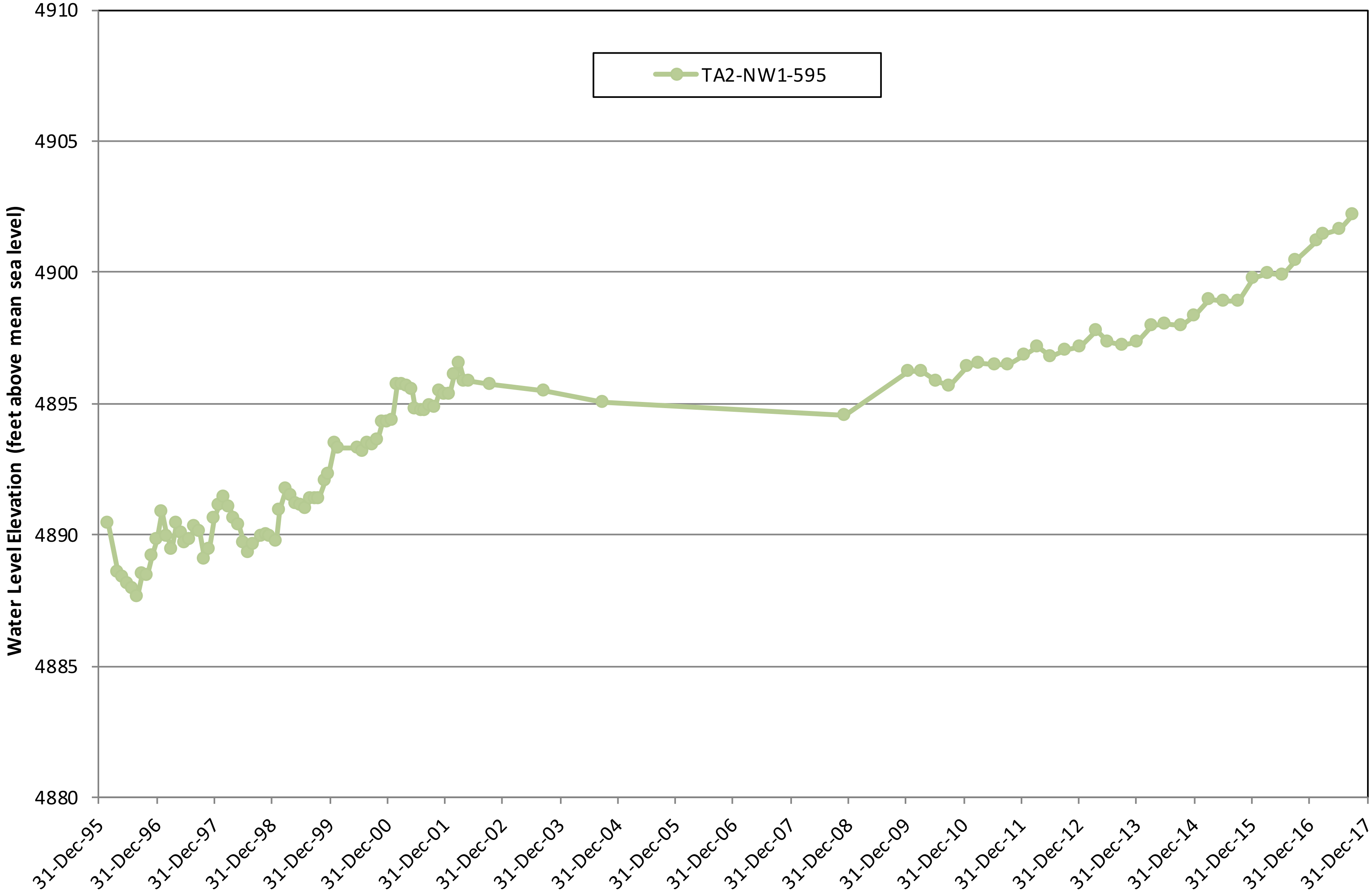


Figure 6B-3. TAG AOC Monitoring Wells (3 of 10)

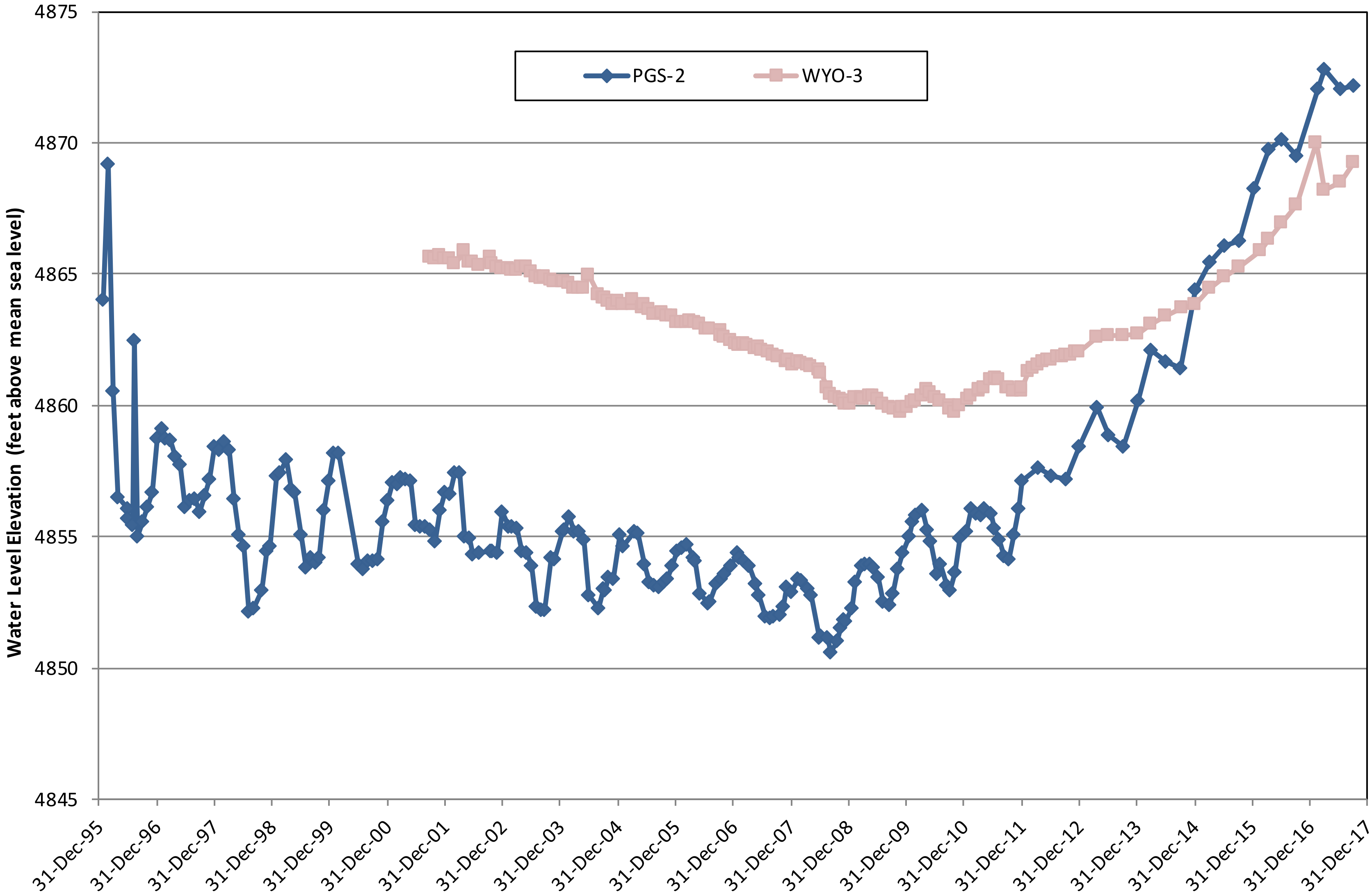


Figure 6B-4. TAG AOC Monitoring Wells (4 of 10)

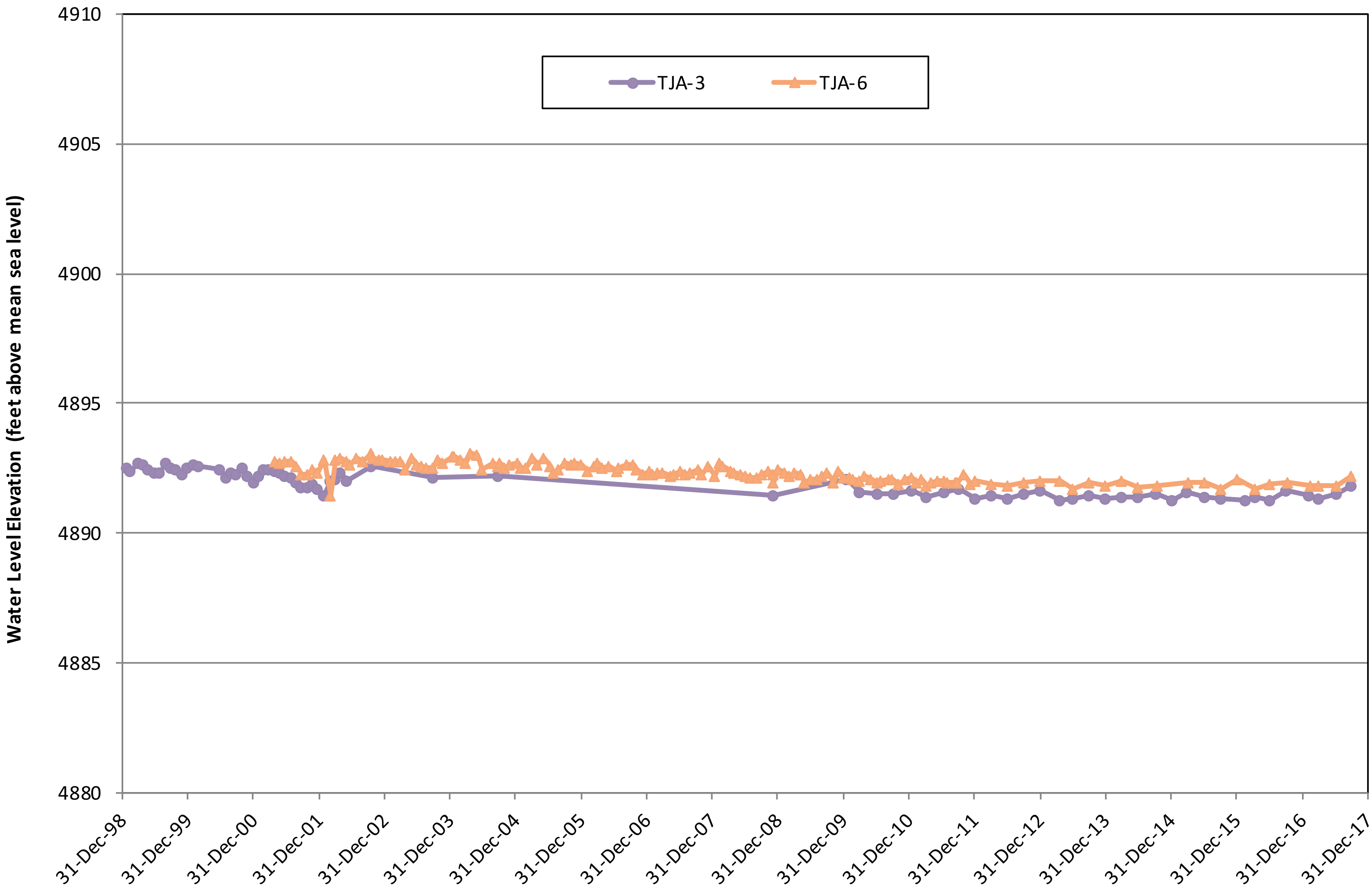


Figure 6B-5. TAG AOC Monitoring Wells (5 of 10)

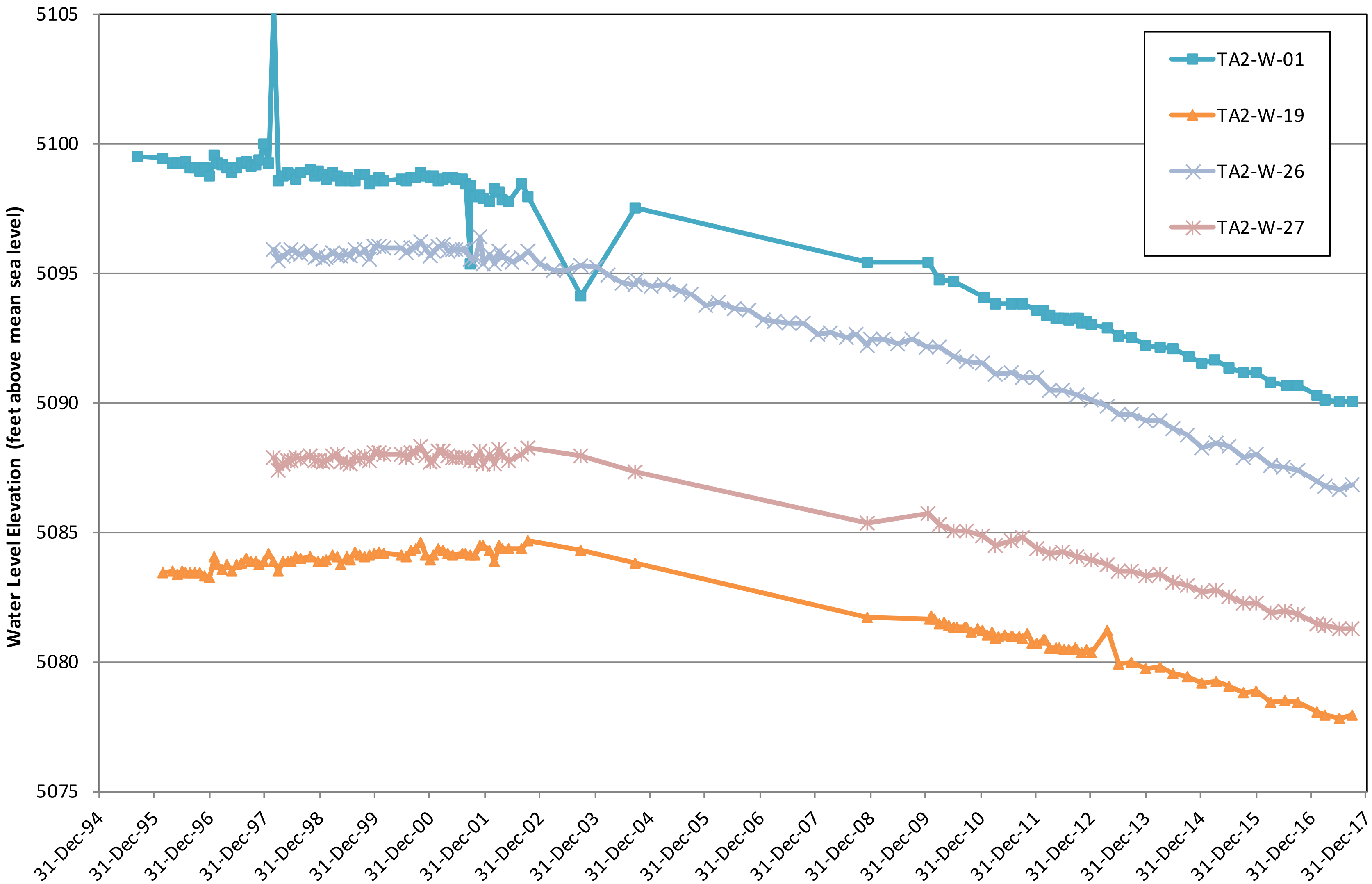


Figure 6B-6. TAG AOC Monitoring Wells (6 of 10)

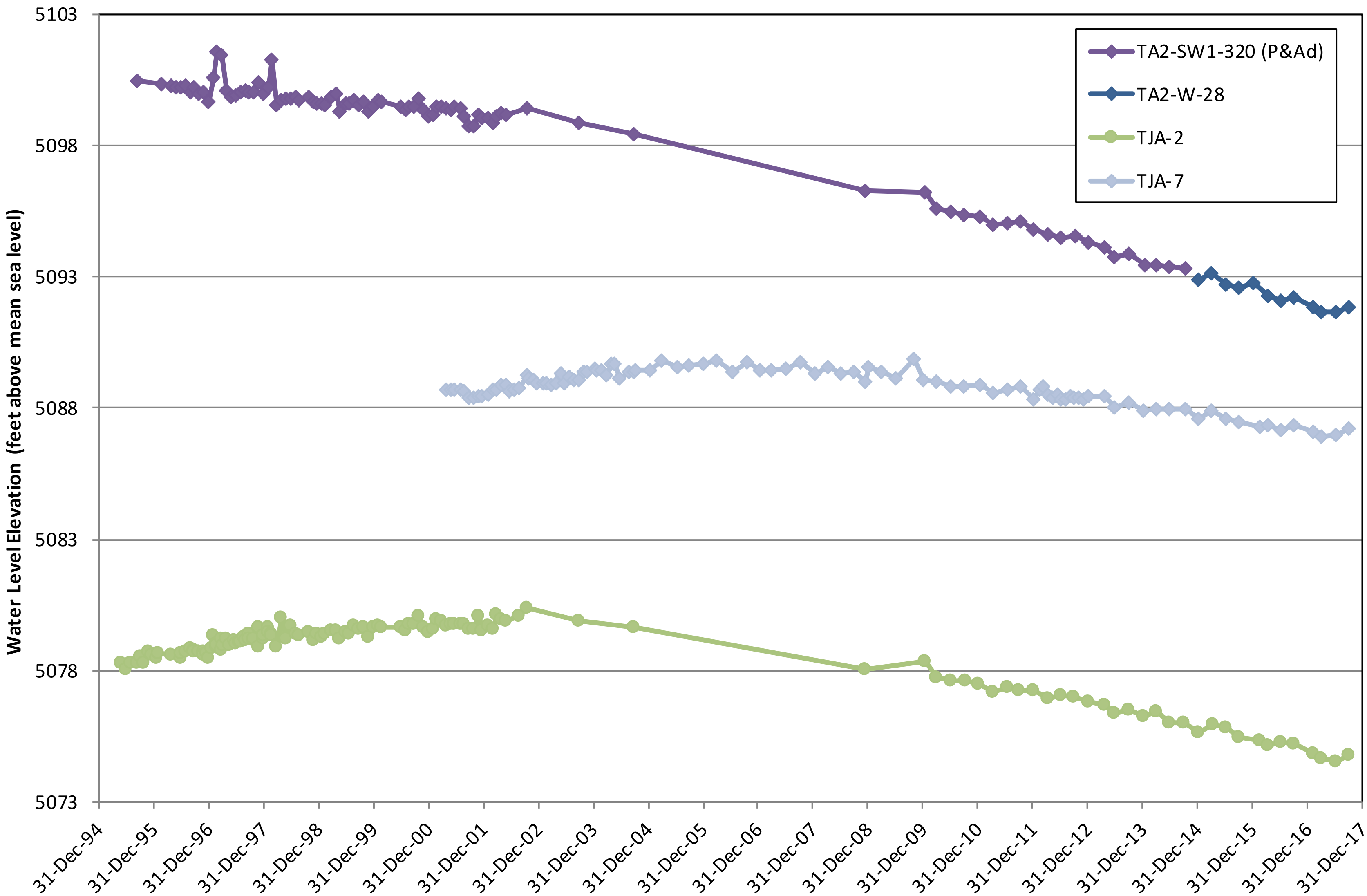


Figure 6B-7. TAG AOC Monitoring Wells (7 of 10)

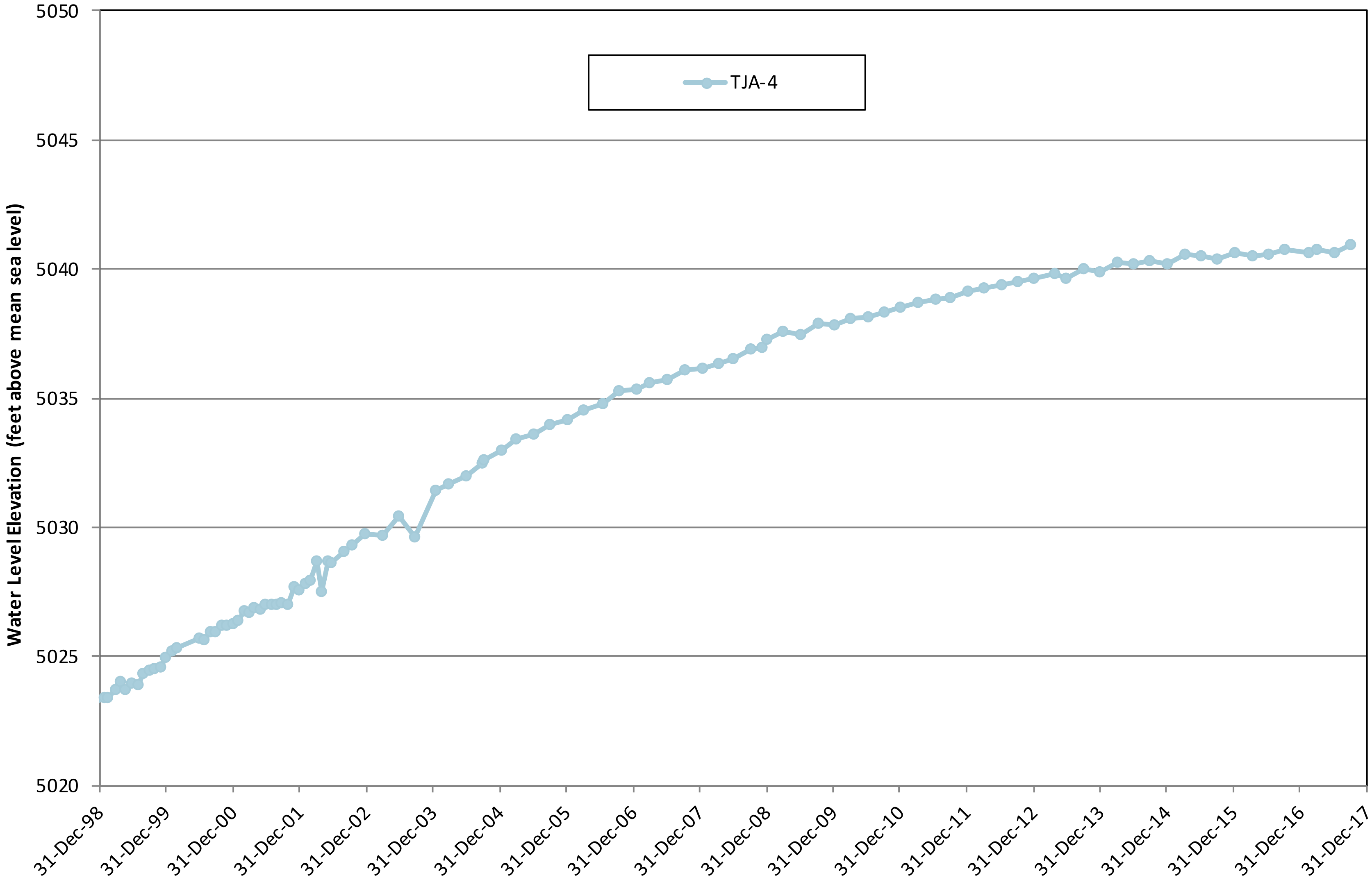


Figure 6B-8. TAG AOC Monitoring Wells (8 of 10)

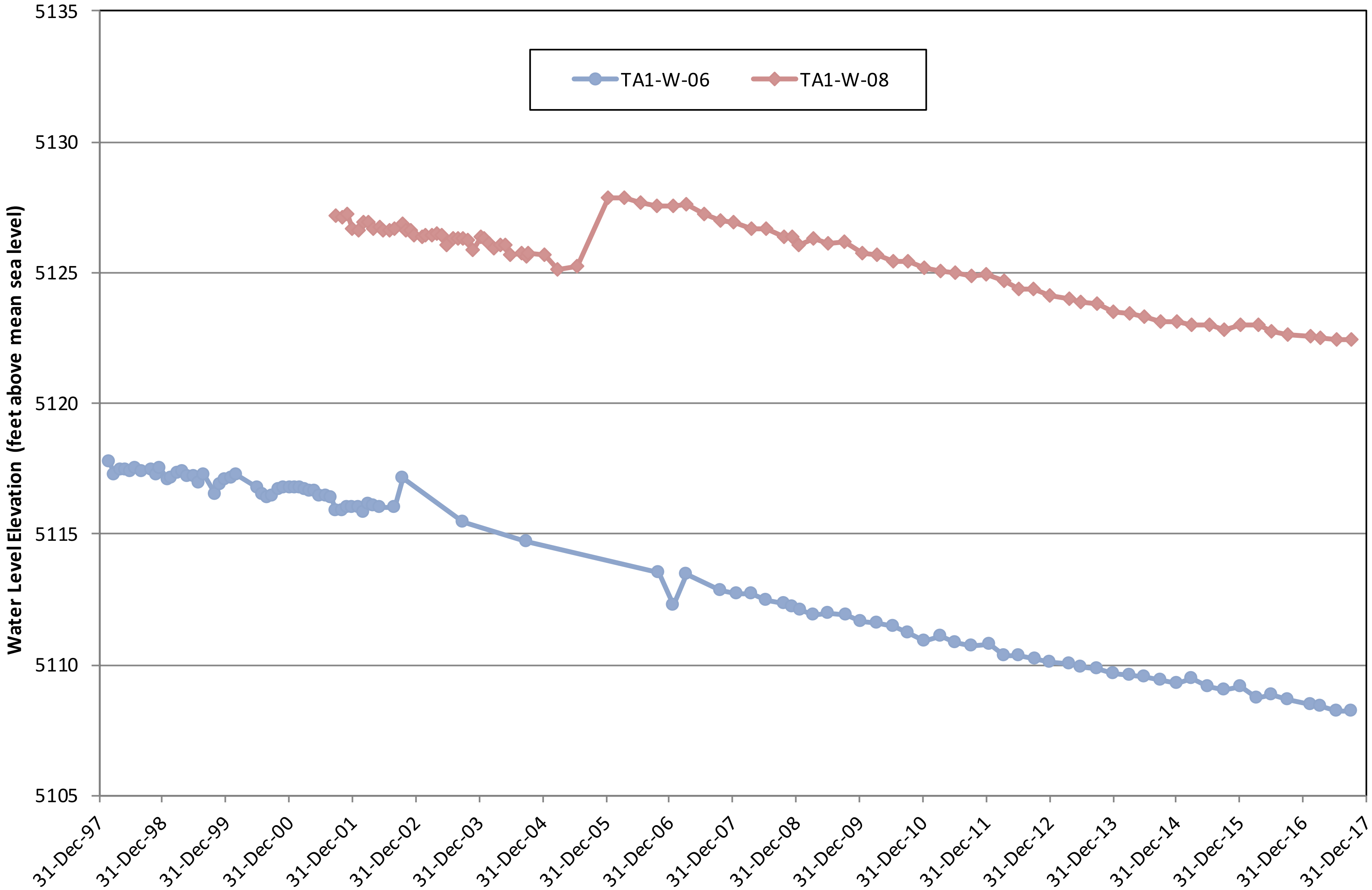


Figure 6B-9. TAG AOC Monitoring Wells (9 of 10)

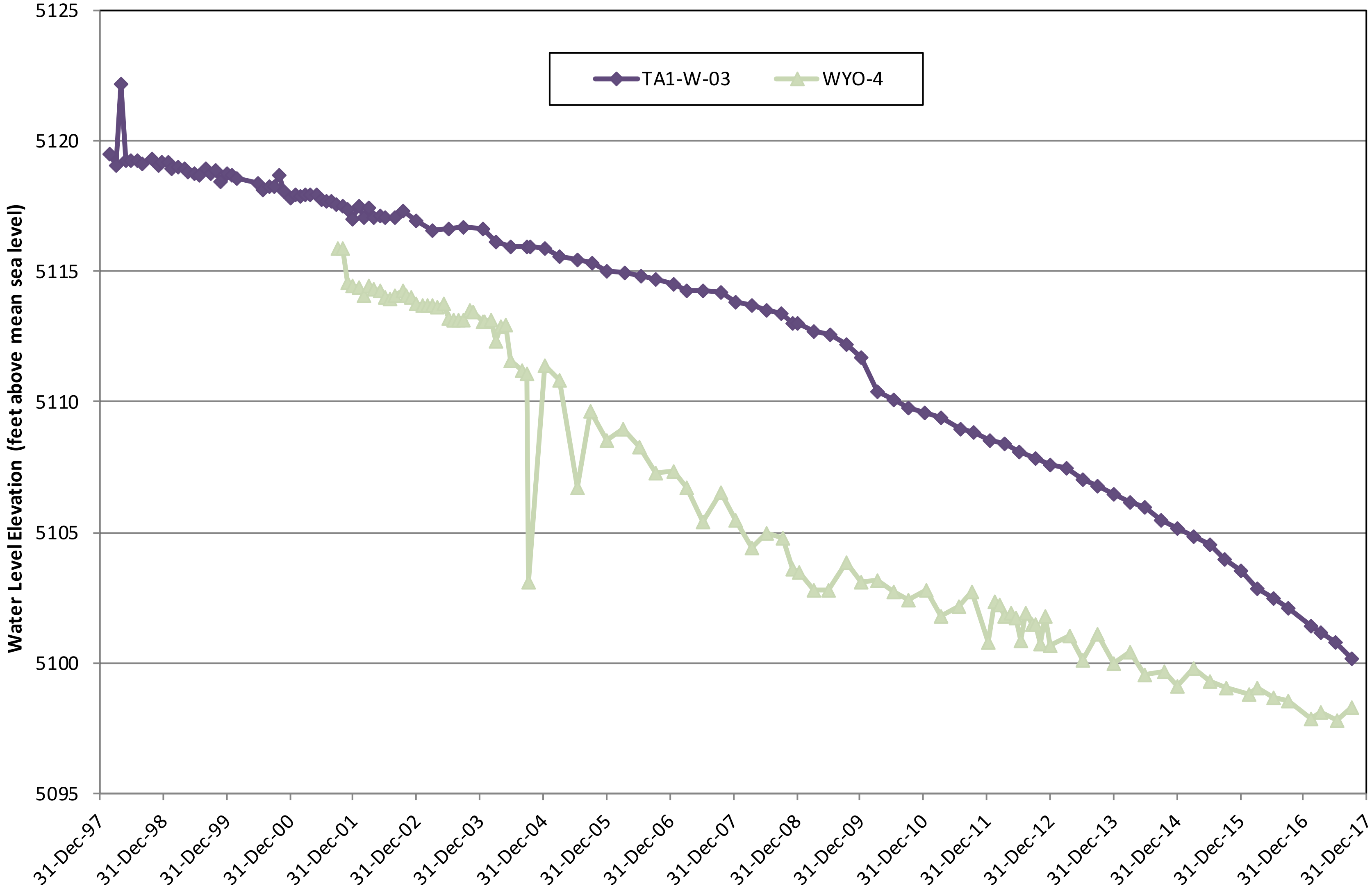


Figure 6B-10. TAG AOC Monitoring Wells (10 of 10)

Attachment 6C
Tijeras Arroyo Groundwater
Analytical Results Tables

This page intentionally left blank.

Attachment 6C Tables

This page intentionally left blank.

Table 6C-1
Summary of Detected Volatile Organic Compounds, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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]
TA1-W-06	1,1-Dichloroethene	0.820	0.300	1.00	7.00	J		101821-001	SW846-8260
07-Mar-17	Trichloroethene	0.390	0.300	1.00	5.00	J		101821-001	SW846-8260
TA2-W-01	Tetrachloroethene	0.360	0.300	1.00	5.00	J		101828-001	SW846-8260
09-Mar-17	Trichloroethene	1.14	0.300	1.00	5.00			101828-001	SW846-8260
TA2-W-01 (Duplicate)	Tetrachloroethene	0.370	0.300	1.00	5.00	J		101829-001	SW846-8260
09-Mar-17	Trichloroethene	1.19	0.300	1.00	5.00			101829-001	SW846-8260
TA2-W-19 27-Mar-17	Trichloroethene	1.63	0.300	1.00	5.00			101846-001	SW846-8260
TA2-W-26	Tetrachloroethene	0.850	0.300	1.00	5.00	J		101842-001	SW846-8260
24-Mar-17	Trichloroethene	0.910	0.300	1.00	5.00	J		101842-001	SW846-8260
TA2-W-27	Acetone	2.93	1.50	10.0	NE	J	10U	101835-001	SW846-8260
21-Mar-17	Tetrachloroethene	1.59	0.300	1.00	5.00			101835-001	SW846-8260
	Trichloroethene	1.23	0.300	1.00	5.00			101835-001	SW846-8260
TA2-W-27 (Duplicate)	Acetone	2.68	1.50	10.0	NE	J	10U	101836-001	SW846-8260
21-Mar-17	Tetrachloroethene	1.57	0.300	1.00	5.00			101836-001	SW846-8260
	Trichloroethene	1.20	0.300	1.00	5.00			101836-001	SW846-8260
TJA-2	1,1-Dichloroethane	0.370	0.300	1.00	NE	J		101852-001	SW846-8260
29-Mar-17	Trichloroethene	3.51	0.300	1.00	5.00			101852-001	SW846-8260
	cis-1,2-Dichloroethene	0.360	0.300	1.00	70.0	J		101852-001	SW846-8260
TJA-2 (Duplicate)	1,1-Dichloroethane	0.390	0.300	1.00	NE	J		101853-001	SW846-8260
29-Mar-17	Trichloroethene	3.54	0.300	1.00	5.00			101853-001	SW846-8260
	cis-1,2-Dichloroethene	0.360	0.300	1.00	70.0	J		101853-001	SW846-8260
TJA-6 22-Mar-17	Acetone	2.62	1.50	10.0	NE	J		101838-001	SW846-8260
TJA-7 30-Mar-17	Trichloroethene	1.64	0.300	1.00	5.00			101907-001	SW846-8260
TA2-W-19	1,1-Dichloroethane	0.310	0.300	1.00	NE	J		102859-001	SW846-8260
21-Jun-17	Methylene chloride	1.04	1.00	10.0	5.00	J		102859-001	SW846-8260
	Trichloroethene	2.19	0.300	1.00	5.00			102859-001	SW846-8260
TA2-W-26	Methylene chloride	1.06	1.50	10.0	5.00	J	10U	102857-001	SW846-8260
20-Jun-17	Tetrachloroethene	0.810	0.300	1.00	5.00	J		102857-001	SW846-8260
	Trichloroethene	1.01	0.300	1.00	5.00			102857-001	SW846-8260
	cis-1,2-Dichloroethene	0.380	0.300	1.00	70.0	J		102857-001	SW846-8260
TJA-2	1,1-Dichloroethane	0.390	0.300	1.00	NE	J		102865-001	SW846-8260
26-Jun-17	Trichloroethene	2.95	0.300	1.00	5.00			102865-001	SW846-8260

Refer to footnotes on page 6C-41.

Table 6C-1 *(Continued)*
Summary of Detected Volatile Organic Compounds, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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]
TJA-3 19-Jun-17	Methylene chloride	1.33	1.00	10.0	5.00	J	10U	102850-001	SW846-8260
TJA-3 (Duplicate) 19-Jun-17	Methylene chloride	1.23	1.00	10.0	5.00	J	10U	102851-001	SW846-8260
TJA-7 27-Jun-17	Trichloroethene	1.42	0.300	1.00	5.00			102868-001	SW846-8260
TA1-W-01 17-Aug-17	Acetone	3.32	1.50	10.0	NE	J	10UJ	103285-001	SW846-8260
	Methylene chloride	1.12	1.00	10.0	5.00	J	10U	103285-001	SW846-8260
TA1-W-01 (Duplicate) 17-Aug-17	Methylene chloride	1.31	1.00	10.0	5.00	J	10U	103286-001	SW846-8260
TA1-W-02 (Duplicate) 21-Aug-17	Acetone	1.61	1.50	10.0	NE	J	10U	103291-001	SW846-8260
TA1-W-04 (Duplicate) 28-Aug-17	Acetone	2.98	1.50	10.0	NE	J	10U	103300-001	SW846-8260
TA1-W-05 22-Aug-17	Acetone	1.60	1.50	10.0	NE	J	10UJ	103293-001	SW846-8260
TA1-W-06 06-Sep-17	1,1-Dichloroethene	0.840	0.300	1.00	7.00	J		103332-001	SW846-8260
	Trichloroethene	0.360	0.300	1.00	5.00	J		103332-001	SW846-8260
TA2-NW1-595 05-Sep-17	Acetone	1.60	1.50	10.0	NE	J	10U	103330-001	SW846-8260
TA2-W-01 07-Sep-17	Tetrachloroethene	0.360	0.300	1.00	5.00	J		103334-001	SW846-8260
	Trichloroethene	1.14	0.300	1.00	5.00			103334-001	SW846-8260
TA2-W-19 19-Sep-17	Acetone	2.02	1.50	10.0	NE	J		103353-001	SW846-8260
	Trichloroethene	1.66	0.300	1.00	5.00			103353-001	SW846-8260
TA2-W-26 18-Sep-17	Acetone	2.81	1.50	10.0	NE	J		103343-001	SW846-8260
	Tetrachloroethene	0.790	0.300	1.00	5.00	J		103343-001	SW846-8260
	Trichloroethene	0.850	0.300	1.00	5.00	J		103343-001	SW846-8260
	cis 1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		103343-001	SW846-8260
TA2-W-27 13-Sep-17	Tetrachloroethene	1.56	0.300	1.00	5.00			103336-001	SW846-8260
	Trichloroethene	1.08	0.300	1.00	5.00			103336-001	SW846-8260
TA2-W-28 20-Sep-17	Acetone	1.52	1.50	10.0	NE	J		103355-001	SW846-8260
TJA-2 21-Sep-17	1,1-Dichloroethane	0.350	0.300	1.00	NE	J		103357-001	SW846-8260
	Trichloroethene	3.32	0.300	1.00	5.00			103357-001	SW846-8260
	cis 1,2-Dichloroethene	0.420	0.300	1.00	70.0	J		103357-001	SW846-8260

Refer to footnotes on page 6C-41.

Table 6C-1 *(Concluded)*
Summary of Detected Volatile Organic Compounds,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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]
TJA-3 14-Sep-17	Trichloroethene	0.350	0.300	1.00	5.00	J		103341-001	SW846-8260
TJA-6 13-Sep-17	Toluene	0.390	0.300	1.00	1000	J		103338-001	SW846-8260
TJA-7 26-Sep-17	Trichloroethene	2.25	0.300	1.00	5.00			103360-001	SW846-8260
WYO-3 29-Aug-17	Acetone	1.57	1.50	10.0	NE	J		103306-001	SW846-8260
TA2-W-19 13-Dec-17	Trichloroethene	1.51	0.300	1.00	5.00			104111-001	SW846-8260
TA2-W-26	Tetrachloroethene	0.650	0.300	1.00	5.00	J		104116-001	SW846-8260
12-Dec-17	Trichloroethene	0.790	0.300	1.00	5.00	J		104116-001	SW846-8260
TA2-W-26 (Duplicate)	Tetrachloroethene	0.630	0.300	1.00	5.00	J		104117-001	SW846-8260
12-Dec-17	Trichloroethene	0.750	0.300	1.00	5.00	J		104117-001	SW846-8260
TJA-2	1,1-Dichloroethane	0.450	0.300	1.00	NE	J		104126-001	SW846-8260
15-Dec-17	Trichloroethene	4.00	0.300	1.00	5.00			104126-001	SW846-8260
	cis-1,2-Dichloroethene	0.430	0.300	1.00	70.0	J		104126-001	SW846-8260
TJA-7 18-Dec-17	Trichloroethene	2.22	0.300	1.00	5.00			104133-001	SW846-8260

Refer to footnotes on page 6C-41.

Table 6C-2
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] SW846-8260), Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

Analyte	MDL[b] (µg/L)	Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300	Chlorobenzene	0.300
1,1,2,2-Tetrachloroethane	0.300	Chloroethane	0.300
1,1,2-Trichloroethane	0.300	Chloroform	0.300
1,1-Dichloroethane	0.300	Chloromethane	0.300
1,1-Dichloroethene	0.300	Cyclohexane	0.300
1,2,3-Trichlorobenzene	0.300	Dibromochloromethane	0.300
1,2,4-Trichlorobenzene	0.300	Dichlorodifluoromethane	0.300
1,2-Dibromo-3-chloropropane	0.500	Ethyl benzene	0.300
1,2-Dibromoethane	0.300	Isopropylbenzene	0.300
1,2-Dichlorobenzene	0.300	Methyl acetate	1.50
1,2-Dichloroethane	0.300	Methylcyclohexane	0.300
1,2-Dichloropropane	0.300	Methylene chloride	1.00
1,3-Dichlorobenzene	0.300	Styrene	0.300
1,4-Dichlorobenzene	0.300	Tert-butyl methyl ether	0.300
2,2-trifluoroethane, 1,1,2-Trichloro-1	2.00	Tetrachloroethene	0.300
2-Butanone	1.50	Toluene	0.300
2-Hexanone	1.50	Trichloroethene	0.300
4-methyl-, 2-Pentanone	1.50	Trichlorofluoromethane	0.300
Acetone	1.50	Vinyl chloride	0.300
Benzene	0.300	Xylene	0.300
Bromochloromethane	0.300	cis-1,2-Dichloroethene	0.300
Bromodichloromethane	0.300	cis-1,3-Dichloropropene	0.300
Bromoform	0.300	m-, p-Xylene	0.300
Bromomethane	0.300	o-Xylene	0.300
Carbon disulfide	1.50	trans-1,2-Dichloroethene	0.300
Carbon tetrachloride	0.300	trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 6C-41.

Table 6C-3
Summary of Nitrate plus Nitrite Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 07-Mar-17	Nitrate plus nitrite	3.42	0.170	0.500	10.0			101821-002	EPA 353.2
TA2-W-01 09-Mar-17	Nitrate plus nitrite	4.56	0.170	0.500	10.0			101828-002	EPA 353.2
TA2-W-01 (Duplicate) 09-Mar-17	Nitrate plus nitrite	4.47	0.170	0.500	10.0			101829-002	EPA 353.2
TA2-W-19 27-Mar-17	Nitrate plus nitrite	**10.9**	0.170	0.500	10.0			101846-002	EPA 353.2
TA2-W-26 24-Mar-17	Nitrate plus nitrite	6.36	0.170	0.500	10.0			101842-002	EPA 353.2
TA2-W-27 21-Mar-17	Nitrate plus nitrite	4.57	0.085	0.250	10.0			101835-002	EPA 353.2
TA2-W-27 (Duplicate) 21-Mar-17	Nitrate plus nitrite	4.78	0.085	0.250	10.0			101836-002	EPA 353.2
TA2-W-28 28-Mar-17	Nitrate plus nitrite	**21.4**	0.850	2.50	10.0			101914-002	EPA 353.2
TJA-2 29-Mar-17	Nitrate plus nitrite	**11.1**	0.850	2.50	10.0			101852-002	EPA 353.2
TJA-2 (Duplicate) 29-Mar-17	Nitrate plus nitrite	**10.6**	0.850	2.50	10.0			101853-002	EPA 353.2
TJA-3 23-Mar-17	Nitrate plus nitrite	2.63	0.085	0.250	10.0	H	J	101840-002	EPA 353.2
TJA-4 31-Mar-17	Nitrate plus nitrite	**31.1**	0.850	2.50	10.0			101910-002	EPA 353.2
TJA-6 22-Mar-17	Nitrate plus nitrite	3.12	0.085	0.250	10.0			101838-002	EPA 353.2
TJA-7 30-Mar-17	Nitrate plus nitrite	**25.5**	0.850	2.50	10.0			101907-002	EPA 353.2
TA2-W-19 21-Jun-17	Nitrate plus nitrite	**11.2**	0.425	1.25	10.0			102859-002	EPA 353.2
TA2-W-26 20-Jun-17	Nitrate plus nitrite	6.09	0.170	0.500	10.0			102857-002	EPA 353.2
TA2-W-28 22-Jun-17	Nitrate plus nitrite	**18.1**	0.425	1.25	10.0			102861-002	EPA 353.2
TJA-2 26-Jun-17	Nitrate plus nitrite	**11.2**	0.425	1.25	10.0			102865-002	EPA 353.2

Refer to footnotes on page 6C-41.

Table 6C-3 *(Continued)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 19-Jun-17	Nitrate plus nitrite	2.74	0.085	0.250	10.0			102850-002	EPA 353.2
TJA-3 (Duplicate) 19-Jun-17	Nitrate plus nitrite	2.75	0.085	0.250	10.0			102851-002	EPA 353.2
TJA-4 28-Jun-17	Nitrate plus nitrite	**29.0**	0.850	2.50	10.0			102878-002	EPA 353.2
TJA-4 (Duplicate) 28-Jun-17	Nitrate plus nitrite	**29.2**	0.850	2.50	10.0			102879-002	EPA 353.2
TJA-7 27-Jun-17	Nitrate plus nitrite	**22.2**	0.850	2.50	10.0			102868-002	EPA 353.2
TA1-W-01 17-Aug-17	Nitrate plus nitrite	2.56	0.085	0.250	10.0			103285-002	EPA 353.2
TA1-W-01 (Duplicate) 17-Aug-17	Nitrate plus nitrite	2.52	0.085	0.250	10.0			103286-002	EPA 353.2
TA1-W-02 21-Aug-17	Nitrate plus nitrite	1.37	0.085	0.250	10.0			103290-002	EPA 353.2
TA1-W-02 (Duplicate) 21-Aug-17	Nitrate plus nitrite	1.10	0.017	0.050	10.0			103291-002	EPA 353.2
TA1-W-04 28-Aug-17	Nitrate plus nitrite	1.84	0.085	0.250	10.0			103299-002	EPA 353.2
TA1-W-04 (Duplicate) 28-Aug-17	Nitrate plus nitrite	1.81	0.085	0.250	10.0			103300-002	EPA 353.2
TA1-W-05 22-Aug-17	Nitrate plus nitrite	1.23	0.017	0.050	10.0			103293-002	EPA 353.2
TA1-W-06 06-Sep-17	Nitrate plus nitrite	3.32	0.085	0.250	10.0			103332-002	EPA 353.2
TA1-W-08 30-Aug-17	Nitrate plus nitrite	7.86	0.170	0.500	10.0			103311-002	EPA 353.2
TA1-W-08 (Duplicate) 30-Aug-17	Nitrate plus nitrite	7.93	0.170	0.500	10.0			103312-002	EPA 353.2
TA2-NW1-595 05-Sep-17	Nitrate plus nitrite	3.84	0.170	0.500	10.0			103330-002	EPA 353.2
TA2-W-01 07-Sep-17	Nitrate plus nitrite	4.38	0.170	0.500	10.0			103334-002	EPA 353.2
TA2-W-19 19-Sep-17	Nitrate plus nitrite	**11.1**	0.850	2.50	10.0			103353-002	EPA 353.2

Refer to footnotes on page 6C-41.

Table 6C-3 *(Continued)*
Summary of Nitrate plus Nitrite Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 18-Sep-17	Nitrate plus nitrite	6.30	0.425	1.25	10.0			103343-002	EPA 353.2
TA2-W-27 13-Sep-17	Nitrate plus nitrite	3.93	0.170	0.500	10.0			103336-002	EPA 353.2
TA2-W-28 20-Sep-17	Nitrate plus nitrite	**16.4**	1.70	5.00	10.0			103355-002	EPA 353.2
TJA-2 21-Sep-17	Nitrate plus nitrite	**11.0**	1.70	5.00	10.0			103357-002	EPA 353.2
TJA-3 14-Sep-17	Nitrate plus nitrite	2.68	0.085	0.250	10.0			103341-002	EPA 353.2
TJA-4 27-Sep-17	Nitrate plus nitrite	**29.9**	1.70	5.00	10.0			103364-002	EPA 353.2
TJA-6 13-Sep-17	Nitrate plus nitrite	2.47	0.085	0.250	10.0			103338-002	EPA 353.2
TJA-7 26-Sep-17	Nitrate plus nitrite	**23.4**	1.70	5.00	10.0			103360-002	EPA 353.2
WYO-3 29-Aug-17	Nitrate plus nitrite	2.11	0.085	0.250	10.0			103306-002	EPA 353.2
WYO-3 (Duplicate) 29-Aug-17	Nitrate plus nitrite	2.19	0.085	0.250	10.0			103307-002	EPA 353.2
TA2-W-19 13-Dec-17	Nitrate plus nitrite	**11.4**	0.425	1.25	10.0		J	104111-002	EPA 353.2
TA2-W-26 12-Dec-17	Nitrate plus nitrite	6.10	0.425	1.25	10.0		J	104116-002	EPA 353.2
TA2-W-26 (Duplicate) 12-Dec-17	Nitrate plus nitrite	6.23	0.425	1.25	10.0		J	104117-002	EPA 353.2
TA2-W-28 14-Dec-17	Nitrate plus nitrite	**16.9**	0.850	2.50	10.0		J	104123-002	EPA 353.2
TA2-W-28 (Duplicate) 14-Dec-17	Nitrate plus nitrite	**17.0**	0.850	2.50	10.0		J	104124-002	EPA 353.2

Refer to footnotes on page 6C-41.

Table 6C-3 *(Concluded)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 15-Dec-17	Nitrate plus nitrite	**12.2**	0.850	2.50	10.0			104126-002	EPA 353.2
TJA-3 11-Dec-17	Nitrate plus nitrite	2.67	0.085	0.250	10.0			104129-002	EPA 353.2
TJA-4 20-Dec-17	Nitrate plus nitrite	**33.1**	1.70	5.00	10.0			104131-002	EPA 353.2
TJA-7 18-Dec-17	Nitrate plus nitrite	**26.0**	0.850	2.50	10.0			104133-002	EPA 353.2

Refer to footnotes on page 6C-41.

Table 6C-4
Summary of Anions and Alkalinity Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Bromide	0.187	0.067	0.200	NE	J		103285-003	SW846 9056
17-Aug-17	Chloride	14.7	0.335	1.00	NE			103285-003	SW846 9056
	Fluoride	0.429	0.033	0.100	4.0			103285-003	SW846 9056
	Sulfate	80.4	0.665	2.00	NE			103285-003	SW846 9056
	Bicarbonate Alkalinity	176	1.45	4.00	NE			103285-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103285-004	SM 2320B
TA1-W-02	Bromide	0.182	0.067	0.200	NE	J		103290-003	SW846 9056
21-Aug-17	Chloride	13.6	0.670	2.00	NE		J	103290-003	SW846 9056
	Fluoride	0.351	0.033	0.100	4.0			103290-003	SW846 9056
	Sulfate	73.4	1.33	4.00	NE		J	103290-003	SW846 9056
	Bicarbonate Alkalinity	171	1.45	4.00	NE			103290-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103290-004	SM 2320B
TA1-W-04	Bromide	0.168	0.067	0.200	NE	J		103299-003	SW846 9056
28-Aug-17	Chloride	12.7	0.335	1.00	NE			103299-003	SW846 9056
	Fluoride	0.341	0.033	0.100	4.0			103299-003	SW846 9056
	Sulfate	70.0	0.665	2.00	NE			103299-003	SW846 9056
	Bicarbonate Alkalinity	176	1.45	4.00	NE			103299-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103299-004	SM 2320B
TA1-W-05	Bromide	0.147	0.067	0.200	NE	J		103293-003	SW846 9056
22-Aug-17	Chloride	10.1	0.670	2.00	NE			103293-003	SW846 9056
	Fluoride	0.249	0.033	0.100	4.0			103293-003	SW846 9056
	Sulfate	92.6	1.33	4.00	NE			103293-003	SW846 9056
	Bicarbonate Alkalinity	212	1.45	4.00	NE			103293-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103293-004	SM 2320B
TA1-W-06	Bromide	1.24	0.067	0.200	NE			103332-003	SW846 9056
06-Sep-17	Chloride	96.2	1.34	4.00	NE			103332-003	SW846 9056
	Fluoride	0.253	0.033	0.100	4.0			103332-003	SW846 9056
	Sulfate	195	2.66	8.00	NE	B		103332-003	SW846 9056
	Bicarbonate Alkalinity	89.2	1.45	4.00	NE			103332-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103332-004	SM 2320B

Refer to footnotes on page 6C-41.

