1.0 GENERAL INFORMATION
1.3 SITE DESCRIPTION

1.3.1 CONDUCT OF REVIEW

This chapter of the revised draft Safety Evaluation Report (DSER) contains the staff's review of the site description provided by the applicant in Chapter 1 of the revised Construction Authorization Request (CAR). The objective of this review is to: 1) ensure that site conditions, including site geography, demographics, meteorology, hydrology, and geology are accurately described in order to properly define potential accident conditions; and 2) determine whether principal structures, systems and components (PSSCs) and their design bases, identified by the applicant, provide reasonable assurance of protection against natural phenomena and the consequences of potential accidents. The staff evaluated the site description information provided by the applicant by reviewing Chapter 1 of the revised CAR, other sections of the revised CAR, supplementary information provided by the applicant, and relevant documents available at the applicant's offices but not submitted by the applicant. The review of the site description was closely coordinated with the natural phenomena accident sequences described in the Safety Assessment of the Design Bases (see Chapter 5 of this revised DSER), and the review of other plant systems.

The staff reviewed how the information in the revised CAR addresses the following regulations:

- Section 70.23(b) of 10 CFR states, as a prerequisite to construction approval, that the design bases of the PSSCs and the quality assurance program be found to provide reasonable assurance of protection against natural phenomena and the consequences of potential accidents.

- Section 70.64 of 10 CFR requires that baseline design criteria (BDC) and defense-in-depth practices be incorporated into the design of new facilities. It specifically addresses quality standards; natural phenomena hazards; fire protection; environmental conditions and dynamic effects; chemical protection; emergency capability; inspection, testing, and maintenance; criticality control; and instrumentation and controls.

Section 1.3 of the revised CAR discusses the geographical location of the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF or the facility) and its environment, including demographic, meteorological, hydrological, geological, seismological, and geotechnical characteristics of the site and the surrounding area. It describes population distribution near the site, land and water uses, transportation routes, and nearby industrial facilities which potentially can affect the site. It also describes and evaluates site characteristics that affect the magnitude of natural phenomena (e.g., rain, snow, wind, earthquakes) that may affect the site. Section 1.3 evaluates site characteristics with respect to safety and identifies assumptions and input that is needed to evaluate safety and the design bases in other evaluations in the revised CAR.

The staff evaluated site characteristics by reviewing Section 1.3 of the revised CAR, documents cited in the revised CAR, and other relevant literature. Where appropriate, findings of regulatory compliance are made for requirements that are fully addressed in Section 1.3 of the revised CAR. In some cases, regulatory compliance can only be determined by integrating the information in Section 1.3 with information in other sections of the revised CAR. In these cases, evaluations of regulatory compliance are made in Chapter 5, "Safety Assessment of the Design Basis," of the revised CAR and findings of technical adequacy are made in Chapter 1.3 of this revised DSER.

1.3.1.1 Site Geography

In the application, the applicant provided information on the site location to include state, county, municipality, and topographic information; information on public and Savannah River Site (SRS) roads, railroads, and waterways; nearby bodies of water; and significant geographical features.

The proposed site will be located in F-Area of the SRS in southwest South Carolina near Aiken. The site is restricted and has few public roads. There are no unrestricted public roads in the vicinity of F-Area. A rail system is operated at the SRS by the U.S. Department of Energy (DOE). This rail system connects to commercial rail lines outside SRS boundaries. Nearby, the principal body of water is the Savannah River, which forms the SRS's southwest boundary. The only river navigation that takes place is infrequent construction-related barge traffic. The significant physiographic features at the SRS are the Pleistocene Coastal Terraces and the Aiken Plateau. The applicant provided supplemental information about aircraft flights and airports in a letter dated March 8, 2002 (Reference 1.3.3.16). The applicant stated that there are only two airports within 60 miles (96.5 km) of SRS that provide scheduled air passenger services. Six general aviation airports were identified by the applicant. Aircraft flight data was presented based on Federal Aviation Administration data. Aircraft hazards are discussed in revised DSER Section 11.1.

This geographic information provided in the application was current and accurate, was appropriately referenced, and was consistent with information used in the safety assessments to support the design bases of PSSCs.

1.3.1.2 Demographics and Land Use

In the application, the applicant provided information on demographics and land use to include 1990 census data for the area and for minority and low-income populations; a description, distance, and direction to nearby population centers, public facilities, hospitals, and industrial facilities that could present potential hazards; residential, industrial, commercial, and agricultural land use data in the vicinity of the proposed site; and uses of nearby bodies of water.

There are a total of 621,527 people living within 50 miles (80 km) of the proposed facility site based on 1990 census data. The population is expected to grow to slightly more than 1,000,000 in 2030. This population includes those living in the two metropolitan areas of Augusta, Georgia, and Aiken, South Carolina. Because the proposed site is on the SRS, there are no residents within 5 miles (8 km) of the proposed site. Within 5 miles (8 km) and 10 miles (16 km) of the site, 6,528 people reside, the majority being in the towns of New Ellenton, and Jackson, South Carolina.

Nearby industrial areas include other DOE SRS operations; several other Federal and State sponsored activities; Chem-Nuclear Systems, Inc., commercial low-level waste disposal and waste transportation activities in Barnwell County; Transnuclear, Inc., waste transportation activities in Aiken County; Carolina Metals, Inc., depleted uranium processing operations in Barnwell County; the Vogtle nuclear generating station across the Savannah River in Georgia; a fossil-fired electric generating plant 20 miles north of the SRS; and the Fort Gordon Army post southwest of Augusta, Georgia.

Within the SRS, land use is controlled for the purposes of DOE operations and timber management. Forested areas within the SRS are managed by the U.S. Forest Service.

The Savannah River is used to supply domestic water following treatment, for fish propagation, and for commercial and agricultural uses. Except for limited transportation of construction equipment, there is no commercial shipping performed on the river. Domestic uses of water from the Savannah River occur about 100 miles (161 km) downstream at treatment plants near Hardeeville, South Carolina, and near Savannah, Georgia.

Groundwater extracted near the SRS is used for domestic, industrial, and agricultural use. About 35 million gallons (133 million liters) per day were pumped in 1985 by 56 communities and industries near the SRS. Smaller communities, schools, and small commercial businesses also use local groundwater.

This demographic and land use information provided in the application was accurate, was appropriately referenced, and was consistent with information used in the safety assessments used to support the design bases of PSSCs.

