Nevada Site Specific Advisory Board (NSSAB)

Full Board Meeting - Wednesday, January 15, 2025

Handouts…

NSSAB minutes, agendas, recommendations, meeting dates and locations, handouts, and member application is available on the NSSAB website at: www.nnss.gov/NSSAB/
NSSAB Phone: 702-523-0894; NSSAB Email: nssab@emcbc.doe.gov
NSSAB Address: 100 N. City Parkway, Suite 1750, Las Vegas, NV 89106
Fax: 702-724-0981; www.facebook.com/NNSANevada

Post Closure Inspection Observation and Evaluation for Groundwater Sites – Work Plan Item #6 and for Industrial Sites and Soils Sites – Work Plan Item #7

Jackie Petrello
Long-Term Monitoring Activity Lead
U.S. Department of Energy (DOE)
Environmental Management (EM) Nevada Program
January 15, 2025

NSSAB – Work Plan Item #6

- From a community perspective, the Nevada Site Specific Advisory Board (NSSAB) will provide a recommendation on ways the standard Post Closure Inspection Process for **groundwater sites** could be improved or enhanced
- NSSAB Members will observe post-closure inspections and provide an oral report at the April 16th NSSAB Meeting
- Based on member reports, NSSAB recommendation is due in April 2025

NSSAB meeting

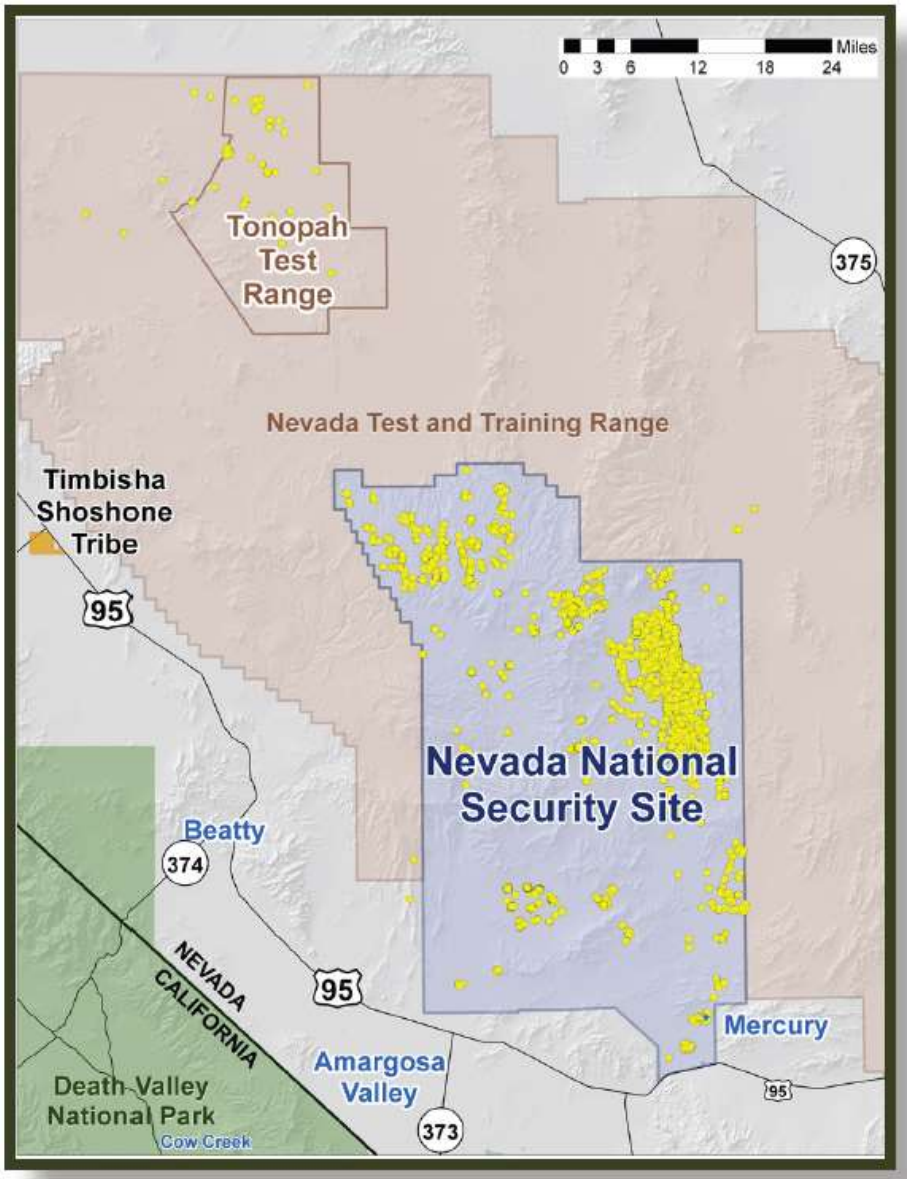
NSSAB – Work Plan Item #7

- From a community perspective, the NSSAB will provide a recommendation on ways the standard Post Closure Inspection Process for **Industrial Sites** and **Soils sites** could be improved or enhanced
- NSSAB Members will observe post-closure inspections and provide an oral report at the June 18th NSSAB Meeting
- Based on member reports, NSSAB recommendation is due in June 2025

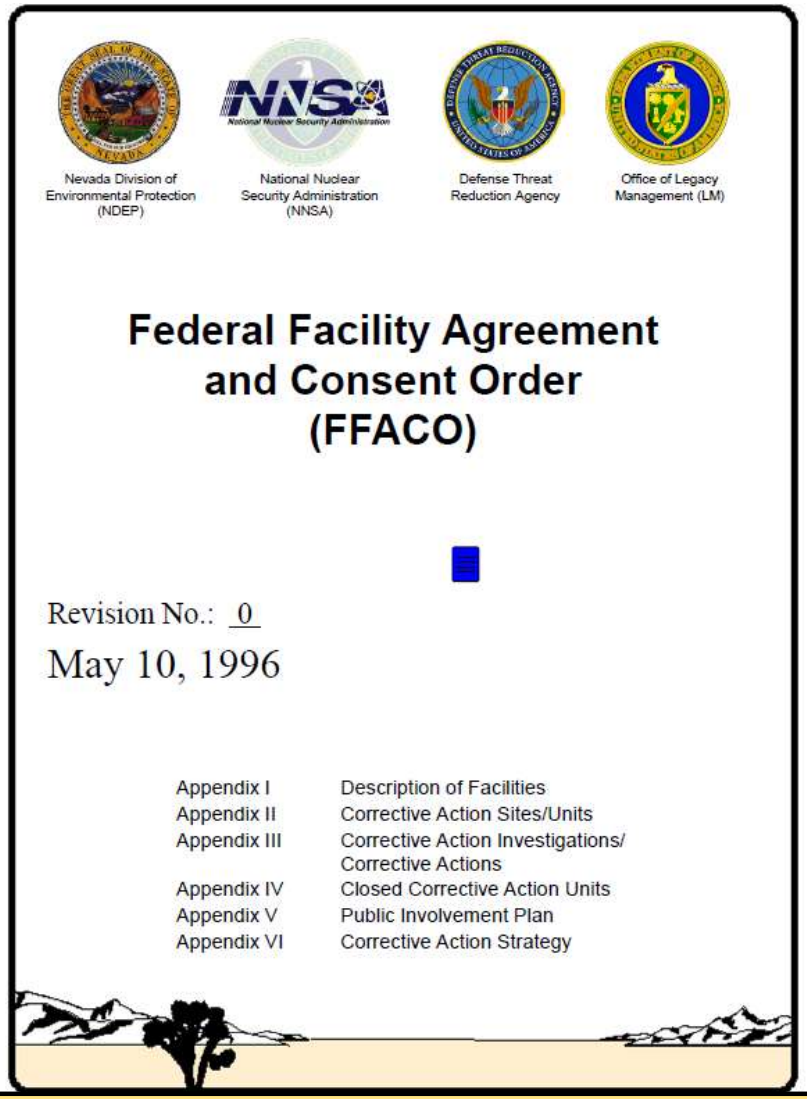

NSSAB meeting

Background

- Atmospheric and underground nuclear weapons tests were conducted at the Nevada National Security Site (NNSS) between 1951 and 1992
- Historic nuclear testing resulted in the contamination of some groundwater, surface soils, and industrial facilities
- The EM Nevada Program is responsible for completing environmental corrective actions at these historic nuclear testing locations in accordance with the Federal Facility Agreement and Consent Order (FFACO)



Yellow dots indicate sites identified in the FFACO


Nevada Division of Environmental Protection (NDEP)

National Nuclear Security Administration (NNSA)

Defense Threat Reduction Agency

Office of Legacy Management (LM)

Federal Facility Agreement and Consent Order (FFACO)

Revision No.: 0

May 10, 1996

Appendix I	Description of Facilities
Appendix II	Corrective Action Sites/Units
Appendix III	Corrective Action Investigations/ Corrective Actions
Appendix IV	Closed Corrective Action Units
Appendix V	Public Involvement Plan
Appendix VI	Corrective Action Strategy

The FFACO can be viewed online:
https://nnss.gov/wp-content/uploads/FFACO_Document.pdf
The FFACO fact sheet can be viewed online:
https://nnss.gov/wp-content/uploads/DOENV_964.pdf

Key Terminology

- FFACO - a regulatory agreement between federal agencies and the State of Nevada that identifies sites of historic contamination to be addressed by DOE and the U.S. Department of Defense
- Corrective Action Site (CAS) - A site that has been identified as needing remediation
- Corrective Action Unit (CAU) - A grouping of CASs that are similar in remediation technique, type of contaminants or proximity to each other

Closure Options

- Corrective actions must be considered when site conditions exceed a final action level
- Possible Corrective Action Alternatives (CAAs) identified in the FFACO:
  - **Closure in Place** with use restrictions, as necessary
  - **Clean Closure** (removal of contaminants, no use restrictions)
  - **No Further Action**
- CAAs evaluated based on *general standards* and *remedy selection decision factors* defined by the U.S. Environmental Protection Agency (EPA)

Closed site requiring post-closure surveillance and maintenance

EPA General Standards

- All CAAs must meet four general standards to be selected for further evaluation:
  - Protection of human health and the environment
  - Compliance with environmental cleanup standards
  - Control the source(s) of the release
  - Comply with applicable federal, state, and local standards for waste management


Sampling activities

EPA Remedy Selection Decision Factors

- Only CAAs that meet the EPA general standards are scored on the remedy selection decision factors:
  - Short-term reliability and effectiveness
  - Reduction of toxicity, mobility, and/or volume
  - Long-term reliability and effectiveness
  - Feasibility
  - Cost

Groundwater Closure

- Corrective action is closure in place with monitoring and institutional control
- Reasons for this corrective action:
  - Current groundwater contamination removal and stabilization technologies are not cost effective
  - Risk to groundwater user and the environment requires access to groundwater – prevent access – reduce the risk
- FFACO, Appendix VI, Chapter 3, Section 3.2


Well with multiple sample intervals

Post-Closure Monitoring Program

- CASs that are closed in place under the FFACO require some form of reporting, maintenance, or inspections and are referred to as Post-Closure Monitoring sites that include:
  - Closed Soils Sites
  - Closed Industrial Sites
  - Closed Underground Test Area [UGTA] (groundwater) Sites

Sites Closed in Place under FFACO

- FFACO sites that have been closed in place have requirements for regular inspections and/or maintenance
- Inspections and maintenance are required to ensure that any controls (posting, fencing, landfill caps, etc.) are maintained and are performing as designed
  - Controls and inspection requirements vary by site based on the potential hazards
  - Climate, weather events, animal burrows, and other factors may affect the controls over time

Closed site requiring post-closure surveillance and maintenance

Monitoring and Inspections

- UGTA (Groundwater) Sites
  - Groundwater levels in approximately 50 wells per year are monitored
  - An additional 50 wells per year are inspected to ensure the well head is secure
  - Sampling is conducted annually in one well and samples are obtained from 29 wells every six years


Sampling activities

Monitoring and Inspections (continued)

