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Final
Environmental Impact Statement
for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah

Docket No. 72-22
Private Fuel Storage, L.L.C.

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards

U.S. Bureau of Indian Affairs
U.S. Bureau of Land Management
U.S. Surface Transportation Board

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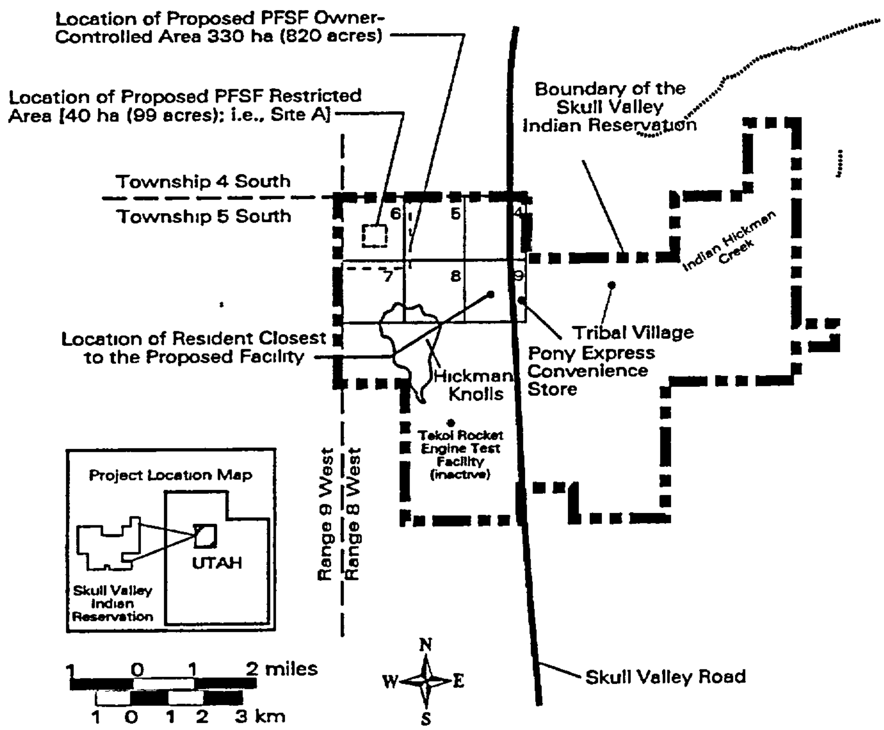


Figure 2.1. Location of the proposed site (i.e., Site A) for the PFSF on the Reservation.

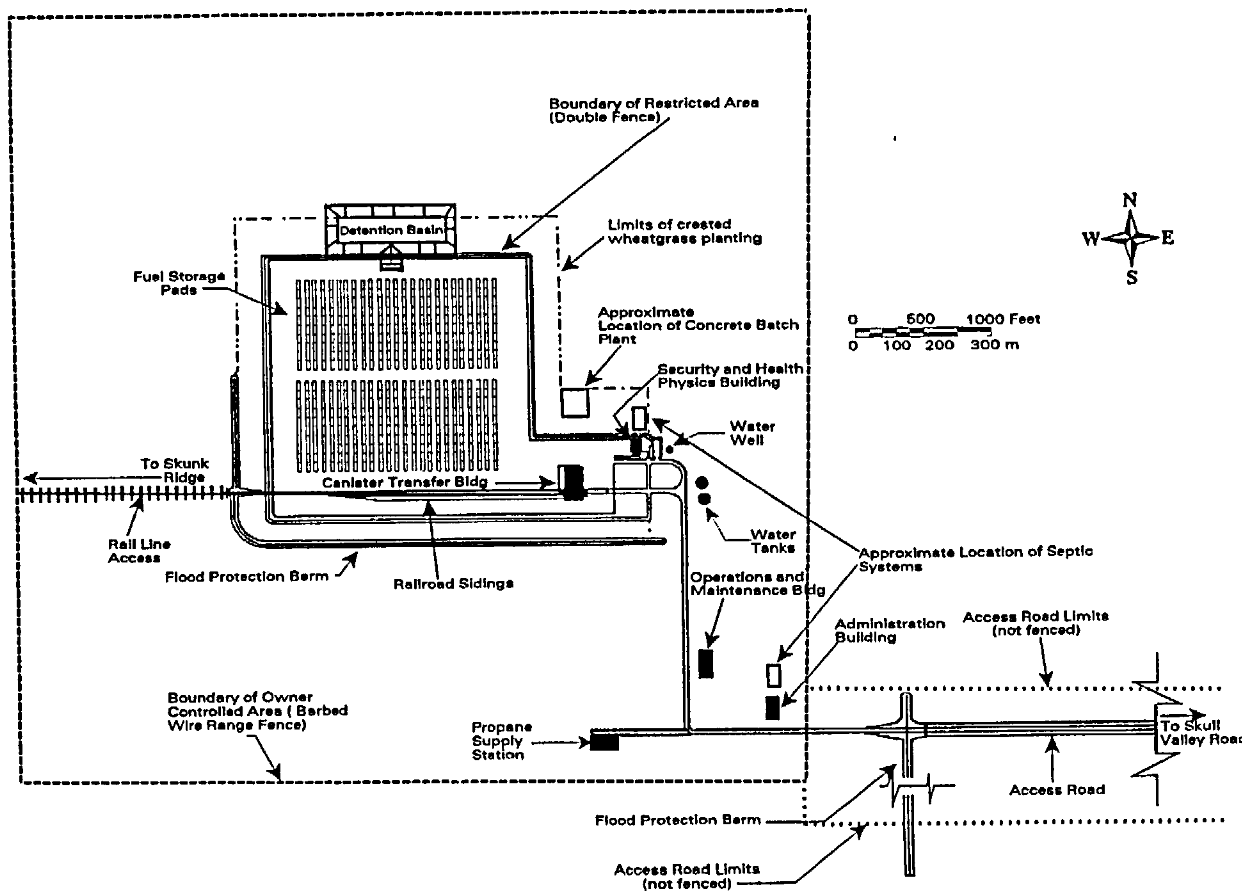


Figure 2.2. Basic site plan and layout of structures and facilities at the proposed PFSF.

2.1.2.2 Proposed Storage Cask System

The storage casks provide structural support for the canisters, physical protection, radiation shielding, and passive natural convection for cooling to remove decay heat while in storage. During storage, temperatures of the casks would be monitored, and periodic surveillance of the casks for vent blockage would be conducted on the basis of the requirements of the NRC license for the proposed PFSF.

PFS expects that its proposed dual-purpose canister system would be compatible with DOE's plans for placement in a permanent repository. When a DOE permanent repository becomes available, the stored SNF would be moved from the storage pads in Skull Valley and transferred to shipping casks following the same transfer operations described above but in reverse order. Shipment of SNF away from the proposed PFSF could occur at anytime during the term of the PFSF license once a permanent repository becomes available. As discussed in Chapter 8 of this EIS, under the NRC license the maximum amount of SNF that the applicant could accept at the proposed PFSF over the term of the license is 40,000 MTU (44,000 tons) of SNF. Once the applicant has accepted 40,000 MTU of SNF, the applicant may not accept any additional SNF shipments, even if the applicant has begun to ship SNF off site (as proposed in the lease between PFS and the Band).

PFS intends to operate the proposed PFSF for up to 40 years (i.e., an initial 20 year license and a 20 year renewal). The proposed PFSF would be designed to store up to 40,000 MTU (44,000 tons) of SNF from U.S. commercial reactors. While at the proposed PFSF, the SNF would remain the property of the originating power reactor generating company. The service to be provided by PFS under the terms of the proposed lease would be storage only, and all SNF would be removed from the proposed PFSF before completion of decommissioning. Consistent with the NRC's Waste Confidence Decision (see Section 1.3), by the end of that period, it is expected that a permanent repository would be available to receive the SNF from the proposed PFSF. In any event, should the NRC grant the application, service agreements (i.e., contracts) between PFS and companies storing SNF at the proposed PFSF will require that the originating companies, which own the SNF, remove all SNF from the proposed PFSF by the time PFS has completed its licensing or regulatory obligations under its NRC license. The service agreement requirement to remove the SNF from the proposed PFSF is not dependent upon the availability of a permanent geological repository. Therefore, if the PFS license is terminated before a permanent geological repository becomes available, the companies storing SNF at PFSF would continue to retain responsibility for the fuel and would be required to remove it from the proposed PFSF site.

The cask system being considered for use at the proposed PFSF is the Holtec International HI-STORM system (see Figure 2.10). The cask supplier would be responsible for design and certification by NRC of the canisters, casks, and transfer equipment. The characteristics of the HI-STORM canister and storage cask are shown in Tables 2.5 and 2.6, respectively. More detailed descriptions of the specifications for the cask, canister, and canister transfer operations may be found in Chapters 4 and 5 of the SAR and the NRC's SER, as updated.

