APPENDIX A
DETAILED DESCRIPTION OF ALTERNATIVES

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This appendix contains detailed descriptions of the alternatives that are being evaluated by the U.S. Department of Energy National Nuclear Security Administration (DOE/NNSA) for continued operation of the Nevada National Security Site (NNSS) (formerly known as the Nevada Test Site), the Remote Sensing Laboratory (RSL) at Nellis Air Force Base, the North Las Vegas Facility (NLVF), and the Tonopah Test Range (TTR). Also addressed are environmental restoration sites located on the Nevada Test and Training Range (formerly the Nellis Air Force Range). Three alternatives are addressed in this *Site-Wide Environmental Impact Statement for the Continued Operation of the Department of Energy/National Nuclear Security Administration Nevada National Security Site and Off-Site Locations in the State of Nevada (NNSS SWEIS)*: (1) the No Action Alternative, which represents the continuation of the levels of operations at the NNSS and offsite NNSA locations in Nevada; (2) the Expanded Operations Alternative, which includes the capabilities and projects described under the No Action Alternative, plus additional newly proposed capabilities and projects; and (3) the Reduced Operations Alternative, which reflects a reduction in the levels of operations for some programs, ceasing some activities, and limiting activities in some operational areas of the NNSS. This appendix provides additional technical content and detail to supplement the alternatives descriptions in Chapter 3. Section A.1 describes the No Action Alternative; Section A.2 describes the Expanded Operations Alternative; and Section A.3 describes the Reduced Operations Alternative.

Descriptions of the alternatives are organized under three mission areas, each with two or more associated programs. These missions and their associated programs are (1) the National Security/Defense Mission, which includes the Stockpile Stewardship and Management, Nuclear Emergency Response, Nonproliferation, Counterterrorism, and Work for Others Programs; (2) the Environmental Management Mission, which includes the Waste Management and Environmental Restoration Programs; and (3) the

Terminology Used in this Site-Wide Environmental Impact Statement (SWEIS)

Missions. In this SWEIS, this term refers to the major responsibilities assigned to the U.S. Department of Energy (DOE) and the National Nuclear Security Administration (NNSA), which are described in this section. DOE and NNSA accomplish these missions by assigning groups or types of activities to DOE's system of national security laboratories, production facilities, and other sites.

Programs. DOE and NNSA are organized into Program Offices, each of which has primary responsibilities within the set of DOE and NNSA missions. Funding and direction for activities at DOE facilities are provided through these Program Offices, and similar coordinated sets of activities to meet Program Office responsibilities are often referred to as "programs," which are usually long-term efforts with broad goals or requirements.

Capabilities. This term refers to the combination of facilities, equipment, infrastructure, and expertise necessary to undertake types or groups of activities and implement mission assignments. Capabilities at NNSA facilities in Nevada have been established over time, principally through mission assignments and activities directed by Program Offices.

Projects. This term is used to describe activities with a clear beginning and end that are undertaken to meet a specific goal or need. Projects can vary in scale from very small (such as a project to undertake one experiment or a series of small experiments) to large (such as a project to construct and start up a new nuclear facility). Projects are usually relatively short-term efforts, and they can cross multiple programs and missions, although they are usually "sponsored" by a primary Program Office. In this SWEIS, the term is usually used more narrowly to describe construction activities, including facility modifications (such as a project to build a new office building or to establish and demonstrate a new capability). Construction projects considered reasonably foreseeable at NNSA facilities in Nevada over about a 10-year period are discussed and analyzed in this SWEIS.

Activities. In this SWEIS, this term is used to describe physical actions used to implement missions, programs, capabilities, or projects.

Nondefense Mission, which includes the General Site Support and Infrastructure, Conservation and Renewable Energy, and Other Research and Development Programs.

For each of the proposed alternatives, mission-related capabilities, projects, activities, and facilities are identified.

The alternatives evaluated in this *NNSS SWEIS* comprise missions, programs, capabilities, and projects for which activities are currently in progress and/or future activities are proposed. Current activities include those that are ongoing or for which the capability is being maintained by NNSA. In evaluating the impacts of the projects and activities that make up the alternatives, the most reliable data are derived from current activities. Proposed projects are those that NNSA expects would be implemented over the next 10 years.

The projects proposed under the three alternatives have generally undergone sufficient conceptual development to allow a reasonable assessment. Those that have not been sufficiently defined to allow a reasonable assessment are noted in the text and will require further National Environmental Policy Act (NEPA) analysis should NNSA decide to implement them.

A.1 No Action Alternative

As defined in this *NNSS SWEIS*, the No Action Alternative reflects the use of existing facilities and ongoing projects to maintain operations consistent with those experienced in recent years at the NNSS and offsite locations in Nevada. For each mission area and its supporting programs, levels of operations for associated capabilities and projects were determined by evaluating historic absolute values since 1996, such as the amount of low-level radioactive waste (LLW) disposed through mid-2010; reasonable expectations for implemented projects, such as the number of projected shots for the Large-Bore Powder Gun; or the nature and number of proposed activities, such as training undertaken for the Office of Secure Transportation. For example, in 2004 and 2006, NNSA conducted 8 experiments with plutonium at the Joint Actinide Shock Physics Experimental Research Facility (JASPER); under the No Action Alternative, NNSA is analyzing up to 12 such experiments at JASPER. The operational level for disposal operations of LLW under the No Action Alternative is based on the volume of LLW disposed at the NNSS during Fiscal Years (FY) 1997 through 2010. The No Action Alternative level of operations represents the baseline against which the other alternatives are compared. In the *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (*1996 NTS EIS*) (DOE 1996), NNSA identified land use zones in which certain categories of activities, such as nuclear, dynamic, and hydrodynamic experiments and other compatible defense and nondefense research and development and testing, would be conducted. **Figure A–1** depicts these land use zones and the major facilities at the NNSS that would continue under the No Action Alternative.

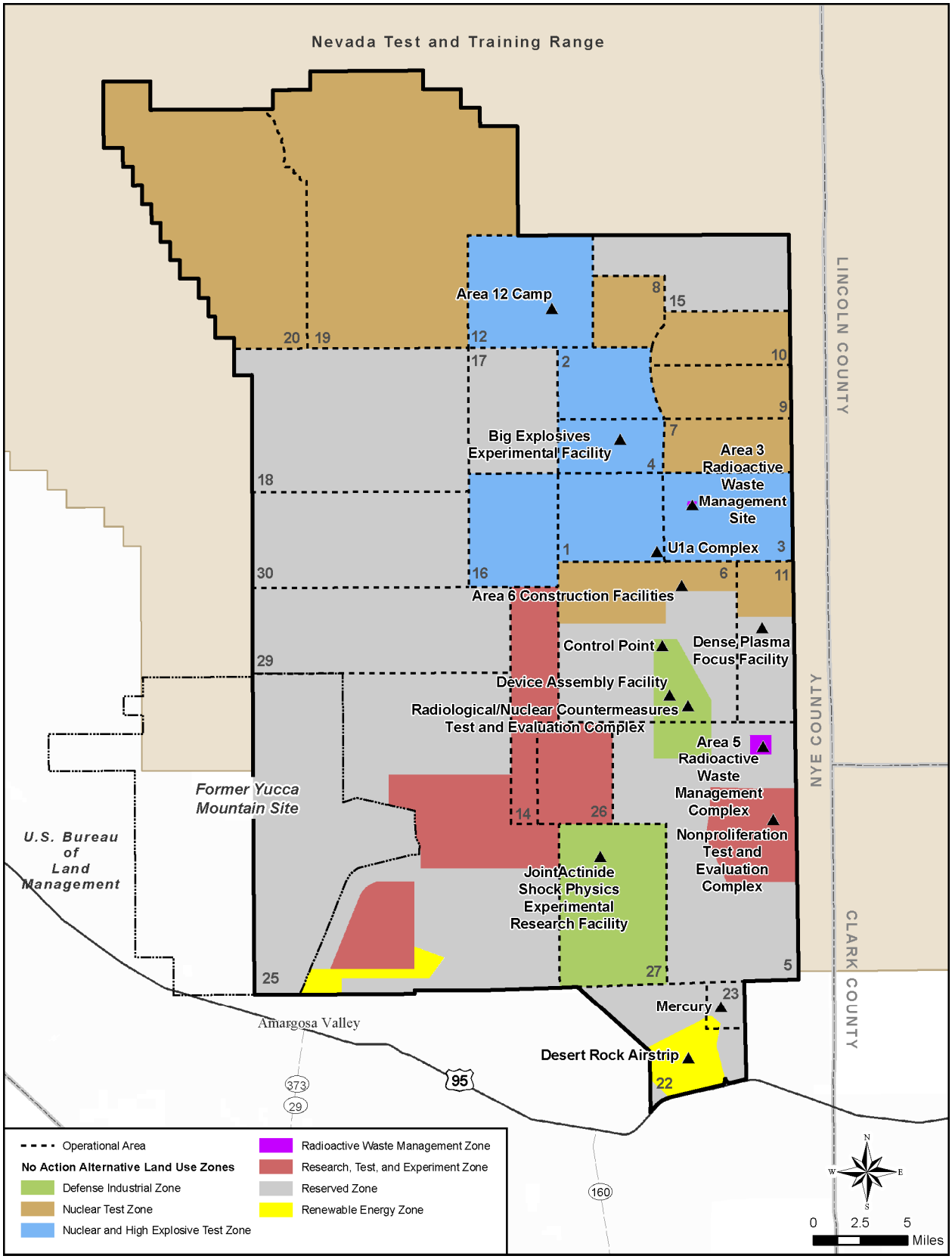

Figure A–1 Nevada National Security Site Land Use Zones and Major Facilities Under the No Action Alternative

A.1.1 National Security/Defense Mission

Under the No Action Alternative, NNSA would continue to pursue the Stockpile Stewardship and Management, Nuclear Emergency Response, Nonproliferation, Counterterrorism, and Work for Others Programs. Projects and activities managed under these programs are described in the following sections.

A.1.1.1 Stockpile Stewardship and Management Program

As part of its National Security/Defense Mission, NNSA is tasked with strengthening national security through the military application of nuclear energy and reducing the global threat from terrorism and weapons of mass destruction. The NNSA Stockpile Stewardship and Management Program supports national security by providing the following capabilities:

- Maintenance of a safe, secure, and reliable nuclear weapons stockpile to ensure the security of the United States and its allies, deter aggression, and support international stability
- Maintenance of a fully capable, agile, responsive nuclear weapons complex infrastructure to continue to support the nuclear weapons stockpile and to be prepared for an uncertain and evolving threat environment
- Research and development activities to ensure U.S. leadership in science and technology (DOE 2006)

Special Nuclear Material (SNM) and Security Categories

SNM is (1) plutonium, uranium-233, uranium enriched in isotopes of uranium-233 or -235, and any other materials that the U.S. Nuclear Regulatory Commission determines to be SNM, or (2) any material artificially enriched by any of these radioactive materials.

The U.S. Department of Energy (DOE) uses a graded approach to provide SNM safeguards and security. Quantities of SNM stored at each DOE site are categorized into Security Categories I, II, III, and IV, with the greatest quantities included under Security Category I, and lesser quantities included in descending order under Security Categories II through IV.

The term "stockpile stewardship" refers to core competencies in activities associated with research, design, development, and testing of nuclear weapons components, as well as the assessment and certification of their safety and reliability. NNSA's science-based Stockpile Stewardship and Management Program maintains and enhances the safety, reliability, and performance of the U.S. nuclear weapons stockpile, including the ability to design, produce, and test weapons, to meet national security requirements. Stockpile stewardship and management activities at NNSA facilities in Nevada are conducted via a variety of methods, including experiments involving special nuclear material (SNM) and explosives, including high explosives (either in combination or separately), shock physics, nuclear criticality, pulsed power, and plasma physics and nuclear fusion. Under the No Action Alternative, diagnostics and other instrumentation would be developed and used in related tests and experiments. In addition, NNSA would conduct drillback operations; support Office of Secure Transportation training; and, as necessary, disposition damaged U.S. nuclear weapons. Major facilities at the NNSS where these activities are performed include the Device Assembly Facility (DAF), the U1a Complex, the Big Explosives Experimental Facility (BEEF), and JASPER. NNSA also conducts stockpile stewardship and management activities at the TTR.

Stockpile stewardship and management activities would continue at NNSA facilities in Nevada, particularly at the NNSS, under the conditions of the ongoing nuclear testing moratorium. These activities would emphasize science-based stockpile stewardship and management tests, experiments, and activities to maintain the safety and reliability of the nuclear weapons stockpile without underground nuclear testing. Historically, the primary mission of the NNSS was to conduct nuclear weapons tests. With the current moratorium on testing that began in October 1992, this mission changed to maintaining a readiness to conduct nuclear tests. For this reason, the No Action Alternative includes those activities

necessary to maintain the capability to conduct nuclear tests if so directed by the President. Readiness-to-test activities include maintaining the necessary infrastructure and, more importantly, exercising the research and engineering disciplines of the Nation's nuclear weapons program through an active science-based Stockpile Stewardship and Management Program at the NNSS to ensure the continued competence of its technical staff. As part of its readiness-to-test activities, NNSA would conduct training and exercises using various kinds of nuclear weapon simulators.

In addition to maintaining the capability to conduct nuclear weapon tests and in support of stockpile stewardship and management, NNSA would perform a variety of activities under the No Action Alternative, as described below:

Dynamic experiments – Dynamic experiments include subcritical and hydrodynamic experiments. Subcritical experiments, a subset of dynamic plutonium experiments, use SNM coupled with explosives or explosive-driven flyer plates or impactors. These experiments would be conducted in alcoves at the U1a Complex, in unused nuclear test emplacement holes, or at other locations within the Nuclear Test and Nuclear and High Explosives Test Zones of the NNSS, which include all or parts of Areas 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 16, 19, and 20.

Initially, subcritical experiments were conducted in alcoves in the U1a Complex that were designed and constructed to contain the detonation of explosives and contamination resulting from SNM used in the experiments. Following execution of these experiments, the alcoves were sealed and considered "expended." Since 1996, the operational concept for subcritical experiments has changed to include other methods. Lawrence Livermore National Laboratory (LLNL) introduced vessels to contain subcritical experiments that allowed multiple experiments to be conducted in a single alcove, and Los Alamos National Laboratory (LANL) introduced racklettes (small cylindrical racks), which are lowered into vertical emplacement holes within an alcove in the U1a Complex, and has also used vessels in a manner similar to LLNL. Subcritical experiments have been performed outside of the U1a Complex in vertical emplacement holes using racklettes similar to, but smaller than, the canisters used for underground nuclear testing. Experiments involving SNM are designed and conducted in a manner that contains the SNM and prevents release of contamination to an uncontrolled environment. This is accomplished by using a specially prepared alcove at the U1a Complex, stemming (engineered backfilling) emplacement holes, using a containment vessel, or a combination of these methods.

Hydrodynamic tests, which do not include SNM, may be conducted in the open air or underground, and may be contained or uncontained. Hydrodynamic tests and experiments would be conducted within some of the same areas as subcritical tests and other experiments (see the following discussion regarding conventional explosives tests and experiments).

Under the No Action Alternative in this site-wide environmental impact statement (SWEIS), 10 dynamic tests and experiments per year were evaluated over about a 10-year period. Over the next 10 years, a total of 5 dynamic experiments would be conducted in emplacement holes with each such experiment causing an estimated 20 acres of new land disturbance.

Conventional explosives experiments – Experiments using conventional explosives would continue to be conducted at BEEF and other locations in the Nuclear and High Explosives Test Zone (Areas 1, 2, 3, 4, 12, and 16). These experiments would use up to 70,000 pounds TNT [2,4,6-trinitrotoluene]-equivalent of explosive charges per experiment and may be conducted at or above the ground surface or underground. Experiments within the BEEF operational area would include potentially hazardous materials, such as beryllium, depleted uranium, deuterium, and tritium. Conventional explosives experiments would support activities for the Stockpile Stewardship and Management Program (other conventional explosives operations are described below for the Nuclear Emergency Response, Nonproliferation, Counterterrorism,

and Work for Others Programs). Under the No Action Alternative, up to 20 conventional explosives experiments would be conducted each year at BEEF, and up to 10 per year would be conducted at other locations at the NNSS. The experiments would consist of both open-air and contained (no release to the atmosphere) research and diagnostic experiments using a variety of explosive compounds. All explosive operations would be conducted in compliance with DOE Manual 440.1-1A, *DOE Explosives Safety Manual*. These totals do not include the dynamic experiments discussed above.

Shock physics experiments – Shock physics experiments are a subset of dynamic experiments, but are not included in the dynamic experiments described above. There are two shock physics facilities at the NNSS: JASPER in Area 27, which uses a two-stage gas gun and is currently operational and the U1a Complex in Area 1, which uses a Large-Bore Powder Gun and is currently in development.

The basic concept of a gas gun is to use high-pressure gas to propel a projectile into a target at extremely high velocities. The JASPER gas gun is specifically designed to conduct research on plutonium and other actinides and surrogate materials as targets. The two-stage gas gun consists of a first-stage breech containing gunpowder and a chamber filled with helium, hydrogen, or argon (nitrogen is used as a purge gas), as well as a second-stage evacuated barrel for guiding the high-velocity projectile to the target. Hot gases from the burning propellant drive a heavy piston down the pump tube, compressing the gas. At sufficiently high pressures, the gas eventually breaks a rupture valve and enters the narrow barrel, propelling a projectile housed in the barrel toward the target, which is contained within a primary target chamber. The primary target chamber is designed to contain the experiment and prevent release of contaminants to the environment. For experiments using SNM, an ultrafast closure valve system traps debris, particles, and gases, including radioactive contaminants, within the primary target chamber after the projectile enters. When the projectile hits the target, it produces a high-pressure shock wave. In a fraction of a microsecond, the shock wave reverberates through the target. Triggered by the initial wave, diagnostic equipment measures the properties of the shocked material inside the target during this extremely brief period. The target is disintegrated by the impact of the projectile, but is contained within the primary target chamber. The primary target chamber is placed within a secondary confinement chamber prior to execution of the experiment. The secondary confinement chamber is designed and constructed to prevent release of SNM contamination to an uncontrolled environment. The data from these experiments are used by the national laboratories to refine the computer codes used to certify the U.S. nuclear stockpile. Up to 12 SNM shots per year using actinide targets would be conducted at JASPER under the No Action Alternative. Additional operations of the two-stage gas gun would be conducted without SNM for other experiments and to calibrate and evaluate the equipment.

There are two major project elements of the Large-Bore Powder Gun Project. The first is establishment of a development alcove in the U1a Complex and completion of engineering testing necessary to finalize designs. The second element is preparation of the actual test bed for the Large-Bore Powder Gun, which would be in an existing alcove in the U1a Complex and would be designed for conducting subcritical experiments using SNM. Once operational, the Large-Bore Powder Gun would use a powder charge to propel a projectile into a target within a confinement vessel. It operates at lower velocities than JASPER and uses a larger-diameter projectile and a larger target. The Large-Bore Powder Gun could also be used for experiments with materials other than SNM. These experiments would be designed to investigate the properties of SNM and enhance the understanding of the plutonium equation of state and constitutive models for plutonium alloys. Models would be used to perform higher-fidelity simulations of weapons performance. SNM experiments would be conducted using the Large-Bore Powder Gun firing into a single-use confinement vessel with a fast closure valve designed to confine SNM and avoid contamination of the alcove. The alcove would serve as a secondary confinement chamber for the Large-Bore Powder Gun. For experiments containing SNM, the confinement vessels would be entombed within the U1a Complex after the target is expended. The Large-Bore Powder Gun would be used to conduct a

series of up to 10 subcritical experiments per year. Additional operations would be conducted without SNM for other experiments and to calibrate and evaluate the equipment.

