BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of: Application No. 2013-01 TESORO SAVAGE, LLC TESORO SAVAGE DISTRIBUTION TERMINAL	CASE NO. 15-001 SWORN PRE-FILED TESTIMONY OF TODD SCHATZKI

I, Todd Schatzki, state as follows:

1. I swear under the penalty of perjury of the laws of Washington and the United States that the following testimony is true and correct.

2. I am over eighteen years of age and am otherwise competent to testify in this case. My testimony is based upon my education, training, experience, professional qualifications, and understanding of the matters herein.

3. The purpose of my testimony is to provide testimony regarding the Tesoro Savage Petroleum Terminal LLC, d/b/a Vancouver Energy (hereinafter, "TSPT" or the "Applicant") Application for Site Certification ("ASC") for the Vancouver Energy Terminal (the "Project") and its compliance with WAC 463-60-535, regarding socioeconomic impacts of the Project.

4. I am a Vice President at Analysis Group, where I provide expertise on energy and environmental economics, regulation, and policy. For more than fifteen years, I have worked with government agencies, regulators, market operators, non-profit organizations, and private corporations on a range of matters related to strategy, policy, regulation, and legal matters. My work has spanned a wide range including: market design; financial analysis; evaluation of the economic consequences of energy and environmental regulations, and infrastructure changes; and environmental regulation. I

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have testified before state and federal commissions on these matters. I have performed economic impact assessments of new infrastructure developments in a range of contexts, including biofuels production facilities to new airport capacity. My work has appeared in both academic and industry journals such as the *Journal of Environmental Economics and Management*, the *Electricity Journal*, and *Public Utilities Fortnightly*, and in publications associated with institutions such as the AEI-Brookings Joint Center for Regulatory Studies and the Harvard Regulatory Policy Program.

5. I received a Bachelor of Arts in physics from Wesleyan University, a Masters in City Planning, Environmental Policy and Planning from the Massachusetts Institute of Technology, and a Ph.D. in Public Policy from Harvard University. Since receiving my doctorate degree, I have worked with several economic consulting firms, including National Economic Research Associates, Inc., LECG, LLC and now Analysis Group ("AGI"). My professional experience and qualifications are summarized in my curriculum vitae, which is included as Attachment A.

6. Based on my professional experiences and training, I have developed an expertise in socioeconomic impacts of industrial facilities.

7. I have reviewed relevant portions of the ASC, as well as the Draft Environmental Impact Statement ("DEIS") and key comments thereto, including the Marten Letter[1] and Johnson Review[2] to form my opinions and testimony.

8. I have been asked to address two issues. First, I summarize my analysis of the anticipated socioeconomic impacts of the Project, including the primary impacts based

[1] Marten Law, Comments on Draft Environmental Impact Statement, Tesoro-Savage Energy Distribution Terminal, Docket EF-131590, January 21, 2016.

[2] Johnson Economics, "Tesoro Savage Vancouver Energy Distribution Terminal DEIS Independent Review," January 20, 2016.

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on IMPLAN analysis and secondary impacts arising from activity associated with Project operations, including a statistical analysis of property values impacts. Findings reported in my testimony reflect information provided in reports that were included in preliminary draft environmental impact statement materials, with the exception of the statistical analysis, which reflects new research. In this section, I also address comments provided by certain parties (Marten Law and Johnson Economics) regarding my analyses. Second, I assess the DEIS developed by the Washington Environmental Facility Site Evaluation Council's ("EFSEC") consultant, Cardno, Inc. ("Cardno").

I. PROJECT SOCIOECONOMIC IMPACTS

9. In this section, I summarize my findings regarding the Project socioeconomic impacts. These include the primary economic impacts of the Project's construction and operation on the region's economy. In addition, I consider secondary economic impacts that may arise from activities associated with the Project, notably potential impacts that changes in rail traffic frequency (to the extent there are any) may have on property values, road traffic delays, and rail system congestion and delays. By considering both the positive primary impacts and secondary impacts, which could be positive or negative, my analysis considers the "net" impacts of the Project's construction and operation; likewise the DEIS considers wide range of impacts, both positive and negative, from the Project's development.

10. I have prepared several figures and tables to illustrate my statements in this testimony. These can be found in the Figures and Tables attached hereto as Attachment B, incorporated herein by reference.

11. My opinions and conclusions related to the socioeconomic impacts of the Project are largely contained in three reports, Todd Schatzki and Bruce Strombom, "Assessment of Vancouver Energy Socioeconomic Impacts: Primary Economic Impacts,"

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July 28, 2014 ("Primary Impacts Report"), attached hereto as Attachment C, Todd Schatzki and Bruce Strombom, "Assessment of Vancouver Energy Socioeconomic Impacts: Secondary Economic Impacts," September 5, 2014 ("Secondary Impacts Report"), attached hereto as Attachment D, and Todd Schatzki and Bruce Strombom, "Assessment of Vancouver Energy Socioeconomic Impacts: Statistical Analysis of Potential Property Value Impacts from Vancouver Energy" May 13, 2016 ("Property Value Impacts Report"), attached hereto as Attachment E, all of which are incorporated herein by reference.

A. Primary Economic Impacts

12. Primary economic impacts reflect the changes in economic activity from the Project's construction and operations, and include increased income for local workers, increased profits for local business owners and increased tax revenue streams for local government. These impacts arise due to the direct employment and local business activity from the Project's construction and operation, as well as the spillover effects as this direct activity ripples through the region's economy. Impacts are estimated over a regional geographic area comprised of the 10 counties closest to the Project. Further details on this analysis are available in the Primary Impacts Report.

13. Economic impacts are evaluated through comparison between a "policy case" in which the Project is developed and a "base case" in which the Project is not developed. Comparison between this base case and the policy case provides a measure of the Project's "stand alone" impact. Because the Project would result in new economic activity, this results in positive economic impacts to the region.

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14. The primary economic impacts associated with an alternative industrial activity are not explicitly analyzed.[3] In principle, an alternative Port of Vancouver ("Port") use could result in impacts that are larger or smaller than those from the Project depending on a range of factors.[4] While alternative uses are not considered, one factor suggesting that the Project would have greater impacts than an alternative use is that, based on an assessment by the Port, a crude-by-rail facility would provide the Port with greater revenue streams than other uses.[5] Revenues to the Port result in positive economic impacts to the regional economy because these revenues would be used to either increase operations at the Port or increase investment by the Port in the region, both of which would create positive economic impacts. Thus, all else equal, the Project would provide greater regional impacts than alternatives, assuming the Port was correct in its assessment that the Project provides the largest revenue streams to the Port.

i. Overview of IMPLAN

15. The primary impacts of the operation and construction of the Project on the regional economy are estimated using the IMPLAN model.[6] The IMPLAN model

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[3] In practice, it is highly likely that if the Project were not developed that another business operation would take its place and use the parcels and resources planned for use by the Project. The impacts of the Project relative to such an alternative Port use would depend critically on the particular type of business and the details of its operations that would be developed in place of the Project. Because, based on communications with the Port, there is no preferred or likely secondary use of Port resources if the Project is not developed, I do not attempt to independently identify and model alternative uses. Personal communication with the Port of Vancouver personnel.

[4] These factors include labor requirements during construction and operations, use of goods and services from Vancouver and other regional businesses, tax revenues to local government, and other factors.

[5] I understand that the decision by the Port to pursue a crude-by-rail terminal through a competitive solicitation was made after analysis of various alternative uses that considered compatibility with the particular configuration of available parcels within the Port, potential revenue streams to the Port, and other factors. Personal communication with the Port of Vancouver personnel.

[6] IMPLAN stands for "IMpact analysis for PLANning." It is a social accounting/input-output (I/O) model designed to replicate the structure and functioning of the economy in a specific geographic area. Input/output (I/O) models draw on long-standing, well-established, and broadly accepted methodologies to estimate how a change in economic activity impacts a regional economy based on data-driven estimates of

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estimates local economic impacts arising from changes in economic activity and is based on detailed region- and sector-specific data from the U.S. Commerce Department's Bureau of Economic Analysis. This model provides highly detailed estimates specific to the geographic region and industries being analyzed. IMPLAN is widely used for economic impact assessments in the public and private sectors.

16. The IMPLAN analysis reflects the direct impacts of the new economic activity from the Project's construction and operation. The estimated impacts also reflect the indirect and induced impacts, as the direct effects of Project construction and operation flow through the regional economy.[7] Thus, estimated economic impacts reflect the many layers of economic activity that would be created with construction and operation of the Project.

17. A number of economic metrics can be evaluated using IMPLAN. My analysis focuses on four metrics:

- *Employment* – the total number of jobs created or lost;
- *Labor Income* – the total change in income to employees that results from the economic activity;
- *Tax Revenue* – the total change in revenues received by state and local governments; and

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how this change ripples through the economy. IMPLAN estimates are based on census data collected from businesses by the Bureau of Economic Analysis ("BEA"), U.S. Department of Commerce. For further information on IMPLAN or input/output models, see https://implan.com.

[7] *Direct* impacts reflect the immediate impacts of the new project on employment. *Indirect* economic activity arises because various phases of the Project's development – plant construction and subsequent operations – create new demand for local goods and services, which in turn leads to new jobs in these sectors. *Induced* economic activity arises from increases in spending on general goods and services made by workers with new earned income.

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- *Value Added* – the total change in the value added to the economy from the new economic activity.[8] In practice, value added reflects new "value" created by the economic activity to labor (in the form of labor income), government (in the form of tax revenues) and business owners (in the form of "profits").[9] Consequently, both labor income and tax revenue, which are reported separately, are components of value added.[10]

ii. Data and Assumptions

18. Information on the Project's construction and operations were provided to me by Tesoro-Savage. This information includes: employment during construction and operations phases; construction costs and annual operations costs, both disaggregated into various categories of expenditures; schedules for the timing of the Project's construction; and schedules for plant operations, including assumptions about throughput levels over time.[11] Expenditures were assigned into appropriate IMPLAN sector categories, based on assumptions about the character of the economic activity associated with each category of spending. Further details on the assumptions and data used in estimating the Project's primary impacts are provided in the Primary Impacts Report.[12]

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[8] This value reflects new gross economic output net of the cost of non-labor inputs used in creating this output.

[9] Note that value added and gross output are not equal. Value added represents the remaining portion of gross output after accounting for input costs. Thus, one dollar of direct spending does not translate into one dollar of value added.

[10] Estimates for value added reported below understate the likely value added because they do not reflect certain tax revenue estimates that I make outside the IMPLAN analysis. Further discussion of the tax estimates is provided below.

[11] Cost information relied on are initial estimates, provided for the purposes of this economic analysis. Actual costs may differ from those shown in this testimony.

[12] The Comment Letter and Johnson Review both suggest that the modeling provided in the DEIS and the Primary Impacts Report "provides no information regarding the assumptions or inputs to the model." Marten Letter, page 10. These comments appear to ignore the vast amount of information provided in the Primary Impacts Report regarding assumptions and methods, particularly Section III, titled "Data and

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19. The Project's construction and operations will occur over a multi-year time frame, with an initial construction period and subsequent operations period. Figure 1 summarizes the timeline assumed in my analysis for Project construction and operations. Construction of the Project will potentially occur in two phases. For purposes of this analysis, Phase I construction was assumed to start December 1, 2014 and last approximately 12 months.[13] After Phase I construction is complete, the Project will have the capacity to serve two to three trains per day. Phase II construction was assumed to start January 1, 2016 and last approximately 6 months. Upon completion of Phase II construction, the Project will have the capacity to serve up to four trains per day, its maximum capacity.[14] Phase I construction costs total approximately $150 million, while Phase II construction costs total approximately $60 million. The labor employed in Phase I of construction is summarized in Table 1 (see Attachment B).

20. The Project's operations will begin after completion of Phase I construction, which, for purposes of this evaluation, was assumed to be in 2016. It is assumed that during 2016, the Project would receive up to two or three trains per day based on Phase I capacity, with volumes increasing to four trains by the end of the year

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Assumptions," This section lays out in significant detail the assumptions and data used to support the analysis, including, for example, Table 2, which provides the specific IMPLAN activity types used, the IMPLAN sectors modeled, and the dollar values input into the IMPLAN model for the annual operations at the project.

[13] The time line for construction and operations assumed in my analysis reflected development planning at the time of the Primary Impacts Report. Although this schedule has been delayed, this delay does not affect the findings of my analysis. In effect, the delay shifts all economic activity to the point in time when the construction and operations activity occur, but does not meaningfully change the magnitude or nature of these impacts.

[14] If construction was consolidated into one phase, this would not have a meaningful effect on my overall conclusions. Expected economic impacts would depend on the specific details of the construction activity under a consolidated one-phase development (as opposed to two phases) and the change in operations, including whether there would be an operation start-up phase. However, I would not expect the economic impacts under a one-phase development process to meaningful differ from those arising from a two-phase development process.

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upon completion of Phase II. Consequently, I have modeled a one-year operations "start-up" period during 2016 in which deliveries to the Project average two trains per day.

21. I assume that once Phase II construction is completed, the Project will operate at full capacity of four trains per day in 2017 and all subsequent years. I assume that the Project will operate for 14 years at full capacity, which includes the initial ten year lease period and an additional five year lease period. The actual length of the Project's operations is uncertain at present. Plant operations could be as short as ten years, the length of the initial lease with the Port, or could continue up to an additional ten years due to the two five year lease options. The assumption of a 15 year operating term reflects a balance between these potential outcomes.[15] Table 2 summarizes start-up and full build-out expenditures. The direct labor employed at the Project is summarized in Table 3 (see Attachment B).

22. Lease and fees paid to the Port of Vancouver are modeled as a separate set of direct activities, with the quantity of expenditures based on pro-rata shares of activities in the Port of Vancouver's 2014 final budget.[16] For example, the portion of the lease and fee payments assumed to be spent on capital project investment at the Port is based on the percentage of the current budget devoted to capital project investment.

23. Johnson Economics raises a number of concerns regarding the data and methods used in the IMPLAN analysis, resulting in the broad claim that impacts are overstated.[17] The individual points raised by Johnson Economics are either without merit

[15] To the extent that the actual operations extend for a twenty year period, the primary economic impacts would be larger than those estimated, reflecting the additional five years of Project operations.

[16] Available at http://www.portvanusa.com/assets/2014-FINAL-Budget-111213.pdf, accessed April 15, 2014.

[17] For example, "The Primary Economic Impacts Analysis included in [the Primary Impacts Report] overstates positive impacts." Johnson Review, p. 2.

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or indicate misunderstanding by Johnson Economics about IMPLAN and the analysis performed. Thus, the broad claim regarding overstatement of benefits is without merit.

24. First, Johnson Economics suggests that analysis of a 16-year construction and operations period is "inconsistent" with the lease with the Port.[18] As described above, this is plainly incorrect, since it includes a one year construction period and 15-year operations period. Moreover, this period strikes a reasonable balance between the minimum and maximum operating period of 10 and 20 years, respectively, as provided for in the lease.

25. Second, Johnson Economics states that impacts are overstated as a result of using off-site employment as a direct impact.[19] Because direct impacts reflect any immediate impacts of the Project so long as they occur within the study area, the fact that some impacts were on-site and some were off-site is immaterial to whether or not they are defined as "direct" within IMPLAN.[20] Therefore, the Johnson Review (and Marten Letter) statements that economic benefits are overstated as a result of off-site employment being modeled as direct impacts are incorrect.

26. Third, Johnson Economics makes a number of comments regarding modeling of the Port lease payments. Johnson Economics claims that there is a "double count" in the treatment of Port lease payments.[21] This is incorrect. As shown in Table 2 of the Primary Impacts Report, the Port of Vancouver lease payments and fees are a

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[18] Johnson Review, p. 4

[19] "The analysis also appears to adopt the application's use of off-site related employment as direct employment, which overstates the impacts of the Project. This overstates impacts, as it incorrectly categorizes indirect impacts as direct impacts." Johnson Review, p. 4.

[20] This was described in the Primary Impacts Report, p. 6: "Direct impacts reflect the immediate impacts of the new project on employment. In this case, direct impacts reflect workers hired during facility construction and employees needed to operate the Project on an on-going basis. All of this economic activity is new to the region and thus creates incremental employment and economic effects."

[21] Johnson Review, p. 5.

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separate line item within the annual operations modeled distinct from any other operations costs.[22] Johnson Economics also claims that the approach taken to modeling the impacts is "somewhat unusual," but does not draw any inferences from its assertion.[23] As an independent public agency, the Port would be expected to fully spend additional revenues through either expanded operations or investment in new operations within Vancouver. Moreover, this spending would occur locally because of the Port's mission to provide "economic benefit to our community".[24] The IMPLAN analysis simply implements this logic by assuming that this new revenue is spent in proportion to the current mix of spending. Finally, Johnson Economics also claims that "we may question if the revenue streams to a public agency will have the same proportional impact as private sector income,"[25] but offers no explanation of or support for the claim. Within IMPLAN, there is no distinction between the impact of spending by public and private entities, and, moreover, it is unclear why such a difference would exist. Further, Johnson Economics discounts the fact that, because the Port is a public agency, payments to the Port would likely be spent locally, whereas profits earned by a private entity might be spent outside the region.

27. Fourth, Johnson Economics claims that the assumption that all construction labor comes from Clark County overstates benefits, and, on this basis, reduces construction period economic impacts by 50 percent. This conclusion and proposed

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[22] These payments represent $19.17 million and $44.86 million (start-up and full build-out, respectively) of the $46.54 (start-up) and $99.24 million (full build-out) in total operation costs, and are modeled separately from the General Operating Expenses and Property Tax expenses shown in Table 2.

[23] "The analysis also appears to adopt the application's use of off-site related employment as direct employment, which overstates the impacts of the facility. This overstates impacts, as it incorrectly categorizes indirect impacts as direct impacts." Johnson Review, p. 4.

[24] Port of Vancouver, "Frequently Asked Questions," accessed April 28, 2016.

[25] Johnson Review, p. 5.

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adjustment are incorrect. The IMPLAN analysis is performed for a multi-region area including all counties surrounding Clark County within a one hour commute of the Project.[26] Because these counties are within a one-hour commute of the Project, it is reasonable to assume that all or almost all construction labor would reside within this region. However, within this large area, the specific residence of construction workers will have little effect on the overall estimated impacts.[27]

iii. Results: Estimated Primary Economic Impacts of the Project

28. Table 4 summarizes the expected primary economic impacts from the Project, while Figures 2 to 4 illustrate the annual values, broken out into direct, indirect, and induced impacts (see Attachment B).[28] In total, the combined effects of the construction and operations of the Project yield an average of over 1,000 jobs annually over the assumed 16-year construction and operation period, totaling over 17,000 job-years over this period. Other cumulative impacts include nearly $1.6 billion in labor income, and over $2.0 billion in economic value added to Clark County and the surrounding area. On a present value basis, these nominal impact estimates correspond to about $890 million in labor income and about $1.2 billion in economic value added.

29. These total impacts reflect the combined effect of direct, indirect, and induced effects. The direct employment impacts in Clark County of Phase I construction are expected to be 239 jobs for the one-year construction period, while these impacts are

[26] See Primary Impacts Report, pp. 7-8.

[27] The difference in impact – which could be positive or negative –would be driven by slightly different spending patterns for the construction workers between individual counties within the study area.

[28] Annual results are presented in nominal terms, while cumulative impacts are presented in both nominal terms (i.e., the sum of annual values) and as the net present value as of 2014 in 2014 dollars. The net present values reflect the use of a 7 percent discount rate, consistent with guidance provided by the Office of Management and Budget ("OMB"). OMB, Circular No. A-94 Revised, October 29, 1992.

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expected to be 81 jobs for the six-month Phase II construction period.[29] Phase I construction is expected to also lead to $23 million in economic value added, while Phase II is expected to lead to $8 million in economic value.[30]

30. During the Project's operations, direct employment impacts are expected to average 616 jobs annually over the assumed 15-year operational period (totaling 8,925 jobs over the period). The estimated direct employment impacts of the on-going operation of the Project include three components: labor on-site at the Project, jobs associated with other direct Project operational activities (i.e., expenditures on goods and services), and lease payments and fees to the Port of Vancouver. The direct labor specific to on-site Project operations is expected to be 91 jobs annually for the start-up period, and 176 jobs annually for each year of the remaining years over the 15-year operational period studied. This employment specific to on-site operations at the Project represents 28 percent of total direct employment (2,555 of the 9,245 total direct job-years).[31]

31. Other direct impacts over the 15-year operational period assumed for this assessment include $1.1 billion in labor income ($76 million annually on average), and $1.2 billion in economic value added ($83 million annually on average). Like the employment impacts, these impacts reflect both the direct labor at the Project as well as

[29] Job impacts are measured in "full-time" positions, which could reflect full-time jobs or an equivalent quantity of part-time jobs (e.g., two half-time jobs being equivalent to one full-time job).

[30] Due to the approach taken to analyzing construction phase economic benefits, economic value added from direct impacts during this phase only those arising from labor income. Other value added components (taxes and business profits) are included in the indirect and induced category of benefits. (This method is known as "analysis-by-parts" in IMPLAN. For more information, please see the IMPLAN website and associated documentation.)

[31] A job-year reflects one job held for one year, and provides a metric for measuring employment over multiple years. In this case, total on-site employment equals one year of start-up employment (91 jobs) plus 14 years of full build-out operations (176 jobs) – that is, 91 jobs + 14 years * 176 jobs = 2,555 jobs-years.

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the direct activities created by the Project including lease payments and fees to the Port of Vancouver.

32. Indirect and induced impacts to the ten-county area of study of Phase I construction yield 792 jobs during the one-year construction period, $39 million in labor income, and $66 million in economic value added, while Phase II construction impacts yield 317 jobs over the six month period, $16 million in labor income, and $27 million in economic value added.

33. During the Project's operations, the indirect and induced employment impacts are expected to result in 449 jobs on average, totaling 6,728 jobs over the assumed 15-year Project operation period. Over the assumed 15-year period, indirect and induced labor income is expected to be $382 million, while indirect and induced value added is expected to be $709 million.

iv. Tax Revenues Impacts

34. Taxes generated by the Project include several forms of payments to state and local governments. These include sales tax, business and occupation ("B&O") tax, property taxes on both the Project and other supporting businesses, and other taxes, such as payments for temporary disability insurance and business license fees. Table 5 summarizes estimated tax impacts from the Project (see Attachment B).

35. In total, the construction of the Project is expected to have a one-time tax impact of over $22 million to state and local governments, and the annual operation of the Project is expected to have a recurring annual impact of approximately $7.8 million once the Project is operating at full capacity. Sales tax increases represent the largest portion of both construction and operations phases. Sales taxes represent nearly 80 percent of construction phase total increases ($17.6 million of $22.1 million) and over 40 percent of operations phase total increases ($3.2 million of $7.9 million at full build-out). Property

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taxes are the second largest tax component, representing 12 percent of construction phase tax increases and 39 percent of operations phase tax increases.

B. Secondary Socioeconomic Impacts

36. Secondary impacts reflect impacts to existing or potential new economic activity from development and operation of the Project, including activities associated with the Project's operations, such as the transportation of crude oil by rail to the Project. Secondary Project impacts could arise from changes in rail traffic as a consequence of trains delivering crude oil to the Project. My testimony explicitly considers several potential impacts from changes in rail traffic, to the extent such exist, including:

- Dis-amenity, such as noise and aesthetic impacts, from increased rail traffic;
- Increased road congestion at at-grade rail crossings; and
- Increased congestion on the rail system.

37. Secondary socioeconomic impacts should be evaluated through comparison between a "policy case" in which the Project is developed and a "base case" in which the Project is not developed. Likely secondary impacts depend, in part, on the difference between rail traffic between these two cases. I understand that, based on comments provided by BNSF, that there is not anticipated to be any meaningful change in rail traffic as a consequence of the Project.[32] Among the many factors affecting rail traffic through Vancouver in the absence of the Project are alternative uses of the Port and alternative modes by which crude oil is delivered to West Coast petroleum refineries. To the extent that the parcel currently assigned to the Project would be used for another activity that

[32] BNSF Railway Company, Comments in Response to Publication of Draft Environmental Impact Statement; Tesoro Savage Vancouver Energy Distribution Terminal, January 21, 2016 (hereafter, "BNSF Railway Comments").

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would involve rail transport, the incremental rail traffic from the Project would only reflect the difference between traffic associated with the Project and traffic associated with the alternative use. In addition, rail traffic would depend on the route and mode (e.g., rail or ship) taken by crude oil that West Coast refineries would use to replace the crude oil supplies they would have received from the Project.[33] In spite of these factors, I evaluate potential incremental increases in rail traffic of zero and four unit trains per day.

i. Dis-amenity Impact on Local Development and Economic Activity from Increased Rail Traffic

38. Increased rail traffic potentially has an adverse impact on local development and economic activity in any area near rail lines because of the dis-amenity of rail traffic (e.g., noise, vibration, odor, and visual impact). All things being equal, residents or businesses may prefer to locate at a distance from rail lines to avoid these dis-amenities and other impacts from rail traffic, such as delays at road crossings, which can impose delay costs. On the other hand, proximity to rail can provide benefits, particularly when it provides better access to passenger rail systems for households or certain commercial businesses (e.g., office space) or improved access to freight transportation for industries and certain commercial businesses (e.g., warehousing).[34] However, given these (and other) countervailing factors, it may be difficult to estimate, with any precision, what might be the positive or negative impacts attributed to changes in rail traffic on that rail

[33] For example, in the Base Case (with no Project), if crude supplies destined for West Coast refineries are still delivered via a rail through Vancouver, then the Project would have no incremental impact on crude rail traffic through Vancouver.

[34] For example, see Wardrip, Keith, "Public Transit's Impact on Housing Costs: A Review of the Literature," Insights from Housing Policy Research, Center for Housing Policy, August 2011; Debrezion, Ghebreegziabiher, Eric Pels and Piet Rietveld, "The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-analysis," Journal of Real Estate Financial Economics 35: 161-180, 2007.

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line, particularly in a situation in which the presence of the rail line predates proximate land uses.

39. In my analysis, I evaluate the potential impact of increased rail traffic on property values using two approaches. One approach is a literature survey of existing statistical analyses of the impact of rail traffic on property values. The second approach is original research on the change in property values in Vancouver, Washington since the announcement of the Project. The literature search was referenced in the Secondary Impacts Report. The original research on changes in property values in Vancouver, Washington since the announcement is work that I have completed subsequently, and is attached to this testimony as Attachment E.

a. Hedonic Analysis of Property Value Impacts

40. One approach to evaluating the economic impact of a particular land use is to analyze how proximity to the land use of interest affects real estate values. From an economic standpoint, the market value of a residential property reflects the attributes of the property (the parcel size, the size of the house, the quality of construction, the number of bedrooms, etc.), its location, attributes of the neighborhood and its proximity to other land uses (e.g., parks, schools, major roads, rail lines). The value of properties for commercial and industrial use would reflect a different set of attributes relevant to those types of uses. Economists have used a statistical approach called hedonic analysis to estimate how each of these attributes affect property values.[35] Hedonic analysis uses information about the actual prices paid for properties and the actual property attributes to

[35] Freeman, A. Myrick III. *The Measurement of Environmental and Resource Values, Theory and Methods*," Resources for the Future: Washington, D.C.

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determine how variations in property values are explained by differences in property and location attributes.

41. Research using hedonic analysis has evaluated how proximity to rail lines affects property values. Because the Project may affect the number of trains that travel along the existing rail line, I performed a literature search to identify studies that evaluated the impact of variation in rail traffic on property values. While there are many studies that estimate the impact of proximity to a rail line on property values, I was only able to identify two reliable studies that evaluated the impact of changes in in the level of rail traffic.[36] Both of these studies evaluated general rail traffic, not traffic involving specific commodities (e.g., crude oil). Each study estimates the impacts of changes in rail traffic on single-family residences, with one study examining impacts in Los Angeles (Futch)[37] and the other in Cleveland (Simons and El Jaouhari).[38] Using the parameter estimates provided in these studies, I have estimated the expected impact of additional rail traffic on property values in Vancouver assuming that operation of the Project increases rail traffic past residences by four trains per day, which is the Project's maximum potential impact given the assumed routing. Tables 6 and 7 (see Attachment B) report estimated impacts.[39]

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[36] My analysis only considers studies that do not use reliable statistical methods. In particular, I do not consider estimates developed through subjective "opinion" rather than empirical analysis. For example, the Eastman Company has stated that impacts from the Gateway Pacific Project, with increased traffic of 18 trains daily in some areas, would range from 5 to 20 percent for single-family residences, 5 to 15 percent for multi-family residences, and 5 to 10 percent for commercial properties. On a per-train basis, these impacts are significantly higher than those derived from actual market transactions in the studies I evaluate. The Eastman Company, "Increased Coal Train Traffic and Real Estate Values," October 30, 2012.

[37] Futch, Michael, "Examining the Spatial Distribution of Externalities: Freight Rail Track and Home Values in Los Angeles," November 11, 2011.

[38] Simons, Robert A. and Abdellaziz El Jaouhari, "The Effect of Freight Railroad Tracks and Train Activity on Residential Property Values," *The Appraisal Journal* Summer 2004, pp. 223-233.

[39] To the extent that actual increases in rail traffic are smaller than four trains per day, the resulting impacts would be proportionately smaller.

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42. Table 6 provides estimated property value impacts based on Futch for varying distances from the rail corridor (see Attachment B). Assuming an increase in rail traffic of four trains per day, single-family residential properties near the rail line could be reduced by 0.85 to 1.49 percent within one-third mile of the rail line (across the specifications). From one-third to two-third of a mile from the rail line, the estimated impact is smaller, ranging from 0.59 to 0.69 percent, and from two-thirds of a mile to one mile are smaller still (0.37 to 0.67 percent).

43. Table 7 provides estimated property value impacts based on Simons and El Jaouhari for 1999 (see Attachment B). Estimated impacts range from 0.0 to 1.07 percent for distances up to 750 feet from the rail (which is approximately one-seventh of a mile, thus considerably shorter than the distance evaluated by Futch). In addition to the results in Table 7 for 1999, the authors also estimate similar values based on data from 1996. In this year, the authors find that the relationship between the level of rail traffic and property values is not statistically different from zero at any distance for any property size.

44. Based on existing empirical research analyzing the impact of changes in the volume of rail traffic on property values, I find that the additional rail traffic from the development of the Project, to the extent any exists, would be expected to reduce residential property values near the existing rail lines by 0 percent to at most 1.5 percent, with impacts diminishing as distance from the rail line increases. While there are differences between the circumstances of the Project on Vancouver and Washington State and the circumstances considered in these studies, the best available research indicates that the Project is unlikely to have significant impacts, if any, on property values due to increased volume of rail traffic.

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45. In the context of the many economic factors that affect real estate values, these potential changes in property values are small.[40] To provide some context, Figure 5 provides a price index for homes in the Portland, Oregon area. Since 2000, housing prices have varied dramatically, first increasing by over 80 percent through August 2007, then declining by 30 percent (from August 2007 prices) through March 2012, and then increasing by nearly 50 percent since this low in March 2012. Thus, compared to the magnitude of price fluctuations in recent years, an impact of at most 1.5 percent (and potentially much lower or even non-existent) is relatively small in comparison.

46. Moreover, the property value impact associated with the assumed dis-amenity must be balanced against other potential impacts to property values, particularly potential appreciation in property values due to the improved economic conditions from the Project's construction and operations. Such appreciation is to be expected given the increase in employment and labor income anticipated from the Project's construction and operations, which can result in greater demand for housing. Past economic research has established that there is a strong empirical relationship between property values and economic conditions, such as employment and labor income.[41] Thus, it would be reasonable to assume that the improved economic conditions arising from the Project that

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[40] As discussed earlier, the Johnson Economics study does not explain the mechanism by which an increase in rail traffic is expected to lead to a reduction in the size of the Waterfront project. Consequently we cannot comment directly on the reasonableness of that assumed process or the economic logic upon which the assumption is based. However we would expect a potential price variance on the order of one percent to be well within the normal range of forecasting uncertainty for a multi-year development project such as the Waterfront project. Given that, it seems highly implausible on its face that the increase, if any, in rail traffic from operation of the Project could necessitate a reduction in the size of the Waterfront project of 30 percent.

[41] Jesse M. Abraham & Patric H. Hendershott, "Patterns and determinants of metropolitan house prices, 1977 to 1991", Federal Reserve Bank of Boston, Conference Series, 36: 18-56, 1992; Capozza, Dennis, et al., "Determinants of Real House Price Dynamics," NBER Working Paper #9262, October 2002; Quigley, John, "Real Estate Prices and Economic Cycles," *International Real Estate Review* 2(1): 1-20, 1999.

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were estimated in Section I of my testimony would tend to increase property values, all else equal, and that these changes would tend to partially, fully or more than fully offset any adverse impacts from any dis-amenity arising from any change in rail traffic.[42]

b. Impact of Announcement of the Project on Property Values in Vancouver

47. I performed a statistical analysis to test whether the announcement of the Project's development has had an impact on property values in Clark County. This statistical analysis uses the same hedonic framework as the Futch analysis and Simons and El Jaouhari analysis evaluated in the previous section. The analysis considers whether information about the Project's potential development has affected property values. This impact could arise due to any factor that would make it less desirable for current and potential homeowners to live nearby to the rail line, including dis-amenity of potential increases in rail traffic, the perceived risk of crude oil trains, or any other factor. While the Project has not been constructed and no increases in rail traffic have yet occurred, there has been much information available to real estate market participants through substantial press coverage about these facilities and the potential for increased rail traffic. Because property markets will adjust for new information about factors that would impact future property values, I would expect to observe some change in property values if the Project were to result in significant future impacts. Attachment E to my testimony provides greater detail on the assumptions, data, and results of this analysis.

[42] The DEIS found that immediate impacts on the supply of housing would likely be negligible because the "Portland-Vancouver MSA is likely capable of supplying most, if not all, of the experienced labor necessary for Project construction." DEIS Section 3.13.3.1. This conclusion suggests that the Project would not lead to shortages of housing, but not preclude some appreciation in property values given the additional income to the region.

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48. The statistical analysis tests whether the announcement of the Project has had an impact on the discount (or premium) to properties nearby to the rail lines. Assume that otherwise identical properties within 250 feet of the rail line on average sell at a lower price (a "discount") compared to properties further from the rail line. If this discount after the announcement is larger (and statistically different) from the discount before the announcement, then this is an indication that the announcement has led to a decline in property values. For example, suppose that being within 250 feet of the rail line (on average) reduces property values by 0.75 percent before the announcement. If, after the announcement, this discount is 1.0 percent, then the difference in the estimated impact 0.25 percent (= 1.0 percent – 0.75 percent) can be attributed to the Project's announcement.

49. The development of the Project has occurred in a series of steps, with various milestones occurring over time. The potential for the Project first became public knowledge on April 22, 2013 when the Port of Vancouver announced that Tesoro and Savage Corporations had formed a joint venture to develop the Project, subject to approval by the Port's Commissioners and the approval of regulatory agencies.[43] I use this date as the starting point of potential impacts. Since this time, there was substantial news coverage of the Project's development in the press, along with significant attention to marine energy terminals generally, in light of proposals for other facilities in Washington State.[44]

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[43] http://www.portvanusa.com/news-releases/tesoro-and-savage-announce-joint-venture-to-construct-and-operate-crude-by-rail-unloading-and-marine-loading-facility-at-port-of-vancouver-usa/

[44] *See, e.g.*, "Tesoro-Savage: Opposition to oil terminal premature," The Columbian, March 24, 2014, available at: http://www.columbian.com/news/2014/mar/25/tesoro-savage-executives-opposition-oil-terminal-p/; "Proposed oil terminal would be biggest in volume," The Columbian, November 24, 2014, available at: http://www.columbian.com/news/2014/nov/24/proposed-oil-terminal-biggest-volume-vancouver/; "Public comment ends Friday for nation's largest proposed oil terminal," Oregon Public

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50. Because the Project has not yet received regulatory approvals, there is the possibility that it may not clear these hurdles and thus may not be developed. Thus, from the standpoint of a homeowner that might find it more undesirable to live near the rail line when the Project is in operation, the Project creates the potential for diminution in value, although this is not a certainty. While such an outcome is uncertain, the homeowner would nonetheless be expected to place a lower value on the property once the information about the possibility is known. This outcome reflects two economic principles. First, information about factors that will change the value that homeowners place on owning the property in the future – when the Project is actually in operation – will impact the market value of the property today, as soon as the information is known.[45] Second, even if there is uncertainty about whether impacts to value will occur, market prices will adjust to account for the risk that such impacts will occur.[46] Thus, to the extent that the Project would lead to adverse impacts to property values, I would expect to observe such impacts in market prices today, adjusted for the probability that such adverse impacts may not occur.