2.1.3 Emissions, Effluents, and Solid Wastes

Atmospheric emissions (e.g., dust and vehicle exhaust) would be generated by the soil-disturbing activities associated with site preparation and construction of the storage area, the access road, the new rail siding and the new rail line. However, few atmospheric emissions are anticipated during the

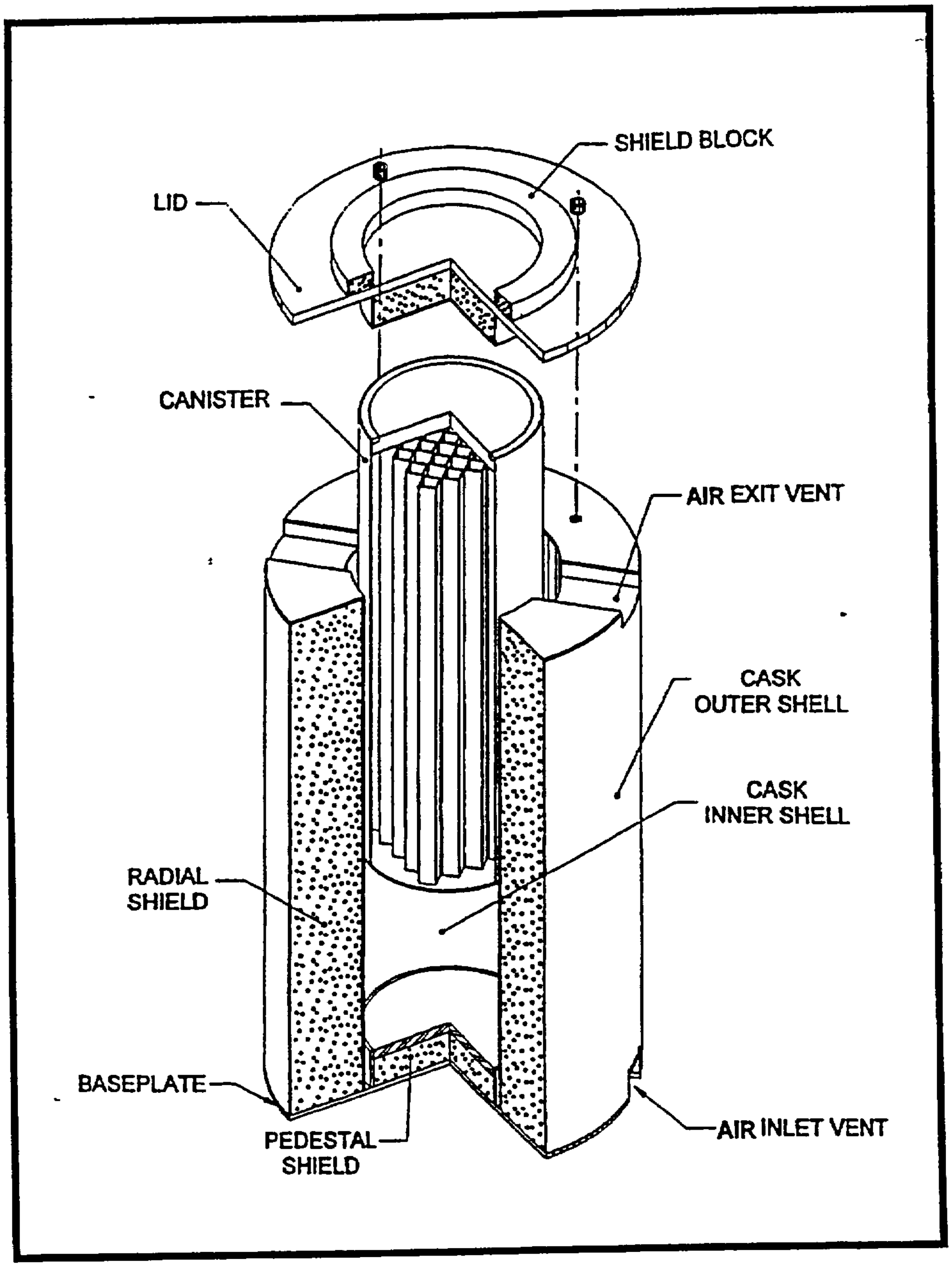


Figure 2.10. HOLTEC HI-Storm® storage cask. Note: Air inlets and outlets would be covered by wire mesh.

Table 2.5. Characteristics of the HI-STORM canister

Parameter	Value
Outside diameter	1.7 m (5.7 ft)
Maximum length	4.8 m (15.9 ft)
Capacity	24 PWR[a] assemblies *or* 68 BWR[b] assemblies
Maximum heat load	20.88 kW for PWR canister 21.52 kW for BWR canister
Material of construction	Stainless steel
Maximum weight (loaded with SNF)	PWR: 36.3 MT (40.0 tons) BWR: 39.6 MT (43.6 tons)
Internal atmosphere	Helium

[a]PWR = Pressurized water reactor
[b]BWR = Boiling water reactor

Source PFS/SAR 2001; Table 4.2-1

facility's operation. Those anticipated emissions would come from vehicles involved in transporting and transferring shipping casks, storage casks and liners, and personal cars for workers commuting to the facility. In addition, emissions would be released from the concrete batch plant, which would continue operations throughout the life of the proposed PFSF to provide concrete for the storage pads and storage casks.

The only liquid effluents that would be generated at the facility are stormwater runoff that would be directed to the detention basin and the natural drainage system, and domestic wastes that would be fed into the facility's septic system. Stormwater runoff is not expected to contain any radiological effluents since PFS intends to employ a "start clean/stay clean" philosophy. PFS has stated that it would employ "best management practices" (BMPs) to minimize atmospheric emissions and liquid effluents (see Section 2.1.4).

Drain sumps would be provided in the cask load/upload bay of the Canister Transfer Building. These sumps would catch and collect any water that drips from the shipping casks (e.g., from rainfall or melting snow) onto the floor. Water collected in these drain sumps would be sampled and analyzed to verify it is not radioactively contaminated prior to its release. In the event that contaminated water is detected, it would be collected in a suitable container, solidified by the addition of an agent (such as cement) so that it would constitute solid waste, staged in a low-level waste holding cell while awaiting shipment offsite, and then transported to a licensed low-level waste disposal facility.

The proposed PFSF is intended to be a zero-release facility. Nevertheless, solid dry low-level radioactive waste (e.g., smears, disposable clothing) could be generated while performing health physics surveys. These wastes would be collected, identified, packaged in low-level waste containers marked in accordance with the requirements of 10 CFR Part 20. These wastes would then be

Table 2.6. Characteristics of the HI-STORM storage cask system

Parameter	Value
Height	6.1 m (20.0 ft)
Outside diameter	3.4 m (11.0 ft)
Capacity	1 canister, loaded with approximately 10 MTU of SNF
Maximum radiation dose rate	
1 m (39 inches) from surface:	
Side	17 mrem/hr
Top	2 mrem/hr
On contact with surface:	
Side	35 mrem/hr
Top	5 mrem/hr
Top vents	9 mrem/hr
Bottom vents	15 mrem/hr
Material of construction	Concrete (core and lid) Steel (liner and shell)
Maximum weight (empty)	121.7 MT (134.2 tons)
Maximum weight (loaded with single SNF canister)	PWR[a]: 158.0 MT (174.2 tons) BWR[b]: 161.3 MT (177.8 tons)
Service life	More than 100 years

[a]PWR = Pressurized water reactor fuel assemblies inside canister.
[b]BWR = Boiling water reactor fuel assemblies inside canister.

Source: PFS/SAR 2001; Table 4.2-2.

temporarily stored in the holding cell of the Canister Transfer Building while awaiting shipment to a licensed offsite low-level radioactive waste disposal facility. No other radioactive wastes are expected from the proposed facility.

Other solid wastes, such as office or paper trash and lunchroom wastes, would be collected and disposed of as garbage at an off-site commercial location.

2.1.4 Best Management Practices

Best management practices (BMPs) are defined in both Federal and state regulations. EPA's definition is contained in 40 CFR 122.2, which consists of regulations that address the management of practices that could create water pollution. This definition states:

> *Best Management Practices, "BMPs," mean schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of*

"waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

This definition is also used by the State of Utah in its Department of Environmental Quality's Stormwater General Permit for Construction Activity, Part VII. PFS has expanded the above definition and has committed to management practices that include additional pollution prevention measures. These management practices address the protection of surface waters, the preservation of existing air quality, and the prevention of erosion of the surface soils during construction of the proposed PFSF. The additional pollution prevention measures are listed in Table 2.7

2.1.5 Monitoring Programs

PFS would establish a pre-operational radiological environmental baseline to characterize the existing background levels of radiation. The baseline would include sampling for radioactivity in soil, groundwater, vegetation, and in the flesh of non-migrating animals near the proposed PFSF site. An on-going monitoring program is not necessary since the operating storage facility has no effluents that could carry radioactivity into the environment. One exception is the monitoring of water collected in drain sumps in the Canister Transfer Building (see discussion in Section 2.1.3).

