



26 February 2025

Mr. Tim Fluitt
Sr. Project Engineer
Sunoco LP
19003 IH-10 West
San Antonio, TX 78257

Re: Response to DEQ Geotechnical Checklist Questions related to the Seismic Vulnerability Assessment Report of the Shore Terminals Portland Terminal, Portland, OR

Dear Mr. Fluitt:

As you have requested, SGH has prepared this response to the Oregon Department of Environmental Quality (DEQ), related to the Seismic Vulnerability Assessment (SVA) we performed and submitted for your Portland Terminal, submitted on 31 May 2024.

Specifically, we have prepared responses to the "Geotechnical Checklist" provided on the DEQ website. We have prepared this response in collaboration with the geotechnical engineer for the SVA, Mr. Benjamin Serna, P.E. of Gannett Fleming, Inc.

Please feel free to reach out with any questions on this response.

Best regards,

A handwritten signature in blue ink that reads "Gayle S. Johnson".

Gayle S. Johnson, P.E.
Senior Principal
OR License No. 87981PE
Encl.

Seismic Vulnerability Assessment (SVA) – Shore Terminals Portland Terminal
Response to Geotechnical Checklist Questions

Comment	Comment Text	Response
GEO1	Provide a scale plan or plot drawing of the entire facility, including all tanks, berms, marine terminals, loading racks, pipelines, etc. [GEO1]	Drawing site plans of the facility are provided in Appendix A of the SVA Report. An aerial site plan is also provided as Figure 2 of the Geotechnical Assessment Report (Appendix B of the SVA Report).
GEO2	Provide all available soil data, boring logs and geotechnical reports developed for the site since the original design and as-built properties of the facility. [GEO2]	Two legacy geotechnical reports are available for the site, as summarized on Page 3 of the Geotechnical Assessment Report (PDF Page 57 of 241). Geotechnical data from those investigations pertinent to the SVA are provided in Appendix A of the Geotechnical Assessment Report (Appendix B of the SVA Report). Data from Gannett Flemings's 2024 exploration in support of the SVA is also summarized on Pages 3 and 4 of the Geotechnical Assessment Report (PDF Pages 57 & 58 of 241). Detailed data from the 2024 exploration is provided in Appendix B of the Geotechnical Assessment Report (PDF Pages 149 through 227 of 241). Information regarding the as-built properties of the facility is provided in Section 2 and Appendix A of the SVA Report.
GEO3	Provide locations of all existing boreholes or CPTs on the plan or plot drawings. [GEO3]	A plan showing the locations of all available borings CPTs, SCPTs, and test pits is provided in Figure 2 of the Geotechnical Assessment Report (PDF Page 70 of 241).

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Response to Geotechnical Checklist Questions (cont.)

Comment	Comment Text	Response
GEO4	Do the borings, CPTs and other geotechnical investigational tools meet the following criteria and conform to Oregon Structural Specialty Code 2022 ed. [GEO4] a. Boring or CPT depth shall be a minimum of 100ft (Appendix E, API 650, MOTEMS Section 3106F.2.2, ASCE7, Section 20.1). b. Borings are to be onshore and offshore (if any marine structures are present). c. Spacing of boreholes or CPTs along the berms shall not be more than 200 ft. (AASHTO, Table 10.4.2-1). For the perimeter of tank farms, there must be a minimum of one record at each corner., If there are minimal or no differences, this may be adequate. If not, a spacing of 200 ft along the berm or perimeter is necessary if there are erratic subsurface conditions encountered (AASHTO, Table 10.4.2-1). d. If CPTs are used, a few cases of verification of results should be compared to those from adjacent borings. Relationships between the SPTs, CPTs and full borings should be provided, using the latest geotechnical references and procedures. e. Provide geologic cross sections (color) of the facility to provide stratigraphy of the site, and to establish the site classification (A-F). f. If any other geotechnical data (other than CPT, SPT or borings) was available, provide details and dates. g. Employ contemporary standards of practice for all new soil investigations. h. Verify compliance with items (i) through (v) of OAR 340-300-0003(6)(a).	With regard to code conformance, the requirements of the 2022 Oregon Structural Specialty Code Section 1803 (Geotechnical Investigations) apply to geotechnical design reports. The SVA does not include any new or retrofit design. We consider the existing and new geotechnical data to be sufficient to support the geotechnical requirements of the SVA. Any geotechnical investigation to support design as part of a future mitigation phase will conform to the Oregon Structural Specialty Code. With regard to item (h), the Geotechnical Assessment Report included in the SVA report conforms with items (i) through (v) of OAR 340-300-0003(6)(a)(A).

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Response to Geotechnical Checklist Questions (cont.)

