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 GREG A. RHOADS

I, Greg A. Rhoads, state as follows:

1. I swear under the penalty of perjury of the laws of Washington and the United States that the following statements are 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. The purpose of this declaration is to provide testimony regarding the regarding the Tesoro Savage Petroleum Terminal LLC, d/b/a Vancouver Energy (hereinafter, "TSPT" or the "Applicant") Application for Site Certification ("ASC") for the Vancouver Energy Terminal (the "Project") related to environmental health and public safety issues. Specifically, this testimony describes emergency incidents at the Project as well as in the transportation of crude by rail. Additionally, this testimony identifies and assesses the adequacy of emergency planning and response measures.

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I. STATEMENT OF EXPERT QUALIFICATIONS

4. Based on my professional experiences and background, I have developed expertise in emergency planning and response for facility and rail incidents, including those involving hazardous materials. I am the Principal Consultant and President of Greg Rhoads & Associates, Inc. of Jacksonville, Florida. Greg Rhoads & Associates, Inc. is a full service health, safety, and environmental consulting company specializing in serving the chemical, petroleum, and transportation industry sectors.

5. I earned a Bachelor's of Science degree from the University of Maryland in Fire Protection and Industrial Safety in 1984 and an MBA in Business Administration from Nova Southeastern University in 1995. I currently hold professional certifications as a Certified Fire Protection Specialist by the National Fire Protection Association ("NFPA"), as a Certified Safety Professional by the Board of Certified Safety Professionals, and as a Certified Hazardous Materials Manager by the Institute of Hazardous Materials Management. I am certified as a lead auditor for ISO 14001-Environmental Management systems and OHSAS 18001 Health and Safety Management systems. Outside of my formal collegiate education I have over 100 hours of fire services training in structural firefighting, emergency medical services, hazardous materials, and incident command systems.

6. I entered the emergency services sector in 1977 as a volunteer firefighter with the Avis, Pennsylvania Fire Company. I served as an active member for 14 years and am a 25-year member of the company. I also served as a firefighter/emergency medical technician with the Prince Georges County, Maryland Fire and Rescue Department ("PGFD") as part of the live-in program with the Berwyn Heights Volunteer Fire Department. While with the PGFD I was a member of the county Hazardous Material's Response Team.

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7. I worked for the Virginia Department of Emergency Services as a Hazardous Materials Officer from 1985 to 1987. In this role I responded to hazardous materials emergencies throughout the Commonwealth of Virginia as a state response official and worked with local agencies to develop response plans, develop operational capability, and I conducted training for fire, rescue, and law enforcement officers. In 1987, I was promoted to Hazardous Materials Response Supervisor. In this expanded role I was responsible for the response operations of four offices and 10 Hazardous Materials Officers and for the implementation of the Commonwealth's regional hazardous materials teams. This included development and delivery of training programs, equipping, and operational management for large scale events. During the development of the Commonwealth's regional response team build out I was the lead developer and instructor for the Decontamination, Personal Protective Equipment, and Hazardous Materials Technician courses.

8. In 1989 I joined CSX Transportation ("CSXT") as a Hazardous Materials Manager and was responsible for planning, training, and rail centric regulatory compliance in a six-state area. I was also responsible for emergency response throughout the CSXT 20-state network for hazardous materials and environmental emergencies. Later in my tenure with CSXT I was responsible for management of the emergency response for the rail network and later served as the Director of Chemical Safety. I served as the representative to the National TRANSCAER® Leadership Group and as the Florida TRANSCAER® state chairman to develop local rail centric emergency response training, and served on the Association of American Railroads Non-Accidental release ("NAR") committee, the American Chemistry Council Responsible Care team, and was the chairman of the Responsible Care Partners program representing 80 railcars, bulk motor

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carriers and terminal operators in the areas of health, safety and environmental management systems.

9. In 2001, I established Greg Rhoads & Associates to serve the chemical, petroleum, and transportation industrial sectors with fire protection, chemical handling, employee safety, and regulatory compliance services. My practice includes successful projects with both Class 1 railroads and short line rail carriers, bulk trucking companies, terminal operators, and transloading operations. I have completed projects with local governments for the planning for, and response to, hazardous materials incidents involving all modes of land transportation and for a variety of chemical products. I have been a lead safety consultant in the design, construction, and initial operations of several flammable liquid unit train operations. I am a lead instructor for a Class 1 railroad for outreach to local emergency responders.

10. I am the author of the text Emergency Responders' Guide to Railroad Incidents, Red Hat Publishing, 2007, and the Instructors' Guide that accompanies the text. This text has been adopted by emergency responders preparing for a possible response to a railroad based incident. My Curriculum Vitae, containing additional professional work history and other related training, has been attached to my testimony as Attachment A.

11. I have reviewed relevant portions of the Application for Site Certificate, as well as the Draft Environmental Impact Statement and key comments thereto to form my opinions and testimony.

II. SUMMARY OF REGULATORY FRAMEWORK AND INDUSTRY PRACTICES FOR SAFE TRANSPORTATION OF HAZARDOUS MATERIALS BY RAIL.

12. The transportation of hazardous materials in the United States is regulated by a number of federal departments and agencies, each charged with a specific mission and defined area of responsibility. In some cases these missions overlap. The movement

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of hazardous materials occurs across multiple state jurisdictions and numerous county and local jurisdictions. To allow for the efficient movement of these materials and to minimize possible conflicting regulations between local and state jurisdictions, the responsibility for the regulation of interstate transportation resides at the federal level.

13. The primary federal agency charged with the responsibility to ensure the efficient and safe movement of commodities is the United States Department of Transportation ("DOT"). The DOT has a number of transportation related roles with separate administrations and agencies focusing upon specific modes of transportation and transportation related issues such as safety standards, research, and statistical analysis of data reported from a variety of sources.

14. The DOT was established by an Act of Congress in 1966 and is headed by a Secretary appointed by the President. The mission of the DOT is to:

> *Serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.* (US Department of Transportation - Mission)

15. Federal hazardous materials transportation law ("Federal hazmat law") found in 49 U.S.C § 5101 is the basic statue regulating hazardous materials transportation in the United States. 49 U.S.C § 5103 directs the Secretary of Transportation to designate materials or a group of class of materials as hazardous when the Secretary determines that transporting the material in commerce in a particular amount and form may pose an unreasonable risk to health, safety, and property. The Secretary is also required to issue regulations for the safe transportation, including security, of hazardous material in intrastate, interstate, and foreign commerce.

16. The definition of a hazardous material is found in 49 CFR 171.8 and defined as:

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> a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under section 5103 of Federal hazardous materials transportation law (49 U.S.C. 5103). The term includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (*see* 49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions in part 173 of this subchapter. (49 CFR 171.8)

(Emphasis added.)

17. "Transported in commerce" can mean one or more of the five standard modes of transportation recognized by the DOT: Marine (including inland waterways and trans-oceanic), Pipeline, Highway, Rail, and Aviation. Transportation of hazardous materials involves different industries and industry sectors. The regulations apply to any one who offers for shipment a product or commodity that is classified as a hazardous materials based upon its physical characteristics, hazards, or form. The DOT regulations also apply to the modal carriers who are bound by law as common carriers with accepting the goods and moving them to a final destination.

18. Under this regulatory scheme, DOT recognizes that transportation is a federal activity involving both interstate and intrastate movement of goods. As such each mode of transportation has its own specific physical operating environment and equipment. Thus each modal transportation method has its own regulatory oversight agency. The movement of hazardous materials is a subset of the overall transportation activity for most transportation carriers. The basic regulations for hazardous materials focus upon the shippers who classify, describe, and package the hazardous materials prior to tendering it to the transportation providers. Once accepted into transportation the transportation carrier becomes responsible for the safe handling of the materials while in their possession.

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A. Pipeline and Hazardous Materials Safety Administration ("PHMSA")

19. The starting point for transportation regulations covering hazardous material lies with the Pipeline and Hazardous Materials Administration ("PHMSA"). PHMSA's mission is

> *to protect people and the environment from the risks of hazardous materials transportation.* To do this, we establish national policy, set and enforce standards, educate, and conduct research to prevent incidents. We also prepare the public and first responders to reduce consequences if an incident does occur. (PHMSA Website 8/23/13)
>
> *Our vision is that no harm results from hazardous materials transportation.* We cannot accept death as an inevitable consequence of transporting hazardous materials, so we will work continuously to find new ways to reduce risk toward zero deaths, injuries, environmental and property damage, and transportation disruptions.
> *(PHMSA - Mission)*

20. As the primary source for hazardous materials transportation regulations, PHMSA issues the Hazardous Materials Regulations ("HMR") found in 49 CFR Parts 171-180. PHMSA also has responsibility for procedural regulations, including provisions on registration and public sector training and planning grants (49 CFR Parts 105, 106, 107, and 110).

