REMOVE Section 15.1.1.1 on Page 15-4 of the SER, and INSERT:

15.1.1.1 Cask Drop Less Than Design Allowable Height

At the Facility, a loaded HI-STORM 100 storage cask will not be lifted over 9 inches. The HI-STORM 100 storage cask was analyzed for vertical drops from heights of 6.5 and 10 inches onto the storage pads (Holtec International, 2001a) for site specific conditions. Based on a linear interpolation between the 6.5 inches and 10 inches drop conditions, a 9 inch drop will result in an deceleration (42.6g) that is less than the design basis (45g) deceleration. Therefore, the conclusions drawn in the HI-STORM 100 FSAR are still applicable. The analysis (Holtec International, 2001a) demonstrated that a vertical drop from 9 inches would not impair the cask's ability to maintain subcriticality, confinement, and sufficient shielding of the stored fuel. As discussed in Chapter 5 of this SER, drop of a HI-TRAC transfer cask and MPC will not occur due to the design of the lifting devices used in the Canister Transfer Building.

REMOVE Section 15.1.2.1 on pages 15-8 and 15-9 of the SER, and INSERT:

15.1.2.1 Cask Tipover

The staff reviewed the information presented in Section 8.2.6 of the SAR, Hypothetical Storage Cask Drop/Tipover. This accident event involves a hypothetical tipover of a storage cask while on the storage pad or while being transported from the Canister Transfer Building to the storage pad by a cask transporter.

As discussed in Section 8.2.6 of the SAR, the HI-STORM 100 storage cask will not tipover on the storage pad as a result of a credible natural phenomenon, including a design basis seismic event, tornado wind, and impact by a tornado-generated missile. However, to demonstrate the defense-in-depth features of the HI-STORM 100 storage cask design, a non-mechanistic, hypothetical tipover scenario was analyzed (Holtec International, 2001a) for site-specific conditions. The staff reviewed applicant's method of analysis, inputs, assumptions, and conclusions, and agrees with the applicant that the deformations of the storage cask as a result of a tipover event would not impose unacceptable loads on the MPC.

Tipover of the storage cask while on the transporter (due to overturning of a cask transporter) is prevented by the design of the transporter. Cask transporters are considered to be commercially available equipment and are not part of the cask system or ISFSI design. The Technical Specifications require the licensee to use cask transporters that are designed to preclude tipover during a design basis earthquake or if impacted by a design basis tornado missile.

Based on the design of the cask system, the site characteristics, the equipment to be used at the proposed Facility, and the analysis presented in the PFS Facility SAR, the staff agrees that the cask will not tipover. Nevertheless, a hypothetical, non-mechanistic tipover would not impair the cask's ability to maintain subcriticality, confinement and sufficient shielding of the stored fuel.

REMOVE Section 15.1.2.2 on page 15-9 of the SER, and INSERT:

15.1.2.2 Cask Drop

The staff reviewed the information presented in Section 8.2.6 of the SAR, Hypothetical Storage Cask Drop/Tip Over. This accident event involves dropping a loaded transfer cask, storage cask, or canister in the Canister Transfer Building, cask storage area, or path from the transfer facility to the storage area.

The storage casks are moved from the Canister Transfer Building to the storage pad using the cask transporter. The Technical Specifications in the PFS Facility SAR require that the transporter be designed to mechanically limit the storage cask vertical lifting height to 9 inches. As discussed in Section 4.7.5.5 of the SAR (Holtec International, 2001a), the vertical lift height for the cask transporters to move the casks to the storage pads is 4 inches. As discussed in Section 15.1.1.1 of this SER, the applicant has demonstrated with site specific drop and tipover analyses (Holtec International, 2001a) that a vertical drop from 9 inches would not impair the cask's ability to maintain subcriticality, confinement and sufficient shielding of the stored fuel. As discussed in Chapter 5 of this SER, drop of a HI-TRAC transfer cask and MPC will not occur due to the design of the lifting devices proposed to be used in the Canister Transfer Building.

Based on the above discussion, the staff finds that a cask drop from the maximum allowable height of 9 inches would not impair the cask's ability to maintain subcriticality, confinement and sufficient shielding of the stored fuel.

15.1.2.4 Fire and Explosion

INSERT a new subsection before the subsection entitled “Potential for Wildfires” on page 15-18 of the SER, as follows:

Potential Fires at the Canister Transfer Building - Structural Steel Roof

The structural steel roof will be fireproofed to provide the required 2-hour fire resistance rating (Parkyn, 2001). The bounding fire for the building structural consideration as discussed in PFS Facility SAR Section 8.2.5 is the 300 gallon diesel fuel fire combined with a 30-minute tire fire. Therefore, the 2-hour fire resistance rating is adequate to ensure that the fire scenarios discussed in PFS Facility SAR section 8.2.5 will not result in a structural failure. The 2-hr fire rating is based on the construction classification Type II-FR per the UBC, and Type II-222 per NFPA 220. The building construction meets the requirements of NFPA, Section 3-5. Therefore, there is reasonable assurance that the postulated fires will not pose any hazard to the structural integrity of the structural steel of the Canister Transfer Building.

REMOVE Section 15.1.2.6 on pages 15-29 to 15-32 of the SER, and INSERT:

15.1.2.6 Earthquake

The staff has reviewed the information presented in the following SAR sections: Section 8.2.1, Earthquake; Section 2.6, Geology and Seismology; Section 3.2.10, Seismic Design; Section 4.2.3, Cask Storage Pads; Section 4.7.1.4.1, Seismic Support Struts; Section 4.7.1.5.1.F, Earthquake; Section 4.7.1.5.3, Structural Analysis; Section 4.7.2, Canister Transfer Cranes; and Section 4.7.5, Cask Transporter. The staff also reviewed the information in Appendix 2G of the SAR, which provided an additional seismic evaluation on co-seismic rupturing of the Stansbury and East or East/West faults.

