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2005

Nevada Test Site Environmental Report Summary

Disclaimer

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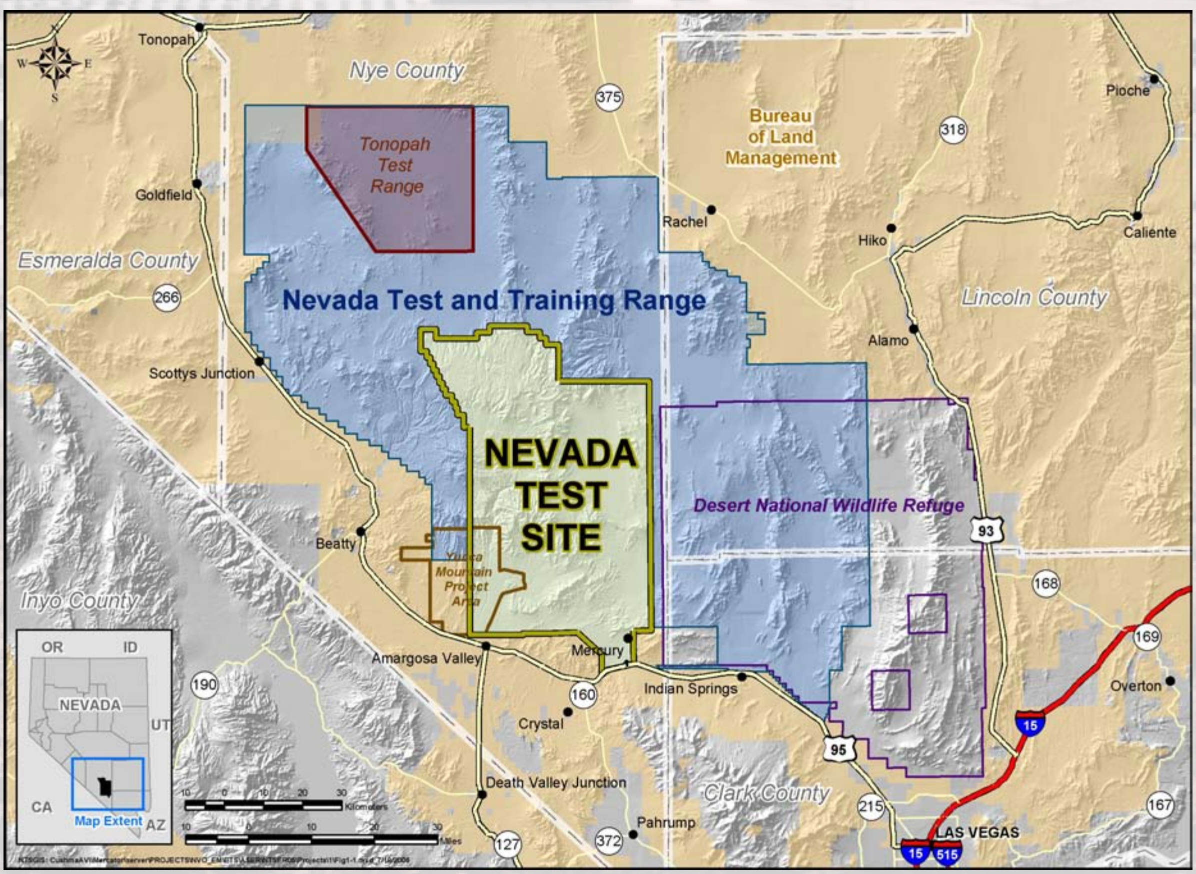
The information presented in this document is explained in greater detail in the Nevada Test Site Environmental Report 2004 (DOE/NV/25946--007). It can be downloaded from the NNSA/NSO web site at http://www.nv.doe.gov/library/publications/environmental.aspx or from the U.S. Department of Energy Office of Scientific and Technical Information at http://www.osti.gov/bridge.

Nevada Test Site
Environmental Report 2005 Summary

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), the nation's historical testing site for nuclear weapons from 1951 through 1992, and currently the nation's unique site for ongoing national-security-related missions and high-risk operations. NNSA/NSO strives to provide to the public an understanding of the current activities on the NTS, including environmental monitoring and compliance activities aimed at protecting the public and the environment from radiation hazards and from non-radiological impacts. This document is a summary of the Nevada Test Site Environmental Report (NTSER) for calendar year 2005. The NTSER is a comprehensive report of environmental activities performed at the NTS and its satellite 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. To provide an abbreviated and more readable version of the NTSER, this summary report is produced. This summary does not include detailed data tables, monitoring methods or design, a description of the NTS environment, or a discussion of all environmental program activities performed throughout the year. The reader may obtain a hardcopy or compact disc of the full NTSER as directed on the inside front cover of this summary report.

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.



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 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*.[1]

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. Since late 1962, nearly all tests have been 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 or below the water table.

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 were conducted in Area 25, and a series of tests with a nuclear ramjet engine was conducted in Area 26. The test released mostly gaseous radioactivity (radio-iodines, radio-xenons, radio-kryptons) and some fuel particles due to erosion of the metal cladding on the reactor fuel; these releases resulted in negligible deposition on the ground.

NTS - Continental Test Site

After the end of World War II, the U.S. 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 is called the Nevada Proving Ground.

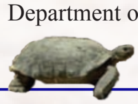
On Saturday, January 27, 1951, an Air Force B-50D bomber dropped a one-kiloton yield nuclear bomb over Frenchman Flat. It was the world's tenth nuclear detonation and was the first NTS test.

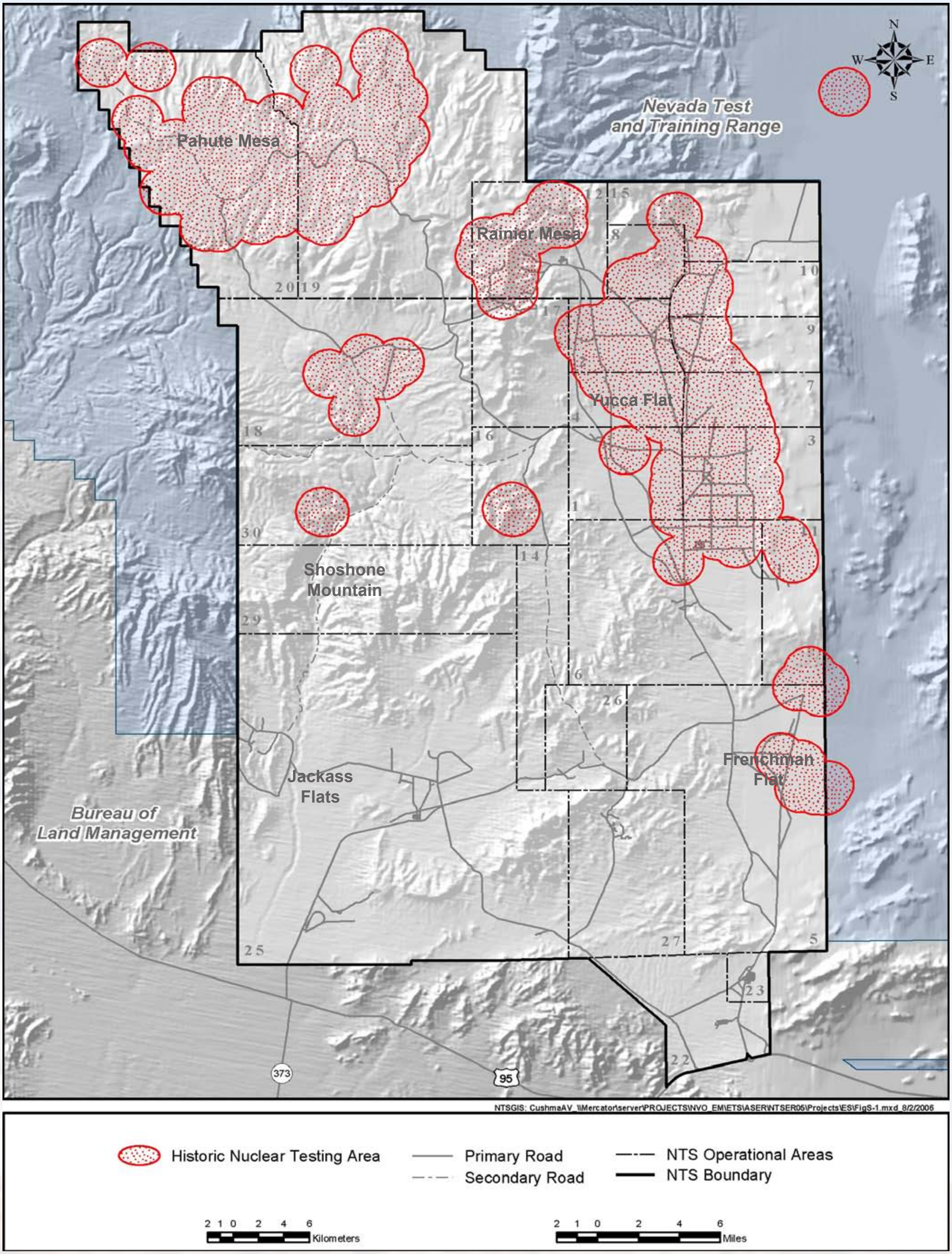
On September 23, 1992, the last underground nuclear test was conducted on the NTS after which Congress imposed a moratorium on nuclear weapons testing.

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.

[1] U.S. Department of Energy, 2000. Report No. DOE/NV-209 (Rev. 15).



