

Final Environmental Impact Statement  
for Tacoma LNG (Excerpts)  
(11/9/2015)

(Publicly Available at

[https://cms.cityoftacoma.org/planning/pse/Reissued%20Final%20Tacoma%20LNG%20EIS%20\(11-9-15\).pdf](https://cms.cityoftacoma.org/planning/pse/Reissued%20Final%20Tacoma%20LNG%20EIS%20(11-9-15).pdf))

**Table ES-1 Mitigation Measures Addressing the Potential Impacts of the Tacoma LNG Project**

Resource	Important Topics Addressed	Summary of Mitigation and Minimization Measures	Significant and Unavoidable Adverse Impacts
		<ul style="list-style-type: none"> <li>Project-associated tugs and bunkering barges would maintain slow speeds (less than 5 miles per hour) to avoid striking marine mammals.</li> <li>During pile-driving, a qualified observer would monitor humpback and killer whale activity. Observers would have authority to halt pile driving if humpback or killer whales are observed within distances in which behavior disturbance may occur.</li> </ul>	
<b>Section 3.5: Health and Safety</b>			
<ul style="list-style-type: none"> <li>Fire/explosion risk due to construction and/or operation of the Project</li> <li>Risks to workers from existing on-site contamination</li> <li>Spill potential during Project construction</li> <li>Increased traffic accidents as a result of construction</li> </ul>		<ul style="list-style-type: none"> <li>The LNG facility design would incorporate mitigation measures to ensure that thermal radiation and vapor dispersion does not extend beyond the land portions of the PSE and TOTE property lines.</li> <li>During LNG fueling in the Blair Waterway or barge loading activities on the Hybelos Waterway PSE should consider establishing public exclusion zones around the operating area.</li> <li>A Contaminated Media Management Plan would be developed, outlining the proper protocol that would be implemented should contaminated media be encountered during installation of the distribution system.</li> <li>Hazardous materials would be stored, handled, and used in accordance with best practices for storage and management of hazardous materials.</li> <li>A construction worker health and safety plan would be implemented to address health and safety during construction.</li> <li>A Joint Emergency Response Plan would be prepared by local first responders and facility owners/operators that would detail emergency response command system and procedures.</li> <li>Fueling and maintenance of construction-related equipment would occur within dedicated areas equipped with spill kits.</li> <li>PSE would strictly adhere to local jurisdictional traffic control requirements to minimize traffic impacts, which may include night-time work or reduced-duration daytime schedules to avoid rush-hour traffic.</li> <li>The facility and equipment would be laid in such a way as to separate the public from hazardous material dispersion.</li> <li>Fire and gas monitoring and protection systems would be installed throughout the facility.</li> <li>The facility would be provided with an emergency shutdown system designed to leave the facility in a safe state in case of an incident.</li> </ul>	<ul style="list-style-type: none"> <li>With mitigation measures identified in the EIS, and mitigation measures inherent in Project design, the Project would have no significant unavoidable adverse impacts.</li> </ul>

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<b>Section 3.6: Noise</b>			
	<ul style="list-style-type: none"> <li>Noise impacts from the construction and operation of the Project</li> </ul>	<ul style="list-style-type: none"> <li>In-water and air noise during pile driving would be minimized using a vibratory hammer, followed by limited impact hammering.</li> <li>Sound-reducing design measures would be implemented during construction and operation</li> <li>Haul trucks and other engine-powered equipment would be equipped with adequate mufflers.</li> <li>PSE would establish a phone number or other effective means for the public to report significant undesirable noise conditions associated with construction and operation of the Tacoma LNG Facility.</li> <li>Throughout Project construction and operation, PSE would document, investigate, evaluate, and attempt to resolve noise complaints related to the Project.</li> </ul>	<ul style="list-style-type: none"> <li>With mitigation measures identified in the EIS, and mitigation measures inherent in Project design, the Project would have no significant unavoidable adverse impacts.</li> </ul>
<b>Section 3.7: Land Use and Recreation</b>			
	<ul style="list-style-type: none"> <li>Construction-related impacts to recreational resources</li> <li>Project’s consistency with existing zoning regulations</li> </ul>	<ul style="list-style-type: none"> <li>Temporary limitations on active recreational waterway uses within the Project Area would not be significant enough to require mitigation</li> <li>Facilities would be landscaped to be reasonably compatible with existing development. To this end, existing vegetation bordering the site of the proposed Golden Given Limit Station should be maintained, or new, densely planted row vegetation should be placed along edges of proposed fence.</li> </ul>	<ul style="list-style-type: none"> <li>With mitigation measures identified in the EIS, and mitigation measures inherent in Project design, the Project would have no significant unavoidable adverse impacts.</li> </ul>
<b>Section 3.8: Aesthetics/Light, and Glare</b>			
	<ul style="list-style-type: none"> <li>Permanently changed views from residential, recreational and roadway viewpoints</li> <li>Light and glare impacts</li> </ul>	<ul style="list-style-type: none"> <li>During construction, lighting for safety and security will be shielded and oriented downward, bare bulbs will be fully screened from view from sensitive viewing receptors such as residences, and on-demand lighting and/or timers will be used to minimize visual impacts of lighting.</li> <li>It is recommended that the LNG storage tank be a non-reflective concrete finish and dark gray color.</li> <li>To minimize visual impacts and add texture and structure around the LNG storage tank, PSE would include a combination of gravel, larger boulders, and intermittent stands of drought resistant trees and shrubs. PSE would also keep this area free of invasive and noxious plants.</li> <li>To minimize impacts from street views along 11th Street and Alexander Way, to the degree possible, existing trees should be retained and additional landscaping provided.</li> </ul>	<ul style="list-style-type: none"> <li>Due to the size of the LNG storage tank, overall visual impact of the Project would be unavoidable, but not significant. Minimization measures in the form of aesthetic alterations would greatly reduce its visual impact.</li> <li>With implementation of design and other measures, the impacts of light and glare would not be significant or</li> </ul>

