DOE/NV/25946--1067-SUM

Nevada Test Site Environmental Report Summary 2009

National Nuclear Security Administration

National Security Technologies LLC
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New Name for the Nevada Test Site

On August 23, 2010, the U.S. Department of Energy, National Nuclear Security Administration announced the renaming of the Nevada Test Site to the **Nevada National Security Site**. Because this document reports on calendar year 2009 activities, the Nevada Test Site name has not been changed. Next year's report will be titled the Nevada National Security Site Environmental Report.

Document Availability

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The information presented in this document is explained in greater detail in the ***Nevada Test Site Environmental Report 2009*** (DOE/NV/25946--1067). A compact disc of this document is included on the back inside cover. This document can also be downloaded from the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office at **http://www.nv.doe.gov/library/publications/aser.aspx**.

For more information about the Nevada Test Site Environmental Report, contact **Pete Sanders** at **(702) 295-1037** or **sanders@nv.doe.gov**.

Work performed under contract number:

DE-AC52-06NA25946

This report was prepared for:

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office

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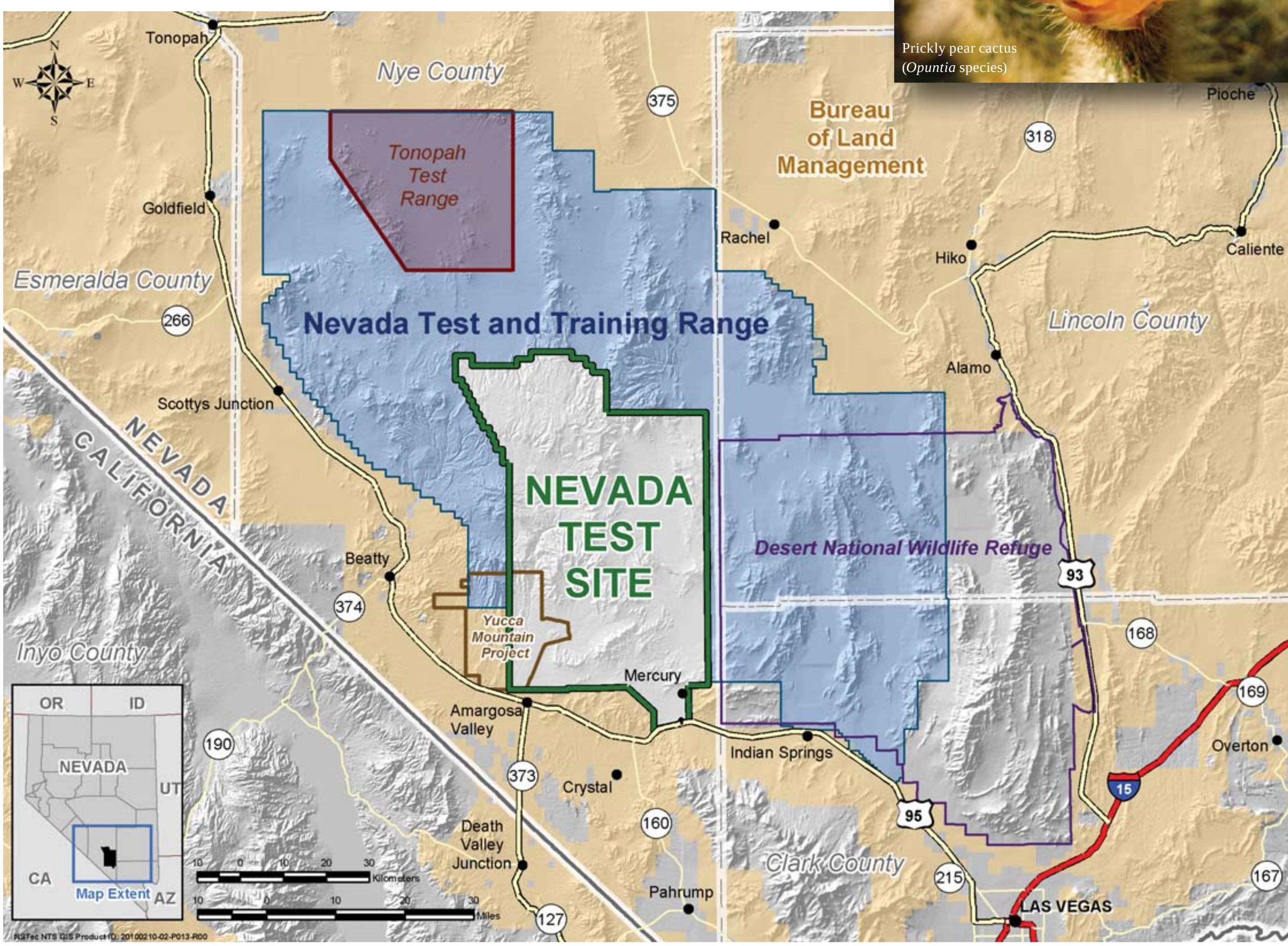
Nevada Test Site Environmental Report Summary 2009

The U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) directs the management and operation of the Nevada Test Site (NTS). NNSA/NSO prepares the *Nevada Test Site Environmental Report* (NTSER) to provide the public an understanding of the environmental monitoring and compliance activities that are conducted on the NTS to protect the public and the environment from radiation hazards and from nonradiological impacts.

The NTSER is a comprehensive report of environmental activities performed at the NTS and offsite facilities over the previous calendar year. It is prepared annually to meet the requirements and guidelines of the U.S. Department of Energy (DOE) and the information needs of NNSA/NSO stakeholders. This summary provides an abbreviated and more readable version of the NTSER. It does not contain detailed descriptions or presentations of monitoring designs, data collection methods, data tables, the NTS environment, or all environmental program activities performed throughout the year. The reader is provided with an electronic file of the full NTSER and of *Attachment A: Nevada Test Site Description* (see attached compact disc on the inside back cover). The reader may obtain a hard copy of the full NTSER as directed on the inside front cover of this summary report.

The NTS was the nation's testing site for nuclear weapons from 1951 through 1992 and is currently the nation's unique site for ongoing national security–related missions and high-risk operations. The NTS is located about 65 miles northwest of Las Vegas. The approximately 1,375-square mile site is one of the largest restricted access areas in the United States. It is surrounded by federal installations with strictly controlled access as well as by lands that are open to public entry.

Prickly pear cactus (*Opuntia* species)



NTS History

Between 1940 and 1950, the area now known as the NTS was part of the Las Vegas Bombing and Gunnery Range. In 1950, the NTS was established as the primary location for testing the nation's nuclear explosive devices. Such testing took place from 1951 to 1992.

Tests conducted through the 1950s were predominantly atmospheric tests. These involved a nuclear explosive device detonated while either on the ground surface, on a steel tower, suspended from tethered balloons, dropped from an aircraft, or placed on a rocket. Several tests were categorized as "safety experiments" and "storage-transportation tests," involving the destruction of a nuclear device with non-nuclear explosives. Some of these tests resulted in dispersion of plutonium in the test vicinity. One of these test areas, Project 57, lies just north of the NTS boundary on the Nevada Test and Training Range (NTTR). Other tests, involving storage-transportation, were conducted at the north end of the NTTR (Double Tracks) and on the Tonopah Test Range (TTR) (Clean Slates I, II, and III). All nuclear device tests are listed in *United States Nuclear Tests, July 1945 through September 1992* (U.S. Department of Energy, Nevada Operations Office, 2000, DOE/NV--209, Rev. 15).

The first underground test, a cratering test, was conducted in 1951. The first totally contained underground test was in 1957. Testing was discontinued during a moratorium that began October 31, 1958, but was resumed in September 1961 after tests by the Union of Soviet Socialist Republics began. Beginning in late 1962, nearly all tests were conducted in sealed vertical shafts drilled into Yucca Flat and Pahute Mesa or in horizontal tunnels mined into Rainier Mesa. From 1951 to 1992, a total of 828 underground nuclear tests were conducted at the NTS. Approximately one-third of these tests were detonated near on in the saturated zone.

Five earth-cratering (shallow-burial) tests were conducted over the period of 1962 through 1968 as part of the Plowshare Program that explored peaceful uses of nuclear explosives. The first and highest yield Plowshare crater test, Sedan, was detonated at the northern end of Yucca Flat on the NTS. The second-highest yield crater test was Schooner, located in the northwest corner of the NTS. Mixed fission products, tritium, and plutonium from these tests were entrained in the soil, ejected from the craters, and deposited on the ground surrounding the craters.

Other nuclear-related experiments at the NTS included the Bare Reactor Experiment–Nevada series in the 1960s. These tests were performed with a 14-million electron volt neutron generator mounted on a 1,527-foot steel tower used to conduct neutron and gamma-ray interaction studies on various materials and assess radiation doses experienced by the nuclear bomb survivors of Hiroshima and Nagasaki. In addition, from 1959 through 1973 a series of open-air nuclear reactor, nuclear engine, and nuclear furnace tests was conducted in Area 25, and a series of tests with a nuclear ramjet engine was conducted in Area 26. The tests released mostly gaseous radioactivity (radio-iodines, radio-xenons, radio-kryptons) and some fuel particles. These releases resulted in negligible deposition on the ground.

NTS - Continental Test Site

After the end of World War II, the United States tested nuclear weapons at Bikini Atoll and Enewetak in the Marshall Islands of the Central Pacific.

In June 1950, with the outbreak of hostilities in Korea and U.S. relations with the Soviet Union continuing to deteriorate, the search began for a continental test site to overcome the difficulties with remoteness and security experienced with testing in the Pacific. The final choices included Dugway Proving Ground–Wendover Bombing Range in western Utah, Alamagordo-White Sands Guided Missile Range in south-central New Mexico, and a North Site and a South Site on the Las Vegas Bombing and Gunnery Range in southern Nevada.

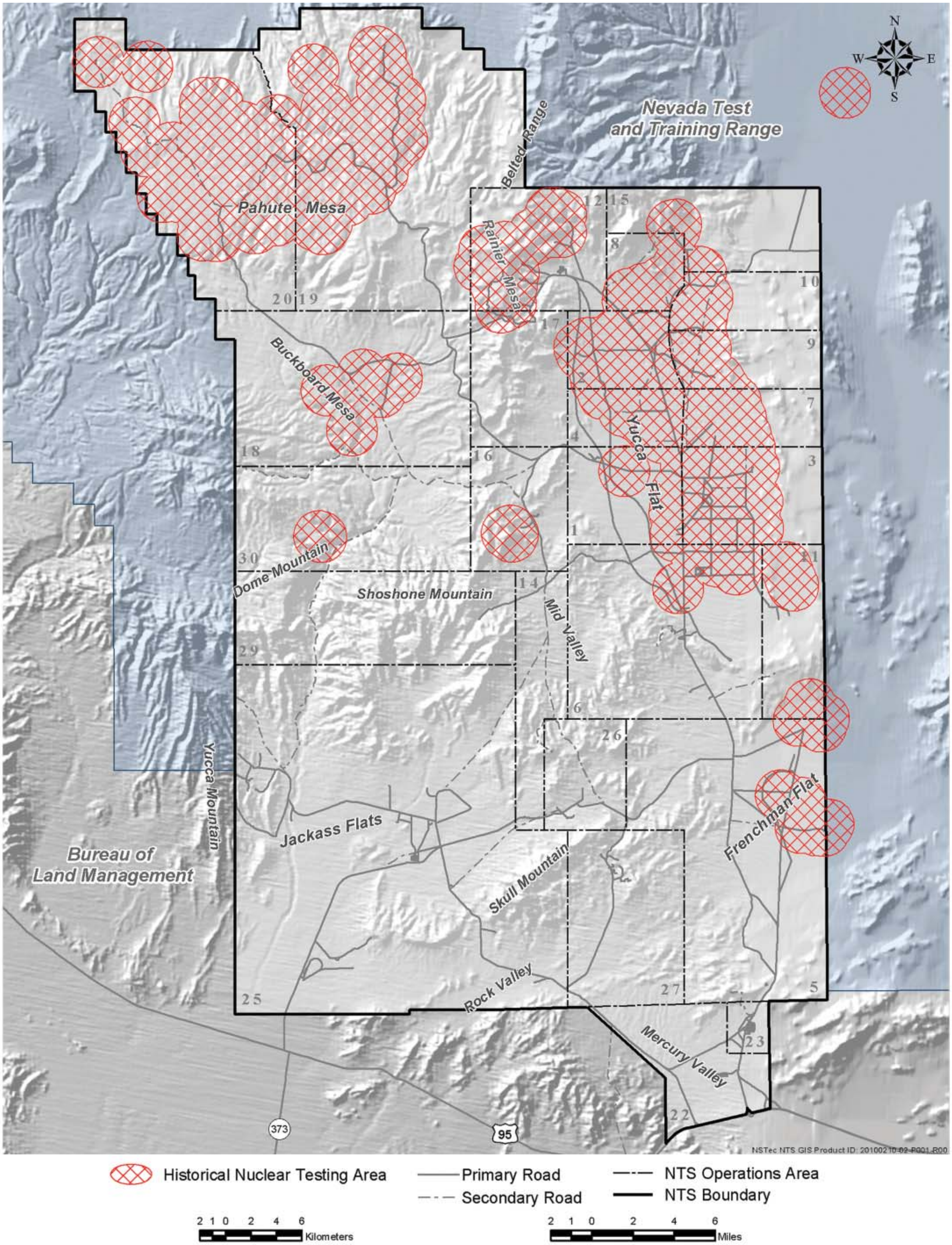
On December 18, 1950, President Truman approved the recommendations of Los Alamos testing officials and the Atomic Energy Commission, christening the South Site on the Las Vegas Bombing and Gunnery Range as the nation's continental test site. It was called the Nevada Proving Ground.