Table 6C-4 *(Continued)*
Summary of Anions and Alkalinity Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Bromide	2.63	0.067	0.200	NE			103311-003	SW846 9056
30-Aug-17	Chloride	200	6.70	20.0	NE		J	103311-003	SW846 9056
	Fluoride	0.191	0.033	0.100	4.0			103311-003	SW846 9056
	Sulfate	684	13.3	40.0	NE		J	103311-003	SW846 9056
	Bicarbonate Alkalinity	83.2	1.45	4.00	NE			103311-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103311-004	SM 2320B
TA2-NW1-595	Bromide	ND	0.067	0.200	NE	U		103330-003	SW846 9056
05-Sep-17	Chloride	82.7	1.34	4.00	NE			103330-003	SW846 9056
	Fluoride	0.262	0.033	0.100	4.0			103330-003	SW846 9056
	Sulfate	94.1	2.66	8.00	NE	B		103330-003	SW846 9056
	Bicarbonate Alkalinity	137	1.45	4.00	NE			103330-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103330-004	SM 2320B
TA2-W-01	Bromide	1.36	0.067	0.200	NE			103334-003	SW846 9056
07-Sep-17	Chloride	91.6	1.34	4.00	NE			103334-003	SW846 9056
	Fluoride	0.294	0.033	0.100	4.0			103334-003	SW846 9056
	Sulfate	55.1	2.66	8.00	NE	B		103334-003	SW846 9056
	Bicarbonate Alkalinity	99.0	1.45	4.00	NE			103334-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103334-004	SM 2320B
TA2-W-19	Bromide	0.724	0.067	0.200	NE			103353-003	SW846 9056
19-Sep-17	Chloride	52.9	0.670	2.00	NE			103353-003	SW846 9056
	Fluoride	0.362	0.033	0.100	4.0			103353-003	SW846 9056
	Sulfate	57.0	1.33	4.00	NE			103353-003	SW846 9056
	Bicarbonate Alkalinity	113	1.45	4.00	NE			103353-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103353-004	SM 2320B
TA2-W-26	Bromide	2.52	0.067	0.200	NE			103343-003	SW846 9056
18-Sep-17	Chloride	198	3.35	10.0	NE			103343-003	SW846 9056
	Fluoride	0.199	0.033	0.100	4.0			103343-003	SW846 9056
	Sulfate	419	6.65	20.0	NE	B		103343-003	SW846 9056
	Bicarbonate Alkalinity	81.8	1.45	4.00	NE			103343-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103343-004	SM 2320B
TA2-W-27	Bromide	1.42	0.067	0.200	NE			103336-003	SW846 9056
13-Sep-17	Chloride	103	1.34	4.00	NE			103336-003	SW846 9056
	Fluoride	0.259	0.033	0.100	4.0			103336-003	SW846 9056
	Sulfate	138	2.66	8.00	NE	B		103336-003	SW846 9056
	Bicarbonate Alkalinity	98.8	1.45	4.00	NE			103336-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103336-004	SM 2320B

Refer to footnotes on page 6C-41.

Table 6C-4 *(Continued)*
Summary of Anions and Alkalinity Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-28	Bromide	0.514	0.067	0.200	NE			103355-003	SW846 9056
20-Sep-17	Chloride	33.6	0.335	1.00	NE			103355-003	SW846 9056
	Fluoride	0.411	0.033	0.100	4.0			103355-003	SW846 9056
	Sulfate	16.6	0.133	0.400	NE		J	103355-003	SW846 9056
	Bicarbonate Alkalinity	122	1.45	4.00	NE			103355-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103355-004	SM 2320B
TJA-2	Bromide	0.856	0.067	0.200	NE			103357-003	SW846 9056
21-Sep-17	Chloride	63.9	0.670	2.00	NE			103357-003	SW846 9056
	Fluoride	0.328	0.033	0.100	4.0			103357-003	SW846 9056
	Sulfate	51.0	1.33	4.00	NE			103357-003	SW846 9056
	Bicarbonate Alkalinity	110	1.45	4.00	NE			103357-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103357-004	SM 2320B
TJA-3	Bromide	0.162	0.067	0.200	NE	J		103341-003	SW846 9056
14-Sep-17	Chloride	12.4	0.670	2.00	NE			103341-003	SW846 9056
	Fluoride	0.332	0.033	0.100	4.0			103341-003	SW846 9056
	Sulfate	75.0	1.33	4.00	NE	B		103341-003	SW846 9056
	Bicarbonate Alkalinity	173	1.45	4.00	NE			103341-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103341-004	SM 2320B
TJA-4	Bromide	0.338	0.067	0.200	NE			103364-003	SW846 9056
27-Sep-17	Chloride	20.3	0.670	2.00	NE			103364-003	SW846 9056
	Fluoride	0.384	0.033	0.100	4.0			103364-003	SW846 9056
	Sulfate	16.9	1.33	4.00	NE			103364-003	SW846 9056
	Bicarbonate Alkalinity	137	1.45	4.00	NE			103364-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103364-004	SM 2320B
TJA-6	Bromide	0.183	0.067	0.200	NE	J		103338-003	SW846 9056
13-Sep-17	Chloride	13.6	0.335	1.00	NE		J	103338-003	SW846 9056
	Fluoride	0.381	0.033	0.100	4.0			103338-003	SW846 9056
	Sulfate	61.8	0.665	2.00	NE	B	J	103338-003	SW846 9056
	Bicarbonate Alkalinity	165	1.45	4.00	NE			103338-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103338-004	SM 2320B

Refer to footnotes on page 6C-41.

Table 6C-4 *(Concluded)*
Summary of Anions and Alkalinity Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.407	0.067	0.200	NE			103360-003	SW846 9056
26-Sep-17	Chloride	22.5	0.670	2.00	NE			103360-003	SW846 9056
	Fluoride	0.366	0.033	0.100	4.0			103360-003	SW846 9056
	Sulfate	22.5	1.33	4.00	NE			103360-003	SW846 9056
	Bicarbonate Alkalinity	131	1.45	4.00	NE			103360-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103360-004	SM 2320B
WYO-3	Bromide	0.222	0.067	0.200	NE			103306-003	SW846 9056
29-Aug-17	Chloride	15.8	0.670	2.00	NE			103306-003	SW846 9056
	Fluoride	0.444	0.033	0.100	4.0			103306-003	SW846 9056
	Sulfate	90.1	1.33	4.00	NE			103306-003	SW846 9056
	Bicarbonate Alkalinity	157	1.45	4.00	NE			103306-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		103306-004	SM 2320B

Refer to footnotes on page 6C-41.

Table 6C-5
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103285-005	SW846 6020
17-Aug-17	Antimony	ND	0.001	0.003	0.006	U		103285-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103285-005	SW846 6020
	Barium	0.0569	0.00067	0.002	2.00			103285-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103285-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103285-005	SW846 6020
	Calcium	70.4	0.800	2.00	NE			103285-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103285-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103285-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103285-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103285-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103285-005	SW846 6020
	Magnesium	13.7	0.010	0.030	NE		J	103285-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103285-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103285-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103285-005	SW846 6020
	Potassium	2.19	0.080	0.300	NE			103285-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		103285-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103285-005	SW846 6020
	Sodium	26.5	0.080	0.250	NE		J	103285-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103285-005	SW846 6020
	Uranium	0.00339	0.000067	0.0002	0.030			103285-005	SW846 6020
	Vanadium	0.00581	0.0033	0.010	NE	J		103285-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103285-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	ND	0.0193	0.050	NE	U		103290-005	SW846 6020
21-Aug-17	Antimony	ND	0.001	0.003	0.006	U		103290-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103290-005	SW846 6020
	Barium	0.0482	0.00067	0.002	2.00			103290-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103290-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103290-005	SW846 6020
	Calcium	69.5	0.800	2.00	NE			103290-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103290-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103290-005	SW846 6020
	Copper	0.000669	0.0003	0.001	NE	J		103290-005	SW846 6020
	Iron	0.155	0.033	0.100	NE			103290-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103290-005	SW846 6020
	Magnesium	12.9	0.100	0.300	NE			103290-005	SW846 6020
	Manganese	0.00275	0.001	0.005	NE	J		103290-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103290-005	SW846 7470
	Nickel	0.0018	0.0006	0.002	NE	J		103290-005	SW846 6020
	Potassium	2.11	0.080	0.300	NE			103290-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		103290-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103290-005	SW846 6020
	Sodium	23.2	0.080	0.250	NE			103290-005	SW846 6020
	Thallium	0.000712	0.0006	0.002	0.002	J	0.002U	103290-005	SW846 6020
	Uranium	0.00365	0.000067	0.0002	0.030			103290-005	SW846 6020
	Vanadium	0.00567	0.0033	0.010	NE	J		103290-005	SW846 6020
	Zinc	0.00526	0.0033	0.010	NE	J		103290-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103299-005	SW846 6020
28-Aug-17	Antimony	ND	0.001	0.003	0.006	U		103299-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103299-005	SW846 6020
	Barium	0.0589	0.00067	0.002	2.00			103299-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103299-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103299-005	SW846 6020
	Calcium	71.8	0.400	1.00	NE			103299-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103299-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103299-005	SW846 6020
	Copper	0.000579	0.0003	0.001	NE	J		103299-005	SW846 6020
	Iron	0.183	0.033	0.100	NE			103299-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103299-005	SW846 6020
	Magnesium	11.1	0.010	0.030	NE			103299-005	SW846 6020
	Manganese	0.00159	0.001	0.005	NE	J		103299-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	103299-005	SW846 7470
	Nickel	0.00198	0.0006	0.002	NE	J		103299-005	SW846 6020
	Potassium	2.12	0.080	0.300	NE			103299-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		103299-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103299-005	SW846 6020
	Sodium	22.8	0.080	0.250	NE			103299-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103299-005	SW846 6020
	Uranium	0.00349	0.000067	0.0002	0.030			103299-005	SW846 6020
	Vanadium	0.00465	0.0033	0.010	NE	J		103299-005	SW846 6020
	Zinc	0.00902	0.0033	0.010	NE	B, J	0.010UJ	103299-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103293-005	SW846 6020
22-Aug-17	Antimony	ND	0.001	0.003	0.006	U		103293-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103293-005	SW846 6020
	Barium	0.0342	0.00067	0.002	2.00			103293-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103293-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103293-005	SW846 6020
	Calcium	90.1	0.400	1.00	NE			103293-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103293-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103293-005	SW846 6020
	Copper	0.000644	0.0003	0.001	NE	J		103293-005	SW846 6020
	Iron	0.190	0.033	0.100	NE			103293-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103293-005	SW846 6020
	Magnesium	12.1	0.050	0.150	NE			103293-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103293-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103293-005	SW846 7470
	Nickel	0.00179	0.0006	0.002	NE	J		103293-005	SW846 6020
	Potassium	2.17	0.080	0.300	NE			103293-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		103293-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103293-005	SW846 6020
	Sodium	31.7	0.400	1.25	NE			103293-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103293-005	SW846 6020
	Uranium	0.00392	0.000067	0.0002	0.030			103293-005	SW846 6020
	Vanadium	0.00393	0.0033	0.010	NE	J		103293-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103293-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	ND	0.0193	0.050	NE	U		103332-005	SW846 6020
06-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103332-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103332-005	SW846 6020
	Barium	0.0254	0.00067	0.002	2.00			103332-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103332-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103332-005	SW846 6020
	Calcium	122	1.60	4.00	NE			103332-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103332-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103332-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103332-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103332-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103332-005	SW846 6020
	Magnesium	16.2	0.010	0.030	NE	B		103332-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U	UJ	103332-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103332-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103332-005	SW846 6020
	Potassium	1.94	0.080	0.300	NE			103332-005	SW846 6020
	Selenium	0.00872	0.002	0.005	0.050			103332-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103332-005	SW846 6020
	Sodium	30.7	0.080	0.250	NE			103332-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103332-005	SW846 6020
	Uranium	0.0011	0.000067	0.0002	0.030			103332-005	SW846 6020
	Vanadium	0.0051	0.0033	0.010	NE	J		103332-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103332-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0351	0.0193	0.050	NE	J	0.05U	103311-005	SW846 6020
30-Aug-17	Antimony	ND	0.001	0.003	0.006	U		103311-005	SW846 6020
	Arsenic	0.00215	0.002	0.005	0.010	J		103311-005	SW846 6020
	Barium	0.0186	0.00067	0.002	2.00			103311-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103311-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103311-005	SW846 6020
	Calcium	332	0.800	2.00	NE			103311-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103311-005	SW846 6020
	Cobalt	0.000548	0.0003	0.001	NE	J		103311-005	SW846 6020
	Copper	0.00181	0.0003	0.001	NE		J+	103311-005	SW846 6020
	Iron	0.800	0.033	0.100	NE			103311-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103311-005	SW846 6020
	Magnesium	37.7	0.010	0.030	NE			103311-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103311-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	103311-005	SW846 7470
	Nickel	0.00712	0.0006	0.002	NE			103311-005	SW846 6020
	Potassium	2.99	0.080	0.300	NE			103311-005	SW846 6020
	Selenium	0.0283	0.002	0.005	0.050			103311-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103311-005	SW846 6020
	Sodium	76.2	0.800	2.50	NE			103311-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103311-005	SW846 6020
	Uranium	0.00181	0.000067	0.0002	0.030			103311-005	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		103311-005	SW846 6020
	Zinc	0.00699	0.0033	0.010	NE	B, J	0.01UJ	103311-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103330-005	SW846 6020
05-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103330-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103330-005	SW846 6020
	Barium	0.0426	0.00067	0.002	2.00			103330-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103330-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103330-005	SW846 6020
	Calcium	90.4	1.60	4.00	NE			103330-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103330-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103330-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103330-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103330-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103330-005	SW846 6020
	Magnesium	15.6	0.010	0.030	NE	B		103330-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103330-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103330-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103330-005	SW846 6020
	Potassium	2.23	0.080	0.300	NE			103330-005	SW846 6020
	Selenium	0.00776	0.002	0.005	0.050			103330-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103330-005	SW846 6020
	Sodium	29.6	0.080	0.250	NE			103330-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103330-005	SW846 6020
	Uranium	0.00202	0.000067	0.0002	0.030			103330-005	SW846 6020
	Vanadium	0.00478	0.0033	0.010	NE	J		103330-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103330-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0244	0.0193	0.050	NE	J		103334-005	SW846 6020
07-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103334-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103334-005	SW846 6020
	Barium	0.0637	0.00067	0.002	2.00			103334-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103334-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103334-005	SW846 6020
	Calcium	81.7	1.60	4.00	NE			103334-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103334-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103334-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103334-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103334-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103334-005	SW846 6020
	Magnesium	11.5	0.010	0.030	NE	B		103334-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103334-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103334-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103334-005	SW846 6020
	Potassium	1.68	0.080	0.300	NE			103334-005	SW846 6020
	Selenium	0.00706	0.002	0.005	0.050			103334-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103334-005	SW846 6020
	Sodium	21.1	0.080	0.250	NE			103334-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103334-005	SW846 6020
	Uranium	0.000976	0.000067	0.0002	0.030			103334-005	SW846 6020
	Vanadium	0.00538	0.0033	0.010	NE	J		103334-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103334-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-19	Aluminum	ND	0.0193	0.050	NE	U		103353-005	SW846 6020
19-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103353-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103353-005	SW846 6020
	Barium	0.0514	0.00067	0.002	2.00			103353-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103353-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103353-005	SW846 6020
	Calcium	72.4	0.800	2.00	NE			103353-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103353-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103353-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103353-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103353-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103353-005	SW846 6020
	Magnesium	12.2	0.010	0.030	NE			103353-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103353-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103353-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103353-005	SW846 6020
	Potassium	1.89	0.080	0.300	NE			103353-005	SW846 6020
	Selenium	0.00489	0.002	0.005	0.050	J		103353-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103353-005	SW846 6020
	Sodium	23.3	0.080	0.250	NE			103353-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103353-005	SW846 6020
	Uranium	0.00123	0.000067	0.0002	0.030			103353-005	SW846 6020
	Vanadium	0.00636	0.0033	0.010	NE	J		103353-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103353-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Aluminum	0.0381	0.0193	0.050	NE	J		103343-005	SW846 6020
18-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103343-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103343-005	SW846 6020
	Barium	0.0621	0.00067	0.002	2.00			103343-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103343-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103343-005	SW846 6020
	Calcium	222	0.800	2.00	NE			103343-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103343-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103343-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103343-005	SW846 6020
	Iron	0.0467	0.033	0.100	NE	J		103343-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103343-005	SW846 6020
	Magnesium	28.6	0.010	0.030	NE			103343-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103343-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103343-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103343-005	SW846 6020
	Potassium	2.61	0.080	0.300	NE			103343-005	SW846 6020
	Selenium	0.0212	0.002	0.005	0.050			103343-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103343-005	SW846 6020
	Sodium	42.3	0.080	0.250	NE			103343-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103343-005	SW846 6020
	Uranium	0.00123	0.000067	0.0002	0.030		J+	103343-005	SW846 6020
	Vanadium	0.00389	0.0033	0.010	NE	J		103343-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103343-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103336-005	SW846 6020
13-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103336-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103336-005	SW846 6020
	Barium	0.0519	0.00067	0.002	2.00			103336-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103336-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103336-005	SW846 6020
	Calcium	113	0.800	2.00	NE			103336-005	SW846 6020
	Chromium	0.0048	0.003	0.010	0.100	B, J	0.01U	103336-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103336-005	SW846 6020
	Copper	0.000653	0.0003	0.001	NE	J	J+	103336-005	SW846 6020
	Iron	0.246	0.033	0.100	NE			103336-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103336-005	SW846 6020
	Magnesium	14.2	0.010	0.030	NE			103336-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103336-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103336-005	SW846 7470
	Nickel	0.00262	0.0006	0.002	NE		J+	103336-005	SW846 6020
	Potassium	1.93	0.080	0.300	NE			103336-005	SW846 6020
	Selenium	0.00807	0.002	0.005	0.050			103336-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103336-005	SW846 6020
	Sodium	25.5	0.080	0.250	NE			103336-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103336-005	SW846 6020
	Uranium	0.00104	0.000067	0.0002	0.030			103336-005	SW846 6020
	Vanadium	0.00354	0.0033	0.010	NE	J		103336-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103336-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-28	Aluminum	ND	0.0193	0.050	NE	U		103355-005	SW846 6020
20-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103355-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103355-005	SW846 6020
	Barium	0.197	0.00067	0.002	2.00			103355-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103355-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103355-005	SW846 6020
	Calcium	58.9	0.800	2.00	NE			103355-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103355-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103355-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103355-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103355-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103355-005	SW846 6020
	Magnesium	10.8	0.010	0.030	NE			103355-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103355-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103355-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103355-005	SW846 6020
	Potassium	1.88	0.080	0.300	NE			103355-005	SW846 6020
	Selenium	0.00378	0.002	0.005	0.050	J		103355-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103355-005	SW846 6020
	Sodium	17.8	0.080	0.250	NE			103355-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103355-005	SW846 6020
	Uranium	0.00139	0.000067	0.0002	0.030			103355-005	SW846 6020
	Vanadium	0.00602	0.0033	0.010	NE	J		103355-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103355-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103357-005	SW846 6020
21-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103357-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103357-005	SW846 6020
	Barium	0.046	0.00067	0.002	2.00			103357-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103357-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103357-005	SW846 6020
	Calcium	73.3	0.800	2.00	NE			103357-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103357-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103357-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103357-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103357-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103357-005	SW846 6020
	Magnesium	11.5	0.010	0.030	NE			103357-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103357-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103357-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103357-005	SW846 6020
	Potassium	1.78	0.080	0.300	NE			103357-005	SW846 6020
	Selenium	0.00457	0.002	0.005	0.050	J		103357-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103357-005	SW846 6020
	Sodium	21.8	0.080	0.250	NE			103357-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103357-005	SW846 6020
	Uranium	0.00121	0.000067	0.0002	0.030			103357-005	SW846 6020
	Vanadium	0.00615	0.0033	0.010	NE	J		103357-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103357-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103341-005	SW846 6020
14-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103341-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103341-005	SW846 6020
	Barium	0.0402	0.00067	0.002	2.00			103341-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103341-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103341-005	SW846 6020
	Calcium	70.3	0.400	1.00	NE			103341-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103341-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103341-005	SW846 6020
	Copper	0.000574	0.0003	0.001	NE	J		103341-005	SW846 6020
	Iron	0.135	0.033	0.100	NE			103341-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103341-005	SW846 6020
	Magnesium	10.9	0.010	0.030	NE			103341-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103341-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103341-005	SW846 7470
	Nickel	0.00163	0.0006	0.002	NE	J		103341-005	SW846 6020
	Potassium	1.82	0.080	0.300	NE			103341-005	SW846 6020
	Selenium	0.00205	0.002	0.005	0.050	J		103341-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103341-005	SW846 6020
	Sodium	24.0	0.080	0.250	NE			103341-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103341-005	SW846 6020
	Uranium	0.00226	0.000067	0.0002	0.030			103341-005	SW846 6020
	Vanadium	0.00366	0.0033	0.010	NE	J		103341-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103341-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		103364-005	SW846 6020
27-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103364-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103364-005	SW846 6020
	Barium	0.168	0.00067	0.002	2.00			103364-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103364-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103364-005	SW846 6020
	Calcium	69.4	0.800	2.00	NE			103364-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103364-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103364-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103364-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103364-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103364-005	SW846 6020
	Magnesium	13.7	0.010	0.030	NE			103364-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103364-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103364-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103364-005	SW846 6020
	Potassium	3.24	0.080	0.300	NE			103364-005	SW846 6020
	Selenium	0.00336	0.002	0.005	0.050	J		103364-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103364-005	SW846 6020
	Sodium	25.3	0.080	0.250	NE			103364-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103364-005	SW846 6020
	Uranium	0.00275	0.000067	0.0002	0.030			103364-005	SW846 6020
	Vanadium	0.00632	0.0033	0.010	NE	J		103364-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103364-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0805	0.0193	0.050	NE			103338-005	SW846 6020
13-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103338-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103338-005	SW846 6020
	Barium	0.062	0.00067	0.002	2.00			103338-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103338-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103338-005	SW846 6020
	Calcium	63.9	0.400	1.00	NE			103338-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103338-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103338-005	SW846 6020
	Copper	0.00201	0.0003	0.001	NE			103338-005	SW846 6020
	Iron	0.183	0.033	0.100	NE			103338-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103338-005	SW846 6020
	Magnesium	11.3	0.010	0.030	NE			103338-005	SW846 6020
	Manganese	0.00223	0.001	0.005	NE	J		103338-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103338-005	SW846 7470
	Nickel	0.00172	0.0006	0.002	NE	J		103338-005	SW846 6020
	Potassium	2.16	0.080	0.300	NE			103338-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		103338-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103338-005	SW846 6020
	Sodium	22.4	0.080	0.250	NE			103338-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103338-005	SW846 6020
	Uranium	0.00288	0.000067	0.0002	0.030			103338-005	SW846 6020
	Vanadium	0.00567	0.0033	0.010	NE	J		103338-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103338-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.123	0.0193	0.050	NE			103360-005	SW846 6020
26-Sep-17	Antimony	ND	0.001	0.003	0.006	U		103360-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103360-005	SW846 6020
	Barium	0.219	0.00067	0.002	2.00			103360-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103360-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103360-005	SW846 6020
	Calcium	72.3	0.800	2.00	NE			103360-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103360-005	SW846 6020
	Cobalt	0.00105	0.0003	0.001	NE			103360-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103360-005	SW846 6020
	Iron	0.0823	0.033	0.100	NE	J		103360-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103360-005	SW846 6020
	Magnesium	12.8	0.010	0.030	NE			103360-005	SW846 6020
	Manganese	0.00219	0.001	0.005	NE	J		103360-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103360-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		103360-005	SW846 6020
	Potassium	2.13	0.080	0.300	NE			103360-005	SW846 6020
	Selenium	0.0049	0.002	0.005	0.050	J		103360-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103360-005	SW846 6020
	Sodium	19.1	0.080	0.250	NE			103360-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103360-005	SW846 6020
	Uranium	0.00179	0.000067	0.0002	0.030			103360-005	SW846 6020
	Vanadium	0.0066	0.0033	0.010	NE	J		103360-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		103360-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-5 *(Concluded)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0409	0.0193	0.050	NE	J	0.05U	103306-005	SW846 6020
29-Aug-17	Antimony	ND	0.001	0.003	0.006	U		103306-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103306-005	SW846 6020
	Barium	0.0491	0.00067	0.002	2.00			103306-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103306-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103306-005	SW846 6020
	Calcium	64.7	0.400	1.00	NE			103306-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		103306-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103306-005	SW846 6020
	Copper	0.000525	0.0003	0.001	NE	J		103306-005	SW846 6020
	Iron	0.174	0.033	0.100	NE			103306-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103306-005	SW846 6020
	Magnesium	11.6	0.010	0.030	NE			103306-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103306-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	103306-005	SW846 7470
	Nickel	0.00183	0.0006	0.002	NE	J		103306-005	SW846 6020
	Potassium	2.33	0.080	0.300	NE			103306-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		103306-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103306-005	SW846 6020
	Sodium	28.0	0.080	0.250	NE			103306-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103306-005	SW846 6020
	Uranium	0.00352	0.000067	0.0002	0.030			103306-005	SW846 6020
	Vanadium	0.00579	0.0033	0.010	NE	J		103306-005	SW846 6020
	Zinc	0.00625	0.0033	0.010	NE	B, J	0.01UJ	103306-005	SW846 6020

Refer to footnotes on page 6C-41.

Table 6C-6
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-01	Americium-241	0.180 ± 12.4	20.6	9.97	NE	U	BD	103285-006	EPA 901.1
17-Aug-17	Cesium-137	0.662 ± 1.89	3.36	1.59	NE	U	BD	103285-006	EPA 901.1
	Cobalt-60	0.541 ± 1.86	3.56	1.63	NE	U	BD	103285-006	EPA 901.1
	Potassium-40	6.09 ± 56.5	31.7	14.4	NE	U	BD	103285-006	EPA 901.1
	Gross Alpha	4.35	NA	NA	15 pCi/L	NA	None	103285-007	EPA 900.0
	Gross Beta	3.74 ± 1.28	1.69	0.814	4 mrem/yr		J	103285-007	EPA 900.0
	Tritium	-19.3 ± 82.8	151	70.7	NE	U	BD	103285-008	EPA 906.0 M
TA1-W-02	Americium-241	5.46 ± 8.13	13.0	6.30	NE	U	BD	103290-006	EPA 901.1
21-Aug-17	Cesium-137	-1.33 ± 1.84	2.52	1.18	NE	U	BD	103290-006	EPA 901.1
	Cobalt-60	-0.0827 ± 1.54	2.83	1.29	NE	U	BD	103290-006	EPA 901.1
	Potassium-40	-8.71 ± 32.5	42.3	19.9	NE	U	BD	103290-006	EPA 901.1
	Gross Alpha	0.17	NA	NA	15 pCi/L	NA	None	103290-007	EPA 900.0
	Gross Beta	3.27 ± 1.06	1.41	0.687	4 mrem/yr		J	103290-007	EPA 900.0
	Tritium	-27.9 ± 86.2	159	74.2	NE	U	BD	103290-008	EPA 906.0 M
TA1-W-04	Americium-241	0.0829 ± 7.19	11.6	5.61	NE	U	BD	103299-006	EPA 901.1
28-Aug-17	Cesium-137	0.218 ± 1.88	3.28	1.55	NE	U	BD	103299-006	EPA 901.1
	Cobalt-60	-0.549 ± 1.98	3.45	1.58	NE	U	BD	103299-006	EPA 901.1
	Potassium-40	26.7 ± 47.3	33.0	15.1	NE	U	BD	103299-006	EPA 901.1
	Gross Alpha	0.85	NA	NA	15 pCi/L	NA	None	103299-007	EPA 900.0
	Gross Beta	1.73 ± 0.775	1.12	0.542	4 mrem/yr		J	103299-007	EPA 900.0
	Tritium	-18.8 ± 80.8	148	69.0	NE	U	BD	103299-008	EPA 906.0 M
TA1-W-05	Americium-241	1.12 ± 7.78	13.5	6.55	NE	U	BD	103293-006	EPA 901.1
22-Aug-17	Cesium-137	0.811 ± 2.19	2.54	1.21	NE	U	BD	103293-006	EPA 901.1
	Cobalt-60	1.30 ± 1.51	2.79	1.30	NE	U	BD	103293-006	EPA 901.1
	Potassium-40	-9.48 ± 33.6	41.9	20.0	NE	U	BD	103293-006	EPA 901.1
	Gross Alpha	0.93	NA	NA	15 pCi/L	NA	None	103293-007	EPA 900.0
	Gross Beta	2.70 ± 0.994	1.38	0.674	4 mrem/yr		J	103293-007	EPA 900.0
	Tritium	-21.8 ± 86.0	158	73.6	NE	U	BD	103293-008	EPA 906.0 M
TA1-W-06	Americium-241	2.28 ± 6.73	11.9	5.76	NE	U	BD	103332-006	EPA 901.1
06-Sep-17	Cesium-137	-2.11 ± 3.56	4.09	1.96	NE	U	BD	103332-006	EPA 901.1
	Cobalt-60	1.45 ± 1.74	3.24	1.49	NE	U	BD	103332-006	EPA 901.1
	Potassium-40	37.9 ± 44.2	27.9	12.6	NE	X	R	103332-006	EPA 901.1
	Gross Alpha	0.06	NA	NA	15 pCi/L	NA	None	103332-007	EPA 900.0
	Gross Beta	1.89 ± 0.917	1.33	0.630	4 mrem/yr		J	103332-007	EPA 900.0
	Tritium	24.9 ± 88.4	156	72.4	NE	U	BD	103332-008	EPA 906.0 M

Refer to footnotes on page 6C-41.

Table 6C-6 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-08	Americium-241	10.3 ± 16.1	13.7	6.61	NE	U	BD	103311-006	EPA 901.1
30-Aug-17	Cesium-137	0.442 ± 1.81	3.23	1.52	NE	U	BD	103311-006	EPA 901.1
	Cobalt-60	0.090 ± 1.68	3.14	1.43	NE	U	BD	103311-006	EPA 901.1
	Potassium-40	81.1 ± 30.6	29.4	13.3	NE		J	103311-006	EPA 901.1
	Gross Alpha	6.95	NA	NA	15 pCi/L	NA	None	103311-007	EPA 900.0
	Gross Beta	3.19 ± 1.71	2.46	1.15	4 mrem/yr		NJ+	103311-007	EPA 900.0
	Tritium	22.9 ± 86.1	151	70.8	NE	U	BD	103311-008	EPA 906.0 M
TA2-NW1-595	Americium-241	-4.94 ± 13.3	20.5	9.87	NE	U	BD	103330-006	EPA 901.1
05-Sep-17	Cesium-137	-0.226 ± 2.01	3.24	1.52	NE	U	BD	103330-006	EPA 901.1
	Cobalt-60	-1.03 ± 2.15	3.55	1.61	NE	U	BD	103330-006	EPA 901.1
	Potassium-40	-9.77 ± 38.1	54.7	25.7	NE	U	BD	103330-006	EPA 901.1
	Gross Alpha	-1.54	NA	NA	15 pCi/L	NA	None	103330-007	EPA 900.0
	Gross Beta	2.01 ± 1.10	1.59	0.764	4 mrem/yr		J	103330-007	EPA 900.0
	Tritium	10.9 ± 81.3	145	67.5	NE	U	BD	103330-008	EPA 906.0 M
TA2-W-01	Americium-241	1.16 ± 14.4	23.5	11.4	NE	U	BD	103334-006	EPA 901.1
07-Sep-17	Cesium-137	1.36 ± 2.03	3.50	1.66	NE	U	BD	103334-006	EPA 901.1
	Cobalt-60	-1.11 ± 2.12	3.57	1.64	NE	U	BD	103334-006	EPA 901.1
	Potassium-40	39.8 ± 55.7	34.5	15.8	NE	X	R	103334-006	EPA 901.1
	Gross Alpha	2.15	NA	NA	15 pCi/L	NA	None	103334-007	EPA 900.0
	Gross Beta	2.32 ± 1.08	1.63	0.793	4 mrem/yr		J	103334-007	EPA 900.0
	Tritium	-19.1 ± 78.7	144	67.3	NE	U	BD	103334-008	EPA 906.0 M
TA2-W-19	Americium-241	-12.3 ± 15.6	23.8	11.5	NE	U	BD	103353-006	EPA 901.1
19-Sep-17	Cesium-137	-0.976 ± 1.90	3.05	1.43	NE	U	BD	103353-006	EPA 901.1
	Cobalt-60	1.06 ± 2.05	3.81	1.75	NE	U	BD	103353-006	EPA 901.1
	Potassium-40	13.1 ± 45.9	32.0	14.4	NE	U	BD	103353-006	EPA 901.1
	Gross Alpha	1.73	NA	NA	15 pCi/L	NA	None	103353-007	EPA 900.0
	Gross Beta	1.96 ± 0.608	0.713	0.338	4 mrem/yr		J	103353-007	EPA 900.0
	Tritium	-1.11 ± 85.7	154	72.0	NE	U	BD	103353-008	EPA 906.0 M
TA2-W-26	Americium-241	-14.8 ± 17.2	22.3	10.8	NE	U	BD	103343-006	EPA 901.1
18-Sep-17	Cesium-137	-0.409 ± 1.93	3.34	1.56	NE	U	BD	103343-006	EPA 901.1
	Cobalt-60	0.0478 ± 1.99	3.78	1.72	NE	U	BD	103343-006	EPA 901.1
	Potassium-40	26.8 ± 56.8	34.0	15.3	NE	U	BD	103343-006	EPA 901.1
	Gross Alpha	1.40	NA	NA	15 pCi/L	NA	None	103343-007	EPA 900.0
	Gross Beta	8.29 ± 2.45	3.10	1.51	4 mrem/yr		J	103343-007	EPA 900.0
	Tritium	92.0 ± 94.1	154	71.8	NE	U	BD	103343-008	EPA 906.0 M

Refer to footnotes on page 6C-41.

Table 6C-6 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-27	Americium-241	-3.23 ± 13.1	14.9	7.23	NE	U	BD	103336-006	EPA 901.1
13-Sep-17	Cesium-137	0.0532 ± 1.73	3.07	1.44	NE	U	BD	103336-006	EPA 901.1
	Cobalt-60	0.566 ± 1.87	3.17	1.45	NE	U	BD	103336-006	EPA 901.1
	Potassium-40	-11.3 ± 38.1	43.5	20.3	NE	U	BD	103336-006	EPA 901.1
	Gross Alpha	1.08	NA	NA	15 pCi/L	NA	None	103336-007	EPA 900.0
	Gross Beta	1.27 ± 1.44	2.39	1.17	4 mrem/yr	U	BD	103336-007	EPA 900.0
	Tritium	-24.6 ± 82.0	151	70.5	NE	U	BD	103336-008	EPA 906.0 M
TA2-W-28	Americium-241	5.75 ± 18.7	30.0	14.6	NE	U	BD	103355-006	EPA 901.1
20-Sep-17	Cesium-137	-0.103 ± 2.00	3.51	1.66	NE	U	BD	103355-006	EPA 901.1
	Cobalt-60	-0.718 ± 2.15	3.82	1.75	NE	U	BD	103355-006	EPA 901.1
	Potassium-40	5.58 ± 59.5	35.8	16.3	NE	U	BD	103355-006	EPA 901.1
	Gross Alpha	2.85	NA	NA	15 pCi/L	NA	None	103355-007	EPA 900.0
	Gross Beta	1.67 ± 0.829	1.20	0.570	4 mrem/yr		J	103355-007	EPA 900.0
	Tritium	70.5 ± 91.2	153	71.2	NE	U	BD	103355-008	EPA 906.0 M
TJA-2	Americium-241	3.01 ± 13.5	21.6	10.5	NE	U	BD	103357-006	EPA 901.1
21-Sep-17	Cesium-137	0.400 ± 1.86	3.45	1.63	NE	U	BD	103357-006	EPA 901.1
	Cobalt-60	-0.00782 ± 2.03	3.65	1.66	NE	U	BD	103357-006	EPA 901.1
	Potassium-40	17.3 ± 51.5	36.2	16.5	NE	U	BD	103357-006	EPA 901.1
	Gross Alpha	1.97	NA	NA	15 pCi/L	NA	None	103357-007	EPA 900.0
	Gross Beta	2.09 ± 0.830	1.11	0.528	4 mrem/yr		J	103357-007	EPA 900.0
	Tritium	10.4 ± 84.5	151	70.3	NE	U	BD	103357-008	EPA 906.0 M
TJA-3	Americium-241	4.21 ± 8.63	14.8	7.18	NE	U	BD	103341-006	EPA 901.1
14-Sep-17	Cesium-137	0.773 ± 1.56	2.80	1.33	NE	U	BD	103341-006	EPA 901.1
	Cobalt-60	0.0121 ± 1.55	2.91	1.34	NE	U	BD	103341-006	EPA 901.1
	Potassium-40	-5.58 ± 34.2	49.1	23.4	NE	U	BD	103341-006	EPA 901.1
	Gross Alpha	1.23	NA	NA	15 pCi/L	NA	None	103341-007	EPA 900.0
	Gross Beta	1.06 ± 0.666	1.01	0.486	4 mrem/yr		J	103341-007	EPA 900.0
	Tritium	-9.27 ± 82.6	150	70.0	NE	U	BD	103341-008	EPA 906.0 M
TJA-4	Americium-241	4.81 ± 24.3	24.7	11.9	NE	U	BD	103364-006	EPA 901.1
27-Sep-17	Cesium-137	-1.71 ± 2.07	3.12	1.46	NE	U	BD	103364-006	EPA 901.1
	Cobalt-60	-1.01 ± 2.03	3.48	1.58	NE	U	BD	103364-006	EPA 901.1
	Potassium-40	36.4 ± 51.0	29.7	13.2	NE	X	R	103364-006	EPA 901.1
	Gross Alpha	2.77	NA	NA	15 pCi/L	NA	None	103364-007	EPA 900.0
	Gross Beta	3.21 ± 0.858	0.895	0.425	4 mrem/yr		J	103364-007	EPA 900.0
	Tritium	-9.57 ± 82.3	149	69.7	NE	U	BD	103364-008	EPA 906.0 M

Refer to footnotes on page 6C-41.

Table 6C-6 *(Concluded)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-6	Americium-241	1.20 ± 9.31	15.2	7.34	NE	U	BD	103338-006	EPA 901.1
13-Sep-17	Cesium-137	0.882 ± 1.69	2.98	1.41	NE	U	BD	103338-006	EPA 901.1
	Cobalt-60	0.569 ± 1.65	3.09	1.42	NE	U	BD	103338-006	EPA 901.1
	Potassium-40	9.42 ± 38.0	34.7	16.1	NE	U	BD	103338-006	EPA 901.1
	Gross Alpha	4.21	NA	NA	15 pCi/L	NA	None	103338-007	EPA 900.0
	Gross Beta	2.69 ± 1.04	1.45	0.703	4 mrem/yr		J	103338-007	EPA 900.0
	Tritium	51.3 ± 89.6	153	71.4	NE	U	BD	103338-008	EPA 906.0 M
TJA-7	Americium-241	-4.73 ± 8.54	14.2	6.86	NE	U	BD	103360-006	EPA 901.1
26-Sep-17	Cesium-137	0.710 ± 1.76	3.09	1.46	NE	U	BD	103360-006	EPA 901.1
	Cobalt-60	0.0187 ± 1.83	3.32	1.53	NE	U	BD	103360-006	EPA 901.1
	Potassium-40	3.87 ± 47.6	28.4	12.9	NE	U	BD	103360-006	EPA 901.1
	Gross Alpha	0.47	NA	NA	15 pCi/L	NA	None	103360-007	EPA 900.0
	Gross Beta	2.52 ± 0.847	1.09	0.525	4 mrem/yr		J	103360-007	EPA 900.0
	Tritium	61.7 ± 91.1	154	72.0	NE	U	BD	103360-008	EPA 906.0 M
WYO-3	Americium-241	-7.77 ± 14.7	22.0	10.7	NE	U	BD	103306-006	EPA 901.1
29-Aug-17	Cesium-137	1.10 ± 1.90	3.51	1.65	NE	U	BD	103306-006	EPA 901.1
	Cobalt-60	-0.914 ± 2.09	3.48	1.58	NE	U	BD	103306-006	EPA 901.1
	Potassium-40	24.4 ± 55.8	37.8	17.3	NE	U	BD	103306-006	EPA 901.1
	Gross Alpha	2.60	NA	NA	15 pCi/L	NA	None	103306-007	EPA 900.0
	Gross Beta	1.61 ± 0.854	1.14	0.549	4 mrem/yr		NJ+	103306-007	EPA 900.0
	Tritium	33.8 ± 87.6	152	71.2	NE	U	BD	103306-008	EPA 906.0 M

Refer to footnotes on page 6C-41.

Table 6C-7
Summary of Field Water Quality Measurements[h], Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
TA1-W-06	07-Mar-17	18.35	793.7	268.1	7.55	0.59	83.1	7.79
TA2-W-01	09-Mar-17	18.43	583.9	244.4	7.47	2.05	82.8	7.74
TA2-W-19	27-Mar-17	19.06	530.9	243.7	7.50	0.27	102.6	9.48
TA2-W-26	24-Mar-17	16.78	1292.0	220.0	7.41	0.79	79.6	7.69
TA2-W-27	21-Mar-17	19.91	760.3	172.1	7.54	0.41	91.3	8.27
TA2-W-28	28-Mar-17	14.99	412.3	265.5	7.57	0.91	76.7	7.71
TJA-2	29-Mar-17	16.54	516.5	269.2	7.40	0.35	85.7	8.35
TJA-3	23-Mar-17	20.01	479.1	212.1	7.34	0.25	71.4	6.48
TJA-4	31-Mar-17	18.47	517.9	207.6	7.62	0.38	62.2	5.83
TJA-6	22-Mar-17	20.42	447.3	197.0	7.39	1.09	65.2	5.86
TJA-7	30-Mar-17	17.40	466.1	232.5	7.53	1.03	82.3	7.88
TA2-W-19	21-Jun-17	20.17	515.4	90.6	7.56	0.28	95.3	8.61
TA2-W-26	20-Jun-17	21.56	1351.2	134.1	7.38	3.83	91.1	8.00
TA2-W-28	22-Jun-17	21.70	449.4	91.1	7.63	2.29	92.3	8.10
TJA-2	26-Jun-17	19.95	524.7	181.3	7.58	0.37	94.6	8.59
TJA-3	19-Jun-17	22.63	477.9	121.2	7.41	0.45	77.9	6.68
TJA-4	28-Jun-17	20.90	514.8	79.2	7.49	0.11	56.5	5.01
TJA-7	27-Jun-17	19.79	462.7	225.1	7.57	1.05	90.8	8.26
TA1-W-01	17-Aug-17	21.19	496.6	292.8	7.37	0.73	74.0	6.55
TA1-W-02	21-Aug-17	20.07	467.0	281.8	7.46	1.65	56.2	5.12
TA1-W-04	28-Aug-17	19.99	478.2	265.0	7.47	0.96	61.8	5.61
TA1-W-05	22-Aug-17	20.75	561.6	299.2	7.32	1.66	83.1	7.43
TA1-W-06	06-Sep-17	20.31	836.3	314.1	7.54	0.38	82.9	7.52
TA1-W-08	30-Aug-17	23.39	2016.4	293.6	7.42	0.56	87.4	7.40
TA2-NW1-595	05-Sep-17	20.66	705.9	233.6	7.38	0.40	90.8	8.12
TA2-W-01	07-Sep-17	21.38	630.3	305.1	7.57	0.47	84.9	7.50
TA2-W-19	19-Sep-17	20.48	508.5	302.3	7.50	0.14	94.2	8.47
TA2-W-26	18-Sep-17	19.49	1280.1	253.0	7.32	1.46	83.2	7.60
TA2-W-27	13-Sep-17	21.00	786.0	326.3	7.52	0.28	84.6	7.52
TA2-W-28	20-Sep-17	19.69	423.8	323.7	7.55	0.48	86.6	7.90
TJA-2	21-Sep-17	19.60	512.9	303.1	7.49	0.27	88.9	8.16

Refer to footnotes on page 6C-41.

Table 6C-7 *(Concluded)*
Summary of Field Water Quality Measurements[h], Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
TJA-3	14-Sep-17	20.45	486.2	301.3	7.41	0.22	77.4	6.97
TJA-4	27-Sep-17	17.20	466.3	316.2	7.45	0.97	56.5	5.43
TJA-6	13-Sep-17	21.90	448.7	231.3	7.54	1.69	68.8	6.02
TJA-7	26-Sep-17	18.60	443.2	293.7	7.48	2.61	85.1	7.95
WYO-3	29-Aug-17	21.77	515.7	296.5	7.67	0.52	80.8	7.08
TA2-W-19	13-Dec-17	18.10	514.7	300.7	7.52	0.65	106.7	10.10
TA2-W-26	12-Dec-17	17.40	1316.1	296.9	7.37	2.51	85.9	8.20
TA2-W-28	14-Dec-17	16.29	414.9	300.3	7.54	1.47	89.3	8.75
TJA-2	15-Dec-17	17.16	519.8	310.6	7.45	0.31	88.5	8.50
TJA-3	11-Dec-17	19.57	490.7	240.2	7.45	0.22	74.1	6.79
TJA-4	20-Dec-17	17.85	514.7	291.2	7.50	0.49	62.8	5.95
TJA-7	18-Dec-17	15.17	492.8	272.8	7.56	4.45	84.2	8.43

Refer to footnotes on page 6C-41.

Footnotes for Tijeras Arroyo Groundwater Analytical Results Tables

%	= Percent.
CFR	= Code of Federal Regulations.
EPA	= U.S. Environmental Protection Agency.
ID	= Identifier.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
mrem/yr	= Millirem per year.
No.	= Number.
pCi/L	= Picocuries per liter.

[a]Result or Activity

Result applies to Tables 6C-1 through 6C-5. Activity applies to Table 6C-6.
Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Part 141).
Activities of zero or less are considered to be not detected.

Bold = Value exceeds the established MCL.
ND = Not detected (at method detection limit).

[b]MDL or MDA

The MDL applies to Tables 6C-1 through 6C-5. MDA applies to Table 6C-6.

MDA = The minimal 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.

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 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

The PQL applies to Tables 6C-1 through 6C-5. Critical Level applies to Table 6C-6.

Critical Level = 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.

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

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).

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 Part 141).
- 4 mrem/yr = Any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Tijeras Arroyo Groundwater Analytical Results Tables *(Concluded)*

[e]Lab Qualifier

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

B	= The analyte was found 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.
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 associated value is an estimated quantity.
J+	= The associated numerical value is an estimated quantity with a suspected positive bias.
None	= No data validation for corrected gross alpha activity.
NJ+	= Presumptive evidence of the presence of the material at an estimated quantity with a suspected positive bias.
R	= The data are unusable, and resampling or reanalysis are necessary for verification.
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

Clesceri, Greenburg, and Eaton, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th ed., Method 2320B, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C.

EPA, 1986, (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed.

EPA, 1984, "Methods for Chemical Analysis of Water and Wastes." EPA 600-4-79-020.

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

[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 6D
Tijeras Arroyo Groundwater
Plots

This page intentionally left blank.

Attachment 6D Plots

This page intentionally left blank.