Broadcasting (OPB), January 22, 2016, available at: http://www.opb.org/news/article/public-comment-ends-friday-for-largest-proposed-oil-terminal/.

[45] This is true of any property or asset in which market value reflects a stream of future benefits, such as publicly trade share prices that reflect the future profits from the underlying firms. In the case of real estate values, these future benefits reflect the value homeowners place on living in a given property. To the extent that information about the property becomes known that would positively or negatively affect this value in the future, it will affect the real estate price that people are willing to pay for the property today. For example, *see* MacKinlay, Craig, "Event Studies in Economics and Finance," *Journal of Economic Literature* 25(1): 13-39, 1997.

[46] In this regard, the potential for the Project to be developed is not different than the potential for an accident to occur or environmental contamination to arise from nearby hazardous facilities. For example, *see* Palmquist, Raymond and V. Kerry Smith, "The Use of Hedonic Property Value Techniques for Policy and Litigation," *International Yearbook of Environmental and Resource Economics*, Volume VI, August 10, 2001.

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51. The statistical analysis evaluates all residential property transactions within Clark County from 2007 to present through April 2015. This sample period includes approximately 24 months of data in which the market had information about the development of the Project. My sample includes over 41,000 property transactions. I control for multiple factors, listed in Table 8, that would lead to variation in the price for an individual property, including property characteristics, property location, when the transaction occurred, the distance from the rail line, and the time period after the development of Project was announced.

52. Tables 9 and 10 summarize my results (see Attachment B). These tables report two impacts. The first column shows the estimated impact of proximity to the rail line on property values; the second column shows the change in this impact since the announcement of the development of the Project. (Thus, the net impact of proximity to the rail line after the Project's announcement is the sum of the values in these two columns.) Tables 9 and 10 test two different models for the relationship between proximity to the rail and property values. Table 9 provides estimates of the percentage difference in property values for each of four discrete distance bandwidths as compared to properties beyond the one mile rail corridor. Table 10 assumes that impact diminishes with distance from the rail, with the impact varying continuously as an arithmetic function of the property's distance to the rail.

53. The results in Table 9 indicate that properties within 250 feet of the rail sell at a discount (-4.56 percent). However, this impact is not statistically significant – that is, from a statistical standpoint, the estimate cannot be distinguished from zero.[47] In Table 9,

[47] That is, from a statistical standpoint, we cannot assume that the estimated value is any different than zero. In these tests, I consider a statistical confidence level of 10 percent. (Technically, this means that zero is within the range of possible values at a 90 percent probability.) A standard benchmark for statistical

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estimates that are statistically significant have stars to the right of the estimated coefficient, with the number of stars indicating the level of statistical significance.[48]

54. Properties that are 250 to 1000 feet from the rail sell at a premium (+2.69 percent), although this estimate also is not statistically significant. Beyond 1000 feet up to one mile, properties sell at a premium of +4.31 or +5.36 percent, which is statistically significant.

55. The test of whether the Project's announcement has had an impact on property values depends on the estimated coefficients in the second column. If these estimated values are statistically different from zero, this would indicate that the Project's announcement has had an impact of property values. The estimated change in discount/premium to proximity to the rail ranges from -1.47 percent to +4.65 percent. However, none of these estimated changes in the discount/premium are statistically significant. This result is consistent with the conclusion that the Project has had no impact on property values to date irrespective of distance from the rail.

56. Table 10 reports results assuming that the impact of proximity to the rail varies continuously as the distance from the rail increases (based on a quadratic and logarithmic function) (see Attachment B for more details). Here, I find that there is no statistically significant relationship between property prices and distance from the rail. More importantly, I also find that there is no statistically significant change in these relationships after the announcement of Project. Thus, the analysis results are again

significance is a 5 percent confidence level. Thus, testing against a 10 percent confidence interval is biased in favor of finding a statistically significant effect. Pindyck, Robert and Daniel Rubinfeld, *Econometric Models & Economic Forecasts*, third edition, McGraw-Hill: New York, 1991.

[48] The notes provide further details on this notation.

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inconsistent with the conclusion that the Project has had a (statistically significant) impact on property values in the Vancouver market area that was the subject of this study.

57. I also consider the possibility that the impact on local property values from potential development of the Project has varied over time. To consider this possibility, I test for a difference between the impact of proximity to the rail in each quarter since the announcement against the pre-announcement average impact. Figure 6 shows the results of this analysis (see Attachment B). The change in impact has varied by quarter, with a negative change as large as 15 percent and a positive change as high as 36 percent. However, most importantly, the vast majority (26 of 32) of the estimated impacts in Figure 6 are not statistically significant, and only one of the 10 negative values are statistically significant.[49] These results do not suggest any consistent, statistically significant change in the impact of proximity to the rail over time since the Project's announcement. Thus, again, the results are inconsistent with the conclusion that the Project has had a statistically significant negative impact on property values.

58. In addition to the results reported in Tables 9 and 10 and Figure 6, tests were performed under a range of alternative assumptions to test the robustness of our results. These sensitivities are described in Attachment E. In all cases, my results are consistent with the conclusion that the Project has not adversely affected property values in close proximity to the rail.

59. Thus, the analysis finds across the many statistical tests that there is no association between the announcement of the Project and the sale price of properties located nearby to the rail line that would deliver crude supplies to the Project. Because

[49] While some effects may appear large, the results suggest that in some quarters at some distances from the rail that there is a wide variance in the estimated values.

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the Project has not yet been constructed and deliveries of crude supplies have not yet begun, it is possible that the full impact of the Project has not yet been felt. However, because property markets will adjust for new information about factors that would impact future property values, I would expect to observe some change in property values if the Project were to result in a large and significant impacts in the future. Consequently, my results are inconsistent with the conclusion that the Project would result in a significant adverse impact on property values in the Vancouver area.

C. Johnson Economics Assessment of Impacts to Property Values

60. The Johnson Review includes an analysis of potential property value impacts from the Project. The analysis includes multiple flaws that render its findings wholly unreliable.

61. Johnson Economics performs a review of existing literature that considers "similar impacts" to those from the Project. This review is flawed in several respects. First, the review includes studies that evaluate the impact of proximity to a railroad line, suggesting that proximity to the rail line is a "similar impact" to that arising from the Project. This is clearly not the case, as the rail line already exists and, at worse, the Project would increase rail traffic in Vancouver from current levels of approximately 28 trains per day.[50]

62. Johnson Economics' confusion is illustrated in its summary of the Simon and El Jaouhari study, which was one of the two studies I evaluate above. While my analysis found that the property value impact of four incremental trains per day would be expected to range from 0.00 to 1.07 percent, Johnson Economics reports values of 5 to 7

[50] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," Final Report, prepared by Cambridge Systematics, March 2014.

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percent, which represent the full "discount" to property values from being nearby to rail (as compared to being far from the rail). Johnson Economics failed to include consideration of the change in rail traffic, as distinguished from mere proximity to the rail line.

63. In fact, four of the six studies identified in Table 2 of the Johnson Review have no information regarding the impacts of incremental changes in rail traffic, and thus provide no information relevant to assessing the impact of the Project. When performing my literature survey, these studies were not included because they do not consider the incremental effect of additional rail traffic.[52] My literature review includes the two other studies – Futch and Simon and El Jaouhari.

64. Johnson Economics also cites to several studies that "support the proposition that perception of hazard has a negative impact on property values."[53]. First, the studies cited by Johnson Economics are not a representative sample of studies that can reliably provide information about the potential impacts on property values associated with proximity to hazards. For example, other studies have found that proximity to hazards (e.g., hazardous waste sites) has not adversely affected property values. [54] Second, while it is not controversial that environmental risks could have potential consequences for property values, the relevance of the particular studies cited to Johnson Economics' findings are unclear because these studies consider risks that are not directly comparable to those relevant to the Project. Two of the three studies consider associations between

[52] In addition, three of the four studies estimate property value impacts outside the U.S. (in Holland and Norway) which is less likely to provide a reliable measure of impacts in the U.S.

[53] Johnson Review, p. 16.

[54] One study found that designation of a site for long-term clean under the federal Superfund program (i.e., placement on the National Priority List) had little impact on the growth of nearby property values. Greenstone, M., and J. Gallagher, "Does Hazardous Waste Matter? Evidence from the Housing Market and the Superfund Program," MIT Department of Economics Working Paper 05-27, October 2005, p. 2.

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property values and stationary facilities, such as hazardous waste disposal sites and nuclear power plants, and particular events (in one case, an explosion at a chemical plant). By contrast, the presumed risk associated with the Project arises from rail transport over a wide geographic area. The third study examines rail transport, but considers a particular type of freight (nuclear waste from foreign countries) that may lead to "perceptions" about hazards that differ greatly from the transport of crude oil.[55] In this regard, I note that the results of my statistical analysis indicate that, over two years since the Project's announced development, property values have not been adversely affected by any perceived risk associated with the Project's development.

65. Finally, Johnson Economics develops quantitative estimates of the potential impacts to property values from development of the project. However, Johnson Economics assumes property value impacts of 1.5, 5 and 7 percent, which correspond to the impact of proximity to the rail line, rather than potential impacts that correspond to an assumed increase in rail traffic (which range from 0 to 1.5 percent for the maximum incremental traffic of four unit trains per day, as identified in Tables 6 and 7). Table 11 provides estimates of the percent impact over geographic ranges (from the rail) appropriate to the Futch and Simons and El Jaouhari studies.[56] For the Futch study, the average effect is a 0.65 decrease in property values within one mile of the rail line. For the Simons and El Jaouhari study, the average effect is a 0.30 percent decline in property values within 750 feet of the rail (which I conservatively assume extends to one-third of a

[55] This nuclear waste was fuel rods made of highly enriched uranium that, in addition to producing energy, could be used to produce nuclear warheads. Gawande and Jenkins-Smith, 2001, p. 211.

[56] These estimates reflect an average effect across the individual geographic ranges evaluated in the Futch, and Simons and El Jaouhari studies accounting for both the magnitude of the estimated effect and whether the estimated effect is statistically significant. Impacts to property values and taxes reflect total property values and assess tax values, as reported by Johnson Economics.

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mile) based on the 1999 results, and a 0.0 percent decline in property values based on the 1996 results. These estimated effects shown in Table 11 are significantly smaller than the range of values – 1.5 to 7 percent – considered by Johnson Economics.

66. Table 11 also provides corresponding estimates of real market value and annual tax impacts. Potential impacts range from $0.0 to $66 million for real market value, and $0.00 to $0.80 million in annual tax impacts based on Futch and Simons and El Jaouhari. These estimates are substantially lower than those estimated by Johnson Economics, which range from $63.9 to $396.5 million for property value impacts, and $0.7 to $4.7 million for annual property tax impacts. As discussed above, when considering these estimated potential impacts, it is important to recognize the wide fluctuations that already occur in property values arising from many changes in the regional and macro-economy, as well as the countervailing (and potential positive) effects that the Project's new economic activity may have on property values. However, in any event, the estimated range of impacts shown in Table 11 are smaller than the estimated assessed value and corresponding property tax revenues that are expected from the Project as described in Section I.A, above.

D. Impact on Economic Activity from Increased Delays at Road Crossings

67. As discussed in the DEIS, if the Project's operations resulted in a change (increase) in rail traffic, this could result in delays in vehicle traffic at at-grade rail crossings. To the extent that such delays occurred, they could have economic consequences.

68. In the Secondary Impacts Report, the economic costs associated with delays at at-grade road crossing were estimated for crossings within Vancouver and at several different locales throughout Washington State, which were identified as a

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representative case for the range of potential impacts that might occur across the state, including Bingen and Spokane. To provide an indicative measure of economic consequences, I estimated the costs to business activity from increased delays at rail crossings in each of these locales. The estimated costs reflect a number of factors that were identified in the Secondary Impacts Report. My analysis assumes four incremental train crossings (although, as discussed above, I understand no incremental traffic is anticipated). Assumptions regarding anticipated down times (reflecting train length and speed), and average traffic volumes were developed by transportation experts.[57] The analysis only considers potential impacts to economic activity, and does not reflect other potential impacts, such as increased delays for emergency vehicles. Details on these calculations are provided in the Secondary Impacts Report.

69. Table 11 from the Secondary Impacts Report describes estimates of annual total costs and costs related to business activity for six at-grade intersections within Vancouver, while Table 12 reports the same metrics for 13 intersections outside of the Vancouver area (see Attachment B).[58] Business impacts are relatively limited. Within Vancouver, intersections potentially affected by incremental rail traffic all have relatively low traffic levels, with half of these occurring in industrial areas nearby the Port. The incremental impacts to business are all estimated to be less than $1,200 annually. Outside of Vancouver, intersections east and west of Spokane, which are likely to have an additional 8 trains per day from the Project (four loaded inbound trains, and four empty outbound trains), could experience impacts of up to $7,000 per year.

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[57] Vancouver Energy Draft Environmental Impact Statement, Section 5.17, Traffic and Transportation.

[58] Table 9 excludes the Jefferson and 8th Street at-grade crossings, which have been closed permanently. Two of the at-grade crossings in Table 9 are not in Figure 6, but are to the east of the geographic area shown (see Attachment B).

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70. These impacts could have some tangible effects in terms of lost income or value added. However, compared to the magnitude of the economies of the communities in which these impacts occur, they are extremely limited. For example, in 2013, the total income earned for the city of Vancouver was about $4.3 billion, while total income in Spokane was about $12.4 billion.[59] In percentage terms, total potential business impacts (relative to income earned) are less than one-thousandth of one percent.

E. Impact of changes in Rail System Congestion

71. As discussed above, under certain future scenarios, other parties have asserted that development of the Project could lead to increases in traffic on the rail system within Washington State which, in turn, could contribute incrementally to rail system congestion, potential delays, and associated impacts on rail operators and customers. In this section, without regard to the likelihood of this impact, I consider those potential economic consequences for the rail system.

72. As a starting point, it is important to recognize that, according to BNSF routing of freight rail traffic is very dynamic and does not adhere to a particular route.[60] The route taken by a freight train on a given day will depend not only on convenience or distance, but also on other numerous factors, including weather events, customer needs and market demands.

73. The Secondary Impacts Report reported that current utilization on lines affected by the assumed routes range from 15 to 86 percent,[61] based on the traffic levels as

[59] U.S. Census Bureau, State and County Quick Facts.

[60] BNSF Railway Comments.

[61] These routes assume that all inbound fully-loaded trains will arrive from the east via the BNSF rail lines that follow the Columbia River and that empty trains will head north towards Kalama/Longview back to their point of origin.

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reported in the State of Washington's Final Draft State Rail Plan.[62] With the additional traffic from the Project, and assuming none of the planned capital improvement projects will be constructed, it is expected that utilization would range from 26 to 108 percent. Thus, except for the Spokane to Pasco segment, there is sufficient capacity to accommodate increased rail traffic from the Project without any capital improvements to the rail infrastructure and without adjustments to other rail traffic.[63]

74. These estimates reflect a static view of the potential impact of the Project on the rail system in Washington State. They do not account for the various dynamic adjustments that can occur within an economic market that allow the supply of available and potential resources to shift to meet the demand for goods and services. In this case, rail system operators have many alternatives available to optimally utilize, enhance, and expand the existing rail system to serve various rail customers whose demand for service may vary over time in both intensity and location. For example, BNSF has undertaken investment aimed at increasing capacity in its Lakeside subdivision, which roughly corresponds to the Spokane to Pasco section, which has the highest capacity utilization of any section over the assumed route.[64]

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[62] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," Final Report, prepared by Cambridge Systematics, March 2014; other recent estimates of rail capacity and forecast demand are provided in: BST Associates, MainLine Management, "Pacific Northwest Marine Cargo Forecast Update and Rail Capacity Assessment," prepared for Pacific Northwest Rail Coalition, December 2011. The estimates in Table 11 do not reflect certain investments currently being undertaken by BSNF that will likely increase rail capacity of the Washington rail system. In 2014, BNSF plans called for investment of $1 Billion in capital on expansion and maintenance on the Northern Corridor, with $235 million going to projects in Washington State. There are several major capital projects currently under way in Washington, including construction of a second mainline track at various locations on the route between Cheney, Wash. and Mesa, Wash., and replacement of the railroad bridge over the Washougal River in Camas, Wash.

[63] BNSF Railway Comments.

[64] This includes investment in siding and double-tracks. https://www.bnsf.com/customers/oil-gas/img/northern-corridor.pdf. Also, see the 2015 capital projects identified in: BNSF Railway Comments.

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75. From an economic standpoint, it is important to evaluate potential impacts from both short-run and long-run perspectives that account for the dynamic adjustments made by market participants that allow the supply (and location) of resources to meet demand. In the short-run, options to adjust rail use for new demand from the Project are more limited, while in the long-run, there is a larger set of options available to adjust system use, configuration, and capacity. It is important to account for these economic adjustments in any assessment, because they can mitigate many apparent impacts from static assessments.

76. The impact of any additional traffic from the Project is not expected to be significant. Moreover, the ability of the system to increase capacity to meet expanding demand will not depend on any additional traffic from the Project, but from factors such as the ability of the railroads to earn sufficient return to justify potentially significant investments.[65] Thus, the Project would not be expected to have significant impacts on the rail system, in the form of disruption to other services or significant price increases, in the long-run.

II. ASSESSMENT OF THE DRAFT EIS

77. The DEIS considers both the primary and secondary socioeconomic impacts of the Project. As recognized by the DEIS, the Project is expected to result in substantial positive economic impacts to the local, regional and state economies.[66] These positive impacts include increases in economic value added, employment, and tax revenues. The DEIS also assesses the potential adverse secondary economic impacts from the project.

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[65] For example, *see* Cambridge Systematics, Inc., "National Rail Freight Infrastructure Capacity and Investment Study," prepared for the Association of American Railroads, September 2007.
[66] DEIS, Chapter 3.16.3.

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78. In general, the DEIS reaches reasonable conclusions about the Project's economic impacts. Despite my general concurrence with the DEIS findings, in this section, I identify and discuss several socioeconomic findings in the DEIS that either warrant correction or clarification.

A. Additional Socioeconomic Benefits from the Project

79. The DEIS identifies two additional primary socioeconomic benefits that were not identified in analyses I performed. First, the DEIS considers taxes to the governments within the State of Oregon. I did not include an estimate of Oregon income tax revenue in my Primary Impacts Report. Specifically, the DEIS quantifies income tax revenues to the state of Oregon, finding that the project would generate approximately $362,100 in income tax during both construction phases and $332,900 annually with full operations in 2017.[67] Second, the DEIS also notes that the additional rail activity may lead to additional railroad employment (and associated economic benefits), which are not included in the DEIS statements regarding economic impact.[68]

B. Rail Congestion

80. The DEIS identifies potential impacts from increased congestion on the rail system. While the DEIS does not quantify an aggregate effect, it does find that the average costs of carrier and shipper cost per train hour of delay was estimated to be $409.07 (2014 dollars) based on review of multiple studies.[72] However, the DEIS does not provide an estimate of the expected shipping delays as a consequence of the Project. As a result, it does not provide an estimate of the aggregate economic impact of any such delays. An analysis to estimate any delays in rail delivery as a result of the project would

[67] DEIS, Table N-17, Appendix N.
[68] DEIS, Section 3.16.3.2, p. 3.16-14.
[72] DEIS, Section 3.16.1.5, p. 3.16-3.

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need to account for both the current system operations and the responses that the rail system operators could make to mitigate any changes in shipping times that might occur. Given such responses and recognition that rail traffic associated with the Project is a small share of total Washington State rail traffic,[73] it is likely that such delays (and any consequent economic impact) would be insignificant.

C. Secondary Impacts from an Accident or Spill

81. The DEIS identifies potential economic impacts that would be expected as a result of an accident associated with the Project's operations, including a spill of crude oil during rail or marine transport.[74] Proper assessment of the expected economic impacts from such accidents or spills requires consideration of both the likelihood that accidents of varying severity occur and the corresponding economic impacts arising from such accidents. Evaluation of the likelihood of an incident that would result in a spill of crude oil is outside the scope of my testimony and has been addressed by other witnesses.

82. The DEIS describes potential economic impacts to commercial fishing activity in the event of a spill at the Project. The economic impacts contemplated assume that the entire economic activity associated with all fishing activity in the Columbia River would be lost for the entire duration of any restriction or closure of fishing activity. When considering the economic impact of any limit on economic activity, it is important to consider ways in which producers (e.g., fishermen) can change their activity to mitigate the economic impacts of the limitation on production. One option producers have is to shift the location of their activity. For example, fishermen may be able to shift the location of their fishing activity to areas that are not covered by the restriction or closure.

[73] See BNSF Comment Letter.
[74] DEIS, Section 4.7.17.1 and 4.7.17.2.

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A second option is for producers to shift the timing of their activity. In this case, fishermen may shift the timing of their fishing activity. In particular, if fishing is restricted or closed for a period, they may be able to increase fishing activity during periods when the fishing area is permitted to compensate for the temporary restriction on fishing activity. By not accounting for these actions to mitigate economic impacts, the DEIS may overstate the economic impacts that would likely arise from a marine oil spill.

83. The DEIS also describes impacts from vessel diversions in the event of a spill at the Project. As with the response of fishermen to a restriction in fishing activity, when assessing impacts, it is important to evaluate the responses of businesses to such a diversion in vessels. First, vessels may shift the timing of their landings. For example, the source relied on by the DEIS for estimates of the impacts of vessel delays assumed that business was delayed, but was not actually eliminated.[75] That is, vessel diversions may delay the timing of when landings occur, but not eliminate the landings (and the associated economic activity) entirely.[76] Second, vessels unable to land at the Port of Vancouver due to a diversion may be able to shift landings to other ports (e.g., the Port of Portland or the Port of Longview), which would produce economic activity for region, albeit potentially at a greater distance to the Vancouver region.

84. The DEIS analysis of a discharge during rail transportation identifies current economic activity associated with recreational fishing and tourism in the Columbia River Gorge, suggesting that all of this economic activity would be eliminated in the event

[75] "Business was assumed to be delayed rather than completely voided." Ecology, 2005, p. 9.

[76] Further, some of the findings in the source relied on in the DEIS for certain impacts estimates, Ecology (2005), raise questions about its reliability. For example, the study reports significant differences in the daily impact of port disruption due to an oil spill. While the study identifies a daily "wage" impact of over $1 million to the Port of Vancouver, the impacts to other Ports are orders of magnitude smaller for larger ports: $762,430 for Portland, $179,517 for Seattle, and $1,849 for Anacortes. The study does not explain these differences.

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of a spill. However, such a conclusion may overstate impacts by failing to consider the many changes in behavior and substitutions that are made in response to restrictions in certain recreational activities. First, a spill may not lead to a complete restriction on fishing activity, but may only lead to advisories, particularly with respect to the fish consumption. In this case, many fishermen may continue recreational fishing, despite the reduced pleasure received from the recreational experience. Second, to the extent that a spill results in reduced recreational fishing, people will likely shift their free time to other sorts of recreational activity that can also result in economic activity, depending on particular activities undertaken. The Columbia River Gorge offers multiple recreational and tourism opportunities, not all of which are connected to recreational fishing activity. Assuming a shift to a different recreational activity, the impact would reflect the difference in economic impacts between recreational fishing and the alternative recreational activity, not the impacts associated with recreational fishing, by itself. The DEIS fails to consider these types of responses and thus may overstate expected impacts.

85. The DEIS identifies many economic impacts arising from an accident associated with Project operations,[77] but fails to recognize economic activity that would be generated by spill response.[78] When a spill occurs, new economic activity occurs to clean-up contaminated areas, remediate affected properties, and supply equipment for cleanup activities. Anecdotal evidence from recent spills suggests that such activity can be potentially large.[79] A complete assessment of economic impact from spills would need

[77] DEIS, Section 4.7.17.1, p. 4-109 to 4-110.

[78] These economic activities are typically paid through a combination of insurance claims and funding from the companies involved in these accidents.

[79] A recent spill in Santa Barbara, California led to more than 700 new temporary positions (Panzar, Javier and Tony Perry, "More than 700 workers to help with California oil spill cleanup," *Los Angeles Times*, May 22, 2015). The BP Deepwater Horizon spill led to an even larger increase in employment and economic

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to take into an account both the potential losses (and the duration of those losses), but also the potential new opportunities to reach on overall conclusions regarding the economic impact of the incident and the response.

III. CONCLUSION

86. Through my analysis, and that of EFSEC's consultant Cardno, there has been substantial analysis of the potential primary and secondary economic impacts to be expected from the construction and operation of the Project. This analysis has been detailed, comprehensive and has considered both potential positive and negative impacts, therefore providing an assessment of the Project's expected "net" impacts. Thus, in my judgment, TSPT has met the general requirements, as I understand them, for socioeconomic impacts analysis of new energy facilities under Washington statutes.[80]

87. My analysis demonstrates that there are significant economic benefits associated with development of the Project. It has also shown that claims of meaningful negative economic benefits by certain parties, as reflected in the Johnson Economics' comments, are inaccurate or otherwise unsupported.

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

- Attachment A: Curriculum Vitae of Todd Schatzki
- Attachment B: Tables and Figures to this Testimony
- Attachment C: Todd Schatzki and Bruce Strombom, "Assessment of Vancouver Energy Socioeconomic Impacts: Primary Economic Impacts," July 28, 2014 ("Primary Impacts Report")

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activity, with employment of approximately 25,000 workers (Kawamoto, Dawn, "BP Oil Spill Creates a Wave of New Jobs, Takes Others Under", Daily Finance, June 1, 2010).

[80] Washington Administrative Code, 463-60-535.

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- Attachment D: Todd Schatzki and Bruce Strombom, "Assessment of Vancouver Energy Socioeconomic Impacts: Secondary Economic Impacts," September 5, 2014 ("Secondary Impacts Report")
- Attachment E: Todd Schatzki, "Assessment of Vancouver Energy Socioeconomic Impacts: Statistical Analysis of Potential Property Value Impacts from Vancouver Energy" May 13, 2016.

[Signature on the Following Page]

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DATED this 13 day of May, 2016.

Todd Schatzki, Declarant

STATE OF Massachusetts)
)
COUNTY OF Suffolk)

TODD SCHATZKI, being duly sworn upon oath, deposes and says: The foregoing testimony is true, correct, and complete to the best of my knowledge, information, and belief and is given subject to the laws of perjury in the State of Washington.

GIVEN under my hand and official seal this 13 day of May, 2016.

NOTARY PUBLIC in and for the State of:
Massachusetts

Residing at: _____

My Commission Expires: 4/6/23

Katherine A. Barber
Printed Name of Notary:
Katherine A. Barber

KATHERINE A. BARBER
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
April 6, 2023

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ATTACHMENT A

TODD SCHATZKI, Ph.D.
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Dr. Schatzki is an expert in energy and environmental economics and policy, and specializes in the application of microeconomics, econometrics, and data analysis to complex business and policy problems. He has worked with clients on corporate strategy, public policy design, and problems arising in regulation and litigation.

Dr. Schatzki has worked extensively on the design of electricity markets, analysis of wholesale electricity markets, economic analysis of energy and environmental regulations, asset valuation, resource planning and procurement, utility ratemaking and retail electricity markets. He has submitted testimony to both state and federal energy commissions. His research has been supported by organizations such as the Electric Power Research Institute, Edison Electric Institute, Federal Energy Regulatory Commission, and National Association of Regulatory Utility Commissioners. His work has appeared in journals such as the *Journal of Environmental Economics and Management, the Electricity Journal, Public Utilities Fortnightly*, and *AEI-Brooking Joint Center for Regulatory Studies.* He has also provided litigation support in many cases, including several high profile cases involving alleged wholesale electricity price manipulation and the implications of such manipulation for derivative contracts.

Prior to joining Analysis Group, he had research and consulting affiliations with the Harvard Institute for International Development and the International Institute for Applied Systems Analysis (Vienna, Austria), and was an economist at LECG, LLC and National Economic Research Associates.

EDUCATION

1998 Ph.D., Public Policy, Harvard University, Cambridge, MA

Specialized Fields: Microeconomics, econometrics, industrial organization, natural resource and environmental economics

- Doctoral Fellow, Harvard University, Cambridge, MA (1993-1995)
- Crump Fellowship, Harvard University, Cambridge, MA (1995-1996)
- Pre-doctoral Fellow, Harvard Environmental Economics Program

1993 M.C.P., Environmental Policy and Planning (Urban Studies and Planning,), M.I.T., Cambridge, MA

1986 B.A., Physics, Wesleyan University, Middletown, CT

PROFESSIONAL EXPERIENCE

2005-present	Analysis Group, Inc.
2001-2005	LECG, LLC, *Managing Economist*
1998-2001	National Economic Research Associates, Inc., *Senior Consultant*
1997-1998	Harvard Institute for International Development, *Consultant*
1996-1997	Department of Economics, Harvard University, *Teaching Fellow and Research Assistant*
1994	International Institute for Applied Systems Analysis (IIASA)
1992	Toxics Reduction Institute, University of Massachusetts
1987-1991	Tellus Institute, *Research Associate*

SELECTED CASE WORK

Energy

- **ISO New England.** Assessment of framework for evaluating capacity market offers from elective transmission projects for market mitigation.
- **Barclays**. Provide analysis of allegations of manipulation of western U.S. electric power exchange markets.
- **Southwest Power Pool Power Suppliers**. Provides analysis and testimony related to what types of costs are appropriately short run marginal costs and thereby should be incorporated into energy market resource offers.
- **New York Independent System Operator**. Evaluation of capacity market rule changes including a forward market structure and multi-year price lock-in, including quantitative economic analysis of changes in market outcomes under alternative market structures.
- **Ameren Missouri**. Analysis of the economic impact of the Mark Twain Project, a new transmission project designed to support renewable energy requirements and other objectives (using PROMOD)
- **ISO New England.** Assistance to the ISO New England market monitor in the development of a de-list offer model consistent with new market rules.
- **ISO New England.** Assistance in the development of a Winter fuel assurance programs for 2013/14, 2014/15 and 2015/16, including oil inventory, dual fuel, liquefied natural gas and demand response programs
- **Ameren Transmission.** Analysis of the impact of the Multi Value Project No. 16, a new transmission project, on energy market competition in Illinois (using PROMOD).
- **Vancouver Energy**. Assessment of economic impacts of a new energy distribution terminal, including change in economic activity, property value impacts and changes in rail congestion
- **ISO New England.** Assessment of the economic costs associated with winter 2013/2014 reliability programs, including oil inventory, dual fuel, liquefied natural gas and demand response programs
- **ISO New England.** Assessment of and testimony regarding the economic and reliability impacts of proposed capacity market rules introducing new performance incentives

- **ITC Midwest.** Analysis of and testimony regarding the LMP and production cost impacts of new transmission infrastructure (using PROMOD)
- **Entergy.** Evaluation of economic damages associated with an alleged contract breach
- **Ameren Transmission.** Analysis of the impact of the Illinois River Project, a new transmission project, on energy market competition in Illinois (using PROMOD)
- **Dayton Power and Light.** Evaluation of the aggregate benefits created by a proposed rate plan
- **Corporation with distribution companies across multiple jurisdictions.** Regulatory assessment considering current ratemaking models, regulatory environment and alternative ratemaking structures
- **ISO New England.** Assessment of the costs, feasibility and effectiveness of technical options to securing fuel supply for gas-fired generators
- **ISO New England.** Assessment of reliability risks and potential market and regulatory solutions to electric-gas interdependencies
- **Pacific Gas and Electric.** Assessment of ratemaking issues, including cost of capital adjustments, associated with a gas pipeline safety plan
- **Confidential Technology Company.** Analyzed the regional economic impacts of a prototype biofuels production facility at two potential development sites using the IMPLAN model.
- **ISO New England.** Statistical analysis of the performance of resources responding to system contingencies
- **Direct Energy.** Assistance developing regulatory options for promoting retail competition in Pennsylvania, including development of customer service auctions
- **ISO New England.** Assistance developing design enhancements for the region's Forward Reserve Markets
- **Confidential Client.** Analysis of energy and capacity market implications of a potential asset agreement (using GE's Multi-Area Production Simulation Software)
- **Confidential Client.** Analysis of fleet turnover decisions and outcomes (using GE's Multi-Area Production Simulation Software)
- **Confidential Regulated Utility.** Development of a white paper on transmission planning and policy needed to support legislative and regulatory goals for renewable development
- **Commonwealth Edison.** Analysis of appropriate ratemaking tools (cost of equity adjustment) in light of energy efficiency program requirements
- **New England Power Generators Association.** Analysis of impacts of proposed electric power company merger
- **Confidential Technology Company.** Development of a quantitative model of energy savings associated with end-use technological modifications..
- **Confidential Regulated Utility.** Development of a white paper assessing the potential for alternative ratemaking tools to mitigate multiple utility capital, load and service challenges
- **EDF Group.** Analysis of financial and credit implications of the sale of a portion of power generation assets
- **New England States Committee on Electricity.** Technical support and analysis related to design of regulations and wholesale electricity markets to achieve resource adequacy
- **National Grid Utilities.** Assistance developing ratemaking plans including revenue decoupling and associated revenue adjustments

- **NARUC and FERC.** Analysis of "best practices" in state policies for competitive procurement of retail electricity supply
- **New York ISO.** Analysis of single-clearing-price versus pay-as-bid market designs
- **Confidential System Operator.** Analysis of metrics for characterizing the economic value provided by regional transmission organizations
- **TransCanada.** Assessment of regulatory and finance issues involved in fuel adjustment clauses within long-term standard offer service contracts
- **New York ISO.** Analysis of market implications of fuel diversity issues
- **Confidential.** Analysis of alleged exercise and extension of market power in a wholesale electricity market, including statistical analysis of spot and real-time electricity markets and statistical modeling of outages using hazard model methods to examine potential physical withholding
- **Confidential.** Financial and strategic analysis of gas supply contracting alternatives
- **Confidential.** Analysis of value of generating assets using real options analysis
- **Confidential.** Statistical analysis of prices in the spot and forward markets using time-series methods for an energy trading firm in a federal proceeding related to the reasonableness of the terms of certain forward market contracts
- **Confidential.** Financial and strategic analysis of renewable generation technologies

Environment

- **Maxus.** Assessment of reliability of analyses and conclusions reached regarding settlement of claims related to environmental contamination.
- **ExxonMobil**. Assessment of methods for valuation of environmental contamination.
- **Chevron.** Development of a white paper on post-2020 climate policy for California
- **American Petroleum Institute.** Assessment of issues related to the impact of changes to National Ambient Air Quality Standard Requirements on oil and gas exploration and production
- **Greater Boston Real Estate Board.** Development of a white paper on mandatory building energy labeling/benchmarking policies
- **Little Hoover Commission.** Analysis of the economic and environmental consequences of a local climate policy plan implemented in the context of a state-wide cap-and-trade system
- **Exelon.** Analysis of the economic and market consequences of EPA's Clean Air Transport Rule
- **Chevron.** Assessment of lessons learned from Federal requirements for regulatory review for the potential development of state requirements
- **Western States Petroleum Association and Chevron.** Regulatory support and analysis related to climate policy in California, including submission of various comments and reports to the Air Resources Board
- **Honeywell.** Analysis of proposed limits on HFC consumption under domestic climate policy
- **Electric Power Research Institute.** Analysis of three 2006 studies on the economic impact of meeting the California carbon emissions reduction targets (in the California Global Warming Solutions Act of 2006)

- **Confidential.** Assessment of various policy issues in the design of national climate change policies, including market-based policies, approaches to cost containment, offset projects, and non-CO_2 GHGs
- **Confidential.** Quantitative analysis of the impacts for technology, consumers and asset owners of a market-based domestic climate policy
- **Toyota.** Analysis of the economic value of emissions for a major auto manufacturer associated with alleged non-compliance with emissions control requirements
- **Barajas Airport.** Evaluated the regional economic impacts of runway expansions at the Barajas airport in Spain.

