4. ENVIRONMENTAL CONSEQUENCES OF CONSTRUCTING AND OPERATING THE PROPOSED PFSF

This chapter describes how the natural and human environment could be affected by the construction, operation, and decommissioning of the proposed facility in Skull Valley, Utah. This chapter presents or references relevant data, describes the approach and methods used to predict future environmental effects, and presents an assessment of the potential environmental impacts.

Each subsection describes, as appropriate, any potential impacts to specific categories of environmental resources. Each subsection also contains a concluding statement as to whether the potential impacts are judged to be small, moderate, or large. The standards used for these concluding statements are presented in the dialogue box below. In addition to a discussion of the potential impacts, the possible mitigation measures that could be employed to eliminate or reduce the magnitude of any impacts are also presented and discussed within each subsection. Each subsection identifies certain of the possible mitigation measures that the Cooperating Agencies recommend be required. See Section 9.4.2 for a complete list of the mitigation measures that the Cooperating Agencies recommend be required.

The proposed action under consideration in this FEIS involves the construction and operation of the proposed PFSF in Skull Valley, Utah, and the construction and operation of new transportation facilities in Skull Valley for moving SNF to the proposed PFSF. This chapter does not address the impacts of constructing and operating either a new rail line or an ITF. The environmental impacts of the new transportation facilities are discussed in Chapter 5 of this FEIS. This chapter focuses only on the construction and operation of the proposed PFSF on the Reservation. It should be noted that assessments were made considering either a 20-year or a 40-year (assuming license renewal) period of operation for the proposed PFSF. Where the 40-year period was assumed, this reflects a conservative analysis.

Section 4.9 also discusses decommissioning of the proposed PFSF. This discussion is based on currently available information. Because decommissioning would take place well into the future, all technological changes that could improve the decommissioning process cannot be predicted. As a result, the NRC requires that an applicant for decommissioning of an ISFSI submit, at least 12 months prior to the expiration of the NRC license, a Decommissioning Plan. The requirements for the Final Decommissioning Plan are delineated in 10 CFR 72.54(g)(1)–(6), 72.54(d), and 72.54(i). This plan will be the subject of further NEPA review that would result in the NRC staff's preparing an environmental assessment or environmental impact statement, as appropriate, at the time the Decommissioning Plan is submitted to the NRC.

As shown in Figures 2.1 and 2.11, there are two potential sites for the proposed PFSF in Skull Valley. Both sites are located on the Reservation. The proposed action being evaluated in this FEIS involves a location for the proposed PFSF in the northwest corner of the Reservation, which is designated as "Site A" (see Figure 2.1). An alternative site, also being evaluated in this FEIS, lies to the south of Site A on the Reservation and is designated as "Site B" (see Figure 2.11). The assessments described in this chapter distinguish the impacts associated with Site A from those at Site B wherever possible.

DETERMINATION OF THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

A standard of significance has been established by NRC (see NUREG-1437) for assessing environmental impacts. With the standards of the Council on Environmental Quality's regulations as a basis, each impact is to be assigned one of the following three significance levels:

- ***Small:*** The environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- ***Moderate:*** The environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- ***Large:*** The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

4.1 Geology and Soils

This section discusses the assessment of potential environmental impacts to geologic resources (such as minerals) and soils during site preparation, construction, and operation of the proposed facility. Impacts could result from planned excavation activities for the proposed PFSF and the consumption of mineral resources for use in roadbeds and as materials of construction. The adequacy of the proposed PFSF design to withstand earthquakes is addressed in the NRC's SER, as updated, and is not addressed in this FEIS.

4.1.1 Construction Impacts at the Preferred Site (Site A)

Environmental impacts to soils include loss of the soils resource because of physical alterations to the existing soil profile. These alterations lead to a reduction in the soils' ability to support plant and animal life and may possibly lead to changes in windborne erosion patterns, changes in surface water drainage and erosion patterns, and changes in infiltration characteristics. The impacts to land use and the loss of vegetation and habitat are described in Sections 4.4 and 4.5, windborne erosion impacts in Section 4.3, surface water drainage and water erosion impacts in Section 4.2, and infiltration impacts in Section 4.2. Impacts would also occur to economic geologic resources (e.g. aggregate) from their use as construction materials and from possible access restrictions to minerals beneath the site. As discussed below, impacts involving the loss of the soils resource and the loss of economic geologic resources would be small.

The assessment for the loss of the soils resource compares the amount of soil to be lost at the proposed PFSF site with the amount of similar soils resources available in Skull Valley. The assessment of impacts to economic geologic resources (e.g. aggregate) compares the estimated amount of materials required for construction with the availability of those resources in the area. It also considers the impacts to mineral resource exploitation in the immediate area of the proposed PFSF.

The uppermost 23 cm (9 inches) of soil on the 99-acre pad area [(roughly 92,500 m^3 (121,000 yd^3)] would be stripped and used for construction of the earthen flood protection berms, and for access and perimeter roadway slope dressing. The pad area would then be further excavated to a depth of about 1.5 m (5 ft), and the spoils [i.e., about 61,000 m^3 (800,000 yd^3)] would be stockpiled and used to make a soil/cement pad base material (see Section 2.1.1.2). None of this spoil material would leave the site; thus, there would be no impacts to any potential off-site fill areas or disposal sites (see Section 4.9 for

decommissioning of the berms). Even if all of this soil is used in the soil/cement mixture, it represents a loss of less than 0.04 percent of the upper 1.2 to 2 m (4 to 6 ft) of soil in Skull Valley. While small differences exist in the characteristics of Skull Valley soils, they are generally similar, and those at the proposed PFSF site have no unusual characteristics that make them of greater intrinsic value. The impacts involving loss of the soils resource is thus considered to be small.

The cask storage pads would be independent structural units (see Figure 2.3). Each pad is 9 m wide by 20 m long by 1 m thick (30 ft wide by 67 ft long by 3 ft thick). Excavation of soils at the preferred site would be required so that the pads would be flush with grade level for direct access by the cask transporter. Foundation preparation for the pads would consist of the necessary soil excavation and placement of a 0.6-m (2-ft) thick concrete soil/cement mat on the in-situ soil. The bottom of the mat and the bottom of the storage cask pads would be well below the local frost depth of 75 cm (30 inches) below grade level (PFS/ER 2001). This would prevent upward movement of the pads due to the “heaving” and other ground motions associated with the freeze-thaw cycle. PFS has performed field and laboratory geotechnical investigations of site soils. The adequacy of those studies to assess site soils and the test results to demonstrate that site soils can accommodate the storage cask pads and canisters is addressed in PFS’s SAR (PFS/SAR 2001) and the NRC SER, as updated.

Resources such as concrete aggregate, crushed rock, and asphalt would be required during construction of the proposed PFSF. Table 4.1 compares anticipated construction material requirements for all phases of construction of the proposed PFSF with estimated quantities of such materials available from five private, commercial sources in the vicinity of Skull Valley (see Table 3.2). PFS would be able to use any or all of these locations for the source of construction materials (PFS/ER 2001). These five sites are located within 10 to 75 highway km (6 to 48 highway miles) of the proposed PFSF. BLM notes the existence of five additional sand and gravel pits within and immediately outside Skull Valley but provides no material quantity estimates. However, considering only the estimated quantities of material available from the five private, commercial sources in Table 4.1, no more than about one-third of this material would be required for the proposed PFSF construction. Including other sources, such as those on BLM land, would reduce that percentage further. The impacts on aggregate material for site construction are thus considered to be small.

Table 4.1. Comparison of PFSF construction material requirements with quantities of materials commercially available in the vicinity of Skull Valley

Material type	Material required	Material available
Concrete aggregate		
Small (sand)	87,900 m^3 (115,000 yd^3)	300,000 m^3 (393,000 yd^3)
Large (crushed rock)	103,300 m^3 (135,200 yd^3)	465,000 m^3 (607,000 yd^3)
Crushed rock for access road base, rip-rap, storage area, and building grading	102,700 m^3 (134,600 yd^3)	600,000 m^3 (786,000 yd^3)

Mineral resources located beneath the site would be unavailable for exploitation during construction. However, the impacts from this unavailability would be small due to the wide availability of similar minerals in the region. No mitigation measures are warranted for the loss of the soils resource or the unavailability of minerals during facility construction.

4.1.2 Impacts During Operations at the Preferred Site

Operational impacts include the use of aggregate and materials used for the continued construction of the concrete storage pads and the unavailability of mineral resources. These impacts are included in the discussion above and have been determined to be small. Other than construction of the storage casks themselves, materials needed for facility construction would no longer be needed, and no further depletion of those resources would be anticipated. No mitigation measures are warranted for the loss of soils resources or the unavailability of minerals during facility operation.

4.1.3 The Alternative Site (Site B) in Skull Valley

The impacts to soils and economic geologic resources for the alternative site (Site B) are the same as for the preferred site (Site A). The geologic setting for the alternative site (Site B) is not environmentally differentiable or significantly different from the preferred site (Site A). Thus, the environmental impacts to soils and economic geologic resources from the construction and operation of the proposed PFSF at Site B would not be quantifiably different from those at the preferred site (Site A). No mitigation measures are warranted for the loss of the soils resource or the unavailability of minerals during construction or operation of the facility operation at the alternative site (Site B).

4.1.4 Mitigation Measures

Based on the above discussion of the impacts to soils and economic geologic materials (aggregate), no mitigation measures were identified that would appreciably reduce the impact, beyond those described in Sections 4.2, 4.3, 4.4, and 4.5 to address the types of impacts identified in the first paragraph of Section 4.1.

4.2 Water Resources

This section discusses the assessment of potential environmental impacts to surface water and groundwater during construction and operation of the proposed PFSF including the proposed site access road from Skull Valley Road to the site. The discussion includes the potential impacts to surface water flow at the valley-wide scale, as well as impacts to natural drainages on and around the site, and potential degradation of water quality or supply.

4.2.1 Construction Impacts at the Preferred Site (Site A)

4.2.1.1 Surface Water

This section discusses potential impacts to the surface water flow system during and as a result of construction activities. Construction of the facility and the site access road are discussed separately.

Facility construction. As discussed below, impacts to the surface water flow system in Skull Valley would be small as a result of construction of the facility at the preferred site. Small impacts to local ephemeral drainage features would occur during and as a result of the construction and presence of the facility.

Construction of the proposed PFSF would require modification of the existing surface drainage system within the site footprint and small changes in surface water runoff volumes and patterns would result. The principal modification to local surface drainage features would be the construction of the flood diversion berm, an approximately 1,310 m (4,300 ft) earthen berm along the southern and western sides of the facility (see Figure 2.2). This berm would divert normal and flood flows of surface water from upslope and adjacent areas from the west to a discharge location near the northwest corner of the facility. The proposed PFSF is 40-ha (99-acre) facility in which existing surface drainage features would be modified to provide engineered foundations and a contained runoff area for the facilities. The total watershed area of Skull Valley is 181,000 ha (448,000 acres). The footprint of the facility is 0.02 percent of the total watershed area. Alteration of the surface water runoff or infiltration characteristics of this small proportion of the watershed would not have a noticeable effect on surface water flows in the Skull Valley watershed.

After construction of the surface water detention basin, surface runoff from within the facility area would be directed into the basin where infiltration into soils and evaporation would occur. According to PFS's construction sequencing plan (PFS/ER 2001), the first period of activities in Phase 1 construction would include construction of the site access road with its flood protection berm, and initial earthwork in the southeast quadrant of the cask storage area. During the second period of Phase 1 construction activities the storage area would be leveled, the facility's flood protection berm constructed, and the surface water detention basin would be constructed. During a short time (weeks) in Period 1 and an unspecified time in Period 2, there would be a potential for water erosion to transport disturbed site soils into the local drainage features in the event of severe storms. The magnitude of such effects would depend on unpredictable seasonal variables in weather conditions. Assuming that erosion control measures would be implemented and would function as intended, impacts to local surface water drainage channels would be small. Additional discussion of potential impacts from flooding during extreme events is presented below.

Once constructed, the site surface water runoff collection system would be sized to contain all site runoff up to and including the precipitation associated with a 100 year flood event (i.e., 100 year flood). This would prevent the site from having any adverse effect on area flooding under conditions equal to or less than a 100-year flood. The construction BMPs (see Section 2.1.4) include measures to protect the local drainage features outside the immediate construction footprint from siltation. Pursuant to 40 CFR 122.26(b)(14), PFS would be required to obtain an NPDES permit to protect surface waters from pollutants that could be conveyed in construction-related storm water runoff and would be required to prepare a Stormwater Pollution Prevention Plan.

Site access road. As discussed below, any impacts on the surface water flow system related to construction of the site access road would be small.

The site access road would connect the proposed PFSF with Skull Valley Road to allow site access for construction and operations personnel. Under normal weather conditions, and considering the BMPs that PFS would use to control erosion and sedimentation of surface flow channels, any effects on the surface water drainage system during the construction period would be small. Pursuant to

40 CFR 122.26(b)(14), construction activities for the site access road would also be subject to the terms of the required NPDES permit and PFS's Stormwater Pollution Prevention Plan.

Potential impacts to surface water quality. Potential impacts to surface water quality during construction would be small. Potential events that might cause water quality impacts include soil erosion followed by offsite transport of suspended solids and turbidity associated with storms, as well as accidental fuel spills in uncontrolled areas. Fugitive dust from site construction could be controlled to acceptable levels without using any chemicals (see Section 4.3). PFS has not indicated, nor have the Cooperating Agencies recommended, the use of chemicals for surface wetting activities. Therefore, water used for surface wetting and soil compaction would not likely contain any chemicals and therefore would not impact surface water.

PFS is committed to implementing BMPs (see Section 2.1.4) that include measures to prevent or minimize erosional impacts to the surface water system. In the event that extreme weather conditions should occur during construction, the possibility exists that localized soil erosion and transport could occur causing downstream channel siltation. Although such an event is unlikely, potential mitigation measures that could reduce the impact of such an event are described below.

If an accidental spill of petroleum hydrocarbon fuel occurred while rainfall or snowmelt was causing surface flow through the site during construction, there could be an adverse impact on surface water. Protection of surface water quality under such conditions would require an emergency spill response to intercept and clean up spilled fuel, affected surface water, and soil. PFS's Best Management Practices Plan would prescribe methods for minimizing or eliminating the potential impacts from spills.

Potential impacts related to flooding. In the unlikely event that severe flooding should occur during construction of the proposed PFSF and the site access road, moderate impacts to the surface water hydrological system could occur.

BMPs that would be used during construction of the proposed PFSF and the access road include erosion and siltation control for normal events. A severe flood event could occur during the construction phase. Such an event would likely overwhelm the BMPs measures and could result in erosion of disturbed soils or portions of embankments with deposition of the eroded materials in channels downstream of the work sites. The severity of such an impact would vary with the storm intensity. Such potential impacts are judged to be moderate because a severe flooding event would also affect adjacent areas and would likely cause erosion and channel siltation that would not otherwise occur in these areas in the absence of the proposed PFSF. Should severe flooding (i.e., from storms associated with the 100-year flood or greater) occur, eroded materials from the construction site would be commingled with the natural material transported by flood flows. This erosion would be indistinguishable from the impacts of the natural erosion processes during floods.

4.2.1.2 Water Use

Construction of the facility would have a small impact on water availability in Skull Valley. Information provided by PFS indicates that Phase 1 construction activities would use water at rates that vary from about 102 m^3/day (27,000 gal/day) to over 520 m^3/day (138,300 gal/day) (PFS/ER 2001). Additional quantities of water would be required for the planned revegetation of disturbed areas. The volume of water needed is dependent upon the method used to revegetate the area. The water requirements will be determined during the development of a final revegetation plan. Therefore, no estimate is available at this time as to how much water would be needed for this purpose.

As can be seen in Figure 4.1, a large amount [as much as 511 m^3/day (135,000 gal/day)] of the water used for construction activities, including Phases 1, 2, and 3, would be obtained from offsite sources and would be trucked to the site for use in dust suppression, concrete mixing, and soil cement mixing. PFS has obtained information from private water suppliers that indicates the required volumes of water anticipated for project construction needs are readily available in the northern portion of the Stansbury Mountains without impact to regional water availability (PFS/RAI2 1999c).

4.2.1.3 Groundwater

The potential impacts from the proposed use of groundwater would be small. The use of onsite groundwater would vary from about 13 to 38 m^3/day (3,300 to 10,000 gal/day) (PFS/ER 2001) during Phase 1 construction. The peak groundwater use estimate would be satisfied with an onsite groundwater production capacity of about 0.025 m^3/min (7 gal/min), which is a moderate yield requirement. Figure 4.1 shows the anticipated water use levels during Phase 1 construction and shows the estimated cumulative total water use through the period. During later phases of construction (about years 3 and 7 after project initiation based on PFS's projected schedule), there would be two repeat periods when water use would increase to about 358 to 449 m^3/day (94,600 to 118,600 gal/day). These periods would be relatively short (2 to 3 months) and most of the water used for the later construction phases would be brought to the site from offsite sources as they would be during the Phase 1 construction activities.

There is some uncertainty as to the availability of sufficient groundwater quantity on site to meet the expected needs. The greatest uncertainty is whether the sedimentary deposits beneath the site contain enough sandy zones that are hydraulically connected to the sandy aquifer along the eastern valley margin to supply the desired water quantity. It is very likely that little aquifer recharge occurs on the site or elsewhere near the center of Skull Valley because of low annual precipitation and because surficial and near-surface deposits are silt and clay that have low permeability and inhibit downward percolation of water (Hood and Waddell 1968).

Based on analysis provided by PFS using the average water pumping rate during the project, the drawdown from a well constructed on site is not expected to extend beyond about 2.1 km (7,000 ft) from the pumped well (see SWEC Calculation 05996.02-G(B)-15, Rev. 1 as cited in PFS/ER 2001). The nearest well to the proposed PFSF is located on the Reservation approximately 3.2 km (2 miles) away. Assuming the radius of influence of the pumped well for the PFSF is approximately 2.1 km (7000 ft) it would be possible to site such a well on the Reservation at a location where the drawdown would not affect off-Reservation groundwater users. The basis for PFS's analysis is interpretation of a single, short-duration test in a small diameter well on site, with a test interval approximately 8 m (25 ft) long. The analysis assumed that a production well would have a screened interval 33 m (100 ft) long and a range (0.01 to 0.3) of the aquifer storage coefficient (water yield per unit of water level drawdown) was assumed. Wells drilled deeper than the previous test borings may encounter higher water yields; however, very few existing wells are located near the center of the valley to provide a basis for comparison.

While PFS's analysis appears reasonable, there is not sufficient information available concerning the water producing characteristics of the central valley area to refine a potential groundwater availability analysis. Assuming PFS's evaluation is correct, it is unlikely that any existing groundwater users in Skull Valley would be affected by groundwater pumping for the facility construction. Nevertheless, in the event that onsite water quality or water quantity are inadequate, PFS has made arrangements that potable water would be obtained directly from the existing Reservation supply or from additional wells

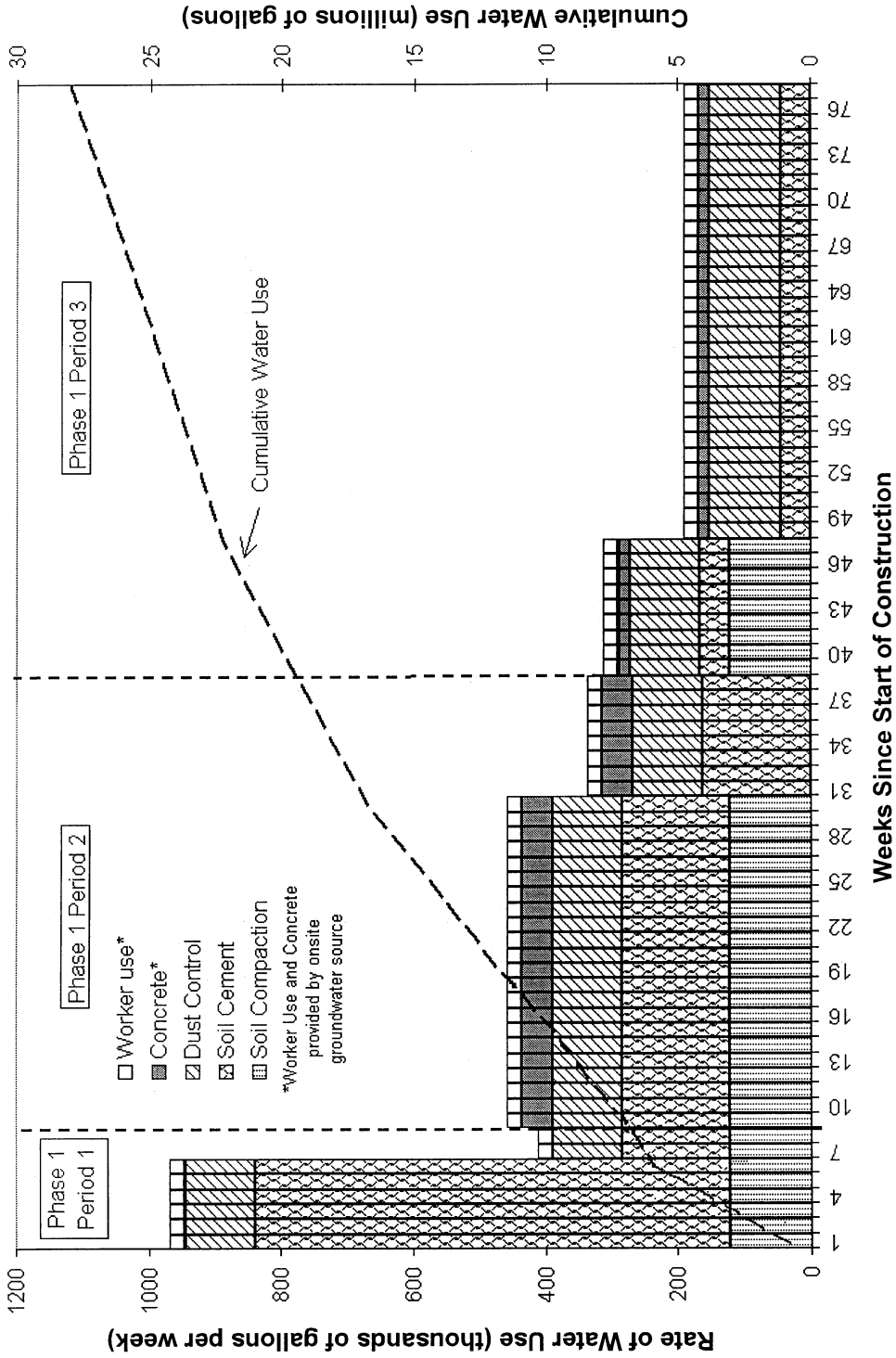

Figure 4.1. Estimated water use during construction of the proposed PFSF.

that would be drilled east of the site. PFS has made inquiry of persons familiar with water quantities and usage in the Skull Valley area and has reported that three permitted wells within a 24 km (15 mile) radius of Low, Utah, are capable of producing 1,510 m^3/day (400,000 gal/day) each. Current withdrawal of water from those wells is less than half the permitted quantity (PFS/RAI3 2000). Accordingly, impacts to groundwater use during construction are expected to be small.

Construction of the site access road would require water for dust control and soil compaction. Water for these purposes would be acquired from offsite sources and trucked to the site for use. There would be no impact on groundwater availability in Skull Valley since all water required for road construction would be acquired offsite from private water suppliers.

Potential impacts to groundwater quality. Potential impacts to groundwater quality from the proposed PFSF construction activities would be small. Spills of liquids (such as fuels) on the PFSF site during facility and access road construction activities could potentially have an adverse impact on groundwater quality if the spills were very large and if no mitigating cleanup actions were taken. A large fuel spill would be required to adversely impact groundwater quality at the site because the groundwater table is approximately 38 m (125 ft) below the ground surface and soil retention would hold up the liquid. Soils in central Skull Valley are silty soils and percolation of spilled liquids would not be extremely rapid. Furthermore, PFS would prepare a Best Management Practices Plan which would prescribe methods to mitigate any potential impacts to groundwater from fuel leaks or spills.

4.2.2 Impacts During Operations at the Preferred Site

This section discusses potential impacts to the hydrological system, including the surface water flow system, water use, and water quality during operation of the facility.