21. The HMR apply to any shipment that meets the criteria to be classed as a hazardous material tendered to transportation by anyone or entity. This includes individuals making a shipment via UPS or FedEx or an oil company shipping a unit train of petroleum products and is regardless of the mode of transportation.

22. PHMSA's regulatory functions include:

- Issuing rules and regulations governing the safe transportation of hazardous materials;
- Issuing, renewing, modifying, and terminating special permits;
- Issuing, modifying, and terminating approvals for specific activities;

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- Receiving, reviewing, and maintaining important records (e.g., incident reports);
- Making (or issuing) administrative determinations whether state, local, or Indian tribe requirements are preempted by the Federal hazmat law, or may remain in effect, under a waiver of preemption
- Representing DOT in international organizations and working to assure the compatibility of domestic regulations with the regulations of bodies such as, the United Nations Subcommittee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labeling of Chemicals

23. In addition, PHMSA serves as the focal point for regulatory oversight of the national pipeline infrastructure. The HMR include regulations for modal operators for the safe handling of hazardous materials including specifications for the design and construction of containers used to transport hazardous materials, including tank cars. While PHMSA inspectors can issue enforcement actions against companies who violate the HMR, each transportation mode has a corresponding regulatory administration that is responsible for enforcement of the modal specific the PHMSA regulations.

24. PHMSA has been active in the regulation of transportation of crude oil, dilbit, ethanol, and other flammable liquid products over the past several years in response to the increase in the domestic transportation of these products arising from the production of energy sources from multiple major production areas throughout the United States including the ethanol production sites in the mid-west, shale oil and gas fields of the mid-Atlantic, the Bakken oil field in the upper mid-west, and other various shale oil and gas fields in the gulf coast and southwest regions.

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25. PHMSA has also undertaken an extensive effort to investigate and characterize the flammable properties of Bakken crude oil and shipper classification of these shipments in light of crude oil incidents. This focus has produced a better understanding of the actual properties of this crude oil stream and has attempted to resolve much of the misunderstanding about Bakken crude oil chemical and physical properties. PHMSA senior officials have publicly testified about Bakken crude oil light ends content, flash point and boiling points being within the normal ranges for light crude oils. Written Statement of Timothy P. Butters Before the Subcommittees on Energy and Oversight Committee on Science, Space and Technology, U.S. House of Representatives at page 12 (Sept. 9, 2014).

26. PHMSA has worked in conjunction with the Federal Railroad Administration ("FRA"), the Association of American Railroads ("AAR"), the American Petroleum Institute ("API") and others on the correct classification of these shipments as a Class 3 flammable liquid with assignment of appropriate Packing Group based upon particular physical characteristics. Regardless of the Packing Group assigned, Bakken crude oil remains correctly classed as a flammable liquid much like other commonly used and transported flammable liquids.

27. PHMSA has developed and distributed training materials for emergency responders on the safe response measure for responding to a crude oil emergency. The basis for much of this effort is centered upon use of the DOT Emergency Response Guidebook ("ERG") used by first responders to the identification and immediate direction for actions to protect themselves and local populations from a release of hazardous materials. The ERG includes specific guides for use by the responders which are arranged to list the primary product hazard first. The ERG guide relevant to petroleum crude oil correctly lists the fire and explosion hazard as the primary hazard for responders to

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consider if dealing with an incident involving crude oil. The explosion hazard is markedly different from the directions provided for Class 1 explosive materials in both the primary risk and response actions sections.

B. Federal Railroad Administration ("FRA")

28. The FRA's Office of Railroad Safety regulates safety throughout the United States rail industry. This office carries out its regulatory and inspection responsibilities using 400 Federal safety inspectors who operate out of eight regional offices. The Office of Railroad Safety and its inspectors have responsibility for five primary disciplines focusing upon compliance and enforcement:

- Hazardous Materials
- Motive Power and Equipment
- Operating Practices
- Signal and Train Control
- Track

29. These inspectors have full authority to inspect all railroad operations in the United States. Each day these inspectors are in the field conducting inspections with the five operating disciplines to ensure railroad operations are being performed in compliance with federal regulations. The FRA Office of Railroad Safety is also involved in activities such as

- Railroad safety and customer training (including State safety inspectors);
- Accident and employee fatality investigations and reporting;
- Partnerships between labor, management, and the agency that address systemic initiatives; and
- Development and implementation of safety rules and standards.

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30. The DOT, through the activity of PHMSA for the promulgation of the HMR, and the FRA, for inspection and enforcement of the HMR in the rail environment is the primary Federal agency involved in the transportation of hazardous materials. However, there are other agencies with missions that overlap those of the FRA and PHMSA.

31. The FRA promulgates regulations for freight railroad operations in areas such as track classification and inspection criteria, hours of service for railroad employees and operating rules for train operation. FRA inspectors are generally functional area specific in their training, experience, and daily inspection activity.

32. The FRA has the authority to issue Emergency Orders and Safety Advisories to rail carriers that impose immediate actions to ensure safe operations. Emergency Orders are enforceable as a legal requirement upon the carriers and can be used until a law or regulation is developed following the normal regulatory process. The recent Emergency Order, Number 28addresses this. Emergency Order Establishing Additional Requirements for Attendance and Securement of Certain Freight Trains and Vehicles on Mainline Track or Mainline Siding Outside of a Yard or Terminal, 78 Fed. Reg. 48,218 (Aug. 7, 2013). This Emergency Order demonstrates the ability of the FRA and of the DOT to take prompt action to address safety concerns or issues within the railroad.

33. The FRA has been active in responding to the sharp increase in crude oil and other energy products through Emergency Orders and active rulemaking. This includes new operating practices for railroads handling crude oil in unit trains (also referred to as High-Hazard Flammable Unit Train or "HHFUT") as well as changes to the current tank car specification for transportation these products.

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C. Department of Homeland Security ("DHS")

34. The Aviation and Transportation Security Act ("ATSA") of 2001, and under delegated authority from the Secretary of Homeland Security, the Transportation Security Administration ("TSA") was granted responsibility and authority for security in all modes of transportation. Under this authority TSA can assess a security risk for any mode of transportation and develop security measures for dealing with that risk and enforce compliance with those measures.

35. The U.S. Department of Homeland Security ("DHS") regulations aimed at strengthening the security of the nation's freight and passenger rail systems and reducing the risk associated with the transportation of security-sensitive materials was published in the Federal Register on Nov. 26, 2008. The Rail Transportation Security Rule, 49 CFR 1580, granted TSA regulatory authority in the following key areas:

- Secure Chain of Custody
- Communication
- Reporting Security Concerns
- Location Tracking
- Inspection Authority

36. TSA has a staff of rail freight inspectors who conduct field inspections of railroad operations to ensure compliance with the provisions of 49 C.F.R. 1580. These inspections extend beyond railroad operations and include fixed shipper locations for the bulk transportation of poisonous-by-inhalation materials, certain explosive materials, and certain high-level radioactive material shipments.

37. Other agencies within the DHS have a limited role in the transportation of hazardous materials. The U.S. Customs and Border Protection are involved with trans-

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border shipment of material including hazardous materials by all modes. The Federal Emergency Management Agency provides states and local communities with resources including training, grants, and other assets to prepare for, respond to and to recover from hazardous materials transportation incidents.

D. Applicable State Regulations Addressing "Volatility"

38. Although states do not generally have the ability to regulate transportation of hazardous materials, recent regulations in North Dakota are intended to do so in part as it relates to Bakken crude oil. Questions about the presence of "light ends" in Bakken crude oil (including propane and butanes) led the North Dakota Industrial Commission to develop pre-conditioning regulations at the well head or in the field for Bakken crude oil subsequently being offered for rail shipment. This pre-conditioning activity should serve, on average, to remove more of these light ends from the crude oil. This conditioning also effectively serves to cap the vapor pressure of Bakken crude oil to no more than 13.7 psi absolute (per laboratory testing method ASTM D6377), which is substantially below the federal standard for shipment as a Hazard Class 3 Flammable Liquid, even though multiple industry and PHMSA's own study showed that essentially all Bakken crude oil was already below 13.7 psi prior to the pre-conditioning regulations. This also potentially lessens the volatility from the vapors that would be released if the product was released. The fewer vapors with a wide flammability range lessen the overall flammable properties of the crude oil.

