Jody McCaffree
Individual/ Executive Director
Citizens For Renewables/
Citizens Against LNG
PO Box 1113
North Bend, OR 97459

July 9, 2019

Andrew Stamp, Hearings Officer
Coos County Planning Department
225 N. Adams St.
Coquille OR 97423

RE: Second Open Record (Rebuttal/Surrebuttal) for County Remand File No. REM-19-001/LUBA Case No. 2016-095

Dear Hearing Officer Stamp:

Please accept the following Second Open Record (Rebuttal/Surrebuttal) comments into the record in addition to comments that are being submitted by attorney Tonia Moro and comments previously submitted into the record on June 10th and June 24th 2019 including those submitted from Attorney Tonia Moro and also comments from Katy Eymann on behalf of Citizens for Renewables and Crag Law on behalf of Oregon Shores.

Please see attached ***Exhibit A*** *for a* corrected Table of Contents for comments submitted into the record on June 24, 2018.

On June 24, 2018 Jordan Cove dumped 3013 pages of information into the record including a series of ECONorthwest studies despite the fact that ECONorthwest studies have been shown to be flawed and inaccurate in past proceedings.

The ECONorthwest economic study that was done on the Coos County 12-inch pipeline prior to its being built in 2003/2004 use the IMPLAN Model (*this model is also being used in current Jordan Cove studies*) and predicted that employment in Coos County could increase by over 2,900 in the region because of the availability of natural gas. (Page 72 of the Coos County 12-inchd Gas Pipeline EIS.) [1] Not only did that NOT happen and the majority of the jobs that ECONorthwest predicted cease to materialize, the pipeline ended up costing Coos County tax payers far more than what the study had predicted would be the case and only about 7 to 10 percent of the pipeline's capacity is even used to this day.

[1] https://books.google.com/books?id=A_4xAQAAMAAJ&pg=PA67&lpg=PA67&dq=Coos+County+Pipeline,+Implan+model&source=bl&ots=0YKxfe1eje&sig=ACfU3U1SZYdkXgyNCJK9DoK3xnnuJSBUPQ&hl=en&sa=X&ved=2ahUKEwjXup3gqfLiAhWHJzQIHQPcAwUQ6AEwAHoECAkQAQ#v=onepage&q=Coos%20County%20Pipeline%2C%20Implan%20model&f=false)

The ECONorthwest study that Jordan Cove did on their proposed LNG "Import" terminal in Oct 2006 was also obviously flawed. There was never a "need" for an IMPORT terminal so the entire study is highly questionable but all those predicted jobs for Jordan Cove's proposed "import" terminal NEVER PANNED OUT and still would not to this day. (ECONorthwest 2006 study is attached as ***Exhibit B***).

So really, how reliable are these reports anyway?

It turns out, …not so much:

See testimony submitted to the US Department of Energy in 2012:[2] (***Attached as Exhibit C***)

A thorough investigative review of the ECONorthwest reports similar to what the United States Department of Agricultural (USDA) Rural Development did in 2008 is in order. In December of 2008, the USDA Rural Development questioned the reliability and accuracy of an ECONorthwest report that was being used to justify a $6 million dollar proposed expansion of the Salmon Harbor resort in Winchester Bay, Oregon. The USDA **did their own investigation** and found the ECONorthwest projections used to justify the proposed expansion **were not feasible, nor were the ECONorthwest conclusions warranted**. (See Copy of this Article included as a part of ***Exhibit C***.)

1. A need (ie., a substantial public benefit) has not been demonstrated

Under Coos Bay Estuary Management Plan (CBEMP) Policy 5 with respect to Estuarine Fill and Removal:

CBEMP Policy #5 Estuarine Fill and Removal

> *I. Local government shall support dredge and/or fill **only if such activities are allowed in the respective management unit, and**:*
>
> *a. The activity is required for navigation or other water-dependent use that require an estuarine location or in the case of fills for non-water-dependent uses, **is needed for a public use and would satisfy a public need that outweighs harm to navigation, fishing and recreation**, as per ORS 541.625(4) and an exception has been taken in this Plan to allow such fill;*
>
> *b. **A need (ie., a substantial public benefit) is demonstrated and the use or alteration does not unreasonably interfere with public trust rights**;*
>
> *c. No feasible alternative upland locations exist; and*
>
> *d. **Adverse impacts are minimized.***
>
> *e. Effects may be mitigated by creation, restoration or enhancement of another area to ensure that the integrity of the estuarine ecosystem is maintained;*
>
> *f. The activity is consistent with the objectives of the Estuarine Resources*

[2] https://fossil.energy.gov/ng_regulation/sites/default/files/programs/gasregulation/authorizations/2012/orders/Citizens_Against_LNG_Answer_to_JCEP_09_1.pdf

Goal and with other requirements of state and federal law, specifically the conditions in ORS 541.615 and Section 404 of the Federal Water Pollution Control Act (P.L.92-500).
(Emphasis added)

II. Other uses and activities which could alter the estuary shall only be allowed if the requirements in (b), (c), and (d) are met.

Identification and minimization of adverse impacts as required in "d" above shall follow the procedure set forth in Policy #4. (Emphasis added)

* * * *

…Identification and minimization of adverse impacts as required in "e" above shall follow the procedure set forth in Policy #4a. The findings shall be developed in response to a "request for comment" by the Division of State Lands (DSL), which shall seek local government's determination regarding the appropriateness of a permit to allow the proposed action.

"Significant" as used in "other significant reduction or degradation of natural estuarine values", shall be determined by: a) ***the U.S. Army Corps of Engineers through its Section 10.404 permit processes****; or b) the Department of Environmental Quality (DEQ) for approvals of new aquatic log storage areas only; or c) the Department of Fish and Wildlife (ODFW) for new aquaculture proposals only.* (Emphasis added)

This strategy recognizes that Goal #16 limits dredging, fill and other estuarine degradation in order to protect the integrity of the estuary. (Emphasis added)

A need (ie., a substantial public benefit) has not been demonstrated by the applicant. The project would unreasonably interfere with navigation, fishing and public recreation and would therefore not be in compliance with CBEMP Policy 5(I)(b). The applicant has given no indication how the estuary would be protected from the sludge and other compounds that would be found in the tidal muds.

Identification and minimization of adverse impacts by mitigation, creation, restoration or enhancement of another area to ensure that the integrity of the estuarine ecosystem is maintained must follow the procedure set forth in CBEMP Policy #4a

CBEMP Policy #4a Deferral of (I) Resource Capability Consistency Findings, and (II) Resource Impact Assessments

Local government shall defer, until the time of permit application, findings regarding consistency of the uses/activities listed in Policy #4 with the resource capabilities of the particular management unit.

Additionally, the impact assessment requirement for those uses/activities as specified in Policy #4 shall be performed concurrently with resource capability findings above at the time of permit application.

*I. **<u>This strategy shall be implemented through an Administrative Conditional Use process that includes local cooperation with the appropriate state agencies</u>**:*

a. Where aquaculture is proposed as a use, local government shall notify the Oregon Department of Fish & Wildlife (ODFW) and Department of Agriculture in writing of the request, with a map of the proposed site;

b. Where log storage dredging is proposed as an activity local government shall notify the Oregon Department of Environmental Quality (DEQ) in writing of the request, together with a map of the proposed site.

* * * *

*IV. **<u>For all other uses/activities specified above, local government shall</u>**:*

*a. **<u>Determine through appropriate findings whether the proposed use/activity is consistent with the resource capabilities of the management unit</u>**, and*

*b. **<u>Perform the assessment of impacts required by Policy #4</u>**.*

V. This strategy recognizes:

a. That resource capability consistency findings and impact assessments as required by LCDC Goal #16 can only be made for the uses specified above at the time of permit application, and

b. That the specified state agencies have expertise appropriate to assist local government in making the required finding and assessments.

This strategy is based upon the recognition that the need for and cumulative effects of estuarine developments were fully addressed during development of this Plan and that no additional findings are required to meet Implementation Requirement #1 of Goal #16.
(Emphasis added)

As I previously explained in comments submitted on June 24 2019, the Jordan Cove LNG Project has not proven that there is a need for their proposed project. They have no signed contracts yet and despite them saying they have agreements, nothing they have is binding. They have yet to supply any contractual documents to the U.S. Department of Energy. As indicated previously, several Reports clearly show that the project is not likely to succeed. **We would be significantly altering the Coos Estuary and taking critical fish, clam and crab habitat out of production for a project that is <u>not likely to be successful</u>.**

Jordan Cove does not have the financial means necessary to build a greenfield LNG project, nor the experience. Pembina, Jordan Cove's parent company, has already announced that it intends to seek partners for both the pipeline and liquefaction facility thereby reducing its 100 percent ownership interest to a net ownership interest of between 40 and 60 percent.

On Sept 10, 2018, an article by Gaurav Sharma titled, "*Next Wave Of U.S. LNG Projects Lurks But Market Fistfight is Inevitable*"[3] reported the following:

[3] https://www.forbes.com/sites/gauravsharma/2018/09/10/next-wave-of-u-s-lng-projects-lurks-but-market-fistfight-is-inevitable/#3c008b552fa8

> *…Ultimately, whichever way you look at it – the fistfight for offtake agreements, both within and beyond North America, would determine which U.S. LNG project makes it or not.* ***Its highly likely many will not****.*

The GJ Sentinel reported on November 26, 2018 in an article titled, "*Jordan Cove about to be overwhelmed by Canadian LNG terminals at Kitimat"*[4]

> *…LNG Canada is now breaking ground while Jordan Cove is still awaiting both FID from its sponsor and a US government OK from the Federal Energy Regulatory Commission.* ***Betting here is that it will never get either one****.*
>
> *Location, location, location is why this happened. Jordan Cove is proposed for a very scenic undeveloped place on the* ***Oregon coast beloved by locals and tourists alike, and they are hollering their disapproval****. But LNG Canada creates no complainers since Kitimat is a brownfield site with a smelter, deep water port and rail….* (Emphasis added)

On November 7, 2018 Reuters reported that Japan's Toshiba Corp will exit its U.S. liquefied natural gas (LNG) business by paying China's ENN Ecological Holdings Co more than $800 million to take over the unit as part of a plan to shed money-losing assets. "***The project posed a huge risk, because no one knows how the situation will be over the next 20 years***," Toshiba's Chief Executive Officer Nobuaki Kurumatani told reporters at a press conference.[5]

Apparently JERA Co, the same company that Pembina states is willing to sign a long term contract with them for JCEP LNG was not able to help Toshiba find buyers for its LNG[6] coming from the Freeport LNG project in the U.S. Gulf Coast. So what does this mean? How can JERA sign a long-term contract with Pembina if they cannot even sell U.S. gas that is already under contract? …?

On Oct 11, 2018, the LNG Law Blog in an article titled, "*Tokyo Gas Signs HOA for LNG Canada Purchases***"**[7] the following:

> *Platts reports that Tokyo Gas Tuesday has signed a heads of agreement (HOA) with Diamond Gas International, the trading arm of Mitsubishi Corporation,* ***to purchase LNG from the proposed LNG Canada project in British Columbia.*** *According to the report, the HOA provides that Tokyo Gas will purchase up to 0.6 million metric tonnes/year from LNG Canada for a period of 13 years, from April 2026 to March 2039, delivered on an ex-ship basis with destination flexibility.*

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[4] https://www.gjsentinel.com/opinion/jordan-cove-about-to-be-overwhelmed-by-canadian-lng-terminals/article_c6608c2c-f194-11e8-b5a0-cf3bb7245574.html
and; https://fromthestyx.wordpress.com/2018/11/26/jordan-cove-about-to-be-overwhelmed-by-canadian-lng-terminals-at-kitimat/

[5] *Toshiba to pay ENN more than $800 million to exit U.S. LNG business*
Osamu Tsukimori, Jessica Jaganathan; November 7, 2018
https://www.reuters.com/article/us-toshiba-lng-sale/toshiba-to-pay-enn-more-than-800-million-to-exit-u-s-lng-business-idUSKCN1ND0DT

[6] https://newsbase.com/topstories/toshiba-sees-lng-business-big-risk

[7] https://www.lnglawblog.com/2018/10/tokyo-gas-signs-hoa-for-lng-canada-purchases/?utm_source=vuture&utm_medium=email&utm_campaign=vuture-emails

Tokyo Gas is Japan's second-biggest LNG importer, taking in 14 million tonnes per year, after JERA Co, the LNG buying joint venture of Tokyo Electric Power Co (Tepco) and Chubu Electric.[8]

The CBC News reported in Oct 2018:

> **$40B LNG facility is the light at the end of a long tunnel for Canada's natural gas sector** - Struggling gas industry faces several more years of low prices until new Asia export project is built[9] by Kyle Bakx · CBC News · Posted: Oct 03, 2018
>
> *On Tuesday morning, hours after LNG Canada announced it would go ahead with its $40-billion export facility on the West Coast, analyst Martin King gave a presentation about the state of the oil and gas industry at the Calgary Petroleum Club in the city's downtown.*
>
> *The LNG announcement is massive for the natural gas sector, but King had some cold truth for hundreds of people who came to hear him despite the heavy snow outside.* ***Until the LNG export facility is up and running, he said, there is little reason for optimism****...* (Emphasis added)

In July of 2017 ConocoPhillips Senior Communications Specialist Amy Burnett made the following statement:

> *"Over the last few years, more facilities have come online to export LNG," Burnett said "So there are* ***more sources available*** *for the product which* ***makes competition more difficult****."* (Emphases added)

Larry Persily, Chief of Staff for the Kenai Peninsula Borough also stated in the same 2017 article:

> *"It's also a hard reminder to Alaskans that no matter how much we want to sell our oil and gas, if the market doesn't want it, doesn't need it or isn't willing to pay a price to make it profitable — we can't sell our oil and gas," Persily said.*
>
> *Prices have tumbled from $15-$18 per million btu, to just over $5.*
>
> *"****You can't buy gas out of Cook Inlet, pay to liquify it, burn up some of it while you're liquefying it, put it in a tanker and deliver it for $5.50 per million btu and make money****," Persily said. "****It is a[n] inhospitable market and will be for the near future****."*[10] (Emphasis added)

[8] https://www.reuters.com/article/japan-tokyo-gas/tokyo-gas-will-not-accept-destination-clauses-in-new-lng-contracts-president-idUSL4N1MG0O1

[9] https://www.cbc.ca/news/business/lng-canada-gmp-firstenergy-arc-1.4847377

[10] *Facing global gas glut, ConocoPhillips to mothball Kenai LNG plant*
By Rashah McChesney, Alaska's Energy Desk - Juneau - July 13, 2017
http://www.alaskapublic.org/2017/07/13/facing-global-gas-glut-conocophillips-to-mothball-kenai-lng-plant/

RBN Energy reported on March 26, 2019 that a second wave of North American LNG export projects was officially underway. As noted above, LNG Canada took final investment decision (FID) last October and would be the first large-scale LNG export facility in Canada. Golden Pass and Calcasieu Pass followed in February, marking the beginning of the next round of LNG export build on the U.S. Gulf Coast. Sabine Pass Train 6 is expected to get the green light any day. It still remains to be seen if these projects will all actually make it to completion given the continued glutted LNG market.

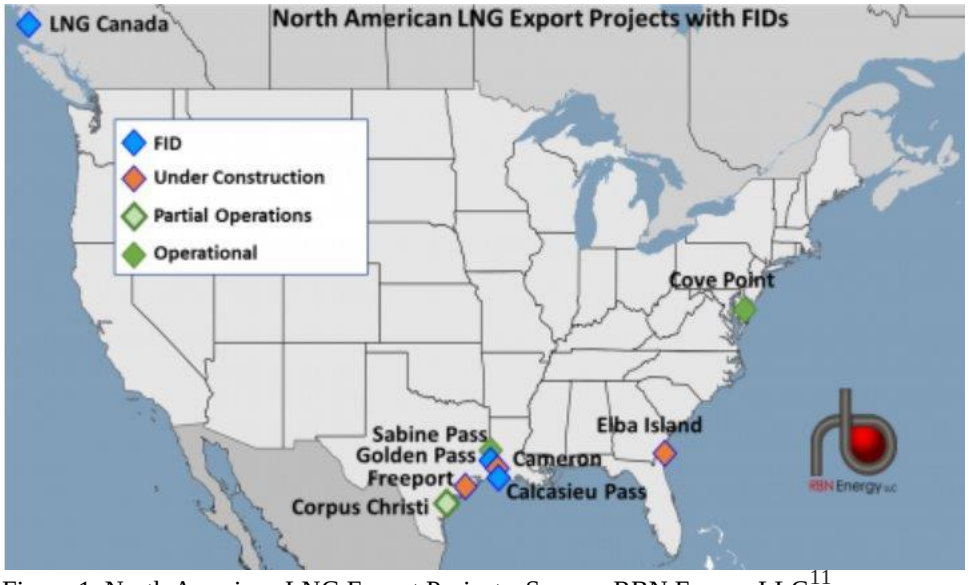


Figure 1. North American LNG Export Projects. Source: RBN Energy LLC[11]

Pembina needs to prove that there is in fact a need for their project and explain how they plan to compete with all these other players in the current glutted international marketplace

Eversheds LNGLawBlog has within the last few months reported the following:

- BP and ExxonMobil to Contribute $20 million Toward FERC Approval of Alaska LNG Project.
- FERC Grants Freeport LNG Extension to Complete Construction and Enter Service.
- Cameron LNG Sends Out First Commissioning Cargo; Receives Extension of Time to Complete Facilities.
- NextDecade Signs EPC Contracts with Bechtel for Rio Grande LNG Project
- Stonepeak Signs Agreement For $1.3 Billion Equity Investment in Venture Global's Calcasieu Pass LNG Project
- Freeport LNG Requests Extension to Complete Liquefaction Project; DOE Authorizes Train 4 Exports
- China to Increase Tariff on U.S. LNG from 10% to 25%
- Construction at Golden Pass LNG Terminal to Start May 13
- Final EIS Released for Venture Global Plaquemines LNG Project
- Port Arthur LNG Receives FERC Construction and DOE Export Authorizations

[11] https://rbnenergy.com/catch-a-wave-what-it-takes-for-an-lng-export-project-to-reach-fid

- Driftwood LNG Receives FERC Construction and DOE Export Authorizations
- FERC Releases Final EIS for the Rio Grande LNG Project
- FERC Releases Final EIS for the Annova LNG Project
- FERC Releases Final EIS for the Gulf LNG Liquefaction Project
- Golden Pass Cleared for Initial LNG Terminal Site Preparation
- FERC Releases Final EIS for Eagle LNG Partners Jacksonville Project
- Chevron Canada Proposes to Nearly Double Size of Proposed Kitimat LNG Terminal
- Total and Tellurian Sign LNG Agreements
- Venture Global Starts Construction at Calcasieu LNG Plant
- NextDecade, Developer of the Rio Grande LNG export project in Brownsville, Texas, signs 20-year LNG Contract Indexed to Brent Oil Prices
- DOE Grants Authorization for Non-FTA LNG Re-Exports from Proposed Mexican Terminals
- Elba Island LNG Exports to Begin Late April 2019

On May 13, 2019 Reuters reported that in retaliation for a U.S. increase in tariffs on $200 billion in Chinese goods to 25% from 10%, China is set to increase the tariff on U.S. LNG from 10% to 25% starting June 1. The report states that:

> * * * *
> *So far this year, only two LNG vessels have gone from the United States to China, versus 14 during the first four months of 2018 before the start of the 10-month trade war.*
> * * * *
> *On Monday, China said it would boost the tariff on U.S. LNG to 25% starting June 1 versus the current rate of 10%.*
>
> *U.S. LNG sales had already been affected by a 60 percent collapse in Japan Korea Marker (JKM) LNG prices seen since September.*
>
> *"**Weaker JKM spot prices in Asia already killed most of the commercial reasoning for U.S. LNG sales to China**. **The tariff is the knockout blo**w," said Ira Joseph, head of global gas and power analytics at S&P Global Platts.*[12]

Jordan Cove has no experience in LNG or in exporting LNG and has yet to explain how they would compete in the already glutted international LNG marketplace with seasoned gas and oil industry players that have LNG projects far ahead of them in the permitting process. They have also failed to show how China LNG tariff's will impact their project.

