3.0 ALTERNATIVES

Chapter 3 begins with a description of the pit production operations and requirements of the proposed Modern Pit Facility. It includes a description of the reasonable alternatives and the planning assumptions and basis for the environmental impact statement analyses. The alternatives considered and subsequently eliminated from detailed evaluation also are discussed. The chapter concludes with a summary comparison of the environmental impacts associated with each of the alternatives and identifies the U.S. Department of Energy's Preferred Alternative.

3.1 PIT PRODUCTION OPERATIONS AND REQUIREMENTS

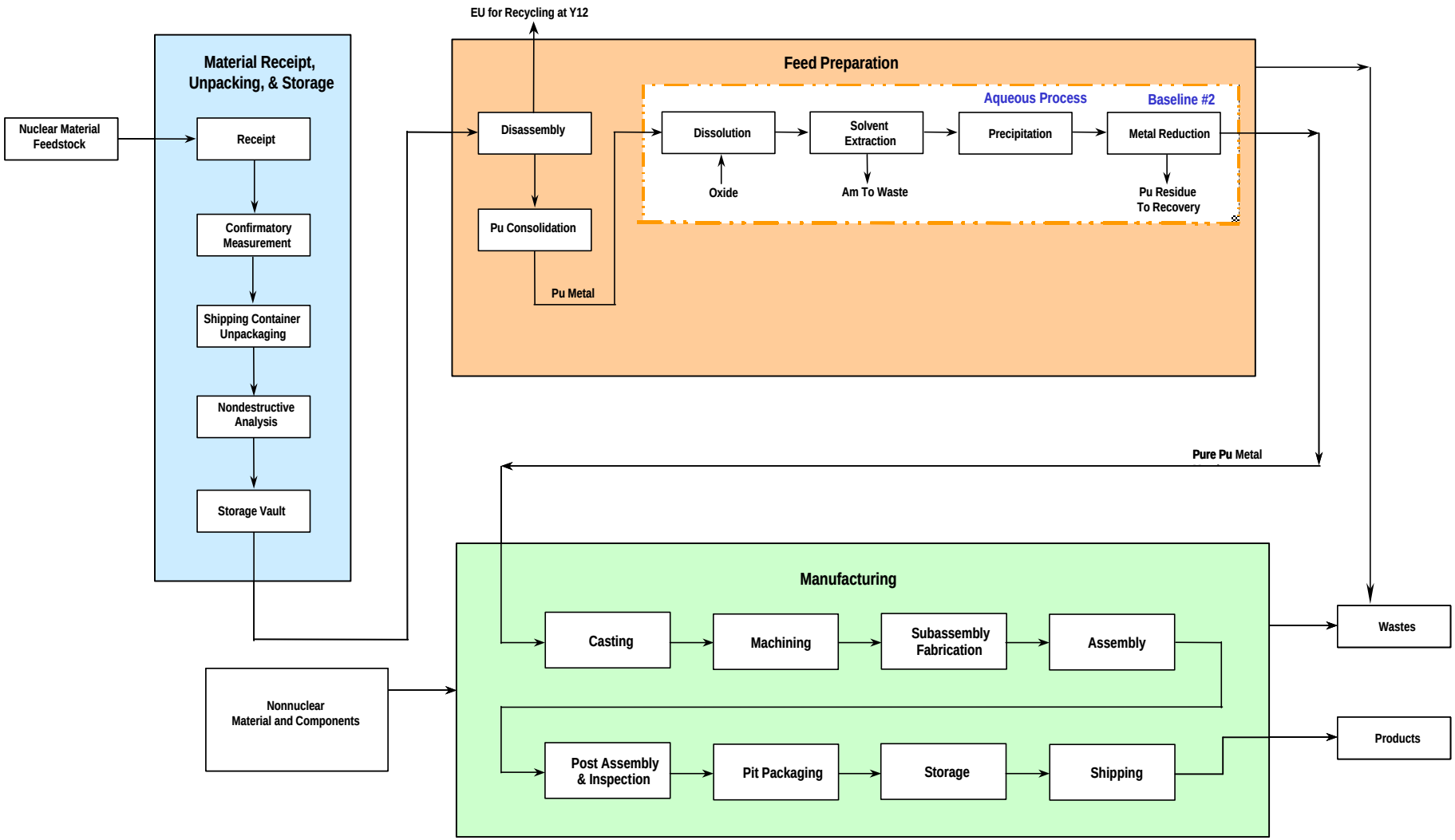
This Environmental Impact Statement (EIS) analyzes the impacts from the construction and operation of a new facility, referred to as a Modern Pit Facility (MPF), to produce plutonium pits for nuclear weapons. In addition to the construction of a totally new facility, an option to upgrade the existing Technical Area (TA)-55 Plutonium Facility, Building 4 (PF-4) at the Los Alamos National Laboratory (LANL) to increase its output is analyzed as well as the No Action Alternative. This section discusses the overall pit production process, and lists the facility requirements necessary to accommodate this process. The MPF is in a conceptual design stage.

3.1.1 Pit Production Process

The following discussion is a brief summary of the pit production process that would be accomplished in a MPF. A more detailed discussion is contained in Appendix A. The overall process is depicted in Figure 3.1.1–1 which shows three main areas: Material Receipt, Unpacking, & Storage; Feed Preparation; and Manufacturing.

3.1.1.1 Material Receipt, Unpacking, and Storage

Plutonium feedstock material would be delivered from offsite sources in the U.S. Department of Energy (DOE)/Department of Transportation (DOT) approved shipping containers. The shipping containers would be held in Cargo Restraint Transporters (CRT) and hauled by Safe Secure Trailers (SST) or Safeguards Transporters (SGT). The bulk of the feedstock material would be in the form of pits from old weapons to be recycled with small amounts of plutonium metals from LANL and SRS. The CRTs would be unloaded from the truck and the shipping packages unpacked from the CRT. Each shipment would be measured to confirm the plutonium content, entered into the facility's Material Control & Accountability (MC&A) database, and placed into temporary storage. The shipping packages would be later removed from storage and opened to remove the inner containment vessel. Containment vessels with the feedstock material would then be accountability measured and transferred to the Receipt Storage Vault pending transfer to the Feed Preparation Area.



Am = Americium.
EU = Enriched Uranium.
Pu = Plutonium.
Source: Modified from NNSA 2002.

Figure 3.1.1–1. Modern Pit Facility Flow Process

3.1.1.2 Feed Preparation

The containers would then be transferred through a secure transfer corridor to an adjacent Feed Preparation Area where plutonium metal is prepared for manufacturing. For pits to be recycled, mechanical disassembly involves cutting the pit in half and removing all non-plutonium components. Notable among these non-plutonium components is enriched uranium which would be decontaminated and then shipped to the Y-12 National Security Complex for recycling. All of the other disassembled components would be decontaminated to the maximum extent possible and then disposed of as either low level waste (LLW) or transuranic (TRU) waste as appropriate.

There are two baseline processes being evaluated for the purification of the plutonium metal. One baseline relies more heavily on aqueous chemistry (aqueous process) and the other on pyrochemical reactions (pyrochemical process). The primary difference between the two baselines is that the aqueous process does not employ chloride containing aqueous solutions, which means conventional stainless steels can readily be used to contain all of its processes. On the other hand the pyrochemical process requires specialized materials to contain the corrosive chloride bearing solutions that it employs.

The primary process evaluated in this EIS is the aqueous process. This is a well-known process, which has been successfully used at DOE sites for many years. It is comparatively simple and experiences few, but well controlled corrosion problems. However, it is not as space efficient and does not produce as pure a product metal as the pyrochemical process. This lower purity requires more complete processing and historically the aqueous process produces significantly more waste than the pyrochemical process. This provides a bounding analysis of the waste impact from a MPF.

The pyrochemical process is more complex than the aqueous process, employing seven versus four major processing steps. However, this can be done in less space with more processing flexibility. It also produces very pure metal and a lower volume of waste. The purity of metal allows the pyrochemical process to have the option of only partially processing metallic plutonium to obtain adequate production purity. Although it requires special materials of construction to contain the corrosive chloride solutions it appears to have the greatest potential for improvement based on results from ongoing technology development projects. The pyrochemical process has been used for many years at LANL.

The pyrochemical process is being investigated because it has the potential to be environmentally more benign, thus having less environmental impact than the aqueous process. The impacts from both of these processes will therefore be bounded in this EIS. As the design of a MPF develops and a final purification method is chosen, the site-specific tiered EIS will evaluate the impact of the actual process to be used.

3.1.1.3 Manufacturing

The plutonium metal resulting from the purification process would be transferred to the manufacturing area where it would be melted and cast into required shapes in a foundry operation. These castings would be machined to proper dimensions, combined with other non-plutonium parts, and assembled into pits. New pits would be inspected and prepared for

storage and eventual shipment to Pantex. The majority of the waste from this process would be plutonium shavings that would be recycled within a MPF. Other wastes generated from the manufacturing process are included in Table 3.1.2.5–3.

3.1.2 Modern Pit Facility Requirements

Aside from the question of when a MPF would need to become operational, the question of actual design size of a MPF is next in importance. Design size would be primarily affected by both the operational lifetime of pits and the size of the stockpile. Since there is some level of uncertainty over both these issues (see Chapter 2), the final design size of a MPF has not yet been determined. These uncertainties have been evaluated in classified studies. Three levels of production are evaluated to provide a reasonable range for analysis in this MPF EIS. These are 125, 250, and 450 pits per year (ppy) in a single-shift operation. To accommodate these three production rates, this EIS analyzes three different plant sizes. Another consideration is the contingency or surge use of two-shift operations for emergencies.

3.1.2.1 Security

The majority of MPF would be located within a Perimeter Intrusion Detection and Assessment System (PIDAS). The PIDAS would be a multiple-sensor system within a 9-m (30-ft) wide zone enclosed by two fences that surround the entire Security Protection Area. In addition, there would be 6-m (20-ft) clear zones on either side of the PIDAS. There would be an Entry Control Facility (ECF) at the entrance to the Security Protection Area.

3.1.2.2 Process Buildings

A proposed concept being evaluated for a MPF divides the major plant components into three separate process buildings identified as Material Receipt, Unpacking & Storage; Feed Preparation; and Manufacturing as described in Section 3.1.1. The process buildings would be two-story reinforced concrete structures located aboveground at grade. The exterior walls and roofs would be designed to resist all credible man-made and natural phenomena hazards and comply with security requirements. The exterior walls of the first level would consist of double-reinforced concrete wall construction with loose aggregate backfill between the walls to satisfy security requirements.

The first story of each building would include plutonium processing areas, manufacturing support areas, waste handling, control rooms, and support facilities for operations personnel. The second story of each of the three process buildings would include the heating, ventilating, and air conditioning (HVAC) supply fans, exhaust fans and high-efficiency particulate air (HEPA) filters, breathing/plant/instrument air compressor rooms, electrical rooms, process support equipment rooms, and miscellaneous support space. Interior walls are typically reinforced concrete to provide personnel shielding and durability in the 50-year facility design life. Each of these processing buildings would have its own ECF, truck loading docks, operations support facility, and safe havens designed in accordance with applicable safety and security requirements. The three processing buildings would be connected with secure transfer corridors.

3.1.2.3 Support Buildings Within the Perimeter Intrusion Detection and Assessment System

The major support structures located within the PIDAS would include the Analytical Support Building and the Production Support Building. The Analytical Support Building would contain the laboratory equipment and instrumentation required to provide analytical chemistry and metallurgical support for the MPF processes, including radiological analyses. The Production Support Building would provide the capability for performing nonradiological classified work related to the development, testing, staging and troubleshooting of MPF processes and equipment during operations. A number of other smaller structures also supporting a MPF would include the standby generator buildings, fuel and liquid gas storage tanks, HVAC chiller building, cooling towers, and the HVAC exhaust stack.