39. Further study of crude oil by rail by the U.S. Department of Energy at Sandia National Laboratories has reported that the volatility of the crude oil is not a major factor in combustion events that can arise from accidents with a release involving crude oil. The amount of fuel released, the surrounding infrastructure and environment, and the mechanical energy involved in a train derailment all play a large role in the severity of the

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event. The report further states that there is no single parameter that defines the degree of flammability of a fuel, rather several parameters are relevant including flashpoint, flammable limits and auto-ignition temperature.

40. The National Transportation Safety Board ("NTSB") Chair Christopher Hart stated in September 2015 that "Our accident investigation experience, from the ones that we have looked at, has not indicated that volatility is a significant issue. The biggest contributor to a large explosion or fire is how much product is released, rather than the volatility of the product."

41. Volatility is an important factor but not the single or driving factor in the overall classification of Bakken crude oils as flammable liquids. It is important for the correct classification and UN product identification name in the correct context, to be made available to the emergency responders as part of the training and awareness required for a response to these products. In the past 8 years the number of crude oil shipments by rail has increased at an almost exponential rate, before leveling off and now declining somewhat. During this same period the number of train accidents has continued to decrease. Several large impact derailments focused attention by the regulatory agencies, industry, and the public to increase the level of safety for these shipments. The actions by PHMSA, the FRA, the AAR, and API in response to these incidents have made meaningful impacts upon the safety of crude oil shipments. Proper product classification, railroad operating practices, improved tank car designs and increased responder training and awareness are all a direct result of this focus. In my opinion, these efforts make real safety performance improvements in the overall safety of crude by rail operations. I further believe that the rail and energy industries, state and local responders, and communities need to take continued actions to prepare for and safely handle crude oil transportation accident events.

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III. CHARACTERIZATION OF THE TYPES OF RAIL INCIDENTS THAT MIGHT OCCUR TO TRAINS DESTINED FOR THE VANCOUVER ENERGY PROJECT

42. The transportation of crude oil by rail has sharply risen in the past several years and is projected to continue. PHMSA and the FRA have reacted to calls for increased safety for these shipments and in response to lessons learned from a series of derailments involving these products. The DEIS references 20 incidents between 2013 and 2015 involving crude oil. Of these events, the range of emergency consequences included derailment of tank cars with no release, a minor to moderate release with no fire or explosion and larger releases with fires and catastrophic failure of tank cars. From these events, responders can identify a defined set of scenarios involving crude oil unit train emergencies and plan for such incidents.

43. The types of crude oil railroad incidents that a responder could potentially be ask to respond to include:

- Crossing accident with no derailment.
- Derailment with no release.
- Derailment with release of some size (minor to 1400 bbl.).
- Derailment with release and fire event (this event includes the possible explosion involving a tank car exposed to a pool fire or other direct flame impingement that leads to a sudden release of pressure with a corresponding fireball type event).
- Non-accidental release of product from a tank car valve or other fitting with no derailment.

44. An emergency response decision-making tool was developed by Ludwig Benner, former NTSB investigator, in the early 1970's that is widely used by emergency response agencies and is the basis of numerous hazardous materials response curriculums.

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Benner's D.E.C.I.D.E. model is a simple acronym to allow responders to consider important questions in the development of their on–scene response strategy and tactics:

> D - Detect the presence of a hazardous material. Not only is there a hazardous material present but what it is and the quantity of the product.
>
> E - Estimate likely harm without intervention. What is the material doing? Is it being interacted upon by external events (fires, water, and other chemicals)? Is it interacting with the containers to cause stress upon the container causing it to fail or breach.
>
> C - Choose response objective. Emergency responders need to identify what they want to accomplish early in the incident to begin to assemble the necessary resources and develop action plans to conduct some form of operation. This could include a non-intervention strategy of allowing the products to burn or react; to provide cooling water to stressed containers, to extinguish fires from the products and structures, to move people away from harm or potentially harmful locations until the risk has been controlled or is dissipated. In all responses the primary objective is to protect life and ensure safety to humans. This includes the general public and the responders (local, industry and regulatory) who are at the event. Protection of property and the environment are considerations but are a far second and third priority to the life safety objective. System restoration and minimizing effects of the incident upon other local and regional infrastructure are also important objectives.
>
> I - Identify Action Options. With the objectives established the incident commander can identify the action options currently available. This is based upon resources include responder staffing, knowledge and expertise; specialized protective equipment, firefighting tools such as foam or spill response equipment like booms, skimmers, and similar supplies and upon water supplies and access to the incident. From available resources the Incident Commanders can make tactical plans to manage the events either with available resources or upon the arrival of additional or specialized resources before taking action.
>
> D - Do best option. Implementing the response plan developed in conjunction with railroad emergency response specialists, shipper subject matter experts and other stakeholders in the response effort.
>
> E - Evaluate the success of the interaction to safely affect the outcome of the incident.

45. This response methodology is included in most hazardous materials response training and can be applied to any hazardous materials emergency regardless of the size or complexity. This methodology is applied to each of the response scenarios described in this report.

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46. The most serious of these scenarios involves the derailment of a tank car or cars containing crude oil products. While in transportation the product is contained and is stable. Crude oil is not reactive and is stable at normal temperature ranges expected in this region. These products are not considered air or water reactive. If loaded to allowable tank volume and weight limits the product will remain contain if closures are properly secured and the tank remains in an upright orientation, or even if the tank is overturned, provided that the closures, valves, and seals are undamaged.

47. The following testimony describes the varying types of incidents that could happen given the transportation of crude oil by rail. Responses to such incidents are described in the sections below and reflect recognized best practices and emergency response and management principles. The use of the word should is used to reflect a correct, recognized, or recommended action or decision point. If a specific action is required by law or status it will be referenced.

48. My testimony also includes emergency response to spill and fire events that could occur at the railcar unloading and storage terminal activities at the Project.

49. My testimony describes the incidents and responses to such incidents assuming they have occurred, but does not make any judgments or assessments about the probability or likelihood of any of these events. It is my understanding that risks and probabilities of such incidents are addressed in the testimony prepared by Dr. Christopher Barken and others.

A. <u>Crossing Accident</u>

50. A railroad highway crossing accident is a scenario where a moving train impacts an object (most often a vehicle or trespasser) at a public or private highway railroad interface. The speed and size of the train makes emergency stopping within short distances very difficult. Stopping distances for a train can be up to one mile from the time

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the braking action is initiated to a total stop depending upon train makeup, weight, and geometry of the track. Most crossing accidents result in high levels of damage to the object struck and limited damage to the lead locomotives. Crossing accidents can lead to derailment of the locomotive and following cars.

51. Emergency response to a crossing accident involving a crude oil unit train would be very similar to response to any train/vehicle collision. First responders should take immediate action to request the railroad controlling the track segment be contacted to stop train traffic to prevent further train movement. This can be done by calling the railroad emergency number as identified on the required crossing marking sign, through pre-established notification channels or via the AskRail app, which provides real-time information to first responders about the contents of any train car.

52. Standard practice is for arriving emergency responders to conduct an incident assessment or a size-up to identify the problem and immediate hazards to the responders. Care of injured victims including the train crew should be initiated only after the scene is safe for intervention. Inspection of the train for any derailed or damaged cars can begin and be done in conjunction with the train crew members if possible. If a derailed tank car is identified, the incident action plans should follow protocols for handling a train derailment of crude oil and follow the hazard assessment steps to identify the scope and nature of the problem.

53. The local Incident Commander may recognize that the train may be blocking other crossings that could impact response times and accessibility for responders to other areas and emergencies. The Incident Commanders should work with local law enforcement officials and the railroad to ensure public and responder safety while restoring operating systems to return the scene to normal in an efficient manner. Additional options for response measures are described in later sections of my testimony.

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B. **Derailment with No Release**

54. A train may experience a derailment due to a number of factors including track structure failure, weather related impacts, train handling, mechanical failure, or other train/outside party interface. A derailment is when the normal wheel/rail interface is impacted causing one or more wheels to leave the rail head and impact the other track components or the ground. A derailment can include one wheel on the ground to several cars derailed and out of normal upright orientation. All train derailments are not the same and can range from no tank damage and a minor immediate risk to a larger event with potentially cascading effects that will require a large scale response effort from multiple department, agencies, and sources.

