2.5.4.5.4 Properties of Backfill Beneath and Adjacent to Nuclear Island

Based on a design grade elevation of 15.5 m (51 ft.) NAVD88, the elevation of each nuclear island basemat will be 3.4 m (11 ft.) NAVD88. A 15.2 cm (6 in.) mudmat will be located beneath each nuclear island basemat at elevation 3.4 m (11 ft.) NAVD88. Structural fill between the excavation bottom (elevation -7.3 m [-24 ft.] NAVD88) and the nuclear island mudmat (elevation 3.4 m [11 ft.] NAVD88) will consist of an RCC bridging mat, as shown on Figures 2.5.4.5-201B and 2.5.4.5 202B. A waterproofing membrane will be located between the RCC and the mudmat, meeting AP1000 DCD requirements of 0.55 static coefficient of friction between horizontal membrane and concrete. For buildings adjacent to the nuclear islands, the design grade will be raised to elevation 15.5 m (51 ft.) NAVD88 using engineered fill.

The following is the Design Description of the RCC. This RCC fill will serve two purposes: 1) replace the weakly cemented, undifferentiated Tertiary sediments that are present above elevation -7.3 m (-24 ft.) NAVD88, thereby, creating a uniform subsurface with increased bearing capacity; and 2) bridge conservatively postulated karst features.

The RCC bridging mat has been conceptually designed to bridge a 3-m (10-ft.) air-filled cavity located immediately beneath the RCC (elevation -7.3 m [-24 ft.] NAVD88) at any plan location for loading conditions identified in Subsection 2.5.4.10.1.1. In addition, a base shear load of 136,000 kips based on the AP1000 generic analysis was applied at the top of the RCC bridging mat. These loads are based on generic AP1000 analyses. During detailed design of the RCC bridging mat site specific loads may be used. However, if site specific loads are used they shall consider RCC bridging mat loadings considering both the scaled updated EPRI SOG FIRS and the Regulatory Guide 1.60 FIRS discussed in Subsection 3.7.2.4.1.7. The 1-year specified compressive strength (f'_c) of the RCC is 2500 psi. The design of the RCC bridging mat has considered a nominal tensile strength of 250 psi.

Deleted: DCD Tier 1 Table 5.0-1 and Tier 2 Table 2-1

A theoretical rock profile for the North and South Plant Units was developed using LNP site-specific rock properties and layering information. A SAP2000 Finite Element Model (FEM – linearly elastic) of the RCC, nuclear island basemat, and the subsurface rock was created using the design geometry, the rock profile beneath the RCC Bridging Mat, and the total loads applied by the nuclear island.

Also included in the FEM was the presence of theoretical cavities of different sizes and configurations. Three different cases, with cavities located at different depths, were considered:

- Case A: Cavities were located immediately below the grouted limestone, at elevation -99 ft. NAVD88 (75 ft. under the RCC).

- Case B: Cavities were located immediately below the RCC, at elevation -24 ft. NAVD88.

- Case C: Cavities were located at the top of rock layer NAV-3, which is the layer with lower Elastic Modulus for the North Reactor profile, below elevation -149 ft. NAVD88 (125 ft. under the RCC). This case was analyzed only in the North Reactor, where the lower Elastic Modulus layer is somewhat thicker than in the South Reactor profile.