BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of: Application No. 2013-01 TESORO SAVAGE, LLC TESORO SAVAGE DISTRIBUTION TERMINAL	CASE NO. 15-001 SWORN PRE-FILED TESTIMONY OF SCOTT MCMAHON

I, Thomas S. (Scott) McMahon, state as follows:

1. I swear under the penalty of perjury of the laws of Washington and the United States that the following testimony is true and correct.

2. I am over eighteen years of age and am otherwise competent to testify in this case. My testimony is based upon my education, training, experience, professional qualifications, and understanding of the matters herein.

3. Based on my professional experience and training, I have developed an expertise in marine structure engineering.

I. INTRODUCTION, EDUCATION AND PROFESSIONAL BACKGROUND, OTHER QUALIFICATIONS

4. I am a senior project manager for BergerABAM. I have a bachelor's of science degree in civil engineering (1993) and a master's of science degree in civil engineering (1997) from the University of Notre Dame, Department of Civil & Environmental Engineering & Earth Sciences. BergerABAM is a multidisciplinary consulting firm, founded in 1951, offering services in the areas of planning, civil and structural engineering, environmental services, public involvement, construction management and support, surveying, and underwater inspection services.

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5. I began my engineering career with Boswell Engineering located in South Hackensack, New Jersey, in 1993. My position was as a design engineer with responsibilities that included analysis and design of bridge structures and performance and documentation of bridge condition assessments. The work was generally performed on behalf of various county and state agencies. After approximately two years in this position, I left Boswell Engineering to pursue a graduate degree in civil engineering.

6. In 1997, I accepted a position as an engineer with BERGER/ABAM Engineers Inc. (current name is BergerABAM) in Federal Way, Washington. My primary responsibilities included the analysis and design of transportation facilities, including highway and transit structures.

7. In 1998, I accepted a position as a civil engineer with Lawson-Fisher Associates, PC in South Bend, Indiana. My primary responsibilities included design of roadways and associated roadway elements for state and county clients.

8. In 2000, I returned to work with BergerABAM in Portland, Oregon, as a senior engineer. Over the last 16 years with BergerABAM, I have primarily been involved in the design of transportation and marine facilities in the Pacific Northwest and internationally for state agencies, port authorities, and private developers with progressive responsibility for the design.

9. My curriculum vitae is attached hereto as Attachment A.

II. PURPOSE OF TESTIMONY

The purpose of my testimony is to address how the Vancouver Energy Project's Application for Site Certification (ASC) complies with the requirements of WAC 463-60-145 and Adjudication Issue 16 and 31, as identified in the Administrative Law Judge's Order Clarifying EFSEC's Process, Modifying Dispositive Motion Deadline, Summarizing Preliminary Issues, and Setting Hearing Dates (February 3, 2016). As

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explained below, based upon my review of the application and available information, the seismic analysis of Area 400 and the dock improvement components of the ASC meet or exceed the requirements of WAC 463-60-145, all applicable codes and engineering standards, and the design reasonably mitigates risks from geological or soil hazards.

III. SCOPE OF ANALYSIS

10. In 2013, BergerABAM was requested by the Applicant to review existing information, including as-built plans for the existing dock, condition assessments, and expected vessel characteristics to evaluate the existing facility for expected mooring and berthing loads. Following this initial focus, BergerABAM was requested to expand our role to encompass the entire marine facility, including the seismic analysis for the final configuration of the dock. The work included mooring elements, fenders, dock structure, abutments, pile strengthening, and catwalks.

