Potential Socio-Economic Impacts of the Proposed Shipment of Crude Oil from Grays Harbor

January 2014

Natural Resource Economics

1430 Willamette St., # 553
Eugene, Oregon USA 97401-4049
ernie.niemi@nreconomics.com

The is report was prepared on behalf of Earthjustice by Ernie Niemi of Natural Resource Economics, which is solely responsible for its content.

Table of Contents

I. Executive Summary 1

II. Background 4

III. Potential Harmful Impacts on People, Property, Businesses, Communities, and Ecosystems 6

IV. Potential Negative Economic Consequences of the Proposed Shipment of Crude Oil into and out of Grays Harbor 16

A. Potential Oil-Shipment-Related Events that Threaten to Harm Individuals, Businesses, Communities, Ecosystems, and the Economy 16

B. Potential Negative Effects on the Economies of Washington and Grays Harbor County 17

C. Potential Negative Effects on the Quinault Indian Nation 25

IV. Conclusions 30

I. Executive Summary

Two firms, Westway Terminal Company LLC (Westway) and Imperium Terminal Services LLC (Imperium), have announced plans to ship crude oil through Grays Harbor, Washington. Under the proposals, they would transfer crude oil first from trains to bulk storage tanks and then from the tanks to ships and barges for shipment to ports in the U.S. and potentially other nations. In support of their proposals, the firms commissioned a report by ECONorthwest that purports to describe the "overall impacts" of the facilities' construction and operation on the economies of Washington and Grays Harbor County.[1] The study concludes that the new facilities would create hundreds of jobs and millions of dollars in workers' incomes and business sales.

In reality, though, the study falls far short of describing the overall economic impacts of the proposed crude oil shipments. Instead, it paints a rosy picture of the intended positive impacts of the firms' investments, but ignores the unintended negative ones. That is, it focuses solely on, and provides exaggerated estimates of the potential positive economic impacts of the firms' expenditures on, sales, jobs, and incomes, but disregards entirely the negative impacts on these variables. These negative impacts would materialize from the disruption of commerce and household activities; the risk of accidents, oil spills, and explosions that would accompany the movement and storage of crude oil; and the impacts of oil exports on the domestic price of petroleum products.

Disruption of commerce and household activities would materialize as one, maybe two, mile-long, crude-oil trains per day would move to and from the proposed facilities, blocking rail crossings and delaying the movement of other trains. Each crude-oil train would carry with it multiple risks: of congestion, collision, derailment, emission of hazardous substances into the air, oil spills onto the ground or into the water, and explosions. The risk of oil spills and explosions would be extraordinarily high insofar as each of the 100–120 cars in these trains would carry only crude oil, and hence, if an accident should occur, have the potential to produce an oil spill or explosion. The U.S. Pipeline and Hazardous Materials Safety Administration recently warned of even greater risk of fire and explosion when trains carry oil from the Bakken region because it "may be more flammable than traditional heavy crude oil."[2] Additional risk of hazardous emissions, spills, and explosions would exist insofar as the proposed storage tanks would store up to 1,520,000 barrels of crude oil, and as 260 ocean-going vessels per year would pass into and out of the Port of Grays Harbor, carrying more than 36 million barrels of crude oil through the Chehalis River estuary and along Washington's coast.[3]

Negative effects on sales, jobs, and incomes in Washington and Grays Harbor County would occur in the following scenarios:

---

[1] ECONorthwest. 2013. *Economic Impact Analysis of Bulk Liquid Storage Facilities at the Port of Grays Harbor*. September 5. p. 1.

[2] U.S. Pipeline and Hazardous Materials Safety Administration. 2014. "Safety Alert: Preliminary Guidance from OPERATION CLASSIFICATION." January 2. http://www.phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=c6efec1c60f23410VgnVCM100000d2c97898RCRD&vgnextchannel=d248724dd7d6c010VgnVCM10000080e8a8c0RCRD&vgnextfmt=print.

[3] ECONorthwest, p. 2.

- Traffic disruptions, collisions, derailments, hazardous emissions, oil spills, and explosions would result in human death, injury, illness and stress; death, injury, illness and stress to livestock, fish, and wildlife; damage to commercial and residential property; damage to public infrastructure; curtailed use of private and public property; reduction in the value of goods and services derived from affected ecosystems; or disruption of activities and investments that otherwise would take place.
- Traffic disruptions, collisions, derailments, hazardous emissions, oil spills, and explosions would negatively affect the Quinault Indian Nation, by directly harming its members, e.g., by exposing them to harmful substances, or by threatening or actually degrading their social, economic, and cultural relationship with the natural resources of their traditional homeland, e.g., by killing salmon and disrupting their ability to catch fish and wildlife or to harvest native plants.
- The risk of traffic disruptions, collisions, derailments, hazardous emissions, oil spills, and explosions—whether or not these events actually occur—would impair the well-being of households and reduce the productivity of businesses and public entities by forcing them to bear the risk unabated or incur risk-reduction expenditures.
- Combustion of fossil fuels that would not occur, absent the shipment of crude oil into and from Grays Harbor, would result in changes in climate, acidification of water resources, higher sea levels, and related outcomes that negatively affect residents, businesses, and public entities.
- Increased vessel traffic would interfere with and reduce the value of commercial and recreational fishing or degrade ecosystem productivity, e.g., by churning the waters of Grays Harbor.
- The increased combustion of fossil fuels would harm households, businesses, and public entities by increasing the risk of undesirable outcomes, whether or not these outcomes actually occur.
- The export of crude oil to other countries would diminish the domestic supply and might increase the prices of petroleum products in Washington and Grays Harbor County.

Each of these scenarios would impose economic costs on and reduce the welfare of affected workers and families, the earnings of affected landowners and businesses, and the productivity of governmental infrastructure and workers. As workers, families, landowners, businesses, and governments incur these costs, they likely would alter their expenditures, and the change in expenditures would have a negative impact on overall sales, jobs, and incomes for affected businesses and workers. For example, if an oil spill were to reduce fish populations or to taint the value of the fish, tribal and non-tribal commercial fishermen would see their incomes fall and they would have less to spend. As a consequence, local businesses would see a reduction in sales, workers would see fewer job opportunities and reduced earnings, and taxpayers would see an impairment of community services and infrastructure. Closure or tainting of the statewide Dungeness crab fishery, alone, would jeopardize the revenue of commercial boats, which have realized ex-vessel sales of $30–50 million per year in recent years. Similarly, an oil spill that taints shellfish or closes related activities in Grays Harbor and adjacent counties would jeopardize income for businesses and workers associated with a large portion of Washington's cultivated shellfish industry, which currently experiences annual sales of about $108 million. Tainting of razor clams or closure of clam harvests on beaches on the south coast would jeopardize annual revenues expected to be about $38 million for local motels, restaurants, and other recreation-related enterprises.

The failure of ECONorthwest's study to consider these negative economic effects violates widely accepted professional standards applicable to any analysis that purports to describe the "overall impacts" of the proposed oil-shipment facilities. At their core, these standards require consideration of all the economic effects—negative as well as positive, unintended as well as intended. By focusing solely on the intended, potential positive impacts, the study gives an incomplete, biased description of the actual, overall impacts that would occur if the proposals were implemented.

This paper describes the deficiencies in ECONorthwest's study, provides an overview of the negative effects that it overlooked, and outlines appropriate steps for correcting the deficiencies. The information provided below supports these two conclusions:

1. **The proposed shipment of oil from Grays Harbor would have sufficiently large negative effects that, for many households, businesses, and communities, the negative effects may outweigh the positive effects. The aggregate negative effects may exceed the aggregate positive effects.**
2. **Further investigation of these potential negative effects must be completed before decision-makers and the public can fully understand the overall economic consequences in their entirety.**

II. Background

Westway and Imperium have developed plans to construct facilities to accept crude oil delivered by rail to the Port of Grays Harbor, store the oil, and transfer it to ocean-going vessels for shipment to ports elsewhere in the U.S. and potentially other countries. Combined, the two firms' plans anticipate accepting crude oil from 1-2 trains a day and transferring it to about 260 vessels (ships and barges) a year. A third company, U.S. Development, also has expressed interest in shipping crude oil through the Port of Grays Harbor.

Westway and Imperium jointly funded a study by ECONorthwest, a consulting firm in Portland, Oregon, "to estimate the economic and fiscal impacts of the combined expansion projects." (p. 6) The authors of the study concluded that the firms would, over 9-16 months, spend about $62.2 million on construction of the facilities and these expenditures would, on average over the period, directly result in 231 jobs for Washington residents who would receive about $27.9 million in income. They also concluded that, during the first year of operation, the firms would spend about $97.8 million in Grays Harbor County, directly resulting in jobs for 148 workers, some of whom would immigrate to the county from elsewhere, and labor income of $12.8 million.

The study's authors also concluded that these direct impacts on sales, jobs, and labor income would have so-called multiplier, or indirect impacts on the economy, as the firms and workers directly working on the construction and operations would spend their revenues and incomes. Using a model called IMPLAN, they estimated that these indirect impacts would vary, from about 20 percent of the direct impacts on in-county sales resulting from operational expenditures, to more than 100 percent of the direct impacts on in-state construction expenditures.

ECONorthwest's application of the IMPLAN model embodies some powerful assumptions that bias the analysis so that it over-estimates the positive changes in the sales, jobs, and incomes that would occur if the proposals from Westway and Imperium were implemented. Three of these assumptions stand out. One, ECONorthwest's report assumes that the proposed actions by Westway and Imperium would be the only game in town. That is, it assumes that, absent implementation of the firms' proposals, there would be no other demand for labor, land, materials, equipment, and other inputs. Thus, it concludes that every worker employed as a result of the firms' expenditures on construction or operations would have been unemployed absent these expenditures, and, hence, the overall impact on jobs equals the total number of construction- or operations-related jobs. It reaches a similar conclusion regarding the other inputs.

