1.0 SUMMARY

Monitoring and surveillance, on and around the Nevada Test Site, (NTS) by United States Department of Energy (DOE) National Nuclear Security Administration Nevada Operations Office (NNSA/NV) contractors and NTS user organizations during 2000, indicated that operations on the NTS were conducted in compliance with applicable NNSA/NV, state, and federal regulations and guidelines. All discharges of radioactive liquids remained onsite in containment ponds, and there was no indication of migration of radioactivity to the offsite area through groundwater. During 2000, no accidental or unplanned releases occurred on the NTS. Oversite surveillance by the Desert Research Institute (DRI) of the University and Community College System of Nevada around the NTS indicated that airborne radioactivity from diffusion and evaporation of liquid effluents was not detectable offsite. However, low levels of airborne $^{239+240}$Pu (< 2 percent of the Derived Concentration Guide [DCG]) were detected offsite by high-volume air samplers. Using the U.S. Environmental Protection Agency's (EPA's) Clean Air Package 1988 model (CAP88-PC) and NTS radionuclide emissions by the resuspension of soil and environmental monitoring data, the effective dose equivalent (EDE) to the maximally exposed individual (MEI) offsite was calculated to be 0.17 mrem. This value is 1.7 percent of the federal dose limit prescribed for radionuclide air emissions. The EDEs calculated from measured radioactivity concentrations by high-volume offsite air samplers were all less than the model prediction. Levels detected are consistant with the surrounding area fallout soil concentration from past atmospheric testing. The MEI receiving this dose would also have received an external exposure of 143 mrem from natural background radiation. A maximized estimate of the EDE to the MEI, from the inhalation of NTS airborne emissions and the ingestion of wild life, was calculated to be 0.33 mrem/yr (0.0033 mSv/yr), which is only 0.33 percent of the 100 mrem/yr dose limit to the general public. There were no nonradiological releases to the offsite area. Hazardous wastes were shipped offsite to approved disposal facilities. Compliance with the various regulations stemming from the National Environmental Policy Act (NEPA) is being achieved and, where mandated, permits for air and water effluents and waste management have been obtained from the appropriate agencies. Cooperation with other agencies has resulted in 12 different agreements, memoranda, and consent orders.

Biota Concentration Guides derived by the DOE Biota Dose Assessment Committee were used to determine that the radiation doses to terrestrial biota in all areas of the NTS are in compliance with a proposed DOE regulatory standard for biota.

Support facilities at off-NTS locations have complied with the requirements of air quality permits and state or local wastewater discharge and hazardous waste permits as mandated for each location.

1.1 ENVIRONMENTAL MANAGEMENT

The NNSA/NV is committed to increasing the quality of its management of NTS environmental resources. This has been promoted by the establishment of an Environment, Safety and Health Division under the purview of the Assistant Manager for Technical Services and by upgrading the Environmental Management activities to the Assistant Manager level to address those environmental issues that have arisen in the course of performing the original primary mission of the NNSA/NV, i.e., underground testing of nuclear explosive devices. NNSA/NV management has vigorously promoted the practice of pollution prevention, including waste minimization and material recycling.

Operational releases and seepage of radioactivity are reported soon after their occurrence. In compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAP), as set forth in Title 40 Code of Federal Regulations Part 61, the accumulated annual emissions are used as part of the input to the EPA's CAP88-PC software program (DOE 1997b) to calculate potential EDEs to people living beyond the boundaries of the NTS and the surrounding exclusion areas.

RADIOLOGICAL ENVIRONMENT

Radiological effluents in the form of air emissions and liquid discharges are not normally released into the environment as a routine part of operations on the NTS. Radioactivity in liquid discharges released to onsite waste treatment or disposal systems (containment ponds) is monitored to assess the efficacy of treatment and control and to provide an annual summary of released radioactivity. Air emissions are monitored for source characterization and operational safety as well as for environmental surveillance purposes.

