USCG General Bridge Permit Economics Report

Additional Information – April 17, 2013

Much of the information in this report is based on confidential and proprietary information provided to the CRC project under non-disclosure agreements with the affected firms. The highly sensitive nature of the proprietary information upon which this report is based requires that the use, re-disclosure, or dissemination of this information be strictly limited under the terms of those agreements. ***The information identified as confidential below is indicated by underlining (for text), or is blocked out in tables. It was submitted in confidence to CRC by the individual fabricators. It is business information that is considered extremely sensitive and confidential. Accordingly, it is subject to FOIA Exemption 4.***

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PURPOSE

This memorandum presents the next installment of information to inform the general bridge application submitted on behalf of the states of Washington and Oregon on January 30, 2013.

The focus of this work is a comprehensive current and future river use market analysis and the current and future capacity to meet identified river market needs. As part of that comprehensive analysis we provide specific findings on the potential impacts to the four potentially impacted river users at the proposed 116 feet vertical clearance.

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1. PROJECTED FINANCIAL IMPACT TO FABRICATORS

Three metal fabricators are located in the Columbia Business Center, including Thompson Metal Fab (TMF), Oregon Iron Works (OIW), and Greenberry Industrial. This section discusses the firms' operations and financial performance. As noted below, much of the data underlying the discussion was supplied by the fabricators. However, it is important to note that the analyses and conclusions are those of the project team, and have not necessarily been endorsed by the fabricators.

1.1 DATA SOURCES

Information presented in this section was derived from data provided by Thompson Metal Fab, Greenberry Industrial, and Oregon Iron Works, including data provided directly to BST Associates, as well as analyses and reports prepared on behalf of the firms. Additional information was derived from a wide variety of public sources, such as U.S. Census data and Washington State Employment Security data. A complete listing of sources is provided as Appendix A to this report.

1.2 DESCRIPTION OF FABRICATORS

TMF has leased space at the Columbia Business Center (CBC) for approximately 40 of the firm's 75 years in business. The CBC represents TMF's only location. TMF fabricates oil field equipment (rigs), bridge sections, dam and power plant equipment, and other large industrial equipment and structures. TMF fabricated approximately one-third of the existing oil rigs on the North Slope of Alaska and has stated that they anticipate a significant increase in demand to meet near-term oil field operations on the North Slope.

OIW was founded in 1971. OIW has leased space at the CBC for approximately 20 years and purchased land and a building at CBC in 1991. OIW also has a fabrication

facility and corporate headquarters in Clackamas, Oregon. Typically, OIW fabricates project components in Clackamas and assembles them at the CBC. Some projects are initiated at the CBC and then finished or assembled in Clackamas. In addition, some projects commence at CBC and are then barged to Swan Island for additional work, prior to final assembly back at the CBC. OIW fabricates a variety of structures including bridges, dams and power plant equipment, wind and tidal power structures (bases), nuclear and marine projects, and specialized civilian and military vessels. According to OIW, the 116-foot height of the proposed I-5 replacement bridge would impact shipments of structural bases for offshore tidal and wind power projects.

Greenberry was established in 1974 in Corvallis, and until a few years ago focused on traditional Northwest industries, including cement, wood products, and pulp and paper. Greenberry has diversified into other industrial sectors, including biomass, aerospace, bio-technology, high technology, nuclear, petrochemical, marine terminals, and solar industries. According to Greenberry, the proposed I-5 Bridge would impact its ability to ship oil rigs and related equipment, and pre-assembled cargo terminal handling systems. Greenberry began leasing space at CBC in 2010 and has entered into mid-range term contracts (the term of major fabrication/assembly space extends through 2019 at Building 40). It should be noted that Greenberry entered the CBC after the decision to build a mid-height fixed bridge that could pose a height constraint had been selected and publically identified as the recommended alternative following publication of the Draft Environmental Impact Statement.

1.3 GROSS REVENUES

Table 1-1 describes the company-wide gross revenues of the three potentially impacted fabricators and the estimated gross revenue associated with height-constrained projects at the CBC.

Company-wide (including all locations), the firms' combined gross revenues increased dramatically between 2002 and 2012, growing from $83.4 million in 2002 to an estimated $315.8 million in 2012, or at an average annual growth rate of 14.2 percent per year. Most of this increase was due to Greenberry's dramatic growth in 2012 as a result of entering into energy markets (primarily related to the oil industry). [redacted]

[redacted]

Table 1-1 also presents the gross revenues of the operations that occurred at the CBC that would have been constrained by the proposed 116-foot I-5 Bridge during the 11-year period. During that period (2002 to 2012 est.), height-constrained revenues at CBC amounted to $161 million, which represents 8.7 percent of combined gross revenues. Oil rig construction accounted for approximately 90 percent of the height-constrained gross revenues, while height-constrained projects unrelated to the oil industry accounted for the remaining 10 percent. This calculation assumes that all height-restricted shipments from the CBC would be impacted. It does not reflect shipments that may have still been fabricated by the three identified users, but manufactured in a different way due to a height limitation at the I-5 Bridge.