Airborne monitoring (by continuous radiation air monitors) would be performed by PFS inside the Canister Transfer Building during SNF transfer operations. The building would also use area radiation monitors for recording the general building doses during canister transfer operations.

Workers at the facility would be monitored and their accumulated doses would be administratively controlled to maintain such doses within NRC regulatory limits. Monitoring of off-site individuals is not planned; however, radiation monitors [i.e., thermoluminescent dosimeters (TLDs)] would be used along the boundaries of the restricted-access area and the OCA to record radiation levels. The primary purpose of the TLDs is to monitor the direct radiation emanating from the storage casks.

To minimize the likelihood that animals could spend extensive periods of time near to the storage casks, PFS would implement monitoring and take other actions to deter animals from entering the restricted-access area. PFS would monitor for signs of any on-site wildlife activity and would take measures to prevent habitation. Small mammals and reptiles would be kept from the area by using traps, if necessary to safely capture and remove the animals. The entire facility would be surveyed by workers. If any signs of wildlife habitation are found, actions would be taken immediately to remove the animals.

An on-site meteorological monitoring program has already been established by PFS. The intent of this program is to collect data for the characterization of the local meteorology and not for radiological dispersion calculations.

At the completion of the project, the BLM right-of-way grant would require PFS to develop and implement a sampling program, either at various points along the proposed rail line right-of-way or at the proposed ITF (see Section 2.2.4.2) to assure there is no contamination. Prior to releasing the right-of-way, BLM would also require PFS to provide sample results and written certification from the NRC and the Utah Department of Environmental Quality, Division of Radiation Control that the proposed ITF or the proposed rail line right-of-way is free from radiological contaminants.

Table 2.7. Best management practices as proposed by PFS during the construction of the PFSF

Construction activity	Minimum controls or BMPs to be implemented
PFSF Site	
Construction of the flood diversion berms	Drainage ditches will be stabilized and lined with rock aggregate/rip-rap to reduce flow velocity and prohibit scouring.
Containment of sediment-ladened stormwater runoff during grading and construction	A large stormwater infiltration basin (i.e., detention basin) will be constructed at the site during the initial phase of construction to collect the majority of runoff from the construction site. The basin will be designed to capture the 100-year storm event and will be equipped with a stilling basin and an emergency overflow constructed of stabilized non-erodible material. Any solids collected within the runoff entering the basin will settle out and the water will either evaporate or will provide groundwater recharge.
Dissipation of stormwater runoff routed around the facility boundary	Flow dissipaters will be installed at each diversion channel to further reduce the velocity of the stormwater sheet flow. At a minimum, these devices will be constructed of rip-rap.
Stabilization of disturbed soils around the concrete SNF storage pads	Disturbed soils around each concrete storage pad will be permanently stabilized with a layer of limestone aggregate.
Stabilization of disturbed soils around the four buildings proposed for the site	Silt fencing and sediment traps will be installed where appropriate. The construction roads will be periodically watered down to control fugitive dust emissions.
PFSF Access Road Construction	
Construction of the flood diversion berm	The flood diversion berm constructed perpendicular to the site access road will be stabilized and lined with rock aggregate/rip-rap to reduce flow velocity and prevent scouring If necessary, a stormwater flow dissipation device will also be placed where the diversion berm redistributes meteoric flow .
Grading and construction	Silt fencing and sediment traps will be installed where appropriate. The construction road will be periodically watered down to control fugitive dust emissions. Stone construction pads will be placed at the entrance/exit point-of-access roads to avoid excessive tracking of dirt and sediment onto county or state highways. Where appropriate, external vehicle washing (without the use of detergents) will be performed on-site, if it becomes necessary.
Fugitive dust controls	Construction road watering trucks will be used to periodically wet active construction road surfaces; stone construction entrance pads will be placed at construction road egress points to avoid excessive sediment tracking onto county or state roadways.
Drainage way construction	Box culverts will be placed at select locations under the access road entering the site. Rip-rap or other flow dissipation devices will be placed at the culvert where water is dissipated and silt fencing and/or sediment traps will be employed were appropriate.
Rail Access Corridor from Skunk Ridge	
Grading and construction	Silt fences and sediment traps will be installed where appropriate. Disturbance of soils will be limited to the extent practicable. Soils immediately around the rail line will be stabilized with crushed aggregate.
Stabilization of soil stockpiles associated with cut-and-fill operations	Soil stockpiles generated during the construction of the rail corridor will be placed in a manner to reduce erosion, and down-gradient areas will be protected by silt fencing. Temporary seeding or additional temporary soil stabilization measures will be applied, if necessary.

Table 2.7. Continued

Construction activity	Minimum controls or BMPs to be implemented
Arroyo crossings	Culverts will be placed in drainage ways along the rail corridor and will be designed to convey the runoff from a 100-year storm. In addition, stone aggregate or other flow dissipation devices will be placed to reduce stormwater velocity and minimize erosion. Sideslope soil stabilization devices, including silt fencing and aggregate, will be used where appropriate.
Universal Housekeeping BMPs	
All	Construction equipment maintenance and repair will be designated and controlled to prevent the discharge of oils, grease, hydraulic fluids, etc.
All	Waste receptacles and/or trash dumpsters will be placed at convenient locations for the regular collection of waste. Where practicable, materials suitable for recycling will be collected.
All	If external washing of construction vehicles is necessary, no detergents will be used, and the runoff will be captured in a sediment trap.
All	Adequately maintained sanitary facilities will be provided for all construction crews.

Source: PFS/ER 2001; Table 9.1-1.

2.1.6 Facility Closure and Decommissioning

At the end of its useful life (or upon termination of the lease with the Skull Valley Band or termination of the NRC license, whichever comes first), the proposed PFSF would be closed. As a condition of the lease with the Skull Valley Band and as required by NRC regulations, decommissioning of the proposed PFSF would be required prior to closure of the facility and termination of the NRC license. The objective of the radiological decommissioning would be to remove all radioactive materials having activities above the applicable NRC limits in order for the site to be released for unrestricted use. The NRC license would also contain requirements and provisions for assurance from PFS prior to and during operations that sufficient funds would be available at the end of the project's life to cover the costs of decommissioning activities. A "decommissioning fund" would be established by PFS prior to commencing operations in conjunction with the "per item" costs for receiving and storing each SNF canister. At the option of the Skull Valley Band, non-radiological decommissioning and restoration of the facility may include the removal of structures and reasonably returning the land to its original condition.

A Preliminary Decommissioning Plan is contained in Appendix B of the license application for the proposed PFSF. Because the exact nature of decommissioning cannot be predicted at this stage of the project, the information presented below represents the best available conceptual description of the activities envisioned for decommissioning of the proposed PFSF. A Final Decommissioning Plan would include information on site preparation and organization; procedures and sequences for removal of systems and components; decontamination procedures; design, procurement, and testing of any specialized equipment; identification of outside contractors to be used; procedures for removal and disposal of any radioactive materials; and a schedule of activities. The Final Decommissioning Plan must be submitted to the NRC for review and approval. This approval process would require its own environmental review under NEPA that would result in an environmental assessment or

3.1.4 Mineral Resources

The State of Utah and the Basin and Range Province have abundant mineral resources. Bon (1995) reports the presence of eleven large mine permits and plants in Tooele County including gold and silver, building stone, industrial minerals, and salt. Of these, the closest to the proposed PFSF site is a 5-ha (12-acre) surface quarry of aragonite dimension stone located about 10 km (6 miles) south of Low in the Cedar Mountains. Slightly further south and on the western flank of the Cedar Mountains, Tripp et. al. (1989) report the presence of several limestone and dolomite quarries and one iron prospect near Hastings Pass. Tripp et. al. (1989) also report a small prospect of unidentified material located about 3 km (2 miles) southeast of Horseshoe Springs, two small iron claims about 13 km (8 miles) southeast of Horseshoe Springs, and another small iron prospect immediately north of the Reservation at the foot of the Stansbury Mountains. Numerous small claims of unidentified commodities and one small multi-metal claim are also reported by Tripp et. al. (1989) to be near the foot of the Stansbury Mountains southeast of the Reservation and adjacent to a small silica sand deposit located on the eastern edge of the valley about 13 km (8 miles) northeast of Dugway. Tripp et. al. (1989) report a very large sand and gravel resource in the Tooele quadrangle while lacustrine deposits are the chief resources that contain large quantities of high-quality aggregate.