3.1.2.4 Support Buildings Outside the Perimeter Intrusion Detection and Assessment System

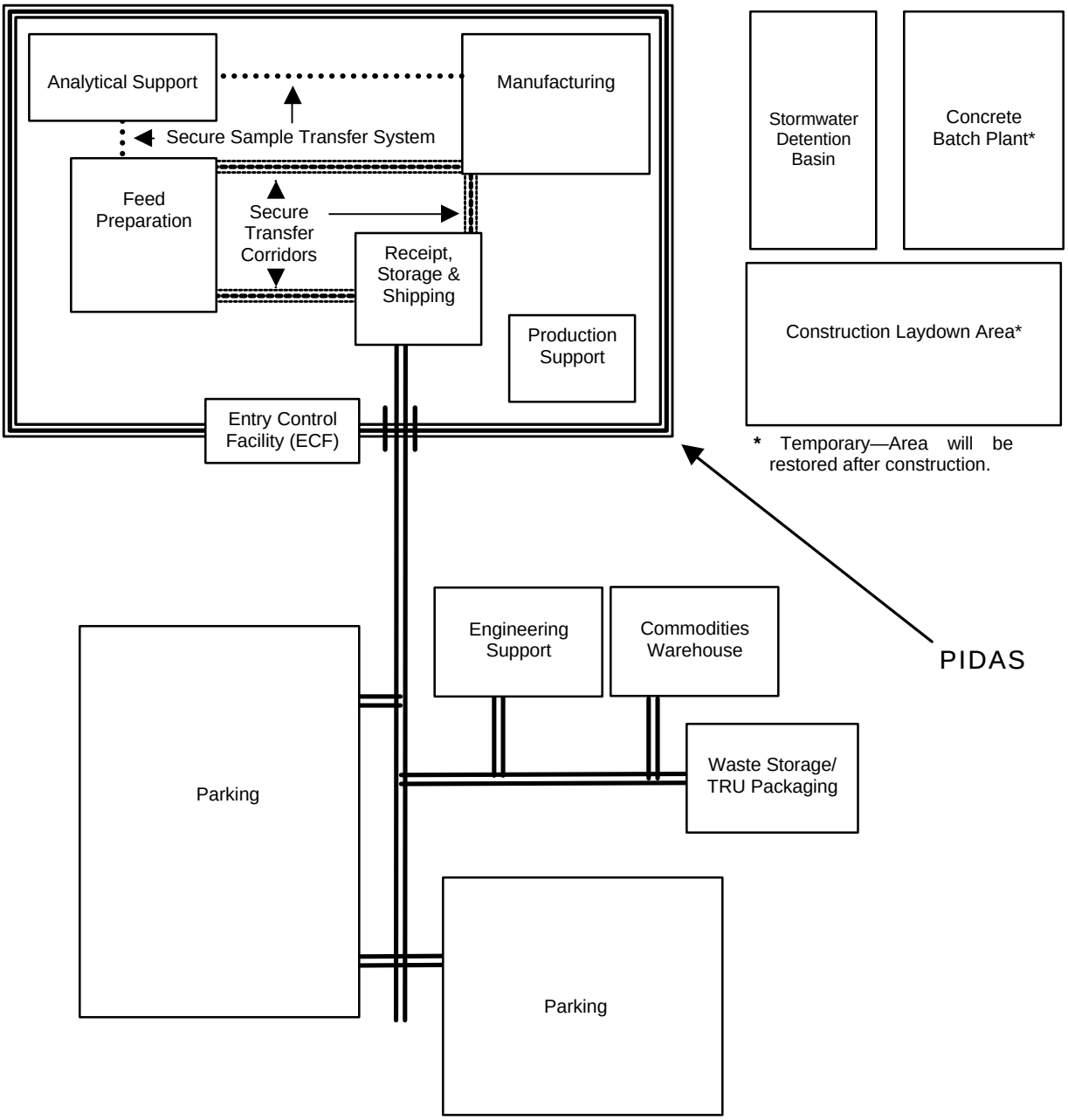
The major structures located outside the PIDAS would include the Engineering Support Building, the Commodities Warehouse, and the Waste Staging/TRU Packaging Building. This Waste Staging/TRU Packaging Building would be used for characterizing and certifying the TRU waste prior to packaging and short-term lag storage prior to shipment to the TRU waste disposal site. Parking areas and stormwater detention basins would also be located outside the PIDAS. In addition, a temporary Concrete Batch Plant and Construction Laydown Area would be required during construction. A generic layout showing the major buildings and their relationship to each other is shown in Figure 3.1.2.4–1. Table 3.1.2.4–1 shows the dimensions involved for the three different plant capacities.

The overall plant layout in the generic representation is a greenfield campus type layout, and would be adapted to each site as necessary. The actual footprint of all of the buildings, as shown in the table, is considerably less than the "developed" area from the generic layout. Thus, the actual developed site layout could be much less than that shown in Table 3.1.2.4–1, and could fit any site with enough space for buildings footprint and adequate security standoff distances.

Table 3.1.2.4–1. Dimensions for the Three Different MPF Capacities

	125 ppy	250 ppy	450 ppy
Processing Facilities Footprint (m^2)	28,600	32,800	44,900
Support Facilities Footprint (m^2)	26,000	26,200	29,900
Total Facilities Footprint (m^2)	54,600	59,000	74,800
Total Facilities Footprint (ha)	5.46	5.90	7.48
Area inside PIDAS (ha)	25.5	26.3	31.6
Area Developed During Construction (ha)	56.3	58.3	69.2
Post Construction Developed Area (ha)	44.5	46.5	55.8

Source: MPF Data 2003.



Source: Modified form MPF Data 2003.

Figure 3.1.2.4–1. Generic Layout of a Modern Pit Facility

3.1.2.5 Modern Pit Facility Construction and Operational Materials and Wastes

Tables 3.1.2.5–1 through 3.1.2.5–3 contain the construction and operational material requirements for all three plant sizes of a MPF along with the associated waste values.

Table 3.1.2.5–1. Modern Pit Facility Construction Requirements

Requirement	Total Consumption		
	125 ppy	250 ppy	450 ppy
Material/Resources			
Electrical Energy (MWh)	6,000	6,750	8,000
Peak Electricity (MWe)	3.0	3.5	4.0
Concrete (m^3)			
Total	214,000	241,000	349,000
Peak Yearly	74,000	84,000	122,000
Aggregate (m^3)			
Total	200,000	222,000	310,000
Peak Yearly	55,000	63,000	92,000
Steel (metric tons)			
Total	36,400	40,200	56,000
Peak Yearly	9,800	11,200	16,300
Liquid Fuels (Mega Liters)			
Total	16.7	10.1	13.0
Peak Yearly	2.6	2.9	3.7
Gases (m^3)			
Total	13,600	15,000	19,500
Peak Yearly	3,960	4,250	5,660
Water (Mega Liters)			
Total	71.9	79.5	110.0
Peak Yearly	21.2	23.8	33.7
Employment			
Total (Worker Years)	2,650	2,950	3,800
Peak (Workers)	770	850	1,100
Construction Period (yrs)	6	6	6

Mega Liters: 1 Mega Liter = 1 million liters.
Source: MPF Data 2003.

Table 3.1.2.5–2. Modern Pit Facility Operations Annual Requirements

Resources	Plant Size		
	125 ppy	**250 ppy**	**450 ppy**
Electrical Consumption[a] (MWh)	79,800	113,750	175,600
Peak Electrical (MWe)	20.5	23.5	36.5
Diesel Fuel[b] (L)	259,650	357,150	583,500
Nitrogen[c] (m^3)	223,900	245,050	303,250
Argon[c] (m^3)	4,200	7,300	11,800
Domestic Water[d] (L)	44,875,000	61,680,400	81,619,750
Cooling Tower Make-up (L)	232,514,800	267,758,300	422,737,800
Steam[e] (Kgs)	43,717,300	50,063,300	77,562,900
Employment			
Total workers	988	1,358	1,797
Radiation workers	546	799	1,101

[a] Electrical: Based on 24 hrs/day, 365 days/yr.
[b] Diesel Fuel: Based on diesel generator testing 1 hr/week
[c] Nitrogen and Argon: Annual consumption is based on 1 percent make-up.
[d] Domestic Water: Calculations for the annual consumption were based on 189 L/day/person, 240 days/year.
[e] Steam would require an energy source for generation. If coal were used, it would require 3,710 metric tons/yr (125 ppy), 4,245 metric tons/yr (250 ppy), 6,275 metric tons/yr (450 ppy). If natural gas were used, it would require 4,358,100 m^3/yr (125 ppy), 4,990,750 m^3/yr (250 ppy), 7,732,150 m^3/yr (450 ppy).
Source: MPF Data 2003.

Table 3.1.2.5–3. Modern Pit Facility Waste Volumes

Annual Operating Waste Type (m^3)	Plant Size		
	125 ppy	**250 ppy**	**450 ppy**
TRU Solid (including Mixed TRU)	590	740	1,130
TRU Liquid[a]	0	0	0
Mixed TRU Solid (included in TRU solid above)	200	275	420
Mixed TRU Liquid[a]	0	0	0
LLW Solid	2,070	3,300	5,030
LLW Liquid[a]	0	0	0
Mixed LLW Solid	1.5	2.0	3.5
Mixed LLW Liquid	0.2	0.4	0.7
Hazardous Solid	2.5	3.0	5.0
Hazardous Liquid	0.3	0.4	0.6
Nonhazardous Solid	5,500	5,800	6,900
Nonhazardous Liquid	45,000	61,900	81,800
Construction Waste Type (m^3)	**125 ppy**	**250 ppy**	**450 ppy**
Hazardous Liquid	4.9	5.1	5.9
Nonhazardous Solid	7,110	7,870	11,200
Nonhazardous Liquid	37,500	41,300	54,100

[a] Liquid waste in this category would be solidified at the MPF prior to disposition.
Source: MPF Data 2003.

3.1.3 Differences Between a Modern Pit Facility and the Rocky Flats Plant

A MPF would be designed and operated to minimize risk to both workers and the general public during normal operations and in the event of an accident. Benefiting from decades of experience, a MPF would employ modern processes and manufacturing technologies and would utilize an oversight structure for safety, environmental protection, and management oversight that has been established since the closure of Rocky Flats.

3.1.3.1 Building Design

Modern safety and security design standards of today require substantially different structures from the earlier pit manufacturing facilities at the Rocky Flats Plant, near Golden, Colorado. The buildings at the Rocky Flats Plant were constructed in the 1950s with metal roof sheeting covered by a built-up weather seal. In contrast, the exterior walls and roof of PF-4 (the current interim production plutonium machining facility at LANL) are constructed of reinforced concrete more than a foot thick. Internal walls at PF-4 are designed to provide multiple-hour fire barriers between wings. A MPF would be designed with similar improvements over practices at Rocky Flats.

3.1.3.2 Fire Control

Although DOE experienced accidents associated with the manufacture of plutonium pits, most of these accidents occurred in a relatively short time period (from 1966-1969) at the Rocky Flats Plant. The majority of these accidents involved plutonium metal and chips undergoing spontaneous ignition. Such events can occur when the environment they are in allows for the rapid oxidation of plutonium, often in association with a moist air environment. Efforts at Rocky Flats concentrated on the elimination of such fires. It is now recognized that potential for fire initiation cannot be totally eliminated. Although the frequency and severity of fires can be reduced through the management of combustible materials and facility design, such events are now anticipated and planned for in the structural and process design and operational procedures. Engineering monitoring systems would be activated if a fire occurs. These systems would activate controls and procedures to control, quickly suppress, and contain fires within the specific originating glovebox, minimizing the risk to workers and the general public.

