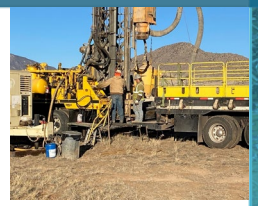
Sandia National Laboratories

U.S. Department of Energy/ National Nuclear Security Administration and Sandia National Laboratories



Semi Annual Public Meeting

Tuesday, October 29, 2024


U.S. DEPARTMENT OF ENERGY | NNSA National Nuclear Security Administration

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Semi Annual Public Meeting

- Environmental Restoration Activities at Sandia National Laboratories
- Stormwater Pollution Control and Monitoring Activities at Sandia National Laboratories.
- Information resources for environmental restoration activities at Sandia National Laboratories
  - New Mexico Environment Department Hazardous Waste Bureau https://www.env.nm.gov/hazardous-waste/sandia-national-laboratories/
  - Sandia National Laboratories https://www.sandia.gov/about/environment/index.html https://www.sandia.gov/about/environment/environmental_management_system/index.html

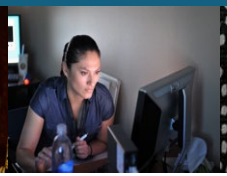
Questions?

Send email to envinfo@sandia.gov

Environmental Restoration Activities at Sandia National Laboratories

- Mission: Identify, characterize, and remediate sites where hazardous materials may have been released to the environment
- Sites in the Corrective Action Process
  - Burn Site Groundwater AOC
  - Tijeras Arroyo Groundwater AOC
  - Technical Area-V Groundwater AOC
- The New Mexico Environment Department Hazardous Waste Bureau regulates the activities through the 2004 *Compliance Order on Consent*
- Drinking water standards serve as groundwater cleanup goals for human health and environmental protection
  - No drinking water wells are located in or near the contaminated groundwater
  - The contamination boundaries in each AOC are defined

Burn Site Groundwater (BSG) Investigation



Michael Skelly
Environmental Restoration Operations

October 2024

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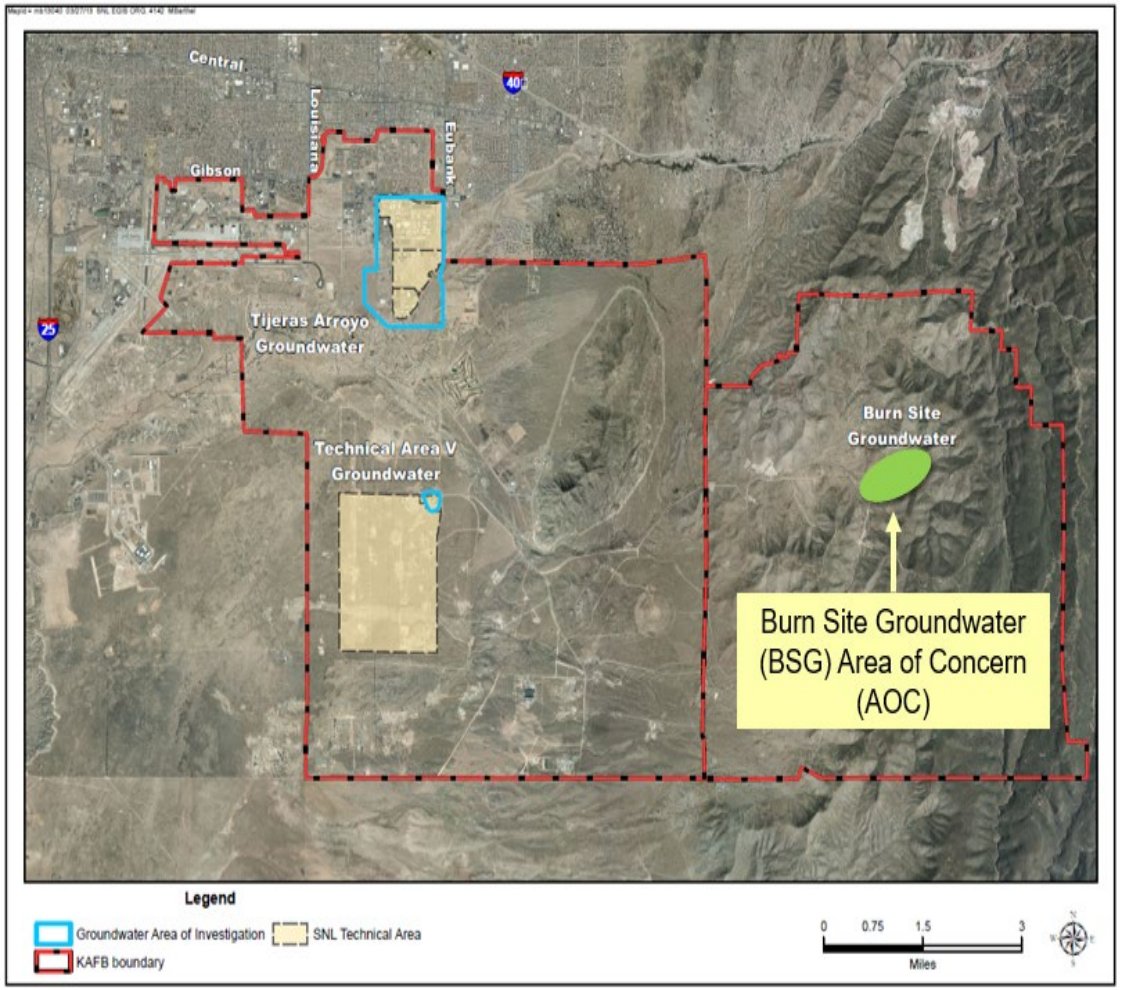
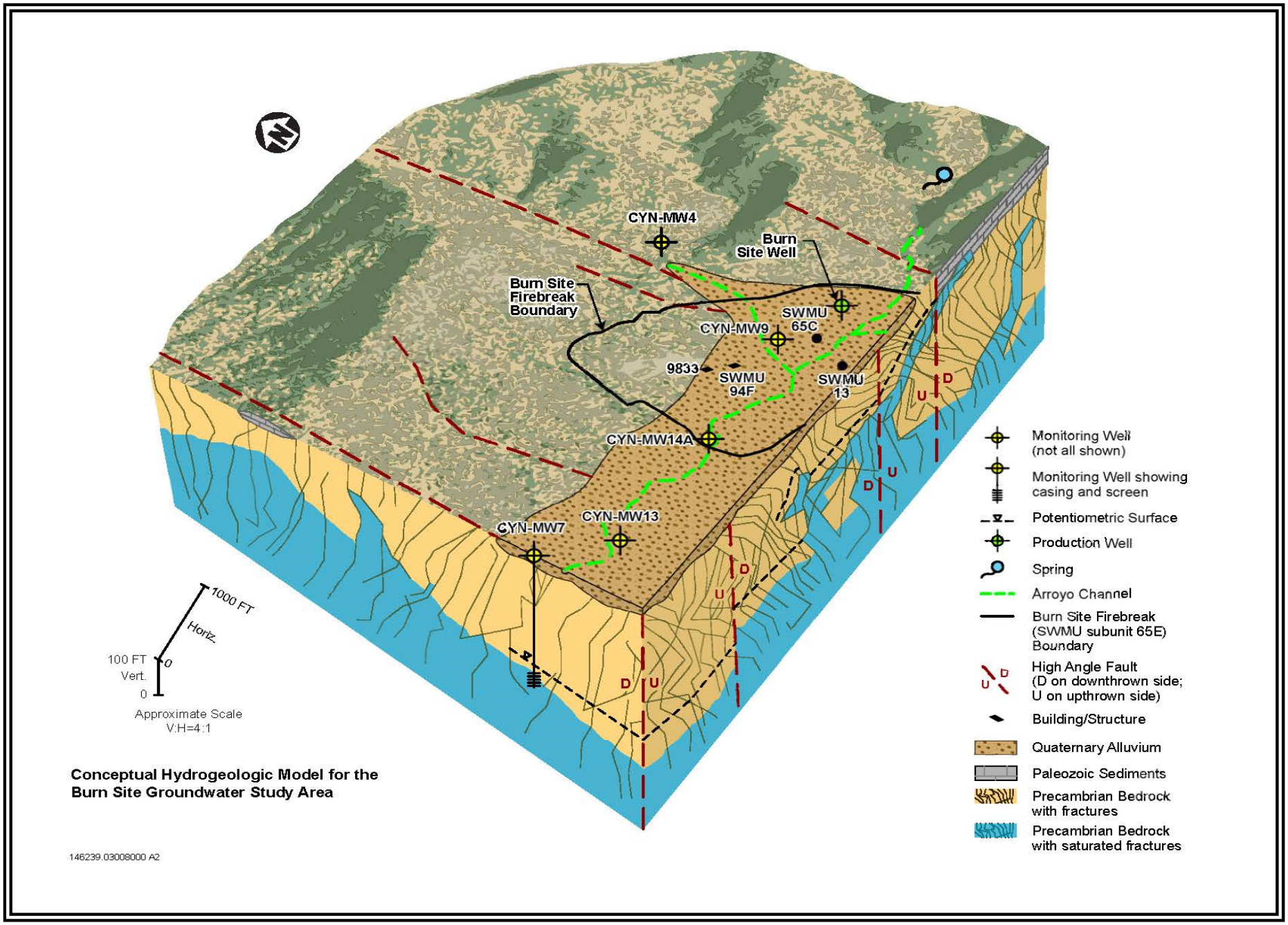
Site Description

- The BSG Area of Concern (AOC) is located in Lurance Canyon in a remote area of the Manzanita Mountains.
- Lurance Canyon is a west-flowing drainage deeply incised into Paleozoic and Precambrian bedrock in moderately to heavily wooded pinon-juniper forest.
- Sandia National Laboratories (SNL) activities at the Burn Site began in 1967. Early activities included explosives testing; current activity is fire survivability studies (i.e., burn testing).
- Only the groundwater at the Burn Site requires corrective action.
- The groundwater occurs in fractured Precambrian bedrock that is recharged by infiltrating precipitation; flow is controlled by changes in rock type and faults/fractures.



Conceptual Site Model for the BSG AOC



Conceptual Hydrogeologic Model for the Burn Site Groundwater Study Area

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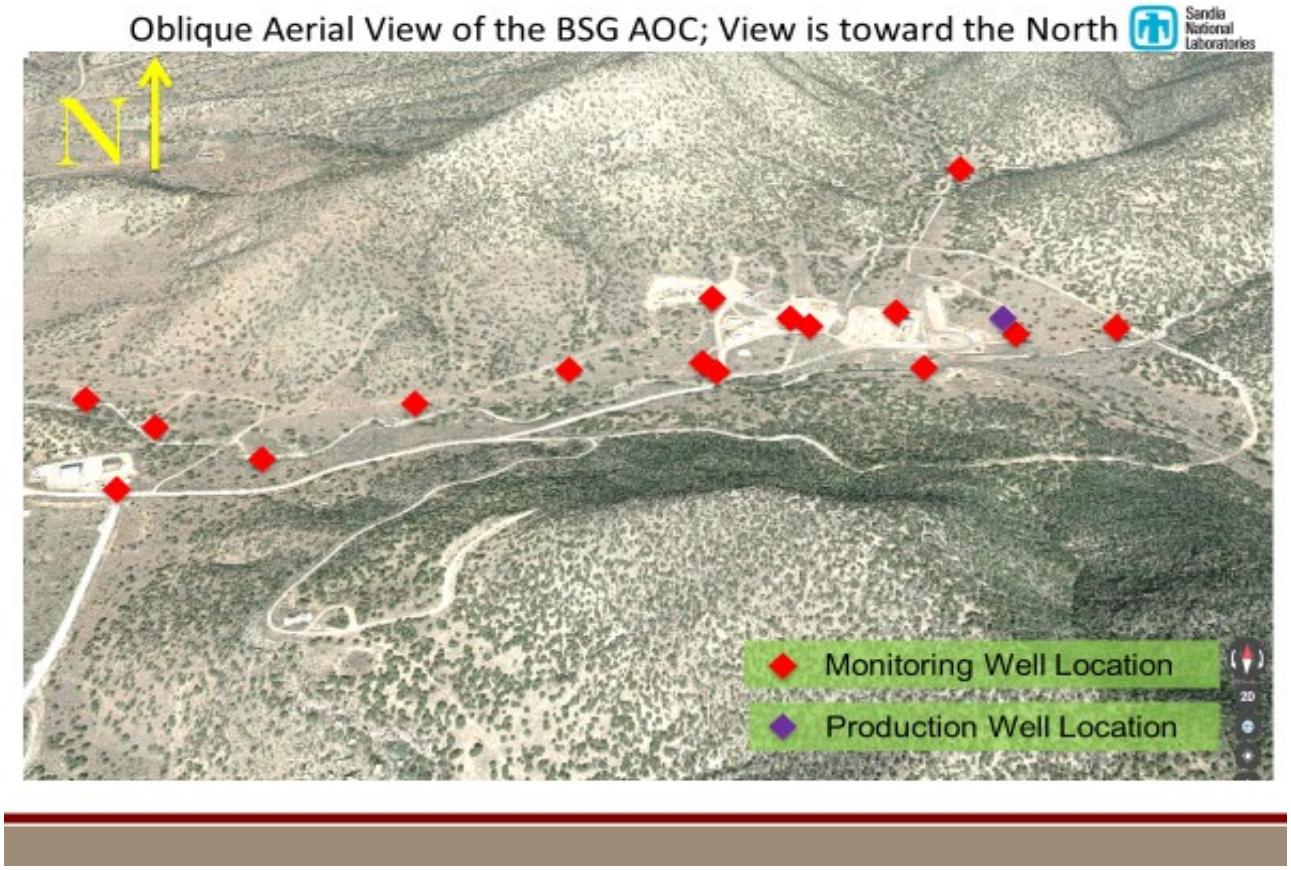
BSG AOC Groundwater Monitoring

- Groundwater monitoring began in 1996.
- Depth to groundwater ranges from 46 to 363 feet below ground surface, and the groundwater flows to the west.
- The monitoring well network consists of 16 active monitoring wells and 1 inactive production well (used for water elevation measurements), with the 4 newest wells installed in October/November 2019.