1.3.1.3 Meteorology

In the revised CAR, the applicant provided meteorological information on temperatures; wind speeds and average and prevailing wind directions; amounts and form of precipitation; design basis values for maximum snow and ice loads and probable maximum precipitation; and types, magnitudes, and frequency of severe weather events, such as tornadoes, hurricanes, and lightning.

Temperature data for the SRS are presented in the revised CAR based on 30 years of measurements at the site. The annual average temperature is 64.7F. Observed temperature extremes ranged from 107F to -3F. Data for Augusta, Georgia, indicate that daytime high temperatures rarely fall below 32F during the winter. Temperatures are above 90F on more than half of all days in the summer months.

Winds nearby the SRS are generally light to moderate, with the highest wind speeds occurring in the spring. The lightest winds occur in the summer and fall. The prevailing wind direction varies throughout the year, coming from the northwest in the winter, from the southeast in the late spring and early autumn, and from the southwest in the summer. The peak wind gust at Bush Field in Augusta was 60 mph (96.5 km/hr) based on 10 years of data.

The average annual precipitation for the SRS from 1967 to 1996 is 49.6 inches (126 cm). The highest rainfall over a 24-hour period was 7.5 inches (19 cm) in October 1990. During summer thunderstorms rainfall rates of up to 2 inches/hour (5.1 cm/hr) can occur. An average of 54 thunderstorm days per year have been observed. Hail storms occur infrequently, an average of once every 2 years.

Snowfalls of 1 inch (2.5 cm) or greater occur on the average once every 3 years. The greatest single snowfall recorded from 1951 to 1995 occurred in Augusta in 1973 when 14.0 inches (35.6 cm) fell. The maximum ground snow load for a 100-year recurrence period is 6 psf (0.29 kPa). Ice accumulates once every 2 years. The maximum accumulation for a 100-year recurrence period is 0.67 inch (1.7 cm) or an ice load of 3 psf (144 Pa).

Over a 30-year period from 1967, 165 tornadoes occurred in the vicinity of the SRS. Five Fujita-scale 2 and four Fujita-scale 1 tornadoes occurred onsite or in close proximity since site operations began. Damage was primarily to trees. One of these tornadoes produced wind speeds up to 150 mph (241 km/hr). Design basis wind speeds for DOE moderate hazard performance category (PC-3) facilities and high hazard performance category (PC-4) facilities are 180 mph (290 km/hr) and 240 mph (386 km/hr), respectively. The PSSCs are evaluated for a tornado recurrence interval of 2E-6 per year and a design basis tornado with a 3-second tornado speed of 240 mph (386 km/hr). For other extreme winds from hurricanes, tropical weather systems, thunderstorms, and winter storms, PSSCs will be evaluated based on a recurrence period of 1E-4 per year for a 3-second wind speed of 130 mph (209 km/hr). These extreme wind speeds are based on SRS meteorological data and data from National Weather Service stations in Columbia, South Carolina, and Augusta, Macon, and Athens, Georgia.

Over the period from 1700 to 1992, 36 hurricanes have caused damage in South Carolina. However, no hurricane-force winds of greater than 75 mph (120 km/hr) have been measured at the SRS.

Extreme rainfalls generally occur during spring and summer thunderstorms and tropical storms. The design basis rainfall for principal structures, systems, and components are evaluated for a recurrence interval of 1E-5 for various rainfall durations (e.g., 3.9 inches (9.9 cm) for a 15-minute rainfall; 22.7 inches (58 cm) for a 24-hour rainfall).

The number of lightning strikes is estimated at 10 strikes per square km per year. From 1989 to 1993, SRS data show an average of four strikes per square km per year.

Meteorological information provided in the application was current and accurate, was appropriately referenced, and was consistent with information used in the safety assessments used to support the design bases of PSSCs.

1.3.1.4 Hydrology

In the revised CAR, the applicant provided information on surface hydrology including descriptions of nearby rivers, streams, and other water bodies; subsurface water hydrology including water table depths, flow characteristics, potentiometric surfaces, and aquifer characteristics; and design basis floods.

The Savannah River forms the southwest boundary of the SRS and is the dominant body of surface water in the nearby area. The Savannah River Basin drains an area of 10,577 square miles (27,394 square km) and extends 289 miles (465 km) from the Atlantic Ocean to the Blue

Ridge Mountains. The principal streams that enter the Savannah River from the SRS are Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs. These streams discharge water from rainfall, subsurface waters, and various effluent streams from SRS operations. SRS surface water bodies include Par Pond and L Lake, created as cooling water reservoirs for production reactors; marshes; and natural basins, including Carolina bays.

The record historical Savannah River flood at Augusta, Georgia, in 1796, had a discharge of 360,000 cfs (10,000 m^3/sec). The peak Savannah River flow recorded by the U.S. Geological Survey was 350,000 cfs (9900 m^3/sec) in 1929. There have been no major floods in the Augusta area since dams were constructed upstream of Augusta beginning in the 1950's. The estimated 50-year maximum flow is now 74,600 cfs (2100 m^3/sec). The probable maximum flood at the SRS is a water level of 224.5 feet (68.4 m) above mean sea level. The normal Savannah River flow elevation at the SRS Boat Dock is 85 feet (25.9 m). The design basis flood for the MOX fuel fabrication facility is 207.9 feet (63.4 m) above mean sea level with an annual recurrence interval of 1E-5. Because the facility is proposed to be located at an elevation of 272 feet (82.9 m), the probabilities of flooding the site were calculated to be less than 1E-5 per year. A cascading failure of the Savannah River dams upstream of Augusta, Georgia, was estimated to produce a peak flow in the Savannah River of 980,000 cfs (28000 m^3/sec) and a flood elevation of 141 feet (43 m) at the Vogtle station, which is directly across from the SRS on the Georgia side. Because the MOX fuel fabrication facility is at an elevation of 272 feet (82.9 m), other events such as ice flooding, wave surges, and seiches will not affect the facility.

The groundwater setting at the SRS is characterized by three aquifer systems that overlay the bedrock formations of the Southeastern Coastal Plain. The Southeastern Coastal Plain consists of sediments deposited from erosional processes of the Appalachian Mountains that lie to the west of the SRS. These sediments consist of water-bearing sandy materials and limestone and clayey confining units. In the F-area, the confining units of the three aquifer systems become disjointed and have poor separation that allows flow between aquifer systems. In the uppermost Floridan Aquifer System, the Three Runs Aquifer overlays the deeper Gordon Aquifer. These aquifers are separated by a broken confining unit. Recharge of these aquifers is primarily through local precipitation and discharge is primarily through local streams. Because Upper Three Runs Creek and the Savannah River incise the Floridan Aquifer System, there is a head reversal between it and the Crouch Branch Aquifer in the Dublin Aquifer System that lies just below the Floridan Aquifer System. This means that groundwater from the lower system is under a greater head and flows up into the Floridan. This phenomena tends to limit migration of contamination into the lower aquifer systems. The Midville Aquifer System is the deepest system and lies just above the bedrock formations.

