Nevada National Security Site and Waste Management Activities

A large, geographically diverse outdoor laboratory used for national security programs and other research and development efforts; historically used for nuclear research, development and testing

- Big - 1,360 square miles
- Secure - Access to the site is controlled
- Remote - Surrounded by federally-owned land

Defense Experimentation and Stockpile Stewardship

Ensures the nation's nuclear weapons remain safe, secure, and reliable by conducting a wide range of experiments using advanced diagnostic technologies, many of which were developed at the Nevada National Security Site

Homeland Security and Defense Applications

Detecting and locating "dirty bombs," "loose nukes," and radiological sources; training first responders to confront a radiological or nuclear emergency

National Center for Nuclear Security

Proving ground for technologies used for treaty verification that must perform more accurately, reliably and at stand-off distances

Environmental Management

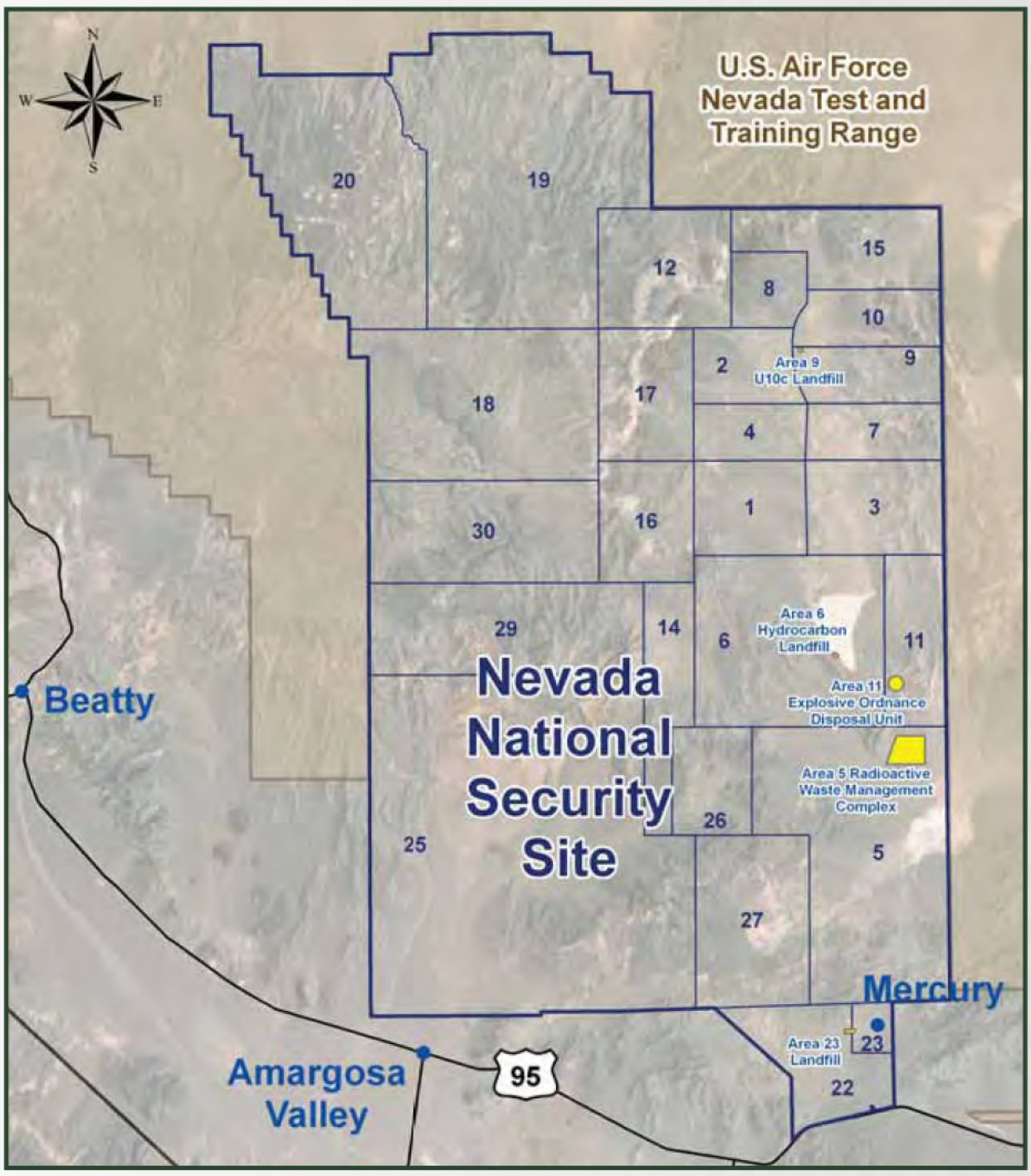
Addressing the environmental legacy from historic nuclear weapons-related activities, while ensuring the health and safety of workers, the public, and the environment

Safety

Performance

Cleanup

Closure



Highlighted areas are permitted waste management facilities in operation at the Nevada National Security Site

- U.S. Department of Energy (DOE) authority for managing the radioactive waste generated by this environmental legacy is within the Atomic Energy Act of 1954 (as amended)
- DOE sets forth specific requirements for radioactive waste management in DOE Order 435.1
- A federal law, the Resource Conservation and Recovery Act mandates how hazardous waste is managed
- State regulations stipulate the requirements for the disposal of sanitary waste and construction debris

National Nuclear Security Administration

Log No. 2012-119

What is Low-Level and Mixed Low-Level Radioactive Waste and Where Does it Come From?

Safety
❖
Performance
❖
Cleanup
❖
Closure

Low-Level Waste:

Radioactive waste that is ***not*** high-level radioactive waste, spent nuclear fuel, transuranic waste or by-product materials, such as mill tailings.

Radioactive waste disposed in cell 20 at the Area 5 Radioactive Waste Management Site

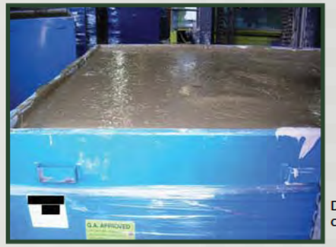
Area 5 Radioactive Waste Management Site disposal activities using cranes

Mixed Low-Level Waste:

A "mix" of both low-level radioactive waste and hazardous waste. These wastes are considered hazardous because they are toxic, corrosive, reactive, ignitable, or specifically identified by the U.S. Environmental Protection Agency as "hazardous." Mixed low-level waste shall meet the land disposal restrictions as listed in Title 40 CFR 268

Debris waste being loaded into a 55-gallon container

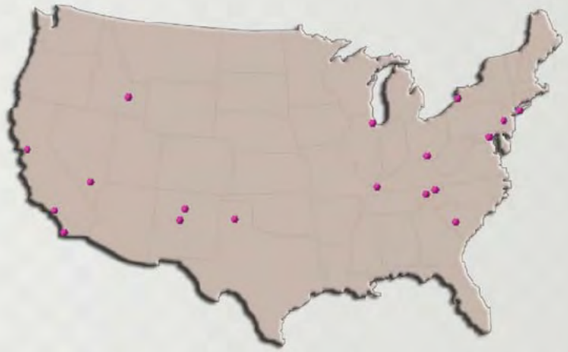
On-site waste stabilized to meet land disposal restrictions



Debris waste covered with grout

Where Does the Waste Come From?