On January 27, 1951, an Air Force B-50D bomber dropped a 1 kiloton yield nuclear bomb over Frenchman Flat. It was the world's tenth nuclear detonation and was the first NTS test.

On September 23, 1992, the last underground nuclear test was conducted on the NTS after which Congress imposed a moratorium on nuclear weapons testing.

Since 1951, a total of 100 atmospheric and 828 underground nuclear weapons tests were conducted at the NTS.

Source: T. R. Fehner and F. G. Gosling, 2000. *Origins of the Nevada Test Site*, DOE/MA-0518, History Division, Executive Secretariat, Management and Administration, U.S. Department of Energy.



Historical Nuclear Testing Areas On and Adjacent to the NTS

The NTS Now

Los Alamos, Lawrence Livermore, and Sandia National Laboratories are the principal organizations that sponsor and implement experimental programs at the NTS. The three major NTS missions include National Security/Defense, Environmental Management, and Nondefense. During the conduct of all missions and their programs, NNSA/NSO complies with applicable environmental and public health protection regulations and strives to manage the land and facilities at the NTS as a unique and valuable national resource. In 2009, National Security Technologies, LLC (NSTec), was the Management and Operations contractor accountable for the successful execution of work and ensuring that work was performed in compliance with environmental regulations.

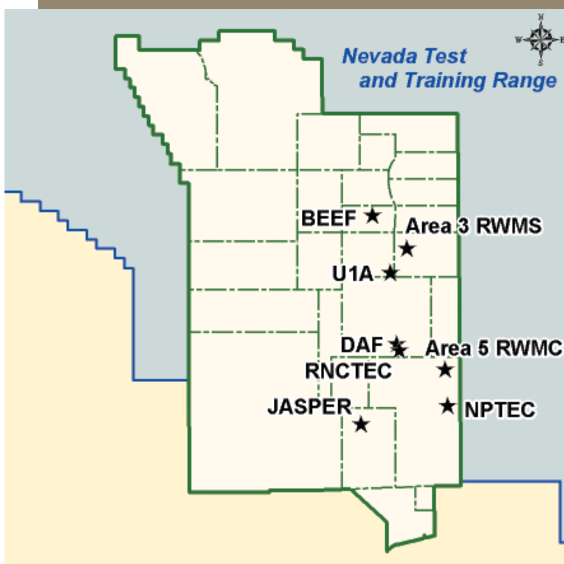
NTS activities in 2009 continued to be diverse, with the primary goal to ensure that the existing U.S. stockpile of nuclear weapons remains safe and reliable. Other NTS activities include demilitarization activities; controlled spills of hazardous material at the Nonproliferation Test and Evaluation Complex (NPTEC); remediation of legacy contamination sites; characterizing of waste destined for the Waste Isolation Pilot Plant in Carlsbad, New Mexico, or the Idaho National Laboratory in Idaho Falls, Idaho; disposal of radioactive and mixed waste; and environmental research. Facilities that support the National Security/Defense mission include the U1a Facility, Big Explosives Experimental Facility (BEEF), Device Assembly Facility (DAF), Joint Actinide Shock Physics Experimental Research (JASPER) Facility, and the Radiological/Nuclear Countermeasures Test and Evaluation Complex (RNCTEC). Facilities that support the Environmental Management mission include the Area 5 Radioactive Waste Management Complex (RWMC) and the Area 3 Radioactive Waste Management Site (RWMS), which has been in cold stand-by since 2006.

NTS Missions and Their Programs

National Security/Defense

Stockpile Stewardship and Management Program – Conducts high-hazard operations in support of defense-related nuclear and national security experiments.

Nuclear Emergency Response, Nonproliferation, and Counterterrorism Programs – Provides support facilities, training facilities, and capabilities for government agencies involved in emergency response, nonproliferation technology development, national security technology development, and counterterrorism activities.



Work for Others Program – Provides support facilities and capabilities for other agencies/organizations involved in defense–related activities.

Environmental Management

Environmental Restoration Program – Characterizes and remediates the environmental legacy of nuclear weapons and other testing at the NTS and NTTR locations, and develops and deploys technologies that enhance environmental restoration.

Waste Management Program – Manages and safely disposes of low-level waste and mixed low-level waste received from DOE- and U.S. Department of Defense (DoD)-approved facilities throughout the U.S. and wastes generated in Nevada by NNSA/NSO. Safely manages and characterizes hazardous and transuranic wastes for offsite disposal.

Nondefense

Infrastructure Program – Maintains the buildings, roads, utilities, and facilities required to support all NTS programs and to provide a safe environment for NTS workers.

Conservation and Renewable Energy Programs – Operates the pollution prevention program and supports renewable energy and conservation initiatives at the NTS.

Other Research and Development – Provides support facilities and NTS access to universities and organizations conducting environmental and other research unique to the regional setting.

The Legacy of NTS Nuclear Testing

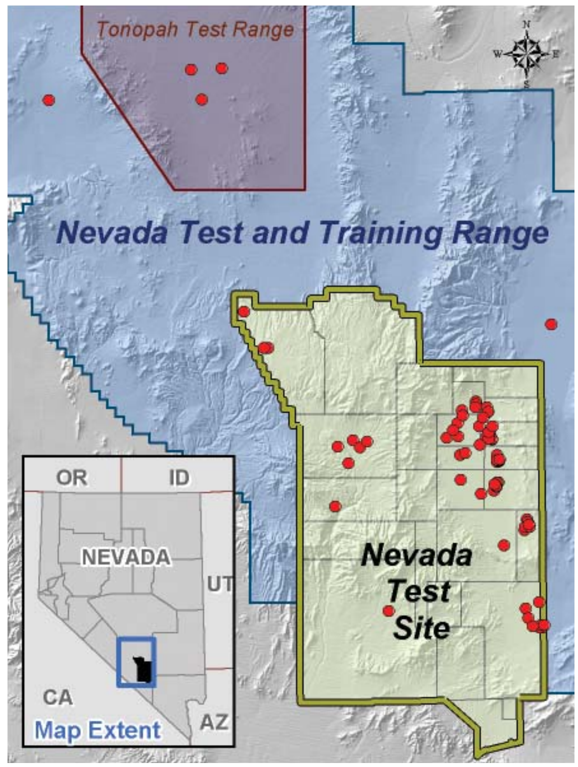
Approximately one-third of the 828 underground nuclear tests on the NTS were detonated near or in the saturated zone resulting in the contamination of groundwater in some areas. In addition, the 100 atmospheric nuclear tests conducted on the NTS and numerous nuclear-related experiments resulted in the contamination of surface soils, materials, equipment, and structures, mainly on the NTS. The NNSA/NSO Environmental Management mission was established to address this legacy of contamination. Within Environmental Management, the Environmental Restoration Project is responsible for remediating contaminated sites, and the Waste Management Project is responsible for safely managing and disposing of radioactive waste.

The primary regulatory driver of the Environmental Restoration Project is the Federal Facility Agreement and Consent Order (FFACO) between the State of Nevada, DOE, and DoD. The FFACO identifies Corrective Action Units (CAUs), which are groupings of Corrective Action Sites (CASs) that delineate and define areas of concern for contamination. Approximately 2,800 CASs have been identified, many of which have already been remediated and/or closed. The public is kept informed of Environmental Management activities through periodic newsletters, exhibits, and fact sheets, and Environmental Management provides the opportunity for public input via the Community Advisory Board, consisting of 15–20 citizen volunteers from Nevada.

Legacy Contamination

Groundwater — As a result of the 828 underground nuclear tests conducted at the NTS, millions of curies of radiation were released underground. The total amount of radiation remaining below the groundwater table is approximatley 60 million curies, based on the most recent decay-corrected calculation from 1992. The areas of known and potential groundwater contamination on the NTS due to underground nuclear testing are called Underground Test Area (UGTA) Corrective Action Units (CAUs). The corrective action strategy of the Environmental Management Program is to identify contaminant boundaries for these UGTA CAUs and to implement an effective long-term monitoring system *(see page 20)*.

Soil — Radioactively contaminated surface soils directly resulting from nuclear weapons testing exist at approximately 100 sites on and around the NTS. Closure of these sites is conducted in accordance with the FFACO and upon approval by the State of Nevada. Corrective actions required to complete closure range from removal of soil to closure in place with restricted access controls, such as fencing and posting. As of December 31, 2009, 16 sites have been approved for closure in accordance with the FFACO and approved by the State of Nevada.