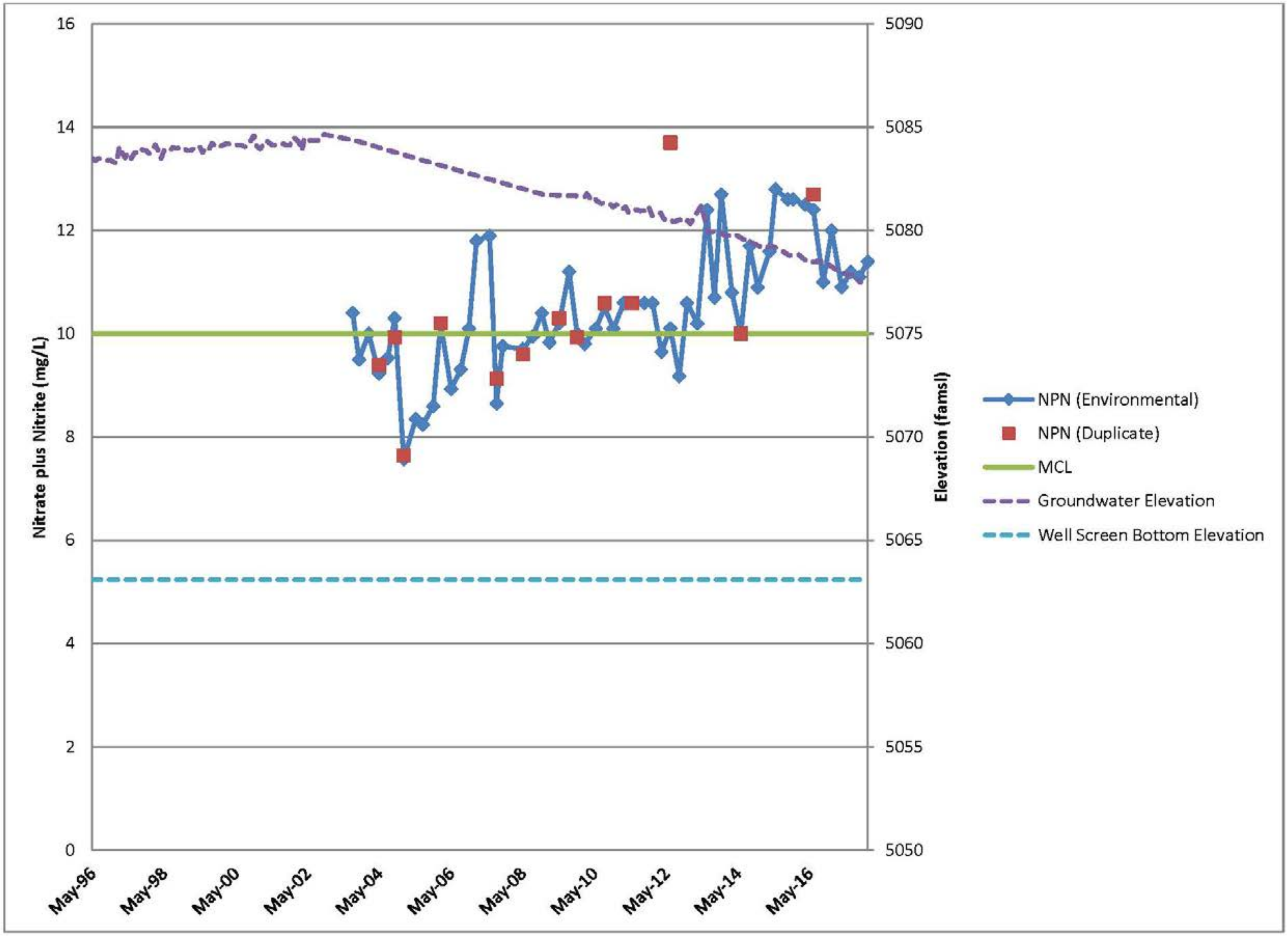


Figure 6D-1. Nitrate plus Nitrite Concentrations, TA2-W-19

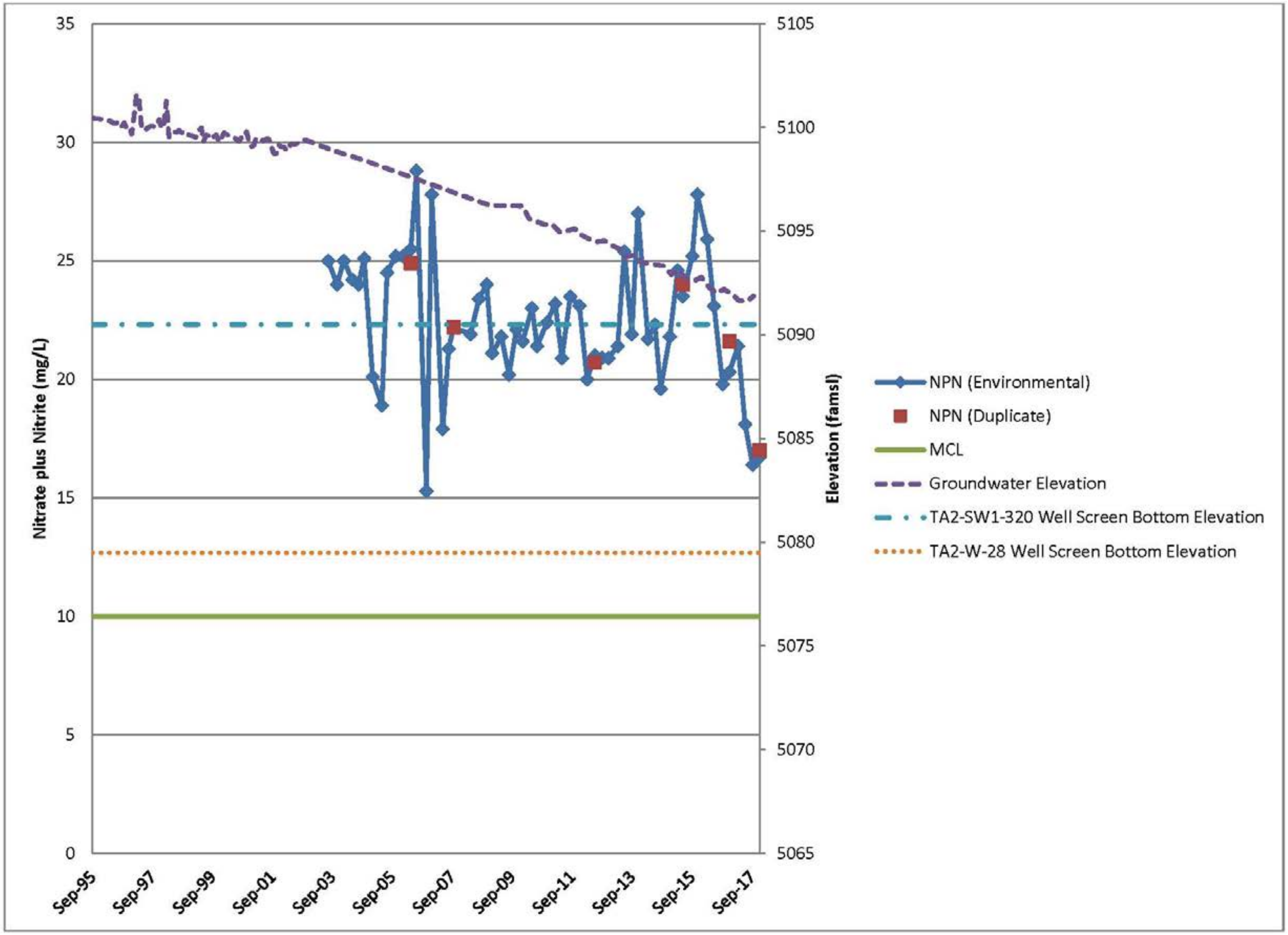


Figure 6D-2. Nitrate plus Nitrite Concentrations, TA2-W-28 (replaced TA2-SW1-320, December 2014)

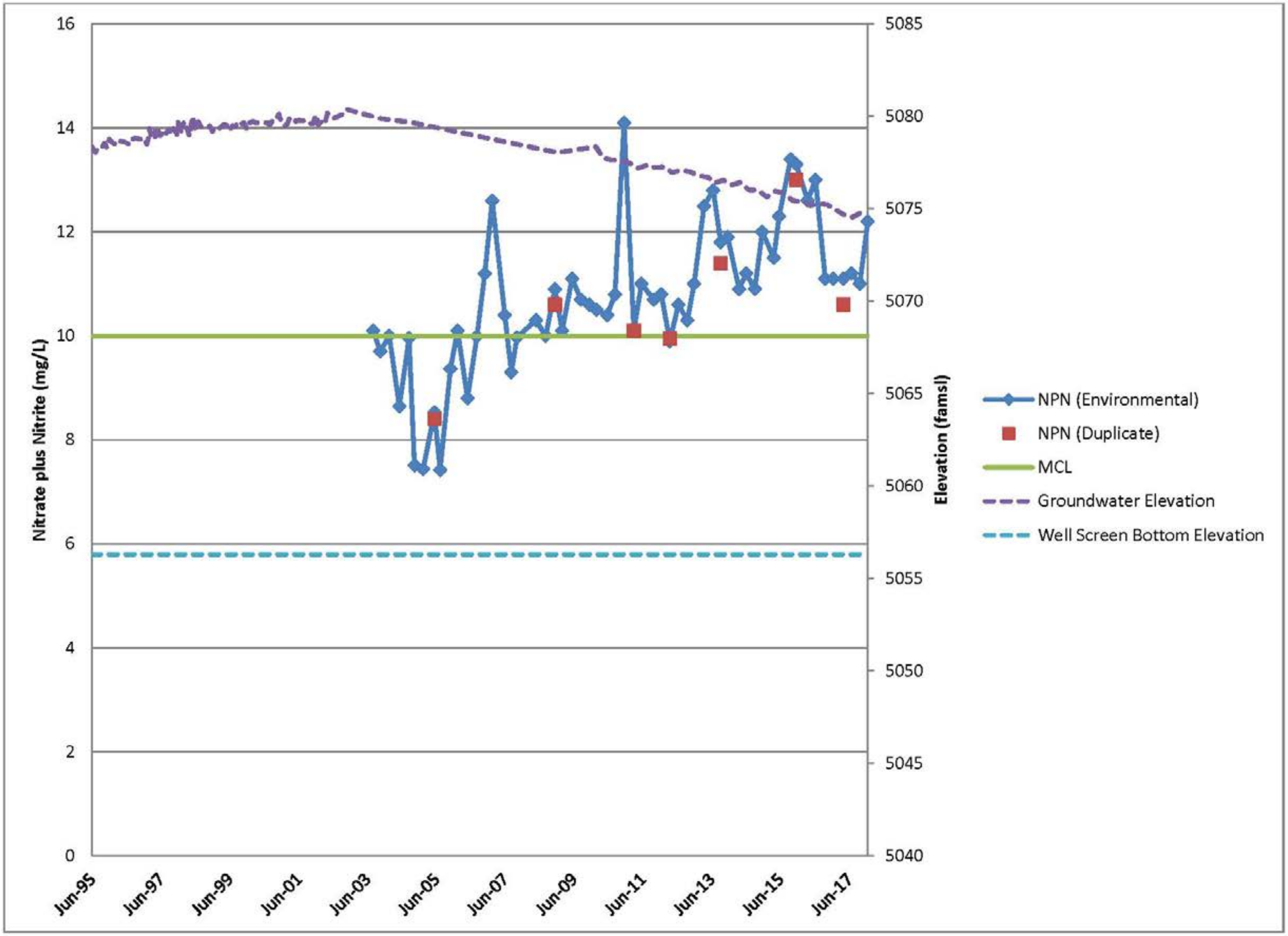


Figure 6D-3. Nitrate plus Nitrite Concentrations, TJA-2

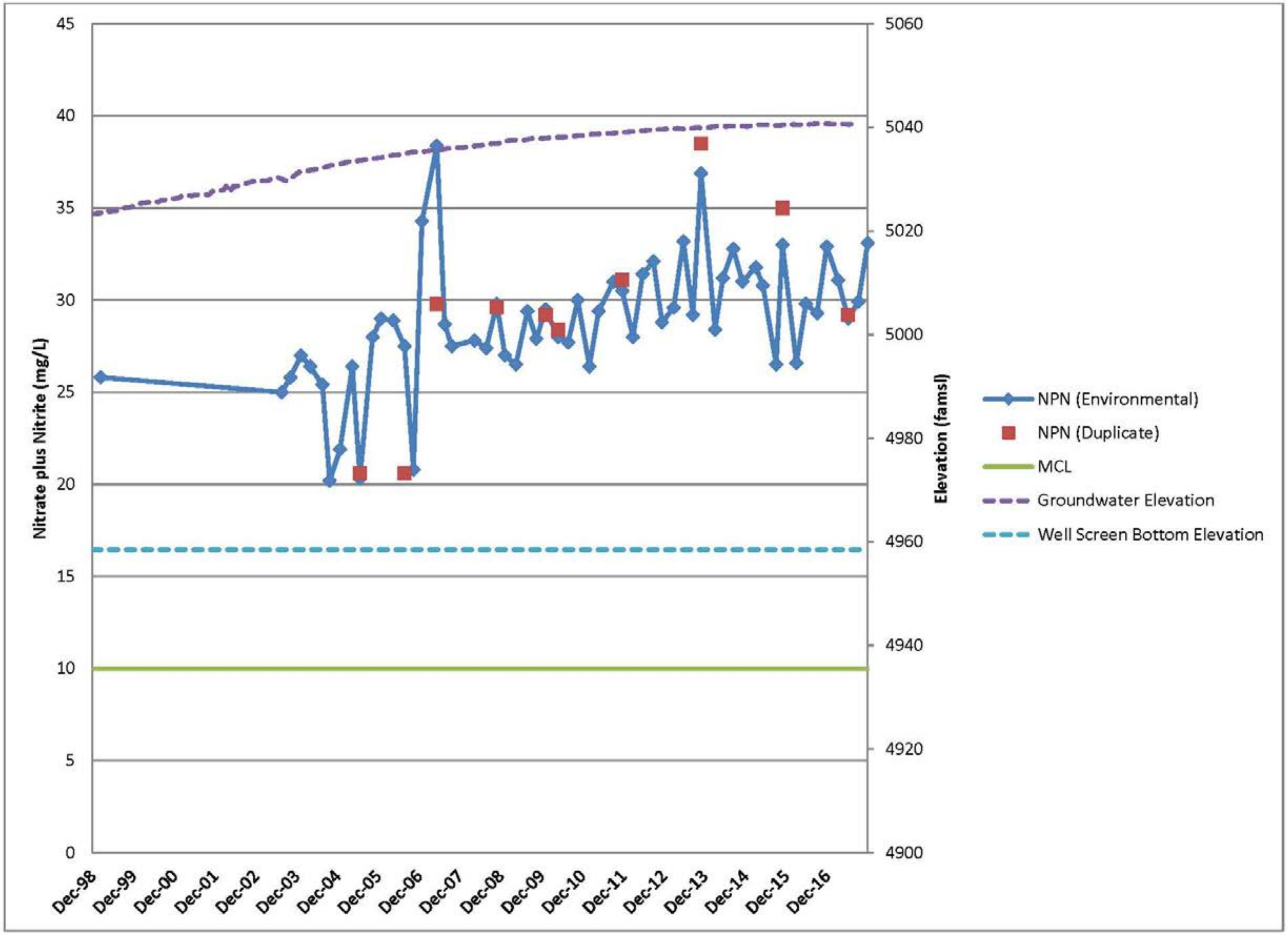


Figure 6D-4. Nitrate plus Nitrite Concentrations, TJA-4

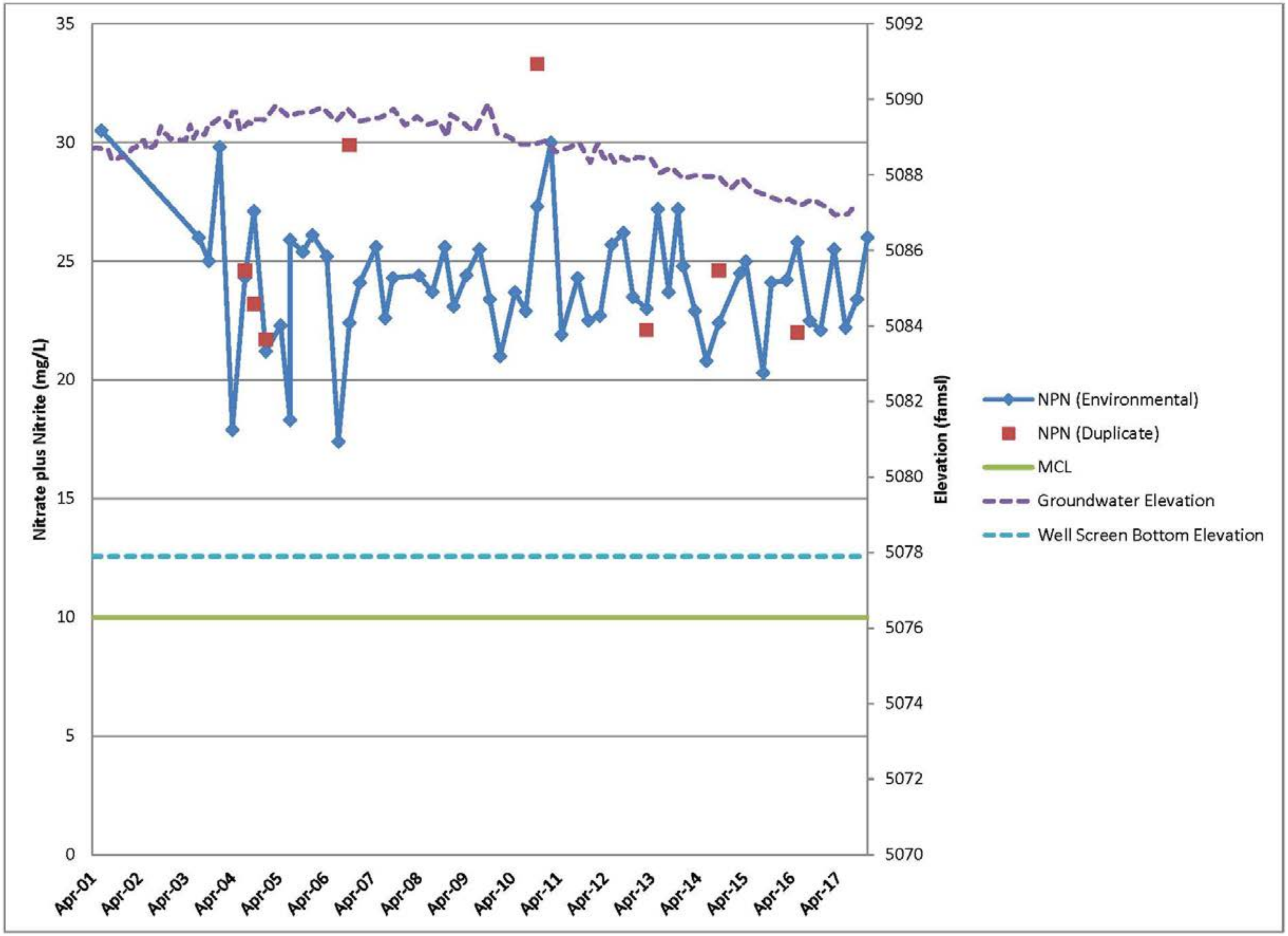


Figure 6D-5. Nitrate plus Nitrite Concentrations, TJA-7

This page intentionally left blank.

Chapter 6
Tijeras Arroyo Groundwater
References

This page intentionally left blank.

AquaVISION July 1999 AquaVISION, July 1999. *Colloidal Borescope Investigation of the Sandia North Site*, Albuquerque, New Mexico, July 21, 1999, 36 pp..

BGW September 2002 Balleau Groundwater, Inc. (BGW), September 2002. *Model of a Perched Zone of Saturation at Sandia National Laboratories, New Mexico*, SAND Report SAND-2011-0005P, prepared for Sandia National Laboratories, Albuquerque, New Mexico by Balleau Groundwater, Inc., Albuquerque, New Mexico, 64 pp.

BGW February 2001 Balleau Groundwater, Inc. (BGW), February 2001. *A Preliminary Three-Dimensional Variably Saturated Model of a Perched Aquifer at Sandia National Laboratories, New Mexico*, prepared for Sandia National Laboratories, Albuquerque, New Mexico by Balleau Groundwater, Inc., Albuquerque, New Mexico.

Brady and Domski 2001 Brady, P.V. and P.S. Domski, 2001. *Geochemical Analysis of Shallow Aquifer System at Sandia North*, Internal report prepared for Sandia National Laboratories, Albuquerque, New Mexico, 24 pp.

CE2 Corporation September 2016 CE2 Corporation, September 2016, E-mail "RE: old TAG release sites," from Cook, N. at CE2 Corporation, Pleasanton, CA, to Copland, J.R. at Sandia National Laboratories/New Mexico, Environmental Operations, Albuquerque, NM, with two attachments: "Notes_HistoricalAirfieldImageryAndDocumentation_20160921.docx" and "Fx_ce16548_TAG_CCM_HistoricalFacilitySites_portrait_v03_20161017.pdf," September 13, 2016.

Collins December 2000 Collins, S., December 2000. *Memo to: All ER Personnel Re: Project Name Change from the "Sandia North Groundwater Investigation" to the "Tijeras Arroyo Groundwater Investigation*," Sandia National Laboratories, Albuquerque, New Mexico.

Copland and Skelly October 2003 Copland, J.R., and M.F. Skelly, October 2003. *Tijeras Arroyo Groundwater (TAG) High Performing Team (HPT) Meeting Notes*, Sandia National Laboratories, Albuquerque, New Mexico, October 16, 2003.

DOE September 2017 U.S. Department of Energy (DOE), September 2017. Letter to J. Kieling (New Mexico Environment Department), "Request for Extension for Submittal of the Revised Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report in Response to the NMED Disapproval Letter dated May 18, 2017," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, September 25, 2017.

DOE December 2016 U.S. Department of Energy (DOE), December 2016. *Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report – December 2016*, U.S. Department of Energy National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico.

DOE November 2016 U.S. Department of Energy (DOE), November 2016. Letter to J. Kieling (New Mexico Environment Department), "Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report – December 2016," U.S. Department of Energy National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 23, 2017.

DOE March 2016 U.S. Department of Energy (DOE), March 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015,* U.S. Department of Energy National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, March 30, 2016.

DOE September 1987 U.S. Department of Energy (DOE), September 1987. *Draft Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment, Sandia National Laboratories, Albuquerque,* U.S. Department of Energy, Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, Albuquerque, New Mexico**.**

en.wikipedia.org 2016 en.wikipedia.org, 2016. Website https:en.wikipedia.org/wiki/Oxnard_Field, accessed 2016.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations*, EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C..

Fritts and Van Hart March 1997 Fritts, J.E., and D. Van Hart, March 1997. *Sandia North Geologic Investigation Project Report*, prepared for Sandia National Laboratories Environmental Restoration Project by GRAM, Inc. under Contract AS-4959. March 31, 1997, 28 pp.

Furman 1990 Furman, N.S., 1990. *Sandia National Laboratories – The Postwar Decad*e, University of New Mexico Press, Albuquerque, NM, 858 pp.

GRAM and Lettis December 1995 GRAM and Lettis, December 1995. *Conceptual Geologic Model of the Sandia National Laboratories and Kirtland Air Force Base,* prepared for Site-Wide Hydrogeologic Characterization Project, Sandia National Laboratories, Albuquerque, New Mexico by GRAM, Inc., Albuquerque NM and William Lettis & Associates, Inc. Walnut Creek, CA, 2 volumes.

IT January 1997 IT Corporation (IT), January 1997. *Soil Vapor Sampling in Technical Area 2, Boreholes 21, 23, and 20, November – December 1996*, prepared for R. Arnold, Air Force Center for Engineering and the Environment, Environmental Restoration Division by IT Corporation, Albuquerque, New Mexico.

KAFB December 2015 Kirtland Air Force Base (KAFB), December 2015. *Draft Fiscal Year 2015 Long-Term Monitoring Report, ST-105 – Nitrate Contaminated Groundwater,* prepared for Air Force Civil Engineer Center by URS Group Inc. in association with FPM Remediations, Inc.

KAFB March 2013 Kirtland Air Force Base (KAFB), March 2013. Kirtland AFB History Fact Sheet, http://www.kirtland.af.mil/library/factsheets/factsheet.asp?id=20526.

Madrid et al. June 2013 Madrid, V., M.J. Singleton., A. Visser, and B.K. Esser, June 2013. *Summary of Isotopic Data and Preliminary Interpretation of Denitrification and Age-dating for Groundwater Samples from Three Sites at Sandia National Laboratories, New Mexico*, a report to Sandia National Laboratories, New Mexico, Lawrence Livermore National Laboratory, LLNL-SR-636381.

NMED October 2017 New Mexico Environment Department (NMED), October 2017. *Approval: Request for Extension for Submittal of Revised Current Conceptual Model and Corrective Measures Evaluation Report, Sandia National Laboratory [sic] EPA ID#NM5890110518, HWB-SNL-16-020,* October 13, 2017.

NMED May 2017 New Mexico Environment Department (NMED), May 2017. *Disapproval: Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report December 2016, Sandia National Laboratories [sic] EPA ID#NM5890110518, HWB-SNL-16-020,* May 18, 2017.

NMED April 2016 New Mexico Environment Department (NMED), April 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015, March 30, 2016, EPA ID# NM5890110518, HWB-SNL-16-MISC,* April 14, 2016.

NMED January 2015 New Mexico Environment Department (NMED), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED February 2010 New Mexico Environment Department (NMED), February 2010. *Notice of Approval: Tijeras Arroyo Groundwater Investigation Report, November 2005, Sandia National Laboratories EPA ID# NM5890110518, SNL-05-028*, New Mexico Environment Department, Santa Fe, New Mexico, February 22, 2010.

NMED August 2009 New Mexico Environment Department (NMED), August 2009. *Notice of Disapproval: Response to the Notice of Disapproval for the Tijeras Arroyo Groundwater Investigation Report, February 2009, Sandia National Laboratories EPA ID# NM5890110518, SNL-05-028*, New Mexico Environment Department, Santa Fe, New Mexico, August 12, 2009.

NMED August 2008 New Mexico Environment Department (NMED), August 2008. *Notice of Disapproval: Tijeras Arroyo Groundwater Investigation Report, November 2005, Sandia National Laboratories EPA ID# NM5890110518, SNL-05-028*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED October 2004 New Mexico Environment Department (NMED), October 2004. *Approval with Modifications: Corrective Measures Evaluation Work Plan for Tijeras Arroyo Groundwater, July 2004, Sandia National Laboratories NM5890110518, HWB-SNL-04-036*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED April 2004 New Mexico Environment Department (NMED), 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order,* New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

NMED September 2003 New Mexico Environment Department (NMED), 2003. *Notice of Approval: Tijeras Arroyo Groundwater Investigation Work Plan, June 2003, Sandia National Laboratories, NM5890110518-1, HWB-SNL-03-006*, New Mexico Environment Department, Santa Fe, New Mexico, September 3, 2003.

Skelly November 2006 Skelly, M.F., November 2006. "Field Report – Plug and Abandonment of Vadose Monitoring Wells RB-11/RW-06 and TAG-SV03," internal memorandum to Paul Freshour, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, November 28.

Skelly et al. May 2004 Skelly, M.F., S. Griffith, R. Lynch, and G. Quintana, May 2004. "Technical Memorandum—Field Report on the Slug Tests at Tijeras Arroyo Geologic Groundwater Investigation Wells," prepared for U.S. Department of Energy, Albuquerque Operations Office by Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2017 Sandia National Laboratories, New Mexico (SNL/NM), October 2017. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY18, 1st Quarter Sampling*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2017 Sandia National Laboratories, New Mexico (SNL/NM), July 2017. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY17, 4th Quarter Sampling*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2017 Sandia National Laboratories, New Mexico (SNL/NM), June 2017. A*nnual Groundwater Monitoring Report, Calendar Year 2016*, *June 2017*, Sandia National Laboratories, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL May 2017 Sandia National Laboratories, New Mexico (SNL/NM), May 2017. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY17, 3rd Quarter Sampling,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2017 Sandia National Laboratories, New Mexico (SNL/NM), February 2017. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY17*, *2nd Quarter Sampling,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2016 Sandia National Laboratories, New Mexico (SNL/NM), December 2016. *Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2015 Sandia National Laboratories, New Mexico (SNL/NM), April 2015. *Installation of Groundwater Monitoring Wells CYN-MW14A, CYN-MW15, and TA2-W-28, and the Decommissioning of Groundwater Monitoring Well TA2-SW1-320*, Environmental Restoration Operations and Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2013 Sandia National Laboratories, New Mexico (SNL/NM), March 2013. *Installation of Replacement Monitoring Well CYN-MW13 at the Burn Site Groundwater Study Area and the Decommissioning of Three Groundwater Monitoring Wells at the Burn Site, Eight Groundwater and Soil-Vapor Monitoring Wells at the Chemical Waste Landfill, and Eight FLUTe™ Soil-Vapor Monitoring Wells at Various SWMUs and DSS Sites*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2010 Sandia National Laboratories, New Mexico (SNL/NM), January 2010. *Response to NMED's "Notice of Disapproval: Tijeras Arroyo Groundwater Investigation Report, November 2005" Dated February 2009*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, January 19, 2010.

SNL February 2009 Sandia National Laboratories, New Mexico (SNL/NM), February 2009. *Response to NMED's "Notice of Disapproval: Tijeras Arroyo Groundwater Investigation Report, November 2005" Dated August 2008*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, February 26, 2009.

SNL November 2005 Sandia National Laboratories, New Mexico (SNL/NM), November 2005. *Tijeras Arroyo Groundwater Investigation Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL August 2005 Sandia National Laboratories, New Mexico (SNL/NM), August 2005. *Corrective Measures Evaluation Report for Tijeras Arroyo Groundwater*, SAND Report SAND2005-5297, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2004 Sandia National Laboratories, New Mexico (SNL/NM), December 2004. *Corrective Measures Evaluation Work Plan, Tijeras Arroyo Groundwater, Revision 0*, SAND Report SAND2004-6111. Environmental Restoration Project, Sandia National Laboratories, New Mexico.

SNL November 2004 Sandia National Laboratories/New Mexico (SNL/NM), November 2004. *Corrective Measures Evaluation Work Plan, Tijeras Arroyo Groundwater*, SAND Report SAND2004-3247P, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2004 Sandia National Laboratories, New Mexico (SNL/NM), July 2004. *Corrective Measures Evaluation Work Plan, Tijeras Arroyo Groundwater*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2003 Sandia National Laboratories, New Mexico (SNL/NM), June 2003. *Tijeras Arroyo Groundwater Investigation Work Plan (Final Version)*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2003 Sandia National Laboratories, New Mexico (SNL/NM), October 2003. "Drain and Septic Systems (DSS) Soil Vapor Well Sample Results," internal memo, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, October 27, 2003.

SNL November 2002 Sandia National Laboratories, New Mexico (SNL/NM), November 2002. *Tijeras Arroyo Groundwater Continuing Investigation Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL August 2001 Sandia National Laboratories, New Mexico (SNL/NM), August 2001. *Environmental Restoration Project Operational Report: Tijeras Arroyo Groundwater Analysis of Pressure Transducer Monitoring Data Investigation*, prepared by D. Chace, August 20, 2001, 44 pp.

SNL February 2001 Sandia National Laboratories, New Mexico (SNL/NM), February 2001. *Environmental Restoration Project Long-Term Monitoring Strategy for Groundwater*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2000 Sandia National Laboratories, New Mexico (SNL/NM), June 2000. *Sandia North Groundwater Investigation*, *Annual Report, Fiscal Year 1998*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1998 Sandia National Laboratories, New Mexico (SNL/NM), March 1998. *Sandia North Groundwater Investigation, Annual Report, Fiscal Year 1997*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), February 1998. *Revised Conceptual Geologic Model of the Sandia National Laboratories and Kirtland Air Force Base, prepared for Site-Wide Hydrogeologic Characterization Project, Sandia National Laboratories, Albuquerque, New Mexico,* prepared for Sandia National Laboratories, Albuquerque, New Mexico by GRAM, Inc., Albuquerque, NM and William Lettis & Associates, Inc. Walnut Creek, CA, 2 volumes.

SNL March 1996a Sandia National Laboratories, New Mexico (SNL/NM), March 1996a. *Sandia North Groundwater Investigation Plan*, Sandia National Laboratories, Environmental Restoration Project, Albuquerque, New Mexico.

SNL March 1996b Sandia National Laboratories, New Mexico (SNL/NM), March 1996b. *Groundwater Protection Program, Calendar Year 1995 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1995a Sandia National Laboratories, New Mexico (SNL/NM), March 1995. *Site-Wide Hydrogeologic Characterization Project*, *Calendar Year 1994 Annual Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1995b Sandia National Laboratories, New Mexico (SNL/NM), March 1995. *Groundwater Protection Program, Calendar Year 1994 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

Stone et al. February 2000 Stone, B.D., J.C. Cole, and D.A. Sawyer, February 2000. "Regional Stratigraphic Framework for an Integrated Three-Dimensional Geologic Model of the Rio Grande Rift," in *U.S. Geological Survey, Middle Rio Grande Basin Study—Proceedings of the Fourth Annual Workshop, Albuquerque, New Mexico*, February 15-16, 2000, Open File Report 00-488. U.S. Geological Survey, Albuquerque, New Mexico.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico*, SAND Report SAND2003-1869, prepared for Sandia National Laboratories, Albuquerque, New Mexico.

Van Hart June 2001 Van Hart, D., June 2001. *Shallow Groundwater System Investigation: Tijeras Arroyo and Vicinity*, prepared for the Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Van Hart et al. October 1999 Van Hart, D., D.A. Hyndman, and S.S. Brandwein, October 1999. *Analysis of the USGS Isleta/Kirtland Air Force Base Aeromagnetic Survey for Application to SNL/KAFB Area Geologic Structure*, prepared for the Groundwater Protection Program/Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, October 15, 1999.

Wolford September 1996 Wolford R., September 1996. *Hydrologic Evaluation of a Perched Aquifer near TA-II Tijeras Arroyo: Estimating Aquifer Parameters, Water Travel Times, and Possible Sources of Recharge in the Perched Zone. Site-Wide Hydrogeologic Characterization Project, Environmental Restoration Program, SNL/NM*, prepared for Sandia National Laboratories, Albuquerque, New Mexico by GRAM, Inc., Albuquerque NM, 61 pp.

www.airfields-freeman.com 2016 www.airfields-freeman.com, 2016. Website http://www.airfields-freeman.com/NM/Airfields_NM_Albuquerque.htm., Freeman, P., *Abandoned & Little-Known Airfields*, accessed 2016.

www.econtent.unm.edu 2016 www.econtent.unm.edu, 2016. Website http://www.econtent.unm.edu/cdm/search/collection, accessed 2016.

www.militarymedia inc.com 2016 www.militarymediainc.com 2016. Website http://www.militarymediainc.com/kirtland/history.html, accessed 2016.

This page intentionally left blank.

7.0 Burn Site Groundwater Area of Concern

7.1 Introduction

Unique features of the Burn Site Groundwater (BSG) Area of Concern (AOC), 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 based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) in samples collected from several monitoring wells. Since August 1998, the maximum concentration of nitrate detected has been 44.9 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, and its replacement well, in the BSG AOC. 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 (Consent Order) stipulates that a select group of groundwater monitoring wells are to be sampled for perchlorate using a screening level/method detection limit (MDL) of 4 micrograms per liter (μg/L) [New Mexico Environment Department (NMED) April 2004]. Furthermore, the Consent Order requires that for detections equal to or greater than 4 μg/L, the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA), and Sandia National Laboratories, New Mexico (SNL/NM) personnel will evaluate the nature and extent of perchlorate contamination in groundwater. Since perchlorate monitoring began in March 2006, the maximum concentration of perchlorate in groundwater at the BSG AOC has been 8.93 μg/L.

7.1.1 Location

The Coyote Canyon Test Area is located in the eastern portion of Kirtland Air Force Base (KAFB). 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, which is a tributary to Tijeras Arroyo. Testing activities at the Lurance Canyon Burn Facility, which includes the Burn Site, began in 1967.

The BSG AOC 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

Groundwater issues at the BSG AOC are primarily associated with two solid waste management units (SWMUs). The Lurance Canyon Burn Site (SWMU 94) and the nearby Lurance Canyon Explosive Test Site (SWMU 65) have been used since 1967. The majority of the operational activities involved testing the fire survivability of transportation containers, weapon components, simulated weapons, and satellite components. Historical operations (Attachment 7A, Table 7A-1) include open detonation of high explosive (HE) compounds and ammonium-nitrate slurry along with the open burning of HE compounds, liquid propellants, and solid propellants. Most HE testing occurred between 1967 and 1975 and was completely phased out by the 1980s.

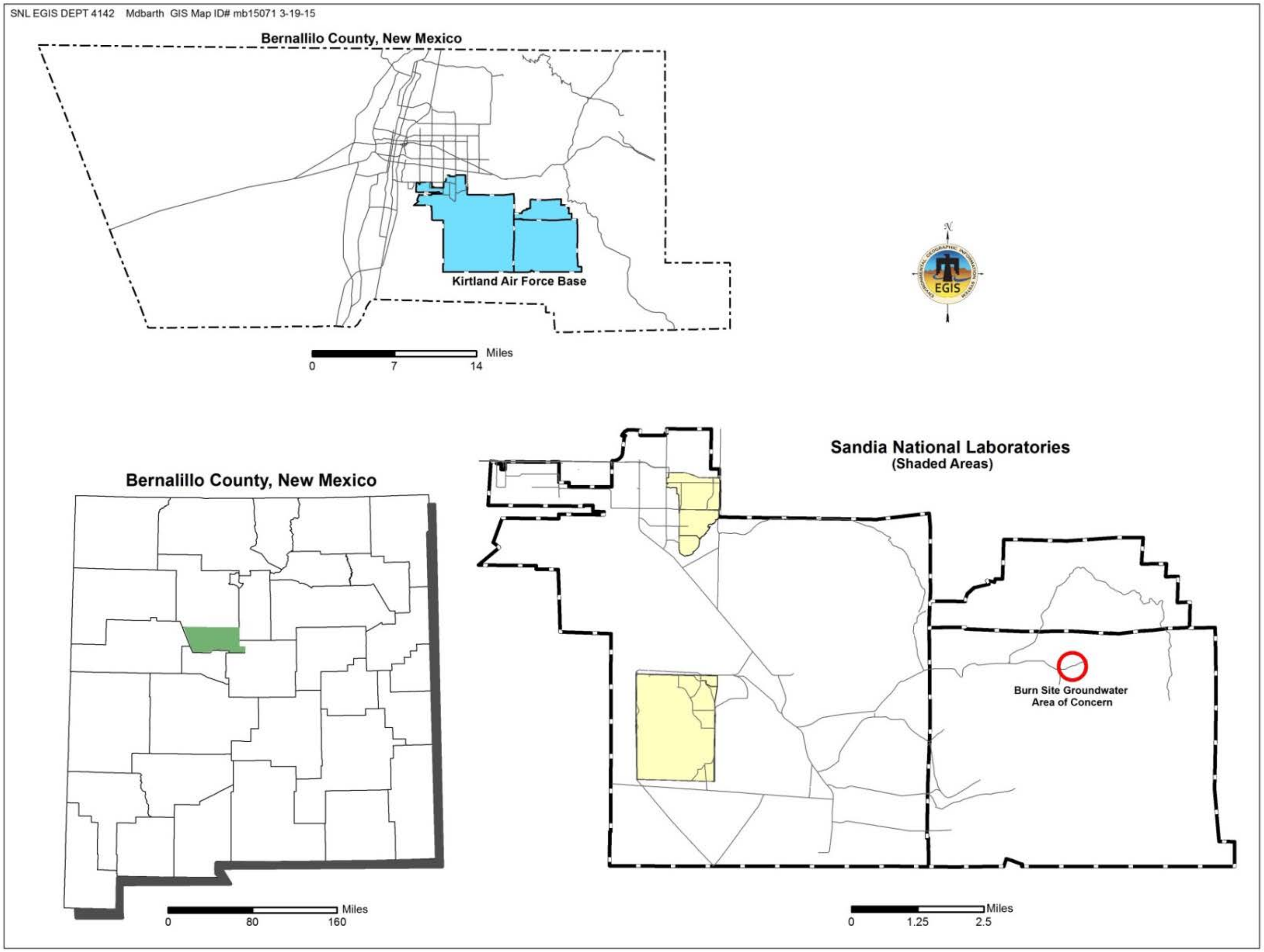


Figure 7-1. Location of the Burn Site Groundwater Area of Concern

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 and alluvium. By 1975, portable steel burn pans were used for open burning, mostly using jet propellant, fuel grade 4 (JP-4). Several engineered structures, such as the Light Air Transport Accident Resistant Container Unit, were used at the Burn Site. The structures mostly used JP-4 and occasionally used diesel fuel and gasoline to create the high temperatures associated with transportation accidents. In the mid-1990s, jet propellant, fuel grade 8 replaced JP-4 as the petroleum fuel used for burn tests. Most test structures have been dismantled. The only remaining test cell is the Fire Laboratory for Accreditation of Modeling by Experiment. Portable burn pans up to 25 ft in diameter are occasionally used.

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 (maximum of 27 mg/L in August 1996). In 1997, the NMED, DOE, and SNL/NM personnel agreed to investigate the source of this contamination. Later in 1997, monitoring wells CYN-MW1D and CYN-MW2S were installed downgradient of the Burn Site Well (Table 7-1). Samples from monitoring well CYN-MW1D contained nitrate concentrations exceeding the MCL. Two more monitoring wells, CYN-MW3 and CYN-MW4, were installed between 1999 and 2001 to further characterize the study area. Based on regulatory requirements, monitoring wells CYN-MW6, CYN-MW7, and CYN-MW8 were installed in 2006. Figure 7-2 shows the current BSG AOC groundwater monitoring network.

Table 7-1. Groundwater Monitoring Wells at the Burn Site Groundwater Area of Concern

Well	Installation Year	WQ	WL	Comments
12AUP01	1996			Alluvial-underflow monitoring well, plugged and abandoned in November 2012
Burn Site Well	1986		√	Nonpotable bedrock production well, inactive since 2003
CYN-MW1D	1997			Bedrock groundwater well, plugged and abandoned in November 2012
CYN-MW2S	1997			Alluvial-underflow monitoring well, plugged and abandoned in November 2012
CYN-MW3	1999		√	Bedrock groundwater well
CYN-MW4	1999	√	√	Bedrock groundwater well
CYN-MW6	2005		√	Bedrock groundwater well
CYN-MW7	2005	√	√	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
CYN-MW13	2012	√	√	Bedrock groundwater well, replaced CYN-MW1D
CYN-MW14A	2014	√	√	Bedrock groundwater well
CYN-MW15	2014	√	√	Bedrock groundwater well, replacement for CYN-MW6

NOTES:

Check marks in the WQ and WL columns indicate WQ sampling and WL measurements were obtained during this reporting period.

CYN = Canyons.
MW = Monitoring well.
WL = Water level.
WQ = Water quality.

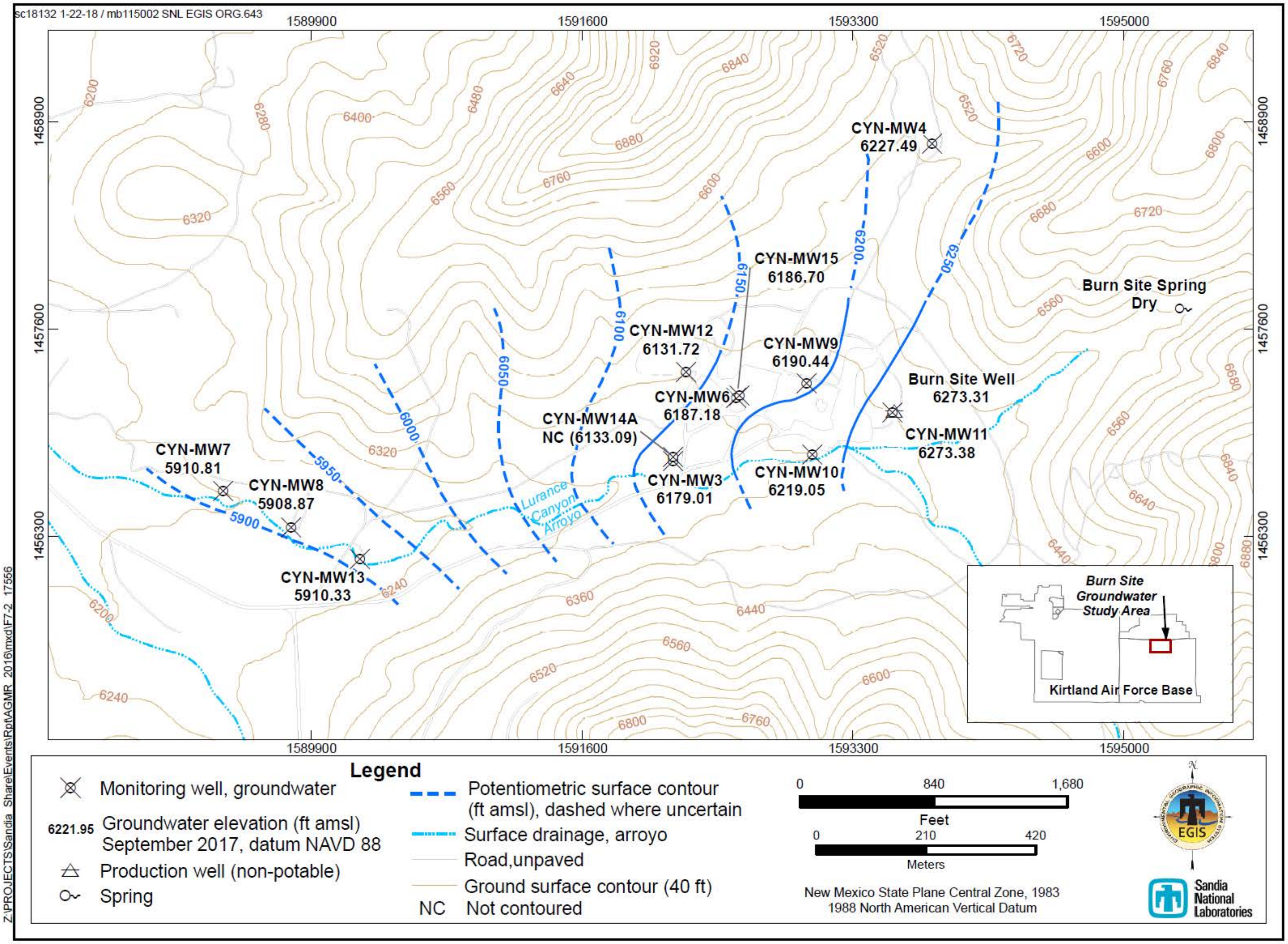


Figure 7-2. Localized Potentiometric Surface of the Burn Site Groundwater Area of Concern (September 2017)

Previous monitoring reports include analytical results for monitoring well CYN-MW5. Groundwater monitoring well CYN-MW5 was installed at SWMU 49 in 2001 as part of the investigation of Drain and Septic System (DSS) sites. This monitoring well was sampled for eight quarters as part of the DSS investigation and was incorporated into the BSG AOC 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, monitoring well CYN-MW5 has not been sampled as part of the BSG investigation since the third quarter of Fiscal Year 2005.

Since the initial discovery of nitrate at the BSG AOC, numerous characterization activities have been conducted (Attachment 7A, Table 7A-1). The results of these characterization activities are summarized in the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site* (SNL June 2004a) and subsequent update (SNL April 2008a). The BSG Conceptual Site Model provides a comprehensive list of groundwater monitoring data sources used to support the summary of investigations.

In April 2004, the Consent Order became effective, and the Consent Order specifies the Burn Site as an area of groundwater contamination. In response to the Consent Order, the BSG AOC Corrective Measures Evaluation (CME) Work Plan was submitted to the NMED in June 2004 (SNL June 2004b). Based on requirements stipulated by the NMED (discussed in Section 7.2), the BSG Interim Measures Work Plan (IMWP) was submitted (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. Quarterly sampling for eight quarters began for these three monitoring wells in March 2006 and was completed in December 2007. Samples from the two monitoring wells (CYN-MW7 and CYN-MW8) located downgradient of CYN-MW1D were analyzed for nitrate and other analytes. Groundwater samples from monitoring well CYN-MW6 (adjacent to SWMU 94F) were analyzed for nitrate, total petroleum hydrocarbons as gasoline range organics (GRO), diesel range organics (DRO), and other parameters. Groundwater monitoring programs have continued as outlined in the IMWP.

Based on a letter received from the NMED (NMED April 2009), DOE/NNSA and SNL/NM personnel are required to further characterize the nature and extent of the perchlorate contamination at the BSG AOC. The BSG Characterization Work Plan (SNL November 2009) was submitted and then approved by the NMED (NMED February 2010). In July 2010, the requirements of the work plan were implemented and four groundwater monitoring wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) were installed to determine the extent of groundwater contamination. These four new wells were sampled for the first time in September 2010.

In February 2012, a work plan was submitted to decommission three obsolete groundwater monitoring wells (12AUP01, CYN-MW1D, and CYN-MW2S); and install a replacement groundwater monitoring well, CYN-MW13 (SNL February 2012). Monitoring wells 12AUP01 and CYN-MW2S were screened at the contact of unconsolidated coarse sand and gravel (alluvium) and the underlying bedrock. Although alluvium at this contact was dry during drilling, these wells were installed in anticipation of recharge occurring after rainfall events. However, these wells were consistently dry. Monitoring well CYN-MW1D was constructed with a nonstandard completion (low carbon steel screen and riser pipe), had very turbid water, and exhibited erratic nitrate concentrations. A video log showed that the well was heavily corroded. In April 2012, the NMED approved the work plan (NMED April 2012); the three monitoring wells (12AUP01, CYN-MW1D, and CYN-MW2S) were decommissioned in November 2012; and replacement monitoring well CYN-MW13 was installed in December 2012 near well CYN-MW1D.

In August 2013, DOE/NNSA submitted an Extension Request to the NMED for the BSG CME Report to March 31, 2013 (DOE August 2013). DOE/NNSA requested the extension for consideration of recently collected groundwater sample analytical results from replacement well CYN-MW13 that could impact the CME Report.

In October 2013, DOE Office of Environmental Management submitted the BSG AOC Internal Remedy Review memorandum to the DOE/NNSA Sandia Field Office (DOE October 2013). This memorandum stated that more characterization activities should be conducted at the BSG AOC before a CME could be prepared. The Internal Remedy Review recommended a weight of evidence approach to determine the source(s) of nitrate contamination.

In September 2013, a work plan for the installation of two groundwater monitoring wells was submitted (SNL September 2013b), and in June 2014 the work plan was approved by NMED (NMED June 2014a). The work plan discussed the need for installing two replacement wells (CYN-MW14 and CYN-MW15) because of declining groundwater levels at the Burn Site. Monitoring well CYN-MW14 was planned to replace CYN-MW3, whereas well CYN-MW15 was planned to replace CYN-MW6. In December 2014, monitoring wells CYN-MW14A (note the ‘A’ suffix) and CYN-MW15 were installed (SNL April 2015). The installation of a direct replacement for well CYN-MW3 was not possible because the shallow water-bearing fracture zone was not encountered by either of two nearby boreholes. A deeper-than-planned well, CYN-MW14A, was installed near CYN-MW3. The replacement well CYN-MW15 was installed as planned near well CYN-MW6.

7.1.4 Current Monitoring Network

Currently 12 monitoring wells in the BSG AOC are in place to monitor for water levels and water quality, including CYN-MW3, CYN-MW4, CYN-MW6, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15 (Figure 7-2). However, monitoring well CYN-MW3 was dry, and CYN-MW6 did not produce adequate water volume during both Calendar Year (CY) 2017 sampling events.

7.1.5 Summary of Calendar Year 2017 Activities

The following activities were performed for the BSG AOC during CY 2017:

- Conducted semiannual groundwater sampling at monitoring wells CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15 in April and October 2017.
- Prepared tables of analytical results (Attachment 7B), concentration versus time graphs (Attachment 7C), and hydrographs (Attachment 7D) in support of this report.
- Performed an Aquifer Pumping Test in March 2017 (SNL December 2017).
- Submitted the Aquifer Pumping Test Report to the NMED (SNL December 2017).

7.1.6 Conceptual Site Model

The BSG AOC groundwater flow is controlled by the local geologic framework and structural features described in the following sections.

7.1.6.1 Regional Hydrogeologic Conditions

The Manzanita Mountains are composed of a complex sequence of uplifted Precambrian metamorphic and granitic units that were subjected to several episodes of 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 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 immediate area, the Burn Site Spring, is located upgradient and upslope of the testing facilities at a limestone outcrop. No flow has been observed at this spring since 2007. The matrix permeability of the fractured bedrock units is low, and most groundwater is produced from discontinuous water-bearing fracture zones. Groundwater discharges to small ephemeral springs located at the base of the Manzanita Mountains approximately 3 miles west of the Burn Site. The groundwater from these springs at the base of the Manzanita Mountains is of a different geochemical character than that under the BSG AOC. Additionally, some groundwater may discharge as underflow to unconsolidated sedimentary deposits of the Albuquerque Basin after crossing the Tijeras Fault Zone.