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		<ul style="list-style-type: none"> <li>• PSE would maintain the appearance of all construction and operation sites and would ensure that vehicles are located as inconspicuously as possible.</li> <li>• To minimize nighttime visibility of lights associated with the Tacoma LNG Facility site, PSE would use minimum lighting necessary for security at construction areas, and orient lighting in a way to minimize the effects of increased light pollution.</li> <li>• Exterior lighting fixtures would be attached to 30-foot-tall poles, which would be similar in height, or shorter than, most poles used for lighting in the area.</li> <li>• Exterior nonpole (attached to buildings and other facilities) lighting would point downward and be shielded.</li> <li>• Lighting would be located and oriented to minimize horizontal radiation or light spillover.</li> <li>• Lighting would be provided with switches or automatic controls that would turn off lights when not required for operations.</li> </ul>	unavoidable.
<b>Section 3.9: Cultural Resources</b>			
<ul style="list-style-type: none"> <li>• Impacts of construction on existing historic and cultural resources or potential resources.</li> </ul>	<ul style="list-style-type: none"> <li>• PSE will prepare an Unanticipated Discovery Plan that will outline procedures in the event of an unanticipated discovery of cultural resources and human skeletal remains. This would help minimize the potential for, and degree of, impacts.</li> <li>• Pipeline construction in areas near the base of the Blair-Hylebos peninsula at or near the natural shoreline that are deemed likely to have cultural importance would be monitored by a trained and experienced cultural resource expert.</li> <li>• PSE will provide training in identifying cultural artifacts according to a training protocol developed by PSE and approved by the City after consultation with the Puyallup Tribe.</li> <li>• If suspected cultural artifacts are found, construction will be halted in the vicinity of the find until the status of the artifact can be determined.</li> <li>• In addition, PSE will notify a contact person provided by the Puyallup Tribe prior to commencement of ground breaking and the expected duration of any excavation.</li> </ul>	<ul style="list-style-type: none"> <li>• With mitigation measures identified in the EIS, and mitigation measures inherent in Project design, the Project would have no significant unavoidable adverse impacts.</li> </ul>	
<b>Section 3.10: Transportation</b>			
<ul style="list-style-type: none"> <li>• Impacts related to additional traffic trips generated by Project</li> <li>• Impacts on roadways related to construction and delivery of oversized loads</li> </ul>	<ul style="list-style-type: none"> <li>• A construction traffic management plan would be developed.</li> <li>• Applicable governmental permits or approvals would be obtained.</li> <li>• Public involvement and outreach efforts would be undertaken prior to construction to help minimize access disruptions</li> </ul>	<ul style="list-style-type: none"> <li>• With mitigation measures identified in the EIS, and mitigation measures inherent in Project design, the Project would have no significant</li> </ul>	

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Resource	Important Topics Addressed	Summary of Mitigation and Minimization Measures	Significant and Unavoidable Adverse Impacts
	<ul style="list-style-type: none"> <li>Impacts related to road maintenance and public access</li> <li>Damage to roadways</li> </ul>	<ul style="list-style-type: none"> <li>Carpooling among construction workers and personnel would be encouraged to reduce traffic volume to and from the Tacoma LNG Facility site.</li> <li>Pipeline Segment A would be constructed without disturbing rail tracks by using a horizontal drill or bore construction technique.</li> <li>All roads and other transportation infrastructure impacted by construction would be videotaped prior to construction to document pre-construction conditions.</li> <li>Following installation of the pipeline, roads would be restored by repaving the travel lane impacted by the pipeline construction pursuant to the appropriate plans and specifications adopted by Tacoma Public Works, City of Fife Public Works, and Pierce County Public Works.</li> <li>To improve driving conditions on Taylor Way, from SR 509 to the project site an approach that results in rebuilding of Taylor Way to “heavy haul” standards has been agreed upon by PSE, the Port of Tacoma, and The City of Tacoma.</li> <li>Construction of Phase I of the planned ITS Infrastructure is needed for basic information sharing among stakeholders, as defined in the ER/ITS study.</li> </ul>	<p>unavoidable adverse impacts.</p> <ul style="list-style-type: none"> <li>Construction and operation of the Project would not significantly impact maritime activity in either the Hylebos or Blair waterways.</li> </ul>