Gloyn (1999) reports the potential for shallow mineral deposits in the immediate vicinity of the proposed site and surrounding area. The most likely mineral types are copper with the potential for surrounding lead-zinc-silver or gold-silver. Minor but numerous lead-zinc-silver, iron, copper-silver, and arsenic-antimony-silver mines and prospects are noted in the adjacent Cedar and Stansbury Mountains. Several similar suspected gold or silver claims are also noted in Skull Valley. Most of the claims in both the valley and adjacent mountains are reported by Gloyn (1999) to have lapsed, suggesting a past but discontinued interest in the area at present.

BLM (1999) reports five existing sand and gravel pits and six oil and natural gas leases in or near the proposed action area. Two active mining claims are identified on the eastern flank of the Cedar Mountains, and the entire length of Skull Valley has been identified as prospectively valuable for oil and gas minerals. Much of the valley north of the proposed site is also prospectively valuable for geothermal resources.

PFS has identified five commercial sources of construction materials between 10 and 77 highway km (6 and 48 highway miles) from the proposed PFSF site (see Figure 3.2). These five sites are described in Table 3.2. All of the sites in Table 3.2 are on private land.

3.2 Water Resources

3.2.1 Surface Water Hydrology and Quality

3.2.1.1 General Site Setting

The proposed PFSF in Skull Valley (see Figure 1.1) would be located approximately 39 km (24 miles) south of the present shoreline of the Great Salt Lake. In the Late Pleistocene Epoch (see Table 3.1), Skull Valley was inundated by Lake Bonneville, the predecessor of the existing Great Salt Lake.

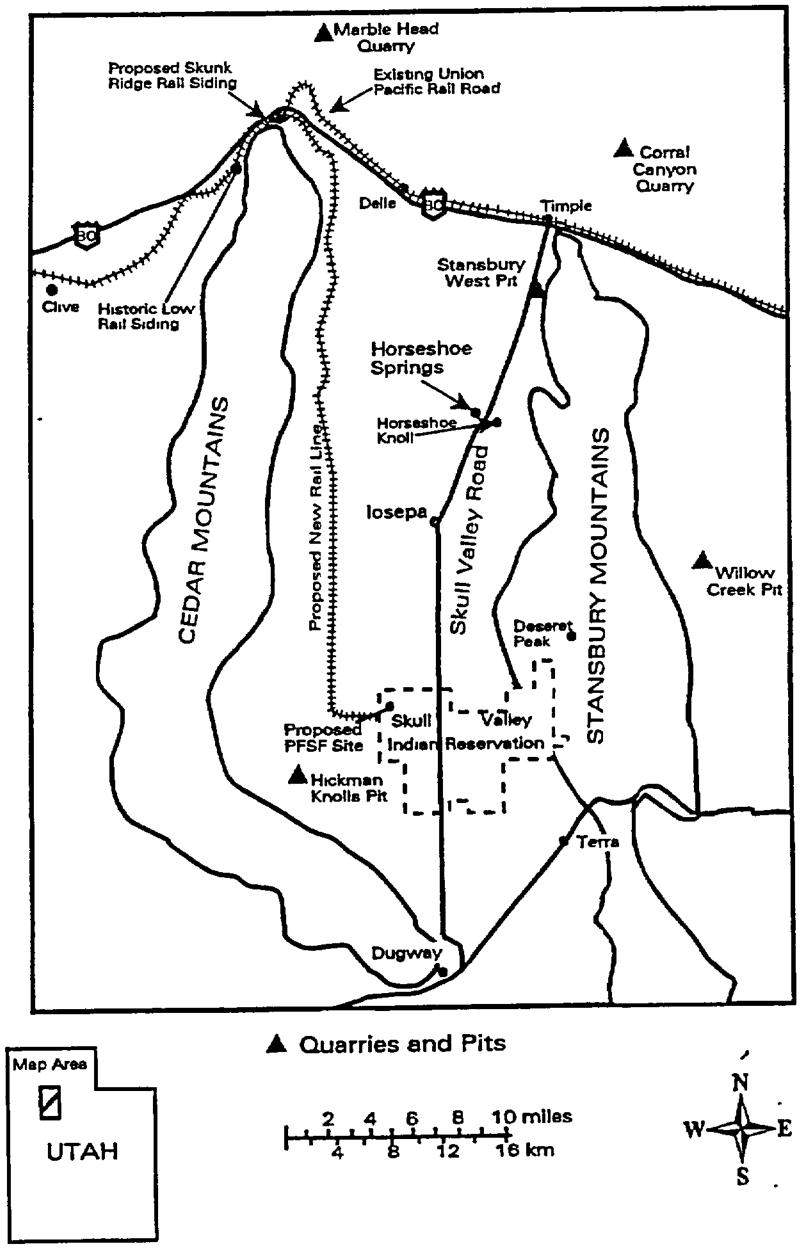


Figure 3.2. Locations of potential sources of construction aggregate in Skull Valley.

Table 3.2. Types of construction materials and their quantities available in the vicinity of Skull Valley

Type of material	Site 1	Site 2	Site 3	Site 4	Site 5	Total
Sand	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Crushed rock (1")	164,000 m^3 (214,000 yd^3)	137,000 m^3 (179,000 yd^3)	164,000 m^3 (214,000 yd^3)	NA	NA	465,000 m^3 (607,000 yd^3)
Small road base (≤1")	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Large road base (approx. 1.5")	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Structural fill material (1½" minus)	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Common fill	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Sub-ballast	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Ballast	NA	NA	NA	219,000 m^3 (286,000 yd^3)	219,000 m^3 (286,000 yd^3)	438,000 m^3 (572,000 yd^3)

Site 1: The Stansbury West Pit, approximately 27 km (17 miles) north of the proposed PFSF site.
Site 2: The Hickman Knolls Pit, approximately 10 km (6 miles) west of the proposed PFSF site.
Site 3: The Willow Creek Pit, approximately 77 km (48 miles) north-east of the proposed PFSF site.
Site 4: The Corral Canyon Quarry, approximately 61 km (38 miles) north-northeast of the proposed PFSF site.
Site 5: The Marble Head Quarry, approximately 56 km (35 miles) north of the proposed PFSF site.

Note: Distances reported to the five sites above are highway/road miles.

Figure 3.3 shows the locations of drainage channels, springs, and surficial geology/soil. Annual precipitation in Skull Valley ranges from 18 to 30 cm (7 to 12 inches) while the adjacent Stansbury mountains receive up to about 100 cm (40 inches) and the Cedar Mountains receive 40 to 51 cm (16 to 20 inches) of precipitation (PFS/ER 2001). Based on data collected between 1997 and 1998, approximately 26 cm (10.2 inches) of precipitation fell annually at the site. Much of the precipitation falls as snow. Snowmelt provides flow in streams, most of which are intermittent, that drain the mountains.

Local drainage features are poorly developed dry washes [<0.3 to 0.66 m (<1 to 2 ft deep)] that may carry flows temporarily during spring snowmelt or during infrequent summer thunderstorms. Because of the arid climate and geologic conditions in and around the mountains, most of the runoff from the mountains either evaporates or infiltrates into alluvial materials near the margins of Skull Valley. Infiltration of runoff from the mountains recharges aquifers in the alluvial fans that extend beneath Skull Valley. There are few perennial streams in Skull Valley and none near the site of the proposed PFSF.

The total watershed area of Skull Valley is approximately 1,800 km^2 (446,000 acres). Surface water runoff generally drains from south to north into the Great Salt Lake. The proposed site is located on the northern toeslope of Hickman Knolls, a rocky outcrop near the center of the valley. Hickman Knolls and the slightly elevated land surface around the base of the knolls form an area of high ground in the valley. The proposed PFSF site is located on this slightly elevated portion of the Skull Valley floor. The local topography is comprised of a series of north-trending shallow washes that carry surface runoff from the site and upslope areas to the south near the knolls.

The proposed site location is on an upland area that forms a drainage area boundary between the main axis of Skull Valley and a southwestern drainage area that drains a portion of the Cedar Mountains (see Figure 3.3). The drainage basins, as described below, were determined during the flood analysis conducted as part of the NRC staff's safety review (see NRC/SER). The site is centrally located in the watershed, with 48 percent of surface drainage area upstream and 52 percent downstream. About 700 km^2 (173,000 acres) of drainage basin lie to the south (upstream) of the proposed PFSF site in the main upstream watershed area, approximately 165 km^2 (41,000 acres) lie upslope to the southwest toward the Cedar Mountains, and approximately 948 km^2 (234,000 acres) lie downstream of the site toward the Great Salt Lake.

There are no perennial lakes or ponds within 8.5 km (5 miles) of the proposed PFSF site or along the proposed Skunk Ridge rail corridor other than a few stock ponds or small reservoirs used to store irrigation water (PFS/ER 2001). There are no public or private surface water sources used for human consumption in Skull Valley.