Air emissions in 2000 consisted primarily of small amounts of tritium and plutonium that were assumed to be released to the atmosphere and were attributed to:

- Diffusion of tritiated water (HTO) vapor from evaporation of HTO from tunnel and characterization well containment ponds.

- Diffuse emissions calculated from the results of environmental surveillance activities.

- Resuspension of plutonium calculated by use of resuspension equations.

Diffuse emissions in 2000 included HTO, only slightly above detection limits, from the Radioactive Waste Management Site in Area 5 (RWMS-5), E Tunnel Pond #2, the SEDAN crater in Area 10, and the SCHOONER crater in Area 20 and resuspended $^{239+240}$Pu from areas on the NTS, where it was deposited by atmospheric nuclear tests or device safety tests in earlier years. Table 1.1 shows the quantities of radionuclides assumed to be released from all sources, including postulated loss of standards during laboratory operations. The radioactive materials listed in this table were not detected in the offsite area above ambient radioactivity levels. Onsite liquid discharges to containment ponds included approximately 14 Ci (0.52 TBq) of tritium. This was a reduction of 40 percent from the tritium discharge last year. Tritium emissions were detected by air sampling at SEDAN and SCHOONER sites and the tunnel containment ponds. No liquid effluents were discharged to offsite areas.

ONSITE ENVIRONMENTAL SURVEILLANCE

Environmental surveillance on the NTS is designed to cover the entire area with some emphasis on areas of past nuclear testing and present operational activities. In 2000, samplers were operated at 33 locations on and near the NTS to collect air particulate samples and at 12 locations to collect HTO in atmospheric moisture. Grab samples were collected frequently from water supply wells, water taps, containment ponds, and sewage lagoons. Thermoluminescent dosimeters (TLDs) were placed at 86 locations on the NTS to measure ambient gamma exposures.

Data from these networks are summarized as annual averages for each monitored location. Those locations with concentrations above the NTS average are assumed to reflect onsite emissions. These emissions arise from diffuse (areal) sources and from certain operational activities (e.g., radioactivity buried in the low-level radioactive waste [LLW] site).

Approximately 520 air samples were analyzed by gamma spectroscopy. All isotopes detected by gamma spectroscopy were naturally occurring in the environment (^{40}K, ^{7}Be, and members of the uranium and thorium series), except for 37 samples in which very low levels of ^{137}Cs were detected.

Gross beta analysis of the air samples yielded an annual mean for the network of 2.1×10^{-14} µCi/mL (0.78 mBq/m^3). Plutonium analyses of monthly NTS composited air filters indicated an annual network mean of 46×10^{-18} µCi/mL (1.7 µBq/m^3) for $^{239+240}$Pu and 2.6×10^{-18} µCi/mL (0.096 µBq/m^3) of ^{238}Pu for all locations during 2000.

Slightly higher concentrations were found in samples from certain areas, but they were calculated to be only 2.3 percent of the Derived Air Concentration for exposure to workers. Higher than background levels of plutonium are to be expected in some air samples because fallout from atmospheric tests in the 1950s, and nuclear safety tests in the 1950s and 1960s dispersed plutonium over a small portion of the NTS's surface.

Atmospheric moisture was collected for two-week periods at 12 locations on the NTS and analyzed for HTO content. The annual network mean of $(42 \pm 152) \times 10^{-6}$ pCi/mL (1.6 ± 5.6 Bq/m^3) was slightly higher than last year. The highest annual mean concentrations were at the SCHOONER crater, SEDAN crater, and the E Tunnel pond in that order. The primary radioactive liquid discharge to the onsite environment in 2000 was about 14 Ci (0.52 TBq) of tritium (as HTO) in seepage from E Tunnel and from water pumped from wells into containment ponds. When calculating the dose for the offsite public, it was assumed that all of the HTO had evaporated.

Surface water sampling was conducted at two containment pond and the effluent for the Area 12 E Tunnel. A grab sample was taken from each of these surface water sites for analysis of gross beta, tritium, gamma-emitters, and plutonium isotopes. Strontium-90 was analyzed once per year for each location. Samples collected from the tunnel containment pond and Well RNM-25 contained detectable levels of radioactivity, as would be expected. Water samples were collected from the sewage lagoons and contained background levels of gross beta, tritium, plutonium, and strontium.