It is far more likely, however, that some of the workers would have jobs regardless, and that some of the other inputs would be used for other investments and activities, absent the oil-related activities. In such instances, the oil-related activities would not expand the overall use of labor and other inputs but, instead, substitute their use of these inputs for those of other activities elsewhere in the state or county. To the extent that such substitution would occur, the overall impact on jobs, sales, and incomes would be less than ECONorthwest has estimated. Stated differently, the net impact would be less than the gross impact.

ECONorthwest's report acknowledges this shortcoming in a section with the heading, "Limitations:"

> "This analysis does not measure potential counterfactual scenarios that consider how scarce resources would have been allocated, should the storage expansion projects never occur. It does not consider how funding and operating new bulk liquid storage tanks could divert spending from other potential uses (in economics, this is termed the "substitution effect"). This analysis assumes that as the investments are undertaken willingly by private entities the investment is a first-best use of those resources. The analysis assumes that access to national and international capital markets is unrestricted and that this investment does not drive out other worthwhile investments." (p. 10)

ECONorthwest does not, however, make any effort to quantify the consequences of this limitation, and instead reports its estimates of the gross potential increases in sales, jobs, and incomes as the "overall impacts."

Two, ECONorthwest's report assumes the number of jobs and the level of income resulting from the firms 'expenditures during the facilities' first year of operations would continue in future years. It states, "The impacts from operations, estimated in the first year, will reoccur in future years." (p. 2) In a general review of this type of analysis, however, Washington's Office of Financial Management warns that this assumption likely results in an overestimate of the expected jobs and incomes in future years, because "growth in labor productivity would increasingly reduce the validity of using these fixed ratios to estimate employment impact."[4] By failing to acknowledge the potential decline in jobs and incomes over time, ECONorthwest's report overstates the facilities' positive economic impacts over time.

Three, ECONorthwest's report assumes that impacts other than those that stem from shipment-related expenditures have no place in its purported description of the "overall impacts." It states, "The analysis also does not measure non-economic and environmental costs and benefits." (p. 10) Moreover, it does not even attempt to describe what effect this failure to measure these costs and benefits might have on its findings and conclusions.

With these deficiencies, ECONorthwest's report fails to satisfy widely accepted professional standards applicable to any analysis that purports to describe the "overall impacts" of constructing and operating oil-shipment facilities. These standards are described in several, well-known reference documents.[5] They recognize that, to provide an unbiased description of the potential economic consequences of investments, such as those planned by Westway and Imperium, the analysis must consider all the economic effects—negative as well as positive, unintended as well as intended. Toward that end, it must compare two scenarios, one with and the other without implementation of the proposals, to isolate the economic impacts uniquely attributable to them. It also must fully present all relevant information, qualitative as well as quantitative, about the economic importance of the socio-economic and environmental resources potentially affected by the proposed oil-shipment activities.

---

[4] "Limitations of Input-Output Impact Analysis." http://www.ofm.wa.gov/economy/io/2007/I-O_2007_chapter_3.pdf. p. 14.

[5] Applicable standards are illustrated, e.g., by Washington State Department of Ecology. 2006. *Final Cost Benefit Analysis for Oil Spill Contingency Planning*. Pub. No. 06-08-020. September. p. 6; U.S. Environmental Protection Agency. 2010. *Guidelines for Preparing Economic Analyses.* December; U.S. Council on Environmental Quality. 2013. *Principles and Requirements for Federal Investments in Water Resources (plus Draft Interagency Guidelines for implementation).* March; Office of the President. 1994. *Executive Order 12866: Regulatory Review and Planning*; and Office of Management and Budget. 1994. *Circular A-4: Regulatory Analysis*.

III. Potential Harmful Impacts on People, Property, Businesses, Communities, and Ecosystems

The shipment of crude oil into and from Grays Harbor could have harmful impacts on people, commerce, infrastructure, and the environment not just locally but along the entire shipment route. These impacts could occur in many ways.

A. Emission of particulates, other harmful substances, and noise by diesel locomotives and ocean-going vessels. For example:[6]

"Emissions from diesel engines found in trucks, ships, locomotives, agricultural and construction equipment—especially the microscopic soot known as "particulate matter" (PM)—create serious health problems for adults and have extremely harmful effects on children and the elderly. Children are especially adversely affected by diesel emissions because their respiratory systems are still developing; and they have a faster breathing rate. Public health authorities associate exposure to PM with an increased risk of premature death, greater number of hospital admissions for heart and lung disease, and amplified adverse respiratory symptoms such as asthma. Long-term exposure to diesel exhaust may pose a lung cancer hazard to humans.

"Diesel emissions from port-related goods movement are a significant and growing contributor to regional air pollution."

B. Train–auto collisions and train derailments. For example:

In 2012, 1,960 highway-rail accidents in the U.S. at grade crossings killed 235 persons and injured 913, and hazardous materials transported by rail caused property damage totaling $17,869,000 with $15,091,000 of this damage occurring because of accidents.[7]

"Operation Lifesaver, a national, non-profit education and awareness program dedicated to ending crashes, fatalities and injuries at highway-railroad crossings, provides these national statistics:

- 64% of all crashes occur in daylight hours
- 25% of all crashes occur when a vehicle runs into a train
- Most crashes occur with trains traveling under 30 mph
- Most crashes occur within 25 miles of the driver's home
- Nearly 50% of all crashes occur at crossings equipped with automatic warning devices
- A 100 car freight train traveling at 55 mph may take over a mile to stop once the emergency brakes are applied
- A typical locomotive pulling 100 railcars can weigh approximately 6,000 tons, making the weight ratio of a train to an automobile proportional to that of an automobile to a soda can.[8]

---

[6] West Coast Collaborative. No date. "Diesel and the Economy." http://www.westcoastcollaborative.org/files/outreach/DieselAndEconomy.pdf.

[7] U.S. Department of Transportation, Bureau of Transportation Statistics. 2013. "Table 2-5: Highway-Rail Grade-Crossing Safety." http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_02_05.html; and Table 2-6: Hazardous Materials Fatalities, Injuries, Accidents, and

- Death is 40 times more likely in a crash involving a train, than in a crash involving another motor vehicle"[9]

To the extent that oil shipments resemble coal shipments, they will generate similar risks. An extensive investigation into the potential spillover costs of coal-fired electricity in the early 1990s concluded that the spillover costs associated with the human-health effects of accidents that accompany the shipment of coal to power plants were "of the same order of magnitude" as those that were caused by airborne pollutants.[10]

C. Ship/barge accidents. For example:

Transportation accounts for about 10 percent of the oil introduced to North American coastal water through human behavior.[11]

[Foundering] accounts for approximately 50% of all the annual ship losses. Foundering is defined by ISL (2010) as, '*Sinking due to rough weather, leaks, breaking in two etc, but not due to other categories such as collision [and so on]*'. Foundering incidences are clearly associated with the geographical area they occur in and the extreme weather conditions often experienced in such locations, as discussed in section 3.3. These incidences also occur in areas such as the North Sea and the Black Sea where there are high volumes of shipping and many coastal trading routes associated with short sea shipping. The second major cause of loss by incident type is associated with wrecked or stranded vessels, which is defined as '*Striking the sea bottom, shore or underwater wrecks. Also termed "Grounding*" (ISL, 2010). However this attributes to less than half of those that are foundered. Project Horizon, a research project looking at the effects of sleepiness on the cognitive performance of maritime watch keepers, stated that marine insurance statistics have shown that human error is a major contributing factor in about 60% of shipping accidents, with other research suggesting that this figure significantly increases in the case of collisions and groundings….[12]

---

[8] Property Damage Data. http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_02_06.html_mfd.

[9] Melendy, L. and M. Hood. No date. "Tracks, Trains and Automobiles: Safety at Railroad Grade Crossings." http://www.techtransfer.berkeley.edu/newsletter/04-4/tracks.php.

[10] Oak Ridge National Laboratory and Resources for the Future. 1994. *Estimating Externalities of Coal Fuel Cycles.* September. Retrieved June 18, 2007, from http://www.osti.gov/energycitations/purl.cover.jsp? purl=/757381-ZMgpzz/webviewable/.

[11] Ramseur, J.L. 2012. *Oil Spills in U.S. Coastal Waters: Background and Governance.* http://www.fas.org/sgp/crs/misc/RL33705.pdf. p. 3.

[12] Butt, N., D. Johnson, K. Pike, N. Pryce-Roberts, and N. Vigar. 2013. *15 Years of Shipping Accidents: A Review for WWF*. p. 23. [Italic highlights in the original]. http://awsassets.panda.org/downloads/15_years_of_shipping_accidents_a_review_for_wwf_.pdf.

D. Delay and displacement of other traffic caused by crude-oil trains and ocean-going vessels. For example:[13]

Oil trains blocking other trains, automobiles, and pedestrian traffic can impose these costs on households, businesses, emergency services, and other governmental services:

- Costs for maintenance of road-rail grade crossing surface and crossing signals (and perhaps installation of new crossings and signals).
- Driver and vehicle delay costs.
- Costs associated with providing increased highway and train storage capacity (to accommodate traffic backed up by a train).
- Fuel and pollution mitigation cost savings (from idling queued vehicles).
- Costs from any "spillover" congestion on the rest of the railway and roadway system.
- Costs from impeded emergency access.
- Possible delay and disruption costs from derailments and train/vehicle accidents.

E. Churning of the estuary by the propellers and wakes of ocean-going vessels. For example:[14]

"As a ship moves through water, it creates waves. These waves contain energy and can have an impact on the water surface environment and, if they reach land, on the land environment. When wake wash reaches land it can cause erosion (carrying sediment away from the shoreline) or accretion (carrying sediment onto the shoreline) of beaches, channel beds, and banks, altering the structure of the land….

"It is not always obvious that marine vessels can have an impact on the land below the water since it is not always visible. However, there are organisms, such as clams and oysters, which rely on the ocean floor for survival. Therefore, any movement or change to the ocean floor is an impact on their possibility of survival. …

"Most of the change to the environment on land under water is due to movement of the sediment on the seabed. When marine vessels dock in a shallow area, their propulsion system (prop wash) can move the sediment and create holes, also called bottom scouring. When the wake from boats travels towards a beach, it transfers sediment along with it, termed sediment transportation. Any time sediment from the ocean floor is disturbed, there is the possibility that pollution previously deposited will be stirred up and cause more of an impact (McKesson, Remley and Karni). If bottom scouring or sediment transport does occur, then the impact translates into the category of Impact on Water."