The Precambrian metamorphic rocks (predominantly schists and phyllite) and the Precambrian intrusive rocks (predominantly granitic gneiss) are typically fractured as a result of the long and complex history of regional deformation. Drill core data and outcrop exposures indicate that some fractures in shallow bedrock are filled with chemical precipitates, such as calcium carbonate. The carbonate precipitation likely occurred when the water table was regionally elevated prior to the development of the Rio Grande. As chemical precipitates filled the fractures, permeability was effectively reduced, possibly 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 mostly 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 monitoring well CYN-MW4. Nearby outcrops indicate that the fault displacement is approximately 160 ft (SNL June 2004a).

The BSG AOC canyon floor consists of unconsolidated alluvium 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 boreholes drilled at the BSG AOC. The alluvial deposits pinch-out nearby along the steep canyon slopes.

7.1.6.2 Hydrogeologic Conditions at the Burn Site Groundwater Area of Concern

When the Burn Site Well was installed in 1986, the depth to the groundwater bearing fracture zone was approximately 222 ft below ground surface. Following completion of the well in fractured bedrock, the water level rose approximately 154 ft above the groundwater bearing fracture zone 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), the low-permeability of the bedrock matrix, and the discontinuous nature of the bedrock fractures.

Regionally, groundwater in the western Manzanita Mountains flows generally toward the west from a groundwater flow divide located east of the BSG AOC. Groundwater flow along 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 ephemeral and perennial 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 occurs in the form of rainfall and minor snowfall. Most precipitation falls between July and October, mainly in the form of brief, heavy rain showers. The average annual precipitation in this drainage basin is estimated to range between 12 and 16 inches (SNL April 2008a). Potential evapotranspiration in the Albuquerque area greatly exceeds 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 monitoring wells (CYN-MW2S and 12AUP01) were constructed in Lurance Canyon to monitor presumed water levels within the channel deposits at the contact with underlying Precambrian bedrock. No groundwater was detected in either shallow monitoring well until September 2, 2004. After a series of rain events, between 1 and 2 inches of water were measured in monitoring well 12AUP01. The water level remained constant for about one month. However, no water was measured in monitoring well 12AUP01 since 2005 and no groundwater had ever been measured in monitoring well CYN-MW2S. Both of these wells were plugged and abandoned in 2012 (SNL March 2013). It is likely that significant saturation in the alluvium occurs only after a series of significant rain events. Episodic accumulation of precipitation may provide a mechanism for recharging the brecciated fault zones and non-cemented fractures in the underlying bedrock.

7.1.6.3 Local Direction of Groundwater Flow

Figure 7-2 presents the September 2017 potentiometric surface for the BSG monitoring well network, and Table 7-2 presents the data used to construct the potentiometric surface map. The general direction of groundwater flow beneath the BSG AOC is to the west-southwest as inferred from the potentiometric surface. No water supply wells are located near the BSG AOC, except for the Burn Site Well that was used only rarely (last pumped in 2003) for nonpotable applications, such as for fire suppression in testing structures and for fuel pool tests. The submersible pump was removed from the well in December 2014. Groundwater levels in the Paleozoic and Precambrian bedrock near the BSG AOC are not influenced by water supply well pumping from the basin fill deposits of the Albuquerque Basin (Regional Aquifer), which are located to the west of the Tijeras Fault Zone.

The apparent horizontal groundwater gradient based on BSG monitoring wells varies from approximately 0.08 to 0.18 feet per foot (ft/ft). Figure 7-2 shows the potentiometric surface, which infers an average horizontal gradient of approximately 0.1 ft/ft in the semiconfined to confined bedrock fracture system. The horizontal gradient west of the BSG AOC flattens substantially (Plate 1).

The variability of hydraulic gradients in Lurance Canyon indicates that localized controls are associated with brecciated fault zones in the low-permeability fractured bedrock at the BSG AOC. Limited groundwater flow velocity information is based on COC first arrival estimates. Based on petroleum fuel releases from SWMU 94F arriving at monitoring well CYN-MW1D, the minimum apparent velocity of the COCs was initially estimated to be approximately 160 feet per year (SNL April 2008a). However, recent geochemical studies indicate that inferring such a groundwater velocity may not be valid because fracture connectivity may be limited. No information is available about vertical flow velocity within the fractured rocks at the BSG AOC. However, vertical movement of groundwater within the brecciated fault zones probably occurs as rapid, partially saturated to saturated flow. Filled fractures within the upper portion of the metamorphic and intrusive rocks may act as a semiconfined unit restricting vertical flow.

Table 7-2. Groundwater Elevations Measured in September 2017 at Monitoring Wells Completed in the Fractured Bedrock System at the Burn Site Groundwater Area of Concern

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Water Elevation (feet amsl)
Burn Site Well	6374.66	29-Sep-2017	101.35	6273.31
CYN-MW3	6313.26	29-Sep-2017	134.25	6179.01
CYN-MW4	6455.48	29-Sep-2017	229.43	6226.05
CYN-MW6	6343.37	29-Sep-2017	156.19	6187.18
CYN-MW7	6216.35	29-Sep-2017	305.54	5910.81
CYN-MW8	6230.11	29-Sep-2017	321.24	5908.87
CYN-MW9	6360.67	29-Sep-2017	170.23	6190.44
CYN-MW10	6345.45	29-Sep-2017	126.40	6219.05
CYN-MW11	6374.41	29-Sep-2017	101.03	6273.38
CYN-MW12	6345.16	29-Sep-2017	213.44	6131.72
CYN-MW13	6237.79	29-Sep-2017	327.46	5910.33
CYN-MW14A	6315.85	29-Sep-2017	182.76	6133.09
CYN-MW15	6344.44	29-Sep-2017	157.74	6186.70

NOTES:

amsl = Above mean sea level.
btoc = Below top of casing.
CYN = Canyons.
ID = Identifier.
MW = Monitoring well.
NAVD 88 = North American Vertical Datum of 1988.

Water levels have been routinely monitored in BSG monitoring wells since 1999. Figures 7D-1 through 7D-9 (hydrographs, Attachment 7D) show groundwater levels in BSG wells that are completed in bedrock. No substantial seasonal variations in water levels are 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 BSG AOC low-permeability fractured groundwater system is poorly interconnected. Water level fluctuations may be a result of local heterogeneities in hydraulic properties related to the water-bearing fracture zones. The BSG monitoring wells in the upper portion of the canyon, most notably at monitoring wells CYN-MW9, CYN-MW10, and CYN-MW11, showed significant increases in groundwater levels during a two-year interval starting in early 2014, apparently in response to intense thunderstorms in the 2014 and 2015 monsoon seasons. Water levels in these three wells rebounded by 14.79 to 19.65 ft between July 2014 and October 2015. However, most of the BSG wells currently show declining groundwater elevations of up to several feet per year.

7.1.6.4 Contaminant Sources

Nitrate in the BSG AOC may be derived from both natural and anthropogenic sources. The NMED-specified background concentration for nitrate in groundwater is 4 mg/L (Dinwiddie September 1997). Potential natural sources include the weathering of rocks, atmospheric deposition, and the grading of soils and alluvium. Evaporation and transpiration of rainwater that has infiltrated canyon alluvial sediments might have increased nitrate concentrations. Potential anthropogenic nitrate sources include the use of ammonium-nitrate slurry, wastewater discharges, and the degradation of HE compounds. SNL/NM personnel have conducted several soil sampling events in the BSG AOC to identify the source of nitrate; however, no conclusive source has been identified, most likely because chemical releases ceased decades ago and precipitation has leached away the nitrate.

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 AOC and contains open-air detonation areas where nitrate-based explosives were used. The detonations dispersed explosive compounds across the ground surface, and subsequent degradation (weathering) of these explosive compounds most likely released some nitrate. SWMU 94 testing also involved burn tests involving large volumes of ammonium-nitrate slurry, HE compounds (both nitrate-based and plastic explosives), and rocket 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 fuel products in groundwater was evaluated.

7.1.6.5 Contaminant Distribution and Transport in Groundwater

In October 1991, nitrate was first detected above the MCL of 10 mg/L in groundwater samples from the Burn Site Well. Since the installation of the 10 monitoring wells shown in Table 7-3, nitrate concentrations that exceed the MCL have consistently been detected in groundwater samples. Nitrate concentrations in groundwater samples from monitoring wells CYN-MW4, CYN-MW7, and CYN-MW8 have not exceeded the MCL. In CY 2017, there were new maximum values of nitrate in monitoring wells CYN-MW9, CYN-MW11, and CYN-MW12.

Table 7-3. Summary of Historical Nitrate Concentrations in Groundwater Monitoring Wells that Exceed the MCL[a] at the Burn Site Groundwater Area of Concern

Well	Historical Maximum NPN Concentration (mg/L)	Approximate Distance and Direction from Burn Site Well
Burn Site Well	27.0	Not applicable
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	44.9[b]	600 ft west-northwest
CYN-MW10	21.8	600 ft west-southwest
CYN-MW11	25.4[b]	10 ft south
CYN-MW12	20.2[b]	1,300 ft west-northwest
CYN-MW13	39.5	3,400 ft south-southwest
CYN-MW14A	15.7	1,400 ft west
CYN-MW15	29.8	1,000 ft west

NOTES:
[a]MCL for nitrate is 10 mg/L.
[b]New maximum in CY 2017.
CYN = Canyons.
ft = Feet.
MCL = Maximum Contaminant Level.
mg/L = Milligrams per liter.
MW = Monitoring well.
NPN = Nitrate plus nitrite (as nitrogen).

Potential downgradient receptors for the nitrate plume are Coyote Springs, approximately 3 miles west of the AOC, and the Albuquerque Bernalillo County Water Utility Authority and KAFB well fields, located approximately 7 to 12 miles to the west-northwest of the study area. Numerical simulations suggest nitrate concentrations in groundwater would decrease to below the MCL by the time the nitrate reaches Coyote Springs, and to far 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 predict that groundwater travel times exceed 600 years from the study area to the Albuquerque Bernalillo County Water Utility Authority and KAFB well fields (SNL May 2005).

7.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM Environmental Restoration (ER) Operations, as well as implements and enforces regulations mandated by the Resource Conservation and Recovery Act (RCRA). All SWMUs and AOCs are listed in the *RCRA Facility Operating Permit* (RCRA Permit) (NMED January 2015).

All BSG AOC corrective action requirements are contained in the Consent Order. The BSG groundwater monitoring activities are not associated with a single SWMU, but are more regional in nature. Before the Consent Order became effective in April 2004, BSG AOC groundwater investigations had been conducted voluntarily by SNL/NM ER Operations.

Initially, BSG groundwater monitoring was initiated to satisfy the requirements of the RCRA Permit for characterization of SWMUs. The Consent Order transferred regulatory authority for corrective action requirements from the RCRA Permit to the Consent Order. The BSG investigation must comply with requirements set forth in the Consent Order for site characterization and the development of a CME.

In response to the Consent Order, the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site*, and *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site* (SNL April 2008a) was submitted to the NMED. The Current Conceptual Model provides site-specific characteristics by which remedial alternatives were evaluated. The CME Work Plan provides a description and justification of the remedial alternatives 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 Consent Order and with the guidance of the *RCRA Corrective Action Plan* (EPA 1994).

On March 1, 2005, a letter was received from the NMED that disapproved the CME Work Plan and offered the following statements/requirements:

- DOE/NNSA and SNL/NM personnel 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 AOC. 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* because it is not satisfied with the existing characterization of nitrate-contaminated groundwater near the BSG AOC.

- 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, an IMWP was submitted to the NMED that proposed the installation of additional groundwater monitoring wells to characterize the extent of nitrate contamination in the fractured bedrock system downgradient of monitoring well CYN-MW1D and fuel-related compounds downgradient of SWMU 94F (SNL May 2005). The selected interim measures described in the IMWP included additional well installation, groundwater monitoring, and institutional controls. These interim measures were proposed to serve three purposes: provide data to support the CME; monitor the migration of the nitrate plume to provide an early warning if an impact to downgradient ecological receptors (Coyote Springs) becomes apparent; and 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:

- Remedial Alternatives Data Gaps Review
- Nitrate Source Evaluation
- Evaluation of Contaminant Transport

The Remedial Alternatives Data Gaps Review included detailed definitions of remedial alternatives and a preliminary evaluation of data gaps (SNL May 2005). One of the data gaps included determining background nitrate concentrations in soil/rock 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 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.

Data collected as part of additional characterization required by the IMWP were incorporated into an updated version of the Conceptual Site Model that 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 and to comply with requirements of the Consent Order. The CME Work Plan provides information and data gathered during interim measures, and performance and compliance goals and objectives for the possible remediation of BSG.

On April 30, 2009, a letter was received from the NMED entitled, *Perchlorate Contamination in Groundwater, Sandia National Laboratories, EPA ID #NM5890110518* (NMED April 2009). The 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/NNSA and SNL/NM personnel must characterize the nature and extent of the assumed perchlorate contamination at the BSG AOC and submit to the NMED a plan for such characterization. DOE/NNSA and SNL/NM personnel met with the NMED in June and July 2009 and submitted a letter requesting an extension to November 30, 2009 (DOE July 2009). The results of the discussions have been incorporated into the BSG Characterization Work Plan, which included such items as number and locations of wells and boreholes.

In February 2010, a notice of conditional approval for the November 2009 BSG Characterization Work Plan was received. In July 2010, the requirements of the work plan were implemented and subsurface soil sampling was completed at 10 deep soil borehole locations to determine contaminant sources, and installed four groundwater monitoring wells to determine the extent of groundwater contamination. Due to an outstanding schedule commitment, an extension request was submitted for the BSG CME Report in September 2010 (SNL September 2010), which was approved by the NMED (NMED October 2010) with a revised CME Report submittal date of March 31, 2014. In January 2014, the DOE/NNSA requested an additional extension to the delivery date of the BSG CME Report to March 31, 2016 (DOE January 2014). In June 2015, NMED approved the DOE/NNSA's proposed extension request .

In June 2016, DOE/NNSA and SNL/NM personnel submitted the *BSG Aquifer Pumping Test Work Plan* (SNL June 2016b), and this plan was quickly approved by NMED (NMED June 2016). Field work associated with the aquifer pumping test was performed in 2017, and in December 2017, the *BSG Aquifer Pumping Test Report* was submitted to NMED (SNL December 2017).

In this report, BSG monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (i.e., gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/NNSA and SNL/NM personnel. 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 Consent Order. Additional information on radionuclides and the scope of the Consent Order is available in Section III.A of the Consent Order.

7.3 Scope of Activities

Section 7.1.5 lists the BSG investigation activities conducted during this reporting period, including plans and reports. The field activities completed during CY 2017 include groundwater monitoring (Table 7-4) and hydrologic tests. Table 7-5 lists the analytical parameters for each well and each sampling event.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include environmental duplicate samples, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Section 1.3 discusses the utility of QC samples.

7.4 Field Methods and Measurements

Section 1.3 describes in detail the monitoring procedures conducted for the BSG groundwater monitoring. Figure 7-2 presents the water level information used to create the potentiometric surface map and Attachment 7D, Figures 7D-1 through 7D-9 presents the hydrographs.

Table 7-4. Groundwater Monitoring Well Network and Sampling Dates for the Burn Site Groundwater Area of Concern, Calendar Year 2017

Date of Sampling Event	Wells Sampled		SAP
April 2017	CYN-MW4 CYN-MW7 CYN-MW8 CYN-MW9 CYN-MW10	CYN-MW11 CYN-MW12 CYN-MW13 CYN-MW14A CYN-MW15	*Burn Site Groundwater Monitoring, Mini-SAP for Third Quarter Fiscal Year 2017* (SNL March 2017)
October 2017	CYN-MW4 CYN-MW7 CYN-MW8 CYN-MW9 CYN-MW10	CYN-MW11 CYN-MW12 CYN-MW13 CYN-MW14A CYN-MW15	*Burn Site Groundwater Monitoring, Mini-SAP for First Quarter Fiscal Year 2018* (SNL September 2017)

NOTES:
CYN = Canyons.
MW = Monitoring well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.

Table 7-5. Parameters Sampled at Burn Site Groundwater Area of Concern Wells for Each Sampling Event, Calendar Year 2017

Parameter	April 2017	
Alkalinity Anions DRO Gamma Spectroscopy (short list[a]) GRO Gross Alpha/Beta Activity HE compounds Isotopic Uranium NPN Perchlorate[b] TAL Metals Tritium VOCs	CYN-MW4 CYN-MW4 (duplicate) CYN-MW7 CYN-MW8 CYN-MW9 CYN-MW10 CYN-MW11	CYN-MW12 CYN-MW13 CYN-MW13 (duplicate) CYN-MW14A CYN-MW14A (duplicate) CYN-MW15
Parameter	**October 2017**	
DRO GRO NPN Perchlorate[b]	CYN-MW4 CYN-MW7 CYN-MW8 CYN-MW8 (duplicate) CYN-MW9 CYN-MW10 CYN-MW10 (duplicate)	CYN-MW11 CYN-MW11 (duplicate) CYN-MW12 CYN-MW13 CYN-MW14A CYN-MW15 CYN-MW15 (duplicate)

NOTES:
[a]Gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40).
[b]Perchlorate analysis performed on samples from monitoring well CYN-MW15 only.
CYN = Canyons.
DRO = Diesel range organics.
GRO = Gasoline range organics.
HE = High explosive.
MW = Monitoring well.
NPN = Nitrate plus nitrate (reported as nitrogen).
TAL = Target Analyte List.
VOC = Volatile organic compound.

7.5 Analytical Methods

Section 1.3.2 (Tables 1-5 and 1-6) describes all groundwater samples analyzed by the off-site laboratory using EPA-specified protocols.

7.6 Summary of Analytical Results

This section discusses analytical results, exceedances of regulatory standards, and pertinent trends in COC concentrations. Attachment 7B, Tables 7B-1 through 7B-10 present the analytical results and field measurements for the CY 2017 BSG sampling events. Tables 7B-1 through 7B-10 footnotes explain the data qualifiers.

No VOCs or HE compounds were detected. Table 7B-1 lists the MDLs for all analyzed VOCs and Table 7B-2 lists the MDLs for all analyzed HE compounds.

Table 7B-3 presents the analytical results for nitrate plus nitrite (NPN) (reported as nitrogen) and Figure 7-3 presents the BSG AOC NPN concentration contours. NPN results exceed the MCL of 10 mg/L in samples from monitoring wells CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15. NPN concentrations in samples from the other BSG monitoring wells are less than the MCL (Table 7B-3). For CY 2017, the NPN concentrations for wells exceeding the MCL are summarized as follows:

- Monitoring well CYN-MW9 had reported concentrations of 44.9 mg/L (April 2017), and 35.8 mg/L (October 2017). The historical range of NPN concentrations for monitoring well CYN-MW9 is approximately 29 to 45 mg/L with an overall consistent trend with high variability over the life of the well (Figure 7C-1).

- Monitoring well CYN-MW10 had reported concentrations of 18.5 mg/L (April 2017), 14.5 mg/L (October 2017), and 15.5 mg/L (October 2017, environmental duplicate sample). The historical range of NPN concentrations for monitoring well CYN-MW10 is approximately 4 to 22 mg/L with a slightly decreasing trend until June 2014, dramatically increasing trend in 2015, and then decreasing again starting in 2016 (Figure 7C-2).

- Monitoring well CYN-MW11 had reported concentrations of 25.4 mg/L (April 2017), 22.6 mg/L (October 2017), and 18.4 mg/L (October 2017, environmental duplicate sample). The historical range of NPN concentrations for monitoring well CYN-MW11 is approximately 9 to 25 mg/L with a consistent trend until June 2014, then a mostly increasing trend starting in 2015 (Figure 7C-3).

- Monitoring well CYN-MW12 had reported concentrations of 20.2 mg/L (April 2017) and 19.4 mg/L (October 2017). The historical range of NPN concentrations for monitoring well CYN-MW12 is approximately 11 to 20 mg/L with increasing concentrations with high variability over the life of the well (Figure 7C-4).

- Monitoring well CYN-MW13 had reported concentrations of 38.2 (April 2017), 36.2 mg/L (April 2017, environmental duplicate sample), and 36.9 mg/L (October 2017). The historical range of NPN concentrations for monitoring well CYN-MW13 is approximately 34 to 40 mg/L with an overall consistent trend over the life of the well (Figure 7C-5).

- Monitoring well CYN-MW14A had reported concentrations of 11.9 (April 2017), 12.0 mg/L (April 2017, environmental duplicate sample), and 15.0 mg/L (October 2017). The historical range of NPN concentrations for monitoring well CYN-MW14A is approximately 10 to 16 mg/L with an overall consistent trend over the life of the well (Figure 7C-6).

- CYN-MW15 had reported concentrations of 28.2 mg/L (April 2017), 22.9 mg/L (October 2017), and 22.2 mg/L (October 2017, environmental duplicate sample). Monitoring well CYN-MW15 replaced well CYN-MW6 in December 2014; Figure 7C-7 displays all NPN concentrations for monitoring well CYN-MW6 and the replacement monitoring well CYN-MW15. The historical range of NPN concentrations for monitoring wells CYN-MW6 and CYN-MW15 is approximately 19 to 40 mg/L with an overall consistent trend with high variability over the life of the wells (Figure 7C-7).

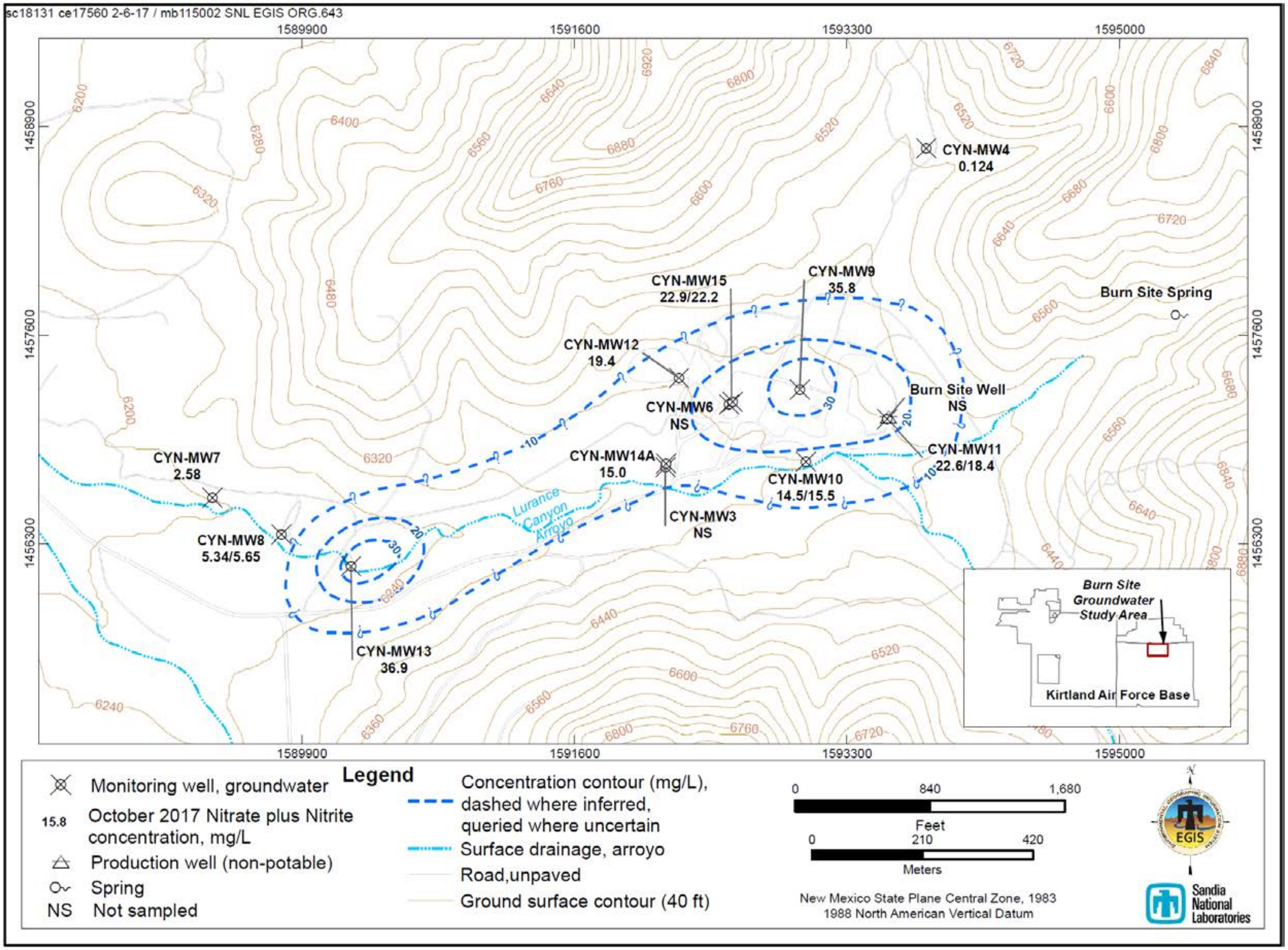


Figure 7-3. Nitrate plus Nitrite Concentration Contour Map for the Burn Site Groundwater Area of Concern, October 2017

Table 7B-4 lists the results for DRO and GRO. No DRO or GRO MCLs have been established. No detections of DRO and GRO were reported for any of the samples collected during the CY 2017 sampling events (Table 7B-4).

Table 7B-5 lists the results for perchlorate. Perchlorate was detected at monitoring well CYN-MW15 at 0.00407 mg/L (April 2017), 0.00319 mg/L (April 2017, reanalysis), 0.00405 mg/L (October 2017), and 0.00466 mg/L (October 2017, environmental duplicate sample). The April analytical results were verified using a different analytical method. No MCL has been established for perchlorate.

Table 7B-6 presents the analytical results for anions. None of the analytes exceed MCLs, where established.

Table 7B-7 presents the analytical results for alkalinity. No MCLs exist for alkalinity parameters.

Table 7B-8 presents total metal results. No metals exceed established MCLs.

Table 7B-9 presents the results of groundwater samples analyzed for tritium, gross alpha/beta activity, isotopic uranium, and radionuclides by gamma spectroscopy. All radionuclide activity results are below established MCLs. Gross alpha activity is measured as a radiological screening tool and in accordance with 40 Code of Federal Regulations Part 141. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements are corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. Radiological results are further reviewed by an SNL/NM Health Physicist to assure that samples are nonradioactive. Corrected gross alpha activity results are below the MCL of 15 picocuries per liter (pCi/L) for all samples.

Field water quality parameters are measured during purging of each monitoring well prior to sampling and include temperature, specific conductivity, oxidation-reduction potential, pH, turbidity, and dissolved oxygen. Table 7B-10 presents these parameter measurements obtained immediately prior to sample collection at each well.

7.7 Quality Control Results

Section 1.3 describes how the field and laboratory QC samples were collected and prepared. Attachment 7B provides data validation qualifiers with the analytical results. The results of QC samples and the impact on data quality for the BSG sampling events are discussed in the following sections.

Environmental duplicate results from all CY 2017 sampling events show good correlation (relative percent difference values less than 35 for inorganic analyses) for all calculated parameters.

The results of the EB sample analyses are as follows:

- **April 2017 Sampling Event at Monitoring Wells CYN-MW4, CYN-MW13, and CYN-MW14A**—The EB samples were collected prior to sampling these wells and analyzed for all parameters. Chloride, fluoride, silver, and sulfate were detected above the laboratory MDLs. No corrective action was necessary for chloride, fluoride, or sulfate, because these analytes were detected in environmental samples at concentrations greater than five times the associated EB result. Silver results reported in samples from CYN-MW4, CYN-MW13, and CYN-MW14A were qualified as not detected during data validation, because silver was reported at concentrations less than five times the associated EB result.

- **October 2017 Sampling Event at Monitoring Wells CYN-MW8, CYN-MW10, CYN-MW11, and CYN-MW15**—No DRO, GRO, NPN, or perchlorate were detected in EB samples. NPN was detected in two EB samples, and no corrective action was necessary because NPN was reported in associated environmental samples at concentrations greater five times the EB result.

The results of the FB sample analyses are as follows:

- **April 2017 Sampling Event at Monitoring Wells CYN-MW10, CYN-MW11, and CYN-MW15**—No VOCs or GRO were detected above laboratory MDLs in these FB samples.

- **October 2017 Sampling Event at Monitoring Wells CYN-MW8, CYN-MW10, CYN-MW11, and CYN-MW15**—GRO was not detected in the FB samples.

The results of the TB sample analyses are as follows:

- **April 2017 Sampling Event**—A total of 14 VOC and 13 GRO TB samples were submitted during this sampling event. No VOCs or GRO were detected above laboratory MDLs in any TB sample.

- **October 2017 Sampling Event**—A total of 15 GRO TB samples were submitted during this sampling event. No GRO was detected above laboratory MDLs in any TB sample.

7.8 Project Field Notes and Comments

No variances or issues from requirements in the BSG monitoring mini-SAPs were identified during sampling activities for the April and October 2017 sampling events.

7.9 Summary and Conclusions

This section provides a brief summary of the following: field activities, COC concentrations, trends of concentrations versus time, the Conceptual Site Model, and plans for studies to be completed during CY 2017 at the BSG AOC.

The BSG AOC 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.

Monitoring wells were sampled during April and October 2017. The samples were analyzed for VOCs, HE compounds, DRO, GRO, NPN, Target Analyte List metals (plus total uranium), anions, alkalinity, cations, perchlorate, gross alpha/beta activity, tritium, isotopic uranium, and radionuclides by gamma spectroscopy.

NPN was the only COC that exceeded a drinking water standard. NPN was detected at concentrations exceeding the MCL of 10 mg/L in samples from seven BSG AOC monitoring wells: CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15. The maximum concentration reported in CY 2017 is 44.9 mg/L in the sample collected from monitoring well CYN-MW9 during the April 2017 sampling event.

The analytical results for this reporting period are mostly consistent with historical concentrations. The notable exceptions are new maximum concentrations of nitrate in wells CYN-MW9, CYN-MW11, and CYN-MW12.

Ongoing environmental studies of the BSG AOC include the following:

- Continue semiannual collection of groundwater samples at 10 monitoring wells (CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15) during the second and fourth quarters of CY 2018. At a minimum, the analytes for groundwater sampling per well will consist of NPN, DRO, and GRO.

- Continue periodic measurements of groundwater elevations in 12 monitoring wells and the Burn Site Well.

- Report future BSG investigation results in the CY 2018 SNL/NM Annual Groundwater Monitoring Report.

- Discuss the Aquifer Pumping Test Report with NMED and decide on options for further characterization and/or remediation.

This page intentionally left blank.

Attachment 7A
Historical Timeline of the Burn Site Groundwater Area of Concern

This page intentionally left blank.

Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern

Month	Year	Event	Reference
	1967-early 1980s	HE testing conducted at the BSG AOC until early 1980s. Burn testing began in 1970s using excavation pits and portable burn pans with JP-4. Open detonations of HE materials conducted. Wastewater discharged into unlined pits.	SNL November 2001
	1987	Eighteen potential SWMUs were identified during the Comprehensive Environmental Assessment and Response Program investigation. HE compounds, nitrate, and diesel range organics identified as potential COCs.	DOE September 1987
February	1998	Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report containing description of BSG hydrogeology submitted.	SNL February 1998
November	1996	Groundwater sample from Burn Site Well yielded nitrate concentration of 25 mg/L.	SNL January 2005
July	1997	NMED/DOE/OB, DOE, and Sandia agree on installation of deep and shallow monitoring wells and one year of quarterly sampling.	SNL July 1997
November	1997	Monitoring wells CYN-MW2S and 12AUP01 are installed to serve as piezometers. (Piezometers are constructed of narrow-diameter casing and not used for collecting groundwater samples.)	SNL June 1998
December	1997	Monitoring well CYN-MW1D 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 AOC 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
August	2001	Monitoring well CYN-MW5 installed 1.7 miles west of the BSG AOC.	SNL June 2005
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 AOC 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 AOC that requires a CME.	NMED April 2004
June	2004	A CCM of the BSG AOC prepared.	SNL June 2004a
June	2004	A CME work plan for the BSG AOC prepared.	SNL June 2004b
January	2005	Nitrate source evaluation of deep soil in the BSG AOC performed.	SNL January 2005

Refer to footnotes on page 7A-6.

Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern *(Continued)*

Month	Year	Event	Reference
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 sends an RSI 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
December	2005	Monitoring wells CYN-MW6 and CYN-MW7 installed.	SNL October 2006
January	2006	Monitoring well CYN-MW8 installed.	SNL October 2006
March	2007	GWPP Fiscal Year 2006 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2007
April	2008	BSG CCM 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 AOC.	NMED April 2009
November	2009	BSG Characterization Work Plan submitted.	SNL November 2009
June	2009	GWPP Calendar Year 2008 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL June 2009
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 2009
July	2010	Installed four groundwater monitoring wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) to determine extent of groundwater contamination.	SNL November 2009
September	2010	An extension request for the BSG CME Report submitted.	SNL September 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 CME Work Plan, BSG.	NMED August 2011
September	2011	GWPP Calendar Year 2010 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL September 2011
January	2012	Summary Report for BSG Characterization Field Program submitted.	SNL January 2012
February	2012	Monitoring Well Plug and Abandonment Plan and Well Construction Plan for BSG wells and status of CYN-MW3 submitted.	SNL February 2012
April	2012	Received notice of approval for the January 2012 BSG Monitoring Well Plug and Abandonment Plan and Well Construction Plan.	NMED April 2012
June	2012	Received notice of approval for the January 2012 Summary Report for BSG Characterization Field Program.	NMED June 2012

Refer to footnotes on page 7A-6.

Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern *(Continued)*

Month	Year	Event	Reference
September	2012	GWPP Calendar Year 2011 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL September 2012
December	2012	Completed field program to decommission BSG monitoring wells 12AUP01, CYN-MW1D, CYN-MW2S, and install monitoring well CYN-MW13.	SNL March 2013
August	2013	DOE/NNSA submitted an Extension Request to the NMED for the Burn Site Groundwater CME Report to March 31, 2013.	DOE August 2013
September	2013	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2012 SNL/NM Annual Groundwater Monitoring Report.	SNL September 2013a
October	2013	In October 2013, DOE Office of Environmental Management submitted an Internal Remedy Review of the Burn Site Groundwater AOC to DOE/NNSA Sandia Field Office.	DOE October 2013
November	2013	Monitoring Well Plug and Abandonment Plan and Well Construction Plan for Installation of Groundwater Monitoring Wells CYN-MW14 and CYN-MW15 submitted.	SNL September 2013b
January	2014	DOE/NNSA requested an extension to the delivery date of the Burn Site Groundwater CME Report to March 31, 2016.	DOE January 2014
June	2014	Approval for installation of groundwater monitoring wells CYN-MW14A and CYN-MW15.	NMED June 2014a
June	2014	NMED approved the proposed extension request for the Burn Site Groundwater CME Report to March 31, 2016.	NMED June 2014b
October	2014	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2013 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2014
December	2014	Installed groundwater monitoring wells CYN-MW14A and CYN-MW15.	SNL April 2015
April	2015	Summary Report for Installation of Groundwater Monitoring Wells CYN-MW14A and CYN-MW15 submitted.	SNL April 2015
June	2015	Approval of the Installation Report for CYN-MW14A and CYN-MW15.	NMED June 2015
June	2015	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2014 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2015
June	2016	Aquifer Pumping Test Work Plan submitted.	SNL June 2016a
June	2016	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2015 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2016b
June	2016	Aquifer Pumping Test Work Plan approved.	NMED June 2016
March	2017	Field requirements of the Aquifer Pumping Test were completed.	SNL December 2017
May	2017	Preliminary results of the pumping test were shared with NMED on May 10, 2017 at the NMED District 1 office.	SNL December 2017
June	2017	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2016 SNL/NM Annual Groundwater Monitoring Report.	SNL July 2017
November	2017	DOE/NNSA/SFO request an extension for the submittal of recommendations for further characterization activities.	DOE November 2017
November	2017	Extension request approved.	NMED November 2017
December	2017	Aquifer Pumping Test Report submitted.	SNL December 2017

Refer to footnotes on page 7A-6.

Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern *(Concluded)*

NOTES:

AOC	= Area of Concern.
BSG	= Burn Site Groundwater.
CAC	= Corrective Action Complete.
CCM	= Current Conceptual Model.
CME	= Corrective Measures Evaluation.
CYN	= Canyons.
COC	= Constituent of concern.
DOE	= U.S. Department of Energy.
GWPP	= Groundwater Protection Program.
HE	= High explosive.
JP-4	= Jet propellant, fuel grade 4.
mg/L	= Milligram(s) per liter.
MW	= Monitoring well.
NFA	= No Further Action.
NMED	= New Mexico Environment Department.
NNSA	= National Nuclear Security Administration.
OB	= Oversight Bureau.
RSI	= Request for Supplemental Information.
Sandia	= Sandia Corporation.
SNL	= Sandia National Laboratories.
SNL/NM	= Sandia National Laboratories, New Mexico.
SWMU	= Solid waste management unit.

Attachment 7B
Burn Site Groundwater
Analytical Results Tables

This page intentionally left blank.

Attachment 7B Tables

This page intentionally left blank.

Table 7B-1
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] SW846-8260B), Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Analyte	MDL[b] (µg/L)	Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300	Chlorobenzene	0.300
1,1,2,2-Tetrachloroethane	0.300	Chloroethane	0.300
1,1,2-Trichloroethane	0.300	Chloroform	0.300
1,1-Dichloroethane	0.300	Chloromethane	0.300
1,1-Dichloroethene	0.300	Cyclohexane	0.300
1,2,3-Trichlorobenzene	0.300	Dibromochloromethane	0.300
1,2,4-Trichlorobenzene	0.300	Dichlorodifluoromethane	0.300
1,2-Dibromo-3-chloropropane	0.500	Ethyl benzene	0.300
1,2-Dibromoethane	0.300	Isopropylbenzene	0.300
1,2-Dichlorobenzene	0.300	Methyl acetate	1.50
1,2-Dichloroethane	0.300	Methylcyclohexane	0.300
1,2-Dichloropropane	0.300	Methylene chloride	1.00
1,3-Dichlorobenzene	0.300	Styrene	0.300
1,4-Dichlorobenzene	0.300	Tert-butyl methyl ether	0.300
2,2-trifluoroethane, 1,1,2-Trichloro-1	2.00	Tetrachloroethene	0.300
2-Butanone	1.50	Toluene	0.300
2-Hexanone	1.50	Trichloroethene	0.300
4-methyl-, 2-Pentanone	1.50	Trichlorofluoromethane	0.300
Acetone	1.50	Vinyl chloride	0.300
Benzene	0.300	Xylene	0.300
Bromochloromethane	0.300	cis-1,2-Dichloroethene	0.300
Bromodichloromethane	0.300	cis-1,3-Dichloropropene	0.300
Bromoform	0.300	m-, p-Xylene	0.300
Bromomethane	0.300	o-Xylene	0.300
Carbon disulfide	1.50	trans-1,2-Dichloroethene	0.300
Carbon tetrachloride	0.300	trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 7B-31.

Table 7B-2
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8321A), Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.0860 – 0.0899
1,3-Dinitrobenzene	0.0860 – 0.0899
2,4,6-Trinitrotoluene	0.0860 – 0.0899
2,4-Dinitrotoluene	0.0860 – 0.0899
2,6-Dinitrotoluene	0.0860 – 0.0899
2-Amino-4,6-dinitrotoluene	0.0860 – 0.0899
2-Nitrotoluene	0.0882 – 0.0921
3-Nitrotoluene	0.0860 – 0.0899
4-Amino-2,6-dinitrotoluene	0.0860 – 0.0899
4-Nitrotoluene	0.161 – 0.169
HMX	0.0860 – 0.0899
Nitro-benzene	0.0860 – 0.0899
Pentaerythritol tetranitrate	0.108 – 0.112
RDX	0.0860 – 0.0899
Tetryl	0.0860 – 0.0899

Refer to footnotes on page 7B-31.

Table 7B-3
Summary of Nitrate plus Nitrite Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 11-Apr-17	Nitrate plus nitrite	0.124	0.017	0.050	10.0			102369-004	EPA 353.2
CYN-MW4 (Duplicate) 11-Apr-17	Nitrate plus nitrite	0.125	0.017	0.050	10.0			102370-003	EPA 353.2
CYN-MW7 10-Apr-17	Nitrate plus nitrite	2.27	0.085	0.250	10.0			102269-004	EPA 353.2
CYN-MW8 12-Apr-17	Nitrate plus nitrite	4.55	0.425	1.25	10.0			102373-004	EPA 353.2
CYN-MW9 18-Apr-17	Nitrate plus nitrite	**44.9**	0.850	2.50	10.0			102402-004	EPA 353.2
CYN-MW10 24-Apr-17	Nitrate plus nitrite	**18.5**	1.70	5.00	10.0			102394-004	EPA 353.2
CYN-MW11 14-Apr-17	Nitrate plus nitrite	**25.4**	0.850	2.50	10.0			102388-004	EPA 353.2
CYN-MW12 17-Apr-17	Nitrate plus nitrite	**20.2**	0.850	2.50	10.0			102392-004	EPA 353.2
CYN-MW13 17-Apr-17	Nitrate plus nitrite	**38.2**	1.70	5.00	10.0			102408-004	EPA 353.2
CYN-MW13 (Duplicate) 17-Apr-17	Nitrate plus nitrite	**36.2**	1.70	5.00	10.0			102409-003	EPA 353.2
CYN-MW14A 13-Apr-17	Nitrate plus nitrite	**11.9**	0.850	2.50	10.0		J	102381-004	EPA 353.2
CYN-MW14A (Duplicate) 13-Apr-17	Nitrate plus nitrite	**12.0**	0.850	2.50	10.0		J	102382-003	EPA 353.2
CYN-MW15 19-Apr-17	Nitrate plus nitrite	**28.2**	0.850	2.50	10.0			102400-004	EPA 353.2

Refer to footnotes on page 7B-31.

Table 7B-3 *(Concluded)*
Summary of Nitrate plus Nitrite Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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 13-Oct-17	Nitrate plus nitrite	0.124	0.017	0.050	10.0		J	103687-003	EPA 353.2
CYN-MW7 09-Oct-17	Nitrate plus nitrite	2.58	0.085	0.250	10.0		J	103722-003	EPA 353.2
CYN-MW8 10-Oct-17	Nitrate plus nitrite	5.34	0.170	0.500	10.0		J	103726-003	EPA 353.2
CYN-MW8 (Duplicate) 10-Oct-17	Nitrate plus nitrite	5.65	0.170	0.500	10.0		J	103727-003	EPA 353.2
CYN-MW9 12-Oct-17	Nitrate plus nitrite	**35.8**	1.70	5.00	10.0			103744-003	EPA 353.2
CYN-MW10 11-Oct-17	Nitrate plus nitrite	**14.5**	0.850	2.50	10.0			103753-003	EPA 353.2
CYN-MW10 (Duplicate) 11-Oct-17	Nitrate plus nitrite	**15.5**	0.850	2.50	10.0			103754-003	EPA 353.2
CYN-MW11 10-Oct-17	Nitrate plus nitrite	**22.6**	0.850	2.50	10.0			103736-003	EPA 353.2
CYN-MW11 (Duplicate) 10-Oct-17	Nitrate plus nitrite	**18.4**	0.850	2.50	10.0			103737-003	EPA 353.2
CYN-MW12 12-Oct-17	Nitrate plus nitrite	**19.4**	0.850	2.50	10.0			103740-003	EPA 353.2
CYN-MW13 09-Oct-17	Nitrate plus nitrite	**36.9**	1.70	5.00	10.0			103757-003	EPA 353.2
CYN-MW14A 11-Oct-17	Nitrate plus nitrite	**15.0**	0.850	2.50	10.0			103732-003	EPA 353.2
CYN-MW15 13-Oct-17	Nitrate plus nitrite	**22.9**	1.70	5.00	10.0			103748-003	EPA 353.2
CYN-MW15 (Duplicate) 13-Oct-17	Nitrate plus nitrite	**22.2**	1.70	5.00	10.0			103749-003	EPA 353.2

Refer to footnotes on page 7B-31.

Table 7B-4
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW4	Diesel Range Organics	ND	53.8	215	NE	U		102369-003	SW846 8015D
11-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102369-002	SW846 8015A/B
CYN-MW4 (Duplicate)	Diesel Range Organics	ND	53.2	213	NE	U		102370-002	SW846 8015D
11-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102370-001	SW846 8015A/B
CYN-MW7	Diesel Range Organics	ND	53.2	213	NE	U		102269-003	SW846 8015D
10-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102269-002	SW846 8015A/B
CYN-MW8	Diesel Range Organics	ND	52.1	208	NE	U		102373-003	SW846 8015D
12-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102373-002	SW846 8015A/B
CYN-MW9	Diesel Range Organics	ND	52.1	208	NE	U		102402-003	SW846 8015D
18-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102402-002	SW846 8015A/B
CYN-MW10	Diesel Range Organics	ND	50.0	200	NE	U		102394-003	SW846 8015D
24-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102394-002	SW846 8015A/B
CYN-MW11 04-Apr-17	Diesel Range Organics	ND	51.0	204	NE	U		102388-003	SW846 8015D
CYN-MW11 26-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102558-002	SW846 8015A/B
CYN-MW12 17-Apr-17	Diesel Range Organics	ND	52.6	211	NE	U		102392-003	SW846 8015D
CYN-MW12 26-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102561-002	SW846 8015A/B
CYN-MW13	Diesel Range Organics	ND	50.0	200	NE	U		102408-003	SW846 8015D
24-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102408-002	SW846 8015A/B
CYN-MW13 (Duplicate)	Diesel Range Organics	ND	49.0	196	NE	U		102409-002	SW846 8015D
24-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102409-001	SW846 8015A/B
CYN-MW14A	Diesel Range Organics	ND	51.0	204	NE	U		102381-003	SW846 8015D
13-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102381-002	SW846 8015A/B
CYN-MW14A (Duplicate)	Diesel Range Organics	ND	52.6	211	NE	U		102382-002	SW846 8015D
13-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102382-001	SW846 8015A/B
CYN-MW15	Diesel Range Organics	ND	52.6	211	NE	U		102400-003	SW846 8015D
19-Apr-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		102400-002	SW846 8015A/B

Refer to footnotes on page 7B-31.

Table 7B-4 *(Concluded)*
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW4	Diesel Range Organics	ND	53.8	215	NE	U		103687-002	SW846 8015D
13-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103687-001	SW846 8015A/B
CYN-MW7	Diesel Range Organics	ND	53.8	215	NE	U		103722-002	SW846 8015D
09-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103722-001	SW846 8015A/B
CYN-MW8	Diesel Range Organics	ND	54.3	217	NE	U		103726-002	SW846 8015D
10-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103726-001	SW846 8015A/B
CYN-MW8 (Duplicate)	Diesel Range Organics	ND	53.8	215	NE	U		103727-002	SW846 8015D
10-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103727-001	SW846 8015A/B
CYN-MW9	Diesel Range Organics	ND	53.8	215	NE	U		103744-002	SW846 8015D
12-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103744-001	SW846 8015A/B
CYN-MW10	Diesel Range Organics	ND	53.8	215	NE	U		103753-002	SW846 8015D
11-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103753-001	SW846 8015A/B
CYN-MW10 (Duplicate)	Diesel Range Organics	ND	54.3	217	NE	U		103754-002	SW846 8015D
11-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103754-001	SW846 8015A/B
CYN-MW11	Diesel Range Organics	ND	53.8	215	NE	U		103736-002	SW846 8015D
10-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103736-001	SW846 8015A/B
CYN-MW11 (Duplicate)	Diesel Range Organics	ND	51.0	204	NE	U		103737-002	SW846 8015D
10-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103737-001	SW846 8015A/B
CYN-MW12	Diesel Range Organics	ND	56.8	227	NE	U		103740-002	SW846 8015D
12-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103740-001	SW846 8015A/B
CYN-MW13	Diesel Range Organics	ND	50.0	200	NE	U		103757-002	SW846 8015D
09-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103757-001	SW846 8015A/B
CYN-MW14A	Diesel Range Organics	ND	53.8	215	NE	U		103732-002	SW846 8015D
11-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103732-001	SW846 8015A/B
CYN-MW15	Diesel Range Organics	ND	50.0	200	NE	U		103748-002	SW846 8015D
13-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103748-001	SW846 8015A/B
CYN-MW15 (Duplicate)	Diesel Range Organics	ND	52.1	208	NE	U		103749-002	SW846 8015D
13-Oct-17	Gasoline Range Organics	ND	16.7	50.0	NE	U		103749-001	SW846 8015A/B

Refer to footnotes on page 7B-31.

Table 7B-5
Summary of Perchlorate Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW15 19-Apr-17	0.00407	0.004	0.012	NE	J		102400-013	EPA 314.0
	0.00319	0.0001	0.0004	NE	H, h	J-	102400-R13	SW846 6850M
CYN-MW15 13-Oct-17	0.00405	0.004	0.012	NE	J		103748-004	EPA 314.0
CYN-MW15 (Duplicate) 13-Oct-17	0.00466	0.004	0.012	NE	J		103749-004	EPA 314.0

Refer to footnotes on page 7B-31.

Table 7B-6
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Bromide	0.385	0.067	0.200	NE			102369-005	SW846 9056
11-Apr-17	Chloride	25.0	0.670	2.00	NE			102369-005	SW846 9056
	Fluoride	0.743	0.033	0.100	4.0			102369-005	SW846 9056
	Sulfate	141	1.33	4.00	NE			102369-005	SW846 9056
CYN-MW7	Bromide	0.639	0.067	0.200	NE			102269-005	SW846 9056
10-Apr-17	Chloride	42.7	0.670	2.00	NE			102269-005	SW846 9056
	Fluoride	1.30	0.033	0.100	4.0			102269-005	SW846 9056
	Sulfate	87.9	1.33	4.00	NE			102269-005	SW846 9056
CYN-MW8	Bromide	0.796	0.067	0.200	NE			102373-005	SW846 9056
12-Apr-17	Chloride	59.2	0.670	2.00	NE			102373-005	SW846 9056
	Fluoride	1.41	0.033	0.100	4.0			102373-005	SW846 9056
	Sulfate	127	1.33	4.00	NE			102373-005	SW846 9056
CYN-MW9	Bromide	0.750	0.067	0.200	NE			102402-005	SW846 9056
18-Apr-17	Chloride	60.4	0.670	2.00	NE			102402-005	SW846 9056
	Fluoride	0.644	0.033	0.100	4.0			102402-005	SW846 9056
	Sulfate	147	1.33	4.00	NE			102402-005	SW846 9056
CYN-MW10	Bromide	0.710	0.067	0.200	NE			102394-005	SW846 9056
24-Apr-17	Chloride	49.6	1.34	4.00	NE			102394-005	SW846 9056
	Fluoride	0.671	0.033	0.100	4.0			102394-005	SW846 9056
	Sulfate	176	2.66	8.00	NE			102394-005	SW846 9056
CYN-MW11	Bromide	1.17	0.067	0.200	NE			102388-005	SW846 9056
14-Apr-17	Chloride	86.2	1.34	4.00	NE			102388-005	SW846 9056
	Fluoride	0.697	0.033	0.100	4.0			102388-005	SW846 9056
	Sulfate	228	2.66	8.00	NE			102388-005	SW846 9056
CYN-MW12	Bromide	1.00	0.067	0.200	NE			102392-005	SW846 9056
17-Apr-17	Chloride	91.3	1.34	4.00	NE			102392-005	SW846 9056
	Fluoride	1.12	0.033	0.100	4.0			102392-005	SW846 9056
	Sulfate	247	2.66	8.00	NE			102392-005	SW846 9056
CYN-MW13	Bromide	0.344	0.067	0.200	NE			102408-005	SW846 9056
24-Apr-17	Chloride	20.1	0.670	2.00	NE			102408-005	SW846 9056
	Fluoride	1.76	0.033	0.100	4.0			102408-005	SW846 9056
	Sulfate	82.0	1.33	4.00	NE			102408-005	SW846 9056

Refer to footnotes on page 7B-31.