**Section 3.11: Public Services**

	<ul style="list-style-type: none"> <li>Increase in demand for public services (police, emergency services, medical services, education)</li> <li>Increased response time for emergency services</li> <li>Impacts to the distribution of regional fire protection services.</li> <li>Impacts related to wastewater and solid waste generation</li> </ul>	<ul style="list-style-type: none"> <li>A new unit of the Tacoma Fire Department with fire response and EMS response capabilities and hazardous materials awareness could be stationed in proximity to the site of the Tacoma LNG Facility for the duration of construction.</li> <li>PSE would provide emergency response agencies with regularly updated maps of the facilities and current access points, relevant contact information, and site procedures for fire protection and rescue operations.</li> <li>The emergency preparedness, emergency access, and construction health and safety measures proposed by PSE and described in Section 3.5 (Health and Safety) would reduce potential impacts to fire protection and EMS throughout the construction period for the Tacoma LNG Facility and TOTE Marine Vessel LNG Fueling System.</li> <li>Security would be provided throughout the construction period for each separate component of the Project.</li> <li>Temporary security fencing would be erected around the construction sites to prevent trespassing and vandalism.</li> <li>PSE or its selected contractor would notify the relevant fire department or district prior to initiating work within that department or district’s service area.</li> </ul>	<ul style="list-style-type: none"> <li>The Proposed Action could have significant impact on local fire protection services. However, this would be mitigated by reintroducing a staffed fire station in advance of the Project’s opening in late 2017.</li> <li>With mitigation measures identified in the EIS, and mitigation measures inherent in Project design, the Project would have no significant unavoidable adverse impacts.</li> </ul>
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Resource	Important Topics Addressed	Summary of Mitigation and Minimization Measures	Significant and Unavoidable Adverse Impacts
		<ul style="list-style-type: none"> <li>• PSE would obtain permits before hydrostatic testing of Pipeline Segment A and Segment B begins, in accordance with the provisions of local codes for the use of fire hydrants.</li> <li>• During post-construction hydrostatic testing, the contractor would communicate with fire protection services prior to drawing water from any fire hydrant.</li> <li>• A new unit of the Tacoma Fire Department with fire response, EMS, and hazardous materials operations capabilities would be stationed in proximity to the site of the Tacoma LNG Facility.</li> <li>• PSE would provide regular orientation to the site to relevant responders at the Tacoma Fire Department, and operations personnel and the Fire Department would consult to develop and implement an ongoing training regime that integrates best practices for responding to fire and emergencies at the Tacoma LNG Facility.</li> <li>• The Tacoma LNG Facility would contain fire and hazardous gas detectors, fire-extinguishing systems, and an extensive firewater system, as well as new pier and access trestles that would provide firetruck access to the loading platform.</li> <li>• The intrusion detection system would monitor the perimeter for the facility and alarm when the perimeter is disturbed.</li> <li>• Security cameras would be installed along the perimeter and other select locations for maximum viewing coverage.</li> <li>• Closed-circuit television system components would be powered by an uninterruptible power system.</li> <li>• The perimeter of the Tacoma LNG Facility and TOTE Marine Vessel LNG Fueling System sites would be enclosed by a chain-link security fence to ensure public safety, welfare, and site security.</li> <li>• Phase I of the Intelligent Transportation System study would be implemented.</li> <li>• PSE would implement measures to plan for and minimize emergencies, such as LNG and facility-specific safety and emergency response training to raise the level of preparedness in case of an emergency.</li> <li>• Security measures would be implemented during construction and operation, including policies for security procedures, protective enclosures, security communications, security monitoring, and warning signs.</li> <li>• New firefighting, emergency medical services, and hazardous material capacity would be added in the vicinity of the Project.</li> </ul>	

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Resource	Important Topics Addressed	Summary of Mitigation and Minimization Measures	Significant and Unavoidable Adverse Impacts
<b>Section 3.12: Socioeconomics</b>			
	<ul style="list-style-type: none"> <li>• Increases in population growth</li> <li>• Increases in employment opportunities and wage/payroll impacts</li> <li>• Long-term positive revenue growth with some potential for short-term reduction in state equality payment for schools</li> </ul>	<ul style="list-style-type: none"> <li>• No mitigation measures are required or proposed because there are no negative socioeconomic impacts associated with the proposed Action.</li> </ul>	<ul style="list-style-type: none"> <li>• The Project would have no significant or unavoidable adverse impacts.</li> </ul>

most stringent federal and state requirements. Federal regulations include CFR Title 49, Part 192 (*Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards*), which are administered by the United States Department of Transportation Office of Pipeline Safety. The WUTC adopts and enforces additional state requirements. As noted above, the WUTC regularly inspects PSE facilities to ensure compliance with WUTC regulations. In accordance with federal regulation, all natural gas distributed by PSE is odorized to ensure that a leak is readily detectable, and natural gas pressure is regulated by mechanical equipment to ensure that system pressure is less than or equal to the maximum design pressure of the system. As with all pressure-regulating stations, the Golden Givens Limit Station would have a 100 percent redundancy backup regulator system to ensure that the facility operates safely.

In addition to the safety plans associated with PSE's "Nobody Gets Hurt Today" policy, standardized construction protocols (see Appendix XX, Selected Standard Protocols for PSE Construction Contracts) include developing routing plans that locate and avoid all existing utilities. In areas of brownfield development, construction plans contain methods for handling hazardous materials if encountered. Once all utilities are located and design plans are complete, the company applies for and acquires all permits needed for installation. This includes traffic control plans and other environmental impact avoidance and mitigation plans. The WUTC may conduct safety inspections at any time during the construction process. Completed pipe is subjected to and must pass pressure testing before placement into service.

