Sensitivity Analysis

DOE could elect to operate the MPF using a double shift to increase the plutonium pit manufacturing capability. Double-shift operation of the 450 ppy facility would approximately double the impacts to the waste management infrastructure from those described above for the single-shift operation. The Carlsbad Site currently manages only small quantities of site-generated waste. Even at the lowest proposed pit manufacturing capacity, the combination of MPF operations and repository operations would require a substantial increase in waste management infrastructure at the Carlsbad Site. The waste volumes resulting from double-shift operation would require additional expansion of the Carlsbad Site's waste management infrastructure. See Section 6.5 for a discussion of the availability of WIPP for disposal of TRU waste resulting from MPF operations.

5.7 IMPACTS COMMON TO ALL ALTERNATIVES

There are three impacts which are common to all of the action alternatives, regardless of which site is chosen. These are the operation of a new Beryllium Facility to supply required beryllium parts for the increased levels of pit production, decommissioning the MPF Alternative or the TA-55 Upgrade Alternative at the end of their useful lives, and the phase out of the No Action Alternative Pit Production Activity at LANL. These impacts are discussed below.

5.7.1 New Beryllium Facility

A beryllium fabrication capability is necessary to produce the required supporting component parts for the MPF. Currently, NNSA does not have an existing capability to produce the beryllium components that would be required for the MPF. Although it is unclear where beryllium components would be produced, there is no requirement to collocate such a capability at the MPF site. Additionally, there is no need to propose alternatives for a Beryllium Facility at this time, because the planning requirements for such a facility are much shorter than for the MPF. Nonetheless, because it is reasonably foreseeable that beryllium components would be produced to support MPF operations, this EIS assesses the environmental impacts of such beryllium production for completeness. DOE will explore all reasonable options for providing beryllium components to the MPF and will prepare any appropriate NEPA documentation when this issue is ripe for review and decisionmaking.

Although transportation of properly packaged beryllium material to the Beryllium Facility and transport of the finished components to the MPF is not hazardous, breathing fine particulate beryllium is a health hazard. Inhaled beryllium triggers an auto-immune response in an estimated 1-6 percent of exposed individuals that can result in Chronic Beryllium Disease, a debilitating and sometimes fatal disease. Consequently, individuals working with beryllium must minimize exposure and establish rigorous housekeeping practices and emissions to the environment must be severely limited.

Supply of beryllium feed stock is also in question. The former plant at Rocky Flats received metal blanks of the material from commercial suppliers, but there are now problems with this supply, so the plant may have to process its own blanks from beryllium powder. This option is included in the following plant description. If a commercial supplier of beryllium blanks can be developed, then that part of the facility may not be necessary.

Since only one Beryllium Facility will be required to support the MPF, no matter where it is located, the environmental impacts of its operation would have equal impact on all alternatives. Included is a brief description of the proposed facility and its operation.

5.7.1.1 Beryllium Operations

The Beryllium Facility would have two main production areas: the blank forming operations and machining operations. Equipment and supporting services would be provided to form beryllium blanks. All blank forming operations would be enclosed in gloveboxes to protect workers from exposure to beryllium. Blank forming operations would include removing containers of powder from storage units, weighing and blending the powder, loading it into molds to be pressed, pressing, disassembling the molds, removing the formed blanks, cleaning and certifying blanks, and transferring them to machining.

The machining process would rough and finish grind the formed blanks to the required dimensions using specialty grinding machines. The machined parts would be cleaned, inspected, and nondestructively tested. Parts that pass inspection and nondestructive testing would be certified. Beryllium part certification would include physical testing, dimensional metrology, and radiography. The certified parts would be packaged and transported to the beryllium shipping area.

5.7.1.2 Beryllium Impacts

The Beryllium Facility would house all production operations that must be performed in a beryllium control area. Because of the toxic nature of beryllium, appropriate measures would be incorporated in the building design to ensure isolation of workers from hazardous materials (e.g., the use of multiple occupancy zones to achieve containment; and the isolation of all people, equipment, and processes not required to be in direct contact with the toxic materials).

Ventilation zones would be used to contain contamination. The primary (regulated) zone would house the actual process operations, the buffer zone would be for all areas directly surrounding the primary zone, and nonregulated zones would surround the buffer zone. Each zone would have increasing negative air pressure passing from the nonregulated zone inward to the primary zone.

A containment system would be established for the collection and HEPA filtration of ventilation exhaust air from primary enclosures and equipment containing hazardous materials before discharge to the main ventilation exhaust system. Centralized air emission control systems would ensure environmentally acceptable discharges of all ventilation and would include a central discharge stack and a system to permit collection of appropriate air samples.