At the proposed MOX site, the groundwater table is about 50 feet (15 m) below existing ground level. Potentiometric surface maps show groundwater in the uppermost Upper Three Runs Aquifer flows principally toward Upper Three Runs Creek and toward the unnamed creek located toward the northeast of the proposed site. The underlying Gordon Aquifer flows horizontally toward the Savannah River. The deeper Dublin and Midville Aquifer Systems flow to the southeast towards the Savannah River and the coast. The hydraulic conductivity of the Upper Three Runs Aquifer varies from less than 1.0 feet/day (0.3 m/day) to about 33 feet/day (10 m/day) with an average of about 10 feet/day (3 m/day). At the MOX site, groundwater is abundant, usually soft, slightly acidic, and low in dissolved solids. Groundwater used in site operations from the F-Area are treated to raise the pH and remove iron.

The F-Area Seepage Basin, located to the west of the proposed MOX site, was remediated in 2000 under a Hazardous Waste Part B, Post-Closure Permit issued by the State of South Carolina. After remediating the site, boundary wells hydrologically downstream of the seepage basin were installed and samples were analyzed. The first set of analyses indicated that there is a contamination plume that exceeds the U.S. Environmental Protection Agency Drinking Water Standards. DOE staff are beginning an investigation to further evaluate this groundwater contamination and to better understand the local hydrologic conditions that may exist at the proposed MOX site.

The applicant indicated that there is radioactive contamination in the Upper Three Runs aquifer from upgradient contamination sources in F-Area as well as the F-Area Seepage Basin. This groundwater contamination consists of concentrations of gross alpha and beta activity, uranium, tritium, trichloroethylene exceeding the maximum contamination limits for drinking water. The applicant also indicated that this groundwater contamination occurs at least 30 ft (9.1 m) below the deepest level of expected construction.

During site characterization activities, the applicant measured radioactivity levels of soils using Geiger-Mueller detector scans and gross alpha and beta measurements of soil samples. The applicant indicated that the sensitivity of the gross alpha and beta measurements were 200 nCi/gm and 100 pCi/gm, respectively. In a letter dated February 11, 2003 (Reference 1.3.3.39), DCS stated that soil radioactivity measurement sensitivity (MDC) in the Pre-construction Environmental Monitoring Report (Reference 1.3.3.40) was much better than described in the CY2000 geotechnical investigations.

NRC staff compared the results. The CY2000 geotechnical value was 200 nCi/gram (200,000,000 pCi/kg) gross alpha. The 2002 Preconstruction Environmental Monitoring Report measured values of actinides in soil include a mean value of 12.5 pCi/kg Pu-239, and a maximum of 4380 pCi/kg Pu-239, for example. The SRS Radiological Soil Guides for SRS worker protection is 248,000 pCi/kg (Reference 1.3.3.41). Across the depth profile, the values are:

depth	Pu-239 mean	max (pCi/kg)
0-3"	137	690
3-6"	87.1	1590
6-9"	154	4380
9-12"	121	4280

These values correspond to a potential maximum exposure of 0.3 mrem to an exposed worker using the mean values, and a maximum exposure of 3.3 mrem using the maximum values (Reference 1.3.3.40). The 3.3 mrem annual projected dose is acceptable because the NRC annual limit for members of the public in the controlled area is 100 mrem. The higher 5000 mrem limit for workers does not apply until a restricted area is established or unless construction workers could receive an occupational dose.

The hydrologic information provided in the application was current and accurate, was appropriately referenced, consistent with information used in the safety assessments used to support the design bases of PSSCs.

The planned construction of the facility will not penetrate into the upper groundwater table that exists 50 feet (15 m) below grade level. The groundwater contamination in the Upper Three Runs aquifer is, therefore, not expected to result in hazardous conditions that could affect construction.

1.3.1.5 Seismic Hazards

To assess the potential seismic hazard at the site, Duke, Cogema, Stone and Webster (DCS) established two sets of ground motion spectra in the revised CAR; one for the design of the surface facilities and one for soil stability analyses (liquefaction and dynamic settlements). Although the details of these spectra differ, analyses presented in the revised CAR show they are comparable. The design spectra (both vertical and horizontal) for the facility uses a Regulatory Guide 1.60 spectrum (Reference 1.3.3.29) anchored at 0.20 g peak ground acceleration. The spectra are also used for the design of the nearby Vogtle Nuclear Power Plant (licensed under 10 CFR Part 50). For soil stability, a spectrum was developed based on the existing DOE uniform hazard spectra developed for the SRS. Because the seismic design and analyses rely on these established spectra, much of the site-specific seismic hazard information presented in the revised CAR is developed to establish that these two proposed design and soil stability analysis spectra are adequate to meet the regulatory requirement of 10 CFR Part 70 and the performance guidelines in NUREG–1718.

The following areas concerning the seismic hazards applicable to the safety analysis and design of the proposed facility were reviewed:

- Seismic Source Characterization.
- Ground Motion Attenuation.
- Seismic Hazard Calculations.
- SRS-Wide Rock and Surface Response Spectra.
- Site Response and Design Ground Motion.
- Surface Faulting.

1.3.1.5.1 Seismic Source Characterization

Geological and Tectonic Setting: The revised CAR provides a detailed description of the local and regional geological and tectonic settings. The revised CAR noted that the SRS is located on sediments of the Upper Atlantic Coastal Plain in South Carolina. These sediments consist of stratified but generally unconsolidated sands, silts, clays, and carbonaceous muds deposited in fluvial, deltaic, near-shore, and marine shelf environments. They range in age between Late Cretaceous (~100 Ma) and present and reach a maximum thickness of approximately 4000 feet [1200 m]. Similar to Coastal Plain sedimentary sequences along the entire Atlantic seaboard, the South Carolina Coast sediments rest unconformably on Precambrian to Paleozoic (~ 1.1 Ga to 245 Ma) metamorphic, metasedimentary, and igneous rocks of the Appalachian Orogen and on Triassic to Early Jurassic (~245-180 Ma) siliciclastic rocks associated with early rifting along the North American continental margin. Age and distribution of the rocks and strata provide an adequate geologic record to assess faulting and earthquake hazards.