Standard construction techniques within jurisdictional rights-of way (ROWs) encompass excavation, removal, and 100-percent haul-off of subsurface material; pipeline preparation, including welding and placement in the excavation; followed by proper backfill placement and compaction. Construction would occur beneath or within the paved surface or graveled road shoulder of the ROW as appropriate in consultation with the jurisdiction. The *Manual on Uniform Traffic Control Devices* would be utilized to minimize traffic impacts and provide safe working conditions (FHWA 2009). PSE would strictly adhere to local jurisdictional traffic control requirements to minimize traffic impacts, which may include nighttime work or reduced-duration daytime schedules to avoid rush hour traffic. Horizontal directional drill installation under Interstate 5 would not impede freeway traffic as the drilling and receiving pits would be located outside of the Interstate 5 ROW.

### **3.5.4.2 Operations Impacts**

#### **Tacoma LNG Facility and Tote Marine Vessel LNG Fueling System**

Potential safety hazards that could occur at the Tacoma LNG Facility relate to the specific characteristics of LNG and the conditions under which it would be handled and stored, and associated operations that are conducted involving other hazardous materials used at the facility. As described in Section 2.2.1.1 (Overview), LNG consists of natural gas that has been pretreated to remove impurities and liquefied to cryogenic temperatures. The potential hazards of most concern at the Tacoma LNG Facility are those related to the potential flammability of any vapors released from an LNG spill and the cryogenic liquid nature of LNG.

#### ***Operation, Maintenance, and Emergency Procedures***

Operation of the Tacoma LNG Facility would not pose a potential public hazard if strict design and operational measures to control potential accidents were applied. The primary concerns regarding public safety are events that could lead to an LNG spill of sufficient magnitude to create an off-site hazard. Stringent requirements are in place for the design, construction, operation, and maintenance of the facility, as well as the extensive safety systems to detect and control potential hazards. In addition to the operation and maintenance procedures that are required by both 49 CFR 193 Subpart F and NFPA 59A, emergency procedures are also required. All of the procedures (operation, maintenance, emergency) would be developed and documented prior to commissioning. With specific reference to the emergency procedures, elements that would be addressed include recognizing an emergency situation, responding to an emergency, and issuing the appropriate notifications to emergency responders. The overarching goal of all



of these procedures would be to ensure the safety of personnel through sound operation and maintenance procedures and monitoring of the various safety systems located throughout the facility.

Subpart F provides prescriptive requirements for operating procedures, emergency procedures, personnel safety, operating records, and other requirements for the ongoing operation of the facility. PSE would prepare all procedures in advance of plant operation. Each procedure would be reviewed and approved by the WUTC Pipeline Safety Office as the duly-appointed delegate of PHMSA. These procedures and records would be subject to ongoing audits by the WUTC for the life of the Project.

### **LNG Hazards**

LNG's principal hazards result from its low temperature (-260°F), asphyxiation potential, and flammability. Each of these hazard characteristics is described in the following sections. Often, the hazards associated with LNG are compared with, and mistakenly assumed to be more severe than, diesel fuel, gasoline, propane, and compressed natural gas. This is not an accurate assessment because LNG vapor is lighter than air above temperatures of -160°F, which means that vapor at ambient temperature will rise and dissipate, thereby reducing vapor concentration such that ignition is not possible.<sup>8</sup> In contrast, gasoline and diesel vapors, and any other hydrocarbon vapor, are much heavier than air at ambient or normal temperatures, and so remain concentrated with a higher potential for ignition.

#### *Low Temperatures*

Although LNG can cause "freeze burns" and, depending on the length of exposure, more serious injury, its low temperature does not present a significant hazard to the public because all low temperatures are confined to the site. As a cryogenic liquid, LNG will quickly cool materials it contacts and may cause thermal stress and brittleness in materials not specifically designed for cryogenic temperatures.<sup>9</sup> These hazards, however, are not substantially different from the hazards associated with the storage and transportation of liquid oxygen (-296°F), liquid nitrogen (-321°F), and several other cryogenic gases that are routinely produced, used, maintained, and transported safely in the United States.

Areas with potential for cryogenic spill would all be located on the LNG plant site and in areas under PSE's control at the TOTE terminal. As described in Section 2.2.1.7 (Other Process Facilities), in the unlikely event of an LNG spill, LNG would be directed to various spill containments consisting of below-grade, open-top concrete sumps. LNG spills on the loading platform at the end of the pier would be collected in a concrete curbed area under the loading arms or hoses and piping, which would gravity-drain to a concrete trench that runs the length of the pier back ashore. Sumps would be sized for a maximum design spill pursuant to federal regulations. There would be no public access to either of these facilities.

#### *Asphyxiation*

Methane, the primary component of LNG, is colorless, odorless, and tasteless, and its vapor is classified as a simple asphyxiant. As such, methane can cause health hazards, including death from lack of oxygen at concentrations above 50 percent, as described on OSHA's website.<sup>10</sup> Asphyxiation, like low temperature, is a risk only in confined spaces and, as a result, normally represents a minimal risk to employees and even less risk to the public, which has no access to the facility. The facility design includes strategically placed gas detection devices that are monitored on a continuous basis and trigger alarms at levels well below those that could pose a human health hazard. Further, the siting and design of the facility are configured so that, however unlikely, any vapor cloud forming would stay on site. Operating procedures and training would address this risk to employees.

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<sup>8</sup> For ignition to occur, vapors must be at a concentration of 5 to 15 percent of ambient air.

<sup>9</sup> Concrete, nickel steel, and stainless steel can withstand cryogenic temperatures without damage.