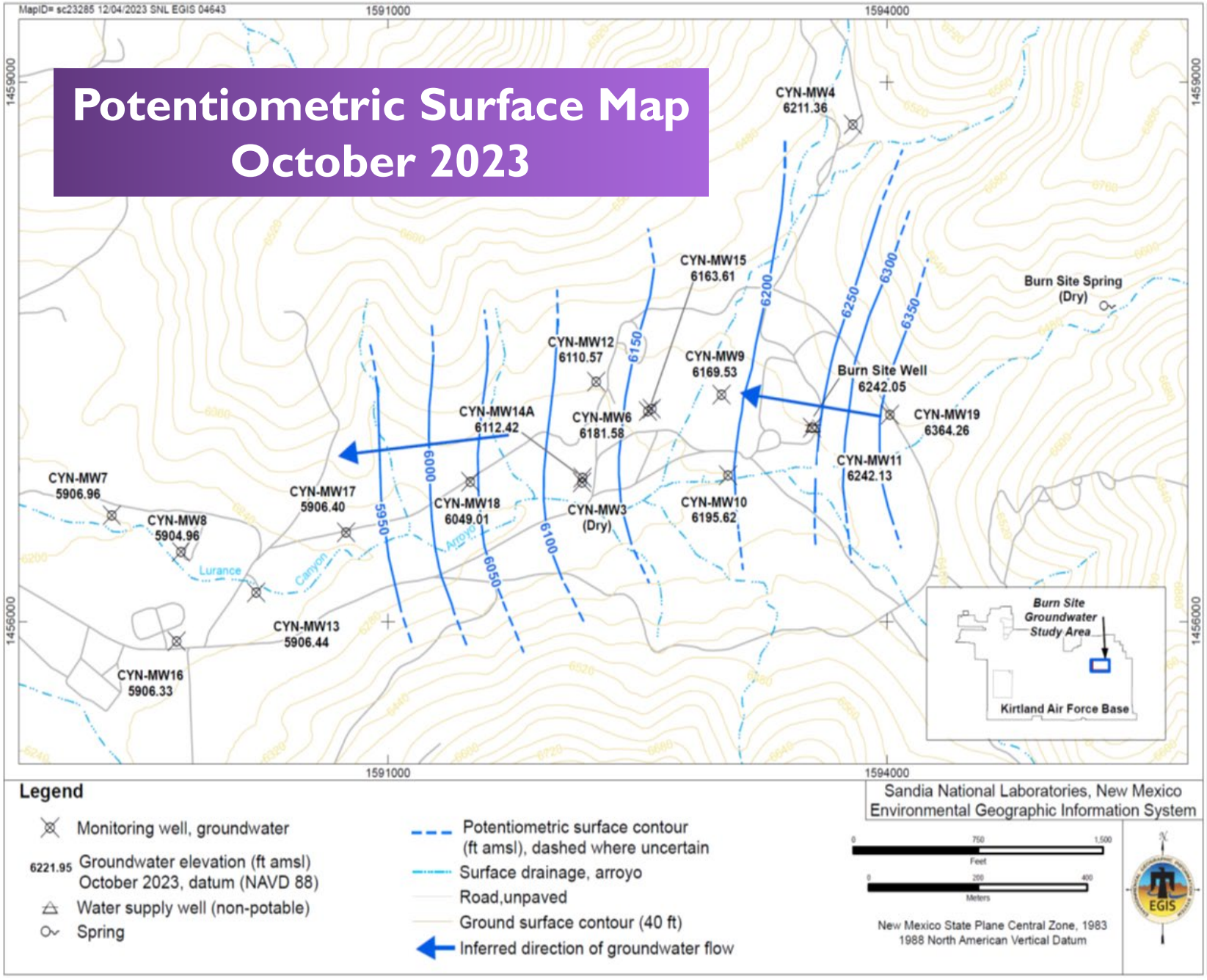


BSG AOC Groundwater Monitoring (concluded)

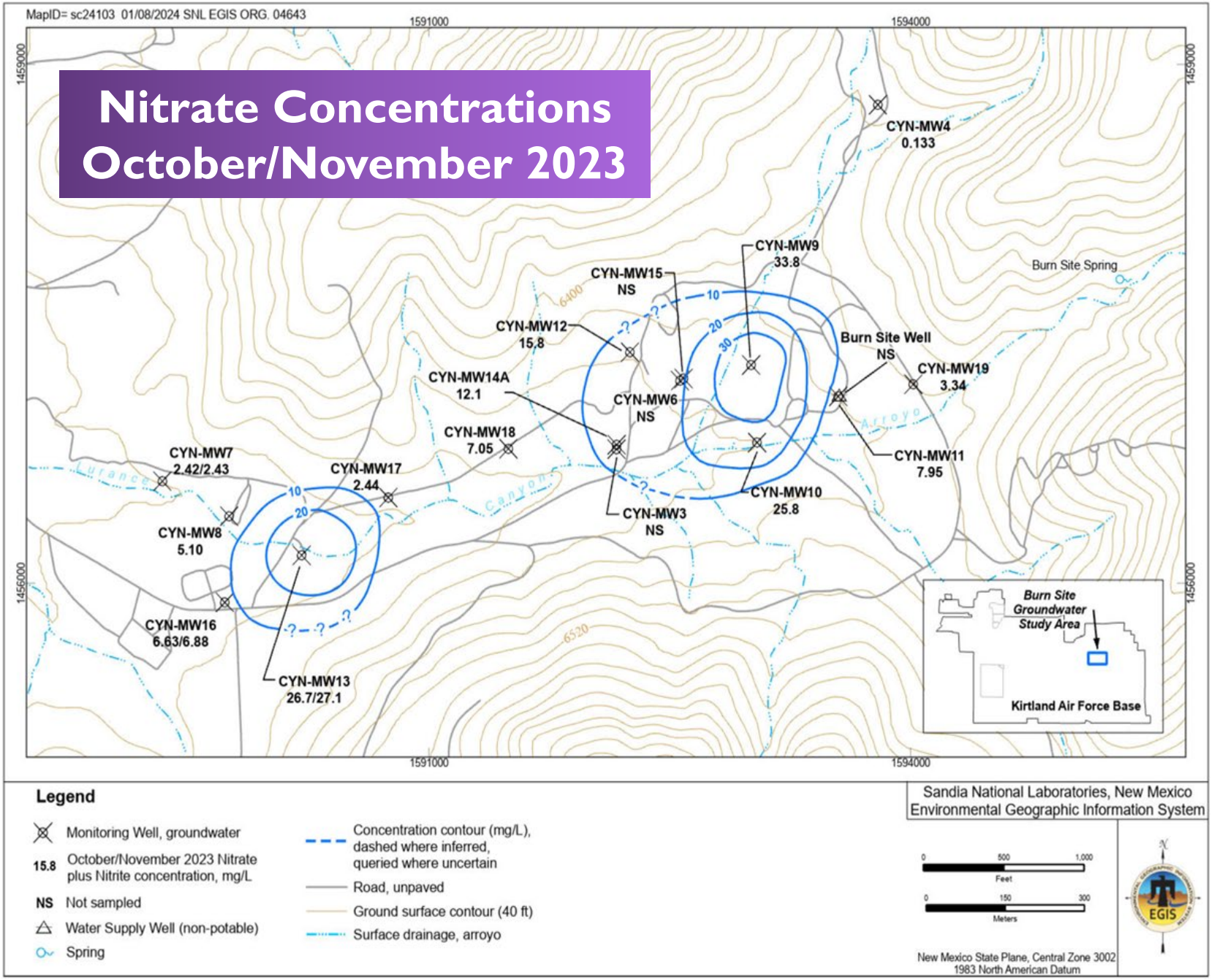
- The groundwater is contaminated with nitrate (the constituent of concern) at concentrations above the U.S. Environmental Protection Agency maximum contaminant level (MCL) for drinking water.
- Nitrate above the MCL has been detected in approximately half the monitoring wells.
- The two nitrate plumes combined cover approximately 41 acres.
- The nitrate is derived from both manmade and natural sources, including ammonium nitrate slurry, wastewater discharges, and degraded explosive compounds.
- The groundwater is not used for any beneficial purpose; no one is drinking contaminated groundwater.
- The nearest downgradient drinking water supply well (KAFB-4) is 8.4 miles to the west.
- No other constituents in the groundwater exceed the MCLs.

Constituent of Concern	Maximum Concentration in 2023	MCL
Nitrate	33.8 milligrams per liter (well CYN-MW9; October/November)	10 milligrams per liter

Potentiometric Surface Map October 2023



Nitrate Concentrations October/November 2023



Current Status and Recent Activities

- The BSG AOC is in the corrective action process.
- SNL personnel performed quarterly water level measurements and semiannual groundwater sampling and presented the results in the *Annual Groundwater Monitoring Report, Calendar Year 2023* submitted to the NMED HWB in July 2024.
- SNL submitted the *Burn Site Groundwater Area of Concern Current Conceptual Model and Corrective Measures Evaluation Report* to the NMED HWB in January 2023. The NMED HWB approved the Long-Term Monitoring strategy and the report in May 2024.
- SNL will submit the *Burn Site Groundwater Corrective Measures Implementation Plan* to the NMED HWB in December 2024.