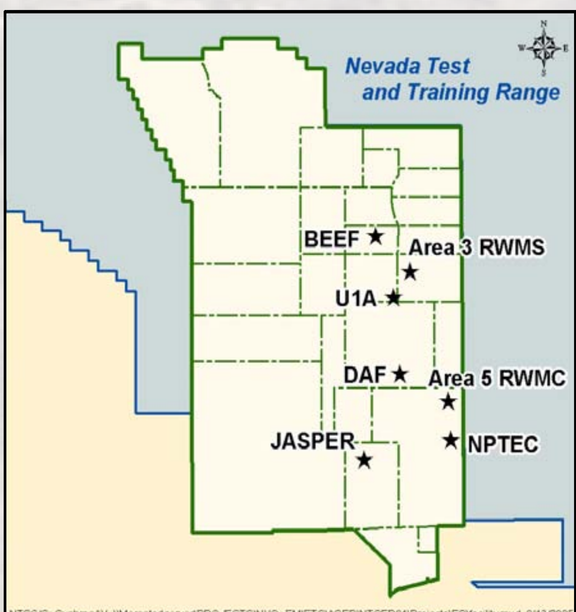


Historic Nuclear Testing Areas

The NTS Now

Los Alamos, Lawrence Livermore, and Sandia National Laboratories are the principal organizations that sponsor and implement experimental programs at the NTS. In 2005, Bechtel Nevada (BN) was the Management and Operations contractor accountable for the successful execution of work and ensuring that work was performed in compliance with environmental regulations. The three major NTS missions include National Security, Environmental Management, and Stewardship of the NTS. 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.

NTS activities in 2005 continued to be diverse, with the primary goal being to ensure that the existing U.S. stockpile of nuclear weapons remains safe and reliable. Facilities that support this mission include the U1a Facility, the Big Explosives Experimental Facility (BEEF), the Device Assembly Facility (DAF), and the Joint Actinide Shock Physics Experimental Research (JASPER) Facility. Other NTS activities include demilitarization activities; controlled spills of hazardous material at the Non-Proliferation Test and Evaluation Complex (NPTEC) (formerly known as the Hazardous Materials Spill Center); remediation of industrial sites; processing 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.



NTS Missions and Their Programs

National Security

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

Homeland Security Program - Provides support facilities, training facilities, and capabilities for government agencies involved in counterterrorism activities, emergency response, first responders, national security technology development, and nonproliferation technology development.

Test Readiness Program - Maintains the capability to resume underground nuclear weapons testing, if directed.

Environmental Management

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

Waste Management Program - Manages and safely disposes of low-level waste received from DOE- and DoD-approved facilities throughout the United States and mixed low-level waste generated in Nevada by NNSA/NSO, and safely manages and characterizes hazardous and transuranic wastes for offsite disposal.

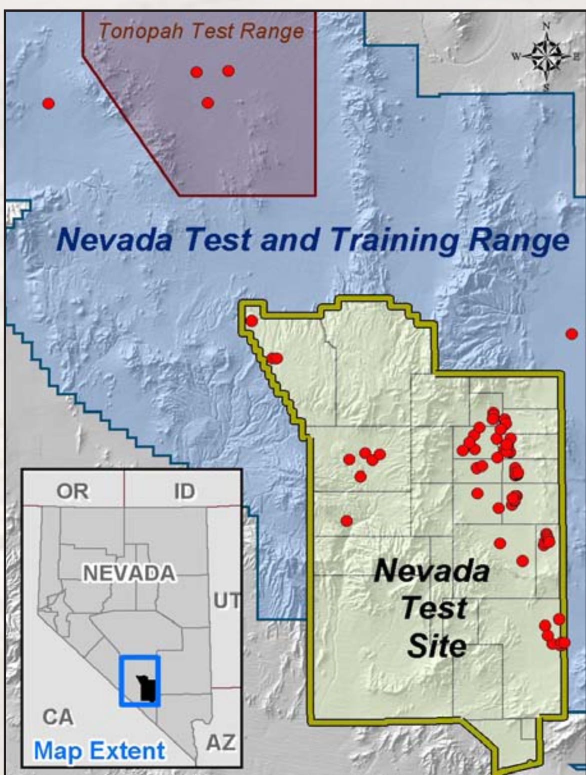
Stewardship of the NTS

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

Aerial View of NPTEC (source: BN Facility Data Warehouse, October 1998)

The Legacy of NTS Nuclear Testing

There have been 828 underground nuclear tests conducted at the NTS. Approximately one-third of these tests were detonated near or below the water table resulting in the contamination of groundwater in some areas of the NTS. In 1996, DOE, U.S. Department of Defense (DoD), and the state of Nevada entered into a Federal Facilities Agreement and Consent Order which established Corrective Action Units (CAUs) on the NTS that delineated and defined areas of concern for groundwater contamination. There have been 100 atmospheric above-ground nuclear tests and numerous above-ground nuclear-related experiments that have contaminated surface soils, materials, equipment, and structures, mainly on the NTS. The Environmental Management (EM) Mission of NNSA/NSO addresses this legacy of contamination resulting from the effects of historic nuclear activities conducted at the NTS, NTTR, and the TTR. The Environmental Restoration (ER) Program is responsible for conducting environmental restoration of contaminated sites and to conduct safe waste management and disposal activities. NNSA/NSO, along with the state of Nevada, has identified over 1,700 above-ground CASs and CAUs that have already been or are scheduled for cleanup and closure. EM keeps the public informed of their activities through quarterly newsletters, exhibits, and fact sheets and provides opportunity for public input via the Community Advisory Board comprised of 10-15 citizen volunteers from Nevada.



Areas of Soil Contamination on and off the NTS

Legacy Contamination

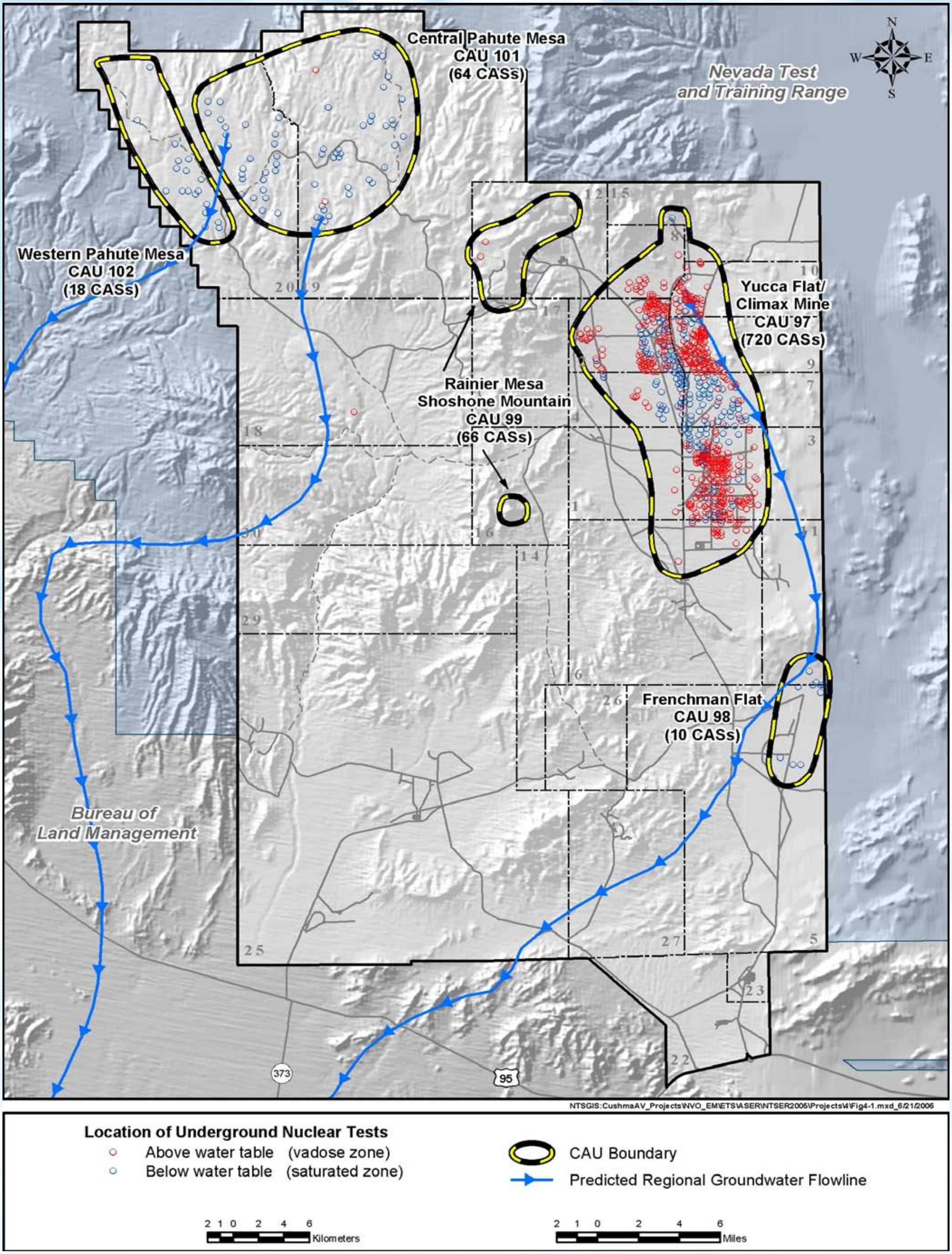
Groundwater - Areas of known and potential groundwater contamination on the NTS due to underground nuclear testing are called Underground Test Area (UGTA) CAUs. It is estimated that from combined underground testing, a total of 57,000,000 curies (Ci) of tritium remain underground. There is no technology available that would allow for the cleanup of deep, extensive groundwater contamination. The EM Program's strategy, therefore, is to identify contaminant boundaries and implement an effective long-term monitoring system.

