DOE/EA-0971

May 1995

Final

Environmental Assessment for Device Assembly Facility Operations

Nevada Test Site, Nye County, Nevada

U. S. Department Of Energy

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A. INTRODUCTION

Nuclear explosive operations are an integral component of the Department of Energy (DOE) mission at the Nevada Test Site (NTS). This mission is to conduct the nation's nuclear testing program in a safe, secure, and efficient manner, in full compliance with federal and state regulations and DOE orders and directives. These operations generally include assembly, disassembly or modification, staging, transportation, and testing. Nuclear explosive operations may also include maintenance, repair, retrofit, and surveillance. An important element of nuclear explosive operations is a dedicated facility in which to prepare nuclear explosive assemblies for their intended dispositions. In an effort to modernize the NTS facilities, nuclear explosive operations, currently housed in two geographically separate complexes in Area 27, would be moved to the combined device assembly facility (DAF) in Area 6. The DAF design incorporates state-of-the-art safety and security features while minimizing the risks of environmental impacts.

Currently a moratorium on testing nuclear weapons at the NTS is in effect. The Energy and Water Appropriations Act of 1992 (Title 5, Section 507, Public Law No. 102-377, October 2, 1992) established a testing moratorium until June 30, 1993, and thereafter established limits of five tests through September 30, 1994, five tests through September 30, 1995, five tests through September 30, 1996, and then a comprehensive test ban. President Clinton extended the moratorium to September 30, 1994, and later extended that date to September 30, 1995. However, the President has directed the DOE to maintain the capability to conduct a nuclear test on six months' notice up to fiscal year 1996 and on two to three years' notice thereafter.

This environmental assessment (EA) evaluates the proposed action to open and operate the DAF. Since the DAF has already been constructed, this EA focuses on potential impacts resulting from operation of the facility. The alternative of no action, i.e., continuing current operations at the Area 27 facilities, is also considered. The proposed action and the no-action alternative are compared with respect to their potential environmental impacts, their effect on the safety of operations, and their security concerns.

B. PURPOSE AND NEED FOR ACTION

B.1 Purpose and Need for Action

The DOE, to meet its mission at the NTS, needs to be able to safely, securely, and efficiently conduct nuclear explosive operations. These operations are currently conducted in Area 27 Assembly/Disassembly facilities which were originally designed in the late 1950s.

B.2 Related National Environmental Policy Act (NEPA) Compliance Documents

The 1977 NTS Environmental Impact Statement (EIS)[2] for the Nevada Test Site (ERDA, 1977) provides extensive information and analysis on activities conducted at the site. The historical mission of the NTS has been to conduct nuclear weapons and nuclear weapons effects tests, however, the NTS has also supported many other research and development activities due to its favorable environmental and infrastructure characteristics. These favorable characteristics have led to new DOE and non-DOE activities proposed for possible siting at the NTS. To aid in the

evaluation of these new proposals and changing missions, DOE has begun the process of preparing a Site-wide EIS for the NTS. A Notice of Intent was published in the federal register on August 10, 1994 and a series of scoping meetings have been conducted at various locations within Nevada and southwestern Utah. This EIS will evaluate four use alternatives and support the development of a Resource Management Plan for the NTS. The proposed action that is the subject of this environmental assessment supports the mission, as directed by the president, to maintain the capability to conduct nuclear tests and would not limit the choice of reasonable alternatives to be analyzed in the Site-wide EIS.

Other related NEPA documents currently in preparation include: the Site-wide Environmental Impact Statement for Continued Operations of the Pantex Plant and Associated Storage of Nuclear Weapons Components, and the Environmental Assessment for Interim Storage of Nuclear Weapons at the NTS. The Pantex EIS addresses the disassembly of nuclear weapons, plutonium pit storage, and the risks associated with transporting nuclear weapons and hazardous materials. The NTS is being considered as a potential site under the relocation of operations alternative in this EIS.

The EA for Interim Storage of Nuclear Weapons at the NTS evaluates the proposed action to make available six existing storage magazines on the NTS for the Interim Storage of Nuclear Weapons for a period of up to 18 months. This assessment focuses on the potential environmental impacts resulting from use of the storage magazines. The Pre-Approval Draft of this EA was transmitted for state of Nevada review on January 4, 1995.

C. PROPOSED ACTION AND ALTERNATIVES

This section evaluates the proposed action and the no-action alternative. The design and structural characteristics of the DAF is discussed in detail and is compared to the design and structure of the current assembly facilities in Area 27. Since both the DAF and the Area 27 facilities have already been constructed, only the potential environmental consequences of operating the facilities will be discussed.

C.1 Proposed Action

The action proposed in this environmental assessment is to consolidate all nuclear explosive operations at the NTS by opening and operating the DAF. These operations generally include assembly, disassembly or modification, staging, transportation, testing, maintenance, repair, retrofit, and surveillance. The overall objective of operating the DAF is to provide enhanced capabilities and facilities for safe, secure, and efficient nuclear explosive operations at the NTS. The DAF will provide state-of-the art facilities for those nuclear explosive operations that require the handling of high explosives in combination with special nuclear materials (plutonium and highly enriched uranium), and will reduce the environmental impact and personnel exposure in the unlikely event of an accident.

C.1.a DAF Design

The DAF is a multi-structure facility containing approximately 9,290 m^2 (100,000 ft^2) of floor space within a 12-hectare (29-acre), high-security area in the central portion of the NTS (Figure 1). Construction is primarily of heavy, steel-reinforced concrete. The facility is earth covered ("cut and cover" construction) with a minimum of five feet of compacted earth overlay leaving only one exterior wall.

The structures within the DAF have been designated as buildings rather than rooms, since they are distinct structures separated by earthen embankments. They are connected by a common corridor. Although the DAF is a two-story facility, Figure 1 depicts only the first floor. Ceiling heights of each individual structure on the first floor vary and some are as high as 7 to 9 meters (25 to 30 feet). These have no second story. A second story exists over the corridor and those "short" structures that accommodate a second story. This floor is planned to be used for security forces and additional mechanical and electrical equipment space. No nuclear explosive operations would be conducted on the second floor.

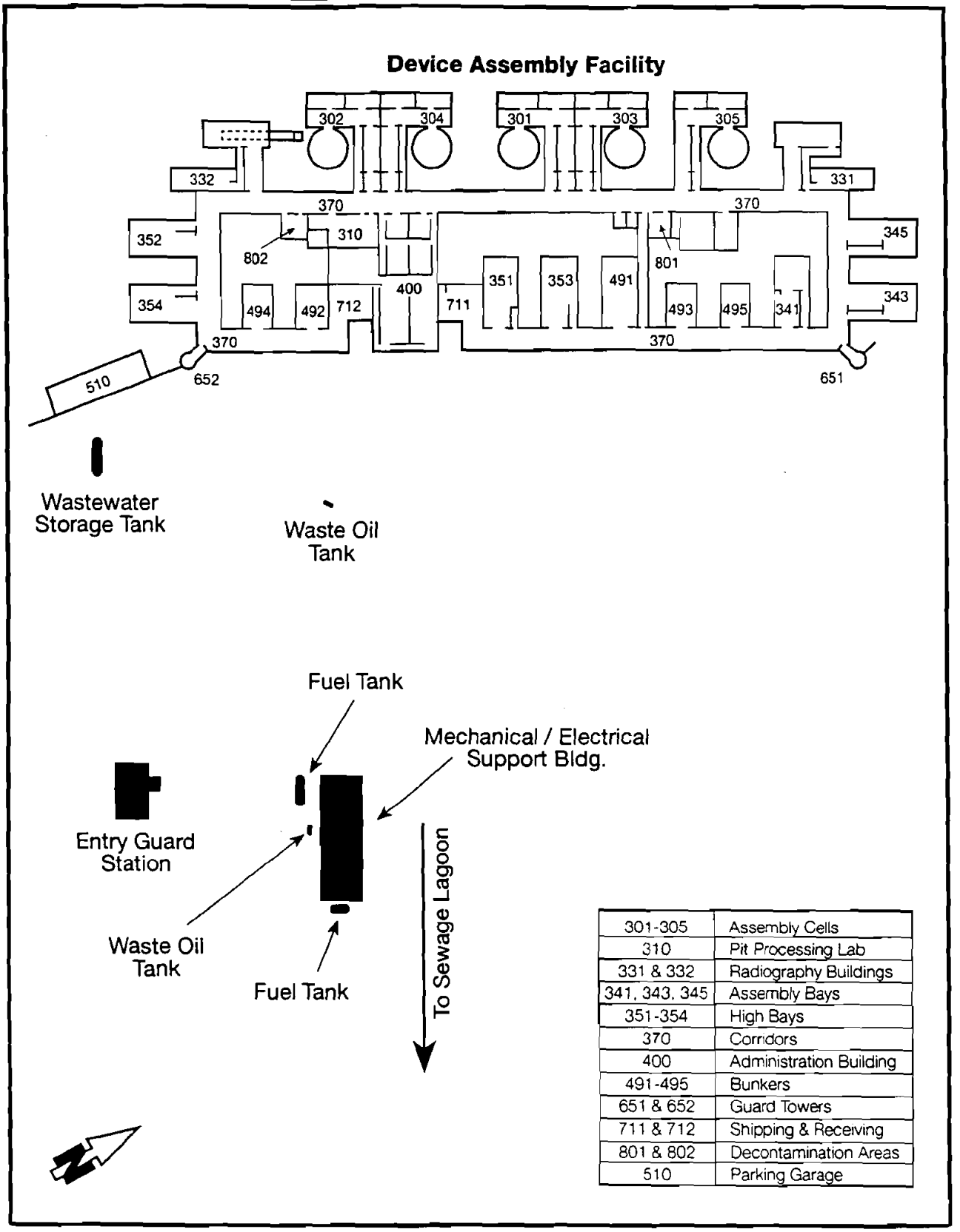
C.1.b DAF Structures and Operations

The entire DAF is constructed with noncombustible materials. The various individual buildings and structures also meet the intent of the Life Safety Code (National Fire Protection Association Code 101).[3] Electrical components in operating areas were designed to comply with National Electrical Code standards for hazardous locations. The entire facility is provided with an automatic fire suppression system. In those areas where a nuclear explosive may be present, "quick response," on-off sprinkler heads are also installed.