The stream nearest to the proposed PFSF site is Indian Hickman Creek, (see Fig. 1.2), which flows westward from the Stansbury Mountains onto the Reservation. This creek is over 6.5 km (4 miles) from the proposed PFSF site. It feeds the Reservation's water supply reservoir. Indian Hickman Creek originates from springs in the mountains and has recorded flowrates at the Reservation boundary of 70 to 90 L/s (2.5 to 3.1 ft^3/s) from April 6 to June 5.

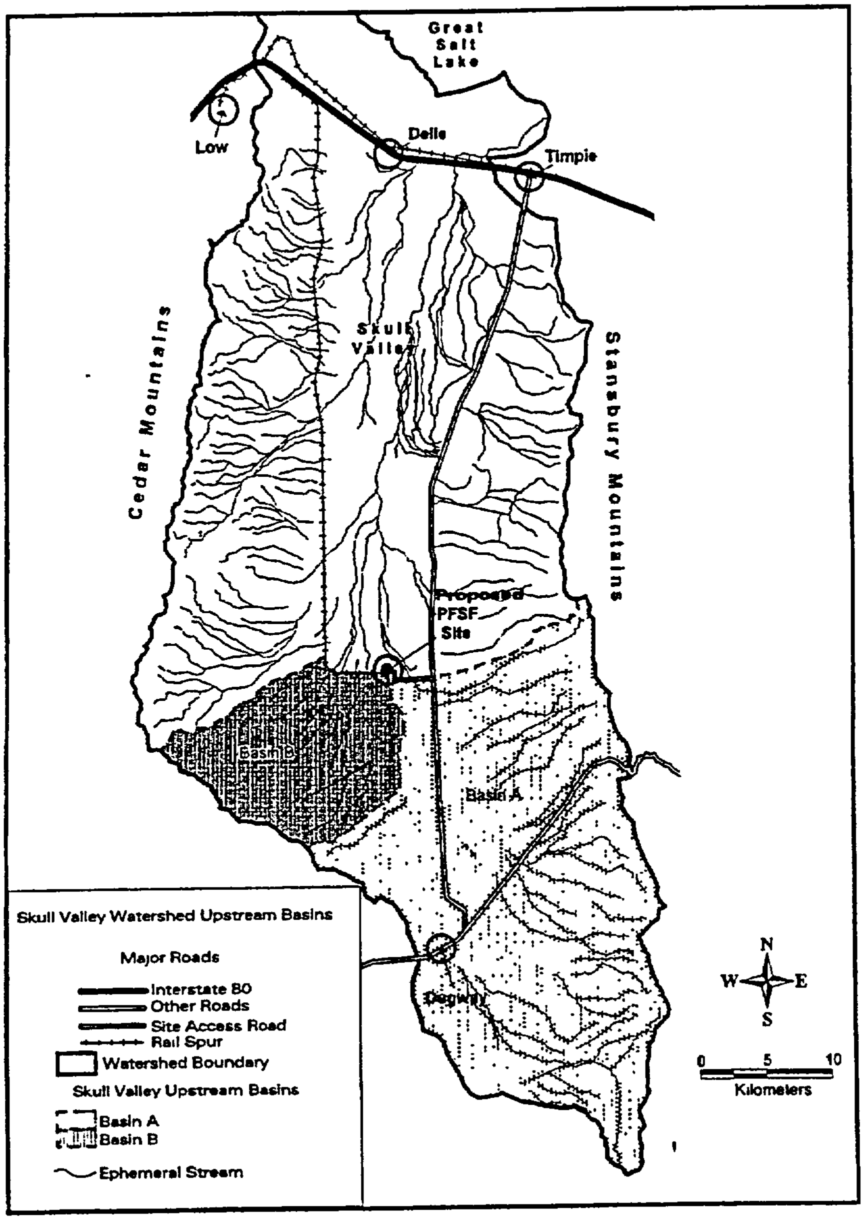


Figure 3.3. Drainage channels and soils/surficial geology in Skull Valley.

The stream channel feature nearest to the proposed site is approximately 500 m (1,500 ft) to the northeast, is up to 1 m (3 ft) deep, and is 2 to 2.5 m (6 to 8 ft) wide in places (PFS/ER 2001). No flow was observed in this channel during the observation period of June 1996 through February 1997 (PFS/ER 2001). The nearest perennial surface water flow downstream of the proposed PFSF site is Horseshoe Springs located 16 km (10 miles) to the north (PFS/ER 2001).

3.2.1.2 Flooding

The potential for site flooding is summarized in this EIS. The details of the flooding analysis performed for the PFSF site can be found in NRC staff's SER.

Flooding is an extremely rare event in the Skull Valley area. The proposed site lies on an elevated drainage basin boundary on the northern toeslope of Hickman Knolls. The direct upslope drainage area that would generate overland flow onto the site between Hickman Knolls and the site is approximately 260 ha (640 acres). Access routes to the proposed site, including the access road from Skull Valley Road to the Skunk Ridge rail corridor, cross other areas with larger upslope drainage areas. After heavy rainfall or snowmelt, surface runoff in the normally dry washes in the vicinity of the proposed site and access routes could exceed the channel capacities and flooding could occur. During 1982 and 1983, much of the State of Utah experienced unusually high annual precipitation [i.e., 38 cm (15 inches) and 33 cm (13 inches), respectively, compared to an annual average of 20 cm (7.7 inches)]. Adverse effects on the stability of Skull Valley Road were noted. According to Kaliser (1989), Skull Valley Road was softened sufficiently that two heavy transport carriers were adversely affected. One vehicle sank into the asphalt, presumably because of softening of road fill under the pavement, and the other overturned. It is not apparent that substantial improvements have been made to Skull Valley Road to prevent similar occurrences.

As described in the previous section, the upstream area that could contribute runoff to potential floods is subdivided into two basin areas–Basin A, and Basin B (NRC/SER). Basin A includes approximately 700 km^2 (173,000 acres) of southernmost Skull Valley. Basin B includes approximately 165 km^2 (41,000 acres) of runoff area to the south of the PSF site. The Basin A dry stream channel approximately 500 m (1,500 ft) northeast of the site would carry floodflows from an upstream basin area of approximately 700 km^2 (173,000 acres). The minor drainage channels that exist on the site would be supplied by sheet flow from the area south of the site to Hickman Knolls during extreme rain events.

The normal elevation of the Great Salt Lake is about 1281 m (4203 ft). In 1986, the Great Salt Lake flooded to a recent high level of 1283.8 m (4211.85 ft) above sea level. Planning documents issued by the State of Utah Department of Natural Resources in January 1999 have designated the floodplain elevation of the Lake as 1284 m (4212 ft) for planning purposes and 1285 m (4217 ft) as the extent of the Lake's historic floodplain.

Components of the proposed PFSF project for which flood impact has been reviewed include the facility, the site access road from Skull Valley Road, and the rail line access route. Flooding impacts are discussed in Sections 4.2 and 5.2.

3.2.2 Groundwater Hydrology and Quality

Groundwater flows generally northward in Skull Valley toward the Great Salt Lake. Groundwater in the region is generally recharged in the mountains and alluvial aprons on their flanks adjacent to the valleys. Springs occur in a number of settings in Skull Valley. Some springs shown on area maps occur in bedrock areas in the mountains, some occur in alluvial aprons or near the axis of Skull Valley, while others occur on or near the outcrop of faults. The Springline Fault (as shown in Figure 3.1) is a major geologic feature in the eastern portion of Skull Valley. Several prominent springs in Skull Valley—including Big Spring, Burnt Spring, Muskrat Spring, and Horseshoe Spring—occur along the outcrop of the Springline Fault. (See Section 3.4.2.2 and Figure 3.8 for additional information about these springs.)

Skull Valley is a typical Basin and Range valley that contains a thick accumulation of sediment derived from erosion of the adjacent mountain ranges. The best source of groundwater in Skull Valley in terms of both quantity and quality is the alluvial aquifer along the eastern edge of the valley that receives recharge from streams that drain the Stansbury Mountains. Toward the center of Skull Valley, the Salt Lake Group of Tertiary age (see Table 3.1) comprises the majority of the valley fill and ranges in thickness from 600 m to more than 1,800 m (about 2,000 to 6,000 ft) (PFS/ER 2001).

The Salt Lake Formation is estimated to be approximately 150 to 245 m (500 to 800 ft) thick at the site (PFS/ER 2001). Subsurface investigations performed on the site encountered approximately 6 to 9 m (20 to 30 ft) of fine-grained deposits of clayey silts and silty clays the overlie fine sand that contains interbeds or zones of silty to clayey materials with small amounts of sand. Data are not available to fully define the soil hydraulic properties under saturated or unsaturated conditions however some basic soil moisture content and re-worked soil moisture properties data (Atterberg limits) are available. Soil test data for numerous soil samples obtained within the upper 10 m (33 ft) show that most of the soils are fairly dry with natural moisture contents near the lower end of the plastic range for the silty clays and clayey silts (PFS/SAR 2001; Appendix 2A). This condition is indicative that in addition to the direct percolation of water through the soil column the site soils have the capacity to absorb some infiltrating moisture prior to reaching a state of saturation.