2. Use or alteration would unreasonably interfere with public trust rights;

On Friday, March 29, 2019 the Federal Energy Regulatory Commission (FERC) released the Draft Environmental Impact Statement (DEIS) on Pembina's proposed Jordan Cove LNG export project under Docket Nos. CP17-494-000 and CP17-495-000. While the DEIS is not a FINAL

[12] https://www.reuters.com/article/us-usa-trade-china-lng/u-s-liquefied-natural-gas-shipments-to-china-face-mounting-tariffs-idUSKCN1SJ1O4

Document yet as it **<u>is still under review</u>**, the DEIS for the Jordan Cove/Pacific Connector project shows the following diagram on page 4-709:

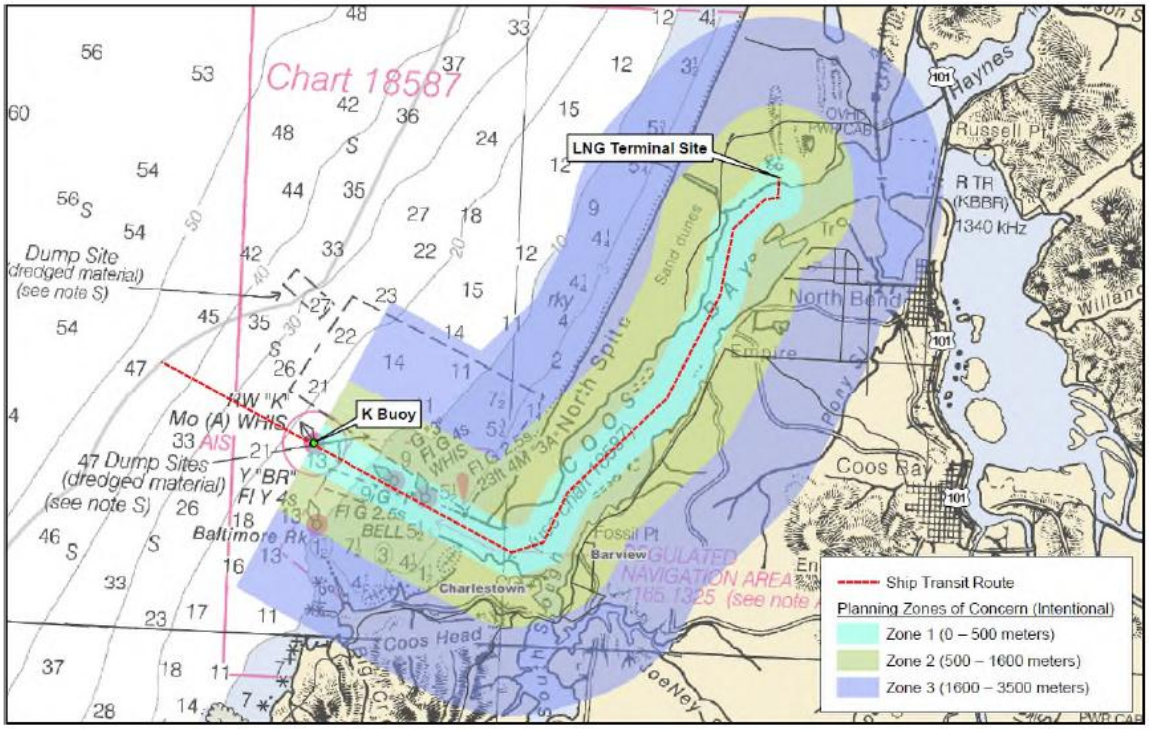


Figure 4.13-2. Intentional Hazard Zones along LNG Marine Vessel Route

On Monday, April 1, 2019, Jerry Havens, Distinguished Professor of Chemical Engineering at University of Arkansas, submitted <u>detailed comments</u> on the DEIS with respect to public safety hazards being underestimated at the proposed Jordan Cove LNG terminal. (***See Exhibit D***)

JCEP Computer Modeling Flawed

According to Havens, computer modeling used to predict the Jordan Cove Energy Project (JCEP) LNG export terminal vapor cloud explosion hazards have not been approved for predicting explosion overpressures by the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA). Havens expressed concerns to both the FERC and to the PHMSA that the Government is failing to adequately provide for the risks of potentially devastating Unconfined Vapor Cloud Explosions (UVCEs) of heavier-than-methane hydrocarbons at the proposed Jordan Cove Export Terminal (JCET) site. **Those hazards appear to be seriously underestimated**.

> *The new Draft Environmental Impact Statement (DEIS) for the Jordan Cove Export Terminal, just issued, continues to seriously underestimate vapor cloud explosion overpressures (damage) that could occur following credible releases of heavy hydrocarbons at the JCET site. The latest predictions that I am aware of appear to be an order of magnitude lower than are indicated by physical evidence of numerous*

documented UVCEs that have occurred worldwide with the potential to cause injuries and deaths to persons and result in destruction of the facility.
Jerry Havens, PhD, April 1, 2019

This not the first time these concerns have been raised by the Distinguished Professor. On January 14, 2015 [13], and February 6, 2015 [14], both Professor Havens and Professor James Venart (Professor Emeritus of Mechanical Engineering at University of New Brunswick) published several papers with respect to the former Jordan Cove LNG Export Terminal Draft Environmental Impact Statement under FERC Docket No. CP13-483 et al. **Professor Havens and Professor Venart found significant discrepancies and problems with Jordan Cove's hazard analysis and determined the hazards had been significantly underestimated.** Safety measures incorporated in the proposed Jordan Cove LNG export terminal actually increased the chance of a catastrophic failure and presented a far more serious public safety hazard than regulators had analyzed or deemed acceptable. On January 16, 2015, Oregonian reporter Ted Sickinger wrote an article summarizing the January 2015 FERC filing; "*Scientists say public safety hazards at Jordan Cove LNG terminal in Coos Bay are underestimated*" (***See Exhibit E***)

PHMSA Finds Hazard Concerns Justified

On April 11, 2016, the PHMSA contracted with the British Health and Safety Laboratories (HSL) for an Expert Evaluation of the Risk of Unconfined Vapor Cloud Explosions. On May 18 and 19, 2016, the PHMSA conducted a two day Public Workshop on Liquefied Natural Gas (LNG) Regulations in Washington, DC. The PHMSA stated at that time that:

"*This two-day LNG Workshop is to solicit input and obtain background information for the formulation of a future regulatory change to CFR 49 Part 193, Liquefied Natural Gas Facilities. This workshop will bring federal and State regulators, emergency responders, NFPA 59A technical committee members, industry, and interested members of the public together to participate in shaping a future liquefied natural gas (LNG) rule.*"

On June 7, 2016, E&E reporter, Jenny Mandel, published an article, "*Explosive LNG issues grab PHMSA's attention,*" concerning the two day PHMSA LNG Workshop event. (***See Exhibit F***)

After input from the LNG Workshop, the HSL finalized their Report: "*Review of Vapor Cloud Explosion Incidents*" in June of 2016.

Despite the findings found in the HSL Report and multiple comments submitted to the PHMSA with respect to this issue by Professor Havens on July 28, 2016, September 22, 2018, October 2, 2018, December 3, 2018, and now once again on April 1, 2019, nothing has ever been done by the PHMSA to formulate a regulatory change or address these critical hazard issues.

On May 2, 2019 the PHMSA did issue an advisory bulletin with respect to "***Pipeline Safety: Potential for Damage to Pipeline Facilities Caused by Earth Movement and Other Geological Hazards.*"** (***See Exhibit G***) The report states among other issues that:

[13] https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20150114-5038
[14] https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20150206-5040

Once operational, § 192.317(a) of the pipeline safety regulations for natural gas pipelines states that "[t]he operator must take all practicable steps to protect each transmission line or main from washouts, floods, unstable soil, landslides, or other hazards that may cause the pipeline to move or to sustain abnormal loads…

… ***Land movement, severe flooding, river scour, and river channel migration are the types of unusual operating conditions that can adversely affect the safe operation of a pipeline and require corrective action under §§ 192.613(a) and 195.401(b)****. Additional guidance for identifying risk factors and mitigating natural force hazards on pipeline segments, that could affect high consequence areas, are outlined in Appendix C, section B, to Part 195.* (Emphasis added)

Page 8 of the May 2, 2019 PHMSA Bulletin states:

6. Mitigation measures should be based on site-specific conditions and may include:

- ***Re-routing the pipeline right-of-way prior to construction to avoid areas prone to large ground movement such as unstable slope areas, earthquake fault zones, permafrost movement, or scour.***

Sightline / CSB Confirm Regulatory Gaps

On June 3, 2016, Sightline reporter, Tarika Powell, did a follow-up report on the explosion that had occurred on March 31, 2014 at a much smaller liquefied natural gas (LNG) peak shaving plant in eastern Washington. That explosion forced hundreds to evacuate their homes within a two mile radius of the facility, injured five workers, and caused $69 million in damages.

Powell's 2016 Sightline article[15] states that the Washington Department of Labor and Industries (Washington L&I), which had conducted an investigation into the safety of employees at the Plymouth plant found that Williams endangered its employees, lacked an adequate emergency response plan, and had deficient safety training. The company's track record—not just in the Northwest, but throughout the US—revealed a pattern of failing to heed safety regulations. This illustrates why we should not underestimate the fire and explosion hazards of natural gas processing plants such as LNG facilities. (***See Exhibit H***)

On October 21, 2015, the U.S. Chemical Safety Board (CSB) finalized an investigation report into the 2009 massive explosion at the Caribbean Petroleum, or CAPECO, terminal facility near San Juan, Puerto Rico.[16] The report included recommendations for addressing regulatory gaps in safety oversight of petroleum storage facilities by the Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA). It is not clear to me whether the CSB recommendations were ever addressed by regulators. While the CAPECO incident involved the storage of gasoline, the same overfilling of a storage tank could also occur with LNG, but with even more disastrous results.

[15] https://www.sightline.org/2016/06/03/williams-companies-failed-to-protect-employees-in-plymouth-lng-explosion/

[16] https://www.csb.gov/caribbean-petroleum-refining-tank-explosion-and-fire/

Jordan Cove has stated the Navigation Channel alterations are necessary in order to *allow for vessel transit under a broader weather window to enable JCEP to export the full capacity from JCEP's liquefied natural gas ("LNG") terminal on the nearby North Spit*. Jordan Cove has informed the local Coos Bay Bar Pilots ...*that excessive delays in LNG Carrier transits to and from the LNG terminal could result in a* ***shore storage tank topping situation***... (July 25, 2018 letter from Coos Bay Pilots Association - Emphasis added)

The proposed channel alternations where the dredging material would come from DO NOT CORRECT the ISSUES with LNG Tanker ships coming in over the Coos Bay Bar. Not only would the proposed alternations put more water volume in the channel and alter the Coos Bay channel's velocity and flow, the changes do not solve the problems with high surf and sneaker waves that commonly occur at the Coos Bay channel jetty entrance. It is not uncommon for the Coast Guard to close all the maritime entrances in Oregon and Washington due to flood debris, high seas.

"My job as a Captain of the Port is to ensure safety throughout the maritime infrastructure and part of that is to sometimes close the lanes of traffic that mariners use," said Capt. Dan Travers, commander Sector Columbia River and Captain of the Port for all ports in Oregon and Southwest Washington. "The storms that we all experienced over the last several days have made it dangerous for mariners to transit in and out of our many rivers due to severe sea conditions and debris."

"It's not rare at all to close the ports," said Coast Guard spokesman, Petty Officer 1st Class Levi Read. "The closures usually come with heavy sea conditions and the ships can't get out. The reason for this closure in addition to the heavy seas is because of the amount of the debris." [17]

Photo below is of the Rose Lynn as it crosses the Coos Bay Bar late in the afternoon as a wave breaks behind it in 2014. Photo by Kristal Talbot

[17] *Coast Guard closes all maritime entrances in Oregon, Washington due to flood debris, high seas (video)*; Dec 11, 2015
https://www.oregonlive.com/pacific-northwest-news/2015/12/coast_guard_closes_all_maritim.html
* Coast Guard transiting Coos Bay Channel Entrance: https://www.youtube.com/watch?v=qvordhPI8Ds
* Sneaker wave south of Coos Bay Caught on camera: https://www.youtube.com/watch?v=RPypT9dOvSY

Jordan Cove Continues to Ignore Hazard Concerns

Despite all the concerns about safety that have been raised with respect to the proposed Jordan Cove LNG Project over the last 15 years, the Project sponsors have continued to ignore or disregard most of these concerns.

Jordan Cove is proposing to build an LNG export terminal on dredging spoils located on a sand spit (an unstable sand dune area), directly across the bay from an airport runway, in the flight path of the runway, in an extreme tsunami inundation zone, in an earthquake subduction zone, in an area known for high winds and ship disasters, less than a mile from a highly populated city. Thousands of people in the Coos Bay/North Bend area would be put at risk due to living in Jordan Cove's LNG Hazardous Burn Zones. The Project is one of the worst sited LNG export proposals out there.

FERC's current Draft EIS and suggested unprecedented 137 Conditions of Approval do not alleviate the concerns.

At some point here regulators need to stop catering to the gas and oil industry and stop delaying all the regulatory oversight and updates that are necessary in order to protect the public health, safety and welfare of the American people.

Citizens have a right to have their lives, property and livelihoods protected and not subjected to harm or even death due to improper planning. When the projected Cascadia subduction earthquake occurs off the Oregon Coast this would compound the problem and mean more harm.

3. Feasible alternative LNG terminal locations exist but have not been considered

Alternative Terminal locations were presented on June 24, 2019 as McCaffree ***Exhibit 53*** but have not been considered in this permit application process.

4. Adverse impacts are not minimal

The Weyerhaeuser's mitigation site on the North Spit was not successful and there is no guarantee that what Jordan Cove has planned will be successful either. They are trying to mitigate habitat that would be located in the lower bay to a site far too upland and fish are not likely to be protected or have the habitat they need to survive in the lower bay.

Jordan Cove has yet to prove a need for their dredging project that outweighs the negative impacts to fishing, recreation and navigation. Jordan Cove's proposed eelgrass mitigation site also lacks sufficient proof that it would be successful.

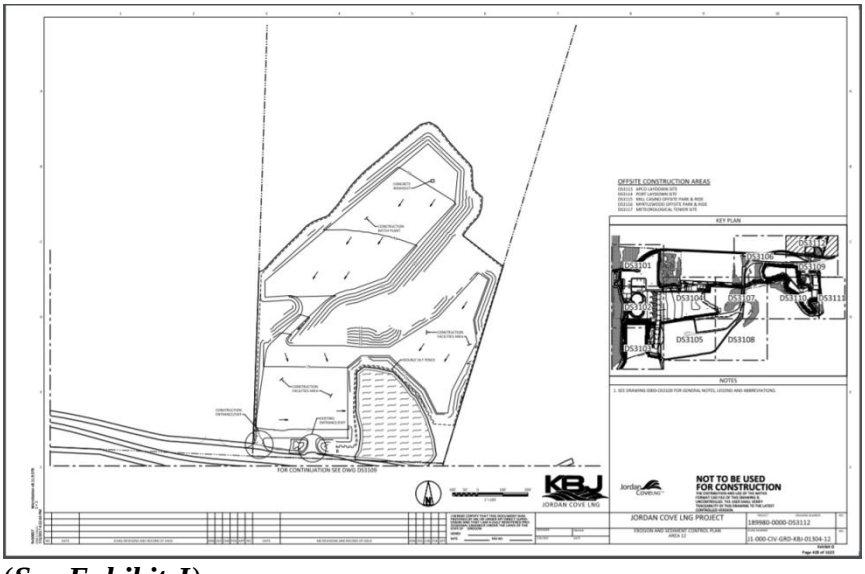
A March 2019 letter from Shon Schooler, Ph.D., Research Coordinator with the South Slough National Estuarine Research Reserve states: (*See McCaffree June 24, 2019, Exhibit 10*)

We are particularly concerned with the potential impacts to eelgrass (Zostera marina) populations as eelgrass is an important habitat for many estuarine species and improves estuarine water quality. The following comments fit under CBEMP Policy 4: Resource Capability Consistency and Impact Assessment. Eelgrass habitat in the Coos Estuary has experienced a net loss since 2005 (from mapping/GIS methods) and abundance has declined more recently since 2016 (from intertidal field surveys). [Photo: S. Jeffery - Copper rockfish swims among eelgrass blades.]

The dredging spoils from natural habitat areas in the Coos Estuary are also highly likely to be full of marine life that would attract birds. In addition, the finished grade shown above would be in violation of FAA regulations for height at the end of an active airport runway at APCO sites #1 and APCO sites #2.

Jordan Cove project would harm Recreation Activities.

On Saturday, June 27, 2019 The World newspaper in Coos Bay ran a front page story about UTV's taking over Box Car Hill Camground. (***See Exhibit I***) Thousand of people coming from all over to watch and participate in various ATV and UTI events that were scheduled from June 26th to June 30th. Recreational events like these will be severely harmed by the Jordan Cove LNG export project. Jordan Cove's June 10, 2019 submittal, electronic page 2435, into the North Bend land use proceeding under North Bend **File No. FP4-19/CBE 5-19** clearly shows Jordan Cove's plans in more detail than our June 24, 2019 comments (pages 69 to 71) concerning their plans to make the Boxcar Hill campground a Construction Facilites area and cement batch plant:



(***See Exhibit J)***

Conclusion

For all the reasons stated above and previously, please deny the Jordan Cove REM-19-001 application.

Sincerely,

Jody McCaffree

Table of Contents

Exhibit B

Forecast of the Net Economic Benefits of a Proposed LNG Terminal in Coos County, Oregon

An Economic Impact Analysis Prepared for the South Coast Development Council

October 16, 2006

ECONorthwest
ECONOMICS • FINANCE • PLANNING

888 SW Fifth Avenue
Suite 1460
Portland, Oregon 97204
503-222-6060
www.econw.com

Section I

Introduction

The South Coast Development Council ("SCDC") engaged ECONorthwest to forecast the net economic benefits, which would arise in a typical year from the operations of a proposed liquefied natural gas ("LNG") terminal in Coos County and its associated Pacific Connector Gas Pipeline.

The question this white paper answers is: What would be the effect on the local economy if an LNG terminal were built in Coos County rather than in Northern California? This report addresses three key issues in answering that question:

1. Research on LNG terminals and property values is discussed beginning on page 5.

2. On page 9 is the start of a section on the economic impacts of the LNG terminal project in 2016—chosen for the analysis because it would be a typical future operating year.