- Waste disposed at the Nevada National Security Site (NNSS) is generated during facility operations and environmental cleanup activities
- Generators of this waste are the NNSS and other sites within "the nuclear weapons complex," a vast research, production, and testing network that supported the United States in the nuclear arms race
- 5% of the waste generated throughout the Department of Energy Complex is disposed at the NNSS
- 86% of the waste is disposed at the generating site. The remaining percentage of waste is commercially disposed



• Approved low-level/mixed low-level radioactive waste generator locations

National Nuclear Security Administration

Log No. 2012-120

Considerations for Disposing LLW/MLLW at the NNSS

A number of factors must be explored before the Nevada National Security Site (NNSS) will consider accepting off-site-generated low-level waste (LLW) or mixed low-level waste (MLLW) for disposal. It is important to note that waste must comply with the NNSS Waste Acceptance Criteria (WAC) in order to be accepted for disposal at the NNSS. If waste cannot meet the WAC, the waste will be rejected.

Low-Level or Mixed Low-Level Radioactive Waste

- ***Safety***
- ***Performance***
- ***Cleanup***
- ***Closure***

Is LLW/MLLW generated by DOE or DOD*?

- No → Must use a facility other than NNSS

Waste Control Specialists, TX

- Yes ↓

Can generators dispose waste on site?

- Yes → Dispose waste at generator site

Oak Ridge, TN

- No ↓

Is waste DOE or DOD classified?

- Yes → Does waste meet the NNSS WAC?
  - Yes → Use NNSS disposal option

- No ↓

Can commercial facility accept waste?

- No → Does waste meet the NNSS WAC?
  - Yes → Use NNSS disposal option
  - No ↓
- Yes ↓

Is commercial option the most financially responsible?

- Yes → Use commercial disposal option

Clive, UT

- No ↓

*DOE/DOD - U.S. Department of Energy/U.S. Department of Defense

National Nuclear Security Administration

Log No. 2012-114

Nevada National Security Site (NNSS) Waste Acceptance Activities

Safety
❖
Performance
❖
Cleanup
❖
Closure

NNSS Waste Acceptance Criteria (WAC)

- Set of guidelines and requirements designed to protect workers, the public and the environment
- Incorporates requirements set forth by the U.S. Department of Transportation, the *Resource Conservation and Recovery Act* (RCRA), and other federal and state laws and regulations
- Compliance with criteria must be demonstrated by generators of low-level/mixed low-level radioactive waste in order to submit documentation requesting disposal at the NNSS
  - Criteria include: waste characterization, quality assurance policies, and practices associated with waste inspection, packaging, shipping, and disposal

Waste Acceptance Review Panel

- Reviews and makes recommendations for approval of generator programs and low-level/mixed low-level waste streams
- Comprised of Radioactive Waste Acceptance Program (RWAP) personnel, Area 5 Radioactive Waste Management Site (RWMS) Disposal Operations supervisors, and the State of Nevada Division of Environmental Protection
- Experts in the areas of quality assurance, waste traceability, radiological characterization/nuclear criticality, and RCRA characterization
- All Waste Acceptance Review Panel members must agree that the waste is acceptable for disposal before the DOE issues an approval

Waste Acceptance Process

- Generator programs are approved when the generator site operations, procedures, documentation and worker qualifications comply with RWAP standards
- Waste streams are approved when compliance with the NNSS WAC (waste origin, quantity, composition, packaging, and the analytical and preparatory methods used to characterize the waste) and applicable federal and state regulations and permits is demonstrated
- Waste is shipped to the NNSS Area 5 RWMS
  - Upon arrival, shipping documentation is compared with previously approved paperwork
  - Each truck/trailer/container is surveyed (in some cases, using on-site x-ray technology)
  - After final inspection, the label on the waste package is scanned before it is positioned within a grid system in one of the excavated disposal cells within the Area 5 RWMS

*** If at any point RWAP standards are not met, waste may be rejected and returned to the generator site**

National Nuclear Security Administration

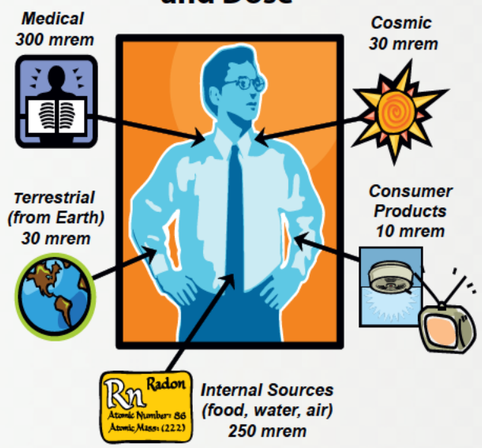
Log No. 2012-126

Radiation Basics

- The average person receives approximately 620 mrem of radiation per year from all sources
- The maximum legal radiation dose limit for a person whose profession permits exposure is 5,000 mrem per year

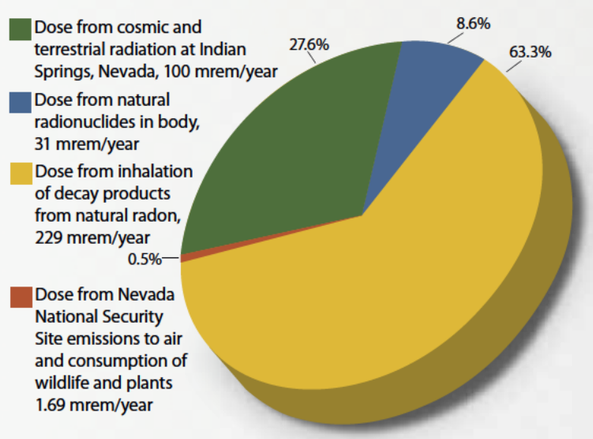
Safety ❖ Performance ❖ Cleanup ❖ Closure