Water samples from onsite supply wells and drinking water distribution systems were also analyzed for radionuclides. The supply well average gross beta activity of 6.9×10^{-9} µCi/mL (0.25 Bq/L) was 2 percent of the DCG for ^{40}K (used for comparison purposes); gross alpha was 6.3×10^{-9} µCi/mL (0.21 Bq/L), which was 42 percent of the drinking water standard; the

concentrations of ^{3}H, ^{90}Sr, $^{239+240}Pu$, and ^{238}Pu were all below their respective minimum detectable levels of about 16.7 x 10^{-9} µCi/mL (0.62 Bq/L), 0.35 x 10^{-9} µCi/mL (13 mBq/L), and 0.016 x 10^{-9} µCi/mL (0.59 mBq/L). During the fourth quarter, four wells were at or slighty above the analytical detection limits, ranging from 14.1 to 32.7 x 10^{-9} µCi/mL (0.52 to 1.2 Bq/L), resampled results were below detection limits.

Monitoring of the vadose zone beneath the waste management sites in Areas 3 and 5 revealed that wetting fronts extended only a few feet below the floor of these sites. Also, Resource Conservation and Recovery Act (RCRA) monitoring wells, for sampling groundwater under RWMS-5, indicated that contamination from mixed waste buried therein is not detectable in the well samples.

Analysis of the TLD network showed that the 10 historic stations had an average annual exposure of 104 mR, while the 14 boundary stations (located at higher elevation) had a higher average annual exposure of 132 mR. Both exposures were consistent with previous data.

Monitoring System Design

During 1998, in an effort to make the environmental surveillance system on the NTS more efficient, it was redesigned. Using the Seven-Step Data Quality Objective (DQO) process, published by EPA, and information on the distribution and amount of radioactive sources on the NTS, a "Routine Radiological Environmental Monitoring Plan" (RREMP) was developed (DOE 1998a). As a result of the DQO process, some monitoring was eliminated in 1999. The number of air and TLD monitoring stations were reduced, and monitoring frequencies were also changed in 1999. The monitoring was conducted in accordance with the Plan during 2000. The Plan was implemented in the latter part of 1998 and is scheduled for review at the end of 2001.

OFFSITE ENVIRONMENTAL SURVEILLANCE

The offsite radiological compliance monitoring was conducted around the NTS at six locations using high-volume air samplers. The high-volume samplers collects ten times the volume of air, providing lower detection limits and greater sensitivity to confirm the concentrations predicted by modeling efforts. Plutonium analyses of monthly offsite composite air filters indicated an annual network mean of 8 x 10^{-18} µCi/mL (0.29 µBq/m^3) $^{239+240}Pu$ and 0.72 x 10^{-18} µCi/mL (0.027 µBq/m^3) for ^{238}Pu during 2000. The calculated mean EDE at the measurement locations by CAP88-PC model is 0.056 mrem and by measured mean EDE is 0.025 mrem.

Oversite radiological monitoring is conducted by public individuals in communities and at ranches around the NTS, and is coordinated by the DRI of the University and Community College System of Nevada under contract with NNSA/NV. The EPA Radiation and Indoor Environments National Laboratory administered an additional ranch station network in 2000. These programs consist of several environmental sampling, radiation detection, and dosimetry networks as described below. A network of 20 Community Environmental Monitoring Program (CEMP) stations were operated continuously during 2000. During 2000, no airborne radioactivity related to current activities at the NTS was detected on any sample from low-volume samplers.

In 2000, external exposure was monitored by a network of 20 TLDs and pressurized ion chambers (PICs) located in towns and communities around the NTS. The PIC network in the communities surrounding the NTS indicated background exposures, ranging from 68 to 152 mR/yr, that were consistent with previous data and well within the range of background data in other areas of the United States. The exposures measured by the TLDs were slightly less, as has been true in the past.