A seismic event can occur at any time during any stage of a transfer or storage operation involving a cask or a canister. At a specific site, earthquake potential is often described by annual probability of exceeding certain ground motion levels or seismic hazard curves. Section 3.4 of the SAR classifies the structures, systems, and components important to safety into three categories: A, B, and C, based on the QA procedures. All structures, systems, and components important to safety should be able to function during a seismic event. These important to safety features of the Facility include the (i) canister (Category A), (ii) concrete storage cask (Category B), (iii) transfer cask (Category B), (iv) lifting devices (Category B), (v) Canister Transfer Building including the reinforced concrete structure, the steel structure supporting the reinforced concrete roof, and the sliding doors for the transfer cells (Category B), (vi) canister transfer overhead bridge crane (Category B), (vii) canister transfer semi-gantry crane (Category B), (viii) seismic struts (Category B), and (ix) cask storage pads (Category C).

The PFS Facility design earthquake was originally described by the site-specific 84th-percentile response spectrum curves anchored at a peak horizontal acceleration of 0.67g and a peak vertical acceleration of 0.69g, based on an earlier DSHA study conducted by Geomatrix Consultants, Inc. (1997). A subsequent geological survey conducted by Geomatrix Consultants, Inc. (1999a) has identified additional faults in the vicinity of the site. After taking into account these newly discovered faults in the DSHA (Geomatrix Consultants, Inc. 1999b), the 84th percentile peak horizontal acceleration and peak vertical acceleration values rose to 0.72 and 0.80g, respectively, exceeding the originally proposed design values. Subsequently, PFS proposed to use PSHA for design (Parkyn, 1999) and submitted to the NRC a request for exemption from the seismic design requirement of 10 CFR 72.102(f)(1). Based on the site-specific PSHA conducted by Geomatrix Consultants, Inc. (1999a) and additional evaluation of the site (Geomatrix Consultants, Inc, 2001a) identified the 2000-yr return period earthquake that produces a peak horizontal acceleration of 0.711g and a peak vertical acceleration of 0.695g at the proposed PFS site. The design of the Facility is based on a design response spectrum that envelops the 2,000-year return period hazard spectra. Section 2.1.6 of this SER provides additional information on the seismic ground motion hazard and the staff's review of the PFS request for exemption at the Facility.

The Canister Transfer Building protects the canisters from earthquake ground motions during transfer from the transportation cask to the storage cask. The previous building design in SAR Revision 18 (Private Fuel Storage 2000d) was analyzed for a seismic event using a lumped mass model (Stone & Webster Engineering Corporation, 1998a). The applicant also prepared a three-dimensional finite element model, using the ANSYS computer code, to analyze and design the building in accordance with the ACI codes (Stone & Webster Engineering Corporation, 1998b & 1998c). The staff reviewed the applicant's analyses of seismic loads of the previous design and concluded that the method of analyses and assumptions are reasonable. The applicant has updated the seismic load analysis (Private Fuel Storage 2001c) to reflect the physical changes in the building design (SAR Revision 22, Private Fuel Storage 2001a), as a result of updated design-basis seismic conditions. The applicant also plans to update the detailed design of the building prior to construction. Based on (1) the detailed review of the applicant's design criteria and the process for the previous building design and (2) the applicant's statement in the SAR (section 4.7.1.5.3) that the changes to the detailed design will follow the same design criteria and the process, the staff concludes that the design of the Canister Transfer Building for the design-basis earthquake loads is acceptable. Detailed analysis has been completed for the upper and lower roof steel (Stone & Webster Engineering Corporation, 2001d) and the rolling doors for the transfer cells (Stone & Webster Engineering Corporation, 2001e). These structural steel elements will be designed in accordance with ANSI/AISC N–690. Results of these analyses indicated that the available design strength exceeds that required for the factored design loads. Chapter 5 of this SER provides a detailed evaluation of the design of the Canister Transfer Building.

The overhead bridge crane, the semi-gantry crane, and the canister downloader are all single-failure-proof lifting devices, as discussed in Chapter 4 of the SAR. A 200-ton overhead bridge crane and a 150-ton semi-gantry crane will be used for loading and unloading shipping casks and transferring spent nuclear fuel canisters between the shipping and storage casks. The overhead bridge crane lifts the shipping casks from a heavy-haul trailer or rail car and places it upright into one of the transfer cells. These cranes utilize a patented hoisting safety system called X–SAM. The cranes are designed in accordance with ASME NOG–1 (American Society of Mechanical Engineers, 1989) and are single-failure-proof in accordance with NUREG–0554 (Nuclear Regulatory Commission, 1979). ASME NOG–1 provides the requirements of electrical overhead and gantry cranes with top running bridge and trolley and components of cranes used at nuclear facilities. NUREG-0554 identifies the design features, fabrication, installation, inspection, testing, and operation of the hoisting system and braking systems for trolley and bridge of a single-failure-proof overhead crane handling system. The Facility lifting devices are designed with single-failure-proof features so that any potential failure of a single component will not result in the crane losing capability to stop and hold the load (SAR Section 4.7.2.5.4). The cranes are provided with suitable restraints to prevent any uplift during an earthquake. The crane design will not allow any part to become detached and fall in a design earthquake. Additionally, the cranes will not lower the load in an uncontrolled manner during or as a result of a design earthquake. Moreover, design specification of the cranes include manual release capability to release the brakes for hoist, emergency, bridge, gantry, and trolley for controlled lowering and positioning of the load in case of an emergency (SAR Section 4.7.2.5).