- UGTA (Groundwater) Sites – Annually
  - Verify Use Restrictions
  - Verify institutional controls
  - Determine groundwater usage on the NNSS and surrounding hydrographic basins

Monitoring and Inspections (continued)

- Industrial and Soils Sites – Closed in Place
  - Over 160 surface sites on the NNSS require annual post-closure monitoring and inspections
  - An additional 20 sites require inspections on a three or five-year basis
  - Three sites require an additional inspection if precipitation exceeds one inch in a 24-hour period
- Typical inspections:
  - Posting and warning signs are present and legible
  - Land fill caps are free of large cracks
  - Other items that may affect the integrity of the site

Reporting Provided to State of Nevada Division of Environmental Protection

- Industrial and Soils Sites
  - Annual Non-RCRA CAU Post-Closure Inspection Report
- UGTA (Groundwater) Sites
  - Post-Closure Annual Letter Report
  - Yucca Flat Post-Closure Sampling Report (every 6 years)
  - Rainier Mesa Post-Closure Sampling Report (every 6 years)
  - Frenchman Flat Post-Closure Sampling Report (every 6 years)
  - Post-Closure Presentation (every 12 years)
  - Frenchman Flat 5-year Evaluation Report

NSSAB Recommendations from August 2022

- Report observed burrowing animal and erosion activity on the checklist
  - DOE Response: burrowing animal and erosion activity documented any time that the use restriction controls could be affected


Sample trailer

- Provide separate cooling stations, other than vehicles and the labs, for the safety of the workers when performing sampling activities
  - DOE Response: Anticipated weather conditions are considered during planning, pre-field briefings, and tailgate safety briefings at the job site; worker safety is taken very seriously and planning for hot or cold weather is a key piece of preparation; when the NSSAB visit occurred, there were pandemic-related restrictions on the number of people in the air-conditioned sample trailer, which have since been lifted

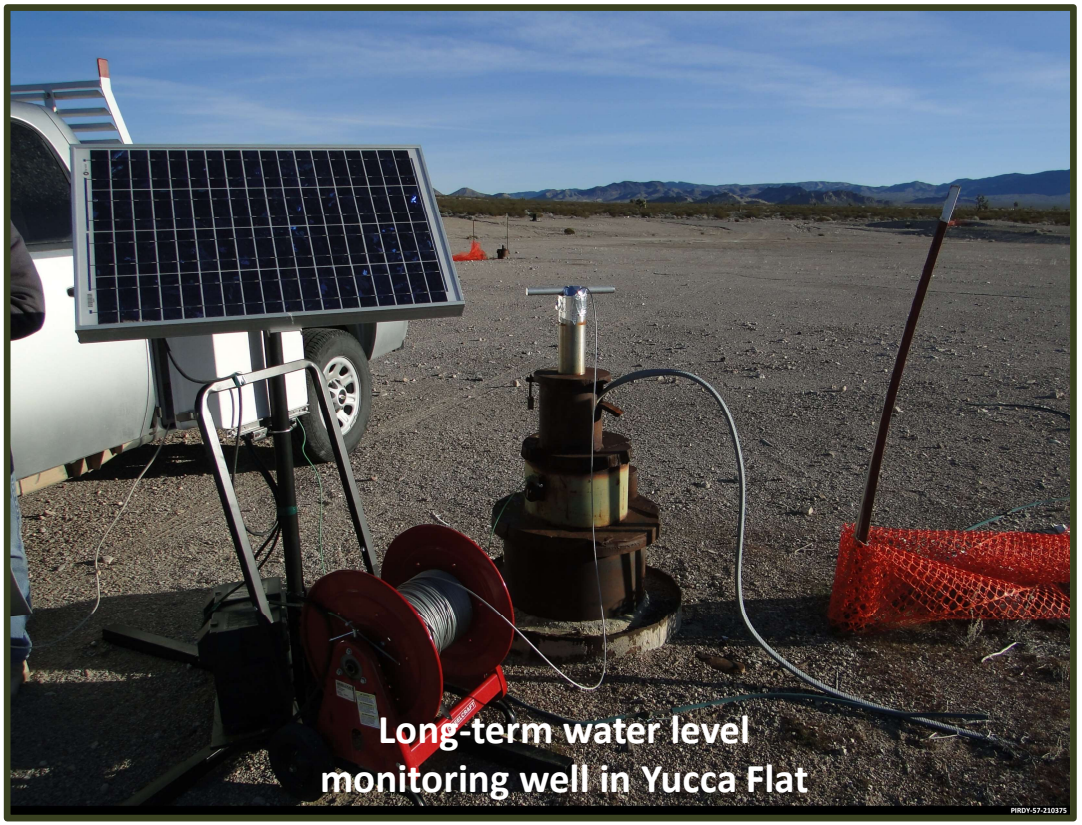
NSSAB Recommendations from August 2022 (continued)

- Photograph observations at each site and include photos on the next version of the checklist and tag photos with GPS information
  - DOE Response: Photographs are taken at each site and inspected and utilized by the inspector on subsequent inspections; and while GPS coordinates are not associated with each picture, the site location, directions and any applicable details are associated with each picture


NSSAB observation - June 2022

NSSAB Site Visits – Groundwater Sites (Work Plan #6)

- Two NSSAB members will have an opportunity to observe the Post Closure Inspections of **groundwater sites**:


Long-term water level monitoring well in Yucca Flat

  - UGTA Well Site – WW-C-1 sampled annually through 2026
  - Well site inspections conducted annually at sampling and water level monitoring locations

NSSAB Site Visits – Industrial Sites and Soils Sites (Work Plan #7)*

- Two NSSAB members will have an opportunity to observe the Post Closure Inspections of **Industrial Sites and Soils Sites**:

- CAU 547 Miscellaneous Contaminated Waste Sites in Areas 2 and 3
- CAU 568 Plutonium Dispersion Sites in Area 3
- CAU 383 E-Tunnel Muck Pile in Area 12
- CAU 139 Waste Disposal Sites (trenches) in Area 1

*substitutions may be made based on NNSS activities or weather

Key Messages

- Environmental corrective actions are performed in accordance with regulatory agreements with the State of Nevada and national standards
- Remediation strategies prioritize the protection of personnel, public health, safety, and the environment
- Post-closure monitoring is conducted to ensure the long-term protection of the public
- Use restrictions are implemented to prevent unauthorized access to or disturbance of areas where contamination remains above action levels
- Site controls are customized for location, accessibility, land use, and contamination

Key Messages - Groundwater

- Annual monitoring focuses on groundwater system stability, well site integrity, and maintenance of institutional control
- Six-year monitoring adds radionuclide measurements to assess contamination progression
- Twelve-year evaluation assures monitoring is consistent with contaminant boundary forecast

Questions

EM Nevada Program Subject Matter Experts (SMEs):
Jackie Petrello, John Myers

Navarro SMEs:
Juan Alvarado, Brian Haight, Pat Matthews, Ken Rehfeldt

NSSAB Path Forward – Work Plan Item #6

- From a community perspective, the NSSAB will provide a recommendation on ways the standard Post Closure Inspection Process for **groundwater sites** could be improved or enhanced
- NSSAB Members will observe post-closure inspections and provide an oral report at the April 16th NSSAB Meeting
  - Select two NSSAB members **tonight**
  - Time commitment for the onsite observation would be (1) full day
  - Proposed timeframe is the first week in March (targeting Tues., March 4)*
- Based on member reports, NSSAB recommendation is due in April 2025

NSSAB meeting

*substitutions may be made based on NNSS activities or weather

NSSAB Path Forward – Work Plan Item #7

- From a community perspective, the NSSAB will provide a recommendation on ways the standard Post Closure Inspection Process for **Industrial Sites** and **Soils sites** could be improved or enhanced
- NSSAB Members will observe post-closure inspections and provide an oral report at the June 18th NSSAB Meeting
  - Select two NSSAB members **tonight**
  - Time commitment for the onsite observation would be (1) full day
  - Proposed timeframe is the first two weeks in April (Monday – Thursday in the weeks of March 31-April 3 or April 7-10)*
- Based on member reports, NSSAB recommendation is due in June 2025


NSSAB meeting

*substitutions may be made based on NNSS activities or weather

Annual Nevada National Security Site Environmental Report (NNSSER) – Work Plan Item #2

Tiffany Gamero, Regulatory/FFACO Lead
U.S. Department of Energy (DOE)
Environmental Management (EM) Nevada Program
January 15, 2025

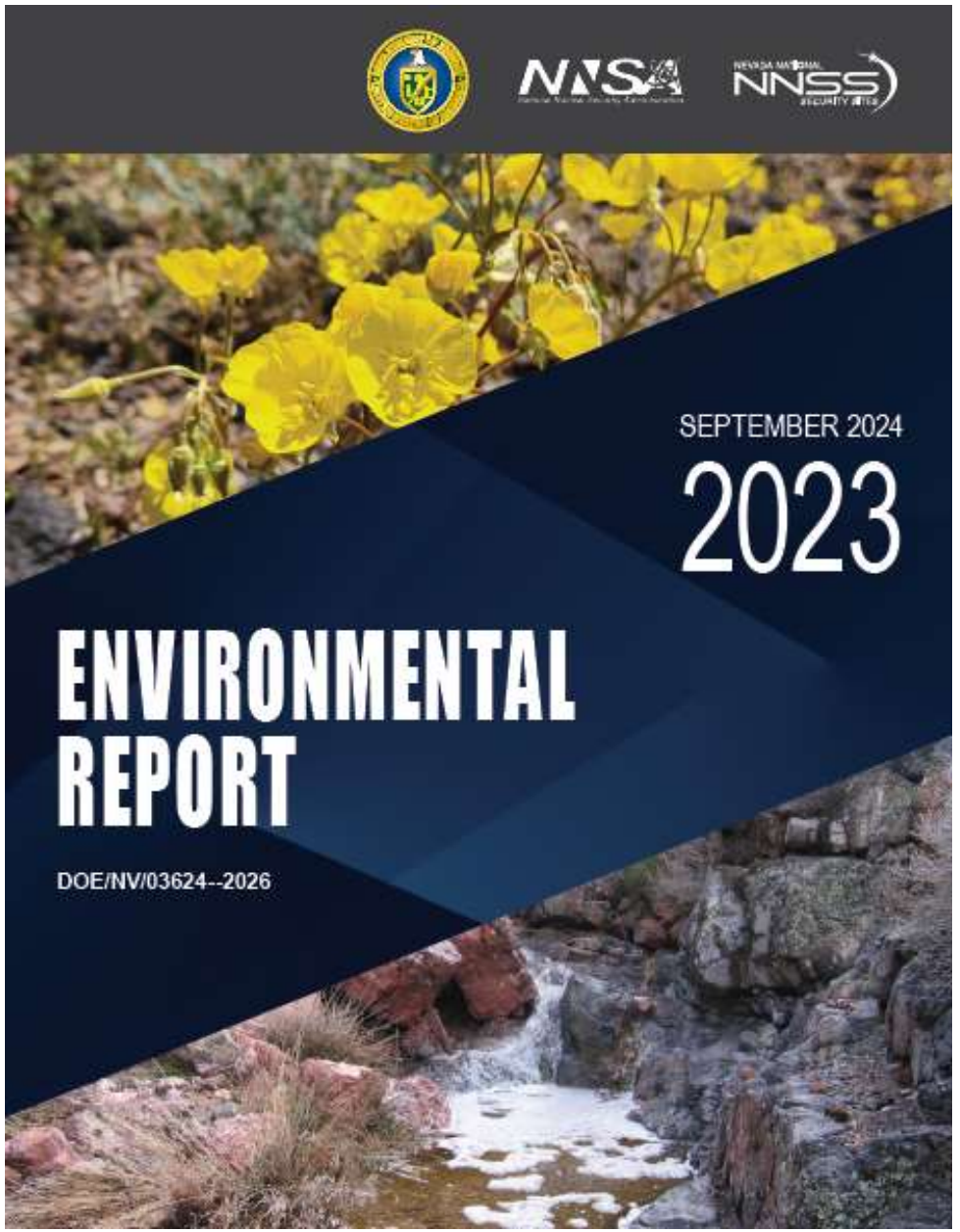
NSSAB - Work Plan Item #2

- From a community perspective, the Nevada Site Specific Advisory Board (NSSAB) will provide a recommendation for ways that Chapter 11 of the NNSSER could be enhanced (i.e., readability, presentation of information, etc.)
- NSSAB recommendation is due either tonight or during the February 19, 2025, NSSAB Full Board Meeting