Finance and Commercial Damages

- Analysis of financial and credit implications of the sale of a portion of power generation assets
- Analysis of bond pricing, transactions and holdings related to default of sovereign bonds
- Analysis of transfers between financial institutions within credit card networks
- Analysis of the impact of product taxes on firm market shares related to determination of payments under a settlement agreement
- Analysis of damages related to breached contract and appropriation of trade secrets in the development of a pharmaceutical product
- Analysis of damages from breach of commodity swap contract (petroleum)
- Analysis of allegations regarding mutual fund day trading, including analysis of trading patterns and calculation of dilution

Antitrust

- Estimation of damages associated with an alleged monopolization and foreclosure resulting from a distribution agreement (retail consumer products)
- In a price-fixing case across multiple markets in the pharmaceutical industry, estimated overcharges and cartel periods based on a time-series analysis of price data
- Analysis of multiple antitrust claims (including foreclosure, monopolization, and vertical restraints) related to an alleged collusive distribution arrangement (retail consumer product)
- Analysis of alleged tying of aftermarket products and the provision of service, including evaluation of the alleged tie, competitive effects, and damages (office systems)
- Analysis of liability, timing, geographic scope, and damages issues for a petrochemical company facing potential price-fixing charges by DOJ and private parties
- Analysis of tying, monopolization, and patent abuse claims involving a patent licensing scheme for process and instrument patents (scientific equipment)
- Analysis of foreclosure, attempted monopolization of innovation markets, and damages claims arising from the termination of an investment/licensing agreement (medical devices)
- Estimation of damages related to alleged invalid patents and tying of products to patent rights associated with a process patent (scientific equipment)

ARTICLES AND PAPERS

"Beyond AB 32: Post-2020 Climate Policy for California" (with Robert N. Stavins), Regulatory Policy Program, Mossavar-Rahmani Center for Business and Government, Harvard Kennedy School, January 2014.

"Three Lingering Design Issues Affecting Market Performance in California's GHG Cap-and-Trade Program" (with Robert N. Stavins), Regulatory Policy Program, Mossavar-Rahmani Center for Business and Government, Harvard Kennedy School, January 2013.

"Using the Value of Allowances from California's GHG Cap-and-Trade System" (with Robert N. Stavins), Regulatory Policy Program, Mossavar-Rahmani Center for Business and Government, Harvard Kennedy School, August 27, 2012.

"Implications of Policy Interactions for California's Climate Policy" (with Robert N. Stavins), Regulatory Policy Program, Mossavar-Rahmani Center for Business and Government, Harvard Kennedy School, August 27, 2012.

"The Interdependence of Electricity and Natural Gas: Current Factors and Future Prospects," (with Paul Hibbard), *The Electricity Journal*, May 2012.

"California's Cap-and-Trade Decisions," Forbes.com, August 19, 2010.

"Competitive Procurement of Retail Electricity Supply: Recent Trends in State Policies and Utility Practices," (with Susan F. Tierney), *The Electricity Journal*, March 2009.

"Pay-as-Bid vs. Uniform Pricing: Discriminatory Auctions Promote Strategic Bidding and Market Manipulation" (with Susan F. Tierney and Rana Mukerji), *Public Utilities Fortnightly*, March 2008.

"Free Greenhouse Gas Cuts: Too Good to Be True?" (with Judson Jaffe and Robert Stavins) VoxEU.org, January 3, 2008.

"Too Good to Be True? An Examination of Three Economic Assessments of California Climate Change Policy" (with Robert N. Stavins and Judson Jaffe), AEI-Brookings Joint Center for Regulatory Studies, Related Publication 07-01. Jan 2007.

"Options, Uncertainty and Sunk Costs: An Empirical Analysis of Land Use," Journal of Environmental Economics and Management, Vol. 46, p. 86-105, 2003.

"The database on the economics and management of endangered species (DEMES)," (with David Cash, Andrew Metrick, and Martin Weitzman) in *Protecting Endangered Species in the United States: Biological Needs, Political Realities, Economic Choices*. Cambridge University Press, 2001

"The Issue of Climate," *Fundamentals of the Global Power Industry, Petroleum Economist, 2000.*

Review of "Sustainable Cities: Urbanization and the Environment in International Perspective," *Environmental Impact Assessment Review*, (Vol. 12, No, 4), 1993.

"Bottle Bills and Municipal Recycling," *Resource Recycling*, June 1991.

WORKING PAPERS

"Quality *and* Quantity: Alternatives for Addressing Reliability Concerns from Shifting Resource Mixes," June 23, 2014.

"Reliability and Resource Performance," May 16, 2012.

"Can Cost Containment Raise Costs? Allowance Reserves in Practice," March 2012.

Schatzki, Todd, Paul Hibbard, Pavel Darling and Bentley Clinton, Generation Fleet Turnover in New England: Modeling Energy Market Impacts, June, 2011.

"A Hazard Rate Analysis of Mirant's Generating Plant Outages in California," with William Hogan and Scott Harvey. Presented at the IDEI Conference on Competition and Coordination in the Electricity Sector, Toulouse, France, January 16-17, 2004.

"Estimating Structural Change in Industries with Application to Cartels," June 2003.

"The Pollution Control and Management Response of Thai Firms to Formal and Informal Regulation," (with Theodore Panayotou) draft, 1999.

"Differential Industry Response to Formal and Informal Environmental Regulations in Newly Industrializing Economies: The Case of Thailand," (with Theodore Panayotou and Qwanruedee Limvorapitak), Harvard Institute for International Development 1997 Asia Environmental Economics Policy Seminar, Bangkok, Thailand, February 1997.

"The Effects of Uncertainty on Landowner Conversion Decisions," John F. Kennedy School of Government, Center for Science and International Affairs, Environment and Natural Resources Program, Discussion Paper 95-14, December 1995.

SELECTED PRESENTATIONS

"Evaluating Carbon Risk Measures Under Policy Uncertainty," Workshop, EUCI U.S./Canada Cross-Border Power Summit, March 14-15, 2016.

"Implications of Policy Initiatives for Wholesale Markets," moderator of panel discussion, Northeast Energy and Commerce Association, Power Markets Conference, November 17, 2015.

"Capacity Performance (and Incentive) Reform" and "Out of Market Actions," EUCI Conference: Capacity Markets: Gauging Their Real Impact on Resource Development & Reliability, August 31-September 1, 2015.

"California Climate Goals for 2030 to 2050," California Council on Environmental and Economic Balance, Summer Issues Seminar, July 14, 2015.

"Local and Regional Climate Protection Efforts," California Council on Environmental and Economic Balance, Summer Issues Seminar, July 14, 2015.

"Current Regional Transmission Planning and Issues in New England," Law Seminar International Transmission in the Northeast, March 19, 2015.

"Stakeholder Assessment and Outlook for the Markets," Power Markets Conference, Northeast Energy and Commerce Association, October 20, 2014.

"Market Changes to Promote Fuel Adequacy – Capacity Markets to Promote Fuel Adequacy," moderator of panel discussion, Northeast Energy Summit 2014, September 17-19, 2014.

"Quality *and* Quantity: Alternatives for Addressing Reliability Concerns from Shifting Resource Mixes," Center for Research In Regulated Industries 27th Annual Western Conference June 26, 2014.

"Climate Policy Choices – RPS, Cap-and-Trade & the Implications for Actions (and Exits) that Affect Emissions," Electric Utilities Environmental Conference, February 4, 2014.

"Multiple Dimensions of Gas-Electric Coordination Concerns," Electric Utilities Environmental Conference, February 3, 2014.

"The Economics of Cap-and-Trade in the California Power Markets," EUCI Conference, California Carbon Policy Impacts on Western Power Markets, January 27, 2014.

"An Economic Perspective on Building Labeling Policies," Greater Boston Real Estate Board, April 26, 2013.

"Market-Based Policies to Address Climate Change," Sustainable Middlesex, May 4, 2013.

"Market Forces and Prospects/Economic Ripple Effects, 5-10 Years Ahead," Air & Waste Management Association, New England Section, October 12, 2012.

"Gas and Electric Coordination: Is It Needed? If So, To What End?" Harvard Electric Policy Group, Cambridge, MA, October 11, 2012.

"Reliability and Resource Performance," Center for Research In Regulated Industries 31st Annual Eastern Conference May 16, 2012.

"Can Cost Containment Raise Costs? Allowance Reserves in Practice," International Industrial Organization Conference, Boston, MA, April 9, 2011.

"Ratemaking Mechanisms/Tools as Carrots for Achieving Desirable Regulatory Outcomes," Conference on Electric Utility Rate Cases, Law Seminars International, Boston, Massachusetts, November 9, 2010.

"Evolving Issues in Revenue Decoupling: Designs for an Era of Rising Costs," Center for Research In Regulated Industries 29th Annual Eastern Conference May 19, 2010.

"Aligning Interest with Duty: Revenue Decoupling as a Key Element of Accomplishing Energy Efficiency Goals," National Conference of State Legislatures, Fall Forum, December 8, 2009.

"Federal Proposals to Limit Carbon Emissions and How They Would Affect Market Structures – Regional Trading Programs' Futures in Light of New Federal Interest in Reducing GHG Emissions," Energy in California, Law Seminars International, San Francisco, California, September 15, 2009.

"Current Market, Technology and Regulatory Risks: Impact on Investment and Implications for Policy", Utility Rate Case, Issues and Strategy 2009, Law Seminars International, Las Vegas, Nevada, February 9, 2009.

"An Economic Perspective on the Benefits of Going Green," Harvard Electricity Policy Group, Atlanta, Georgia, December 11-12, 2008.

"Implications of Current Regulatory, Technology and Market Risks," Energy in California, Law Seminars International, San Francisco, California, September 22-23, 2008.

"Competitive Procurement of Retail Electricity Supply: Recent Trends in State Policies and Utility Practices," National Association of Regulatory Utility Commissioners Summer Committee Meetings, Portland, Oregon, July 20, 2008.

"Too Good to Be True? An Examination of Three Economic Assessments of California Climate Change Policy, Key Findings and Lessons Learned," POWER Research Conference on Electricity Markets and Regulation, University of California at Berkeley, March 21, 2008.

"Preliminary Findings: Study of Model State and Utility Practices for Competitive Procurement of Retail Electric Supply," National Association of Regulatory Utility Commissioners Annual Meeting, Washington, D.C., February 17, 2008.

"The ABC's of California's AB 32: Issues and Analysis, Cost Analyses and Policy Design" Environmental Market Association Webinar, April 12, 2007.

SELECTED CONSULTING REPORTS

NYISO Capacity Market: Evaluation of Options, (with Hibbard, P., Aubuchon, C., and Wu, C.), Prepared for the New York Independent System Operator, May 2015.

Assessment of the Impact of ISO-NE's Proposed Forward Capacity Market Performance Incentives (with Paul Hibbard), prepared for ISO New England, September 2013.

LMP Impacts of Proposed Minnesota-Iowa 345 kV Transmission Project: Supplemental Analysis, with Rodney Frame and Pavel Darling, Appendix M, ITC Midwest LLC, Application to the Minnesota Public Utilities Commission for a Certificate of Need, Docket No. ET6675/CN-12-1053, April 9, 2013.

LMP Impacts of Proposed Minnesota-Iowa 345 kV Transmission Project, with Rodney Frame and Pavel Darling, Appendix M, ITC Midwest LLC, Application to the Minnesota Public Utilities Commission for a Certificate of Need, Docket No. ET6675/CN-12-1053, March 22, 2013.

Analysis of Reserve Resources: Activation Response following Contingency Events, prepared for ISO New England, May 29, 2012.

Economic and Environmental Implications of Allowance Benchmark Choices (with Robert N. Stavins), prepared for the Western States Petroleum Association, October 2011.

Next Steps for California Climate Policy II: Moving Ahead under Uncertain Circumstances (with Robert N. Stavins), prepared for the Western States Petroleum Association, April 2010.

Options for Addressing Leakage in California's Climate Policy (with Jonathan Borck and Robert N. Stavins), prepared for the Western States Petroleum Association, February 2010.

Addressing Environmental Justice Concerns in the Design of California's Climate Policy (with Robert N. Stavins), prepared for the Western States Petroleum Association and the AB 32 Implementation Group, November 2009.

Next Steps for California with Federal Cap-and-Trade Policy On the Horizon (with Robert N. Stavins and Jonathan Borck), prepared for the Western States Petroleum Association, July 2009.

Evolving GHG Trading Systems Outside Its Borders: How Should California Respond? (with Robert N. Stavins and Jonathan Borck), prepared for the Western States Petroleum Association, July 2009.

Competitive Procurement of Retail Electricity Supply: Recent Trends in State Policies and Utility Practices, (with Susan Tierney) prepared for the National Association of Regulatory Utility Commissioners in collaboration with the Federal Energy Regulatory Commission, July 2008.

Uniform Pricing versus Pay-as-bid: Does it Make a Difference?, (with Susan Tierney and Rana Mukerji) prepared for the New York Independent System Operator, March 2008.

Prospects for the U.S. Nuclear Industry, (co-author), prepared for a major Japanese electric power company, January 2001.

Costs and Benefits of Fish Protection Alternatives at Mercer Generating Station, (with David Harrison and Michael Lovenheim), prepared for Public Service Enterprise Group, September 2000.

Economic Evaluation of EPA's Proposed Rules for Cooling Water Intake Structures for New Facilities, (with David Harrison) prepared for the Utility Water Act Group, November 2000.

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ATTACHMENT B

Figure 1

Timeline of Construction and Annual Operations for the Project

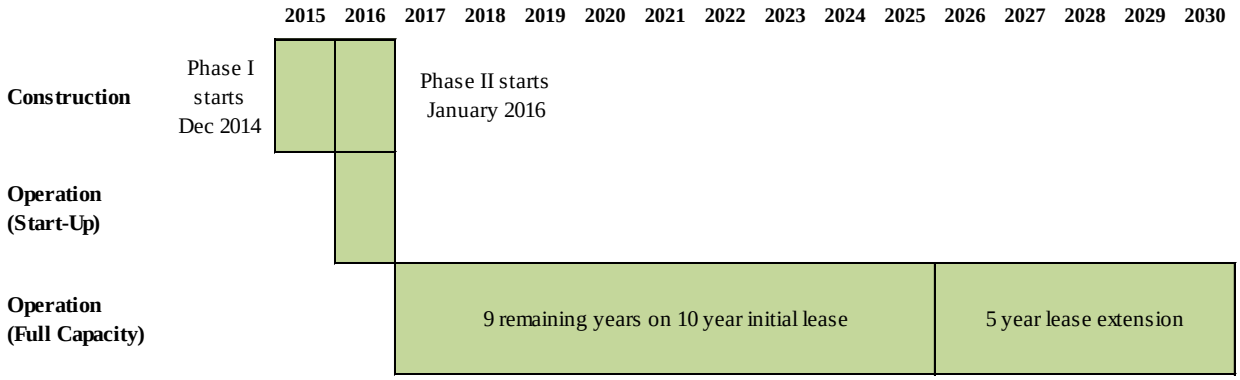


Table 1

Summary of Annual Direct Operations Employment at the Project

Phase I Construction

Description	Onsite	Offsite	Total
Steel erecting	32	-	32
Laborers	53	10	63
Mechanical & piping	50	15	65
Equipment operators	25	4	29
Tank erectors	40	10	50
Electrical	25	20	45
Concrete	25	20	45
Ground improvements/pilling	22	10	32
Dock seismic upgrades	20	10	30
Fire system installation	6	10	16
Total number of workers employed	298	109	407
Total full-time jobs (given 50% average on-site)	149	55	204
Additional permitting and engineering support	-	35	35
Total (full-time jobs)	149	90	239

Note: Employment figures reflect full-time jobs or their equivalent. Facility construction would result in 298 on-site positions, although it is assumed that only 50 percent would be employed at any given time. Consequently, on-site employment levels would be comparable to 149 full-time on-site positions. Facility construction would also result in 109 off-site positions, with 50 percent active at any given time, resulting in the equivalent of 55 full-time positions.

EX 0155-TSS

Table 2

Summary of IMPLAN Inputs for Annual Operations at the Project

Description	IMPLAN Activity Type(s)	IMPLAN Sector(s)	Start-up (2014 dollars, annually)	Full Build-out (2014 dollars, annually)
General Operating Expenses	Labor Income, Commodity Change	3032, 3033, 3326, 3327, 3329, 3351, 3367, 3369, 3382, 3413, 5001	$25.06 million	$52.07 million
Property Tax	Commodity Change	3437 & 3438 (50/50 split)	$2.31 million	$2.31 million
Port of Vancouver Lease/Fees	Commodity Change	See report text	$19.17 million	$44.86 million
Total Operations			**$46.54 million**	**$99.24 million**

Table 3

Summary of Annual Direct On-Site Operations Employment at Project

Description	Start-up Employment	Full Build-out Employment
Marine (dock, vessel securement, etc.)	16	19
Rail (engineers, switchmen, inspectors, etc.)	20	40
Transload (transloaders, tanks farm, trainers, etc.)	30	79
Safety Health Environment & Maintenance (mechanics, maintenance, EHS, etc.)	9	13
Office/Management (managers, coordinators, supervisors, etc.)	16	25
Total Operations	**91**	**176**

Note: Employment figures reflect full-time jobs or their equivalent. Table 3 includes direct on-site employment, while Table 4 includes both direct on-site employment and direct off-site employment, including activities resulting from the Project's operations and leases/fees paid to the Port of Vancouver.

Table 4
Summary of IMPLAN Results
Construction and Annual Operations at the Project, 2015-2030

	Direct Impacts			Total Impacts (Direct, Indirect and Induced)		
	Total Employment (Full-time Jobs)	Labor Income ($ millions)	Economic Value Added ($ millions)	Total Employment (Full-time Jobs)	Labor Income ($ millions)	Economic Value Added ($ millions)
Construction						
Phase I	239	$23.3	$23.3	1,031	$62.6	$89.6
Phase II	81	$8.1	$8.1	398	$24.2	$35.2
Total for Phase I and II	320	$31.4	$31.4	1,429	$86.8	$124.8
Operations (Annual)						
Start-up (2016 only)	302	$33.5	$35.7	519	$44.1	$55.5
Full Build-out (2017-2030)[1]	616	$67 - $88	$73 - $95	1,081	$90 - $118	$116 - $151
Construction and Operations Total over 16 year lifespan	**9,245**	**$1,144**	**$1,239**	**17,082**	**$1,581**	**$2,042**
Net Present Value over 16 year lifespan	**n/a**	**$634**	**$686**	**n/a**	**$892**	**$1,156**

Note: Labor income and economic value added grow over the Project's 2017-2030 lifespan due to inflation.

Figure 2
Summary of IMPLAN Results - Employment
Construction and Annual Operations at the Project, 2015-2030

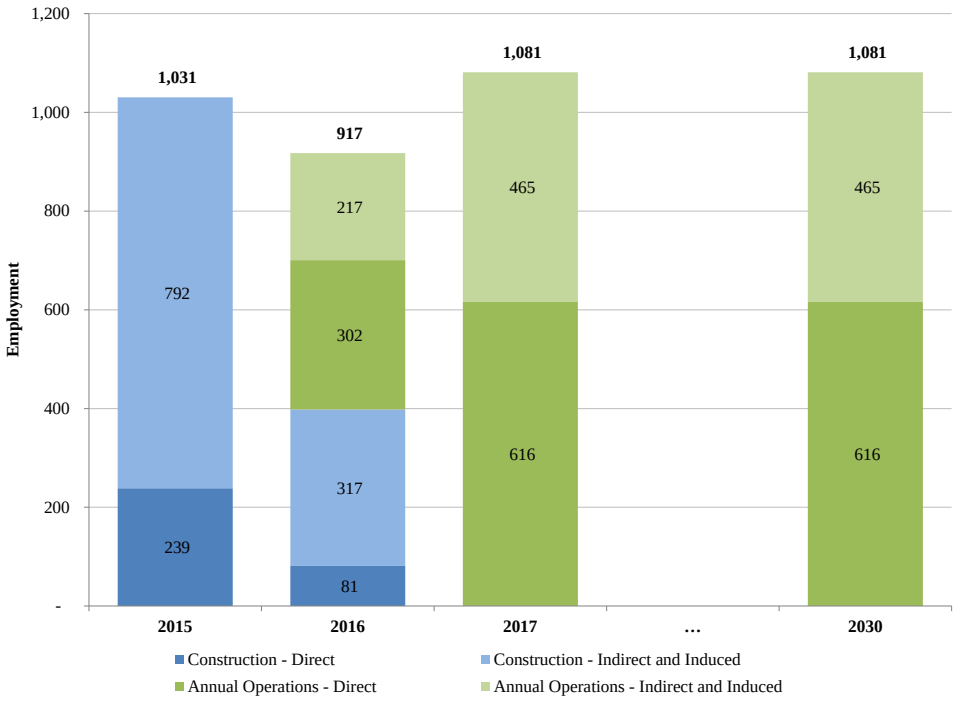
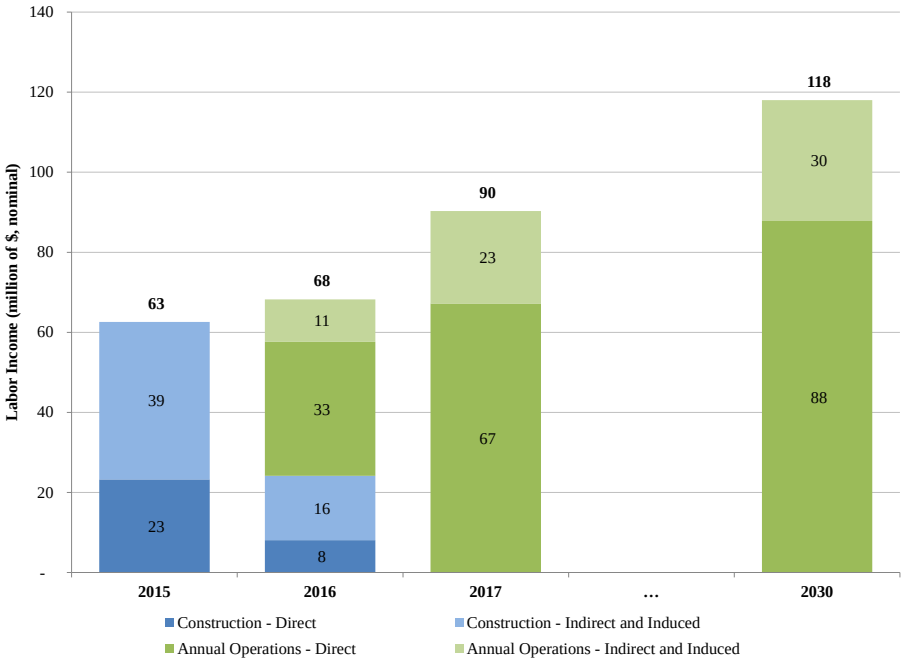
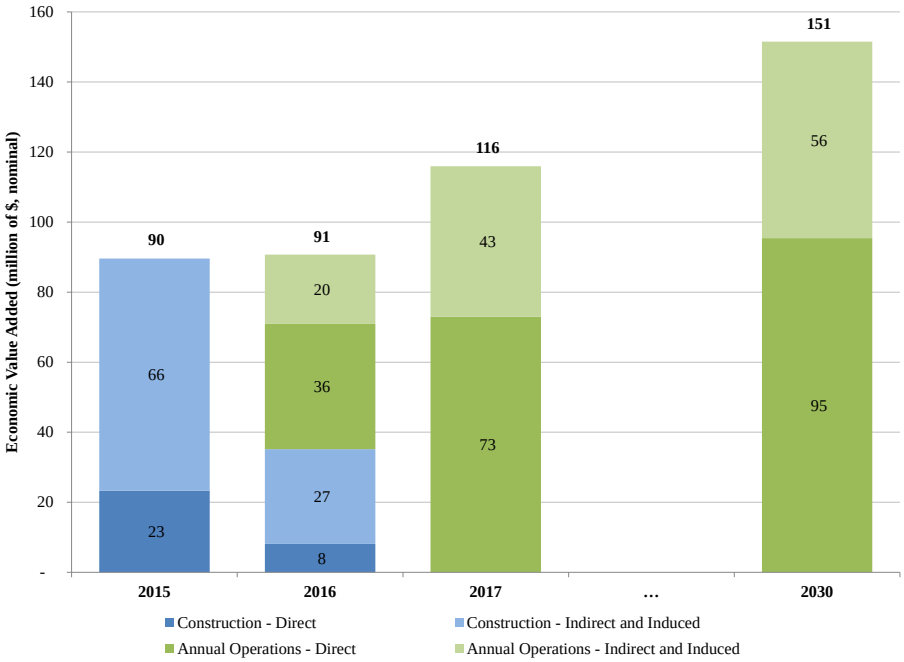


Figure 3
Summary of IMPLAN Results - Labor Income
Construction and Annual Operations at the Project, 2015-2030



Note: Values shown represent nominal values and grow between 2017 and 2030 due to inflation.

Figure 4
Summary of IMPLAN Results – Economic Value Added
Construction and Annual Operations at the Project, 2015-2030



Note: Values shown represent nominal values and grow between 2017 and 2030 due to inflation.

Table 5

Summary of Tax Impacts

Construction and Annual Operations at the Project

	Construction (Phase I and II)	Annual Operations (Start-Up)	Annual Operations (Full Build-Out)
Sales Tax	$17,640,000	$1,497,657	$3,225,410
B&O Tax	$989,100	See note 2	See note 2
Property Tax (Terminal)	n/a	$2,317,898	$2,317,898
Property Tax (non-Terminal)	$2,572,557	$752,269	$1,638,342
Other Taxes	$947,474	$313,830	$682,393
Total	$22,149,131	$4,881,654	$7,864,043

Notes: Further details are available in the Primary Impacts Report.

Table 6: Estimates of Percent Change in Single-Family Residential Property Values from Assumed Incremental Project Traffic (4 Trains per Day) Based on Futch (2011)

	Baseline	With Additional Explanatory Variables	Pre-"Market Crash" Sales Only
0 - 1/3 mi. from Corridor	-0.85% ***	-0.93% ***	-1.49% ***
1/3 - 2/3 mi. from Corridor	-0.69% ***	-0.59% ***	-0.62% **
2/3 - 1 mi. from Corridor	-0.37% **	-0.34% *	-0.67% ***

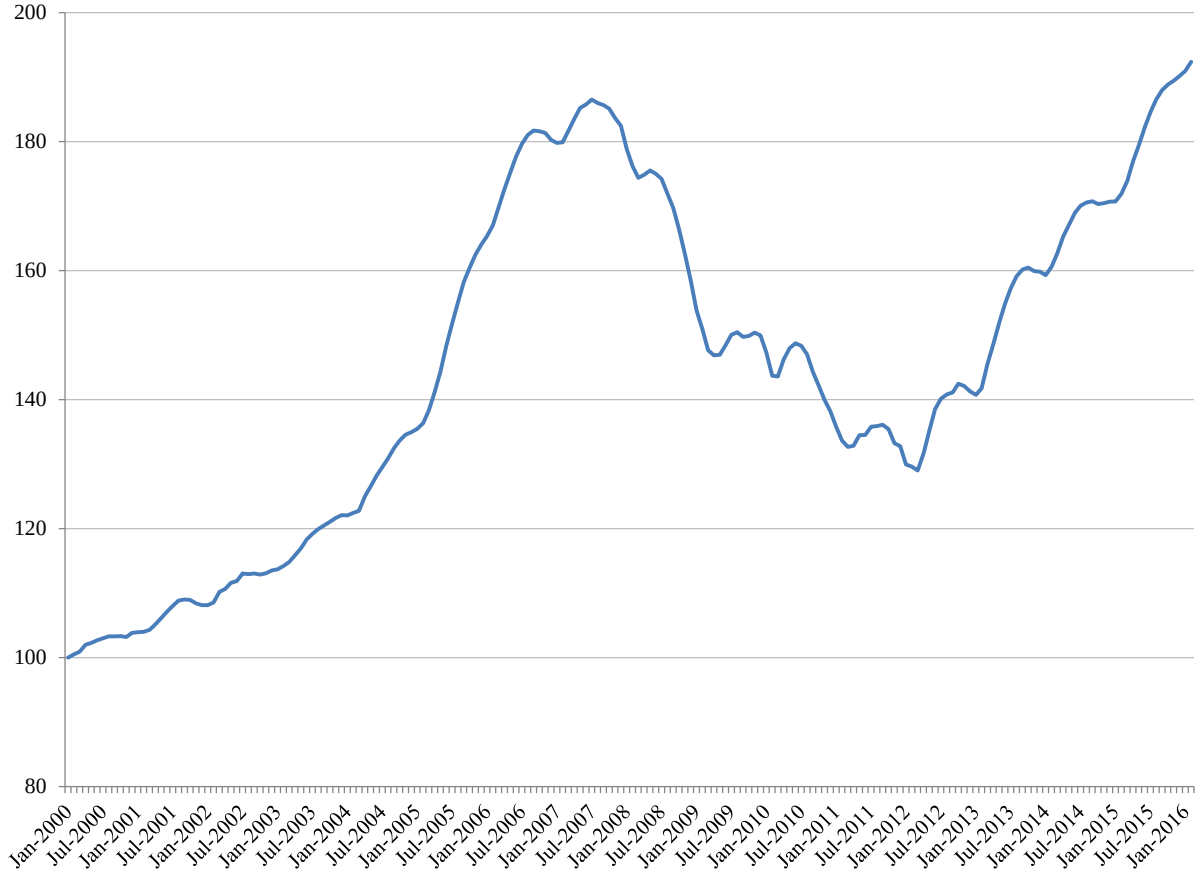
Note: * significant at 10% level; ** significant at 5% level; *** significant at 1% level. Estimates reflect per ton-mile impacts as estimated by Futch, which are translated into per rail car impacts based on average rail car weight. Project impacts reflect assumed incremental traffic, given these per rail car impacts. Results are reported for three specifications: a baseline specification, a specification with additional explanatory variables (e.g., geographic zones, seasons and house characteristics), and a specification excluding transactions after the 2006-2007 "market crash" in housing prices. Average values reflect the unweighted average of the three model estimates. Among the models estimated, the "with additional explanatory variables" specification has the greatest explanatory power. Reported estimates reflect (1) the specification that allows for asymmetric marginal effects for increases and decreases in rail traffic and (2) the sample that includes the construction period. Futch (2011).

Table 7: Estimates of Percent Change in Single-Family Residential Property Values from Assumed Incremental Project Traffic (4 Trains per Day) Based on Simons and El Jaouhari (2004)

	Property Size		
Distance from Rail Line	**Small**	**Medium**	**Large**
Less than 250 feet	-0.85% **	-1.07% **	-0.76%
250 to 500 feet	-0.37% **	-0.44%	-0.01%
500 to 750 feet	-0.41% ***	-0.29%	0.00%

Note: ** significant at 5% level; *** significant at 1% level.

Figure 5: S&P/Case-Shiller Portland, Oregon Home Price Index



Source: S&P Dow Jones Indices LLC.

Table 8: Independent Variables in Housing Price Regression Model

Variable Category	Specific Variables
Housing characteristics	• Year built • Number of bathrooms • Number of bedrooms • Finished square footage • Lot square footage • Cooling system (central, wall or none)
Transaction timing	• Year fixed effects • Month fixed effects • Year-month fixed effects
Housing location	• Zip code fixed effects • Census tract fixed effects
Distance From Rail	• Continuous distance measure (log and quadratic) • Distance Bandwidths: < 250 feet; 250 to 1,000 feet; 1,000 feet to one-half mile; and one-half to one mile
Time Period After Announcement	• Quarterly variables • Monthly variable

Table 9
Impact of Proximity to Rail on Property Values, Distance Bandwidths
Change in Impact After the Vancouver Energy Announcement

Proximity to Rail	Percent Impact	Change in Percent Impact After Announcement
1/2 mile to 1 mile from rail	4.31%***	0.65%
1000ft to <1/2 mile from rail	5.36%***	2.41%
250ft to <1000ft from rail	2.69%	-1.47%
< 250ft from rail	-4.56%	4.65%

Notes:

[1] Measure of statistical significance: *** = at 1% level; ** = at 5% level: * = at 10% level;

[2] The net Percent Impact after the announcement reflects that sum of the (1) Percent Impact and (2) Change in Percent Impact After Announcement. For example, the net impact after the announcement for properties less than 250 feet from the rail is +0.11% (= -4.46% + 4.57%).

[2] Estimates control for house characteristics, location (zip codes) and time of sale (year-month dummy variables).

Sources: Realty Trac, ArcGIS

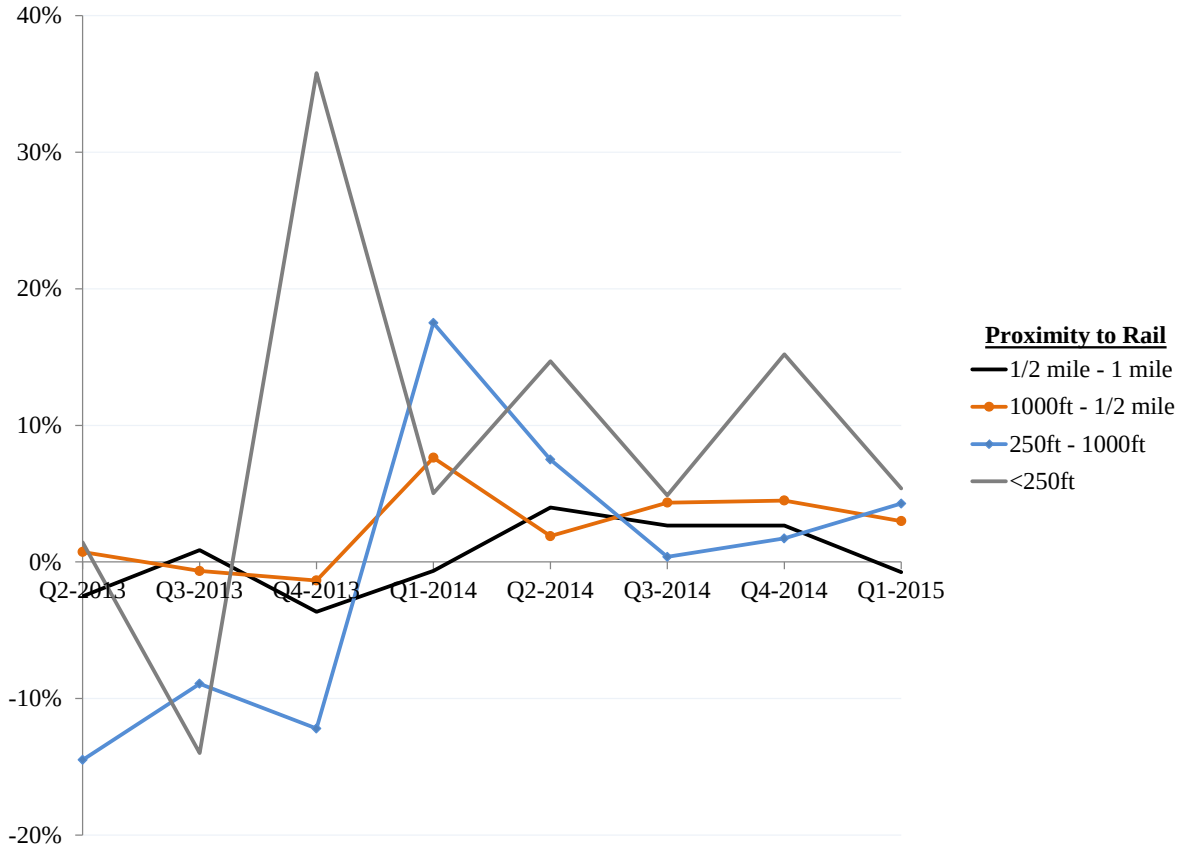
Table 10
Impact of Proximity to Rail on Property Values
Impact as a Function of Continuous Distance
Change in Impact After the Vancouver Energy Announcement

	Percent Impact	Change in Percent Impact After Announcement
Quadratic		
Kilometers from rail	0.0000311	-0.00157
Kilometers from rail (squared)	-0.0000956	-0.0000291
Logarithmic		
Log(kilometers from rail)	-0.00286	-0.00584

Notes: [1] Measure of statistical significance: *** = at 1% level; ** = at 5% level: * = at 10% level; [2] Estimates control for house characteristics, location (zip codes) and time of sale (year-month dummy variables).