Above-ground fuel tanks would be used at the site to store vehicle fuel. PFS's Best Management Practices Plan could prescribe methods for properly responding to fuel leaks or spills to minimize fire hazard or contamination of groundwater. To ensure that construction and operational activities will not lead to contamination of groundwater, the Cooperating Agencies propose that PFS be required to implement a BMP including a spill response procedure, and be required to be responsible for clean up of spills or accidents on the facility site in conformance with applicable standards (see Section 9.4.2).

4.2.2.1 Surface Water

This section discusses potential impacts to the surface water flow system during operation of the facility. Potential impacts related to the facility and the site access road are discussed separately below.

Facility operation. Potential impacts to surface water during facility operation are expected to be small. Under normal conditions there is no surface water flow in the vicinity of the proposed PFSF site. As discussed in Section 4.2.1, the presence of the facility would alter some of the dry washes that normally carry stormwater and snowmelt water across the site area. Normal flows that would occur upslope of the facility would be diverted around the site by the flood diversion berm and would flow into a single existing natural runoff channel near the northwest corner of the facility. Small changes in the channel may occur as a result of concentrating flows from several pre-existing channels into one. Drainage channels along the flood protection berm would be stabilized and lined with rock to reduce flow velocity and prevent scouring.

The spent fuel containment system that would be used at the PFSF is a zero release system, and there would be no radioactive discharges to the detention basin. Operation of the proposed PFSF would not create excess runoff that would have adverse downstream impacts. There would be no discharge of water to the land surface. All surface runoff generated within the 40-ha (99-acre) area from precipitation events up to, and including, the 100-year storm event would be collected in a surface water runoff basin for infiltration and evaporation. Even if site runoff were not collected, there would be no adverse impact to flooding at the watershed scale because of the very small size of the proposed PFSF [40 ha (99 acres)] in comparison to the overall Skull Valley drainage basin area [181,000 ha (448,000 acres)]. The area that is developed for the project is 0.02 percent of the total Skull Valley watershed area.

Parking lots adjacent to the buildings at the proposed PFSF would occupy a total area of about 1.5 ha (3.5 acres) (see Section 2.1.1.2). Surface water runoff from these parking lots would be small in comparison to existing runoff from the proposed project area, and would therefore have a small impact on natural drainage patterns.

Site access road. Under normal conditions, the presence of the site access road would have a small impact on surface water flows. PFS's site access road design includes culverts installed at wet-weather surface water flow channel crossings that would accommodate flows up to and including the 100-year flood [about 6.9 cm (2.7 inches) in a 24-hr period)]. PFS has specified design criteria for placement of energy dissipating materials at culvert outlets for elements of the transportation system to prevent or minimize downstream erosion or scouring below culverts. Since the same criteria were used for the site access road, there would be no channel erosional impacts related to flows through culverts along the site access road from normal seasonal runoff.

4.2.2.2 Potential Impacts Related to Flooding

As discussed below, the presence of the proposed PFSF and site access road would incrementally increase the impacts resulting from extreme flood events. During flood conditions, the presence of the proposed PFSF would create only minor, incremental impacts beyond what would occur if the facility were not constructed. These impacts are judged to be small for the proposed PFSF and the site access road, and are discussed below.

The flood-related impacts associated with the project are summarized here. Detailed flood analysis information can be obtained in the NRC staff's SER (NRC/SER). As described in Section 4.2.1, the PFSF design incorporates an upslope flood diversion berm that would divert surface water runoff from the upland area toward Hickman Knolls and flood waters from drainage channels to the southwest. The diverted flow would be discharged into an existing arroyo near the northwest corner of the facility.

A flooding analysis was performed by PFS to determine if the proposed PFSF would be protected from floodwaters during a PMF. The PMF is the maximum credible flooding event that could occur in an area, and the analysis considers both local runoff and flooding that could result because of runoff from areas upstream in the surface water drainage basin. The PMF is a flood of severity greater than the 100-year flood. The flood analyses performed included the expected PMF water elevations in the site vicinity for the post-construction condition (access road embankment, railroad grade, PFSF facilities, and flood control berms assumed to be in place). Analyses were performed for both a general storm condition [about 31 cm (12.2 inches) of rainfall in a 72-hr period] and for a locally intense storm [about 27 cm (10.6 inches) in 6 hours]. More surface water runoff would be produced by the general storm than by the intense local storm. The flood analysis showed that the proposed PFSF

would be protected from flooding during the PMF due to the presence of earthen berms uphill and at road and railroad access points.

A severe flood event could result in moderate impacts to surface water drainage channels adjacent to the proposed PFSF. Surface drainage features on the proposed PFSF site are shallow dry washes that carry occasional runoff from thunderstorms and snowmelt. Some of these features would be intersected by the facility, and upslope surface water in the washes would be diverted around the facility perimeter by the flood diversion berm. PFS's facility design description states that rip-rap would be used to prevent erosion of the berm during periods of flow. Although not identified in the design descriptions, a drainage swale would probably develop through natural flow and erosion processes upslope of the berm (outside of the facility area). Without adequate energy dissipating design, concentration of all natural upslope flow along the toe of the berm with discharge into a single, unprotected wash could cause erosion near the proposed PFSF with channel sedimentation downstream. Potential impacts could occur for storm events less severe than the 100-year event. PFS' proposed design includes flow routing and energy dissipating features in the design of the flood diversion berm that would mitigate this potential moderate impact.

The access road crosses Skull Valley and would be affected by severe flooding. The culvert systems at seven channel crossing locations along the site access road would be designed by PFS to accommodate water volumes associated with the 100-year, 24-hour storm event. The storm intensity associated with this frequency event would result in about 6.9 cm (2.7 inches) of rainfall within a 24-hour period. [The PMF analysis was applied to the site access road and the analysis determined that the roadway would be inundated by 0.75 to 1 m (2.5 to 3.2 feet) of water. This would temporarily prevent access to or egress from the facility. Such flooding would also likely cause some erosion of the road embankment requiring repairs prior to returning the road to service. PFS's facility design incorporates an earthen berm at the western end of the access road to protect the PFSF from potential flooding by waters that would overtop the access road embankment and could potentially be diverted into the facility area.]

Due to the presence of the access road embankment, during severe flood events some ponding of surface water could occur upstream of the access road. Such effects would be temporary and would include sediment deposition upstream of the road embankment that could alter the existing drainage features. Impacts could occur to vegetation in areas affected by short-term ponding and silt deposition. Erosion of soil from the road embankment or related to channel scour may cause local changes in the channel morphology downstream of the access road through siltation or scouring. Revegetation of embankments and other cleared areas is proposed by PFS and would reduce the potential impacts of channel siltation.

4.2.2.3 Water Use

PFS's estimate of operational groundwater use is expected to be less than 6.8 m^3/day (1,800 gal/day) (PFS/ER 2001). Based on PFS's analysis of the site groundwater conditions (see Section 4.2.1.3), it is anticipated that onsite wells would be capable of supplying the amount of water required during facility operations. In the event that onsite water quality or water quantity are inadequate, potable water would be obtained directly from the existing Reservation supply wells or from additional wells that would be drilled east of the site where the aquifer yield may be greater. Further NEPA review may be required by BIA for any additional water wells drilled off the lease site.

4.2.2.4 Groundwater

Potential impacts to groundwater quality from operation of the facility would be small. Components of the facility that could have the potential to interact with the groundwater system include the surface water detention basin, the two planned septic systems with leach fields, and onsite vehicle fuel. Facility design and operating procedures would minimize the possibility that contaminants would enter the hydrologic environment.

Impacts to groundwater from surface infiltration at the storm water detention basin or from the shallow septic systems depend on: (1) whether the volume of infiltration causes saturated flow to the water table or is absorbed in the vadose zone, (2) whether the constituents dissolved in the water, and (3) the ability of the soil to attenuate the migration of dissolved constituents.

The detention basin would be constructed with compacted soil sideslopes and floor. The storm water detention basin will be a 3-ha (8-acre) basin with 10 : 1 (horizontal : vertical) embankments with crested wheatgrass vegetative cover. PFS estimates that the percolation rate for water in the basin would be 2.6×10^{-6} cm/s (0.09 inch/day) which is a significantly lower rate than the estimated percolation rate for underlying soils or the estimated groundwater seepage rate beneath the site (see Sect 3.2.2). Since the estimated seepage rate for water through the detention basin floor is much less than the estimated percolation rate for water in site soils it is unlikely that saturated flow conditions will occur during infiltration unless there is degradation of the compacted soil layer or groundwater perching zones exist beneath the detention basin. If processes such as frost heave or vegetation root penetration cause disruption of the compacted soil layer, increasing its permeability, the seepage rate through the floor and sideslopes of the detention basin could increase. If perching of groundwater occurs beneath the site, lateral seepage could occur in the interbedded silts and silty clays allowing groundwater to migrate to natural or man-made preferential seepage pathways. Natural preferential seepage pathways could include buried dessication cracks in the subsurface soils and man-made pathways could include abandoned geotechnical borings beneath the site. The nearest identified exploratory boring to the detention basin floor is approximately 60 m (200 ft) to the south (upslope).

Surface water runoff from throughout the restricted area would enter the detention basin. The runoff would originate on the spent fuel storage pads, from building roof drains at the canister transfer building and the security and health physics building, and from general area runoff including the rail yard area. The drainage channels leading to the detention basin would be unlined but would contain erosion control structures. It is expected that water from small runoff events would percolate into soils beneath the drainage channels and that larger runoff events would carry surface flow to the detention basin. The runoff water would carry any soluble materials from the outside surfaces of the fuel storage casks, the pad surface, the building surfaces, soluble materials in surface soils, and any loose particulate materials such as soil particles and any windblown vegetation debris. The spent fuel storage containers are not expected to be a source of radiological contamination because of container integrity certification requirements and decontamination procedures required prior to shipping from the originating reactor sites. The water quality of runoff that would enter the detention basin is expected to be similar to that from urban or industrial facilities in the region.

PFS does not expect the detention basin to contain water except after severe storms. Protection of soils and groundwater beneath the detention basin from contamination depends on the fact that (1) the SNF storage canisters are sealed by welding that precludes leakage of any radioactive material, (2) measures are applied at the originating nuclear plants when fuel is loaded into the canisters to prevent outside contamination, (3) the canisters may not be shipped to the PFSF unless

they are free from surface contamination, (4) PFS staff will perform a receipt survey to verify that the canisters are free from surface contamination, and (5) after loading of canisters into storage casks at the PFSF, the storage casks will be surveyed to verify that no surface contamination is present. Further, the PFS "start clean/stay clean" philosophy will require PFS to reject and return any canisters with external contamination. However, PFS has a commitment to sample and analyze water in the detention basin when freestanding water is present to determine if radiological contaminants are present (PFS/ER 2001) followed by appropriate treatment actions, such as conformance of any clean-up activities with the standards set forth in 10 CFR Part 20.

PFS has indicated that temporary pumps would be used to remove long-term standing water from the detention basin to prevent stimulating plant growth and attracting wildlife (PFS/RAI2 1999e). Any water pumped from the basin would be distributed to an area located on tribal lands within the lease area just to the north of the proposed detention basin. The area on this side of the basin slopes gently down toward the north and contains no arroyos or natural drainage channels. Distribution of the pumped water could be done in a time-release manner, if necessary, to avoid oversaturation of the receiving soils.

Although the presence of contamination in the detention basin is considered unlikely, in the event that PFS should fail to detect contaminants that are present in infiltrating water, some contamination of underlying soils and groundwater could occur. The extent of such contamination would depend on the type of contamination present and contaminant attenuation capacity of underlying soils. Site-specific soil contaminant attenuation properties are not known for Skull Valley soils. PFS does not propose to monitor groundwater quality at the site. If contamination of soils or groundwater should occur at the detention basin, site cleanup actions would be required to restore the site.

The proposed PFSF would have two septic systems to serve occupied areas of the site. Pursuant to 40 CFR 144.26, Underground Injection Control registration with EPA Region VIII would be required. One of the proposed septic systems system would serve the Administration and Operation and Maintenance Buildings [estimated 2460 liter/day (650 gal/day)] and the other would serve the Canister Transfer and Health Physics Buildings [estimated 1514 liter/day (400 gal/day)]. Both septic systems are designed to use 130 m^2 (1400 ft^2) leach fields. The estimated rate of application of water to the leach fields would be 1.5×10^{-5} to 2.2×10^{-5} cm/sec (0.02 and 0.03 in/hr) which is much lower than the estimated soil percolation rate of 1.4×10^{-4} to 4.2×10^{-4} cm/sec (0.2 to 0.6 in/hr). The leach fields should be able to accept the anticipated water volumes unless subsurface soils have much lower infiltration capacities than estimated. Like the soils beneath the detention basin, improper functioning of a septic system could occur if natural or man-made preferential seepage pathways exist within the seepage field area. In such a case there could be rapid percolation of incompletely treated septic water downward toward or to the groundwater table. The septic systems would be located downslope from the Administration area and the Health Physics Building on the eastern side of the facility.

PFS has committed to implement operational procedures and controls to prevent the introduction of radiological contaminants into the wastewater treatment systems. In addition the facility design does exclude the construction of drains to the wastewater treatment systems from radiological areas. Influent to the septic systems would include water from lunch rooms, janitor closets, and restroom/shower facilities. Drains from areas where radiological materials are present (i.e., in the spent fuel Canister Transfer Building or the Health Physics Building laboratory) would not be connected to the septic systems. The Canister Transfer Building would have a sump to collect any water that may drip from the exterior surface of shipping casks. Any liquid collected in the sumps would be sampled to ensure that it is not contaminated prior to removal and disposal. Any

contaminated liquid would be collected, solidified, and disposed as solid LLW offsite. The Health Physics Building laboratory (where dry wipe samples would be subjected to radiological analysis and any liquid samples would be analyzed) would not have a drain. Any liquids found to be contaminated would be solidified for offsite disposal as solid LLW.

Non-radiological chemicals that would be used on site include painting supplies, pesticides, and non-hazardous janitorial cleaning supplies. Such materials are typical of municipal and industrial facilities and would be managed in such a manner as to prevent the introduction of these materials into the wastewater treatment system. Paint waste can be hazardous. Pesticides are hazardous waste (actually universal waste, a subset of hazardous waste). These materials cannot be diluted for disposal, and they cannot be put into the wastewater system. They would be disposed of as hazardous waste and taken to an approved disposal facility by a licensed transporter. It is possible that small quantities of non-hazardous chemicals could be introduced into the wastewater treatment system through equipment cleaning. The biological decomposition of some of these chemicals would minimize the potential for adverse impacts to groundwater via the wastewater treatment systems.

Above-ground fuel tanks would be used at the site to store vehicle fuel. PFS's Best Management Practices Plan should prescribe methods for properly responding to fuel leaks or spills to minimize fire hazard or contamination of groundwater.

4.2.3 The Alternative Site (Site B) in Skull Valley

Under normal conditions, the potential hydrological impacts at Site B in Skull Valley would be small and would be similar to the impacts discussed for use of Site A. There are no distinguishable differences in the surface water or groundwater characteristics of Sites A and B. Both sites have shallow dry washes that carry ephemeral surface water runoff. Since Site B is immediately upslope from Site A some of the same drainage features cross both sites. Assuming that the facility configuration would remain the same on Site B as it would be on Site A, the expected flooding effects would be the similar, although flood heights may be slightly lower at Site B since it is at a slightly higher elevation.

Soil and groundwater conditions are expected to be the same at Site B as they are at Site A and potential impacts expected at Site B would be small.

Above-ground fuel tanks would be used at the site to store vehicle fuel. PFS's Best Management Practices Plan could prescribe methods for properly responding to fuel leaks or spills to minimize fire hazard or contamination of groundwater. To ensure that construction and operational activities will not lead to contamination of groundwater, the Cooperating Agencies propose that PFS be required to implement a BMP including a spill response procedure, and be required to be responsible for clean up of spills or accidents on the facility site in conformance e with applicable standards (see Section 9.4.2).

4.2.4 Mitigation Measures

Several small to moderate impacts related to the hydrologic system at Skull Valley have been described. PFS has identified mitigation measures for some, but not all, of the potential impacts. The following discussion highlights additional mitigation measures that could further reduce potential impacts of construction of the facility.

One potential impact to surface water from construction is related to the construction sequencing for the PFSF. Construction of the southeastern storage pad, and perhaps other upslope facilities, prior to construction of the detention basin (which could be configured as a sedimentation basin during early construction) creates a potential for erosional/depositional impacts in drainage ways downslope of the site during the early periods (weeks) of Phase 1 construction. PFS could reduce this impact if the detention basin was the first feature constructed on the site. All construction area runoff could be routed into the basin to prevent local channel degradation. Accordingly, the Cooperating Agencies recommend that the detention basin be the first feature constructed on the site.

While there is some uncertainty regarding the potential impact of on-site pumping on neighboring water supply wells, PFS could either monitor water levels in adjacent wells or otherwise monitor the effect on area groundwater levels to verify the small impact predicted.

The Cooperating Agencies propose that PFS be required to develop a monitoring program, including one of the methods described above, to determine if the wells nearest the proposed PFSF are adversely impacted from groundwater withdrawal associated with the construction and operation of the proposed PFSF (see Section 9.4.2).

In the event that neighboring groundwater users were adversely affected, the Cooperating Agencies recommend that PFS mitigate this impact by exercising the option of using an existing supply well located approximately 4 km (2.5 miles) to the east of the site or construct wells in a higher yield portion of the aquifer.

4.3 Air Quality

This section discusses impacts from site preparation and construction of the PFSF. It also includes an assessment of potential air quality impacts in the context of NAAQS (40 CFR Part 50). The NAAQS were established to protect human health and welfare with an adequate margin of safety (40 CFR Part 50). The greatest expected air quality impacts would involve airborne particulate matter arising from the extensive earthwork involved in site preparation and construction. Existing literature provides estimates of construction-related particulate emissions in terms of mass generated per unit area per unit time. Emissions from earth disturbance and from exposed loose dust during hours when earth disturbance would not occur were included in the analysis; emissions from construction vehicles and from a concrete batch plant located within the proposed facility during the construction period were also included. Emissions parameters were input into standard Gaussian air dispersion models that provide estimates of increases in atmospheric concentrations (mass per unit volume) of contaminants at various distances from the site of the proposed PFSF. The EPA-recommended pollutant dispersion model, ISCST3, was used. Modeled increases in particulate concentrations have been added to measurements of existing background concentrations in the region (as taken from data available on EPA's web site), and the sums have been compared to NAAQS (40 CFR Part 50) to check for particulate concentrations resulting from the proposed construction activities potentially exceeding the standards. A similar evaluation has been performed for construction activities associated with the proposed Skunk Ridge rail route and the ITF near Timpie (see Section 5.3.1).

Air emissions associated with routine operations are evaluated separately in Section 4.3.2 of this FEIS.

4.3.1 Construction Impacts at the Preferred Site (Site A)

During construction of the proposed PFSF, temporary and localized increases in atmospheric concentrations of nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and particulate matter would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. Because a maximum of 10 equipment operators are expected to be on site at any one time (PFS/ER 2001), emissions from construction-related equipment are expected to be small. However, due to the large extent of the disturbed area, particulate matter in the form of fugitive dust emitted from excavation and earthwork could lead to appreciable local increases in atmospheric concentrations of particulate matter less than 10 microns in diameter (PM-10), as described below. Fugitive dust would have the greatest influence on air quality during construction.

Estimates of PM-10 concentrations from construction-related fugitive dust originating at the proposed PFSF site were obtained from air-dispersion modeling, and were added to existing (background) concentrations to obtain estimates of total airborne PM-10 concentration for comparisons with the NAAQS.

To obtain upper-bound estimates of construction-related PM-10 concentrations, the EPA-recommended Industrial Source Complex Short-Term (ISCST) air dispersion model (EPA 1995) was applied to an assumed construction area of maximum extent. This area totaled 30 ha (75 acres), and included: the entire detention basin, the southwestern portion of the diversion berm, the southeastern pad area, all but the northwest portion of the boundary area, the health physics building, the canister transfer building, and the concrete batch plant. This configuration was chosen to represent a maximum area that would likely be undergoing heavy construction at any single time; it is unlikely that any realistic construction area would produce higher PM-10 concentrations in any direction from Site A.

On the basis of EPA-recommended data (EPA 1988), an average emission factor of 1.02 g/ha/s (1.2 tons/acre/mo) of total suspended particulate was used to calculate fugitive dust emissions. Of these emissions, 30 percent of the mass is expected to consist of PM-10 (Kinsey and Cowherd 1992). Because PFS has stated that sprinkling of water would be performed during construction to control dust (PFS/ER 2001), fugitive dust emissions were reduced in the model by 50 percent (EPA 1985, 1988). However, no such emission reductions were assumed for the concrete batch plant or for loose dirt subject to wind erosion during off hours.

Construction was assumed to occur continuously during a normal 9-hour shift (8:00 A.M. to 5:00 P.M. each day). The modeled PM-10 concentrations during construction were added to the background concentrations given in Table 3.2 to estimate total impacts for comparison with the NAAQS; however, it should be noted that the background PM-10 concentrations given in Table 3.2 were obtained from Magna, which is well to the northeast of the proposed PFSF site (see Figure 1.1). Therefore, the impacts from some large existing PM-10 sources within 50 km (32 miles) of the site, and particularly sources to the southwest of the site (e.g., Dugway Proving Ground), would not be fully represented in the background data from Magna. To account for this, the effects of emissions from other large sources in the area (e.g., Dugway Proving Ground, Tooele Army Depot) on concentrations near the site of the proposed PFSF were included in the modeling without any compensation for obstructions that exist, such as mountain ranges between these other sources and the proposed PFSF site. These results were added to the background concentrations obtained from the air quality monitoring data at Magna to provide a conservative estimate for background.

Eight years (1984–1991) of Salt Lake City meteorological data (available from EPA at URL http://www.epa.gov/ttn/scram/t25/htm) were used in the modeling. Salt Lake City is the nearest location at which quality-assured hourly meteorological data have been archived over a period of several years. The two years (1997 and 1998) of meteorological data from near the Pony Express convenience store located on Skull Valley Road about 3.2 km (2 miles) southeast of Site A were also used, providing a total of 10 years of meteorological data; results from the two meteorological monitoring sites were similar to each other.

Atmospheric concentrations of PM-10 were modeled at 125 locations (receptors) within 3.5 km (2.2 miles) of the center of the proposed storage-pad area but outside the immediate area of the proposed facility. The outermost circle of receptors passes close to the nearest residences; no locations closer to the proposed PFSF were identified as places where a member of the general public would likely spend appreciable fractions of any given day. The innermost circle of receptors passes close to the nearest publicly-owned land, about 1,100 m (0.7 mi) northeast of the center of the proposed PFSF.

Table 4.2 shows the results of the above analysis. Construction of the proposed facility is not expected to lead to any exceedances of NAAQS for PM-10 at the nearest residences, even if construction activity is as intensive as that assumed in the modeling. Moreover, the modeled contribution of construction activities to total PM-10 concentrations is small compared to the background concentration values.

Table 4.2. Effects of site construction on PM-10 concentrations at the nearest residences

Averaging period	Contribution to PM-10 concentration (as modeled)		Total modeled concentration	NAAQS	Total modeled concentration as percent of NAAQS
	Construction	Background[a]			
24-hour	24 μg/m^3	92 μg/m^3	116 μg/m^3	150 μg/m^3	77
Annual	2 μg/m^3	22 μg/m^3	24 μg/m^3	50 μg/m^3	48

[a]The modeled effect of PM-10 emissions from Dugway Proving Ground is included.

The highest 24-hour average concentration expected at the location of the nearest residence due to the combined influences of modeled background sources and site construction is 116 μg/m^3. The modeled contribution of off-site sources was minuscule (i.e., less than 0.1 μg/m^3) due to the absence of large PM-10 sources, other than site construction, in the upwind direction on days when the wind is transporting PM-10 from the construction site toward the nearest residence. Therefore, the maximum modeled 24-hour PM-10 concentrations at the nearest residence almost exclusively originate from disturbance at Site A. Because NAAQS would not be exceeded at the nearest residence, the expected air quality impacts from the preparation and construction of Site A would be small.

4.3.2 Impacts During Operations at the Preferred Site

The proposed PFSF would not be a “major stationary source” of air emission as defined in 40 CFR 52.21(b) or a significant air emission source under 40 CFR 51.166(b)(23)(i). Emissions from daily operations of the proposed facility would arise primarily from (1) a switchyard locomotive; (2) a

small emergency generator, vehicles for transportation of material within Skull Valley, guard and security patrol vehicles, commuter traffic; and (3) space-heating furnaces.