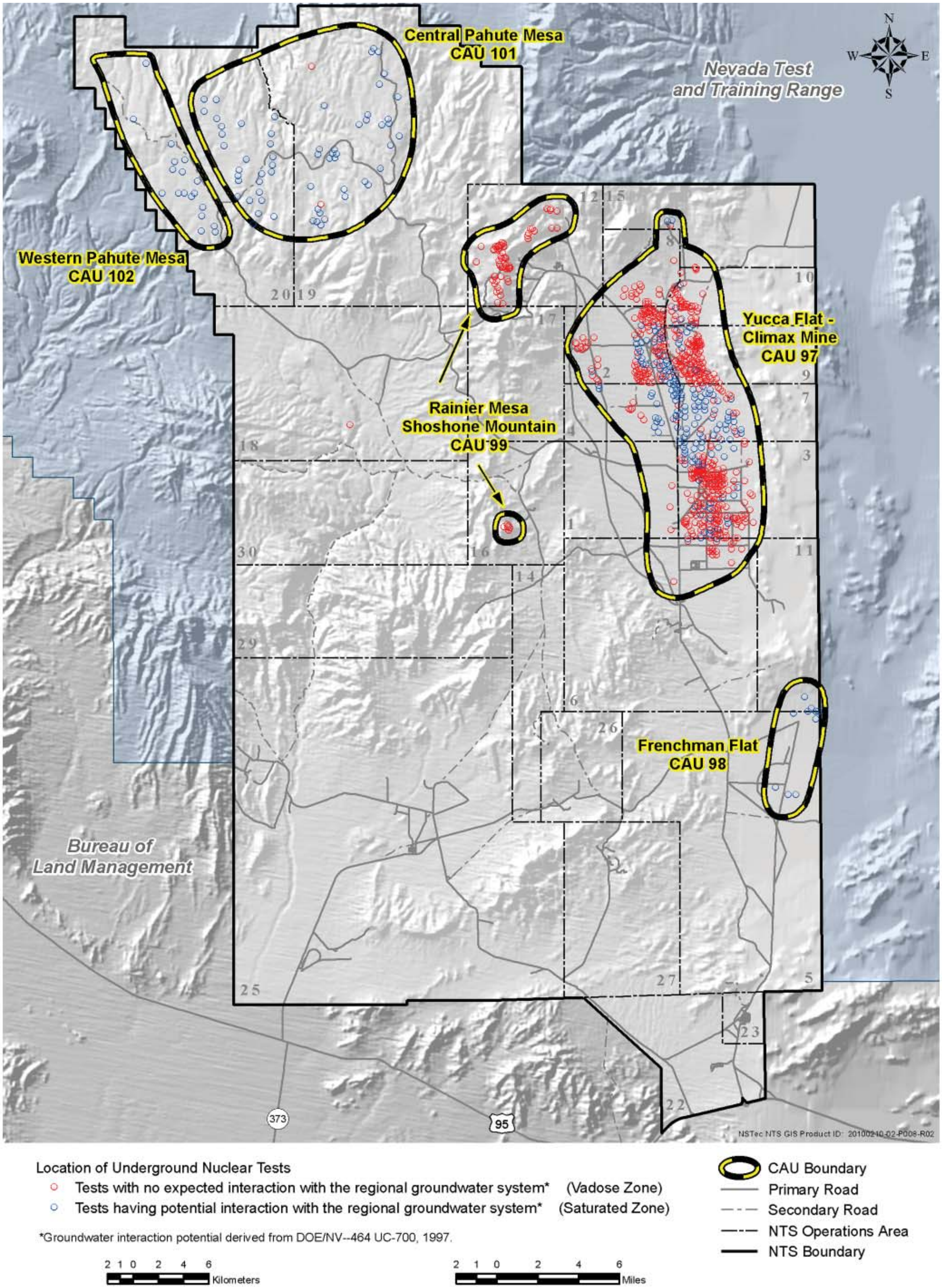


Locations of soil contamination on and off the NTS

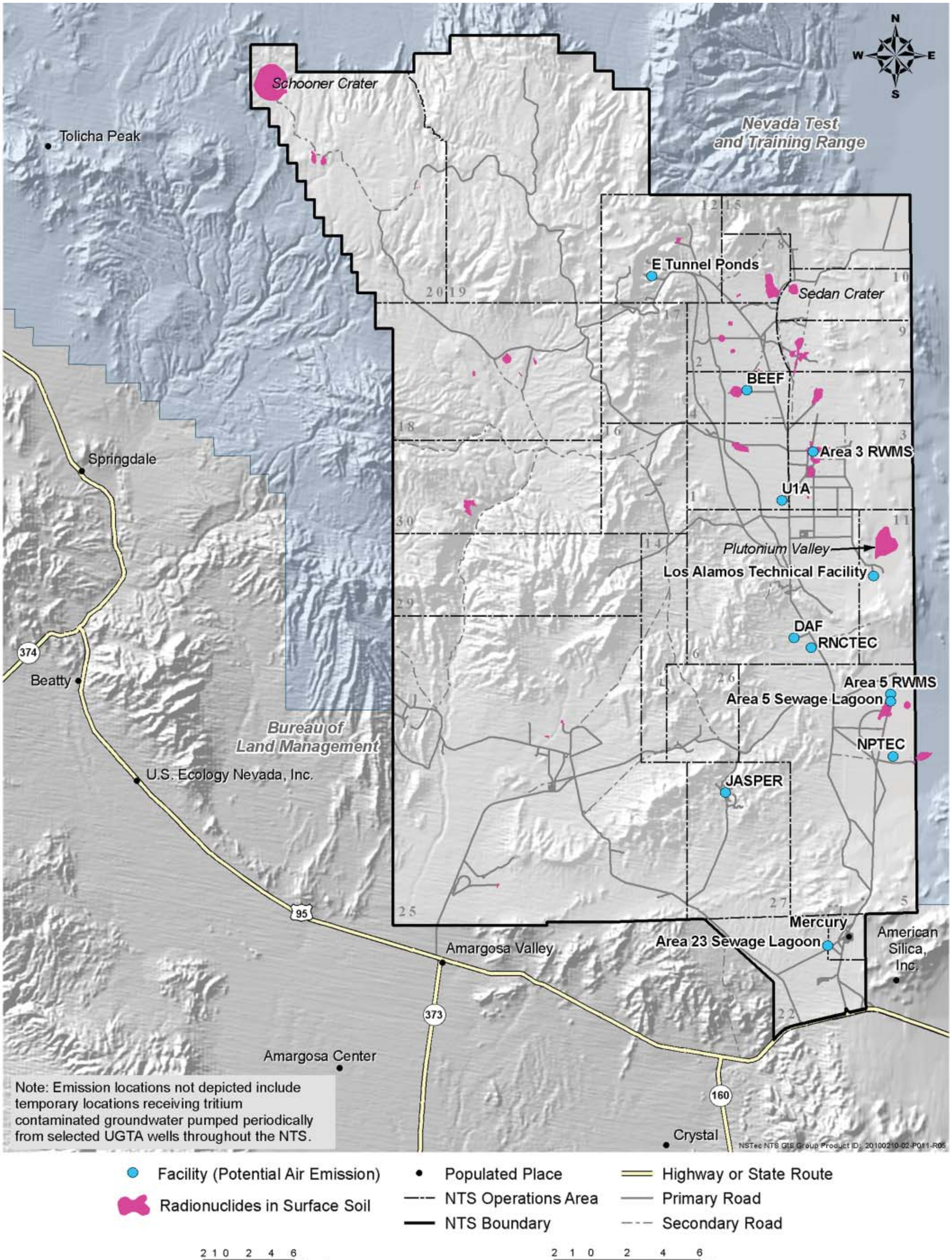
Air — Airborne radioactive contamination from the resuspension of contaminated soils at legacy sites and from current activities is monitored continuously on and off the NTS. Since the cessation of atmospheric nuclear testing, the annual amounts of radiation released into the air from the NTS have ranged from 48 to 2,200 Ci for tritium, 0.0018 to 0.40 Ci for plutonium, and 0.039 to 0.049 Ci for americium. In air measured in communities surrounding the NTS, these emissions from the NTS cannot be distinguished from background airborne radiation.

Structures/Materials — There are approximately 1,850 sites where facilities, equipment, structures, and/or debris were contaminated by historical nuclear research, development, and testing activities. The responsibility for remediating these Industrial Sites belongs to the Environmental Restoration Project. As of December 31, 2009, 1,768 sites have been approved for final completion in accordance with the FFACO and approved by the State of Nevada.

Waste Disposal — Low-level and mixed low-level radioactive wastes have been generated by historical nuclear research, development and testing activities, and environmental cleanup activities. Since the 1960s, nearly 1.42 million cubic yards of this waste have been safely disposed at the Area 3 and Area 5 Radioactive Waste Management Sites through December 31, 2009. The estimated total amount of radioactivity at the time of disposal was 15 million Ci. The radioactive content of the disposed waste decays over time at a varied rate depending on the radionuclide.



Areas of Potential Groundwater Contamination on the NTS



Sources of Radiological Air Emissions on the NTS

Understanding Radiation

Radiation is energy that travels through matter or space in the form of waves or high-speed particles. Light, heat, and sound are types of radiation. Ionizing radiation is a very high-energy form of electromagnetic radiation. Ionizing radiation consists of particles or rays given off by unstable atoms as they are converted, or decay, into more stable atoms. Ionizing radiation may be found everywhere. Almost all exposure to ionizing radiation comes from natural sources (82 percent in the United States). These sources include cosmic radiation from outer space, terrestrial radiation from materials like uranium and radium in the earth, and naturally occurring radioactive elements (i.e., radionuclides) in our food, water, and the aerosols and gases in the air we breathe. We use man-made sources and applications of ionizing radiation in our everyday life such as smoke-detectors, x-rays, CT scans, and nuclear medicine procedures. For people living in areas around the NTS, less than 2 percent of their total radiation exposure is attributable to past or current NTS activities.

Forms of Radiation

Alpha particles are heavy, positively charged particles given off by some decaying atoms. Alpha particles can be blocked by a sheet of paper. Atoms emitting alpha particles are hazardous only if they are swallowed or inhaled.

Beta particles are electrons or positrons (positively charged electrons) ejected from the nucleus of a decaying atom. More penetrating than alpha radiation, beta particles can pass through several millimeters of skin. A sheet of aluminum only a fraction of an inch thick will stop beta radiation. Beta particles can damage skin but are most hazardous if the beta-emitting atoms are swallowed or inhaled.

Gamma rays are waves of pure energy similar to X-rays, light, microwaves, and radio waves. Gamma rays are emitted by certain radionuclides when their nuclei transition from a higher to a lower energy state. They can readily pass into the human body. They can be almost completely blocked by about 40 inches of concrete, 40 feet of water, or a few inches of lead. Gamma rays can be both an external and internal hazard.

X-rays are a more familiar form of electromagnetic radiation, usually with a limited penetrating power, typically used in medical or dental examinations. Television sets, especially color, give off soft (low-energy) X-rays; thus, they are shielded to greatly reduce the risk of radiation exposure.

Neutrons are uncharged heavy particles contained in the nucleus of every atom heavier than ordinary hydrogen. They induce ionization only indirectly in atoms that they strike, but they can damage body tissues. Neutrons are released, for example, during the fission (splitting) of uranium atoms in the fuel of nuclear power plants. They can also be very penetrating. In general, efficient shielding against neutrons can be provided by materials containing hydrogen, such as water. Like gamma rays, neutrons are both an external and internal hazard.

Curie (Ci) is the traditional measure of radioactivity based on the observed decay rate of 1 gram of radium. One curie of radioactive material will have 37 billion disintegrations in 1 second.

Understanding Radiation Dose

Dose is a generic term to describe the amount of radiation a person receives. The energy deposited indicates the number of molecules disrupted. The energy the radiation deposits in tissue is called the absorbed dose. The units of measure of absorbed dose are the rad or the gray. The biological effect of radiation depends on the type of radiation (alpha, beta, gamma, or X-ray) and the tissues exposed. A measure of the biological risk of the energy deposited is the dose equivalent. The units of dose equivalent are called rems or sieverts. In the NSTER, the term dose is used to mean dose equivalent measured in rems. A thousandth of a rem is called a millirem, abbreviated as mrem. An average person in the United States receives about 310 mrem each year from natural sources and an additional 310 mrem from medical procedures and consumer products. Whether or not there is a “safe” radiation dose equivalent is a controversial subject. Because the topic has yet to be settled scientifically, regulators take a conservative approach and assume that there is no such thing as a 100 percent safe dose equivalent. It is believed that the risk of developing an adverse health effect (such as cancer) is proportionate to the amount of radiation dose received. Many human activities increase our exposure to radiation over and above the average background radiation dose of 310 mrem per year. These activities include, for example, uranium mining, airline travel, and operating nuclear power plants. Regulators balance the benefit of these activities to the risk of increasing radiation exposures above background and, as a result, set dose limits for the public and workers specific to these activities. The DOE has set the dose limit to the public from exposure to DOE-related nuclear activities to 100 mrem/yr. This is the same public dose limit set by the U.S. Nuclear Regulatory Commission (NRC) and recommended by the International Commission on Radiological Protection and the National Commission on Radiological Protection and Measurements. The NRC has set the dose limit for radiation workers to 5,000 mrem/yr. There is no common or agreed-upon dose limits for workers or the public across industries, states, or countries.

Common Doses to the Average American

Source/Activity	Average Dose/Year (or as noted)
Five-hour jet plane ride	3 mrem/5 hours
Building materials	4 mrem
Chest X-ray	8 mrem
Cosmic	30 mrem
Soil	35 mrem
Internal to our body	40 mrem
Mammogram	138 mrem
Radon gas	200 mrem
CT scan	2,500 mrem
Smoking 20 cigarettes/day	5,300 mrem to a smoker's lung
One cancer treatment	5,000,000 mrem to the tumor

Source: http://hss.energy.gov/HealthSafety/WSHP/radiation/Radiation-final-6-20.pdf, as accessed on March 25, 2010

Radionuclides Detected on the NTS

	Name*	Abbreviation	Primary Type(s) of Radiation	Major NTS Source
Man-Made	Americium-241	^{241}Am	Alpha, gamma	In soil at and near legacy sites of aboveground nuclear testing. Detected in soil and air.
	Cesium-137	^{137}Cs	Beta, gamma	
	Plutonium-238	^{238}Pu	Alpha	
	Strontium-90	^{90}Sr	Beta	
	Cobalt-60	^{60}Co	Gamma	In soil at and near legacy sites of aboveground nuclear testing. Detected in soil.
	Europium-152	^{152}Eu	Gamma	
	Europium-155	^{155}Eu	Gamma	
	Plutonium-239+240	$^{239+240}Pu$	Alpha	In soil at and near legacy sites of plutonium dispersal experiments. Detected in soil and air.
	Tritium	^{3}H	Beta	In groundwater in areas of underground nuclear tests, in surface ponds used to contain contaminated groundwater, in soil at nuclear test locations, in waste packages buried in pits at waste management sites. Detected in groundwater and air.
Naturally Occurring	Be-7	^{7}Be	Gamma	Produced by interactions between cosmic radiation from the sun and the earth's upper atmosphere. Detected in air.
	Potassium-40	^{40}K	Beta, gamma	Naturally occurring in the earth's crust. Detected in groundwater, soil, and air.
	Radium-226	^{226}Ra	Alpha, gamma**	
	Thorium-232	^{232}Th	Alpha**	
	Uranium-234	^{234}U	Alpha**	
	Uranium-235	^{235}U	Alpha, gamma**	
	Uranium-238	^{238}U	Alpha**	

*The number given with the name of the radionuclide is the atomic mass number, which is the total number of protons and neutrons in the nucleus of the atom. Atoms with the same number of protons are the same element; atoms of the same element with different mass numbers are called isotopes of one another. Plutonium and uranium each have several radioactive isotopes that are detected on the NTS.

**Some progeny or daughter radionuclides produced by the natural decay of this radionuclide would emit alpha, beta, or gamma radiation as well as alpha.

Monitoring NTS Radiation and Pathways of Exposure to the Public

The release of man-made radionuclides from the NTS has been monitored since the first decade of atmospheric testing. After 1962 nuclear tests were conducted only underground, greatly reducing the radiation exposure in the areas surrounding the NTS. Underground nuclear testing nearly eliminated atmospheric releases of radiation but resulted in the contamination of groundwater in some areas of the NTS. After the 1992 moratorium on nuclear testing, radiation monitoring focused on detecting airborne radionuclides that are resuspended with historically contaminated soils on the NTS and on detecting man-made radionuclides in groundwater.

There are three pathways in this dry desert environment by which man-made radionuclides from the NTS might reach the surrounding public:

Air Transport Pathway – Members of the public may inhale or ingest radionuclides that are resuspended by the wind from contaminated sites on the NTS. However, such resuspended radiation measured off and on the NTS is much lower than natural background radiation in all areas accessible to the public.