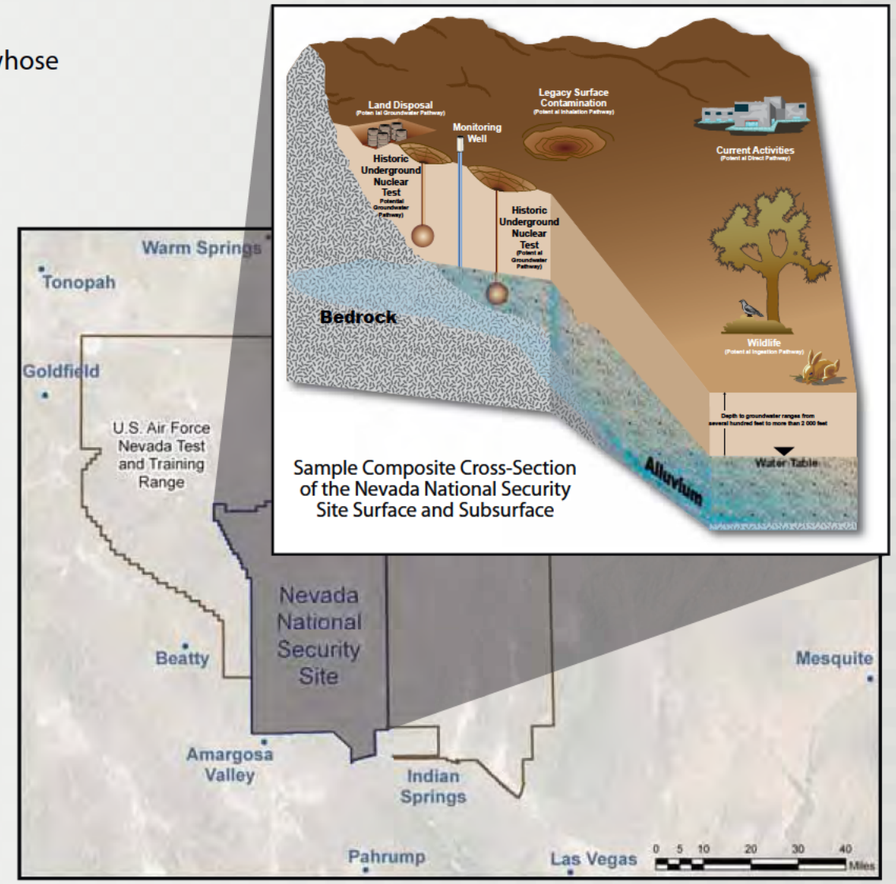
Average Annual Radiation Source and Dose



Source: National Council on Radiation Protection & Measurements Report No. 160, March 3, 2009

Percents of Total Dose to the Public from Natural Background Sources and from the Nevada National Security Site





Sample Composite Cross-Section of the Nevada National Security Site Surface and Subsurface

Potential Primary Exposure Pathways from Nevada National Security Site Activities (Past and Present)

Public Dose Limits

- ***10 mrem/year***
  Dose limit to the public (above natural background) from just the air transport pathway, as specified by the Clean Air Act National Emission Standards for Hazardous Air Pollutants
- ***100 mrem/year***
  Dose limit to the public (above natural background) from all possible pathways combined, as specified by U.S. Department of Energy Order 458.1, "Radiation Protection of the Public and the Environment."

- RAD (Radiation Absorbed Dose) is the amount of energy actually absorbed by a material, such as human tissue
- REM (Radiation Equivalent Man) measures the biological damage (dose) of the absorbed radiation
- A millirem (MREM) is one-thousandth of a REM

National Nuclear Security Administration

Log No. 2012-125

Waste Packaging and Public Safety

Safety

❖

Performance

❖

Cleanup

❖

Closure

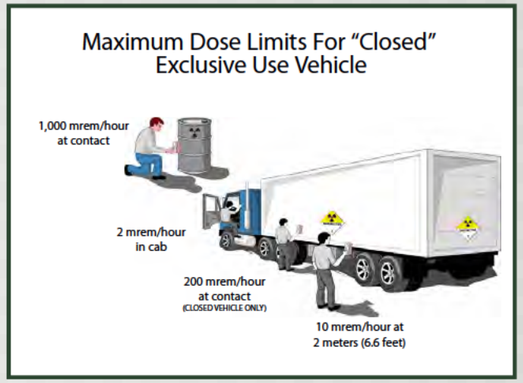
Packaging for Safety

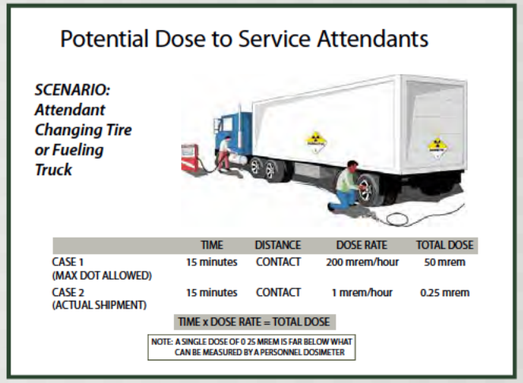
- All hazardous material packages must meet the general packaging requirements of 49 CFR 173.24. These requirements lay the foundation for all types of packaging and require that packages be designed, constructed, maintained, filled, and closed such that for transportation there will be no identifiable release of hazardous materials to the environment or impact to public safety.

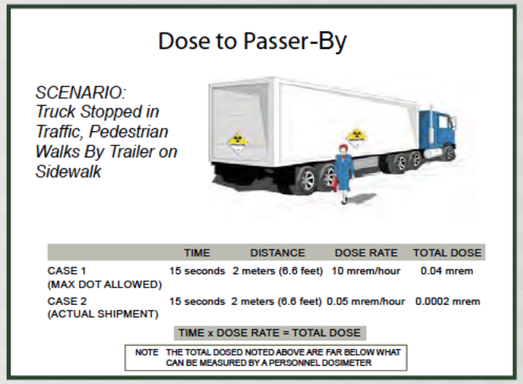
- Safety in transporting radioactive material primarily depends upon the use of the proper packaging for the type, quantity, and form of the radioactive material to be transported.

- Packaging design is performance based, with the packaging integrity being dictated by the hazards of the radioactive content. The packages/containers must pass or be capable of passing a series of performance tests specified by the U. S. Department of Transportation before they are authorized for the transport of hazardous materials.