NSSAB meeting

Discussion Topics

- Purpose
- DOE Order (O) 231.1B, *Environment, Safety and Health Reporting* and 458.1, *Radiation Protection of the Public and the Environment* Requirements
- Overview
- Chapter 11



NNSSER Purpose

- As required by DOE O 231.1B, prepared annually by Mission Support and Test Services, LLC (MSTS), the Nevada National Security Site (NNSS) management and operating (M&O) contractor
  - Working with MSTS, Navarro prepares EM input and coordinates EM Nevada Program review
- Contains information on environmental program performance, site-wide environmental monitoring, and surveillance effectiveness
- Documents compliance with environmental standards and requirements including the radiological protection requirements of DOE O 458.1
- Mechanism for providing technical information and sampling results to the public living near DOE sites
- Key component of DOE's commitment to transparency and public understanding of DOE operations

DOE O 231.1B and 458.1 Requirements

- Summary of environmental data for calendar year that addresses:
  - Site environmental management performance, including
    - Effluent releases
    - Environmental monitoring*
    - Types/quantities of radioactive materials discharged to the environment*
    - Calculated Total Effective Dose to a representative member of the public
    - Calculated collective dose to public from exposure to radiation source
  - Environmental occurrences and responses reported
  - Compliance with environmental standards and requirements*
  - Significant site programs and efforts
  - Property clearance activities, including
    - Types, quantities, and summary of approved authorized limits
    - Results of radiological monitoring* and surveys of cleared property
    - Independent verification results

* EM Nevada Program contributes input

NNSSER Overview

- Published annually in three volumes for the preceding calendar year: NNSSER (15 chapters and two appendices), NNSSER Summary, and NNSSER Attachment A: Site Description
  - National Nuclear Security Administration Nevada Field Office (NNSA/NFO) and EM Nevada Program groundwater sampling and monitoring activities discussed in Chapters 2 (Compliance Summary), 5 (Water Monitoring), and 11 (Environmental Corrective Actions)
  - NNSA/NFO and EM Nevada Program Radioactive Waste Management and Radioactive Waste Acceptance Program (RWAP) activities included in Chapter 10 (Waste Management)
  - EM Nevada Program laboratory quality control results for groundwater analyses are summarized in Chapter 14 (Quality Assurance Program)
  - EM Nevada Program activities to characterize, remediate, close, and conduct post-closure monitoring of Underground Test Area (UGTA), Industrial Sites, and Soils corrective action sites are covered in Chapter 11

Chapter 11

- Objective: Summarize EM Nevada Program Activities
  - Provide updates and accomplishments on *Federal Facility Agreement and Consent Order* (FFACO) corrective action sites (CASs)/Corrective Action Units (CAUs) including UGTA and Industrial Sites/Soils sites
- Current format established in the 2019 report
  - Chapter Introduction
  - Corrective Actions Progress
  - Corrective Action Sites – Active Investigations
    - UGTA
    - Industrial Sites
  - Corrective Action Sites – Post-Closure Activities
    - UGTA (by CAU)
    - Industrial Sites and Soils
  - EM Nevada Public Outreach
- Content highlights included in NNSSER Summary

Key Messages

- NSSAB input must be focused on Chapter 11 as it is the only chapter dedicated to EM Nevada Program environmental restoration mission activities
  - As the NNSS lead, NNSA/NFO is primarily responsible for the activities covered in the other chapters
- Seeking feedback and suggestions on:
  - Level and depth of technical information presented
  - Flow of information presented
  - Information gaps
  - Other input

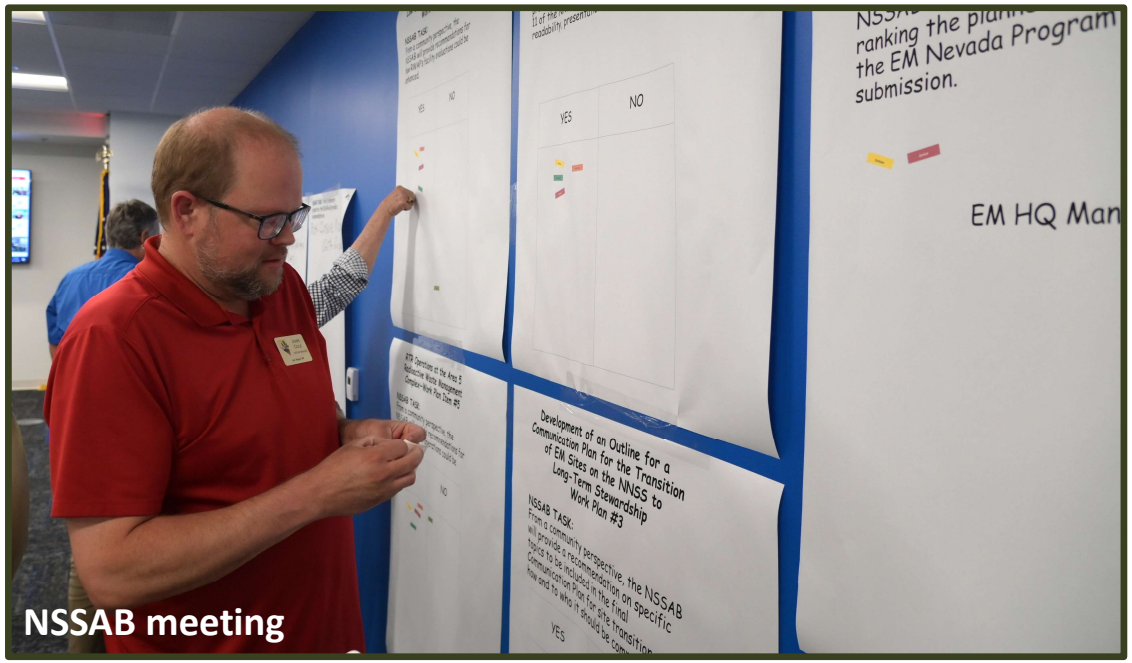
Questions

EM Nevada Program Subject Matter Expert (SME):
Tiffany Gamero

Navarro SMEs:
Dona Murphy and Irene Farnham

NSSAB Path Forward – Work Plan Item #2

- From a community perspective, the NSSAB will provide recommendations for ways that Chapter 11 of the NNSSER could be enhanced (i.e., readability, presentation of information, etc.)
- NSSAB recommendation is due either tonight or during the February 19, 2025, NSSAB Full Board Meeting



NSSAB meeting

Chapter 11: Environmental Corrective Actions

Irene M. Farnham, Patrick K. Matthews, and Dona F. Murphy
Navarro Research and Engineering, Inc.

Reed J. Poderis and Alissa J. Silvas
Mission Support and Test Services, LLC

Environmental Corrective Action Objectives for All Sites

Characterize sites contaminated by activities related to nuclear testing. Remediate contaminated sites in accordance with Federal Facility Agreement and Consent Order (FFACO)-approved planning documents. Conduct post-closure monitoring of sites in accordance with FFACO closure documents.

The U.S. Department of Energy (DOE) Environmental Management (EM) Nevada Program is responsible for evaluating and implementing corrective actions and performing required post-closure monitoring of FFACO[1] sites located on the Nevada National Security Site (NNSS) and the adjacent Nevada Test and Training Range (NTTR). These corrective action sites (CASs) are grouped into larger, corrective action units (CAUs) according to location, physical and geological characteristics, and/or contaminants. Environmental corrective action strategies are developed and completed based on the nature and extent of contamination, the risks posed by contamination, and future land use. Since 1989, the EM Nevada Program has overseen the compliant completion of corrective actions at 99% of the more than 2,100 surface and near-surface CASs and 91% of the 878 deep subsurface CASs, including implementation of required long-term monitoring at more than 900 of the 2,943 closed CASs.

CASs are broadly organized into four categories based on the source of contamination: Underground Test Area (UGTA), Industrial Sites, Soils, and Nevada Offsites. UGTA deep subsurface sites are directly related to groundwater impacted by past underground nuclear testing. Industrial Sites are facilities and land that may have become contaminated due to activities conducted in support of nuclear research, development, and testing. These include an extensive complex of research/development/testing facilities, disposal wells, inactive tanks, contaminated waste sites, inactive ponds, muckpiles, spill sites, drains and sumps, and ordnance sites. Industrial Sites include CASs on the NNSS owned by DOE and the Defense Threat Reduction Agency. Soils CASs include areas where nuclear tests have resulted in surface and/or shallow subsurface contamination from radioactive materials and potentially from oils, solvents, heavy metals, and contaminated instruments and test structures used during testing activities. Nevada Offsites are associated with historical testing activities at the Project Shoal Area and the Central Nevada Test Area, located in northern and central Nevada, respectively. Long-term monitoring for those sites is the responsibility of the DOE Office of Legacy Management (LM) along with closed FFACO Soils and Industrial Sites on the NTTR/Tonopah Test Range (TTR) where environmental corrective actions were completed by the EM Nevada Program.

In May 1996, DOE, the U.S. Department of Defense, and the State of Nevada entered into the FFACO to address the environmental remediation of CASs. LM became a signatory to the FFACO in June 2006 after assuming responsibility for the Nevada Offsites. Appendix VI of the FFACO (1996, as amended), describes the strategy to plan, implement, and complete environmental corrective actions (i.e., to "close" the CASs). The State of Nevada Division of Environmental Protection (NDEP) provides regulatory oversight and approval throughout the FFACO closure process, and the public is kept informed of progress through the Nevada Site Specific Advisory Board (NSSAB)[2], news articles, intergovernmental stakeholder meetings, and other educational/outreach initiatives. The NSSAB is a federally chartered group of volunteer members representing Nevada stakeholders who review and provide the EM Nevada Program informed recommendations and comments that are strongly considered throughout the corrective action process.

This chapter provides an update on EM Nevada Program corrective action progress and summarizes corrective action and post-closure activities at UGTA, Industrial Sites, and Soils CASs in calendar year (CY) 2023 and summarizes the NSSAB's CY 2023 activities and recommendations. Post-closure activities at Nevada Offsites

[1] A fact sheet on the FFACO is available via https://nnss.gov/wp-content/uploads/2023/04/DOENV_964.pdf.
[2] Information on NSSAB activities can be accessed at https://nnss.gov/NSSAB/.

and FFACO Soils and Industrial Sites on the NTTR/TTR performed in 2023 are presented in LM's Annual Site Environmental Report.

11.1 Corrective Actions Progress

Figure 11-1 depicts the progress made since 1996 to complete environmental corrective actions at sites managed under the FFACO (1996, as amended). A total of 2,943 of the 3,044 CASs managed under the FFACO were closed as of December 31, 2023; this includes CASs that are currently under EM Nevada Program or LM stewardship. The number of CASs closed as of December 31, 2023, decreased from the end of CY 2022 due to previously closed CASs that were re-evaluated during 2023. These 11 CASs were regrouped into a new CAU 578 (see Figure 11-5) that underwent the corrective action process in 2023 and was approved for closure in February 2024. The last open CAS in CAU 577, disposal cell 21 at the Area 5 Radioactive Waste Management Site (RWMS), was approved for closure in October 2023. Of the remaining 90 CASs yet to be closed under the FFACO (all of which are the responsibility of EM Nevada Program), 82 (89%) are UGTA CASs and the remainder are Industrial Sites CASs.