Beryllium and beryllium compounds enter the environment as a result of the release and/or disposal of beryllium-contaminated wastewater, dust, or as a component of solid wastes. Once beryllium has been released to the environment, exposure to beryllium can occur by breathing air, eating food, or drinking water that contains beryllium. Dermal contact with metal containing beryllium or water containing dissolved beryllium salts will result in only a small fraction of the beryllium actually entering the body. A portion of beryllium dust breathed into the lungs will dissolve and eventually result in the transfer of the beryllium into the bloodstream; some may be transferred to the mouth then swallowed, and the rest will remain in the lungs for a long time. Of the beryllium ingested via contaminated foodstuffs or water, or swallowed subsequent to inhalation, about 1 percent will pass from the stomach and intestines into the bloodstream. Therefore, most of the beryllium that is swallowed leaves the body through the feces without entering the bloodstream. Of the beryllium that enters the bloodstream, some is routed to the kidneys and is eliminated from the body in urine. Some beryllium can also be carried by the blood to the liver and bones where it may remain for a long period of time. If beryllium is swallowed, it leaves the body in a few days. However, if beryllium is inhaled, it may take months to years before the body rids itself of beryllium.

As with any contaminant, the health effects resulting from exposure to beryllium are dependent on the exposure concentration, frequency, and duration. Inhalation of large amounts of soluble beryllium compounds can result in Acute Beryllium Disease. Acute Beryllium Disease results in lung damage that resembles pneumonia with reddening and swelling of the lungs. Lung damage may heal provided exposure does not continue or the exposed individual may become sensitive to beryllium. The increased sensitivity of some individuals to beryllium results in an immune or inflammatory reaction when subsequent low-level exposures occur. This condition is called Chronic Beryllium Disease. This disease can occur long after exposure to either the soluble or the insoluble forms of beryllium. Studies linking exposure to beryllium or beryllium compounds with an increased incidence of cancer (in particular, lung cancer) have been performed on laboratory animals. However, these studies are not considered reliable predictors of human health effects and ongoing efforts are currently underway to evaluate workers who have been known to be exposed.

In 1997, DOE initiated an Interim Chronic Beryllium Disease Prevention Program. The purpose of the program was to enhance, supplement, and integrate a worker protection program to reduce the number of current workers exposed, minimize the levels of beryllium exposure and the potential for exposure to beryllium, and to establish medical surveillance protocols to ensure early detection of disease. In December of 1999, DOE published a final rule to establish the Chronic Beryllium Disease Prevention Program that became effective on January 7, 2000 (10 CFR 850). The final rule establishes:

- An airborne beryllium concentration action level as 0.2 $\mu g/m^3$
- A requirement for employers to ensure that workers use respirators in areas where the concentration of beryllium is at or above the action level and to provide a respirator to any employee who requests one regardless of the concentration of airborne beryllium
- Criteria and requirements governing the release of beryllium-contaminated equipment and other items at DOE sites for use by other DOE facilities or the public
- Requirements for offering medical surveillance to any “beryllium-associated worker”
- Medical removal protection and multiple physician review provisions

Any beryllium production would be accomplished using layered engineering and administrative controls to protect workers by providing primary, secondary, and tertiary confinement to protect workers and the environment. Process improvements, engineered confinement controls, and the use of gloveboxes would be expected to reduce worker exposures to beryllium to as low as reasonably achievable. Based upon previous analyses for beryllium production at the Y-12, it is expected that the public Hazard Quotient from beryllium exposure would be much less than 1.0, and the excess cancer risk for exposure of the public would be less than the EPA range of concern (1.0×10^{-4} to 1.0×10^{-6}). For workers, it is expected that the Hazard Quotient from beryllium exposure would be much less than 1.0, and the excess cancer risk for exposure would be within the EPA range of concern.

5.7.2 Decommissioning the Modern Pit Facility or the TA-55 Upgrade Facility

At the end of their use for producing new and replacement pits for the Nuclear Weapons Stockpile, the MPF facilities or the TA-55 Upgrade Facilities would be subject to the process of decommissioning. The primary decommissioning goal would be for the facility to be decontaminated to the extent that its residual radioactivity is at an acceptable level. The facility decontamination would be conducted in a manner to minimize potential impact on health and safety to workers, the general public, and the environment. The facility decontamination would be executed in accordance with the decommissioning plan prepared by the facility operator (a DOE contractor) and approved by DOE.

Prior to the initiation of decommissioning activities, the facility operator would have to prepare a detailed decommissioning plan. The decommissioning plan would contain a detailed description of the site-specific decommissioning activities to be performed and would be sufficient to allow an independent reviewer to assess the appropriateness of the decommissioning activities; the potential impacts on the health and safety of workers, the public, and the environment; and the adequacy of the actions to protect health and safety and the environment. The decommissioning plan would also contain a credible site-specific cost estimate for these actions to allow DOE to allocate adequate funding such that decommissioning activities could be conducted in a timely manner. It is expected that both LLW and TRU waste would result from decommissioning activities.