Operational emissions would be intermittent and would not be expected to contribute to an exceedance of any ambient air quality standard. Facility operations would not result in air emissions of sufficient magnitude to warrant analysis for permits for New Source Performance Standards or Prevention of Significant Deterioration (PSD) under the CAA. The staff has reached these conclusions based on the following considerations.

- The space heating units at the proposed PFSF would use less than one million Btu per hour heat input and, therefore, would be small enough to be exempt from air quality regulations.

- The emergency diesel generators for the proposed PFSF would have a capacity less than 150 kW and would not be operating more than 250 hours per year. Such generators are not large enough to require analysis for compliance with New Source Performance Standards or Prevention of Significant Deterioration.

- To the extent that the concrete batch plant would be operating during the lifetime of the proposed PFSF, its expected PM-10 emissions would be about 3.2 tons per year. Under 40 CFR 52.21, the threshold for classification of a source as a major stationary source is 250 tons per year. Under 40 CFR 51.166, the threshold for a significant increase in PM-10 emissions is 15 tons per year.

- Mobile sources (e.g., heavy-haul trucks, commuter vehicles, etc.) are not subject to the regulations applicable to stationary sources in areas that are in attainment of the NAAQS.

- Even if they were to be combined into a single source, sources of air emissions from operation of the proposed PFSF would not be expected to exceed the significance levels for PSD analysis given in 40 CFR 51.166(b)(23)(i).

4.3.3 The Alternative Site (Site B) in Skull Valley

With respect to the potential for impacts to air quality, there is no clearly distinguishable difference between the preferred site (Site A) and the alternative site (Site B) on the Reservation. While Site B is slightly closer than Site A to the nearest residences, the highest construction-related PM-10 concentrations at those residences would be slightly less than for Site A. This is because the worst dispersion conditions when the wind is moving toward those residences from Site B are not as unfavorable as when the wind is from the direction of Site A.

4.3.4 Mitigation Measures

Sprinkling the disturbed area with water to reduce fugitive dust is one of the most effective means of reducing construction-related emissions. The need to control these emissions has already been accounted for in the construction planning and in the foregoing analysis. In addition, operation of construction equipment and related vehicles with standard pollution control devices and maintenance of this equipment in good working order would minimize emissions from these sources. Other methods of minimizing the potential impacts from dust emissions include covering material in trucks and washing trucks frequently, designating personnel to monitor dust emissions and to order increased surface watering as necessary, and minimizing dust emissions from the concrete batch plant through the use of water sprays and/or shrouding or enclosing material transfer points and

aggregate storage piles. The Cooperating Agencies propose that PFS be required to develop a program to control fugitive dust during construction that includes one or more of the methods described above, as appropriate, to control and reduce construction related emissions (see Section 9.4.2).

4.4 Ecological Resources

The potential impacts of site preparation, construction, and operation on ecological resources are evaluated and discussed in this section. Areas of potential concern include construction and operation activities that would disturb or remove vegetation or animals either temporarily or permanently. Since the existing drainages in the area of the preferred site are ephemeral and support no permanent aquatic communities, construction activities would have negligible direct and indirect impacts on aquatic biota, and they are, thus, not considered in this section. Direct losses from land disturbance are quantified by determining the amounts of habitat lost as a result of construction activities. Potential impacts on species of special concern, as identified in Section 3.4.3, that are found to reside on or use the proposed site are also evaluated in Section 4.4.3.

4.4.1 Construction Impacts at the Preferred Site (Site A)

Table 2.4 shows the amount of land that would be cleared for the proposed PFSF. The OCA for the proposed PFSF (only part of which would be cleared) would consist of about 330 ha (820 acres), which is less than 0.3 percent of Skull Valley's approximately 108,400 ha (271,000 acres). PFS proposes to use herbicides to maintain the 40-ha (99-acre) restricted-access area clear of vegetation. The impacts of using herbicides during operation of the proposed PFSF are addressed in Section 4.4.2.

4.4.1.1 Vegetation

Direct impacts on vegetation of constructing the facility (including the access road) at the preferred site would include removing existing vegetation, replacing some of it for the life of the project with structures and ancillary facilities such as the access road, and replanting other parts of the disturbed areas with some mixture of native and non-native plant species. Direct impacts to soil, which would include the biological soil crust if present (see Section 3.4.1.1), are described in Section 4.1.1. The direct impact of clearing vegetation and disturbing the biological soil crust for the proposed action would be small, as the area to be cleared for the life of the project at the preferred site contains no unique habitats and amounts to less than 0.1 percent of the land area of Skull Valley. Planting native species on those areas to be cleared that are currently dominated by cheatgrass would have a beneficial impact on vegetation and biodiversity; but this impact would be small in relation to the entire area of Skull Valley.

Indirect effects on vegetation of constructing the facility (including the access road) at the preferred site would include modifying wildlife habitat and introducing a non-native species, crested wheatgrass (*Agropyron cristatum)*, as a fire barrier, thus reducing the susceptibility of the area to wildfires. In addition, ground water withdrawal, fugitive dust from construction, and movement of large trucks could have indirect effects on vegetation and the biological soil crust. These impacts would all be small.

Construction of the proposed PFSF at the preferred site, including the access road, would require clearing vegetation and grading soil from approximately 94 ha (232 acres) of desert shrub/saltbush vegetation community within the 330-ha (820-acre) OCA and the 82-ha (203 acre) access road right-of-way. Most of the vegetation that would be cleared is dominated by non-native species such as cheatgrass (see Section 3.4.1). About 57 ha (140 acres) would remain cleared for the life of the proposed PFSF.

PFS has stated that it would revegetate approximately 37 ha (92 acres) after construction. The approximately 28-ha (68-acre) fire barrier would be planted with crested wheatgrass, and the remaining cleared area [about 9 ha (24 acres)] would be planted with native species. The revegetation plan for the PFSF site would be developed during construction in consultation with the Skull Valley Band and BIA (PFS/RAI2 1999). It would include monitoring during the life of the facility to ensure successful vegetation establishment. [See Section 4.4.5 for a discussion of mitigation measures (e.g., irrigation) to ensure success of the revegetation program.]

Subdividing large areas dominated by annuals such as cheatgrass by planting less flammable species in borders or greenstrips can help both to contain large fires and to aid in fire suppression. Because fires currently spread rapidly through Skull Valley due to the extensive amounts of cheatgrass growing there, the use of crested wheatgrass as a fire barrier might act to reduce the extent of fires.

Crested wheatgrass, which PFS is planning to plant in a strip around the proposed facility as a fire barrier, is a native of east and central Asia where it evolved with extensive grazing. It has been widely planted in the United States and is often used in the Intermountain Region for revegetating disturbed lands (Ahlernslager 1988; Harrison et al. 1996). It is considered to be fire resistant because observers have reported that wildfires move only two to three meters (a few feet) into an area seeded with it (Ahlernslager 1988). While the plants burn quickly, they are only slightly damaged by fire and recover quickly. However, the response to fire varies with the season and intensity of the burn. The species is tolerant of fire when dormant, and several studies have shown that its growth is enhanced by late summer and fall fires.

When used in revegetation, crested wheatgrass is typically seeded alone and is one of the easiest and most successful grasses to establish on semiarid rangeland sites (Ahlernslager 1988; Harrison et al. 1996). This species has been grown in the western United States since the early 1900s and is considered by some to be semi-naturalized (Harrison et al. 1996). In Utah it grows on disturbed or revegetated sites along roads and on open slopes in salt desert shrub to ponderosa pine communities (Albee et al. 1988). It is an excellent seed producer that in many instances spreads readily by seed and is capable in some places of invading surrounding habitats.

Although it provides permanent, self-sustaining vegetation, the use of crested wheatgrass has generated controversy (Christian and Wilson 1999). The relative stability of monocultures of crested wheatgrass can retard the succession of native vegetation and result in a loss of wildlife habitat in areas seeded totally in this one species. While in some parts of the western United States it has spread outside the area where it was planted, in other places it has not spread or out-competed native species, and in some cases plantings of crested wheatgrass have been repopulated by native species such as big sagebrush and rabbitbrush (Harrison et al. 1996).

Revegetation with native species would have a small positive impact on vegetation, while planting a fire barrier with crested wheatgrass would replace an area dominated primarily by one non-native species with another non-native species. Planting crested wheatgrass would have a small impact on

vegetation because it is no more invasive than the cheatgrass already there; it resists cheatgrass competition better than many other species, and it provides some protection from fire that may occur in the area. Mitigation measures that would result in a larger positive impact from revegetation are discussed in Section 4.4.5.

Withdrawal of groundwater to support construction of the facility would have a small impact on vegetation. (See Section 4.1.2 for a discussion of groundwater use for the proposed facility.) Plants from arid environments tend to have deeper roots than those growing in other ecosystems; the maximum average rooting depth for vegetation in the desert biome has been reported to be 9.5 ± 2.4 m (31 ± 8 ft) (Canadell et al. 1996). The depth to the perennial water table in Skull Valley is about 38 m (125 ft) (Section 3.2.2), much deeper than plant roots usually grow. Thus, withdrawing groundwater for the proposed facility would have a small impact on vegetation.

Surface water runoff from the restricted-access area (discussed in Section 4.2.1) would be routed to a detention pond. Thus, there would be only a small impact to vegetation in the surrounding undisturbed habitats from runoff from impermeable surfaces constructed within the project area.

Fugitive dust would be generated during construction, as discussed in Section 4.3.1. The small, short-term, incremental amount of the dust that would be generated from construction activities is expected to only have a small impact on vegetation since vegetation in arid environments is not sensitive to dust.

4.4.1.2 Wildlife

The proposed construction activities would result in the temporary disturbance of 94 ha (232 acres) and the permanent disturbance of 57 ha (140 acres) of desert shrub/saltbush ecosystem. This disturbance would reduce habitats for wildlife species such as jack rabbits, small mammals, and birds. Certain species such as mule deer and pronghorn antelope may be forced to change their movement patterns due to the presence of the restricted-access area fence. As discussed below, all of these potential impacts are expected to be small.

During construction, wildlife, such as ground squirrels, kangaroo mice, and small reptiles could be displaced or lost due to the excavation of soils. There would be a loss of nest sites for certain species of birds and burrow sites for species such as the Skull Valley pocket gopher and burrowing owl. This reduction of animals and wildlife habitat would have a small negative impact on the abundance of prey for predatory species, such as hawks, eagles, owls, and fox species. In addition, along some of the proposed roads and the edges of construction areas, the soils may be loosened in such a way that habitat for burrowing mammals and owls might be created. Overall, the permanently disturbed area is expected to have only a small negative impact, as less than 0.1 percent of Skull Valley would be disturbed due to the construction of the proposed facility.

The revegetation of 37 ha (92 acres) would create a small amount of improved wildlife habitat. These areas may provide habitat for burrowing owl, gopher, and small mammals and may also support some prey species and help replace those lost or displaced by construction. The crested wheatgrass fire barrier may supply resources for some wildlife species. Many wildlife species eat crested wheatgrass, and some prefer it to native grasses (Ahlenslager 1988; Harrison et al. 1996). It supplies quality green forage on many ranges in the fall and during snow-free periods of the winter when native species are either dormant or produce little foliage, thereby extending the availability of browse areas. Crested wheatgrass starts growth earlier in the spring than most other range species and provides a high-

quality forage that helps wildlife rapidly recover body condition after the stressful winter period. Small areas planted in crested wheatgrass often attract birds. Upland game birds seek crested wheatgrass stands for food, cover, and nesting. The removal of sagebrush displaces shrub-nesting bird species, but the seeding of perennial grasses such as crested wheatgrass provides more habitat for some ground-nesting bird species.

Currently there is a livestock fence on the northern and western borders of the Reservation. The proposed action calls for the fencing of the OCA [approximately 330 ha (820 acres)]. This fence would be a typical range fence of approximately 1.2 m (4 ft) high and would not inhibit the movement of wildlife species. Only approximately 40 ha (99 acres) of this area (i.e., the restricted-access area) would be fenced in a manner that would restrict wildlife movement. Wildlife use of and movement through the restricted-access area would be limited, and the presence of the facility may inhibit the movement of range wildlife such as mule deer and pronghorn antelope. Some wildlife would have to change their movement patterns to negotiate around the restricted-access area fences. This should not have a significant impact on mule deer or pronghorn antelope populations as the western portions of the Reservation (i.e., areas to the west of Skull Valley Road) have not been identified as critical fawning or wintering areas for either species (BLM 1988a). The closest critical habitats for pronghorn antelope can be found to the north of the proposed PFSF, 10 km (6 miles) northwest of Delle [about 40 km (25 miles) from the proposed site] and to the south of the proposed PFSF, approximately 40 km (25 miles) south of the Reservation. Critical mule deer habitat is present to the east of Skull Valley Road and is shown on Figure 3.7. The range fence around the OCA would restrict the movement of cattle. However cattle would be permitted to graze within this area at the discretion of the Skull Valley Band, the BIA and PFS.

The access road between Skull Valley Road and the proposed facility would not be fenced. The proposed fence nearest to Skull Valley Road would be around the OCA at a distance of 3 km (2 miles) away. Because the access road would not be fenced, there would be no forced changes to wildlife movement patterns near Skull Valley Road.

Noise impacts from construction would have a temporary adverse effect on area wildlife. This effect is expected to be small, as wildlife sensitive to noise intrusions are those which are nesting or raising young. The area in the vicinity of the proposed PFSF construction does not provide good nesting sites for raptorial birds or critical wintering or fawning areas for deer or antelope (BLM 1988a; UDWR 1997a). Smaller mammals and birds may be affected temporarily, but many of these animals, such as burrowing owls, frequently can adapt to human activity.

4.4.1.3 Wetlands

Because there are no wetlands on or near the preferred site for the proposed PFSF, there would be no direct impacts to wetlands from construction. The only other potential impact to wetlands would be from increased recreational use of the area in the northern part of Skull Valley around Horseshoe Springs by construction workers and their families. This impact should be small (see Section 4.8.3).

4.4.2 Impacts During Operations at the Preferred Site

4.4.2.1 Vegetation

Direct and indirect impacts of operation of the proposed PFSF on vegetation should be small. During operation of the proposed PFSF, no additional disturbance of soils or vegetation would occur beyond

that discussed above for construction of the proposed PFSF. Hence, no further direct impacts from the disturbance of soils or vegetation should occur.

Indirect impacts to vegetation during operation of the proposed PFSF could result from air emissions and groundwater withdrawal. During the operational lifetime of the proposed PFSF, only minor atmospheric emissions would be expected (see Section 4.3.2). These emissions would be at levels unlikely to impact vegetation. Groundwater use for the proposed PFSF is discussed in Section 4.2. The level from which groundwater would be drawn by wells is much below the area where plant roots would reach. Thus, withdrawal of groundwater during operation of the proposed PFSF should not impact vegetation.

PFS has indicated that it may use herbicides to assist in maintaining the restricted-access area free of vegetation. EPA's requirements [as mandated by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 USC 136)] control when and under what conditions herbicides can be applied, mixed, stored, loaded, or used (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). By following these requirements, PFS would ensure that the impact of herbicides on non-target vegetation during the operational lifetime of the facility would be small. Similarly, the impact of herbicides on wildlife and water resources during the operational lifetime of the facility would be small.

4.4.2.2 Wildlife

The proposed operation of the PFSF would result in a number of potential impacts to wildlife. Roaming animals may need to adjust their movements and migration patterns from time to time due to the increase in traffic in the area. Wildlife may be attracted to the storage casks, buildings, landscaping plants and trees, power lines and poles, and light posts of the facility. Birds, mammals, and reptiles may be attracted to the cask storage area, as this area will be warmer than the ambient air in the winter. Birds may be attracted to the facilities including the cask storage area for perching and potential nesting because of the limited perching and nesting sites now available in the vicinity. In all these cases, with the application of proper mitigation measures as discussed below in Section 4.4.5, impacts to wildlife populations are predicted to be small.

As part of the construction of the proposed PFSF, long stretches of power lines and poles would be built to connect the proposed site with existing electrical service along Skull Valley Road. The longest proposed stretch would follow the approximately 4-km (2.5-mile) long access road that would connect Skull Valley Road to the proposed PFSF. The new power line poles could be attractive to raptors as perching sites and could, therefore, pose a threat of electrocution to large raptors such as hawks and eagles. Collisions with the power lines could also affect birds. The new power lines and power poles should be designed in such a manner as to minimize or avoid these types of impacts, including the proper application of accepted raptor protection practices (see Section 4.4.5). If these measures are used, the impact on birds would be expected to be small.

During the operation of the proposed PFSF, because construction activities would be for the most part completed, minor impacts from on-site transportation would be expected. Truck traffic could cause roaming wildlife to sometimes adjust their movements and migration patterns. However, these impacts are expected to be minor.

Exposure to ionizing electromagnetic radiation would produce a radiation dose at the perimeter of the proposed Skull Valley facility. When an animal is exposed to such radiation, the radiation may interact

with body tissue, or it may pass entirely through the animal (Wicker and Schultz 1982). If such radiation does interact with body tissue, it will deposit the energy it possesses, and eventually this energy will be expressed as heat. In the process, water molecules will be ionized, and OH radicals produced. These radicals would be the cause of most of the radiation damage. In contrast to electromagnetic radiation, a radioactive particulate is a real substance that can be measured in grams. Sources of particle radiation often contain many radioactive atoms (called radionuclides). When ingested, some of these radionuclides will decay while the particulate source is still within the body. These decays will result in the production of energy, and the eventual formation of OH radicals. Only in the case when an animal has ingested a radioactive particle is it possible for a second animal that eats the first animal to concentrate (i.e., bioaccumulate) radionuclides. Because there would be no releases of radioactive particles (i.e., either as solid, liquid, or gaseous effluents) from the proposed Skull Valley facility (PFS/RAI1 1999) (see Section 4.7.2.1), animals living and feeding around the storage casks would not ingest radioactive particles, and bioaccumulation would not occur. Accordingly, the following discussion evaluates only the direct impacts to animals from exposure to ionizining radiation emitted from the SNF inside the storage casks at the proposed PFSF.

During the operations of the proposed PFSF, measurable radiation (but not radioactive effluents) would be present in and around the storage cask area. Doses have been estimated for the HI-STORM storage cask system at the boundary of the restricted-access area (see Table 7.3-7 in PFS/SAR 2001). Assuming that the storage cask area is at maximum capacity (i.e., 4,000 casks present), the radiation doses for the system should pose no threat to wildlife using the habitats adjacent to the fence. Under a maximum exposure scenario of 24 hours a day for 365 days a year, doses to wildlife at the fence around the northern boundary of the restricted-access area would be 0.148 Sv/yr (14.8 rem/yr) for the HI-STORM system. NRC has no standard for radiation doses to wildlife. PFS has established a radiation dose criterion of 1 Sv/yr (100 rem/yr) which it believes is adequate to protect wildlife (PFS/RAI1 1999). The 1 Sv/yr (100 rem/yr) rate is the lowest dose rate at which harmful effects (e.g., impairment of cell development and growth) of chronic irradiation have been reliably observed in several species (Ross 1992; NBS 1994). The International Atomic Energy Agency (IAEA) reports that for mammals, 10 mGy/day (1 rad/day) represents the threshold at which slight effects of radiation become apparent in those attributes (e.g., reproductive capacity) which are of importance for the maintenance of the population. For birds, the IAEA reports that it is more difficult to study the chronic effects of radiation because of their mobility. The IAEA reports that a study showed that the breeding of swallows and wrens exposed to 0.7 to 6 mGy/day (70 to 600 mrad/day) appeared essentially normal (IAEA 1992). The estimated doses to wildlife from operation of the proposed PFSF are well below the PFS and IAEA criteria. Therefore, only small impacts from radiation are expected to wildlife that use habitats near the boundary of the restricted-access area.

Potential impacts to wildlife may occur from exposure to radiation if animals intrude into the storage cask area. Wildlife that could be potentially exposed to radiation from the storage casks include perching birds, nesting birds, birds and mammals seeking warmth and shelter in winter (as the casks will be above-ambient temperatures in winter), and reptiles.

For the HI-STORM cask system, the highest levels of radiation would come from contact with the bottom vents (see Table 4.3). In order for an animal to receive a dose that exceeds the 1 Sv/yr (100 rem/yr) criterion, that animal would have to be in close proximity to the bottom vents 76 percent of the time during the course of a year. This scenario is unlikely. In addition, vents for the proposed storage casks would be covered with appropriately sized wire mesh to discourage wildlife use and habitation of these areas. The already low likelihood of an animal spending enough time near the

Table 4.3. Calculated radiation doses to wildlife from the storage cask array

Location	Dose rate[a] [mSv/hr (mrem/hr)]	Approximate exposure time (in hours per year) required to exceed 1 Sv/yr (100 rem per year)
Bottom vents	0.14 (14)	7,200
Top surface	0.10 (10)	N/A

Note: N/A indicates that exposure for one full year (8,760 hours) will not exceed 1 Sv (100 rem).

[a]Dose rates taken from Table 4.2-2 in PFS/SAR 2001.

vents to receive a dose that exceeds 1 Sv/yr (100 rem/yr) would be decreased further by an active monitoring plan (see Section 4.4.5) to prevent animals from being in the cask storage area. Impacts to wildlife due to radiation exposure via the bottom vents of the casks is therefore predicted to be small. Radiation exposure from the top surface of the HI-STORM storage cask system is low. Even if an animal (e.g., a perching hawk) were to sit on the surface of a cask for an entire year, the doses received by that animal would be 0.9 Sv/yr (90 rem/yr), which is below the 1 Sv/yr (100 rem/yr) criterion. Impacts to wildlife exposed to radiation from the top surface of the HI-STORM cask system are therefore expected to be small.

Nocturnal wildlife species such as nighthawks and bats may forage on insects attracted to the lighting at the proposed PFSF. Wildlife species could also use light poles for nesting platforms. Since these light poles are to be approximately 40 m (130 ft) high, they would be a sufficient distance away from the storage casks to ensure that birds would not be exposed to radiation doses above the 1 Sv/yr (100 rem/yr) criterion. If power poles, 37 m (120 ft) high, are in the vicinity of the cask storage area, birds using these poles as nesting platforms would likewise not be exposed to doses above the 1 Sv/yr (100 rem/yr) criterion. Therefore radiation impacts to animals that may be using the light or power poles in the vicinity of the cask storage area are expected to be small.

4.4.2.3 Wetlands

The area around Horseshoe Springs is a designated ACEC (BLM 1992a). This BLM designation protects and recognizes the unique, environmentally sensitive wetlands and springs found there. Indirect impacts (see Section 4.8.3) to these wetlands could occur if an increased population in Skull Valley over the lifetime of the proposed action results in greater human visitation to Horseshoe Springs and greater use of the informal camping area at Horseshoe Knolls. In 1997 this area had at least 3,475 visitor-use days (BLM 1998c). Only if visitation rose significantly beyond that level might there be a potentially negative impact.

The wetlands habitat around Horseshoe Springs is closed to off-highway vehicle (OHV) use year round (BLM 1992a, 1992b). On areas to the north and south of the wetlands, OHV use is limited to existing roads and trails from April 16 through November 30 and is completely closed to OHV use from December 1 through April 15. These restrictions, if effectively enforced, should protect the wetlands habitat even if an increase in the number of people in Skull Valley during the lifetime of the

proposed facility results in increased recreational use of that area. However, as not many workers are projected to move into the valley (see Section 4.5), these impacts would be small.

4.4.3 Impacts to Threatened, Endangered, and Other Species of Special Concern

Section 3.4.3 describes the Federal and State listed threatened and endangered species and other species of special concern that could potentially be affected by the proposed action. Consultation with the FWS has been completed to comply with Section 7 of the Endangered Species Act. On June 30, 2000, the Utah Field Office of the FWS concurred with the “no effect” determination for threatened and endangered species and critical habitat (see the FWS letter in Appendix B).

4.4.3.1 Plants

Direct and other impacts on special concern plant species of constructing and operating the facility (including the access road) at the preferred site would be similar to the general impacts on vegetation discussed in Sections 4.4.1. and 4.4.2. No federally listed threatened or endangered plant species is known to occur in the project area. The only known plant species of concern that might be affected by the proposed facility is the rare Pohl’s milkvetch, which is found to the south of the proposed site (i.e., Site A) (see Section 3.4.3.1). Accordingly, impacts to the Pohl’s milkvetch from construction or operation activities for the project as proposed should be small because it is not located at the proposed PFSF site. Furthermore, PFS has indicated that it will conduct another survey of the site for the Pohl’s milkvetch prior to construction to confirm its original findings.