<sup>10</sup> [https://www.osha.gov/dts/chemicalsampling/data/CH\\_250700.html](https://www.osha.gov/dts/chemicalsampling/data/CH_250700.html)

*Thermal Radiation, and Vapor Dispersion*

To define the extent of thermal vapor dispersion and thermal radiation exclusion zones to ensure the public's safety requires quantitative modeling. When LNG is released from a container and comes in contact with air, it vaporizes and produces methane vapor. For any methane vapor to ignite (not only LNG, but any fuel containing methane), two conditions must simultaneously occur: (1) the methane vapor must be at a concentration of 5 to 15 percent in air, and (2) an ignition source must be present. If such a methane vapor-air mixture from an LNG spill ignites, the LNG flame front will either burn back to the release location (if the vapor concentration along this path is sufficiently high to support the combustion process) or, if the vapors dissipate quickly enough, the flame will burn out for lack of fuel.

For Tacoma LNG, vapor dispersion analyses have been conducted for credible spill scenarios, using the methodologies and computational models prescribed by PHMSA and approved on similar facilities. The modeling conclusively demonstrates that exclusion zones defined by federal regulation 49 CFR. § 193.2059 and, by reference NFPA 59A (2001), remain within the property lines of the proposed site. Keeping all spilled LNG (and any potential resulting flammable vapor clouds) within the property boundary eliminates the risk of off-site ignition.

LNG is not explosive in the manner that it is normally transported and stored. Any flammable vapor will develop an overpressure if ignited while in a confined space, but there is no evidence suggesting that LNG vapor will develop an overpressure in unconfined, open areas (ABS Consulting 2004). Experiments to determine if unconfined methane-air mixtures can explode have all demonstrated that, even for combustion initiated with a blasting cap, the shockwave (the characteristics of an explosion) quickly dies out, as unconfined methane combustion and flame front will not support overpressures (ABS Consulting 2004). In other words, unconfined methane-air mixtures will burn but will not explode.

A rapid-phase transition (RPT) can occur when a portion of LNG spilled onto water changes from liquid to gas, virtually instantaneously. Unlike an explosion that releases energy and combustion products from a chemical reaction as described above, an RPT is the result of heat transferred to LNG, inducing a change to the vapor state. The rapid expansion of LNG from the liquid to vapor state can cause locally large overpressures. RPTs have been observed during LNG test spills onto water. In some test cases, the overpressures generated were strong enough to damage test equipment in the immediate vicinity of the LNG release point. However, the sizes of the overpressure events have generally been small. Such a small overpressure is not expected to cause significant local damage, nor is it expected to endanger the public. With regard to testing, RPTs have not been observed when methane content is greater than 95 percent. The LNG to be produced by the proposed facility is expected to have methane content greater than 95 percent (Cleaver et al. 2013).

A common misconception of the flammability of LNG with respect to LNG tanks damaged by impact or impinged directly by flames is that this scenario has the potential to create a boiling liquid expanding vapor explosion (BLEVE). LNG storage tanks are not susceptible to BLEVEs (Ditali and Fiore 2008). The LNG storage tank is a tank within a tank with 3 feet of insulation between the two. Even with direct flame impingement on the outer tank, the inner tank would not experience an increase in temperature. Further, LNG stored in the tank is at or near atmospheric pressure; LNG stored in the tank would be less than 3 psig.

The primary safety concern of an LNG terminal is a fire from the release of LNG caused by equipment failure or spill. The siting and design of the facility would incorporate containment features, such as sumps to which a release of LNG would be directed. If a release and subsequent ignition were to occur, the fire hazard would be localized. LNG vaporizes rapidly on contact with a temperature greater than the LNG itself. At -259°F, LNG becomes a vapor. Between -259°F and -160°F, LNG vapor is heavier than air and pools at the ground level in collection pools or sumps. In the unlikely event of an LNG spill at the Project site, LNG would be directed to various spill containments consisting of below grade open top concrete sumps. LNG spills on the loading platform at the end of the pier would be collected in a concrete curbed area under the loading arms or

hoses and piping, which would gravity drain to a concrete trench that runs the length of the pier back ashore. Sumps would be sized for a maximum design spill pursuant to federal regulations.

At -159°F, LNG vapor is lighter than air. Any spilled LNG not collected in a sump would rise. LNG is flammable as a vapor, as stated above, between approximately 5 and 15 percent concentration of gas in air. LNG is less flammable than other fuels such as propane and gasoline and requires a higher ignition temperature (1,004°F). If a flammable vapor-air mixture from an LNG spill is ignited, it may result in a flash fire, which is a short-duration fire that burns the vapors already mixed with air in flammable concentrations. The flame front will burn back through the vapor cloud to the spill site, provided the vapor concentration along this path is high enough to continue burning (AcuTech 2007).

#### **PSE Natural Gas Distribution System**

PSE would operate proposed Pipeline Segments A and B of the natural gas distribution system in the affected jurisdictions at pressures of up to 250 and 500 psig. Pipeline Segment A would consist of approximately 4 miles of 16-inch pipe, and Pipeline Segment B would consist of approximately 1 mile of 12-inch pipe. Both the 16-inch pipe and the 12-inch pipeline segments would operate at a hoop stress below 20 percent Specified Minimum Yield Strength. This constitutes a safety factor of 5, which exceeds the applicable federal and state requirements.

All natural gas in distribution lines is odorized for ready detection in the event of a leak. The building density in the area where a pipeline is proposed determines the required safety factor to which a pipeline must be built. These standards are determined by Class Location 1 through 4, with the lower number representing less densely developed locations, and the highest number representing heavily urbanized locations. Pipeline Segments A B would be built to exceed the highest design factor for a Class 4 location.

