QUESTION 362.1

Provide typical cross sections of the slope north of the spray pond area. Show steepest sections closest to the pond.

RESPONSE:

This information is contained in revised FSAR Subsections 2.5.1.2.5.2 and 2.5.5. FSAR Figure 2.5-22 has been revised, and a new Figure 2.5-56 has been added.

QUESTION 362.2

Explain the basis for the statement in the FSAR "heave at the base of excavated rock slopes or in the bottom of excavations was not noted." Were measurements made?

RESPONSE:

See Subsection 2.5.1.2.5.8 for response.

QUESTION 362.3

When will FSAR Figure 2.5-15, Geologic Map of Spray Pond Area, and FSAR Figure 2.5-16, Geologic Profiles in Spray Pond area be provided?

RESPONSE:

Figure 2.5-15 provides the geologic map of the Spray Pond Area. The need for proposed Figure 2.5-16 has been eliminated because it is considered redundant to the information shown on Figures 2.5-30, 2.5-40, and 2.5-56.

QUESTION 362.4

Clarify the identification of Category I pipelines with respect to FSAR Figures 2.5-17 and 2.5-22. Identify where such pipelines are supported on rock and where they are supported on soil.

RESPONSE:

Figure 2.5-17A has been added to the FSAR to supply this information.

QUESTION 362.5

FSAR Figure 2.5-32 shows relative density related to N values at the ESSW Pumphouse. On this plot include relative density values obtained from nearby undisturbed samples and from in situ field density tests (Test Pit and Trench investigations) together with the corresponding N values at each density test location. Discuss the applicability of the Gibbs and Holtz relationship at this site in view of the presence of gravel which can cause blow counts to be misleading.

RESPONSE:

See Subsection 2.5.4.2.2(b) for response.

QUESTION 362.6

Provide information on physical properties, structure and variability of the near surface materials as well as logs of test pits and trenches as discussed in this section, page 2.5-94 paragraph 2 of the FSAR. FSAR Appendix 2.5c currently shows only logs of Test Pits 1 and 2.

RESPONSE:

Near surface materials at the site consist of an upper silty sand and a lower sandy gravel, which in turn is underlying by siltstone bedrock. The locations of all test pits and trenches are shown on Figure 2.5-22 of the FSAR. The two test pit logs presented in the FSAR, labeled "Pit 1" and "Pit 2" were revised to read "Pit B-1" and "Pit B-2" respectively in order to be compatible with Figure 2.5-22. Logs for the above test pits and all other test pits at the site are presented in Appendix 2.5C.

Subsurface data for the two north-south trenches are incorporated in revised Figures 2.5-21a and 2.5-21b of the FSAR. These cross sections show the approximate locations of each trench.

QUESTION 362.7

On FSAR Figure 2.5-37 provide typical cross sections showing the levels of Category I foundations. Also provide an east-west section on the east side of Unit 1 Reactor. Extend Section C further south to show the edge and foundation level of the Radwaste Building. On all sections indicate the limits of compacted fill and natural materials.

RESPONSE:

Figure 2.5-37 has been amended to include the information requested. Subsection 2.5.4.5.1 has been amended accordingly.

QUESTION 362.8

Provide appropriate density test data for recompaction of the surface layer and for compaction of the Category I fill and backfill.

RESPONSE:

Test data is available for the soil compaction carried out in the vicinity of the spray pond. Appendix 2.5C of the FSAR has been revised to include this data.

Granular backfill was not used in other areas adjacent to Seismic Category I structures.

<u>QUESTION 362.9</u>

When will settlement readings on the ESSW Pumphouse Basement (FSAR Table 2.5-8) be provided?

<u>RESPONSE</u>:

The response to this question is given in 362.22.

QUESTION 362.10

Identify the boring number and sample depth for each CR tests number (FSAR Table 2.5-14).

RESPONSE:

The boring number and sample depth for all CR tests listed in FSAR Table 2.5-14 are given in Table V of Ref. 2.5-102 (Geotechnical Engineers, Inc., Report on Soil Testing, Susquehanna Steam Generating Station, October 11, 1974).

Table 2.5-14 has been revised, through the addition of a footnote, to contain this information.