4.4.3.2 Wildlife

Potential impacts to threatened, endangered, and other species of special concern from the construction and operation of the proposed PFSF are due to loss of habitat. Because the site is not within any critical habitat areas and the maximum amount of land to be cleared is a very small portion of Skull Valley (less than 0.1 percent), impacts due to loss of habitat are predicted to be small.

The construction and operation of the facility would decrease the amount of foraging area by up to a maximum of 94 ha (232 acres) for Federally- and State-listed birds. Because this represents less than 0.1 percent of available habitat in Skull Valley, impacts due to loss of habitat are expected to be small. Furthermore, a portion of this area would be temporarily disturbed, while a total of only 57 ha (140 acres) would be lost for the life of the project.

The loggerhead shrike is a bird that many times can adapt well to certain types of human development. This species may even realize a positive benefit from the proposed project. Shrikes may benefit if barbed wire fences are constructed, thereby creating more points where they could impale their prey.

As discussed in Section 4.4.1.2, nest sites of burrowing owls may be lost due to construction. However, where soil is loosened, some habitat for them may be created.

Mammal habitat would be diminished due to construction of the proposed PFSF. The BLM-listed kit fox may be displaced or forced to change its movement and migration patterns. Skull Valley pocket gophers located on the proposed PFSF site in areas of construction would be displaced or destroyed.

However, since the gophers are widespread in Skull Valley, the population would not be significantly affected even if the individuals in impacted burrows were to be lost (Pritchett 2001). No critical areas for deer, antelope, or fox would be affected by the proposed PFSF, however.

As discussed in Section 4.4.2, one potential source of impact to wildlife is the exposure to radiation from the storage casks. State or Federally listed birds that may use the storage casks as perches, such as ferruginous or Swainson's hawks, would not receive a radiation dose in excess of 1 Sv/yr (100 rem/yr). As set forth above, even if a bird were to sit on the top surface of a cask for an entire year, the dose received would be below the 1 Sv/yr (100 rem/yr) criterion. However, if State or Federally listed mammals or birds spent excessive amounts of time (more than 82 percent) of a year in close proximity to the bottom vents of the storage casks, radiation doses could exceed the 1 Sv/yr (100 rem/yr) criterion. With the implementation of a comprehensive wildlife monitoring plan, this scenario would be unlikely. Therefore, impacts due to radiation exposure from the cask vents to endangered, threatened, and State listed species are expected to be small.

4.4.4 The Alternative Site (Site B) in Skull Valley

The construction and operation of the proposed PFSF at Site B would include the same potential impacts as at the proposed site (i.e., Site A). As discussed in Sections 4.4.1 through 4.4.3, most impacts to vegetation and wildlife at Site B are predicted to be small and similar to those at Site A.

Construction of the PFSF at the alternative site (i.e., Site B) in Skull Valley would require the same amount of vegetation clearing and soil grading as construction at the preferred site (i.e., Site A), as discussed in Section 4.4.1. While the alternative site (Site B) has a somewhat greater diversity of micro-communities, the difference is minor, and construction of the proposed facility on Site B would not significantly reduce the biodiversity found in Skull Valley.

There is, however, a greater potential for impacts, including trampling or habitat destruction, to the rare Pohl's milkvetch (see Sections 3.4.3.1 and 4.4.3) if the facility is constructed at Site B instead of Site A, because Site B is approximately 1.6 km (1 mile) closer than Site A to identified populations of that plant species. In particular, widening or otherwise modifying the road to Hickman Knolls could destroy individuals of the species and/or its habitat. With the possible exception of negative impacts to Pohl's milkvetch, the impacts on vegetation of construction and operation at Site B are expected to be identical to those at Site A.

In regard to wildlife, perennial and intermittent streams, and wetlands, the resources on or near Site B are comparable to those at Site A. Thus, the impacts described above for Site A would apply equally to Site B.

4.4.5 Mitigation Measures

4.4.5.1 Vegetation

The Cooperating Agencies propose that PFS be required to use BMPs listed in Section 9.4.2, during construction of the proposed PFSF which would keep the impacts on vegetation to a minimum.

PFS has proposed to plant crested wheatgrass as a fire barrier. When vegetative fuel breaks are used to reduce the size or frequency of wild fires, they provide protection for soil, water, and other resource values, including the use and perpetuation of native species (BLM 1998a and b). Generally, native

species are preferred and should be used where feasible, but the major concern is to maintain ecologically functioning perennial plant communities. Thus, the Cooperating Agencies recommend that species to be used for revegetation be selected for ease of establishment, seedling vigor, and persistence in the community. The Cooperating Agencies also recommend that single species plantings of non-native species on extensive areas be minimized for ecological and utilitarian reasons. Planting a mixture of native species in the fire barrier, such as the seed mix recommended by BLM for the proposed rail line (see Section 5.4.1.1), would have a beneficial impact on the local ecosystem and biodiversity, and the Cooperating Agencies recommend that planting such a mixture be investigated to determine if it is a feasible alternative to planting a monoculture of crested wheatgrass. [Information on fire, its impact on various plants, and possible additional native species to use for a fire barrier is available on the World Wide Web (USDA Forest Service 1996; VegSpac 1999).] The Cooperating Agencies recommend that emphasis be placed on those plants that are best suited for the proposed PFSF site, with species selection made at the local level by qualified personnel on a site-specific basis.

The Cooperating Agencies also recommend the following. The revegetation plan should include careful consideration of the appropriate seed mixes and plants to use, soil conditions, and other measures. In addition, the plan should include a thorough study of site-specific conditions (e.g., elevation, slope, aspect, soil chemistry) and the need for irrigation (see Section 2.1.1.2), seed bed preparation, mulching, and fertilizing to aid in successful site restoration (Holzworth and Brown 1999). Other land uses should be restricted on rehabilitated areas for one to two years to enhance habitat recovery. A preinventory of expected needs and a proactive program of encouraging the collection and storage of native seed should be included. BIA and the Skull Valley Band should be consulted to help identify native species that could meet both goals of providing a fire barrier and increasing biodiversity by improving local ecosystems.

Revegetation with native species would allow the Federal executive agencies to comply with Executive Order (EO) 13112, Invasive Species. This Order requires Federal executive agencies, to the extent practicable and permitted by law, to prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, accurately and reliably monitor invasive species populations, provide for restoration of native species and habitat in ecosystems that have been invaded, conduct research on invasive species, and develop technologies to prevent introduction and to provide for environmentally sound control of invasive species. Therefore, the Cooperating Agencies propose that PFS be required to develop a revegetation plan in consultation with BIA and the Skull Valley Band (see Section 9.4.2). The revegetation plan could include the re-establishment of native species. However, the BIA has selected crested wheatgrass as the preferred species for seeding around the PFSF. Crested wheatgrass can be successfully established easier than native grass and once established, should maintain a successful stand of grass for the entire period of the lease. Crested wheatgrass also will compete better with cheat grass than native grass. This is significant since cheat grass is prone to burn easily and thrives from rangeland fires. In addition, crested wheatgrass is a valuable forage plant for both livestock and wildlife.

The Cooperating Agencies recommend that foot and vehicle traffic be routed away from the known populations of Pohl’s milkvetch. Erecting temporary fencing around them during construction to indicate their location would help prevent inadvertent impacts from trampling. In addition, the Cooperating Agencies recommend that a field survey be conducted near the Hickman Knolls Pit (see Section 4.4.3) to search for and identify any additional populations of the species before earth disturbing activities begin. Any populations of this plant that are found should be fenced to protect individuals of this species.

In general, the use of herbicides should be restricted to as small an area as necessary. Herbicides must be applied at the proper stage of plant growth for the best control of noxious weeds (Whitson 1998). In general, care should be taken to ensure that non-target plant species outside the restricted area are not affected. Herbicides must be used in compliance with all applicable laws, including EPA's labeling instructions (40 CFR 156) for prescribed environmental conditions (e.g., wind speed, relative humidity, air temperature, chemical persistence, time since last rainfall). The Cooperating Agencies propose that PFS be required to consult with BIA prior to construction in order to develop an adequate plan for monitoring and controlling noxious weeds during operation of the proposed PFSF (see Section 9.4.2). This proposed consultation should be coordinated with the consultation with BLM regarding the use of herbicides during the operation of the rail line. The plan should include an approved list of herbicides and could consider the use of non-chemical (e.g., biological) means of controlling noxious weeds (BLM 1991), and should incorporate BLM's most recent standard stipulations for chemical treatment (e.g., spraying) of vegetation (see Appendix 5 in BLM 1983).

4.4.5.2 Wildlife

The Cooperating Agencies propose that PFS be required to survey the site of the proposed PFSF and the area within 0.8 km (0.5 mile) of the site prior to construction for burrowing owl and loggerhead shrike nests to ensure that construction activities do not impact nesting birds (see Section 9.4.2). If active nests are present in these areas, construction activities should be curtailed or restricted during the period from April 1 to August 15 (Stone & Webster 1998; UDWR 1997) to avoid any impacts on nesting success and rearing young. Similarly, the Cooperating Agencies propose that PFS be required to survey the site of the proposed PFSF and the area within 0.8 km (0.5 mile) of the site prior to construction for Skull Valley pocket gopher burrows and kit fox dens to minimize the potential for loss of wildlife during construction (see Section 9.4.2).

In order for the BIA to provide appropriate guidance on the above matters, the Cooperating Agencies propose that PFS be required to consult with BIA regarding the appropriate timing of the surveys and to notify BIA immediately if the surveys identify the presence of these species (see Section 9.4.2). In addition, in order to avoid impacts to Federally-listed or endangered species during construction, the Cooperating Agencies propose that PFS be required to notify BIA and cease construction activities immediately if PFS identifies any such species within the proposed PFSF site during construction.

The design of the power transmission poles may have an impact on large perching birds such as eagles or hawks. The power poles that would support the power lines for the proposed PFSF could be designed in such a way (i.e., including wooden perches, insulated wires, etc.) that the potential for electrocution would be greatly diminished. Power poles designed to conform to the "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996" or most recent revision (APLIC 1996) would meet this objective. Given the number of raptors that are known to rest or forage in Skull Valley, the Cooperating Agencies propose this mitigation measure be required (see Section 9.4.2).

PFS proposes to employ facility design features and monitoring and deterrent actions in order to prevent impacts to animals that might gain access to the storage casks. The fence around the 40-ha (99-acre) restricted-access area would be embedded 30 cm (1 ft) into the ground to prevent certain animals from burrowing underneath and gaining access to the storage casks. The fence would be of chain-link design and would be 2.4 m (8 ft) tall to keep larger wildlife from leaping into the area. PFS would monitor for signs of any on-site wildlife activity and would take measures to prevent habitation. This monitoring could employ the use of remote video cameras to limit worker exposure to the cask

area. Small mammals and reptiles would also be kept from vents by appropriately sized wire mesh, and from the area by using traps, if necessary. PFS states that the entire facility would be frequently surveyed by workers. If any signs of wildlife habitation were found, actions would be taken immediately to remove the animals. If State or Federally listed species are likely to be taken, BIA would be contacted. The goal of this mitigation measure is to preclude animals from being near the casks for an extended period of time. The Cooperating Agencies propose that PFS be required to develop a monitoring program, consistent with the PFS commitments discussed above, in consultation with NRC, BIA, and the Skull Valley Band (see Section 9.4.2).

4.5 Socioeconomics and Community Resources

This section describes the potential impacts to socioeconomic and community resources, such as population, land use, employment, economy, housing, community services, utilities, schools, etc. A discussion of traffic, particularly along Skull Valley Road, is also included. The potential for workers moving into the area as a result of the proposed action is discussed below.

The existing socioeconomic and community resources in the vicinity of the preferred site (i.e., Site A) for the proposed PFSF are presented in Section 3.5. These resources could be affected either during construction or operation of the proposed PFSF.

Impacts to the socioeconomic and community resources of the Skull Valley Band and their Reservation differ from those to the remainder of Tooele County with respect to such matters as population, land use, and economic structure. The Reservation is not a source of community services, utilities, and schools to the extent that Tooele county is a source of these services. Impacts specific to the Skull Valley Band, as compared to the remainder of Tooele County, are noted in the following discussions as appropriate.

4.5.1 Construction Impacts at the Preferred Site (Site A)

Both the direct and indirect impacts to socioeconomic and community resources during construction of the proposed PFSF are primarily associated with (1) workers who might move into the area and (2) the transport of construction material to the proposed site. The impacts from workers who might move into the area, and the impacts of transporting construction materials are summarized in Table 4.4, and are discussed in the following paragraphs.

The overall approach to the assessment of impacts to socioeconomic and community resources involves the development of an estimate of the number of construction workers who might move into the area. Both the number of direct construction jobs and indirect jobs are considered. These numbers are used to determine the potential increase in the existing population, the demand on local housing, and the number of new children that might be enrolled in the existing school system. These increased numbers of people in the local area serve as the basis for determining impacts to socioeconomics and community resources during all phases of construction. The analytical approach and method are described below.

The proposed PFSF would be constructed in three phases to optimize the resources and schedule required to expedite facility operation and provide continuous local employment for construction of concrete pads and casks (see Section 2.1.1.2). During Phase I, construction would include all the

Table 4.4. Potential impacts to socioeconomic and community resources during the construction of the proposed PFSF

Category of potential impact	Significance level of potential impact
Population	Small
Housing	Small
Educational system	Small
Utilities	Small
Solid waste	Small
Transportation and traffic	Small to moderate
Land use	Small
Economic structure	Small but beneficial

buildings (Administration Building, Operations and Maintenance Building, Security and Health Physics Building, and Canister Transfer Building), the access road, the ITF near Timpie (if transportation from the railroad is to be by heavy haul tractor/trailer), the new rail line from Skunk Ridge (if PFS's preferred option is selected), and the pads within the southeast quadrant of the restricted-access area. The remainder of the restricted-access area would be constructed in Phases II and III. Phase II would include construction of the pads in the southwest quadrant, and Phase III would include construction of the pads in the northern half of the restricted-access area. Completion of Phase II and III would be scheduled to meet the SNF storage needs of nuclear power plants who seek to ship SNF to the PFSF.

Phase I construction of the proposed PFSF would begin upon issuance of an NRC license and would be completed in 18 months. Approximately 130 construction workers would be employed on site during the Phase I construction period, and 43 construction workers would be employed on site during Phases II and III of the construction period. The construction work force required for constructing the two local transportation options (peak of 125 workers for the rail line option or 35 workers for the ITF) are discussed in Chapter 5 and are not included in these totals (see Section 5.4.5). In addition to the jobs that would result directly from facility construction, a number of indirect jobs would be created as a result of the purchases of goods and services by PFS and the construction workers (including purchases by workers at the Pony Express Convenience Store on the Reservation). Based on past experience in similar rural areas (NRC 1996), it can be assumed that each direct job would lead to the creation of 0.5 indirect jobs within the area, for a total of 65 indirect jobs during Phase I and approximately 21 indirect jobs during Phases II and III of the construction period.

Based on worker behavior at similar sites (NRC 1996) and taking into account the relatively small size of the work force and the relative brevity of the construction period, it can be assumed that up to 30 percent of the direct workforce (i.e., approximately 40 workers) could move into the area (i.e., communities in the eastern portions of Tooele County) during Phase I of the construction period. Because many construction workers would probably choose to commute from areas farther away from the proposed PFSF site but within a 60- to 90-minute drive of the site (e.g., Salt Lake City or suburbs of Salt Lake City), it is likely that the actual number of in-moving workers would be substantially less than 40. However, that number is used throughout the following analysis as a reasonable upper bound.

Past experience (NRC 1996) also indicates that approximately 60 percent of in-movers (i.e., 24 workers) would be accompanied by their families, while the remaining 40 percent (16 workers) would come to the area alone. If the in-moving construction workers have an average family size of 2.87, which is the average for Tooele County (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/rankings/county/hhsizegh.htm), the local population would increase by 85 residents in 40 households due to direct employment. This translates into 16 workers unaccompanied by family, 24 workers accompanied by family, and 45 family members of construction workers.

Indirect jobs generally are less specialized than direct jobs and are more likely to be filled by existing area residents, including residents of Salt Lake City, Provo, and Orem. Accordingly, it can be assumed that only 10 percent of the indirect work force (i.e., seven workers) would move to the area during the construction period. Once again assuming that 60 percent of in-movers (four workers) would bring families and that their average family size would be 2.87, an upper bound of 15 new residents in seven households would be expected as the result of indirect employment.

Combining the above direct and indirect in-migration yields a total of 100 new residents in 47 households as an upper bound. Unaccompanied workers would live in 19 of these households while the other 28 households would consist of workers and their families. Based on the Tooele County average of 0.7 school aged children per household (Governor's Office of Planning and Budget, Economic and Demographic Projections, 1997; http://www.governor.state.ut.us/dea/demographics/household.htm), it is expected that 20 additional children would be added to local schools.

4.5.1.1 Population

Impacts to the population levels of Tooele County are expected to be small. Workers who move into the area during the construction period would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed project site and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available. It is possible that members of the Skull Valley Band who return to their Reservation for employment at the proposed PFSF might decide to live on the Reservation. At this time it is impossible to accurately estimate the number of Skull Valley Band members living off the Reservation who would move back. Therefore a precise estimation of the impact from an increase in population on the Reservation cannot be made.

The precise distribution of any in-movers would be determined by a number of factors, including proximity to the site and the availability of housing and public services. The 100 new residents used as an upper bound in this analysis would represent an increase of 0.3 percent to the 1996 population of Tooele County. If all of these in-migrants located in either Grantsville or Tooele, the population increase would be 2.0 percent in Grantsville or 0.7 percent in Tooele. While growth of this magnitude could be accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community. Similarly, while some of the in-movers may be members of the Skull Valley Band who seek to move back to the Reservation, the total number of such persons is not expected to be large due to the limited available vacant housing on the Reservation. However the influx of additional persons onto the Reservation would lead to increased water and utilities usage and waste generation on the Reservation.

4.5.1.2 Housing

Any housing impacts are expected to be small. The 47 new households used as an upper bound in this analysis would represent 13.4 percent of the vacant housing units (not counting housing units in Wendover or Dugway) that were for sale or rent in Tooele County in 1990 (the most recent year for which data are available). Even if all project-induced in-movers settled in either Grantsville or Tooele, which is highly unlikely, it would not exceed the number of vacant units for sale or rent in either of these communities. It should be noted that construction workers would not be permitted to camp on public lands during facility construction, therefore, there would be no impact from construction workers establishing temporary quarters near the proposed PFSF site.

The Skull Valley housing market is isolated by geography, and part of the valley is also isolated by its Reservation status from the rest of Tooele County. The Reservation itself is not a normal housing market. The housing market on the Reservation has the following unique characteristics. Any housing built or placed on the Reservation may be owned only by members of the Skull Valley Band. A Band member seeking to build or place housing on the Reservation must obtain approval from the Skull Valley Band General Council. Any transfer of ownership of a housing structure or a building on the Reservation must also be approved by the Council. The only persons who may reside on the Reservation itself are Band members, spouses of Band members, and their children. The values of existing houses do not include the value of underlying land, which remains in trust for the Skull Valley Band. Housing prices also reflect the strong presence of Federal housing programs. It is not clear whether there is an active housing market on the Reservation.

Impacts on Reservation housing prices would partly depend on whether the proposed PFSF would attract Band members back to the Reservation and partly on the financing mechanisms used to construct housing. If some Band members moved back to the Reservation to take jobs at the proposed PFSF, there might be some increase in demand for housing on the Reservation, but whether returning Band members would simply build new housing, with no effect on the nominal value of existing homes, is not known. In any case, due to the small number of workers expected to move back to the Reservation, the impact on housing prices is expected to be small. Similarly, it is not anticipated that the presence of the proposed facility would deter Band members from moving back to the Reservation, and thereby potentially depress housing prices. It is equally likely that members would move back to be near employment opportunities, as is the case with, for example, nuclear power plants workers. These workers are likely to be more concerned with the ease of commuting to work, rather than potential adverse environmental impacts of the proposed PFSF. In summary, given the above characteristics of the housing market on the Reservation, and the small number of workers expected to move back to the Reservation, the proposed PFSF project would likely have only a small effect on the housing market on the Reservation.

4.5.1.3 Education

The impacts to the education system of Tooele County are expected to be small. The addition of 20 new school-age children would increase enrollment in Tooele County by only 0.25 percent. Even in the highly unlikely event that all in-movers would locate in a single community, the increases in enrollment would be relatively small. For instance, if all new students were enrolled in elementary school in the city of Tooele, there would be an increase of approximately 1 percent. The increase would be 2.7 percent if all new students were enrolled in the Tooele Junior High School, and would be 1.3 percent if all new students were enrolled in the Tooele High School. Similarly, if all the new students were enrolled at schools in Grantsville, the increases would be 2.6 percent in the elementary

school, 3.8 percent in the middle school, or 2.5 percent in the high school. It should be noted, however, that the Tooele County School District is already embarked on a significant expansion of its capacity, so that any additional increase may not place demands on the system not already anticipated.

4.5.1.4 Utilities

The addition of 47 new households and 100 new residents is expected to result in small impact to utilities. Most if not all of those in-movers would be expected to occupy currently vacant housing units already connected to utilities (e.g., in Rush Valley or Tooele Valley). As discussed in Section 4.2.1.2, the impacts of constructing the proposed PFSF on water use within Skull Valley, including PFSF impacts to the Skull Valley Band, are expected to be minimal. The only off-site utility infrastructure resource connections to be used at the proposed PFSF are for electrical power and telephone service (PFS/RAI1 1999). For each of these services, new connections would be made from existing lines paralleling Skull Valley Road, and new lines would be constructed along the access road to the proposed PFSF. Construction of the proposed PFSF may require that upgraded electrical service (i.e., reliable, higher voltage electricity) be brought to Skull Valley (PFS/ER 2001), which could be considered a positive benefit.

4.5.1.5 Solid and Sanitary Wastes

Only small impacts are expected from managing solid and sanitary wastes during construction of the proposed PFSF. Excavation and construction debris, as well as removed vegetation and backfill would result from construction of the proposed PFSF. Other than construction debris, which would be transported to a licensed landfill for disposal, other solid wastes would remain on the site and be used for other facility purposes (e.g., building the earthen berm). Sanitary wastes would be managed with conventional systems such as underground sewage (septic) and portable toilet systems.

4.5.1.6 Transportation and Traffic

The impacts during Phase I of construction of the proposed PFSF on Skull Valley Road could be small to moderate. Impacts to other transportation routes (e.g., Interstate 80) should be small. Moreover, the impacts during other construction phases should be less than during Phase I (about 18 months), when most of the equipment and material and the largest number of construction workers would be using Skull Valley Road.

Based upon revisions to the applicant's license application and Environmental Report (PFS/ER 2001), traffic impacts associated with construction of the proposed facility are projected to be less than indicated in the DEIS. Specifically, the amounts of material and water (for dust suppression and soil compaction) to be trucked to the proposed site to support construction of the proposed facility have decreased substantially [from 92,000 m^3 to 41,100 m^3 (from 120,000 yd^3 to 53,600 yd^3) of construction materials and 510 m^3 (135,000 gal) of water per day instead of 680 m^3/day (180,000 gal/day). This includes materials and water needed for construction of the access road from Skull Valley Road to the site of the proposed PFSF site and the access road flood diversion berm, for soil stabilization of the southeast quadrant of the cask storage yard pad area by mixing cement with the upper layer of soil, and initial grading and excavation for the Administration Building and the Operations and Maintenance Building. This reduction in materials and water to be transported results in 150 truck trips per day (75 trucks going each way) instead of the 250 truck trips per day (125 trucks going each way) for the transport of materials indicated in the DEIS and 36 truck shipments per day of water (18 tanker trucks

going each way) instead of the 48 truck trips per day of water (24 tanker trucks going each way) indicated in the DEIS during the first period of Phase 1 construction.

This volume of truck traffic on Skull Valley Road has the potential to result in adverse impacts to traffic movement on Skull Valley Road. As noted in Section 3.5, the most recently available traffic data (1995) indicate an average of 325 vehicles per day from the gate at Dugway Proving Ground north to Iosepa and 565 vehicles per day from Iosepa north to Interstate 80. In addition to adverse impacts from increased traffic, there is the potential for increased wear and maintenance requirements for Skull Valley Road due to heavy truck traffic.