Additionally, the shipping cask will be secured prior to disconnecting the crane and unbolting the lid, by attaching seismic support struts between the cask and the transfer cell building columns (SAR Section 4.7.1.4.1). The seismic support struts are designed to resist the forces generated by the PFS Facility design basis ground motion and maintain the shipping cask secured in the upright position. The HI-TRAC transfer cask can remain connected to either the overhead bridge crane or the semi-gantry crane throughout the transfer operation. Continuous connection with the crane assures that the transfer cask cannot topple under PFS Facility design basis ground motion. Seismic support struts will be attached to the transfer cask prior to disconnecting the crane to assure cask stability under PFS Facility design basis ground motion.

Cask transporters will be used to move the loaded storage cask between the canister building and the storage pad. The Technical Specifications require that the transporter be designed to limit the lifting height of a canister to a maximum of 9 inches and to prevent overturning or tipover under a design basis ground motion.

The cask storage pads have been designed in accordance with ANSI/ANS–57.9–1992 (American National Standards Institute/American Nuclear Society, 1992) and ACI 349–90 (American Concrete Institute, 1989). Each pad is an independent reinforced concrete structure of dimensions 30 ft wide, 67 ft long, and 3 ft thick. Eight loaded proposed storage casks will be placed on each pad. The design of the storage pads accounts for the weight of the loaded storage casks and the design earthquake for the site. The design of the storage pads would provide an adequate safety factor against bearing failure under static and earthquake loadings. Additionally, the storage pad is not susceptible to subsurface failures associated with liquefaction (SAR Section 2.6.4.8). The staff's evaluation of the storage pads is discussed in Sections 2.1.6.3 and 5.1.3 of this SER.

The generic cask stability analysis, presented in the FSAR for the HI-STORM 100 Cask System does not bound the PFS Facility site-specific ground motion. Therefore, Holtec International (2001b) carried out additional analysis to demonstrate that the HI-STORM 100 storage casks will not tip over in a PFS Facility design basis ground motion, characterized by the response curves with a zero period acceleration of 0.711g in both horizontal directions and 0.695g in the vertical direction. This supplemental analysis has been reviewed in Chapter 5, Installation and Structural Evaluation, of this SER. This supplemental analysis of the stability of the HI-STORM 100 storage cask considered soil-structure interaction, actual storage pad site, and a variety of cask placement configurations on the storage pad. Two bounding coefficients of friction for the cask-pad interface were analyzed: (1) coefficient of friction equal to 0.2 emphasizing sliding and (2) coefficient of friction equal to 0.8 emphasizing tipover. For the case with coefficient of friction equal to 0.2, a cask will slide less than 3 in. For the other case, the lateral motion of the cask top center point from its initial position is less than 4 in. In addition a case was considered that allowed the storage pad to slide with respect to the soil-cement and soil foundation. The resulting motion of the casks on the storage pad in this condition were less than the sliding distances stated above.

The staff has reviewed the information and analyses provided by PFS for potential hazards from earthquake ground motion at the Facility as discussed in Section 2.1.6.2 of this SER. The staff found that the PSHA methodology with a 2,000-year return period value used to determine the design earthquake for accident analyses to be acceptable because:

- There are sufficient regulatory and technical bases to accept the PSHA methodology for seismic design of the Facility, as detailed in Section 2.1.6, Geology and Seismology, of this SER and in Stamatakos et al. (1999).

- The PFS PSHA is based on adequate characterization of potential seismic sources, ground motion attenuation, and associated uncertainties; and the PSHA results are conservative, as detailed in Section 2.1.6, Geology and Seismology, of this SER and in Stamatakos et al. (1999).

- The design spectra were developed based on the procedures outlined in Regulatory Guide 1.165 (Nuclear Regulatory Commission, 1997) and sufficiently incorporated near-source effects, as detailed in Section 2.1.6, Geology and Seismology, of this SER and in Stamatakos et al. (1999).

- Co-seismic rupturing of the Stansbury fault with the East or East/West fault would not significantly affect the 2,000-year return period ground motion level at the proposed PFS site, as detailed in Section 2.1.6,Geology and Seismology, of this SER and in Stamatakos et al. (1999).

The staff also reviewed the information presented by the applicant on stability analyses of structures, systems, and components important to safety. The staff's evaluation is discussed in Chapter 5 of this SER. The staff found PFS's stability analyses acceptable because:

- The applicant has demonstrated that the HI-STORM 100 storage casks will not tipover or slide while stored on the concrete pads from site-specific ground motion.

- Single-failure-proof lifting devices, designed to withstand the site-specific ground motion without toppling or dropping the load, will be used in the Facility.

- Seismic support struts, designed to resist the forces generated by site-specific design basis ground motion, will secure the shipping, storage, and transfer casks during transfer operations.

PFS has adequately determined design basis earthquake events for the Facility design. The methods adopted by the PFS for evaluating the design basis ground motion are appropriate as evaluated in Section 2.1.6 of this SER. Also, as discussed in Section 2.1.6 of this SER, the regional extent of earthquakes and subsequent ground motion are identified. The applicant submitted a request for an exemption from the seismic design requirements of

10 CFR 72.102(f)(1) (Parkyn, 1999) and supporting documents (Donnell, 2000). The staff found the exemption request is acceptable with a 2,000-year return period earthquake. PFS has conducted accident analyses using 2,000-year return period ground motions and demonstrated the adequacy of design of structures, systems, and components important to safety.

Based on the foregoing evaluation, the staff finds that a design earthquake event would not impair the ability of the structures, systems, and components to maintain subcriticality, confinement, and sufficient shielding of the stored fuel.

REMOVE Section 15.1.2.9 on pages 15-33 to 15-35 of the SER, and INSERT:

15.1.2.9 Tornadoes and Missiles Generated by Natural Phenomena

The staff reviewed the information presented in SAR Section 2.3.1.3.3, Tornadoes; Section 3.2.8, Tornado and Wind Loadings; Section 4.7.1.5.1.E, Tornado Winds and Missiles; and Section 8.2.2, Extreme Wind. This evaluation assumed that site personnel would not have any prior warning before the Facility structures, systems, and components are impacted by a potential design basis tornado and a tornado missile.