Today, plutonium machining activities are conducted in gloveboxes supplied with an inert gas. Furthermore, gloveboxes are now equipped with exhaust filter systems. All working areas are separately vented with systems containing HEPA filters. These HEPA filters are fabricated of special non-flammable bonded material. Filter plenums are equipped with an automatic cooling system to reduce the temperature of the air reaching the final stages of HEPA filters. Unlike Rocky Flats, a MPF would have an automatic fire detection and suppression system designed to meet the latest National Fire Protection Association life safety codes and standards for manufacturing facilities. The design features would include multiple zones for both fire detection and suppression to assure that any fire which may occur would be isolated in small, separated areas of the facility, and thereby preclude the spread of fire to other separated areas or the entire building.

3.1.3.3 Waste Management and Material Control

A MPF will have a dedicated waste handling area capable of preparing waste for transport in accordance with established procedures and waste acceptance requirements. In addition, all waste streams to be generated by a MPF have an established disposition path for each alternative being considered. Since the MPF EIS analyzes operations over a 50-year period, it is reasonable to expect that some disposition paths may change. A MPF would utilize a stringent MC&A System to accurately account for all special nuclear material.

3.1.4 TA-55 Upgrade Facility Requirements

The TA-55 Upgrade Alternative (80 ppy) would involve expanding the current pit production capabilities of plutonium facilities in Building PF-4 up to approximately 80 ppy without expanding the size of the building. To do this, a number of plutonium processing activities that are not related to pit production or stockpile certification would be relocated to other facilities or downsized and consolidated within PF-4. Material characterization and chemical analyses would be performed at another LANL facility.

The TA-55 Upgrade Alternative differs from a MPF in several important aspects that derive from upgrading existing facilities. First, a production level of only 80 ppy is the maximum deemed feasible and is used in this analysis. Next, the MPF design life of 50 years may not be achievable by a facility that will have already operated about 40 years before achieving these increased production levels. Since equipment for feed material preparation, recovery of metal from scrap, and waste processing already exist in this building, feed preparation will use the pyrochemical process to purify material in conjunction with aqueous processing of recoverable residues.

Additionally, all production functions—Receipt and Storage, Feed Preparation, Manufacturing, and Analytical Support—will be performed within a single PIDAS at TA-55 in buildings connected by secure transfer corridors. Feed preparation and manufacturing will be performed in PF-4 and analytical support functions will be performed at another LANL facility. PF-4 will be upgraded as appropriate to perform required material receipt and storage functions.

3.1.4.1 PF-4 Alterations

Additional space for pit manufacturing would be obtained by expanding into laboratory space currently used for processing operations that are unrelated to pit manufacturing. In this option, these activities would have to be relocated to another facility or downsized/consolidated (with a subsequent reduction of capacity) and the vacated space used for pit manufacturing support. The affected activities include analytical chemistry and materials characterization (AC and MC) operations. Approximately 511 m^2 (5,500 ft^2) of floorspace would be realized by moving the AC and MC operations out of PF-4.

Modifications to the facility would include major upgrades to the residue recovery/metal feed facilities in the 400 Area of PF-4. Many of the gloveboxes in this part of the facility would have to be replaced. Replacement of these older gloveboxes would be required to ensure that the recovery/feed process operations are adequate to supply plutonium metal to the manufacturing operations. There would also be significant glovebox decontamination/decommissioning/

disposal operations as new process development and certification operations are moved into other areas of PF-4. In addition, various manufacturing equipment will be added to or replaced in the fabrication areas of PF-4 to increase capacity and reliability.

To obtain the required space in PF-4 and to expand the pit manufacturing production to greater than 20 ppy, consolidation of plutonium-238 operations and relocation of plutonium-239 oxide characterization operations within the facility would be necessary. Consolidation of plutonium-238 operations from approximately 790 m^2 (8,500 ft^2) to about 641 m^2 (6,900 ft^2) of laboratory space would reduce the capacity, but not eliminate the capability, for heat source fabrication. Additional space could be obtained by moving some plutonium-239 oxide characterization operations (214 m^2 [2,300 ft^2]) from one laboratory to the upgraded 400 Area and by acquiring space from some programs that would be completed in the 2015 to 2020 timeframe when space is needed for expanding pit production capacities.

3.1.4.2 Support Facilities

Modifications to existing facilities at TA-55 would be to accommodate additional workers employed in pit manufacturing. As the capacity of the pit fabrication operations is increased, the plant ingress/egress requirement for plutonium workers also increases. This results in the need for additional space for the increased access/egress as well as additional change rooms. New engineering support facilities containing a cold (nonradiological) laboratory, additional office space, and a warehouse for receipt and storage of nonradioactive materials and parts would have to be constructed. The cold laboratory is needed for cold process development, staging, training, and as space for uncleared workers. Office space at TA-55 is currently oversubscribed and increasing the pit fabrication capacity would require additional space.

The Radioactive Liquid Waste Treatment Facility (TA-50) and the Solid Waste Management Facility (TA-54) would be capable of processing the waste streams from PF-4 even with the enhanced fabrication mission of 80 ppy. A small glovebox decontamination/handling facility at TA-54 that is specifically designed to prepare decommissioned gloveboxes for shipment to WIPP as TRU waste or burial as low-level waste would be required. This facility is required because the modifications in this alternative would entail the removal of approximately 140 gloveboxes over the course of about 10 years. The new decontamination/handling facility would perform decontamination, size-reduction, packaging, and/or other activities necessary to satisfy the waste acceptance or burial criteria.

The construction of these new facilities would result in an addition of approximately 1.0 ha (2.5 ac) to the permanent TA-55 footprint with 2.5 ha (6.2 ac) total area disturbed during construction. The actual removal of the gloveboxes from PF-4 and decontamination/decommissioning are not included as part of the construction process, and the workers and waste resulting from these activities are not included in the construction data presented in Section 3.1.4.3. Because the removal of the approximately 140 gloveboxes would take place over a 10-year period, the requirements and wastes from the activity are included with the operational values.

3.1.4.3 TA-55 Upgrade Construction and Operational Materials and Wastes

Tables 3.1.4.3-1 through 3.1.4.3-3 contain the construction and operational material requirements and waste volumes for the TA-55 Upgrade Alternative (80 ppy).

Table 3.1.4.3–1. TA-55 Upgrade Construction Requirements

Requirement	TA-55 Upgrade (80 ppy)
Material/Resources	
Electrical Energy (MWh)	1.5
Peak Electricity (MWe)	
Concrete (m^3)	
Total	25,000
Peak Yearly	
Aggregate (m3)	
Total	In Concrete
Peak Yearly	
Steel (metric tons) including Rebar	
Total	3,500
Peak Yearly	
Liquid Fuels (Mega Liters)	
Total	0
Peak Yearly	
Material/Resources	
Gases (m^3)	
Total	3,000
Peak Yearly	
Water (Mega Liters)	
Total	0.021
Peak Yearly	
Employment	
Total (Worker Years)	430
Peak (Workers)	190
Radiation Workers	0
Construction Period (yrs)	4

Source: MPF Data 2003.

Table 3.1.4.3–2. TA-55 Upgrade Operations Annual Requirements

Requirement	TA-55 Upgrade (80 ppy)
Material/Resources	
Electrical Energy (MWh)	5,480
Peak Electricity (MWe)	10.0
Nitrogen (m^3)	
Argon (m^3)	
Diesel Fuel (Liters)	0
Domestic Water (Mega Liters)	30.2
Makeup Water (Mega Liters)	
Steam (metric tons)	
Natural Gas (m^3) for Steam	
Employment	
Total Workers	680
Radiation Workers	458

Source MPF Data 2003.

Table 3.1.4.3–3. TA-55 Upgrade Waste Volumes

Waste (m^3)	Annual Operating	Construction
TRU Waste		
Solid (includes Mixed TRU Solid)	440[a]	0
Liquid	5	0
Mixed TRU Waste		
Solid (included in TRU Solid)	2	0
Liquid	0	0
LLW		
Solid	1,430	0
Liquid	15	0
Mixed LLW		
Solid	53	0
Liquid	0	0
Hazardous		
Solid	203	0
Liquid	2	3
Nonhazardous		
Solid	552	7,500
Liquid	12,300	6,000

[a] Includes 56 m^3/yr over a 10-year period to replace gloveboxes in PF-4.
Source: MPF Data 2003.

3.2 DEVELOPMENT OF REASONABLE ALTERNATIVES AND ENVIRONMENTAL IMPACT STATEMENT SCOPE

3.2.1 Planning Assumptions and Basis for Analysis

This MPF EIS evaluates reasonable alternatives in order to decide: (1) whether to proceed with construction and operation of a MPF; and (2) if so, where to locate a MPF. Five alternatives are evaluated for a MPF: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site (NTS), Nevada; (3) the Carlsbad Site, New Mexico; (4) Savannah River Site (SRS), South Carolina; and (5) Pantex Site, Texas. For the five MPF site alternatives, the EIS evaluates the environmental impacts associated with constructing and operating a MPF to produce sufficient quantities of plutonium pits to support the U.S. nuclear stockpile. In addition, the EIS evaluates the environmental impacts associated with expanding operations at TA-55 while upgrading the existing TA-55 facilities (TA-55 Upgrade Alternative). Some of the more specific assumptions and considerations that form the basis of the analyses and impact assessments that are the subject of this EIS are presented below.

- As required by the Council on Environmental Quality (CEQ) regulations, the MPF EIS evaluates a No Action Alternative. The No Action Alternative would utilize the capabilities currently being established at LANL for interim capacity to meet the Nation's long-term needs for pit manufacturing. Under the No Action Alternative, National Nuclear Security Administration (NNSA) would not proceed with a MPF, which might limit the ability to maintain, long-term, the nuclear deterrent that is a cornerstone of U.S. national security policy. In previous *National Environmental Policy Act* (NEPA) documents (the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management,* DOE/EIS-0236 [SSM PEIS] and the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory,* DOE/EIS-0238 [LANL SWEIS]), DOE evaluated the environmental impacts associated with producing up to 50-80 ppy at LANL; however, the ROD for the LANL SWEIS limited production to 20 ppy. Thus, under the MPF EIS No Action Alternative, NNSA could produce up to 20 ppy for the foreseeable future.

- In the LANL SWEIS, DOE committed to provide appropriate NEPA review to implement manufacturing capacity beyond 20 ppy. This MPF EIS provides NEPA coverage for nominal pit production up to approximately 80 ppy at LANL TA-55 under the TA-55 Upgrade Alternative. Construction activities (primarily the addition of office space) associated with the upgrade would begin in approximately 2008 and end in approximately 2012. However, production of 80 ppy would not be possible until replacement of all gloveboxes would be completed by approximately 2018.

- If the Secretary decides to build and operate the proposed MPF, construction at one of the five site alternatives, would begin in approximately 2011, peak in 2014 and last about 6 years. Mission startup and initial operations would occur between 2017 and 2019, with full-scale production beginning in 2020. Because a MPF would be designed for a service life of at least 50 years, the EIS assesses the environmental impacts associated with the operation of a MPF for a period of 50 years, at which time the structures would undergo decontamination and decommissioning (D&D).