55. As stated, crude oil in the properly secured tank car poses little risk in normal operation. A derailed tank car that is in the upright position with no tank damage posed little risk from a fire or explosion since the product remains secured within the tank. The derailment and overturning of the tank car places the car and product into an abnormal environment and may lead to other scenarios based upon damage to the tank and integrity of the tank valves and closures.

56. Emergency responders should take precautions during the initial hazard assessment to carefully identify if any tank cars are leaking and to control possible ignition sources in the derailment area and in downwind locations. If no product is released during the initial derailment event, the threat of a fire and explosion is lessened during the response and mitigation if responders and industry resources work to ensure that the product remains contained. In the derailment with no release scenario, a fire or explosion is very unlikely after the initial event. Once all the cars in the train have stopped moving, the damage to the tanks is completed. If no tanks are compromised to

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the point of leakage and the fittings remain secure the product remains contained, the scene is at a stable point.

57. Railroad equipment, including tank cars are designed to provide constant rail/wheel interface and tracking through curves and elevation changes while maintaining the car boy stability. This is requires the rail car wheel sets and truck assemblies to be free to move independent of the car body. During a derailment the car or tank body separates from the wheels assemblies. This separation is normal and helps to protect the tank body from damage if the wheels were permanently attached. This can create the image of great damage when in fact the tank car is intact and maintains its containment integrity.

58. Local emergency responders should take actions to control the scene and limit entry to railroad emergency response personnel and other regulatory officials. The incident commander will likely establish entry controls and accountability to ensure everyone at the site understands the hazards and to maintain scene security.

59. The railroad and its response contractors typically conduct a more detailed damage assessment of any tank cars involved and make plans to handle the cars and product to prevent any product release. This could include the transfer of product from tank cars into other tank cars or highway cargo tanks from those tank cars that have tank integrity issues that could result in the release if the car is moved or lifted. For a derailment with no product release, the objectives include responder and general public safety and ensuring that the cars do not leak or release product during the derailment clearing and system restoration work. The derailment scene can pose physical hazards from unstable equipment and track components damaged in the event to simple personnel injuries from falls, working around heavy equipment and hazards from chains, slings, and other hoisting equipment. A site safety plan must be developed and safe work practices

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used by all site personnel in accordance with OSHA 29 CFR 1910.120, Hazardous waste operations and emergency response.

60. While time is a factor in system restoration, the damage assessment must be completed so a clear action plan can be developed that ensures safe product handling, derailment clearing, and system restoration. Local emergency responders may be asked to continue to be involved in the incident response to ensure that local concerns and safety are maintained. Fire suppression and emergency medical service resources may need to be maintained at the scene to protect the site in the event there is a fire or injury during the response recovery phase of the incident.

C. Derailment with Release but No Fire

61. A derailment with a crude oil release that does not involve a fire is also a serious event that can escalate into a fire event if the released product pools and creates concentrations of flammable vapor and an ignition source is present. After life safety concerns are addressed, the incident commander should conduct an incident assessment that includes the number of cars involved, their status (breached, intact, overturned, or just derailed), how many cars are releasing product, the volume being released, and the source (fittings or tank breach). Of the spilled or spilling product, the Incident Commander should determine where the product is going now and where it will go in the next few hours. As a liquid product, crude oil will flow the same as any other liquid. It will follow natural geographical contours and at some point could reach a waterway or other sensitive environmental receptor.

62. The product vapors will be influenced based upon ambient temperature, weather conditions, and air currents. Vapors from volatizing crude oil products may be moving in directions opposite of the liquid flow. The primary concern with the vapors is the flammability of the vapors if they contact an ignition source, which could be some

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distance from the event. Dispersion patterns show that vapor concentrations begin to decline the further from the incident location or product source. At some point between the leading edge of the vapor plume and the source of the product release there can be vapors above the lower flammable limits ("LFL") that pose the greatest risk of a flash fire where the fire front can travel back to the source and create a sustained fire from spilled product either in a pool or running product scenario. Accumulation of flammable vapors above the LFL and within the flammable range are typically limited to the point of a release. Given the unconfined nature and natural dispersion, vapors are normally not contained to the point of concentrations above the LFL. If the released product has not been ignited as part of the derailment it is unlikely they will ignite unless another ignition source is introduced from accident response actions or mitigation efforts such as cutting, internal combustion engines, or smoking.

63. Human exposure to these vapors can also lead to health effects from hydrogen sulfur contact and other volatile hydrocarbons. Responders can use product-appropriate air monitoring instrument to identify the levels and locations of flammable vapors. Bakken crude has low levels of hydrogen sulfide (H2S) as part of its chemical composition. These levels are identified prior to shipping and are part of the product specifications issued by a terminal operator for acceptance. Exposure to H2S by responders for Bakken crude is an issue of concern but is not typically found in concentrations which pose a significant risk outside of the immediate spill area and the initial few moments of release.

64. The control of spilled and flowing liquid can be done through physical methods such as dams, dikes, spill control booms, and other means. This requires application of the technique or equipment inserted ahead of the flowing product and to have capacity to hold the spilled product within the control devices. Intermit structures

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and devices can be employed to slow the spread of the product while other resources are being assembled and deployed downstream of or at down gradient locations to achieve final product control. Once contained, the spilled product will continue to release or emit potential flammable vapors. The control of these vapors can be achieved through the use of product compatible firefighting foam used for vapor suppression or through air monitoring of the actual vapor levels to identify plume dissipation and travel.

65. Emergency responders, public works personnel, and contractors can be used to conduct defensive spill control with proper training and coordination. These efforts are based upon the principle that the responders are not in a positon to be exposed to the liquid or vapor from the product and can complete the task before the product reaches the containment location.

66. This activity is recognized in the OSHA 29 CFR 1910.120 hazardous waste operations and emergency response regulations as First Responder - Operations Level type of action. Once the spilled product is controlled, the incident remains an active site while flammable vapors remain being monitored and the area kept clear of personnel until qualified response and remediation contractors begin the process of product recovery and containment from the breached containers. As with a derailment with no release, cars that remain intact and secure but damaged will have a complete damage assessment completed before the car is moved or handled.

67. The scope of the emergency response effort is dictated by the amount of spilled or potentially spilled product. Incidents involving crude oil have ranged from one car partially releasing product to 23 cars releasing some or all of their contents. The Lac-Mégantic incident is the largest crude oil release event and highlights the potential for large number of cars to breach, however, based upon other industry experience and modeling it is not the typical release event.

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68. In my opinion, based upon my experience with train accidents, the Lac-Mégantic incident is not reflective of even a small percentage of train accidents. The loss of containment from a large number of tank cars is a very remote possibility and is documented in the accident probability studies done by Dr. Barken and others. Regulatory and industry operating practices changes have addressed the unique set of circumstances which contributed to the Lac-Mégantic event. Industry and local emergency responders are much more aware of the hazards of crude oil and safe response measures than even 3 years ago. The efforts of the rail industry to provide free or low cost training to responders continues to drive awareness and emergency planning along crude by rail routes.

D. <u>Derailment with Release and Subsequent Fire</u>

69. A derailment of a crude oil tank car that suffers damage sufficient to cause a tank car breach can lead to the ignition of the released product from derailment related sources. Metal-to-metal contacts, metal-to-rock contacts, and electrical sources can lead to released crude oil being ignited. The size of any fire is directly related to the amount and form of the fuel source. A small amount of fuel leads to a small fire that can consume the available fuel in a short period of time. The more fuel, the larger and longer the duration of the fire event. During the fire event, heat is generated that can be transmitted to objects within a sphere of the fire location. This can include the preheating of other spilled products, tank cars which have also released product, tank cars which remain intact and other structures, vegetation, and combustible objects in the derailment area. A serious threat from this type event is for a fire to be continually fed from a large or ongoing release such that the flames or heat can directly impinge upon another tank car that has not breached.

