LIQUEFACTION ANALYSIS

GEOSYNTEC CONSULTANTS
COMPUTATION COVER SHEET

Client: Tennessee Valley Authority (TVA)

Project: Kingston Fossil Plant Gypsum Disposal Facility **Project/Proposal #:** GR3731 **Task #:** 06

Title of Computations: *Liquefaction Analysis*

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Client: TVA Project: Kingston Fossil Plant Project/Proposal No.: GR3731 Task No.: 06

LIQUEFACTION ANALYSIS

PURPOSE

This analysis was performed to evaluate the liquefaction potential of foundation soils during the design earthquake event and the potential effect of liquefaction on the integrity of the gypsum disposal facility located at the Kingston Fossil Plant-Peninsula Site (hereafter referenced as the KIF gypsum disposal facility).

METHOD OF ANALYSIS

Guidelines for the evaluation of the liquefaction potential of cohesionless soils in Tennessee is provided in the Tennessee Division of Solid Waste Management (a division of the Tennessee Department of Environment and Conservation (TDEC)) guidance document [TDEC, 1993]. The native material present within the footprint of the KIF gypsum disposal facility is generally classified as a fine-grained soil, therefore, the TDEC guidelines may not apply. The liquefaction analysis presented herein is based on procedures recommended in the Southern California Earthquake Center (SCEC) guidance document [SCEC, 1999] which can be applied to fine-grained soils. Specifically, the SCEC guidance states:

> *"If clayey soil materials are encountered during site exploration, those materials may be considered non-liquefiable. For purposes of this screening, clayey soils are those that have a clay content (particle size <0.005 mm) greater than 15 percent. However, based on the "Chinese Criteria," [Seed and Idriss, 1982] clayey soils having all of the following characteristics may be susceptible to severe strength loss:*
>
> - *Percent finer than 0.005 mm less than 15 percent*
> - *Liquid Limit less than 35*
> - *Water Content greater than 0.9 x Liquid Limit"*

ANALYSIS RESULTS

Grain size distributions from 25 samples taken from the foundation soils at the KIF gypsum disposal facility are summarized in Figure 1. As illustrated in this figure, the range of percentages of material finer

than 0.005 mm is 45 to 95 percent (which is greater than 15 percent). Results from 68 index property tests indicate that only one sample has a liquid limit of less than 35 and a water content greater than 0.9 x the liquid limit. Grain size information for another sample from this same borehole indicate that the percent finer than 0.005 mm is greater than 15 percent. Based on this, no native soils below the KIF gypsum disposal facility meet all of the "Chinese Criteria" and therefore these soils are not anticipated to experience severe strength loss (or liquefaction) during the deisgn earthquake event.

An additional screening method suggested by Tsuchida (1970) is also illustrated in Figure 1. The bold lines indicate the grain size distribution for the lower boundary for potentially liquefiable soils and the lower boundary for most liquefiable soils. The grain size distributions for all samples from the KIF gypsum disposal facility do not fit within these boundaries due to the appreciable amounts of silt and clay-size particles.

Based on the above analyses, no potentially liquefiable soils were identified in any of the borings.

CONCLUSIONS

Based on the soil stratigraphy, sample grain size distribution, and index property information, it is concluded that no potentially liquefiable zones exist within the native soils below the KIF gypsum gypsum disposal facility.

REFERENCES

Southern California Earthquake Center (SCEC), "*Recommended Procedures for Implementation of DMG Special Publication 117: Guidelines for Analyzing and Mitigating Liquefaction Hazards in California*," University of Southern California, March 1999, 70 p.

Seed, H.B. and Idriss, I.M., "Ground Motions and Soil Liquefaction During Earthquakes," *Earthquake Engineering Research Institute Monograph Series*, Berkley, California, 1982, 134 p.

Tennessee Division of Solid Waste Management, a Division of the Tennessee Department of Environment and Conservation (TDEC), "*Technical Guidance Document: Earthquake Evaluation Guidance Policy*," 1993, 41 p.

Tsuchida, H. "Prediction and Countermeasure Against the Liquefaction in Sand Deposits", (in Japanese) in abstract of the *Seminar in the Port and Harbor Research Institute*, 1970, pp 3.1-3.33.

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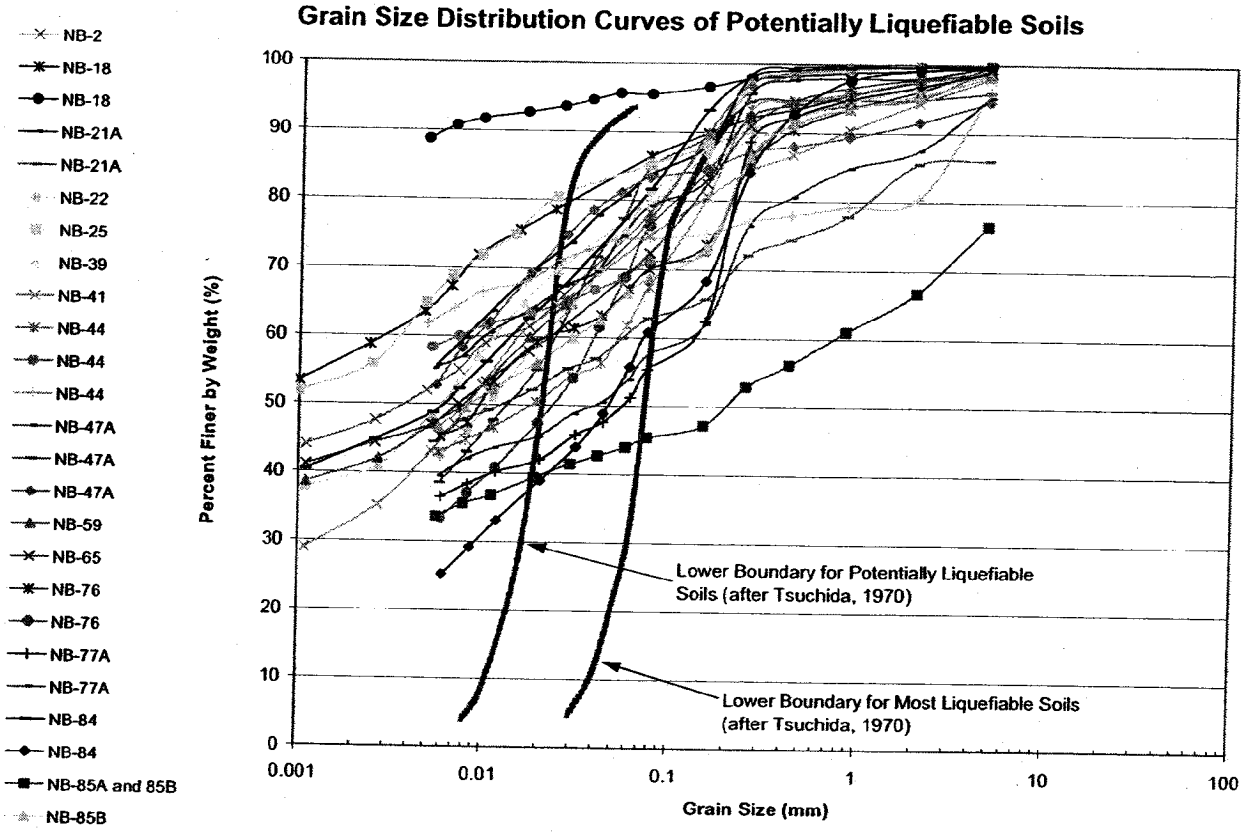

Figure 1. Summary of Grain Size Distribution for Native Material.