Principal assembly-related structures of the DAF are listed in Table 1. Associated structures include a mechanical/electrical support building, a security building, a sewage lagoon system, and five underground storage/holding tanks. The following information discusses the procedures that would take place within the DAF and the details of its environmental protection and safety features.

Table 1. Principal Assembly-Related Structures at the DAF

STRUCTURES	QUANTITY
Assembly Cells	5
Assembly Bays	3
High Bays	4
Bunkers	5
Radiography Buildings	2



301-305	Assembly Cells
310	Pit Processing Lab
331 & 332	Radiography Buildings
341, 343, 345	Assembly Bays
351-354	High Bays
370	Corridors
400	Administration Building
491-495	Bunkers
651 & 652	Guard Towers
711 & 712	Shipping & Receiving
801 & 802	Decontamination Areas
510	Parking Garage

Figure 1. DAF Site Layout

(1) Assembly Operations

Assembly operations are to be carried out only in the assembly cells, assembly bays, and high bays of the DAF. These operations are governed by the use of written assembly procedures authorized after extensive review by the users and completion and approval of a DOE/NV nuclear explosives safety study. In operations involving high explosives, both high explosives and special nuclear materials would enter through the doors on the southeast end of the complex and would be staged in bunkers. The materials would then be transferred to assembly cells where the high explosives, special nuclear materials, and other components would be assembled to the point that the explosive is no longer exposed. At this point, the assembly would either be finished in the assembly cell or moved to another part of the facility for completion. Completion activities include mechanical and electrical measurements, radiography, radiation checks, alignment, and installation of other components. Radiographic operations would be conducted on components or the entire assembly in the radiography bays and occasionally in the assembly cells or bays. The final step would be configuring the assembly for shipment to the event location at another area on the NTS.

Other nuclear explosive operations would also be conducted in the assembly structures using procedures similar to those used for assembly. These operations generally include disassembly, modification, staging, transportation, testing, maintenance, repair, retrofit, and surveillance.

(a) Assembly Cells

One of the primary features of the DAF is the design of the five assembly cells. The assembly cells have 30.5 cm (12 in.) thick concrete walls and a catenary roof structure overlain with 7.6 m (25 ft) of graded gravel. This "Gravel Gertie" composite roof is designed to expand upward in the unlikely event of a high explosive detonation, and to collapse into the cell where the detonation occurred. "Gravel Gerties" provide filtration which has been shown to reduce the dispersion of aerosolized special nuclear materials by over 99.5 percent, and at the same time, absorb the energy of an explosive blast to prevent propagation of the explosion into other structures within the facility.[15] Each "Gravel Gertie" assembly cell includes a circular work area 10.4 m (34 ft) in diameter with associated support structures including air-locked access vestibules and both mechanical and electrical facilities. Decontamination facilities with tank storage are located in close proximity to the assembly cells. The assembly cells are the only places in the DAF where uncased high explosives would be permitted to be co-located with special nuclear materials. High explosive material which is uncased (uncovered and unprotected) is more sensitive to being inadvertently detonated or set on fire.

Assembly operations involving insensitive high explosives may also be performed in assembly cells. DOE Order 6430.1A defines insensitive high explosives as "explosives substance that, although mass detonating, are so insensitive that there is negligible probability of accidental initiation or transition from burning to detonation."

The air-locked access vestibules are equipped with double sets of blast doors. Each set of blast doors is designed to contain all of the overpressures and fragmentation loads generated by a high explosives accident in the assembly cell.

The two blast doors are interlocked so that one door must be closed before the other can be opened. Thus, in case of an explosion in the cell, one door would always act to eliminate negative blast effects outside the cell and mitigate the escape of contamination through the airlock corridor. The personnel airlock blast doors are similarly interlocked.

Once inside the blast doors, the parts for assembly would be moved through the inner corridor into the staging areas or the assembly room as required for operations. After a high explosive/special nuclear materials subassembly is cased, it would stay in the assembly room for completion or be moved to a temporary staging area, an assembly bay, or a high bay for completion of all assembly steps. The term "cased" (totally enclosed) is derived from DOE Order 6430.1.

The concrete structure, "Gravel Gerties", and interlocking blast doors within the assembly cells reduce the potential environmental impacts that could occur during an accident and reduce exposure to workers not located in the immediate vicinity of an accident.

(b) Assembly Bays

Assembly bays have concrete walls with separate personnel and equipment access air locks and interlocking blast doors. Devices containing only insensitive high explosives (and no special nuclear material) could be assembled in the assembly bays. Assembly operations involving insensitive high explosives would be similar to the process preformed in the assembly cells. Additional work could be performed on nuclear explosives containing high explosives, provided the assemblies were cased. Other activities conducted in assembly bays would involve the assembly of secondary components (radioactive or classified materials). Uncased explosives other than insensitive high explosives could be handled in these bays if no special nuclear materials were present. As in the assembly cells, parts and materials would be brought into the work area through an airlock.

(c) High Bays

Four high bays to support test operations are similar to the assembly bays in structure and function, except that no equipment airlock is provided. Those nuclear explosive operations conducted in assembly bays may also be conducted in high bays. Two of the four high bays are designed to allow the Device Transportation Vehicle to be backed in for loading and unloading.

(d) Bunkers

Bunkers are constructed with reinforced concrete walls and roofs and are equipped with bullet-resistant doors. The bunkers are sized for use in staging partially assembled nuclear packages awaiting shipment to their test locations. Bunkers would also be used for staging high explosives and special nuclear materials components prior to assembly. These components would be staged in approved shipping containers.[3]

(e) Mechanical/Electrical Support Areas

A separate metal-frame mechanical/electrical support building and support areas are located inside the DAF structure itself. Mechanical/electrical support areas include plant mechanical systems, diesel electrical generators, an uninterruptible battery power supply station, and transformers.

(f) Component Testing Laboratory

Various tests and inspection procedures on nuclear explosive components would be performed in the component testing laboratory. Testing would involve leak detection, weighing, and neutron and gamma counting. Pressure vessel proof testing would be conducted using inert gases. Only small quantities of Class C explosives contained in squibs would be permitted in this laboratory.

(2) Administrative Offices

An administrative office area is located on the first floor of the two-story section of the DAF. Each corridor of the administrative area is provided with independent heating, cooling, and ventilation systems.[4]

(3) Radiography

The two radiography buildings include air-locked access corridors, blast doors, and supporting facilities comprising a control room, service area, dark room, and radiography room.

A variety of machines and sources are used to radiograph nuclear assemblies and components as part of the assembly process and quality activities. Building 332 was designed for a 25-Mev fixed beam radiography machine, and Building 331 was designed for a 9-Mev movable beam radiography machine. Both were intended to allow other sources to be used. No uncased high explosives would be allowed in these buildings when special nuclear materials are present. Associated with each radiography area is film processing equipment for the development of radiographic film and a radiographic control room. Radiographic sources (Co-60, Ir-192) may be utilized in all cells and bays where radiation monitoring equipment is available.

(4) Security

An entry guard station will control traffic ingress and egress to the complex. The entry guard station is a pre-engineered metal building with a bullet-resistant enclosure and multiple gun ports. Primary and secondary alarm stations within the DAF are housed in two separate structures constructed with concrete walls and roofs. Exterior security surveillance of the DAF is provided from two hardened guard towers constructed of reinforced concrete.

Only limited shipping and receiving operations are visible from outside the DAF. All other operations, including nuclear explosive movement within the DAF, are concealed from external viewing.

(5) Waste Management

It is expected that under normal operations, hazardous waste in gram amounts of epoxies, pints of solvents, and small quantities of waste explosives would be generated. All wastes would be minimized, neutralized, and/or disposed of in a manner which meets state and federal regulations. Waste generation would be subject to the pollution prevention and waste minimization provisions of the DAF Waste Management Plan which would be prepared prior to commencement of DAF operations. All high explosive waste would be disposed of at the NTS Area 11 Explosive Ordnance Disposal Unit which is operated under interim status. Class A combustible materials contaminated with high explosives would be burned under a state of Nevada open burn permit. Low-level radioactive waste would be disposed of at the NTS Area 5 Radioactive Waste Management Site. Nonhazardous solid waste would be hauled from the DAF to an approved facility. Sewage would be contained in a sewage lagoon system which is operated in accordance with a state of Nevada permit. Waste from the radiographic developing laboratories which contains silver would be processed through a silver recovery unit before going to the sewage lagoon. These waste management units have more than adequate capacity to accept the wastes generated by DAF operations.

