OYSTER CREEK **NUCLEAR GENERATING STATION**

JCP&L GPU

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December 15, 1981

Mr. Robert Fell
U.S. Nuclear Regulatory Commission
7920 Norfolk Avenue
Bethesda, Maryland 20014

Dear Mr. Fell:

Please find enclosed the safety assessment report concerning SEP Topic II-4D "Stability of Slopes".

This information is being provided on an informal basis since it will be used as an input to the draft Safety Evaluation Report to be reviewed by JCP&L.

Please contact me in the event that any questions or comments arise.

Very truly yours,

Yoshito Nagai
Senior Licensing Engineer

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SEP Safety Topic Evaluation
Oyster Creek Nuclear Station
Topic II-4.D Stability of Slopes

Introduction

In order to assure that all safety related structures, systems and components are adequately protected against the failure of natural or man-made slopes, the possibility of movement of these slopes is evaluated by comparing forces resisting failure to those causing failure. The scope of this safety topic evaluation is to review the condition of existing slopes, including geotechnical properties, ground water table, etc. and, using current review criteria as a basis, to evaluate the adequacy of these slopes.

Current Review Criteria

The current review criteria for this specific safety topic are:

1. SRP 2.5.5

2. Appendix A to 10CFR Part 100

Related Safety Topics and Interfaces

None

Evaluation

The following permanent onsite slopes must be considered:

a) Intake and Discharge canal

b) Area North-West of the Turbine Building from grade elevation 17'-6" to elevation 23'-0".

The slope described in (b) is only 5'-6" high in dry sand, and is considered stable by comparison to the stability calculations for the canals in (a).

As per SRP 2.5.5 I_ Acceptance Criteria stating that "the emergency cooling water source is of particular interest with regard to slope stability," therefore the intake canal slopes are considered critical.

As per reference 1 the soils bounding the intake canal can be described as heterogeneous deposits of sand containing random clay interbeds.

The canal banks are dredged to a slope of 1.0 on 1.5. These slopes have exhibited no lack of stability. There is no evidence of shear failures along the banks (ref. 2).

The canal banks have been analyzed under two different combinations of natural phenomena:

1. Probable Maximum Hurricane + High Water + Operating Basis Earthquake

In considering the effects of these combined phenomena on the stability of earth banks it should be recognized that any adjustments in bank configuration are in the direction of increasing stability. Therefore, the effects are not additive. At some point the bank configuration attains a degree of stability that permits it to withstand additional disruptive forces without further alteration. (Reference 3)

2. Safe Shutdown Earthquake

Through most of the area clay occurs near the base of the slope. Locally this clay, is absent. Therefore, evaluations have been made for sections with the clay seam both present and absent.

a. In order to study the earthquake induced slope failure in the canal bank for the condition in which the clay seam is absent, a quasi-static analysis was made assuming a sliding wedge driven by its own weight plus a 22 percent horizontal acceleration. The factor of safety was found to be 1.12. This condition is local and limited. The results are summarized below:

   - It is assumed that all soil above the failure plane translates into the canal and comes to rest below the water level. Under this most conservative assumption, using a factor of safety 1 on the failure wedge, over 56 percent of the canal remains unblocked.

   - An examination of more probable failure modes, i.e., modes involving movements of a few feet on the failure plane, indicates that the resulting canal blockage would be insignificant (Reference 2).

b. For the majority of slopes, where clay seams are present, an earthquake induced slope failure study was made. The assumed failure mode was sliding along a circular arc. A quasi-static analysis was again made assuming that the soil mass was being driven by its own weight plus a 22 percent horizontal acceleration. The factor of safety was found to be 2.93. The results are summarized below:

   - Using a Factor of Safety 2 on the failure wedge, and the conservative assumption that all the soil above the failure plane came to rest below water level, over 81 percent of the canal remained unblocked.

   - Examination of a more probable failure mode, i.e., modes involving movements of a few feet, indicated that the resulting canal blockage would be insignificant (Reference 2).

The possibility of soil liquefaction in the canal was reviewed by Dr. A. Casagrande. The investigation included test trenches, in-situ testing and visual inspection. The results of this investigation are presented in reference 4 stating:

> The detailed inspection of all soil strata in the canal banks and test results convinced the writer that there is no possibility that the banks could experience liquefaction slides. The worst that could happen during a severe earthquake would be slumping of oversteepened slopes. Most of the slumped material would collect on the flat beach-like berm which has formed within the range of normal tidal fluctuations.

Conclusion

Based on the information provided in the references and the evaluation stated above, we conclude that the slopes at Oyster Creek site are in stable condition.

References

1. Forked River Nuclear Station - Unit 1 - Preliminary Safety Analysis Report - Supplement 2 - Response to Question 2.8.

2. Same Response to Question 2.19.

3. Same Response to Question 2.25.

4. Casagrande: Investigation of Stability Characteristics of Soils in the Canal Banks - FRNS PSAR Appendix 2A.

5. H. Bolton Seed - Landslides during Earthquakes due to Soil Liquefaction (Journal of the Soil Mech and Found Div. Proc. of ASCE Vol 94 Mo SM5 Sept. 1968.