Sources: Realty Trac, ArcGIS

Figure 6
Change in Impact to Property Value from Proximity to Rail
By Quarter Since the Announcement



Note: The estimates reflect the change in the impact of proximity to the rail in each quarter after the announcement of the Vancouver Energy project as compared to the pre-announcement impact of proximity to the rail. For example, in Q1 2015, properties within 250 of the rail sold at a premium (on average, all else equal) of 5.4 percent relative to the discount/premium of proximity to the rail prior to the announcement, which was -5.6 percent (as estimated in this specification).

Table 11: Estimates of Delay Costs Associated with Increased Rail Traffic

Select Locations within Vancouver

	Intersection Characteristics			Volume per Delay		Annual Costs	
	Additional Trains	Average Vehicles	% Trucks	Cars	Trucks	All Vehicles	Business Travel
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Vancouver, Washington:							
Hill Street	4	100	4%	0.2	0.0	$154	$24
Beach Drive	4	342	1%	0.9	0.0	$511	$52
11th Street	4	1,000	5%	2.4	0.1	$1,552	$265
Ind St W 16th St	4	4,400	5%	10.6	0.6	$6,827	$1,164
SE 139th St	4	1,250	1%	3.1	0.0	$1,867	$191
SE 147th Ave	4	300	1%	0.8	0.0	$448	$46
Total						$11,359	$1,741

Notes and sources: see Secondary Impacts Report.

Table 12: Estimates of Delay Costs Associated with Increased Rail Traffic

Select Locations Outside Vancouver

	Intersection Characteristics			Volume per Delay		Annual Costs	
	Additional Trains	Average Vehicles	% Trucks	Cars	Trucks	All Vehicles	Business Travel
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Bingen, Washington:							
Maple St	4	330	12%	0.7	0.1	$545	$152
Spokane,[9] Washington:							
East of Spokane							
N Park Rd	8	6,682	9%	15.4	1.5	$21,508	$5,032
N Vista Rd	8	2,185	9%	5.0	0.5	$7,033	$1,645
N University Rd	8	2,662	9%	6.1	0.6	$8,569	$2,005
N Pines Rd	8	11,000	7%	26.0	2.0	$34,772	$7,052
N Evergreen Rd	8	1,258	9%	2.9	0.3	$4,049	$947
N Flora Rd	8	362	9%	0.8	0.1	$1,165	$273
N Barker Rd	8	1,258	9%	2.9	0.3	$4,049	$947
Southwest of Spokane							
S Scribner Rd	8	37	11%	0.1	0.0	$121	$32
W Anderson Rd	8	90	11%	0.2	0.0	$295	$78
Pine St	8	480	5%	1.2	0.1	$1,490	$254
F Cheney Spa Rd	8	2,300	5%	5.5	0.3	$7,138	$1,217
Cheney-Plaza Rd	8	670	5%	1.6	0.1	$2,079	$355
Total						$92,269	$19,837

Notes and sources: see Secondary Impacts Report.

Table 13

Estimated Real Market Value and Annual Tax Impact, Vancouver Energy

Study	Geographic Range	Average Effect Over Range	Real Market Value Impact ($ Million)	Annual Tax Impact ($000s)
Futch	1 Mile	-0.65%	-65.57	-801.8
Simons and El Jaouhari - 1996	1/3 Mile	0.00%	0.00	0.0
Simons and El Jaouhari - 1999	1/3 Mile	-0.30%	-12.79	-146.1

Note: Estimates reflect market values for properties within one mile of the rail line in Clark County as estimated by Johnson Economics. Effects are based on estimated effects from Futch, and Simons and El Jaouhari. Conservative assumptions are used to translate estimated effects from the hedonic studies to the aggregate property values estimated by Johnson Economics for properties within one-third of a mile of the rail, and properties from one-third to one mile from the rail.

ATTACHMENT C

Assessment of Vancouver Energy Socioeconomic Impacts:

Primary Economic Impacts

Analysis Group, Inc.

July 28, 2014

EX 0156-TSS

Assessment of Vancouver Energy Socioeconomic Impacts: Primary Economic Impacts

Executive Summary

Todd Schatzki and Bruce Strombom[1]

July 2014

The proposed Vancouver Energy project ("the Project") would provide Clark County and the neighboring region with new economic benefits, including increases in labor employment and income, opportunities for local business and tax revenues. Quantitative estimates of these impacts were developed using the IMPLAN model, a widely-used economic model grounded in data developed by the U.S. Commerce Department's Bureau of Economic Analysis. The estimates reflect not only the direct economic impact of the Project's construction and operations, but also the "indirect" spillover effects as the Project's economic activity ripples through the economy and the "induced" effects as income earned by workers at the Project (and other workers indirectly supporting the Project) is spent in the economy.

Our analysis finds that the development of the Vancouver Energy project would lead to increases in employment, labor income and tax revenues. Our results are summarized in Table ES-1 and Figure ES-1, and further details on assumptions, methods and results are provided in our full report. We find that over the Project's sixteen year assumed life-time, reflecting both construction and operations, over 1,000 jobs annually would be generated by the Project, on average. This aggregate impact reflects the combined effect of activity at the Project, regional activity to support its operations, and the indirect and induced impacts that occur as this spending ripples through the regional economy. These aggregate employment impacts are driven by direct employment impacts from the Project, including 239 jobs during the one-year Phase I construction period, 162 jobs for the six-month Phase II construction period, 302 jobs annually from on- and off-site Project operations during the one-year start-up period, and 616 on- and off-site jobs annually for each of the remaining 15 years of the assumed operational period studied. These impacts represent "full time" jobs or their equivalent.[2] To the extent that actual operations were shorter or longer than this assumed operational period, economic impacts would be proportionately smaller or larger.

This new employment would lead to significant new labor income, which is expected to total nearly $1.6 billion in labor income ($890 million on a present value basis) over the 16 year construction and operation period. Similarly, economic value added, reflecting labor income, property, sales and other

[1] Dr. Strombom is a Managing Principal and Dr. Schatzki is a Vice President at Analysis Group. The report was conducted on behalf of Tesoro Savage Petroleum Terminal LLC, but the opinions expressed are exclusively those of the authors. To request further information or provide comments, Dr. Schatzki can be reached at: tschatzki@analysisgroup.com .

[2] Job impacts are measured in "full-time" positions, which could reflect full-time jobs or an equivalent quantity of part-time jobs (e.g., two half-time jobs being equivalent to one full-time job).

production taxes, and returns to local business, is expected to total over an additional $2.0 billion ($1.2 billion on a present value basis) to Clark County and the surrounding area.

The Project would also provide additional tax revenues to local and state government resulting from income and other profits taxes. In total, the Project is expected to have a one-time tax impact of over $22 million to state and local government during Project construction, and an annual impact of over $7.8 million once the Project is operating at full capacity.

Table ES-1

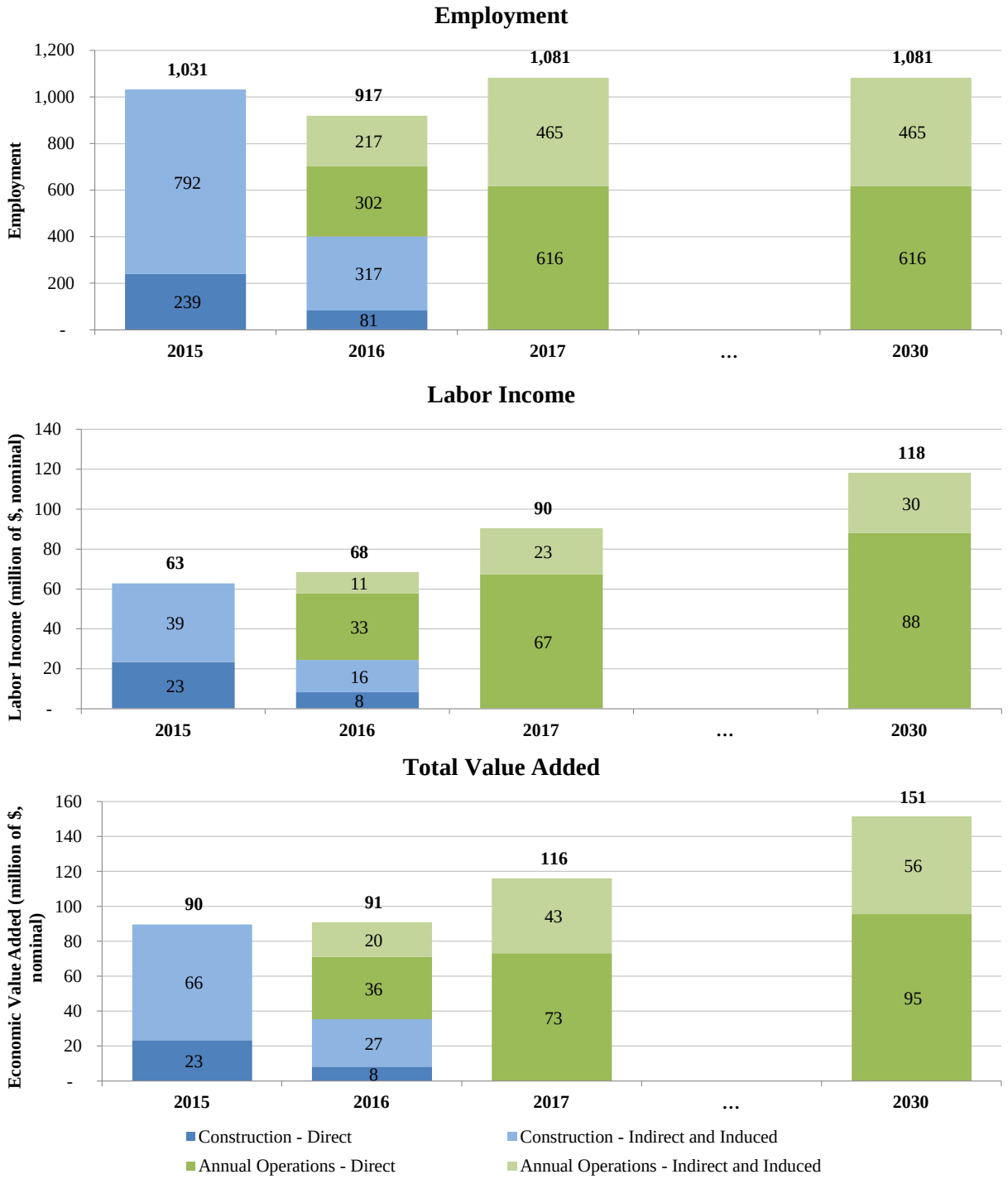
Summary of Estimated Annual Economic Impacts from the Vancouver Energy Project

	Direct Impacts			Total Impacts (Direct, Indirect and Induced)		
	Total Employment (Full-time Jobs)	Labor Income ($ millions)	Economic Value Added ($ millions)	Total Employment (Full-time Jobs)	Labor Income ($ millions)	Economic Value Added ($ millions)
Construction						
Phase I	239	$23.3	$23.3	1,031	$62.6	$89.6
Phase II	81	$8.1	$8.1	398	$24.2	$35.2
Total for Phase I and II	320	$31.4	$31.4	1,429	$86.8	$124.8
Operations (Annual)						
Start-up (2016 only)	302	$33.5	$35.7	519	$44.1	$55.5
Full Build-out (2017-2030)[1]	616	$67 - $88	$73 - $95	1,081	$90 - $118	$116 - $151
Construction and Operations Total over 16 year lifespan	**9,245**	**$1,144**	**$1,239**	**17,082**	**$1,581**	**$2,042**
Net Present Value over 16 year lifespan	**n/a**	**$634**	**$686**	**n/a**	**$892**	**$1,156**

Note
[1] Labor income and economic value added grow over the Project's 2017-2030 lifespan due to inflation.

Figure ES-1

Summary of Estimated Annual Economic Impacts from the Vancouver Energy Project



Note: Values shown represent nominal values, and labor income and total value added grow between 2017 and 2030 due to inflation.

Assessment of Vancouver Energy Socioeconomic Impacts: Primary Economic Impacts

Todd Schatzki and Bruce Strombom[3]

July 2014

Tesoro Savage Petroleum Terminal LLC ("Tesoro Savage", a joint venture between Tesoro Corporation ("Tesoro") and Savage Companies ("Savage"), is proposing to develop the Vancouver Energy project ("the Project") in Vancouver, Washington, which will facilitate the movement of crude oil produced in North America to West Coast refineries. The Project would be located in the Port of Vancouver.

This technical report provides an assessment of the expected primary socioeconomic impacts of the proposed Project, and is designed to provide input to the Draft Environmental Impact Statement.[4] Primary economic impacts reflect the changes in economic activity from the Project's construction and operations, and include increased income for local workers, increased profits for local business owners and increased revenue streams for local government. These impacts reflect the direct employment and local business activity from the Project's construction and operation, as well as the spillover effects as this activity ripples through the region's economy. We assess these impacts over a regional geographic area comprised of the 10 counties closest to the Project.

This study is divided in to four sections. In Section I, we provide an overview of the methodological approach taken to estimating the Project's primary economic impacts. In Section II, we provide an overview of the IMPLAN model and the types of economic impacts estimated. In Section III, we describe the data and assumptions used in performing the analysis. Finally, in Section IV, we summarize the estimated economic impacts of the Project.

I. OVERVIEW OF METHODOLOGICAL APPROACH

Economic impacts are evaluated through comparison between a "policy case" in which the Project is developed and a "base case" in which the Project is not developed. This base case implicitly assumes a "No Action Base Case" in which the parcel in the Port that the Project would occupy in the

[3] Dr. Strombom is a Managing Principal and Dr. Schatzki is a Vice President at Analysis Group. The report was conducted on behalf of Tesoro Savage Petroleum Terminal LLC, but the opinions expressed are exclusively those of the authors. To request further information or provide comments, Dr. Schatzki can be reached at: tschatzki@analysisgroup.com .

[4] Our estimates differ from the estimated Project impacts developed by BST Associates, which were submitted with the Project's EFSEC Application. Impacts differ for a variety of reasons, including updated information about construction costs and employment, operations costs, and the timing of project development, and methodological differences. Appendix K, Tesoro Savage Vancouver Energy Distribution Terminal Socio-Economic Analysis, EFSEC Application No. 2013-01, prepared by BST Associates, Revised November 25, 2013.

policy case remains undeveloped. Comparison between this base case and the policy case provides a measure of the Project's "stand alone" impact. Because the Project would result in new economic activity, this results in positive economic impacts to the region.

We do not explicitly model scenarios in which another industrial activity is undertaken in place of the Project.[5] In principle, an alternative Port use could result in impacts that are larger or smaller than those from the Project depending on a range of factors.[6] While we do not consider alternative uses, one factor suggesting that the Project could have greater impacts than an alternative use is the Port's conclusion that a crude-by-rail facility would provide the Port with greater revenue streams than other uses.[7] Revenues to the Port affect overall economic impacts to the regional economy because these revenues would be used to either increase operations at the Port or increase investment in additional construction by the Port, both of which would increase primary positive economic impacts.

II. OVERVIEW OF IMPLAN

Our analysis of primary impacts of the facility on the regional economy is performed using the IMPLAN model. The IMPLAN model estimates local economic impacts arising from changes in economic activity and is based on detailed region- and sector-specific data from the U.S. Commerce Department's Bureau of Economic Analysis.[8] This model provides highly disaggregated estimates

[5] In practice, it is highly likely that if the Project were not developed that another business operation would take its place and use the parcels and resources planned for use by the Project. The impacts of the Project relative to such an alternative Port use would depend critically on the particular type of business and the details of its operations that would be developed in place of the Project. Because, based on communications with the Port, there is no preferred or likely secondary use of Port resources if the Project is not developed, we do not attempt to independently identify and model alternative uses. Personal communication with the Port of Vancouver personnel.

[6] These factors include labor requirements during construction and operations, use of goods and services from Vancouver and other regional businesses, tax revenues to local government and other factors.

[7] We understand that the decision by the Port to pursue a crude-by-rail terminal through a competitive solicitation was made after analysis of various alternative uses that considered compatibility with the particular configuration of available parcels within the Port, potential revenue streams to the Port and other factors. Personal communication with the Port of Vancouver personnel.

[8] IMPLAN data files are compiled from a wide variety of sources including the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor, and the U.S. Census. These include the following federal programs: Bureau of Economic Analysis Benchmark I/O Accounts of the US and Output Estimates; Bureau of Labor Statistics Covered Employment and Wages (ES202) Program and Consumer Expenditure Survey; Census Bureau County Business Patterns, Decennial Census and Population Surveys, Censuses and Surveys; Department of Agriculture Crop and Livestock Statistics; and US Geological Survey. Information is collected about regional employment, income, value added, household and government consumption. Examples include: employee compensation; proprietary income; federal, state and local taxes affecting income, sales, real estate, and so forth; personal consumption expenditures at nine income levels; federal government purchases (military and non-military) and investments; purchases by local and state governments (including educational institutions); inventory purchases; capital formation; foreign exports; and inter-institutional transfers.

specific to the geographic region and industries being analyzed. IMPLAN is widely used for economic impact assessments in the public and private sectors.[9]

In this study, we use IMPLAN to model the impacts to the city of Vancouver and surrounding counties from the new economic activity generated by the construction and operation of the Project. IMPLAN captures both the direct impacts of this new activity as well as the subsequent impacts as the effects of Project construction and operation flow through the regional economy. Thus, estimates of economic impacts reflect the many layers of economic activity that would be created with construction and operation of the Project.

The immediate economic impacts of the Project's construction and on-going operations are referred to as *direct impacts:*

> *Direct impacts*. Direct impacts reflect the immediate impacts of the new project on employment. In this case, direct impacts reflect workers hired during facility construction and employees needed to operate the Project on an on-going basis. All of this economic activity is new to the region and thus creates incremental employment and economic effects.
>
> - *Example:* Wages earned by construction workers.

In addition to this direct economic activity, the subsequent flow of economic activity within the region would lead to *indirect* and *induced* economic activity. These impacts are often referred to as "multiplier effects."

> *Indirect impacts*. Indirect economic activity arises because various phases of the Project's development – plant construction and subsequent operations – create new demand for local goods and services, which in turn leads to new jobs in these sectors. These local purchases can include fuel, materials (e.g., water, feedstock) and other services (e.g., maintenance, information technology, and consulting services). Indirect impacts capture the cycle of spending, as initial spending works its way backward through the supply chain of business interactions.[10]

[9] IMPLAN stands for "IMpact analysis for PLANning." It is a social accounting/input-output (I/O) model designed to replicate the structure and functioning of the economy in a specific geographic area. Input/output (I/O) models draw on long-standing, well-established and broadly accepted methodologies to estimate how a change in economic activity impacts a regional economy based on data-driven estimates of how this change ripples through the economy. IMPLAN estimates are based on census data collected from businesses by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce. This data tracks the flows of dollars into and out of enterprises and is used to develop input/output tables – or a Social Accounting Matrix ("SAM") – that capture the movement of dollars between sectors of the economy. From these tables, multiplier effects emerge as dollars flow through the economy from one sector to another. Input/output tables within IMPLAN are geographically-specific, reflecting the particular flows within a region's economy based on region-specific data collected by BEA. The model tracks dollars spent in a region, including dollars that circulate within the region, and dollars that flow into and outside of the region from neighboring economies. For further information on IMPLAN or input/output models, see https://implan.com.

[10] This backward cycle will continue until all money leaks from the local economy, either through imports or through the creation of new value (i.e., value added).

- *Example:* Services procured by the Project, such as crude oil testing or janitorial services, would utilize local businesses such as scientific testing laboratories and janitorial service companies.

Induced impacts. As workers increase their spending on general goods and services with new income earned in direct and indirect economic activity, this creates *induced* economic activity. Induced impacts reflect the re-spending of income received through both direct and indirect activity

- *Example:* Dollars spent by the Project's personnel on local businesses, such as restaurants, retail stores, automotive purchases and home improvement.

A number of economic metrics can be evaluated using IMPLAN. Our analysis focuses on four metrics:

Employment – the total number of jobs created or lost;

Labor Income – the total change in income to employees that results from the economic activity;

Tax Revenue – the total change in revenues received by state and local governments; and

Value Added – the total change in the value added to the economy from the new economic activity.[11] In practice, value added reflects new "value" created by the economic activity which goes to labor (in the form of labor income), government (in the form of tax revenues) and shareholders (in the form of "profits" or residual value).[12] Consequently, both labor income and tax revenue, which are reported separately, are components of value added.[13]

Below, we describe in further detail the particular assumptions and data relied on in our IMPLAN analysis.

III. DATA AND ASSUMPTIONS

Estimates of the impacts of the Project were modeled using IMPLAN's 2012 data file for Clark County, where the facility is to be constructed and operated. A multi-region analysis was conducted which includes impacts to the following additional counties in Oregon and Washington: Multnomah County, Cowlitz County, Clackamas County, Washington County, Marion County, Skamania County, Yamhill County, Columbia County, Hood River County. Thus, our analysis does not account for broader economic impacts in Washington (and Oregon) beyond this ten-county region, and therefore understates the full economic impacts throughout the state. These counties were analyzed based on prior

[11] This value reflects new gross economic output net of the cost of non-labor inputs used in creating this output.

[12] Note that value added and gross output are not equal. Value added represents remaining portion of gross output after accounting for input costs. Thus, one dollar of direct spending does not translate into one dollar of value added. For example, the value added associated with the sale of a light bulb includes only the net revenue (and labor income) of the retail store where the light bulb was sold, but does not include the cost of manufacturing the light bulb itself.

[13] Estimates for value added reported below understate the likely value added because they do not reflect certain tax revenue estimates that we make outside the IMPLAN analysis. Further discussion of the tax estimates is provided in Section IV.B.

determination as part of the Project's Energy Facility Siting Evaluation Council (EFSEC) Application filed in November 2013, and includes counties within a one-hour commute of the Project.[14] These county-level data files include information for a set of highly disaggregated industries, sorted generally by their 4- and 5-digit NAICS codes.[15] A multi-region analysis allows us to capture the Project's impacts on Clark County and neighboring counties within a one-hour commute of the Project.

Information on the Project's construction and operations were provided to us by Tesoro Savage. This information includes: employment during construction and operations phases; construction costs and annual operations costs, both disaggregated into various categories of expenditures; schedules for the timing of the Project's construction; and schedules for plant operations, including assumptions about throughput levels over time.[16] We assigned expenditures into appropriate IMPLAN sector categories, based on assumptions about the character of the economic activity associated with each category of spending. Construction wages were based on information from the EFSEC Application, which was based on data from the Washington State Employment Security Department.[17]

The Project's construction and operations will occur over a multi-year time frame, with an initial construction period and subsequent operations period. A summary of the timeline assumed in our analysis for Project construction and operations is provided below in Figure 1. Construction of the Project will potentially occur in two phases. For purposes of this analysis, PhaseI construction is assumed to start December 1, 2014 and last approximately 12 months. After Phase I construction is complete, the Project will have the capacity to serve two to three trains per day. Phase II construction is assumed to start January 1, 2016 and last approximately 6 months. Upon completion of Phase II construction, the facility will have the capacity to serve up to four trains per day, its maximum capacity. Phase I construction costs total approximately $150 million, while Phase II construction costs total approximately $60 million. The labor employed in Phase I of construction is summarized in Table 1. Labor employed in Phase II reflects the same mix of job types, although the number of on-site and off-site positions is scaled proportionately to the relative magnitudes of Phase I and Phase II construction costs.

The Project's operations will begin after completion of Phase I construction, for purposes of this evaluation assumed to be in 2016. It is anticipated that during 2016, the Project will receive up to two or three trains per day based on Phase I capacity, with volumes increasing to four trains by the end of the year when Phase II is complete. Consequently, we have modeled a one-year operations "start-up" period during 2016 in which deliveries to the Project average two trains per day.

[14] EFSEC Application, Appendix K, pp. 1-2.

[15] NAICS codes are tied to the North American Industry Classification System, which is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

[16] Cost information relied on are initial estimates, provided for the purposes of this economic analysis. Actual costs may differ from those shown in this report.

[17] EFSEC Application, Appendix K, p. 2.

Figure 1
Timeline of Construction and Annual Operations for the Project

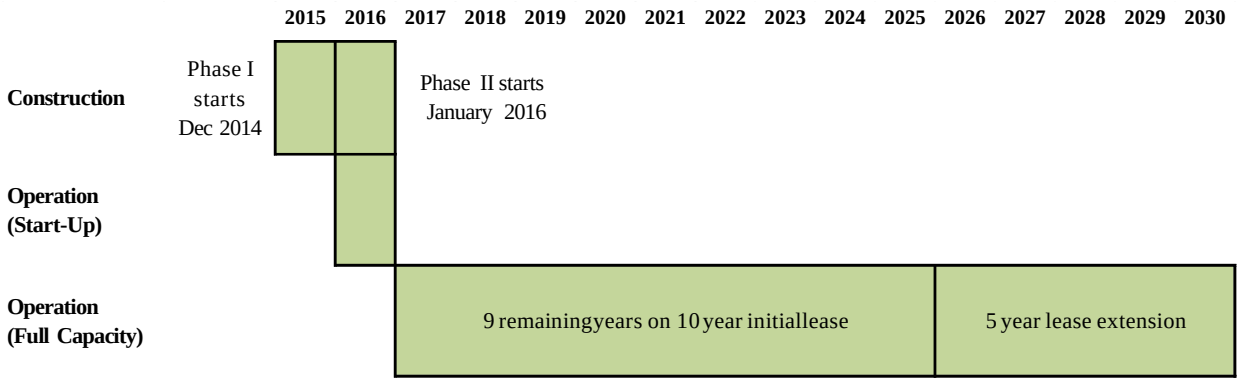


Table 1
Summary of Annual Direct Operations Employment at the Project
Phase I Construction

Description	Onsite	Offsite	Total
Steel erecting	32	-	32
Laborers	53	10	63
Mechanical & piping	50	15	65
Equipment operators	25	4	29
Tank erectors	40	10	50
Electrical	25	20	45
Concrete	25	20	45
Ground improvements/pilling	22	10	32
Dock seismic upgrades	20	10	30
Fire system installation	6	10	16
Total number of workers employed	298	109	407
Total full-time jobs (given 50% average on-site)	149	55	204
Additional permitting and engineering support	-	35	35
Total (full-time jobs)	149	90	239

Note: Employment figures reflect full-time jobs or their equivalent. Facility construction would result in 298 on-site positions, although it is assumed that only 50 percent would be employed at any given time. Consequently, on-site employment levels would be comparable to 149 full-time on-site positions. Facility construction would also result in 109 off-site positions, with 50 percent active at any given time, resulting in the equivalent of 55 full-time positions.

We assume that once Phase II construction is completed, the Project will operate at full capacity of four trains per day in 2017 and all subsequent years. We assume that the Project will operate for 14 years at full capacity, which includes the initial ten year lease period and an additional five year lease period. The actual length of the Project's operations is uncertain at present. Plant operations could be as short as ten years, the length of the initial lease with the Port, or could continue indefinitely beyond the

ten year lease and subsequent two five year lease options. The assumption of a 15 year operating term reflects a balance between these potential outcomes. We have not evaluated impacts under different assumptions about plant lifetime. Our analysis also does not consider activities that could occur after the Project's operational life, such as site remediation, construction activities to modify the site for subsequent uses or the operations under subsequent uses. Each of these activities would lead to additional future primary economic benefits to the region that are not included in this analysis. Start-up and full build-out expenditures are summarized in Table 2 below. The direct labor employed at the Project is summarized in Table 3.

Lease and fees paid to the Port of Vancouver are modeled as a separate set of direct activities, with the quantity of expenditures based on pro-rata shares of activities in the Port of Vancouver's 2014 final budget.[18] For example, the portion of the lease and fee payments assumed to be spent on capital project investment at the Port is based on the percentage of the current budget devoted to capital project investment.

Table 2

Summary of IMPLAN Inputs for Annual Operations at the Project

Description	IMPLAN Activity Type(s)	IMPLAN Sector(s)	Start-up (2014 dollars, annually)	Full Build-out (2014 dollars, annually)
General Operating Expenses	Labor Income, Commodity Change	3032, 3033, 3326, 3327, 3329, 3351, 3367, 3369, 3382, 3413, 5001	$25.06 million	$52.07 million
Property Tax	Commodity Change	3437 & 3438 (50/50 split)	$2.31 million	$2.31 million
Port of Vancouver Lease/Fees	Commodity Change	See report text	$19.17 million	$44.86 million
Total Operations			**$46.54 million**	**$99.24 million**

[18] Available at http://www.portvanusa.com/assets/2014FINAL-Budget-111213.pdf, accessed April 15, 2014.

Table 3
Summary of Annual Direct On-Site Operations Employment at Project

Description	Start-up Employment	Full Build-out Employment
Marine (dock, vessel securement, etc.)	16	19
Rail (engineers, switchmen, inspectors, etc.)	20	40
Transload (transloaders, tanks farm, trainers, etc.)	30	79
Safety Health Environment & Maintenance (mechanics, maintenance, EHS, etc.)	9	13
Office/Management (managers, coordinators, supervisors, etc.)	16	25
Total Operations	**91**	**176**

Note: Employment figures reflect full-time jobs or their equivalent. Table 3 includes direct on-site employment, while Table 4 includes both direct on-site employment and direct off-site employment, including activities resulting from the Project's operations and leases/fees paid to the Port of Vancouver.

IV. RESULTS: ESTIMATED PRIMARY ECONOMIC IMPACTS OF THE PROJECT

The Project would create economic benefits for local workers, businesses and governments. Below, we provide estimates of these impacts developed using the IMPLAN model. First, we report estimates of the job, labor income and value added impacts. Next, we provide estimates of the increase in tax revenues to state and local governments.

A. Employment, Labor Income and Value Added Impacts

The economic impacts of the Project are summarized in Table 4 below and Appendix A provides further details. Annual results are presented in nominal terms, while cumulative impacts are presented in both nominal terms (i.e., the sum of annual values) and as the net present value as of 2014 in 2014 dollars.[19] Figures 2 to 4 illustrate the annual values, broken out into direct, indirect, and induced impacts.

The direct employment impacts in Clark County in Phase I construction are expected to be 239 jobs for the one-year construction period, while these impacts are expected to be 81 jobs for the six-month Phase II construction period. Throughout the report, job impacts are measured as "full time" jobs or their equivalent.[20] Phase I construction will also lead to $23 million in both labor income and economic value added, while Phase II will lead to $8 million in labor income and economic value.[21]

[19] The net present values reflect the use of a 7 percent discount rate. This rate is consistent with guidance provided by the Office of Management and Budget (OMB) to regulatory agencies when performing regulatory analysis. Because employment is not a monetary measure, these values are not discounted. OMB, Circular No. A-94 Revised, October 29, 1992.

[20] Job impacts are measured in "full-time" positions, which could reflect full-time jobs or an equivalent quantity of part-time jobs (e.g., two half-time jobs being equivalent to one full-time job).

[21] Estimates of economic valued added reflect tax revenues as reported by IMPLAN. Below, we provide further detail on our estimates of tax revenues, including differences between our estimates and those from IMPLAN.

During the Project's operations, direct employment impacts will average 616 jobs annually over the assumed 15 year operational period (totaling 8,925 jobs over the period). These estimated direct employment impacts of the on-going operation of the Project include labor on-site at the Project, as well as jobs associated with activities directly created by the Project and lease payments and fees to the Port of Vancouver. The direct labor specific to on-site Project operations is expected to be 91 jobs annually for the start-up period, and 176 jobs annually for each year of the remaining years over the 15 year operational period studied. This employment specific to on-site operations at the Project represents 28 percent of total direct employment (2,555 of the 9,245 total direct job-years).[22]

Other direct impacts over the 15 year operational period include $1.1 billion in labor income ($76 million annually on average), and $1.2 billion in economic value added ($83 million annually on average). Like the employment impacts, these impacts reflect both the direct labor at the facility as well as the direct activities created by the facility including lease payments and fees to the Port of Vancouver.

Table 4
Summary of IMPLAN Results
Construction and Annual Operations at the Project, 2015-2030

	Direct Impacts			Total Impacts (Direct, Indirect and Induced)		
	Total Employment (Full-time Jobs)	Labor Income ($ millions)	Economic Value Added ($ millions)	Total Employment (Full-time Jobs)	Labor Income ($ millions)	Economic Value Added ($ millions)
Construction						
Phase I	239	$23.3	$23.3	1,031	$62.6	$89.6
Phase II	81	$8.1	$8.1	398	$24.2	$35.2
Total for Phase I and II	320	$31.4	$31.4	1,429	$86.8	$124.8
Operations (Annual)						
Start-up (2016 only)	302	$33.5	$35.7	519	$44.1	$55.5
Full Build-out (2017-2030)[1]	616	$67 - $88	$73 - $95	1,081	$90 - $118	$116 - $151
Construction and Operations Total over 16 year lifespan	**9,245**	**$1,144**	**$1,239**	**17,082**	**$1,581**	**$2,042**
Net Present Value over 16 year lifespan	**n/a**	**$634**	**$686**	**n/a**	**$892**	**$1,156**

Note
[1] Labor income and economic value added grow over the Project's 2017-2030 lifespan due to inflation.

Because IMPLAN tends to understate likely tax revenues, reported estimates of economic value added are generally conservative with respect to the tax revenue component. Also, for direct impacts in the construction phase, economic value added reflects only labor income.

[22] A job-year reflects one job held for one year, and provides a metric for measuring employment over multiple years. In this case, total on-site employment equals one year of start-up employment (91 jobs) plus 14 years of full build-out operations (176 jobs) – that is, 91 jobs + 14 years * 176 jobs = 2,555 jobs-years.

Figure 2
Summary of IMPLAN Results - Employment
Construction and Annual Operations at the Project, 2015-2030

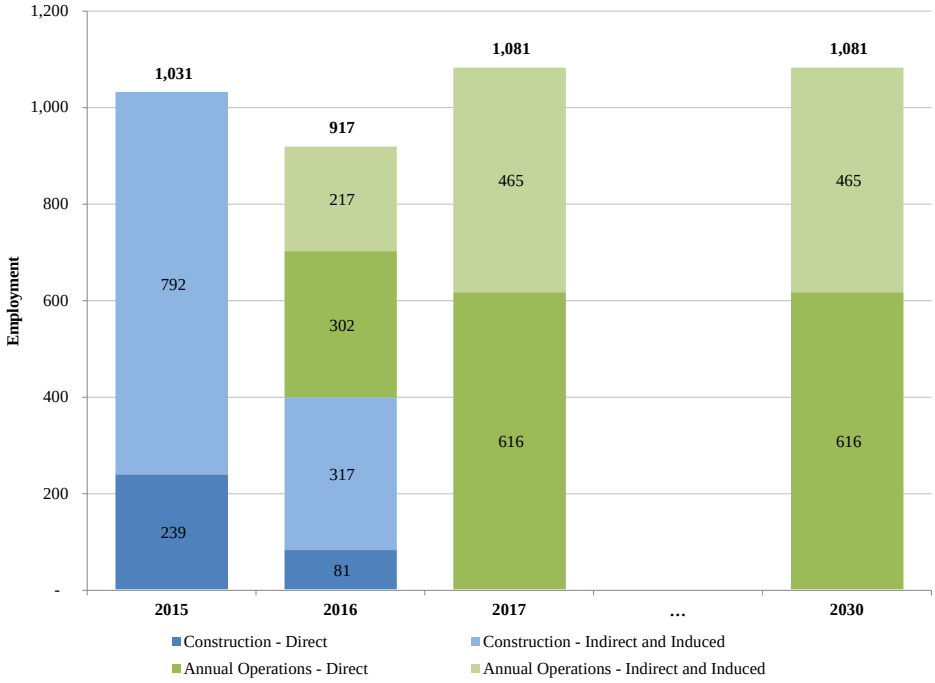
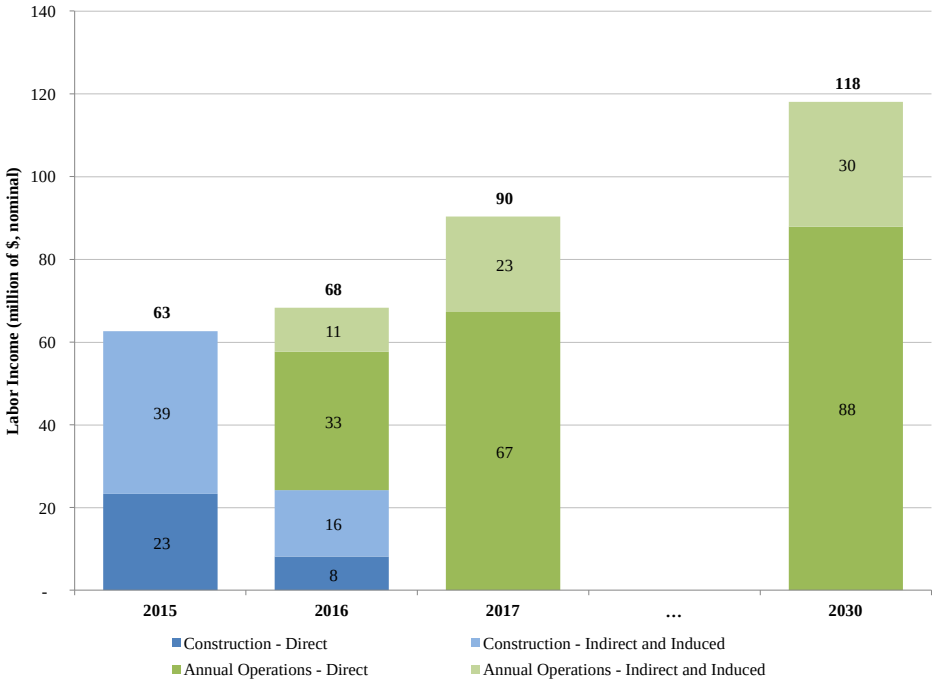


Figure 3
Summary of IMPLAN Results - Labor Income
Construction and Annual Operations at the Project, 2015-2030



Note: Values shown represent nominal values and grow between 2017 and 2030 due to inflation.