Table 7B-6 *(Concluded)*
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW14A	Bromide	0.871	0.067	0.200	NE			102381-005	SW846 9056
13-Apr-17	Chloride	67.8	1.34	4.00	NE			102381-005	SW846 9056
	Fluoride	0.984	0.033	0.100	4.0			102381-005	SW846 9056
	Sulfate	194	2.66	8.00	NE			102381-005	SW846 9056
CYN-MW15	Bromide	1.34	0.067	0.200	NE			102400-005	SW846 9056
19-Apr-17	Chloride	143	1.34	4.00	NE			102400-005	SW846 9056
	Fluoride	0.726	0.033	0.100	4.0			102400-005	SW846 9056
	Sulfate	237	2.66	8.00	NE			102400-005	SW846 9056

Refer to footnotes on page 7B-31.

Table 7B-7
Summary of Alkalinity Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Bicarbonate Alkalinity	244	1.45	4.00	NE			102369-006	SM 2320B
11-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102369-006	SM 2320B
CYN-MW7	Bicarbonate Alkalinity	277	1.45	4.00	NE			102269-006	SM 2320B
10-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102269-006	SM 2320B
CYN-MW8	Bicarbonate Alkalinity	259	1.45	4.00	NE			102373-006	SM 2320B
12-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102373-006	SM 2320B
CYN-MW9	Bicarbonate Alkalinity	293	1.45	4.00	NE			102402-006	SM 2320B
18-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102402-006	SM 2320B
CYN-MW10	Bicarbonate Alkalinity	277	1.45	4.00	NE			102394-006	SM 2320B
24-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102394-006	SM 2320B
CYN-MW11	Bicarbonate Alkalinity	259	1.45	4.00	NE			102388-006	SM 2320B
14-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102388-006	SM 2320B
CYN-MW12	Bicarbonate Alkalinity	258	1.45	4.00	NE			102392-006	SM 2320B
17-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102392-006	SM 2320B
CYN-MW13	Bicarbonate Alkalinity	181	1.45	4.00	NE			102408-006	SM 2320B
24-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102408-006	SM 2320B
CYN-MW14A	Bicarbonate Alkalinity	252	1.45	4.00	NE			102381-006	SM 2320B
13-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102381-006	SM 2320B
CYN-MW15	Bicarbonate Alkalinity	294	1.45	4.00	NE			102400-006	SM 2320B
19-Apr-17	Carbonate Alkalinity	ND	1.45	4.00	NE	U		102400-006	SM 2320B

Refer to footnotes on page 7B-31.

Table 7B-8
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		102369-007	SW846 6020
11-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102369-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102369-007	SW846 6020
	Barium	0.0431	0.00067	0.002	2.00			102369-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102369-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102369-007	SW846 6020
	Calcium	75.3	0.800	2.00	NE			102369-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102369-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102369-007	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102369-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102369-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102369-007	SW846 6020
	Magnesium	38.5	0.010	0.030	NE			102369-007	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102369-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102369-007	SW846 7470
	Nickel	0.000835	0.0006	0.002	NE	B, J	0.0038U	102369-007	SW846 6020
	Potassium	7.16	0.080	0.300	NE			102369-007	SW846 6020
	Selenium	0.0155	0.002	0.005	0.050			102369-007	SW846 6020
	Silver	0.000451	0.0003	0.001	NE	J	0.0024U	102369-007	SW846 6020
	Sodium	47.4	0.080	0.250	NE			102369-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102369-007	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102369-007	SW846 6020
	Zinc	0.006	0.0033	0.010	NE	J		102369-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	ND	0.0193	0.050	NE	U		102269-007	SW846 6020
10-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102269-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102269-007	SW846 6020
	Barium	0.111	0.00067	0.002	2.00			102269-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102269-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102269-007	SW846 6020
	Calcium	106	0.800	2.00	NE			102269-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102269-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102269-007	SW846 6020
	Copper	0.0005	0.0003	0.001	NE	J		102269-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102269-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102269-007	SW846 6020
	Magnesium	22.0	0.010	0.030	NE			102269-007	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102269-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102269-007	SW846 7470
	Nickel	0.000957	0.0006	0.002	NE	B, J	0.0038U	102269-007	SW846 6020
	Potassium	2.82	0.080	0.300	NE			102269-007	SW846 6020
	Selenium	0.00413	0.002	0.005	0.050	J		102269-007	SW846 6020
	Silver	0.000455	0.0003	0.001	NE	J		102269-007	SW846 6020
	Sodium	43.0	0.080	0.250	NE			102269-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102269-007	SW846 6020
	Vanadium	0.00365	0.0033	0.010	NE	J		102269-007	SW846 6020
	Zinc	0.00997	0.0033	0.010	NE	J		102269-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		102373-007	SW846 6020
12-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102373-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102373-007	SW846 6020
	Barium	0.0588	0.00067	0.002	2.00			102373-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102373-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102373-007	SW846 6020
	Calcium	114	0.800	2.00	NE			102373-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102373-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102373-007	SW846 6020
	Copper	0.000353	0.0003	0.001	NE	J		102373-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102373-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102373-007	SW846 6020
	Magnesium	25.6	0.010	0.030	NE			102373-007	SW846 6020
	Manganese	0.00193	0.001	0.005	NE	J	J+	102373-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102373-007	SW846 7470
	Nickel	0.00113	0.0006	0.002	NE	B, J	0.0038U	102373-007	SW846 6020
	Potassium	2.53	0.080	0.300	NE			102373-007	SW846 6020
	Selenium	0.00574	0.002	0.005	0.050			102373-007	SW846 6020
	Silver	0.00048	0.0003	0.001	NE	J		102373-007	SW846 6020
	Sodium	47.8	0.080	0.250	NE			102373-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102373-007	SW846 6020
	Vanadium	0.00416	0.0033	0.010	NE	J		102373-007	SW846 6020
	Zinc	0.00622	0.0033	0.010	NE	J		102373-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	Aluminum	ND	0.0193	0.050	NE	U		102402-007	SW846 6020
18-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102402-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102402-007	SW846 6020
	Barium	0.053	0.00067	0.002	2.00			102402-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102402-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102402-007	SW846 6020
	Calcium	155	0.800	2.00	NE			102402-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102402-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102402-007	SW846 6020
	Copper	0.000339	0.0003	0.001	NE	J		102402-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102402-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102402-007	SW846 6020
	Magnesium	44.0	0.010	0.030	NE			102402-007	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102402-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102402-007	SW846 7470
	Nickel	0.000717	0.0006	0.002	NE	B, J	0.0032U	102402-007	SW846 6020
	Potassium	2.32	0.080	0.300	NE			102402-007	SW846 6020
	Selenium	0.0058	0.002	0.005	0.050			102402-007	SW846 6020
	Silver	0.000448	0.0003	0.001	NE	J		102402-007	SW846 6020
	Sodium	41.0	0.080	0.250	NE			102402-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102402-007	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102402-007	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102402-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		102394-007	SW846 6020
24-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102394-007	SW846 6020
	Arsenic	0.00207	0.002	0.005	0.010	J		102394-007	SW846 6020
	Barium	0.0654	0.00067	0.002	2.00			102394-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102394-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102394-007	SW846 6020
	Calcium	139	0.800	2.00	NE			102394-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102394-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102394-007	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102394-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102394-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102394-007	SW846 6020
	Magnesium	38.0	0.010	0.030	NE			102394-007	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102394-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102394-007	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102394-007	SW846 6020
	Potassium	1.99	0.080	0.300	NE			102394-007	SW846 6020
	Selenium	0.00544	0.002	0.005	0.050			102394-007	SW846 6020
	Silver	0.000418	0.0003	0.001	NE	J		102394-007	SW846 6020
	Sodium	37.7	0.080	0.250	NE			102394-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102394-007	SW846 6020
	Vanadium	0.00367	0.0033	0.010	NE	J		102394-007	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		102394-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		102388-007	SW846 6020
14-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102388-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102388-007	SW846 6020
	Barium	0.0793	0.00067	0.002	2.00			102388-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102388-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102388-007	SW846 6020
	Calcium	164	0.800	2.00	NE			102388-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102388-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102388-007	SW846 6020
	Copper	0.000503	0.0003	0.001	NE	J		102388-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102388-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102388-007	SW846 6020
	Magnesium	48.1	0.010	0.030	NE			102388-007	SW846 6020
	Manganese	0.0121	0.001	0.005	NE		J+	102388-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102388-007	SW846 7470
	Nickel	0.000959	0.0006	0.002	NE	B, J	0.0032U	102388-007	SW846 6020
	Potassium	2.93	0.080	0.300	NE			102388-007	SW846 6020
	Selenium	0.00617	0.002	0.005	0.050			102388-007	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		102388-007	SW846 6020
	Sodium	42.3	0.080	0.250	NE			102388-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102388-007	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102388-007	SW846 6020
	Zinc	0.013	0.0033	0.010	NE			102388-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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	0.0193	0.050	NE	U		102392-007	SW846 6020
17-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102392-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102392-007	SW846 6020
	Barium	0.0337	0.00067	0.002	2.00			102392-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102392-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102392-007	SW846 6020
	Calcium	168	0.800	2.00	NE			102392-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102392-007	SW846 6020
	Cobalt	0.000323	0.0003	0.001	NE	J		102392-007	SW846 6020
	Copper	0.000385	0.0003	0.001	NE	J		102392-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102392-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102392-007	SW846 6020
	Magnesium	44.2	0.010	0.030	NE			102392-007	SW846 6020
	Manganese	0.014	0.001	0.005	NE		J+	102392-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102392-007	SW846 7470
	Nickel	0.000852	0.0006	0.002	NE	B, J	0.0032U	102392-007	SW846 6020
	Potassium	2.56	0.080	0.300	NE			102392-007	SW846 6020
	Selenium	0.0086	0.002	0.005	0.050			102392-007	SW846 6020
	Silver	0.000337	0.0003	0.001	NE	J		102392-007	SW846 6020
	Sodium	43.5	0.080	0.250	NE			102392-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102392-007	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102392-007	SW846 6020
	Zinc	0.0131	0.0033	0.010	NE			102392-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW13	Aluminum	ND	0.0193	0.050	NE	U		102408-007	SW846 6020
24-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102408-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102408-007	SW846 6020
	Barium	0.0958	0.00067	0.002	2.00			102408-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102408-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102408-007	SW846 6020
	Calcium	111	0.800	2.00	NE			102408-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102408-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102408-007	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		102408-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102408-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102408-007	SW846 6020
	Magnesium	20.3	0.010	0.030	NE			102408-007	SW846 6020
	Manganese	0.00899	0.001	0.005	NE			102408-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102408-007	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		102408-007	SW846 6020
	Potassium	2.02	0.080	0.300	NE			102408-007	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		102408-007	SW846 6020
	Silver	0.000328	0.0003	0.001	NE	J	0.0024U	102408-007	SW846 6020
	Sodium	24.7	0.080	0.250	NE			102408-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102408-007	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102408-007	SW846 6020
	Zinc	0.00762	0.0033	0.010	NE	J		102408-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW14A	Aluminum	ND	0.0193	0.050	NE	U		102381-007	SW846 6020
13-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102381-007	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		102381-007	SW846 6020
	Barium	0.0446	0.00067	0.002	2.00			102381-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102381-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102381-007	SW846 6020
	Calcium	147	0.800	2.00	NE			102381-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102381-007	SW846 6020
	Cobalt	0.000873	0.0003	0.001	NE	J		102381-007	SW846 6020
	Copper	0.000562	0.0003	0.001	NE	J		102381-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102381-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102381-007	SW846 6020
	Magnesium	39.1	0.010	0.030	NE			102381-007	SW846 6020
	Manganese	0.021	0.001	0.005	NE		J+	102381-007	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		102381-007	SW846 7470
	Nickel	0.00133	0.0006	0.002	NE	B, J	0.0038U	102381-007	SW846 6020
	Potassium	2.61	0.080	0.300	NE			102381-007	SW846 6020
	Selenium	0.00857	0.002	0.005	0.050			102381-007	SW846 6020
	Silver	0.000343	0.0003	0.001	NE	J	0.0026U	102381-007	SW846 6020
	Sodium	41.8	0.080	0.250	NE			102381-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102381-007	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102381-007	SW846 6020
	Zinc	0.0119	0.0033	0.010	NE			102381-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-8 *(Concluded)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

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-MW15	Aluminum	ND	0.0193	0.050	NE	U		102400-007	SW846 6020
19-Apr-17	Antimony	ND	0.001	0.003	0.006	U		102400-007	SW846 6020
	Arsenic	0.00202	0.002	0.005	0.010	J		102400-007	SW846 6020
	Barium	0.0654	0.00067	0.002	2.00			102400-007	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		102400-007	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		102400-007	SW846 6020
	Calcium	194	0.800	2.00	NE			102400-007	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		102400-007	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		102400-007	SW846 6020
	Copper	0.00197	0.0003	0.001	NE			102400-007	SW846 6020
	Iron	ND	0.033	0.100	NE	U		102400-007	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		102400-007	SW846 6020
	Magnesium	54.0	0.100	0.300	NE			102400-007	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		102400-007	SW846 6020
	Mercury	0.000158	0.000067	0.0002	0.002	J		102400-007	SW846 7470
	Nickel	0.000775	0.0006	0.002	NE	B, J	0.0032U	102400-007	SW846 6020
	Potassium	2.70	0.080	0.300	NE			102400-007	SW846 6020
	Selenium	0.00921	0.002	0.005	0.050			102400-007	SW846 6020
	Silver	0.000444	0.0003	0.001	NE	J		102400-007	SW846 6020
	Sodium	47.3	0.080	0.250	NE			102400-007	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		102400-007	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		102400-007	SW846 6020
	Zinc	0.00371	0.0033	0.010	NE	J		102400-007	SW846 6020

Refer to footnotes on page 7B-31.

Table 7B-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 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Americium-241	-5.81 ± 8.76	14.9	7.15	NE	U	BD	102369-009	EPA 901.1
11-Apr-17	Cesium-137	-0.0961 ± 1.61	2.86	1.35	NE	U	BD	102369-009	EPA 901.1
	Cobalt-60	0.692 ± 1.56	2.96	1.36	NE	U	BD	102369-009	EPA 901.1
	Potassium-40	-47.3 ± 37.6	39.9	18.8	NE	U	BD	102369-009	EPA 901.1
	Gross Alpha	1.84	NA	NA	15 pCi/L	NA	None	102369-R10	EPA 900.0
	Gross Beta	8.57 ± 2.18	1.76	0.846	4 mrem/yr			102369-R10	EPA 900.0
	Uranium-233/234	35.5 ± 3.43	0.135	0.061	NE			102369-011	HASL-300
	Uranium-235/236	0.500 ± 0.120	0.111	0.0478	NE			102369-011	HASL-300
	Uranium-238	4.86 ± 0.543	0.109	0.0484	NE			102369-011	HASL-300
	Tritium	-31.3 ± 78.9	151	68.9	NE	U	BD	102369-012	EPA 906.0
CYN-MW7	Americium-241	11.4 ± 16.3	25.0	12.2	NE	U	BD	102269-009	EPA 901.1
10-Apr-17	Cesium-137	1.55 ± 1.94	3.00	1.42	NE	U	BD	102269-009	EPA 901.1
	Cobalt-60	-0.729 ± 1.91	3.24	1.49	NE	U	BD	102269-009	EPA 901.1
	Potassium-40	6.38 ± 58.4	36.7	17.0	NE	U	BD	102269-009	EPA 901.1
	Gross Alpha	-4.21	NA	NA	15 pCi/L	NA	None	102269-R10	EPA 900.0
	Gross Beta	3.96 ± 1.32	1.58	0.761	4 mrem/yr		J	102269-R10	EPA 900.0
	Uranium-233/234	18.6 ± 1.83	0.131	0.0595	NE			102269-011	HASL-300
	Uranium-235/236	0.370 ± 0.0968	0.108	0.0466	NE			102269-011	HASL-300
	Uranium-238	2.44 ± 0.308	0.107	0.0472	NE			102269-011	HASL-300
	Tritium	0.373 ± 82.5	152	69.2	NE	U	BD	102269-012	EPA 906.0
CYN-MW8	Americium-241	-0.238 ± 22.2	35.7	17.6	NE	U	BD	102373-009	EPA 901.1
12-Apr-17	Cesium-137	1.59 ± 2.60	3.90	1.88	NE	U	BD	102373-009	EPA 901.1
	Cobalt-60	-0.619 ± 2.29	3.96	1.88	NE	U	BD	102373-009	EPA 901.1
	Potassium-40	10.8 ± 42.3	50.3	24.1	NE	U	BD	102373-009	EPA 901.1
	Gross Alpha	13.25	NA	NA	15 pCi/L	NA	None	102373-010	EPA 900.0
	Gross Beta	9.24 ± 2.01	1.35	0.644	4 mrem/yr			102373-010	EPA 900.0
	Uranium-233/234	22.4 ± 2.14	0.121	0.0547	NE			102373-011	HASL-300
	Uranium-235/236	0.412 ± 0.0989	0.0996	0.0428	NE			102373-011	HASL-300
	Uranium-238	2.74 ± 0.328	0.098	0.0434	NE			102373-011	HASL-300
	Tritium	22.5 ± 84.9	152	69.3	NE	U	BD	102373-012	EPA 906.0

Refer to footnotes on page 7B-31.

Table 7B-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 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW9	Americium-241	-0.664 ± 6.65	10.8	5.24	NE	U	BD	102402-009	EPA 901.1
18-Apr-17	Cesium-137	3.70 ± 4.80	2.75	1.30	NE	X	R	102402-009	EPA 901.1
	Cobalt-60	-0.0601 ± 1.52	2.77	1.28	NE	U	BD	102402-009	EPA 901.1
	Potassium-40	-13.3 ± 39.5	38.3	18.0	NE	U	BD	102402-009	EPA 901.1
	Gross Alpha	1.68	NA	NA	15 pCi/L	NA	None	102402-010	EPA 900.0
	Gross Beta	4.94 ± 1.69	2.18	1.05	4 mrem/yr		J	102402-010	EPA 900.0
	Uranium-233/234	8.17 ± 0.806	0.0804	0.0364	NE			102402-011	HASL-300
	Uranium-235/236	0.237 ± 0.0614	0.0664	0.0285	NE			102402-011	HASL-300
	Uranium-238	2.71 ± 0.302	0.0653	0.0289	NE			102402-011	HASL-300
	Tritium	-59.8 ± 79.0	157	71.7	NE	U	BD	102402-012	EPA 906.0
CYN-MW10	Americium-241	2.95 ± 6.57	10.2	4.96	NE	U	BD	102394-009	EPA 901.1
24-Apr-17	Cesium-137	1.01 ± 1.92	3.03	1.44	NE	U	BD	102394-009	EPA 901.1
	Cobalt-60	1.17 ± 1.75	3.22	1.50	NE	U	BD	102394-009	EPA 901.1
	Potassium-40	-24.5 ± 29.4	39.1	18.4	NE	U	BD	102394-009	EPA 901.1
	Gross Alpha	1.30	NA	NA	15 pCi/L	NA	None	102394-010	EPA 900.0
	Gross Beta	5.36 ± 1.93	2.67	1.30	4 mrem/yr		J	102394-010	EPA 900.0
	Uranium-233/234	5.97 ± 0.629	0.118	0.0533	NE			102394-011	HASL-300
	Uranium-235/236	0.156 ± 0.0631	0.0971	0.0417	NE		J	102394-011	HASL-300
	Uranium-238	2.29 ± 0.283	0.0955	0.0423	NE			102394-011	HASL-300
	Tritium	-5.67 ± 87.3	162	73.8	NE	U	BD	102394-012	EPA 906.0
CYN-MW11	Americium-241	2.85 ± 6.58	10.6	5.13	NE	U	BD	102388-009	EPA 901.1
14-Apr-17	Cesium-137	0.456 ± 1.77	3.09	1.47	NE	U	BD	102388-009	EPA 901.1
	Cobalt-60	1.82 ± 2.03	3.61	1.69	NE	U	BD	102388-009	EPA 901.1
	Potassium-40	33.5 ± 49.1	30.2	13.9	NE	X	R	102388-009	EPA 901.1
	Gross Alpha	7.33	NA	NA	15 pCi/L	NA	None	102388-010	EPA 900.0
	Gross Beta	2.92 ± 1.35	1.81	0.864	4 mrem/yr		J	102388-010	EPA 900.0
	Uranium-233/234	7.03 ± 0.710	0.0848	0.0384	NE			102388-011	HASL-300
	Uranium-235/236	0.239 ± 0.0626	0.070	0.0301	NE			102388-011	HASL-300
	Uranium-238	2.20 ± 0.258	0.0689	0.0305	NE			102388-011	HASL-300
	Tritium	-4.13 ± 85.4	158	72.0	NE	U	BD	102388-012	EPA 906.0

Refer to footnotes on page 7B-31.

Table 7B-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 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW12	Americium-241	1.46 ± 15.4	24.3	11.8	NE	U	BD	102392-009	EPA 901.1
17-Apr-17	Cesium-137	3.01 ± 2.60	2.90	1.37	NE	X	R	102392-009	EPA 901.1
	Cobalt-60	0.534 ± 1.83	3.36	1.55	NE	U	BD	102392-009	EPA 901.1
	Potassium-40	-18.5 ± 41.3	45.6	21.5	NE	U	BD	102392-009	EPA 901.1
	Gross Alpha	1.80	NA	NA	15 pCi/L	NA	None	102392-R10	EPA 900.0
	Gross Beta	5.14 ± 2.08	2.72	1.30	4 mrem/yr		J	102392-R10	EPA 900.0
	Uranium-233/234	12.8 ± 1.35	0.157	0.0712	NE			102392-011	HASL-300
	Uranium-235/236	0.328 ± 0.101	0.130	0.0558	NE		J	102392-011	HASL-300
	Uranium-238	3.07 ± 0.392	0.128	0.0565	NE			102392-011	HASL-300
	Tritium	2.53 ± 86.1	158	72.0	NE	U	BD	102392-012	EPA 906.0
CYN-MW13	Americium-241	-3.05 ± 15.2	23.5	11.4	NE	U	BD	102408-009	EPA 901.1
24-Apr-17	Cesium-137	-0.0758 ± 1.91	3.25	1.54	NE	U	BD	102408-009	EPA 901.1
	Cobalt-60	1.45 ± 1.96	3.56	1.65	NE	U	BD	102408-009	EPA 901.1
	Potassium-40	14.6 ± 54.4	32.4	14.9	NE	U	BD	102408-009	EPA 901.1
	Gross Alpha	3.28	NA	NA	15 pCi/L	NA	None	102408-010	EPA 900.0
	Gross Beta	5.69 ± 1.79	2.36	1.15	4 mrem/yr		J	102408-010	EPA 900.0
	Uranium-233/234	9.07 ± 0.914	0.120	0.0545	NE			102408-011	HASL-300
	Uranium-235/236	0.236 ± 0.0743	0.0993	0.0427	NE		J	102408-011	HASL-300
	Uranium-238	1.91 ± 0.248	0.0977	0.0432	NE			102408-011	HASL-300
	Tritium	-11.9 ± 85.0	159	72.3	NE	U	BD	102408-012	EPA 906.0
CYN-MW14A	Americium-241	-29.9 ± 15.5	9.88	4.88	NE	U	R	102381-009	EPA 901.1
13-Apr-17	Cesium-137	3.12 ± 3.84	5.81	2.81	NE	U	BD	102381-009	EPA 901.1
	Cobalt-60	-1.49 ± 3.66	5.40	2.54	NE	U	BD	102381-009	EPA 901.1
	Potassium-40	95.3 ± 82.0	58.1	27.4	NE	X	R	102381-009	EPA 901.1
	Gross Alpha	13.67	NA	NA	15 pCi/L	NA	None	102381-010	EPA 900.0
	Gross Beta	8.57 ± 2.43	2.75	1.33	4 mrem/yr			102381-010	EPA 900.0
	Uranium-233/234	13.0 ± 1.26	0.117	0.0531	NE			102381-011	HASL-300
	Uranium-235/236	0.245 ± 0.076	0.0968	0.0416	NE		J	102381-011	HASL-300
	Uranium-238	2.79 ± 0.330	0.0952	0.0421	NE			102381-011	HASL-300
	Tritium	11.9 ± 84.2	152	69.6	NE	U	BD	102381-012	EPA 906.0

Refer to footnotes on page 7B-31.

Table 7B-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 2017

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW15	Americium-241	-10.3 ± 19.2	27.1	13.2	NE	U	BD	102400-009	EPA 901.1
19-Apr-17	Cesium-137	1.80 ± 2.60	3.28	1.56	NE	U	BD	102400-009	EPA 901.1
	Cobalt-60	0.790 ± 1.90	3.50	1.63	NE	U	BD	102400-009	EPA 901.1
	Potassium-40	29.2 ± 43.9	34.7	16.1	NE	U	BD	102400-009	EPA 901.1
	Gross Alpha	1.99	NA	NA	15 pCi/L	NA	None	102400-010	EPA 900.0
	Gross Beta	5.30 ± 2.09	2.75	1.32	4 mrem/yr		J	102400-010	EPA 900.0
	Uranium-233/234	14.0 ± 1.36	0.0847	0.0384	NE			102400-011	HASL-300
	Uranium-235/236	0.304 ± 0.0736	0.070	0.0301	NE			102400-011	HASL-300
	Uranium-238	3.41 ± 0.373	0.0688	0.0305	NE			102400-011	HASL-300
	Tritium	38.5 ± 90.8	159	72.7	NE	U	BD	102400-012	EPA 906.0

Refer to footnotes on page 7B-31.

Table 7B-10
Summary of Field Water Quality Measurements[h], Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2017

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (μmhos/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CYN-MW4	11-Apr-17	17.64	634.2	195.0	7.38	0.26	44.3	4.22
CYN-MW7	10-Apr-17	18.38	701.7	200.1	7.20	0.58	47.8	4.48
CYN-MW8	12-Apr-17	18.96	806.1	155.1	7.16	0.60	34.7	3.17
CYN-MW9	18-Apr-17	17.91	1001.9	229.5	7.04	0.40	60.3	5.69
CYN-MW10	24-Apr-17	17.40	846.8	157.6	7.37	0.26	72.6	6.94
CYN-MW11	14-Apr-17	18.24	1077.5	86.3	7.33	0.44	9.3	0.87
	26-Apr-17	16.17	932.5	63.7	7.20	0.72	8.2	0.77
CYN-MW12	17-Apr-17	18.88	1073.5	166.4	7.12	0.58	11.6	1.08
	26-Apr-17	16.40	1016.1	220.2	7.17	1.73	10.6	1.03
CYN-MW13	24-Apr-17	19.05	714.4	198.4	7.30	0.52	27.2	2.52
CYN-MW14A	13-Apr-17	18.16	936.7	118.2	7.31	0.33	7.3	0.68
CYN-MW15	19-Apr-17	16.92	1234.0	152.5	7.02	0.52	11.3	1.09
CYN-MW4	13-Oct-17	19.09	708.9	285.9	7.30	0.24	42.7	3.96
CYN-MW7	09-Oct-17	18.56	683.7	142.2	7.16	0.29	49.3	4.60
CYN-MW8	10-Oct-17	18.08	765.0	130.0	7.19	0.29	53.6	5.01
CYN-MW9	12-Oct-17	17.75	1046.1	300.9	6.96	0.23	56.9	5.39
CYN-MW10	11-Oct-17	16.45	854.4	295.5	7.33	0.16	72.3	7.04
CYN-MW11	10-Oct-17	17.01	1067.4	202.5	7.23	0.21	11.5	1.11
CYN-MW12	12-Oct-17	18.59	1025.3	104.1	7.05	0.39	14.0	1.27
CYN-MW13	09-Oct-17	18.53	741.8	206.9	7.19	0.11	36.5	3.39
CYN-MW14A	11-Oct-17	17.69	900.0	105.9	7.21	0.13	13.2	1.26
CYN-MW15	13-Oct-17	18.16	1218.1	89.3	6.95	0.39	11.7	1.10

Refer to footnotes on page 7B-31.

This page intentionally left blank.

Footnotes for Burn Site Groundwater Analytical Results Tables

%	= Percent.
CFR	= Code of Federal Regulations.
CYN	= Canyons.
EPA	= U.S. Environmental Protection Agency.
HMX	= Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID	= Identifier.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
mrem/yr	= Millirem per year.
MW	= Monitoring well.
No.	= Number.
pCi/L	= Picocuries per liter.
RDX	= Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Tetryl	= Methyl-2,4,6-trinitrophenylnitramine.

[a]Result or Activity

The Result applies to Tables 7B-3 through 7B-8. Activity applies to Table 7B-9.

Activity	= Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Part 141). Activities of zero or less are considered to be not detected.
Bold	= Value exceed the established MCL.
ND	= Not detected (at method detection limit).

[b]MDL or MDA

The MDL applies to Tables 7B-3 through 7B-8. MDA applies to Table 7B-9.

MDA	= The minimal 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.
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 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

The PQL applies to Tables 7B-3 through 7B-8. Critical level applies to Table 7B-9.

Critical Level	= 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.
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

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards (EPA May 2009).

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 Part 141).
- 4 mrem/yr = Any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Burn Site Groundwater Analytical Results Tables *(Concluded)*

[e]Lab Qualifier

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

B = The analyte was detected in the blank above the effective method detection limit (MDL).
h = Prep holding time exceeded.
H = Analytical holding time was exceeded.
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.

[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.

[g]Analytical Method

DOE, Environmental Measurements Laboratory, 1997, "EML Procedures Manual," 28th ed., Vol. 1, Rev. 0, HASL-300.

EPA, 1986 (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed.

EPA, 1984, "Methods for Chemical Analysis of Water and Wastes." EPA 600-4-79-020.

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

Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri, 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, Washington, D.C.

DOE = U.S. Department of Energy.
HASL = Health and Safety Laboratory.
SM = Standard Method.

[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 7C
Burn Site Groundwater
Plots

This page intentionally left blank.

Attachment 7C Plots

This page intentionally left blank.

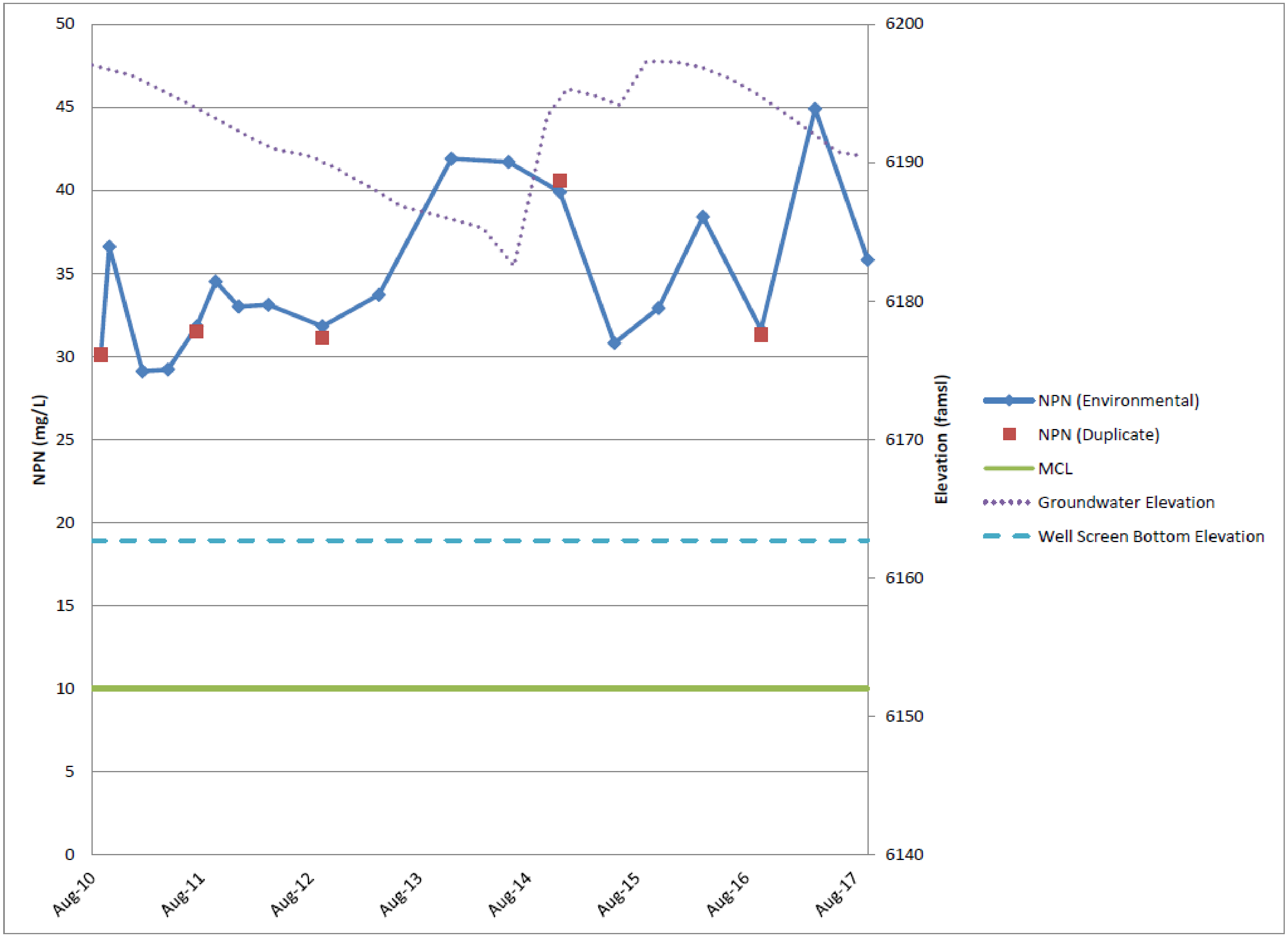


Figure 7C-1. Nitrate plus Nitrite Concentrations, CYN-MW9

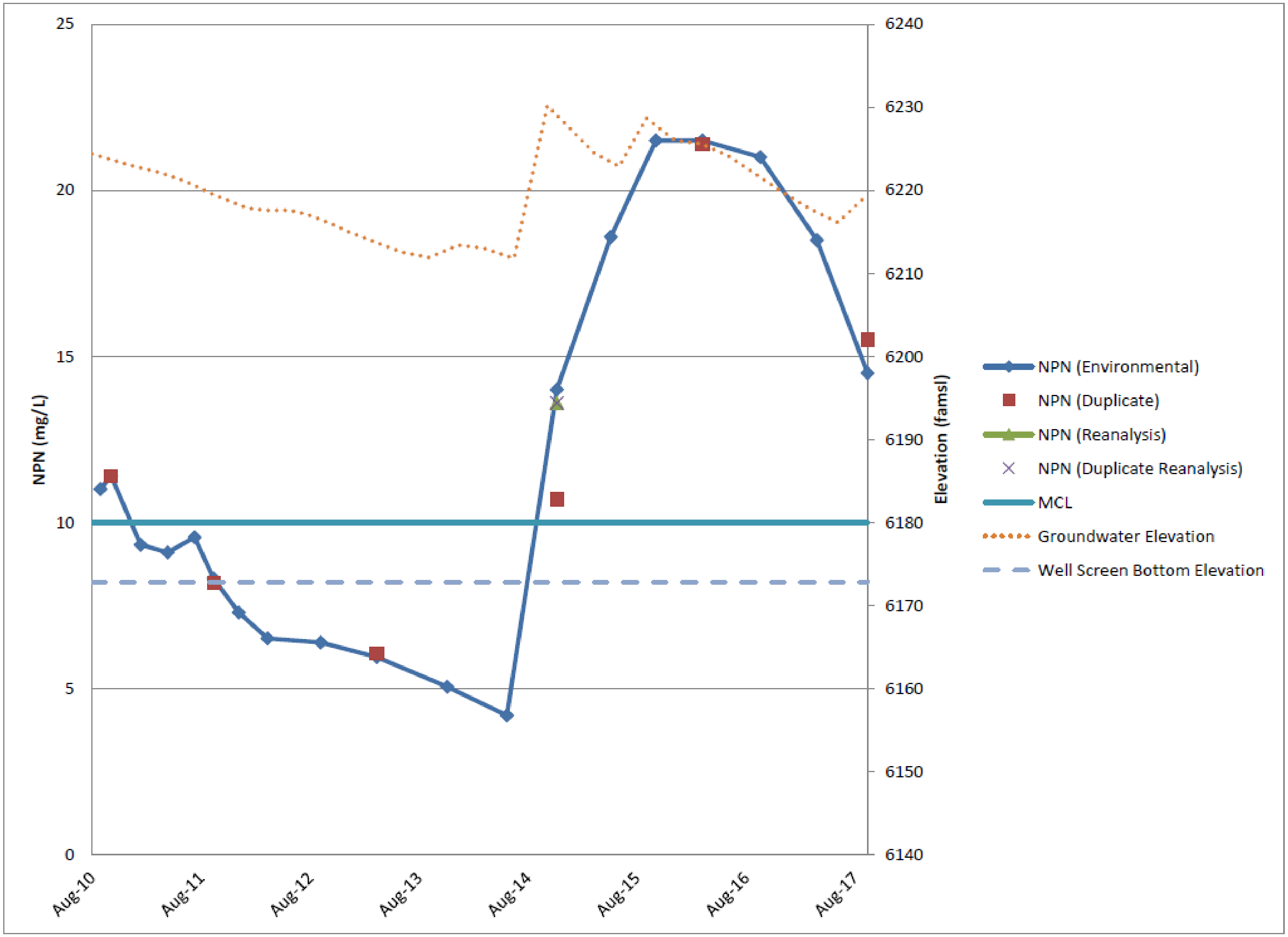


Figure 7C-2. Nitrate plus Nitrite Concentrations, CYN-MW10

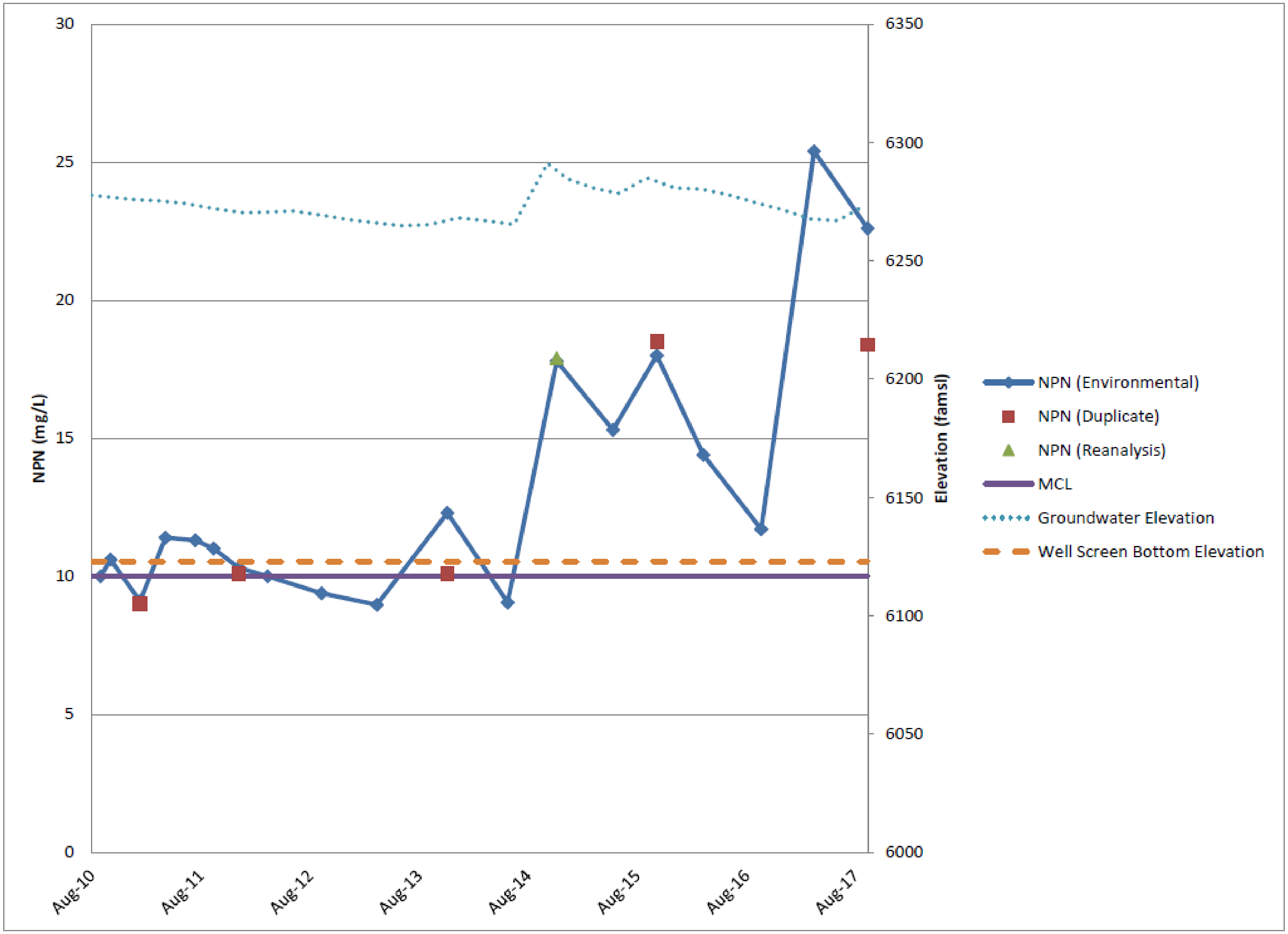


Figure 7C-3. Nitrate plus Nitrite Concentrations, CYN-MW11

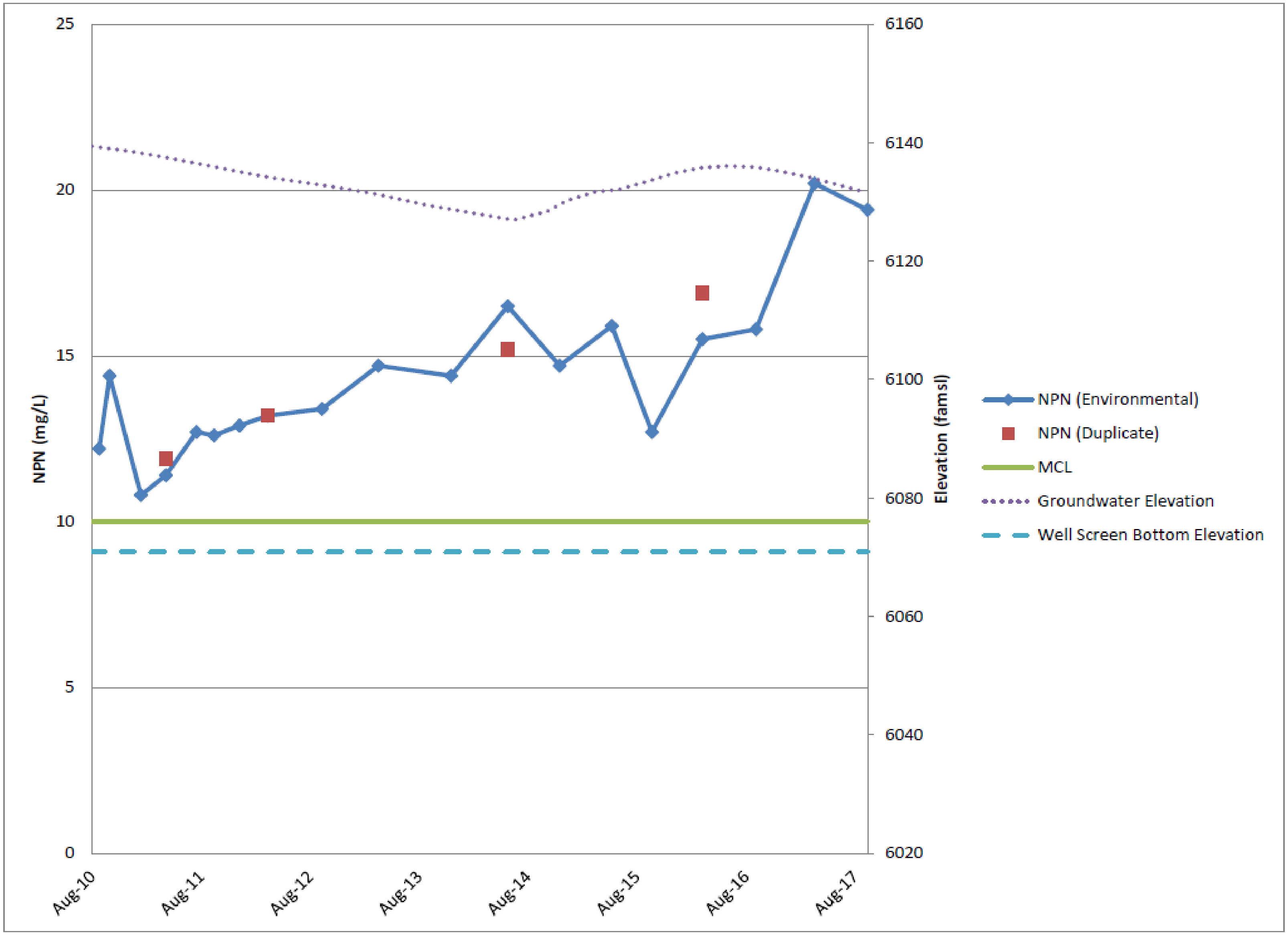


Figure 7C-4. Nitrate plus Nitrite Concentrations, CYN-MW12

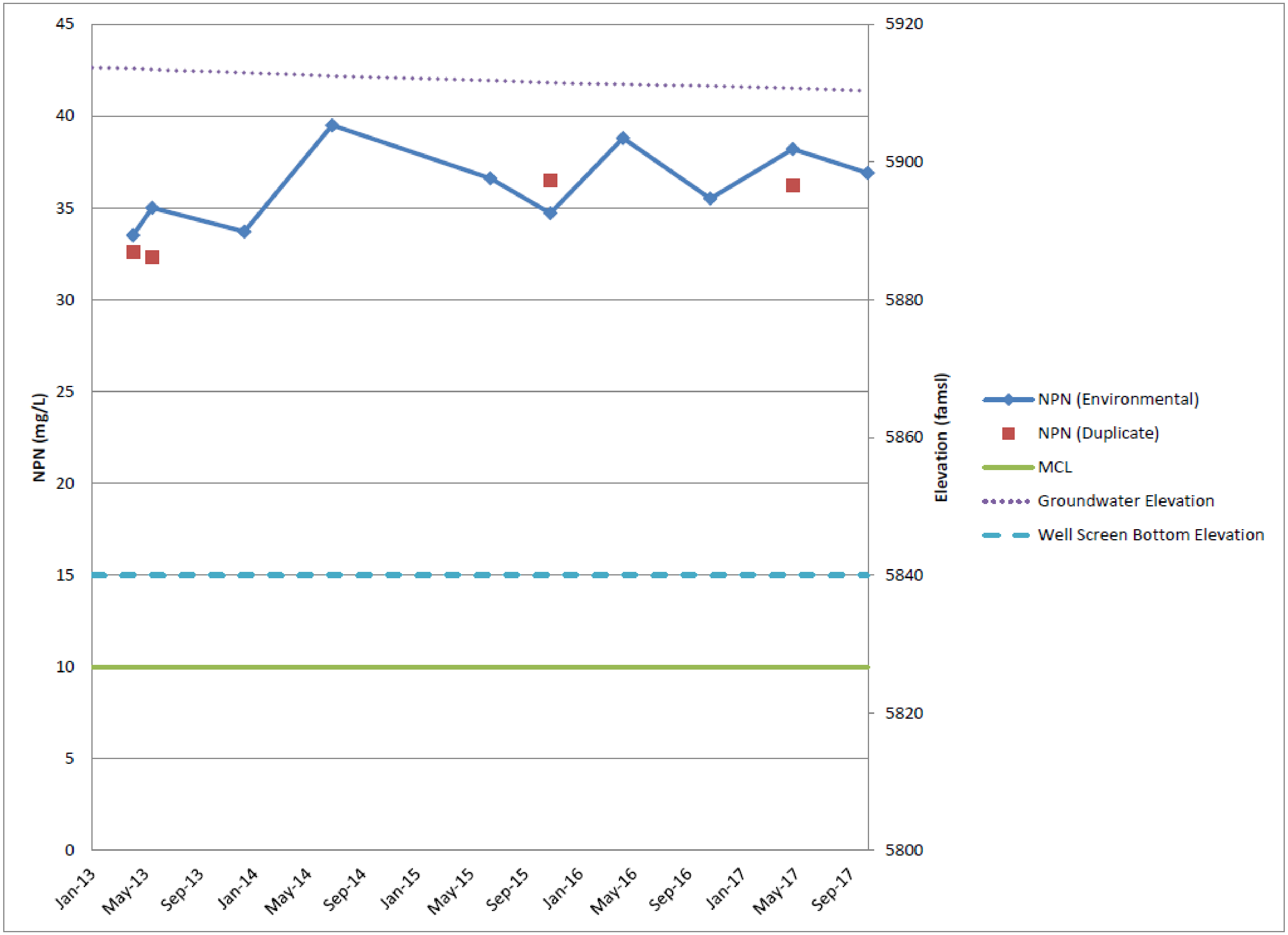


Figure 7C-5. Nitrate plus Nitrite Concentrations, CYN-MW13

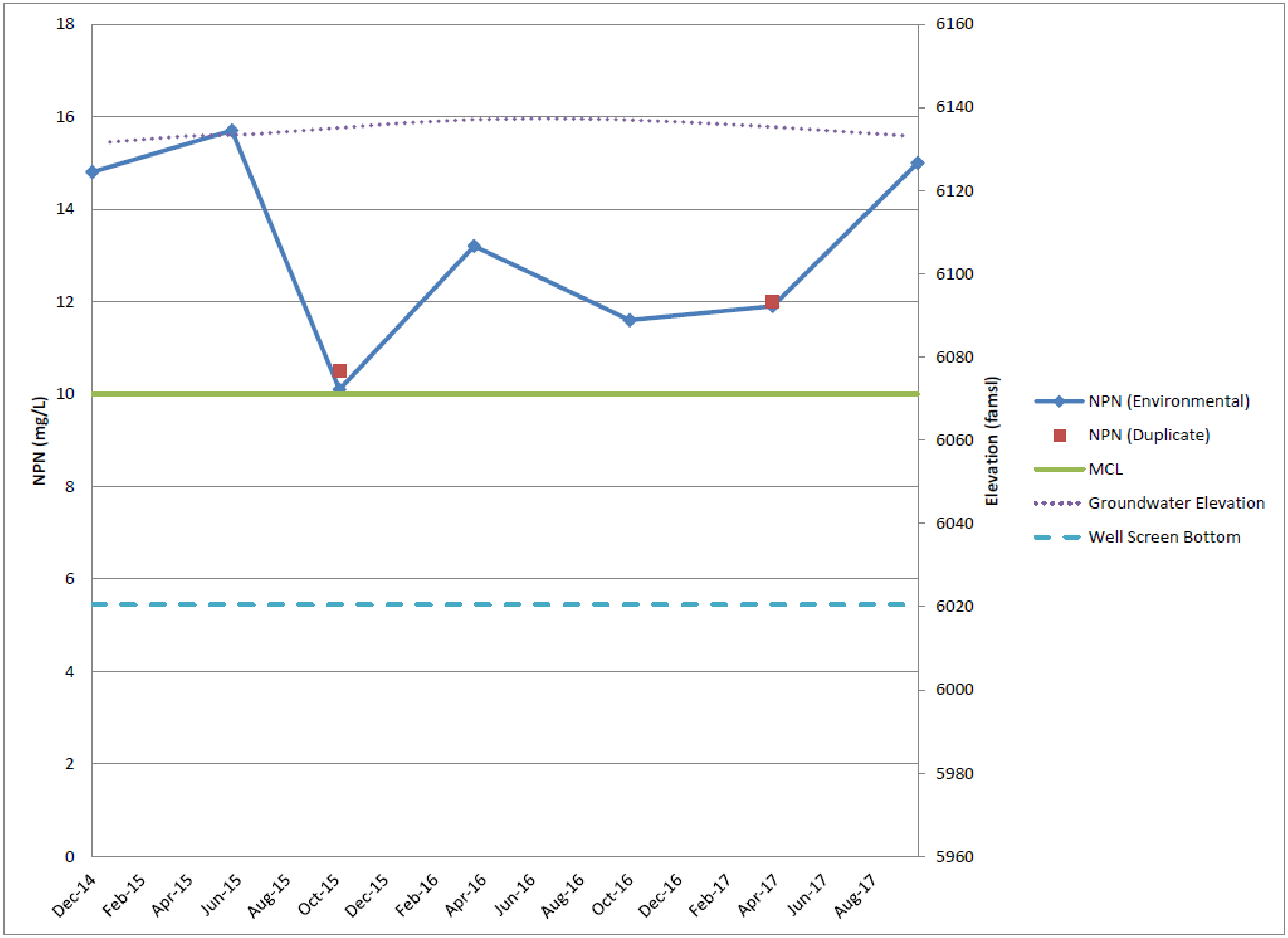


Figure 7C-6. Nitrate plus Nitrite Concentrations, CYN-MW14A

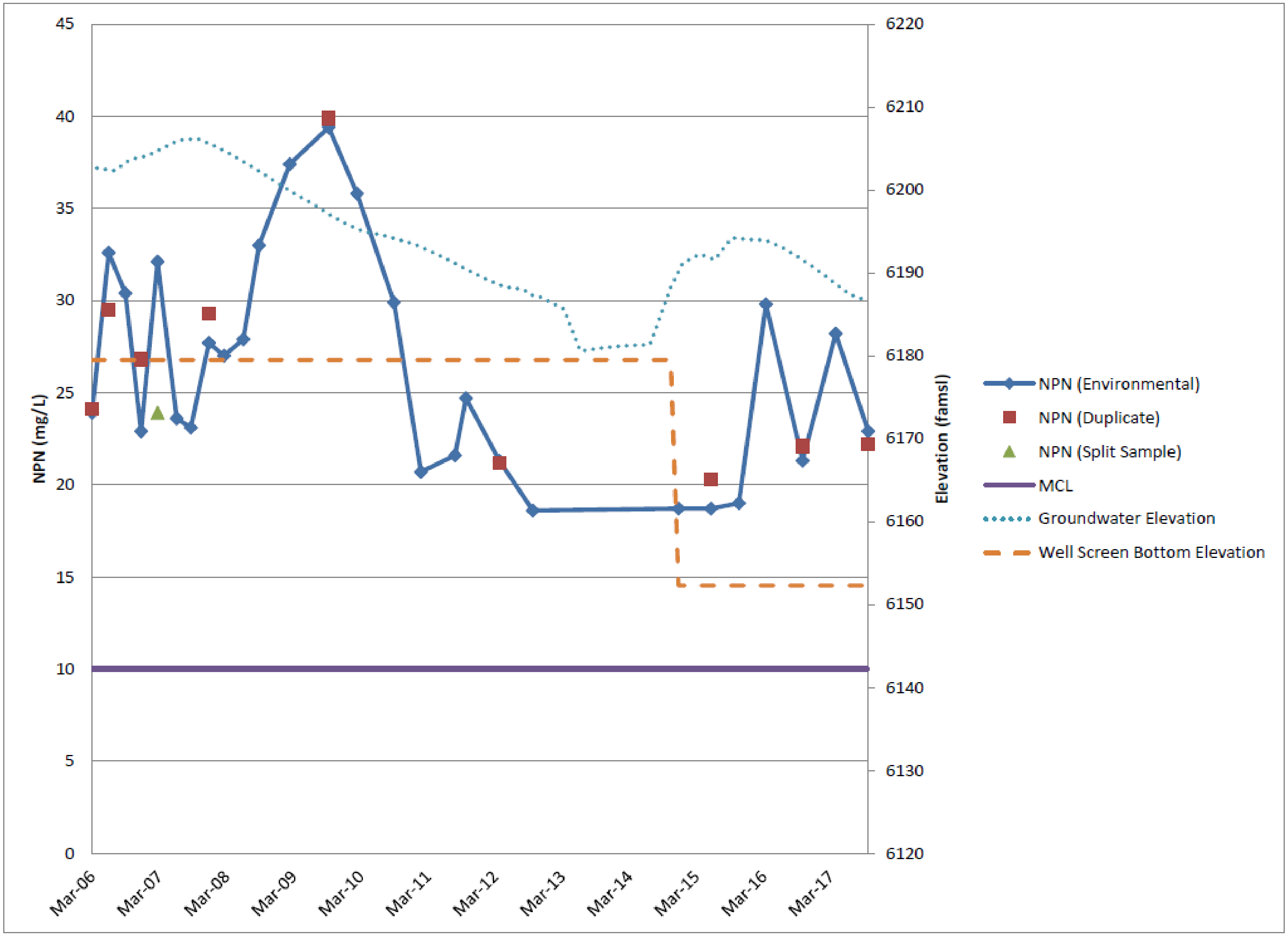


Figure 7C-7. Nitrate plus Nitrite Concentrations, CYN-MW15 (Includes Historical CYN-MW6 Data)

This page intentionally left blank.