(6) Emergency Operations

Emergency operations at the DAF would be carried out to the specifications of the Nuclear Explosive Assembly Facility Joint Management Plan and the DOE/NV Internal Emergency Management Plan.

C.1.c DAF Safety Analysis

Safety was a major consideration incorporated in the requirement for a new assembly facility. The goal was to provide structures that meet the DOE safety standards for assembly of nuclear materials and high explosives.[3] The DAF design implements safety and environmental features from DOE Order 6430.1, *General Design Criteria*, and DOE Order 5610.11, *Program to Prevent Accidental or Unauthorized Nuclear Detonation*, to provide improved worker safety in nuclear materials handling operations. All nuclear and explosive material handling operations would be conducted in accordance with DOE Order 5610.10, *Nuclear Explosive and Weapons Safety Program*, and all radioactive materials would be handled in accordance with the *USDOE Radiological Control Manual* (DOE/EH-0256T, Revision 1, April 1994). The DAF incorporates modern features for containment of radioactive materials, one of which is the "Gravel Gertie" roof. This type roof is designed to expand upward in the unlikely event of a high explosive detonation, then to collapse into the building where the detonation occurred to contain most of the radioactive contamination. Gravel Gerties are incorporated into all of the assembly cells, which are the only facilities where special nuclear materials and uncased conventional high explosives will be colocated. Other containment design characteristics include special doors and special ventilation features such as HEPA filters and blast-activated valves to maximize personnel safety.[15]

Preliminary safety analyses, including air dispersion modeling, were based on accident scenarios that might occur during three categories of normal operations conducted at the DAF: staging; transportation; and assembly; and on scenarios related to natural phenomena such as

earthquakes and floods[3]. The risks identified in the analyses are summarized in section E.1.g, Accident Analysis.

C.1.d Longevity of the DAF

Under the specifications of this proposed action, the life expectancy of the DAF is 30 years. When the facility is no longer needed, it would be decommissioned or placed into alternate service. If the DAF is decommissioned, much of the equipment and other property would be removed and salvaged. The site would be surveyed for radiological and chemical contamination and decontaminated, if necessary. The sewage lagoon would be cleaned out and filled with soil, the underground storage tanks would be abandoned and closed in accordance with state regulatory requirements, and the roads would be left intact.

C.1.e Disposition of the Area 27 Facilities

Disposition of the Area 27 facilities is an action connected to the proposed action. This would include moving equipment required for DAF operations to the DAF and turning the Area 27 facilities over to the DOE/NV Facility Use Committee for evaluation of potential alternate uses. These facilities would be available for utilization in future NTS missions.

C.2 No Action Alternative

Presently, NTS assembly activities are performed within two multistructure facilities located approximately 0.4 km (0.25 mi) apart in Area 27. These facilities were designed and erected during the late 1950's. Principal assembly-related structures of the Area 27 facilities are shown in Table 2.

Table 2. Principal Area 27 Facilities

STRUCTURES	QUANTITY
Assembly Bays	5
Bunkers	4
Combination Assembly Bay/Bunker	2
Radiography Buildings	3

C.2.a Assembly Operations

Assembly operations currently conducted in the Area 27 facilities are the same as those that would be conducted in the DAF [see Section C.1.b(1)]. The main Area 27 assembly buildings are reinforced concrete or concrete masonry unit structures with frangible or easily broken roof systems. Individual assembly bays within the buildings are separated from each other by 0.6 m

(2.0 ft) divider walls. The roof is supported, but not attached, to a series of wide-flanged, steel beams; hence, the roof could blow out in the case of a high explosive detonation.

Each of the bays is equipped with double dead-bolt combination locks with interior quick-release emergency features. Opposite the personnel doors in the assembly bays are larger doors for equipment access. Storage magazines (bunkers) at the Area 27 facilities are reinforced concrete structures used to stage components uncased high explosives, special nuclear material, and nuclear weapons. They are covered with a compact earth fill 1.0 m (3.3 ft) thick at the top. The assembly facilities in Area 27 do not have containment systems for decontamination wastewater and contaminated fire suppression effluent; nor do they have mechanisms to prevent explosion propagation other than quantity-distance siting characteristics.[6]

C.2.b Administration Offices

Administrative offices are located both in reinforced concrete buildings and in trailers. The concrete office buildings are equipped with hollow metal doors with locking devices for additional security.

C.2.c Radiography

The radiography laboratories are housed both in reinforced concrete buildings and in metal buildings or trailers. Those within concrete buildings have gypsum-board and wood-stud partitions.

C.2.d Security

Two entry guard stations control traffic ingress and egress to the Area 27 assembly complex. Both of the facilities in Area 27 are in exclusion areas surrounded by cyclone fences, and each fenced area is accessed by a single road. Although a security tower is located on a hill between the facilities, early detection of intruders is difficult due to the hilly terrain in the area. The buildings are not connected by corridors, so exposed movement of personnel and material between buildings is necessary at these facilities.

C.2.e Waste Management

Small amounts of hazardous wastes are produced during normal operations at the Area 27 facilities. Historically, these wastes amount to grams of epoxies, pints of solvents, and small quantities of waste explosives which are disposed of according to state and federal regulatory requirements.[5] Other appropriate waste management procedures would continue throughout the operating life of the Area 27 facilities. Nonhazardous solid waste would be hauled from the facility to an approved landfill; waste explosives would be disposed of at the Area 11 Explosive Ordnance Disposal Unit; explosives-contaminated, Class A combustible materials would be disposed of at an appropriate disposal area; and radioactive waste would be disposed of at the Area 5 Radioactive Waste Management Site. These waste management units have more than adequate capacity to accept the wastes generated by DAF operations. Waste generation at the

Area 27 facilities is subject to provisions of the NTS Waste Minimization and Pollution Prevention Plan.

C.2.f Emergency Operations

The emergency operations procedures for the Area 27 facilities are currently under revision.[3] Presently, a general emergency plan, an emergency response procedure, and the DOE/NV Internal Emergency Management Plan are utilized for emergency operations.

C.2.g Safety Analysis

Certain safety controls exist at the Area 27 facilities. All nuclear and explosive material handling operations are conducted in accordance with DOE Order 5610.10, *Nuclear Explosive and Weapons Safety Program*, and DOE Order 5610.11, *Program to Prevent Accidental or Unauthorized Nuclear Detonation*, and all radioactive materials are handled in accordance with the *DOE Radiation Control Manual*. All buildings are grounded and have lightning protection. Electrical fixtures were designed so that no spark could be created or escape the fixture enclosure to detonate any high explosives in the room. Radiation detectors and evacuation bells have been placed in certain areas. Despite these safety controls, however, the Area 27 facility structures do not fully meet current DOE safety guidelines and specifications[6] for assembly/disassembly operations.

Although the majority of the facility consists of concrete structures, some structures in certain buildings are of wood construction. Some of the ventilation systems in some buildings are not adequately designed to prevent the spread of combustion products in the event of a fire. Fire suppression water is supplied by an 80,000 gallon water tank which is refilled by trucks and provides approximately 90 minutes of fire fighting water.

In the event of an accidental detonation, the explosion could propagate from one bay to the next. This would pose serious safety consequences to persons involved with operations in adjacent bays.

C.3 Alternatives Eliminated from Consideration

Upgrading the Area 27 facilities will not be considered as a reasonable alternative to the proposed action in this environmental assessment. In order for the facilities currently utilized for nuclear explosive operations to meet DOE standards and remain operative, extensive upgrades to the current buildings would be required. The costs of upgrading the existing facilities would exceed the costs of completing and operating the DAF. And in spite of this effort, the nuclear explosive operations would continue to be spread over two separate building complexes. Due to the extensive ground disturbance that would be required, these upgrades would increase the amount of affected wildlife habitat compared to the status quo or the proposed action. The safety features presently incorporated into the DAF could not be equaled through improvements to the existing buildings. Therefore, a program of upgrades to the existing A-27 facility to meet current standards for assembly/disassembly operations is not a reasonable alternative to the proposed action.

Constructing another combined assembly facility at a different location within the NTS will not be considered in this environmental assessment. Such an action would only disturb more land and incur additional costs without any other benefit. Therefore, this is not a reasonable alternative to the proposed action.

Conducting nuclear explosive operations, currently conducted at the NTS at an off-site location, will not be considered in this environmental assessment. This solution would introduce complex difficulties with transportation between the NTS and the off-site location and with technical coordination of these nuclear explosive operations. Moreover, the additional costs of duplicating the safety, security, and environmental protection features incorporated into the DAF make this an unreasonable alternative.