Criticality experiments, training, and other activities – These activities were formerly performed at Technical Area 18 at LANL in New Mexico, but were moved to DAF after the December 5, 2002, Record of Decision (ROD) for the *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (67 *Federal Register* [FR] 79906). As part of the relocation of these activities, critical assemblies and associated Category I/II SNM were relocated from LANL to the NNSS. Criticality experiments provide information on nuclear criticality control and understanding of chain reacting systems needed to support nuclear safety and U.S. national security in the broadest sense. This encompasses both national defense and energy policy. To accomplish this objective, the following activities would be carried out:

- Experiments below critical levels (subcritical), in the delayed critical region, and super-prompt critical (pulsed-power) region
- Support for nuclear emergency and accident response programs, as well as programs established to respond to national and international terrorism
- Development of safeguards and arms control methods and technology to detect and control nuclear materials
- Training in support of all the above activities
- Activities to maintain the capability to respond to future criticality accidents or nuclear-materials-handling or -control situations that cannot be understood without special experiments

Critical Assembly

A critical assembly is a machine used to manipulate a mass of fissile material (uranium-233, uranium-235, plutonium-239, plutonium-241, or neptunium-237) with or without a moderator in a specific proportion and shape. The critical assembly can be gradually built up by adding additional fissile material and/or a moderator until this system achieves the dimensions necessary for a criticality condition.

The capability to conduct criticality experiments provides a means to measure and evaluate integral cross sections, perform accident simulation, and develop nuclear instruments, dosimetry, and protocols for the detection and characterization of nuclear material. Under the No Action Alternative, NNSA would conduct up to 500 criticality operations within DAF each year for experiments, training, and other purposes in support of the Stockpile Stewardship and Management and Work for Others Programs.

Criticality experiments would initially be conducted using the refurbished or replaced critical assemblies relocated from Technical Area 18 at LANL to DAF. Four Category I/II SNM critical assembly machines are required to support NNSA's criticality-related activities:

- A general-purpose, vertical-lift table machine is used for training and initial assembly of new experiments. Vertical-lift machines are ideal for this purpose because the stored energy for disassembly is provided by gravity. At the present time, the Planet machine provides this capability.

- A fast-neutron spectrum benchmarked assembly is used for validation of calculation methods, basic measurements of nuclear data of interest to defense and nuclear nonproliferation programs, and training. At the present time, the Flattop assembly serves this purpose.

- A pulse assembly is used to validate dynamic weapons models, verify the function of criticality alarm systems to a fast transient, calibrate detectors, and validate radiation dosimetry. The Godiva assembly provides this function at the present time

- A large-capacity, general-purpose, vertical table machine is used to accommodate benchmark experiments designed to explore unknowns. The Comet machine is used for this purpose.

In the future, NNSA may need to expand its criticality experiments capability to include other experimental machines capable of using security Category I SNM, such as a general-purpose, horizontal split table designed for large experiments that cannot be accommodated on a vertical-lift split table, as well as a low-temperature (cryogenic) critical assembly machine designed to evaluate potential space reactor applications. Potential acquisition of these or any other new critical assembly machines is not included under the proposed actions; thus, their operation is not analyzed in this *NNSS SWEIS*.

Pulsed-power experiments – The Atlas Facility's Pulsed-Power Machine was moved to Area 6 of the NNSS from LANL in 2004 following publication of the *Atlas Relocation and Operation at the Nevada Test Site Final Environmental Assessment* (DOE/EA-1381) (NNSA 2001) and issuance of a Finding of No Significant Impact on May 30, 2001. Experiments that provide the high-quality, high-energy density hydrodynamics data needed to validate new Accelerated Scientific Computing Initiative codes for the Stockpile Stewardship and Management Program would be conducted at the Atlas Facility. Computer models based on such codes would be used to certify the safety and reliability of the Nation's nuclear stockpile, as part of the NNSA Stockpile Stewardship and Management Program. Experiments in support of basic research in nondefense areas would also be conducted at the Atlas Facility.

The physical environments produced at the Atlas Facility enable a wide range of safe, highly precise, reproducible, and controllable experiments. The extreme conditions of high-energy density, strongly coupled plasmas, and high magnetic fields aid in the understanding of planetary physics, condensed-matter physics, fusion-energy research, and astrophysics.

The Atlas Facility is designed to perform pulsed-power experiments on macroscopic targets; that is, targets that are larger than those possible when using lasers and other currently available diagnostic equipment. Larger targets approximately a cubic centimeter in size make measurement easier and allow the investigation of physical phenomena that cannot be scaled down to smaller sizes without affecting parameters of importance. The Atlas Facility's Pulsed-Power Machine is designed to deliver a pulse of very high electrical current through a high-precision cylindrical metal liner that surrounds the sample of interest. The electrical current produces a brief but powerful magnetic force on the liner, which implodes upon the sample. For hydrodynamic experiments, the Pulsed-Power Machine would deliver 25 to 30 mega-amperes to an imploding liner, which would reach velocities of over 15 centimeters per microsecond with final kinetic energies of 2 to 5 megajoules. Pressures of up to 20 megabars could be achieved, depending on the design of the experiment. Under the No Action Alternative, the Atlas Facility would be maintained in a standby status with the capability to conduct up to 12 pulsed-power experiments per year.

Plasma physics and fusion experiments – Using the OneSys Dense Plasma Focus Machine, located in Area 11 of the NNSS, and the Gemini Dense Plasma Focus Machine, located at NLVF, NNSA would conduct plasma physics and fusion experiments under the No Action Alternative. These machines cause fusion (the process the Sun uses to create energy) by compressing and heating a gas. Both machines support Stockpile Stewardship and Management Program experiments and the Work for Others Program with the Defense Threat Reduction Agency and the U.S. Department of Homeland Security (DHS). These Dense Plasma Focus Machines are flexible and powerful scientific tools. They can be configured to investigate plasma physics and to cause nuclear fusion (i.e., joining light atomic nuclei to release energy, in contrast to nuclear fission, the splitting of heavy atomic nuclei to release energy). The most frequently used fusion processes involve combining (fusing) two atoms of hydrogen-2 (deuterium) to form helium-3 and an energetic neutron and fusing deuterium and hydrogen-3 (tritium) to form helium-4 and an energetic neutron. The neutron radiation is emitted in a short, intense pulse. The OneSys machine

uses a deuterium-tritium source and the Gemini machine uses a deuterium-deuterium source. Both machines generate approximately 10^{12} neutrons per pulse. Because initiation of the fusion process requires a large electrical current, capacitor banks are used to store electrical energy (up to 1 million joules) at voltages up to 70,000 volts. Safety, radiation exposure protection, and emission control are ensured through administrative controls and redundant engineered systems, including use of coated lead. Up to 650 plasma physics and fusion experiments would be conducted yearly under the No Action Alternative: 50 in Area 11 of the NNSS and 600 at NLVF.

Drillback operations – Also known as "post-shot drilling," drillback operations were performed routinely when underground nuclear tests were conducted at the NNSS. Drillback operations provide essential data on the results and post-shot underground environment of the underground nuclear test. Post-shot drilling provided the means for obtaining samples from the explosion cavity region for radiochemical analysis and determining the size of the collapse chimney, the effects of the explosion on the surrounding medium, and the distribution of radioactivity in the cavity area. Drillback activities have been conducted since the end of underground nuclear testing as a means of exercising the capability to do such drilling (maintenance of capability) and to obtain data for groundwater studies. Drillback activities include standard directional or slant drilling using equipment and monitoring/warning devices and procedures to prevent a release of radioactivity to an uncontrolled environment from the drilling activity. NNSA estimates that up to five drillback operations would take place under the No Action Alternative over the next 10 years. Each drillback project would be conducted in the area of a former underground nuclear test location and would disturb approximately 5 acres of land.

Stockpile management activities – Stockpile management activities are the hands-on, day-to-day functions and activities involved in maintaining an enduring nuclear weapons stockpile, including assembly, disassembly, modification, and maintenance of nuclear weapons; quality assurance testing of weapons components; and interim storage of nuclear weapons and components.

NNSA would conduct some or all of the following stockpile management activities at the NNSS under the No Action Alternative:

Disposition of damaged U.S. nuclear weapons – A damaged U.S. nuclear weapon would be transported to the NNSS, where it would be evaluated for further action, which could involve repair or disposition. Activities associated with repair would include full or partial disassembly of the damaged weapon, repair or replacement of damaged parts, and reassembly of the weapon. If the weapon were damaged beyond repair, it would be disassembled and its component parts prepared for shipment. Following completion of this work, the weapon or its component parts would be transported to the Pantex Plant or another appropriate NNSA facility.

Nuclear Weapon Pit

The pit is the central core of a nuclear weapon containing plutonium-239 and/or highly enriched uranium that undergoes fission when compressed by high explosives. The pit and the high explosive are known as the "primary" of a nuclear weapon.

Storage and staging of nuclear devices – Nuclear devices would be staged (i.e., programmatic material, such as SNM or other materials, would be stored in a safe and secure manner until needed in a test, experiment, or other activity; staging does not include storage of material with no reasonable expectation of use in the foreseeable future) at DAF pending an underground nuclear test, if so directed by the President. Nuclear weapons training devices would be staged at DAF as part of readiness training and exercises.

Assembly and disassembly of nuclear devices – NNSA would conduct assembly/disassembly operations on nuclear devices associated with an underground nuclear test, if so directed by the President. Nuclear weapons training devices also would be assembled/disassembled as part of readiness exercises and training.

Staging of SNM, including nuclear weapon pits – SNM would be staged at the NNSS for operational purposes associated with dynamic experiments, pulsed-power experiments, criticality experiments, and other activities. All SNM would be staged and used in strict compliance with all applicable requirements.

Training for the Office of Secure Transportation – Through its Office of Secure Transportation, NNSA safely and securely transports nuclear weapons, weapons components, and SNM to meet projected NNSA, U.S. Department of Defense (DoD), and other customer requirements. These shipments are highly guarded to provide the utmost protection of the public and U.S. national security. Throughout their careers, the Federal agents who do this work are given in-service training to defend, recapture, and recover nuclear materials in case of an attack. This training also includes preparing the agents for disruptive demonstrations by activist or other kinds of groups or armed attacks. The Office of Secure Transportation would use existing infrastructure at the NNSS to conduct training and exercises to maintain and improve the skills of its agents to safely and securely transport nuclear weapons, weapons components, and SNM. Training would include convoy activities on existing NNSS roads and adjacent off-road areas using weapons simulators and live-fire exercises at various locations on the NNSS. These activities would occur up to six times each year.

TTR operations – The primary mission of NNSA at the TTR is to ensure that U.S. nuclear weapons systems meet the highest standards of safety and reliability. In addition, Work for Others Program activities are conducted at the TTR. NNSA activities at the TTR are conducted under the conditions set forth in a land use permit from the U.S. Air Force (USAF) and are the responsibility of the Sandia Site Office, located in Albuquerque, New Mexico. Certain TTR activities that were included in the *1996 NTS EIS* ROD (61 FR 65551) (seismic verifications, hazardous burn-test operations, chemical effects testing of stockpile weapons, and thermal testing) are no longer conducted. Under the No Action Alternative, NNSA would use the TTR for the following stockpile stewardship and management tasks:

- Tests and experiments, including flight test operations for gravity weapons (bombs), would be conducted to ensure the compatibility of the hardware necessary for the interface between weapons and delivery systems and to assess weapon system functions in realistic delivery conditions. NNSA does not expect to use Category I/II SNM in flight tests.
- Impact testing would be conducted to test various parameters of a weapon while in flight or when dropped, including penetration of the ground surface. Weapons tested would include joint test assemblies and conventional and inert projectiles. For joint test assemblies and nuclear projectiles, a portion of the nuclear package would be omitted, making them incapable of achieving criticality and producing a nuclear detonation. Impact tests would include the following:
    - Air drop operations – Delivery of any test asset (i.e., gravity bomb, air-dropped sensor package, parachute deployment system, etc.) from an airborne platform
    - Ground/air-launched rocket operations
    - Ground/air-launched missile operations
    - Compressed-air gun operations
    - Davis Gun operations
    - Fuel-air explosives operations

  - Open-air and underground detonation of explosives
  - Post-test procedures and recovery operations
- Passive tests using high-resonance energy, lasers, and ultrasound techniques would be conducted to check the systems in joint test assemblies and conventional weapons. Tests would also be conducted in support of nonproliferation research to develop equipment and techniques for determining whether other countries are using or developing nuclear capabilities. Passive tests would include the use of the following:
  - Telemetry, microwave, and photometric operations
  - Radar operations
  - Laser tracker operations
  - Radiographic operations
  - Electromagnetic radiation testing

Although not listed under the Work for Others description in Section A.1.1.3, all of these Stockpile Stewardship and Management Program activities are similar to activities that may be conducted under the Work for Others Program at the TTR.

A.1.1.2 Nuclear Emergency Response, Nonproliferation, and Counterterrorism Programs

Although no land area is specifically dedicated to Nuclear Emergency Response Program activities, NNSA facilities in Nevada provide a broad support base for those activities, including a variety of areas and facilities that may be used for training and exercise activities. Under the No Action Alternative, NNSA would provide support for the following Nuclear Emergency Response, Nonproliferation, and Counterterrorism Program activities:

- Personnel and logistical support for the Nuclear Emergency Support Team at RSL. The Nuclear Emergency Support Team provides specialized technical expertise in resolving nuclear or radiological terrorist incidents. NNSA assists the Federal Bureau of Investigation or U.S. Department of State in conducting, directing, and coordinating search and recovery operations for nuclear materials, weapons, or devices, and assists in identifying and deactivating an improvised nuclear device or a radiological dispersal device. Nuclear Emergency Support Team activities would also occur at the NNSS and other locations. This ongoing program provides search teams and equipment as required to respond to a nuclear/radioactive material dispersal event.

- Support would be provided for consequence management, including personnel with technical expertise from RSL. As part of this support, NNSA would continue to manage early-phase activities and provide personnel to staff the Federal Radiological Monitoring and Assessment Center (FRMAC). FRMAC coordinates the efforts of 17 agencies to integrate the Federal response to a radiological emergency within the United States. DOE's responsibility is to set up and initially manage FRMAC and NNSA provides the Consequence Management Response Team, which draws from NNSA Emergency Response Assets, including the Radiological Assistance Program and Aerial Measuring Systems. The Phase 1 Consequence Management Response Team is deployed from among NNSA Nevada Site Office (NNSA/NSO) assets. FRMAC is supported through activities at various locations in the United States, as required for training and/or response to a radiological emergency.

- Fixed-wing and rotary-wing aircraft would be provided for emergency response and aerial mapping activities as part of the Aerial Measuring System. The Aerial Measuring System provides rapid response to radiological emergencies with helicopters and fixed-wing aircraft equipped to detect and measure radioactive material. In addition, the Aerial Measuring System surveys DOE sites, participates in interagency exercises, and performs work for other Federal agencies. Aerial Measuring System can also provide detailed aerial photographs and multi-spectral imagery and analyses. The system is housed at and supported by RSL, and activities are conducted at various offsite locations.

- Personnel and logistical support would be provided to the Accident Response Group. The Accident Response Group develops and maintains readiness to efficiently manage the resolution of accidents or significant incidents involving nuclear weapons that are in DOE or DoD custody. The Accident Response Group's role in an emergency situation involving a nuclear weapon includes initial onsite assessment; evaluations to ensure the safety and health of emergency response personnel, the public, and the environment; weapon recovery; and support for onsite radiological monitoring, analysis, and assessment.

- Logistical support would be provided to the Radiological Assistance Program. The Radiological Assistance Program is a first-response resource that assesses a radiological emergency, conducts the initial radiological assessment of the area of the emergency, and provides assistance to minimize immediate radiation risks. The Radiological Assistance Program also provides emergency response training to first responders and is involved in the Weapons of Mass Destruction First Responder Training Program. The Radiological Assistance Program is implemented on a regional basis, with eight Regional Coordinating Offices in the United States. NNSA/NSO is part of Region 7, which is headquartered in Oakland, California.

- Weapons of mass destruction emergency responder training would be provided.

- Equipment and technical support would be provided to NNSA for the DOE-dedicated Emergency Communications Network.

- NNSA would disposition improvised nuclear devices on an as-needed basis at appropriate locations at the NNSS. This activity would include initial evaluation of an improvised nuclear device and, if considered safe to do so, disassembling the device. Throughout the disassembly process, the improvised nuclear device components would be turned over to the Disposition Forensics Program. The Disposition Forensics Program is an extension of the Disposition Program, and its function is to conduct forensics activities on an improvised nuclear device. Existing NNSS facilities would be used for staging, handling, and forensic analysis of improvised nuclear devices and their components. Training drills and exercises also would be conducted at the NNSS to maintain the readiness capability of the Disposition and Disposition Forensics Programs.

  The Federal Bureau of Investigation has lead responsibility for nuclear forensics in response to a radiological event within the United States. However, for the most part, the scientific expertise

Nuclear Forensics

Nuclear forensics is the analysis of nuclear materials recovered from either the capture of unused materials or the radioactive debris following a nuclear explosion. Nuclear forensics can contribute significantly to the identification of the sources of the materials and the industrial processes used to obtain them. In the case of an explosion, nuclear forensics can also reconstruct key features of the nuclear device (AAAS 2008).

and laboratory facilities for nuclear forensics and the assets for collection and storage of radiological samples reside in the DOE complex.

The NNSS has unique facilities and capabilities for staging, as well as experimentation with, nuclear materials and would provide a centralized location where currently dispersed nuclear forensics capabilities would be integrated. The Federal Bureau of Investigation Disposition Forensics Program would deploy a small number of personnel to the NNSS for training and exercises or for an actual incident, as needed. All activities would take place in existing facilities at the NNSS.

- Nonproliferation- and counterterrorism-related activities would continue in the areas of: (1) arms control (see below), (2) nonproliferation, (3) nuclear forensics (discussed above), and (4) counterterrorism. Nonproliferation- and counterterrorism-related activities would provide scientific research and development, technology realization, process and procedure development, equipment testing and certification, and training that support these areas. The kinds of activities that would be involved in supporting nonproliferation and counterterrorism include use of underground detonations of conventional explosives for seismic studies, releases of chemical and biological simulants, geological studies, and experiments to simulate radio frequencies resulting from various nuclear fuel cyle technologies. These activities are addressed in more detail in Section A.1.1.3. Activities supporting U.S. nonproliferation and counterterrorism efforts would occur at RSL and NLVF, but would primarily be conducted at the NNSS.

  The primary goal of the nonproliferation- and counterterrorism-related activities would be to integrate development, testing, and validation of technologies applied to control the spread of weapons of mass destruction, particularly those that are nuclear. This goal would be a platform for collaboration among a diverse group of Federal agencies and their partners, including allied and other foreign nations, international arms control organizations, and nongovernmental or industrial organizations, as appropriate. These activities would also support partnerships in counterterrorism and nuclear forensics. Nonproliferation- and counterterrorism-related activities would be designed for versatility to adapt to changing technology requirements and evolving global security conditions.

  Under the No Action Alternative, nonproliferation- and counterterrorism-related activities would integrate existing activities (i.e., research and development, training, nonproliferation tests and experiments, counterterrorism training, etc.) under an overall program. There would be no new facilities constructed, although existing buildings and other facilities would be used and modified as necessary to accommodate these activities.

Arms control – A key component of nonproliferation activities would be the use of existing facilities as part of an Arms Control Treaty Verification Test Bed dedicated to supporting U.S. arms control initiatives and commitments. Using existing capabilities (such as the Nonproliferation Test and Evaluation Complex [NPTEC], BEEF, various tunnels, laboratories, and training facilities), this component would support design and certification of treaty verification technology, training of inspectors, and development of arms control confidence-building measures. More specifically, in support of the work at the Arms Control Treaty Verification Test Bed, NNSA would conduct the following activities:

Test Bed

A test bed is an area that includes physical structures or designated terrain where tests and experiments are conducted. Test beds may be permanent facilities or temporary sites.