11. The marine area at the Terminal site is designated as Area 400 and includes the existing Berths 13 and 14. The existing dock was constructed in 1993 and consists of two T-dock structures with the fender line for each approximately 250 feet from the top of embankment. Berth 13 was selected by the client to serve as the location for loading crude oil. When docked, the ship manifold (near the center of the vessel) will be aligned with Berth 13. The Berth 13 dock is composed of an access trestle bridge approximately 185 feet long by 24 feet wide and a platform that is approximately 100 feet long by 24 feet wide. The existing concrete dock and approach trestle are supported by plumb and battered 18-inch-diameter steel pipe piles. Steel catwalks join the T-docks to adjacent concrete breasting dolphins, which are also supported on steel piles. Typical construction of the existing dock consists of steel piles, concrete pile caps with pre-stressed concrete deck panels, and a concrete topping slab. A description of the proposed dock

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improvements, and the construction of those improvements is detailed in the ASC at Section 2.17.7.

12. Proposed modifications to Berth 13 include removal of the existing concrete superstructure, strengthening of existing steel piles, construction of a new abutment, and construction of a new steel and concrete superstructure. New steel trusses will connect the platform to adjacent breasting dolphins. The fender system will be rehabilitated by installing new rubber fender elements and a new face panel. Quick release hooks will be installed at mooring points and two new upland mooring dolphins will be constructed. Existing mooring dolphins will be strengthened. Two mooring points will be located on Berth 14.

13. For development of the analysis and design, we were provided several reference documents that were relied upon for analysis and design of the proposed structure, including

a. As-built structural plans of the existing marine facility, Port of Vancouver - T-Docks at Terminal 4, dated 21 September 1994.

b. Geotechnical report, Geotechnical Investigation, Proposed T-Docks/Dolphins, Port of Vancouver, Washington, dated 31 March 1993.

c. Dynamic Pile Measurements Report, Terminal 4 T-Docks, Port of Vancouver, Vancouver, Washington, dated 30 November 1993.

d. Pile-driving records, September through November 1993.

e. Geotechnical report, Geotechnical Investigation, Tesoro Savage Vancouver Energy Distribution Terminal - Dock Facility, Port of Vancouver, USA, dated 5 September 2014.

f. Vessel design information with Vessel Particulars Questionnaire (OCIMF Sire Programme) for design vessels, by Tesoro, various dates.

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III. DOCK IMPROVEMENT DESIGN AND COMPLIANCE OF DOCK IMPROVEMENT DESIGN

14. For the development of the structural analysis and design, we relied on the geotechnical recommendations and design criteria established by GRI, taking into account the soil conditions in Area 400. We relied on GRI's analysis for any element related to the underlying soil, including new and existing pile axial capacities in both compression and tension, seismic design spectrums, soil engineering parameters, slope stabilities, and the effects of soil liquefaction and lateral spreading on the dock and access trestle foundations. We reviewed and discussed the reports with GRI in order to understand the concerns and logic behind the recommended design criteria and parameters in the reports. We also asked GRI to review and comment on our conceptual designs and provide the pertinent geotechnical recommendations.

15. The structural design of the dock platform and trestle included provisions for ground improvements in the proximity of the trestle abutment. As part of our design work, we coordinated with Hayward Baker (HBI), the contractor working on the ground improvement design. In order to assist their work, we provided HBI performance criteria for limiting allowable lateral deflections for the "Design Earthquake," which under GRI's analysis considers the effects of a magnitude 9 Cascadia Subduction Zone (CSZ) earthquake, at the location where the trestle connecting the dock with the upland improvements (the abutment). In other words, we informed HBI of the maximum amount the trestle could move during an earthquake under the design conditions. In response, HBI provided a design for ground improvements in that area intended to improve and strengthen the soil conditions to meet the criteria we established for the dock construction. We reviewed and provided comments on HBI's ground improvement design report in the

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portion of Area 400 where the trestle abutment is located. Our review focused on the integration of the proposed ground improvements with the proposed dock structure to confirm that these elements would work together to meet or exceed all codes, regulations, and standards.

