

## CHAPTER 3: DESCRIPTION OF ALTERNATIVES

This chapter describes the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The National Nuclear Security Administration (NNSA) has analyzed them in detail in this *Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement* (LLNL SW/SPEIS). This chapter describes the types and levels of activities for each action and presents a summary of environmental impacts.

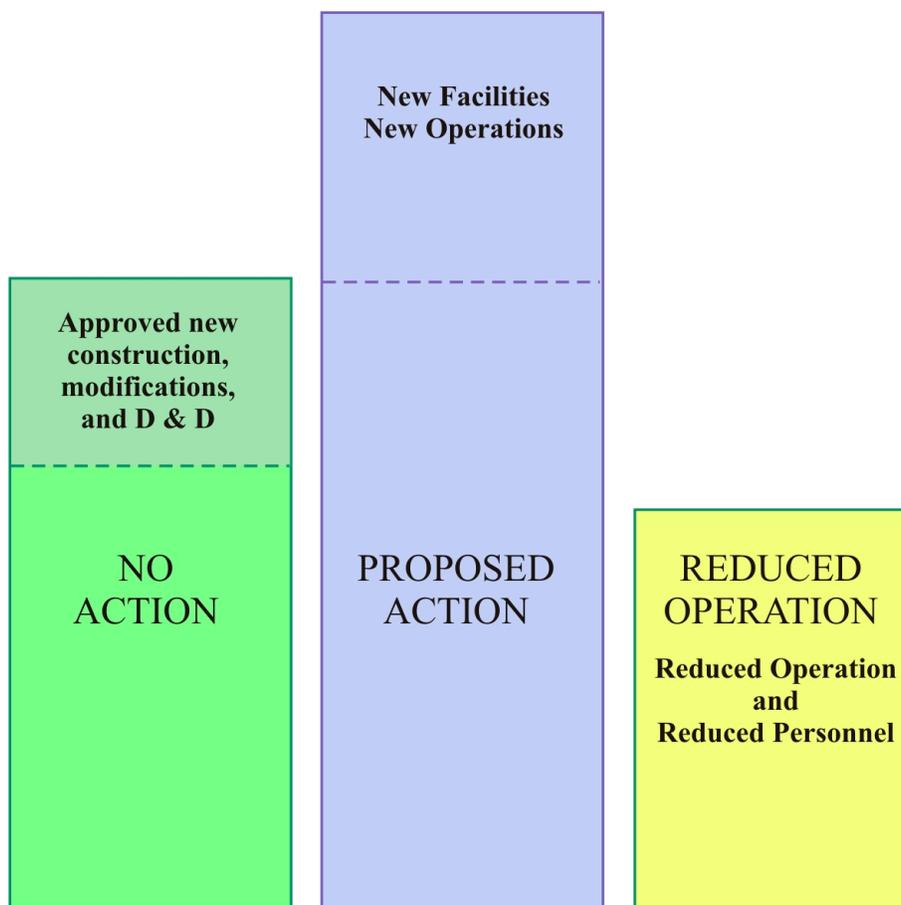
### 3.1 DEVELOPMENT OF ALTERNATIVES

Council on Environmental Quality (CEQ) regulations (40 *Code of Federal Regulations* [CFR] Parts 1500–1508) require Federal agencies to use the review process established by the *National Environmental Policy Act* (NEPA) of 1969, as amended (42 *United States Code* [U.S.C.] §4321 et seq.), and the U.S. Department of Energy (DOE) regulations implementing NEPA (10 CFR Part 1021) to evaluate not only the Proposed Action, but also to identify and evaluate reasonable alternatives to the Proposed Action, as well as the No Action Alternative. CEQ regulations implementing NEPA require that all reasonable alternatives be evaluated in an Environmental Impact Statement (EIS) (40 CFR §1502.14 [a]). The term “reasonable” has been interpreted by CEQ to include alternatives that are practical or feasible from a common sense, technical, and economic standpoint.

Figure 3.1–1 illustrates a qualitative comparison of the level of operation under the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

NNSA’s work assignments to LLNL are based on using existing personnel and facility capabilities, as described in Chapters 1 and 2 of this LLNL SW/SPEIS. To provide comprehensive baseline data from which operational levels could be projected, NNSA gathered the best available data for the current level of operation. The base year for data in most cases was 2002; however, data from previous years were used if 2002 data were unavailable or if they provided a more conservative analysis. The plans used to define the No Action Alternative, Proposed Action, and Reduced Operation Alternative include the Presidential Decision Directives and Executive Orders, Congressional legislation, Nuclear Posture Review, DOE and NNSA program plans for LLNL, the LLNL Ten-Year Comprehensive Site Plan, Work-for-Others proposals, and interagency agreements such as those between DOE/NNSA and the U.S. Department of Defense (DoD).

A range of operations have been evaluated, from the minimum level that maintains core capabilities (Reduced Operation Alternative) to the highest reasonable activity levels that could be supported by current facilities and the potential expansion and construction of new facilities for specifically identified future actions (Proposed Action). All operations assume LLNL would continue to operate as an NNSA national laboratory. However, the Reduced Operation Alternative includes an overall reduction of LLNL activities to a level that would prevent LLNL from accomplishing the currently assigned NNSA Stockpile Stewardship Program mission, as described in the following paragraphs. The No Action Alternative, Proposed Action, and Reduced Operation Alternative represent the range of operating levels that could be considered in the reasonably foreseeable future.



Source: Original.

**FIGURE 3.1–1.—Qualitative Comparison of Operations Among the No Action Alternative, Proposed Action, and Reduced Operation Alternative**

### Stockpile Stewardship Program

The Stockpile Stewardship Program is divided into six campaign categories that are multiyear, multifunctional efforts involving, to varying degrees, every NNSA site in the nuclear weapons complex.

- **Science Campaigns (Primary Certification, Dynamic Materials Properties, Advanced Radiography, and Secondary Certification and Nuclear Systems Margins)**—These four campaigns develop certification methodologies and the associated capabilities and scientific understanding required to ensure the safety and reliability of aged and remanufactured weapons in the absence of nuclear testing. This technology base must be in place to carry out weapons refurbishments and other stockpile support work.
- **Engineering Campaigns (Enhanced Surety, Weapons System Engineering Certification, Nuclear Survivability, Enhanced Surveillance, and Advanced Design and Production Technologies)**—These five campaigns and engineering construction activities provide the required tools, methods, and technologies for the continued certification and long-term sustainment, via refurbishment, of the nuclear weapons stockpile. Many of the deliverables

are timed to coincide with the individual Life Extension Program schedule, negotiated with DoD for these refurbishments, and in a number of instances provide capabilities lost with the cessation of underground nuclear testing.

- **Inertial Confinement Fusion Ignition and High Yield Campaign**—This campaign advances the Nation’s capabilities to achieve inertial confinement fusion (ICF) ignition in laboratory experiments and addresses high-energy density physics issues required for the Stockpile Stewardship Program.
- **Advanced Simulation and Computing Campaign**—This campaign provides the simulation and modeling tools that enable the design community to assess and certify the safety, performance, and reliability of the U.S. nuclear weapons stockpile. The campaign evolved from the merging of the Advanced Simulation and Computing Initiative and the ongoing Stockpile Computing Program.
- **Pit Manufacturing and Certification Campaign**—This campaign’s mission is to regenerate the nuclear weapons complex capability to produce nuclear primaries. In the near term, the campaign will focus mainly on W88 pit manufacturing and certification, while planning for a modern pit facility that is capable of reestablishing and maintaining sufficient levels of production to support requirements for the safety, reliability, and performance of all forecast U.S. requirements for nuclear weapons.
- **Readiness Campaigns (Stockpile Readiness, High Explosives Manufacturing and Weapon Assembly/Disassembly Readiness, Nonnuclear Readiness, and Tritium Readiness)**—These four campaigns are technology based efforts designed to reestablish, maintain, and enhance manufacturing and other capabilities needed for the future production of weapons components, mostly needed for the near-term Life Extension Program.

## Balance of Operations

Some activities at LLNL, defined as balance-of-operations activities, are not expected to change significantly, regardless of which alternative NNSA selects for continued operations. Balance-of-operations analyses were included for each resource area, along with more detailed analyses of specific facilities, to provide the impacts from all operations. Examples of balance-of-operations activities are maintenance, fire hazard management, safety and health enhancements, asbestos management, custodial services, reconfiguration of research facilities and offices, infrastructure projects, and landscaping.

### 3.2 No Action Alternative

The No Action Alternative has been analyzed to comply with CEQ’s NEPA implementing regulations (40 CFR Parts 1500–1508), providing a baseline against which the impacts of the Proposed Action and Reduced Operation Alternative can be compared. Under the No Action Alternative, LLNL would continue to support major DOE and NNSA programs such as defense programs, environmental management, nuclear nonproliferation, and energy research. The No Action Alternative includes approved interim actions, facility construction, facility expansion or modification, and facility decontamination and decommissioning for which NEPA analysis and documentation already exist. Therefore, the No Action Alternative includes a level of operation

for LLNL greater than exists today. The major facilities and operations included in the No Action Alternative, including those that are currently under construction or planned in the near future, are described below.

### **3.2.1 National Ignition Facility**

Conventional facilities construction of the NIF is complete. Completion of systems leading to full operations in fiscal year (FY) 2008 is in progress. In operation, the NIF would perform fusion ignition, high energy density, and radiation effects experiments in support of stewardship of the Nation's nuclear weapons stockpile and fusion energy and applied sciences objectives. The NIF is designed and constructed for a 30-year operating life. The *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (SSM PEIS) (DOE/EIS-0236) provides NEPA coverage for the construction and operation of this facility. The ROD for the SSM PEIS (61 FR 68014) announced DOE's decision to proceed with NIF construction and operations. The SSM PEIS was amended by the *Supplement Analysis for Use of Hazardous Materials in NIF Experiments* (DOE/EIS-SA236-SA2) and the *National Ignition Facility Final Supplemental Environmental Impact Statement to the Stockpile Stewardship and Management Environmental Impact Statement* (DOE/EIS-0236-S1F).

### **3.2.2 BioSafety Level 3 Facility**

A BioSafety Level 3 (BSL-3) Facility would provide for environmentally safe and physically secure manipulation and storage of infectious micro-organisms, many of which are potential bioweapon agents.<sup>1</sup> NNSA's BSL-3 work at LLNL would require efficient, high-quality sample processing for scientific and security reasons. The BSL-3 Facility would be a 1,500-square-foot laboratory and office complex designed to accommodate work on detection and counter-terrorism technologies. The facility is scheduled to be constructed and become operational in FY2004. The projected life of this facility is 30 years. An environmental assessment provides NEPA coverage for the construction and operation of this facility (NNSA 2002a). A Finding of No Significant Impact, dated December 16, 2002 (NNSA 2002e), was issued for the BSL-3 Facility at LLNL.

### **3.2.3 Terascale Simulation Facility**

The Terascale Simulation Facility is a new facility currently under construction in the center of the Livermore Site scheduled to be operational in FY2005. The 253,000-square-foot facility would accommodate parallel processing computer systems of increasing computational power within the same footprint and building space. The facility would be capable of housing the 100-Teraflops-class (trillion operations per second) computers and networks and the data and visualization capabilities necessary to perform the simulations essential to ensuring the safety and reliability of the U.S. nuclear stockpile. The projected lifetime of the building is beyond 30 years. A final environmental assessment providing NEPA coverage for this facility was issued in

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<sup>1</sup> BSL – 3 facilities are suitable for work with infectious agents which may cause serious or potentially lethal disease as a result of exposure by the inhalation route.