With regard to minimum depth of cover over high-pressure distribution lines, federal standards require at least 24 inches. PSE designs to meet a minimum cover of 36 inches over high-pressure distribution mains.

For the operational lifetime of distribution pipelines, federal and state regulations require that leak surveys be conducted every five years unless the pipelines are located within business districts, where they undergo a leak survey annually. PSE conducts leak surveys annually on all business district pipelines and higher-pressure distribution mains; all other locations undergo leak surveys every three years.

The pressure of the gas at the proposed Golden Given Limit Station would be reduced to less than 250 psig to match the downstream pipeline. The Frederickson Gate Station is where natural gas is delivered from Northwest Pipeline to PSE. At this location, the gas is measured for custody transfer, the pressure is regulated to system pressure, and the gas is odorized so that any unintended release can be detected by the public. PSE operates its facilities, including the proposed Golden Given Limit Station and Frederickson Gate Station, in accordance with all applicable federal and state regulations.

#### **3.5.4.3 Decommissioning Impacts**

This section describes the procedures proposed to address potential decommissioning impacts associated with the end of the design life of the Project. Accounting for each Project component, the estimated total design life of the Project is 50 years. Decommissioning of the Project components would generate impacts similar to those discussed in Section 3.5.4.1 (Construction Impacts).

#### **Tacoma LNG Facility and TOTE Marine Vessel LNG Fueling System**

Decommissioning activities would require construction worker safety training and safety plans designed to prevent workers' exposure to vapors or other contaminated media that may pose an unacceptable risk exposure scenario. Similar safety training and safety plans would be appropriate to construction workers operating in and around equipment at the decommissioning site.

During decommissioning of the facility, hazardous materials would be stored, handled, and used in accordance with plans prepared for the safe management of such materials.

# 1 Purpose, Need, and Alternatives Considered

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This section presents the purpose of the Proposed Action set forth by the proponent, Puget Sound Energy (PSE), the need for the Proposed Action, and the various alternatives considered, consisting of the Proposed Action, the No Action Alternative, and alternatives eliminated from further consideration. Throughout this draft environmental impact statement (DEIS), the term “Proposed Action” refers to the construction, operation, and decommissioning of the Tacoma Liquefied Natural Gas (LNG) Project, referred to herein as the “Project.”

## 1.1 Purpose and Need

The purpose of the Proposed Action is summarized as follows:

- Receive natural gas from PSE’s distribution system, chill natural gas to produce approximately 250,000 to 500,000 gallons of LNG daily, and store up to 8 million gallons of LNG on site.
- Re-inject and divert approximately 85,000 decatherms (Dth) per day (995,000 gallons of LNG) of peak-day gas supply into PSE’s distribution system.
- Dispense LNG for the following uses: maritime transportation fuel to be used by Totem Ocean Trailer Express (TOTE) at their Port of Tacoma facility (approximately 39 million gallons per year) and other future regional LNG marine vessel fuel customers, and loading to trucks or barges for other regional markets seeking a cleaner fuel.

The Proposed Action responds to the following needs:

- **Peak-day resource for natural gas customers**
- PSE plans for the peak-day needs of its retail natural gas customers in its biennial integrated resource plan (IRP) as mandated by the Washington Utilities and Transportation Commission (WUTC). Through the IRP process, PSE has identified long-term needs for new peak-day resources to serve retail natural gas customers using standard and WUTC-accepted load projection methodology. The IRP considered expected customer loads, including the effect of demand-side resource programs, based on long-term expected regional economic growth. The 2013 IRP demonstrated a need for peaking resources beginning in 2017 that is expected to grow to a deficit of approximately 150,000 Dth per day by 2022, and 200,000 Dth per day by 2026.
- PSE evaluated various resource alternatives available to reliably meet customer demand and determined which resource, or set of resources, would meet such customer demand most cost-effectively. The Tacoma LNG Facility was evaluated against long-haul interstate pipeline capacity, regional underground natural gas storage service combined with interstate pipeline storage redelivery service, and a stand-alone LNG peaking facility in other locations. In consideration of the company’s resource needs and prudence requirements, PSE determined that the most cost effective way of meeting these needs would be a combination of additional regional underground storage, the Tacoma LNG Facility, and system refurbishment of an existing, on-system, peak-day resource. The Tacoma LNG Facility would fill approximately 50 percent of the anticipated deficit. PSE requires 6 to 7 million gallons of storage to adequately serve the storage requirements associated with such peak-shaving volumes (see definition of peak shaving in Section 1.2.1 [Proposed Action]); therefore, taking into account the needs of other customers, the proposed single 8-million-gallon, unpressurized, full-containment LNG storage tank best meets long-term customer storage needs.
- **Fuel for TOTE vessels and other maritime or terrestrial transportation**
- PSE has entered into a contract with TOTE to provide LNG to TOTE at its Port of Tacoma terminal. TOTE operates two Orca class vessels between the Port of Tacoma and Port of Anchorage and transports

approximately 30 percent of all consumer goods shipped to Alaska. In 2010, the International Maritime Organization approved the North American Emissions Control Area (ECA), establishing more stringent emissions standards within 200 nautical miles of the United States and Canadian coasts. The United States Environmental Protection Agency (EPA) is responsible for administering vessels operating within the ECA. Ships operating within the ECA were required to reduce the sulfur content of their fuel to 1 percent in August 2012 and must further reduce the sulfur content to 0.1 percent by 2015. TOTE chose to meet this requirement by converting to LNG as the fuel for its Tacoma-Alaska fleet and obtained a conditional ECA waiver from EPA in July 2012 that provides forbearance on enforcement until late 2016 to allow for procurement of the LNG engines and the development of LNG fuel supply infrastructure. TOTE would consume more than 39 million gallons of LNG annually, which is a significant portion of the LNG to be produced at the Tacoma LNG Facility. TOTE's vessels operate on a regimented schedule of sailings, arriving in Tacoma on Wednesdays and Fridays and departing approximately 12 hours later. The liquefaction and loading capacity of the Project must meet the requirements of the TOTE operation.