Of the numerous borings performed on site for geotechnical purposes, two borings were advanced to depths greater than about 30 m (100 ft) on site. One of these borings was advanced to a total depth of 47 m (154 ft) and encountered groundwater at a depth of 38 m (124.5 ft). The elevation of groundwater encountered in this boring (4350 ft) is slightly higher than the level estimated for this part of Skull Valley by Hood and Waddell (1968). The other deep boring was advanced to a total depth of 69 m (226.5 ft) and soils below the 38 m (125 ft) depth were noted as damp or wet with only one notation of saturated soils at the 47 m (155 ft) depth. No groundwater table was documented on the boring log.

Seismic reflection surveys were performed on the site as part of geotechnical characterization studies and three profiles provide information on the elevation of the top of the saturated zone (groundwater table) beneath the site (PFS/SAR 2001; Appendix 2B). These data are considered less reliable than direct water level observations made in onsite borings or wells because the interface resolution may not be precise in areas with a variable capillary fringe above the water table or where subsurface material properties result in seismic energy returns similar to those of saturated soils. The saturated zone surface information derived from the geophysical interpretation is useful as a basis of comparison with the limited available well data. Two profiles were performed in a cross pattern centered on the storage pad area and the third was performed near the access road and administration building area. In north-south profile the top of saturated materials interpreted in the seismic reflection profiles is an undulating surface that is generally higher 1332 m (4370 feet) near the southern end of the pad area and lower 1322 m (4335 ft) near the northern end of the pad area. The southernmost end of the profile suggests the potential for a local groundwater seepage gradient to the south toward Hickman Knolls. In east-west profile it appears that the top of the saturated interval is highest (4377 ft) near the eastern edge of the pad area, with a broad low region 1328 m (4355 ft) beneath the center of the site and a slightly elevated saturated surface level 1329 m (4360 ft) near the western edge of the pad area. This overall saturated zone surface configuration would indicate that most of the groundwater movement beneath the site would be toward the center of the site and then northward. The third profile is located southeast (upslope) of the pad area and the inferred top of saturated materials may occur from approximately 1366 m (4480 ft) near the administration area to approximately 1328 m (4355 ft) to the east along the site access road.

In Skull Valley groundwater is supplied from unconsolidated or semi-consolidated sediments that formed from alluvial fan deposits. Recharge to the area groundwater system is mainly from infiltration and snow melt runoff on the Stansbury Mountains. The alluvial aquifer along the eastern edge of the valley is recharged by stream infiltration and direct recharge through the coarse-grained soils of the coalesced alluvial fans. Surficial soils in the alluvial fans have relatively high infiltration capacities [5 to 15 cm/hr (2.0 to 6.0 inch/hr)] as described in Section 3.1. The reported infiltration capacity of soils in Skull Valley is 0.5 to 1.5 cm/hr (0.2 to 0.6 inch/hr) which is equivalent to a saturated hydraulic conductivity of 1.4 X 10^{-4} to 4.2 X 10^{-4} cm/sec. One published reference (Hood and Waddell, 1968) states that in Skull Valley little or none of the precipitation that falls on lands below 1616 m (5,300 ft) reaches the groundwater reservoir because the average annual amount of precipitation (the natural source of recharge) is small and because the surficial or near-surface deposits are silt and clay that have low permeability and inhibit downward percolation of water. Localized induced recharge could occur beneath ponds or continually saturated areas if sufficient excess water is available or through natural or man-made permeable pathways beneath water ponding areas. Seasonal perched groundwater and semi-confined ground water can be found in valley fill sand and gravel deposits that are overlain by lacustrine silt and clay deposits although none were noted in boring logs for the PFS project.

The regional water table hydraulic gradient beneath the floor of Skull Valley is about 9.5 X 10^{-4} to the north toward the Great Salt Lake (PFS/ER 2001). The local hydraulic gradient beneath the site estimated from the top of the saturated zone described above, may be as much as 2.5 X 10^{-2} to the north. The hydraulic conductivity of the water-bearing zone (determined from a test performed in one onsite well) is approximately 5.0 X 10^{-5} cm/sec (2.0 X 10^{-5} inch/sec) (PFS/ER 2001). Based on the estimates for hydraulic parameters at the PFS site the apparent groundwater seepage velocity beneath the site would be approximately 1.2 X 10^{-6} cm/sec (1.04 m/day). If a saturated zone porosity of 0.3 is assumed, the actual seepage velocity would be approximately 3.9 X 10^{-6} cm/sec (3.5 m/day). No site-specific hydraulic conductivity test data are available for materials above the water table. Based on available reported surface material infiltration rates and the onsite hydraulic conductivity test result, the hydraulic conductivity profile at the PFS may consist of higher permeability materials overlying lower conductivity material—a condition in which excess water at the land surface could infiltrate to the underlying water table.

Hood and Waddell (1968) have estimated that annual groundwater recharge and discharge are on the order of 3.7 X 10^{7} to 6.2 X 10^{7} m^3 (30,000 to 50,000 acre-ft) with evapotranspiration accounting for 80 to 90 percent of discharge. They also estimate that approximately 9.9 X 10^{5} m^3/yr (800 acre-ft/yr) underflow out of the valley, presumably to the north. Approximately 6.2 X 10^{6} m^3/yr (5,000 acre-ft/yr) of groundwater is withdrawn for domestic and agricultural uses.

Groundwater in the alluvial apron along the base of the Stansbury Mountains contains the lowest total dissolved solids (TDS) in the valley, with concentrations from 100 to 800 mg/L. Groundwater can be obtained from the Salt Lake Formation in some areas near the center of Skull Valley although the TDS content increases toward the center and northern end of the basin. TDS levels between 1,000 and

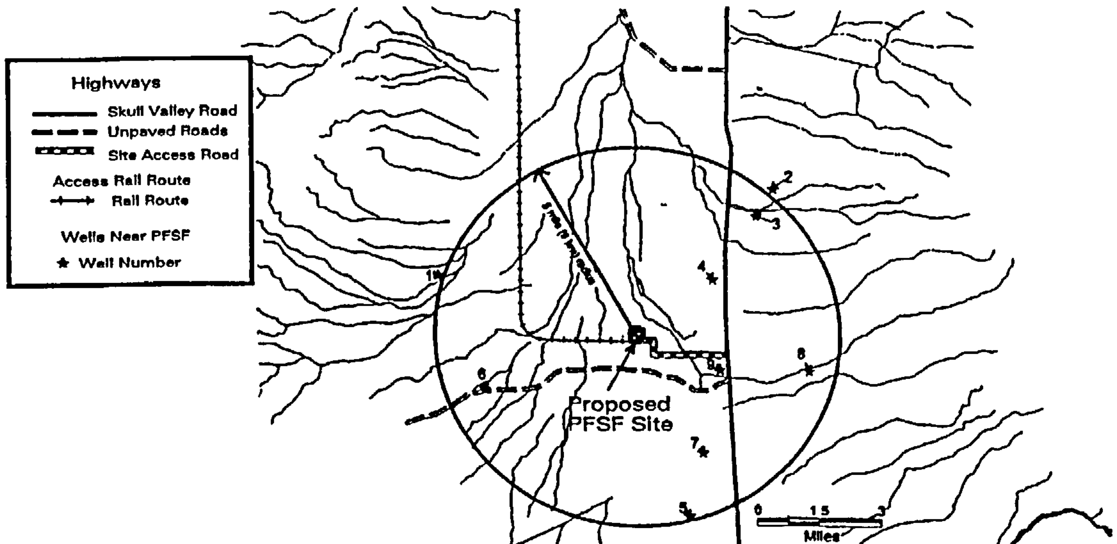
10,000 mg/L have been reported in the central and northern part of Skull Valley (PFS/ER 2001). Sodium and chloride are the principal ions that contribute to elevated TDS in the basin.

3.2.3 Water Use

Water rights in Utah have been described as follows: "All waters in Utah are public property. A water right is a right to the use of water based upon (1) quantity, (2) source, (3) priority date, (4) nature of use, (5) point of diversion, and (6) physically putting water to beneficial use. The Utah pioneers in the late 1840s were the first Anglo-Saxons to practice irrigation on an extensive scale in the United States. Being a desert, Utah contained much more cultivable land than could be watered from the incoming mountain streams. The principle was established that those who first made beneficial use of water should be entitled to continued use in preference to those who came later. This fundamental principle was later sanctioned and is known as the Doctrine of Prior Appropriation. This means those with earliest priority dates who have continuously used the water since that time have the right to water from a certain source before others with later priority dates" (Excerpted from http://nrwrt1.nr.state.ut.us/wrinfo/default/htm, as accessed on 12/4/00). The Reservation was established by Executive Orders of September 7, 1917 (17,920 acres), and February 15, 1918 (640 acres). At the time the Reservation was established, the doctrine of Federal reserved water rights operated to reserve from then–unappropriated sources of water appurtenant to the Reservation an amount necessary to fulfill the purpose of the Reservation. The water rights reserved with establishment of the Reservation assures for the Skull Valley Band the amount of water needed to irrigate practicably irrigable acreage, maintain fisheries, and supply domestic, municipal, and industrial needs.