F. Emission of airborne hazardous materials from crude oil in trains, storage tanks, and ships/barges. For example:

"The transportation and marketing of petroleum liquids involve many distinct operations, each of which represents a potential source of evaporation loss. … Loading losses are the primary source of evaporative emissions from rail tank car, tank truck, and

---

[13] Federal Highway Administration. "IV. Identification of Alternatives." *Railroad-Highway Grade Crossing Handbook–Revised Second Edition August 2007*. http://safety.fhwa.dot.gov/xings/com_roaduser/07010/sec04a.htm.

[14] P.A. Coker. 2013. *The Fundamentals of a Course on the Environmental Impacts of* Ships. pp. 9-11. http://scholarworks.uno.edu/cgi/viewcontent.cgi?article=2711&context=td.

marine vessel operations. Loading losses occur as organic vapors in "empty" cargo tanks are displaced to the atmosphere by the liquid being loaded into the tanks. These vapors are a composite of (1) vapors formed in the empty tank by evaporation of residual product from previous loads, (2) vapors transferred to the tank in vapor balance systems as product is being unloaded, and (3) vapors generated in the tank as the new product is being loaded."[15]

"[C]rude oil accounted for the most non-accident releases (NARs) by commodity in 2012, nearly doubling the next highest commodity (alcohols not otherwise specified, which accounts for a comparable annual volume transported by rail). FRA's [Federal Railroad Administration's] data indicates that 98% of the NARs involved loaded tank cars."[16]

G. Oil spills. For example:

"Oil spills can occur during a multitude of facility and vessel operations although one of leading sources of oil spills is from oil transfers during cargo loading or fueling (bunkering) operations."[17]

"The complex geographic setting of the storage terminals near wetlands, the Chelalis [sic] River mouth, and Fry Creek present additional complications in mitigating spills with respect to protecting local ecology and preventing spread to waterways."[18]

"The rail route between Centralia and Hoquiam transects multiple municipalities and lies in close proximity to numerous residential and commercial tracts along the way. Spills occurring in populated areas would present significant risks of environmental exposures to crude oil constituents, primarily through air and soil vapor pathways. Contamination of potable water sources would also be a concern if the water table of aquifers were substantially shallow in the affected area. Petroleum hydrocarbons and sulfur compounds found in crude oil are known to cause numerous adverse health effects in humans, including, but not limited to: eye irritation, respiratory complications, neurological disorders, and cancer under severe or prolonged conditions. Under the most dire of situations, evacuation of nearby communities would be necessary during the primary stages of emergency response."[19]

"Remediation efforts following a spill on land would include excavation, soil vapor extraction, bioremediation, groundwater treatment and testing, and additional strategies

---

[15] "Transportation And Marketing Of Petroleum Liquids." AP 42, Fifth Edition, Volume I. EPA *Clearinghouse for Inventories and Emissions Factors*. http://www.epa.gov/ttn/chief/ap42/ch05/final/c05s02.pdf.

[16] Federal Railroad Administration, cited in Vantuono, W.C. 2013. "U.S. Regulators Reviewing Crude-by-Rail." *Railway Age*. August 29. www.railwayage.com/index.php/safety/us-regulators-reviewing-crude-by-rail.html.

[17] Paul S. O'Brien. 2013. Direct Testimony to the Shorelines Hearings Board SHB No. 13-012c (SHB Nos. 13-012, -013, -020 and -021). 5 September. p. 4.

[18] Paul Rosenfeld. 2013. Direct Testimony to the Shorelines Hearings Board SHB No. 13-012c (SHB Nos. 13-012, -013, -020 and -021). 5 September. p. 4.

[19] Paul Rosenfeld, p. 8.

that do not appear to have been considered by Ecology or Hoquiam. Use of geo-probes or installation of monitoring wells would be necessary to assess the effectiveness of the ongoing remediation efforts, which would be required for an extended period of time. The presence of wetlands nearby in Grays Harbor, as well as the mouth of the Chelalis [sic] River, further complicates the remediation approaches."[20]

"Crude oil released into the environment can have toxic effects and harmful impacts to marine organisms and wildlife. Crude oil can affect individual animals by disrupting physiological processes that occur at the cellular level and at the organism level. Crude oil can also impact the behavior of animals. The impacts to individual animals can lead to modifications in a species population, and alter communities when multiple populations of species are affected. The biological effects of crude oil can be acute, occurring from a single exposure. Biological effects also can be chronic, resulting from multiple or continued exposure. … The lighter molecular weight compounds in crude oil, called aromatic compounds, are typically highly toxic. These light compounds present acute, or immediate, harm when animals are exposed to them. Ingestion, inhalation, or external contact can result in a range of adverse effects from irritation of skin and eyes to immediate death. Medium and heavy crude oils can pose both acute and chronic adverse biological effects. Immediate threats include suffocation or coating skin, feathers or fur impeding an animal's ability to maintain body heat or its ability to swim or float."[21]

"Marine organisms are sensitive to the exposure to crude oil. Marine organisms may be exposed to oil in the environment through a number of mechanisms. Exposure routes include direct contact with oil, exposure to oil dissolved in the water, oil adsorbed to the substrate and particles, and oil compounds on or in food. Adverse effects to invertebrates and fish include death, inability to feed due to impairment of feeding mechanisms and senses, slowed growth rates, lesions, impairment of swimming ability, and behavioral impairment. Reproductive processes may be impacted, resulting in the production of fewer eggs, less viable eggs, deformation, and slowed developmental rates. If these effects occur in large enough numbers, a species population can experience reproductive failure."[22]

"Regardless of when an oil spill occurs, marine organisms and wildlife, as well as the Grays Harbor ecosystem, are at risk of harm. This harm can be direct and immediate, or it can happen through lasting impacts rendering habitat unsuitable for migrating animals."[23]

[20] Paul Rosenfeld, p. 9.

[21] Brent Finley. 2013. Direct Testimony to the Shorelines Hearings Board SHB No. 13-012c (SHB Nos. 13-012, -013, -020 and -021). 5 September. p. 5.

[22] Brent Finley, p. 6.

[23] Brent Finley, p. 10.

"Each vessel poses an individual risk that an oil spill could occur. More vessels operating means more chances of a spill."[24]

"The number of spills and other accidents from railroad cars carrying crude oil has skyrocketed in recent years, up from one or two a year early in the previous decade to 88 last year.

> "'Increasing volumes of crude oil transported by rail raise questions of safety,' the IEA [International Energy Agency] said, as quoted at Bloomberg. 'Our analysis reveals that compared to pipelines, rail incident rates are higher while the opposite holds for spill rates.'
>
> "The IEA found the risk of a rail spill is six times as high as the risk of a pipeline spill, but pipelines simply spill more when they rupture.
>
> "The agency looked at eight years of data from the U.S. Department of Transportation, from 2004 to 2012, but noted it did not include a 2013 rail oil spill in Minnesota that leaked more than double what had been spilled in the four years before." [25]

H. Explosions. For example:

"There is a high flammability hazard when dealing with crude oil transport failures, in addition to the human health risks that would be associated with a spill regardless of whether it were to catch fire. The availability of aqueous foam treatment at all unloading stations may not be sufficient to address issues encountered if an accident were to occur along the rail line between Centralia and Hoquiam. The Puget Sound and Pacific (PSAP) rail route transects portions of Grays Harbor, Lewis, and Thurston Counties between the two cities, passing through numerous smaller municipalities that may not be equipped with a full cache of mitigation equipment. A preliminary spill response plan prepared by National Response Corporation (NRC) identified that minimum response times to some locations would be approximately one and a half to two hours, and could be longer depending on traffic and accessibility. Fires and explosions resulting from spills would be capable of causing significant damages within these timeframes."[26]

"Along the rail corridor from Centralia to Hoquiam, there are numerous towns and cities with residential and commercial tracts located within a one-kilometer proximity of the rail line. Depending on the number of cars involved, the blast radius may be even larger than one kilometer."[27]

"Petroleum vapors from the spill as well as smoke from any accompanying fire will result in air pollution to which neighboring residential and commercial properties will

---

[24] Brent Finley, p. 12.

[25] Soraghan, M. 2013. "Crude Mishaps on Trains Spike as Rail Carries More." *EnergyWire*. July 17. www.eenews.net/stories/1059984505.

[26] Paul Rosenfeld, pp. 3-4.

[27] Paul Rosenfeld, p. 10.

be exposed. If an explosion occurs, debris from the rail cars could damage properties close to the site, and proximal buildings could be leveled."[28]

"**Rail Industry Group Says Tougher Rules Needed for Tank Cars Hauling Oil**

"A major rail industry group is calling for updating or phasing out thousands of tank cars used to carry crude oil, as federal officials weigh new regulations on moving hazardous materials by rail."

"The Association of American Railroads is urging U.S. regulators to require retrofits for roughly 72,000 older tank cars that haul flammable substances such as crude and ethanol, plus minor upgrades for an additional 14,000 newer cars. The AAR also recommends an 'aggressive phase-out' of cars that can't meet retrofit requirements, the group said yesterday in comments filed with the Pipeline and Hazardous Materials Safety Administration.

"PHMSA, an arm of the U.S. Department of Transportation, is seeking public input for long-awaited updates to its tank car regulations. Two recent oil train explosions -- one in Quebec this summer and another last week in Alabama -- have heightened public scrutiny of the fast-growing crude-by-rail market."[29]

"Warning Issued about Oil Shipped from ND, Mont.

"BILLINGS, Mont. (AP) —Following a string of explosive accidents, federal officials say crude oil being shipped by rail from the Northern Plains across the U.S. and Canada may be more flammable than traditional forms of oil. A safety alert issued by the U.S. Department of Transportation warns the public, emergency responders and shippers about the potential high volatility of crude from the Bakken oil patch. The sprawling oil shale reserve is fueling the surging industry in eastern Montana and western North Dakota, which is now the nation's second-largest oil producer behind Texas.

