3.4 WATER LEVEL (FLOOD) DESIGN

3.4.1 Flood Elevations

Figure 3.4-1 displays the relationship between the Mean Sea Level (MSL) datum, the Public Service Datum (PSD), the plant grade level and water levels for various conditions. The Probable Maximum Hurricane (PMH) surge level for the site is 113.8 feet PSD as estimated by the Coastal Engineering Research Center.

The highest recorded water level at the site was +8.5 feet MSL in November 1950. This elevation is referred to as high-high water (HHW). The site grade was established by fill at an elevation of +10.5 feet MSL, or 2 feet above HHW.

3.4.2 Structural Loadings

Load combinations and calculations for Category I structures are described in Section 3.8.

3.4.3 Flood Protection

3.4.3.1 Hurricane

Safety-related equipment required for cold shutdown are located inside the containment, service water intake, Auxiliary Building, and main steam and feedwater pipe penetration areas. The containment is watertight and can withstand the static and dynamic loads associated with a storm producing stillwater level of 113.8 feet PSD and the corresponding wave runup to 120.4 feet PSD.

The portion of the service water intake enclosing the pumps, motors, and vital switchgear is watertight up to Elevation 126.0 feet PSD with wave runup protection to Elevation 128.0 feet PSD. The service water intake can also withstand the static and dynamic effects of the storm. Each vertical, turbine type service water pump column bowl and suction bell is installed in an individual chamber which is open to the river. The chamber

is isolated from the watertight compartments where the pump discharge heads and motors are located. The pump discharge heads are bolted down to pads to Elevation 92 feet-6 inches PSD. The joint between the pump discharge head and the pad at Elevation 92 feet-6 inches PSD is watertight to prevent leakage of water into the compartments. Provisions have also been made to prevent leakage from the discharge head glands and leakoff connections into the watertight compartments. A sump pump is provided in each compartment to remove any accumulated water in the event a minor leak should occur.

The Auxiliary Building is watertight up to Elevation 115 feet PSD. All doors in the outer Auxiliary Building walls below Elevation 120.4 feet PSD are watertight. All watertight doors and structural walls can withstand the static and dynamic effects associated with a storm that produces a stillwater level of Elevation 113.8 feet PSD with wave runup to Elevation 120.4 feet PSD. Conduit penetrations above Elevation 115 feet PSD and below Elevation 120.4 feet PSD will be packed to eliminate gross inleakage during the storm.

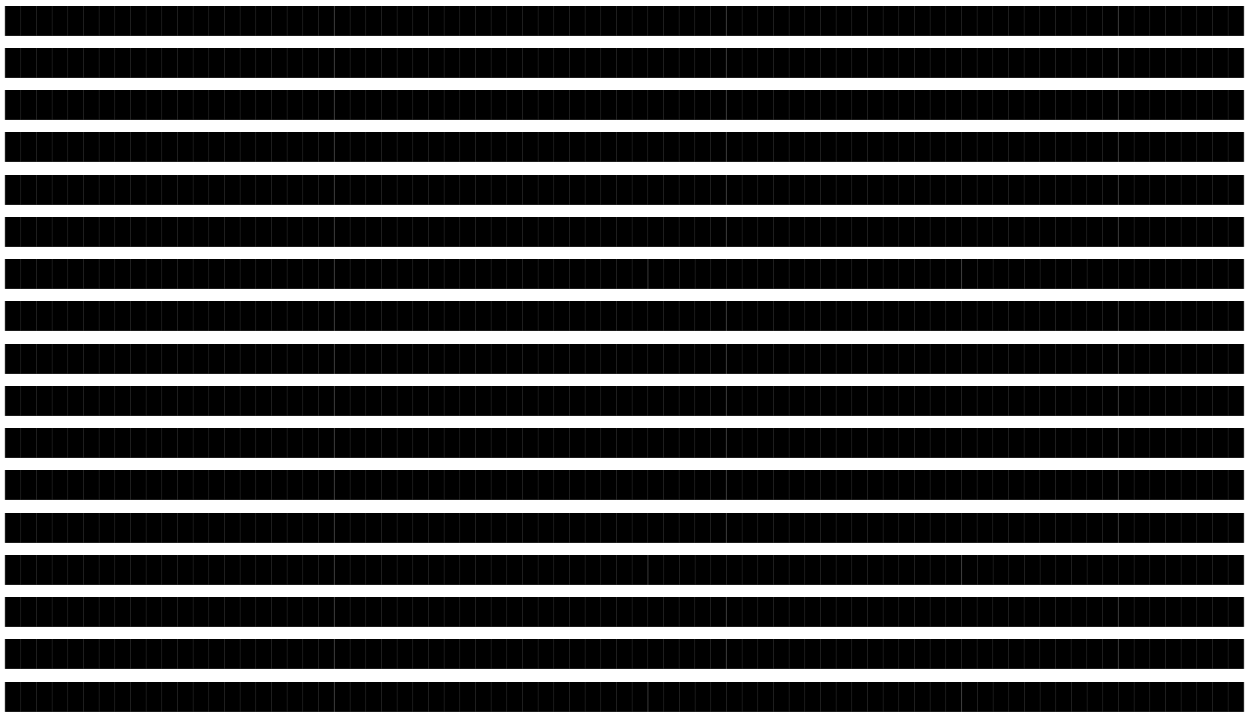
Each residual heat removal pump room, the lowest point in the Auxiliary Building, contains two sump pumps, each adequate to provide the minimum capacity of 50 gpm.