Attachment 7D
Burn Site Groundwater
Hydrographs

This page intentionally left blank.

Attachment 7D Hydrographs

This page intentionally left blank.

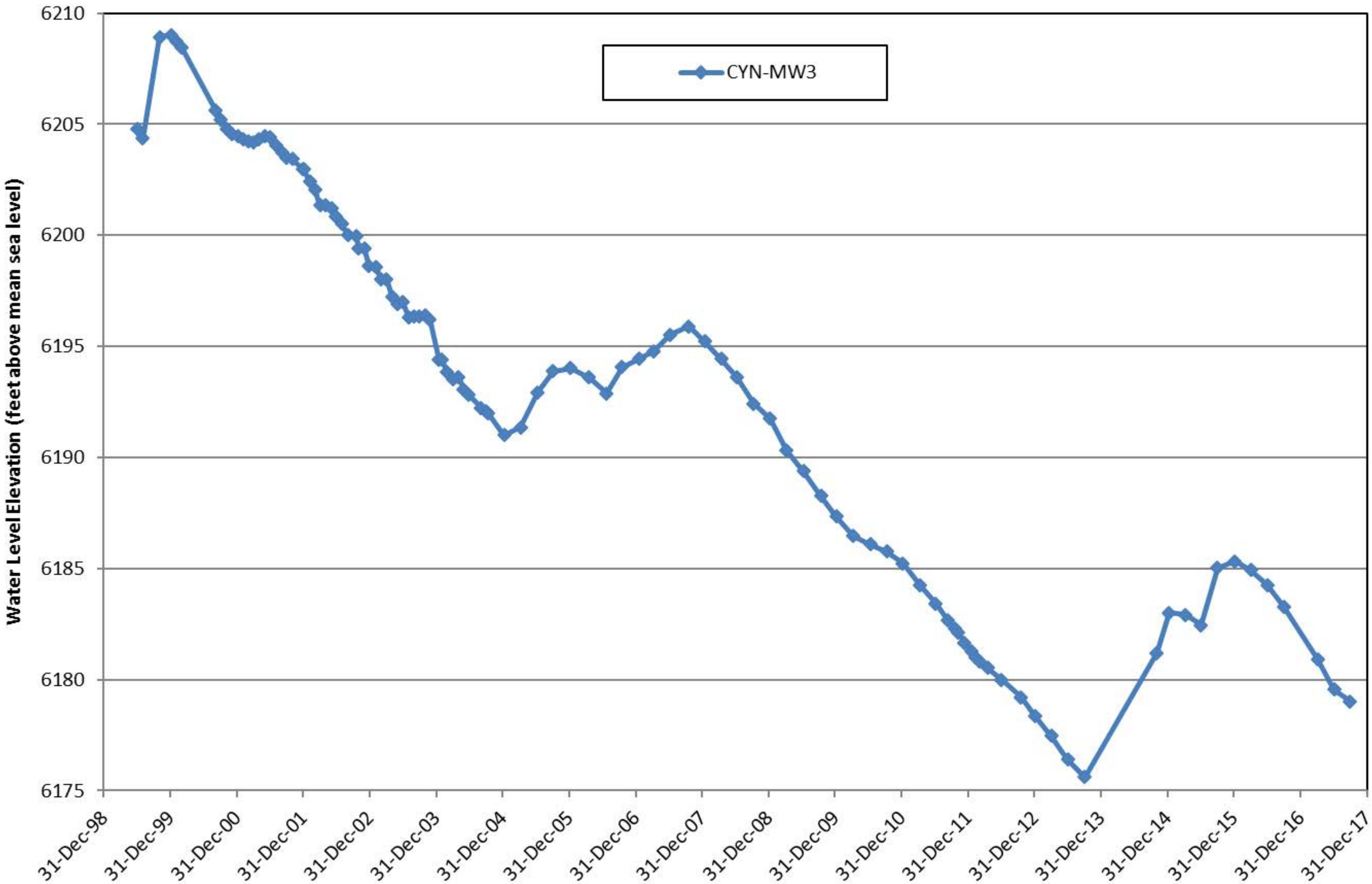


Figure 7D-1. BSG Area of Concern Wells (1 of 9)

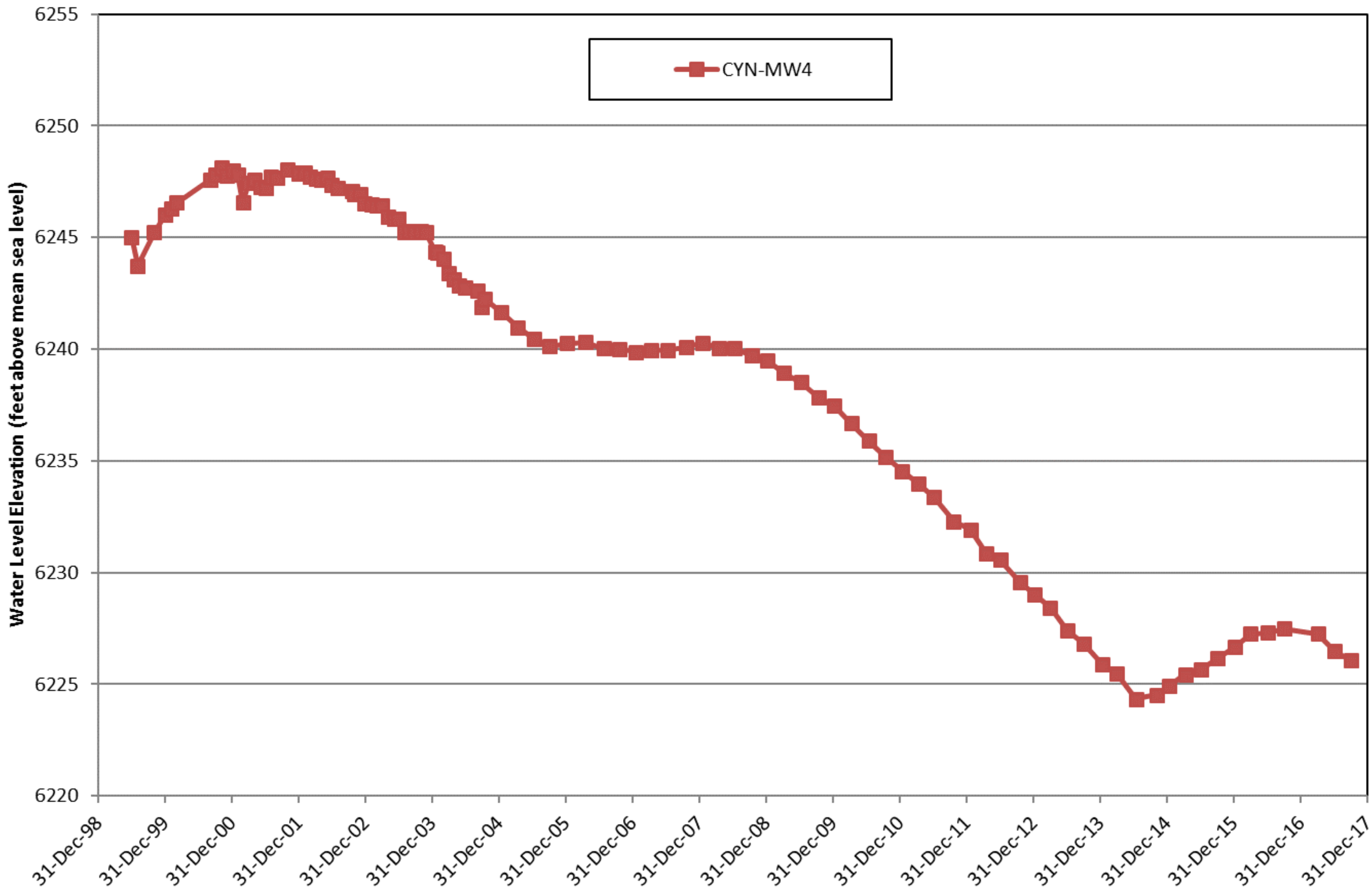


Figure 7D-2. BSG Area of Concern Wells (2 of 9)

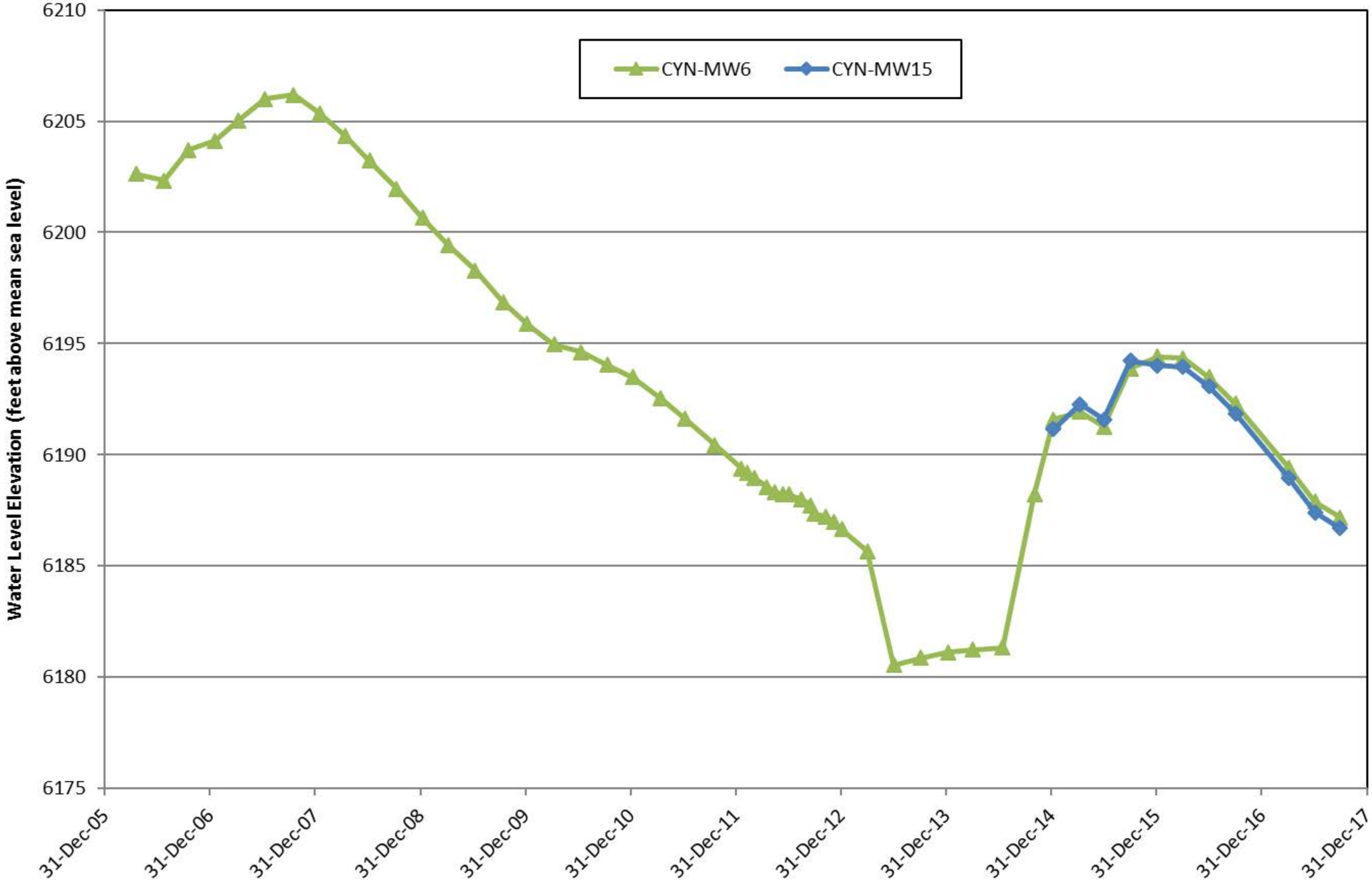


Figure 7D-3. BSG Area of Concern Wells (3 of 9)

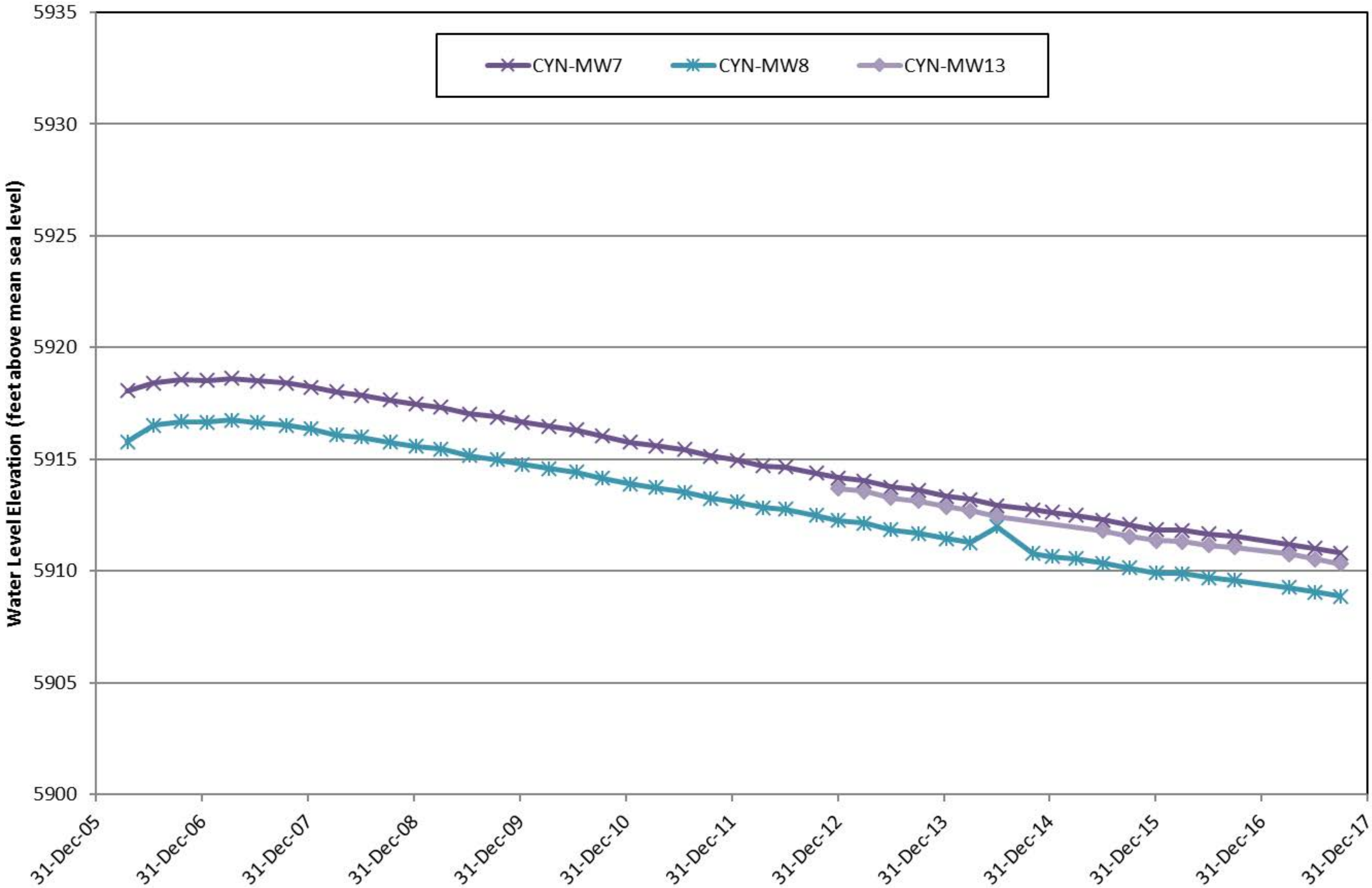


Figure 7D-4. BSG Area of Concern Wells (4 of 9)

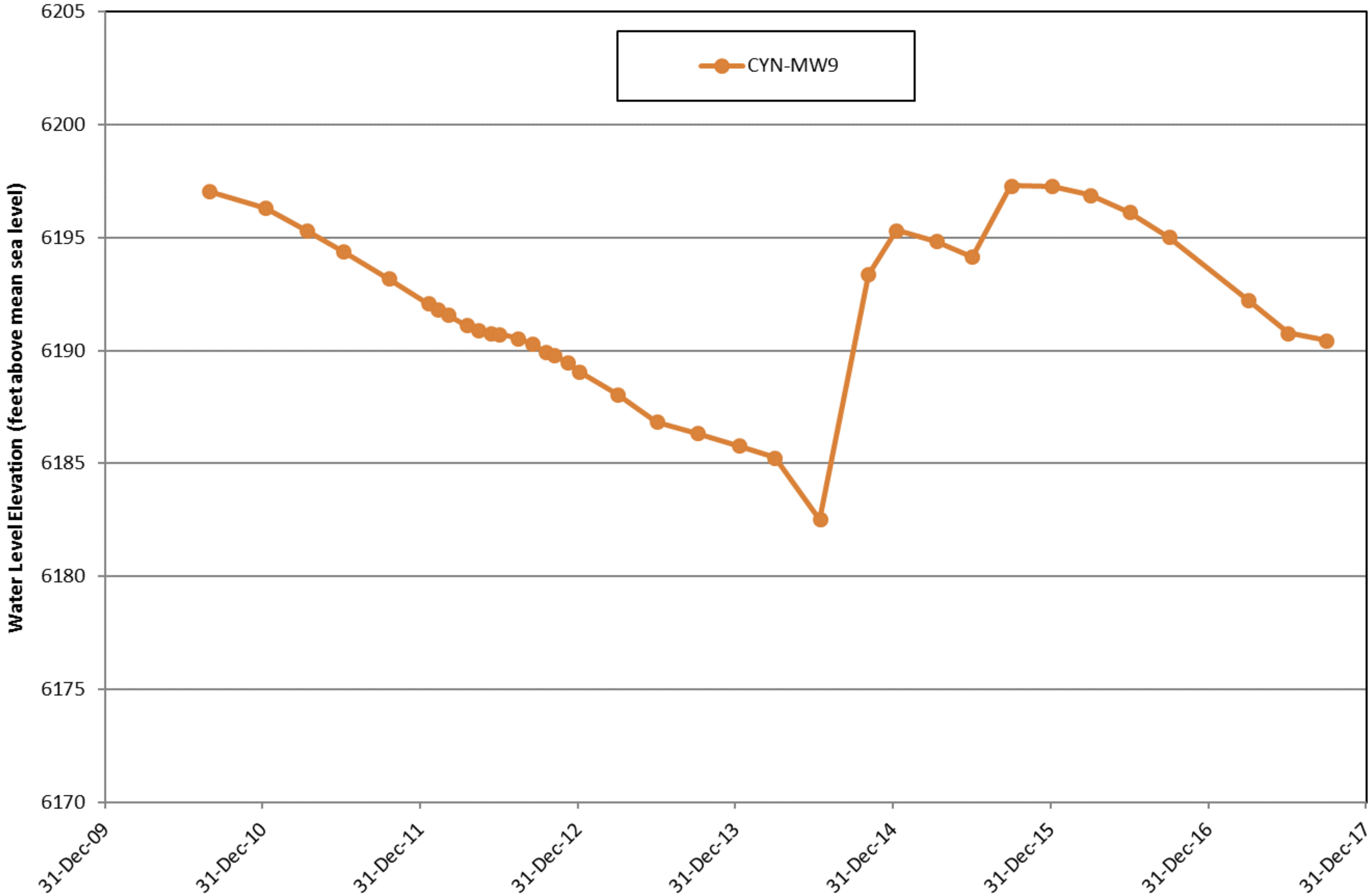


Figure 7D-5. BSG Area of Concern Wells (5 of 9)

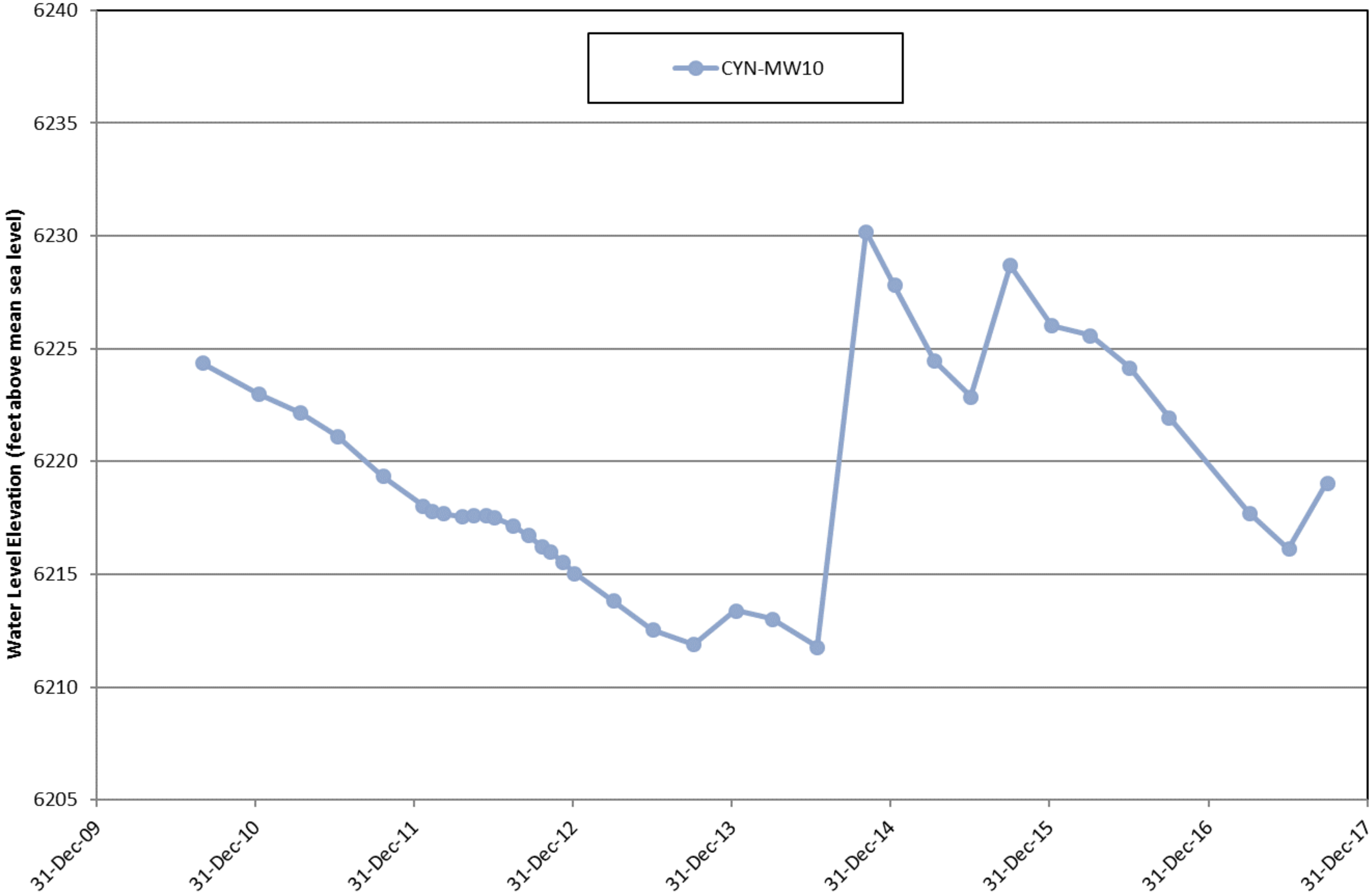


Figure 7D-6. BSG Area of Concern Wells (6 of 9)

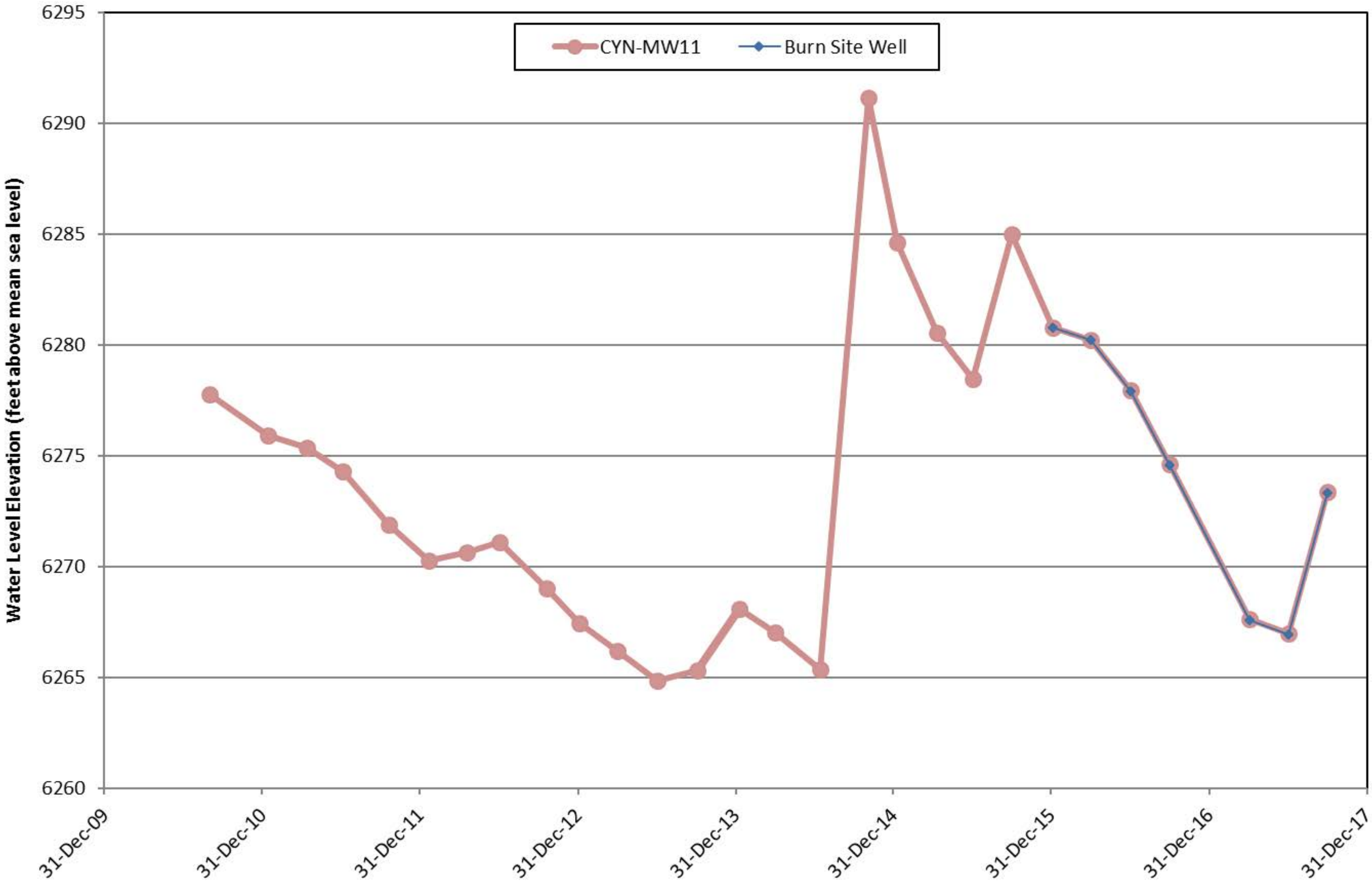


Figure 7D-7. BSG Area of Concern Wells (7 of 9)

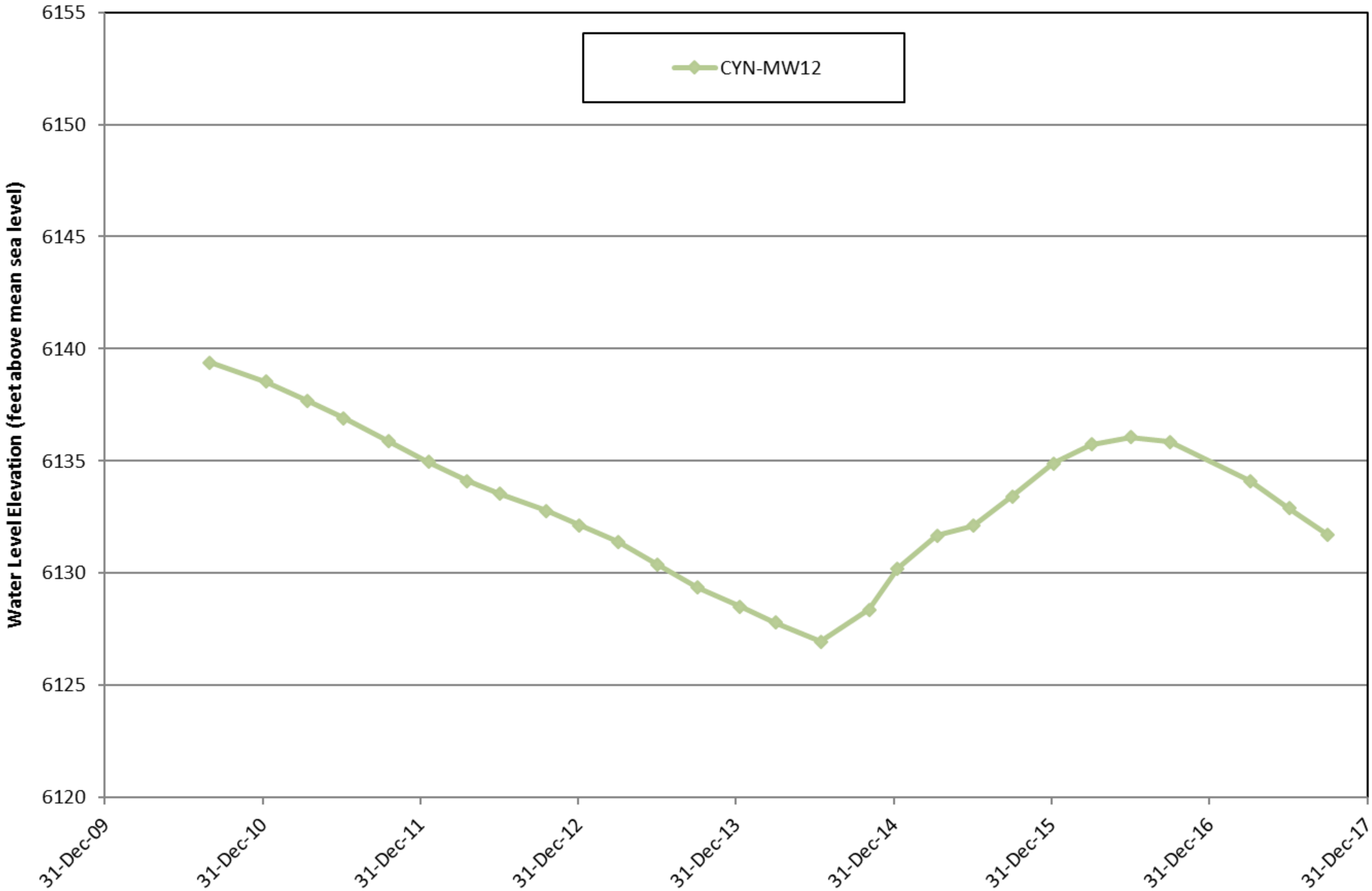


Figure 7D-8. BSG Area of Concern Wells (8 of 9)

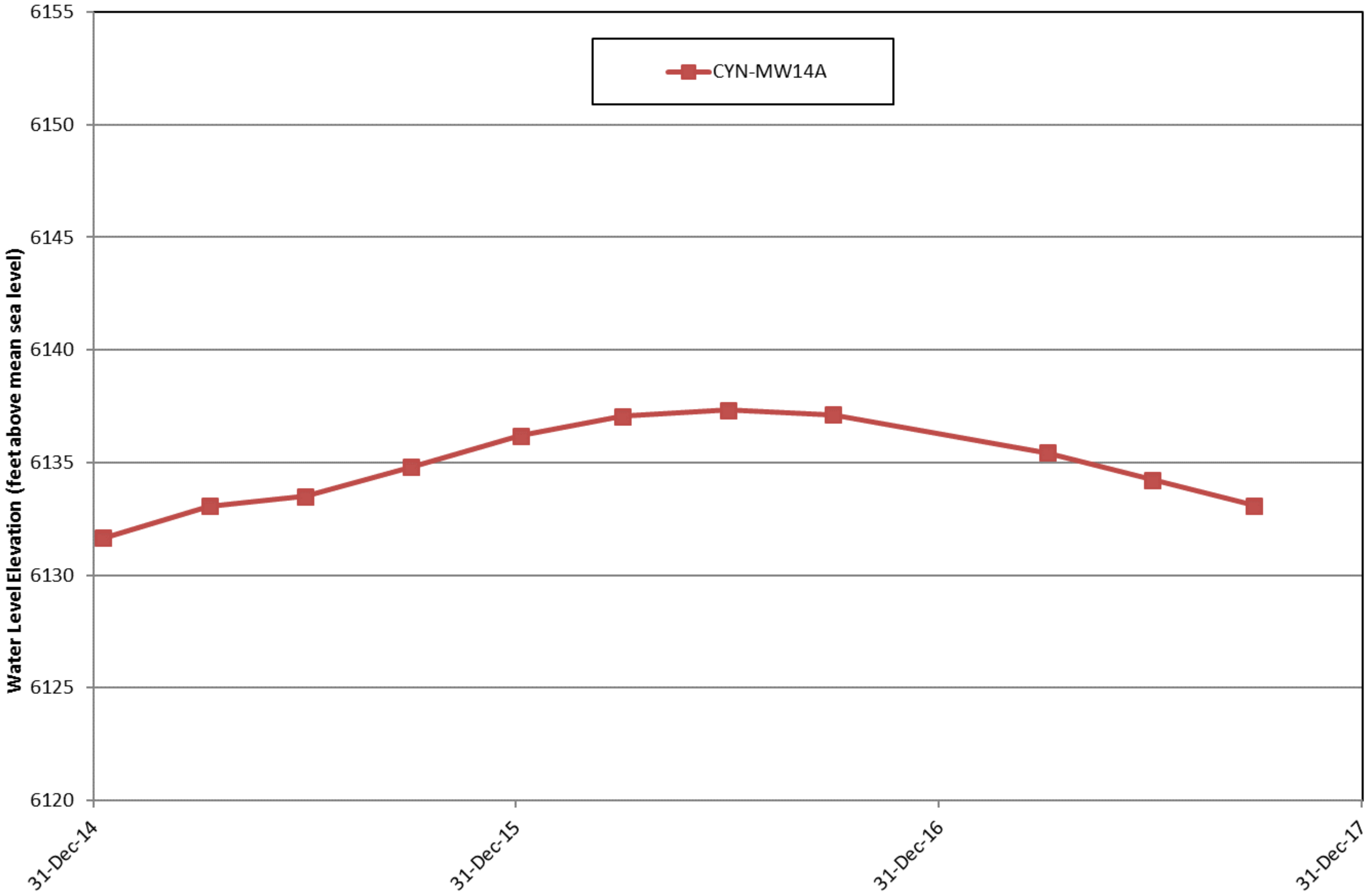


Figure 7D-9. BSG Area of Concern Wells (9 of 9)

This page intentionally left blank.

Chapter 7
Burn Site Groundwater
References

This page intentionally left blank.

Brown et al. 1999 Brown, C.L., K.E. Karlstrom, M. Heizler, and D. Unruh, 1999. *Paleoproterozoic deformation, metamorphism, and 40Ar/39Ar thermal history of the 1.65-Ga Manzanita Pluton, Manzanita Mountains, New Mexico*, in New Mexico Geological Society 50th Annual Fall Field Conference, Albuquerque Geology, pp. 255–68.

Dinwiddie September 1997 Dinwiddie, R.S., September 1997. Letter to M.J. Zamorski (U.S. Department of Energy, Kirtland Area Office), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB," New Mexico Environment Department, Hazardous & Radioactive Materials Bureau, Santa Fe, New Mexico, September 24, 1997.

DOE November 2017 U.S. Department of Energy (DOE), November 2017. Letter to J.E. Kieling (New Mexico Environment Department) "RE: Burn Site Aquifer Pumping Test Report; Request for Extension for Recommendations," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, November 8, 2017.

DOE January 2014 U.S. Department of Energy (DOE), January 2014. Letter to J.E. Kieling (New Mexico Environment Department), "Extension Request for the Burn Site Groundwater Corrective Measures Evaluation Report," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, January 31, 2014.

DOE October 2013 U.S. Department of Energy (DOE), October 2013. *Internal Remedy Review of the Burn Site Groundwater Area of Concern, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Compliance, to Geoffrey Beausoleil, Manager, U.S. Department of Energy, Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, October 30, 2013.

DOE August 2013 U.S. Department of Energy (DOE), August 2013. Letter to J.E. Kieling (New Mexico Environment Department), "Extension Request for the Burn Site Groundwater Corrective Measures Evaluation Report," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, August 7, 2013.

DOE July 2009 U.S. Department of Energy (DOE), July 2009. Letter to J.E. Kieling (New Mexico Environment Department), :"Extension Request for Submission of Characterization Work Plan for the Burn Site Groundwater Study Area," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, July 23, 2009.

DOE September 1987 U.S. Department of Energy (DOE), September 1987. *Draft Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment, Sandia National Laboratories, Albuquerque*, Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, U.S. Department of Energy, Albuquerque, New Mexico.

EPA 1994 U.S. Environmental Protection Agency (EPA), 1994. *RCRA Corrective Action Plan*, U.S. Environmental Protection Agency, Washington, D.C.

McQuillan and Space 1995 McQuillan, D., and M. Space, 1995. "High ground-water nitrate in Tijeras Arroyo, Hells Canyon, and Abo Arroyo—Evidence for a natural geologic origin," Abstract in *New Mexico Geologic Society 1995 Spring Meeting* and published in *New Mexico Geology*, Vol. 17, No. 2, pp. 23.

NMED November 2017 New Mexico Environment Department (NMED), November 2017. *RE: Approval, Burn Site Aquifer Pumping Test Report; Request for Extension for Recommendations, November 2017 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-16-010*, New Mexico Environment Department, Santa Fe, New Mexico, November 17, 2015.

NMED June 2016 New Mexico Environment Department (NMED), June 2016. *RE: Approval, Aquifer Pumping Test Work Plan for the Burn Site Groundwater Area of Concern, June 2016, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-16-010*, New Mexico Environment Department, Santa Fe, New Mexico, June 21, 2016.

NMED June 2015 New Mexico Environment Department (NMED), June 2014. *RE: Approval, Installation of Groundwater Monitoring Wells CYN-MW14A, CYN-MW15, and TA2-W-28, and Decommissioning of Groundwater Monitoring Well TA2-SW1-320*, New Mexico Environment Department, Santa Fe, New Mexico, June 2, 2015.

NMED January 2015 New Mexico Environment Department (NMED), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED June 2014a New Mexico Environment Department (NMED), June 2014. *RE: Approval, Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Well TA2-SW1-320, Installation of Groundwater Monitoring Wells TA2-W-28, CYN-MW14 and CYN-MW15, September 2013, Sandia National Laboratories, EPA ID #NM5890110518, SNL-13-010*, New Mexico Environment Department, Santa Fe, New Mexico, June 4, 2014.

NMED June 2014b New Mexico Environment Department (NMED), June 2014. *RE: Approval: Extension for Submittal of the Burn Site Corrective Measures Evaluation Report, January 31, 2014, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-12-002*, New Mexico Environment Department, Santa Fe, New Mexico, June 18, 2014.

NMED June 2012 New Mexico Environment Department (NMED), June 2012. *RE: Approval: Summary Report for Burn Site Groundwater Characterization Field Program, Installation of Groundwater Monitoring Wells CYN-MW9, CYN-MW10, CYN-MW11 and CYN-MW12, Collection of Subsurface Soil Samples at Boreholes BSG-BH001 through BSG-BH010, January 2012, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-12-002*, New Mexico Environment Department, Santa Fe, New Mexico, June 29, 2012.

NMED April 2012 New Mexico Environment Department (NMED), April 2012. *RE: Notice of Approval: Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Wells 12AUP-01, CYN-MW1D and CYN-MW2S, Installation of Groundwater Monitoring Well CYN-MW13, January 2012, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-12-003*, New Mexico Environment Department, Santa Fe, New Mexico, April 13, 2012.

NMED August 2011 New Mexico Environment Department (NMED), August 2011. *RE: Notice of Approval, Corrective Measures Evaluation Work Plan, Burn Site Groundwater, March 2008, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-04-035*, New Mexico Environment Department, Santa Fe, New Mexico, August 3, 2011.

NMED October 2010 New Mexico Environment Department (NMED), October 2010. *RE: Time Extension Request for Submittal of the Burn Site Groundwater Corrective Measures Evaluation Report, Sandia National Laboratories, EPA ID#NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico, October 4, 2010.

NMED February 2010 New Mexico Environment Department (NMED), February 2010. *RE: Notice of Conditional Approval, Burn Site Groundwater Characterization Work Plan, November 2009, Sandia National Laboratories, EPA ID #NM5890110518, SNL-09-017*, New Mexico Environment Department, Santa Fe, New Mexico, February 12, 2010.

NMED April 2009 New Mexico Environment Department (NMED), April 2009. *RE: Perchlorate Contamination in Groundwater, Sandia National Laboratories, EPA ID #NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico, April 30, 2009.

NMED July 2005 New Mexico Environment Department (NMED), July 2005. *Request for Supplemental Information: Burn Site Groundwater Interim Measures Work Plan, Dated May 2005, Sandia National Laboratories, EPA ID #NM5890110518, HWB-SNL-04-039*" July 18, 2005.

NMED February 2005 New Mexico Environment Department (NMED), February 2005. *RE: Current Conceptual Model for the Sandia National Laboratories Canyons Area (Burn Site), June 2004: Requirement to Conduct Additional Site Characterization and Interim Measures, Sandia National Laboratories NM5890110518, HWB-SNL-04-039*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

SNL December 2017 Sandia National Laboratories, New Mexico (SNL/NM), December 2017. *Aquifer Pumping Test Report for the Burn Site Groundwater Area of Concern,* Sandia National Laboratories, New Mexico, Environmental Restoration Operations, Albuquerque, New Mexico, December 5, 2017.

SNL September 2017 Sandia National Laboratories, New Mexico (SNL/NM), September 2017. *Burn Site Groundwater Monitoring, Mini-Sampling and Analysis Plan (s) for First Quarter, Fiscal Year 2018,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2017 Sandia National Laboratories, New Mexico (SNL/NM), July 2017. *Annual Groundwater Monitoring Report, Calendar Year 2016, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, July 3, 2017.

SNL March 2017 Sandia National Laboratories, New Mexico (SNL/NM), March 2017. *Burn Site Groundwater Monitoring, Mini-Sampling and Analysis Plan (SAP) for Third Quarter, Fiscal Year 2017,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2016a Sandia National Laboratories, New Mexico (SNL/NM), June 2016. *Aquifer Pumping Test Work Plan for the Burn Site Groundwater Area of Concern,* Sandia National Laboratories, New Mexico, Environmental Restoration Operations, Albuquerque, New Mexico, June 3, 2016.

SNL June 2016b Sandia National Laboratories, New Mexico (SNL/NM), June 2016. *Annual Groundwater Monitoring Report, Calendar Year 2015, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, June 28, 2016.

SNL June 2015 Sandia National Laboratories, New Mexico (SNL/NM), June 2015. *Annual Groundwater Monitoring Report, Calendar Year 2014, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, June 23, 2015.

SNL April 2015 Sandia National Laboratories, New Mexico (SNL/NM), April 2015. *Report: Installation of Groundwater Monitoring Wells CYN-MW14A, CYN-MW15, and TA2-W-28, and Decommissioning of Groundwater Monitoring Well TA2-SW1-320,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, April 24, 2015.

SNL October 2014 Sandia National Laboratories, New Mexico (SNL/NM), October 2014. *Annual Groundwater Monitoring Report, Calendar Year 2013, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, October 24, 2015.

SNL September 2013a Sandia National Laboratories, New Mexico (SNL/NM), September 2013. *Annual Groundwater Monitoring Report Calendar Year 2012, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2013b Sandia National Laboratories, New Mexico (SNL/NM), September 2013. *Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Wells TA2-SW1-320, Installation of Groundwater Monitoring Wells TA2-W-28, CYN-MW14, and CYN-MW15*, Environmental Restoration Operations, Sandia National Laboratories, New Mexico, Albuquerque, New Mexico.