- Developing, testing, and certifying sensors for deployment with onsite arms control inspection teams

- Developing and testing technologies for seismic and electromagnetic pulse discrimination between nuclear and conventional explosions
- Developing and testing samples and measurements from aerial, surface, and subsurface environments for Comprehensive Test Ban Treaty verification purposes
- Developing and testing technologies and methods for nonintrusive observation of tunnel complexes and other underground facilities for potential nuclear weapons-related activities
- Providing training areas where inspectors can learn methods of conducting searches of large areas for radioactive debris or other evidence of nuclear activity
- Providing training in nuclear forensics of radiation-contaminated materials
- Training international inspectors for Strategic Arms Reduction Treaty follow-on and Comprehensive Test Ban Treaty inspections

Under the No Action Alternative, an existing facility in Mercury would be modified to provide important arms control functions such as data fusion, analysis, and visualization. This facility would integrate multiple disciplines and would use both state-of-the-art and experimental data analysis techniques and experimental methods to increase understanding of the means of detecting weapons materials, weapons of mass destruction, clandestine explosions, and hidden laboratories. These data would be combined with other data streams to facilitate turning raw data into actionable knowledge. In addition to treaty verification and weapons of mass destruction detection, this capability would be used for climate change studies, timely warning of natural disasters, environmental remediation, and advancement of earth sciences.

Nonproliferation – The NNSS would serve as a base of operations for the collaborative technical work that underlies nonproliferation programs. Facilities would be provided for Federal agencies to validate sensor performance. This capability would include a security-controlled environment for multinational collaboration in technology development and for technical training and information sharing. These multinational collaborations would be particularly aimed at U.S. allies that do not have ready access to areas where nuclear weapons have been tested in the past and would allow them to gain experience at former testing facilities and sites to aid in their nonproliferation programs. NNSA would use existing facilities in Nevada to support the following areas:

- Safeguarding fissile materials in nations with nuclear weapons or nuclear industries
- Tightening export controls on technology with potential application to weapons of mass destruction
- Improving border protection by installing detectors for radioactive materials
- Inspecting commercial shipments for smuggled nuclear materials
- Collaborating with law enforcement in these areas

For some specific tasks in support of nonproliferation and counterproliferation objectives, NNSA would use existing unique NNSS capabilities, such as NPTEC, areas contaminated by previous nuclear testing, and various tunnel complexes to conduct research, development, and training in the following areas:

- High-hazard experiments and evaluations of equipment and methods for detection of radioactive, chemical, or biological agents using simulants
- Hands-on training and exercises to “render safe” a contraband nuclear device

- Nuclear forensics field exercises involving collection of radioactive material dispersed by an explosion

- Airborne, electromagnetic, and seismic assessment of deep underground facilities

Counterterrorism – A counterterrorism training program would provide an advanced, immersive training environment that would include international participation. The ability to execute complex scenarios in field conditions, with various U.S. agencies and possibly international participants, would lead to refinement of tactics and a direct encounter with unanticipated problems. These training exercises would use the isolated, rugged terrain of the NNSS to simulate many current military areas of operation. The special attributes of the NNSS, which allow use of explosives, chemical and radiological substances, electronic countermeasures, and live weapons fire, would provide realistic training for the military, Federal agents, police officers, and others who conduct counterterrorism operations.

NNSA would support research, development, and training associated with detecting and countering various types of improvised explosive devices, including those that are vehicle-borne. These activities would occur at BEEF, NPTEC, and other NNSS locations. All explosive operations would be conducted in compliance with DOE Manual 440.1-1A, *DOE Explosives Safety Manual*. In addition to BEEF and the Area 11 Explosives Ordnance Disposal Unit, NNSA is currently permitted under the NNSS Air Quality Operating Permit to conduct up to 10 explosive detonations per year, each using up to 2,000 pounds of explosives, at each of the following facilities: (1) the High Explosive Simulation Technique Facility in Area 14, (2) Test Cell C in Area 25, (3) Port Gaston in Area 26, and (4) NPTEC in Area 5.

A.1.1.3 Work for Others Program

The Work for Others Program, hosted by NNSA, facilitates the use by other agencies and organizations of NNSA facilities and capabilities, such as BEEF, NPTEC, the Radiological and Nuclear Countermeasures Test and Evaluation Complex (RNCTEC), and the T-1 Training Area, as well as resources at the NNSS, RSL, NLVF, and the TTR. Under the No Action Alternative, NNSA would continue to host the projects and activities of other Federal agencies such as DoD and DHS, as well as other Federal, state, and local government agencies and nongovernmental organizations, including the following:

Treaty verification – NNSA would host activities related to verification under a number of nuclear weapon-related treaties. The activities that would be conducted range from hosting inspections by other nations to conducting research and development in the area of detecting violations of treaties by others.

Nonproliferation projects and counterproliferation research and development – NNSA would provide the following support to other agencies:

- Conventional weapons effects testing, including live-drop and static high-explosives detonations using up to 30,000-pound-class weapon systems with up to 20,000 pounds TNT-equivalent explosives. These activities would be conducted primarily in the Nuclear and High Explosives Test Zone (Areas 1, 2, 3, 4, 12, and 16 of the NNSS) and would be in compliance with the *DOE Explosive Safety Manual* (DOE Manual 440.1-1A) and other applicable requirements.
- Development and demonstration of capabilities and technologies to effectively threaten and defeat military missions protected in tunnels and other deeply buried hardened facilities. These activities would use military munitions and other explosives and nonexplosive methods. Existing tunnels and bunkers on the NNSS would be used for these activities.
- Conduct experiments and other operations using conventional explosives. All explosive operations would be conducted in compliance with DOE Manual 440.1-1A, *DOE Explosives Safety Manual*. In addition to BEEF and the Area 11 Explosives Ordnance Disposal Unit, NNSA

is currently permitted under the NNSS Air Quality Operating Permit to conduct up to 10 explosive detonations per year, each using up to 2,000 pounds of explosives, at each of the following facilities: (1) the High Explosive Simulation Technique Facility in Area 11, (2) Test Cell C in Area 25, (3) Port Gaston in Area 26, and (4) NPTEC in Area 5.

- Controlled experiments involving releases (including explosive releases) of chemical and biological simulants. These experiments would support development of detectors, sensors, and equipment and methods to control leaking containers (i.e., tanks, truck and railroad tankers, etc.), and provide data for training first responders and others to detect biological and/or chemical traces that may indicate the manufacture or presence of a chemical or biological weapon. They would also support detection, control, and remediation of leaks and spills. Up to 20 controlled chemical and biological simulant release tests and experiments would be conducted yearly.

Large releases of chemicals would be conducted at NPTEC and would comply with the parameters in *Hazardous Materials Testing at the Hazardous Materials Spill Center, Nevada Test Site* (DOE/EA-0864) (DOE 2002), including: (1) chemical concentrations must not exceed specific limits within three 3.1-mile-wide geographic impact zones established in the downwind direction from the NPTEC release point (see **Table A–1** for limitations for each zone); (2) restrictions on materials that have cumulative, long-term persistence in the environment; (3) restrictions on the duration of releases that are of sufficient quantity and/or concentration to have a potential for environmental impacts in downwind testing sectors; (4) restrictions on the frequency of releases that may approach the limits of the geographic impact zones; (5) windspeed must be calm to 33.5 miles per hour; and (6) specific wind direction requirements for each of the three geographic impact zones. Before NNSA/NSO accepts any particular chemical release test or experiment, the proponent of the test/experiment must provide specific documentation, including a proposal letter, a test plan, a safety assessment, and a test management summary. These documents provide information used by NNSA/NSO to evaluate the proposed releases to determine whether they would comply with all applicable requirements to protect human health and the environment.

Chemical Release Criteria

Immediately Dangerous to Life or Health (IDLH) – The National Institute of Occupational Safety and Health (NIOSH) defines IDLH as a situation that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.

Short-Term Exposure Limit (STEL) – An Occupational Safety and Health Administration (OSHA) or NIOSH 15-minute time-weighted average that cannot be exceeded at any time during the workday.

Permissible Exposure Limit – An OSHA time-weighted average concentration that must not be exceeded during any 8-hour work shift in a 40-hour workweek.

Recommended Exposure Limit – A NIOSH time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek.

Threshold Limit Value (TLV) – The amount of chemical in the air established by the American Conference of Industrial Hygienists that almost all healthy adult workers are predicted to be able to tolerate without adverse effects. There are three types:

- The TLV-TWA (TLV Time-Weighted Average) is averaged over the normal 8-hour day/40-hour workweek.
- A TLV-STEL is a 15-minute exposure that should not be exceeded for even an instant. It is not a standalone value, but is accompanied by the TLV-TWA. It indicates a higher exposure that can be tolerated for a short time without adverse effect as long as the total TLV-TWA is not exceeded.
- The TLV-C (Ceiling limit) is the concentration that should not be exceeded during any part of the working exposure.

Table A–1 Nonproliferation Test and Evaluation Complex Geographic Impact Zones

Zone	*Description*	*Allowable Chemical Concentration*
I	A semicircular area with a radius of 3.1 miles centered on a bearing of 225 degrees from the release point	May contain lethal concentrations for exposures of less than 15 minutes to humans and wildlife
II	An area centered on a bearing of 225 degrees extending from 3.1 miles to 6.2 miles from the release point and bounded on either side by bearing lines 270 degrees on the south and 180 degrees on the north	May contain concentrations for which an exposure of less than 15 minutes would have a low probability of morality, but may cause respiratory damage to humans or animals
III	An area centered on a bearing of 225 degrees extending from 6.2 miles to 9.3 miles from the release point and bounded on either side by bearing lines 260 degrees on the south and 190 degrees on the north	May contain concentrations that cause mild and reversible respiratory tract irritation on wildlife and minor and reversible effects on vegetation

Low concentrations of chemicals may be released anywhere on the NNSS within the requirements presented in the *Final Environmental Assessment for Activities Using Biological Simulants and Releases of Chemicals at the Nevada Test Site* (*Chem/Bio EA*) (DOE/EA-1494) (DOE 2004a). Under those requirements, chemical concentrations would not exceed the "Immediately Dangerous to Life or Health Program" limit beyond a radius of 328 feet from the release point; would not exceed the "Short-Term Exposure Limit" beyond 1,000 feet from the release point; and would not exceed the more conservative of "Permissible Exposure Limits," "Recommended Exposure Limit," or "Threshold Limit Value" beyond 1,640 feet from the release point.

Releases of biological simulants at the NNSS are subject to specific parameters addressed in the *Chem/Bio EA*. In the *Chem/Bio EA*, based on scientific information regarding potential effects on human and ecological receptors, NNSA identified six microorganisms that may be used in experiments as simulants for biological agents: *Bacillus subtilis* var. *niger* (formerly *B. globigii*), *B. thuringiensis*, *Clostridium sporogenes*, *Erwinia herbicola* (also known as *Panoea aggloverans*), Bacteriophage MS2, and noninfectious (killed) influenza A virus. A biological agent is a pathogenic microorganism or any naturally occurring, genetically manipulated, or synthesized component of biological origin that is capable of causing death, disease, or other biological malfunction in humans, animals, or plants, or causing deterioration of food, water, equipment, or supplies. A biological simulant is a biologically derived substance or microorganism that shares at least one physical or biological characteristic of the biological agent it is simulating, has been shown to be nonpathogenic, and can replace the biological agent in testing. Biological simulants are intended to mimic the behavior of potentially more lethal or severely debilitating biological agents that may be used in warfare or by terrorist organizations.

Counterterrorism – NNSA would continue to support DoD and other Federal agencies in developing methods for engaging or neutralizing an adversary in a variety of topographical environments. These organizations would take advantage of the NNSS restricted access and remote high desert terrain to develop realistic scenarios that could be encountered in specific mission profiles. Activities would include the following:

- Training in direct-action live-fire take-down of high-fidelity target test beds
- Low-altitude fixed- and rotary-wing desert flight training and technique development
- Development of and training in remote area advanced personnel overland navigation techniques

- Development and field-testing of special-use military hardware, including new ordnance and vehicles
- Field-testing and training activities for unmanned aerial vehicles and/or unmanned aircraft systems
- Overland movement of military personnel and equipment through rugged terrain to assess fatigue and war-fighter capability

In addition to the ground-based military operations that occur at the NNSS, the USAF would conduct military operations in the restricted air space above the NNSS and the TTR.

DHS technology programs and DoD would continue to use NNSS facilities to assist in development of technology for homeland security applications. The NNSS would continue to provide land and infrastructure to support evaluation of radiological and nuclear detection devices for use in transportation-related applications. DHS would continue to use RNCTEC (a facility constructed at the NNSS on behalf of DHS), as well as other NNSS land and infrastructure for its activities. RNCTEC would continue to operate as a less-than-Category-3 nonreactor nuclear facility with a mock Primary Port of Entry, Active Interrogation Facility, storage and staging areas, and a Test Support Building. Radioactive and nuclear materials (including SNM) used in RNCTEC activities would not be released under normal operations. All radionuclides would be transported in strict compliance with applicable regulations of the U.S. Department of Transportation. A detailed description of RNCTEC facilities and activities is contained in the *Radiological/Nuclear Countermeasures Test and Evaluation Complex, Nevada Test Site, Final Environmental Assessment* (DOE/EA-1499) (DOE 2004b).

DOE Hazard Categories

In accordance with DOE Order 5480.23, *Nuclear Safety Analysis Report*, as part of establishing the safety basis of DOE nuclear facilities, contractors that design, construct, or operate such a facility are required to perform a hazard analysis of their nuclear activities and classify their processes, operations, or activities in accordance with the following requirements (cited from DOE Order 5480.23):

"The consequences of unmitigated releases of radioactive and/or hazardous material shall be evaluated and classified by the following hazard categories:

(a) Category 1 Hazard. The hazard analysis shows the potential for significant offsite consequences.

(b) Category 2 Hazard. The hazard analysis shows the potential for significant onsite consequences.

(c) Category 3 Hazard. The hazard analysis shows the potential for only significant localized consequences."

NNSA's Counterterrorism Operations Support Program would continue supporting the Federal Emergency Management Agency. This program involves development and implementation of a national program to enhance the capability of state and local agencies to respond to weapons of mass destruction incidents through coordinated training, equipment acquisition, technical assistance, and support for state and local exercise planning.

Military Training and Exercises – NNSA would continue to support DoD by providing land, airspace, and infrastructure for use by various branches of the military to conduct training and exercises. These activities range from small-scale, i.e., focused at a specific building or site, to large-scale exercises involving multiple air and/or ground assets with live-fire operations. These activities would include use of live fire of military munitions, including small arms, hand grenades, rocket-propelled grenades, etc. Military training and exercises may be conducted throughout the NNSS, but would be primarily conducted in the western portions, including Areas 18, 19, 20, 25 (northern portion), 29, and 30 to preclude interference with and from other NNSS activities. Military training and exercises are subject all applicable regulatory requirements and to NNSA/NSO work authorization processes (NSO O 412.X1E,

Real Estate/Operations Permit, December 9, 2009), which are designed to minimize hazards to workers, the environment, and NNSS physical assets.

Support for the U.S. National Aeronautics and Space Administration (NASA) – NNSA would conduct criticality experiments at DAF in support of NASA's efforts to develop power sources for use in future missions to Mars and similar space exploration.

Miscellaneous Work for Others Program activities – Customers would continue to use aerial platforms for various purposes, including research and development, training and exercises, and deployment of sensors for detection of various items. These types of activities would use a variety of manned and unmanned aerial vehicles, including fixed-wing aircraft (airplanes) and helicopters. Existing aviation facilities at the NNSS, Nellis and Creech Air Force Bases, and other locations would be used as part of these activities.

Work for Others Program activities at the TTR – These activities would be similar to those addressed under the Stockpile Stewardship and Management Program (Section A.1.1.1), with the following additions:

- Robotics testing and development (handling, application, and recovery of hazardous [chemical] material)
- Smart transportation-related testing – preprogrammed/remote-controlled vehicles (air and ground)
- Smoke obscuration operations
- Infrared tests
- Rocket development, testing, and deployment

A.1.2 Environmental Management Mission

DOE/NNSA's Environmental Management Mission includes the Waste Management Program and Environmental Restoration Program. These programs are under the organizational control of DOE's Environmental Management Program. The Waste Management Program conducts waste management operations for all solid wastes, LLW, and mixed low-level radioactive waste (MLLW) generated by NNSA operations and environmental restoration operations. The Waste Management Program operates disposal facilities that receive various waste types, including the Area 5 Radioactive Waste Management Complex (RWMC) and Area 3 Radioactive Waste Management Site (RWMS), which dispose LLW and MLLW received from onsite- and offsite-approved waste generators. The Environmental Restoration Program conducts, as needed, characterization, monitoring, and remediation of facilities, sites, and groundwater contaminated by previous nuclear weapons-related and other activities at the NNSS, the TTR, and the Nevada Test and Training Range. The Environmental Restoration Program also implements the Borehole Management Program, which plugs unneeded boreholes for which NNSA is responsible.

A.1.2.1 Waste Management Program

Waste management operations support DOE and NNSA operations and environmental cleanup and restoration programs. The waste management objective is to conduct proper disposal and monitoring of wastes generated by NNSA and other approved generators. Waste types stored, treated, and/or disposed at the NNSS include LLW, MLLW, transuranic (TRU) waste, mixed TRU waste, hazardous waste, asbestos, polychlorinated biphenyl (PCB) wastes, hydrocarbon-contaminated soil and debris, and solid wastes such as construction or demolition debris or sanitary solid waste. Liquid nonhazardous wastes (such as sewage and other wastewater) are not included under the Waste Management Program, but are addressed in Section A.1.3.1, "General Site Support and Infrastructure." All NNSA waste management activities operate in compliance with applicable regulatory requirements. Waste management activities at the NNSS under the No Action Alternative would include the following:

LLW and MLLW management – LLW and MLLW from NNSS, DoD, and other approved generators that meet the NNSS waste acceptance criteria would continue to be accepted and disposed. The volume of LLW projected for disposal at the NNSS and analyzed under the No Action Alternative is based on the actual volume of LLW disposed at the NNSS from FY 1997 through FY 2010 and is estimated to total about 15,000,000 cubic feet. The volume of MLLW projected for disposal at the NNSS and analyzed under the No Action Alternative is estimated to total about 900,000 cubic feet. This estimated volume is based on the disposal capacity of the new Mixed Waste Disposal Unit, Cell 18; the actual permitted capacity of Cell 18 is 899,996 cubic feet. The volumes of LLW and MLLW include those from authorized out-of-state generators as well as those from operations and environmental restoration at the NNSS and other authorized in-state locations.

NNSA would continue to manage in-state-generated MLLW by a combination of several options: (1) repackage MLLW, as appropriate, at the TRU Pad in the Area 5 RWMC; (2) store in-state-generated MLLW at the TRU Pad or at a new MLLW storage facility, pending certification for disposal; or (3) ship in-state-generated MLLW to a permitted facility such

Waste Definitions and Information

Radioactive Waste – Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery.

Transuranic (TRU) Waste – Radioactive waste containing alpha particle-emitting radionuclides having an atomic number greater than 92 (the atomic number of uranium) and half-lives greater than 20 years, in concentrations greater than 100 nanocuries per gram.

Low-Level Radioactive Waste (LLW) – Radioactive waste not classified as high-level radioactive waste, TRU waste, spent nuclear fuel, or byproduct material as defined by Section 11e(2) of the Atomic Energy Act of 1954, as amended. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as LLW, provided the concentration of TRU elements is less than 100 nanocuries per gram.

Hazardous Waste – A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in Title 40 of the *Code of Federal Regulations* (CFR) 261.20-24 (ignitability, corrosivity, reactivity, and toxicity), or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.31-33.

Mixed Waste – Waste containing both radioactive and hazardous components, as defined by the Atomic Energy Act and RCRA, respectively. Mixed waste intended for disposal must meet the Land Disposal Restrictions as listed in 40 CFR Part 268. Mixed waste is a generic term for specific types of mixed waste, such as mixed low-level radioactive waste (MLLW) and mixed TRU waste.

Waste Generator – An individual, facility, corporation, government agency, or other institution that produces waste material for certification, treatment, storage, or disposal.

Waste Acceptance Criteria – A document that establishes the National Nuclear Security Administration Nevada Site Office waste acceptance criteria. The document provides the requirements, terms, and conditions under which the Nevada National Security Site (NNSS) accepts LLW and MLLW for disposal. It includes requirements for the generator's waste certification program, characterization, traceability, waste form, packaging, and transfer. The criteria apply to radioactive waste received at the NNSS Area 3 Radioactive Waste Management Site and Area 5 Radioactive Waste Management Complex for storage or disposal.

as Energy Solutions in Clive, Utah, or Materials and Energy Corporation in Oak Ridge, Tennessee, for appropriate treatment. MLLW treated at an offsite facility would be returned to the NNSS for disposal or would be disposed at a permitted commercial facility.

The Area 5 RWMC would continue to operate within the approximately 740-acre area set aside for waste management purposes. LLW and MLLW disposal units would be developed, filled, and closed as needed, in compliance with applicable regulatory requirements. NNSS- and offsite-generated LLW and MLLW would be disposed within these units. Individual disposal units would be operationally closed as they are filled to capacity, pending final closure at a later date. Final closure of existing operationally closed units, including the greater confinement disposal boreholes, began in calendar year 2011. LLW and permitted MLLW disposal would continue elsewhere at the Area 5 RWMC.

On December 1, 2010, the Nevada Division of Environmental Protection (NDEP) issued a permit to NNSA/NSO for a new MLLW Disposal Unit at the Area 5 RWMC. The new MLLW Disposal Unit consists of a single lined cell (Cell 18) with a capacity of about 900,000 cubic feet (actual permitted disposal volume is 899,996 cubic feet). Temporary storage operations for onsite-generated LLW and MLLW would continue. Support activities within the Area 5 RWMC, such as the Real-time Radiography Facility, would continue.

The Area 3 RWMS would be maintained in a standby status under the No Action Alternative.

Small quantities of LLW (a few to a few hundred cubic feet over the next 10 years) may be generated at RSL and NLVF. Normal operations at the TTR are not expected to generate radioactive waste, but environmental restoration activities would generate LLW and possibly unknown quantities of TRU waste. These environmental restoration wastes would be disposed at appropriate disposal facilities, such as the Area 5 RWMC and/or the Waste Isolation Pilot Plant, as appropriate.

TRU waste management – With the exception of two experimental spheres, the remaining legacy TRU waste previously stored at the NNSS was sent to Idaho National Laboratory for processing and then shipped to DOE's Waste Isolation Pilot Plant for disposal in 2009. Environmental Restoration Program projects at the NNSS, the TTR, and the Nevada Test and Training Range may generate some TRU waste, and experiments at JASPER and other national security activities would also generate small annual quantities (approximately 500 cubic feet per year) of TRU waste that would be safely stored at the TRU Pad pending characterization. Overall, NNSA estimates that about 9,600 cubic feet of TRU waste would be generated by its operations and the Environmental Restoration Program over the next 10 years. These TRU wastes would be shipped either directly to the Waste Isolation Pilot Plant for disposal or to another facility, such as Idaho National Laboratory, for processing before being sent to the Waste Isolation Pilot Plant.

TRU wastes would not be generated during RSL, NLVF, or NNSA Sandia Site Office activities at the TTR.

Hazardous waste management – DOE/NNSA activities would generate about 170,000 cubic feet of hazardous waste at the NNSS over the next 10 years under the No Action Alternative. The Hazardous Waste Storage Unit in Area 5 of the NNSS would continue to operate under a RCRA Part B permit issued by NDEP. Onsite-generated hazardous waste would be stored for up to 1 year prior to shipment to offsite treatment and/or disposal facilities.

RSL is a small-quantity generator of hazardous waste. Hazardous waste would continue to be accumulated at RSL for no more than 90 days before being transferred off site to a permitted facility for treatment and/or disposal. Waste management field activities at RSL are provided by the USAF as

landlord services under a Memorandum of Agreement. USAF personnel pick up and dispose miscellaneous laboratory and process equipment wastes under the terms of Nellis Air Force Base Plan 12 (Hazardous Waste Management Plan, October 2007).

NLVF is a conditionally exempt small-quantity generator of hazardous waste. Hazardous waste would continue to be accumulated at NLVF for no more than 90 days before being transferred off site to a commercially permitted facility for treatment and/or disposal.

The TTR is a small-quantity generator of hazardous waste. Hazardous wastes would continue to be accumulated at the TTR for no more than 180 days before being transferred off site to a permitted treatment, storage, and disposal facility.

Used oil from all NNSA/NSO facilities and the TTR would continue to be collected and sent for recycling.

Asbestos and PCB waste management – Friable, nonradioactive asbestos waste would continue to be disposed at the Area 23 Solid Waste Disposal Site and possibly at the U10c Solid Waste Disposal Site, pending permit modification and review. Radioactive asbestos waste would continue to be disposed at the Area 5 RWMC. Nonfriable asbestos waste would continue to be disposed at the U10c Solid Waste Disposal Site. Nonradioactive PCB wastes would be stored at the Hazardous Waste Storage Unit in Area 5, pending transfer to a permitted treatment and/or disposal facility. Radioactive PCB-contaminated waste meeting U.S. Environmental Protection Agency (EPA) requirements (40 *Code of Federal Regulations* [CFR] Part 761) would continue to be disposed in a RCRA-permitted MLLW Disposal Unit through November 30, 2010. After that time, this waste type would be disposed in the new RCRA-permitted MLLW Disposal Unit described above. NNSA would continue to dispose asbestos and PCB wastes generated at the TTR at a permitted treatment, storage, and disposal facility.

Explosives waste treatment – NNSA would continue to treat old and/or unusable explosives by open-air detonation at the Explosives Ordnance Disposal Unit in Area 11. This treatment operation would continue to be governed by a RCRA Part B permit and the NNSS Air Quality Operating Permit.

Hydrocarbon-contaminated soil and debris management – The Area 6 Hydrocarbon Solid Waste Disposal Site would continue to operate under a permit issued by NDEP and would accept onsite-generated soil and debris contaminated with hydrocarbons. The U10c Solid Waste Disposal Site would also continue to operate under a permit issued by NDEP and would accept limited amounts of onsite-generated soil and debris contaminated with hydrocarbons. Onsite-generated, hydrocarbon-contaminated LLW would continue to be disposed in the Area 5 RWMC. If hydrocarbon-contaminated waste were generated due to an accidental release at RSL or NLVF, it would be disposed at a facility permitted to receive such waste. The TTR would continue to dispose hydrocarbon-contaminated soil and debris at a permitted/approved landfill.

Solid waste management – DOE/NNSA activities would generate about 3,700,000 cubic feet of sanitary solid waste and construction and demolation waste at the NNSS. NNSA would continue to operate the Area 23 Solid Waste Disposal Site. This permitted facility accepts less than 20 tons of sanitary waste per day. Industrial solid waste and construction and demolition debris would continue to be disposed at the U10c Solid Waste Disposal Site. About 370,000 cubic feet of sanitary solid waste would be sent off site to permitted facilties to be recycled.

At RSL and NLVF, sanitary solid waste would continue to be disposed by a municipal waste service.

At the TTR, sanitary solid waste would continue to be disposed at the USAF TTR sanitary landfill. Industrial solid waste, such as construction or demolition debris, would be disposed at a USAF landfill or shipped off site for disposal at the NNSS or a permitted commercial landfill.

Excess materials that are suitable for recycling or reuse, such as scrap metal, would be shipped off site.

A.1.2.2 Environmental Restoration Program

NNSA's Environmental Restoration Program is generally a DOE-funded activity under the organizational direction of the DOE Environmental Management Program. Under the No Action Alternative, the NNSA Environmental Restoration Program would continue, in compliance with the Federal Facility Agreement and Consent Order (FFACO), to characterize, monitor, and remediate identified contaminated areas, facilities, and the environment. Environmental restoration is not considered a land use, but is a necessary activity before reuse or disposition of land, facilities, and environmental media. The Environmental Restoration Program is organized into three projects and also supports the Defense Threat Reduction Agency in addressing its environmental restoration sites at the NNSS. The three projects are the Underground Test Area (UGTA) Project, Soils Project (includes contaminated soil sites from the TTR and the Nevada Test and Training Range), and Industrial Sites Project (includes the Decontamination and Decommissioning Project and facilities to be remediated at the TTR and the NNSS under the *1996 NTS EIS*). The *1996 NTS EIS* also included the Project Shoal Site and the Central Nevada Test Area as projects under the Environmental Restoration Program. These two sites have since been transferred to DOE's Office of Legacy Management and are not addressed in this SWEIS. NNSA Borehole Management Program work is executed by the Environmental Restoration Program. The following NNSA environmental restoration projects and activities would continue at the NNSS under the No Action Alternative:

Underground Test Area Project – The UGTA Project would monitor groundwater from existing wells; continue drilling characterization wells; expand groundwater monitoring to include new wells; develop groundwater flow and transport models; and continue to evaluate closure strategies, including adaptive monitoring and management. UGTA activities would occur on the NNSS, the Nevada Test and Training Range, U.S. Bureau of Land Management land, and privately owned land, as necessary and as permission is obtained. This project includes five corrective action units (CAUs): Yucca Flat/Climax Mine (CAU 97), Frenchman Flat (CAU 98), Rainier Mesa/Shoshone Mountain (CAU 99), Central Pahute Mesa (CAU 101), and Western Pahute Mesa (CAU 102). The UGTA Project has planned for Phase I and Phase II corrective action investigations for each CAU; however, depending on the results at the end of Phase I, NDEP may approve a Corrective Action Decision Document/Corrective Action Plan. In 2009, CAUs 101 and 102 began the second phase of characterization; a Phase II investigation was completed for CAU 98; and a Phase II Transport Model was submitted to NDEP. Also during 2009, a Phase I Flow Model was under preparation for CAU 97, and a Phase I Source Term Model was under preparation for CAU 99. The closure strategy for all CAUs in the UGTA Project is closure in place and long-term monitoring with institutional controls. An estimated five wells would be drilled for the UGTA Project each year for approximately 10 years, each affecting 10 acres due to construction of drill pads and fluid pits. Hydraulic testing would occur at many of these new wells, and possibly at existing wells, requiring the use of portable power generators and resulting in withdrawal of groundwater and disposition in the fluid pits. Tracer tests could also be conducted, which would involve injecting nonhazardous chemical substances (for example, bromide) into a well and monitoring their concentrations in an adjacent pumped well. Other characterization activities would include seismic or other geophysical tests.

Soils Project – The Soils Project would continue to investigate soil sites using in situ monitoring (thermoluminescent detectors, onsite radiation surveys, and aerial radiological surveys), air monitoring, surface-water contaminant transport studies, and soil sampling, as well as perform corrective actions

using clean closure, closure in place, or a combination to ensure that the public and workers are protected. The Soils Project would ensure that proper use restrictions are in place to implement site closure, in compliance with access and posting requirements of DOE's *Occupational Radiation Protection* rules (10 CFR Part 835) and Nevada Test and Training Range radiation protection policies, which may include fencing and posting. The current closure strategy for Soils Project sites at the NNSS is based on a future industrial land use scenario with a 25-millirem-per-year exposure action level. This action level is used for the analysis under the No Action Alternative in this SWEIS. Soils sites on the Nevada Test and Training Range, including the TTR, are expected to be remediated to an action level that is mutually agreed upon by DOE/NNSA, the USAF, and NDEP. Activities would continue to be conducted in compliance with the FFACO, although alternate uses may require stricter cleanup levels than currently anticipated. The impacts of potential stricter cleanup levels are addressed under the Expanded Operations Alternative. Sixteen of the current 107 sites being addressed by the Soils Project have been closed. Over about 10 years, as more contaminated soil sites are found, the Soils Project is expected to add up to 20 additional sites. As these sites close, some may require postclosure monitoring and land use controls. NNSA anticipates that all identified Soils Project sites will be closed under the FFACO by the end of 2022.

Industrial Sites Project – The Industrial Sites Project would continue its field program to identify, characterize, and remediate industrial sites under the FFACO and to decontaminate and decommission unneeded facilities. Under the No Action Alternative, some industrial sites may require clean closure rather than closure in place. The majority of the FFACO industrial sites have been closed. Remediation, decontamination, and decommissioning activities are projected to be complete by the end of 2012, with the exception of CAU 114 (EMAD [Engine Maintenance Assembly and Disassembly Facility]). The current number of CAUs is 265, with a total of 1,870 corrective action sites (CASs) (including 64 CASs at the TTR, all of which have been closed as of September 2010). Twelve CAUs and 102 CASs remain to be closed at the NNSS. As of 2009, 8 of 9 Part A sites identified in the *1996 NTS EIS* (DOE 1996) were closed under RCRA. The remaining Part A site is expected to be closed by 2012. Some closed industrial sites may require monitoring and land use controls. Industrial Sites Project activities would continue at present levels, although alternate uses of remediated facilities may require revised cleanup levels.

Defense Threat Reduction Agency sites – The Defense Threat Reduction Agency sites are identified as part of the NNSA Environmental Restoration Program because their site activities are considered environmental remediation on the NNSS. However, the Defense Threat Reduction Agency is responsible for implementing and funding these activities in compliance with applicable agreements with NDEP. In September 2005, with the concurrence of NDEP, the Defense Threat Reduction Agency adopted a risk-based closure strategy for closure of nine CAUs (NDEP 2005). This risk-based closure strategy uses final action levels based on risks to human health and the environment. The final action levels were used to determine the risk a particular site poses to human health and the environment so that available resources would be used in the most effective manner in closing each site. Surface-disturbing activities have been completed and environmental monitoring, such as water sampling, would continue. The Environmental Restoration Program accepted responsibility for the E-Tunnel effluent ponds and associated long-term postclosure monitoring from the Defense Threat Reduction Agency in 2008.

Borehole Management Program – More than 4,000 boreholes were drilled on and off the NNSS in support of nuclear testing (DOE/NV 2009). The boreholes were drilled for various purposes, including post-shot investigation, exploratory holes, instrument holes, potable water wells, construction water supply wells, monitoring wells, and other special purposes. Unneeded boreholes would be plugged to reduce the potential for boreholes to act as conduits for contaminant transport from the surface or from contaminated aquifers to uncontaminated aquifers. To date, the Borehole Management Program has identified 874 unneeded boreholes (Townsend 2009) on the NNSS; 151 of these are believed to penetrate groundwater and underground nuclear test cavities (DOE/NV 2009). The NNSA Borehole Management

Program plugs unneeded boreholes as a matter of comity in accordance with *Nevada Administrative Code* 534.420-534.427 requirements, to the extent possible.

Through 2009, a total of 691 unneeded boreholes were plugged by the Borehole Management Program (Townsend 2009). Under the No Action Alternative, NNSA would continue to plug the remaining unneeded boreholes on the NNSS. Based on the current schedule and known inventory of unneeded boreholes on the NNSS that need to be plugged, the Borehole Management Program would be complete by the end of 2013.

A.1.3 Nondefense Mission

The Nondefense Mission generally includes those activities that are necessary to support mission-related programs, such as constructing and maintaining facilities, providing supplies and services, warehousing, and similar activities. Activities related to supply and conservation of energy, including renewable energy and other research and development projects, are also considered under the Nondefense Mission.

A.1.3.1 General Site Support and Infrastructure Program

Like any large facility, the NNSS has substantial infrastructure that provides all site-support services. Under the No Action Alternative, infrastructure-associated activities would continue, including small projects such as repairs and replacements to maintain present capabilities of NNSA facilities. For instance, maintenance and repair projects include, among other things, repairing the Area 23 sewer main; remediating underground storage tanks; replacing five roll-up doors; renovating and reactivating several water tanks; replacing electric hot water heaters; installing water tank security ladders; and replacing the roofs on several buildings. Increasing the capacities and capabilities or extending the ranges of facilities and/or services is not proposed under the No Action Alternative.

NNSS infrastructure includes buildings that house various functions, such as administration; storage; security, fire protection, and health care services; research and development; and industrial processes (see **Table A–2**). Utilities at the NNSS, NLVF, RSL, and the TTR include potable and nonpotable water systems, wastewater systems, electrical transmission and distribution systems, and communications systems. Although they are part of NNSA's infrastructure, characterization and monitoring wells developed under the UGTA Project are addressed as part of the Environmental Management Program rather than the General Site Support and Infrastructure Program.

The TTR contains about 105 major buildings, providing 161,505 square feet of space. TTR infrastructure also includes about 90 smaller buildings, towers, and small sheds. Services available at the TTR include security, fire protection, and health care. Utilities at the TTR include water systems, wastewater systems, and electrical systems.

In addition to maintaining and repairing its infrastructure at the NNSS, RSL, NLVF, and the TTR, NNSA would maintain the existing infrastructure, provide site security, and manage all applicable existing permits and agreements for the former Yucca Mountain Repository. NNSA would perform these functions pending decisions on the disposition of the former Yucca Mountain Repository.

Table A–2 Building Floor Space and Functions for National Nuclear Security Administration Facilities in Nevada

Function	*Nevada National Security Site 484 Buildings (square feet)*	*Remote Sensing Laboratory 7 Buildings (square feet)*	*North Las Vegas Facility 30 Buildings (square feet)*	*Offsite Leased (square feet)*
Administration	383,336	0	444,090	117,263
Storage	332,877	16,454	22,179	1,104
Industrial/Production/Process	359,980	0	58,969	8,253
Research and Development	486,405	144,059	136,079	87,451
Services	413,948	0	4,023	0
Other	255,056	1,015	648	0
Total	2,231,602	161,528	665,988	214,071

Source: Mason 2009.

A.1.3.2 Conservation and Renewable Energy Program

Under the No Action Alternative, NNSA would continue to identify and implement energy conservation measures and renewable energy projects, in compliance with Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (72 FR 3919); DOE Order 430.2B, *Department of Energy, Renewable Energy and Transportation Management Requirements*; and Transformational Energy Action Management objectives.

Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, was signed by President Obama on October 5, 2009. Executive Order 13514 expands the requirements of Executive Order 13423 in the following areas:

- Measuring and reporting greenhouse gases
- Implementing strategies and policies to support low-carbon commuting and travel
- Identifying, promoting, and implementing water reuse strategies that reduce potable water consumption
- Increasing diversion of compostable and organic material from waste streams
- Ensuring that planning for new facilities/leases considers pedestrian-friendly sites near existing employment
- Managing existing building systems to reduce consumption of energy, water, and materials
- Identifying opportunities to consolidate and dispose existing assets to optimize real property portfolios

In accordance with DOE Order 430.2B, Executive Order 13423, and Executive Order 13514, NNSA would continue to identify and implement requirements in the following areas:

- Energy efficiency
- Renewable energy

Energy Efficiency and Intensity

Energy efficiency can be defined for a component or service as the amount of energy required in the production of that component or service; for example, the amount of steel that can be produced with 1 billion British thermal units of energy. Energy efficiency is improved when a given level of service is provided with reduced amounts of energy inputs, or services or products are increased for a given amount of energy input.

Energy intensity is the amount of energy used in producing a given level of output or activity. It is measured by the quantity of energy required to perform a particular activity (service), expressed as energy per unit of output or activity measure of service.

Source: http://www1.eere.energy.gov/ba/pba/intensityindicators/trend_definitions.html

- Water conservation
- Transportation/fleet management
- High-performance sustainable buildings

NNSA activities (as of December 2009) associated with selected requirements from DOE Order 430.2B, Executive Order 13423, and Executive Order 13514 are discussed below.

Energy efficiency– NNSA would improve energy efficiency and reduce greenhouse gas emissions at the NNSS by reducing energy intensity by 3 percent annually or a total of 30 percent through the end of FY 2015, relative to the baseline of energy use in FY 2003. Energy intensity measures energy consumption per gross square foot of building space, including industrial and laboratory facilities. Greenhouse gas emissions would be reduced by 28 percent by FY 2020.