Although no radioactivity attributable to current NTS operations was detected by any of the offsite monitoring networks, based on the NTS airborne releases, an atmospheric dispersion model calculation (CAP88-PC) indicated that the maximum potential EDE to any offsite individual would have been 0.17 mrem (1.7×10^{-3} mSv) at Springdale, and the dose to the population within 80 km of the several emission sites on the NTS would have been 0.44 person-rem (4.4×10^{-3} person-Sv), both of which were similar to last year. If one assumes that the MEI at Springdale also ate the meat of wild life which had migrated off the NTS after eating and drinking in radioactively contaminated areas, he could have received an additional EDE of 0.16 mrem/yr (0.0016 mSv/yr). These added to the air pathway EDE gives a total of 0.33 mrem/yr (0.0033 mSv/yr). For comparison, the hypothetical person receiving this dose would also have been exposed to 152 mrem/yr (1.52 mSv/yr) from natural background radiation. A summary of the potential EDEs due to operations at the NTS is presented in Table 1.2.

In compliance with the regulatory standards published by the DOE Biota Dose Assessment Committee, the dose to terrestrial biota was calculated for the most contaminated NTS areas. All such areas were in compliance with the committee's technical standard.

LOW-LEVEL WASTE DISPOSAL

Environmental monitoring at the RWMS, Area 3 (RWMS-3) has detected plutonium in air samples. However, the upwind/ downwind sampler results were equivalent, and plutonium was detected in other air samples from Area 3, indicating that the source is resuspended plutonium from areas surrounding RWMS-3. Elevated levels of plutonium have been detected in air samples from several areas on the NTS where operational activities, vehicular traffic, and high winds resuspend plutonium for detection by air sampling. The presence of plutonium on the NTS is primarily due to atmospheric and safety tests conducted in the 1950s and 1960s. These tests spread plutonium on surface soil in the eastern and northwestern areas of the NTS (Figure 2.3, Chapter 2.0 displays these locations).

Environmental monitoring at and around RWMS-5 indicated that HTO in air was detectable at, but not beyond, the waste site boundaries. This monitoring included air sampling, water sampling, and external gamma exposure measurement. Vadose zone monitoring for water seepage is conducted beneath RWMS-3 and RWMS-5, as a method of detecting any downward migration of waste. Also, three monitoring wells, installed to satisfy RCRA requirements for a mixed-waste disposal operation at RWMS-5, have not yet detected any migration of hazardous materials.

NONRADIOLOGICAL MONITORING

Nonradiological environmental monitoring of NTS operations involved only onsite monitoring because there were no discharges of nonradiological hazardous materials to offsite areas. The primary environmental permit areas for the NTS were monitored to verify compliance with ambient air quality and the RCRA requirements. Air emissions sources common to the NTS included particulates from construction, aggregate production, surface disturbances, fugitive dust from unpaved roads, fuel burning equipment, open burning, and fuel storage facilities. NTS environmental permits active during 2000, which were issued by the state of Nevada or by federal agencies, included one comprehensive air quality permit covering emissions from construction of facilities, boilers, storage tanks, and surface disturbances; three onsite open-burn variances; one offsite permit for surface disturbance (environmental restoration activities); seven permits for onsite drinking water distribution systems; one permit for sewage discharges to

lagoon collection systems; five permits for seepage hauling; one incidental take permit for the threatened desert tortoise; and one permit for the scientific collection and study of various species on the NTS. Further, a RCRA permit has been obtained for general NTS operations and for two specific facilities on the NTS.

Permits at non-NTS operations included 12 air pollution control permits, 1 sewage discharge permit, and 2 hazardous material storage permits.

The only nonradiological air emission of regulatory concern under the Clean Air Act (CAA) has been due to asbestos removal during building renovation projects and from insulated piping at various locations on the NTS. During 2000, there were no projects that required state of Nevada notifications. The annual estimate for non-scheduled asbestos demolition/renovation projects for fiscal year 2000 was sent to EPA Region 9 in December 13, 1999.