The State of Utah experiences on average two tornadoes each year based on National Oceanic and Atmospheric Administration data for the period 1950–1995 (http://www.ncdc.noaa.gov/ol/climate/severeweather/small/avgt5095.gif). Table 2.3-1 of the SAR lists four tornadoes during the period 1975–1995 that occurred within a 1° latitude-longitude square, approximately 3,641 sq mi, centered at the proposed site. All four tornadoes occurred in Tooele County. However, no information is available for one of these tornadoes, that was reported on September 23, 1992. Based on data for the other three tornadoes, PFS estimated the mean number of tornados per year in the square to be 0.14 with a geometric mean tornado path area of 0.035 sq mi. The estimated probability of a tornado striking anywhere in the square that includes the PFS Facility site is 1.37×10^{-6} per year or a recurrence interval of 728,200 years.

Characteristics of the design basis tornado and tornado missile are given in Section 3.2.8 of the SAR. The SAR developed the characteristics of the design basis tornado in accordance with Regulatory Guide 1.76, Design Basis Tornado for Nuclear Power Plants (Nuclear Regulatory Commission, 1974). The proposed site is located in Region III, as defined in Regulatory Guide 1.76. The characteristic of the design basis tornado for Region III is defined as a tornado with a maximum wind speed of 240 mph, a rotational speed of 190 mph, a translational speed of 50 mph, a radius of maximum rotational speed of 150 ft, and a 1.5-psi pressure drop at a rate of 0.6 psi/s.

Three design basis tornado missiles are based on Spectrum I missiles of Section 3.5.1.4, Missiles Generated by Natural Phenomena, of NUREG–0800 (Nuclear Regulatory Commission, 1981c). These missiles include an automobile with a weight of 1,800 kg (3,600 lb) (a massive kinetic energy missile that will deform on impact), an 8-in. 125-kg armor-piercing artillery shell (a rigid missile to test penetration resistance), and a 1-in. solid steel sphere (a small rigid missile of a size sufficient to pass through openings in protective barriers). It is assumed, based on Section 3.5.1.4 of NUREG–0800, that all three missiles will impact at 35 percent of the maximum horizontal wind speed of the design basis tornado, that is, at 84 mph. The first two missiles are assumed to impact at normal incidence. The last missile impinges on the barrier openings in the most damaging directions. These objects are postulated to be picked up and transported by the winds of a design basis tornado.

Important to safety structures, systems, and components that may be affected by design basis tornado missiles are (i) canister transfer facility superstructures, (ii) site transporters, and (iii) storage casks. These structures, systems, and components are required to function during this design basis event.

The HI-STORM 100 storage cask is designed to withstand a 360 mph tornado with a 3.0 psi pressure drop, and a 1800 kg tornado-generated missile with a velocity of 126 mph. These parameters bound the PFS Facility design basis tornado. The tornado analysis for the HI-STORM 100 and the staff's evaluation are respectively provided in the HI-STORM 100 FSAR and the NRC's related SER. This analysis demonstrated that the HI-STORM 100 cask can withstand a design basis tornado and tornado missile impact without penetration, permanent deformation, or tipover.

The structure of the Canister Transfer Building is expected to function during an extreme wind event. Tornado wind with associated pressure drop is considered to act simultaneously. The tornado wind speed converted to wind pressure following ASCE 7–95 (American Society of Civil Engineers, 1996). This methodology is acceptable to the staff. The structure will be designed to protect all structures, systems, and components within the building by withstanding the tornado wind and associated pressure drop by means of its static strength without requiring any venting (SAR Section 4.7.1.5.1). The Canister Transfer Building walls, superstructure, and sliding doors for the transfer cells are designed to structurally withstand both horizontal and vertical components of the impact of the spectrum of tornado missiles. The transfer facility superstructure provides tornado missile protection through reinforced concrete walls and roof. The composite steel and concrete sliding doors for the transfer cells provide tornado missile protection for this region of the Canister Transfer Building. Components of this building will be of sufficient strength and size to resist the missile impact without compromising the strength and stability of the structure and to prevent penetration of the missile and associated spalling of concrete interior to the point of impact. The layout of the building (SAR Figure 4.7-8) and specially designed labyrinths will prevent tornado missiles from entering through the doors or ventilation openings in the walls and roof, and impacting the fuel canisters, single-failure-proof cranes and their supports, and any other structures, systems, and components in the building (SAR Section 4.7.1.5.1).

Section 4.8.2.6.2 of the SAR includes discussion of the resistance of the cask transporters to overturning on impact by a design basis tornado missile. Cask transporters are commercially available equipment and are not considered to be part of the cask system or ISFSI design. The proposed Technical Specifications require the licensee to use cask transporters that are designed to preclude tipover if impacted by a design basis tornado-driven missile.

The staff reviewed the information provided by the applicant and evaluated the analyses of potential hazards from design basis tornadoes and tornado missiles at the Facility. The staff found it acceptable because:

- The frequency and characteristics of tornadoes and tornado missiles for the proposed site have been adequately assessed.
- Acceptable methodologies have been used to characterize the design basis tornadoes and tornado missiles for the proposed site.
- Structures, systems, and components important to safety that may be affected by the design basis tornados and tornado missiles have been identified.
- The storage cask and Canister Transfer Building are adequately designed to withstand postulated tornado wind loads and loads imparted by the postulated tornado missiles.
- The Technical Specifications require the licensee to use cask transporters that are designed to preclude tipover if impacted by a design basis tornado-driven missile.