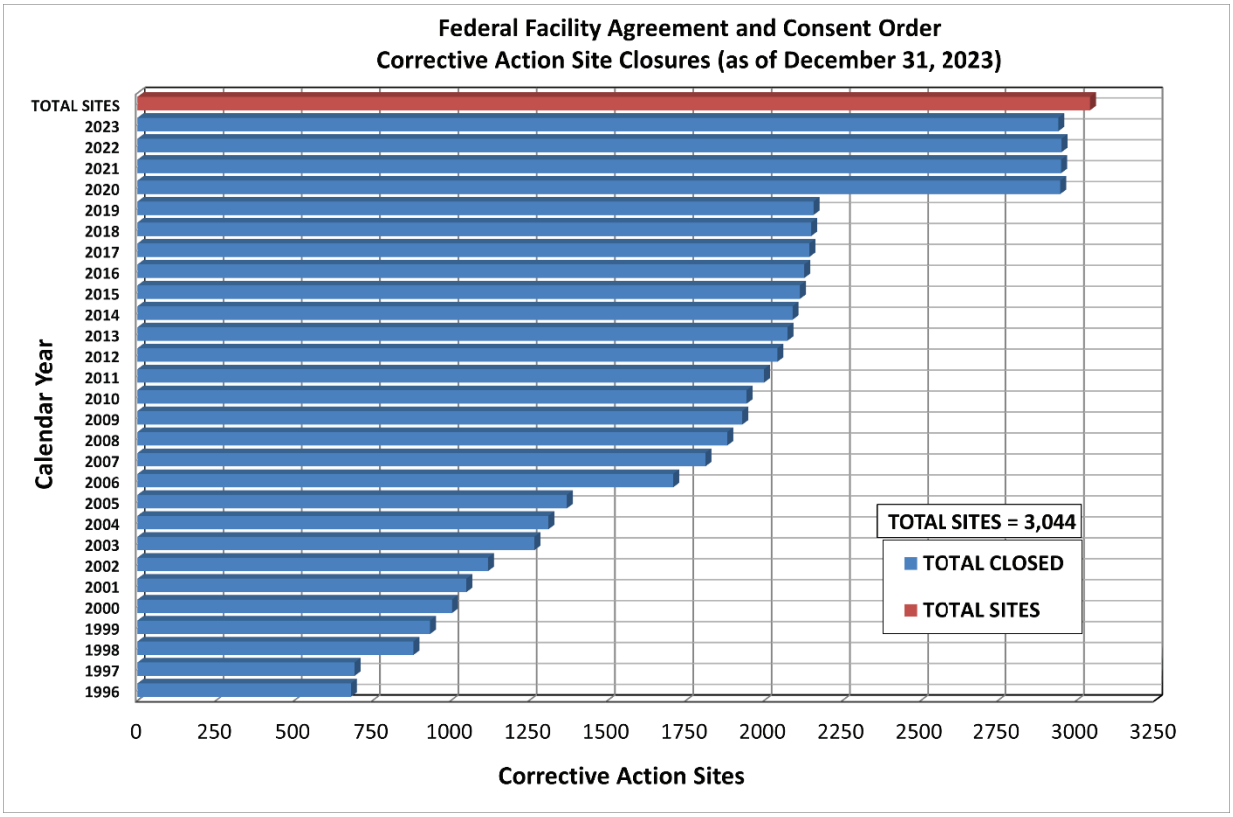


Figure 11-1. Annual cumulative totals of FFACO CAS closures

The EM Nevada Program satisfied numerous regulatory commitments in 2023, including submittal of the following reports[3] that reflect significant mission progress:

- Addendum 2 to the Closure Report for CAU 577: Area 5 Chromium Containing Waste Disposal Cells
- CY 2022 Non-Resource Conservation and Recovery Act (RCRA) CAU Post-Closure Inspection Report
- CY 2022 UGTA Annual Sampling Letter Report (CAUs 101/102)
- CY 2022 Post-Closure Monitoring Letter for Closed UGTA CAUs
- CY 2022 Post-Closure Report for Closed RCRA CAUs

[3] Available through the DOE Office of Scientific and Technical Information at https://www.osti.gov/.

- FFACO, January 2023 Appendices Update
- Report of the Peer Review Panel for the Pahute Mesa Groundwater Flow and Transport Model
- Response to Report of the Peer Review Panel for the Pahute Mesa Groundwater Flow and Transport Model
- Risk Evaluation of Radionuclides in Groundwater for CAUs 101 and 102: Central and Western Pahute Mesa[4]
- Streamlined Approach for Environmental Restoration (SAFER) Plan for CAU 578: Miscellaneous Inactive Sites

The post-closure monitoring and inspection reports present the monitoring and inspection results used to verify compliance and corrective action effectiveness for the sites closed under the FFACO process. The UGTA annual sampling letter report presents sampling results for the Pahute Mesa CAUs 101 and 102, which are the only UGTA CAUs that have not yet reached closure.

11.2 Corrective Action Sites – Active Investigations

The location and status (open or closed) of UGTA, Industrial Sites, and Soils CASs as of December 31, 2023, are shown in Figure 11-2. Figure 11-2 also includes the closed CASs (Industrial Sites and Soils) on the NTTR/TTR that were transferred to LM. Investigations and, as appropriate, corrective actions were performed at 82 UGTA CASs in two CAUs and 20 Industrial Sites CASs in four CAUs during 2023.

11.2.1 Underground Test Area Sites

The agreed-upon corrective action for UGTA CASs is closure in place with institutional controls and monitoring (FFACO 1996, as amended). This corrective action is based on three assumptions: (1) groundwater technologies for removal or stabilization of subsurface radiological contamination are not cost effective; (2) because of high remediation costs, closure in place with monitoring and institutional controls is the only likely corrective action; and (3) in order for workers, the public, and the environment to be exposed to the potential risks from radiological contamination in groundwater, the contaminated groundwater must first be accessed.

The corrective action is implemented in four stages: (1) *planning*; (2) *investigation* (characterization and modeling); (3) *model evaluation*; and (4) *closure*. NDEP approval of each stage is required before advancing to the next stage. Characterization and modeling studies are evaluated throughout the *investigation stage* by a committee of scientists (preemptive review committee) specializing in the fields of geology, hydrology, chemistry, and nuclear testing. CAU-specific preemptive review committees provide internal technical review of ongoing studies to ensure work is comprehensive, accurate, consistent with the state-of-the-art modeling and data analysis methods, and consistent with CAU goals (EM Nevada Program 2019). In addition, a scientific external peer review is included in the *investigation stage*.

Environmental Corrective Action Objectives for UGTA Sites

- *Collect data (e.g., new wells, groundwater samples, groundwater levels, geologic, hydrologic testing, field and laboratory studies) to characterize the hydrogeological setting and nature and extent of contamination.*
- *Develop CAU-specific models of groundwater flow and contaminant transport.*
- *Identify **contaminant boundaries**[5] within which contaminants are forecasted to potentially (95th percentile) exceed the Safe Drinking Water Act limits at any time within a 1,000-year compliance period.*
- *Negotiate and implement **regulatory boundary** objectives and regulatory boundaries to protect the public and environment from the effects of radioactive contaminant migration.*

[4] A revision to this document (Rev. 2) was published in February 2024 to remove reference to DOE Order DOE O 458.1, "Radiation Protection of the Public and the Environment," as it is not central to the analysis or the results. The approach and results presented in Rev. 2 did not change from Rev. 1.
[5] The definition of word(s) in ***bold italics*** may be found by referencing the Glossary, Appendix B.

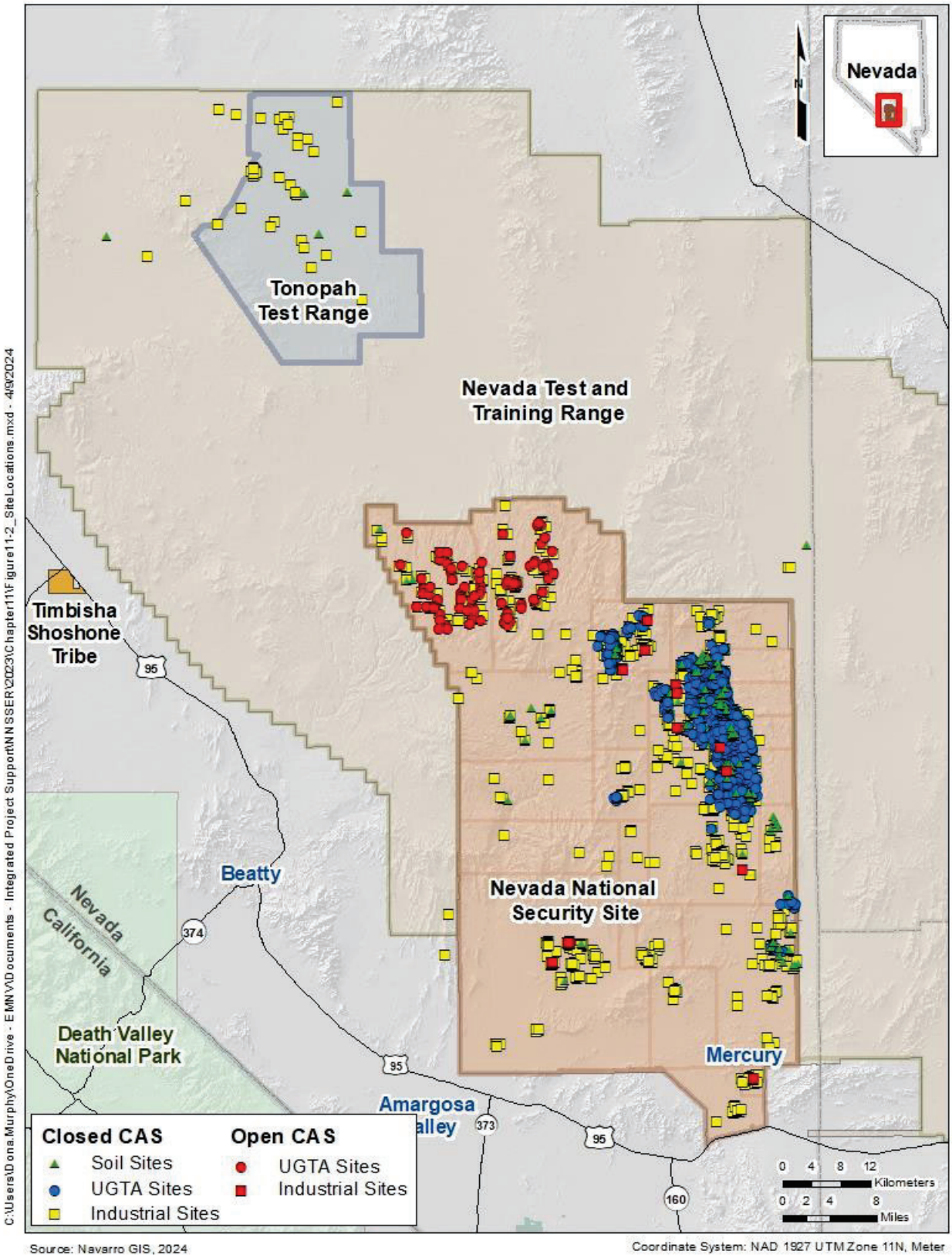


Figure 11-2. Map of FFACO closure status for UGTA, Industrial Sites, and Soils CASs as of December 31, 2023

- *Negotiate and implement **use-restriction boundaries** to restrict access to contaminated groundwater.*
- *Develop and implement a long-term closure monitoring network to verify consistency with the contaminant boundaries, compliance to the regulatory boundary, and protection of human health and the environment.*

The locations of UGTA CAUs are shown in Figure 11-3.

Central and Western Pahute Mesa CAUs (101 and 102), comprising a total of 82 CASs, are the only two UGTA CAUs remaining to be closed. The CASs are nuclear test cavities produced from the underground nuclear detonations. These roughly spherical cavities with original diameters greater than 200 meters (m) in some cases, are in complex geologic units at depths ranging from 226 to 1,450 m below ground surface (Carle et al. 2021). Most of these detonations were within 100 m of the ***water table***, or deeper, indicating potential interaction with the groundwater system (Figure 11-3).