RCRA requirements were met through an operating permit for hazardous waste storage and explosives ordnance disposal. NTS operations also include mixed waste storage through a Consent Agreement between NNSA and the state of Nevada.

As there are no liquid discharges to navigable waters, offsite surface water drainage systems, or publicly owned treatment works, no Clean Water Act (CWA) National Pollution Discharge Elimination System (NPDES) permits were required for NTS operations. Under the conditions of the state of Nevada operating permits, liquid discharges to onsite sewage lagoons are regularly tested for biochemical oxygen demand, pH, and total suspended solids. In addition to the state-required monitoring, these influents were also tested for RCRA related constituents as an internal initiative to further protect the NTS environment.

There were no formal state inspections of NTS equipment regulated by the state air quality permit. In May of 2000, NNSA/NV inspected area 25 for industrial discharges.

In compliance with the Safe Drinking Water Act (SDWA) and four drinking water supply system permits from the state, the onsite distribution systems supplied by onsite wells are sampled either monthly or quarterly for coliform bacteria and water quality parameters, depending on the status as a community or non-community system.

1.2 COMPLIANCE ACTIVITIES

NNSA/NV is required to comply with various environmental laws and regulations in the conduct of its operations. Monitoring activities required for compliance with the CAA, CWA, SDWA, Toxic Substance Control Act, and RCRA are summarized above. Endangered Species Act activities include compliance with the United States Fish and Wildlife Service (USFWS) Biological Opinion on NTS Activities and the Biological Opinion on Fortymile Canyon Activities. NEPA activities include one Environmental Assessment, and 17 Categorical Exclusions. Of the 60 NEPA checklist completed, 42 projects were excluded because they had been considered in the site-wide Environmental Impact Statement or the Record of Decision.

Wastewater discharges at the NTS are not regulated under NPDES permits, because all such discharges are to onsite sewage lagoons. Discharges to these lagoons are permitted under the Nevada Water Pollution Control Act. Wastewater discharges from the non-NTS support facilities were within the regulated levels established by city or county publicly owned treatment works.

The National Historic Preservation Act directs federal agencies to consult with Native Americans when NNSA/NV programs or activities at the NTS may impact their environmental and cultural interests. In 2000, work continued on a summary report, site records, and an artifact inventory of materials in the NNSA/NV Curatorial Facility. The final Fourtymile Canyon rock art sites report was issued. Consultations with several Native American tribes were conducted to determine whether artifact collections should be repatriated.

The Ecological Monitoring and Compliance Program monitoring tasks, which were selected for 2000 included habitat mapping of the NTS, characterizing the natural wetlands on the NTS, conducting a census of the horse population, surveying bat species, surveying for raptors, and periodically monitoring man-made water sources to assess their effects on wildlife. Reviews of spill test plans for the Hazardous Materials Spill Center were also conducted.

Field surveys were conducted from June 1996 through February 1998 to identify those natural NTS springs, seeps, tanks, and playas, which could be designated by the United States Army Corps of Engineers as jurisdictional wetlands. During 2000, five of these wetlands were visited to characterize seasonal trends in physical and biological parameters.

The annual compliance report for calendar year 2000 NTS activities was prepared and submitted to the USFWS.

Pollution prevention activities conducted at the NTS and its offsite facilities involve active programs for recycling, material exchange, and waste minimization.

1.3 GROUNDWATER PROTECTION

No radioactivity was detected above background levels in the groundwater sampling network surrounding the NTS. Low levels of tritium, in the form of HTO, were detected in onsite wells used only for monitoring purposes and not for drinking water.

Because wells that were drilled for water supply or exploratory purposes are used in the NTS monitoring program, rather than wells drilled specifically for groundwater monitoring, a program of well drilling for groundwater characterization at the NTS is underway. The design of the program is for installation or recompletion of groundwater characterization wells at strategic locations on and near the NTS. Through 2000, three wells were completed, one offsite west of the NTS and two in Frenchman Flats area. Hydrological tests and sampling were completed at eight wells drilled before 2000.