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70. The long term external heating of a closed container is well known to emergency responders and was first widely communicated in the late 1970's and early 1980's by the National Fire Protection Association in the film "BLEVE." A BLEVE is a Boiling Liquid Expanding Vapor Explosion. This is caused when a closed container of a liquid is subjected to external heating. The heating causes the internal liquid to heat and exceed the liquids boiling point. Above the boing point the liquid continues to heat and attempts to change phase from a liquid to a gas, and thus causes an increase in pressure in the container. This pressure increase will continue to stress the container and at some point may cause the container pressure relief device to activate. If the pressure in the tank exceeds the relief capacity of the pressure relief device to relieve this pressure, the container will ultimately fail. This failure can be immediate and result in a catastrophic failure of the container with fragments and parts being expelled considerable distances from the initial container location due to the pressure release, or depending on the chemical properties of the liquid, alternatively undergo a large rip or tear in the container causing a rapid release of the product called a Heat Induced Tear ("HIT"). If the liquid contained in the tank is flammable there will be a sudden ignition of the newly released and pressurized product as it mixes with air and is exposed to the original ignition source. This type of event is explosive in nature in that it includes a sudden release of pressure and large volumes of fuel and it is most often characterized by the large fireball type fire. BLEVE events occur in tank equipment transportation of liquefied petroleum gases ("LPG") and propane much more likely than in flammable liquid tank cars. LPG tank cars are a different DOT specification and have higher pressure relief device operating pressures. While a BLEVE can occur in the tank cars used for crude oil it is not a normal release scenario. A heat induce tear from the tank shell with a rapid release of product vapors is a more likely tank failure scenario.

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71. The DEIS repeatedly uses the expression "fire or explosion" in the report. This term has numerous definitions and connotes a massive release of destructive energy similar to a bomb or other weapon. The effects of an explosion are largely based upon how the energy is contained or directed. A BLEVE can be called an explosion because of the rapid release of energy as the container fails. This energy can propel tank fragments and parts from the initial site. The flammable gases under considerable pressure are then released and mix with air. This vapor cloud often ignites into a large and impressive fire also called an explosion. The energy released during this incomplete combustion of fuel is expressed through light and heat and causes a pressure wave in a spherical form. As this pressure is no longer contained the energy is rapidly dispersed. The pressure generated is largely related to the speed of the fuel combusting. DOT Class 1 explosives detonate or deflagrate at supersonic and subsonic speeds. This pressure release wave moves at very high speeds with harmful effects. The speed at which a release of hydrocarbon fuel is combusted during a pressure release (BLEVE or HIT) is much less than a typical DOT Class 1 explosive product, with lower pressure waves and much smaller impact radius for hydrocarbon fuel. Furthermore, a BLEVE involving a liquefied flammable gas such as propane is much more explosive than crude oil in that the pressurized gas is more rapidly combusted and in a more complete manner. This reduces the likelihood of the crude oil tank container from being propelled from the site and fragmentation of the tank itself.

72. Fire ball events can have major impact and pose a serious risk if emergency responders or affected persons are within the fire ball area or within the radiant heat zone at ground level surrounding fire ball. A response strategy that recognizes that a BLEVE or HIT can result in a fire ball type explosion can prevent responder injury from exposure

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to this sudden radiant heat and fragment impact simply by letting the event occur an adequate distance away from first responder personnel.

73. For the expected range of conditions associated with crude oil transportation, the 2016 Emergency Response Guidebook in Guide 128 for flammable liquids, such as petroleum crude oil (UN 1267), recommends an evacuation distance of ½ mile if a tank, rail car or tank truck is involved in a fire, which is how first responders plan for and what first responders use to respond to an actual crude oil incident. The ERG also includes a table of isolation and evacuation distance for a BLEVE event using LPG products as the basis for the distance. While these LPG products meaningfully differ from crude oil in their energy and explosiveness, responders can also take these distances into general consideration to preplan evacuation areas in the event of truly exceptional conditions for crude oil that might result in an actual BLEVE.

74. Incidents that have a large release of crude oil and involve a fire require the first responders to make quick decisions about the methods used to handle the event. Critical information as to the amount of spilled product, whether other tank cars are being impacted or exposed to the heat from the fire through radiation or direct flame impingement, and the type of tank cars involved needs to be considered before an aggressive firefighting effort is mounted. The resources available to the response agencies and the access to the incident also need to be factored into the decision. Impacted population exposures and the life safety exposures should be the foremost factor in determining if the fire can be successfully fought to affect a positive outcome. If there is evidence of a large release with pooling under one or more tank cars and a fire has stated involving the product with flame impingement or flame exposure to the tanks, incident commanders need to quickly determine if they are going to move to an offensive, defensive, or non-intervention strategy.

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75. If fire suppression is attempted it should only be initiated if there is sufficient water supply and resources to mount a sustained attack to completely extinguish the fire and to provide vapor suppression to the pooled product. Failure to control vapors from pooled product can result in a re-ignition of the vapor and restart the fire. Fire suppression and vapor suppression for spilled and pooled crude oil product will require the use of product-compatible firefighting foams. Application of foam requires the use of specialized and compatible foam appliances and equipment. Sufficient volumes of foam must be on hand before beginning this attack to prevent the attack being interrupted due to no foam supply and thus the foam was waste without full fire suppression.

76. The use of firefighting foam is often referenced in training for emergency response to a crude oil incident. Foam is an effective fire extinguishing agent for hydrocarbon-based fires but does have its limitations. Foam works through the creation of a blanket that both limits the vapors from being mixed with air and limits the amount of oxygen available to the fire. As long as the foam blanket is maintained, a fire can be controlled. A major limitation to the use of foam is that it is only effective on a two dimensional fire (i.e., a pool fire) where the fuel surface is flat to allow the foam blanket to float on top of the fuel and exclude air. A three dimensional fire such as a fire affecting a tank car manway, valve, or a torch fire will not be controlled with the application of foam. Foam is also ineffective when the fire involves a fuel released from a tank breach or valve that is falling and creating a pool.

77. Several of the large scale incidents included in the DEIS listing of crude oil derailments were effectively managed by local responders without the use of firefighting foam. These Incident Commanders understood their resources, the option of a defensive or non-intervention strategy and the location of the incident. The spilled product was

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allowed to burn within responder exposure or intervention. The incidents were managed to a safe conclusion.

78. If an incident is conducted in a defensive mode, large volumes of water may be applied to other tank cars at the point of flame impingement to limit the effects of the high temperature at a single spot on the tank shell. This strategy may result in the spreading of product from the scene as it is carried by firewater runoff and result in a larger environmental impact than simply allowing the spilled product to burn and thus be consumed.

79. Use of a non-intervention strategy may be the best option until sufficient resources and expertise can be assembled to develop a comprehensive response strategy. This non-intervention is not to be confused with no action. Non-intervention in the incident release does include protection of the general public through evacuation, shelter in place or other protective measures to ensure public and responder safety. In this strategy, the incident is allowed to move through the normal stages with limited interaction by the responders and with personnel and resources pulled back to a safe distance. This method applies the protection of human life at its foremost and recognizes that the risk to reward balance of placing responders into the hazard zone is a poor decision. The product, tank cars, and other assets can be replaced and environmental impact mitigated while injury and human health may not.

80. A large scale incident of this type could stress the resources of all communities and highlight the need for a joint response with local responders, state and federal agencies, the railroad, and with specialized response contactors and remediation firms. In a number of recent high publicity large scale events, the local response was of limited intervention until sufficient resources could be gathered. In these incidents, protection of life was paramount and the incidents were ultimately resolved with no inures

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to the public or responders. Lessons learned from these events have been reviewed and shared with response stakeholders through training programs offered by PHMSA, the Transportation Technology Center Inc.-Security and Emergency Response Training Center ("TTCI-SERC"), and individual railroad responder outreach and through fire service channels.

81. The DEIS references a potential "explosion" through the document and is used almost synonymously with "fire." The presence of a fire associated with a release of a crude oil product is not a given event. An "explosion" is a possible outcome from a derailment with a release of product and fire but an explosion may or may not occur based upon the incident conditions, the type of tank car and its pressure relief device and thermal protection or due to offensive actions by responders. In either case, an explosion would have an immediate impact and may actually accelerate the incident to a successful outcome as the risk is lessened once the tank cars have breached and fuel consumed. The highest risk is from a tank car with no pressure release from a pressure release device ("PRD") that is orientated below the cars vapor space, defective or inoperative or blocked PRD on a tank car that continues to be heated with a corresponding internal pressure increase until the tank fails violently and releases both the pressure energy wave and the product with a secondary energy release from the fire ball ignition. Once this occurs, the risk of that car being subject to an HIT event (or a BLEVE event with fragments being expelled from the accident location) decreases. Again it is important to note that BLEVE events are more often associated with LPG type tank cars and incidents. General service tank cars which are subjected to long term high temperature events are more likely to experience a HIT with large product release as a fireball combustion.