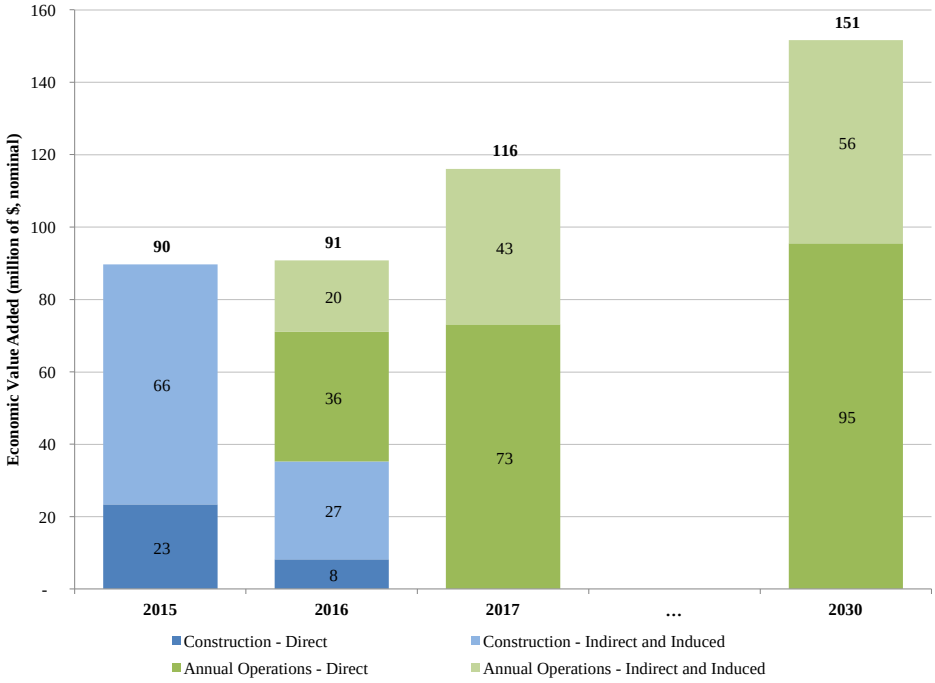
Indirect and induced impacts to the ten-county area of study of Phase I construction yield 792 jobs during the one-year construction period, $39 million in labor income, and $66 million in economic value added, while Phase II construction impacts yield 317 jobs over the six month period, $16 million in labor income, and $27 million in economic value added.

During the Project's operations, the indirect and induced employment impacts are expected to result in 449 jobs on average, totaling 6,728 jobs over the 15 year Project operation period. Over the assumed 15-year period, indirect and induced labor income is expected to be $382 million, while indirect and induced value added is expected to be $709 million.

In total, the combined effects of the construction and operations of the Project yield an average of over 1,000 jobs annually over the assumed 16 year construction and operation period, totalingover 17,000 job-years over this period. Other cumulative impacts include nearly $1.6 billion in labor income, and over $2.0 billion in economic value added to Clark County and the surrounding area. On a present value basis, these nominal impact estimates correspond to about $890 million in labor income and about $1.2 billion in economic value added.

Figure 4

Summary of IMPLAN Results – Economic Value Added Construction and Annual Operations at the Project, 2015-2030



Note: Values shown represent nominal values and grow between 2017 and 2030 due to inflation.

B. Tax Revenues Impacts

Taxes generated by the facility include several forms of payments to state and local governments. These include sales tax, business and occupation (B&O) tax, property taxes on both the facility and other supporting businesses, and other taxes, such as payments for temporary disability insurance and business license fees. Taxes were calculated using information from multiple sources, including the Washington Department of Revenue, Tesoro Savage, the Application Supplement,[23] and IMPLAN.[24] Table 5 summarizes estimated tax impacts from the Project.

Table 5
Summary of Tax Impacts
Construction and Annual Operations at the Project

	Construction (Phase I and II)	Annual Operations (Start-Up)	Annual Operations (Full Build-Out)
Sales Tax	$17,640,000	$1,497,657	$3,225,410
B&O Tax	$989,100	See note 2	See note 2
Property Tax (Terminal)	n/a	$2,317,898	$2,317,898
Property Tax (non-Terminal)	$2,572,557	$752,269	$1,638,342
Other Taxes	$947,474	$313,830	$682,393
Total	$22,149,131	$4,881,654	$7,864,043

Notes:
[1] Retail sales tax includes a state and local portion, and is calculated on the full construction costs for Phase I and II of $210 million. The state tax rate is 6.5% and the local tax rate is 1.9%, for a total tax rate of 8.4%. Sales tax for annual operations comes from the IMPLAN results. IMPLAN estimates of sales tax from indirect and induced activities are not included for the construction phase. For more information, see http://dor.wa.gov/content/FindTaxesAndRates/SalesAndUseTaxRates/.
[2] Business & Occupation tax is based on the classification of activity, and is calculated on gross business income. The rate for construction is based on the retailing classification, and is .00471. The B&O tax for annual operations is not reported independently in IMPLAN, but is accounted for in the sales tax and other taxes categories reported. For more information, see http://dor.wa.gov/content/FindTaxesAndRates/BAndOTax/.
[3] The Project's property tax for annual operations was estimated by Tesoro Savage.
[4] The non-Project property tax for annual operations is based on IMPLAN results, and represents property taxes on production and imports only (i.e., it does not include household property taxes).
[5] Other taxes include a variety of other taxes and fees, such as payments for temporary disability insurance and business license fees.

Sales taxes will be assessed during both the construction and operations phases of the projects. The construction of the Project will generate almost $18 million in one-time state and local sales taxes, while the operation of the Project will generate about $1.5 million in state and local sales taxes in the

[23] Tesoro Savage Vancouver Energy Distribution Terminal, Application No. 2013-01 Supplement, Section 4.4 – Socioeconomic Impact, February 2014.

[24] IMPLAN has limited capability to identify the portion of total taxes that will accrue to local governments. Because a large fraction of total taxes would accrue to non-local governments, we assume that state and local tax revenues are not allocated back into the area of study. The exception to this is the property tax paid by the Project, which is assumed to be reinvested in the local community.

initial start-up year, and then produce approximately $3 million in annual sales tax revenues thereafter. This estimate reflects a state sales tax rate of 6.5 percent and a City of Vancouver local sales tax rate of 1.9 percent. During construction, sales tax is assessed on the Project's full construction cost (totaling $210 million for both Phase I and Phase II). Sales taxes during operations are assessed annually and are calculated by IMPLAN.

B&O taxes, assessed during the Project's construction, are estimated to produce almost $1 million in revenues for both state and local governments. These revenues are based on a B&O tax rate of 0.471 percent.[25]

Property taxes include taxes on the Project itself, as well as increased property taxes due to expanded business activity in support of the Project's construction and operation. Property tax on the Project itself is expected to be $2.3 million annually based on information received from Tesoro Savage. Additional property taxes from expanded (indirect and induced) business activity are expected to be about $2.6 million during construction, $0.75 million in the first year of operation start-up, and about $1.6 million annually during the remainder of the Project's operation. These estimates are based on IMPLAN output.

Other taxes reported in Table 5, such as payments for temporary disability insurance, business license fees, payments for fines and donations, are also calculated by IMPLAN. Construction of the Project will generate approximately $0.9 million in other one-time taxes and fees to state and local government, while operation of the Project will generate an additional $0.31 million in other tax revenues the first year of operations start-up, and $0.68 million annually thereafter.

In total, the construction of the Project is expected to have a one-time tax impact of over $22 million to state and local governments, and the annual operation of the Project is expected to have a recurring annual impact of approximately $7.8 million once the Project is operating at full capacity.

[25] This is based on the assignment of construction activity to the "retailing" classification.

Appendix A
Detailed Summary of IMPLAN Results
Construction and Annual Operations at the Project, 2015-2030

	Total Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Impacts			
Construction			
Phase I	239	$23	$23
Phase II	81	$8	$8
Subtotal	320	$31	$31
NPV Subtotal	n/a	$29	$29
Annual Operations [1]			
Start-up	302	$33	$36
Full Build-out	8,623	$1,079	$1,172
Subtotal	8,925	$1,113	$1,208
NPV Subtotal	n/a	$605	$657
Total	9,245	$1,144	$1,239
NPV Total	n/a	$634	$686
Indirect and Induced Impacts			
Construction			
Phase I	792	$39	$66
Phase II	317	$16	$27
Subtotal	1,109	$55	$93
NPV Subtotal	n/a	$51	$86
Annual Operations			
Start-up	217	$11	$20
Full Build-out	6,511	$371	$689
Subtotal	6,728	$382	$709
NPV Subtotal	n/a	$207	$385
Total	7,837	$437	$802
NPV Total	n/a	$258	$471
Total Impacts			
Construction			
Phase I	1,031	$63	$90
Phase II	398	$24	$35
Subtotal	1,429	$87	$125
NPV Subtotal	n/a	$80	$114
Annual Operations			
Start-up	519	$44	$56
Full Build-out	15,134	$1,450	$1,862
Subtotal	15,653	$1,494	$1,917
NPV Subtotal	n/a	$812	$1,042
Grand Total	**17,082**	**$1,581**	**$2,042**
NPV Grand Total	**n/a**	**$892**	**$1,156**

Notes:

[1] Annual operations includes facility labor, purchases, and Port of Vancouver lease payments/fees. Direct labor to support annual operations at the Tesoro Savage facility is expected to account for 2,555 of the 8,925 job-years.

ATTACHMENT D

Assessment of the Vancouver Energy Socioeconomic Impacts:

Secondary Economic Impacts

Analysis Group, Inc.

September 5, 2014

EX 0157-TSS

Assessment of the Socioeconomic Impacts of the Vancouver Energy Distribution Project: Secondary Impacts

Todd Schatzki and Bruce Strombom[1]

September 2014

Tesoro Savage Petroleum Terminal LLC ("Tesoro Savage", a joint venture between Tesoro Refining & Marketing Company LLC ("Tesoro") and Savage Companies ("Savage"), is proposing to develop the Vancouver Energy project ("the Project" or "Vancouver Energy") in Vancouver, Washington, which will facilitate the movement of crude oil produced in North America to West Coast refineries. The Project would be located in the Port of Vancouver.

This technical report provides an assessment of expected socioeconomic impacts of the proposed Project, and is designed to provide input to the Draft Environmental Impact Statement. The assessment will enumerate and quantify, to the extent possible, certain changes to economic activity ("economic impacts") likely to arise from the development and operation of the Project. Our analysis in this report considers the *expected secondary and ancillary impacts* from the proposed Project. Secondary impacts reflect impacts to existing or potential new economic activity from development and operation of the Project, including activities associated with the Project operations, such as the transportation of crude oil by rail to the Project.[2]

Economic impacts will be assessed over both the region nearby the Project and more broadly over the state of Washington. Within this geographic framework, we consider the potential for various effects from the Project and make best efforts to quantify those that are likely to be significant. The secondary Project impacts of greatest potential significance are likely to arise from potential changes in rail traffic as a consequence of trains delivering crude oil to the Project. Our analysis explicitly considers several potential impacts from increased rail traffic, including:

1. Dis-amenity, such as noise and aesthetic impacts, from increased rail traffic;
2. Increased road congestion at at-grade rail crossings;
3. Increased congestion on the rail system; and
4. Rail accidents.

[1] Dr. Strombom is a Managing Principal and Dr. Schatzki is a Vice President at Analysis Group. The report was conducted on behalf of Tesoro Savage Petroleum Project LLC, but the opinions expressed are exclusively those of the authors. To request further information or provide comments, Dr. Schatzki can be reached at: tschatzki@analysisgroup.com .

[2] This report does not assess impacts associated with marine vessel traffic. Due to the nature of the transport systems involved, the types of potential impacts from rail traffic evaluated in this report, such as crossing delays and system congestion, are less relevant for marine traffic.

Each of the impacts would likely lead to adverse economic consequences discussed in more detail below.

The specific secondary/ancillary impacts evaluated in this report reflect negative impacts that tend to offset (to some degree) the positive economic impacts of the Project resulting from the immediate or "primary" impact of Project construction and operations on employment, labor income, tax revenues and profits for local businesses. We have analyzed those primary economic impacts in a separate technical report.[3] That report estimated primary economic benefits to a 10-county study region, but did not consider additional positive impacts beyond this economic region or benefits due to certain upstream and downstream transportation activities, such as increased transport of crude via rail and ship.[4] Thus, there may be additional economic benefits both within and outside the 10-county study area that are not considered or quantified in our primary impacts report.

It is also important to recognize that there could be positive secondary impacts from Project development that we have not evaluated in further detail. For example, as discussed immediately below, depending on the alternative use of Port facilities (and the increase in rail traffic that would be associated with that alternative use) and the transport of crude supplies through Vancouver in the absence of the Project, operation of the Project could, in theory, reduce rail traffic through Vancouver. If that were the case, then the Project would reduce negative secondary impacts (along with providing positive primary economic impacts).

This study is divided into six sections. In Section I, we discuss certain methodological issues related to the counterfactual or baseline conditions that would prevail if the Project were not developed. In Section II, we assess impacts associated with the dis-amenity of increased rail traffic, including an assessment of impact estimates developed by Johnson Economics. In Section III, we assess secondary impacts from increased traffic at at-grade road crossings, and in Section IV, we assess the impacts of potential increases in rail traffic on rail system congestion. Section V considers the economic impacts of rail accidents involving trains carrying crude oil, when such accidents occur. Section IV provides conclusions.

I. OVERVIEW OF METHODOLOGICAL APPROACH

Economic impacts are evaluated through comparison between a Policy Case in which the Project is developed and a Base Case in which the Project is not developed. Likely secondary impacts depend, in part, on the difference between rail traffic in the Policy Case and the Base Case. If the Project is not developed, the amount of rail traffic that would pass through Vancouver as a consequence would depend on two factors. The first factor is the different use that would be made of the Port's resources in place of

[3] Schatzki, Todd and Bruce Strombom, "Assessment of the Socioeconomic Impacts of the Vancouver Energy Distribution Project: Primary Economic Impacts," July 2014.

[4] The 10-county study area was identified based on Washington State Energy Facility Site Evaluation Council ("EFSEC") regulatory requirements, which require a socio-economic impact assessment of areas within a 1-hour commute of the proposed project. WAC 463-60-535.

the Project. The second factor is route and mode (e.g., rail or ship) taken by crude oil that West Coast refineries would use to replace the crude oil supplies they would have received from the Project. To assess the range of potential outcomes in the Base Case, we consider each of these factors.

Our Base Case assumes that the parcel in the Port that the Project would occupy in the Policy Case remains undeveloped (a "No Action Base Case"). In this case, there would be no incremental rail traffic to the Port as compared to current traffic levels. Comparison between this Base Case and the Policy Case provides a measure of the Project's "stand alone" impact. Our assessment of this No Action Base Case is provided in Section II through IV.

A. Rail Traffic from Alternative Use of Port

The magnitude of the secondary impacts we assess is conservative (*i.e.*, the negative impacts are larger) compared to a base case in which another industrial activity is developed in the Port on the parcels where the Project would be located.[5] These alternative Port uses could lead to rail traffic levels that, while higher than the No Action Base Case, are less than, equal to or greater than the anticipated rail traffic from the Project. A comparison between such an "Alternative Port Use Base Case" and the Policy Case would provide a measure of the Project's impact relative to other potential uses.

Estimated impacts of the Project relative to an alternative Port use would depend critically on the particular type of business and the details of its operations that would be developed in place of the Project. Based on communications with the Port, there is no preferred or likely secondary use of Port resources if the Project is not developed. However, the Port's decision to pursue the development of a crude-by-rail Project through a competitive solicitation was made after analysis by the Port indicated that this use was highly compatible with available parcels and would provide the greatest revenue stream to the Port.[6] This suggests the proposed Project is the highest and best use from a purely economic standpoint at the present time.

B. Rail Traffic from Replacement Crude

In addition to traffic from an alternative Port use, rail traffic through Vancouver under both base cases would be affected by the route and mode taken by crude that West Coast refineries would use in the absence of the Project ("VE Replacement Supplies"). The purpose of the Project is to facilitate the transportation of crude supplies, largely, if not only, from inland sources (North American mid-continent crude) to West Coast refineries, including those in California and Washington.[7] Crude would arrive at the

[5] Such an "Alternative Use Base Case" could correspond to either the "No Action Alternative 1" or "No Action Alternative 2" in the Draft Environmental Impact Statement ("DEIS"). The "No Action Alternative 1" assumes other facilities would be developed to handle the crude supplies that would have been handled by the Project, while "No Action Alternative 2" assumes no such facilities are developed.

[6] Personal communication with Port of Vancouver personnel.

[7] At present, crude supplies produced in the U.S. cannot be exported to other countries.

Project via unit trains with 100 or more cars and be transferred to marine tankers at the Project. We assume a volume of traffic equivalent to four trains daily (on average), based on limits included in the permit application. Other than transferring crude from rail to tanker and possible blending of crude slates, crude would undergo no processing at the Project. The Project would thus enable delivery of lower cost mid-continent crude supplies to these existing west coast refineries and displace higher cost supplies. A portion of these cost savings can be expected to be passed on to consumers, due to the competitive dynamics of the fuel markets. However, the Project would not alter these refineries' use of or demand for crude supplies, because there are many potential alternative means of transporting crude, particularly pipeline and rail transport of domestic supplies directly to the refineries and marine transport of imported and domestic supplies. Consequently, if the Project were not constructed, it is expected that the existing refineries would continue operations using other means of crude transport to the refinery.

Because demand for crude by West Coast refineries is unlikely to be affected by development of the Project, it is important to consider alternative means by which crude oil would be delivered to these refineries absent development of the Project. Market conditions for the foreseeable future could support several alternative routes or modes for crude deliveries to West Coast refineries. The range of potential outcomes is bounded by two alternatives. On the one hand, absent the Project, crude supplies that would have been delivered via the Project could be transported directly to the refineries by rail through Vancouver. Such supplies could include shipments to Washington refineries or even to California refineries to the extent they relied on the southern end of the Pacific Northwest Rail Corridor (which runs through Eugene, Oregon) and routes further south into California. In this case, an additional four trains of crude supplies would pass through Vancouver per day (the same number as would be the case if the Project were developed). On the other hand, absent the Project, crude supplies to West Coast refineries could be delivered via marine vessels (particularly for imports) or via rail lines by-passing Washington. In this case, no additional trains of crude supplies would pass through Vancouver.

C. Total Incremental Effect on Rail Traffic

Taking into account these two factors – traffic from an alternative Port use and traffic from VE Replacement Supplies, the Project could increase, decrease or have no effect on rail traffic through Vancouver. Traffic may increase with the Project in place under a number of scenarios, particularly if there is no alternative Port use or if little of the crude supply needed to replace Vancouver Energy deliveries would pass through Vancouver. If the combined traffic from an alternative Port use and VE Replacement Supplies is four trains a day, then the Project would lead to no net change in rail traffic, because four trains a day would pass through Vancouver under both the Policy Case and the respective base case. If this combined traffic (alternative Port use and VE Replacement Supplies) was greater than four trains per day, then rail traffic would actually be lower with the Project as compared to traffic under this alternative base case. If the alternative Port use led to rail traffic through Vancouver in excess of four trains per day, the Project would reduce rail traffic compared to this alternative use base case regardless of the route and mode of VE Replacement Supplies.

In our analysis, we generally consider the impacts of four trains per day (on average), which is the maximum level of incremental traffic as a consequence of Vancouver Energy. Along with the level of

rail traffic, impacts could also be affected by the type of commodity transported. In particular, the rail accident risks associated with crude rail transport would differ from impacts associated with other commodities. An assessment of risk associated with transport of crude or other commodities is beyond the scope of this study. The range of economic impacts that may be associated with a spill, based on publically available information from PHMSA is discussed in Section V, below.

II. DIS-AMENITY IMPACT ON LOCAL DEVELOPMENT AND ECONOMIC ACTIVITY FROM INCREASED RAIL TRAFFIC

Increased rail traffic potentially has an adverse impact on local development and economic activity in any area near rail lines because of the dis-amenity of rail traffic (e.g., noise, vibration, odor and visual impact). All things being equal, residents or businesses may prefer to locate at a distance from rail lines to avoid these dis-amenities and other impacts from rail traffic, such as delays at road crossings, which can impose delay costs. On the other hand, proximity to rail can provide benefits, particularly when it provides better access to passenger rail systems for households or certain commercial businesses (e.g., office space) or improved access to freight transportation for industries and certain commercial businesses (e.g., warehousing).

In this section we address several aspects of such potential impacts. First, we assess potential impacts using a benefits-transfer approach that relies on hedonic (statistical) analyses of the impacts of rail traffic on property values that have been previously performed in other locales.[8] Specifically, we use hedonic studies of the impact of increases in rail traffic in non-Vancouver locales to estimate the expected impact of potential increases in rail traffic on the residential property values in Vancouver.[9] Second, we assess estimates of the potential impacts of the Project on real estate activity in Vancouver developed by Johnson Economics.[10]

A. Hedonic Analysis of Property Value Impacts

One approach to evaluating the economic impact of a particular land use is to analyze how proximity to the land use of interest affects real estate values. From an economic standpoint, the market value of a residential property reflects the attributes of the property (the parcel size, the size of the house, the quality of construction, the number of bedrooms, etc.), its location, attributes of the neighborhood and its proximity to other land uses (e.g., parks, schools, major roads, rail lines). The value of properties for commercial and industrial use would reflect a different set of attributes relevant to those types of uses. Economists have used a statistical approach called hedonic analysis to estimate how each of these

[8] U.S. Environmental Protection Agency, "Guidelines for Preparing Economic Analysis," updated, National Center for Environmental Economics, Office of Policy, May 2014.

[9] For this report, we have not evaluated market prices within the Vancouver and surrounding area real estate markets.

[10] The studies were submitted as exhibits to comments submitted by Columbia Waterfront LLC to the EFSEC.

attributes affect property values.[11] Hedonic analysis uses information about the actual prices paid for properties and the actual property attributes to determine how variations in property values are explained by differences in property and location attributes.

Research using hedonic analysis has evaluated how proximity to rail lines affects property values. In these studies, the measured impact reflects the impact of proximity to a rail corridor compared to properties that are distant from a rail corridor. However, in the current case, the rail corridor already exists and will be unaffected by the Project; therefore, these studies do not provide an appropriate benchmark for evaluating the impacts of the Project.[12]

Instead, the Project may affect the number of trains that travel along the existing rail line. We performed a literature search of studies evaluating the impact of rail proximity on property values and identified two studies that provide statistical estimates of the impact of incremental rail traffic on property values. Our search excludes studies based on subjective assessment without empirical support.[13] One study is by Futch (2011) and the other is by Simons and El Jaouhari (2004).[14] Each study estimates the impacts of changes in rail traffic on single-family residences, with one study examining impacts in Los Angeles (Futch) and the other in Cleveland (Simons and El Jaouhari). Using the parameter estimates provided in these studies, we have estimated the expected impact of additional rail traffic on property values in Vancouver assuming that operation of the Project increases rail traffic past residences by four trains per day. Given assumed routing of inbound and outbound traffic to the Project (described further below in Section IV), these are the largest estimated impacts on property values from increased traffic volume given that the increase in rail traffic from the Project would be at most four trains per day.[15] [16] Our estimates are reported in Tables 1 and 2.

[11] Freeman, A. Myrick III. *The Measurement of Environmental and Resource Values, Theory and Methods*," Resources for the Future: Washington, D.C.

[12] Research using hedonic analysis has also evaluated how proximity to large facilities affects residential property values. We do not use such research to evaluate the impacts of the Project itself to properties values in Vancouver because the distance between the Project and the closest residential properties is relatively great (approximately 0.6 miles) and the Project will be sited within a large pre-exiting property dedicated exclusively to industrial uses (the Port of Vancouver).

[13] *For example*, Eastman Group, "Increased Coal Train Traffic and Real Estate Values: A study of the potential impact of increased coal train traffic on property values resulting from the proposed Gateway Pacific Project at Cherry Point, WA," October 30, 2012.

[14] Futch, Michael, "Examining the Spatial Distribution of Externalities: Freight Rail Track and Home Values in Los Angeles," November 11, 2011; Simons, Robert A. and Abdellaziz El Jaouhari, "The Effect of Freight Railroad Tracks and Train Activity on Residential Property Values," *The Appraisal Journal* Summer 2004, pp. 223-233.

[15] These estimated effects reflect the specific types of freight that were transported along the rail lines studied, which likely reflects a diversity of cargo. To the extent that impacts for particular types of cargo would impose greater or lesser impacts, these results would not reflect such differences. We identify no previous empirical research that attempted to evaluate the effects on property values of changes in the volume of crude oil traffic specifically.

Based on parameter estimates from Futch, an increase in rail traffic of four trains per day could reduce values of single-family residential properties near the rail line by an estimated 0.37 percent to 1.49 percent. Table 1 provides impact estimates for varying distances from the rail corridor. Results are provided under several modeling assumptions ("specifications") used by Futch to illustrate the range (and average) of potential effects. Across these three specifications, impacts decrease as the distance from the rail corridor increases. Within one-third of a mile of the rail corridor, property values decrease by an estimated 0.85 percent to 1.49 percent. Beyond one-third of a mile, estimated negative impacts are at most 0.37 percent.

Table 1: Estimates of Percent Change in Single-Family Residential Property Values from Assumed Incremental Project Traffic (4 Trains per Day) Based on Futch (2011)

	Baseline	With Additional Explanatory Variables	Pre-"Market Crash" Sales Only	Average
0 - 1/3 mi. from Corridor	-0.85%	-0.93%	-1.49%	-1.09%
1/3 - 2/3 mi. from Corridor	-0.69%	-0.59%	-0.62%	-0.63%
2/3 - 1 mi. from Corridor	-0.37%	-0.34%	-0.67%	-0.46%

Note: Estimates reflect per ton-mile impacts as estimated by Futch, which are translated into per rail car impacts based on average rail car weight. Project impacts reflect assumed incremental traffic, given these per rail car impacts. Results are reported for three specifications: a baseline specification, a specification with additional explanatory variables (e.g., geographic zones, seasons and house characteristics), and a specification excluding transactions after the 2006-2007 "market crash" in housing prices. Average values reflect the unweighted average of the three model estimates. Reported estimates reflect (1) the specification that allows for asymmetric marginal effects for increases and decreases in rail traffic and (2) the sample that includes the construction period. Futch (2011).

Impacts based on estimates from Simons and El Jaouhari, shown in Table 2, appear smaller than those developed using estimates from Futch. While the magnitude of the impacts in Table 2 issimilar to those in Table 1, the distances from the rail line are significantly shorter. Futch's shortest distance to the rail line is one-third of a mile or 1,760 feet, which is 2.4 times greater than 750 feet, the furthest distance considered by Simons and El Jaouhari.[17]

[16] To the extent that actual routing differs from these assumptions such that incremental rail traffic exceeds four trains per day (e.g., if inbound and outbound trains took the southern route between Pasco and Vancouver), impacts would be proportionately greater than values reported in Tables 1 and 2.

[17] The magnitude of these estimated impacts differs from levels reported in some other recent studies which are more subjective in nature. For example, the Eastman Group has stated that impacts from the Gateway Pacific Project, with increased traffic of 18 trains daily in some areas, would range from 5 to 20 percent for single-family residences, 5 to 15 percent for multi-family residences, and 5 to 10 percent for commercial properties. On a per-train basis, these impacts are significantly higher than those derived from actual market transactions in the studies we evaluate.

Public information about rail line activity also potentially affects property value impacts. Greater information or publicity regarding rail impacts may lead people to place a greater emphasis or value on proximity to the rail corridor. The research by Simons and El Jaouhari, which evaluates impacts before and after a highly publicized rail merger that was anticipated to increase rail traffic, supports this conclusion. The impact estimates in Table 2 are based on transactions during a period after significant publicity about potential rail line impacts. However, estimates based on transactions from an earlier period show much less sensitivity of property values to both the proximity to a rail corridor and the amount of train traffic. In fact, in this period, Simons and El Jaouhari find that proximity to a rail line and frequency of rail traffic often has no statistically significant impact on property values.[18]

Table 2: Estimates of Percent Change in Single-Family Residential Property Values from Assumed Incremental Project Traffic (4 Trains per Day) Based on Simons and El Jaouhari (2004)

	Property Size		
Distance from Rail Line	**Small**	**Medium**	**Large**
Estimated Impact Per Freight Trip ($ per Trip)			
Less than 250 feet	-194	-262	-264
250 to 500 feet	-85	-107	-4
500 to 750 feet	-94	-72	-1
Percent Change in Property Value per Train/Day			
Less than 250 feet	-0.21%	-0.27%	-0.19%
250 to 500 feet	-0.09%	-0.11%	0.00%
500 to 750 feet	-0.10%	-0.07%	0.00%
Mean Sale price	91,007	97,851	138,510
Percent Change in Property Values from Terminal (4 Trains/Day)			
Less than 250 feet	-0.85%	-1.07%	-0.76%
250 to 500 feet	-0.37%	-0.44%	-0.01%
500 to 750 feet	-0.41%	-0.29%	0.00%

Based on existing empirical research analyzing the impact of changes in the volume of rail traffic on property values, we find that the additional rail traffic from the development of the Project, to the extent any exists, would be expected to reduce residential property values near the existing rail lines by 0 percent to 1.5 percent, with impacts diminishing as distance from the rail line increases. While there are differences between the circumstances of the Project on Vancouver and Washington State and the circumstances considered in these studies, the best available research indicates that the Project is unlikely to have significant impacts, if any, on property values due to increased volume of rail traffic.

[18] For example, the variable for the number of freight trips is not statistically significant in 8 of 9 regressions at the 5 percent confidence level (reflecting pairs of distance to track and property size). Similarly, 7 of 9 estimates of the impact of the presence of a rail corridor were not statistically significant.

B. Economic Impacts to the Waterfront Project and Downtown Vancouver

In this section, we consider the potential for the Project to have adverse impacts on economic activity in the city of Vancouver, including impact to a new development – the Waterfront project. The Waterfront project is a proposed multi-use project that has been approved for development along the Vancouver waterfront and adjacent to a portion of the rail corridor that potentially would experience increased traffic as a consequence of the Project.[19] We do not perform an independent assessment of these potential impacts. Instead, we assess two studies that attempt to evaluate potential impacts from the Project on local economic activity. These reports, prepared by Johnson Economics, were included as Exhibits D and E to EFSEC comments submitted by Columbia Waterfront LLC.[20] One report (in Appendix D) provides an IMPLAN assessment of the impact of the Waterfront project on the local economy. This report also posits that the development of the Project would have an adverse impact on the potential positive economic impacts from the Waterfront project, and develops an estimate of this impact.[21] We refer to this as the "Waterfront Report". The other report (in Appendix E) assesses the Project's potential impact on development and redevelopment in downtown Vancouver.[22] We refer to this as the "Downtown Report".

Our assessment of the Johnson Economics' reports proceeds as follows. First, we summarize Johnson Economics' estimates of these adverse impacts. Second, we compare these estimates to our estimates of the positive impacts of the Project on the region. Finally, we assess the reasonableness of the assumption made by Johnson Economics about the estimated impact of (or from) the Project.

a. Summary of Johnson Economics Results

Johnson Economics develops two reports that evaluate potential impacts of the Project on Vancouver. These reports develop impact estimates using different methodologies and measure impacts in terms of different economic metrics. The Waterfront Report assumes levels of investment and on-going economic activity from the Waterfront project, calculates the regional economic impacts through the IMPLAN model and then considers impacts from the Project. The Downtown Report assumes future levels of development and redevelopment in downtown Vancouver, and considers changes in this level of development and redevelopment activity from the Project. However, Johnson Economics does not translate these changes in development and redevelopment activity into regional economic impacts

[19] http://www.thewaterfrontvancouverusa.com/ .

[20] Columbia Waterfront LLC, SEPA Scoping Comments, Tesoro-Savage Energy Distribution Terminal, Docket EF-131590, December 18, 2013.

[21] Johnson Economics, "Estimated Economic and Fiscal Impacts of the Tesoro Savage Project on the Waterfront Vancouver Development and Downtown Vancouver," December 9, 2013.

[22] Johnson Economics, "Predicted Impacts of the Tesoro Savage Project on Development and Redevelopment in Downtown Vancouver, Washington," December 18, 2013.

through a model, such as IMPLAN. In both cases, the estimated adverse impacts of the Project reflect downward adjustments to certain modeling assumptions made by Johnson Economics.

Tables 3 and 4 replicate tables from the Johnson Economics' Waterfront Report. The tables provide Johnson Economics' estimates of the economic impact of construction and on-going operation of the Waterfront project. Impacts to employment, labor income and total value added are developed using the IMPLAN model. Table 3 reflects impacts over the entire construction period, which appears to be 6 years, while impacts in Table 4 reflect annual impacts.[23]

Table 3
Summary of Johnson Economics IMPLAN Results
Construction at Waterfront Project

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	4,580.5	$ 245	$ 318
Indirect Effect	1,244.5	52	82
Induced Effect	1,356.6	56	105
Total Effect	**7,181.6**	**$ 353**	**$ 505**

Table 4

Summary of Johnson Economics IMPLAN Results
Annual Operations at Waterfront Project

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	1,364.4	$ 65	$ 60
Indirect Effect	332.2	11	19
Induced Effect	347.2	14	27
Total Effect	**2,043.8**	**$ 91**	**$ 105**

Note on IMPLAN economic measures:[24]

> Job-years: Johnson Economics reports employment impacts in job-years. A job-year equals the equivalent of a full-time job held for one year. It can reflect full-time or an equivalent number of part-time jobs. For example, two half-time jobs

[23] The figure on page 10 of their report shows construction occurring over a 6 year period.

[24] For further description of IMPLAN and the economic measures produced by IMPLAN, *see* Schatzki, Todd and Bruce Strombom, "Assessment of Vancouver Energy Socioeconomic Impacts: Primary Impacts," July 28, 2014.

(held for one year) would be equivalent to one job-year. Job-years can be used to measure employment impacts occurring over multiple years. For example, one full-time job held for two years would be equivalent to two job-years.

Total Value Added: Total value added includes income to labor, tax revenues to government, and net income (profits) to privately held businesses.

The Johnson Economics Waterfront Report aims to estimate the extent to which the development of the Project would reduce the positive economic impacts that would otherwise be created by the Waterfront project. To estimate the adverse impact from the Project, Johnson Economics assumes that the Project would reduce the size of the Waterfront project by 30 percent. They write:

> "To evaluate the construction impacts of each scenario, we modeled the estimated impacts of the current master plan, and reconciled those impacts with a second scenario that *assumed a 30% reduction in development yield on the site*."[25] (Emphasis added.)