The information presented in the SAR demonstrates that appropriate methodologies have been adopted to investigate the potential tornado severity and frequency at the proposed site along with the associated missile hazards. PFS has identified the severity of hazards associated with a design basis tornado for the proposed site and incorporated it into the design of the Canister Transfer Building using appropriate design loads and layout of the building. The design of the Canister Transfer Building has adequately considered the appropriate design basis tornado loadings and the associated hazards so that the important to safety structures, systems, and components in the building will be protected. The information presented is sufficient to conclude that the design of the Canister Transfer Building is adequate to withstand the design basis tornado loadings and the associated tornado missiles so that the important to structures, systems, and components will be protected.

Based on the foregoing evaluation, the staff finds that a tornado or tornado-generated missile would not impair the ability of the structures, systems, and components to maintain subcriticality, confinement, and sufficient shielding of the stored fuel.

REMOVE Section 15.3 on pages 15-103 to 15-109 of the SER, and INSERT:

15.3 References

[The] Air Force Association. 1999. 1999 USAF Almanac. *Air Force Magazine*. May, pp.51–66.

American Concrete Institute. 1989. Code *Requirements for Nuclear Safety Related Concrete Structures and Company.* ACI 349–90 and ACI 349R-90. Detroit, MI: American Concrete Institute.

American National Standards Institute/American Nuclear Society. 1992. *Design Criteria for an Independent Spent Fuel Storage Installation (Dry Storage Type)*. ANSI/ANS 57.9–1992. La Grange Park, IL: American National Standards Institute/American Nuclear Society.

American Society of Civil Engineers. 1996. *Minimum Design Loads for Buildings and Other Structures*. ASCE 7–95. New York: American Nuclear Society.

American Society of Mechanical Engineers. 1989. *Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Bridge)*. ASME NOG–1. New York: American Society of Mechanical Engineers.

American Society for Testing and Materials. 1998. *Standard Test Methods for Fire Tests of Building Construction and Materials*. E119–98. West Conshohocken, PA: American Society for Testing and Materials.

Banas, J. 1999. Electronic communication from J. Banas to J. Wilson, U.S. Air Force, January 8, 1999. Submitted as a part of the State of Utah Opposition to Applicant's Motion for Partial Summary Disposition of Utah Contention K and Confederate Tribes Contention B (July 22), before the Atomic Safety and Licensing Board, Nuclear Regulatory Commission, Washington, DC.

Booth, L. 1999. *MGR External Events Hazards Analysis*, Document Identifier ANL-MGR-SE-000004 Rev 00, North Las Vegas, NV: Civilian Radioactive Waste Management System Management and Operating Contractor.

Britton, C.M. *Affidavit of C. Britton* 1999. (June 7) Before the Atomic Safety and Licensing Board. Lubbock, TX.

Brunsdon, B. *Declaration of B. Brunsdon* 1999. (June 2) Before the Atomic Safety and Licensing Board. Denver, CO: Stone & Webster Engineering Corporation.

Brunson, F.G. 1999. *Letter (January 25) to J.L. Cole, Jr., General, U.S. Army. Washington, DC: Office of Command Judge Advocate*.

Bureau of Indian Affairs. 1975. *Environmental Impact Analysis Rocket Motor Test Site Skull Valley Band of Goshute Indians Skull Valley Reservation*. Fort Duchesne, UT: Bureau of Indian Affairs, Uintah and Ouray Agency.

Carruth, G. 1999. *Affidavit of G. Carruth* (June 7) Before the Atomic Safety and Licensing Board. Washington, DC: Nuclear Regulatory Commission.

Chun, R., Witte, M., and Swhartz, M. 1987, *Dynamic Impact Effects on Spent Fuel Assemblies*, UCID-21246, Lawrence Livermore National laboratory, Livermore, CA.

Cole, J.L., Jr. 1999a. *Risk Assessment of Credible Aircraft or Missile Accidents Impacting Private Fuel Storage LLC Independent Spent Fuel Storage Installation*. Exhibit 2 of Declaration of J. Cole, Jr., before the Atomic Safety Licensing Board, Nuclear Regulatory Commission, Springfield, VA.

Cole, J.L., Jr. 1999b. *Declaration of J.L. Cole, Jr.* (June 3) Before the Atomic Safety and Licensing Board, Nuclear Regulatory Commission, Springfield, VA.

Cole, J.L., Jr., W.O. Jefferson, Jr., and R.E. Fly. 2000. *Declaration of James L. Cole, Jr., Wayne O. Jefferson, Jr., and Ronald E. Fly.* (December 30) Before the Atomic Safety and Licensing Board. Washington, DC: Nuclear Regulatory Commission.

Cooper, J. 1999. *Affidavit of J. Cooper* (June 7) Before the Atomic Safety and Licensing Board. Englewood, CO: Stone & Webster Engineering Corporation.

Davis, C.F. 1999. *Affidavit of C.F. Davis* (June 7) Before the Atomic Safety and Licensing Board. Magna, UT: Alliant Techsystems, Inc.

Department of the Army.1996. *Tactics, Techniques and Procedures for Multiple Launch Rocket System (MLRS) Operations*. Field Manual No. 6-60. Washington, D.C. Department of the Army.

Donnell, J.L. 2000. *Commitment Resolution Letter Number 29.* Letter (April 10) to Document Control Desk, Nuclear Regulatory Commission. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Donnell, J.L. 2001. *Response to April 18, 2001.* Meeting Issues Regarding PFSF License Application Amendment #22, Docket No. 72-22/TAC No.L22462. Letter (May 1), Document Control Desk, Nuclear Regulatory Commission. La Crosse, WI: Private Fuel Storage Limited Liability Company.

E.I. du Pont de Nemours and Company, Inc. 1977. *Blasters' Handbook*. 175th Anniversary Edition. Wilmington, DE: E.I. du Pont de Nemours and Company, Inc.