Soil - An estimated 7 million cubic feet of radioactively-contaminated surface soils which exceed 1,000 picocuries per gram (pCi/g) of soil occur at 87 sites (Corrective Action Sites [CASs]) on and around the NTS. This is the action level of radioactivity above which some mitigation is planned (1,000 pCi/g is equal to 0.000000001 Ci/g). To date, two sites on NTTR have been cleaned through soil removal. The remaining sites both on and off the NTS are in the process of cleanup and restoration.

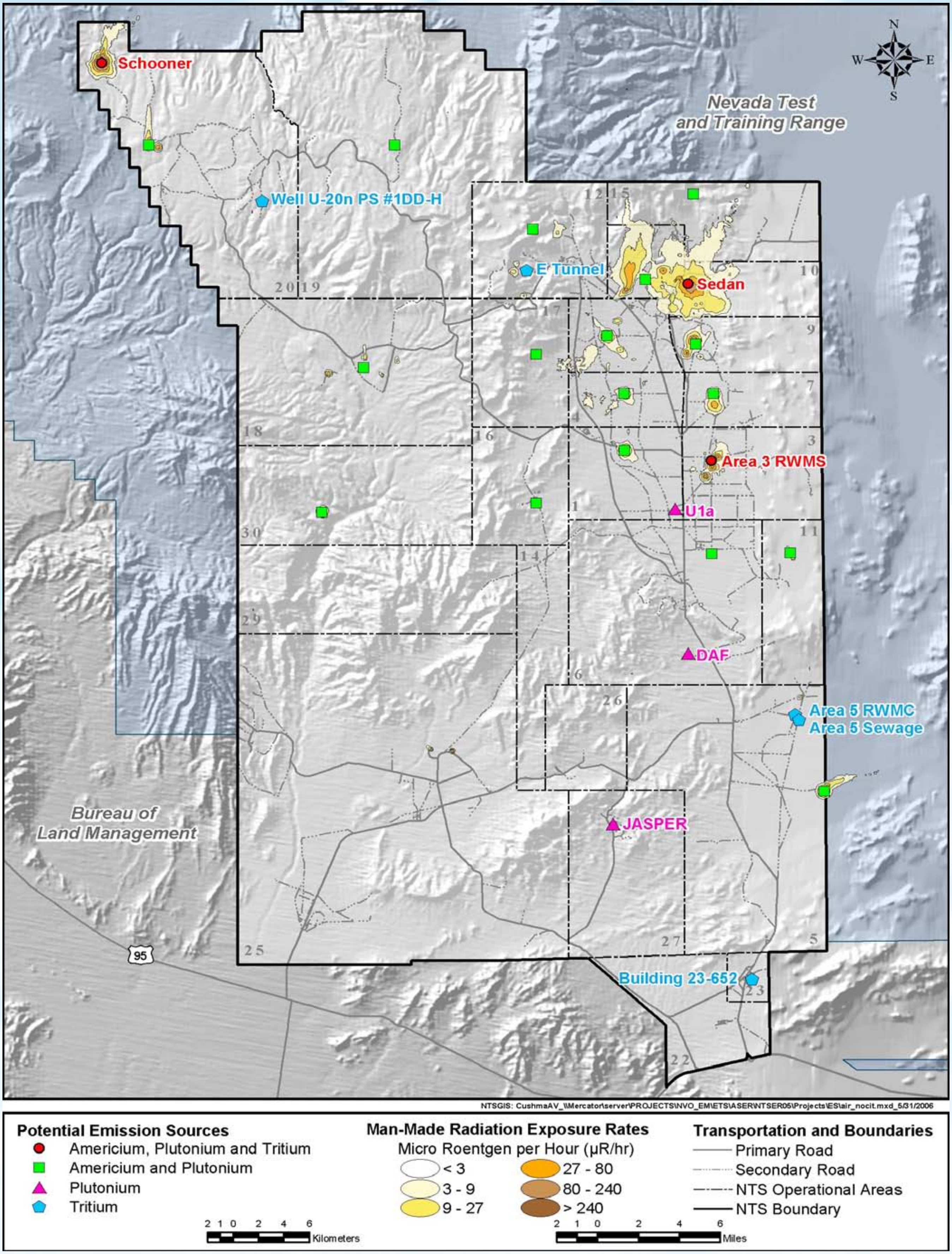
Air - Airborne radioactive contamination from the resuspension of contaminated soils at legacy sites and from current activities (such as waste management) is monitored continuously on and off the NTS. Since the cessation of above-ground nuclear testing, the annual amounts of airborne radiation from the NTS have ranged from 48 to 2,000 Ci for tritium, 0.24 to 0.40 Ci for plutonium, and 0.39 to 0.049 Ci for americium. Since 1992 (when public dose monitoring was started), surrounding communities have received radiation doses from air emissions which are less than 1 percent of background radiation levels.

Structures/Materials - There are 1,647 sites where facilities, equipment, structures, or debris occur which are contaminated by past nuclear testing activities and are no longer used. The ER Program is responsible for restoring and cleaning up such sites. To date, over 1,209 sites have been cleaned up, and the remaining sites are in the process of cleanup and restoration.

Waste Disposal - Low-level and mixed low-level radioactive wastes have been generated by historic NTS nuclear testing activities; by nuclear laboratories supporting NTS testing; and by the historic nuclear reactor, rocket, and furnace testing in Area 25. At the Area 5 and Area 3 Radioactive Waste Management Sites (RWMSs) combined, the Waste Management Program has safely disposed a total volume of 326,500 cubic yards (yd^3) of radioactive waste that contains an estimated total of 72,972 Ci. The average concentration of radioactivity in the disposed waste is about 0.22 Ci/yd^3. Disposed waste from the Area 25 testing activities has the highest average concentration of 0.93 Ci/yd^3.



Areas of Potential Groundwater Contamination on the NTS



Potential 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 are 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. Exposures to man-made radiation in our everyday life come from smoking cigarettes, traveling on airplanes, and having medical X-rays. For the public surrounding the NTS, less than 1 percent of their total radiation exposure is now attributable to past or current NTS activities.

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.

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 which they strike, but 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.

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 biologic risk of the energy deposited is the dose equivalent. The units of dose equivalent are called rems or sieverts. In this report, 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 300 mrem each year from natural sources and an additional 60 mrem from medical procedures, consumer products, and activities. 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

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 above-ground nuclear testing. Detected in soil and air.
	Cesium-137	^{137}Cs	Beta, gamma	
	Plutonium-238	^{238}Pu	Alpha	
	Strontium-90	^{90}Sr	Beta	
	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.
	Potasium-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 and is the number of protons and neutrons together in the nucleus of the atom. Radionuclides with the same number of protons are the same element and radionuclides of the same element are called isotopes of one another. Plutonium and uranium each have several radioactive isotopes that are detected on the NTS.

**These radionuclides decay to other radionuclides (called progeny or daughters) which emit alpha, beta, and gamma radiation.

approach and assume that there is no such thing as a 100 percent safe dose equivalent, and it is assumed that the risk of developing an adverse health effect (such as cancer) is proportionate to the amount of radiation dose. Many human activities increase our exposure to radiation over and above the average background radiation dose of 300 mrem per year (mr/yr). 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 (1 mSv/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 & Measurements. The NRC has set the dose limit for radiation workers to 5 rem/yr (50 mSv/yr). There is no regulatory standard for radiation dose limits to workers or the public across industries, states, or countries.

Common Doses to the Public

Source/Activity	Average Dose/Year (or as noted)
Five-hour jet plane ride	3 mrem
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	2500 mrem
Smoking 20 cigarettes/day	5300 mrem to a smoker's lung
One cancer treatment	5,000,000 mrem to the tumor

Source: http://www.eh.doe.gov/radiation/Radiation-final-6-20.pdf, accessed on 8/8/2006

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 when nuclear tests were conducted only underground, the radiation exposure to the public surrounding the NTS was greatly reduced. 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.

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).

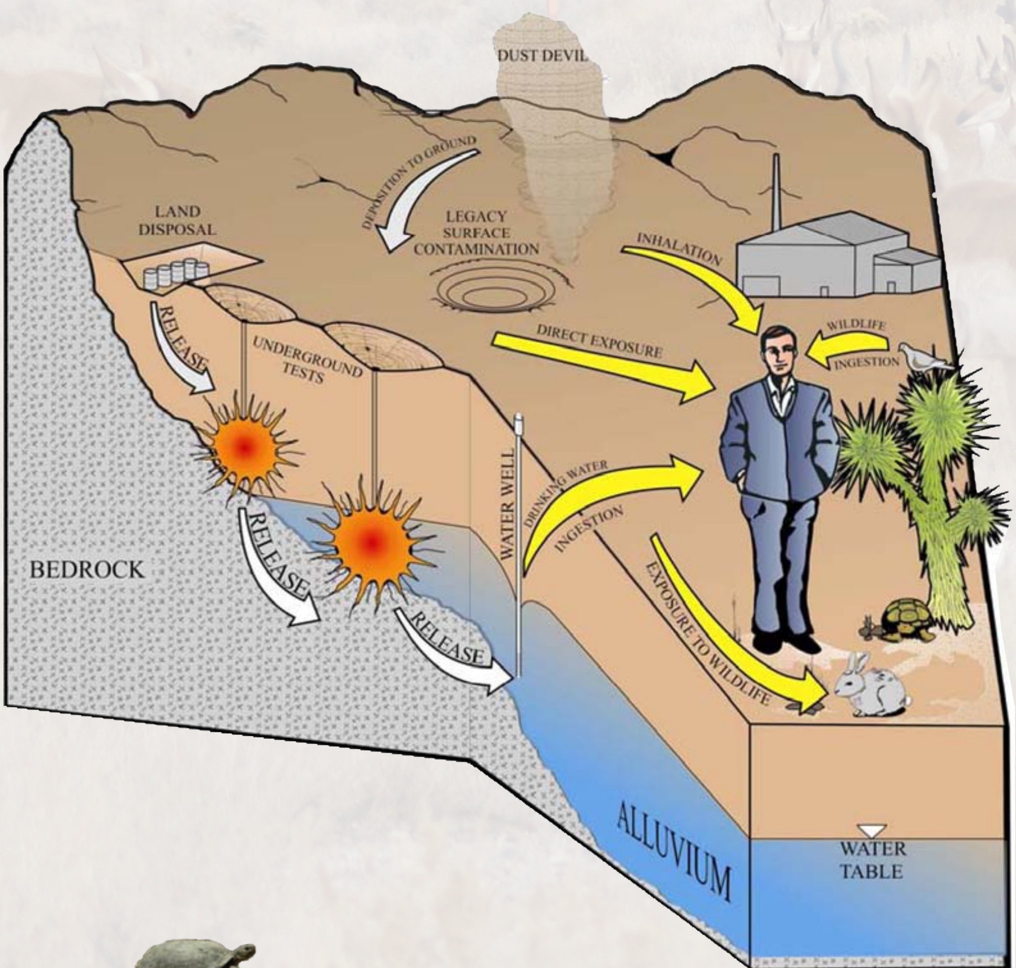
100 mrem/yr - This is the dose limit to the public (above natural background) from all possible pathways combined, as specified by DOE Order 5400.5, Radiation Protection of the Public and the Environment.