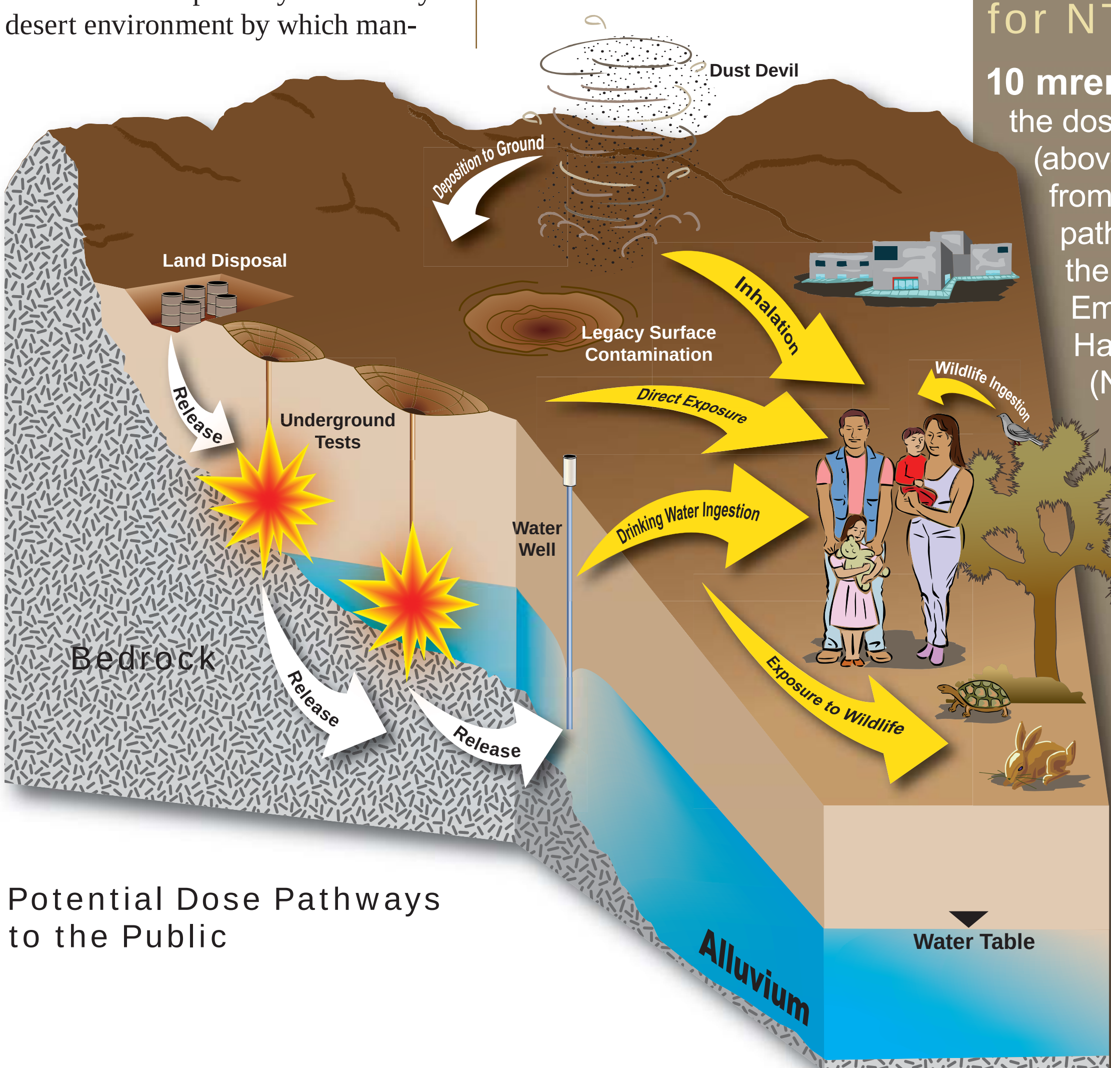
Ingestion Pathway – Members of the public may ingest game animals that have been exposed to contaminated soil or water on the NTS, have moved off the NTS, and have then been hunted.

Groundwater Pathway – Based on monitoring data, drinking contaminated groundwater is currently not a possible pathway for public exposure given the restricted public access to the NTS and the location of known contaminated groundwater on and off the NTS. No manmade radionuclides have been detected in drinking water sources monitored off the NTS, and no drinking water wells on the NTS have measurable levels of manmade radionuclides. In 2009, radioactively contaminated groundwater was discovered in a characterization well on NTTR just west of the NTS boundary *(see pages 20 and 21)*. This well is not a source of drinking water.

Public Dose Limits for NTS Radiation

10 mrem/yr — This is the 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 (NESHAP).

100 mrem/yr — This is the dose limit to the public (above natural background) from all possible pathways combined, as specified by DOE O 5400.5, "Radiation Protection of the Public and the Environment."



Potential Dose Pathways to the Public

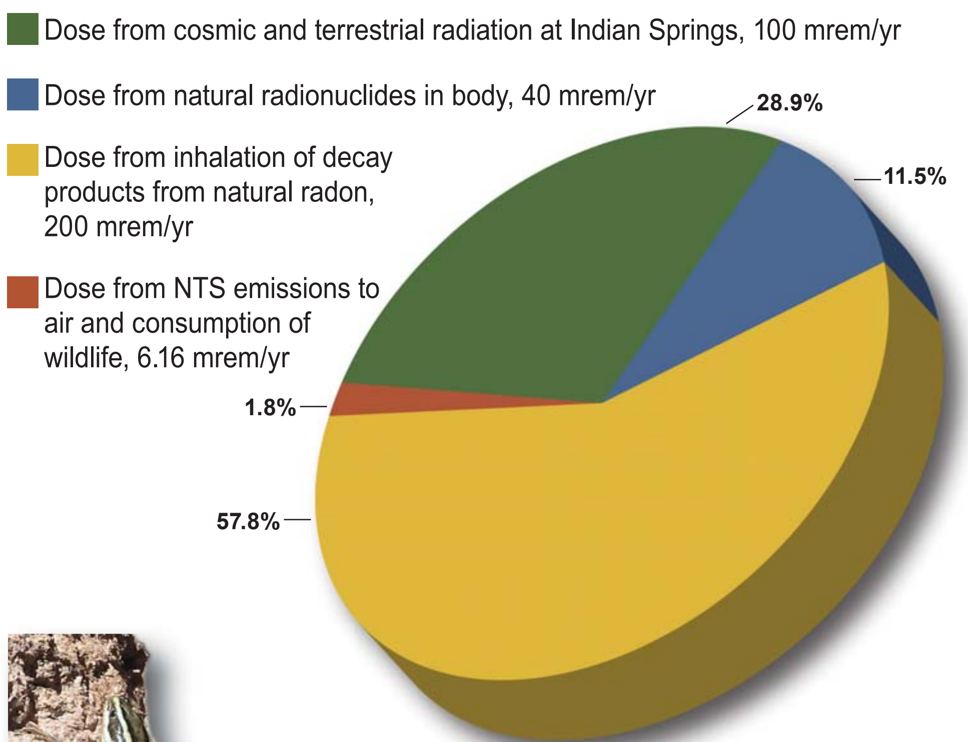
Estimated 2009 Radiation Dose to the Public from NTS Operations

Inhalation – Compliance with radiation dose limits to the general public from the air transport pathway is demonstrated using air sampling results from six onsite "critical receptor" sampling stations. The radionuclides detected at four or more of the NTS critical receptor samplers were ^{241}Am, ^{238}Pu, $^{239+240}$Pu, $^{233+234}$U, $^{235+236}$U, ^{238}U, and ^{3}H. Uranium in NTS surface soils has generally been attributed to naturally occurring uranium. As in previous years, the 2009 data from the six critical receptor samplers show that the NESHAP dose limit to the public of 10 mrem/yr was not exceeded. The Schooner critical receptor station, in the far northwest corner of the NTS, had the highest concentrations of radioactive air emissions, yet an individual residing at this station would experience a dose from air emissions of 1.69 mrem/yr, only 17 percent of the NESHAP public dose limit. No one resides at this location, and the dose at the closest populated offsite locations (12 to 50 miles away) would be much lower due to wind dispersion.

Ingestion – NTS game animals include pronghorn antelope, mule deer, chukar, Gambel's quail, mourning doves, cottontail rabbits, and jackrabbits. Small game animals from different contaminated NTS sites are trapped each year and analyzed for their radionuclide content. These results are used to construct worst-case scenarios for the dose to hunters who might consume these animals if the animals moved off the NTS. If game animals are not sufficiently abundant to sample, non-game small mammals are used as an analog. In 2009, small game and non-game mammals were sampled from Plutonium Valley in Area 11, Area 3 RWMS, and Area 5 RWMC. A mule deer and a pronghorn antelope, accidentally killed by vehicles on the NTS, were opportunistically sampled. Based on these samples, the highest dose to a member of the public was estimated to be 4.47 mrem for a person who consumed 20 jackrabbits from Plutonium Valley.

Direct Exposure – No members of the public are expected to receive direct gamma radiation that is above background levels as a result of NTS operations. Areas accessible to the public, such as the main entrance gate, had direct gamma radiation exposure rates comparable to natural background rates from cosmic and terrestrial radiation.

Percents of Total Dose to the Public from Natural Background Sources and from the NTS



Great Basin skink *(Eumeces skiltonianus)*

2009 Dose to the Public from All Pathways

6.16 mrem/yr — **This is the maximum dose to the public from inhalation, ingestion, and direct exposure pathways that is attributable to NTS operations. It is well below the dose limit of 100 mrem/yr established by DOE O 5400.5 for radiation exposure to the public from all pathways combined. This total dose estimate is indistinguishable from natural background radiation experienced by the public residing in communities near the NTS.**

Monitoring of Radioactive Air Emissions and Direct Radiation

NTS radioactive emissions are monitored to determine the public dose from inhalation *(shown on page 11)* and to ensure compliance with the NESHAP under the Clean Air Act. A network of 19 air sampling stations and a network of 109 thermoluminescent dosimeters (TLDs) are located throughout the NTS *(see map on page 13)*, mainly within NTS operations areas where historical nuclear testing has occurred or where current radiological operations occur. NTS air sampling stations monitor tritium in water vapor, man-made radionuclides, and gross alpha and beta radioactivity in airborne particulates. The TLD stations monitor direct gamma radiation exposure.

Radioactive emissions are also monitored at stations in selected towns and communities within 240 miles of the NTS by the independent Community Environmental Monitoring Program (CEMP), which is coordinated by the Desert Research Institute (DRI) of the Nevada System of Higher Education under contract with NNSA/NSO. Its purpose is to provide monitoring for radionuclides that may be released from the NTS. A network of 29 CEMP stations is used *(see map on page 14)*. The CEMP stations monitor gross alpha and beta radioactivity in airborne particulates using low-volume particulate air samplers, penetrating gamma radiation using TLDs, gamma radiation exposure rates using pressurized ion chamber (PIC) detectors, and meteorological parameters using automated weather instrumentation (meteorological stations).

Range in Average Concentrations of Man-Made Radionuclides in Air Samples on the NTS in 2009

	Concentration (10^{-15} µCi/mL)[a]		
Radionuclide	**Limit[b]**	**Lowest Average**	**Highest Average**
^{241}Am	1.9	0.00065	0.059
^{3}H	1,500,000	60	249,600
^{238}Pu	2.1	-0.00067	0.0061
$^{239+240}$Pu	2.0	0.0014	0.39

(a) The scale of concentration units for radionuclides shown in the table have been standardized to 10^{-15} microcuries per milliliter (µCi/mL). This scale may differ from those reported in detailed radionuclide-specific data tables in the NTSER

(b) The concentration established by NESHAP as the compliance limit.

Man-Made Radionuclides at NTS Air Sampling Stations – Several man-made radionuclides were detected at NTS air sampling stations in 2009: ^{241}Am, ^{3}H, ^{238}Pu, and $^{239+240}$Pu. None, however, exceeded concentration limits established by the Clean Air Act. The highest average level of ^{241}Am, ^{238}Pu and $^{239+240}$Pu was detected at Bunker 9-300 in Area 9, located within an area of known soil contamination from past nuclear tests. The highest average level of tritium was detected at Schooner, site of the second-highest yield Plowshare cratering experiment on the NTS where tritium-infused ejecta surrounds the crater.

No man-made radionuclides were detected above minimum detectable concentrations in the air samples from the JASPER Facility. No radiological releases occurred at BEEF, U1a, DAF, RNCTEC, or NPTEC.

The total amounts (measured in Ci) of man-made radionuclides that were emitted to the air from all sources on the NTS in 2009 was estimated to be 173 Ci for tritium, 0.047 Ci for ^{241}Am, 0.050 Ci for ^{238}Pu, and 0.29 Ci for $^{239+240}$Pu. In 2009, these sources included contaminated soils at legacy sites, Area 3 and Area 5 RWMS, Sedan and Schooner craters, and containment ponds or lagoons holding pumped groundwater from UGTA CAUs. Over the past 10 years, total emissions have ranged from 160 to 564 Ci for tritium, 0.039 to 0.049 Ci for ^{241}Am, and 0.24 to 0.39 Ci for $^{239+240}$Pu. Emissions of ^{238}Pu are estimated to have remained consistent at about 0.050 Ci over the same time frame.