D. AFFECTED ENVIRONMENT

The NTS occupies approximately 3,500 km^2 (1350 mi^2) of Nye County, Nevada (Figure 2). Its rectangular shape varies from 45 km (28 mi) to 56 km (35 mi) in width and 64 km (40 mi) to 89 km (55 mi) in length. The DAF, which is located in Area 6, resides in the east-central portion of the NTS (Figure 3). The current assembly facilities are south-centrally located in Area 27. The environments of the NTS, including Areas 6 and 27, have been described in detail in the NTS Environmental Impact Statement.[2]

The land immediately adjacent to the NTS is managed by either the U.S. Bureau of Land Management or the U.S. Air Force. The Air Force controls most of the lands adjacent to the west, north and east boundaries of the NTS. In the remaining outlying areas, the nearest town is Amargosa Valley, Nevada, which supports a population of 761 and lies 42 km (26 mi) to the southwest of the DAF.[3] Other nearby population centers include Beatty, 64 km (40 mi) to the west of the DAF with a population of 1,623, and Indian Springs, 48 km (30 mi) to the southeast with a population of 1,164. The largest city in the region, Las Vegas, is approximately 97 km (65 mi) to the southeast and supports a metropolitan population of over 740,000.[8]

The topography of the NTS and the surrounding area is diverse. Primarily, it consists of large basins and flats, ranging from 910 m (3,000 ft) to 1,220 m (4,000 ft) above mean sea level separated by mountain ranges that reach elevations of 1,830 m (6,000 ft) to 2,130 m (7,000 ft) above mean sea level. Both the DAF and the Area 27 facilities are located in valley basins. The DAF is situated on the western margin of Frenchman Flat, at an approximate elevation of 1,130 m (3,700 ft) above mean sea level. The Area 27 facilities are located in the northeastern portion of Rock Valley at an approximate elevation of 1,280 m (4,200 ft) above mean sea level.

The climate throughout the NTS is warm temperate continental. Although there is a distinct seasonality to the weather patterns, extended periods of freezing conditions are rare. At Frenchman Flat, the average warmest and coldest temperatures in July are 36° C (97° F) and 17° C (62° F), respectively. Similarly, the average warmest and coldest temperatures in January are 12° C (53° F) and -3° C (26° F). Dry, arid conditions prevail throughout the year. The average annual precipitation is less than 18 cm (7 in.).

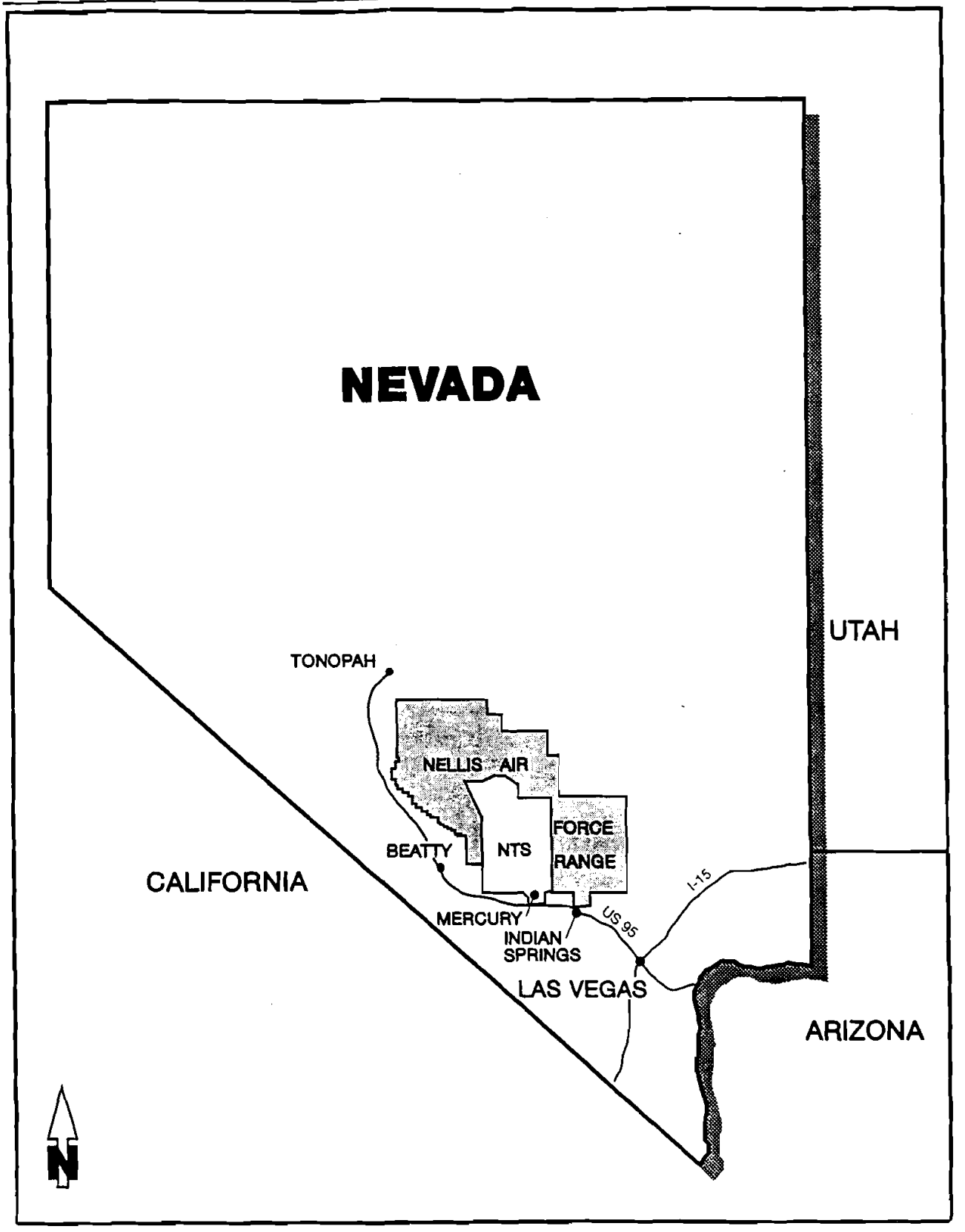


Figure 2. **Nevada Test Site Location Map**

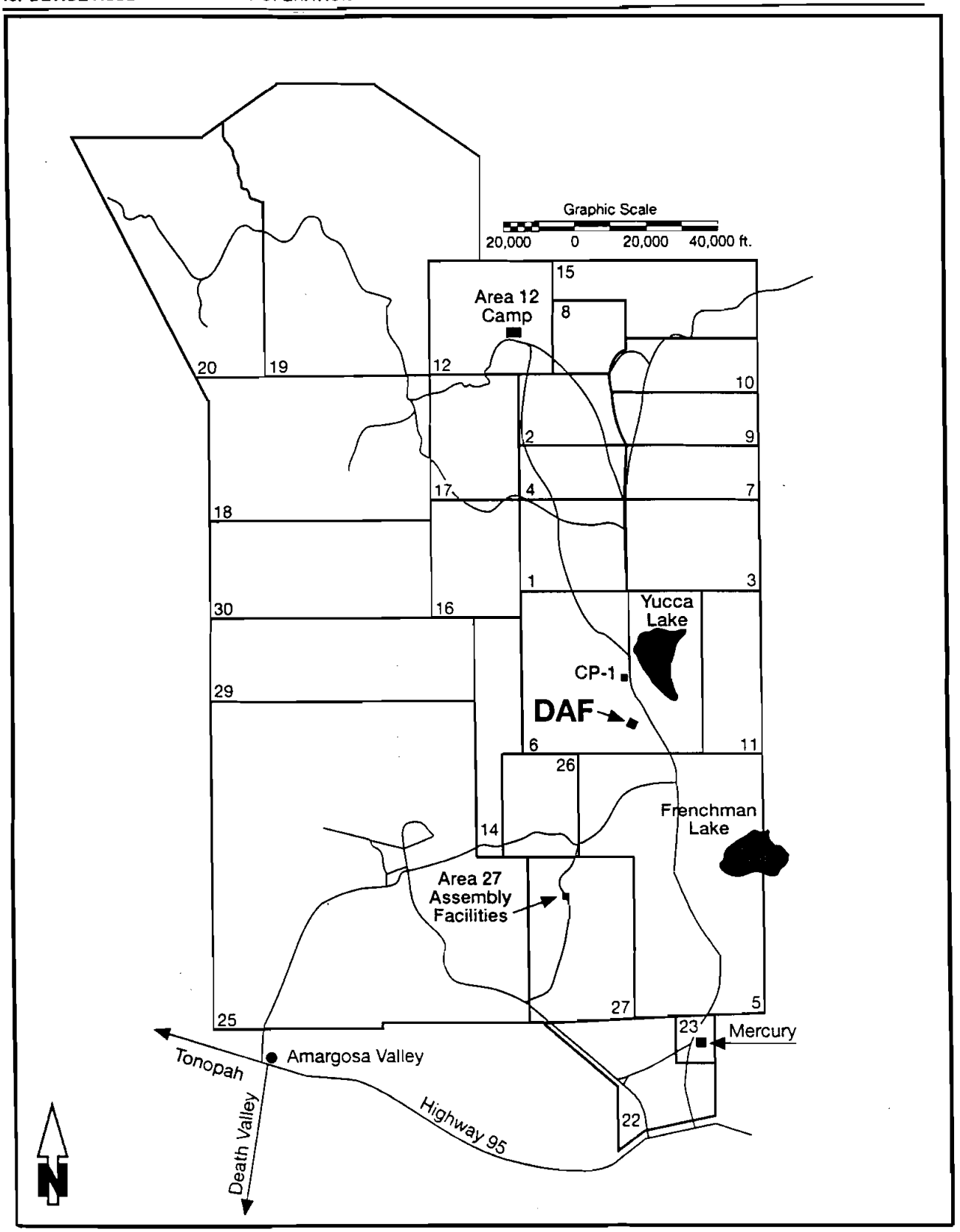


Figure 3. Map of Selected NTS Facilities

D.1 Air Quality

During a previously conducted air monitoring study, the air quality at the NTS was uniformly within the current federal and state primary and secondary standards.[9] In addition, simultaneous tests of selected point sources of air emissions were found to be in compliance with applicable permits. It was concluded, as a result of the study, that NTS air quality is well within all applicable local, state and federal regulations.