In addition to material, equipment, and water deliveries, a peak construction work force of 130 workers would commute to and from the construction site using individual passenger vehicles and light trucks on a daily basis. These workers could account for an increase of 260 vehicles per day on Skull Valley Road during Phase I of construction. All together, construction of the proposed PFSF (during Phase I) could result in an increase of approximately 450 vehicle trips per day on Skull Valley Road. This increase amounts to approximately 130 percent greater use of Skull Valley Road from the proposed site north to Iosepa and an increase of approximately 79 percent from Iosepa north to Interstate 80. This additional traffic volume would lower the Level of Service (LOS) on Skull Valley Road from Level A to Level B, where Level A is the highest quality of service with little or no restriction on maneuverability or speed caused by other traffic, and level B is a zone of stable flow where operating speed is beginning to be affected by other traffic (PFS/ER 2001). This reduction in LOS also results from delivery trucks moving at a slower rate of speed (estimated at 40 mph) than the posted speed limit of 55 mph, requiring other traffic to reduce travel speed or make additional passing maneuvers. Impacts on traffic during subsequent phases and periods of construction would be smaller than during the first period (i.e., the first two months) of Phase 1 construction.

In addition to the truck traffic associated with transporting materials and water during Phase 2 of construction of the PFSF facility, additional construction materials would be transported to the proposed facility to support construction of storage casks. These materials would be transported by truck or rail (using the proposed rail line to be constructed from Skunk Ridge during Phase 1). Assuming construction of 200 casks per year and truck delivery of cask materials along Skull Valley Road, approximately 7,200 m^3 (9,400 yd^3) of material would be required annually, supplied by approximately 520 trucks. Based on construction taking place 9 months per year, with 22 work days per month, about 6 truck trips per day (3 truck trips per day each way) would be required for storage cask construction. Even when added to traffic necessary for Phase 2 construction, [including traffic for transportation of materials, water, and construction workers (43 workers)], and traffic resulting from operations workers (43 workers) (see Section 4.5.2), the total traffic during the peak period of Phase 2 of construction would not result in increased traffic or adversely affect the LOS of Skull Valley Road during Phase 2 of construction.

4.5.1.7 Land Use

The expected impacts for construction are expected to be small. Construction of the proposed PFSF would change the nature of land use within the Reservation. While this change would be qualitatively substantial (i.e., from agricultural to industrial), the land parcel is sufficiently remote and small (when compared to the remainder of the Reservation and surrounding lands) that no quantitatively significant impact would occur.

4.5.1.8 Economic Structure

Because the construction workforce (direct and indirect) would be relatively small compared to the current Tooele County population/workforce and the Phase 1 construction period would be relatively short, the effect of the proposed PFSF on the economic structure of the local area would be small but favorable during the Phase 1 construction period. Impacts during subsequent phases of construction would also be favorable, but even smaller. The unemployment rate in Tooele County could fall slightly due to the potential hiring of current residents and the in-migration of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any construction jobs that might be filled by Skull Valley Band members would constitute a positive impact on the Skull Valley Band economy. Moreover, there would be the potential for increased business at the Pony Express Convenience Store on the Reservation. In addition to construction jobs for Tribal members, the applicant has indicated that training and development opportunities would be available for other Tribal members (PFS/ER 2001).

4.5.2 Impacts During Operations at the Preferred Site

Both the direct and indirect impacts to socioeconomic and community resources during the operational period of the proposed PFSF are primarily associated with workers who might move into the area. These impacts are summarized in Table 4.5, and as discussed in the following paragraphs, would be small.

Table 4.5. Potential impacts to socioeconomic and community resources during the operation of the proposed PFSF

Category of potential impact	Significance level of potential impact
Population	Small
Housing	Small
Educational system	Small
Utilities	Small
Solid waste	Small
Transportation and traffic	Small
Land use	Small
Economic structure	Small but beneficial

As described in Section 4.5.1, the overall approach to the assessment of impacts to socioeconomic and community resources involves the development of an estimate of the number of operations workers that might move into the area. Both the number of direct operations jobs and indirect jobs are considered. These numbers are used to determine the potential increase in the existing population, the demand on local housing, and the number of new children that might be enrolled into the existing school system. These increased numbers of people in the local area serve as the basis for

determining impacts to socioeconomic and community resources during the operational period of the facility. The analytical approach and method are described below.

The proposed PFSF would begin commercial operation following completion of Phase I construction and would provide continuous local employment for the duration of its operation. Approximately 43 full-time positions would be required to staff activities during the operational life of the proposed PFSF. Based on past experience in similar rural areas (NRC 1996), it can be assumed that each direct job would lead to the creation of 0.5 indirect jobs within the area, for a total of 21 indirect jobs during operation of the proposed PFSF.

Based on worker behavior at similar sites (NRC 1996) and taking into account the relatively small size of the work force and the duration of the operation period, it can be assumed that all of the direct workforce (i.e., 43 workers) could move to the area (i.e., communities in the eastern portions of Tooele County) during operations. Because many operations workers would probably choose to commute from areas farther away from the proposed site but within a 60- to 90-minute drive of the site (e.g., Salt Lake City or suburbs of Salt Lake City), it is likely that the actual number of in-moving workers would be substantially less than 43. However, that number is used in the following analysis as a reasonable upper bound. In contrast to the case with construction workers, it is assumed that all in-moving operations workers would bring families since the duration of work is essentially permanent. If the in-moving operations workers have an average family size of 2.87, the average family size for Tooele County, the local population would increase by 123 residents in 45 households due to direct employment. This equates to 43 workers accompanied by family, and 80 family members of operations workers.

Indirect jobs generally are less specialized than direct jobs and are more likely to be filled by existing area residents. Accordingly, it can be assumed that only 10 percent of the indirect work force (i.e., two workers) would move to the area during the operations period. Once again assuming that their average family size would be 2.87, an upper bound of six new residents in two households would be expected as a result of indirect employment.

Combining the above direct and indirect in-migration yields a total of 129 new residents in 45 new households as an upper bound. Based on the Tooele County average of 0.7 school aged children per household, it is expected that 32 additional children would be added to local schools.

4.5.2.1 Population

Impacts of facility operations to the population levels of Tooele County are expected to be small. Workers who move into the area during the proposed PFSF's operating period would probably be distributed in communities in the eastern portion of Tooele County (e.g., Grantsville and Tooele) because they are closest to the proposed project site and have vacant housing units available for rent and sale. It is unlikely that any in-moving workers and their families would locate in Skull Valley itself since there are few, if any, housing units available; it is possible that members of the Skull Valley Band who return to their Reservation for employment at the proposed PFSF might decide to live on the Reservation. At this time it is impossible to accurately estimate the number of Skull Valley Band members living off the Reservation who would move back. Therefore any estimation of the impact from an increased population on the Reservation would be speculative. The precise distribution of in-movers would be determined by a number of factors, including proximity to the site and the availability of housing and public services. The 126 new residents used as an upper bound in this analysis would represent an increase of 0.4 percent to the 1996 population of Tooele County. If all of these in-

migrants located in either Grantsville or Tooele, the population increase would be 2.5 percent in Grantsville or 0.9 percent in Tooele. While growth of this magnitude could be accommodated without disrupting the affected communities, it is very unlikely that all new residents would settle in a single community.

4.5.2.2 Housing

Impacts of facility operations to the housing conditions are expected to be small. The 45 new households used as an upper bound in this analysis would represent 13.0 percent of the vacant housing units (not counting housing units in Wendover or Dugway) that were for sale or rent in Tooele County in 1990. Even if all project-induced in-movers settled in either Grantsville or Tooele, which is highly unlikely, the number of housing units needed would not exceed the number of vacant units for sale or rent in either of these communities.

4.5.2.3 Education

Impacts of the proposed PFSF operations to the education system are expected to be small. The addition of 32 new school-age children would increase enrollment in Tooele County by only 0.39 percent. Even in the highly unlikely event that all in-movers would locate in a single community, the increases in enrollment would be relatively small. For instance, if all new students were enrolled in elementary school in the city of Tooele, there would be an increase of approximately 1.3 percent. The increase would be 4.4 percent if all new students were enrolled in the Tooele Junior High School, and would be 2.1 percent if all new students were enrolled in the Tooele High School. Similarly, if all the new students were enrolled at schools in Grantsville, the increases would be 4.2 percent in the elementary school, 6.1 percent in the middle school, or 4 percent in the high school. It should be noted, however, that the Tooele County School District is already embarked on a significant expansion of its capacity, so that any additional increase would place demands on the system that may be already anticipated.

4.5.2.4 Utilities

The impacts of operating the proposed PFSF upon utilities are expected to be small. The addition of 45 new households and 129 new residents is not expected to strain existing utilities within the area, since most if not all of those in-movers would be expected to occupy currently vacant housing units already hooked up to utilities (e.g., in Rush Valley or Tooele Valley). The impacts of operating the proposed PFSF itself on water use within Skull Valley, including impacts to the Skull Valley Band, are expected to be minimal and are addressed quantitatively in Section 4.2. Other utilities (e.g., electric power) would be provided to the proposed site during construction.

4.5.2.5 Solid and Sanitary Wastes

Small quantities of solid wastes would be generated during operation of the proposed PFSF radiation surveys. These wastes would be controlled, stored, and disposed in compliance with 10 CFR Part 20. A sanitary drainage system would be constructed at the proposed PFSF to transmit waste from the building to a septic system. Two septic tank and drain field systems would be constructed at the proposed PFSF to collect and process sanitary waste water from the proposed PFSF. The systems would be sized for the maximum number of personnel expected on site during normal operating periods. No adverse impacts are expected from managing sanitary wastes from the proposed PFSF.

4.5.2.6 Transportation and Traffic

Operation of the proposed PFSF would result in small impacts to the local transportation system due to the movement of operations workers commuting each day to the proposed PFSF and due to the movement of fabricated steel liners for the storage casks and the SNF shipping casks to the proposed PFSF. An operations work force of 43 workers would commute each day using individual private vehicles or light trucks. These workers could account for an increase of 86 vehicle trips per day on Skull Valley Road during operations. Using 1995 traffic volume data as the baseline, this increase amounts to approximately 25 percent greater use of Skull Valley Road from the proposed PFSF north to Iosepa and an increase of 14.9 percent from Iosepa north to Interstate 80. This increase in traffic volume due to commuting operations workers (actually a decrease from the volume generated during construction of the proposed PFSF) would not result in any degradation of the LOS on Skull Valley Road. The weekly over-the-road truck shipment of four steel liners for the storage casks should not result in any discernible adverse impact on traffic. The impacts of operating the proposed PFSF on other transportation routes (e.g., Interstate 80) should be negligible.

4.5.2.7 Land Use

Impacts to land use can be characterized as small because the operation of the proposed PFSF would create no additional impacts to land use beyond those discussed in Section 4.5.1 for the construction of the facility. In regard to the UTTR, the NRC staff has met with the U.S. Air Force about the potential for its activities to impact the PFSF and for the PFSF to impact the UTTR or the mission of Hill Air Force Base. The potential for aircraft crashes or other military activity to affect the PFSF is addressed in the NRC staff's SER, as updated, in which it is concluded that these events do not pose a credible hazard to the PFSF. No overflight restrictions are being contemplated to accommodate the proposed PFSF.

4.5.2.8 Economic Structure

Because the operations workforce (direct and indirect) would be relatively small and the operations period would be relatively long, the effect of the proposed project on the economic structure of the local area would be small but favorable and long-lasting. The unemployment rate in Tooele County could fall slightly due to the potential hiring of current residents and the in-migration of project employees. In addition, impacts to the economic structure of the Skull Valley Band should be proportionately greater, since any operations jobs that might be filled by Tribal members would constitute a positive impact on the Skull Valley Band economy. As during the construction period (see Section 4.5.1), there would also be the potential for increased business at the Pony Express Convenience Store on the Reservation.

The Skull Valley Band intends to use lease payments for a number of beneficial purposes, including on-Reservation improvements to housing, development of schools, day-care, medical facilities, higher education opportunities, and commercial improvements to the Pony Express Convenience Store (PFS/RAI1 1999). Additionally, Skull Valley Band members living off the Reservation have expressed an interest in returning if employment and housing conditions improved. The increased revenue to the Skull Valley Band would contribute significantly to the Skull Valley Band's goal of creating a productive homeland for all enrolled members.

Additional impacts on the economic structure of the impact area during the operational life of the proposed PFSF include payments to Tooele County, local payroll, and other local expenditures.

Payments to Tooele County have been estimated to be $91.2 million over the life of the PFSF (based on a proposed agreement negotiated between PFS and the County) (PFS/RAI2 1999). Local payroll during operation of the proposed PFSF has been estimated to be $81 million (based on the PFS's estimate of actual staff positions and anticipated pay for each position, including benefits) (PFS/RAI2 1999). Other local expenditures, including operations support and utilities, have been estimated to be $79 million (based on the PFS's estimate of the number of personnel involved, and utilities based on the number of buildings and the estimated utility load for these buildings) (PFS/RAI2 1999). In addition, steel liners for the storage casks would be fabricated in the Salt Lake City or Tooele County area over about a 21-year period and shipped over-the-road by truck to the site on the Reservation, where they would be filled with concrete from the batch plant; the number of weekly shipments to the site would be four (or 200 per year). The construction of casks and canisters has been estimated to be worth $747 million (PFS/RAI2 1999). The direct and indirect benefits of cask and liner construction would accrue to whatever jurisdiction hosts their manufacture.

In addition to impacts to the local economic structure, operation of the proposed PFSF would result in sales tax revenues to the State of Utah, estimated to be $53.5 million (based on PFS's review of the Utah tax structure) (PFS/RAI2 1999).

4.5.3 The Alternative Site (Site B) in Skull Valley

The alternative location (i.e., Site B) in Skull Valley for the proposed PFSF is on the Reservation and lies just south of the preferred site (i.e, Site A). Because Site B is very close to Site A, there would be no discernible differences in the anticipated impacts to socioeconomic and community resources during either construction or operation of the proposed PFSF if it were to be located at Site B.

4.5.4 Mitigation Measures

The only socioeconomic and community resource that is potentially adversely affected by construction and operation of the proposed PFSF is increased traffic along Skull Valley Road. This potential exists due to the anticipated increase in the use of Skull Valley Road by construction and operation workers, as well as the movement of construction materials to the Reservation. The potential for adverse impacts to traffic on Skull Valley Road is greatest during Phase I construction (i.e., when approximately 190 truck trips per day would be anticipated). The magnitude of such impacts is discussed above. The Cooperating Agencies recommend that consideration be given to the avoidance or amelioration of these impacts by appropriate scheduling of the proposed PFSF related traffic.

4.6 Cultural Resources

The overall cultural resources setting in Skull Valley is discussed in Section 3.6. This section discusses the potential impacts to the known cultural resources in the project areas. As indicated in Section 3.6.2.1, cultural resources inventories have recently been completed for all proposed action areas in Skull Valley (Birnie and Newsome 2000). The field effort was preceded by a cultural resources overview and literature search, Class I (Bright and Schroedl 1998). The Skull Valley Band has not expressed any concerns about traditional cultural properties being affected. Additionally, during the Section 106 consultation process with regional Federally Recognized Indian Tribes and other organizations, no traditional cultural properties have been identified within the project area (see

Section 1.5.5). The potential for adverse impacts to cultural resources and the need for mitigative activities are discussed below

4.6.1 Construction Impacts at the Preferred Site (Site A)

Based on the results of the intensive field cultural resources survey of the proposed PFSF site, as set forth below, and the Section 106 consultation process (see Section 1.5.5), potential impacts to archaeological and historical resources from construction of the proposed PFSF are considered to be small.

The general environmental setting at this site is such that the potential for locating archaeological or historic properties is low. Site A is located in the center of the valley, exhibits no relief (i.e., no noticeable change in elevation across the proposed site), and is characterized by a vegetative community approximately 70 percent grasses and 30 percent bare ground. No perennial surface water resources are located near the proposed site. A cultural resource inventory of about 400 ha (1,000 acres) for the proposed PFSF area on the Reservation did not encounter any cultural resources properties. However, four isolated artifacts were noted, one in the southeast corner of the proposed PFSF area and three others within the corridor for the east-west access road that would extend from the existing Skull Valley Road to the proposed PFSF (Birnie and Newsome 2000). Two of these isolated occurrences were nondiagnostic stone flakes and two were identifiable early prehistoric projectile points. Because the finds are isolated artifacts and not designated as cultural resources properties, none of these items is considered potentially eligible for listing on the *National Register*. Because these isolated artifacts were all found in areas of soil deflation, there is only minor potential for additional artifacts that are currently buried to be exposed during construction.

However, should buried cultural resources be encountered during the construction phase, the Cooperating Agencies propose to require implementation of specific mitigation measures as described in Section 4.6.5.

4.6.2 Impacts During Operations at the Preferred Site

Normal operation of the proposed PFSF following construction of the transportation route and the PFSF would not be expected to have potential for impacts on archaeological and historical resources since no additional ground disturbance will occur. Similarly, decommissioning activities for the proposed PFSF will take place in previously disturbed areas. Therefore, the overall impact on cultural resources from operation of the proposed PFSF is expected to be small.

4.6.3 Native American Cultural Resources

General issues related to broader cultural values held by some Skull Valley Band members living on the Reservation in proximity to the proposed PFSF have been raised in public scoping meetings and meetings on the DEIS. The proposed action would, in their view, lead to potential impacts on traditional cultural values, such as (1) natural resources (e.g., plants and animals), (2) reverence for the larger area as a cultural landscape, and (3) sacred religious ceremonies.

However, according to the Skull Valley Band Tribal Chairman, no traditional cultural properties or use of culturally important natural resources are known within the specific project areas (PFS/ER 2001). Traditional plants of value to the Skull Valley Band (e.g., sage and cedar) are sparse in the PFS

project area due to a lack of surface water, and are considered inferior to the same plants growing in the nearby mountains east of the Reservation and the adjacent Tooele Valley. Natural resources extant at proposed project areas on the Reservation are similar to those found throughout much of the rest of the valley (see Section 4.4). No further information was provided during the public meetings. Additionally, during the Section 106 consultation process with regional Federally Recognized Indian Tribes and other organizations, no traditional cultural properties were identified within the project area (see Section 1.5.5). Further, a thorough review of available ethnographic and historical information revealed no mention of such properties that might be affected.

Consequently, construction and operation of the storage facility on the Reservation is considered to have a small potential for affecting Tribal cultural values or traditional cultural properties. Based on the known situation, no mitigation measures are required for potential impacts to Native American resources.

The Cooperating Agencies recommend that PFS provide appropriate funding to the Skull Valley Band of Goshutes to develop and provide educational materials (e.g., exhibit/brochure/booklet) on the wider context of impacts of European settlement on the pre-contact Skull Valley and the surrounding traditional Goshute lands to be located at appropriate locations (e.g., a proposed Skull Valley Band Cultural Center on the Reservation).

4.6.4 The Alternative Site (Site B) in Skull Valley

The alternative site in Skull Valley (i.e., Site B) is located just south of the preferred site (i.e., Site A), and generally in the same type of environmental setting. The acreage that includes Site B was included in the cultural resources inventory for the proposed PFSF, and findings for the preferred site are applicable at the alternative site. The potential for adverse impacts to cultural resources from construction and operation of the storage facility at the alternative site on the Reservation is small.

4.6.5 Mitigation Measures

In general, land clearing, excavation, and construction activities have the potential to disturb or cause the relocation of cultural data and artifacts. The operation of industrial facilities can degrade the value of traditional sites or uses. In addition, human activity in project areas causes concern that members of the workforce could affect cultural resource sites, especially those at buried locations or with artifacts.

Actions taken to mitigate adverse impacts to cultural resources at the proposed PFSF include those required by law or regulation, as well as those determined by the Cooperating Federal Agencies and the Skull Valley Band to be necessary to reduce or eliminate such impacts. The surface of all project areas where construction activities will occur has been intensively inspected to identify archaeological, historic or other cultural resources that may exist in those areas. The survey and Section 106 consultation process did not identify any cultural resources on the proposed PFSF site.

Buried resources could be encountered during construction. To address these cases, mitigation measures that comply with historic preservation laws and regulations could be put in place to ensure that PFS would implement appropriate measures following identification and evaluation of significant cultural resources. Therefore, the Cooperating Federal Agencies propose that PFS be required to have a process to identify and evaluate any buried artifacts or cultural resources during construction (see Section 9.4.2).

4.7 Human Health Impacts

Except for transportation-related impacts, all human health impacts resulting from construction, operation and potential accidents at the proposed PFSF are discussed in this section. The human health impacts associated with the construction and operation of local transportation facilities in Skull Valley and the transportation of SNF are discussed in Section 5.7.

Section 4.7.1 presents the analysis of non-radiological impacts from construction and operation of the proposed PFSF. The analysis in Section 4.7.1 includes industrial morbidity and mortality from occupation-related activities and accidents. Section 4.7.2 presents the analysis of radiological impacts from the SNF stored at the facility, as well as potential radiological accidents and their consequences.

4.7.1 Non-Radiological Impacts at the Proposed Site (Site A)

During the construction and operation of the proposed PFSF, there are several non-radiological pollutants that may be of concern to worker and public health. The first group of pollutants of concern include the criteria pollutants and dust (both of which are addressed in Section 4.3). With adequate control measures, such as treating areas with water or chemical surfactants for dust suppression, etc., the impact on worker and public health would be expected to be small. There are no additional potential health impacts to the public from the proposed project, since members of the general public would not be allowed on the proposed PFSF site. Accordingly, no further analysis of these matters is necessary.

Potential health impacts to workers during construction of the proposed PFSF would be limited to the normal hazards associated with construction (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). These normal hazards include fatal and nonfatal occupational injuries, which, for the construction industry, typically result from overexertion, falls, or being struck by equipment (NSC 2000). Because there are no unusual situations anticipated to make the construction-related activities at the proposed PFSF more hazardous than normal, there would be only small impacts to worker health and safety due to fatal and nonfatal occupational construction-related activities. The staff finds the non-radiological occupational health effects of the proposed action to be small. These are discussed below.

In order to estimate the number of potential fatal and nonfatal occupational injuries due to the initial construction, normal operations, and decommissioning of the proposed PFSF, data on fatal occupational injuries per 100,000 workers per year and data on nonfatal occupational injuries per 100 full-time workers per year were identified in the National Safety Council Injury Facts 2000 edition (NSC 2000). Data from both the Bureau of Labor Statistics (BLS) and the Occupational Safety and Health Administration (OSHA) are represented therein. The BLS and OSHA construction, trucking, and warehousing industry injury rates were used to estimate the potential fatal (using 1999 data) and nonfatal occupational (using 1998 data) injuries. Table 4.6 presents the expected number of potentially fatal and nonfatal occupational injuries during the construction and normal operations of the proposed PFSF.

Table 4.6. Estimated numbers of fatal and nonfatal occupational injuries for the construction and operation of the proposed PFSF

Activity	Duration of activity	Predicted number of fatal injuries	Predicted number of nonfatal Injuries[b]
Construction			
Phase 1	1.5 years	0.027	6.4
Phase 2	5 years	0.030	7.1
Phase 3	5 years	0.030	7.1
Operations	40 years[a]	0.184	6.5

[a]40 years includes 20 years of operations under the license and 20 years of operations under a renewed license, if any.

[b] Includes injuries and illnesses involving lost days of work.

Source: National Safety Council (2000). "Injury Facts" 2000 Edition, Itasca, IL.

There would be only small impacts to worker health and safety due to potentially fatal and nonfatal occupational injuries resulting from construction and normal operational activities. The estimated probabilities of injuries and fatalities would not require or warrant Federal, State, or community attention so as to require modification of construction-related or normal operational-related procedures.

4.7.1.1 Potential Worker Injuries During Construction

The proposed PFSF facility would be subject to OSHA's General Industry Standards (29 CFR Part 1910) and Construction Industry Standards (29 CFR Part 1926). Construction risks would be minimized by adherence to the procedures and policies established by OSHA.

These standards establish practices, procedures, exposure limits, and equipment specifications to preserve employee health and safety. In addition, OSHA inspections would also be employed in an effort to reduce the frequency of accidents and further ensure worker safety.

Potential fatalities. The construction of the proposed PFSF would occur in three phases. Phase 1 construction would require a peak work force of 130 workers and would be completed in about 1.5 years. Based on historical records of construction worker fatal occupational injuries, the estimated number of fatalities is 0.03; that is, much less than one, fatality would be expected to occur over the construction period. This estimate is conservative, because it assumes there would be a work force of 130 continually for the full 18-month construction period.