Earthquakes that could impact safe operation of the proposed facility are associated with two seismic sources, a repeat of the Charleston 1886 earthquake within the Middle Place-Summerville Seismic Zone and small shallow earthquakes of the South Carolina Piedmont. Earthquake source characteristics associated with these seismic zones are consistent with information used in both the Electric Power Research Institute (Reference 1.3.3.10) and Lawrence Livermore National Laboratory (Reference 1.3.3.27) seismic hazard studies for the Eastern United States. As discussed in Section 1.1.1.2 of this report, the bedrock uniform hazard spectra for both the Electric Power Research Institute and Lawrence Livermore National Laboratory form the basis for the site-wide DOE PC–3 and PC–4 hazard spectra (Lee, et al., 1997).

Historical Seismicity: The revised CAR provides a summary of the historical seismicity, including those from the cultural historical record (historical accounts date back to about 1698) as well as more recent instrumented earthquake records (the South Carolina Seismic network and the SRS network, both in operation since the mid 1970s). As noted in the revised CAR, the most significant earthquake source is a repeat of the 1886 Charleston, estimated to have a modified Mercalli intensity (MMI) of X at Charleston, South Carolina, and an MMI at the SRS of VI–VII. Magnitude estimate of the 1886 Charleston earthquake is M 7.3 ± 0.3 (Reference 1.3.3.21 and 1.3.3.1). Other significant historical earthquakes felt at the SRS include the 1913 Union County earthquake (MMI of VII at the epicenter and an MMI of II–III at Aiken, South Carolina); the 1811–1812 New Madrid earthquakes (M > 8.0 at New Madrid, Missouri); and the 1897 Giles County, Virginia, earthquake (MMI of VII, M 5.6 at Pearisburg, Virginia).

Paleoliquefaction features associated with the Charleston-type earthquake indicate these earthquakes are restricted to the Carolina Coastal Plain (Reference 1.3.3.33). However, no definitive geologic evidence has yet been discovered to tie the 1886 Charleston earthquake to a causative seismogenic fault. Tarr et al. (Reference 1.3.3.34), defined the Middleton Place-Summerville Seismic Zone to include the known distribution of seismicity and paleoseismicity associated with the Charleston-type earthquake. The Middleton Place-Summerville Seismic Zone is located 12 miles [20 km] northwest of the city of Charleston, South Carolina. Based on geological and geophysical data, Marple (Reference 1.3.3.23), Madabhushi and Talwani (Reference 1.3.3.22), and Marple and Talwani (Reference 1.3.3.24) all inferred that complex and interactive strike slip and reverse faulting associated with the northwest trending Ashley River fault and the north-northeast trending Woodstock fault were the most likely causes of the Charleston earthquake. Recently, Weems and Lewis (Reference 1.3.3.35) concluded that the region around Charleston, South Carolina, is an active tectonic zone that accommodates differential movement between the Cape Fear arch and Southeast Georgia embayment. All these models are consistent with the source characterization of the Charleston-type earthquake presented in the Electric Power Research Institute and Lawrence Livermore National Laboratory Probablistic Seismic Hazard Assessment (PSHA) seismic hazard studies.

Near the SRS, instrumented historical seismic records indicate seismicity associated with the SRS and surrounding region is closely related to the earthquake activity within the South Carolina Piedmont (Reference 1.3.3.2). This activity is characterized by shallow, small magnitude, and infrequent earthquakes. Searches of the National Earthquake Information Center and Council of National Seismic System show that the vast majority of these earthquakes are *M* 3 or less. The largest magnitude earthquakes in the record are the 1974 *M* 4.9 and *M* 4.7 events. All instrumented earthquakes on the SRS itself were *M* 2.7 or less.

Earthquake Recurrence: The long repeat times (> 500 yr) and relatively brief historical record (< 350 yr) coupled with the absence of active surficial deformation limit estimates of earthquake recurrence for a Charleston-type earthquake. The most complete record of the temporal and spatial distribution of large prehistoric earthquakes comes from identification of earthquake-induced liquefaction features called sand blows. Numerous sand blows have been identified throughout the South Carolina coastal area but few if any outside this region (Westinghouse Savannah River Company, 2000). Recent reanalysis of the paleoliquefaction investigations in South Carolina and recalibrated ^{14}C ages suggest that there were as many as seven large-magnitude earthquakes in the Charleston region within the last 6000 yrs. (Talwani and Schaeffer, 2001). These results translate to a recurrence interval for the Charleston-type earthquake of 500 and 600 yrs. This estimated recurrence interval is conservative because it assumes the maximum number of possible paleoearthquakes using the age constraints derived from the ^{14}C age data. Talwani and Schaeffer (revised DSER Reference 1.3.3.33) used 1σ error ranges to develop their list of age-distinct paleoearthquakes. Overlap of the ^{14}C ages using 2σ error ranges results in a smaller number of age-distinct paleoearthquakes during this same 6000-yr interval and thereby increase the recurrence interval. Nevertheless, the 500–600-yr recurrence interval for the Charleston-type earthquake is consistent with the Lawrence Livermore National Laboratory and Electric Power Research Institute PSHA studies.

Staff Review of Seismic Source Characterization: The staff reviewed the information about seismic sources presented in the revised CAR and found it sufficient because all potentially significant seismic sources related to the SRS (including, but not limited to the Charleston seismic zone) have been identified and assessed. The characterization of the tectonic setting and identification of capable seismic sources were based on extensive review of the published geological literature, regional and site geological and geophysical data, historical and instrumental seismicity data, regional stress field analysis, and geological investigations of prehistoric earthquakes. The information follows guidelines presented in Regulatory Guide 1.165 (Reference 1.3.3.30) and Section 2.5.2.2 of NUREG–0800 (Reference 1.3.3.26). Criteria used to assess capable fault and areal source zones include those outlined in 10 CFR Part 100, Appendix A, as well as those in DOE–STD–1022–94 (Reference 1.3.3.7).

Information provided by DCS to determine the tectonic setting of the facility was developed into a coherent, well-documented discussion that provides an adequate technical basis for evaluation of the seismic potential of the site. Specifically, documentation in the revised CAR was sufficient to determine the earthquake potential of geological structures and potential tectonic zones (i.e., regions of uniform earthquake potential). The information provided in the revised CAR was also sufficient to evaluate uncertainties associated with seismic source geometry (e.g., fault dip, width, segmentation, depth of seismogenic crust) and recurrence models. Thus, the staff reviewed the information in the revised CAR and found it acceptable because the basis geologic and seismic characteristics of the site and vicinity were adequately described in detail to allow investigation of seismic characteristics at the facility.