"Thursday's announcement from officials declares that the Bakken's light, sweet crude oil may be different from traditional heavy crudes because it is prone to ignite at a lower temperature. Experts say lighter crudes, which contain more natural gas, have a much lower "flash point" — the temperature at which vapors given off by the oil can ignite.

"The government's warning comes after a huge explosion on Monday caused by a crude train derailment near Casselton, N.D."[30]

---

[28] Paul Rosenfeld, p. 11.

[29] Society of Environmental Journalists. "Blake Sobczak Reports for EnergyWire November 15, 2013." www.sej.org/headlines/rail-industry-group-says-tougher-rules-needed-tank-cars-hauling-oil. [bold emphasis in original]

[30] Brown, M. and MacPherson. 2014. "Warning Issued about Oil Shipped from ND, Mont." *Yahoo News.* http://news.yahoo.com/warning-issued-oil-shipped-nd-mont-185942105.html. The safety alert regarding the shipment of Bakken oil: U.S. Pipeline and Hazardous Materials Safety Administration. 2014. "Safety Alert: Preliminary Guidance from OPERATION CLASSIFICATION." January 2. http://www.phmsa.dot.gov/portal/site/PHMSA/menuitem.6f23687cf7b00b0f22e4c6962d9c8789/?vgnextoid=c6efec1c60f23410VgnVCM100000d2c97898RCRD&vgnextchannel=d248724dd7d6c010VgnVCM10000080e8a8c0RCRD&vgnextfmt=print.

I. Changes in climate, as well as increases ocean acidification, sea level rise, local pollution, and other effects resulting from the combustion of products derived from the crude oil shipped into and from Grays Harbor. For example:

"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased…. The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia…. The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions…."[31]

In 2009, the Washington Department of Ecology summarized recent research regarding the potential effects of climate change resulting from increased atmospheric concentrations of greenhouse gases. The summary concluded that "Each [of the studies] shows that without additional action to reduce carbon emissions, the severity and duration of the impacts due to climate change will be profound and will negatively affect nearly every part of Washington's economy."[32]

In 2012, Washington's Blue Ribbon Panel on Ocean Acidification reported:[33]

"Washington is particularly vulnerable to ocean acidification [which] has significant implications for Washington's marine environment, our state and local economies, and tribes." (p. xii.)

"Washington is the country's top provider of farmed oysters, clams, and mussels. Annual sales of farmed shellfish from Washington account for almost 85 percent of U.S. West Coast sales (including Alaska). The estimated total annual economic impact of shellfish aquaculture is $270 million, with shellfish growers directly and indirectly employing more than 3,200 people. Shellfish are also an integral part of Washington's commercial wild fisheries, generating over two-thirds of the harvest value of these fisheries. Shellfish of ecological and economic importance include oysters, mussels (native and Mediterranean), clams (e.g., geoduck, razor, littleneck, Manila), scallops, Dungeness crab, shrimp (e.g., spot prawns, pink shrimp), pinto abalone, and urchins.

"The economic benefits of Washington's wild and hatchery-based seafood harvests extend well beyond the value of the harvest when it arrives on shore. For example, licensing for recreational shellfish harvesting generates $3 million annually in state revenue and recreational oyster and clam harvesters contribute more than $27 million annually to coastal economies. Overall, Washington's seafood industry generates over 42,000 jobs in Washington and contributes at least $1.7 billion to gross

---

[31] Intergovernmental Panel on Climate Change. 2013. *Climate Change 2013 The Physical Science Basis: Summary for Policymakers.* pp. 2-9. http://www.climatechange2013.org/images/uploads/WGI_AR5_SPM_brochure.pdf.

[32] Washington Department of Ecology. 2009. "Focus on Impacts of Climate Change in Washington State." February. http://www.ecy.wa.gov/pubs/0901006.pdf.

[33] Washington State Blue Ribbon Panel on Ocean Acidification. 2012. *Ocean Acidification: From Knowledge to Action.* November. https://fortress.wa.gov/ecy/publications/publications/1201015.pdf.

state product through profits and employment at neighborhood seafood restaurants, distributors, and retailers.6 While our understanding of how ocean acidification affects the range of species driving this economic activity is limited at this time, it is clear that the impacts of ocean acidification on Washington's marine industry could extend far into and beyond the state's local and regional economies." (p. xv.)

The U.S. Environmental Protection Agency has recognized the importance of taking all reasonable steps, even those that will, in isolation have a small impact, to reduce atmospheric concentrations of greenhouse gases: "[N]o single greenhouse gas source category dominates on the global scale, and many (if not all) individual greenhouse gas source categories could appear small in comparison to the total, when, in fact, they could be very important contributors in terms of both absolute emissions or in comparison to other source categories, globally or within the United States. If the United States and the rest of the world are to combat the risks associated with global climate change, contributors must do their part even if their contributions to the global problem, measured in terms of percentage, are smaller than typically encountered when tackling solely regional or local environmental issues."[34]

Recognizing the harm the emission of greenhouse gases would impose on the state's residents, businesses, communities, and natural resources, the legislature and governor have implemented multiple actions to reduce emissions. Many of the relevant laws and executive orders are readily available for review.[35]

One effect of greenhouse gas emissions of particular importance to the Grays Harbor area and the Washington coast is their impact on the acidity of ocean waters. "Ocean acidification (OA) refers to changes in global ocean carbon chemistry in response to rising levels of atmospheric carbon dioxide (CO2). When absorbed by ocean and Great Lakes surface waters, CO2 acidifies them (i.e., reducing pH), increases the carbon content, and causes a decrease in the availability of carbonate ions important to carbonate mineral formation (e.g., shells, reef frameworks, marine sediments). Today's ocean pH has declined by 0.1 globally since the industrial revolution (an increase in acidity of about 30%) and is projected to decline by an additional 0.3 over the next century unless global carbon emissions are significantly curtailed. Such changes are at least ten times faster than at any time over the past 50 million years."[36]

In 2012, the governor issued an executive order recognizing that "Washington's marine waters are particularly vulnerable to ocean acidification."[37] The executive order

[34] Environmental Protection Agency. 2009. "Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Federal Register. p. 66543. December 15. http://www.epa.gov/climatechange/Downloads/endangerment/Federal_Register-EPA-HQ-OAR-2009-0171-Dec.15-09.pdf.

[35] Washington Department of Ecology. no date. Washington State Climate Policy Laws and Executive Orders Policy Framework (2005-2010). www.ecy.wa.gov/climatechange/laws.htm.

[36] National Oceanic and Atmospheric Administration. 2013. "Ocean Acidification." *State of the Science FACT Sheet.* January. http://www.noaa.gov/factsheets/new%20version/SoS%20Fact%20Sheet_Ocean%20Acidification%2020130306%20Final.pdf. p. 1.

[37] Governor Christine Gregoire. 2012. Executive Order 12-07: Washington's Response to Ocean Acidification. http://www.ecy.wa.gov/water/marine/oa/MRAC_ExecutiveOrder_12-07.pdf.

concludes that ""[I]t is critical to our economic and environmental future that effective and immediate actions be implemented in a well-coordinated way and that we work collaboratively with federal, tribal, state, and local governments, universities, the shellfish industry, businesses, the agricultural sector, and the conservation/environmental community to address this emerging threat." And it directs "[t]he Office of the Governor and the cabinet agencies that report to the Governor to advocate for reductions in emissions of carbon dioxide at a global, national, and regional level."

Reducing the emission of carbon dioxide through the combustion of fossil fuels is particularly important for avoiding the harm the climate changes and ocean acidification pose for Washington. "The combustion of fossil fuels such as gasoline and diesel to transport people and goods is the second largest source of CO2 emissions, accounting for about 31% of total U.S. CO2 emissions and 26% of total U.S. greenhouse gas emissions in 2011. This category includes transportation sources such as highway vehicles, air travel, marine transportation, and rail."[38]

"Subsidies cause over-consumption of petroleum products… and reduce incentives for investment in energy efficiency and renewable energy. This over-consumption in turn aggravates global warming and worsens local pollution. The high levels of vehicle traffic that are encouraged by subsidized fuels also have negative externalities in the form of traffic congestion and higher rates of accidents and road damage."[39]

[38] U.S. Environmental Protection Agency. "Carbon Dioxide Emissions." *Overview of Greenhouse Gases.* 2013. 9 September. www.epa.gov/climatechange/ghgemissions/gases/co2.html.

[39] International Monetary Fund. 2013. *Energy Subsidy Reform: Lessons and Implications*. 28 January. http://www.imf.org/external/np/pp/eng/2013/012813.pdf.

IV. Potential Negative Economic Consequences of the Proposed Shipment of Crude Oil into and out of Grays Harbor

The potential harmful effects of crude oil shipments on people, property, businesses, communities, and ecosystems, described in Section III, likely would negatively affect the overall economies of Washington and Grays Harbor County, with extraordinary negative effects on the social, economic, and cultural relationship between citizens of the Quinault Indian Nation and the natural resources of their traditional homeland. These negative effects must be investigated fully if the public and state officials are to have a complete understanding of the potential economic consequences of the proposed oil-shipment facilities. To facilitate such an investigation, this section describes:

A. The potential oil-shipment-related events that threaten to harm individuals, businesses, communities, ecosystems, and the economy.

B. The potential negative effects on the economies of Washington and Grays Harbor County, should one or more of these events materialize.