- The MPF is in a conceptual design stage. As such, best available design information for the analysis is contained in this EIS (see the descriptions of a MPF in Section 3.1 and Appendix A). For the purpose of the environmental impact analysis, assumptions have been used such that construction requirements and operational characteristics of a MPF would maximize the environmental impacts. Thus, the potential impacts from the implementation of any MPF final designs are expected to be less severe than those analyzed in this EIS.

- The exact size and composition of the enduring stockpile is determined on an annual basis as explained in Section 1.1.3. In the classified appendix to the MPF EIS, the NNSA has considered a range of future stockpiles. Based on current long-range planning consistent with the Nuclear Posture Review (NPR), NNSA must be capable of supporting a stockpile of approximately 1,700-2,200 strategic deployed weapons in 2012 and beyond. Classified studies have examined capacity requirements that would result from a wide range of enduring stockpile sizes and compositions, pit lifetimes, emergency production needs (referred to as "contingency" requirements), and facility full production start dates. Although the precise future capacity requirements are not known with certainty, enough clarity has been obtained through these ongoing classified studies that NNSA has identified a range of pit production capacity requirements (125-450 ppy) that form the basis of the capacity evaluations in this EIS. The EIS evaluates the impacts of a MPF designed to produce three capacities: 125 ppy, 250 ppy, and 450 ppy. A pit lifetime range of 45-60 years is assumed.

- For each of the capacities (125 ppy, 250 ppy, and 450 ppy), the EIS evaluates the environmental impacts associated with single-shift operations 5 days per week, as this represents the most likely long-term, normal operating scenario for a MPF. However, if national security requirements ever demand, a MPF could be operated in a two-shift mode to produce more pits than in the single-shift mode. Because the environmental impacts associated with single-shift production of 250 ppy would bound the impacts associated with two-shift production in a 125 ppy plant, no additional NEPA analysis would be necessary for this scenario. Likewise, because the environmental impacts associated with single-shift production of 450 ppy would bound the impacts associated with two-shift production in a 250 ppy plant, no additional analysis would be necessary for this scenario. For the 450 ppy capacity, the EIS assesses the environmental impacts of two-shift operations in a qualitative sensitivity analysis.

- This EIS does not support decisions to select a specific location at any DOE site alternative for a MPF. However, initial reference locations have been identified at each site, consistent with the environmental analysis in this EIS to evaluate the potential environmental impacts of a MPF. These reference locations were designated by the individual DOE site offices not to conflict or interfere with existing or planned future site operations. In general, undeveloped areas are used so that any potential environmental impacts would be greater than those projected for a specific location to be developed. These reference locations are defined for each site in Section 3.3.2. The characterization of the affected environment addresses the entire candidate site and the affected region surrounding the site. Each region varies by resource, but generally extends to an 80-km (50-mi) radius from the center of each site.

- Both construction and operational impacts are considered for all resources at all sites. Construction impacts are generally short-term (e.g., would occur over the 6-year construction period), while operational impacts are expected to be long-term (e.g., would occur annually over the 50-year operating period).

- Generated wastes would be managed in accordance with applicable Federal, state, and local laws, regulations, and requirements, as well as DOE/NNSA's waste management orders and pollution prevention and waste minimization policy.

- The EIS analyzes low-consequence/high-probability accidents and high-consequence/low-probability accidents. A spectrum of both types of accidents is analyzed. For radiological accidents, impacts are evaluated for both the general population residing within an 80-km (50-mi) radius (including the maximally exposed individual) and for non-involved workers in collocated facilities. The accident analyses in this EIS are based on facility conditions that are expected to exist in 2020. The core set of accident scenarios is applicable to each location alternative with adjustments to certain parameter values (e.g., leak path factors and materials at risk) to reflect site-specific features. Added to the core set of accidents are other site-specific accidents, if any, caused by natural phenomena or accidents at collocated facilities, that have the potential for initiating accidents at a MPF. The impacts of accidents analyzed for each alternative reflect and bound the impacts of all reasonably foreseeable accidents that could occur if the alternative were implemented. The plutonium Research and Development (R&D) mission and pit surveillance functions would remain at LANL and Lawrence Livermore National Laboratory (LLNL) and would be unaffected by the proposed alternatives.

- Proven technology is used as a baseline. No credit is taken for emerging technology improvements. The design goal of a MPF includes consideration of waste minimization and pollution prevention to minimize facility and equipment contamination, and to make future D&D as simple and inexpensive as possible. The EIS includes a general discussion of the environmental impacts from D&D, including a discussion of the D&D process, the types of actions associated with D&D, and the general types of impacts associated with D&D. Any discussion of specific D&D impacts are more appropriate for tiered NEPA documents, because the extent of contamination, the degree of decontamination, and the environmental impacts associated with performing D&D, cannot be known without performing a detailed study of a MPF at the appropriate time.

- Liquid TRU and LLW streams would be solidified as part of a MPF process (i.e., a MPF would not generate any liquid TRU or LLW) that requires disposition. The solidified waste forms would meet applicable waste acceptance criteria prior to leaving a MPF. Any TRU waste generated by a MPF would be treated and packaged in accordance with the WIPP Waste Acceptance Criteria and transported to WIPP or a similar type facility for disposition. The preferred alternative in the *WIPP Disposal Phase Final Supplemental Environmental Impact Statement* (SEIS) (DOE 1997b) currently includes a 35-year operating period starting in March 1999. To accommodate all projected TRU waste from MPF and other NNSA operations, DOE must ensure that either the WIPP or another similar type facility would be available for long-term disposition of TRU waste.

Section 6.5.1.5 gives additional detail relative to the WIPP. All other wastes would be managed in accordance with applicable site procedures and disposed of in accordance with decisions made in the *Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* Records of Decision.

- A MPF would be capable of producing all existing pit types in the nuclear weapons stockpile, as well as any future new design pits. The environmental impacts associated with manufacturing a particular type of pit, whether an existing design pit or future new-design pit, are considered to be similar.

- The operation of a MPF would require transporting existing pits from Pantex, where more than 12,000 are presently stored, to a MPF, and transporting new pits from a MPF to Pantex where they would be assembled into weapons. In addition, small quantities of plutonium metal would be transported from LANL and SRS to a MPF location. All transportation of pits and plutonium metal is assumed to occur via the NNSA transportation fleet of SSTs over Federal and state highways to the extent practicable. The quantities of pits and other materials that would be transported to/from a MPF are provided in Appendix D.

- A modern nuclear weapon consists of many components, most of which are nonnuclear. In general, any components for pits not produced at a MPF would be produced in existing facilities and shipped to a MPF for assembly into the pit. The environmental impacts associated with producing these components have been addressed in previous NEPA documents (see specifically the *Nonnuclear Consolidation Environmental Assessment*, DOE/EA- 0792, DOE 1993).

- Because the NNSA will need a facility to manufacture beryllium components required for the MPF, this programmatic EIS assesses the environmental impacts of such manufacturing for completeness (see Section 5.7.1). Site-specific issues concerning the manufacturing of beryllium components will be addressed in future NEPA documentation, as required.

- The methodology used to assess the environmental impacts of constructing and operating a MPF is described in Appendix F.

- As explained in Section 3.3.3, the MPF EIS evaluates an upgrade to PF-4 at the TA-55 facility at LANL to increase pit production capacity. Although this TA-55 Upgrade Alternative does not meet the minimum capacity requirement of 125 ppy, it is evaluated as a “hedge” in the event of significant further reductions in the nuclear weapons stockpile size, or if future technical studies demonstrate that pit lifetimes significantly exceed 45-60 years. TA-55 is the only existing pit production facility capable of being upgraded to provide such a hedge (see Sections 3.4.3 and 3.4.4). As such, this is the only reasonable Upgrade Alternative assessed in this EIS. It is noted that this Upgrade Alternative would be timed to minimize disruption of LANL’s interim small-scale pit production activities required to meet current U.S. Department of Defense (DOD) requirements.

- The classified appendix with information relevant to this EIS has been prepared and will be considered by the decisionmaker during this NEPA process. To the extent allowable, the MPF EIS summarizes this information in an unclassified manner.

3.2.2 Development of the Environmental Impact Statement Site Alternatives

Following the approval of the Critical Decision on Mission Need (CD-0) by the Secretary of Energy on May 24, 2002, NNSA developed a site screening process to develop the reasonable site alternatives that are evaluated in this MPF EIS. The purpose of the site-screening process was twofold: (1) to identify reasonable site alternatives for the MPF EIS; and (2) to identify unsuitable site alternatives and document why these alternatives were not reasonable for the MPF EIS.

A two-step screening process was employed: first, all potential sites were evaluated against "go/no go" criteria; and second, those sites satisfying the go/no go criteria were evaluated against desired, weighted criteria. The desired criteria and weights were developed by members of the MPF project office. Federal employees from NNSA and other relevant DOE program offices then "scored" the potential sites using the desired criteria. Aggregate scores for the alternatives were then tallied, and the reasonable site alternatives were determined.

Existing, major DOE sites were considered to serve as the host location for a MPF. Non-DOE or new sites were not considered to avoid potential contamination issues at a new location that had not previously been associated with plutonium or plutonium-bearing waste operations. Many DOE sites did not satisfy the go/no-go criteria and were eliminated during the first step of the screening process. The seven sites that were evaluated through both steps of the screening process were: Idaho National Engineering and Environmental Laboratory, LANL, NTS, Pantex, SRS, Carlsbad Site, and the Y-12 National Security Complex.

The site screening analysis considered the following criteria: population encroachment, mission compatibility, margin for safety/security, synergy with existing/future plutonium operations, minimizing transportation of plutonium, NNSA presence at the site, and infrastructure. The first two criteria were deemed to be go/no go criteria; that is, a site either passed or failed on each of these two criteria. The sites that passed the go/no go criteria were then scored against all criteria. Based upon results from the site screening analysis, the following were determined to be reasonable alternatives for a MPF: (1) Los Alamos Site, New Mexico; (2) Nevada Test Site, Nevada; (3) Carlsbad Site, New Mexico; (4) Savannah River Site, South Carolina; and (5) Pantex Site, Texas. Appendix G contains a copy of the site screening study.

3.3 REASONABLE ALTERNATIVES

NNSA conducted a site-screening process (Appendix G) to assure that alternative sites meet program requirements; this process is summarized in Section 3.2.2. Based upon results from the site screening process, the following sites were determined to be reasonable alternatives for a MPF: Los Alamos Site, SRS, NTS, Pantex Site, and Carlsbad Site.

3.3.1 No Action Alternative

Consistent with the 1996 SSM PEIS ROD (61 FR 68014) and the 1999 LANL SWEIS ROD (64 FR 50797), NNSA has been re-establishing an interim pit manufacturing capability at LANL. The establishment of the interim pit production capacity is expected to be completed in 2007. As required by the CEQ NEPA Regulations (40 CFR Parts 1500-1508) and the DOE NEPA Regulations (10 CFR 1021), the MPF EIS includes a No Action Alternative. The No Action Alternative would be to maintain the interim pit production capacity at LANL PF-4 in TA-55 and not build a MPF at any site. The No Action Alternative is encompassed within the Expanded Operations Alternative listed in the LANL SWEIS, which evaluated the impact of producing 50-80 ppy at PF-4, but selected a 20 ppy level in the respective Record of Decision. There would be no additional impact on the other four sites.

3.3.2 Modern Pit Facility Alternatives

This section presents the alternatives to build a MPF at each of the five alternative sites. In addition, if a MPF is built at any of these sites, including LANL, the interim pit capability at TA-55/PF-4 would not be relied on to meet future stockpile needs. For each of the sites, a representative or reference location for a MPF at that site has been chosen for analysis purposes only. When a decision is made as to whether to proceed with a MPF, and if so, at which site to locate a MPF, a site-specific EIS process will be completed. The site-specific process will analyze reasonable locations in the vicinity of the selected site.