As required by the UGTA Strategy, three-dimensional groundwater flow and contaminant transport models were developed to represent the complex geologic structure underlying Pahute Mesa, as well as the complex contaminant transport processes associated with ***radionuclide*** movement through the fractured rock. Four models were constructed and calibrated, including a "base case" and three alternative models to address different geologic and recharge conditions (EM Nevada Program 2022c). Similar contaminant boundary forecasts resulted from each model. The 1,000-year contaminant boundary for the base-case model, shown in Figure 11-4, extends a few kilometers beyond the NNSS boundary but is more than 12 kilometers upgradient of the closest public receptor in Oasis Valley. These results indicate that radionuclides from underground nuclear testing on Pahute Mesa pose little to no risk to the health of groundwater users in Oasis Valley.

In 2023, the Pahute Mesa CAUs advanced to the model evaluation stage, marking a major step toward achieving regulatory closure. This advancement, which received NDEP approval, followed an extensive peer review of the groundwater flow and contaminant transport model and model results (Navarro 2023a,b). Activities planned for the model evaluation stage are identified in the Corrective Action Decision Document/Corrective Action Plan (EM Nevada Program 2024) for the Pahute Mesa CAUs, which was submitted to NDEP in October 2023 and approved in early 2024. Model evaluation activities are focused on improving confidence in the model results for use in developing a monitoring network and establishing use restrictions that ensure downgradient groundwater users remain protected.

A *Risk Evaluation of Radionuclides in Groundwater* for the Pahute Mesa CAUs (Navarro 2024) presents the potential impacts to the health of hypothetical human receptors from exposure to radiological contaminants in groundwater of the Pahute Mesa CAUs. The results of this evaluation provide additional confidence that public groundwater users downgradient of the NNSS in Oasis Valley will not be adversely impacted by the radionuclides within the 1,000-year time frame defined in the FFACO.

In addition, 11 wells were sampled in the Pahute Mesa CAUs in 2023. The sample analysis results are presented in Chapter 5. The sampling results, including samples with no radionuclides present, will continue to be used to ensure that the groundwater flow and contaminant transport model results are consistent with known levels of contamination within the Pahute Mesa CAUs

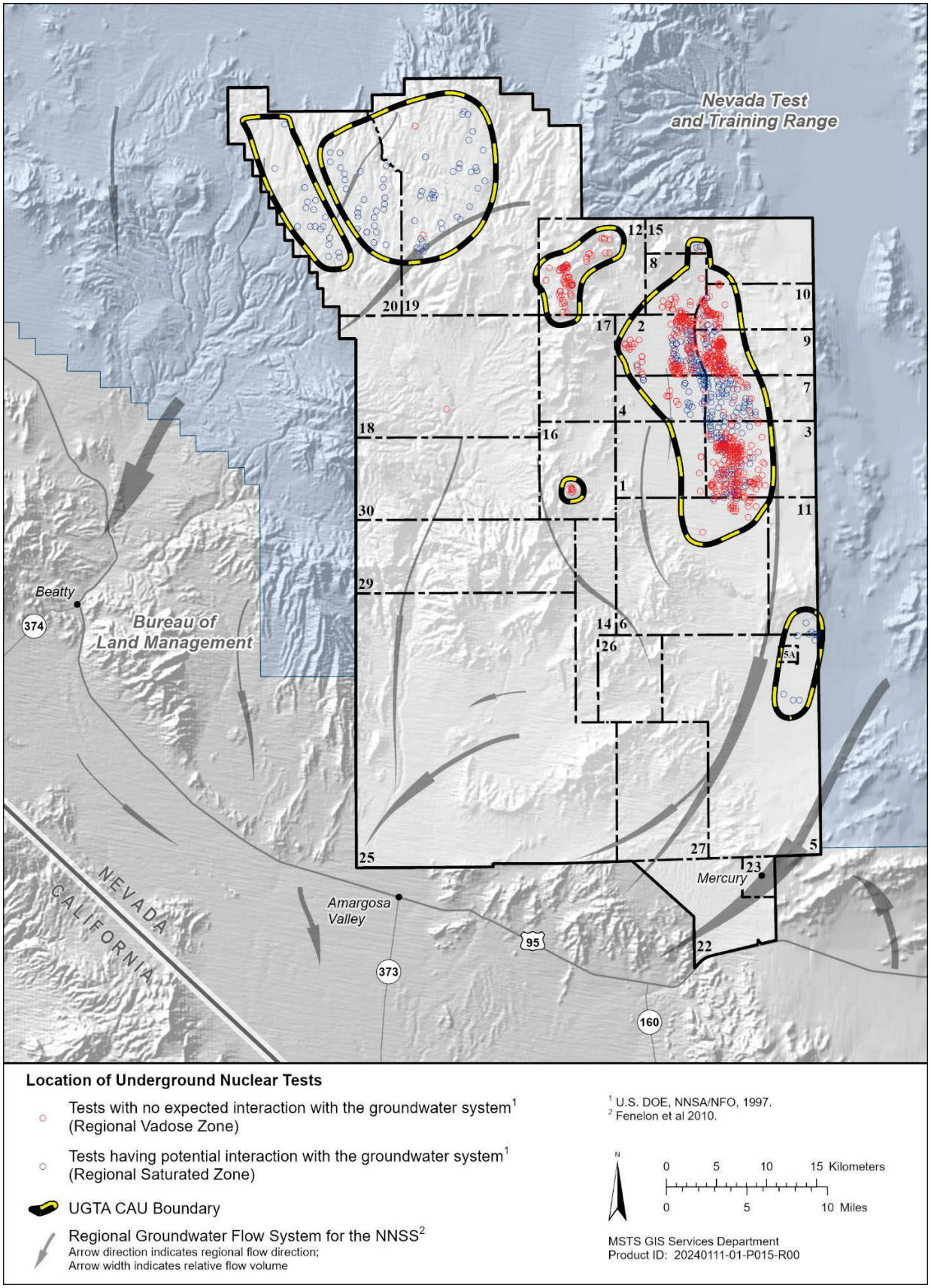


Figure 11-3. UGTA CAUs

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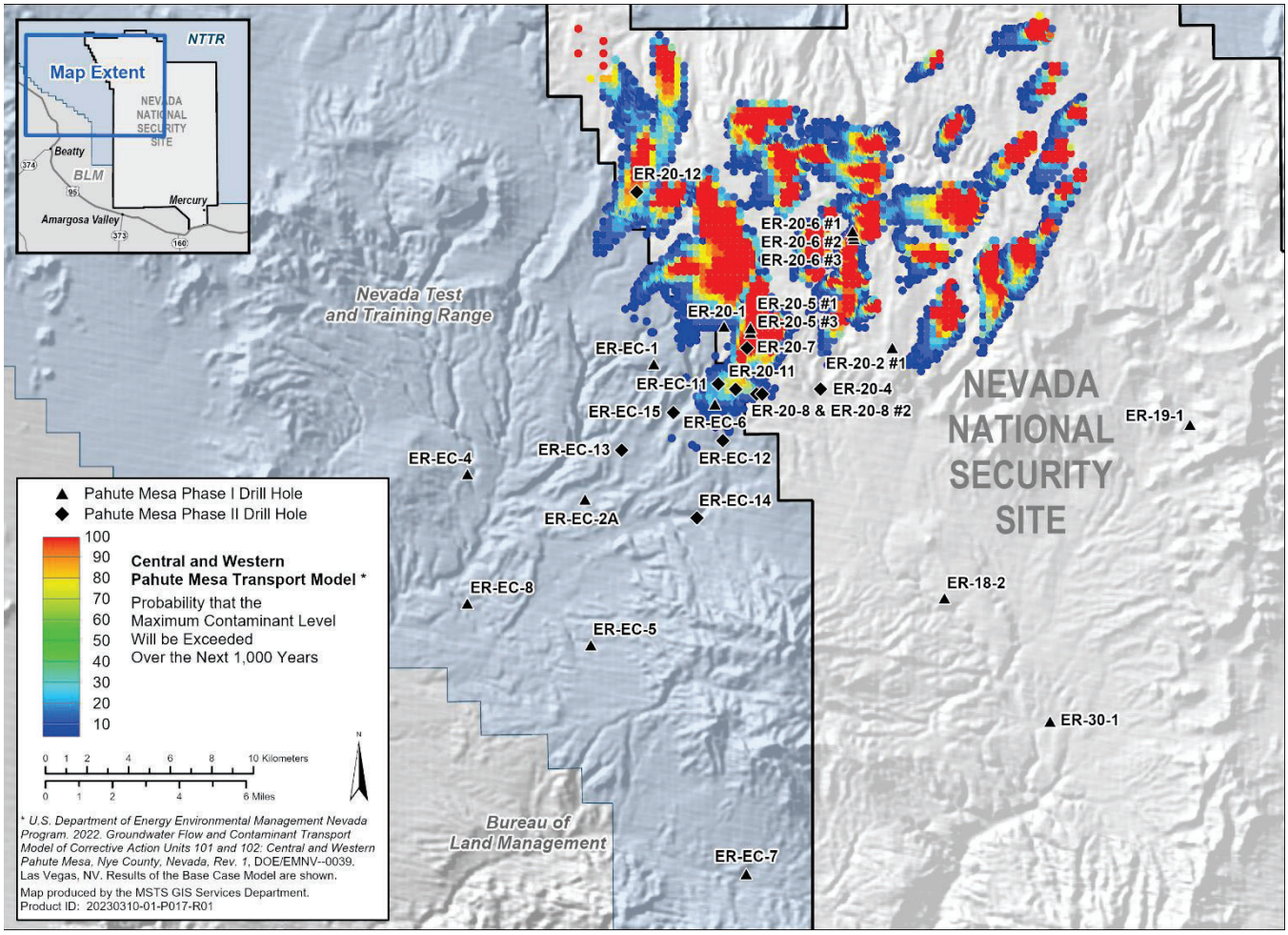


Figure 11-4. Contaminant boundary forecasted by the Pahute Mesa Base-Case Groundwater Flow and Contaminant Transport Model

11.2.2 Industrial Sites

Environmental corrective actions at 20 Industrial Sites CASs occurred in 2023. One of these CASs is within CAU 577, Chromium Containing Waste Disposal Cells, located at the Area 5 Radioactive Waste Management Complex (Figure 11-5). CAU 577 was established in the FFACO under a 2019 Settlement Agreement with NDEP and consists of five CASs. Corrective actions were previously completed for four of the CASs (EM Nevada Program 2021c, 2022a). Following completion of corrective actions (including construction and revegetation of RCRA-compliant closure covers over the remaining waste disposal cell), the fifth and final CAS was closed and approved by NDEP in 2023 (EM Nevada Program 2023b).

Eight of the remaining active Industrial Site CASs are the Test Cell C Ancillary Building and Structures (CAU 572) and the Engine Maintenance, Assembly, and Disassembly (EMAD) (CAU 114) sites (Figure 11-5), which are undergoing decontamination and demolition (D&D). Test Cell C Ancillary Building and Structures and EMAD were part of a larger complex of facilities constructed to support the historical Nuclear Rocket Development Station that was jointly administered by the Atomic Energy Commission (predecessor to DOE) and the National Aeronautics and Space Administration's Space Nuclear Propulsion Office between 1958 and 1971.