Table A–3 presents energy intensity reduction goals from the FY 2003 baseline through FY 2015 based on the Energy Independence and Security Act of 2007, Section 431, "Energy Reduction Goals." Additional mission requirements may preclude accomplishing this goal at the NNSS.

Table A–3 National Nuclear Security Administration Energy Intensity Reduction Goals

Fiscal Year	*Annual British Thermal Units Per Square Foot*	*Cumulative Percent Reduction*
2003	115,729	Base Year
2006	113,414	2
2007	111,100	4
2008	105,313	9
2009	101,842	12
2010	98,370	15
2011	94,898	18
2012	91,426	21
2013	87,954	24
2014	84,482	27
2015	81,010	30

Source: NSTec 2008.

NNSA would install advanced electric metering systems to the maximum extent practicable at all NNSS buildings, in accordance with the DOE metering plan for site monitoring of electric energy, and implement a centralized data collection, reporting, and management system. Standard metering systems for steam, natural gas, and water would also be installed and centrally monitored. Advanced meters have the capability to measure and record interval data (at least hourly for electricity) and to communicate the data to a remote location in a format that can be easily integrated into an advanced metering system.

As of December 2008, there were 395 electrical meters installed in the 423 buildings identified for electrical meter installation at the NNSS, with a projected 28 facilities identified for future installations (NSTec 2008). NLVF consists of 30 buildings, 3 of which are metered. Electrical, gas, and water meters would be installed at buildings at NLVF to allow NNSA to better track its use of electricity, water, and gas, thus improving its ability to identify conservation opportunities.

NNSA would, to the extent practicable, use standardized operations and maintenance and measurement and verification protocols, coupled with real-time information collection and centralized reporting capabilities. NNSA also would expedite improvement in the quality, consistency, and centralization of data collected and reported through the use of commercially available software.

Renewable energy – NNSA would maximize installation of onsite renewable energy projects at the NNSS where technically and economically feasible. The initial goal would be to acquire at least 7.5 percent of the NNSS's annual electricity and thermal consumption from onsite renewable sources. NNSA installed solar-powered pathway lighting where such lighting is feasible at the NNSS. This is expected to result in an energy savings of 120 million British thermal units per year. To achieve the initial goal under the No Action Alternative, NNSA would consider various options, including the possibility of entering into an agreement with a commercial entity to construct a solar power generation project at the NNSS. A portion of the electricity generated by such a project would be used to meet NNSS electrical needs.

Commercial Solar Power Generation – The *1996 NTS EIS* analyzed the environmental impacts of constructing and operating a solar power generation facility at two potential Solar Enterprise Zone sites on the NNSS (Area 22 and Area 25) and three non-NNSS sites in southern Nevada. The locations of the Area 22 and Area 25 solar power generation facility sites are depicted in Figure A–1. (The Solar Enterprise Zone on the NNSS is now called the Renewable Energy Zone.) Although a solar power generation facility was not constructed at any of the sites evaluated in the *1996 NTS EIS*, as part of the No Action Alternative in this SWEIS, NNSA is evaluating a potential commercial solar power generation facility at the NNSS. NNSA has determined that the southwestern portion of Area 25 is the only reasonable location on the NNSS for a commercial solar power generation facility. Area 25 includes an extensive area of suitable terrain for solar power facilities, has existing vehicular access from Highway 95 (Lathrop Wells Road) and an existing 138-kilovolt transmission line, and would not interfere with national security-related activities on the NNSS that require limited access to uncleared individuals. Although it possesses many of the same attributes as Area 25, Area 22 is not being considered as a potential location for solar power development in this *NNSS SWEIS* because all current solar power technologies require substantial water for cooling and other purposes and there would be potential impacts on Devil's Hole (see Chapter 5, Section 5.1.6) resulting from construction of any facility that would withdraw groundwater from the Mercury Valley (Hydrographic Basin 225). Low-water-use renewable energy projects may be considered for Area 22 in the future.

The solar technologies that are most likely to be deployed at utility scale over the next 20 years are photovoltaic and concentrating solar power, such as the parabolic trough, power tower, and dish engine technologies (BLM/DOE 2010). It is unknown which technology would be used in a solar power generation facility at the NNSS, but the analysis in this *NNSS SWEIS* assumes a concentrating solar power parabolic trough facility, based on the prevalence of that technology in other operating, proposed, and potential solar energy projects in southern Nevada (see Table 6–2 in Chapter 6). It is estimated that a concentrating solar power generation facility using parabolic trough technology would require between 9 and 10 acres of land for each megawatt of generating capacity, based on the proposed Amargosa Farm Road Solar Energy Project (BLM 2010). This acre per megawatt of generating capacity is about double that used in the *Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States* (BLM/DOE 2010) but is consistent with proposed parabolic trough solar power generation facilities currently being considered in southern Nevada. The assumptions used in the *Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States* are shown in **Table A–4**. Using the ratio scaled from the Amargosa Farm Road Solar Energy Project, the area of land required for a 240-megawatt parabolic trough solar power generation facility would be about 2,400 acres. For this SWEIS, NNSA assumed that the 240-megawatt capacity would employ a dry-cooled concentrating solar power technology using parabolic troughs, similar to the Amargosa Farm Road Solar Energy Project (BLM 2010). Potential impacts of commercial solar power generation at the NNSS are scaled from the Amargosa Farm Road Solar Energy Project (West 2010). In addition, additional electrical transmission capacity would be required to integrate the electricity generated by a 240-megawatt facility into the regional system. Approximately 10 miles of new 230-kilovolt transmission line (all off of the NNSS) was assumed for purposes of this analysis. As noted in Chapter 6,

Section 6.2.4.4, Valley Electric Association intends to upgrade its electrical transmission system in its service territory, which would likely provide a suitable interconnection for the electrical generation from a commercial solar power generation facility on the NNSS. In addition, independent of, and unrelated to, the commercial solar power generation facilities considered in this *NNSS SWEIS*, NV Energy, a commercial electrical energy company, and Renewable Energy Transmission Company are planning separate new large capacity transmission line projects that would accommodate the additional electrical generation (see Chapter 6, Section 6.2.4.4, for additional information). Currently, no commercial solar power generation projects are proposed at the NNSS. Therefore, additional NEPA analysis would be required before any such project could be implemented.

Table A–4 Technology-Specific Assumptions for Environmental Impact Analyses from the Draft Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States

Parameter	*Parabolic Trough*	*Power Tower*	*Dish Engine*	*Photovoltaic*
Facility power capacities (megawatts)	100 – 400	100 – 400	10 – 750	10 – 750
Land area requirements (acres per megawatt) [a]	5	9	9	9
Operational water use (acre-feet per year per megawatt)				
Wet (recirculating) cooling [b]	4.5 – 14.5	4.5 – 14.5	N/A	N/A
Dry cooling [b]	0.2 – 1.0	0.2 – 1.0	N/A	N/A
Hybrid system [c]	0.9 – 2.9	0.9 – 2.9	N/A	N/A
Mirror/panel washing/other [d]	0.5	0.5	0.5	0.05
Chemicals/hazardous materials present on site	Heat transfer fluid, water treatment chemicals and herbicides	Heat transfer fluid, water treatment chemicals, and herbicides	Hydrogen tanks and herbicides	Encased semiconductor materials and herbicides

N/A = not applicable.

[a] Land area estimates were based on areas required for existing facilities and estimated areas for proposed facilities. In some cases disturbed area estimates were not available, so values were based on total plant area (which should approximate disturbed area). The estimated land use values for parabolic trough and tower facilities are minimums; the land area requirement could be higher if thermal energy storage is incorporated into facilities.

[b] Wet-cooling and dry-cooling requirements are based on estimates given as gallons per hour per megawatt in the *Nevada Test Site Environmental Report 2008* (DOE/NV 2009). An assumed range of operational hours of 30 to 60 percent of annual hours (1 gallon = ~3.1 x 10^{-6} acre-feet) was used to generate acre-feet per year per megawatt values.

[c] Hybrid systems were assumed to use 20 percent of the water requirements of wet-cooling systems.

[d] The mirror washing estimates originate from the assumed 2 percent of total water needs of wet-cooled parabolic trough facilities from DOE/NV (2009). This estimate equals 20 gallons per hour per megawatt, which corresponds to 0.5 acre-feet per year per megawatt, with no assumption on operational time (conservative estimate). The panel-washing estimate for photovoltaic facilities was assumed to be a factor of 10 less than that for concentrating solar power technologies (Appendix M).

Source: BLM/DOE 2010.

Water conservation – In FY 2007, NNSA established a water production baseline, 210.6 million gallons, in accordance with Executive Order 13423. Actual water consumption figures are not available because NNSS facilities do not have water meters attached to the buildings. Instead, water production data were used to provide metrics in this area. The FY 2007 production baseline was used during FY 2008 to identify trends, and make recommendations for the implementation of site-wide water conservation measures. NNSA sites began saving water through several conservation measures. Examples include the installation of WaterSense™ products, xeric landscaping, using nonpotable water for dust suppression, and the institution of 4-day workweeks.

Table A–5 presents potable water production goals from the FY 2007 baseline through FY 2015. Water production was reduced by 18 percent in FY 2008 compared with the FY 2007 baseline, thereby

exceeding the FY 2015 goal of 16 percent water reduction. Water production was reduced by an additional 8 percent in FY 2009.

Table A–5 Potable Water Production Goals for the Nevada National Security Site

Fiscal Year	*Potable Water Production (millions of gallons)*	*Cumulative Percent Reduction*
2007	210.6	Base Year
2008	206	2
2009	202	4
2010	198	6
2011	194	8
2012	190	10
2013	185	12
2014	181	14
2015	177	16

Source: NSTec 2008.

Efforts to identify water-saving projects and obtain funding to complete them are ongoing to ensure that the water production reductions that have been achieved are maintained. NNSA would continue to use best management practices for water efficiency in the following areas: water management planning; system audits, leaks, and repairs; landscaping; irrigation; toilets and urinals; faucets and showerheads; boiler systems; and other water uses.

The NNSS does not have a water-recycling program. Water and sewage are discharged into either sewage lagoons or septic systems. NNSA evaluated recycling gray water at the NNSS and determined that the cost would be prohibitive given the quantity of flow and lack of means to redistribute the recycled water. The water could be used for dust control in some cases, but, depending on the extent of treatment, there are restrictions on how the water may be used. Water recycling is not being considered under the No Action Alternative.

Transportation/fleet management – The current NNSA fleet has 540 alternative-fuel vehicles, equal to 96 percent of the covered fleet. NNSA requires that its fleet operate any alternative-fuel vehicles exclusively on alternative fuels to the maximum extent practicable. In FY 2007, NNSA constructed an E85 fuel station in Mercury (E85 is an alcohol–fuel mixture that typically contains a mixture of up to 85 percent denatured fuel ethanol and gasoline or other hydrocarbon by volume) and implemented a successful plan to promote the use of the alternative fuel. In FY 2007, the total actual usage of E85 fuel was 135,141 gallons; the consumption in FY 2008 was 182,997 gallons, a 35 percent increase in usage. For every gallon of E85 fuel used, 85 percent of the petroleum base fuel is reduced; for every gallon of B-20 biodiesel fuel used, 20 percent of the petroleum base fuel is reduced; and for every gallon of unleaded gasoline used, 10 percent is reduced. Biodiesel fuel is used in all equipment, with the exception of emergency generators and boilers, and is currently at the maximum possible usage level.

High-performance sustainable buildings – NNSA would ensure that: (1) all new construction and renovation projects implement design, construction, maintenance, and operations practices in support of the high-performance building goals of Executive Order 13423 and statutory requirements; and (2) existing facilities' maintenance and operations practices meet the goals of Executive Order 13423. The High-Performance Building Plan would also align with Executive Order 13327 and DOE's Real Property Asset Management Plan. At a minimum, the High-Performance Building Plan would include employment of integrated design principles, optimization of energy efficiency, use of renewable energy, protection and conservation of water, enhancement of indoor environmental quality, and reduction of environmental impacts of materials in accordance with the guiding principles of DOE Order 430.2B, Attachment 1, and construction related to Executive Order 13423.

A.1.3.3 Other Research and Development Programs

In 1992, the NNSS became the seventh unit of the DOE National Environmental Research Park Program. The NNSS program initially operated under a cooperative agreement between the DOE Nevada Operations Office (now NNSA/NSO); the University of Nevada, Reno; and the University of Nevada, Las Vegas, whereby the DOE Nevada Operations Office's Environmental Management Office provided financial assistance to the two universities to conduct scientific research projects unique to the Nevada National Environmental Research Park. Areas of research would include, but would not be limited to, habitat reclamation, hydrogeologic systems, radionuclide transport, ecological change, waste management, monitoring processes, remediation, and characterization. In addition, scientific research projects conducted by parties other than those in the above-mentioned agreement could be conducted, but would be funded from sources other than DOE/NNSA.

The Nevada Desert Free-Air Carbon Dioxide Enrichment Facility and Mojave Global Change Facility are two environmental research facilities located in Area 5 of the NNSS that are conducting long-term environmental research.

The Nevada Desert Free-Air Carbon Dioxide Enrichment Facility is a state-of-the-art facility designed to study responses of an undisturbed desert ecosystem to increasing levels of atmospheric carbon dioxide. The experimental plots are designed to permit a controlled release of elevated carbon dioxide in the air around vegetation without disturbing other environmental and ecosystem conditions. There are nine experimental plots: three with elevated levels of atmospheric carbon dioxide and six without elevated carbon dioxide levels. Collaborators at the Nevada Desert Free-Air Carbon Dioxide Enrichment Facility include the Desert Research Institute; University of Nevada, Las Vegas; University of Nevada, Reno; and Brookhaven National Laboratory. The facility is supported by DOE and NNSA. This facility has been placed in a standby condition due to lack of funding.

The Mojave Global Change Facility was established in Area 5 of the NNSS and would continue to examine the impact of global climate change factors other than increased carbon dioxide (i.e., increasing summer monsoon rains, increased nitrogen deposition, and disturbance or destruction of the desert soil crust) on the Mojave Desert ecosystem. Three treatments at various levels are applied to the 96 196-square-meter plots. These treatments include three summer irrigation treatments, two levels of nitrogen fertilization, and soil crust disturbance.

An anticipated focus of research at these two facilities may be determining mechanisms by which carbon is sequestered in deserts. Results of research at the Mojave Global Change Facility and other arid region research sites suggest that arid regions sequester significantly more carbon than originally believed. Determining how this occurs would be a research priority.

A.2 Expanded Operations Alternative

The scope of the Expanded Operations Alternative in this SWEIS is defined to include all the capabilities and projects described under the No Action Alternative, plus additional newly proposed capabilities and projects. These additional activities would include modification or expansion of existing facilities and construction of new facilities. In addition, some ongoing activities would be conducted more frequently than under the No Action Alternative. For each activity addressed in this section, the differences from the No Action Alternative are noted. In addition to changes in activities, under the Expanded Operations Alternative, there would be two changes in NNSS land use zones: (1) the designated use for Area 15 would be changed from "Reserved" to "Research, Test, and Experiment"; and (2) approximately 39,600 acres within Area 25 would be designated as a Renewable Energy Zone. **Figure A–2** depicts the land use zones and major facilities at the NNSS under the Expanded Operations Alternative.

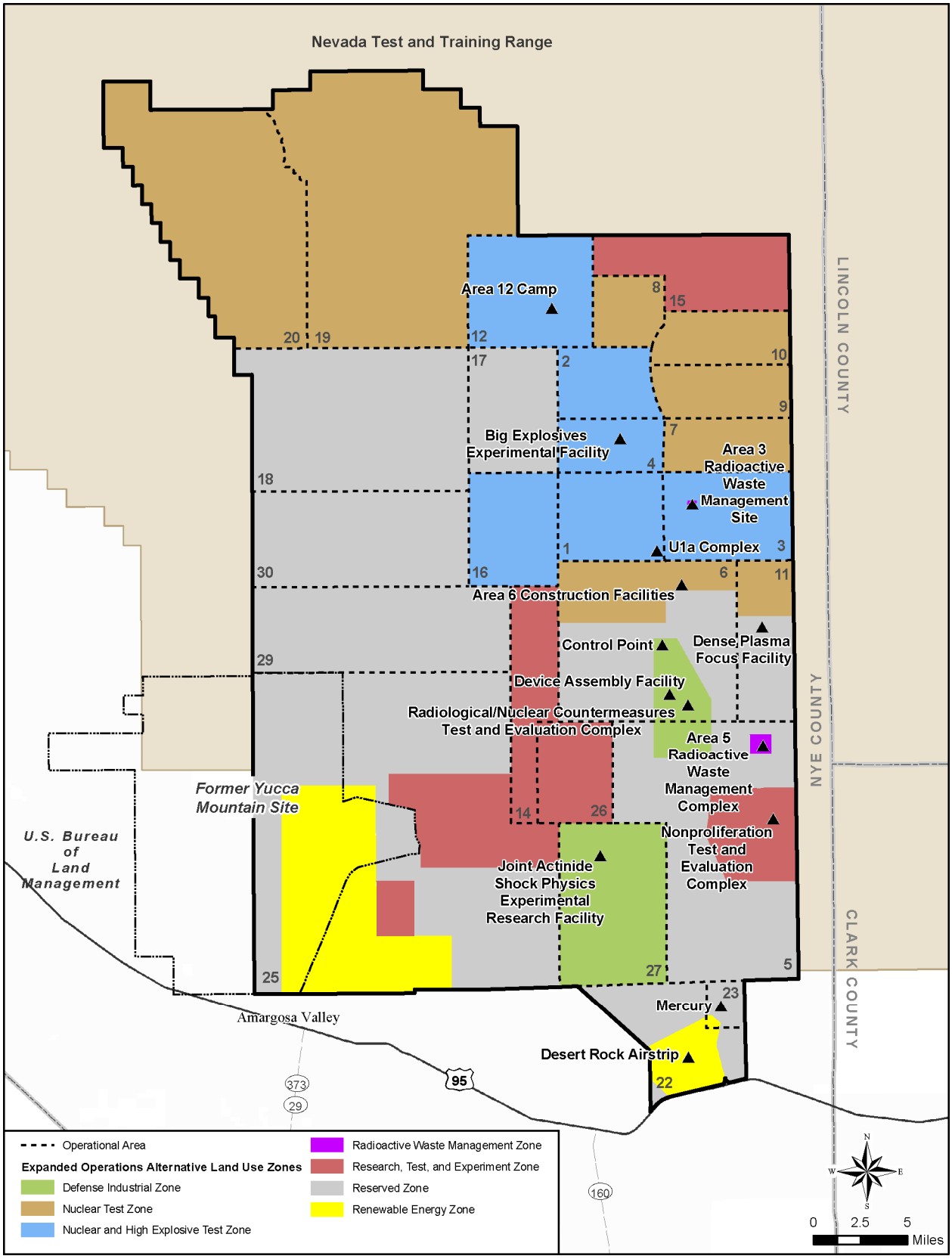

Figure A–2 Nevada National Security Site Land Use Zones and Major Facilities Under the Expanded Operations Alternative

A.2.1 National Security/Defense Mission

Under the Expanded Operations Alternative, NNSA would pursue additional activities associated with the Stockpile Stewardship and Management, Nuclear Emergency Response, Nonproliferation, Counterterrorism, and Work for Others Programs.

A.2.1.1 Stockpile Stewardship and Management Program

Under the Expanded Operations Alternative, Stockpile Stewardship and Management Program operations would continue at NNSA facilities in Nevada, particularly at the NNSS, under the conditions of the ongoing nuclear testing moratorium. This alternative would include those activities necessary to maintain the capability to conduct nuclear tests if so directed by the President. Readiness-to-test activities include maintaining the necessary infrastructure and, more importantly, exercising the research and engineering disciplines of the Nation's nuclear weapons programs through an active science-based Stockpile Stewardship and Management Program at the NNSS to ensure the continued competence of its technical staff.