82. The impact to the immediate area can be major, but long term impact is negligible. A reference to craters, bedrock fracturing, and other lasting impacts from an

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explosion caused from a release with fire and vapor cloud explosion fail to accurately consider the directional energy and lack of pressure containment in the area of the incident. Even in a tunnel situation, the release of the pressure would extend in both directions. The vapor would not explode at the site of the tank failure but would be at a point on both sides of the event were the fuel was mixed with air, most likely at the tunnel portals. Thus, the DEIS's characterization of the fire or even explosion greatly overstates the potential for damage in many instances.

Responders have considerable experience with Class 3 hazardous materials including gasoline and they understand the properties of this common product. Crude oil is less familiar to many responders who have limited knowledge or training for this product. Many wrongly consider it to have widely different properties from other flammable liquids. An important step in the pre-emergency planning stage (described below) is to ensure that emergency responders get information about the product's chemical and physical properties and understand of how these properties can affect their response tactics if called to respond to a crude oil derailment.

E. <u>Non-Accidental Release</u>

83. Incidents involving a non-accidental release of product are typically characterized as leaking tank car events. Non-accidental releases are those product releases that occur from a leaking tank appliance or valve. The tank car has not been subject to an accident or derailment. These events can be identified during inspection by railroad personnel at the receiving facility or by regulatory inspectors while the tank car is in yard or facility. Non-accidental releases are small release events with little product release (less than 250 gallons). These releases are most often handled by railroad or shipper contractors and contained by securing a loose of defective valve. If the fitting cannot be secured, the product is off loaded into another tank car or cargo tank. These

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events are very limited in impact area and duration and are often handled within several hours with no environmental or health effects.

F. Facility Spill and Fire Events

84. A release of crude oil at the unloading facility would present the Project personnel and local emergency responders with many of the same challenges to safely mitigate the spill as a rail centric event. While the product would be the same, the chemical and physical properties of the product the same and the railcars the same; there are other significant difference in a spill and fire event at the unloading facility. The foremost difference is in the emergency planning aspect. Since this is a fixed facility, pre-emergency plans can be more detailed and specific. Items like sensitive receptors, exposures, and water supplies are more defined and can be more accurately factored into the response scenarios. The Project will have more resources readily available than a potential rail incident, such as foam immediately available, fire suppression systems (pumps, nozzles, foam eduction tubes), sustainable water supply and emergency access.

85. The fixed facility design includes fire alarm and fire/vapor identification system to quickly identify high flammable vapors and/or ignition at the railcar unloading areas. The railcar unloading facility, the pump area, and the tanks all have fixed fire suppression systems served by the facility fire pumps and sustainable water supplies.

86. Release of crude oil would most likely be from a single release point rather than from potentially multiple tank cars releasing product. All of the product handling lines and tanks have some form of secondary containment with limits the overland flow of product or into to waterways (excluding the lines from the pier to the receiving vessels). The Project is much less likely to have outside forces impacting its physical infrastructure (no vehicles at grade crossings, downed trees, weather affects, or trespasser events).

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87. With the designed fire alarm and fire suppression systems, Project and local responders would have more resources immediately available to control a spill or fire event. Fires involving fixed storage tanks are rare and are most often contained using the fixed fire suppression systems built into the tank. Failure of these systems is most frequently due to a facility failure to maintain the systems. With a fully maintained and property operated system, fires can be controlled and safely extinguished with minimal personnel exposure.

88. The Project can stock foam resources to handle low probability but high significance events such as tank seal fires, pool fires from pipeline or transfer hose releases, pump seal fires and other fire scenarios. As a fixed location, the Project can conduct emergency drills with different release scenarios and can engage and include local emergency responders in these exercises. The exercises can be a table top with command level personnel to full scale hands on drills to maintain firefighter orientation of the facility physical layout, interaction with the facility fire suppression systems and the railcar unloading and tank farm safety systems. Post exercise debriefs to identify plan weakness and improvements will serve to strengthen the overall response plan.

89. The floating roof tanks offer a much lower potential for an explosion due to inherent design features to limit the buildup of pressure from heating products or fires. The seals and vents allow pressure to be relieved while maintaining the tanks structural integrity. The dikes and tank separations all prevent pool fires of burning product from impacting other tanks and to limit the spread of the fire to other tanks.

90. Local emergency responders can become familiar with the fire suppression systems, facility layout, and operations personnel that would greatly benefit them if called to a fire or spill at the facility. Correct and prompt use of the suppression systems and foam resources will greatly limit the risk from a large release of product at the Project.

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91. The operational controls proposed (control of hot work, grounding systems, electrical classifications and other work practices) will contribute to the fire prevention and protection for the Project.

92. Based upon my review of the operational controls, Project design and risk assessments I believe the Project has carefully considered its risk profile from a spill and fire perspective and has incorporated protection systems in accordance with recognized and generally accepted engineering principles ("RAGAGEP").

IV. DEVELOPMENT OF LOCAL PRE-EMERGENCY PLANS AND RESPONSE OPERATING GUIDELINES ("SOG")

93. For the incident scenarios described above, use of the DECIDE model is clearly applicable. Notification to emergency response agencies can be from witness 911 reporting, from the BNSF operations center, or from the train crew. For events that occur in locations not readily visible by the public, the BNSF train dispatching system can identify location of each train. A large portion of the rail route to the Project is signaled track with train movement controlled under the direction of a train dispatcher and with communication to each train in the assigned territory. This communication would serve as the initial report of remote location emergency events from the train crew to the dispatcher. Following BNSF procedures the dispatchers will elevate the notification to the BNSF critical incident or emergency desk to make local emergency notification of the incident including the location and nature of the emergency. This communication link would be maintained to support local responders with key immediate information about the train, the products, and response assistance. Meanwhile, the railroad will active its internal response effort including hazardous materials responders and response contractors.

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94. Of the DECIDE response steps, the first – Detect the presence of the hazardous materials – sets the tone and direction of the remaining actions. Responders need to quickly identify the product involved in the incident to be able to make safe and effective response decisions that meet the objective of any response efforts to protect human life, both the general public and the responders. For most railroad-related emergency response, the local responders may be faced with a variety of types of rail cars and products. A general manifest train may have multiple cars of hazardous materials located throughout the train. Identification of the product can take some time as responders use placarding, train documents, and other response systems and tools to positively identify all the products that could be involved. Crude oil moving in a dedicated unit train offers responders with several advantages in the identification step.

95. Federal agencies, industry groups, the railroads, and others all agree that pre-incident planning as an important step in ensuring a safe response to a crude oil unit train event. The Project is very clear on the routing of the unit trains and the permitting process offers time to allow local, regional, and state officials the time to conduct planning, training, and response activities before the Project-related trains begin to impact their communities. Recent regulatory changes involving the notification to state emergency planning and warning points or state fusion centers of the movement of these trains allows for local officials to know when a unit train of crude is moving through their areas.

96. Local responders will know the products being handled, the types of railcars used, and the volumes, and can apply training and established plans in the event of a derailment involving crude oil and shorten the initial confusion and information gathering steps that can occur when a mixed manifest train is involved in a rail incident. Other recent initiatives by both federal agencies and the railroad industry, such as free

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online training for emergency responders (PHMSA) and the AskRail mobile app (offered by AAR), make responder training and information gathering easier in real time.

97. Washington State has developed and uses Geographical Response Plans (GRP) for sections of the rail route. The BNSF has also developed detailed response plans and Company Control Points to aid in rapid resource deployment in the event of an incident. As local plans are developed they should be designed to allow for integration of state and industry plans to ensure coordination of all responding resources. The goal of these plans and their format is to give local first responding incident commanders tools to make good tactical decisions.

98. The potential location of a crude by rail event limited to the track locations within any response jurisdiction as compared to a highway event where a flammable liquid truck could be operating on any highway while making deliveries to services stations or fueling points. Rail based incident locations are static and can be easily identified through use of USGS topographical maps, on-line electronic mapping, and GIS-type sites, through the use of a simple GPS device or through contact with the state DOT offices. Additional resources are available for the Class 1 railroads to identify track mileposts, road crossings, sidings, and other operational information. At a minimum, local emergency planners and responders should know the location, type, and ownership of all rail operations within their area.