Each reference location was chosen based on the following factors: the site is approximately 32 hectares (ha) (80 acres [ac]) in size, does not conflict with any ongoing or planned activities, is not potentially contaminated, and is located near an existing Category I Security Area (if possible). If the selected site did not have the requisite 32 ha (80 ac) (the maximum desired area inside a PIDAS), but still had enough space to accommodate the entire facilities footprint, it was deemed adequate for analysis purposes in this EIS. The proposed reference locations provide a basis for impact studies on the site and surrounding areas, which will allow reasonable comparisons between the various sites. If a decision is made to go forward with one of the MPF alternatives, a site will be selected, and the actual MPF location will be determined in a site-specific tiered EIS.

3.3.2.1 Los Alamos Site

The Los Alamos Site MPF Alternative would involve constructing a MPF at LANL as described in Section 3.1. For analysis purposes, it is assumed that a MPF would be located on an unused location in TA-55. This is shown in Figure 3.3.2.1–1. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

3.3.2.2 Nevada Test Site

The NTS MPF Alternative would involve constructing a MPF at NTS as described in Section 3.1. For analysis purposes, it is assumed that a MPF would be located on an unused location near the Device Assembly Facility. This is shown in Figure 3.3.2.2–1. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

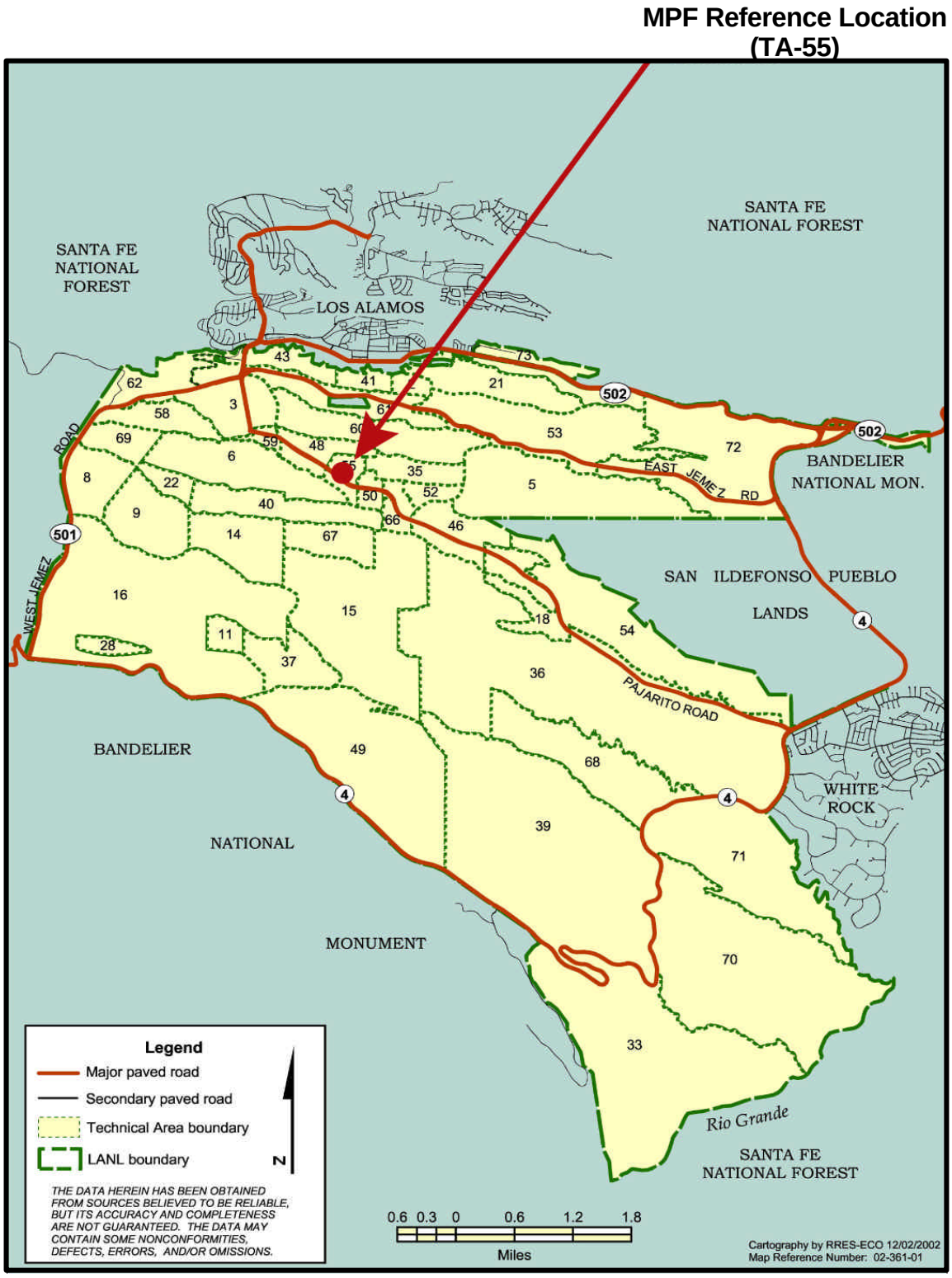


Figure 3.3.2.1–1. Los Alamos Site

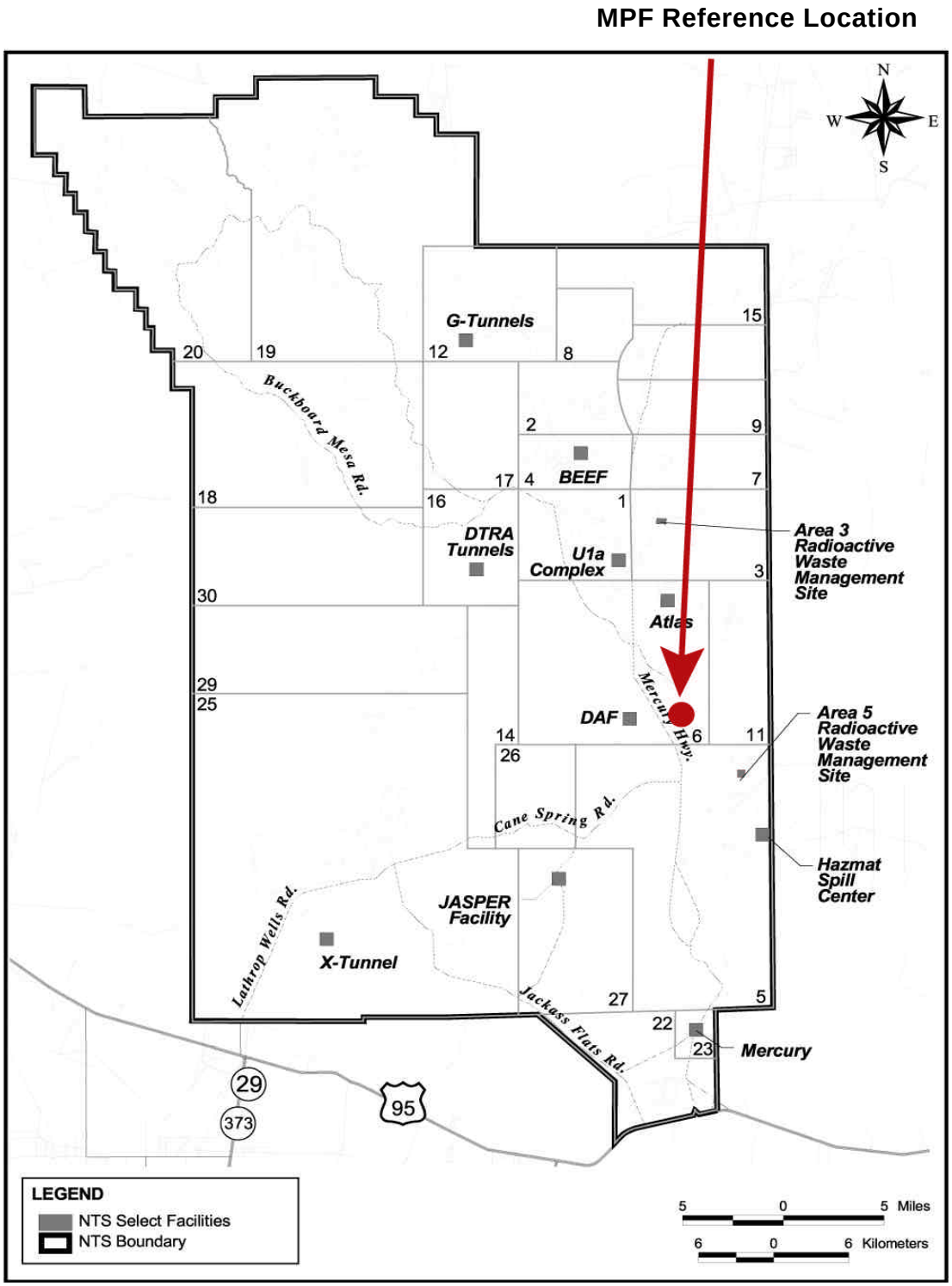


Figure 3.3.2.2–1. Nevada Test Site

3.3.2.3 Pantex Site

The Pantex Site MPF Alternative would involve constructing a MPF at Pantex as described in Section 3.1. For analysis purposes, it is assumed that a MPF would be located on an unused location in Area 11. This is shown in Figure 3.3.2.3–1. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

3.3.2.4 Savannah River Site

The SRS MPF Alternative would involve constructing a MPF at SRS as described in Section 3.1. For analysis purposes, it is assumed that a MPF would be located on an unused location southwest of the F Canyon area. This is shown in Figure 3.3.2.4–1. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

3.3.2.5 Carlsbad Site

The Carlsbad Site MPF Alternative would involve constructing a MPF at Carlsbad as described in Section 3.1. For analysis purposes, it is assumed that a MPF would be located on an unused location. This is shown in Figure 3.3.2.5–1. In addition, the interim pit production capability at LANL would not be relied on to meet future stockpile needs.

NNSA notes that legislation may be required to proceed with the construction and operation of a MPF at the Carlsbad Site either on land at the WIPP site or in the vicinity of the WIPP site.

The EPA's current compliance certification of WIPP does not consider the potential impacts of a MPF on the long-term performance of the repository. If the Secretary were to decide to locate an MPF in the vicinity of WIPP, DOE would need to provide EPA with sufficient information for the Agency to determine whether the potential impacts of an MPF should be included in the performance assessment to ensure that they would not adversely impact the repository's long-term performance. EPA's consideration of an MPF's potential impacts could result in a modification rulemaking involving the compliance certification.

3.3.3 TA-55 Upgrade Alternative

The TA-55 Upgrade Alternative (80 ppy) would involve expanding the pit production capability of PF-4 without expanding the size of the facility as described in Section 3.1 and the Summary of TA-55/PF-4 Upgrade Evaluation to Provide Long-term Pit Manufacturing Capacity contained in Appendix G. Two support facilities would also be constructed in TA-55 and one in TA-54. The interim pit production capability at LANL would be expanded to approximately 80 ppy through the upgrade process.

