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2.4.9 CHANNEL DIVERSIONS

PTN COL 2.4-3 Units 6 & 7 are located on the western shore of Biscayne Bay. Based on the seismic, geological, topographical, thermal, and hydrological evidences of the region, there is no plausible risk that the safety-related facilities and functions of the plant will be adversely affected by channel diversions or shoreline migrations as described below.

The site's geologic setting, including the seismic and stratigraphic properties, is described in Subsection 2.5.1. Units 6 & 7 are located within the Southern Slope subprovince of the Southern Zone physiographic subregion of the Florida Platform (a partly submerged peninsula of the continental shelf) within the Atlantic Coastal Plain physiographic province. The geology was influenced by sea level fluctuations, processes of carbonate and clastic deposition, and erosion. The Paleogene (early Cenozoic) is dominated by the deposits of carbonate rocks, while the Neogene (late Cenozoic) is more influenced by the deposits of quartzitic sands, silts, and clays. The geology is dominated by flat, planar bedding in late Pleistocene and older units. The original site was within 3 feet of sea level and was uniformly flat throughout with the exception of a few isolated vegetated depressions. The local terrain was covered with a thin (less than 6 feet) veneer of organic muck that overlaid the Pleistocene Miami Limestone. There is no geological or topographic evidence that indicates historical channel diversions in the general area.

According to the hydrological description in Subsection 2.4.1, there are no major natural rivers or channels located near Units 6 & 7, and the preconstruction elevation within the plant area where the safety-related facilities are located varies from approximately –2.4 feet to 0.8 feet NAVD 88. An extensive system of canals, as shown on Figures 2.4.1-208 and 2.4.1-209, was built between Lake Okeechobee and the Atlantic Ocean, Biscayne Bay and Gulf of Mexico during the last century for the purposes of drainage, flood protection, and water supply.

Consisting of multiple waterways with locks and gates for controlling flow and water levels, the canal system has elevated levees along the left and right banks to contain flood flow during storm events and is not susceptible to channel migration or cutoff. There is no evidence of channel diversions in the area as a result of natural flooding events since the canal system was built.

As described in Subsection 2.4.1, the Biscayne Bay is bounded by mainland Florida to the west; by barrier islands and a wide, shallow opening of coral shoal near the middle of the bay; and by several channels and cuts to the east. The barrier islands are located between the bay and the Atlantic Ocean. The Biscayne Bay is a shallow subtropical lagoon with a natural depth ranging from 3 to 9 feet. However, much of the bay has been dredged and the current depth ranges from 6 to 10 feet (Reference 201). There is historical evidence of shoreline changes along the Florida coasts, including the western shore of Biscayne Bay where Units 6 & 7 are located.

Shoreline changes along east Florida are due to hurricanes, tropical storms, northeasters, and tidal and wave actions (References 202, 203, and 204). These forces effect erosion of sandy beaches and barrier islands, especially around inlets (Reference 202). In addition, coastal protection structures amplify shoreline fluctuations by changing the natural long shore sediment transport pattern. Although the lagoons along east Florida (such as Biscayne Bay) are protected by barrier islands, wakes generated by boats in the lagoons can contribute to local shore erosion in some areas (Reference 202). Any migration of the shoreline due to coastal protection structures, dredging, and other human activities near and around the plant site should be gradual and will be addressed before the safety-related facilities are adversely impacted.

Reference 202 provides a summary of long- and short-term shoreline change for the southeast Atlantic coast. Long-term rates of shoreline change were estimated based on surveys of shoreline positions from the 1800s to 1999, and short-term rates of shoreline change were estimated based on 1970s and 1999 shoreline positions. The average long- and short-term shoreline-change rates for east Florida are 0.2 ±0.6 meter/year (0.66 ±2.0 feet/year) and 0.7 meter/year (2.3 feet/year), respectively (plus sign indicates accretion and minus sign indicates erosion). This long-term shoreline rate of change is relatively small compared to shoreline changes for the other parts of the southeast Atlantic coast because tidal and wave energy levels are low and beach nourishments are common where shore erosion persists. Nevertheless, at least 39 percent of the east Florida shoreline experiences a long-term average erosion rate of 0.5 meter/year (1.6 feet/year). The study did not estimate the long- and short-term shoreline change rates specifically for Biscayne Bay. However, shoreline changes in the Biscayne Bay, especially along the western shore, are expected to be smaller because of the protection provided by the barrier islands. Any erosion or inundation of the barrier islands due to long-term wave action would be gradual with sufficient warning and will be addressed before the safety-related facilities are adversely impacted.