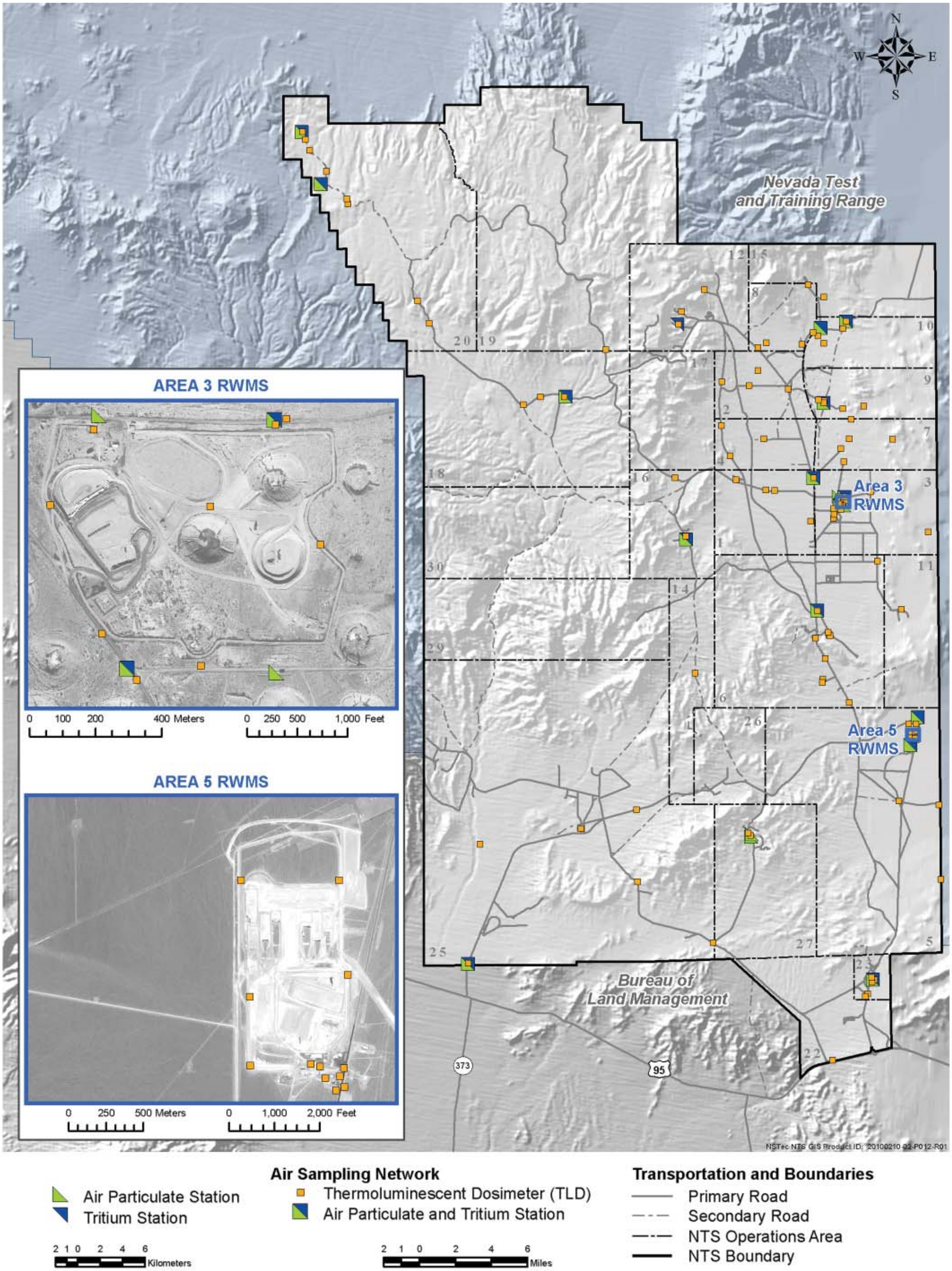
Man-Made Radionuclides at Offsite Air Sampling Stations – No airborne radioactivity related to any NTS operations was detected at the CEMP stations during 2009. No man-made gamma-emitting radionuclides were detected. Naturally occurring radioactive beryllium (^{7}Be) was detected in most air particulate samples.

Greater Roadrunner *(Geococcyx californianus)*

Estimated Quantity of Man-Made Radionuclides Released into the Air from the NTS in 2009 (in Curies)

Tritium (^{3}H)	Americium (^{241}Am)	Plutonium (^{238}Pu)	Plutonium ($^{239+240}$Pu)
173	0.047	0.050	0.29

Plutonium and americium sources are legacy sites of past nuclear testing on the NTS where these radionuclides are in surface soils that can become re-suspended by wind.



2009 NTS Air Sampling Network

Gamma Radiation Exposure – Ten of the NTS TLD stations are located where radiation effects from past or present NTS operations are negligible, and therefore measure only natural background levels of gamma radiation from cosmic and terrestrial sources. In 2009, the mean measured background level from the ten stations was 120 milliroentgens per year (mR/yr). This is well within the range of variation in background levels observed in other parts of the U.S. of similar elevation above sea level. Background radiation varies not only by elevation but by the amounts of natural radioactive materials in soil and rock in different geographic regions.

The highest estimated mean annual gamma exposure measured at a TLD station on the NTS was 671 mR/yr at Schooner, one of the legacy Plowshare sites on Pahute Mesa. The lowest was 59 mR/yr in Mercury at the fitness track. The mean annual gamma exposure at 17 TLD locations near the Area 3 and Area 5 RWMSs was 140 mR/yr, and at the 35 TLD locations near known legacy sites (including Schooner), it was 252 mR/yr.

The CEMP offsite TLD and PIC results remained consistent with previous years' background radiation levels and are also well within the range of variation in background levels observed in other parts of the U.S. and with the 120 mR/yr level measured on the NTS. The highest total annual gamma exposure measured off site, based on the PIC detectors, was 180 mR/yr at Warm Springs Summit, Nevada (at 6,290 feet elevation). The lowest offsite rate, based on the PIC detectors, was 73 mR/yr at Pahrump, Nevada (at 2,639 feet elevation).

Direct exposure

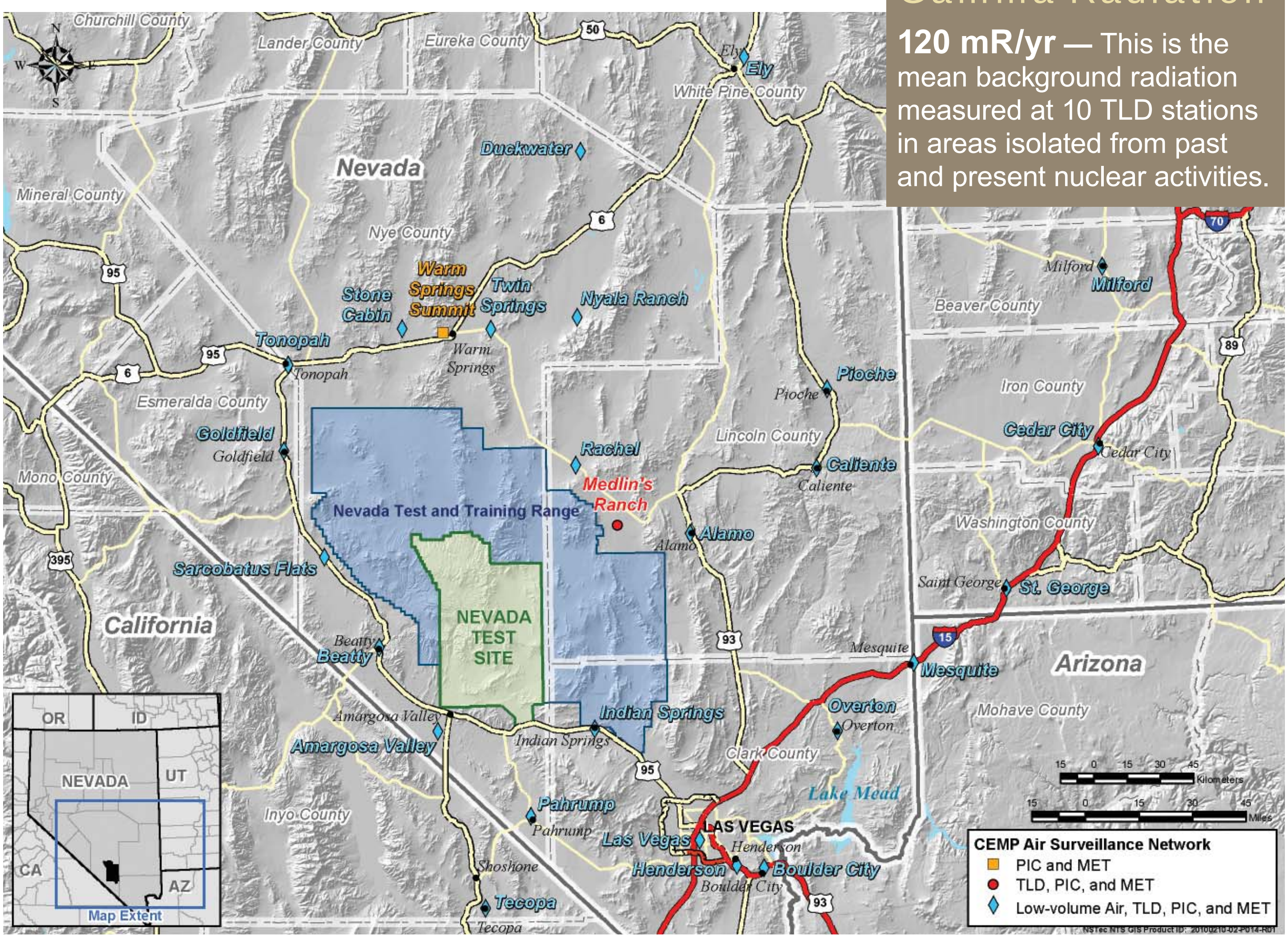
to gamma radiation is measured at 109 TLD stations on the NTS.

Exposure is reported in units called milliroentgens (mR).

Generally, a 1 mR gamma exposure from the most common external radionuclides produces a 1 mrem dose.

2009 NTS Background Gamma Radiation

120 mR/yr — This is the mean background radiation measured at 10 TLD stations in areas isolated from past and present nuclear activities.



2009 CEMP Air Surveillance Network

Average Direct Radiation Measured in 2009		
Location	**Elevation Above Sea Level** (feet)	**Radiation Exposure** (mR/yr)
NTS - Schooner TLD station	5,660	671
NTS - 35 Legacy Site TLD stations (includes Schooner)	3,077–5,938	252
Warm Springs Summit, Nevada CEMP PIC station	7,570	180
Twin Springs, Nevada PIC station	5,146	171
NTS - 17 Waste Operation TLD stations	3,176–4,021	140
NTS - 10 Background TLD stations	2,755–5,938	120
St. George, Utah PIC station	2,688	84
Pahrump, Nevada PIC station	2,639	73
NTS Mercury Fitness Track TLD station	3,769	59

Nonradioactive Air Emissions

The release of air pollutants is regulated on the NTS under a Class II air quality operating permit. Class II permits are issued for "minor" sources where annual emissions must not exceed 100 tons of any one "criteria pollutant" or 10 tons of any one of the 189 "hazardous air pollutants" (HAPs), or 25 tons of any combination of HAPs. Common sources of such air pollutants on the NTS include particulates from construction, aggregate production, surface disturbances, fugitive dust from driving on unpaved roads, fuel-burning equipment, open burning, fuel storage facilities, and chemical release tests conducted at the NPTEC on Frenchman Flat playa in Area 5.

An estimated 4.30 tons of criteria air pollutants were released on the NTS in 2009. The majority of the emissions were nitrogen oxides from diesel generators. Total air emissions of lead, also a criteria pollutant, was 12.3 pounds (0.006 tons). The quantity of HAPS released in 2009 was 0.30 tons. No emission limits for any air pollutants were exceeded.

Average Background Radiation of Selected U.S. Cities (Excluding Radon)		
City	**Elevation Above Sea Level** (feet)	**Radiation** (mR/yr)
Denver, CO	5,280	164.6
Wheeling, WV	656	111.9
Rochester, NY	505	88.1
St. Louis, MO	465	87.9
Portland, OR	39	86.7
Los Angeles, CA	292	73.6
Fort Worth, TX	650	68.7
Richmond, VA	210	64.1
Tampa, FL	0	63.7
New Orleans, LA	39	63.7

Source: http://www.wrcc.dri.edu/cemp/Radiation.html, "Radiation in Perspective," August 1990, as accessed on March 22, 2010

Estimated Quantity of Pollutants Released into the Air from NTS Operations in 2009	
Criteria Air Pollutants:	**Tons**
Particulate Matter[(a)]	0.49
Carbon Monoxide	0.55
Nitrogen Oxides	2.45
Sulfur Dioxide	0.10
Volatile Organic Compounds	0.71
Hazardous Air Pollutants (HAPs)	0.30
Lead	0.006

(a) Particulate matter equal to or less than 10 microns in diameter

Offsite Radiological Monitoring of Groundwater

NNSA/NSO's comprehensive radiological environmental monitoring program includes sampling and analysis of groundwater and natural springs off of the NTS to determine if groundwater contamination from past nuclear testing poses a current threat to public health and the environment. In 2009, NSTec conducted radiological monitoring of 14 offsite private/community water supply wells, 12 offsite non-potable NNSA/NSO wells, and 7 offsite springs *(see map on page 17)*.