SNL March 2013 Sandia National Laboratories, New Mexico (SNL/NM), March 2013. *Installation of Replacement Monitoring Well CYN-MW13 at the Burn Site Groundwater Study Area and the Decommissioning of Three Groundwater Monitoring Wells at the Burn Site, Eight Groundwater and Soil-Vapor Monitoring Wells at the Chemical Waste Landfill, and Eight FLUTe™ Soil-Vapor Monitoring Wells at Various SWMUs and DSS Sites*, Environmental Restoration Operations, Sandia National Laboratories, New Mexico, Albuquerque, New Mexico.

SNL September 2012 Sandia National Laboratories, New Mexico (SNL/NM), September 2012. *Annual Groundwater Monitoring Report, Calendar Year 2011, Groundwater Protection Program*, Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2012 Sandia National Laboratories, New Mexico (SNL/NM), February 2012. *Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Wells 12AUP-01, CYN-MW1D, and CYN-MW2S, Installation of Groundwater Monitoring Well CYN-MW13: Status of CYN-MW3, DOE/NNSA SNL/New Mexico*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, February 3, 2012.

SNL January 2012 Sandia National Laboratories, New Mexico (SNL/NM), January 2012. *Summary Report for Burn Site Groundwater Characterization Field Program, Installation of Groundwater Monitoring Wells CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12, Collection of Subsurface Soil Samples at Boreholes BSG-BH001 through BSG-BH010*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, January 30, 2012.

SNL September 2011 Sandia National Laboratories, New Mexico (SNL/NM), September 2011. *Annual Groundwater Monitoring Report, Calendar Year 2010, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2010 Sandia National Laboratories, New Mexico (SNL/NM), October 2010. *Annual Groundwater Monitoring Report, Calendar Year 2009, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2010 Sandia National Laboratories, New Mexico (SNL/NM), September 2010. *Extension Request for the Burn Site Corrective Measures Evaluation (CME) Report*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, September 20, 2010.

SNL November 2009 Sandia National Laboratories, New Mexico (SNL/NM), November, 2009. *Burn Site Groundwater Characterization Work Plan, Installation of Groundwater Monitoring Wells CYN-MW9, CYN-MW10, and CYN-MW11, Collection of Subsurface Soil Samples*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, November 23, 2009.

SNL June 2009 Sandia National Laboratories, New Mexico (SNL/NM), June 2009. *Annual Groundwater Monitoring Report, Calendar Year 2008, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2008a Sandia National Laboratories, New Mexico (SNL/NM), April 2008. *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2008b Sandia National Laboratories, New Mexico (SNL/NM), April 2008. *Corrective Measures Evaluation Work Plan, Burn Site Groundwater,* Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2008 Sandia National Laboratories, New Mexico (SNL/NM), March 2008. *Annual Groundwater Monitoring Report, Fiscal Year 2007, Groundwater Protection Program*, Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2007 Sandia National Laboratories, New Mexico (SNL/NM), March 2007. *Annual Groundwater Monitoring Report, Fiscal Year 2006, Groundwater Protection Program*, Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2006 Sandia National Laboratories, New Mexico (SNL/NM), October 2006. *Field Report: Installation of Burn Site Groundwater Monitoring Wells CYN-MW6, CYN-MW7, and CYN-MW8*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2005 Sandia National Laboratories, New Mexico (SNL/NM), October 2005. *Annual Groundwater Monitoring Report, Fiscal Year 2004, Groundwater Protection Program*, Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL August 2005 Sandia National Laboratories, New Mexico (SNL/NM), August 2005. *Responses to NMED Request for Supplemental Information: Burn Site Groundwater Interim Measures Work Plan*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2005 Sandia National Laboratories, New Mexico (SNL/NM), June 2005. *Request for Supplemental Information Responses and Proposals for Corrective Action Complete, Drain and Septic Systems SWMUs 49, 101, 116, 138, 149, 154, and 161, Drain and Septic Systems Round 9*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL May 2005 Sandia National Laboratories, New Mexico (SNL/NM), May 2005. *Interim Measures Work Plan, Burn Site Groundwater*, SAND Report SAND2005-2952, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2005 Sandia National Laboratories, New Mexico (SNL/NM), January 2005. *Field Report, Burn Site Groundwater Nitrate Source Evaluation, January 2005*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2004a Sandia National Laboratories, New Mexico (SNL/NM), June 2004. *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2004b Sandia National Laboratories, New Mexico (SNL/NM), June 2004. *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2004 Sandia National Laboratories, New Mexico (SNL/NM), March 2004. *Annual Groundwater Monitoring Report, Fiscal Year 2003, Groundwater Protection Program*, Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2004 Sandia National Laboratories, New Mexico (SNL/NM), February 2004. *Justification for Class III Permit Modification, ER Site 94H Operable Unit 1333, JP-8 Fuel Site*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2003 Sandia National Laboratories, New Mexico (SNL/NM), March 2003. *Annual Groundwater Monitoring Report, Fiscal Year 2002, Groundwater Protection Program*, Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2002 Sandia National Laboratories, New Mexico (SNL/NM), March 2002. *Annual Groundwater Monitoring Report, Fiscal Year 2001, Groundwater Protection Program*, Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL November 2001 Sandia National Laboratories, New Mexico (SNL/NM), November 2001. *Groundwater Investigation, Canyons Test Area, Operable Unit 1333, Burn Site, Lurance Canyon*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2001 Sandia National Laboratories, New Mexico (SNL/NM), April 2001. *Annual Groundwater Monitoring Report, Fiscal Year 2000, Groundwater Protection Program*, Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2000 Sandia National Laboratories, New Mexico (SNL/NM), March 2000. *Annual Groundwater Monitoring Report, Fiscal Year 1999, Groundwater Protection Program*, Environmental Management and Integrated Training Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1999 Sandia National Laboratories, New Mexico (SNL/NM), March 1999. *Groundwater Protection Program, Fiscal Year 1998, Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 1998 Sandia National Laboratories, New Mexico (SNL/NM), June 1998. *Letter Report–Information Summarizing Recent Well Installation and Sampling Activities Near the Burn Site*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), February 1998. *Revised Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 1997 Sandia National Laboratories, New Mexico (SNL/NM), July 1997. *Bullets of Understanding Between NMED DOE OB and the SNL/NM ER Project for the Nitrate Assessment at the Lurance Canyon Explosive Test Site, ER Site 65, OU 1333, Canyons Test Area,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico,* SAND Report SAND2003-1869, prepared for Sandia National Laboratories, Albuquerque, New Mexico.

This page intentionally left blank.

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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	MW	5437.95	5436.0	445.0	495.0	4991.0	4941.0	495.0	2.1	SS	Regional Aquifer – SFG sediments	08-Jul-1985	Aug-2003
CWL-BW2	MW	5436.21	5434.3	490.0	980.0	4944.3	4454.3	980.0	5.6	S/SS	Regional Aquifer – SFG sediments	17-Sep-1985	2003
CWL-BW3	MW	5432.76	5431.6	485.0	505.0	4946.6	4926.6	507.5	4.8	PVC	Regional Aquifer – SFG sediments	22-Sep-1988	12-Nov-2012
CWL-BW4	MW	5427.67	5431.7	485.0	505.0	4946.7	4926.7	510.0	4.8	PVC	Regional Aquifer – SFG sediments	06-May-1994	Jan-1997
CWL-BW4A	MW	5434.03	5431.8	485.0	505.0	4946.8	4926.8	510.0	4.8	PVC	Regional Aquifer – SFG sediments	16-May-1994	14-Apr-2010
CWL-BW5	MW	5434.79	5432.2	500.0	520.0	4932.2	4912.2	525.0	4.8	PVC	Regional Aquifer – SFG sediments	11-May-2010	
CWL-MW1	MW	5425.88	5423.7	535.0	575.0	4888.7	4848.7	610.0	2.1	SS	Regional Aquifer – SFG sediments	01-Sep-1985	Sep-1997
CWL-MW1A	MW	5424.16	5423.1	474.0	494.0	4949.1	4929.1	495.0	4.8	PVC	Regional Aquifer – SFG sediments	31-Jul-1988	11-Nov-2012
CWL-MW2	MW	5421.22	5419.1	520.0	650.0	4899.1	4769.1	650.0	2.1	SS	Regional Aquifer – SFG sediments	22-Sep-1985	Sep-1997
CWL-MW2A	MW	5421.25	5419.8	473.0	493.0	4946.8	4926.8	495.0	5.0	PVC	Regional Aquifer – SFG sediments	01-Aug-1988	Jun-2004
CWL-MW2BL	MW	5421.85	5420.1	532.5	552.5	4887.6	4867.6	557.5	4.8	PVC	Regional Aquifer – SFG sediments	05-Jun-1994	10-Nov-2012
CWL-MW2BU	MW	5421.88	5420.1	476.0	496.0	4944.1	4924.1	501.0	1.9	PVC	Regional Aquifer – SFG sediments	05-Jun-1994	10-Nov-2012
CWL-MW3	MW	5421.50	5419.5	525.0	565.0	4894.5	4854.5	615.0	2.1	SS	Regional Aquifer – SFG sediments	26-Sep-1985	Sep-1997
CWL-MW3A	MW	5420.45	5419.1	470.0	490.0	4949.1	4929.1	492.0	4.8	PVC/SS	Regional Aquifer – SFG sediments	11-Aug-1988	10-Nov-2012
CWL-MW4	MW	5423.00	5421.0	478.0	498.0	4943.0	4923.0	503.0	3.8	PVC/SS	Regional Aquifer – SFG sediments	04-May-1990	14-Apr-2010
CWL-MW5L	MW	5418.47	5416.7	533.0	553.0	4883.7	4863.7	558.0	1.9	PVC	Regional Aquifer – SFG sediments	19-Apr-1994	14-Apr-2010
CWL-MW5U	MW	5418.68	5416.7	477.0	497.0	4939.7	4919.7	502.0	4.8	PVC	Regional Aquifer – SFG sediments	19-Apr-1994	14-Apr-2010
CWL-MW6L	MW	5419.80	5417.3	539.0	559.0	4878.3	4858.3	564.0	1.9	PVC	Regional Aquifer – SFG sediments	04-May-1994	14-Apr-2010
CWL-MW6U	MW	5419.45	5417.3	477.0	497.0	4940.3	4920.3	502.0	4.8	PVC	Regional Aquifer – SFG sediments	04-May-1994	14-Apr-2010
CWL-MW7	MW	5421.98	5419.9	618.0	638.0	4801.9	4781.9	643.0	4.8	PVC	Regional Aquifer – SFG sediments	20-Mar-2003	12-Nov-2012
CWL-MW8	MW	5421.71	5419.8	612.0	632.0	4807.8	4787.8	637.0	4.8	PVC	Regional Aquifer – SFG sediments	02-Apr-2003	12-Nov-2012
CWL-MW9	MW	5426.12	5423.5	495.0	515.0	4928.5	4908.5	520.0	4.8	PVC	Regional Aquifer – SFG sediments	13-May-2010	
CWL-MW10	MW	5424.58	5422.2	493.0	513.0	4929.2	4909.2	518.0	4.8	PVC	Regional Aquifer – SFG sediments	27-May-2010	
CWL-MW11	MW	5423.24	5420.8	491.0	511.0	4929.8	4909.8	516.0	4.8	PVC	Regional Aquifer – SFG sediments	27-May-2010	
MRN-1	MW	5308.54	5306.4	546.7	586.7	4759.7	4719.7	606.7	4.8	SS	Regional Aquifer – SFG sediments	22-Jan-1995	Aug-2001
MRN-2	MW	5308.18	5306.2	410.0	440.0	4896.2	4866.2	450.0	3.7	PVC	Regional Aquifer – SFG sediments	28-Jan-1995	
MRN-3D	MW	5309.34	5306.8	660.3	680.3	4646.5	4626.5	685.3	4.8	PVC	Regional Aquifer – SFG sediments	20-Jul-2003	
SWTA-3	MW	5323.24	5321.6	407.2	427.2	4914.4	4894.4	432.2	4.8	PVC/SS	Regional Aquifer – SFG sediments	06-Sep-1989	Apr-1998
SWTA3-MW2	MW	5325.60	5323.2	455.0	475.0	4868.2	4848.2	480.0	4.8	PVC	Regional Aquifer – SFG sediments	07-May-2002	
SWTA3-MW3	MW	5323.94	5321.4	619.0	639.0	4702.4	4682.4	659.4	4.8	PVC	Regional Aquifer – SFG sediments	20-Feb-2004	
SWTA3-MW4	MW	5324.81	5322.3	430.0	450.0	4892.3	4872.3	460.0	4.7	PVC	Regional Aquifer – SFG sediments	26-Aug-2005	
Lurance Canyon and Burn Site Vicinity													
CCBA-MW1	MW	5902.34	5899.9	60.0	80.0	5839.9	5819.9	85.0	4.7	PVC	Alluvium and bedrock (granite)	01-Sep-2011	
CCBA-MW2	MW	5939.28	5937.0	98.0	118.0	5839.0	5819.0	123.0	4.7	PVC	Bedrock (granite)	31-Aug-2011	
CYN-MW1D	MW	6239.59	6236.7	372.0	382.0	5864.7	5854.7	392.0	5.1	S	Bedrock (granitic gneiss)	22-Dec-1997	15-Nov-2012

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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
Lurance Canyon and Burn Site Vicinity (Continued)													
CYN-MW2S	MW	6239.41	6236.7	23.6	28.6	6213.1	6208.1	34.2	4.0	PVC	Alluvium and bedrock (granitic gneiss)	22-Dec-1997	15-Nov-2012
CYN-MW3	MW	6313.26	6311.9	120.0	130.0	6191.9	6181.9	135.0	5.0	PVC	Bedrock (metamorphics)	18-Jun-1999	
CYN-MW4	MW	6455.48	6454.7	260.0	280.0	6194.7	6174.7	290.0	5.0	PVC	Bedrock (quartzite)	18-Jun-1999	
CYN-MW5	MW	5984.23	5981.3	135.0	155.0	5846.3	5826.3	160.0	5.0	PVC	Bedrock (quartzite)	15-Aug-2001	
CYN-MW6	MW	6343.37	6340.5	141.5	161.3	6199.0	6179.2	161.7	5.0	PVC	Bedrock (metamorphics)	09-Dec-2005	
CYN-MW7	MW	6216.35	6213.7	315.0	334.2	5898.7	5879.5	339.9	5.0	PVC	Bedrock (granitic gneiss)	06-Dec-2005	
CYN-MW8	MW	6230.11	6227.8	338.5	358.3	5889.3	5869.5	363.4	5.0	PVC	Bedrock (granitic gneiss)	12-Jan-2006	
CYN-MW9	MW	6360.67	6358.5	175.8	195.8	6182.7	6162.7	200.8	4.8	PVC	Bedrock (metamorphics)	27-Jul-2010	
CYN-MW10	MW	6345.45	6342.8	150.4	170.4	6192.4	6172.4	175.4	4.8	PVC	Bedrock (metamorphics)	28-Jul-2010	
CYN-MW11	MW	6374.41	6371.9	229.8	249.8	6142.1	6122.1	254.8	4.8	PVC	Bedrock (metamorphics)	29-Jul-2010	
CYN-MW12	MW	6345.16	6342.9	252.5	272.5	6090.4	6070.4	277.5	4.8	PVC	Bedrock (metamorphics)	29-Jul-2010	
CYN-MW13	MW	6237.79	6236.0	376.8	396.8	5859.2	5839.2	402.2	4.8	PVC	Bedrock (granitic gneiss)	05-Dec-2012	
CYN-MW14A	MW	6315.85	6313.5	263.6	293.6	6049.9	6019.9	298.6	4.8	PVC	Bedrock (metamorphics)	09-Dec-2014	
CYN-MW15	MW	6344.44	6342.3	162.2	192.2	6180.1	6150.1	195.0	4.8	PVC	Bedrock (metamorphics)	08-Dec-2014	
12AUP01	MW	6357.00	6355.0	52.5	57.5	6302.5	6297.5	58.1	2.0	PVC	Alluvium and bedrock (granitic gneiss)	19-Nov-1996	14-Nov-2012
Greystone-MW2	MW	5814.20	5811.4	60.0	80.0	5751.4	5731.4	85.0	4.8	PVC	Alluvium, shallow	25-Apr-2002	
Mixed Waste Landfill and Vicinity													
MWL-BW1	MW	5387.18	5385.4	452.2	472.2	4933.2	4913.2	477.2	5.0	PVC	Regional Aquifer – SFG sediments	01-Jul-1989	24-Jan-2008
MWL-BW2	MW	5391.02	5388.7	467.0	497.0	4921.7	4891.7	502.0	4.8	PVC	Regional Aquifer – SFG sediments	22-Jan-2008	
MWL-MW1	MW	5384.21	5381.8	456.0	476.0	4925.8	4905.8	478.0	5.0	PVC/S	Regional Aquifer – SFG sediments	01-Oct-1988	Jul-2008
MWL-MW2	MW	5379.93	5378.4	452.0	472.0	4926.4	4906.4	477.0	5.0	PVC/SS	Regional Aquifer – SFG sediments	01-Aug-1989	Jul-2008
MWL-MW3	MW	5383.99	5381.7	451.3	471.3	4930.4	4910.4	476.3	4.8	PVC/SS	Regional Aquifer – SFG sediments	22-Aug-1989	Jul-2008
MWL-MW4 [d]	MW	5391.70	5390.2	488.4[d]	508.4[d]	4901.8[d]	4881.8[d]	553.9[d]	4.8	PVC	Regional Aquifer – SFG sediments	10-Feb-1993	
MWL-MW5	MW	5382.56	5380.4	496.5	516.5	4883.9	4863.9	521.5	4.8	PVC	Regional Aquifer – SFG sediments	19-Nov-2000	
MWL-MW6	MW	5375.31	5372.7	505.5	525.5	4867.2	4847.2	505.5	4.8	PVC	Regional Aquifer – SFG sediments	19-Oct-2000	
MWL-MW7	MW	5383.30	5380.9	464.7	494.0	4916.2	4886.9	498.8	4.8	PVC	Regional Aquifer – SFG sediments	24-Jun-2008	
MWL-MW8	MW	5384.67	5382.4	465.0	495.0	4917.4	4887.4	500.0	4.8	PVC	Regional Aquifer – SFG sediments	26-Jun-2008	
MWL-MW9	MW	5381.91	5379.3	465.0	495.0	4914.3	4884.3	500.0	4.8	PVC	Regional Aquifer – SFG sediments	30-Jun-2008	
NWTA3-MW1	MW	5336.48	5332.9	434.9	454.9	4898.0	4878.0	460.4	4.8	PVC	Regional Aquifer – SFG sediments	20-Sep-1989	12-Sep-2002
NWTA3-MW2	MW	5337.49	5335.5	455.0	475.0	4880.5	4860.5	505.0	4.8	PVC	Regional Aquifer – SFG sediments	25-Aug-2000	
NWTA3-MW3D	MW	5340.80	5335.7	654.4	674.4	4681.3	4661.3	679.4	4.8	PVC	Regional Aquifer – SFG sediments	09-Jul-2003	
PL-1	MW	5334.99	5333.4	440.0	470.0	4893.4	4863.4	480.0	2.0	PVC	Regional Aquifer – SFG sediments	28-Oct-1994	12-Sep-2009
PL-2	MW	5336.01	5333.0	577.0	597.0	4756.0	4736.0	617.0	4.8	SS	Regional Aquifer – SFG sediments	18-Nov-1994	
PL-3	MW	5334.64	5332.8	445.0	465.0	4887.8	4867.8	475.0	3.8	PVC	Regional Aquifer – SFG sediments	04-Dec-1994	12-Sep-2009
PL-4	MW	5334.98	5332.7	464.0	494.0	4868.7	4838.7	499.0	4.8	PVC	Regional Aquifer – SFG sediments	28-Sep-2009	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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
Coyote Test Field and Vicinity													
OBS-MW1	MW	5871.42	5869.1	135.0	155.0	5734.1	5714.1	160.0	4.7	PVC	Bedrock (granite)	31-Aug-2011	
OBS-MW2	MW	5863.16	5860.8	234.0	254.0	5626.8	5606.8	259.0	4.7	PVC	Bedrock (granite)	30-Aug-2011	
OBS-MW3	MW	5865.50	5863.3	190.0	210.0	5673.3	5653.3	215.0	4.7	PVC	Bedrock (granite)	30-Aug-2011	
CTF-MW1	MW	6082.63	6079.7	240.0	260.0	5839.7	5819.7	265.0	5.0	PVC	Bedrock (granite)	16-Aug-2001	
CTF-MW2	MW	5578.60	5575.6	110.0	130.0	5465.6	5445.6	135.0	5.0	PVC	Bedrock (granite)	18-Aug-2001	
CTF-MW3	MW	5522.82	5519.8	340.0	360.0	5179.8	5159.8	365.0	5.0	PVC	Bedrock (granite)	21-Aug-2001	
LMF-1	MW	5628.60	5626.5	310.0	350.0	5316.5	5276.5	360.0	4.1	PVC	Bedrock (limestone)	11-Aug-1995	15-Jan-1998
SFR-1D	MW	5399.13	5396.9	348.0	368.0	5048.9	5028.9	378.0	3.8	PVC	Regional Aquifer – SFG sediments	06-Aug-1992	
SFR-1S	MW	5399.16	5396.9	152.0	172.0	5244.9	5224.9	182.0	1.9	PVC	Regional Aquifer – SFG sediments	08-Aug-1992	
SFR-2S	MW	5432.77	5430.3	97.0	117.0	5333.3	5313.3	122.0	3.8	PVC	Regional Aquifer – SFG sediments	20-Aug-1992	
SFR-3D	MW	5497.94	5496.1	311.5	351.5	5184.6	5144.6	361.5	1.9	PVC	Regional Aquifer – SFG sediments	05-Nov-1992	
SFR-3P	MW	5499.63	5497.2	175.0	195.0	5322.2	5302.2	205.0	3.8	PVC	Regional Aquifer – SFG sediments	12-Jul-1993	
SFR-3S	MW	5498.24	5496.1	182.0	212.0	5314.1	5284.1	222.0	1.9	PVC	Regional Aquifer – SFG sediments	10-Nov-1992	
SFR-3T	MW	5498.66	5496.9	713.0	733.0	4783.9	4763.9	753.0	5.4	SS	Bedrock (sandstone)	23-Sep-1993	
SFR-4P	MW	5573.33	5571.3	344.0	354.0	5227.3	5217.3	364.0	1.9	PVC	Bedrock (sandstone)	29-Jul-1993	
SFR-4T	MW	5573.95	5572.4	340.0	360.0	5232.4	5212.4	380.0	4.8	PVC/SS	Bedrock (sandstone)	30-Sep-1993	
STW-1	MW	5535.53	5533.3	149.8	169.8	5383.5	5363.5	179.8	4.3	PVC	Regional Aquifer – SFG sediments	18-Jun-1995	23-Sep-1997
TRE-1	MW	5497.25	5495.2	255.0	295.0	5240.2	5200.2	305.0	4.3	PVC	Regional Aquifer – SFG sediments	31-Jul-1995	
TRE-2	MW	5497.20	5495.2	150.0	170.0	5345.2	5325.2	190.0	2.0	PVC	Regional Aquifer – SFG sediments	31-Jul-1995	
TRN-1	MW	5735.62	5733.6	320.0	340.0	5413.6	5393.6	350.0	3.8	PVC	Bedrock (sandstone)	12-Oct-1994	
TRS-1D	MW	5779.80	5777.5	266.4	306.4	5511.1	5471.1	316.4	1.9	PVC	Bedrock (limestone)	06-Sep-1995	
TRS-1S	MW	5780.07	5777.5	164.0	204.0	5613.5	5573.5	214.8	1.9	PVC	Bedrock (limestone)	06-Sep-1995	
TRS-2	MW	5780.76	5778.3	165.0	205.0	5613.3	5573.3	210.0	4.5	S	Bedrock (limestone)	09-Sep-1995	
Tijeras Arroyo Groundwater [e]													
TA1-W-01	MW	5403.82	5401.8	575.0	595.0	4826.8	4806.8	600.0	4.8	PVC	Regional Aquifer – SFG sediments	22-Mar-1997	
TA1-W-02	MW	5416.62	5416.9	540.0	560.0	4876.9	4856.9	565.6	5.0	PVC	Regional Aquifer – SFG sediments	27-Feb-1998	
TA1-W-03	MW	5457.03	5454.9	337.0	357.0	5117.9	5097.9	362.6	5.0	PVC	PGWS – SFG sediments	27-Jan-1998	
TA1-W-04	MW	5460.98	5458.3	576.0	596.0	4882.3	4862.3	601.7	5.0	PVC	Regional Aquifer – SFG sediments	06-Oct-1998	
TA1-W-05	MW	5433.84	5434.2	597.5	617.5	4836.7	4816.7	623.2	5.0	PVC	Regional Aquifer – SFG sediments	16-Nov-1998	
TA1-W-06	MW	5417.10	5417.4	300.0	320.0	5117.4	5097.4	325.6	5.0	PVC	PGWS – SFG sediments	27-Feb-1998	
TA1-W-07	MW	5404.92	5402.8	268.6	288.6	5134.2	5114.2	289.1	5.0	PVC	PGWS – SFG sediments	03-Dec1998	
TA1-W-08	MW	5434.19	5434.7	302.0	322.0	5132.7	5112.7	327.0	4.5	PVC	PGWS – SFG sediments	10-Oct2001	
TA2-NW1-325	MW	5421.94	5420.0	295.0	325.0	5125.0	5095.0	330.3	4.8	PVC	PGWS – SFG sediments	01-Apr-1993	
TA2-NW1-595 [f]	MW	5421.26	5420.0	535.0[f]	555.0[f]	4885.0	4865.0	598.0	4.8	PVC	Regional Aquifer – SFG sediments	27-Jul-1993	
TA2-SW1-320	MW	5411.85	5410.1	299.6	319.6	5110.5	5090.5	324.6	3.8	PVC	PGWS – SFG sediments	30-Nov-1992	12-Dec-2014

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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 (Continued)													
TA2-W-01	MW	5419.99	5417.4	312.0	332.0	5105.4	5085.4	332.0	4.8	PVC	PGWS – SFG sediments	27-Jun-1994	
TA2-W-19	MW	5351.21	5349.0	265.9	285.9	5083.1	5063.1	285.9	4.8	PVC	PGWS – SFG sediments	29-Nov-1995	
TA2-W-24	MW	5363.66	5361.8	465.0	485.0	4896.8	4876.8	490.6	5.0	PVC	Regional Aquifer – SFG sediments	09-Feb-1998	
TA2-W-25	MW	5374.86	5372.5	492.0	512.0	4880.5	4860.5	517.8	4.8	PVC	Regional Aquifer – SFG sediments	28-Apr-1997	
TA2-W-26	MW	5375.77	5373.8	276.0	296.0	5097.8	5077.8	301.6	5.0	PVC	PGWS – SFG sediments	19-Jan-1998	
TA2-W-27	MW	5362.85	5360.8	275.0	295.0	5085.8	5065.8	300.6	5.0	PVC	PGWS – SFG sediments	09-Feb-1998	
TA2-W-28	MW	5412.41	5410.0	310.5	330.5	5099.5	5079.5	335.45	4.8	PVC	PGWS – SFG sediments	10-Dec-2014	
TJA-1	MW	unk	5351.3	275.0	295.0	unk	unk	305.0	3.8	PVC	PGWS – SFG sediments	25-Jun-1994	9-Jul-1994
TJA-2	MW	5353.20	5351.3	275.0	295.0	5076.3	5056.3	305.0	3.8	PVC	PGWS – SFG sediments	12-Jul-1994	
TJA-3	MW	5390.56	5387.8	496.0	516.0	4891.8	4871.8	521.7	5.0	PVC	Regional Aquifer – SFG sediments	04-Dec-1998	
TJA-4	MW	5341.16	5338.5	360.0	380.0	4978.5	4958.5	385.7	5.0	PVC	merging zone – SFG sediments	01-Dec-1998	
TJA-5	MW	5341.33	5338.5	267.0	287.0	5071.5	5051.5	292.7	5.0	PVC	PGWS – SFG sediments	02-Dec1998	
TJA-6	MW	5343.16	5340.6	454.9	474.9	4885.7	4865.7	480.7	5.0	PVC	Regional Aquifer – SFG sediments	04-Feb-2001	
TJA-7	MW	5391.27	5388.4	290.5	310.5	5097.9	5077.9	316.3	5.0	PVC	PGWS – SFG sediments	12-Mar-2001	
WYO-1	MW	5392.50	5390.4	510.0	560.0	4880.4	4830.4	570.0	4.3	PVC	Regional Aquifer – SFG sediments	28-Aug-1995	Jul-2001
WYO-2	MW	5392.50	5390.4	265.0	285.0	5125.4	5105.4	295.0	2.0	PVC	PGWS – SFG sediments	26-Sep-1995	Jul-2001
WYO-3	MW	5392.09	5390.0	520.0	540.0	4870.0	4850.0	545.0	4.5	PVC	Regional Aquifer – SFG sediments	10-Oct-2001	
WYO-4	MW	5392.57	5390.2	275.0	295.0	5115.2	5095.2	300.0	4.5	PVC	PGWS – SFG sediments	16-Oct-2001	
PGS-1	MW	5407.41	5407.9	503.0	513.0	4904.9	4894.9	538.0	5.0	SS	Regional Aquifer – SFG sediments	12-Oct-1994	Apr-1998
PGS-2 [g]	MW	5408.29	5407.9	535.0[g]	565.0[g]	4872.9	4842.9	655.0	5.0	SS	Regional Aquifer – SFG sediments	22-Sep-1995	
Technical Area V													
AVN-1	MW	5443.00	5440.2	570.0	590.0	4870.2	4850.2	600.0	5.0	SS	Regional Aquifer – SFG sediments	23-May-1995	
AVN-2	MW	5442.39	5440.6	495.0	515.0	4945.6	4925.6	520.0	3.8	PVC	Regional Aquifer – SFG sediments	5-Jun-1995	
LWDS-MW1	MW	5423.83	5424.5	495.0	515.0	4929.5	4909.5	520.3	3.9	PVC	Regional Aquifer – SFG sediments	03-May-1993	
LWDS-MW2	MW	5412.41	5411.5	506.0	526.0	4905.5	4885.5	531.0	3.9	PVC	Regional Aquifer – SFG sediments	30-Oct-1992	
TAV-INJ1	Inj	5430 est.		509.0	539.0			544.0	5.0	Dual PVC	Regional Aquifer – SFG sediments	Pending survey	
TAV-MW1	MW	5437.81	5435.2	489.5	509.5	4945.7	4925.7	509.5	5.0	PVC	Regional Aquifer – SFG sediments	28-Feb-1995	05-Feb-2008
TAV-MW2	MW	5427.33	5424.3	497.0	513.5	4927.3	4910.8	513.5	4.8	PVC	Regional Aquifer – SFG sediments	30-Mar-1995	
TAV-MW3	MW	5464.30	5461.6	532.0	552.0	4929.6	4909.6	557.7	4.8	PVC	Regional Aquifer – SFG sediments	11-Apr-1997	
TAV-MW4	MW	5427.89	5425.4	495.0	515.0	4930.4	4910.4	520.7	4.8	PVC	Regional Aquifer – SFG sediments	18-Apr-1997	
TAV-MW5	MW	5408.71	5406.6	487.0	507.0	4919.6	4899.6	512.7	4.8	PVC	Regional Aquifer – SFG sediments	26-Apr-1997	
TAV-MW6	MW	5431.17	5431.5	507.0	527.0	4924.5	4904.5	532.0	4.8	PVC	Regional Aquifer – SFG sediments	24-Apr-2001	
TAV-MW7	MW	5430.40	5430.9	597.0	617.0	4833.9	4813.9	622.0	4.8	PVC	Regional Aquifer – SFG sediments	06-Apr-2001	
TAV-MW8	MW	5417.00	5417.4	491.0	511.0	4926.4	4906.4	516.0	4.8	PVC	Regional Aquifer – SFG sediments	11-Apr-2001	
TAV-MW9	MW	5416.27	5416.9	582.0	602.0	4834.9	4814.9	607.0	4.8	PVC	Regional Aquifer – SFG sediments	17-Mar-2001	
TAV-MW10	MW	5437.03	5434.7	508.0	528.0	4926.7	4906.7	533.0	4.8	PVC	Regional Aquifer – SFG sediments	06-Feb-2008	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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
Technical Area V (Continued)													
TAV-MW11	MW	5440.12	5440.4	512.0	532.0	4928.4	4908.4	537.0	4.8	PVC	Regional Aquifer – SFG sediments	19-Nov-2010	
TAV-MW12	MW	5435.72	5432.9	507.0	527.0	4925.9	4905.9	532.0	4.8	PVC	Regional Aquifer – SFG sediments	16-Nov-2010	
TAV-MW13	MW	5409.02	5406.0	525.0	545.0	4881.0	4861.0	550.0	4.8	PVC	Regional Aquifer – SFG sediments	12-Nov-2010	
TAV-MW14	MW	5441.52	5438.6	512.0	532.0	4926.6	4906.6	538.0	4.8	PVC	Regional Aquifer – SFG sediments	09-Nov-2010	
TAV-MW15	MW	5437.32	5435.1	516.0	541.0	4919.1	4894.1	546.0	4.8	PVC	Regional Aquifer – SFG sediments	18-Jan-2017	
TAV-MW16	MW	5448.34	5446.1	527.0	552.0	4919.1	4894.1	557.0	4.8	PVC	Regional Aquifer – SFG sediments	12-Jan-2017	
Albuquerque Bernalillo County Water Utility Authority, Lovelace Respiratory Research Institute, New Mexico Environment Department, Isleta Pueblo, and Unites States Geological Survey													
Eubank-1	MW	5460.02	5458.1	550.0	610.0	4908.1	4848.1	615.0	4.0	SS	Regional Aquifer – SFG sediments	16-Jul-1998	
Eubank-2	MW	5474.39	5472.4	552.0	592.0	4920.4	4880.4	597.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Nov-1996	
Eubank-3	MW	5498.73	5496.7	590.0	650.0	4906.7	4846.7	655.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Nov-1996	
Eubank-5	MW	5507.40	5505.4	605.0	665.0	4900.4	4840.4	670.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Nov-1996	
IP-1	MW	5622.18	5620.7	78.0	98.0	5542.7	5522.7	98.0	2.0	PVC	Regional Aquifer – SFG sediments	17-Jul-1994	
ITRI-MW-16	MW	5644.91	5643.7	100.0	120.0	5543.7	5523.7	120.0	4.0	PVC	Regional Aquifer – SFG sediments	13-Jan-1993	
NMED-1	MW	5623.44	5620.7	90.0	110.0	5530.7	5510.7	115.0	4.0	PVC	Regional Aquifer – SFG sediments	12-Jun-1995	
Mesa del Sol-S	MW	5302.67	5302.7	420.0	520.0	4882.7	4782.7	525.0	2.2	PVC	Regional Aquifer – SFG sediments	14-May-1997	
Montessa Park-S	MW	5102.67	5102.7	260.0	320.0	4842.7	4782.7	330.0	2.2	PVC	Regional Aquifer – SFG sediments	10-Sep-1997	
MVMW-J	MW	5118.04	5118.6	200.0	220.0	4918.6	4898.6	225.0	2.0	PVC	Regional Aquifer – SFG sediments	30-Sep-1988	
MVMW-K	MW	5186.05	5186.5	unk	unk	unk	unk	unk	unk	unk	Regional Aquifer – SFG sediments	30-Sep-1988	
YALE-MW9	MW	5271.06	5272.0?	382.0	422.0	4890.0	4850.0	427.0	4.0	PVC	Regional Aquifer – SFG sediments	19-May-1997	
4HILLS-1	MW	5671.34	5692.6	24.0	64.0	5668.6	5628.6	69.0	4.0	PVC	Regional Aquifer – SFG sediments	Mar-2000?	
Kirtland Air Force Base [h]													
EOD Well	MW	5829.70	5828.7	206.0	247.0	5622.7	5581.7	206.0	6.0	S/OH	Bedrock (granite)	1970?	
KAFB-0118	MW	5320.75	5321.2	458.0	488.0	4863.2	4833.2	499.6	5.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0119	MW	5315.82	5315.6	452.3	482.3	4863.3	4833.3	482.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0120	MW	5292.29	5288.7	429.0	459.0	4859.7	4829.7	461.5	4.0	PVC	Regional Aquifer – SFG sediments	12-Jun-2006	
KAFB-0121	MW	5307.60	5305.0	445.8	475.8	4859.2	4829.2	480.8	4.0	PVC	Regional Aquifer – SFG sediments	24-Nov-2006	
KAFB-0213	MW	5286.95	5285.1	378.0	428.0	4919.3	4869.3	438.0	5.0	PVC	Regional Aquifer – SFG sediments	10-Jan-1984	
KAFB-0219	MW	5263.69	5262.7	396.0	426.0	4866.7	4836.7	428.5	4.0	PVC	Regional Aquifer – SFG sediments	08-Jun-2006	
KAFB-0220	MW	5265.10	5262.5	424.0	454.0	4838.5	4808.5	456.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	15-Jul-2006	
KAFB-0221	MW	5274.36	5271.5	410.5	440.5	4861.0	4831.0	455.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0222	MW	5247.65	5245.2	366.0	396.0	4879.2	4849.2	401.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0223	MW	5254.49	5252.1	376.0	406.0	4876.1	4846.1	411.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0307	MW	5364.53	5362.7	405.0	450.0	4957.7	4912.7	460.0	3.8	PVC	Regional Aquifer – SFG sediments	04-Aug-1991	
KAFB-0308	MW	5381.65	5380.7	463.0	488.0	4917.7	4892.7	498.0	3.8	PVC	Regional Aquifer – SFG sediments	31-Jul-1991	
KAFB-0309	MW	5411.80	5410.7	500.0	525.0	4910.7	4885.7	535.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	6-Jul-1992	
KAFB-0310	MW	5416.48	5413.2	400.0	445.0	5013.2	4968.2	455.0	3.8	PVC	PGWS – SFG sediments	27-Aug-1991	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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-0311	MW	5353.29	5351.7	433.0	458.0	4918.7	4893.7	468.0	3.8	PVC	Regional Aquifer – SFG sediments	24-Jul-1992	
KAFB-0312	MW	5432.17	5430.2	503.0	528.0	4927.2	4902.2	533.0	4.5	PVC	Regional Aquifer – SFG sediments	26-Aug-1998	
KAFB-0313	MW	5418.98	5416.9	348.0	368.0	5068.9	5048.9	373.0	4.5	PVC	PGWS – SFG sediments	13-Aug-1998	
KAFB-0314	MW	5455.75	5453.9	428.0	448.0	5025.9	5005.9	453.0	4.5	PVC	Regional Aquifer – SFG sediments	30-Sep-1998	
KAFB-0315	MW	5466.11	5464.1	447.0	472.0	5017.1	4992.1	477.0	4.5	PVC	Regional Aquifer – SFG sediments	08-Sep-2000	
KAFB-0417	MW	5313.07	5310.0	430.0	455.0	4880.0	4855.0	465.0	3.8	PVC	Regional Aquifer – SFG sediments	06-Jun-1992	
KAFB-0504	MW	5357.87	5356.9	470.0	490.0	4886.9	4866.9	500.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	20-Jan-1990	
KAFB-0505	MW	5362.81	5360.8	495.4	520.5	4865.4	4840.3	521.3	4.5	PVC	Regional Aquifer – SFG sediments	22-Jul-1999	
KAFB-0506	MW	5363.47	5361.0	200.0	220.0	5161.0	5141.0	220.0	4.5	PVC	PGWS – SFG sediments	31-Aug-1998	
KAFB-0507R	MW	5358.21	5355.7	492.0	512.0	4863.7	4843.7	517.0	4.0	PVC	Regional Aquifer – SFG sediments	3-Apr-2013	
KAFB-0508	MW	5351.88	5349.7	481.0	506.0	4868.7	4843.7	507.0	3.5	PVC	Regional Aquifer – SFG sediments	02-May-2001	
KAFB-0510	MW	5367.10	5364.7	511.0	536.0	4853.7	4828.7	537.0	3.5	PVC	Regional Aquifer – SFG sediments	17-May-2001	
KAFB-0512R	MW	5302.73	5300.2	430.0	450.0	4870.2	4850.2	455.0	4.0	PVC	Regional Aquifer – SFG sediments	4-Apr-2013	
KAFB-0514	MW	5206.41	5204.7	340.0	365.0	4864.7	4839.7	366.0	3.5	PVC	Regional Aquifer – SFG sediments	17-May-2001	
KAFB-0516	MW	5205.64	5203.4	322.0	357.0	4881.4	4846.4	358.0	4.0	PVC	Regional Aquifer – SFG sediments	29-Jan-2002	
KAFB-0517	MW	5197.10	5194.6	325.0	350.0	4869.6	4844.6	352.0	4.0	PVC	Regional Aquifer – SFG sediments	08-Nov-2002	
KAFB-0518	MW	5177.76	5175.5	305.0	335.0	4870.5	4840.5	337.0	4.0	PVC	Regional Aquifer – SFG sediments	22-Dec-2002	
KAFB-0520	MW	5247.90	5246.2	379.5	404.5	4866.7	4841.7	410.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Jun-2004	
KAFB-0522	MW	5267.48	5265.7	405.0	430.0	4860.7	4835.7	432.5	4.0	PVC	Regional Aquifer – SFG sediments	23-Jun-2004	
KAFB-0523	MW	5352.62	5350.5	600.0	625.0	4750.5	4725.5	627.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0524	MW	5345.61	5343.4	484.0	509.0	4859.4	4834.4	511.0	4.0	PVC	Regional Aquifer – SFG sediments	31-Oct-2006	
KAFB-0525	MW	5229.75	5227.9	371.0	396.0	4856.9	4831.9	398.0	4.0	PVC	Regional Aquifer – SFG sediments	19-Nov-2006	
KAFB-0611	MW	5386.09	5383.5	498.0	508.0	4885.5	4875.5	513.0	4.0	PVC	Regional Aquifer – SFG sediments	13-Nov-2002	
KAFB-0612	MW	5385.45	5383.5	290.0	315.0	5093.5	5068.5	317.0	4.0	PVC	PGWS – SFG sediments	21-Nov-2002	
KAFB-0613	MW	5390.78	5391.3	420.0	450.0	4971.3	4941.3	452.0	4.0	PVC	Regional Aquifer – SFG sediments	08-Dec-2002	
KAFB-0614	MW	5390.89	5391.4	360.0	370.0	5031.4	5021.4	372.0	4.0	PVC	PGWS – SFG sediments	12-Dec-2002	
KAFB-0615	MW	5638.43	5636.3	300.0	325.0	5336.3	5311.3	327.0	4.0	PVC	Bedrock (granite)	27-Nov-2002	
KAFB-0616	MW	5481.07	5478.7	472.0	497.0	5006.7	4981.7	499.0	4.0	PVC	Regional Aquifer – SFG sediments	24-Nov-2002	
KAFB-0617	MW	5505.78	5503.3	565.0	590.0	4938.3	4913.3	592.0	4.0	PVC	Regional Aquifer – SFG sediments	18-May-2004	
KAFB-0618	MW	5410.05	5408.2	535.0	560.0	4873.2	4848.2	562.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Jun-2004	
KAFB-0619	MW	5410.78	5409.0	389.0	404.0	5020.0	5005.0	406.0	4.0	PVC	PGWS – SFG sediments	04-Jun-2004	
KAFB-0620	MW	5334.64	5332.0	447.0	472.0	4885.0	4860.0	474.5	4.0	PVC	Regional Aquifer – SFG sediments	18-Jun-2004	
KAFB-0621	MW	5569.89	5568.0	624.0	649.0	4944.0	4919.0	650.0	4.0	PVC	Regional Aquifer – SFG sediments	17-Jun-2004	
KAFB-0622	MW	5488.64	5486.2	529.0	554.0	4957.2	4932.2	555.0	4.0	PVC	Regional Aquifer – SFG sediments	25-Jun-2004	
KAFB-0623	MW	5328.94	5327.0	265.0	290.0	5062.0	5037.0	292.5	4.0	PVC	PGWS – SFG sediments	29-Jun-2004	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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-0624	MW	5673.78	5671.1	765.0	790.0	4906.1	4881.1	792.5	3.8	PVC	Regional Aquifer – SFG sediments	31-Oct-2008	
KAFB-0625	MW	5390.23?	5387.5?	470.0	495.0	4917.5	4892.5	497.5	4.0	unk	Regional Aquifer – SFG sediments	unk	
KAFB-0626 [i]	MW	5331.21	5328.8	425.0[i]	629.0[i]	4903.8	4699.8	638.4	5.0	FLUTe	Regional Aquifer – SFG sediments	20-Aug-2010	
KAFB-0901	MW	5390.07	5389.8	465.0	527.0	4924.8	4862.8	537.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Mar-1990	
KAFB-0903	MW	5391.63	5389.4	225.0	250.0	5164.4	5139.4	251.0	4.0	PVC	merging zone – SFG sediments	3-Apr-2002	
KAFB-0904	MW	5291.75	5289.3?	343.0	368.0	5034.0	5009.0	368.0	4.0	PVC	Regional Aquifer – SFG sediments	2002	
KAFB-1001	MW	5260.43	5255.7	342.0	367.0	4913.7	4888.7	377.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	19-Apr-1992	
KAFB-1002	MW	5254.75	5252.7	342.0	367.0	4910.7	4885.7	377.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	30-Mar-1992	
KAFB-1003	MW	5258.29	5257.7	345.0	370.0	4912.7	4887.7	380.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	21-May-1992	
KAFB-1004	MW	5258.81	5267.7	348.0	373.0	4919.7	4894.7	383.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	24-Aug-1992	
KAFB-1005	MW	5274.68	5287.7	363.0	388.0	4924.7	4899.7	398.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	26-May-1992	
KAFB-1006	MW	5257.01	5257.0	363.0	383.0	4894.0	4874.0	383.0	4.0	SS	Regional Aquifer – SFG sediments	10-Aug-1996	
KAFB-1007R	MW	5260.62	5258.4	376.5	396.5	4881.9	4861.9	401.5	4.0	PVC	Regional Aquifer – SFG sediments	18-May-2013	
KAFB-1008	MW	5260.77	5258.8	367.6	397.6	4891.2	4861.2	400.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-1009	MW	5272.16	5271.8	392.7	422.7	4879.1	4849.1	427.7	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-1901	MW	5751.58	5748.7	80.5	105.5	5668.2	5643.2	115.5	4.0	PVC/SS	Regional Aquifer – SFG sediments	30-Jun-1992	
KAFB-1902	MW	5754.27	5752.7	80.7	105.7	5672.0	5647.0	115.7	4.0	PVC/SS	Regional Aquifer – SFG sediments	9-Jul-1992	
KAFB-1904	MW	5752.29	5750.0?	84.3	104.3	5665.7	5645.7	104.3	4.0	SS	Regional Aquifer – SFG sediments	unk	
KAFB-2004	MW	5592.08	5592.5?	278.0	308.0	5314.5	5284.5	309.0	4.0	PVC	Regional Aquifer – SFG sediments	17-Feb-2002	
KAFB-2005	MW	5624.27	5624.6	126.0	156.0	5498.6	5468.6	158.5	4.0	PVC	Regional Aquifer – SFG sediments	10-May-2006	
KAFB-2006	MW	5590.88	5591.0?	303.0	333.0	5288.0	5258.0	335.0	4.0	PVC	Regional Aquifer – SFG sediments	10-May-2006	
KAFB-2007	MW	5564.48	5562.1	273.0	303.0	5289.1	5259.1	305.5	4.0	PVC	Regional Aquifer – SFG sediments	13-May-2006	
KAFB-2008	MW	5541.74	5539.5	650.0	680.0	4889.5	4859.5	688.0	5.0	unk	Regional Aquifer – SFG sediments	unk	
KAFB-2009	MW	5655.63	5653.4	74.0	104.0	5579.4	5549.4	110.0	4.0	unk	Regional Aquifer – SFG sediments	unk	
KAFB-2622	MW	5358.14	5356.5	195.0	215.0	5161.5	5141.5	217.0	4.0	PVC	PGWS – SFG sediments	02-Dec-2004	
KAFB-2623	MW	5367.48	5365.3	199.8	219.8	5165.5	5145.5	221.8	4.0	PVC	PGWS – SFG sediments	30-Dec-2004	
KAFB-2624	MW	5362.27	5359.6	195.0	215.0	5164.6	5144.6	217.0	4.0	PVC	PGWS – SFG sediments	unk	
KAFB-2625	MW	5359.26	5357.4	185.0	205.0	5172.4	5152.4	207.0	4.0	PVC	PGWS – SFG sediments	unk	
KAFB-2626	MW	5357.51	5355.6	185.0	205.0	5170.6	5150.6	208.0	4.0	PVC	PGWS – SFG sediments	unk	
KAFB-2627	MW	5367.47	5365.5	195.0	215.0	5170.5	5150.5	217.5	4.0	PVC	PGWS – SFG sediments	unk	
KAFB-2628	MW	5369.64	5367.4	506.0	530.0	4861.4	4837.4	535.0	5.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-2629	MW	5361.53	5359.0	499.5	519.5	4859.7	4839.7	523.5	5.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-2901	MW	5839.08	5836.7	121.0	141.0	5715.7	5695.7	146.0	4.0	PVC	Regional Aquifer – SFG sediments	31-May-2015	
KAFB-2902	MW	5832.10	5829.7	160.0	180.0	5669.7	5649.7	185.0	4.0	PVC	Regional Aquifer – SFG sediments	9-May-2015	
KAFB-2903	MW	5819.46	5817.0	165.0	185.0	5652.0	5632.0	190.0	4.0	PVC	Bedrock (Abo Formation) siltstone and shale	11-Jun-2015	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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-2904	MW	5842.72	5840.4	58.0	78.0	5782.4	5762.4	83.0	4.0	PVC	Bedrock (Madera Formation) limestone	14-Jun-2015	
KAFB-3391	MW	5396.60	5394.1	262.3	282.3	5131.8	5111.8	284.3	4.0	PVC	PGWS – SFG sediments	1-Aug-1998	
KAFB-3392	MW	5394.51	5393.4	536.0	561.0	4857.4	4832.4	562.0	4.0	PVC	Regional Aquifer – SFG sediments	08-Oct-1999	
KAFB-3411	MW	5342.81	5340.5	477.0	502.0	4863.5	4838.5	503.0	4.0	PVC	Regional Aquifer – SFG sediments	11-Nov-1999	
KAFB-6241	MW	5466.50	5463.2	528.0	553.0	4935.2	4910.2	555.0	4.0	PVC	Regional Aquifer – SFG sediments	16-Jan-2007	
KAFB-6243	MW	5426.22	5421.0	488.0	513.0	4933.0	4908.0	516.0	4.0	unk	Regional Aquifer – SFG sediments	unk	
KAFB-6301	MW	5459.64	5457.3	535.0	560.0	4922.3	4897.3	561.0	4.0	PVC	Regional Aquifer – SFG sediments	7-Sep-1999	
KAFB-7001	MW	5322.87	5323.0?	454	479	4869.0	4844.0	480	4	PVC	Regional Aquifer – SFG sediments	before 2011	
KAFB-8281	MW	5401.03	5401.7	544.0	569.0	4857.7	4832.7	570.0	4.0	PVC	Regional Aquifer – SFG sediments	27-Oct-1999	
KAFB-8282	MW	5402.92	5403.4	262.0	287.0	5141.4	5116.4	288.0	4.0	PVC	PGWS – SFG sediments	unk	
KAFB-8351	MW	5325.51	5323.3	474.0	499.0	4849.3	4824.3	505.0	4.0	PVC	Regional Aquifer – SFG sediments	23-Nov-1999	
ST105-EX01	MW	5353.54	5348.5	505.0	575.0	4843.5	4773.5	575.0	10.0	PVC/SS	Regional Aquifer – SFG sediments	unk	
ST105-MW001	MW	5279.34	5276.6	408.0	428.0	4868.6	4848.6	433.0	4.0	PVC	Regional Aquifer – SFG sediments	11-Mar-2103	
ST105-MW002	MW	5180.32	5177.8	308.8	328.8	4869.0	4849.0	333.8	4.0	PVC	Regional Aquifer – SFG sediments	25-Feb-2013	
ST105-MW003	MW	5174.61	5171.9	301.0	321.0	4870.9	4850.9	326.0	4.0	PVC	Regional Aquifer – SFG sediments	28-Feb-2013	
ST105-MW004	MW	5234.61	5234.1	365.0	385.0	4869.1	4849.1	390.0	4.0	PVC	Regional Aquifer – SFG sediments	20-Feb-2013	
ST105-MW005	MW	5287.57	5284.9	273.0	293.0	5011.9	4991.9	298.0	4.0	PVC	Regional Aquifer – SFG sediments	27-May-2103	
ST105-MW006	MW	5313.26	5310.7	228.0	248.0	5082.7	5062.7	253.0	4.0	PVC	PGWS – SFG sediments	2-Feb-2013	
ST105-MW007	MW	5311.18	5308.5	290.0	310.0	5018.5	4998.5	315.0	4.0	PVC	Regional Aquifer – SFG sediments	24-Feb-2013	
ST105-MW008	MW	5358.94	5356.5	461.0	476.0	4895.5	4880.5	481.0	4.0	PVC	Regional Aquifer – SFG sediments	20-Feb-2013	
ST105-MW009	MW	5519.71	5517.5	480.0	500.0	5037.5	5017.5	505.0	4.0	PVC	Regional Aquifer – SFG sediments	7-Nov-2013	
ST105-MW010	MW	5334.70	5332.1	436.5	456.5	4895.6	4875.6	461.5	4.0	PVC	Regional Aquifer – SFG sediments	1-Jun-2013	
ST105-MW011	MW	5422.66	5420.0	456.8	476.8	4963.2	4943.2	482.3	4.0	PVC	Regional Aquifer – SFG sediments	9-Apr-2013	
ST105-MW012	MW	5419.90	5417.1	376.0	396.0	5041.1	5021.1	401.0	4.0	PVC	PGWS – SFG sediments	17-Apr-2013	
ST105-MW013	MW	5447.27	5444.5	433.6	453.6	5010.9	4990.9	453.6	4.0	PVC	Regional Aquifer – SFG sediments	16-Apr-2013	
ST105-MW015	MW	5623.95	5621.2	687.0	707.0	4934.2	4914.2	712.0	4.0	PVC	Regional Aquifer – SFG sediments	7-May-2013	
ST105-MW017	MW	5621.97	5619.6	702.0	722.0	4917.6	4897.6	727.0	4.0	PVC	Regional Aquifer – SFG sediments	14-Jun-2013	
ST105-MW018	MW	5221.68	5218.8	349.2	369.2	4869.6	4849.6	374.6	4.0	PVC	Regional Aquifer – SFG sediments	9-Mar-2013	
ST105-MW019	MW	5217.94	5215.2	345.0	365.0	4870.2	4850.2	370.0	4.0	PVC	Regional Aquifer – SFG sediments	6-Mar-2013	
ST105-MW020	MW	5383.72	5381.0	281.0	301.0	5100.0	5080.0	306.0	4.0	PVC	PGWS – SFG sediments	24-Apr-2013	
ST105-MW021	MW	5390.90	5388.4	322.0	342.0	5066.4	5046.4	347.0	4.0	PVC	PGWS – SFG sediments	5-Apr-2013	
ST105-MW022	MW	5386.66	5383.9	472.0	492.0	4911.9	4891.9	497.0	4.0	PVC	Regional Aquifer – SFG sediments	10-Apr-2013	
ST105-MW023	MW	5275.86	5273.3	406.0	426.0	4867.3	4847.3	431.0	4.0	PVC	Regional Aquifer – SFG sediments	28-Oct-2013	
ST105-MW024	MW	5595.67	5593.3	442.0	462.0	5151.3	5131.3	467.0	4.0	PVC	Regional Aquifer – SFG sediments	12-Nov-2013	
Site 58 MW-1	MW	5720.88	5718.4?	46.8	71.8	5671.6	5646.6	71.8	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-2	MW	5715.94	5715.9	76.7	96.7	5639.2	5619.2	96.7	2.0	PVC	Bedrock (granite)	2001?	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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)													
Site 58 MW-3	MW	5717.88	5717.9	52.0	72.0	5665.9	5645.9	72.0	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-4	MW	5722.31	5719.8?	55.5	75.5	5664.3	5644.3	75.5	2.0	PVC	Bedrock (granite)	2001?	
Site 58 MW-5	MW	5716.83	5716.8	25.0	65.0	5691.8	5651.8	80.0	4.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-6	MW	5720.30	5717.8?	57.0	82.0	5660.8	5635.8	87.0	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-7	MW	5717.76	5715.3?	50.0	75.0	5665.3	5640.3	80.0	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Production, Injection, and Extraction Wells													
ASL-PD	P	6030.00	6030.0	337.0	401.6	5693.0	5628.4	401.6	4.0	PVC	Bedrock (granite)	11-Jan-1990	
Burn Site Well	Px	6374.66	6372.9	231.0	341.0	6141.9	6031.9	341	4.0	PVC	Bedrock (schist and granite)	20-Feb-1986	Inactive 2003
Greystone Well	P	5822.87	5820.8	44	54	5776.8	5766.8	54	4.0	PVC/S	Alluvium	1902	12-Sep-2002
KAFB-1	P	unk	5386.5	550	1199	4836.5	4187.5	1199	12.0	S	Regional Aquifer – SFG sediments	1-Aug-1949	Dec 2016
KAFB-2	P	5327.06	5327.1	494	1000	4833.1	4327.1	1000	12.0	S	Regional Aquifer – SFG sediments	Jan-1951	Dec 2016
KAFB-3	P	unk	5356.9	452	900	4904.9	4456.9	920	14.0	S	Regional Aquifer – SFG sediments	01-Oct-1949	
KAFB-4	P	unk	5360.2	494	1000	4866.2	4360.2	1000	14.0	S	Regional Aquifer – SFG sediments	01-Dec-1949	
KAFB-5	P	unk	5439.0	504	1004	4935.0	4435.0	1004	14.0	S	Regional Aquifer – SFG sediments	1-Jul-1952	1999
KAFB-6	P	unk	5423.5	504	1002	4919.5	4421.5	1006	14.0	S	Regional Aquifer – SFG sediments	1-Jul-1952	1999
KAFB-7	Inj	unk	5350.4	448	976	4902.4	4374.4	976	16.0	S	Regional Aquifer – SFG sediments	1-Feb-1955	Inj. starts 2016
KAFB-8	P	5372.00	5372.0	440	975	4932.0	4397.0	1000	14.0	S	Regional Aquifer – SFG sediments	1-Feb-1955	1999
KAFB-9	P	5501.19	5501.2	unk	unk	unk	4851.2?	650	10.0	S	Regional Aquifer – SFG sediments	1-Oct-1949	1970
KAFB-10	P	5418.65	5418.7	495	970	4923.7	4448.7	970	12.75	S	Regional Aquifer – SFG sediments	27-May-1959	Apr 1996
KAFB-11	P	5470.67	5481.0	670	1327	4811.0	4154.0	1327	16.0	S	Regional Aquifer – SFG sediments	10-Apr-1972	Dec 2016
KAFB-12	P	5322.87	5324.2	446	1032	4878.2	4292.2	1032	16.0	S	Regional Aquifer – SFG sediments	1-Oct-1952	1999
KAFB-13	P	5305.67	5307.0	413	953	4894.0	4354.0	977	14.0	S	Regional Aquifer – SFG sediments	1-Mar-1956	1999
KAFB-14	P	5324.67	5324.2	380	1000	4944.2	4324.2	1000	16.0	S	Regional Aquifer – SFG sediments	01-Jan-1969	
KAFB-15	P	unk	5347.0	697	993	4650.0	4354.0	1600	30.0	S	Regional Aquifer – SFG sediments	1996	
KAFB-16	P	unk	5370.0	697	993	4673.0	4377.0	1600	30.0	S	Regional Aquifer – SFG sediments	1996	
KAFB-17 (Heliport #1)	Px	unk	5275.0?	unk	unk	unk	4525.0?	750	6.0	SS	Regional Aquifer – SFG sediments	1991	Dec 2016
KAFB-18 (SOR) [j]	Px	5965.70	5965.7	160	320	5805.7	5645.7	320	5.0	PVC	Bedrock (metarhyolite)	19-Aug-1987	
KAFB-19 (HERTF)	P	unk	6229.7	449	500	5780.7	5729.7	500	5.0	S/OH?	Bedrock (granite)	13-Jul-1990	2008
KAFB-20	P	unk	5389.0	710	1180	4679.0	4209.0	1240	20.0	S	Regional Aquifer – SFG sediments	Jan 2008	
KAFB-PG-1598 [k]	Ext	5369.90	5368.4	290	440	5078.4	4928.4	455	12.0	SS	PGWS – SFG sediments	14-Oct-1998	
KAFB-0602	Ext	5365.47	5364.2	437	457	4927.2	4907.2	467	4.0	PVC/SS	PGWS – SFG sediments	20-Mar-1990	
KAFB-0608	Ext	5361.17	5359.9	307	327	5052.9	5032.9	338	4.0	PVC/SS	PGWS – SFG sediments	28-Mar-1990	
KAFB-0609	Ext	5365.87	5364.7	316	336	5048.7	5028.7	345	4.0	PVC/SS	PGWS – SFG sediments	31-Mar-1990	22-Jun-2014
KAFB-0610	Ext	5359.47	5357.3	333	353	5024.3	5004.3	363	4.0	PVC/SS	PGWS – SFG sediments	04-Apr-1990	
KAFB-106228	Ext	5322.08		440.0	540.0			545.0	8.0	SS	Regional Aquifer – SFG sediments	2-June-2015	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (feet amsl, NAVD 88)	Ground Surface [c] (feet amsl, NAVD 88)	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
Production, Injection, and Extraction Wells (Continued)													
KAFB-106233	Ext	5312.30		430.0	532.1			537.1	8.0	SS	Regional Aquifer – SFG sediments	30-Sep-2015	
KAFB-106234	Ext	5322.51		439.7	539.7			544.7	8.0	SS	Regional Aquifer – SFG sediments	9-Oct-2015	
KAFB-106239	Ext			470.0	570.0			575.0	8.0	SS	Regional Aquifer – SFG sediments	Dec 2016	
Lake Christian West [l]	Px	5716.61	5714.8	60	72	5654.8	5642.8	72	6.0	S	SFG sediments or sandstone	before 1990	after 2004
Ridgecrest-1	P	unk	5444.7	636	1260	4808.7	4184.7	1260	16.0	S	Regional Aquifer – SFG sediments	13-Jan-1964	
Ridgecrest-2	P	unk	5418.7	730	1500	4688.7	3918.7	1543	16.0	S	Regional Aquifer – SFG sediments	1-Jan-1977	
Ridgecrest-3	P	unk	5387.7	621	1436	4766.7	3951.7	1449	16.0	S	Regional Aquifer – SFG sediments	01-May-1974	
Ridgecrest-4	P	unk	5346.7	573	1413	4773.7	3933.7	1450	unk	S	Regional Aquifer – SFG sediments	01-Mar-1974	
Ridgecrest-5	P	unk	5356.7	650	1450	4706.7	3906.7	1450	20.0	S	Regional Aquifer – SFG sediments	8-Dec-1990	
School House Well	P	5796.33	5799.0	83	103	5716.0	5696.0	103	6.0	S/OH	Bedrock (Sandia Formation) sandstone?	1930s?	inactive
TSA-1	P	6063.68	6060.2	190	210	5870.2	5850.2	300	6.0	S	Bedrock (metamorphics)	10-Nov-1987	Aug 2001
VA-2	P	unk	5346.3?	590	990	4756.3	4356.3	1010	13.4	SS	Regional Aquifer – SFG sediments	18-Apr-1997	
Yates Well	P	6104.67	6102.7	unk	unk	unk	unk	unk	unk	S	Bedrock (granite)	1929	1942?