Enges-Maas, M.A. 1999a. Electronic communication from Enges-Mass to C. Nakahara, State of Utah. July 20, 1999. Submitted as a part of the State of Utah Opposition to Applicant's Motion for Partial Summary Disposition of Utah Contention K and Confederate Tribes Contention B (July 22), before the Atomic Safety and Licensing Board, Nuclear Regulatory Commission, Washington, DC.

Enges-Maas, M.A. 1999b. Electronic communication from Enges-Mass to C. Nakahara, State of Utah. July 22, 1999. Submitted as a part of the State of Utah Opposition to Applicant's Motion for Partial Summary Disposition of Utah Contention K and Confederate Tribes Contention B (July 22), before the Atomic Safety and Licensing Board, Nuclear Regulatory Commission, Washington, DC.

Ermak, D.L. 1990. *User's Manual for SLAB: An Atmospheric Dispersion Model for Denser-Than-Air Releases*. UCRL–MA–10567. Livermore, CA: Lawrence Livermore National Laboratory.

Federal Aviation Administration. 1999. FAA Long-Range Aerospace Forecasts Fiscal Years 2015, 2020 and 2025. FAA–APO–99–5. Office of Aviation Policy and Plans. Washington, DC: Federal Aviation Administration.

Federal Emergency Management Agency. 1989. *Handbook of Chemical Hazards Analysis*. Washington, DC: Federal Emergency Management Analysis.

Geomatrix Consultants, Inc. 1997. *Deterministic Earthquake Ground Motions Analysis, Private Fuel Storage Facility, Skull Valley, Utah.* GMX #3801.1. Revision 0. San Francisco, CA: Geomatrix Consultants, Inc.

Geomatrix Consultants, Inc. 1999a. *Fault Evaluation Study and Seismic Hazard Assessment Private Fuel Storage Facility, Skull Valley, Utah*. San Francisco, CA: Geomatrix Consultants, Inc.

Geomatrix Consultants, Inc. 1999b. *Update of Deterministic Ground Motion Assessments, Private Fuel Storage Facility, Skull Valley.* San Francisco, CA: Geomatrix Consultants, Inc.

Geomatrix Consultants, Inc. 2001a. *Fault Evaluation Study and Seismic Hazard Assessment Study - Final Report.* Revision 1. San Francisco, CA: Geomatrix Consultants, Inc.

Geomatrix Consultants, Inc. 2001b. *Development of Design Ground Motions for the Private Fuel Storage Facility.* Revision 1. San Francisco, CA: Geomatrix Consultants, Inc.

Girman, D. and G. Wagner. 2001. Risk Assessment of Cruise Missile Accidents Impacting Private Fuel Storage LLC Independent Fuel Storage Installation. Revision 1. January 25. Englewood, CO: Private Fuel Storage Limited Liability Company.

Gray, M.D. *Deposition of M.D. Gray.* 1999a. (May 12) at the law offices of Parsons, Behle & Latimer, Salt Lake City, UT: Parsons, Behle & Latimer.

Gray, M.D. *Declaration of M.D. Gray.* 1999b. (July 22) Regarding Material Facts in Dispute With Respect to Contention K. Washington, DC: Nuclear Regulatory Commission.

Hawley, B.W. *Deposition of B.W. Hawley.* 1999. (May 11) at the law offices of Parsons, Behle & Latimer. Salt Lake City, UT: Parsons, Behle & Latimer.

Holtec International. 1999. *MultiCask Response at the PFS ISFSI from 2000 Year Seismic Event.* Report No. HI–992295. Marlton, NJ: Holtec International.

Holtec International. 2000. *Final Safety Analysis Report for the Holtec International Storage and Transfer Operation Reinforced Module Cask System (HI-STORM 100 Cask System).* Volumes I and II. HI–2002444. Docket 72-1014. Marlton, NJ: Holtec International.

Holtec International. 2001a. *PFSF Site-Specific HI-STORM Drop/Tipover Analysis.* Report No. HI–2012653. Revision 2. Marlton, NJ: Holtec International.

Holtec International. 2001b. *Multi Cask Response at PFS ISFSI from 2000-Yr Seismic Event.* Revision 2. Report No. HI–2012640. Marlton, NJ: Holtec International.

Industrial Risk Insurers. 1992. *Oil and Chemical Properties Loss Potential Estimation Guide.* IM 8.0.1.1. March 2. Hartford, CT: Industrial Risk Insurers.

International Conference of Building Officials. 1997. *Uniform Building Code*. Whittier, CA: International Conference of Conference of Building Officials.

Kimura, C.Y., and R.J. Budnitz. 1987. Evaluation of External Hazards to Nuclear Power Plants in the United States. NUREG/CR-5042. Livermore, CA: Lawrence Livermore National Laboratory.

Kimura, C.Y. R.E. Glaser, R.W. Mensing, T. Lin, T.A. Haley, A.B. Barto, and M.A. Stutzke. 1996. *Data Development Technical Support Document for the Aircraft Crash Risk Analysis Methodology (ACRAM) Standard*. UCRL-ID-124837. Livermore, CA: Lawrence Livermore National Laboratory.

Kimura, C.Y., D.L. Sanzo, and M. Sharirli. 1998. *Crash Hit Frequency Analysis of Aircraft Overflights of the Nevada Test Site (NTS) and the Device Assembly Facility (DAF)*. UCRL-ID-131259, Rev. 1. Livermore, CA: Lawrence Livermore National Laboratory.

Larsen, D.C. 1999. *Deposition of D.C. Larsen* at the law offices of Parsons, Behle & Latimer. Salt Lake City, UT: Parsons, Behle and Latimer.

Lightfoot, C. 2000. Electronic communication from Colonel C. Lightfoot, U.S. Air Force, 388FW/CCM, Hill Air Force Base to M. Delligatti, Nuclear Regulatory Commission. April 27, 2000.