Related activities included studies of groundwater transport of contaminants (radionuclide migration studies) and nonradiological monitoring for water quality assessment and RCRA requirements.

1.4 RADIOACTIVE AND MIXED WASTE STORAGE AND DISPOSAL

Two RWMSs are operated on the NTS: one each in Areas 3 and 5. During 2000, the RWMSs received LLW generated at the NTS and other NNSA/NV facilities. Waste is disposed of in shallow pits and trenches in RWMS-5 and in subsidence craters in RWMS-3.

At RWMS-5, LLW is disposed of in standard packages. Transuranic (TRU) and TRU mixed wastes are stored on a curbed asphalt pad on pallets in overpacked 55-gal drums and steel boxes. These will be characterized prior to shipment to the Waste Isolation Pilot Plant in New Mexico. The RWMS-3 is used for disposal of bulk LLW waste and LLW that is packaged, including packages that are larger than the specified standard size used at RWMS-5.

Environmental monitoring at both sites included air sampling for radioactive particulates and measurement of external exposure using TLDs. Water sampling and vadose zone monitoring for moisture and hazardous constituents are conducted at the RWMS-5, as is monitoring for tritium in atmospheric moisture. Environmental monitoring results for 2000 indicated that measurable radioactivity from waste disposal operations was detectable only in the immediate vicinity of the facilities.

Because the NTS is not a RCRA-permitted disposal facility, RCRA regulations require the shipment of nonradioactive hazardous waste to licensed disposal facilities offsite. Therefore hazardous waste is not disposed of onsite.

LLW is accepted for disposal only from generators (onsite and offsite) that have submitted a waste application that meets the requirements of the Waste Acceptance Criteria document (DOE 1996e) and that have received NNSA/NV approval of the waste stream(s) for disposal at the NTS.

1.5 QUALITY ASSURANCE

The NTS's quality assurance (QA) program ensures the collection and analysis of samples for radiological parameters to meet customer-and regulatory-defined requirements. Data quality is assured through process-based QA, procedure-specific QA, measurement quality objectives, and performance evaluation programs. The QA program for radiological data consists of participation in the Quality Assessment Program administered by the NNSA/NV Environmental Measurements Laboratory, the InterLaB RadCheM™ Proficiency Testing Program directed by Environmental Resource Associates, the Radiochemistry Intercomparison Program provided by the National Institute of Standards and Technology, and the Mixed Analyte Performance Evaluation Program conducted by the Idaho National Engineering and Environmental Laboratory. TLD radiation measurement QA for the program is assessed by the Bechtel Nevada Dosimetry Group's participation in the NNSA/NV's Laboratory Accreditation Program and intercomparisons provided by the Battelle Pacific Northwest National Laboratory during the course of the year.

1.6 ISSUES AND ACCOMPLISHMENTS

PRINCIPAL COMPLIANCE PROBLEMS FOR 2000

- Results for lead were found above the SDWA action level in the Area 12, Building 12-43 drinking water systems. The water is restructured to non-potable use until a remedy is found for this situation.

ACCOMPLISHMENTS FOR 2000

- The RREMP uses a DQO approach to identify the environmental data that must be collected for regulatory compliance and provides QA, Analysis and Sampling Plans to ensure that defensible data are generated. The RREMP provides one common integrated approach for all routine environmental monitoring both on and off the NTS. Other facilities also included in

the RREMP are the associated NNSA facilities at the North Las Vegas Facility, the Remote Sensing Laboratory (RSL) - Nellis, the Los Alamos Operations, the Special Technologies Laboratory, and the RSL-Andrews.

- The Bechtel Environmental Integrated Data Management System (BEIDMS), Oracle relational database, replaced the Laboratory Data Analysis System for the storage, documentation and retrieval for all environmental sampling results. BEIDMS integrates the preparation of chain-of-custody, sample labeling, QA, data verification/validation, and user-friendly querying in one system providing greater assurance that the data are defensible.

- Sample package documents were developed for all environmental sampling media providing guidance to the sampler to ensure consistency and quality, collection of all field notes and comments, and safety guidance and work control. Document are scanned and electronic archived. Selected is entered in BEIDMS.