Phase 2 and 3 construction would require a work force of 43 workers (This number of workers is conservative because it includes workers that would also be present during the operational period for the proposed PFSF). Each phase would be completed in 5 years. It was estimated that less than 1 fatality would occur during each Phase (i.e., less than 1 fatality in Phase 2 and less than 1 fatality in Phase 3).

Potential nonfatal occupation injuries. Based on historical records of construction worker nonfatal occupational injuries that include lost workdays, the numbers of nonfatal injuries occurring during the 18-month Phase 1 construction is estimated to be about 6.4. Phase 2 and 3 construction would each last 5 years. For each phase of construction beyond Phase 1, the number of nonfatal injuries is estimated to be 7.1.

4.7.1.2 Potential Worker Injuries During Operations

Following Phase 1 construction of the proposed PFSF, the total number of employees needed to operate the facility would be approximately 43 workers. The overall design, layout, and operation of the proposed PFSF would minimize hazards to human health. Compliance with the Federal Occupational Safety and Health Standards, as well as safety standards specified by NRC, would help maintain the occupational safety record.

Potential fatalities. Operation of the proposed PFSF would involve receiving, transferring, storing, and shipping the SNF and would require a work force of about 43 people for up to 40 years (20 years under the initial license and 20 years under a renewed license, if any). Based on a statistical analysis of the trucking and warehousing industry, it was estimated that about 0.18 fatalities (i.e., less than one) would occur during a 40-year period of operations.

Potential nonfatal occupational injuries. A review of the trucking and warehousing industry records indicated that the expected number of nonfatal injuries accompanied by lost workdays at the proposed PFSF during normal operations over a 40-year period would be 65, or about 1.6 per year.

4.7.2 Radiological Impacts at the Proposed Site (Site A)

Construction and operation of the proposed PFSF would result in exposing PFSF workers and the general public to ionizing radiation. Phase 1 construction would be conducted without the presence of radioactive materials. As construction moves into Phases 2 and 3, there would be some storage casks present, and on-going construction activities would result in the installation of more storage casks. Thus, construction work leading to additional storage pads would be performed at the same time some pads are occupied with storage casks. Moreover, normal operations would bring workers into areas where they would receive radiation exposures. These would include the personnel that inspect and service the casks, the security personnel, and the machine operators who move casks to their storage locations. Radiological health impacts from the proposed action and alternatives are determined to be small, as explained below.

The proposed PFSF is an interim facility; thus, after a period of SNF receipt and storage, the SNF would be shipped to a permanent repository. During shipment to a permanent repository, the activities would be similar to those which occurred during the receipt of the SNF at the proposed PFSF, and the health impacts of both sets of activities would be similar. Therefore, no specific additional analyses have been performed for health impacts for this phase. For the purpose of analysis in this EIS, the radiological impact for removal of SNF is taken to be the same as the impact of receipt of SNF at the proposed PFSF, even though the dose for these casks would be lower than the dose when they arrived in Skull Valley due to radioactive decay over the storage period.

Radiation dose measures are discussed in the dialogue box presented in Section 3.7. The same measures are used in this section: radiation dose is given in terms of milliSiverts (millirem) and the consequential risk is given in terms of latent cancer fatality (LCF). The coefficients or factors used for

health effects in this FEIS for the public and occupational radiation risk are 5×10^{-2} and 4×10^{-2} LCF/Sv (5×10^{-4} and 4×10^{-4} LCF/rem), respectively. These coefficients are based on data obtained at much higher doses and dose rates than those encountered by the general public or workers. A linear extrapolation from the lowest doses at which effects are observable down to the occupational range was used to generate these coefficients. The assumption of a linear extrapolation has considerable uncertainty, but is believed to present a conservative estimate of the risk. Table 3.18 in Section 3.7 provides the equivalent annual dose received by an average individual in the United States. Because of the sparse nature of on-site data, all comparisons below are made to the national average. The doses given below are presented in the form of incremental additions to existing background radiation doses. That is, in the discussion below, the estimated doses attributable to the PFSF are not added to background doses.

The methods used to estimate radiological impacts are as follows: PFS has provided dose estimates for the Holtec HI-STORM cask. An NRC staff analysis was made of PFS's approach. Results of dose estimates for key conditions demonstrated that PFS's approach provided results consistent with those of the staff; thus the analysis presented in this section is based on PFS's SAR.

4.7.2.1 Estimated Dose to the General Public

To assess the radiological impacts to the general public from routine operation of the proposed PFSF, analyses were performed that examine the potential dose to a hypothetical maximally exposed individual (MEI) located at the boundary of the proposed PFSF, as well as to individuals who may actually be present or reside nearby. In evaluating the potential radiation doses to members of the public, it is important to examine (1) the potential pathways of exposure and (2) the potential sources of radiation. Considering each of these two matters assures that all important issues are addressed.

The potential exposure pathways at the Skull Valley site include: (1) direct exposure to radiation (neutrons and gamma rays), including skyshine, that is emitted from the storage casks, (2) exposure to radioactive material through ingestion of contaminated water or food, including plants and animals in the vicinity of the site that may be used for subsistence, and (3) exposure to radioactive material through submersion or inhalation of airborne radionuclides. The evaluation of exposures from the first route requires consideration of the radiation source (i.e., the casks). Exposures from the second and third routes require that some radioactive material escape from the casks and the proposed PFSF. Given the PFS start clean/stay clean philosophy (i.e., PFS plans to reject and return canisters that have unacceptable external contamination), as well as the fact that no canisters would be opened at the proposed PFSF, and considering the engineered features of the canister/cask, there appears to be no viable mechanism by which significant radioactive materials would migrate off-site, or even away from the casks. Thus, while the latter two exposure routes are possible, radioactive material is unlikely to be available for ingestion or inhalation via those pathways during normal conditions, and hence, there is no opportunity for impacts from these pathways.

For this analysis, under normal conditions, the casks are assumed to maintain confinement of radioactive material under normal conditions. The lid of the dual purpose canister is double sealed, and consists of a closure lid to shell weld (lid-to-shell) and a closure ring to shell weld (ring-to-shell). In order for a leak to the environment to occur, both the primary and secondary welds must be leaking. Because the confinement boundary is welded and the temperature and pressure of the canister are within the design limits, no discernible leakage is credible (NRC/SER). In view of the above, direct radiation, including skyshine, from the casks would be the only source of radiation to members of the public as a result of normal operations. Accordingly, the balance of this discussion considers the

doses attributable to the first pathway (i.e., direct radiation). The storage casks would emit direct radiation in the form of gamma rays and neutrons from the SNF sealed inside the canister. Radiation levels for the HI-STORM casks estimated by PFS are presented in Chapter 2, Table 2.6 for both surface contact and at a distance of 1 m (39 inches).

Doses at the nearest boundary. Dose rates for locations on the boundary of the OCA (see Figure 2.1) were presented by PFS for the HI-STORM cask design. The location that would result in the maximum exposure for a person at the boundary of the facility is to the north at a distance of 600 m (2,000 ft) from the boundary of the RA, which is 646 m (2,120 ft) from the storage pads. For the purposes of analysis, it was assumed that the PFSF consisted of an array of 4,000 HI-STORM storage casks each containing 40,000 MWD/MTU burnup and 10-year cooled PWR SNF. PFS has indicated that the average or typical SNF expected to be stored at PFSF would be PWR fuel having a 35,000 MWD/MTU burnup and 20 years cooling time. Such SNF would result in lower doses than the SNF assumed in this analysis. PWR fuel was assumed because PFS determined that the contact dose rates on top and at the duct openings of a HI-STORM storage cask containing PWR fuel are higher than those of HI-STORM casks containing BWR SNF (PFS/SAR 2001).

Assuming an individual works at the fence boundary at some time in the future, as much as 2,000 hours a year could be spent at this location. For an assumed annual 2,000 hours of exposure to a hypothetical individual at this location, the maximum annual dose to this individual would be 0.0585 mSv (5.85 mrem) (PFS/ER 2001). Doses to real individuals farther from the OCA, or who spend less than 2,000 hours at the boundary, would be smaller. The estimated 0.0585 mSv (5.85 mrem) dose is less than the 0.25 mSv (25 mrem) regulatory limit specified in 10 CFR 72.104 for the maximum permissible annual whole body dose to any real individual. The 0.0585 mSv/yr (5.85 mrem/yr) dose corresponds to slightly less than 2 percent of the natural background radiation dose in the United States of 3.0 mSv/yr (300 mrem/yr) (see Table 3.18). Using ICRP (1991) risk factors relating dose and LCF[1] risk for members of the public [i.e., 5×10^{-5} LCF/mSv (5×10^{-7} LCF/mrem)], the 0.0585 mSv/yr (5.85 mrem/yr) dose corresponds to an annual LCF risk of about 3×10^{-6} or about one chance in three million of developing a fatal cancer from one year of operations for an individual at the OCA boundary.

Dose to the nearest resident. The nearest resident is approximately 3.2 km (2 miles) east-southeast of the proposed PFSF site. At large distances, absorption and attenuation of radiation in the air becomes an important factor. Assuming a resident spent 8,760 hours (an entire year) at the location without shielding by the residence or other structures such as the flood protection berms, the computed annual dose would be 0.000356 mSv (0.0356 mrem) (PFS/ER 2001), which is smaller than the 0.25 mSv (25 mrem) regulatory limit specified in 10 CFR 72.104 for the maximum permissible annual whole body dose to any real individual. The 0.000356 mSv/yr (0.0356 mrem/yr) dose corresponds to about 0.01 percent of the natural background radiation dose in the United States. In addition, the 0.000356 mSv (0.0356 mrem) dose corresponds to an annual LCF risk of about 2×10^{-8} or two chances in 100 million of developing a fatal cancer from the maximum radiation exposure for an individual located at the nearest residence resulting from one year of operations.

[1]A latent cancer facility (LCF) is a measure of risk associated with exposure to ionizing radiation. For a detailed interpretation of numerical LCF values, the reader is referred to the discussion contained in the dialogue box in Section 3.7

4.7.2.2 Estimated Dose to Occupational Personnel

Workers at the PFSF would perform occupational tasks that can be grouped into four categories: (1) handling (i.e., receiving, transferring, and moving) of the SNF canisters and casks; (2) security, inspection, and maintenance activities; (3) administration and management; and (4) facility construction.

Category 1. PFS estimates that approximately 12 workers would be involved in Category 1 tasks: four for maintenance/operation activities, four for electrical activities, and four for radiation protection/health physics. Estimates of radiation dose to these workers have been made using time/motion studies. These studies are a part of PFS's ALARA (i.e., as low as reasonably achievable) dose reduction program. Occupational radiation exposures were estimated for the HI-STORM cask during the receipt of the shipping cask, transfer of the canister from the shipping cask to the storage cask (using a transfer cask), movement of the storage cask to the pad, and placement of the cask on the pad. The estimated dose rate values included both neutron and gamma contributions for fuel compositions considered to be representative of typical fuels. Details of the dose-task relationships can be found in Table 7.4-1 of PFS's SAR (PFS/SAR 2001).

Per individual canister, a collective dose of about 0.0025 person-Sv (0.25 person-rem) is estimated. The person-Sv (person-rem) is an expression of the collective dose equivalent exposure to a number of individuals doing different tasks. Based on the projected receipt of 200 casks annually, the total collective annual dose equivalent for Category 1 tasks is estimated to be approximately 0.49 person-Sv/yr (49 person-rem/yr). This yields an average of 0.0408 Sv/yr (4.08 rem/yr) for each of the 12 individuals. This dose is below the 0.05 Sv/yr (5 rem/yr) total effective dose regulatory limit specified in 10 CFR 20.1201(a) for occupational exposure. This dose equates to an LCF risk of 0.0016 per individual or about one chance in 600 of developing a fatal cancer from one year of operations. Because these exposures do not exceed NRC regulatory guidelines for workers, the staff finds the impacts to be small. In addition, the applicant's ALARA program would likely reduce the doses described above (see Section 4.7.4).

Category 2. The Category 2 tasks include inspection, maintenance, and security. PFS indicates that approximately 15 people would be involved in inspection and maintenance tasks. These tasks would take place inside the restricted-access area and would include cleaning of debris from inlet ducts, daily monitoring of temperatures of the casks, and quarterly inspections. These duties would be performed by the same 12 workers that perform Category 1 tasks, as well as 3 other persons. These inspection and maintenance tasks would result in a total collective dose equivalent of 0.037 person-Sv (3.7 person-rem) annually or approximately 0.0025 Sv/yr (0.25 rem/yr) for each of the 15 people. An annual dose of 0.0025 person-Sv (0.25 person-rem) equates to an LCF risk per individual, of 0.0001 or one chance in 10,000 of developing a fatal cancer from one year of operations.

Information in PFS's Environmental Report suggests that there would be some overlap of personnel between Category 1 tasks and Category 2 tasks. For the purpose of developing an upper bound dose estimate in this FEIS, the dose calculations in the remainder of this paragraph are based on the assumption that all 12 Category 2 workers performing inspection and maintenance tasks would receive the combined Category 1 and Category 2 doses as described in the preceding paragraphs. That is, the 12 workers that perform both the Category 1 and Category 2 inspection and maintenance tasks are assumed to each receive an average of 0.0433 Sv/yr [4.33 rem/yr (i.e., 4.08 + 0.25 rem/yr)]. This corresponds to an LCF of 0.0017 per individual (about one chance in 580). The summed doses are within NRC regulatory guidelines for occupational exposure; hence, the impacts are small.

The final Category 2 task involves security. Based on 4,000 storage casks, the radiation dose rate at the closest point outside of the restricted-access area (where security personnel will provide inspections) is in the range of 0.01 mSv/hr (1 mrem/hr). With multiple inspections each day, the security force is expected to accumulate approximately 0.006 person-Sv (0.6 person-rem) annually.

The total collective dose resulting from all Category 2 tasks (i.e, inspection, maintenance, and security) would be 0.043 person-Sv [4.3 person-rem (i.e., 3.7 + 0.6 person-rem)] annually (PFS/SAR 2001). Because these exposures do not exceed regulatory levels, the impacts are small. The 0.043 person-Sv (4.3 person-rem) dose corresponds to an annual LCF risk, as shared among all Category 2 workers, of about 0.0017 or about one chance in 580 of some Category 2 workers developing a fatal cancer from one year of PFSF operations.

Category 3. The next category involves tasks that are primarily associated with administrative functions. These workers would be located in buildings generally 600 m (2,000 ft) or more away from the restricted-access area and the buildings in which they work would provide shielding for them. Individual dose rates are anticipated to be below 0.25 mSv/yr (25 mrem/yr), not taking into account building shielding (PFS/SAR 2001). This upper limit dose to administrative personnel is about 8 percent of the natural background radiation dose in the United States (see Table 3.18) and would represent an annual LCF risk of about 1×10^{-5} or about one chance in 100,000 of developing a fatal cancer from one year of operations.

Category 4. During Phase 1 construction, the construction workers will have no exposure from storage casks because there will be none delivered until after Phase 1 is completed. However, during Phases 2 and 3 of construction, there will be storage casks on some of the pads while the construction workers prepare the additional storage pads. PFS estimates (PFS/ ER 2001) the dose to an individual worker during Phase 2 as 0.23 mSv/yr (23 mrem/yr), which corresponds to an LCF of 9.2×10^{-6} or about one chance in 109,000. For a work crew of 43 people, the collective dose would be about 0.01 person-Sv/yr (1.0 person-rem/yr). The exposure during Phase 2 construction is well within NRC dose limits and is small.

During the first half of Phase 3 construction, the estimated dose to an individual worker is 1.89 mSv/yr (189 mrem/yr), which corresponds to an LCF of 7.6×10^{-5} or about one chance in 13,000. For a work crew of 43 people, the collective dose would be about 0.081 person-Sv (8.1 person-rem). The exposure during the first half of Phase 3 construction is well within NRC dose limits and is small.

During the second half of Phase 3 construction, the workers would be relatively near stored casks. The estimated dose to an individual worker during the second half of Phase 3 is 0.00345 Sv/yr (0.345 rem/yr), which corresponds to an LCF of 0.00014 or about one chance in 7,200. For a work crew of 43 people, the collective dose would be about 0.148 person-Sv (14.8 person-rem). The exposure during the second half of Phase 3 construction is well within NRC dose limits and is small.

4.7.2.3 Estimated Doses from Off-Normal Operations and Accidents

Off-normal operations and accidents could potentially result in members of the general public being exposed to additional levels of radiation or radiological effluents, beyond those associated with routine operations. The potential radiological impacts of off-normal operations and accidents are presented and discussed in this section. As set forth below, radiological impacts from credible off-normal operations and accidents at the proposed PFSF are considered to be small.

The analyses presented in this FEIS are not intended to substitute for a detailed safety analysis or accident/risk assessment. A more detailed examination is included in the NRC staff's final SER, as updated. The NRC staff, as documented in the SER, evaluated the effects on the proposed PFSF of natural phenomena, including earthquakes, flooding, high winds, and tornados of the maximum severity expected at the proposed site during the lifetime of the facility. These events bound all of the natural phenomena expected to occur at the proposed PFSF. As set forth in the SER, for all such events, the proposed design for the PFSF provides reasonable assurance that radiation exposures would remain within NRC limits.

As is also described in the SER, the probability that natural phenomena would be more severe than those events evaluated is extremely low; such events at the proposed PFSF are not credible during the lifetime of the facility. Because these events are not credible, they are not considered in this FEIS. The information evaluated in this section is based on data provided by PFS. The analyses summarized in this FEIS are intended only to identify and bound the types of environmental impacts that could accompany off-normal operations or credible accidents.

Four categories of design events have been identified by PFS to aid in the examination of requirements for satisfying operational and safety criteria. The four categories are:

- Design Event I; an event associated with normal operations.
- Design Event II; an event associated with off-normal operations that can be expected to occur with moderate frequency, or on the order of once during a calendar year of operation of the proposed PFSF operations.
- Design Event III; an infrequent event that could be reasonably expected to occur over the lifetime of the proposed PFSF.
- Design Event IV; an event that is not reasonably expected to occur during the lifetime of the PFSF but is postulated to occur because it establishes a conservative design basis for systems, structures, and components important to safety.

Doses from the Design Event I scenarios are included for worker categories 1 through 4, above. Off-site doses to members of the general public would be lower than the doses to on-site workers. Hence, the analyses presented in this section focus on the last three design event categories because of the potential larger magnitude of the consequences of such events.

Design Event II. A Design Event II includes scenarios that result in a loss of external electrical power, off-normal ambient temperatures, partial blockage of storage cask air inlet ducts, operator error, and off-normal contamination release. Of these events, only partial blockage of the storage cask inlet ducts and a postulated release of removable surface contamination were found to result in an additional dose to either workers or the public. These two events are discussed below.

In the event of a partial blockage of the inlet ducts of a storage cask, facility personnel would be required to remove the debris or other foreign material blocking the duct(s). It is assumed that a single worker kneeling with hands on the inlet duct would require 30 minutes to clear the ducts. Assuming the highest dose rates associated with a storage cask containing SNF, a worker could accrue approximately 0.193 mSv (19.3 mrem) to the hands and forearms and 0.293 mSv (29.3 mrem) to the chest and body from the subject storage cask and the adjacent casks, in addition to doses the worker would receive during normal operations. These dose estimates remain below the annual regulatory limit of 5 rem for workers. No additional doses would result to members of the public from this event.

The other Design Event II involves the postulated release of removable surface contamination from the exterior of a fuel-containing canister into the environment. The analysis conservatively assumes that removable contamination at a level of 1×10^{-4} μCi/cm^2 covers the entire external surface of a canister and that the entire amount of removable external surface contamination is released to the atmosphere in the single Design Event II; however, this amount is significantly higher than is anticipated for canisters that would be received at the proposed PFSF. This is because only a small portion, if any, of the canister's exterior would have any removable contamination due to the preventive measures used during underwater loading at the originating nuclear power plant. In addition, the originating nuclear power plant would decontaminate the exterior of canisters to acceptable levels prior to shipment, and PFS would detect and return any canisters with unacceptable removable contamination levels upon receipt of the canisters at the PFSF (in a leak- tight HI-STAR shipping cask). PFS would also employ decontamination methods that would confine radioactive material as dry waste under a postulated off-normal condition. Therefore, the amount of removable contamination available for hypothetical release under off-normal conditions would be significantly less than the amount assumed by PFS.

For this event, PFS's ER examines a hypothetical individual located 500 m (1,640 ft) downwind from the release point. In addition, the most unfavorable meteorological conditions are assumed, and the dominant radioactive isotope released is assumed to be Cobalt-60 (Co-60). Co-60 is assumed because any contamination on the exterior surface of the canister is likely to come from the radioactive particulates suspended in the spent fuel pool water. At the time of loading, most of the particulates in the pool are the long half-life corrosion products from SNF surfaces that might dislodge during SNF movement. The most prominent particulates are Co-60, Co-58, Iron-55, Iron-59, Manganese-54, Chromium-51, and Zinc-65. Of these products Co-60 has the highest inhalation dose conversion factor and half life (5.27 years) (PFS/SAR 2001). For these conditions, the individual exposed at 500 m (1,640 ft) would receive a total effective dose equivalent of 0.000044 mSv (0.0044 mrem) and a committed dose equivalent to the lungs (the maximally exposed body organ) of 0.000255 mSv (0.0255 mrem). For on-site personnel, located 150 m from the release point, the total effective dose equivalent would be 0.0003 mSv (0.03 mrem), and the committed dose equivalent to the lungs would be 0.002 mSv (0.2 mrem). The staff considers these conservative dose estimates for this postulated off-normal condition to be insignificant because these dose levels are generally undetectable and well below regulatory dose limits in 10 CFR 72.104 (by approximately three to four orders of magnitude). Therefore, the staff finds the radiological impacts from these off-normal conditions to be small.

Design Events III and IV. For the purposes of analysis, no distinction is made between Design Events III and IV. Design Event III and IV include events such as earthquakes; tornadoes and missiles generated by natural phenomena; floods; fire (including wildfires; see Section 4.8.4) and explosions; storage cask drop or tip-over; loss of shielding; adiabatic heatup resulting from 100 percent blockage of air inlet ducts; and lightning. The NRC staff has concluded that two events (i.e., extreme winds and 100 percent air duct blockage) might create situations in which PFSF personnel could be exposed to higher levels of radiation than normal. No credible accident scenarios, however, would result in release of radiological material (including airborne radioactive materials). However, for the purposes of demonstrating compliance with 10 CFR 72.106(b), a hypothetical accident that results in an off-site release was analyzed. These events are discussed in the following paragraphs. A discussion of other accident events can be found in PFS's SAR.

Extreme winds in combination with debris (or missiles) from a design basis tornado [i.e., maximum wind speeds of 380 km/hr (240 mph); see PFS/SAR 2001] are not capable of overturning a storage cask or of damaging a canister within a storage cask, therefore, no radioactivity would be released. However, as concluded in the HI-STORM SAR (HOLTEC 2000), a design missile could cause a localized reduction in shielding resulting in increased dose rates on contact but would have a negligible effect on the dose at the OCA. PFS states that it would examine the HI-STORM storage cask to determine the extent of damage. If required, the canister would be transferred to another HI-STORM storage cask and the damaged cask repaired or permanently removed from service. Removal of the dual-purpose canister from the storage cask and placing it in a new cask would result in a dose of about 2.47 person-Sv (247 person-mrem).

On-site workers might also receive a dose during the removal of debris or other foreign material that created a 100 percent blockage of the inlet air ducts on a storage cask. A partial blockage was discussed above under Design Event II. The radiation dose to the worker who removes the 100 percent blockage is estimated to be double the dose estimated for the partial blockage case; hence, for the 100 percent blockage case, the dose to the worker would be 0.586 mSv (58.6 mrem) to the hands and forearms and 0.386 mSv (38.6 mrem) to the chest, which is below acceptable regulatory limits even when combined with normal worker doses.

Canister leakage under hypothetical accident conditions is not considered to be a credible event. Nevertheless, to demonstrate compliance with 10 CFR 72.106(b), a bounding calculation was performed. For this calculation, a leak rate of 1×10^{-4} cm^3/s is postulated and is assumed to remain undetected for 30 days, as well as 100 percent fuel rod failure. The leak rate assumed exceeds the vendor's calculated leak rate of 1.25×10^{-5} cm^3/s (at 843°K, 9.5 atm) for the HI-STORM storage cask. A suite of over 20 radionuclides is assumed to escape in the leak. The primary exposure mechanism would be inhalation of the leaking material. The resulting total effective dose equivalent (TEDE) to the exposed individual at the OCA boundary [approximately 500 m (1,640 ft) from the Canister Transfer Building] downwind from the leak for 30 days would be about 0.76 mSv (76 mrem). The maximum organ dose, 8.24 mSv (824 mrem), is the committed dose equivalent to the bone surface plus the dose for submersion in the plume. This dose is well below the regulatory dose limit for accidents in 10 CFR 72.106 [i.e., 50 mSv (5,000 mrem) for accidents]. Therefore, any individuals located at or beyond the nearest OCA boundary would not receive a dose that exceeds the regulatory limit.