3. Because an LNG terminal would change the competitiveness of Coos County, this report concludes with a review of the longer-term effects a terminal would have of the local economy (page 16).

Major Findings of This Analysis

This analysis measures the economic impacts arising from the delivery, storage, and regasification of LNG into natural gas at Coos Bay, the shipping of the natural gas through a connector pipeline, and the cost savings to Oregonians due to having the LNG terminal in Coos County instead of Northern California. Furthermore, the analysis includes research into the other effects the presence of an LNG terminal might have. The principal findings of this analysis are:

- There is no evidence that LNG facilities hurt nearby property values or deter economic development. This finding is based on reviews of academic literature and county assessors' data for two existing LNG operations in Oregon.

- The proposed LNG facility for Coos County, during 2016 (a typical operating year), will supply 292 billion cubic feet of natural gas into the market. Natural gas prices on the western side of Oregon would be less than if LNG were to be brought into a port in California. However, prices elsewhere in Oregon and on the California border are not expected to be markedly less.

- Overall, Oregonians would save $17.0 million in 2016 on their energy bills if the terminal were built in Coos County instead of California. Local businesses in the State would save $31.5 million. Savings of this magnitude will occur each year the terminal operates.

- Because of lower natural gas prices, Oregonians, especially those living in southwestern Oregon, will be better off economically and will spend much of the money they would save on utility bills on other goods and services in the local economy.

- The combination of lower utility prices and better supply stability would make businesses in Oregon more competitive. They would increase both their output and employment.

- Since natural gas is the primary source of industrial hydrogen, the availability of LNG at Coos Bay could stimulate the development of a hydrogen industry. Hydrogen is a non-polluting fuel.

- Access to LNG would make power plants fueled by natural gas more feasible and potentially stimulate the decommissioning of dams to enhance salmon habitat.

- Overall, by placing the LNG terminal in Coos County instead of California, the County's economy would be able to support 400 additional jobs with above-average wages.

- Statewide, the terminal would raise annual employment by 1,173 and, in the year 2016, total economic output would be $488 million greater.

Section II

Background

LNG Project Description

The Jordan Cove Energy Project, L. P. ("JCEP") is planning to build and operate an LNG import terminal on 170 acres of industrial land on the North Spit of Coos Bay. The land area would be sufficiently large to accommodate the terminal facility and a required exclusion zone (buffer area) around it.

The terminal would have two large containment storage tanks and a regasification facility. Regasification is the process of taking LNG and warming it up to normal outside temperatures, thus, converting it into the conventional form of natural gas familiar to homeowners. The gas would then be shipped out by pipeline to consumers in Oregon, Washington, northern California, and Nevada. A 37-megawatt ("MW") plant at the terminal would capture waste heat from the regasification and use it to make electricity.

LNG terminals are designed to supply natural gas on an uninterrupted basis to power plants, factories, and homeowners via local utilities. To do so, they must receive LNG at a competitive price, which is only possible if shipped in large quantities. Modern, efficient LNG carriers (ships) do this and each holds about 160,000 cubic meters of LNG.

The size of terminals is dictated by the size of the carriers. Storage tanks onshore must be able to hold one shipload of LNG. These tanks constitute up to half the total cost of construction of a terminal.[1] To ensure steady gas supplies and flexibility in deliveries, at least two storage tanks are typically built at import terminals.

The terminal in Coos Bay would be designed to sendout, or put into the pipeline system, one billion cubic feet ("BCF") of natural gas a day or 365 BCF a year. However, because energy demand fluctuates with the weather and seasons, it is assumed that in a normal year the terminal would average 292 BCF. To achieve that volume, the terminal would unload about 80 carriers a year.

The economies of scale of LNG tankers and import terminals are such that the proposed facility would sendout volumes that exceed local demand in Coos County. Therefore, a connector pipeline is necessary so that gas from the terminal can reach a critical mass of customers. By doing so, most of the costs of building and running the LNG project would be incurred by consumers outside the County. Without access to large end-use markets, an import terminal would be uneconomic.

[1] U.S. Department of Energy, Energy Information Administration website accessed on August 30, 2006 at http://www.eia.doe.gov/oiaf/analysispaper/global/lngindustry.html

To move 292 BCF of natural gas a year the terminal would need to be connected to the existing large natural gas pipelines that deliver Canadian gas down the west coast. For this reason, the Jordan Cove project also entails the construction of a 223-mile natural gas pipeline that would run through parts of Coos, Douglas, Jackson, and Klamath counties. It would connect to the Williams Pipeline near Myrtle Creek, which would then bring gas mostly to points north on the western half of Oregon, and to the Pacific Gas & Electric ("PG&E") Pipeline in Malin, Oregon, that moves gas south into California through the Tuscarora Pipeline into Nevada.

Natural gas consumption in Oregon has tripled from 79 BCF in 1984 to 235 BCF in 2004.[2] Besides the natural growth of the economy and expansion of gas distribution systems into more communities, natural gas use has also grown in Oregon over the last twenty years because it has been generally more economical than other forms of energy.

Natural gas has also benefited from its growing use in electric power generation. With few opportunities to expand hydroelectric power plant capacity and major gains in the efficiencies of gas-fired power plants, natural gas use in power plants has risen. Natural gas is also less polluting than other conventional fuels. Unlike coal and biomass, it is essentially free of sulfur and particulate matter[3] and has a high hydrogen-to-carbon ratio that minimizes CO_2 emissions.[4]

Industrial Displacement

This analysis considered the possibility that an LNG terminal might displace other industries. Presumably, if an LNG terminal would occupy 170-acres of industrial land on the North Spit, that property would not be able to be used by other industries and, thus, potentially cause a net loss or displacement in industrial employment.

Displacement can only happen if there is no alternative land supply. Oregon law ensures that there is. The State requires that every city have a 20-year supply of industrial lands for development. Cities may expand their urban growth boundaries or convert existing lands to industrial uses to meet that 20-year supply.

The development of an LNG terminal would not absorb all of the available industrial land in the Coos Bay area. Indeed, even after taking 170 acres for an LNG terminal, there would be 1,130 acres left on the North Spit and most could be used for new industrial developments. There are also available industrial parcels available in the nearby cities of North Bend and Coos Bay.

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[2] Energy Information Administration, U.S. Department of Energy website accessed on September 23, 2006 at http://www.eia.doe.gov/oil_gas/natural_gas/data_publications/historical_natural_gas_annual/hnga.html.

[3] Jensen, James, The Development of a Global LNG Market, 2004. Oxford Institute from Energy Studies.

[4] Todd Gabe, Jonathan Rubin, Charles Morris, and Lisa Bragg. Economic and Fiscal Impacts of a Proposed LNG Facility in Robbinston, Maine. Department of Resource Economics and Policy, University of Maine. November 2005. Page 7.

Since Oregon law would preclude any displacement of industrial development because of the LNG terminal, this analysis finds that there would not be any negative consequences to industrial employment because of the LNG terminal operations occupying 170 acres on the North Spit.

Impact on Neighboring Properties

Common in disputes over major commercial or industrial developments are claims by detractors that such projects would hurt local property values. They point to attributes they perceive as so undesirable that the market as a whole would factor them in causing real estate prices to fall—a process that economists call "capitalizing disamenities." Since the perceptions of individuals can differ from economic realities, this analysis sought good evidence whether an LNG facility would be a disamenity or not.

Published Research

There is one report by an anti-LNG group that postulates that an LNG terminal would be a disamenity and, as such, should adversely affect property values. However, the report did not offer any data in support of that belief, did not examine property values around existing LNG terminals, and indeed made only a loose comparison to earlier research on a coal-fired power plant in a residential neighborhood.[5]

Currently there are five LNG import terminals and almost 100 LNG storage facilities in the United States, so there is ample data for testing whether LNG is a disamenity.[6] However, most research on disamenities focuses on the more common sources for consideration such as toxic waste sites, landfills, airports, and social factors (poor schools, high crime rate areas, *etc.*).

Thus, a search of the economic literature for this analysis uncovered only one academic study, which sought to quantify potential disamenities associated with LNG facilities. It was a peer reviewed research paper published in the *Journal of Environmental Economics and Management* that analyzed residential property values near eleven LNG liquefied natural gas storage facilities throughout the United States.

The researchers found that there was no disamenity impact. Indeed, their analysis revealed that when adjusted for other factors, the presence of LNG storage facilities is "found to positively affect annual housing rents." They also found that the presence of LNG did not adversely affect wage rates.[7]

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[5] Yellow Wood Associates, Report on Potential Economic and Fiscal Impacts of LNG Terminals in the Whole Passamaquoddy Bay, Report for "Save Passamaquoddy Bay." June 20, 2006.

[6] Mike Hightower, *et al.*, Guidance on Risk Analysis and safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water, Sandia National Laboratories. December 2004. Page 26.

[7] David E. Clark and Leslie A. Nieves, "An Interregional Hedonic Analysis of Noxious Facility Impacts on Local Wages and Property Values," Journal of Environmental Economics and Management. November 1994, p. 235-253.

The researchers were unsure why the data show a positive relationship between property values and proximity to LNG terminals. One possibility is that there are exclusion zones around LNG storage facilities and these open-space buffers eliminate any possible disamenity effect. The LNG storage tanks proposed for Coos Bay, for example, would occupy about three acres of a 170-acre site. The bulk of the land area would be open space.

LNG Storage in Oregon

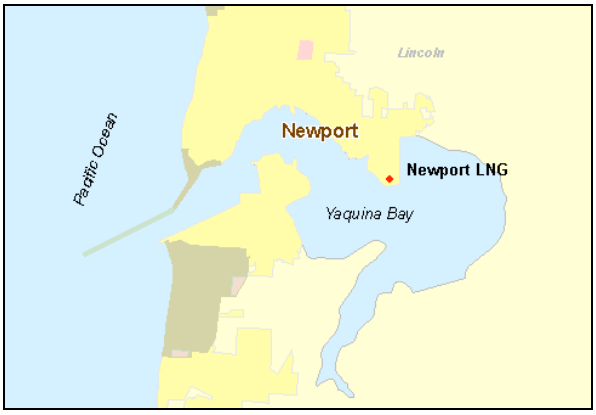
To explore whether LNG storage tanks hurt nearby property values or employment, this analysis collected data from county tax assessors on the two LNG storage facilities that have long operated in Oregon.

One is in Newport and the other is in Portland. Both are used for peak shaving—a way of storing a lot of gas for use in emergencies or when demand is extremely high. The LNG facilities in Oregon take natural gas off pipelines, liquefy it, and store it on-site. When demand surges, such as on a very cold winter night, the LNG is converted into a gaseous form and put back into the pipeline system. By doing so, utilities can assure customers of reliable supply. Although peak shaving is expensive, it is nonetheless cheaper for consumers than having to pay for setting aside pipeline capacity that would be needed only for brief peak demand periods.

Newport

The Newport LNG facility is located on a point of industrial land that juts out into Yaquina Bay. The Port of Newport owns and leases land in the area, which supports Newport's lumber, fishing, and tourism industries. The Port offers a variety of shipping terminal facilities including two berths with the capability of serving large ocean-going vessels, and over 500 berths for commercial and sport boats. The location of the LNG facility in Newport is shown on Figure 1.

Figure 1: LNG Facility in Newport Oregon



Source: ESRI US Base Map

The local utility, Northwest Natural, operates the LNG facility in Newport. It takes natural gas from a pipeline, liquefies it, and stores it in an above ground tank.

A review of data from the Lincoln County Assessor's Office indicates that property values near the LNG facility are not depressed. The area immediately around the LNG tank includes the normal exclusion zone. Nearby there are several industrial and commercial businesses. The largest is Trident Seafoods, which has a plant that processes Pacific whiting. The plant employs 120 workers seasonally.[8]

Overlooking the LNG facility and within a half mile of it are about 25 homes. They have above average market values according to the assessor's data. Consequently, the notion that the LNG facility serves as a disamenity to the surrounding residential community seems unlikely.

Portland

Northwest Natural operates an LNG facility, similar to the one in Newport, on a 40-acre site in Portland five miles from downtown. It is in the Portland Harbor industrial area, which is home to manufacturers, metalworking companies, and petroleum product facilities.

Within a half-mile radius of the site, there is a park and the Willamette River. According to data from the Multnomah County assessor,[9] there are many businesses in the area including five industrial properties on parcels exceeding six acres. They are shown in Table 1. Among them is Siltronic Corporation. It is the second largest industrial employer in Portland. Next door to the LNG facility, Siltronic manufactures silicon wafers for the semiconductor industry and employs about 970 workers.

Table 1: Five Industrial Properties Within a Half-Mile of the Portland LNG Facility

Owner	Business/Use
Siltronic Corporation	Semiconductor wafer manufacturing plant
U.S. Army Corps. Of Engineers	Willamette River dredging operations
City of Portland	Vehicle storage yard
Advanced American Construction	Marine construction company
Columbia Forge & Machining	Manufacturer of steel forgings

Source: Metro Data Resource Center. 2002a. RLIS Lite: Data for Mapping and Analysis (August 2006).

Advanced American Construction is a marine construction firm in close proximity to the LNG facility. They recently moved into the area. Columbia Forge & Machine Works is right across the river from the LNG facility, employs 17, has sales of about $1.6 million a year, and has been operating continuously at its present site since 1957.[10]

[8] Trident Seafoods website accessed October 9, 2006 at http://www.tridentseafoods.com

[9] Assessor data was accessed through: *Metro Data Resource Center. 2002a. RLIS Lite: Data for Mapping and Analysis (August 2006)*

[10] Dun & Bradstreet Market Identifiers. Accessed September 2006.

Conclusion

A search of academic literature uncovered only one paper that analyzed data on properties near LNG terminals and it found no negative consequences.

An examination of data on the two LNG storage facilities currently in Oregon found no evidence of a disamenity. In fact, there are a variety of industrial businesses located in close proximity to both. In Newport, there is very expensive housing within a half mile of the LNG storage tank. In Portland, the second largest industrial employer in the city is adjacent to an LNG storage tank property.

As a result, this analysis has no basis for considering disamenities in its assessment of the net economic impact of placing an LNG terminal in Coos County. Indeed, for some industries, the presence of an LNG terminal could be a positive amenity by supplying large and steady amounts of natural gas at very competitive prices. It may well attract more employment to the region. This dynamic impact is explored in a section beginning on page 16, although it was not included in the net impact analysis which follows.

Section III

Net Economic Impacts

The LNG project will cause increased economic activity in Coos County and much of the rest of Oregon through the spending by the project's operators and employees, but also because of lower natural gas prices if the LNG were brought into Coos Bay rather than to a port in California. To quantify these impacts an economic analysis was done, which predicts the effect of the LNG facility on economic activity in a particular year.

In this section, we first review what an economic impact analysis is and what it measures. This is followed by a discussion of the findings of the analysis.

What is a Net Impact Analysis

In simple terms, an economic impact analysis is a way of accounting for all the effects that a project, such as Jordan Cove, would have on an economy. A net impact analysis counts only the net increase in economic activity because of a project compared to what would happen if some other alternative project were built. In this report, the alternative would be to build an LNG terminal and pipeline in Northern California instead of Coos County.

There are several common measures of economic activity. The one that is important to most people is jobs. Impact studies can also measure the impacts of a project on employee compensation (wages and benefits), taxes, self-employed worker income, property income, and output, which is the value of services done and things produced in an economy. The impact analysis for this report tracked all of these.

Economic Impact Model

An impact analysis uses a computer model. It is a mathematical description of an economy, for example, the economy of Oregon, which follows how money in a given year is spent and made as it goes from the project being studied to other workers, households, and businesses in the State. It does this by taking information from the U. S. Census and other sources, and carries out the dollar flows to nearly every possible segment of the economy by tracing how money is spent and re-spent.

Impact models are specific to an economic area. Therefore, if a worker at the LNG terminal spends money on a vacation in Washington, an impact model of Oregon would not count any of that spending as affecting the Oregon economy even if some of those dollars could potentially come back to the State in some way.

Economies Measured in this Report

For this report, the economic impacts were measured for three economic areas.

Since the SCDC is most interested in Coos County, the first model used was one of Coos County.

However, the pipeline will extend through other parts of Southwestern Oregon, so a second model was developed to measure the project's impacts on a four county region of the State.

Finally, because there is interest in the project elsewhere in the state, a model that would measure the economic impacts of Jordan Cove on Oregon was also created and run.

Year Analyzed

Economic impacts are normally measured for a given year. This provides a good snapshot picture of how a project like Jordan Cove affects an economy. However, it is understood that those impacts would reoccur year after year, as the terminal continues to operate.

For this report, the impacts were measured for the year 2016. This would be about the fifth year of the terminal's operation. It is normal for large energy projects, particularly those in new markets, to take up to five years to reach a routine level of operations—a point where the rapid growth period ends and business stabilizes. That is why 2016 was chosen.

All the dollar values reported in the analysis include the effects of the inflation expected between this year, 2006, and 2016.

Types of Impacts

The analysis begins by estimating the direct impacts of a project. Direct impacts are the basic facts of a project such as the number of workers, total payroll and benefits, and output for a given year. The direct impacts are then run through the model of the economy.

The model calculates all the downstream impacts that are felt in the economy that arise from the jobs, output, and spending at the project. The results fall into one of three types of impacts, which are:

(1) Direct impacts are activities that occur primarily on-site at the location of the project. For this report, we also count the savings in natural gas prices and those direct impacts are going to be spread out throughout the region.

(2) Indirect impacts are the result of successive rounds of purchases of goods and services that start with the spending done by the project, but quickly disperse throughout the economy. The indirect impacts representing what the JCEP would spend money on, including payments to local governments and emergency service crews, were incorporated into the impact models.

(3) Induced impacts come from the increased spending of money made by workers, either directly or indirectly, because of a project.

For this analysis, only the changes in direct and some indirect impacts that would occur if the terminal were placed in Coos County instead of the alternative in California were put into the economic impact model.

Economics of the Alternative

The alternative is an LNG terminal in California. As with Jordan Cove, if an LNG terminal were built in Northern California, a new connecting pipeline would be needed to link it to the PG&E Pipeline. Because of this, the economics are similar.

Transmission costs to take gas from the Northern California coast to the PG&E Pipeline near the California-Oregon border at Malin would be about the same as the cost of getting gas to Malin from Coos Bay. Thus, this analysis assumes that only consumers in Coos, Douglas, and Jackson Counties, and other Oregon counties along the Williams Pipeline, which runs from Grants Pass north up through the Willamette Valley, would save money from having the LNG terminal in Coos Bay instead of Northern California.

Net Direct Impacts

For this analysis, the Jordan Cove project is viewed from the perspective of counting all of the activities associated with the direct handling of the LNG and resulting natural gas from the point at which the LNG tankers come into Coos Bay through to the points at which the natural gas goes onto the Williams and PG&E pipelines.

Therefore, the direct net impacts of the Jordan cove project in 2016 would be the sum of the following five sources:

1. The employment, payroll costs, and output of the LNG terminal all would count as net direct impacts because, if the project were built in California instead, none of these impacts would occur in Oregon.

2. Similarly, the employment and output of the Pacific Connector Gas Pipeline are all net direct impacts.

3. If built in Coos County instead of California, the terminal would result in lower natural gas prices in much of Oregon because Oregonians would be closer to the source of the gas. Gas utilities are regulated and pass-on such savings to residential customers. For people, lower gas bills would leave some extra money in their pockets. Some of it would be saved and some of it would probably be taxed, but much of it is going to be spent. The portion that would be spent locally is going to stimulate the economy and is counted here as a net direct impact.

4. The energy cost savings for businesses are going to make them more competitive, especially relative to companies in higher energy price states like California. As a result, Oregon businesses that see lower natural gas prices, because the terminal is in Coos County instead of further away in California, are going to be able to increase their output and, in doing so, employ more people. This is a direct impact.

5. The analysis includes the employment, payrolls, and output of vessel service activities done in Coos County for the purposes of delivering LNG to the terminal as net direct impacts. If the terminal were in California, none of this economic activity would benefit Oregon. Vessel services include pilots, dockworkers, stevedores, chandlers, and others that serve ships.

The five sources of direct impacts all feed into the impact models, which trace and sum all the indirect and induced impacts.

To illustrate the relative size of the five direct impacts, Table 2 shows the number of jobs for each in Coos County and statewide. It indicates that in Coos County, the direct employment at the terminal and for vessel service providers is particularly important, but in the rest of Oregon, the benefits of lower natural gas prices on direct jobs are more significant.

Table 2: Direct Employment Impact by Activity in Coos County and Oregon, 2016

Activity	Coos County	Oregon
Direct employment by LNG terminal company	57	68
Direct employment of those providing vessel services	26	26
Direct employment by the natural gas connector pipeline	1	4
Higher economic activity from lower gas prices for households	19	52
Higher economic activity from lower gas prices businesses	21	224
Net direct labor	124	374

Source: ECONorthwest Impact Analysis. October 2006.

In total, the direct employment impact of the JCEP in Coos County would be 124 jobs. Statewide, the net direct impact would amount to 374 additional jobs. For both, however, the indirect and induced impacts more than triple the benefits on employment.

Results of the Net Impact Analysis

Table 3 shows the net effects on jobs, output, and personal income that would arise in 2016 because of the direct, indirect, and induced impacts of the JCEP.

Table 3: Net Economic Impacts by Type, 2016

Study Area / Type of Impact	Output	Personal Income	Jobs
Coos County			
Direct	$202,143,900	$11,777,900	124
Indirect	16,711,400	11,060,200	180
Induced	8,708,700	3,450,600	96
Total	227,564,000	26,288,700	400
SW Oregon			
Direct	$375,225,000	$17,335,800	242
Indirect	28,543,900	18,138,700	298
Induced	20,223,700	7,756,400	195
Total	423,992,600	43,230,900	735
Oregon			
Direct	$395,816,200	$24,288,100	374
Indirect	53,164,200	32,113,700	475
Induced	38,915,500	15,056,000	324
Total	$487,895,900	$71,457,800	1,173

Source: ECONorthwest Impact Analysis. October 2006.

In total, Coos County would see a net increase of 400 jobs in 2016. Personal income would be about $26 million higher as a result—this includes pay, benefits, and proprietors' (self-employment) income. Output would be nearly $228 million higher in 2016 if the terminal were built in Coos County instead of California.

Southwest Oregon would capture many of the benefits from Jordan Cove because much of the savings on natural gas prices would accrue to people and businesses in that part of Oregon. Southwest Oregon would see a net gain of 735 jobs or about 63 percent of the total gain in Oregon. This region would also experience a $424 million increase in economic output in 2016.

Statewide, personal income would be over $71 million higher with the LNG terminal in Coos County instead of California. The net benefit would indirectly stimulate 475 jobs around Oregon and, through income induced means, another 324 jobs.

Net direct economic output would be $396 million. Indirect output would be $53 million higher in the State because of the project whereas the increase in economic activity induced by higher labor income would spark almost another $39 million in net output in 2016.

The direct impacts of the JCEP are high relative to the total impacts because LNG terminals and pipelines are very capital intensive—involving hundreds of millions of dollars in construction and equipment installations. Most of the spending on the project occurs during that construction phase, which causes a large burst of indirect and induced economic impacts in the economy. However, once up and running, spending on ongoing operations is comparatively lower, and the indirect and induced impacts are more modest.

Total Economic Impacts

Table 4 shows the total impacts. In Coos County, employee compensation would be almost $25 million higher in 2016 than if the LNG project were not built. Compensation includes wages, health insurance, and retirement benefits. That compensation averages $62,470 a year for the 400 workers affected by the JCEP in 2016. With inflation taken out, that would be the same as $44,878 a year in today's dollars—well above the current average wage in Coos County of $27,248.[11] One reason why the compensation would be so high is that many of the jobs connected with the LNG terminal are high skilled and high paying. Many are union jobs.

Table 4: Total Economic Impacts, 2016

Type of Impact	Coos County	SW Oregon	Rest of Oregon	Total Statewide
Output	$227,564,000	$423,992,600	$63,903,300	$487,895,900
Employee Compensation	24,988,000	39,782,100	25,709,800	65,491,900
Proprietors' Income	1,300,700	3,448,800	2,517,100	5,965,900
Other Income	3,649,600	7,160,600	9,080,900	16,241,500
Jobs	400	735	438	1,173

Source: ECONorthwest Impact Analysis. October 2006.

In the rest of Oregon, outside of the four counties, the net increase in economic output due to the terminal would be nearly $64 million in the year 2016. About $21 million of this would be attributable to the reduction in the cost of natural gas to homeowners, businesses, and local governments throughout western Oregon.

The analysis does not assume any savings in central or eastern Oregon, because getting gas to those markets from an LNG terminal in Northern California would cost as much as getting it from Coos Bay. Thus, there is no net benefit to gas utility customers. However, because of the indirect spending effects and the economic activity resulting from higher payrolls caused by the Coos Bay operation, there would be an additional $43 million in economic output statewide in 2016.

[11] Oregon Employment Department covered payroll per employee in Coos County for the first quarter of 2006 annualized.

Net Tax Impacts

The incremental taxes arising from the LNG project would exceed $43 million in 2016 alone. Much of it would come in the form of property taxes on the real estate and equipment of the terminal and pipeline. However, property taxes will also come about because the higher value of housing of workers benefiting from the induced impacts of the LNG project. So too would the properties of various industries that would increase their output because of the availability of lower cost energy in the State.

Table 5: Tax Impacts, 2016

Taxing Jurisdiction / Type of Tax	Coos County	SW Oregon	Oregon
Federal Government			
Business	$499,100	$1,141,700	$2,457,900
Personal	883,300	1,325,053	2,053,291
Social insurance taxes	3,199,300	5,864,300	9,260,900
Total Federal	$4,581,700	$8,331,053	$13,772,091
State and Local Government			
Business income, property & other	$8,674,600	$15,957,100	$26,069,800
Personal income, property & other	834,400	1,438,400	2,498,400
Social insurance taxes	540,400	1,668,000	779,700
Total State and Local	$10,049,400	$19,063,500	$29,347,900
Total All	$14,631,100	$27,394,553	$43,119,991

Source: ECONorthwest Impact Analysis. October 2006.

The boost in economic activity forecast here for 2016 would reoccur each year the terminal operates. In the long run, the economy would benefit in other ways. Most notably, having LNG would offer Coos County and Oregon an absolute competitive advantage over nearby states that lack such a stable and cost effective energy source.

Over time, the local economy will respond to this advantage and new industries will take hold. We may see not only traditional energy intensive industries expand, but alternative energy sources—most notably hydrogen manufacturing—may also become feasible. These dynamic impacts are discussed in the following section.

Section IV Long-Term Dynamic Impacts

Investments of the size and nature of the LNG terminal fundamentally alter the economic landscape allowing new employers to establish themselves that would otherwise have never considered Coos County. What had formerly been an isolated, high-energy cost county would become a better location for industries.

LNG would lower the cost of energy and assure consumers of a secure, ample supply of natural gas. The flow of ships would enhance the economic viability of the Port of Coos Bay and further improve the area's attractiveness as a business location. Together, these would expand the range of goods and services that could logically be produced in Coos County.

Economists call this effect an expansion of the production possibility frontier. Effectively, it means that the possibilities for how the economy can grow are fundamentally improved by the permanent advantage in energy costs that Coos County would enjoy because of the LNG terminal. This triggers a series of changes in the structure of the economy as new businesses emerge.

The dynamic process occurs over many years and their evolution can be carried out in innumerable directions. In this section, the dynamic impacts are discussed.

Dynamic Impacts

Dynamic impacts are the result of a stimulating business investment in an area that affects economic structural changes in that area's economy. Although often requiring years to "play out," the ultimate result is further industrial production and supportive infrastructure investments that would otherwise not have occurred.

The consequences include growth in investment, expansion of career and employment opportunities, and subsequent improvements in the standards of living. The dynamic impacts make it possible for participants to engage in an expanded range of productive wealth creating activities.

For purposes of this analysis, the proposed LNG terminal project at Coos Bay is the subject economic opportunity stimulus. That investment would include a marine docking facility for tankers, natural gas conditioning equipment, handling and storage facilities, a cogeneration power plant, and a gas pipeline for connecting the terminal to gas transmission facilities.

Topics of interest include the economic advantage offered the Coos Bay and Oregon South Coast areas by such a stimulus, and the nature and impacts of further investment and expansion that could be anticipated.

Elements of a Healthy Economy

A healthy economy has the ability and community support to foster growth. Most communities hope that they can have ample living wage jobs for their citizens and for their children to take on when they reach adulthood. Hope, however, is not enough. Certain elements in support of a healthy economy need to be in-place.

Historical Perspective

Coos Bay and the South Coast of Oregon need to look no further than the recent past to understudy the elements of a healthy economy. Until the early 1980's, the region experienced economic health through the auspices of a natural resources based economy. Logging, mill production, log exports, and healthy fisheries and agricultural industries provided for productivity, employment, and provision of public services.

Necessary elements included:

- General community support for economic growth
- Solid foundation for productive economic activity
- Diversity of activities
- Worker availability and employment participation
- Supportive education system
- Adequately funded social services

The area economy prevailed for years despite cycles of prosperity and recession. However, change was inevitable. New competitors emerged, natural resources dwindled, environmental rules intervened, and the character of the economy changed over time to reflect today's reality.

The evolving question for the past two decades has been, "how does the area re-establish its economic vitality." Tourism and retirement induced employment have been helpful albeit remain insufficient.

This is reflected in the payroll employment data that show a decline of 3,998 manufacturing jobs between 1976 and 2005. While total employment grew 5,165, much of it had been in lower paying sectors. Indeed, in 1976, the average fulltime job in Coos County paid $248 more a year than the average job paid in all of Oregon. In 2005, jobs in the County were paying an astounding $9,176 a year less than the average job in Oregon.[12]

[12] Data from the covered employment and payrolls reported by the Oregon Employment Department website as accessed on September 10, 2006 at http://www.qualityinfo.org/olmisj/CEP.

Furthermore, much of the relatively high-paying job growth was confined to the government sector. Indeed, 45 percent of the growth in Coos County between 1976 and 2005 came from government jobs—a ratio far higher than the norm (about 13 percent statewide) and unsustainable without significant private sector income growth.

Re-engaging the Economy

Coos County would benefit from a structural economic change that would facilitate high-wage job growth. The long-term answer may well be found by reestablishing in the area the key elements necessary for successful economic engagement.

Support in the community for industrial activity would have to be forthcoming. A broad-based desire to seek opportunities is fundamental. Resources, assets, and financing on which to establish new ventures are basic. A willingness to share in investment and risk is equally relevant.

The proposed LNG project at Jordon Cove offers a venture that can once again economically engage and invigorate the South Coast region.

Energy and Economies

The LNG terminal being proposed for the North Bay Marine Industrial Park at Coos Bay will set it apart from other major west coast ports. As the gateway of a natural gas based energy resource, the area will acquire the advantages and characteristics of an energy supplier region. The west coast of the U.S. is energy deficient. The LNG facility would place Coos County in a unique regional situation as the equivalent of an energy producer.

To be anticipated are investments in sectors in which energy is important. Of particular attraction are energy supplies that are both secure and offer pricing stability over the long term. The LNG facility will afford these attributes by virtue of long term contracting and capacity sizing. To operate at an efficient scale, the LNG terminal would have to handle more natural gas than the entire Oregon economy currently consumes. This would put businesses in the Coos Bay area in the enviable position of having access to more than ample supplies of natural gas at what are likely to be at or near the lowest prices on the coast.

The importance of energy cannot be understated. As a critical input of manufacturing and many other key economic sectors, having stable, low-priced natural gas would allow Coos County to become more competitive in the global market.

International & U.S. Situation With Natural Gas

Unlike petroleum, which has seen declining reserves, the global situation for natural gas is quite different. New reserves continue to be discovered and total proved reserves have more than doubled in the last 25 years.[13] World proven reserves now equal about 70 years of current consumption. Discoveries are adding to this faster than gas production is being consumed.

Proved reserves are known, measured deposits that can be brought to market using current technology and infrastructure at a competitive price. In addition to these there are less certain reserves and resources including between 3,000 to 4,500 trillion cubic feet of known gas that can be brought to the surface, but from wells that are too far from markets. When this gas is brought to the surface, it is considered "stranded," and, as such, it is either flared (burnt off on-site) or injected back into the ground.

Stranded gas is a problem in the remote locations of the more recent discoveries, the challenge being economical transport of the gas to markets. It is also an issue for many petroleum-producing counties. Throughout the Gulf Countries, natural gas is extracted as a necessary byproduct of oil production only to have to be burnt off in the atmosphere because there are no practical markets reachable by pipelines for it. The undisputed solution is use of the LNG option.

Several countries today rely on LNG for natural gas supplies. Examples include France – 32 percent, Spain – 59 percent, Taiwan – 80 percent and Japan – 96 percent. Japan has relied on LNG for natural gas supplies in excess of 35 years. LNG incorporates mature technology that continues to be improved.

Considering the energy situation in the U.S., proven natural gas reserves and production are little changed over the last 25 years. However, demand is up and imports are filling the gap. LNG currently supplies only about three percent of domestic demand. Because of the growing world reserves of natural gas, concerns over petroleum supplies, high natural gas prices domestically, and improved means of producing and transporting LNG, the situation is about to change. It is projected that by 2025, 14 percent of the U.S. natural gas needs will be supplied by LNG.

Local Situation

At the state level, Oregon has only 15 producing natural gas wells that fill just 0.2 percent of its annual consumption. Nearly all the state's natural gas comes from the Rocky Mountain Basin and Canada—places where the costs of producing natural gas have been on the rise. Indeed, natural gas prices in Oregon increased 168% between 1999 and 2004. Price swings have become more volatile, a situation destined to continue. It is apparent that actions, which bring security and stability of supply, and pricing stability, will be advantageous to the state economy. LNG could contribute a meaningful response.

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[13] From the U.S. Department of Energy report accessed on the Internet on September 10, 2006 at http://www.eia.doe.gov/oiaf/ieo/nat_gas.html.

In reviewing the energy situation in the Coos Bay area, the results of recruitment efforts over recent years attest to the importance of having available a secure, stable, and price competitive energy supply. Following is a list of industrial recruitments that had been lost by the Coos Bay area because natural gas was not available. This activity took place before its availability in January 2005. The firms are indicative of the types of manufacturers that LNG would attract:

- US Gypsum – 200 jobs – sheet rock manufacturing – went to the Port of St. Helens.
- Pohang Steel – 200 jobs – steel mill.
- BHP Steel – 200 jobs – coil mill – went to Kalama, Washington.
- Hokishen – 120 jobs – secondary wood products.
- Project Vision – 250 to 300 jobs – glass production.

These losses were significant and point to the importance of securing a viable energy future for the region.

South Coast Development

The economic opportunity presented to Coos Bay and the South Coast as an LNG host site is substantial. The availability of a secure and stable natural gas supply with pricing advantages would act as a catalyst for attracting downstream development and stimulating economic growth. The significance of such a response is not to be underestimated.

It is conceivable that the response would be immediate with companies locating near the LNG terminal. In addition to the gas resource, these players would be seeking to take advantage of the industrial land available on the North Spit and the other assets available including the deepwater port, fresh water resources, and land transportation infrastructure.

Downstream industrial and commerce development would necessitate a continuum of both private and public investments in industrial plant construction and infrastructure. Such activity could readily result in the establishment of a major west coast industrial park and the re-establishment of Coos Bay as a major seaport with modern facilities.

Indeed, with LNG tanker operations, potential ship transport of natural gas liquids products, the delivery of raw materials and shipments of manufactured product associated with sited industry, yearly shipping as a separate activity could become substantial. It is conceivable that operations could once again return to numbers approaching the 450 ships annually of years past as compared to today's 45 ships.

Some idea of the types of industry that would be attracted can be acquired by evaluating what industrial processes are reliant on natural gas, and what supportive industries might follow. The significance of supplier and secondary support enterprises can be equally important to targeted growth.

A goal of importance is the achievement of a critical mass of economic activity, fundamental to ensuring continued success. The lack of a sufficient critical mass is a significant contributor to economic initiative failure.

Industry accounts for 43 percent of domestic natural gas use including use as a feedstock for such important everyday products as fertilizers, plastics, and synthetic fabrics. As an energy resource for industry, a greater percentage entails provision of the basic requirements of heating, cooling and cooking as stages of industrial processing.

This application scenario is not unlike that of the commercial and residential sectors. In the residential sector, natural gas is applied to our fundamental needs of keeping homes warm, supplying hot water, drying clothes, and preparing foods.

From past experience, the types of industries that would be attracted to Coos Bay because of the LNG resource include wood products, metals, food processing, glass, ceramics, building products manufacturing, metal fabrication, paper, hydrogen production, and energy-intensive forms of recycling.

Many innovative options are utilized in other parts of the U.S. for both attracting new industrial investments and retaining successful operations. One example of a program that has been successfully applied in excess of ten years in the state of New York is the provision of subsidized electricity as practiced by the New York Power Authority.

The program was started in the 1990's, has been substantially effective over the period, and continues to the present time. Another example is a series of utility and transportation programs being utilized in Suffolk County, NY. Involved are gas and electric utility rate incentives for assisting business development initiatives.

Comparable programs could be derived for the South Coast using the natural gas supply as an economic incentive to encourage industrial development in the area. Such an initiative strategy would effectively turn the LNG natural gas energy resource into an economic development tool.

The net effect of a Jordan Cove LNG project and follow up industrial investment is that Coos Bay and the South Coast areas would once again have "at work" the elements of a healthy economy. Involvement, investment, and participation would prevail to the benefit of employers, employees, and area residents. A sound economic and social services foundation would be constructed for the benefit of the next generations.

The Environment and Alternative Fuels

With large surplus reserves of natural gas coming on the market and onshore at Coos Bay, opportunities to expand end-uses arise and none is as promising as alternative fuels. LNG is a source of nearly pure methane, which is a simple hydrogen rich compound that burns cleanly. As such, it is a low polluting alternative to gasoline and diesel, and is the most cost effective feedstock in commercial hydrogen production.

Air pollution is a concern locally, domestically, and at the international level. It is being driven by increasing levels of harmful pollutants in our immediate surroundings, and the accumulation of greenhouse gases in the upper atmosphere through the measured onset of global warming being made evident by the scientific community.

Vehicle Fuel

The single largest contribution to air pollution is forthcoming from transportation, principally vehicular traffic operating on gasoline and diesel fuels. It is estimated that vehicles on the road today in the U.S. account for 50 to 60 percent of carbon monoxide pollution, 30 percent of hydrocarbon pollutants that contribute to the greenhouse effect, and 31 percent of nitrogen oxide emissions, a major contributor to ozone formation.

The situation in Oregon is similar. Gasoline and diesel fuel use account for 40 percent of the state's total energy requirements. Gasoline consumption accounts for 60 percent of the total petroleum use in Oregon. The State's need to cut vehicular pollution emissions is great.

State and federal mandates call for more stringent emission standards. However, because neither gasoline- nor diesel-fueled vehicles as currently operated can meet those standards, options are being evaluated. One of the more promising alternatives is to fuel vehicles with natural gas. In fact, vehicles have been operated on a limited scale for years using both compressed natural gas ("CNG") and LNG as alternative fuels.

The reason for the interest in natural gas is overall reduced emissions. Natural gas vehicles produce, on average, 70 percent less carbon monoxide, and 80 percent fewer nitrogen oxides than traditional powered vehicles. Furthermore, since natural gas is hydrogen rich, water is its primary combustion product. Thus, natural gas vehicles generate less carbon dioxide than do gasoline or diesel ones. Additionally such harmful emissions as sulfur dioxide, volatile organic compounds, and particulate are substantially less. It is further noteworthy that natural gas operated vehicles are superior in performance to gasoline.

On an equally positive note, natural gas is cheaper. The energy content of a thousand cubic feet of natural gas equals that of about six gallons of gasoline. Thus, if natural gas were priced at $5, it would be the equivalent cost of 63 cents a gallon for gasoline. In most places the costs of compressing and delivering the natural gas plus motor fuel taxes raises the final cost to a CNG vehicle owner as much as four-fold. However, with LNG delivered into Coos Bay, the costs of delivering CNG to users would be much less.

The latest national price data, for June 2006, show that CNG cost $1.90 a gasoline gallon equivalent. Gasoline sold nationally for $2.84 then. Diesel, when adjusted for energy content (better road mileage because it contains more BTUs per gallon) cost the equivalent of $2.65. B99 biodiesel was being sold for an average energy equivalent price of $3.71. E85 ethanol was $3.43. Thus, natural gas was the least expensive.[14]

Fuel Cells

An emerging technology that would produce clean energy is the fuel cell. These devices are very energy efficient and produce electricity from hydrogen gas. They are sold commercially on a limited scale, but advances are being made to bring their costs down. Ultimately fuel cells could find widespread use in electric vehicles and in powering homes.

The key material needed in fuel cells is hydrogen gas. Hydrogen is produced commercially in a process called steam methane reforming, which uses methane from natural gas. Methane has the highest ratio of hydrogen to carbon of any hydrocarbon. Some fuel cells, such as the one operated by the City of Portland that runs off methane from a wastewater treatment plant, have small reformers that make hydrogen on-site. As with any chemical process, however, it is more efficient to produce hydrogen on a large scale. The benefits of using natural gas in large-scale plants to make hydrogen are low emissions, high energy efficiencies, and low costs.[15]

With a steady and substantial supply of low cost methane at the LNG terminal, Coos County would be a logical place to build a hydrogen plant. This would complement the State's interest. In July 2006, Governor Kulongoski expressed a strong support for moving Oregon toward a "hydrogen economy."[16]

[14] U.S. Department of Energy. Clean Cities Alternative Fuel Price Reports. June 2006.

[15] International Energy Agency—OECD, Hydrogen Production, and Storage, 2006. Page 8.

[16] State of Oregon Governor's Office. Press release. July 28, 2006.

Report Summary

Having an LNG terminal in Coos County would alleviate a major hindrance to economic growth. It would effectively create a means by which natural gas, a stranded natural resource in Asia, could be economically brought to the west coast of the United States and in doing so make Coos County the lowest cost location for LNG in the west. It could fundamentally change the County's competitiveness, especially in attracting industrial jobs.

An analysis done for the SCDC reveals that in a typical operating year (2016) the LNG terminal and its associated elements would, in net terms, stimulate an additional 1,173 jobs and $488 million in economic output for Oregon. Most of this would be felt in Coos, Douglas, Jackson, and Klamath Counties. Furthermore, these benefits would reoccur for many years into the future.

From an economic perspective, a review of economic literature and of actual property data for two LNG liquefaction facilities in Oregon, both show no negative consequences on employment or property values. Furthermore, because of the large supply of developable industrial lands in Coos County, the citing of an LNG terminal on 170-acres of the North Spit would not hinder industrial growth.

On the contrary, an LNG terminal would make the Coos Bay area a more desirable place for some industries because of its proximity of cost effective, reliable, and substantial supplies of natural gas. Such assuredness of competitive supply would set Coos County apart. The result would be long term economic benefits that would change the dynamics of the local economy and attract good paying jobs. Such dynamic impacts would be in addition to the net economic impacts forecast in this report for a typical operating year.

Finally, an LNG terminal would position Coos County as a center for alternative energy. LNG and compressed natural gas are recognized as practical, low-polluting alternative fuels under known and proven technologies. More importantly, methane, the main constituent of natural gas, is hydrogen-rich and the source from which hydrogen gas is most economically produced. If Oregon pursues a "hydrogen economy" plan, Coos County would be the most logical place to build a large-scale plant.

Exhibit C

Jody McCaffree
Individual / Executive Director
Citizens Against LNG
PO Box 1113
North Bend, OR 97459

September 12, 2012

By Email
fergas@hq.doe.gov
larine.moore@hq.doe.gov

Ms. Larine A. Moore
Docket Room Manager
FE-34
U.S. Department of Energy
PO Box 44375
Washington, D.C. 20026-4375

Re: Answer of Jordan Cove Energy Project, L.P. to Protests of Application for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Nations, FE Docket No. 12-32-LNG

Dear Ms. Moore:

Please accept for filing the following response of Citizens Against LNG to the recent "Answer" filed by the Jordan Cove Energy Project (JCEP) dated August 29, 2012. We received this document by postal mail only a few days ago and even though the document has yet to appear in the U.S. Department of Energy Office of Fossil Energy e-library web portal for FE Docket No. 12–32–LNG, we feel a response is warranted in this case.

The Jordan Cove "Answer" included yet another ECONorthwest report that was dated May 14, 2012, and titled, "*The Impact of the Jordan Cove Energy Project on Coos County Housing and Schools.*" As previously explained in our August 6, 2012, protest comments, the U.S. Department of Energy Office of Fossil Energy should take a closer look into the ECONorthwest reports being submitted by the Jordan Cove Energy Project. The following supporting evidence is being provided to you in addition to our previously submitted documentation to help give you a better understanding as to why a thorough independent economic analysis is in order by the U.S. Department of Energy.

In October 2006 the South Coast Development Council (SCDC) in Coos Bay, Oregon, who fully supported the proposed Jordan Cove liquefied natural gas (LNG) import project, engaged the Portland-based ECONorthwest to forecast the net economic benefits of the proposed Jordan Cove LNG project. The report, "*Forecast of the Net Economic Benefits of a Proposed LNG*

Terminal in Coos County, Oregon," [1] was used as a justification for the Jordan Cove LNG import facility and was relied on by the Federal Energy Regulatory Commission (FERC) in the preparation of the Environmental Impact Statement (EIS) that led to the FERC Order approving the project in 2009. The ECONorthwest report was flawed for several reasons in that it did not include negative economic impacts that would have occurred as a result of the proposed Jordan Cove LNG import facility, nor did the report confirm the specifics as to the high number of jobs they were predicting would result due to Jordan Cove's operations. We now know the 2006 predictions and projections by ECONorthwest were incorrect. On Feb. 29, 2012, Jordan Cove notified FERC that due to current market conditions they no longer intended to implement their Dec. 17, 2009, FERC Order authorizing them to construct and operate a LNG import terminal. FERC vacated the Order for the Jordan Cove import project on April 16, 2012. Obviously the Jordan Cove Energy Project would not have produced the economic benefits and jobs that the 2006 ECONorthwest report had predicted would occur from the importation of LNG.

The U.S. Department of Energy should consider taking a thorough investigative review of the ECONorthwest reports similar to what the United States Department of Agricultural (USDA) Rural Development did in 2008. In December of 2008, the USDA Rural Development questioned the reliability and accuracy of an ECONorthwest report that was being used to justify a $6 million dollar proposed expansion of the Salmon Harbor resort in Winchester Bay, Oregon. The USDA did their own investigation and found the ECONorthwest projections used to justify the proposed expansion were not feasible, nor were the ECONorthwest conclusions warranted. As a result of the investigation, the USDA pulled their funding for that proposed project. (See Exhibit A) Likewise, the U.S. Department of Energy Office of Fossil Energy should not rely solely on the economic projections being provided by the Jordan Cove Energy Project. Before our property rights, businesses, people and the environment are potentially put at risk there should be an in-depth, complete and accurate economic analysis that includes the impacts on the public both now and in the future from exporting LNG. As we stated earlier in our August 6, 2012, protest comments on page 7:

> "Jordan Cove has already demonstrated its inability to predict demand for natural gas imports and exports. Jordan Cove based the proposed Jordan Cove LNG import terminal in Coos Bay on predictions that an import facility would be needed to meet growing U.S. demand for natural gas imports from overseas. These predictions turned out to be wrong.
>
> "Jordan Cove's assumption about sustained Asian demand for LNG imports is likely to be wrong as well; the same factors that created an oversupply of domestic natural gas would likely also create an oversupply of natural gas in Asia, curtailing demand for LNG imports from the U.S. and rendering a West Coast-based LNG export facility economically unviable…."

An example of the kind of economic analysis that should be done by the U.S. Department of Energy can be found in the 2006 Passamaquoddy Whole Bay Study (Part 1) that was completed

[1] "*Forecast of the Net Economic Benefits of a Proposed LNG Terminal in Coos County, Oregon*" An Economic Impact Analysis Prepared for the South Coast Development Council – October 16, 2006 ; ECONorthwest

by Yellow Wood Associates, Inc.[2] Citizens of three nations, the United States, Canada and the Passamaquoddy Tribe, commissioned the Whole Bay Study to determine what the potential costs and benefits of one or more LNG terminals in Passamaquoddy Bay would mean from the perspective of Bay communities. The focus of the Part 1 Whole Bay Study was on direct employment impacts on local residents and businesses, economic impacts on the real estate market, and fiscal impacts related to community infrastructure, transportation, housing, public safety and property values.

Unlike the ECONorthwest reports being presented to the U.S. Department of Energy Office of Fossil Energy by the Jordan Cove Energy Project, the Passamaquoddy Whole Bay Study looked at both economic benefit and loss. Part 1 of the Whole Bay Study concluded that there was no net gain that was realized overall by these LNG facilities and that the economic stimulus provided to a region by one or more LNG import terminals would be limited. The study also concluded the following:

> "…LNG is not a local resource. The beneficiaries of LNG development, including both investors and consumers, will be overwhelmingly from away. LNG is not a renewable resource. LNG is not an inexpensive form of energy. Even if LNG were made available through pipeline extensions and connections to local communities, it would not shield these communities from price hikes dictated by multinational corporations and the global economy. Nor would it increase the capacity of local communities to meet their own energy needs affordably today and in the future…
>
> "...**Economic Diversification**
> A diversified economic base in which the elements are compatible and synergistic is widely viewed as contributing to the health, resiliency, and vitality of rural communities. Diversity means that no single employer dominates the market, no single landowner dominates the tax rolls, and no single buyer determines the fate of the community.
>
> " Several of the LNG terminals proposed for Passamaquoddy Bay communities are offering millions of dollars in "support" to host communities in an attempt to make their development proposals more palatable. Although millions of dollars sounds like (and is) a lot of money in the context of a small rural community, in the context of LNG, it is very little. Each proposed terminal on Passamaquoddy Bay has the capacity to handle more than $1 billion worth of natural gas each year at present prices. Local communities need to be aware of the trade-offs made in accepting such "support." Once a single corporate entity comprises the majority of the tax base, communities rapidly lose the capacity and ability to make independent decisions regarding local services and investments..."[3]"

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[2] "*Report on Potential Economic and Fiscal Impacts of LNG Terminals on the Whole Passamaquoddy Bay*". Prepared by Yellow Wood Associates, Inc – June 20th 2006
http://www.savepassamaquoddybay.org/documents/community_impact_studies/whole_bay_study/whole_bay_study/WholeBayStudy-Part_1.pdf
"*Study: Impacts of LNG costly, benefit limited*", Edward French; THE QUODDY TIDES Newspaper; Vol. 38, No. 14; June 23, 2006; http://quoddytides.com/lng6-23-06.html

[3] "*Report on Potential Economic and Fiscal Impacts of LNG Terminals on the Whole Passamaquoddy Bay*". Prepared by Yellow Wood Associates, Inc – June 20th 2006 – Page 121

The Yellow Wood Associates determined that a more thorough study would be required to determine the extent to which any economic gains that do result from LNG may be offset by damage to existing sections and that may create new obstacles of future economic diversification and sustainability.

Citizens in rural poor areas such as Coos Bay, Oregon, do not have the resources that the multinational corporations and the gas and oil industry have to conduct such a thorough independent analysis. We citizens depend on agencies such and the United States Department of Agricultural (USDA) Rural Development and the U.S. Department of Energy to do such an analysis for us and to make sure their decisions are in the public interest.

It would "not" be in the public interest of our fishing, timber, clamming, crabbing, oyster growing, farming, tourism, recreation and industries that use natural gas for the U.S. Department of Energy to make a decision on Jordan Cove exporting LNG to non-free trade agreement nations based solely on economic projections and reports provided by the Jordan Cove Energy Project. The decision as to whether Jordan Cove should be allowed to export LNG to nations that do not have a free trade agreements with the United States should be based on a rigorous independent economic and environmental impact analysis that includes "all" potential impacts (both negative and positive) of exporting natural gas from both natural gas produced domestically in the United States and natural gas produced in Canada. The analysis should encompass all proposed and potential LNG export proposals in North America.

Sincerely,

/s/ Jody McCaffree

Jody McCaffree

cc:
DOE/FE
john.anderson@hq.doe.gov
marc.talbert@hq.doe.gov
DOE/GC
edward.myers@hq.doe.gov

By postal mail to all persons listed in the Service list for FE Docket No. 12-32-LNG

The World – Coos Bay
http://theworldlink.com/news/local/feds-say-no-to-resort-funding/article_9b6904dc-b754-5a19-a23c-409471752788.html

Feds say no to resort funding

Monday, December 28, 2009 By Alex Powers, Reedsport Staff Writer

REEDSPORT — Federal officials have pulled funding for the Salmon Harbor Marina's proposed Phase III expansion to its resort.

In a letter dated Dec. 14 to the Port of Umpqua, Clem Singer, Roseburg area director for USDA Rural Development, told commissioners "there remains some serious doubt" if the expansion could pay for itself.

The nearly $6 million expansion calls for 46 new campsites, a bathroom and an about $1.8 million, 9,576-square-foot community building in Winchester Bay. According to an economic impact study prepared in 2008 by Portland-based ECONorthwest, that center could draw guests to the park during winter, a time of year that historically sees low usage from RVs. The study said in its first year, the expanded RV resort is expected to make $426,855 and more each year after that.

"It's not feasible. That building is not going to pay for itself. It's just not," Singer said.

Singer said USDA was not satisfied with ECO Northwest's projections.

"The conclusions that they drew weren't warranted, in our opinion," he said.

He said USDA also examined the occupancy earlier this year at Lakeside's Osprey Point RV Resort, Woahink Lake RV Resort and Sea Perch RV Resort in Yachats.

"All three of those, we were told, have high wintertime occupancy," Singer said.

USDA found they have few guests during winter.

Harbor Master Jeff Vander Kley said Salmon Harbor cannot become a special district and tax for revenue. It may look to Douglas County for assistance.

"This effort to expand the RV resort was to reduce the need for the county … contributions to the operations," Vander Kley said. "It's a big conundrum."

County Commissioner Susan Morgan asked the marina earlier this month to re-evaluate ECONorthwest's analysis.

Marina project manager Linda Noel said the marina probably will plug updated cashflow information from the resort into the original report, while Vander Kley said the agency may consider downsizing or phasing the project.

Exhibit D

Submitted by
Jerry Havens, Distinguished Professor Emeritus
Department of Chemical Engineering, University of Arkansas
April 1, 2019

Regarding the
DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE
JORDAN COVE ENERGY PROJECT
Docket Nos. CP17-494-000 and CP17-495-000
March 2019

My comments, directed simultaneously to FERC and PHMSA,
are not to be attributed to the University of Arkansas.

COMPUTER MODEL USED TO PREDICT LNG EXPORT TERMINAL VAPOR CLOUD EXPLOSION HAZARDS HAS NOT BEEN APPROVED BY PHMSA - PREDICTED EXPLOSION OVERPRESSURES APPEAR SERIOUSLY UNDERESTIMATED

These comments are intended to notify FERC, PHMSA, and the public of critically important developments regarding our expanding knowledge of the risk of cascading fire and unconfined vapor cloud explosion (UVCE) accidents that could occur at the Jordan Cove Export Terminal (JCET). The comments are an expansion on my earlier ones to the Public Workshop on Liquified Natural Gas Regulations Website on July 28, 2016, September 22, 2018, October 2, 2018, and December 3, 2018 - all of which I stand by. They are also intended as a response to the joint news release of August 31, 2018 by PHMSA and FERC, entitled " FERC, PHMSA Sign MOU to Coordinate LNG Reviews**"**, from which I quote - "The MOU establishes a framework **for** coordination between FERC and PHMSA to process LNG applications in a timely and expeditious manner while ensuring decision-makers are fully informed on public impacts". I trust these comments will be helpful to the decision-makers in fully informing the public.

My concerns remain essentially the same as commented to FERC in January 2015 by James Venart and myself[1]. I believe that Government is failing to adequately provide for the risks of potentially devastating Unconfined Vapor Cloud Explosions (UVCEs) of heavier-than-methane hydrocarbons at the JCET.

I remain concerned that the predictions of explosion overpressures (determining explosion damage) presented in the 2015 JCET DEIS were an order of magnitude (factor 10) too low. Such overpressures are not conservative enough to indicate the real hazard that exists, as evidenced by numerous confirmed occurrences of devastating UVCEs involving the same heavy hydrocarbons in similar conditions.

My review of the March 2019 JCET DEIS did not disclose any detailed predictions of vapor cloud explosion (VCE) overpressure for design spills of heavy hydrocarbons. However, I did locate on the FERC Website a report entitled "Facility Siting Hazard Analysis", dated October 2, 2018, which

[1] UNITED STATES LNG TERMINAL SAFE-SITING POLICY IS FAULTY, Comments submitted to FERC by Jerry Havens and James Venart, January 14, 2015, Docket No. CP13-483.

presents a collection of hazard footprints for overpressure, calculated with FLACS, predicted to result from design spills of heavier-than-methane hydrocarbons at the JCET[2]. The collection of calculations presented in that report presents a picture very similar to that presented in the 2015 DEIS. The overpressures presented therein still appear to be significantly lower than those reported for numerous incidents that have occurred with the same materials, in similar amounts and in similar conditions. I cannot determine to what extent these newer predictions have been utilized in the 2019 DEIS, but I am very concerned that such predictions as these might be approved by FERC in the FEIS - repeating the approval of similar predictions prepared for FERC with the same mathematical model (FLACS) in 2015. If that were to happen, I believe a serious error affecting public safety will be the result, because the unrealistically low damage predictions could be used again by FERC as a basis to dismiss the UVCE hazard at the JCET. Continued dismissal of the UVCE hazard would be a very serious error. If the magnitude of the possible overpressures are estimated using actual data (experience) available for UVCEs (rather than predicted with the FLACS theoretical model), the VCE hazard would be clearly indicated as a serious major hazard at the JCET[3]. *UVCEs at numerous similar heavy hydrocarbon handling/storage facilities have resulted in destruction of the facilities as well as injuries and deaths beyond the plant boundaries.*

Contrasting LNG Import and Export Terminal Siting Regulations

I want to state here that if either PHMSA or FERC believes that anything I present is in error I request that I be notified immediately. I will make any corrections as necessary, and I will alter my comments, as necessary, as well. My goal is to ensure that the science-based tools that are used for hazard evaluation in the regulations are applied correctly. I am very concerned that failure to ensure proper, validated, use of mathematical models for UVCE hazard evaluation could result in devastating UVCEs that, in addition to public endangerment, could cripple the industry.

In order to most effectively explain my concerns, I think it helpful to provide a very brief history of the LNG regulations. The provisions of 49 CFR 193. Liquefied Natural Gas Facilities: Federal Safety Standards were developed by PHMSA to govern the siting of LNG peak shaving terminals and import terminals. It has been accepted practice to identify for these two types of terminals only two principal hazards; pool fire hazards and vapor dispersion hazards. A third hazard, Unconfined Vapor Cloud Explosion (UVCE), is generally considered negligible for Import Terminals. This policy is based on the generally accepted fact that import terminals handle and store primarily LNG with methane contents sufficiently high that the LNG can be assumed to be pure methane. Given the very low propensity for explosion of unconfined methane-air clouds, UVCEs at LNG import terminals have historically been neglected as a hazard. As a consequence the present Regulation, 49 CFR 193, does not mandate the consideration of UVCE hazards.

With the advent of LNG export terminals in the United States the requirements for safe siting of LNG terminals have changed importantly. That is because the export terminals typically remove and store large quantities of heavier-than-methane hydrocarbons from the incoming natural gas feed stream. Furthermore, the removal of those heavy hydrocarbons typically requires the use of

[2] https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20181116-5198
Click on "Facility Siting Hazard Analysis" and download

[3] https://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=111 Atkinson, G., Vapor Cloud Explosion (VCE) Historical Review, PHMSA Public Workshop on Liquefied Natural Gas (LNG) Regulations, Washington DC, 19 May 2016.

large quantities of refrigerant gases that are heavier-than-methane hydrocarbons. The storage and handling of large quantities of these heavier-than- air hydrocarbons results in a new primary hazard - vapor cloud explosions of the heavy hydrocarbon materials that could follow accidental release.

I have been involved in the development of 49 CFR 193 from its beginning in the early 1980s. My principal involvement has been as an author/evaluator of the DEGADIS model for use in predicting LNG vapor cloud dispersion. DEGADIS is approved by PHMSA for use in predicting the requirements for vapor cloud dispersion exclusion zones for LNG Import Terminals. During the last decade, and coincident with the advent of LNG Export Terminals in the United States, additional vapor dispersion models have been approved by PHMSA for use by LNG terminal companies seeking siting approval.

My comments here are restricted to the FLACS model. The FLACS model is an example of what is known as a computational fluid dynamics (CFD) model. I generally support the use of CFD models for vapor dispersion predictions because they are appropriate for dealing with complexities not catered for by simpler models such as DEGADIS. Accordingly, I supported the approval by PHMSA of the FEM3A model developed by the Lawrence Livermore National Laboratory (LLNL) and I supported the request for PHMSA approval of FLACS for vapor dispersion use. I do not object to FLACS' approval, which PHMSA granted, for vapor dispersion prediction.

FLACS has not been Evaluated or Approved by PHMSA for Explosion Prediction

This is the crux of the matter. There are now four mathematical models approved by PHMSA for vapor dispersion prediction, in order of the time approved; DEGADIS, FEM3A, FLACS, and PHAST. All four were required by PHMSA to be subjected to evaluation of their performance in demonstrating suitable agreement with experimental data available from a collection of field and wind tunnel tests of vapor dispersion.

FLACS (FLame ACceleration Simulator) is a commercial Computational Fluid Dynamics (CFD) software used extensively for atmospheric dispersion modeling and explosion modeling in the field of industrial safety and risk assessment[4]. FLACS has been subjected to the written protocol provided by PHMSA and approved by PHMSA for vapor dispersion predictions required by 49 CFR 193. PHMSA has not completed development of a written protocol for the evaluation of FLACS for explosion prediction. Consequently, FLACS has not been formally evaluated for explosion prediction and has not received approval for the evaluation of UVCE hazards (read explosion overpressures) by PHMSA.

Although it appears that a process for developing a written protocol for evaluation of FLACS for application to the prediction of overpressures was requested by PHMSA to be funded following the LNG Regulation Workshop of 2016[5], I can find no evidence that the required protocol has been completed. It appears that the plans announced at the LNG Workshop of 2016 for a required updating of 49 CFR 193 to cater for the new hazards that will be present at export terminals are currently at a standstill. The only conclusion I am able to reach is that the newly announced JCET DEIS appears to me likely to utilize predictions of explosion overpressures for the heavier-than-methane hydrocarbon design spills selected for analysis that have not been approved by PHMSA. Such a failure to adequately address the risk of UVCEs would mean that potential risks of cascading

[4] https://en.wikipedia.org/wiki/FLACS

[5] https://primis.phmsa.dot.gov/rd/mtgs/111616/WG%205%20Report-Out.pdf – See GAP #4

violent explosions that could destroy the plant as well as extend dangers to the public beyond the facility boundary are effectively being ignored.

PHMSA Contracted for Expert Evaluation of the Risk of Unconfined Vapor Cloud Explosions

Simultaneously with my comments to FERC in 2015 I notified PHMSA of my concerns. I have also filed a total of four comments (to date) on PHMSA's LNG Regulation Workshop site. Further, there have been a series of important developments subsequent to my 2015 comments to FERC, the results of which I think are critically important to consider now.

PHMSA contracted with the British Health and Safety Laboratories (HSL) to prepare the report "Review of Vapour Cloud Explosion Incidents"[6]. Quoting excerpts from the Executive Summary of that report:[7]

> **"T**his review of major vapor cloud incidents has been jointly commissioned by the US Pipeline and Hazardous Materials Safety Administration (PHMSA) and the UK Health and Safety Executive (HSE). The primary objective was to improve understanding of vapor cloud development and explosion in order to examine the potential for these hazards to exist or develop at LNG export plants that store substantial quantities of these flammable gases for use in the liquefaction process or as a by-product from the liquefaction …
>
> This review has not found any historical records of LNG (methane) vapor cloud explosions in open areas with severity sufficient to cause secondary damage to tanks and pipes and consequently rapid escalation of an incident from a minor process leak to a major loss of inventory.
>
> On the other hand some LNG sites (especially export sites) also hold substantial amounts of refrigerant gases and blends containing ethane, propane, ethylene and iso-butane. Higher hydrocarbons may also be produced and stored on LNG export sites as by-products of gas condensation. There are numerous examples of Vapor Cloud Explosions (VCEs) in open areas involving these higher molecular weight materials and the storage and use of higher molecular weight hydrocarbons on LNG export sites which may, if not managed adequately, introduce an additional set of incident scenarios in which VCEs trigger rapid escalation of loss of containment. (emphasis added)
>
> This study involves a review of 24 major VCE incidents focusing on source terms, cloud development and explosion mechanics. The incidents studied are split between permanent fuel gas (C2-C4 (e.g. LPG) and volatile liquids C4-C6 (e.g. gasoline). The source terms for leaks of gases and liquids are different but once a stable current of cold heavy vapor forms, the subsequent development of LPG and gasoline clouds are similar…
>
> An important finding from the review is that a high proportion of vapor cloud incidents occurred in nil/low wind conditions. By the term "nil/low wind" we mean a wind that was so weak close to the ground that it only detrained (stripped away) a small proportion of the vapor accumulating around the source … Rather than being picked up and moved downwind, the vapor flow in this case was gravity driven; spreading out in all directions and or following any downward slopes around the source.
>
> In many of the cases examined, 50% (12/24), there is clear evidence from the well-documented transport of vapor in all directions and/or meteorological records that the

[6] https://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=111

[7] HSL Report on PHMSA LNG Regulation Workshop site.

vapor cloud formed in nil/low wind conditions. In a further 21% (5/24), the pattern of vapor suggests nil/low wind conditions but there is insufficient data available to be sure … incidents in nil/low wind conditions apparently make up the majority of historical records of the most serious VCEs … In nil/low wind conditions the cloud continues to grow throughout the time that the tank takes to empty… The maximum area covered by the flammable cloud is typically several hundred times greater in nil/low winds condition than in light winds.

The implication of this type of analysis is that if the density of ignition sources is constant and quite low in the area around the tank the chances of ignition in nil/low wind conditions would be hundreds of times greater for a given release. This illustrates why nil/low wind conditions dominate records of major vapor cloud incidents even though the weather frequency is low. Losses of containment in nil/low wind conditions are also particularly dangerous because a highly homogeneous cloud can be formed that may spread by gravitational slumping (without significant dilution) for hundreds of meters… A very large cloud that is all close to the stoichiometric ratio increases the risk of flame acceleration to a high pressure regime capable of seriously damaging storage and process facilities, when compared with clouds that are entraining air because of wind-driven dilution. This is because fundamental burning rates fall off rapidly for concentrations away from the stoichiometric. Once a high pressure regime is established explosions are not confined to congested areas of a site. In many of the cases reviewed almost all the footprint of the cloud was exposed to pressures in excess of 2000 mbar (29 psi). In at least one case the cloud detonated, causing extremely severe damage over the area covered by the cloud)." (emphasis added)

PHMSA Conducted a Public Workshop on Liquefied Natural Gas (LNG) Regulations

The Workshop was conducted in Washington, DC in May 2016. Quoting excerpts from PHMSA's Statement of Mission (from the Workshop Website):

"Historically, most LNG facilities were peak shavers built to liquefy and store natural gas to be degasified and injected back into the pipeline during periods of peak demand … However, due to the recent abundance of domestic shale gas, LNG export terminals are now being constructed that liquefy vast volumes of natural gas. These facilities require significantly greater quantities of refrigerants to liquefy the natural gas than the amount typically used at peak shavers… Most refrigerant gases and blends used at the export facilities contain ethane, propane, ethylene, and iso-butane and are referred to as heavy hydrocarbons. These gases are similar to gases that have resulted in VCEs at petrochemical facilities…

The understanding of VCEs is evolving. PHMSA recognizes that significant quantities of heavy hydrocarbons present different risks than methane and seeks to better understand that risk. Prior to investigative work on the Buncefield accident, the prevailing understanding was that vapor clouds formed outdoors were unlikely to explode if ignited. Today it is understood that VCEs involving higher hydrocarbons have occurred in outside areas. This paper advances our understanding further. PHMSA sponsored the "Review of Vapour Cloud Explosion Incidents" report with the primary objective to improve the scientific understanding of vapour cloud development and explosion in order to more

reliably assess hazards at large Liquid Natural Gas (LNG) export facilities… The aim of reviewing the particular incidents in this report is the extensive forensic evidence available that provides the information needed to study how the vapor cloud formed and ignited, the amount of overpressure exerted, and other information about the mechanism of VCE. This research was performed by the Health and Safety Laboratory (HSL) under a subcontract with the Oak Ridge National Laboratory, a United States Department of Energy (DOE) facility, and was supported by the United States Department of Transportation Pipeline and Hazardous Materials Safety Administration (DOT PHMSA and DOE) and the United Kingdom Health and Safety Executive (HSE). The research's objective was to improve understanding of vapor development and explosions in order to more reliably assess hazards and safety measures at facilities that contain significant quantities of heavy hydrocarbons…

The technical review of the report was performed by uncompensated subject matter experts… The purpose of this independent review was to provide candid and critical comments to make the report as sound as possible… The review, comments, and draft manuscript remain confidential to protect the integrity of the deliberative process. The panel reviewed multiple drafts of the report, held several conference calls, and convened a meeting on May 17th (2016) in Washington, D.C. A presentation about the draft report was given at a public meeting, PHMSA's Public Workshop on LNG Regulations, on May 19th, 2016, in Washington, D.C. …" (emphasis added)

The 2018 PHMSA /FERC MEMORANDUM OF UNDERSTANDING

PHMSA is responsible for developing the regulations that specify the means of ensuring public safety in siting LNG terminals. The applicable regulation is 49 CFR 193, Liquefied Natural Gas Facilities: Federal Safety Standards. The present regulation was developed in the early Eighties to regulate LNG peak shaving and import terminals. Consequently, the present PHMSA regulation does not address the "new" hazards of vapor cloud explosions of heavier-than-methane hydrocarbons that are present in large quantities at LNG export terminals. So, during the period following my comments to FERC in 2015 on the UVCE hazard, and until very recently, I failed to understand why the 2015 JCET DEIS included an address of the UVCE hazard (not required by 49 CFR 193) by presenting the extensive predictions of explosion overpressure for heaver-than-methane hydrocarbon/air clouds that could be formed following accidental release at JCET. I remain uncertain why that action was taken, but I am increasingly concerned that the UVCE hazards present in the operation of LNG export terminals are effectively being ignored. My concern is that the order-of-magnitude-too-low predictions of the overpressures used by FERC to evaluate the VCVE hazard in the environmental impact statements for the JCET might result in the continued dismissal of the importance of this hazard for the JCET.

On August 31, 2018, the Federal Energy Regulatory Commission (FERC) and the Hazardous Materials Safety Administration within the U.S. Department of Transportation announced the signing of an agreement to coordinate the siting and safety review of FERC-jurisdictional LNG facilities. Quoting therefrom:

"The Memorandum of Understanding (MOU) establishes a framework for coordination between FERC and PHMSA to process LNG applications in a timely and expeditious manner while ensuring decision-makers are fully informed on public safety impacts. The MOU provides that PHMSA will review LNG project applications to determine whether a proposed facility complies

with the safety standards set forth in PHMSA's regulations, and that PHMSA will issue a letter to FERC stating its findings regarding such compliance. FERC will then consider PHMSA's compliance findings in its decision on whether a project is in the public interest." (emphasis added)

It is my understanding that the JCET DEIS issued in 2019 does not state that FERC received an LOD (letter of determination) from PHMSA that presented its findings regarding compliance with the safety standards set forth in its regulations. It is further my understanding that the FERC/PHMSA MOU effectively requires PHMSA to issue such an LOD by the time the FEIS is completed.

My review of the Reliability and Safety section of the DEIS disclosed no direct reference to the UVCE hazard. It is as if the problem had either been decided as lacking further need of address or that some further address might be forthcoming by the time the EIS is completed.

I respectfully request that I be provided an answer to the following question: Given PHMSA's announcement in 2016 at the Public Workshop on LNG Regulation that 49 CFR 193 appeared to require updating to cater for the new (UVCE) hazards that attend Export Terminal operations, why has that announcement not led to any further analysis and evaluation in the 2019 JCET DEIS?

Unless that question can be answered satisfactorily, it appears that critical safety recommendations by PHMSA requiring changes to 49 CFR 193, backed up by extensive advice from the scientific expert community, are being ignored.

Who Required the UVCE Hazard to be Addressed in the 2015 JCET DEIS?

The only government source I have found for guidance regarding calculations of overpressure required to be presented in the 2015 JCET DEIS is in "Guidance Manual for Environmental Report Preparation, Volume II, LNG Facility Resource Reports 11 & 13 Supplemental Guidance, DRAFT, December 2015", prepared by FERC. Section 13.H.3, "Hazard Analysis Reports" of that draft appears to be the source of the requirement for explosion overpressure that appeared in the 2015 JCET Environmental Impact Statements. The requirement for explosion overpressures remains in the Guidance Manual for Environmental Report Preparation, FINAL, dated February 2017.

It is my understanding that the Draft FERC document providing guidance to JCET for providing VCE overpressure calculations was not based on the requirements of 49 CFR 193. It appears that FERC may have recognized the need to evaluate the UVCE hazards that could attend the operation of the JCET, and that those hazards should be considered in the JCET DEIS. I have no information about why FERC included the requirement to address UVCE hazards in their Guidance Document for preparation of Environmental Impact Statements. In any case, the "requirement" in FERC's Guidance Manual for Environmental Reports appears to demonstrate FERC's awareness of the importance of addressing the UVCE hazard.

The fact remains that the predictions of overpressure that were provided for the JCET DEIS in 2015 were stated therein to be made with the FLACS model, and although FLACS is approved for vapor dispersion calculations required by 49 CFR 193, it is my understanding that FLACS still has not been either evaluated or approved by PHMSA for explosion overpressure determination. If this is the case, then a major course-correction seems required, because comparisons of those (order-of-magnitude-too-low) overpressure predictions with documented measurements of overpressure data for a large number of UVCE events involving the same hydrocarbons, in similar amounts, and in similar atmospheric conditions, will demonstrate that the predictions utilized in the JCET environmental impact statements are in serious error.

If this problem is not addressed, it appears likely that such errors accompanied by FERC's approval thereof will ignore the scientific expert advice that resulted from the PHMSA Workshop conducted in 2016. The effect will be to ignore extensive accident experience that demonstrates the potential for cascading explosions that could destroy the plant and possibly extend damages to the public beyond the facility boundary.

CONCLUSIONS

49 CFR 193 Liquefied Natural Gas Facilities: Federal Safety Standards does not currently provide for adequate consideration of the hazards of Unconfined Vapor Cloud Explosion (UVCE) hazards that attend LNG Export Terminals handling and storing large quantities of heavier-than-methane hydrocarbons.

PHMSA conducted the Public Workshop on Liquefied Natural Gas (LNG) Regulations in Washington, DC, 19 May 2016. The principal purpose of the Workshop was stated to be the intention to address the need for updating 49 CFR 193 in order to cater for any new hazards that could be involved in siting LNG Export Terminals. The Workshop clearly identified the UVCE hazard as being the most important hazard present at Export Terminals that was not currently addressed adequately by 49 CFR 193.

PHMSA initiated a program to address the needs for changes in the regulation to provide for UVCE hazards. It appears that no progress has been forthcoming.

The new Draft Environmental Impact Statement (DEIS) for the Jordan Cove Export Terminal, just issued, continues to seriously underestimate vapor cloud explosion overpressures (damage) that could occur following credible releases of heavy hydrocarbons at the JCET site. The latest predictions that I am aware of appear to be an order of magnitude lower than are indicated by physical evidence of numerous documented UVCEs that have occurred worldwide with the potential to cause injuries and deaths to persons and result in destruction of the facility.

Exhibit E

https://www.oregonlive.com/business/2019/04/facebook-expects-to-pay-billions-in-privacy-fines.html

Scientists say public safety hazards at Jordan Cove LNG terminal in Coos Bay are underestimated

Updated Jan 16, 2015; Posted Jan 16, 2015

Gallery: Jordan Cove Seismic

By Ted Sickinger| The Oregonian/OregonLive

A pair of scientists told federal regulators this week that safety measures incorporated in a proposed liquefied natural gas terminal in Coos Bay actually increase the chance of a catastrophic failure and present far more serious public safety hazards than those regulators have analyzed and deemed acceptable.

Jerry Havens, a chemical engineering professor at the University of Arkansas, and James Venart, an emeritus professor of mechanical engineering at the University of New Brunswick, filed a public comment Wednesday outlining their concerns with hazard modeling for the proposed Jordan Cove Energy Project.

Those results were summarized in the project's draft environmental impact statement that the Federal Energy Regulatory Commission issued in November.

The modeling addresses the project's most fundamental public safety question – what will happen in the event of an accident, natural disaster or terrorist attack at the facility that results in a leak of natural gas or other chemicals.

FERC staff have concluded that since there are no homes within a mile of the facility, the resulting hazard would be minimal. But the question took center stage at public meetings following the release of FERC's draft analysis. And it's one that politicians say must be adequately addressed.

A sample of the vapor cloud modeling completed for Jordan Cove.

Regulators acknowledge that such leaks could lead to flammable and potentially explosive vapor clouds, liquid pool fires and other knock-on effects. So they require applicants to model various scenarios and demonstrate that they wouldn't pose any risk outside the facility's property line.

Havens and Venart have both researched and published extensively on the fire and explosive risks of LNG and other materials during the last 40 years. Indeed, Havens authored two of the models that the FERC formerly used to model LNG spills and vapor cloud dispersion.

In their public comments, they conclude that Jordan Cove's hazard modeling provides inadequate safety exclusion zones due to the ballooning size of LNG facilities in general, and export facilities in particular due to their use of other chemicals. Those include propane and ethylene used to purify and refrigerate natural gas. Those gases are more flammable than natural gas and subject to high order explosions.

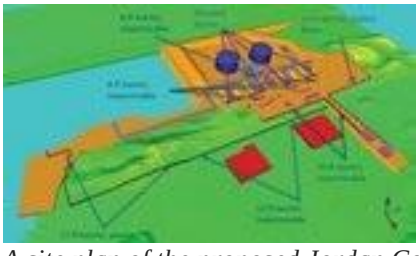
They also contend that the facility design proposed at Jordan Cove would actually increase such risks during a leak. The design includes impermeable barriers as high as 40 feet designed to retain vapor clouds within the facility's property line during a spill.

Yet their read of the modeling results is that vapor clouds would be concentrated by the barriers, enveloping the facility's liquefaction equipment, its massive storage tanks and much of its shipping berth, potentially including a tanker full of LNG docked there. In the event of ignition, the knock-on effects could be disastrous, they contend.

"We believe the hazards attending the operations at the Jordan Cove export facility could have the potential to rise, as a result of cascading events, to catastrophic levels that could cause the near total and possibly total loss of the facility, including any LNG ships berthed there," their comment said. "Such an event could present serious hazards to the public well beyond the facility boundaries."

Havens said Thursday that the risk of such an event is probably very, very low. But in the last decade alone, he said, there have been four major international incidents involving explosions that destroyed facilities using similar gases as Jordan Cove.

Havens and Venart are also concerned that regulators -- primarily the U.S. Department of Transportation -- have switched from using open-source hazard modeling software, where the underlying code was freely available for independent scientific review and verification, to proprietary models developed by private companies.



A site plan of the proposed Jordan Cove LNG terminal on the North Spit of Coos Bay, including vapor barriers.

Activists have also complained that hazard modeling data filed with regulators is often submitted under the designation of "Critical Energy Infrastructure Information," which means it isn't immediately available for outside review.

"I can't accuse them of using models that are wrong, but I can't get inside to even check them," Havens said. "If you can't, as a member of the public, satisfy yourself that these things are being calculated right, it undermines confidence in the entire procedure."

Jordan Cove declined to address specific critiques on Thursday, but a company spokesman, Michael Hinrichs, sent a statement via email.

"We understand that people are likely going to have concerns and that's what the public comment period is all about. Jordan Cove submitted safety information to FERC, DOT, PHMSA and other agencies per regulations and for their review. We believe our data satisfies applicable regulations to meet FERC review standards. The FERC will determine if added regulation or additional modeling is needed."

FERC project manager Paul Friedman said Friday that the agency will address specific issues raised in public comments in its final environmental impact statement.

Oregon Sen. Ron Wyden has expressed strong support for Jordan Cove based on the potential for the $7 billion project to create much needed jobs and tax revenue in Coos County and other locales along the pipeline route . But he has told residents repeatedly that the federal analysis on the project will be done right, and he will insist that community members be provided with full answers to legitimate questions.

Wyden's office sent out a statement indicating that he intends to follow up. "It's unacceptable for FERC to rely on anything other than the most up-to-date modeling when it comes to evaluating safety risks at Jordan Cove. Senator Wyden plans to write to FERC and to ask why the modeling cannot be made public and to make clear FERC needs to make sure it is using the best information available to approve or deny that facility."

-- tsickinger@oregonian.com

503-221-8505; @tedsickinger

Exhibit F

NATURAL GAS:

Explosive LNG issues grab PHMSA's attention

Jenny Mandel, E&E reporter

EnergyWire: Tuesday, June 7, 2016

Smoke pours from petroleum storage tanks following a 2009 explosion at the Caribbean Petroleum Corp. refinery in San Juan, Puerto Rico. The blast and fire damaged 17 of the 48 tanks at the site, and flames burned for nearly 60 hours. Photo courtesy of the U.S. Chemical Safety and Hazard Investigation Board.

The Department of Transportation's May 19 workshop on liquefied natural gas (LNG) safety started with a bang.

At DOT's headquarters in Washington, D.C., the agency's Pipeline and Hazardous Materials Safety Administration (PHMSA) hosted an in-depth discussion of what went wrong during a March 2014 explosion at an LNG facility in Plymouth, Wash., that led to five injuries and $72 million in property damage (***EnergyWire***, May 6).

The decision by PHMSA to conduct a broad review of its LNG safety rules -- and kick it off with an unusually open discussion of a fiery accident -- suggests the agency has taken to heart the saltiest criticisms tossed from Capitol Hill. "PHMSA is not only a toothless tiger, but one that has overdosed on Quaaludes and is passed out on the job," Rep. Jackie Speier, a Democrat from San Francisco, said during a congressional hearing in April 2015.

She pointed to the lethal and destructive natural gas pipeline accident in San Bruno, Calif., in 2010. In its aftermath, PHMSA came under fire for being slow to update its safety regulations. Late last year, a leaking Aliso Canyon underground gas storage facility outside Los Angeles, operated by Southern California Gas Co., prompted hand-wringing that regulators were underprepared.

If gas pipelines and storage fields come with risk, researchers are increasingly concerned that the expanding footprint of big LNG export terminals and other facilities along the U.S. coast are also potentially deadly.

LNG is jam-packed with energy. Natural gas is turned into a liquid by supercooling it to minus 260 degrees Fahrenheit, which shrinks its volume 600-fold and makes it easier to transport across the ocean.

Natural gas and its liquid form are flammable and explosive in confined spaces, but researchers say it's not prone to exploding when released in large, open areas. That's not the case for other heavy hydrocarbons such as propane and ethane, which can be stored at large LNG export facilities.

The concern among researchers and regulators grappling with how to regulate LNG safety is the potentially deadly mix of liquid fuels at an LNG site.

Things that go boom

At the DOT workshop last month, a presentation by Graham Atkinson, a principal scientist in the Major Hazards Unit of the Health and Safety Lab in Buxton, England, focused on what happens when heavy hydrocarbons explode.

explode.

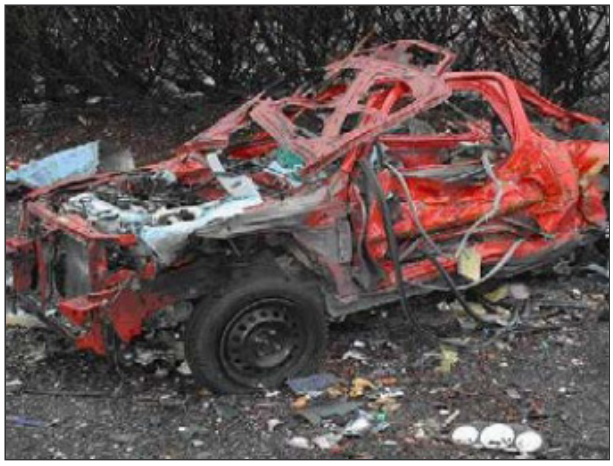
The audience listened, riveted, as Atkinson showed photos -- some not previously seen by the public -- from industrial accidents linked to liquefied petroleum gas (LPG), LNG, gasoline and other petrochemicals.

Four of the incidents took place within the last decade and were explosions of so-called unconfined vapor clouds that led to a series of cascading events that ultimately destroyed the facilities.

Researchers looked at 24 vapor cloud explosions but focused their attention on four major industrial accidents -- at gasoline storage sites in Buncefield, England, in 2005; Jaipur, India, in 2009; San Juan, Puerto Rico, in 2009; and at an LPG storage site at Venezuela's Amuay refinery in 2012.

In work funded by PHMSA through a contract with the Energy Department's Oak Ridge National Laboratory, Atkinson's team reviewed photos and videos from the accidents and conducted tests with gasoline in a range of spill conditions. The team focused on how vapor clouds form in low wind conditions and when barriers keep gases from fully dispersing.

Atkinson said an accident can happen under two conditions. One is a small leak that, after as little as 15 minutes with no wind, can cause a massive explosion that resembles a bomb blast with no epicenter. Devastation is spread evenly across the range of the vapor cloud.



An unconfined vapor cloud explosion at a gasoline storage site in Buncefield, England, in 2005 left bomblike devastation across a wide area. Photo courtesy of the U.K. Health and Safety Laboratory.

The other accident scenario is a large leak on a windy day, when cloud dispersion from the wind cannot keep up with the volume of gas released. That, too, creates a cloud-sized explosion zone. The shape of the plume can be mapped from the destruction.

Pictures from San Juan, Buncefield, Amuay and Jaipur show cars twisted and burned, bombed-out buildings, and flaming storage tanks.

"Fuel tanks are efficiently set on fire in the area covered by the vapor cloud," Atkinson noted, estimating that 95 percent of tanks exposed to the vapor clouds were set on fire. "It means it's a real tough job for all the emergency services. They're dealing with [potentially] 20 tanks set on fire. It's an almost unmanageable situation."

The researchers also looked at cases in which flash fires turned into explosions, finding that in some cases a confined space or a congested intersection of piping turned a fire into a blast.

"In all but one of the incidents reviewed, when a very large cloud was formed, there was a severe explosion," Atkinson said.

In low wind conditions, vapor clouds that accumulated from small, sustained leaks caused blast damage and fatalities 765 yards -- nearly half a mile -- or more from the source.

And if a large cloud of gasoline or LPG accumulates, a "severe explosion" is likely, Atkinson said.

'20 minutes'

After Atkinson spoke, a leader in the LNG industry quickly tried to wrestle control of the discussion, emphasizing that LNG doesn't carry the same risks as the non-methane fuels he had focused on.

Cheniere Energy Inc. is developing the Sabine Pass LNG export terminal in Cameron Parish, La. The terminal already has one processing train up and running to liquefy LNG, and construction plans include four more; the plant is the first modern LNG export facility in the United States (***EnergyWire***, May 3).

Pat Outtrim, vice president of government affairs for Cheniere, questioned Atkinson on his presentation in a rapid-fire series of yes-or-no questions.

Atkinson agreed with Outtrim that the heavy hydrocarbons tested have different properties from methane, and that the alert and emergency shutdown equipment at the facilities studied were absent, nonfunctioning or not able to alert the right people quickly.

But he disagreed with the notion that his results aren't applicable to LNG facilities.

Ethane blends, propane, isobutane and ethylene, as well as hundreds of metric tons of condensates like pentanes and hexanes, might be present at an LNG export site. The explosion research "shows just how important the detection and response protocols are," Atkinson told Outtrim. Vapor cloud explosions like those demonstrated "can't happen at an LNG facility if you detect [a leak] early and shut it down right away," he said.

The takeaway for the LNG industry should include consideration of automatic equipment shut-offs, Atkinson told *EnergyWire*.

"Twenty minutes can be enough to cause a problem," he said. If equipment shut-offs are manual, the staff needs to be well-trained. If sensors indicate a leak, "the response can't be, 'Oh, I need to go tighten it up.'"

"Problems tend to come from people. There are just so many cases where [warning lights] start flashing and people just go to pieces," he said.

One more challenge? Explosion events often occur at night, when wind speeds slow as the air cools. So plant personnel can go from keeping watch over a sleepy facility in the small, dark hours to a rapidly evolving emergency.

"When they decide what's sensible to automate, they ought to think about these factors and take it into account," Atkinson said.

The new LNG era

Still, automated controls are probably not the big worry that set PHMSA down the path of researching old accidents -- especially since many of a plant's most important controls have physical fail-safe mechanisms in case the electronics fail.

So why did PHMSA dedicate so much time to discussion of the hazards tied to gasoline, LPG and other hydrocarbons that are afterthoughts at most LNG installations?

A critique by two longtime LNG researchers offers some insight.

Jerry Havens and James Venart submitted public comments to the Federal Energy Regulatory Commission in January 2015 on a proposal to build the Jordan Cove LNG terminal in Coos Bay, Ore.

Havens has worked on LNG safety issues throughout his 40-year career and authored two of the computer models whose use was long required by federal regulators to assess the hazards of proposed LNG facilities. Venart was the longtime director of the Fire Science Centre at the University of New Brunswick in Canada, and studied industrial heat exchange and catastrophic explosions.

A 2009 vapor cloud explosion and ensuing fire at an Indian Oil Corp. facility in Jaipur, India, destroyed the plant and damaged homes more than a mile away, according to an investigation report. Photo courtesy of the U.K. Health and Safety Laboratory.

The Jordan Cove project proposed a liquefaction plant capable of processing up to 6.8 million metric tons per year of natural gas.

Havens and Venart said they were concerned that regulations governing LNG import terminals had been guided by the premise that LNG, as methane, poses less danger than other gas liquids and petroleum fuels. But with LNG export terminals designed and constructed under regulations used for simpler LNG import facilities, Havens and Venart warned that regulators were overlooking dangers.

"We believe the [Jordan Cove draft environmental impact statement] fails to provide for protection of the public from credible fire and explosion hazards," the researchers said.

The mix of refrigerants used to chill the gas and the heavy hydrocarbon impurities in pipeline gas that are stripped out and stored on-site pose a threat, they said.

"We believe these additional hazards have been discounted without sufficient scientific justification in spite of multiple international reports during the last decade of catastrophic accidents involving unconfined hydrocarbon

vapor cloud explosions," Havens and Venart said.

The researchers also raised concerns that Jordan Cove and other proposed facilities would use concrete "vapor walls" to trap a gas cloud on the property and keep the fire hazards from breaching the property lines. But such walls would cause methane and other gases to build up into concentrated vapor clouds several meters deep, increasing the explosion risk.

With densely packed processing equipment on the site and a vapor fence trapping hydrocarbons, "one could hardly design the releases to better maximize the potential for catastrophic explosion hazard," Havens and Venart added.

FERC finalized Jordan Cove's EIS in September. It made no mention of Havens and Venart's comments.

Michael Hinrichs, a spokesman for the Jordan Cove project, noted in an email that "dispersion modeling, safety and security were all thoroughly analyzed and accepted by the FERC, [the Department of Transportation] and PHMSA to be within compliance." The three agencies, he said, "have all upheld the current modeling as meeting the safety criteria for the industry."

The Jordan Cove project's fate has since been thrown up in the air by an unexpected FERC decision to reject the project despite the favorable review by agency staff, pointing to a lack of firm contracts for LNG off-take (***EnergyWire***, April 19).

But Havens continues to be concerned. In a paper at the Health and Safety Laboratory -- where researcher Atkinson works -- in April, he **argued** that regulators are "doing it wrong" when it comes to gauging the explosion hazards of large hydrocarbon clouds.

Havens said PHMSA may be relying on the wrong computer models to assess explosion risks. Most of its results are classified for security reasons.

Divided responsibilities

At the workshop in May, Kenneth Lee, who directs PHMSA's engineering and research division within the Office of Pipeline Safety, declined to say what specific regulatory changes are on the table for an upcoming overhaul of the LNG rulebook, or even what the key questions are, deferring to public input from the meeting to shape the process (***EnergyWire***, May 20).

But the workshop itself, in providing a platform to discuss heavy hydrocarbon risks, points to the potential for new requirements for LNG export facilities. How those requirements might be designed remains to be seen.

Industry has welcomed small tweaks to PHMSA's rules that would bring them up to date, more easily encompass new technologies and be more in line with standards used by regulators in other jurisdictions. But any changes that added new hurdles to the process of siting LNG facilities -- which primarily falls under FERC jurisdiction -- could face opposition from developers. They could raise difficult questions about Sabine Pass LNG and the four other LNG export terminals under construction.

For its part, PHMSA pledges that the coming rulemaking process will be transparent. "We take comments that you submit very seriously," said Julie Halliday, a member of the agency's engineering and research division who coordinated much of the meeting, in a discussion of the next steps. "We will address those points that you submit."

Still, she noted that PHMSA's authority over LNG facility siting is limited. "We don't actually have authority for siting within our regulations," she said, describing the agency's role in that process as working out the public safety "exclusion zones" that extend around the core of the facility.

"It's about a setback. It's not telling you whether you can site a facility at a certain location," she added, noting that other agencies control that question. "If FERC doesn't have jurisdiction to site a facility, it's the local jurisdiction."

Twitter: **@JennyMandel1** | Email: **jmandel@eenews.net**

Exhibit G

Billing Code: 4910-60-W

DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

[Docket No. PHMSA-2019-0087]

Pipeline Safety: Potential for Damage to Pipeline Facilities Caused by Earth Movement and Other Geological Hazards

AGENCY: Pipeline and Hazardous Materials Safety Administration (PHMSA), DOT.

ACTION: Notice; Issuance of Advisory Bulletin.

SUMMARY: PHMSA is issuing this advisory bulletin to remind owners and operators of gas and hazardous liquid pipelines of the potential for damage to pipeline facilities caused by earth movement from both landslides and subsidence in variable, steep, and rugged terrain and for varied geological conditions. These conditions can pose a threat to the integrity of pipeline facilities if those threats are not identified and mitigated.

FOR FURTHER INFORMATION CONTACT: Operators of pipelines subject to regulation by PHMSA should contact the appropriate PHMSA Region Office. The PHMSA Region Offices and their contact information are as follows:

- Eastern Region: 609-771-7800

  Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia

- Southern Region: 404-832-1147

  Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, and Tennessee

- Central Region: 816-329-3800

Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin

- Southwest Region: 713-272-2859

  Arkansas, Louisiana, New Mexico, Oklahoma, and Texas

- Western Region: 720-963-3160

  Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming

Intrastate pipeline operators should contact the appropriate state pipeline safety authority. A list of state pipeline safety authorities is available at http://www.napsr.org/state-program-managers.html.

For general information about this notice contact Mike Yazemboski, Project Manager, PHMSA Eastern Region, at 609-771-7800 or by email at Mike.Yazemboski@dot.gov.

SUPPLEMENTARY INFORMATION

I. Background

The purpose of this advisory bulletin is to remind owners and operators of gas and hazardous liquid pipelines, particularly those with facilities located in inland areas, about the serious safety-related issues that can result from earth movement and other geologic hazards.