1.3.1.5.2 Ground Motion Attenuation

Seismic hazards used to define bedrock uniform hazard spectra at the SRS are based on the Lawrence Livermore National Laboratory and Electric Power Research Institute probabilistic seismic hazard studies. The Lawrence Livermore National Laboratory and Electric Power Research Institute bedrock uniform hazard spectra were averaged and then broadened using the SRS-specific spectral shapes to develop bedrock response spectra.

Ground motion attenuation models contained in the Lawrence Livermore National Laboratory and Electric Power Research Institute hazard studies incorporated a number of models developed by individuals and organizations for the southeastern United States. These models are considered to be representative of the state-of-the-art studies of ground motion attenuation characteristics in the southeastern United States and have captured diverse opinions in the scientific community.

The ground motion attenuation model used to develop site-specific spectral shapes was the Band Limited White Noise/Random Vibration Theory ground motion model (Reference 1.3.3.12, and 1.3.3.3). In applying this stochastic approach, the applicant utilized the layered crustal velocity model developed by Herrmann (Reference 1.3.3.19) with some modifications; the Electric Power Research Institute median site attenuation model (Q-model); and the range of the Electric Power Research Institute site-dependent parameter Kappa values (Reference 1.3.3.11).

Staff Review of Ground Motion Attenuation: Ground motion attenuation models used in the Lawrence Livermore National Laboratory and Electric Power Research Institute studies represent the state of the art ground motion attenuation studies in the southeastern United States. Application of these models to the SRS and, consequently, to the facility is considered acceptable. Nuclear Regulatory Commission (NRC) staff has previously accepted the Lawrence Livermore National Laboratory and Electric Power Research Institute ground motion modeling (Reference 1.3.3.30) for sties in the central and eastern United States.

The use of the stochastic model or numerically simulated ground motions in central and eastern United States instead of recorded ground motions is consistent with common practice and the state of knowledge, because sufficient strong motion data are lacking in this tectonic regime due to low seismicity rates. The approach was accepted by the staff in its review of the probabilistic seismic hazard analysis for Paducah Gaseous Diffusion Plant (Reference 1.3.3.5). In addition, the Random Vibration Theory model has been shown to yield conservative results for eastern United States crustal conditions (Reference 1.3.3.32). Thus, the staff has determined that the applicant’s ground motion attenuation modeling is acceptable because it provides reasonable assurance that ground motion attenuation modeling is accurate.

1.3.1.5.3 Seismic Hazard Calculations

The applicant used the seismic hazard results from the Lawrence Livermore National Laboratory and Electric Power Research Institute probabilistic seismic hazard to define bedrock uniform hazard spectra at the Savannah River. No other probabilistic seismic hazard calculations were conducted specifically for the SRS or the facility. The Lawrence Livermore

National Laboratory and Electric Power Research Institute hazard studies included site-specific hazard calculations for the SRS.

Staff Review of Seismic Hazard Calculations: The Lawrence Livermore National Laboratory and Electric Power Research Institute studies represent the state-of-the-art probabilistic hazard studies in the southeastern United States. Application of these results to the SRS and, consequently, to the facility, is considered acceptable. NRC staff previously accepted the Lawrence Livermore National Laboratory and Electric Power Research Institute data, seismic sources, seismic hazard methods, and results (NRC, 1997) for sites in the central and eastern United States. Thus, the staff determined using the Lawrence Livermore National Laboratory and Electric Power Research Institute hazard results is technically sound.

1.3.1.5.4 SRS-Wide Rock and Surface Response Spectra

The SRS-wide rock response spectra were developed by Westinghouse Savannah River Company for the entire SRS (Reference 1.3.3.36). These are site-specific uniform hazard spectra for bedrock from the Lawrence Livermore National Laboratory and Electric Power Research Institute seismic probabilistic hazard studies, broadened using site specific spectral shapes. The rock response spectra were used as the bases for developing bedrock time histories as input into site response analyses for the facility and the SRS-wide surface response spectra.

The SRS-wide surface response spectra are not directly utilized in the design of structures or in soil stability analyses for the facility. However, they were used by the applicant to justify the sufficiency of the selected design spectra for the facility.

The SRS-specific rock uniform hazard spectra for bedrock were developed following the guidance and methodologies outlined in DOE–STD–1023 (Reference 1.3.3.9). Probabilistic hazards were developed according to DOE performance category 3 (PC–3) and 4 (PC–4) spectra. The DOE PC–3 and PC–4 spectra were developed following seismic design and evaluation criteria in the DOE STD–1020–94 (Reference 1.3.3.8). In DOE STD–1020–94, PC–3 and PC–4 categories have mean annual probabilities of exceedance for design ground motions at 5×10^{-4} and 1×10^{-4}, respectively. In terms of the annual return period ground motions, mean annual probabilities of exceedances of 5×10^{-4} and 1×10^{-4} correspond to mean 2000-yr and 10,000-yr return period ground motions, respectively.

The development of the rock response spectra included the following procedures:

- The mean bedrock uniform hazard spectra were computed for two mean annual probabilities of exceedances, 5×10^{-4} and 1×10^{-4} (corresponding to performance categories of PC–3 and PC–4, respectively), by averaging Lawrence Livermore National Laboratory and Electric Power Research Institute mean uniform hazard spectra for the SRS.

- Site-specific spectral shapes were generated using Electric Power Research Institute mean magnitude and mean distance values based on the magnitude and distance deaggregation results at each probability of exceedance.

- The spectral shapes were then scaled to the corresponding mean bedrock uniform hazard spectrum at frequencies 1–2.5 and 5–10 Hz.

- The resulting three spectra (the averaged Lawrence Livermore National Laboratory and Electric Power Research Institute uniform hazard spectrum and the 1–2.5 Hz and 5–10 Hz scaled site-specific spectra) were then enveloped and smoothed to obtain the broadened bedrock response spectra for the PC–3 and PC–4 hazards.

Site-Wide Surface Response Spectra: Site-wide surface response spectra were obtained by multiplying the broadened bedrock uniform hazard spectra by frequency dependent site amplification factors to account for soil effects. In deriving site amplification factors, hypothetical bedrock spectra were vertically propagated through soil columns representative of the site soil conditions using the one-dimensional equivalent linear analysis procedure developed by Silva (Reference 1.3.3.32). The procedure was considered to be equivalent to SHAKE analyses summarized in Idriss and Sun (Reference 1.3.3.20).

