

NRC RAI Letter No. PTN-RAI-LTR-041

SRP Section: 02.05.01 - Basic Geologic and Seismic Information

QUESTIONS from Geosciences and Geotechnical Engineering Branch 2 (RGS2)

NRC RAI Number: 02.05.01-8 (eRAI 6024)

FSAR Section 2.5.1.1.5, "Tsunami Geologic Hazard Assessment," Section 2.5.1.2.1, "Site Physiography and Geomorphology," and Section 2.5.1.2.4, "Site Geologic Hazards," state that an extensive review of scientific literature resulted in no evidence of Quaternary seismically induced or landslide-generated tsunami deposits within the 200-mile radius of the Units 6 & 7 site region. The FSAR adds that sampling performed as part of the subsurface investigations at the Turkey Point site encountered about 1 meter (3 feet) of organic muck overlying Pleistocene and older carbonate strata and that the muck is the dominant surficial sediment type varying in thickness across the site from 2 to 6 feet (0.6 to 1.8 meters). FSAR Figure 2.5.1-332 shows the organic muck section as Holocene. Finally, the FSAR states that examination of Units 6 & 7 has provided no evidence of known tsunami deposits. In light of the foregoing conclusion, the staff notes that the FSAR does not provide an analysis of the Holocene section (muck layers) in the site vicinity with respect to paleo-tsunami or paleo-storm surge events and core data regarding the muck layers is absent from the FSAR.

In order for the staff to understand the Holocene geologic setting of the TPNPP and in support of 10 CFR 100.23 please address the following questions:

- a) Provide justification for your conclusion that there are no tsunami deposits at the site with a detailed presentation of the Holocene section, including how it varies across the site in terms of thickness and internal structure.
- b) Discuss the organic sediment ("muck") and included silt layers within an appropriate framework for the description of biogenic deposits, such as the Troels-Smith sediment classification system. Provide sufficient detail to illustrate how you evaluated silt layers as either potential storm or tsunami-derived sources.

FPL RESPONSE:

The information requested in part a) and the second sentence of part b) of this RAI is addressed in the responses to RAI 02.05.01-6 and 02.05.01-7. The part b) response of this RAI addresses the use of the Troels-Smith sediment classification system and an example of how the organic sediment ("muck") and included silt layers are described within this sediment classification system.

The muck soils at the Turkey Point Units 6 & 7 site are classified under the Unified Soil Classification System (USCS) in accordance with ASTM D2488-06 and D2487 instead of the Troels-Smith sediment classification system. The USCS was used because the geotechnical engineering subsurface investigation was conducted for the purpose of foundation design. The USCS provides nomenclature to describe soil in terms of gradation, plasticity, and organic content as determined visually or based on laboratory testing. This widely used classification system is applicable to a wide variety of

geotechnical engineering projects. The major soil divisions of the USCS are coarse grained (gravel and sand), fine grained (silts and clays or clays and silts that are either organic or inorganic), organic soils (organic matter with gravel, sand, silt or clay), and peat.

The Troels-Smith classification system is not applicable for standard geotechnical practice for field subsurface investigations because the focus of the Troels-Smith classification system is to reconstruct paleodepositional environments and climate. The Troels-Smith sediment classification system is a comprehensive classification system that is used by palynologists, paleoclimatologists, paleoecologists, and limnologists to describe organic-rich sediments deposited in northern temperate lakes, and wetlands. The classification was originally designed primarily as a field-based system but could be expanded to include laboratory analysis (i.e. determining peat humification, quantifying peat bulk density, organic matter, and carbon content). It has been widely applied by European paleoecologists because the more specialized terms are applicable to northwestern Europe (i.e. Finland, Sweden, Norway, northern Russia, Great Britain, and Ireland), the region for which they were originally devised (Reference 1).

The Troels-Smith classification system describes deposits based on physical properties, humicity (the degree of decomposition of organic substances), and composition. Physical properties are further characterized in terms of the degree of darkness (Nigror), the degree of stratification (Stratifacto), the degree of elasticity (Elasticitas), and the degree of dryness (Siccitas). Composition comprises six classes to describe the properties of sediments. The classes are Substantua humosa, Turfa, Detritus, Limus, Argilla and Grana. For all composition classes, a scale of 0-4 is used for characterization. Zero describes the absence of the element concerned and 4 the maximum presence (References 1 and 2). If FPL had used the Troels-Smith classification system at the Turkey Point Units 6 & 7 site, a hypothetical example of sample descriptions of the deposits of marl and muck with silt layers would be as follows:

Class: Limus calcareus

Symbol: Lc

Description: Marl

Degree of Darkness: clear

Degree of Stratification: 0

Degree of Elasticity: 0

Degree of Dryness: 2

Color: very dark gray

Structure: homogenous

Sharpness of Boundary: diffuse

Humicity: no record

Class: Argilla granosa

Symbol: Ag

Description: Silt

Degree of Darkness: 0

Degree of Stratification: 3, 4

Degree of Elasticity: 1

Degree of Dryness: 2

Color: white

Structure: homogenous mixed with marl and or muck

Sharpness of Boundary: gradual and sharp

Humidity: no record

Class: Argilla granosa

Symbol: Ag

Description: Silt

Degree of Darkness: 0

Degree of Stratification: 3, 4

Degree of Elasticity: 1

Degree of Dryness: 2

Color: white

Structure: homogenous mixed with marl and or muck

Sharpness of Boundary: gradual and sharp

Humidity: no record

This response is PLANT SPECIFIC.

References:

1. Schnurrenberger, D., Russell, J., and Kelts, K, 2003. Classification of lacustrine sediments based on sedimentary components, Journal of Paleolimnology, Vol 29, pp. 141-154.
2. Kershaw, A. P., 1997. A modification of the Troels-Smith system of sediment description and portrayal, Quaternary Australasia, Vol 15, no. 2, pp. 63-68.

Proposed Turkey Point Units 6 and 7
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ASSOCIATED COLA REVISIONS:

None

ASSOCIATED ENCLOSURES:

None

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