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 known 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 - 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 the NTS. No man-made radionuclides occur in drinking water sources monitored off the NTS and no drinking water wells on the NTS have measurable levels of man-made radionuclides. Only the groundwater from monitoring wells drilled near underground tests on the NTS show radioactive contamination.



Estimated 2005 Radiation Dose to the Public from All Possible Pathways

There is no NTS radiation dose to the public from the groundwater pathway. Annual monitoring continues to verify that no contaminated groundwater has migrated beyond the NTS boundaries into surrounding water supplies used by the public.

The radiation dose to the general public by just the air transport pathway was estimated using air sampling results from six onsite "critical receptor" sampling stations. The radionuclides detected at three 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 tritium. The uranium isotopes are attributed to naturally-occurring uranium. As in previous years, the 2005 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 only 2.3 mrem/yr. This annual dose is 0.6 percent of the background radiation dose estimated for an individual residing at Indian Springs. No one resides at the Schooner station, and the dose at offsite populated locations 12 – 50 miles from the Schooner station would be much lower due to wind dispersion, probably a fraction of 1 mrem, similar to dose estimates generated by computer models in previous years.

Dose to the Public from the Air Transport Pathway Based on 2005 Sample Data
2.3 mrem/yr – This is the estimated dose to an individual if they lived year-round on the NTS at the Schooner air sampling station. The offsite public 12 – 50 miles away would only receive a fraction of 1 mrem/yr.

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. In 2005, both mourning doves and jackrabbits were sampled at the Sedan crater in Area 10, and mourning doves were sampled at a sump in which tritium-contaminated water from a well drilled adjacent to an underground test site was pumped and stored. Based on these samples, the highest dose to a member of the public was estimated to be 0.32 mrem if this person consumed 20 jackrabbits from the Sedan crater site.

Dose to the Public from Ingestion of Game Animals Based on 2005 Sample Data
0.32 mrem/yr – This is the estimated dose from ingestion of NTS game animals assuming one consumed 20 jackrabbits from the Sedan crater site, a known site of legacy soil contamination.

The maximum dose to the public from all pathways (air and ingestion) during 2005 is estimated to be 0.52 mrem/yr. This assumes that an individual who resides in a community surrounding the NTS will receive an air pathway dose no greater that 0.20 mrem/yr, as dose estimates from 1992 – 2004 suggest. It also assumes that this individual consumes an additional 0.32 mrem from game animals.

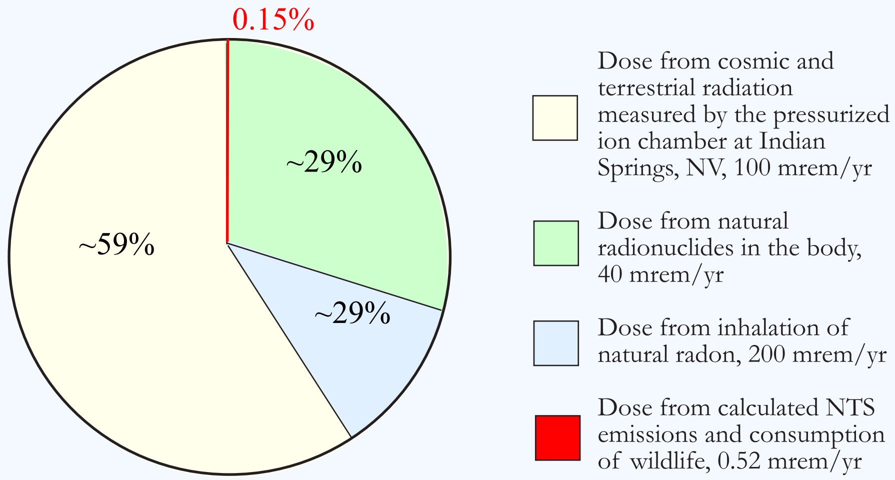
2005 Dose to the Public from All Pathways
0.52 mrem/yr – This estimated dose combines 0.2 mrem/yr (based on past year's computer model estimates) and the 0.32 mrem/yr from ingestion of NTS game animals. This total dose estimate is indistinguishable from natural background radiation experienced by the public residing in Las Vegas or other communities surrounding the NTS.

Dose to the Public fom the Air Transport Pathway Based on Computer Modeling[(a)]

<0.2 mrem/yr – This is the estimated dose to an individual who resides in one of the many communities surrounding the NTS based on the use of soil resuspension models, wind models, and historical NTS soil sample data. From 1992 to 2004, these models were used to estimate the dose to the maximally exposed individual (MEI) and to identify the probable community surrounding the NTS in which they lived. Since 1992, the estimated dose to the MEI has been <0.2 mrem/yr, and the MEI has been identified as residing in either Springdale or Cactus Springs, Nevada.

[(a)] The U.S. Environmental Protection Agency (EPA) and the DOE no longer require NTS to use these models to confirm that the annual dose to the public from NTS is below the NESHAP limit of 10 mrem/yr. Data collected onsite each year from the six critical receptor air sampling stations will be used from now on to document NESHAP compliance, and 0.2 mrem will be assumed to be the maximum possible annual dose to the offsite public.

This total dose is well below the dose limit of 100 mrem/yr established by DOE Order 5400.5 for radiation exposure to the public from all pathways combined. This dose is so small it cannot be distinguished from the dose from background radiation (it is ~0.15 percent of the total dose from naturally-occurring sources).



Percents of Total Dose to the Public (340 mrem/yr) from Natural Background Sources and from the NTS

Monitoring Onsite Radionuclide Air Emissions

Each year, the total quantity of radioactive emissions from the NTS (in curies [Ci]) and their sources are identified. In 2005, total tritium (^{3}H) emissions from all sources was estimated to be 170 Ci and total $^{239+240}Pu$ and ^{241}Am emissions were estimated to be 0.29 and 0.047 Ci, respectively.

No radioactivity was detected above minimum detectable concentrations (MDCs) in any of the samples collected from the JASPER Facility. No radiological releases occurred at U-1a, BEEF, or DAF.

Estimated NTS Tritium Air Emissions by Source in 2005 (in Curies)

Equipment Calibration:	
Area 23 Building 650	0.000014
Evaporation from Water Sources:	
Area 12 E Tunnel Ponds	17
Well U-20n PS #1DD-H Sump	3.5
Area 5 Sewage Lagoon	0.00037
Evaporation/Transpiration from Soil/Vegetation:	
Area 3 RWMS	57
Area 5 RWMS	8.9
Area 10 Sedan	45
Area 20 Schooner	40
Total	**170**

To monitor the diffuse onsite NTS radioactive emissions, a network of 19 air sampling stations and a network of 109 thermoluminescent dosimeters (TLDs) were used (see map on page 14). Air sampling stations and TLDs are located throughout the NTS, mainly within those numbered Operational Areas where historic nuclear testing has occurred or where current radiological operations occur.

Total Estimated NTS Radiological Air Emissions in 2005 (in Curies)

Tritium (^{3}H)	Plutonium ($^{239+240}$Pu)	Americium (^{241}Am)
170	0.29	0.047

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

Several human-made radionuclides were measured at air sampling stations at levels above their MDCs in 2005: ^{241}Am, ^{3}H, ^{238}Pu, and $^{239+240}$Pu. The highest mean level of ^{241}Am was detected at Bunker 9-300 in Area 9, a vacant building located within an area of known soil contamination from past nuclear tests. The highest mean 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. The highest mean levels of plutonium isotopes in air were at Bunker 9-300. Uranium isotopes were also detected in air samples collected in areas where depleted uranium ordnance has been used or tested. However, the samples' isotopic ratios were what one would expect from naturally-occurring uranium in soil and not from either man-made depleted or enriched uranium.

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

Radionuclide	CL [(a)] (10^{-15} μCi/mL)	Highest Average Concentration (10^{-15} μCi/mL)[(b)]	Sampler Location
^{241}Am	1.9	0.230	Bunker 9-300
^{3}H	1,500,000	330,540	Schooner
^{238}Pu	2.1	0.020	Bunker 9-300
$^{239+240}$Pu	2.0	1.52	Bunker 9-300

(a) Concentration limits established NESHAP, in microcuries per milliliter (μCi/mL).