- Further implementation of fuel switching from petroleum products to LNG under ECA requirements is anticipated to result in the additional need for maritime LNG fuel in the Seattle and Tacoma areas. Siting a facility that can load LNG directly into bunker barges minimizes the costs and logistical challenges of transporting LNG by bulk to maritime end users.
- State and regional policies encourage the use of clean fuels to meet greenhouse gas (GHG) emission reduction objectives. Washington's 2012 Energy Strategy calls for the implementation of clean energy strategies in the transportation sector under Revised Code of Washington (RCW) 43.21F.088(1)(e) and the reduction of GHGs under RCW 70.235. Regionally, the *Pacific Coast Action Plan on Climate and Energy*, signed by the leaders of California, Oregon, Washington, and British Columbia on October 28, 2013 (Pacific Coast Collaborative 2013), calls for the transition of the West Coast to clean modes of transportation and the reduction of a large share of GHG emissions with actions that, among others, support emerging markets and innovation for alternative fuels in commercial truck, bus, rail, port, and marine transportation. Natural gas has been identified as a key resource to implement such reductions; see, for example, RCW 46.37.467(2), and the United States Department of Energy Alternative Fuels Data Center at [http://www.afdc.energy.gov/vehicles/natural\\_gas\\_emissions.html](http://www.afdc.energy.gov/vehicles/natural_gas_emissions.html). The Proposed Action would address the need for regional natural gas resources in the transportation industry and other industrial markets desiring to avail themselves of a cleaner fuel in support of GHG emissions reduction policies, and reduced operational cost.

## 1.2 Alternatives Considered

Under Washington Administrative Code 197-11-440(5)(d) regarding private projects proposed at a specific site, the lead agency must evaluate only the proposed action, the no action alternative, and other reasonable alternatives for achieving the proposal's objective on the same site. A reasonable alternative must be feasible and capable of meeting the proposal's objective at a lower environmental cost. In the case of the Proposed Action, PSE seeks to achieve the following objectives at the proposed site:

- Receive and chill natural gas to create approximately 250,000 to 500,000 gallons per day of LNG;
- Store up to 8 million gallons of LNG in an on-site storage tank;
- Deliver LNG via cryogenic pipeline to fuel vessels or load bunker barges on the Blair Waterway, including TOTE container vessels;
- Provide bulk LNG loading to bunker barges on the Hylebos Waterway; and
- Regasify the LNG and inject natural gas into PSE's distribution system as a peak day resource; the connected distribution system must have sufficient demand to consume the injected natural gas.

This DEIS evaluates the Proposed Action and the No Action Alternative described below. Additionally, it discusses alternatives that were considered but eliminated from further consideration as alternatives because they failed to meet the objectives stated above.

### 1.2.1 Proposed Action

The Proposed Action is to develop and operate the Project, as defined above. The Proposed Action would include construction and operation of a small-scale facility to produce LNG to fuel marine vessels and provide LNG fuel to various customers in the Puget Sound area via LNG bunkering barges and tanker trucks. The Project would also have the capability of vaporizing LNG back to its gaseous state for injection into the PSE Natural Gas Distribution System during periods of high demand, referred to as “peak shaving.” The area of the Proposed Action is shown in Figure 1-1. The Project would consist of the following main components:

- **Tacoma LNG Facility:** Liquefies natural gas, stores LNG, and includes facilities to transfer LNG to the TOTE Marine Vessel LNG Fueling System (described below), bunkering barges in the Hylebos or Blair waterways, or tanker trucks on site. It also includes facilities to regasify stored LNG and inject natural gas into the PSE Natural Gas Distribution System. This facility will be located in the Port of Tacoma within the city of Tacoma.
- **TOTE Marine Vessel LNG Fueling System:** Conveys LNG by cryogenic pipeline from the Tacoma LNG Facility to the TOTE site and includes transfer facilities and an in-water trestle and loading platform in the Blair Waterway to fuel vessels or load bunker barges. The locations of these components are shown in Figure 1-2.
- **PSE Natural Gas Distribution System:** Conveys natural gas to and from the Tacoma LNG Facility. It includes two new distribution pipeline segments (Pipeline Segment A and Pipeline Segment B), a new limit station (Golden Given Limit Station), and an upgrade to the existing Fredrickson Gate Station. Pipeline Segment A would be located in the city of Tacoma and the city of Fife. Pipeline Segment B would be located in unincorporated Pierce County. In addition, the Golden Given Limit Station and Fredrickson Gate Station would be located in unincorporated Pierce County.

The two new pipeline segments on the Blair-Hylebos peninsula would be required to serve the Tacoma LNG Facility. The existing natural gas facilities in the area do not have the capacity to serve the new facility. Segment A would extend from the Tacoma LNG Facility to the existing PSE distribution system on the south side of Interstate 5 in the City of Fife.