No explanation, justification or rationale is provided for the assumption that the Project would reduce the "development yield" of the Waterfront project by 30 percent – the statement above is the extent of the discussion or explanation for this crucial assumption. In fact, the linkage between the way in which the Project potentially impacts the Waterfront development (e.g., change in property value) and how such an impact translates into changes in economic activity (e.g., employment) is potentially complex. As discussed above, the linkage between dis-amenities and property values is well-established and well-studied. However, the subsequent linkage to development and redevelopment decisions and other factors that would affect regional economic activity are less well-studied. While the Johnson Economics report notes potential impacts on achievable pricing, pace of absorption, reduced investment "attractiveness" and resulting yields needed for investment, it does not draw any connection between such impacts and their modeling assumptions.[26]

To analyze the Project impacts, Johnson Economics simply reduces the full Waterfront Development impacts shown in Tables 3 and 4 by 30 percent. For example, to estimate the adverse impact of the Project on total construction employment from the Waterfront project, the total Employment Effect of 7,181.6 job-years is multiplied by 30 percent, leading to an estimated negative

[25] Johnson Economics, December 9, 2013, p. 2. Johnson Economics also notes that their approach is to "… model an alternative development program reflecting what is viable under an impacted scenario assuming the Tesoro Savage Facility." Johnson Economics, December 9, 2013, p. 8.

[26] "These negative impacts would be expected to have a significantly negative impact on both achievable pricing for residential and commercial tenants, reduce the pace of absorption and reduce the attractiveness of the location from an investment standpoint, increasing yields necessary to induce investment (reflected in higher capitalization rates)." Johnson Economics, December 9, 2013, p. 6.

impact of 2,154.5 job-years.[27] The complete set of negative impacts calculated by Johnson Economics is reproduced in Tables 5 and 6 below.

Table 5
Summary of Johnson Economics IMPLAN Results
Negative Impact of Vancouver Energy on Waterfront Project Construction Impacts

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	(1,374)	$ (73)	$ (95)
Indirect Effect	(373)	(16)	(25)
Induced Effect	(407)	(17)	(31)
Total Effect	**(2,154)**	**$ (106)**	**$ (152)**

Table 6
Summary of Johnson Economics IMPLAN Results
Negative Impact of Vancouver Energy on Waterfront Project Annual Operations Impacts

Impact Type	Employment (job-years)	Labor Income ($ millions)	Total Value Added ($ millions)
Direct Effect	(409)	$ (19)	$ (18)
Indirect Effect	(100)	(3)	(6)
Induced Effect	(104)	(4)	(8)
Total Effect	**(613)**	**$ (27)**	**$ (32)**

Johnson Economics also fails to provide any tangible connection between the rationale for the claimed impacts (a reduction in "development yield" of 30 percent) and the approach used to estimate impacts (i.e., simply reducing Waterfront economic impacts by 30 percent).[28] In fact, a 30 percent reduction in development yield could have an impact on economic development that differs from (greater than or less than) 30 percent. Such impacts would depend on many factors, such as whether different types of properties (e.g., residential, commercial) would be equally affected, the extent to which common infrastructure (e.g., parking garages) is affected and the extent of fixed costs. For example, if 30 percent reduction in development yield did not reduce the need for certain fixed infrastructure costs, then aggregate spending may not decline by 30 percent. Thus, the impact of a 30 percent reduction in

[27] Note that the adverse impact of the Project reflects a difference between the impacts of the Waterfront project without the Project in place (the values in Tables 3 and 4) and the impacts of the Waterfront project with the Project in place (reflecting impacts equal to 70 percent of the values in Tables 3 and 4).

[28] We assume that, as used by Johnson Economics, "development yield" is the quantity of property developed, reflected in either size (e.g., square foot) or dollar terms. Development yield is also a measure of net cash flow from a real estate project commonly used in the field of real estate.

development yield may not result in 30 percent reduction in *regional economic impacts* from the Project, as the Waterfront Report simply assumes.

b. Assessment of Johnson Economics Estimates of the Impacts of the Project

To assess the results of the Johnson Economics study, we perform several analyses. First, we compare the adverse impacts on the Waterfront project, as estimated by Johnson Economics, against estimates of the positive or "primary" economic impacts from the Project that we have developed in a separate report.[29] Second, we assess the reasonableness of the impact of the Project on the Waterfront project assumed by Johnson Economics. We discuss Johnson Economics' estimated impacts to downtown Vancouver, although we do not make explicit comparisons between our estimates of primary economic impacts and Johnson Economics' estimates of changes in investment because these impact measures are not directly comparable.[30]

In order to appropriately compare the economic impacts of the Project and any assumed adverse impact to the Waterfront project, it is necessary to compare the timeline of construction and operations for both projects. Figure 1 below provides a summary of the timeline assumed in our analysis of the Project and the timeline of the Waterfront project assumed by Johnson Economics in its analysis.

Johnson Economics assumes that the Waterfront project is developed over a six year period, and that operations, reflecting occupancy of retail business, commercial office space and residences, increase for five years gradually during the construction period until the Waterfront project reaches full capacity after construction is complete.[31] Then, Johnson Economics considers impacts for an additional fourteen years. While, given the nature of the Waterfront project, its life could extend beyond this time period, it is reasonable to assume that any adverse impacts from the Project would not extend beyond the Project's life. In total, Johnson Economics considers six years of construction and 19 years of operation, which overlap to form a 20 year modeling period for the Waterfront project.[32]

[29] Schatzki and Strombom, July 28, 2014.

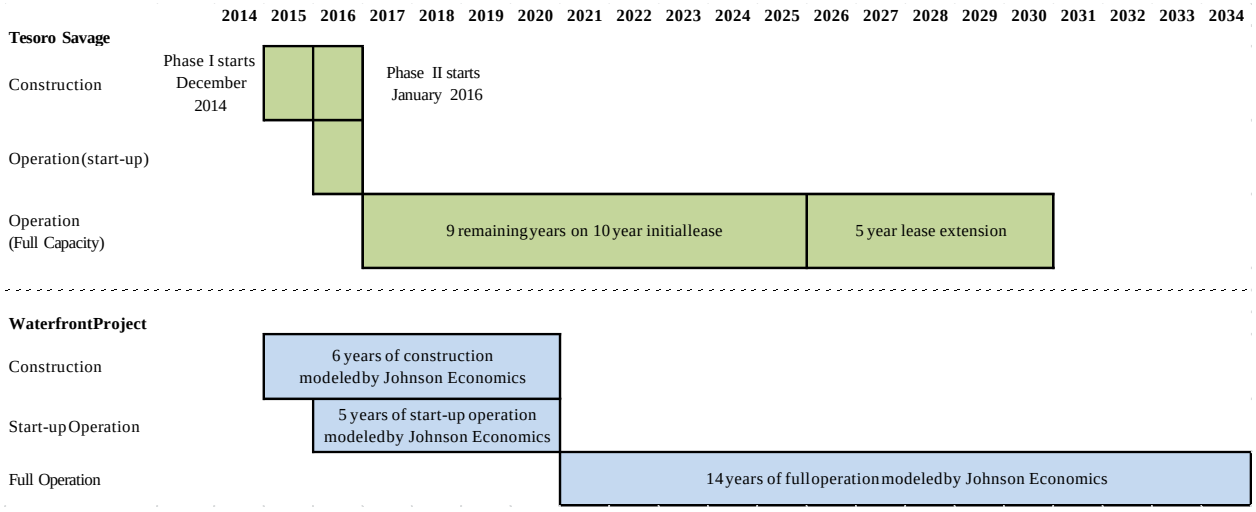
[30] The comparisons we develop between our estimated impacts of Vancouver Energy and impacts reported by Johnson Economics do not represent an endorsement of Johnson Economics' values. We did not conduct an independent assessment of the economic impact of the Waterfront project, nor have we assessed the reasonableness of the underlying analysis performed by Johnson Economics (although we assess the reasonableness of the magnitude of estimated impacts). To fully assess potential impacts of Vancouver Energy to the Waterfront project specifically or downtown Vancouver more generally, it would be necessary to complete such an assessment to capture existing or baseline conditions. However, such an analysis is beyond the scope of this report.

[31] Johnson Economics, December 9, 2013, figures on p. 10.

[32] Johnson Economics does not report any cumulative impacts. However, figures on page 10 of their report show impacts occurring over the sixteen year period we consider. Note that this comparison results in an additional three years of impacts beyond that assumed for the Project.

Figure 1

Timeline of Construction and Annual Operations of the Project and Waterfront Project



To compare positive and adverse impacts from the Project, we assume that construction of the Waterfront project would begin in parallel with construction of Vancouver Energy, and that Vancouver Energy would operate for fifteen years, under the ten year initial lease and a five year extension. We have thus modeled two years of construction and 15 years of operation, which overlap to form a 16 year modeling period.

Using this timeline, we compare the employment, labor income, and economic value added impacts over the modeling period 2015 through 2034 using the Johnson Economics assumption that the Project would reduce the economic impacts of the Waterfront project by 30 percent. Because impacts vary from year to year and between projects, labor income and value added impacts are compared in present value terms (in 2014 dollars, assuming a 7 percent discount rate).[33]

Along with present value comparisons, we also compare cumulative employment, labor income and value added impacts in Figures 2, 3 and 4, respectively. Each of these figures shows the cumulative positive impacts of the Project in the green bars, and the cumulative adverse impact to the Waterfront project (from the Project), as estimated by Johnson Economics, in the blue bars. The black dotted line represents the Project's net impact – that is, the "primary" benefits of the Project net of any adverse impact to the Waterfront project assumed by Johnson Economics.

[33] A 7 percent discount rate is consistent with guidance provided by the Office of Management and Budget (OMB) to regulatory agencies when performing regulatory analysis. Because employment is not a monetary measure, these values are not discounted. OMB, Circular No. A-94 Revised, October 29, 1992.

For all three economic metrics considered – employment, labor income and value added – the Project creates net benefits, even after accounting for adverse Project impacts at the levels assumed by Johnson Economics. Table 7 reports these cumulative impacts. For total employment, the Tesoro Savage Project is estimated to create 17,082 job-years over a 16 year construction and operating period (an average of 1,068 full-time jobs per year). By comparison, the reduced employment from Johnson Economics' assumed 30 percent reduction over a 20 year impact period is 12,271 job-years. Consequently, the Project creates, on net, 4,811 job-years even under the Johnson Economics' assumptions. Net impacts to labor income and total value added are similar – the net increase in labor income is $532 million, while the net increase in total value added is $713 million (both in present value terms).

Figure 2

Comparison of Cumulative Employment
Vancouver Energy and Johnson Economics Assumed Reductions to Waterfront Development

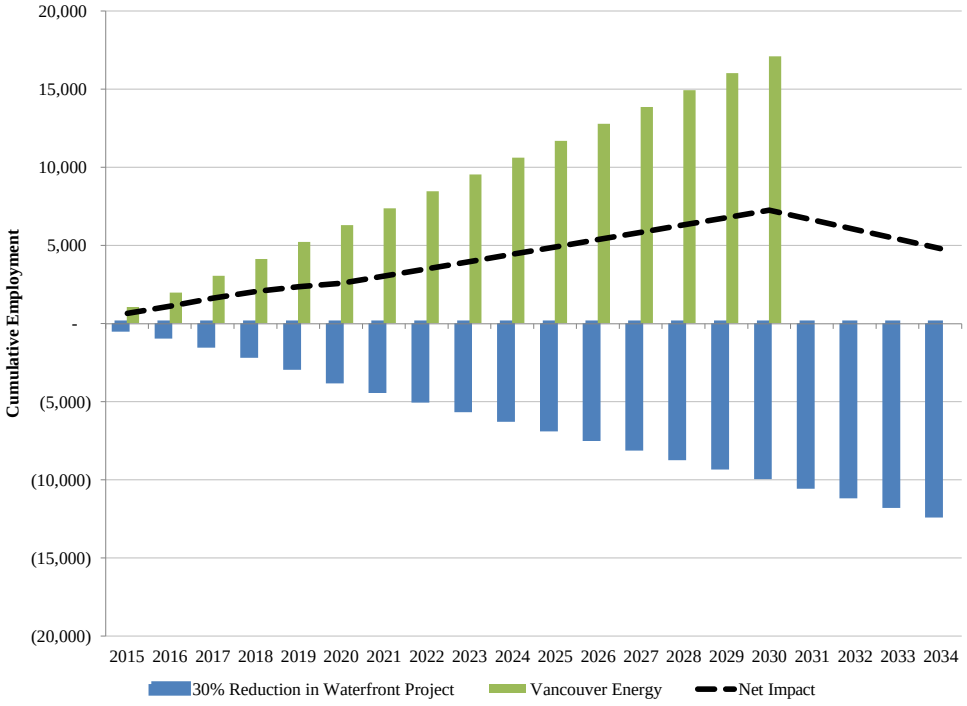


Figure 3
Comparison of Cumulative Labor Income (Present Value, $2014)
Vancouver Energy and Johnson Economics Assumed Reductions to Waterfront Development

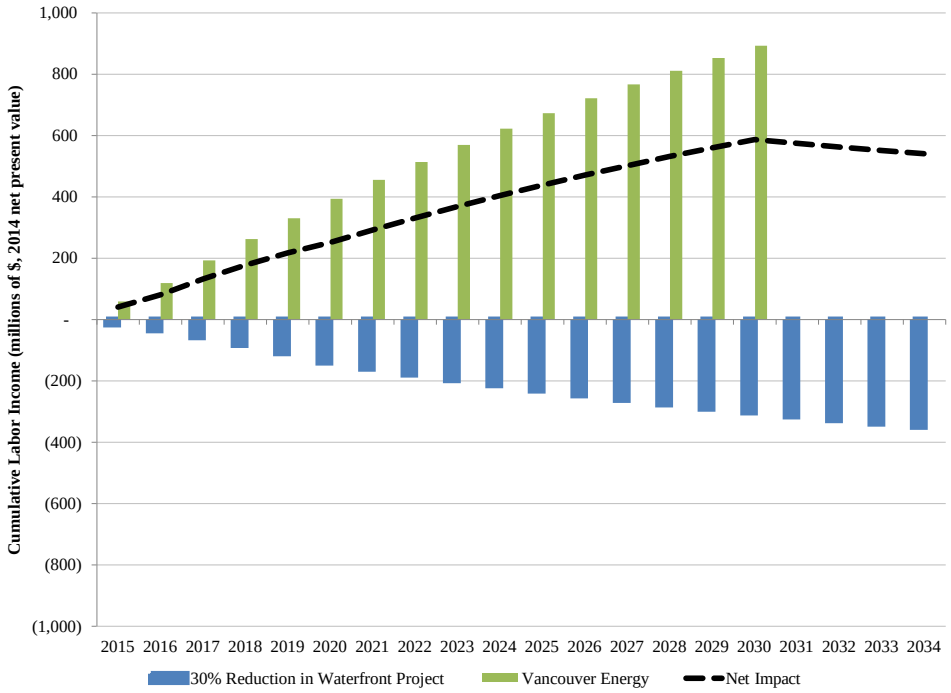
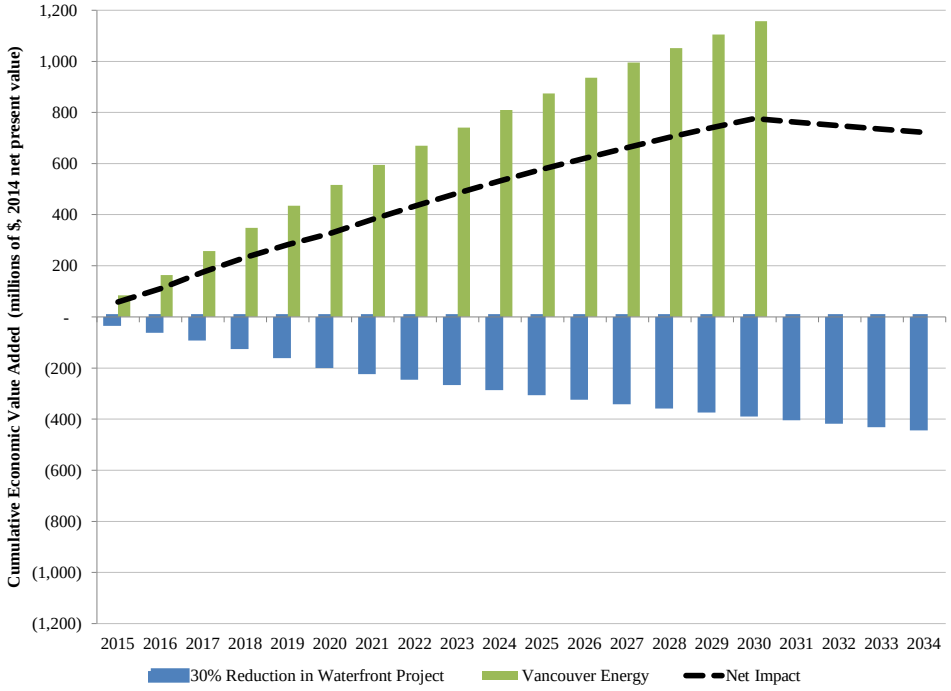


Figure 4
Comparison of Cumulative Economic Value Added (Present Value, $2014)
Vancouver Energy and Johnson Economics Assumed Reductions to Waterfront Development



In its analysis of downtown Vancouver, Johnson Economics estimates changes in development and redevelopment investment, but not the subsequent economic impacts in terms of increased jobs, income and taxes. Consequently, we cannot perform the same type of comparisons as provided above between the Vancouver Energy and Waterfront project. However, comparison of the Waterfront and downtown Vancouver investment amounts suggests that, given Johnson Economics' estimates, impacts to downtown Vancouver would be less than impacts to the Waterfront. On the one hand, a 30 percent reduction in Waterfront investment would correspond to $246 million (although it is important to recognize that a 30 percent reduction in development yield need not result in a 30 percent reduction in investment).[34] On the other hand, Johnson Economics estimates the change in downtown Vancouver development and redevelopment investment from the Project to be $98 million. Given that the estimated change in development and redevelopment investment in downtown Vancouver is much lower than the comparable change in Waterfront investment, it is reasonable to assume that the associated economic impacts would be lower.[35]

The analysis provided in Table 7 is performed assuming that the development of the Project would adversely affect the economic impacts of the Waterfront project by 30 percent, and that such an effect would extend for three years after Project closure.[36] As discussed earlier, Johnson Economics provided no rationale or support for this assumption.

Similarly, Johnson Economics' assessment of the impacts to downtown Vancouver is grounded in assumptions that are provided without support. Specifically, Johnson Economics assumes a 15 percent reduction in achievable rent levels and a 10 percent reduction in capitalization rates to reach the conclusion that development and redevelopment investment declines by 28 percent and real market value declines by 36 percent.[37] However, Johnson Economics provides no basis for its assumptions about changes in rent levels or capitalization rates, and its report provides insufficient detail to assess other aspects of its model.

In light of the large size of its assumed impacts and the lack of rationale or support, we have assessed the reasonableness of the assumptions that underlie Johnson Economics' analyses. Based on a number of considerations, we find that the assumptions upon which the Johnson Economics study is

[34] Johnson Economics reports total Waterfront construction costs of $818.884 million – 30 percent of this total amount is approximately $246. Johnson Economics, December 9, 2013, p. 8.

[35] Assuming a $246 million reduction in Waterfront development investment, the change in downtown Vancouver development and redevelopment would be 40 percent of the change in Waterfront development investment.

[36] This is likely a conservative assumption. Once operation of the Project ceases, the Waterfront project would effectively be in the same position it would have been in had the Project never been developed. We are aware of no reason that the Waterfront project could not be further developed after closure of the Project.

[37] Investment declines by $98.3 million from $351.0 million to $252.7 million. Real Estate Market Value (RMV) falls by $138.1 million, from $318.5 million to $243.4 million. Johnson Economics, December 18, 2013, p. 10.

based grossly overstate any adverse impact the Project would likely have on the Waterfront project and downtown Vancouver. Our conclusion is based on several factors.

Table 7

Comparison of Construction and Annual Operations for the Project and Johnson Economics' Assumed 30 percent Reduction in Waterfront Project Development

	Total Employment (job-years)	Labor Income ($ millions,2014 NPV)	Economic Value Added ($ millions,2014 NPV)
Vancouver Energy			
Construction	1,429	$ 80	$ 114
Operations Period	15,653	812	1,042
Total	17,082	$ 892	$ 1,156
Assumed 30% Reduction in Waterfront Project			
Construction	(2,154)	$ (92)	$ (132)
Operations Period	(10,117)	(268)	(312)
Total	(12,271)	$ (360)	$ (443)
Net Impact Total	**4,811**	**$ 532**	**$ 713**

Notes:
[1] Labor income and value added are reported in $2014 net present value, using a 7 percent discount rate. Employment is reported in nominal terms.
[2] Waterfront Project values are based on information contained in Exhibit D, grown to nominal terms using IMPLAN's GDP deflators, and discounted back as noted above.

As discussed earlier, empirical studies that have used data on real estate prices to statistically estimate the impact of incremental rail traffic on property values indicate that the likely impact of the increase, if any, in rail traffic from operation of the Project on property values would be negligible.[38] As shown in Tables 1 and 2, based on results from two published empirical studies, we estimate that an increase in rail traffic of four trains per day to serve the Project at full build-out would reduce residential property values an estimated zero to 1.5 percent for properties in close proximity to the rail lines.[39]

In the context of the many economic factors that affect real estate values, these estimated changes in property values are relatively small. To provide some context, Figure 5 provides a price index for

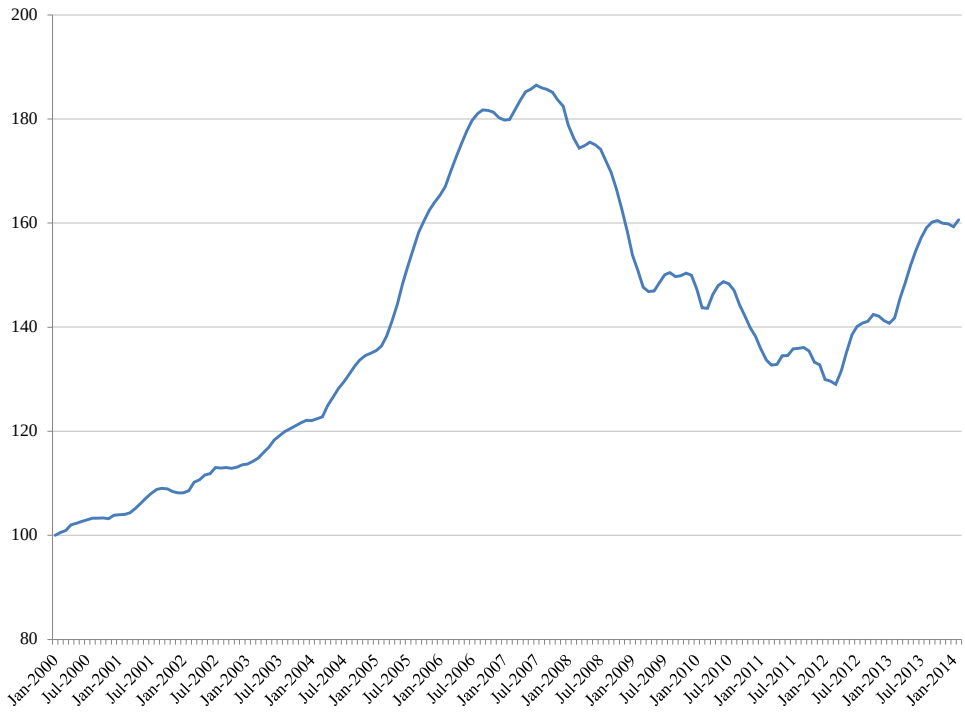
[38] As discussed earlier, the Johnson Economics study does not explain the mechanism by which an increase in rail traffic is expected to lead to a reduction in the size of the Waterfront project. Consequently we cannot comment directly on the reasonableness of that assumed process or the economic logic upon which the assumption is based. However we would expect a potential price variance on the order of one percent to be well within the normal range of forecasting uncertainty for a multi-year development project such as the Waterfront project. Given that, it seems highly implausible on its face that the increase, if any, in rail traffic from operation of the Project could necessitate a reduction in the size of the Waterfront project of 30 percent.

[39] Futch 2011; Simons and El Jaouhari 2004.

homes in the Portland, Oregon area. Since 2000, housing prices have varied dramatically, first increasing by over 80 percent through August 2007, and then declining by 30 percent (from August 2007 prices) through March 2012 before increasing in recent years. Thus, the magnitude of impacts estimated in these studies of 1.5 percent or less is relatively small in comparison to the variation experienced in recent years.

Along with these considerations regarding the magnitude of any likely impact, it is also important to consider the appropriate baseline against which certain impacts are evaluated.[40] In particular, the presence of the rail corridor and the potential for increases in rail traffic as a consequence of the West Vancouver Freight Access (WVFA) project were known and therefore assumed in development plans for the Waterfront project specifically and downtown Vancouver redevelopment generally. Further, there have been multiple efforts to mitigate the effects of rail traffic on nearby properties in the downtown Vancouver area, including construction of sub-grade crossings, adoption of a rail noise mitigation ordinance within Vancouver, and specific design requirements imposed on the Waterfront project specifically to address proximity to the rail line.[41]

Figure 5: S&P/Case-Shiller Portland, Oregon Home Price Index



Source: S&P Dow Jones Indices LLC.

[40] As discussed earlier, our analysis does not include an assessment of the reasonableness of the baseline level of economic impacts from the Waterfront project estimates by Johnson Economics.

[41] For example, *see* Downtown Waterfront Development Agreement between The City of Vancouver and Columbia Waterfront LLC, October 19, 2009.

III. IMPACT ON ECONOMIC ACTIVITY FROM INCREASED DELAYS AT ROAD CROSSINGS

Various modes of transportation intersect at "crossings" at which one stream of traffic must wait for the other to clear before proceeding. In particular, "at grade" crossings between railways and roads require that road vehicle traffic wait for rail traffic to clear the crossing intersection before proceeding. Thus, the transportation of freight by rail can lead to delays in road traffic, which in turn can have potential economic consequences. This section considers whether the development of the Project would lead to significant economic impacts as a consequence of these delays.

As discussed above, development of the Project could lead to additional rail traffic, which would increase delays at at-grade crossings along the routes described above. Increases in these delays could lead to economic impacts to affected businesses and consumers.

In principle, vehicle traffic delays potentially have a number of economic consequences. First, such delays can inconvenience drivers by increasing travel times. When driving is for leisure or other non-business purposes, such delays may be a nuisance to drivers but do not necessarily reduce economic activity.[42] Second, delays can adversely affect business activity. Delays can impose costs on businesses, such as higher costs for labor, fuel and capital when business traffic is delayed at a crossing, or reduced customer demand if delays reduce the number of customers frequenting a business.

When impacts are not uniform across businesses, delays can lead to shifts in economic activity between businesses. For example, the added costs of delivery "across the tracks" could lead consumers to shift purchases to businesses "on the right side of the tracks." If such shifts were to occur, the impact on the regional economy would depend on the extent to which activity shifted to businesses outside the region. If business shifts outside the region, this would have adverse consequences for the region's aggregate economy. However, if business shifts within the region, this would not adversely affect the regional economy, although it may have varying distributional consequences among businesses (with some "winners" and some "losers"). Another alternative is that no shifts in economic activity occur, but that business either passes through the costs to customers or absorbs the costs in the form of lower profits.

We analyze the impact of delays at at-grade road crossings through an analysis of economic costs to business activities for crossings within Vancouver and at several different locales throughout

[42] In principle, increased driving times could cause consumers to reduce shopping and other consumption, which would lead to a drag on overall economic activity. However, such potential impact is expected to be negligible, if any, as consumers might respond by conducting fewer trips, but spending more, or by shopping at other businesses in the community that do not require crossing the tracks. We do not explicitly estimate this type of potential economic impact, because of this expected offsetting effect.

Washington State, which were identified as a representative case for the range of potential impacts that might occur across the state, including:[43]

1. Bingen – Bingen is a rural locale along the Columbia River where the rail line separates certain industrial properties from the rest of the town; and
2. Spokane – There are no major at-grade crossings within the city limits of Spokane.[44] We have identified and evaluated crossings outside the city limits along each of the two BNSF lines that pass through Spokane that are potentially affected.

Figure 6 provides a map illustrating these locations in the Vancouver region.

To provide an indicative measure of economic consequences, we estimate the costs to business activity from increased delays at rail crossings in each of these locales. The costs reflect a number of factors, including the number of incremental train crossings, anticipated down times (reflecting train length and speed), and average traffic volumes. Our analysis only considers potential impacts to economic activity, and does not reflect other potential impacts, such as increased delays for emergency vehicles.

Table 8 reports the underlying assumptions used in evaluating delay costs. Given assumed train speeds and lengths, and gate down times prior to and after crossings, the average length of a delay is roughly two minutes. This assumes a train speed of 30 miles per hour ("mph"). To the extent that train speeds were lower (higher), delays would be longer (shorter) and costs would be correspondingly larger (smaller). Table 8 also provides information on estimates of the value of lost time to individuals used in the calculation of the economic impacts of delays at rail crossings. These cost estimates are based on estimates of the value of lost time developed by the U.S. Department of Transportation and reflect full wage rates for individuals involved in business activity and a fraction of the wage rate for individuals involved in non-business activity.[45] Our estimates do not account for any incremental fuel costs (e.g., due to idling), externality values, or capital costs.[46]

Table 9 reports estimates of annual total costs and costs related to business activity for six at-grade intersections within Vancouver, while Table 10 reports the same metrics for 13 interactions outside

[43] Other studies have evaluated traffic impacts from increased rail traffic along different routes from those likely to be impacted by the Project. For example, Parametrix evaluate rail impacts at eight intersections in Seattle. Parametrix, Inc., ""Coal Train Traffic Impact Study," October 2012.

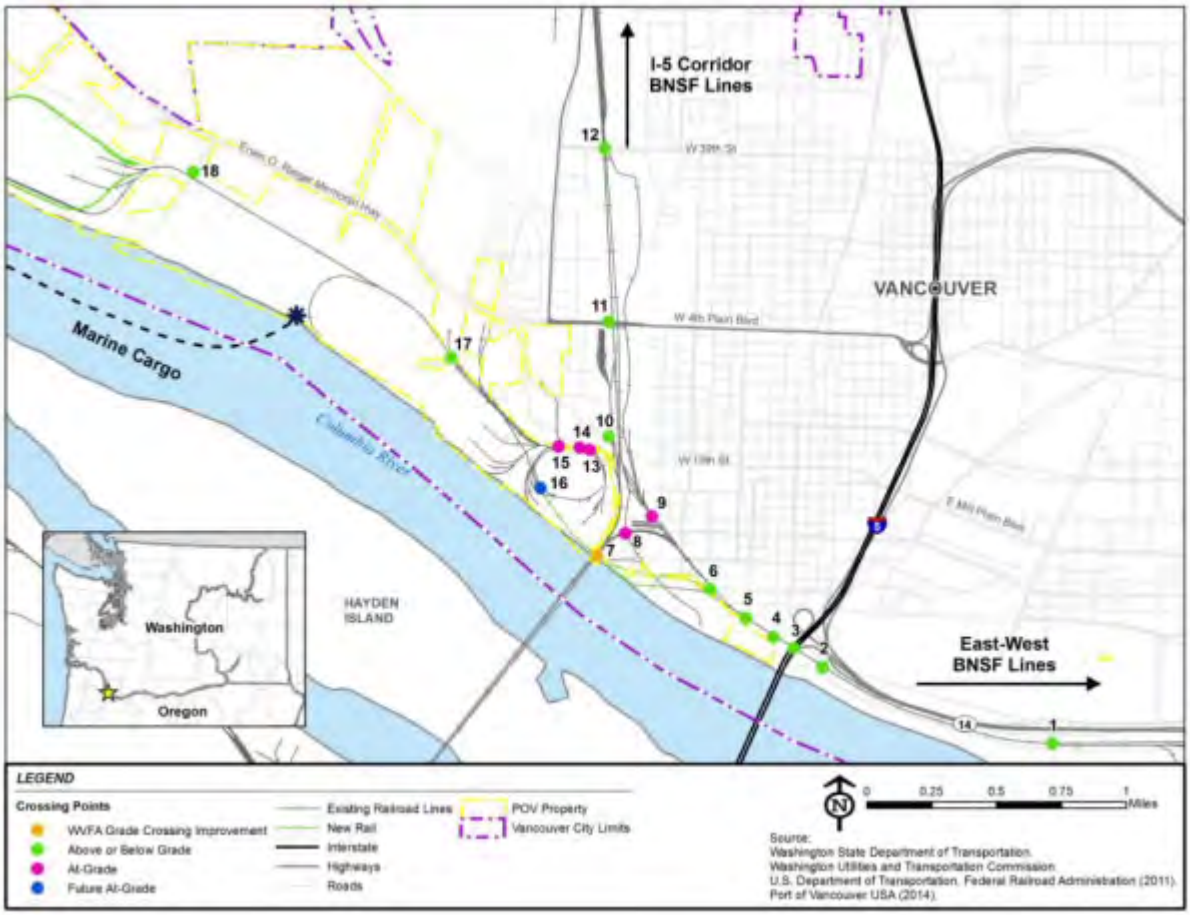
[44] Based on city limit boundaries identified in Google maps.

[45] U.S. Department of Transportation ("DOT"), "The Value of Time Savings: Departmental Guidance for Conducting Economic Evaluations," Revision 2, September 29, 2011.

[46] Delays could lead to capital costs if business operators needed to invest in additional transportation infrastructure, such as trucks, to meet a fixed level of service. Given the total incremental increase in delay projected by Project rail traffic, such capital costs are not anticipated. Moreover, significant heterogeneity in these costs makes reliable estimation challenging. Similarly, incremental fuel and externality costs associated with idling at the crossings are a small fraction of the value of lost time included in our calculation.

of the Vancouver area.[47] Traffic delays, on average, have a relatively limited impact from an economic standpoint. Because most travel is not business related, non-business impacts are greater than business impacts. These non-business impacts have limited effect in terms of lost income or lost value added.

Figure 6: Location of Vancouver At-Grade Crossings Evaluated



Note: Intersections evaluated in Table 9 include the following at-grade intersection: 8 (Hill St.), 9 (11th St.) and 13 (Ind St West 16th Street). Other at-grade crossings identified in Figure 6 (14 and 15, both in the industrial / Port area) were not reported in the U.S. DOT data. At-grade crossings included in Table 9 but not in Figure 6 are to the east of the geographic area included in Figure 6.

[47] Table 9 excludes the Jefferson and 8th Street at-grade crossings, which have been closed permanently. Two of the at-grade crossings in Table 9 are not in Figure 6, but are to the east of the geographic area shown.

Table 8: Assumptions Used in Calculating Costs of Rail Crossing Delays

Length of Delay Calculation:		
train length (feet)	7,800	**[A]** Draft EIS, p. 5-106
average train speed (mph)	30	**[B]** Assumption
gate down time prior (sec)	30	**[C]** Draft EIS, p. 5-16
gate down time post (sec)	12	**[D]** Draft EIS, p. 5-16
crossing time (min)	3.0	**[E]** = (([A]/ (5,280 ft per mile)) / [B]) * 60 min/h
total gate down time (min)	3.7	**[F]** = [E] + (([C] + [D]) / 60 s/min)
average length of delay (min)	**1.8**	**[G]** = [F] / 2
Value of Lost Time Calculation:		
Year Modeled	**2014**	**[H]**
Passengers / Vehicle	**1.0**	**[I]** Assumption
Hourly Earnings Car - Personal ($/hr)	$23.90	**[J]** DOT 2011, Table 3
Hourly Earnings Car - Business ($/hr)	$22.90	**[K]** DOT 2011, Table 3
Hourly Earnings Trucks ($/hr)	$24.70	**[L]** DOT 2011, Table 3
Personal % Earnings with Economic Impact	50%	**[M]** DOT 2011, Table 1
Business % Earnings with Economic Impact	100%	**[N]** DOT 2011, Table 1
Local % Business Travel vs. Total Travel	**4.6%**	**[O]** DOT 2011, p. 12
Weighted value of car time ($/hr)	$12.50	**[P]** = ([J] * [M] * (1 - [O])) + ([K] * [N] * [O])
Business value of car time ($/hr)	$22.90	**[Q]** = [K] * [N]
Value of truck time ($/hr)	$24.70	**[R]** = [L] DOT 2011, Table 1
Cost of car delay time, total ($/min)	**$0.21**	**[S]** = [P] / 60
Cost of car delay time, business only ($/min)	**$0.38**	**[T]** = [Q] / 60
Cost of truck delay time ($/min)	**$0.41**	**[U]** = [R] / 60

Notes:
[1] For [G], we assume vehicles arrive at a crossing at a constant rate, so that each vehicle's wait time will be, on average, half of the total gate downtime waiting.
[2] The Value of Lost Time calculations follow the DOT outlined procedure for valuing delay time in economic analyses.