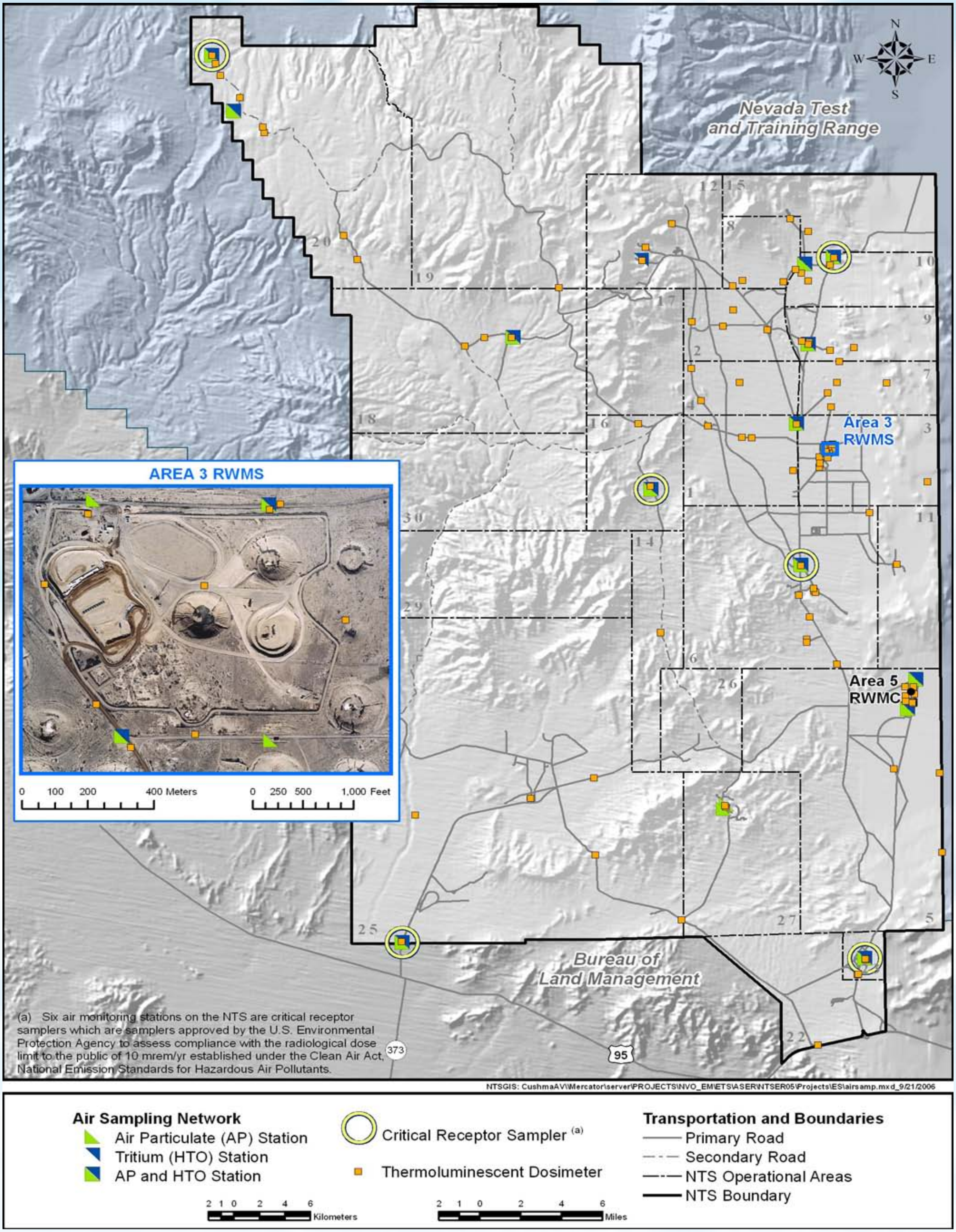
(b) The scale of concentration units for radionuclides shown in the table have been standardized to 10^{-15} μCi/mL. This scale may differ from those reported in detailed radionuclide-specific data tables in the NTSER.

Both $^{239+240}$Pu and tritium concentrations in NTS air samples continue to decline. Tritium concentrations have decreased since the cessation of testing in 1992. The average decline varies in amount among NTS areas. Area 1 tritium concentrations show an average decrease of 52 percent since 1992, while Areas 23 and 25 show an average decrease of 99.7 percent since then.

$^{239+240}$Pu concentrations have likewise decreased; the average decline since 1992 ranges from 38 percent in Areas 1 and 3 to 91 percent in Areas 18, 19, and 20. The downward trends in plutonium concentrations are attributed to its dispersal by the wind and weathering in the soil, where it becomes bound to less mobile particles.

Gross alpha and beta radioactivity was detected at all stations on the NTS. The average gross alpha activities ranged from 15.29 to 54.68 x 10^{-16} μCi/mL; the highest seen at Bunker 9-300. The average gross beta activities ranged from 17.29 to 22.51 x 10^{-15} μCi/mL; the highest seen at Sugar Bunker, an unoccupied structure used during past nuclear testing, located about 1 km (0.6 mi) south-southwest of the Area 5 Radioactive Waste Management Complex (RWMC).

Direct exposure to gamma radiation is measured at 109 TLD stations on the NTS. Exposure is reported in units called milliroentgens (mR). The TLD detectors can measure gamma radiation from all sources, both natural background radiation from cosmic and terrestrial sources and radiation from man-made sources. Ten of the NTS TLD stations measure natural background levels. The mean level was well within average background levels observed in other parts of the United States of similar elevation above sea level. Background radiation varies



2005 NTS Air Sampling Network

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 834 mR/yr at Schooner, one of the legacy Plowshare sites on Pahute Mesa. The lowest was 60 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 147 mR. At the 35 TLD locations near known legacy sites (including Schooner), it was 277 mR.

NTS Background Gamma Radiation
119 mR/yr – This is the background radiation measured at 10 TLD stations in areas isolated from past and present nuclear activities.

Average Direct Background Radiation of Selected U.S. Cities (Excluding Radon)

City	Elevation Above Sea Level (feet)	Radiation Exposure (mR/yr)[a]
Denver, Colorado	5,280	164.6
Wheeling, West Virginia	656	111.9
Rochester, New York	505	88.1
St. Louis, Missouri	465	87.9
Portland, Oregon	39	86.7
Los Angeles, California	292	73.6
Fort Worth, Texas	650	68.7
Richmond, Virginia	210	64.1
Tampa, Florida	3	63.7
New Orleans, Louisiana	0	63.7

(a) Source: < http://www.wrcc.dri.edu/cemp/Radiation.html>
"Radiation in Perspective," August 1990, as accessed on 3/22/2005

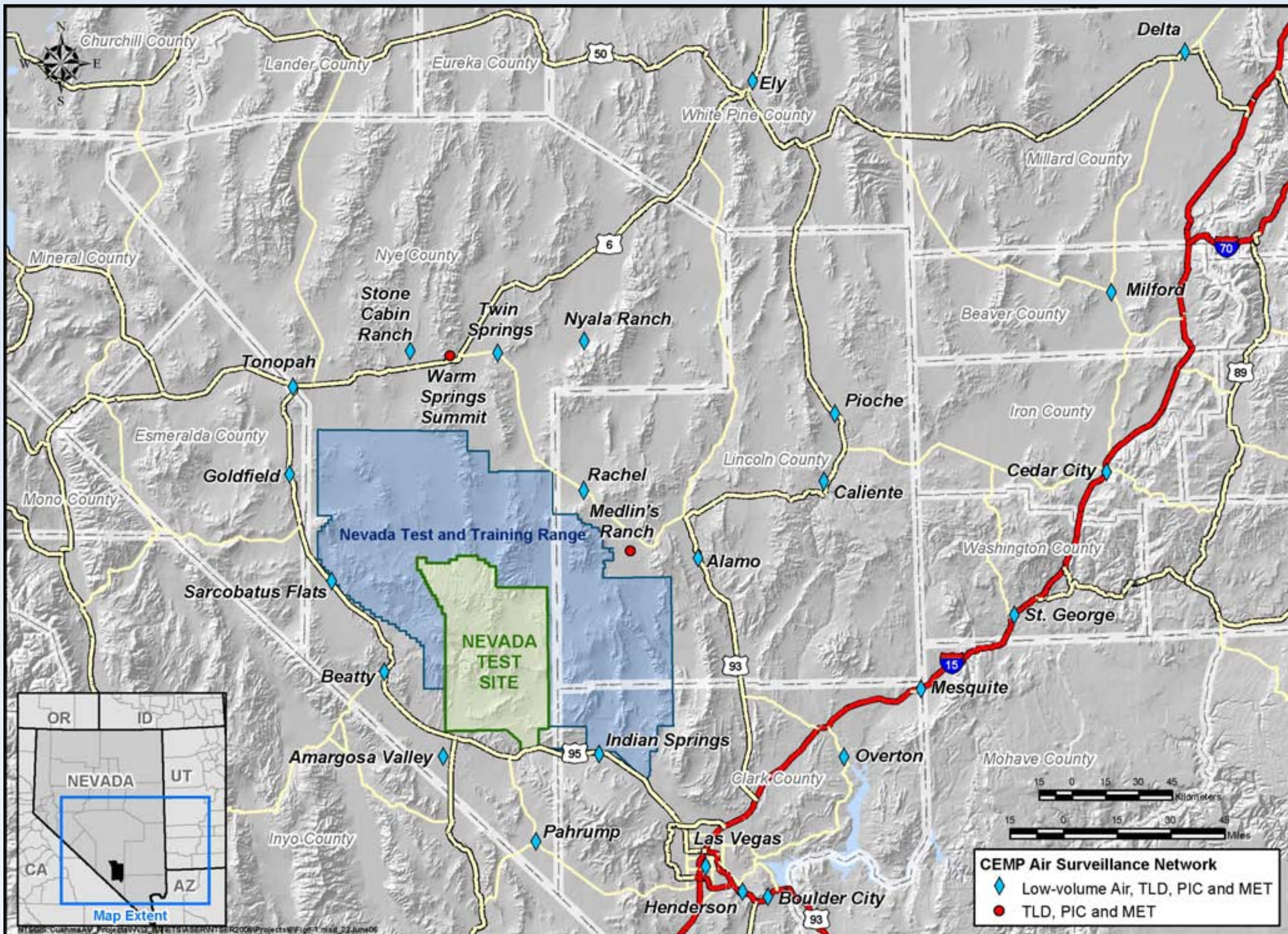
Monitoring Offsite NTS Radiological Air Emissions by the Community Environmental Monitoring Program (CEMP)

An important component of the NTS radiological monitoring program is the oversight program run by the CEMP which is coordinated by the Desert Research Institute (DRI) of the Nevada System of Higher Education under contract with NNSA/NSO. It can independently confirm NTS compliance with radiological air emission and water quality standards offsite. Its purpose is to provide monitoring for radionuclides which may be released from the NTS. A network of 27 CEMP stations located in selected towns and communities within 240 miles from the NTS was operated continuously during 2005. The CEMP stations monitored gross alpha and beta radioactivity in airborne particulates using low-volume particulate air samplers, penetrating gamma radiation using TLDs, gamma radiation exposure rates using PIC detectors, and meteorological parameters using automated weather instrumentation (MET stations).