Matthews, J.L. 1999a. *Supplemental Declaration of J.L. Matthews* (July 22) Regarding Material Facts in Dispute With Respect to Contention K. Salt Lake City, UT: Law Offices of Parsons, Behle and Latimer.

Matthews, J.L. 1999b. *Declaration of J.L. Matthews* (July 20) Before the Atomic Safety and Licensing Board, Regarding Material Facts in Dispute With Respect to Contention K. Washington, DC: Nuclear Regulatory Commission.

Matthews, J.L. *Deposition of J.L. Matthews* 1999c. (May 27) at the law offices of Parsons, Behle & Latimer, Salt Lake City, UT: Parsons, Behle and Latimer.

McCormick, N.J. 1981. *Reliability and Risk Analysis methods and Nuclear Power Plant Applications*. New York, NY: Academic Press.

National Fire Protection Association. Flammable and Combustible Liquids Code. NFPA 30. Quincy, MA: National Fire Protection Association. 1996.

National Fire Protection Association. 1996a*. Standard for the Installation of Standpipes and Hose Systems*. NFPA 37. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1996b. *Flammable and Combustible Liquids Code*. NFPA 30. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1998c*. Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*. NFPA 37. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. *Standard for the Installation of Lightning Protection Systems*. NFPA 780. Quincy, MA: National Fire Protection Association. 1997a.

National Fire Protection Association. 1997b. *Fire Protection Handbook*. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1998a. *Standard for Fire Protection for Facilities Handling Radioactive Materials*. NFPA 801. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1998b. *Liquified Petroleum Gas Code. NFPA 58.* Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1999a. *Standard on Types of Building Construction*. NFPA 220. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1999b. *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*. NFPA 16. Quincy, MA: National Fire Protection Association.

National Fire Protection Association. 1999c. *Installation of Sprinkler Systems*. NFPA 13. Quincy,MA: National Fire Protection Association.

National Fire Protection Association. 2000. *Standard on Industrial Fire Brigades*. NFPA 600. Quincy, MA: National Fire Protection Association.

Nuclear Regulatory Commission. 1974. *Design Basis Tornados for Nuclear Power Plant*. Regulatory Guide 1.76. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission. 1978. *Evaluation of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plants*. Regulatory Guide 1.91. Revision 1. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission. 1979. *Single-Failure-Proof Cranes for Nuclear Power Plants*. NUREG-0554. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission. 1981a. *Standard Review Plan Section 3.5.1.6 Aircraft Hazards*. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. NUREG–0800. Washington, DC: Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation.

Nuclear Regulatory Commission. 1981b. *Standard Review Plan Section 2.2.3 Evaluation of Potential Accidents*. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. NUREG-0800. Washington, DC: Office of Nuclear Reactor Regulation, Office of Nuclear Reactor Regulation.

Nuclear Regulatory Commission. 1981c. Section 3.5.1.4: Missiles generated by natural phenomena. Revision 2. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants. NUREG–0800. Washington, DC: Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation.

Nuclear Regulatory Commission. 1981d. Barrier Design Procedures. Section 3.5.3, NUREG–0800, Standard Review Plan. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission.1983. *Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants*. Regulatory Guide 1.145. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission. 1986. "Policy Statement on Safety Goals," *Federal Register*, Vol. 51, August 21, 1986, pp. 30028.

Nuclear Regulatory Commission. 1996. *Analysis of Section 60.136 Preclosure Controlled Area*. in Federal Register Col. 61, No. 234, December 4, 1996, pp. 64264–64266.

Nuclear Regulatory Commission. 1998. *Summary and Evaluation of Low-Velocity Impact Tests of Solid Steel Billet onto Concrete Pads*. NUREG/CR-6608. Washington, DC. Nuclear Regulatory Commission.

Nuclear Regulatory Commission. 1999. "Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada," *Federal Register*, Vol. 64, No. 34, February 22, 1999, pp. 8639-8679.

Nuclear Regulatory Commission. 2000a. *Standard Review Plan for Spent Fuel Dry Storage Facilities—Final Report*. NUREG–1567. Washington, DC: Nuclear Regulatory Commission.

Nuclear Regulatory Commission. 2000b. 10 CFR Part 72 *Certificate of Compliance No. 1014, Amendment 0, for the HI-STORM 100 Cask System.* Docket No. 72-1014. May 31.

Nuclear Regulatory Commission. 2000c. *Holtec International HI-STORM 100 Cask System Safety Evaluation Report*. Docket No. 72-1014. May.

Parkyn, J.D. 1998. *Response to Request for Additional Information*. Letter (February 10) to Director, Office of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Parkyn, J.D. 1999. *Request for Exemption to 10 CFR 72.102(f)(1) Seismic Design Requirement*. Letter (April 2) to M.S. Delligatti, Nuclear Regulatory Commission. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Parkyn, J.D. 2001. *Data Needed for NRC Review of License Amendment #22*. Docket No.72721, Letter (May 31) to Document Control Desk of Nuclear Regulatory Commission. Nuclear Regulatory Commission. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2000a. *Safety Analysis Report for the Private Fuel Storage Facility*. Revision 14. Docket No. 72-22. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2000b. *Aircraft Crash Impact Hazard at the Private Fuel Storage Facility*. Revision 4. August 10. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2000c. *Assessment of the Hazard Posed to the Private Fuel Storage Facility by the Use of the Army Multiple Launch Rocket System on Dugway Proving Ground*. April 18. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2000d. *Safety Analysis Report for the Private Fuel Storage Facility*. Revision 18. Docket No. 72-22. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2001a. *Safety Analysis Report for the Private Fuel Storage Facility*. Revision 22. Docket No. 72-22. La Crosse, WI: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2001b. *Request for Additional Information on Aircraft Hazards—Clarification and Revised Addendum to Aircraft Crash Hazard Report*. July 20. Englewood, CO: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2001c. *Request for Additional Information on Aircraft Hazards—Remaining Response and Clarification*. May 31. Englewood, CO: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2001d. *Request for Additional Information on Aircraft Hazards—Clarification*. May 15. Englewood, CO: Private Fuel Storage Limited Liability Company.