- NEPA Environmental Evaluation Checklists were completed for 60 proposed projects.

- Throughout 2000, NNSA/NV continued to maintain and update the "NNSA/NV Compliance Guide" (Volume III), a handbook containing procedures, formats, and guidelines for personnel responsible for NEPA compliance activities.

In 2000, the following accomplishments were achieved in the management of cultural resources at the NTS:

- Five cultural resources, one inventory, and five historical evaluations were conducted on NTS facilities to determine eligibility for National Register of Historic Places (NRHP). Cane Springs was determined to be eligible for listing on the NRHP.

- Operations conducted under the Nevada Operations Site Pollution Prevention Program in 2000 resulted in recycle or new uses of nearly 2.56 metric tons of materials. Several employee awareness projects were conducted: Integrated Safety Management Day, Family Days, and others.

- Continued use of a Just-in-Time supply system allowed NTS contractors to reduce product stock and control potentially hazardous products.

- Progress continued on the NTS groundwater characterization program by use of pumping programs on several wells to estimate yields and radionuclide content.

- Habitat maps of vegetation alliances on the NTS were completed to identify groups of visually similar vegetation, soils, slope, and hydrology which may warrant active protection from NNSA projects.

- Monitoring of 26 sensitive species of vegetation and animals was continued to ensure their continued presence on the NTS by protecting them from impacts of NNSA projects and to determine if further protection under state and federal laws is necessary.

- The state issued a RCRA Research, Development, and Demonstration Permit for the construction and operation of a facility to develop treatment methods for demilitarizing rocket motors.

1.7 CONCLUSION

The environmental monitoring results presented in this report document that operational activities on the NTS in 2000 were conducted so that no measurable radiological exposure occurred to the public in offsite areas. Calculation of the highest individual dose that could have been received by an offsite resident (based on estimation of onsite worst-case radioactive releases obtained by measurement or engineering calculation and assuming the person remained outdoors all year) equated to 0.17 mrem to a person living in Springdale, Nevada. If this same individual also was a hunter who ate a bag limit of doves which migrated from the NTS after drinking water from the E Tunnel ponds, he would also receive 0.16 mrem for a total of 0.33 mrem. This may be compared to that individual's exposure to 152 mrem/yr from natural background radiation as measured by the PIC instrument at Beatty, Nevada.

There were no major incidents of nonradiological contaminant releases to the environment in 2000. Many contaminated sites are on schedule for remediation, and intensive efforts to characterize and protect the NTS environment, implemented in 1990, were continued in 2000. The Underground Testing Area program and other activities devoted to characterization and protection of groundwater on and around the NTS continued on schedule.

Table 1.1 Radionuclide Emissions on the NTS - 2000[a]

Radionuclide	Half-life (years)	Quantity Released (Ci)[b]
Airborne Releases:		
^{3}H	12.35	431[c]
$^{239+240}Pu$	24065.[e]	3.2×10^{-1}[d]
^{241}Am	432.2	4.9×10^{-2}[d]

(a) Assumes worst-case point and diffuse source releases; there were no unplanned releases.

(b) Multiply by 37 to obtain GBq.

(c) Includes calculated data from air sampling results, postulated loss of laboratory standards, and evaporation of water from containment ponds.

(d) Calculated from the resuspension of surface deposits.

(e) This is the half-life of ^{239}Pu.

Table 1.2 NTS Radiological Dose Reporting - 2000

Pathway	Dose to Maximally Exposed Individual (mrem)	Dose to Maximally Exposed Individual (mSv)	Percent of DOE 100-mrem Limit	Estimated Population Dose (person-rem)	Estimated Population Dose (person-Sv)	Population within 80 km	Estimated Natural Radiation Dose (person-rem)
Air	0.17	0.0017	0.17	0.44	0.0044	38,381	5,830
Air and Wild Life	0.33	0.0033	0.33	0.44	0.0044	38,381	5,830

View of Shoshone Mountain (No Date Provided)