The hypothetical bedrock spectra were power spectral density functions and spectral accelerations for a suite of peak ground accelerations at the soil/bedrock interface (bedrock motions described previously) and were developed using the Random Vibration Theory model (Reference 1.3.3.3). Three magnitude and distance dependent spectra were developed for each control motion acceleration representing the 5th, 50th, and 95th percentile contribution to the probability of exceedance. Again, the magnitude and distance pairs were obtained from Electric Power Research Institute deaggregated hazard results

The calculation of the site amplification factors considered SRS-wide variability in velocity profile, soil column thickness, bedrock velocity, and dynamic properties (Reference 1.3.3.36). The site-wide uniform hazard based response spectrum was taken as the envelope of all of the soil response spectra obtained by multiplying the broadened mean bedrock uniform hazard spectra by the site amplification factors for different soil/bedrock categories, scaling frequencies, and magnitude levels. As with the design ground motions, the site-specific soil spectra was shown to envelope the Charleston earthquake spectra.

Staff Review of SRS Rock and Surface Response Spectra: The Lawrence Livermore National Laboratory and Electric Power Research Institute studies represent the state-of-the-art probabilistic hazard studies in the southeastern United States. Application of these probabilistic hazard results to the SRS and, consequently, to the facility is considered acceptable. NRC staff previously accepted the Lawrence Livermore National Laboratory and Electric Power Research Institute ground motion modeling (Reference 1.3.3.30) for sites in the central and eastern United States. In addition, broadening the Lawrence Livermore National Laboratory and Electric Power Research Institute bedrock uniform hazard spectral shapes and the development of surface response spectra are consistent with the methodologies of DOE-STD-1023 (Reference 1.3.3.9). These methodologies and procedures are well established within the ongoing seismic program at the SRS. These site-specific adjustments have been extensively reviewed by the Westinghouse Savannah River Company and the DOE. Thus, the staff determined that SRS-wide rock and surface response spectra are acceptable because they provides reasonable assurance that potential seismic hazards are sufficiently estimated.

1.3.1.5.5 Design Spectra and Site Response Analyses

Design Spectra: The applicant-proposed design basis ground motions for the surface facilities are a Regulatory Guide 1.60 spectra (Reference 1.3.3.29) anchored at 0.20g peak ground acceleration, which is the same spectra used for the design of the nearby Vogtle Nuclear Power Plant (licensed under 10 CFR Part 50). More recently, regulations in 10 CFR Part 100.23 for nuclear power plants have been updated to include the application of probabilistic methods to the assessment of seismic hazards. Regulatory Guide 1.165 (Reference 1.3.3.30) provides general guidance for determining the Safe Shutdown Earthquake for new nuclear reactors based on a probabilistic seismic hazard analysis, consistent with the regulatory requirements of 10 CFR Part 100.23. Regulatory Guide 1.165 recommends a reference median annual probability of exceedance of 1×10^{-5}. As shown by a similar analysis in Appendix C of the DOE STD-1020-2002 (Reference 1.3.3.8), a median annual probability of exceedance of 1×10^{-5} corresponds approximately to a mean annual probability of exceedance of 1×10^{-4} (see also revised DSER Reference 1.3.3.9).

Evaluations performed by the applicant in the Safety Analysis Report (SAR) show that the 0.20g Regulatory Guide 1.60 spectra have mean annual exceedance probabilities that range between 1.6×10^{-4} and 4.5×10^{-5} (or equivalent return periods that range between 6,300 and 22,000 years; see Table 1 of Enclosure B of revised DSER Reference 1.3.3.15). For frequencies between 2 and 10 Hz, the mean annual probabilities of exceedance are equal to or less than 1×10^{-4} (or equivalent return periods greater than 10,000 years). For higher frequencies up to the peak ground accelerations, the mean annual probabilities of exceedance are equal to or sightly greater than 1×10^{-4}. These mean annual exceedance probabilities are based on ground motions from the averaged Electric Power Research Institute (Reference 1.3.3.10) and Lawrence Livermore National Laboratory (Reference 1.3.3.27) seismic hazard results for the Eastern United States.

Regulatory Guide 1.60 spectra anchored at 0.20 g were selected by the applicant because they were deemed to be conservative. This seismic design spectrum is shown by the applicant to lie between the SRS-wide DOE performance category 3 (PC–3) and performance category 4 (PC–4) spectra. The current PC-3 and PC-4 site wide spectra are based on ground motion spectra developed by Westinghouse Savannah River Company (Reference 1.3.3.36) for the entire SRS. The PC-3 and PC-4 spectra were developed following seismic design and evaluation criteria in the DOE STD-1020-94 (Reference 1.3.3.8), as discussed in more details in Section 1.1.1.1.4.

To ensure safe operation of the structures, systems and components (SSCs) beyond the design ground motions, DOE STD-1020-94 (Reference 1.3.3.8) developed performance goals associated with each performance category. The performance goals are defined in terms of the ability of the SSCs to perform essential safety functions during and after the natural hazard phenomena (in this case an earthquake). The acceptable behavior limit for normal use SSCs, such as buildings, is major damage, but limited in extent such that the occupants can safely exit the building. For more critical structures, systems, and components, such as nuclear containment structures, damage at the performance goal should be limited such that the containment is not compromised. In DOE STD-1020-94 (Reference 1.3.3.8) as well as DOE STD-1020-2002), the seismic ground motion performance goals for PC-3 and PC-4 structures, systems, and components were established with a mean annual probability of exceedance of 1×10^{-4} and 1×10^{-5}, respectively.

On page 27 of the MOX Fuel Fabrication Facility Site Geotechnical Report (References 1.3.3.14 and 1.3.3.15), the applicant indicates that the desired performance goal probability is based on the approach recommended in DOE-STD-1020-94 (Reference 1.3.3.8). That assertion is supported by performance calculations (Enclosure B of revised DSER Reference 1.3.3.15) which showed that many of the structures, systems, and components performed their safety functions to ground motion levels with a mean annual probability of exceedance of 1×10^{-5} or less. These calculations support the conclusion that the design criteria—Regulatory Guide 1.60 (Reference 1.3.3.29) spectra anchored to the 0.20g peak ground acceleration (PGA), which is significantly greater than the site wide PC-3 spectra— is adequate for safe design of the facility.

The design spectra were also shown by the applicant to envelop the deterministic spectra for a repeat of the Charleston-type earthquake. This deterministic check analysis follows requirements in DOE–STD–1023 (Reference 1.3.3.9), using the largest historic earthquakes within 75 miles [121 km] having a moment magnitude greater than six. In this analysis, the deterministic median bedrock and soil spectra were generated for the 1886 Charleston earthquake using median source parameters, a source-to-site distance of 124 miles [120 km], and other parameters used in the generating uniform hazard based response spectra.