For an evaluation of the potential doses from environmental pathways following deposition of material in the plume from the same hypothetical loss-of-confinement accident described in the preceding paragraph, the RESRAD computer code was used. The RESRAD analysis involves the hypothetical deposition of radionuclides from the atmospheric plume and the subsequent direct exposure to contaminated ground, inhalation of resuspended radioactive particles, ingestion of milk and beef following grazing in contaminated areas, and inadvertent ingestion of soil. The assumed exposure scenarios are considered to be conservative, given the current land use and conditions adjacent to the boundary of the proposed PFSF [i.e., at the 500 m (1,640 ft) downwind location]. The dominant exposure pathway was found to be contaminated land, with the radionuclide Co-60 being the largest contributor to dose. The resulting exposures from the assumed deposition of all radionuclides via all environmental pathways were total effective dose equivalents of 0.027 mSv/yr (2.7 mrem/yr) at 500 m (1,640 ft). This value is well below the dose limits established for accidents in 10 CFR 72.106; hence, the potential impacts would be small.

The NRC staff, has concluded that there are no credible mechanisms (either from off-normal operations or from hypothetical accidents) that would result in the release of radioactive SNF contents, including airborne radioactive material, into the environment. The only credible exposure scenarios are associated with worker exposures to direct radiation during cleaning of the storage cask vents or replacing a cask damaged by windborne debris. Such exposures would be small and would be administratively controlled to further reduce the exposure levels; hence, the potential impacts would be small.

Seismic Analysis. PFS provided an in-depth analysis in its license application that considered the ground faults in the vicinity of the site and other information relevant to seismic characteristics of the proposed facility design. PFS has requested an exemption from the NRC's seismic requirements specified in 10 CFR 72.102 that are based on deterministic methods. PFS requested, instead, to demonstrate that the proposed PFSF would be safe in a seismic event by using a probabilistic seismic hazard analysis (PSHA) to analyze potential seismic activity at the proposed PFSF. The NRC staff evaluated the exemption request and the supporting analysis and found that the applicant's method adequately considered the seismic factors at the proposed site and demonstrated that a seismic event would not pose an undue risk to public health and safety. The NRC staff also found that there is sufficient basis to grant the requested exemption if it issues a license for the proposed facility.

The NRC staff evaluation of the PFS seismic analysis is documented in Chapters 2 and 15 of the safety evaluation report, as updated. As discussed in Section 15.1.2.6 of the SER, the staff evaluated the PFS analysis of potential earthquake hazards (seismic events) at the PFS site and performed confirmatory analyses. It was determined, using a PSHA, that an earthquake event could result in a maximum ground acceleration of 0.711 g horizontally and 0.695 g vertically (1.0 g equals the acceleration from earth's gravity) within a given 2,000-year period at the site. PFS's accident analysis assuming this design basis earthquake and maximum ground acceleration was evaluated for the structures, systems, and components important to safety at the proposed PFSF (i.e., canister, concrete storage cask, transfer cask, lifting devices, canister transfer building, canister transfer overhead bridge crane, canister transfer semi-gantry crane, seismic struts, and cask storage pads) and considered both cask handling operations in the canister transfer building and storage operations on the pad. The analysis considered the stability of the cask storage pad, canister transfer building, and storage casks during the design basis earthquake. The analysis also assumed that the design basis earthquake could take place during any stage of facility operations such as canister or cask transfer activities.

PFS determined and the NRC staff confirmed from these analyses that the proposed PFSF and storage cask are adequately designed to withstand this maximum ground motion based on a 2,000-year return period. The storage canisters containing the SNF would remain intact during the design basis earthquake and therefore would not result in a release of radioactive material. Therefore, the staff concluded that there is no additional radiological impact from the proposed PFSF due to the occurrence of the design basis earthquake.

4.7.3 Impacts at the Alternative Site (Site B) in Skull Valley

The radiological impacts of constructing and operating the proposed PFSF at Site B would not be appreciably different than those described in Section 4.7.2 for Site A. While Site B is approximately 0.8 km (0.5 mile) closer to the nearest resident and would result in a slightly higher radiological dose to that resident, the difference is negligible.

4.7.4 Mitigation Measures

No additional mitigation measures would appreciably reduce the small radiological impact to the general public from routine operation of the proposed PFSF. Operations involving transfer of the canister and subsequent movement of the storage cask to its storage pad destination will require additional ALARA planning if PFS employs the small labor force suggested in its ER. The staff's assessment is that the upper bound dose estimate of 0.043 Sv/yr (4.3 rem/yr) for each of the 12 Category 2 workers (see Section 4.7.2.2) would require careful efforts to keep each worker's dose below the 0.05 Sv/yr (5 rem/yr) limit in 10 CFR 20.1201(a) for occupational exposure. In actual practice, individual doses to occupational personnel would be administratively controlled to ensure that they are maintained below the 0.05 Sv/yr (5 rem/yr) total effective dose equivalent occupational limit.

The occupational dose limit for workers of 5 rem/yr is based on consideration of the potential for delayed biological effects. The regulatory limit, together with application of the concept of keeping occupational doses ALARA, provides a level of risk of delayed effects considered acceptable by the NRC. Occupational doses to workers at the proposed PFSF could be maintained ALARA by means of active programs that involve administrative controls, engineering controls, measurements, and training. The PFSF Radiation Protection Manager would be responsible for administering the radiation protection program and for the radiation safety of the PFSF.

Finally, 10 CFR Part 20 requires that actual measurements of dose would be made as work is performed. Actual doses would be compared with estimated doses, as well as the dose limits in 10 CFR 20.1201(a), for both specific procedures and individuals, and administrative guidelines would be used to determine when corrective action should be taken to reduce doses for either specific individuals or for specific tasks. Radiation protection programs for the proposed PFSF are discussed in Section 7 of PFS's SAR (see PFS/SAR 2001). Radiation protection is evaluated in Chapter 11 of the NRC staff's SER, as updated.

4.8 Other Impacts

4.8.1 Noise

4.8.1.1 Noise During Construction

Noise impacts would result from construction equipment and earthwork activities, as well as from additional traffic associated with construction. Earthwork and excavation can generate noise levels up to 95 decibels (dB) in the A range of frequencies [dB(A)], which corresponds to the frequency range of human hearing. This noise level applies at a reference distance of 15 m (50 ft) from the source. Noise levels decrease by about 6 dB(A) for each doubling of distance from the source, although further reduction occurs when the sound energy has traveled far enough to have been appreciably reduced by absorption into the atmosphere. Absorption depends strongly on the frequency of the sound. Low frequencies often associated with construction equipment are typically absorbed at a rate of around 1 dB(A) per km (Campanella 1992).

Construction-related noise levels would be expected to be less than 48 dB(A) in the ambient air at the nearest residences. A noise level of 45 dB(A) has been identified by EPA (1974) as a guideline value for protection from indoor activity interference and annoyance in locations, such as schools, where quiet is a basis for use. That is also about the same as the outdoor background given for a "quiet

suburban street" (EPA 1978). Therefore, noise from construction activity would not be expected to be annoying for residents located inside the nearest houses.

Increased traffic associated with construction activities could increase noise levels along Skull Valley Road by 5 dB(A), leading to noise levels as high as 69 dB(A) within 15 m (50 ft) of the road during peak traffic volume; at least two residences are included in this area (PFS/ER 2001). However, the area along Skull Valley Road is almost entirely undeveloped; therefore, community noise impacts in the area are expected to be small. The noise levels involved during peak traffic are in the range where noise can become highly annoying, and an increase of 5 dB(A) could be judged a moderate impact by some individuals. Probably of more importance would be the substantial increase in construction-related traffic throughout the day in this normally quiet area. Therefore, the temporary increase in noise associated with construction traffic would produce moderate impacts along the immediate vicinity of Skull Valley Road.

4.8.1.2 Noise During Operations

Noise resulting from operation of the proposed PFSF would be primarily from mobile sources associated with the delivery of casks. The loudest potential noise source would be a diesel switch engine operating on site. Momentary noise from routine operation could exceed 100 dB(A). Train whistles are often audible at distances greater than 1.6 km (1 mile); however, at greater distances the absorption of sound energy by the atmosphere is no longer negligible, and noise decreases by more than 6 dB(A) for each doubling of distance from the source, especially in the higher frequencies corresponding to a whistle (Campanella 1992). Nonetheless, a train whistle from an on-site switch engine would almost surely be audible at the nearest residence. Low-frequency noise from routine operation of a diesel locomotive is not likely to exceed the 45-dB level recommended by EPA for protection from activity interference or annoyance at indoor locations such as schools. However, outdoor sound levels would not be attenuated by structural features such as walls and windows. For brief periods of locomotive acceleration during movement of a cask, outdoor sound levels at distances of up to about 1.6 km (1 mile) from the source might occasionally exceed the 55-dB level recommended by EPA for protection from activity interference or annoyance at outdoor locations. However, it is not expected that the outdoor noise would be typically noticeable at the nearest residence. The exact noise level, and whether it would be noticeable would depend on several factors, including wind direction and background noise levels at the time. Because the locomotive would be expected to operate only a few hours per week, indoor and outdoor noise impacts are expected to be very small. Given the small magnitude of the noise impacts discussed above, no mitigation measures are warranted.

During construction, noise levels at the nearest residence would be only about 1 dB(A) louder if construction occurred at Site B instead of Site A; therefore, there are no distinguishable differences between the two sites in regard to construction noise impacts. Noise impacts resulting from normal operation of the proposed facility would be small at either Site A or Site B.

4.8.2 Scenic Qualities

Construction and operation of the proposed PFSF would change the scenic quality of Skull Valley by introducing an industrial presence into a largely undeveloped landscape. Facility construction would create the short-term visual impacts of additional dust from the operation of heavy equipment on-site and additional vehicle traffic on Skull Valley Road. Facility operation would create long-term visual impacts through the contrast of a large industrial facility with the surrounding landscape, the contrast

of security lights with the surrounding darkness at night, and the generation of additional vehicle traffic as workers commute to and from the facility on Skull Valley Road.

The proposed action appears consistent with the BLM classification of the surrounding landscape. Nonetheless, changes in the scenic quality of the landscape would represent small to moderate impacts to recreational viewers, residents of Skull Valley, and motorists traveling Skull Valley Road. The following analysis explains the reasons for these conclusions.

4.8.2.1 BLM Perspective

The BLM administers 56 percent of the land within 8 km (5 miles) of the proposed PFSF site. The BLM evaluates the scenic quality of the land it administers through a "Visual Resource Inventory," the objective of which is "to manage public lands in a manner which will protect the quality of the scenic (visual) values of these lands" (BLM 1984). Through such inventories, BLM classifies land into one of four categories depending on visual resource objectives (BLM 1986):

- Category I: Preserve the existing character of the landscape.
- Category II: Retain the existing character of the landscape.
- Category III: Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- Category IV: Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt would be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Although the BLM does not administer the land on which the proposed PFSF would be located, most of the BLM lands in Skull Valley are classified as Category IV, the lowest category in terms of scenic values. Thus, from the BLM perspective, the proposed PFSF would be consistent with the Category IV classification, which allows for "high" levels of changes to the characteristic landscape.

4.8.2.2 Visual Analysis

To assess the visual impacts of the proposed PFSF, the most important visual resources in the project vicinity were evaluated. This was accomplished through a site visit and the use of photographs, maps, and the checklist included here as Figure 4.2. The important visual resources identified are primarily the undeveloped scenic qualities of the valley and the surrounding Stansbury and Cedar Mountains; these are discussed in Section 3.8.2.

Next, the groups of viewers who would be most affected by visual impacts based on their proximity and exposure to the proposed PFSF and their perceived sensitivity to changes in the surrounding landscape were identified (see Figure 4.2). The significance of potential visual impacts to the three primary groups identified–recreationists, local residents, and motorists on Skull Valley Road were then evaluated.

I. Description of Existing Visual Environment

1. Area surrounding project site can be identified by one or more of the following items:

	Within 1 mile	
Essentially undeveloped	Yes G	No G
Forested	Yes G	No G
Agricultural	Yes G	No G
Suburban residential	Yes G	No G
Industrial	Yes G	No G
Commercial	Yes G	No G
Urban	Yes G	No G
River, lake, pond	Yes G	No G
Cliffs, overlooks	Yes G	No G
Designated open space	Yes G	No G
Flat	Yes G	No G
Hilly	Yes G	No G
Mountains	Yes G	No G
Other: Limited residential development related to Reservation and surrounding ranches	Yes G	No G

2. Are there visually similar projects within:

One mile	Yes G	No G
Two miles	Yes G	No G
Three miles	Yes G	No G
Adjacent	Yes G	No G

II. Degree of Project Visibility

1. Will the project be visible from outside the limits of the project site? Yes G No G

2. The project may be visible from

Site or structure on the National Register or State Register of Historic Places	Yes G	No G
Palisades	Yes G	No G
State or county park	Yes G	No G
Parkway	Yes G	No G
Interstate route	Yes G	No G
State highway	Yes G	No G
County road	Yes G	No G
Local road	Yes G	No G
Bridge	Yes G	No G
Railroad	Yes G	No G
Existing residences	Yes G	No G
Existing public facility	Yes G	No G
Adjacent property owner(s)	Yes G	No G
Other: National Forest, designated Wilderness Area, designated Wilderness study area	Yes G	No G

Figure 4.2. Visual impact identification worksheet.

3.	Will the project eliminate, block, partially screen, or detract from views or vistas known to be important to the area?	Yes G	No G
4.	Is the visibility of the project seasonal? For example, screened by summer foliage, etc. but visible fall/winter/spring?	Yes G	No G
5.	How many linear feet of frontage along a public thoroughfare does the project occupy?		0 feet
6.	Will project open new access to or create new scenic views or vistas?	Yes G	No G
7.	Does proposed project or action plan to:		
	a. maintain existing natural screening	Yes G	No G
	b. introduce new screening to minimize project visibility	Yes G	No G
	If yes, is screening: vegetative G structural G		

III. Viewing Context

Viewers will likely be in which of the following situations when the project is visible to them?

	Frequency			
Activity	Daily	Weekly	Holidays, Weekends	Seasonally
Travel to and from work	G	G	G	G
Involved in recreational activities	G	G	G	G
Routine travel by residents	G	G	G	G
At a residence	G	G	G	G
At worksite	G	G	G	G
Other: _____	G	G	G	G

IV. Visual Compatibility

1.	Are the visual characteristics of the project obviously different from those of the surrounding area?	Yes G	No G
	If yes, the visual difference is because of:		
	Type of project	Yes G	No G
	Design style	Yes G	No G
	Size (including length, width, height, number of structures, etc.)	Yes G	No G
	Coloration	Yes G	No G
	Condition of surroundings	Yes G	No G
	Construction material	Yes G	No G
	Other: exterior lighting	Yes G	No G

Source: Adapted from Smardon, Palmer, and Felleman 1986 (as presented in Canter 1996).

Figure 4.2 (continued)

4.8.2.3 Recreational Viewers

As discussed in Sections 3.8.2 and 3.8.3, recreationists in Skull Valley and in areas adjacent to the valley would be able to view the proposed PFSF. Recreationists would access areas along the Stansbury Mountain ridge using the trail to Deseret Peak. The proposed PFSF could be visible from this area (see Figures 4.3 and 4.4). Additional recreationists on BLM lands would be able to view the proposed PFSF from the Cedar Mountains or from areas within Skull Valley. The facility would also be visible to bird watchers along Skull Valley Road (see Figure 4.5).

Recreationists in the Stansbury Mountains and along Skull Valley Road would be most affected by the visual intrusion of the proposed PFSF because it would be more visible from these areas than from the Cedar Mountains or from other areas within the valley. For many recreationists, particularly those seeking wilderness experiences, a large industrial facility in the midst of a scenic and nearly undeveloped landscape would represent a noticeable contrast and a moderate visual impact.

4.8.2.4 Local Residential Viewers

The facility would be the most noticeable manmade structure visible from the Goshute Village and other residences on the Reservation (see Figures 4.6 and 4.7). Residents of the Reservation (approximately 30 persons) would be the group with the most continuous view of the facility because of their proximity. The overall significance of visual impacts to local residents, including residents in Skull Valley outside the Reservation, would likely be moderate.

4.8.2.5 Motorists on Skull Valley Road

The facility would be highly visible to motorists on Skull Valley Road (see Figures 4.5 and 4.8), with most exposures being to daily commuters connecting to Interstate 80. From Skull Valley Road, the facility would be viewed against the distant background of the Cedar Mountains to the west. The facility would not affect the more scenic views of the Stansbury Mountains and Deseret Peak to the east. The facility would be the most noticeable manmade structure from Skull Valley Road, particularly at night because of the contrast between the security lighting and the surrounding darkness (see Figure 4.8). During the day, delays resulting from increased traffic associated with facility construction and operation could also influence aesthetic perceptions. Overall, it is likely that visual impacts to motorists on Skull Valley Road would be small to moderate because most exposures would be to regular commuters who are not likely to be as sensitive to the facility's appearance as are some recreationists and local residents.

4.8.2.6 The Alternative Site (Site B) in Skull Valley

The alternative site (Site B) is located about 800 m (2,600 ft) south of the proposed site and has very similar visual qualities. Site B would be approximately the same distance from the Goshute Village and Skull Valley Road as the proposed site. Therefore, the visual impacts of constructing and operating the facility at Site B would be similar to the impacts discussed above for the proposed site.

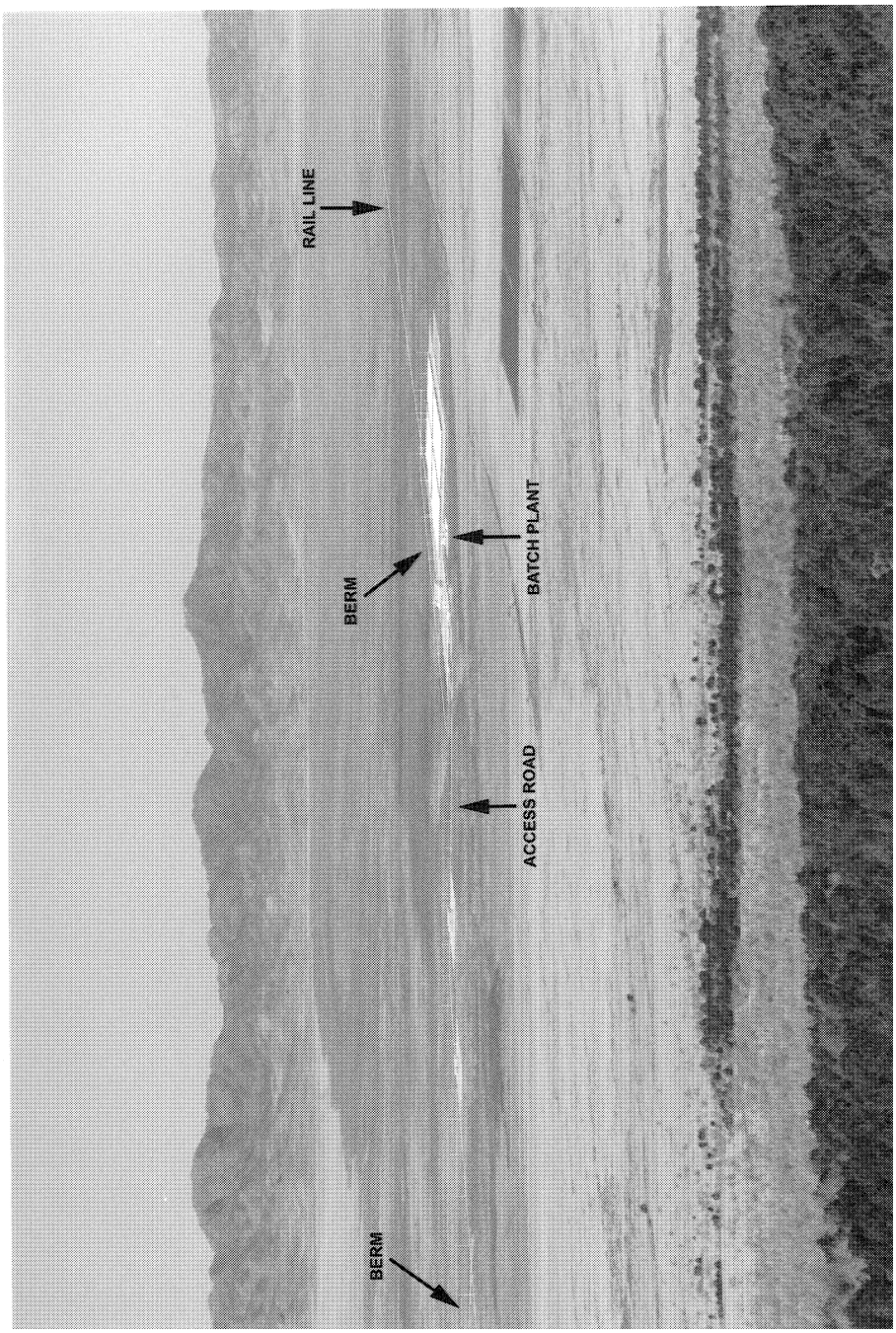

Figure 4.3. Artist's rendering of the daytime view of the proposed PFSF from Deseret Peak.

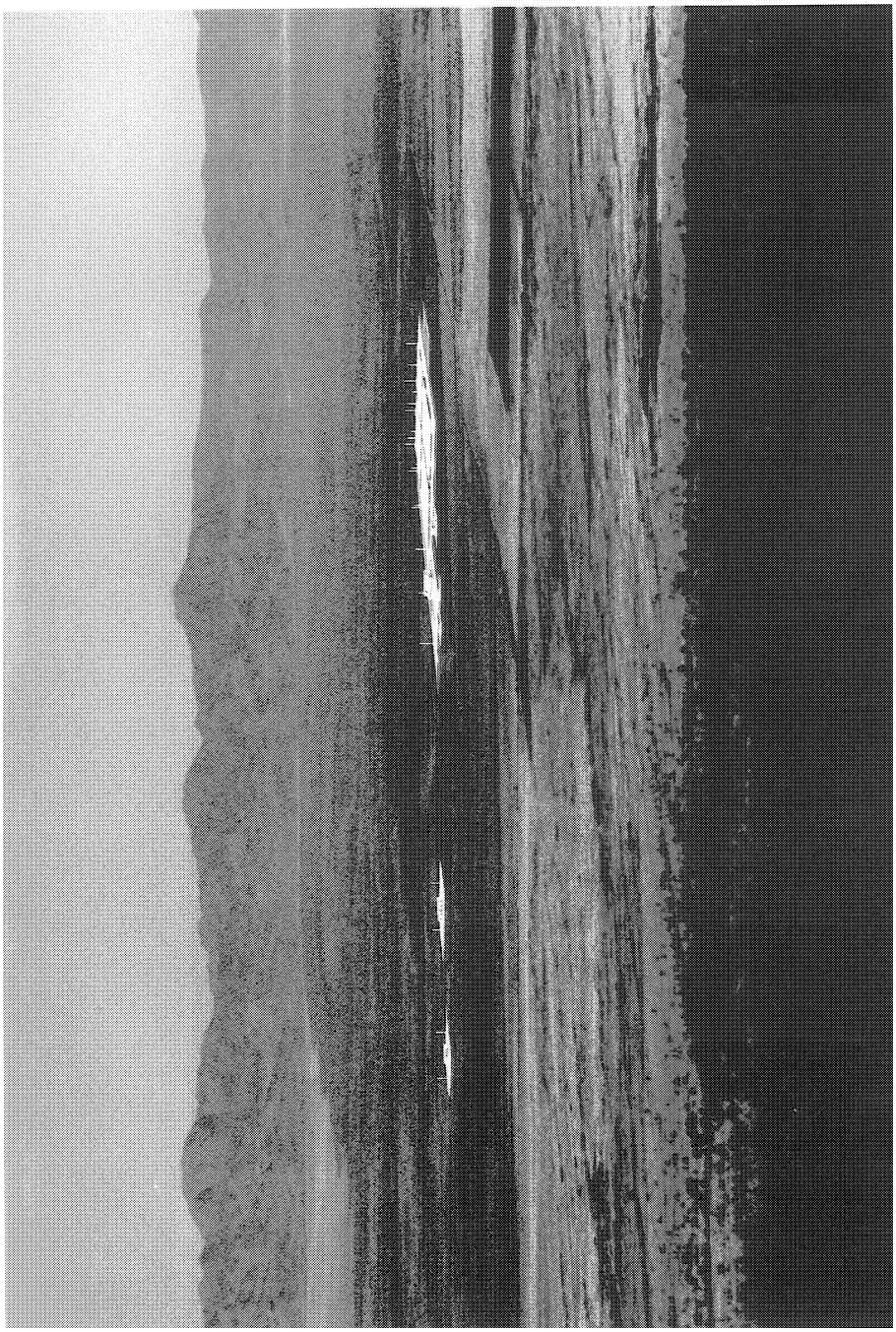

Figure 4.4. Artist's rendering of the nighttime view of the proposed PFSF from Deseret Peak.