Tijeras Arroyo Groundwater (TAG) Investigation

John R. Copland
TAG Task Leader
Environmental Restoration Operations

October 2024

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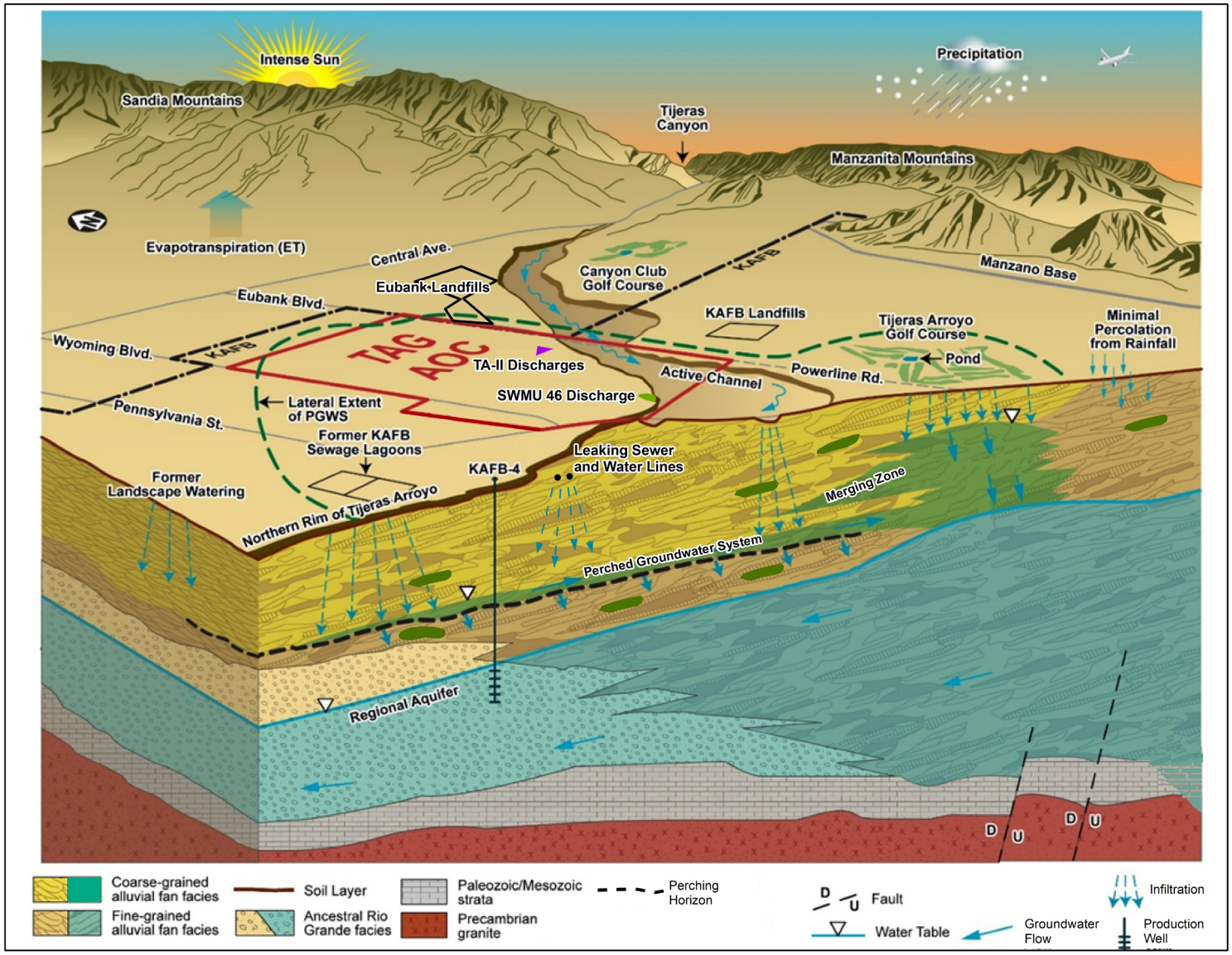
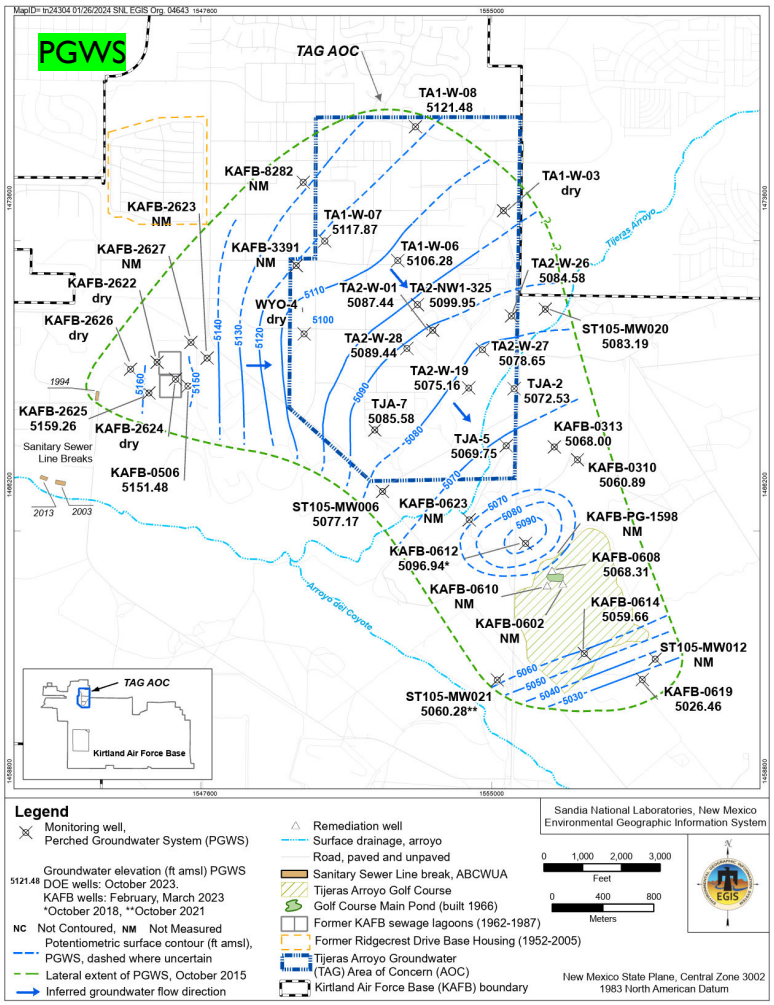
Site Description

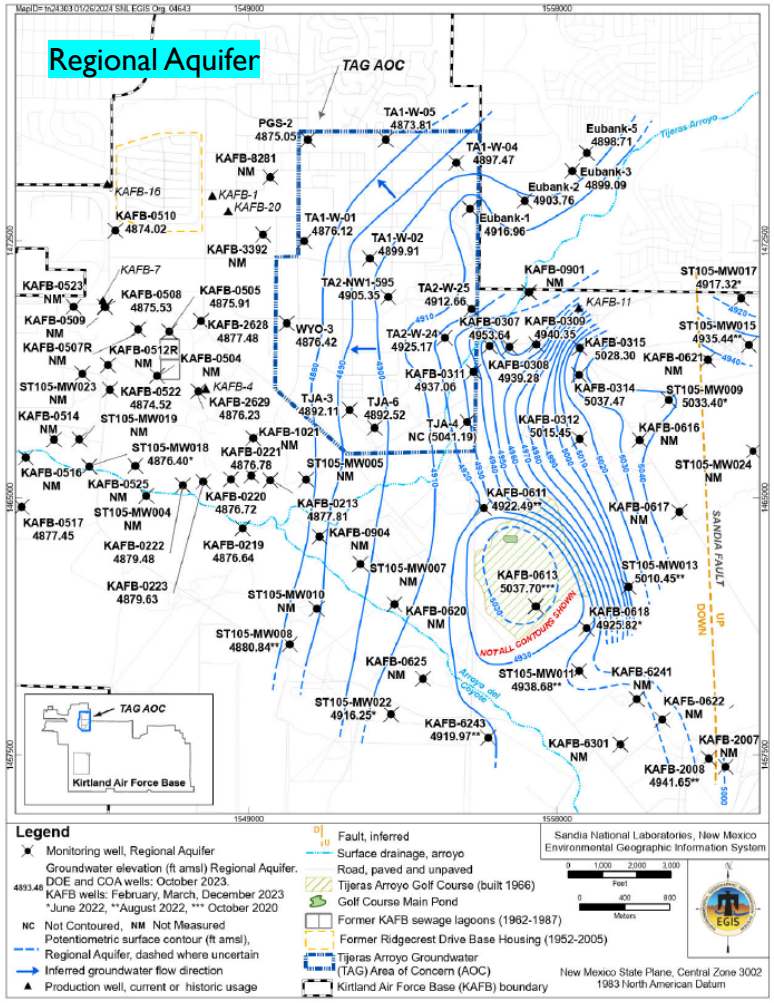
- The TAG Area of Concern (AOC) covers approximately 1.82 square miles in the north-central part of Kirtland Air Force Base (KAFB) and spans Technical Areas (TAs) I, II, and IV at Sandia National Laboratories (SNL).
- The Santa Fe Group underlying the TAG AOC contains two water-bearing zones: the Perched Groundwater System (PGWS) and the Regional Aquifer. The PGWS water table is approximately 280 to 330 feet below ground surface. The Regional Aquifer water table is approximately 440 to 560 feet below ground surface. The PGWS and the Regional Aquifer are vertically separated by a Perching Horizon and approximately 200 feet of unsaturated sediments. A localized Merging Zone is present under the TAG AOC's southeast corner and hydraulically connects the PGWS and the Regional Aquifer.
- Solid Waste Management Unit (SWMU) 46 and TA-II Discharges, two SNL sites located in the TAG AOC, released significant volumes of wastewater and septic water before 1992. SWMU 46 released approximately 1.3 billion gallons from 1948 to 1974. TA-II Discharges released approximately 100 million gallons from 1948 to 1992.
- Only the groundwater in the PGWS requires corrective action.

Conceptual Site Model for the TAG AOC and Vicinity



Potentiometric Surface Maps, PGWS and Regional Aquifer, October 2023

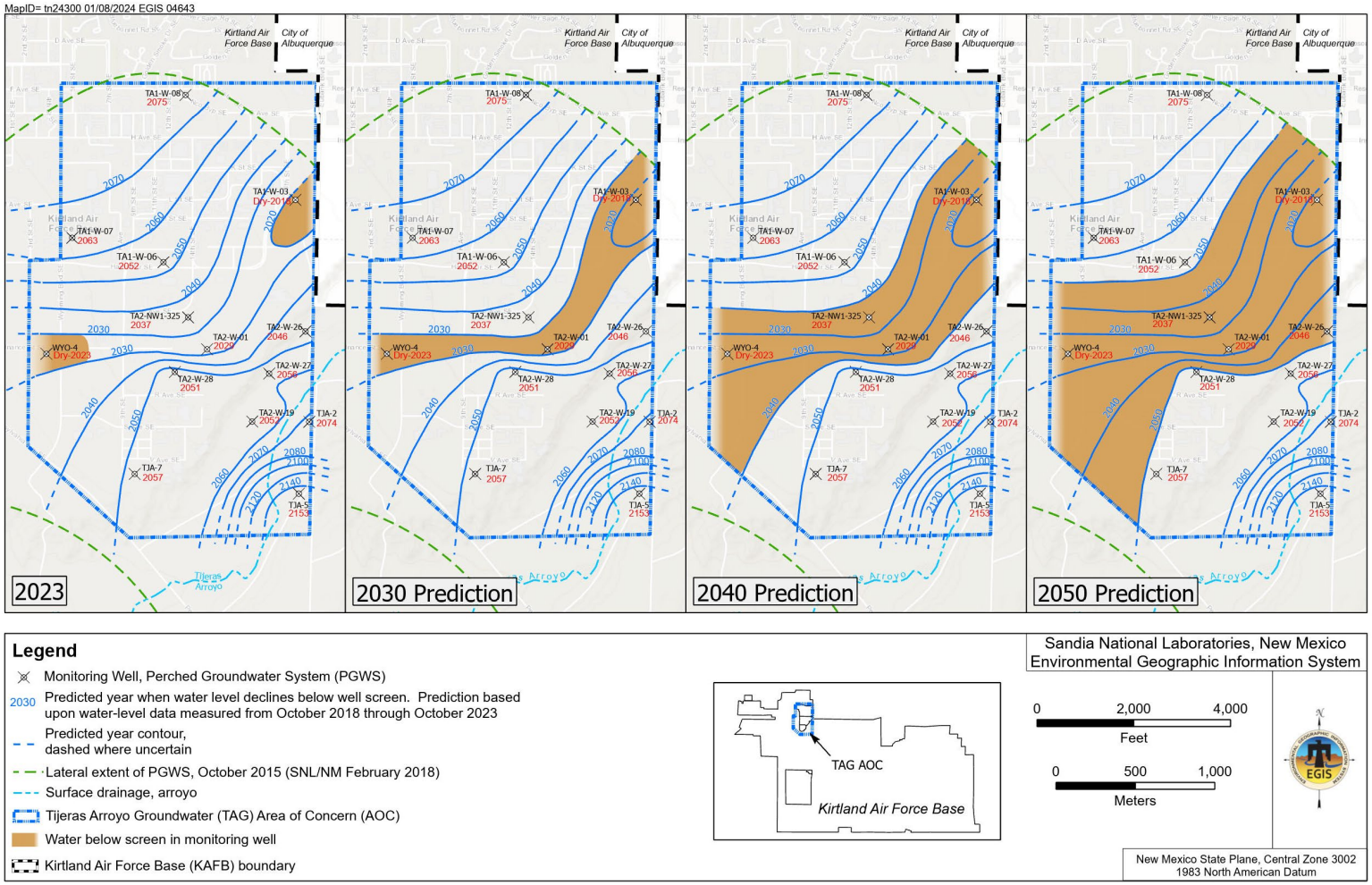




TAG AOC Groundwater Monitoring

- Groundwater monitoring began in 1992, with 31 monitoring wells installed in the TAG AOC to date.
- SNL personnel currently sample 18 of the 31 monitoring wells for nitrate. The remaining monitoring wells do not require sampling or have been decommissioned.
- Monitoring wells in the surrounding area include 84 KAFB wells and 4 City of Albuquerque wells. Data sharing enhances our understanding of the hydrogeologic setting.
- The monitoring wells in the PGWS yield small volumes of groundwater, typically less than 1 gallon per minute. The groundwater in the PGWS is not used for any beneficial purpose at SNL.
- Production wells operated by KAFB, Veterans Affairs, and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) are screened in the Regional Aquifer.
- The nearest KAFB production well is KAFB-20; it is located approximately 1 mile west of the elevated nitrate concentrations in the PGWS.
- The nearest ABCWUA production well is Ridgecrest 1; it is located approximately 2 miles north of the elevated nitrate concentrations in the PGWS.