D.2 Geology/Seismicity

The oldest strata in the vicinity of the NTS consist of a 1,520 m (5,000 ft) sequence of Precambrian and lower Cambrian clastic rock overlain by a 4,570 m (15,000 ft) sequence of Middle Cambrian to Middle Devonian carbonate rock.[3] This is interspersed by volcanic tuffs and lavas of Tertiary age. The valleys are covered by late Tertiary and Quaternary alluvium. Both the DAF and the Area 27 facilities are located on alluvium.

The NTS lies within Zone 3 on the seismic risk map of the Uniform Building Code. Historical records of tectonic earthquakes within a 320 km (200 mi) radius of the NTS indicate that its structures have been subjected to ground accelerations of 0.12 g or less. In the near vicinity of the DAF and the Area 27 facilities, the Cane Spring Fault is the most probable source of seismic activity. The maximum credible earthquake associated with this fault would be expected to have a peak acceleration of 0.67 g and a magnitude of 6.7 on the Richter scale.[3]

D.3 Hydrology

D.3.a Groundwater

The eastern half of the NTS, including both the DAF and the Area 27 facilities, is within the Ash Meadows component of the Death Valley groundwater basin.[10] The groundwater in this basin is accessed by several water wells (Figure 4). Locally, the groundwater is closest to the surface at the Frenchman Playa, where it occurs at a depth of 157 m (515 ft) below land surface. At the DAF,on the margins of Frenchman Flat, the depth to groundwater is greater, occurring at approximately 360 m (1,180 ft). The depth to groundwater at the Area 27 facilities is approximately 520 m (1,700 ft).[11]

D.3.b Surface Hydrology

Neither perennial streams nor wetlands exist in the area of or adjacent to the DAF or the Area 27 facilities. The land surface around the DAF descends at a four to five percent slope, toward Frenchman Lake to the east. Frenchman Flat is a closed drainage basin; surface water collects in measurable quantities on the playa during the winter months.

The drainage patterns in the vicinity of the Area 27 facilities direct surface flows to the southwest. After crossing the NTS boundary, the drainage passes near Amargosa Valley, Nevada, and Death

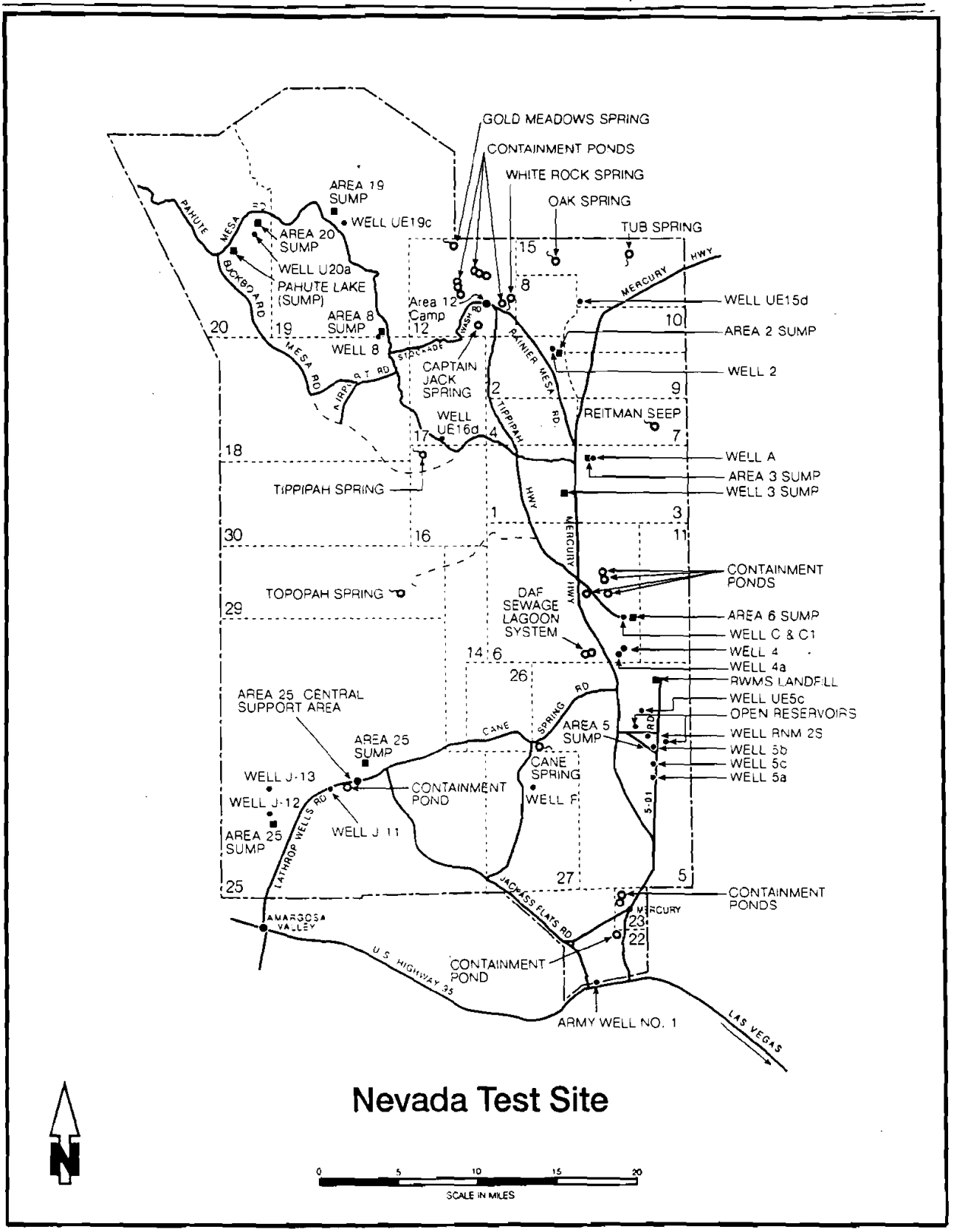


Figure 4. **NTS Wells, Springs, and Surface Water Bodies**

Valley Junction, California. In the vicinities of both the DAF and the Area 27 facilities, rainfall typically collects in drainage channels which flow to lower elevations, infiltrates into the soil, or evaporates.

D.4 Biological Resources

D.4.a Flora

The NTS and surrounding areas are on the transition between the Great Basin Desert, to the north, and the Mojave Desert, to the south.[1] The zone of transition extends along an east-west transect from Shoshone Mountain to the Massachusetts Mountains. Together, the two zones support a total of 706 taxa of vascular plants representing 67 families.[3] About a third of these species are members of one of three families; the *Asteraceae* (sunflowers), the *Poaceae* (grasses) or the *Polygonaceae* (buckwheats). Much of the areas of interest in Frenchman Flat and Rock Valley are populated by creosote bush communities.[12,13] None of the plant species in the vicinity of the DAF are listed as threatened or endangered, nor are any of the plant species in the immediate vicinity of the Area 27 facilities. During the September 5-6, 1984 preconstruction survey conducted for the DAF by EG&G Energy Measurements, Inc., no threatened or endangered plants were found.

D.4.b Fauna

Faunal diversity of the NTS is also enhanced by the transitional nature of its ecosystems.[3] However, due to the predominance of desert landscapes, most of the animal species are small, nocturnal or migratory. The zoological species list includes 1028 invertebrates, mostly insects, and 266 vertebrates, mostly migratory and seasonally resident birds.

The desert tortoise (*Gopherus agassizii*), a threatened species, is the only animal species on the U.S. Fish and Wildlife Service Threatened and Endangered Species List common to the NTS.[1] DOE/NV estimates that the southern third of the NTS is desert tortoise habitat (Figure 5). This species appears to be more abundant on the upper elevations of the flats and valleys adjacent to limestone, dolomite and shale mountains and less abundant near mountains of volcanic origin.[1] The desert tortoise also tends to be more abundant in areas where creosote bush is the dominant plant species. Transect studies have shown that signs of desert tortoise were commonly found on and adjacent to the south slopes of the Control Point Hills and in the southern portions of Rock Valley. During the 1984 preconstruction survey mentioned above, two live tortoises and five tortoise burrows were among tortoise sign found in the immediate area. Based on the survey results, it was recommended that DAF construction be conducted so as not to disturb the specific areas where live tortoises and tortoise burrow systems were found.