Sources of potable water for the Reservation and scattered ranches are wells drilled into unconsolidated or semi-consolidated sediments that form the alluvial fan along the toe of the Stansbury Mountains to the east of the proposed PFSF site. Indian Hickman Creek originates in the east of the Skull Valley Reservation on the Wasatch National Forest and flows in a westerly direction onto the Reservation. A pipeline carries water from Indian Hickman Creek to a small reservoir located near the Skull Valley Village. The reservoir stores less than 5 acre-feet of water and approximately 3 acres of land is irrigated with water diverted from Indian Hickman Creek on the Reservation. No surface water in Skull Valley provides private or public drinking water.

Water use in the valley is estimated at 6.2×10^6 m^3/yr (5,000 acre-ft/yr) (PFS/ER 2001). Seven wells are known to extract groundwater for domestic or stock watering purposes within an 8 km (5 mile) radius of the center of the PFSF site. Three of those 7 wells are owned by members of the Skull Valley Band and are not reflected in available records from the State of Utah. Assuming all wells are used to the limit of the applicable water rights, the estimated groundwater withdrawals within the 8 km (5 mile) radius of the site are approximately 1.9×106 m^3/yr (1600 acre-feet/yr). Figure 3.4 shows the locations of these wells and indicates ownership and water rights. The well nearest to the site is located approximately 3.2 km (2 miles) away.



Well Map No.	Owner	Total Depth (feet)	Date Drilled	Use	Depth to Water Before Pumping (feet)	Yield When Well Drilling Was Completed (gal per min)	Priority/Allowed Diversion
1	Skull Valley Co., Ltd	340	1967	Stockwatering	297	No Data	0.015 cfs 1955
2	Island Ranching Co., Inc.	325	1959	Irrigation, Stockwatering	No Data	765	2 18 cfs 1959
3	Island Ranching Co., Inc.	347	1954	Irrigation, Stockwatering	168	No Data	1 226 cfs 1954
4	Auschutz Land Company	408	No Data	Irrigation, Stockwatering	No Data	No Data	0 7487 cfs 1960
5	Auschutz Land Company	209	1948	Stockwatering	150	20	0.015 cfs 1948
6	Auschutz Land Company	292	1940	Stockwatering	260	12	0 015 cfs 1940
7	Skull Valley Indian Reservation	401	1975	Domestic, Industrial	77 5	15	Not Required
8	Skull Valley Indian Reservation	651	1976	Domestic	519.5	60	Not Required
9	Skull Valley Indian Reservation	No Data	No Data	Domestic	No Data	No Data	Not Required

Figure 3.4. Locations of water wells within 8 km (5 miles) of the proposed PFSF.
Note: 1 ft = 0.3048 m, 1 gpm = 3.78541 L/min, 1 cfs = 28.3169 L/sec.

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).

Groundwater uses in Skull Valley include domestic use, livestock watering, and irrigation. Wells are normally completed to depths of at least 33.5 m (110 ft) below ground surface in the unconsolidated alluvial deposits on the east side of the valley where water quality is best. The community well for the Skull Valley Band (well no. 8 in Figure 3.4) is about 6 km (4 miles) from the proposed PFSF site.

3.3 Climate and Air Quality

3.3.1 Climate

The broad regional characteristics of the climate of Skull Valley can be described using data from the Salt Lake City International Airport (SLCIA), which has longer records of more meteorological variables than does any other station within 160 km (100 miles). Records for most variables extend back before 1950. However, SLCIA is 80 km (50 miles) northeast of the site of the proposed PFSF, and SLCIA is more strongly influenced by the Great Salt Lake, which is about 5 km (3 miles) to its northwest.

Records at Dugway, about 19 km (12 miles) south of the proposed PFSF site, extend back to 1950 but do not include all the variables recorded at SLCIA. The monitoring station nearest to the proposed PFSF site is located near the Pony Express Convenience Store, about 3.5 km (2.2 miles) southeast of the site, at the closest topographically similar location having access to an AC power source; these data are usually called the "on-site data" in environmental documents relevant to the proposed PFSF. Only two years (1997 and 1998) of such on-site data are available, making the record highly subject to climatic variability of either year. Based on comparisons of the data sets with each other, and with other nearby data from Tooele Army Depot, both sets of data are believed to be generally accurate representations of on-site conditions, and both are used in this FEIS so as to maximize the amount of useful data included in the analysis.

The climate of Skull Valley reflects its mid-latitude continental-interior location; summers are hot and winters are moderately cold. Temperatures at SLCIA rise above 32°C (90°F) on more than half (58 percent) of the days in summer (June through August), and minimum temperatures reach below freezing on about 80 percent of the days in winter (December through February); however, extreme temperatures of −18°C (0°F) or lower only occur on an average of 3 days per winter. The mean January temperature at SLCIA is −2.2°C (28°F); the mean July temperature is 25°C (77°F). Meteorological records for Dugway give the mean January temperature as −2.8°C (27°F), and the mean July temperature as 25.5°C (78°F) (Western Regional Climate Center 1999). The two-year record of on-site data indicates an average January temperature of −0.5°C (31°F) and an average July temperature of 23°C (74°F).

Distance and mountain barriers between Skull Valley and a large source of moisture (i.e., the Gulf of Mexico or the Pacific Ocean) produce a dry climate. Annual average precipitation at Dugway since 1950 has been approximately 20 cm (8 inches), about one-third of which [6.6 cm (2.6 inches)] occurs during the spring months (March, April, and May), with the other two-thirds evenly distributed among the remaining three seasons. The two-year on-site record indicates approximately 26 cm (10.2 inches)

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

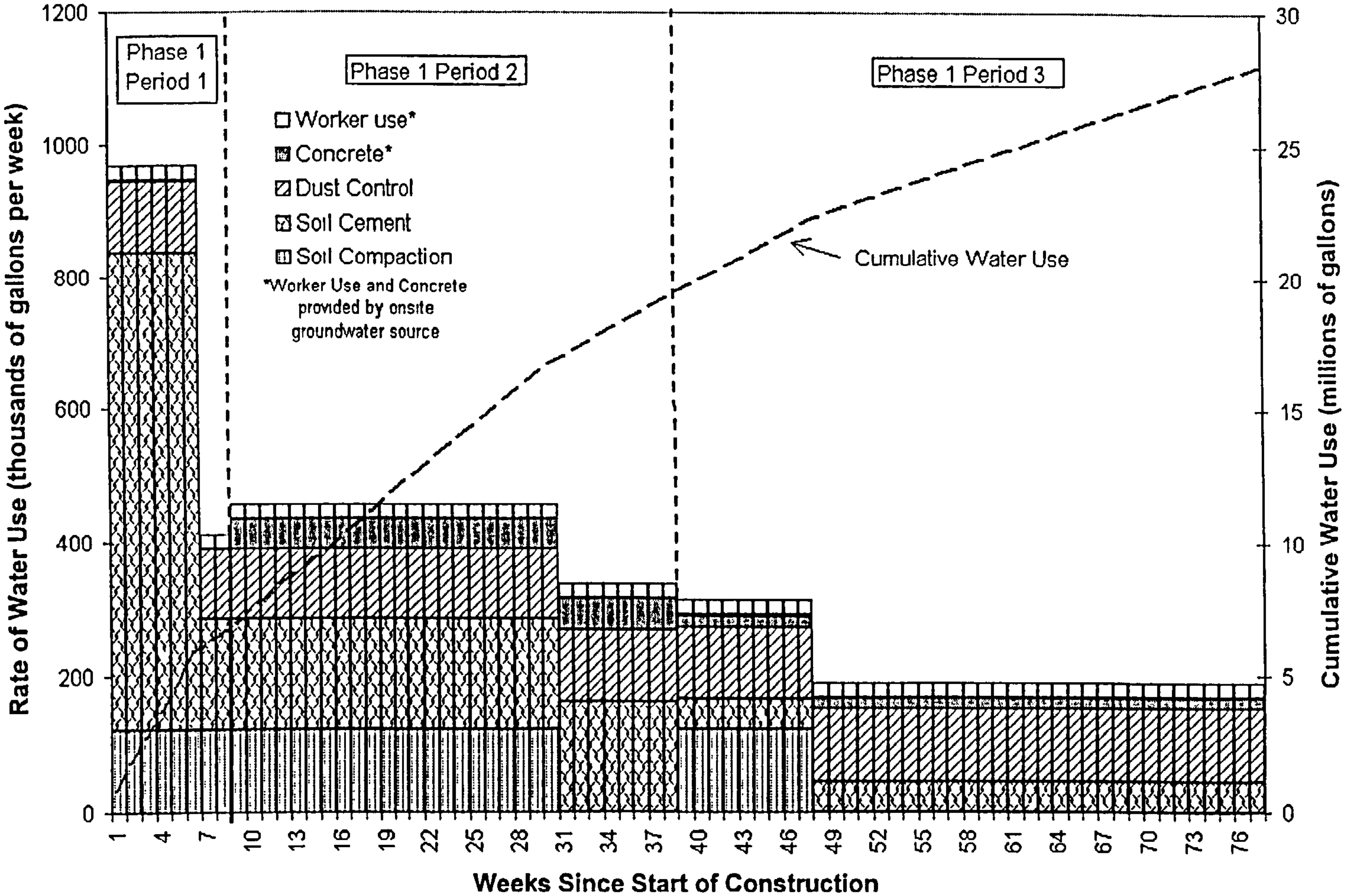


Figure 4.1. Estimated water use during construction of the proposed PFSF.