QUESTION 362.11

Discuss how the integrity of the concrete pond liner will be assured during static and dynamic loading so that the 0.12 ft/yr coefficient of permeability will be maintained to eliminate the potential for liquefaction. What monitoring of seepage is planned?

RESPONSE:

FSAR Subsection 2.5.5.2.2.1 has been revised and Figure 2.5-57 has been added to address this question.

QUESTION 362.12

Provide references 2.5-98, 2.5-99a dn 2.5-102.

RESPONSE:

(a) Reference 2.5-98 entitled "Dames & Moore, Supplemental Foundation Investigation Report, Susquehanna Steam Electric Station, Units 1 and 2, September 24, 1973", was previously listed as a reference on page 44 of Attachment 1 to PSAR Amendment No. 17, and transmitted to NRC on March 14, 1975.

(b) FSAR Reference 2.5-99 entitled "Weston Geophysical Engineers, Inc., Seismic Velocity and Elastic Moduli Measurements, Spray Pond, Susquehanna Steam Electric Station, October 18, 1974", was previously submitted to NRC as Appendix "A" of Attachment 1 to PSAR Amendment No. 17.

(c) FSAR Reference 2.5-102 entitled "Geotechnical Engineers, Inc., Report on Soil Testing, Susquehanna Steam Generating Station, October 11, 1974", was previously submitted to NRC as Appendix "C" of Attachment 1 to PSAR Amendment No. 17. Copies were transmitted to NRC on March 14, 1975.

QUESTION 362.13

In the FSAR Section 2.5.4.1.2 the effects of preloading of the bedrock at the site are discussed. Provide a discussion of the effects of preloading on the glacial till and outwash material, the estimated magnitude of preloading, and the effects of preloading on:

(a) Standard Penetration Test (SPT) values

(b) Relative density values estimated from SPT values as shown on Figure 2.5-32

(c) Coefficient of lateral earth pressure as shown on Figure 2.5-39

(d) Cyclic shear stress ratio at failure as shown on Table 2.5-14.

Provide cross-references to relevant discussions in other sections as appropriate.

RESPONSE:

The FSAR text has been amended in Subsection 2.5.4.1.2 to respond to this question. In addition, the fact that the soils are normally consolidated is incorporated in Subsections 2.5.4.2.2, 2.5.5.1.1. 2.5.5.1.4, and 2.5.5.2.2.

QUESTION 362.14

Density determinations on undisturbed sand specimens are shown on FSAR Table V, reference 2.5-102. Calculate the relative density of each sample using the most appropriate maximum and minimum density values available and also by using the maximum probable ranges of maximum and minimum density values. Provide similar data for in place field density tests performed on exposed soils in the bases of the spray pond, pumphouse, or pipeline excavations prior to compaction. Compare these relative density values to the values estimated from Standard Penetration Test results.

RESPONSE:

The response to this question is provided in Subsection 2.5.5.1.4.5.

QUESTION 362.15

Some flyash is known to be corrosive. Provide evidence to show that the lean mix concrete known as sand cement flyash backfill is not corrosive.

RESPONSE:

The response to this question is provided in Subsection 2.5.4.5.3.

QUESTION 362.16

On FSAR page 2.5-122, correct the equation for G.

RESPONSE:

Subsection 2.5.5.2.2.2.3 has been revised.

QUESTION 362.17

Provide a copy of the curve of damping ratio versus strain used in the liquefaction analysis. Explain why the range of damping ratio ± 30% is conservative. Support the explanation with any laboratory test results which are available.

RESPONSE:

The response to this question is provided in Subsection 2.5.5.2.2.2.7.2.

QUESTION 362.18

Summarize the statistical distribution of field density test results, relate them to Category I structures, and compare the results with design criteria. The test report sheets from United States Testing Company show various sample identities such as:

existing soil in pond
existing material Type B
borrow soil
stone screenings
Type B fill
Type A fill
Sand Material Type I
Class A material

Provide the specifications for each of the various sample identities, include the specified gradation and compaction criteria for required fills.

RESPONSE:

The response to this question is provided in Appendix 2.5C.