Before construction began on the DAF, the desert tortoise was not yet listed under the Endangered Species Act, and no consultations with the U.S. Fish and Wildlife Service were conducted until later. On April 2, 1990, the desert tortoise was listed (55 Fed. Reg. 12191, codified at 50 C.F.R. § 17.11) as a threatened species. Since the listing, DOE/NV has consulted with the U.S. Fish and Wildlife Service, which issued a *Biological Opinion on Nevada Test Site*

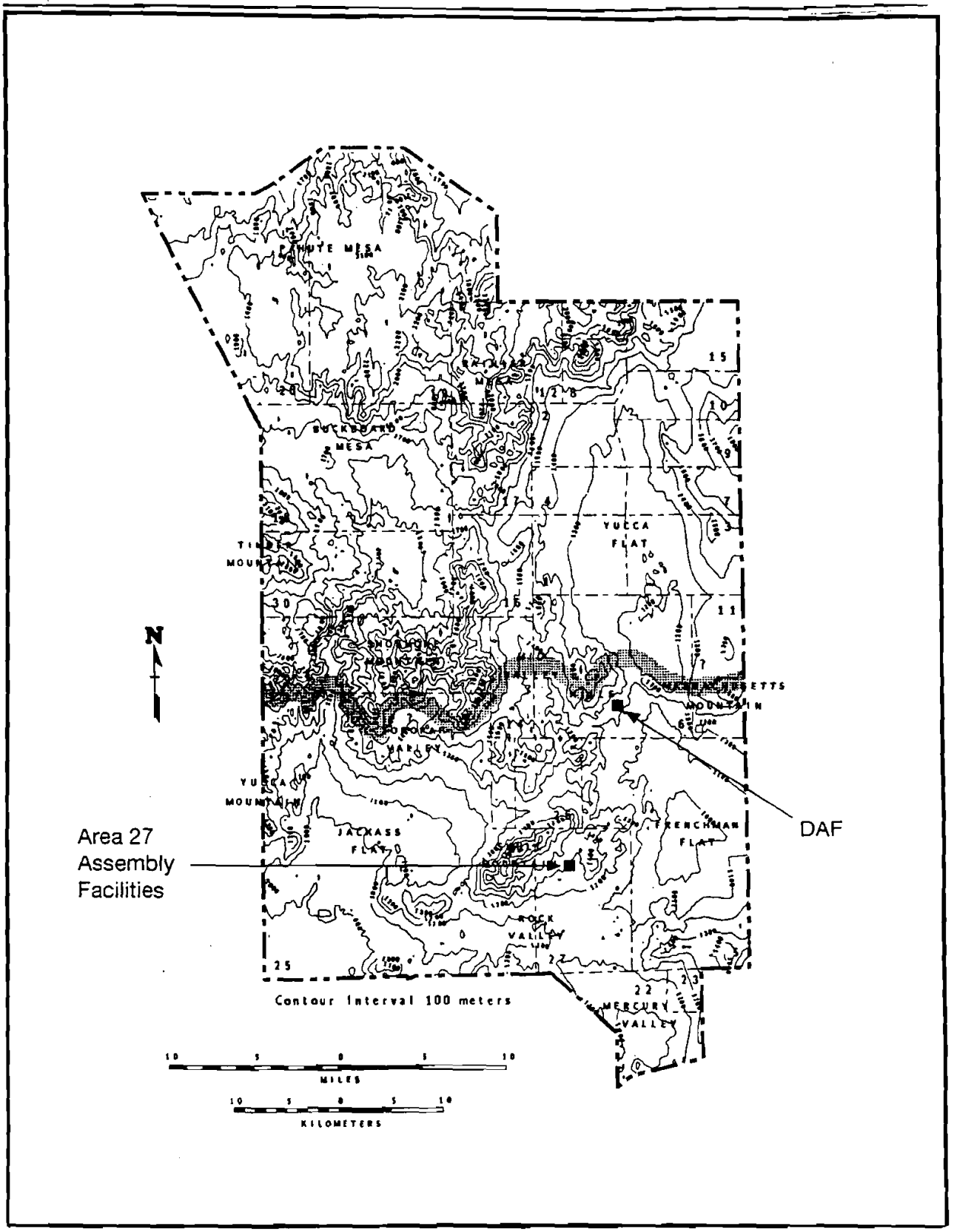


Figure 5. The Northern Limit of the Range of Desert Tortoises on the NTS

Activities[14] regarding the desert tortoise on the NTS. All subsequent construction has been conducted in accordance with the Biological Opinion.

The operations described by this environmental assessment will be conducted inside a cleared and fenced area in accordance with the Biological Opinion.

D.5 Cultural Resources

During a previous investigation, 17 significant archeological sites were identified on the NTS.[3] None of these sites are located in the vicinity of the DAF or the Area 27 facilities. On September 5-9, 1984, a Class III Cultural Resource Reconnaissance of the DAF was conducted by the Desert Research Institute (Report #SR090584-1). This report indicated that no significant cultural resources were discovered in the project area. After consultation with the state of Nevada Division of Historic Preservation and Archeology, that office issued a memorandum concurring that "the construction of a nuclear device assembly area in the surveyed area of Frenchman Flat will have no effect on properties of Register quality."

E. ENVIRONMENTAL CONSEQUENCES

E.1 Proposed Action

The potential environmental consequences resulting from the proposed action, opening and subsequent operation of the DAF, are discussed in this section. Environmental resources that are considered include air quality, geology, water quality, animal and plant species, cultural resources, human health, and the risk of accidents.

E.1.a Air Quality

The only air pollutants expected to be generated by the operation of the DAF are engine exhausts and dust generated by vehicular traffic. It is not anticipated that particulate matter generated as a result of normal operations would exceed air quality standards. Two emergency backup generators are present at the DAF. Because these generators are used to generate electrical power to maintain operations during unplanned electrical power outages, no permits to construct or operating permits are required (Nevada Administrative Code 445.705, "Air Pollution Exemptions"). The airborne emissions resulting from the emergency use of these generators would be insignificant. No storage tanks for gasoline, petroleum distillate, or other volatile organic compounds that would require an air quality permit would be utilized at the DAF.

The possibility of an accidental detonation or criticality is extremely remote because of a combination of administrative controls, personnel assurance training and certification, psychological evaluations, and safety design features. However, since an unlikely combination of several concurrent equipment failures and human errors or unauthorized acts could result in a detonation, the outcome of this event has been examined. The term, detonation, means the explosion of the chemical high explosive (HE) alone, the explosion of HE accompanied by release of plutonium as a contaminant, or an explosion from a low-order nuclear yield. Criticality means

an unplanned assembly of a critical mass that would release prompt radiation and fission products with little or no blast.[3]

If an accident should occur in one of the assembly cells, the cell's "Gravel Gertie" feature would serve as a filtration system to minimize dispersion of radioactive contamination. Assembly cells are maintained at a negative pressure with respect to the corridor to ensure that, in the unlikely event of a pit being opened, any contamination would be contained within that cell. Air exhausted from the DAF would pass through high-efficiency particulate air filters to ensure minimum release of particulate to the environment. Estimates of downwind doses are given in section E.1.g, Accident Analysis.

E.1.b Geology/Seismicity

Seismicity is not expected to affect the operation or integrity of the facility or cause any associated adverse environmental impacts. The Cane Springs Fault has been identified as the most significant geological feature from the standpoint of potential seismic risk, and its mapped surface expression is located approximately 3-5 miles south southeast of the DAF. The DAF is designed to withstand the Safe Shutdown Earthquake postulated for the Crane Spring Fault, which is an earthquake with a magnitude of 6.7 on the Richter Scale and an expected mean peak acceleration of 0.67 g. The Safe Shutdown Earthquake is defined as an earthquake which produces the maximum vibratory ground motion for which structures, systems, and components necessary for the safe operation of a facility remain functional. The Nevada Test Site lies within Zone 3 on the seismic risk map of the Uniform Building Code. An estimate of risk from earthquakes is given in section E.1.g.

E.1.c Hydrology

The operation of the DAF would not adversely affect the groundwater or surface water hydrology in the vicinity of the DAF. All of the underground storage/holding tanks at the DAF would comply with applicable laws and regulations. The sewage lagoon would be operated in accordance with a permit issued by the state of Nevada. A flood diversion structure has been constructed to protect the facility from flooding.

(1) Groundwater

No liquid effluents containing hazardous materials will be discharged during operations at the DAF. Even in the highly unlikely event of an accidental hazardous materials release, the great depth to groundwater (approximately 360 m [1,180 ft]) and its slow vertical movement, provide an effective barrier. The groundwater would therefore not be adversely affected by operation of the DAF.

Five double-walled fiberglass underground storage/holding tanks are utilized at the DAF. These include one holding tank for non-PCB transformer oil spill containment, one holding tank for fuel spill containment, two diesel fuel storage tanks that supply a boiler and an emergency power generator, and one holding tank for contaminated fire suppression/decontamination effluent. All tanks would comply with the requirements of 40 CFR 280. Proper notification has been made

with regard to these tanks in accordance with 40 CFR 280. Spill and overfill prevention and leak detection equipment would also be installed and operated as required no later than January 1998, the deadline set forth in state and federal regulations.

A collection system for contaminated wastewater, including fire suppression effluent, is provided for each assembly cell and each decontamination room shower drain. A written procedure would be developed for evacuating contaminated wastewater from the tank. The water would be tested to determine if contamination exists and would be disposed of properly.

Sewage and other nonhazardous water effluent from the facility is contained in a sewage lagoon system near the facility. A permit has been issued from the Nevada Division of Environmental Protection, which authorizes the discharge from the DAF via an evaporation/percolation basin.

(2) Surface Hydrology

The normal operation of the DAF would have no adverse effects on the surface hydrology in the area. The containment system for contaminated wastewater described in the previous section would reduce the risk of impacts to surface water due to contamination accidents or fires. No perennial streams exist in the area of or adjacent to the DAF; no wetlands exist in the area.