Natural gas and hazardous liquid pipelines are required to be designed to withstand external loads including those that may be imposed by geological forces. Specifically, natural gas pipelines must be designed in accordance with 49 CFR 192.103 and hazardous liquid pipelines must be designed in accordance with § 195.110. To comply with these regulations, the design of new pipelines, including repairs or replacement, must consider load that may be imposed by geological forces.

Once operational, § 192.317(a) of the pipeline safety regulations for natural gas pipelines states that "[t]he operator must take all practicable steps to protect each transmission line or main from washouts, floods, unstable soil, landslides, or other hazards that may cause the pipeline to move or to sustain abnormal loads. In addition, the operator must take all practicable steps to protect offshore pipelines from damage by mud slides, water currents, hurricanes, ship anchors, and fishing operations." This advisory bulletin addresses those protective requirements associated with damage caused by geological factors.

In addition, § 192.705 requires operators of gas transmission lines to have a patrol program to observe surface conditions on and adjacent to the transmission line right-of-way for indications of leaks, construction activity, and other factors affecting safety and operation and the frequency of patrols must be based upon the size of the line, operating pressures, class locations, terrain, seasonal weather conditions, and other relevant factors. One of the primary reasons for this patrol requirement is to monitor geological movement, both slowly occurring or acute changes, which may affect the current or future safe operation of the pipeline.

Furthermore, § 192.613(a) states that "[e]ach operator shall have a procedure for continuing surveillance of its facilities to determine and take appropriate action concerning changes in class location, failures, leakage history, corrosion, substantial changes in cathodic protection requirements, and other unusual operating and maintenance conditions." Section 192.613(b) further states that "[i]f a segment of pipeline is determined to be in unsatisfactory condition but no immediate hazard exists, the operator shall initiate a program to recondition or phase out the segment involved, or, if the segment cannot be reconditioned or phased out, reduce the maximum allowable operating pressure in accordance with § 192.619(a) and (b)."

Section 195.401(b)(1) of the pipeline safety regulations for hazardous liquid pipelines states that "[w]henever an operator discovers any condition that could adversely affect the safe operation of

its pipeline system, it must correct the condition within a reasonable time. However, if the condition is of such a nature that it presents an immediate hazard to persons or property, the operator may not operate the affected part of the system until it has corrected the unsafe condition." Section 195.401(b)(2) further states that "[w]hen an operator discovers a condition on a pipeline covered under [the integrity management requirements in] § 195.452, the operator must correct the condition as prescribed in § 195.452(h)." Land movement, severe flooding, river scour, and river channel migration are the types of unusual operating conditions that can adversely affect the safe operation of a pipeline and require corrective action under §§ 192.613(a) and 195.401(b). Additional guidance for identifying risk factors and mitigating natural force hazards on pipeline segments, that could affect high consequence areas, are outlined in Appendix C, section B, to Part 195.

Sections 192.935 and 195.452(i) require an operator to take additional preventative and mitigative measures to prevent a pipeline failure and to mitigate the consequences of a pipeline failure that could affect a high consequence area. An operator must base the additional measures on the threats the operator has identified for each pipeline segment. If an operator determines there is a threat to the pipeline, such as outside force damage (e.g., earth movement, floods), the operator must take steps to prevent a failure and to minimize the consequences of a failure under these regulations.

PHMSA is aware of recent earth movement and other geological-related incidents/accidents and safety-related conditions throughout the county, particularly in the eastern portion of the United States. Seven of the more notable events are briefly described below:

- On October 21, 2016, a pipeline release of over 1,238 barrels of gasoline spilled into the Loyalsock Creek in Lycoming County, Pennsylvania. The release was caused by extreme localized flooding and soil erosion.
- On December 5, 2016, approximately 12, 615 barrels of crude oil was released into Ash Coulee Creek in Billings County, North Dakota. The metallurgical and root cause failure analysis

indicated the failure was caused by compressive and bending forces due to a landslide impacting the pipeline. The landslide was the result of excessive moisture within the hillside creating unstable soil conditions.

- On April 30, 2018, a pipeline failure occurred in a remote mountainous region of Marshall County, West Virginia resulting in the release of 2,658 barrels of propane. The failure and subsequent release was caused by lateral movement of the 8-inch intrastate pipeline due to earth movement along the right-of-way.
- On June 7, 2018, a rupture occurred on a 36-inch pipeline located in a rural, mountainous area near Moundsville, West Virginia, resulting in the release of approximately 165,000 MCF of natural gas. The failed sections of the pipeline were sent to a metallurgical laboratory to determine the probable cause behind the failure of the pipeline. According to the analysis, the cause of the rupture was due to earth movement on the right-of-way due to a single overload event. Overloading of the pipeline likely resulted from a series of lateral displacements with accompanying bending.
- On January 9, 2018, a failure occurred on a 22-inch transmission pipeline in Montecito California. The incident resulted in a fire and explosion and the release of an estimated 12,000 MFC of natural gas within a Class 3 location.[1] It is believed that heavy rains and localized flooding contributed to the incident. Automated safety equipment designed to stop the flow of gas to the effected segment activated to shut off gas flow to the damaged segment of pipeline.
- On January 31, 2018, a portion of a pipeline experienced an in-service rupture near the city of Summerfield, Ohio. The rupture of the 24-inch interstate pipeline resulted in the release of approximately 23,500 MCF of natural gas in a rural forested area. A root cause analysis concluded that the girth weld failure was caused by axial stress due to movement of the pipe

[1] *See* 49 C.F.R. § 192.5(b)(3) (defining Class 3 locations).

that exceeded the cross-sectional tensile strength of the net section weld zone surrounding the crack initiation location. This determination is supported by metallurgical analysis, strain capacity evaluation and geotechnical findings.

- On January 29, 2019, a pipeline ruptured near the town of Lumberport in Harrison County, West Virginia. The rupture was located at a girth weld of an elbow on the 12-inch interstate pipeline. The root cause investigation concluded that a landslide about 150 yards from the rupture moved the pipeline approximately 10 feet from its original location causing excessive stress on the pipe resulting in the rupture.

II. Advisory Bulletin (ADB-2019-02)

To: Owners and Operators of Gas and Hazardous Liquid Pipeline Systems.

Subject: Potential Damage to Pipeline Facilities Caused by External Loads Imposed by Earth Movement and Other Geologic Hazards on and Adjacent to Pipeline Right-of-Way Corridors.

Advisory: All owners and operators of gas and hazardous liquid pipelines are reminded that earth movement, particularly in variable, steep, and rugged terrain and with varied geological subsurface conditions, can pose a threat to the integrity of a pipeline if those threats are not mitigated. Pipeline operators should consider taking the following actions to ensure pipeline safety:

1. Identify areas surrounding the pipeline that may be prone to large earth movement, including but not limited to slope instability, subsidence, frost heave, soil settlement, erosion, earthquakes, and other dynamic geologic conditions that may pose a safety risk.
2. Utilize geotechnical engineers during the design, construction, and ongoing operations of a pipeline system to ensure that sufficient information is available to avoid or minimize the impact of earth movement on the integrity of the pipeline system. At a minimum, this should include soil strength characteristics, ground and surface water conditions, propensity for erosion or scour of underlying soils, and the propensity of earthquakes or frost heave.

3. Develop design, construction, and monitoring plans and procedures for each identified location, based on the site-specific hazards identified. When constructing new pipelines, develop and implement procedures for pipe and girth weld designs to increase their effectiveness for taking loads, either stresses or strains, exerted from pipe movement in areas where geological subsurface conditions and movement are a hazard to the pipeline integrity.
4. Monitoring plans may include:
    - Ensuring during construction of new pipelines that excavators do not steepen, load (including changing the groundwater levels) or undercut slopes which may cause excessive ground movement during construction or after operations commence.
    - Conducting periodic visits and site inspections; increased patrolling may be necessary due to potential hazards identified and existing/pending weather conditions. Right-of-way patrol staff must be trained on how to detect and report to appropriate staff the conditions that may lead to or exhibit ground movement.
    - Identifying geodetic monitoring points (i.e. survey bench marks) to track potential ground movement;
    - Installing slope inclinometers to track ground movement at depth which may otherwise not be detectable during ROW patrols;
    - Installing standpipe piezometers to track changes in groundwater conditions that may affect slope stability;
    - Evaluating the accumulation of strain in the pipeline by installing strain gauges on the pipeline.

- Conducting stress/strain analysis utilizing in-line inspection tools equipped with Inertia Mapping Unit technology and High Resolution Deformation in-line inspection for pipe bending and denting from movement.
- Utilizing aerial mapping light detection and ranging or other technology to track changes in ground conditions.

5. Develop mitigation measures to remediate the identified locations.
6. Mitigation measures should be based on site-specific conditions and may include:
    - Re-routing the pipeline right-of-way prior to construction to avoid areas prone to large ground movement such as unstable slope areas, earthquake fault zones, permafrost movement, or scour.
    - Utilize properly designed horizontal directional drilling (HDD) to go below areas of potential land movement.
    - Installation of drainage measures in the trench to mitigate subsurface flows and enhance surface water draining at the site including streams, creeks, runs, gullies or other sources of surface run-off that may be contributing surface water to the site or changing groundwater levels that may exacerbate earth movement.
    - Reducing the steepness of potentially unstable slopes, including installing retaining walls, soldier piles, sheet piles, wire mesh systems, mechanically stabilized earth systems and other mechanical structures.
    - Installing trench breakers and slope breakers to mitigate trench seepage and divert trench flows along the surface to safe discharge points off the site or right-of-way.
    - Building retaining walls and/or installing steel piling or concrete caissons to stabilize steep slope areas as long as the corrosion control systems are not compromised.

- Reducing the loading on the site by removing and/or reducing the excess backfill materials to off-site locations. Soil placement should be carefully planned to avoid triggering earth movement in other locations.
- Compacting backfill materials at the site to increase strength, reduce water infiltration, and to achieve optimal moisture content.
- Drying the soil using special additives such as lime-kiln dust or cement-kiln to allow the materials to be re-used and worked at the site. Over-saturated materials may require an extensive amount of time and space to dry.
- Regrading the pipeline right-of-way to minimize scour and erosion.
- Bringing the pipeline above ground and placing them on supports that can accommodate large ground movements, (e.g. transitions across earthquake fault zones or unstable slopes, without putting excessive stress or strain on the pipeline).
- Reducing the operating pressure temporarily or shutting-in the affected pipeline segment completely.
- Re-routing the pipeline when other appropriate mitigation measures cannot be effectively implemented to maintain safety.

If a pipeline has suffered damage or is shut-in as a precautionary measure due to earth movement or other geologic hazards, the operator should advise the appropriate PHMSA regional office or state pipeline safety authority before returning the line to service, increasing its operating pressure, or otherwise changing its operating status. Per § 190.239, PHMSA may propose additional safety measures, including testing of the pipeline, or design changes to address external loads induced by ground movement, be taken to ensure that the serviceability of the pipeline has not been impaired or

that the condition will not worsen over time. Furthermore, reporting a safety-related condition as prescribed in §§ 191.23 and 195.55 may also be required.

Issued in Washington, DC on April 29, 2019, under authority delegated in 49 CFR 1.97.

Alan K. Mayberry,
Associate Administrator for Pipeline Safety.
[FR Doc. 2019-08984 Filed: 5/1/2019 8:45 am; Publication Date: 5/2/2019]

Exhibit I

The World – Coos Bay
https://theworldlink.com/news/local/utvs-to-takeover-box-car-hill-this-weekend/article_c3258d6e-e77f-5073-b28c-8d2a657c7186.html

UTVs to 'takeover' Box Car Hill this weekend

NICHOLAS A. JOHNSON - The World
Jun 27, 2019

Riders navigate at the dunes Wednesday at Box Car Hill during the UTV Takeover in North Bend. Ed Glazar The World

A message scrawled on a sand covered tire Wednesday during the UTV takeover at Boxcar Hill Campground in North Bend. Ed Glazar The World

NORTH BEND — Once again the UTV Takeover has, as its name suggests, taken over Box Car Hill with thousands coming from all over to watch and participate in a weekend full of ATV and UTV events.

While most leave the events to the professionals and just come for a viewing, nearly anyone can participate in the various events from June 26-30 out on Box Car Hill, located on the Transpacific Highway north of the McCullough Bridge. Events run all day and entry to the takeover costs $25 for general admission.

UTV Takeover
A rider speeds up a hill Wednesday out of Box Car Hill campground during the UTV Takeover in North Bend.

A Utility Task Vehicle, also known as a side-by-side, is similar to an all-terrain vehicle but typically larger and uses a steering wheel and pedals rather than handlebars and can carry passengers.

Events include more extreme activities like barrel racing, drag strip racing, and a wheeliefest. However, there are plenty of events throughout the weekend for those who might prefer to just eat food, listen to music and watch the more adventurous types tear around the dunes.

The Sand Outlaw is a helmets-required event where two drivers face off and simultaneously barrel down two equal tracks, the distance of two football fields. The course contains several elevation changes, jumps, crossovers and hurdles. The competition is single elimination, with winners moving on to another round and losers staying back to watch. Like most larger events, the

prize for the Sand Outlaws event is $100 and four raffle tickets, with second being $50 and two raffle tickets.

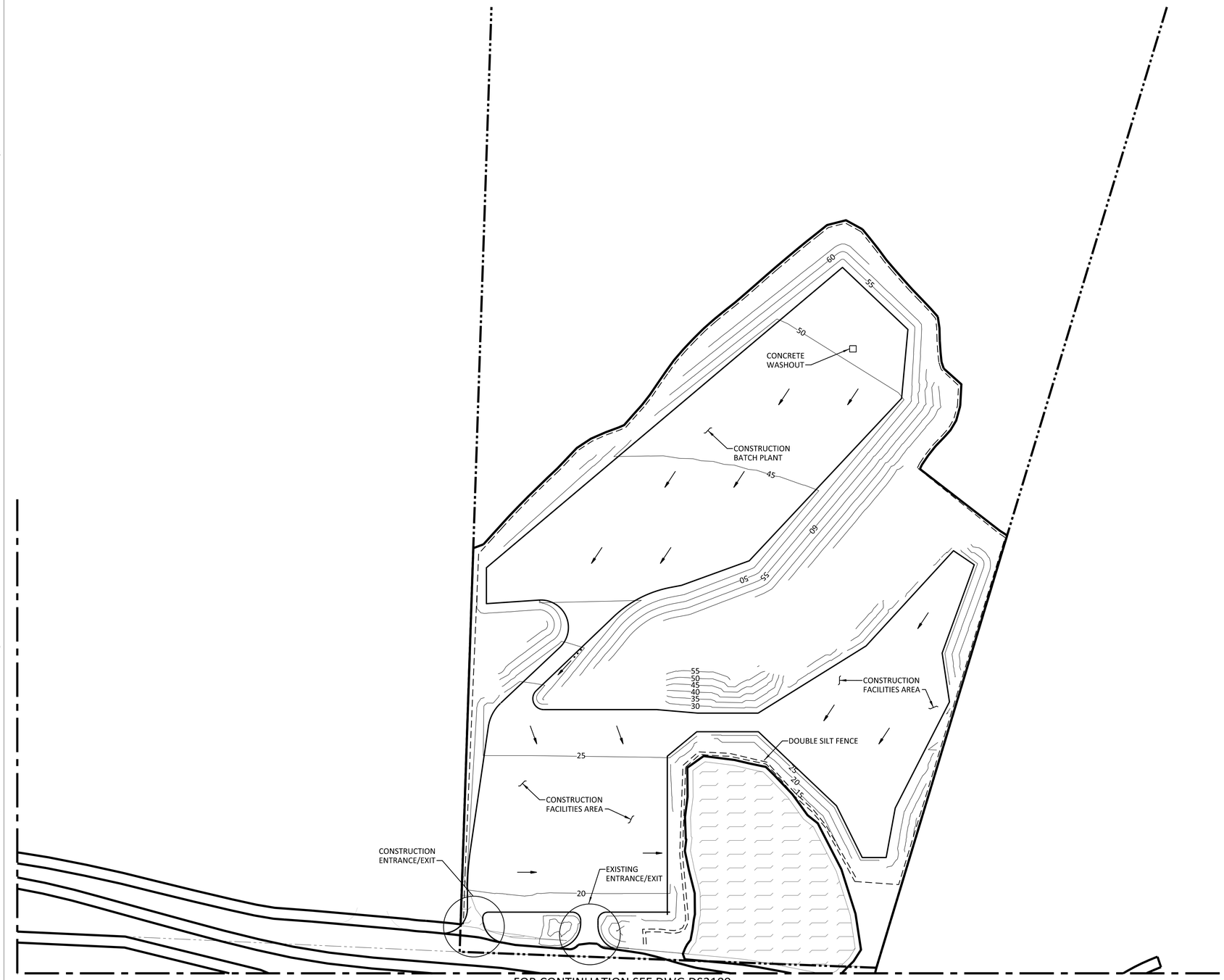
UTV Takeover
An vehicle sits Wednesday among vendor tents during the UTV takeover at Boxcar Hill Campground in North Bend.

Some of the less competitive events only net winners $40 and four raffle tickets or $20 and two raffle tickets. Events like the Blind Bandit adhere to this prize structure. The Blind Bandit event sees blindfolded drivers attempt to navigate through a tight obstacle course, while receiving only verbal instructions from the passenger.

Throughout the takeover, participants and spectators have the opportunity win and purchase raffle tickets. Those entered in the raffle have a chance to win up to $20,000 in prizes from various sponsors and vendors.

Nicholas A. Johnson can be reached at 541-266-6049, or by email at nicholas.johnson@theworldlink.com.

Exhibit J

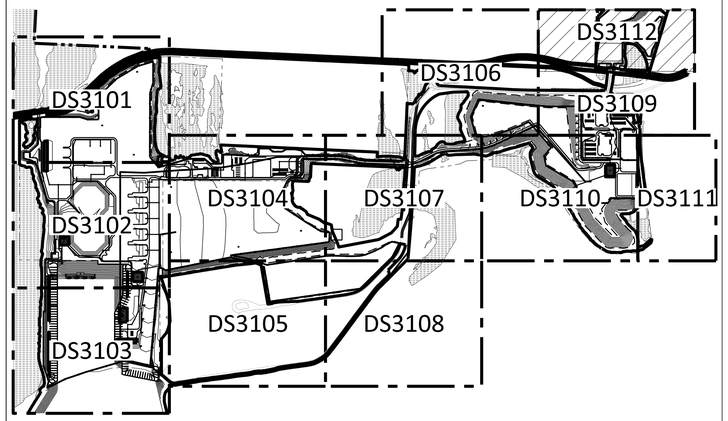


FOR CONTINUATION SEE DWG DS3109

OFFSITE CONSTRUCTION AREAS

DS3113 APCO LAYDOWN SITE
DS3114 PORT LAYDOWN SITE
DS3115 MILL CASINO OFFSITE PARK & RIDE
DS3116 MYRTLEWOOD OFFSITE PARK & RIDE
DS3117 METEOROLOGICAL TOWER SITE

KEY PLAN



NOTES

1. SEE DRAWING 0000-DS3100 FOR GENERAL NOTES, LEGEND AND ABBREVIATIONS.

100' 50' 0 100' 200'
1"=100'

JORDAN COVE LNG

Jordan Cove LNG SM

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I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF OREGON
SIGNED
DATE REG NO.

DESIGNER | DRAWN
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JORDAN COVE LNG PROJECT

EROSION AND SEDIMENT CONTROL PLAN
AREA 12

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