PGWS Lateral Extent in 2023 and Predicted Dewatering



TAG AOC Groundwater Monitoring Results for 2023

Constituent of Concern	Maximum Concentration in PGWS, August-September 2023	Maximum Concentration in Merging Zone, August-September 2023	Maximum Concentration in Regional Aquifer, August-September 2023	U.S. Environmental Protection Agency Maximum Contaminant Level (MCL)
Nitrate	20.7 milligrams per liter	30.3 milligrams per liter	4.05 milligrams per liter	10 milligrams per liter

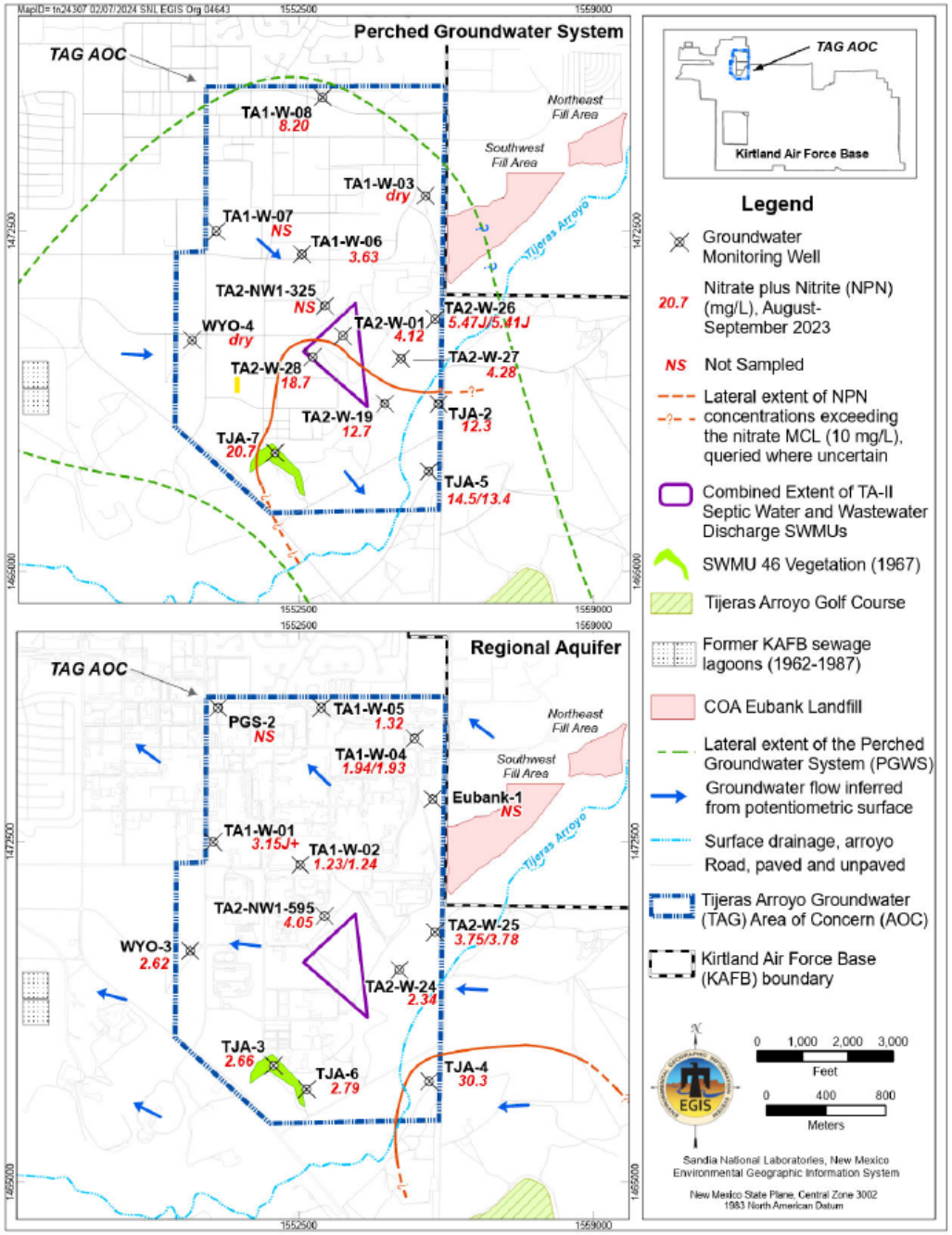
- The elevated nitrate concentrations in the PGWS do not pose a threat to the Regional Aquifer. SNL operations have not contaminated the Regional Aquifer. Computer modeling and ongoing groundwater sampling continue to demonstrate that the Regional Aquifer will not be impacted.
- Over much of the TAG AOC, monitoring wells in the PGWS are predicted to go dry by 2050 because the manmade recharge sources, such as the septic water leach fields and wastewater outfalls, have been eliminated. Landscape watering at KAFB has also been reduced.

Nitrate Results

The upper panel shows the August - September 2023 nitrate concentrations for the PGWS and the SNL nitrate release sites. The lower panel shows the August – September 2023 nitrate concentrations for the Regional Aquifer.

For the PGWS, five monitoring wells in the TAG AOC's southeast corner consistently exceed the nitrate MCL.

For the Regional Aquifer, one monitoring well in the TAG AOC's far southeast corner consistently exceeds the nitrate MCL. However, the groundwater sampled at that well (TJA-4) is likely from an upgradient source and/or has natural origins.



Current Status and Recent Activities

- In March 2024, the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) approved the *Tijeras Arroyo Groundwater Corrective Measures Implementation Plan (Revised)*. The approved final remedy for the TAG AOC is Monitored Natural Attenuation for the elevated nitrate concentrations in the PGWS.
- In accordance with the plan, SNL personnel will sample 11 monitoring wells in the PGWS semiannually and 8 monitoring wells in the Regional Aquifer annually and will present the analytical results in annual groundwater monitoring reports submitted to the NMED HWB each summer.
- SNL will submit performance monitoring reports to the NMED HWB every five years. The reports will evaluate the remedy's progress and discuss topics such as nitrate analytical results for the PGWS and the Regional Aquifer, water-level trends, dewatering of the PGWS, well inspections, well maintenance, and land use controls.

Technical Area-V Groundwater (TAVG) Investigation

Jun Li
Environmental Restoration Operations

October 2024

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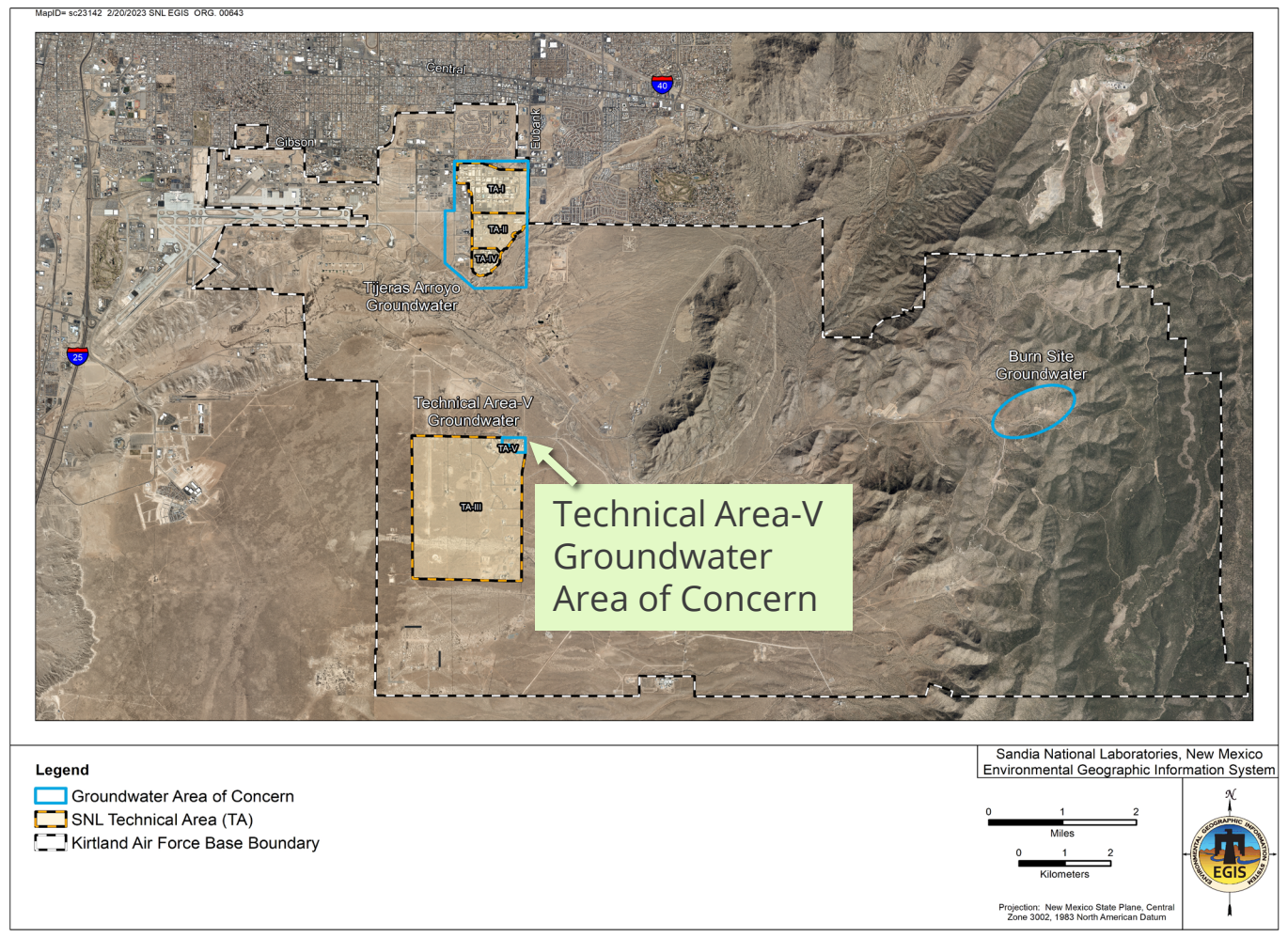
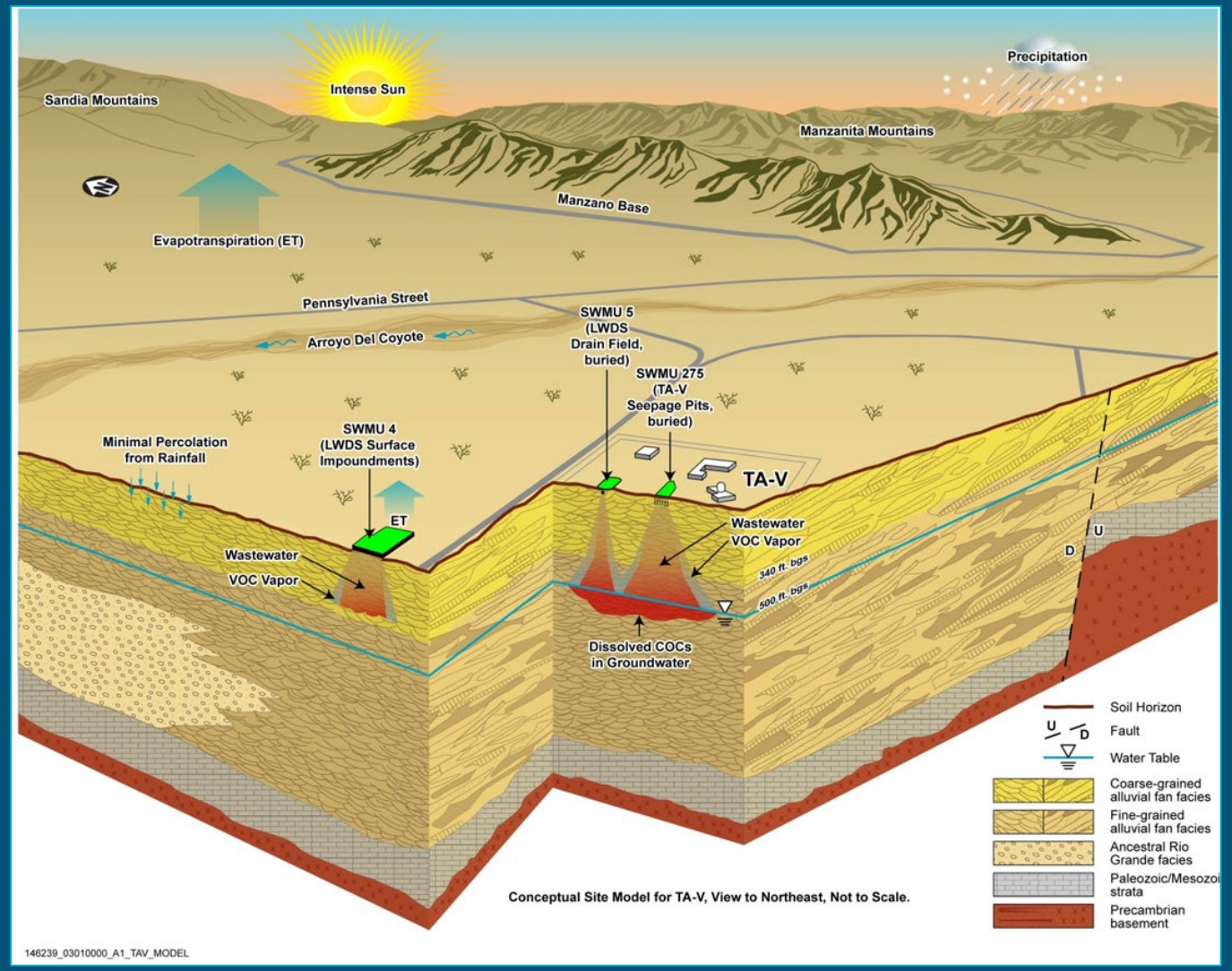
Site Description