1999 (DOE 1999b), along with a Finding of No Significant Impact that was issued on October 29, 1999.

### **3.2.4 Superblock Stockpile Stewardship Program Operations**

The LLNL Superblock has several Stockpile Stewardship Programs and operations under the No Action Alternative. These include the Shelf Life Program, Enhanced Surveillance Program, Emergency Response Program, W88 Stockpile-to-Target Sequence Testing Program, and disassembly and feed preparation demonstrations. The SSM PEIS provides NEPA coverage for these operations (DOE 1996a). The ROD for the SSM PEIS approved these operations in the LLNL Superblock (61 FR 68014). Full implementation of these projects would become constrained in the future by the existing administrative limit of 700 kilograms of fuel-grade equivalent plutonium unless a disposition pathway becomes available. NNSA is working on a long-term comprehensive solution for disposal of excess plutonium. Superblock operations would have to be modified or curtailed if a disposition pathway is not established for plutonium.

### **3.2.5 Container Security Testing Facility**

The Container Security Testing Facility is a planned NNSA facility wherein an intermodal cargo container can be introduced, with a variety of contents, and evaluated while stationary, moving laterally, being lifted, or being stacked. Various actual or simulated threat materials that could be illicitly introduced to the U.S. for the purposes of terrorism, would be loaded in the container, along with other contents. These configurations would then be used to challenge the best available detection methods. The construction would start in FY2005. Facility lifetime is 30 years. DOE determined that this facility was categorically excluded from further NEPA review (DOE 2003a).

### **3.2.6 East Avenue Security Upgrade**

The East Avenue security upgrade project administratively controls a portion of East Avenue between South Vasco and Greenville roads. This project would be completed in FY2004. This project provides NNSA with the ability to control access to the roadway by the general public on either a temporary or permanent basis to improve security at LLNL and Sandia National Laboratories/California. This is consistent with DOE's overall security enhancement plan at both institutions. An environmental assessment was prepared and a Finding of No Significant Impact was issued in September 2002 (DOE 2002h) for this security upgrade.

### **3.2.7 Central Cafeteria Replacement**

The replacement for the central cafeteria would be located near the existing Drainage Retention Basin. The 16,300-square-foot facility would accommodate food preparation and dining and can also be used as meeting rooms. Construction has started and the facility is to be operational in FY2004. The life of the facility is beyond 30 years. DOE determined that this facility was categorically excluded from further NEPA review (DOE 2002a).

### 3.2.8 International Security Research Facility

The International Security Research Facility is a new 64,000-square-foot, two-story building currently under construction on the west side of the Livermore Site, adjacent to and north of the Building 132 Defense Programs Research Facility. The facility would provide enhancements in information management, optical-fiber networking, storage and retrieval, and real-time communications with NNSA and the intelligence community (DOE 2001a). The International Security Research Facility would contain capabilities for handling classified information. Construction is ongoing and operation is scheduled to begin in FY2004. The projected life of the facility is beyond 30 years. DOE determined that this facility was categorically excluded from further NEPA review (DOE 2000a).

### 3.2.9 Waste Isolation Pilot Plant Mobile Vendor

In an effort to expedite the removal of transuranic waste from the Livermore Site, a Waste Isolation Pilot Plant (WIPP)-qualified “mobile” contractor would package and ship more than 1,000 drums of transuranic and mixed transuranic waste to WIPP. This work would be initiated in FY2004. DOE determined that this facility was categorically excluded from further NEPA review (DOE 2003k).

### 3.2.10 Modifications, Upgrades, and Decontamination and Decommissioning

In addition to the new construction described above, a number of facilities at LLNL would undergo modification, upgrades, or D&D. For the main Livermore Site, these would include Plutonium Facility ductwork replacement, Tritium Facility modernization, Engineering Technology Complex upgrade, modifications to the biological safety and security laboratories, roof replacement on a number of facilities, and seismic and safety upgrades on a number of facilities. Nearly 255,000 square feet of floorspace would undergo D&D. D&D facilities are listed in Appendix A, Table A.2.3–2 and A.3.3–2. In addition to these projects, three major road-related projects are planned to improve site security and movement of traffic at the Livermore Site. They are to extend Fifth Street to improve traffic circulation, Westgate Drive widening and improvements, and security upgrades.

#### Decontamination and Decommissioning

D&D may include deactivation, decontamination, decommissioning or demolition. Deactivation is the process of placing a facility in a stable and known condition including the removal of readily removable hazardous and radioactive materials to ensure adequate protection of the worker, public health and safety, and the environment. Decommissioning takes place after deactivation and includes surveillance and maintenance, decontamination, and/or dismantlement. Decontamination is the removal or reduction of residual radioactive and hazardous material. Demolition is the destruction and removal of facilities or systems from the construction site.

At Site 300, modifications would include wetlands enhancements, completion of the hookup to the Hetch Hetchy water supply, and modification to an existing building for emergency response training.

### 3.3 PROPOSED ACTION

The Proposed Action would result in an increase in LLNL operations to support reasonably foreseeable mission requirements. This includes the expansion or modification of current facilities and construction of new facilities, as well as those projects, activities, and facilities described in the No Action Alternative.

#### 3.3.1 Use of Proposed Materials on the National Ignition Facility

In 1996, the programmatic impacts of conducting DOE/NNSA's Stockpile Stewardship and Management Program at all NNSA sites were evaluated in the SSM PEIS. The SSM PEIS ROD documented the decision to construct and operate the NIF at LLNL. In 1997, the Natural Resources Defense Council (NRDC) and 39 other organizations brought suit against DOE in *NRDC v. Peña*, Civ. No. 97-936(SS) (D.D.C.), challenging the adequacy of the SSM PEIS, partially on the basis that DOE should have analyzed conducting experiments on the NIF using plutonium, other fissile materials, fissionable materials, and lithium hydride. DOE maintained that the use of these materials were not reasonably foreseeable at that time. In August 1998, the judge in the lawsuit issued a Memorandum Opinion and Order that dismissed the plaintiffs' case. The Memorandum Opinion and Order provided in Paragraph 6 that:

No later than January 1, 2004, DOE shall (1) determine whether any or all experiments using plutonium, other fissile materials, fissionable materials other than depleted uranium (as discussed in the Supplement Analysis for the Use of Hazardous Materials at the NIF experiments, A.R. doc. VIIA-12), lithium hydride, or a Neutron Multiplying Assembly (NEUMA), such as that described in the document entitled Nuclear Weapons Effects Test Facilitization of the National Ignition Facility (A.R. doc VII.A-4) shall be conducted at the NIF; or (2) prepare a Supplemental SSM PEIS, in accordance with DOE NEPA regulation 10 C.F.R.1021.314, analyzing the reasonably foreseeable environmental impact of such experiments. If DOE undertakes the action described in subpart (2) of this paragraph, DOE shall complete and issue the Supplemental SSM PEIS and the Record of Decision based thereon within eighteen (18) months after issuing a notice of intent to prepare the Supplemental SSM PEIS.

In November 2002, the NNSA Deputy Administrator for Defense Programs approved proposing experiments on the NIF using plutonium, other fissile materials, fissionable materials, and lithium hydride. NNSA has chosen to use the LLNL SW/SPEIS as the mechanism for complying with the court's instruction to prepare a supplemental SSM PEIS. The inclusion of this supplemental SSM PEIS in the LLNL SW/SPEIS ensures timely analysis of these proposed experiments within the environmental impacts being evaluated for the continued operation of LLNL. In any ROD to be issued, NNSA will address decisions on the use of any or all of these materials in NIF experiments within the context of continuing LLNL operations.

#### 3.3.2 Increased Administrative Limits for Plutonium in the Superblock

In the 1992 *Final Environmental Impact Statement and Environmental Impact Report for Continued Operations of Lawrence Livermore National Laboratory and Sandia National Laboratories, Livermore* (LLNL EIS/EIR), a primary goal of LLNL was to reduce the plutonium

inventory to 200 kilograms through offsite disposition of significant portions of the inventory. This goal was partially achieved by relocating approximately half of the excess material offsite; however, DOE facilities were unable to accept all materials identified to be shipped. In 1999, DOE prepared a supplement analysis that reexamined future program requirements at LLNL and identified the need to modify certain radioactive material limits established in the 1992 LLNL EIS/EIR. The 1999 supplement analysis confirmed the need for an administrative limit of 700 kilograms of plutonium to provide for continued LLNL support of the Stockpile Stewardship Program.

#### **Administrative Limits**

Administrative limits are defined as the maximum amount of the referenced material allowed at a facility. The actual inventory for some materials at LLNL for which there is an administrative limit may be classified.

NNSA continues to rely on LLNL to meet its Stockpile Stewardship Program mission objectives. These objectives include campaigns relating to pit manufacturing and certification, advanced radiography, dynamic materials testing, materials shelf life experiments, and enhanced surveillance research. These NNSA-assigned campaigns and programs require continued and increasing use of plutonium. NNSA continues to work on a solution for disposal of plutonium, but no pathway for LLNL to dispose of excess plutonium currently exists, requiring an increase in the plutonium administrative limits. Therefore, NNSA would increase the administrative limit for fuel-grade equivalent plutonium to 1,500 kilograms from the existing 700 kilograms. The limit for enriched uranium would remain unchanged at 500 kilograms.

### **3.3.3 Integrated Technology Project in the Plutonium Facility**

Science-Based Stockpile Stewardship and Management Program (SBSSMP) experiments are needed to increase the understanding of the complex physics and behavior of materials in nuclear weapons and ultimately to certify the efficacy of the Nation's aging stockpile. Accurate, theoretical, scientific, and experimental data are required to validate the computer models of the weapon performance. SBSSMP experiments involve the use of both surrogate and actual materials that would be used in the weapon system.

The Advanced Materials Program involves the development and demonstration of the Atomic Vapor Laser Isotope Separation (AVLIS) technology. The ITP is a follow-on activity to the Advanced Materials Program to produce material to augment the current inventory of special nuclear materials (e.g., plutonium and enriched uranium) for use in SBSSMP experiments. The ITP would not proceed until the Advanced Materials Program demonstrations are complete. The expected start would be FY2008. The ITP is one of the bases for the increase in the plutonium material-at-risk limit from the current 20 kilograms in any room of the Plutonium Facility to 60 kilograms of fuel-grade equivalent plutonium in each of two rooms. This material-at-risk increase would enable LLNL to pursue multiple Stockpile Stewardship Program missions simultaneously. Details of the Advanced Materials Program and ITP are presented in Appendix N.

### 3.3.4 Increased Material-at-Risk Limit for the Plutonium Facility

The Proposed Action would increase the plutonium material-at-risk limit from 20 to 60 kilograms of fuel-grade equivalent plutonium in each of two rooms of the Plutonium Facility. This increase is needed to meet future Stockpile Stewardship Programs such as the ITP and the casting of plutonium parts. These activities support campaigns for advanced radiography, pit manufacturing, and certification programs. If the material-at-risk is increased, the bounding Plutonium Facility accident consequences to the population surrounding LLNL would increase from an aircraft crash resulting in  $5.82 \times 10^{-2}$  latent cancer fatalities (LCFs) per year under the No Action Alternative to an unfiltered fire involving 60 kilograms fuel-grade equivalent plutonium resulting in  $1.68 \times 10^{-1}$  LCFs per year under the Proposed Action.