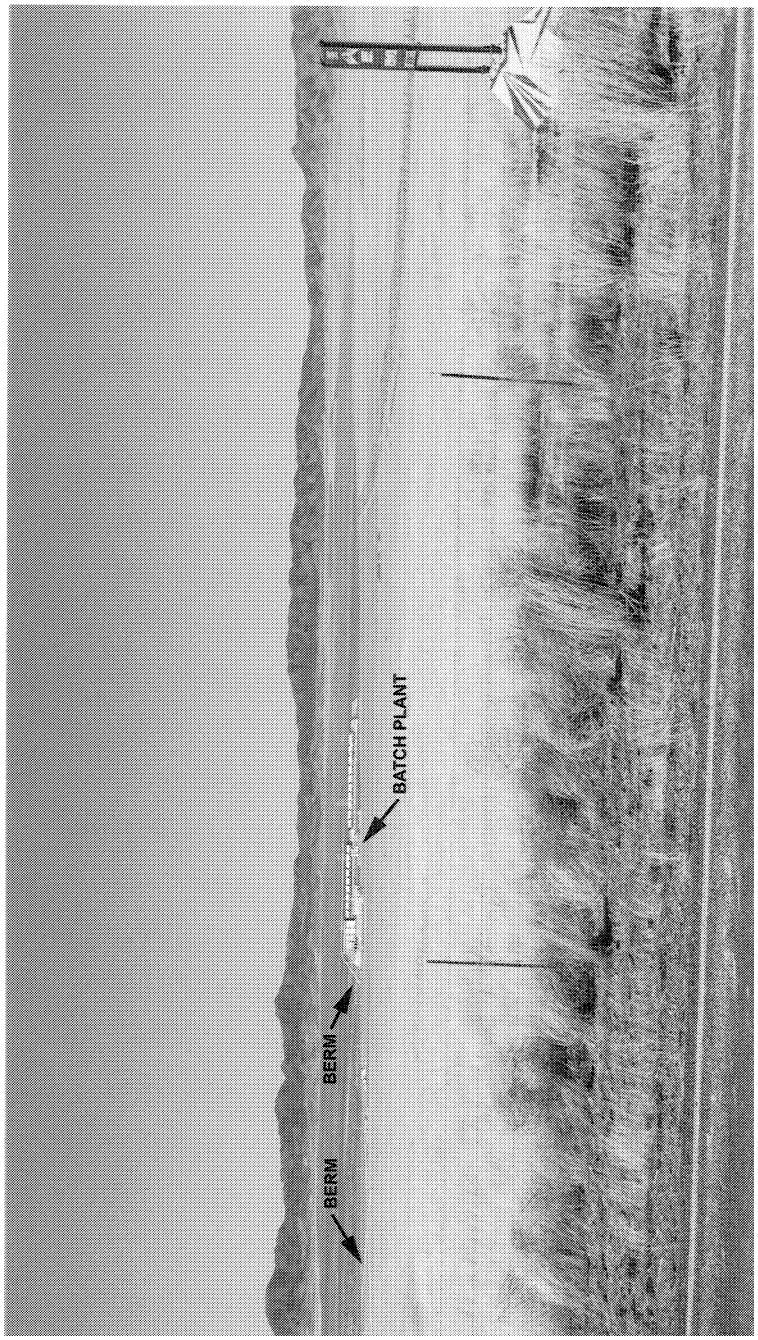

Figure 4.5. Artist's rendering of the daytime view of the proposed PFSF from Skull Valley Road.

Figure 4.6. Artist's rendering of the daytime view of the proposed PFSF from the Goshute Tribal village.

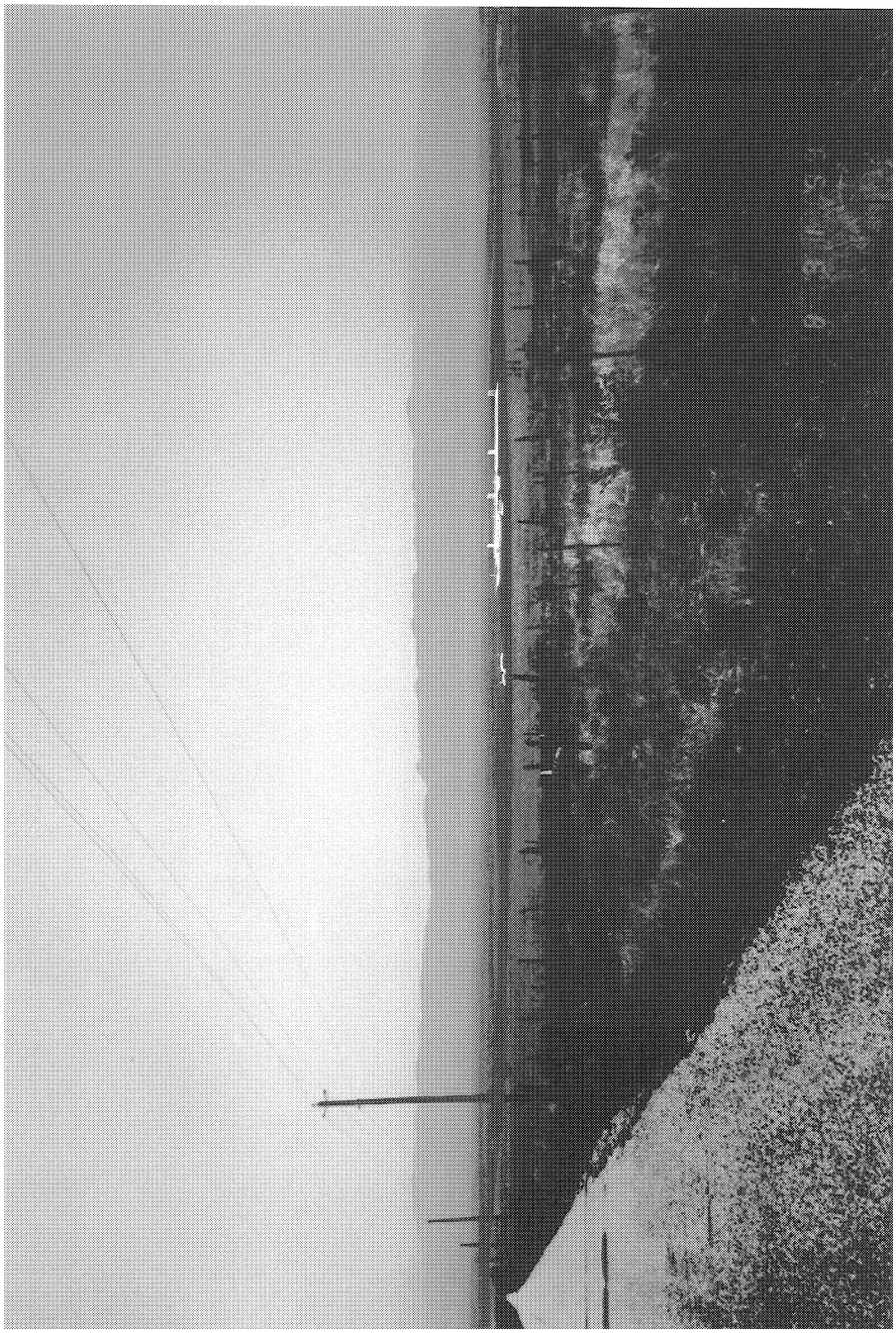

Figure 4.7. Artist's rendering of the nighttime view of the proposed PFSF from the Goshute Tribal village.

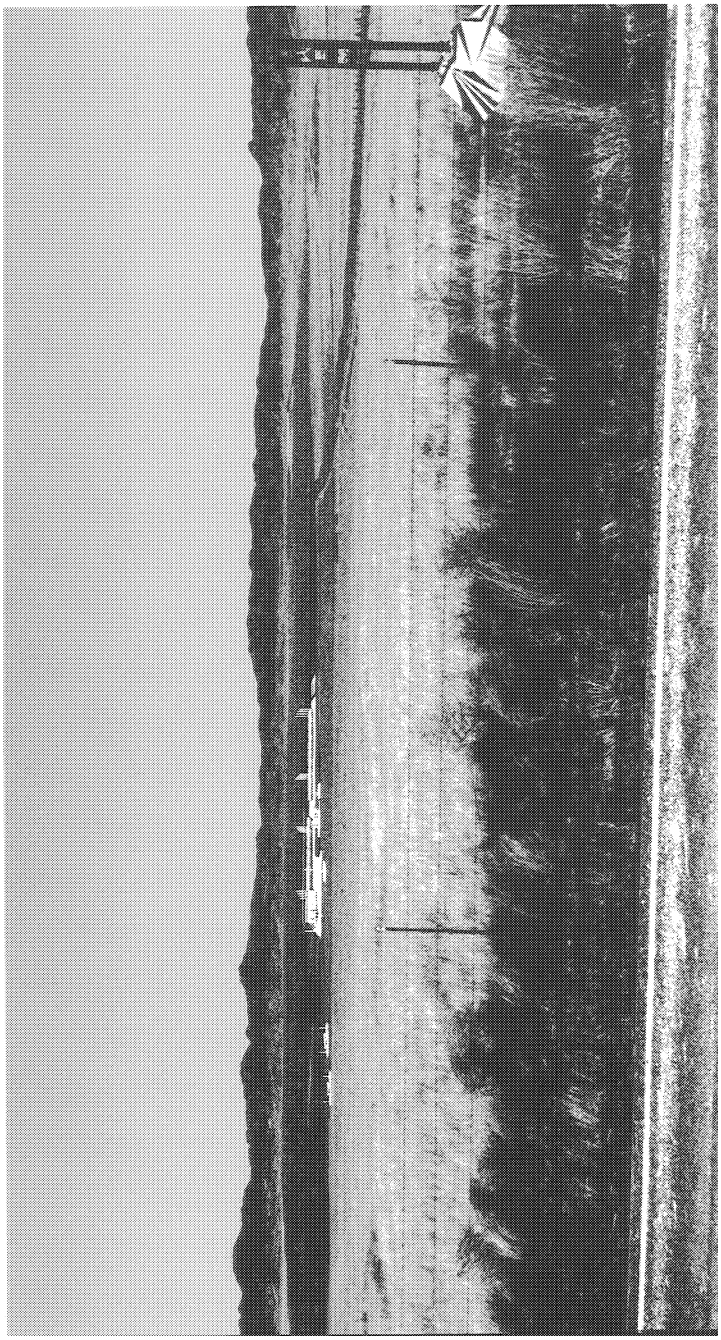

Figure 4.8. Artist's rendering of the nighttime view of the proposed PFSF from Skull Valley Road.

4.8.2.7 Conclusion Regarding Visual Qualities

Skull Valley and the mountain ranges that define the valley offer visual qualities that are very appealing to residents and visitors who appreciate undeveloped natural surroundings. While it is true that relatively few persons would view the proposed PFSF in this isolated location, some of the viewers may be sensitive to the facility's "industrial presence." Thus, because it would be a new industrial development in a nearly undeveloped setting, overall the facility would represent a small to moderate visual impact.

4.8.2.8 Mitigation Measures

PFS has identified certain measures it would utilize to make the facility less visible to potential viewers. For example, PFS would implement its proposal to use shielded lights to minimize light diffusion at night. PFS would consult with the BIA and BLM to determine whether planting native vegetation or constructing earthen berms would be useful in screening the facility. PFS would consult with the BIA and BLM to identify colors of paint that would blend facility structures with the surrounding landscape.

The Cooperating Agencies recommend that PFS use shielded lights to minimize light diffusion at night, and that PFS consult with BIA and BLM regarding the matters noted above.

4.8.3 Recreation

Direct impacts to recreational resources and opportunities are primarily associated with any physical changes to those resources and opportunities that would result from construction and associated activities. Indirect impacts are primarily associated with workers who might move into the area and place additional demands on existing resources and opportunities. As discussed in the following paragraphs, both direct and indirect recreational impacts are expected to be small.

Recreational uses of the land in Skull Valley include such activities as driving off-road vehicles, bird watching, and hiking. Because the site of the proposed PFSF is on tribal trust land, access restrictions for members of the general public already exist. There would be no additional impacts to recreational uses of this property by the general public beyond those that already exist.

Activities associated with construction of the proposed PFSF, including the movement of materials and workers to and from the Reservation, have the potential to affect recreational resources and opportunities. In particular, persons wishing to use Skull Valley Road to access recreational opportunities at Horseshoe Springs or the Deseret Peak Wilderness would occasionally encounter possible delays during the movement of materials and workers on Skull Valley Road (see Section 4.5). These impacts are expected to be greatest during the first part of the first phase of construction, when approximately 300 truck trips per day and 260 construction worker vehicle trips per day are expected. However, the Applicant's use of Skull Valley Road is expected to occur during the week and would not be expected to affect the use of Skull Valley Road by those who would generally recreate in the area on weekends. Impacts during operation of the proposed PFSF (i.e., over the twenty year license of the facility) would be expected to be even smaller, given the much smaller operating workforce associated with the operational period of the proposed PFSF (see Section 4.5).

Since demand on recreational resources varies directly with population, indirect impacts to recreational resources and opportunities are expected to be small because of the small numbers of in-

moving workers expected during construction and operation of the proposed PFSF (see Section 4.5). As indicated in Section 4.5, the number of in-moving workers is sufficiently small, even when added to any accompanying family members (approximately 0.3 percent of the Tooele County total population in 1996), that any increased demand placed by those workers and family members on recreational resources and opportunities in Skull Valley or its surrounding areas (e.g., Mount Deseret, the Deseret Peak Wilderness, or the Wasatch-Cache National Forest) should not result in a noticeable effect on them. Accordingly, impacts to recreational resources are expected to be small.

Given the small magnitude of the impacts to recreational resources and opportunities expected to result from construction of the proposed PFSF, no mitigation measures are warranted.

4.8.4 Wildfires

As described in Section 3.4.1.1, wildfires have been a periodic problem in Skull Valley; however, the presence of the proposed facility would not be expected to increase the potential for fire in Skull Valley because of the actions to be taken by the applicant and based on the presence of an on-site firefighting capability described below.

The proposed SNF storage facility would be designed so that it would be appropriately protected from wildfires. A 90-m (300-ft) wide fire barrier would surround the 40-ha (99-acre) restricted area. As described in Section 4.4.1.1, this barrier would be planted with crested wheatgrass that would act as a fire retardant. In addition, the applicant will revegetate the rail route with native grasses which have a high fire tolerance. The area immediately around each of the storage pads would be covered with crushed gravel and would be kept clear of vegetation and other combustible materials. In addition, the PFSF has been designed to withstand the effects of fires on-site, as described in Sections 6 and 15 of the NRC staff's SER.

An on-site fire fighting capability would be provided by PFS personnel. A PFSF fire truck would be stationed at the site. A minimum of five staff personnel would be required to fully staff the PFSF fire brigade. Members of the PFSF fire brigade would be trained in the operation of the fire trucks and in advanced first aid. A second fire truck is presently located at the Goshute Village.

In the event of a fire at the proposed facility, personnel would be evacuated from the affected area and the fire brigade would be mobilized to mitigate the consequences of the fire. The Tooele County Fire Department would be called to assist in extinguishing fires beyond the capability of the fire brigade; however, the Tooele County dispatcher is located over 80 km (50 miles) by road from the proposed SNF storage facility in Skull Valley.

PFS has stated that it does not intend to use its proposed on-site fire fighting capability to assist with the fighting of wildfires not on the proposed PFSF site. The security personnel for the proposed facility would be equipped with appropriate emergency breathing apparatus such that the smoke from a nearby wildfire would not require them to evacuate the facility. Based on the above, the staff found no basis to conclude that the proposed PFSF would cause wildfires in the area.

4.9 Decommissioning and Closure

Decommissioning activities are generally described in Section 2.1.6; however, the actual actions taken to decommission the proposed PFSF at the expiration of its NRC license period cannot be predicted at this time. At least 12 months prior to the expiration of the NRC license for the proposed PFSF, a Final Decommissioning Plan must be prepared and submitted by PFS to the NRC. The requirements for the Final Decommissioning Plan are delineated in 10 CFR 72.54. This plan will be the subject of further NEPA review that would result in the NRC's preparing an environmental assessment or environmental impact statement, as appropriate, at the time the Final Decommissioning Plan is submitted to NRC. The discussion of potential impacts in this section is intended to capture the types of impacts that may occur during closure and decommissioning of the proposed PFSF.

The types of impacts that may occur during decommissioning would be similar to many of those that would accompany the initial construction of the facility, although some impacts, such as water usage and the number of truck trips, would be substantially lower. These construction impacts are discussed in Sections 4.1 through 4.8.

As discussed in Section 2.1.6, the fate of the buildings, structures, access roads, and other improvements for the proposed PFSF would be determined by consultation with the Skull Valley Band and BIA prior to termination of the lease for the proposed PFSF. If the Skull Valley Band and BIA elect to have the facility remain intact, then few environmental impacts would be associated with the closure and decommissioning of the facility. If the Skull Valley Band and BIA request the removal of any or all parts of the proposed PFSF, then the impacts similar to those described in the following paragraphs could occur.

4.9.1 Geology and Soils

The crushed gravel between the storage pads would represent an asset that could potentially be recovered and used to offset the loss of this resource that was incurred during the construction of the facility. It is unlikely that the casks, concrete pads, or foundations for the buildings could be recovered for reuse. If they are removed from the site, they are likely to become solid waste items that must be sent to an appropriate landfill for disposal. Any inaccessibility to mineral resources beneath the site would no longer exist after the proposed PFSF is decommissioned and removed.

Soil used in the construction of the flood protection berms could be used to cover the pads if they are left in place upon facility decommissioning and closure; however, it should be noted that the decommissioning action preferred by BIA would be to remove the storage pads. Assuming little to no elastic soil response to pad unloading, sufficient soil is available in the berms to cover the entire pad area to a depth of slightly over 15 cm (6 inches). However, this would likely not be sufficient for revegetating the area. If the overlay cannot be successfully revegetated, the soil placed over the pads is likely to erode. Therefore, a decision whether to cover the pads with soil should consider the potential for soil erosion. If revegetation is successful, soil removed from the berms and placed over the pads would create a gentle topographic rise over the area that is unlikely to result in an area of enhanced erosion or present an appearance significantly different from the topographic undulations of the valley that currently exist. (See the discussion of ecological resources and impacts below.)

4.9.2 Surface Water and Groundwater

The types of impacts to surface water and groundwater during the closure and decommissioning of the proposed PFSF would be similar to those that would accompany the construction of the proposed PFSF. It is anticipated that water would be required for dust suppression; however, the amounts of water anticipated to be needed during decommissioning activities would be smaller than that needed for construction of the facility, because construction of the facility would require water for concrete construction, and no concrete construction would be needed during decommissioning. Revegetation could also require PFS to water replanted areas. As described in Section 4.2 for construction of the facility, the impacts to surface water and groundwater during decommissioning would be small.

4.9.3 Air Quality

The types of impacts to air quality during the closure and decommissioning of the proposed PFSF would be similar to those that would accompany the construction of the facility, if the major structures are disassembled and removed from the site. As described in Section 4.3, these impacts would be small.

4.9.4 Ecological Resources

If the concrete storage pads were removed, the 40-ha (99-acre) restricted-access area would be recontoured and actively revegetated with native plant species. The flood protection berms would also be leveled, the storm water detention basin would be filled, and the 6 ha (14 acres) covered by those facilities would be recontoured and revegetated in a similar manner.

Any decommissioned and denuded areas (such as the areas covered by the flood protection berms) would be revegetated in conformance with then-current BIA standards. Careful consideration of the appropriate seed mixes and plants to use, soil conditions, and other measures including a thorough study of site-specific conditions (e.g., elevation, slope, aspect, soil chemistry) would aid in successful site restoration (see Section 4.4).

Removal of the concrete pads and other facilities followed by revegetation of the project area with native plant species would have a positive impact on areas where non-native, invasive plants such as cheatgrass now grow. This reclamation and revegetation would restore, and potentially improve, wildlife habitat, but might require active management for a period of years to ensure success.

If the storage pads are left in place, covered with topsoil, and revegetated with native plants, the success of revegetation would be dependent on placing a sufficient depth of soil on the pads and then selecting appropriate native species to plant. It is likely that 15 cm (6 inches) of soil would not sustain plant life in this part of Skull Valley. Plants from arid environments tend to have deeper roots than those growing in other ecosystems (Canadell et al. 1996). Big sagebrush, for example, growing in Utah has been reported to have roots that reach a maximum depth of 2.2 m (7 ft) (Richards and Caldwell 1987). Species which normally have roots that grow deeper than the depth of the soil placed on the pads would be less likely to survive. Breaking up the storage pads before placing soil on them might create large cracks through which roots could grow. It is BIA's position that 15 cm (6 in) of soil would not be sufficient to allow revegetation. Therefore, BIA proposes the removal of the pads. Use of BMPs as proposed by PFS in Section 2.1.4 and the additional BMPs listed in Section 9.4.2 during

decommissioning of the proposed PFSF should keep the impacts on vegetation to a minimum. Revegetation of the proposed PFSF site would restore habitat for some wildlife in Skull Valley.

Based on the assessment of impacts to ecological resources during construction of the proposed PFSF (as discussed in Section 4.4), the impacts of decommissioning are expected to be small.

4.9.5 Socioeconomic and Community Resources

The types of impacts to socioeconomic and community resources during the closure and decommissioning of the proposed PFSF would be similar to those that would accompany the construction of the facility. As described in Section 4.1.5, these impacts would be small.

Perhaps the most potentially significant impact of the closure of the proposed PFSF would be the loss of revenue to the Skull Valley Band (from the lease payments) and to State and local governments (from tax or other payments). The Skull Valley Band and State and local governments would have sufficient notice of the date of the facility's closure to plan for this loss of revenue.

4.9.6 Cultural Resources

Because no further disturbance of land surface would accompany decommissioning activities, there would be no impacts to cultural resources.

4.9.7 Human Health

As discussed in Section 2.1.6, no radiological contamination of the facility, the storage casks, or storage pads is expected. In the event that residual contamination were discovered, it would be removed from the remainder of the uncontaminated items (as described in Section 2.1.4) and would be disposed as low-level waste in facilities properly licensed for that type of disposal.

Potential worker injuries during decommissioning. The proposed PFSF may be left in place for future Skull Valley Band use. However, should the Skull Valley Band decide the facility should be removed, it is assumed that the same amount of time and number of workers would be needed to complete the decommissioning activities as would be needed originally to construct the facility. Thus, the estimates of worker fatalities and injuries for Phase 1, 2, and 3 of construction are expected to be applicable to decommissioning. Consequently, 20.6 nonfatal occupational injuries with lost workdays are anticipated, and 0.09 (i.e., less than one) fatal injury is anticipated during decommissioning.

4.9.8 Noise

The noise that would accompany the dismantling and removal of any proposed PFSF buildings and structures would be similar to the noise generated by the initial construction of the facility. As discussed in Section 4.8, these impacts would be small.

4.9.9 Scenic Qualities

If the buildings and structures of the proposed PFSF are dismantled and removed from the site, then the scenic qualities of the area would be returned to the state they were in prior to the construction of the facility. This would constitute a favorable impact to the scenic qualities of Skull Valley.

4.9.10 Recreation

Because the site for the proposed PFSF is located on the Reservation, it is unlikely that any changes to recreational opportunities would accompany the closure and decommissioning of the facility. Impacts to recreational users of other areas would be similar to the impacts during initial construction. The impacts to recreation would therefore be small.