99. Communities which have railroad operations with crude oil presently being transported in their community need to begin now to address emergency response actions in the event of an emergency involving this product. Regardless of the event type or severity there are several important actions any community can undertake to ensure the safety of their residents and their responders. These activities include:

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- Identification of the location and type of railroad systems within their response area.
- The emergency contact numbers and means to contact the operator and owner of the rail segment.
- A response plan that includes rail/highway crossing both public and private to identify assess points within their area.
- The location of population centers including residential, assembly (churches, sporting arenas and fields), schools, hospitals and nursing homes, correctional facilities, and other high-value, high-density population centers.
- The location of sensitive environmental receptors, including waterway crossings, water supply points and wells, reservoirs, rivers, parks, and reactional and refuge areas.

100. From this mapping exercise, the planers can begin to assess current emergency response capability. It is difficult for every community to maintain a fully staffed and equipped hazardous materials response team. Likewise it is not realistic for any single department to staff firefighting personnel to the levels which may be needed for a large-scale crude-by-rail incident.

101. Emergency planners and responders have long recognized the value and importance of formalized and working mutual aid agreements with neighboring response agencies, private contractors, and private industry. Mutual aid organizations have proven effective at safely managing and mitigating large scale fires, chemical releases, mass causality incidents, and natural disasters across the United States. The use of mutual aid organizations has long been recognized in Washington as evidenced by the Clean Rivers

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Cooperative ("CRC") and the Marine Fire Safety Association ("MFSA") which are both supported by the industries they serve.

102. During a significant rail emergency, the operating rail carrier (in this case BNSF) will respond with internal company emergency personnel and resources as well as mobilize their emergency response and environmental remediation contractors. These contactors have the organizational depth to bring resources including spill control equipment, heavy equipment, vacuum trucks, and spill control booms and absorbents. Local emergency responders do not need to maintain resources to handle these types of events on their own. Other responders will need to be mobilized to assemble the personnel, equipment, and specialized resources needed. Contact with the railroad can also lead to additional commodity flow data on the types of product and volumes being handled on the line. From this, the local emergency responders can begin to build pre-emergency response plans, standard operating procedures, and guidelines.

103. Local resource planning activity needs to consider the number of trained responders (including the level of hazardous materials and foam firefighting qualifications), the number of fire pumper apparatus, water tankers, command and air resupply units, and emergency medical services.

104. The local response plans should include the closest water supply points to various road crossings within the response area, including the water supply method (fire hydrants and municipal water sources, local source drafting or water shuttle operations). Large diameter hose supply and compatibility with other mutual aid response agencies need to be a part of the plan. The availability of foam firefighting equipment and supplies (including type and concentration) need to be identified and confirmed. Large volume fire monitors and other master stream devices should be inventoried and their locations confirmed.

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105. The location and detailed data of spill control equipment (boats, skimmers, and tanks) and supplies (booms, pads, and other spill supplies) should be identified and their locations confirmed. Inventory and capability of small boats, work vessels, and other spill control deployment equipment need to be cataloged in the spill control section of the plan. This type of equipment is most often maintained in quickly deployable formats by commercial emergency response and remediation contractors and many of these companies have existing relationships with the railroads as par to of the railroad response plans.

106. Interagency communications systems, including communication with the railroad responders and contracts, should be identified. Command post resources for the management of a large incident which may last several days need to be identified and confirmed.

107. The most important part of an emergency response system is in a careful and accurate hazard assessment and planning stage. To know what the potential incident could be, where it could be and the available resources for immediate response, at one hour into the incident, two to four hours into the incident, and six hours into the incident are important parts of the plan.

108. The plan needs to consider and address the logistical needs of a large scale event to include evacuation points for persons displaced due to a large incident where evacuation of local residents offers the safest protection until the fires and release is under control or extinguished. Feeding, sheltering, and support evacuated residents is a local level activity for the first 12 hours of the event until railroad claims personnel can being to provide individual assistance.

109. Large scale incidents will also require logistical support for emergency response operations such as replacement crews, feeding and sheltering of responders over

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multiple operational periods, fuel for firefighting vehicles, command posts and communications, health and sanitation, post incident decontamination and restocking of response vehicles, equipment and supplies.

110. Washington State response officials have developed detailed GRPs for spills impacting the Columbia River. Likewise, the BNSF has partnered with Ecology to develop Company Control Points ("CCPs") with site specific information with access, field notes, response techniques, and resources at risk. This could serve as a basic format for cities and towns along the rail route. These plans would provide local responders with critical information and pre-developed tactical plans for the non-intervention, evacuation, defensive or offensive actions depending upon the incident type. The GRP and CCP's have established a state-industry cooperative framework and can be leveraged to improve the level of response planning along the rail route for spill control actions, evacuation areas, and potential impact zones to establish isolation distance. These plans can be developed for both the rail route and facility portion of the Project. If these plans are developed through a joint effort with state, local and industry response groups I believe they can be effective to deal with potential rail events associated with this Project.

V. WHAT TYPES OF TRAINING SHOULD FIRST RESPONDERS HAVE TO BE PREPARED TO HANDLE ANY OF THESE INCIDENTS?

111. Subsequent to the planning process is the training of emergency responders to understand the hazards of crude oil, the risks associated with response to a large scale uncontrolled release of crude oil in including a fire, and potential violent rupture of a tank car. This training needs to start with hazard awareness and product identification skills (placards, railroad shipping papers) and use of the DOT ERG. Since local responders will know the products involved in unit trains, they should also have access to response guides, preplanned action guides and other decisions making tools to allow for a quick size up of

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the problem, the volume involved, the state of the damaged and stressed tank cars, and a clear path to choosing a response tactic that fits with their level of training and local resources immediately available.

112. Emergency response of any type, including fire, rescue/emergency medical services, and law enforcement, could involve interaction with hazardous materials. This interaction could be from a small container such an accidental ingestion by a child to illicit drug manufacturing, to fuel spills from highway accidents. Responders should have training to include recognition of the presence of the hazardous materials using situational awareness, placards and marking, container labels, shipping papers or occupancies and location. This basis awareness training also applies other rail transportation of crude oil and ethanol. Responders should know the locations of transportation routes in their response areas, including rail lines. Hazardous materials transported by rail and highway are in larger containers and offer the potential for a more serious event.

113. Local responder training may involve training to the operations level to allow application of defensive spill control actions that require no specialized personal protective equipment and can include personnel beyond classical fire, emergency medical services, and law enforcement officials. Public works, utilities, and maintenance personnel could be trained to provide defensive spill control activity through use of dikes, dams, and other diversion devices during a large scale crude oil release.

114. From the initial planning data, a training assessment for responders including non-traditional responding officials who may be part of a large scale incident from an incident management perspective (county, city, and tribal elected officials, public works, utilities, and health services agency personnel) can be developed. Training in hazardous materials awareness, operations level and the incident command system are

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good starting points for this training and are available in a no-cost on-line basis from several sources.

115. Recommend additional training would include effective incident management through the use of the National Incident Management System including the Incident Command System ("ICS") and Unified Command structure for involving multiple response agencies and industries.

116. Depending upon the response agency, staffing resources, and capability, additional training could include foam firefighting training, air monitoring devices and railroad tank car specialist training. The latter is more appropriate for organized hazardous materials response teams, however, foam firefighting can be done outside of hazardous materials technicians and specialist levels. Local responders should conduct ongoing training and exercise their skills on a regular basis. A problem identified in many response plans and capabilities is that due to the very low number of incidents, a local response team or agency may never have to deal with a crude oil incident. The potential severity of an incident may be minimal and be a derailment with no release type of event. The long interval between the initial training and a need to use the training may be five to ten years, if ever. Maintaining these specialized skill and experience levels requires vigilance and a realistic training plan. The plan needs to include a variety of training methods (classroom, hands-on, exercises and table top reviews) to keep training materials and critical topics fresh in the minds of the responders. The training needs to be reflective of the activities responders will be called upon to do when responding to a crude by rail incident.

117. The buildup of a large response capability with no response activity can lead to dilatation of the knowledge base, maintenance of response equipment and supplies, and lead to an overestimation of the actual response capability. Emergency planners and

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managers should carefully consider the level of training that can be realistically maintained by the organization and strive to maintain at least an operations level response for most department. The routine training involving water based fire suppression should maintain the basic firefighting skills. If foam is part of the agencies response inventory it needs to be trained upon on at least an annual basis.

