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Final Environmental Impact Statement for the

Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory

VOLUME 2

Appendices A through K

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Title: Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory (TA-18 Relocation EIS)

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***Abstract*:** The National Nuclear Security Administration, a separately organized agency within DOE, is responsible for providing the Nation with nuclear weapons, ensuring the safety and reliability of those nuclear weapons, and supporting programs that reduce global nuclear proliferation. These missions are accomplished with a core team of highly trained nuclear experts. One of the major training facilities for these personnel is located at Technical Area 18 (TA-18), within the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico. Principal TA-18 operational activities involve research in and the design, development, construction, and application of experiments on nuclear criticality.

Though TA-18 is judged to be secure by DOE's independent inspection office, its buildings and infrastructure are from 30 to more than 50 years old and are increasingly expensive to maintain and operate. Additionally, the TA-18 operations are located in a relatively isolated area, resulting in increasingly high costs to maintain a security Category I infrastructure. NNSA wishes to maintain the important capabilities currently provided at TA-18 in a manner that reduces the long-term costs for safeguards and security. NNSA proposes to accomplish this by relocating the TA-18 security Category I/II capabilities and materials to new locations.

The *TA-18 Relocation EIS* evaluates the potential direct, indirect, and cumulative environmental impacts associated with this proposed action at the following DOE sites: (1) a different site at LANL at Los Alamos, New Mexico; (2) the Sandia National Laboratories/New Mexico at Albuquerque, New Mexico; (3) the Nevada Test Site near Las Vegas, Nevada (the Preferred Alternative); and (4) the Argonne National Laboratory-West near Idaho Falls, Idaho. The EIS also analyzes the alternatives of upgrading the existing TA-18 facilities and the No Action Alternative of maintaining the operations at the current TA-18 location.

Public Comments: The draft EIS was issued for public review and comment on August 17, 2001. The public comment period was scheduled to end on October 5, 2001, but due to the events of September 11, 2001 the comment period was extended to October 26, 2001. Public hearings to solicit comments on the draft EIS were held in Idaho, Nevada and New Mexico. All comments were considered during the preparation of the final EIS, which also incorporates additional and new information received since the issuance of the draft EIS. In response to comments on the *TA-18 Relocation Draft EIS*, the final EIS contains revisions and new information. These revisions and new information are indicated by a double underline for minor word changes or by a sidebar in the margin for sentence or larger additions. Appendix J contains the comments received during the public review period of the *TA-18 Relocation Draft EIS* and DOE's responses to these comments. DOE will use the analyses presented in this final EIS as well as other information in preparing the Record of Decision for the proposed relocation of TA-18 capabilities and materials at the Los Alamos National Laboratory. DOE will issue this Record of Decision no sooner than 30 days after the U.S. Environmental Protection Agency publishes a notice of availability of this final EIS in the *Federal Register*.

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Acronyms, Abbreviations, and Conversion Charts

TA-18

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ANL-W	Argonne National Laboratory-West
BEIR	Biological Effects of Ionizing Radiation
CASA	Critical Assembly Storage Area
CAV	critical assembly vessel
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
DAF	Device Assembly Facility
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EA	environmental analysis
EBR-II	Experimental Breeder Reactor-II
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
FMF	Fuel Manufacturing Facility
FR	*Federal Register*
FY	fiscal year
GPEB	general-purpose experimental building
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
KAFB	Kirtland Air Force Base
LACEF	Los Alamos Critical Experiments Facility
LANL	Los Alamos National Laboratory
MESA	Microsystems and Engineering Sciences Applications
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMAC	New Mexico Administrative Code
NMSF	Nuclear Material Storage Facility
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
OSHA	Occupational Safety and Health Administration
PEIS	programmatic environmental impact statement
PIDAS	Perimeter Intrusion Detection and Assessment System
PM_n	particulate matter less than or equal to *n* microns in aerodynamic diameter
RCRA	Resource Conservation and Recovery Act
SARP	Safety Analysis Report for Packaging
SEA	special environmental analysis
SHEBA	Solution High-Energy Burst Assembly
SNL/NM	Sandia National Laboratories/New Mexico
SNM	special nuclear material(s)
START	Strategic Arms Reduction Treaty

SWEIS	sitewide environmental impact statement
TA	technical area
TA-18	Technical Area 18
TREAT	Transient Reactor Test Facility
USFWS	United States Fish and Wildlife Service
U.S.C.	*United States Code*
ZPPR	Zero Power Physics Reactor

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1[a]	Parts/million	Parts/million	1[a]	Milligrams/liter
Micrograms/liter	1[a]	Parts/billion	Parts/billion	1[a]	Micrograms/liter
Micrograms/cubic meter	1[a]	Parts/trillion	Parts/trillion	1[a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,025.6	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Temperature					
Absolute					
Degrees C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.78533	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons (short)	Tons (short)	907.18	Kilograms
Metric tons	1.1023	Tons (short)	Tons (short)	0.90718	Metric tons
ENGLISH TO ENGLISH					
Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

a. This conversion is only valid for concentrations of contaminants (or other materials) in water.

METRIC PREFIXES

Prefix	Symbol	Multiplication factor
exa-	E	1,000,000,000,000,000,000 = 10^{18}
peta-	P	1,000,000,000,000,000 = 10^{15}
tera-	T	1,000,000,000,000 = 10^{12}
giga-	G	1,000,000,000 = 10^{9}
mega-	M	1,000,000 = 10^{6}
kilo-	k	1,000 = 10^{3}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	µ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}

Appendix A

Critical Assembly Descriptions

APPENDIX A
CRITICAL ASSEMBLY DESCRIPTIONS

This appendix provides a brief description of Technical Area (TA)-18 critical assembly machines and their characteristics. Descriptions of the critical assembly machines are limited to those that are currently operating and would be relocated under the TA-18 relocation alternatives.

A.1 CRITICAL ASSEMBLY MACHINES

The critical assemblies, or assembly machines, at TA-18 have been in existence since 1946 (DOE 2001). Since then, many thousands of criticality measurements have been made on assemblies of fissile material (uranium-235, uranium-233, and plutonium-239) in various configurations, including the nitrate, sulfate, fluoride, carbide, and oxide chemical compositions and the solid, liquid, and gaseous states. At present, the complex consists of five operating machines that include roughly five types of assemblies:

- Benchmark critical assemblies (Flattop)
- Assembly machines used to remotely assemble critical experiments (Comet and Planet)
- Solution assemblies in which the fuel is a fissile solution (Solution High-Energy Burst Assembly [SHEBA])
- Prototype reactor assemblies that operate at low power without the need for heat-rejection systems
- Fast-burst assemblies for producing fast neutron pulses (Godiva)

The critical assemblies at TA-18 are a unique category of nuclear research reactors. The critical assemblies, are clearly classified as Category B research reactors in U.S. Department of Energy (DOE) Order 5480.30, yet they share little in common with most permanently configured research reactors. Some of the fundamental differences are (LANL 1998, DOE 2001):

- Critical assemblies are designed to operate at low average power (milliwatts to a few kilowatts) for short periods of time. They do not require coolant systems, which reduces the overall complexity of the assemblies.

- Critical assemblies include machines designated as fast burst reactors, (i.e., Godiva). These reactors normally operate in a pulse mode at a very high peak power, with total pulse widths on the order of 100 microseconds leading to a total energy yield per pulse of about ~1 megajoule. Each pulse operation is initiated from room temperature. Thus, these reactors share a low-energy release-rate behavior compared with the traditional critical assemblies.

- Because they operate at low average power for short periods, they do not build up a significant radiological inventory of long-lived fission products. The majority of the fission products remain within the fuel material and decay to stable isotopes. This eliminates problems with decay heat and makes the critical assemblies "walk-away" safe after a safe shutdown. Furthermore, most of the assemblies can be accessed shortly after operating with relatively minor radiation protection requirements.

As a result of these three differences, there is no need for engineered safeguards such as decay heat removal systems, emergency core coolant systems, engineered containment structures, etc. A simple confinement building to mitigate the consequences of design basis accidents is all that is needed.

The critical assemblies at TA-18 are experimental systems that are designed and reconfigured for the needs of an experimental program. Two generic classes of machines are used:

- Permanently configured assemblies with fuel and control elements mounted on the machine (Flattop, Godiva, and SHEBA)

- Critical experiment remote assembly machines that serve as stable platforms for assembling fuel components and control elements for remote operation (Comet and Planet)

Since this discussion of the operation and controls of critical assemblies uses various technical terms relevant to criticality safety, a brief discussion of the technical concepts and terms is provided below.

A critical assembly is a system of fissile material with or without a reflector (beryllium, copper, iron, etc.) in a specific shape and geometry. The critical assembly can be gradually built up by adding additional fissile material and/or reflector until this system achieves the dimensions necessary for sustaining a constant rate of fission in a chain reaction (a nuclear reaction), known as critical condition. The minimum quantity of fissile material capable of sustaining such a reaction is called the critical mass for that assembly. Critical mass is a function of the purity of the fissile material, as well as the geometry, or the shape, of the assembly.

A nuclear fission is a nuclear reaction in which an atom of fissile material absorbs a neutron causing it to split into two smaller atoms while releasing energy and a few neutrons. The neutrons which are released from the fission reaction are called fast neutrons because of their high energy and velocity. The probability that a fissile isotope's atom can absorb a neutron and fission is much higher if the neutron has a lower energy and velocity. Therefore, systems which are designed to optimize the fission process and sustain criticality (e.g., in a nuclear reactor) include a material called a moderator. A moderator is one or more elements with a relatively low atomic weight, such as hydrogen (water), carbon, and beryllium, which are effective at slowing down the fast neutrons emitted from the fission process. When most fast-fission neutrons collide with moderator atoms, these neutrons lose some of their energy and velocity by transferring this energy to the moderator atom. This process is similar to that of a billiard ball striking one or more other billiard balls after which the striking billiard ball has slowed down.

Critical systems use a reflector outside the fissile isotope. Neutrons produced from fission escape or leak out of the fissile isotope. These lost neutrons cannot contribute to maintaining fission reactions. A reflector is a material which returns many of these escaping neutrons back to the fissile material. Typical reflectors include steel, aluminum, beryllium, copper, and natural uranium.

When the fission chain reaction produces enough neutrons to initiate additional fissions so that this reaction becomes self-sustaining, a condition called criticality is achieved and such a system is critical. The ratio of the neutrons produced in one generation to the neutrons produced in the previous generation is called the neutron multiplication factor, or K_{eff}. For the critical system, the multiplication factor is equal to 1. If the multiplication factor of a system is less than 1, the system is called subcritical, i.e., the fission chain converges (decreases with time) and eventually ends. Conversely, if the multiplication factor is greater than 1, the system is called supercritical, i.e., the fission chain diverges (increases continuously).

Two categories of neutrons are produced from the nuclear fission process: prompt and delayed. Prompt neutrons are emitted instantaneously with the fission event and have a typical lifetime of about 0.00001 seconds. Delayed neutrons are emitted by fission products over a time period of up to approximately one minute after the fissions have occurred. Prompt neutrons constitute over 99 percent of all fission neutrons while delayed neutrons account for approximately 0.2 to 0.7 percent of all fission neutrons depending on which fissile isotope is present. For uranium-235, the delayed neutron fraction is about 0.007, and for plutonium-239 it is about 0.002. A system of fissile material can achieve a critical state using just the prompt neutrons or both the prompt and delayed neutrons. These two conditions are called prompt critical and delayed critical, respectively. On a similar basis, a fissile material system can become prompt supercritical or delayed supercritical. An important difference between these two conditions is that the longer lifetime of delayed neutrons allows a delayed supercritical system to be controlled much more easily than a prompt supercritical system. Typically, a delayed supercritical system increases fission over a time period that allows the mechanical movement of components either to control it or to shut down the fission process. A prompt supercritical system's fission rate increases too rapidly for mechanical movements to be effective. Instead, the system relies on inherent natural behavior such as fissile material temperature rise to reduce the multiplication factor below 1.

The fractional change in the neutron multiplication factor from one neutron generation to the next is known as reactivity. Reactivity is defined by the following expression: $\rho = 1 - 1/K_{eff}$. Reactivity is stated either in terms of percent change in multiplication factor as $\Delta K/K$, or in units of dollars ($) and cents (¢). A dollar reactivity is equal to the delayed neutron fraction—the fraction of all neutrons produced during nuclear fission that is delayed by up to about one minute after the fission occurs. The reactivity cent is one hundredth of a reactivity dollar. The addition of negative reactivity to a critical system results in a subcritical condition. The addition of positive reactivity to a critical system results in a supercritical condition. When a system has a reactivity of exactly one dollar, the system is called prompt-critical. The addition of sufficient positive reactivity to a subcritical system can result in a critical condition. Reactivity can be determined by measuring the change in neutron emission rate over time from an array of fissile material(s).

A fissile material system's multiplication factor can be determined by measuring its neutron generation. This is accomplished by placing a known neutron source inside the fissile material system and measuring the rate of neutrons emanating from the outside surface of the system. The increase in the number of neutrons, called the multiplication factor or M, compared to the number of neutrons emitted by the source can be converted into the system's multiplication factor, K_{eff}, by the formula:

$$K_{eff} = 1 - 1/M$$

Thus a system with a neutron multiplication of 100 indicates that its K_{eff}=0.99, (1-1/100).

A.1.1 Flattop

Flattop is located in Building 32 (CASA 2) at TA-18. The Flattop assembly has interchangeable spherical cores of highly enriched uranium [93 percent enriched in uranium-235, denoted as U(93)] metal or plutonium-239 metal, surrounded (during remote operation) by a reflector of thick natural (normal) uranium metal. The reflector is subdivided into a stationary hemisphere, into which the core is recessed, and two movable quadrants. Three natural uranium control rods, one large and two small, enter the stationary hemisphere from below. The large control rod is worth from $1.1 for a uranium-235 core to $1.6 for a plutonium-239 core, and the two small control rods are worth $0.26 for a uranium-235 core to $0.4 for a plutonium-239 core. Upon shutdown, also called scram, both quadrants of the reflector retract rapidly to the normal "disassembled" condition. Flattop is used for fundamental reactor physics studies and, by irradiation in the known neutron spectra, to provide samples for radiochemical research. **Figure A–1** and **Figure A–2** show the general structure of Flattop. Flattop is approximately 2.4 × 1.8 × 1.5 meters (8 × 6 × 5 feet) in size and operates at a low average power without the need for external cooling.

Figure A–1 Flattop Benchmark Assembly

Figure A–2 shows a schematic of a typical Flattop assembly. It consists of a core (a sphere) of fissile material at the center of a sphere of a natural uranium reflector (made out of three blocks). The core is supported on its own natural uranium pedestal, which is mounted on a keyed track with manual control for positioning the assembled core in the stationary hemisphere of a natural uranium reflector. Closure of the movable reflector quarter spheres (quadrants), known as safety block A and B, and insertion of the control rods are done remotely from the control room. The scram action (shutdown mechanism) causes the quarter-sphere safety blocks to disassemble and retract at a graded rate. The initial separation, in the first centimeter (0.4 inches), provides a reactivity withdrawal of $2.3 per block. Then the rate at which the safety blocks separate would be one tenth of the speed during the first separation. These blocks are operated by an Alternating current (Ac)-driven hydraulic pressure system, backed by two independent nitrogen gas accumulators to ensure positive scram in the event of loss of electrical power. The control rod drives are Ac-powered and do not require loss-of-power backup.

A horizontal hole (known as a glory hole) through the center of the stationary hemisphere reflector and the core provides access for irradiation samples and detectors to the central zone of the assembly. The pedestal where the fissile core sits contains many voids (cavities) that may be filled with either natural uranium or highly enriched uranium buttons to compensate for the various glory hole configurations.

The uranium and plutonium core masses (without the mass adjustment buttons and glory pieces) weigh 18 and 6 kilograms (39.7 and 13.2 pounds), respectively. The addition of mass adjustment buttons is insufficient to exceed the critical mass for the unreflected core. The cores are stored in the CASA 2 vault

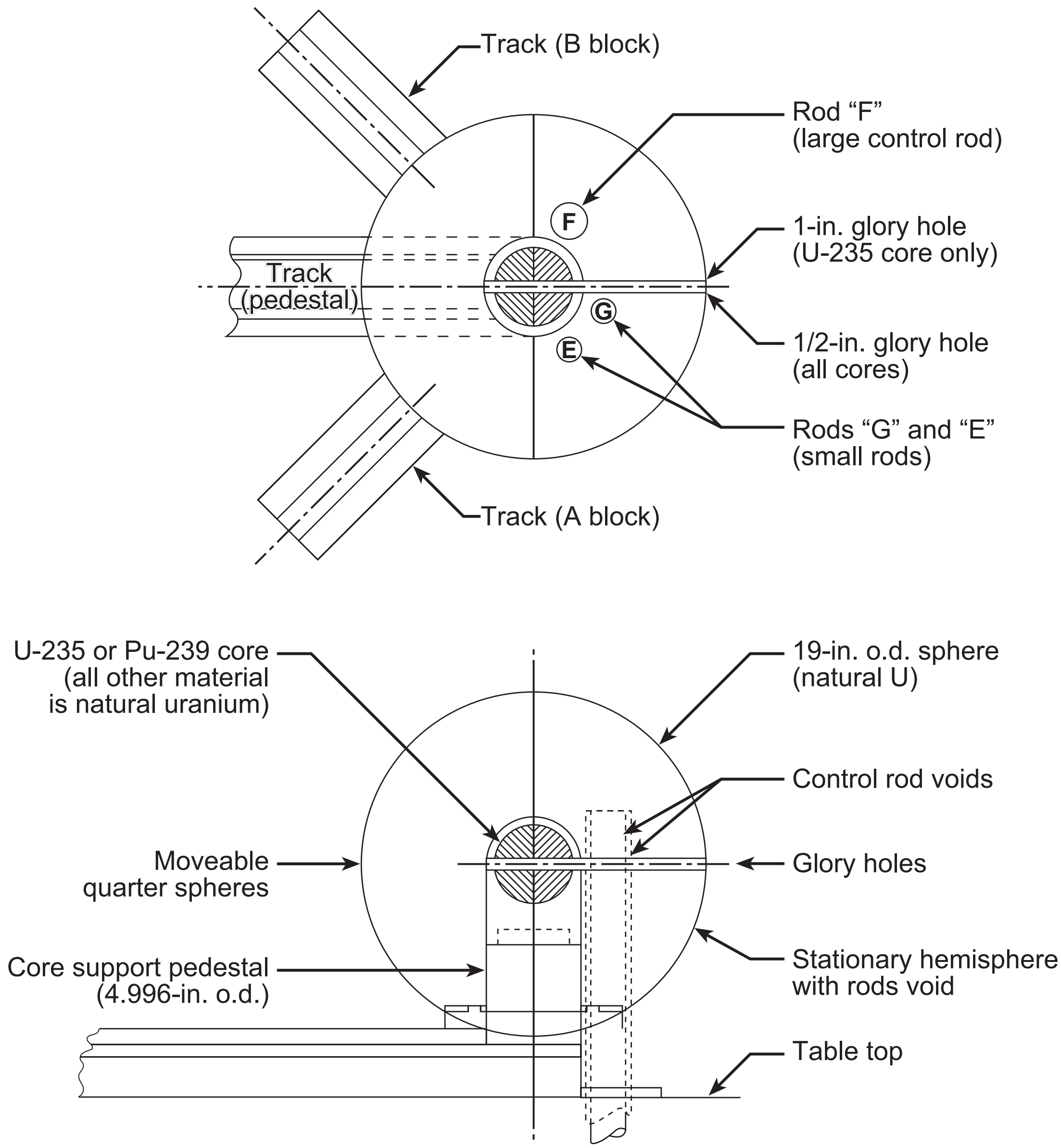

Figure A–2 Schematic of Flattop Assembly

in a criticality safe configuration when Flattop is not operating. The plutonium core is stored in heat sinks to dissipate heat from spontaneous fission decay of plutonium-240 (which constitutes about 5 percent of the total plutonium).

A.1.2 Godiva

Godiva is a fast-burst assembly with a fuel mass of 65.4 kilograms (144 pounds) of highly enriched uranium. Godiva is the fourth in a series of basically bare, unreflected, fast-burst assemblies with similar characteristics. Godiva is primarily an irradiation assembly, although its original purpose was to test design features, including material selection, that are expected to increase resistance to shock damage. The

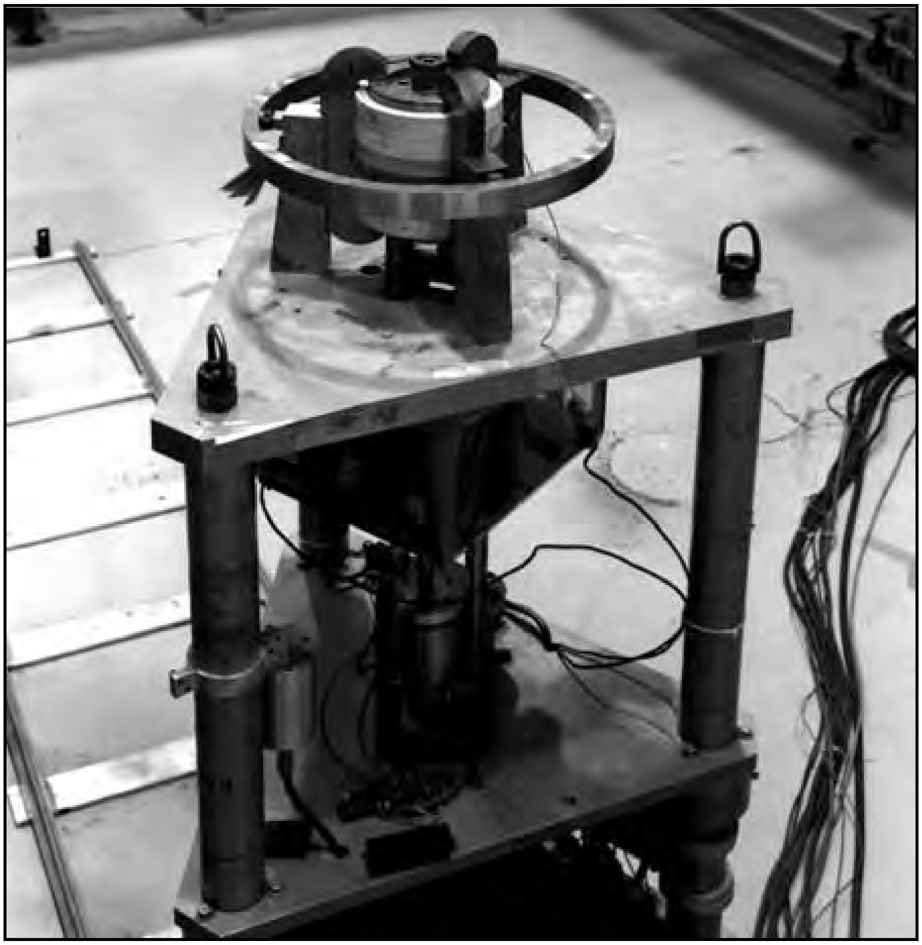

Figure A–3 Godiva (shown without optional cover)

assembly has fixed core components and a permanent structural base, (see **Figure A–3**). The entire Godiva assembly is approximately 0.90 × 1.2 × 3 meters (3 × 4 × 10 feet) tall in size. It is secured in a special vault in TA-18 Building 116 (CASA 3), and is moved on aluminum tracks from the vault to the test area. Power, control, and instrumentation circuits for Godiva are provided by an umbilical panel that physically attaches to the machine. After the test, this panel is removed by remote activation. A winch cable attached to the assembly cart is actuated, pulling the assembly into the vault. The vault door is closed and locked by command from the control room.

Figure A–4 shows the Godiva fuel components and support system. The Godiva fuel is enriched uranium alloyed with 1.5 percent molybdenum by weight. Fuel components are all aluminum-ion plated. Three external C-shaped clamps fabricated from high performance maraging steel fasten the stack of fuel component rings. The five major uranium-molybdenum alloy subsections of Godiva (stationary head and movable safety block and three control rods [two shim rods and one burst rod]) form an essentially unreflected cylinder when brought together remotely. Delayed criticality is attained when the safety block is inserted by adjustment of two uranium control rods (each worth about $1.5) that enter the head. From this state, a burst may be produced by sudden insertion of an interlocked U(93) burst rod with a reactivity worth of about $1, allowing a further adjustment of control-rod position. Thermal expansion of the fuel components produces a shock which terminates the burst. The safety block is threaded onto a stainless steel support mandrel at the lower end of the core so that thermal expansion exerts a downward thrust on the support shaft, opening a magnetic clutch to provide shock-induced trip. The production of a burst of known magnitude involves a well-defined cycle including a delayed critical check, retraction of the safety block to allow delay of the neutron population, and control adjustment to trim excess reactivity as required for the desired burst while allowing for temperature drift, reinsertion of the safety block, and burst-rod insertion. Interlocks prevent major departures from this cycle. The burst actuates a scram signal, which deactivates a magnet that normally secures the safety block and ejects the burst rod.

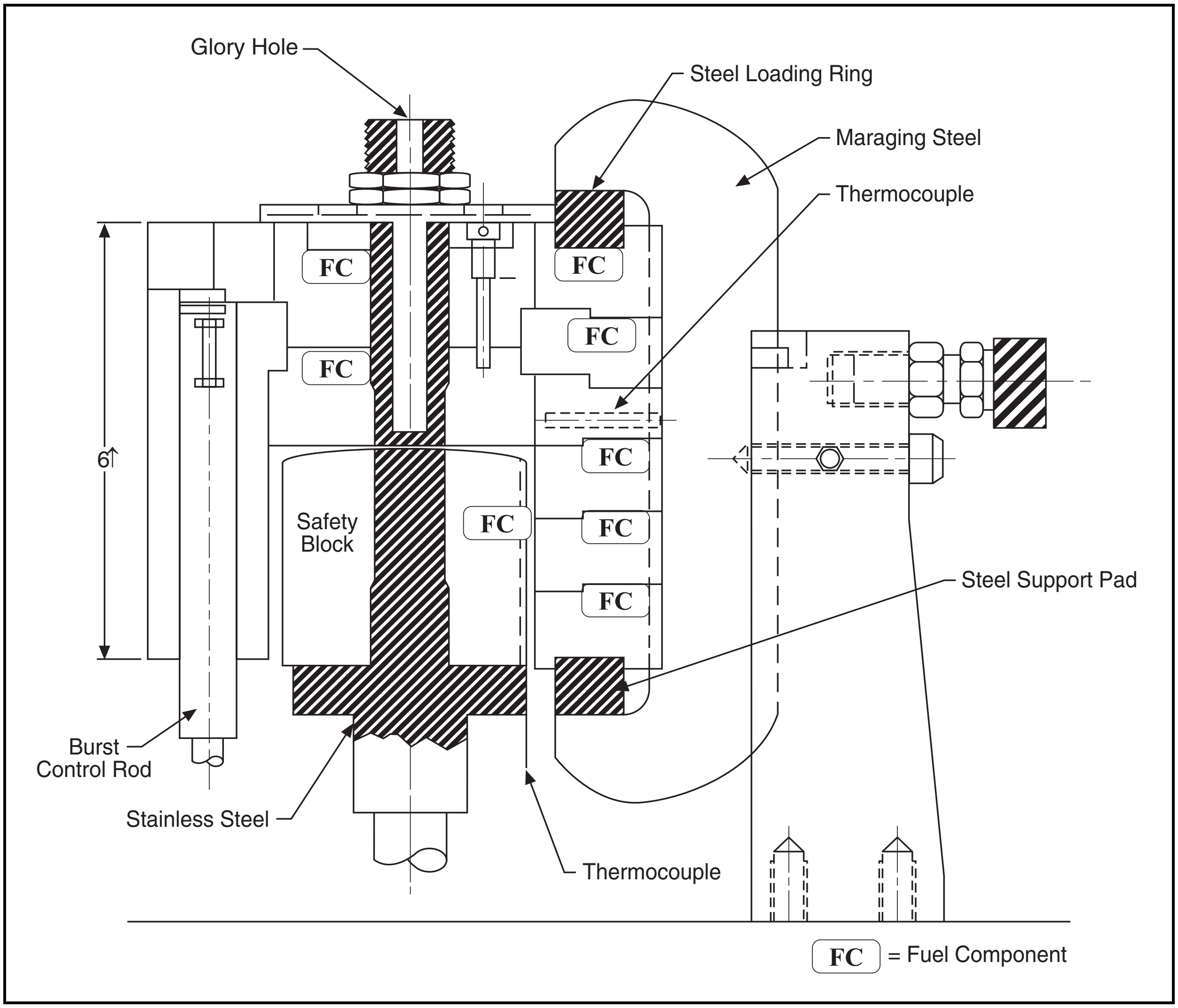

Figure A–4 Godiva Fuel Components and Support System

A.1.3 Comet

The Comet general-purpose assembly machine is a vertical lift platform located in TA-18 CASA 2, (see **Figure A–5**). The machine is designed to accommodate a wide variety of experiments in which neutron multiplication is measured as a function of separation distance between experiment components. The Comet machine may be used for criticality safety training on approach-to-critical. The Comet configuration is split into two parts, one of which is mounted in a stationary position (upper structure), while the other is located on a movable platen. The movable part of the experiment occurs in two discrete steps: actuation of a hydraulic lift and completion of motion by a stepping motor (fine adjustment). The entire assembly is 1.2 × 1.2 × 3.6 meters (4 × 4 × 12 feet) in size with its reflector in place. **Figure A–6** shows a schematic of the Comet assembly machine without reflector.

The current fuel configuration uses unclad enriched uranium circular plates approximately 0.31 centimeters (0.125 inches) thick, separated by plates of graphite approximately 1 centimeter (0.39 inches) thick. Proposed future fuel for the present experiment may include plutonium plates with a total mass of about 200 kilograms (441 pounds) or other fuel elements. Configurations may also include other geometric combinations of fissile material and interstitial materials. The Comet reflector, like the fuel, can be arranged

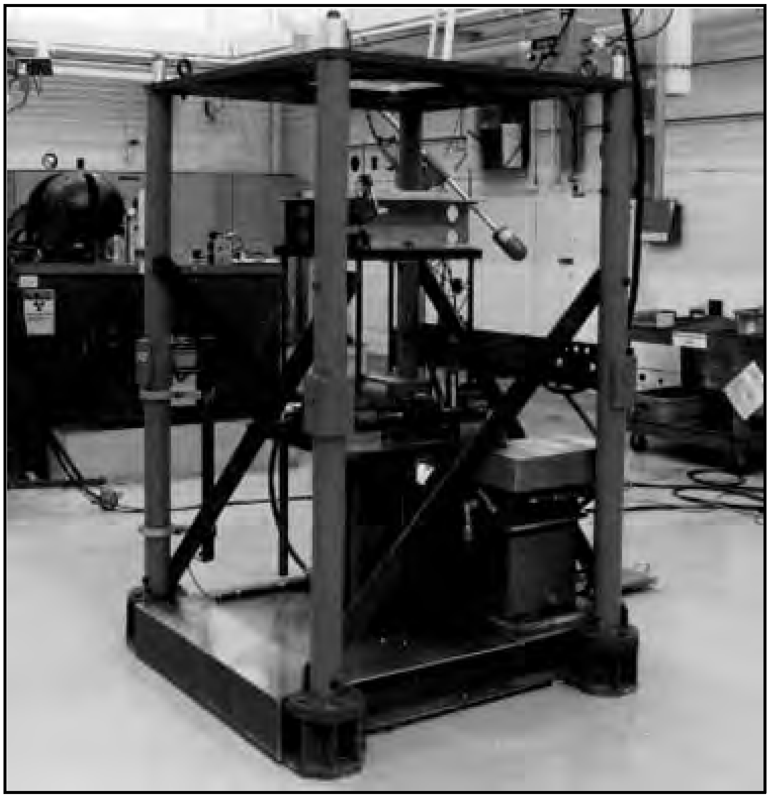

Figure A–5 Comet Assembly Machine

in various configurations. The current configuration consists of an upper region containing approximately 6,350 kilograms (14,000 pounds) of copper assembled in blocks surrounding the upper fuel components. The height of the reflector is approximately 1.2 meters (47 inches) on a 0.91-meter (34-inch) base.

Comet is designed to approach or reach the condition of criticality as the lower assembly nears the upper stationary assembly. This is accomplished by first raising the movable platen hydraulically, followed by a stepper motor drive for precision positioning of the lower assembly. Nuclear operations with Comet are first supported with detailed calculations of the proposed assembly. As material (fissile and interstitial) is stacked, but well before a critical configuration, careful measurements of the partially assembled mass are taken to verify that excessive reactivity is not present. The fuel materials which can be used in Comet include uranium, plutonium, and neptunium. Test quantities can exceed 200 kilograms (441 pounds) of fissile material. Under normal scrams, both the hydraulic ram and the stepper motor move to the least reactive conditions (initial positions). Under loss of power, the valve for the hydraulic ram switches to the down position causing the hydraulic ram to move down. This downward motion is caused by gravity and assisted by a pressure accumulator in the hydraulic system.

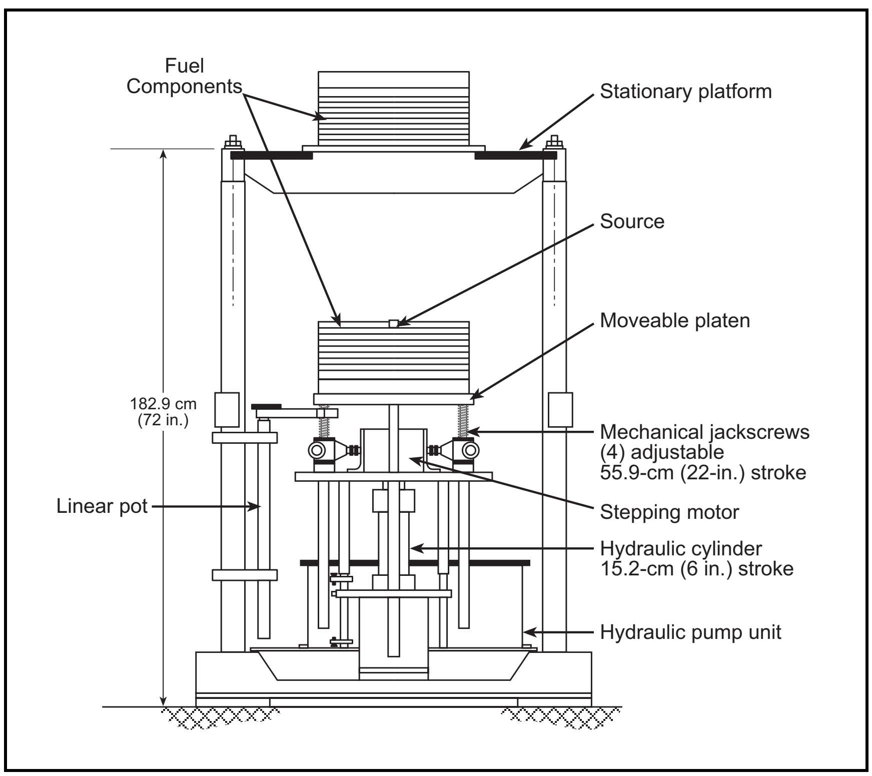

Figure A–6 Comet (shown without reflector)

A.1.4 Planet

Planet is a general-purpose, portable vertical assembly machine located in TA-18 CASA 1. Like Comet, the Planet machine uses a moveable table powered by hydraulic lift with movable platen powered by a stepping motor. A fixed (stationary) platform is mounted above the table and platen assembly. The steel frame is mounted on casters/wheels and is not rigidly attached to the CASA structure. There are retractable feet to hold the Planet in place. The planet machine has two features not found on the Comet machine: (1) a remotely adjustable positive stop on the hydraulic lift up-limit and (2) mechanical stops on the platen up-limit. The entire assembly is similar to that of Comet, i.e., 1.2 × 1.2 × 3.6 meters (4 × 4 × 12 feet) in size. **Figure A–7** illustrates the physical set up of Planet in a special criticality experiment arrangement.

Planet is used to investigate the criticality characteristics of different geometries and compositions. Both heterogeneous and homogeneous arrangements of fissile materials with different types and quantities of moderator materials can be used. Its past use includes experiments to evaluate the criticality of slab tanks filled with liquid solutions of highly enriched uranyl nitrate to simulate storage tanks at a proposed reprocessing facility.

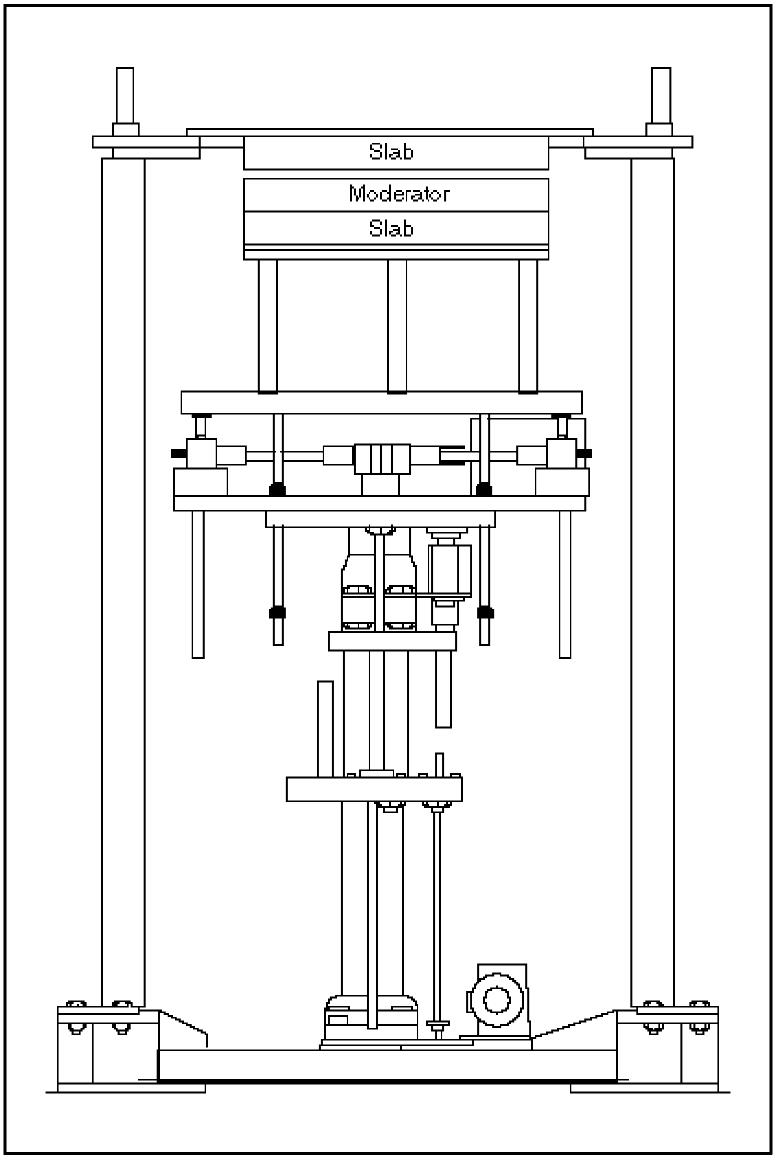

Figure A–7 Planet (in a Special Experimental Arrangement)

A hydraulic ram is the primary scram device for removing reactivity from critical assemblies on the Planet machine. Given a scram signal, the hydraulic system valves are de-energized in a manner that allows the ram to descend at a fairly rapid rate (i.e., gravity-assisted), and the stepping motor also drives the platen downward. In the event of loss of power, the hydraulic valves open to allow the ram to move down under the force of gravity. This downward movement separates the two critical-assembly segments, thereby stopping the criticality process.

Currently, one basic core type is used in Planet. The core consists of laminated foils containing 93 percent enriched uranium-235, interspersed with a variety of interstitial materials. This core loading is used in a criticality experiment performed monthly as part of the Nuclear Criticality Safety Course conducted at the Los Alamos National Laboratory (LANL). In addition, it is currently used to evaluate issues including the design of repositories for long-term disposal of nuclear materials. In the future, Planet may be fueled with weapons-grade plutonium (approximately 7 kilograms [15 pounds]), and/or with about 50 kilograms (110 pounds) of highly enriched uranium using cryogenic materials to achieve low temperatures.

A.1.5 Solution High-Energy Burst Assembly

SHEBA is operated in TA-18 Building 168 (SHEBA building). It is a simple, unreflected, fissile solution critical assembly vessel that is controlled by adding or removing solution. It was designed especially for proof testing criticality accident detection systems (see **Figure A–8** and **Figure A–9**). The detectors for criticality accident alarms were calibrated by fast-neutron leakage pulses from Godiva-like reactors (solid metal critical assemblies), whereas the majority of criticality accidents have occurred in solutions. As a thermal spectrum assembly, SHEBA generates relatively slow leakage neutrons such as those emitted by critical solutions. Fueled with either an aqueous solution of low-enriched (about 5 percent uranium-235) uranyl fluoride [$U0_2F_2$] or a solution of up to 20 percent uranium-235 enriched uranyl nitrate. SHEBA fuel requires a moderator to achieve criticality; the moderator is integral with the fuel because the fuel is a water-based solution. The critical mass of uranium-235 in SHEBA is about 4.1 kilograms (9 pounds). SHEBA is installed in a sheet metal building outside TA-18 Building 23 (CASA 1). Criticality is attained by solution-height adjustment in the critical assembly vessel whose inside diameter measures 48.9 centimeters (19.25 inches).

Figure A–8 SHEBA Machine

Major equipment at SHEBA includes the critical assembly vessel, four fuel storage tanks, a pumped-fuel fill system, a gravity fuel drain system, a flowing nitrogen cover gas system, and a safety rod system. The fuel solution is initially stored in four criticality-safe, stainless steel tanks. The solution is transferred to the critical assembly vessel by an AC-driven fuel feed pump. The critical assembly vessel and the storage tanks are equipped with heating and cooling jackets to maintain the solution temperature at a desired level. The jackets are attached to the building chiller system.

The nitrogen cover gas system sweeps the fission product and radiolytic gases into holding tanks after passing them through a catalytic recombiner. In the holding tanks the fission gases are allowed to decay under confinement before release. The catalytic converter recombines the radiolytic gas to maintain a noncombustible atmosphere in the holding tanks. The design pressure of the critical assembly vessel is 1.03 megapascals (150 pounds per square inch).

Shutdown is achieved by rapid draining of the uranium solution into storage cylinders. Upon scram signal, two independent scram (drain) valves open, allowing gravity draining of the fuel solution. A pneumatically operated safety rod that can drop into a 6.35-centimeter (2.5-inch)-diameter axial tube inside the critical assembly vessel is also provided as a supplement to the rapid draining shutdown process.

SHEBA has been used principally to assess and calibrate criticality accident dosimeters for a uranium enrichment plant. In addition, the assembly is used for general-purpose critical experiments and studies of the behavior of nuclear excursions in a low-enriched solution medium. It has also served as a source for skyshine (radiation scattering in air) measurements. SHEBA can also be used as training tool as part of a nuclear criticality safety class.

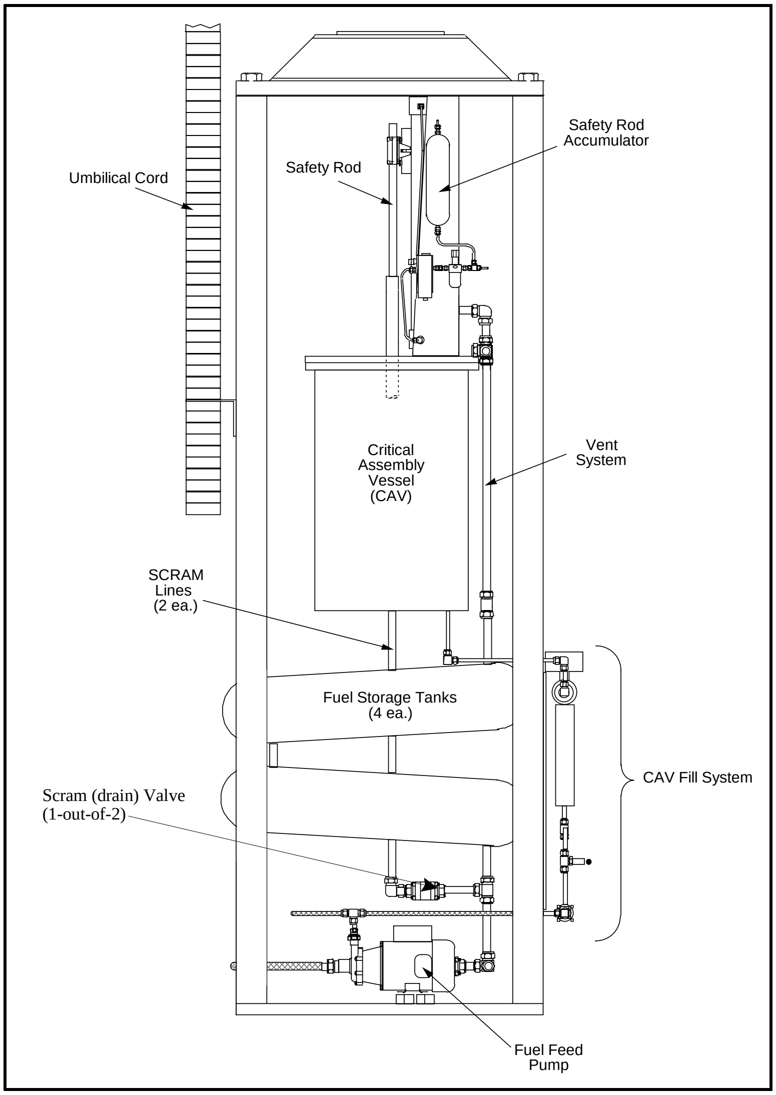

Figure A–9 Schematic of SHEBA

A.2 REFERENCES

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LANL (Los Alamos National Laboratory), 1998, *Safety Analysis Report for the Los Alamos Critical Experiments Facility (LACEF), and Hillside Vault (PL-26)*, LA-CP-92-235, Rev 4.0, Los Alamos, New Mexico, February.

Appendix B

Human Health Effects from Normal Operations

APPENDIX B
HUMAN HEALTH EFFECTS FROM NORMAL OPERATIONS

B.1 INTRODUCTION

This appendix provides a brief general discussion on radiation and its health effects. It also describes the methods and assumptions used for estimating the potential impacts and risks to individuals and the general public from exposure to releases of radioactivity during normal operations and postulated accidents at facilities used to perform Technical Area (TA)-18 missions.

This appendix presents numerical information using engineering and/or scientific notation. For example, the number 100,000 also can be expressed as 1×10^5. The fraction 0.001 also can be expressed as 1×10^{-3}. The following chart defines the equivalent numerical notations that may be used in this appendix.

FRACTIONS AND MULTIPLES OF UNITS

Multiple	*Decimal Equivalent*	*Prefix*	*Symbol*
1×10^6	1,000,000	mega-	M
1×10^3	1,000	kilo-	k
1×10^2	100	hecto-	h
1×10	10	deka-	da
1×10^{-1}	0.1	deci-	d
1×10^{-2}	0.01	centi-	c
1×10^{-3}	0.001	milli-	m
1×10^{-6}	0.000001	micro-	μ

B.2 RADIOLOGICAL IMPACTS ON HUMAN HEALTH

Radiation exposure and its consequences are topics of interest to the general public. For this reason, this environmental impact statement (EIS) places emphasis on the consequences of exposure to radiation, provides the reader with information on the nature of radiation, and explains the basic concepts used in the evaluation of radiation health effects.

B.2.1 Nature of Radiation and Its Effects on Humans

What Is Radiation?

Radiation is energy transferred in the form of particles or waves. Globally, human beings are exposed constantly to radiation from the solar system and the Earth's rocks and soil. This radiation contributes to the natural background radiation that always surrounds us. Manmade sources of radiation also exist, including medical and dental x-rays, household smoke detectors, and materials released from nuclear and coal-fired power plants.

All matter in the universe is composed of atoms. Radiation comes from the activity of tiny particles within an atom. An atom consists of a positively charged nucleus (central part of an atom) with a number of negatively charged electron particles in various orbits around the nucleus. There are two types of particles in the nucleus: neutrons that are electrically neutral and protons that are positively charged. Atoms of different types are known as elements. There are more than 100 natural and manmade elements. An element has equal numbers of electrons and protons. When atoms of an element differ in their number of neutrons, they are called isotopes of that element. All elements have three or more isotopes, some or all of which could be unstable (i.e., decay with time).

Unstable isotopes undergo spontaneous change, known as radioactive disintegration or radioactive decay. The process of continuously undergoing spontaneous disintegration is called radioactivity. The radioactivity of a material decreases with time. The time it takes a material to lose half of its original radioactivity is its half-life. An isotope's half-life is a measure of its decay rate. For example, an isotope with a half-life of eight days will lose one-half of its radioactivity in that amount of time. In eight more days, one-half of the remaining radioactivity will be lost, and so on. Each radioactive element has a characteristic half-life. The half-lives of various radioactive elements may vary from millionths of a second to millions of years.

As unstable isotopes change into more stable forms, they emit electrically charged particles. These particles may be either an alpha particle (a helium nucleus) or a beta particle (an electron), with various levels of kinetic energy. Sometimes these particles are emitted in conjunction with gamma rays. The alpha and beta particles are frequently referred to as ionizing radiation. Ionizing radiation refers to the fact that the charged particle energy force can ionize, or electrically charge, an atom by stripping off one of its electrons. Gamma rays, even though they do not carry an electric charge as they pass through an element, can ionize its atoms by ejecting electrons. Thus, they cause ionization indirectly. Ionizing radiation can cause a change in the chemical composition of many things, including living tissue (organs), which can affect the way they function.

When a radioactive isotope of an element emits a particle, it changes to an entirely different element, one that may or may not be radioactive. Eventually a stable element is formed. This transformation, which may take several steps, is known as a decay chain. For example, radium, which is a member of the radioactive decay chain of uranium, has a half-life of 1,622 years. It emits an alpha particle and becomes radon, a radioactive gas with a half-life of only 3.8 days. Radon decays first to polonium, then through a series of further decay steps to bismuth, and ultimately to a stable isotope of lead. Meanwhile, the decay products will build up and eventually die away as time progresses.

The characteristics of various forms of ionizing radiation are briefly described below and in the box at right (see Chapter 8 for further definitions):

Radiation Type	Typical Travel Distance in Air	Barrier
α	Few centimeters	Sheet of paper or skin's surface
β	Few meters	Thin sheet of aluminum foil or glass
γ	Very large	Thick wall of concrete, lead, or steel
n	Very large	Water, paraffin, graphite

Alpha (α)—Alpha particles are the heaviest type of ionizing radiation. They can travel only a few centimeters in air. Alpha particles lose their energy almost as soon as they collide with anything. They can be stopped easily by a sheet of paper or by the skin's surface.

Beta (β)—Beta particles are much (7,330 times) lighter than alpha particles. They can travel a longer distance than alpha particles in the air. A high-energy beta particle can travel a few meters in the air. Beta particles can pass through a sheet of paper, but may be stopped by a thin sheet of aluminum foil or glass.

Gamma (γ)—Gamma rays (and x-rays), unlike alpha or beta particles, are waves of pure energy. Gamma rays travel at the speed of light. Gamma radiation is very penetrating and requires a thick wall of concrete, lead, or steel to stop it.

Neutrons (n)—Neutrons are particles that contribute to radiation exposure both directly and indirectly. The most prolific source of neutrons is a nuclear reactor. Indirect radiation exposure occurs when gamma rays and alpha particles are emitted following neutron capture in matter. A neutron has about one-quarter the weight of an alpha particle. It will travel in the air until it is absorbed in another element.

Units of Radiation Measure

During the early days of radiological experience, there was no precise unit of radiation measure. Therefore, a variety of units were used to measure radiation. These units were used to determine the amount, type, and intensity of radiation. Just as heat can be measured in terms of its intensity or effects using units of calories or degrees, amounts of radiation or its effects can be measured in units of curies, radiation absorbed dose (rad), or dose equivalent (roentgen equivalent man, or rem). The following summarizes those units (see also the definitions in Chapter 8).

Curie—The curie, named after the French scientists Marie and Pierre Curie, describes the "intensity" of a sample of radioactive material. The rate of decay of 1 gram of radium was the basis of this unit of measure. Because the measured decay rate kept changing slightly as measurement techniques became more accurate, the curie was subsequently defined as exactly 3.7×10^{10} disintegrations (decays) per second.

Rad—The rad is the unit of measurement for the physical absorption of radiation. The total energy absorbed per unit quantity of tissue is referred to as absorbed dose (or simply dose). As sunlight heats pavement by giving up an amount of energy to it, radiation similarly gives up energy to objects in its path. One rad is equal to the amount of radiation that leads to the deposition of 0.01 joule of energy per kilogram of absorbing material.

Radiation Units and Conversions to International System of Units

1 curie = 3.7×10^{10} disintegrations per second
= 3.7×10^{10} becquerels
1 becquerel = 1 disintegration per second
1 rad = 0.01 gray
1 rem = 0.01 sievert
1 gray = 1 joule per kilogram

Rem—A rem is a measurement of the dose equivalent from radiation based on its biological effects. The rem is used in measuring the effects of radiation on the body as degrees centigrade are used in measuring the effects of sunlight heating pavement. Thus, 1 rem of one type of radiation is presumed to have the same biological effects as 1 rem of any other kind of radiation. This allows comparison of the biological effects of radionuclides that emit different types of radiation.

The units of radiation measure in the International System of Units are: becquerel (a measure of source intensity [activity]), gray (a measure of absorbed dose), and sievert (a measure of dose equivalent).

An individual may be exposed to ionizing radiation externally (from a radioactive source outside the body) or internally (from ingesting or inhaling radioactive material). The external dose is different from the internal dose because an external dose is delivered only during the actual time of exposure to the external radiation source, while an internal dose continues to be delivered as long as the radioactive source is in the body. The dose from internal exposure is calculated over 50 years following the initial exposure. Both radioactive decay and elimination of the radionuclide by ordinary metabolic processes decrease the dose rate with the passage of time.

Sources of Radiation

The average American receives a total of approximately 360 millirem per year from all sources of radiation, both natural and manmade, of which approximately 300 millirem per year are from natural sources. The sources of radiation can be divided into six different categories: (1) cosmic radiation, (2) terrestrial radiation, (3) internal radiation, (4) consumer products, (5) medical diagnosis and therapy, and (6) other sources (NCRP 1987). These categories are discussed in the following paragraphs.

Cosmic Radiation—Cosmic radiation is ionizing radiation resulting from energetic charged particles from space continuously hitting the Earth's atmosphere. These particles and the secondary particles and photons they create comprise cosmic radiation. Because the atmosphere provides some shielding against cosmic radiation, the intensity of this radiation increases with the altitude above sea level. The average dose to people in the United States from this source is approximately 27 millirem per year.

External Terrestrial Radiation—External terrestrial radiation is the radiation emitted from the radioactive materials in the Earth's rocks and soils. The average dose from external terrestrial radiation is approximately 28 millirem per year.

Internal Radiation—Internal radiation results from the human body metabolizing natural radioactive material that has entered the body by inhalation or ingestion. Natural radionuclides in the body include isotopes of uranium, thorium, radium, radon, polonium, bismuth, potassium, rubidium, and carbon. The major contributor to the annual dose equivalent for internal radioactivity is the short-lived decay products of radon, which contribute approximately 200 millirem per year. The average dose from other internal radionuclides is approximately 39 millirem per year.

Consumer Products—Consumer products also contain sources of ionizing radiation. In some products, such as smoke detectors and airport x-ray machines, the radiation source is essential to the product's operation. In other products, such as televisions and tobacco, the radiation occurs as the products function. The average dose from consumer products is approximately 10 millirem per year.

Medical Diagnosis and Therapy—Radiation is an important diagnostic medical tool and cancer treatment. Diagnostic x-rays result in an average exposure of 39 millirem per year. Nuclear medical procedures result in an average exposure of 14 millirem per year.

Other Sources—There are a few additional sources of radiation that contribute minor doses to individuals in the United States. The dose from nuclear fuel cycle facilities (e.g., uranium mines, mills, and fuel processing plants) and nuclear power plants has been estimated to be less than 1 millirem per year. Radioactive fallout from atmospheric atomic bomb tests, emissions from certain mineral extraction facilities, and transportation of radioactive materials contribute less than 1 millirem per year to the average dose to an individual. Air travel contributes approximately 1 millirem per year to the average dose.

Exposure Pathways

As stated earlier, an individual may be exposed to ionizing radiation both externally and internally. The different ways that could result in radiation exposure to an individual are called exposure pathways. Each type of exposure is discussed separately in the following paragraphs.

External Exposure—External exposure can result from several different pathways, all having in common the fact that the radiation causing the exposure is external to the body. These pathways include exposure to a cloud of radiation passing over the receptor (i.e., an individual member of the public), standing on ground that is contaminated with radioactivity, and swimming or boating in contaminated water. If the receptor departs from the source of radiation exposure, the dose rate will be reduced. It is assumed that external exposure occurs uniformly during the year. The appropriate dose measure is called the effective dose equivalent.

Internal Exposure—Internal exposure results from a radiation source entering the human body through either inhalation of contaminated air or ingestion of contaminated food or water. In contrast to external exposure, once a radiation source enters the body, it remains there for a period of time that varies depending on decay and biological half-life. The absorbed dose to each organ of the body is calculated for a period of 50 years following the intake. The calculated absorbed dose is called the committed dose equivalent. Various organs have different susceptibilities to harm from radiation. The quantity that takes these different susceptibilities into account is called the committed effective dose equivalent, and it provides a broad indicator of the risk to the health of an individual from radiation. The committed effective dose equivalent is a weighted sum of the committed dose equivalent in each major organ or tissue. The concept of committed effective dose equivalent applies only to internal pathways.

Radiation Protection Guides

Various organizations have issued radiation protection guides. The responsibilities of the main radiation safety organizations, particularly those that affect policies in the United States, are summarized below.

International Commission on Radiological Protection—This Commission has the responsibility for providing guidance in matters of radiation safety. The operating policy of this organization is to prepare recommendations to deal with basic principles of radiation protection and to leave to the various national protection committees the responsibility of introducing the detailed technical regulations, recommendations, or codes of practice best suited to the needs of their countries.

National Council on Radiation Protection and Measurements—In the United States, this Council is the national organization that has the responsibility for adapting and providing detailed technical guidelines for implementing the International Commission on Radiological Protection recommendations. The Council consists of technical experts who are specialists in radiation protection and scientists who are experts in disciplines that form the basis for radiation protection.

National Research Council/National Academy of Sciences—The National Research Council is an organization within the National Academy of Sciences that associates the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the Federal Government.

Environmental Protection Agency—The Environmental Protection Agency (EPA) has published a series of documents, *Radiation Protection Guidance to Federal Agencies*. This guidance is used as a regulatory benchmark by a number of Federal agencies, including the U.S. Department of Energy (DOE), in the realm of limiting public and occupational work force exposures to the greatest extent possible.

Limits of Radiation Exposure

Limits of exposure to members of the public and radiation workers are derived from International Commission on Radiological Protection recommendations. The EPA uses the National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection recommendations and sets specific annual exposure limits (usually less than those specified by the Commission) in *Radiation Protection Guidance to Federal Agencies* documents. Each regulatory organization then establishes its own set of radiation standards. The various exposure limits set by DOE and the EPA for radiation workers and members of the public are given in **Table B–1**.

Table B–1 Exposure Limits for Members of the Public and Radiation Workers

Guidance Criteria (Organization)	*Public Exposure Limits at the Site Boundary*	*Worker Exposure Limits*
10 CFR 835 (DOE)	—	5,000 millirem per year [a]
10 CFR 835.1002 (DOE)	—	1,000 millirem per year [b]
DOE Order 5400.5 (DOE) [c]	10 millirem per year (all air pathways) 4 millirem per year (drinking water pathway) 100 millirem per year (all pathways)	—
40 CFR 61 (EPA)	10 millirem per year (all air pathways)	—
40 CFR 141 (EPA)	4 millirem per year (drinking water pathways)	—

[a] Although this is a limit (or level) which is enforced by DOE, worker doses must still adhere to as low as is reasonably achievable principles. Refer to footnote b.

[b] This is a control level. It was established by DOE to assist in effecting its goal to maintain radiological doses as low as is reasonably achievable. DOE recommends that facilities adopt a more limiting 500 millirem per year Administrative Control Level (DOE 1999b). Reasonable attempts have to be made by the site to maintain individual worker doses below these levels.

[c] Derived from 40 CFR 61, 40 CFR 141, and 10 CFR 20.

B.2.2 Health Effects

Radiation exposure and its consequences are topics of interest to the general public. To provide the background for discussions of impacts, this section explains the basic concepts used in the evaluation of radiation effects.

Radiation can cause a variety of damaging health effects in people. The most significant effects are induced cancer fatalities. These effects are referred to as "latent" cancer fatalities because the cancer may take many years to develop. In the discussions that follow, all fatal cancers are considered latent; therefore, the term "latent" is not used.