Pipeline Segment B, a 1-mile-long distribution pipeline, would interconnect the north and south Tacoma distribution systems and would be designed to increase the capacity to the Port of Tacoma area. The Golden Given Limit Station would regulate the gas pressure as it moves from south to north. The Project would result in an increased flow of natural gas through the Fredrickson Gate Station beyond its present capacity, necessitating a rebuild of the station.

### 1.2.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented. It is assumed that existing land uses would continue at the proposed Project site, which include various industrial and commercial uses.

LNG would not be produced or stored at the Tacoma LNG Facility site and would not be available to fuel marine vessels or other customers in the Puget Sound area. Additionally, natural gas would not be stored as LNG at the Tacoma LNG Facility site to regasify and inject into the PSE Natural Gas Distribution System and ensure that PSE customers receive natural gas supplies as needed during periods of peak demand.

Under the No Action Alternative, the economic and employment impacts of the Proposed Action would not be realized. Moreover, a new supply of fuel with fewer air emissions than traditional fuels would not be available to help improve air quality in the Puget Sound airshed and the ECA.

### 1.2.3 Alternatives Eliminated from Further Consideration

Before determining that the selected site was the only one that enabled the company to meet its objectives, this and other sites in the Puget Sound region were evaluated to assess whether they could meet each Proposed Action objective. Key attributes in this evaluative process included sufficient setbacks to comply with federal code 49 Code of Federal Regulations 193 (which require large parcels), proper industrial zoning, access to markets, access to PSE's distribution system, and waterfront siting to accommodate deliveries to TOTE and potential marine markets. All of these factors contribute to the development and economic viability of the Proposed Action.

Western Washington has a dearth of compatible sites. There is very little available heavy-industrial zoned acreage of sufficient parcel size to accommodate the necessary tank size. A variety of sites were examined for suitability, and the results of those investigations are described below. The sites are as follows:

- BP Cherry Point Refinery – Whatcom County
- Intalco site – Whatcom County
- Port of Everett Jeld-Wen site
- Port of Everett Shadow Development site
- Port of Tacoma Fredrickson site
- Port of Tacoma Kaiser Aluminum site
- Port of Tacoma Earley development site
- Port of Tacoma Snail site (site of former snail infestation)
- Port of Tacoma Naval Reserve site

Whatcom County and Washington Department Fish and Wildlife regulations prevent the construction of additional piers at the Cherry Point and Intalco sites that are needed to meet the requirements for an LNG facility. In addition, the remote location makes service to TOTE and PSE's retail natural gas customers economically unfeasible. Neither of the Port of Everett sites was on the market for sale or a long-term industrial tenant lease at the time PSE was looking to procure a site for LNG development. While the sites may have worked for the purpose of peak shaving, neither site presented immediate proximity to the TOTE facility, where its newly commissioned LNG vessels would be fueled. TOTE's business model for serving the Tacoma-Anchorage route is based on round-trip speed and efficiency: fueling must occur at its Port of Tacoma terminal at the same time as its cargo loading/unloading operations. Fueling stops in the Port of Everett would make TOTE's Tacoma-Anchorage route economically inefficient. Additionally, the proximity to Naval Station Everett could considerably constrain the ability to move frequent and large barge shipments of LNG past the sensitive military installation. The Shadow Development site was only approximately 15 acres, too small to host an 8-million-gallon storage tank. Tidal effects and shallow river depth precluded further investigation into this site. The Jeld-Wen site owners preferred to use the site for residential development. Ultimately, their distance from TOTE and other siting constraints rendered each of these four sites physically and economically incompatible with PSE's proposed LNG development.

The Port of Tacoma's various sites each presented an improved case for proximity to TOTE and workable solution for the purpose of peak shaving. Despite its adequate size, the Fredrickson site presented limited product mobility because of its inland location. The only way to move LNG from the site to TOTE was either by rail through suburban and city neighborhoods, or by truck. Railcars to transport LNG are presently not authorized by the federal government. Both solutions require tankage at the Blair-Hylebos peninsula. The 4-hour fueling window for each vessel is inadequate for the delivery of 450,000 gallons of LNG arriving by truck in 10,000-gallon increments. These numbers are not limited to TOTE vessels alone; barging infrastructure, tank storage, and additional LNG trucks would still be necessary at the Port of Tacoma to accommodate other marine customers. The cost of infrastructure and transportation constraints at the Fredrickson site rendered the development of the project there infeasible.

The Port of Tacoma presented two other sites for early consideration. One (the “Snail site”) was constrained by both a stormwater pond and extensive wetlands on the site. At the time that PSE was asked to consider it, the site was also subject to a federal lawsuit related to the removal of forested wetlands. Even pending a satisfactory resolution of the litigation, the site was too small for the Proposed Action. The other site is the former Kaiser Aluminum site at the base of the Blair-Hylebos peninsula. This site was far too large for the proposal, and the lease costs alone would have rendered the development of the facility and associated infrastructure uneconomical. Further, it was economically infeasible to develop a cryogenic line to serve the TOTE site from this distance.

PSE examined a third site at the tip of the Blair-Hylebos peninsula known as the Earley Business Center. The Port of Tacoma has designated this site as an incubator site for small businesses and declined to make it available to PSE.

The remaining site (the Naval Reserve site) is the proposed site for development of Tacoma LNG. This site meets the objectives set forth for the successful development of the Proposed Action. Chapter 2 provides further description.