[redacted]

[redacted] Greenberry undertook the rebuilding of the Arctic Challenger oil rig in Bellingham, [redacted] Shipment of this project down the Columbia would have been constrained by a 116-foot I-5 Bridge had it been built at the CBC. The fact that it was not undertaken at the CBC indicates that Greenberry can fabricate such projects at other locations. OIW had no height-constrained projects between 2002 and 2012.

The fabricators experienced average annual growth of 14.2 percent in gross revenues between 2002 and 2012, which surpassed the growth rates of fabricators in Washington State (9.7 percent from 2002 to 2011) and fabricators across the U.S. (2.9 percent per year). Note that the majority of the growth experienced by the fabricators was due to increased activity by OIW and Greenberry at sites other than the CBC.

Table 1-1. Gross Revenues by Impacted Fabricators (million$)

	Company-wide		Height Constrained at CBC	
Year	[redacted]	**Total**	[redacted]	**Total**
2002		$83.4		$0.0
2003		$95.0		$0.0
2004		$109.3		$0.0
2005		$115.3		$8.1
2006		$147.5		$2.8
2007		$189.8		$3.5
2008		$211.3		$26.6
2009		$208.0		$62.3
2010		$195.6		$52.2
2011		$186.9		$5.5
2012 est		$315.8		$0.0
Total		**$1,857.8**		**$161.1**
%Total		**100%**		**100%**
	Compound Annual Growth Rate			
2002-12	[redacted]	**14.2%**	**NM**	**NM** **NM** **NM**

Source: Individual firms, BST Associates

Tables 1-2 and 1-3 present forecasts of gross revenue for the fabricators at the CBC (including company-wide gross revenues and height-constrained activities undertaken at the CBC). The U.S. Bureau of Economic Analysis (BEA) projected that the gross revenues of U.S. fabricators would grow at 4.9 percent per year from 2010 to 2020. The CBC fabricators have experienced growth that outperforms the national average and the average for fabricators in Washington State. Under the low and high growth forecast scenarios, the CBC fabricators are expected to grow at average annual rates of 5.2 percent (low forecast) and 7.0 percent (high forecast) on a company-wide basis from

2013 to 2030. The height constrained projects undertaken at the CBC are expected to range between a decline of -3.7 percent (low forecast) to a growth of 0.3 percent (high forecast) from 2013 to 2030.

However, the gross revenue forecasts associated with height constrained projects are low relative to earlier years because no oil rig construction is expected to occur in 2029 and 2030. A comparison of real revenues in 2013 dollars on annual basis presents a more precise comparison of expected growth. Annualized real gross revenues companywide are expected to increase from $187.9 million for the period 2002 to 2012 to $320.5 million (low forecast) and $422.3 million (high forecast) for the period 2013 to 2030, representing an increase of 71 percent (low forecast) to 125 percent (high forecast). The gross revenues of height-constrained projects at the CBC are expected to change from $16.0 million for the period 2002 to 2012 to $3.9 million (low forecast) and $25.0 million (high forecast) for the period 2013 to 2030, representing a decrease of -76 percent under the low forecast and an increase of 56 percent under the high forecast.

Table 1-2. Actual and Forecast Gross Revenues by Impacted Fabricators (million$)