C. The potential negative effects on the Quinault Indian Nation, should one or more of these events materialize.

A. Potential Oil-Shipment-Related Events that Threaten to Harm Individuals, Businesses, Communities, Ecosystems, and the Economy

Westway and Imperium have not fully described the activities that implementation of their proposals would entail or the nature and potential extent of the impacts of these activities. They have not completed either a Rail Transportation Impact Analysis or a Vessel Transportation Analysis. In the absence of these analyses, it is reasonable to conclude that implementation of the proposals could have significant effects on the incidence and severity of the potential events listed below.[40] Negative effects would materialize primarily whenever one or more of these events harm residents, businesses, communities, ecosystems, or the economy:

- **Emission of particulates, other harmful substances, and noise by diesel locomotives and ocean-going vessels.** Harm would be borne by affected individuals living, working, or recreating near the railroad tracks and the harbor channel.
- **Train–auto collisions and train derailments.** These events would kill or injure affected individuals, damage their property, or damage the property of business and governments.
- **Ship/barge accidents.** These events would kill or injure affected individuals, livestock, or fish and wildlife.
- **Blockage of road and boat traffic, including emergency vehicles and first-responders.** Blockage by crude-oil trains and ocean-going vessels would impose delay costs on affected individuals or displace traffic in a manner that adversely affects their homes and businesses.

[40] State of Washington, Shoreline Hearings Board. 2013. "Order on Summary Judgment, Quinault Indian Nation, Friends of Grays Harbor, Sierra Club, Surfrider Foundation, Grays Harbor Audubon, and Citizens for a Clean Harbor (Petitioners) v. City of Hoquiam, State of Washington Department of Ecology, and Westway Terminal Company, LLC (Respondents), and Imperium Terminal Services, LLC (Respondent Intervenor). SHB No. 13-012c. November 12. p. 32.

- **Churning of the estuary.** The propellers and wakes of ocean-going vessels could reduce the fishing success rates of affected commercial or recreational fishers.
- **Emission of airborne hazardous materials from crude oil in trains, storage tanks, and ships/barges.** Exposure to hazardous materials would harm the health of affected individuals, their livestock, and the fish and wildlife important to them. Hazardous materials also may have other adverse effects, such as reductions in visibility that reduce people's enjoyment of the environment.
- **Oil spills.** Trains, storage tanks, or vessels could spill oil and harm affected individuals by damaging, or even destroying, elements of the ecosystem that are essential to their spiritual and cultural well-being and by reducing, or even eliminating, their ability to catch fish and shellfish, and to collect natural products with commercial and subsistence importance. Oil spills also would reduce the net earnings of affected businesses and workers, and increase the costs of affected governments.
- **Explosions of crude oil.** Trains, storage tanks, or vessels could explode and kill or injure affected individuals and their livestock. Explosions also would destroy or degrade affected habitats and reduce their ability to support fish and wildlife and provide inputs to commercial and recreational activities. Explosions also would damage or destroy the property of affected individuals, businesses, and governments.
- **The combustion of products derived from crude oil.** Increases in the combustion of oil-related products resulting from implementation of the proposals would harm affected individuals as the emission of greenhouse gases contribute to more frequent and extreme weather events, make the ocean more acidic, and raise the sea level. Other combustion products, such as particulates, would harm affected individuals, livestock, and fish and wildlife exposed to them.
- **Increases in fuel prices.** Higher domestic prices resulting from the export of crude oil would increase costs for affected households, businesses, and governments.

B. Potential Negative Effects on the Economies of Washington and Grays Harbor County

If one or more of the events listed above should materialize as oil is shipped through Grays Harbor, they would impose costs on affected workers, families, landowners, businesses, visitors, and communities. These costs would have negative effects on the state and local economies. The costs would materialize through multiple mechanisms, including these:

- Negative impacts on the Quinault Indian Nation's treaty rights.
- Reduction in tribal harvests of fish, shellfish, wildlife, and other items.
- Reduction in the spiritual and cultural value of the ecosystem.
- Changes in climate, and its effects on ecosystems; extreme weather events; the incidence of wildfires, insects, and disease; heat waves, etc.
- Increased acidification of the ocean, and reduction in its production of valuable goods and services.
- Accelerated rise in sea level, and injury to low-lying property.
- Increased human injuries, illnesses, and premature deaths.
- Harm to crops and livestock.
- Pollution and churning of the state's waters.
- Reduction in the productivity of soils, vegetation, fish, and wildlife.
- Reduction in non-tribal commercial and recreational fish catch.

- Degradation of recreational opportunities.
- Increased toxicity of fish.
- Increased noise, light, and dust pollution.
- Harm to threatened or endangered species.

Additional costs would result, even in the absence of these events, because the oil shipments would create risk for households, businesses, and communities that these events might occur in the future. The risk of explosions and spills, for example, might cause households and businesses to become more reluctant to invest in the local economy, more likely to relocate, or more inclined to invest in hazard-mitigation facilities and equipment. State or local agencies might respond to the risk by redirecting resources they otherwise would use to provide other public services so that they, instead, increase the readiness for potential emergencies related to the crude oil shipments. These effects would reduce their use of money, labor, property and other resources to produce the valuable goods and services they otherwise would produce, and the sales, jobs, and incomes associated with these goods and services would decline.

Many of the costs would materialize through reductions in the value of goods and services derived from the aquatic, upland, atmospheric, and marine ecosystems that would be affected by the events listed above. The ECONorthwest report, however, ignores these entirely. Numerous analytical and research resources provide guidance for correcting this deficiency. For example, the National Research Council recently described an approach for assessing the effects of the *Deepwater Horizon* oil spill on ecosystem goods and services and much of this approach applies to potential oil spills associated with the shipment of oil through Grays Harbor.[41] This guidance builds on a long history of research regarding the economic importance of ecosystem goods and services.[42]

A full assessment of the impacts on ecosystem goods and services is widely accepted as a requirement for the use of and investments in public resources.[43] Decisions about federal investments affecting the nation's water resources, for example, must be based on an evaluation that fully includes their impacts on ecosystem goods and services:

> "Evaluation methods should be designed to ensure that potential Federal investments in water resources are justified by public benefits, particularly in comparison to costs associated with those investments. Such methods should apply an ecosystem services approach in order to appropriately capture all effects … Services and effects of potential interest in water resource evaluations could include, but are not limited to: water quality; nutrient regulation; mitigation of floods and droughts; water supply; aquatic and riparian habitat; maintenance of biodiversity; carbon storage; food and agricultural products; raw materials; transportation; public safety; power generation; recreation;

[41] National Research Council, Committee on the Effects of the Deepwater Horizon Mississippi Canyon-252 Oil Spill on Ecosystem Services in the Gulf of Mexico. 2013. *An Ecosystem Services Approach to Assessing the Impacts of the Deepwater Horizon Oil Spill in the Gulf of Mexico.* www.nap.edu/catalog.php?record_id=18387.

[42] *See, for example,* National Research Council. 2004. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*. www.nap.edu/catalog.php?record_id=11139.

[43] This requirement is discussed in National Research Council. 2004. *Valuing Ecosystem Services: Toward Better Environmental Decision-Making*; U.S. Environmental Protection Agency. 2010. *Guidelines for Preparing Economic Analyses.* December; U.S. Council on Environmental Quality. 2013. *Principles and Requirements for Federal Investments in Water Resources (plus Draft Interagency Guidelines for implementation).* March; Office of the President. 1994. *Executive Order 12866: Regulatory Review and Planning*; and Office of Management and Budget. 1994. *Circular A-4: Regulatory Analysis.*This requirement are illustrated, e.g., by Washington State Department of Ecology. 2006. *Final Cost Benefit Analysis for Oil Spill Contingency Planning.* Pub. No. 06-08-020. September. p. 6;

aesthetics; and educational and cultural values. Changes in ecosystem services are measured monetarily and non-monetarily, and include quantified and unquantified effects."[44]

The Washington Legislature has expressed the economic, social, and ecological importance of avoiding risks to and degradation of water and related ecosystems:[45]

"**Specific Directives of the Statute**

"The legislature (see RCW 90.48.010) has declared that it is the public policy of the state of Washington "to maintain the highest possible standards to insure the purity of all waters of the state consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state of Washington. Consistent with this policy, the state of Washington will exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state."

"In RCW 90.56.005, the legislature declares further that "water borne transportation as a source of supply for oil and hazardous substances poses special concern for the state of Washington." Additionally, the legislature found "that prevention is the best method to protect the unique and special marine environments in this state...the technology for containing and cleaning up a spill of oil or hazardous substances is at best only partially effective.. and preventing spills is more protective of the environment and more cost-effective when all the response and damage costs associated with responding to a spill are considered. Therefore, the legislature finds that the primary objective of the state is to achieve a zero spills strategy to prevent any oil or hazardous substances from entering waters of the state."

"(3) The legislature also finds that...

"(b) Even with the best efforts, it is nearly impossible to remove all oil that is spilled into the water, and average removal rates are only fourteen percent;

"(c) Washington's navigable waters are treasured environmental and economic resources that the state cannot afford to place at undue risk from an oil spill…."

Legislative findings of the Ocean Resources Management Act (Chapter 43.143 RCW) recognize the importance of the state's marine resources:

"(1) Washington's coastal waters, seabed, and shorelines are among the most valuable and fragile of its natural resources.

"(2) Ocean and marine-based industries and activities, such as fishing, aquaculture, tourism, and marine transportation have played a major role in the history of the state and will continue to be important in the future.

"(3) Washington's coastal waters, seabed, and shorelines are faced with conflicting use demands. Some uses may pose unacceptable environmental or social risks at certain times.

"(4) The state of Washington has primary jurisdiction over the management of coastal and ocean natural resources within three miles of its coastline. From three miles seaward to the boundary of the two hundred mile exclusive economic zone, the United States federal government has primary jurisdiction. Since protection, conservation, and development of the natural resources in the exclusive economic zone directly affect Washington's economy and environment, the state has an inherent interest in how these resources are managed."

---

[44] Council on Environmental Quality. 2013. *Principles and Requirements for Federal Investments in Water Resources*. March. www.whitehouse.gov/administration/eop/ceq/initiatives/PandG.