- Technical Area-V (TA-V) covers approximately **35 acres**.
- Sandia National Laboratories (SNL) activities in TA-V **began in 1961**.
- Corrective action for all the surface and shallow subsurface contamination in TA-V is complete.
- Only the groundwater in TA-V, designated as the **TAVG Area of Concern (AOC)**, requires corrective action.

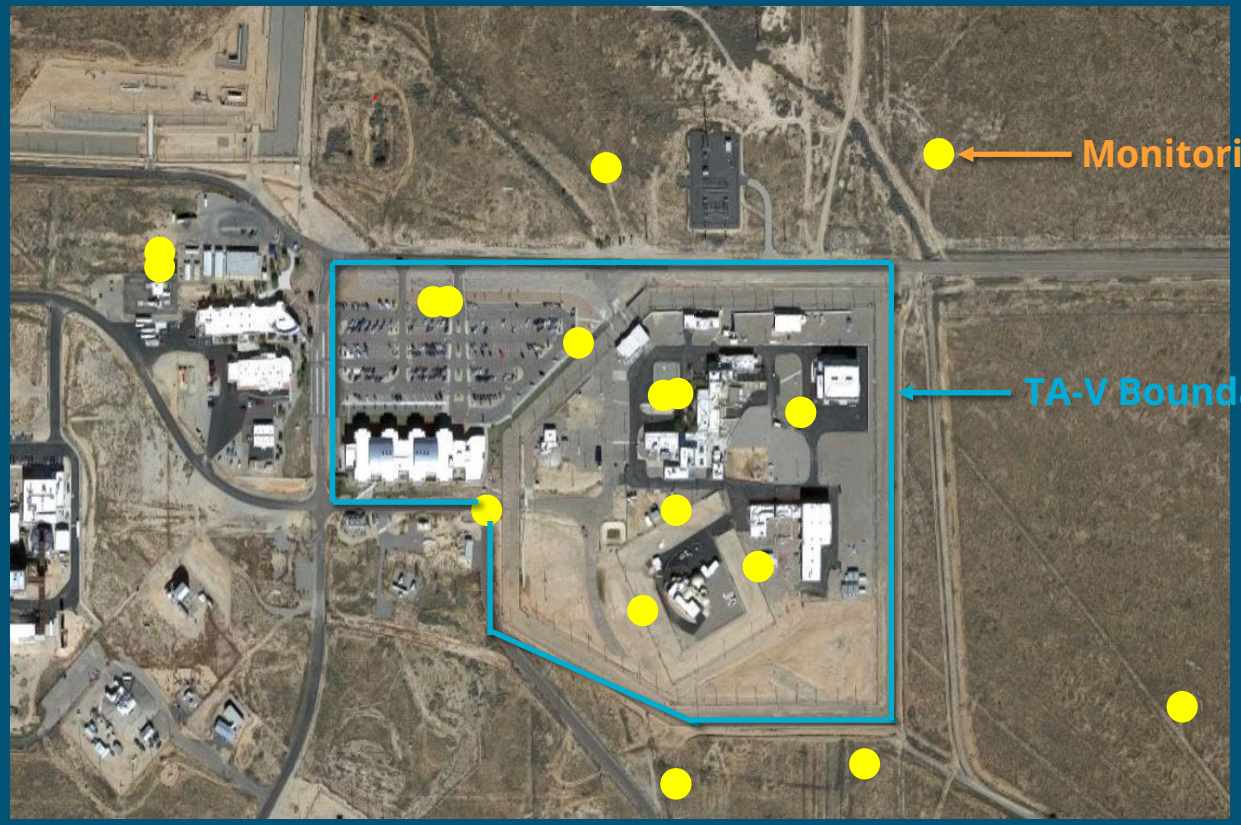
Conceptual Site Model for the TAVG AOC



- The groundwater in TA-V occurs in the **Regional Aquifer** in fine-grained, clay-rich alluvial-fan sediments.
- The water table in TA-V is approximately **500 – 550 feet below ground surface**.
- The groundwater in the Regional Aquifer flows to the west, then turns northeast toward production wells.
- The nearest drinking water supply well (KAFB-4) is 2.8 miles northwest of TA-V.

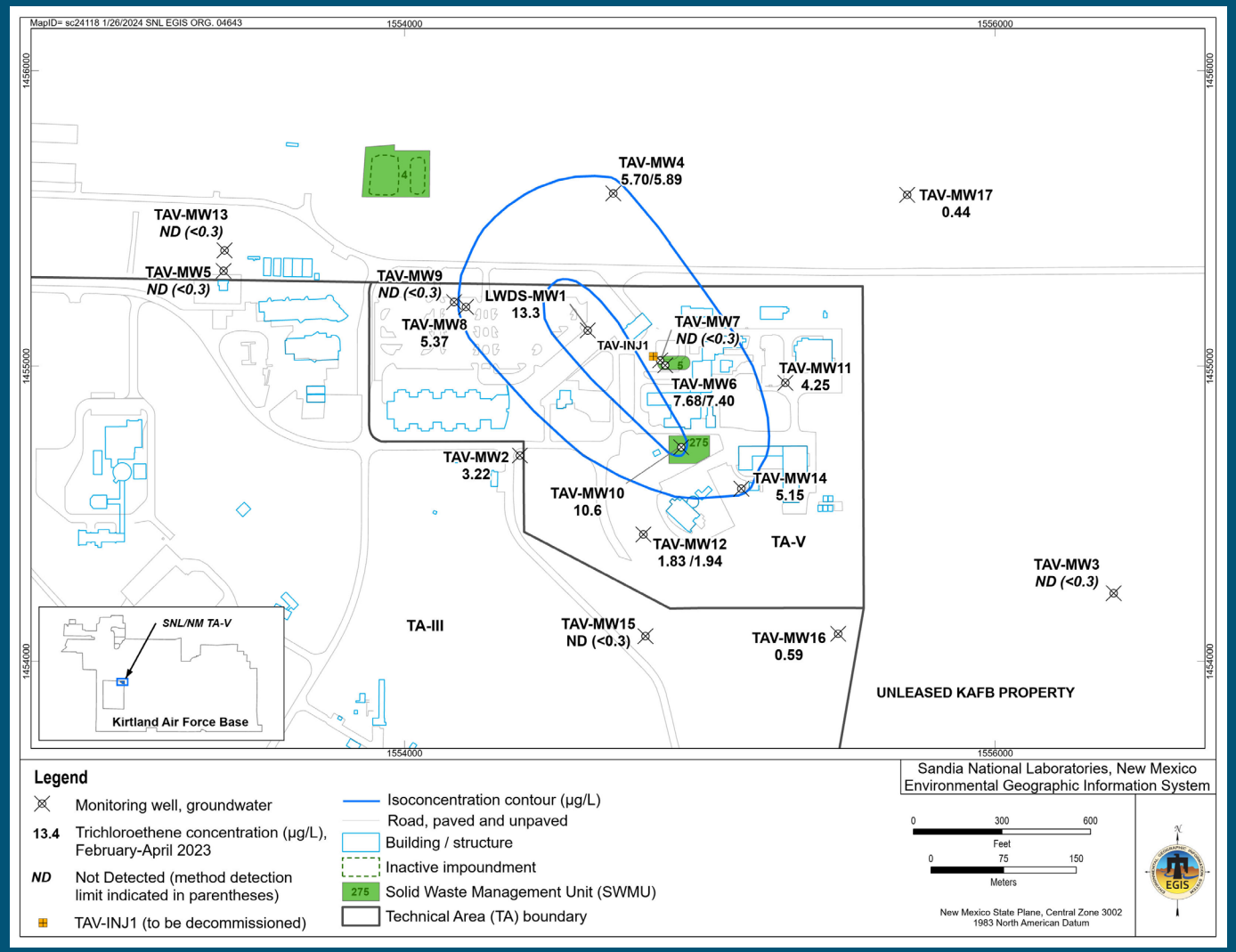
  - KAFB = Kirtland Air Force Base

TAVG AOC Groundwater Monitoring



- Groundwater monitoring **began in 1992**, with 21 monitoring wells installed to date.
- The current monitoring well network consists of **17 active wells**.
- Groundwater levels are measured quarterly.
- 11 monitoring wells are sampled semiannually and 6 monitoring wells are sampled annually.