Sources:
[1] Vancouver Energy Draft Environmental Impact Statement, Section 5.17.
[2] "Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis," U.S. Department of Transportation, September 2011. Available at: http://www.dot.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf.

Table 9: Estimates of Delay Costs Associated with Increased Rail Traffic

Select Locations within Vancouver

	Intersection Characteristics			Volume per Delay		Annual Costs	
	Additional Trains	Average Vehicles	% Trucks	Cars	Trucks	All Vehicles	Business Travel
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Vancouver, Washington:							
Hill Street	4	100	4%	0.2	0.0	$154	$24
Beach Drive	4	342	1%	0.9	0.0	$511	$52
11th Street	4	1,000	5%	2.4	0.1	$1,552	$265
Ind St W 16th St	4	4,400	5%	10.6	0.6	$6,827	$1,164
SE 139th St	4	1,250	1%	3.1	0.0	$1,867	$191
SE 147th Ave	4	300	1%	0.8	0.0	$448	$46
Total						$11,359	$1,741

Notes:

[1] Four trains will be added to routes in Vancouver.

[2] DOT National Grade Crossing Inventory

[3] Data sources same as in [2]

[4] = ([2] * (([F])/(24hr * 60 min))) * (1 - [3])

[5] = ([2] * (([F])/(24hr * 60 min))) * [3]

[6] = (1.016^([H] - 2011)) * ((([4] * [S]) + ([5] * [U])) * [G]) * [I] * [1] * 365 days

[7] = (1.016^([I] - 2011))*((([4] * [T] * [O])+([5] * [U]))* [G]) * [I] * [1] * 365 days

[8] Intersections were selected by examining cities of interest using the US Department of Transportation National Grade Crossing Inventory and Google Maps Street view.

Sources:

[1] US Department of Transportation National Grade Crossing Inventory, available at: http://safetydata.fra.dot.gov/officeofsafety/publicsite/downloaddbf.aspx?itemno=7.02.

[2] Vancouver Energy Draft Environmental Impact Statement, Section 5.17.

[3] Value of travel time based on "Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis," US Department of Transportation, September 2011. Available at: http://www.dot.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf.

Table 10: Estimates of Delay Costs Associated with Increased Rail Traffic
Select Locations Outside Vancouver

	Intersection Characteristics			Volume per Delay		Annual Costs	
	Additional Trains	Average Vehicles	% Trucks	Cars	Trucks	All Vehicles	Business Travel
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Bingen, Washington:							
Maple St	4	330	12%	0.7	0.1	$545	$152
Spokane, [9] Washington:							
East of Spokane							
N Park Rd	8	6,682	9%	15.4	1.5	$21,508	$5,032
N Vista Rd	8	2,185	9%	5.0	0.5	$7,033	$1,645
N University Rd	8	2,662	9%	6.1	0.6	$8,569	$2,005
N Pines Rd	8	11,000	7%	26.0	2.0	$34,772	$7,052
N Evergreen Rd	8	1,258	9%	2.9	0.3	$4,049	$947
N Flora Rd	8	362	9%	0.8	0.1	$1,165	$273
N Barker Rd	8	1,258	9%	2.9	0.3	$4,049	$947
Southwest of Spokane							
S Scribner Rd	8	37	11%	0.1	0.0	$121	$32
W Anderson Rd	8	90	11%	0.2	0.0	$295	$78
Pine St	8	480	5%	1.2	0.1	$1,490	$254
F Cheney Spa Rd	8	2,300	5%	5.5	0.3	$7,138	$1,217
Cheney-Plaza Rd	8	670	5%	1.6	0.1	$2,079	$355
Total						$92,269	$19,837

Notes:

[1] Spokane crossing are travelled by trains coming to and from Bakken. For these crossings, there are eight additional trains. The Bingen crossing is only travelled once and has four additional trains.

[2] Data for Seattle from DOT "Coal Train Traffic Impact Study." Other cities from the DOT National Grade Crossing Inventory

[3] Data sources same as in [2]

[4] = ([2] * ([F])/(24hr * 60 min))) * (1 - [3])

[5] = ([2] * ([F])/(24hr * 60 min))) * [3]

[6] = (1.016^ ([H] - 2011)) * ((([4] * [S]) + ([5] * [U])) * [G]) * [I] * [1] * 365 days

[7] = (1.016^ ([I] - 2011))*((([4] * [T] * [O])+([5] * [U]))* [G]) * [I] * [1] * 365 days

[8] Intersections were selected by examining cities of interest using the US Department of Transportation National Grade Crossing Inventory and Google Maps Street view.

[9] Our review showed that all relevant crossings in the Spokane city limits were either above or below grade. Instead, intersections were selected along the same lines to the East and West of the city.

Sources:

[1] US Department of Transportation National Grade Crossing Inventory, available at: http://safetydata.fra.dot.gov/officeofsafety/publicsite/downloaddbf.aspx?itemno=7.02.

[2] Data for Seattle, Washington includes adjustments to DOT data as reported in "Coal Train Traffic Impact Study," City of Seattle, October 2012. Avalable at: http://www.seattle.gov/transportation/docs/121105PR-CoalTrainTrafficImpactStudy.pdf.

[3] Vancouver Energy Draft Environmental Impact Statement, Section 5.17.

[4] Value of travel time based on "Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis," U.S. Department of Transportation, September 2011. Available at: http://www.dot.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf.

Business impacts are relatively limited. Within Vancouver, intersections potentially affected by incremental rail traffic all have relatively low traffic levels, with half of these occurring in industrial areas nearby the Port. The incremental impacts to business are all less than $300 annually. Outside of Vancouver, intersections east and west of Spokane, which are likely to have an additional 8 trains per day from the Project (four loaded inbound trains, and four empty outbound trains), experience impacts of up to $7,000 per year. Within Bingen, the more rural location, business impacts are below $200 annually per intersection. In aggregate, across the intersections evaluated, business impacts are less than $20,000 per year.

These impacts could have some tangible effects in terms of lost income or value added. However, compared to the magnitude of the economies of the communities in which these impacts occur, they are extremely limited. For example, in 2013, the total income earned for the city of Vancouver was about $4.3 billion, while total income in Spokane was about $12.4 billion.[48] In percentage terms, total business impacts (relative to income earned) are less than one-thousandth of one percent.

IV. CHANGES IN RAIL SYSTEM CONGESTION

As discussed above, under certain future scenarios, development of the Project could lead to increases in traffic on the rail system within Washington State which, in turn, could contribute incrementally to rail system congestion, potential delays, and associated impacts on rail operators and customers. In this section, we consider those potential economic consequences for the rail system.

Table 11 shows the potential impact of the Project on rail traffic in Washington, based on assumptions about the most likely routes for incoming and return traffic.[49] Figure 7 illustrates these routes. This table provides estimates of the short-run impact of the Project on rail traffic given current (2010) traffic levels as reported in the State of Washington's Final Draft State Rail Plan.[50] Specifically, Table 11 assumes that all inbound fully-loaded trains will arrive from the east via the BNSF rail lines that follow the Columbia River and that empty trains will head north towards Kalama/Longview back to their point of origin.[51]

[48] U.S. Census Bureau, State and County Quick Facts.

[49] These impacts were developed within Section 5.17 of the Draft Environmental Impact Statement.

[50] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," Final Report, prepared by Cambridge Systematics, March 2014; other recent estimates of rail capacity and forecast demand are provided in: BST Associates, MainLine Management, "Pacific Northwest Marine Cargo Forecast Update and Rail Capacity Assessment," prepared for Pacific Northwest Rail Coalition, December 2011.

[51] The estimates in Table 11 do not reflect certain investments currently being undertaken by BSNF that will likely increase rail capacity of the Washington rail system. In 2014, BNSF plans to invest $1 Billion in capital on expansion and maintenance on the Northern Corridor, with $235 million going to projects in Washington State. There are several major capital projects currently under way in Washington, including construction of a second

While we assume rail traffic along the route illustrated in Figure 7, it is important to recognize that, generally speaking, routing of freight rail traffic is very dynamic and does not adhere to a particular route. The route taken by a freight train on a given day will depend not only on convenience or distance, but also on other numerous factors, including weather events, customer needs and market demands. As a result, because there are three east-to-west routes through Washington from the eastern border to the Project in Vancouver, BNSF has greater flexibility and available capacity to ensure network fluidity than is reflected in our assumption that rail traffic follows the route identified in Figure 7. With that caveat in mind, this report assumes the most likely route, as demonstrated through current practice and given current conditions.

Table 11: Potential Changes in Daily Train Volume and Utilization from the Vancouver Energy Distribution Project (No Capital Improvements to Rail Infrastructure)

(Freight trains in parentheses for all alignments)

Rail Segment	Current Trains (2010)	Proposed Action	Capacity (2010)	Percent of Line Capacity	Existing Utilization (2010)	Utilization w/ Proposed Action (2010)	Rail Alignment
Assumed Inbound Route – Columbia River Alignment							
Sandpoint, ID, to Spokane, WA	48 (46)	56 (54)	74	11%	65%	76%	Columbia River + Central Return
Spokane, WA, to Pasco, WA	32 (30)	40 (38)	37	22%	86%	108%	Columbia River + Central Return
Pasco, WA, to Vancouver, WA	28 (26)	32 (30)	40	10%	70%	80%	Columbia River
Assumed Return Route – Central Alignment							
Vancouver, WA, to Kalama/Longview, WA	41 (31)	45 (35)	78	5%	53%	58%	Central Return
Kalama/Longview, WA, to Tacoma, WA	41 (31)	45 (35)	78	5%	53%	58%	Central Return
Tacoma, WA to Auburn, WA	41 (13)	45 (17)	115	3%	36%	39%	Central Return
Auburn, WA to Pasco, WA, via Stampede Pass	6 (6)	10 (10)	39	10%	15%	26%	Central Return

Sources: Current Trains and Capacity: Washington State Rail Plan, 2014, pages 41.

Over the assumed route, current utilization on affected lines ranges from 15 to 86 percent. With the additional traffic from the facility, and assuming none of the planned capital improvement projects

mainline track at various locations on the route between Cheney, Wash. and Mesa, Wash., and replacement of the railroad bridge over the Washougal River in Camas, Wash.

will be constructed, utilization would range from 26 to 108 percent. Thus, except for the Spokane to Pasco segment, there is sufficient capacity to accommodate increased rail traffic from the facility without any capital improvements to the rail infrastructure and without adjustments to other rail traffic. Even if trains were to return empty via the Columbia River, there would be sufficient capacity along the Vancouver to Pasco route to accommodate the additional demand for freight rail from the Project (traffic would increase to 36 trains on lines with a capacity of 40 trains). In addition, this analysis does not account for the excess capacity along the Seattle-to-Everett-to-Spokane route that could accommodate traffic from the Project or other customers using the Tacoma-to-Pasco-to-Spokane route.

Figure 7: Washington Rail System Map and Assumed Route for Project Rail Traffic

Estimates of rail segment utilization reported in Table 11 reflect estimates of current rail traffic and capacity for individual rail segments developed for the Washington State Department of Transportation ("DOT"). Other studies have developed similar estimates of rail traffic and capacity for these segments. In some cases, these traffic and capacity estimates differ meaningfully from those

developed by the Washington DOT.[52] We have not evaluated utilization relative to these other forecasts, nor have we performed an assessment of the relative accuracy or reliability of these estimates.

Table 11 provides a static view of the potential impact of the Project on the rail system in Washington State. It does not account for the various dynamic adjustments that can occur within an economic market that allow the supply of available and potential resources to shift to meet the demand for goods and services. In this case, rail system operators have many alternatives available to optimally utilize, enhance and expand the existing rail system to serve various rail customers whose demand for service may vary over time in both intensity and location. For example, BNSF is currently undertaking investments that would likely increase capacity in its Lakeside subdivision, which roughly corresponds to the Spokane to Pasco section listed in Table 11.[53]

From an economic standpoint, it is important to evaluate potential impacts from both short-run and long-run perspectives that account for the dynamic adjustments made by market participants that allow the supply (and location) of resources to meet demand. In the short-run, options to adjust rail use for new demand from the Project are more limited, while in the long-run, there is a larger set of options available to adjust system use, configuration and capacity. It is important to account for these economic adjustments in any assessment, because they can mitigate many apparent impacts from static assessments.

c. Short-run Impacts

As shown in Table 11, in the short-run, development of the Project could increase the demand for rail services in Washington State (relative to the No Action Base Case assuming all rail traffic to the Project is incremental). The incremental traffic from the Project would be modest in comparison to current levels of traffic. The additional traffic represents as little as 3 percent of route traffic (Tacoma-to-Auburn) and at most 22 percent of route traffic (Spokane-to-Pasco). With the additional traffic, route capacity utilization ranges from 26 percent (Auburn-to-Pasco) to 108 percent (Spokane-to-Pasco). While traffic would exceed the capacity of the Spokane-to-Pasco route, there is an alternative route (Tacoma-to-Everett-to-Spokane) with surplus capacity that could be used instead of the Spokane-to-Pasco route.

[52] BST Associates, Mainline Management, "Pacific Northwest Marine Terminal Cargo Forecast Update and Rail Capacity Analysis," Final Report, prepared for Pacific Northwest Rail Coalition, December 2011. Also, see prior rail capacity and system needs studies, in which capacity along some segments exceeds capacities in the most recent assessment: Washington State Department of Transportation, "Statewide Rail Capacity and System Needs Study," Final Report, prepared by Cambridge Systematics, et al., December 2006.

[53] This includes investment in siding and double-tracks. http://www.bnsf.com/customers/service-page/index.html . http://www.bnsf.com/media/news-releases/2014/may/2014-05-01a.html.

The static assessment represented in Table 11 does not account for adjustments that can be made in the short-run to either shift demand or increase supply along different rail routes. These adjustments include:[54]

1. Addition of more equipment, such as rail cars and engines;
2. Hiring (and training) of new employees;
3. Alternate routing and logistics, including the re-routing of trains to avoid bottleneck and implementation of advanced train control technologies;
4. Schedule and train speed adjustments;
5. Operation of longer trains;
6. Adjustments to the timing of shipments by shippers, including additional stockpiling of materials; and.
7. Certain track infrastructure investments

In prior periods, the rail system has faced significant increases in demand for services, and has successfully managed these shifts in demand through a number of the mechanisms discussed above. For example, in 2004, significant disruptions to freight transportation were anticipated as a result of the combination of steady growth in year-to-year demand for general freight combined with large grain harvests.[55] However, through a combination of adjustments by both the rail system and shippers, disruptions were limited and the predicted "meltdown" never occurred.

In addition to these adjustments to operations, in principle, short-term increases in prices can occur in response to increases in demand. Such changes would reflect complex interactions between rail system and economic conditions, and market regulation. Full evaluation of potential price impacts in the short term from development of the Project is outside the scope of this assessment. However, assuming that rail system adjustments and existing system flexibility due to the availability of multiple routes through Washington State is sufficient to avoid any existing capacity constraints (e.g., as shown in Figure 7 over the Spokane to Pasco segment), it is reasonable to conclude that no curtailments in service would be expected in the short-term.

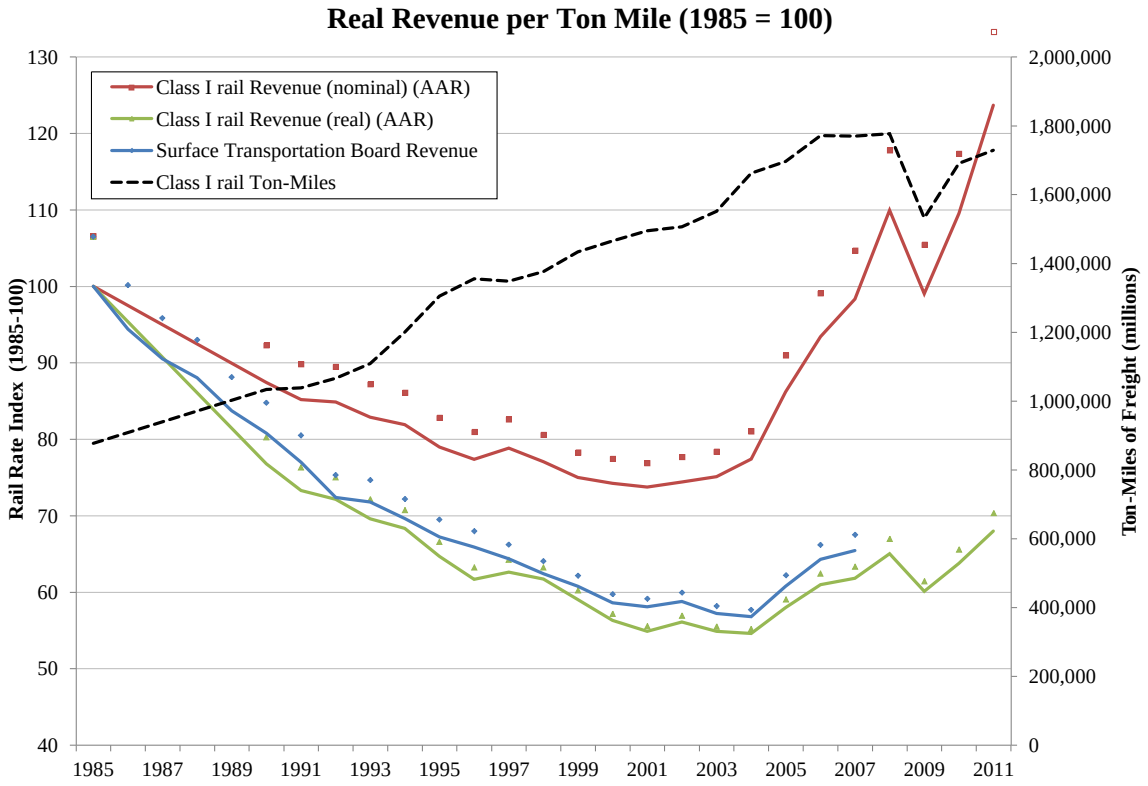
While we do not evaluate potential short-term price impacts, when considering potential for price impacts as a consequence of new rail traffic, it is important to put any such potential increases in the context of past trends in rail prices. As shown in Figure 8, while rail prices have increased in nominal terms since 2000, in real terms they have decreased significantly since deregulation of rail traffic in the mid-1980s. Moreover, prices have generally decreased over periods in which demand has been generally increasing. Price decreases have occurred due to a variety of factors, although the "rationalization" of rail

[54] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," prepared by Cambridge Systematics, Final Draft, December 2013, pp. 48-50; Congressional Budget Office ("CBO"), "Freight Rail Transportation: A Review of the 2004 Experience," Mary 2005.

[55] Congressional Budget Office (CBO), "Freight Rail Transportation: A Review of the 2004 Experience," May 2005.

services, including more efficient operations and existing infrastructure following deregulation of the rail industry is largely credited with these changes.[56]

Figure 8: Rail Rate Indices and Class I Traffic Volume, 1985-2007



Source: Department of Transportation, Association of American Railroads, Surface Transportation Board.

d. Long-run Impacts

In the long-run, at both a regional and national level, certain studies have forecasted that demand for rail services in future periods – for example, 10 to 20 years into the future – will exceed current capacity.[57] These increases reflect anticipated growth in economic activity and the associated demand for

[56] For example, *see* U.S. General Accountability Office, "Freight Railroads, Industry Health Has Improved, but Concerns about Competition and Capacity Should be Addressed," GAO-07-94, October 2006.

[57] While the system before deregulation was characterized by surplus capacity and inefficiencies along multiple dimensions, this surplus has diminished over time. As this surplus has diminished and system utilization has increased, a focus on increasing capacity at the national and regional level has emerged. Cambridge Systematics, *National Rail Freight Infrastructure Capacity and Investment Study*, prepared for the Association of American Railroads, September 2007; American Association of State Highway and Transportation Officials, "Transportation Investment in American, Freight-Rail Bottom Line Report," 2003.

transportation services, including rail and non-rail modes, and are not particular to any near-term trends in rail demand (e.g., crude by rail).

Within Washington State, while current capacity is sufficient to meet demand, planning studies indicate that the system could face shortfalls of capacity in future years *absent* expansion of system capacity. For example, the Washington State DOT found that projected daily train volume will exceed current capacity on a large fraction of lines by 2035.[58] Similarly, a recent study of the cumulative impact of additional train volume from energy Projects, including coal and crude oil, raised concerns that this additional demand would adversely affect existing users of the freight rail system by either "displacing" traffic or raising prices.[59] Our assessment does not include a review of these assessments, although we note that other parties have disagreed with certain findings.[60]

The rail system is privately owned and, for the most part, relies on private investment and operations decisions by the railroads to ensure that there is sufficient system capacity to meet demand. In recent years, reflecting a combination of factors, investment in rail infrastructure by rail operators has increased significantly. Figure 9 shows annual investment has grown about 65 percent over the past decade.[61] These investments reflect both upkeep of existing infrastructure as well as investments to expand rail capacity, including options to further expand capacity that are less feasible in the short-run, such as the deployment of advanced train control technologies, investment in additional rail lines (e.g., double- or triple-tracking rail corridors) and development of infrastructure to eliminate bottlenecks or constraints, such as raising tunnel ceilings, removing other obstacles to accommodate double-decker containers and replacing drawbridges that lead to rail delays.[62] Similarly, Figure 10 shows that the size of the Class I locomotive fleet has increased steadily over the last few decades. These investments have been one factor in allowing the industry to keep pace with the significant increases in services, as reflected in ton-miles in Figure 10, over the past several decades.

[58] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," prepared by Cambridge Systematics, Final Draft, December 2013.

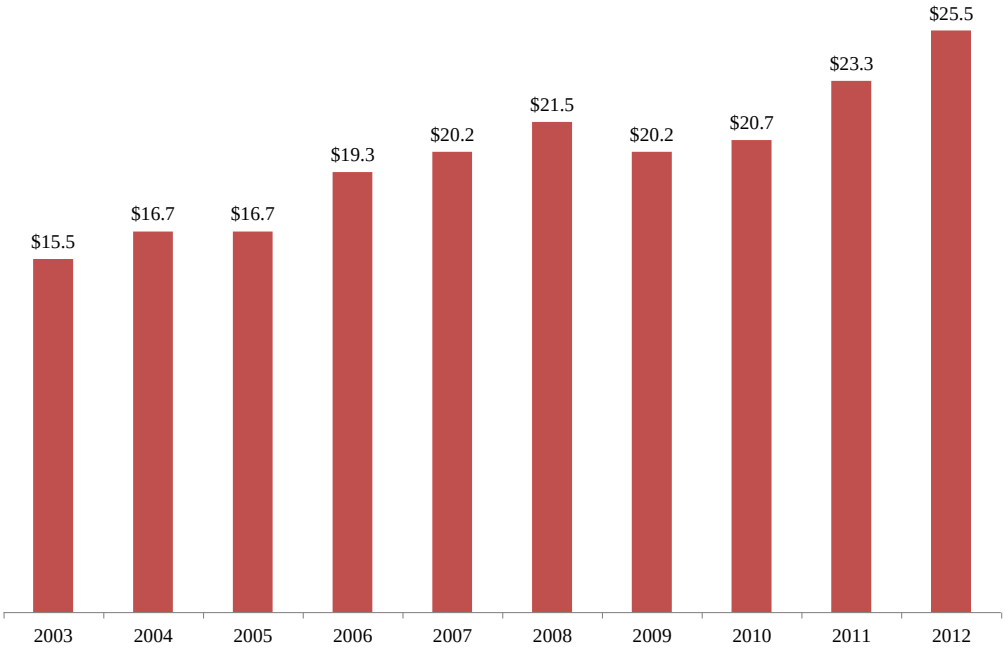
[59] Whiteside, Terry and Gerald Fauth III, "Heavy Traffic Still Ahead," prepared for the Western Organization of Resource Councils, February 2014.

[60] *For example*, LaBoe, Barbara, "Coal Facilities Would Tie Up NW Railroads, Study Says," *The Daily News*, July 11, 2012. http://tdn.com/mobile/article_1cb95c08-cbda-11e1-9a16-0019bb2963f4.html.

[61] *See*, Morris, Betsy, "Boom Times on the Tracks: Rail Capacity, Spending Soar," *Wall Street Journal*, March 26, 2013.

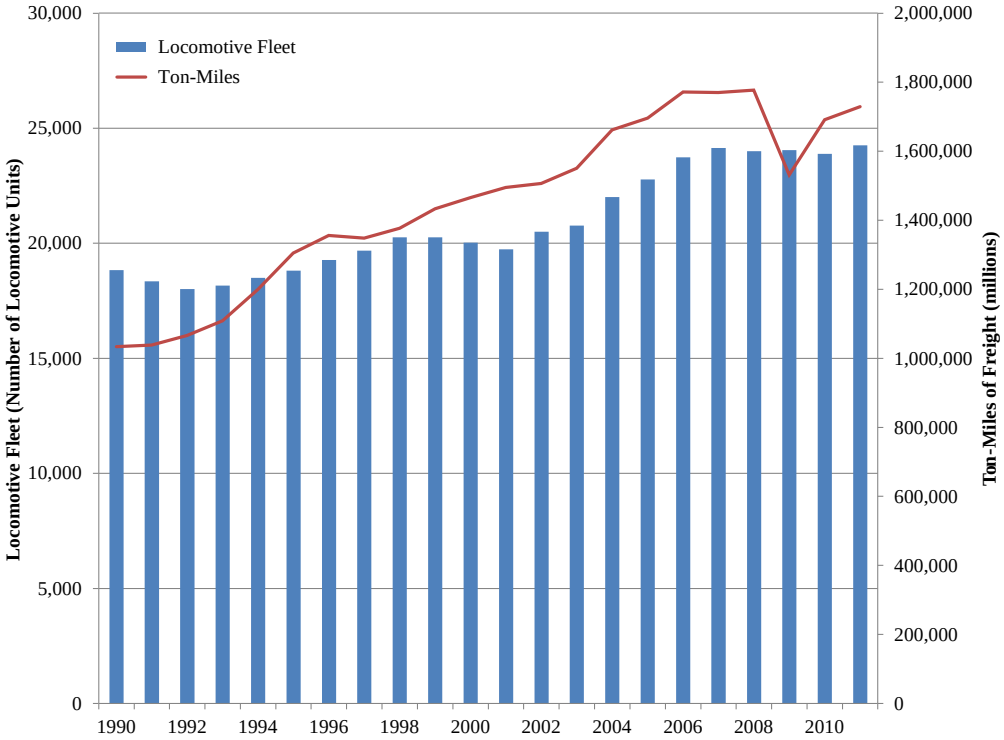
[62] Morris, 2003;

Figure 9: Freight Railroad Spending on Infrastructure and Equipment ($ Billion)



Source: Association of American Railroads.

Figure 10: Class I Locomotive Fleet, Number of Locomotive Units



Source: U.S. Department of Transportation.

In this context, it is worth noting that railroads in Washington State are undertaking capital investments to improve operational performance and capacity. For example, BNSF indicates that it is undertaking investments in siding projects along the Fallbridge (Pasco to Vancouver) and Lakeside subdivisions, and is undertaking five double-tracking projects along the Lakeside subdivision.[63] As noted earlier, these investments along the Lakeside route would increase capacity on the Spokane-to-Pasco section that appears potentially constrained under the highest level of incremental traffic from the Project.

Within this long-run context, the impact of any additional traffic from the Project is not expected to be significant. Moreover, the ability of the system to increase capacity to meet expanding demand will not depend on any additional traffic from the Project, but from factors such as the ability of the railroads to earn sufficient return to justify potentially significant investments.[64] Thus, the Project will not have significant impacts on the rail system, in the form of disruption to other services or significant price increases, in the long-run. While this is a topic beyond this scope of this assessment, it is important to note that many assessments conclude the rail system is likely to and has been able to meet capacity needs under a variety of circumstances.[65] For example, the Washington State Rail Plan notes that "[i]n reality, it is anticipated the Class I railroads (BNSF and UP) and other infrastructure owners will likely address key capacity issues as they emerge."[66] Similarly, the rail system has been able to meet past surges in demand for rail services, such as the significant new demand for the transport of coal from the Power River Basin in Wyoming, which grew steadily over a 25 year period.[67]

[63] http://www.bnsf.com/customers/service-page/index.html . A rail siding is a track section (usually a short length and designed for low speeds) that runs adjacent to an existing lines to allow two trains to pass or to allow a train to load/unload or temporarily stop while making the rail passable. Double-tracking involves two parallel tracks that run for a longer distance and can accommodate normal rail speeds.

[64] For example, *see* Cambridge Systematics, Inc., "National Rail Freight Infrastructure Capacity and Investment Study," prepared for the Association of American Railroads, September 2007.

[65] To the extent concerns are raised, these are typically used to suggest a role for public financing, which is justified by a number of factors, including public funding of infrastructure in competing transportation modes (e.g., highways for trucking, airports for air freight and publicly maintained waterways for water) and public benefits provided by rail systems. Moreover, all assessments conclude that the rail operators would provide the majority of any needed investment. For example, the *National Rail Freight Infrastructure Capacity and Investment Study* found that "Class I railroads anticipate that they will be able to generate approximately $96 billion of their $135 billion share through increased earnings from revenue growth, higher volumes and productivity improvements, while continuing to renew existing infrastructure and equipment." American Association of State Highway and Transportation Officials, "Transportation Investment in American, Freight-Rail Bottom Line Report," [n.d.]

[66] Washington State Department of Transportation, "Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013-2035," prepared by Cambridge Systematics, Final Draft, December 2013.

[67] *See*, United State Department of State, Keystone XL Pipeline Environmental Impact Statement, pp. 1.4-77 to 1.4-80.

V. ECONOMIC IMPACTS OF A CRUDE RAIL ACCIDENT

The transport of crude oil via rail can create certain accident risks that have potential economic consequences. Accidents of greatest concern involve those affecting environmental conditions (e.g., spills in sensitive environmental areas), economic activity (e.g., property damage) or human health (e.g., injuries or loss of life). In this section, we consider the economic consequences of such accidents, when they do occur. We do not, however, consider the likelihood that such accidents occur.

The potential impacts of rail accidents depend on multiple factors. Many of these are location specific, while others vary with the rail operator or system. Moreover, industry practices and regulations affecting crude rail transportation are rapidly evolving. On-going regulatory proceedings in the U.S. could increase the stringency of operational and safety standards by the time the Terminal comes into operation, leading (along with voluntary actions) to changes in tanker car designs and operating practices that improve safety.

When they occur, rail accidents potentially lead to a number of adverse economic consequences, including:

1. Environmental contamination from spills
2. Injury or loss of life from fire or collisions
3. Damages to property

In this section, we consider several issues related to the economic impacts of crude rail accidents.

A. Historical Crude Rail Accident Impacts

The extent to which an accident leads to economic, environmental and human health impacts will depend on many factors, including rail car design and the associated risk of spills or fires; the quantity of crude spilled; proximity to residences, economic activity (e.g., commerce, industry, agriculture and livestock) and environmental conditions (e.g., surface and groundwater, sensitive ecological areas or pristine natural resources); and speed and effectiveness of emergency response. When an accident occurs, it can lead to a number of different types of economic impacts, including: property damage (including freight, rail infrastructure, nearby homes, businesses or other properties); interruption of economic activity; response, environmental cleanup and remediation costs; and natural resource damages.

For the purposes of this report, we consider accidents that occur outside of the rail yard in which some quantity of hazardous material is spilled. The data relied on are collected by the Pipeline and Hazardous Materials Safety Administration ("PHMSA"). PHMSA requires that any transportation accident in which some quantity of transported hazardous materials is spilled (meeting certain reporting requirements) be reported to PHMSA. Thus, in principle, the data set provides comprehensive information on all accidents in which crude oil was spilled.[68] However, the U.S. Department of

[68] PHMSA provides information on rail accidents that result in the spill of hazardous materials above threshold levels. Information provided in the PHMSA data includes spill volume, dollar damages, injuries and fatalities. All

Transportation ("DOT"), in its regulatory impact analysis of proposed new operational requirements for trains carrying large volumes of crude, has identified certain "inaccuracies" in the PHMSA data,[69] such as the possibility that costs may be understated, without providing an assessment of the magnitude of any such inaccuracies.[70] Because our analysis of the PHMSA data to date does not include an assessment of data accuracy and reliability, we cannot at this stage assess the conclusions reached by DOT regarding the quality of the PHMSA data.

Based on a review of accident costs in the PHMSA data, the potential impacts of an accident involving a train carrying crude oil cargo can vary widely. Among accidents involving train incidents, damages reported in the PHMSA data range from less than $10,000 to $5.3 million.[71] Damages from accidents not involving train incidents have also ranged widely, from a low of $0 to a high of $21.1 million.[72] This section discusses the range of potential economic impacts based on PHMSA data on rail transport of hazardous material generally, rather than attempting to analyze the likely range of economic impacts associated with a potential accident due to traffic specifically related to the Vancouver Energy Terminal.

B. Economic Impacts and Distribution of Damages

In the event that an accident occurs, existing regulations require cleanup of releases by responsible parties.[73] In addition, existing statutes can require that a Natural Resource Damage Assessment occur to identify damages to natural resources and assign responsibility for such damages.[74] Cleanup actions, associated mitigation and other compensation can reduce impacts to local communities by reducing the period of time over which communities are adversely affected by the contamination,

data is self-reported by the transportation operator. Our analysis is limited to in-transit accidents. Rail accidents are also reported to the Federal Railway Administration (FRA), although reporting requirements differ, with, for example, FRA requiring the reporting of all accidents whether or not they involve hazardous materials. However, the FRA data provides limited information on accident impacts.

[69] U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, "Draft Regulatory Impact Analysis, Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains," Docket PHMSA-2012-0082, July 2014, p. 26.

[70] DOT, July 2014, pp. 29-30.

[71] Rail incidents considered include derailments, rollover incidents and vehicular crash or accident.

[72] The PHMSA data includes larger crude by rail accidents, such as those occurring in Casselton, North Dakota, Aliceville, Alabama, and Lynchburg, Virginia, but does not include accidents that occurred in Canada, including the accident in Lac-Mégantic, Quebec, which is likely to result in higher costs than those reported to PHMSA to date. Initial estimates put those costs at more than $200 million, although final costs could be higher than this amount. In its recent Regulatory Impact Analysis, the Department of Transportation assumes an estimated cost associated with the Lac-Mégantic accident of $1.2 billion, citing to press reports as a source for this estimate. National Transportation Safety Board, Safety Recommendation, R-14-1 to -3, January 23, 2014; DOT, PHMSA, 2014, p. 37.

[73] These statutes include the Resource Conservation and Recovery Act, the Safe Drinking Water Act, and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

[74] These statutes include the Oil Pollution Act and CERCLA.

requiring mitigating actions to reduce economic consequences (e.g., replacing contaminated drinking water supplies) and providing financial compensation for economic damages.

Under these laws, the financial costs associated with cleanup, mitigation and compensation would generally be incurred by the responsible party, rather than the communities in which accidents occur. In addition, government funds may be available to address certain types of costs, such as contaminant removal costs.[75] Thus, the final economic impact to communities affected by a crude rail accident would reflect compensation for economic damages as a result of a crude rail accident.

To ensure that rail operators can fulfill their liability for rail accidents, they are required to carry insurance to compensate for damages arising from rail accidents. In recent years, Class I railroads have carried $1 billion in insurance.[76] As a Class I railroad, BNSF, the rail operator to and from Vancouver Energy, would be expected to carry coverage at this general level, as available in the insurance market. As recently as 2008, BNSF reported carrying a combination of self-insurance and excess liability insurance of $1 billion.[77] Such insurance would be sufficient to cover impacts from all past accidents, as reflected in the range of costs reported in the PHMSA data associated with crude rail accidents in the U.S. to date described above. Thus, based on the incident costs reported to date by PHMSA, in all but perhaps the most severe of accidents, such as the Lac-Mégantic accident,[78] the amount of insurance coverage available is likely to be sufficient to cover the costs associated with a spill.