The National Research Council's Committee on the Biological Effects of Ionizing Radiation (BEIR) has prepared a series of reports to advise the U.S. Government on the health consequences of radiation exposures. *Health Effects of Exposure to Low Levels of Ionizing Radiation*, BEIR V (National Research Council 1990), provides the most current estimates for excess mortality from leukemia and other cancers that are expected to result from exposure to ionizing radiation. BEIR V provides estimates that are consistently higher than those in its predecessor, BEIR III. This increase is attributed to several factors, including the use of a linear dose response model for cancers other than leukemia, revised dosimetry for the Japanese atomic bomb survivors, and additional followup studies of the atomic bomb survivors and associated others. BEIR III employs constant, relative, and absolute risk models, with separate coefficients for each of several sex and age-at-exposure groups. BEIR V develops models in which the excess relative risk is expressed as a function of age at exposure, time after exposure, and sex for each of several cancer categories. The BEIR III models were based on the assumption that absolute risks are comparable between the atomic bomb survivors and the U.S. population. BEIR V models were based on the assumption that the relative risks are comparable. For a disease such as lung cancer, where baseline risks in the United States are much larger than those in Japan, the BEIR V approach leads to larger risk estimates than the BEIR III approach.

The models and risk coefficients in BEIR V were derived through analyses of relevant epidemiologic data that included the Japanese atomic bomb survivors, ankylosis spondylitis patients, Canadian and Massachusetts fluoroscopy (breast cancer) patients, New York postpartum mastitis (breast cancer) patients, Israeli tinea capitis (thyroid cancer) patients, and Rochester thymus (thyroid cancer) patients. Models for leukemia, respiratory cancer, digestive cancer, and other cancers used only the atomic bomb survivor data, although results of analyses of the ankylosis spondylitis patients were considered. Atomic bomb survivor analyses were based on revised dosimetry, with an assumed relative biological effectiveness of 20 for neutrons, and were restricted to doses less than 400 rads. Estimates of risks of fatal cancers, other than leukemia, were obtained by totaling the estimates for breast cancer, respiratory cancer, digestive cancer, and other cancers.

The National Council on Radiation Protection and Measurements (NCRP 1993), based on the radiation risk estimates provided in BEIR V and the International Commission on Radiological Protection Publication 60 recommendations (ICRP 1991), has estimated the total detriment resulting from low dose[1] or low dose rate exposure to ionizing radiation to be 5.6×10^{-4} per rem for the working population and 7.3×10^{-4} per rem for the general population. The total detriment includes fatal and nonfatal cancer which is severe hereditary (genetic) effects. The major contribution to the total detriment is from fatal cancer which is estimated to be 4×10^{-4} and 5×10^{-4} per rem for radiation workers and the general population, respectively. The breakdowns of the risk estimators for both workers and the general population are given in **Table B–2**. Nonfatal cancers and genetic effects are less probable consequences of radiation exposure. To simplify the presentation of the impacts, estimated effects of radiation are calculated only in terms of cancer fatalities. For higher doses to an individual (20 rem or more), as could be associated with postulated accidents, the risk estimators given in Table B–2 are doubled.

Table B–2 Nominal Health Risk Estimators Associated with Exposure to 1 Rem of Ionizing Radiation

Exposed Individual	*Fatal Cancer* [a, c]	*Nonfatal Cancer* [b]	*Genetic Disorders* [b]	*Total*
Worker	.0004	.00008	.00008	.0005
Public	.0005	.0001	.00013	.00073

[a] For fatal cancer, the health effect coefficient is the same as the probability coefficient. When applied to an individual, the units are the lifetime probability of a cancer fatality per rem of radiation dose. When applied to a population of individuals, the units are the excess number of fatal cancers per person-rem of radiation dose.

[b] In determining a means of assessing health effects from radiation exposure, the International Commission on Radiological Protection has developed a weighting method for nonfatal cancers and genetic effects.

[c] For high individual exposures (greater than or equal to 20 rem), the health factors are multiplied by a factor of 2.

Source: NCRP 1993.

The numerical estimates of fatal cancers presented in this EIS were obtained using a linear extrapolation from the nominal risk estimated for lifetime total cancer mortality that results from a dose of 0.1 gray (10 rad). Other methods of extrapolation to the low-dose region could yield higher or lower numerical estimates of fatal cancers. Studies of human populations exposed to low doses are inadequate to demonstrate the actual level of risk. There is scientific uncertainty about cancer risk in the low-dose region below the range of epidemiologic observation, and the possibility of no risk cannot be excluded (CIRRPC 1992).

Health Effect Risk Estimators Used in This EIS

Health impacts from radiation exposure, whether from external or internal sources, generally are identified as "somatic" (i.e., affecting the exposed individual) or "genetic" (i.e., affecting descendants of the exposed individual). Radiation is more likely to produce somatic effects than genetic effects. The somatic risks of most importance are induced cancers. Except for leukemia, which can have an induction period (time between exposure to carcinogen and cancer diagnosis) of as little as 2 to 7 years, most cancers have an induction period of more than 20 years.

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[1] *Low dose is defined as the dose level where DNA repair can occur in a few hours after irradiation-induced damage. Currently, a dose level of about 0.2 grays (20 rad), or a dose rate of 0.1 milligrays (0.01 rad) per minute is considered low enough to allow the DNA to repair itself in a short period (EPA 1999).*

For a uniform irradiation of the body, the incidence of cancer varies among organs and tissues; the thyroid and skin demonstrate a greater sensitivity than other organs. Such cancers, however, also produce relatively low mortality rates because they are relatively amenable to medical treatment. Because fatal cancer is the most probable serious effect of environmental and occupational radiation exposures, estimates of cancer fatalities rather than cancer incidence are presented in this EIS. The numbers of fatal cancers can be used to compare the risks among the various alternatives.

Based on the preceding discussion and the values presented in Table B–2, the number of fatal cancers to the general public during normal operations and for postulated accidents in which individual doses are less than 20 rem are calculated using a health risk estimator of 5×10^{-4} per person-rem. For workers, a risk estimator of 4×10^{-4} excess fatal cancers per person-rem is used. (The risk estimators are lifetime probabilities that an individual would develop a fatal cancer per rem of radiation received.) The lower value for workers reflects the absence of children (who are more radiosensitive than adults) in the workforce. The risk estimators associated with nonfatal cancer and genetic disorders among the public are 20 and 26 percent, respectively, of the fatal cancer risk estimator. For workers, these health risk estimators are both 20 percent of the fatal cancer risk estimator. The nonfatal cancer and genetic disorder risk estimators are not used in this EIS.

For individual doses of 20 rem or more, as could be associated with postulated accidents, the risk estimators used to calculate health effects to the general public and to workers are double those given in the previous paragraph, which are associated with doses of less than 20 rem.

The fatal cancer estimators are used to calculate the statistical expectation of the effects of exposing a population to radiation. For example, if 100,000 people were each exposed to one time radiation dose of 100 millirem (0.1 rem), the collective dose would be 10,000 person-rem. The exposed population would then be expected to experience 5 additional cancer fatalities from the radiation (10,000 person-rem $\times 5 \times 10^{-4}$ lifetime probability of cancer fatalities per person-rem = 5 cancer fatalities).

Calculations of the number of excess fatal cancers associated with radiation exposure do not always yield whole numbers. These calculations may yield numbers less than 1, especially in environmental impact applications. For example, if a population of 100,000 were exposed to a total dose of only 0.001 rem per person, the collective dose would be 100 person-rem, and the corresponding estimated number of cancer fatalities would be 0.05 (100,000 persons $\times$ 0.001 rem $\times 5 \times 10^{-4}$ cancer fatalities per person-rem = 0.05 cancer fatalities). The 0.05 means that there is one chance in 20 that the exposed population would experience one fatal cancer. In other words, the 0.05 cancer fatalities is the *expected* number of deaths that would result if the same exposure situation were applied to many different groups of 100,000 people. In most groups, no person (0 people) would incur a fatal cancer from the 0.001 rem dose each member would have received. In a small fraction of the groups, 1 cancer fatality would result; in exceptionally few groups, 2 or more cancer fatalities would occur. The *average* expected number of deaths over all the groups would be 0.05 cancer fatalities (just as the average of 0, 0, 0, and 1 is 1/4, or 0.25). The most likely outcome is 0 cancer fatalities.

The same concept is applied to estimate the effects of radiation exposure on an individual member of the public. Consider the effects of an individual's exposure to a 360 millirem (0.36 rem) annual dose from all radiation sources. The probability that the individual will develop a fatal cancer from continuous exposure to this radiation over an average life of 72 years (presumed) is 0.013 (1 person $\times$ 0.36 rem per year $\times$ 72 years $\times 5 \times 10^{-4}$ cancer fatality risk per person rem = 0.013). This correlates to one chance in 77 that the individual would develop a fatal cancer.

B.3 METHODOLOGY FOR ESTIMATING RADIOLOGICAL IMPACTS

B.3.1 GENII Computer Code, a Generic Description

The radiological impacts from releases during normal operation of the facilities used to perform TA-18 missions were calculated using Version 1.485 of the GENII computer code (PNL 1988). Site-specific input data were used, including location, meteorology, population, and source terms. This section briefly describes GENII and outlines the approach used for normal operations.

B.3.1.1 Description of the Code

The GENII computer model, developed by Pacific Northwest National Laboratory, is an integrated system of various computer modules that analyze environmental contamination resulting from acute or chronic releases to, or initial contamination in air, water, or soil. The model calculates radiation doses to individuals and populations. The GENII computer model is well documented for assumptions, technical approach, method, and quality assurance issues. The GENII computer model has gone through extensive quality assurance and quality control steps, including comparing results from model computations with those from hand calculations and performing internal and external peer reviews (PNL 1988).

The GENII code consists of several modules for various applications; see the code manual (PNL 1988) for details. For this EIS, only the ENVIN, ENV, and DOSE computer modules were used. The output of one module is stored in a file that can be used by the next module in the system. The functions of the three GENII computer modules used in this EIS are discussed below.

ENVIN

The ENVIN module of the GENII code controls the reading of input files and organizes the input for optimal use in the environmental transport and exposure module, ENV. The ENVIN code interprets the basic input, reads the basic GENII data libraries and other optional input files, and organizes the input into sequential segments based on radionuclide decay chains.

A standardized file that contains scenario, control, and inventory parameters is used as input to ENVIN. Radionuclide inventories can be entered as functions of releases to air or water, concentrations in basic environmental media (air, soil, or water), or concentrations in foods. If certain atmospheric dispersion options have been selected, this module would generate tables of atmospheric dispersion parameters that are used in later calculations. If the finite plume air submersion option is selected in addition to the atmospheric dispersion calculations, preliminary energy-dependent finite plume dose factors can be prepared as well. The ENVIN module prepares the data transfer files that are used as input by the ENV module; ENVIN generates the first portion of the calculation documentation—the run input parameters report.

ENV

The ENV module calculates the environmental transfer, uptake, and human exposure to radionuclides that result from the chosen scenario for the user-specified source term. The code reads the input files from ENVIN and then, for each radionuclide chain, sequentially performs the precalculations to establish the conditions at the start of the exposure scenario. Environmental concentrations of radionuclides are established at the beginning of the scenario by assuming decay of pre-existing sources, considering biotic transport of existing subsurface contamination, and defining soil contamination from continuing atmospheric or irrigation depositions. For each year of postulated exposure, the code then estimates the air, surface soil, deep soil, groundwater, and surface water concentrations of each radionuclide in the chain. Human exposures and intakes of each radionuclide are calculated for: (1) pathways of external exposure from finite atmospheric plumes; (2) inhalation; (3) external exposure from contaminated soil, sediments, and water; (4) external exposure from special geometries; and (5) internal exposures from consumption of terrestrial foods, aquatic foods, drinking water, animal products, and inadvertent intake of soil. The intermediate information on annual media concentrations and intake rates are written to data transfer files. Although these may be accessed directly, they are usually used as input to the DOSE module of GENII.

DOSE

The DOSE module reads the intake and exposure rates defined by the ENV module and converts the data to radiation dose.

B.3.1.2 Data and General Assumptions

To perform the dose assessments for this EIS, different types of data were collected and generated. This section discusses the various data, along with the assumptions made for performing the dose assessments.

Dose assessments were performed for both members of the general public and workers at Los Alamos National Laboratory (LANL), Sandia National Laboratories/New Mexico (SNL/NM), Nevada Test Site (NTS), and Argonne National Laboratory-West (ANL-W). These assessments were made to determine the incremental doses that would be associated with the alternatives addressed in this EIS. Incremental doses for members of the public were calculated (via GENII) for two different types of receptors:

- Maximally Exposed Offsite Individual—The maximally exposed offsite individual was assumed to be an individual member of the public located at a position on the site boundary that would yield the highest impacts during normal operations.

- Population—The general population living within 80 kilometers (50 miles) of the facility.

Meteorological Data

The meteorological data used for all normal operational scenarios discussed in this EIS were in the form of joint frequency data files. A joint frequency data file is a table listing the fractions of time the wind blows in a certain direction, at a certain speed, and within a certain stability class. The joint frequency data files were based on measurements taken over a period of several years at the LANL, SNL/NM, NTS, and ANL-W sites.

Population Data

Population distributions were based on U.S. Department of Commerce state population projections (DOC 1999). Projections were determined for the year 2001 for areas within 80 kilometers (50 miles) of the release locations at LANL, SNL/NM, NTS, and ANL-W. The projected site-specific population in 2001 was used in the impact assessments. The population was spatially distributed on a circular grid with 16 directions and 10 radial distances up to 80 kilometers (50 miles). The grid was centered at the location from which the radionuclides were assumed to be released.

Source Term Data

The site- and process-specific source terms used to calculate the impacts of normal operations are provided in Section B.4.

Food Production and Consumption Data

Generic food consumption rates are established in the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.109 (NRC 1977). This regulatory guide provides guidance for evaluating ingestion doses from consuming contaminated terrestrial and animal food products using a standard set of assumptions for crop and livestock growth and harvesting characteristics.

Basic Assumptions

To estimate annual radiological impacts to the public from normal operations, the following additional assumptions and factors were considered in using GENII:

- Radiological airborne emissions were assumed to be released to the atmosphere at a height of 10 meters (33 feet).
- The exposure time to the plume was assumed to continue throughout a year for the maximally exposed offsite individual and the general population. Plume exposure parameters used in the GENII model are provided in **Table B–3**.
- The exposed individual or population was assumed to have the characteristics and habits of an adult human.
- A semi-infinite/finite plume model was used for the air immersion doses.

Table B–3 GENII Parameters for Exposure to Plumes (Normal Operations)

Maximally Exposed Offsite Individual			*General Population*		
External Exposure	*Inhalation of Plume*		*External Exposure*	*Inhalation of Plume*	
Plume (hours)	*Exposure Time (hours)*	*Breathing Rate (cubic centimeters per second)*	*Plume (hours)*	*Exposure Time (hours)*	*Breathing Rate (cubic centimeters per second)*
6,136	8,766	270	4,383	8,766	270

Sources: PNL 1988, NRC 1977.

Worker doses associated with TA-18 mission operations were determined from historical data. Refer to Section B.4 for a further discussion of worker impacts.

B.3.1.3 Uncertainties

The sequence of analyses performed to generate the radiological impact estimates from normal operations include: (1) selection of normal operational modes, (2) estimation of source terms, (3) estimation of environmental transport and uptake of radionuclides, (4) calculation of radiation doses to exposed individuals, and (5) estimation of health effects. There are uncertainties associated with each of these steps. Uncertainties exist in the way the physical systems being analyzed are represented by the computational models and in the data required to exercise the models (due to measurement, sampling, or natural variability).

In principle, one can estimate the uncertainty associated with each source and predict the remaining uncertainty in the results of each set of calculations. Thus, one can propagate the uncertainties from one set of calculations to the next and estimate the uncertainty in the final results. However, conducting such a full-scale quantitative uncertainty analysis is neither practical nor a standard practice for a study of this type. Instead, the analysis is designed to ensure—through judicious selection of release scenarios, models, and parameters—that the results represent the potential risks. This is accomplished by making conservative assumptions in the calculations at each step. The models, parameters, and release scenarios used in the calculations are selected in such a way that most intermediate results and, consequently, the final estimates of impacts are greater than would be expected. As a result, even though the range of uncertainty in a quantity might be large, the value calculated for the quantity would be close to one of the extremes in the range of possible values, so the chance of the actual quantity being greater than the calculated value would be low. The goal of the radiological assessment for normal operation in this study is to produce results that are conservative in order to capture any uncertainties in the operations of TA-18 mission facilities.

The degree of conservatism in the calculated results is related closely to the range of possible values the quantity can have. This range is determined by what realistically can be expected to occur. Limitations on the handling of material (e.g., design capacity/processing rate, system availability, operational duration) provide upper limits to the quantity of material that can be handled in a given time, e.g., annually. In many cases these restrictions were used to represent normal operating capacity, thus maximizing the amount of material that can be handled annually. Using these upper limits on processing rates provides a conservative estimate of the annual release of radionuclides during normal operation for each of the facilities. Conservative release estimates were used to calculate the annual impacts presented for each alternative. The uncertainties associated with the values of the health estimates used to project health effects, e.g. fatal cancer, are discussed in Section B.2.2.

B.4 Radiological Releases and Impacts During Normal Operations

The estimated radiological releases to the environment associated with normal operation of the facilities used to perform TA-18 missions are discussed below. The methodology for estimating radiological impacts to the public, including associated input data and analytical assumptions, is provided in Section B.3.1. Information relevant to the determination of impacts to workers is given below. The resulting impacts to the public and to workers associated with each alternative or action are presented and discussed in Chapter 5 of this EIS.

Argon-40 gas is a nonradioactive nuclide that is a normal constituent of air, including the air surrounding the TA-18 mission facilities. Neutrons produced during normal operations of the facilities interact with this gas to produce argon-41, a radioactive argon isotope with a half-life of about 109 minutes. This argon-41 represents the only radioactive source term to which members of the public would be exposed during normal operations. It is estimated that about 100 curies per year of argon-41 would be associated with SHEBA operations and 10 curies per year with the operations of the other TA-18 mission facilities for a total of 110 curies per year of argon-41 released from all TA-18 operations (DOE 1999a). The amount of argon-41 to which the public would be exposed is specific to the alternative assessed. Two examples of this are: (1) under the No Action Alternative, 110 curies of argon-41 would be produced in the atmosphere from operating all TA-18 mission facilities, including SHEBA, and (2) under the Nevada Test Site Alternative, only 10 curies of argon-41 would be produced at NTS from operations of the TA-18 mission facilities because SHEBA would remain at LANL. The source term associated with each alternative is given in the "radiological release" subsections of Chapter 5. The impacts to the public are given and discussed in the "public and occupational health and safety" subsections of Chapter 5.

The average individual worker dose associated with TA-18 operations is based on historical operational data, receiving an annual dose of 100 millirem (DOE 1999a). It is estimated that 110 involved workers would be associated with SHEBA as other security Category III/IV operations and 100 involved workers would be associated with the TA-18 security Category I/II operations. As is the case with the radiological source term (above), the impacts to the workers are dependent on the specific alternative assessed. The impacts are presented and discussed in the "public and occupational health and safety" subsections of Chapter 5.

B.5 RADIOLOGICAL RELEASES AND IMPACTS ASSOCIATED WITH POSTULATED ACCIDENTS

The releases of radioactivity and associated impacts from postulated accidents are addressed in detail in Appendix C. The information is summarized in Chapter 5 of this EIS.

B.6 References

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APPENDIX C

Human Health Effects from Facility Accidents

TA-18

APPENDIX C
HUMAN HEALTH EFFECTS FROM FACILITY ACCIDENTS

C.1 INTRODUCTION

Accident analyses were performed to estimate the impacts on workers and the public from reasonably foreseeable accidents for the Los Alamos National Laboratory (LANL) Technical Area 18 (TA-18) mission relocation alternatives. The analyses were performed in accordance with National Environmental Policy Act (NEPA) guidelines, including the process followed for the selection of accidents, definition of accident scenarios, and estimation of potential impacts. The sections that follow describe the methodology and assumptions, accident selection process, selected accident scenarios, and consequences and risks of the accidents evaluated.

C.2 OVERVIEW OF METHODOLOGY AND BASIC ASSUMPTIONS

The radiological impacts from accidental releases from the facilities used to perform TA-18 missions were calculated using the MACCS computer code, Version 1.12 (MACCS2). A detailed description of the MACCS model is provided in NUREG/CR-4691 (NRC 1990). The enhancements incorporated in MACCS2 are described in the *MACCS2 Users Guide* (SNL 1997). This section presents the MACCS2 data specific to the accident analyses. Additional information on the MACCS2 code is provided in Section C.8.

As implemented, the MACCS2 model evaluates doses due to inhalation of airborne material, as well as exposure to the passing plume. This represents the major portion of the dose that an individual would receive as a result of a TA-18 mission facility accident. The longer-term effects of radioactive material deposited on the ground after a postulated accident, including the resuspension and subsequent inhalation of radioactive material and the ingestion of contaminated crops, were not modeled for this environmental impact statement (EIS). These pathways have been studied and found to contribute less significantly to the dosage than the inhalation of radioactive material in the passing plume; they are also controllable through interdiction. Instead, the deposition velocity of the radioactive material was set to 0, so that material that might otherwise be deposited on surfaces remained airborne and available for inhalation. This adds a conservatism to inhalation doses that can become considerable at large distances. Thus, the method used in this EIS is conservative compared with dose results that would be obtained if deposition and resuspension were taken into account.

The impacts were assessed for the offsite population surrounding each site, the maximally exposed offsite individual, and a noninvolved worker. The impacts on involved workers were addressed qualitatively because no adequate method exists for calculating meaningful consequences at or near the location where the accident could occur. Involved workers are also fully trained in emergency procedures, including potential accidents.

The offsite population is defined as the general public residing within 80 kilometers (50 miles) of each site. The population distribution for each proposed site is based on U.S. Department of Commerce state population projections (DOC 1999). State and county population estimates were examined to interpolate the data to the year 2001. These data were fitted to a polar coordinate grid with 16 angular sectors aligned with the 16 compass directions, with radial intervals that extend outward to 80 kilometers (50 miles). The offsite population within 80 kilometers (50 miles) was estimated to be 320,182 persons at TA-18 (the No Action Alternative and the TA-18 Upgrade Alternative); 283,571 persons at TA-55 (the LANL New

Facility Alternative); 745,287 persons at TA-V[1] (the Sandia National Laboratories/New Mexico [SNL/NM] Alternative); 18,074 persons at the Device Assembly Facility (DAF) (the Nevada Test Site [NTS] Alternative); 239,099 persons at Argonne National Laboratory-West (ANL-W) (the ANL-W Alternative); and 450,302 persons at TA-39 (the Solution High-Energy Burst Assembly [SHEBA] proposed relocation site). For this analysis, no credit was taken for emergency response evacuations or temporary relocation of the general public.

The maximally exposed offsite individual is defined as a hypothetical individual member of the public who would receive the maximum dose from an accident. This individual is usually assumed to be located at a site boundary. However, for some sites, there are public residences within the site boundary, such as the trailer park within the LANL site boundary. In these instances, the maximally exposed individual could be at these onsite locations.

The maximally exposed offsite individual location was determined for each site. The maximally exposed individual location can vary at a site based on the type of accident. Therefore, some sites may have more than one location for the maximally exposed offsite individual. For this analysis, the maximally exposed offsite individual is located at 1.1 kilometers (0.7 miles) to the northeast (TA-18); 1 kilometer (0.6 miles) to the north and 2.6 kilometers (1.6 miles) to the east-southeast (TA-55); 2.0 kilometers (1.2 miles) to the northeast and to the north (TA-V); 10.9 kilometers (6.8 miles) to the east-northeast (DAF); 5.2 kilometers (3.2 miles) and 6.7 kilometers (4.2 miles) to the south-southeast (ANL-W); and 0.8 kilometers (0.5 miles) to the southwest (TA-39).

A noninvolved worker is defined as an onsite worker who is not directly involved in the facility activity pertaining to the accident. The noninvolved worker is assumed to be exposed to the full release, without any protection, at various distances from the point of release from facilities depending on the alternative or action being assessed. For SHEBA, this distance would be 400 meters (1,310 feet); for the other TA-18 mission facilities, this distance would be 400 meters (1,310 feet) if the facilities remain at TA-18, and 100 meters (330 feet) if the missions are relocated to TA-55, SNL/NM, NTS, or ANL-W. Workers would respond to a site emergency alarm and evacuate to a designated shelter area, reducing their exposure potential. For purposes of the analyses, however, it was conservatively assumed that no evacuation would take place.

Doses to the offsite population, the maximally exposed offsite individual, and a noninvolved worker were calculated based on site-specific meteorological conditions. Site-specific meteorology is described by one year of hourly windspeed atmospheric stability and by rainfall recorded at each site. The MACCS2 calculations produce distributions based on the meteorological conditions. For these analyses, the results presented are based on mean meteorological conditions. The mean produces more realistic consequences than a 95th percentile condition, which is sometimes used in accident analyses. The 95th percentile condition represents low-probability meteorological conditions that are not exceeded more than 5 percent of the time.

As discussed in Appendix B, the probability coefficients for determining the likelihood of a latent cancer fatality for low doses or dose rates are 0.0004 and 0.0005 fatal cancers per rem, applied to individual workers and individuals in the general public, respectively. For high doses received at a high rate, respective probability coefficients of 0.0008 and 0.001 fatal cancers per rem were applied for individual workers and individuals in the general public. The higher-probability coefficients apply where individual doses are above 20 rad or dose rates are above 10 rad per hour.

The preceding discussion focuses on radiological accidents. Chemical accident scenarios were not evaluated, since inventories of hazardous chemicals to support TA-18 operations do not exceed the Threshold Planning Quantities as stipulated on the Extremely Hazardous Substances List provided in Section 3.02 of the

[1] *Technical areas at Sandia National Laboratories/New Mexico are designated using roman numerals.*

Emergency Planning and Community Right-to-Know Act (EPA 1998). The U.S. Department of Energy (DOE) has considered impacts from sabotage in a separate analysis. This analysis is incorporated as a classified appendix to the EIS. Industrial accidents were evaluated and the results are presented in Section C.7.

C.3 Accident Scenario Selection Process

In accordance DOE NEPA guidelines, an EIS should, to the extent applicable, contain a representative set of accidents that includes various types such as fire, explosion, mechanical impact, criticality, spill, human error, natural phenomena, and external events. DOE's Office of NEPA Oversight, in the *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements,* the "Green Book" (DOE 1993), presents recommendations for determining which accident scenarios to analyze.

The accident scenario selection was based on evaluation of accidents reported in the *Basis for Interim Operations (TA-18 BIO)* (DOE 2001). The selection and evaluation of accidents in the *TA-18 BIO* was based on a process described in the *DOE Standard: Preparation Guide for U.S. Department of Energy New Reactor Nuclear Facility Safety Analysis Reports (New Reactor SAR Preparation Guide)* (DOE 1994a). The accident selection process for this EIS is described in Sections C.3.1 through C.3.3 for Steps 1 through 3, respectively.

C.3.1 Hazard Identification – Step 1

Hazard evaluation, or hazards analysis, is the process of identifying the material, system, process, and plant characteristics that can potentially endanger the health and safety of workers and the public and then analyzing the potential consequences to humans of accidents involving the identified hazards. The hazards analysis examines the complete spectrum of accidents that could expose members of the public, onsite workers, facility workers, and the environment to hazardous materials. The hazards present at TA-18 were identified by reviewing broad hazards lists, assessing the applicability to the facilities and activities at the site, and looking for possible unique hazards posed by the unique activities carried out at TA-18.

Hazards analysis teams were assembled by LANL to collect and review documentation pertinent to the activities, machines, and facilities at TA-18 (DOE 2001). They performed technical walk downs of each facility and observed, from the remote-control room, actual criticality experiments on the critical assembly machines. Technical discussions and interviews were held with TA-18 personnel covering the spectrum of activities carried out at the site. **Table C–1** indicates the range of activities investigated and assessed for inclusion in the hazards analysis.

Table C–1 TA-18 Activities Evaluated in the Hazards Analysis

Category	*Activity*
Detector development	Active interrogation
	Detector development and operation
Emergency response	Readiness activities
	Interagency training
	Criticality safety demonstration
	Low- and medium-dose radiography
Critical assembly machines	Storage of security Category I and II nuclear materials
	Manual handling of nuclear materials
	Licensed equipment operations (crane, hoist, forklift)
	Operation of special equipment (e.g., vacuum cleaner)
	Detector development and operation

Category	***Activity***
Critical assembly machines (cont'd)	Welding
	Radiation test object construction
	Use of CASA or miscellaneous buildings as temporary material access areas
	Temporary staging of vault materials into CASA workspace
	Transfer of FL-10 bottle contents
	Criticality safety demonstration
	Special nuclear materials handling demonstration
	Planned criticality
	Local mode of machine operation (Plan 2)
	Source handling
	Loading/unloading of core materials
	Machine setup and tear-down operations
	Uranium fuel solution handling (fueling, defueling, spill cleanup)
	Dosimeter retrieval
	Hand stacking, hand cranking of core materials
	Worker re-entry into CASA after operations
	Radiography (excludes linear accelerator)
	Radiography with linear accelerator
	Drum or counter assay
	Portal installation, development, and testing
	Package monitoring
	Transport of nuclear materials (truck, motorized cart, forklift)
	Uranium hexafluoride operations
	Propane bottle handling
Operation	Basic criticality safety class
	Advanced criticality safety class
	CASA maintenance
	Long-range alpha detector
Material protection, control, and accountability	Portal installation, development, and testing
	Package monitor development
	Accelerator operations
	Operation of portable linear accelerator
	Sealed neutron generators
Support activities	Work control
	Soldering
	Machinists
	General mechanical support
	Licensed equipment operations (cranes, hoist, forklifts, etc.)
	Welding, staff, and shop
	Gamma spectroscopy
	Source handling
	Health physics support
	Special nuclear materials moves
	Industrial hygiene support
	Handling gas cylinders
	Waste management

CASA = Critical Assembly Storage Area.
Source: DOE 2001.

Hazard tables were prepared for the TA-18 facilities and activities. A LANL team screened the hundreds of potential hazards in the hazard tables to develop a subset of approximately 400 major TA-18 radiological hazards for use in the preparation of the *TA-18 BIO* (DOE 2001).

C.3.2 Hazard Evaluation – Step 2

The LANL team preparing the *TA-18 BIO* subsequently screened the subset of approximately 400 major TA-18 radiological hazards developed in Step 1. Using a hazards analysis process based on guidance provided by the *New Reactor SAR Preparation Guide* (DOE 1994a), the 400 major hazards were reduced to 22 major accidents. The process ranks the risk of each hazard based on estimated frequency of occurrence and potential consequences to screen out low-risk hazards. The subset of 22 major accidents (i.e., 4 reactivity insertion accidents, 2 criticality accidents, 6 fire/explosion accidents, 6 natural-phenomena events, 1 external event, and 3 miscellaneous events) were identified for analysis in the *TA-18 BIO* (DOE 2001). Descriptions of critical assembly machines are provided in Appendix A.

C.3.3 Accidents Selected for This Evaluation – Step 3

The EIS team screened the subset of 22 major accidents analyzed in the *TA-18 BIO* (DOE 2001) to select a spectrum of accident scenarios for the No Action Alternative. The following accident categories were considered in the selection process:

- fire
- explosion
- uncontrolled reactivity insertion
- inadvertent criticality
- spill
- mechanical impact
- human error
- natural phenomena
- external events

Screening criteria used in the selection process included, but were not limited to: (1) consideration of the impacts on the public and workers of high-frequency/low-consequence accidents and low-frequency/high-consequence accidents; (2) selection of the highest-impact accident in each accident category to envelope the impacts of all potential accidents; and (3) consideration of only reasonably foreseeable accidents. The list of No Action Alternative accident scenarios was reviewed for applicability to the other reasonable alternatives evaluated in this EIS. In addition, hazards and accident analyses at the candidate sites were reviewed to determine the potential for accidents initiated by external events (e.g., aircraft crash, and explosions in collocated facilities) and natural phenomena (e.g., external flooding, earthquake, extreme winds, and missiles).

Accident scenarios that involved the spill of radioactive material or the release of radioactive material due to mechanical impacts of machines or storage containers were considered but not evaluated in this EIS. The explosion scenario envelopes the worker and public health and safety impacts of these potential scenarios, where machine and storage containers in the facility were breached by the force of the explosion. Accident scenarios initiated by human error are evaluated in this EIS. Human error can be the initiating event for the postulated inadvertent criticality and uncontrolled reactivity insertion accident scenarios.

The results of the Step-3 selection process are presented below for each of the accident categories.

Fire – The high-pressure spray fire on a Comet machine, with a plutonium core, was selected from the list of fire accidents evaluated in the *TA-18 BIO* because it has a potentially large impact. Unmitigated, the fire has the potential to damage the Comet machine plutonium core. This accident scenario is applicable to all alternatives, excluding activities involving SHEBA relocation.

Explosion – Hydrogen detonation in SHEBA was selected as the representative explosion accident scenario. This accident scenario was selected because the accident analyses postulated that the force of the explosion could damage not only the SHEBA core, but also storage containers in the facility and could release additional radioactive material. This scenario is applicable to the two alternatives that involve SHEBA, the No Action and TA-18 Upgrade Alternatives, and to SHEBA relocation.

Uncontrolled reactivity insertion – Since TA-18 operations involve tests with both solid and liquid cores, two uncontrolled reactivity insertion accident scenarios were selected for evaluation in this EIS. The uncontrolled reactivity insertion in Comet or Planet, with a plutonium core, was selected as a representative scenario for insertions into a solid core. This scenario is applicable to all alternatives, excluding activities involving SHEBA relocation.

The uncontrolled reactivity insertion in SHEBA, in the burst mode, was selected as a representative scenario for insertions into a liquid core. This scenario is applicable to the two alternatives that involve SHEBA (i.e., the No Action and TA-18 Upgrade Alternatives).

Inadvertent criticality – Since TA-18 operations involve the handling of both solid and liquid radioactive materials, two inadvertent criticality accident scenarios were selected for evaluation in this EIS. The first postulated scenario is a bare, fully reflected, or moderated metal criticality accident. This scenario is applicable to all alternatives but is not applicable to SHEBA relocation. The second scenario postulates an inadvertent solution criticality. Since the handling of radioactive solutions is primarily associated with SHEBA operations, the inadvertent solution criticality scenario is applicable to the two alternatives that involve SHEBA, the No Action and TA-18 Upgrade Alternatives, and to SHEBA relocation.

Natural phenomena (earthquake) – The earthquake-induced facility collapse, without fire, was selected as the representative natural phenomena-induced accident scenario. At TA-18, natural gas from broken pipelines that would otherwise cause a fire is released through the rubble and fails to reach a flammable mixture. This scenario is applicable to all alternatives and to SHEBA relocation. The failure (i.e., collapse) of existing facilities and proposed new facilities due to an earthquake is based on site-specific facility seismic design features and the return frequencies for earthquakes with forces that significantly exceed the design-basis earthquake for the facility. An earthquake with less force, causing less damage, could trap natural gas from broken pipelines, leading to a fire, but with a smaller source term and lower impacts.

External events (aircraft crash) – The locations of existing facilities and the proposed locations of new facilities were evaluated to determine the probability of an aircraft impacting the facility, penetrating the facility, and damaging equipment and/or storage containers, causing the release of radioactive material. In those cases where the probability was less than 1.0×10^{-7} per year (i.e., less than 1 chance in 10 million years), the postulated scenario is not considered credible and is not evaluated in the EIS. The only alternative considered vulnerable to the high-energy aircraft-crash accident scenario is the SNL/NM Alternative. The accident scenario is initiated by a large aircraft crashing into an underground facility. The frequency of this accident is estimated to be 6.3×10^{-6} per year. However, analysis showed that there would be no damage to the materials at risk and, therefore, no radiological release to the environment (SNL/NM 2001). Therefore, this accident was eliminated from further analysis.

The locations of the existing facilities and the proposed locations of new facilities were also evaluated to determine if an accident in an adjacent facility or in a collocated or shared facility supporting another mission could propagate or initiate an accident in a facility with a TA-18-related mission. No externally initiated reasonably foreseeable accidents were identified that could affect the relocated TA-18 mission facilities.

Table C–2 shows the correlation between accidents and alternatives.

Table C–2 Applicability of TA-18 Existing Facilities Accidents to Alternatives

Accident Scenario	*Alternatives*						*Relocation of Security Category III/IV and SHEBA*
	No Action	*TA-18 Upgrade*	*LANL New Facility*	*SNL/NM*	*NTS*	*ANL-W*	
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	Yes	Yes	Yes	Yes	Yes	Yes	No
Bare, fully reflected, or moderated metal criticality	Yes	Yes	Yes	Yes	Yes	Yes	No
High-pressure spray fire on a Comet machine with a plutonium core	Yes	Yes	Yes	Yes	Yes	Yes	No
Earthquake-induced facility failures without fire	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Uncontrolled reactivity insertion in SHEBA in burst mode	Yes	Yes	No	No	No	No	Yes
Hydrogen detonation in SHEBA	Yes	Yes	No	No	No	No	Yes
Inadvertent solution criticality	Yes	Yes	No	No	No	No	Yes

C.4 ACCIDENT SCENARIO DESCRIPTIONS AND SOURCE TERM

This section describes the accident scenarios and corresponding source term developed for the relocation of TA-18 operations. The spectrum of accidents described below was used to determine the consequences (public and worker doses) and associated risks. Additional assumptions were made when further information was required to clarify the accident condition, update some of the parameters, or facilitate the evaluation process; these are referenced in each accident description.

The source term is the amount of respirable radioactive material released to the air, in terms of curies or grams, assuming the occurrence of a postulated accident. The airborne source term is typically estimated by the following equation:

$$\text{Source term} = \text{material at risk} \times \text{damage ratio} \times \text{airborne release fraction} \times \text{respirable fraction} \times \text{leak path factor}$$

The material at risk is the amount of radionuclides (in curies of activity or grams for each radionuclide) available for release when acted upon by a given physical stress (i.e., an accident). The material at risk is specific to a given process in the facility of interest. It is not necessarily the total quantity of material present, but is that amount of material in the scenario of interest postulated to be available for release.

The damage ratio is the fraction of material exposed to the effects of the energy, force, or stress generated by the postulated event. For the accident scenarios discussed in this analysis, the value of the damage ratio varies from 0.1 to 1.0.

The airborne release fraction is the fraction of material that becomes airborne due to the accident. In this analysis, airborne release fractions were obtained from the *TA-18 BIO* (DOE 2001) or the *DOE Handbook* on airborne release fractions (DOE 1994b).

The respirable fraction is the fraction of the material with a 10-micrometer (micron) or less aerodynamic-equivalent diameter particle size that could be retained in the respiratory system following inhalation. The respirable fraction values are also taken from the *TA-18 BIO* (DOE 2001) or the *DOE Handbook* on airborne release fractions (DOE 1994b).

The leak path factor accounts for the action of removal mechanisms (e.g., containment systems, filtration, deposition) to reduce the amount of airborne radioactivity ultimately released to occupied spaces in the facility or the environment. A leak path factor of 1.0 (i.e., no reduction) is assigned in accident scenarios involving a major failure of confinement barriers. Leak path factors were obtained from the *TA-18 BIO* (DOE 2001) and site-specific evaluations.

Since the isotopic composition and shape of some of the nuclear materials are classified, the material inventory has been converted to equivalent amounts of plutonium-239. The conversion was on a constant-consequence basis, so that the consequences calculated in the accident analyses are equivalent to what they would be if actual material inventories were used. The following sections describe the selected accident scenarios and corresponding source terms for each alternative.

C.4.1 Uncontrolled Reactivity Insertion in Comet or Planet with a Plutonium Core

An uncontrolled reactivity insertion in Comet or Planet could occur if additional fissile material is inadvertently added to the plutonium core; the geometry of the core is changed so that it has a higher reactivity; neutron-absorbing material in the system is removed; or a substance is placed outside the core which improves the reflection of neutrons from the core back into the core. This reactivity can be added as an immediate step increase or as a gradually increasing reactivity.

The scenario assumes a step insertion of reactivity followed by a runaway power excursion accident in Comet or Planet with a plutonium core. The accident is initiated by an unplanned reactivity insertion in either a Comet or Planet machine caused by a large deviation from the experiment plan and other human errors. Core damage is possible depending on the amount of excess reactivity insertion. The extent of any core damage also depends on the insertion rate (fast or slow) and the operator's response in initiating reactor protection-system scram. Core damage can range from fuel surface oxidation to fuel melting. Fuel melting has a higher airborne release fraction than metal oxidation. For this analysis, an unmitigated case is evaluated (i.e., no credit is taken for reactor protection-system scram or opportunities for operator-initiated manual scram). For this accident scenario, a bounding reactivity[2] insertion of $0.80 is postulated. This level of reactivity insertion is in excess of the administrative control limit of $0.50 and, therefore, is extremely conservative. Appendix A, Section A.1, provides a detailed discussion of reactivity.

The estimated frequency of this event is 1.0×10^{-6} per year. The material at risk is approximately 27 kilograms (60 pounds) of plutonium-239 equivalent metal. The damage ratio is 1.0 (i.e., the accident causes the entire core to melt). The airborne release fraction is 0.01, and the respirable fraction is 1.0.

[2] *Reactivity is the fractional change in neutron multiplication factor from one neutron generation to the next. Reactivity in dollars is equal to the delayed neutron fraction corresponding to a multiplication factor of 1.002 for a plutonium-239 core.*

For the No Action Alternative, the leak path factor is assumed to be 1.0 because the buildings are not specifically designed to contain or filter releases. This results in a source term of approximately 270 grams (10 ounces) of plutonium-239 equivalent.

For the TA-18 Upgrade, LANL New Facility, SNL/NM, NTS, and ANL-W Alternatives, the leak path factor is assumed to be 0.001 due to the implementation of improved containment, including high-efficiency particulate air filtration systems. This results in a source term of approximately 0.27 grams (0.01 ounces) of plutonium-239 equivalent.

In addition to the plutonium release, there would also be a fission product release. The fission products, however, were not included in the source term because analysis showed that the fission product release consequence contribution would be a minute fraction of the plutonium release and would not change the presented results (DOE 2001).

C.4.2 Bare, Fully Reflected, or Moderated Metal Criticality

An inadvertent criticality of a solid metal fissile material assembly could occur if the number of neutrons leaking out of the system (and therefore not available for further fissions) is reduced by introducing or enhancing reflection of these neutrons back into the fissile material. The number of neutrons available to cause additional fissions directly affects a system's ability to become critical. Some neutrons leak out of a mass of fissile material and are not available for further fissions, but a reflector outside the fissile material returns many of these leaking neutrons back to the fissile atoms.

The accident is a solid criticality involving fissile material, reflectors, and moderators resulting from mechanical failures or human errors that lead to introduction or increase of reflection in the system. The accident may be caused by computational errors in criticality safety evaluations, mechanical failures, or human errors that lead to the introduction of moderators in the system, or by human errors in following procedures or established criticality safety limits. A single-pulse yield of 1.0×10^{17} fissions is assessed to be bounding for metal criticalities.

The estimated frequency of this event is 1.0×10^{-6} to 1.0×10^{-4} per year. For this analysis, the high end of the frequency range, 1.0×10^{-4} per year, was conservatively chosen. The damage ratio is 0.1. The respirable fraction is 1.0. The airborne release fractions are 0.5 (krypton, xenon); 0.2 (cesium, rubidium); 0.03 (barium, strontium); 0.05 (iodine); 0.07 (tellurium); 0.002 (ruthenium, rhodium); 0.03 (molybdenum, niobium, technetium); 0.0004 (cerium, zirconium); 0.0006 (lanthanum, praseodymium, neodymium, yttrium); and 0.004 (antimony). The damage ratio and the airborne release fractions were obtained from the *DOE Handbook* on airborne release fractions (DOE 1994b).

For the No Action Alternative, the leak path factor is assumed to be 1.0 because the buildings are not specifically designed to contain or filter releases. The radioisotopes were obtained from the *TA-18 BIO* (DOE 2001). The source term for the No Action alternative is presented in **Table C–3**.

For the TA-18 Upgrade, LANL New Facility, SNL/NM, NTS, and ANL-W Alternatives, the leak path factors are assumed to be 1.0 (noble gases), 0.01 (halogens), and 0.001 (particulates) due to the implementation of improved containment, including high-efficiency particulate air and charcoal filtration systems. The source terms for these alternatives are also presented in Table C–3.

Table C–3 Solid Criticality Source Terms

Isotope	*1 × 10^17 Fissions Activity (curies)*	*No Action Alternative Release Activity (curies)*	*All Other Alternatives Release Activity (curies)*
Krypton-85	3.68×10^{-7}	1.84×10^{-8}	1.84×10^{-8}
Krypton-85m	0.0118	0.00059	0.00059
Krypton-87	0.566	0.0283	0.0283
Krypton-88	1.25	0.0625	0.0625
Rubidium-86	1.26×10^{-6}	2.52×10^{-8}	2.52×10^{-11}
Strontium-89	0.0000364	1.09×10^{-7}	1.09×10^{-10}
Strontium-90	1.54×10^{-6}	4.62×10^{-9}	4.62×10^{-12}
Strontium-91	0.199	0.000597	5.97×10^{-7}
Strontium-92	2.14	0.00642	6.42×10^{-6}
Yttrium-90	8.89×10^{-6}	5.33×10^{-10}	5.33×10^{-13}
Yttrium-91	0.0000198	1.19×10^{-9}	1.19×10^{-12}
Yttrium-92	0.0448	2.69×10^{-6}	2.69×10^{-9}
Yttrium-93	0.0952	5.71×10^{-6}	5.71×10^{-9}
Zirconium-95	0.000472	1.89×10^{-8}	1.89×10^{-11}
Zirconium-97	0.539	0.0000216	2.16×10^{-8}
Niobium-95	4.45×10^{-6}	1.34×10^{-8}	1.34×10^{-11}
Molybdenum-99	0.00150	4.50×10^{-6}	4.50×10^{-9}
Technetium-99m	5.24×10^{-6}	1.57×10^{-8}	1.57×10^{-11}
Ruthenium-103	5.26×10^{-6}	1.05×10^{-9}	1.05×10^{-12}
Ruthenium-105	0.0902	0.000018	1.80×10^{-8}
Ruthenium-106	0.00046	9.20×10^{-8}	9.20×10^{-11}
Rhodium-105	9.07×10^{-6}	1.81×10^{-9}	1.81×10^{-12}
Antimony-127	0.00242	9.68×10^{-7}	9.68×10^{-10}
Antimony-129	0.648	0.000259	2.59×10^{-7}
Tellurium-127	0.000216	1.51×10^{-6}	1.51×10^{-9}
Tellurium-127m	7.73×10^{-7}	5.41×10^{-9}	5.41×10^{-12}
Tellurium-129	0.132	0.000924	9.24×10^{-7}
Tellurium-129m	0.00019	1.33×10^{-6}	1.33×10^{-9}
Tellurium-131	5.53	0.0387	0.0000387
Tellurium-131m	0.0768	0.000538	5.38×10^{-7}
Tellurium-132	0.180	0.00126	1.26×10^{-6}
Iodine-131	0.000313	1.57×10^{-6}	1.57×10^{-8}
Iodine-132	0.309	0.00155	0.0000155
Iodine-133	0.233	0.00117	0.0000117
Iodine-134	13.0	0.065	0.00065
Iodine-135	3.43	0.0172	0.000172
Xenon-133	0.000385	0.0000193	0.0000193
Xenon-135	0.264	0.0132	0.0132
Cesium-136	0.00168	0.0000336	3.36×10^{-8}
Cesium-137	0.000015	3.00×10^{-7}	3.00×10^{-10}
Barium-139	1.36	0.00408	4.08×10^{-6}
Barium-140	0.0135	0.0000405	4.05×10^{-8}
Lanthanum-140	0.00307	1.84×10^{-7}	1.84×10^{-10}
Lanthanum-141	0.0502	3.01×10^{-6}	3.01×10^{-9}
Lanthanum-142	0.593	0.0000356	3.56×10^{-8}
Cerium-141	5.68×10^{-7}	2.27×10^{-11}	2.27×10^{-14}

Isotope	*1×10^{17} Fissions Activity (curies)*	*No Action Alternative Release Activity (curies)*	*All Other Alternatives Release Activity (curies)*
Cerium-143	0.002	8.00×10^{-8}	8.00×10^{-11}
Cerium-144	0.0000609	2.44×10^{-9}	2.44×10^{-12}
Praseodymium-143	1.45×10^{-7}	8.70×10^{-12}	8.70×10^{-15}
Neodymium-147	0.0000123	7.38×10^{-10}	7.38×10^{-13}

Sources: DOE 1994b, DOE 2001.

C.4.3 High-Pressure Spray Fire on the Comet Machine with a Plutonium Core

An operational accident could occur involving a fire on one of the experimental machines in the three TA-18 Critical Assembly Storage Areas (CASAs) while fueled with a plutonium core. For this analysis, the accident is assumed to occur on the Comet machine because it has the most material at risk. A high-pressure spray fire resulting from a leak on the motor side of the hydraulic system fuels the postulated fire. The hydraulic system is an integral part of the Comet machine. A puncture in the high-pressure portion of the system is presumed to produce a spray-like fire that directly impinges on the underside of the aluminum plate on which the special nuclear material is placed. The flame melts the aluminum plate and then the plutonium core.

The estimated frequency of this event is 1.0×10^{-6} per year. The material at risk is approximately 27 kilograms (60 pounds) of plutonium-239 equivalent metal. The damage ratio is 1.0. The airborne release fraction is 0.01 and the respirable fraction is 1.0.

For the No Action Alternative, the leak path factor is assumed to be 1.0 because the buildings are not specifically designed to contain or filter releases. This results in a source term of approximately 270 grams (10 ounces) of plutonium-239 equivalent. The fire adds heat to the release, creating buoyancy, which results in a different release pattern and, therefore, different consequences than the 270 grams (10 ounces) released in the uncontrolled reactivity insertion accident.

For the TA-18 Upgrade, LANL New Facility, SNL/NM, NTS, and ANL-W Alternatives, the leak path factor is assumed to be 0.1 due to the implementation of improved containment, including high-efficiency particulate air filtration systems. This results in a source term of approximately 27 grams (1 ounce) of plutonium-239 equivalent.

C.4.4 Earthquake-Induced Facility Failures without Fire

The accident scenario is initiated by an earthquake event. The event produces sufficient peak ground acceleration to initiate the common-cause collapse of all facilities and the release of respirable material without fire. The *TA-18 BIO* (DOE 2001) described other earthquake events, including an event with a fire. For a fire to occur, the earthquake event must be of sufficient magnitude to damage a natural gas line, while leaving structures substantially intact to retain the released gas. The concentration of the natural gas would build up in the structure and could potentially ignite. The earthquake event with a fire, as well as the other earthquake events, however, all lead to lesser releases than the bounding event in this analysis. Sufficient damage occurs in the bounding event that the leaking natural gas would be dispersed to the atmosphere through the rubble and, therefore, fail to accumulate to a flammable concentration.

The frequency of an earthquake event of this magnitude is estimated to be 0.0001 per year. The material at risk is approximately 360 kilograms (794 pounds) of plutonium-239 equivalent in various forms. The damage ratio is 1.0 for all material forms and facilities. The airborne release fractions for all facilities are 0.0 (metal); 0.00006 (ceramic); 0.002 (powder); 0.0002 (liquid); and 1.0 (gas). The respirable fraction for all facilities is 1.0 (metal, ceramic, gas); 0.3 (powder); and 0.8 (liquid).

For the No Action Alternative, the leak path factor is assumed to be 1.0 because the buildings are assumed to have failed with no potential to contain or filter releases. This results in a source term of approximately 17 grams (0.6 ounces) of plutonium-239 equivalent.

For the TA-18 Upgrade Alternative, the leak path factor is assumed to be 1.0 because the buildings are assumed to have failed with no potential to contain or filter releases. This results in a source term of approximately 17 grams (0.6 ounces) of plutonium-239 equivalent.

For the LANL New Facility, SNL/NM, NTS, and ANL-W Alternatives, the leak path factor is assumed to be 0.001 because the facilities would be located underground, creating an arduous leak path, especially for particulates. The material at risk is approximately 350 kilograms (770 pounds) of plutonium-239 equivalent due to the absence of SHEBA. This results in a source term of approximately 0.015 grams (0.0005 ounces) of plutonium-239 equivalent.

For SHEBA relocation to TA-39, the material at risk is approximately 10 kilograms (22 pounds) of plutonium-239 equivalent. Assuming the material at risk is in liquid form, the airborne release factor is 0.0002 and the respirable fraction is 0.8. The leak path factor for this accident is assumed to be 1.0. This results in a source term of 1.6 grams (0.056 ounces) of plutonium-239 equivalent.

C.4.5 Uncontrolled Reactivity Insertion in SHEBA in Burst Mode

Burst operations in SHEBA are conducted by gradually filling the critical assembly vessel (CAV) with fuel until a stable, delayed critical condition is achieved. The safety rod is then inserted to terminate neutron multiplication and additional fuel is added to the CAV, followed by rapid withdrawal of the safety rod to initiate the burst. An unanticipated or larger-than-planned prompt critical burst is postulated as a result of failed engineering and administrative controls. The unmitigated reactivity insertion accident is assumed to result in the overpressure rupture of the CAV. Vessel fragments are assumed to also impact material located in the SHEBA building.

The estimated frequency of this event is 1.0×10^{-6} per year. The material at risk is approximately 10 kilograms (22 pounds) of plutonium-239 equivalent metal in mostly metal form and very small amounts in ceramic and liquid forms. The damage ratio is 1.0 for all material forms. The airborne release fractions for the SHEBA core are 1.0 (metal, gas); 0.006 (ceramic, powder); and 0.00005 (liquid). The SHEBA building airborne release fractions are 0.0005 (metal); 0.005 (ceramic, powder); 0.00005 (liquid); and 1.0 (gas). The respirable fractions for the SHEBA core are 1.0 (metal, gas); 0.01 (ceramic, powder); and 0.8 (liquid). The SHEBA building respirable release fractions are 0.5 (metal); 0.4 (ceramic, powder); 0.8 (liquid); and 1.0 (gas). The leak path factor for this accident, regardless of location, is assumed to be 1.0 because the buildings are not designed to contain releases. This results in a source term of approximately 700 grams (25 ounces) of plutonium-239 equivalent.

C.4.6 Hydrogen Detonation in SHEBA

Hydrogen detonation could occur under certain conditions and involve nuclear materials placed in the SHEBA core and/or the SHEBA building. Normal high levels of ionizing radiation generated during SHEBA experiments can cause radiolytic decomposition of water and production of hydrogen. Under sufficiently high energy levels, hydrogen is released to the cover gas space. The unmitigated accident scenario assumes the cover gas system is not operating, resulting in hydrogen detonation or, under partial mitigation in which there is a partial failure of the cover gas system, hydrogen deflagration. For this analysis, the bounding hydrogen detonation scenario is evaluated.

The estimated frequency of this event is 0.0054 per year. The material at risk is approximately 0.9 kilograms (2 pounds) (ceramic); 0.009 kilograms (0.3 ounces) (liquid); 0.7 kilograms (1.5 pounds) (metal); and 0.00006 kilograms (0.002 ounces) (powder) of plutonium-239 equivalent. The damage ratio is 1.0 for all material forms. The airborne release fractions are 0.0005 (metal); 0.005 (ceramic, powder); and 0.00005 (liquid). The respirable release fractions are 0.5 (metal); 0.4 (ceramic, powder); and 0.8 (liquid). The leak path factor is assumed to be 1.0 because the buildings are not designed to contain releases. This results in a source term of approximately 2 grams (0.07 ounces) of plutonium-239 equivalent.

C.4.7 Inadvertent Solution Criticality in SHEBA

An inadvertent solution criticality could occur in a solution containing one or more fissile isotopes if one or more of the following occurs: (1) the fissile isotope concentration is increased; (2) the total solution mass increases; (3) the geometric configuration of the solution changes in a way that increases its reactivity; or (4) materials are placed outside the solution vessel that reflect neutrons back into the solution, thereby increasing its reactivity. It could occur in a vault or CASA used to support SHEBA operations. It would involve an enriched fuel solution such as uranyl fluoride or nitrate up to 93 percent enriched fuel. In the vault, the most likely initiating events are the reconfiguration of five or six FL-10 containers by maintenance personnel or a seismic event. In a CASA, the criticality could be initiated by mishandling, leading to a spill or reconfiguration such as excessive stacking/reflection. An inadvertent solution criticality could also occur in Building 168 in SHEBA caused by human errors such as miscalculation or inadequate transfers during a switchover to a new fissile solution. No other operations or activities within TA-18 are assumed to handle, stage, or store fissile solutions in sufficient quantities to pose a solution criticality concern. A total yield of 3×10^{18} fissions is assessed to be bounding for all expected postulated solution criticalities at TA-18.

The estimated frequency of this event is 1.0×10^{-6} per year. The material at risk is approximately 100 liters (26.4 gallons), with an assumed fuel composition of 0.855 percent uranium-234; 93.04 percent uranium-235; 0.269 percent uranium-236; and 5.836 percent uranium-238. The damage ratio is 1.0. The analysis assumes that 25 percent of the solution boils off and 75 percent remains in a bulk configuration. The airborne release fraction and respirable fraction are different for the boiled/ejected and nonejected fractions of the solution. The airborne respirable fractions are 1.0 (krypton, xenon); 0.001 (cesium, rubidium, rhodium, ruthenium, tellurium); 0.000625 (antimony, barium, cerium, lanthanum, molybdenum, neodymium, niobium, praseodymium, strontium, technetium, yttrium, zirconium); and 0.4375 (iodine). The unmitigated leak path factor is conservatively assumed to be 1.0 with no depletion or plate out during transport within the building. The resulting source term is presented in **Table C–4**.

Table C–4 Liquid Criticality Source Terms

Isotope	*3×10^{18} Fissions Activity (curies)*	*Release Activity (curies)*
Krypton-85	3.94×10^{-6}	3.94×10^{-6}
Krypton-85m	0.559	0.559
Krypton-87	44.8	44.8
Krypton-88	63.0	63.0
Rubidium-86	0.0000126	1.26×10^{-8}
Strontium-89	0.000327	2.04×10^{-7}
Strontium-90	0.0000194	1.21×10^{-8}
Strontium-91	2.91	0.00182
Strontium-92	81.3	0.0508
Yttrium-90	0.000551	3.44×10^{-7}
Yttrium-91	0.0000315	1.97×10^{-8}
Yttrium-92	0.352	0.00022
Yttrium-93	1.67	0.00104

Isotope	*3×10^{18} Fissions Activity (curies)*	*Release Activity (curies)*
Zirconium-95	0.00313	1.96×10^{-6}
Zirconium-97	18.6	0.0116
Niobium-95	3.41×10^{-6}	2.13×10^{-9}
Molybdenum-99	0.0374	0.0000234
Technetium-99m	9.38×10^{-6}	5.86×10^{-9}
Ruthenium-103	0.0000313	3.13×10^{-8}
Ruthenium-105	0.0969	0.0000969
Ruthenium-106	0.0000294	2.94×10^{-8}
Rhodium-105	4.93×10^{-6}	4.93×10^{-9}
Antimony-127	0.00891	5.57×10^{-6}
Antimony-129	3.03	0.00189
Tellurium-127	0.000345	3.45×10^{-7}
Tellurium-127m	7.73×10^{-6}	7.73×10^{-9}
Tellurium-129	1.67	0.00167
Tellurium-129m	0.00221	2.21×10^{-6}
Tellurium-131	42.1	0.0421
Tellurium-131m	1.01	0.00101
Tellurium-132	3.14	0.00314
Iodine-131	0.0033	0.00144
Iodine-132	1.17	0.512
Iodine-133	1.31	0.573
Iodine-134	78.0	34.1
Iodine-135	75.1	32.9
Xenon-133	0.000822	0.000822
Xenon-135	1.63	1.63
Cesium-136	0.00268	2.68×10^{-6}
Cesium-137	0.0000679	6.79×10^{-8}
Barium-139	7.93	0.00496
Barium-140	0.224	0.00014
Lanthanum-140	0.0224	0.000014
Lanthanum-141	0.819	0.000512
Lanthanum-142	10.6	0.00663
Cerium-141	4.80×10^{-6}	3.0×10^{-9}
Cerium-143	0.155	0.0000969
Cerium-144	0.00171	1.07×10^{-6}
Praseodymium-143	1.38×10^{-6}	8.63×10^{-10}
Neodymium-147	0.0002	1.25×10^{-7}

Source: DOE 2001.

C.5 Accident Analyses Consequences and Risk Results

Once the source term for each accident scenario is determined, the radiological consequences are calculated. The calculations vary depending on how the release is dispersed, what material is involved, and which receptor is being considered. Risks are calculated based on the accident's frequency and its consequences. The risks are stated in terms of additional cancer fatalities resulting from a release.

For example, if the dose to the maximally exposed individual is 10 rem, the probability of a latent cancer fatality is $10 \times 0.0005 = 0.005$, where 0.0005 is the latent cancer fatality probability factor. If the maximally exposed individual receives a dose in excess of 20 rem, the latent cancer probability factor is doubled to 0.001. Thus, if the maximally exposed individual receives a dose of 30 rem, the latent cancer probability factor is 30 × 0.001 = 0.03.

For a noninvolved worker, the latent cancer fatality probability factor is 0.0004 rather than the 0.0005 factor used for the public. If a noninvolved worker receives a dose of 10 rem, the probability of a latent cancer fatality is 10 × 0.0004 = 0.004. As with the maximally exposed individual, if the dose exceeds 20 rem, the latent cancer probability factor doubles to 0.008.