Figure 2.4.9-201 shows the shorelines near Units 6 & 7 for the years 1928, 1946, and 1971/1972 (Reference 205). As the figure indicates, there has been some shoreline erosion between 1928 and 1971/1972 (approximately a 43-year lapse), although some areas also experienced accretion. Nevertheless, between the years 1946 and 1971/1972 (approximately a 25-year lapse), only minor shoreline changes were observed. Any shoreline changes that would occur near Units 6 & 7 as a result of long-term tidal and wave actions would be relatively gradual with sufficient warning for mitigating actions to be implemented before the safety facilities will be adversely impacted.

Shoreline changes as a result of hurricanes or tropical storms occur on a shorter time scale. As addressed in Subsection 2.4.5, during the landfall of Hurricane Andrew in 1992, the combined storm surge and astronomical tide in the northern Biscayne Bay ranged from 4 to 6 feet NGVD 29, which is approximately 2.4 to 4.4 feet NAVD 88 based on the datum relationship given in Subsection 2.4.1. The maximum surge height of 16.9 feet NGVD 29 (15.3 feet NAVD 88) from Hurricane Andrew was observed on the western shoreline near the center of the Biscayne Bay. In the southern part of the Biscayne Bay, the surge elevation ranged from 4 to 5 feet NGVD 29 (2.4 to 3.4 feet NAVD 88). During the landfall of the hurricane, the mainland coast of Biscayne Bay, from Rickenbacker Causeway to Turkey Point, experienced a strong onshore surge (Reference 206). The lower beach slope erosion from the hurricane seldom exceeded 0.3 to 1 meter (1 to 3.3 feet) and the lateral erosion of the shoreline was less than 10 meters (33 feet) (Reference 206). As described in Subsection 2.4.10, the Units 6 & 7 plant area is built up to higher elevations from the adjacent grade and is protected by a retaining wall structure with the top of wall elevation varying from 20 feet to 21.5 feet NAVD 88. In addition, the retaining wall, though not a safety-related structure, is designed to withstand the hydrostatic and hydrodynamic forces from hurricane surge up to the probable maximum storm surge and coincidental wave run-up actions. Therefore, no adverse impact on the structures, systems, or components is expected as a result of shoreline erosion caused by hurricane or tropical storm surges.

Long-term sea level rise will cause a landward shift of the shoreline position, inundating low-lying areas along the coast. As described in Subsection 2.4.5, the long-term average sea level rise at the plant property is expected to be approximately 0.78 foot per century (0.094 inch/year), similar to the sea level rise rate at Miami Beach, Florida. The rate of the sea level rise is too slow to cause any significant short-term shoreline change. On a long-term perspective, the determination of the design basis flood level, established as a result of the probable maximum hurricane storm surge, has included the effect of sea level rise as described in Subsection 2.4.5. Descriptions of safety-related flood protection measures for Units 6 & 7 are detailed in Subsection 2.4.10.

Because the plant property is flat and no major rivers are located nearby, there is no potential for subaerial landslide-generated flooding. In addition, as addressed in Subsection 2.4.6, the largest submarine landslide zones near Units 6 & 7 are identified along the salt domes of the Carolina Trough where tectonic activities of the salt domes have been suggested as one of the triggering mechanisms for these slides. Units 6 & 7 are located approximately 400 miles southwest of Blake Spur, with a wide and shallow continental shelf in between, and, therefore, the impact of any submarine landslide-generated tsunami in the continental shelf north of Blake Spur would be considerably reduced before reaching Units 6 & 7. Subsection 2.4.6 concludes that the safety function of the plant will not be affected by tsunami induced flooding or low water conditions.

As presented in Subsection 2.4.7, there are no records of ice jams in the region of South Florida where Units 6 & 7 are located. Therefore, there is no potential for flooding or low water concerns as a result of channel diversions both upstream and downstream of Units 6 & 7 from ice blockage or breaching of ice jams.