U.S. Department of Transportation (DOT) Regulations







National Nuclear Security Administration

Log No. 2012-134

Routing Waste Shipments to the Nevada National Security Site (NNSS)

- Waste generators must comply with U.S. Department of Transportation (DOT) regulations, NNSS Waste Acceptance Criteria, and other applicable federal, state, and local regulations and requirements
  - Select routes based on minimizing radiological risk
  - Avoid O'Callaghan-Tillman Memorial Bridge and Las Vegas US-95/I-15 Interchange
  - Avoid heavily populated/congested areas in the state of Nevada (including the Las Vegas Beltway, I-215)
  - Avoid the Davis Dam (AZ-68 and NV-163)
  - Use northern route, I-80, during summer months
  - Use southern routes during winter months, but divide shipments between CA-127 and NV-160
  - Direct drivers to complete the mandatory driver routing documentation
- Shipment routing reported quarterly and annually *(www.nv.energy.gov/emprograms/transportationreports.aspx)*
- DOT sets requirements for communicating shipment hazards through marking, labeling, shipping papers, and placarding

Safety ❖ **Performance** ❖ **Cleanup** ❖ **Closure**

In fiscal year 2011, a total of 2,388 low-level/mixed low-level radioactive waste shipments were transported to the NNSS. Shipments traveled through the following communities† and the corresponding percentage is based on number of shipments:

Amargosa Valley: 18%	Baker, CA: 15%
Barstow, CA: 14%	Beatty: 16%
Ely: 15%	Goldfield: 16%
Kingman, AZ: 70%	Laughlin: 3%
Needles, CA: 67%	Pahrump: 82%
Searchlight: 70%	Shoshone, CA: 13%
Tonopah: 16%	West Wendover: 9%

†One shipment may travel through multiple communities

Transportation Working Group

- Provides forum for information exchange related to low-level and mixed low-level waste transportation to the NNSS
- Initially established in 1994; reviewed 1996 Draft Environmental Impact Statement
- Re-convened in 2011 to review the Draft Site-Wide Environmental Impact Statement
- Group to re-convene as-needed, to address transportation related topics

During fiscal years 1999 through 2011, a total of 21,297 low-level/mixed low-level radioactive waste shipments traveled to the NNSS. Of these shipments, seven (7) were involved in an incident*. There was no release of radioactive material during any of these incidents.

A summary of these incidents is available on-line at www.nv.energy.gov/emprograms/pdfs/TWG%20Combo.pdf#page=23

National Nuclear Security Administration

Log No. 2012-124

Shipment Acceptance and Waste Disposal at the Nevada National Security Site (NNSS)

Long before any low-level/mixed low-level radioactive waste can be shipped to and disposed at the NNSS Area 5 Radioactive Waste Management Site (RWMS), several rigorous reviews, inspections and certification processes must be conducted to ensure that everything – from characterization, packaging and transportation to disposal and monitoring – is in accordance with stringent nuclear safety requirements and NNSS Waste Acceptance Criteria

- Following reviews, generators must obtain U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office formal approval for each specific waste stream before shipping to the NNSS for disposal
- Waste may be rejected and returned to the generator if anything is found to be out of compliance with NNSS Waste Acceptance Criteria

Safety

❖

Performance

❖

Cleanup

❖

Closure

- Upon arrival, shipping papers are checked against approved waste stream documentation
- Visual inspections are conducted to ensure security seals are in place, and waste packages are intact and appropriately labeled

- Once a shipment is unloaded in the appropriate disposal cell, the waste package is scanned and positioned within a grid system
- Empty trucks/trailers are again surveyed to ensure stringent release requirements are met

- Radiological surveys are conducted on each shipment before granting access to disposal cells

The Area 5 RWMS is comprised of excavated disposal cells that range from 12 to 48 feet deep

Radiation control technicians analyze radiological survey samples of shipments taken upon arrival at the Area 5 RWMS and prior to release to ensure compliance with federal regulations for the safety of the public, workers, and the environment

National Nuclear Security Administration

Log No. 2012-127

Nevada National Security Site (NNSS) Low-Level/ Mixed Low-Level Radioactive Waste Disposal Volumes

Safety ❖ Performance ❖ Cleanup ❖ Closure

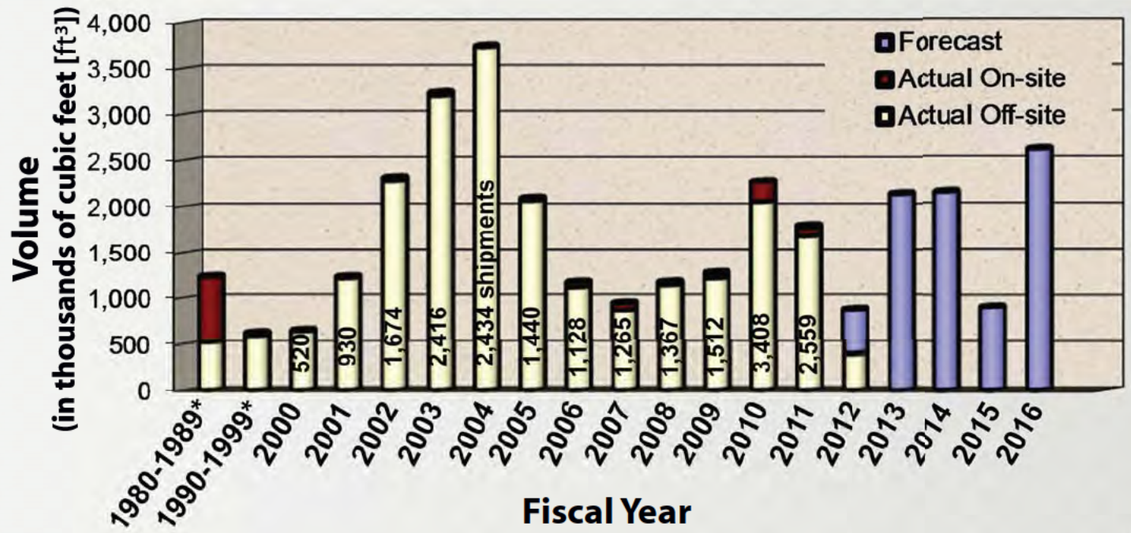
Volume of low-level/mixed low-level radioactive waste disposed at the NNSS since its peak in fiscal year (FY) 2004

- **FY 2004** – 3,743,292 ft³
- **FY 2005** – 2,089,028 ft³
- **FY 2006** – 1,172,949 ft³
- **FY 2007** – 943,824 ft³
- **FY 2008** – 1,174,656 ft³
- **FY 2009** – 1,273,468 ft³
- **FY 2010** – 2,347,052 ft³
- **FY 2011** – 1,766,254 ft³
- **FY 2012** – 468,327 ft³ (as of April 29, 2012)