16. Currently, there is no design code adopted by the state of Washington specifically associated with the design, analysis, assessment, and maintenance of a non-public industrial marine terminal. However, as of 1 July 2013, the City of Vancouver had formally adopted the International Building Codes (IBC) with Washington amendments. For structural design, the Washington amendments are included in the Washington Administrative Code (WAC) Chapter 51-50, "State Building Code Adoption and Amendment of the 2012 Edition of the International Building Code." The amendments adopted by the State of Washington do not address design of non-public industrial marine terminals. WAC Chapter 51-50 implements the provisions of Chapter 19.27, "State Building Code," of the Revised Code of Washington (RCW). It formally adopts the 2012 edition of the IBC and the 2012 edition of the International Existing Building Code.

17. "The Effective Use of the International Building Code" section of the IBC notes that, "The International Building Code (IBC) is a model code that provides the minimum requirements to safeguard the public health, safety and general welfare of the occupants of new and existing building and structures."

18. Chapter 16 of the IBC addresses structural design, including design loads and load combinations. It does not include provisions for mooring and berthing loads typical for a marine loading facility. The IBC references ASCE 7 for design to resist the effects earthquake motions. The 2012 IBC references ASCE 7-10.

19. Mooring and berthing loads were determined using industry standards, including Mooring of Ships to Piers and Wharves (ASCE Manuals and Reports on

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Engineering Practice No. 129), and mooring loads were analyzed using OPTIMOOR mooring analysis computer program, by Tension Technology International, LLC. Existing mooring dolphins will be strengthened and connections between the quick release hooks and structure will be designed to capacity to protect the structure. All the mooring hooks will have load monitoring capability reported back to the dock control room and operational controls will be established in order to limit mooring line loads.

20. For seismic design, ASCE 7-10 Chapter 15.5.6, "Piers and Wharves," notes that "piers and wharves that are not accessible to the general public are beyond the scope of this section." The Commentary of the National Earthquake Hazards Reduction Program Recommended Seismic Provisions for New Buildings and Other Structures, FEMA P-750 (2009), Chapter C15.5.6, notes that current industry practice is that piers and wharves without occupancy by the general public are often treated differently than publically accessible piers and wharves, and the design is performed using other industry-accepted approaches. It is recognized that performance-based design approaches are often used.

21. At the time of initial design, a new ASCE standard was released, Seismic Design of Piers and Wharves (ASCE/COPRI 61-14). The design team decided to use the new ASCE/COPRI 61-14 standard for determining the seismic performance requirements of the structure and the seismic hazards to be considered in design. The "Design Earthquake," is in accordance with ASCE 7-05 with a life-safety protection performance level. This means that the dock improvement design had to be designed to withstand a magnitude 9 CSZ earthquake to meet the design criteria established by GRI and the ASCE standard.

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22. Dr. Yuanjing (George) Sheng of BergerABAM (Federal Way, Washington), a registered professional engineer in the state of Washington, built the seismic models and completed the analysis of the structure to ensure the design complies with the Design Earthquake criteria.

23. The dock improvement was designed to comply with all applicable codes and standards, as listed above. My team at BergerABAM also designed the dock improvements to comply with the soil design criteria established by GRI, which are conservative and meet the ASCE standard. Considering all of these facts, in my professional opinion and experience, the dock improvement design meets or exceeds all applicable code requirements, regulations, and standards and, therefore, satisfies the requirements for site certification for this element of the project.

24. The following documents are attached to my testimony for reference:

Attachment A: Curriculum Vitae of Scott McMahon

DATED this 13th day of May, 2016.

Scott McMahon, Declarant

g.

STATE OF OREGON)
)
COUNTY OF MULTNOMAH)

THOMAS SCOTT MCMAHON, being duly sworn upon oath, deposes and says: The foregoing testimony is true, correct and complete to the best of my

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knowledge, information and belief and is given subject to the laws of perjury in the State of Washington.

GIVEN under my hand and official seal this 13th day of May, 2016.

NOTARY PUBLIC in and for the State of: ~~ROBERT MUSAFIRI~~ OREGON

Residing at: PORTLAND, OR

My Commission Expires: January 15, 2018

Printed Name of Notary: ROBERT MUSAFIRI

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MY COMMISSION EXPIRES JANUARY 15, 2018

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