For the population, the same latent cancer fatality probability factors are used to determine the estimated number of latent cancer fatalities. The MACCS2 computer code calculates the dose to each individual in the exposed population and then applies the appropriate latent cancer probability factor (i.e., 0.0005 for doses less than 20 rem or 0.001 for doses greater than or equal to 20 rem). Therefore, for some releases, the estimated number of latent cancer fatalities will not be a straight multiplication from the population dose. For example, at TA-18, the uncontrolled reactivity insertion in SHEBA in a burst-mode accident results in a population dose of 6,580 person-rem with 3.93 estimated latent cancer fatalities. The estimated number of latent cancer fatalities is between the 0.0005 and 0.001 probability factors. The 0.0005 factor would yield 3.29 cancer fatalities and the 0.001 would yield 6.58 cancer fatalities. This indicates that some members of the population received doses in excess of 20 rem. Allowing the computer code to calculate the number of latent cancer fatalities results in a more realistic number of potential latent cancer fatalities than using a straight multiplication factor.

The following tables (**C–5** through **C–18**) provide the results, which are presented in two tables for each alternative. The first of these tables presents the consequences (doses and latent cancer probability), assuming the accident occurs. The second provides the annual cancer risks, taking into account the accident frequency.

Table C–5 Accident Frequency and Consequences under the No Action Alternative

Accident	*Frequency (per year)*	*Maximally Exposed Offsite Individual*		*Offsite Population* [a]		*Noninvolved Worker*	
		Dose (rem)	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.0×10^{-6}	8.70	0.00435	2,580	1.30	133	0.106
Bare, fully reflected or moderated metal criticality	0.0001	2.49×10^{-7}	1.25×10^{-10}	0.0000669	3.34×10^{-8}	2.58×10^{-6}	1.03×10^{-9}
Uncontrolled reactivity insertion in SHEBA in burst mode	1.0×10^{-6}	22.2	0.0222	6,580	3.93	339	0.271
High-pressure spray fire on a Comet machine with a plutonium core	1.0×10^{-6}	2.09	0.00105	2,180	1.09	6.28	0.00251
Hydrogen detonation in SHEBA	0.0054	0.0625	0.0000313	18.8	0.00942	0.909	0.000364
Earthquake-induced facility failures without fire	0.0001	0.413	0.000207	158	0.0792	5.96	0.00238
Inadvertent solution criticality in SHEBA	1.0×10^{-6}	0.000185	9.25×10^{-8}	0.058	0.0000288	0.00179	7.16×10^{-7}

[a] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table C–6 Annual Cancer Risks Due to Accidents under the No Action Alternative

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	4.35×10^{-9}	1.30×10^{-6}	1.06×10^{-7}
Bare, fully reflected or moderated metal criticality	1.25×10^{-14}	3.34×10^{-12}	1.03×10^{-13}
Uncontrolled reactivity insertion in SHEBA in burst mode	2.22×10^{-8}	3.93×10^{-6}	2.71×10^{-7}
High-pressure spray fire on a Comet machine with a plutonium core	1.05×10^{-9}	1.09×10^{-6}	2.51×10^{-9}
Hydrogen detonation in SHEBA	1.69×10^{-7}	5.09×10^{-5}	1.97×10^{-6}
Earthquake-induced facility failures without fire	2.07×10^{-8}	7.92×10^{-6}	2.38×10^{-7}
Inadvertent solution criticality in SHEBA	9.25×10^{-14}	2.88×10^{-11}	7.16×10^{-13}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.

Table C–7 Accident Frequency and Consequences under the TA-18 Upgrade Alternative

Accident	Frequency (per year)	Maximally Exposed Offsite Individual: Dose (rem)	Maximally Exposed Offsite Individual: Latent Cancer Fatalities [b]	Offsite Population [a]: Dose (person-rem)	Offsite Population [a]: Latent Cancer Fatalities [c]	Noninvolved Worker: Dose (rem)	Noninvolved Worker: Latent Cancer Fatalities [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.0×10^{-6}	0.0087	4.35×10^{-6}	2.58	0.00129	0.133	0.0000532
Bare, fully reflected or moderated metal criticality	0.0001	2.49×10^{-10}	1.25×10^{-13}	6.69×10^{-8}	3.34×10^{-11}	2.58×10^{-9}	1.03×10^{-12}
Uncontrolled reactivity insertion in SHEBA in burst mode	1.0×10^{-6}	22.2	0.0222	6,580	3.93	339	0.271
High-pressure spray fire on a Comet machine with a plutonium core	1.0×10^{-6}	0.209	0.000105	218	0.109	0.628	0.000251
Hydrogen detonation in SHEBA	0.0054	0.0625	0.0000313	18.8	0.00942	0.909	0.000364
Earthquake-induced facility failures without fire	0.0001	0.413	0.000207	158	0.0792	5.96	0.00238
Inadvertent solution criticality in SHEBA	1.0×10^{-6}	0.000185	9.25×10^{-8}	0.0575	0.0000288	0.00179	7.16×10^{-7}

[a] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table C–8 Annual Cancer Risks Due to Accidents under the TA-18 Upgrade Alternative

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	4.35×10^{-12}	1.29×10^{-9}	5.32×10^{-11}
Bare, fully reflected or moderated metal criticality	1.25×10^{-17}	3.34×10^{-15}	1.03×10^{-16}
Uncontrolled reactivity insertion in SHEBA in burst mode	2.22×10^{-8}	3.93×10^{-6}	2.71×10^{-7}
High-pressure spray fire on a Comet machine with a plutonium core	1.05×10^{-10}	1.09×10^{-7}	2.51×10^{-10}
Hydrogen detonation in SHEBA	1.69×10^{-7}	5.09×10^{-5}	1.97×10^{-6}
Earthquake-induced facility failures without fire	2.07×10^{-8}	7.92×10^{-6}	2.38×10^{-7}
Inadvertent solution criticality in SHEBA	9.25×10^{-14}	2.88×10^{-11}	7.16×10^{-13}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 320,182 persons residing within 80 kilometers (50 miles) of the site.

Table C–9 Accident Frequency and Consequences under the LANL New Facility Alternative

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatalities [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatalities [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.0×10^{-6}	0.00334	1.67×10^{-6}	2.89	0.00144	1.53	0.000612
Bare, fully reflected or moderated metal criticality	0.0001	1.20×10^{-10}	6.0×10^{-14}	8.49×10^{-8}	4.24×10^{-11}	2.58×10^{-8}	1.03×10^{-11}
High-pressure spray fire on a Comet machine with a plutonium core	1.0×10^{-6}	0.121	0.0000605	181	0.0907	4.06	0.00162
Earthquake-induced facility failures without fire	0.0001	0.000156	7.8×10^{-8}	0.16	0.0000802	0.0638	0.0000255

[a] Based on a population of 283,571 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table C–10 Annual Cancer Risks Due to Accidents under the LANL New Facility Alternative

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.67×10^{-12}	1.44×10^{-9}	6.12×10^{-10}
Bare, fully reflected or moderated metal criticality	6.0×10^{-18}	4.24×10^{-15}	1.03×10^{-15}
High-pressure spray fire on a Planet machine with a plutonium core	6.05×10^{-11}	9.07×10^{-8}	1.62×10^{-9}
Earthquake-induced facility failures without fire	7.8×10^{-12}	8.02×10^{-9}	2.55×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 283,571 persons residing within 80 kilometers (50 miles) of the site.

Table C–11 Accident Frequency and Consequences under the SNL/NM Alternative

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatalities [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatalities [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.0×10^{-6}	0.000872	4.36×10^{-7}	5.25	0.00262	0.572	0.000229
Bare, fully reflected or moderated metal criticality	0.0001	3.20×10^{-11}	1.60×10^{-14}	1.47×10^{-7}	7.37×10^{-11}	9.91×10^{-9}	3.96×10^{-12}
High-pressure spray fire on a Comet machine with a plutonium core	1.0×10^{-6}	0.0331	0.0000166	433	0.216	6.91	0.00276
Earthquake-induced facility failures without fire	0.0001	0.0000367	1.83×10^{-8}	0.291	1.45×10^{-4}	0.0257	0.0000103

[a] Based on a population of 745,287 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table C–12 Annual Cancer Risks Due to Accidents under the SNL/NM Alternative

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	4.36×10^{-13}	2.62×10^{-9}	2.29×10^{-10}
Bare, fully reflected or moderated metal criticality	1.60×10^{-18}	7.37×10^{-15}	3.96×10^{-16}
High-pressure spray fire on a Comet machine with a plutonium core	1.66×10^{-11}	2.16×10^{-7}	2.76×10^{-9}
Earthquake-induced facility failures without fire	1.83×10^{-12}	1.45×10^{-8}	1.03×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 745,287 persons residing within 80 kilometers (50 miles) of the site.

Table C–13 Accident Frequency and Consequences under the NTS Alternative

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatalities [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatalities [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.0×10^{-6}	0.0000626	3.13×10^{-8}	0.016	8.00×10^{-6}	1.52	0.000608
Bare, fully reflected or moderated metal criticality	0.0001	2.18×10^{-12}	1.09×10^{-15}	2.47×10^{-10}	1.23×10^{-13}	2.52×10^{-8}	1.01×10^{-11}
High-pressure spray fire on a Comet machine with a plutonium core	1.0×10^{-6}	0.00497	2.49×10^{-6}	1.55	0.000773	10.0	0.004
Earthquake-induced facility failures without fire	0.0001	2.60×10^{-6}	1.30×10^{-9}	8.88×10^{-4}	4.44×10^{-7}	0.0638	0.0000255

[a] Based on a population of 18,100 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table C–14 Annual Cancer Risks Due to Accidents under the NTS Alternative

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	3.13×10^{-14}	8.00×10^{-12}	6.08×10^{-10}
Bare, fully reflected or moderated metal criticality	1.09×10^{-19}	1.23×10^{-17}	1.01×10^{-15}
High-pressure spray fire on a Comet machine with a plutonium core	2.49×10^{-12}	7.73×10^{-10}	4.00×10^{-9}
Earthquake-induced facility failures without fire	1.30×10^{-13}	4.44×10^{-11}	2.55×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 18,074 persons residing within 80 kilometers (50 miles) of the site.

Table C–15 Accident Frequency and Consequences under the ANL/W Alternative

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatalities [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatalities [b]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.0×10^{-6}	0.000213	1.07×10^{-7}	0.162	0.0000811	1.15	0.00046
Bare, fully reflected or moderated metal criticality	0.0001	8.32×10^{-12}	4.20×10^{-15}	3.12×10^{-9}	1.56×10^{-12}	1.99×10^{-8}	7.96×10^{-12}
High-pressure spray fire on a Comet machine with a plutonium core	1.0×10^{-6}	0.0145	7.25×10^{-6}	15.4	0.00772	17.9	0.00716
Earthquake-induced facility failures without fire	0.0001	8.85×10^{-6}	4.42×10^{-9}	0.00902	4.51×10^{-6}	0.0485	0.0000194

[a] Based on a population of 239,099 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table C–16 Annual Cancer Risks Due to Accidents under the ANL/W Alternative

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Uncontrolled reactivity insertion in Comet or Planet with a plutonium core	1.07×10^{-13}	8.11×10^{-11}	4.60×10^{-10}
Bare, fully reflected or moderated metal criticality	4.20×10^{-19}	1.56×10^{-16}	7.96×10^{-16}
High-pressure spray fire on a Comet machine with a plutonium core	7.25×10^{-12}	7.72×10^{-9}	7.16×10^{-9}
Earthquake-induced facility failures without fire	4.42×10^{-13}	4.51×10^{-10}	1.94×10^{-9}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 239,099 persons residing within 80 kilometers (50 miles) of the site.

Table C–17 Accident Frequency and Consequences under SHEBA Relocation

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatalities [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatalities [b]
Uncontrolled reactivity insertion in SHEBA in burst mode	1.0×10^{-6}	18.0	0.009	6,300	3.54	340	0.272
Hydrogen detonation in SHEBA	0.0054	0.0506	0.0000253	18.0	0.009	0.912	0.000365
Earthquake-induced facility failures without fire	0.0001	0.0315	0.0000158	14.3	0.00717	0.565	0.000226
Inadvertent solution criticality in SHEBA	1.0×10^{-6}	0.000139	6.95×10^{-8}	0.052	0.000026	0.00179	7.16×10^{-7}

[a] Based on a population of 450,302 persons residing within 80 kilometers (50 miles) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table C–18 Annual Cancer Risks Due to Accidents under SHEBA Relocation

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Uncontrolled reactivity insertion in SHEBA in burst mode	9.0×10^{-9}	3.45×10^{-6}	2.72×10^{-7}
Hydrogen detonation in SHEBA	1.37×10^{-7}	4.87×10^{-5}	1.97×10^{-6}
Earthquake-induced facility failures without fire	1.58×10^{-9}	7.17×10^{-7}	2.26×10^{-8}
Inadvertent solution criticality in SHEBA	6.95×10^{-14}	2.60×10^{-11}	7.16×10^{-13}

[a] Increased risk of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 450,302 persons residing within 80 kilometers (50 miles) of the site.

C.6 Analysis Conservatism and Uncertainty

The analysis of accidents is based on calculations relevant to hypothetical sequences of events and models of their effects. The models provide estimates of the frequencies, source terms, pathways for dispersion, exposures, and the effects on human health and the environment as realistic as possible within the scope of the analysis. In many cases, the scarcity of experience with the postulated accidents leads to uncertainty in the calculation of the consequences and frequencies. This fact has promoted the use of models or input values that yield conservative estimates of consequences and frequency.

Due to the layers of conservatism built into the accident analysis for the spectrum of postulated accidents, the estimated consequences and risks to the public represent the upper limit for the individual classes of accidents. The uncertainties associated with the accident frequency estimates are enveloped by the analysis conservatism.

Of particular interest are the uncertainties in the estimates of cancer fatalities from exposure to radioactive materials. The numerical values of the health risk estimators used in this EIS were obtained by linear extrapolation from the nominal risk estimate for lifetime total cancer mortality resulting from exposures of 10 rad. Because the health risk estimators are multiplied by conservatively calculated radiological doses to predict fatal cancer risks, the fatal cancer values presented in this EIS are expected to be overestimates.

For the purposes of this EIS, the impacts calculated from the linear model are treated as an upper-bound case, consistent with the widely used methodologies for quantifying radiogenic health impacts. This does not imply that health effects are expected. Moreover, in cases where the upper-bound estimators predict a number of latent cancer fatalities greater than 1, this does not imply that the latent cancer fatality risk can be determined for a specific individual.

C.7 INDUSTRIAL SAFETY

Estimates of potential industrial impacts on workers during construction and operations were evaluated based on DOE and U.S. Bureau of Labor Statistics. Impacts are classified into two groups, total recordable cases and fatalities. A recordable case includes work-related fatality, illness, or injury that resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid.

DOE and contractor total recordable cases and fatality incidence rates were obtained from the CAIRS database (DOE 2000a, 2000b). The CAIRS database is used to collect and analyze DOE and DOE contractor reports of injuries, illnesses, and other accidents that occur during DOE operations. The five-year average (1995 through 1999) rates were determined for average construction total recordable cases, average operations total recordable cases, and average operations fatalities. The average construction fatality rate was obtained from the Bureau of Labor Statistics (Toscano and Windau 1998).

Table C–19 presents the average occupational total recordable cases and fatality rates for construction and operations activities.

Table C–19 Average Occupational Total Recordable Cases and Fatality Rates (per worker year)

Labor Category	*Total Recordable Cases*	*Fatalities*
Construction	0.053	0.000139
Operations	0.033	0.000013

Expected annual construction and operations impacts on workers for each alternative are presented in **Table C–20**.

Table C–20 Industrial Safety Impacts from Construction and Operations (per year)

Alternative	*Estimated Number of Construction Workers*	*Estimated Number of Operations Workers*	*Construction Injuries*	*Construction Fatalities*	*Operations Injuries*	*Operations Fatalities*
No Action	0	212	0.0	0.0	7.00	0.003
TA-18 Upgrade	110	212	5.83	0.015	7.00	0.003
LANL New Facility	300	100	15.9	0.042	3.30	0.001
SNL/NM	300	100	15.9	0.042	3.30	0.001
NTS	60	100	3.18	0.008	3.30	0.001
ANL-W	120	100	6.36	0.017	3.30	0.001
Relocation of Security Category III/IV and SHEBA	70	110	3.71	0.010	3.63	0.001

As expected, the incidence of impacts, above and beyond those requiring first aid, do indeed exceed impacts from radiation accidents evaluated in this analysis. However, no fatalities would be expected from either construction or operations of any facility.

C.8 MACCS2 CODE DESCRIPTION

The MACCS2 computer code is used to estimate the radiological doses and health effects that could result from postulated accidental releases of radioactive materials to the atmosphere. The specification of the release characteristics, designated a "source term," can consist of up to four Gaussian plumes that are often referred to simply as "plumes."

The radioactive materials released are modeled as being dispersed in the atmosphere while being transported by the prevailing wind. During transport, whether or not there is precipitation, particulate material can be modeled as being deposited on the ground. If contamination levels exceed a user-specified criterion, mitigative actions can be triggered to limit radiation exposures.

There are two aspects of the code's structure that are basic to understanding its calculations: (1) the calculations are divided into modules and phases, and (2) the region surrounding the facility is divided into a polar-coordinate grid. These concepts are described in the following sections.

MACCS is divided into three primary modules: ATMOS, EARLY, and CHRONC. Three phases are defined as the emergency, intermediate, and long-term phases. The relationship among the codes's three modules and the three phases of exposure are summarized below.

The ATMOS module performs all of the calculations pertaining to atmospheric transport, dispersion, and deposition, as well as the radioactive decay that occurs before release and while the material is in the atmosphere. It uses a Gaussian plume model with Pasquill-Gifford dispersion parameters. The phenomena treated include building wake effects, buoyant plume rise, plume dispersion during transport, wet and dry deposition, and radioactive decay and ingrowth. The results of the calculations are stored for use by EARLY and CHRONC. In addition to the air and ground concentrations, ATMOS stores information on wind direction, arrival and departure times, and plume dimensions.

The EARLY module models the time period immediately following a radioactive release. This period is commonly referred to as the emergency phase. The emergency phase begins at each successive downwind distance point when the first plume of the release arrives. The duration of the emergency phase is specified by the user, and it can range between one and seven days. The exposure pathways considered during this period are direct external exposure to radioactive material in the plume (cloudshine); exposure from inhalation of radionuclides in the cloud (cloud inhalation); exposure to radioactive material deposited on the ground (groundshine); inhalation of resuspended material (resuspension inhalation); and skin dose from material deposited on the skin. Mitigative actions that can be specified for the emergency phase include evacuation, sheltering, and dose-dependent relocation.

The CHRONC module performs all of the calculations pertaining to the intermediate and long-term phases. CHRONC calculates the individual health effects that result from both direct exposure to contaminated ground and from inhalation of resuspended materials, as well as indirect health effects caused by the consumption of contaminated food and water by individuals who could reside both on and off the computational grid.

The intermediate phase begins at each successive downwind distance point upon the conclusion of the emergency phase. The user can configure the calculations with an intermediate phase that has a duration as short as zero or as long as one year. In the zero-duration case, there is essentially no intermediate phase and a long-term phase begins immediately upon conclusion of the emergency phase.

Intermediate models are implemented on the assumption that the radioactive plume has passed and the only exposure sources (groundshine and resuspension inhalation) are from ground-deposited material. It is for this reason that MACCS2 requires the total duration of a radioactive release be limited to no more than four days. Potential doses from food and water during this period are not considered.

The mitigative action model for the intermediate phase is very simple. If the intermediate phase dose criterion is satisfied, the resident population is assumed to be present and subject to radiation exposure from groundshine and resuspension for the entire intermediate phase. If the intermediate phase exposure exceeds the dose criterion, then the population is assumed to be relocated to uncontaminated areas for the entire intermediate phase.

The long-term phase begins at each successive downwind distance point upon the conclusion of the intermediate phase. The exposure pathways considered during this period are groundshine, resuspension inhalation, and food and water ingestion.

The exposure pathways considered are those resulting from ground-deposited material. A number of protective measures, such as decontamination, temporary interdiction, and condemnation, can be modeled in the long-term phase to reduce doses to user-specified levels. The decisions on mitigative action in the long-term phase are based on two sets of independent actions: (1) decisions relating to whether land at a specific location and time is suitable for human habitation (habitability), and (2) decisions relating to whether land at a specific location and time is suitable for agricultural production (farmability).

All of the calculations of MACCS2 are stored on the basis of a polar-coordinate spatial grid with a treatment that differs somewhat between calculations of the emergency phase and calculations of the intermediate and long-term phases. The region potentially affected by a release is represented with a (r, Θ) grid system centered on the location of the release. The radius, r, represents downwind distance. The angle, Θ, is the angular offset from north, going clockwise.

The user specifies the number of radial divisions as well as their endpoint distances. The angular divisions used to define the spatial grid are fixed in the code and correspond to the 16 points of the compass, each being 22.5 degrees wide. The 16 points of the compass are used in the United States to express wind direction. The compass sectors are referred to as the coarse grid.

Since emergency phase calculations use dose-response models for early fatalities and early injuries that can be highly nonlinear, these calculations are performed on a finer grid basis than the calculations of the intermediate and long-term phases. For this reason, the calculations of the emergency phase are performed with the 16 compass sectors divided into three, five, or seven equal, angular subdivisions. The subdivided compass sectors are referred to as the fine grid.

Two types of doses may be calculated by the code, “acute” and “lifetime.”

Acute doses are calculated to estimate deterministic health effects that can result from high doses delivered at high dose rates. Such conditions may occur in the immediate vicinity of a nuclear facility following hypothetical severe accidents where confinement and/or containment failure has been assumed to occur. Examples of the health effects based on acute doses are early fatality, prodromal vomiting, and hypothyroidism.

Lifetime doses are the conventional measure of detriment used for radiological protection. These are 50-year dose commitments to either specific tissues (e.g., red marrow and lungs) or a weighted sum of tissue doses defined by the International Commission on Radiological Protection and referred to as “effective dose.”

Lifetime doses may be used to calculate the stochastic health effect risk resulting from exposure to radiation. MACCS2 uses the calculated lifetime dose in cancer risk calculations.

C.9 References

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APPENDIX D

Human Health Effects from Transportation

APPENDIX D
HUMAN HEALTH EFFECTS FROM TRANSPORTATION

D.1 INTRODUCTION

Transportation of any commodity involves a risk to both transportation crew members and members of the public. This risk results directly from transportation-related accidents and indirectly from the increased levels of pollution from vehicle emissions, regardless of the cargo. The transportation of certain materials, such as hazardous or radioactive waste, can pose an additional risk due to the unique nature of the material itself. To permit a complete appraisal of the environmental impacts of the proposed action and alternatives, the human health risks associated with the transportation of Technical Area (TA)-18 nuclear materials are assessed.

This appendix provides an overview of the approach used to assess the human health risks that may result from transportation. The topics in this appendix include the scope of the assessment, packaging and determination of potential transportation routes, analytical methods used for the risk assessment (e.g., computer models), and important assessment assumptions. It also presents the results of the assessment. In addition, to aid in the understanding and interpretation of the results, specific areas of uncertainty are described with an emphasis on how the uncertainties may affect comparisons of the alternatives.

The risk assessment results are presented in this appendix in terms of "per-shipment" risk factors, as well as for the total risks for a given alternative. Per-shipment risk factors provide an estimate of the risk from a single shipment. The total risks for a given alternative are found by multiplying the expected number of shipments by the appropriate per-shipment risk factors.

D.2 SCOPE OF ASSESSMENT

The scope of the transportation human health risk assessment, including the alternatives and options, transportation activities, potential radiological and nonradiological impacts, and transportation modes considered, is described below. Additional details of the assessment are provided in the remaining sections of the appendix.

Proposed Action and Alternatives

The transportation risk assessment conducted for this environmental impact statement (EIS) estimates the human health risks associated with the transportation of radioactive and special nuclear material currently stored at TA-18. Consistent with the scope of the transportation human health risks, this evaluation focuses on using onsite and offsite public highways. Impacts associated with onsite transportation of material in support of the Los Alamos National Laboratory (LANL) New Facility Alternative are addressed qualitatively. Impacts associated with offsite transportation of materials to Sandia National Laboratories/New Mexico (SNL/NM), Nevada Test Site (NTS) and Argonne National Laboratory-West (ANL-W) are quantitatively evaluated.

Transportation-Related Activities

The transportation risk assessment is limited to estimating the human health risks related to transportation for each alternative. The risks to workers or to the public during loading, unloading, and handling prior to or after shipment are included in the transportation assessment. The transportation risk assessment does not address possible impacts from increased transportation levels on local traffic flow, noise levels, or infrastructure.

Radiological Impacts

For each alternative, radiological risks (i.e., those risks that result from the radioactive nature of the materials) are assessed for both incident-free (i.e., normal) and accident transportation conditions. The radiological risk associated with incident-free transportation conditions would result from the potential exposure of people to external radiation in the vicinity of a shipment. The radiological risk from transportation accidents would come from the potential release and dispersal of radioactive material into the environment during an accident and the subsequent exposure of people.

All radiological impacts are calculated in terms of committed dose and associated health effects in the exposed populations. The radiation dose calculated is the total effective dose equivalent (see 10 CFR 20), which is the sum of the effective dose equivalent from external radiation exposure and the 50-year committed effective dose equivalent from internal radiation exposure. Radiation doses are presented in units of roentgen equivalent man (rem) for individuals and person-rem for collective populations. The impacts are further expressed as health risks in terms of latent cancer fatalities and cancer incidence in exposed populations using the dose-to-risk conversion factors established by the National Council on Radiation Protection and Measurement (NCRP 1993).

Nonradiological Impacts

In addition to the radiological risks posed by transportation activities, vehicle-related risks are also assessed for nonradiological causes (i.e., causes related to the transport vehicles and not the radioactive cargo) for the same transportation routes. The nonradiological transportation risks, which would be incurred for similar shipments of any commodity, are assessed for both incident-free and accident conditions. The nonradiological risks during incident-free transportation conditions would be caused by potential exposure to increased vehicle exhaust emissions. The nonradiological accident risk refers to the potential occurrence of transportation accidents that directly result in fatalities unrelated to the shipment of cargo. Nonradiological risks are presented in terms of estimated fatalities.

Transportation Modes

All shipments are assumed to take place by truck transportation modes. Rail transportation is not practical at TA-18 or any of the potential receiving sites, and the U.S. Department of Energy (DOE) has considerably more experience safeguarding special nuclear material on the highways.

Receptors

Transportation-related risks are calculated and presented separately for workers and members of the general public. The workers considered are truck crew members involved in the actual transportation and the site workers involved in repackaging, loading and unloading the materials. The general public includes all persons who could be exposed to a shipment while it is moving or stopped during transit. The affected population includes individuals living within 800 meters (0.5 miles) of each side of the road. Potential risks are estimated for the affected populations and for the hypothetical maximally exposed individual. For incident-free operation, the maximally exposed individual would be an individual stuck in traffic next to the shipment for 30 minutes. For accident conditions, the maximally exposed individual would be an individual located 33 meters (108 feet) directly downwind from the accident. The risk to the affected population is a measure of the radiological risk posed to society as a whole by the alternative being considered. As such, the impact to the affected population is used as the primary means of comparing various alternatives.

D.3 PACKAGING AND REPRESENTATIVE SHIPMENT CONFIGURATIONS

Regulations that govern the transportation of radioactive materials are designed to protect the public from the potential loss or dispersal of radioactive materials, as well as from routine radiation doses during transit. The primary regulatory approach to promote safety is the specification of standards for the packaging of radioactive materials. Because packaging represents the primary barrier between the radioactive material being transported and radiation exposure to the public and the environment, packaging requirements are an important consideration for transportation risk assessment. Regulatory packaging requirements applicable to the TA-18 radioactive and special nuclear material (SNM) are discussed below. The representative packaging and shipment configurations assumed for this EIS also are described below.

D.3.1 Packaging Overview

Although several Federal and state organizations are involved in the regulation of radioactive material transportation, primary regulatory responsibility resides with the U.S. Department of Transportation and the U.S. Nuclear Regulatory Commission (NRC). All transportation activities must take place in accordance with the applicable regulations of these agencies as specified in 49 CFR 172 and 173 and 10 CFR 71.

Transportation packaging for small quantities of radioactive materials must be designed, constructed, and maintained to contain and shield their contents during normal transport conditions. For large quantities and for more highly radioactive material, such as high-level radioactive waste or spent nuclear fuel, they must contain and shield their contents in the event of severe accident conditions. The type of packaging used is determined by the total radioactive hazard presented by the material within the packaging. Four basic types of packaging are used: Excepted, Industrial, Type A, and Type B. Another packaging option, "Strong, Tight," is still available for some domestic shipments.

Excepted packages are limited to transporting materials with extremely low-levels of radioactivity. Industrial packages are used to transport materials that, because of their low concentration of radioactive materials, present a limited hazard to the public and the environment. Type A packages are designed to protect and retain their contents under normal transport conditions and must maintain sufficient shielding to limit radiation exposure to handling personnel. These packages are used to transport radioactive materials with higher concentrations or amounts of radioactivity than Excepted, or Industrial packages. Strong, Tight packages are used in the United States for shipment of certain materials with low-levels of radioactivity, such as natural uranium and rubble from the decommissioning of nuclear reactors. Type AF packages (the "F" stands for fissile material) are designed to carry material with relatively low radioactivity levels with additional requirements to prevent a fission chain reaction under severe transportation conditions. Type B packages are used to transport material with the highest radioactivity levels, are designed to protect and retain their contents under transportation accident conditions, and are described in more detail in the following sections.

D.3.2 Regulations Applicable to Type B Casks

Regulations for the transport of radioactive materials in the United States are issued by the U.S. Department of Transportation and are codified in 49 CFR 173. The regulation authority for radioactive materials transport is jointly shared by the Department of Transportation and the NRC. As outlined in a 1979 Memorandum of Understanding with the NRC, the U.S. Department of Transportation specifically regulates the carriers of radioactive materials and the conditions of transport, such as routing, handling and storage, and vehicle and driver requirements. The U.S. Department of Transportation also regulates the labeling, classification, and marking of all radioactive material packages. The U.S. Department of Transportation also has a specification for one Type B package, the 6M, that could be used to transport TA-18 materials. NRC sets the standards for packages containing Type B quantities of radioactive material, fissile materials and spent nuclear fuel.

DOE policy requires compliance with applicable Federal regulations regarding domestic shipments of radioactive materials. Accordingly, DOE has adopted the requirements of 10 CFR 71, *Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions*, and 49 CFR 173, *Shippers--General Requirements for Shipping and Packaging*. DOE Headquarters can issue a certificate of compliance for a package to be used only by DOE and its contractors. Packages certified by NRC, certified by DOE or specified by the U.S. Department of Transportation could be used to transport TA-18 material.

For certification, transportation casks must be shown by analysis and/or testing to withstand a series of hypothetical accident conditions. These conditions have been internationally accepted as simulating damage to transportation casks that could occur in most reasonably foreseeable accidents. The impact, fire, and water-immersion tests are considered in sequence to determine their cumulative effects on one package. These accident conditions are described in **Figure D–1**.

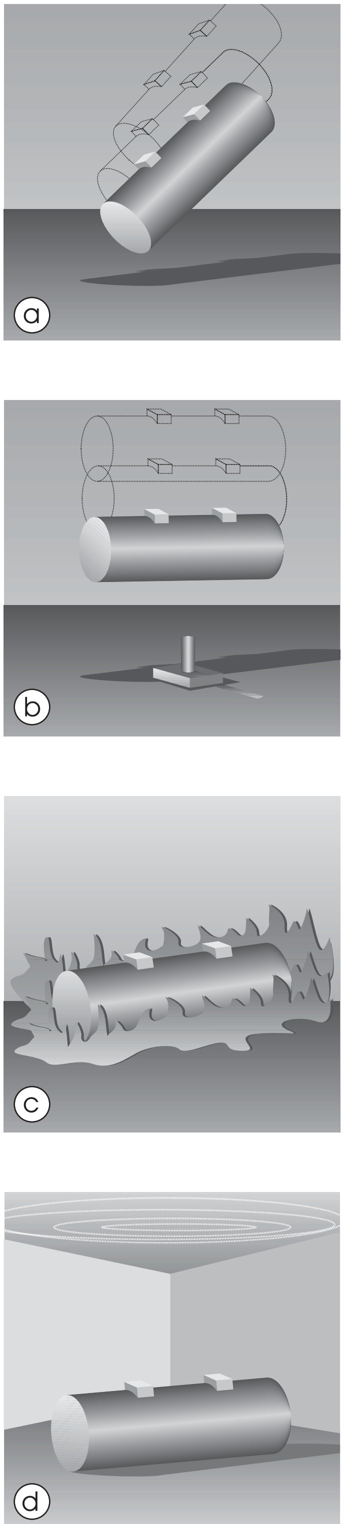
Under the Federal certification program, a Type B packaging design must be supported by a Safety Analysis Report for Packaging (SARP), which demonstrates that the design meets Federal packaging standards. The SARP must include a description of the proposed packaging in sufficient detail to identify the packaging accurately and provide the basis for evaluating its design. The SARP must provide the evaluation of the structural design, materials' properties, containment boundary, shielding capabilities, and criticality control, and present the operating procedures, acceptance testing, maintenance program, and the quality assurance program to be used for design and fabrication. Upon completion of a satisfactory review of the SARP to verify compliance with the regulations, a Certificate of Compliance is issued. For risk assessment purposes, it is important to note that all packaging of a given type is designed to meet the same performance criteria. Therefore, two different Type B designs would be expected to perform similarly during incident-free and accident transportation conditions.

D.3.3 External Radiation Limits

External radiation from a package must be below specified limits that minimize the exposure of handling personnel and the general public. For these types of shipments, the external radiation dose rate during normal transportation conditions must be maintained below the following limits of 49 CFR 173:

- 10 millirem per hour at any point 2 meters (6.6 feet) from the vertical planes projected by the outer lateral surfaces of the transport vehicle (referred to as the regulatory limit throughout this document), and

- 2 millirem per hour in any normally occupied position in the transport vehicle



Standards for Type B Casks

For certification to the U.S. Nuclear Regulatory Commission standards, a cask must be shown by test or analysis to withstand a series of accident conditions without releasing its contents. These conditions have been internationally accepted as simulating damage to spent nuclear fuel casks that could occur in most severe credible accidents. The impact, fire, and water-immersion tests are considered in sequence to determine their cumulative effects on one package. An undamaged containment system is subjected to a deep water-immersion test. The details of the tests are as follows:

Impact

Free Drop (a) – The cask drops 9 meters (30 feet) onto a flat, horizontal, unyielding surface so that it strikes at its weakest point.

Puncture (b) – The cask drops 1 meter (40 inches) onto a 15.2-centimeter (6-inch) diameter steel bar at least 20.3 centimeters (8 inches) long; the bar strikes the cask at its most vulnerable spot.

Fire (c)

After the impact tests, the cask is totally engulfed in an 802 °C (1,475 °F) thermal environment for 30 minutes.

Water Immersion (d)

The cask is completely submerged under at least 1 meter (40 inches) of water for 8 hours. Additionally, undamaged containment systems (casks) are required to withstand more rigorous immersion tests.

Figure D–1 Standards for Transportation Casks

Additional restrictions apply to package surface contamination levels, but these restrictions are not important for the transportation radiological risk assessment. Current contamination standards assure that workers and public receive doses much lower than those associated with radiation emitted from the packages.

D.4 GROUND TRANSPORTATION ROUTE SELECTION PROCESS

According to DOE guidelines, radioactive material shipments must comply with both the NRC and the U.S. Department of Transportation regulatory requirements. NRC regulations cover the packaging and transport of radioactive materials, whereas DOT specifically regulates the carriers and the conditions of transport, such as routing, handling and storage, and vehicle and driver requirements. The highway routing of nuclear material is systematically determined according to the U.S. Department of Transportation regulation 49 CFR 397 for commercial shipments. Specific routes cannot be publicly identified in advance for DOE's Transportation Safeguards Division's shipments because they are classified to protect national security interests.

The U.S. Department of Transportation routing regulations require that shipments of highway route-controlled quantities of radioactive material be transported over a preferred highway network, including interstate highways, with preference toward interstate system bypasses and beltways around cities and state-designated preferred routes. A state or tribe may designate a preferred route to replace or supplement the interstate highway system in accordance with the U.S. Department of Transportation guidelines (49 CFR Section 397.103).

Carriers of highway route-controlled quantities are required to use the preferred network unless they are moving from their origin to the nearest interstate highway or from the interstate highway to their destination, they are making necessary repair or rest stops, or emergency conditions render the interstate highway unsafe or impassable. The primary criterion for selecting the preferred route for a shipment is travel time. Preferred routing takes into consideration accident rate, transit time, population density, activities, time of day, and day of the week.

Representative routes that may be used for the shipments were selected for risk assessment purposes using the HIGHWAY code. They do not necessarily represent the actual routes that would be used to transport nuclear materials. The selection of the actual route would be responsive to environmental and other conditions that would be in effect or could be predicted at the time of shipment. Such conditions could include adverse weather conditions, road conditions, bridge closures, and local traffic problems. For security reasons, details about a route would not be publicized before the shipment.

The HIGHWAY computer code (Johnson et al. 1993) is used for selecting highway routes in the United States. The HIGHWAY database is a computerized road atlas that currently describes over 386,000 kilometers (240,000 miles) of roads. The Interstate System and all U.S. (US-designated) highways are completely described in the database. In addition, most of the principal state highways and many local and community roads are also identified. The code is updated periodically to reflect current road conditions and has been benchmarked against reported mileages and observations of commercial truck firms. Features in the HIGHWAY code allow the user to select routes that conform to U.S. Department of Transportation regulations. Additionally, the HIGHWAY code contains data on the population densities along the routes. The distances and populations from the HIGHWAY code are part of the information used for the transportation impact analysis in this *TA-18 Relocation EIS.*

D.5 SAFEGUARDED TRANSPORTATION

DOE anticipates that any transportation of SNM would be required to be made through use of the Transportation Safeguards System and shipped using Safe, Secure Trailers/Safeguards Transports (SST/SGTs). Transportation safeguards are required for (1) nuclear explosives; (2) components moved in a single shipment that could comprise a complete nuclear explosive; (3) any form of uranium-235 enriched 20 percent or greater in quantities of 5 kilograms (11 pounds) or more, or uranium-233 or plutonium in quantities of 2 kilograms (4.4 pounds) or more; (4) classified forms of plutonium and uranium-235 regardless of quantity as requested by Heads of Field Elements; (5) DOE-owned plutonium in any quantity to be transported by air; or (6) any form of plutonium-238 in excess of 5 grams (0.18 ounce) (DOE Order Supplemental Directive AL 5610.14). The SST/SGT is a fundamental component of the Transportation Safeguards System.

The SST/SGT is a specially designed component of an 18-wheel tractor-trailer vehicle. While 49 CFR Section 173.7(b) exempts SST/SGT shipments from U.S. Department of Transportation regulations, DOE operates and maintains these vehicles in a way that exceeds U.S. Department of Transportation requirements. Although details of vehicle enhancements and some operational aspects are classified, key characteristics of the SST/SGT system include the following:

- Enhanced structural characteristics and a highly-reliable tie-down system to protect cargo from impact.
- Heightened thermal resistance to protect the cargo in case of fire (newer SST/SGT models).
- Established operational and emergency plans and procedures governing the shipment of nuclear materials.
- Various deterrents to prevent unauthorized removal of cargo.
- An armored tractor component that provides courier protection against attack and contains advanced communications equipment.
- Specially designed escort vehicles containing advanced communications and additional couriers.
- 24-hour-a-day real-time communications to monitor the location and status of all SST/SGT shipments via DOE's Security Communication system.
- Couriers, who are armed Federal officers, receive rigorous specialized training and are closely monitored through DOE's Personnel Assurance Program.
- Significantly more stringent maintenance standards than those for commercial transport equipment.
- Conduct of periodic appraisals of the Transportation Safeguards System operations by the DOE National Nuclear Security Administration to ensure compliance with DOE orders and management directives, and continuous improvement in transportation and emergency management programs.

The Transportation Safeguards System is operated by the DOE Transportation Safeguards Division of the Albuquerque Operations Office for the DOE Headquarters National Nuclear Security Administration. Based on operational experience between fiscal year 1984 and fiscal year 1998, the mean probability of an accident requiring the tow-away of the SST/SGT was 0.058 accidents per million kilometers (0.096 accidents per million miles) (Claus and Shyr 1999). By contrast, the rate for commercial trucking in 1989 was about 0.3 accidents per million kilometers (0.5 accidents per million miles) (Saricks and Tompkins 1999). Accident rates for commercial trucking and SST/SGTs were used in the human health effects analysis. Since its establishment in 1975, the Transportation Safeguards Division has accumulated more than 151 million kilometers (94 million miles) of over-the-road experience transporting DOE-owned cargo with no accidents resulting in a fatality or release of radioactive material.

Loading and unloading of SST/SGTs at DOE sites is routinely done in accordance with site facility and Transportation Safeguards Division procedures. The DOE SST/SGT operations team directs and approves loading and securing of packages within SST/SGT vehicles and is solely responsible for closing and securing SST/SGT vehicles and cargo areas prior to transport.

Task interactions between Transportation Safeguards Division operations teams, the SST/SGT operations center, the shipping and receiving sites, and security personnel involved in loading, securing, and dispatching SST/SGT shipments are conducted in accordance with the requirements of DOE Orders 461.1, 5632.1C, and 474.1 and SST/SGT operations procedures. In dispatching shipments, DOE's SST operations team and operations center also coordinate with the security operations center at a DOE site. Estimated time of arrival, shipment, and material accountability information is transmitted to designated persons at the receiving site in accordance with prearranged protocols. DOE anticipates the time necessary to prepare, load, secure, and dispatch SST/SGTs to be on the order of less than 1 day (per convoy).

SGT and SST have similar dimensions. The general dimensions for SST are given below (Ludwig et al. 1997):

Gross vehicle weight rating	36,288 kilograms (80,000 pounds)
Maximum payload	6,169 kilograms (13,600 pounds)
Trailer overall length	18.3 meters (60 feet)
Trailer overall width	259 centimeters (102 inches)
Trailer overall height	4 meters (13 feet)
Trailer rear door width	179.1 to 215.9 centimeters (70.5 to 85 inches)
Trailer rear door height	229 centimeters (90 inches)
Trailer floor height above roadway	144 centimeters (56.5 inches)
Tractor trailer minimum turning radius	11.4 meters (37.5 feet)

D.6 TRANSPORTATION IMPACT ANALYSIS METHODOLOGY

The transportation risk assessment is based on the alternatives described in Chapter 3 of this EIS. After the EIS alternatives were identified, and the requirements of the shipping campaign were understood, data was collected on the material characteristics and accident parameters. Section D.7 describes these parameters. **Figure D–2** summarizes the transportation risk assessment methodology.

Transportation impacts calculated in this EIS are presented in two parts: impacts from incident-free or routine transportation, and impacts from transportation accidents. Impacts from incident-free transportation and transportation accidents were further divided into nonradiological and radiological impacts. Nonradiological impacts from incident-free transportation would be impacts from vehicular emissions and from transportation accidents would be traffic fatalities. Radiological impacts from incident-free transportation include impacts to members of the public and crew from radiation emanating from materials within the package. Only under worst case accident conditions, which are of low probability of occurrence, could a transportation package of the type used to transport radioactive and SNM be damaged to the point that radioactivity could be released to the environment.

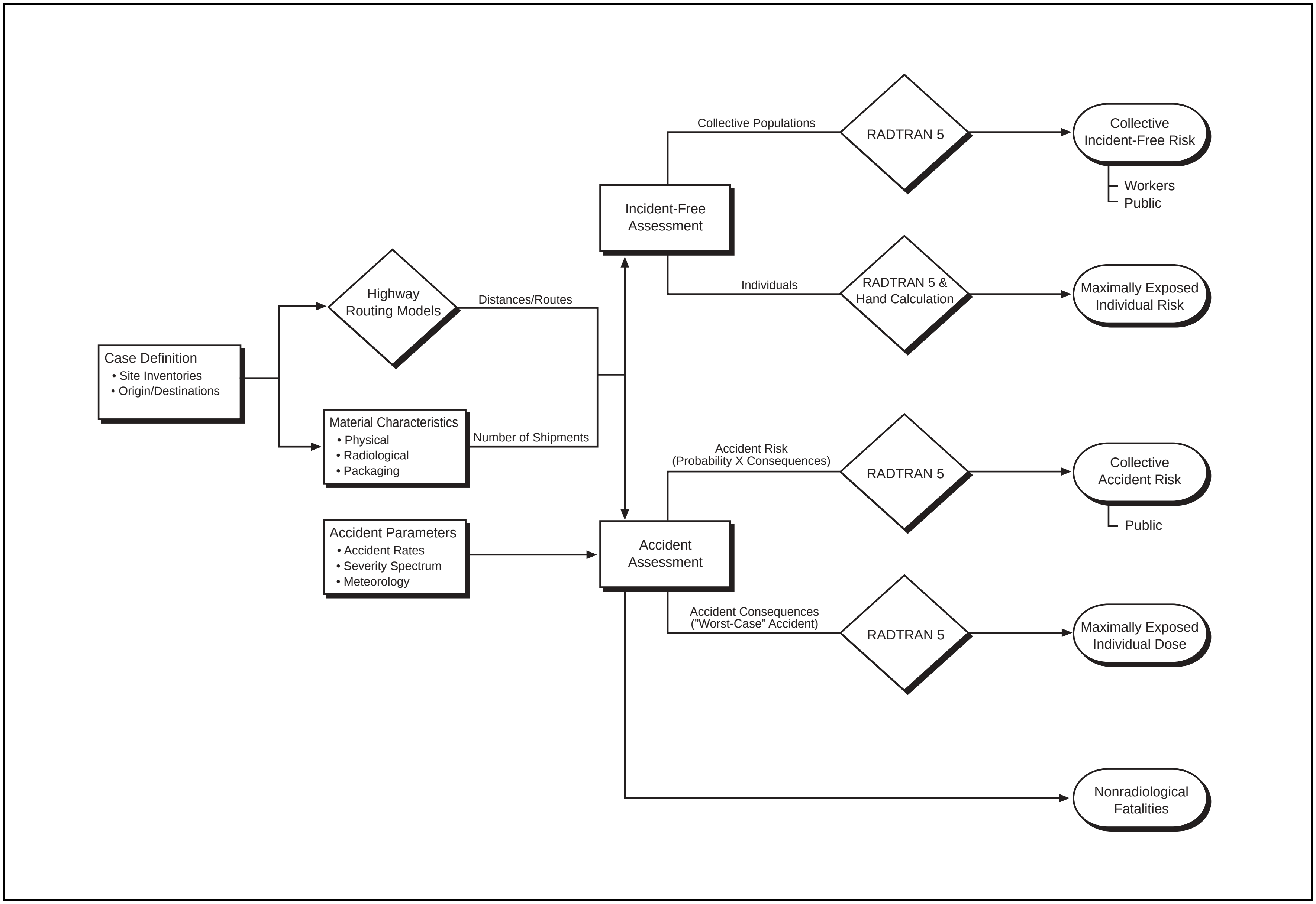


Figure D–2 Overland Transportation Risk Assessment

The impact of transportation accidents is expressed in terms of probabilistic risk, which is the probability of an accident multiplied by the consequences of that accident and summed over all reasonably conceivable accident conditions. Hypothetical transportation accident conditions ranging from low-speed "fender-bender" collisions to high-speed collisions with or without fires were analyzed. The frequencies of accidents and consequences were evaluated using a method developed by the NRC and originally published in NUREG-0170 (NRC 1977). The risk of radiological accidents is expressed in terms of additional latent cancer fatalities and risk of nonradiological accidents is expressed in terms of additional immediate fatalities. Incident-free risks are also expressed in terms of additional latent cancer fatalities.

Transportation-related risks are calculated and presented separately for workers and members of the general public. The workers considered are truck crew members involved in the actual transportation, and workers involved in the packaging, loading, unloading and unpacking of TA-18 material. The general public includes all persons who could be exposed to a shipment while it is moving or stopped during transit.

The first step in the ground transportation analysis is to determine the distances and populations along the routes. The HIGHWAY (Johnson et al. 1993) computer code was used to choose representative routes and the associated distance and population. This information, along with the properties of the material being shipped and route-specific accident frequencies, was entered into the RADTRAN 5 computer code (Neuhauser and Kanipe 2000), which calculated incident and accident risks on a per-shipment basis. The per-shipment risks are multiplied by the number of shipments to determine the risk for each alternative. The doses to TA-18 workers are estimated in a separate analysis.

The RADTRAN 5 computer code (Neuhauser and Kanipe 2000) is used for incident-free and accident risk assessments to estimate the impacts on population. RADTRAN 5 was developed by Sandia National Laboratories to calculate population risks associated with the transportation of radioactive materials by a variety of modes, including truck, rail, air, ship, and barge. RADTRAN 5 was used to calculate the doses to the maximally exposed individuals.

The RADTRAN 5 population risk calculations include both the consequences and probabilities of potential exposure events. The RADTRAN 5 code consequence analyses include cloud shine, ground shine, inhalation, and resuspension exposures. The collective population risk is a measure of the total radiological risk posed to society as a whole by the alternative being considered. As such, the collective population risk is used as the primary means of comparing the various alternatives.

D.7 TRANSPORTATION ANALYSIS, PARAMETERS, AND ASSUMPTIONS

D.7.1 Material Inventory and Shipping Campaigns

The materials that would be transported under each alternative include approximately 2.4 metric tons (2.6 tons) of SNM and 10 metric tons (11 tons) of depleted natural uranium and thorium. The SNM would consist of uranium in all forms and enrichments and plutonium (mostly metals, double-encapsulated or clad) with a wide variety of contents including plutonium-240, uranium-233, neptunium-237, and other isotopic sources. The materials would be in various chemical (metals, oxides, alloys, etc.) and geometric (sphere, shell, cylinders, rings, plates, and others) forms specific to the experiments in support of the TA-18 operations. Since the specifics of isotopic composition and the shape of the materials to be transported are classified, for the purposes of analysis in this EIS, the SNM inventory has been converted to an equivalent amount of plutonium-239. The conversion is on a constant consequence-basis, so the consequences calculated in the accident analyses are exactly the same as they would be if the actual material inventory were used. The equivalent inventory of plutonium-239 to be transported in support of the TA-18 relocation is approximately 1,000 kilograms (2,205 pounds).

DOE has performed a survey of materials to be transported and has identified a preliminary estimate of the packaging and transportation needs. DOE has identified that the materials would be packaged in either a Type AF, in a Type B, in a National Nuclear Security Administration weapon component, or in a U.S. Department of Transportation specification packaging. The packages include SAFKEG, DT-22, DT-23, Model FL, ES-2100, and 6M. Some of the proposed packages would require additional analysis and modifications to Certificates of Compliance. Before shipping any materials, DOE would document compliance with the Federal regulations in effect at the time of the shipment. Most of the material currently stored at TA-18 can be accommodated within current and proposed DOE-owned packages or readily available commercial packages. However, since shipments would not be carried out for several years, some existing packages may be retired and substitute packages identified.

DOE has not yet completed a package-by-package, shipment-by-shipment plan for relocating TA-18 materials. This will not be performed until after an alternative is selected and the Record of Decision is published. Since the isotopic composition and shape of some of the materials are classified, part of this plan would have to be classified. DOE's preliminary analysis of the shipping requirements indicates a need for 87 SST/SGT shipments (Lanthrum 2001) of assorted radioactive and SNM (enriched uranium, plutonium, and other fissile isotopes) and 5 truck shipments for machines, depleted and natural uranium, and thorium, for a total of 92 shipments.

D.7.2 General Description of Packages Selected for Transportation of Nuclear Materials

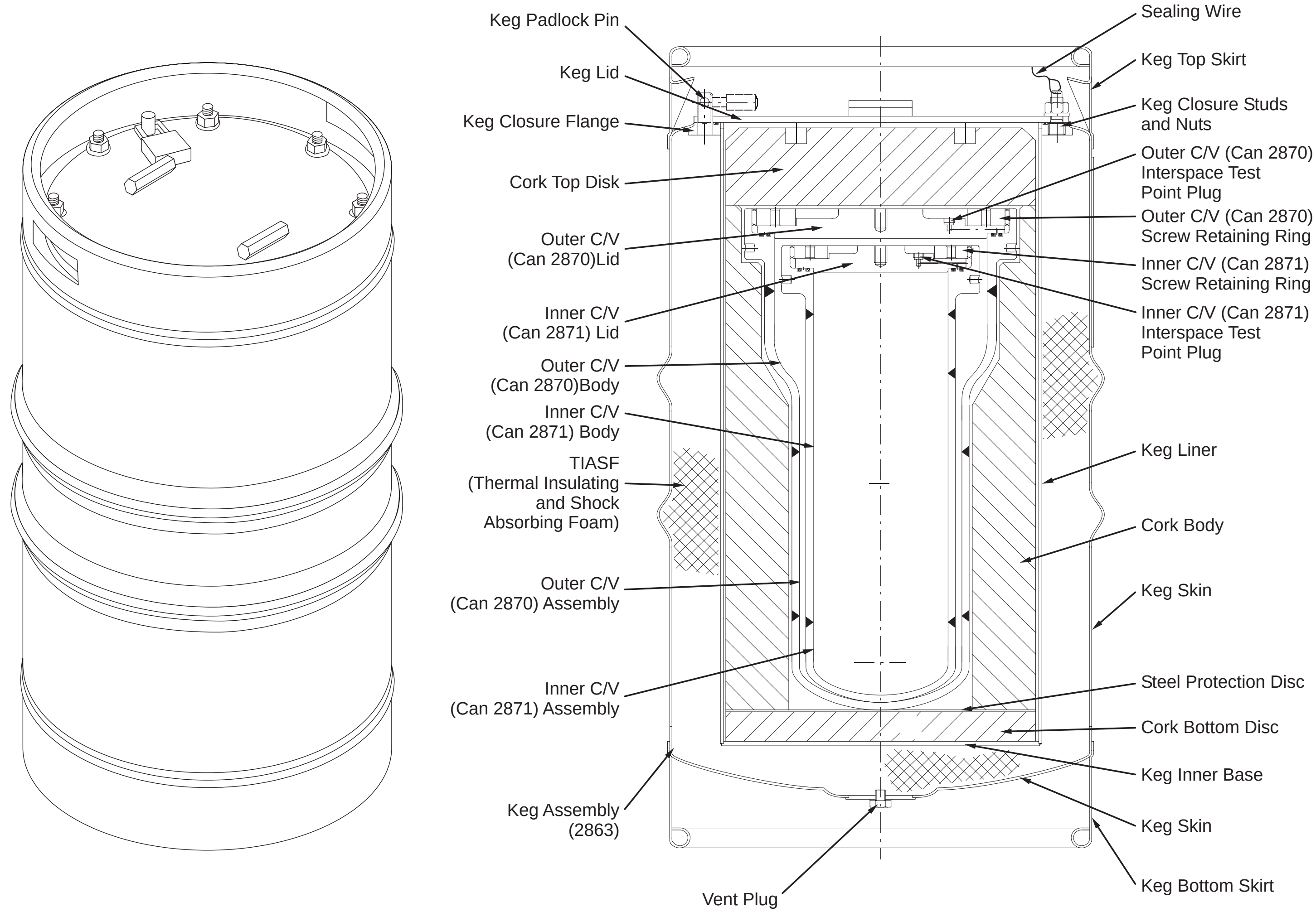
Most of the material currently stored at TA-18 can be accommodated within current and proposed DOE-owned packages or readily available commercial packages. DOE could choose to design new or use existing similar packaging. A select list of packages is described in detail to show the reader typical features of these packages. These packages have been used for the purpose of estimating input parameters, such as number of shipments and mass of contents, for the purpose of the impact analysis. Any new packages of similar designs could be used. Similar packaging would be designed to the same level of safety and would be expected to have similar features.

D.7.2.1 SAFKEG Packages

The SAFKEG 2863B packaging (see **Figure D–3**) consists of a CROFT keg model number 2863 (Keg 2863) which is 760 millimeters (30 inches) long and 425 millimeters (16.7 inches) diameter, and carries a double containment configuration using resealable containment vessels, model numbers 2870 and 2871 (Can 2870 and Can 2871). This packaging is to be used as a general purpose container for the shipment of solid or powder fissile or other actinide material. The contents have been limited such that the packaging does not require exclusive use provisions. The permitted internal heating of the contents is 30 watts. The allowable modes of transport are: road, rail, sea, and air (except that air shipment of plutonium is not allowed within the United States in this packaging). The package shall be externally labeled by the user in accordance with 49 CFR 172 subpart E. The SAFKEG 2863B package meets all applicable requirements of 10 CFR 71.

A SARP has been prepared to support a Certificate of Compliance for the SAFKEG 2863B shipping package (DOE 1999). Approval for use is requested in accordance with 49 CFR 173.7(d). The SARP addresses applicable NRC, DOE and the U.S. Department of Transportation rules and regulations regarding packaging and shipment of Type B radioactive material.

The packaging consists of an outer double skin insulated keg (Keg 2863), an insulating cork liner, an outer resealable containment vessel (Can 2870), and an inner resealable containment vessel (Can 2871). These resealable vessels are designed to remain within regulatory limits regarding leakage rate, under both normal



C/V = containment vessel.

Figure D–3 SAFKEG 2863B

and accident conditions of transport. The nominal weight of the packaging is 103.5 kilograms (228 pounds), excluding contents. The maximum contents weight is 20 kilograms (44 pounds). The keg and containment vessels along with the nomenclature used in the packaging description and analysis are provided in Figure D–2. The containment boundary for each containment vessel consists of the body, lid, and inner o-ring. The outer o-rings of the containment vessels and test port seals are not part of the containment boundary. The design pressure for the package is 8 bar absolute/116 pounds per square inch absolute (7 bar gauge/101.5 pounds per square inch gauge) which is the bounding pressure for the containment vessels for all environmental conditions.

The Keg 2863 consists of a double skinned stainless steel keg body. A flat stainless steel lid is secured with studs and nuts. The lid may be secured to prevent unauthorized removal by a padlock attached to a lockpin welded to the keg closure flange. Studs are provided for fitting tamper indicating devices in accordance with 10 CFR 71.43(b). The cavity between the double skin is filled with a thermal insulating and shock absorbing phenolic resin foam. This cavity is normally sealed but will vent through the vent plug at the bottom of the keg during a hypothetical accident fire. The assembled SAFKEG 2863B has an overall length of 760 millimeter (30 inches) and an overall diameter of 425 millimeter (16.7 inches). The keg is fitted with a nameplate that complies with the requirements in 10 CFR 71.85 and 49 CFR 173.444.

There is an insulating cork liner between the Keg 2863 and the outer containment vessel Can 2870. The top and bottom of this cork liner varies in thickness from 75 millimeters (3 inches) at the top to 28 millimeters (1.1 inches) at the base of the keg. The side-wall thickness of the cork liner varies from 14.5 millimeters (0.57 inches) at the top to 59.5 millimeters (2.3 inches) at the bottom.

The outer containment vessel (Can 2870) is made from stainless steel. The body is fabricated from four pieces, welded and tested. The seal between the body and the lid is effected by two, 3-millimeter (0.118-inch) chord diameter o-ring face seals; access to the interspace between the two o-rings is provided for operational and maintenance leak testing. The lid is held in position by a threaded retaining ring. Both the retaining ring and the lid are recessed into the body of the container, thus reducing the vulnerability of the closure.

The design, materials, and construction of the inner containment vessel (Can 2871) are similar to those of the outer containment vessel, but the inner containment vessel is smaller to enable it to fit inside the outer. The cavity has an overall length of 401 millimeters (15.75 inches) (to the bottom of the curved base) and a minimum diameter of 127.6 millimeters (5.024 inches). The vessel operates at atmospheric pressure, although the internal pressure may vary due to absorption of oxygen by the contents and heating of the gasses within the containment vessels by decay heat of the contents, by radiolysis of organic materials (when present) and atmospheric temperature and pressure.

D.7.2.2 DT-22 and D-23 Packages

DT-23 and DT-23 packages are functionally similar to the previously described SAFKEG, in that they rely on a steel drum and are supported by packing material to protect the hardened inner container. Each consists of an outer drum and an inner container made of Type 304 stainless steel, with Celotex fiber insulation between the drum and liner. The DT-22 outer structure is a 170-liter (45-gallon) drum about 64 centimeters (25 inches) in diameter and 71 centimeters (28 inches) in height. The inner container is made of 0.4-centimeter (0.16-inch) stainless steel and is about 32centimeters (12 inches) in diameter and 44 centimeters (17 inches) in height. The empty package weighs about 108 kilograms (238 pounds). The DT-23 outer structure is a 413-liter (109-gallon) drum about 84 centimeters (33 inches) in diameter and 104 centimeters (41 inches) in height. The inner container is made of 0.4-centimeter (0.16-inch) stainless steel and is about 53 centimeters (21 inches) in diameter and 69 centimeters (27 inches) in height. Both packages are double-containment packages that can be used to transport weapon parts, highly enriched uranium or plutonium. The empty package weighs about 246 kilograms (542 pounds).

D.7.2.3 Model FL Packages

FL 10-1 consists of two, 16-gauge 208-liter (55-gallon) drums welded end to end, approximately 172 centimeters (68 inches) long and 57 centimeters (22.5 inches) in diameter. The outer drum closure is accomplished by at least a 12-gauge bolt-locking ring with drop-forged lugs, one of which is threaded to receive at least a 1.6 centimeter (5/8-inch) diameter bolt and lock nut. The pressure vessel support mechanism consists of wood supports, steel inner sleeve and nut ring to receive the containment vessel, and fire resistant phenolic foam, formed in place. Gas relief holes are provided in the outer steel drum.