Forecasted volume of low-level/mixed low-level radioactive waste anticipated for NNSS disposal in Fiscal Years (FY) 2012-2016

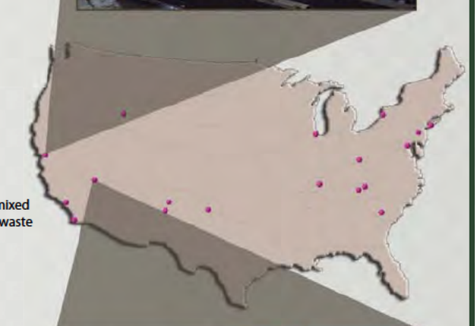
- **FY 2012** – 944,542 ft³
- † **FY 2013** – 2,136,626 ft³
- † **FY 2014** – 2,151,135 ft³
- † **FY 2015** – 906,904 ft³
- † **FY 2016** – 2,621,194 ft³

† Out-year forecasts per **EM/HQ Baseline Low-Level Waste Disposition Database,** maintained by Florida International University



* Annual average for 10-year period

Dismantlement of the Bevatron Facility at Lawrence Berkeley National Lab generated low-level radioactive waste



• Approved low-level/mixed low-level radioactive waste generator locations

Low-level radioactive waste generated by the dismantlement of the Bevatron Facility is disposed at the NNSS Area 5 Radioactive Waste Management Site

HISTORICAL PERSPECTIVE

1950s	1960s	1970s	1980s	1990s	2000 - 2012
First atmospheric nuclear test conducted (1951).	Limited Test Ban Treaty (1963) moves nuclear testing underground.	U.S. and U.S.S.R. sign treaties (1974 and 1976) limiting nuclear tests to less than 150 kilotons.	U.S. and U.S.S.R. perform first joint verification of underground nuclear yield test (1988).	Moratorium on nuclear testing (1992) and Stockpile Stewardship (1994) begins.	Expansion of Stockpile Stewardship experiments and National Center for Combating Terrorism established.
Nuclear test activities generate radioactive waste Radioactive waste consolidated in fenced areas at the NNSS	First radioactive waste trench (Sugar Bunker) excavated in Area 5 Radioactive waste first disposed in a subsidence crater at the NNSS Cleanup begins on atmospheric testing areas	Cleanup begins on tunnel testing areas Radioactive waste management program officially established at NNSS Low-level radioactive waste from other U.S. Department of Energy and U.S. Department of Defense sites is disposed at NNSS	Radioactive waste collected in fenced areas during the 1950s is disposed Off-site generated mixed low-level radioactive waste is first accepted for disposal Radioactive waste is disposed in deep boreholes at NNSS	State of Nevada prohibits the disposal of mixed low-level radioactive waste generated outside the state A Low-Level Waste Joint Oversight Agreement covering NNSS disposal activities is entered into with the state of Nevada Radioactive-contaminated asbestos disposal begins	NNSS is identified as one of two regional disposal sites for low-level and mixed low-level radioactive waste Forecasted disposal volumes begin to decline as closure is achieved at U.S. Department of Energy sites State of Nevada removes restriction on NNSS disposal of mixed low-level waste generated outside the state U.S. Department of Energy nuclear weapons-related facilities accelerate cleanup of their sites using American Recovery and Reinvestment Act funds State of Nevada issues new Resource Conservation and Recovery Act Part B Permit for NNSS disposal of mixed wastes
On-site waste is consolidated (No disposal)	212,776 cubic feet	1,290,902 cubic feet	12,683,370 cubic feet	6,315,764 cubic feet	22,072,555 cubic feet (as of April 29, 2012)

National Nuclear Security Administration

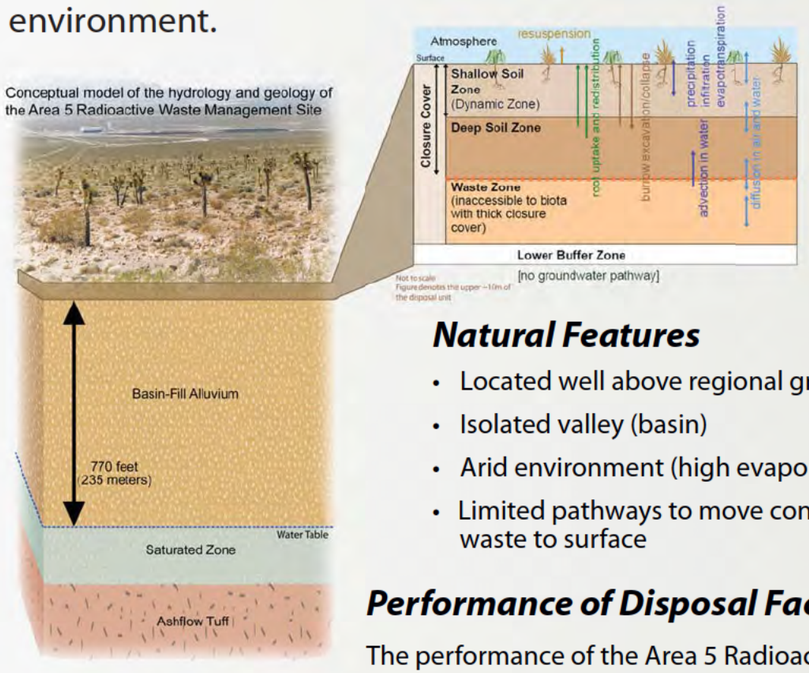
Log No. 2012-122

Nevada National Security Site Disposal Facility Attributes

The Area 5 Radioactive Waste Management Site is considered one of the nation's most ideal disposal locations because of the site's **natural features**, state-of-the-art **design**, and outstanding **performance** (ability to safely isolate disposed waste). These elements play a vital role in maintaining the safety of workers, the public, and the environment.