Under the Expanded Operations Alternative, there would be no changes from the No Action Alternative (see Section A.1.1.1) for the following Stockpile Stewardship and Management Program projects and activities:

- Criticality experiments in DAF
- Drillback operations
- Disposition of damaged U.S. nuclear weapons
- Stockpile stewardship and management activities at the TTR

Stockpile stewardship and management activities that would change relative to the No Action Alternative under the Expanded Operations Alternative include the following:

Dynamic experiments, dynamic plutonium experiments (a type of subcritical experiment), and hydrodynamic tests – NNSA would conduct up to 20 dynamic experiments per year. Over the next 10 years, a total of 5 dynamic experiments would be conducted in emplacement holes, with each such experiment causing an estimated 20 acres of new land disturbance.

Conventional explosives experiments at BEEF and other locations in the Nuclear and High Explosives Test Zone – NNSA would conduct up to 100 explosives tests and experiments per year. NNSA would also add a firing table and ancillary features within the already developed area at BEEF. NNSA would also develop and test for proof of concept a high-energy x-ray capability at BEEF. Following successful testing, the new x-ray system would be moved to the U1a Complex for operational use.

In addition to activities at BEEF (limited to 70,000 pounds TNT-equivalent), NNSA would conduct tests and experiments using up to 120,000 pounds TNT-equivalent of explosives at various locations within the Nuclear and High Explosives Test Zone. These detonations would be conducted both underground and in the open air. Conventional explosives operations supporting other programs at the NNSS are described under those programs. All explosive operations would be conducted in compliance with DOE Manual 440.1-1A, *DOE Explosives Safety Manual*.

NNSA would establish up to three areas dedicated to conducting explosives tests and experiments using depleted uranium. Depleted uranium test and experiment areas may be established within Areas 2, 4, 12, or 16. Each of these depleted uranium test and experiment areas would be about 40 acres in size and dedicated to tests and experiments with depleted uranium and explosives. An annual maximum of 4,000 pounds of depleted uranium and 12,000 pounds TNT-equivalent of explosives would be used to conduct up to 20 of these types of tests and experiments per year. Individual experiments would use up to 200 pounds of depleted uranium and 600 pounds TNT-equivalent of explosives.

Shock physics experiments at JASPER, located in Area 27, and the Large-Bore Powder Gun, located in Area 1 in the U1a Complex – NNSA would make the shock physics experimental facilities available for academic and other research on a nonconflicting basis and would increase the number of experiments with actinide materials up to 36 per year at JASPER and 24 at the Large-Bore Powder Gun in the U1a Complex.

Pulsed-power experiments – Under the Expanded Operations Alternative, the Atlas Facility would be activated, and up to 24 pulsed-power experiments per year would be conducted.

Fusion experiments at the NNSS and NLVF – New experimental uses would be pursued for the Dense Plasma Focus Machines, requiring deuterium-deuterium, deuterium-tritium, and tritium-tritium fusion and pulsed x-ray production. These experiments also would require a much larger-capacity energy storage bank than the one currently in use at the Area 11 facility. These new experimental uses would include ensuring an enduring experimental capability to support nuclear resonance spectroscopy, neutron materials investigations, and other stockpile stewardship activities. To facilitate the new uses for the Dense Plasma Focus Machine currently located in Area 11 of the NNSS, it would be relocated to an existing building in Area 6 of the NNSS. Following the relocation, the Area 11 facility would be placed on standby. NNSA would conduct up to 1,650 plasma physics and fusion experiments per year: 1,000 in the Dense Plasma Focus Machine at NLVF, and 650 in the machine in Area 11 (or Area 6 if it is moved).

Stockpile management activities – NNSA would conduct nuclear explosives operations at the NNSS in association with conducting an underground nuclear test, if so directed by the President. In addition, under the Expanded Operations Alternative, NNSA would conduct the following activities:

- Staging of nuclear devices pending disassembly, modification/maintenance, and/or transportation to another location
- Dismantlement of select weapons or weapon systems to aid the United States in meeting its commitment to reduce its nuclear weapons stockpile (weapons shipments to the NNSS under this activity would not exceed 100 per year)
- Modification and maintenance of nuclear devices at DAF, including replacing limited-life components in selected nuclear weapons systems
- Weapons components testing for quality assurance purposes at DAF

Staging of SNM, including pits – NNSA would continue to stage SNM at appropriate facilities on the NNSS. SNM would be relocated from other DOE/NNSA sites. For example, the following materials would be moved to the NNSS: up to 4 metric tons of SNM currently part of the Zero Power Physics Reactor Program at Idaho National Laboratory (for use in criticality experiments); about 200 kilograms of global security SNM currently stored at Lawrence Livermore National Laboratory (for use in detector development and as radiation test objects); 2 kilograms of uranium-233 currently stored at Los Alamos National Laboratory (associated with test readiness); and 500 kilograms of highly enriched uranium, depleted uranium, and uranium stored at Lawrence Livermore National Laboratory (associated with

criticality safety). In addition, NNSA would stage weapon pits at DAF, pending their transport to the Pantex Plant in Texas or another appropriate location.

Training for the Office of Secure Transportation – In addition to hosting training and exercises on NNSS roadways, NNSA would construct new support facilities in Area 17 to support Office of Secure Transportation training programs. The new facilities would include administrative offices (5,000 square feet), a mock town (20 acres), a 8,000- to 10,000-square-foot shooting house (a building that can simulate various kinds of structures for conducting scenario-driven tactics development and training), and target props. Support facilities would also include two modular training facilities with restrooms (2,000 square feet each), two Butler buildings (5,000 square feet each), an electrical substation (100 square feet), a communications trailer (300 square feet), a 10,000- to 20,000-gallon potable drinking water tank, and a septic system with a leach field. The entire training area, including buffer areas, would occupy approximately 10,000 acres (including a live-fire training area for the Office of Secure Transportation). A total of about 3,500 acres would be disturbed to provide individual training venues, and 25 miles of roads and firebreaks would be developed surrounding the whole active training area and between individual training venues. Most of these roads and firebreaks would be graded, single-lane dirt roads with shoulders; up to 4 miles would be paved asphalt, double-lane roads with shoulders. Potable water would be obtained from an existing well approximately 4.5 miles away, requiring construction of a water pipeline. An electrical distribution line would also be constructed to extend electrical service from the vicinity of the well to the new facilities. Main access to the complex would be from the Tippipah Highway.

The Office of Secure Transportation would expand its facilities in 12 Camp (Area 12), the Area 6 Control Point, or Mercury (Area 23), and maintenance buildings (20,000 square feet), administrative buildings (10,000 square feet), and a dormitory (20,000 square feet) would be constructed to support training operations.

These facilities would also be available to other NNSS customers (e.g., DoD and other Government agencies) when not in use by the Office of Secure Transportation.

A.2.1.2 Nuclear Emergency Response, Nonproliferation, and Counterterrorism Programs

Under the Expanded Operations Alternative, there would be no changes from the No Action Alternative for the following Nuclear Emergency Response Program, Nonproliferation, and Counterterrorism Program projects and activities:

- Nuclear Emergency Support Team support
- Consequence management support for FRMAC, the Aerial Measuring System, the Accident Response Group, and the Radiological Assistance Program
- Disposition of improvised nuclear devices on an as-needed basis
- Weapons of mass destruction emergency responder training
- Provision of equipment and technical support for the DOE-dedicated Emergency Communications Network
- Nuclear forensics

Activities associated with the Nuclear Emergency Response, Nonproliferation, and Counterterrorism Programs that would change relative to the No Action Alternative under the Expanded Operations Alternative include the following:

Nonproliferation and counterterrorism-related activities – NNSA nonproliferation- and counterterrorism-related activities would include four related areas: arms control, nonproliferation, nuclear forensics, and counterterrorism. Although the purpose of nonproliferation- and counterterrorism-related activities would be the same as that under the No Action Alternative, new nonproliferation and counterterrorism facilities, described below, would be constructed at various locations on the NNSS to undertake enhanced activities. Because the new nonproliferation and counterterrorism facilities (Arms Control Treaty Verification Test Bed, Nonproliferation Test Bed, and Urban Warfare Complex) are still conceptual in nature and their locations are unknown, they are not fully analyzed in this SWEIS, and an appropriate level of NEPA analysis would be required before they could be implemented.

Arms control – The Arms Control Treaty Verification Test Bed would require construction of both indoor and outdoor laboratory space and test areas for design and certification of treaty verification technology, training of inspectors, and development of arms-control-related confidence-building measures. These facilities would be sited at various locations at the NNSS; construction of new facilities would require a total of about 100 acres of land.

A new facility for data fusion, analysis, and visualization would also be constructed. The new building would have approximately 10,000 square feet of floor space and would be integrated with a building constructed to house other Arms Control Treaty Verification functions.

Nonproliferation – A Nonproliferation Test Bed would require construction of a new facility where users would simulate chemical and radiological processes that could be conducted clandestinely by an adversary.

Counterterrorism – In addition to counterterrorism training being conducted at existing facilities, an Urban Warfare Complex would be constructed at the NNSS. This would include full-scale, modular replicas of urban areas where terrorists and insurgents typically seek refuge. This urban warfare training ground would be wired and instrumented for continuous recording of exercises for post-event evaluations and classroom training. NNSA expects that the Urban Warfare Complex would cover about 100 acres in a remote location on the NNSS.

A.2.1.3 Work for Others Program

Under the Expanded Operations Alternative, there would be no changes from the No Action Alternative for the following Work for Others Program activities:

- Treaty verification activities
- Military training and exercises
- Work for Others Program activities at the TTR

Work for Others Program activities that would change relative to the No Action Alternative under the Expanded Operations Alternative include the following:

Nonproliferation projects and counterproliferation research and development – Support would be provided for development of radiation detection capabilities, additional sensor development, and active interrogation programs to detect nuclear material.

Counterterrorism – Under the Expanded Operations Alternative, NNSA's Work for Others Program would support the counterterrorism activities of other Federal agencies. Future USAF activities would include research, development, testing, and evaluation of unmanned aerial vehicles and/or unmanned aircraft systems, as well as integration of training and exercises. Other activities would include development and testing of sensors for detection and defeat of improvised explosive devices, which would require construction of test beds (roads, intersections, small towns, etc.) and support facilities. Construction of these facilities would require new buildings with about 10,000 square feet of new floor space and would disturb about 75 acres of land.

DHS counterterrorism operations support would include construction of new training facilities (about 10,000 square feet of floor space). In addition, RNCTEC would be operated up to the level of a Hazard Category 2 nonreactor nuclear facility, which would allow larger amounts of radioactive material in alternative configurations to be used in tests and experiments. A high-speed road, a short section of full-scale railroad line, a simulated seaport facility, and a mock urban area would also be added to RNCTEC (NNSA 2004), requiring about 125 acres of additional land in Area 6. Because these new facilities are still conceptual in nature and their locations are unknown, an appropriate level of NEPA analysis and documentation would be required before they could be implemented.

Support for NASA – NNSA would support NASA nuclear rocket motor development, including using existing boreholes to examine the use of deep alluvial basins for sequestering radionuclides released as part of emissions from tests of a yet-to-be-developed prototype nuclear rocket motor. Over about a 10-year period, NASA would not likely test a nuclear rocket motor, but may conduct proof-of-concept tests using a surrogate, such as spiked xenon, in a borehole to evaluate the effectiveness of the alluvium for this purpose. Research that could be performed in conjunction with this would use the results to determine field-scale properties of alluvial materials for improved modeling of transport of fluid and gases in unsaturated and saturated environments. If it becomes necessary to test an actual nuclear rocket motor, additional NEPA analysis would be conducted.

Aviation Work for Others – Activities would include increased research, development, and use of aerial platforms at the NNSS. To support these activities, additional facilities would be required at Desert Rock Airport (hangars, shops, and other buildings occupying approximately 200,000 square feet) and the Area 6 Aerial Operations Facility (a hangar occupying approximately 20,000 square feet). Additional facilities occupying approximately 5,000 square feet may be required at other locations to support air operations, including testing of various types of manned and unmanned aerial vehicles such as small, remote-controlled, fixed-wing airplanes and helicopters. Unmanned aerial vehicles would be tested for potential use carrying sensors for collecting environmental data (e.g., multi- and hyperspectral imagery) to be used in digital environmental model development and for terrain analysis in arid and semiarid regions.

Active Interrogation – Active interrogation uses penetrating nuclear radiation, such as neutrons or photons, as a probe to stimulate a unique radiation signature from fissionable material. It has been demonstrated as an effective way to sense the presence of SNM, even when it is shielded. Many active interrogation methods are based on the detection of neutrons from fission induced by fast neutrons or high-energy gamma rays (Pozzi n.d.). The energy spectrum of the fission neutrons provides data to identify the fissionable isotopes and materials such as shielding between the fissionable material and the detector. Active interrogation works by using an accelerator or other radiation-generating device to produce a pulsed radiation beam that is directed at a target, then the radiation that propagates from the target is measured, usually between the pulses.

Work for Others Program activities would include support for development of active interrogation systems to detect nuclear material and other materials of interest. NNSA would expand its support for research and development of active interrogation equipment, such as accelerators and other radiation-

generating devices, as well as associated radiation detection systems, operations, methods, and training. DHS would use a facility at RNCTEC to conduct this activity, but other Federal agencies may require an additional facility, most likely located in Area 12 or 16. In addition to fixed facilities, temporary test beds would be used for testing accelerators and other radiation-generating devices and detectors. In general, temporary active interrogation test beds would use existing NNSS roads, but could also include some off-road areas. Operations at temporary test beds would most often involve the use of mobile accelerators/radiation-generating devices. Construction of additional support facilities and temporary test beds would disturb about 100 acres of previously undisturbed land over the next 10 years.

The accelerators/radiation-generating devices would be used to generate beams of electrons, x-rays, neutrons, gamma radiation, and other types of radiation, as appropriate, to interrogate target material. Test targets to be interrogated would include radioactive material, SNM, and various other materials utilized as shielding. The quantity of SNM that would be used as a target would be within subcritical limits, i.e., quantities that can be demonstrated to be subcritical under all normal, abnormal, and accident conditions (quantity and nature of process activities must preclude the potential for a nuclear criticality). Test targets would also incorporate various materials to better understand the physical properties associated with the exposure of materials to various forms of energy from the accelerators/radiation-generating devices.

The radiation from these machines would be penetrating, and significant transmission intensities could occur through shields of substantial thickness. Unshielded radiation from these devices would be primarily forward-directed and could travel over long distances (a few miles). This effect is beneficial for measurement situations focused on interrogating objects long distances away from the accelerator/radiation-generating device (often called standoff interrogation). Unshielded radiation fields in the vicinity of these devices are high, and occupational radiation exposure limits for personnel in the immediate vicinity of the device and for several hundred meters downrange could be exceeded without mitigating controls. However, with proper engineered and administrative controls, they can be readily used in a safe manner.

When energetic x-rays interact with materials, they have the potential to cause the ejection of neutrons (as well as protons and other charged particles) from atomic nuclei via photonuclear reactions including (γ,n), (γ,2n), and (γ,p). In fissionable materials, including uranium and plutonium, energetic x-rays can also induce fission to take place via the photofission (γ,fission) reaction. The x-ray energy thresholds and reaction probabilities for these reactions vary from isotope to isotope. Radiation, such as gamma rays, x-rays, or neutrons, produced during the interrogation pulse are called prompt radiation. Fission products also produce delayed radiation over a time period of several hundred seconds after the beam pulse. Radiation exposure from these interactions is expected to be relatively small when compared to the direct radiation from the beam itself at energies below 60 million electron-volts.

Unique differences exist in the energy, emission rates, and emission properties between these prompt and delayed radiations. Photonuclear active interrogation exploits these unique signatures to be able to detect, identify, and characterize different fissionable materials. Neutrons produced in the test object thermalize and are captured or produce fission in short time periods after each radiation pulse. Prompt and delayed photo-fission neutrons can remain in a test object for short periods of time (milliseconds) after each radiation beam pulse. In these short time periods, these residual neutrons can lead to additional neutron-induced fission events.

To measure these signatures, special detector systems must be employed that are simultaneously capable of withstanding the radiation fields generated when the device pulses and achieving very sensitive detection efficiencies for the delayed radiation products.

Initially, energy levels used in active interrogation research and development at the NNSS are not expected to exceed about 60 million electron-volts. Future activities may include machines that operate at energy levels in the range of 100 million electron-volts.

Radioactive tracer experiments – Radioactive tracer experiments would be conducted to validate sensor technology. These experiments would include both underground releases and open-air releases of radioactive noble gases and nonradioactive gases (helium and sulfur hexafluoride). The underground experiments would release up to 27 curies of radioactive noble gases with short half-lives (5 to 36 days); nonradioactive releases would include from about 300 gallons of helium to about 2,000 gallons of sulfur hexafluoride. The underground experiments would include explosive gas releases, pressurized releases, explosive radioactive particulate releases, and a baseline survey of legacy contamination. The open-air experiments would release small quantities of radionuclides with short half-lives. Up to 12 experiments involving open-air releases would be conducted each year. NNSA would comply with applicable requirements of 10 CFR Part 61, Subpart H, for all experiments that could result in a release of radioactive material to the air. Prior to conducting any experiment that would result in a release of radioactive materials to the air, NNSA would conduct an evaluation using EPA-approved methods to estimate the potential radiological dose to the maximally exposed individual at the boundary of the NNSS. For any release that may result in a dose of 0.1 millirem or more, NNSA would submit an application to the Nevada Bureau of Air Pollution Control and EPA for approval to conduct the experiment, in compliance with 40 CFR 61.96. NNSA would ensure that the cumulative annual radiological dose at the boundary of the NNSS resulting from all activities involving radioactive materials would comply with EPA's annual emission standard of 10 millirem (40 CFR 61.92).

New test beds – Additional test beds would be developed to support research and development for sensors, high-power microwaves, and high-power lasers, as required. These new test beds (including new buildings totaling approximately 50,000 square feet of floor space) would be constructed at various locations on the NNSS and would disturb approximately 200 acres of previously undisturbed land. Because there are no specific plans for construction of these new test beds at this time, additional NEPA analysis would be necessary before they could be implemented.

The following new test beds would be developed at the NNSS under the Expanded Operations Alternative:

Nuclear-Fuel-Cycle-Related Radionuclide Release, Diagnostics and Solids Detection, and Characterization Test Bed – In support of the various nuclear nonproliferation treaties in which the United States participates or anticipates participation, NNSA would establish test beds at the NNSS for use in developing sensors to support treaty verification and nonproliferation validation. Facilities to support deployment of fixed uranium oxides and controlled amounts of depleted uranium would include static concrete display pads, static target display pans, thermal targets, and ponds and pools of water.

Specialized Explosive Testing and Manufacture Test Bed – Support for DoD and the U.S. intelligence community would expand to include development of sensors and techniques for detection and defeat of improvised explosive devices, homemade explosives, conventional military ordnance, and chemical explosives, as well as explosives-driven, shaped-charge development and evaluation.

Radio Frequency Generation Test Bed – Technologies would be developed to detect, sample, characterize, and identify radio frequency signatures and observables. The test bed would be used to develop the ability to generate specific signals, to characterize the radio frequency environment, and to monitor tests.

Infrasonic Observations Test Bed – Technologies would be developed to monitor earthquakes and underground disturbances. The test bed would be used to develop the ability to detect specific signals, characterize the seismic environment, and monitor tests.

Chemical Test Bed – Activities at this test bed would include simulated manufacture and releases of illegal drugs by authorized Federal organizations to develop detection and prevention technologies. An existing facility would be used to train personnel and test sensors and procedures for detection of toxic industrial chemicals.

Biological Simulants Test Bed – Activities at this test bed would include manufacture of biological simulants by authorized Federal organizations for use in detection technology development. Biological simulant releases to the soil, the air, or an NNSS sewer/septic system, would emulate anticipated real-world scenarios. Construction to support these functions would disturb up to 50 acres of land.