The containment vessel is a 304L stainless steel 12.7-centimeter (5-inch) Schedule 40 pipe, approximately 136 centimeters (53.5 inches) long, with a 304L stainless steel 1.3-centimeter (0.5-inch)-thick welded bottom plate and a 304L stainless steel slip-on flange and blind flange which is fastened by eight, 1.9-centimeter (0.75-inch) steel bolts. The flange closure is gasketed by two fluoroelastomer o-rings with a pressure tap between the two o-ring grooves. During shipment, the o-ring groove pressure tap is sealed with a pipe plug with threads wrapped in teflon tape. A steel valve is screwed into the blind flange of the containment vessel. The valve is sealed by a pipe cap (threads wrapped with Teflon tape) and is protected by a section of Schedule 40 pipe welded to the top of the flange. The packaging has a maximum gross weight of 234 kilograms (515 pounds).

The Model FL package is certified to carry a variety of fissile material solutions and dry compounds. The maximum quantities per package and the number of packages per shipment vary with the amount and form of the contents.

D.7.2.4 U.S. Department of Transportation 6M Packages

The original U.S. Department of Transportation 6M packaging (49 CFR 173.354) was Dow Chemical Corporation's Model 1518, a 38-liter (10-gallon) container, approved by the U.S. Atomic Energy Commission (now DOE) in March 1967 and issued as U.S. Department of Transportation Special Permit 5000 the following month. The 6M packaging was issued in December 1968 to cover a variety of similar containers ranging in capacity from 38 to 417 liters (10 to 110 gallons). The 6M packaging is currently authorized by U.S. Department of Transportation regulations for shipment of Type B quantities of radioactive materials (49 CFR 173, Subpart I).

In 1980, NRC expressed concern about shipping plutonium in the 6M packaging. Because of changing specifications, secondary containment for plutonium was required (10 CFR 71). NRC decided the 6M packaging was adequate as an overpack.

As secondary containment was required, NRC also wanted assurance that U.S. Department of Transportation Specification 2R (Inside Containment Vessel) would meet the new leak rates specified in the International Atomic Energy Agency regulations (Kelly 1994).

General construction requirements for the 6M packaging may be found in 49 CFR 178.354, *Specification 6M; Metal Packaging*, and for the 2R vessel in 49 CFR 178.360. Refer to **Figure D–4** for an example of a typical 6M package with the 2R inner vessel or container.

In response to U.S. Nuclear Regulatory Commission concerns, the DOE and its contractors expended considerable effort to determine what role the 6M packaging should have for shipping DOE-owned

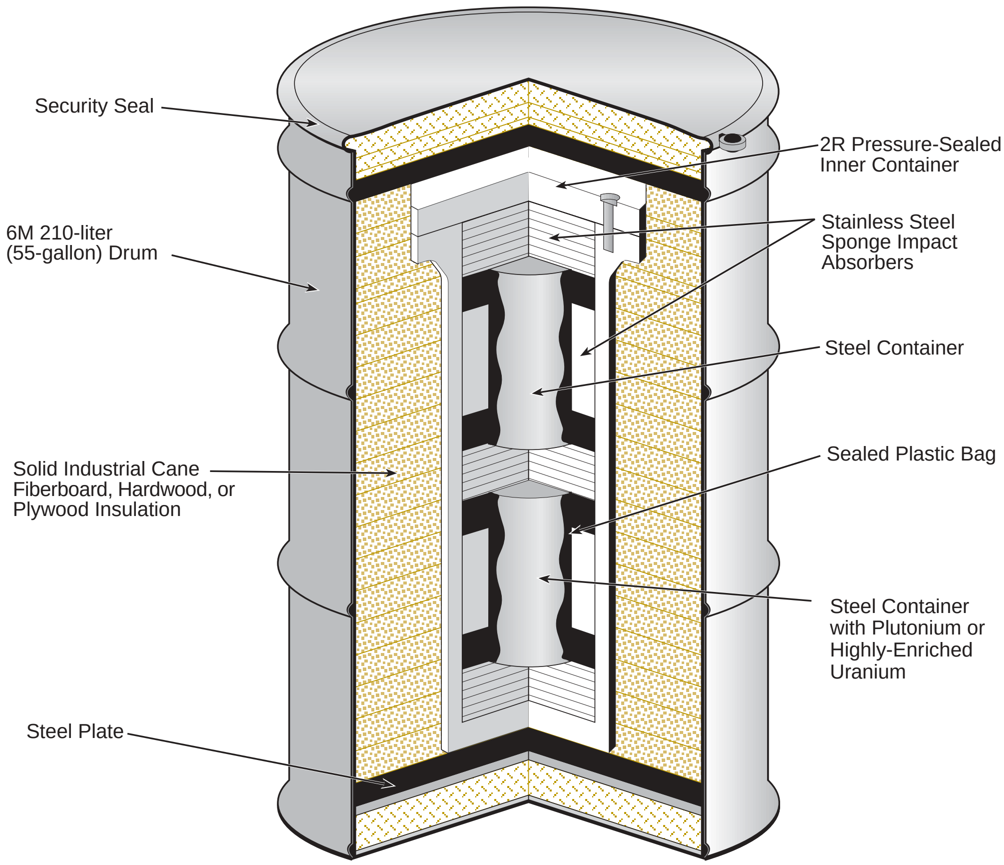


Figure D–4 Typical Assembly of 6M, Type B Packaging for Plutonium

plutonium. Technical reviews and safety assessments have been performed on 6M specification packaging, 2R inner container welds associated with 6M packaging, the types and quantities of radioactive material being shipped in 6M packaging, and future packaging to replace the 6M. In 1988, a DOE task force performed a technical review of the 6M packaging configuration. The review and subsequent documentation found that the 6M packaging configuration merits continued use (SNL 1988).

The task force that studied this subject recognized that the use of the 6M is authorized by current U.S. Department of Transportation regulations and recommended procedural improvements for its continued use. It was determined that the number of product can configurations and the number of 6M drum sizes should be reduced, and that the major shipping sites should coordinate an effort to minimize the number of can configurations and drum sizes used for shipment of plutonium.

In 1988, weld defects were found in the DT-14A packages fabricated by a particular manufacturer. Because the manufacturer was a major supplier of 2R inner containers, the integrity of 2R inner containers became a concern. In 1989, DOE Headquarters issued directives (Wade 1989) to all Defense Programs Operations Offices that future shipments of Type B radioactive material in the 6M packaging implement the applicable requirements as specified in the DOE task force's technical document (SNL 1988). The Container Weld Advisory Committee was formed in 1989 to develop recommendations and provide criteria for specific weld issues related to the 2R inner container. The Container Weld Advisory Committee recommended static force testing to ensure that the weld was strong enough to withstand the postulated hypothetical accident condition loadings. Leak testing was specified to ensure that no leak paths existed in the weld. The safety enhancements developed will allow interim use of the 6M until a replacement container is available. As a result, 2R inner-containment vessels have had their bottom plate welds static force tested and leak tested. The purpose of the added requirements is to allow interim use of the 6M configuration until a replacement container is available (Kelly 1994).

The outer shell of the 6M packaging is made of straight-sided steel, with welded body seams, and in accordance with U.S. Department of Transportation Specification 6C or 17C, with each length to contain 3 wedged or rolled rolling hoops as prescribed for either of these specifications. A removable head has one or more corrugations in the cover near the periphery. For a packaging exceeding 57 liters (15 gallons) volume, the head must be crowned (convex), not extending beyond the level of the chime, with a minimum convexity of 1 centimeter (3/8 inches).

Each drum has at least four 1.2-centimeter (0.5-inch) diameter vents near the top, each covered with a weatherproof tape or fusible plug, or equivalent device. A layer of porous refractory fiber may be placed behind the pressure-relief vent holes.

The closure device has means for the attachment of a tamper-proof lock wire and seal.

The inner containment vessel is fixed within the outer shell by solid centering media, with the sides of the inner vessel protected by at least 9.5 centimeters (3.75 inches) of insulation media, and the ends with at least the thickness as prescribed in 49 CFR 178.104-3(a)(1). The centering media is usually machined discs and rings made of solid industrial can fiberboard having a density of at least 0.24 grams per cubic centimeter (15 pounds per cubic foot) fitted such that the radial clearances between the fiberboard, inner vessel, and shell do not exceed 6 millimeters (.25 inches).

When necessary, shielding may be provided within the 2R containment vessel. Any radiation shielding material used must be placed within the inner containment vessel or must be protected in all directions by at least the thickness of the thermal insulating material.

The primary containment vessel is constructed to U.S. Department of Transportation Specification 2R (49 CFR 178.360). Each vessel is made of stainless steel, malleable iron, or brass, or other material having equivalent physical strength and fire resistance.

The closure device is a screw-type cap or plug. The number of threads per inch must not be less than U.S. standard pipe threads and must have sufficient length of thread to engage at lease five threads when securely tightened. Pipe threads are luted with an appropriate nonhardening compound which must be capable of withstanding up to 149 degrees celsius (300 degrees fahrenheit) without loss of efficiency. Tightening torque is adequate to maintain leak tightness with the specific luting compound.

D.7.3 Representative Routes

Representative truck routes were selected for the shipments from TA-18 to SNL/NM, NTS and ANL-W. The routes were selected consistent with current routing practices and all applicable routing regulations and guidelines. However, the routes were determined for risk assessment purposes. They do not necessarily represent the actual routes that would be used to transport radioactive materials in the future. Specific routes cannot be identified in advance. The representative truck routes are shown in **Figure D–5**.

Route characteristics that are important to the radiological risk assessment include the total shipment distance and the population distribution along the route. The specific route selected determines both the total

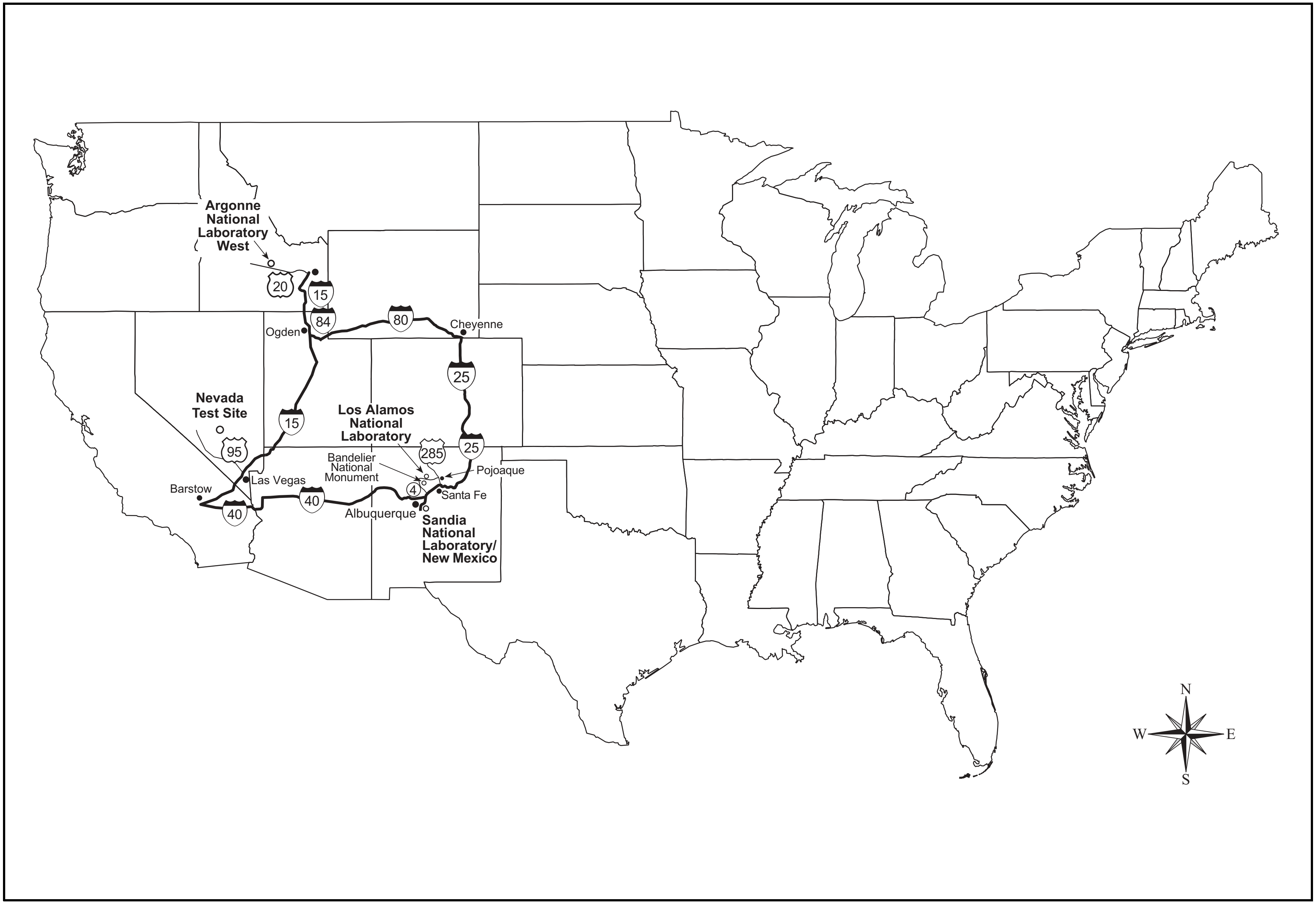


Figure D–5 Representative Overland Truck Route potentially exposed population and the expected frequency of transportation-related accidents. Route characteristics are summarized in **Table D–1**. The population densities along each route are derived from 1990 U.S. Bureau of Census data. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per square kilometer (0 to 139 persons per square mile); the suburban range is from 55 to 1,284 persons per square kilometer (140 to 3,326 persons per square mile); and the urban range includes all population densities greater than 1,284 persons per square kilometer (3,326 persons per square mile). The affected population, for route characterization and incident-free dose calculation, includes all persons living within 800 meters (0.5 mile) of each side of the road.

Table D–1 Potential Shipping Routes Evaluated for the TA-18 Relocation EIS

From	*To*	*Distance (kilometers)*	*Percentages in Zones*			*Population Density in Zone (per square kilometer)*			*Number of Affected Persons*
			Rural	*Suburban*	*Urban*	*Rural*	*Suburban*	*Urban*	
Truck Routes									
TA-18	NTS	1,671	93.4	5.9	0.7	3.6	381	2,096	108,000
TA-18	SNL/NM	167	78.9	16.1	5	8.6	431	2,125	49,000
TA-18	ANL-W	1,873	89.4	9.1	1.4	4.5	393	2,085	207,000

D.7.4 External Dose Rates

The external dose rates are conservatively estimated using engineering judgment. Based on DOE's operational experience, external dose rates from packages containing enriched uranium, plutonium, and thorium would generally be low. Therefore, for 82 of the 87 shipments of radioactive and SNM, the dose rate at 1 meter (3.3 feet) from the vehicle is estimated to be 1 millirem per hour. It is assumed that 5 of the 87 shipments would be carrying material, such as uranium-233, that has a much higher contact dose rate. For these shipments, a dose rate of 10 millirem per hour, at 1 meter (3.3 feet) from the vehicle, was assumed. This is just below the regulatory limit of 10 millirem per hour at 2 meters (6.6 feet). Additionally, about 5 shipments are assumed to be needed to ship the machines and 10 metric tons (11 tons) of depleted and natural uranium and thorium (which do not require special security measures such as described in Section D.5). The average dose rate for the depleted and natural uranium and thorium shipments is estimated to be 0.1 millirem at 1 meter (3.3 feet) from the vehicle.

D.7.5 Health Risk Conversion Factors

The health risk conversion factors used to estimate expected cancer fatalities were: 0.0005 and 0.0004 latent cancer fatalities per person-rem for members of the public and workers, respectively (NCRP 1993).

D.7.6 Accident Frequencies

For the calculation of accident risks, vehicle accident and fatality rates are taken from data provided in ANL/ESD/TM-150 (Saricks and Tompkins 1999). Accident rates are generically defined as the number of accident involvements (or fatalities) in a given year per unit of travel in that same year. Therefore, the rate is a fractional value, with accident-involvement count as the numerator of the fraction and vehicular activity (total travel distance in truck-kilometers) as its denominator. Accident rates are generally determined for a multiyear period. For assessment purposes, the total number of expected accidents or fatalities is calculated by multiplying the total shipment distance for a specific case by the appropriate accident or fatality rate.

For truck transportation, the rates presented are specifically for heavy combination trucks involved in interstate commerce (Saricks and Tompkins 1999). Heavy combination trucks are rigs composed of a separable tractor unit containing the engine and one to three freight trailers connected to each other. Heavy combination trucks are typically used for radioactive material shipments. The truck accident rates are computed for each state based on statistics compiled by the Federal Highway Administration, Office of Motor Carriers from 1994 to 1996. A fatality caused by an accident is the death of a member of the public who is killed instantly or dies within 30 days due to the injuries sustained in the accident.

The HIGHWAY code classifies highways as rural, suburban or urban, and provides the distance and population information for use in RADTRAN. These codes require accident frequency data calculated for rural, urban and suburban zones. An older report, ANL/ESD/TM-68 (Saricks and Kvitek 1994), reports accident rates for Federally Aided Interstates in urban and rural areas, and a composite accident rate for all Federally Aided Interstates. TM-150 does not provide data that can be directly used to estimate frequencies for rural, urban and suburban zones. The ratios of accident frequencies for the zones was calculated from TM-68 data, and used with the newer TM-150 data to establish up-to-date accident frequency estimates. Since the distance traveled on non-interstate highways was very small compared to the distance traveled on interstates, and the accident rates are similar, interstate accident rates were used for all roads. TM-68 and TM-150 information is used for both the accident rate estimate for the radiological risk, and the fatal accident rate estimate for the nonradiological risk.

For SST/SGT transportation, the rates presented are specifically adjusted for the experience of the DOE Transportation Safeguards Division. Between fiscal year 1984 and fiscal year 1998, the Transportation Safeguards Division reports 0.058 accidents per million kilometers (0.096 accidents per million miles) (Claus and Shyr 1999). Using influence factors from SAND93-0111 (Phillips, Clauss, and Blower 1994), accident frequencies for rural, urban, and suburban driving can be estimated.

D.7.7 Container Accident Response Characteristics and Release Fractions

D.7.7.1 Development of Conditional Probabilities

NUREG-0170 (NRC 1977) originally was used to estimate the conditional probabilities associated with the accidents involving transportation of radioactive materials. The analysis was primarily performed using best engineering judgments and presumptions concerning cask response. Design parameters of the representative casks were chosen to meet the minimum test criteria specified in 10 CFR 71. The study is believed to provide realistic, yet conservative, results for radiological releases under transport accident conditions.

As discussed above, the accident consequence assessment only considers the potential impacts from the most severe transportation accidents. In terms of risk, the severity of an accident must be viewed in terms of potential radiological consequences, which are directly proportional to the fraction of the radioactive material within a cask that is released to the environment during the accident. Although regions span the entire range of mechanical and thermal accident loads, they are grouped into accident categories that can be characterized by a single set of release fractions and are, therefore, considered together in the accident consequence assessment. The accident category severity fraction is the sum of all conditional probabilities in that accident category.

D.7.7.2 Release Fraction Assumptions

The release fractions for each material form (metal, non-metallic solid, liquid, powder and gaseous) were taken from NUREG-0170 (NRC 1977) and the aerosol and respirable fractions were taken from the

RADTRAN 5 User Guide (Neuhauser and Kanipe 2000). These accident analysis parameters are generally applicable to a variety of materials and are conservative.

D.7.8 Nonradiological Risk (Vehicle-Related)

Vehicle-related health risks resulting from incident-free transport may be associated with the generation of air pollutants by transport vehicles during shipment and are independent of the radioactive nature of the shipment. The health end-point assessed under incident-free transport conditions is the excess latent mortality due to inhalation of vehicle exhaust emissions. The risk factor for pollutant inhalation in terms of latent mortality is 1×10^{-7} mortality per kilometer (1.6×10^{-7} per mile) of truck travel in urban areas (Neuhauser and Kanipe 2000). The risk factors are based on regression analyses of the effects of sulfur dioxide and particulate releases from diesel exhaust on mortality rates. Excess latent mortalities are assumed to be equivalent to latent cancer fatalities. Vehicle-related risks from incident-free transportation (affecting the population in urban areas along the transportation route) are calculated for each case by multiplying the total distance traveled in urban areas by the appropriate risk factor. Similar data are not available for rural and suburban areas.

Risks are summed over the entire route and over all shipments for each case. This method has been used in several EISs to calculate risks from incident-free transport. Lack of information for rural and suburban areas is an obvious data gap, although the risk factor would presumably be lower than for urban areas because of lower total emissions from all sources and lower population densities in rural and suburban areas.

D.7.9 Packaging and Handling Doses

TA-18 materials would be placed into packages for onsite or offsite shipment. These packages would be loaded onto SST/SGT or commercial trailers, shipped to the receiving site at LANL, NTS, SNL/NM, or ANL-W, unpacked and placed into storage. DOE's estimate of the radiation doses likely to be received by personnel moving (which includes handling, packaging, loading, and unloading) radioactive materials from TA-18 as part of moving the materials to another location is based on a review of TA-18 operational doses. The major assumption for this analysis is that the dose received from removing TA-18 material from its storage location, setting up experiments, and returning the material to storage is essentially the same as the dose for moving the radioactive materials. Another assumption is that the dose rate for the material handled for experiments is representative of the dose rates of all the TA-18 material being moved.

Based on a review of the radiological exposure information, in about 250 working days of the year 2000, material handlers working at TA-18 received about 0.250 person-rem (LANL 2001). For the purposes of the analysis, it was estimated that the workers handled the equivalent of one package per day. Therefore, TA-18 personnel received about 0.001 person-rem (or 1 person-millirem) for each package handled.

To estimate the potential handling dose to site workers at both the origin and the destination, this EIS assumed an average of 1 person-millirem per package would be handled. The number of packages to be placed in one shipment (a full SST/SGT or a commercial trailer) would be less than 25 per shipment. For the purpose of bounding the impacts, 25 packages in each of the 92 shipments was assumed. Multiplying these numbers equals 2,300 packages, which can be multiplied by the estimated dose to calculate 2.3 person-rem for the entire operation. Using the same approach, and assuming 20 packages would be required to move the material for SHEBA, estimates 0.02 person-rem for moving SHEBA material. Under the TA-18 Upgrade Alternative, there would be some movement of material to support modifications. The dose would be smaller than the dose received during normal operations and is estimated to be, at most, 0.250 person-rem, i.e., a dose equal to that associated with a year of material handling at TA-18.

D.8 RISK ANALYSIS RESULTS

Per-shipment risk factors have been calculated for the collective populations of exposed persons and for the crew for all anticipated routes and shipment configurations. The radiological risks are presented in doses per shipment for each unique route, material, and container combination. The radiological dose per shipment factors for incident-free transportation are presented in **Table D–2** for the transportation routes analyzed for this EIS.

Doses are calculated for the crew, off-link public (i.e., people living along the route), on-link public (i.e., pedestrians and drivers along the route), and public at rest and fueling stops (i.e., stopped cars, buses and trucks, workers, and other bystanders). For the onsite shipments (LANL Alternatives) quantitative impact analysis is not necessary. Since the shipments would be over a short distance, on closed DOE-controlled roads, LANL procedures ensure public safety. No incident free analysis is necessary because the public is not close enough to the vehicles to received measurable exposure. Worker dose is included in the process and handling dose estimates because the same personnel would be moving the radioactive and special nuclear material. No accident analysis is necessary because potential accidents during movement are bounded in frequency and consequence by handling accidents. Once the package is closed for the low-speed movement to the nearby building, the likelihood and consequence of any foreseeable accident are very small and not further quantified.

The radiological dose risk factors for transportation accidents are also presented in Table D–2. The accident risk factors are called "dose risk" because the values incorporate the spectrum of accident severity probabilities and associated consequences. The accident dose is very low because, although persons are residing in an 80 kilometers (50 miles) radius of the road, they are generally quite far from the road. Since RADTRAN 5 uses an assumption of homogeneous population from the road out to 80 kilometers (50 miles), it would greatly overestimate the actual doses. The accident analysis was performed using average equivalent plutonium-239 loading per shipment for both high- and low-contact dose materials.

The nonradiological risk factors are presented in fatalities per shipment in **Table D–3**. Separate risk factors are provided for fatalities resulting from exhaust emissions (caused by hydrocarbon emissions known to be carcinogens) and transportation accidents (fatalities resulting from impact).

Table D–4 shows the risks of transportation for each alternative. The risks are calculated by multiplying the previously given per-shipment factors by the number of shipments over the duration of the program and, for the radiological doses, by the health risk conversion factors.

The risks to various exposed individuals under incident-free transportation conditions have been estimated for hypothetical exposure scenarios. The estimated doses to workers and the public are presented in **Table D–5.**

All doses are presented on a per-event basis (person-rem per event) because it is not likely that the same person will be exposed to multiple events. The maximum dose to a crew member is based on the same individual being responsible for driving every shipment for the duration of the campaign. Note that the potential exists for larger individual exposures if multiple exposure events occur. For example, the dose to a person stuck in traffic next to a shipment for 10 minutes is calculated to be 0.03 millirem. However, since the intersite shipments pass through urban areas, a 30-minute exposure time is considered. Using the estimated dose rates, the maximally exposed individual would receive 0.1 millirem.

Table D–2 Radiological Risk Factors for Single Shipments

		Incident-Free Dose (person-rem)					Accident Dose (person-rem)
			Public				
From TA-18 To	**Material**	**Crew**	**Off-Link**	**On-Link**	**Stops**	**Total**	
NTS	Low-contact dose	0.00042	0.000032	0.00035	0.00018	0.00056	3.3×10^{-7}
	High-contact dose	0.042	0.0032	0.035	0.018	0.056	
	Uranium and thorium	0.000042	3.2×10^{-6}	0.000035	0.000064	0.00010	$<1.0 \times 10^{-10}$
SNL/NM	Low-contact dose	0.000042	9.5×10^{-6}	0.000041	0.000018	0.000068	8.2×10^{-8}
	High-contact dose	0.0042	0.0010	0.0041	0.0018	0.0068	
	Uranium and thorium	4.2×10^{-6}	9.5×10^{-7}	4.1×10^{-6}	6.5×10^{-6}	0.000012	$<1.0 \times 10^{-10}$
ANL-W	Low-contact dose	0.00047	0.000055	0.00041	0.00020	0.00066	4.3×10^{-7}
	High-contact dose	0.047	0.0055	0.041	0.020	0.066	
	Uranium and thorium	0.000047	5.5×10^{-6}	0.000041	0.00012	0.00012	$<1.0 \times 10^{-10}$

Table D–3 Nonradiological Risk Factors per Shipment

Nonradiological Risk Estimates (fatalities/shipment)				
	Exhaust Emission		Accident	
From TA-18 To	**Truck**	**SST**	**Truck**	**SST**
NTS	2.3×10^{-6}	3.0×10^{-6}	3.0×10^{-5}	5.7×10^{-7}
SNL/NM	1.7×10^{-6}	2.2×10^{-6}	3.0×10^{-6}	8.8×10^{-8}
ANL-W	5.2×10^{-6}	6.8×10^{-6}	3.4×10^{-5}	7.2×10^{-7}

Table D–4 Risks of Transporting the Hazardous Materials[a]

			Incident-Free				*Accident*	
			Radiological			*Nonradiological*		
Alternative	***Number of Shipments***	***Distance on Public Roads (kilometers)***	***Vehicle Crew***	***Packaging and Handling***	***Public***	***Emission***	***Traffic***	***Radiological***
No Action	(b)							
TA-18 Upgrade	(b)			0.0001				
LANL New Facility	(c)	less than 1,000		0.0009				
NTS	92	307,000	0.00010	0.0009	0.00016	0.00028	0.00020	1.4×10^{-8}
SNL/NM	92	31,000	0.000010	0.0009	0.00020	0.00020	0.000023	3.5×10^{-9}
ANL-W	92	345,000	0.00011	0.0009	0.00019	0.00062	0.00023	1.9×10^{-8}

[a] All risks are expressed as number of latent cancer fatalities, except for the Accident-Traffic column, which lists number of accident fatalities.

[b] Very little onsite and no offsite transportation for the No Action and TA-18 Upgrade Alternatives, therefore no accident or public risk analysis was performed.

[c] Probably more shipments than other alternatives, but not evaluated because population, distance, and accident risk would be smaller than other alternatives. The shipments would be on site at LANL, therefore, no accident or public risk analysis was performed.

Table D–5 Estimated Dose to Exposed Individuals During Incident-Free Transportation Conditions

Receptor		***Dose to Maximally Exposed Individual***
Workers	Crew member (truck driver) [a]	0.137 rem per year
	Inspector	0.000029 rem per event [b]
Public	Resident	4.0×10^{-9} rem per shipment
	Person in traffic congestion	0.00011 rem per event [b]

[a] Assumes that an individual driver takes every shipment.

[b] Event for an inspector means during inspection period, and for a person in traffic means during a 30-minute traffic jam.

The cumulative dose to a resident was calculated assuming all shipments passed his or her home. The cumulative doses assume that the resident is present for every shipment and is unshielded at a distance of 30 meters (about 98 feet) from the route. Therefore, the cumulative dose depends on the number of shipments passing a particular point and is independent of the actual route being considered. The maximum dose to this resident, if all the material were to be shipped via this route, would be less than 0.01 millirem.

The estimated dose to transportation crew members is presented for a commercial crew. No credit is taken for the shielding associated with the tractor or trailer.

The previously described accident risk assessment and the impacts provided in Table D–4 take into account the entire spectrum of potential accidents, from the fender-bender to extremely severe. To provide additional insight into the severity of accidents in terms of the potential dose to a maximally exposed individual, an accident consequence assessment has been performed for a hypothetical accident scenario. This accident would fall into Severity Category 8 of the NUREG-0170 accident matrix (NRC 1977), which is the only category with a release of radioactive material. To incur this level of damage, the vehicle would have to collide with an immovable object at a speed much greater than 88 kilometers per hour (55 miles per hour), and the contents of the vehicle would have to end up in a sustained fire. This analysis was performed irrespective of its potential likelihood. The maximally exposed individual was assumed to be 33 meters (108 feet) directly downwind of the accident and to remain at that location for 40 minutes. The accident could result in a dose of 139 rem to the maximally exposed individual.

D.9 LONG-TERM IMPACTS OF TRANSPORTATION

The Programmatic Spent Nuclear Fuel EIS (DOE 1995) analyzed the cumulative impacts of all transportation of radioactive materials, including impacts from reasonably foreseeable actions that include transportation of radioactive material for a specific purpose and general radioactive materials transportation that is not related to a particular action. The total worker and general population collective doses are summarized in **Table D–6**. The table shows that the impacts of this program are quite small compared with overall transportation impacts. Total collective worker dose from all types of shipments (historical, the alternatives, reasonably foreseeable actions, and general transportation) was estimated to be 320,000 person-rem (130 latent cancer fatalities) for the period 1943 through 2035 (93 years). Total general population collective dose was also estimated to be 320,000 person-rem (160 latent cancer fatalities). The majority of the collective dose for workers and the general population was due to the general transportation of radioactive material. Examples of these activities are shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level radioactive waste to commercial disposal facilities. The total number of latent cancer fatalities estimated to result from radioactive materials transportation over the period between 1943 and 2035 was 290. Over this same period (93 years), approximately 28 million people would die from cancer, based on 300,000 cancer fatalities per year. It should be noted that the estimated number of transportation-related latent cancer fatalities would be indistinguishable from other latent cancer fatalities, and the transportation-related latent cancer fatalities are 0.0010 percent of the total number of latent cancer fatalities.

D.10 UNCERTAINTY AND CONSERVATISM IN ESTIMATED IMPACTS

The sequence of analyses performed to generate the estimates of radiological risk for transportation includes: (1) determination of the inventory and characteristics, (2) estimation of shipment requirements, (3) determination of route characteristics, (4) calculation of radiation doses to exposed individuals (including estimating of environmental transport and uptake of radionuclides), and (5) estimation of health effects. Uncertainties are associated with each of these steps. Uncertainties exist in the way that the physical systems being analyzed are represented by the computational models; in the data required to exercise the models (due to measurement errors, sampling errors, natural variability, or unknowns simply caused by the future nature of the actions being analyzed); and in the calculations themselves (e.g., approximate algorithms used by the computers).

Table D–6 Cumulative Transportation-Related Radiological Collective Doses and Latent Cancer Fatalities (1943 to 2035)

Category	*Collective Worker Dose (person-rem)*	*Collective General Population Dose (person-rem)*
TA-18 relocation transportation impacts (from Table D–5)	less than 1	less than 1
Other Nuclear Material Shipments		
Truck	11,000	50,000
Rail	820	1,700
General transportation (1943–2035)	310,000	270,000
Total collective dose	322,000	322,000
Total latent cancer fatalities	130	160

Source: DOE 1995.

In principle, one can estimate the uncertainty associated with each input or computational source and predict the resultant uncertainty in each set of calculations. Thus, one can propagate the uncertainties from one set of calculations to the next and estimate the uncertainty in the final, or absolute, result; however, conducting such a full-scale quantitative uncertainty analysis is often impractical and sometimes impossible, especially for actions to be initiated at an unspecified time in the future. Instead, the risk analysis is designed to ensure, through uniform and judicious selection of scenarios, models, and input parameters, that relative comparisons of risk among the various alternatives are meaningful. In the transportation risk assessment, this design is accomplished by uniformly applying common input parameters and assumptions to each alternative. Therefore, although considerable uncertainty is inherent in the absolute magnitude of the transportation risk for each alternative, much less uncertainty is associated with the relative differences among the alternatives in a given measure of risk.

In the following sections, areas of uncertainty are discussed for the assessment steps enumerated above. Special emphasis is placed on identifying whether the uncertainties affect relative or absolute measures of risk. The reality and conservatism of the assumptions are addressed. Where practical, the parameters that most significantly affect the risk assessment results are identified.

D.10.1 Uncertainties in Material Inventory and Characterization

The inventories and the physical and radiological characteristics are important input parameters to the transportation risk assessment. The potential amount of transportation for any alternative is determined primarily by the projected dimensions of package contents, the strength of the radiation field, the heat that must be dissipated, and assumptions concerning shipment capacities. The physical and radiological characteristics are important in determining the material released during accidents and the subsequent doses to exposed individuals through multiple environmental exposure pathways.

Uncertainties in the inventory and characterization are reflected in the transportation risk results. If the inventory is overestimated (or underestimated), the resulting transportation risk estimates are also overestimated (or underestimated) by roughly the same factor. However, the same inventory estimates are used to analyze the transportation impacts of each of the EIS alternatives. Therefore, for comparative purposes, the observed differences in transportation risks among the alternatives, as given in Table D–4, are believed to represent unbiased, reasonably accurate estimates from current information in terms of relative risk comparisons.

D.10.2 Uncertainties in Containers, Shipment Capacities, and Number of Shipments

The transportation required for each alternative is based in part on assumptions concerning the packaging characteristics and shipment capacities for commercial trucks. Representative shipment capacities have been defined for assessment purposes based on probable future shipment capacities. In reality, the actual shipment capacities may differ from the predicted capacities such that the projected number of shipments and, consequently, the total transportation risk would change. However, although the predicted transportation risks would increase or decrease accordingly, the relative differences in risks among alternatives would remain about the same.

D.10.3 Uncertainties in Route Determination

Representative routes have been determined between all origin and destination sites considered in the EIS. The routes have been determined to be consistent with current guidelines, regulations, and practices, but may not be the actual routes that would be used in the future. In reality, the actual routes could differ from the representative ones with regard to distances and total population along the routes. Moreover, since materials could be transported over an extended time starting at some time in the future, the highway infrastructures and the demographics along routes could change. These effects have not been accounted for in the transportation assessment; however, it is not anticipated that these changes would significantly affect relative comparisons of risk among the alternatives considered in the EIS. Specific routes cannot be identified in advance because the routes are classified to protect national security interests.

D.10.4 Uncertainties in the Calculation of Radiation Doses

The models used to calculate radiation doses from transportation activities introduce a further uncertainty in the risk assessment process. Estimating the accuracy or absolute uncertainty of the risk assessment results is generally difficult. The accuracy of the calculated results is closely related to the limitations of the computational models and to the uncertainties in each of the input parameters that the model requires. The single greatest limitation facing users of RADTRAN, or any computer code of this type, is the scarcity of data for certain input parameters.

Uncertainties associated with the computational models are reduced by using state-of-the-art computer codes that have undergone extensive review. Because many uncertainties are recognized but difficult to quantify, assumptions are made at each step of the risk assessment process intended to produce conservative results (i.e., overestimate the calculated dose and radiological risk). Because parameters and assumptions are applied consistently to all alternatives, this model bias is not expected to affect the meaningfulness of relative comparisons of risk; however, the results may not represent risks in an absolute sense.

Post accident mitigative actions are not considered for dispersal accidents. For severe accidents involving the release and dispersal of radioactive materials in the environment, no post accident mitigative actions, such as interdiction of crops or evacuation of the accident vicinity, have been considered in this risk assessment. In reality, mitigative actions would take place following an accident according to U.S. Environmental Protection Agency radiation protection guides for nuclear incidents (EPA 1992). The effects of mitigative actions on population accident doses are highly dependent upon the severity, location, and timing of the accident. For this risk assessment, ingestion doses are only calculated for accidents occurring in rural areas (the calculated ingestion doses, however, assume all food grown on contaminated ground is consumed and is not limited to the rural population). Examination of the severe accident consequence assessment results has shown that ingestion of contaminated foodstuffs contributes about 50 percent of the total population dose for rural accidents. Interdiction of foodstuffs would act to reduce, but not eliminate, this contribution.

D.11 REFERENCES

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APPENDIX E

Environmental Justice

TA-18

APPENDIX E
ENVIRONMENTAL JUSTICE

E.1 INTRODUCTION

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations.

The Council on Environmental Quality (CEQ) has oversight responsibility for documentation prepared in compliance with the National Environmental Policy Act (NEPA). In December 1997, the Council released its guidance on environmental justice under NEPA (CEQ 1997). The Council's guidance was adopted as the basis for the analysis of environmental justice contained in this *Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory (TA-18 Relocation EIS).*

This appendix provides an assessment of the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations resulting from the implementation of the alternatives described in Chapter 3 of the *TA-18 Relocation EIS*. The *TA-18 Relocation EIS* was prepared during a time when the U.S. Bureau of the Census is analyzing and publishing results of the decennial census conducted in 2000 (hereafter referred to as Census 2000). As discussed below, Census 2000 data were included in this analysis based on availability at the time of publication. Results and projections from the 1990 Census were used to fill gaps in available demographic data.

E.2 DEFINITIONS

Minority Individuals and Populations

The following definitions of minority individuals and population were used in this analysis of environmental justice:

- **Minority individuals—**Individuals who are members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or two or more races. This definition is similar to that given in the CEQ environmental justice guidance (CEQ 1997), except that it has been modified to reflect *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity* (62 FR 58782) and recent guidance (OMB 2000) published by the Office of Budget and Management. These revisions were adopted and used by the Bureau of the Census in collecting data for Census 2000. When data from the 1990 Census are used, a minority individual will be defined as someone self-identified as: Hispanic; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; or Black. As discussed below, racial and ethnic data from the 1990 Census cannot be directly compared with that from Census 2000.

  The Office of Management and Budget has also recommended that persons self-identified as multiracial should be counted as a minority individual if one of the races is a minority race (OMB 2000). During Census 2000, approximately 2 percent of the population identified themselves as members of more than one race (DOC 2001). Approximately two-thirds of those designated themselves as members of at least one minority race. For the purposes of evaluation in this environmental impact statement (EIS), where more detailed data is not available, persons designating themselves as members of more than one race were included in the minority population. This will tend to overestimate the minority population, but the uncertainties are small and would not affect the conclusions regarding environmental justice.

- **Minority population—**Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. In identifying minority communities, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a geographically dispersed and transient set of individuals (such as migrant workers or American Indians/Alaska Natives), where either type of group experiences common conditions of environmental exposure or effect. The selection of the appropriate unit of geographic analysis may be a governing body's jurisdiction, a neighborhood, census tract, or other similar unit that is to be chosen so as to not artificially dilute or inflate the affected minority population. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds.

In the discussions of environmental justice in this EIS, persons self-designated as Hispanic or Latino are included in the Hispanic or Latino population, regardless of race. For example, the Asian population is composed of persons self-designated as Asian and not of Hispanic or Latino origin. Asians who designated themselves as having Hispanic or Latino origins are included in the Hispanic or Latino population. Data for the analysis of minority populations in 1990 were extracted from Table P012 of Summary Tape File 3 (DOC 1992). Census 2000 data were obtained from the Census Bureau's website at address www.census.gov.

Low-Income Populations and Individuals

Executive Order 12898 specifically addresses "disproportionately high and adverse effects" on "low-income" populations. The CEQ recommends that poverty thresholds be used to identify "low-income" individuals (CEQ 1997).

The following definition of low-income population was used in this analysis:

- **Low-income population—**Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the U.S. Bureau of the Census' *Current Population Reports, Series P–60 on Income and Poverty*. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or American Indians/Alaska Natives), where either type of group experiences common conditions of environmental exposure or effect (CEQ 1997).

Data for the analysis of low-income populations were extracted from Table P121 of Summary Tape File 3 (DOC 1992). Detailed income data resulting from Census 2000 is not yet available. It will be incorporated into the *Final TA-18 Relocation EIS* if it becomes available prior to publication of the Final EIS.

Disproportionately High and Adverse Human Health Effects

Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts to human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority population or low-income population is significant and exceeds the risk of exposure rate for the general population or for another appropriate comparison group (CEQ 1997).

Disproportionately High and Adverse Human Environmental Effects

A disproportionately high environmental impact refers to an impact or risk of an impact in a low-income or minority community that is significant and exceeds the environmental impact on the larger community. An adverse environmental impact is an impact that is determined to be both harmful and significant. In assessing cultural and aesthetic environmental impacts, impacts that uniquely affect geographically dislocated or dispersed or minority low-income populations are considered (CEQ 1997).

Potentially affected areas examined in this EIS include areas defined by an 80-kilometer (50-mile) radius centered on candidate facilities for TA-18 activities. As discussed in Chapter 3, candidate sites include Los Alamos National Laboratory (LANL), Sandia National Laboratories/New Mexico (SNL/NM), Nevada Test Site (NTS), and Argonne National Laboratory-West (ANL-W) at the Idaho National Engineering and Environmental Laboratory. Potentially affected areas used in the analysis of environmental justice are the same as those used in the analysis of radiological health effects described in Chapter 5.

E.3 METHODOLOGY

E.3.1 Spatial Resolution

For the purposes of enumeration and analysis, the Census Bureau has defined a variety of areal units (DOC 1992). Areal units of concern in this document include (in order of increasing spatial resolution) states, counties, census tracts, block groups, and blocks. The "block" is the smallest of these entities and offers the finest spatial resolution. This term refers to a relatively small geographical area bounded on all sides by visible features such as streets and streams or by invisible boundaries such as city limits and property lines. During the 1990 census, the Census Bureau subdivided the United States and its territories into 7,017,425 blocks. For comparison, the number of counties, census tracts, and block groups used in the 1990 census were 3,248; 62,276; and 229,192; respectively. While blocks offer the finest spatial resolution, economic data required for the identification of low-income populations are not available at the block-level of spatial resolution. In the analysis below, block groups are used throughout as the areal unit. Block groups generally contain between 250 and 500 housing units (DOC 1992).

During the decennial census, the Census Bureau collects data from individuals and aggregates the data according to residence in a geographical area, such as a county or block group. This EIS uses data from the 1990 census as a baseline for calculations performed with block group level spatial resolution. The Census Bureau has not yet published block group level results of the 2000 census. The data are scheduled for publication in mid-2002.

Boundaries of the areal units are selected to coincide with features such as streams and roads or political boundaries such as county and city borders. Boundaries used for aggregation of the census data usually do not coincide with boundaries used in the calculation of health effects. As discussed in Chapter 5, radiological health effects due to an accident at each of the sites considered for the proposed actions are evaluated for persons residing within a distance of 80 kilometers (50 miles) of an accident site. In general, the boundary of the circle with an 80-kilometer (50-mile) radius centered at the accident site will not coincide with boundaries used by the Census Bureau for enumeration of the population in the potentially affected area. Some block groups lie completely inside or outside of the radius for health effects calculation. However, other block groups are only partially included. As a result of these partial inclusions, uncertainties are introduced into the estimate of the population at risk from the accident.

To estimate the populations at risk in partially included block groups, it was assumed that populations are uniformly distributed throughout the area of each block group. For example, if 30 percent of the area of a block group lies within 80 kilometers (50 miles) of the accident site, it was assumed that 30 percent of the population residing in that block group would be at risk.

E.3.2 Population Projections

Health effects were calculated for populations projected to reside in potentially affected areas during the year 2001. Extrapolations of the total population for individual states are available from both the Census Bureau and various state agencies (Campbell 1996). The Census Bureau also projects populations by ethnic and racial classification in one-year intervals for the years from 1995 to 2025 at the state level (Campbell 1997). State agencies project total populations for individual counties. No Federal or state agency projects block group or low-income populations. Data used to project minority populations were extracted from the Census Bureau's World Wide Web site at address www.census.gov. To project minority populations in potentially affected areas, minority populations determined from the 1990 census data were taken as a baseline for each block group. Then it was assumed that percentage changes in the minority population of each block group for a given year (compared to the 1990 baseline data) will be the same as percentage changes in the state minority population projected for the same year. An advantage to this assumption is that the projected populations are obtained using a consistent method, regardless of the state and associated block group involved in the calculation. A disadvantage is that the method is insensitive to localized demographic changes that could alter the projection in a specific area.

The Census Bureau uses the cohort-component method to estimate future populations for each state (Campbell 1996). The set of cohorts is comprised of: (1) age groups from one year or less to 85 years or more, (2) male and female populations in each age group, and (3) the following racial and ethnic groups in each age group: Hispanic, non-Hispanic Asian, non-Hispanic Black, non-Hispanic Native American, and non-Hispanic White. Racial and ethnic groups will change in the projections based on Census 2000 data. Components of the population change used in the demographic accounting system are births, deaths, net state-to-state migration, and net international migration. If P(t) denotes the number of individuals in a given cohort at time "t," then:

$$P(t) = P(t_0) + B - D + DIM - DOM + IIM - IOM$$

where:

$P(t_0)$	=	Cohort population at time $t_0 \leq t$. For this analysis, t_0 denotes the year 1990.
B	=	Births expected during the period from t_0 to t.
D	=	Deaths expected during the period from t_0 to t.
DIM	=	Domestic migration into the state expected during the period from t_0 to t.
DOM	=	Domestic migration out of the state expected during the period from t_0 to t.
IIM	=	International migration into the state expected during the period from t_0 to t.
IOM	=	International migration out of the state expected during the period from t_0 to t.

Estimated values for the components shown on the right side of the equation are based on past data and various assumptions regarding changes in the rates for birth, mortality, and migration (Campbell 1996). It should be noted that the Census Bureau does not project populations of individuals who identified themselves as "other race" during the 1990 census. This population group is less than 2 percent of the total population in each of the states. However, to project total populations in the environmental justice analysis, population projections for the "other race" group were made under the assumption that the growth rate for the "other race" population will be identical to the growth rate for the combined minority and white populations.

E.4 ENVIRONMENTAL JUSTICE ANALYSIS

The analysis of environmental justice concerns was based on an assessment of the impacts reported in Chapter 5. This analysis was performed to identify any disproportionately high and adverse human health or environmental impacts on minority or low-income populations surrounding the candidate sites. Demographic information obtained from the Census Bureau was used to identify the minority populations and low-income communities in the zone of potential impact surrounding the sites (DOC 1992 and www.census.gov). Data from Census 2000 were used to identify minority populations at risk in potentially affected counties. Census 1990 data projected to the year 2001 were used for detailed calculations.

E.5 RESULTS FOR THE CANDIDATE SITES

E.5.1 Los Alamos National Laboratory (LANL)

As discussed in Chapter 3, three technical areas at LANL are associated with the relocation of TA-18 mission activities (see **Figure E–1**): 1) TA-18, the current location, 2) TA-55, candidate for relocation of TA-18 mission activities except SHEBA activities, and 3) TA-39, candidate for relocation of SHEBA activities.

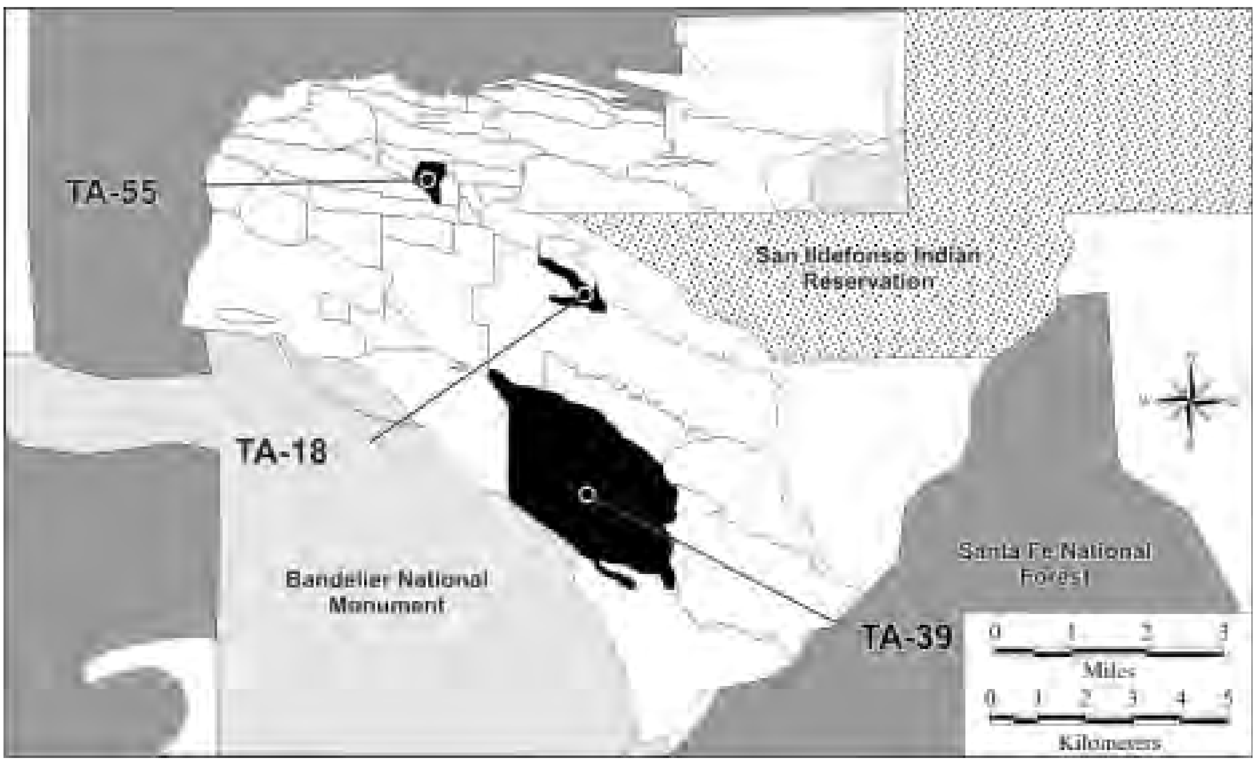

Figure E–1 Candidate Technical Areas at LANL

Figure E–2 and **Table E–1** show the counties at radiological risk and the composition of the population of these counties, respectively. The Counties are: Bernalillo, Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos. As indicated in Figure E–2, circles of 80 kilometers (50 miles) radius centered at the three candidate technical areas all contain or intersect the same nine counties. The total population at risk from the SHEBA mission at TA-39 would be the largest of the three populations at risk because TA-39 is closest to Bernalillo County.

Figure E–2 Potentially Affected Counties near LANL

Table E–1 Populations in Potentially Affected Counties Surrounding LANL in 2000

Population Group	*Population*	*Percentage of Total*
Total	900,696	100.0
Minority	488,850	54.3
Hispanic/Latino	400,673	44.5
Black/African American	16,204	1.8
American Indian/Alaska Native	44,430	4.9
Asian	13,195	1.5
Native Hawaiian/Pacific Islander	607	0.1
Two or more races	13,741	1.5
Some other race	1,498	0.2
White	410,348	45.6

Data shown in Table E–1 reflect the results of Census 2000. The Hispanic or Latino population shown in Table E–1 includes persons of any race who designated themselves as having Hispanic or Latino origins. Populations for each race shown in the last seven rows of Table E–1 did not characterize themselves as having Hispanic or Latino origins. As discussed in Section E.2 above, persons indicating that they were multiracial are included in the estimate of the minority population given in the second row of the table. Approximately two percent of the total U.S. population selected two or more races during Census 2000. Of those, approximately one-third selected "White" and "Some other race." Since "White" and "Other race" are not included in the CEQ current definition of minority races (CEQ 1997), the minority population shown in Table E–1 is overestimated. However, since non-Hispanic persons in the group "Two or more races" were less than two percent of the total population of these counties in 2000, the overestimate is relatively small.

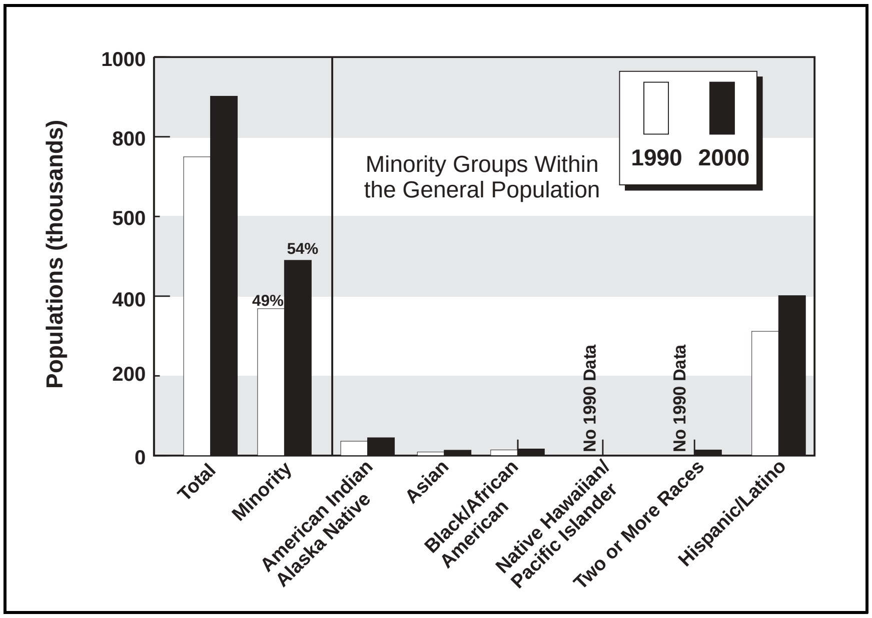

Figure E–3 Comparison of County Populations near LANL in 1990 and 2000

Figure E–3 compares Census 2000 data with that for 1990 (to the extent that the data can be compared). There are several reasons that minority data from Census 1990 cannot be directly compared with Census 2000 data. During the 1990 Census, Asian and Pacific Islanders were counted together in a single category. However, during Census 2000, "Native Hawaiian and Other Pacific Islander" and "Asian" were separate responses (selection of either one or both was an option). As a result, the 1990 population composed of Native Hawaiian and Other Pacific Islanders cannot be identified as a population distinct from Asians. In addition, during the 1990 Census, respondents were asked to designate themselves as members of only a single race. During Census 2000, respondents could select any combination of all of the six single race categories. As indicated in Figure E–3, there is no multiracial data available from the 1990 Census.

Bearing in mind the changes in racial categories and enumeration that occurred between the 1990 Census and Census 2000, the following approximate comparison can be made. In the decade from 1990 to 2000, the minority population in potentially affected counties increased from approximately 49 percent to 54 percent. Hispanics and American Indians composed approximately 91 percent of the total minority population. This is commensurate with characteristics of the State of New Mexico. In the same decade, the percentage minority population of New Mexico increased from approximately 49 percent to 55 percent. As a percentage of the total population in 1990, New Mexico had the largest minority population among all of the contiguous states. That was also found to be the case in the year 2000.

Figure E–4 shows the geographical distribution of minorities residing near LANL in 1990 using block group resolution. Shaded block groups shown in Figure E–4 indicate that the percentage minority population residing in those block groups exceeded that for the State of New Mexico as a whole and was more than twice the percentage minority population for the nation as a whole. **Figure E–5** shows the geographical distribution of the low-income population residing near LANL in 1990. In 1990, approximately 13 percent of the nation's resident population reported incomes below the poverty threshold, and approximately 21 percent of New Mexico's population was composed of low-income individuals. Shaded block groups in Figure E–5 indicate that the percentage low-income population residing in those block groups exceeded that for New Mexico as a whole and was more than twice the percentage low-income population for the nation as a whole.

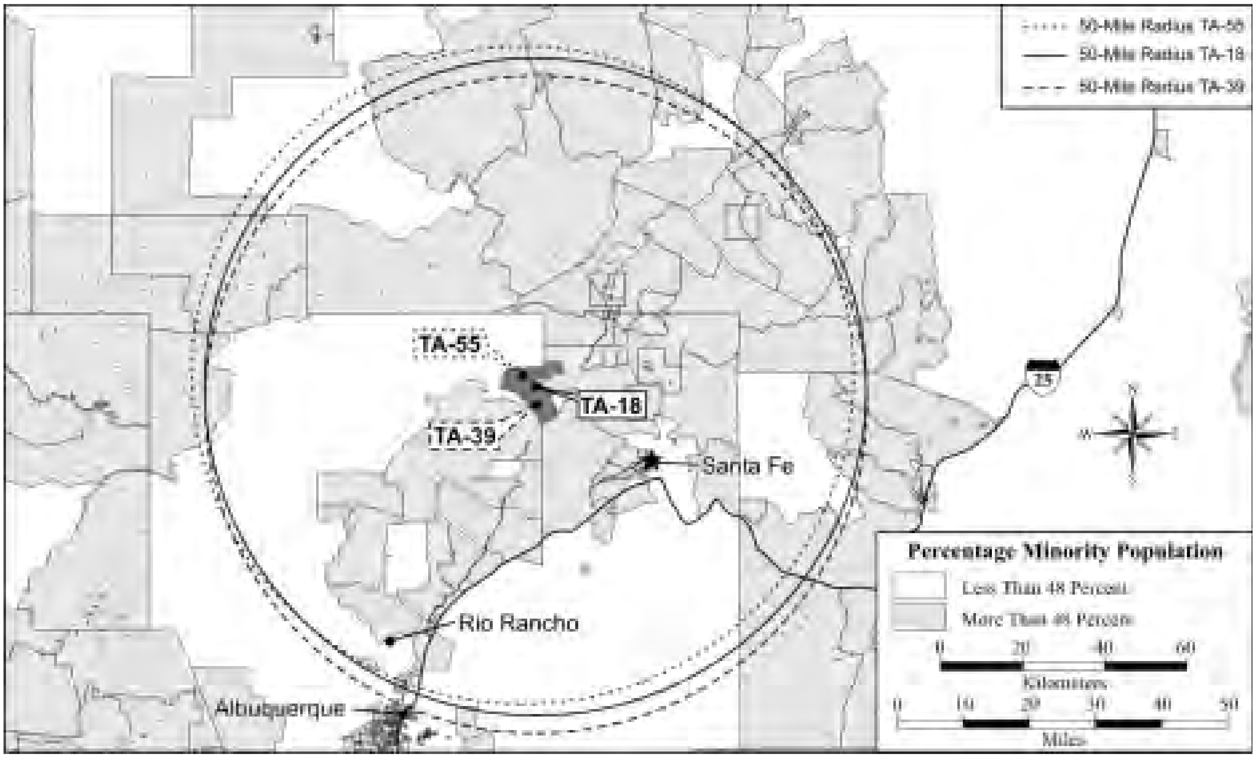

Figure E–4 Geographical Distribution of Minorities Residing near LANL

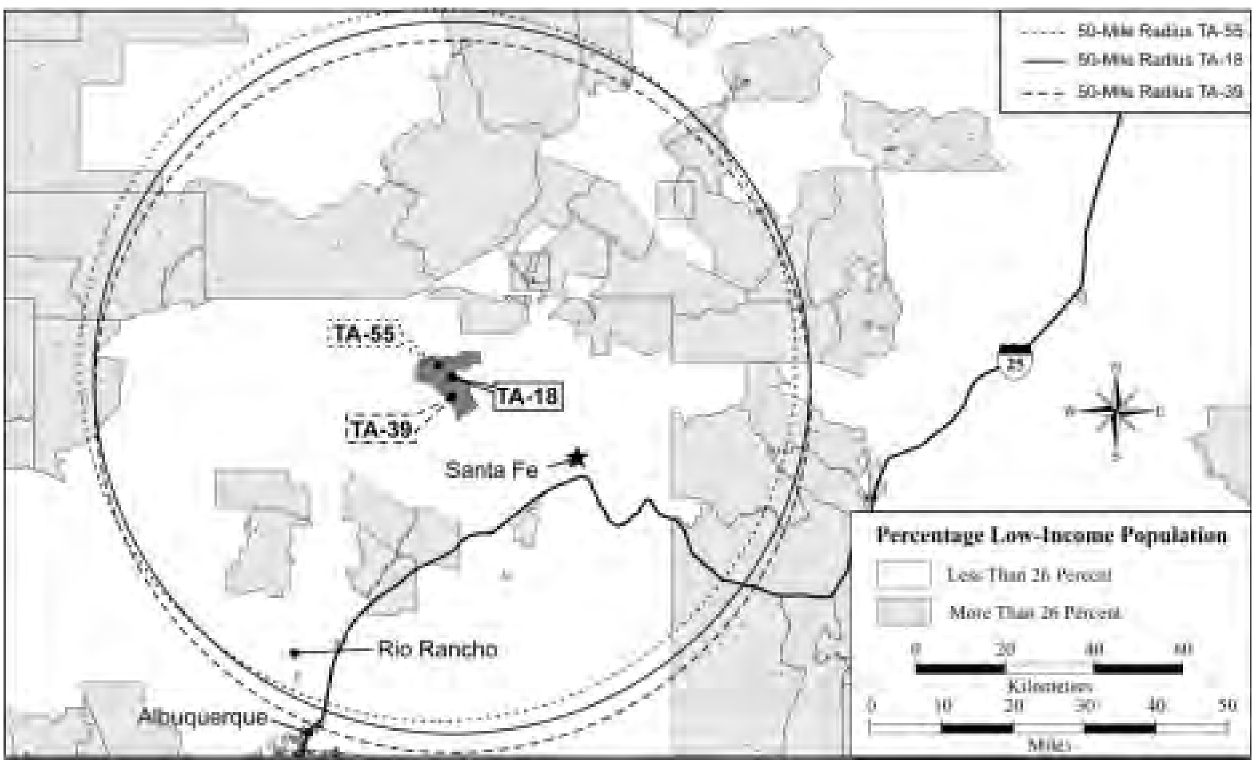

Figure E–5 Geographical Distribution of Low-Income Populations Residing near LANL

A total of approximately 156,350 minority individuals and 41,520 low-income persons resided within 80 kilometers (50 miles) of TA-39 in 1990. **Figure E–6** shows the cumulative percentage of these populations residing at a given distance from TA-39. For example, approximately 37 percent of the total minority population of 156,350 resided within 32 kilometers (20 miles) of TA-39, and approximately 33 percent of the total low-income population of 41,520 resided within 32 kilometers (20 miles) of TA-39. The curve representing percentages of minority residents (solid line in Figure E–6) is nearly identical in shape to that representing percentages of low-income residents (dashed line in Figure E–6). Both percentages rise sharply near the outskirts of the cities of Santa Fe and Albuquerque. Approximately 2 percent of the minority population (3,269 minority individuals) and 1.5 percent of the low-income population (615 low-income individuals) reside within 16 kilometers (10 miles) of TA-39. As indicated in the figure, the majority population (dot-dashed line in Figure E–6) residing within 80 kilometers (50 miles) of TA-39 was relatively concentrated in the cities of Santa Fe and Albuquerque in 1990. Low-income and minority residents were more noticeably distributed throughout the rural areas. As indicated by the similarities of the 80-kilometer (50-mile) bands shown in Figures E–4 and E–5, cumulative percentages of these populations for TA-18 and TA-55 are similar to those for TA-39.