[45] Washington State Department of Ecology. 2006. *Final Cost Benefit Analysis for Oil Spill Contingency Planning*. Pub. No. 06-08-020. September. p. 6. [bold and italic emphasis in original]

The Ocean Resources Management Act also states legislative preference for activities that sustain renewable resources over those likely to adversely affect the resources:

> "(1) The purpose of this chapter is to articulate policies and establish guidelines for the exercise of state and local management authority over Washington's coastal waters, seabed, and shorelines. …
>
> "(3) When conflicts arise among uses and activities, priority shall be given to resource uses and activities that will not adversely impact renewable resources over uses which are likely to have an adverse impact on renewable resources."

In this context, the act expresses legislative policy to conserve liquid fossil fuels, such as crude oil:

> "(4) It is the policy of the state of Washington to actively encourage the conservation of liquid fossil fuels, and to explore available methods of encouraging such conservation."

Table 1 provides a more detailed, though not comprehensive summary of resources, goods, and services at risk from an oil spill in the Grays Harbor area.[46] The information comes from a recent report prepared by the Washington State Department of Ecology and approved by the U.S. Coast Guard.

The top section of Table 1 lists some of the species, protected as endangered, threatened, or sensitive, that can be found in the Grays Harbor vicinity during at least some portion of the year. The list compiled by the Department of Ecology is incomplete, notably by failing to include eulachon in its list of protected species. Protected species can have considerable economic value, and harm to them or their habitat would represent an economic loss for those who place a value on them.[47] Residents of the Grays Harbor area, for example, have indicated that, on average, they would be willing to pay about $140 (2006$) annually for a doubling of coho salmon populations.[48] The harm from a reduction in these populations likely would exceed this amount.

A 2013 assessment of Washington's coast resources documents the potential impacts of an oil spill on aquatic and marine habitats, and on the fish and wildlife they support.[49] Its findings include:

- **Persistent Impacts:** "The acute effects of spilled oil in the habitat types found on the Washington coast are well documented." If a spill were to occur, some of the oil would evaporate, leaving behind "more dense, viscous, and carcinogenic" compounds that can persist "for decades in intertidal sediments (especially in coarse-grained gravel beaches and stream banks and under mussel beds) where it is not rapidly degraded."

---

[46] Washington State Department of Ecology. 2013. *Grays Harbor Geographic Response Plan (GRP)*. December. www.ecy.wa.gov/programs/spills/preparedness/GRP/GraysHarbor/GraysHarbor.html. The GRP encompasses Grays Harbor, most rivers and streams that drain into the harbor, and coastal areas from Copalis Beach southward to the border between Grays Harbor and Pacific Counties.

[47] *See, for example,* Richardson, L and J. Loomis. 2009. "The Total Economic Value of Threatened, Endangered, and Rare Species: an Updated Meta-Analysis." *Ecological Economics.* 1535-1548. http://www.sciencedirect.com/science/article/pii/S0921800908004771.

[48] Richardson and Loomis, citing Bell, K.P., D. Huppert, and R.L. Johnson. 2003. "Willingness To Pay for Local Coho Salmon Enhancement in Coastal Communities." *Marine Resource Economics.* 18, 15–31.

[49] Skewgar, E. and S.F. Pearson (Eds.). 2011. *State of the Washington Coast: Ecology, Management, and Research Priorities.* Washington Department of Fish and Wildlife, Olympia, Washington. p. 21.

Table 1. Partial List of Resources at Risk from an Oil Spill

A. Sensitive Species (Federal- and state-listed species that may be present in the area, at some time of the year)		
Birds:		
Marbled Murrelet	Bald Eagle	Western Grebe
Snowy Plover	Peregrine Falcon	Brant's Cormorant
Streaked Horned Lark	Common Loon	Cassin's Auklet
Brown Pelican	Common Murre	Northern Goshawk
Mammals:		
Southern Resident Killer Whale	Steller Sea Lion	Gray Whale
Fish:		
Bull Trout	Pacific Lamprey	Coastal Cutthroat Trout
Pacific Herring	River Lamprey	Green Sturgeon
Reptiles:		
Green Sea Turtle	Leatherback Sea Turtle	Loggerhead Sea Turtle
B. Habitats		
Intertidal and Shallow Subtidal Mud/Sand Flats	Native Salt Marsh	Offshore Waters
Eelgrass	Rivers and Smaller Tributary Streams	Outer Sand Beaches
Oyster Beds/Reefs	Nearshore Waters	Stream Mouths on Outer Beaches
C. Fish		
Juvenile salmonids	Marine Fish	Oyster Culture
Herring	Dungeness Crab	Clams
D. Wildlife		
Migratory Shorebird Site of Hemispheric Importance	Brown Pelican	Peregrine Falcons
Red Knot	Waterfowl Concentrations	Harbor Seals
Snowy Plover	Seabirds and Marine Waterfowl	Gray Whales
	Bald Eagles	
E. Cultural Resources		
Prehistoric and Historic (more than 50 years old)		
F. Economic Resources		
Residential Areas: situated near the waterfront and on-site sources of drinking water.		
Water Dependent Commercial Areas: Commercial port, commercial ships, commercial fishing and shellfish/aquaculture industry, a fish hatchery on Lake Aberdeen, and several marinas.		
Water Dependent Recreational Areas: Five Washington State Parks and a number of recreational beaches; Grays Harbor National Wildlife Refuge (Bowerman Basin); two state wildlife recreation areas; boating, sport fishing, and boat charters; bird watching, including the spring migration of hundreds of thousands of birds. The refuge is a Western Hemisphere Shorebird Reserve Network Site, one of only eight similar sites in the Western Hemisphere.		

Source: Washington State Department of Ecology. 2013. *Grays Harbor Geographic Response Plan (GRP).*

- **Estuaries:** "[S]ome of the most severe and long-lasting damage can occur when oil spills contaminate estuarine habitats. … Oil could cover vegetation and animals and become incorporated into sandy and muddy sediments. Because estuaries have relatively low wave energy, oil on the substrate or in sediments will not degrade quickly. Oil that becomes incorporated into muddy sediments may persist for decades, because the degradation of oil by natural or introduced bacteria requires oxygen and this substrate typically is anaerobic within 1 cm below the surface…."

  "Oil can directly kill and injure animals found in estuaries [citation omitted]. Seabirds and shorebirds with oiled feathers and marine mammals such as sea otters (Enhydra lutris) and river otters (Lontra canadensis) with oiled pelage may die from toxic effects of ingested oil ingested when preening, or from hypothermia from loss of waterproofing and thermal insulation. Despite human efforts at cleaning those animals that can be captured, long-term survival is highly variable and reproductive capacity may be adversely affected, with effects depending greatly on the oil type, the season, the experience and skill of the rehabilitators, and the species [citations omitted]. Fish such as juvenile salmon using estuarine habitats may also be poisoned by contaminated water or prey, and significant oil contamination would likely close one or more commercial shellfish harvest seasons."

- **Beaches:** "Specialists previously believed that long-term effects of oil on sand and gravel beaches would be less severe than for estuaries. The small crustaceans, worms, and bivalves that live in these beaches (providing food for shorebirds and other species) are very vulnerable to spilled oil [citations omitted], but these habitats were thought to be amenable to shoreline cleanup techniques. Also, it was believed that the high wave energy that maintains these habitats would disperse and break down trapped oil. However, these assumptions are not universally applicable, as demonstrated by recent work showing that oil in the subsurface layers of some of Prince William Sound's gravel beaches has persisted 20 years after the Exxon Valdez spill [citation omitted]."
- **Mixed Substrates:** "For mixed-substrate habitats, oil spills also can cause persistent impacts. Oil could readily be deposited on the cobble-sediment platforms, killing species in pools and on the rocks and becoming incorporated into the sediment. Oil that reaches one of these broad platforms may get carried to the high beach component and deposited on sand, gravel, and logs, as occurred during the *Nestucca* spill. Where offshore formations and surface substrate provide protection from wave energy, oil in subsurface sediment layers can persist for years and continue to expose organisms to oil. Like sand and gravel beaches, mixed-substrate subsurface sediments were still saturated by oil decades after the spill at some sites after the Exxon Valdez oil spill [citation omitted]."
- **Rocky Shores:** "Both toxic effects of oil and direct mechanical effects of cleaning procedures to remove oil can kill marine organisms [citation omitted]. Oil, cleaning agents, or dispersants also can have sublethal effects on growth and reproduction. Following the Exxon Valdez oil spill, oil was retained within mussel beds, weathering only slowly continually exposing mussels, which are key prey for other species ranging from fishes and seastars to sea otters and bears [citation omitted]. Following the complete destruction of rocky intertidal communities by Exxon Valdez oil spill and mechanical cleanup activities, several species showed atypical, unstable population

cycles during recovery from spill impacts, presumably because of the loss of normal mixed-age populations and trophic interactions [citation omitted]."

- **Kelp Habitat:** "Oil spills are particularly damaging to kelp habitat. The attachment point and microscopic phases of kelp are on the bottom of the water column and thus vulnerable to oil that reaches the seafloor through natural processes or chemical dispersion. The majority of the biomass of floating kelps (Macrosystis) and reproductive structures (Nereocystis) are near the water surface and thus vulnerable to oil that remains near the water survace, as are kelp-associated organisms ranging from juvenile rockfish to sea otters. Kelp blades have been known to trap oil floating on the ocean's surface, making it easier for cleanup crews to collect oil but increasing exposure and causing irreversible damage to the plants themselves [citation omitted]. Kelp forests provide protected habitat for numerous juvenile and adult fish and their prey. Consequently, these organisms can be directly (exposure to oil) or indirectly (loss of habitat) impacted by oil spills."
- **Nearshore Pelagic Zone:** "In the nearshore pelagic zone, oil spills directly harm birds and marine mammals that encounter surface slicks, either by destroying the insulating characteristics of their feathers or fur, or from toxic effects from ingestion when trying to clean the oil from their bodies (U.S. Fish and Wildlife 2005). Floating algal mats, which are an important refuge for juveniles of some species of rockfish, tend to concentrate oil [citation omitted]."