C. Forward-looking Adjustments

As discussed above, economic impacts from rail accidents depend, in part, on the practices of and equipment used by rail operators. Safety regulations, largely imposed by federal regulators including the Department of Transportation, affect these decisions. The economic consequences of rail accidents, thus, depend, in part, on the design and implementation of these regulations.

Within the past year, changes to rail safety regulations have been made and other regulatory changes have been proposed or are under consideration. Changes affecting braking power, train speeds, and proper materials testing and classification are under review, and regulatory changes are being

[75] For example, the Oil Spill Liability Trust Fund has funds to pay for certain costs, including removal costs that are uncompensated or performed by the Coast Guard or the Environmental Protection Agency, and payments to conduct natural resource damage assessments. http://www.uscg.mil/npfc/About_NPFC/osltf.asp.

[76] Union Pacific, Verified Statement of Warren B. Beach, Surface Transportation Board, Ex Parte No. 677, August 21, 2008; BNSF, Surface Transportation Board, Ex Parte No. 677, July 22, 2008; Department of Transportation, "The Transportation of Hazardous Materials: Insurance, Security, and Safety Costs," A Report to Congress as required by Section 1555(b) of the Implementing Recommendations of the 9/111 Commission Act of 2007, December 2009.

[77] BNSF, December 2009.

[78] See footnote 72 for a discussion of reported estimates of costs associated with this accident.

considered.[79] Notably, the U.S. Department of Transportation has recently proposed rules for enhanced tank car standards, including enhanced braking, and operational controls, including actions to lower operating speeds and improve rail routing, materials classification and safety authority notification.[80]

The changes that have occurred over the past year in rail safety regulation, together with additional changes anticipated with current federal rule-making, would be expected, all else equal, to reduce the magnitude of impacts from rail accidents involving trains carrying crude oil. However, we have not evaluated the extent to which recently enacted and proposed regulations would reduce potential economic impacts from incremental rail traffic associated with Vancouver Energy.

VI. CONCLUSION

This report provides an assessment of secondary impacts from potential increases in rail traffic associated with Vancouver Energy, including dis-amenity, such as noise and aesthetic impacts, from increased rail traffic, increased road congestion at at-grade rail crossings, increased congestion on the rail system; and rail accidents. We find that the dis-amenity, increased congestion at at-grade crossings and increase rail system congestion from Vancouver Energy would not be expected to impose significant economic impacts. We have not evaluated potential costs from rail accidents associated with Vancouver Energy. Such costs are highly variable and would reflect many factors particular to the rail route and rail operator. However, existing laws, spill response funds and hazardous materials handling insurance are expected to cover the economic impacts for all but the most severe accidents.

[79] American Association of Railroads, "Freight Railroads Join U.S. Transportation Secretary Foxx in Announcing Industry Crude by Rail Safety Initiative," February 21, 2014; Frittelli, John, et al., "U.S. Rail Transportation of Crude Oil: Background and Issues for Congress," Congressional Research Service, May 5, 2014; U.S. DOT, Amended and Restated Emergency Restriction/Prohibition Order, Docket No. DOT-OST-2014-0025.

[80] U.S. DOT, PHMSA, Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains, Docket No. PHMSA-2012-0082, August 1, 2013.

ATTACHMENT E

Assessment of Vancouver Energy Socioeconomic Impacts:

Statistical Analysis of Potential Property Value Impacts from Vancouver Energy

Analysis Group, Inc.

May 13, 2016

EX 0158-TSS

Assessment of Vancouver Energy Socioeconomic Impacts:

Statistical Analysis of Potential Property Value Impacts from Vancouver Energy

Todd Schatzki and Bruce Strombom[1]

May 2016

This report summarizes an assessment of the impacts to property values in the Vancouver, Washington area as a consequence of the development of the Vancouver Energy distribution terminal (the "Project"). The analysis considers impacts given the potential for increased rail traffic from deliveries of crude oil supplies to the Project.[2] Such impacts could occur due to the expectation of dis-amenity from increased rail traffic, or rail traffic transporting crude oil supplies. There has been significant coverage of the proposed facility in the local press, as well as extensive coverage of other proposed terminals supporting rail transport of crude oil and coal within Washington State. Consequently, while the facility has not been constructed and no increases in rail traffic have yet occurred, there has been much information available to real estate market participants about these facilities and the potential for increased rail traffic.

To evaluate whether the proposed facility has yet had any impact on property values, I perform a statistical analysis of real estate transactions in Clark County, Washington to determine whether the announcement of the Project has had an adverse impact on property values. To test for such an adverse impact, I test whether there is a change in the impact of proximity to rail on property values changes after the announcement of the facility's development. Note that this test differs from the more basic question of whether proximity to the rail affects property values – that is, there is a discount (or premium) to living near to a rail line. If homeowners find it less desirable to live near a rail given the possibility of increased crude rail traffic, I would expect to observe a change in the discount/premium from living near the rail after the Project's announcement. For example, if homes near the rail corridor had, on average, sold for 5 percent less than those more distance, this impact might increase to, say, 10 percent as a consequence of anticipated increases in rail traffic due to the facility. Claims have been made that such potential impacts could be as large as 30 percent.[3]

[1] Dr. Strombom is a Managing Principal and Dr. Schatzki is a Vice President at Analysis Group. The report was conducted on behalf of Tesoro Savage Petroleum Terminal LLC, but the opinions expressed are exclusively those of the authors. To request further information or provide comments, Dr. Schatzki can be reached at: tschatzki@analysisgroup.com.

[2] The report does not consider potential impacts from proximity to the facility itself. The facility is located within the Port of Vancouver, an existing part of Vancouver that is already highly industrial.

[3] Johnson Economics, "Estimated Economic and Fiscal Impacts of the Tesoro Savage Project on the Waterfront Vancouver Development and Downtown Vancouver," December 9, 2013; Johnson Economics, "Predicted Impacts

This appendix is divided in to four sections. Section I provides relevant background on Vancouver Energy project development process. Section II provides an overview of the data and methods used in our statistical analysis. Section III summarizes the results of our analysis. Finally, Section IV provides some concluding remarks. Two appendices provide more information on earlier work I developed to measure potential property value impacts and the details of our statistical analysis.

I. BACKGROUND ON VANCOUVER ENERGY DEVELOPMENT RELEVANT TO THE HEDONIC ANALYSIS

The development of the Vancouver Energy facility has occurred in a series of steps, with various milestones occurring over time. The potential for the facility first became public knowledge on April 22, 2013 when the Port of Vancouver announced that Tesoro and Savage Corporations had developed a joint venture to develop the Project, subject to approval by the Port's Commissioners and the approval of regulatory agencies.[4] On July 23, 2013, Vancouver Energy received approval of the lease with the Port of Vancouver.[5] This approval occurred after a series of five commission workshops held over a ten-week period, providing both general information on issues related to crude oil as well as information specific to the Project. Approvals from regulatory agencies, principally the Energy Facility Siting Evaluation Council (EFSEC) are on-going. Public hearings, with the opportunity for oral or written comment, were held in Fall of 2013.[6] Subsequently, preliminary Draft Environmental Impact Statement (EIS) submitted to EFSEC by Vancouver Energy in July 2014, with additional material provided in September 2014.[7] Various governmental and non-governmental agencies have taken actions with respect to the project, including resolutions by Vancouver's City Council.[8] Over this period of time, there was substantial news coverage of the Project's development in the press, along with significant attention to marine energy terminals generally, in light of proposals for other facilities in Washington State.

The development of the Vancouver Energy facility has not yet been approved. Absent these approvals, the Project would not be developed, and, as a result, there is some possibility that the Project would not be developed and that the potential increases in rail traffic from the Project would not occur. However, to the extent that the Project's development is considered likely, impacts to property values from any increase in rail traffic would be expected to occur as the information becomes known. This outcome reflects two economic principles. First, information about factors that will change the value

of the Tesoro Savage Project on Development and Redevelopment in Downtown Vancouver, Washington," December 18, 2013.

[4] http://www.portvanusa.com/news-releases/tesoro-and-savage-announce-joint-venture-to-construct-and-operate-crude-by-rail-unloading-and-marine-loading-facility-at-port-of-vancouver-usa/

[5] http://www.portvanusa.com/news-releases/port-commission-approves-lease-with-tesoro-savage/

[6] http://www.efsec.wa.gov/Tesoro%20Savage/Public%20Comments%20page_copy(1).shtml

[7] http://www.vancouverenergyusa.com/assets/pdeis_12.17.14.pdf

[8] http://www.opb.org/news/article/vancouver-city-council/

that homeowners place on owning the property in the future – when the facility is actually in operation – will impact the market value of the property today, as soon as the information is known.[9] Second, even if there is uncertainty about whether impacts to value will occur, market prices will adjust to account for the risk that such impacts will occur.[10] Thus, to the extent that the Project would lead to adverse impacts to property values, I would expect to observe such impacts in market prices today, dampened for the probability that such adverse impacts may not occur.

As described above, the diffusion of information about the Project to the local real estate market has evolved over time. This information has potentially important consequences for the impact of the Project on local property values. Because information and attention has varied over time, the market's view of the likelihood that the Project would be developed may be constantly changing, which could lead to variation in the Project's impact on property values. For example, the impact could grow gradually as information about the facility becomes widely known.

Similarly, the availability and type of information about a potential "nuisance" such as the Project can influence the extent of market value impacts. For example, public attentiveness to the Project could increase impacts above the impacts that would have occurred absent the attention. In fact, one study evaluating the potential impact of proximity to a rail corridor found that property value impacts were larger when information about the rail line was receiving public attention (as a result of a rail operator merger), while the impacts were smaller and statistically insignificant, when public attention diminished.[11] Because of these factors, I utilize statistical tests that allow the impact of the Project's development to vary over time.

I am unaware of any analyses of the potential impacts of crude-by-rail shipments specifically on property values. Within the context of the public proceedings related to siting of the Vancouver Energy facility, certain assertions have been made regarding potential impacts. In particular, several analyses performed by Johnson Economics regarding the development of the Vancouver Energy facility assume that these impacts would be large. These analyses were included as Exhibits D and E to EFSEC

[9] This is true of any property or asset in which market value reflects a stream of future benefits, such as publicly trade share prices that reflect the future profits from the underlying firms. In the case of real estate values, these future benefits reflect the value homeowners place on living in a given property. To the extent that information about the property becomes known that would positively or negatively affect this value in the future, it will affect the real estate price that people are willing to pay for the property today. For example, *see* MacKinlay, Craig, "Event Studies in Economics and Finance," *Journal of Economic Literature* 25(1): 13-39, 1997.

[10] In this regard, the potential for the Project to be developed is not different than the potential for an accident to occur or environmental contamination to arise from nearby hazardous facilities. For example, *see* Palmquist, Raymond and V. Kerry Smith, "The Use of Hedonic Property Value Techniques for Policy and Litigation," *International Yearbook of Environmental and Resource Economics*, Volume VI, August 10, 2001.

[11] The research by Simons and El Jaouhari (2004), which evaluates impacts before and after a highly publicized rail merger that was anticipated to increase rail traffic, supports the conclusion that greater information or publicity regarding rail impacts may lead people to place a greater emphasis or value on proximity to the rail corridor. See Appendix A for further discussion.

comments submitted by Columbia Waterfront LLC.[12] One report (in Appendix D) posits that the development of the Project would have an adverse impact on the potential positive economic impacts from a local development project – the Waterfront project.[13] Johnson Economics assumes that the Project would reduce the size of the Waterfront project by 30 percent. They write:

> "To evaluate the construction impacts of each scenario, we modeled the estimated impacts of the current master plan, and reconciled those impacts with a second scenario that *assumed a 30% reduction in development yield on the site*."[14] (Emphasis added.)

No explanation, justification or rationale is provided for the assumption that the Project would reduce the "development yield" of the Waterfront project by 30 percent – the statement above is the extent of the discussion or explanation for this crucial assumption.[15]

In another report (Appendix E to Columbia Waterfront LLC's comments), Johnson Economics assesses the Project's potential impact on development and redevelopment in downtown Vancouver.[16] This report makes assumptions about the impact of the Vancouver Energy facility on future levels of development and redevelopment in downtown Vancouver, and considers changes in this level of development and redevelopment activity from the Project. Based on these assumptions, Johnson Economics concludes that the Vancouver Energy facility would reduce development and redevelopment investment by 28 percent and real market value by 36 percent.[17]

Thus, although the Project has not yet gone into operation, some claims have been made that it would lead to significant impacts to the local real estate market. As discussed in the Secondary Impact Report, these claims are inconsistent with prior economic analysis that has found impacts on the order or 0 to 1.5 percent for similar changes in rail traffic. Our analysis in this report complements these analyses of rail traffic impact in other regions by analyzing the extent to which the Project has to date led to property values impacts in the Vancouver area.

[12] Columbia Waterfront LLC, SEPA Scoping Comments, Tesoro-Savage Energy Distribution Terminal, Docket EF-131590, December 18, 2013.

[13] Johnson Economics, "Estimated Economic and Fiscal Impacts of the Tesoro Savage Project on the Waterfront Vancouver Development and Downtown Vancouver," December 9, 2013.

[14] Johnson Economics, December 9, 2013, p. 2. Johnson Economics also notes that their approach is to "… model an alternative development program reflecting what is viable under an impacted scenario assuming the Tesoro Savage Facility." Johnson Economics, December 9, 2013, p. 8.

[15] Our Secondary Impacts Report provides further assessment of this Johnson Economics' study, including comparison of the magnitude of asserted economic impact to the economic benefits created by Vancouver Energy and assessment of the linkage between Johnson Economics' asserted impact on "development yield" and the way in which impacts are evaluated in their economic analysis.

[16] Johnson Economics, "Predicted Impacts of the Tesoro Savage Project on Development and Redevelopment in Downtown Vancouver, Washington," December 18, 2013.

[17] These conclusions reflect assumptions that achieve rents levels would decline by 15 percent and capitalization rates would fall by 10 percent.

II. OVERVIEW OF DATA, ASSUMPTIONS AND METHODS

To evaluate the potential impacts of Vancouver Energy on property values in the Vancouver, Washington real estate market, we analyze whether there has been a change in real estate property values since the announcement of Vancouver Energy that can be attributed to the Project's development. To perform this analysis, we develop a model to estimate prices as a function of attributes of the property, its location and its surrounding neighborhood, and the time when the sale occurred.

We first construct a data set that includes all residential property transactions within Clark County from 2007 to present through April 2015. This sample period includes 14 months of data in which the market had information about the development of the Vancouver Energy facility. We limit our sample to "arms-length" transactions of single-family residences, and employ certain data restrictions to remove anomalous observations from our data. Details regarding our sample are provided in Appendix B.

We then develop a set of variables that capture each property's characteristics, its location and the time when the sale occurred account for sources of variation in transaction prices. Table 1 provides a list of the variables we use to control for variation in these factors. To control for variation in property characteristics, we include variables such as the lot size, interior house size and the number of bathrooms and bedrooms. To control for a property's location, we include a variable for each unique zip code. To control for the time when the transaction occurred, we develop one model with a year variable and another model with year-month variables. We also perform numerous sensitivity analyses that modify the sample of transactions and the control variables to ensure that the conclusions are robust to these decisions. Further details on these robustness checks are provided in Appendix B.

To measure the potential impacts associated with Vancouver Energy, we construct two types of variables: variables measuring the distance between each property and the BNSF rail corridor, and variables capturing the time period since the Project was announced. A variable measuring the distance between the rail and each property is constructed. In our analysis, we consider different functional forms for how property values vary with distance from the rail. First, we allow property values to vary with four discrete distance "band" from the rail line, with bandwidths including: less than 250 feet; 250 to 1,000 feet; 1,000 feet to one-half mile; and one-half to one mile. Second, we consider models in which impact varies continuously with distance from rail. Specifications are considered in which impacts varies according to a quadratic or logarithmic function. The two functions provide reasonable alternatives for a functional form that declines non-linearly with distance from the rail.

To capture when information about the Vancouver Energy facility was available to the real estate market, we construct time variables that are aligned with the announcement of the Project. One variable is a fixed variable that assumes that the announcement has a constant effect across the 14 month period since the announcement. Another set of variables relax the assumption that these impacts are equal across the 14-month period, and allow this impact to vary by quarter over the 14 month period.[18]

[18] We also consider models in which the impact varies by month.

Table 1: Independent Variables in Housing Price Regression Model

Variable Category	Specific Variables
Housing characteristics	• Year built • Number of bathrooms • Number of bedrooms • Finished square footage * • Lot square footage * • Cooling system (central, wall or none) §
Transaction timing	• Year fixed effects • Month fixed effects § • Year-month fixed effects
Housing location	• Zip code fixed effects • Census tract fixed effects §
Distance From Rail	• Continuous distance measure (log and quadratic) • Distance Bandwidths: < 250 feet; 250 to 1,000 feet; 1,000 feet to one-half mile; and one-half to one mile
Time Period After Announcement	• 14-month variables • Quarterly variables • Monthly variable §

Notes:

* denotes variable specified in logarithmic form in the housing price regression model.

§ denotes variables considered as part of model sensitivities.

Throughout our analysis, we will focus on determining whether the announcement of the Project has had an adverse impact on properties in the Vancouver region. Under the theory that properties closest to the rail corridor would experience the greatest impact, we test whether impact of proximity to the rail has *changed* since the Project's announcement. Thus, instead of focusing on the impact of proximity to the rail, we focus on the *change* in this impact since announcement of the project as a way to try to isolate the impact of the announcement itself from the impacts of proximity to the rail line generally, with or without the Project.

The rail line generally runs along the Columbia River. To the east of downtown Vancouver, the rail corridor is in very close proximity to River, whereas to the north of downtown Vancouver, the corridor runs somewhat inland with farmland and less densely populated land in the area between the corridor and the River.

The models are estimated using ordinary least square (OLS), a standard statistical approach for estimating how multiple independent factors of interest affect the primary (dependent) variable of interest. In this case, property value is estimated as a function of the dependent variables listed in Table 1.

III. RESULTS

Our results are summarized in Tables 2 and 3. Tables 2 and 3 each report two impacts. The first column shows the estimated impact of proximity to the rail line on property values; the second column shows the change in this impact since the announcement of the development of the Vancouver Energy project. (Thus, the net impact of proximity to the rail line after the Project's announcement is the sum of the values in these two columns.)

Tables 2 and 3 test two different models for the relationship between proximity to the rail and property values. Table 2 provides estimates of the percentage difference in property values for each of four discrete distance bandwidths as compared to properties beyond the one mile rail corridor. Table 3 assumes that impact to diminish with distance from the rail, with the impact varying continuously as an arithmetic function of the property's distance to the rail.

The results in Table 2 indicate that properties within 250 feet of the rail sell at a discount (-4.46 percent). However, this impact is not statistically significant – that is, from a statistical standpoint, the estimate cannot be distinguished from zero.[19] Properties that are 250 to 1000 feet from the rail sell at a premium (+2.75 percent), although this estimate also is not statistically significant. Beyond 1000 feet up to one mile, properties sell at a premium of +4.36 or +5.32 percent, which is statistically significant.

The test of whether the Project's announcement has had an impact on property values depends on the estimated coefficients in the second column. If these estimated values were statistically different from zero, this would indicate that the Project's announcement has had an impact of property values. The estimated change in the discount/premium associated with proximity to the rail ranges from -1.54 percent to +4.57 percent. However, none of these estimated changes in the discount/premium are statistically significant. This result is consistent with the conclusion that the Project has had no impact on property values to date irrespective of distance from the rail.

[19] That is, from a statistical standpoint, we cannot assume that the estimated value is any different than zero. In these test, I consider a statistical confidence level of 10 percent. (Technically, this means that zero is within the range of possible values at a 90 percent probability.) A standard benchmark for statistical significance is a 5 percent confidence level. Thus, testing against a 10 percent confidence interval is biased in favor of finding a statistically significant effect. Pindyck, Robert and Daniel Rubinfeld, *Econometric Models & Economic Forecasts*, third edition, McGraw-Hill: New York, 1991.

Table 2

Impact of Proximity to Rail on Property Values, Distance Bandwidths

Change in Impact After the Vancouver Energy Announcement

Proximity to Rail	Percent Impact	Change in Percent Impact After Announcement
1/2 mile to 1 mile from rail	4.31%***	0.65%
1000ft to <1/2 mile from rail	5.36%***	2.41%
250ft to <1000ft from rail	2.69%	-1.47%
< 250ft from rail	-4.56%	4.65%

Notes:

[1] Measure of statistical significance: *** = at 1% level; ** = at 5% level: * = at 10% level

[2] Estimates control for house characteristics, location (zip codes) and time of sale (year-month dummy variables). These variables are further described in Appendix A.

Sources: Realty Trac, ArcGIS

Table 3

Impact of Proximity to Rail on Property Values, Continuous Distance

Change in Impact After the Vancouver Energy Announcement

	Percent Impact	Change in Percent Impact After Announcement
Quadratic		
Kilometers from rail	0.0000311	-0.00157
Kilometers from rail (squared)	-0.0000956	-0.0000291
Logarithmic		
Log(kilometers from rail)	-0.00286	-0.00584

Notes:

[1] Measure of statistical significance: *** = at 1% level; ** = at 5% level: * = at 10% level

[2] Estimates control for house characteristics, location (zip codes) and time of sale (year-month dummy variables). These variables are further described in Appendix A.

Sources: Realty Trac, ArcGIS

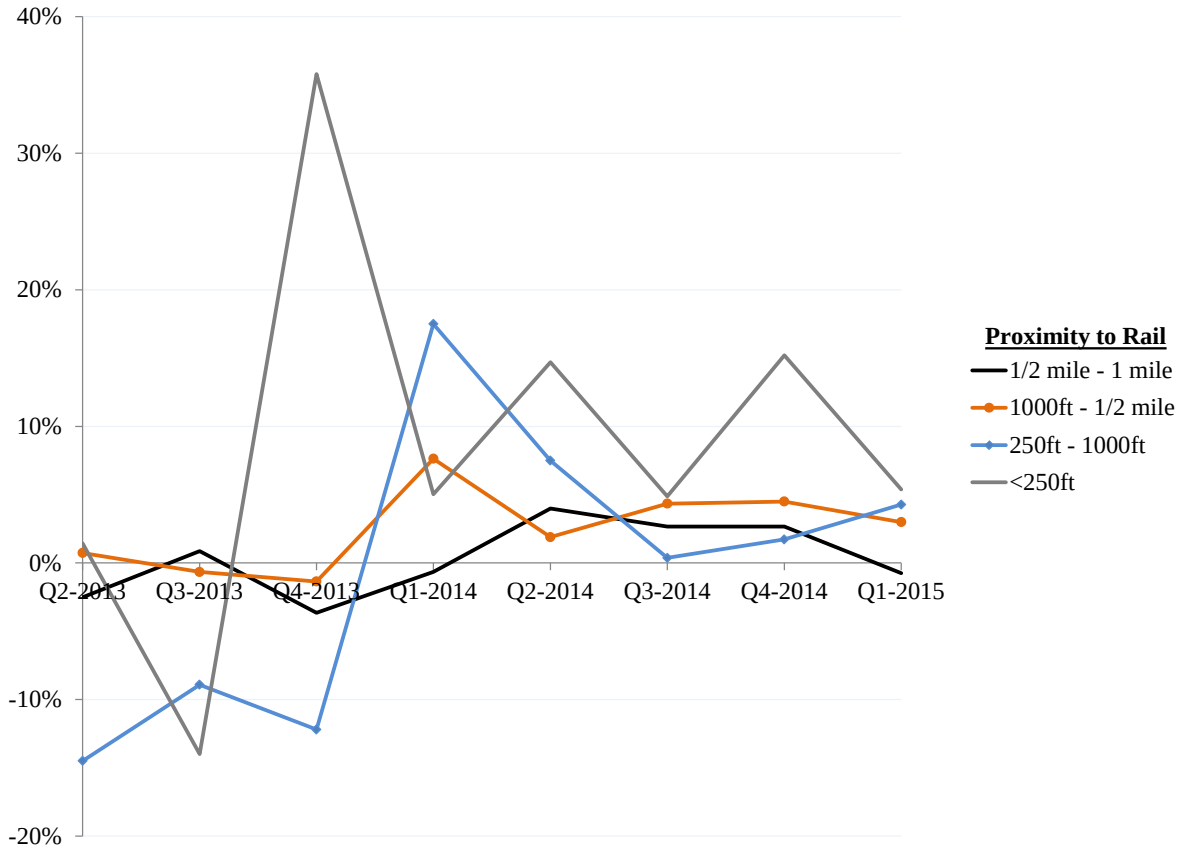
Since the announcement, these premia (positive or negative) to properties nearby the rail line have changed by between -1.54% to +4.6%, and none of the estimated changes are statistically significant. This result is consistent with the conclusion that the Project has had no impact on property values to date.

The results in Table 3 reveal there is no statistically significant association between prices and distance from the rail, specified linearly, quadratically, or logarithmically. On average properties closer to the rail line sell at a premium to those further from the rail, however this trend is not statistically significant. As with the distance band results in Table 2, there is no statistically significant change in the relationship between property value and distance from the rail after the announcement of Project. Thus, the analysis results are again inconsistent with the conclusion that the Project has had a statistically significant negative impact on property values.

As discussed earlier, it is important to consider the possibility that the Project could have an impact on local property values that has changed over time. To consider this possibility, we perform statistical tests in which we measure whether there has been a change in the impact of proximity to the rail in each quarter since the announcement. The results of this analysis are reported in Figure 1. Figure 2 shows that the change in impact has varied by quarter, with an adverse change as large as 14 percent and a positive change as higher as 36 percent. However, most importantly, the vast majority of the estimated impacts in Figure 2 are not statistically significant. Thus, again, the results are inconsistent with the conclusion that the Project has had a statistically significant negative impact on property values.

In addition to the results reported in Tables 2 and 3 and Figure 1, we perform tests under a range of alternative assumptions to test the robustness of our results. Several of these additional tests are of note. First, we consider the possibility that the change in impacts vary by month instead of by quarter. Second, we control for locational or neighborhood effects using census tract variables, rather than zip code variables. Third, we limit our sample to properties nearby to the rail line (within three miles), rather than including all properties within Clark County. Fourth, we consider the possibility that the impact of proximity to the rail varies for the southern segment (along the Columbia River) as opposed to the northern segment (heading to Seattle). These results are reported in Tables A2 to A4. In all cases, our results are consistent with the conclusion that the Project has not adversely affected property values in close proximity to the rail.

Figure 1
Change in Impact to Property Value from Proximity to Rail
By Quarter Since the Announcement



Note: The estimates reflect the change in the impact of proximity to the rail in each quarter after the announcement of the Vancouver Energy project as compared to the pre-announcement impact of proximity to the rail. For example, in Q1 2015, properties within 250 of the rail sold at a premium (on average, all else equal) of 5.4 percent relative to the discount/premium of proximity to the rail prior to the announcement, which was -5.6 percent (as estimated in this specification).

IV. CONCLUSIONS

The development of the Vancouver Energy facility could lead to potential impacts to local real estate markets due to increased rail traffic. Certain claims have been made that the Project could have adverse impacts as large as 30 percent to activity in these markets. In this report, we provide analysis that is inconsistent with this conclusion.

In our Secondary Impacts study, we developed estimates of impact of potential increases in rail traffic delivering crude oil supplies to the Vancouver Energy facility. Based on parameter estimates from two prior studies, we found that the potential adverse impacts were likely to range from 0 to 1.5 percent. This result suggests a small impact from the Project.

In this report, using statistical analysis, we test whether the announcement of the Project has had any adverse impact on the sale price of properties located nearby to the rail line that would deliver crude supplies to the Project. We find no such adverse impacts across the many statistical tests we perform. Because the Project has not yet been constructed and deliveries of crude supplies have not yet begun, it is possible that the full impact of the Project has not yet been felt. However, because property markets will adjust for new information about factors that would impact future property values, we would expect to observe some change in property values if the Project were to result in a large and significant impacts in the future. Consequently, our results are consistent with the conclusion that the Project will not result in a large and significant adverse impact on property values in the Vancouver area.

Appendix A:

Details Information Regarding Data, Sample and Results

The data set was constructed from several sources. Property transaction data was obtained from Renwood RealtyTrac, LLC. These data include information on the type of transaction (sale, transfer, refinancing), the current physical characteristics of the property and property's geographic location (geospatial location). The distance to the BNSF rail line and census tract identification were developed using ArcGIS.

Our sample only includes properties meeting the following criteria:

- Transactions between January 2008 and April 2015;
- Single family homes under 10 bedrooms;
- Arm's length transactions (as identified by RealtyTrac)
- Properties identified as within Clark Country, Washington and within 20 miles of the railway corridor;
- Transaction price above $20,000; and
- Single-parcel transactions (multi-parcel transactions reporting only the sale price across multiple parcels were excluded).

The fixed effect (constant) dummy variable for the timing of the rail announcement identifies all transactions occurring during and after April 2013. The post-announcement quarterly dummy variables identify the months start with the quarter June 2013 to August 2013. By starting the quarterly dummy variables in May 2013, the eight dummy variables cover the entire sample through April 2015. Because transactions typically require multiple weeks to close on the final transaction date, relatively few if any transactions occurring after April 22, 2014 would have a transaction date earlier than June 2013.

Estimates of the transaction price model are performed using OLS, with robust standard errors. Results are reported in Tables A1 to A4. Table A1 reports estimates of the household characteristic control variables. The estimated coefficients measure the change in property value associated with the change in each household characteristic. For example, in the model with no time controls (the first column), the property value increases (on average) 7.58 percent for each additional bathroom. As indicated by the asterisks to the right of the estimated coefficient, this value is statistically significant (at the 1 percent level). In general, most of the estimated coefficient have signs (positive or negative) consistent with reasonable expectations about how household characteristics affect house values (e.g., property values are higher for properties that are larger and have more bathrooms and bedrooms.) In addition, these estimated coefficients are significant at the 1 percent confidence level.

As shown in Tables A2 to A4, the impact of proximity to the rail is relatively consistent across the specifications reported. As discussed in the body of the report, properties closer to the rail tend to have higher value than those more distant, even when accounting for locational fixed effects (zip codes). The one exception is properties within 250 feet of the rail, which have a lower price, although the effect is not statistically significant. This negative premium on properties in very close proximity to the rail differs between the southern segment (along the Columbia River) and the northern segment (heading to Seattle), with the northern segment experiencing a larger negative effect. These results suggest that

proximity to the Columbia River, potentially driven by the scenic view, is a contributing factor to the positive premiums earned by properties in proximity to the rail.

The impact of the Project on property values is measured through interaction terms between the variables measuring a property's distance to the rail and variables indicating the period after the Project's announcement. Across all of the specifications analyzed, these interaction terms are not statistically significant, indicating that there has been no change in the premium (positive or negative) to houses in close proximity to the rail.

Table A1

Property Sales Price Regression Model

Single family residences in Clark County, WA sold after 2007

Dependent variable Ln(Sales price)

Household Control Variables

	Time controls		
Coefficients	**None**	**Yearly fixed effects**	**Quarterly fixed effects**
House year built	0.00%	0.00%	0.00%
	(0.02%)	(0.02%)	(0.02%)
Number of Bathrooms	7.59%***	7.77%***	7.78%***
	(0.47%)	(0.46%)	(0.46%)
Number of Bedrooms	0.42%	0.37%	0.37%
	(0.37%)	(0.36%)	(0.36%)
Ln(square feet total)	46.00%***	45.80%***	45.90%***
	(1.12%)	(1.09%)	(1.09%)
Ln(square feet first floor)	11.00%***	11.50%***	11.50%***
	(0.84%)	(0.81%)	(0.81%)
Ln(Lot size)	9.52%***	9.84%***	9.85%***
	(0.30%)	(0.29%)	(0.29%)
Observations	44,116	44,116	44,116
R-squared	0.344	0.393	0.396

Notes

[1] Robust standard errors in parentheses

[2] *** p<0.01, ** p<0.05, * p<0.1

[3] Estimates are from distance from rail band specification and include zip code fixed effects.

Sources

[1] RealtyTrac

[2] ArcGIS

Table A2
Property Sales Price Regression Model
Single family residences in Clark County, WA sold after 2007
Dependent variable Ln(Sales price)
Distance Control: Distance Bandwidths

	Time controls		
Coefficients	**None**	**Yearly fixed effects**	**Quarterly fixed effects**
Distance band indicators			
1/2 mile - 1 mile from rail	4.55%***	4.35%***	4.31%***
	(0.72%)	(0.81%)	(0.80%)
1000ft - <1/2 mile from rail	6.26%***	5.34%***	5.36%***
	(0.91%)	(1.02%)	(1.02%)
250ft - <1000ft from rail	2.69%*	2.68%	2.69%
	(1.53%)	(1.77%)	(1.77%)
<250ft from rail	-3.92%	-4.77%*	-4.56%
	(2.61%)	(2.87%)	(2.87%)
After announcement indicator		8.32%***	-2.60%
		(1.28%)	(1.71%)
After announcement indicator interacted with distance band indicators			
1/2 mile - 1 mile from rail		0.58%	0.65%
		(1.22%)	(1.22%)
1000ft - <1/2 mile from rail		2.19%	2.41%
		(1.50%)	(1.50%)
250ft - <1000ft from rail		-1.52%	-1.47%
		(2.98%)	(2.98%)
<250ft from rail		4.69%	4.65%
		(5.91%)	(5.91%)
Observations	44,116	44,116	44,116
R-squared	0.344	0.393	0.396

Notes
[1] Robust standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1
[3] Estimates control for year house built, number of bedrooms, number of bathrooms, finished square footage, lot size, cooling detail description, and include zip code fixed effects

Sources
[1] RealtyTrac
[2] ArcGIS

Table A3

Property Sales Price Regression Model

Single family residences in Clark County, WA sold after 2007

Dependent variable Ln(Sales price)

Distance Control: Quadratic Distance Function

	Time controls		
Coefficients	**None**	**Yearly fixed effects**	**Quarterly fixed effects**
Meters from rail	6.64E-4	-3.43E-5	3.11E-5
	(2.07E-3)	(2.12E-3)	(2.12E-3)
Meters from rail (squared)	-1.30E-4	-8.48E-5	-9.56E-5
	(9.48E-5)	(9.71E-5)	(9.68E-5)
After announcement indicator		9.53E-2***	-1.17E-2
		(1.47E-2)	(1.83E-2)
After announcement indicator interacted with meters from rail		-1.16E-3	-1.57E-3
		(2.21E-3)	(2.21E-3)
After announcement indicator interacted with meters from rail (squared)		-4.98E-5	-2.91E-5
		(1.08E-4)	(1.07E-4)
Observations	44,116	44,116	44,116
R-squared	0.342	0.392	0.395

Notes

[1] Robust standard errors in parentheses

[2] *** p<0.01, ** p<0.05, * p<0.1

[3] Estimates control for year house built, number of bedrooms, number of bathrooms, finished square footage, lot size, cooling detail description, and include zip code fixed effects

Sources

[1] RealtyTrac

[2] ArcGIS

Table A4

Property Sales Price Regression Model

Single family residences in Clark County, WA sold after 2007

Dependent variable Ln(Sales price)

Distance Control: Log Distance Function

	Time controls		
Coefficients	**None**	**Yearly fixed effects**	**Quarterly fixed effects**
Log(meters from rail)	-0.42%	-0.27%	-0.29%
	(0.32%)	(0.33%)	(0.33%)
After announcement indicator		9.24%***	-1.56%
		(1.36%)	(1.75%)
After announcement indicator interacted with Log(meters from rail)		-0.56%	-0.58%
		(0.38%)	(0.38%)
Observations	44,116	44,116	44,116
R-squared	0.342	0.392	0.395

Notes

[1] Robust standard errors in parentheses

[2] *** p<0.01, ** p<0.05, * p<0.1

[3] Estimates control for year house built, number of bedrooms, number of bathrooms, finished square footage, lot size, cooling detail description, and include zip code fixed effects

Sources

[1] RealtyTrac

[2] ArcGIS