#### Material-at-Risk

A material-at-risk limit is defined as the maximum amount of the referenced material that is involved in the process and thus at risk in the event of a postulated accident. Material locked in secure storage is not considered material at risk.

### 3.3.5 Increase of Tritium Facility Material Limits

The Proposed Action would increase the Building 331 Tritium Facility tritium administrative limit from 30 to 35 grams and the material-at-risk at a single workstation from 3.5 to 30 grams. These increases are needed to support future planned Stockpile Stewardship Program activities such as the high-energy density physics target fill and the Test Readiness Program. The activities support the campaign for ICF and high yield and the readiness to resume testing, if directed. Analysis in the LLNL SW/SPEIS shows that the increased material-at-risk would result in higher consequences from an aircraft crash into the Tritium Facility.

### 3.3.6 National Ignition Facility Neutron Spectrometer

A neutron spectrometer would be constructed and operated as part of the NIF core facility diagnostics capability. The neutron spectrometer would provide a sensitive and accurate measure of the neutrons generated in experiments. The construction would not start before FY2008 and when completed, the neutron spectrometer would become part of the NIF operational facility. The neutron spectrometer would be installed in a specially constructed concrete shaft from the target chamber to a point 52 feet below the surface. The neutron spectrometer would reside at the end of the shaft and contain solid plastic scintillation sheets layered between sheets of lead, with a total mass of approximately 20 tons.

### 3.3.7 High Explosives Development Center Project

The High Explosives Development Center Project would construct new buildings and renovate the current complex located in the south-central section of Site 300. The construction and renovation would be completed and the center would become operational in FY2013. The lifetime of new construction would be beyond 30 years. This project would consolidate operations currently conducted in four existing buildings. Operations and equipment would include mechanical pressing; vertical temperature-controlled mixers for mixing explosives, binders, plasticizers, and other compounds; a 50-cubic-inch deaerator loader for processing the extrudable explosives; vacuum ovens for drying materials; mills for reducing particle sizes; a

loader for processing extrudable explosives; blenders and kettles for preparing explosives; an environmental chamber and associated control and interlock modules; electrical resistance measurement devices; a gas-sampling oven; and a computer system (LLNL 2002ap).

### **3.3.8 Energetic Materials Processing Center Replacement**

Existing energetic materials processing facilities and equipment at Site 300 are becoming obsolete and inadequate to meet the requirements of LLNL programs. This project would move the operations currently conducted in the Building 805 High Explosives Assembly/Machining, Building 806 High Explosives Machine Shop, Building 807 High Explosives Machining, Buildings 810A-C High Explosives Assembly Facility, Building 813 Change House, and Building 823A-B LINAC Radiography Facility into a new, modern facility. The Building 810A-C complex would be retained for some assembly operations currently conducted and waste package operations currently conducted in Building 805. The proposed Energetic Materials Processing Center would be located at the Site 300 process area, in the vicinity of the Magazine 21-24 loop. The project would include the construction of a new 40,000-square-foot processing facility and four magazines: two capable of storing 1,000 pounds of high explosives and two capable of storing 500 pounds of explosives. The center would house explosives machining, pressing assembly, inspection, and radiography. Additionally, the facility would provide an inert machine shop, offices, inert storage, showers/changing room facilities, equipment rooms, and miscellaneous support spaces. The construction would be completed and operation begun in FY2008. The life of the new Energetic Materials Processing Center would be beyond 30 years.

### **3.3.9 Materials Science Modernization Project**

The Materials Science Modernization Project is an upgrade of existing facilities in the southwest quadrant of the Livermore Site. A modern materials research complex would provide LLNL with infrastructure in the areas of materials fabrication, characterization, and testing, relevant to LLNL's national security mission. The facility would be engineered to conduct precision experiments and precision fabrication of designer materials to a level not currently available. The facility construction would be completed and operation begun in FY2013. The lifetime of the facility would be beyond 30 years.

### **3.3.10 Chemical and Biological Nonproliferation Program Expansion**

NNSA proposes to perform research and development activities to develop a variety of biodetector technologies in the Building 132S NAI/Physics Facility, and the Building 153 Microfabrication Laboratory at the Livermore Site. Two classes of detectors would require deoxyribonucleic acid (DNA) sequences or antibodies to identify and characterize biological pathogens. Planned activities would include fluid manipulation experiments using LLNL equipment for optical or flow cytometer analysis. This activity would be performed no sooner than FY2005.

Other experiments would evaluate the performance of an electrophoresis detection system for applications involving trace detection of biological warfare agents and precursors. Lasers and an ultra-violet-visible-near-infrared spectrometer would also be used in the laboratories.

### **3.3.11 Petawatt Laser Prototype**

The proposed petawatt laser prototype would be installed and operation would begin no earlier than FY2005. The petawatt laser is a short-pulse, high-power laser that can be generated by modifying existing solid state glass laser technology developed at LLNL and other laboratories. The first petawatt laser prototype was demonstrated in the Building 391 Inertial Confinement Fusion Laser Facility and then dismantled when the NOVA laser facility was shut down. To continue this area of research, a second petawatt prototype is proposed for installation and operation in the Building 381 Laser Facility.

### **3.3.12 Consolidated Security Facility**

The proposed Consolidated Security Facility would result in the physical consolidation of security services to improve functionality, efficiency, and effectiveness. The scope of work would include the construction of a multipurpose security structure of approximately 50,000 square feet. The facility would contain offices, vaults, conference and meeting rooms, interview rooms, shops, and specialized technical support areas. The facility would be operational in FY2012 and would operate for 30 years. The new facility would be collocated with the existing Security Department Administration Facility.

### **3.3.13 Waste Management**

Under the Proposed Action, waste management activities would change to accommodate increased waste generation and to improve overall operational methods. These proposed changes would include modifying the permit status of existing facilities to allow different types of waste to be stored or treated; e.g., obtaining hazardous waste facility permits for areas now used for nonhazardous or radioactive waste management, and to improve operational flexibility and efficiencies; e.g., relocate permitted waste treatment units from old facilities to newer facilities. A detailed explanation of permit changes under the Proposed Action is included in Appendix B, Section B.3.

### **3.3.14 Building 625 Waste Storage**

The amount of transuranic waste stored in the Building 625 Radiological and Hazardous Waste Storage Facility would be increased to consolidate waste from LLNL facilities planned for D&D and to accept drums from facilities prior to shipment to the Waste Isolation Pilot Plant (WIPP). The maximum curie limit under the Proposed Action would be equivalent to an array of drums where one drum contains 60 plutonium-equivalent curies and the other surrounding drums contain 12 plutonium-equivalent curies. Possible configurations of drums would be limited to those where the consequences of the bounding accident for Building 625 analyzed in Appendix D would not be exceeded.

### **3.3.15 Direct Shipment of Transuranic Wastes from the Superblock**

NNSA is proposing to develop the capability to load transuranic waste into pipe overpacks in the Superblock, beginning in FY2005. These pipe overpacks would allow for significantly higher actinide loading into each drum for disposal at WIPP. The proposed pipe overpack would allow up to 80 plutonium-equivalent curies per drum and up to 200 fissile-gram equivalents. The pipe

overpack provides a way for LLNL to dispose of waste, such as plutonium with high americium levels. The pipe overpack can be loaded and stored into Transuranic Package Transporter-II (TRUPACT-II) shipping containers, and shipped from Superblock to WIPP without increasing the nuclear material inventory or hazard levels in other LLNL facilities. The TRUPACT-II shipping containers would be loaded to the limits of the WIPP waste acceptance criteria.

### **3.3.16 Berkeley Waste Drums**

DOE/NNSA is proposing that LLNL accept up to 14 drums of low-activity transuranic and mixed transuranic waste from the Lawrence Berkeley National Laboratory. All liquids would be solidified and corrosive mixed transuranic waste would be neutralized before shipment to LLNL. DOE would use mobile vendors to certify the waste for shipment to the WIPP. This activity would be performed no sooner than FY2005. This one-time shipment is proposed in order to remove legacy waste from the Lawrence Berkeley National Laboratory without creating a WIPP-certified packaging operation. The packaged waste would then be shipped directly to WIPP in a single TRUPACT-II container.

### **3.3.17 Building Utilities Upgrades**

Within the next 10 years, many of LLNL's key facilities will be past their expected life, severely outdated, and code deficient. The proposed building utilities upgrade project would provide state-of-the-art technological upgrades and reduce maintenance backlog items to selected mission-critical laboratory and office buildings at the Livermore Site. Examples of technological upgrades include expanding building network capability for computing environments; rewiring facilities for high-speed networking; replacing secondary electrical distribution system components such as transformers, panelboards, wiring, lighting systems, and power conditioning equipment for sensitive computing and instrumentation equipment; and increasing capacities of mechanical systems to handle increased cooling requirements for computing and laboratory environments.

### **3.3.18 Building Seismic Upgrades**

Executive Order 12941, *Seismic Safety of Existing Federally Owned or Leased Buildings* (59 FR 65245), requires that all federally owned and leased buildings that do not meet current seismic design and construction standards should be identified and mitigated if necessary. There were 108 buildings identified at LLNL as having potential seismic deficiencies relative to current codes. The deficiencies of these buildings have been prioritized based on a scoring approach that incorporates building vulnerability, failure consequence, and mission essential factors. This project includes designing and installing seismic upgrades needed to bring these 108 buildings into compliance with applicable seismic design and construction standards.

### **3.3.19 Decontamination and Decommissioning**

LLNL would D&D excess facilities totaling approximately 820,000 square feet of floorspace, including approximately 255,000 square feet under the No Action Alternative. D&D facilities are listed in Appendix A, Tables A.2.3–2 and A.3.3–2. The D&D process includes performance of surveillance, maintenance, and minor facility deactivation to ensure facilities remain in stable condition pending their final disposition. Facility deactivation may include disposition of stored

or surplus materials that may be potentially contaminated. These materials and equipment are designated as legacy items, meaning there is no identified sponsor or program. Most legacy materials are materials that were placed in storage or set aside for a future need that never materialized.

### **3.3.20 Increased Administrative Limit for Highly Enriched Uranium for Building 239**

Building 239, Radiography Facility, contains equipment for performing nondestructive evaluations. Facility operations involving radiography are carried out in the basement of the building. The Proposed Action would increase the Building 239 HEU administrative limit from 25 to 50 kilograms to support Stockpile Stewardship Program activities. The use of 50 kilograms of HEU is analyzed in Appendix D and is bounded by the consequences of an accident involving the use of plutonium in Building 239.

## **3.4 REDUCED OPERATION ALTERNATIVE**

The Reduced Operation Alternative includes reductions in LLNL operations supporting the NNSA Stockpile Stewardship Program. A commensurate reduction in scientific and institutional support is part of the analysis. The Reduced Operation Alternative maintains full operational readiness for NNSA facilities and operations listed below, but does not represent the level of operation required to fulfill the Stockpile Stewardship Program mission assigned to LLNL for the foreseeable future. However, LLNL operations would not be reduced beyond those required to maintain safety and security activities, such as maintaining nuclear materials, explosives, or other hazardous materials in storage or use.