Private Fuel Storage Limited Liability Company. 2001e. *Request for Additional Information on Aircraft Hazards—Partial Response*. March 30. Englewood, CO: Private Fuel Storage Limited Liability Company.

Pulcini, G. 2001. Modeling the failure data of a repairable equipment with bathtub type failure intensity. *Reliability Engineering and System Safety*. 71: 209–218.

Society of Fire Protection Engineers. 1995. SFPE Handbook of Fire Protection Engineering. Quincy, MA: National Fire Protection Association.

Stamatakos, J., R. Chen, M. McCann, and A.H. Chowdhury. 1999. *Seismic Ground Motion at the Private Fuel Storage Facility Site in the Skull Valley Indian Reservation*. San Antonio, TX: Center for Nuclear Waste Regulatory Analyses.

State of Utah. 1999. *Reply to NRC Staff's Response in Support of Applicant's Partial Motion for Summary Disposition of Utah Contention K and Confederated Tribes Contention B—Inadequate Consideration of Credible Accidents* (July 22) Before the Atomic Safety and Licensing Board. Washington, DC: Nuclear Regulatory Commission.

Stone & Webster Engineering Corporation. 1998a. *Seismic Analysis of Canister Transfer Building*. PFSF Calculation No. 05996.02. SC–5. Revision 0. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 1998b. *Finite Element Analysis of Canister Transfer Building*. PFSF Calculation No. 05996.02. SC–6. Revision 0. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 1998c. *Design of Reinforcing Steel for Canister Transfer Building*. PFSF Calculation No. 05996.02. SC–7. Revision 0. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2000a. *Plume and Upper Layer Temperatures in Canister Transfer Building and Fire Scenarios*. PFSF Calculation No. 05996.02. P–006. Revision 0. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2000b. *Radiant Heat Flux Calculations for Canister Transfer Building Heavy Haul Vehicle Tire Fire*. PFSF Calculation No. 05996.02. P–007. Revision 0. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2001a. *Stability Analyses of Cask Storage Pads*. PFSF Calculation No. 05996.02. G(B)-04. Revision 9. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2001b. *Stability Analyses of Canister Transfer Building*. PFSF Calculation No. 05996.02. G(B)-13. Revision 6. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2001c. *Seismic Analysis of Canister Transfer Building*. PFSF Calculation No. 05996.02. SC–5. Revision 2. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2001d. *Design of Canister Transfer Building Upper and Lower Roof Steel*. PFSF Calculation No. 05996.02. SC-12. Revision 0. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2001e. *Design of Rolling Doors at Canister Transfer Cells*. PFSF Calculation No. 05996.02. SC-14. Revision 0. Denver, CO: Stone & Webster Engineering Corporation.

Stone & Webster Engineering Corporation. 2001f. *Seismic Restraints for Spent Fuel Handling Casks*. PFSF Calculation No. 05996.02. SC-10. Revision 1. Denver, CO: Stone & Webster Engineering Corporation.

Underwriters Laboratories Inc. 1993. *Steel Aboveground Tanks for Flammable and Combustible Liquids.* UL–142. Northbrook, IL: Underwriters Laboratories, Inc.

Underwriters Laboratories Inc. 1997. *Industrial Aboveground Tanks for Flammable and Combustible Liquids.* UL–2085. Northbrook, IL: Underwriters Laboratories, Inc.

U.S. Air Force. 1998. *Accident Investigation Board Report: United States Air Force AGM-129, Advanced Cruise Missile, Serial Number 90-0001, AFI SI-503, Report of Missile Accident Investigation*. STEI Office of the Commander, U.S. Air Force. Langley Air Force Base, VA.

U.S. Air Force. 1999. Response to December 18, 1998 Freedom of Information Act Request Filed by General Cole. January 20. Headquarters Ogden Air Logistics Center (AFMC). Hill Air Force Base. Ogden, UT: U.S. Air Force.

U.S. Army Corps of Engineers. 1997. *HEC-RAS. River Analysis System*. Davis, CA: U.S. Army Corps of Engineers, Hydrologic Engineering Center.

U.S. Department of the Army. 1990. *Structures to Resist the Effects of Accidental Explosions*. Army Manual TM5-1300. Alexandria, VA: Department of Defense Explosives Safety Board.

U.S. Department of Defense. 1997. *U.S. Department of Defense Contractors' Safety Manual for Ammunition and Explosives*. DOD 4145.26–M. Washington, DC: Department of Defense.

U.S. Department of Energy. 1992. *Natural Phenomena Hazards Performance Categorization Criteria for Structures, Systems, and Components*, DOE-STD-1021-92, Washington, DC: U.S. Department of Energy.

U.S. Department of Energy. 1996. *DOE Standard: Accident Analysis for Aircraft Crash Into Hazardous Facilities*. DOE-STD-3014-96. Washington, DC: U.S. Department of Energy.

U.S. Department of Health and Human Services. 1999. *Biosafety in Microbiological and Biomedical Laboratories (BMBL)*. 4th Edition. Washington, DC: Center for Disease Control.

U.S. Fire Administration. 1993. *Wildfire … Are You Prepared?* Washington, DC: Federal Emergency Management Agency.

Wagner, G. and D. Girman. 2000. Declaration of George Wagner and David Girman (December 30, 2000) Before the Atomic Safety and Licensing Board. Washington, DC: Nuclear Regulatory Commission.