5.7.3 Impacts Associated With Phasing Out Pit Production at Los Alamos National Laboratory

If the decision is made to proceed with the MPF, then interim pit production involving the manufacture of war reserve pits for the stockpile at LANL would be phased out once the MPF becomes operational. The environmental impacts of phasing out pit production at LANL are addressed in this section. In general, these environmental impacts, which are tantamount to the impacts associated with the No Action Alternative at LANL, would have a slightly positive impact on the LANL environment. Phasing out pit production would have no noticeable effect on the following resources: Land Use, Visual Resources, Noise, Nonradiological Air Emissions, Geology and Soils, Ecological, and Cultural and Historic. This is due to the fact that the PF-4 and other support facilities at TA-55 would continue to operate and perform other missions for the foreseeable future. As such, these resources are not discussed further in this section. Socioeconomics would also not be affected, as it is expected that any workers associated with pit production would perform other missions at LANL. Resources that might be affected include: infrastructure (energy use), water use, radiological air emissions, human health, waste generation, transportation, and accidents. These resources are discussed below.

Infrastructure

Electricity demands associated with No Action Alternative pit production are small (less than approximately 5,000 MWh/yr). This quantity is less than 1 percent of the total electrical energy consumption at LANL. Consequently, the positive impact of reducing electricity demands by less than 1 percent are insignificant. Natural gas use would also decrease by less than 1 percent.

Water Use

Groundwater use associated with No Action Alternative pit production is small, less than approximately 30 million L/yr (7.9 million gal/yr). This quantity is less than 1 percent of the total groundwater use at LANL. Consequently, the positive impact of reducing groundwater use by less than 1 percent is insignificant.

Radiological Air Emissions

Radiological air emissions associated with No Action Alternative pit production are small, approximately 10 microcuries per year. This accounts for less than 2 percent of the total radiological air emissions from LANL. The positive impacts to human health from a less than 2 percent reduction in radiological air emissions are insignificant.

Human Health

The average dose to workers associated with No Action Alternative pit production is approximately 380 mrem/yr. For approximately 230 workers, this translates into a total worker dose of approximately 90 person-rem/yr. Statistically, this translates into a LCF risk of 0.045, which means approximately one LCF would be expected approximately every 22 years of operation. Phasing out pit production at LANL would eliminate this source of exposure to workers and reduce the risk of LCFs by 0.045. For the 80-km (50-mi) population, reducing radiological air emissions by less than 2 percent would have an insignificant impact on human health, which is already projected to be small (less than 0.017 LCFs per year of LANL operations). Consequently, no changes to environmental justice are expected.

Waste Generation

Waste generation would be reduced if pit production were phased out at LANL. TRU waste would be reduced by approximately 15 m^3 (530 ft^3) and LLW would be reduced by approximately 200 m^3 (7,063 ft^3). These reductions amount to less than 1 percent of the total TRU waste and LLW quantities generated by other LANL activities and are not considered significant.

Transportation

If pit production were phased-out at LANL, there would be no need to transport pits from LANL to Pantex for weapons assembly. This would eliminate 28 shipments per year. As described in Section 5.2.12, the impact associated with transportation to and from LANL is approximately 1.9×10^{-3} LCFs per year for incident-free transport. Eliminating this impact is not considered significant.

Accidents

If pit production were phased out at LANL, there would be no potential impacts from accidents associated with pit production. The potential impacts associated with pit production at LANL are described in Appendix C and Section 5.2.10. These impacts, while small, would be eliminated.

5.8 CUMULATIVE IMPACTS

5.8.1 Introduction

The CEQ regulations implementing the NEPA define cumulative effects as "the impact on the environment which results from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." Other DOE programs and other Federal, state, and local development programs all have the potential to contribute to cumulative effects on DOE sites.

The methodology for the analysis of cumulative effects is presented in Appendix F and was developed from the guidelines and methodology in the CEQ's *Considering Cumulative Effects Under the National Environmental Policy Act*. Cumulative impacts are presented for those resource areas having the potential to present a significant impact. Each potential site is examined separately for cumulative impacts, and generally the alternative with the maximum impact (MPF with 450 ppy) is presented as the bounding impact to cumulative effects. For some resource areas, such as waste management, the cumulative effect may only be the impact from the MPF project combined with the impact (if any) from existing operations.

5.8.2 Los Alamos Site

The No Action Alternative provides the baseline for the cumulative effects of the Proposed Action at LANL. The projected incremental environmental impacts of implementing the Proposed Action at LANL were added to the impacts of other present, past, and reasonably foreseeable future actions at or near LANL to obtain the cumulative impacts.

Primary sources of information for cumulative impacts at LANL, include the following DOE documents: