Wim de Vriend
573 South 12th Street
Coos Bay, OR 97420, USA
(541) 267-6177. Cell: (541) 404-7672.
(Please, no voice mail or texting)
costacoosta@coosnet.com

June 11, 2019

Andrew Stamp, Esq.,
Coos County Planning Department
Coquille, OR 97423 Hand-delivered

Re: County hearing on remand from the Land Use Board of Appeals in regards to 76 OR LUBA 346 (217), County file No. HBCU-15-05/CD-15-152/FP-15-09, regarding Jordan Cove LNG export terminal

Dear Mr. Stamp:

At the hearing on Monday, June 10, in Coquille you mentioned the importance of supplying supporting documents for our comments. For your convenience, please accept the enclosed documents, which I copied for that purpose. Every document carries a reference in the upper right corner, clarifying where in my letter of June 10 the connected material can be found.

Please note that in many cases I have not supplied entire documents. That would have been too onerous, and pointless besides, so in those cases I merely supplied pages. Also, while I copied every page in the SIGTTO booklet that my letter referred to, I did not copy Information Paper No. 14 in its entirety. That's because I was concerned that it might be seen as an infringement on SIGTTO's copyright. In case you want an entire copy of your own, I should mention that I found mine on EBay, for about $70.

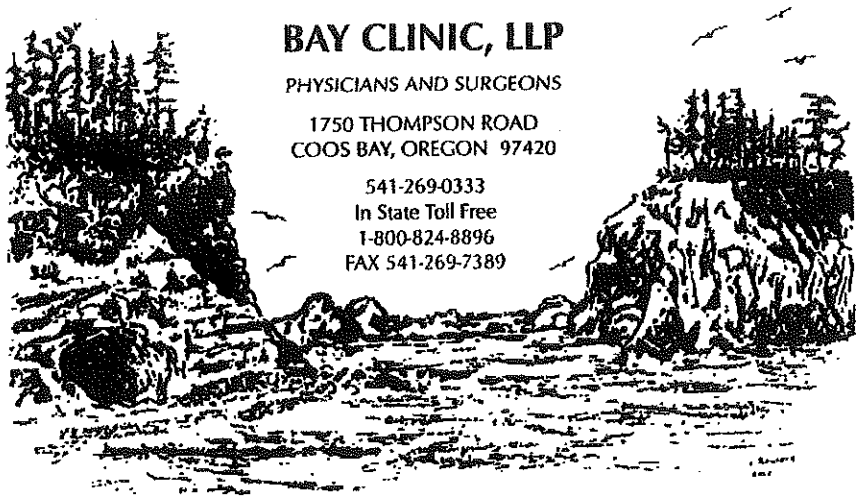
It's possible that I have overlooked something, so if you need any other supporting sources, please let me know.

Also, I have learned that that my understanding, on page 22 of my letter, that personal use by a candidate of leftover campaign contributions is legal is not well-founded. Please disregard that part.

Happy reading,

Wim de Vriend

Exhibit 13
Date: 6/11/19



BAY CLINIC, LLP

PHYSICIANS AND SURGEONS

1750 THOMPSON ROAD
COOS BAY, OREGON 97420

541-269-0333
In State Toll Free
1-800-824-8896
FAX 541-269-7389

Internal Medicine
TERRANCE S. BACH, M.D.
GREG SCHANDELMEIER, M.D.
PETER LUND, M.D.
HASAN AKHTAR, M.D.
ANDREW R. MASLONA, M.D.
WENDY HAACK, D.O.
KELLY SMITH, F.N.P.
ANTHONY BALDACCI, A.N.P.-C.

Surgery
ERIC R. DRITSAS, M.D., F.A.C.S.

Obstetrics & Gynecology
STEPHAN J. GROTH, M.D.
JULIE A. ABBOTT, C.N.M., N.P.

Pediatrics
JON YOST, M.D.
BRIAN L. GUMBS, M.D.
MARY L. MOORE, M.D.
SARA BRAKEBUSH, C.P.N.P.

Allergy
JOSEPH T. MORGAN, M.D.

Administrator
DANIEL E. WALSH

October 9, 2012

Kimberly D. Bose, Secretary
Nathaniel J. Davis, Sr., Deputy Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Docket PF 12-7, Jordan Cove

The following was presented orally in abbreviated form at the FERC Scoping Hearing at the Mill Casino, North Bend , OR on the above date:

My name is Dr. Joseph Morgan. I am an allergist. I have practiced in Coos Bay since 1966 and am the senior physician on the Oregon coast. My curriculum vitae is attached. Because of a particular interest in the environmental aspects of allergies and certain other diseases, I regularly see patients from the Portland area to Medford, OR and Crescent City, CA, as far east as Boise, ID, and sometimes from other states.

I do not belong to, represent, or speak for any group or organization either for or against the LNG terminal. My concerns are entirely for medical reasons and are derived from many years of clinical experience.

I am concerned that the subject of air quality degradation and the potential health effects of an LNG export terminal on the citizens of the Bay Area and Coos County has not been addressed in any information I have seen so far. When an import terminal was proposed, it was estimated that the total airborne emissions from such a facility would amount to 523.5 tons per year, 1,047,000 lb., per year. To that was added another 288.8 tons per year from approximately sixty LNG transports, themselves, and the tug boats to bring them in and see them out, for a total of 812 tons, or 1,624,000 lb. per year.

How much will we see from an export terminal? I'm not aware that any figures have been released yet. Jordan Cove filed an application with the US Department of Energy on 3/23/12. There are 30 pages to the application, itself, and 152 pages of appendices. Of this total of 182

pages, there are two pages under the heading "Environmental Impact." The two pages do not even mention North Bend/Coos Bay or Coos County. They deal primarily with assurances that there will be no harm either to the environment or to the populace as a result of the fracking required to recover the natural gas at its source.

What would be the impact of an export facility on our air quality? The import terminal called for a 37 megawatt power generating plant to supply the necessary electrical power for the operation of an import terminal. We are told that an export terminal is more energy-intense and will need a 380 megawatt power plant. What will be released into the air from a 380 megawatt plant versus a 37 megawatt plant? Natural gas would, of course, serve as the fuel. While the combustion products of natural gas are less visible than from coal, for example, they are not innocuous. The basic reaction, assuming complete combustion, results in methane combining with oxygen to form carbon dioxide and water, with the release of energy in the form of heat.

$$CH4 + 2\ 02 = CO2 + 2\ H2O + HEAT$$

The problem is that complete combustion is almost impossible to achieve. In reality, as actual combustion reactions come to equilibrium, a wide variety of major and minor species will be present, including carbon monoxide and as carbon in the form of soot or ash. Additionally, any combustion in atmospheric air, which is 78 % nitrogen, produces several forms of nitrogen oxides. Over the years I have encountered patients who are unable to tolerate gas appliances in their homes because of hypersensitivity to these combustion products. One of my late mentors, who was a nationally prominent consultant in the field and saw mostly "worst cases" and treatment failures from all over the country, encountered, in a career that spanned almost 50 years, upwards of 5000 families which had to remove all gas from their homes as a result of it demonstrably causing illness in one or more member of each of these families.

What other sources of airborne emmisions will there be? Jordan Cove's Docket No. PF06-25-000, Table 9.3-2 listed as sources a submerged combustion turbine, submerged combustion vaporizers, Backup submerged combustion vaporizers, a hot oil heater, and an emergency diesel generator. What equipment will be required by an export terminal?

The import terminal would have released hundreds of tons of air pollutants from a location between two and four miles directly upwind from the center of population for a large part of the year. This would have absolutely destroyed local air quality. The wind off the ocean would require many, many miles to dilute and dissipate emissions of that magnitude. The DEIS indicated that state and federal regulations would protect us, but I did not find this at all reassuring. The existing permissible levels of air pollutants may protect healthy young adults from acute effects. By and large they do not protect children, the elderly, and the infirm, nor do they typically take into account the cumulative effect of years of chronic exposure. I have in the past treated patients who had to move from the Bay Area because of the former pulp mill on the North Spit. I have treated extremely sensitive patients who could not live at Waldport, OR because of fumes from the pulp mill at Toledo, OR, 13 air miles away. Many of the people who move here to retire do so very deliberately because of the clean air. They come from major metropolitan areas and industrial centers. They have allergies and heart and lung problems. Many had "hung on" in their former locations just long enough to reach retirement age, and then t

they sought a safer environment. If our air quality is degraded, many of them will be forced to move again. Those who choose to remain will see further deterioration in their health. Word will spread, and new retirees will not come. I have had two long time patients from the Portland area who were considering retiring here initially but put their plans on hold and then eventually moved elsewhere because of the uncertainty following the initial export terminal proposal. There was a third patient, a long time resident of North Bend, who had to move after having developed a severe sensitivity to emissions from the former North Spit pulp mill. This person would have liked to eventually move back following the closure of the pulp mill, but the family was afraid to because of the prospect of an LNG terminal. They now live in another coastal city which has clean air. Air flow patterns for the area are such that it is entirely possible for Coquille and Myrtle point to be affected. Several years ago California rejected an LNG import terminal proposed for a location 14 to 20 miles offshore between Oxnard and Malibu with estimated emissions of just 214 tons per year because of the expected negative effect on air quality on shore. Jordan Cove stands to produce hundreds of tons per year right next to the center of population.

Now we are hearing about the potential for up to 90 ships per year and a 380 megawatt power generating plant instead of 37 megawatts. I find this to be of great concern in terms of the quantity of airborne emissions

Jordan Cove does address jobs in their application. They estimate 99 direct jobs at an annual salary of between nearly $80,000 and $82,000 and additional supporting jobs. Are these estimates verifiable? Retirement is now one of our major industries. Our clean air and mild climate are major factors. How many of these families would we stand to lose? Professor Mark Fagan at Jacksonville State University in Alabama has found that every retiree household moving into an area has the the impact on the economy of 3.2 to 3.4 industrial jobs. About 30 such families either moving away or not coming in the first place would negate those 99 jobs. Furthermore, avoidable chronic illness can be expected among the current populace. Those at highest risk are the very young: infants and children, those with allergies and sinus problems, those with heart and lung disease, those with a variety of other chronic illnesses, and the elderly. I do not exaggerate when I say that there are those here at this meeting who would eventually be affected personally or have a loved one affected.

The citizens of Coos County, need to be fully informed. The notion of "jobs at any cost" is often not worth the final true cost. Evaluation of economic impact must consider the costs and burden of otherwise avoidable acute and chronic illness. The social toll of needless suffering must also be addressed.

It is absolutely vital that air quality, as it relates to public health, be thoroughly evaluated.

There needs to be an accurate quantification projected of airborne emissions, including all sources of:

oxides of sulfur

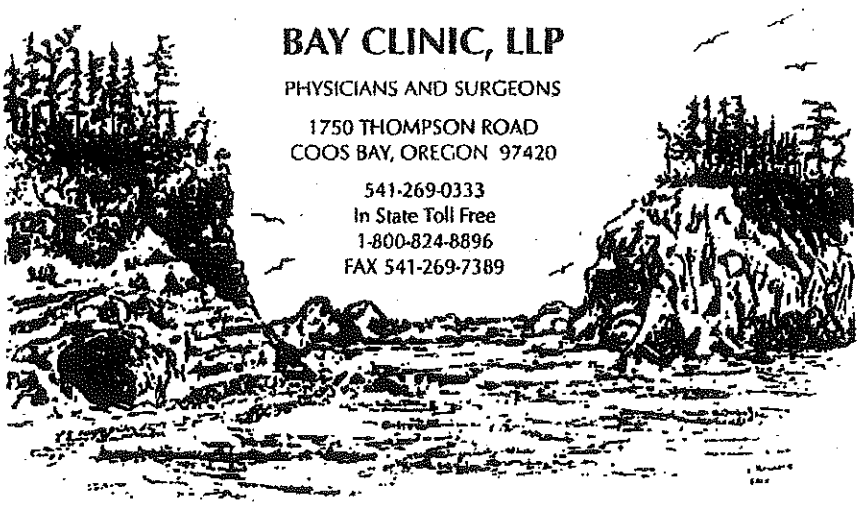
whether hydrogen sulfide will be present in any quantity

oxides of nitrogen

carbon monoxide
volatile organic compounds
fine particulates (less than 10 micron size),

There must be full consideration of any potential for adverse health effects to all residents of the area and especially to the very susceptible segments of the population indicated above.

Joseph T. Morgan MD 10-9-12
Joseph T. Morgan, M.D.



BAY CLINIC, LLP

PHYSICIANS AND SURGEONS

1750 THOMPSON ROAD
COOS BAY, OREGON 97420

541-269-0333
In State Toll Free
1-800-824-8896
FAX 541-269-7389

JOSEPH T. MORGAN, M.D.

Curriculum Vitae

University of Colorado School of Medicine, M.D. 1960

General Rotating Internship, Good Samaritan Hospital, Phoenix, Arizona, July 1, 1960 to June 30, 1961

Pediatric Residency, St. Joseph's Hospital, Phoenix, Arizona July 1, 1961 to June 30, 1962

Pediatric Residency, University of Colorado Medical Center, Denver, Colorado July 1, 1962 to June30, 1963

Chief Resident in Pediatrics, University of Colorado Medical Center, Denver, Colorado July 1 to December 31, 1963

Active Duty, U.S. Army, U.S. Army Hospital, Fort Carson, Colorado January 4, 1964 to January 4, 1966

Private Practice of Medicine, Bay Clinic, Coos Bay, Oregon January 15, 1966 to present
Practice limited to General Pediatrics and to Adult & Pediatric Allergy 1966 to 2003
Practice limited to Adult and Pediatric Allergy Sept. 1, 2003 to present

Certified by the American Board of Pediatrics

Fellow Emeritus, American Academy of Pediatrics

Member, North Pacific Pediatric Society

Member, Oregon Pediatric Society

Fellow Emeritus, American College of Allergy, Asthma and Immunology

Fellow and Past President, American Academy of Environmental Medicine

Certified by the American Board of Environmental Medicine

Member Emeritus, American Academy of Allergy, Asthma and Immunology

Member, Western Society of Allergy, Asthma and Immunology

Member, Oregon Society of Allergy, Asthma and Immunology

Member, Oregon Medical Association

Member and Past President, Southwestern Oregon Medical Society

Member and Past President of Medical Staff, Bay Area Hospital, Coos Bay, Oregon

Chairman, Department of Pediatrics, Bay Area Hospital 1985, 1996, 1997

Clinical Faculty, Department of Pediatrics, Oregon Health and Science University 1992 to 2003

Joseph T. Morgan, M.D.
10/07/2012

PAGE 5
NOTE 3

Geopolitical case for Jordan Cove

gjsentinel - Sep 12, 2018
DENNIS WEBB

Coos County Commissioner, John Sweet, far right, speaks during a meeting on the Jordan Cove project held at Colorado Mesa University on Tuesday, September 11, 2018.

Federal administration and elected officials in Grand Junction Tuesday touted not just the job benefits but the geopolitical case for liquefied natural gas export projects like Jordan Cove in Oregon, while an official for that project said space in it is being set aside for gas production from the Rockies.

Jordan Cove project supporters U.S. Sen. Cory Gardner and U.S. Rep. Scott Tipton, both Colorado Republicans, met at Colorado Mesa University in a roundtable discussion on the project that included Francis "Frank" Fannon, assistant secretary of the State Department for energy resources, and Joe Balash, assistant secretary of the Interior Department for land and minerals management. Also participating were local Jordan Cove boosters including county commissioners from Mesa, Garfield and Rio Blanco counties, and a county commissioner from Coos County, Oregon, where the Jordan Cove project would be built.

"This project is amazing. …. Colorado gas has the opportunity to really fuel the world," Fannon said.

Balash said energy provides freedom to move and grow.

"That is something that we can export to our friends and allies," he said.

Gardner said Taiwan is closing down its nuclear power production and will need to find energy to replace it.

"We have an opportunity to provide geopolitical security to a great ally like Taiwan and to have those jobs being created here," he said.

He said Russia seeks to control and manipulate other countries that depend on its energy exports, and if the United States provides allies with energy to power their economies and save their sovereignty, "that's a pretty powerful tool."

Said Fannon, "Russians use their gas for power, they use their oil for money."

He said Lithuania was able to counter that power by developing an LNG import facility that forced Russia's Gazprom gas supplier to lower its prices.

Fannon said of Jordan Cove, "This project and this kind of work, I can't overstate the importance of the contribution to global energy security."

Stuart Taylor, senior vice president for marketing and new ventures for Jordan Cove LNG, which is part of Canada-based Pembina, said it was a "huge achievement" for Jordan Cove when the Federal Energy Regulatory Commission recently laid out a schedule under which it expects to decide on the project in late 2019. That would allow Jordan Cove to stick to its planned schedule for beginning to ship gas in 2024, when the global demand for LNG is expected to begin exceeding supply, he said.

"We've had great success. There will continue to be regulatory challenges. We need all the support we can get at the state level, at the federal level, in order to keep progressing," he said.

Said Tipton, "Somebody will supply the (LNG) product. Why not us, why not here?"

He said gas can be supplied in an environmental fashion by Colorado producers.

"Nobody will do it better, nobody will do it more responsibly than we will right here," he said.

Jordan Cove is being touted by backers of Western Slope natural gas production as a likely new and long-term outlet for locally produced gas, although it also is expected to get gas from other sources as well, including Canada.

On Tuesday, Taylor said Jordan Cove plans to specifically hold space in the project for Rockies producers.

That space currently may amount to about 75 million to 150 million cubic feet a day, which Taylor acknowledged doesn't sound like a lot in the context of a project that could initially ship 1.3 billion cubic feet a day. But he explained that what's being envisioned is an opportunity within that reserved space for Rockies producers to specifically receive Asian prices for gas, which even after the costs of liquefying and shipping the gas would mean a considerably higher profit margin compared to selling gas on the open market.

"We're excited to work with the Colorado producers," Taylor said.

As for the initial Rockies gas volume envisioned under such an arrangement, "We'd like to start there and see where we go," he said.

Meanwhile, Jordan Cove more generally should help support western United States gas prices by providing a major new outlet for gas, and Taylor said it also could help replace what's expected to be a shrinking California market.

Diane Schwenke, president and chief executive officer of the Grand Junction Area Chamber of Commerce, said one of the things that most excites her about Jordan Cove is the potential for it to provide 20-year contracts for gas producers, providing stability for not just those companies but the many small businesses they support. Businesses want consistency and a level playing field for future investment, she said.

"From our standpoint that is huge," she said.

Mesa County Commissioner Rose Pugliese said stabilization of the energy industry also helps allow for diversifying the economy, such as by investing in infrastructure that benefits things such as tourism and recreation.

"It opens us up to a lot more opportunities," she said.

Quint Shear, a board member and past president of the West Slope Colorado Oil and Gas Association, said the industry has the production capacity and has made the investments that could help meet the needs of a project like Jordan Cove. He noted the benefits that industry provides to small manufacturers, machine shops, welders and other companies that provide services to it.

Coos County Commissioner John Sweet said the project would be vital for his county, which has struggled for decades with the slowdown in the logging industry, and would benefit from the high-paying jobs and big boost to the property tax base. He said the county currently is struggling badly enough financially it has a hard time keeping its jail open.

While timber and lumber products are still a big part of the economy, "We need another leg to our economic stool and this will help provide that," he said.

Sweet's visit to Colorado this week was to include a stop at a local drilling rig site Tuesday as he works to learn more about natural gas production. While he strongly favors the Jordan Cove project, he said a vocal minority opposes it, in part due to the lack of oil and gas drilling in Oregon and the fears about its impacts that can result.

"I think it's important to be able to respond to the concerns and allegations," he said in explaining his desire to learn more about the industry himself.

Balash used Tuesday's event to tout efforts by the Trump administration to reduce regulatory and bureaucratic hurdles to oil and gas development, such as by imposing deadlines and even page-count limits when it comes to environmental reviews and the documents associated with them.

"We're starting to see some real results there," he said.

Taylor said regulatory certainty is important to Jordan Cove as well.

"I can't tell you enough the cloud of doubt that hangs over this project, and it hurts from a competition perspective. Our competitors use the doubt against us," he said.

He said the market wonders as well, with LNG buyers prone to look elsewhere if they worry about Jordan Cove's prospects in the regulatory process.

And Pembina's own board also looks for certainty about the potential for success for the Jordan Cove project, which is currently costing some $10 million a month in permitting and other expenses.

Meanwhile, observers from Balash to Gardner worry about what Colorado voters might decide on this fall's ballot, which includes a measure that would require 2,500-foot setbacks between drilling and homes and vulnerable areas such as streams, lakes, parks and open space. The industry and its supporters say the measure could largely shut down drilling in Colorado.

Balash said he thinks there needs to be more consideration about the "moral argument why our energy is important."

"I think that's an element to the conversation that may be missing around here," he said.

Gardner said if energy production is stopped, "The same people who are worried about Russians taking over are going to take away one of the most powerful tools we have in diplomacy to counter Russia."

Tags

Commerce Jordan Cove Politics Industry Stuart Taylor Economics Joe Balash Cory Gardner John Sweet Natural Gas Liquefied Natural Gas
t System from TownNews.com.

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NOTE 2

Appendix A

Project Description

I. Project Summary

1. The proposed Jordan Cove LNG export terminal ("**Jordan Cove**") is a facility designed to produce and export liquefied natural gas ("**LNG**"). Jordan Cove will be located on the west coast of the United States ("**U.S.**"), within Oregon's International Port of Coos Bay, adjacent to the communities of North Bend and Coos Bay, Oregon. Jordan Cove is owned by Jordan Cove Energy Project L.P. ("**JCEP**"), a subsidiary of Jordan Cove LNG L.P. (the "**Applicant**"), both owned by Veresen Inc. ("**Veresen**").

2. Jordan Cove will have an initial capacity of 6 MMt/y from four trains ("**Phase 1**"), with each train producing 1.5 MMt/y. To produce this amount of LNG, Jordan Cove will require a supply of natural gas of 1.03 Bcf/d, with approximately 918 MMcf/d being delivered to the inlet of the Jordan Cove liquefaction plant. The difference is required for pipeline fuel and losses and for power generation. In response to market demand, Jordan Cove may be expanded to produce up to 9 MMt/y, through the construction of two additional 1.5 MMt/y trains (for a total of six trains) ("**Phase 2**"). In aggregate, the expanded facility will require a natural gas supply of 1.55 Bcf/d with approximately 1.38 Bcf/d being delivered at the Jordan Cove inlet, and the difference being used for pipeline fuel and losses and for power generation.

3. The proposed location of Jordan Cove has benefits for Canada, Western Canada's natural gas producers, and Alberta's petrochemical industry. By utilizing existing natural gas transmission systems in Alberta and British Columbia, natural gas supplies for Jordan Cove can be entirely sourced from the Western Canadian Sedimentary Basin ("**WCSB**"), keeping pipelines and related facilities used and useful, resulting in lower tolls. The petrochemical facilities located at Joffre and Fort Saskatchewan, Alberta, rely on ethane feedstock produced by the extraction plants located on the west-leg of Alberta's natural gas transmission system. Maximizing gas flows through the west-leg delivery system contributes to providing ethane feedstock to Alberta's petrochemical industry. Overall, Jordan Cove will allow for efficient expansion of Canada's natural gas market opportunities.

4. Use of the existing natural gas pipeline networks of both TransCanada PipeLines and Spectra will help to reduce or eliminate both timing and cost risks associated with new, large-scale, pipeline infrastructure development. With respect to the TransCanada pipeline network, natural gas will be transported on the NOVA Gas Transmission Ltd. system and Foothills Pipe Lines (South B.C.) Ltd. system to the

Canada/U.S. border for export at Kingsgate. With respect to gas transportation by Spectra, gas supplies will be gathered and transported on Spectra's BC system through to Kingsvale where, under a proposed common rate structure with FortisBC, supplies will be transported to the Canada/U.S. border for export at Kingsgate. Gas volumes could also flow on the Spectra system to the Canada/U.S. border for export at Sumas, with subsequent swap, exchange or transportation to Jordan Cove.