Impacts of Construction on Minority and Low-Income Populations

As discussed in Chapter 3, construction at LANL would occur under implementation of all of the alternatives except the No Action Alternative. As discussed throughout Section 5.2, construction impacts at LANL would be small and would not be expected to extend beyond the LANL boundary. Construction activities at LANL would have little or no impact on surrounding minority and low-income populations.

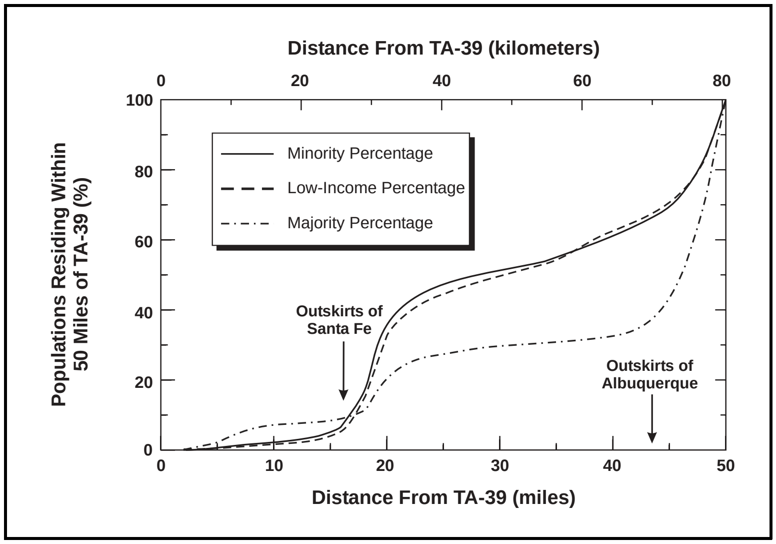

Figure E–6 Cumulative Percentage of Populations Residing within 80 Kilometers (50 Miles) of TA-39

Impacts of Normal Operations on Minority and Low-Income Populations

As discussed in Section 5.2.10.1, incident-free operations at LANL would result in the activation of from 10 curies to 110 curies of the radionuclide argon-41. Argon-41 is a colorless, inert gas with a half-life of approximately one hour and 48 minutes. The expected number of latent cancer fatalities among the general public surrounding LANL that would result from external exposure to argon-41 resulting from normal operations would be 5×10^{-5} or less. LANL is surrounded by Indian reservations that lie completely or partially within the area at radiological risk (see **Figure E–7**). Hence, subsistence consumption of radiologically-contaminated local crops and wildlife is a concern. However, argon-41 is a noble gas that decays into a stable isotope of potassium. No internal dose, either from ingestion or inhalation of argon-41, would result from normal operations at LANL. Therefore, normal operations would not pose a significant radiological risk to minority or low-income populations residing within the area at risk.

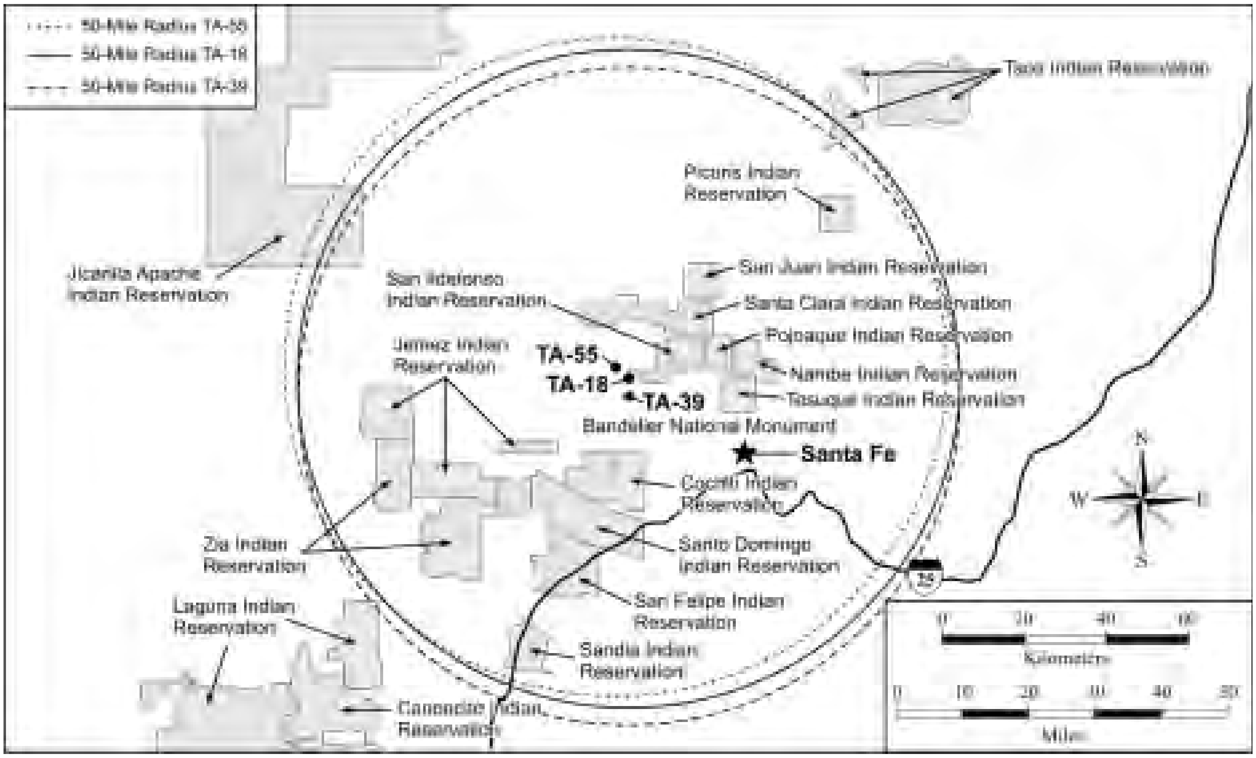

Figure E–7 Indian Reservations near LANL

Impacts of Accidents on Minority and Low-Income Populations

In terms of radiological risk, the most severe accident among those evaluated in this EIS would result in hydrogen denotation at SHEBA (Section 5.2.10.2 of Chapter 5). All accident risks to any member of the public are at least four orders of magnitude less than one latent cancer fatality. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

As discussed in Section C.2 of Appendix C, consequences due to accidents were calculated with the MACCS2 Model. This model evaluates doses due to inhalation of aerosols, such as respirable plutonium, and exposure to the plume. Longer term effects including resuspension/inhalation and ingestion of contaminated crops, wildlife, and fish are not included in the calculation. Such effects are largely controllable through interdiction. In order to conservatively estimate the radiological dose due to inhalation, the deposition velocity was set equal to zero during the MACCS2 calculations. Radioactive materials that would be deposited on surfaces remained airborne and available for inhalation. Given the rarity of accidents that could impact offsite individuals and the conservatism in the calculations of inhaled dose, implementation of the No Action Alternative or of any of the other proposed alternatives, each of which involves construction and retention of all or some of the TA-18 activities at LANL, would not be expected to pose a significant radiological risk to low-income or minority populations residing near LANL, including low-income and minority groups that depend upon subsistence consumption of locally grown crops and wildlife.

E.5.2 Sandia National Laboratories/New Mexico (SNL/NM)

Under the SNL/NM Alternative, security Category I/II activities currently conducted at TA-18 would be relocated to TA-V at SNL/NM. Security Category III/IV and SHEBA activities would remain at LANL. **Figure E–8** and **Table E–2** show the counties at radiological risk and the composition of the populations of those counties, respectively. The counties are: Bernalillo, Cibola, McKinley, Sandoval, San Miguel, Santa Fe, Socorro, Torrance, and Valencia. Four of these counties (Bernalillo, Sandoval, Santa Fe, and San Miguel) would also be potentially affected by activities that would occur at LANL.

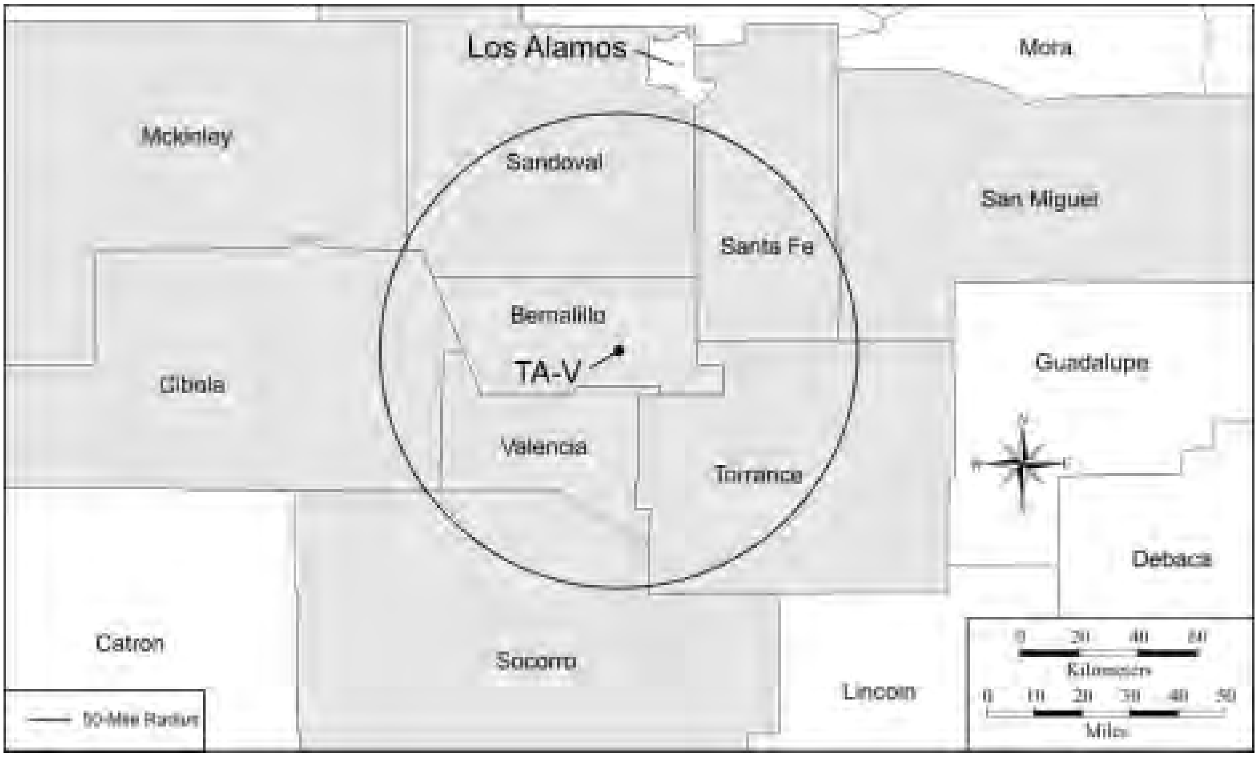

Figure E–8 Potentially Affected Counties Surrounding SNL/NM

Table E–2 Populations in Potentially Affected Counties Surrounding SNL/NM in 2000

Population Group	***Population***	***Percentage of Total***
Total	1,007,538	100.0
Minority	569,428	56.5
Hispanic/Latino	416,189	41.3
Black/African American	17,533	1.7
American Indian/Alaska Native	106,093	10.5
Asian	13,213	1.3
Native Hawaiian/Pacific Islander	647	0.1
Two or more races	15,753	1.6
Some other race	1,644	0.2
White	436,466	43.3

Data shown in Table E–2 reflects the results of Census 2000. The Hispanic or Latino population shown in Table E–2 includes persons of any race who designated themselves as having Hispanic or Latino origins. Populations for each race shown in the last seven rows of Table E–2 did not characterize themselves as having Hispanic or Latino origins. As discussed in Section E.2 above, persons indicating that they were multiracial are included in the estimate of the minority population given in the second row of the table. Approximately two percent of the total U.S. population selected two or more races during Census 2000. Of those, approximately one-third selected "White" and "Some other race." Since "White" and "Other race" are not included in the CEQ's current definition of minority races (CEQ 1997), the minority population shown in Table E–2 is overestimated. However, since non-Hispanic persons in the group "Two or more races" were less than two percent of the total population of these counties in 2000, the overestimate is relatively small.

Figure E–9 compares Census 2000 data with that for 1990 (to the extent that the data can be compared). There are several reasons that minority data from Census 1990 cannot be directly compared with Census 2000 data. During the 1990 Census, Asian and Pacific Islanders were counted together in a single category. However, during 2000 Census, "Native Hawaiian and Other Pacific Islander" and "Asian" were separate responses (selection of either one or both was an option). As a result, the 1990 population composed of Native Hawaiian and Other Pacific Islanders cannot be identified as a population distinct from Asians. In addition, during the 1990 Census, respondents were asked to designate themselves as members of only a single race. During Census 2000, respondents could select any combination of all of the six single race categories. As indicated in Figure E–9, there is no multiracial data available from the 1990 Census.

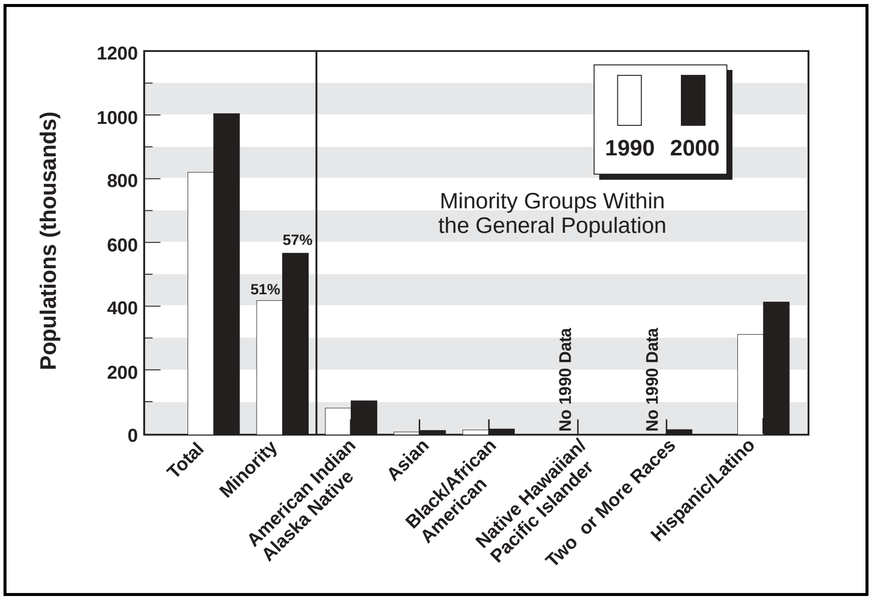

Figure E–9 Comparison of Potentially Affected County Populations near SNL/NM in 1990 and 2000

Bearing in mind the changes in racial categories and enumeration that occurred between the 1990 Census and Census 2000, the following approximate comparison can be made. In the decade from 1990 to 2000, the minority population in potentially affected counties increased from approximately 51 percent to 57 percent. Hispanics and American Indians composed approximately 92 percent of the total minority population. This is commensurate with characteristics of the State of New Mexico. In the same decade, the percentage minority population of New Mexico increased from approximately 49 percent to 55 percent. As a percentage of the total population in 1990, New Mexico had the largest minority population among all of the contiguous states. That was also found to be the case in the year 2000.

Figure E–10 shows the geographical distribution of minorities residing near TA-V in 1990 using block group resolution. Shaded block groups shown in Figure E–10 indicate that the percentage minority population residing in those block groups exceeded that for the State of New Mexico as a whole and was more than twice the percentage minority population for the nation as a whole. **Figure E–11** shows the geographical distribution of the low-income population residing near TA-V in 1990. In 1990, approximately 13 percent of the nation's resident population reported incomes below the poverty threshold, and approximately 21 percent of New Mexico's population was composed of low-income individuals. Shaded block groups in Figure E–11 indicate that the percentage low-income population residing in those block groups exceeded that for New Mexico as a whole and was more than twice the percentage low-income population for the nation as a whole.

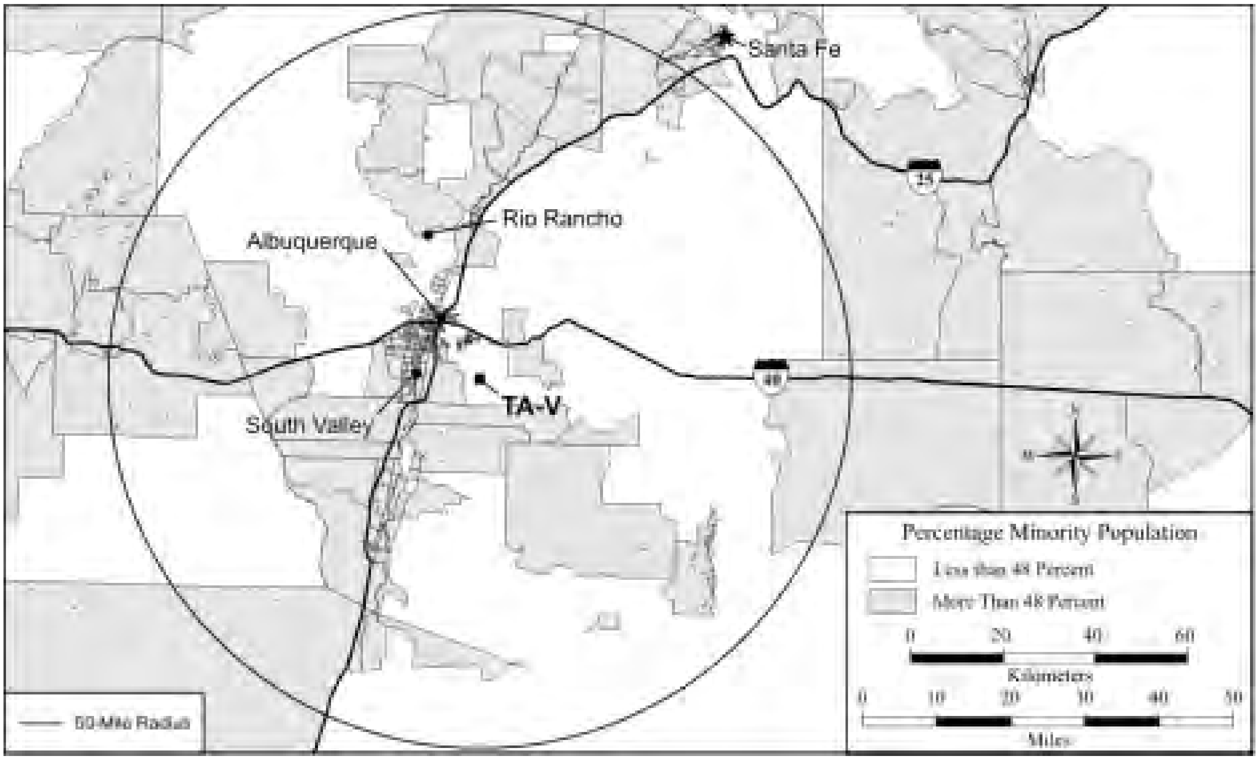

Figure E–10 Geographical Distribution of Minority Populations Residing near TA-V

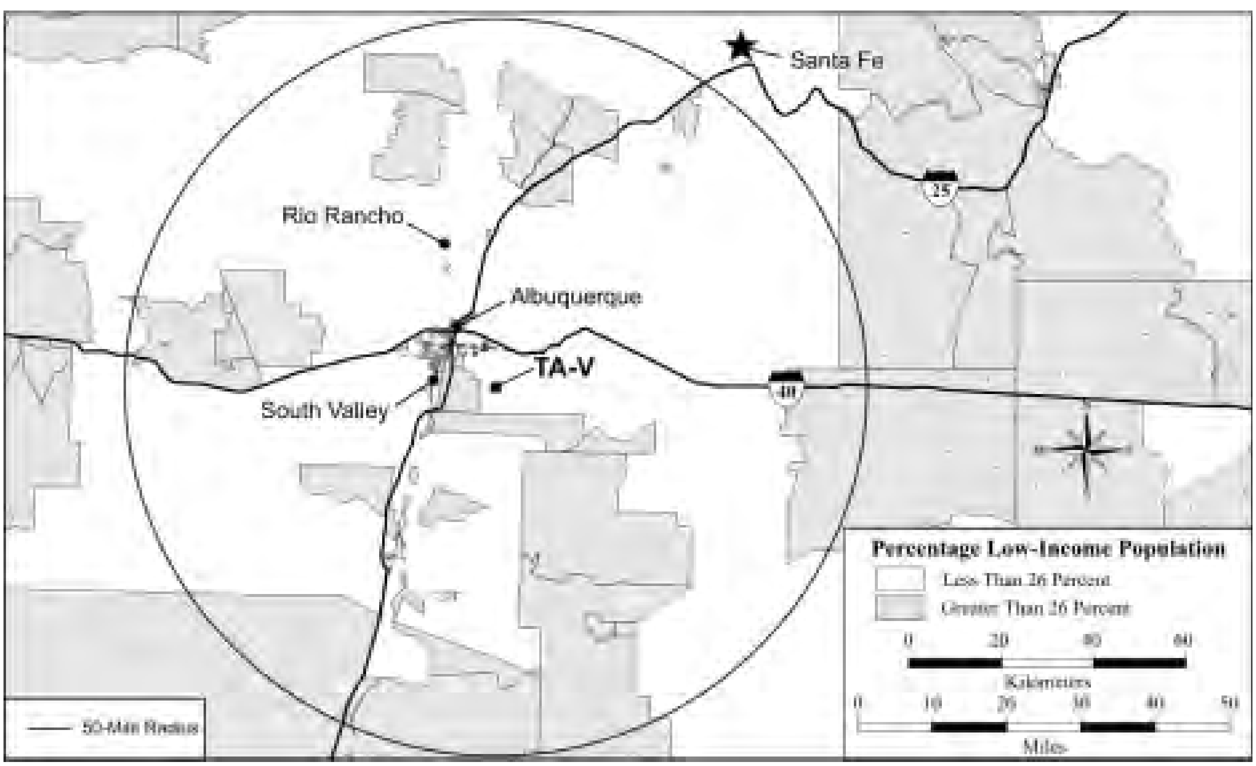

Figure E–11 Geographical Distribution of Low-Income Populations Residing near TA-V

A total of approximately 273,569 minority individuals and 89,146 low-income persons resided within 80 kilometers (50 miles) of TA-V in 1990. **Figure E–12** shows the cumulative percentage of these populations residing at a given distance from TA-V. For example, approximately 83 percent of the total minority population of 273,569 resided within 32 kilometers (20 miles) of TA-V, and approximately 83 percent of the total low-income population of 89,146 resided within 20 miles of TA-39. The curve representing percentages of minority residents (solid line in Figure E–12) is nearly identical in shape to that representing percentages of low-income residents (dashed line in Figure E–12). All percentages rise sharply near the boundary of Kirtland Air Force Base. Approximately 43 percent of the minority population (113,502 minority individuals) and 49 percent of the low-income population (43,437 low-income individuals) reside within 16 kilometers (10 miles) of TA-V. All of the population groups represented in Figure E–12 are concentrated in the Albuquerque metropolitan area.

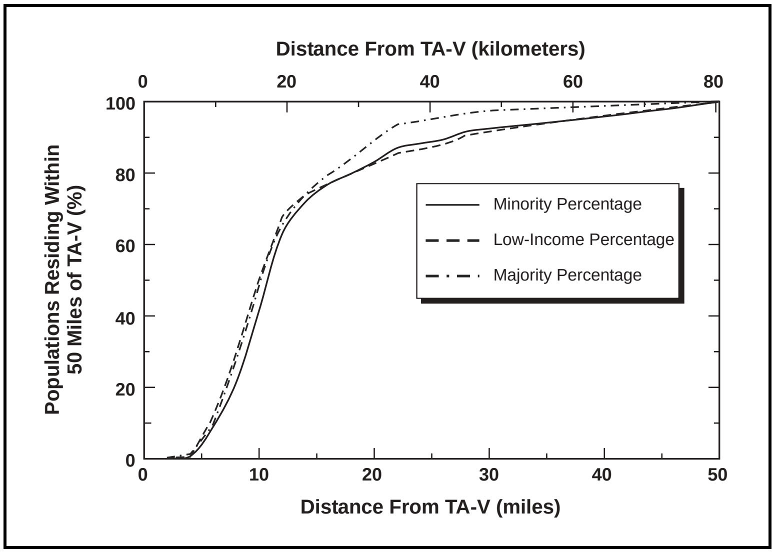

Figure E–12 Cumulative Percentage of Populations Residing within 80 Kilometers (50 Miles) of TA-V

Impacts of Construction on Minority and Low-Income Populations

Construction of new facilities at TA-V would occur under implementation of the SNL/NM Alternative. As discussed throughout Section 5.3, construction impacts at TA-V would be small and would not be expected to extend beyond the boundary of Kirtland Air Force Base. Construction activities at TA-V would have little or no impact on the surrounding minority and low-income populations.

Impacts of Normal Operations on Minority and Low-Income Populations

As discussed in Section 5.3.10.1, incident-free operations at TA-V would result in the activation of 10 curies per year of the radionuclide argon-41. Argon-41 is a colorless, inert gas with a half-life of approximately one hour and 48 minutes. The expected number of latent cancer fatalities that would result from external exposure to argon-41 among the general public surrounding SNL/NM would be approximately 1×10^{-5}. SNL/NM is surrounded by Indian reservations that lie completely or partially within the area at radiological risk (see **Figure E–13**). Hence, subsistence consumption of radiologically-contaminated local crops and wildlife is a concern. However, argon-41 is a noble gas that decays into a stable isotope of potassium. No internal dose, either from ingestion or inhalation of argon-41, would result from normal operations at TA-V. Therefore, normal operations conducted under the SNL/NM Alternative would not pose a significant radiological risk to resident minority or low-income populations.

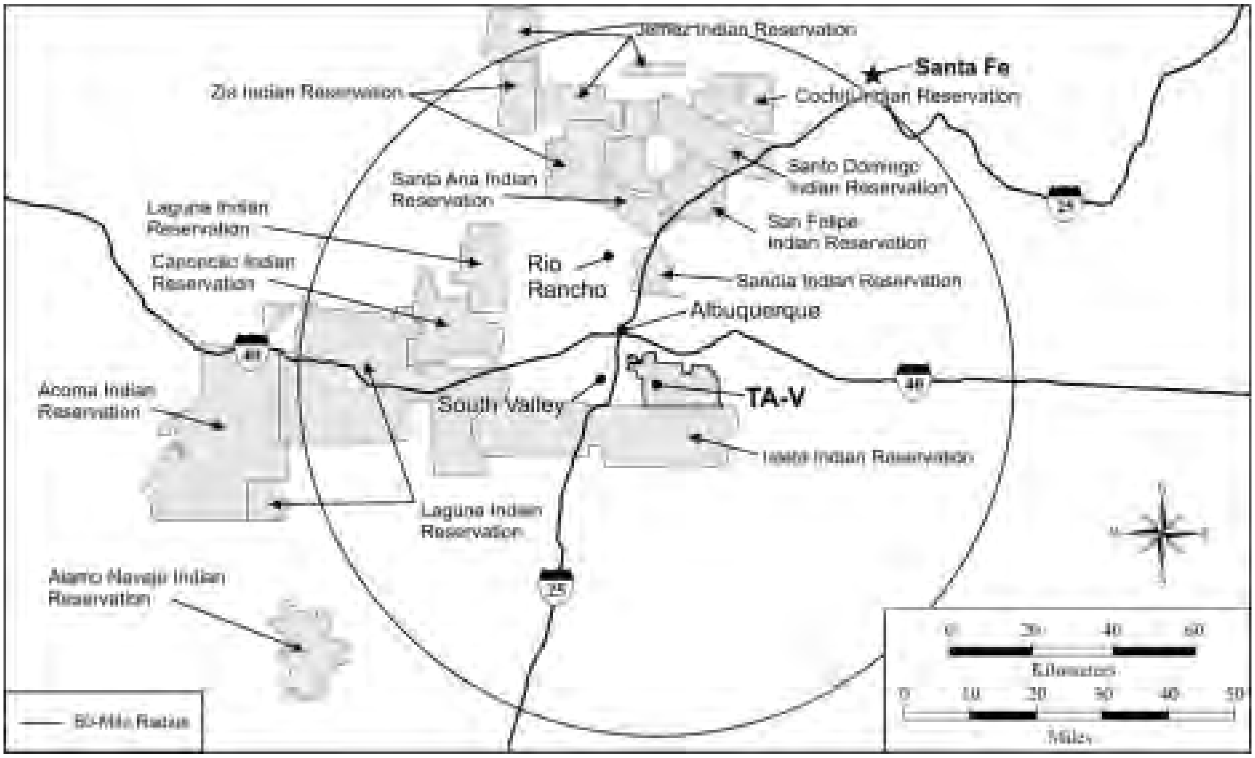

Figure E–13 Indian Reservations near TA-V

Impacts of Accidents on Minority and Low-Income Populations

In terms of radiological consequences and risk to the offsite public, the most severe accident among those evaluated in this EIS would result in a high pressure spray fire at TA-V (Section 5.3.10.2 of Chapter 5). All accident risks to any member of the public are at least seven orders of magnitude less than one latent cancer fatality. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

As discussed in Section C.2 of Appendix C, consequences due to accidents were calculated with the MACCS2 Model. This model evaluates doses due to inhalation of aerosols, such as respirable plutonium, and exposure to the plume. Longer term effects including resuspension/inhalation and ingestion of contaminated crops, wildlife, and fish are not included in the calculation. Such effects are largely controllable through interdiction. In order to conservatively estimate the radiological dose due to inhalation, the deposition velocity was set equal to zero during the MACCS2 calculations. Radioactive materials that would be deposited on surfaces remained airborne and available for inhalation. Given the rarity of accidents that could impact offsite individuals and the conservatism in the calculations of inhaled dose, implementation of the SNL/NM Alternative would not be expected to pose a significant radiological risk to resident low-income or minority populations, including low-income and minority groups that depend upon subsistence consumption of locally grown crops and wildlife.

E.5.3 Nevada Test Site (NTS)

Under the NTS Alternative, security Category I/II activities currently conducted at TA-18 would be relocated to the Device Assembly Facility (DAF) at NTS. Security Category III/IV and SHEBA activities would remain at LANL. **Figure E–14** and **Table E–3** show the counties at radiological risk under implementation of the NTS Alternative and the composition of the population of these counties, respectively. The counties

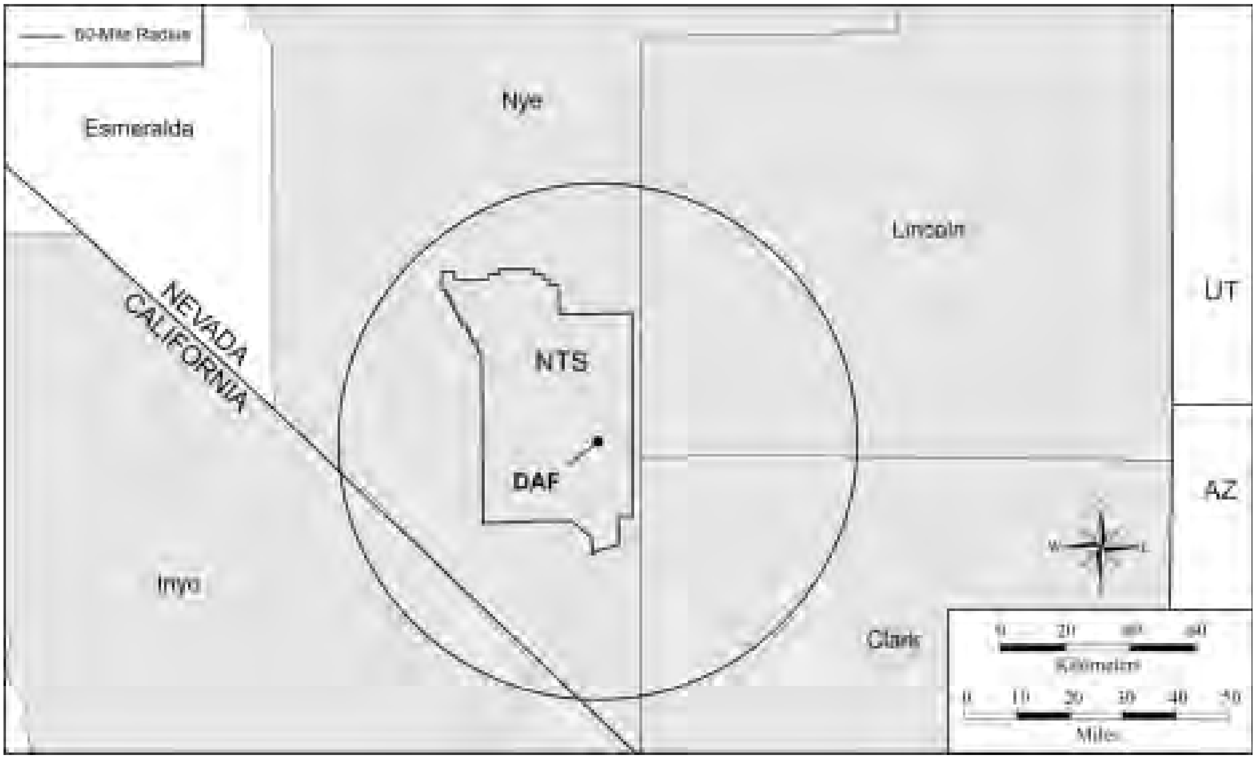

Figure E–14 Potentially Affected Counties near DAF

in Nevada are: Clark, Lincoln, and Nye. A portion of Inyo County, California is also within the area of potential radiological effects.

Table E–3 Populations in Potentially Affected Counties Surrounding DAF in 2000

Population Group	***Population***	***Percent of Total***
Total	1,430,360	100.0
Minority	554,986	38.8
Hispanic/Latino	307,334	21.5
Black/African American	121,865	8.5
American Indian/Alaska Native	10,092	0.7
Asian	71,639	5.0
Native Hawaiian/Pacific Islander	5,980	0.4
Two or more races	38,076	2.7
Some other race	2,133	0.1
White	873,241	61.1

Data shown in the Table E–3 reflects the results of Census 2000. The Hispanic or Latino population shown in Table E–3 includes persons of any race who designated themselves as having Hispanic or Latino origins. Populations for each race shown in the last seven rows of Table E–3 did not characterize themselves as having Hispanic or Latino origins. As discussed in Section E.2 above, persons indicating that they were multiracial are included in the estimate of the minority population given in the second row of the table. Approximately two percent of the total U.S. population selected two or more races during Census 2000. Of those, approximately one-third selected “White” and “Some other race.” Since “White” and “Other race” are not included in the CEQ’s current definition of minority races (CEQ 1997), the minority population shown in Table E–3 is overestimated. However, since non-Hispanic persons in the group “Two or more races" were less than three percent of the total population of these counties in 2000, the overestimate is relatively small.

Figure E–15 compares Census 2000 data with that for 1990 (to the extent that the data can be compared). There several reasons that minority data from Census 1990 cannot be directly compared with Census 2000 data. During the 1990 Census, Asian and Pacific Islanders were counted together in a single category. However, during Census 2000, "Native Hawaiian and Other Pacific Islander" and "Asian" were separate responses (selection of either one or both was an option). As a result, the 1990 population composed of Native Hawaiian and Other Pacific Islanders cannot be identified as a population distinct from Asians. In addition, during the 1990 Census, respondents were asked to designate themselves as members of only a single race. During Census 2000, respondents could select any combination of all of the six single race categories. As indicated in Figure E–15, there is no multiracial data available from the 1990 Census.

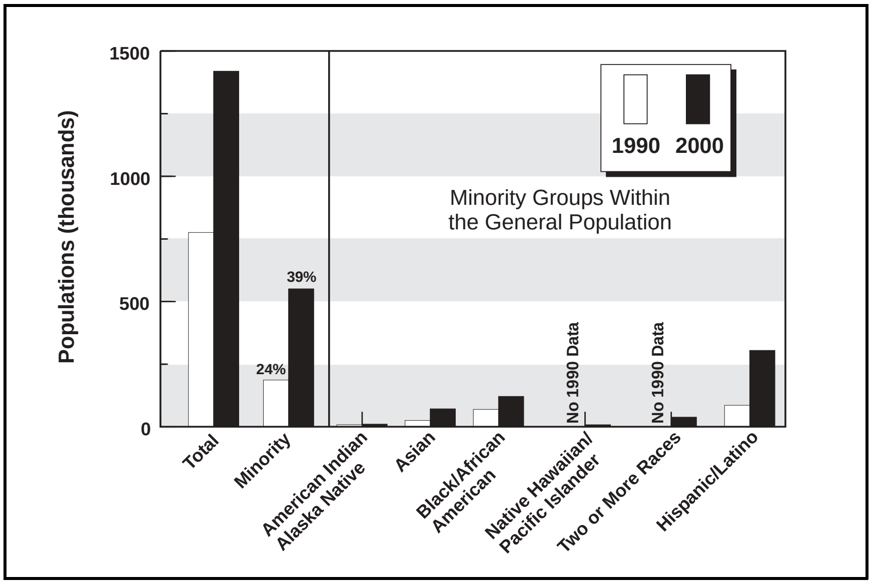

Figure E–15 Comparison of Potentially Affected County Populations near DAF in 1990 and 2000

Bearing in mind the changes in racial categories and enumeration that occurred between the 1990 Census and the 2000 Census, the following approximate comparison can be made. In the decade from 1990 to 2000, Nevada was the fastest growing state in the U.S. The minority population in potentially affected counties increased from approximately 24 percent to 39 percent. The Hispanic or Latino population of these counties more than tripled during the past decade, and the Asian population of those counties nearly tripled during the same decade. Nearly 70 percent of the population of the State of Nevada was found to reside in the Las Vegas metropolitan area of Clark County during Census 2000. Populations shown in Figure E–15 largely reflect the racial and Hispanic composition of Clark County.

Figure E–16 shows the geographical distribution of minorities residing near the DAF in 1990 using block group resolution. Shaded block groups shown in Figure E–16 indicate that the percentage minority population residing in those block groups exceeded that for the nation and State of Nevada as a whole. **Figure E–17** shows the geographical distribution of the low-Income population residing near the DAF. In 1990, approximately 13 percent of the nation's resident population reported incomes below the poverty threshold, and approximately 10 percent of Nevada's population was composed of low-income individuals. Shaded block groups in Figure E–17 indicate that the percentage low-income population residing in those block groups was more than national and state percentages of low-income residents.

Figure E–16 Geographical Distribution of the Minority Population Residing near the DAF

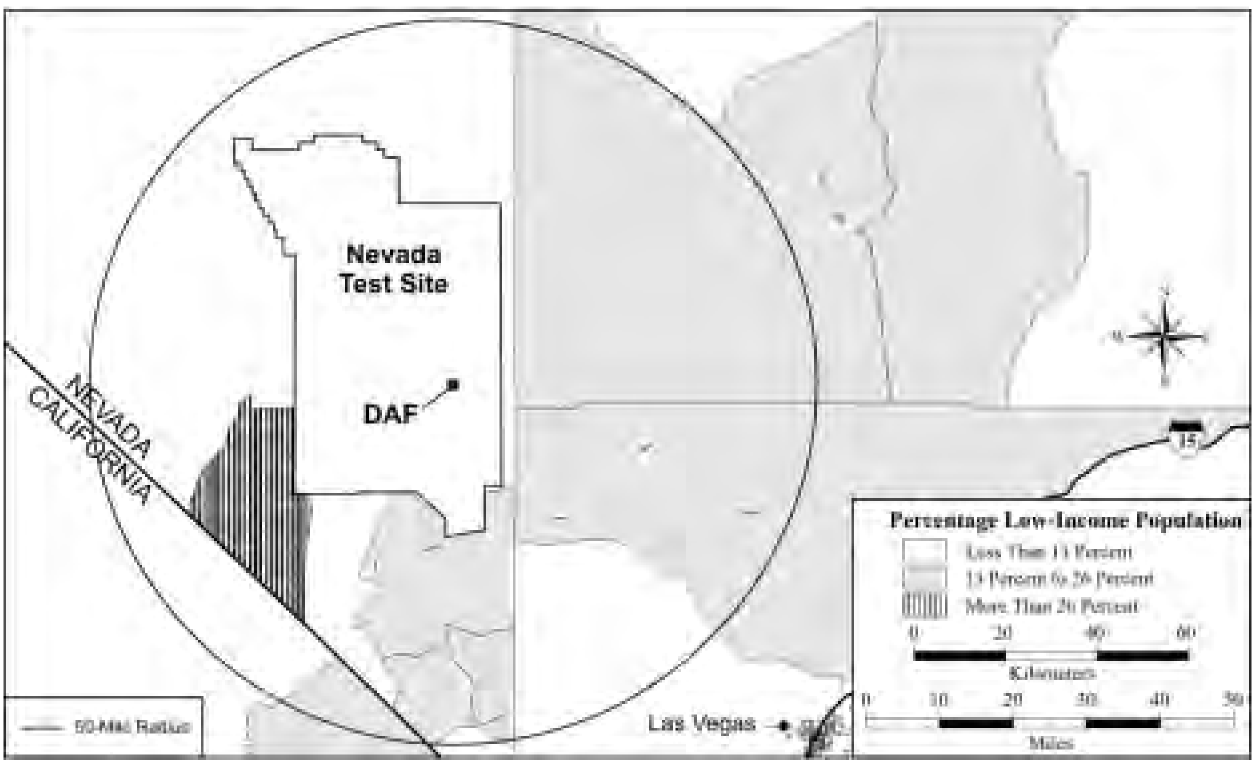

Figure E–17 Geographical Distribution of the Low-Income Population Residing near the DAF

Approximately 1,710 minority individuals and 1,345 low-income persons resided within 80 kilometers (50 miles) of the DAF in 1990. **Figure E–18** shows the cumulative percentage of these populations residing at a given distance from the DAF. For example, approximately 6 percent of the total minority population of 1,710 resided within 32 kilometers (20 miles) of DAF, and approximately 3 percent of the total low-income population of 1,345 resided within 32 kilometers (20 miles) of DAF. Curves representing potentially affected minority (solid line), low-income (dashed line), and majority populations (dot-dash line) in Figure E–18 are similar in shape. There are no major metropolitan areas in the potentially affected area. All three curves increase at approximately the same rate as the distance approaches that for the Las Vegas metropolitan area.

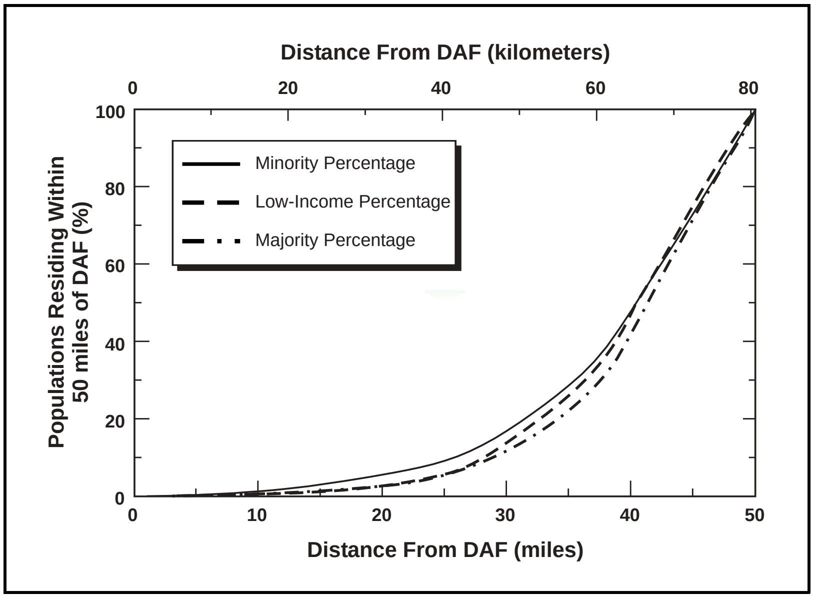

Figure E–18 Cumulative Percentage Population Residing within 80 Kilometers (50 Miles) of DAF

Impacts of Construction on Minority and Low-Income Populations

Construction of new facilities at the DAF would occur under implementation of the NTS Alternative. As discussed throughout Section 5.4, construction impacts at the DAF would be small and would not be expected to extend beyond the boundary of NTS. Construction activities at the DAF would have little or no impact on the surrounding minority and low-income populations.

Impacts of Normal Operations on Minority and Low-Income Populations

As discussed in Section 5.4.10.1, incident-free operations at DAF would result in the activation of 10 curies per year of the radionuclide argon-41. Argon-41 is a colorless, inert gas with a half-life of approximately one hour and 48 minutes. The expected number of latent cancer fatalities that would result from external exposure to argon-41 among the general public surrounding NTS would be approximately 4×10^{-8}. No internal dose, either from ingestion or inhalation of argon-41, would result from normal operations at DAF. Therefore, normal operations conducted under the NTS Alternative would not pose a significant radiological risk to resident minority or low-income populations.

Impacts of Accidents on Minority and Low-Income Populations

In terms of radiological consequences and risk to the offsite population, the most severe accident among those evaluated in this EIS would result in a high pressure spray fire at DAF (Section 5.4.10.2 of Chapter 5). All accident risks to any member of the public are essentially zero. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

As discussed in Section C.2 of Appendix C, consequences due to accidents were calculated with the MACCS2 Model. This model evaluates doses due to inhalation of aerosols, such as respirable plutonium, and exposure to the plume. Longer term effects including resuspension/inhalation and ingestion of contaminated crops, wildlife, and fish are not included in the calculation. Such effects are largely controllable through interdiction. In order to conservatively estimate the radiological dose due to inhalation, the deposition velocity was set equal to zero during the MACCS2 calculations. Radioactive materials that would be deposited on surfaces remained airborne and available for inhalation. Given the rarity of accidents that could impact offsite individuals and the conservatism in the calculations of inhaled dose, implementation of the NTS Alternative would not be expected to pose a significant radiological risk to resident low-income or minority populations, including low-income and minority groups that depend upon subsistence consumption of locally grown crops and wildlife.

E.5.4 Argonne National Laboratory-West (ANL-W)

Under the ANL-W Alternative, security Category I/II activities currently conducted at TA-18 would be relocated to the vicinity of the Fuel Manufacturing Facility (FMF) and its environs at ANL-W. Security Category III/IV activities would remain at LANL. **Figure E–19** and **Table E–4** show the counties at radiological risk and the composition of the populations of these counties, respectively. The counties are: Bannock, Bingham, Blaine, Bonneville, Butte, Clark, Caribou, Custer, Fremont, Jefferson, Lemhi, Madison, Minidoka, and Power.

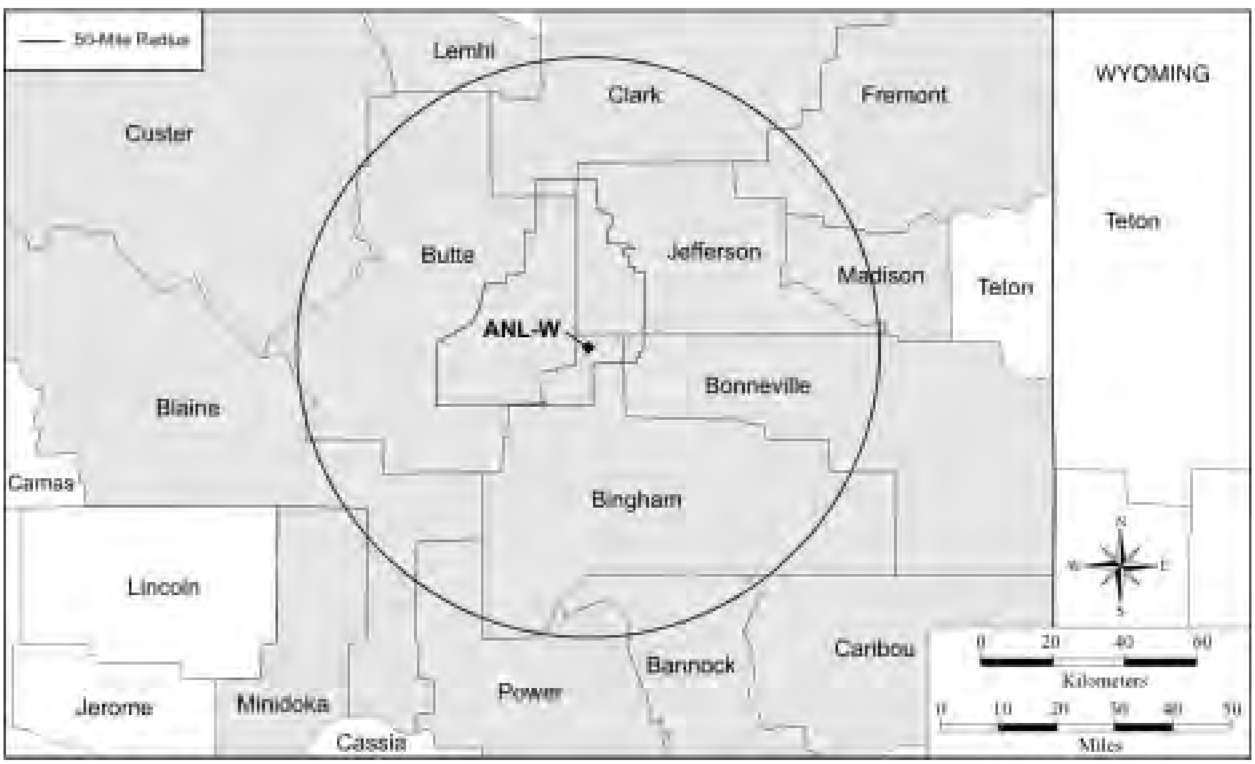

Figure E–19 Potentially Affected Counties near ANL-W

Data shown in Table E–4 reflects the results of Census 2000. The Hispanic or Latino population shown in Table E–4 includes persons of any race who designated themselves as having Hispanic or Latino origins. Populations for each race shown in the last seven rows of Table E–4 did not characterize themselves as having Hispanic or Latino origins. As discussed in Section E.2 above, persons indicating that they were multiracial are included in the estimate of the minority population given in the second row of the table.

Approximately two percent of the total U.S. population selected two or more races during the 2000 Census. Of those, approximately one-third selected "White" and "Some Other Race." Since "White" and "Other Race" are not included in the CEQ's current definition of minority races (CEQ 1997), the minority population shown in Table E–4 is overestimated. However, since non-Hispanic persons in the group "Two or More Races" were less than 2 percent of the total population of these counties in 2000, the overestimate is relatively small.

Table E–4 Populations in Potentially Affected Counties Surrounding ANL-W in 2000

Population Group	*Population*	*Percentage of Total*
Total	328,339	100.0
Minority	41,547	12.7
Hispanic/Latino	28,950	8.8
Black/African American	990	0.3
American Indian/Alaska Native	5,702	1.7
Asian	2,125	0.6
Native Hawaiian/Pacific Islander	277	0.1
Two or more races	3,503	1.1
Some other race	225	0.1
White	286,567	87.3

Figure E–20 compares the 2000 Census data with that for 1990 (to the extent that the data can be compared). There are several reasons that minority data from Census 1990 cannot be directly compared with Census 2000 data. During the 1990 Census, Asian and Pacific Islanders were counted together in a single category. However, during Census 2000, "Native Hawaiian and Other Pacific Islander" and "Asian" were separate responses (selection of either one or both was an option). As a result, the 1990 population composed of Native Hawaiian and Other Pacific Islanders cannot be identified as a population distinct from Asians. In addition, during the 1990 Census, respondents were asked to designate themselves as members of only a single race. During Census 2000, respondents could select any combination of all of the six single race categories. As indicated in Figure E–20, there is no multiracial data available from the 1990 Census.

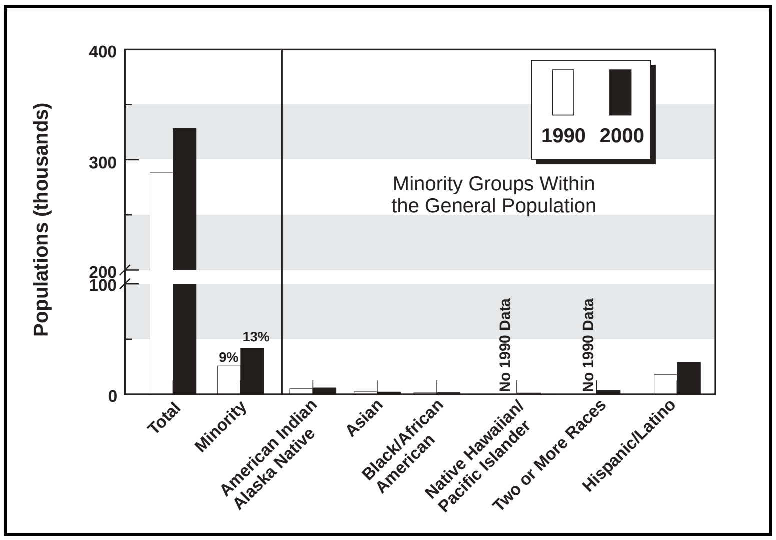

Figure E–20 Comparison of Potentially Affected County Populations near ANL-W in 1990 and 2000

Bearing in mind the changes in racial categories and enumeration that occurred between the 1990 Census and Census 2000, the following approximate comparison can be made. In the decade from 1990 to 2000, the minority population in potentially affected counties increased from approximately 9 percent to 13 percent. This is commensurate with characteristics of the State of Idaho. In the same decade, the percentage minority population of Idaho increased from approximately 8 percent to 12 percent.

Figure E–21 shows the geographical distribution of minorities residing near ANL-W in 1990 using block group resolution. Shaded block groups shown in Figure E–21 indicate that the percentage minority population residing in those block groups exceeded that for the nation as a whole and was more than three times the percentage minority population for the State of Idaho.

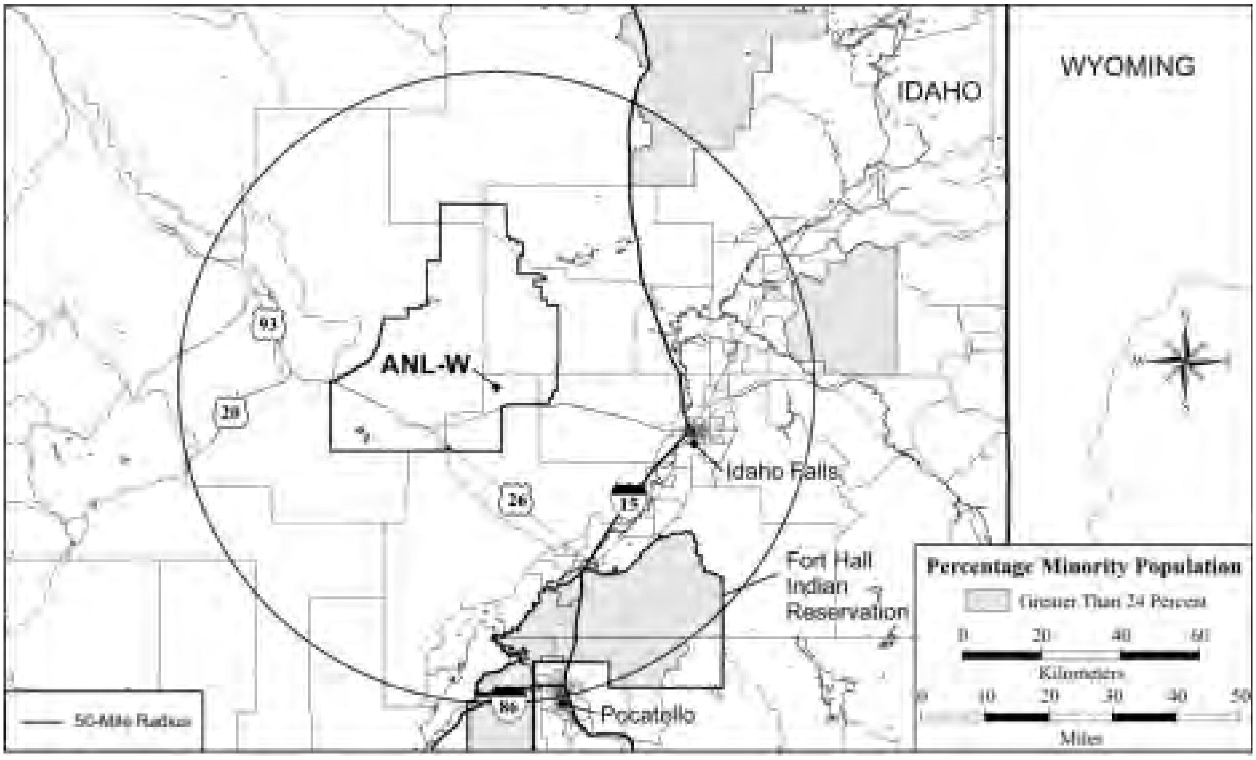

Figure E–21 Geographical Distribution of Minorities Residing near ANL-W

Figure E–22 shows the geographical distribution of the low-income population residing near ANL-W in 1990. In 1990, approximately 13 percent of the nation's resident population reported incomes below the poverty threshold, and approximately 13 percent of Idaho's population was composed of low-income individuals. Shaded block groups in Figure E–22 indicate that the percentage low-income population residing in those block groups exceeded that for Idaho and the nation.

A total of approximately 15,691 minority individuals and 25,045 low-income persons resided within 80 kilometers (50 miles) of ANL-W in 1990. **Figure E–23** shows the cumulative percentage of these populations residing at a given distance from ANL-W. For example, approximately 2 percent of the total minority population and approximately 1.5 percent of the total low-income population resided within 32 kilometers (20 miles) of FMF. The curve representing percentages of minority residents (solid line in Figure E–23) increases steadily throughout the potentially affected area. The percentage of low-income residents (dashed line) and majority residents (dot-dash line) rise sharply near the outskirts of the cities of Idaho Falls and Pocatello. Less than 1 percent of the minority population (92 minority individuals) and low-income population (70 low-income individuals) reside within 16 kilometers (10 miles) of FMF.

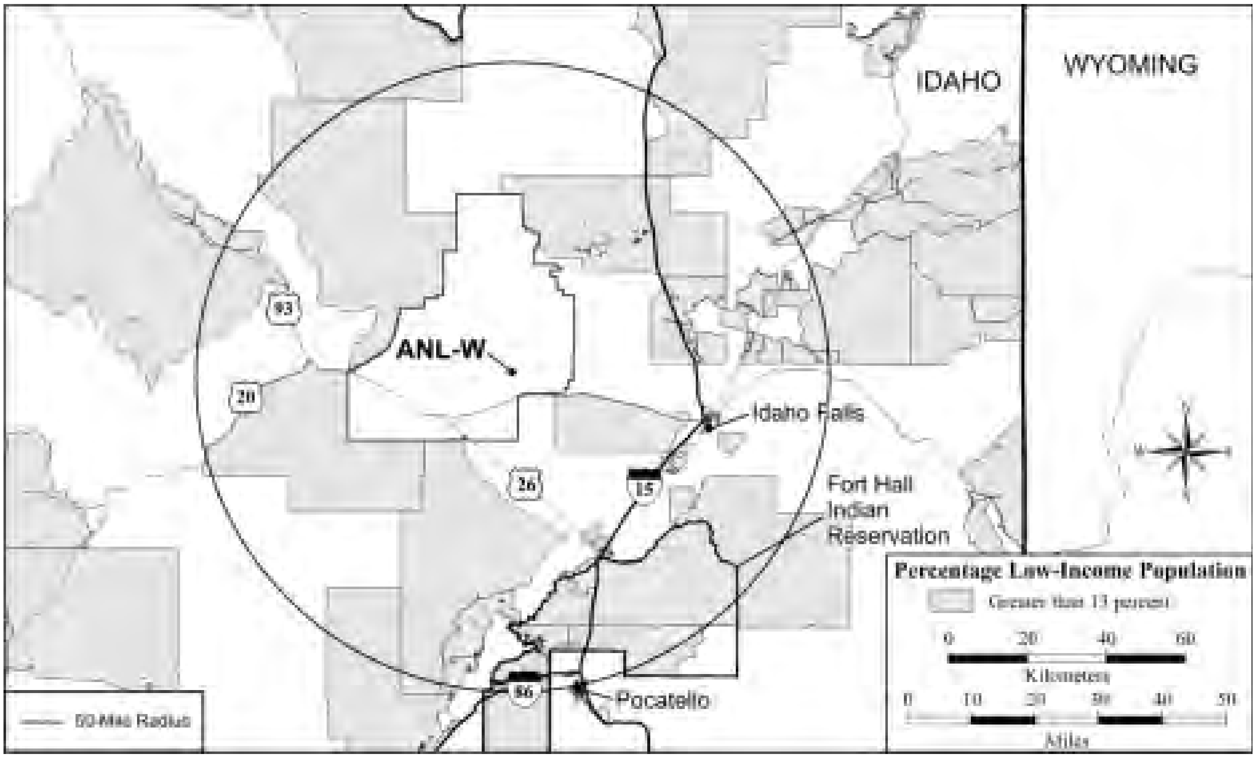

Figure E–22 Geographical Distribution of Low-Income Populations Residing near ANL-W

Impacts of Construction on Minority and Low-Income Populations

Modification of existing facilities and construction of new facilities at ANL-W would occur under implementation of this alternative. As discussed throughout Section 5.5, construction impacts at ANL-W would be small. Construction activities at ANL-W would have little or no impact on the surrounding minority and low-income populations.

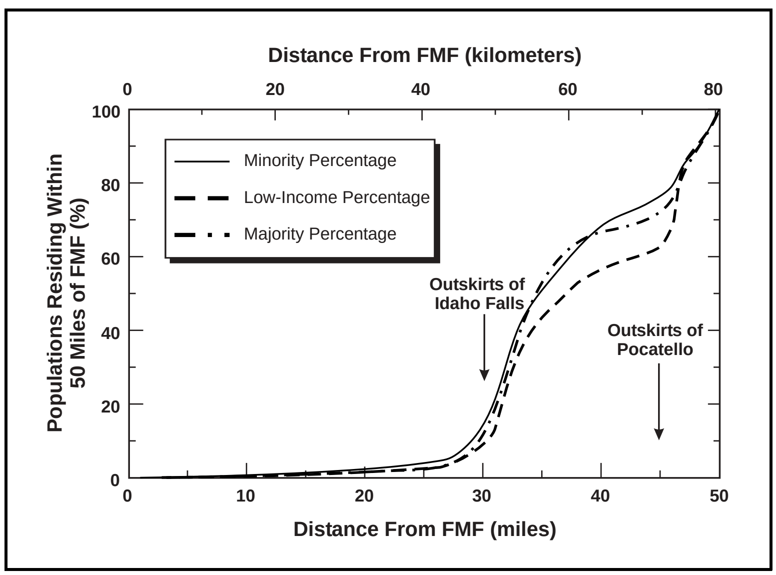

Figure E–23 Cumulative Percentage of Populations Residing within 80 Kilometers (50 Miles) of FMF

Impacts of Normal Operations on Minority and Low-Income Populations

As discussed in Section 5.5.10.1, incident-free operations at FMF would result in the activation of 10 curies per year of the radionuclide argon-41. Argon-41 is a colorless, inert gas with a half-life of approximately one hour and 48 minutes. The expected number of latent cancer fatalities that would result from external exposure to argon-41 among the general public surrounding ANL-W would be approximately 2×10^{-7}. No internal dose, either from ingestion or inhalation of argon-41, would result from normal operations at FMF. Therefore, normal operations conducted under the ANL-W Alternative would not pose a significant radiological risk to resident minority or low-income populations.

Impacts of Accidents on Minority and Low-Income Populations

In terms of radiological consequences and risk, the most severe accident among those evaluated in this EIS would result in a high pressure spray fire at FMF (Section 5.5.10.2 of Chapter 5). All accident risks to any member of the public are essentially zero. Hence, none of the postulated accidents would pose a significant radiological risk to the public, including minority and low-income individuals and groups within the population at risk.

As discussed in Section C.2 of Appendix C, consequences due to accidents were calculated with the MACCS2 Model. This model evaluates doses due to inhalation of aerosols, such as respirable plutonium, and exposure to the plume. Longer term effects including resuspension/inhalation and ingestion of contaminated crops, wildlife, and fish are not included in the calculation. Such effects are largely controllable through interdiction. In order to conservatively estimate the radiological dose due to inhalation, the deposition velocity was set equal to zero during the MACCS2 calculations. Radioactive materials that would be deposited on surfaces remained airborne and available for inhalation. Given the rarity of accidents that could impact offsite individuals and the conservatism in the calculations of inhaled dose, implementation of the ANL-W Alternative would not be expected to pose a significant radiological risk to resident low-income or minority populations, including low-income and minority groups that depend upon subsistence consumption of locally grown crops and wildlife.

E.6 REFERENCES

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APPENDIX F

Environmental Impacts Methodology

APPENDIX F
ENVIRONMENTAL IMPACTS METHODOLOGY

This appendix briefly describes the methods used to assess the potential direct, indirect, and cumulative effects of the alternatives in this *Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory (TA-18 Relocation EIS)*. Included are impact assessment methods for land resources, site infrastructure, air quality, noise, geology and soils, water resources, ecological resources, cultural and paleontological resources, socioeconomics, waste management, and cumulative impacts. Each section includes descriptions of the affected resources, region of influence, and impact assessment methods. Descriptions of the methods for the evaluation of human health effects from normal operations, facility accidents, and transportation, and environmental justice are presented in Appendices B, C, D, and E, respectively.

Impact analyses vary for each resource area. For air quality, for example, estimated pollutant emissions from the candidate facilities were compared with appropriate regulatory standards or guidelines. Comparison with regulatory standards is a commonly used method for benchmarking environmental impacts and is done here to provide perspective on the magnitude of identified impacts. For waste management, waste generation rates were compared with the capacities of waste management facilities. Impacts within each resource area were analyzed consistently; that is, the impact values were estimated using a consistent set of input variables and computations. Moreover, calculations in all resource areas used accepted protocols and up-to-date models.

Baseline conditions at the four sites (Los Alamos National Laboratory [LANL], Sandia National Laboratories/New Mexico [SNL/NM], Nevada Test Site [NTS], and Argonne National Laboratory-West [ANL-W]) assessed in this EIS include present actions at each site. The No Action Alternative was used as the basis for the comparison of impacts that would occur under implementation of the other alternatives.

F.1 LAND RESOURCES

F.1.1 Land Use

F.1.1.1 Description of Affected Resources and Region of Influence

Land use includes the land on and adjacent to each candidate site, the physical features that influence current or proposed uses, pertinent land use plans and regulations, and land ownership and availability. The region of influence for land use varies due to the extent of land ownership, adjacent land use patterns and trends, and other geographic or safety considerations, but generally includes the site and areas immediately adjacent to the site.

F.1.1.2 Description of Impact Assessment

The amount of land disturbed and conformity with existing land use were considered in order to evaluate impacts at each candidate site from construction and operation (see **Table F–1**). Both factors were considered for each of the action alternatives. However, since new construction would not take place under the No Action Alternative, only conformity with existing land use was evaluated for this alternative. Land-use impacts could vary considerably from site to site, depending on the extent of new construction and where it would take place (i.e., on undeveloped land or within a previously disturbed area).

Table F–1 Impact Assessment Protocol for Land Resources

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Land area used	Site acreage	Facility location and acreage requirement	Acreage converted to project use
Compatibility with existing or future facility land use	Existing facility land use configurations	Location of facility on the site; expected modifications of facility activities and missions to accommodate the alternatives	Incompatibility with existing or future facility land use
Visual resources	Current Visual Resource Management classification	Location of facility on the site; facility dimensions and appearance	Change in Visual Resource Management classification

F.1.2 Visual Resources

F.1.2.1 Description of Affected Resources and Region of Influence

Visual resources are the natural and human-created features that give a particular landscape its character and aesthetic quality. Landscape character is determined by the visual elements of form, line, color, and texture. All four elements are present in every landscape; however, they exert varying degrees of influence. The stronger the influence exerted by these elements in a landscape, the more interesting the landscape. The region of influence for visual resources includes the geographic area from which the candidate facilities may be seen.

F.1.2.2 Description of Impact Assessment

Impacts to visual resources from construction and operation of the proposed action at each site may be determined by evaluating whether the Bureau of Land Management Visual Resource Management classifications of the candidate sites would change as a result of the proposed action (DOI 1986) (see Table F–1). Existing classifications were derived from an inventory of scenic qualities, sensitivity levels, and distance zones for particular areas. For those alternatives involving existing facilities at candidate U.S. Department of Energy (DOE) sites, alterations to visual features may be readily evaluated and the impact on the current Visual Resource Management classification determined. In order to determine the range of potential visual effects from new facilities, the analysis considered potential impacts from construction and operation in light of the aesthetic quality of surrounding areas, as well as the visibility of the proposed action from public vantage points.

F.2 SITE INFRASTRUCTURE

F.2.1 Description of Affected Resources and Region of Influence

Site infrastructure includes the physical resources required to support the construction and operation of the candidate facilities. It includes the capacities of onsite road and rail transportation networks; electric power and electrical load capacities; natural gas, coal, and/or liquid fuel (e.g., gasoline, diesel fuel, propane) capacities; and water supply system capacities.

The region of influence is generally limited to the boundaries of DOE sites. However, should infrastructure requirements exceed site capacities, the region of influence would be expanded (for analysis) to include the sources of additional supply. For example, if electrical demand (with added facilities) exceeded site availability, then the region of influence would be expanded to include the likely source of additional power (i.e., the power pool currently supplying the site).

F.2.2 Description of Impact Assessment

In general, infrastructure impacts were assessed by evaluating the requirements of each alternative against the site capacities. An impact assessment was made for each resource (i.e., transportation, electricity, fuel, and water) for the various alternatives (see **Table F–2**). Local transportation impacts were addressed qualitatively, as transportation infrastructure requirements under the proposed action were considered negligible. Tables reflecting site availability and infrastructure requirements were developed for each alternative. Data for these tables were obtained from reports describing the existing infrastructure at the sites, and from the data reports for each alternative. If necessary, design mitigation considerations conducive to reduction of the infrastructure demand were also identified.

Table F–2 Impact Assessment Protocol for Infrastructure

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Transportation - Roads (kilometers) - Railroads (kilometers)	Site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding site capacity
Electricity - Energy consumption (megawatt-hours per year) - Peak load (megawatts)	Site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding site capacity
Fuel - Natural gas (cubic meters per year) - Liquid fuel (liters per year) - Coal (tons per year)	Site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding site capacity
Water (liters per year)	Site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding site capacity

Any projected demand for infrastructure resources exceeding site availability can be regarded as an indicator of environmental impact. Whenever projected demand approaches or exceeds capacity, further analysis for that resource is warranted. Often, design changes can mitigate the impact of additional demand for a given resource. For example, substituting fuel oil for natural gas (or vice versa) for heating or industrial processes can be accomplished at little cost during the design of a facility, provided the potential for impact is identified early. Similarly, a dramatic spike or surge in peak demand for electricity can sometimes be mitigated by changes to operational procedures or parameters.

F.3 AIR QUALITY

F.3.1 Description of Affected Resources and Region of Influence

Air pollution refers to the introduction, directly or indirectly, of any substance into the air that could:

- endanger human health,
- harm living resources and ecosystems,
- damage material property, or
- impair or interfere with the comfortable enjoyment of life and other legitimate uses of the environment.

For the purpose of this *TA-18 Relocation EIS*, only outdoor air pollutants were addressed. They may be in the form of solid particles, liquid droplets, gases, or a combination of these forms. Generally, they can be categorized as primary pollutants (those emitted directly from identifiable sources) and secondary pollutants (those produced in the air by interaction between two or more primary pollutants, or by reaction with normal atmospheric constituents that may be influenced by sunlight). Air pollutants are transported, dispersed, or concentrated by meteorological and topographical conditions. Thus, air quality is affected by air pollutant emission characteristics, meteorology, and topography.

Ambient air quality in a given location can be described by comparing the concentrations of various pollutants in the atmosphere with the appropriate standards. Ambient air quality standards have been established by Federal and state agencies, allowing an adequate margin of safety for the protection of public health and welfare from the adverse effects of pollutants in the ambient air. Pollutant concentrations higher than the corresponding standards are considered unhealthy; those below such standards, acceptable.

The pollutants of concern are primarily those for which Federal and state ambient air quality standards have been established, including criteria air pollutants, hazardous air pollutants, and other toxic air compounds. Criteria air pollutants are those listed in 40 CFR Part 50, "National Primary and Secondary Ambient Air Quality Standards." Hazardous air pollutants and other toxic compounds are those listed in Title I of the Clean Air Act, as amended (40 U.S.C. 7401 et seq.), those regulated by the National Emissions Standards for Hazardous Air Pollutants (40 CFR 61), and those that have been proposed or adopted for regulation by the applicable state, or are listed in state guidelines. States may set ambient standards that are more stringent than the national ambient air quality standards. The more stringent of the state or Federal standards for each site is shown in this document. Also of concern are air pollutant emissions that may contribute to the depletion of stratospheric ozone or global warming.

Areas with air quality better than the National Ambient Air Quality Standards (NAAQS) for criteria air pollutants are designated as being in attainment, while areas with air quality worse than the NAAQS for such pollutants are designated as nonattainment. Areas may be designated as unclassified when sufficient data for attainment status designation are lacking. Attainment status designations are assigned by county, metropolitan statistical area, consolidated metropolitan statistical area, or portions thereof, or air quality control regions. Air quality control regions designated by the U.S. Environmental Protection Agency (EPA) are listed in 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purposes." LANL, SNL/NM, NTS, and ANL-W are all located in attainment areas (40 CFR Sections 81.332, 81.329, and 81.313).

For locations that are in an attainment area for criteria air pollutants, Prevention of Significant Deterioration regulations limit pollutant emissions from new or modified sources and establish allowable increments of pollutant concentrations. Three Prevention of Significant Deterioration classifications are specified, with the criteria established, in the Clean Air Act. Class I areas include national wilderness areas, memorial parks larger than 2,020 hectares (5,000 acres), national parks larger than 2,430 hectares (6,000 acres), and areas that have been redesignated as Class I. Class II areas are all areas not designated as Class I. No Class III areas have been designated (42 U.S.C. 7472, Title I, Section 162).

LANL, SNL/NM, NTS, and ANL-W are all in Class II areas. However, LANL is adjacent to the Bandelier National Monument and Wilderness Area Class I area (DOE 1999a). SNL/NM is 80 kilometers (50 miles) from Bandelier National Monument and Wilderness Area (DOE 1999b). NTS is 208 kilometers (130 miles) from the Grand Canyon National Park Class I area, and 169 kilometers (105 miles) from Sequoia National Park Class I area (DOE 1996). ANL-W is 68 kilometers (42 miles) from the Craters of the Moon Wilderness Area Class I area (DOE 2000b).

The region of influence for air quality encompasses an area surrounding a candidate site that is potentially affected by air pollutant emissions caused by the alternatives. The air quality impact area normally evaluated is the area in which concentrations of criteria pollutants would increase more than a significant amount in a Class II area (i.e., on the basis of averaging period and pollutant: 1 microgram per cubic meter for the annual average for sulfur dioxide, nitrogen dioxide and particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}), 5 micrograms per cubic meter for the 24 hour average for sulfur dioxide and PM_{10}, 500 micrograms per cubic meters for the 8 hour average for carbon monoxide, 25 micrograms per cubic meter for the 3 hour average for sulfur dioxide, and 2,000 micrograms for the 1 hour average for carbon monoxide [40 CFR Section 51.165]). Generally, this covers a few kilometers downwind from the source. Further, for sources within 100 kilometers (60 miles) of a Class I area, the air quality impact area evaluated would include the Class I area if the increase in concentration were greater than 1 microgram per cubic meter (24-hour average). The area of the region of influence depends on emission source characteristics, pollutant types, emission rates, and meteorological and topographical conditions. For the purpose of this analysis, where most of the candidate sites are large, impacts were evaluated at the site boundary and roads within the sites to which the public has access, plus any additional area in which contributions to pollutant concentrations are expected to exceed significance levels.

Baseline air quality is typically described in terms of pollutant concentrations modeled for existing sources at each candidate site and background air pollutant concentrations measured near the sites. For this analysis, concentrations for existing sources were obtained from existing source documents such as the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory* (DOE 1999a), *Sandia National Laboratories/New Mexico Final Site-Wide Environmental Impact Statement* (DOE 1999b), *Idaho High-Level Waste and Facilities Disposition Draft Environmental Impact Statement* (DOE 1999c) and *Final Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel* (DOE 2000a) and from modeling of concentrations using recent emissions inventories and the Industrial Source Complex (ISCST3) model (EPA 1995, EPA 2000).

F.3.2 Description of Impact Assessment

Potential air quality impacts of pollutant emissions from construction and normal operations were evaluated for each alternative. This assessment included a comparison of pollutant concentrations from each alternative with applicable Federal and state ambient air quality standards (see **Table F–3**). If both Federal and state standards exist for a given pollutant and averaging period, compliance was evaluated using the more stringent standard. Operational air pollutant emissions data for each alternative were based on conservative engineering analyses.

For each alternative, contributions to offsite air pollutant concentrations were modeled on the basis of guidance presented in EPA's "Guidelines on Air Quality Models" (40 CFR Part 51, Appendix W). The EPA-recommended model ISCST3 (EPA 1995), was selected as an appropriate model to perform the air dispersion modeling because it is designed to support the EPA regulatory modeling program and predicts conservative worst-case impacts.

The modeling analysis incorporated conservative assumptions, which tend to overestimate pollutant concentrations. The maximum modeled concentration for each pollutant and averaging time was selected for comparison with the applicable standard. The concentrations evaluated were the maximum occurring at or beyond the site boundary and at a public access road, or other publicly accessible area within the site. Available monitoring data, which reflect both onsite and offsite sources, were also taken into consideration. Concentrations of the criteria air pollutants were presented for each alternative. Concentrations of hazardous and toxic air pollutants were evaluated in the public and occupational health effects analysis. At least one year of representative hourly meteorological data was used for each site.

Table F–3 Impact Assessment Protocol for Air Quality

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Criteria air pollutants and other regulated pollutants [a]	Measured and modeled ambient concentrations (micrograms per cubic meter) from existing sources at site	Emission rate (kilograms per year) of air pollutants from facility; source characteristics (e.g., stack height and diameter, exit temperature and velocity)	Concentration of alternative and total site concentration of each pollutant at or beyond site boundary, or within boundary on public road compared to applicable standard
Toxic and hazardous air pollutants [b]	Measured and modeled ambient concentrations (micrograms per cubic meter) from existing sources at site	Emission rate (kilograms per year) of pollutants from facility; source characteristics (e.g., stack height and diameter, exit temperature and velocity)	Concentration of alternative and total site concentration of each pollutant at or beyond site boundary, or within boundary on public road used to calculate hazard quotient or cancer risk

[a] Carbon monoxide; hydrogen fluoride; lead; nitrogen oxides; ozone; particulate matter with an aerodynamic diameter less than or equal to 10 microns; sulfur dioxide; total suspended particulates.
[b] Clean Air Act, Section 112, hazardous air pollutant; pollutants regulated under the National Emissions Standard for Hazardous Air Pollutants; and other state-regulated pollutants.

Ozone is typically formed as a secondary pollutant in the ambient air (troposphere). It is formed in the presence of sunlight from the mixing of primary pollutants, such as nitrogen oxides, and volatile organic compounds that emanate from vehicular (mobile), natural, and other stationary sources. Ozone is not emitted directly as a pollutant from the candidate sites. Although ozone may be regarded as a regional issue, specific ozone precursors, notably nitrogen dioxide and volatile organic compounds, were analyzed as applicable to the alternatives under consideration.

The Clean Air Act, as amended, requires that Federal actions conform to the host state's "state implementation plan." A state implementation plan provides for the implementation, maintenance, and enforcement of NAAQS for the six criteria pollutants: sulfur dioxide, particulate matter with an aerodynamic diameter less than or equal to 10 microns, carbon monoxide, ozone, nitrogen dioxide, and lead. Its purpose is to eliminate or reduce the severity and number of violations of NAAQS and to expedite the attainment of these standards. No department, agency, or instrumentality of the Federal Government shall engage in or support in any way (i.e., provide financial assistance for, license or permit, or approve) any activity that does not conform to an applicable implementation plan. The final rule for "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (58 FR 63214) took effect on January 31, 1994. LANL, SNL/NM, NTS, and ANL-W are within areas currently designated as attainment for criteria air pollutants, except that SNL/NM is in a maintenance area for carbon monoxide. Therefore, the alternatives being considered at these sites are not affected by the provisions of the conformity rule, except at SNL/NM. If carbon monoxide emissions for the alternative at SNL/NM are below the applicability threshold of 0.91 metric tons (100 tons) per year, a conformity determination is not required (40 CFR 51.853).

Emissions of potential stratospheric ozone-depleting compounds such as chlorofluorocarbons were not evaluated, as no emissions of these pollutants were identified in the conceptual engineering design reports.

F.4 NOISE

F.4.1 Description of Affected Resources and Region of Influence

Sound results from the compression and expansion of air or some other medium when an impulse is transmitted through it. Sound requires a source of energy and a medium for transmitting the sound wave. Propagation of sound is affected by various factors, including meteorology, topography, and barriers. Noise is undesirable sound that interferes or interacts negatively with the human or natural environment. Noise may disrupt normal activities (e.g., hearing, sleep), damage hearing, or diminish the quality of the environment.

Sound-level measurements used to evaluate the effects of nonimpulsive sound on humans are compensated by an A-weighting scale that accounts for the hearing response characteristics (i.e., frequency) of the human ear. Sound levels are expressed in decibels (dB), or in the case of A-weighted measurements, decibels A-weighted (dBA). EPA has developed noise-level guidelines for different land use classifications. Some states and localities have established noise control regulations or zoning ordinances that specify acceptable noise levels by land use category.

Noise from facility operations and associated traffic could affect human and animal populations. The region of influence for each candidate site includes the site, nearby offsite areas, and transportation corridors where proposed activities might increase noise levels. Transportation corridors most likely to experience increased noise levels are those roads within a few miles of the site boundary that carry most of the site's employee and shipping traffic.

Sound-level data representative of site environs were obtained from existing reports. The acoustic environment was further described in terms of existing noise sources for each candidate site.

F.4.2 Description of Impact Assessment

Noise impacts associated with the alternatives may result from construction and operation of facilities and from increased traffic (see **Table F–4**). Impacts from facility construction and operation were assessed according to the types of noise sources and the locations of the candidate facilities relative to the site boundary. Potential noise impacts from traffic were based on the likely increase in traffic volume. Possible impacts to wildlife were evaluated based on the possibility of sudden loud noises occurring during facility construction or modification and operation.

Table F–4 Impact Assessment Protocol for Noise

Resource	Required Data		Measure of Impact
	Affected Environment	*Alternative*	
Noise	Identification of sensitive offsite receptors (e.g., nearby residences); description of sound levels in the vicinity of the site	Description of major construction, modification, and operational noise sources; shipment and workforce traffic estimates	Increase in day/night average sound level at sensitive receptors

F.5 GEOLOGY AND SOILS

F.5.1 Description of Affected Resources and Region of Influence

Geologic resources include consolidated and unconsolidated earth materials, including mineral assets such as ore and aggregate materials, and fossil fuels such as coal, oil, and natural gas. Geologic conditions include hazards such as earthquakes, faults, volcanoes, landslides, sinkholes and other conditions leading to land subsidence, and unstable soils. Soil resources include the loose surface materials of the earth in which plants grow, usually consisting of mineral particles from disintegrating rock, organic matter, and soluble salts. Prime farmland, as defined in 7 CFR Part 657.5, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water).

Geology and soils were considered with respect to those portions of the resource that could be affected by the alternatives, as well as natural conditions that could affect the alternative. Thus, the region of influence for geology and soils includes the project site and nearby offsite areas subject to disturbance by facility construction and operation under the alternatives, including those areas beneath existing or new facilities that would remain inaccessible for the life of the facilities. The region of influence also encompasses those geology and soil conditions that could affect the integrity and safety of the facilities include large-scale geologic hazards (e.g., earthquakes, volcanic activity, landslides, and land subsidence) and local hazards associated with the site-specific attributes of the soil and bedrock beneath site facilities.

F.5.2 Description of Impact Assessment

Facility construction and operations for the relocation alternatives were considered from the perspective of impacts on specific geologic resources and soil attributes. Construction and facility modification activities were the focus of the impacts assessment for geologic and soil resources; hence, key factors in the analysis were the land area to be disturbed during construction and occupied during operations (see **Table F–5**). The main objective was avoidance of the siting of new or modified facilities over unstable soils (i.e., soils prone to subsidence, liquefaction, shrink-swell, or erosion).

Table F–5 Impact Assessment Protocol for Geology and Soils

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Geologic hazards	Presence of geologic hazards within the region of influence	Location of facility on the site	Potential for damage to facility
Valuable mineral and energy resources	Presence of any valuable mineral or energy resources within the region of influence	Location of facility on the site	Potential to destroy or render resources inaccessible
Prime farmland soils	Presence of prime farmland soils within the region of influence	Location of facility on the site	Conversion of prime farmland soils to nonagricultural use

The geology and soils impact analysis (see Table F–5) also considered the risks to the existing and new facilities of large-scale geologic hazards such as faulting and earthquakes, lava extrusions and other volcanic activity, landslides, and sinkholes (i.e., conditions that tend to affect broad expanses of land). This element of the assessment included collection of site-specific information on the potential for impacts on site facilities from local and large-scale geologic conditions. Historical seismicity within a given radius of each facility site was reviewed as a means of assessing the potential for future earthquake activity. As used in this EIS, earthquakes are described in terms of several parameters as presented in **Table F–6**. This included identification of maximum considered earthquake ground motion at each site as reflected in the International Building Code (ICC 2000) and in any site-specific studies. In general, the facility hazard assessment was based on the presence of any identified hazard and the distance of the facilities from it.

Table F–6 The Modified Mercalli Intensity Scale of 1931, with Generalized Correlations to Magnitude, Earthquake Classification, and Peak Ground Acceleration

Modified Mercalli Intensity [a]	*Observed Effects of Earthquake*	*Approximate Magnitude* [b]	*Class*	*Peak Ground Acceleration* [c]*(g)*
I	Usually not felt except by a very few under very favorable conditions.	Less than 3	Less than 2.5 - Micro	Less than 0.0017
II	Felt only by a few persons at rest, especially on the upper floors of buildings.	3 to 3.9	Minor	0.0017 to 0.014
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.			
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy object striking building. Standing motor cars rock noticeably.	4 to 4.9	Light	0.014 to 0.039
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.			0.039 to 0.092
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	5 to 5.9	Moderate	0.092 to 0.18
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	6 to 6.9	Strong	0.18 to 0.34
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	7 to 7.9	Major	0.34 to 0.65
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.			0.65 to 1.24
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.			1.24 and higher
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.	8 and higher	Great	
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.			

[a] Intensity is a unitless expression of observed effects from earthquake-produced ground shaking. Effects may vary greatly between locations based on earthquake magnitude, distance from the earthquake, and local subsurface geology. The descriptions given are abbreviated from the Modified Mercalli Intensity Scale of 1931.

[b] Magnitude is an exponential function of seismic wave amplitude, related to the energy released. There are several "magnitude" scales in common use including local "Richter" magnitude, body-wave magnitude, surface wave magnitude, and moment magnitude. Each has applicability for measuring particular aspects of seismic signals and may be considered equivalent within each scale's respective range of validity.

[c] Acceleration is expressed as a percent relative to the earth's gravitational acceleration (g) (i.e., g = 980 centimeters per second squared). Given values are correlated to Modified Mercalli Intensity based on measurements of California earthquakes only (Wald et al. 1999).

Source: Compiled from Wald et al. 1999, USGS 2000a, USGS 2000b.

An evaluation was also performed to determine if construction or operation of relocated facilities at a specific site could destroy, or preclude the use of, valuable mineral or energy resources.

Pursuant to the Farmland Protection Policy Act (7 U.S.C. 4201 et seq.), and the regulations (7 CFR 658) promulgated as a result thereof, the presence of prime farmland was also evaluated. This act requires agencies to make Farmland Protection Policy Act evaluations part of the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) process, the main purpose being to reduce the conversion of farmland to nonagricultural uses by Federal projects and programs. Potential prime farmlands not acquired prior to June 22, 1982, the effective date of the Farmland Protection Policy Act, are exempt from its provisions as are lands acquired or used by a Federal agency for national defense purposes.

F.6 WATER RESOURCES

F.6.1 Description of Affected Resources and Region of Influence

Water resources are the surface and subsurface waters that are suitable for human consumption, aquatic or wildlife propagation, agricultural purposes, irrigation, or industrial/commercial purposes. The region of influence used for water resources encompasses those site and adjacent surface water and groundwater systems which could be impacted by water withdrawals, effluent discharges, and spills or stormwater runoff associated with facility construction and operational activities under the relocation alternatives.

F.6.2 Description of Impact Assessment

Determination of the impacts of the relocation alternatives on water resources consisted of a comparison of site-generated data and professional estimates regarding water use and effluent discharge with applicable regulatory standards, design parameters and standards commonly used in the water and wastewater engineering fields, and recognized measures of environmental impact.

Certain assumptions were made to facilitate the impacts assessment: (1) that all water supply (production and treatment) and effluent treatment facilities would be approved by the appropriate permitting authority; (2) that the effluent treatment facilities would meet the effluent limitations imposed by the respective National Pollutant Discharge Elimination System permits; and (3) that any stormwater runoff from construction and operation activities would be handled in accordance with the regulations of the appropriate permitting authority. It was also assumed that, during construction, sediment fencing or other erosion control devices would be used to mitigate short-term adverse impacts from sedimentation, and that, as appropriate, stormwater holding ponds would be constructed to lessen the impacts of runoff on surface water quality.

F.6.2.1 Water Use and Availability

This analysis involved the review of engineering estimates of expected surface water and/or groundwater use and effluent discharge associated with facility construction and operation activities for each alternative, and the impacts on local and regional water availability in terms of quantity and quality. Impacts on water use and availability were generally assessed by determining changes in the volume of current water usage and effluent discharge as a result of the proposed activities. For facilities intending to use surface water, effluent discharges back to surface waters were included in the evaluation to determine net usage. The impact of discharging withdrawn groundwater to surface waters or back to the subsurface was also considered, as appropriate. The determination of impacts on water use and availability are summarized in **Table F–7**.

Table F–7 Impact Assessment Protocol for Water Use and Availability

Resource	Required Data		Measure of Impact
	Affected Environment	Facility Design	
Surface water availability	Surface waters near the facilities, including average flow and current usage	Volume of withdrawals from, and discharges to, surface waters	Changes in availability to local/ downstream users of water for human consumption, irrigation, or animal feeding
Groundwater availability	Groundwater near the facilities, including existing water rights for major water users and current usage	Volume of withdrawals from, and discharges to, groundwater	Changes in availability of groundwater for human consumption, irrigation, or animal feeding

If the determination of impacts reflected an increase in water use or effluent discharge, then an evaluation of the design capacity of the water supply production and treatment facilities and the effluent treatment facilities, respectively, was made to determine whether the design capacities would be exceeded by the additional flows. If the combined flow (i.e., the existing flow plus those from the proposed activities), was less than the design capacity of the water supply systems and effluent treatment plants, then it was assumed that there would be no impact on water availability for local users, or on receiving surface waters or groundwater from effluent discharges. Further, a separate analysis (see Section F.6.2.2) was performed as necessary to determine the potential for effluent discharge impacts on ambient surface water or groundwater quality based on the results of the effluent treatment capacity analysis.

Because water withdrawals and effluent discharges from the site facilities were generally found not to exceed the design capacity of existing water supply systems or effluent treatment facilities, additional analyses were not performed.

F.6.2.2 Water Quality

The water quality impact assessment analyzed how effluent discharges to surface water, as well as discharges reaching groundwater, from the facilities under each alternative would directly affect current water quality. The determination of the impacts of the alternatives is summarized in **Table F–8** and consisted of a comparison of the projected effluent quality with relevant regulatory standards and implementing regulations under the Clean Water Act (33 U.S.C. 1251 et seq.), Safe Drinking Water Act (42 U.S.C. 300 (f) et seq.), state laws, and existing site permit conditions. Separate analyses were conducted for surface water and groundwater impacts.

Table F–8 Impact Assessment Protocol for Water Quality

Resource	Required Data		Measure of Impact
	Affected Environment	Facility Design	
Surface water quality	Surface waters near the facilities in terms of stream classifications and changes in water quality	Expected contaminants and contaminant concentrations in discharges to surface waters	Exceedance of relevant surface water quality criteria or standards established in accordance with the Clean Water Act or state regulations and existing permits
Groundwater quality	Groundwater near the facilities in terms of classification, presence of designated sole source aquifers, and changes in quality of groundwater	Expected contaminants and contaminant concentrations in discharges that could reach groundwater	Contaminant concentrations in groundwater exceeding relevant standards or criteria established in accordance with the Safe Drinking Water Act or state regulations and existing permits

Surface Water Quality—The evaluation of surface water quality impacts focused on the quality and quantity of any effluents (including stormwater) to be discharged and the quality of the receiving stream upstream and downstream from the discharges. The evaluation of effluent quality featured review of the expected parameters, such as the design average and maximum flows, as well as the effluent parameters reflected in the existing or expected National Pollutant Discharge Elimination System or applicable state discharge permit. Those parameters include total suspended solids, metals, organic and inorganic chemicals, and any other constituents that could affect the local environment. Any proposed water quality management practices were reviewed to ensure that any applicable permit limitations and conditions would be met. Factors that currently degrade water quality were also identified.

During facility construction, ground disturbing activities could impact surface waters through increased runoff and sedimentation. Such impacts relate to the amount of land disturbed, the type of soil at the site, the topography, and weather conditions. They would be minimized by application of standard management practices for stormwater and erosion control (e.g., sediment fences, mulching disturbed areas).

During operations, surface waters could be affected by increased runoff from parking lots, buildings, or other cleared areas. Stormwater from these areas could be contaminated with materials deposited by airborne pollutants, automobile exhaust and residues, materials handling, and process effluents. Impacts of stormwater discharges could be highly specific, and mitigation would depend on management practices, the design of holding facilities, the topography, and adjacent land use. Data from existing water quality databases were compared with expected flows from the facilities to determine the relative impacts on surface waters.

Groundwater Quality—Potential groundwater quality impacts associated with any effluent discharges during facility construction and operation activities were examined. Engineering estimates of contaminant concentrations were weighed against applicable Federal and state groundwater quality standards, effluent limitations, and drinking water standards to determine the impacts of each alternative. Also evaluated were the consequences of groundwater use and effluent discharge on other site groundwater conditions.

F.6.2.3 Waterways and Floodplains

The locations of waterways (e.g., ponds, lakes, streams) and the 100- and 500-year floodplains were identified from maps and other existing documents to assess the potential for impacts from facility construction and operation activities, including direct effects on hydrologic characteristics or secondary effects such as sedimentation (see Surface Water Quality in Section F.6.2.2.). All activities would be conducted to avoid delineated floodplains and to ensure compliance with Executive Order 11988, *Floodplain Management*. However, for any facilities proposed for location in a floodplain, a floodplain assessment would be prepared.

F.7 ECOLOGICAL RESOURCES

F.7.1 Description of Affected Resources and Region of Influence

Ecological resources include terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. The region of influence for the ecological resource analysis encompassed the site and adjacent areas potentially disturbed by construction and operation of the candidate facilities.

Terrestrial resources are defined as those plant and animal species and communities that are most closely associated with the land; for aquatic resources, a water environment. Wetlands are defined by the U.S. Army Corps of Engineers and EPA as "… those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR Section 328.3).

Endangered species are defined under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) as those in danger of extinction throughout all or a large portion of their range. Threatened species are defined as those species likely to become endangered within the foreseeable future. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service propose species to be added to the lists of threatened and endangered species. They also maintain a list of "candidate" species for which they have evidence that listing may be warranted, but for which listing is currently precluded by the need to list species more in need of Endangered Species Act protection. Candidate species do not receive legal protection under the Endangered Species Act, but should be considered in project planning in case they are listed in the future. Critical habitat for threatened and endangered species is designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Critical habitat is defined as specific areas that contain physical and biological features essential to the conservation of species and that may require special management consideration or protection. States may also designate species as endangered, threatened, sensitive protected, in need of management, of concern, monitored, or species of special concern.

F.7.2 Description of Impact Assessment

Impacts to ecological resources may occur as a result of land disturbance, water use, air and water emissions, human activity, and noise associated with project implementation (see **Table F–9**). Each of these factors was considered when evaluating potential impacts from the proposed action. For those alternatives involving construction of new facilities, direct impacts to ecological resources was based on the acreage of land disturbed by construction. Indirect impacts from factors such as human disturbance and noise were evaluated qualitatively. Indirect impacts to ecological resources, including wetlands, from construction due to erosion were evaluated qualitatively, recognizing that standard erosion and sediment control practices would be followed. Impacts to terrestrial and aquatic ecosystems and wetlands from water use and air and water emissions were evaluated based on the results of the analyses conducted for air quality and water resources. The determination of impacts to threatened and endangered species was based on similar factors as noted above for terrestrial resources, wetlands, and aquatic resources.

Table F–9 Impact Assessment Protocol for Ecological Resources

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Terrestrial resources	Vegetation and wildlife within vicinity of facilities	Facility location and acreage requirement, air and water emissions, and noise	Loss or disturbance to terrestrial habitat; emissions and noise values above levels shown to cause impacts to terrestrial resources
Wetlands	Wetlands within vicinity of facilities	Facility location and acreage requirement, air and water emissions, and wastewater discharge quantity and location	Loss or disturbance to wetlands; discharge to wetlands
Aquatic resources	Aquatic resources within vicinity of facilities	Facility air and water emissions, water source and quantity, and wastewater discharge location and quantity	Discharges above levels shown to cause impacts to aquatic resources; changes in water withdrawals and discharges
Threatened and endangered species	Threatened and endangered species and critical habitats within vicinity of facilities	Facility location and acreage requirement, air and water emissions, noise, water source and quantity, and wastewater discharge location and quantity	Measures similar to those noted above for terrestrial and aquatic resources

F.8 Cultural and Paleontological Resources

F.8.1 Description of Affected Resources and Region of Influence

Cultural resources are the indications of human occupation and use of the landscape as defined and protected by a series of Federal laws, regulations, and guidelines. For this *TA-18 Relocation EIS*, potential impacts were assessed separately for each of the three general categories of cultural resources: prehistoric, historic, and Native American. Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geological age, and may be sources of information on ancient environments and the evolutionary development of plants and animals. Although not governed by the same historic preservation laws as cultural resources, they could be affected by the proposed action in much the same manner.

Prehistoric resources are physical remains of human activities that predate written records; they generally consist of artifacts that may alone or collectively yield otherwise inaccessible information about the past. Historic resources consist of physical remains that postdate the emergence of written records; in the United States, they are architectural structures or districts, archaeological objects, and archaeological features dating from 1492 and later. Ordinarily, sites less than 50 years old are not considered historic, but exceptions can be made for such properties if they are of particular importance, such as structures associated with Cold War themes. Native American resources are sites, areas, and materials important to Native Americans for religious or heritage reasons. Such resources may include geographical features, plants, animals, cemeteries, battlefields, trails, and environmental features. The region of influence for the cultural and paleontological resource analysis encompassed the site and areas adjacent to the site that are potentially disturbed by construction and operation of the candidate facilities.

F.8.2 Description of Impact Assessment

The analysis of impacts to cultural and paleontological resources addressed potential direct and indirect impacts at each candidate site from construction and operation (see **Table F–10**). Direct impacts include those resulting from groundbreaking activities associated with new construction and possibly building modifications. Indirect impacts include those associated with reduced access to a resource site, as well as impacts associated with increased stormwater runoff, increased traffic, and visitation to sensitive areas.

Table F–10 Impact Assessment Protocol for Cultural and Paleontological Resources

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Prehistoric resources	Prehistoric resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation, or alteration of the character of prehistoric resources; introduction of visual, audible, or atmospheric elements out of character
Historic resources	Historic resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation, or alteration of the character of historic resources; introduction of visual, audible, or atmospheric elements out of character
Native American resources	Native American resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation, or alteration of the character of Native American resources; introduction of visual, audible or atmospheric elements out of character
Paleontological resources	Paleontological resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation or alteration of paleontological resources

F.9 SOCIOECONOMICS

F.9.1 Description of Affected Resources and Region of Influence

Socioeconomic impacts are defined in terms of changes to the demographic and economic characteristics of a region. The number of jobs created by the proposed action could affect regional employment, income, and expenditures. Job creation is characterized by two types: (1) construction-related jobs, which are transient in nature and short in duration, and thus less likely to impact public services; and (2) operation-related jobs, which would last for the duration of the proposed project, and thus could create additional service requirements in the region of influence.

The region of influence for the socioeconomic environment represents a geographic area where site employees and their families reside, spend their income, and use their benefits, thereby affecting the economic conditions of the region. Site-specific regions of influence were identified as those counties in which approximately 90 percent or more of the site's workforce reside. This distribution reflects an existing residential preference for people currently employed at the sites and was used to estimate the distribution of workers associated with facility construction and operation under the relocation alternatives.

F.9.2 Description of Impact Assessment

For each site, data were compiled on the current socioeconomic conditions, including unemployment rates, economic area industrial and service sector activities, and the civilian labor force. The workforce requirements of each alternative were determined in order to measure their possible effect on these socioeconomic conditions. Although workforce requirements may be able to be filled by employees already working at DOE sites, it was assumed that new employees would be hired to ensure that the maximum impact was assessed. For each site, census statistics were also compiled on population, housing demand, and community services. U.S. Census Bureau population forecasts for the regions of influence were combined with overall projected workforce requirements for each of the alternatives being considered at each candidate site to determine the extent of impacts on housing demand and levels of community services (see **Table F–11**).

F.10 WASTE MANAGEMENT

F.10.1 Description of Affected Resources and Region of Influence

Depending on the alternative, construction and operation of the candidate facilities would generate several types of waste. Such wastes may include the following:

- Low-level radioactive: Waste that contains radioactivity and is not classified as high-level radioactive waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level radioactive waste, provided the transuranic concentration is less than 100 nanocuries per gram of waste.

- Mixed low-level radioactive: Low-level radioactive waste that also contains hazardous components regulated under the Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.).

Table F–11 Impact Assessment Protocol for Socioeconomics

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Regional Economic Characteristics			
Workforce requirements	Site workforce projections from DOE sites	Estimated construction and operating staff requirements and time frames	Workforce requirements added to sites' workforce projections
Region of influence civilian labor force	Labor force estimates	Estimated construction and operating staff requirements and time frames	Workforce requirements as a percentage of the civilian labor force
Employment	Latest available employment in counties surrounding sites	Estimated construction and operating staff requirements	Potential change in employment
Demographic Characteristics			
Population and demographics of race, ethnicity, and income	Latest available estimates by county from the U.S. Census Bureau	Estimated effect on population	Potential effects on population
Housing and Community Services			
Housing – percent of occupied housing units	Latest available ratios from the U.S. Census Bureau	Estimated housing unit requirements	Potential change in housing unit availability
Education - Total enrollment - Teacher-to-student ratio	Latest available information from the U.S. Department of Education	Estimated effect on enrollment and teacher-student ratio	Potential change in student enrollment Potential change in teacher-student ratio
Health care – number of hospital beds and physicians per 1,000 residents	Latest available rates from the U.S. Census Bureau	Estimated effect on ratio	Potential change in the availability of hospital beds/physicians-population ratio

- Hazardous: Under the Resource Conservation and Recovery Act, a waste that, because of its characteristics, may (1) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous wastes appear on special EPA lists or possess at least one of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. This category does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act (42 U.S.C. 2011 et. seq).

- Nonhazardous: Discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. This category does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act (42 U.S.C. 2011 et seq.).

The alternatives could have an impact on existing site facilities devoted to the treatment, storage, and disposal of these categories of waste. Waste management activities in support of the proposed action would be contingent on Records of Decision issued for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (Waste Management PEIS)* (DOE 1997). In the Record of Decision for hazardous waste, released on August 5, 1998 (63 FR 41810), DOE sites evaluated in this *TA-18 Relocation EIS* will continue to use offsite facilities for the treatment and disposal of major portions of their nonwastewater hazardous waste, (with the

Oak Ridge Reservation continuing to treat some of its nonwastewater hazardous waste in existing facilities where economically feasible). Based on the Record of Decision for low-level radioactive waste and mixed low-level radioactive waste issued on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed at all sites, and to the extent practical, onsite disposal of low-level radioactive waste will continue. Hanford and NTS will be made available to all DOE sites for the disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, the Idaho National Engineering and Environmental Laboratory, the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at Hanford and NTS.

F.10.2 Description of Impact Assessment

Waste management impacts were assessed by comparing the projected waste stream volumes generated from the proposed activities at each candidate site with that site's waste management capacities and generation rates (see **Table F–12**). Only the impacts relative to the capacities of waste management facilities were considered; other environmental impacts of waste management facility operations (e.g., human health effects) are evaluated in other sections of this *TA-18 Relocation EIS*, or in other facility-specific or sitewide NEPA documents. Projected waste generation rates for the proposed activities were compared with site processing rates and capacities of those treatment, storage, and disposal facilities likely to be involved in managing the additional waste. The waste generation rates were provided by the sites' technical personnel. Potential impacts from waste generated as a result of site environmental restoration activities are not within the scope of this analysis.

Table F–12 Impact Assessment Protocol for Waste Management

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Waste management capacity - Low-level radioactive waste - Mixed low-level radioactive waste - Hazardous waste - Nonhazardous waste	Site generation rates (cubic meters per year) for each waste type Site management capacities (cubic meters) or rates (cubic meters per year) for potentially affected treatment, storage, and disposal facilities for each waste type	Generation rates (cubic meters per year) from facility operations for each waste type	Combination of facility waste generation volumes and other site generation volumes in comparison to the capacities of applicable waste management facilities

F.11 CUMULATIVE IMPACTS

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR Section 1508.7). The cumulative impact analysis for this *TA-18 Relocation EIS* involved combining the impacts of the alternatives (including the No Action Alternative) with the impacts of other present and reasonably foreseeable activities in the regions of influence. The key resources are identified in **Table F–13**.

In general, cumulative impacts were determined by collectively considering the baseline affected environment (i.e., conditions attributable to present actions by DOE and other public and private entities), the proposed action (or no action), and other future actions. Quantifiable information was incorporated to the degree available. Factors were weighed against the appropriate impact indicators (e.g., site capacity or number of fatalities) to determine the potential for impact. For this cumulative impact assessment, it was conservatively assumed that all facilities would operate concurrently at the candidate DOE sites. The selected indicators of cumulative impacts evaluated in this *TA-18 Relocation EIS* are shown in **Table F–14**.

Table F–13 Key Resources and Associated Regions of Influence

Resources	***Region of Influence***
Resource use	The site
Air quality	The site, nearby offsite areas within local air quality control regions, where significant air quality impacts may occur, and Class I areas within 100 kilometers
Human health	The site, offsite areas within 80 kilometers of the site, and the transportation corridors between the sites where worker and general population radiation, radionuclide, and hazardous chemical exposures may occur
Waste management	The site
Transportation	Onsite and offsite highways used for material transport

Table F–14 Selected Indicators of Cumulative Impact

Category	***Indicator***
Resource use	- Workers required compared with existing workforce - Electricity use compared with site capacity - Water use compared with site capacity
Air quality	Criteria pollutant concentrations and comparisons with standards or guidelines
Human health	Public - Maximally exposed offsite individual dose - Offsite population dose - Fatalities Workers - Total dose - Fatalities
Waste	- Low-level radioactive waste generation rate compared with existing management capacities and generation rate - Mixed low-level radioactive waste generation rate compared with existing management capacities and generation rate - Hazardous waste generation rate compared with existing management capacities and generation rate - Nonhazardous waste generation rate compared with existing management capacities and generation rate
Transportation	Radiation exposures - Public - Transportation workers - Fatalities Traffic fatalities

The analysis focused on the potential for cumulative impacts at each candidate site from DOE actions under detailed consideration at the time of this *TA-18 Relocation EIS*, as well as cumulative impacts associated with transportation. The following sitewide NEPA documents were used to establish baseline conditions upon which incremental cumulative impacts were assessed:

- *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory* (DOE 1999a);
- *Sandia National Laboratories/New Mexico Final Site-Wide Environmental Impact Statement* (DOE 1999b);
- *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE 1996);
- *Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement* (DOE 1999c).

The related programs included in the cumulative impact assessment for the potentially affected candidate sites are identified in **Table F–15**.

It is assumed that construction impacts would not be cumulative because construction is typically short in duration, and construction impacts are generally temporary. Decontamination and decommissioning of the candidate facilities was not addressed in the cumulative impact estimates. Given the uncertainty regarding the timing of decontamination and decommissioning, any impact estimate at this time would be highly speculative. A detailed evaluation of decontamination and decommissioning would be provided in follow-on NEPA documentation closer to the actual time of those actions.

Table F–15 Other Present and Reasonably Foreseeable Actions Considered in the Cumulative Impact Assessment

Activities	*LANL*	*SNL/NM*	*NTS*	*INEEL/ ANL-W*
Waste Management PEIS				X
Spent Nuclear Fuel Management and INEL Environmental Restoration and Waste Management				X
Foreign Research Reactor Spent Nuclear Fuel Management				X
Nuclear Infrastructure PEIS				X
Advanced Mixed Waste Treatment Project				X
Treatment and Management of Sodium-Bonded Spent Nuclear Fuel				X
Atlas Relocation and Operation	X		X	
Sandia Underground Reactor Facility		X		
Microsystems and Engineering Sciences Applications Complex		X		
Idaho High-Level Waste and Facilities Disposition				X

F.12 REFERENCES

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DOE (U.S. Department of Energy), 1997, *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-F, Office of Environmental Management, Washington, DC, May.

DOE (U.S. Department of Energy), 1999a, *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, DOE/EIS-0238, Albuquerque Operations Office, Albuquerque, New Mexico, January.

DOE (U.S. Department of Energy), 1999b, *Sandia National Laboratories/New Mexico Final Site-Wide Environmental Impact Statement*, DOE/EIS-0281, Albuquerque Operations Office, Albuquerque, New Mexico, October.

DOE (U.S. Department of Energy), 1999c, *Idaho High-Level Waste and Facilities Disposition Draft Environmental Impact Statement*, DOE/EIS-0287D, Idaho Operations Office, Idaho Falls, Idaho, December.

DOE (U.S. Department of Energy), 2000a, *Final Environmental Impact Statement for the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel*, DOE/EIS-0306, Office of Nuclear Energy, Science and Technology, Washington, DC, July.

DOE (U.S. Department of Energy), 2000b, *Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility*, DOE/EIS-0310, Office of Nuclear Energy, Science and Technology, Washington, DC, December.

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USGS (U.S. Geological Survey), 2000b, *General Earthquake Information*, National Earthquake Information Center, Geologic Hazards, March 21 (*available at http://neic.usgs.gov/neis/general/handouts/*).

Wald, D. J., Quitoriano, V., Heaton, T. H., and H. Kanamori, 1999, "Relationships Between Peak Ground Acceleration, Peak Ground Velocity and Modified Mercalli Intensity in California," *Earthquake Spectra*, Vol. 15 (3), pp. 557-564 (*available at http://www-socal.wr.usgs.gov/shake/pubs/regress/regress.html*).

Appendix G

Ecological Resources

APPENDIX G
ECOLOGICAL RESOURCES

Table G–1 contains a listing of the scientific names of animal and plant species found in the text. Species are listed in alphabetical order by common name within each taxonomic group.

Table G–1 Scientific Names of Plant and Animal Species

Common Name	*Scientific Name*
Mammals	
Big free-tailed bat	*Nyctinomops macrotis*
Black bear	*Ursus americanus*
Black-tailed jackrabbit	*Lepus californicus*
Bobcat	*Lynx rufus*
Cliff chipmunk	*Eutamias dorsalis*
Cottontail rabbit	*Sylvilagus audubonii*
Coyote	*Canis latrans*
Deer mouse	*Peromyscus maniculatus*
Elk	*Cervus elaphus*
Fringed myotis	*Myotis thysanodes*
Goat Peak pika	*Ochotona princeps nigrescens*
Gray wolf	*Canis lupus*
Great Basin pocket mouse	*Perognathus parvus*
Gunnison's prairie dog	*Cynomys gunnisoni*
Kit fox	*Vulpes velox*
Long-eared myotis	*Myotis evotis*
Long-legged myotis	*Myotis volans*
Long-tailed pocket mouse	*Chaetodipus formosus*
Long-tailed vole	*Iklicrotus longicaudus*
Long-tailed weasel	*Mustela frenata*
Merriam's kangaroo rat	*Dipodomys merriami*
Merriam's shrew	*Sorex merriami*
Mountain lion	*Felis concolor*
Mule deer	*Odocoileus hemionus*
New Mexico jumping mouse	*Zapus hudsonius luteus*
Occult little brown bat	*Myotis lucifugus occultus*
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*
Pronghorn	*Antilocapra americana*
Pygmy rabbit	*Brachylagus idohoensis*
Raccoon	*Procyon lotor*
Rock squirrel	*Sciurus variegates*
Small-footed myotis	*Myotis ciliolabrum*
Spotted bat	*Euderma maculatum*
Townsend's big-eared bat	*Plecotus townsendii*
Townsend's ground squirrel	*Spermophilus townsendii*
Vagrant shrew	*Sorex vagrans*

Common Name	***Scientific Name***
Western spotted skunk	*Spilogale gracilis*
Wild horse	*Equus caballus*
Wood rat	*Neotoma albigula*
Yuma myotis	*Myotis yumanensis*
Birds	
American kestrel	*Falco sparverius*
American peregrine falcon	*Falco peregrinus aratum*
Ash-throated flycatcher	*Myiarchus cinerascens*
Audubon's warbler	*Dendroica coronata*
Baird's sparrow	*Ammodramus bairdii*
Bald eagle	*Haliaeetus leucocephalus*
Bell's vireo	*Vireo billii arizonae*
Black-headed grosbeak	*Pheucticus melanocephalus*
Black swift	*Cyseloides niger borialis*
Black tern	*Chilidonias niger*
Black-throated sparrow	*Amphispiza bilineata*
Boreal owl	*Aegolius funereus*
Brewer's sparrow	*Spizella breweri*
Cassin's kingbird	*Tyrannus vociferans*
Cliff swallow	*Hirundo pyrrhonota*
Cooper's hawk	*Accipiter cooperii*
European starling	*Sturnus vulgaris*
Ferruginous hawk	*Buteo regalis*
Flammulated owl	*Otus flammeolus*
Golden eagle	*Aquila chrysaetos*
Gray flycatcher	*Empidonax wrightii*
Gray vireo	*Vireo vicinior*
Great-horned owl	*Bubo virginianus*
House finch	*Carpodacus mexicanus*
House sparrow	*Passer domesticus*
Least bittern	*Ixobrychus exilis hesperis*
Loggerhead shrike	*Lanius ludovicianus*
Long-billed curlew	*Numenius americanus*
Lucy's warbler	*Vermivora lucine*
Mexican spotted owl	*Strix occidentalis lucida*
Mountain plover	*Charadrius montanos*
Mourning dove	*Zenaidura macroura*
Northern flicker	*Colaptes auratus*
Northern goshawk	*Accipiter gentilis*
Phainopepla	*Phainopepla nitens*
Prairie falcon	*Falco mexicanus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rough-legged hawk	*Buteo lagopus*
Sage grouse	*Centrocercus urophasianus*
Sage sparrow	*Amphispiza belli*
Scrub jay	*Aphelocoma coerulescens*
Solitary vireo	*Vireo solitarius*

Common Name	***Scientific Name***
Southwestern willow flycatcher	*Empidonax traillii eximus*
Swainson's hawk	*Buteo swainsonii*
Turkey vulture	*Cathartes aura*
Violet-green swallow	*Tachycineta thalassiana*
Western bluebird	*Sialia mexicana*
Western burrowing owl	*Athene cunicularia hypugea*
White-breasted nuthatch	*Sitta carolinensis*
White-faced ibis	*Plegadis chihi*
Whooping crane	*Grus americana*
Reptiles	
Bandelier Gila monster	*Heloderma suspectum cinctum*
Chuckwalla	*Sauromalus obesus*
Collared lizard	*Crotaphytus collaris*
Desert massasuaga	*Sistrurus catenatus edwardsii*
Desert tortoise	*Gopherus agassizii*
Eastern fence lizard	*Sceloporus undulatus*
Gopher snake	*Pituophis melanoleucus*
Many-lined skink	*Eumeces multivigratus*
Northern sagebrush lizard	*Sceloporus graciosus*
Prairie lizard	*Sceloporus undulates*
Side-blotched lizard	*Uta stansburiana*
Sidewinder snake	*Crotalus cerastes*
Short-horned lizard	*Phrynosoma douglassi*
Striped whipsnake	*Masticophis taeniatus*
Texas horned lizard	*Phrynosoma cornutum*
Texas longnose snake	*Rhinocheilus lecontei*
Western fence lizard	*Sceloporus occidentalis*
Western shovelnose snake	*Chionactis occipitalis*
Whiptail lizard	*Cnemidophorus velox*
Zebra-tailed lizard	*Callisaurus draconoides*
Amphibians	
Canyon tree frog	*Hyla arenicolor*
Jemez Mountain salamander	*Plethodon neomexicanus*
Red-spotted toad	*Bufo puntatus*
Western chorus frog	*Pseudacris triseriata*
Fish	
Bluegill	Lepomis macrochirus
Brook trout	*Salvelinus fontinalis*
Flathead chub	*Platygobio gracilis*
Golden shiner	*Notemigonus crysoleucas*
Goldfish	*Carassius auratus*
Kokanee salmon	*Oncorhynchus nerka*
Mountain whitefish	*Prosopium williamsoni*
Rainbow trout	*Salmo gaidneri*
Shorthead sculpin	*Cottus confusus*
Speckled dace	*Rhinichthys osculus*

Common Name	***Scientific Name***
Plants	
Beatley milk vetch	*Astragalus beatleyae*
Beatley phacelia	*Phacelia beatleyae*
Big sagebrush	*Artemisia tridentata*
Black grama	*Bouteloua eriopoda*
Black woolypod	*Astragalus funereus*
Blackbrush	*Coleogyne ramosissima*
Bluebunch wheatgrass	*Agropyron spicatum*
Bottlebrush squirreltail	*Sitanion hystrix*
Broad-leafed cattail	*Typha latifolia*
Burro bush	*Ambrosia dumosa*
Cane Spring evening primrose	*Camissonia megalanatha*
Cattail	*Typha latifolia*
Checkered lily	*Fritillaria atropurpurca*
Clokey's egg-vetch	*Astragalus oopherus var. clokeyanus*
Cottonwood	*Populus spp.*
Creosote bush	*Larrea tridentata*
Crested wheatgrass	*Agropyron desertorum*
Death Valley beardtongue	*Penstemon fruticiformis var. amargosae*
Delicate rock daisy	*Perityle megaloceplala var. intricata*
Desert thorn	*Lycium spp.*
Eastwood milkweed	*Aschepias eastwoodiana*
Fir	*Abies spp.*
Galleta	*Hilaria jamesii*
Giant wildrye	*Elymus condensatus*
Grama grass cactus	*Pediocactus papyracanthus*
Gray horsebrush	*Tetradymia canescens*
Green rabbitbrush	*Chrysothamnus greenei*
Helleborine orchid	*Epipactis gigantea*
Indian ricegrass	*Oryzopsis hymenoides*
Joshua tree	*Yucca brevifloria*
Juniper	*Juniperus spp.*
Kingston bedstraw	*Galium hilendiae ssp. Kingstonense*
Lemhi milkvetch	*Astragalus aquilonius*
Little bluestem	*Andropogon scoparius*
Low sagebrush	*Artemisia arbuscula*
Needle-and-thread grass	*Stipa comata*
Nevada jointfir	*Ephedra nevadensis*
One-seeded juniper	*Juniperus monosperma*
Pahute Mesa beardtongue	*Penstemon pahutensis*
Pahute Mesa green gentian	*Frasera pahutensis*
Painted milkvetch	*Astragalus ceramicus var. apus*
Parish's phacelia	*Phacelia parishii*
Pinyon pine	*Pinus edulis*
Ponderosa pine	*Pinus ponderosa*
Poverty-weed	*Monolepis mittaliana*
Prickly pear cactus	*Opuntia spp.*
Rabbitbrush	*Chrysothamnus spp.*

Common Name	Scientific Name
Ring muhly	*Muhlenbergia torreyi*
Rush	*Juncus spp.*
Sagebrush	*Artemisia spp.*
Saltbush	*Atriplex spp.*
Salt-cedar	*Tamarix pentandra*
Sand dropseed	*Sporobolus cryptandrus*
Sanicle biscuitroot	*Cymopterus ripleyi var. saniculoides*
Sante Fe milkvetch	*Astragalus feenis*
Shadscale saltbush	*Atriplex confertifolia*
Speal-tooth dodder	*Cuscuta denticulata*
Spreading gilia	*Ipomopsis polycladon*
Spruce	*Picea spp.*
Strong prickly pear	*Opuntia valida*
Thickspike wheatgrass	*Agropyron dasytachyum*
Three-square	*Scirpus americanus*
Threetip sagebrush	*Artemisia tripartita*
Torrey rush	*Juncus torreya*
Utah juniper	*Juniperus osteosperma*
Ute's ladies tresses	*Spiranthes diluvialis*
Western wheatgrass	*Agropyron smithii*
White bearpoppy	*Arctomecon merriami*
White bursage	*Ambrosia dumosa*
White-margined beardtongue	*Penstemon albomarginatus*
Willow	*Salix spp.*
Winged-seed evening primrose	*Camissonia pterosperma*
Winterfat	*Eurotia lanata*
Wire rush	*Juncus balticus*
Wolfberry	*Lycium spp.*
Wood lily	*Lilium philadelphicum var. andinum*
Yellow lady's slipper orchid	*Cyprepedium calceolus var. pubescens*

APPENDIX H

Federal Register Notices

DEPARTMENT OF ENERGY

National Nuclear Security Administration

Notice of Intent To Prepare an Environmental Impact Statement for The Proposed Relocation of the Los Alamos National Laboratory Technical Area 18 Missions

AGENCY: Department of Energy, National Nuclear Security Administration.