Safety ❖ *Performance* ❖ *Cleanup* ❖ *Closure*

Conceptual model of the hydrology and geology of the Area 5 Radioactive Waste Management Site



A crew positions radioactive waste for disposal at the Area 5 Radioactive Waste Management Site

Natural Features

- Located well above regional groundwater levels
- Isolated valley (basin)
- Arid environment (high evaporation rates)
- Limited pathways to move contamination from buried waste to surface

Facility Design

- Engineered cells are used to dispose waste packages
- Waste packages are placed in a grid system to allow for long-term waste tracking
- Waste is buried below ground with a soil cover that prevents water from reaching the waste

Performance of Disposal Facility

The performance of the Area 5 Radioactive Waste Management Site is evaluated based on:

- A computer model of the disposal system that forecasts the potential release and movement of radionuclides within 1,000 years after the disposal site is closed. The model, referred to as a performance assessment, assesses:
  - The geologic and hydrologic setting of the disposal facility
  - Processes that could release (transport) radioactive waste
  - Current and future land uses
  - Facility features and closure design
  - The effects of natural processes (e.g. flooding, earthquakes) that could change the facility over 1,000 years
  - Expected waste inventories
- Demonstration that the disposal location meets all applicable regulations over 1,000 years (dose to the public for all exposure pathways, release of radon at the ground surface)

Waste transported into cell 20 at the Area 5 Radioactive Waste Management Site

The model results are documented in the *Performance Assessment* document. This document, along with the Waste Acceptance Criteria and Monitoring and Maintenance plans, must be in place before authorization to dispose low-level/mixed low-level waste is granted (under DOE Order 435.1, a *Disposal Authorization* must be issued to low-level waste disposal facilities).

National Nuclear Security Administration

Log No. 2012-135

Environmental Monitoring at the Disposal Facility

Safety

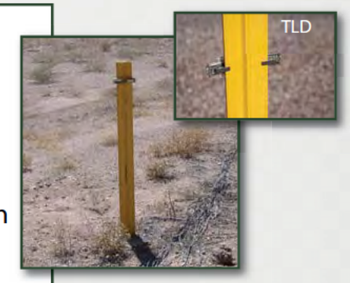
Performance

Cleanup

Closure

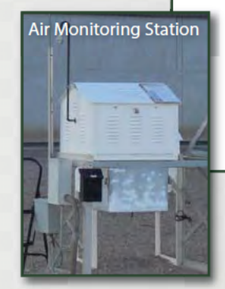
Radiation Monitoring

- Twelve monitoring locations at Area 5 Radioactive Waste Management Site (RWMS) with thermoluminescent dosimeter (TLD) radiation detectors
- Quarterly measurements* of total ionizing radiation exposure
- Results comparable to background radiation levels



Air Monitoring

- Two monitoring locations at Area 5 RWMS
- Monitoring devices collect air and vapor samples
- Quarterly measurements* with analysis for americium, plutonium, tritium, and gamma spectroscopy activity
- Measurement results significantly below radiation limit of 10 millirem per year from the air pathway (*Clean Air Act*)



Groundwater Monitoring

- Three monitoring wells at Area 5 RWMS
- Quarterly and semi-annual sampling* to measure contaminant indicators (pH, conductivity , tritium, and organic carbon/halide), water chemistry, and radionuclides (plutonium, strontium, technetium, and carbon-14)
- No measurable impact to the uppermost aquifer from the Area 5 RWMS

Biota Monitoring

- Periodic analysis of plant and animal samples* for tritium and other radionuclides provide a measurement of potential transport from buried waste to surface
- Design of waste cells is such that waste is inaccessible to plants and animals

Soil Moisture Monitoring

- Two monitoring stations: one vegetated lysimeter** and one bare weighing lysimeter
- Ongoing/automated sampling of evapotranspiration†, precipitation, transpiration, evaporation, and drainage
- Moisture content changes have never been detected below the waste emplacement area

Meteorology

- One monitoring station at the Area 5 RWMS
- Hourly and daily measurements of temperature, relative humidity, precipitation, wind speed, wind direction, barometric pressure, solar radiation, and soil heat flux
- The potential loss of water through evapotranspiration† is estimated at 10 to 20 times annual precipitation

* Detailed results reported in the *Annual Waste Management Monitoring Report*
**Lysimeter - An instrument that measures water drainage and evapotranspiration from soil
†Evapotranspiration - the process of water from the ground and plants vaporizing into the atmosphere

National Nuclear Security Administration

Log No. 2012-128

State of Nevada Division of Environmental Protection (NDEP) Regulatory Authority of Waste Management Activities at the Nevada National Security Site

ndep NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

NDEP's role in Waste Management at the Nevada National Security Site

- Verify waste meets all applicable disposal criteria
- Review/comment on waste profiles, and provide input to accept or reject the disposal at the Nevada National Security Site
- Participate in inspections/audits to verify characterizations, packaging and quality assurance at generator sites
- Provide input on revising and implementing changes to the Nevada National Security Site Waste Acceptance Criteria
- Review/comment on the resolution and approval of Corrective Action Plans developed by generators
- Review, approve and/or deny Resource Conservation and Recovery Act permit applications
- Provide accurate information about waste streams to the legislature, State agencies and members of the public

NDEP inspection of leachate collection tank

NDEP inspection of disposal operations

Applicable Laws and Agreements

Resource Conservation and Recovery Act

Agreement In Principle Attachment X

NDEP ensures compliance with federal and State regulations applicable to:

- Storage, treatment and disposal of solid and hazardous waste
- Underground storage tanks
- Water pollution control
- Safe drinking water
- Corrective actions

Log No. 2012-117

Regulatory Oversight and Permitting Actions

State of Nevada Division of Environmental Protection (NDEP) Regulatory Oversight of Active Disposal Facilities at the Nevada National Security Site

Disposal Location	Area 5 Radioactive Waste Management Complex								Area 6	Area 9	Area 11	Area 23
	Cell 12	Cell 16	Cell 17	Cell 18*	Cell 19*	Cell 20*	Mixed Waste Storage Unit*	Hazardous Waste Storage Unit*	Hydrocarbon Landfill*	Industrial Solid Waste* (Cell U10C)	Explosive Ordnance Disposal Unit*	Municipal Class II*
Waste Type	LLW	LLW	LLW	Resource Conservation and Recovery Act (RCRA) Solid Waste Disposal Asbestos Mixed LLW	LLW	Asbestos LLW	RCRA	RCRA	Spill Clean Ups	Construction Debris Bulk Asbestos	RCRA	
State of Nevada Permit Number				NEV HW 0101	Pending for Non-Hazardous Non-Rad	SW 523	NEV HW 0101	NEV HW 0101	SW 13 097 02	SW 13 097 03	NEV HW 0101	SW 13 097 04

Highest
RCRA
RCRA is the highest level of regulatory authority.