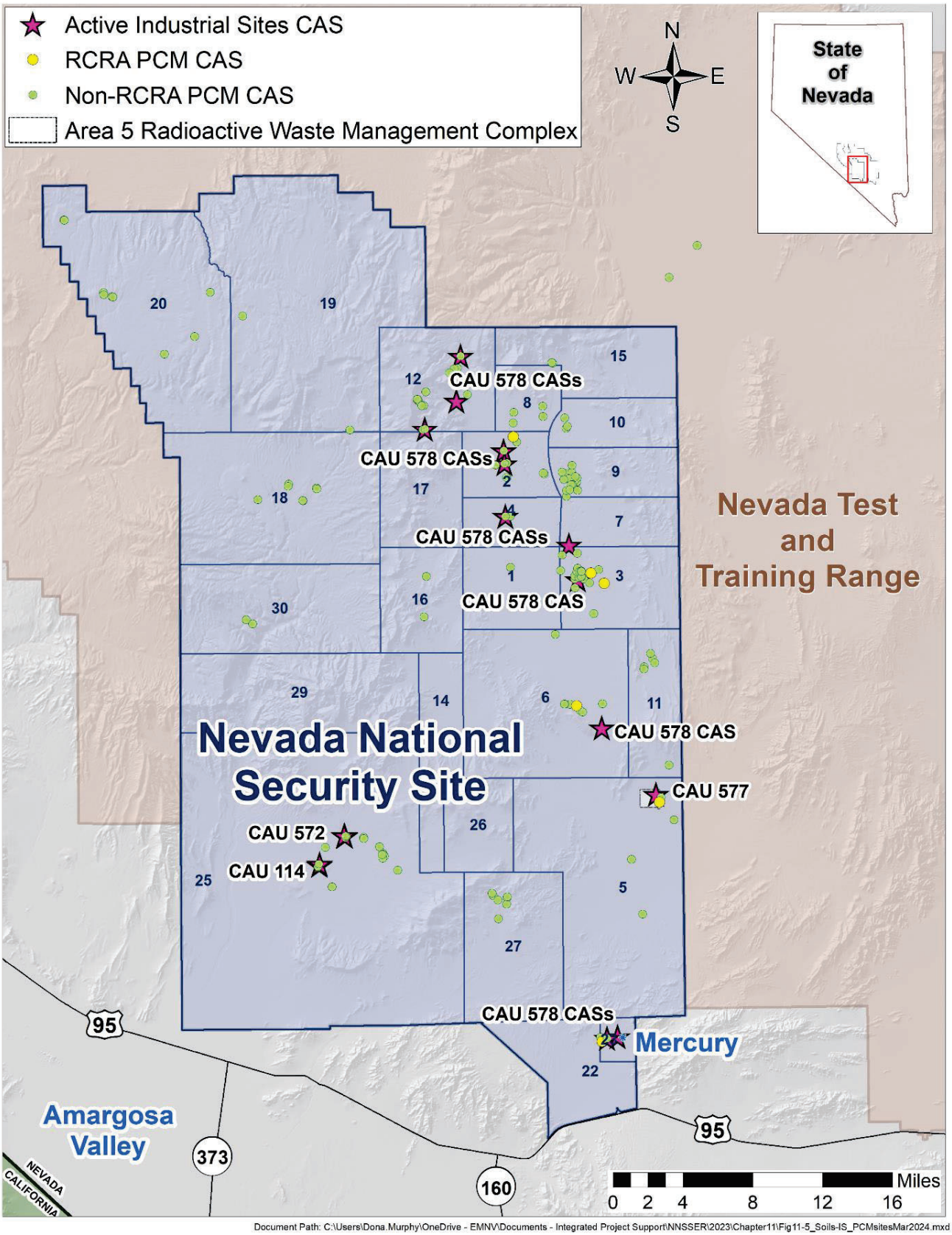


Figure 11-5. CASs undergoing active investigation and post-closure monitoring during 2023

Test Cell C Ancillary Building and Structures (CAU 572) consists of a 6,800-square-foot (ft^2) single-story masonry building with multiple rooms (e.g., cryogenic bench lab, pump and electric shops, control room); a large steel-framed building containing three large electric motors; a 750-ft^2 single-story concrete-framed pump house; a 1,700-ft^2 light steel-framed building used for cryogenic experiments and storage; and 10 large ancillary structures (i.e., dewars for storing liquid hydrogen, cooling towers, storage tanks, and piping). The EMAD facility (CAU 114) encompasses a 100,000-ft^2, 80-foot (ft)-tall, four-story building with 6-ft-thick concrete walls and the largest "hot cell" in the world; a steel-framed building that was used for railcar maintenance and treatability tests on plutonium-contaminated soil; a 32-ft-long, 107-ton manned control car; and a 60-foot long, 70-ton engine installation vehicle.

FFACO closure of both facilities will be accomplished through the SAFER process (EM Nevada Program 2021d,e). The goal of D&D is to reduce risks to site workers, the public, and environment; and to limit the long-term cost of surveillance and maintenance. D&D also includes proper disposal of the generated waste. During 2023, four ancillary structures at Test Cell C were safely demolished. At EMAD, considerable progress was made in 2023 to prepare for demolition through decontamination, dismantlement, removal of contaminated materials and hazardous items, and asbestos abatement. In support of these activities, radiological surveys and sampling were also performed.

11.3 Corrective Action Sites – Post-Closure Activities

11.3.1 Underground Test Area Sites

Three UGTA CAUs – Frenchman Flat (CAU 98), Rainier Mesa/Shoshone Mountain (CAU 99), and Yucca Flat/ Climax Mine (CAU 97) – are in the *closure stage*. During the *closure stage*, contaminant, regulatory, and use-restriction boundaries are identified and agreed upon by DOE and NDEP. The boundaries for each CAU are presented in Figure 11-6. If radionuclides exceeding the agreed-upon level reach the regulatory boundary, the EM Nevada Program is required to submit to NDEP a plan that meets the CAU's regulatory boundary objectives.

Closure reports for these CAUs were developed at the beginning of the *closure stage* to document these boundaries and describe the monitoring well network and land-use restrictions. Three types of monitoring are performed during closure: water quality, water level, and institutional control. The monitoring objective is to determine whether use-restriction boundaries remain protective of human health and the environment. Additionally, water-quality and water-level monitoring are used to evaluate consistency with the groundwater flow and contaminant transport conceptual and numerical model. Such consistency is important because the models are the primary basis for use-restriction boundaries.

In 2023, a letter report was submitted to NDEP that summarized post-closure monitoring activities completed for the closed UGTA CAUs (97, 98, and 99) in 2022 (EM Nevada Program 2023a). Institutional control monitoring confirmed that use restrictions are recorded in land management systems maintained by the DOE National Nuclear Security Administration Nevada Field Office (NNSA/NFO) and the U.S. Air Force (for the Frenchman Flat CAU) and that no activities are occurring that could potentially affect the contaminant boundaries of the closed UGTA CAUs. A survey of groundwater resources in basins surrounding the CAUs similarly identified no current or pending development that would indicate the need to increase monitoring activities or otherwise cause concern for the closure decision. Use restrictions continue to prevent ***exposure*** to the public, workers, and the environment from contaminants of concern by preventing access to potentially contaminated groundwater.

11.3.1.1 Frenchman Flat Corrective Action Unit 98

The closure report for the Frenchman Flat CAU (comprising 10 CASs) was approved by NDEP in 2016 (NNSA/NFO 2016) and describes the monitoring program for the first 5 years post-closure (2016 through 2020). An evaluation of the 5-year monitoring data was published in 2023 (EM Nevada Program 2022b). This evaluation showed the 5-year radionuclide concentrations in groundwater samples and water-level monitoring data to be consistent with the current understanding of the groundwater flow as well as the forecasted contaminant boundaries for this CAU (Figure 11-6). A rapid water-level drop in well ER-5-3-2, which is the only well in the Frenchman Flat basin completed in the regional lower carbonate aquifer (LCA), required further investigation by the U.S. Geological Survey, a participant in the UGTA process. This investigation identified well-construction

effects as the reason for the earlier elevated water levels and determined that samples collected from well ER-5-3-2 are representative of the carbonate system (Jackson and Frus 2023). Future monitoring requirements, based on these evaluation results, will be documented in an addendum to the closure report, which will require NDEP approval before implementation.

The Frenchman Flat CAU regulatory boundary objective is to protect receptors downgradient of the Rock Valley fault system from radionuclide contamination. Although contaminants resulting from underground nuclear tests are not forecasted to migrate out of the basin within the next 1,000 years, the Rock Valley fault system is the expected groundwater migration pathway. The negotiated regulatory boundary is established at the interface of the alluvial/volcanic aquifer and the Rock Valley fault (Figure 11-6). All monitoring results indicate that the regulatory boundary objective has been met (EM Nevada Program 2022b).

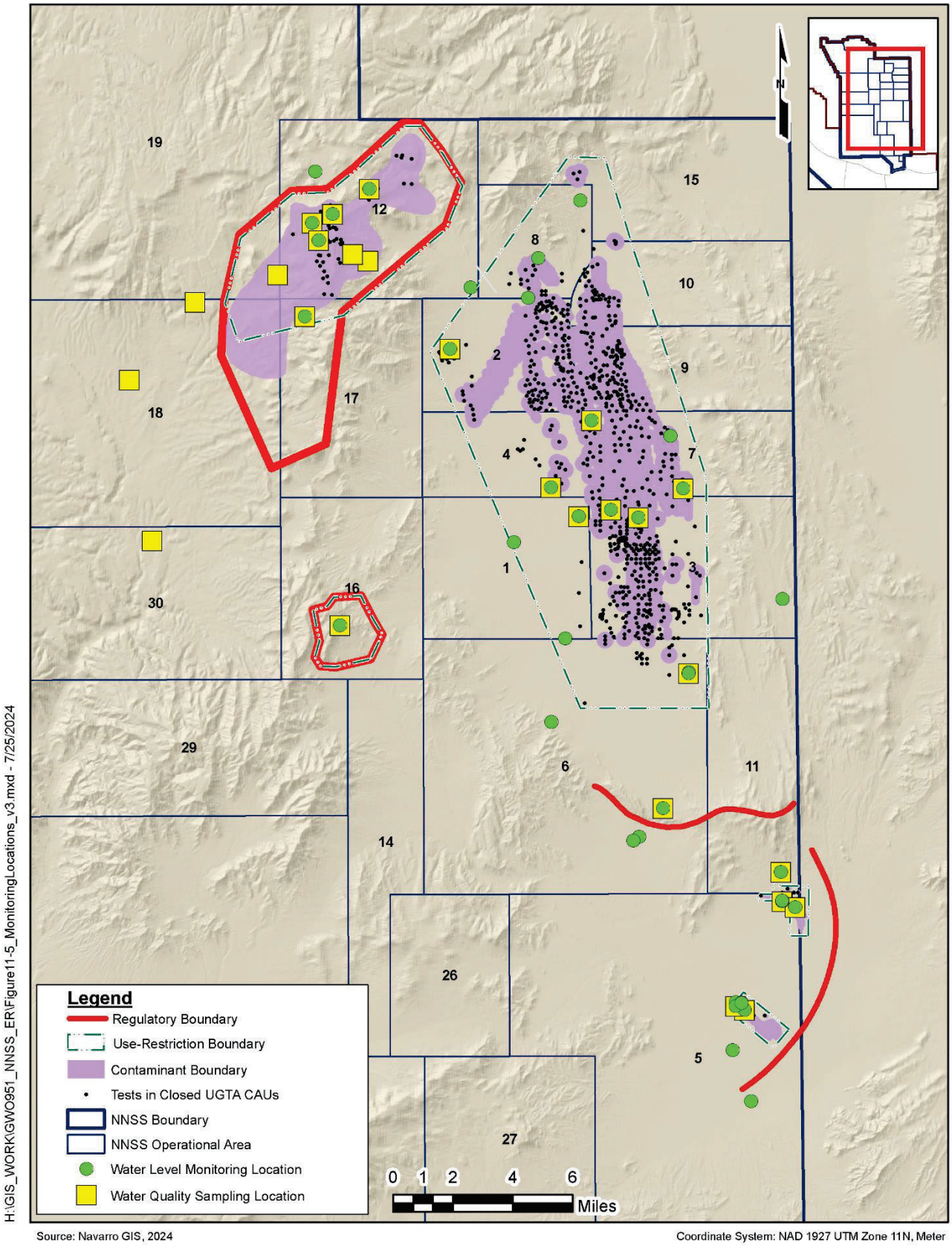


Figure 11-6. Boundaries and monitoring wells for closed UGTA CAUs

11.3.1.2 Rainier Mesa/Shoshone Mountain Corrective Action Unit 99

The closure report for the Rainier Mesa/Shoshone Mountain CAU (comprising 66 CASs) was approved by NDEP in 2020 (EM Nevada Program 2020b). The regulatory boundary objective for Rainier Mesa is to protect receptors of groundwater from radionuclide contamination within the three downgradient groundwater basins that receive recharge from Rainier Mesa (Pahute Mesa-Oasis Valley, Ash Meadows, and Alkali Flat-Furnace Creek). The regulatory boundary objective for Shoshone Mountain is to verify that radionuclide contamination does not reach the LCA (i.e., the regional aquifer) below Shoshone Mountain.