ACTION: Notice of Intent.

SUMMARY: On April 11, 2000, Energy Secretary Bill Richardson announced the Department of Energy's (DOE) proposal to relocate missions at Technical Area 18 (TA–18), a group of facilities at the Los Alamos National Laboratory (LANL), by the end of 2004. Secretary Richardson also announced that an environmental impact study on the proposed transfer of TA–18's missions to another location will begin immediately. Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 USC 4321 et seq., and the DOE Regulations Implementing NEPA (10 CFR Part 1021), the National Nuclear Security Administration (NNSA), an agency within the Department of Energy, is announcing its intent to prepare an Environmental Impact Statement (EIS) for the Proposed Relocation of the TA–18 Missions.

TA–18 supports important defense, nuclear safety, and other national security missions. Though TA–18 is judged to be secure by the Department's independent inspection office, its facilities are between 30 and 50 years old and are increasingly expensive to maintain and operate. Relocating the TA–18 missions will enable the Department to conduct these missions in a more efficient and cost-effective manner. Currently, DOE expects that the TA–18 Relocation EIS will evaluate the environmental impacts associated with relocating the TA–18 missions to the following alternative locations: (1) A different site at LANL (the preferred alternative) at Los Alamos, New Mexico; (2) the Nevada Test Site (NTS) near Las Vegas, Nevada; (3) the Sandia National Laboratory (SNL) at Albuquerque, New Mexico; and (4) the Argonne National Laboratory—West (ANL–W) near Idaho Falls, Idaho. It is possible that this list of reasonable alternatives may change during the scoping process. The EIS will also evaluate the no-action alternative of maintaining the missions at the current TA–18 location.

DATES: Comments on the proposed scope of the TA–18 Relocation EIS are invited from the public. To ensure consideration in the preparation of the EIS, comments must be postmarked by June 1, 2000. Late comments will be considered to the extent practicable. Public scoping meetings to discuss issues and receive oral comments on the scope of the EIS will be held in the vicinity of sites that may be affected by the proposed action. The public scoping meetings will provide the public with an opportunity to present comments, ask questions, and discuss concerns with DOE/NNSA officials regarding the EIS. The location, date, and time for these public scoping meetings is as follows:

Los Alamos National Laboratory —May 17, 7 p.m.–10 p.m., Betty Ehart Senior Center, 2132 Central Avenue, Los Alamos, NM 87544.

Sandia National Laboratory —May 18, 7 p.m.–10:00 p.m., Albuquerque Convention Center, 401 Second Street, N.W., Albuquerque, NM 87102.

Nevada Test Site —May 23, 7 p.m.–10 p.m., U.S. DOE Nevada Operations Office Auditorium, 232 Energy Way, North Las Vegas, NV 89030.

Argonne National Laboratory —West—May 25, 7 p.m.–10 p.m., The Shilo Inn, 780 Lindsay Blvd., Idaho Falls, ID 83402.

Any agency that desires to be designated as a cooperating agency should contact Mr. Jay Rose at the address listed below by May 31, 2000.

ADDRESSES: General questions concerning the TA–18 Project can be asked by calling 1–800–832–0885, ext. 65484, or by writing to: Mr. Jay Rose, Document Manager, TA–18 Relocation EIS, U.S. Department of Energy/NNSA, 1000 Independence Avenue, S.W., Washington, D.C. 20585.

Comments can be submitted to Mr. Rose at the address above; or faxed to: 1–202–586–0467; or e-mailed to *James.Rose@ns.doe.gov*. Please mark envelopes, faxes, and E-mail: ''TA–18 Relocation EIS Comments.''

FOR FURTHER INFORMATION CONTACT: For general information on the NNSA NEPA process, please contact: Mr. Henry Garson, NEPA Compliance Officer for Defense Programs, U.S. Department of Energy/NNSA, 1000 Independence Avenue, SW., Washington, DC 20585; or telephone 1–800–832–0885, ext. 30470. For general information on the DOE NEPA process, please contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Assistance (EH–42), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, telephone 202–586–4600, or leave a message at 1–800–472–2756.

SUPPLEMENTARY INFORMATION: On April 11, 2000, Secretary of Energy Bill Richardson announced that the Department would begin preparation of an EIS on the proposed transfer of TA–18's capabilities and up to approximately 2 tons of special nuclear materials to another location. TA–18, known as the Pajarito Site, consists of a main building, three outlying remote-controlled critical assembly buildings known as ''kivas'', several smaller laboratories, nuclear material storage vaults, and support buildings. The site is located on approximately 130 acres along Pajarito Road. The Los Alamos Critical Experiments Facility (LACEF) and other experimental facilities are located at TA–18, which is situated in the base of a canyon whose walls rise approximately 200 feet on three sides. The three kivas are Category 2 nuclear facilities (i.e., hazard analysis shows the potential for significant on-site consequences) and are within fenced areas to keep personnel at a safe distance during criticality experiments. Additionally, the entire TA–18 is bounded by a security fence to aid in physically safeguarding special nuclear material. Site access is through a guarded portal.

The principal TA–18 activities are the design, construction, research, development, and applications of experiments on nuclear criticality. Excluding security and support personnel, about 80 full-time employees work at TA–18. They provide expertise and knowledge in advanced nuclear technologies that support three primary areas: (1) Critical experiments in support of Stockpile Stewardship and other programs; (2) emergency response in support of counter-terrorism activities; and (3) safeguards and arms control in support of domestic and international programs to control excess nuclear materials. TA–18 is the nation's only facility capable of performing general-purpose nuclear materials handling for a variety of experiments, measurements and training. TA–18 also houses the Western Hemisphere's largest collection of machines for conducting nuclear safety evaluations and establishing limits for operations.

Since 1948, thousands of criticality experiments and measurements have been performed at TA–18 on assemblies using uranium-233, uranium-235, and plutonium-239 in various configurations, including nitrate, sulfate, and oxide compounds as well as solid, liquid, and gas forms. Critical assemblies at TA–18 are designed to operate at low-average power and temperatures well below phase change transition temperatures (which sets them apart from normal reactors) with low fission production and minimal inventory. Special nuclear materials are stored at kivas or in a vault. The on-site TA–18 nuclear materials inventory (about 2 metric tons of special nuclear materials) is relatively stable, and consists primarily of isotopes of plutonium and uranium. The bulk of the plutonium is metal, and is either clad or encapsulated; plutonium oxide is double-canned. The use of toxic and hazardous chemicals is limited. The criticality experiments generate very small amounts of fission products and there is little radioactive waste. Criticality experiments do not release significant emissions to the atmosphere at the site. A more detailed description of TA–18 activities and associated impacts can be found in the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (January 1999).

Purpose, Need, and Proposed Action

The Department proposes to provide a long-term capability to conduct criticality experiments and evaluations, develop emergency response procedures, and support non-proliferation safeguards and arms control. Since the 1980's, this capability has been based upon the operation of facilities at TA–18, some of which have been operational since 1946. Though TA–18 is judged secure by the Department of Energy's independent inspection office, its facilities are between 30 and 50 years old and are increasingly expensive to maintain and operate. The Defense Nuclear Facilities Safety Board has recommended, in 1993 and 1997, that the Department continue to maintain the capability to support the only remaining criticality safety program in the nation. Consistent with this, the Department wishes to maintain the important capabilities currently provided by TA–18 in a manner that reduces the long-term costs for safeguards and security. Relocating the TA–18 missions would reduce life-cycle costs and improve safeguards and security.

Alternatives

Currently, the NNSA expects that the TA–18 Relocation EIS will evaluate the environmental impacts associated with TA–18 missions at the following DOE sites: (1) a different location at LANL (the preferred alternative); (2) NTS; (3) SNL; and (4) ANL–W. This preliminary list of sites is based on the initial efforts of a Department-wide Option Study Group chartered to develop reasonable alternatives for conducting TA–18 missions. Site screening criteria were developed by the Group that looked for sites with existing Category I (highest level) security infrastructure; nuclear environment, safety and health infrastructure; and compatibility between the site and TA–18 missions. These alternatives are described in greater detail below.

LANL Alternative. This alternative would involve constructing a new facility near the TA–55 Plutonium Facility 4. Consolidating the TA–18 missions near the existing TA–55 facilities could significantly reduce future costs associated with safeguards and security by consolidating safeguards and security requirements. Following construction, the existing Perimeter Intrusion Detection and Assessment System (PIDAS) fence would be expanded to encompass the new facility. Other possible LANL locations for a new facility may also be identified.

NTS Alternative. This alternative would house the TA–18 missions at or near the existing Device Assembly Facility (DAF). The DAF, which became operational in 1998, has the capability to support a variety of nuclear explosive operations (including device assembly, disassembly, modification, staging, testing, repair, and surveillance). Currently, the DAF is used for assembly of sub-critical assemblies, as well as miscellaneous other national security missions. The DAF is approximately 100,000 square feet and has capacity available to accept the TA–18 missions with internal modifications and some minor external construction.

SNL Alternative. This alternative would house the TA–18 missions within TA–V at SNL. Currently, SNL operates a variety of research-oriented nuclear facilities in TA–V. Because existing space in TA–V could accommodate the TA–18 missions, no new buildings would be needed for this alternative. Internal modifications to existing buildings would be required.

ANL–W Alternative. This alternative would house the TA–18 missions in the existing Fuel Manufacturing Facility, and possibly the Transient Reactor Test Facility and other existing facilities. New construction to expand the existing Fuel Manufacturing Facility would be required to accommodate the TA–18 missions. Security upgrades may also be necessary.

As required by the Council on Environmental Quality regulations, the TA–18 Relocation EIS will also evaluate the no-action alternative of maintaining the missions at the current TA–18 location. This alternative would maintain the current missions at Technical Area 18 as described in the expanded use alternative of the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory and Associated Record of Decision (64 FR 50797, September 20, 1999). As stated in the Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, previously planned routine upgrades for infrastructure and security would be conduced in order to maintain the facility.

It is possible that this list of reasonable alternatives may change during the scoping process. In addition, as the EIS is being prepared, the NNSA will be examining the TA–18 missions in order to optimize the number and kind of facilities, and the amount of special nuclear material that would be required to carry out the missions. Following completion of the EIS process, the Secretary of Energy intends to decide where and how to conduct the TA–18 missions, as well as the future use of the existing TA–18 facilities.

Identification of Environmental and Other Issues

The NNSA has identified the following issues for analysis in the EIS. Additional issues may be identified as a result of the scoping process.

1. Public and Worker Safety, Health Risk Assessment: Radiological and non-radiological impacts, including projected effects on workers and the public from construction, normal operations and accident conditions, and decommissioning and decontamination activities associated with relocating and carrying out the TA–18 missions.
2. Impacts from releases to air, water, and soil associated with relocating and carrying out the TA–18 missions.
3. Impacts to plants, animals, and habitats, including threatened or endangered species and their habitats, associated with relocating and carrying out the TA–18 missions.
4. The consumption of natural resources and energy associated with relocating and carrying out the TA–18 missions.
5. Socioeconomic impacts to affected communities from construction and operation associated with relocating and carrying out the TA–18 missions.
6. Environmental justice: Disproportionately high and adverse human health or environmental effects on minority and low-income populations associated with relocating and carrying out the TA–18 missions.
7. Impacts to cultural resources such as historic, archaeological, scientific, or culturally important sites associated with relocating and carrying out the TA–18 missions. Because some facilities at TA–18 are over 50 years old, and potentially important in the context of the Cold War, these will be evaluated for their historical significance under all alternatives.
8. Impacts associated with transportation and storage of nuclear materials.
9. Status of compliance with all applicable Federal, state, and local statutes and regulations; required Federal, state, and tribe environmental consultations and notifications; and DOE Orders on waste management, waste minimization, and environmental protection.
10. Cumulative impacts from the proposed action and other past, present, and reasonably foreseeable actions at the alternative sites.
11. Potential irreversible and irretrievable commitments of resources associated with relocating and carrying out the TA–18 missions.
12. Pollution prevention and waste management practices, including characterization, storage, treatment and disposal of wastes associated with relocating and carrying out the TA–18 missions.

NNSA anticipates that certain classified information will be consulted in the preparation of this EIS and used by decision-makers to decide where and how the capabilities at TA–18 will be carried out. The EIS may contain a classified appendix. To the extent allowable, the EIS will summarize this information in an unclassified manner.

EIS Schedule

The importance of the TA–18 missions requires that the facilities remain operational until the final decision is made and implemented so there is minimal disruption to existing programs or commitments. To support a Record of Decision for this EIS by January 2001, the major milestones for the EIS are shown below.

Public Scoping Meetings: May 2000.

Publish Draft EIS: September 2000.

Draft EIS Public Hearings: October 2000.

Publish Final EIS: December 2000.

Record of Decision: January 2001.

To facilitate this schedule, the TA–18 Relocation EIS will tier from existing EISs for the four alternative sites, as appropriate. For example, the Department has previously prepared Site-Wide EISs for LANL (Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, January 1999), SNL (Site-Wide Environmental Impact Statement for Sandia National Laboratories, Albuquerque, New Mexico, November 1999), and NTS (Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada, August 1996) that are expected to provide much of the existing environmental information. Additionally, several NEPA documents for ANL–W facilities will be utilized, including the Electro-metallurgical Treatment Research and Demonstration Project at ANL–W Environmental Assessment (May 1996) and the Treatment and Management of Sodium-Bonded Spent Nuclear Fuel EIS (Final EIS expected to be published in May 2000).

Public Scoping Process

To assist in defining the appropriate scope of the EIS and to identify significant environmental issues to be addressed, NNSA representatives will conduct public scoping meetings at the locations, dates, and times described above under **DATES.** Each scoping meeting will begin with an overview of the TA–18 missions, the current EIS alternatives, and the proposed EIS scope. Following the initial presentation, NNSA representatives will answer questions and accept comments. Copies of handouts from the meetings will be available to those unable to attend, by contacting the NNSA as described above under **ADDRESSES.**

Issued in Washington, D.C., this 26th day of April, 2000.

T. J. Glauthier,

Deputy Secretary of Energy, Department of Energy.

[FR Doc. 00–10897 Filed 5–1–00; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

National Nuclear Security Administration

Notice of Schedule Change for Preparing the Environmental Impact Statement for the Proposed Relocation of the Los Alamos National Laboratory Technical Area 18 Missions

AGENCY: Department of Energy, National Nuclear Security Administration.

ACTION: Notice of schedule change.

SUMMARY: On May 2, 2000, the Department of Energy (DOE), National Nuclear Security Administration (NNSA), published a Notice of Intent to prepare an Environmental Impact Statement (EIS) for the Proposed Relocation of the Los Alamos National Laboratory (LANL) Technical Area 18 (TA–18) (hereafter that EIS will be referred to as the TA–18 EIS) (65 FR 25472). In that notice, the NNSA indicated that the TA–18 EIS process was scheduled to be completed by January 2001. The purpose of this notification is to inform the public that the schedule for completing the TA–18 EIS has changed. The NNSA now projects that the EIS process will not be completed before September 2001.

ADDRESSES: General questions concerning the TA–18 Project can be asked by calling 1–800–832–0885, ext. 6–5484, or by writing to: Mr. Jay Rose, Document Manager, TA–18 Relocation EIS, U.S. Department of Energy/NNSA, 1000 Independence Avenue, S.W., Washington, D.C. 20585.

FOR FURTHER INFORMATION CONTACT: For general information on the NNSA National Environmental Policy Act (NEPA) process, please contact: Mr. Henry Garson, NEPA Compliance Officer for Defense Programs, U.S. Department of Energy/NNSA, 1000 Independence Avenue, SW., Washington, DC 20585; or telephone 1–800–832–0885, ext. 30470. For general information on the DOE NEPA process, please contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (EH–42), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, telephone 202–586–4600, or leave a message at 1–800–472–2756.

SUPPLEMENTARY INFORMATION: On April 11, 2000, Secretary of Energy Bill Richardson announced that the NNSA would begin preparation of an EIS on the proposed transfer to another location of TA–18's capabilities and up to approximately 2 tons of special nuclear materials. In the Notice of Intent, published on May 2, 2000, the NNSA solicited comments on the proposed scope of the TA–18 EIS from the public and conducted public scoping meetings as follows: May 18, 2000, in Albuquerque, New Mexico; May 23, 2000, in North Las Vegas, Nevada; May 25, 2000, in Idaho Falls, ID; and May 30, 2000, in Espanola, New Mexico.

Due primarily to budget constraints, funding for the TA–18 EIS was not available during the summer of 2000 and the schedule for completing the TA–18 EIS began to slip. The events associated with the Cerro Grande fire at LANL (see 65 FR 120, June 21, 2000) further disrupted TA–18 planning activities and added to the schedule slip. The revised EIS schedule is as follows:

Issue Draft EIS—May 2001

Draft EIS Public Hearings—June 2001

Issue Final EIS—August 2001

Record of Decision—September 2001

There have been no significant changes to the TA–18 EIS scope or alternatives, as described in the original TA–18 EIS Notice of Intent.

Issued in Washington, DC, this 18th day of January 2001.

T.J. Glauthier,

Deputy Secretary of Energy, Department of Energy.

[FR Doc. 01–2469 Filed 1–26–01; 8:45 am]

BILLING CODE 6450–01–P

ENVIRONMENTAL PROTECTION AGENCY

[ER–FRL–6620–9]

Environmental Impact Statements; Notice of Availability

Responsible Agency: Office of Federal Activities, General Information (202) 564–7167 or www.epa.gov/oeca/ofa.

Weekly receipt of Environmental Impact Statements.

Filed August 6, 2001 Through August 10, 2001.

Pursuant to 40 CFR 1506.9.

EIS No. 010299, Final EIS, SFW, CA, Metro AirPark Habitat Conservation Plan, Issuance of an Incidental Take Permit, To Protect, Conserve and Enhance Fish, Wildlife and Plants and their Habitat, Natomas Basin, Sacramento County, CA , Wait Period Ends: September 17, 2001, Contact: Julie Concannon (503) 231–2068.

EIS No. 010300, Draft EIS, FRC, CA, Big Creek No. 4 Hydroelectric Project, Issuing New License, (FERC Project No. 2017), San Joaquin River Basin, Sierra National Forest, Fresno, Madera and Tulare Counties, CA, Comment Period Ends: October 16, 2001, Contact: John Ramer (202) 219–2833.

EIS No. 010301, Draft EIS, FTA, FL, Tampa Rail Project, Transportation Improvements, Light Rail Transit (LRT) or Diesel Multiple Unit (DMU) Vehicles, City of Tampa, Hillsborough County, FL, Comment Period Ends: October 5, 2001, Contact: Derek Robert Scott (404) 562–3524.

EIS No. 010302, Draft EIS, DOE, NM, ID, NV, Technical Area 18 (TA –18) Relocation of Capabilities and Materials at the Los Almos National Laboratory (LANL), Operational Activities Involve Research in and the Design, Development, Construction, and Application of Experiments on Nuclear Criticality, NM, NV and ID, Comment Period Ends: October 5, 2001, Contact: James J. Rose (866) 357–4345.

EIS No. 010303, Draft EIS, AFS, WA, Crystal Mountain Master Development Plan, To Provide Winter and Summer Recreational Use, Special-Use-Permit, Mt. Baker-Snoqualmie National Forest, Silver Creek Watershed, Pierce County, WA, Comment Period Ends: October 16, 2001, Contact: Larry Donovan (425) 744–3403. This document is available on the Internet at: www.fs.fed.us/r6/mbs/.

EIS No. 010304, Final EIS, AFS, OR, Mill Creek Timber Sales and Related Activities, To Implement Ecosystem Management Activities, Prospect Ranger District, Rogue River National Forest, Jackson County, OR, Wait Period Ends: September 17, 2001, Contact: Joel T. King (541) 560–3400.

Amended Notices

EIS No. 010241, Draft EIS, FHW, RI, Sakonnet River Bridge Rehabilitation or Replacement Project, Portsmouth & Tiverton, Newport County, RI , Due: October 5, 2001, Contact: Daniel J. Berman (401) 528–4541. Revision of FR Notice Published on 7/13/2001: CEQ Review Period Ending 9/7/2001 has been Extended to 10/05/2001.

EIS No. 010229, Draft EIS, NOA, CA, San Francisco Bay National Estuarine Research Reserve, Proposes to Designate Three Sites: China Camp State Park, Brown 's Island Regional Parks District, and Rush Ranch Open Space Preserve, Contra Costa, Marin and Solano Counties, CA, Due: August 31, 2001, Contact: Nina Garfield (301) 713 –3132. Revision of FR Notice Published on 7/13/2001: CEQ Review Period Ending 9/7/2001 to 10/5/2001 has been extended.

Dated: August 14, 2001.

Joseph C. Montgomery,

Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. 01–20821 Filed 8–16–01; 8:45 am]

BILLING CODE 6560–50–P

Appendix I

Public Scoping Process

TA-18

APPENDIX I
PUBLIC SCOPING PROCESS

I.1 SCOPING PROCESS DESCRIPTION

As a preliminary step in the development of an environmental impact statement (EIS), regulations established by the Council on Environmental Quality (40 CFR 1501.7) and the U.S. Department of Energy (DOE) require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." The purpose of this scoping process is: (1) to inform the public about a proposed action and the alternatives being considered, and (2) to identify and/or clarify issues that are relevant to the EIS by soliciting public comments.

On May 2, 2000, The National Nuclear Security Administration (NNSA), a separately-organized agency within DOE, published a Notice of Intent in the *Federal Register* announcing its intent to prepare a *Draft Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory*. During the National Environmental Policy Act (NEPA) process, there are opportunities for public involvement (see **Figure I–1**). The Notice of Intent listed the issues initially identified by DOE for evaluation in the EIS. Public citizens, civic leaders, and other interested parties were invited to comment on these issues and to suggest additional issues that should be considered in the EIS. The Notice of Intent informed the public that comments on the proposed action could be communicated via U.S. mail, a special DOE web site on the internet, a toll-free phone line, a toll-free fax line, or in person at public meetings to be held near the alternative relocation sites.

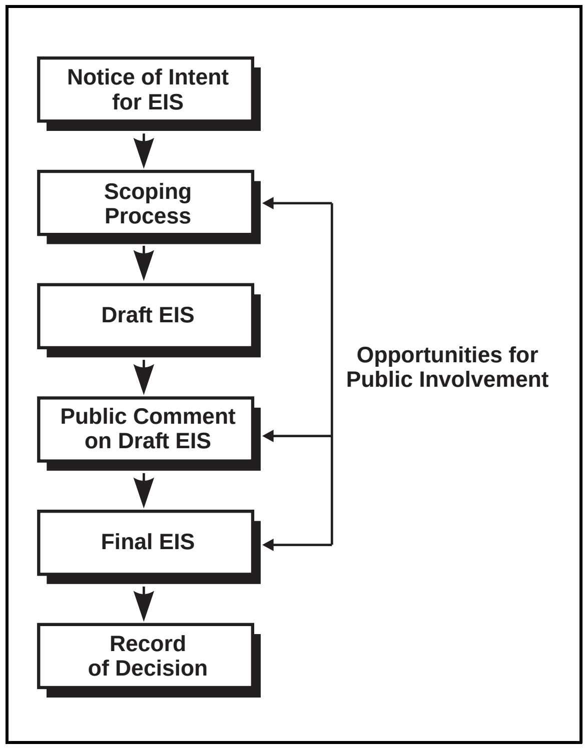

Figure I–1 NEPA Process

Public meetings were held near each of the four alternative relocation sites: (1) Sandia National Laboratories/New Mexico (SNL/NM), on May 18, 2000, in Albuquerque, New Mexico; (2) Nevada Test Site (NTS), on May 23, 2000, in North Las Vegas, Nevada; (3) Argonne National Laboratory-West (ANL-W), on May 25, 2000, in Idaho Falls, Idaho; and (4) Los Alamos National Laboratory (LANL), on May 30, 2000,[1] in Española, New Mexico (see **Figure I–2**).

[1] *Due to the Cerro Grande Fire in the Los Alamos, New Mexico area, the LANL public scoping meeting originally scheduled for May 17, 2000, in Los Alamos was rescheduled to May 30, 2000, in Española, New Mexico.*

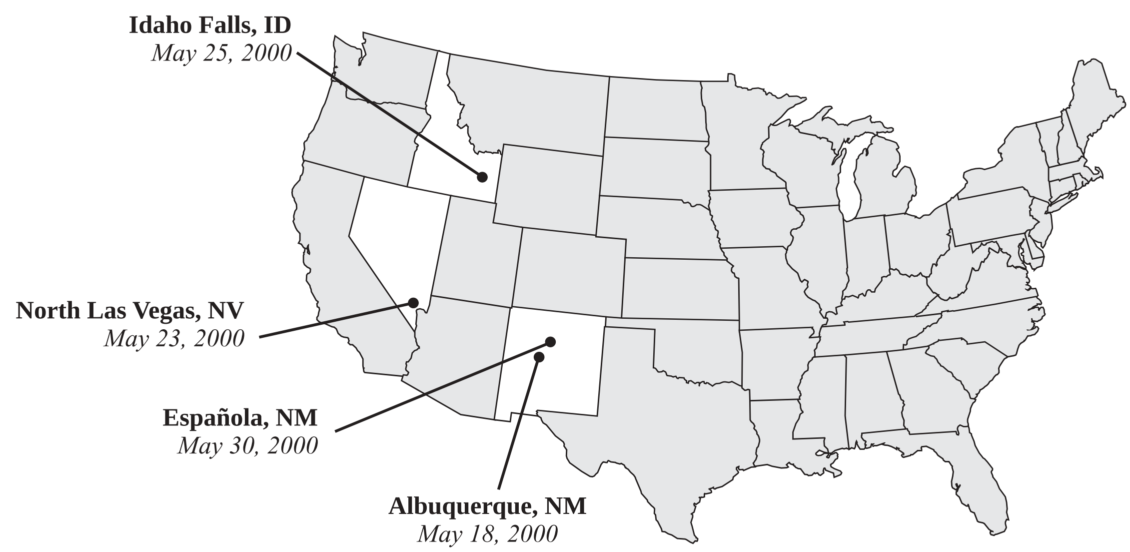

Figure I–2 Public Scoping Meeting Locations and Dates

As a result of previous experience and positive responses from attendees of other DOE NEPA public meetings and hearings, DOE chose an interactive format for the scoping meetings. Each meeting began with a presentation by a DOE representative who explained the proposed Technical Area 18 (TA-18) relocation plan. Afterwards, the floor was opened to questions, comments, and concerns from the audience. DOE representatives were available to respond to questions and comments as needed. The proceedings and formal comments raised at each meeting were recorded verbatim, and a transcript for each meeting was produced. The public was also encouraged to submit written or verbal comments, during the meetings or to submit comments via letters, the DOE internet web site, toll-free phone line, or toll-free fax line, until the end of the scoping period. Due to the rescheduling of the LANL public meeting, necessitated by the Cerro Grande Fire, the end of the scoping period was extended from June 1, 2000 to June 15, 2000. Comments received after June 15, 2000 were considered and included to the extent practicable.

It should be noted that, for EIS public scoping purposes, a comment is defined as a single opinion concerning a specific issue. An individual commentor's public statement may contain several such comments. Most of the verbal and written public statements submitted during the EIS scoping period contained multiple comments on various specific issues. These issues are summarized in the following section.

I.2 SCOPING PROCESS RESULTS

Nearly 400 comments were received from citizens, interested groups, and Federal, state, and local officials during the public scoping period, including approximately 50 verbal comments made during the public meetings. The remainder of the comments (336) were submitted at the public meetings in written form, or were submitted via mail, internet, fax, or phone over the entire scoping period. Some commentors who spoke at the public meetings also prepared written statements that were later submitted during or after the meetings. Where this occurred, each comment provided by an individual commentor in both verbal and written form was counted as a single comment. It should be noted that a single commentor provided more than 200 of the total scoping comments that were received during the public scoping period.

Many of the verbal and written comments received during the public scoping period identified the need for DOE to describe in detail the existing TA-18 facilities and processes, as well as the specific requirements associated with the alternatives for fulfilling the proposed action. In particular, comments addressed the suitability of other sites to perform TA-18 operations, the design of any facilities to be constructed or modified, construction and operation timelines, and controls to limit releases to the environment.

A significant number of comments also expressed concern about the costs associated with operating TA-18 or relocating these operating capabilities and materials elsewhere. These comments suggested that detailed cost analyses be conducted to analyze the construction, operation, security, and transportation needs of the various alternatives.

Many comments were expressed about the special nuclear materials (SNM) needed to support, and the waste streams resulting from, TA-18 activities. Commentors requested clarification about the amount of SNM that would be required under each alternative, the manner and route of its transport, and the availability of suitable shipping containers. Waste management concerns expressed by commentors included the need to identify the types and volumes of waste generated by the proposed action, the facilities available at each site to treat, store and/or dispose of these wastes, transportation requirements, and compatibility of managing these wastes with state and Federal regulations.

Several commentors expressed concern about environmental, health, and safety risks associated with TA-18 activities. DOE representatives were urged to thoroughly evaluate the potential consequences of the proposed action on local wildlife, water resources, and the health and safety of area residents, and to address the Cerro Grande Fire at LANL in the EIS. Comments also suggested that the EIS quantify all radionuclide and chemical emissions resulting from the proposed action. Concerns also were raised about the safety and security of existing TA-18 facilities, and how safety and security would be addressed at each of the proposed relocation sites. Commentors also expressed favor or opposition to a relocation alternative, reasons for which included security, cost, and workforce advantages.

Public comments and materials submitted during the scoping period were logged and placed in the Administrative Record of this EIS.

I.3 COMMENT DISPOSITION AND ISSUE IDENTIFICATION

Comments received during the scoping period were systematically reviewed by DOE. Where possible, comments on similar or related topics were grouped under comment issue categories as a means of summarizing the comments. The comment issue categories were used to identify specific issues of public concern. After the issues were identified, they were evaluated to determine whether they fell within or outside the scope of the EIS. Some issues were found to be already "in scope," and that they were among the EIS issues initially identified by DOE for inclusion in the EIS. **Table I–1** lists these issues along with where these issues are addressed in the EIS.

As a result of the public scoping process, one additional issue, consideration of an alternative to upgrade the existing TA-18 facilities at LANL, and clarification of the requirements for such an alternative, was added to the scope of the *TA-18 Relocation EIS* (see **Table I–2**).

During the scoping process, DOE received many comments that were judged to be beyond the scope of the *TA-18 Relocation EIS*. The purpose and scope of the *TA-18 Relocation EIS* are only to evaluate the potential environmental impacts associated with the relocation of TA-18 activities. Comments judged to be beyond the scope of the EIS included: (1) national security matters, (2) cost of TA-18 operations, (3) opposition to TA-18 activities, and (4) weapons development activities. These issues are not addressed in the EIS.

Table I–1 Issues Included In the EIS (In Scope)

Issues	Number of Comments	EIS References
General history of TA-18 and its missions, and the continued importance of current TA-18 operations to national security	15	Section 1.1 and Chapter 3
NNSA's responsibilities under DOE with respect to the proposed action and alternatives	2	Section 1.1.1
Purpose, need, and duration for relocating TA-18 activities	5	Chapter 2 and Section 3.2.1
Unclassified description of the radioactive and non-radioactive materials to be used and the types of experiments to be conducted at the proposed facility, including critical assembly experiments, any uses of cladding, cooling experiments, and storage requirements	19	Section 3.1
Current and proposed use of SNM by TA-18 operations, and its availability	9	Section 3.1.2
TA-18 decontamination and decommissioning, closure, and post-closure plans	5	Section 3.2.1 and Section 5.7
Transportation requirements associated with the proposed action and alternatives	4	Section 3.1.2, Chapter 5, and Appendix D
Unclassified description of the bounding amount of SNM proposed for transport to each candidate location, the manner and route of transport, the containers and casks that would be used to transport this material, necessary safeguards and security measures to protect shipments, and potential accidents associated with this transport	19	Section 3.1.2 and Appendix D
Radionuclide and chemical emissions resulting from the proposed action	7	Section 3.2.1
Time frame for TA-18 operations for all alternatives	3	Section 3.2.1
Potential employment impacts to the TA-18 workforce resulting from the proposed relocation	6	Section 3.2.1 and Chapter 5
Siting criteria used to determine the reasonable site alternatives for the TA-18 operations	3	Section 3.2.2
Description of TA-18 facilities and critical assembly machines, and the specific requirements associated with the alternative proposals for carrying out the TA-18 operations at the alternative sites, including the purpose and design of each facility, timeline and major schedule milestones, any necessary construction, software and security systems to be used, and any systems that would be used to prevent emissions to the environment	36	Section 3.2.1, Section 3.3 and Appendix A
The alternative of discontinuing TA-18 operations	2	Section 3.4.1
Sites that were considered but eliminated from detailed study	6	Section 3.4.2
Environmental, safety, and health impacts of relocating/conducting TA-18 activities over the lifetime of operations at each proposed location	18	Section 3.5 and Chapter 5
DOE's Preferred Alternative	2	Section 3.6
Existing affected environments at each alternative site, including current storage of transuranic materials, as well as releases of radiation from TA-18 normal operations and their effect on workers and the general population	6	Chapter 4
Changes to the affected environment as a result of the Cerro Grande Fire	2	Chapter 4
Accident history of the existing TA-18 facilities and of each alternative relocation site	7	Chapter 4
Seismic and floodplain issues relative to TA-18 operations	3	Chapter 4 and 5
Waste types and volumes that would be generated as a result of the proposed action and alternatives, and how these wastes would be transported/managed at each proposed location	33	Section 3.2.1 and Chapter 5
Environmental justice	1	Chapters 4 and 5 and Appendix E
Potential routes for air, water, and soil contamination from proposed facility operation	1	Chapter 5

Issues	***Number of Comments***	***EIS References***
Applicable laws and regulations associated with the proposed action and alternatives	13	Chapter 6
Consultation with Native American representatives	5	Chapter 6
Reasonable spectrum of accidents (including criticality accidents) associated with the TA-18 proposal	13	Appendix C
Safety measures to prevent criticality accidents	4	Appendix A
Description of recent independent safety evaluations, and other issues associated with safety at TA-18	6	Appendix C
Software and computer codes used in performing the accident analyses in this *TA-18 Relocation EIS*.	4	Appendix C
Impact assessment methodology	1	Appendices B, C, D, E, and F
Summary of public scoping comments on the proposed action and alternatives	1	Appendix I

Table I–2 Issues Added to the Scope of the TA-18 Relocation EIS

Issues	***Number of Comments***	***EIS References***
Consideration of the alternative to upgrade existing TA-18 facilities and clarification of the specific requirements for such an alternative	1	Section 3.3

APPENDIX J

Public Comments

TA-18

APPENDIX J
PUBLIC COMMENTS

This appendix describes the public comment process for the National Nuclear Security Administration's (NNSA) *Draft Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (*TA-18 Relocation Draft EIS*). Section J.1 discusses the process for obtaining public comments on the *TA-18 Relocation Draft EIS* and identifies the comment period and the location and date of public hearings. Section J.2 addresses the public hearing format, while Section J.3 discusses comment disposition. Sections J.4 and J.5 provide the comments presented at the public hearings and received via U.S. mail, e-mail, toll-free 800-number phone line, and toll-free fax, respectively, as well as NNSA's responses to those comments.

J.1 OVERVIEW

In August 2001, NNSA published the *TA-18 Relocation Draft EIS*. National Environmental Policy Act regulations mandate a minimum 45-day public comment period after publication of a draft EIS to provide an opportunity for the public and other stakeholders to comment on the EIS analysis and results. The public comment period on the *TA-18 Relocation Draft EIS* began on August 17, 2001, and was scheduled to end on October 5, 2001. Due to the events of September 11, 2001, the comment period was extended through October 26, 2001. During this comment period, public hearings were held in Idaho Falls, Idaho; Las Vegas, Nevada; and Albuquerque and Española, New Mexico (see **Figure J–1)**. In addition, the public was encouraged to submit comments via the U.S. mail, e-mail, toll-free phone number, and fax.

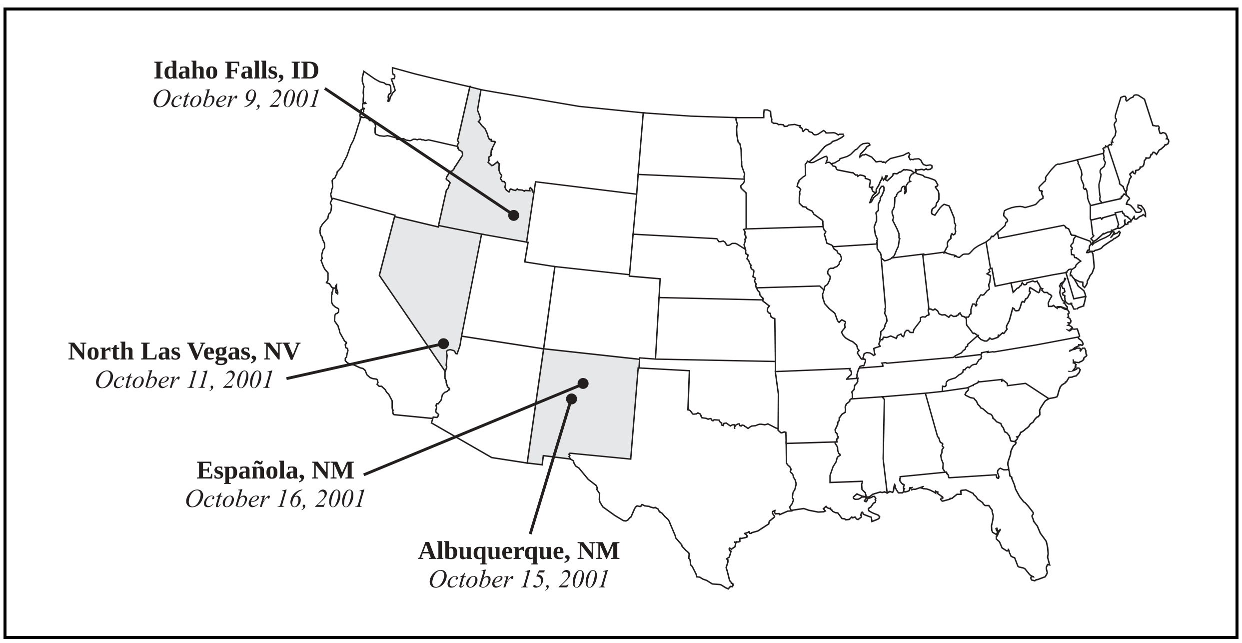

Figure J–1 Public Hearing Locations and Dates, 2001

The number of persons estimated in attendance at each hearing or meeting, together with the number of comments submitted and recorded, are presented in **Table J–1**. These attendance estimates are based on the number of registration forms completed and returned at each hearing or meeting, as well as a rough "head count" of the audience, and may not include all those present.

The public hearing comments were combined with comments received by other means (i.e., U.S. mail, e-mail, toll-free phone number, and fax) during the comment period. Written comments were date-stamped and assigned a sequential document number. **Table J–2** lists the number of comments received by method of submission.

Table J–1 Public Hearing/Meeting Locations, Attendance, and Comments Received

Location	*Date*	*Estimated Attendance*	*Comments*
Idaho Falls, Idaho	October 9, 2001	4	1
Las Vegas, Nevada	October 11, 2001	4	0
Albuquerque, New Mexico	October 15, 2001	3	0
Los Alamos, New Mexico	October 16, 2001	30	13

Table J–2 Method of Comment Submission

Method	*Number of Commentors*	*Number of Comments*
Faxes	0	0
U.S. mail	10	42
1-800 number	0	0
E-mail	1	5
Hearings (written/oral)	2 / 6	2 / 12

J.2 PUBLIC HEARING FORMAT

The public hearings were organized to encourage public comments on the *TA-18 Relocation Draft EIS* and to allow two-way interaction between public attendees and U.S. Department of Energy (DOE) and NNSA representatives. A court reporter was present at each hearing to record the proceedings and provide a transcript of the public comments and the dialogue between the public and the NNSA representatives on hand. These transcripts are available in DOE public reading rooms near each of the proposed sites and in Washington, D.C.

The format used for each hearing included a presentation, question and answer session, and a public comment period. The hearing opened with a welcome from the facilitator, followed by a presentation on the proposed action by an NNSA representative. The facilitator next opened the question and answer session to give the audience a chance to ask questions about the material presented. This was followed by the public comment session, during which attendees were given an opportunity to read a prepared statement. Modifications to the format were made at each of the public hearings to fulfill the special requests of attendees. Following the public hearings, the comments were identified from the transcripts of each hearing and the comment documents submitted by the attendees.

J.3 COMMENT DISPOSITION

All comments received during the *TA-18 Relocation Draft EIS* comment period appear in either Section J.4 or J.5 of this appendix. Section J.4 contains a set of tables corresponding to each of the public hearings. Transcriptions of the oral comments submitted at each of the public hearings are presented in appropriate tables, along with NNSA's responses to each comment. Section J.5 includes scanned images of the comments received via U.S. mail, e-mail, toll-free phone number, fax, or personal submission at the public hearings. NNSA's response to each comment is presented on the opposite side of the page.

Table J–3 is an index of all of the commentors who made statements or submitted comments at the public hearings or during the public comment period, including members of the public, representatives of organizations or agencies, and public officials. Commentors are listed alphabetically by their last name, along with the page on which their comments appear in Sections J.4 or J.5. **Table J–4** identifies separately Federal, state, and local officials and agencies; companies; organizations; and special interest groups that submitted comments.

Table J–3 Commentors Index

Commentor	***Commentor Number***	***Page Number***
Anonymous	7	J-20
Vernon J. Brechin, Mountain View, California	11	J-25
Lary Marks	3	J-11
William L. Partain, Los Alamos, New Mexico	8	J-21
Donivan Porterfield, Los Alamos, New Mexico	10	J-24
Thomas F. Stratton	9	J-22

Table J–4 Index of Public Officials, Organizations, and Public Interest Groups

Commentor Information	***Commentor Number***	***Page Number***
INEEL Citizens Advisory Board, Stanley Hobson, Chair, Idaho Falls, Idaho	4	J-12
Nuclear Watch of New Mexico, Colin King, Research Director, Santa Fe, New Mexico	13	J-29
Pueblo of San Ildefonso, Perry Martinez, Governor, Santa Fe, New Mexico	1	J-9
The Shoshone-Bannock Tribes, Diana K. Yupe, Program Interim Director, Fort Hall, Idaho	5	J-14
State of New Mexico Environment Department, Peter Maggiore, Secretary, Santa Fe, New Mexico	6	J-17
U.S. Department of the Interior, Glenn B. Sekavec, Regional Environmental Officer, Albuquerque, New Mexico	2	J-10
U.S. Environmental Protection Agency, Robert D. Lawrence, Chief, Region 6, Dallas, Texas	12	J-26

INEEL = Idaho National Engineering and Environmental Laboratory

J.4 PUBLIC HEARING COMMENTS AND NNSA RESPONSES

Comments presented in this section were submitted during oral presentations at the public hearings held on October 9, 2001, in Idaho Falls, Idaho; October 11, 2001, in Las Vegas, Nevada; October 15, 2001, in Albuquerque, New Mexico; and October 16, 2001, in Española, New Mexico. NNSA's responses to these comments are also presented.

Comments from the Idaho Falls, Idaho, Public Hearing October 9, 2001		
Commentor	***Comment***	***NNSA Response***
Steve Piat	I note in the presentation what looks to be a point zero four percent fatality per rem linear response assumption. And I have to question why do we continue to use that when the Health Physics Society, the American Nuclear Society, and people who have studied this in more detail recognize that there is just plain no evidence, no evidence for cancer fatalities down in that sort of dose range. And I think you're doing a disservice when you continue to propagate those sort of numbers.	DOE agrees with the commentor that at very low doses the numerical estimates of fatal cancers per rem are conservative. As explained in Appendix B, Section B.2.2, of the Final EIS, the numerical estimates of fatal cancers were obtained using a linear extrapolation from nominal risk estimated for lifetime total cancer mortality that results from a dose of 0.1 gray (10 Rad). Studies of human population exposed to low doses are inadequate to demonstrate the actual level of risk. There is scientific uncertainty about cancer risk in the low-dose region below the range of epidemiological observation, and the possibility of no risk cannot be excluded. Nevertheless, for conservatism, the EIS uses a constant fatal cancer risk factor for low doses with no threshold.

Comments from the Las Vegas, Nevada, Public Hearing October 11, 2001		
Commentor	***Comment***	***NNSA Response***
No comments were received at this public hearing.		

Comments from the Albuquerque, New Mexico, Public Hearing October 15, 2001		
Commentor	***Comment***	***NNSA Response***
No comments were received at this public hearing.		

Comments from the *Española**, New Mexico, Public Hearing* ***October 16, 2001***		
Commentor	***Comment***	***NNSA Response***
Dave Thompson	I had a question on the cost, relative cost of the refurbishing where it is now versus putting it in at TA-55. Do you have to build two or three new experimental areas, what we now call KIVAS, up at some other location if you build a new location? Are these cost about the same if you rebuilt them one at a time at TA-18?	The concept that NNSA is currently considering, as outlined in the *TA-18 Relocation EIS*, is a single facility. An underground facility at TA-55 would house four of the five critical assembly machines that are currently used at TA-18. Such a facility would enhance security, reliability, and safety. While cost is one of several factors which would be considered by the decision makers in the Record of Decision, it is beyond the scope of the *TA-18 Relocation EIS*, which focuses on assessing the potential environmental impacts of the proposed action and reasonable alternatives.
	I support your tentative decision or preferred decision to keep the site at Los Alamos.	The commentor's support for keeping TA-18 capabilities and materials at LANL is noted.
Bill Stratton	Are we to understand that you do not have reasonable cost estimates yet?	NNSA does have preliminary cost estimates for each of the alternatives. However, it should be noted that these are based on preliminary engineering design and would not be used as a basis for actual construction. Additionally the cost of moving materials to other locations must be considered as well as cost savings related to security if an alternative other than the No Action alternative is selected. While cost is one of the factors considered by the decision makers in the Record of Decision, it is beyond the scope of the TA-18 Relocation EIS, which focuses on assessing the potential environmental impacts of the proposed action and reasonable alternatives.
	I really have my doubts about the need for a new facility. I think perceived security is the problem. I think this has not been seriously addressed. There are lots of cheaper ways to secure the physical materials at a place like the Pajarito site without running and spending $200 billion, $500 million for an underground site next to a crucial import site like TA-55. I would like to just make a comment about the record at the Pajarito site. There has not been any harm to any individual whatsoever since 1946 or 1947 when there was a criticality accident right after the war.	The TA-18 location was selected for criticality experiments in 1947 because of its remoteness, and laboratory protection provided by the Pajarito Canyon walls. However, through the years the experiments evolved with larger potential impacts that needed additional protective actions and restrictions (i.e., road closure, evacuation of personal, security, etc.) before those experiments could be performed. The proposed relocation of critical assembly machines to an underground facility at TA-55 would allow the criticality experiments to be performed with enhanced public and operational safety, as well as enhanced security. As discussed in Section 3.5 and Section 5.2.10.2 of the *TA-18 Relocation EIS*, the potential consequences of accidents to the public and the workers from activities associated with operation of critical assembly machines at TA-55 would be orders of magnitude less than that of those at TA-18. Therefore, the relocation and operation of critical assembly machines at TA-55 would result in improved, rather than reduced, safety.

Comments from the* Española*, New Mexico, Public Hearing
October 16, 2001

Commentor	***Comment***	***NNSA Response***
Bill Stratton (cont'd)	I really think that best alternative is to keep it where it is and do what upgrades are necessary but keep the place in operation.	The commentor's support for the TA-18 Upgrade Alternative is noted.
	Would the new facility at TA-55 impinge upon the possibility of more construction with the plutonium activity at TA-55 or are they going to be contiguous so close that we will be sorry?	LANL uses an integrated planning process that takes into account various present and potential future uses of the site as a whole, including TA-55. The new underground facility at TA-55 is far enough away from other facilities at the site that it would not impinge upon activities taking place within them.
Frances Berting (Citizens Advisory Board)	Question with regard to what would happen to TA-18 if the facility is moved. How much D&D, how much environmental restoration and that sort of thing, and that is probably a little bit outside the EIS, but it's a question that I have.	Potential impacts from the decontamination and decommissioning of TA-18 facilities have been generally addressed in Section 5.7 of the EIS. Since the ultimate disposition of TA-18 facilities has not been determined, impacts from the decontamination and decommissioning of TA-18 would be addressed as part of a separate NEPA review. As stated in Section 5.7, prior to the initiation of decommissioning activities, a detailed decontamination and decommissioning plan would be prepared in conjunction with site planning documents.
	This has to do with the cost of security protection. I understand that one of the reasons for moving it is that it's extremely expensive to essentially defend now. I was wondering whether there is probably less security cost involved at TA-18. Does security at the current site need to be so expensive?	Security costs, as one of the components of the overall operations budget to keep TA-18 on line, are high and growing. Thus, cost is one of the reasons that NNSA is considering relocating TA-18 capabilities and materials. NNSA is committed to safety and security at its sites, and security costs commensurate with requirements are being factored into each into each alternative considered in this EIS. A separate cost review is underway to support the Record of Decision.
	Is there more of a possibility of release of radiation from TA-55 than from TA-18?	The proposed relocation of critical assembly machines to an underground facility at TA-55 would allow the criticality experiments to be performed with enhanced public and operational safety, as well as enhanced security. As discussed in Section 3.5 and Section 5.2.10.2 of the *TA-18 Relocation EIS*, the potential consequences of radiological releases to the public and the workers from activities associated with operation of critical assembly machines at TA-55 would be orders of magnitude less than that of those at TA-18 without facility modifications. Therefore, the relocation and operation of critical assembly machines at TA-55 would result in improved, rather than reduced, safety. Implementing the TA-18 Upgrade Alternative would also reduce the risk of radiological releases from TA-18 facilities.

Comments from the** Española**, New Mexico, Public Hearing October 16, 2001		
Commentor	***Comment***	***NNSA Response***
Jean Dewart	I want to acknowledge DOE's commitment to building state of the art facilities. I also want to express my concern as an employee and citizen that the infrastructure of the Laboratory doesn't seem to have kept pace and we don't seem to have a facility that is built for 12,000 employees to drive here, and safety and driving has been a real problem for employees, and there is a lot of concern.	Ground transportation network at LANL is addressed in Section 4.5.2.1 of the *TA-18 Relocation EIS*. Impacts of the LANL alternatives on ground transportation are addressed in Section 5.2.2. The analysis indicates that impacts on the local transportation network from any of the LANL alternatives are expected to be small.
Oscar Lindquist (Sante Fe Research Corp.)	Has any consideration been made that only four and a half acres are available to field national needs, national defense needs, and other needs as they come up at TA-18, as they have in the past. The size of the area in the past has been sufficient to allow multiple independent unrelated events to proceed simultaneously, whereas if you have an integrated building, as I understand TA-55 will be, it appears that four and a half acres might not be able to offer the flexibility this country might need in times of emergency response.	The new underground building at TA-55 has been designed to accomplish all of the TA-18 missions. Since two to four operations have been conducted simultaneously at TA-18 in the past, the new facility was designed from the beginning for this capability. Thus, the new facility should have more than adequate flexibility for future operations.

J.5 WRITTEN COMMENTS AND NNSA RESPONSES

Comments presented in this section were submitted to NNSA via the U.S. mail, e-mail, toll-free phone number, and fax, or in person at the public hearings. All comments received during the comment period, which began on August 17, 2001, and ended on October 26, 2001, as well as submittals received after October 26, are reproduced in this section. This section provides a side-by-side display of the written comments received (full-text reproductions) and NNSA's responses. Individual comments are numbered in the margins of the comment letters, and NNSA responses to each of the numbered comments are provided on the right side of each page.

Commentor No. 1: Pueblo of San Ildefonso, Perry Martinez, Governor

Office of Governor

PUEBLO DE SAN ILDEFONSO TEWA NEW MEXICO

Telephone
(505)455-2273
FAX (505)455-7351

Route 5, Box 315-A
Santa Fe, New Mexico 87501

SI-GC01-758

August 28, 2001

James J. Rose
Defense Programs (DP-42)
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C., 20585

Dear Mr. Rose:

Thank you for providing the Pueblo of San Ildefonso with the opportunity to review and comment upon the Draft Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory (TA-18 EIS) [DOE/EIS-0319D].

The Pueblo of San Ildefonso strongly disagrees with your preliminary decision to relocate TA-18 materials and operations at a different site at Los Alamos National Laboratory (LANL) as the preferred alternative. We feel that TA-18 operations and materials should be relocated to Sandia National Laboratories, the Nevada Test Site, or Argonne National Laboratory-West. The Pueblo has been adversely affected by LANL operations for more than 50 years and to continue operations involving radiological and chemical materials that can potentially release contaminants to the environment is an insult to our tradition and culture. As you may know the Pueblo of San Ildefonso is the only Native American community to share a common boundary with a National Nuclear Weapons Research Facility (LANL). Both past and present operations at LANL have had an adverse impact upon our traditional way of life, cultural and religious resources, and traditional cultural properties (TCP's). 1-1 1-2

We do not believe that the draft EIS fully considered the risk to Native American communities and our unique utilization of natural resources and reliance upon a subsistence way of life. Nor did the EIS fully consider Environmental Justice issues. We therefore must oppose your preliminary decision and request that you reconsider the other alternative sites for relocation of TA-18. 1-3

Again, thank you for providing the Pueblo with the opportunity to comment. Please feel free to contact me, if you would like to continue this consultation process.

Sincerely,

Perry Martinez
Governor

Cc: David Gurule, DOE/LAAO
Neil Weber, DECP

Response to Commentor No. 1

1-1: Opposition of the Pueblo of San Ildefonso to the LANL New Facility Alternative and support for the SNL/NM Alternative, NTS Alternative, or ANL-W Alternative is noted.

1-2: The *TA-18 Relocation EIS* does not address past practices, but rather the impacts of relocating TA-18 operational capabilities and materials. Impacts of LANL alternatives on Native American Resources are addressed in Section 5.2.8.3. The analysis of impacts on Native American resources presented in the EIS provides a comparative assessment of the impacts expected from each alternative. As noted in Section 5.2.8.3, a cultural resources survey will be conducted prior to beginning construction of any new facilities. If Native American resources were discovered during construction, work would stop while appropriate action was taken, including notification of appropriate agencies and Tribes. As discussed in Section 5.2.11, Environmental Justice, the subsistence consumption of crops and wildlife radiologically contaminated with argon-41 would not be harmful because argon-41, the only radionuclide of concern, has a half-life of 1 hour and 48 minutes and decays into a stable isotope of potassium that is not harmful to human health in small quantities.

1-3: Environmental Justice issues were considered in the *TA-18 Relocation EIS* as required by Executive Order 12898. An analysis of potential environmental justice impacts concluded there would be no disproportionately high and adverse environmental impacts on minority and low-income populations due to any of the LANL alternatives. The minority and low-income setting within a 50-mile (80-kilometer) radius of LANL is provided in Section 4.2.10, while the impacts to these populations are discussed in Section 5.2.11.

Commentor No. 2: U.S. Department of the Interior, Glenn B. Sekavec

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Post Office Box 649
Albuquerque, New Mexico 87103

IN REPLY REFER TO:

September 28, 2001

ER 01/771

Carol M. Borgstrom, Director
Office of NEPA Policy and Compliance (EH-42)
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585

Dear Ms. Borgstrom:

The U.S. Department of the Interior has reviewed the Draft Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory, DOE/EIS-319D and, in this regard, has no comment. Thank you for the opportunity to review this document. **2-1**

Sincerely,

Glenn B. Sekavec
Regional Environmental Officer

OCT 03 2001

Response to Commentor No. 2

2-1: NNSA appreciates the U.S. Department of the Interior's review of the *TA-18 Relocation EIS* and notes that the Department had no comment on the document.

Commentor No. 3: Lary Marks

202-586-0467

To The U.S. Department of ENeRgy/NNSA.
ATT. MR. Jay Rose DP-42

I am apposed To the movement of The LANL To The Nevada Test site
RE: We Allready have The contamation from The above ground Nuclear Test AT The Nevada Test site To contend with.
Plus The fact That The State of Nevada dose not have a Nuclear generation plant within our state, The federal government is still Trying To Dump The Nations Nuclear waste AT yucca mountian project. 3-1

This is a nother concern of the people here in our state. I Live 75 miles from yucca mountian. The E.I.R. Reports And Resorch has not Addressed any subject of sabatoge AT This site as of Date is your E.I.R. going To address This. 3-2

LARY MARKS
(702) 647-9525

Response to Commentor No. 3

3-1: The commentor's opposition to the NTS Alternative is noted. The *TA-18 Relocation EIS* does not address past practices, but rather the impacts of relocating TA-18 operational capabilities and materials. The DOE Nevada Environmental Restoration Division is tasked with the mission of identifying the nature and extent of past contamination, determining the risk to the public and the environment, and acting to protect or restore natural resources adversely affected by contamination. To ensure compliance with applicable regulations, the Environmental Restoration Division works closely with the State of Nevada. The commentor is referred to the Environmental Management Program website (i.e., www.nv.doe.gov/programs/envmgmt/default.htm) for more information on the Nevada Operations Office's Environmental Management Program. The commentor is also referred to the *Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250) for a discussion of impacts related to the Yucca Mountain project.

3-2: Issues related to the security of relocated TA-18 capabilities and materials, including sabotage, are covered in a classified appendix to the EIS, as discussed in Section 5.1. This information will be considered when NNSA issues a Record of Decision.

Commentor No. 4: INEEL Citizens Advisory Board, Stanley Hobson

Citizens Advisory Board

Idaho National Engineering and Environmental Laboratory

01-CAB-092

October 2, 2001

James J. Rose
Defense Programs (DP-42)
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. Rose:

The Site-Specific Advisory Board (SSAB) for the Idaho National Engineering and Environmental Laboratory (INEEL), also known as the INEEL Citizens Advisory Board (CAB), is a local advisory committee chartered under the Department of Energy's (DOE) Environmental Management SSAB Federal Advisory Committee Act Charter.

Attached you will find Recommendation #86 approved by the consensus of the full INEEL CAB. It provides our joint recommendation relating to the Draft Environmental Impact Statement for the Proposed Relocation if Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory.

We await your response to our recommendation.

Sincerely,

Stanley Hobson
Chair, INEEL Citizens Advisory Board

cc: Warren Bergholz, DOE-ID
Jessie Roberson, DOE-HQ
Martha Crosland, DOE-HQ
Fred Butterfield, DOE-HQ
Governor Dirk Kempthorne
Larry Craig, U.S. Senate
Mike Crapo, U.S. Senate
Mike Simpson, U.S. House of Representatives
Butch Otter, U.S. House of Representatives
Robert L. Geddes, President Pro-Tem, Idaho Senate
Laird Noh, Chair, Idaho Senate Resources and Environment Committee
Bruce Newcomb, Speaker, Idaho House of Representatives
JoAn Wood, Chair, Idaho House Resources and Conservation Committee
Jack Barraclough, Chair, Idaho House Environmental Affairs Committee
Gerald Bowman, DOE-ID
Kathleen Trever, State of Idaho INEEL Oversight
Wayne Pierre, U.S. Environmental Protection Agency Region X
John Sackett, Argonne National Laboratory - West

Jason Associates Corporation • 477 Shoup Avenue, Suite 201 • Idaho Falls, Idaho 83402
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http://www.ida.net/users/cab

Response to Commentor No. 4

Commentor No. 4: INEEL Citizens Advisory Board, Stanley Hobson (Cont'd)

Citizens Advisory Board
Idaho National Engineering and Environmental Laboratory

Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory

The Idaho National Engineering and Environmental Laboratory (INEEL) Citizens Advisory Board (CAB) has reviewed the Draft Environmental Impact Statement (EIS) on the Proposed Relocation of Technical Area 18 (TA-18) Capabilities and Materials at the Los Alamos National Laboratory (LANL).