QUESTION 362.19

Provide a summary of the field tests which show that the properties of the sand-cement-flyash backfill met specifications given in Section 2.5.4.5.3 of the FSAR. In your response, list the field tests performed, describe the frequency of testing and provide a statistical analysis of strength test results using a format similar to Figure 2.5-60.

RESPONSE:

The response to this question is provided in Subsection 2.5.4.5.3.

QUESTION 362.20

Provide a description of the bedding requirements for seismic Category 1 pipelines and conduits. Provide a description of the quality control procedures adopted to ensure that these requirements were met. Summarize relevant field test results using a format similar to Figure 2.5-60.

RESPONSE:

Refer to new Subsection 2.5.4.5.4 of the FSAR for the discussion on bedding requirements.

QUESTION 362.21

FSAR Figure 2.5-38 shows rock and groundwater contours for the spray pond. On the west side of the pond, at rock contour EL 650 the estimated groundwater contour is EL 670. Explain the apparent discrepancy between the design groundwater level of EL 665 and the predicted ground water level of EL 670 in an area where the pond base is supported on about 17 ft. of granular, glacial soils. Provide an additional liquefaction analysis for this part of the spray pond. Revise the relevant sections of the FSAR, including 2.5.4.10.2 (third last paragraph) as necessary, based on your response to this item.

RESPONSE:

The seepage loss from the spray pond and its impact on ground water has been reevaluated, the original design value for seepage loss (3×10^5 gallons in 30 days) was based on a conservative maximum for different materials that might be used for the spray pond liner.

However, since the SSES pond liner is reinforced concrete, figures 2.5-38, 2.5-40 and 2.5-47 have been revised to conservatively reflect the existing design conditions.

Table 2.5-15 shows maximum ground water elevations that would occur beneath the center of the pond with the various liner parameters indicated. A seepage rate of 1.2×10^5 gallons per 30 days, which is twice the calculated rate, would result in a ground water elevation of 650 feet beneath the center of the pond; the estimated ground water levels shown on Figures 2.5-38 and 2.5-40 reflect this seepage rate. These contours indicate that at no place beneath the spray pond would the maximum ground water elevation exceed the design value of 665 feet. Therefore, the existing liquefaction analysis is valid and Subsection 2.5.4.10.2 does not require revision.

QUESTION 362.22

Update Table 2.5-8 of the FSAR to include settlement readings on the ESSH pumphouse from October 1978 to the present. Also, provide a list of unusual occurrences, such as the occurrence of the OBE or rapid lowering of the groundwater level, which have the potential for causing settlement of the pumphouse. We require that settlement monitoring of the pumphouse continue on at least an annual frequency for a period of at least four years, and after an unusual occurrence that has the potential for causing settlement of the pumphouse. Discuss the technical specifications for settlement monitoring, including limits of acceptable settlement and action plans if these limits should be exceeded.

RESPONSE:

Subsection 2.5.4.13.2 has been revised to provide this information.

Table 2.5-8 has been revised and Figure 2.5-62 has been added.

QUESTION 362.23

Provide a discussion of the cracking of the spray pond liner that occurred during liner construction. Describe the location, depth and length of typical and extreme cracks. Describe the corrective measures that were adopted. Provide your evaluation of the cause(s) of cracking, including your opinion regarding the influence of hydrostatic uplift or soil settlement as contributing factors.

RESPONSE:

Subsection 2.5.4.14 has been revised to include the requested information.

QUESTION 362.24

Excavated material reportedly was temporarily stored at the spray pond location during construction. Provide a brief description of material handling procedures which shows that there are no safety-related cut slopes or embankments comprised of dumped material. Alternatively, show that compaction criteria were met for such dumped soil materials.

RESPONSE:

See revised Subsection 2.5.4.14 for response.

QUESTION 362.25

We understand from your submittals and response of Q.362.8 that the backfill against seismic Category 1 structures is lean concrete (sand-cement-flyash). Thus, we conclude that all seismic Category 1 pipes and conduits are supported on lean concrete where they enter or leave structures, and therefore there should be no concern with differential settlement at the interface between structure-supported and ground-supported parts of pipelines or conduits. Please confirm that this is correct.

RESPONSE:

The response to this question is provided in Subsection 2.5.4.5.3.