No airborne radioactivity related to any NTS operations was detected in any of the CEMP samples during 2005. Gross alpha and gross beta radioactivity was detected at all CEMP stations at levels consistent with previous years, which reflect radioactivity from background radiation. No man-made gamma-emitting radionuclides were detected. Naturally-occurring radioactive beryllium (^{7}Be) was detected in most air particulate samples.

Range in Radioactivity/Radiation Levels Measured at Offsite and Onsite Air Sampling Stations

	Average Gross Alpha ($\times 10^{-16}$ µCi/mL)		Average Gross Beta ($\times 10^{-15}$ µCi/mL)	
	Offsite (CEMP)	Onsite (BN)	Offsite (CEMP)	Onsite (BN)
Highest Average Value	3.22 (*Boulder City*)	54.68 (*Sugar Bunker*)	2.40 (*Boulder City*)	22.51 (*Sugar Bunker*)
Lowest Average Value	1.08 (*Nyala Ranch*)	15.29 (*Gate 20-2P*)	1.73 (*Nyala Ranch*)	17.29 (*3545 Substation*)



2005 CEMP Air Surveillance Network

The offsite TLD and PIC results remained consistent with previous years' background radiation levels and are well within average background levels observed in other parts of the United States and with the 119 mR/yr level measured on the NTS. The highest total annual gamma exposure measured offsite, based on the PIC detectors, was 183.96 mR/yr at Milford, Utah (at 4,957 feet elevation). The lowest offsite rate, based on the PIC detectors, was 58.87 mR/yr at Pahrump, Nevada (at 2,675 feet elevation).

Average Direct Radiation Measured in 2005

Location	Elevation Above Sea Level (feet)	Radiation Exposure (mR/yr)
NTS - Schooner TLD station	5,660	834
NTS - 35 Legacy Site TLD stations	3,077 – 5,938	277
Milford, Utah PIC station	4,900	184
Twin Springs, Nevada PIC station	5,055	168
NTS - 17 Waste Operation TLD stations	3,176 – 4,021	147
NTS - 10 Background TLD stations	2,755 – 5,938	119
St. George, Utah PIC station	2,600	80
Pahrump, Nevada PIC station	2,550	75
NTS - Mercury Fitness Track TLD station	3,769	60

Offsite Radiological Monitoring of Groundwater

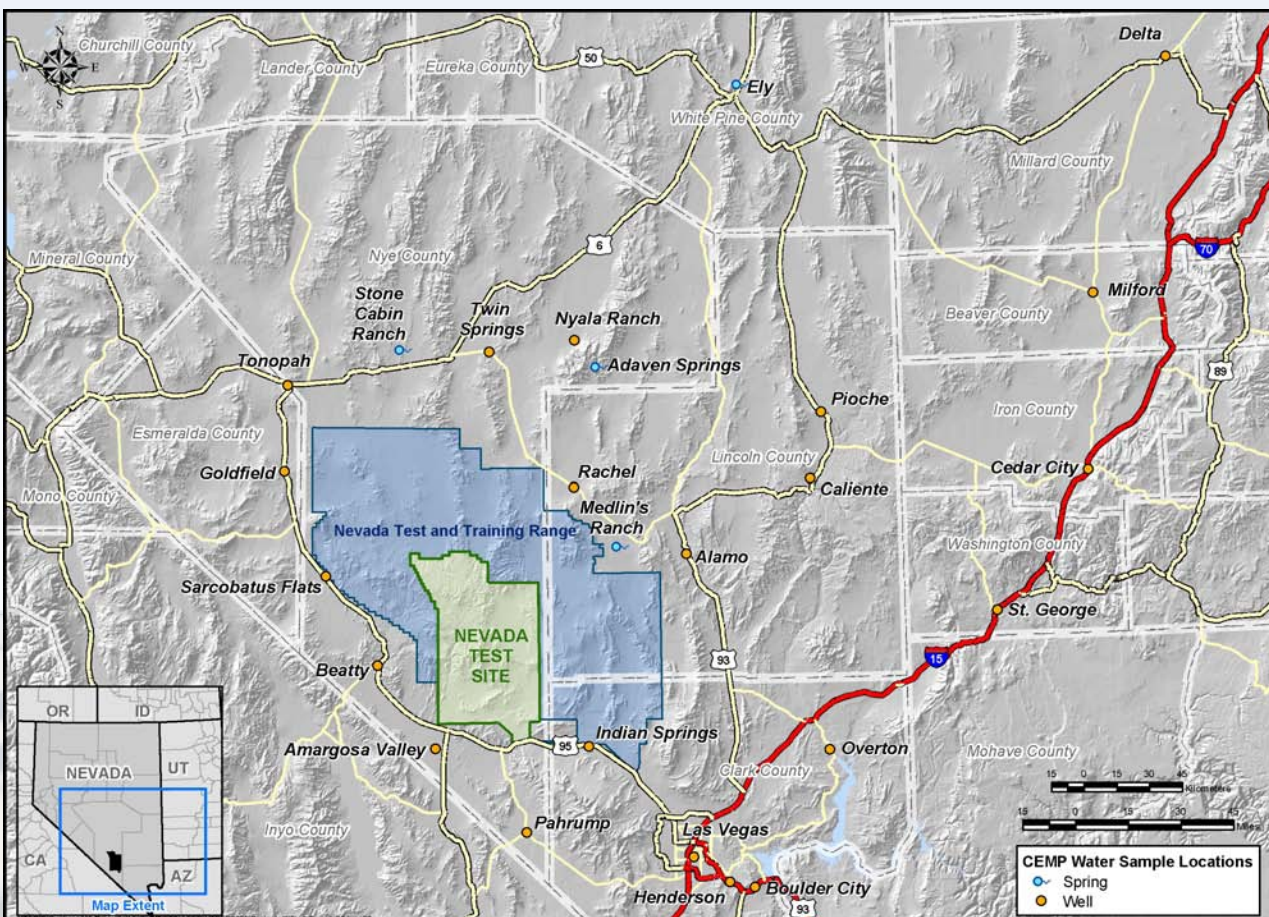
The comprehensive radiological environmental monitoring program off the NTS includes sampling and analysis of groundwater and natural springs to determine if groundwater contamination from past nuclear testing poses a current threat to public health and the environment.

In 2005, BN conducted radiological monitoring of 27 offsite wells and 3 offsite springs. The wells included 9 private domestic wells, 6 local community wells, and 12 NNSA/NSO wells drilled for hydrogeologic investigations including groundwater flow modeling. All of the BN-sampled wells and springs are in Nevada within 19 miles from the western and southern borders of the NTS (see map on page 18).