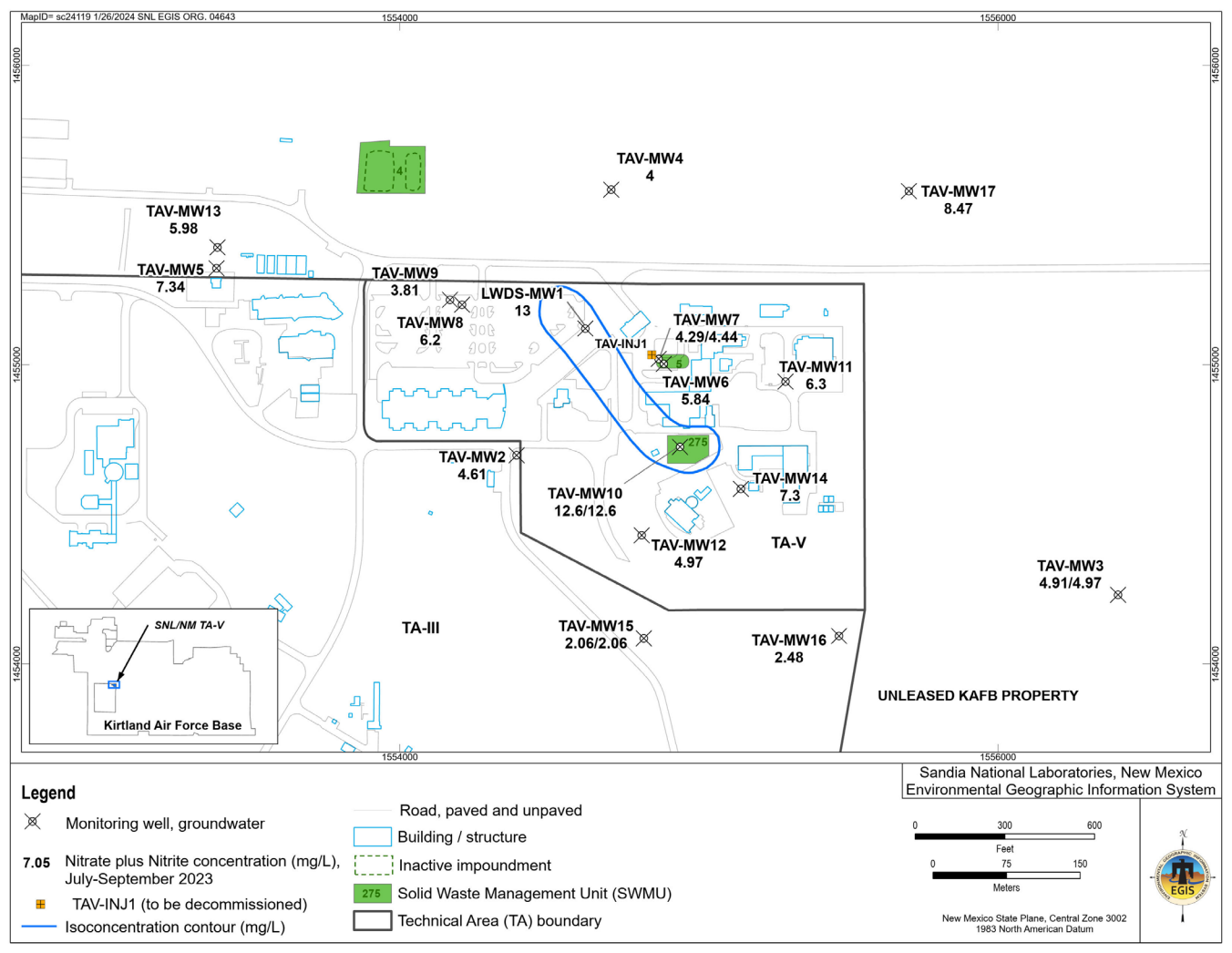
TAVG AOC Groundwater Monitoring (continued)



- The groundwater contaminant **trichloroethene (TCE)** is derived from industrial wastewater discharged from the 1960s to 1992.
- In 2023, the TCE plume covered approximately 17 acres.
- In 2023, the maximum TCE concentration was 13.3 µg/L (EPA MCL is 5 µg/L).
- The TCE plume is **not migrating off site** and is not adversely impacting human health or the environment.

  - EPA = U.S. Environmental Protection Agency
  - MCL = maximum contaminant level
  - µg/L = micrograms per liter

TAVG AOC Groundwater Monitoring (concluded)



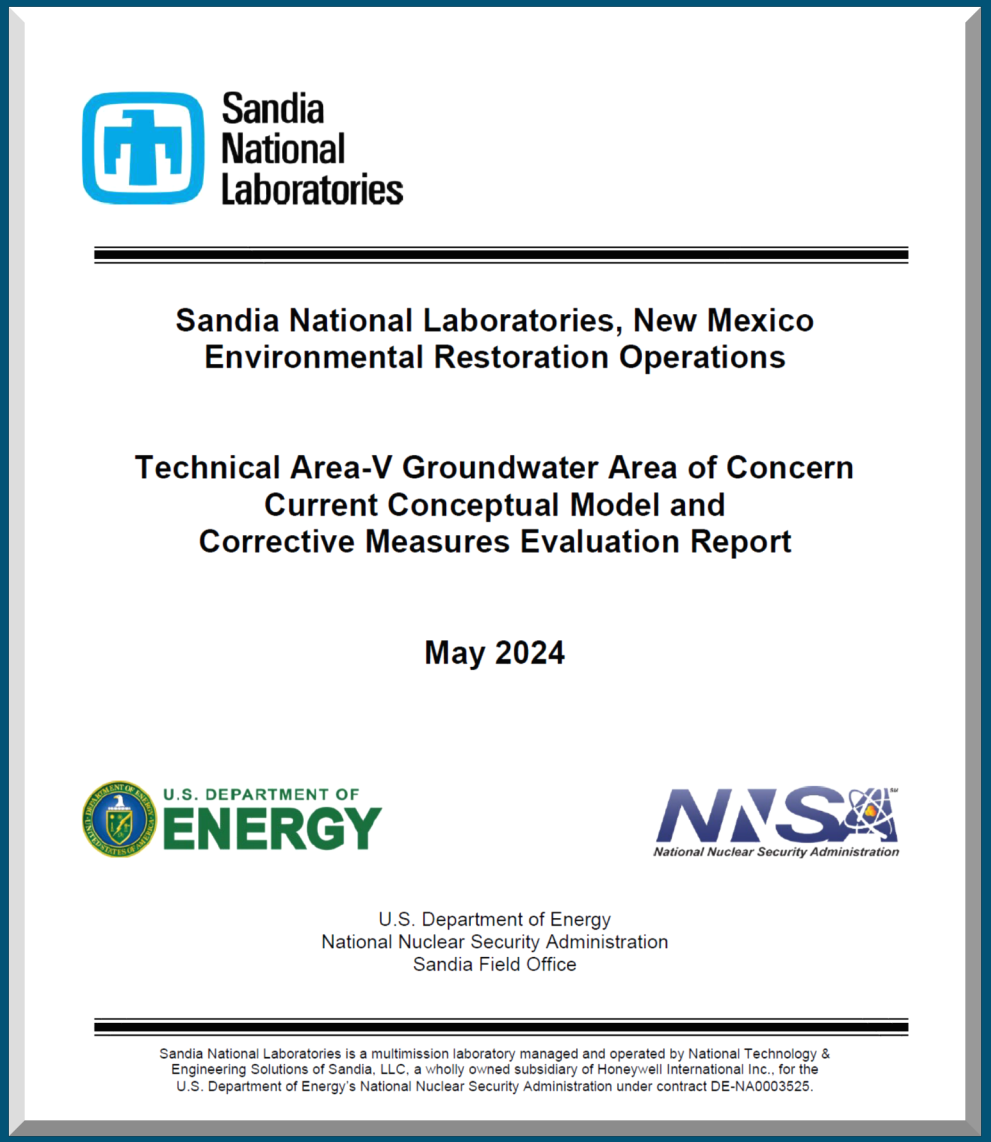
- The groundwater contaminant **nitrate** is derived from septic wastewater discharged from the 1960s to 1992.
  - Nitrate could also be naturally occurring.
- In 2023, the nitrate plume covered approximately 2.7 acres.
- In 2023, the maximum nitrate concentration was 13 mg/L (EPA MCL is 10 mg/L).
- The nitrate plume is **not migrating off site** and is not adversely impacting human health or the environment.
  - mg/L = milligrams per liter

Current Status and Recent Activities

- The TAVG AOC is in the **Corrective Action Process**.

- CCM = current conceptual model
- CME = corrective measures evaluation
- ISB = in-situ bioremediation

Current Status and Recent Activities (continued)



Sandia National Laboratories

Sandia National Laboratories, New Mexico
Environmental Restoration Operations

Technical Area-V Groundwater Area of Concern
Current Conceptual Model and
Corrective Measures Evaluation Report

May 2024

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

U.S. Department of Energy
National Nuclear Security Administration
Sandia Field Office

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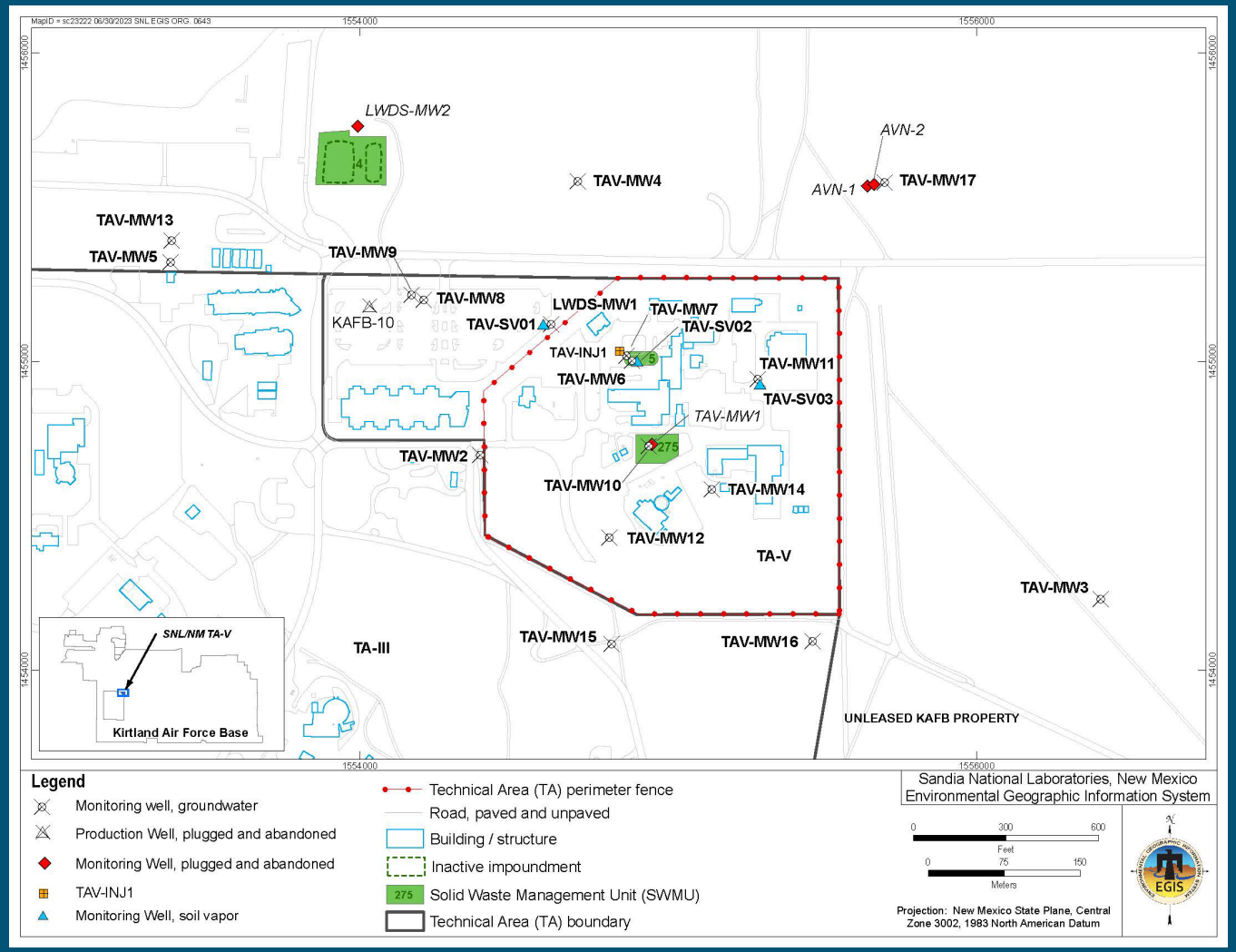
- SNL submitted the **TAVG AOC CCM CME Report** to the NMED HWB in May 2024.
- **NMED will**
  - Select a final remedy for the TAVG AOC,
  - Issue a Statement of Basis for selection of the remedy, and
  - Receive public comment on the remedy.

- NMED = New Mexico Environment Department
- HWB = Hazardous Waste Bureau

Current Status and Recent Activities (continued)



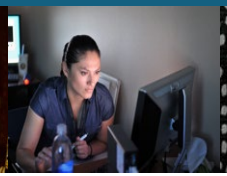
- SNL personnel sampled all 17 active monitoring wells in July and August 2024.
- Sampled for **nitrate, TCE, and waste characterization parameters**.

Current Status and Recent Activities (concluded)

- Injection Well TAV-INJ1
  - The **NMOSE requirement** is that the well "shall be plugged upon completion of permitted use."
  - The NMED HWB approved the decommissioning work plan in March 2023.
  - SNL submitted the Well Plugging Plan of Operations (WD-08) to the NMOSE in June 2024.