The monitoring network includes 16 locations, of which seven are sampled for radionuclides and measured for water levels, seven for sampling only, and two for water levels only. Sampling for ***tritium*** is required every 6 years at all locations and for additional radionuclides at three locations that access the tunnels where testing took place. Water-level measurements are required annually. Sampling results, presented in Chapter 5, are consistent with the current understanding of the groundwater flow as well as the forecasted contaminant boundaries for this CAU (Figure 11-6). All monitoring results indicate that the regulatory boundary objective has been met (EM Nevada Program 2021a).

11.3.1.3 Yucca Flat/Climax Mine Corrective Action Unit 97

The closure report for the Yucca Flat/Climax Mine CAU (comprising 720 CASs) was approved by NDEP in 2020 (EM Nevada Program 2020a). The regulatory boundary objective for the Yucca Flat/Climax Mine CAU is to verify that radionuclide contamination from this CAU is contained within the Yucca Flat basin, thus not impacting the LCA beneath Frenchman Flat or downgradient receptors. The regulatory boundary aligns with the southern extent of the Yucca Flat hydrographic basin (Basin 159; Nevada Division of Water Resources 2024) and supports the regulatory boundary objective.

The post-closure monitoring network for this CAU includes 26 locations, nine of which are sampled for radionuclides (i.e., tritium) and water levels, one for sampling only, and 16 for water levels only. Eight wells in Yucca Flat and one well in Frenchman Flat are sampled every 6 years, and one well in Yucca Flat will be sampled annually for 6 years (2020 through 2025). These wells access the LCA, which is a regional aquifer and the only pathway out of Yucca Flat (Navarro 2019). Water-level measurements are made annually. Sampling results, presented in Chapter 5, are consistent with the current understanding of the groundwater flow as well as the forecasted contaminant boundaries for this CAU (Figure 11-6). All monitoring results indicate that the regulatory boundary objective has been met (EM Nevada Program 2021b).

11.3.2 Industrial Sites and Soils

As of December 31, 2023, environmental corrective actions are complete at 2,104 Industrial Sites and Soils CASs on the NNSS, NTTR, and TTR. Characterization and closure of these CASs were completed in accordance with the FFACO (1996, as amended). Closure strategies include removal of debris, excavation of soil, decontamination and decommissioning of facilities, and ***closure in place*** with subsequent monitoring. The contaminants of concern include hazardous chemicals/materials, unexploded ordnance, and low-level radiological materials. Clean closures are those where pollutants, hazardous materials, radiological materials, and ***solid wastes*** have been removed and properly disposed, and where removal of all contaminants to concentrations agreed upon between DOE and NDEP is verified in accordance with corrective action plans approved under the FFACO. Closure in place entails the stabilization or isolation of pollutants, hazardous materials, radiological materials, and solid wastes – with or without partial treatment, removal activities, and/or post-closure monitoring – in accordance with corrective action plans approved under the FFACO. Radioactive materials removed from sites were either disposed as ***low-level waste*** or ***mixed low-level waste*** at the Area 5 Radioactive Waste Management Site (Section 10.1). Solid waste (e.g., demolition debris) containing asbestos is disposed at the Area 9 U10c Solid Waste Landfill. ***Hazardous waste*** removed from CASs is shipped to approved offsite treatment and disposal facilities or recycled. Post-closure monitoring requirements are established as needed to provide for the long-term protection of the public and the environment.

During 2023, 134 CASs within 67 FFACO Soils and Industrial Sites CAUs on the NNSS had post-closure inspection requirements and 13 CASs (in seven CAUs) were inspected as required by the RCRA Part B Permit (NNSA/NFO 2023). Inspection frequencies (such as annually, every 5 years, or following a rain event) for non-RCRA CAUs are identified in the Use Restriction for each CAU and requirements for RCRA CAUs are detailed in the RCRA Part B Permit. In 2023, the EM Nevada Program conducted 94 inspections of closed non-RCRA CASs managed under the FFACO, and 35 inspections in total were performed at CASs within the seven CAUs identified in the RCRA Part B Permit. In 2023, annual inspection reports for FFACO (EM Nevada Program 2023c) and RCRA Permit (EM Nevada Program 2023d) post-closure sites on the NNSS were prepared and submitted to NDEP.

11.3.3 Environmental Management Nevada Program Public Outreach

In 2023, the EM Nevada Program conducted many public outreach activities in partnership with its Environmental Program Services contractor, Navarro Research and Engineering, Inc. This includes a variety of community outreach events designed to educate and inform the public. Emphasis was placed on fostering science, technology, engineering, and math (STEM) learning for local students. The EM Nevada Program partnered with Clark County schools and the Atomic Museum to provide a demonstration at a 'STEM Saturday' event. The demonstration featured an interactive display of groundwater movement for youth participants. The EM Nevada Program also hosted a groundwater demonstration for 90 students at Sunrise Acres Elementary School in Las Vegas, an educational groundwater booth for a Star Wars-themed May the Science Be With You event at the Atomic Museum, and a similar educational demonstration in Pahrump, Nevada, for Earth Day.

A major highlight for 2023 was the awarding of Navarro Education Grants. The grant program, in its third year, was created to support educational activities related to STEM learning in communities near the NNSS. Navarro received a record number of applications in 2023 and, of the grants selected, four of the five were fully funded for the requested amounts. In total, Navarro awarded nearly $16,000 in CY 2023 for the advancement of STEM learning throughout Nevada. This brings the total investment since the inception of this grant to more than $37,000. Navarro representatives visited two past grant winners in 2023, including 2022 grant recipient Walter Bracken STEAM Academy, which used its funding to purchase Spheros robots to learn coding skills[6]. Navarro also visited a farmers market attended by students from Lied STEM Academy. Students sold produce grown using a hydroponics system purchased with grant funding[7].

The EM Nevada Program successfully hosted four Low-Level Waste Stakeholders Forum meetings, six Intergovernmental Liaison meetings, and six NSSAB public meetings. The NSSAB provided informed recommendations in 2023 on topics covered during public meetings that included enhancements to the Groundwater Open House; revegetation of EM sites; improvement and refinement of the groundwater sampling plan; developing Radioactive Waste Acceptance Program facility evaluation schedules; and improvements to the annual update presentation for CAUs at the Pahute Mesa groundwater region. NSSAB meeting agendas, handouts, minutes, and recommendations are posted on the NNSS website[8].

The NSSAB also held an extensive membership recruitment drive for new Board members. This included efforts to attract applicants from Pahrump, Alamo, Amargosa Valley, the Las Vegas Valley, Goldfield, Tonopah, and Beatty, Nevada, as well as from the communities of Shoshone and Tecopa in California. The EM Nevada Program produced a variety of print and media advertising distributed in these regions and posted on social media for months to bolster recruitment. Navarro representatives also advertised recruitment efforts at numerous events, making two appearances each at Amargosa Valley and Beatty town boards and Nye County Commission meetings. One of the Nye County visits was featured in the *Pahrump Valley Times*[9]. In addition, Tiffany Gamero with the EM Nevada Program was interviewed about the NSSAB on the Nye County television news station, KPVM TV channel 25[10].

[6] https://youtu.be/uLt8x_YlnH8
[7] https://youtu.be/xwmX95jB2zM
[8] https://nnss.gov/NSSAB/
[9] https://pvtimes.com/news/how-to-get-involved-with-former-test-sites-clean-up-126664/
[10] 01/02/2024 U.S. Department of Energy's Nevada Site Seeking Volunteers (youtube.com)

Throughout 2023, EM Nevada Program also facilitated multiple tours of the NNSS. EM Nevada Program scientists made numerous presentations, both virtually and in person, as part of the ongoing effort to share the details of the EM Nevada Program mission to stakeholders throughout the region.

11.4 References

Carle, S.F., A.F.B. Tompson, and M. Zavarin, 2021. *Review of Cavity Radius and Chimney Height Information for Underground Nuclear Tests at Nevada National Security Site*, LLNL-TR-818725. Livermore, CA: Lawrence Livermore National Laboratory.

EM Nevada Program, see U.S. Department of Energy, Environmental Management Nevada Program.

Federal Facility Agreement and Consent Order, 1996 (as amended March 2010). Agreed to by the State of Nevada; U.S. Department of Energy, Environmental Management; U.S. Department of Defense; and U.S. Department of Energy, Legacy Management. Appendix VI, which contains the Underground Test Area Strategy, was last modified June 2014, Revision No. 5.

FFACO, see *Federal Facility Agreement and Consent Order.*

Jackson, T.R., and R.J. Frus, 2023. *Evaluation of Potential Stresses and Hydrologic Conditions Driving Water-Level Fluctuations in Well ER-5-3-2, Frenchman Flat, Southern Nevada*: U.S. Geological Survey Scientific Investigations Report 2022–5132, 35 p., https://doi.org/10.3133/sir20225132.

Navarro, 2019. *Model Evaluation Report for Corrective Action Unit 97: Yucca Flat/Climax Mine, Nevada National Security Site, Nye County, Nevada*, Rev. 1, N/0002653--063. Las Vegas, NV.

Navarro, 2023a. *Report of the Peer Review Panel for the Pahute Mesa Groundwater Flow and Transport Model, Nevada National Security Site, Nevada*, Rev. 0, N/0002653--103. Las Vegas, NV.

Navarro, 2023b. *Response to Report of the Peer Review Panel for the Pahute Mesa Groundwater Flow and Transport Model, Nevada National Security Site, Nevada*, Rev. 0, N/0002653--105. Las Vegas, NV.

Navarro, 2024. *Risk Evaluation of Radionuclides in Groundwater for Corrective Action Units 101 and 102: Central and Western Pahute Mesa, Nye County, Nevada*, Rev. 2, N/0002653--106-REV. 2. Las Vegas, NV.

Nevada Division of Water Resources, 2024. "Hydrographic Regions and Basins" As accessed at http://water.nv.gov/hydrographicregions.aspx

NNSA/NFO, see U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office.

U.S. Department of Energy, Environmental Management Nevada Program, 2019. *Underground Test Area Activity Preemptive Review Guidance Nevada National Security Site, Nevada*, Rev. 0, DOE/EMNV--0003; Revision to DOE/NV--1552. Las Vegas, NV.

———, 2020a. *Underground Test Area (UGTA) Closure Report for Corrective Action Unit 97: Yucca Flat/Climax Mine, Nevada National Security Site, Nevada*, Rev. 0, DOE/EMNV--0021. Las Vegas, NV.

———, 2020b. *Underground Test Area (UGTA) Closure Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Nevada National Security Site, Nevada*, Rev. 1, DOE/EMNV-0012, March 2020. Las Vegas, NV .

———, 2021a. *Calendar Year 2020 Post-Closure Monitoring Report for Corrective Action Unit 99: Rainier Mesa/Shoshone Mountain, Underground Test Area, Nevada National Security Site, Nevada,* Rev. 1, DOE/EMNV--0028. Las Vegas, NV.

———, 2021b. *Closure Monitoring Report for Corrective Action Unit 97: Yucca Flat/Climax Mine, Underground Test Area, Nevada National Security Site, Nevada,* Rev. 1, DOE/EMNV--0024. Las Vegas, NV.

———, 2021c. *Final Closure Report (CR) for Corrective Action Unit (CAU) 577: Area 5 Chromium Containing Waste Disposal Cells, Nevada National Security Site, Nevada*, Revision 0, DOE/EMNV--0030. Las Vegas, NV.

———, 2021d. *Streamlined Approach for Environmental Restoration (SAFER) Plan for Corrective Action Unit 114: EMAD Facility, Nevada National Security Site, Nevada*, Rev. 0, DOE/EMNV--0029. Las Vegas, NV.

———, 2021e. *Streamlined Approach for Environmental Restoration (SAFER) Plan for Corrective Action Unit 572: Test Cell C Ancillary Building and Structures, Nevada National Security Site, Nevada*, Rev. 0, DOE/EMNV--0026. Las Vegas, NV.