The main steam and feedwater pipe penetration area will be watertight below Elevation 120.4 feet PSD. The structural walls and watertight doors will also be capable of withstanding the static and dynamic effects of the storm which produces a stillwater level of Elevation 113.8 feet PSD and wave runup to Elevation 120.4 feet PSD.

Electrical equipment not housed in structures designed to provide flood protection is located at a minimum elevation of 3.0 feet above HHW (or Elevation 100.5 feet PSD). The Turbine Building and Auxiliary Building floors are constructed at 2.5 feet above HHW (or Elevation 100 feet PSD). Turbine Building sump pumps and available portable pumps can be used to dispose of accumulated water resulting from leakage into the Turbine Building.

The existing earthen dike was replaced by a protective rockfill dike along the portion of the Delaware estuary subjected to maximum wind wave forces, to protect the safety related structures and equipment. The following describes the Public Service implementation of the recommendations of the Dames and Moore reports (References 1, 2, and 3) as well as modifications made necessary by an increase in the estimated PMH surge level from Elevation 110.9 feet PSD to Elevation 113.8 feet PSD.

The protective dikes were provided South of the power block between the Salem barge slip and the Salem circulating water intake structure, between the Salem circulating water and service water intake structures, and North of the Salem service water intake structure.



A dike stability analysis was also performed by Dames and Moore, using a computer program based on the Fellinius method of slices.

Based upon Dames and Moore's recommendation, all recent alluvial deposits and dredge soil were removed and replaced with granular fill. The fill consisted of a rock toe dike and a general fill consisting of clean granular soils.

In the vicinity of the barge slip, unsuitable soils were excavated directly beneath the proposed dike down to the old river bottom on slopes as steep as possible and replaced with clean granular soils. The barge slip provides adequate toe protection for stability and against erosion.

The configuration of the toe dike is based on a conservative value of angle of internal friction of the sand fill. If a better grade material is available, the toe dike could be reduced, or possibly eliminated.

In the area of the existing fuel oil tank, the excavation slope was steepened sufficiently to provide a minimum distance of 10 feet between the pile cap and the top of the slope. The excavation was backfilled as soon as possible to minimize local slope failures.

Tests and analyses of borings in the dike area confirmed the validity of these design features.

The shoreline protection and dike system will be inspected by station operating personnel prior to storms and hurricanes and following the passage of such storms and hurricanes. Additionally, a more complete annual inspection will be conducted both by boat and from the dike itself. The station security forces also make regular patrols of these areas as part of their surveillance duties, and are instructed to report any abnormalities observed in the structure.

In the event of rising water levels, all watertight doors will be closed to maintain watertight integrity. The decision to shut down the plant in the event of rising water levels will be made by the Station Manager. Accordingly, the Technical Specifications specify the flood levels at which (1) watertight integrity will be established (at which time flood protection procedures will be initiated on a site-wide basis to protect the plant from flood waters) and (2) plant shutdown will be initiated.

3.4.3.2 Precipitation

The Yard Drainage System is designed to pass the drainage associated with a rainfall rate of 4 inches per hour for a period of 20 minutes (based on 90 percent runoff from paved areas and 50 percent runoff from graded areas). Interior drains in the Auxiliary and Fuel Handling Buildings are independently piped to the Liquid Waste Disposal System and are not connected to the Yard Drainage System.

Roof drains are designed to dispose of a maximum rainfall rate of 4 inches per hour for a period of 20 minutes through the Yard Drainage System. Roof slabs are watertight to prevent building interiors from being damaged by severe rainstorms. The slabs are designed to withstand a loading equivalent to a depth of water up to the full height of the building's parapet or roof curb. In the unlikely event that some of the roof drains become plugged up, the backed up water will spill down the outside of the building.

Wall penetrations above Elevation 115 feet PSD on Class I (seismic) buildings are designed to prevent roof spillage or heavy rain from seeping inside the building.

In the event the capacity of the Yard Drainage System were to be exceeded as a result of an unusually severe rainstorm, the excess water would accumulate in puddles in the vicinity of the catch basins (see Figure 3.4-4) and run off. This water would not enter

any safety-related structure, since these structures are watertight up to at least Elevation 115 feet PSD. Therefore, safety-related equipment would not be adversely affected as a result of a severe rainstorm.

3.4.4 Protection From Hurricane Drawdown

As discussed in Section 2.4, the lowest instantaneous water elevation at the service water pumps is 11.1 feet MSL. This could occur during the passage of a PMH oriented to produce drawdown at the site. In order to ensure operation of the service water pumps during this condition, the minimum submergence level is specified to be -13.0 feet MSL.

3.4.5 Reference for Section 3.4

1. Shoreline Investigation and Oceanographic Study, Proposed Nuclear Generating Station, Salem, New Jersey; Dames and Moore, November 20, 1970.
2. Stability of Protective Dikes, Salem Nuclear Generating Station, Salem, New Jersey, Dames and Moore, April 2, 1973.
3. Final Report, Stability of Protective Dikes, Salem Nuclear Generating Station, New Jersey, October 8, 1973.
4. U. S. Army Coastal Engineering Research Center, "Shore Protection Planning and Design," Technical Report No. 4, 3rd Edition, 1966.