5. For gas exported at Kingsgate, gas supplies will be transported on the Gas Transmission Northwest system ("**GTN**") to the Malin Hub, located near Malin, Oregon. From the Malin Hub, gas supplies will be transported by the proposed Pacific Connector Gas Pipeline ("**Pacific Connector**") to Jordan Cove. All existing pipeline routes, as well as the location of Jordan Cove and the Pacific Connector are shown on Figure 1.

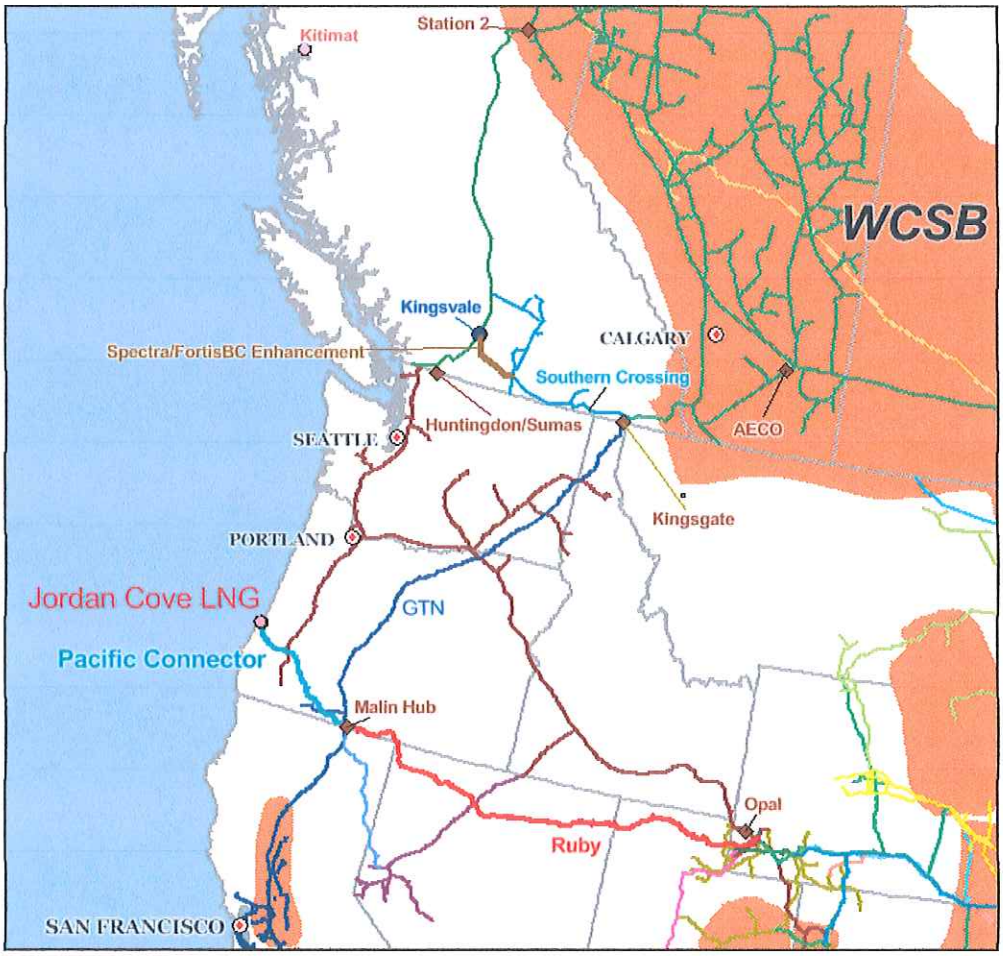

Figure 1: Existing Western North America Pipelines – with Jordan Cove and Pacific Connector

6. In addition to natural gas supplied from conventional and unconventional gas resources in the WCSB, it is possible that long-term gas supplies for LNG export through Jordan Cove could be sourced from the U.S. Rocky Mountain region ("**US Rockies**"). In this regard, Kinder Morgan's Ruby Pipeline will interconnect with Pacific Connector at the Malin Hub and provide access to the US Rockies. However, to create flexibility in the sourcing of natural gas for Jordan Cove, the Applicant is requesting authorization from the National Energy Board to export the full amount of gas required to support Jordan Cove at full build-out from Canada.

7. Jordan Cove and the Pacific Connector will each be offered to prospective long-term customers (terminal capacity holders and pipeline shippers, respectively) on a toll model, pursuant to which the sourcing of natural gas supplies will be arranged by individual customers of Jordan Cove and Pacific Connector. The Applicant will not be directly involved in the purchase or sale of natural gas, but will act as agent and facilitator to its customers with respect to the exportation of gas from Canada.

8. Customers may own proprietary reserves in the WCSB or have access to their own internal gas trading and marketing capabilities. Customers may also choose to use a third party gas trading and marketing company to source gas supplies. Alternatively, it is possible that an aggregated group of natural gas producers will provide natural gas under term contracts. It is also possible that a combination of some or all of these strategies may be implemented.

9. JCEP is in commercial discussions with a number of LNG customers for the off-take of a portion or all of the initial 6 MMt/y of available LNG from Jordan Cove. Once customers have been secured for Phase 1, JCEP will enter into discussions for the additional 3 MMt/y of LNG capacity available in Phase 2. Possible market players include Asia Pacific consumption markets, international energy traders, and major energy companies. JCEP is seeking customer contracts with initial terms of twenty-five (25) years for each of Jordan Cove and Pacific Connector.

10. The advanced status of Jordan Cove and Pacific Connector within the U.S. regulatory approval process provides a high degree of confidence that a Final Investment Decision ("**FID**") will be possible by the end of 2014. Subject to completion of all regulatory approvals, it is expected that construction of Jordan Cove, and Pacific Connector will commence in early 2015, with commercial operations expected to begin in early 2019.

II. Project Facility Descriptions

11. Jordan Cove consists of natural gas receipt and conditioning equipment, liquefaction facilities, two full-containment LNG storage tanks, an LNG carrier berth and cargo

loading system, and a dedicated power plant. These facilities, as shown on Figure 2, will be developed on approximately 400 acres of land owned by an affiliate of the Applicant, which are zoned industrial or marine-dependent industrial. The location of Jordan Cove was chosen for its wide open channel, access to existing natural gas infrastructure, ease of construction due to mild temperatures, and access to labour and housing requirements for construction and operations.

Figure 2: Layout of Proposed Jordan Cove Facilities

12. Gas supply to Jordan Cove will be delivered by Pacific Connector. Pacific Connector is owned equally by the Applicant and a subsidiary of The Williams Company ("**Williams**"), a major U.S. natural gas pipeline and energy company. As shown in Figure 3, Pacific Connector is a 232-mile, 36-inch diameter pipeline which will extend from the Malin Hub to Jordan Cove. The pipeline will have an initial capacity in excess of 1 Bcf/d, powered by a 41,000 horsepower gas turbine compressor station. With additional compression, Pacific Connector's capacity may be expanded to an amount in excess of 1.5 Bcf/d. Williams is the EPC development partner and has responsibilities for regulatory processing, development and construction of the Pacific Connector.

Figure 3: Proposed Pacific Connector, Malin Hub to Jordan Cove

13. At the Jordan Cove site, gas supplies, after treatment through a gas conditioning facility, will be liquefied using the Black & Veatch PRICO® liquefaction process. Once the natural gas is liquefied, it will be stored at -162 Celsius in two, 160,000 cubic meter full-containment storage tanks prior to being available for loading into LNG cargo ships.

14. Electrical power requirements for the liquefaction facility will be provided by a dedicated 420 megawatt power plant located adjacent to the liquefaction facilities and referred to as the South Dunes Power Plant. This natural gas fueled, combined cycle generating plant will power the refrigeration systems in the natural gas liquefaction process, and supply steam to the pipeline gas conditioning units. The South Dunes Power Plant will be owned and operated by an affiliate of the Applicant.

III. U.S. Regulatory Summary

15. Jordan Cove has been under development since 2005, initially as an import facility and subsequently as an export facility following significant changes to gas supply availability within North America. Jordan Cove was approved for construction and operation as an LNG import facility by the U.S. Federal Energy Regulatory Commission ("**FERC**") in late 2009. At that same time Pacific Connector was also authorized for construction by the FERC, which would allow for the flow of natural gas to western U.S. markets from Jordan Cove. No facilities were ever constructed under these previous authorizations.

16. In mid-May 2013, JCEP achieved a major regulatory milestone to export natural gas by completing all requirements under the FERC Pre-Filing process, including

requirements under the *National Environmental Policy Act* ("***NEPA***"), an approximate one-year process. The Pre-Filing and *NEPA* processes allow for extensive public input and for the cooperation and participation of various U.S. federal agencies to coordinate the processes and environmental reviews needed in the authorization of large energy infrastructure projects such as LNG terminals and interstate pipelines. Following completion of the Pre-Filing and *NEPA* processes, JCEP filed a formal application with the FERC, in late-May 2013, seeking authorization to construct Jordan Cove, and thus the export of LNG.

17. Regulatory approval by the FERC authorizing construction of Jordan Cove is expected by the latter part of 2014. The four-year construction period of Jordan Cove is expected to begin in early 2015, with facility commissioning in late 2018 and commercial operations beginning by early 2019. A copy of the FERC filing can be found at: http://elibrary.ferc.gov/idmws/docket_search.asp under Docket CP13-483.

18. With completion of the FERC Pre-Filing and *NEPA* processes, Pacific Connector Gas Pipeline, LP, the owner of the Pacific Connector gas pipeline project, filed a completed FERC application in June 2013 for authorization to construct the Pacific Connector pipeline, which would allow for the transportation of natural gas to Jordan Cove and thus to enable the export of natural gas. Approval for this project is also expected by late 2014, with construction initiation to allow for commercial operations to be concurrent with Jordan Cove in early 2019. A copy of the filing can be found at: http://elibrary.ferc.gov/idmws/docket_search.asp under Docket CP13-492.

19. JCEP holds a licence to export up to 9 MMt/y of LNG, for thirty (30) years, to countries with which the U.S. has a Free Trade Agreement ("**FTA**"). A copy of the FTA approval can be found at: http://www.fossil.energy.gov/programs/gasregulation/authorizations/Orders_Issued_2011/ord3041.pdf.

20. In March 2012, JCEP filed an application with the U.S. Department of Energy to export LNG to non-FTA countries, which, at the time of the Applicant's filing of an application for a licence to export gas with the National Energy Board, has the Jordan Cove facility in the top four of qualified facilities (out of twenty-plus applicants) seeking non-FTA approval. Jordan Cove's application to export LNG to non-FTA countries can be found at: http://www.fe.doe.gov/programs/gasregulation/authorizations/2012_applications/12_32_LNG_Application.pdf.

21. Authorization to construct the South Dunes Power Plant is governed by the Oregon Department of Energy – Energy Facilities Siting Council. A notice of intent was filed

by JCEP in August 2012 and a formal application will be filed in the fall of 2013. Once filed, a copy of the application will be available at: http://www.oregon.gov/energy/Siting/Pages/SDP.aspx. Regulatory approval for the power plant is expected mid-2014, allowing for construction to begin concurrently with the LNG facility in early 2015.

22. *Jordan Cove and Pacific Connector are in receipt of local land use approvals,* including all consents required from Coos County and the City of Coos Bay, Oregon. A local government approval is required from the City of North Bend, Oregon for the North Point Workforce Housing ("NPWH") complex. A Conditional Use Permit application will be submitted to the City of North Bend for the NPWH in the fall of 2013.

23. Other federal, state and local applications required for Jordan Cove and Pacific Connector are being made as required to meet a FID in late 2014. These include, but are not limited to, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Fish and Wildlife Service, National Marine Fisheries Service, Federal Aviation Administration, U.S. Bureau of Land Management, U.S. Forest Service, U.S. Bureau of Reclamation, Oregon Department of Environmental Quality, Oregon Department of Water Resources, Oregon Department of Land Conservation and Development, Oregon Division of State Lands, Oregon Department of Fish and Wildlife, Oregon Department of Transportation, Native American Heritage Commission, Oregon State Historic Preservation Office, and numerous county planning departments.

IV. Project Sponsor and Ownership

24. JCEP is a Delaware limited partnership, duly registered to conduct business in the State of Oregon. The general partner of JCEP is Jordan Cove Energy Project, L.L.C., a Delaware limited liability company. The two limited partners in JCEP own equal interests in both JCEP and its general partner. The first, the Applicant, a Delaware limited partnership, owns seventy-five percent of each entity. The Applicant is indirectly wholly-owned and controlled by Veresen, a Canadian public corporation based in Calgary, Alberta. The second limited partner, Energy Projects Development L.L.C., a Colorado limited liability company, owns twenty-five percent of each entity and is in turn owned by various private individuals, all of whom are U.S. citizens. Veresen expects to acquire the twenty-five percent interest in JCEP and its general partner from Energy Projects Development L.L.C.

25. Veresen is a diversified energy infrastructure company that owns and operates stable, long-life energy infrastructure assets across North America. Over the last fifteen

years, Veresen has focused on three principal business lines: pipelines, midstream and power. Veresen's experience with these large-scale energy infrastructure assets will play a key role in the construction and operation of Jordan Cove.

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NOTE 2

National Energy Board | Office national de l'énergie

LETTER DECISION

File OF-EI-Gas-GL-J705-2013-01 01
20 February 2014

Mr. Kevan King
Senior Vice President, General Counsel and Secretary
Veresen Inc.
Suite 900, Livingston Place
222 – 3rd Avenue SW
Calgary, AB T2P 0B4
Facsimile 403-213-3648

Mr. L.E. Smith, Q.C.
Bennett Jones LLP
4500 Bankers Hall East
855-2nd Street S.W.
Calgary, AB T2P 4K7
Facsimile: 403-265-7219

Dear Mr. King and Mr. Smith:

Jordan Cove LNG L.P. (Jordan Cove LNG) 9 September 2013 Application for a Licence to Export Natural Gas pursuant to Section 117 of the *National Energy Board Act* (NEB Act) National Energy Board (Board) Reasons for Decision

Recent developments in gas production technology have resulted in a significant increase in the Canadian gas resource base and North American gas supply. One of the major impacts of this increase is lower demand for Canadian gas in traditional gas markets in the United States and eastern Canada. As a result, the Canadian gas industry is seeking to develop access to overseas gas markets.

On 9 September 2013, Jordan Cove LNG applied to the Board pursuant to section 117 of the NEB Act for a licence (Licence) authorizing the export of natural gas (Application). Jordan Cove LNG seeks a licence duration of 25 years, starting on the date of first export with an annual volume of 16.03 billion cubic metres ($10^9 m^3$) [1] of natural gas, which corresponds to a natural gas equivalent of 1.55 billion cubic feet per day (Bcf/d)[2], and a maximum quantity of 442.68 $10^9 m^3$ over the term of the licence[3]. The proposed export points would be at the points at which natural gas crosses the Canada/U.S. border via existing natural gas pipelines near Kingsgate, British Columbia and near Huntingdon, British Columbia.

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[1] Applied-for annual quantity not including tolerance

[2] As calculated by the Board from Jordan Cove LNG's applied for export volume of 565.75 Bcf/year divided by 365 days

[3] As calculated by the Board, Jordan Cove LNG's applied for maximum term quantity of 15.63 trillion cubic feet (Tcf) is equivalent to 442.68 10^9 m^3 using a conversion of 35.301 cf/m^3 and includes the applied-for tolerance and ramp-up

The quantity of gas requested for export under the Licence is necessary to support a liquefied natural gas (LNG) export facility to be located at the Port of Coos Bay, Oregon.

Board Decision

We have decided to issue a licence to Jordan Cove LNG, subject to the approval of the Governor in Council, to export natural gas with the terms and conditions described in Appendix I to this letter. Our role, under s. 118 of the NEB Act, is to assess whether the natural gas proposed to be exported does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada, having regard to trends in the discovery of gas in Canada (Surplus Criterion).

In fulfilling this mandate, we recognize that Canadian natural gas requirements are met within a North American integrated market. Depending on regional characteristics, exports and imports contribute to either gas supply or gas demand. It is in this context that we must consider whether the Surplus Criterion in the NEB Act is satisfied.

We have determined that the quantity of gas proposed to be exported by Jordan Cove LNG is surplus to Canadian needs. The Board is satisfied that the gas resource base in Canada, as well as North America, is large and can accommodate reasonably foreseeable Canadian demand, the natural gas exports proposed in this Application, and a plausible potential increase in demand.

We note that the evidence in this Application is generally consistent with the Board's own market monitoring. Recent studies of natural gas resources uncovered significant amounts in the Western Canada Sedimentary Basin and in the United States (U.S.). The North American gas market is a mature marketplace characterized by a large number of buyers and sellers, an extensive and growing pipeline and storage network and a sophisticated commercial structure. Since deregulation of Canadian gas markets in 1985, gas markets in North America have functioned efficiently and there is no evidence to suggest that they will not continue to do so in the future.

Natural Gas Export Regulation

The Board's regulation of natural gas exports is governed by a statutory framework that includes the following three components:

- that all natural gas exports must be authorized by an order or licence[4];
- that the Board must satisfy itself that the gas to be exported by licence is surplus to Canadian requirements[5]; and
- that all exports are reported[6].

[4] Section 116 of the NEB Act
[5] Section 118 of the NEB Act
[6] Section 4 of the *National Energy Board Export and Import Reporting Regulations*

A mandatory hearing for gas export licences is no longer required by the amended NEB Act. For this Application, the Board decided to utilize a written process providing a Notice of Application by the applicant and a Comment Period for impacted persons.

Summary of the Notice, Comment Process and Submissions

On 2 October 2013, the Board directed Jordan Cove LNG to publish a Notice of Application and Comment Period in the *Globe and Mail* and *La Presse* and to serve the Notice of Application and Comment Period on specified persons and agencies. The Notice of Application and Comment Period requested that any impacted person who wished to file submissions on the merits of the Application do so by 18 November 2013. The Board received submissions from the Chemistry Industry Association of Canada (CIAC) on 15 November 2013, Landowners United on 17 November 2013, Citizens Against LNG Inc. on 18 November 2013, and NOVA Chemicals Corporation 18 November 2013. Jordan Cove LNG provided reply comments to these submissions on 26 November 2013.

The Board issued one Information Request (IR) to Jordan Cove LNG on 14 November 2013. Jordan Cove LNG filed its response to the IR on 21 November 2013.

Surplus Determination

Jordan Cove LNG submitted that the quantity of gas it seeks to export does not exceed the surplus as required by the Surplus Criterion. In support of this submission, Jordan Cove LNG submitted the following studies: (1) *Supply and Demand Market Assessment and Surplus Evaluation Report* prepared by Navigant Consulting Inc. (Navigant), and (2) an *Export Impact Assessment* prepared by Mr. Gordon Pickering, Navigant.

Navigant submitted that U.S. and Canadian domestic natural gas supply is abundant to such a degree that it will support domestic market requirements as well as export demands for LNG shipped from North America; and that LNG exports in general offer the potential for a reliable baseload market which will serve to underpin ongoing supply development. Navigant forecasts that Eastern Canadian market imports from the U.S. will lessen competitive demand for Western Canadian gas supplies, enhancing supply availability for Jordan Cove exports. Navigant concludes that pipeline flows between Canada and the U.S., as well as the ability of North American gas supply and demand to balance efficiently and effectively, highlight the interconnected, competitive and functional nature of the North American gas market.

Mr. Pickering concluded that the export of natural gas proposed by the Applicant is unlikely to cause Canadians difficulty in meeting their energy requirements at fair market prices over the forecast period. Mr. Pickering submitted that although changing gas flow patterns between Canada and the U.S. will be dramatic due to access to additional gas supplies, in the future the market should provide an even higher degree of assurance of gas supply availability and reliability at fair market prices for the long term. Mr. Pickering stated that the large North American gas market has a long history of sophistication and performance, made up of key

components of a well-functioning commodity market that has allowed the market to be reliable over the years.

In a letter of comment dated 17 November 2013, Landowners United outlined a number of concerns with Jordan Cove LNG's analysis and conclusions including: the applicant's views of the integrated North American natural gas market, specifically as they relate to the availability of eastern continental gas supplies and the availability of pipeline connections in the Pacific Northwest; that shale gas supplies may not be as great as estimated; and that natural gas demand may be in excess of Navigant's estimate.

Citizens Against LNG Inc., in a letter of comment dated 18 November 2013, questioned the applicant's assumptions that adequate Canadian and U.S. water supplies will be available to sustain increased production by hydraulic fracturing as well as potential impacts of hydraulic fracturing bans by countries, states, regions and cities. Citizens Against LNG Inc. also raised the possibility of exports increasing natural gas prices which could have negative impacts on the manufacturing sector.

In its 26 November 2013 reply comments, Jordan Cove LNG submitted that the gas supply related submissions fail to make the case that the statutory criteria for the grant of an export licence have not been satisfied. Jordan Cove LNG stated that at expected export levels there are more than adequate supplies available to satisfy Canadian requirements, and cited the Board's Montney Formation study which stated Montney natural gas resources are thought to represent 145 years of Canadian needs at current consumption rates. Jordan Cove LNG noted that no moratoria related to hydraulic fracturing exist in the provinces where most of the project supply is expected to be sourced.

In an IR, the Board requested that Jordan Cove LNG provide a Canadian demand sensitivity analysis (an additional 20 per cent increase in Canadian demand above and beyond its original estimates) and discuss its impact, if any, on Jordan Cove LNG's surplus conclusions. Jordan Cove LNG consulted with Navigant to provide its response. The more robust demand scenario requested by the IR did not vary the fundamental conclusions that the natural gas exports would not cause Canadians any difficulty in meeting their gas requirements over the forecast period and that the quantity of gas Jordan Cove LNG seeks to export does not exceed the surplus as required by the Surplus Criterion.

Views of the Board

The Board is satisfied that the gas resource base in Canada, as well as North America, is large and can accommodate reasonably foreseeable Canadian demand, the natural gas exports proposed by this Application, and a plausible potential increase in demand. The Board further accepts Navigant's analysis of Canadian demand and concludes that given the size of Canadian natural gas resources and the integrated and well-functioning nature of the North American gas market, Canadian gas requirements will be met.

The Board acknowledges that production forecasts are typically based on assumptions which carry some uncertainties. In this case, the Board's conclusion on surplus is not dependent on whether specific gas resources, as opposed to others, will in fact contribute to supply. As Jordan Cove LNG has noted, the Application relies on a number of potential supply sources. In regard to natural gas price concerns, the Board considers price as only one indicator of market conditions as North American natural gas supply and demand adjusts to changes in price signals.

The Board notes that the evidence in this Application is generally consistent with the Board's own market monitoring. Since deregulation of Canadian gas markets in 1985, gas markets in North America have functioned efficiently and there is no evidence to suggest that they will not continue to do so in the future.

Based on all of the foregoing, the Board is satisfied that the quantity of gas proposed to be exported by Jordan Cove LNG does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada, having regard to the trends in the discovery of gas in Canada.

Other Issues Raised During Comment Period

Chemistry Industry Association of Canada

The CIAC, in a letter of comment dated 15 November 2013, expressed support for the Application because it would provide ethane feedstock to Alberta's petrochemical industry using existing facilities. This would provide additional benefits to this industry, including increased availability of ethane and lower pipeline transportation tolls. The CIAC did not oppose the Application, but recommended that the Board impose a licence condition requiring Jordan Cove LNG to report the natural gas liquids (NGL) composition contained in exported natural gas.

In its 26 November 2013 reply comments, Jordan Cove LNG submitted that gas to be exported under its licence would provide the same full and fair access to entrained gas liquids at competitive prices as currently exists for all previous and current gas exports at the proposed export points. Jordan Cove LNG stated that the concerns address access to gas liquids and related reporting matters rather than whether the gas to be exported is surplus to reasonably foreseeable requirements for use in Canada, and there appears to be no basis for new or unique licence conditions or reporting requirements such as those proposed by the CIAC. Furthermore, the CIAC did not object to Jordan Cove's Application.

Views of the Board

The Board acknowledges that the CIAC highlighted the benefits of the applied for export and did not oppose the Application.

The Board denies CIAC's request to include a NGL composition reporting requirement as a condition of this natural gas export licence. The Board is of the view that imposing a NGL reporting requirement on some licences would not be useful. The Board notes that

all licence holders are required to report the average heating value of the gas exported, permitting some monitoring of NGL entrained in the exported natural gas, under the *National Energy Board Export and Import Reporting Regulations* (Reporting Regulations).

NOVA Chemicals

NOVA Chemicals, in a letter of comment dated 18 November 2013 outlined the benefits to Canada's petrochemical industry of the proposed export Application and did not oppose the Application

Landowners United

Landowners United, in addition to their comments regarding the Surplus Criterion discussed above, expressed concerns with Jordan Cove LNG's estimated project timelines for final investment decision given the status of U.S. Department of Energy and Federal Energy Regulatory Commission application reviews and that the new *Canadian Environmental Assessment Act 2012* (CEAA 2012) prohibits the Board from making its decision on export licences until an environmental assessment process is completed.

Citizens Against LNG Inc.

Citizens Against LNG Inc. outlined a number of concerns mainly focused on potential effects of the construction and operation of the Jordan Cove liquefaction plant and the Pacific Connector Gas Pipeline, in addition to its comments regarding the Surplus Criterion, discussed above. Citizens Against LNG Inc. also raised other issues such as: the requirement for the Board to conduct an environmental assessment under the CEAA 2012, including effects crossing international boundaries; the requirement for the Board to conduct an economic assessment of the entire Jordan Cove project; the obligations of the Government of Canada to prevent Canadian companies from placing Americans at risk; and the lack of significant permits for the project at the local, state and federal level in the U.S. Citizens Against LNG Inc. concluded that the Application is not in the Canadian public interest.

In its 26 November 2013 reply comments, Jordan Cove LNG submitted that many of Landowners United and Citizens Against LNG's comments are related to U.S. environmental, regulatory, export and facilities siting approval issues which are irrelevant in the context of NEB export licence applications. It believes that these issues should be left to U.S. regulators and governmental authorities to be determined in accordance with U.S. law. Jordan Cove LNG states that the U.S. based opponents failed to identify any statutory requirement in the CEAA 2012 that requires an environmental assessment prior to the issuance of an NEB export licence and further, that the NEB has indicated in its Interim Memorandum of Guidance that matters such as potential environmental effects and related social effects are not relevant to the Board's exercise of its gas export licence authority. Finally, Jordan Cove LNG concluded that any opportunity for Canada to economically utilize existing gas pipelines and gas processing infrastructure and to diversity its traditional export markets clearly serves the Canadian public interest.

Views of the Board

In the Board's view, the concerns of Landowners United and Citizens Against LNG Inc. are largely environmental and public interest in nature and are outside the Board's jurisdiction on natural gas export licence applications. The sole consideration of an export licence application is the Surplus Criterion identified in section 118 of the NEB Act.

In the Board's view, Jordan Cove LNG's Application does not trigger the environmental assessment requirement of CEAA 2012 as the issuance of an export licence is not a designated physical activity under that Act. The Board notes that a decision on this Application does not authorize the construction or operation of the physical facilities in the U.S. of concern to both Landowners United and Citizens Against LNG Inc., including the LNG Terminal.

The Board is of the view that the Licence is a standalone authorization. The NEB Act does not require that a Licence be issued before, concurrently, or after the issuance of authorizations required for any facilities or activities that may be necessary to enable the export. The export licence is not dependent upon any other permits or approvals from other levels of government, or processes relating to a project under review outside Canada.

Relief Requested

Agent on Behalf of Affiliates and Third Parties

Jordan Cove LNG seeks authorization to export natural gas on its own behalf, and as an agent of the actual owners of the gas.

Views of the Board

Section 116 of the NEB Act prevents any person, except as otherwise authorized by the regulations, from exporting gas except under and in accordance with a licence issued by the Board. In the Board's view, this section does not require the holder of the licence to also be the owner of the gas proposed for export; therefore the Board does not find it necessary to include a term on the licence permitting Jordan Cove LNG to act as agent on behalf of the actual owners of the gas. The Board notes that Jordan Cove LNG, when acting in its capacity as an agent, would be exporting under its licence and responsible for reporting those exports under the Reporting Regulations.

Relief from Filing Requirements

Jordan Cove LNG requests relief from the information requirements for gas export licence applications set out in section 12 of the *National Energy Board Act Part VI (Oil and Gas) Regulations* (Oil and Gas Regulations) and the Board's Filing Manual, except where those requirements are addressed within its Application.

The Board notes that it is in the process of updating the Oil and Gas Regulations to align with recent changes to the NEB Act.

Views of the Board

The Board notes that it may exempt applicants for gas export licences from the filing requirements contained in section 12 of the Oil and Gas Regulations. In its Interim Memorandum of Guidance Concerning Oil and Gas Export Applications and Gas Import Applications under Part VI of the *National Energy Board Act*, dated 11 July 2012, the Board indicated that it no longer requires applicants for gas export licences to file the information contained in section 12(f) of the Part VI Regulations. The Board also recognizes that not all of the other filing requirements contained in section 12 of the Oil and Gas Regulations are relevant to its assessment of this Application. Therefore, the Board exempts Jordan Cove LNG from the filing requirements contained in section 12 of the Oil and Gas Regulations that were not included in the Application.

As stated previously, the Board focused its assessment of the Application on the Surplus Criterion contained in section 118 of the NEB Act. The requirements that are needed for the Board's assessment are identified in Guide Q of the Filing Manual[7]. In the Board's view, the information included in Jordan Cove LNG's Application met the requirements outlined in Guide Q.

The Board notes that Jordan Cove LNG filed some information using an approach consistent with the Board's Market Based Procedure (MBP)[8]. The MBP is no longer in effect. For LNG and natural gas export applications filed since the NEB Act was amended in June 2012, the Board has utilized a written public notice and comment process in place of an oral public hearing and the Complaints Procedure. In addition, the Board has issued Guide Q of the Filing Manual which provides guidance on information requirements for natural gas export licence applications. The Board notes that Guide Q does not prescribe a specific format or specific application content, such as a discussion on energy conservation or fuel switching, and its information requirements may be met in a variety of ways, including qualitatively or quantitatively.

Exemption from Reporting Requirements

Jordan Cove LNG also seeks relief from the reporting requirements set out in section 4 of the Reporting Regulations and requests that the reporting requirements of the licence be limited to quarterly reporting.

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[7] Guide Q of the Filing Manual: http://www.neb-one.gc.ca/clf-nsi/rpblctn/ctsndrgltn/flngmnl/flngmnsrt2013_03-eng.pdf

[8] The MBP is a comprehensive procedure by which the Board previously assessed applications for natural gas export licences described in the Board's Reasons for Decision in GHR-1-87 Review of Natural Gas Surplus Determination Procedures (July 1987)

In a response to an Information Request from the Board, Jordan Cove LNG states that due to the competitive nature of the global LNG trade, it would be placed at a competitive disadvantage against those LNG licence holders which are exempt from the reporting requirements with which Jordan Cove LNG must comply. Jordan Cove LNG submitted that the nature of its business model contemplates a wide range of supply options, including those where some of the information requested may not be available to it. Jordan Cove LNG believes project participants, producers or marketers may be reluctant to disclose to Jordan Cove LNG, as agent, information that is competitively significant to their position or interest in the export chain, particularly where North American or international competitors are not required to disclose the same information.

Views of the Board

The Board has decided to deny Jordan Cove LNG's request for exemption from the Reporting Regulations. The Applicant referred to the competitive disadvantage Jordan Cove LNG would be placed in if other LNG export licence holders were exempted from the reporting requirements with which Jordan Cove LNG is required to comply.

The Board notes that under the Reporting Regulations, Jordan Cove LNG would be reporting exports by pipeline to the U.S., and not LNG exports from the proposed liquefaction facility in Oregon. Reporting on pipeline exports to the U.S. is a well-established practice in which the Reporting Regulations apply to all exporters in a similar manner. The Board reminds Jordan Cove LNG, in any instance where it is acting as an agent, that it is responsible, as the licence holder, for reporting the information prescribed by the Reporting Regulations.

Maximum Daily Quantity and Daily Tolerance

Jordan Cove LNG requested a maximum daily quantity of 43,908 thousand m^3 and a daily tolerance of 20 per cent on the maximum daily quantity.

Views of the Board

The Board does not find it necessary to regulate daily export quantities and has decided not to impose any daily export limits or a daily tolerance.

Additional Licence Terms and Conditions

Jordan Cove LNG requested a 15 per cent annual tolerance to the amount of gas that may be exported under the licence in any 12-month period to account for variability in LNG operations including decreased LNG production due to technical and operational constraints; changes in cargo shipping schedules; changes in market demand including seasonal variations; and, interruptions in pipeline delivery or field production due to technical or operational factors.

Jordan Cove LNG also requested a sunset clause where, unless otherwise authorized by the Board, the licence will expire ten years from its date of issuance if exports have not commenced on or before that date.

Views of the Board

The Board accepts Jordan Cove LNG's request for a 15 per cent annual tolerance. The maximum term quantity permitted under the licence is inclusive of the annual tolerance amount, and takes into consideration the ramp up of export volumes at the Canada/U.S. border over the first three years of the 25 year term.

The Board accepts Jordan Cove LNG's request for a ten year sunset clause, from the date of issuance of the licence, as reasonable. It has generally been Board practice in issuing a gas export licence to set an initial period during which if the export of gas commences, the licence becomes effective for the full term approved by the Board. This condition in the licence is referred to as a sunset clause because the licence would expire if the export did not commence within the specified timeframe.

R.R. George
Presiding Member

P.H. Davies
Member

J. Gauthier
Member

c.c. *Landowners United, Clarence Adams, Chairman, 2039 Ireland Rd., Winston , OR,* 97496, USA, Email: adams@mcsi.net

Mr. Graeme Flint, VP Olefins Business Development, NOVA Chemicals Corporation, 1000 Seventh Avenue SW, Calgary, AB T2P 5L5, facsimile 403-269-7410

Mr. David Podruzny, Vice-President, Business Development & Economics and Board Secretary, Chemical Industry Association of Canada, 350 Sparks Street, Ottawa, ON K1R 7S8, facsimile 613-237-4061

Ms. Jody McCaffree, Executive Director, Citizens Against LNG Inc, PO Box 1113, North Bend, OR 97459, USA (by mail)

February 2014
Calgary, Alberta

Appendix I

Terms and Conditions of the Licence to be Issued for the Export of Natural Gas

General

1. Jordan Cove LNG L.P. (Jordan Cove LNG) shall comply with all of the terms and conditions contained in this licence unless the Board otherwise directs.

Licence Term, Conditions and Point of Export

2. Subject to Condition 3, the term of this licence shall commence on the date of Jordan Cove LNG's first natural gas export via the Canada/U.S. natural gas pipeline network and shall continue for a period of 25 years thereafter.

3. This Licence shall expire 10 years from the date of issuance, unless exports from Canada have commenced on or before that date.

4. The quantity of natural gas that can be exported under the authority of this licence is:

    a. Maximum annual quantity that may be exported in any 12-month period, including the 15 per cent tolerance, may not exceed 18.43 $10^9 m^3$;

    b. Maximum term quantity may not exceed 442.68 $10^9 m^3$.

5. Natural gas will be exported from Canada at the natural gas pipeline export points near Kingsgate, British Columbia and near Huntingdon, British Columbia.

BTU Analytics
Trusted Energy Advisors

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NOTE 5

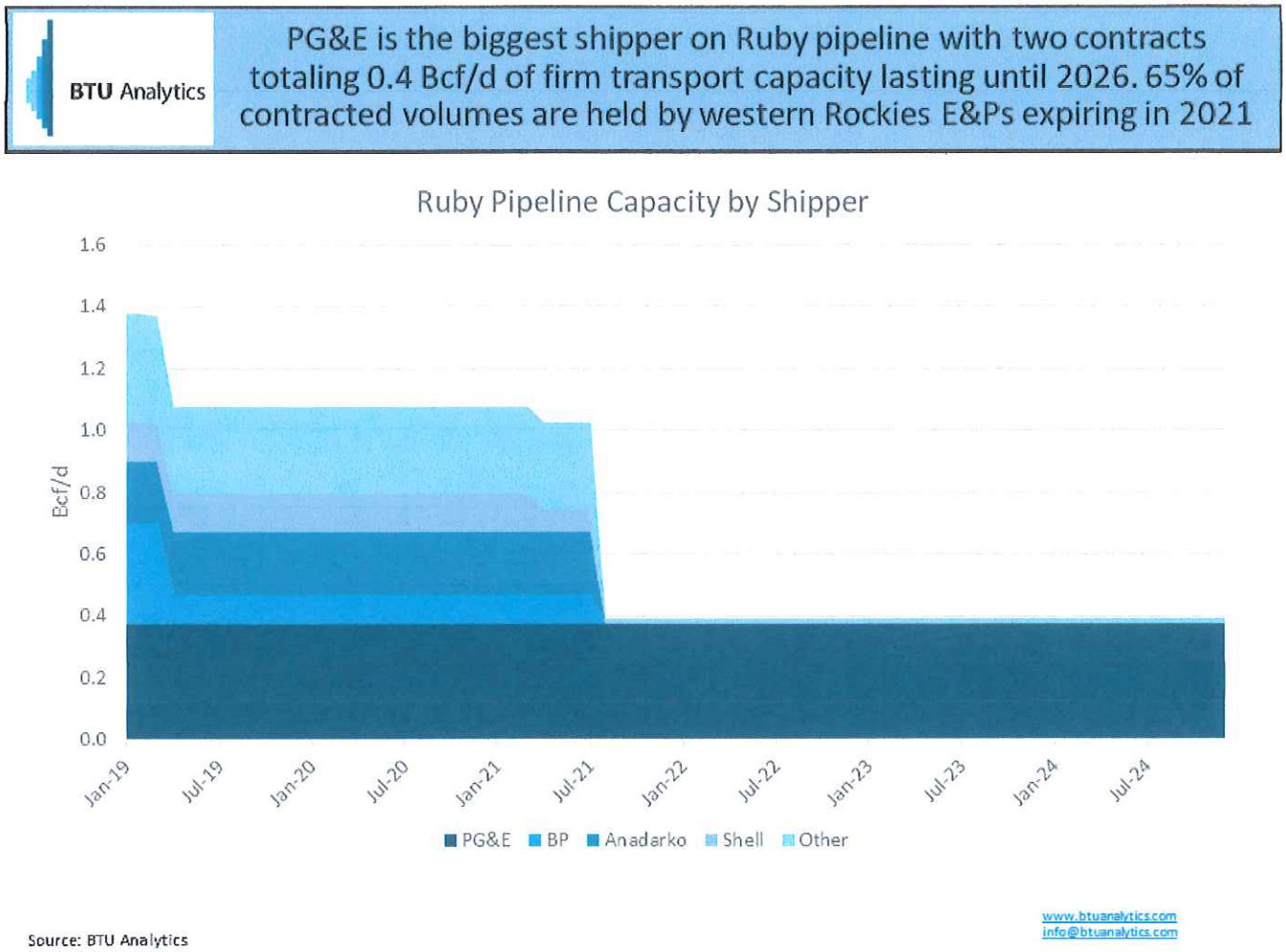
PG&E'S BANKRUPTCY SPELLING TROUBLE FOR RUBY?

January 29th, 2019 | Connor McLean

On January 14, 2019, Pacific Gas & Electric (PG&E) announced it would file for Chapter 11 bankruptcy protection. California's largest utility faces nearly $30 billion in potential liabilities stemming from wildfires in 2017 and 2018. As the company prepares to restructure, some 16 million California customers are preparing to deal with the fallout. However, they're not the only ones as Kinder Morgan (NYSE: KM) and Pembina's (TSX: PPL) Ruby Pipeline serves as a major supply route to the west coast, and PG&E is the largest capacity holder on Ruby Pipeline. The pending bankruptcy combined with delays in west coast LNG exports could leave Ruby Pipeline facing a shortage of potential shippers as existing contracts expire.

The Ruby Pipeline stretches 680 miles across Wyoming, Nevada, and Oregon. Additionally, the Ruby Pipeline provides 1.5 Bcf/d of capacity out of the Rockies to meet demand on the West Coast. The pipe terminates in Malin, OR, where it connects with PG&E's California Gas Transmission line to serve demand in Northern California. It comes as no surprise, then, that PG&E is the largest shipper on Ruby pipeline with one contract serving its electric generation load and one for its gas distribution arm. In total, PG&E has about 0.4 Bcf/d of take-or-pay arrangements that expire in 2026. This represents approximately 35% of Ruby's currently contracted volumes, and 25% of total capacity as illustrated in the chart below. The

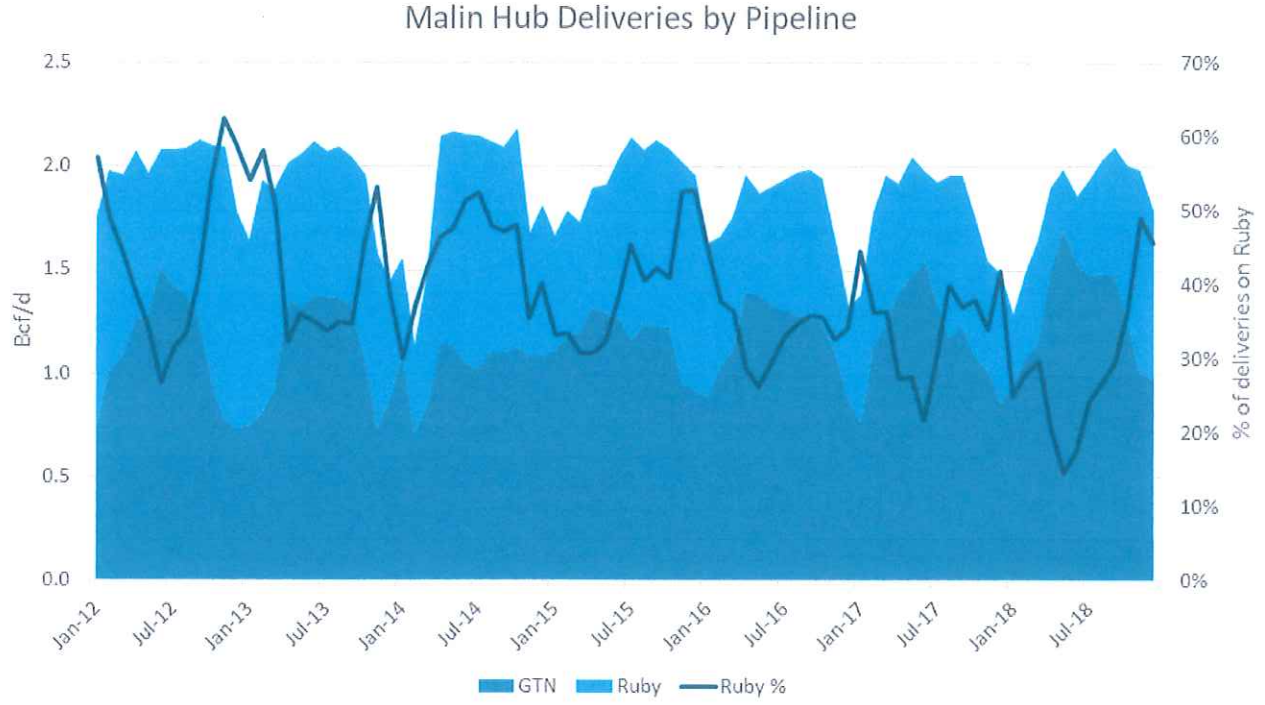
remaining 65% is predominantly held by western Rockies E&P companies with most commitments expiring in 2021.



The uncertainty surrounding the outcome of PG&E's impending bankruptcy isn't the only concern for Ruby Pipeline. Despite filing for Chapter 11, PG&E's natural gas load will still need to be served and PG&E could honor its gas pipeline commitments. Since its first full year of service in 2012, the percentage of Ruby deliveries into Malin Hub has steadily decreased. Competition with cheap Canadian gas on GTN pipeline has replaced declining Rockies natural gas production. For 2018, AECO (Canada) traded at an average of $1.20 while Opal (Rockies) traded at $2.76 outright. As a result , Ruby deliveries hit a low of just 15% of all deliveries into Malin Hub in 2018. The chart below highlights Ruby and GTN deliveries to Malin.

BTU Analytics

Since its first full year of service in 2012, Ruby deliveries into Malin have declined as Canadian gas flows have increased on GTN. Deliveries reached an all-time low in May 2018 providing only 15% of Malin deliveries

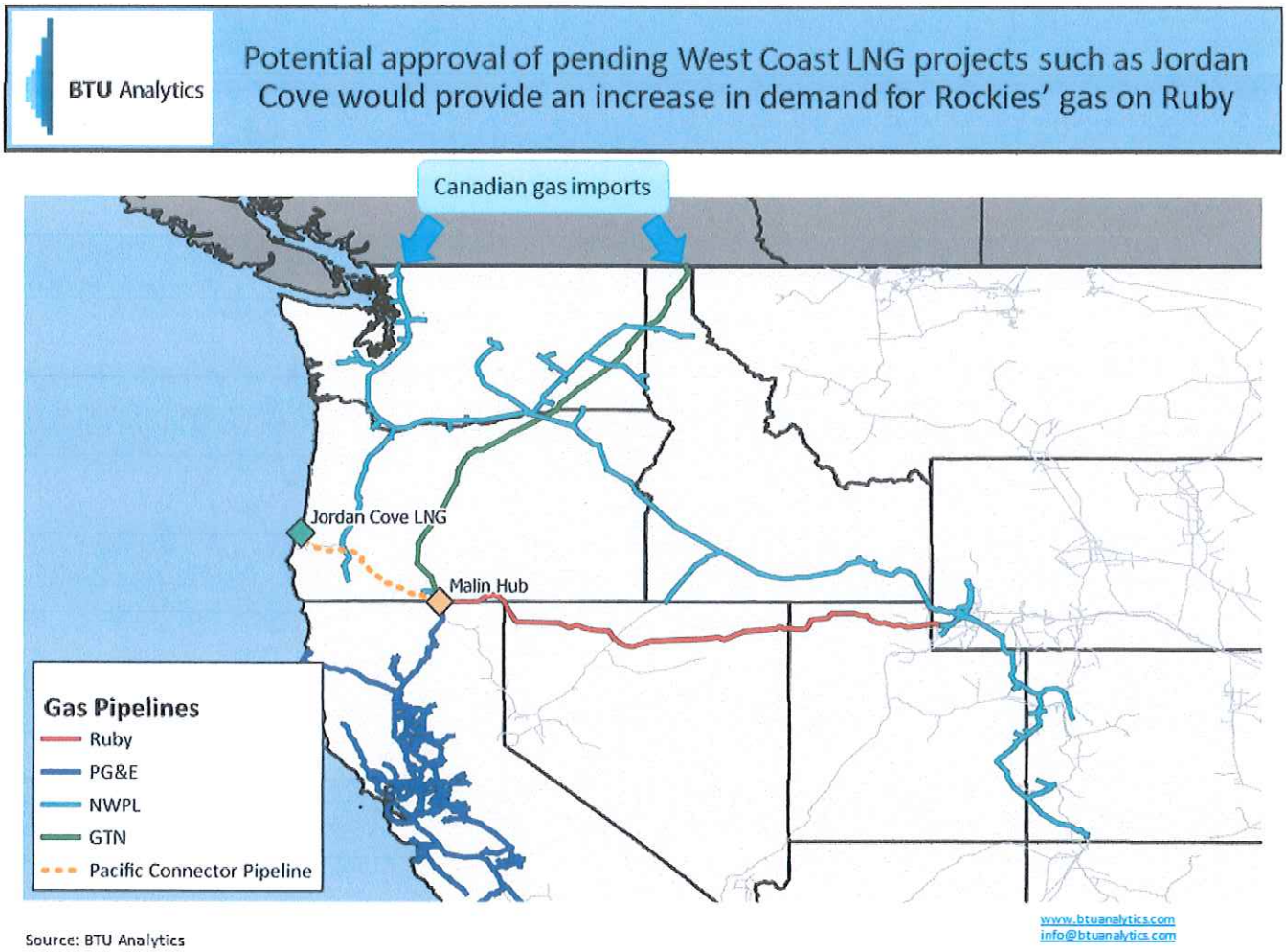


Source: BTU Analytics, Genscape Data (updated 1/25/2019)

www.btuanalytics.com
info@btuanalytics.com

However, Ruby Pipeline volumes jumped higher in late 2018 following the rupture of the Enbridge Westcoast pipeline. The outage on Westcoast pipeline resulted in a decrease of 1.3 Bcf/d in Canadian-US cross-border capacity. The explosion has provided a boost to flows in the short-term. However, it is unlikely Ruby Pipeline will be able to depend on Canadian supply outages going forward and Canadian production shows no signs of declining. Additionally, TransCanada is preparing to expand the West Path of the Nova pipeline by 0.6 Bcf/d by 2020. The expansion would increase deliverability to GTN pipeline. Resulting in a boost to Canadian export capacity into the Pacific Northwest. The increase of supply from Canada will result in Rockies' natural gas facing stiff price competition for west coast markets until new demand arrives.

The Jordan Cove LNG export facility in Coos Bay, OR represents the largest single source of new potential demand in the Western US. The proposed 1.08 Bcf/d LNG facility would source supply from the proposed Pacific Connector Pipeline. The Pacific Connector pipeline joins the proposed terminal in Coos Bay to the Malin Hub served by Ruby and GTN pipelines. However, the Pacific Connector Pipeline still faces significant hurdles from local opposition. In a recent court ruling, existing county land use permits for the line were revoked.



In August of 2018, the DOE approved a request to push back the export permit start date for Jordan Cove to 2024 from the original date of 2021. However, most of the Ruby Pipeline capacity commitments are set to expire in 2021, resulting a potential capacity gap for Ruby Pipeline as shippers await new demand sources. The progress made on the Jordan Cove project will be key in the decision to renew capacity commitments on Ruby Pipeline and the rates shippers will be willing to bear.

PG&E's impending bankruptcy, combined with the upside of future LNG projects, ensures Ruby Pipeline will be a focus of gas dynamics in the West. Find out what BTU Analytics believe will drive the natural gas market by signing up for our free webinar and request a sample of our new Gas Basis Outlook.

Author: Connor McLean

Connor McLean is an Energy Analyst at BTU Analytics focusing on BTU Analytics natural gas modeling and research. Prior to joining BTU Analytics, Connor held internships with Total and EDF Trading building models to analyze pricing trends in the natural gas and power markets. Connor holds a B.S. in Geology and a Master's in Financial Management from Texas A&M University. View all posts by Connor McLean

 Connor McLean / January 29, 2019 / Blog, Energy Market Commentary, Energy Market Commentary, Natural Gas, Pipelines / Malin, Natural Gas, Ruby Pipeline

info@btuanalytics.com | +1 (720) 552 8040
BTU Analytics LLC | 165 South Union Blvd #410 | Lakewood, CO 80228

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Jordan Cove LNG
111 SW 5th Ave Suite 1100
Portland OR 97204
T 971.940.7800

www.jordancovelng.com

Jordan Cove Energy Project, L.P.

Pacific Connector GAS PIPELINE

60697-RF

May 9, 2019

Mr. Bob Lobdell, Aquatic Resource Coordinator
Oregon Department of State Lands
775 Summer St. NE, Suite 100
Salem, OR 97301-1279

Re: Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP
Removal/Fill Application – Response to ODSL April 10, 2019 Additional Information Request

Dear Mr. Lobdell:

On November 7, 2018, Jordan Cove Energy Project L.P. (JCEP) and Pacific Connector Gas Pipeline, LP (PCGP) submitted a Removal/Fill Application to the Oregon Department of State Lands (ODSL). The ODSL provided a sixty-day public comment period on the application, which occurred from December 6 to February 3, 2018. Further, ODSL held five public during this same time. On February 22, 2019, the ODSL provided the Applicants a Request for Assistance Responding to Public Comments, which the Applicants responded to on March 1, 2019. On April 10, 2019, ODSL requested that we provide ODSL with responses to substantive comments received by ODSL during the comment period. Our response to that request is attached to this letter.

We request that ODSL post this response to your website to make the Applicants' responses available to the public and all commenters.

Jordan Cove appreciates ODSL's review efforts to date and looks forward to continued work together on the Removal/Fill authorization. Should you have any questions, please contact Derik Vowels at dvowels@pembina.com or 971-940-7800.

Sincerely,

/s/ Natalie Eades

Natalie Eades
Manager, Environment and Regulatory
Jordan Cove Energy Project L.P.
Pacific Connector Gas Pipeline, LP

cc: Eric Metz – ODSL

U.S. Department of Homeland Security

United States Coast Guard

Captain of the Port
U. S. Coast Guard
Sector Columbia River

2185 SE 12th Place
Warrenton, Oregon 97146-9693
Staff Symbol: s
Phone: (503) 861-6211

16611
May 10, 2018

Director of Gas Environment and Engineering, PJ 11
Attn: Mr. Rich McGuire
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Dear Mr. McGuire:

This Letter of Recommendation (LOR) is issued pursuant to 33 Code of Federal Regulations (CFR) 127.009 in response to the Letter of Intent submitted by Jordan Cove Energy Project. L.P. (Jordan Cove) on January 9, 2017. Jordan Cove proposes to construct and operate the Jordan Cove LNG facility in Coos Bay, Oregon from which Liquefied Natural Gas (LNG) is proposed to be transferred in bulk to a vessel for export. This LOR conveys the Coast Guard's recommendation on the suitability of the Coos Bay Channel for LNG marine traffic as it relates to safety and security. In addition to meeting the requirements of 33 CFR 127.009, this LOR fulfills the Coast Guard's commitment for providing information to your agency under the Interagency Agreement signed in February 2004.

After reviewing the information in the applicant's Letter of Intent (LOI) and Waterway Suitability Assessment (WSA) with subsequent annual updates and completing an evaluation of the waterway in consultation with a variety of state and local port stakeholders, I recommend that the Coos Bay Channel be considered suitable for LNG marine traffic. My recommendation is based on review of the factors listed in 33 CFR 127.007 and 33 CFR 127.009. The reasons supporting my recommendation are outlined below.

On November 1, 2017, I completed a review of the WSA for the Jordan Cove Energy Project, submitted to the Coast Guard by KSEAS Consulting on behalf of Jordan Cove in February 2007. This review was conducted following the guidance provided in U.S. Coast Guard Navigation and Vessel Inspection Circular (NVIC) 01-2011, dated January 24, 2011. In conducting this review and analysis, I focused on the navigation safety and maritime security aspects of LNG vessel transits along the affected waterway. My analysis included an assessment of the risks posed by these transits and validation of the risk management measures proposed by the applicant in the WSA. During the review, I consulted a variety of stakeholders including the Area Maritime Security Committees, Harbor Safety Committees, State representatives, Pilot Organizations, and local emergency responders.

Based upon a comprehensive review of Jordan Cove's WSA, and after consultation with State and Local port stakeholders, I recommend that the Coos Bay Channel be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this project.

The attached LOR Analysis contains a detailed summary of the WSA review process that has guided this recommendation. It documents the assumptions made during the analysis of Jordan Cove's WSA. It discusses details of potential vulnerabilities and operational safety and security measures that were analyzed during the review. The portion of the LOR Analysis which

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addresses matters that affect maritime security is marked as Sensitive Security Information and is withheld from distribution.[1] The LOR Analysis sets forth the navigational safety and maritime security resource gaps that currently exist in, on, and adjacent to the waterway, including the marine transfer area of the proposed facility, and which, to the extent allowable under FERC's existing legal authority, may be addressed in its Commission Order if one is issued. To the extent implementation of specific mitigation measures fall outside the scope of FERC's legal authority, the applicant is expected to examine the feasibility of implementing such mitigation measures, in consultation with the Coast Guard and State and Local agencies as applicable.

This recommendation is provided to assist in the Commission's determination of whether the proposed facility should be authorized. This Letter of Recommendation is not an enforceable order, permit, or authorization that allows any party, including the applicant, to operate a facility or a vessel on the affected waterway. Similarly, it does not impose any legally enforceable obligations on any party to undertake any future action be it on the waterway or at the proposed facility. It does not authorize, nor in any way restrict, the possible future transit of properly certificated vessels on the Coos Bay Channel. As with all issues related to waterway safety and security, I will assess each vessel transit on a case by case basis to identify what, if any, safety and security measures are necessary to safeguard the public health and welfare, critical marine infrastructure and key resources, the port, the marine environment, and vessels. In the event the facility begins operation and LNG vessel transits commence, if matters arise concerning the safety or security of any aspect of the proposed operation, a Captain of the Port Order could be issued pursuant to my authority under the Ports and Waterways Safety Act of 1972, as amended by the Port and Tanker Safety Act of 1978, 33 U.S.C. § 1221 – 1232, among other authorities, to address those matters.

Please note that Enclosures (4) is Sensitive Security Information (SSI) and shall be disseminated, handled and safeguarded in accordance with 49 CFR Part 1520, "Protection of Sensitive Security Information."

If you have any questions on this recommendation, my point of contact is Lieutenant Commander Laura Springer. She can be reached at the address listed above, by phone at (503) 209-2468, or by email at Laura.M.Springer@uscg.mil.

Sincerely,

W. R. TIMMONS,
Captain, U. S. Coast Guard
Captain of the Port, Sector Columbia River

Enclosure (1) LOR Analysis
(2) LOR issued by Sector Portland on April 24, 2009
(3) U.S.C.G.'s Waterway Suitability Report for the Jordan Cove Energy Project
(4) LOR Analysis (SSI Portion)

[1] Documents containing SSI may be made available upon certification that the requestor has a need to know and appropriate document handling and non-disclosure protocols have been established.

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Copy: Commander, Coast Guard District Thirteen (dp)
Commander, Pacific Area (PAC-54)
Commandant (CG-OES), (CG-ODO), (CG-FAC), (CG-741), (CG-CVC), (CG-ENG), (LNGNCOE)
Marine Safety Center (CG MSC)
Jordan Cove

POR 935

UNITED STATES COAST GUARD

Jordan Cove LNG

ANALYSIS SUPPORTING THE LETTER OF RECOMMENDATION ISSUED BY COTP SECTOR COLUMBIA RIVER ON MAY 10, 2018

Enclosure (1)

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Introduction

1. This analysis is a supplement to my Letter of Recommendation (LOR) dated May 10, 2018, that conveys my recommendation on the suitability of the Coos Bay Ship Channel for liquefied natural gas (LNG) marine traffic associated with the Jordan Cove LNG (JCLNG) export terminal project Coos Bay, Oregon. It documents the processes followed in analyzing JCLNG's Waterway Suitability Assessment (WSA) and the suitability of the waterway for LNG marine traffic.

2. For the purposes of this analysis, the following assumptions were made:

    a. The applicant is fully capable of, and would fully implement, any and all risk management measures identified in their WSA.
    b. The conditions of the port identified in the WSA fully and accurately describe the actual conditions of the port at the time of the WSA submission.
    c. The conditions of the port have not changed substantially during the analysis process.
    d. The applicant will fully meet all regulatory requirements including the development and submission of a Facility Security Plan, Emergency Manual, and Operations Manual.

3. The Port of Coos Bay is a deepwater port located in Coos Bay, Oregon on the Pacific Coast of the United States. The Port of Coos Bay offers easy access to Asian markets and facilitates the international movement of goods between the United States and Asia. The Port of Coos Bay is managed under the jurisdiction of the Portland Navigation District and has an authorized channel depth of 37 feet. The channel width is 300 nominal feet. The principal exports are logs, wood chips, lumber, and plywood. The Port of Coos Bay is currently conducting a feasibility study to examine widening and deepening its ship channel.

4. The Port of Coos Bay is approximately 173 nautical miles south of the Columbia River and 367 miles north of the entrance to San Francisco Bay. The Port has seen declining arrivals and is not currently heavily trafficked.

5. Inbound and outbound traffic density in the Port of Coos Bay is currently minimal. In the summer months and during fishing season there are a number of commercial fishing vessels working in the region. The maximum anticipated LNG Carrier port calls per year is expected to be around 120. These projections are based on a maximum nominal LNG output of 7.8 MTPA. Other traffic transiting through the Port of Coos Bay include fishing vessels, recreational vessels, and towing vessels.

6. The Terminal will be sited at the north end of the Coos Bay Channel near Jordan Cove. All Terminal facilities will be located within an approximately 200-acre parcel of land. The approximate locations of the coordinates of the facility are: 43 degrees-25.5' North and 124 degrees 15.7' West.

7. The U.S. Coast Guard regulates the port under the Maritime Transportation Security Act (MTSA), Security and Accountability for Every Port Act (SAFE Port Act), Ports and Waterways Safety Act (PWSA) and other laws applicable to maritime safety and security. U.S. Coast Guard regulated facilities in the area include chip terminals and fuel transfer facilities.

8. Ships entering or departing Coos Bay require a pilot. The Coos Bay Pilots are state licensed Oregon pilots responsible for ensuring the safe transit of vessels transiting through the Port of Coos Bay. They handle approximately 50 vessel transits through the Port of Coos Bay each year.

9. In order to support operations associated with the facility, the applicant will provide additional towing vessels as outlined in their WSA. All tractor tugs must be at least 80 Ton Astern Bollard or larger and equipped with Class 1 Fire Fighting equipment.

10. The applicant established an emergency response planning group in preparation for facility construction and operation in 2006. This group is tasked with education and preparedness concerning this facility. It must be noted that there are schools located in the zones of concern.

Impact to Coast Guard Operations

1. The U.S. Coast Guard is responsible for screening LNG Carriers transiting from foreign ports prior to arrival and will screen all vessels in accordance with existing policies and procedures. The vessels calling on the facility will be foreign flagged and the flag state is yet to be determined. I do not intend to require additional government conducted safety inspections beyond those which already apply to deep draft LNG vessels.

2. Facility and vessel inspection activities will be supported by Marine Safety Unit Portland personnel.

3. Limited access areas (LAA) associated with the project have yet to be established. Sector Columbia River will use risk based decision making and work with existing policy to determine the appropriate LAAs. The proposed LAA in enclosure (3) was not put out for regulatory review and is not in effect.

4. LNG is not considered oil and all vessels calling on the facility will be required to comply with non-tank vessel response plan requirements. The applicant is highly encouraged to work with the Area Committees established under the National Contingency Plan to address issues associated with response in Coos Bay.

5. The Facility will be in the Sector Columbia River Captain of the Port Zone and falls under the purview of the Federal Maritime Security Coordinator who is also the Sector Columbia River Captain of the Port. Specific issues related to this are outlined in Enclosure (4).

Figure 1. Jordan Cove Conceptual rendering of facility

Decision Making Process

1. The following factors regarding the condition of the waterway, vessel traffic, and facilities upon the waterway, were taken into consideration during the LOR process. The processes used are detailed in this section.

2. To ensure all regulatory processes were met, Sector Columbia River took a systematic approach in the WSA validation process. To streamline and ensure transparency, Sector Columbia River worked with Jordan Cove, the Consulting Group KSEAS, and port partners though a series of ad hoc meetings and a one day workshop.

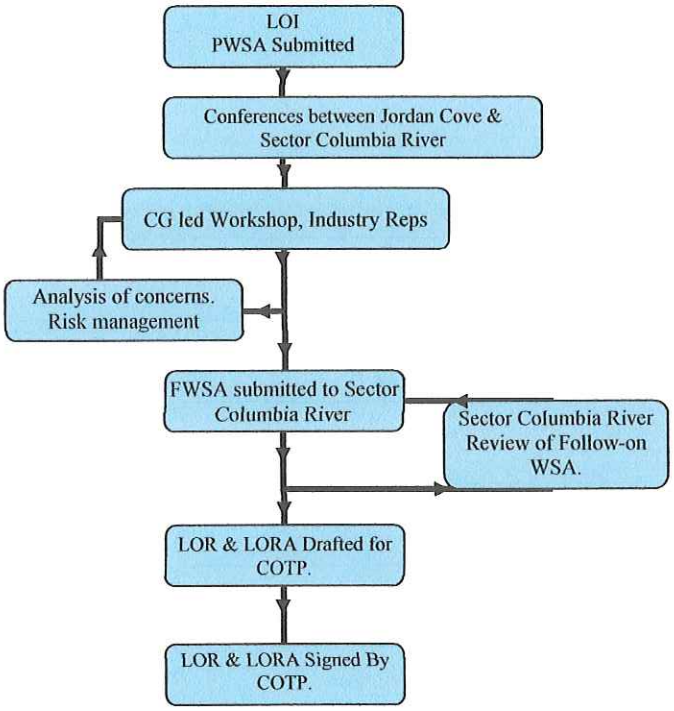

Figure 2 - LNG LOR Process (Sector Columbia River)

3. NVIC 01-2011 provides guidance on the review and validation of a WSA. Applying NVIC 01-2011's procedural framework, my staff held several in-house reviews of the WSA, and facilitated discussions during a workshop held in Coos Bay, OR on October 16, 2017. The workshop included a wide range of participants, including representatives from; the USCG; Coos Bay Pilots Association; Port Authorities, the State of Oregon and law enforcement agencies.

Members	**Position/Role**
LCDR Laura Springer	Waterways Management Division Chief, MSU Portland
LCDR Ben Crowell	Surface Operations, Sector North Bend
LCDR Andrew Madjeska	Incident Management Division Chief, Sector Columbia River
LCDR Xochitl Castaneda	District Thirteen Prevention
Ms. Deanna Henry	Oregon Department of Energy
George Wales	Coos Bay Pilots
Richard Dybevik	Roseburg Forest Products
Doug Strain	Coos Bay Sheriff
Jim Brown	North Bend Fire Department
Doug Eberlein	Coos Bay Response Co-op (CBRC)
LT Ethan Lewallen	USCG LNG NCOE

Table 1 – Jordan Cove WSA Team 1 Nov 2017 (Port of Coos Bay)

4. The participants of this "ad-hoc" workshop, recommended by NVIC 01-2011, utilized their expertise on the physical characteristics and traffic patterns of the waterway, as well as their respective specialty knowledge of the marine environment, LNG, safety, security, and facility operations, to analyze the suitability of the waterway to support LNG marine traffic associated with JCLNG.

5. Participants considered the changes in the area's safety and security dynamics which may result from the introduction of LNG ship traffic associated with the JCLNG Project. Jordan Cove used the American National Standards Institute (ANSI)/American Petroleum Institute (API) Standard 780 Security Risk Assessment (SRA) Methodology, as the basic approach for assessing risk. The standard was published in June of 2013 as a U. S. standard for security risk assessments on petroleum and petrochemical facilities. The standard is a tool used to evaluate all security risks associated with petroleum and petrochemical infrastructure and operations, and assists owners and operators through the process of conducting thorough and consistent SRAs. For security purposes, participants considered potential threats and consequences of intentional act of aggression to the facility and developed security measures to mitigate the risks.

    a. Please see Enclosure (4) if you have a need to know concerning the results of this

6. During the above mentioned workshop held in Coos Bay, OR on October 16, 2017, the ad-hoc working group also evaluated safety factors including the potential impacts of groundings, collisions, and allisions and thoroughly examined the simulator data presented in the WSA.

7. Each of the recommended risk management measures from enclosure (7) of NVIC 01-2011 were considered. In the WSA workshop, additional risks and recommendations were discussed related to a Cascadia Subduction Zone Earthquake and associated implications for the facility and region if a laden vessel was tied up at the layberth.

8. The ad-hoc working group considered each scenario along each transit segment and evaluated the causes of accidental or intentional events. The workshop analyzed the contributing factors for each scenario and their likelihood of occurrence given the adequacy of safety and security layers.

9. Sector Columbia River followed the checklist found in NVIC 01-2011 during the review. Through this review, Sector Columbia River clarified certain points in the WSA to ensure that the document contained accurate information and that references were applicable. With the 2017 update to the WSA, Jordan Cove has satisfied the requirements of the LOR process.

10. Based on my review of the WSA completed on November 1, 2017, and input from state and local port stakeholders, and taking into account previously reviewed expansion projects, I recommend to the Federal Energy Regulatory Commission

that the waterway in its current state be considered suitable for the LNG marine traffic associated with the proposed project.

11. This recommendation is contingent upon the applicant completing all actions outlined in the Waterways Suitability Assessment as submitted, and actions associated with subsequent annual updates, and completing all actions outlined in the most current WSA and actions under the control of the applicant from the July 1, 2008, Waterway Suitability Report.

Waterway Conditions Adjacent to the Facility

1. **Depth of Water**. The channel is currently maintained at a 37' depth.
2. **Tidal Range**. The tides of Coos Bay are of the mixed semi-diurnal type with paired highs and lows of unequal duration and amplitude. The tidal range increases upstream to the City of Coos Bay and the time difference between peak tides at the entrance and City of Coos Bay is about 40-90 minutes, depending on the location. The head of the tide is located at River Mile 27 on both the Millicoma and South Fork Coos Rivers. The tidal range is 7.5 feet near the open sea channel and 6.7 feet at the entrance to Charleston Harbor.

Table 2 Tidal Datums, Coos Bay, OR NOAA Tide Stations 9432895, 9432879, and 9432780

Tide Level	Abbreviation	Tide Level (ft) North Bend	Tide Level (ft) Empire	Tide Level (ft) Charleston
Tide Station ID #		9432895	9432879	9432780
Latitude		43° 24.6'N	43° 22.6'N	43° 20.7'N
Longitude		124° 13.1'W	124° 17.8'W	124° 19.3'W
Extreme High Water	EHW	-	-	+10.5
Mean Higher High Water	MHHW	+8.4	+7.7	+7.6
Mean High Water	MHW	+7.8	+7.1	+7.0
Mean Sea Level	MSL	+4.7	+4.2	+4.1
Mean Low Water	MLW	+1.3	+1.3	+1.3
Mean Lower Low Water	MLLW	+0.0	+0.0	+0.0
Extreme Low Water	ELW	-	-	-3.0

3. **Protection from High Seas**. The entrance to Coos Bay is similar to most harbors along the Pacific Coastline of Northern California, Oregon, and Washington. Strong winds are often experienced at North Bend on Coos Bay during the months of June, July, and August. These winds blow at 17 knots or greater 15-20 percent of the time and at 28 knots or greater 1 to 2 percent of the time. The harbor consists of a river estuary at the mouth of the Coos River. Sand and silt

from the river are carried out to the sea from this entrance. As a result of this material meeting the predominantly westerly seas and swells of the Pacific, a sandy ridge bar is formed at the mouth. This sand ridge causes the channel to be known as "a Bar Channel". As such, a breaking bar does occur in this port.

4. **Natural Hazards**. The navigational hazards in the vicinity of the project site are rock jetties on either side of the channel entrance extending into the Pacific Ocean, and a submerged jetty which extends 50 yards off the east shore of Coos Bay. Discussions and simulations with the Coos Bay Pilots Association have shown that these hazards will not interfere with normal navigation and mooring operations and the applicant has developed transit mitigations to address this issue such as not bringing vessels in or leaving them at the lay berth during conditions that are not conducive to safe navigation i.e. restricted visibility, severe weather and and/or low tides.

5. **Fishing Vessels**. Heavy concentrations of fishing gear may be expected between December 1 and August 15, from shore to about 30 fathoms.

6. **Underwater Pipelines and Cables**. Based on current pipeline charts that are available, there are three cables which are submerged approximately 20 feet running across/underneath the channel in the vicinity of the town of Empire which is on the LNG Carrier transit route.

7. **Maximum Vessel Size by Dock**. The primary dock can accommodate a vessel with a maximum length of 300 meters, 52 meters in breadth, and a draft which can be accommodated by the existing channel. Although the facility dock is able to accommodate vessels drafting up to 12m (39ft), current channel draft is 11m (37ft) with future plans to dredge the channel to accommodate larger deep draft vessels. Jordan Cove Energy Project and the local pilots must ensure transiting LNG vessels are able to maintain 10% under keel clearance as required by JCEP's LNG Transit Management Plan.

    a. The dock must be able to accommodate all vessels calling on the facility.
    b. It must be equipped with adequate numbers of mooring hooks, fendering, and mooring dolphins.
    c. The mooring arrangement must also be able to accommodate safe working loads.
    d. In coordination with appropriate stakeholders, JCLNG must develop and implement vessel mooring/unmooring procedures to ensure safe and environmentally protective operations for LNG Carriers arriving and departing the JCLNG facility.

8. **Vessel Routing**. Included in the WSA, was a plan to divide the LNG Carrier transit route into five (5) inbound, one (1) loading at berth, and five (5) outbound segments. The total inbound transit from the Sea Buoy (pilot boarding area) to the terminal berth is approximately eight (8) miles and will take between 1.5 and 2.0

hours to berth, pilots will be transiting at around 4.5 knots. The route has been divided into segments in order to manage vessel traffic and increase the safety of LNG carrier transits. This was done in conjunction with the Coos Bay Pilots Association.

The route is reversed for outbound LNG Carrier transits with the exception of the turning/maneuvering basin which is bypassed on the outbound transit where the LNG Carrier is moved directly into the Coos Bay Ship Channel. The route and segments are shown in Figure 3.

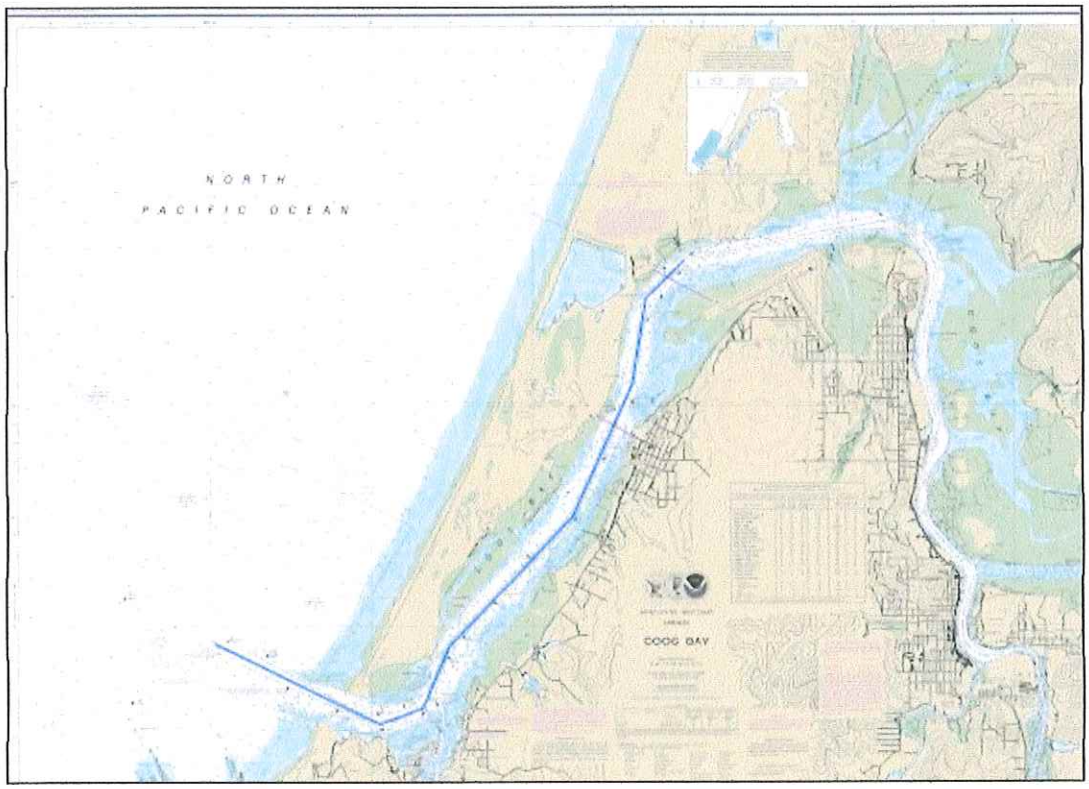

Figure 3. Overview of LNG Carrier Transit Route

9. **Vessel Operations** –LNG vessels will load cargo at the facility. 110-120 arrivals are expected at the facility annually with a dedicated fleet of LNG Carriers conducting cargo operations at the facility. A lay berth will be constructed to accommodate delays, repairs, and maintenance issues associated with Trans-Pacific Trade. Cargo operations will not be permitted at the lay berth and the applicant will outline procedures for the lay berth after the permitting process is complete.

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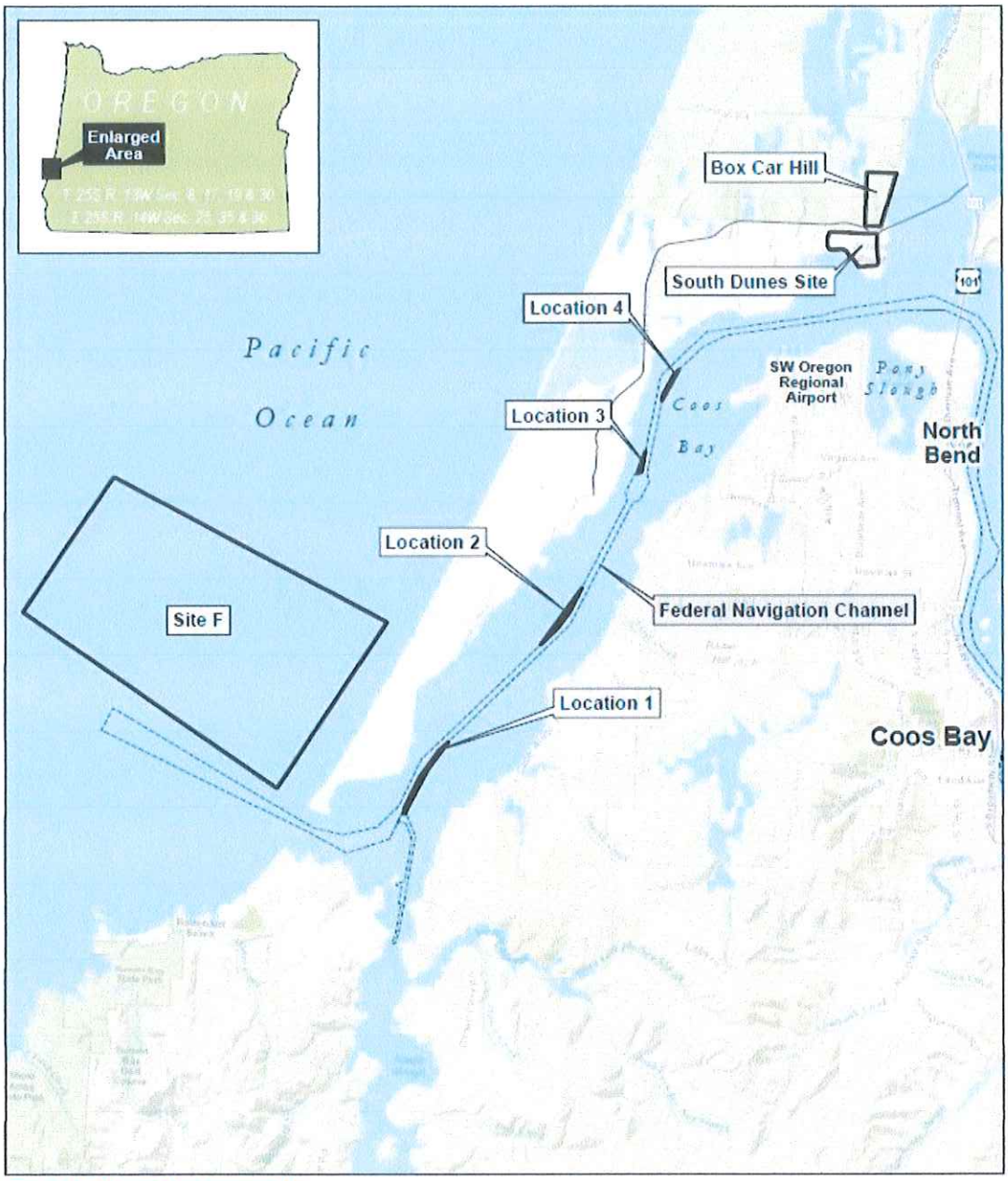

Figure 4. Channel Improvements

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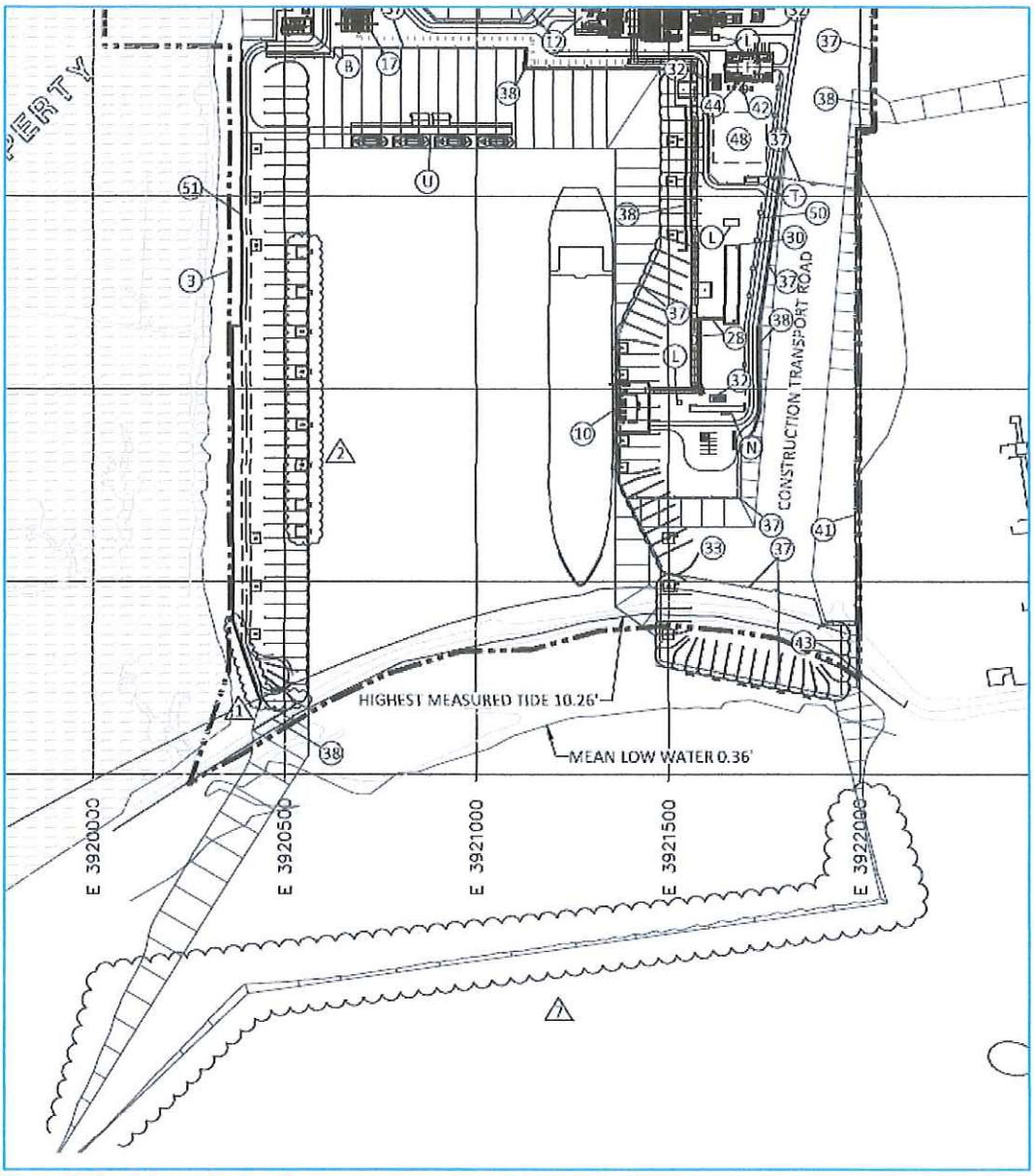

Figure 5. Dredging at the berth

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Regulations *(p9)*

Profile *(p12)*

SIGTTO NEWS

SIGTTO
Society of International Gas Tanker and Terminal Operators Ltd (SIGTTO)
17 St Helen's Place
London EC3A 6DG, UK
Tel: +44 20 7628 1124
Fax: +44 20 7628 3163
E-mail: secretariat@sigtto.org
Web site: www.sigtto.org
Twitter@SIGTTO

Issue 35 www.sigtto.org Spring 2016

MESSAGE FROM GENERAL MANAGER

SIGTTO Strategic Plan shows way forward

Andrew Clifton, the SIGTTO General Manager, describes how the Society's new Strategic Plan lays down a roadmap for the future

As LNG shipping embarks on its second half century, it is important that we do not forget the proud safety record that our industry has achieved. SIGTTO remains the industry leader for disseminating best practice procedures and providing technical support for the liquefied gas shipping and terminal sectors. In this way the Society has a central role to play in maintaining this safety record.

It is necessary for SIGTTO to reappraise its goals and adapt accordingly from time to time. This is done not only to meet the ever-changing requirements of our industry but also to ensure that we remain relevant and fit for purpose as we strive to meet the needs and expectations of the membership in the 21st century.

To facilitate achievement of these goals SIGTTO has prepared an updated Strategic Plan and the completed document was approved at the Autumn Board and Annual General Meeting in November 2015. The Plan outlines the direction that the Society intends to take for the rest of the decade and progress will be reviewed at each Board. The Strategic Plan, which is available on the SIGTTO website, is set to play a key role in the future of the Society. It is described in more detail on page 5.

The Society is funded predominantly by members' fees. These fees have remained unchanged since 2007 and are recognised as being highly competitive in comparison with those levied by similar non-governmental organisations (NGOs). In a decision not taken lightly, the November 2015 Board and AGM agreed to increase the membership fees for 2016.

There was only one space left for SIGTTO's Rick Boudiette in the group photo onboard the Royal Yacht Britannia

The increase was agreed for two reasons. First, the operating cost of the Society has steadily increased, to the point where it is now equal to the income from members' fees. This is despite the continuous rise in the number of members over the last decade. It was therefore recognised that an adjustment is required to meet the cost of the current resources and services provided to the membership.

Secondly, SIGTTO is preparing to embark on a new phase. The future vision of the Society, as laid out in the Strategic Plan, allows for a much larger Secretariat in order to meet the needs and expectations of a growing and changing membership with a more diverse range of requirements.

As this is not only the first increase in members' fees in nine years but also a modest one, SIGTTO is confident that the membership will appreciate why the revised rates have been necessary as well as the extra value that the Society will be able to provide under the new Strategic Plan. >

"Our Strategic Plan provides SIGTTO with a firm roadmap for the rest of the decade and good reason to be optimistic about the future."

IN THIS ISSUE

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Ineos is chartering Evergas ships to carry cargoes from the Mariner East ethane export terminal operated by Sunoco Logistics

Nine more onboard

Nine companies have joined the SIGTTO membership since the last Newsletter was published. The new members and their date of joining the Society are shown below. The SIGTTO membership now stands at 141 full members, 45 associate members and 26 non-contributory members.

Steelhead LNG	1 September 2015
NextDecade LLC	1 November 2015
PT Donggi Senoro LNG	1 November 2015
Jordan Cove LNG	1 November 2015
Sunoco Logistics LP	1 December 2015
Ineos	1 January 2016
Warsash Maritime Academy	1 March 2016
Wilhelmsen Fleet Management	1 March 2016
Flex LNG	1 March 2016

Steelhead LNG is promoting Malahat LNG, a Canadian export project that will make use of a floating LNG production (FLNG) vessel. The shoreside-moored facility would have the capacity to liquefy 6 million tonnes per annum (mta) of LNG for 25 years and be positioned 8km south of Mill Bay on Vancouver Island in British Columbia. Canada's National Energy Board has granted permission for the Malahat exports and Steelhead LNG is targeting a 2017 final investment decision (FID) on the project, following completion of a front-end engineering and design (FEED) study.

NextDecade is another company aiming to make an FID on a proposed North American LNG export project in 2017. The scheme in question is Rio Grande LNG, an initiative which calls for a two-train terminal with a capacity of 9 mta to be in constructed in Brownsville, Texas by late 2020. NextDecade reports that Rio Grande LNG could be expanded with the addition of four further trains in future, should the need arise.

Donggi Senoro LNG (DSLNG) operates Indonesia's third in-service liquefaction plant. The 2.1 mta DSLNG facility loaded its first cargo, a shipment for the country's Arun receiving terminal, in August 2015. The terminal is located about 25km southeast of Luwuk in Central Sulawesi. Sulawesi LNG Development - a joint venture of Mitsubishi Corp and Korea Gas Corp (Kogas) - holds a 59.9 per cent stake in the project, while PT Pertamina Hulu Energi controls 29 per cent and PT Medco LNG Indonesia 11.1 per cent. DSLNG is contracted to deliver, under long-term sale and purchase agreements, 1 mta to Chubu Electric Power, 0.3 mta to Kyushu Electric Power and 0.7 mta to Kogas.

Jordan Cove LNG plans to build an LNG export terminal at Coos Bay in the US state of Oregon. The project has been given US Department of Energy clearance to export 6 mta of LNG for 20 years to customers worldwide. Gas for liquefaction would be piped overland from deposits in western Canada. Jordan Cove LNG is a subsidiary of Veresen, a diversified energy infrastructure company that owns and operates assets across North America. Veresen is yet to take an FID on the Jordan Cove project.

Thanks to the rich Marcellus natural gas liquids shale plays of western Pennsylvania, **Sunoco Logistics** is playing a key role in the rejuvenation of Philadelphia as a leading US oil and gas port. Sunoco is bringing onstream the Mariner East ethane loading facility at its former Marcus Hook refinery complex near the city. Mariner East will have the capacity to export up to 1.9 mta of ethane. Most of the product is destined for shipment to Europe on behalf of Ineos and Borealis for use as petrochemical plant feedstock. Sunoco Logistics also operates Mariner South, a new 5.8 mta LPG export terminal in Nederland, Texas in tandem with Lone Star NGL.

Ineos is the first of a number of chemical manufacturers that have decided to utilise competitively priced US ethane as feedstock for their European petrochemical complexes. The company is chartering eight Evergas semi-pressurised fully refrigerated (semi-ref) gas carriers of 27,500m³ being built in China to handle the transport. Cargoes are being shipped from the Sunoco Logistics Mariner East terminal near Philadelphia to Ineos ethylene crackers at Rafnes in Norway and Grangemouth in Scotland.

Warsash Maritime Academy is the second establishment to join SIGTTO under the Society's new training providers membership category. Part of Solent University, Warsash pioneered the use of simulators during the 1970s and amongst its liquid cargo operations simulator (LICOS) offerings is *LNG Cargo Operations – Management Level.* This course follows the syllabus set out by SIGTTO in its suggested LNG competence standard (Second Edition 2008) at the management level.


Andrew Clifton (right) presents a certificate of membership to Nigel Hare, head of maritime professional development at Warsash

Headquartered in Kuala Lumpur, the Malaysian capital, **Wilhelmsen Ship Management (WSM)** is a provider of third party ship management services on a worldwide basis. The company boasts a portfolio of more than 450 vessels, including LNG and LPG carriers, and 11,000 active seafarers. In December 2015 WSM formed a joint venture with Aurora LPG for the technical management of Aurora's very large gas carrier (VLGC) fleet. Aurora LPG owns three 82,000m³ vessels and and this year will take delivery of six 84,000m³ newbuildings from Hyundai Heavy Industries.

Flex LNG has two 174,000m³ LNG carriers under construction at the Samsung Heavy Industries yard in South Korea. Both are due for delivery in the first half of 2018.

PAGE 6
NOTE 4

To illustrate our ***ecodevo*** clique and their manners: here they are while kicking me out of one of their secret meetings, into which I had blundered – accidentally, I assure you.

The recent County Commissioners' race between anti-LNG candidate Katy Eymann and John Sweet, an establishment figure owned by Jordan Cove, highlighted the financial corruption employed in the LNG promoters' quest to OWN Coos Bay, because they have no prospect of building their plant anywhere else in the U.S. Considering the modest size of this County's population, and the correspondingly modest financial basis of our politics, the fat wads of money that Jordan Cove has been throwing into our elections are intimidating – and probably were meant to be.

Starting with the small stuff, Jordan Cove has been making donations of a few thousand here, a few thousand there, to various civic groups. These are always well-publicized, and their meaning is clear: there's more where this came from.

Then there are the direct subsidies to government agencies, given under some cover like law enforcement assistance, or a lease of public property that buys the company nothing except loyalty. Jordan Cove has already created and financed an entire new department for the County sheriff, to provide security for their nonexistent terminal. Clearly anyone whose livelihood depends on that will be pro-Jordan Cove, as will their families and friends.[6])

> "The greatest evil…is conceived and ordered (moved, seconded, carried, and minuted) in clean, carpeted, warmed, and well-lighted offices, by quiet men with white collars and cut fingernails and smooth-shaven cheeks who do not need to raise their voice."
>
> *C.S. Lewis*

Another example is that for more than 10 years already the County has been receiving $25,000 a month from Jordan Cove, under a so-called "Interruptible Transportation Purchase Agreement", officially a 'lease' of our underused 12-inch County-owned gas supply pipeline. The original idea was that Jordan Cove could use that line's excess capacity to send out the natural gas

[6]) "Combined Services Unit prepares security measures for Jordan Cove - The unit has been around for two years, contracted out by Jordan Cove for its potential LNG terminal," *The World,* Dec 28, 2018.

from the now long-dead LNG *import* terminal, something they have never done, of course. And it's not likely to be used for bringing gas to their hoped-for LNG *export* plant either, because that one will be fed by the hoped-for, much bigger 36" pipeline. But the "*Interruptible Transportation Purchase Agreement*" continues in force, so the County is still getting $300,000 a year from Jordan Cove for – essentially – nothing, except the County Commissioners' keen awareness of who can really pay the piper. At the signing of the "Interruptible Transportation Purchase Agreement", Jordan Cove gave the County a $200,000 bonus, and promised another $200,000 bonus "... if and when Construction is Commenced on an LNG facility within the boundaries of Coos County, Oregon." Perhaps that clause's Copious Capitalization was designed to impress the County

COOS COUNTY

Sweet: "There is no plan B"

January 11, 2015 by magix 34 Comments

The county will "just shrivel up and rot"

The League of Women Voters held a discussion yesterday at the Coos Bay Fire Hall about the CEP (Community Enhancement Plan). It was more a promotion than a discussion, actually, because the only people presenting or taking questions were proponents of the plan. Commissioner John Sweet and Coos Bay City Councilwoman Jennifer Groth offered a primer about enterprise zones and when I arrived about 45 minutes late there was the familiar pie chart on the board showing the various allocations of what should public tax money. The South Coast Community Foundation will receive its 50%, 25% to the so-called waterfront improvement plan and the remainder divided between the actual taxing districts.

Roughly thirty people were in attendance and based upon the questions it is clear not all were in favor of either Jordan Cove or the CEP. One woman asked if the CEP work group had actually done an analysis of the actual economic impact of supporting the worker camps and the increase in traffic and crime. "Have you allocated enough funds to cover the city's expenses?" Sweet explained the work group had not done an actual study but he was confident there would be enough money.

Others asked if the work group had looked at worst case scenarios. "What happens if Jordan Cove doesn't happen," asked one teacher. "Worse, what happens if Jordan Cove is built and then shuts down?"

"Are we going to be left with that eyesore and all the pollution," asked another.

When Sweet replied that "there is no plan B" half the room gasped audibly. Sweet quickly retreated by assuring the crowd there is no need to plan because Jordan Cove was working on contracts with big Asian energy companies that "don't go out of business" and are "not in China." Sweet said he had complete confidence in Jordan Cove because they have already spent $200 million, (a drop in the bucket for oil and gas), and continue to spend $10 million each month so they are not likely to walk away.

Sweet then asked, "What pollution?" Mouths fell open.

If the company does walk away, or does not receive the required state and federal permits before the end of June 2016, the county will face a $2 million budget shortfall, according to Commissioner Bob Main. Sweet said that without a payment from Jordan Cove through the CEP the commission will have to "make drastic cuts in services" in this next budget cycle. While there is no firm agreement with Jordan Cove to make payments in lieu of taxes via the CEP, company spokesman Michael Hinrichs doesn't expect a FERC approval before 2016 and there are other hurdles to cross.

Thanks to Sweet and Cribbins willingness to give part of the county's share to the waterfront enhancement component of the CEP, even if Jordan Cove breaks ground in time to actually begin making payments, it will not be enough money to avoid layoffs at the county.

Mike Graybill was in attendance and asked if it might not be a good idea to avoid "external dependencies" to which Sweet replied, "we have to be dependent." Without Jordan Cove "Coos County will shrivel up and rot!"

Commissioners, but the money must have impressed them a great deal more.

Everything County Commissioner John Sweet does shows that he is Jordan Cove's lap dog. The report above, from a local blog, illustrates this well. Sweet continues to issue dire warnings that if we don't support Jordan Cove, great calamities will befall us. But those warnings, shown above, are now four years old.

On October 9, 2018, I lodged a complaint with the Federal Elections Commission, alleging violations of Section 319 of the Federal Election Campaign Act of 1071 (2 U.S.C.441e), as amended by Public Law 107-155 - Mar. 27, 2002, covering "Contributions and Donations by Foreign Nationals." Jordan Cove qualifies as such because it is 100% Canadian, originally owned by Veresen of Calgary, Alberta, and more recently by Pembina, a pipeline company also headquartered in Calgary. Moreover all of the handful of corporate entities operating as "Jordan Cove" are registered as "foreign" with the Oregon Secretary of State's office.

Incidentally, although there has been much patriotic talk about Jordan Cove serving our *national interest by exporting* American natural gas as LNG, official documents show that all, or almost all of the gas, is likely to be Canadian, which has generated excitement in Canadian government circles. This is obvious in a 'Project Description' appended to a 'Letter Decision' in 2014 by Canada's National Energy Board. That 'Letter Decision' granted Jordan Cove a license to export more than enough Canadian gas to fill the needs of its Coos Bay terminal.[7]) Chapter A to that document stated:

3. The proposed location of Jordan Cove has benefits for Canada, Western Canada's natural gas producers, and Alberta's petrochemical industry. By utilizing existing natural gas transmission systems in Alberta and British Columbia, natural gas supplies for Jordan Cove can be entirely sourced from the Western Canadian Sedimentary Basin ("WCSB"), keeping pipelines and related facilities used and useful, resulting in lower tolls. ...

---

[7]) Letter Decision, 20 February 2014, National Energy Board/Office national de l'énergie, File OF-EI-Gas-GI-J705-2013-01 01, to Kevan King and L.E. Smith, Q.C.

PAGE 8
quotes

Jordan Cove LNG
111 SW 5th Ave Suite 1100
Portland OR 97204
T 971.940.7800

www.jordancovelng.com

Jordan Cove Energy Project, L.P.

Pacific Connector GAS PIPELINE

60697-RF

RECEIVED
MAY 09 2019
DEPARTMENT OF STATE LANDS

May 9, 2019

Mr. Bob Lobdell, Aquatic Resource Coordinator
Oregon Department of State Lands
775 Summer St. NE, Suite 100
Salem, OR 97301-1279

Re: Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP
Removal/Fill Application – Response to ODSL April 10, 2019 Additional Information Request

Dear Mr. Lobdell:

On November 7, 2018, Jordan Cove Energy Project L.P. (JCEP) and Pacific Connector Gas Pipeline, LP (PCGP) submitted a Removal/Fill Application to the Oregon Department of State Lands (ODSL). The ODSL provided a sixty-day public comment period on the application, which occurred from December 6 to February 3, 2018. Further, ODSL held five public during this same time. On February 22, 2019, the ODSL provided the Applicants a Request for Assistance Responding to Public Comments, which the Applicants responded to on March 1, 2019. On April 10, 2019, ODSL requested that we provide ODSL with responses to substantive comments received by ODSL during the comment period. Our response to that request is attached to this letter.

We request that ODSL post this response to your website to make the Applicants' responses available to the public and all commenters.

Jordan Cove appreciates ODSL's review efforts to date and looks forward to continued work together on the Removal/Fill authorization. Should you have any questions, please contact Derik Vowels at dvowels@pembina.com or 971-940-7800.

Sincerely,

/s/ Natalie Eades

Natalie Eades
Manager, Environment and Regulatory
Jordan Cove Energy Project L.P.
Pacific Connector Gas Pipeline, LP

cc: Eric Metz – ODSL

Furthermore, the majority of the dredge material transport pipeline would be located outside the FNC, where the potential for deposition of sediments in the event of a pipeline break is minimized.

F. The Slip and Access Channel, Pile Dike Rock Apron, and NRIs Are Necessary Project Components to Meet the Purpose and Need, and JCEP Has Minimized Impacts to Special Aquatic Sites and Has Proposed Mitigation for Unavoidable Impacts

Commenters claim that insufficient alternative analysis was undertaken on slip and access channel design, the pile dike rock apron, and the NRIs. JCEP has evaluated several different options considering the life of the LNG Terminal for both the slip and the access channel. JCEP has also worked alongside the USCG in the overall access channel and slip design and configuration. The access channel has been modeled and tested to determine the optimal configuration. This has been accomplished with USCG observation using two different modeling systems.

The need to provide sufficient maneuvering room for both the LNG carrier and supporting tractor tugs is the primary basis of design for both the access channel and the slip. JCEP utilized the expertise of the local Coos Bay Pilots Association in reviewing the configuration of the access channel in relation to the slip and the main FNC. The Coos Bay Pilots are considered to be the local experts in ship handling, ship maneuvering, proper use and size of tractor tugs, and the incorporation of safety margins. The width of the slip also accommodates the USCG request for safe harbor for a disabled LNG carrier, which the Applicants have proposed within the lay berth on the west side of the slip and which is further detailed in the JPA Section 5 Part 1.

Commenters also request alternatives analysis on the slip design and documentation supporting the statement that the dredging for the NRIs is needed for the proposed dimensions of vessels. Using the larger size design accommodates a wider variety of LNG carriers without arbitrary limits. The WSA (Waterway Suitability Assessment) (refer to *Suitability of a Waterway for Liquefied Natural Gas [LNG] Marine Traffic*, Attachment A) used a typical ship in service at the time as a reference point and typical LNG carrier for Coos Bay. This LNG carrier model demonstrated that larger LNG carriers could properly utilize Coos Bay with appropriate measures and was approved by the USCG (Attachment A). Unfortunately, this size ship is no longer being produced, and those currently in service may or may not utilize the JCEP marine terminal. More recent LNG carrier design and construction trends and JCEP reviews have identified the potential for slightly larger dimension LNG carriers for service to the U.S.

The movement of any product attempts to utilize full capabilities, maximize efficiency, and reduce the costs of transportation. An example of this is the very large container vessels (18,000 twenty-foot equivalent units (TEUs)) being placed into service between Asia and the U.S. West Coast. Historically, container ships have carried 2,500 to 4,800 TEUs, and it was generally believed that a 12,000 TEU container ship was the largest the West Coast would ever see. This limit has been far exceeded based upon recent trends.

JCEP is a member of Society of International Gas Tanker and Terminal Operators (SIGTTO) and adheres to its principles. The SIGTTO Information Paper 14[3] states: "This paper addresses safety issues for LNG ports. It focuses on the elimination of spillages both at the ship/shore interface and in navigational approach channels. The paper concentrates on issues which can be solved when a port is being designed and is, therefore, of benefit to harbor planners and port authorities. Flowing from these considerations, the paper outlines a way forward for the site selection of LNG terminals, establishes a basis for safe jetty design and considers safety factors in the port approach." The paper was developed for LNG projects where ports do

[3] Site selection and design for LNG ports and jetties: With views on risk limitation during port navigation and cargo operations. 1997. Society of International Gas Tanker and Terminal Operators.

not yet exist and are being developed. The Port of Coos Bay is not within this category. JCEP has, however, used the paper's concepts in addressing risk.

"This paper (SIGTTO) proposes the adoption of the recommendations outlined in chapter 2. However, criteria such as that for channel width, should not be understood as absolute values; these recommendations are just basic guides to prompt special enquiry into particular aspects. Furthermore, the actual values quoted together with their risk reduction effect, still depend upon local conditions which have to be covered individually, port by port."

What is not considered in the SIGTTO Information Paper 14 is the risk assessment conducted based upon the conditions at the specific port where any LNG marine terminal is proposed. SIGTTO states, "Once the port is in operation, the risks identified during planning should be controlled by suitable equipment and pre-arranged procedures." JCEP has worked for 14 years with federal, state, and local agencies, and the Coos Bay Pilots in developing the proper mitigation measures to overcome and mitigate the potential risks identified. The WSA itself is the primary safety risk assessment and has been enhanced by simulation modeling. This simulation modeling has been witnessed by those same federal and state agencies and the Coos Bay Pilots. JCEP has described and has demonstrated to the waterway experts (USCG and Coos Bay Pilots) the ability to effectively implement the mitigation measures to ensure the waterway is suitable for LNG carrier traffic. The SIGTTO-recommended values in the Information Paper do not consider the location-specific risk assessments conducted and the mitigation measures that have been agreed with the maritime experts of these agencies.

One commenter also questions the need for the pile dike rock apron and the use of rock armoring. JCEP developed the design for the pile dike rock apron at the direction of the USACE to arrest migration and prevent effects on pile dike 7.3. Rock armoring was determined to be the most effective means of meeting this purpose from an engineering perspective, while allowing for safe navigation and limiting impacts on special aquatic sites. No technical or feasible alternative was raised by the commenter.

The designation of the lay berth was proposed at the request of the USCG to consider where an LNG carrier could be taken for a very short period of time while awaiting berthing. There are no other docks available in Coos Bay, and the Applicants have committed to no anchoring of the LNG carriers offshore. Normally, vessels would anchor offshore and await entry. The lay berth provides the ability to deal with waterway management, tides, personnel, and resource issues. It also prevents the LNG carriers from interfering with the important fisheries in the offshore area when anchored.

The slight increase in the number of ships per year in the current WSA is based on the expected output of the facility once in operation that is required for the economic threshold in meeting the purpose and need.

G. The Project Does Not Include the Disposal of Contaminated Material in the Kentuck Site

Material to be deposited at the Kentuck site would be dredged from the access channel and excavated from the portion of the Ingram Yard site where the slip will be constructed. Material that would be excavated from upland areas of the LNG Terminal site to create the slip has been subject to several Phase I and Phase II Environmental Site Assessments (ESAs), as detailed in DEIS Section 4.2. Overall, soils at the site have been found to have low levels of contamination that are below ODEQ screening levels. Any soils and/or sediments containing residual contamination must be managed and/or disposed in accordance with ODEQ rules. Material dredged from the access channel would pose no risk of contamination. A January 19, 2016 dredged material Suitability Determination Memorandum (SDM) issued by the Portland Sediment Evaluation Team (PSET) and contained in Attachment F of the JPA found that sediments in the access channel were suitable for unconfined aquatic disposal, and thus free from contamination risk. Based on the

PAGE 9 quotes at top

1.5	**Port Procedures**
	Traffic control or VTS systems should be strictly enforced to ensure safe harbour manoeuvring between the pilot boarding area and the jetty.
	Speed limits should be introduced in appropriate parts of the port approach, not only for the LNG carrier but also for other ships.
	Pilotage services should be required to provide pilots of high quality and experience. Pilot boarding areas should be at a suitable distance offshore.
	Ship movements by nearby ships, when the LNG carrier is pumping cargo, should be disallowed.
	Pilots and tugs should be immediately available in case the LNG carrier has to leave the jetty in an emergency.
1.6	**Port Operating Limits**
	Environmental limits for wind, waves, and visibility should be set for ship manoeuvres and these should ensure adequate safe margins are available under all operating conditions.
	Weather limits for port closure should be established.
1.7	**Weather Warnings**
	Forecasting for long range purposes should be provided to give warning of severe storms, such as typhoons and cyclones.
	Forecasting for short range purposes, such as those required for local storms and squalls, should be made available.
2	**The Jetty**
2.1	**Jetty Location**
	Jetty location should be remote from populated areas and should also be well removed from other marine traffic and any port activity which may cause a hazard.
	The maximum credible spill and its estimated gas-cloud range should be carefully established for the jetty area.
	River bends and narrow channels should not be considered as appropriate positions for LNG carrier jetties.
	Breakwaters should be constructed for jetty areas exposed to sea action, such as excessive waves and currents.
	Restrictions, such as low bridges, should not feature in the jetty approach.
	Ignition sources should be excluded within a predetermined radius from the jetty manifold.
2.2	**Jetty Layout**
	Mooring dolphin spacing - between the outermost dolphins - should not be less than the ship's length (approximately 290 metres).
	Mooring dolphins should be situated about 50 metres inshore from the berthing face.
	Mooring points should be suitably positioned, and have suitable strength, for the environmental conditions.
	Quick-release hooks should be provided at all mooring points.

10.3 EXAMPLES

In this section practical application of the recommendations given in sections 10.1 and 10.2 is illustrated by simplified examples for a hypothetical port. The port in question is shown in Figure 3.

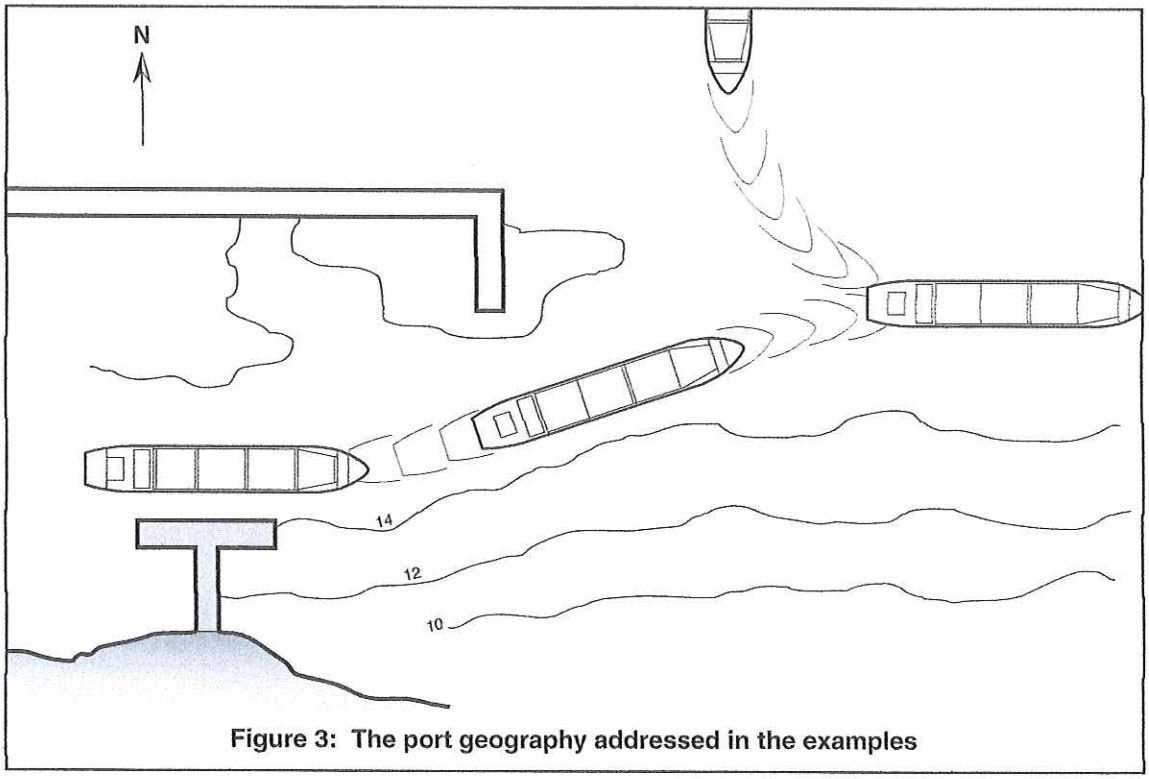

Figure 3: The port geography addressed in the examples

10.3.1 Striking a Fixed Structure - Example 1

Harbour entry is carried out in accordance with the manoeuvre illustrated in Figure 3. This involves moving stern-first through the port entrance under the control of tugs.

The following conditions are assumed to apply:

- Tug numbers, tug power, and operating conditions are specified for the port such that the LNG carrier is fully controlled by tugs alone, even in case of ship engine failure.
- Penetration of the ship's outer hull, through striking the corner of the harbour wall, is calculated to require a side-on speed of 5 knots. Furthermore, the calculations show that this damage will not extend to the cargo tank containment system. (For this scenario, the worst case condition occurs with impact on the ship's parallel body and with the transverse velocity at 90° to the point of impact).
- Misjudgment by those controlling the manoeuvre is assumed.
- At a point on the ship's track (from which impact on the corner of the harbour wall is possible) simultaneous failure of the ship's engines, and sufficient of the tugs for loss of control, is assumed. This is assessed as being possible once in 5 million operations.
- The most likely part of the ship to strike the wall is the ship's stern structure. Collision damage in this area cannot put the cargo containment system immediately at risk.

PAGE 10 AT TOP

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	Mooring points should be suitably positioned, and have suitable strength, for the environmental conditions.
	Quick-release hooks should be provided at all mooring points.

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PAR. 3

NOMENCLATURE

BSI	British Standards Institute
CEN	Comité Européen de Normalisation
ESD	Emergency Shut-Down
ERS	Emergency Release System; a system comprising all ESD and PERC measures
IALA	International Association of Lighthouse Authorities
IAPH	International Association of Ports and Harbors
ICS	International Chamber of Shipping
ISGOTT	International Safety Guide for Oil Tankers and Terminals
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas (butane and propane)
OCIMF	Oil Companies International Marine Forum
PERC	Powered Emergency Release Coupler, with its adjacent quick-acting block valves. This is a device providing a virtual spill-free means of quick disconnection of the hard arm in emergency situations. The block valves are interlocked with the coupler to ensure dual action.
PIANC	Permanent International Association of Navigation Congresses
SIGTTO	Society of International Gas Tankers and Terminal Operators Ltd
TSS	Traffic Separation Scheme
VTS	Vessel Traffic Services

PAGE 14

3 quotes

1 SUMMARY

This paper addresses safety issues for LNG ports. It focuses on the elimination of spillages both at the ship/shore interface and in navigational approach channels. The paper concentrates on issues which can be solved when a port is being designed and is, therefore, of benefit to harbour planners and port authorities. Flowing from these considerations, the paper outlines a way forward for the site selection of LNG terminals, establishes a basis for safe jetty design and considers safety factors in the port approach. In developing its first aim, the paper examines existing industry guidelines covering cargo operations at the ship/shore interface. Indeed, the paper suggests that LNG's excellent safety record owes much to the adoption of existing standards. However, with the industry becoming more widespread, as a second aim, continuing success depends not only on better acceptance of existing standards but also on future improvements. Some of these newer aspects are described and a check list is presented in the Appendix giving an overall package of the items considered most essential for LNG.

Bearing in mind the high commercial exposures within LNG projects, the need to maintain its good safety record is vital to all companies concerned. Furthermore, an incident in one port could have serious knock-on effects in others, and may herald constraints in new projects elsewhere. These concerns, coupled with the dangers perceived during public inquiries into LNG transport, make a very strong case indeed for a continuing high level of safety to be applied.

On ships the good safety record for LNG operations is predicated on an excellent standard of management, high quality crews, the structural robustness of ships' hulls and back-up control systems. On shore, also of importance, are the select number of well managed terminals. At these plants the focus of national agencies, port authorities and terminal managers ensure that safety in operations is always an important element.

However, although LNG has an enviable record it is not risk free. Not only are some hazards difficult to eradicate; an accident, albeit rare, is possible as a result of human error or catastrophic event such as an earthquake. Moreover, technical limitations can have an effect and site location may not always achieve a port design which is entirely risk-free. It can be seen, therefore, that there can remain a very remote chance for some incidents to occur. However, a large release of LNG such as through a damaged hard arm or a ruptured cargo containment system — central themes in this paper — should be specially addressed during port design.

Important matters which should be dealt with when choosing the location of a new terminal are covered in the paper. Apart from general considerations, these emphasis the need for the introduction of risk management techniques. A fact which helps to ease the acceptance of these newer concepts in the LNG trade is its relatively close-knit nature and because most of the trade is held by only a few companies within well-defined limits. Also, investments in LNG projects are such that equipment quality can be planned to a high standard.

This paper proposes the adoption of the recommendations outlined in chapter 2. However, criteria such as that for channel width, should not be understood as absolute values; these recommendations are just basic guides to prompt special enquiry into particular aspects. Furthermore, the actual values quoted together with their risk reduction effect, still depend on local conditions which have to be covered individually, port by port.

3 ACKNOWLEDGMENTS

The content of this paper is based on reports from a company having SIGTTO membership and, in this respect references [1] and [2] were most valuable. The navigational aspects, as detailed in chapters 9 and 10, came about as personnel in that company assessed marine operational risks for new LNG terminals. In one case, the new project was in Europe where the project analysis was carried out in accordance with a European Council Directive for assessing risks and environmental impacts. This is a process which, while being driven by national law, is also of direct concern to the companies involved.

These requirements led the project leaders to consider how the risk of some classes of accident might be better established and, in particular, what the consequences of a large LNG release might be, either in the port approach — due to grounding or collision; or alongside — due to fracture of the hard arm.

The company concluded that such a large release of LNG had never happened. Nevertheless, in some situations such an event was found to be feasible. From a marine viewpoint the scenarios which could lead to a major release were identified and recommendations were prepared to further reduce the chance of any such happening.

This paper also draws on earlier publications from SIGTTO and similar societies which are relevant to the management of port risks.

4 INTRODUCTION

At the time of site selection, the level of marine risk is determined by the position chosen for the terminal and this is especially true of terminals handling hazardous cargoes such as LNG. Once the port is in operation, the risks identified during planning should be controlled by suitable equipment and pre-arranged procedures. This should include the on-going need to keep other industry or populations remote from the plant.

As can be seen from much of its earlier work, SIGTTO urge acceptance of a wide range of equipment and procedures for the reduction of operational risk. To supplement past work, this paper recommends that for new sites the LNG terminal, and its port area, should be examined as a unique risk system. This paper focuses, therefore, on accident exposure and risk management not only during cargo operations alongside, but also during the port transits of LNG carriers.

Implicit in site selection is the recognition of risk. As described elsewhere [3], risk consists of a combination of event frequency and consequence. Thus, port designers are often faced with a number of choices when selecting a site, and these choices can arise from a variety of competing pressures. As described in risk assessment theory, operational solutions are found by acceptance, or non-acceptance, of some categories of risk. However, whatever remote frequencies may be tolerated for a smaller release, there is no acceptable frequency for a large release.

In essence, the issue being addressed is how best to minimise port risks by design factors at the start of a project. As can be seen in the paper there are three components in this equation. Initially questions on satisfactory jetty position and design are covered. Operational procedures are then addressed. Thereafter, having questioned the robustness of these procedures with respect to human elements, the consequences of collisions and groundings are studied and methods of limiting the effect of such accidents are considered. By this means, any high risk scenario is identified during design and this then requires special handling to restrict occurrence.

From a navigational standpoint and as alluded to in the above paragraph, the paper suggests that while the human controls called upon during ship manoeuvring deserve high ranking, of themselves, they can never be considered one-hundred per cent secure: this is because questions of human error can prevail. However, back-up is achieved if it is known that, in a grounding or collision, an LNG

carrier's cargo containment system is most unlikely to be breached. To achieve this end, a detailed study of each port approach is needed and, to give this subject greater clarity, examples are given at section 10.3.

To cover the main risks (as identified), the possibility of liquid spillage during cargo operations at the jetty is also discussed. Here, a three stage solution is offered. First, well deployed moorings. Second, well engineered and interlinked ESD systems. Third, the fitting of PERCs, with quick-acting valves included on either side; all controlled by an ERS system.

Having addressed all risks — big and small — alongside and in the port approach, an outcome from the risk analysis which makes an accident virtually impossible is clearly the most satisfactory. If, however, the outcome shows consequences of a serious nature then, clearly, it is necessary to draw up detailed contingency plans. But, in some circumstances, such as a large LNG release close to a populated area, it may be impossible to devise a realistic contingency plan because of the nature of the problem. Herein lies a conundrum which may only be resolved by further reducing the chance of a major release by designing-out the problem.

The precautions, as recommended by SIGTTO in this paper, do not offer a single package that reduces operational risk to some quantifiable and acceptable level; indeed it is suspected that the pattern of operational risk is too complex to be easily handled in this way. However, this cautionary note aside, the industry's objective must be to further reduce risk whenever possible.

Of course, the safety of life is vital, and so also is continuing public confidence in the trade. However, the enormous financial exposures of LNG projects also must be safeguarded. In some circumstances it is found that the protection given to save life also protects the commercial exposure. In other cases, however, personal safety can be assured while unacceptable business risks remain - so suggesting the improved standards, as recommended in this report, are necessary not only due to personnel hazards but also to protect the business risk.

Important factors such as personnel training, contingency planning or matters of a general safety nature are not covered in this paper; the aim has been to focus more on matters of equipment and issues of navigational interest. Nevertheless, these extra factors are fundamental to future safety in the LNG sector and, as a matter of course, should always be taken into account.

5 DEVELOPMENT OF LNG STANDARDS

The history of developments in the LNG industry has been marked by two separate but interwoven strands. Firstly there was a continuous effort to design systems to reduce the probability of large escapes of gas. On the other hand extra standards — often oil industry based — were re-specified in light of experience and technological improvement. Indeed, as the LNG industry moves into the 21st century it remains true that future improvements should not be altogether separated from progress in the oil world and, where possible, LNG terminalling standards should continue to grow in parallel with port operations generally.

An example of an LNG standard having developed along technological lines is that covering on-shore storage tanks. For a period, earthen embankments were used for support against the force of sudden release from the inner tank. Subsequently, through adoption of improved inner tank material, the probability of catastrophic crack propagation was much reduced. Now, earthen bunds are no longer needed. Similar changes occurred in the design of LNG carriers, where sophisticated methods for assessing crack propagation now allow the secondary barrier to be omitted in two free-standing cargo containment systems - the Moss Rosenberg spherical design and the IHI prismatic design.

To date, the greatest investment to reduce port risks is the limitation of gas escape at the ship/shore interface and on the jetty. Here the application of industry recommendations for jetty design and mooring systems [4] provides a secure base for LNG transfer. Furthermore, the references mentioned in chapter 6 direct port designers to construct jetties handling hazardous cargoes in remote areas

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where other ships do not pose a (collision) risk and where any gas escape cannot affect local populations. When this advice is combined with that from SIGTTO [5] — as outlined in section 7.2.2 — risks at the jetty are vastly reduced.

It can be seen, therefore, that progress in defining LNG standards have taken a step-by-step pattern which can be summarised as follows:

- a start was made with the existing framework of standards for oil
- these were then adapted for the characteristics of LNG
- changes in shipping and terminalling standards were then addressed, and
- finally the engineering challenges for cryogenic systems were answered

Present day standards for limiting problems are thus the result of sensible evolution rather than a well-focused set of risk related measures. Indeed, experience shows that the process was, simply, one of progressive improvement, the motivation being a desire to make operations safer. However, it is at the time of site selection that the foundations of high quality risk management can be laid and where overall cost/benefit judgements are best formed and it is in these areas where this paper recommends the introduction of risk management techniques.

Although the criteria for site selection may differ between LNG terminals, the majority are common to all. Some, such as the proximity of the plant to centres of population, lie beyond the pure marine interest and outside the main scope of this paper. But others, including the harbour movements of LNG carriers, the density of marine traffic (covering the nautical risks to LNG carriers) and the terminal itself, much influence the overall risk which eventually has to be controlled and these concepts are covered in more detail in the following chapters.

6 SITE SELECTION

6.1 GENERAL

At its most elementary level, site selection for LNG loading terminals is predicated by the location of production areas and, at receiving terminals, the situation is dependant upon the location of markets. Thereafter, fine tuning within the selection process is influenced by the optimisation of infrastructure costs such as gas transmission systems, access to trunklines and other distribution networks.

Hence, site selection is driven largely by factors aimed at minimising transportation and storage costs. With this in mind, it can be appreciated that marine criteria are only a part of the overall process. Therefore, at the stage of site selection, input from marine experts consists mainly in optimising fleet capacity (numbers and sizes of ships) and checking civil engineering matters at the ship/shore interface, at the terminal and in the terminal/port approach. This latter aspect is achieved by obtaining the required depth of sheltered water, providing good access to the sea and achieving immediate adjacency to the LNG terminal.

From a marine viewpoint there is little prospect to escape from these basic factors. Prices and hence, to a large extent demand, remain linked to the costs of alternative energies and, LNG's unique environmental benefits notwithstanding, the product must retain market competitiveness. Thus, as the future unfolds, continuing efforts to economise on handling costs and freight rates are likely.

In the site selection process the challenge, therefore, is to limit marine risks while positioning the jetty within realistic limits. Already there are generally accepted criteria and regulatory requirements to guide port designers in achieving this synthesis and most are covered in this paper.

6.2 JETTY LOCATION

The recommended site selection process removes as many risks as possible by placing LNG terminals in sheltered locations remote from other port users. References [6], [7] and [8] all direct port designers to construct jetties handling hazardous cargoes in remote areas where other ships do not pose a (collision) risk and where any gas escape cannot affect local populations.

Furthermore, choosing a jetty position within a sheltered location limits the dynamic forces acting on a ship from sea-waves which, in turn, could break a ship's mooring lines. Considering the standard LNG carrier of about 135,000 m^3 capacity, the waves likely to have such effects are those approaching from directly ahead or astern, having *significant heights* exceeding 1.5 metres and *periods* greater than 9 seconds. Seas approaching the berthed ship from an incidence angle of 90° (to the bow) have much lower cut-off points. It is, therefore, recommended that harbour protection be provided against low frequency waves, either by choice of location or by construction of an effective breakwater. Alternatively, an enhanced mooring system may be designed, suited to dynamic effects (but also taking into account the suitability of gangway access for the moving ship). Without such assurance the mooring system, which is the only defence against ship break-out, could be put at risk.

Jetty location should also be chosen to reduce the risk of passing ships striking a berthed LNG carrier but subjective judgement comes into assessing safety from this standpoint. The acceptability of such positions should be determined only after detailed consideration of local circumstances. However, as far as port design is concerned, some features are clear cut. For example, positioning an LNG terminal on the outside of a river bend raises the risk that a passing ship may strike the berthed carrier if the manoeuvre is not properly executed. This is possible because, at some point on the bend, the manoeuvring ship must head directly at the berthed LNG carrier. In this respect, and following the reasoning in reference [3], ships of over 10,000 tonnes displacement operating at normal harbour speeds — say 10 knots — when striking at 90°, present a hazard to a berthed LNG carrier's containment system. It follows, therefore, that building a jetty in such locations is normally considered unsuitable.

Furthermore, large ships passing near to a berthed LNG carrier can cause surging or ranging along the jetty, with consequential risks to the moorings and this phenomenon should be guarded against. This can occur at jetties located in channels used by large ships and, because of this, these positions are not recommended.

The added risks from increased traffic encounters, and extended shallow-water navigation, when positioning an LNG jetty farther inside a port, must also be considered — but these risks are covered more fully in chapters 9 and 10.

As can be seen, choosing the site for an LNG jetty comprises a mixture of checks, some derived from quantitative analyses, others owing more to subjective judgement. However, when considering an LNG carrier alongside, site selection is directed mainly at minimising the risks of ship strikings, limiting interactive effects from passing ships and reducing the risks of dynamic wave forces within mooring lines.

7 DESIGN CRITERIA FOR JETTIES

When the site selection process finally establishes the best position for an LNG terminal, its design is set within two sets of criteria — root criteria and specific criteria. These are categorised as shown below.

7.1 ROOT CRITERIA FOR HAZARDOUS LIQUID CARGOES

Basic safety for gas, chemical or oil tankers and their respective terminals is governed by ISGOTT [9]. This book contains an essential list of design and operational practices and is amended from time to time in accordance with new experience. In addition to ISGOTT, in establishing safe designs, the use of other guidelines published by SIGTTO, OCIMF, IAPH, PIANC, IALA, and BSI is encouraged. Some of these documents are referred to in chapter 11 — see references [10], [11] and [12]. However, most of these industry documents are general in nature and seldom discuss event frequency nor, for that matter, specific ship-types. In order to cover the hazards more effectively, reference [13] is of help in the gas trades — although written more from the viewpoint of existing plant.

Until the publication of this paper, within the standard suite of industry publications, the possible consequences of an accident are also left largely unaddressed. Previously, it was only reference [14] which gave some guidance on this subject. However, taken together, these older sources provide a robust framework of root criteria around which jetty designs are established and other standards (specific criteria — see below) are then specially tailored to the needs of LNG.

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4th quote + SIGTTO source

not yet exist and are being developed. The Port of Coos Bay is not within this category. JCEP has, however, used the paper's concepts in addressing risk.

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What is not considered in the SIGTTO Information Paper 14 is the risk assessment conducted based upon the conditions at the specific port where any LNG marine terminal is proposed. SIGTTO states, "Once the port is in operation, the risks identified during planning should be controlled by suitable equipment and pre-arranged procedures." JCEP has worked for 14 years with federal, state, and local agencies, and the Coos Bay Pilots in developing the proper mitigation measures to overcome and mitigate the potential risks identified. The WSA itself is the primary safety risk assessment and has been enhanced by simulation modeling. This simulation modeling has been witnessed by those same federal and state agencies and the Coos Bay Pilots. JCEP has described and has demonstrated to the waterway experts (USCG and Coos Bay Pilots) the ability to effectively implement the mitigation measures to ensure the waterway is suitable for LNG carrier traffic. The SIGTTO-recommended values in the Information Paper do not consider the location-specific risk assessments conducted and the mitigation measures that have been agreed with the maritime experts of these agencies.

One commenter also questions the need for the pile dike rock apron and the use of rock armoring. JCEP developed the design for the pile dike rock apron at the direction of the USACE to arrest migration and prevent effects on pile dike 7.3. Rock armoring was determined to be the most effective means of meeting this purpose from an engineering perspective, while allowing for safe navigation and limiting impacts on special aquatic sites. No technical or feasible alternative was raised by the commenter.

The designation of the lay berth was proposed at the request of the USCG to consider where an LNG carrier could be taken for a very short period of time while awaiting berthing. There are no other docks available in Coos Bay, and the Applicants have committed to no anchoring of the LNG carriers offshore. Normally, vessels would anchor offshore and await entry. The lay berth provides the ability to deal with waterway management, tides, personnel, and resource issues. It also prevents the LNG carriers from interfering with the important fisheries in the offshore area when anchored.

The slight increase in the number of ships per year in the current WSA is based on the expected output of the facility once in operation that is required for the economic threshold in meeting the purpose and need.

G. The Project Does Not Include the Disposal of Contaminated Material in the Kentuck Site

Material to be deposited at the Kentuck site would be dredged from the access channel and excavated from the portion of the Ingram Yard site where the slip will be constructed. Material that would be excavated from upland areas of the LNG Terminal site to create the slip has been subject to several Phase I and Phase II Environmental Site Assessments (ESAs), as detailed in DEIS Section 4.2. Overall, soils at the site have been found to have low levels of contamination that are below ODEQ screening levels. Any soils and/or sediments containing residual contamination must be managed and/or disposed in accordance with ODEQ rules. Material dredged from the access channel would pose no risk of contamination. A January 19, 2016 dredged material Suitability Determination Memorandum (SDM) issued by the Portland Sediment Evaluation Team (PSET) and contained in Attachment F of the JPA found that sediments in the access channel were suitable for unconfined aquatic disposal, and thus free from contamination risk. Based on the

3 ACKNOWLEDGMENTS

The content of this paper is based on reports from a company having SIGTTO membership and, in this respect references [1] and [2] were most valuable. The navigational aspects, as detailed in chapters 9 and 10, came about as personnel in that company assessed marine operational risks for new LNG terminals. In one case, the new project was in Europe where the project analysis was carried out in accordance with a European Council Directive for assessing risks and environmental impacts. This is a process which, while being driven by national law, is also of direct concern to the companies involved.

These requirements led the project leaders to consider how the risk of some classes of accident might be better established and, in particular, what the consequences of a large LNG release might be, either in the port approach — due to grounding or collision; or alongside — due to fracture of the hard arm.

The company concluded that such a large release of LNG had never happened. Nevertheless, in some situations such an event was found to be feasible. From a marine viewpoint the scenarios which could lead to a major release were identified and recommendations were prepared to further reduce the chance of any such happening.

This paper also draws on earlier publications from SIGTTO and similar societies which are relevant to the management of port risks.

4 INTRODUCTION

At the time of site selection, the level of marine risk is determined by the position chosen for the terminal and this is especially true of terminals handling hazardous cargoes such as LNG. Once the port is in operation, the risks identified during planning should be controlled by suitable equipment and pre-arranged procedures. This should include the on-going need to keep other industry or populations remote from the plant.

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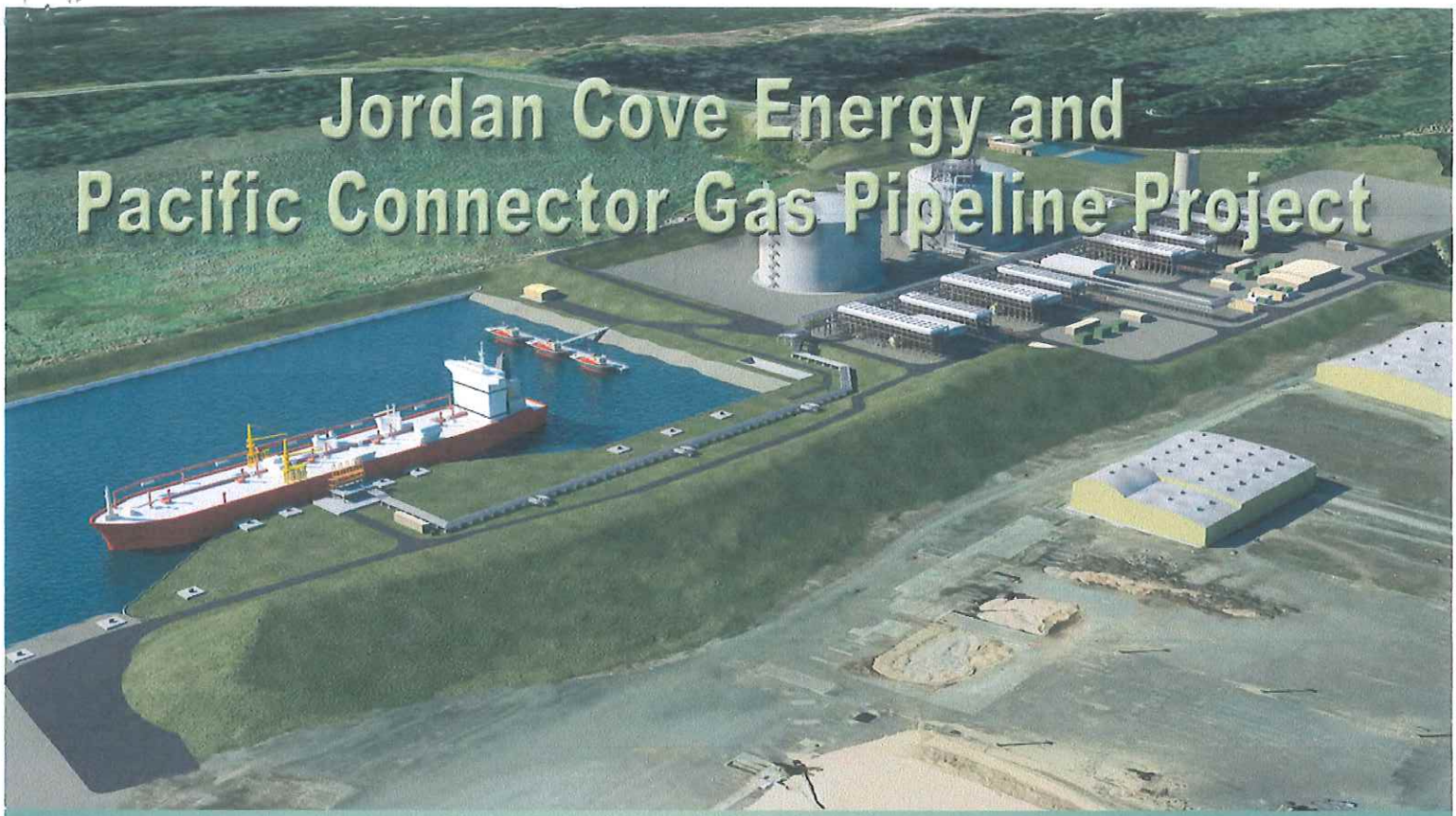
Jordan Cove Energy and Pacific Connector Gas Pipeline Project



Final Environmental Impact Statement

Jordan Cove Energy Project, L.P.
Docket No. CP13-483-000

Pacific Connector Gas Pipeline, L.P.
Docket No. CP13-492-000

DOE Docket No. FE 12-32-LNG ■ DOE/EIS-0489

FERC/EIS 0256F
September 2015

Cooperating Agencies
USDA Forest Service, Pacific Northwest Region
Department of the Army, Corps of Engineers, Portland District
US Department of Energy
US Environmental Protection Agency, Region 10
US Department of Homeland Security Coast Guard, Portland
US Department of Transportation, Pipeline and Hazardous Materials Safety Administration
US Department of the Interior Bureau of Land Management, Oregon State Office
US Department of the Interior Bureau of Reclamation, Klamath Basin Area Office
US Department of the Interior Fish and Wildlife Service, Oregon State Office

Federal Energy Regulatory Commission
Office of Energy Projects
Washington, DC 20426

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tsunami berm is considered minimal due to the relative elevations of the maximum wave heights in relation to the berm protection height.

For the berm slopes subject to the design-level tsunami, erosion control measures and wave runup protection would be used. Slopes would be protected against tsunami runup using cement treatment, concrete cellular mattresses, grout-injected geotextile fabric mattresses (fabriform), or other suitable means as determined during detailed design. The erosion control measures would be designed in accordance with the ODOT Erosion Control Manual, where applicable.

Jordan Cove's tsunami model assumes that structures (e.g., jetties, barriers, dunes) would remain immobile throughout the tsunami event. Design of the barrier wall considers the effects of tsunami waves, including scour and deposition in the path of the scenario tsunamis, flow velocities, any highly probable impact loads from potential floating objects including adrift vessels and barges, breaking waves, prolonged inundation, and the effects of tectonic subsidence (prolonged changes in tidal elevation inherent in the earthquake source scenarios used for tsunami generation).

Based upon the Jordan Cove tsunami study performed for the Project, the first tsunami wave would arrive at the beach approximately 20 minutes after the a major CSZ earthquake occurs. It would reach the Jordan Cove LNG terminal location about 5 minutes later. Maximum inundation near the site would occur about 40 minutes after the earthquake, and the second tsunami wave would arrive about 55 minutes after the earthquake, and would compound on the retreating water from the first wave in some places. The third wave would arrive about 72 minutes after the earthquake, but would be substantially smaller than the first two. The model predicts that modifying the landscape for the LNG terminal would result in slightly smaller waves and less water spilling into the Henderson Marsh. Construction of the slip would result in some localized wave patterns. According to geologists researching tsunami hazards in southern Oregon (including Dr. George Priest), the most critical work to ensure public safety related to tsunamis is to provide accurate maps of the tsunami danger zone and educate the public on what to do when they feel a big earthquake (The Oregonian 2008). The major shaking from the earthquake would be the clearest warning of an approaching tsunami.

We received comments regarding concerns over potential tsunami impacts on LNG vessels at the terminal. There are two tsunami scenarios to address. The first scenario would be a distant earthquake event in Alaska or Japan that would result in a tsunami with a relatively long lead time (12 to 24 hours) before reaching the Oregon Coast. Coast Guard policies would prohibit ships from entering Coos Bay until after the tsunami arrival period. All ships in Coos Bay, including the LNG vessel, would be directed to depart the harbor. LNG vessels at the terminal would face the bay and would be manned with the power on when berthed. Therefore, the LNG vessels could depart quickly from the Jordan Cove terminal in the event of a distant tsunami and in response to notice and instructions from the Coast Guard.

The second scenario involves a large earthquake capable of generating a tsunami from the nearby CSZ. It is calculated that it would take approximately 20 to 25 minutes for a large tsunami generated from the CSZ to reach Coos Bay after the earthquake event occurs, which would provide time for LNG vessels to disconnect from the berth and to reconnect with the tug boats. The tethered LNG vessel and the three tug boats would hold their position under power to offset the advancing wave and currents. The tsunami wave is predicted to impact the bow of the ship

head on. If the LNG vessel is traversing the channel during the tsunami, the tugs would also provide assistance as described above. The Emergency Planning and Response Team for Jordan Cove, which comprises numerous agencies, including the Coast Guard, ODE, Oregon Fire Marshall, Oregon Marine Board, police and sheriff departments, fire departments, and Jordan Cove experts, has reviewed and approved the LNG vessel procedures for dealing with a potential tsunami.

Another commenter stated that the area west of the terminal is low lying and could be swamped by a potential tsunami wave. The area west by northwest of the Jordan Cove terminal and parallel to the shoreline is a high dune that provides considerable protection from a direct tsunami wave inundation. A commenter indicated concerns that the predicted tsunami wave height may not be accurate, and therefore the LNG terminal would be at risk from inundation by a potential tsunami wave. State-of-the-art hydrodynamic modeling studies have been performed for an earthquake on the CSZ with a return period of 2,475 years. As indicated above, this is the same return period criteria used to define the Safe Shutdown Earthquake, which is used for the design of critical LNG facilities. These studies predict that the maximum elevation of a potential tsunami wave at the location of Jordan Cove's LNG terminal would be +32.6 feet (this elevation includes +7.6 feet for co-seismic subsidence) and includes a 1.3 factor to account for modeling uncertainties. The crest elevation of the berm surrounding the LNG storage tanks at the terminal would be +60 feet, and the grade elevation of the liquefaction processing area at the terminal would be +46 feet. Therefore, Jordan Cove's LNG terminal would be protected and should be able to safely handle the design tsunami event.

A comparison was made by a commenter to the 2011 Tohoku earthquake in Japan. The most likely cause of tsunamis at the Jordan Cove site would be earthquakes caused by vertical offsets along the CSZ, which are of the same type of offsets that triggered the tsunamis from the 2011 Tohoku earthquake. The offsets selected for determining the design tsunami are consistent with the maximum considered earthquake magnitudes predicted for the CSZ by the USGS and the associated vertical offsets predicted by DOGAMI. The tsunami generated by 2011 Tokohu earthquake did cause damage to one LNG terminal in Japan (the Minato Gas Plant). The low-lying LNG terminal is located in Sendai and was not well protected from tsunami inundation. Even though it was subjected to inundation depths of 4 meters, there was no damage to the LNG tanks, no release of LNG or any safety hazard was reported as result of the tsunami. However, there was operational damage to piping, buildings, pipe supports, and electrical systems and it took a year to bring the plant back into service. Based on observations, the Japanese recommend the LNG plants be either be elevated above tsunami elevation levels or be protected adequately by berms. The Jordan Cove LNG terminal would be both elevated and well protected by tsunami berms. We therefore conclude that the site-specific tsunami studies, coupled with Jordan Cove's proposed mitigation measures, indicate that the site is not unsuitable because of tsunami hazards.

Volcanic Hazards

The terminal site is over 100 miles west of the nearest volcanic hazard area. Although a future eruption of the Mt. Mazama volcano is possible, the terminal site would not be directly affected by the various types of volcanic eruption hazards at this distance (USGS 1997). It is noted that volcanic ash clouds can affect the atmosphere over much larger areas, but such clouds would not impact the terminal infrastructure.

4.7.8. Summary of additional resources developed with the agencies

JCEP has developed an informal emergency management committee which has been reviewing the numbers and types of equipment necessary. This informal committee is comprised of federal, state and local emergency management agencies.