Medium
Municipal
Municipal waste receives a reduced level of regulatory oversight

Low
Solid Waste
Solid waste is the lowest level of regulatory authority

Not regulated by the State of Nevada or EPA

*Requires an NDEP permit and has NDEP oversight

Safety
Performance
Cleanup
Closure

Cell 18 Mixed Low-Level Waste

Cell 12 Low-Level Waste

Cell 20 Low-Level Waste

National Nuclear Security Administration

Log No. 2012-118

Emergency Preparedness Working Group (EPWG) Grant

- Nevada Site Office instituted a grant in 2000 to provide funding to enhance county emergency response capabilities in communities near the Nevada National Security Site
- Grant based on $.50 per cubic foot of low-level / mixed low-level waste disposed at the Nevada National Security Site
- Six Nevada counties participate in the EPWG: Clark, Elko, Esmeralda, Lincoln, Nye, and White Pine
- EPWG addresses any cross-cutting emergency related issues to attain operations level emergency response capabilities
- Grant funding priorities include consideration for the needs of a county and the resource base available in that county
- State of Nevada Division of Emergency Management administers the grant to include distributing funds and conducting oversight of funding use

Fiscal Year	Waste Volume (cubic feet)	Grant Dollars
2000	646,139	$323,070
2001	1,230,123	$615,062
2002	2,314,714	$1,157,357
2003	3,237,473	$1,618,737
2004	3,743,292	$1,871,646
2005	2,089,028	$1,044,514
2006	1,172,949	$586,474
2007	943,824	$471,912
2008	1,174,656	$587,328
2009	1,273,468	$636,734
2010	2,347,052	$1,173,526
2011	1,766,254	$883,127
Total		**$10,969,487**

Safety
Performance
Cleanup
Closure

Firehouse at Goldfield

Pioche Fire Truck

National Nuclear Security Administration

Log No. 2012-112

Far-Field Hydrogeologic Characterization Relevant to Underground Nuclear Test Areas – A Nye County Proposal

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INTRODUCTION

Nye County is committed to protecting the health, welfare, and economic well-being of its citizens, particularly in areas where past nuclear testing by the US Department of Energy (DOE) has the potential to affect the population. Recent data collected by the DOE Underground Test Area (UGTA) program indicate that contaminants from decades-old nuclear tests conducted on the Nevada National Security Site (NNSS) (formerly the Nevada Test Site) are migrating off the site. In particular, the recently drilled UGTA well ER-EC-11, located just off Pahute Mesa on the US Air Force Nevada Test and Training Range (NTTR) and southwest of the BENHAM and TYBO nuclear tests, showed elevated amounts of tritium (~12,500 picocuries per liter; DOE/NNSA 2009). Groundwater flow modeling efforts conducted by UGTA indicate that radionuclides in this area are migrating southwest and could eventually reach the town of Beatty (Stoller-Navarro 2009).

PURPOSE

This proposal presents a series of locations for exploratory drilling, well construction, and testing; water sampling; and water level monitoring. The work proposed is intended to characterize groundwater flow paths and hydrogeology down gradient from designated Corrective Action Units (CAUs) at legacy nuclear testing areas (e.g., Frenchman Flat (CAU 98), Yucca Flat (CAU 97), and Western Pahute Mesa (CAU 102). Where possible, these activities will be conducted in cooperation with DOE's UGTA program to provide far-field data that can be used as part of the contaminant modeling/migration prediction effort. These data will supplement data currently being collected as part of DOE's UGTA program and should help to improve estimates of travel times for radionuclides escaping the testing areas.

QUALIFICATIONS

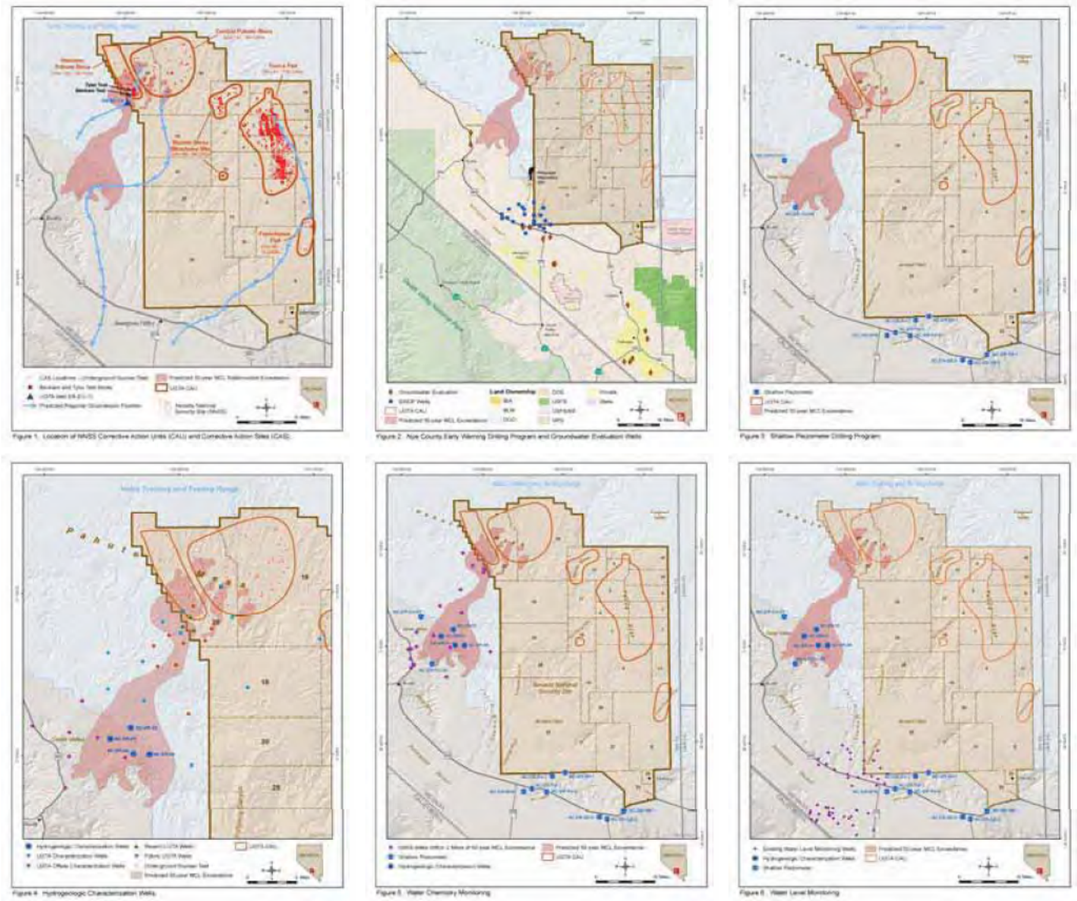
Since 1994, the Nye County Nuclear Waste Repository Project Office (NWRPO), as part of its DOE-funded Early Warning Drilling Program (EWDP) and Independent Scientific Investigation Program (ISIP), has drilled and completed 40 wells down gradient of the proposed nuclear waste repository site on the southwestern boundary of the NNSS. These wells were drilled to characterize the geology and groundwater flow system down gradient from the proposed repository site, and provided the infrastructure for a number of successful tests and data collection efforts, including:

- Aquifer tests
- Tracer tests (single-well, cross-hole, and natural-gradient)
- Conventional and cutting-edge geophysical logging
- Baseline water chemistry
- Water level measurements

A number of these EWDP and ISIP data collection efforts were conducted in cooperation with the DOE, US Geological Survey (USGS), Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and other agencies. All data collection was performed in accordance with the NWRPO Quality Assurance (QA) program (which was accepted by the US Nuclear Regulatory Commission), and much of the data were used by DOE in developing the hydrologic and transport models that supported the repository License Application.