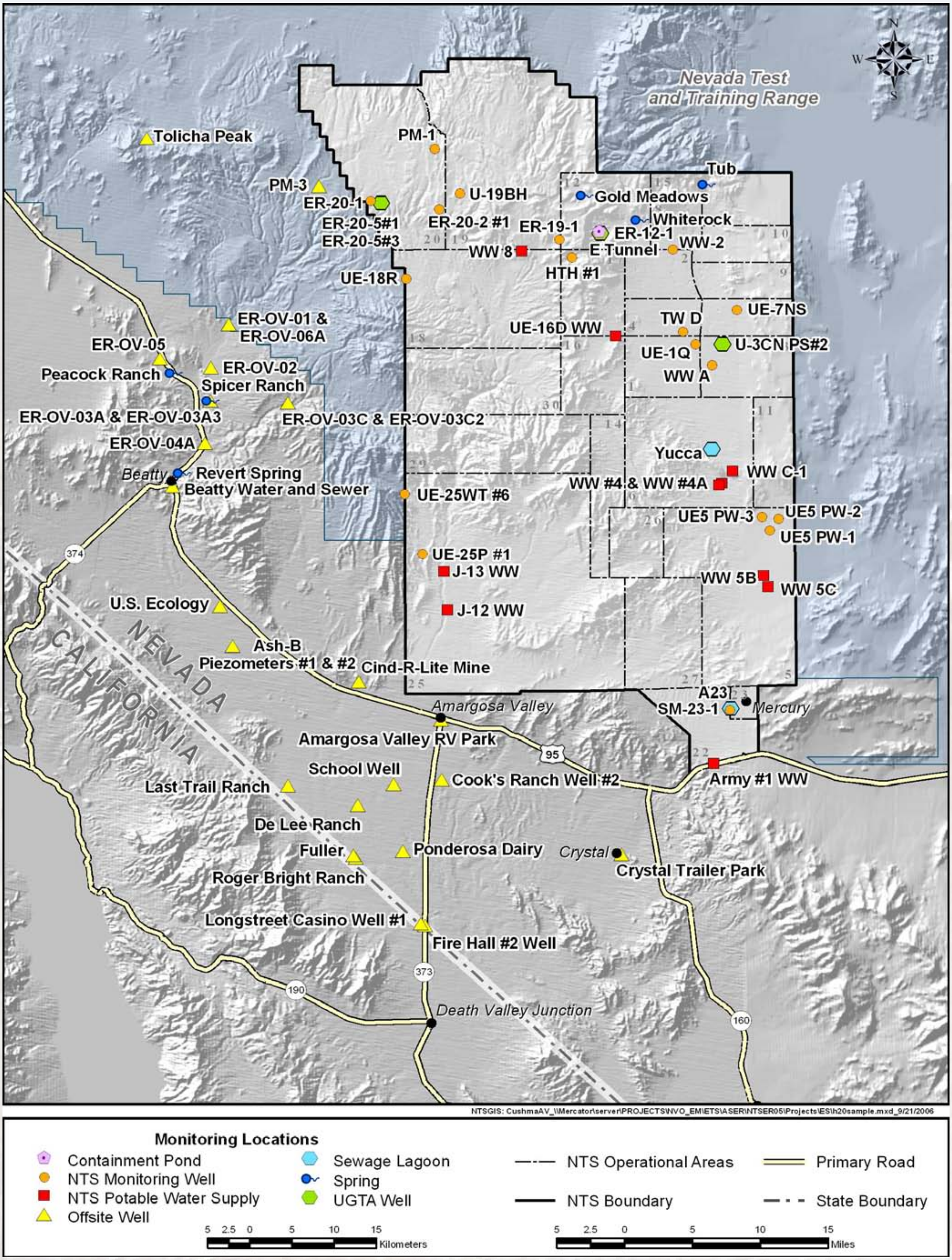
The DRI, through the CEMP, is tasked by NNSA/NSO to provide independent verification of the tritium concentrations in some of the offsite groundwater wells, municipal water supply systems, and springs used for water supplies in areas surrounding the NTS. Samples collected by DRI provide a comparison to the results obtained by BN. In 2005, the CEMP offsite water sampling locations included 18 wells, 3 surface water supply systems, and 4 springs located in selected towns and communities within 240 miles from the NTS. Only one site, the Beatty Water and Sewer well, was sampled by both BN and CEMP.

Tritium is the sole radionuclide for which CEMP water sample analyses are run. Tritium is the radionuclide created in the greatest quantities in underground nuclear tests and is widely believed to be the most mobile. BN offsite water samples were also analyzed for man-made gamma-emitting radionuclides which, if found, would signify contamination from nuclear testing. BN also monitored gross alpha and gross beta activity to determine if they are increasing over time at any well or spring.

20,000 pCi/L – This is the EPA-established maximum concentration limit for tritium in drinking water.



2005 CEMP Water Monitoring Locations



2005 BN Water Monitoring Locations

None of the offsite springs or the offsite public or domestic water supply systems/wells monitored by BN or the CEMP had levels of tritium significantly above detection limits. Measured tritium levels from the CEMP-monitored wells ranged from -7 to 8 pCi/L. For the CEMP-monitored springs and surface waters, they ranged from -2 to 24 pCi/L. As in previous years, samples from Boulder City and Henderson municipal water supplies contained tritium at levels barely above detection. These two municipal water systems obtain water from Lake Mead, which has documented levels of residual tritium persisting in the environment that originated from global atmospheric nuclear testing.

No offsite springs, surface water supplies, or wells had levels of tritium significantly above detection levels.

24 pCi/L – This was the highest level of tritium measured in any offsite water sample.

Measured tritium levels in the BN-monitored drinking water wells ranged from -8.4 to 7.6 pCi/L. For the three offsite springs they ranged from -1.4 to 11 pCi/L. BN measured tritium above detection limits in only 2 of the 12 offsite NNSA/NSO monitoring wells: ER-OV-03A and ER-OV-03C2. Tritium levels in both of these was 24 pCi/L. This level is within the range of concentrations indicative of analytical background levels for tritium. All BN-monitored offsite well and spring samples contained detectable gross alpha and gross beta radioactivity.

No gamma-emitting radionuclides were detected in any of the BN-monitored offsite wells or springs.

Gross alpha and gross beta radioactivity was below drinking water standards in all potable water sources. The radioactivity is most likely from natural sources and the levels show no increasing trend.

Onsite Radiological Monitoring of Water

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 2005, the onsite water monitoring network included 3 natural springs, 10 potable water supply wells, 18 monitoring wells, 1 tritiated water containment pond system, and 2 sewage lagoons (see map on page 18).

White Rock Springs in Area 12
(photo by Paul Greger, August 2002)

Natural Springs

Three onsite springs were sampled in 2005: Gold Meadows Spring, Tub Spring, and White Rock Springs. None of them are discharge points from a regional aquifer but are perched water tables from surface infiltration of precipitation. Tritium was detected at very low concentrations at White Rock Spring (46 pCi/L) and is believed to come from known surface contamination from previous nuclear testing. Gamma spectroscopy detected the man-made fission product cerium-144 (^{144}Ce) in the water sample collected from Tub Spring, although no other man-made radionuclides were detected in the sample.

Potable Water Supply Wells

Nuclear testing has not impacted NTS drinking water wells.

The 2005 data continue to indicate that underground nuclear testing has not impacted the NTS potable water supply network. One water sample from each of three NTS supply wells had concentrations of tritium barely above their MDCs; none had detectable concentrations of man-made gamma-emitting radionuclides. Gross alpha and beta radioactivity was detected at levels below drinking water limits in all of the potable water supply wells and is attributed to the presence of naturally-occurring radionuclides.

Monitoring Wells

Some migration of radionuclides from the underground test areas to monitoring wells sampled annually on the NTS has probably occurred, although the migration distances appear to be very short. Three onsite monitoring wells (PM U-19BH, WW A, and Well PM-1) had detectable concentrations of tritium in 2005 ranging from 46 to 492 pCi/L, all well below the drinking water limit of 20,000 pCi/L. Each of these monitoring wells is located within 0.6 miles of an historical underground nuclear test; all have consistently had detectable levels of tritium in past years, and no trend of rising tritium concentrations in these wells have been observed since 2000. There were also tritium levels measured just above detection limits in well ER-19-1 (21 pCi/L) and well UE-25P #1 (26 pCi/L).

No man-made radionuclides were detected by gamma spectroscopy analyses at concentrations above detection limits in any of the NTS monitoring wells in 2005. Most onsite monitoring wells had gross alpha and gross beta levels above detection limits. Three onsite monitoring wells (U-19BH, UE-25 WT #6, and ER-19-1) showed either gross alpha and/or gross beta levels above the EPA drinking water limits, but none of these wells supply drinking water. The radioactivity is most likely from natural sources.

Monitoring Results for E Tunnel Effluent Waters Pertaining to Water Pollution Control Permit NEV 96021

Parameter	State Water Pollution Control Permit Limit (pCi/L)	Average Measured Concentration (pCi/L)
Tritium	1,000,000	600,000
Gross Alpha	35	13
Gross Beta	100	77

Containment Ponds

Five constructed basins collect and hold water discharged 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 non-radiological contaminants exceed the allowable contaminant levels regulated under a state water pollution control permit. Tritium concentrations in tunnel effluent waters in 2005 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 were sampled 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 UGTA Project. To characterize the groundwater regime under the NTS, suitable additional wells are being drilled and existing wells recompleted in the vicinity of certain underground tests and at other locations on the NTS. If the tritium level exceeds 200,000 pCi/L during these drilling operations, contaminated water is pumped from the wells and diverted to lined containment ponds, as required by the state. During 2005, water containing tritium was pumped from Well U-20n PS #1DD-H into a lined sump; preliminary analysis measured appoximately 37,000,000 pCi/L of tritium.

Lined Tritium-Contaminated Groundwater Containment Sump at an Area 20 UGTA well
(photo by Russell Shelton, November 2005)

Permitted Sewage Lagoons

Two permitted sewage lagoons (Area 6 Yucca and Area 23 Mercury) are sampled annually and analyzed for tritium. As during previous years, no tritium was detected in the lagoon water samples and no man-made gamma-emitting radionuclides were detected during 2005.

Non-Radiological Air Emissions at the NTS

There were no discharges of non-radiological hazardous materials in air or water from the NTS to offsite areas in 2005.

Air quality was monitored on the NTS throughout the year as required by state of Nevada permits for operations that release criteria air pollutants, hazardous air pollutants (HAPs), or toxic and hazardous chemicals. Common sources of air emissions 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. The NTS has been issued a Class II air permit by the state of Nevada. Class II permits are issued to facilities which emit small quantities of air pollutants within a year (less than 100 tons of each criteria air pollutant, or 10 tons of any one HAP, or 25 tons of any combination of HAPs).

Calculated Tons of Emissions

Criteria Air Pollutant	Actual	PTE[(b)]
Particulate Matter (PM10)[(a)]	0.84	36.90
Carbon Monoxide (CO)	0.15	15.16
Nitrogen Oxides (NOx)	0.69	28.63
Sulfur Dioxide (SO_2)	0.04	6.64
Volatile Organic Compounds (VOC)	1.94	18.71
Totals	**3.66**	**106.04**

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

(b) Potential to Emit - the quantity of criteria pollutant that each facility piece of equipment would emit annually if it were operated for the maximum number of hours at the maximum production rate specified in the air permit

An estimated 3.66 tons of criteria air pollutants were released on the NTS in 2005. The majority of these emissions (1.94 tons) were VOCs. Total air emissions of lead, also a criteria pollutant, were 14.55 pounds. The quantity of HAPs released in 2005 was 0.05 tons. No emission limits for any criteria air pollutants or HAPs were exceeded. On June 8, the state of Nevada conducted an inspection of the following facilities regulated by the NTS air quality permit: the Area 1 Aggregate Plant and the Area 23 Incinerator. During the inspection, the incinerator failed its performance emission testing and was immediately shut down. No other exceedances were observed during the state inspection.