The Reduced Operation Alternative is broadly defined as approximately a 30 percent scaledown from the Stockpile Stewardship Program operations under the No Action Alternative. This includes reduction in support activities in addition to direct program cuts. This alternative considers and analyzes reasonable proposals provided by the public for the reduction or cessation of specific operations to reduce adverse environmental impacts.

As stated in the Notice of Intent (NOI) for this LLNL SW/SPEIS (67 FR 41224), NNSA will not consider the complete closure and D&D of the Livermore Site or Site 300, as this is inconsistent with the LLNL mission as defined by NNSA. Though the Reduced Operation Alternative includes reductions in specific project areas, it maintains existing LLNL capabilities and infrastructure. This alternative would affect planned operations and activities, new facilities, and D&D of structures described in Section 3.1 under the No Action Alternative. The changes to planned operations and activities under the Reduced Operation Alternative are listed in the following sections.

### **3.4.1 Integrated Technology Project**

The Advanced Materials Program demonstration activities would be discontinued. No laser separation of isotopes of surrogate material or plutonium would take place. The Plutonium Facility Engineering Demonstration System equipment would remain in its current status of cold

standby. These changes would reduce specific environmental impacts such as transuranic waste generation and worker dose.

### **3.4.2 National Ignition Facility Operations Reduction**

Annual yield from NIF ignition experiments would decrease by approximately 30 percent under the Reduced Operation Alternative, from 1,200 megajoules per year to 800 megajoules per year. The individual experiment yields would remain at up to 20 megajoules (45 megajoules maximum credible yield), but the total number of experiments with high yield would be reduced and the annual tritium throughput would be reduced by approximately 250 curies.

### **3.4.3 Reduce Number of Engineering Demonstration Units**

LLNL fabricates engineering demonstration units to demonstrate the acceptability of different nuclear weapons pit technologies for several weapons systems in the U.S. stockpile. Engineering demonstration units are used to recapture the technology needed to manufacture pits of various types and to develop and demonstrate pit fabrication processes. Under the Reduced Operation Alternative, NNSA proposes to only fabricate engineering demonstration units for half of the pits under the No Action Alternative in the U.S. stockpile. These changes would reduce specific environmental impacts such as transuranic waste generation and worker dose.

### **3.4.4 Reduce Pit Surveillance Efforts**

LLNL performs surveillance activities for pits in the active and inactive U.S. stockpiles. Pit surveillance activities include determination of important pit characteristics through destructive examination of the pits to assess suitability for safety and performance. Under the Reduced Operation Alternative, NNSA proposes to perform pit surveillance activities on LLNL-designed pits only, a reduction of 50 percent from the No Action Alternative. These changes would reduce specific environmental impacts such as transuranic waste generation and worker dose.

### **3.4.5 Reduce the Number of Subcritical Assemblies**

LLNL fabricates subcritical assemblies for the U.S. weapons testing program. Under the Reduced Operation Alternative, NNSA would fabricate subcritical assemblies for the LLNL testing program only. This nearly 50-percent reduction in operations from the No Action Alternative would reduce specific environmental impacts such as transuranic waste generation and worker dose.

### **3.4.6 Terascale Simulation Facility Operations Reduction**

Under the Reduced Operation Alternative, NNSA proposes to operate the Terascale Simulation Facility computer at 60 percent capacity versus 100 percent capacity under the No Action Alternative. These changes would reduce energy requirements for the facility from 25 megawatts to 15.3 megawatts, but would not meet the full Stockpile Stewardship Program mission. However, by maintaining the facility in full operational readiness in terms of hardware, software, and operations staff, the Terascale Simulation Facility could be ramped back to full capacity in a very short time. Therefore, the Reduced Operation Alternative would include no reduction in staff.

### 3.4.7 Reduce Number of Hydroshots at Site 300

NNSA proposes fewer detonation experiments containing tritium at Site 300 firing tables or the Building 801 Contained Firing Facility, resulting in a reduction in the maximum annual tritium emissions to 150 curies versus 200 curies under the No Action Alternative. Other types of experiments, such as environmental testing of explosives assemblies would continue unchanged from the No Action Alternative in the number of experiments and amounts of tritium. The programmatic impacts of this alternative would include less confidence in the evaluation of nuclear weapons systems.

### 3.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

DOE carefully considered public input and comments received during the scoping process in determining the range of alternatives in this LLNL SW/SPEIS. The following alternatives were evaluated as a result of scoping comments, but were eliminated from detailed analysis:

- **Shutdown of LLNL**—LLNL would be shut down, all facilities subject to D&D, restoration, and removal of hazardous and nuclear materials. The Federal Government would develop alternatives for disposition of the land.
- **Conversion of LLNL to an Academic Laboratory**—LLNL would cease its work involving nuclear materials, remove nuclear materials from the premises, and remove all waste. LLNL would use existing facilities and staff for academic research.
- **Conversion of LLNL to an Environmental Research Laboratory**—LLNL would cease its work involving nuclear materials, remove nuclear materials from the premises, and remove all waste. LLNL would use existing facilities and staff for environmental research in the areas of energy efficiency, energy security, renewable energy, environmental remediation, and clean coal.

None of these alternatives would meet the statement from the President (White House 1995a); Public Law 103-160, the *National Defense Authorization Act* of 1994; Presidential Decision Directives; U.S. compliance with treaties; as well as Congressional guidance and national security policy, all of which require the continued viability of all three NNSA weapons laboratories (Los Alamos National Laboratory, Sandia National Laboratories, and LLNL). LLNL's continued operations fulfill national security requirements for stockpile stewardship, and it is not economically feasible to reassign certain LLNL activities to other NNSA laboratories. LLNL's activities in the area of weapons research are assigned by NNSA and it is up to LLNL to meet the requirements of the Stockpile Stewardship Program mission. Public Law 106-65, the *National Defense Authorization Act* of 2000, assigned to NNSA and subsequently to the national laboratories, a charter:

...to conduct basic and applied research that enhances United States national security and reduces the global danger from the proliferation of weapons of mass destruction and special nuclear materials through needs-driven research and development. The emphasis is on developing the requisite technologies to detect and deter nuclear proliferation, to meet United States nuclear explosion monitoring goals, and to develop and demonstrate chemical and biological

detection and related technologies to enable the United States to better prepare for and respond to domestic chemical and biological attacks.

### **3.6 Comparison of Impacts of Alternatives**

A comparison of the environmental consequences for the continued operation of LLNL is provided in Table 3.6–1 at the end of this chapter. At this time, NNSA has not identified a preferred alternative among the No Action Alternative, the Proposed Action, or the Reduced Operation Alternative. The table compares the potential impacts to environmental resources associated with the continued operation of LLNL under Baseline (2002) conditions, the No Action Alternative, the Proposed Action, and the Reduced Operation Alternative. The data in Table 3.6–1 includes data for both the construction and operational phases of the Proposed Action at LLNL.

The major impacts occur in three areas: materials and waste management, human health and safety, and radiological accidents. These impacts are significant in both an absolute level and relative levels among the alternatives.

There are no major differences in the environmental impacts among the alternatives in land uses and applicable plans, prehistoric and historic cultural resources, geology and soils, nonradiological air quality, water, and noise.

For other resource areas evaluated, the analyses indicate that there maybe some environmental impact differences, or based on scoping comments are of greater interest to the public. Resource areas falling into these categories include socioeconomic characteristics and environmental justice, community services, aesthetics and scenic resources, biological resources, radiological air quality, traffic and transportation, utilities and energy, and site contamination. These are discussed below in addition to materials and waste management, human health and safety, and radiological accidents.

#### **3.6.1 Socioeconomic Characteristics and Environmental Justice**

The socioeconomic impact for continued operations at LLNL would vary under the No Action Alternative, Proposed Action, and Reduced Operation Alternative and would primarily affect Alameda and San Joaquin counties. For the No Action Alternative, LLNL employment would increase by 300 workers to 10,650 at the Livermore Site and 250 at Site 300. For the Proposed Action, 11,150 workers would be required at the Livermore Site and 250 workers would be required at Site 300. For the Reduced Operation Alternative, worker population would be 9,770 at the Livermore Site and 230 at Site 300. The number of housing units affected would be proportional to the changes in worker population in both counties.

#### **3.6.2 Community Services**

Within the umbrella of community services, the only notable impact would be to the generation and disposal of nonhazardous solid waste. For the No Action Alternative, it is estimated that 4,600 metric tons per year of nonhazardous solid waste would be generated at the Livermore Site. Under the Proposed Action, the Livermore Site would generate 4,900 metric tons per year of nonhazardous solid waste. Under the Reduced Operation Alternative, nonhazardous solid

waste generation at the Livermore Site would be reduced to 4,200 metric tons per year. Site 300 nonhazardous waste generation would be 208 metric tons per year under both the No Action Alternative and Proposed Action. Under the Reduced Operation Alternative, Site 300 nonhazardous solid waste generation would be reduced to 191 metric tons per year.

### **3.6.3 Aesthetics and Scenic Resources**

Changes to aesthetics would be similar under the No Action Alternative, Proposed Action, and Reduced Operation Alternative at the Livermore Site and at Site 300. The offsite views of the Livermore Site would change due to the completion of the East Avenue security upgrade project, the International Security Research Facility, and the NIF. At Site 300, the proposed changes would have little or no impact on aesthetics and scenic resources. Changes would be consistent with the existing character of LLNL.

### **3.6.4 Biological Resources**

As a result of consultation with the U.S. Fish and Wildlife Service (USFWS), it was identified that LLNL operations could potentially affect six federally listed endangered, threatened, proposed threatened, or candidate species due to potential disturbance of habitat. The six species include the California red-legged frog, California tiger salamander, San Joaquin kit fox, large-flowered fiddleneck, valley elderberry longhorn beetle, and Alameda whipsnake. All of these species are at Site 300 with only one species, the California red-legged frog, at the Livermore Site. Land disturbance in undeveloped zones at the Livermore Site would total 462,000 square feet under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Potential impacts to habitat would be the same under the No Action Alternative, Proposed Action, and Reduced Operation Alternative at the Livermore Site, with no impacts to the California red-legged frog. Jurisdictional wetlands along Arroyo Las Positas could be affected if the Environmental Restoration Program terminated the discharge of treated water. For Site 300, the impacts are the same under the No Action Alternative, Proposed Action, and Reduced Operation Alternative, with potential impacts to threatened, proposed threatened, or candidate species. There would be limited land disturbance in undeveloped areas except for 40,000 square feet required by the Energetic Materials Processing Center under the Proposed Action. NNSA will complete necessary Biological Assessments and obtain Biological Opinions from USFWS on any identified impacts on critical habitat(s).