    - NMOSE = New Mexico Office of the State Engineer

Middle Rio Grande (MRG) Municipal Separate Storm Sewer System (MS4) Permit



Stormwater Quality Program
Environmental Compliance and Monitoring
October 29, 2024

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SAND2024-12996PE

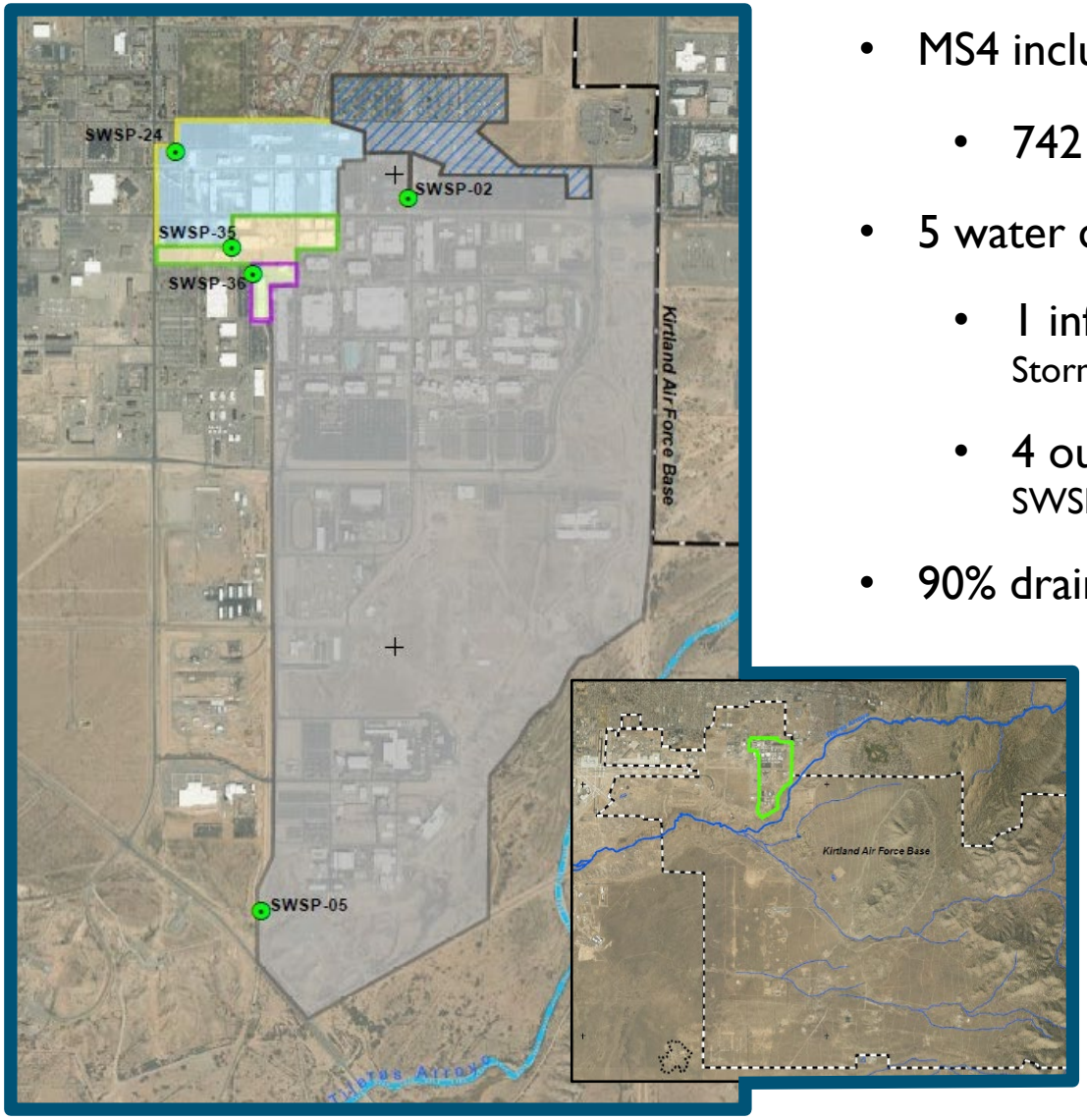
MS4 Permit Overview

- Issued by the Environmental Protection Agency (EPA) in 2014
- National Pollutant Discharge Elimination System (NPDES) permit
- Applies to all centralized storm drainage systems within the Albuquerque Urbanized Area, for example:
  - City of Albuquerque
  - Bernalillo County
  - Albuquerque Metropolitan Area Flood Control Authority (AMAFCA)
  - Kirtland Air Force Base
  - Sandia National Labs
- Permit requires a Stormwater Management Program (SWMP) consisting of 7 control measure programs, water quality monitoring, and annual reporting
- All SNL submittals to EPA available to the public: **http://digitalrepository.unm.edu/snl_ms4/**

Waters of the United States

- Sacket vs. EPA; Supreme Court ruling September 2023
- Effectively changed the definition of WOTUS
- Most intermittent and ephemeral tributaries in NM, including Tijeras Arroyo no longer meet the definition of WOTUS
- This means Sandia may no longer required to obtain NPDES permits
- Sandia has decided that we will maintain existing NPDES permit coverage until the State of NM Permitting program is established
  - NMED is concerned about losing permit coverage and we want to maintain our relationship with state regulators
  - Sandia sees the NPDES permits as a good way of being transparent with the community

SNL/NM MS4 Location and Water Quality Monitoring Stations

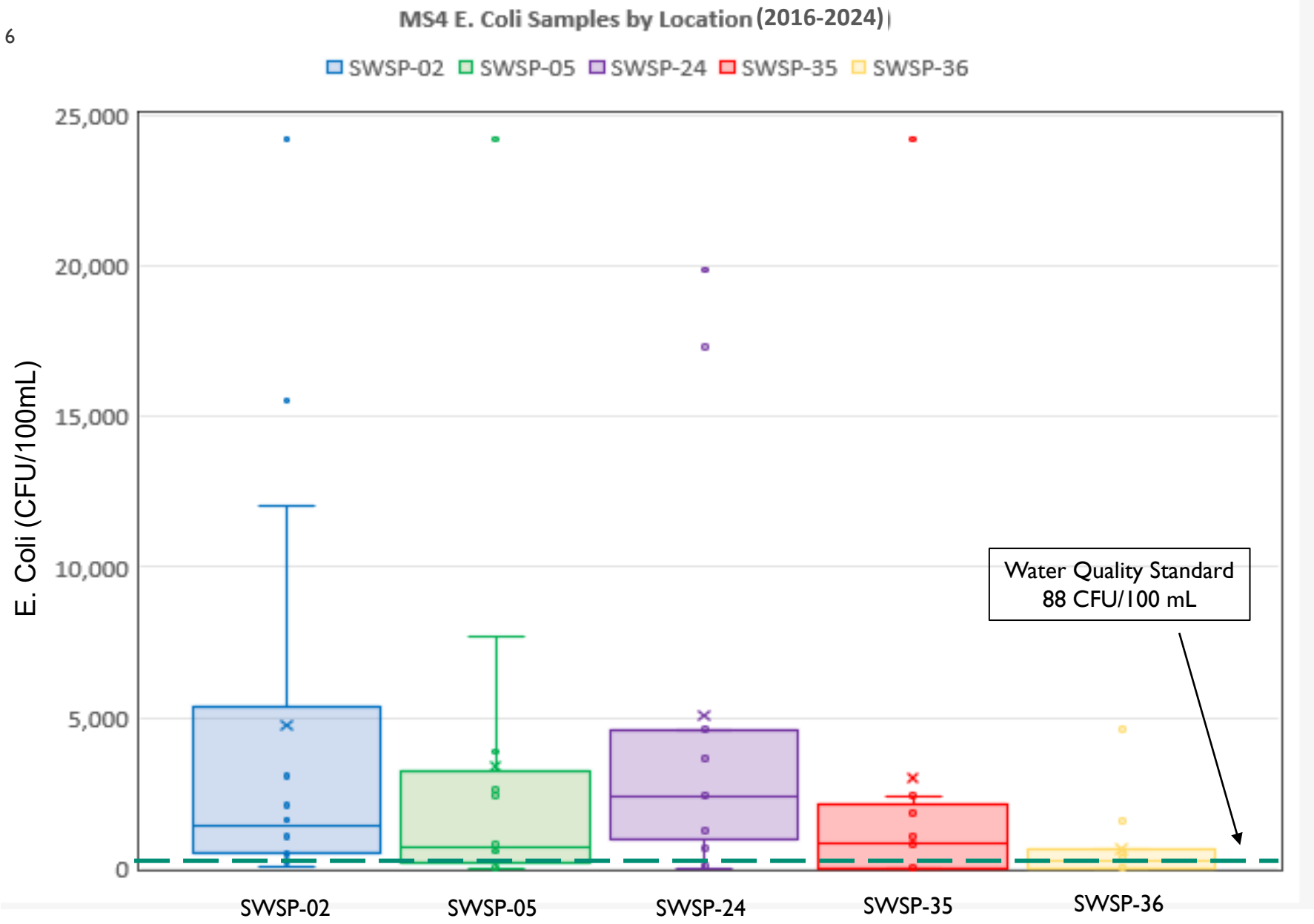


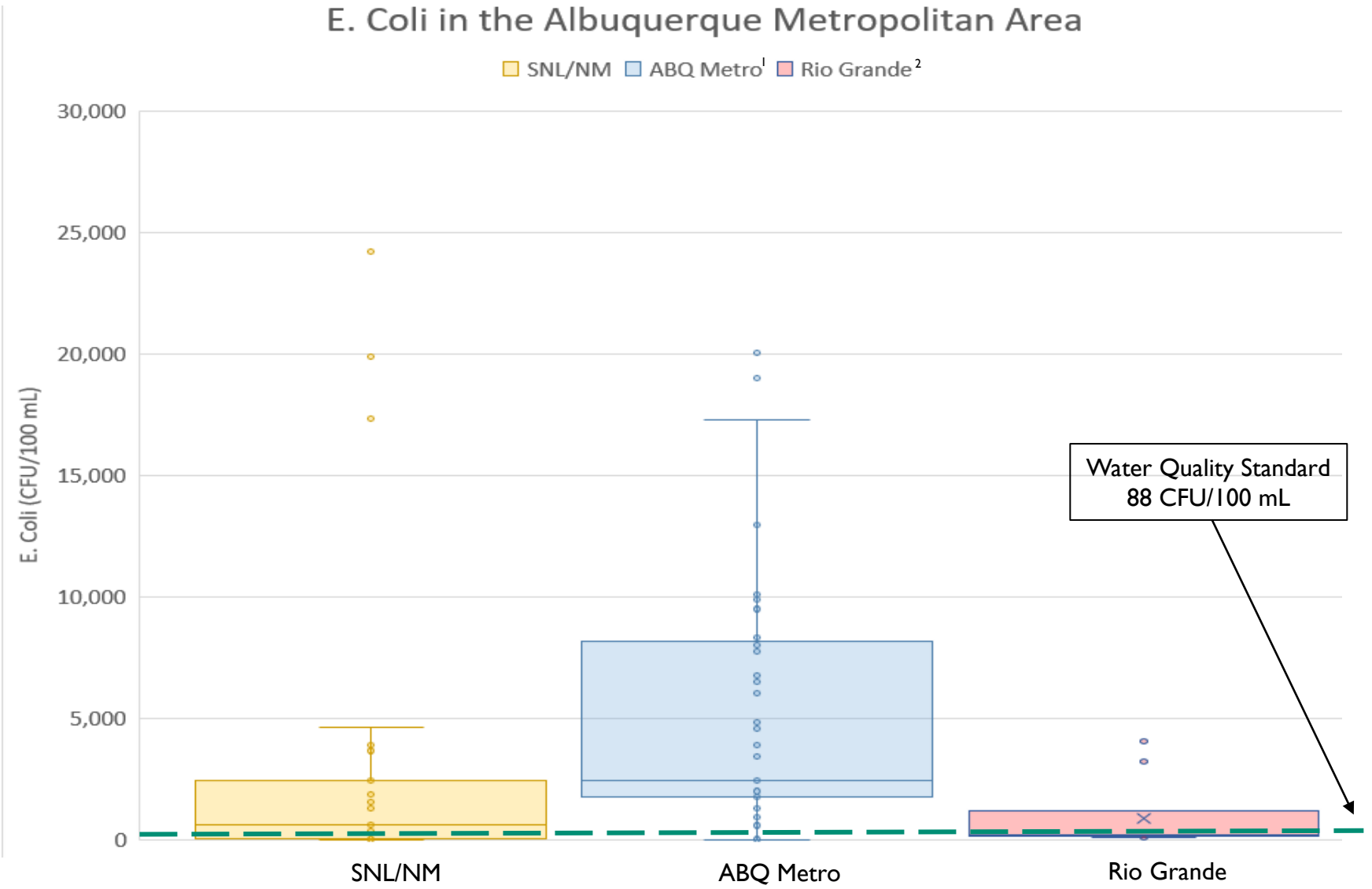
- MS4 includes all of TA-I, TA-II, and TA-IV
  - 742 acres (1.2 square miles)
- 5 water quality monitoring locations:
  - 1 inflow location
    Stormwater Sampling Point (SWSP)-02
  - 4 outflow locations
    SWSP-05, SWSP-24, SWSP-35, SWSP-36
- 90% drains south to Tijeras Arroyo
- 10% drains west to KAFB

MS4 Stormwater Quality Monitoring to Date (2016-2024)

Constituent	# Samples	# Exceedances
pH	71	4
Temperature	71	0
Dissolved Oxygen	71	5
Specific Conductance	71	0
Gross Alpha	66	5
Biological Oxygen Demand	61	--
Chemical Oxygen Demand	63	--
Phosphorous (dissolved)	64	0
Phosphorous (total)	64	0
Oil and Grease	58	0
Total Kjeldahl Nitrogen	64	0
Nitrate plus Nitrite	59	0
Total Dissolved Solids	61	0
Total Suspended Solids	64	--
E. coli	73	51
PCBs	65	65

-- No Water Quality Standard established for this constituent.