In response to the staff request for additional information, the applicant evaluated the vertical-to-horizontal seismic spectral ration for the facility (Reference 1.3.3.13). The results show the vertical-to-horizontal spectral ratios could exceed the standard generally used at the SRS (normally the vertical is assumed to be two-thirds of the horizontal), particularly for frequencies greater than approximately 3 Hz. Thus, the applicant has agreed to use both the horizontal and vertical spectra in Regulatory Guide 1.60 (Reference 1.3.3.29) anchored at 0.20g peak ground acceleration

Site Response Analyses: The applicant indicated that the site-wide response spectra are intended for simple response analysis and not appropriate for soil-structure interaction and soil stability analyses. It was further indicated that the site-wide response spectra represent a surface response, not embedded response. For soil stability and soil-structure interaction analyses, a one-dimensional free-field site response analysis procedure was established by the applicant (Reference 1.3.3.14). The control ground motions for site response analyses included the modified PC-3 motion and the 1886 Charleston motion. The modified PC-3 motion is the SRS-wide PC-3 rock response spectrum increased by a factor of 1.25 (PC-3+ rock spectrum) to yield a bedrock PGA of 0.14g, one that would achieve the design surface PGA of 0.20g at the facility through site response analyses. The 1886 Charleston motion is the 50th percentile attenuated rock motion at the Actinide Packaging and Storage facility site. It was used by the applicant to evaluate the liquefaction potential associated with large, distant earthquakes. The spectrum-compatible acceleration time histories for both of these design motions were developed by Westinghouse Savannah River Company.

Site response analyses were conducted using PROSHAKE, a Windows version of the SHAKE91 (Reference 1.3.3.19). The design motion time histories were applied at the base of the soil column. Properties for the soil column were developed from geotechnical studies specific to the facility. The cyclic stress ratios computed from the site-response analyses were input into the dynamic soil-structure interaction analyses of the critical structures and into the liquefaction analyses.

Results from site response analyses show that the PC-3+ bedrock time history produces a surface PGA of 0.20g and a surface spectrum that correlates well to the Regulatory Guide 1.60 (Reference 1.3.3.29) surface spectrum anchored at 0.20g peak ground acceleration. Thus, the applicant concluded that the PC-3+ bedrock spectrum satisfies the requirement for a bedrock time history that can be used for dynamic analysis at the facility.

1.3.1.5.6 Surface Faulting Hazard

The revised CAR summarized tectonic structures of interest in the SRS and surrounding region, including faults, folds, arches, basins, and paleoliquefaction features that resulted from past earthquakes. Many of these features are vestiges of the contractional tectonism that characterized the Appalachian Orogen from the Late Precambrian through the Late Paleozoic (~1.1 Ga to ~245 Ma) and rifting and extensional tectonism that characterized the break up of Pangea and the opening of the Atlantic Ocean in the Triassic and Early Jurassic periods (~245 to 180 Ma). Although reactivation of some of these features has been proposed to explain the origin of the Charleston-type earthquake (see discussion in Section 1.2.1.1), none of these features impact direct faulting hazards at the SRS.

Faulting of the Atlantic Coastal Plain sediments is evident from geologic and geophysical data (e.g., Revised DSER Reference 1.3.3.31). Most of the faults are moderately to steeply dipping reverse faults although some small normal faults were noted in the Late Cretaceous and Early Tertiary strata (100 to 37 Ma). Maximum displacements are less than 250 feet [80 m], and displacements become progressively smaller in younger sediments suggesting that faulting was coeval with deposition.

At the SRS, the Pen Branch fault has been identified as the primary structural feature of interest to a potential faulting hazard. This fault appears to be an upward propagation of the boundary fault on the northern side of buried Dunbarton Basin, a Triassic to Early Jurassic rift feature. This boundary fault was originally a down-to-the-southeast normal fault but was reactivated as an up-to-the-southeast reverse fault in the Late Cretaceous and Early Tertiary (100 to 37 Ma). Extensive geological and geophysical evidence summarized in the revised CAR documents that the Pen Branch fault was not active in the last 500,000 yr and probably was not active in the Quaternary (last ~ 2 Ma). Thus, the Pen Branch fault is not deemed capable according to criteria established in 10 CFR Part 100, Appendix A.

Staff Review of Surface Faulting Hazard: The staff reviewed the information in the revised CAR and found it acceptable because the potential for surface faulting of the site and vicinity has been adequately assessed. There is sufficient evidence to conclude, with reasonable assurance, that surface faulting hazards do not exist at the SRS.

1.3.1.6 Stability of Subsurface Materials

The objective of the staff review in this section was to determine with reasonable assurance whether characterization of the stability of the subsurface materials for the facility is adequate for foundation design for the civil structural systems. The following areas concerning the subsurface material stability applicable to the safety analysis and design of the proposed facility were reviewed:

- Soil Liquefaction Potential Assessment.
- Soft Zone Characterization.
- Slope Stability Assessment.

1.3.1.6.1 Soil Liquefaction Potential Assessment

The information regarding the paleoliquefaction at the SRS where the proposed facility will be located was provided in Section 1.3.5.3.4.3, "Post-Rift and Cenozoic Structures," of the revised CAR. The revised CAR indicates that no systematic reconnaissance surveys in search of paleoliquefaction evidence within the geomorphic and geologic environment of the SRS were performed in the past because of limited access, high water table conditions, dense vegetative cover, and few exposures.

For seismically induced liquefaction to occur and be identified, several conditions have to be met: (1) presence of Quaternary-age unconsolidated deposits, (2) presence of a shallow groundwater table, (3) proximity to potential seismogenic features, and (4) quality and extent of exposure (Reference 1.3.3.13). According to these conditions, young fluvial terraces at or slightly above the level of the modern flood plain and Carolina bays may have the highest potential for generating and recording Holocene (last 10,000 yr) and Quaternary (~ last 2 Ma) seismically induced liquefaction.

Limited investigation of the exposed young fluvial terraces along the Savannah River adjacent to the SRS suggests that most of the exposed deposits were clay and silt, thus have a low liquefaction potential. Although local clean sand deposits with a high liquefaction potential exist, evidence about the seismically induced liquefaction is not observed (DCS, 2001a). In general, these young fluvial deposits are historical in age. In historical times, no strong ground motions occurred in the SRS area. Consequently, evidence for seismically induced liquefaction in the young fluvial deposits may not exist.