### **3.6.5 Radiological Air Quality**

There are differences among the No Action Alternative, Proposed Action, and Reduced Operation Alternative regarding the potential radiological air quality impacts, all of which would be low. The maximally exposed individual (MEI) would be located due east of the NIF, once the NIF becomes operational. The MEI dose for the Livermore Site under the No Action Alternative would be 0.1 millirem per year. This compares to an MEI dose of 0.13 millirem per year under the Proposed Action and 0.09 millirem per year under the Reduced Operation Alternative. The population dose for the Livermore Site would be 1.8 person-rem per year under the No Action Alternative, Proposed Action, and the Reduced Operation Alternative. At Site 300, the MEI would be west-southwest of Firing Table 851, the only outdoor firing facility that would use tritium. The MEI dose at Site 300 would be 0.055 millirem per year under the No Action Alternative and the Proposed Action, and 0.054 under the Reduced Operation Alternative. The

population dose for Site 300 would be 9.8 person-rem per year under the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

### **3.6.6 Traffic and Transportation**

Traffic at the Livermore Site would be directly affected by the change in worker population under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. Under the No Action Alternative, traffic would increase slightly as a result of the increase in worker population by 290 workers (22,600 total vehicle trips per day). Traffic volume would increase further under the Proposed Action due to the addition of 500 workers (23,700 total vehicle trips per day). Traffic volume would decrease under the Reduced Operation Alternative due to the loss of 880 workers at the Livermore Site (21,000 total vehicle trips per day). At Site 300, the impact to traffic due to changes in the number of workers would be negligible under the No Action Alternative, Proposed Action, and Reduced Operation Alternative.

Transportation of radioactive materials offsite would increase under the No Action Alternative and Proposed Action, primarily as a result of programmatic agreements. Under the No Action Alternative, modeling of the offsite shipments yields a collective dose of 5.9 person-rem per year. Under the Proposed Action, the modeling of offsite shipments yields a collective dose of 6.2 person-rem per year. This would decrease for the Reduced Operation Alternative to 4.9 person-rem per year. The potential cancer risk as a result of shipments of radioactive materials from the Livermore Site would be low under the No Action Alternative, Proposed Action, and Reduced Operation Alternative. The calculated potential LCF under the No Action Alternative and the Proposed Action would be  $4 \times 10^{-3}$ . Under the Reduced Operation Alternative, the LCF would fall to  $3 \times 10^{-3}$ . Under the Proposed Action, the amount of explosive materials transported to Site 300 would increase slightly. Under the Reduced Operation Alternative, transportation of these materials would decrease.

### **3.6.7 Utilities and Energy**

Under the No Action Alternative, the projected peak electrical demand at LLNL would be 82 megawatts and the annual total use would be 446 million kilowatt-hours. Peak demand is a measure of the maximum electrical load being used by LLNL at a single moment in time, usually on the hottest day of the year. In 2004, the State of California projects the statewide peak demand will be 53,464 megawatts and projects a growth in peak demand of about 2.4 percent per year. LLNL's projected peak demand in 2004 would be 0.1 percent of the total State demand. There would be virtually no change in the peak demand under the Proposed Action and the Reduced Operation Alternative. Annual electric use among the No Action Alternative, Proposed Action, and Reduced Operation Alternative would be 446, 442, and 371 million kilowatt-hours, respectively. The State currently projects an adequate supply/demand balance through 2008, but has not made supply projections beyond that year. LLNL's essentially flat projection of electrical demand and usage from 2004 to 2014 reflects an ongoing commitment to energy conservation. The decrease in electricity usage from the No Action Alternative to the Proposed Action is due to a cumulative reduction of LLNL floorspace under the Proposed Action. For the same reason the Livermore Site would experience a decrease in water consumption and sewage discharges under the Proposed Action.

### 3.6.8 Materials and Waste Management

Waste generation for both routine wastes and nonroutine wastes would be higher under the Proposed Action than under the No Action Alternative or Reduced Operation Alternative, primarily due to differences in the operation of the ITP and the NIF. Routine waste is generated from the normal operation of the facility. Nonroutine waste is generated from construction, D&D, and environmental restoration. Notable differences in the amount of waste generated include routine low-level waste at 200 cubic meters per year under the No Action Alternative, 340 cubic meters per year under the Proposed Action, and 180 cubic meters per year under the Reduced Operation Alternative. Differences for routine transuranic waste are 50 cubic meters per year under the No Action Alternative, 60 cubic meters per year under the Proposed Action, and 45 cubic meters per year under the Reduced Operation Alternative.

Differences in waste generation cover all major waste categories across the No Action Alternative, Proposed Action, and Reduced Operation Alternative, with generation the highest under the Proposed Action and lowest under the Reduced Operation Alternative. These quantities are summarized in Table 3.6–1. Levels of waste generation are within the capacities for treatment, transportation, or storage either onsite or at waste repositories such as WIPP.

### 3.6.9 Human Health and Safety

The occupational (involved) worker ionizing radiation dose was 28 person-rem per year in 2002. Under the No Action Alternative, the dose would increase to 90 person-rem per year. The increase includes a worker dose of 15 person-rem per year for NIF operations and a projected increase from approximately 26 person-rem per year to 72 person-rem per year due to a higher level of operation associated with approved projects for which NEPA analysis has been completed. These projects include stockpile stewardship and the packing in the Building 332 Plutonium Facility of excess plutonium in canisters certified for a 50-year shelf life. The Proposed Action would increase occupational worker dose to ionizing radiation to approximately 125 person-rem per year, including 32 person-rem per year from the ITP and approximately 5 person-rem per year from the use of the proposed materials in the NIF. Under the Reduced Operation Alternative, worker dose to ionizing radiation would be approximately 38 person-rem per year. LCFs calculated from these exposures would be  $5.4 \times 10^{-2}$ ,  $7.5 \times 10^{-2}$ , and  $2.3 \times 10^{-2}$  per year of exposure under the No Action Alternative, Proposed Action, and Reduced Operation Alternative, respectively.

The ionizing radiation dose to the general public was 0.5 person-rem per year from the Livermore site and 2.5 person-rem per year from Site 300 in 2002. The population dose to the general public under all three alternatives would increase to 1.8 person-rem per year from the Livermore Site and 9.8 person-rem per year from Site 300. The corresponding LCFs for all three alternatives would be  $1.1 \times 10^{-3}$  from the Livermore site and  $5.9 \times 10^{-3}$  from Site 300. The dose from both sites is within the envelope of doses seen within the past 5 years.

### 3.6.10 Site Contamination

Areas of soil and groundwater contamination exist at the Livermore Site and Site 300. These are primarily the result of past waste management practices, some of which took place during the 1940s when the Livermore Site was a naval air station. Although there is no immediate or long-

term threat to human health from this contamination, there is localized degradation of groundwater. Remediation systems are currently operating to reduce the concentrations and extent of contamination. Appropriate cleanup measures implemented with the concurrence of regulators would continue regardless of the action selected.

Increased site activities under the No Action Alternative or Proposed Action could increase the likelihood of soil contamination due to increased levels of activity and corresponding increases in the potential for accidental releases. However, minimal deposition of contaminants is expected because of spill prevention and control procedures. Under the Reduced Operation Alternative, a lower likelihood of soil contamination would be expected.

### 3.6.11 Accidents

The LLNL SW/SPEIS discusses accidents for all major facilities. Appendix D has detailed information regarding potential accidents at LLNL facilities. Assessment of the impacts of aircraft crashes into LLNL facilities was not presented in the 1992 LLNL EIS/EIR. It is included in this LLNL SW/SPEIS because of advances in DOE/NNSA's methods for performing safety analyses for nuclear and radiological facilities. Potential LCFs in the offsite population for median meteorological conditions were used to identify bounding radiological accidents for nuclear material handling and waste management operations.

The bounding radiological accident for nuclear material handling under the Proposed Action is an unfiltered fire involving radioactive material in the Building 332 Plutonium Facility resulting in 0.168 LCF within the offsite population. The calculated annual frequency for this accident is  $3.9 \times 10^{-7}$ , which is less frequent than once in a million years. Under the No Action Alternative and the Reduced Operation Alternative, the bounding accident for nuclear material handling in the Building 332 Plutonium Facility is a single piston engine aircraft accident resulting in 0.058 LCF within the offsite population.

The bounding radiological accident for waste management operations is a single engine piston aircraft accident at the Building 625 Radiological and Hazardous Waste Storage Facility that would result in 1.21 LCFs within the offsite population under the Proposed Action. The number of LCFs calculated for the same accident under the No Action Alternative and the Reduced Operation Alternative is 0.397 LCF. The calculated annual frequency of an aircraft crashing into the building structure with subsequent gasoline pool fire is  $6.1 \times 10^{-7}$ , which is less frequent than once in a million years. The aircraft accident scenario evaluated at the Building 625 Radiological and Hazardous Waste Storage Facility is very conservative in that it assumes the facility is loaded to its physical limit with containers of transuranic waste loaded to their maximum curie limit. The maximum curie limit under the Proposed Action is equivalent to an array of drums where one drum contains 60 plutonium-equivalent curies and the other surrounding drums contain 12 plutonium-equivalent curies. It is planned that by the end of 2005, all legacy transuranic waste drums in Building 625 Radiological and Hazardous Waste Storage Facility would be shipped to WIPP. It is projected that waste shipments to WIPP would be completed before Building 625 Radiological and Hazardous Waste Storage Facility and other LLNL transuranic waste storage facilities are fully loaded. Therefore, the consequences discussed above are associated with what would be considered a maximum peak inventory in the Building

625 Radiological and Hazardous Waste Storage Facility that would be allowed under the facility's operational procedures but may never occur.

Bounding accident scenarios for chemical, explosive, and biological accidents are the same among the No Action Alternative, the Proposed Action, and the Reduced Operation Alternative, and are unlikely to result in fatalities to the general public.