A.2.2 Environmental Management Mission

The NNSA Environmental Management Mission includes the Waste Management and Environmental Restoration Programs. Under the Expanded Operations Alternative, the Waste Management Program would accept greater volumes of LLW and MLLW from both offsite and onsite sources. As under the No Action Alternative, the Environmental Restoration Program would continue to meet the requirements of the most recent FFACO.

A.2.2.1 Waste Management Program

Waste management operations would support DOE and NNSA research and environmental restoration programs. Under the Expanded Operations Alternative, the waste management objective for the NNSS would continue to be to properly dispose and monitor wastes generated from the NNSS, DoD, and other approved waste generator sites. Approval to ship waste to the NNSS for disposal may be granted only after a waste generator demonstrates that it has a waste characterization and certification program that meets the requirements stated in the NNSS waste acceptance criteria. The process by which NNSA certifies a waste generator, as well as the waste acceptance criteria, is described in greater detail in Chapter 4, Section 4.1.11.1.1.3.

In response to increased levels of operations at NNSA facilities in Nevada under the Expanded Operations Alternative, waste management activities associated with some waste types would increase. In particular, up to approximately 48,000,000 cubic feet of LLW and 4,000,000 cubic feet of MLLW would be disposed at the NNSS. These waste volumes are based on: (1) projections of the respective waste types that are designated for disposal at the NNSS, as well as those without a designated disposal location, as projected in DOE's Waste Information Management System Database as of April 2010, and (2) input from prospective waste generators regarding potential waste streams and/or volumes that are not currently included in the database. Waste estimates include those from West Valley Demonstration Project decontamination and decommissioning, commercial enrichment facilities, Oak Ridge National Laboratory Building 3019 U-233 downblending or direct disposal, disposal of DoD radioisotope thermoelectric generators, and the Global Threat Reduction Initiative.

Table A–6 contains a list of generators of LLW and MLLW under the Expanded Operations Alternative. The quantities shown comprise the inventories currently projected and are used for purposes of analysis. The table is not intended to provide a comprehensive listing of generators that could ship LLW and/or MLLW to the NNSS for disposal or of generator-specific waste volumes that could be disposed in the future. Some of the listed generators may ship larger or smaller quantities than shown based on site-specific determinations. Additionally, some yet-to-be-identified generators may ship LLW and/or

MLLW to the NNSS for disposal. While the quantities from individual generators may vary from those shown in the table, the total volumes would not exceed 48,000,000 cubic feet of LLW or 4,000,000 cubic feet for MLLW. The estimates of LLW and MLLW volumes to be disposed at the NNSS under the Expanded Operations Alternative are based upon conservative estimates from waste-generating facilities, and the aggregated totals reflect this conservatism (i.e., likely overestimate quantities). Additional NEPA review would be conducted if new generators or waste streams were identified.

Table A–6 Waste Generators and Volumes Under the Expanded Operations Alternative [a]

Waste Generators	*Region [b]*	*LLW (cubic feet)*	*MLLW (cubic feet)*
Out-of-State Generators			
Argonne National Laboratory	Upper Midwest	1,300,000	1,200
Brookhaven National Laboratory	Northeast	120,000	NP
Energy Technology Engineering Center	West	110,000	NP
General Atomics	West	8,400	NP
Idaho National Laboratory	Mountain West	1,000,000	46,000
Lawrence Berkeley Laboratory	West	170,000	96
Lawrence Livermore National Laboratory	West	300,000	580
Los Alamos National Laboratory	Southwest	3,200,000	920,000
Naval Reactor Facility	Mountain West	530	NP
Nuclear Fuel Services	South	430,000	NP
Oak Ridge Reservation	South	2,500,000	370,000
Paducah Gaseous Diffusion Plant	South	5,100,000	1,500,000
Pantex Plant	Southwest	20,000	NP
Portsmouth Gaseous Diffusion Plant	Upper Midwest	14,000,000	58,000
Princeton Plasma Physics Laboratory	Northeast	9,900	NP
Puget Sound Naval Shipyard	Northwest	1,100	NP
Sandia National Laboratories	Southwest	7,800	2,900
Savannah River Site	Southeast	160,000	52,000
SLAC National Accelerator Laboratory	West	570,000	570,000
Separations Project Research Unit	Northeast	NP	2,500
West Valley Demonstration Project	Northeast	6,200,000	750
Waste treatment facilities [c]	Multiple regions	88,000	30,000
Commercial enrichment facilities	Upper Midwest	57,000	NP
U.S. Department of Defense (RTGs)	South (Norfolk, VA)	1,400	NP
Offsite Source Recovery Project	Southwest (San Antonio, TX)	8,500	NP
Total Out-of-State Generators		**36,000,000**	**3,500,000**
In-State Generators			
Nevada Nuclear Security Site	Not applicable	1,300,000	520,000
North Las Vegas Facility	Not applicable	150	NP
Tonopah Test Range & Nevada Test and Training Range	Not applicable	11,000,000	NP
Total In-State Generators		**12,000,000**	**520,000**
All Generators		***48,000,000***	***4,000,000***

LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NP = none projected; RTG = radioisotope thermoelectric generator; SLAC = Stanford Linear Accelerator Center.

[a] Actual individual waste volumes by generator may be more or less than presented in the table, and other yet-to-be-identified generators may ship LLW and/or MLLW to the NNSS for disposal. The quantities shown constitute the inventories currently projected and are used for purposes of analysis only.

[b] Regional location of radioactive waste generators used in the transportation analysis.

[c] Refers to wastes from DOE generators that are sent to the NNSS for disposal after processing at a variety of treatment facilities.

Note: Totals may not equal the sum of individual values because of rounding.

Use of rail-to-truck transloading (i.e., intermodal transportation) would increase, including the use of transloading facilities within Nevada, should commercial vendors establish such a facility. As addressed for the No Action and Reduced Operations Alternatives, final closure of existing operationally closed disposal units would begin in calendar year 2011, and LLW and permitted MLLW disposal would continue elsewhere at the Area 5 RWMC. The Area 3 RWMS may be returned to operation to address, together with the Area 5 RWMC, the volumes of LLW projected for receipt under this alternative. Within the existing Area 5 RWMC and the Area 3 RWMS, new disposal units would be constructed, filled, and closed, as needed, to accommodate the additional waste volumes.

Under the Expanded Operations Alternative, NNSA would treat and store various types of MLLW received from authorized in-state and out-of-state generators. This would require development of one or more MLLW storage facilities similar to the Hazardous Waste Storage Unit. NNSA may modify existing facilities within the Area 5 RWMC or may construct a new facility for MLLW storage. Treatment capacity for both onsite- and offsite-generated MLLW would be developed. Existing facilities would be used to develop treatment facilities for both in-state- and out-of-state-generated MLLW. The treatment technologies that would be developed include macroencapsulation, stabilization/microencapsulation, sorting/segregating, and bench-scale mercury amalgamation. Appropriate permits would be obtained before expanding MLLW storage capacity or implementing any of these treatment technologies. Initially, additional MLLW storage capacity would be developed on the TRU Pad to accommodate MLLW treatment (for either in-state- or out-of-state-generated wastes), pending development of MLLW storage capacity in existing or new facilities at the Area 5 RWMC. To handle the increased volumes and more-frequent shipment receipt rates of LLW and/or MLLW, an additional waste offloading and staging area would be established within the Area 5 RWMC to maintain optimal disposal operations efficiency.

Waste management activities at the NNSS under the Expanded Operations Alternative would additionally include the following:

- Because of the projected increased annual number of experiments at JASPER and other national security activities, somewhat larger quantities of TRU waste would be annually generated (about 1,500 cubic feet per year). As with the No Action Alternative, TRU waste generated by DOE/NNSA activities in Nevada would be safely stored at the TRU Pad pending shipment off site for disposition along with other legacy or newly generated environmental restoration waste.

- Continued treatment by evaporation of liquids containing small concentrations of tritium. Continued management of hazardous waste (about 170,000 cubic feet would be generated by DOE/NNSA activities) in compliance with applicable regulations and permits.

- Continued management of asbestos and PCB wastes, and hydrocarbon-contaminated soil and debris, in compliance with applicable regulations and permits.

- Continued treatment of explosives at the Explosives Ordnance Disposal Unit in Area 11.

- Continued operation of the Area 23 Class II Solid Waste Disposal Site, the Area 6 Class III Solid Waste Disposal Site (Hydrocarbon Landfill), and the U10c Class III Solid Waste Disposal Site. Approximately 9,400,000 cubic feet of sanitary solid waste and construction and demolition debris would be generated by DOE/NNSA activities at the NNSS and disposed in these landfills over the next 10 years. To accommodate the potential increases in solid wastes that may be generated by various operations at the NNSS under the Expanded Operations Alternative, NNSA would seek permits to construct and operate new solid waste disposal facilities as needed. A new sanitary waste landfill would require approximately 15 acres of land. To support environmental restoration work in Area 25, NNSA would obtain appropriate permits to construct and operate a

construction/demolition debris landfill that would disturb up to 20 acres in Area 25 of the NNSS. An estimated 9,700,000 cubic feet of sanitary solid waste generated by DOE/NNSA activities would be sent off site to permitted facilities to be recycled.

A.2.2.2 Environmental Restoration Program

Under the Expanded Operations Alternative, the NNSA Environmental Restoration Program would continue in compliance with the FFACO in the form of characterization, monitoring, and, if necessary, remediation of identified contaminated areas, facilities, or environmental media. The NNSA environmental restoration projects that would continue under the Expanded Operations Alternative include the following:

Underground Test Area Project – Activities would continue as identified under the No Action Alternative, but at a potentially accelerated rate.

Soils Project – Activities would continue as identified under the No Action Alternative for the UGTA and Industrial Sites Projects, remediation of Defense Threat Reduction Agency Sites, and Borehole Management Program, but most activities would accelerate. Cleanup standards for Soils Project sites on lands under the jurisdiction of the USAF are subject to agreement among the USAF, NDEP, and DOE. The No Action Alternative addressed cleanup levels consistent with current land uses. However, if more-stringent cleanup standards are adopted than currently planned or additional sites are included under the FFACO, the volumes of waste requiring transport and disposal would increase. For purposes of analysis under the Expanded Operations Alternative, this SWEIS assumes that, at a number of contaminated soil sites on the Nevada Test and Training Range and the TTR (i.e., Clean Slate 2, and 3, Project 57, and Small Boy), a total of about 504 acres would be excavated to a depth of 0.5 feet and the removed soil would be disposed as LLW at either the Area 5 RWMC or the Area 3 RWMS.

Industrial Sites Project – Activities would continue as identified under the No Action Alternative, but some activities would accelerate. The amount of waste that would require transport and disposal may increase if more sites are required to be remediated than currently planned.

Defense Threat Reduction Agency Sites – Activities would remain the same as those under the No Action Alternative for Defense Threat Reduction Agency environmental restoration activities.

Borehole Management Program – Activities would remain the same as those under the No Action Alternative. NNSA would continue to plug unneeded boreholes on the NNSS. Based on the current schedule and known inventory of unneeded boreholes on the NNSS that need to be plugged, the Borehole Management Program should be complete by the end of 2013.

A.2.3 Nondefense Mission

The Nondefense Mission generally includes those activities that are necessary to support mission-related programs, such as construction and maintenance of facilities, provision of supplies and services, warehousing, and similar activities. Activities related to energy supply and conservation, including renewable energy, are considered part of the Nondefense Mission, as are other research and development activities that may occur at NNSA facilities in Nevada, including activities at the Nevada National Environmental Research Park. As described in the following paragraphs, all Nondefense Mission programs would be modified to some extent under the Expanded Operations Alternative.

A.2.3.1 General Site Support and Infrastructure Program

Under the Expanded Operations Alternative, in addition to small projects to maintain the present capabilities of the NNSS, RSL, NLVF, and the TTR, infrastructure-associated activities would include increasing the capacities and capabilities or extending the ranges of facilities and/or services to accommodate new operational programs, projects, and activities.

In addition to accommodating operational requirements and constructing the new facilities described in Sections A.2.1 and A.2.2, the following infrastructure enhancements would be implemented:

- A new security building in Area 23 of the NNSS would be constructed adjacent to existing security facilities. This project would replace outdated facilities (most built in the 1950s and 1960s) and consolidate security facilities (Buildings 1000, 1001, 1002, 114, 701, 1103, 1106, 1107, 1108 and portions of Control Point-41, -111, and -525) and functions into a new, approximately 85,000-square-foot, two-story facility. The facility would include space for administrative offices, computer servers for systems supporting NNSS operations, training, emergency response, locker rooms, restrooms, storage space, armory, technology development, electronic security system engineering and maintenance, and classified work areas. The new building would decrease external exposure to critical security facilities located outside the secure boundaries of the NNSS. The buildings replaced would be evaluated and demolished or used for another purpose. This project is needed in order to provide a safe and secure NNSS to accommodate mandatory training; house new weapons and technology; consolidate protective force operations; provide electronic security system maintenance and testing; provide continuity of operations; and increase exercises per Site Safeguards and Security Plans, Vulnerability Assessments, and protection strategies designed to ensure adequate protective force staffing levels, equipment, facilities, training, management, and administrative support. The proposed project responds to DOE Orders and Federal Codes and Standards, including DOE Order 470.4a, *Safeguards and Security Program*; DOE Order 226.1a, *Implementation of Department of Energy Oversight Policy*; and 10 CFR Part 851, "Worker Safety and Health; Defense Nuclear Security Program; Master Security Plan; DOE Security Strategic Plan; NNSA Defense Nuclear Security Strategic Framework; and Graded Security Protection Policy."

- About 38.5 miles of the existing NNSS 138-kilovolt electrical transmission system would be replaced between Mercury Switching Center in Area 23 and Valley Substation in Area 2. The replacement transmission line would be constructed using steel towers on a right-of-way generally paralleling the existing system. Sufficient separation would be imposed between the existing transmission and new line to ensure electrical safety during construction of the new line and demolition of the old line. Where terrain or other factors dictate, sections of the new line may require a new alignment. The new transmission line would include under-built fiber optic cable and all necessary hardware, including conductors and insulators, to complete a fully operational system. This project would require some new access road construction. The

transmission line replacement project would occur in three distinct and separately operable stages: (1) Mercury Switching Center to Frenchman Flat Substation in Area 5, with a loop tap at Mercury Distribution Substation (approximately 15 miles); (2) Frenchman Flat Substation to Tweezer Substation in Area 6 (approximately 9.5 miles); and (3) Tweezer Substation to Valley Substation (approximately 14 miles). The replacement transmission line would increase the capacity of the system from the current level of about 40 megawatts to 100 megawatts and improve the efficiency of the system, but would not increase the system operating voltage. Due to the isolation, unreliability, and failure rate of the existing transmission line, replacement is a high priority. The existing line is part of a multi-utility corridor that contains power, communication fiber optics, supervisory control and data acquisitions, and relay protection. Failure of the power line would cause interruption of communication, supervisory control and data acquisitions, and relay protection.

- The telecommunication system on the NNSS would be upgraded. This project would replace the existing wired telephone switch with a new one that would seamlessly transition between the older and newer technologies. The wireless elements of the trunked radio infrastructure would be upgraded to interface with the packet switched technology. This project would transition the subscriber units (telephones, radios, Blackberry devices, and cellular phones) in a time-phased, replacement program to blend all elements of the wired and wireless systems into an integrated telecommunications hierarchy. Elements of the NNSA/NSO telecommunication/information backbone infrastructure are suffering from technological obsolescence, limited capacity, and inability to provide overall enterprise architecture for current and emerging NNSA/NSO mission imperatives. The existing telecommunications system technology for the present generation of telephone plant is approaching 40 years since its first design release and the wireless elements have also reached the end of their service life. The replacement parts for hardware, software, and spare parts are becoming scarce and exceedingly expensive to acquire as time passes. Replacement of the wired telephone switch with one that can seamlessly transition between the older and new technologies is necessary to allow for interaction with computerized features, video sessions, wireless mobile phone applications, and continued safety of full site coverage.

- Buildings in Mercury are typically 30 to 50 years old. To maintain an efficient and effective operation in support of national security activities, it is necessary to replace most of these facilities and supporting infrastructure due to their lack of energy efficiencies and deteriorating condition. The redevelopment would provide an optimization of square footage by reducing operational costs and consolidating operations. The NNSS, as part of the nuclear weapons complex, is a national asset that supports experimentation, testing, training, and demonstration for defense systems and advances in high hazard operations. If no action is taken, the requirements to provide a more energy-efficient, modern infrastructure and more-efficient operational site will affect programmatic requirements as operational costs increase. Mercury would be reconfigured to provide the modern facilities and infrastructure needed to support advanced experimentation and production at the NNSS. This proposed project would: (1) demolish facilities that are no longer needed or are not economically salvageable; (2) identify functional zones to facilitate groupings of similar activities; (3) replace obsolete buildings that are needed to support NNSS activities; and (4) rebuild/remodel selected facilities and infrastructure to extend their useful lives to accommodate existing and future support requirements. Because the reconfiguration of Mercury is conceptual in nature, an appropriate level of NEPA analysis and documentation would be required before it could be implemented.

These projects would contribute to meeting NNSA Strategic Goal 2.1: Transform the Nation's nuclear weapons stockpile and supporting infrastructure to be more responsive to the threats of the twenty-first century.

In addition to maintaining and repairing its infrastructure at the NNSS, RSL, NLVF, and the TTR, NNSA would maintain the existing infrastructure, provide site security, and manage all applicable existing permits and agreements for the former Yucca Mountain Repository. NNSA would perform these functions pending decisions on the disposition of the former Yucca Mountain Repository.

As noted under the No Action Alternative, although considered infrastructure, characterization and monitoring wells developed under the UGTA Project are addressed as part of the Environmental Management Program rather than the General Site Support and Infrastructure Program.

A.2.3.2 Conservation and Renewable Energy Program

Under the Expanded Operations Alternative, NNSA would continue to identify and implement energy conservation measures and renewable energy projects, in compliance with DOE Order 430.2B, *Department of Energy, Renewable Energy and Transportation Management Requirements*; Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*; and Transformational Energy Action Management objectives, as described under the No Action Alternative. In addition, NNSA would pursue renewable energy projects, including geothermal and solar projects.

NNSS Photovoltaic Power Project – Under the Expanded Operations Alternative, NNSA proposes to build a 5-megawatt photovoltaic solar power system near the Area 6 Construction Facilities. The 5-megawatt photovoltaic system would require about 50 acres of land, based on a similar project at Nellis Air Force Base (USAF 2006). Construction of this photovoltaic power project would require grading of the entire 50-acre site and erection of either fixed or tracking (one- or two-axis) photovoltaic arrays on most of the graded area. The photovoltaic arrays would be mounted on concrete foundations embedded in the ground. The balance of the graded area would be covered by electrical switchgear, such as inverters to convert the direct current electricity generated by the photovoltaic arrays into alternating current and transformers to raise the voltage of the photovoltaic-generated power to 34.5 kilovolts. A control building would also be erected on the site, along with a small parking area for workers. The facility would be constructed near to and interconnected with the NNSS 34.5-kilovolt electrical distribution system.

Commercial Solar Power Generation – Under the Expanded Operations Alternative, NNSA would allow development of one or more full-scale commercial solar power generation plants in Area 25 of the NNSS. As shown in Figure 3–2, the solar power generation plants would be located within an area of about 39,600 acres in the southwestern part of the NNSS. The reasons for NNSA's consideration of commercial solar power development only in Area 25 and decision to assess the concentrating solar power parabolic trough technology in this *NNSS SWEIS* are addressed under the No Action Alternative in Section A.1.3.2. The facility(ies) could use a variety of solar power-generating technologies (i.e., parabolic trough, power tower, dish engine, photovoltaic) with a combined generating capability of up to 1,000 megawatts. Approximately 10 miles of new 500-kilovolt electrical transmission line (outside of the NNSS) would be required to integrate the electricity generated into the regional system. The existing regional electrical transmission system does not have sufficient capacity to accommodate an additional 1,000 megawatts of power. Development of the solar power generation plants in Area 25 would require construction of additional transmission infrastructure in the region. Independent of, and unrelated to, the commercial solar power generation facilities considered in this *NNSS SWEIS*, NV Energy, a commercial electrical energy company, and Renewable Energy Transmission Company are planning new large capacity transmission line projects that would accommodate the additional electrical

generation (see Chapter 6, Section 6.2.4.4, for additional information). The analysis in this SWEIS is based on assumptions for a representative commercial solar project (West 2010). Because there is no specific proposal for a commercial solar power generation project, additional NEPA analysis would be required to evaluate any such proposals in the future.