In 2006, Nye County secured a grant from DOE's Nevada Site Office for the evaluation of groundwater in southern Nye County. Under this Groundwater Evaluation (GWE) grant, the NWRPO has implemented several studies to better understand the quantity, quality, and availability of groundwater resources in the Oasis, Amargosa, and Pahrump Valleys. These studies include:

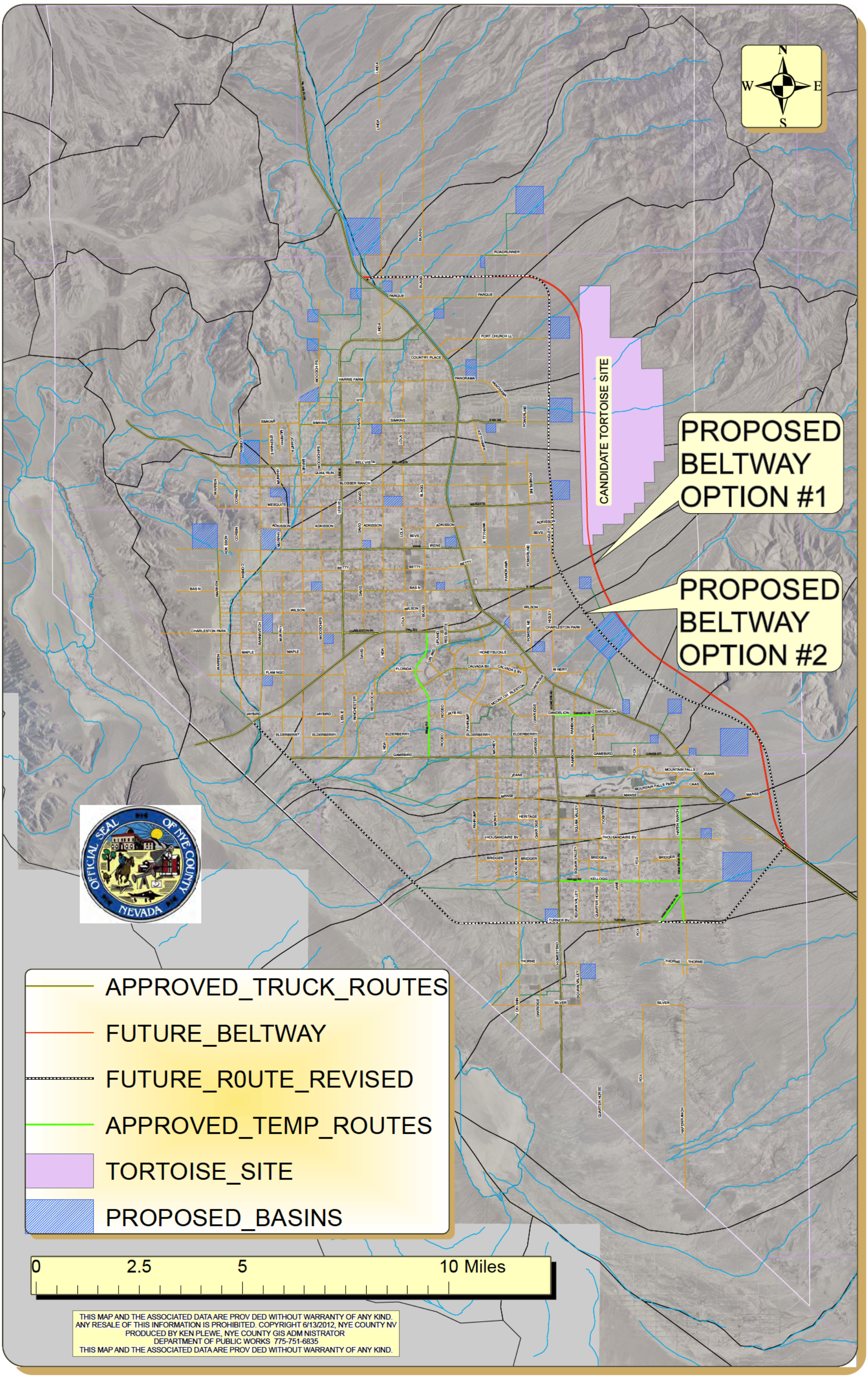
- Shallow water-table piezometer well drilling program
- Evapotranspiration studies in Amargosa Valley (cooperative with USGS)
- Groundwater flow models in Pahrump and Amargosa Valleys (cooperative with Desert Research Institute and USGS)
- Water sampling and analysis program



PROPOSED ACTIVITIES

This section describes the scientific activities required to better characterize the groundwater flow system down gradient from the legacy testing areas discussed above. The first of the drilling activities are intended to characterize the shallow subsurface (i.e., the unsaturated zone and top of the saturated zone) at off-site locations in the areas down gradient from Pahute Mesa and Frenchman and Yucca Flats. These wells are located in or near potential flow paths (DOE 2007), in areas where radionuclides are not currently considered to be moving (DOE 1997).

The second major activity involves the drilling, completion, and testing of larger-diameter wells sited within the predicted 50-year Maximum Contaminant Level (MCL) exceedance area depicted down gradient from Pahute Mesa in Stoller-Navarro (2009). Because radionuclides are presently moving offsite from nuclear test locations on Pahute Mesa, these wells will serve as "early warning" monitoring locations, and are considered to be of the highest priority to Nye County.

The last work activity involves collection and analysis of groundwater chemistry samples and addition of the new wells to the Nye County water level monitoring program (WLMP). Selected nearby wells may also be included in the water chemistry and water level monitoring effort.

PROPOSED PAHRUMP TRUCK ROUTES