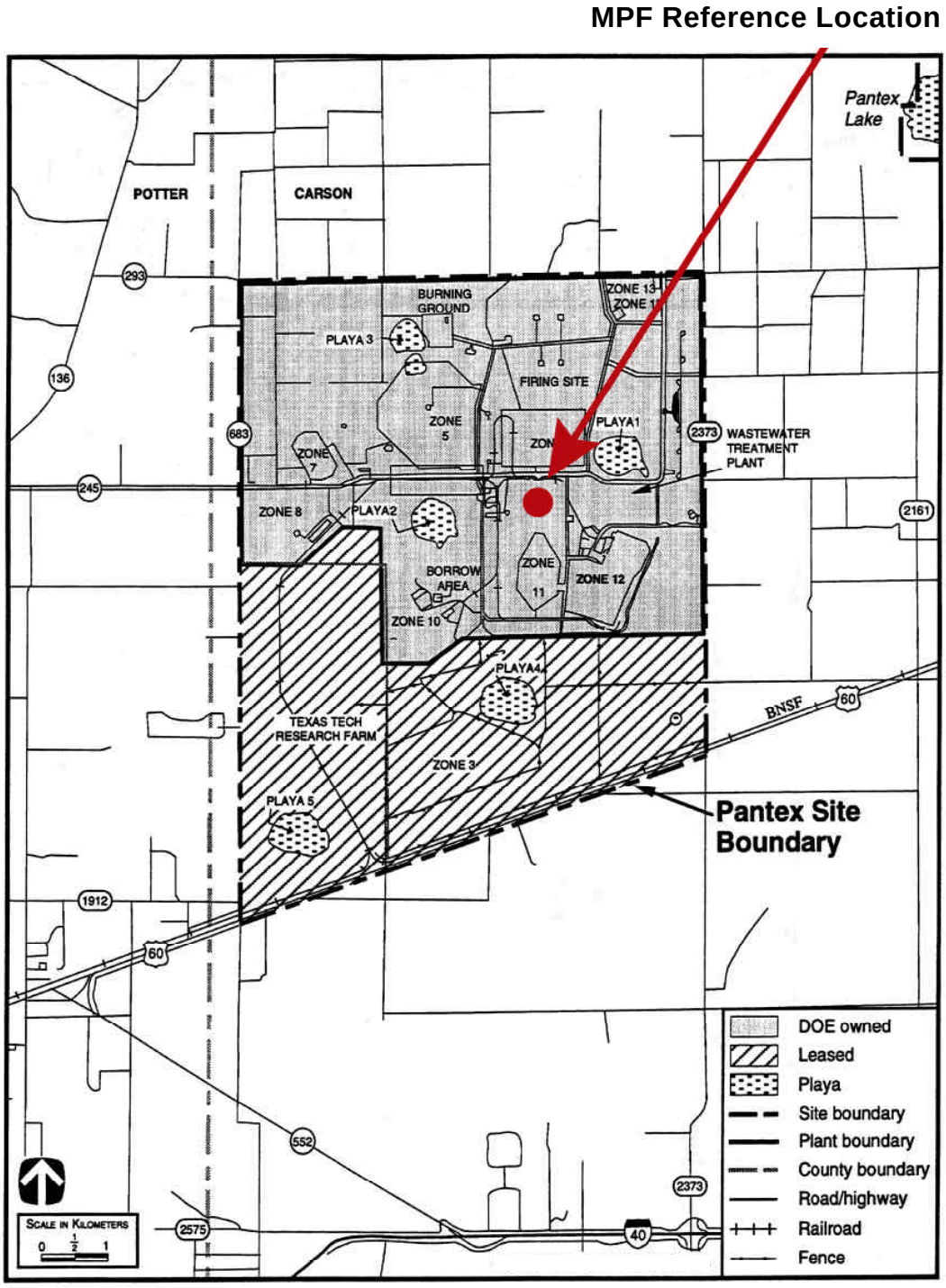


Figure 3.3.2.3–1. Pantex Site

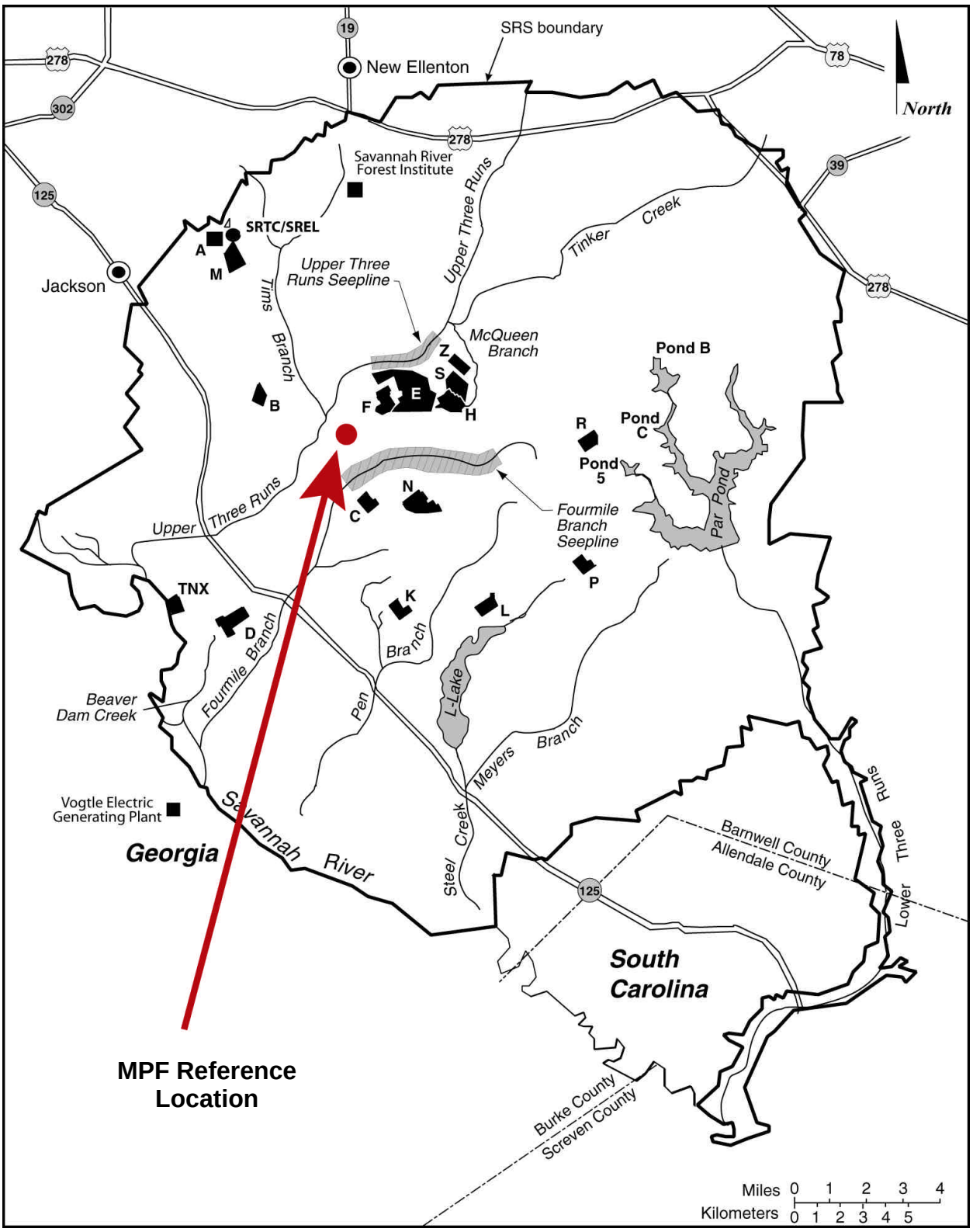


Figure 3.3.2.4–1. Savannah River Site

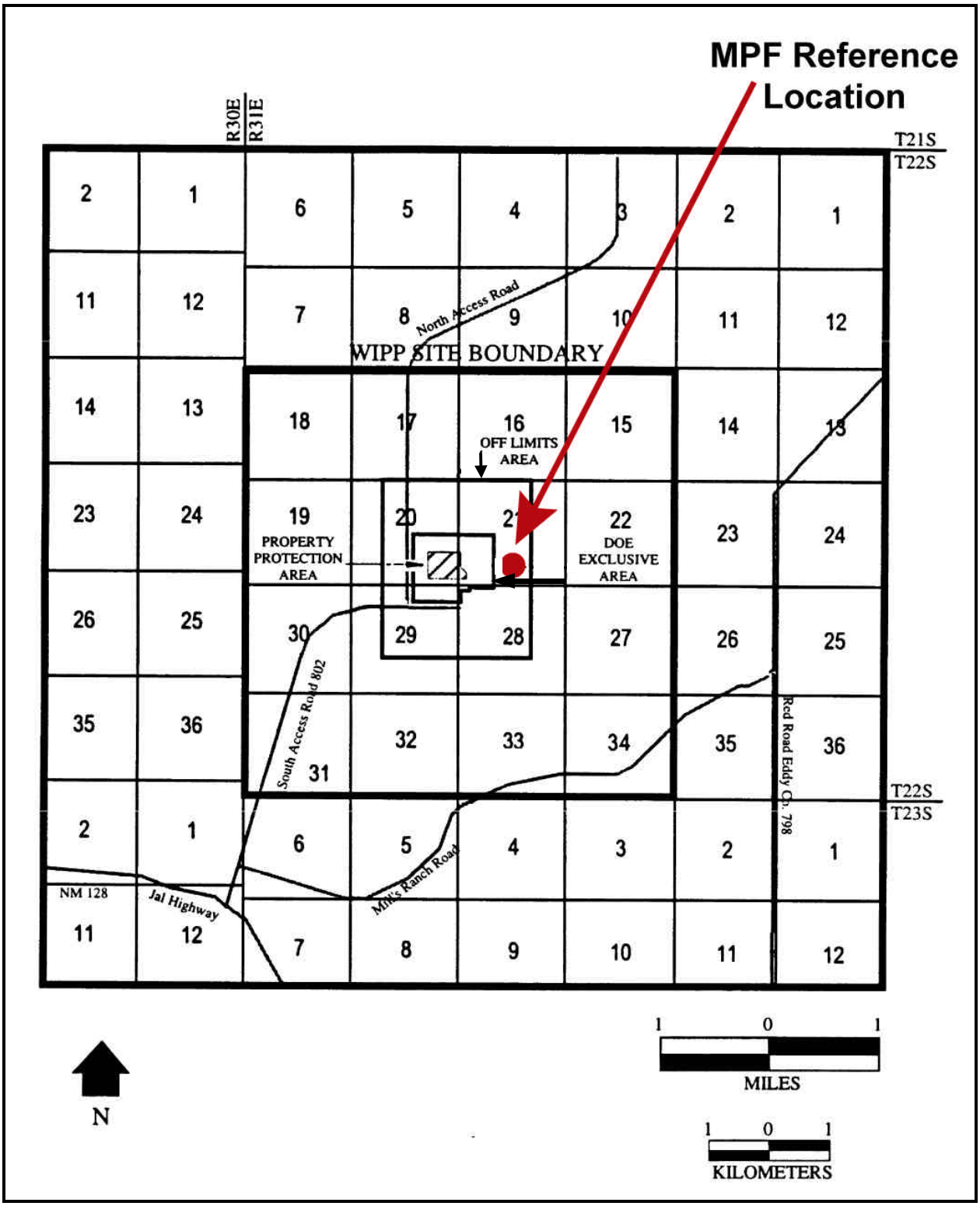


Figure 3.3.2.5–1. Carlsbad Site

3.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

3.4.1 Purchase Pits

While there is no national policy that prohibits purchase of defense materials such as pits from foreign sources, NNSA has determined that the uncertainties associated with obtaining pits from foreign sources render this alternative unreasonable for an assured long-term supply.