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative**

| Site / Environmental Component                                 | Baseline (2002)                                                                                                       | No Action Alternative                                                                                                                                                                                                                                                                        | Proposed Action                                                                                                                                                                                                      | Reduced Operation Alternative     |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>Land Uses and Applicable Plans</b>                          |                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                      |                                   |
| <b>Livermore Site</b>                                          | Land uses at Livermore Site are compatible with surrounding areas and with the land use plans of local jurisdictions. | Planned and approved projects have gone through the land use compatibility process. No new land use changes or development would occur. No change to existing land uses or the approved amount of onsite development would occur. There would be no change to the total acreage of the site. | New facility construction and upgrades represent minor infill in areas of compatible land use. No major alterations in the types of land use would occur. There would be no change to the total acreage of the site. | Same as No Action Alternative     |
| <b>Site 300</b>                                                | Land uses at Site 300 are compatible with surrounding areas and with the land use plans of local jurisdictions.       | Planned and approved projects have gone through the land use compatibility process. Minor new development would occur. Existing facilities are dispersed, and they would not represent infill of land uses. The existing character of the site would remain unaltered.                       | Although there would be some development of additional land, projects and facilities would be dispersed and would not represent infill of land uses. The existing character of the site would remain unaltered.      | Same as No Action Alternative     |
| <b>Socioeconomic Characteristics and Environmental Justice</b> |                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                      |                                   |
| <b>Livermore Site and Site 300</b>                             |                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                      |                                   |
| Employment                                                     |                                                                                                                       |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                      |                                   |
| Livermore Site                                                 | 10,360 LLNL and other site workers                                                                                    | 10,650 LLNL and other site workers                                                                                                                                                                                                                                                           | 11,150 LLNL and other site workers                                                                                                                                                                                   | 9,770 LLNL and other site workers |
| Site 300                                                       | 240 LLNL employees                                                                                                    | 250 LLNL employees                                                                                                                                                                                                                                                                           | Same as No Action Alternative                                                                                                                                                                                        | 230 LLNL employees                |
| Payroll                                                        | \$668 M                                                                                                               | \$690 M                                                                                                                                                                                                                                                                                      | \$729 M                                                                                                                                                                                                              | \$635 M                           |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                                             | Baseline (2002)                                                                                  | No Action Alternative                                                | Proposed Action                                               | Reduced Operation Alternative                                 |
|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------|
| <b>Socioeconomic Characteristics and Environmental Justice (continued)</b> |                                                                                                  |                                                                      |                                                               |                                                               |
| Worker Population and Housing<br><i>Alameda County</i>                     |                                                                                                  |                                                                      |                                                               |                                                               |
| Employment                                                                 | 10,360 total LLNL employment in county                                                           | 10,650 total LLNL employment in county                               | 11,150 total LLNL employment in county                        | 9,770 total LLNL employment in county                         |
| Housing units                                                              | 5,883 housing units occupied by LLNL workers living in county                                    | 6,050 housing units occupied by LLNL workers living in county        | 6,327 housing units occupied by LLNL workers living in county | 5,550 housing units occupied by LLNL workers living in county |
| <i>San Joaquin County</i>                                                  |                                                                                                  |                                                                      |                                                               |                                                               |
| Employment                                                                 | 240 total LLNL employment in county                                                              | 250 total LLNL employment in county                                  | 250 total LLNL employment in county                           | 230 total LLNL employment in county                           |
| Housing units                                                              | 1,961 housing units occupied by LLNL workers living in county                                    | 2,017 housing units occupied by LLNL workers living in county        | 2,109 housing units occupied by LLNL workers living in county | 1,850 housing units occupied by LLNL workers living in county |
| Environmental Justice                                                      | No predominantly minority or low-income populations within 5 miles of Livermore Site or Site 300 | No disproportionately high and adverse impacts                       | Same as No Action Alternative                                 | Same as No Action Alternative                                 |
| <b>Community Services</b>                                                  |                                                                                                  |                                                                      |                                                               |                                                               |
| <b>Livermore Site</b>                                                      |                                                                                                  |                                                                      |                                                               |                                                               |
| Fire protection and emergency services                                     | Mutual assistance agreements in effect with neighboring jurisdictions                            | No additional burden on local fire protection and emergency services | Same as No Action Alternative                                 | Same as No Action Alternative                                 |
| Police and security services                                               | Mutual assistance agreements in effect with neighboring jurisdictions                            | No additional burden on local police and security services           | Same as No Action Alternative                                 | Same as No Action Alternative                                 |
| Nonhazardous solid waste disposal                                          | 4,500 metric tons/yr                                                                             | 4,600 metric tons/yr                                                 | 4,900 metric tons/yr                                          | 4,200 metric tons/yr                                          |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                                               | Baseline (2002)                                                                | No Action Alternative                                                                                         | Proposed Action               | Reduced Operation Alternative |
|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|
| <b>Community Services (continued)</b>                                        |                                                                                |                                                                                                               |                               |                               |
| <b>Site 300</b>                                                              |                                                                                |                                                                                                               |                               |                               |
| Fire protection and emergency services                                       | Mutual assistance agreements in effect with neighboring jurisdictions          | No additional burden on local fire protection and emergency services                                          | Same as No Action Alternative | Same as No Action Alternative |
| Police and security services                                                 | Mutual assistance agreements in effect with neighboring jurisdictions          | No additional burden on local police and security services                                                    | Same as No Action Alternative | Same as No Action Alternative |
| Nonhazardous solid waste disposal                                            | 200 metric tons/yr                                                             | 208 metric tons/yr                                                                                            | Same as No Action Alternative | 191 metric tons/yr            |
| <b>Livermore Site and Site 300</b>                                           |                                                                                |                                                                                                               |                               |                               |
| Workers' students enrolled in Livermore Valley Joint Unified School District | 2,090 students                                                                 | 2,150 students                                                                                                | 2,250 students                | 1,970 students                |
| <b>Prehistoric and Historic Cultural Resources</b>                           |                                                                                |                                                                                                               |                               |                               |
| <b>Livermore Site</b>                                                        |                                                                                |                                                                                                               |                               |                               |
| Prehistoric                                                                  | No resources identified                                                        | No impacts                                                                                                    | Same as No Action Alternative | Same as No Action Alternative |
| Historic                                                                     | Some buildings may be eligible for NRHP. Not all buildings have been assessed. | Potential impacts from D&D and renovation. Programmatic agreement to avoid or mitigate any potential impacts. | Same as No Action Alternative | Same as No Action Alternative |
| <b>Site 300</b>                                                              |                                                                                |                                                                                                               |                               |                               |
| Prehistoric                                                                  | Potentially significant resources identified                                   | Impacts unlikely. Areas protected under Programmatic agreement.                                               | Same as No Action Alternative | Same as No Action Alternative |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                                          | Baseline (2002)                                                                                                                                                                                                                                                                                                                 | No Action Alternative                                                                                                                                                                          | Proposed Action                                                    | Reduced Operation Alternative                                      |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|
| <b>Prehistoric and Historic Cultural Resources (continued)</b>          |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                |                                                                    |                                                                    |
| Historic                                                                | Some buildings may be eligible for NRHP. Not all buildings have been assessed.                                                                                                                                                                                                                                                  | Potential impacts from D&D and renovation. Programmatic agreement to avoid or mitigate any potential impacts.                                                                                  | Same as No Action Alternative                                      | Same as No Action Alternative                                      |
| <b>Aesthetics and Scenic Resources</b>                                  |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                |                                                                    |                                                                    |
| <b>Livermore Site</b>                                                   | Offsite views consist primarily of security fencing, buffer areas, and trees with facilities and industrial storage yards in the background. LLNL facilities dominate view on East Avenue. Light industry across north boundary, scenic roadway to the east, SNL/CA facilities to the south, and residential areas to the west. | Three facilities to be built would be visible from residential areas and scenic roadways. Short-term impacts from construction. Long-term changes in view in character with remainder of site. | Same as No Action Alternative                                      | Same as No Action Alternative                                      |
| <b>Site 300</b>                                                         | Offsite views of site structures limited to GSA building complex. Interior facilities generally hidden from public view. Tesla Road is designated a scenic route by Alameda County.                                                                                                                                             | Changes in interior hidden from public view. Changes in GSA in character of existing public view.                                                                                              | New buildings in built areas. No change to visual character.       | Same as No Action Alternative                                      |
| <b>Geology and Soils (geologic hazards are considered in Accidents)</b> |                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                |                                                                    |                                                                    |
| <b>Livermore Site</b><br>Mineral deposits and fossils<br><br>Soils      | No mineral deposits onsite. Fossils have been found at 20- to-30 foot depths.<br><br>Site is 80% developed. Undeveloped areas along west and north sides and east of central pond. Soils not used for agriculture.                                                                                                              | No mineral deposits onsite. Fossils have been found at 20- to 30-foot depths.<br><br>462,000 ft <sup>2</sup> would be disturbed by construction activities in undeveloped zones                | Same as No Action Alternative<br><br>Same as No Action Alternative | Same as No Action Alternative<br><br>Same as No Action Alternative |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component       | Baseline (2002)                                                                                                                                                                           | No Action Alternative                                                                                                                                                                                            | Proposed Action                                                                | Reduced Operation Alternative |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------|
| <b>Geology and Soils (continued)</b> |                                                                                                                                                                                           |                                                                                                                                                                                                                  |                                                                                |                               |
| <b>Site 300</b>                      |                                                                                                                                                                                           |                                                                                                                                                                                                                  |                                                                                |                               |
| Mineral deposits and fossils         | Region has potential presence of mineral deposits, fossils, and soil resources.                                                                                                           | No known geologic resource would be adversely impacted.                                                                                                                                                          | Same as No Action Alternative                                                  | Same as No Action Alternative |
| Soils                                | Soils are potentially useful for limited agriculture and grazing and wildlife.                                                                                                            | No projects would disturb soils in undeveloped areas.                                                                                                                                                            | Construction of EMPC would disturb 40,000 ft <sup>2</sup> of undeveloped area. | Same as No Action Alternative |
| <b>Biological Resources</b>          |                                                                                                                                                                                           |                                                                                                                                                                                                                  |                                                                                |                               |
| <b>Livermore Site</b>                |                                                                                                                                                                                           |                                                                                                                                                                                                                  |                                                                                |                               |
| Habitat disturbance                  | Site is 80% developed and landscaped, consisting mainly of disturbed habitat. Wildlife diversity is low. California red-legged frog (federally listed threatened species) present onsite. | 462,000 ft <sup>2</sup> would be disturbed by construction activities in undeveloped zones resulting in minor direct and indirect loss of animals and habitat. No impacts to California red-legged frog habitat. | Same as No Action Alternative                                                  | Same as No Action Alternative |
| Wetlands                             | 1.96 acres, primarily along Arroyo Las Positas, could qualify as jurisdictional wetlands.                                                                                                 | Wetlands along Arroyo Las Positas could be impacted upon termination of treated water discharge from environmental restoration program.                                                                          | Same as No Action Alternative                                                  | Same as No Action Alternative |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component          | Baseline (2002)                                                                                                                                                                                                                                                                                                                                                               | No Action Alternative                                                                                                                                                                                                                                                                                                                                                                                                                | Proposed Action                                                                | Reduced Operation Alternative |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------|
| <b>Biological Resources (continued)</b> |                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                |                               |
| <b>Site 300</b>                         |                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                |                               |
| Habitat disturbance                     | 6,800 acres of mostly undisturbed land. Site supports a diversity of wildlife species. Six federally listed endangered, threatened, proposed threatened, or candidate species present onsite: large-flowered fiddleneck, Valley elderberry longhorn beetle, California tiger salamander, California red-legged frog, Alameda whipsnake, and possibly the San Joaquin kit fox. | No previously undeveloped areas would be impacted by construction. Habitat for the California red-legged frog would be adversely affected by proposed termination of releases to breeding ground at artificial wetland at Building 865. Fire prevention program has potential to affect critical habitat for Alameda whipsnake. Stormwater runoff improvement activities could adversely affect California tiger salamander habitat. | Construction of EMPC would disturb 40,000 ft <sup>2</sup> of undeveloped area. | Same as No Action Alternative |
| Wetlands                                | 8.6 acres of wetlands, 4.4 acres of which that could qualify as jurisdictional wetlands.                                                                                                                                                                                                                                                                                      | Water releases to artificial wetlands near Buildings 801, 827, 851, and 865 would be terminated.                                                                                                                                                                                                                                                                                                                                     | Same as No Action Alternative                                                  | Same as No Action Alternative |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                        | Baseline (2002)                                                                                                                                                                                                                                                                                                           | No Action Alternative                                                                                                                                                                                                                                        | Proposed Action                                                                                                                                                                                                                                                                                                                                                                | Reduced Operation Alternative                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Air Quality</b>                                    |                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                           |
| <b>Livermore Site and Site 300</b><br>Nonradiological | Bay Area and San Joaquin air basins are in nonattainment for PM <sub>10</sub> and ozone and so these pollutants and organic precursors to ozone are strictly regulated. LLNL is in compliance with all BAAQMD regulations and has been found to have good controls on oxides of nitrogen and precursor organic compounds. | Carbon monoxide concentration would remain within 20% to 30% of ambient standards. Total projected air pollutant emissions would be a small fraction of project significance levels and threshold levels for conformity. No adverse impact to air resources. | Carbon monoxide emissions dominated by current regional traffic levels and background sources. Emissions associated with proposed projects do not differ appreciably from the No Action Alternative. Total projected air pollutant emissions would be a small fraction of project significance levels and threshold levels for conformity. No adverse impact to air resources. | Emissions associated with the proposed projects do not differ appreciably from the No Action Alternative. There would be a reduction in vehicular activity and electrical and fuel demand. Therefore, there would be a small reduction in air pollutant loading and a net positive impact on air quality. |
| <b>Livermore Site</b><br>Radiological                 | The MEI is located at the UNCLE Credit Union outside the eastern perimeter of site. The MEI dose is 0.023 mrem/yr. The population dose is 0.50 person-rem/yr.                                                                                                                                                             | The MEI location would be due east of the NIF stack because of NIF emissions. The MEI dose would be 0.1 mrem/yr. The population dose would be 1.8 person-rem/yr.                                                                                             | The MEI location would be the same as the No Action Alternative. The MEI dose would be 0.13 mrem/yr. The population dose would be 1.8 person-rem/yr.                                                                                                                                                                                                                           | The MEI location would be the same as the No Action Alternative. The MEI dose would be 0.09 mrem/yr. The population dose would be 1.8 person-rem/yr.                                                                                                                                                      |
| <b>Site 300</b><br>Radiological                       | The MEI is located on the south central boundary bordering the Carnegie State Vehicular Recreation Area. The MEI dose is 0.021 mrem/yr. The population dose is 2.5 person-rem/yr.                                                                                                                                         | The MEI would be west-southwest of Firing Table 851. The MEI dose would be 0.055 mrem/yr. The population dose would be 9.8 person-rem/yr.                                                                                                                    | Same as No Action Alternative                                                                                                                                                                                                                                                                                                                                                  | The MEI location would be the same as No Action. The MEI dose would be 0.054 mrem/yr. The population dose would be 9.8 person-rem/yr.                                                                                                                                                                     |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component         | Baseline (2002)                                                                                                    | No Action Alternative                                                                                                            | Proposed Action               | Reduced Operation Alternative |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|
| <b>Water</b>                           |                                                                                                                    |                                                                                                                                  |                               |                               |