Asbestos is the only non-radiological HAP of regulatory concern on the NTS. Building renovation or demolition projects may release asbestos. Large quantities of asbestos were removed during renovation of the A-1 Building at the North Las Vegas Facility (NLVF) and during demolition of the Test Cell A Facility in Area 25 of the NTS. The EPA was notified of these projects. All materials containing regulated asbestos (asbestos that is friable and, therefore, potentially breathable) that were removed from NTS facilities were disposed of in the Mercury landfill. The Mercury landfill documented receipt of 2 tons of such material in 2005.

A combined total of 3 tests, consisting of 19 releases of hazardous chemicals in all, were conducted at the Area 5 NPTEC and the new Area 25 Test Cell C NPTEC facility in 2005. In accordance with the requirements of the NTS air quality operating permit for the NPTEC, an annual report of the types and amounts of chemicals released and the test plans and final analysis reports for each chemical release were submitted to the state. Based on the low level of risk each test posed to the environment and biota, no test-specific ecological monitoring was performed.

Non-Radiological Drinking Water Quality at the NTS

NNSA/NSO operates a network of nine permitted wells that comprise three permitted public water systems on the NTS which supply the potable water needs of NTS workers and visitors. In addition, three private water systems are maintained but are not regulated under state permit. For work locations at the NTS that are not part of a public water system, NNSA/NSO hauls potable water for use in decontamination and sanitation. Monitoring results for 2005 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 with one exception. The Area 12 water system exceeded the action level for lead (0.046 mg/L; with action level of 0.015 mg/L). The state was notified and more frequent monitoring of this system was initiated to more closely monitor the system's lead levels. The Area 12 buildings were last occupied in March 2005, and there are no immediate plans to use this camp in 2006. No monitoring of the private water systems was conducted.

Non-Radiological Discharges into Water at the NTS

In 2005, industrial discharges on the NTS were limited to two operating sewage lagoon systems: Area 6 Yucca Lake and Area 23 Mercury systems. Under the conditions of state of Nevada operating permits, liquid discharges to these sewage lagoons are tested quarterly for biochemical oxygen demand, pH, and total suspended solids. Sewage lagoon pond waters are sampled annually for a suite of toxic chemicals. Quarterly and annual analyses of sewage influent and of pond waters, respectively, showed that all water measurements were within permit limits (often below detection levels) with one exception. One measure of 5-day Biological Oxygen Demand Mean Daily Load was exceeded at the Area 6 Yucca Lake Sewage lagoons in the first quarter. Subsequent samples in the second quarter showed that the lagoons were once again in compliance.

There are no liquid discharges from the NTS into navigable waters, offsite surface water drainage systems, or publicly owned treatment works.

Non-Radiological Emissions into Air and Discharges into Water at the NLVF

Like the NTS, the NLVF is regulated for the emission of criteria pollutants and HAPs. Air quality operating permits are maintained for a variety of equipment at the NLVF. There are no monitoring requirements associated with these permits. The Clark County Department of Air Quality and Environmental Management requires submittal of an annual emissions inventory. The combined quantity of criteria air pollutants and HAPs emitted at the NLVF in 2005 was 1.391 tons; they ranged from 0.001 tons for HAPs to 0.916 tons for nitrous oxides.

North Las Vegas Facilty (source: NSTec Facility Data Warehouse, September 2006)

Water discharges at the NLVF are regulated by a permit issued by the City of North Las Vegas (CNLV) for sewer discharges and by temporary National Pollution Discharge Elimination System (NPDES) permits with the state for discharging pumped groundwater onsite for irrigation and dust suppression. The NPDES permits were obtained for a groundwater characterization and dewatering project at the facility. Self-monitoring and reporting of the levels of non-radiological contaminants in sewage and industrial outfalls is conducted. In 2005, contaminant measurements were below established permit limits in all water samples from NLVF outfalls and all sludge and liquid samples from sand/oil interceptors except in water samples from two outfalls where total dissolved solids (TDS) exceeded permit limits. In response to these exceedances, a Salinity Control Plan discussing steps taken to reduce the TDS levels was written and submitted to CNLV. CNLV conducted an annual inspection in September 2005 that resulted in no findings or corrective actions.

Accidental or Unplanned Environmental Releases or Occurrences

In 2005, there were no reportable accidental or unplanned environmental releases or occurrence on the NTS or at any of the NTS satellite facilities.

Overall Compliance with Environmental Laws, Regulations, and Policies

The 2005 NTSER lists and discusses the many applicable environmental drivers (laws, regulations, and policies) which govern the protection of the public and the environment during the conduct of NTS missions. The compliance status with these federal laws, state laws, regulations, and policies are reported in Chapter 2 of the NTSER in detail. For this summary report, the major categories of these drivers are listed below. Where compliance for a category is not 100 percent, the non-compliance incidents are noted.

Environmental Compliance Summary for the NTS in 2005

Category	Non-Compliance Incidents
Air Quality	Three pieces of equipment failed their performance emissions test and were shut down.
Water Quality and Protection	Limits for lead were exceeded in Area 12 public water system. Limits for total dissolved solids were exceeded in sewage outfalls at NLVF.
Radiation Dose Protection	None
Radioactive and Non-Radioactive Waste Management and Environmental Restoration	None
Hazardous Materials Control and Management	None
Pollution Prevention and Waste Minimization	One Executive Order 13101 goal and four Secretary of Energy's P2 Leadership goals were not met.
Historic Preservation and Cultural Resource Protection	None
Conservation and Protection of Biota and Wildlife Habitat	11 accidental bird deaths attributable to NTS activities (e.g., roadkill); deaths included 9 species protected as migratory birds.

Other Significant 2005 Environmental Accomplishments

Environmental Restoration

The cleanup of sites contaminated by past DOE operations on and off the NTS and the hydrogeological investigations supporting characterization of underground nuclear contamination areas are the most significant environmental work performed by NNSA/NSO each year. The DOE, DoD, and the state of Nevada Division of Environmental Protection identify a work scope and milestone schedule for the cleanup and safe closure of the contaminated above-ground sites and for the field investigations and model development necessary to characterize the underground sites. A total of 49 contaminated above-ground sites were closed safely in 2005. Extensive progress was made towards the development of hydrologic models describing groundwater flow and possible radionuclide transport

from the primary underground sites into the groundwater underlying public lands outside the boundaries of the NTS. This involved well development, aquifer testing, groundwater characterization sampling, construction of 3-D hydrostratigraphic framework and flow models, and the completion of several technical data documentation packages and modeling approach/strategy documents.

Pollution Prevention and Waste Minimization

Pollution prevention and waste minimization (P2/WM) activities on the NTS result in reductions to the volume and/or toxicity of waste generated onsite. In 2005, the Material Exchange Program reused 2.4 tons of non-hazardous chemicals, equipment, and supplies. During the renovation of a building in Mercury, approximately 15,180 tons of used concrete with lead shielding was generated. The lead shielding was segregated from the concrete and sent to the BN scrap metal salvage group for recycling. Other significant waste reduction efforts continued in 2005, such as sending bulk used oil to an offsite vendor for recycling (182.9 tons) and offsite recycling of mixed paper and cardboard (560.8 tons). Overall, a reduction of 15,391.2 tons of hazardous wastes and 1,313.9 tons of solid wastes was realized in 2005.

BN received three NNSA Pollution Prevention Awards for P2 activities in 2005. BN's Pollution Prevention Team was awarded an Environmental Stewardship Award for developing a Material Exchange Program that utilizes an interactive web site where employees from different organizations can "shop" for used items and add items they no longer need to the list of available items. This reduces the amount of waste that would be slated for the NTS landfill. Two NNSA Best-In-Class Awards for 2005 went to recognize the efforts of the JASPER team to eliminate the generation of low-level, mixed transuranic waste, and to the Fleet Fuel Efficiency Team's proposal to use B-20 bio-diesel, E-85 ethanol/gasoline mixtures and "Micro" vehicles resulting in reductions in the amount of petroleum usage at the NTS.

Waste Management

In 2005, the primary sewage lagoon in Area 23 was lined, thus preventing any infiltration from that basin. This is one of the first lagoons in Nevada to be lined with geisynthetic clay and high-density polyethylene liners.

Ecological Monitoring

Desert Tortoise (*Gopherus agassizii*), protected as a threatened species by the Endangered Species Act (photo by Paul Greger, June 1994)

A total of 25.5 acres of habitat within the range of the federally threatened desert tortoise (*Gopherus agassizii*) was disturbed on the NTS in 2005; however, no desert tortoises were accidentally injured or killed from project activities. Two projects to restore native vegetation to disturbed tortoise habitat were implemented. Five major wildland fires occurred on the NTS in 2005 which burned a total of 13,000 acres. NTS biologists prepared written assessments for soil stabilization and revegetation for these NTS fires. Biologists also participated in two emergency stabilization planning meetings with the Bureau of Land Management, U.S. Fish and Wildlife Service, Nevada Division of Wildlife, and the U.S. Geological Survey to assess the impacts of the large wildfires in southern Nevada and to develop emergency stabilization plans for controlling erosion. BN biologists provided a presentation on revegetation in the Mojave Desert that included topics on techniques, species selection, timing, and irrigation.

A West Nile Virus Sampling Program on the NTS continued in 2005 with guidance from the Clark County Health District. BN biologists conducted 16 trapping sessions at ten sites on the NTS. A total of 77 mosquitoes of three different species was collected. None of the mosquitoes tested positive for the West Nile virus.

For More Information, contact:

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