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2.4.11 LOW WATER CONSIDERATIONS

PTN COL 2.4-3 The passive containment cooling system for Units 6 & 7 does not require an open surface water source to perform its safety-related function, and, therefore, its operation is not adversely affected by low flow conditions described in this section.

The dissipation of the power cycle heat from the main condensers of the circulating water system is by the cooling towers. The cooling towers of the circulating water system, including its pump intake structure, are nonsafety-related structures. The raw water system provides makeup water to the cooling tower basins to compensate for evaporation, drift, and blowdown discharge. The raw water system is nonsafety-related. The source of raw water is either reclaimed water, or saltwater withdrawn from radial collector wells, or a combination of the two types of water sources. Each of these two makeup water sources is able to provide 100 percent of the makeup water flow requirements resulting in 100 percent redundancy in the water supply system.

The reclaimed water is delivered to the plant property/site boundary from Miami-Dade County Water and Sewer Department (MDWASD) facilities. Reclaimed water requires tertiary treatment before it is used for cooling.

The saltwater is supplied from four radial collector wells with radials extending beneath the Biscayne Bay. The saltwater is delivered to the cooling tower basins.

The Miami-Dade potable water supply provides makeup water for the service water cooling towers of each unit. Additionally, the Miami-Dade potable water supply provides water for the potable water system, fire protection system, demineralized water system, and other miscellaneous uses for each unit.

2.4.11.1 Low Flow in Rivers and Streams

Conventional cooling water sources such as rivers and streams are not used for Units 6 & 7. Instead, reclaimed water and the saltwater from radial collector wells are the two main sources of makeup water for the cooling towers. Therefore, low flow conditions in rivers and streams have no impact to the plant water supply.

2.4.11.1.1 Reclaimed Water for Makeup

Units 6 & 7 use reclaimed water from MDWASD. The MDWASD provides wastewater treatment for customers within Miami-Dade County. The secondary treatment and effluent disposal are accomplished at South District Wastewater Treatment Plant (SDWWTP), with deep injection well disposal of effluent (Reference 201). The SDWWTP facility is the potential source of reclaimed water (References 202 and 203). The location of this facility is shown in Figure 2.4.11-201.

Reuse of reclaimed water is also addressed in the water use permit for the Miami-Dade consolidated public water supply, issued by the SFWMD on November 15, 2007 (Reference 202). Consistent with the permit, MDWASD will work with FPL to provide reclaimed water for additional power projects such as the gas power plant expansion and the proposed nuclear power plant (Reference 202). The MDWASD planned supply is 70 mgd of reclaimed water for Units 6 & 7 and 14 mgd for the gas-powered Unit 5 (Reference 203).

The maximum reclaimed makeup water rate required by the mechanical draft cooling towers for Units 6 & 7 is approximately 38,400 gpm or 55.3 mgd. This is based on maintaining four cycles of concentration in the cooling towers. The blowdown discharge flow rate at four cycles of concentration is approximately 10,000 gpm.

2.4.11.1.2 Saltwater for Makeup

Saltwater from radial collector wells is an alternate source of makeup water for the nonsafety-related cooling towers. The wells supply saltwater that recharges from the marine environment (Biscayne Bay). The water salinity in these formations is close to seawater due to its hydraulic connection.

The saltwater for makeup is obtained through a system of radial collector wells. A radial collector well consists of a central reinforced concrete caisson extending below the ground to the target depth. Well screens project laterally outward into the surrounding earth materials in a radial pattern at the target depth. Subsection 2.4.12 provides details of this water supply system.

The maximum saltwater flow rate required by the mechanical draft cooling towers of Units 6 & 7 is approximately 86,400 gpm or 124.4 mgd. This is based on maintaining 1.5 cycles of concentration in the cooling towers. The makeup water to the cooling tower is necessary to compensate for evaporation, drift, and

blowdown discharges from the cooling towers. The blowdown discharge flow rate at 1.5 cycles of concentration is approximately 58,000 gpm.

Units 6 & 7 incorporate four 33.3 percent capacity radial collector wells with a capacity of each well being approximately 45 mgd, based on the 100-year low seawater level of –3.5 feet NAVD 88. The location of the radial collector wells is shown in Figure 2.4.11-202.