All water samples from the offsite springs, wells, and surface water supplies monitored by NSTec and the CEMP had levels of tritium either below laboratory background levels or at very low detectable levels (<30 picocuries per liter [pCi/L]). The very low detectable levels represent residual tritium persisting in the environment that originated from global atmospheric nuclear testing.

No offsite springs or wells contained any man-made gamma-emitting radionuclides.

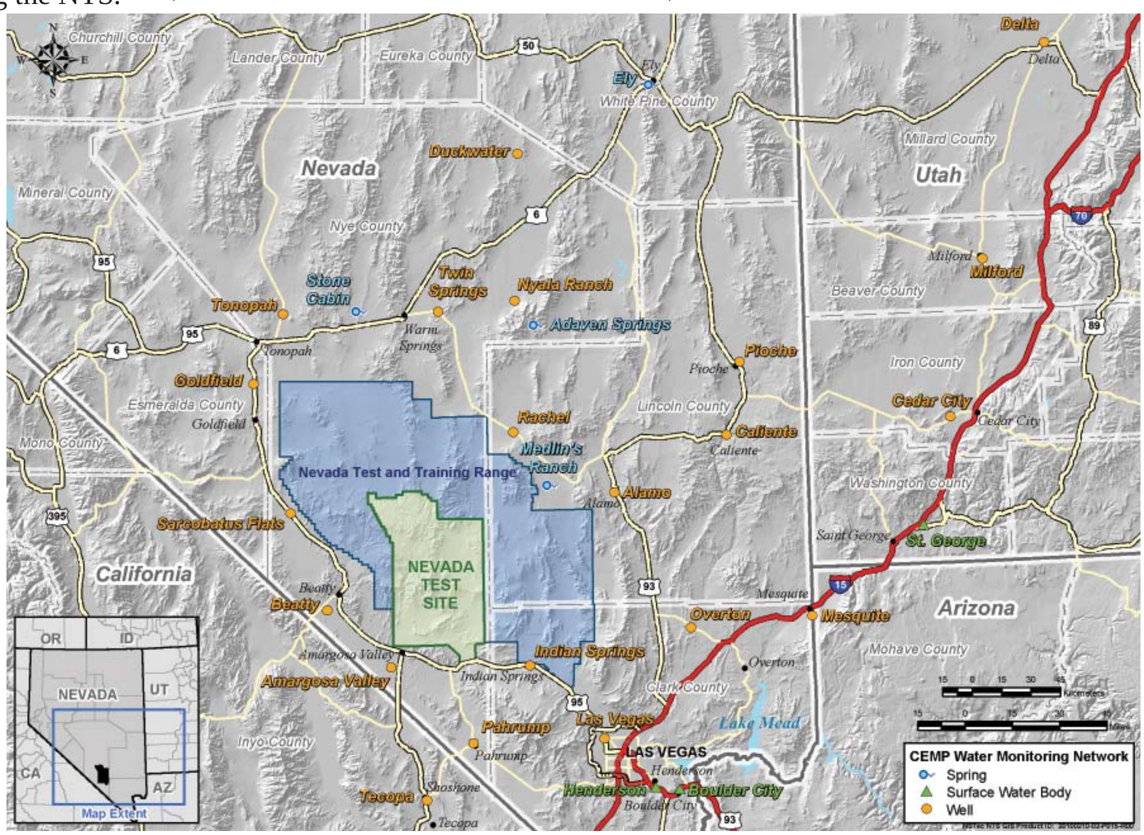
Range in Groundwater Tritium Levels Measured Off the NTS in 2009	
	pCi/L
Offsite Supply Wells (CEMP)	-0.3 to 4.7
Offsite Springs/ Surface Waters (CEMP)	0.5 to 22.4
Offsite NNSA/NSO Monitoring Wells (NSTec)	-10.2 to 23.8

Most offsite wells and all offsite spring samples contained detectable gross alpha and/or gross beta activity consistent with levels anticipated from natural sources. All levels were less than the U.S. Environmental Protection Agency (EPA) limits set for drinking water (15 pCi/L for gross alpha and 50 pCi/L for gross beta), except NNSA/NSO wells ER-OV-02 and Ash-B Piezometer #2 whose measured gross alpha activities were 19.0 and 17.8 pCi/L, respectively.

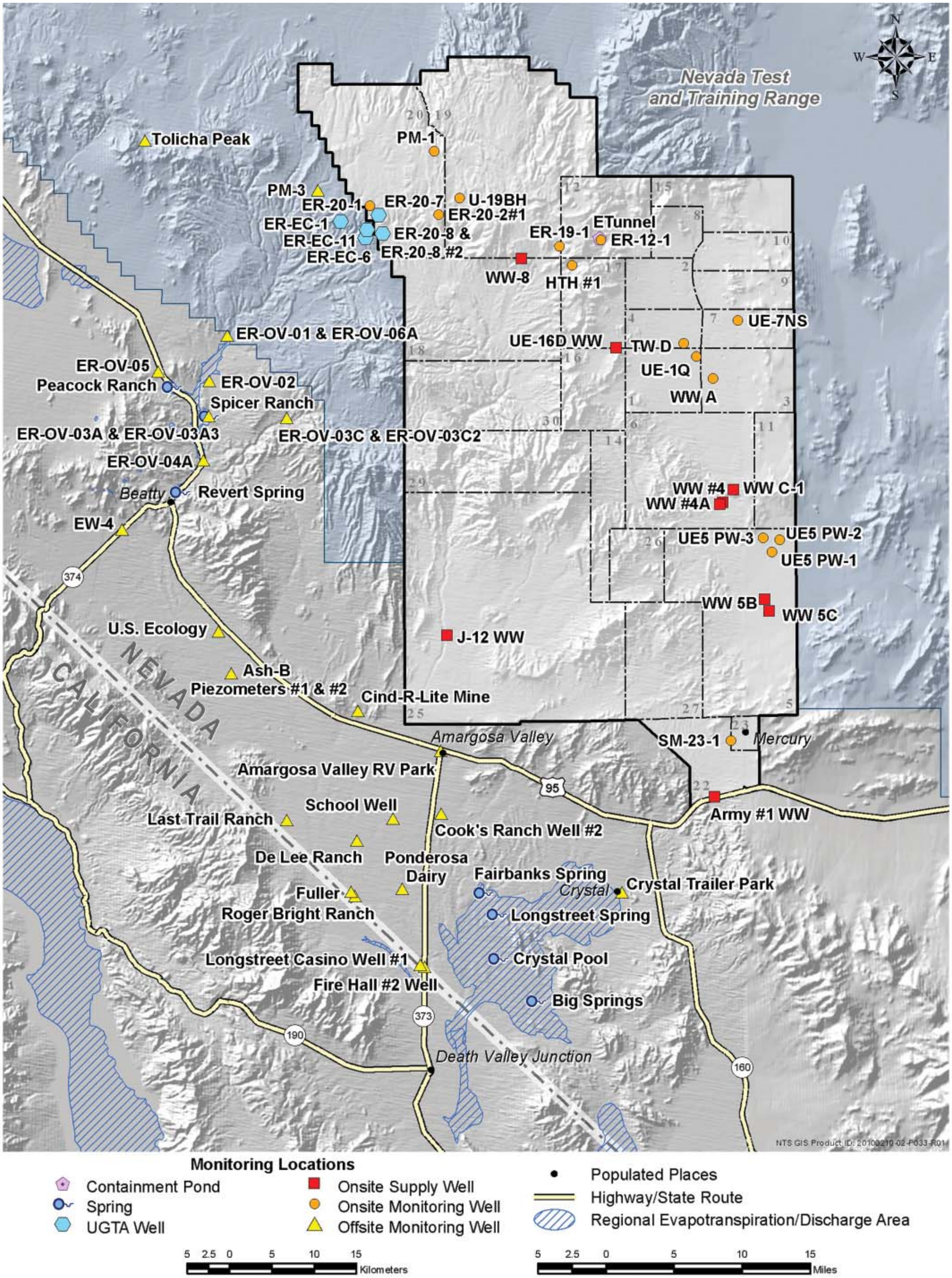
Offsite groundwater monitoring indicates that there has been no offsite migration of man-made radionuclides from underground contamination areas on the NTS to neighboring water supply wells or springs.

The DRI, through the CEMP, is tasked by NNSA/NSO to provide independent verification of the tritium concentrations in some of the offsite groundwater wells, municipal water supply systems, and springs used for water supplies in areas surrounding the NTS. Samples collected by DRI provide a comparison to the results obtained by NSTec. In 2009, the CEMP offsite water sampling locations included 21 wells, 3 surface water supply systems, and 4 springs located in selected towns and communities within 240 miles from the NTS *(see map to the right)*.

NSTec offsite water samples are analyzed for tritium, man-made gamma-emitting radionuclides, and gross alpha and gross beta radioactivity. Tritium is the sole radionuclide for which CEMP water sample analyses are run.



2009 CEMP Water Monitoring Locations



2009 NSTec Water Monitoring Locations

Onsite Radiological Monitoring of Groundwater

Radioactivity in onsite groundwater and surface waters of the NTS is monitored annually in order to (1) ensure that NTS drinking water is safe, (2) determine if permitted facilities on the NTS are in compliance with permit discharge limits for radionuclides, (3) estimate radiological dose to onsite wildlife using natural and man-made water sources, and (4) determine if groundwater is being protected from disposed radioactive wastes at the Area 3 and Area 5 RWMSs. In 2009, the onsite water monitoring network consisted of 5 potable and 4 non-potable water supply wells, 15 monitoring wells, and 1 tritiated water containment pond system *(see map on page 17)*.

Water Supply Wells – The 2009 data continue to indicate that underground nuclear testing has not impacted the NTS drinking water supply network. None of the onsite water supply wells had concentrations of tritium or any man-made gamma-emitting radionuclides above their minimum detectable concentrations (MDCs). The gross alpha and gross beta radioactivity detected in potable water supply wells represent the presence of naturally occurring radionuclides and did not exceed EPA drinking water limits.

Monitoring Wells – Some migration of radionuclides from the underground test areas to NTS monitoring wells has occurred, although the migration distances appear to be very short. Four onsite monitoring wells (PM-1, UE-7NS, U-19BH, and WW A) had detectable concentrations of tritium ranging from 33 to 339 pCi/L, all well below the drinking water limit of 20,000 pCi/L. Each of these wells is located within 0.6 miles of a historical underground test. Tritium concentrations in these wells have been decreasing in recent years; the estimated rates of decrease since 1999 range from 6.6 to 11.0 percent and are consistent with the natural decay rate of tritium. In 2009, all the other onsite monitoring wells sampled had tritium levels below their MDCs, which ranged from -10.7 to 12.1 pCi/L.

20,000 pCi/L — This is the EPA-established concentration limit for tritium in drinking water, equal to a dose of about 4 mrem/yr.

No man-made radionuclides were detected by gamma spectroscopy analyses at concentrations above detection limits in any of the monitoring wells in 2009. Those monitoring well samples measured for gross alpha and gross beta all had detectable levels, which are likely from natural sources. One of the monitoring wells (ER-19-1) had gross beta activity above the EPA drinking water limit; this activity is likely from man-made radionuclides.

Containment Ponds – A series of five constructed ponds collect and hold water discharged

Range in Groundwater Tritium Levels Measured On the NTS in 2009

	pCi/L
Onsite Supply Wells	-26.3 to 7.6
Onsite Monitoring Wells	-94 to 339*

*Four onsite monitoring wells had tritium levels above MDCs; all four are within 1 kilometer (0.6 miles) of underground nuclear tests.

Great Basin collared lizard *(Crotaphytus bicinctores)*

No drinking water wells on the NTS contained detectable tritium or man-made gamma-emitting radionuclides.

2009 Monitoring Results for E Tunnel Effluent Waters Pertaining to Water Pollution Control Permit NEV 96021		
Parameter	**Permit Limit** (pCi/L)	**Average Measured Concentration** (pCi/L)
Tritium	1,000,000	477,000
Gross Alpha	35	13.6
Gross Beta	100	38.9


Ring-necked snake *(Diadophis punctatus)*

from E Tunnel in Area 12 where nuclear testing was conducted in the past. The water is perched groundwater that has percolated through fractures in the tunnel system. Monitoring of the effluent waters from E Tunnel is conducted to determine if radionuclides or other contaminants exceed the allowable contaminant levels regulated under a state water pollution control permit. Tritium concentrations in tunnel effluent waters in 2009 were lower than the permit limit. The E Tunnel containment ponds are fenced and posted with radiological warning signs. Given that the ponds are available to wildlife, game animals are periodically sampled by NSTec to assess the potential radiological dose to humans via ingestion of game animals exposed to these ponds and to evaluate the radiological impacts to wildlife.