Geothermal electrical generation – The NNSS would be evaluated to determine the feasibility of demonstrating an enhanced geothermal system for generating electricity that is applicable to a much broader global geographic area than current 'hot spot' geothermal systems. The primary objective would be to demonstrate the viable recovery of practical operating level energy (5 to 50 megawatts) from rock that is hot (greater than 356 degrees Fahrenheit) but does not contain mobile water. The size of an electrical power plant would be unique to each site's geothermal characteristics and would be based on the optimal balance of temperature, rock reservoir size, heat exchange rate, water pressure, flow rate, etc. If feasible, this system would be developed as a laboratory for use both to improve similar systems and to supply power to the NNSS.

Modular geothermal power plants have a relatively small surface footprint. However, initial project support activities are estimated to require about 30 to 50 acres, including space for an excavated, lined sump to store water during drilling and reservoir development. To achieve the desired temperature (greater than 356 degrees Fahrenheit), several boreholes may be drilled up to 20,000 feet deep. Up to 20 acre-feet of water would be required for initial priming of the system (including the boreholes and underground rock reservoir). Based on the experience of LANL at Fenton Hill, New Mexico, water loss from an enhanced geothermal system was found to be relatively low (Brown 2009) and dependent on flow volume and pressure, which are directly related to electrical output of the power plant. A continuously operating 50-megawatt power plant would require an estimated 50 acre-feet of water per year.

There are a number of locations on the NNSS that have enhanced geothermal system potential, as shown by the red and blue circles depicted in **Figure A–3**. Although Figure A–3 includes areas of geothermal energy potential in areas outside of the NNSS, NNSA is not considering any activities associated with the offsite areas. A decision regarding the best location for a geothermal electrical generation facility would depend on a combination of the enhanced geothermal system's potential, use restrictions, environmental and economic considerations, and other factors. Because there are no specific proposals for geothermal exploration or development on the NNSS at this time, additional NEPA analysis would be required before such work could be conducted.

As a separate but related project, a geothermal research center may be established in Mercury. New construction is not expected to be required for a geothermal research center because existing unused or underused facilities would be employed for this purpose.

A.2.3.3 Other Research and Development Programs

Under the Expanded Operations Alternative, NNSA would continue to host existing environmental research projects at the NNSS and would actively promote and expand the National Environmental Research Park Program. NNSA would consider new environmental or other proposed research and/or development projects not related to the DOE or NNSA National Security/Defense or Environmental Management Missions on a case-by-case basis; however, no research and development projects are proposed at this time that would fall within this category.

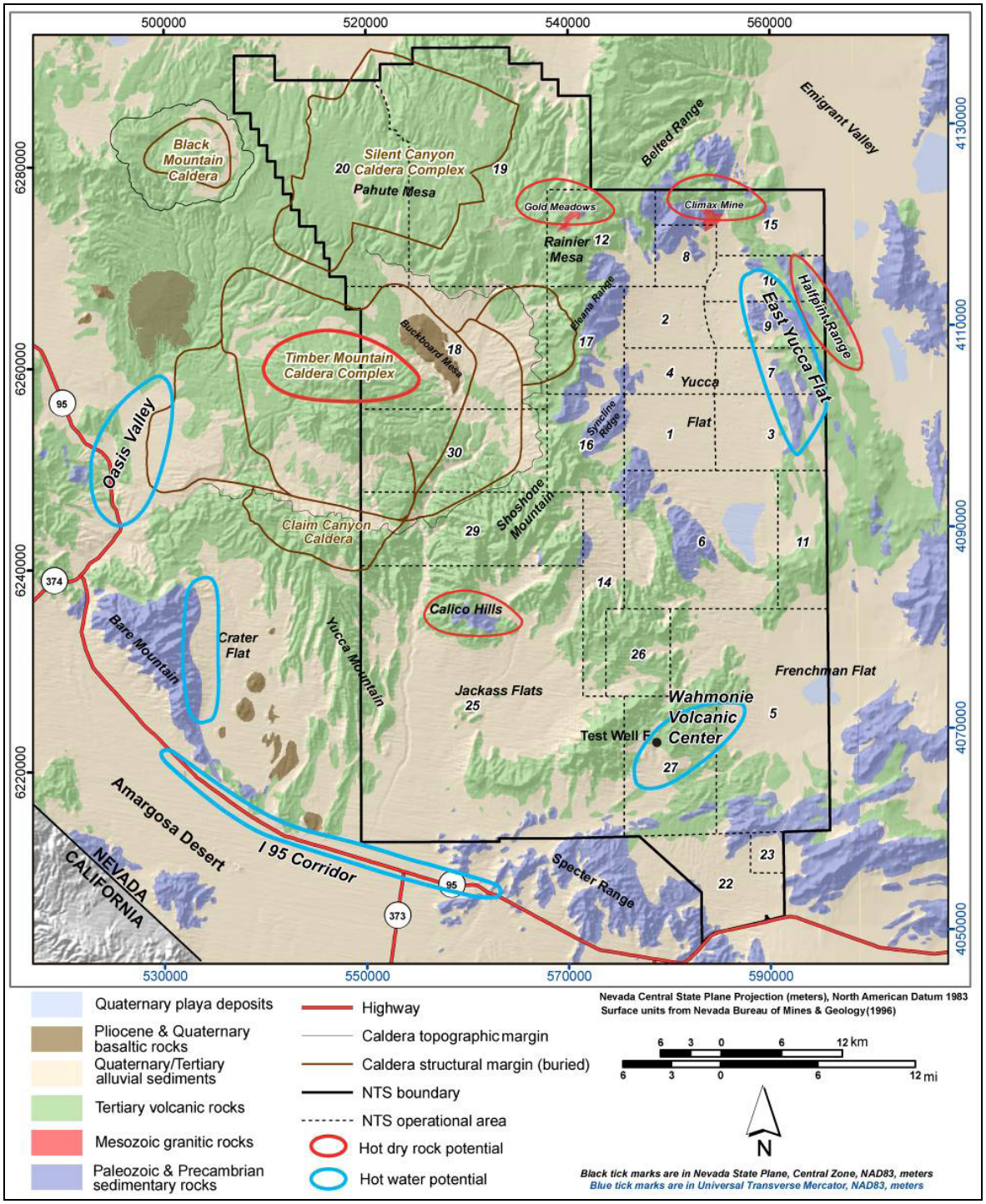

Figure A–3 Potential Locations on the Nevada National Security Site and Surrounding Area for Geothermal Energy Development

A.3 Reduced Operations Alternative

The Reduced Operations Alternative addressed in this SWEIS includes all of the types of activities considered under the No Action Alternative; however, for many programs, the levels of operations would be reduced. The Reduced Operations Alternative, compared to the No Action Alternative, includes diminished activity levels, additional decommissioned facilities, and limited activities in various areas at the NNSS and other NNSA-managed sites in Nevada. Perhaps the most significant changes from the No Action Alternative would be cessation of all activities other than environmental restoration, environmental monitoring, site security operations, and military training and exercises, and changing the land use zone designation to Limited Operations Zone in the northwestern portion of the NNSS (Areas 18, 19, 20, 29, and 30). Under this land use zone change, maintenance of Pahute Mesa, Stockade Wash, and Buckboard Mesa Roads would be terminated and operation of Pahute Mesa Airstrip would be limited to those activities necessary to provide access for the noted activities in these areas. The electrical transmission/distribution system beyond the Echo Peak Substation in Areas 19 and 20 would be de-energized. Ceasing all activities other than those mentioned in Areas 18, 19, 20, 29, and 30 would reduce NNSA's maintenance requirements at the NNSS and allow scarce resources to be focused on the more used areas of the NNSS. It may also reduce impacts on some resources, relative to the No Action and Expanded Operations Alternatives. **Figure A–4** illustrates the configuration of the NNSS under the Reduced Operations Alternative.

The following descriptions of missions, programs, projects, and activities that would be conducted under the Reduced Operations Alternative primarily address only this alternative's differences from the No Action Alternative; that is, those projects and activities that would be conducted at a lower level of intensity or not at all. Because activities under the Reduced Operations Alternative are similar to those under the No Action Alternative, detailed descriptions of the kinds of activities addressed below may be found in Section A.1 of this appendix.

A.3.1 National Security/Defense Mission

Under the Reduced Operations Alternative, NNSA would continue to pursue activities associated with the Stockpile Stewardship and Management, Nuclear Emergency Response, Nonproliferation, Counterterrorism, and Work for Others Programs.

A.3.1.1 Stockpile Stewardship and Management Program

Under the Reduced Operations Alternative, stockpile stewardship and management operations would continue at NNSA facilities in Nevada, particularly at the NNSS, under the conditions of the ongoing nuclear testing moratorium. As under the No Action Alternative, NNSA would continue to maintain its readiness to conduct an underground nuclear weapon test, if so directed by the President.

Under the Reduced Operations Alternative, there would be no change from the No Action Alternative for the following projects and activities associated with the Stockpile Stewardship and Management Program:

- Shock physics experiments at the Large-Bore Powder Gun
- Criticality experiments at DAF
- Disposition of damaged nuclear weapons
- Storage and staging of nuclear devices
- Staging of SNM, including pits
- Readiness-related training and exercises using various kinds of nuclear weapon simulators

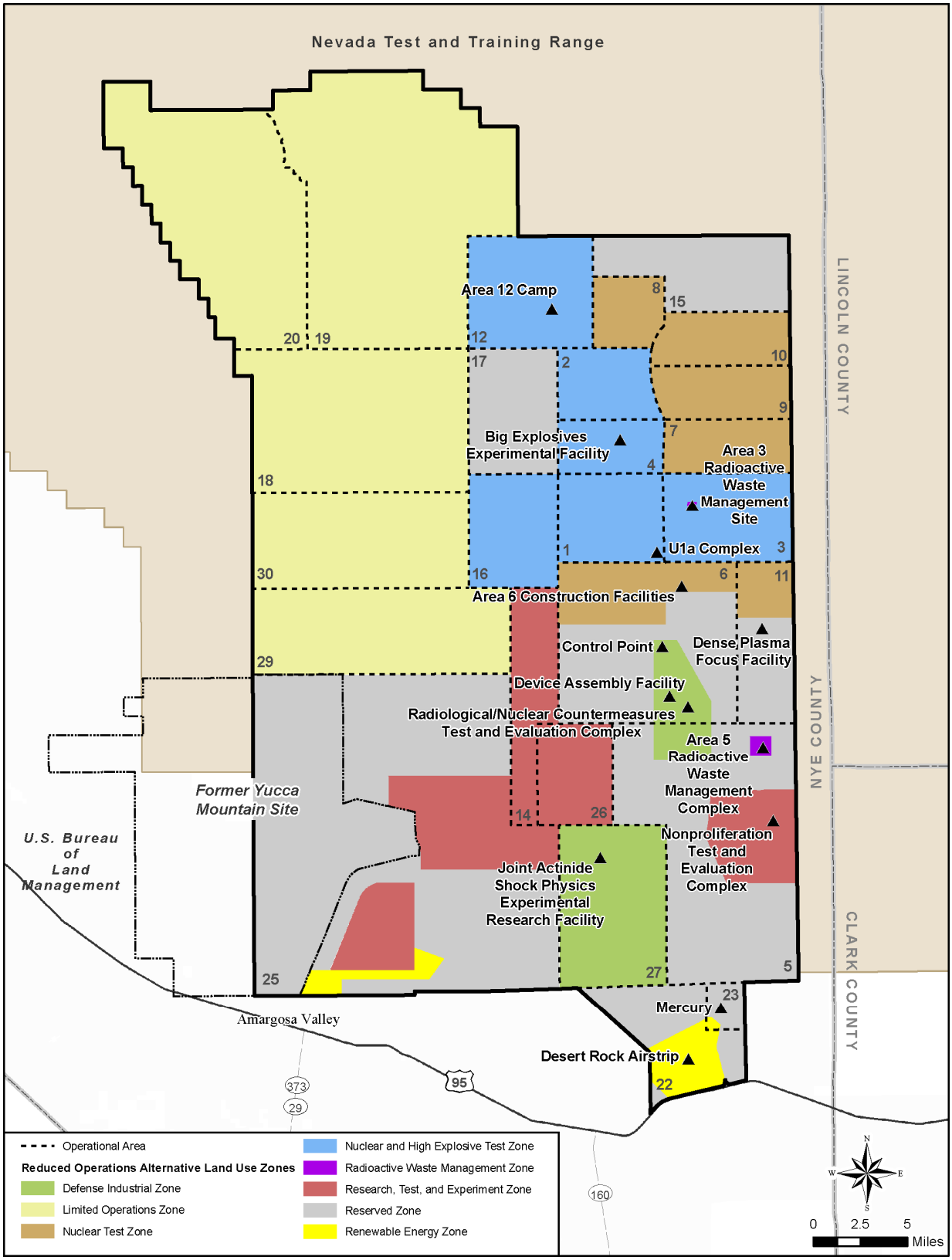

Figure A–4 Nevada National Security Site Land Use Zones and Major Facilities Under the Reduced Operations Alternative

In addition to maintaining these activities, under the Reduced Operations Alternative, the following changes in stockpile stewardship and management activities at NNSA facilities in Nevada would occur:

Dynamic experiments, dynamic plutonium experiments (including subcritical experiments), and hydrodynamic tests – NNSA would annually conduct no more than six of these tests over about a 10-year period. No dynamic or dynamic plutonium experiments or hydrodynamic tests would be conducted in Areas 19 or 20 of the NNSS. Over the next 10 years, a total of five dynamic experiments would be conducted in emplacement holes with each such experiment causing an estimated 20 acres of new land disturbance.

Conventional explosives tests – NNSA would annually conduct up to 10 conventional explosives experiments in the Nuclear and High Explosives Test Zone to directly support the Stockpile Stewardship and Management Program. No other explosives experiments would be conducted.

Shock physics experiments – No more than six shock physics experiments with SNM would be annually conducted at JASPER.

Pulsed-power experiments at the Atlas Facility – The Atlas Facility would be decommissioned and dispositioned.

Fusion experiments at the NNSS and NLVF – NNSA would conduct up to 375 plasma physics and fusion experiments per year: 350 at the Dense Plasma Focus Machine at NLVF, and 25 at the Dense Plasma Focus Machine in Area 11.

Support for Office of Secure Transportation Training – The number of times per year that Office of Secure Transportation training and exercises would be supported would be reduced to four.

Stockpile stewardship and management activities at the TTR – NNSA would not conduct ground- or air-launched rocket or missile operations or fuel-air explosives operations at the TTR.

A.3.1.2 Nuclear Emergency Response, Nonproliferation, and Counterterrorism Programs

There would be no change from the No Action Alternative for activities associated with the Nuclear Emergency Response, Nonproliferation, or Counterterrorism Programs. See Section A.1.1.2 for a detailed description of these activities.

A.3.1.3 Work for Others Program

The Work for Others Program is hosted by NNSA and includes the shared use of certain facilities and resources at the NNSS, RSL, NLVF, and the TTR. Under the Reduced Operations Alternative, NNSA would continue to host the projects and activities of other Federal agencies, such as DoD and DHS, as well as state and local governments and nongovernmental organizations; however, certain activities, such as large-scale explosives tests and experiments, would not be conducted. NNSA also would no longer support the following Work for Others Program activities, which are associated with nonproliferation projects and counterproliferation research and development:

- Conventional weapons effects tests, including live-drop and static explosives detonations using up to 30,000-pound-class bombs

- Development and demonstration of capabilities and technologies to attack and defeat military targets protected in tunnels and other deeply buried hardened facilities

- Conduct experiments using explosives and other explosives operations
- Tests and experiments requiring explosive releases of chemical and biological simulants

No Work for Others Program activities, except military training and exercises, would be conducted in Areas 18, 19, 20, 29, or 30 of the NNSS under the Reduced Operations Alternative. The reason for this exception is that military training and exercises are currently conducted primarily in the western half of the NNSS to ensure adequate separation and to avoid interference with other DOE/NNSA activities. This separation would need to be continued for safety and security considerations.

A.3.2 Environmental Management Mission

The NNSA Environmental Management Mission includes the Waste Management and Environmental Restoration Programs. Under the Reduced Operations Alternative, activities for both of these programs would be the same as under the No Action Alternative, except that less TRU waste would be annually generated (about 250 cubic feet per year) because of the projected reduced annual number of experiments at JASPER and other national security activities. As with the No Action Alternative, waste would be safely stored at the TRU Pad pending shipment off site for disposition along with other legacy or newly generated environmental restoration waste. DOE/NNSA activities would generate an estimated 170,000 cubic feet of hazardous waste, which would be sent off site to permitted treatment, storage, and disposal facilities. Smaller annual quantities of solid wastes (about 3,600,000 cubic feet) are also projected compared to the No Action Alternative because of reduced employment and construction activities.

A.3.3 Nondefense Mission

The Nondefense Mission generally includes those activities necessary to support NNSA-related programs, such as construction and maintenance of facilities, provision of supplies and services, warehousing, and similar activities. Activities related to supply and conservation of energy, including renewable energy and other research and development, are also considered under the Nondefense Mission. Activities under the Reduced Operations Alternative would be the same as those under the No Action Alternative, but at a lower level of effort, reflective of operational levels and establishment of the "Limited Operations Zone."

In addition to maintaining and repairing its infrastructure at the NNSS, RSL, NLVF, and the TTR, NNSA would maintain the existing infrastructure, provide site security, and manage all applicable existing permits and agreements for the former Yucca Mountain Repository. NNSA would perform these functions pending decisions on the disposition of the former Yucca Mountain Repository.

A.3.3.1 General Site Support and Infrastructure Program

Under the Reduced Operations Alternative, infrastructure-associated activities would include repairs, replacements, and projects to maintain the reduced capabilities of the NNSS. Increasing the capacities and capabilities or extending the ranges of facilities and/or services is not proposed under the Reduced Operations Alternative. NNSA would maintain only critical infrastructure within Areas 18, 19, 20, 29, and 30, including the Echo Peak, Motorola, and Shoshone communications facilities; the Echo Peak, Castle Rock, and Stockade Wash Substations; electrical transmission lines interconnecting these substations; and Well 8. Roads within Areas 18, 19, 20, 29, and 30 would only be minimally maintained to provide the basic access necessary to maintain the noted infrastructure.

A.3.3.2 Conservation and Renewable Energy Program

Under the Reduced Operations Alternative, NNSA would allow development of a 100-megawatt commercial solar power generation plant within the Area 25 Renewable Energy Zone, as proposed in the *1996 NTS EIS*, in which it was called the Solar Enterprise Zone. For purposes of the analysis in this SWEIS, NNSA assumed that the commercial solar power generation project would use a dry-cooled concentrating solar power technology, including parabolic troughs similar to the Amargosa Farm Road Solar Energy Project (BLM 2010). Potential impacts of commercial solar power generation at the NNSS would be scaled from the Amargosa Farm Road Solar Energy Project. In addition to a solar power generation plant, additional electrical transmission capacity would be required to integrate the electricity generated onto the regional system. Because no commercial solar power generation project is proposed at the NNSS at this time, additional NEPA analysis would be required before any such project could be implemented.

A.3.3.3 Other Research and Development Programs

Under the Reduced Operations Alternative, NNSA would continue to host existing environmental research projects at the NNSS. NNSA would consider any new environmental or other proposed research and/or development projects not related to the DOE or NNSA National Security/Defense or Environmental Management Missions on a case-by-case basis; however, no research and development projects that would fall within this category are proposed at this time.

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