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.

resources (such as minerals or oil and gas, if any) would be unavailable for exploitation during facility construction and operation However, similar minerals are widely available elsewhere in the region.

In summary, impacts of the proposed action on the soils and economic geologic resources is small.

6.1.1.2 Impacts of Alternative 2

The impacts on the soils and economic geologic resources from Alternative 2 are similar to those from Alternative 1.

6.1.1.3 Impacts of Alternative 3

Soils and economic geologic resource impacts occur from the construction and operation of the proposed PFSF and the ITF. Soils and economic resource impacts for the proposed PFSF are the same as those in the proposed action. Fewer mineral resources would be required for construction of the ITF than the new rail line. However, since these materials are readily available locally and can be recovered at decommissioning, the impacts of this alternative are not significantly different than those associated with the proposed action.

6.1.1.4 Impacts of Alternative 4

Soils and economic geologic resource impacts for this alternative are similar to those of using Site A with the ITF.

6.1.2 Water Resources

6.1.2.1 Impacts of Alternative 1

Surface water. Construction and operation of the proposed PFSF with the new rail line and the proposed access road would have small impacts on surface water hydrology. Under extreme flooding conditions during construction, small to moderate impacts could result from soil erosion and sedimentation of surface water channels. No adverse impacts on surface water quality are anticipated.

The proposed PFSF design includes earthen berms to protect the fuel storage pads and related facilities from flooding up to and including the PMF. The access road and rail line would cross channels that carry ephemeral flows during wet seasons and would also carry surface water flow during floods. All drainage features under access route embankments, including the access road and the rail line, are designed to carry flood water volumes that would occur during the 100-year storm event. Some portions of the access road and rail line would be inundated by as much as 1 m (3 ft) of floodwater during a flood of PMF severity. The presence of the PFSF and its access routes would not increase downstream flooding potential. During extreme flooding some temporary water ponding would likely occur upstream of the access road and railroad culverts within the floodways associated with surface runoff channels.

Potential impacts related to surface water hydrology include minor localized channel alterations that would be caused by the presence and functioning of flood control berms at the proposed PFSF, and embankments and culverts associated with the site access road and the rail line. Ephemeral surface runoff in the dry washes upslope of the facility would be re-routed around the facility. Channel modifications along access routes would be minimized by use of energy dissipating structures and materials at culvert inlets and outlets; however, some changes in channel morphology and sediment distribution would likely occur within short distances upstream and downstream of channel crossings.

Groundwater. Small impacts to groundwater availability or groundwater quality could occur as a result of construction and operation of the PFSF and the rail line access.

Groundwater from wells at or near the site would be used for human consumption at the site and to provide water to the concrete batch plant at the site. The estimated peak groundwater use rate during construction would be about 20 to 40 L/min (5 to 10 gal/min). One or more wells on site would be required to provide the required groundwater volume. There is uncertainty as to the adequacy of the aquifer at the site to produce the required quantity of water required for facility construction and operation; however, PFS has identified an alternate water supply, if required.

To fulfill project construction water requirements, water would be acquired from offsite sources and transported to the site and access routes for use in dust control, soil compaction, and mixing of soil cement for the storage pad foundations. Water of sufficient quantity and quality is commercially available within trucking distance of the construction areas. Approximately 279,031 m^3 (74 million gallons) of water would be required for rail line construction, and approximately 14,327 m^3 (3.8 million gallons) for Phase 1 construction of the site. Use of groundwater from the site at the estimated rate would not be expected to impact other existing groundwater users in Skull Valley.

No activities or processes would occur at the proposed PFSF that would adversely impact groundwater quality. Stormwater runoff from the SNF storage pads and process areas, which is not expected to contain contaminants, would flow into a surface water detention basin where percolation into site soils and evaporation would occur. The facility would have two septic tanks with leach fields. In view of PFS's plan to use BMPs, and the Cooperating Agencies' proposal that PFS be responsible for clean-up in conformance with applicable standards in the event of leaks or spills of vehicle fuels, there would be no potential for petroleum contamination of groundwater.

6.1.2.2 Impacts of Alternative 2

The hydrological impacts of using Site B in Skull Valley with the rail line are expected to be small and would be similar to using Site A with the rail line, since Site B and Site A are adjacent to one another, and the site soils, surface water, and groundwater characteristics are similar.

6.1.2.3 Impacts of Alternative 3

The hydrological impacts for the option of constructing the ITF and using Skull Valley Road would be small, as discussed below.

Surface water. Potential surface water impacts using Site A with the ITF and heavy haul truck transport of the SNF shipping casks would have small impact on surface water features. There is no potential for flooding at the ITF site.

Groundwater. There would be no significant differences in groundwater use if the ITF were used rather than the rail line. Construction of the ITF would require approximately 25,800 m^3 (6.9 million gallons) of water for earthwork and cement, which would be obtained from commercial sources. There would be a somewhat smaller potential for construction-related leaks or spills of vehicle fuel if the ITF and Skull Valley Road were used rather than the proposed rail line corridor. Use of Skull Valley Road for fuel cask transport would slightly increase the possibility of vehicle accidents resulting in spills that could impact surface water or groundwater quality.

6.1.2.4 Impacts of Alternative 4

The hydrological impacts of using Site B in Skull Valley with the ITF are expected to be small and would be similar to using Site A with the ITF, since Site B and Site A are adjacent to one another, and the site soils, surface water, and groundwater characteristics are similar.

6.1.3 Air Quality

6.1.3.1 Impacts of Alternative 1

As discussed below, the temporary and localized effects of construction could produce occasional moderate impacts on air quality in the immediate vicinity of the construction activity along the proposed rail line and small impacts elsewhere. Air quality impacts of operation would be small.

Analysis using the EPA air dispersion model ISCST3 (EPA 1995), discussed in Section 4.3, indicates that air quality impacts would be largely confined to an area well within 3 km (2 miles) of any construction activities, and within much smaller distances with routine mitigation of fugitive dust. Because of the large distance between the proposed storage facility and most of the related rail line, natural air dispersion processes would greatly dilute any pollution plume arising from rail line construction before it could mix with pollutants from the proposed PFSF construction activities, and vice-versa; therefore, impacts would not be additive except when that portion of the rail line adjacent to the storage site is under construction. That case was considered in the modeling of site construction in Section 4.3, where some rail line construction was included. The impacts from construction of the rail line are described in Section 5.3. Other effects would not be additive.

Combined effects of operation would be dominated by pollutants from fossil fuel combustion by locomotives. However, air quality impacts of the switchyard locomotive and other vehicles and equipment used during operation would be small.

6.1.3.2 Impacts of Alternative 2

The impacts of Site B and the rail line would be difficult to distinguish from those for Site A with rail transport and would therefore be small to moderate. Construction would have to include about 2 percent more rail line; and proportionally (i.e., 2 percent) more pollutants would be generated each time a locomotive used the line.

6.1.3.3 Impacts of Alternative 3

As discussed below, the temporary and localized effects of construction could produce occasional moderate impacts on air quality in the immediate vicinity of the construction activity at the ITF location and small impacts elsewhere. Air quality impacts of operation would be small.

As in the case of rail transport, the distance between the ITF and the storage facility precludes any appreciable combined effects of pollution from both sources, for both construction and operation of the proposed PFSF. Road construction adjacent to the storage facility was included in the modeling of

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In the matter of PFS

Staff ______ IDENTIFIED ✓

Applicant ______ RECEIVED ______

Intervenor ✓ REJECTED ______

Other ______ WITHDRAWN ______

DATE 4/24/02 Witness ______

Clerk ______ [illegible]