The INEEL CAB considered the possibility of relocating TA-18 capabilities and materials to Argonne National Laboratory – West as a possible "new mission" for the INEEL. Based on our understanding of the Draft EIS and the alternatives described and evaluated in the document, however, we conclude that it makes little sense to willingly separate operational functions of a process between two locations because efficiencies of operation would likely be severely reduced. If separation were desirable to enhance security, then perhaps the inherent loss of organizational efficiency would be overridden. We note that no justification for separation of functions (that is, security considerations) is presented in the Draft EIS. 4-1

Absent such a justification, the INEEL CAB is opposed to splitting of the TA-18 capabilities and materials between LANL and a remote site. Therefore, **the INEEL CAB recommends that the TA-18 capabilities and materials remain at LANL.**

RECOMMENDATION # 86 October 1, 2001
Page 1

Response to Commentor No. 4

4-1: The commentor's opposition to splitting the TA-18 capabilities and materials is noted. NNSA recognizes that there may be inefficiencies involved in locating TA-18 capabilities and materials at two locations; however, this does not make such an alternative unreasonable. As noted in Question 2a of the Council on Environmental Quality's 40 Most Asked Questions, reasonable alternatives include those that are practical or feasible from a technical and economic standpoint. Since alternatives that involve splitting TA-18 capabilities and materials meet this criterion, they are considered reasonable and have been fully analyzed.

Commentor No. 5: The Shoshone-Bannock Tribes, Diana K. Yupe

The SHOSHONE-BANNOCK TRIBES

FORT HALL INDIAN RESERVATION
PROJECT DIRECTOR (208) 478-3792
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TRIBAL/DOE PROJECT
PIMA DRIVE
P. O. BOX 306
FORT HALL, IDAHO 83203

October 1, 2001

Mr. James J. Rose
Defense Programs (DP-42)
National Nuclear Security Administration
U. S. Department of Energy
1000 Independence Avenue, S. W.
Washington, D. C. 20585

Dear Mr. Rose:

The Shoshone-Bannock Tribes coordinate with the U.S. Department of Energy—Idaho Operations Office regarding DOE issues. Our tribal program provides input to the issues after significant review. In regards to the Proposed Relocation of Technical 18, Capabilities and Materials at the Los Alamos National Laboratory we received the summary document. This project affects our tribal interests because the project may affect transportation across the Fort Hall Indian Reservation and cause ground disturbing activity on the Idaho National Engineering and Environmental Laboratory (INEEL). The INEEL resides on the aboriginal tribal territory of the Shoshone-Bannock Tribes and affects tribal interests.

Our tribal program staff reviewed the Draft Environmental Impact Statement summary for the Proposed Relocation of Technical Area 18 Capabilities and Materials of the Los Alamos National Laboratory. Upon reviewing the document we identified concerns regarding the proposed alternative at the Argonne National Laboratory-West, near Idaho Falls, Idaho.

The DOE-INEEL site lies in close proximity to the Fort Hall Indian Reservation. As stated earlier, the INEEL is located on aboriginal territory and DOE has a trust responsibility to the Tribes and to the residents of the Fort Hall Indian Reservation. A major tribal concern regards the trust responsibilities that DOE, as a federal agency, has to the Tribes and the process for compliance to the Tribes' sovereign government. 5-1

Furthermore, in light of the recent fire seasons, especially those experienced in Idaho it is important that DOE prepare a specific wild land fire preparedness plan that should 5-2

1

Response to Commentor No. 5

5-1: DOE and NNSA recognize the unique interest the Shoshone-Bannock Tribes have in the management of INEEL and ANL-W resources and continue to consult with the Tribes in a government-to-government relationship. DOE formalized its relationship in 1998 with the Shoshone-Bannock Tribes in an "Agreement in Principle Between the Shoshone-Bannock Tribes and the United States Department of Energy" that provides a formal framework for consultation with the Tribes. In addition, DOE and the INEEL Cultural Resources Management Office consult regularly with representatives of the Shoshone-Bannock Tribes through meetings of the INEEL Cultural Resources Working Group. Formed in 1993, this Working Group meets informally with representatives of the Shoshone-Bannock Tribes to share information, coordinate fieldwork, and discuss cultural resource management issues at INEEL.

5-2: DOE prepared the *Idaho National Engineering and Environmental Laboratory Wildland Fire Management Guide* (GDE-7063) to guide activities to prepare for and fight wildfires on the INEEL site. This Guide will be revised for the 2002 fire season based on analysis in the *Environmental Assessment for Idaho National Engineering and Environmental Laboratory Wildland Fire Management* (DOE/EA-1372), which is currently in preparation. The revised *INEEL Wildland Fire Management Guide* will include guidance for alternate transportation routes and recovery efforts after fires are put out. Recovery efforts may include revegetation and other erosion and dust control measures. Argonne National Laboratory-West uses the *INEEL Wildland Fire Management Guide*.

Commentor No. 5: Shoshone-Bannock Tribes, Diana K. Yupe (Cont'd)

accompany this EIS. The plan should also address additional personnel, equipment, and any site-specific hazards. It is also important to identify sufficient alternate transportation/evacuation routes to and from Argonne-West if a fire inhibits travel for extended periods of time or in the event of the immediate danger. In prior fires on the INEEL evacuation routes to and from Argonne was a major concern. **5-2 (Cont'd)**

In regards to the infrastructure already in place at the Argonne-West facility and its entire compound, are there adequate roads, parking lots, and power sources? In addition are there sufficient potable water sources to support increased and extended use on the entire compound? **5-3** Are there plans and funds in place to ensure proper environmental monitoring of the TA-18 activities on the air, water, soil, flora, and fauna? Subsequently, the question of maintenance responsibility arises that may address the question about responsible personnel that will be responsible for the environmental monitoring and who are the participants? The EIS fails to identify these important issues. **5-4**

The plan says the TA-18 activities can expect to run for 25 years. A D&D outline is included, however, funding is not mentioned. What mechanisms or budgetary plans are in place to address funding to start and complete the D&D activities? Who will be responsible? Who are the participants? Has the Long-Term Stewardship and D&D programs reviewed and commented on this document and what plans were proposed, if any? **5-5**

The plan also discusses the transportation of materials and support equipment from Los Alamos to the new site. The Shoshone-Bannock Tribes are deeply concerned about DOE materials crossing the Fort Hall Indian Reservation. With respect to this EIS the question of transportation crossing the Fort Hall Indian Reservation requires significant consultation with the tribal government. What process will be pursued regarding the transportation issue as well as development of plans to mitigate transportation to and from the INEEL. **5-6**

The INEEL is a vast and diverse facility, governed by many state and federal regulations. Does the EIS address the means and ways of complying with the state and federal regulations already in place at the INEEL? The Tribes should have access to a comprehensive compliance plan for adhering to DOE-ID regulations. DOE has a responsibility to ensure that the land and all of its occupants are working together. A successfully executed plan is one that not only addresses the impacts and concerns regarding the land but also its occupants. **5-7**

Another tribal concern addresses the important issues that Argonne National Laboratory-West is located within a culturally sensitive area to the Shoshone-Bannock Tribes. The EIS summary fails to address, or summarize, cultural resource issues. Therefore it appears that the EIS is flawed. It will be important to learn or gain documents that identify if a recent cultural resource survey done on the proposed area? This area is also a sensitive area for cultural resources not specific to Argonne. This means that the area surrounding the Argonne site has significant potential to possess cultural resources, as it is defined in the National Historic Preservation Act and as the cultural resource definition **5-8**

2

Response to Commentor No. 5

5-3: Impacts to site infrastructure from the proposed relocation of TA-18 operational capabilities and materials to ANL-W are analyzed in Section 5.5.2. The analysis concluded that existing INEEL and ANL-W infrastructure resources would be adequate to support the proposed mission over 25 years.

5-4: ANL-W presently has an extensive monitoring program in place. The results of this program are presented in annual environmental surveillance reports. The monitoring program at ANL-W would be expanded to accommodate new TA-18 missions at the site as required.

5-5: Issues related to decontamination and decommissioning of TA-18 activities are presented in Section 5.7. As stated in that section, prior to initiating decommissioning activities, a detailed decontamination and decommissioning plan would be prepared. An integral part of that plan would be a credible site-specific cost estimate for all activities required to ensure that decommissioning is conducted in a timely manner and that potential impacts on the health and safety of workers, the general public, and the environment is minimized. Separate NEPA documentation would be undertaken prior to the commencement of decontamination and decommissioning activities. NNSA is committed to the safe operation and long-term stewardship of any facilities chosen for the relocation of TA-18 missions. As part of that commitment, NNSA will ensure that sufficient funding is available to undertake decontamination and decommissioning activities at the appropriate time.

5-6: As described in Appendix D, Section D.5, of the *TA-18 Relocation EIS*, the carrier for shipments of special nuclear material would be DOE's Transportation Safeguards Division. The transportation of special nuclear materials is the subject of detailed planning within the Transportation Safeguards Division. The dates and times that specific transportation routes would be used for special nuclear materials are classified information. As stated in Section D.7.1 of the EIS, NNSA has not yet completed the details of the shipping plan. That comes after site selection. As discussed in Section 3.1.2, NNSA has made a concerted effort to reduce unnecessary site inventory and would only transport the minimum amount of material necessary to support the forecasted mission. Based on the siting decision, NNSA would consult with affected parties, as stipulated in existing agreements, to develop transportation and emergency response plans.

Commentor No. 5: Shoshone-Bannock Tribes Diana K. Yupe (Cont'd)

is viewed by the Shoshone-Bannock Tribes. It will be interesting to see if a cultural resources section was included in the EIS document but failed to be summarized in the Summary document.

In the event that inadvertent discovery subsurface during ground disturbance is uncovered, be aware that NAGPRA as well as other cultural resource laws come into effect. We recommend that a **"stop work"** policy be put into effect in the event that there is an inadvertent discovery. Notification procedures to contractors, surrounding counties, Idaho State Historic Preservation Office, as well as the Shoshone-Bannock Tribes should be implemented. **5-8 (Cont'd)**

The Shoshone-Bannock Tribal DOE Office appreciates the opportunity to provide technical comments to the proposed relocation of TA-18. Should there be any questions or concerns, feel free to contact Christina Cutler, Project Environmentalist at (208) 478-3740 or contact me at (208) 478-3706 or e-mail me at heto@poky.srv.net

Sincerely,

Diana K. Yupe
Program Interim Director

Cc: S. Timbana/Tribal DOE
File/DOE:TA18

3

Response to Commentor No. 5

5-7: Chapter 6 of the *TA-18 Relocation EIS* addresses environmental, occupational safety and health permit, compliance, and other regulatory requirements associated with relocation of TA-18 operational capabilities and materials to ANL-W. An important part of any NEPA document is analysis of the potential impacts of a project on potentially affected populations. Accordingly, the EIS has analyzed such issues as human health, environmental justice, waste management, air quality, noise, and water quality. Further, NNSA has conducted scoping meetings and public hearings to receive input and comments regarding the proposed TA-18 relocation.

5-8: Native American resources are addressed in the *TA-18 Relocation EIS*. Section 4.5.8.3 addresses the existing environment in relation to Native American resources at ANL-W, while Section 5.5.8.3 discusses impacts to these resources. Although prehistoric Native American resources have been found in the vicinity of ANL-W, due to the developed nature of the site the likelihood of discovering undisturbed material during construction of new facilities would be slight. As stated in Section 5.5.8.3, preconstruction cultural resource surveys would be conducted. Further, if any Native American resources were located during construction, work would stop while appropriate action was taken, including notification of appropriate agencies and tribal representatives.

Commentor No. 6: State of New Mexico Environment Department, Peter Maggiore

Response to Commentor No. 6

State of New Mexico
ENVIRONMENT DEPARTMENT
Office of the Secretary
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502-6110
Telephone (505) 827-2855
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GARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
SECRETARY

PAUL R. RITZMA
DEPUTY SECRETARY

September 17, 2001

James J. Rose
Defense Programs (DP-42)
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Ave., S.W.
Washington, D.C. 20585

Dear Mr. Rose:

RE: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED RELOCATION OF TECHNICAL AREA 18 CAPABILITIES AND MATERIALS AT THE LOS ALAMOS NATIONAL LABORATORY (TA-18EIS) [DOE/EIS-0319D]; AUGUST 2001

This transmits New Mexico Environment Department (NMED) comments concerning the above-referenced Draft Environmental Impact Statement (DEIS).

HAZARDOUS WASTE

Background:

The U.S. Department of Energy (DOE) proposes to relocate the TA-18 mission operational capabilities and materials to a new location and continue to perform operations at the new location. The primary operation at TA-18 is the performance of criticality experiments. Criticality experiments involve systems of fissile material(s), called critical assemblies, which are designed to reach a condition of nuclear criticality. Fissile material that can be used in a critical assembly is typically one of the following five main isotopes: uranium-233, uranium-235, neptunium-237, plutonium-239, or plutonium-241. A neutron source may be placed near the assembly to ensure that the fission rate of the critical assembly can be readily observed as it approaches and reaches criticality. Critical assemblies at TA-18 are designed to operate at low-to-average power and temperatures below the fissile material temperature operating limits (which sets them apart from normal reactors), with low fission-product production and minimal fission-product inventory.

Special nuclear materials (SNM) are defined in the Atomic Energy Act as (1) plutonium, uranium enriched in the isotope 233 or 235, or any other material designated as SNM; or (2) any material artificially enriched by any of the above. Quantities of SNM are categorized into security

Commentor No. 6: State of New Mexico Environment Department, Peter Maggiore (Cont'd)

James J. Rose
September 17, 2001
Page 2

Categories I, II, III, and IV, with the greatest quantities included under security Category I and lesser quantities included in descending order under security Categories II through IV. At TA-18, SNM is stored in either Critical Assembly Storage Areas (CASAs) or in the Hillside vault. The onsite TA-18 nuclear material inventory is relatively stable and consists primarily of isotopes of plutonium and uranium. The bulk of the plutonium is metal and is either clad or encapsulated. The use of toxic and hazardous materials at TA-18 is limited.

This DEIS evaluates four alternatives for the proposed action, as well as the TA -18 Upgrade Alternative and the No Action Alternative. The proposed action includes: transport of critical assembly machines and support equipment to a new location; modification of existing facilities to support the TA -18 missions; or construction and operation of new facilities to support the TA -18 missions. Relocation of TA -18 mission operations would also include transport of approximately 2.4 metric tons of SNM associated with the TA-18 missions and a range of disposition options associated with the existing TA-18 facilities that would be vacated if the mission operations are relocated. The analysis assumes that construction would start in 2004 to 2005 and be completed sometime in 2007 to 2008.

The preferred alternative is the relocation of TA -18 operations to a different site at Los Alamos. This alternative involves the relocation of TA-18 operational capabilities and materials associated with security Category I/II activities to new buildings northwest of the existing Plutonium Facility in LANL's TA -55 and extension of the existing TA -55 Perimeter Intrusion Detection and Assessment System. Under this alternative, a portion of the security Category III/IV activities (the Solution High-Energy Burst Assembly - SHEBA) would either be relocated to a new structure at TA-39 or remain at TA-18. The rest of the security Category III/IV activities would either be relocated to a new structure at TA -55 or remain at TA -18.

Comments:

The NMED supports the relocation of TA -18 operations because all alternatives would reduce potential radiological impacts to the public compared to existing operations at TA -18. It is not clear from the DEIS what level of NEPA review will be conducted as decisions are contemplated regarding the relocation of the security Category III/IV activities. We also expect that alternatives considered in the decontamination and decommissioning of TA-18 would be subject to NEPA analysis. **6-1**

Apparently, the analysis of radiological impacts is based only on estimated exposure to airbome activation products, specifically argon-41. The analysis should include possible exposure by the public (for example, persons living in Royal Crest Trailer Park, approximately one-half mile north of the planned new facility) and workers to direct penetrating radiation and neutrons generated by operations. **6-2**

AIR QUALITY

The facility and surrounding area are currently considered to be in attainment with all state and federal national ambient air quality standards. The proposed construction of new Category I/II operations buildings and relocation of TA –18 operational capabilities and materials toe the new location does not conflict with New Mexico's air quality laws and regulations.

The DEIS addresses short-term high concentrations of total suspended solids during construction but does not mention fugitive dust control measures for the soil excavated during **6-3**

Response to Commentor No. 6

6-1: NNSA believes that the *TA-18 Relocation EIS* provides sufficient coverage for the relocation of Category III/IV activities. Section 1.2, which describes the proposed action, EIS scope, and alternatives, states that the EIS covers both Category I/II and Category III/IV activities. Issues related to decontamination and decommissioning of TA-18 activities are presented in Section 5.7. Since the ultimate disposition of TA-18 has not been determined, DOE plans to analyze the impacts of the eventual decontamination and decommissioning of TA-18 as part of a separate NEPA action.

6-2: Public and worker exposure to direct penetrating radiation and neutrons generated by TA-18 activities at LANL or alternative sites is considered and addressed in the Final EIS. As explained in Section 5.2.10.1 of the Final EIS, no member of the public would be exposed to a direct dose (i.e., neutrons or gamma radiation) from TA-18 operations at the proposed new underground facility at TA-55. This is because the facility would be designed to minimize the potential dose to workers outside the experimental bay area when critical experiments are being performed. The nearest member of the public would receive essentially zero direct dose. In addition, residents of Royal Crest Trailer Park, located more than 900 meters (2,950 feet) north of the proposed new facility, also would not receive any direct dose.

6-3: Section 5.9 has been revised to describe specific examples of fugitive dust control and reclamation measures that would be implemented during construction. Asphalt contractors would be required to have current air quality permits prior to working at any DOE or NNSA site.

Commentor No. 6: State of New Mexico Environment Department, Peter Maggiore (Cont'd)

James J. Rose
September 17, 2001
Page 3

construction. Reclamation measures should be taken after completion of the project to stabilize the soil disturbed by the contractor yard, laydown area and the building site to minimize long-term dust impacts. You may contact Mr. Steve Dubyk at (505) 955-8025 for information about the best available control technology (BACT) for fugitive dust. In addition, contractors supplying asphalt for the project must have current air quality permits. **6-3 (Cont'd)**

We appreciate the opportunity to comment on this document. Please let us know if you have any questions on the above.

Sincerely,

Peter Maggiore

Peter Maggiore
Secretary

NMED File No. 1494ER

Response to Commentor No. 6

Commentor No. 7: Anonymous

environmental impact statement

NNSA

relocation

DRAFT EIS MEETING
COMMENT FORM

1. Are there issues that need to be addressed in the TA-18 Relocation EIS that are not included in the Draft?

No

2. Besides the alternatives discussed in the Draft, are there other alternatives you feel the Department of Energy should consider?

No

3. What other comments do you have on the Draft TA-18 Relocation EIS?

In the interest of safety and economics, I prefer the construction of a new facility at Los Alamos. 7-1

(Please continue on the other side if additional space is needed.)

There are several ways to provide comments on the Draft TA-18 Relocation EIS. These include:

- attending public meetings and giving your comments directly to DOE/NNSA officials
- returning this comment form to the registration desk at the meeting or to the address below
- faxing your comments to: (202) 586-0467
- commenting via e-mail: james.rose@ns.doe.gov

Name (optional):

Organization:

Home/Organization Address (circle one):

City: State: Zip Code:

Telephone (optional):

COMMENTS MUST BE POSTMARKED BY OCTOBER 26, 2001

For more information contact: Jay Rose, DP-42 National Nuclear Security Administration U.S. Department of Energy 1000 Independence Avenue, S.W. Washington, DC 20585
Toll-free Telephone: 1-866-357-4345 Fax: (202) 586-0467 Email: James.Rose@ns.doe.gov

10/01

DEPARTMENT OF ENERGY

Response to Commentor No. 7

7-1: The commentor's support for the LANL New Facility Alternative is noted.

Commentor No. 8: William L. Partain

environmental impact statement

NNSA

relocation

DRAFT EIS MEETING
COMMENT FORM

1. Are there issues that need to be addressed in the TA-18 Relocation EIS that are not included in the Draft?

2. Besides the alternatives discussed in the Draft, are there other alternatives you feel the Department of Energy should consider?

3. What other comments do you have on the Draft TA-18 Relocation EIS?
I strongly support the preferred alternative. Second preference is to perform the upgrades at the present TA-18 site — 8-1

(Please continue on the other side if additional space is needed.)

There are several ways to provide comments on the Draft TA-18 Relocation EIS. These include:

- attending public meetings and giving your comments directly to DOE/NNSA officials
- returning this comment form to the registration desk at the meeting or to the address below
- faxing your comments to: (202) 586-0467
- commenting via e-mail: james.rose@ns.doe.gov

Name (optional): William L. Partain

Organization:

Home/Organization Address (circle one): 83 Barcelona Ave

City: Los Alamos State: NM Zip Code: 87544

Telephone (optional): 505-672-1672

COMMENTS MUST BE POSTMARKED BY OCTOBER 26, 2001

For more information contact: Jay Rose, DP-42 National Nuclear Security Administration U.S. Department of Energy 1000 Independence Avenue, S.W. Washington, DC 20585
Toll-free Telephone: 1-866-357-4345 Fax: (202) 586-0467 Email: James.Rose@ns.doe.gov

10/01 DEPARTMENT OF ENERGY

Response to Commentor No. 8

8-1: The commentor's preference for the LANL New Facility Alternative is noted, as well as his second preference for the TA-18 Upgrade Alternative.

Commentor No. 9: Thomas F. Stratton

Mr. Roger L. Dintaman
Office of Facilities Management - DP17
U.S. Department of Energy

Dear Mr. Dintaman:

Several people have commented to me about proposals to move the critical assembly facilities at Los Alamos National Laboratory to a different laboratory, or to a different site within LANL. The reasons given for the proposed move seem to be financial, related to the cost of safeguarding SNM at LANL TA-18.

The proposal which concerns me most, and which seems to have the most support, is to move the TA-18 critical assembly facility to TA-55, the plutonium fabrication facility on Pajarito Road. That seems to me to a very bad choice, and potentially would reduce the security of the U.S., insofar as we depend on a reliable nuclear weapons stockpile. My reasons for arriving at this conclusion are:

Reduced Safety: The founders of Los Alamos located the LASL critical assembly facility in Pajarito Canyon for a good reason - enhanced safety to non-operational laboratory personnel, and reduced hazard to other essential facilities, both achieved in a remote, protected, location. TA-18 is designed to allow critical assemblies of fissionable materials in various mechanical, geometrical and chemical formulations. The purpose of an experiment is to study new concepts, or modifications to existing designs, which necessarily entail the possibility that unpleasant things may happen when the experiment is outside experience. Unpleasant things in the case of nuclear criticality range from minor contamination to severe radiation exposure. A remote location, but still within the control and confines of an accredited nuclear design facility, is the most simple embodiment of safety. A move to TA-55 brings the critical assembly laboratory closer to the center of gravity of the LANL population, and most importantly, adjacent to the essential facility of the entire DOE nuclear weapons production and maintenance complex - the TA-55 pit rebuild and fabrication facility, which, after the standdown of Rocky Flats, is unique in the entire U.S. The chance of a criticality accident near the plutonium production facility cannot be allowed if the U.S. intends to rely on nuclear weapons as part of its defense posture. 9-1

Reduced Operational Flexibility: The two safety arguments advanced in the earlier paragraph - safety to personnel and safety to production facilities - dictate that a critical assembly facility at TA-55 will operate under reduced operational flexibility because of the greater risk from the very experiments that justify the facility. Computer experiments are safe, in the sense that they do not endanger persons and facilities. Computer experiments are not safe when they are not tested by experiment but lull the nation into false security. The technical community still debates the level of detail and accuracy with which modern computers predict the performance of the first atom bombs. If the capabilities of TA-18 when moved to TA-55 are reduced and restricted because of reduced safety and increased limitations on dose to non-operational workers at TA-55, TA-50, TA-48 and other nearby technical areas, then the need for an experimental critical facility within DOE should be examined anew. At the very least, the DOE should reassess its options for retaining the facility at its present location, or moving the capability to another laboratory which offers safety and 9-2

2

Response to Commentor No. 9

9-1: NNSA agrees with the commentor that the TA-18 location was selected for criticality experiments in 1947 because of its remoteness and the laboratory protection provided by the Pajarito Canyon walls. However, through the years the experiments evolved larger potential impacts that needed additional protective actions and restrictions (i.e., road closure, evacuation of personnel, security, etc.) before those experiments could be performed. The proposed relocation of critical assembly machines to an underground facility at TA-55 would allow criticality experiments to be performed with enhanced public and operational safety, and security. As explained in Section 5.2.10.2 of the EIS, impacts to the public and workers (including collocated workers) from critical assembly operational accidents at TA-55 would be extremely small. Therefore, relocation and operation of critical assembly machines at TA-55 would result in improved, rather than reduced, safety. In the event of a serious accident involving relocated TA-18 activities at TA-55, there could be a temporary disruption of the normal operations of neighboring facilities at TA-55.

9-2: The proposed underground facility at TA-55, along with its specific facility design, would be fully capable of meeting mission requirements as explained in Section 3.1.2 of the *TA-18 Relocation EIS*. Relocation of critical assembly machines to TA-55 would not reduce current TA-18 capabilities. In fact, the facility design would provide additional flexibility to the operation. As explained in Section 5.2.10.2 of the EIS, impacts to the public and workers (including collocated workers) from critical assembly operational accidents at TA-55 would be extremely small.

Commentor No. 9: Thomas F. Stratton (Cont'd)

operational characteristics similar to those that led to the selection of the site at TA-18 in the war years. **9-2 (Cont'd)**

Cost of Security, Operations, and Move: The reason for moving TA-18 was explained to me as cost of security - $12M per year. I do not find the cost argument persuasive. For starters, the cost of security at TA-18 is known. Every other cost associated with relocation - lost and reduced capabilities, new construction, security costs added to existing costs at TA-55, environmental reclamation of TA-18, redesign and fabrication of experiments and related control and data acquisition, are projections that should be considered as uncertain within a factor of three - not counting lost time. Twenty years of security at $240M in today's dollars is more certain, and certainly a fraction of the total direct cost of relocation. **9-3**

These, then, are the reasons I feel that moving the facilities at TA-18 to TA-55 is a bad idea. Defense Programs of DOE needs a critical assembly facility for use by its nuclear designers, its counter-proliferation scientists, and its nuclear environmentalists. Cost is an issue, yes, but if the cost of moving is a capability reduced to non-relevance to these constituents, then the loss to national security is not compensated by reduced costs directly attributable to operational security.

Sincerely yours,

Thomas F. Stratton
Fellow, Emeritus
Los Alamos National Laboratory

My credentials include a Ph.D. in experimental nuclear physics. I worked at Los Alamos from 1954 to 1993 in plasma physics, laser physics and weapons science. Major responsibilities included group leader for large CO2 lasers, project manager for a nuclear SDI concept, and chief scientist for the NPB program at LANL. In 1984-85 I was LANL liaison to ATSDAE, responsible for prompt, urgent communication under nuclear attack. I am now Vice-President and Director of La Mancha Company, a small business in Santa Fe, NM.

E-Mailed to Dintaman with cc to Malenfant on June 11, 2000.

3

Response to Commentor No. 9

9-3: While cost is one of the factors to be considered by the decision makers in the Record of Decision, it is beyond the scope of the *TA-18 Relocation EIS*, which focuses on assessing the potential environmental impacts of the proposed action and reasonable the alternatives.

Commentor No. 10: Donivan Porterfield

Mr. Donivan Porterfield
PO Box 1417
Los Alamos, NM 87544

October 26, 2001

Mr. Jay Rose
DP-42
National Nuclear Security Administration
U.S. Department of Energy
100 Independence Avenue, S.W.
Washington, DC 20585
Fax 202-586-0467

Dear Mr. Rose:

The comments below are on the draft Environmental Impact Statement for the proposed relocation of the TA-18 capabilities and materials.

Comment 1
Footnote d of Table 5-9 does not make it clear whether the number of workers is higher for the "new facility" alternative given the proximity to TA-48 and TA-55 and their respective workforce. In other words can the dose impact of the argon-41 be viewed as not contributing dose to workers at the proximate technical areas? **10-1**

Comment 2
Has the potential impact of the released argon-41 being drawn into TA-48 and/or TA-55 ventilation systems and impacting facility radiation systems been examined and eliminated as an operational impact? **10-2**

Comment 3
I'm disappointed that recommendations are not being made in this EIS as to the radiological monitoring that should be instituted to assure the pubic that radiological releases are within the quantities projected. **10-3**

Comment 4
I would appreciate receiving a paper copy of the final EIS. In part this reflects my inability to access some portions of the draft EIS on the internet. The "VolumeOne1.pdf" link ends at page 1-17 and the link "VolumeOne2a.pdf" starts at page 3-20. **10-4**

Sincerely yours,

Mr. Donivan Porterfield

Response to Commentor No. 10

10-1: The number of workers currently supporting TA-18 activities is 210. The workforce supporting security Category I/II activities are projected to be about 100 persons. The remaining workforce supports security category III/IV and SHEBA activities. The workforce dose of 21 person-rem per year provided in Table 5-9 is the collective dose to all personnel at TA-18. For the purposes of analysis (see Section 3.2.1), it was assumed that this dose is independent of the location where the support activities would be performed. The dose is conservative because operations would be performed in radiologically confined and secured buildings, leading to lower average doses. The collective dose of 21-person-rem per year is an actual recorded dose to all personnel at TA-18, leading to an average dose of 100 millirems to an individual worker, as indicated in the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*. This dose includes all sources of external and direct radiation, including the worker's exposure to any argon-41 in the air. The argon-41 dose is a very small fraction of the total dose received. This dose is not a contributing factor to worker doses at nearby technical areas.

10-2: Argon-41 production at TA-55 from criticality experiments at a new facility would be orders of magnitude smaller than the amount produced at the existing TA-18 facilities. This is because the experiments would be performed within a confined facility with limited air volume – a source of argon activation – compared to that used for evaluation purposes (120-meter hemisphere air volume), as explained in Section 3.2.1. In addition, any argon-41 produced in the new facility would be mixed with the facility air exhaust system and released to the environment, leading to a smaller argon-41 concentration in the air. Further, since argon-41 decays rapidly (less than 2 hours of half-life) and neighboring facility air intake systems are located at some distance and at a lower elevation than the exhaust system of the proposed new LANL facility, the potential for worker exposure from argon-41 is minimal. In fact it would be orders of magnitude less than the worker exposure at TA-55 or TA-48 from other sources.

10-3: As discussed in Sections 5.2.10.1, 5.3.10.1, 5.4.10.1, 5.5.10.1, and 5.6.3.10, radiological impacts from operations at TA-18 or other alternative sites would be small. All sites currently implement environmental monitoring programs, including radiological, the results of which are published in annual environmental effluent reports. TA-18 operations will be included in any site-wide program.

10-4: A copy of the *TA-18 Relocation Final EIS* is being mailed to the commentor.

Commentor No. 11: Vernon J. Brechin

From: Vernon Brechin [vbrechin@igc.org]
Sent: Friday, October 05, 2001 10:03 AM
To: james.rose@ns.doe.gov
Cc: info@lasg.org
Subject: LA TA-18 DEIS Comments

Friday, October 5, 2001

Vernon J. Brechin
255 S. Rengstorff Ave. #49
Mountain View, CA 94040-1734
650/961-5123

Attn: Mr. Jay Rose
DP-42
Independence Avenue, SW
Washington, DC 20585
866/357-4345

RE: TA-18 Relocation Draft EIS Comments

Dear Mr. Rose:

Thank you for the opportunity of commenting on the proposed relocation of the Los Alamos National Laboratory Technical Area 18 facilities. I hope you will use my comments in the formulation of the Final EIS. I also hope you will display all received comments, verbatim, in numerous public places, as well as in the F-EIS. I urge you to select the "No Action Alternative." The "NTS Alternative" should be removed from your consideration. 11-1 11-2

My comments refer to the D-EIS Summary (DOE/EIS-319D August) report and should be extended to the full EIS where applicable. 11-3

The map figure, shown in Figure S-23 Location of NTS (page S-44), contains boundary and location errors. The boundary of the Pahute Mesa portion of the NTS was revised, by Congress, over two years ago. Area 13 is not located accurately and it is shown to be much larger than it actually is. The practice of the NNSA's Nevada Operations Office failing to supply current and accurate maps of the NTS has been common. 11-4

Any portion of the full report that covers the cumulative environmental impacts of the proposed plan, to relocate to the DAF facility at the NTS, should mention the NTS report which estimated that a partial clean-up of the NTS could cost up to $7.3 trillion. 11-5

Please refer to, and cite, Pub.L. 106-65, Div. B, Title XXX, Subtitle A, § 3011(b), Oct. 5, 1999, The Military Land Withdrawal Act of 1999. 11-4

Also cite the DOE report "Focused Evaluation of Selected Remedial Alternatives for the Underground Test Area (DOE/NV--465), April 1997. The $7.3 trillion figure appears in a summary table on page 8-3. 11-5

Thank you for considering these comments.

Sincerely,

Vernon Brechin

Response to Commentor No. 11

11-1: All comments received on the *TA-18 Relocation Draft EIS* are given full and equal consideration. Comments received during the comment period, which began on August 17, 2001, and ended on October 26, 2001, are reproduced in their entirety in this appendix. It should be noted that copies of the Final EIS, including scanned images of each comment document received during the public comment period and respective responses from NNSA, are placed in public reading rooms and are sent to anyone requesting a copy. Thus, the public's comments and NNSA's responses are readily available to the public.

11-2: The commentor's support for the No Action Alternative is noted. While NNSA also notes the commentor's opposition to the NTS Alternative, this alternative was determined to be reasonable under NEPA guidelines and therefore was fully evaluated in the EIS.

11-3: Each of the commentor's comments was applied to the entire *TA-18 Relocation EIS* where applicable.

11-4: The NTS boundary shown in Figure S-23 was corrected along with the location and size of Area 13. Appropriate changes were also made to Figures 4-22 and 4-30. It should be noted that Area 13 officially is known as Nellis Air Force Range Complex Area 13. This area was the location for a plutonium-dispersal safety experiment conducted in 1957. The only future DOE activities that would occur in this area would involve environmental restoration.

11-5: While cost is one of the factors considered by the decision makers in the Record of Decision, it is beyond the scope of the *TA-18 Relocation EIS*, which focuses on assessing the potential environmental impacts of the proposed action and reasonable alternatives.

Commentor No. 12: U. S. Environmental Protection Agency, Robert D. Lawrence

11/08/2001 04:39 FAX 2022876494 NCI D ⌀002
NOV-28-2001 14:39 P.02/04

October 26, 2001

Mr. James J. Rose
Document Manager
Office of Environmental Support (DP-42)
Defense Programs
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Rose:

In accordance with our responsibilities under Section 309 of the Clean Air Act, the National Environmental Policy Act (NEPA), and the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA, the Region 6 Office of the U.S. Environmental Protection Agency (EPA) has completed the review of the Draft Environmental Impact Statement (DEIS) for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory, Los Alamos, New Mexico.

The following comments are now offered for your consideration in the development of the Final EIS (FEIS).

1. Comments received during the scoping process indicated that the public wanted more information regarding accident histories. The "Accident History" sections provided for the sites in question should provide sufficient information to address this concern. Any critical accidents should be well documented. Please address this concern in the FEIS. **12-1**

2. The DEIS needs to address the weapons related nature of the operations and how that nature relates to current operations at the sites under consideration. Many DOE sites are in the process of redefining their character and role for the future and the local and state communities have a stake in those discussion. The weapons-directed nature of the work should be considered and discussed in the FEIS. **12-2**

EPA classifies your DEIS and proposed action as "EC-2," i.e., EPA has "Environmental Concerns and Requests Additional Information". This information will strengthen the FEIS. Our classification will be published in the Federal Register according to our responsibility under Section 309 of the Clean Air Act, to inform the public of our views on proposed Federal actions.

6ENXP:MJANSKY:mj:102601:DOE:DEIS:LANA TECHNICAL 18 CAPABILITIE

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Response to Commentor No. 12

12-1: The discussion of accident histories for each DOE site (Sections 4.2.11.4, 4.3.11.4, 4.4.11.4, and 4.5.11.4) was revised to include a summary of criticality accidents pertaining to the activities of TA-18. As noted in *A Review of Criticality Accidents, 2000 Revision*, LA-13638, by the Los Alamos National Laboratory, criticality accidents have occurred at LANL and INEEL; however, they have not been recorded for SNL/NM or NTS.

12-2: Section 3.1.1 describes the operational capabilities of LANL's TA-18 facilities, including its potential role in support of stockpile stewardship. Stockpile stewardship, a principal mission responsibility of NNSA, involves the development and application of scientific and technical capabilities to assure the continued safety and reliability of U.S. nuclear weapons in the absence of underground testing. As explained in Section 3.1.1, TA-18 facilities do not currently support the nuclear weapons program, but have the capability to eventually provide data specifically for stockpile stewardship. With respect to the sites, LANL, SNL/NM, and NTS directly support stockpile stewardship and the nuclear weapons program. While not an NNSA site, ANL-W provides research and development support to NNSA's tritium program.

Commentor No. 12: U.S. Environmental Protection Agency, Robert D. Lawrence (Cont'd)

11/08/2001 04:40 FAX 2022876494 NCI D 003
NOV-08-2001 14:39 P.03/04

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We appreciate the opportunity to review the DEIS. We request that you send our office five (5) copies of the FEIS at the same time that it is sent to the Office of Federal Activities (2251A), EPA, 1200 Pennsylvania Avenue, N.W., Washington, D.C. 20044.

Sincerely yours,

Robert D. Lawrence, Chief
Office of Planning and Coordination

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Response to Commentor No. 12

Commentor No. 12: U.S. Environmental Protection Agency, Robert D. Lawrence (Cont'd)

11/08/2001 04:40 FAX 2022876494 NCI D 004
NOV-08-2001 14:40 P.04/04

SUMMARY PARAGRAPH FORM

ERP NUMBER D-DOE-G06012-00

TITLE: TECHNICAL AREA 18 RELOCATION LOS ALAMOS NATIONAL LABORATORY, NEW MEXICO

RATING ASSIGNED TO PROJECT EC-2

NAME OF EPA OFFICIAL RESPONSIBLE MIKE JANSKY
309 COORDINATOR

SUMMARY OF COMMENT LETTER

EPA has expressed environmental concerns and has requested additional information in the areas of accident history and weapons operations to strengthen the FEIS..

PARAGRAPH APPROVED FOR PUBLICATION ______ (Initials of Approving Official)

TOTAL P.04

4

Response to Commentor No. 12

Commentor No. 13: Nuclear Watch of New Mexico, Colin King

nuclear watch new mexico

October 18, 2001

Mr. James Rose
Defense Programs (DP-42)
National Nuclear Security Administration
U.S. Department of Energy
1000 Independence Ave, S.W.
Washington, DC 20585

Dear Mr. Rose,

Nuclear Watch of New Mexico submits the following comments on the Draft Environmental Impact Statement (DEIS) for the **Proposed Relocation of Technical Area 18** (TA-18) **Capabilities and Materials at the Los Alamos National Laboratory** (LANL) [NNSA/EIS-0319D]. Our apologies for the delayed submission of these comments. Like many public and private businesses after September 11, 2001, the programmatic work of Nuclear Watch of New Mexico had to be carefully recalibrated, causing delays to our near-term goals.

Lack of stated mission for TA-18 relocation activities

The Draft Environmental Impact Statement for the **Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory**, (hereinafter the DEIS) fails to outline the proposed mission of relocated TA-18 facilities. The DEIS must clearly disclose what the future mission of relocated TA-18 activities are in a manner that is more indepth than is currently provided. **13-1** The current statement of Purpose and Need for Action [1] is inadequate and NNSA does not define a true purpose and need for the relocation of TA-18 activities. According to the Council on Environmental Quality (CEQ), the statement of purpose and need shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action. (CEQ Regulations for Implementing National Environmental Policy Act (NEPA) 40 CFR 1502.13) For example, NNSA provides no description of TA-18 s support of plutonium pit production and certification (including hydrotesting), a distinct possibility given the preferred TA-55 location. **13-2** Also, because NNSA provides its preferred alternative at TA-55 without a concrete discussion of why TA-55 is preferred makes it appear that NNSA has pre-determined its decision without appropriate participatory decision making among government agencies and the public as is required by NEPA. DOE NEPA Implementing Regulations also state that DOE shall complete its NEPA review for each DOE proposal before making a decision on the proposal (10 CFR 1021.210) **13-3**

Furthermore, how will the mission of TA-18 operations, current and near-future, be impacted and or modified by relocation to another site. **13-4** Appendix A of the DEIS provides descriptions of the critical assemblies, however, those descriptions fail to provide validity to the NNSA s claim of the importance of maintaining those individual critical assemblies. Additionally, the National Nuclear Security Administration (NNSA) fails to outline why those critical assemblies are relevant to NNSA operations. Appendix A also fails to provide an analytical overview of critical assembly operations and the purpose for those operations. **13-5** The CEQ stated that Environmental impact statements shall be analytical rather

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Response to Commentor No. 13

13-1: Current TA-18 mission operations and the facilities, personnel, and materials required to support them are described in detail in Section 3.1 of the *TA-18 Relocation EIS*. The EIS also outlines each ongoing TA-18 mission operation, including Nuclear Materials Management and Criticality Safety, Emergency Response, Nonproliferation and Safeguards and Arms Control, and Stewardship Science. As stated in Section 3.1, NNSA would continue to perform these current TA-18 mission operations at a new location. DOE is not proposing any new missions for TA-18 facilities.

13-2: Chapter 2 of the *TA-18 Relocation EIS* discusses the reasons NNSA is proposing to relocate TA-18 capabilities and materials and the proposed objectives of this action. As stated in Chapter 2, DOE needs to maintain the capability to conduct criticality experiments. Currently, this activity is housed in facilities at LANL's TA-18 that are near the end of their useful life. As a result of this situation, NNSA needs to assess alternatives for continuing criticality experiment activities for the next 25 years at a new location. TA-18 mission operations do not directly support plutonium pit production and certification. TA-55 was chosen to collocate TA-18 security Category I/II activities to reduce security costs.

13-3: In accordance with Council on Environmental Quality regulations, an agency's preferred alternative, if one exists, must be presented in the draft EIS (40 CFR 1502.14(e)). Accordingly, Section 3.6 identifies the preferred alternative. Since publication of the TA-18 Relocation Draft EIS, NNSA has conducted additional analyses and has concluded that relocating the security Category I/II activities to the Nevada Test Site is the preferred alternative. It should be noted that the preferred alternative does not constitute a decision. NNSA will use the analyses presented in the final EIS as well as other information when making its decision with respect to relocation of TA-18 capabilities and materials. This decision will be presented in a Record of Decision, which will be published in the *Federal Register* no earlier than 30 days following publication of a Notice of Availability of the final EIS in the *Federal Register* by the U.S. Environmental Protection Agency.

13-4: As discussed in Section 3.1 of the *TA-18 Relocation EIS*, neither current nor near-term TA-18 mission operations would be impacted or modified by relocation to another site.

Commentor No. 13: Nuclear Watch of New Mexico, Colin King (Cont'd)

than encyclopedic. (CEQ Regulations 40 CFR 1502.2) Appendix A fails to meet the guidelines set forth by the CEQ because it is merely an explanation of terms relevant to critical assemblies but NNSA does not demonstrate what the role of a critical assembly is within the mission of TA-18. Hence, NNSA does little in fulfilling the its NEPA responsibilities in the DEIS. **13-5 (Cont'd)**

The NNSA s argument for proposed relocation of critical assemblies, excluding the SHEBA assembly, is inherently flawed because again it lacks concrete facts for its justification. Relocation of the critical assemblies and Category I capabilities of TA-18 lays at the heart of the NNSA s argument. The NNSA declares in its DEIS that While proposals regarding TA-18 activities may fall within the scope of [a long-term strategy for conducting security Category I nuclear operations at LANL] along with other activities such as analytical chemistry, security, and pit manufacturing, DOE has determined that the TA-18 Relocation proposal must move forward independent of this broader planning effort [2] **13-6** The NNSA cannot justify relocation of its Category I operations, including the critical assemblies housed at the TA-18 facilities, without analyzing the impacts on human health and environment that current and near-future Category I missions will have. The NNSA must also clearly state in the DEIS what materials and equipment belong to each Category. Currently, it is unclear whether the critical assemblies and associated materials belong to Category I or II. This lack of clarity is also true for materials within Category III and IV. If NNSA is to meet its NEPA obligations, NNSA must be clear on what devices and materials belong to what category and where that inventory is destined, if a valid assessment of risk to human health and the environment is to be made. Before the NNSA can continue, the planning effort that focuses on the long-term strategy for conducting security Category I nuclear operations at LANL must be completed and fully disclosed as part of this EIS process.[3] **13-7** Additionally, has NNSA fully analyzed the security risks of relocating SNM at a site such as the preferred alternative at TA-55? A clear discussion of potential security risks, such as terrorism, are not given by the NNSA in its DEIS. This must be remedied, particularly in light of the September 11 terrorist attacks. **13-8**

Cleanup and Risk Assessment

Lack of Concrete Decontamination and Decommissioning Plans

The DEIS contains only a very limited discussion of decontamination and decommissioning (D&D) and environmental restoration process of the TA-18 site should the current operations be relocated to another site. The NNSA states that At the present time, the ultimate disposition of existing TA-18 facilities is not known Prior to the initiation of decommissioning activities, the facility operator would have to prepare a detailed decommissioning plan Specific alternatives to be considered in the decontamination and decommissioning process would likely follow the [Resource Conservation and Recovery Act] framework and would be subject to project-specific [National Environmental Policy Act] analysis. [4] Facilities within TA-18 that were built in the flood plain of Pajarito and Three Mile Canyons require near-term D&D and environmental restoration because those structures pose immediate risks to the public health and environment in the event these canyon systems flood. According to the National Environmental Policy Act (NEPA), [I]t is the continuing responsibility of the Federal Government to use all practicable means [to] attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences. (NEPA ⁄ 101 (b)(3)) The Draft EIS must identify facilities of concern within the Canyon flood plain and contain a preliminary plan for carrying out D&D and environmental restoration on them immediately after relocation of those facilities has been completed if the NNSA is to abide by its **13-9**

Nuclear Watch of New Mexico ● Comments on the TA-18 Relocation DEIS ● 10/18/01 ● Page 2

Response to Commentor No. 13

13-5: The importance of maintaining critical assembly operations is discussed in Chapter 2 of the *TA-18 Relocation EIS*. Section 3.1.2 describes the functions and characteristics and identifies the critical assembly machines required to support ongoing TA-18 operational capability requirements. Appendix A describes the critical assembly machines that currently fulfill these operational requirements at TA-18. The operational characteristics of the critical assembly machines that could result in potential environmental impacts are assumed to be the same whether existing, refurbished, or new machines are used.

13-6: Chapter 2 of the *TA-18 Relocation EIS* describes the purpose and need for the proposed relocation of TA-18 capabilities and materials. NNSA considers the proposed action to be reasonable and appropriate. A decision on TA-18 relocation would not prejudice any future decisions with respect to other activities such as analytical chemistry, security, and pit manufacturing. The impacts that continuing TA-18 operations could have on human health and the environment at the current or alternate sites are discussed in Chapter 5 of the EIS.

13-7: The distinctions between security Categories I, II, III, and IV materials and associated activities are provided in Section 1.1.2 of the *TA-18 Relocation EIS*. As stated in that section, the classification is based on quantities and attractiveness (i.e., the relative ease of the processing and handling activities required to convert such materials into a nuclear explosive device) of the special nuclear material in question. Security Category I and II materials and associated activities have more stringent security requirements than security Category III and IV materials and associated activities. However, from an environmental impact point of view, the handling, storing, and transporting of these materials are not directly related to their security classifications. The EIS (see Section 1.3) considers and analyzes security Category I/II materials and associated activities separately from security Category III/IV materials and associated activities because their proposed relocation destinations are different. In general, materials and activities associated with the Planet, Comet, and Godiva critical assembly machines are considered security Category I/II, and material and activities associated with SHEBA are considered security Category III/IV. The amount of security Category I/II material proposed for relocation is 2.4 metric tons, as discussed in Sections 3.1.2 and Appendix D, Section D.7. Although the specific isotopic composition of this inventory is classified and is not provided in the EIS, it has been

Commentor No. 13: Nuclear Watch of New Mexico, Colin King (Cont'd)

obligations under NEPA ⁄ 101. DOE and LANL have continually avoided taking responsibility for site-wide mapping out of cleanup priorities. This occurred most notably in the 1999 Site-Wide EIS. NWNM s concern is amplified by proposed budget cuts to cleanup programs at LANL. DOE and LANL need to address their NEPA responsibilities in a manner that is systematic and that leads to substantive cleanup. **13-9 (Cont'd)**

In a recent letter from the New Mexico Attorney General s Office to the New Mexico Environment Department, the Assistant Attorney General stated that there are unresolved questions of ground water contamination [at TA-18]. [5] NNSA must address the issue of groundwater contamination at TA-18 in its DEIS and fully indicate how it proposes to take remedial action. The Assistant Attorney General also noted that there is no completed reach report for Pajarito Canyon. This reach report is vital to the cleanup process of TA-18 because it begins to establish inventories of hazardous and radioactive constituents within Pajarito Canyon and will help in determining cleanup priorities. **13-10**

Risk Assessments

In light of the terrorist attacks of September 11, 2001, it is no longer appropriate for the NNSA to state that external events such as an aircraft crash that could lead to the release of radioactive material has such an improbable chance of occurring that it was not considered credible and is not evaluated in the EIS. [6] This scenario, along with other possible terrorist attacks upon special nuclear materials (SNM) facilities must be fully considered, regardless of how unorthodox the scenario may be, for the safety and security of the employees at LANL and the public at large. Since the September 11 attacks, the security threshold has been raised substantially. NNSA must provide evidence that it is implementing measures to meet that raised threshold. **13-11**

Safety Concerns

NNSA asserts in the DEIS that LANL has experienced a number of criticality accidents in the period of 1945 to the early 1980s and goes on to say that there have been no accidents since that time that have resulted in significant adverse impacts to workers, the public or the environment. [7] Although it may be true that there have been no accidents that have caused adverse impacts to workers, the public, or the environment, LANL has a notorious record on safety procedures and handling of SNM. As recently as October 9, 2001, the DOE s Office of Enforcement and Investigation (OE) wrote that LANL had reported in February 2000 that its Los Alamos Critical Experiments Facility (LACEF) at TA-18 was in noncompliance with quality assurance provisions of NNSA s nuclear safety requirements. [8] This letter goes on to say that commitments to address violations through noncompliance enforcement actions issued by OE to LANL have yet to be met. OE states that On January 30, 2001, LACEF staff failed to comply with a TSR [Technical Safety Requirement] on the Godiva IV Critical Assembly [and] on February 28, 2001, LACEF staff failed to comply with another TSR on the Planet Critical Assembly [and] on July 25, 2001, the LACEF Team Leader determined that a TSR surveillance violation for the COMET Critical Assembly had occurred[9] [and] on August 9, 2001, LANL contacted the OE to notify OE that [a] corrective action had not been completed as reported. These violations at the TA-18 criticality facilities are of great concern, and do have the potential to adversely impact the health of LANL workers, the public, and the environment. The issues of noncompliance must be addressed in the DEIS and it must also commit to resolving these issues before any relocation of TA-18 activities is made. In fact, NNSA s Office of Enforcement and **13-12**

Nuclear Watch of New Mexico ● Comments on the TA-18 Relocation DEIS ● 10/18/01 ● Page 3

Response to Commentor No. 13

converted to appropriate unclassified equivalent units for the environmental impact analysis.

13-8: As stated in Section 5.1 of the *TA-18 Relocation EIS*, issues related to the security of relocated TA-18 capabilities and materials, including sabotage, are covered in a classified appendix.

13-9: As explained in Section 5.7 of the *TA-18 Relocation EIS*, the ultimate disposition of the existing TA-18 facilities is not known at the present time. The facilities at TA-18 could be used for other laboratory projects and services if a decision is made to relocate TA-18 missions. As explained in Sections 4.2.6.1 and 5.2.6.1 of the Final EIS, DOE has taken actions in constructing flood control structures as well as a flood retention structure to protect TA-18 facilities from flooding. This action was taken as a result of changing conditions after the Cerro Grande fire. The combination of the flood control and retention structures would result in an exceedingly small chance that flooding could result in offsite contamination. In addition, Section 4.2.12.1 of the EIS describes LANL's ongoing environmental restoration program activities at TA-18. As noted in this section, potential release sites at TA-18 have been investigated and characterized, and most of these have been recommended for no further action following site characterization. Several potential release sites at TA-18 have already undergone either interim or final remediation to remove contaminants and to decrease the potential for future releases and migration off site.

13-10: The Environmental Restoration Project at LANL has investigated potential release sites, including TA-18. Shallow groundwater monitoring to date at TA-18 has shown that there are no significantly elevated concentrations of contaminants. These potential release sites are scheduled for additional characterization in future years, and alluvial well sampling is ongoing. DOE has not made a decision about the ultimate disposition of the TA-18 facilities if the mission is relocated. Further NEPA analysis would be done to support a decision about disposition and would address cleanup of any existing contamination.

The Reach Reports are interim reports that address the results of sediment investigations, but do not include groundwater or surface water data. Reach Reports were prepared for Los Alamos Canyon and Pueblo Canyon and for one of the land transfer sites; however, there are no plans to prepare such a report for Pajarito Canyon. Instead, the Environmental Restoration Project will prepare a Facility Investigation report for Pajarito

Commentor No. 13: Nuclear Watch of New Mexico, Colin King (Cont'd)

Investigation (OE) felt that Continued violations indicate that the quality controls necessary to ensure compliance are not adequate, and concludes that continued violations that are necessary to ensure safe operations of the Critical Assemblies could, if left uncorrected, lead to a more significant critical event. 13-12 (Cont'd)

We note that the above letter was issued by the DOE Office of Price-Anderson enforcement. Violations at LANL s TA-18 Critical Experiments Facility, coupled with criticality violations in 1997 at the Lawrence Livermore National Laboratory, demonstrate that the University of California should not be exempt from Price-Anderson fines resulting from violations or accidents in the use and handling of nuclear materials. 13-13

Over the past 5 years, the Neighborhood Environmental Watch Network (NEWNET) has recorded several very high gamma spikes during criticality experiments conducted at TA-18. NEWNET has been a source of substantial public and tribal interest and concern. The NEWNET air monitoring equipment at TA-18 Kappa site must be relocated to the future site for TA-18 activities. 13-14

Additionally, LANL must continue its cooperation with international agencies such as the International Atomic Energy Agency (IAEA). LANL officials have often made the claim that TA-18 has been used for the training of IAEA inspectors. Because it is not explicitly stated in the DEIS, is it to presumed that relocated TA-18 facilities will only have a weapons mission and will no longer have a peaceful aspect in its mission such as the training of IAEA inspectors? Any effort to discontinue cooperation with the IAEA, despite heightened security concerns after the attacks of September 11, must be avoided. This cooperative mission between LANL and the IAEA must continue as part of the mission of relocated TA-18 operations. The DEIS must explicitly state that cooperation with the IAEA will continue despite increased security controls. Relocated TA-18 facilities must continue training IAEA inspectors in this world ever more threatened by weapons of mass destruction. 13-15

In summary, NWNM concluded that:
NNSA failed to clearly state a mission for relocated TA-18 activities and failed to clearly indicate why TA-55 at LANL was the preferred alternative over the other proposed sites.
NNSA has not adequately prepared a decontamination and decommissioning (D&D) plan for facilities at TA-18 that are built in the confluence of the Pajarito and Three Mile Canyon flood plains. NNSA must establish an immediate plan for conducting D&D and environmental restoration on these building as they pose obvious risks to human health and the environment.
NNSA has not addressed issues of ground water contamination at TA-18.
NNSA s claim that risk assessments for events such as airline crashes is unnecessary does not have validity in light of the September 11 terrorist attacks. A risk assessment and plan to handle such potential events must be clearly established.
Although there may not have been recent criticality events that caused harm to the LANL workforce, the public, or the environment, NNSA must address the fact that DOE s Office of Enforcement and Investigation has cited LANL for numerous violations of DOE safety procedures at the TA-18 critical experiments facility. NNSA must also commit to developing a plan that will prevent future violations.
The Kappa NEWNET station must be relocated with the TA-18 critical experiments devices.
Relocated TA-18 facilities must continue to help in the training of IAEA weapons inspectors.

If you have furthers questions, feel free to contact me.

Response to Commentor No. 13

Canyon that will include sediment and water data. The Environmental Restoration Project consults with the New Mexico Environment Department to set priorities for these investigations.

13-11: Issues related to the security of relocated TA-18 capabilities and materials, including sabotage, are covered in a classified appendix to the EIS, as stated in Section 5.1.

13-12: NNSA acknowledges there have been technical safety requirement violations at TA-18 in the past. As part of NNSA's approach to integrated safety management, LANL has taken corrective actions to resolve these violations by implementing procedures and personnel training. Although not all corrective actions have completely satisfied DOE's Office of Enforcement, LANL continues to improve quality assurance and procedures to eliminate procedural violations. Section 5.2.10.2 of the *TA-18 Relocation EIS* presents the impacts from a spectrum of potential accidents at LANL, including accidents initiated by human error, as described in Appendix C, Section C.3.

13-13: In 1988, Congress exempted from civil penalties seven DOE nonprofit contractors, including the University of California, for activities associated with LANL. This decision reflected the concern that major universities and other nonprofit contractors would be unwilling to put their educational endowments at risk for contract-related expenses such as civil penalties. In addition, if nonprofit contractors were subject to civil penalties, DOE would have to increase the fees it pays its nonprofit contractors to compensate for the additional risk that civil penalties could be assessed. This would potentially divert funds away from research without creating a financial incentive for safety.

DOE believes contractual provisions are a better mechanism than civil penalties for making nonprofit contractors more accountable for safety. Such provisions include fee reduction or elimination, stop work orders, and contract termination. Since enactment of the 1988 exemptions, DOE has moved toward performance-based contracting and integrated safety management for all of its contractors. A major tenet of these reforms is that work must be performed safely and that a contractor will be held accountable if it is not. All DOE contracts now must include provisions on integrated safety management and identify the environmental, health, and safety requirements applicable to activities under the contract.

Commentor No. 13: Nuclear Watch of New Mexico, Colin King (Cont'd)

Sincerely,

Colin King
Research Director
Nuclear Watch of New Mexico
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[1] Draft Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory, NNSA/EIS-0319D, August 2001, Summary, p. S-4.

[2] *Ibid.,* p. S-9.

[3] *Ibid.*

[4] *Ibid.,* Volume 1,Chapter 5, pp. 5-109 through 5-111.

[5] Letter to James Bearzi, Hazardous Waste Bureau Chief, New Mexico Environment Department, from Lindsay Lovejoy, Jr. Assistant Attorney General, Attorney General Office of New Mexico, September 27, 2001

[6] *Ibid.,* Appendix C, p. C-6.

[7] Draft Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory, NNSA/EIS-0319D, August 2001, Volume 1, Chapter 4, p. 4-41.

[8] Letter to John Browne, Director, LANL, from R. Keith Christopher, Director, Office of Price-Anderson Enforcement, October 9, 2001. http://tis.eh.NNSA.gov/enforce/els/ellanl100901.htm

[9] OE states that the TSR for the COMET Critical Assembly had been in place since September 1995 and LANL personnel concluded that the TSR surveillance had not been performed since the effective date in 1995. *Ibid.*

Response to Commentor No. 13

13-14: The proposed new facility at LANL's TA-55 would be located under 20 feet of earth and concrete, so it is unlikely that signals would be detected from criticality experiments. However, the relocated activities would continue to be monitored by properly located NEWNET if the TA-18 mission activities remain at LANL.

13-15: There is virtually no weapons work at TA-18. Much of the TA-18 mission operations work is focused on the safe handling of nuclear materials. This includes training of nuclear facility workers for the NNSA complex, training and technical support for emergency responders, training and technology development for nuclear transparency and dismantlement activities, and training and technology development for the safeguarding of nuclear materials worldwide. NNSA has included a requirement for foreign national access to the proposed new facility specifically to continue training activities in support of the IAEA and Russian Transparency programs.

APPENDIX K

Contractor Disclosure Statement

TA-18

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF EIS FOR THE PROPOSED RELOCATION OF TECHNICAL AREA 18 CAPABILITIES AND MATERIALS AT THE LOS ALAMOS NATIONAL LABORATORY

CEQ regulations at 40 CFR 1506.5(c), which have been adopted by DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project," for the purposes of this disclosure, is defined in the March 23, 1981 guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 18026-18038 at Question 17a and b.

"Financial or other interest in the outcome of the project 'includes' any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)." 46 FR 18026-18038 at 18031.

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows: (check either (a) or (b) to assure consideration of your proposal)

(a) ___X__ Offeror and any proposed subcontractor have no financial interest in the outcome of the project.

(b) _______ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests:

1.
2.
3.

Certified by:

____
Signature

Richard T. Profant
Name

Corporate Vice President
Integrated Environmental Services Operation

August 19, 2002
Date

Science Applications International Corporation