2.4.11.1.3 Availability and Reliability of Makeup Water

Two independent sources of makeup water, each with 100 percent supply capacity, provide makeup water to the circulating water system.

The reclaimed water supply and saltwater from radial collector wells are not typical cooling water sources, and they differ from rivers and streams. The sources of these types of water are affected by infrastructure put in place, and hydrometeorological phenomena do not affect the supply of these sources. Consequently, the 100-year low flow condition for rivers and streams is not applicable to reclaimed water, and the 100-year low seawater level condition is used in the design of radial collector wells.

Radial collector wells are designed to induce seabed filtration of suspended sediments. In this manner, sediments are filtered out before reaching the laterals and point of use. This arrangement improves the raw water quality and simplifies the treatment process. One radial collector well can operate in standby mode and function as a reserve well in the event of unplanned well outages or scheduled maintenance events.

2.4.11.2 Low Water Resulting from Surges, Seiches, or Tsunamis

Plant safety-related systems, including the UHS, do not rely on the cooling tower system and are not affected by interruptions in the operation of these mechanical systems.

The hurricane-induced or tsunami-induced set-down is not anticipated to affect the makeup water supply to the cooling towers. The system safeguards include (1) the reclaimed water makeup water supply is 100 percent redundant to saltwater supply system and (2) radial collector wells are designed based on the 100-year low seawater level conditions.

As presented in Subsection 2.4.7, there are no records of ice jams due to freezing temperatures not being sustainable in this region. Consequently, the

nonsafety-related cooling tower makeup water supply systems are not affected by freezing temperatures.

2.4.11.3 Historical Low Water

The reclaimed water production in Miami-Dade County has been increasing continuously due to the increase in population and the expansion of municipalities. To promote the use of reclaimed water, the Florida legislation has passed regulations encouraging the use of reclaimed water and has prohibited the municipalities from discharge of reclaimed water to sea through ocean outfalls.

The radial collector wells are man-made water supply systems and are connected to the saltwater through underground lateral pipes/screens. Consequently, the supply of saltwater from radial collector wells is minimally affected by tide variations. The design capacity of the wells, however, is based on the 100-year low seawater level of –3.5 feet NAVD 88. Units 6 & 7 have one additional radial collector well (33.3 percent redundancy) to overcome any interruption potential.

2.4.11.4 Future Controls

The safety-related systems of Units 6 & 7, including the UHS, do not rely on surface water sources and are not affected by drought conditions. The cooling tower system is only for normal cooling, and it is a nonsafety-related system. No future controls are necessary due to low water conditions.

2.4.11.5 Plant Requirements

The normal heat sink circulating water system is a closed-cycle cooling tower system. The reclaimed water makeup intake is located on the makeup water reservoir supplying makeup water to the cooling tower basins. Reclaimed water supply is conveyed to the onsite FPL reclaimed water treatment facility before its storage in the makeup water reservoir. The intake structure on the makeup water reservoir includes necessary intake screens, pumps, and control systems. The saltwater supply to the cooling tower basins is directly from the radial collector wells.

The maximum makeup water flow requirements for reclaimed water and saltwater sources are shown in Table 2.4.11-201. The rivers and streams 100-year drought flow rates are not applicable to the reclaimed water supply, and the radial collector wells are designed for sustainable operation during a 100-year low seawater level condition.

2.4.11.6 Heat Sink Dependability Requirements

The passive containment cooling system provides emergency cooling for the plant. A continuous natural circulation flow of air removes heat from the containment vessel. The steel containment vessel conducts heat from the containment interior atmosphere to the outside. A separate passive containment cooling system consists of gravity-drained, water storage tank that provides containment wetting. The passive containment cooling system is not reliant on the source of water from the cooling towers' makeup water system. Makeup for passive containment cooling system is provided by connection to the municipal water supply. Therefore, no warning of impending low flow from the cooling tower makeup water system is required. Makeup water supply during low flow conditions would not affect the ability of emergency cooling water systems and the UHS to provide the required cooling for normal operations, anticipated operational occurrences, and emergency conditions.

A detailed description of the UHS design is provided in DCD Subsection 6.2.2, which indicates that it conforms to RG 1.27 guidance.