Tritiated water is also pumped into lined sumps during studies conducted by the Environmental Management's UGTA Sub-Project. This sub-project's mission is to characterize the groundwater beneath the NTS and adjacent lands for the purpose of developing analytical models to predict groundwater movement and contaminant transport. To do this, suitable wells are drilled and existing drill holes are re-completed in the vicinity of some underground tests. If the tritium level exceeds 200,000 pCi/L in water purged from a well during drilling, re-completion, or sampling operations, contaminated water is pumped from the wells and diverted to lined sumps (containment ponds) for evaporation, as required by the State. During 2009, water containing tritium was pumped from four drill holes. Water from one of the wells, ER-20-7, was contained in a sump and had a tritium concentration of 18,300,000 pCi/L. Well ER-20-7, completed in 2009, intercepted a contaminant plume consisting almost entirely of tritium believed to originate from the TYBO and BENHAM underground test areas, which are about 3,100 feet and 4,300 feet away from ER-20-7, respectively.

NTS Drinking Water

The public water systems that supply drinking water to NTS workers and visitors meet all National Primary and Secondary Drinking Water Standards.

Hedgehog cactus *(Echinocereus engelmannii)*

Onsite Nonradiological Monitoring of Drinking Water and Wastewater

NNSA/NSO operates a network of six permitted wells that comprise three permitted public water systems on the NTS that supply the drinking water needs of NTS workers and visitors. NNSA/NSO also hauls potable water to work locations at the NTS that are not part of a public water system. Monitoring results for 2009 indicated that water samples from the three public water systems and from the potable water hauling trucks met the National Primary and Secondary Drinking Water Standards.

Industrial discharges on the NTS are limited to the two operating sewage lagoon systems, Area 6 Yucca and Area 23 Mercury. Under the conditions of the state operating permit, liquid discharges to these sewage lagoons were tested quarterly in 2009 for biochemical oxygen demand, pH, and total suspended solids. All sewage lagoon water measurements were within permit limits.

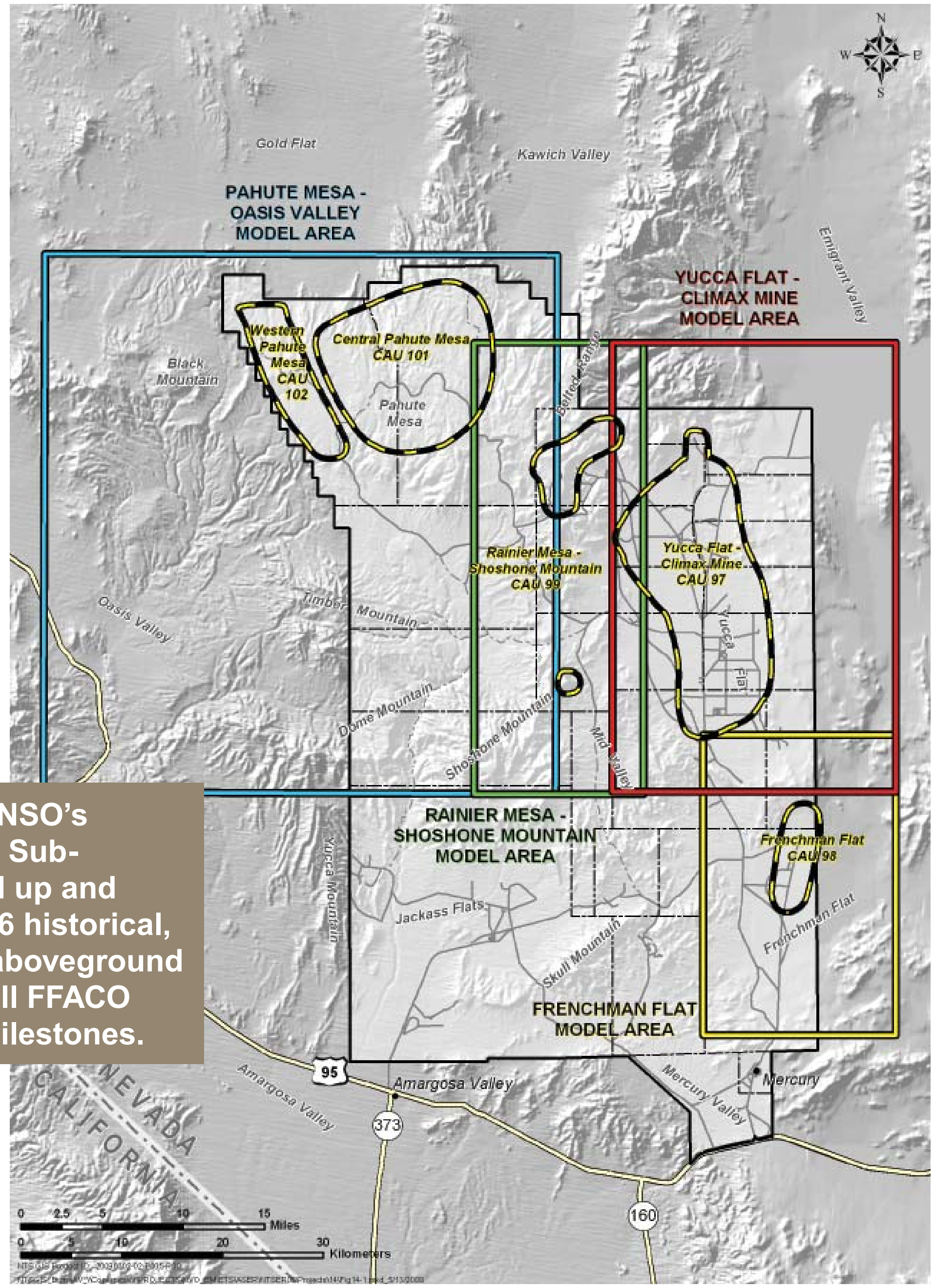
The discharge water from the E Tunnel complex is sampled annually under the state water pollution control permit NEV 96021 for 14 nonradiological contaminants, which are mainly metals. In 2009, none of the contaminants were detected at levels that exceeded permit limits.

Environmental Restoration

In 1996, the DOE, DoD, and the State of Nevada entered into the FFACO. The FFACO (amended in March 2010), addresses the environmental restoration of historical contaminated sites at the NTS, parts of TTR, parts of the NTTR, the Central Nevada Test Area, and the Project Shoal Area. The FFACO identifies a work scope and milestone schedule for the cleanup and safe closure of aboveground contaminated sites and for the field investigations and model development necessary to characterize the underground sites. Closure of the underground sites will involve monitoring groundwater in perpetuity because cost-effective technologies have not been developed to effectively remove or stabilize the radiological contaminants produced during historical underground nuclear testing.

In 2009, NNSA/NSO's Industrial Sites Sub-Project cleaned up and safely closed 46 historical, contaminated aboveground sites and met all FFACO 2009 closure milestones.

The UGTA Sub-Project investigates the areas where local or regional groundwater contamination has occurred on the NTS. These areas have been organized into five UGTA CAUs. Investigations also include areas where groundwater contamination is predicted to occur within 1,000 years.



Location of UGTA Sub-Project CAUs and Model Areas

The Central and Western Pahute Mesa CAUs Phase I Flow and Transport Model published in 2009 predicts that tritium contamination above the Safe Drinking Water Act maximum contaminant level of 20,000 pCi/L should be present off the NTS *(see figure on next page)*. NNSA/NSO presented the model predictions at open house events on February 18, 2009, and April 19, 2010, at the Beatty Community Center in Beatty, Nevada.

The schedule of FFACO corrective actions, particularly for UGTA CAUs, is among the highest mission priorities of NNSA/NSO.

A Phase II hydrogeologic investigation for the Pahute Mesa-Oasis Valley Model Area was started in 2009. Twelve proposed Phase II well sites were identified, and four new wells were drilled in 2009: ER-20-7, ER-20-8, ER-20-8#2, all in Area 20 on the NTS, and ER-EC-11 on the NTTR just 716 meters (2,350 feet) west of the NTS boundary.

Preliminary groundwater sampling of the new ER-EC-11 well in October

The Central and Western Pahute Mesa Flow and Transport Model predicts the migration of tritium off the NTS within 50 years of the first underground detonation (1965) in the Pahute Mesa-Oasis Valley Model Area.

2009 confirmed the presence of tritium at approximately 12,500 pCi/L. Well sample analyses to date have not detected the presence of man-made radionuclides further down gradient of Pahute Mesa in any of the seven nearby UGTA wells on the NTTR (ER-EC-1, -2A, -4, -5, -6, -7, and -8).

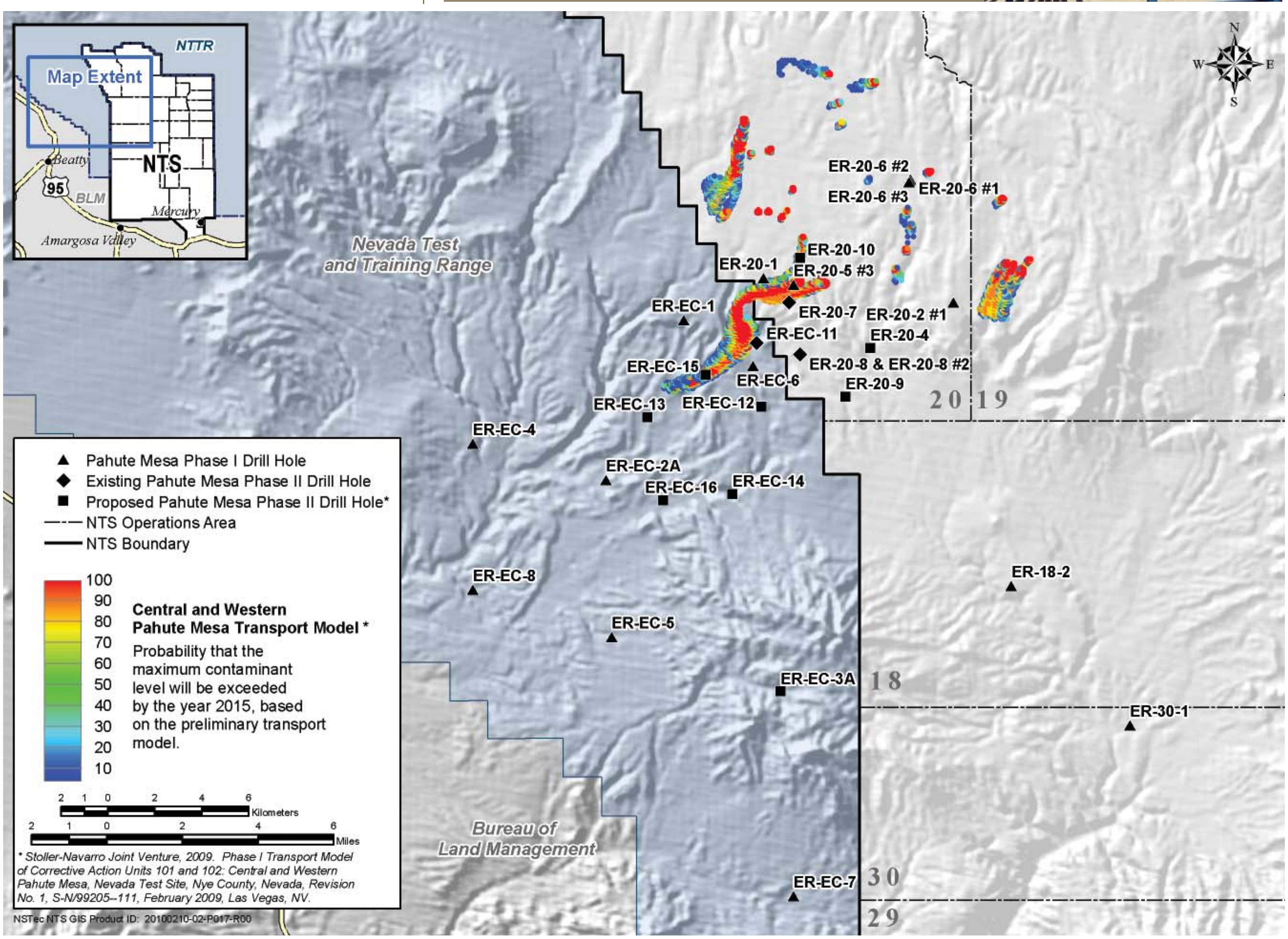
The final number of Pahute Mesa Phase II wells will be determined by NNSA/NSO. Proposed wells are selected to provide the maximum amount of information to support groundwater flow and contaminant transport modeling. Some of the new wells drilled for this investigation may also be used as long-term monitoring wells.

In 2009, the Phase II investigation for the Frenchman Flat CAU was completed, the Phase II Frenchman Flat Transport Model was submitted to the State of Nevada, and the objectives and criteria for the long-term monitoring well network for the Frenchman Flat CAU were developed. The development of flow and transport models for the Yucca Flat-Climax Mine and Rainier Mesa-Shoshone Mountain CAUs continued in 2009.