Notes:

[a] The status of all SNL/NM-installed groundwater wells is maintained in this table. However, not all of decommissioned (P&A) groundwater wells for KAFB and LRRI are listed.

[b] Measuring Point is the elevation for the top of well casing, typically the top of PVC casing, that is used for measuring and calculating groundwater elevations.

[c] Elevations are relative to the NAVD 88, New Mexico State Plane Coordinate System, Central Zone. Elevation data from other government agencies were converted as necessary using a conversion (re-projection) of +2.671 feet.

[d] MWL-MW4 well casing was installed at 6 degrees from vertical. Casing depths were measured during well installation and are not corrected for true vertical (perpendicular to the ground surface) distance of the slant hole.

[e] Merging zone refers to isolated layers of saturation near Tijeras Arroyo, typically between the Perched Groundwater System and the Regional Aquifer. A merging zone is occasionally present above the Perched Groundwater System.

[f] Monitoring well TA2-NW1-595 has two screens: 535 to 555 feet bgs, and 585 to 595 feet bgs. Groundwater samples are collected from the upper screen.

[g] Monitoring well PGS-2 has three screens: 535 to 565 feet bgs, 585 to 595 feet bgs, and 625 to 645 feet bgs. Groundwater samples are collected from the upper screen.

[h] Many of the Bulk Fuels Facility (BFF) monitoring wells, such as KAFB-1062, are not shown in order to reduce clutter on the AGMR figures and Plate 1. The BFF plume does not impact groundwater in the SNL/NM groundwater areas of concern.

[i] Monitoring well KAFB-0626 was constructed with a FLUTe monitoring system with four sampling ports labeled as KAFB-0626A through KAFB-0626D. Sample tubing (0.25-inch diameter) for the four ports was installed in a 5-inch diameter PVC casing. Groundwater elevations cannot be measured. Port KAFB-0626A is set at 425 feet bgs. Port KAFB-06262B is set at 471 feet bgs. Port KAFB-06262C is set at 515 feet bgs. Port KAFB-06262D is set at 629 feet bgs. Each port has an interval of silica sand that is separated by bentonite chips.

[j] KAFB-18 is also known as the Optical Range Well or the Starfire Optical Range well.

[k] The production-nonpotable well KAFB-PG-1598 is also known as the Golf Course Main Pond well. Some KAFB documents also use the identifier RG-1598-S-4 or RG-1589-S-4. Pumped water is used for irrigating the KAFB Tijeras Arroyo Golf Course.

[l] Lake Christian West is also known as well KAFB-1903. Well was used for nonpotable purposes including the filling of a U.S. Air Force high explosives testing pond located approximately 1,600 feet to the east of the well.

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM, Kirtland Air Force Base, and Surrounding Areas *(Concluded)*

Notes (Continued):

amsl = Above mean sea level.
ASL PD = Albuquerque Seismological Laboratory Production.
AVN = Area V (North).
BFF = Bulk Fuels Facility at KAFB.
bgs = Below ground surface.
BW = Background Well.
CCBA = Coyote Canyon Blast Area.
CTF = Coyote Test Field.
CWL = Chemical Waste Landfill.
CYN = Canyons (Lurance Canyon area).
EOD = Explosive Ordnance Disposal.
EX = Well proposed for extraction purposes, but used for monitoring purposes only. This applies to the well number for ST105-EX01.
Ext = Extraction well used for remediating groundwater at the BFF and the KAFB Tijeras Arroyo Golf Course.
FLUTe = Flexible Liner Underground Technologies, LLC.
HERTF = High Energy Research Test Facility.
ID = Identifier.
Inj = Injection well.
IP = Isleta Pueblo.
ITRI = Inhalation Toxicology Research Institute (renamed in 1996 as Lovelace Respiratory Research Institute).
KAFB = Kirtland Air Force Base.
L = Lower screen, a term used at CWL.
LMF = Large Melt Facility.
LRRI = Lovelace Respiratory Research Institute.
LWDS = Liquid Waste Disposal System.
MRN = Magazine Road North.
MVMW = Mountain View Monitoring Well.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
NAVD 88 = North American Vertical Datum of 1988.
NMED = New Mexico Environment Department.
NWTA3 = Northwest Technical Area III.
OBS = Old Burn Site.
P = Production well (water supply well) used for potable purposes.
P&A = Plugged and abandoned (decommissioned).
Px = Production well used for nonpotable purposes such as irrigating the golf course.
PGS = Parade Ground South.
PGWS = Perched Groundwater System.
PL = Power Line Road, located northwest of Technical Area III. The better-known Power Line Road is near the golf course.
PVC = Polyvinyl chloride.
PVC/S = Composition of blank well casing is PVC and composition of well screen is steel (carbon steel).
PVC/SS = Composition of blank well casing is PVC and composition of well screen is stainless steel.
R = Replacement well (term used by KAFB).
S = Steel (carbon steel).
S/OH = Open hole completion (no well screen) with blank casing above.
S/SS = Composition of blank well casing is carbon steel and composition of well screen is stainless steel.
SFG = Santa Fe Group
SFR = South Fence Road.
SNL/NM = Sandia National Laboratories/New Mexico.
SS = Stainless steel.
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 (monitoring well designation).
TAV-INJ1 = Injection well was constructed with two well casings in a single borehole. The 5-inch diameter PVC casing has a screen from 509 to 539 ft bgs. The 1.5-inch diameter PVC casing has a screen from 519 to 539 ft bgs. Both casing have a sump extending from 539 to 544 ft bgs.
TJA = Tijeras Arroyo.
TRE = Thunder Road East.
TRN = Target Road North.
TRS = Target Road South.
TSA = Transportation Safeguards Academy.
U = Upper screen, a term used at CWL.
unk = Unknown information, not available.
VA = Veterans Administration.
WYO = Wyoming.
YALE = Yale Boulevard area.

This page intentionally left blank.

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2017

Well ID	Measurement Point, (feet amsl, NAVD 88)	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Groundwater Elevation, Rounded (feet amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, As Needed	Data Source	Well Owner	Screened Unit
AVN-1	5443.00	4-Oct-2017	527.71	4915.29	4915		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
Burn Site Well	6374.66	29-Sep-2017	101.35	6273.31	6273		SNL/NM	SNL/NM	Bedrock (schist and granite)
CCBA-MW1	5902.34	3-Oct-2017	48.08	5854.26	5854		SNL/NM	SNL/NM	Alluvium and bedrock (granite)
CCBA-MW2	5939.28	3-Oct-2017	72.25	5867.03	5867		SNL/NM	SNL/NM	Bedrock (granite)
CTF-MW1	6082.63	6-Oct-2017	240.16	5842.47	5842		SNL/NM	SNL/NM	Bedrock (granite)
CTF-MW2	5578.60	6-Oct-2017	43.85	5534.75	5535		SNL/NM	SNL/NM	Bedrock (granite)
CTF-MW3	5522.82	6-Oct-2017	309.66	5213.16	5213		SNL/NM	SNL/NM	Bedrock (granite)
CWL-BW5	5434.79	2-Oct-2017	513.38	4921.41	4921		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CWL-MW9	5426.12	2-Oct-2017	504.87	4921.25	4921		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CWL-MW10	5424.58	2-Oct-2017	501.28	4923.30	4923		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CWL-MW11	5423.24	2-Oct-2017	500.16	4923.08	4923		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CYN-MW3	6313.26	26-Sep-2017	134.25	6179.01	6179		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW4	6455.48	30-Sep-2017	229.43	6226.05	6226		SNL/NM	SNL/NM	Bedrock (quartzite)
CYN-MW5	5984.23	29-Sep-2017	108.69	5875.54	5876		SNL/NM	SNL/NM	Bedrock (quartzite)
CYN-MW6	6343.37	29-Sep-2017	156.19	6187.18	6187		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW7	6216.35	29-Sep-2017	305.54	5910.81	5911		SNL/NM	SNL/NM	Bedrock (granitic gneiss)
CYN-MW8	6230.11	29-Sep-2017	321.24	5908.87	5909		SNL/NM	SNL/NM	Bedrock (granitic gneiss)
CYN-MW9	6360.67	29-Sep-2017	170.23	6190.44	6190		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW10	6345.45	29-Sep-2017	123.50	6221.95	6222		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW11	6374.41	29-Sep-2017	101.03	6273.38	6273		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW12	6345.16	29-Sep-2017	213.44	6131.72	6132		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW13	6237.79	29-Sep-2017	327.46	5910.33	5910		SNL/NM	SNL/NM	Bedrock (granitic gneiss)
CYN-MW14A	6315.85	29-Sep-2017	182.76	6133.09	6133	NC - deeper fracture	SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW15	6344.44	29-Sep-2017	157.74	6186.70	6187		SNL/NM	SNL/NM	Bedrock (metamorphics)
Greystone-MW2	5814.20	5-Oct-2017	54.78	5759.42	5759	NC - shallow alluvium	SNL/NM	SNL/NM	Alluvium in arroyo, recent
LWDS-MW1	5423.83	5-Oct-2017	504.71	4919.12	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
LWDS-MW2	5412.41	4-Oct-2017	493.47	4918.94	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MRN-2	5308.18	6-Oct-2017	433.51	4874.67	4875		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MRN-3D	5309.34	6-Oct-2017	433.90	4875.44	4875		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-BW2	5391.02	2-Oct-2017	481.03	4909.99	4910		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW4	5391.70	6-Nov-2017	500.99	4890.71	4891	corrected for inclined casing	SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW5	5382.56	2-Oct-2017	493.55	4889.01	4889		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW6	5375.31	2-Oct-2017	487.20	4888.11	4888		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW7	5383.30	2-Oct-2017	490.12	4893.18	4893		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW8	5384.67	2-Oct-2017	491.69	4892.98	4893		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW9	5381.91	2-Oct-2017	491.88	4890.03	4890		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2017 *(Continued)*

Well ID	Measurement Point, (feet amsl, NAVD 88)	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Groundwater Elevation, Rounded (feet amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, As Needed	Data Source	Well Owner	Screened Unit
NWTA3-MW2	5337.49	6-Oct-2017	464.50	4872.99	4873		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
NWTA3-MW3D	5340.80	6-Oct-2017	463.42	4877.38	4877		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
OBS-MW1	5871.42	3-Oct-2017	72.10	5799.32	5799		SNL/NM	SNL/NM	Bedrock (granite)
OBS-MW2	5863.16	3-Oct-2017	174.63	5688.53	5689		SNL/NM	SNL/NM	Bedrock (granite)
OBS-MW3	5865.50	3-Oct-2017	69.40	5796.10	5796		SNL/NM	SNL/NM	Bedrock (granite)
PGS-2	5408.29	4-Oct-2017	536.11	4872.18	4872		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
PL-2	5336.01	6-Oct-2017	463.61	4872.40	4872		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
PL-4	5334.98	6-Oct-2017	463.03	4871.95	4872		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-1D	5399.13	5-Oct-2017	139.90	5259.23	5259	NC - deeper fracture	SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-1S	5399.16	5-Oct-2017	90.03	5309.13	5309		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-2S	5432.77	5-Oct-2017	100.97	5331.80	5332		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3D	5497.94	5-Oct-2017	162.25	5335.69	5336		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3P	5499.63	5-Oct-2017	162.45	5337.18	5337		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3S	5498.24	5-Oct-2017	161.42	5336.82	5337		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3T	5498.66	5-Oct-2017	68.82	5429.84	5430		SNL/NM	SNL/NM	Bedrock (sandstone)
SFR-4P	5573.33	5-Oct-2017	148.83	5424.50	5425		SNL/NM	SNL/NM	Bedrock (sandstone)
SFR-4T	5573.95	5-Oct-2017	145.43	5428.52	5429		SNL/NM	SNL/NM	Bedrock (sandstone)
SWTA3-MW2	5325.60	20-Oct-2017	449.20	4876.40	4876		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SWTA3-MW3	5323.94	20-Oct-2017	446.64	4877.30	4877		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SWTA3-MW4	5324.81	20-Oct-2017	447.39	4877.42	4877		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-01	5403.82	2-Oct-2017	533.24	4870.58	4871		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-02	5416.62	3-Oct-2017	519.75	4896.87	4897		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-03	5457.03	2-Oct-2017	356.84	5100.19	5100		SNL/NM	SNL/NM	PGWS - SFG sediments
TA1-W-04	5460.98	2-Oct-2017	566.33	4894.65	4895		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-05	5433.84	3-Oct-2017	559.90	4873.94	4874		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-06	5417.10	3-Oct-2017	308.88	5108.22	5108		SNL/NM	SNL/NM	PGWS - SFG sediments
TA1-W-07	5404.92	2-Oct-2017	286.42	5118.50	5119		SNL/NM	SNL/NM	PGWS - SFG sediments
TA1-W-08	5434.19	3-Oct-2017	311.76	5122.43	5122		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-NW1-325	5421.94	2-Oct-2017	319.49	5102.45	5102		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-NW1-595	5421.26	2-Oct-2017	519.04	4902.22	4902		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA2-W-01	5419.99	2-Oct-2017	329.94	5090.05	5090		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-W-19	5351.21	2-Oct-2017	273.28	5077.93	5078		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-W-24	5363.66	2-Oct-2017	440.86	4922.80	4923		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA2-W-25	5374.86	2-Oct-2017	466.04	4908.82	4909		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA2-W-26	5375.77	2-Oct-2017	288.97	5086.80	5087		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-W-27	5362.85	2-Oct-2017	281.58	5081.27	5081		SNL/NM	SNL/NM	PGWS - SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2017 *(Continued)*

Well ID	Measurement Point, (feet amsl, NAVD 88)	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Groundwater Elevation, Rounded (feet amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, As Needed	Data Source	Well Owner	Screened Unit
TA2-W-28	5412.41	2-Oct-2017	320.55	5091.86	5092		SNL/NM	SNL/NM	PGWS - SFG sediments
TAV-MW2	5427.33	5-Oct-2017	508.96	4918.37	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW3	5464.30	5-Oct-2017	547.48	4916.82	4917		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW4	5427.89	4-Oct-2017	509.00	4918.89	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW5	5408.71	4-Oct-2017	492.26	4916.45	4916		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW6	5431.17	4-Oct-2017	512.53	4918.64	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW7	5430.40	23-Oct-2017	515.07	4915.33	4915		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW8	5417.00	5-Oct-2017	497.59	4919.41	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW9	5416.27	5-Oct-2017	501.08	4915.19	4915		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW10	5437.03	4-Oct-2017	518.68	4918.35	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW11	5440.12	4-Oct-2017	521.57	4918.55	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW12	5435.72	4-Oct-2017	518.07	4917.65	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW13	5409.02	4-Oct-2017	497.37	4911.65	4912		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW14	5441.52	4-Oct-2017	525.32	4916.20	4916		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW15	5437.32	4-Oct-2017	520.15	4917.17	4917		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW16	5448.34	4-Oct-2017	531.68	4916.66	4917		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TJA-2	5353.20	2-Oct-2017	278.41	5074.79	5075		SNL/NM	SNL/NM	PGWS - SFG sediments
TJA-3	5390.56	2-Oct-2017	498.70	4891.86	4892		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TJA-4	5341.16	2-Oct-2017	300.24	5040.92	5041	NC - merging zone	SNL/NM	SNL/NM	merging zone – SFG sediments
TJA-5	5341.33	2-Oct-2017	270.38	5070.95	5071		SNL/NM	SNL/NM	PGWS - SFG sediments
TJA-6	5343.16	2-Oct-2017	450.94	4892.22	4892		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TJA-7	5391.27	2-Oct-2017	304.02	5087.25	5087		SNL/NM	SNL/NM	PGWS - SFG sediments
TRE-1	5497.25	5-Oct-2017	177.80	5319.45	5319		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TRN-1	5735.62	3-Oct-2017	92.51	5643.11	5643		SNL/NM	SNL/NM	Bedrock (sandstone)
TRS-1D	5779.80	3-Oct-2017	127.56	5652.24	5652		SNL/NM	SNL/NM	Bedrock (limestone)
TRS-1S	5780.07	3-Oct-2017	135.13	5644.94	5645		SNL/NM	SNL/NM	Bedrock (limestone)
TRS-2	5780.76	3-Oct-2017	135.68	5645.08	5645		SNL/NM	SNL/NM	Bedrock (limestone)
WYO-3	5392.09	2-Oct-2017	522.07	4870.02	4870		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
WYO-4	5392.57	2-Oct-2017	294.25	5098.32	5098		SNL/NM	SNL/NM	PGWS - SFG sediments
Non Sandia Wells									
EOD Well	5829.70	9-Dec-2016	144.91	5684.79	5685		KAFB	KAFB	Bedrock (granite)
Eubank-1	5460.02	2-Oct-2017	546.75	4913.27	4913		SNL/NM	COA EHD	Regional Aquifer – SFG sediments
Eubank-2	5474.39	14-Sep-2017	573.93	4900.46	4900		COA EHD	COA EHD	Regional Aquifer – SFG sediments
Eubank-3	5498.73	14-Sep-2017	602.27	4896.46	4896		COA EHD	COA EHD	Regional Aquifer – SFG sediments
Eubank-5	5507.40	14-Sep-2017	611.26	4896.14	4896		COA EHD	COA EHD	Regional Aquifer – SFG sediments
ITRI-MW-16	5644.91	1-Oct-2016	110.50	5534.41	5534		LRRI	LRRI	Regional Aquifer – SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2017 *(Continued)*

Well ID	Measurement Point, (feet amsl, NAVD 88)	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Groundwater Elevation, Rounded (feet amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, As Needed	Data Source	Well Owner	Screened Unit
Non Sandia Wells (Continued)									
KAFB-0118	5320.75	17-Oct-2017	448.59	4872.16	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0119	5315.82	17-Oct-2017	443.99	4871.83	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0120	5292.29	17-Oct-2017	417.20	4875.09	4875		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0121	5307.60	17-Oct-2017	435.73	4871.87	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0213	5286.95	18-Oct-2017	411.10	4875.85	4876		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0219	5263.69	17-Oct-2017	392.77	4870.92	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0220	5265.10	17-Oct-2017	394.12	4870.98	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0221	5274.36	18-Oct-2017	403.28	4871.08	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0307	5364.53	16-Oct-2017	422.25	4942.28	4942		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0308	5381.65	16-Oct-2017	445.27	4936.38	4936		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0309	5411.80	16-Oct-2017	480.51	4931.29	4931		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0310	5416.48	16-Oct-2017	354.29	5062.19	5062		KAFB	KAFB	PGWS - SFG sediments
KAFB-0311	5353.29	16-Oct-2017	418.79	4934.50	4935		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0312	5432.17	16-Oct-2017	417.36	5014.81	5015		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0313	5418.98	16-Oct-2017	350.97	5068.01	5068		KAFB	KAFB	PGWS - SFG sediments
KAFB-0314	5455.75	16-Oct-2017	417.20	5038.55	5039		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0315	5466.11	16-Oct-2017	438.42	5027.69	5028		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0417	5313.07	17-Oct-2017	446.22	4866.85	4867		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0504	5357.87	17-Oct-2017	486.53	4871.34	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0505	5362.81	17-Oct-2017	492.88	4869.93	4870		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0506	5363.47	17-Oct-2017	209.79	5153.68	5154		KAFB	KAFB	PGWS - SFG sediments
KAFB-0507R	5358.21	17-Oct-2017	487.54	4870.67	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0508	5351.88	17-Oct-2017	481.63	4870.25	4870		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0510	5367.10	17-Oct-2017	498.43	4868.67	4869		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0512R	5302.73	17-Oct-2017	431.90	4870.83	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0514	5206.41	17-Oct-2017	336.52	4869.89	4870		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0516	5205.64	17-Oct-2017	335.77	4869.87	4870		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0517	5197.10	17-Oct-2017	325.08	4872.02	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0518	5177.76	17-Oct-2017	305.44	4872.32	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0520	5247.90	17-Oct-2017	378.24	4869.66	4870		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0522	5267.48	17-Oct-2017	398.79	4868.69	4869		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0523	5352.62	17-Oct-2017	478.23	4874.39	4874		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0524	5345.61	17-Oct-2017	474.19	4871.42	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0525	5229.75	17-Oct-2017	358.85	4870.90	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0608	5361.17	18-Oct-2017	293.89	5067.28	5067		KAFB	KAFB	PGWS - SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2017 *(Continued)*

Well ID	Measurement Point, (feet amsl, NAVD 88)	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Groundwater Elevation, Rounded (feet amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, As Needed	Data Source	Well Owner	Screened Unit
Non Sandia Wells (Continued)									
KAFB-0611	5386.09	18-Oct-2017	462.94	4923.15	4923		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0612	5385.45	18-Oct-2017	290.19	5095.26	5095		KAFB	KAFB	PGWS - SFG sediments
KAFB-0613	5390.78	18-Oct-2017	353.15	5037.63	5038		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0614	5390.89	18-Oct-2017	331.83	5059.06	5059		KAFB	KAFB	PGWS - SFG sediments
KAFB-0615	5638.43	18-Oct-2017	206.68	5431.75	5432		KAFB	KAFB	Bedrock (granite)
KAFB-0616	5481.07	18-Oct-2017	443.53	5037.54	5038		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0617	5505.78	18-Oct-2017	557.05	4948.73	4949	NC - nearby fault	KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0618	5410.05	18-Oct-2017	484.19	4925.86	4926		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0619	5410.78	18-Oct-2017	385.19	5025.59	5026		KAFB	KAFB	PGWS - SFG sediments
KAFB-0620	5334.64	18-Oct-2017	442.68	4891.96	4892		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0621	5569.89	16-Oct-2017	624.95	4944.94	4945	NC - nearby fault	KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0622	5488.64	18-Oct-2017	551.97	4936.67	4937		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0623	5328.94	16-Oct-2017	259.58	5069.36	5069		KAFB	KAFB	PGWS - SFG sediments
KAFB-0624	5673.78	16-Oct-2017	769.65	4904.13	4904	NC - nearby fault	KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0625	5390.23	18-Oct-2017	472.55	4917.68	4918		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0901	5390.07	16-Oct-2017	468.96	4921.11	4921		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-0903	5391.63	16-Oct-2017	236.85	5154.78	5155	NC - semiconfined?	KAFB	KAFB	merging zone – SFG sediments
KAFB-0904	5291.75	18-Oct-2017	351.70	4940.05	4940	NC - semiconfined?	KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-1006	5257.01	1-Dec-2016	380.28	4876.73	4877		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-1007R	5260.62	1-Dec-2016	383.65	4876.97	4877		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-1008	5260.77	1-Dec-2016	380.71	4880.06	4880		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-1009	5272.16	1-Dec-2016	392.89	4879.27	4879		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2005	5624.27	18-Oct-2017	114.30	5509.97	5510		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2006	5590.88	18-Oct-2017	284.18	5306.70	5307		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2007	5564.48	18-Oct-2017	261.19	5303.29	5303		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2008	5541.74	18-Oct-2017	597.82	4943.92	4944		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2009	5655.63	18-Oct-2017	76.77	5578.86	5579		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2622	5358.14	17-Oct-2017	205.38	5152.76	5153		KAFB	KAFB	PGWS - SFG sediments
KAFB-2624	5362.27	17-Oct-2017	217.60	5144.67	5145		KAFB	KAFB	PGWS - SFG sediments
KAFB-2625	5359.26	17-Oct-2017	197.85	5161.41	5161		KAFB	KAFB	PGWS - SFG sediments
KAFB-2626	5357.51	17-Oct-2017	207.35	5150.16	5150		KAFB	KAFB	PGWS - SFG sediments
KAFB-2627	5367.47	17-Oct-2017	219.47	5148.00	5148		KAFB	KAFB	PGWS - SFG sediments
KAFB-2628	5369.64	17-Oct-2017	498.99	4870.65	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2629	5361.53	17-Oct-2017	492.04	4869.49	4869		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2901	5839.08	4-Jan-2017	126.35	5712.73	5713		KAFB	KAFB	Regional Aquifer – SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2017 *(Continued)*

Well ID	Measurement Point, (feet amsl, NAVD 88)	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Groundwater Elevation, Rounded (feet amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, As Needed	Data Source	Well Owner	Screened Unit
Non Sandia Wells (Continued)									
KAFB-2902	5832.10	3-Jan-2017	168.45	5663.65	5664		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-2903	5819.46	3-Jan-2017	141.21	5678.25	5678		KAFB	KAFB	Bedrock (Abo Formation)
KAFB-2904	5842.72	4-Jan-2017	46.30	5796.42	5796		KAFB	KAFB	Bedrock (Madera Formation)
KAFB-3391	5396.60	19-Oct-2017	276.54	5120.06	5120		KAFB	KAFB	PGWS - SFG sediments
KAFB-3392	5394.51	19-Oct-2017	525.50	4869.01	4869		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-3411	5342.81	17-Oct-2017	471.53	4871.28	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-6241	5466.50	18-Oct-2017	540.04	4926.46	4926		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-6243	5426.22	18-Oct-2017	500.32	4925.90	4926		KAFB	KAFB	Regional Aquifer – SFG sediments
KAFB-8351	5325.51	17-Oct-2017	450.63	4874.88	4875		KAFB	KAFB	Regional Aquifer – SFG sediments
Mesa del Sol-S	5302.67	30-Oct-2017	421.26	4881.41	4881		USGS	NMOSE	Regional Aquifer – SFG sediments
Montessa Park-S	5102.67	30-Oct-2017	216.84	4885.83	4886		USGS	ABCUWA	Regional Aquifer – SFG sediments
YALE-MW9	5271.06	14-Sep-2017	377.20	4893.86	4894	NC - semiconfined?	ABCUWA	ABCUWA	Regional Aquifer – SFG sediments
ST105-MW001	5279.34	17-Oct-2017	407.82	4871.52	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW002	5180.32	17-Oct-2017	308.50	4871.82	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW003	5174.61	17-Oct-2017	302.75	4871.86	4872		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW004	5234.61	17-Oct-2017	365.90	4868.71	4869		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW005	5287.57	18-Oct-2017	299.20	4988.37	4988	NC - semiconfined?	KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW006	5313.26	16-Oct-2017	236.56	5076.70	5077		KAFB	KAFB	PGWS - SFG sediments
ST105-MW007	5311.18	18-Oct-2017	317.50	4993.68	4994	NC - semiconfined?	KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW008	5358.94	18-Oct-2017	481.96	4876.98	4877		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW009	5519.71	18-Oct-2017	485.23	5034.48	5034		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW010	5334.70	18-Oct-2017	444.77	4889.93	4890		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW011	5422.66	18-Oct-2017	483.73	4938.93	4939		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW012	5419.90	18-Oct-2017	384.06	5035.84	5036		KAFB	KAFB	PGWS - SFG sediments
ST105-MW013	5447.27	18-Oct-2017	436.73	5010.54	5011		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW015	5623.95	16-Oct-2017	688.64	4935.31	4935	NC - nearby fault	KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW017	5621.97	16-Oct-2017	706.66	4915.31	4915	NC - nearby fault	KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW018	5221.68	17-Oct-2017	350.49	4871.19	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW019	5217.94	17-Oct-2017	346.78	4871.16	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW020	5383.72	18-Oct-2017	297.06	5086.66	5087		KAFB	KAFB	PGWS - SFG sediments
ST105-MW021	5390.90	18-Oct-2017	331.00	5059.90	5060		KAFB	KAFB	PGWS - SFG sediments
ST105-MW022	5386.66	18-Oct-2017	469.39	4917.27	4917		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW023	5275.86	17-Oct-2017	404.83	4871.03	4871		KAFB	KAFB	Regional Aquifer – SFG sediments
ST105-MW024	5595.67	18-Oct-2017	340.65	5255.02	5255		KAFB	KAFB	Regional Aquifer – SFG sediments
Site 58 MW-5	5716.83	31-Oct-2017	61.87	5654.96	5655		KAFB	KAFB	Bedrock (granite)

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2017 *(Concluded)*

Notes:

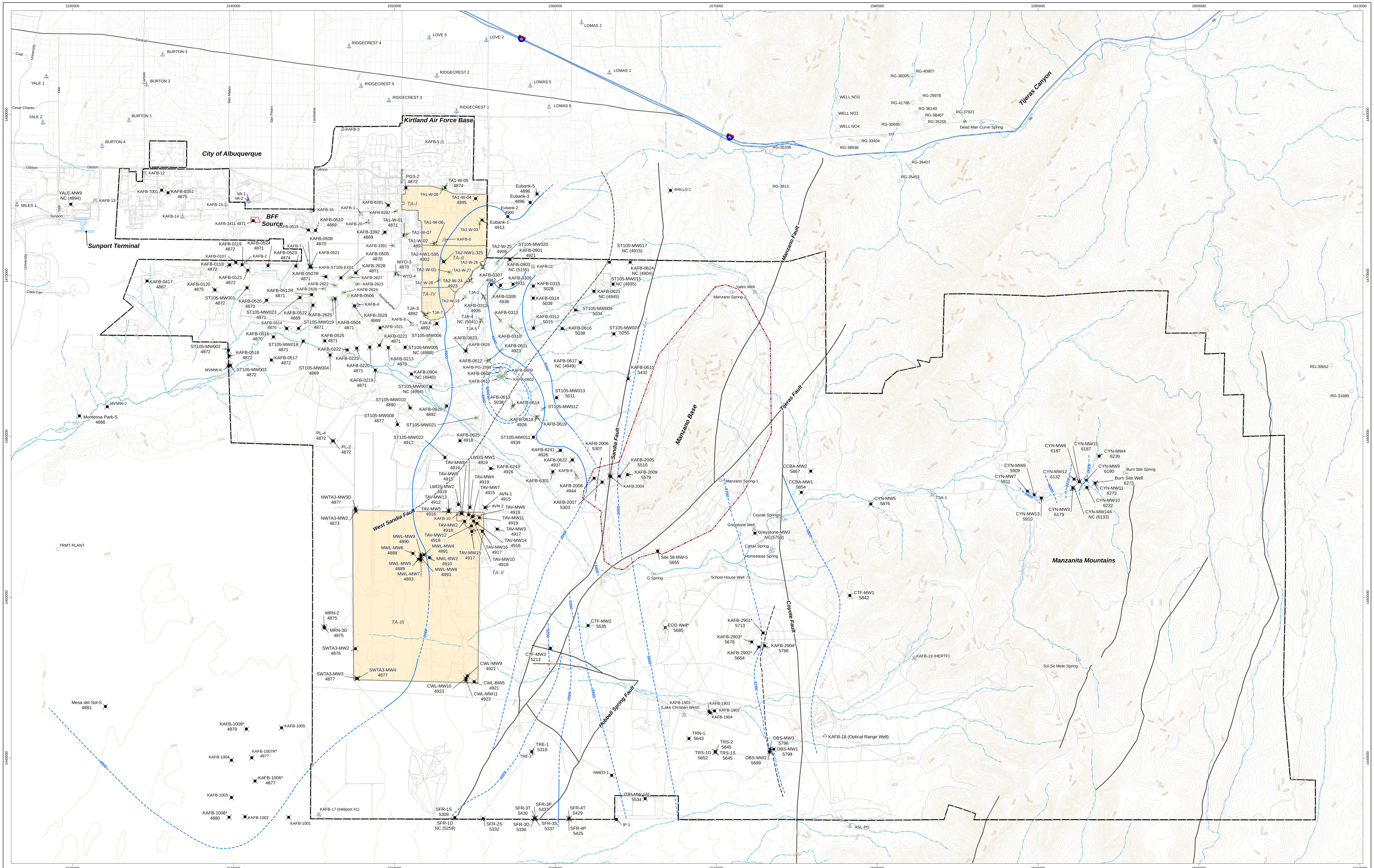
Measuring point is the top of casing elevation used for measuring and calculating the groundwater elevations.

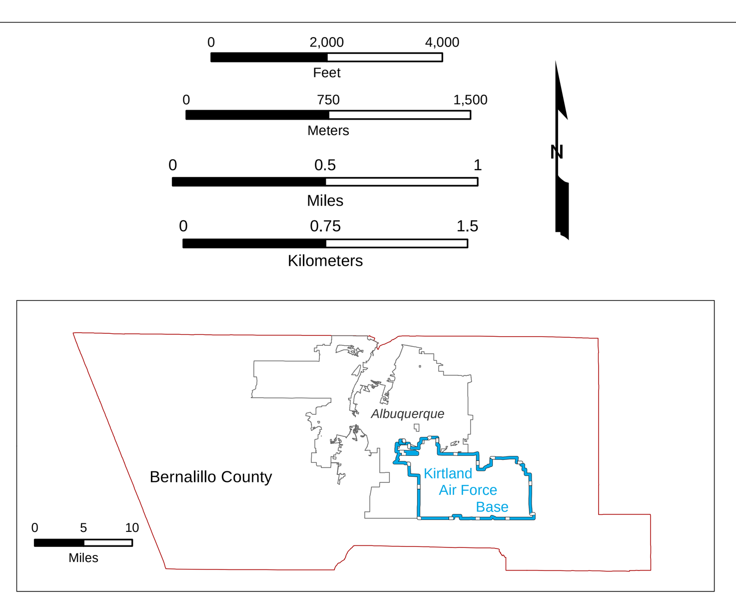
Elevations are relative to the North American Vertical Datum of 1988 (NAVD 88), New Mexico State Plane Coordinate System, Central Zone. Where necessary, elevation data from other government agencies that was based on the National Geodetic Vertical Datum of 1929 (NGVD 29) were converted (re-projected) by +2.671 feet.

As noted on Plate 1, groundwater elevations from the previous year are used for some KAFB and LRRI monitoring wells. The compliance activities for the associated sites have recently changed and the measurement of water levels was no longer required in 2017.

ABCWUA	= Albuquerque Bernalillo County Water Utility Authority.
AVN	= Area V (North).
BW	= Background Well.
CCBA	= Coyote Canyon Blast Area.
COA EHD	= City of Albuquerque Environmental Health Department.
corrected	= MWL-MW4 depth to groundwater was corrected for the inclined well casing (6 degrees).
CTF	= Coyote Test Field.
CWL	= Chemical Waste Landfill.
CYN	= Lurance Canyon.
D	= Deep (deeper well completion).
EOD	= Explosive Ordnance Disposal.
ft amsl	= Feet above mean sea level.
ft btoc	= Feet below top of casing (feet below the measuring point).
ID	= Identifier.
ITRI	= Inhalation Toxicology Research Institute.
KAFB	= Kirtland Air Force Base.
LRRI	= Lovelace Respiratory Research Institute (formerly ITRI).
LWDS	= Liquid Waste Disposal System.
MP	= Measuring point (typically the top of PVC [polyvinyl chloride] well casing).
MRN	= Magazine Road North.
MVMW	= Mountain View Monitoring Well.
MW	= Monitoring Well.
MWL	= Mixed Waste Landfill.
NAVD 88	= North American Vertical Datum of 1988.
NC	= Not contoured (see explanations below).
NC – alluvium	= Well is screened in alluvium along the arroyo channel.
NC – deeper fracture	= Well is screened in a deeper fracture zone at the Burn Site.
NC – merging zone	= Well is screened in a merging zone been the Regional Aquifer and the PGWS.
NC – nearby fault	= A buried (unmapped) fault appears to have a localized effect on groundwater.
NC – semiconfined?	= The screened unit maybe under semiconfined conditions or is hydraulically isolated.
NM	= Not measured.
NWTA3	= Northwest Technical Area III.
OBS	= Old Burn Site.
PGS	= Parade Ground South.
PGWS	= Perched Groundwater System.
PL	= Power Line road (northwest of Technical Area III).
R	= Replacement well (term used by KAFB).
S	= Shallow (shallower well completion).
SFG	= Santa Fe Group.
SFR	= South Fence Road.
SNL/NM	= Sandia National Laboratories/New Mexico.
ST105	= Series of KAFB wells.
SWTA3	= 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.
W	= Well.
WYO	= Wyoming.
YALE	= Yale Boulevard area.

This page intentionally left blank.





Legend

- Monitoring Well, Regional Aquifer / Fractured Bedrock System
- Monitoring Well, Perched Groundwater System
- Production Well, potable
- Production Well, non-potable
- Production Well, plugged and abandoned
- Extraction Well
- Injection Well
- Off-base Well, private use
- Spring, current or historical flow
- NC Not Contoured
- * See Note 3
- Potentiometric surface contour (ft amsl), dashed where uncertain
- Fault, exposed and concealed
- Fault, fully concealed
- Surface drainage, arroyo
- Ground surface contour (40 ft interval)
- Bulk Fuels Facility, KAFB
- Golf Course Main Pond, KAFB
- SNL/NM Technical Area (TA) boundary
- Manzano Base boundary
- Kirtland Air Force Base (KAFB) boundary
- Road, paved and unpaved

NOTES:

1. Groundwater elevations for the Regional Aquifer and the Fractured Bedrock System are shown for monitoring wells located near SNL/NM facilities. The wells with no available groundwater elevation have no value plotted.
2. Monitoring wells with anomalous groundwater elevations in the Regional Aquifer or Fractured Bedrock System are shown with an NC (not contoured) label next to the value. Table 2 states the rationale.
3. Groundwater elevations are rounded to the nearest foot. Water levels were measured at SNL/NM wells between 29 September and 23 October 2017. Wells owned by other agencies that were measured outside this date range are noted by an asterisk next to the well number. Groundwater elevations and measurement dates are listed in Table 2.
4. Groundwater elevations were not used for production-potable wells.
5. Groundwater elevations for monitoring wells screened in the Perched Groundwater System are not plotted. A potentiometric surface figure for the Perched Groundwater System is presented in Chapter 6.
6. Potentiometric surface contours for the Regional Aquifer are primarily shown using two intervals: below 5000 ft amsl the contour intervals are 40 and 60 feet; above 5000 ft amsl the contour interval is 100 feet.
6. Most of the monitoring wells located near the KAFB Bulk Fuels Facility and at KAFB Site 58 are not plotted.
7. Decommissioned (plugged and abandoned) monitoring wells are not shown.
8. Principal faults are derived from GRAM and Lettis (1995), Karlstrom et al., (2000), and Van Hart (2003). The dashed faults located near wells KAFB-2007 and OBS-MW1 are inferred from groundwater elevations.
9. 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 the Paleozoic and Precambrian bedrock.
10. The West Sandia Fault does not affect the alluvial-fan sediments at the water table.

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Plate 1
Potentiometric Surface for the Regional Aquifer and the Fractured Bedrock System at Sandia National Laboratories/New Mexico and Kirtland Air Force Base for Calendar Year 2017

Transverse Mercator Projection
New Mexico State Plane Coordinate System, Central Zone
1983 North American Horizontal Datum
1988 North American Vertical Datum

5/15/2018 mb18021 SNL EGIS ORG.00643