2.4.11.7 References

201. Miami-Dade Water and Sewer Department, *Reuse Feasibility Update*, April 2007.

202. South Florida Water Management District, *Water Use Permit No. RE-ISSUE 13-00017-W*, November 15, 2007.

203. Miami-Dade Water and Sewer Department, *Miami-Dade Consolidated PWS Water Use Permit No. 13-00017-W*, July 7, 2008.

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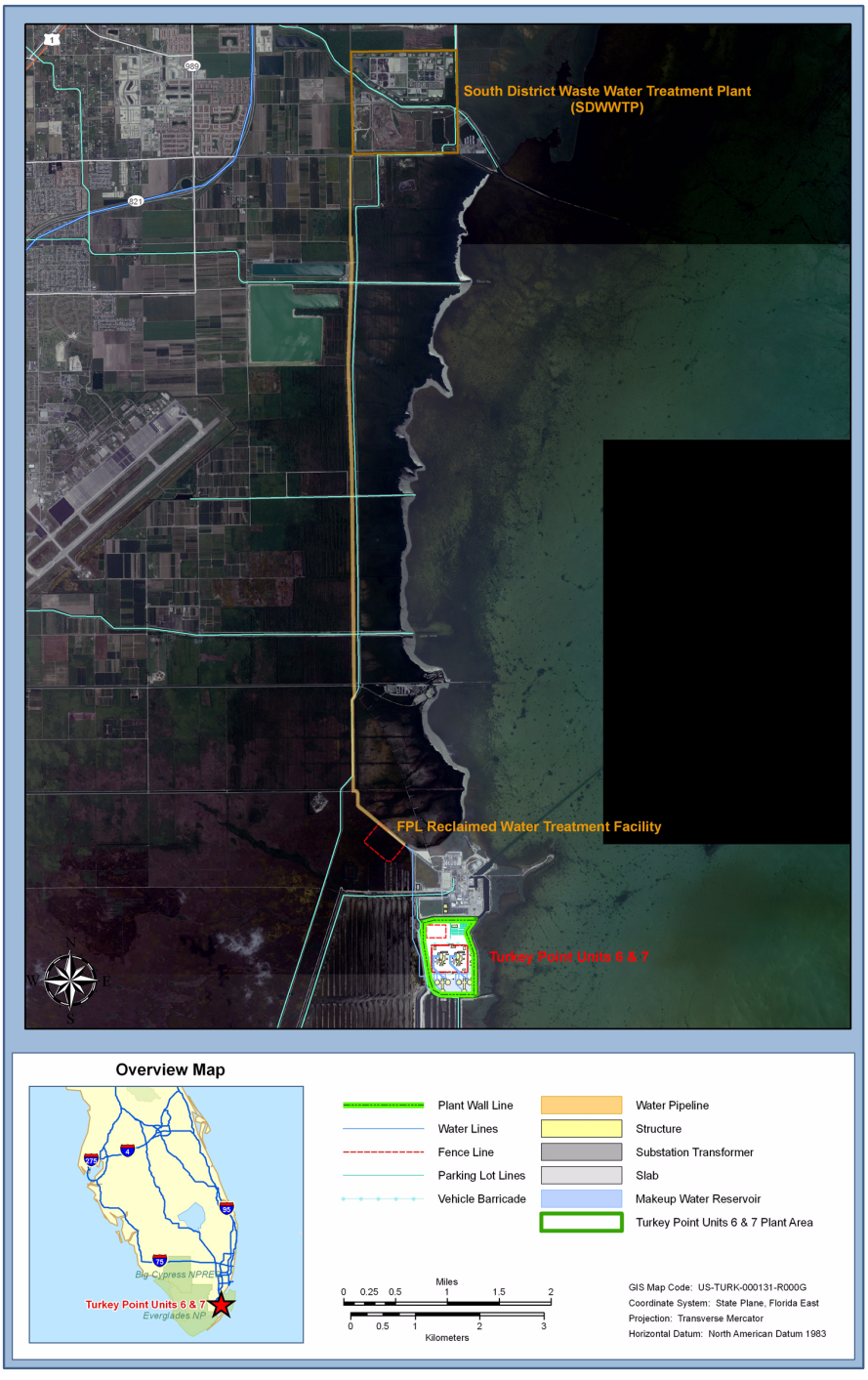
Table 2.4.11-201
Makeup Water Flow Requirements for Units 6 & 7