3.4.2 Utilizing the Pit Disassembly and Conversion Facility at the Savannah River Site

NNSA is currently planning for the permanent disposition of weapons-grade plutonium no longer required for defense purposes. In September 2000, the United States and Russia signed a Plutonium Management and Disposition Agreement (PMDA) in which each country agreed to permanently dispose of 34 metric tons (37 tons) of plutonium. The obligations under this "government-to-government" agreement equate to a pledge by each country to meet the terms put forth in the agreement. Under current plans, surplus nuclear weapons pits would be disassembled and the resulting plutonium metal converted into oxide in a planned Pit Disassembly and Conversion Facility (PDCF). The resulting plutonium oxide would then be fabricated into mixed oxide fuel at a second facility, the Mixed-Oxide Fuel Fabrication Facility, to be built at SRS and then irradiated in existing commercial reactors.

From a purely technical standpoint, the PDCF at SRS could be used to support a MPF project, if a MPF were ultimately built and located at SRS. For example, the PDCF and the MPF are expected to have redundant capabilities in shipping and receiving, secure storage, analytical support, and pit disassembly. As such, it is not unreasonable to consider the potential advantages of using the PDCF to support a MPF, although these capabilities represent only a fraction of the total capabilities to perform a MPF mission. However, the PMDA includes several restrictions that would likely impact synergy between the plutonium disposition program and a MPF. For example, facilities constructed under the PMDA are designated "disposition facilities" and the use of these facilities to process plutonium other than "disposition plutonium" (such as pit manufacturing, or other defense purposes) is prohibited. Article VI Paragraph 5 of the PMDA states, "Disposition facilities may <u>only</u> receive and process disposition plutonium and blend stock." (See Appendix G for more details regarding the PMDA and other potential restrictions.)

Further, using one facility to simultaneously dispose of nuclear weapons and produce nuclear weapons components would likely raise significant concerns from Russia and the international community. In addition, the PMDA contains bilateral and international monitoring and inspection provisions that would be inappropriate for a MPF. NNSA has decided that the international constraints on the PDCF render the facility at SRS incompatible with a MPF National Security mission. As such, this MPF EIS evaluates the potential environmental impacts of constructing and operating a MPF at SRS without regard to the synergy that might exist between the PDCF and a MPF. This will provide a conservative and bounding analysis of the potential environmental impacts. If SRS is chosen as the site for a MPF, the tiered, site-specific EIS could reassess, if desired, the reasonableness of utilizing the PDCF at SRS to support a MPF.

3.4.3 TA-55 Upgrade Alternatives

In August 2002, a multidisciplinary team comprised of national laboratory, NNSA production plant, and Federal Government personnel was chartered to: (1) determine the potential production rates that might be achieved at LANL with upgrades to PF-4; (2) estimate the implementation costs of these upgrade options; (3) address the advantages and disadvantages of upgrading PF-4 to higher production capacities; and (4) prepare information to support a determination on the "reasonableness" of the alternative of relying on an upgraded PF-4. The team was also tasked to prepare detailed environmental data for the MPF Draft EIS on any PF-4 upgrade alternative considered reasonable even though the 50-year life for a MPF may not be achievable for a TA-55 Upgrade.

The team evaluated three upgrade options for TA-55/PF-4 to increase production rate:

- TA-55 Upgrade Option 1 – No impact on current LANL missions in PF-4.
- TA-55 Upgrade Option 2 – Impact some current LANL nondefense-related missions in PF-4.
- TA-55 Upgrade Option 3 – Add floorspace (new wing) to PF-4 and impact some current LANL nondefense-related missions.

The team developed plans for required upgrades to implement these options and established estimates for: (1) production capability and agility of each PF-4 upgrade option; (2) schedule and cost for implementation of each option; and (3) impacts and issues of each option. Based on the team's evaluation, the following conclusions were applicable for all upgrade options:

- PF-4 will be 40 years old when planned capacity is achieved. The ability to meet nuclear facility safety and operating requirements over an additional 50 years will require significant investment.
- Due to increased floorspace use for pit manufacturing, any TA-55 Upgrade Alternative would reduce the agility of PF-4 to support potential future plutonium research and stockpile support missions.
- Physical constraints of upgrading an existing facility limit improvements and inclusion of improved technology in certain areas such as material handling and transport.
- Ingress and egress of an increased number of personnel would have to be addressed and could be problematic for support of higher production rates.
- Major modifications to an operational nuclear facility increase the probability of safety, contamination, or safeguards and security events and significantly increase the PAAA vulnerability of the institution.
- Major facility modifications, especially those associated with significant construction additions, increases vulnerability to changes in regulatory assumptions, interpretations, and requirements for the facility established at the time of original construction.

Based on the team's evaluation, NNSA determined that TA-55 Upgrade Option 1 would not result in an upgraded TA-55 production capacity that was greater than 50 ppy. Since production capacities in this range are already included in the bounding analyses for the No Action Alternative, no separate evaluation of TA-55 Upgrade Option 1 is necessary.

NNSA also determined that TA-55 Upgrade Option 3, which required construction of additional floor space on PF-4 and had hypothetical potential to achieve a maximum capacity of up to 150 ppy, was not a reasonable alternative. Option 3 approaches the cost and schedule of a small, newly-constructed MPF, but does not provide the agility or contingent capacity needed for the long term. As an upgrade to an existing facility, Option 3 does not provide as many opportunities for inclusion of new facility design approaches that can enhance production efficiency, reduce worker radiation exposures, and minimize safety and security risks. Since NNSA would need to maintain PF-4/TA-55 in an operational state during construction upgrades to support ongoing defense programmatic requirements, increased potential for incidents associated with construction in an operating nuclear facility could adversely impact either the upgrade process or ongoing missions. Additionally, Option 3 was deemed to have a large risk of exceeding the estimated project scope, cost, and schedule, making the option even more unattractive than a new facility of a comparable cost and significantly greater performance potential.

TA-55 Upgrade Option 2, estimated to achieve a nominal manufacturing capacity of approximately 80 ppy, was determined to be a reasonable alternative for evaluation in the MPF EIS. For details regarding the TA-55 Upgrade Alternative, see Section 3.1.4. While NNSA notes that Option 2 does not have the potential to reach the minimum production capacity (125 ppy) or agility required by a MPF, inclusion of this upgrade alternative provides a capacity greater than the No Action Alternative. This provides a "hedge" in the event of unforeseeable changes in stockpile size or pit lifetime that result in a significantly smaller pit production capacity requirement. It is noted that this Upgrade Alternative would need to be timed to minimize disruptions to LANL's interim small-scale production activities required to meet current DOD requirements.

A copy of the TA-55 upgrade evaluation is found in Appendix G of this EIS.

3.4.4 Upgrade Building 332 at Lawrence Livermore National Laboratory

Building 332 at the LLNL is located in what is known as the "Superblock." Building 332 is a plutonium R&D facility containing a wide breadth of plutonium processing and fabrication technologies but offering minimal production-like capability. Activities in Building 332 include developing and demonstrating improved technologies for plutonium metal preparation, casting, fabrication, and assembly; fabrication of components for subcritical tests; surveillance of LLNL pits; support for LANL pit surveillance and specimen fabrication, and fundamental and applied research in plutonium metallurgy. Building 332 does not have an existing pit-manufacturing mission and is small in comparison to TA-55/PF-4 at LANL. In order to produce a meaningful quantity of pits, drastic modifications to Building 332 would be required. Additionally, because of the significant population encroachment at LLNL, an upgrade alternative at LLNL is undesirable. Accordingly, the alternative to upgrade Building 332 was eliminated from detailed study.

3.4.5 Chemistry and Metallurgy Research Building Replacement (CMRR)

As explained in Section 1.4.9 of this EIS, NNSA is currently preparing an EIS for the Chemistry and Metallurgy Research Building Replacement Project (CMRR). The purpose of the CMRR EIS is to evaluate alternatives for replacing the existing Chemistry and Metallurgy Research Building (CMR) at LANL, where nuclear operations are scheduled to be shut down in approximately 2010. A new CMRR would provide analytical, chemical, and material characterization support to existing missions at LANL that are expected to continue for the long term. Such support is needed independent of the proposed action in the MPF EIS. While the CMRR could provide support to an eventual MPF at LANL (if LANL were the selected site), such support is not in the baseline design of the CMRR, nor is it required. Instead, because the baseline conceptual design for the MPF includes capabilities for analytical chemistry and metallurgical characterization, the MPF EIS analyzes the environmental impacts of such support capabilities. It is also noted that the environmental impacts of such providing chemical and metallurgical support for a MPF at LANL would be essentially the same whether such support were to occur within the CMRR or a MPF; thus, the MPF EIS includes this analysis as a direct impact in this MPF EIS. A cumulative impact section (Chapter 5, Section 5.8 of this EIS) provides an assessment of the environmental impacts of constructing and operating both the CMRR and a MPF at LANL. Under the No Action Alternative and the TA-55 Upgrade Alternative, direct analytical chemistry and metallurgical support would be provided by the existing CMR or the proposed CMRR. As such, the CMRR EIS includes an analysis of environmental impacts associated with pit production up to approximately 80 pits per year.

3.4.6 Savannah River Site Facilities

The F&H Canyon facilities, which are approximately 50+ years old, were originally designed to recover plutonium and uranium from reactor fuel rods. As such, the portions of these facilities that might be applicable to pit production are primarily in the areas where processing operations took place. Because the only F Area Canyon facility that is set up to purify plutonium material from recycled pits is the New Special Recovery Facility, extensive modifications would be required to generate an adequate capacity over the life of a MPF mission. A list of some of the major deficiencies associated with utilizing the Canyons to support a MPF follows:

- Modifications to existing contaminated facilities are very costly due to radiological control issues. Labor cost increases of 300-500 percent vs. “clean” work are commonly estimated.

- Project risks are increased when using existing facilities due to the higher number of unknown conditions that may be encountered during the project, and the challenges of coordinating construction activities with any ongoing facility operations.

- There is a high potential for hidden cost and regulatory risks associated with the long-term commitment to a legacy facility.

- The service life of the renovated facility would likely not meet the 50-year MPF design requirement.

- The existing robust canyon structures cannot be modified significantly and would therefore result in inefficient equipment arrangement, material handling and storage locations.

- Imbedded infrastructure such as shielding, ventilation systems, electrical cable/switchgear, and process piping/drains may not be suitable for a revised facility mission.

- Obstacles to adding distance and wall shielding in existing structures make achievement of the 500 millirem per year (mrem/yr) design goal, personnel exposure limit unlikely.

Based on these factors, NNSA determined that the F&H Canyon facilities are not reasonable alternatives for supporting a MPF mission. Likewise, NNSA considered whether use of the K-area Materials Storage Facility would be beneficial to a MPF, but concluded that no such advantages existed.

3.4.7 Other Department of Energy/National Nuclear Security Administration Sites

Section 3.2.2 describes the site screening process utilized to determine the reasonable site alternatives for the MPF EIS. As described in that section, all existing, major DOE sites were considered to serve as the host location for a MPF. A two-step screening process was employed: first, all potential sites were judged against "go/no go" criteria; and second, those sites satisfying the go/no go criteria were judged against desired, weighted criteria. Sites that did not satisfy the go/no go criteria, or which scored lowest against desired, weighted criteria were judged to be unreasonable site alternatives for a MPF.