While not all inclusive or finalized, the committee has developed a listing of the resources necessary to safely and securely move LNG into Coos Bay. In addition to the list of resources, the group has been working on developing an LNG Management Plan, and the Emergency Response Plan required by 33 CFR 127.

The committee has now conducted 8 exercises to review large and small responses. Each of these exercises has allowed the group to review the broad response measures and equipment necessary to properly respond to a release or a fire. The exercises have allowed emergency responders to understand the capabilities of both the ships and facility in regards to safety equipment for prevention as well as the emergency equipment required to protect the public. The exercises have included:

1. Tsunami event (requested by the State)
   a. An earthquake reported at 15 kilometers offshore
   b. Ship docked at terminal unloading cargo
   c. Earthquake magnitude 8.0
   d. Oregon Department of Geology has issued a warning that this will reach shore in 3 hours
2. Ship tank failure at entry turn at Charleston
   a. LNG carrier was inspected by the USCG and found ready to enter the port
   b. Pilot boards vessel and is inbound
   c. Upon reaching the turn at Charleston, the vessel edges onto the channel shoulder
   d. Gas is observed being released on the port side of the ship
3. Ship tank failure near Empire
   a. LNG Carrier reports an explosion on the port side of the vessel

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Jordan Cove LNG terminal at Coos Bay designed for Cascadia quake, tsunami though hazards remain
Updated Jun 27, 2014; Posted Jun 26, 2014

By Ted Sickinger tsickinger@oregonian.com
The Oregonian/OregonLive

The worst-case scenario would be truly cataclysmic. A full rupture of the Cascadia Subduction Zone, unleashing a mega-thrust earthquake and tsunami comparable to the magnitude 9.1 temblor that devastated the coast of Japan in 2011.

The region's top seismic experts say such a quake could violently shake the entire Pacific Northwest for more than five minutes, liquefying soil, tossing massive structures off their foundations and sinking entire sections of Oregon's coastal landmass by several meters.

The damage would be most severe in areas closest to the rupture, such as Coos Bay, where the dangerous portion of the fault line passes eight miles off the coast. A subsequent tsunami could magnify the damage, transforming the entire estuary into a giant mixing bowl of devastation.

That's exactly why many Coos Bay residents oppose the Jordan Cove Energy Project, a natural gas export terminal proposed on a sand spit north of town.

They envision multiple pipe breaks leaking a witches brew of methane, ethylene and propane; a gas-fed inferno on the roof of one of the two storage tanks; or a tanker full of LNG ripped from its shipping berth and grounded, its contents leaking into the channel and forming an enormous, highly flammable vapor cloud.

From a regulatory perspective, such a nightmare scenario is not on the radar. The Federal Energy Regulatory Commission, the U.S. Coast Guard and the Pipeline and Hazardous Materials Safety Administration don't require Jordan Cove to model anything like it in the company's hazard analysis submitted to FERC.

They do require Jordan Cove to model an isolated set of single-spill scenarios, each completely contained within the facility's impoundment systems. According to the company and its engineering consultants, the resulting fire and vapor dispersion zones would be confined within Jordan Cove's property line and pose no threat to the public.

A cascading set of failures of the kind seen at Japan's Fukushima nuclear plant, where three reactors were pushed into a meltdown after a similar mega-thrust quake and tsunami, is not part of the public safety analysis.

"We don't close the waterways for maybes," said Coast Guard Lieutenant Russ Berg, discussing the possibility of a runaway tanker during a tsunami. "That's like closing airports that are close to volcanoes."

Not exactly. Experts maintain that a mega-thrust earthquake off the Oregon coast is not simply a possibility, it's inevitable. In fact, it's overdue. Historically such quakes have recurred every 240 years, with the last one 314 years ago.

"It should be an assumption that this will happen during the lifetime of the facility," said Chris Goldfinger, a seismologist at Oregon State University and leading authority on subduction zone earthquakes. "You can engineer anything to survive anything if you put enough money into it, but I've seen a lot of very well-engineered stuff destroyed as if it were Legos."

"From my perspective, and the probabilities, I would certainly have reservations about building one of these terminals down there," he said.

> Jordan Cove site tour Project backers provide a tour of the proposed site for the Jordan Cove LNG terminal in Coos Bay.

Project backers say their design is hardened against a magnitude 9 quake. They've planned myriad mitigation measures and multiple lines of defense.

"We've tried to take everything into account and build everything up beyond what the state considers the worst case scenario," said Jordan Cove's project manager, Bob Braddock.

He notes there are more than 30 LNG facilities on the coast of Japan. "They've been through an event close to what were talking about here, and none of them experienced a problem," he said.

The Japanese are the gold standard in earthquake preparedness. Yet when their engineers mapped the geometry of ocean trenches off Japan's east coast, they determined that a series of tsunami 15 meters high was not possible. Likewise, the failure of backup power systems and other containment measures was not considered plausible.

But in 2011, that's exactly what happened, to disastrous effect.

"I would say every one of us would be reluctant to suggest a liquefied natural gas terminal on the coast here," said Anne Trehu, an OSU geologist who studies the Cascadia Subduction Zone.

The Federal Energy Regulatory Commission has yet to issue its Draft Environmental Impact Statement for the facility, which will include its assessment of the facility's risks and mitigation plans. FERC's report is due this summer. And the project still faces a complicated permitting process before construction can begin.

The Oregonian put together the following overview based on interviews with Jordan Cove officials, industry experts, regulators and scientists, and a review of the company's hazard assessments filed with FERC.

Isn't an earthquake a low-risk scenario?

No. Scientists say there is a 40 percent chance of a mega-thrust quake centered off Coos Bay in the next 50 years.

Cascadia Subduction Zone.

The Cascade Subduction Zone, which runs parallel to the coast within eight miles of Coos Bay, is the mirror image of the fault line off Japan. It's where the Juan De Fuca tectonic plate plunges beneath the North American continental plate. Right now, there is immense strain on the fault line, potential slippage that's been accumulating since the last mega-thrust quake on January 26, 1700.

The timing of such quakes' recurrence is imprecise, and varies along the length of the fault. Geologists say they're more frequent along the southern section near Coos Bay, with an average recurrence at about 240 years.

When the fault finally ruptures, it could generate a maximum earthquake between magnitude 8.3 and 9.2, according to Jordan Cove's analysis.

What are the general risks in a mega-thrust earthquake?

The physical risks to structures come from violent ground motion, soil liquefaction, lateral spreading and subsidence, meaning the entire coastal shelf sinks relative to sea level. Water-saturated sand and silt are particularly prone to liquefaction, experts say. Finally, there's the tsunami generated by the quake.

Models provide scientists and engineers with a best guess of what might happen in a quake of a given size, but it's really just a best guess. Ground acceleration in earthquakes of a given magnitude vary widely, while tsunami size is dependent on the amount of slippage at the fault line and the shape of wave.

So what's the ground like at the project site?

It's sand, silt and organic mill waste. The LNG terminal is proposed on a former mill site on the North Spit of Coos Bay, an overgrown sand spit that juts into the Pacific Ocean just north of town. The site is at the south end of the Oregon Dunes National Recreation Area, and sits atop a mantle of fine-grained sand and silt about 120 feet deep, underlain by weathered sandstone.

No faults are reported at the site and there has been only moderate seismic activity in Coos Bay during the last 170 years.

What exactly do they plan to build and why here?

The proposed site layout at Jordan Cove.

Plans for the North Spit include: a liquefaction plant to purify and super-chill the natural gas into a liquid; storage tanks that would hold up to 80 million gallons of liquefied gas: smaller tanks for refrigerant chemicals; a shipping berth to load the LNG onto tankers; and a 420 megawatt power plant to supply electricity for the whole operation.

Why here? Coos Bay is an industrial port. Its leaders welcome the economic development opportunity, while other communities along the west coast have rejected LNG terminals.

How is the LNG facility being designed to reduce earthquake damage?

The first priority is to increase the density of existing soil at the site to prevent settling and collapse of the structures built on top during an earthquake. Jordan Cove's consultants concluded that the majority of sand at the site was dense enough to resist liquefaction during a magnitude 9 earthquake, but soil borings revealed a number of vulnerable layers. One potential solution is to drill a vibrating probe into those strata to rearrange the soil and eliminate voids. If that doesn't do the job, engineers could inject cement into the strata to stabilize them.

Jordan Cove's shipping berth will be excavated out of the North Spit. The spoils will be used to build two 80-acre mesas to elevate the storage tanks, liquefaction equipment and power plant above the predicted tsunami inundation zone. Again, the plan is to compact that soil to ensure it doesn't settle differentially during an earthquake. The soil will not be reinforced or anchored, but the platforms will be surrounded by storm surge barriers reinforced with rip rap.

What happens if one of the LNG storage tanks is ruptured?

FERC doesn't consider that "a credible event," so Jordan Cove isn't required to analyze it. Jordan Cove says its required demonstrate that the tanks won't fail due to ground shaking that would be experienced in a magnitude 9 earthquake. The "full containment" tanks comprise a massive steel pot with a suspended aluminum ceiling to hold the LNG, three feet of insulation and a three-foot-thick concrete sarcophagus that's big enough to impound the inner tank's contents if they leak. The resulting structure is so rigid that it's not considered plausible to break it open. The plan is to build the tanks on seismic isolation bearings, essentially putting them on a bed of springs, which would minimize shaking and sloshing in the tanks.

Braddock says the earthen dike surrounding the two tanks is tall enough to contain all 80 million gallons of LNG, but Jordan Cove isn't required to model what would happen in that scenario.

So what kind of leak are they required to model?

The worst-case scenario is the biggest possible leak in a given area of the plant if a pipe was cut and associated pumps operated full blast for 10 minutes. The applicant is also required to model "jetting" leaks in refrigerant pipes operating under high pressure.

For Jordan Cove, the biggest possible leak is assumed to be equal to a 10-minute flow of the facility's maximum rate for pumping LNG into a tanker, or about 630,490 gallons. That's within the capacity of the facility's impoundment basins.

The model assumes single leaks, not multiple simultaneous pipe breaks. It also assumes that each spill is fully contained in an underlying trench and successfully directed to one of two impoundment basins.

So what is the risk when there's a leak?

On land, the immediate risk is one of asphyxiation to terminal operators as the LNG warms up and forms a dense methane fog close to the ground. As the gas continues to warm and dissipate, it forms a vapor cloud that can drift with the prevailing wind. If the methane reaches a concentration between five and fifteen percent, it is combustible if it reaches an ignition source.

On water, the big risk is a pool fire. Water forms a heat source to warm the LNG and form a substantial vapor cloud. If there is a sudden ignition of that cloud, the result can be a pool fire that is impossible to extinguish and will continue burning until the fuel supply is exhausted.

> A model of the potential vapor cloud for an LNG spill in the marine area of the Jordan Cove LNG terminal.

Spill risks are amplified at an LNG export facility by chemicals used to refrigerate and liquefy the natural gas -- ethylene, propane and methylbutane. They are heavier chemicals that can form denser vapor clouds and dissipate more slowly. Such clouds are subject not only to a flash fire when ignited, but potentially a powerful explosion that could damage other tanks and equipment at the facility.

FERC does not require applicants to models spills on water. But for each spill within the facility, Jordan Cove is required to demonstrate that a resulting fire, flammable vapor cloud or vapor cloud explosion will not extend beyond its property line or compromise the integrity of the storage tanks.

The consultant that performed the hazard analysis for Jordan Cove, Gex Con U.S., essentially found that the facility posed no hazard. The modeled vapor clouds from the modeled chemical spills remained, for the most part, within the facility's property line, aided by vapor barriers around the tanks and liquefaction equipment (which the model assumes would survive an earthquake). Likewise, the thermal radiation and explosion hazards from the design spills remained within the facility's property line. Jordan Cove plans to negotiate control for one area beyond its property line affected in some scenarios.

What risks does a tsunami pose to the LNG terminal?

Inundation of the LNG terminal or the power plant, or damage to a tanker full of LNG berthed at the facility.

Jordan Cove hired Joseph Zhang, a former professor in Oregon who now works at the Virginia Institute of Marine Science, to conduct tsunami modeling.

Tsunami modeling indicates a possible tsunami run-up of 30 to 50 feet in Jordan Cove's shipping berth. The plan is to have a tanker ride out the wave in the berth, held there by three tugboats.

Zhang calculated that the first wave would sweep over the North Spit approximately 20 minutes after the earthquake, with a second, larger wave propagating up the shipping channel 10 minutes later. Depending on their timing, the waves could offset or reinforce each other, potentially amplifying the effects.

The study indicated that the biggest water run-up -- as high as 50 feet -- would occur on the ocean-facing side of the LNG tanks. Combined with the maximum expected subsidence at the site of 13 feet, the total run-up would be just below the rim of the 65-foot berm.

Run-up and subsidence estimates were considerably less for the smaller, more likely, earthquake scenarios that Zhang modeled. In either case, the study concluded that the height of the proposed design "exceeds the design level tsunami event."

Yet Zhang also says "all the results need to be taken with a grain of salt." Before the Japanese quake in 2011, he said, geophysicists had concluded that 15-meter-high waves were not possible at Fukushima.

Yet that's exactly what happened, resulting in cascading series of failures that ultimately resulted in the meltdown of three nuclear reactors.

What happens if the power plant is inundated, or the transmission lines topple, so the LNG terminal loses power?

About this series
The Oregonian is reporting a series of stories on what the Jordan Cove liquefied natural gas project in Coos Bay involves, its affect on communities and jobs and the global economics driving this push to export natural gas.
The next installment will look at the pipeline that will have to be built from central Oregon to Coos Bay to deliver the gas for export. Send your questions to investigative reporter Ted Sickinger. What do you want us to find out or explain? You can reach Sickinger at tsickinger@oregonian.com

The power plant will be elevated out of the expected tsunami zone. But during any earthquake, Braddock says, vibration sensors would initiate an automatic shutdown. LNG product in process would be released though a vent, and the plant's sensors, powered by backup generators, would continue operating.

Oregon's Department of Geology and Mineral Industries has asked Jordan Cove for an independent, peer-reviewed study of the interdependencies between the power plant and LNG terminal, and the potential for cascading failures.

So what if there's a tanker full of LNG in berth when an earthquake or tsunami strikes?

There's not enough time to get a tanker out to sea in a near-shore earthquake. The plan, instead, is to decouple it from the loading dock and have three tractor tugs hold it in the middle of the slip. Braddock said the slip is 47 feet deep, enough draft to prevent a grounding of the tanker when water recedes during a tsunami.

The maximum wave height modeled in Jordan Cove's tsunami study was 36 feet at the north end of the tanker slip. Combined with potential subsidence of 13 feet, the tanker could be bobbing in a run-up of almost 50 feet. Lesser scenarios still showed a combined run-up at the north end of the slip of nearly 30 feet.

That's a massive and very sudden surge, one potentially full of debris. And it's not clear how a tanker would fare -- even a double-hulled tanker that affords additional protection to the cargo tanks.

Braddock says the storage tanks and other structures would divert a tsunami coming over the North Spit around the tanker slip. The wave affecting the slip would be the one that comes up the shipping channel, which would hit the tanker on the bow.

"We don't see a situation where the tanker is forced out of the slip," Braddock said. "If anything, it keeps it within the slip but not exactly the way we thought it would."

Zhang's study does not reach that conclusion, and the Coast Guard doesn't analyze tanker security in a tsunami.

"I'm very skeptical that anything can be done in a near-shore tsunami" to protect the tanker," said Randy Clark, a security specialist with the U.S. Coast Guard. "There simply isn't enough time. ... There are no real regulations. There is no requirement to mitigate this risk."

-- Ted Sickinger

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to be relocated or abandoned by removal, or abandoned in place, and there are no compressor stations to be modified, as part of the proposed LNG Terminal, and additional analysis of PCB contamination is not warranted.

As discussed in DEIS Sections 4.2.1.2 and 4.2.1.3, JCEP has performed extensive investigations regarding soil contamination throughout the LNG Terminal area. Investigations detected low levels of contamination in several areas of the LNG Terminal site. Contaminants at Ingram Yard and South Dunes will be managed in coordination with the terms and conditions of the "No Further Action" determination granted by ODEQ in 2006, per DEIS Section 4.2.1.2, page 4-47. DEIS Section 4.2.1.2, pages 4.48 to 4-49, describes the JCEP Framework Contaminated Media Management Plan, which includes plans for how the material is to be managed during construction and coordinated with ODEQ. Contaminated sediments at the Kentuck site will be excavated and removed to a permitted disposal facility in accordance with an ODEQ work plan that is approved prior to the removal action. If unanticipated soil contamination is discovered during construction of the LNG Terminal or use of the temporary construction areas, JCEP will abide by the conditions of the Framework Contaminated Media Management Plan. Any residually contaminated soil or sediment excavated during future site activities or development will be properly managed and disposed of in accordance with ODEQ regulations and policies. As a result, contaminants present in soils at these sites will not be mobilized into the environment and will not result in human health impacts.

17. The Project adequately protects against tsunami and earthquake safety hazards

Several commenters claim that potential safety hazards associated with tsunami and earthquake risks are so extreme as to warrant permit denial, and that additional analysis of alternatives is warranted. Commenters specifically discuss inundation of the LNG Terminal from a tsunami, liquefaction of dredged soils used in LNG Terminal construction, compromised integrity of facilities during a tsunami or earthquake, and potential for a vessel to capsize or roll in Coos Bay during a tsunami event. Importantly, it is FERC, not ODSL, that maintains primary jurisdiction to oversee and ensure the public safety of the Project as a whole. As relevant here, for purposes *of removal-fill*, ODSL considers "the positive and negative effects of the removal-fill on public health and safety." "Guide to the Removal-Fill Process." ODSL 6-13 (Aug 2016) (emphasis added); OAR 141-085-0565(4)(e). Thus, much of the aforementioned overall public safety considerations lie outside the scope of ODSL's review and are consequently are discussed elsewhere. See DEIS Section 4.13 for an extensive analysis of Project safety.

To the extent, however, that these comments address the tsunami and earthquake safety hazards implicated by the specific removal-fill activities associated with the Project, Applicants discuss how the Project has minimized potential harm from tsunami and earthquake risks in DEIS Sections 4.1.4 (page 4-40) and 4.13, (Pages 4-734 to 4-740);and the LNG Terminal is designed to protect against tsunami inundation, flooding and sea level rise, hurricanes and storm surge, and seismic events to provide safety and protection to facility staff and the general public. The LNG Terminal site will be elevated above the potential tsunami or storm surge run-up, so that equipment containing hazardous materials maintains its full integrity. The entire LNG Terminal is designed with a grade elevation intended to prevent inundation from the design tsunami wave height. Some commenters further note that the Southwest Oregon Regional Safety Center and Workforce Housing Facility would be located in the tsunami inundation zone, and that additional alternatives analysis should be performed to remove them from this hazard and locate them in uplands. As a result of consultations with the community and further design development, JCEP relocated both the Southwest Oregon Regional Safety Center and the Workforce Housing Facility to the South Dunes portion of the LNG Terminal site. This relocation reduced wetland impacts and also elevated those facilities outside of the tsunami inundation zone.

navigation channel. At this point, one tug would drop lines, and the remaining two tugs would assist the LNG vessel throughout its transit of the Coos Bay navigation channel through the breakwater and offshore. If conditions are deemed not appropriate to leave the facility, the LNG vessel would remain at the pier. For most deep draft vessels, a speed of 4 to 6 knots is maintained while they transit the Coos Bay navigation channel. The total distance an LNG vessel would travel from the entrance of the ship channel to the end of the jetties is approximately 1.7 nmi. LNG vessels would require a minimum depth and width in the Coos Bay navigation channel. The present channel depth and width would be acceptable for the safe transit of a nominal size/capacity 148,000 m^3 LNG vessel with the aid of high tides.

During its approximately eight-mile transit, the LNG vessel would pass by the Southwest Oregon Regional Airport and the neighborhoods of Empire, Barview, and Charleston to the east and the uninhabited North Spit to the west. The LNG vessel would cross Southwest Oregon Regional Airport's main runway designed for instrument landings. The issue of an LNG vessel passing through the flight path of the airport's main runway was discussed between Jordan Cove and the FAA airport authority during the development of the WSA. The current height limitation imposed on marine traffic in the Coos Bay navigation channel by the FAA is 137 above ground level. This equates to a height of 167 feet AMSL. The FAA indicated that as long as vessels did not exceed the maximum height of 167 feet AMSL, they would not have any objections to vessels passing through the flight path of the main runway. In its development of the WSA, Jordan Cove verified the highest height to the mast of existing LNG vessels with a capacity of 148,000 m^3 is 139 feet above mean sea level. Since the development of the WSA, newly constructed LNG vessels could exceed the 167 feet AMSL. In response to a FERC data request on July 21, 2015, Jordan Cove reviewed the global inventory of the LNG vessels that could call on the LNG terminal and all of the LNG vessels would have a maximum height of 167 AMSL or less. Jordan Cove has agreed to amend the FAA's Form 7460 to reflect the change in LNG vessel height. If the FAA agrees with this change to the height of the LNG vessels, there would no longer be a NPH pertaining to the height of LNG vessels.

Hazard Zones Associated with the Proposed Route

The only area of land that would be overlapped by Zone 1 in the LNG vessel's transit to the proposed terminal would be a small portion of the western side of Empire and a small portion of the eastern side of the uninhabited North Spit. During transit, Zone 2 would overlap portions of the neighborhoods of Charleston, Barview, and Empire to the east and most of the North Spit to the west. Near the proposed terminal, Zone 2 would overlap the Roseburg Forest Products site and a portion of the Southwest Oregon Regional Airport's main runway. During transit, Zone 3 would overlap portions of the cities of Coos Bay and North Bend.

Estimates for the number of structures and the population within the Zones of Concern were provided in sections 4.7.1.2 and 4.8.1.1 of the FEIS the FERC issued in May 2009 for the previously proposed Jordan Cove LNG import terminal in Docket No. CP07-444-000. No residential structures, hotels, or motels were identified within Zone 1 (within 1,640 feet of the waterway). There are about 11 hotels or motels, and about 5,457 residential structures, including single family homes, apartments, and mobile homes, within Zones 2 and 3 combined, between 0.3 and 2.2 miles outside of the waterway. We estimated that there are approximately 16,922 people total residing within the Zones of Concern.

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3.32. Navigation Route Security Concerns

The security assessment conducted in association with this Waterway Suitability Assessment demonstrates the lower security risk. Typically, terrorists would be targeting high population areas or targets that would create disastrous consequences. Given the very low population density and the remote nature of the proposed terminal, both may be possible but are not probable. Given this, the following explains the potential security concerns.

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3.33. Density and Character of Marine Traffic

U.S. Coast Guard NVIC 05-05 requires defining the character and activities of marine traffic to include areas of the waterway that are congested with commercial, military and/or recreational vessels (marine events and seasonal activities such as regattas, fisheries, etc.). As discussed in this report, there are no known areas of heavy marine traffic (see report definitions) along the intended route of this project nor are there other marine traffic issues which would be impacted by transiting vessels. Only two small docks are identified between the entrance and the proposed site; one in the Empire Area and the other at I.C.I. Marine Industrial Park. All other port facilities are farther into the port in the Coos Bay area.

Most deep draft and tug and barge traffic would pass the docked LNG carrier during operations and proceed to the Roseburg terminal adjacent to the facility. Ships speeds in this area would be very slow, approximately 2-4 knots, as they approached their mooring area. The new berth is being designed to minimize the risk of another vessel alliding with the LNG carrier. It will accommodate LNG carriers bow in or bow out. The worst case allision would be another vessel hitting the bow or stern of the LNG carrier and not in the cargo containment area. The resulting damage from this type allision would be concentrated in the area of a ship where LNG is not carried. A possibility exists that a spill could occur from the loading arms due to movement of the vessel from the force of impact. In this case, immediate activation of the emergency shutdown system would reduce the amount of spilled product.

Fishing and recreational boat traffic is not measured by the agencies, and information is anecdotal. The U.S. Coast Guard estimates that on an average day, some 75 vessels may get underway. On a nice summer day, possibly 150 boats get underway. The boats are able to utilize the entire Coos Bay harbor area or move offshore to fish. Most fishing is done by