118. More informal training can take place using the online resources available from the PHMSA website and include instructor outlines, student materials, training scenarios and other requires of training at the local site with minimal cost. Regional based response systems should consider providing a rotation of more advanced crude by rail incident response training, TRANSCAER® resources, BNSF training resources, or attending the programs offered by SERTC or Texas A&M Engineering and Extension Services ("TEEX") centers. Development of a local training cadre to support other department or agencies is an effective means to keep training fresh and relevant to the departments needs and capabilities. The TEEX offers very good industrial firefighting training for fixed terminal and tank facilities. In my opinion emergency responder training offered by the railroads, through TRANSCAER® and by federal and state agencies is readily available and is suitable and effective to prepare local emergency responders for a potential crude by rail event.

VI. WHAT TYPES OF EQUIPMENT SHOULD FIRST RESPONDERS HAVE TO BE PREPARED TO HANDLE ANY OF THESE INCIDENTS?

119. Typical response equipment and resources for fire suppression activities and vapor suppression activities include adequate water supply to maintain fire flows of 1000 – 2500 gpm for up to an hour. Pumper apparatus and maser stream devices capable of delivering large volume over a long distance will be needed if tank cooling activities are initiated. If foam is used for fire suppression or vapor suppression it needs to be

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supported with foam delivery equipment (nozzles, eductors, and aspirators) for both master stream devices and hand lines.

120. The quantity of foam is largely dependent upon the size of the pooled product, the volume of product spilled, and the length of time a vapors suppressive blanket is needed. Established foam application rates developed by the NFPA call for a rate of 0.1 gpm per square foot of surface area for 15 minutes. The concentration of the foam (1%, 3%, or 6%) will determine the amount of foam required. For example, a 100 foot by 50 foot pool of spilled crude oil involved in a fire require 450 gallons of 6% AFFF ATC to supply the 500 gpm for 15 minutes. This does not include reapplication of foam to maintain the blanket quality and drain down of the foam over time.

121. Other response equipment include an air monitoring device capable of measuring percentages of flammable vapors in air to determine the direction and concentration of vapors as they leave the area of spilled crude oil. The level of hydrogen sulfide is another important element to measuring the risk posed by crude oil vapors leaving the immediate release area.

122. Exposure to crude oil vapors from spilled materials should be avoided by all persons. Residents downwind of a spill site should be evacuated or provided shelter in place instruction to limit their exposure to vapors. Burning crude oil will produce thick black smoke laden with unburned carbons, volatile gases and other particulates. All persons should avoid breathing smoke from a crude oil fire through use of self-contained breathing apparatus for emergency responders in the spill and fire areas to evacuation of persons or shelter in place to limit inhalation exposure.

123. An important resource that will be deployed early into the event as part of the railroad's response is air monitoring equipment designed to measure air quality downwind of the release area or smoke plume. This real-time monitoring of potential air

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contamination levels and type of contaminates is important to ensure public health and guide evacuation and shelter in place decisions. This data can be used on a real time basis to develop evacuation plans and to support public health officials concerns and actions. Potential exposure to inhalation of product vapors, products of combustion and smoke and thermal exposure are all considered short term exposures and can be protected against by personal protective equipment or evacuation from the affected area. Most railroad event related evacuations are of limited duration and can be managed initially following the pre-emergency plans and with industry support personnel who will respond to the incident.

124. The deployment of specialized equipment should be based upon the ability of the local responders to maintain the equipment, to mobilize the equipment to neighboring areas if needed and to provide coverage along the rail route. Not every location should or can maintain the same level or type of equipment. The staging of key response resources like foam, foam application equipment, and booming equipment can be accomplished by a joint railroad industry and local response agreement. As this Project is developed, local responders in conjunction with the facility and BNSF need to consider additional foam supplies and appliances (foam nozzles and supply devices), spill control equipment and supplies, and air monitoring instruments located along the rail corridor in locations where proper storage and maintenance can be provided.

125. The unloading and storage facility needs to maintain supplies of spill control equipment, foam supplies and other response equipment such as air monitors for use at the facility and for potential rail incidents. The pooling of these resources and mutual aid usage is the most effective way to ensure an adequate supply is maintained along the rail route and at the facility.

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VII. CONCLUSION

126. Crude by rail transportation will continue to be a part of the United States' energy picture for some time as will transportation of other forms of hazardous materials. While the Project is new for Vancouver, it is not a new or unique type of facility with technology or products unknown to the energy or railroad industries. The Project is based upon sound engineering and risk management principles and strategies. Washington State currently has numerous facilities which operate in the same fashion with the same products as this Project. Local communicates can take positive steps to recognize the risk, to work with facility owners and operators to plan for potential events and to work together to maintain the safety of the facility. In my opinion this Project does to pose any more significant risk than other bulk flammable liquid terminals and in many cases less due to the opportunity to leverage current industry best practices and designs and to incorporate lessons learned from other bulk terminal projects. Current usage of Bakken crude at Washington refineries means that crude oil is moving within the state by the rail road, most often in unit train formats. Transportation of crude oil has risen for all Class 1 carriers. Large scale rail incidents with news worthy fires and fire ball releases capture the lead story and create fear among responders and communities alike. However, a critical analysis of the movement of crude oil by rail shows a different risk profile than that presented in the mass media. Without a doubt, crude oil has hazardous characteristics and deserves respect both in the transportation and handling areas as well as by emergency responders called to handle a crude-by-rail event. Emergency responders can safely handle crude by rail incidents with awareness training and pre-response planning. Coordination with the railroad responders is a key to maintain this level of response capability. While being handled in a larger volume, every local fire response agency should be prepared to deal with flammable liquids.

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127. Response to a large scale crude oil derailment with release and fire event will involve different response strategies and tactics based upon the location of the event, the capability of the responders and the magnitude of the event. For any event, the overall response strategy needs to ensure protection of the responders and other potentially impacted populations. Adopting an aggressive fire suppression or tank cooling effort is not a sound risk reward decision if the incident is located far from population centers or other life safety exposures. Review of large scale flammable liquid railroad incidents have shown that a non-intervention strategy with prudent precautionary evacuations resulted in the best outcomes with no human injuries or fatalities. Even in more densely populated areas along the rail route, responders need to carefully consider their resources, water supplies, and firefighting capability when deciding on an offensive or non-intervention response. Use of emergency responders to conduct evacuation of local residents will often prove the best application of resources. Striving to protect rail equipment assets or the crude oil is not a good risk reward decision. Maintaining life safety is the primary goal regardless of where the event occurs.

128. Crude oil can be safely transported by rail. Pre-emergency response plans can be developed and responders trained and equipped to handle potential emergencies involving these shipments. Lessons learned from the events of the past eight years have resulted in meaningful safety improvements to the rail tank car design and performance, to improved railroad operating procedures and to safer response strategies and techniques.

129. A major finding of the lessons learned from past events is that local, state, and tribal responders must recognize the presence of a hazardous material event, quickly determine an appropriate response action that ensures public and responder safety and to actively engage and coordinate with rail industry response plans and responders. Potential exposure and safety risks during the emergency response phase can be larger than either

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party can handle alone depending on the magnitude. A failure to recognize the exposure posed by crude oil transportation is a basic failure to any party. A common admonition in the emergency response community is "a failure to plan is a plan to fail." . Communities which have seen an increase in a specific commodity or rail traffic have successfully used railroad supplied traffic density data to develop realistic and efficient response plans. Likewise, for any new construction, be it high density residential, commercial or public assembly, emergency responders need to plan their response based up the projects unique hazards, exposures and response objectives. This project is no different than any other major project in the need to understand the project and to develop solid emergency plans. No company or shipper wants to see communities or responders placed at an undue risk. Conversely, emergency responders need to be aware of changes in the larger U.S. economy, society, and with n their communities and take actions to provide the highest level of protection to their public and one another.

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

Attachment A: Curriculum Vitae of Greg A. Rhoads

[Signature on the following page]

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DATED this 12th day of May, 2016.

Gregory Allen Rhoads

Greg A. Rhoads, Declarant

STATE OF Maryland)
)
COUNTY OF Prince Georges)

GREG A. RHOADS, being duly sworn upon oath, deposes and says: The foregoing testimony is true, correct and complete to the best of my 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 12 day of May, 2016.

Sophia Njure Nathan
NOTARY PUBLIC
Prince George's County, Maryland
My Commission Expires 1/21/2020

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