On the consideration of the plant's safety-related water supply, the design of the AP1000 reactor employs a passive containment cooling system that functions as the safety-related ultimate heat sink. This system, described in AP1000 DCD Subsection 6.2.2, is responsible for emergency cooling. The passive containment cooling system design of Units 6 & 7 does not rely on an open surface water source or groundwater source to perform its safety-related function. Therefore, its operation is not adversely affected by the interruption of plant water supply as a result of low water conditions caused by channel diversion or shoreline migration events.

2.4.9.1 References

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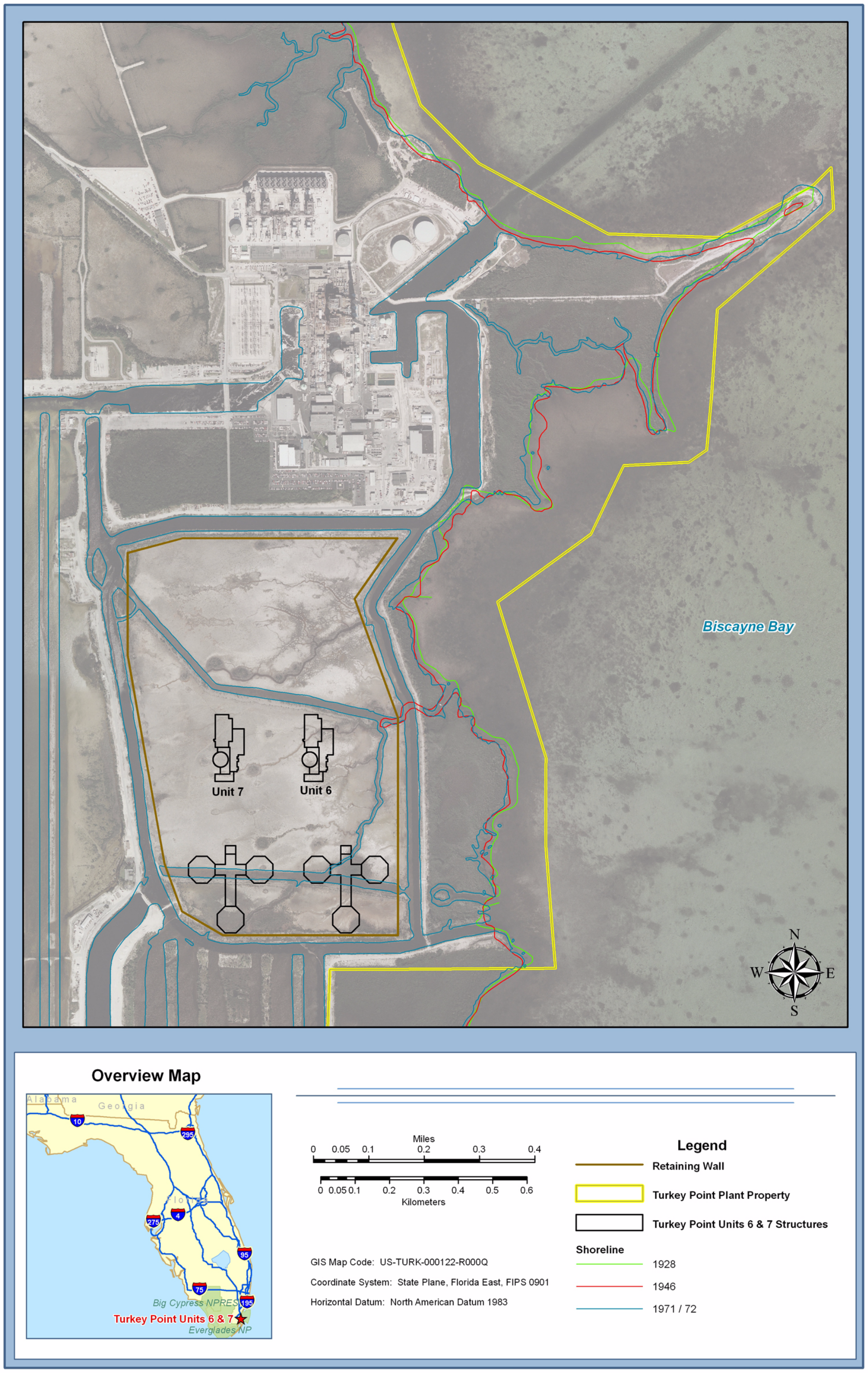
Figure 2.4.9-201 Historical Shoreline Changes at Units 6 & 7



Source; Reference 205