Many of the costs arising from oil-shipments would materialize in Grays Harbor County, but others would materialize elsewhere in Washington. Trains carrying crude oil would generate risks along the entire route through the state, as well as material harm associated with the emission of airborne pollution from locomotives, train-auto collisions, oil spills, explosions, and blockage of road traffic. Increased emission of carbon dioxide would increase risks, through the state, associated with heat waves, droughts, floods, and climate-related diseases. Economists from federal agencies have estimated that the costs associated with the effects of carbon dioxide pollution.[50] The central estimates range from about $44 to $83 (2012 dollars) per metric ton of carbon dioxide for emissions through 2050. These estimates, however, overlook many of the costs associated with the impacts of carbon dioxide on oceans, including increased acidification. A recent analysis concludes that the costs resulting from failure to take action to reduce emissions could increase ocean-related costs so they total 0.25 percent of global gross domestic product (GDP).[51] Insofar as these costs would accrue primarily in coastal areas, the costs to residents, businesses, and communities along Washington's coast could be an even greater percentage of economic output.

These costs are important not just because they would reduce the welfare of affected workers and families, the earnings of affected landowners and businesses, the value of public infrastructure, and the productivity of governmental workers. They also are important because,

---

[50] Interagency Working Group on Social Cost of Carbon, United States Government. 2013. *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866. http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf.*

[51] Ackerman, F. and E.A. Stanton. 2013. *Valuing the Ocean Environment: Economic Perspectives (Preview).* Stockholm Environment Institute. http://www.sei-international.org/mediamanager/documents/Publications/SEI-Preview-ValuingTheOceanEnvironment-EconomicPerspectives.pdf.

as workers, families, landowners, businesses, and governments incur these costs, they likely would alter their expenditures, and the change in expenditures would have a negative impact on overall sales, jobs, and incomes for affected businesses and workers. For example, if an oil spill were to reduce fish populations or to taint the value of the fish, tribal and non-tribal commercial fishermen would see their incomes fall and they would have less to spend, so that local business would see a reduction in sales, and workers would see fewer job opportunities and reduced earnings. Closure or tainting of the statewide Dungeness crab fishery, alone, would jeopardize the revenue of commercial boats, which have realized ex-vessel sales of $30–50 million per year in recent years.[52]

Similar negative impacts on revenues and business activity would occur from other effects of the events listed above. The families of individuals injured or killed in accidents or explosions, or made ill by exposure to hazardous materials likely would have to forgo expenditures they otherwise would make, and the reduced expenditures would diminish sales, jobs, and incomes for the businesses and workers that otherwise would benefit from them. If recreationists who otherwise might visit Grays Harbor decide, instead, to avoid oil-related pollution, risk of explosions, and ecosystem damage, their forgone expenditures in the area would reduce sales, jobs, and incomes. Tainting of razor clams or closure of harvests on beaches on the south coast, for example, would jeopardize annual revenues expected to be about $38 million for local motels, restaurants, and other recreation-related enterprises.[53] About 900 acres of tidelands in Grays Harbor and 9,000 acres of tidelands in Willapa Bay support production of oysters or clams.[54] An oil spill affecting these tidelands would jeopardize income for businesses and workers associated with a large portion of Washington's cultivated shellfish industry, which currently experiences annual sales of about $108 million.[55]

Negative impacts on jobs, incomes, and business activity also could occur more indirectly. If impediments to traffic; pollution from the trains, storage tanks, or vessels; or the risk of accidents, spills, or explosions were to reduce the value of and the income generated by their assets, businesses and landowners would see a loss of wealth and income. As a result, they would have reduced incentive to proceed with otherwise planned investments and increases in hires.

ECONorthwest failed to incorporate any assessment of these costs and other negative effects into the report it prepared for Westway and Imperium. Hence, the report misrepresents the overall impact of the firms' proposals on the state and local economies. Indeed, by ignoring the negative effects, the report does not even demonstrate that the overall impact would be positive. The overall negative effects might outweigh the overall positive ones described in ECONorthwest's report. A net negative overall impact seems likely for some, perhaps all, of the

[52] Dan Ayres, Coastal Shellfish Manager, Washington Department of Fish and Wildlife. Personal communication. 2 January 2014.

[53] Dan Ayres.

[54] Willapa Bay/Grays Harbor Oyster Growers Association and Farm and Forest Helicopter Service. 2006. "Fact Sheet for NPDES Permit No. WA0040975." https://fortress.wa.gov/ecy/wqreports/public/WQPERMITS.document_pkg.download_document?p_document_id=14851.

[55] Pacific Coast Shellfish Growers Association. "Shellfish Production on the West Coast." http://pcsga.org/wprs/wp-content/uploads/2013/04/production_stats.pdf.

individuals, households, businesses, and communities that would experience the highest risk associated with the emissions, spills, explosions, and other negative events described above.

The analytical process ECONorthwest used in preparing its report adds emphasis to this conclusion, insofar as it incorporates biases that overstate the positive economic impacts of the two proposals. These biases stem from several sources. Some of these are inherent in the IMPLAN model that provides the foundation for ECONorthwest's estimates. This model presents a static depiction of the state and local economies at a recent point in time and lacks the ability to account for the future dynamic evolution of these economies. Thus, embedded in the results from the model are some powerful assumptions: the scale of an activity is irrelevant; businesses can effect no substitution between intermediate goods, capital, and labor inputs; and the activities of one business have no external effects on others. As a result:

- The model assumes that all of the business activity associated with the two proposals (and potentially a third, by U.S. Development) would happen only if the proposals were implemented. In particular, it assumes that, absent implementation, all the workers would remain idle and receive no income. As a consequence, ECONorthwest concludes that all of the workers who would be employed during implementation of the proposals represent positive increases in employment; all their income represents new income. In reality, though, many of the workers would have jobs elsewhere for other employers and come to work on the oil-shipment projects after leaving these other jobs. The net effect on employment, thus, would be lower than ECONorthwest's estimates.
- The model assumes that implementation of the projects would have no impact on the price of labor, land, equipment, and other inputs. For this assumption to be accurate, the projects must be small relative to the economy of Grays Harbor County. ECONorthwest, however, has concluded that the new jobs generated by implementation of the two proposals would have "substantial" importance to the local economy because "[t]he lack of jobs affects the wellbeing of residents." (p. 20) In addition, ECONorthwest's analysis implicitly assumes any export of crude oil from Gray Harbor would have no impact on the domestic price of gasoline and other derivative products, an assumption that may be unreasonable in light of the risk that U.S. oil production will soon decline.[56]

The tendency for these assumptions to yield biased, overly enthusiastic estimates of the economic impacts of proposed business activities is well-known. The Washington Office of Financial Management, for example, warns that, whenever these assumptions are not valid, they "impose restrictions on the uses of [the] models for impact analysis."[57] ECONorthwest's failure to incorporate these restrictions into its analysis undermines the validity of its findings.

C. Potential Negative Effects on the Quinault Indian Nation

Because of their special relationship to the area's natural resources, members of the Quinault Indian Nation stand to incur extraordinary risk and harm from the negative events, listed

[56] *See, for example,* Wile, R. 2013. "IEA: The World Is Totally Unprepared For When The Great American Shale Boom Fizzles." *Business Insider.* November 12. www.businessinsider.com/iea-energy-outlook-bearish-on-shale-2013-11; and Oil Change International. 2013. *Should It Stay or Should It Go? The Case Against U.S. Crude Oil Exports.* October.)

[57] Washington Office of Financial Management. No date. "Limitations of Input-Output Impact Analysis. http://www.ofm.wa.gov/economy/io/2007/I-O_2007_chapter_3.pdf. p. 14.

above, associated with the proposed shipment of oil through Grays Harbor. These resources have supported the subsistence, economy, and spiritual well-being of tribal members since time immemorial, and constitute an integral element of their cultural identity. The special relationship is recognized by treaty with the U.S. government that gives the Quinault Indian Nation rights to 50 percent of the harvestable fish and shellfish within their treaty area, which includes Grays Harbor and the coastal area to the north.[58] The Centennial Accord with the State of Washington also recognizes the state's obligations with respect to the sovereignty of the Quinault Indian Nation.[59] Under the accord, the Department of Ecology has developed a plan that states:

> "The unique legal status of tribes and presence of tribally reserved rights and cultural interests throughout the state creates a special relationship between tribes and the state agencies responsible for managing and protecting the natural resources of the state. Tribes and tribal members possess property and self government rights that predate the formation of the United States and the creation of the State of Washington and are guaranteed under treaties and federal law. At the same time, tribal members are citizens of the United States and the State of Washington. Due to federal laws and inherent tribal sovereignty, each reservation in the state constitutes a bordering jurisdiction for environmental purposes. Environmental actions outside the reservation affect the tribe and the residents of the reservation just as the actions within the reservation affect the state and its citizens. … Ecology's objective is to provide early notification and an open invitation for consultation on all decisions that may affect tribal rights and interests. On major issues where we have been informed of tribal interests or the implication of a policy or action has obvious tribal implications, Ecology will seek to cooperatively establish the manner and time frame for consultation with tribal governments."[60]

The potential negative effects of crude oil shipments on the Quinault Indian Nation would mirror but in many ways be more intense than those on the statewide and local economies:

- **Emission of particulates, other harmful substances, and noise by diesel locomotives and ocean-going vessels** would harm tribal members living, working, or recreating near the railroad tracks and the harbor channel.
- **Train–auto collisions and train derailments** would kill or injure affected tribal members, or damage their property.
- **Ship/barge accidents** would kill or injure nearby tribal members.
- **Blockage of road and boat traffic** by crude-oil trains and ocean-going vessels would impose delay costs on affected tribal members or displace traffic in a manner that adversely affects their homes and businesses.
- **Churning of the estuary** by the propellers and wakes of ocean-going vessels would reduce the fishing success rates of affected tribal members.

---

[58] Ervin Joseph Schumacher. Marine Resources Scientist for the Quinault Indian Department of Fisheries. 2013. Direct Testimony to the Shorelines Hearings Board SHB No. 13-012c (SHB Nos. 13-012, -013, -020 and -021). 5 September. p. 2.