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GEO5	The following considerations must be addressed in the geotechnical design report [GEO5] a. Liquefaction Potential in “Sand-Like” Soil and Cyclic Degradation in “Clay-Like” Soil How was cyclic resistance ratio evaluated (simplified or site-specific)? b. If a site-specific response analysis has been performed, was it one or two dimensional? c. What ground motion parameters were used? d. What methodology was used to calculate residual shear strength? e. What safety factor for liquefaction in sand (CRR/CSR) f. If using a simplified procedure, what current methodology has been used? Is the Safety Factor less than 1.4, what reduction factor has been applied to the initial shear strength of the soil? g. If the Safety Factor is $1.0 < SF < 1.2$, how have the seismically induced ground movements been evaluated? h. If the Safety Factor $SF < 1.0$, what is the residual shear strength?	The SVA does not include any new or retrofit design. Thus, no geotechnical design report was created for the SVA. Note that the SVA report includes an evaluation of liquefaction potential using the simplified method developed by Boulanger and Idriss (2014) considering a moment magnitude of 9.3 and PGA of 0.49g. This is discussed on Pages 5-6 of the Geotechnical Assessment Report (PDF Pages 59-60 of 241). The geotechnical assessment performed in support of the SVA conforms with the requirements of OAR 340-300-0003(6)(a).

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Response to Geotechnical Checklist Questions (cont.)

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GEO6	Provide evaluations for other geotechnical hazards, if applicable. [GEO6] a. Slope movement b. Lateral spreading c. Ground settlement d. Other surface manifestations	An evaluation of all these geotechnical hazards is summarized in the Geotechnical Assessment Report, on the following pages: - a.) See Pages 6 through 10 (PDF Pages 60-64 of 241) of the Geotechnical Assessment Report - b.) See Pages 6 through 10 (PDF Pages 60-64 of 241) of the Geotechnical Assessment Report - c.) See Pages 8-10 (PDF Pages 62-64 of 241) of the Geotechnical Assessment Report - d.) Ejecta-induced settlement is addressed on Page 6 (PDF Page 60 of 241) and Table 1 of the Geotechnical Assessment Report
GEO7	Slope stability [GEO7] a. Is there a possibility that a slope failure could affect any component of the facility? b. If a slope failure is possible, has a stability analysis been performed? c. Are seismically induced ground movements considered? d. If there are ground movements considered, what methods have been used to analyze them? e. Is the expected seismic (DE) displacement greater than 0.10 ft?	- a.) Yes - b.) Yes - c.) Yes - d.) Limit equilibrium methods were used to evaluate a flow slide zone (defined as portions of the site with post-earthquake static stability safety factors of 1.0 or less and deemed unstable). To assess seismically-induced ground deformations landward of the flow slide zone, the average of two approaches by Youd et al. (2002) and Zhang et al. (2004) were taken. This is discussed on Pages 6 through 10 (PDF Pages 60-64 of 241) of the Geotechnical Assessment Report. - e.) The estimated seismic displacement is greater than 0.10 ft. See Page 10 of the Geotechnical Assessment Report (PDF Page 64 of 241).

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Response to Geotechnical Checklist Questions (cont.)

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GEO8	Soil Structure Interaction (SSI) [GEO8] a. What aspects of dynamic SSI have been evaluated (e.g., piles, pipelines, tanks, earth retention systems, or other)? b. What assumptions and procedures have been used to assess SSI?	With regards to items (a) and (b), the team qualitatively considered the effects of SSI, including as it relates to shear-induced settlements of tanks, as noted in Page 6 of the Geotechnical Assessment Report (PDF Page 60 of 241). Quantitative evaluation of dynamic SSI may be considered, as appropriate, in design evaluations for future mitigation.

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Response to Geotechnical Checklist Questions (cont.)

Comment	Comment Text	Response
GEO9	The geotechnical design report documents the design requirements, assumptions and calculation processes and results. This document should present a complete set of information that allows for a thorough review of all calculations and data analyzed to develop design recommendations and provide input into the determination of the seismic demand (Ref. 4). [GEO9] a. Describe the local geologic and geomorphologic setting of the facility. b. Include any and all historical geotechnical data, reports, or boring information. c. Present subsurface profiles in graphical cross-sections. d. Describe groundwater levels and possible artesian or sub-artesian conditions. e. Identify main subsurface units, based on material type, strength, and deformability. f. Assess lateral variability of subsurface units. g. Summarize main soil and rock parameters, for each of the identified subsurface units. h. Describe the lateral variability to the top of rock, where the rock is present within the depth of concern. i. What is the likelihood of encountering rock or cobbles that might be present within the soil matrix? j. Provide justification for the “site classification” (A-F) for this facility. k. Any additional requirements per Oregon Specialty Code, Section 1803.6?	The SVA does not include any new or retrofit design. Thus, no geotechnical design report was created for the SVA. Note the Geotechnical Assessment Report summarizes the geologic setting, historical geotechnical data, subsurface conditions including primary soil units and bedrock, groundwater levels, and site classification for seismic hazard evaluations purposes. This addresses items (a) through (j), except (i). Item (k) does not apply. If required, any geotechnical investigation in support of design as part of a future mitigation phase will conform to the Oregon Structural Specialty Code.