———, 2022a. *Addendum to the Closure Report for Corrective Action Unit 577: Area 5 Chromium Containing Waste Disposal Cells, Nevada National Security Site, Nevada*, Rev. 0, DOE/EMNV--0030-ADD. Las Vegas, NV.

———, 2022b. *Corrective Action Unit 98: Frenchman Flat Five-Year Evaluation Nevada National Security* Site, Nevada, Rev. 1, DOE/EMNV--0035. Las Vegas, NV.

———, 2022c. *Groundwater Flow and Contaminant Transport Model of Corrective Action Units 101 and 102: Central and Western Pahute Mesa, Nye County, Nevada*, Rev. 1, DOE/EMNV--0039. Las Vegas, NV .

———, 2023a. *Calendar Year 2022, Post-Closure Monitoring (PCM) Letter*, 1 May. Las Vegas, NV.

———, 2023b. *Addendum 2 to the Closure Report for Corrective Action Unit 577: Area 5 Chromium Containing Waste Disposal Cells, Nevada National Security Site, Nevada*, Rev. 0, DOE/EMNV--0030-ADD. Las Vegas, NV.

———, 2023c. *Non-Resource Conservation and Recovery Act Corrective Action Unit (CAU) Post-Closure Inspection Report, Nevada National Security Site, Nevada For Calendar Year 2022*, Rev. 0, DOE/EMNV--0044. Las Vegas, NV.

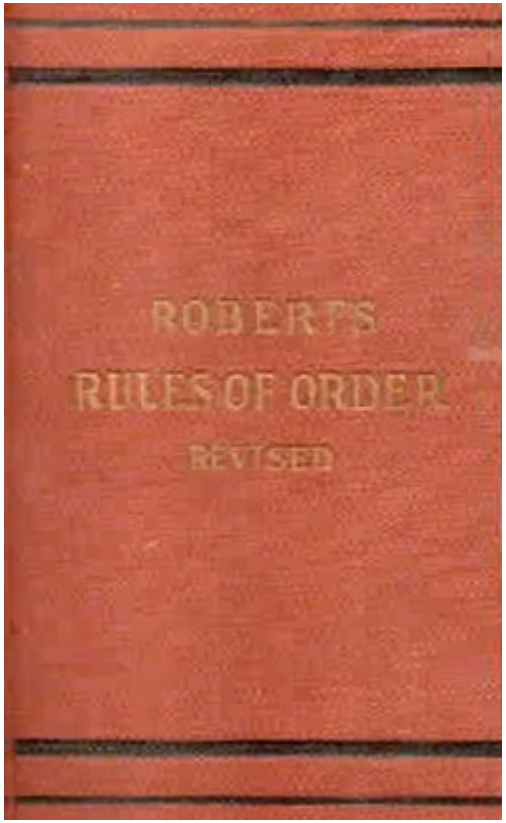
———, 2023d. *Post-Closure Report for Closed Resource Conservation and Recovery Act Corrective Action Units, Nevada National Security Site, Nevada For Calendar Year 2022*, Rev. 0, DOE/EMNV--0046. Las Vegas, NV.

———, 2024. *Corrective Action Decision Document/Corrective Action Plan for Corrective Action Units 101 and 102: Central and Western Pahute Mesa Nevada National Security Site, Nevada*, Rev. 1, DOE/EMNV--0048. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office, 2016. *Underground Test Area (UGTA) Closure Report for Corrective Action Unit 98: Frenchman Flat, Nevada National Security Site, Nevada,* Rev. 1, DOE/NV--1538-Rev. 1. Las Vegas, NV.

U.S. Department of Energy, National Nuclear Security Administration Nevada Field Office, Nevada National Security Site 2023. *RCRA Permit for a Hazardous Waste Management Facility (NEV HW0101)*. Las Vegas, NV.

Robert's Rules



Frank Bonesteel, NSSAB Liaison
January 8, 2025

Robert's Minimum

- To introduce (motion.)
- To change a motion (amend.)
- To adopt (accept a report without discussion.)
- To adjourn (end the meeting.)

Robert's Basics

- Motion
- Postpone Indefinitely
- Amend
- Commit
- Question
- Table
- Adjourn

Robert's Recap

A main motion must be moved, seconded, and stated by the chair before it can be discussed.

- **If you want to move, second, or speak to a motion,** *be recognized and address the chair.*
- **If you approve the motion as is**, *vote for it*.
- **If you disapprove the motion**, *vote against it*.
- **If you approve the idea of the motion but want to change it**, *amend it or submit a substitute for it*.
- **If you want advice or information to help you make your decision**, *move to refer the motion to an appropriate quorum or committee with instructions to report back.*
- **If you feel they can handle it better than the assembly**, *move to refer the motion to a quorum or committee with power to act*.
- **If you feel that there the pending question(s) should be delayed so more urgent business can be considered**, *move to lay the motion on the table*.

Robert's Recap 2

- **If you want time to think the motion over**, *move that consideration be deferred to a certain time*.
- **If you think that further discussion is unnecessary**, *move the previous question*.
- **If you think that the assembly should give further consideration to a motion referred to a quorum or committee**, *move the motion be recalled*.
- **If you think that the assembly should give further consideration to a matter already voted upon**, *move that it be reconsidered*.
- **If you do not agree with a decision rendered by the chair**, *appeal the decision to the assembly*.
- **If you think that a matter introduced is not germane to the matter at hand**, *a point of order may be raised*.
- **If you think that too much time is being consumed by speakers**, *you can move a time limit on such speeches*.
- **If a motion has several parts, and you wish to vote differently on these parts**, *move to divide the motion*.

IN THE MEETING

TO INTRODUCE A MOTION:
Stand when no one else has the floor.
Address the Chair by the proper title.
Wait until the chair recognizes you.

- Now that you have the floor and can proceed with your motion say "I move that...," state your motion clearly and sit down.
- Another member may second your motion. A second merely implies that the seconder agrees that the motion should come before the assembly and not that he/she is in favor of the motion.
- If there is no second, the Chair says, "The motion is not before you at this time." The motion is not lost, as there has been no vote taken.
- If there is a second, the Chair states the question by saying "It has been moved and seconded that ...(state the motion). . ., is there any discussion?"

DEBATE OR DISCUSSING THE MOTION:

- The member who made the motion is entitled to speak first.
- Every member has the right to speak in debate.
- The Chair should alternate between those "for" the motion and those "against" the motion.
- The discussion should be related to the pending motion.
- Avoid using a person's name in debate.
- All questions should be directed to the Chair.
- Unless there is a special rule providing otherwise, a member is limited to speak once to a motion.
- Asking a question or a brief suggestion is not counted in debate.
- A person may speak a second time in debate with the assembly's permission.

VOTING ON A MOTION:

- Before a vote is taken, the Chair puts the question by saying "Those in favor of the motion that ... (repeat the motion)... say "Aye." Those opposed say "No." Wait, then say "The motion is carried," or "The motion is lost."
- Some motions require a 2/3 vote. A 2/3 vote is obtained by standing
- If a member is in doubt about the vote, he may call out "division." A division is a demand for a standing vote.
- A majority vote is more than half of the votes cast by persons legally entitled to vote.
- A 2/3 vote means at least 2/3 of the votes cast by persons legally entitled to vote.
- A tie vote is a lost vote, since it is not a majority.

PARLIAMENTARY PROCEDURE AT A GLANCE

		Debatable	Amendable	Can Be Reconsidered	Requires 2/3 Vote
Privileged Motions	Fix Time at Which to Adjourn	No	Yes	No	No
	Adjourn	No	No	Yes	No
	Question of Privilege	No	Yes	Yes	No
	Call for Order of Day	No	No	Yes	No
Incidental Motions	Appeal	Yes	No	Yes	No
	Objection to Consideration of a Question	No	No	Yes	Yes
	Point of Information	No	No	No	No
	Point of Order	No	No	No	No
	Read Papers	No	No	Yes	No
	Suspend the Rules	No	No	No	Yes
	Withdraw a Motion	No	No	Yes	No
Subsidiary Motions	Lay on the Table	No	No	Yes	No
	The Previous Question (close debate)	No	No	Yes	Yes
	Limit or Extend Debate	No	Yes	Yes	Yes
	Postpone to a Definite Time	Yes	Yes	Yes	No
	Refer to Committee	Yes	Yes	Yes	No
	Amend the Amendment	Yes	No	No	No
	Amendment	Yes	Yes	Yes	No
	Postpone Indefinitely	Yes	No	Yes	No
Main Motion	Main or Procedural Motion	Yes	Yes	Yes	No

This table presents the motions in order of precedence. Each motion takes precedence over (i.e. can be considered ahead of) the motions listed below it. No motion can supersede (i.e. be considered before) any of the motions listed above it.

PLEASE NOTE: many organizations use only the Main Motion and Subsidiary Motions, handling other matters on an informal basis.

PARLIAMENTARY PROCEDURE AT A GLANCE

TO DO THIS	YOU SAY THIS	MAY YOU INTERRUPT SPEAKER	MUST YOU BE SECONDED	IS MOTION DEBATABLE	WHAT VOTE REQUIRED
Adjourn meeting*	I move that we adjourn	No	Yes	No	Majority
Recess meeting	I move that we recess until...	No	Yes	No	Majority
Complain about noise, room temperature, etc.*	Point of privilege	Yes	No	No	No vote
Suspend further consideration of something*	I move we table it	No	Yes	No	Majority
End debate	I move the previous question	No	Yes	No	2/3 vote
Postpone consideration of something	I move we postpone this matter until...	No	Yes	Yes	Majority
Have something studied further	I move we refer this matter to committee	No	Yes	Yes	Majority
Amend a motion	I move this motion be amended by...	No	Yes	Yes	Majority
Introduce business (a primary motion)	I move that...	No	Yes	Yes	Majority
Object to procedure or personal affront*	Point of order	Yes	No	No	No vote, Chair decides
Request information	Point of information	Yes	No	No	No vote
Ask for actual count to verify voice vote	I call for a division of the house	No	No	No	No vote
Object consideration of undiplomatic vote*	I object to consideration of this question	Yes	No	No	2/3 vote
Take up a matter previously tabled*	I move to take from the table...	No	Yes	No	Majority
Reconsider something already disposed of*	I move we reconsider our action relative to...	Yes	Yes	Yes	Majority
Consider something already out of its schedule*	I move we suspend the rules and consider	No	Yes	No	2/3 vote
Vote on a ruling by the Chair	I appeal the Chair's decision	Yes	Yes	Yes	Majority

*Not amendable

AMENDMENTS ILLUSTRATED

Any main motion or resolution may be amended by:

1. Adding at the end
2. Striking out a word or words
3. Inserting a word or words
4. Striking out and inserting a word or words
5. Substitution

A member rises, addresses the chair, receives recognition, and states the motion:

"I move that. . . "

MAIN MOTION

Another member seconds the motion.

The Chair repeats the motion and says, "Is there any discussion?"

Must be germane to the main motion

To improve the motion, a member rises, receives recognition and says, "I move to amend the motion by . . . "

PRIMARY AMENDMENT

Another member seconds the amendment.

The Chair repeats the amendment and says, "Is there any discussion on the amendment?"

Must be germane to the primary amendment

To improve the amendment, a member rises, receives recognition, and says, "I move to amend the amendment by . . . "

SECONDARY AMENDMENT
(not amendable)

Another member seconds the amendment.

The Chair repeats the amendment to the amendment and says, "Is there any discussion on the amendment to the amendment?"

- When discussion ceases, the Chair says, "Those in favor of the amendment to the amendment say 'Aye.' Those opposed say 'No.'"
- If the vote was in the affirmative, the amendment is included in the primary amendment. The Chair then says, "Is there any discussion on the amended amendment?"
- If there is no discussion, a vote is taken on the amended amendment. If the vote in the affirmative, the amendment is included in the main motion. The chair then says, "Is there any discussion on the amended motion?"
- At this place, the motion can again be amended.
- If there is no further discussion, a vote is taken on the amended motion.
- Even though the amendments carried in the affirmative, the main motion as amended can be defeated.