MS4 E. Coli Samples by Location (2016-2024)
SWSP-02
SWSP-05
SWSP-24
SWSP-35
SWSP-36
E. Coli (CFU/100mL)
25,000
20,000
15,000
10,000
5,000
0
Water Quality Standard
88 CFU/100 mL
SWSP-02
SWSP-05
SWSP-24
SWSP-35
SWSP-36



1 U.S. Geological Survey, Scientific Investigations Report 2015-5006. Summary of Urban Stormwater Quality in Albuquerque, NM 2003-2012. 2015.

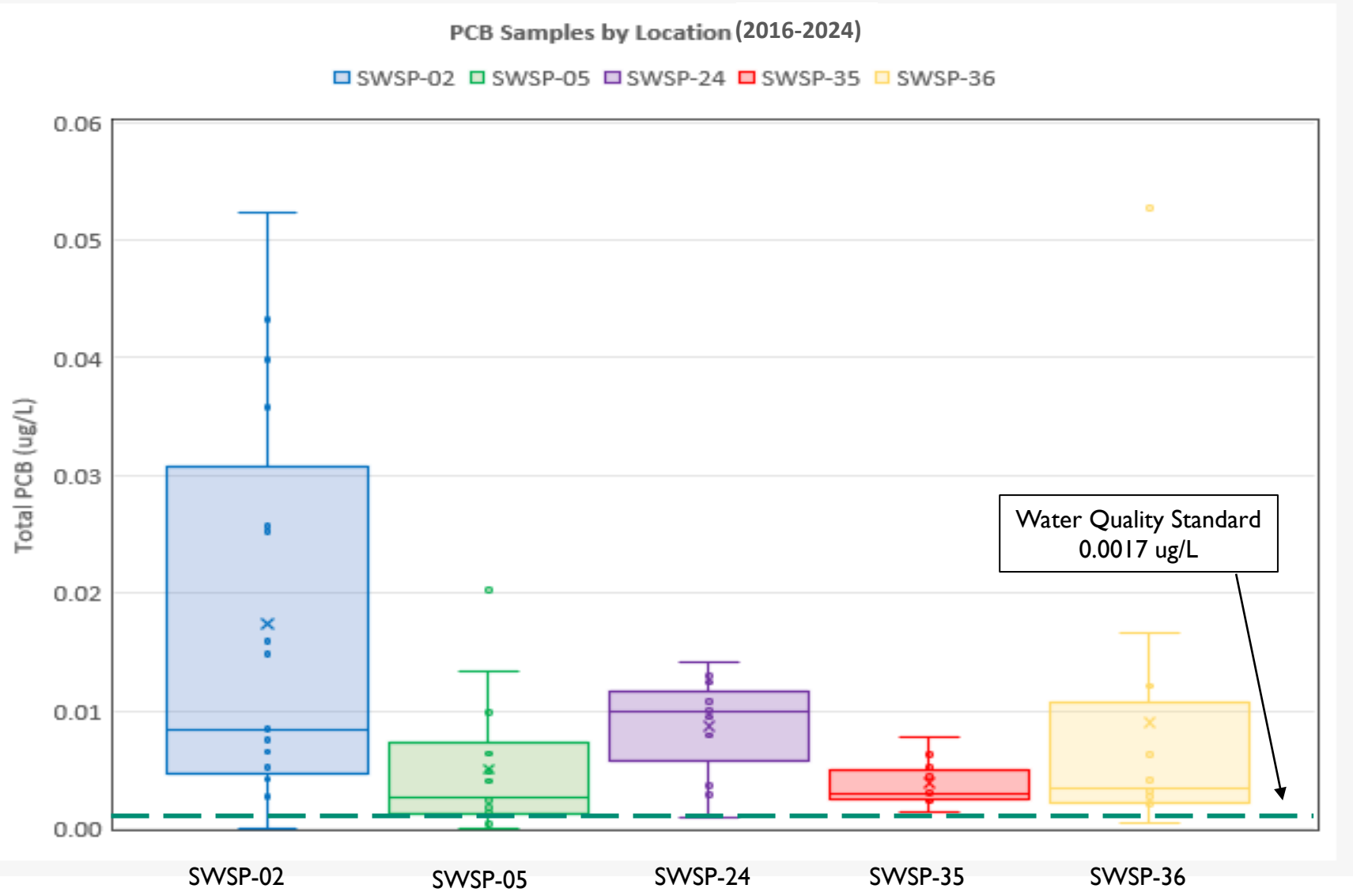
2 https://www.usgs.gov/centers/nm-water/science/microbial-source-tracking-and-escherichia-coli-monitoring-rio-grande-south?qt-science_center_objects=0#qt-science_center_objects.

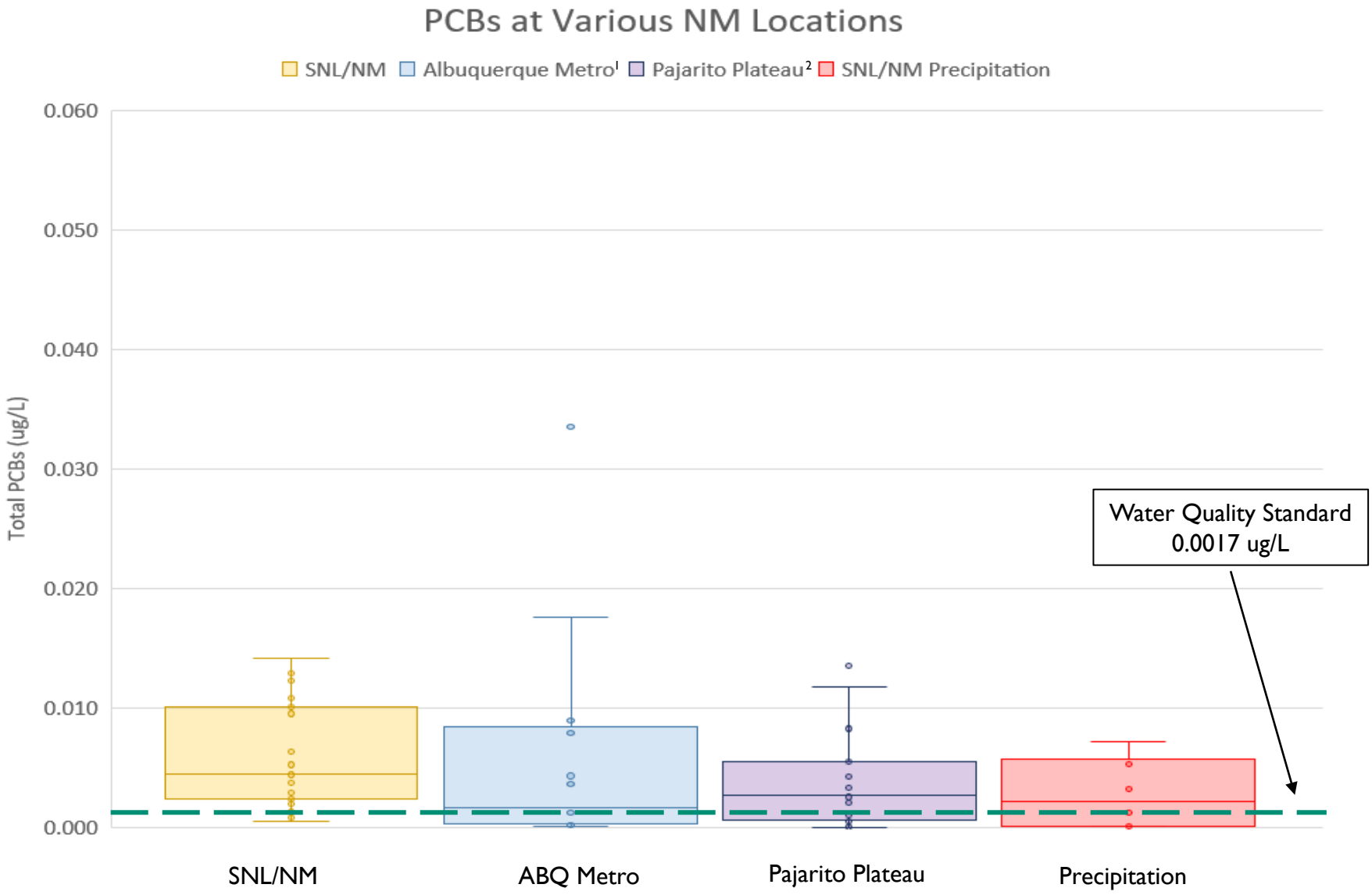
Activities to Decrease E. coli

- Microbial Source Tracking Study (2020)
  - No E. coli from human sources
  - No E. coli from canine sources, low avian contribution
  - Suspect primary source is skunks, racoons, rodents

- Coordination with the Ecology Program reducing wildlife attractants and access to stormdrains
  - Wildlife proof trash cans
  - Barriers to stormdrains

- Coordination with Facilities group to reduce sediment load and standing water in stormdrains
  - Have seen significant improvements in the area of SWSP-02 since 2022


PCB Samples by Location (2016-2024)
SWSP-02
SWSP-05
SWSP-24
SWSP-35
SWSP-36
Total PCB (ug/L)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Water Quality Standard
0.0017 ug/L
SWSP-02
SWSP-05
SWSP-24
SWSP-35
SWSP-36



1 U.S. Geological Survey, Scientific Investigations Report 2015-5006. Summary of Urban Stormwater Quality in Albuquerque, NM 2003-2012. 2015

2 Los Alamos National Laboratory. LA-UR-12-1081. PCBs in Precipitation and Stormwater Within the Upper Rio Grande Watershed. 2012

Activities to Decrease PCBs

- PCB source tracking and characterization (2017-ongoing)
  - Majority of PCBs entering MS4 at SWSP-02
  - PCBs at SWSP-02 strongly correlated to sediment load
  - PCBs at other sites more closely correlated to atmospheric deposition
  - Conducting further monitoring to identify potential source areas

- Sediment Reduction Plan (2015-2020, ongoing)
  - Reduced sediment contribution to stormdrains by ~25%
  - New detention basins and conveyance channel configuration at SWSP-02

- More Information: http://digitalrepository.unm.edu/snl_ms4/

EPA Audit and Site Inspection

- Audit of SWMP and Records, June 2022
  - EPA requested specific information from all 7 control programs + monitoring program
  - SNL provided 550+ pages of records and proof of compliance to EPA
  - No deficiencies identified
- Site Visit and Inspections of MS4 Facilities, May 2023
  - Inspectors from Region 6 Compliance Assurance and Enforcement Division and NMED Surface Water Quality Bureau
  - Inspected all outfalls and numerous facilities
  - No violations identified, several recommendations were made:
    - Cover waste and recycling bins at reapplication yard, fix silt fence around a stormdrain inlet at fleet services, provide better containment of landscaping materials stored on ground surface

EPA Inspection Report issued August 2023: *"…EPA inspectors found no deficiencies in staff understanding and application of permit requirements, or in the condition of the facilities. SNL has a comprehensive stormwater program and appears to do an excellent job of implementing their stormwater permit…"*

Questions?

More Information at the UNM Digital Repository
http://digitalrepository.unm.edu/snl_ms4/