Makeup Water Source	Makeup Flow Rate[(a)] (gpm)
Reclaimed Water	38,400
Saltwater	86,400

(a) Based on 100% use of water source

PTN COL 2.4-3 **Figure 2.4.11-201 Location of Reclaimed Water Source and Pipeline Route**



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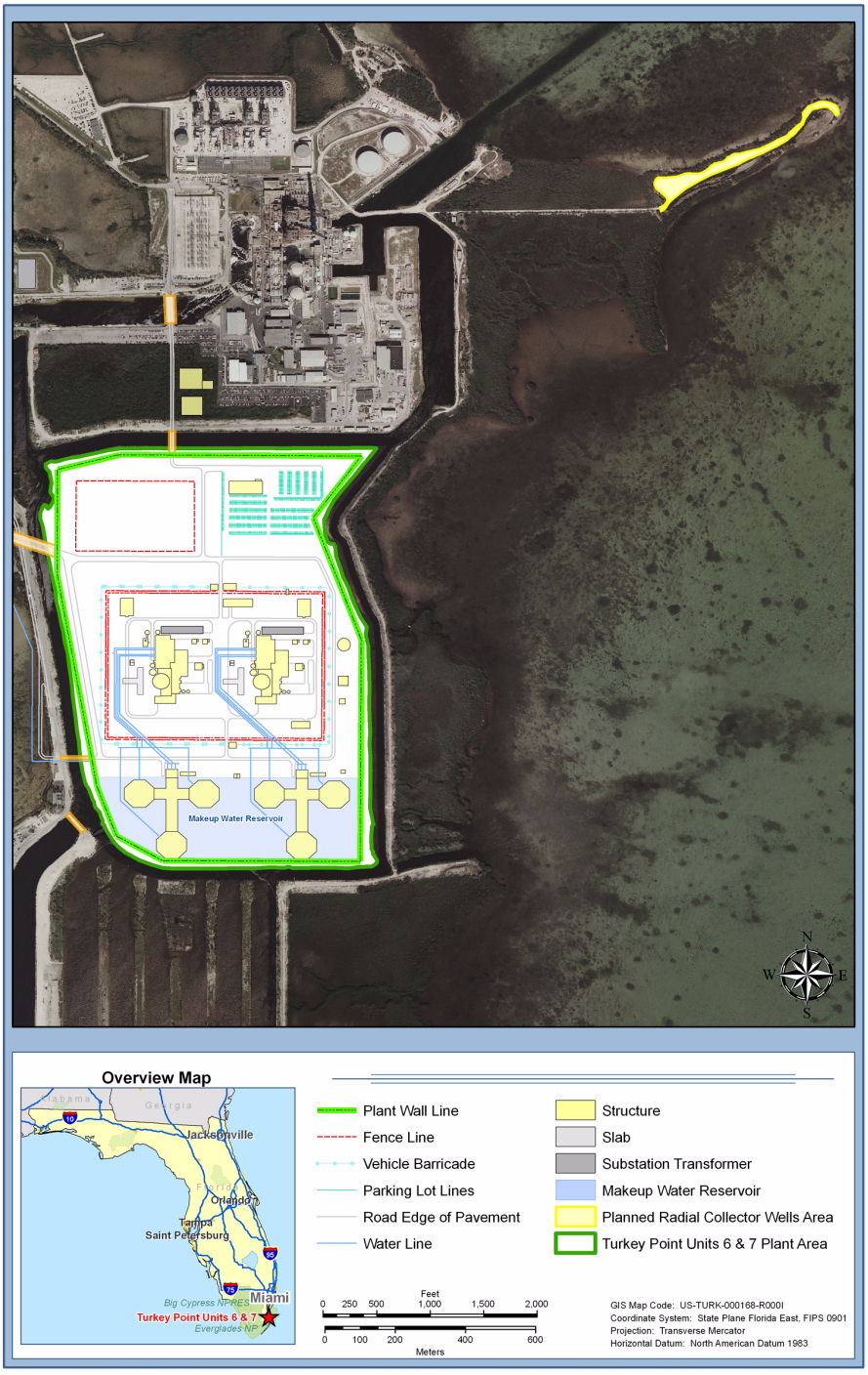
Figure 2.4.11-202 Location of Radial Collector Wells