A storm water conveyance and diversion structure has been constructed to protect the facility and supporting structures from runoff during storm events. The structure was designed to convey the Local-Storm Probable Maximum Precipitation flood peak safely and effectively away from the project site. Evaluations are ongoing to confirm the results of the study on which the structure design was based. In addition, the design of the sewage lagoon incorporates a raised dike. There should therefore be no adverse affects to surface water. Precipitation on the NTS results in surface water runoff only during unusually intense storms. Rainfall typically infiltrates rapidly into the soil, runs off in normally dry channels, and evaporates.

E.1.d Biological Resources

Although existing plant cover in the area was displaced by the construction of the DAF, plant species would not be adversely affected by the operation of the facility. Plant cover was removed immediately adjacent to the DAF, and a lesser extent of disturbance has occurred within a 180 m (600 ft) radius of the site. Although this has resulted in a loss of productive plant biomass, the impact to the overall biota is not significant because the biomass represents a small percentage of the plant cover within the region. No threatened or endangered plant species are known to exist on the DAF site. The DAF is near the extreme northern range of the desert tortoise habitat on the NTS.

The desert tortoise is the only threatened or endangered animal species common to the NTS.[1] The desert tortoise would not be adversely affected by the operation of the DAF. All recommendations and requirements of the Biological Assessment[1] and the Biological Opinion[14] would be followed during the operation of the facility. All specified operational guidelines would be followed. Vehicular traffic on the NTS is restricted to existing roads. DOE/NV monitors compliance with the Endangered Species Act and provides desert tortoise conservation training

to all DOE and contractor personnel working on the NTS. The operations described by this environmental assessment will be conducted inside a cleared and fenced area.

E.1.e Cultural Resources

Operation of the DAF would not adversely affect any cultural resources in the area. Guidelines and operating procedures are followed to protect cultural resources and historic sites on the NTS. Any cultural resources found during operational activities conducted at the DAF would be reported as required by these procedures and applicable laws and regulations.

E.1.f Human Health Effects

Worker exposures to radiation under normal operations would be controlled under established procedures that require doses to be kept as low as reasonably achievable and that limit any individual's dose to less than 5 rem per year. Based on relevant experience with other projects, DOE expects the average dose from this proposed project to be maintained below 0.1 rem per year. Based on an occupational risk factor of 4×10^{-4} fatal cancers per person-rem, workers engaged in this proposed project would not be expected to incur any harmful health effects from radiation exposures they receive during normal operations.

Periodic exposures to epoxies and alcohols occur as part of the nuclear explosive operations conducted at the NTS. However, no Occupational Safety and Health Act Permissible Exposure Limits are exceeded during these operations. The duration of exposure to these substances is minimized by administrative controls and ventilation.

The human health effects of a nuclear explosive operations accident have been assessed for both workers and members of the public. It has been determined that in the event of detonation of all of the HE in a single assembly cell within the DAF, no personnel in occupied areas other than the structure of occurrence would be exposed to missiles with energy greater than 79 joules (58 ft-lb) or overpressures greater than 1.1 kg/cm^2 (15 lb/in^2) gauge (one-half the threshold pressure for lung damage, but about 7 times the threshold for eardrum rupture).[3]

The event described above is what has been termed the "design basis accident." Table 3 describes the effects of normal operations and of the design basis accident on workers conducting a nuclear explosive operation, on other workers not directly involved in the operation, and on the general public.

E.1.g Accident Analysis

Chapter 4 of the Preliminary Safety Analysis Report[3] identifies the hazards and types of credible accidents associated with the DAF and analyzes the probability and consequences of occurrence. The accident considered in each case is the detonation of a nuclear device: either the detonation of all the high explosive (HE) present (550 pounds of PBX 9404 is used as the design limit, which exceeds actual quantities); explosions of HE involving a release of plutonium; explosions resulting

Table 3. Human Radiological Health Effects of NTS Nuclear Explosive Operations

Receptor	Normal Operations		Design Basis Accident (423 lbs PBX 9404 and 25 Kg Pu)	
	A27	DAF	A27	DAF
Worker	Occupational < 500 millirem/year	Occupational < 500 millirem/year	Releases up to 25,000 grams Plutonium	Releases up to 480 grams Plutonium
Colocated Worker	0	0	11 rem/year	0.53 rem/year
General Public	0	0	4.5 rem/year	0.025 rem/year

in a low-order nuclear yield where plutonium and fission products are released; and a criticality (with little or no blast) where prompt radiation and fission products are released.

The consequences of the accidents may be summarized as follows:

A detonation of 550 pounds of HE would be mostly contained within the work or storage area. Overpressures in other work areas of the DAF would not exceed 15 psi. (This pressure is one-half the threshold pressure for lung damage, but is about seven times the threshold for eardrum rupture.) Severe equipment and facility damage and worker fatalities could occur within the chamber containing the detonation.

Assuming 11 pounds of plutonium (the nominal quantity found in one nuclear device) were involved in a one-point (150 pounds of HE) detonation which breached the containment features, the Livermore Hot Spot Health Physics Code estimated a 50-year equivalent whole body dose of 54 rem at 100 meters down wind and 1 rem at 4 km.

Assuming a 0.1-kiloton, low-order nuclear yield that breached the containment features of the DAF, the Code estimated a 50-year equivalent whole body dose of 1,300 rem at 2 km and 240 rem at 5 km. Blast effects were predicted to be 0.6 psi at 1 km, clearly a catastrophic event.

Assuming about 1.5 x 10^4 Ci of fission product activity would be present 10 minutes after a postulated 10^{18}-fission criticality accident, and that negative pressure containment systems and filters were operating, the whole body dose at 800 meters (one-half mile) was estimated to be less than the reactor siting criteria of 25 rem. However, inside the DAF, some workers could be exposed to fatal levels if they could not evacuate promptly. The probability of any of the above accidents is extremely improbable; the expression of probability is in the range of 10^{-5} to 10^{-6}. The likelihood of an accident is kept low by a combination of administrative controls, personnel training, and safety design features. Risks were estimated for normal operations (staging, transportation, and assembly) and the possible triggering events that must be prevented (chemical energy, electrical energy, mechanical energy, thermal energy, radiation, inadvertent acts, and deliberate, unauthorized acts).

The probabilities of occurrence and consequences of the accidents postulated in the Preliminary Safety Analysis Report[3] are summarized in Table 4. The likelihood of an accident would be kept low by a combination of administrative controls, personnel training, and safety design features. Risks have been estimated for three categories of normal operations (staging, transportation, and assembly) and the possible triggering events that must be prevented (chemical energy, electrical energy, mechanical energy, thermal energy, radiation, inadvertent acts, and deliberate unauthorized acts).

Staging is defined as those operations where the nuclear explosive or the components of a nuclear explosive are in a static condition and in approved staging bunkers. These bunkers can be used to stage experimental packages before assembly and/or shipment to the test location. Staging operations are judged to be the least likely to produce an accidental nuclear explosive detonation. Transportation is defined as those operations where nuclear explosives or nuclear components are lifted, moved, and transported for any purpose within the DAF. Mechanical energy would be the most likely triggering event for forklift and monorail crane operations, for example. Assembly generally includes disassembly, modification, testing, maintenance, repair, retrofit, and surveillance of nuclear explosives. Assembly operations pose more risk than either staging or transportation operations.[3] To reduce risk of triggering a detonation, special safety systems are provided. These special systems include smooth, resilient flooring, handling fixtures to aid in lifting, and an automatic self-recording tritium monitor with alarms.

E.2 No Action

The environmental consequences resulting from the no action alternative, i.e., to operate the Area 27 facilities in their current condition, are discussed in this section. Environmental resources considered include air, geology, water, animal and plant species, cultural resources, and human health.

E.2.a Air Quality

Normal operations of the Area 27 facilities would result in air pollutants being generated by engine exhausts and vehicular traffic. The airborne pollutants generated by these sources would not be expected to exceed air quality standards.

Although the possibility of either an accidental low-order nuclear yield or a high explosives detonation is extremely remote, a combination of several occurrences could result in a detonation. Because of the roof design of the assembly bays, an accidental detonation could result in the roof blowing out.[6] The lack of "Gravel Gerties" or any other filtration system would result in the release of radioactive materials to the atmosphere. Also, in the event of a detonation during multibay operations, the explosion would be expected to propagate from one bay to the next. This would also cause increased adverse impacts to humans and the environment. The geographic location of the facilities in the proximity of the border of the NTS could result in off-site contamination. Pollutants could be discharged through roof and exhaust fans of certain structures which have no filtration systems.