| <b>Livermore Site</b><br>Surface water | Discharges within NPDES requirements. Ongoing spill prevention, stormwater runoff, and erosion control management. | Surface water discharges within NPDES requirements. Ongoing spill prevention, stormwater runoff, and erosion control management. | Same as No Action Alternative | Same as No Action Alternative |
| Floodplains                            | 100-year and 500-year floodplains near Arroyo Las Positas and Arroyo Seco                                          | No new facilities in either 100-year or 500-year floodplain.                                                                     | Same as No Action Alternative | Same as No Action Alternative |
| Groundwater                            | Groundwater contamination above drinking water standards. Remediation ongoing.                                     | Contaminants above drinking water standards. Would continue to be remediated.                                                    | Same as No Action Alternative | Same as No Action Alternative |
| <b>Site 300</b><br>Groundwater supply  | Water supplied by onsite wells.                                                                                    | Planned to link to Hetch Hetchy system.                                                                                          | Same as No Action Alternative | Same as No Action Alternative |
| Surface water                          | Ongoing spill prevention, stormwater runoff, and erosion control management. Discharges within NPDES requirements. | Ongoing spill prevention, stormwater runoff, and erosion control management.                                                     | Same as No Action Alternative | Same as No Action Alternative |
| Floodplains                            | 100-year floodplain extends onsite.                                                                                | No activities within floodplain.                                                                                                 | Same as No Action Alternative | Same as No Action Alternative |
| Groundwater                            | Groundwater contamination above drinking water standards. Remediation ongoing.                                     | Contaminants above drinking water standards. Continues to be remediated. Discharges within NPDES requirements.                   | Same as No Action Alternative | Same as No Action Alternative |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                                    | Baseline (2002)                                                                                                                                     | No Action Alternative                                                                                                                                                                                                                        | Proposed Action                                                                                                                                                                      | Reduced Operation Alternative                                                                                                                                                                                                |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Noise</b>                                                      |                                                                                                                                                     |                                                                                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                                                              |
| <b>Livermore Site and Site 300</b>                                |                                                                                                                                                     |                                                                                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                                                              |
| Construction                                                      | Ongoing short-term noise due to construction.                                                                                                       | Ongoing short-term noise due to construction. Noise from near – fence line projects as high as 82 dB(A).                                                                                                                                     | Same as No Action Alternative                                                                                                                                                        | Same as No Action Alternative                                                                                                                                                                                                |
| Operations                                                        | Normal operations long-term noise not noticeable beyond fence line. Administrative limit for impulse noise of 126 dB. Highest recorded was 99.3 dB. | Normal operations long-term noise not noticeable beyond fence line.                                                                                                                                                                          | Same as No Action Alternative                                                                                                                                                        | Same as No Action Alternative                                                                                                                                                                                                |
| Traffic                                                           | Peak one hour daytime L <sub>eq</sub> (dBA) along roadways surrounding site is 60 to 75 L <sub>eq</sub> (dBA).                                      | Transportation vehicle noise levels 81 to 87 dB(A).                                                                                                                                                                                          | Same as No Action Alternative                                                                                                                                                        | Same as No Action Alternative                                                                                                                                                                                                |
| <b>Traffic and Transportation</b>                                 |                                                                                                                                                     |                                                                                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                                                              |
| <b>Livermore Site</b><br>Traffic in vicinity of site              | Heavy traffic in vicinity of site. Site-related commuter traffic of 22,000 total vehicle trips/day.                                                 | Slight increase in employment under No Action would have negligible impact to commuter traffic (22,600 total vehicle trips/day). Fewer construction projects would result in smaller temporary increases in commuter traffic and deliveries. | Employment would increase amount of commuter traffic (23,700 total vehicle trips/day). Construction projects would result in temporary increases in commuter traffic and deliveries. | Slight decrease in employment would have small beneficial impact to commuter traffic (21,000 total vehicle trips/day). Few construction projects would result in small temporary impacts to commuter traffic and deliveries. |
| Material (annual shipments radioactive, chemical, and explosives) | 470                                                                                                                                                 | 540                                                                                                                                                                                                                                          | 600                                                                                                                                                                                  | 550                                                                                                                                                                                                                          |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                               | Baseline (2002)                                                                      | No Action Alternative                                                              | Proposed Action                                                                                                                                                                                | Reduced Operation Alternative                                                                                           |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Traffic and Transportation (continued)</b>                |                                                                                      |                                                                                    |                                                                                                                                                                                                |                                                                                                                         |
| Waste (includes hazardous and radioactive, annual shipments) | 88                                                                                   | 240                                                                                | 310                                                                                                                                                                                            | 200                                                                                                                     |
| Sanitary waste (maximum annual shipments)                    | 518                                                                                  | 534                                                                                | 570                                                                                                                                                                                            | 492                                                                                                                     |
| TRU legacy waste shipments (total)                           | 0                                                                                    | 24                                                                                 | Same as No Action Alternative                                                                                                                                                                  | Same as No Action Alternative                                                                                           |
| LLW legacy waste shipment (total)                            | 1                                                                                    | 64                                                                                 | Same as No Action Alternative                                                                                                                                                                  | Same as No Action Alternative                                                                                           |
| MLLW legacy waste shipment (total)                           | 1                                                                                    | 80                                                                                 | Same as No Action Alternative                                                                                                                                                                  | Same as No Action Alternative                                                                                           |
| LBNL TRU shipment (one time)                                 | 0                                                                                    | 0                                                                                  | 1                                                                                                                                                                                              | Same as No Action Alternative                                                                                           |
| Mixed TSCA waste shipments                                   | 1                                                                                    | 13                                                                                 | Same as No Action Alternative                                                                                                                                                                  | Same as No Action Alternative                                                                                           |
| Dose to public                                               | Collective dose would be 1.5 person-rem/yr with the risk of $9 \times 10^{-4}$ LCFs. | Collective dose would be 5.9 person-rem/yr with a risk of $4 \times 10^{-3}$ LCFs. | Collective dose would be 6.2 person-rem/yr with a risk of $4 \times 10^{-3}$ LCFs.                                                                                                             | Collective dose would be 1.9 person-rem/yr with a risk of $1 \times 10^{-3}$ LCFs.                                      |
| <b>Site 300</b><br>Traffic in vicinity of site               | Site is in a rural location with low traffic volumes.                                | No substantial changes in traffic or transportation.                               | No change in workforce commuting. Construction projects would result in temporary increases in commuter traffic and deliveries. Transportation of explosive materials would increase slightly. | Slight decrease in workforce commuting. No construction projects. Transportation of explosive materials would decrease. |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                | Baseline (2002)             | No Action Alternative     | Proposed Action               | Reduced Operation Alternative |
|-----------------------------------------------|-----------------------------|---------------------------|-------------------------------|-------------------------------|
| <b>Utilities and Energy</b>                   |                             |                           |                               |                               |
| <b>Livermore Site</b>                         |                             |                           |                               |                               |
| Water                                         |                             |                           |                               |                               |
| Capacity                                      | 2.88 M gal/day              | 2.88 M gal/day            | Same as No Action Alternative | Same as No Action Alternative |
| Use                                           | 212 M gal/yr                | 276 M gal/yr              | 273 M gal/yr                  | 230 M gal/yr                  |
| Sewer discharge                               | 216,400 gal/day             | 224,000 gal/day           | 222,000 gal/day               | Same as No Action Alternative |
| Electricity use                               |                             |                           |                               |                               |
| Peak demand                                   | 57 MW                       | 82 MW                     | 82 MW                         | 82 MW                         |
| Annual                                        | 321 M kWh                   | 446 M kWh                 | 442 M kWh                     | 371 M kWh                     |
| Fuel (natural gas) use                        | 12,900 therms/day           | 23,600 therms/day         | 23,000 therms/day             | 22,600 therms/day             |
| <b>Site 300</b>                               |                             |                           |                               |                               |
| Water                                         |                             |                           |                               |                               |
| Capacity                                      | 930,000 gal/day             | 648,000 gal/day           | Same as No Action Alternative | Same as No Action Alternative |
| Use                                           | 67,900 gal/day <sup>a</sup> | 67,900 gal/day            | Same as No Action Alternative | Same as No Action Alternative |
| Sewer discharge                               | 2,100 gal/day <sup>a</sup>  | 2,100 gal/day             | Same as No Action Alternative | Same as No Action Alternative |
| Electricity use                               | 16.3 M kWh/yr <sup>a</sup>  | 16.3 M kWh/yr             | Same as No Action Alternative | Same as No Action Alternative |
| Fuel (fuel oil) use                           | 16,600 gal/yr <sup>a</sup>  | 16,600 gal/yr             | Same as No Action Alternative | Same as No Action Alternative |
| <b>Materials and Waste Management</b>         |                             |                           |                               |                               |
| <b>Livermore Site and Site 300</b>            |                             |                           |                               |                               |
| Waste storage facility modifications          | NA                          | Within existing footprint | Same as No Action Alternative | Same as No Action Alternative |
| Class 1 permit modifications (total requests) | NA                          | 75                        | 100                           | 50                            |
| Class 2 permit modifications (total requests) | NA                          | 10                        | 20                            | 0                             |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                    | Baseline (2002)                        |                                 | No Action Alternative      |                               | Proposed Action               |                               | Reduced Operation Alternative |                               |
|---------------------------------------------------|----------------------------------------|---------------------------------|----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <b>Materials and Waste Management (continued)</b> |                                        |                                 |                            |                               |                               |                               |                               |                               |
| Class 3 permit modifications (total number)       | NA                                     |                                 | 0                          |                               | 2                             |                               | Same as No Action Alternative |                               |
| RCRA closures                                     | NA                                     |                                 | 4 closures                 |                               | Same as No Action Alternative |                               | Same as No Action Alternative |                               |
| <b>Waste Generation by Type</b>                   | <b>Routine<sup>b,g</sup></b>           | <b>Nonroutine<sup>b,g</sup></b> | <b>Routine<sup>g</sup></b> | <b>Nonroutine<sup>g</sup></b> | <b>Routine<sup>g</sup></b>    | <b>Nonroutine<sup>g</sup></b> | <b>Routine<sup>g</sup></b>    | <b>Nonroutine<sup>g</sup></b> |
| LLW                                               | 170 m <sup>3</sup> /yr                 | 480 m <sup>3</sup> /yr          | 200 m <sup>3</sup> /yr     | 630 m <sup>3</sup> /yr        | 340 m <sup>3</sup> /yr        | 710 m <sup>3</sup> /yr        | 180 m <sup>3</sup> /yr        | 550 m <sup>3</sup> /yr        |
| MLLW                                              | 67 m <sup>3</sup> /yr                  | 44 m <sup>3</sup> /yr           | 61 m <sup>3</sup> /yr      | 72 m <sup>3</sup> /yr         | 88 m <sup>3</sup> /yr         | 81 m <sup>3</sup> /yr         | 42 m <sup>3</sup> /yr         | 63 m <sup>3</sup> /yr         |
| TRU                                               | 35 m <sup>3</sup> /yr                  | 4.2 m <sup>3</sup> /yr          | 50 m <sup>3</sup> /yr      | 55 m <sup>3</sup> /yr         | 60 m <sup>3</sup> /yr         | 10 m <sup>3</sup> /yr         | 45 m <sup>3</sup> /yr         | 5 m <sup>3</sup> /yr          |
| Mixed TRU                                         | 2.6 m <sup>3</sup> /yr                 | 0 m <sup>3</sup> /yr            | 1.7 m <sup>3</sup> /yr     | 0 m <sup>3</sup> /yr          | 2.8 m <sup>3</sup> /yr        | 0 m <sup>3</sup> /yr          | 0.7 m <sup>3</sup> /yr        | 0 m <sup>3</sup> /yr          |
| Total hazardous                                   | 440 metric tons/yr                     | 880 metric tons/yr              | 390 metric tons/yr         | 1,500 metric tons/yr          | 510 metric tons/yr            | 1,700 metric tons/yr          | 300 metric tons/yr            | 1,300 metric tons/yr          |
| Sanitary solid                                    | 4,700 metric tons/yr                   | Included in routine             | 4,800 metric tons/yr       | Included in routine           | 5,100 metric tons/yr          | Included in routine           | 4,400 metric tons/yr          | Included in routine           |
| Wastewater                                        | 300,000 gal/day                        | Included in routine             | 310,000 gal/day            | Included in routine           | 330,000 gal/day               | Included in routine           | 290,000 gal/day               | Included in routine           |
| <b>Human Health and Safety</b>                    |                                        |                                 |                            |                               |                               |                               |                               |                               |
| <b>Receptor</b>                                   | <b>Annual Dose</b>                     | <b>Annual LCFs</b>              | <b>Annual Dose</b>         | <b>Annual LCFs</b>            | <b>Annual Dose</b>            | <b>Annual LCFs</b>            | <b>Annual Dose</b>            | <b>Annual LCFs</b>            |
| <b>Livermore Site</b>                             |                                        |                                 |                            |                               |                               |                               |                               |                               |
| MEI                                               | 0.023 mrem                             | 1.4 × 10 <sup>-8</sup>          | 0.30 mrem                  | 1.8 × 10 <sup>-7</sup>        | 0.33 mrem                     | 2.0 × 10 <sup>-7</sup>        | 0.22 mrem                     | 1.3 × 10 <sup>-7</sup>        |
| Population <sup>d</sup>                           | 0.5 person-rem                         | 3.0 × 10 <sup>-4</sup>          | 1.8 person-rem             | 1.1 × 10 <sup>-3</sup>        | Same as No Action Alternative |                               | Same as No Action Alternative |                               |
| Involved-worker population <sup>df</sup>          | 28 person-rem                          | 1.7 × 10 <sup>-2</sup>          | 90 person-rem              | 5.4 × 10 <sup>-2</sup>        | 125 person-rem                | 7.5 × 10 <sup>-2</sup>        | 38 person-rem                 | 2.3 × 10 <sup>-2</sup>        |
| Noninvolved worker population <sup>d</sup>        | Included in involved worker population |                                 | 0.14 person-rem            | 8.9 × 10 <sup>-5</sup>        | 0.16 person-rem               | 9.6 × 10 <sup>-5</sup>        | 0.14 person-rem               | 8.2 × 10 <sup>-5</sup>        |
| <b>Site 300</b>                                   |                                        |                                 |                            |                               |                               |                               |                               |                               |
| MEI                                               | 0.021 mrem                             | 1.3 × 10 <sup>-8</sup>          | 0.055 mrem                 | 3.3 × 10 <sup>-8</sup>        | Same as No Action Alternative |                               | 0.054 mrem                    | 3.3 × 10 <sup>-8</sup>        |
| Population                                        | 2.5 person-rem                         | 1.5 × 10 <sup>-3</sup>          | 9.8 person-rem             | 5.9 × 10 <sup>-3</sup>        | Same as No Action Alternative |                               | Same as No Action Alternative |                               |
| Involved-worker population                        | See footnote F.                        |                                 | 90 person-rem              | 5.4 × 10 <sup>-2</sup>        | 125 person-rem                | 7.5 × 10 <sup>-2</sup>        | 38 person-rem                 | 2.3 × 10 <sup>-2</sup>        |
| Noninvolved worker population                     | Included in involved worker population |                                 | 0.005 person-rem           | 2.8 × 10 <sup>-6</sup>        | Same as No Action Alternative |                               | Same as No Action Alternative |                               |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                                                                                 | Baseline (2002)                                                                                                                                                                                             |             | No Action Alternative                                                                                                                                                                                                                                                  |                                 | Proposed Action               |                                 | Reduced Operation Alternative                                                                                                                                                                                                                                          |             |
|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Site Contamination</b>                                                                                      |                                                                                                                                                                                                             |             |                                                                                                                                                                                                                                                                        |                                 |                               |                                 |                                                                                                                                                                                                                                                                        |             |
| Livermore Site and Site 300                                                                                    | Continued possibility of soil contamination from ongoing activities. Minimal deposition of contaminants expected due to precautions and quick response procedures. Continued removal of known contaminants. |             | Increased likelihood of soil contamination due to increase in activities and increased potential for accidents and releases. Minimal deposition of contaminants is expected due to precautions and quick response procedures. Continued removal of known contaminants. |                                 | Same as No Action Alternative |                                 | Decreased likelihood of soil contamination due to decrease in activities and decreased potential for accidents and releases. Minimal deposition of contaminants is expected due to precautions and quick response procedures. Continued removal of known contaminants. |             |
| <b>Accidents</b>                                                                                               |                                                                                                                                                                                                             |             |                                                                                                                                                                                                                                                                        |                                 |                               |                                 |                                                                                                                                                                                                                                                                        |             |
| Bounding Radiological Accidents                                                                                | <b>Dose</b>                                                                                                                                                                                                 | <b>LCFs</b> | <b>Dose</b>                                                                                                                                                                                                                                                            | <b>LCFs</b>                     | <b>Dose</b>                   | <b>LCFs</b>                     | <b>Dose</b>                                                                                                                                                                                                                                                            | <b>LCFs</b> |
| Materials Handling Accident, Offsite Population (Building 332 Plutonium Facility)                              | Same as No Action Alternative                                                                                                                                                                               |             | 97 person rem                                                                                                                                                                                                                                                          | $5.82 \times 10^{-2} \text{ h}$ | 280 person rem                | $1.68 \times 10^{-1} \text{ h}$ | Same as No Action Alternative                                                                                                                                                                                                                                          |             |
| Waste Management Accident, Offsite Population (Building 625 Radiological and Hazardous Waste Storage Facility) | Same as No Action Alternative                                                                                                                                                                               |             | 662 person rem                                                                                                                                                                                                                                                         | 0.397                           | 2,020 person-rem              | 1.21                            | Same as No Action Alternative                                                                                                                                                                                                                                          |             |