According to the revised CAR, potential paleoliquefaction for the flood plain deposits at depth is likely. Evaluation of post-depositional features associated with the upland areas at the SRS, however, suggests that they are not related to seismically induced liquefaction (Reference 1.3.3.13).

Liquefaction susceptibility at the facility was discussed in Section 1.3.7.1 of the revised CAR. The discussion was supported by detailed soil geotechnical testing data as documented in two facility site geotechnical reports (Reference 1.3.3.14). The site geotechnical reports present properties of soils including soil classifications, particle size distributions, water contents, plasticity indices, liquid limits, blow counts from standard penetration tests, tip shear resistances from cone penetration tests, and shear wave velocities.

The liquefaction potential of the facility site within the proximity of the Mixed Oxide Fuel Fabrication and Emergency Diesel Generator Buildings was evaluated using the cyclic stress approach described in National Center for Earthquake Engineering Research (Reference 1.3.3.25). This approach is acceptable to the staff for liquefaction potential investigation because it represents the state-of-the-art procedure. This procedure is suited for evaluating liquefaction resistance of soils under level to gently sloping ground; the surface gradient at the proposed facility is gently sloping (as shown in Figure 1.3.1-2 of the revised CAR).

In the second geotechnical report (Reference 1.3.3.14), liquefaction potential was evaluated for the 37 soil columns from cone penetration tests and 11 soil columns from standard penetration tests. Cyclic stress ratio and cyclic resistance ratio are two important parameters for assessing liquefaction. The revised CAR assumed full liquefaction was triggered if the factor of safety (cyclic stress ratio/cyclic resistance ratio) was equal to or smaller than 1.1. For factors of safety between 1.1 and 1.4, soil settlement may result because of the excessive water pressure buildup that reduces soil strength and stiffness.

According to the revised CAR, liquefaction potential along soil columns was assessed using the specific cyclic stress ratios and cyclic resistance ratios corresponding to the soil columns analyzed using the procedures proposed in National Center for Earthquake Engineering Research (1997). For cases where soil columns were not available, cyclic stress ratios for the idealized soil column were used. This approach for considering data variability is acceptable to the staff.

The analysis results indicated that the liquefaction potential at the facility site is low. Only a few localized areas have been identified to be liquefiable or to have soil settlement potential because of excessive pore water pressure. The potentially liquefiable soils identified at the site are located in the lower Tertiary (~65 to 33 Ma) Tobacco Road, Dry Branch, and Santee formations. The revised CAR indicated that the analysis results were conservative because the effect of soil aging and the cohesiveness of the soils for the cone penetration-based results are not considered in the analysis.

Staff Review of Soil Liquefaction Potential Assessment: The staff reviewed the information presented in the revised CAR and found reasonable assurance that paleoliquefaction at the SRS was discussed acceptably to support the design of the PSSCs of the proposed facility. The staff review also concurred the analysis of liquefaction potential at the proximity of the Mixed Oxide Fuel Fabrication and Emergency Diesel Generator Buildings demonstrated a conservative approach and is acceptable. Consideration of the effect of the seismically induced settlements caused by either liquefaction or excessive water pressure buildup in the development of design criteria for the principal structures, systems, and components of the facility are evaluated in Section 11.1 of this safety evaluation report.

1.3.1.6.2 Soft Zone Characterization

Soft zones in the soils are unique features for the SRS. The origin of the soft zones was discussed in Section 1.3.5.1.5.5, Carolina Bays, of the revised CAR. The discussion about the characterization of the soft zones at the facility is provided in Section 1.3.7.2, “Evaluation of Soft Zones,” and supported by site geotechnical data (Reference 1.3.3.14).

The soft zones are often found in the Tinker/Santee Formation, particularly in the upper third of this section. These soft zones consist of weak material zones interspersed in stronger carbonate-rich matrix materials. The presence of soft zones may pose a concern for foundation design by developing undesirable soil settlement not accounted for in the design. In engineering terms, a soft zone is defined as a zone with a cone penetration test corrected tip resistance less than 1.44 MPa [15 tsf] or blow counts from a standard penetration test less than five over a continuous interval of at least 2 feet [0.6 m] (Reference 1.3.3.14). In characterizing the soft zones, the applicant used these criteria to identify soft material zones not located in the Tinker/Santee Formation. The staff considered this approach prudent and acceptable.

The results of the site exploration program related to identifying soft material zones were documented in two site geotechnical reports (Reference 1.3.3.14). The exploration hole spacing in the vicinity of an identified soft zone was generally 90 feet [27 m] or less. The lateral extent of soft zones was conveniently estimated to be half of the exploration spacing. The exploration program identified soft zones in the vicinity and beneath the Mixed Oxide Fuel Fabrication Building with limited lateral extent. The thickness of these soft zones ranges from 3 to 7 feet [0.91 to 2.13 m].

Staff Review of Soft Zone Characterization: Based on the review of the information concerning soft zones, the staff concluded the exploration program conducted by the applicant sufficiently characterized the soft zones at the facility to support design of the PSSCs. Consideration of the effect of the soft zones in the development of design criteria for the PSSCs of the facility are evaluated in Section 11.1 of this safety evaluation report.

1.3.1.6.3 Slope Stability

Slope stability was not specifically discussed in Section 1.3, “General Site Description,” of the revised CAR. In evaluating the natural phenomena applicable to the site, however, debris avalanching and landslides were determined not applicable to the site because the site is relatively flat and no significant quantities of soil or rock are available in the surrounding area (see Table 5.5-5 in the revised CAR). An examination of topographic contours provided in Figure 1.3.4-6 confirms the slopes at the facility site are relatively gentle in nature and, therefore, pose no threat for instability or landslide. The staff site visit further confirms slope stability is not a safety concern for the site.

1.3.2 EVALUATION FINDINGS

The staff reviewed the site geographic, demographic and land use, meteorologic and hydrologic information presented in the revised CAR. Assessment of the site geographic, demographic and land use, and meteorologic characterization at the proposed facility site was adequately described so the safety of the site can be assessed and the design criteria for seismicity can be developed. The site geographic, demographic, and land use, meteorologic, and hydrologic information provided in the application was generally current, appropriately referenced and consistent with information in the safety assessments used to support the design bases of the PSSCs.

The staff reviewed the seismic source characterization, ground motion attenuation, seismic hazard calculations, site response and design ground motions, surface faulting, liquefaction potential, and soft zones at the proposed facility site and concludes that the information was accurate and adequately described so the safety of the site can be assessed and the design criteria for seismicity can be developed.

Open item SD-1 in the April 30, 2002, draft Safety Evaluation Report, has been closed. See Appendix B.

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