The FFACO Web page sponsored by the Nevada Division of Environmental Protection, Bureau of Federal Facilities is found at **http://ndep.nv.gov/BOFF/ffco.htm**. Current FFACO-related public notices can be found on the NNSA/NSO Web page at **http://www.nv.doe.gov/outreach/publicnotices.aspx**.

In October 2009, tritium was detected at approximately 12,500 pCi/L in the UGTA Sub-Project Well ER-EC-11 on the NTTR. This is the first time that radionuclides from underground nuclear testing activities at the NTS have been detected in groundwater beyond the NTS boundaries. These results support the Central and Western Pahute Mesa Flow and Transport Model forecasts.

Well ER-20-7



Results of Phase I Central and Western Pahute Mesa Transport Modeling

Pollution Prevention and Waste Minimization

Pollution prevention and waste minimization activities on the NTS result in reductions to the volume and toxicity of waste generated on site. In 2009, a reduction of 125 tons of hazardous wastes was realized. The largest proportion of this reduction came from shipments of bulk used oil (81.0 tons) and lead acid batteries (20.9 tons) to offsite vendors for recycling.

A reduction of 168.9 tons of solid wastes was realized in 2009. The largest proportion of this reduction came from shipping 106.7 tons of mixed paper and cardboard for recycling and shipping 31.2 tons of food wastes from the NTS cafeterias to a local pig farm.


Desert chicory *(Rafinesquia neomexicana)*
Chuckwalla *(Sauromalus obesus)*


Wild horses *(Equus caballus)*

Cultural Resources

DRI archeologists completed archival research and field surveys of 512 acres for 11 proposed NNSA/NSO projects on the NTS and the NTTR in 2009. No cultural resources eligible for the National Register of Historic Places (NRHP) were found during the field surveys.

The National Historic Preservation Act (NHPA) requires federal agencies to identify and maintain the integrity of historic properties under their jurisdiction. In 2009, a historical evaluation report for the U12t Tunnel Complex was finalized and a draft historical evaluation for the U12n Tunnel was completed. These Cold War era sites possess a distinctive type and method of construction and engineering for conducting underground nuclear tests. They are eligible for the NRHP as historic landscapes.

Other field projects included photo-documentation of metal troughs at the historic Little Feller location and the Engine Maintenance, Assembly, and Disassembly building in Area 25 and a site visit to Area 17 for evaluating the proposed location of a live firing and training range. Archival research was conducted for Building 2205.

The NHPA requires that archaeological collections and associated records be maintained at professional standards. DRI maintains the NTS Archaeological Collection, which contains over 400,000 artifacts. Over 30 years of archaeological survey reports, technical reports, and site records are linked to a searchable Geographical Information System. In 2009, electronic files were created for all site forms and reports.

NNSA/NSO's American Indian Program conducts consultations with NTS-affiliated American Indian tribes through the Consolidated Group of Tribes and Organizations (CGTO). In 2009, the Program gave a presentation at the State-Tribal Government Intergovernmental Work Group meeting in Snowbird, Utah, about the CGTO's participation in developing American Indian text for major NTS Environmental Impact Statements. NNSA/NSO also hosted a Tribal Update Meeting with the CGTO in 2009.


Rock cabin at Cane Spring, Area 27

Ecological Monitoring

Numerous species, considered by federal and state agencies to be sensitive or important to track, are known to occur on the NTS and include 19 plants, 1 mollusk, 2 reptiles, over 250 birds, and 27 mammals. Biologists continued to monitor some of these species in 2009, including two plant species, western red-tailed skinks, western burrowing owls, bats, mule deer, and mountain lions. As a result, the documented distribution patterns of these species on the NTS have been increased, and other species new to the NTS have been recorded.

Biologists continued to work in cooperation with Southern Nevada Health District personnel to determine if mosquitoes on the NTS carry West Nile Virus. As in previous years, no infected mosquitoes were found.

In 2009, the Habitat Restoration Monitoring Program monitored one closed Environmental Restoration site on the NTS and five on the TTR, all of which had been revegetated between 1997 and 2004. Closed sites are revegetated to prevent the introduction and spread of non-native species, restore native plants to the site, and provide habitat for wildlife. At closed waste sites, vegetation protects against soil erosion and water percolation into buried waste. In 2009, viable native perennial plant communities were documented at the six sites, and at many of the sites, plant density and plant cover values exceeded pre-established standards for revegetation success.

Endangered Species Protection

The desert tortoise is protected as a threatened species under the Endangered Species Act; it occurs in suitable habitat on the southern third of the NTS. Activities conducted in desert tortoise habitat must comply with the terms and conditions of a Biological Opinion issued to NNSA/NSO by the U.S. Fish and Wildlife Service. In 2009, biologists conducted surveys for 24 projects within the distribution range of the desert tortoise, and 8.08 acres of desert tortoise habitat were disturbed or were scheduled for disturbance. No desert tortoises were accidentally injured or killed, nor were any found, captured, or displaced from project sites. One desert tortoise was accidentally killed on a road in 2009. A cumulative total of 319.54 acres of desert tortoise habitat has been disturbed on the NTS since 1992 when the species was listed as threatened.

Desert tortoise *(Gopherus agassizii)*

Energy Management Program

The NNSA/NSO Energy Management Program was formed to implement projects to meet the goals of DOE O 430.2B, "Departmental Energy, Renewable Energy and Transportation Management." Its mission is to reduce the use of energy and water in NNSA/NSO facilities by advancing energy efficiency, water conservation, and the use of solar and other renewable energy sources. The program's goals are established, tracked, and reported on a fiscal year (FY) basis (October 1 through September 30). In December 2009, the Energy Management Program developed the *FY 2010 NNSA/NSO Energy Executable Plan*, which reports the current status toward meeting the 2015 goals of DOE O 430.2B, the projects completed in FY 2009, and the projects planned for FY 2010.

Energy Executable Plan 2009 Status

Increase Energy Efficiency — Energy intensity (energy consumption per gross square foot of building space) was reduced in FY 2009 by 23% from the FY 2003 baseline. NNSA/NSO is on track to meet the goal of reducing energy intensity by 30% by 2015.

Promote Renewable Energy — NNSA/NSO is investigating a renewable energy facility on the NTS. Full funding to build a Solar Demonstration Zone will achieve the goal of having 7.5% of NTS's annual electricity and thermal consumption supplied by an onsite renewable energy source. Renewable energy credits were purchased to offset this requirement for 2010–2011.

Conserve Water — In FY 2009, potable water use was reduced by 16% percent from the FY 2007 baseline. This is the 2015 goal, which will probably be exceeded each year as the installation of water meters and the use of best management practices for water efficiency continue.

Reduce Consumption of Petroleum Products — In FY 2009, the motor vehicle fleet's consumption of petroleum products was reduced by 2% annually, and the consumption of non-petroleum-based fuel was increased by 10% annually. These are the 2015 goals. In FY 2009, 100% of all light vehicles purchased were alternative fuel vehicles, which exceeded the goal of 75%.

Use High Performance Sustainable Buildings (HPSB) — An HPSB Plan was developed in August 2009. Ten buildings were identified as meeting the Leadership in Energy and Environmental Design (LEED) requirements. NNSA/NSO is on track to meet goal of having 15% of all buildings classified as HPSB by 2015. By the end of 2010, four buildings are expected to achieve LEED certification, which represents 10.4% of the required 15% of enduring buildings.

Environmental Management System

NNSA/NSO conducts activities on the NTS while ensuring protection of the environment, the worker, and the public. This is accomplished by implementing an Environmental Management System (EMS). The EMS is a business management practice that incorporates concern for environmental performance throughout an organization, with the ultimate goal being continual reduction of the organization's impact on the environment. NSTec designed an EMS to meet the 17 requirements of the globally recognized International Organization for Standardization (ISO) 14001 Environmental Management Standard. In 2008, the EMS obtained ISO 14001 certification. NSTec identifies NNSA/NSO operations with a potential environmental aspect and implements the EMS to minimize or eliminate such impacts. An NSTec Environmental Working Group determines which EMS objectives and targets will be implemented each fiscal year

EMS FY 2009 Status

Reduce Hazardous Air Emissions

- Replaced two fuel burning boilers with high efficiency electric boilers. The 2009 target was to replace three boilers. The third boiler was removed instead of replaced.

Prevent Drinking Water Contamination

- Replaced approximately 2,700 feet of old and leaking waterline in Area 6 of the NTS. This target was met by early 2010.

Reduce Energy Use

- Reduced electrical energy use by 20.1% from the FY 2008 baseline. This exceeded the target of a 3% reduction.

Close/Remediate Historical Contaminated Sites Regulated under FFACO

- Completed closure of four CAUs on schedule, meeting the FY 2009 target.

Protect Groundwater Quality

- Prepared 80 historical boreholes for plugging and plugged 74 historical boreholes, meeting the FY 2009 target.

Reduce Risks of Environmental Contamination at Active Vulnerable Sites

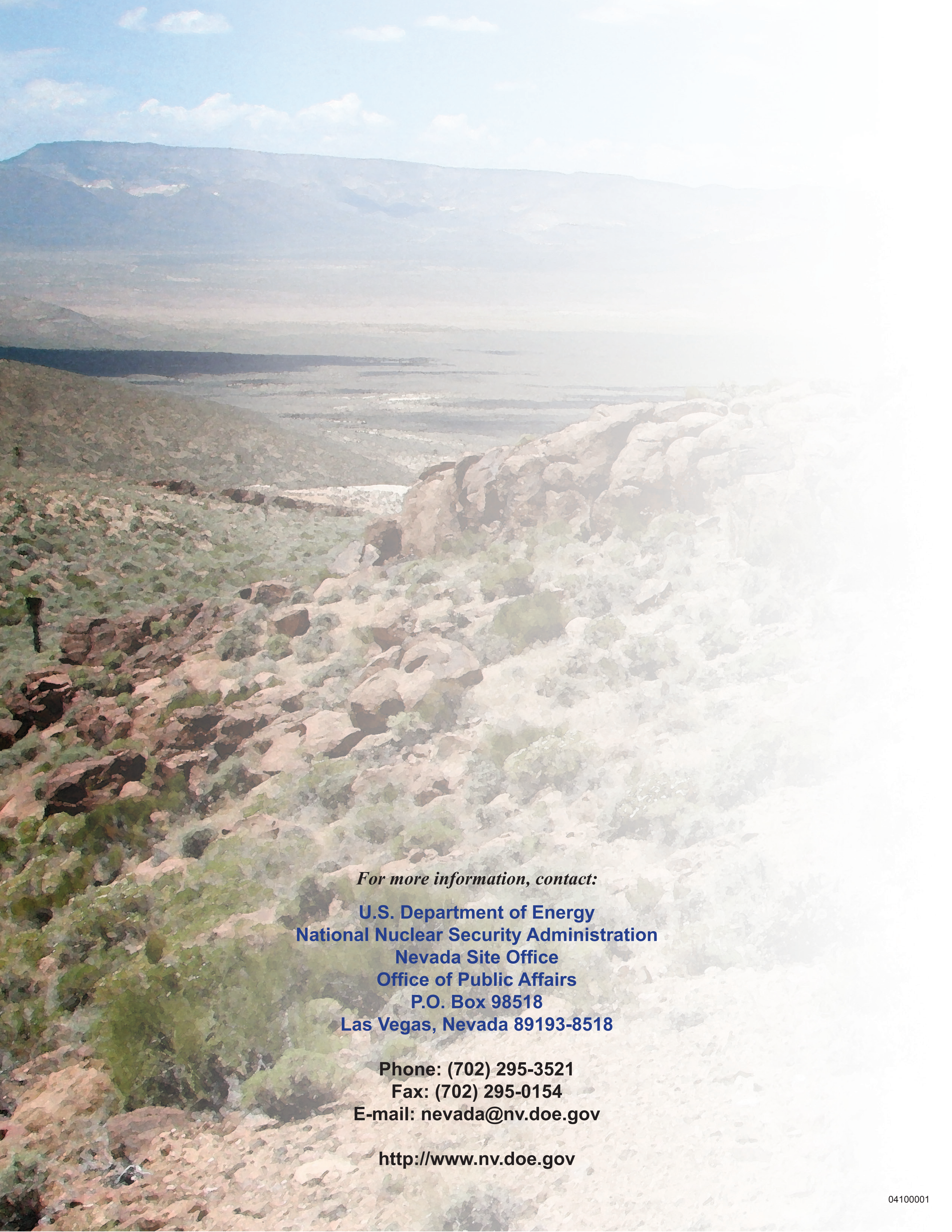
- Mitigating actions were taken at three active operational sites on the NTS to remove or reduce the risk of a chemical release. The target each fiscal year is to take mitigating action for as many vulnerable sites as possible as funds become available.

Reduce Waste Generation

- Reused 100% of the soil (168 cubic yards) excavated from a new disposal cell at the Area 5 RWMS for waste cover and fill material, meeting the FY 2009 target.
- Reused 26.2 miles of existing pavement, which was removed and recycled as road bed material under new pavement, meeting the FY 2009 target.

Reduce Water Usage

- Reduced water usage by 4.4% from the FY 2008 baseline. This exceeded the target of a 2% reduction.



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