**TABLE 3.6–1.—Comparison of Environmental Impacts and Parameters Among Baseline, No Action Alternative, Proposed Action, and Reduced Operation Alternative (continued)**

| Site / Environmental Component                                                                 | Baseline (2002)               | No Action Alternative                                                                                         | Proposed Action               | Reduced Operation Alternative |
|------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|
| <b>Accidents (continued)</b>                                                                   |                               |                                                                                                               |                               |                               |
| Bounding Chemical Accident (Building 332 Plutonium Facility – Chlorine release)                | Same as No Action Alternative | ERPG-2 level would extend 600 meters beyond site boundary.                                                    | Same as No Action Alternative | Same as No Action Alternative |
| Bounding Explosive Accident (Building 801, Contained Firing Facility or Open Air Firing Table) | Same as No Action Alternative | Up to 20 worker fatalities.                                                                                   | Same as No Action Alternative | Same as No Action Alternative |
| Bounding Biological Accident (Building 368, BioSafety Level 3 Facility)                        | Same as No Action Alternative | Population—no credible hazard<br>Noninvolved worker—no credible hazard<br>Involved worker—1 potential illness | Same as No Action Alternative | Same as No Action Alternative |

<sup>a</sup> average from 1998 through 2002

<sup>b</sup> based on average quantities since 1992 and one standard deviation

<sup>c</sup> based on 1999 measurements

<sup>d</sup> includes both Livermore Site and Site 300

<sup>e</sup> based on median meteorology

<sup>f</sup> Total LLNL involved worker population (Livermore Site and Site 300)

<sup>g</sup> Routine waste is generated from the normal operation of the facility. Nonroutine waste is generated from construction, decontamination and decommissioning, and environmental restoration.

<sup>h</sup> Increased number of latent cancer fatalities.

BAAQMD = Bay Area Air Quality Management District; D&D = decontamination and decommissioning; dB = decibel; dBA = A-weighted decibel; EMPC = Energetic Material Processing Center; ft<sup>2</sup> = square feet; gal/day = gallons per day; gal/yr = gallons per year; GSA = General Services Area; kWh/yr = kilowatt hours per year; LBNL = Lawrence Berkeley National Laboratory; LCF = latent cancer fatality; Leq = equivalent continuous sound level; LLNL = Lawrence Livermore National Laboratory; LLW = low-level waste; MLLW = mixed low-level waste; M = million; m<sup>3</sup>/yr = cubic meters per year; MEI = maximally exposed individual; MW = megawatts; mrem/yr = millirems per year; NA = not applicable; NIF = National Ignition Facility; NPDES = National Pollution Discharge Elimination System; NRHP = National Register of Historic Places; PM<sub>10</sub> = particulate matter smaller than 10 microns in diameter; RCRA = *Resource Conservation and Recovery Act*; SNL/CA = Sandia National Laboratories/California; TRU = transuranic; therm = a unit of heat equal to 100,000 British thermal units; TSCA = *Toxic Substances Control Act*.