Table 4. Summary of Risk Resulting from Postulated Accidents[a]

ACCIDENT	FREQUENCY OF OCCURRENCE OVER FACILITY LIFETIME	IMPACT TO PUBLIC	IMPACT ON OPERATING PERSONNEL	IMPACT ON FACILITY	PROGRAMMATIC IMPACT	DOLLAR LOSS	HAZARD SEVERITY
OPERATIONAL ACCIDENTS:							
Minor Power Outage	Frequent ($>10^{-2}$)	None	None	None	None	None	Negligible
Major Power Outage	Occasional (10^{-3} to 10^{-4})	None	None	None	None	None	Negligible
Maximum Realistic Fire Loss	Extremely Improbable (10^{-5} to 10^{-6})	None	None	Catastrophic	None	< $5 million	Catastrophic
Serious Personal Injury	Remote (10^{-4} to 10^{-5})	None	Critical	None	None	None	Critical
Exposure to Nuclear Material	Extremely Improbable (10^{-5} to 10^{-6})	None	Critical	Critical	Marginal	< $500,000	Critical
Detonation	Extremely Improbable (10^{-5} to 10^{-6})	None	Catastrophic	Catastrophic	Marginal	< $5 Million	Catastrophic
ACCIDENTS ASSOCIATED WITH NATURAL PHENOMENA							
Earthquake	Remote (10^{-4} to 10^{-5})	None	Marginal	Marginal	None	< $10,000	Marginal
Tornado	Remote (10^{-4} to 10^{-5})	None	Marginal	Marginal	None	< $10,000	Marginal
Wind-borne Missile	Occasional (10^{-3} to 10^{-4})	None	None	Marginal	None	< $10,000	Marginal
Lightning	Frequent ($>10^{-2}$)	None	None	None	None	None	Negligible
Flood	Extremely Improbable (10^{-5} to 10^{-6})	None	Marginal	Marginal	None	< $10,000	Marginal

[a] From Table 4-4, *Preliminary Safety Analysis Report*, Holmes & Narver, Inc., January 1986.

Although the majority of the facility consists of concrete structures, some structures in certain buildings are wooden. If a fire started, recirculation through the air conditioning and heating system could spread combustion products. Based on these circumstances, a fire at the facilities could cause an accident, potentially discharging pollutants to the atmosphere. These pollutants would consist of those products of combustion expected from a typical industrial building fire plus the products of combustion that could be expected from a nuclear explosive.

E.2.b Geology/Seismicity

Buildings within the facilities would retain their structural integrity during a Safe Shutdown Earthquake, but equipment and minor structural damage would be expected. The adverse structural effect of further load increases to certain roof areas, the questionable strength of some crane lateral supports, and the fact that certain equipment essential for assembly operations is not secured have all been identified as concerns in the event of an earthquake.[6] An accidental detonation and the associated impacts to the environment could conceivably result from an earthquake occurring during assembly/disassembly operations. The Cane Springs Fault has been identified as the most significant geologic feature in the area.

E.2.c Hydrology

The normal operations of the Area 27 facilities would not be expected to adversely affect the groundwater or surface water hydrology in the area. Drainage channels and culverts are present to protect the facility from flooding.

(1) Groundwater

The depth to groundwater at the Area 27 facilities is approximately 520 m (1,700 ft). Due to this depth, the potential of adverse impacts to the groundwater resources in the area are minimal. However, the Area 27 facilities have neither decontamination facilities nor a containment system for contaminated wastewater. This increases the potential for radioactive materials to be discharged to the soils in the event of an accident. Domestic sewage and other effluent is discharged to a leach field; no sewage lagoon has been constructed to support the facilities.

(2) Surface Hydrology

Normal operations at the facilities would have no adverse impacts on the surface hydrology in the area. However, since the facilities have no containment system for contaminated wastewater, the potential for a release of contaminants exists in the event of an accident or fire. One flooding analysis determined that the 100-year design storm event would pose no threat to certain buildings within the facilities.[6] Existing drainage facilities should be adequate in most cases.

E.2.d Biological Resources

Existing plant cover in the area was displaced by the original construction of the Area 27 facilities. However, plant species would not be adversely affected by the operation of the facilities. No threatened or endangered plant species are known to exist on the site.

The desert tortoise is the only listed threatened animal species common to the NTS. The desert tortoise would not be adversely affected by the operation of the facilities. Construction of the existing facilities was completed before the desert tortoise was listed as a threatened species. All recommendations and requirements of the Biological Assessment[1] and the Biological Opinion[14] are followed during the operation of the facility. All specified operational guidelines are also followed. Vehicular traffic on the NTS is restricted to existing roads. DOE/NV monitors compliance with the Endangered Species Act.

E.2.e Cultural Resources

Operation of the Area 27 facilities would not adversely affect any cultural resources in the area. Guidelines and operating procedures are followed to protect cultural resources and historic sites on the NTS.

E.2.f Human Health Effects

Under normal operations, the human health effects of the nuclear explosive operations conducted in the Area 27 facilities are the same as those of operations that would be conducted at the DAF. These effects are discussed in Section E.1.f. The effects resulting from a nuclear explosives accident at the Area 27 facilities are also addressed in Section E.1.f.

E.3 Transportation and Criticality Considerations

Nuclear explosive components are delivered to the NTS from the DOE integrated contractors in several states. The difference in distance and the corresponding risk is negligible. The DAF is approximately 12 miles closer to all testing areas than the Area 27 facilities.

Each individual nuclear explosive operation is analyzed under a nuclear explosive safety study in accordance with DOE Orders 5610.10 and 5610.11. This nuclear explosive safety study includes a criticality analysis for each specific nuclear explosive design. Nuclear explosives are specifically designed to be inherently critically safe. If a nuclear explosive safety study ever indicated a criticality concern, specific mitigative actions would be designed and implemented.

E.4 Summary of Consequences

Normal operation of the DAF would not result in any direct adverse effects on the human environment. The incorporation of state-of-the-art design, construction, and safety and environmental controls would in fact result in a significant reduction of the potential for adverse impacts to both humans and the environment. In the case of an accidental detonation, the

presence of "Gravel Gertie" type construction and the high-efficiency particulate air filters would minimize the release of particulate to the environment. The effects of an accidental explosion would not propagate from one assembly structure to another. In addition, the containment system for decontamination wastewater and contaminated fire suppression effluent would minimize the risk of a release of contaminated water to the environment. All areas of the DAF are designed to withstand the Safe Shutdown Earthquake postulated for the Cane Springs Fault. All of the underground storage tanks at the DAF would comply with existing regulations. A storm water conveyance and diversion structure has been constructed to protect the facility and supporting structures from flooding during storm events. No plant or animal species or cultural resources would be adversely affected by the operation of the facility.

Although the normal operation of the Area 27 facilities would result in no direct adverse effects to the environment, an accidental detonation during assembly/disassembly operations could result in adverse effects to both humans and the environment. The lack of effective safety and environmental control features, including "Gravel Gerties" and contaminated effluent containment systems, could lead to direct impacts to air and water resources, and human safety, in the event of an accident. No plant or animal species, or cultural resources, would be adversely affected by the continued operation of the facilities

REFERENCES

1. U.S. Department of Energy, July 1991, *Biological Assessment of the Effects of Activities of the U.S. Department of Energy Field Office, Nevada, on the Threatened Desert Tortoise*, U.S. Department of Energy, Field Office, Las Vegas, Nevada.

2. U.S. Energy Research and Development Administration, 1977, *Final Environmental Impact Statement; Nevada Test Site*, Nye County, Nevada. ERDA-155/UC-2:11, U.S. Energy Research and Development Administration, Washington, D.C.

3. Holmes & Narver, Inc., 1986, *Preliminary Safety Analysis Report; Device Assembly Facility, Nevada Test Site*, Holmes & Narver, Inc., Las Vegas, Nevada.

4. U.S. Department of Energy, 1983, *Memo to the File, Environmental Report -- New Combined Assembly Area*, U.S. Department of Energy, Nevada Operations Office, Las Vegas, Nevada.

5. U.S. Department of Energy, 1991, *Device Assembly Facility Action Description Memorandum*, U.S. Department of Energy, Nevada Field Office, Las Vegas, Nevada.

6. Lawrence Livermore Laboratory, June 10, 1977, *SAR for LLL 5300 Complex, NTS*, U.S. Department of Energy, San Francisco Operations Office, Oakland, California.

7. U.S. Department of Energy, 1991, *Nevada Operations Office Annual Site Environmental Report- 1990*, Vol. I. U.S. Department of Energy, Nevada Operations Office, Las Vegas, Nevada.

8. U.S. Department of Commerce, 1990, *1990 Census of Population and Housing*, Nevada Volume, Bureau of Census, Washington, D.C..

9. Engineering-Science, 1990, *Project Report of Air Quality Study at the Nevada Test Site*, PE192.05, Engineering-Science, Pasadena, California.

10. Winograd, I. J. and W. Thordarson, 1975, *Hydrogeologic and Hydrochemical Framework, South-central Great Basin, Nevada-California, with Special Reference to the Nevada Test Site*, U.S. Geological Survey Professional Paper 712, U.S. Government Printing Office, Washington, D.C.

11. Raytheon Services Nevada, 1992, *Depth and Fluid Level Surveys for the Month of June 1992.*

12. Beatley, J. C., 1976, *Vascular Plants of the Nevada Test Site and Central-southern Nevada: Ecologic and Geographic Distributions*, TID-26881, U.S. National Technical Information Service, Springfield, Virginia.

13. O'Farrell, T.P. and L.A. Emery, Desert Research Institute, 1976, *Ecology of the Nevada Test Site: A Narrative Summary and Annotated Bibliography*, NVO-167, U.S. Department of Energy, Las Vegas, Nevada.

14. U.S. Department of the Interior, Fish and Wildlife Service, May 20, 1992, *Biological Opinion on Nevada Test Site Activities*, U.S. Department of Energy, Nevada Operations Office, Las Vegas, Nevada.

15. U.S. Department of Energy, 1992, *Start-Up Plan: Combined Device Assembly Facility: Area 6, Nevada Test Site, Nevada* (Draft of July 22, 1992), U.S. Department of Energy, Nevada Field Office, Las Vegas, Nevada.