3.4.8 Construct and Operate a Smaller Modern Pit Facility

As described in Chapter 2, the exact size and composition of the enduring stockpile is uncertain. Studies in the classified appendix have examined capacity requirements that would result from a wide range of enduring stockpile sizes and compositions, pit lifetimes, emergency production needs (referred to as "contingency" requirements), and facility full-production start dates. Although the precise future capacity requirements are not known with certainty, enough clarity has been obtained through these ongoing classified studies that NNSA has identified a range of pit production capacity requirements (125-450 ppy) that form the basis of the capacity evaluations in this EIS. The EIS evaluates the impacts of a MPF designed to produce three capacities: 125 ppy, 250 ppy, and 450 ppy. If there were significant further reductions in the nuclear weapons stockpile (beyond those already considered in the classified analyses), or if future technical studies demonstrate that pit lifetimes significantly exceed 45-60 years, then the need, capacity, and timing for a new MPF would need to be reassessed. With respect to these uncertainties, NNSA has chosen not to speculate beyond the assumptions described in this EIS. As such, this EIS does not propose to construct and operate a MPF with a capacity smaller than 125 ppy. However, as described in Sections 3.3.3.6, this EIS does evaluate a TA-55 Upgrade Alternative (80 ppy) as a "hedge" in the event of unforeseeable significant changes in stockpile size or pit lifetime.

3.5 COMPARISON OF ALTERNATIVES

3.5.1 Introduction

To aid the reader in understanding the differences among the various alternatives, this section presents a summary comparison of the potential environmental impacts associated with the alternatives for a MPF. The comparison concentrates on those resources with the greatest potential to be impacted.

The information in this section is a summary of the environmental impacts based on the information presented in Chapter 5 of this EIS. Table 3.5.1–1 at the end of this chapter provides quantitative information that supports the text below.

3.5.2 Environmental Impacts

Land Use

All action alternatives would result in land disturbance. As shown in Table 3.5.1–1, the amount of land disturbed for all alternatives would be less than 2 percent of the available land area. However, there would be no impacts to land use plans or policies.

Visual Resources

All action alternatives except SRS would result in no changes to current Class IV BLM Visual Resource Management ratings. Although SRS does not have a BLM Visual Resource Management rating, constructing and operating a MPF would be consistent with the currently developed areas of SRS.

Site Infrastructure

SRS has adequate electrical energy capacity and peak load capability for all three proposed MPF sizes. LANL has adequate electrical energy capacity and peak load capability for the TA-55 Upgrade (80 ppy). LANL would require additional peak load capability and Pantex Site would require additional energy capacity for the 450 ppy plant. Carlsbad Site would require additional peak load capability for all three sized plants and additional energy capacity for the 450 ppy plant. NTS would require additional energy capacity and peak load capability for all three sized plants.

Pantex Site, SRS and the Upgrade Alternative (80 ppy) at LANL have adequate process steam available to support all MPF size plants. The Carlsbad Site would require extension of a local gas pipeline and NTS would require the construction of a pipeline or a rail line to supply fuel for the process steam plant required for any of the three production capacity options.

Air Quality

All action alternatives would result in air quality levels that would be in attainment with the NAAQS for all criteria pollutants. However, surge operations of the 450 ppy plant at LANL would exceed the 24-hour nitrogen dioxide standard by approximately 5 percent. If the 450 ppy

plant is built at LANL, mitigation measures would be designed and implement to bring these emissions into compliance. All sites are in attainment areas. A Prevention of Significant Deterioration analysis would be done in the site-specific tiered EIS.

Water Resources

The water requirements for the construction of all action alternatives would be within existing site water allotments. The existing site water allotment at NTS, Pantex Site, and SRS would be adequate to support the operation of all three plant sizes. Although the current water allotment at LANL would support the Upgrade Alternative and 125 ppy options, LANL would need to expand its water allotment for the 250 ppy and 450 ppy plant by purchasing more water. Carlsbad Site would need to purchase more water to expand its water allotment for the operation of all three plant sizes. Sufficient capacity exists for both LANL and Carlsbad Site to purchase additional water to support MPF operations.

Biological Resources

For all action alternatives, some habitats unique to each area would be modified or lost and there could be a decrease in quality of the habitat adjacent to the proposed development. It is not expected that any wetlands would be impacted by any alternative. There are no designated critical habitats for any listed threatened or endangered species at any of the site alternatives, and thus no impacts are expected.

Cultural and Paleontological Resources

Any ground disturbance has the potential to impact cultural and paleontological resources at any of the alternative sites. At the programmatic level, there are no significant differences between the alternative sites with respect to potential impacts to cultural and paleontological resources. Prior to any ground-disturbance activity, NNSA would identify and evaluate any cultural and paleontological resources that could potentially be impacted by the construction of a MPF or upgrade to the TA-55 Facility. If necessary, NNSA would implement appropriate measures to avoid, reduce, or mitigate any impacts.

Socioeconomics

New jobs would be created for all action alternatives. For the MPF alternatives, the number of direct jobs created during the peak year of construction would range from approximately 770-1,100, depending upon the capacity constructed. The number of indirect jobs created would vary depending upon the site. Table 3.5.1–1 displays an estimate of the total number of jobs (direct plus indirect) created during the peak year of construction for the various MPF site alternatives. The maximum population influx would not exceed 3 percent at any site.

During operations, the number of direct jobs created would range from approximately 990-1,800, depending upon the capacity of a MPF. As shown on Table 3.5.1–1, the total number of jobs would range from 1,230-3,090, depending upon the capacity of a MPF. During operations, all sites except NTS and SRS would have an increase in population for all plant sizes. The population increases are shown on Table 3.5.1–1. Due to the population increases, which would be less than 3 percent, there would be no impacts on community services, except at Carlsbad,

where increases in some resources would be required to maintain comparable levels of community services.

The TA-55 Upgrade Alternative (80 ppy) would result in a maximum of 190 direct jobs during the peak year of construction and 660 direct jobs during operations. Table 3.5.1-1 displays the total number of jobs (direct plus indirect) associated with the TA-55 Upgrade Alternative.

Radiological Impacts

During normal MPF operations, radiological impacts to workers and the public would occur. Impacts to workers would be independent of a MPF site. At all MPF sites, the average individual dose to a worker would be 290 mrem/yr for the 125 ppy facility, 390 mrem/yr for the 250 ppy facility, and 510 mrem/yr for the 450 ppy facility. These doses would be below regulatory limits and limits imposed by DOE Orders. Statistically, for the average worker, a 290 mrem/yr dose translates into a risk of one fatal cancer every 8,620 years of operation; a 390 mrem/yr dose translates into a risk of one fatal cancer every 6,410 years of operation; a 510 mrem/yr dose translates into a risk of one fatal cancer every 4,900 years of operation.

For the TA-55 Upgrade Alternative, the average individual dose to a worker would be a 380 mrem/yr. Statistically, this translates into a risk of one fatal cancer every 6,580 years of operation.

Doses to the public would be site dependent. Sites with the smallest 80-km (50-mi) population would have the smallest impact. For example, the collective population dose to the population surrounding NTS and WIPP would be smaller than LANL, Pantex, and SRS due to the relative remoteness of NTS and WIPP. However, the collective population dose at any of the five sites is small in any event. The maximum collective population dose would occur at SRS for the 450 ppy facility. This dose would be 1.3×10^{-6} person-rem/year, which statistically would translate into one fatal cancer risk every 1.5 billion years of operation. The TA-55 Upgrade Alternative would also be bounded by this population dose. At all sites, the maximally exposed offsite individual would receive a dose less than 1 mrem per year.

Nonradiological Impacts

Statistically, nonradiological occupational impacts to workers during the construction and operation of a MPF would be expected to result in less than one fatality. The impacts to workers are estimated to be the same for all action alternatives except the TA-55 Upgrade Alternative (80 ppy) which would have the smallest potential impact due to the least amount of construction activity.

Accidents

Radiological. Potential impacts from accidents were estimated using computer modeling. In the event of any accidents, the projected annual risk of latent cancer fatality (LCF) at all MPF sites for the surrounding population would be less than one. For the bounding accident analyzed in the EIS, (explosion in a feed casting furnace) the highest potential annual risk to the population within 80-km (50-mi) would be an increase in LCFs of 0.125 at LANL from either a MPF or TA-55 Upgrade Alternative. Statistically, this would equate to one additional LCF among the

80-km (50-mi) population surrounding LANL every 8 years of operation. Statistically, this accident would be expected to occur once every 100 years. For this accident, the dose to the maximally exposed offsite individual would be 38 rem, which exceeds DOE exposure guidelines. The analyses in these cases for NEPA purposes are based on unmitigated releases of radioactive material to select a site for the MPF. Following the ROD and selection of a site, additional NEPA action would be taken that would identify specific mitigating features that would be incorporated in the MPF design to ensure compliance with DOE exposure guidelines. At NTS and the Carlsbad Site, this risk would be smallest due to the relative remoteness of these two sites.

Nonradiological. The impacts associated with the potential release of the most hazardous chemicals used at a MPF were modeled to determine whether any impacts could exceed site boundaries. Based upon those modeling results, it was determined that no chemical impacts would exceed site boundaries at SRS and NTS. At LANL, Pantex Site, and Carlsbad Site, an accidental chemical release had the potential to cause impacts beyond site boundaries. In such an event, emergency preparedness procedures would be employed to minimize potential impacts.

Transportation

During normal transportation of radiological materials (plutonium, enriched uranium, TRU waste and LLW), radiological impacts to transportation workers and the public would occur. Impacts to workers and the public would be dependent on a MPF site and the population along expected transportation routes. All pits would originate and terminate at Pantex and all enriched uranium components would be transported to a MPF site from the Y-12 National Security Complex at Oak Ridge, Tennessee, and back. Two locations (Pantex Site and Carlsbad Site) transport LLW offsite.

For all alternatives, the environmental impacts and potential risks of transportation would be small, e.g., less than one latent cancer fatality per year. As shown in Table 3.5.1–1, the average collective dose to transportation workers from incident free transportation would be a maximum of 10.2 person-rem/yr for the 450 ppy facility. Statistically, a 10.2 person-rem/yr dose translates into a risk of one fatal cancer every 245 years of operation. The average collective dose to the general public from incident free transportation would be a maximum of 12 person-rem/yr for the 450 ppy facility. Statistically, a 12 person-rem/yr dose translates into a risk of one fatal cancer every 167 years of operation.

In the event of a transportation accident, the maximum average collective dose to the general public from a transportation accident would be 0.29 person-rem/yr for the 450 ppy facility. Statistically, a 0.29 person-rem/yr dose translates into a risk of one fatal cancer every 6,897 years of operation.

Waste Management

The amount of waste generated by a MPF would be the same at all sites. These values and those from the TA-55 Upgrade Alternative (80 ppy) are shown in Table 3.5.1–1. The TRU waste from all sites would be transported to the Waste Isolation Pilot Plant or other similar type facility for disposal (the impact of this is included in the transportation section). All LLW at LANL and at

NTS would be handled in existing onsite burial LLW disposal facilities. The existing aboveground E Area retrievable vault storage facilities at SRS are not adequate and planned onsite disposal facilities would require additional capacity to handle the quantities of LLW generated by a MPF for the 250 ppy and 450 ppy facilities. Pantex Site and Carlsbad Site do not have any onsite LLW disposal facilities and would ship their MPF LLW to NTS. Pantex Site would need to expand its temporary LLW storage facility, and Carlsbad Site would need to construct a temporary LLW storage facility.

3.6 PREFERRED ALTERNATIVE

The CEQ regulations require an agency to identify its preferred alternative to fulfill its statutory mission, if one or more exists in a Draft EIS (40 CFR 1502.14[e]). For this MPF Draft EIS, constructing and operating a new MPF is the preferred alternative based on considerations of environmental, economic, technical, and other factors. A preferred host site for a MPF has not yet been determined, but will be identified in the Final EIS, if the Secretary decides to proceed with a MPF.