[59] *Centennial Accord between the Federally Recognized Indian Tribes in Washington State and the State of Washington.* August 4, 1989. www.goia.wa.gov/government-to-government/data/centennialaccord.htm.

[60] *Washington State Department of Ecology Centennial Accord Implementation Plan.* http://www.goia.wa.gov/govtogov/pdf/department%20of%20ecology.pdf. pp. 1-2.

- **Emission of airborne hazardous materials from crude oil in trains, storage tanks, and ships/barges** would harm the health of affected tribal members, their livestock, and the fish and wildlife important to them. Hazardous materials also may have other adverse effects, such as reductions in visibility that reduce their enjoyment of the environment.
- **Oil spills** from trains, storage tanks, or vessels would harm affected tribal members by damaging, or even destroying, elements of the ecosystem that are essential to their spiritual and cultural well-being and by reducing, or even eliminating, their ability to catch fish and shellfish or to collect natural products with commercial and subsistence importance.
- **Explosions of crude oil** from trains, storage tanks, or vessels, would kill or injure affected tribal members, their livestock, and the fish and wildlife important to them. Explosions also would damage or destroy their property and reduce their earnings from fishing and other commercial activities.
- **The combustion of products derived from crude oil** shipped into and from Grays Harbor would harm affected tribal members as the emission of greenhouse gases contribute to more frequent and extreme weather events, make the ocean more acidic, and raise the sea level. Other combustion products, such as particulates, could harm tribal members, livestock, and fish and wildlife exposed to them.
- **Increases in fuel prices** resulting from the export of crude oil would increase costs for tribal households, businesses, and government.

Each of the events listed, if it were to occur, has the potential to harm tribal members. The risk that each event might occur in the future also would harm them. The risk of explosions and spills, for example, might cause tribal members to become more reluctant to invest in the local economy, induce them to relocate their homes or businesses, or cause them to invest in hazard-mitigation facilities and equipment that they otherwise would forgo. These effects would reduce their use of money, labor, and property to produce valuable goods and services. The overall effect would be a reduction in jobs and incomes for tribal members.

Of particular concern are the potential negative economic impacts that could materialize through the impacts of crude-oil shipments on fish and wildlife resources. Members of the Quinault Indian Nation participate in treaty-protected commercial, subsistence, and ceremonial fisheries that target chinook, coho, chum, steelhead and white sturgeon within the estuary of Grays Harbor and its freshwater tributaries.[61] For the period 2008-12, the total value of commercial landings of these species by tribal members averaged about $700,000 per year.[62] Adding the value of other species—Dungeness crab, razor clams, sablefish, halibut, and sardines—raises the annual average value of commercial catch by tribal members to almost $13 million.[63] Future landings and harvests could be larger under favorable habitat conditions and fishing regulations. An assessment of what the value of chinook landings would have been in past years under favorable assumptions suggests that the value of future landings could be

[61] James E. Jorgensen, Salmon and Steelhead Management Biologist for the Quinault Indian Department of Fisheries. 2013. Direct Testimony to the Shorelines Hearings Board SHB No. 13-012c (SHB Nos. 13-012, -013, -020 and -021). 5 September. pp. 9-11.

[62] Jorgensen, p. 11. The value of commercial landings, by species, was about: $360,000 for coho, $140,000 for Fall Chinook, $60,000 for chum, $40,000 for steelhead, and $90,000 for white sturgeon.

[63] Schumacher, p. 3.

more than six-times higher.[64]

Additional negative impacts could occur, beyond those associated with fish kills and reductions in fish populations. An oil spill might reduce the marketability of fish caught in the region and, hence, the price tribal fishermen receive for their catch, or it might cause tribal fishermen not to fish, for fear of oiling their gear and boats.[65] Increased ship traffic in the estuary might significantly impede tribal drift gillnet fishing.[66] Clean-up activities following an oil spill might impede fishing and other harvesting activities, as well as harm the ecosystem through its impacts on water quality and populations of individual species.[67]

Economic harm to tribal members could materialize through other channels as well. The Quinault Indian Nation is actively planning to begin aquaculture operations for oysters, mussels, and clams in the near future.[68] Just the prospect of crude oil shipments beginning as proposed by Westway and Imperium could undermine these plans and diminish the return on planning investments. If aquaculture operations begin, an oil spill or the wakes of passing vessels could diminish their productivity and profitability. The shipment of crude oil would harm tribal members if it adversely affected non-commercial fish species—including northern anchovy, Pacific herring, surf smelt, longfin smelt, and Pacific eulachon. These species have food and cultural value for tribal members and their integral role in the overall ecosystem supports higher predators, such as adult salmon, other marine fish, marine mammals, and seabirds.[69] Additional economic harm to tribal members could materialize along the coastal area north of Grays Harbor, from which they harvest razor clams, salmon, lingcod, rockfish, and intertidal species, such as anemones and limpets.

The value of any harm to fish, shellfish, and other species, and to the larger ecosystem, would exceed the commercial or food value, insofar as the overall ecosystem and particular species also have cultural value. Razor clams, for example, are part of the cultural identity of tribal members, whose ancestors have harvested them for millennia.[70] Cultural values typically are not mediated through markets and may not be measurable in market-related terms. They can represent central elements of tribal members' worldview that provides the basis for meaning and value, and have intangible qualities deemed central to cultural identity. When they have these characteristics, consideration of their value would come into play not through the payment of monetary damages for, say, an oil spill, but only through negotiation in which tribal members would raise concerns about the spill's violation of moral principles, such as sovereignty and equity.[71]

---

[64] Jorgensen, p. 15.

[65] Jorgensen, pp. 21-22.

[66] Jorgensen, p. 23; Schumacher, pp. 10-11.

[67] Schumacher, p. 9.

[68] Schumacher, p. 5.

[69] Schumacher, p. 5

[70] Schumacher, p. 8.

[71] Chan, K.M.A, T. Satterfield, and J. Goldstein. 2012. "Rethinking Ecosystem Services to Better Address and Navigate Cultural Values." *Ecological Economics.* 74:8-18. Pp. 10-11.

Additional cultural harm would materialize if shipment of crude oil resulted in damage to archaeological resources. This concern is especially relevant for the Westway site, which "is in an area with high potential for archaeological resources. It is located across from a large fish weir archaeological site and is adjacent to a historic sawmill site."[72]

ECONorthwest failed to incorporate any assessment of these potential negative effects on the Quinault Indian Nation into the report it prepared for Westway and Imperium. Indeed, it makes no mention whatsoever of the Quinault Indian Nation. This failure compounds its failure to account for the potential negative effects on the economies of Grays Harbor County and the state as a whole. The discussion in the previous section, of the negative effects on the state and local economies, explains these failures, as well as the analytical steps that must be completed to fill the gap and provide decision-makers and the public with a complete picture of the overall socio-economic impacts of the proposals to ship crude oil into and from Grays Harbor.

[72] State of Washington, Shoreline Hearings Board. 2013. "Order on Summary Judgment, Quinault Indian Nation, Friends of Grays Harbor, Sierra Club, Surfrider Foundation, Grays Harbor Audubon, and Citizens for a Clean Harbor (Petitioners) v. City of Hoquiam, State of Washington Department of Ecology, and Westway Terminal Company, LLC (Respondents), and Imperium Terminal Services, LLC (Respondent Intervenor). SHB No. 13-012c. November 12. p. 12.

IV. Conclusions

The preceding sections demonstrate the multiple ways in which ECONorthwest's report fails to satisfy its assertion that it assesses the "overall impact" of the two oil-shipment proposals. Instead, the report does no more than provide an exaggerated assessment of the positive impacts on sales, jobs, and income. Because of this bias, the report has become the basis for news reports that mislead households, businesses, and public officials about what to expect if the two proposals were implemented.[73]

In reality, the shipment of crude oil into and out of Grays Harbor would have negative, unintended economic impacts, as well as the positive, intended impacts examined by ECONorthwest. The actual, overall positive impacts likely would be smaller than estimated, and smaller than the negative impacts for many households, businesses, and communities, especially if those that would be affected by oil spills, explosions, and other harmful events.

The public and decision-makers cannot fully understand all of the overall economic impacts of the proposed oil shipments without the completion of further investigation to determine the severity of their potential negative economic effects. Additional investigation also is warranted to determine the distribution of the negative effects among different groups, including the Quinault Indian Nation. Developing a complete picture of the negative effects will require completing these steps:

1. Identify and clearly define each of the effects of the proposed oil shipments that would have negative economic consequences for the residents, businesses, and communities of Washington and Grays Harbor County.
2. Provide a comprehensive description of the negative effects, individually and in combination. The description should include both quantitative and qualitative information. Determine the magnitude of each negative effect, accounting for the likelihood that events harmful to residents, businesses, and communities would occur in the future, and the magnitude of such events.
3. Determine the negative effect of the risk of future events, whether or not they materialize.
4. Describe the distribution of the positive and negative effects among different groups, including future generations.

Completion of these steps will require fully describing the intended and unintended consequences of shipping oil into and from Grays Harbor. The Shoreline Hearings Board has identified some of the requirements, such as a vessel traffic analysis, for preparing this description.[74] The preceding sections of this report provide a more thorough list.

---

[73] *See, for example*, KXRO News Radio: "This analysis proves that the expansion proposals put forward by Westway and Imperium Renewables are in the best economic interest of the Grays Harbor community," said Tim Gibbs, CEO of Greater Grays Harbor, Inc. "One look at these numbers and it's clear that the proposals are a win for Gray Harbor." http://kxro.wordpress.com/2013/10/18/crude-by-rail-could-bring-143-million-to-the-area/.

[74] State of Washington, Shoreline Hearings Board. 2013. "Order on Summary Judgment, Quinault Indian Nation, Friends of Grays Harbor, Sierra Club, Surfrider Foundation, Grays Harbor Audubon, and Citizens for a Clean Harbor (Petitioners) v. City of Hoquiam, State of Washington Department of Ecology, and Westway Terminal Company, LLC (Respondents), and Imperium Terminal Services, LLC (Respondent Intervenor). SHB No. 13-012c. November 12. p. 32.