		Gross Revenues Company-wide		Gross Revenues Height-Constrained at CBC		Percent Height-Constrained at CBC of Total Revenues	
	Year	Low	High	Low	High	Low	High
Actual	2002	83.4	83.4	-	-	0%	0%
Actual	2003	95.0	95.0	-	-	0%	0%
Actual	2004	109.3	109.3	-	-	0%	0%
Actual	2005	115.3	115.3	8.1	8.1	7%	7%
Actual	2006	147.5	147.5	2.8	2.8	2%	2%
Actual	2007	189.8	189.8	3.5	3.5	2%	2%
Actual	2008	211.3	211.3	26.6	26.6	13%	13%
Actual	2009	208.0	208.0	62.3	62.3	30%	30%
Actual	2010	195.6	195.6	52.2	52.2	27%	27%
Actual	2011	186.9	186.9	5.5	5.5	3%	3%
Actual	2012	315.8	315.8	-	-	0%	0%
Estimated	2013	262.3	262.3	9.5	9.5	4%	4%
Forecast	2014	214.2	285.6	-	-	0%	0%
Forecast	2015	233.3	311.0	4.5	36.1	2%	12%
Forecast	2016	254.0	338.7	4.5	36.1	2%	11%
Forecast	2017	276.6	368.8	4.9	39.0	2%	11%
Forecast	2018	301.2	401.7	4.9	39.0	2%	10%
Forecast	2019	328.1	437.4	5.3	42.2	2%	10%
Forecast	2020	357.3	476.3	5.3	42.2	1%	9%
Forecast	2021	389.0	518.7	3.9	31.1	1%	6%
Forecast	2022	423.7	564.9	3.9	31.1	1%	6%
Forecast	2023	444.4	592.6	4.2	33.6	1%	6%
Forecast	2024	466.2	621.6	4.2	33.6	1%	5%
Forecast	2025	489.1	652.1	4.5	36.4	1%	6%
Forecast	2026	513.0	684.0	4.5	36.4	1%	5%
Forecast	2027	538.2	717.5	4.9	39.4	1%	5%
Forecast	2028	564.5	752.7	4.9	39.4	1%	5%
Forecast	2029	592.2	789.6	5.0	10.0	1%	1%
Forecast	2030	621.2	828.3	5.0	10.0	1%	1%
		Compound Annual Growth Rate					
	2002-12	14.2%	14.2%	NM	NM		
	2013-30	5.2%	7.0%	-3.7%	0.3%		
		Annualized Growth in Real Dollars (2013$)					
	2002-12	187.9	187.9	16.0	16.0	8.5%	8.5%
	2013-30	320.4	422.3	3.9	25.0	1.2%	5.9%
	% Change	71%	125%	-76%	56%		

Height-constrained gross revenues are projected in Tables 1-3 (low forecast) and 1-4 (high forecast) on the basis of forecast demand for oil rigs, estimated price of the fabricator's portion of the oil rigs, and an estimate of future non-oil height-constrained work by the fabricators. The number and type of oil rigs to be constructed draws from the forecast by Dr. Van Vactor of Economic Insight, Inc., presented in Appendix B. Dr. Van Vactor forecasts a range of demand of 0-7 new height-constrained oil rigs through the year 2032. Table 1-3 uses the low end of that range and Table 1-4 uses the high end of that range. The average contract value for oil rigs was based on data provided by TMF. Revenue tied to oil rig fabrication was annualized, with a two-year schedule for completion of each rig. Of the projected height-constrained revenues, projects other than oil rigs are estimated to represent nearly all revenue under the low forecast scenario and 29 percent under the high forecast scenario.

The gross revenue associated with height-constrained projects fabricated at CBC is projected to range from $3.9 million (low forecast) to $25.0 million (high forecast) on an annual basis during the period from 2013 to 2030. This would account for approximately 1.2 percent (low forecast) to 5.9 percent (high forecast) percent of total revenues per year of the three fabricators (including height and non-height constrained projects) during the period from 2013 to 2030.

Table 1-3. Actual and Low Forecast Height-Constrained Gross Revenues by Impacted Fabricators

		Number of Transits			Gross Revenue (millions$)		
	Year	Oil Rigs	Other	Total	Oil Rigs	Other	Total
Actual	2002	-	-	-	-	-	-
Actual	2003	-	-	-	-	-	-
Actual	2004	-	-	-	-	-	-
Actual	2005	-	1.0	1.0	-	8.1	8.1
Actual	2006	-	-	-	2.8	-	2.8
Actual	2007	-	-	-	3.5	-	3.5
Actual	2008	-	-	-	26.6	-	26.6
Actual	2009	1.0	-	1.0	62.3	-	62.3
Actual	2010	-	-	-	52.2	-	52.2
Actual	2011	2.0	-	2.0	5.5	-	5.5
Actual	2012	-	-	-	-	-	-
Estimated	2013	-	-	-	1.0	8.5	9.5
Forecast	2014	-	-	-	-	-	-
Forecast	2015	-	0.3	0.3	-	4.5	4.5
Forecast	2016	-	0.3	0.3	-	4.5	4.5
Forecast	2017	-	0.3	0.3	-	4.9	4.9
Forecast	2018	-	0.3	0.3	-	4.9	4.9
Forecast	2019	-	0.3	0.3	-	5.3	5.3
Forecast	2020	-	0.3	0.3	-	5.3	5.3
Forecast	2021	-	0.2	0.2	-	3.9	3.9
Forecast	2022	-	0.2	0.2	-	3.9	3.9
Forecast	2023	-	0.2	0.2	-	4.2	4.2
Forecast	2024	-	0.2	0.2	-	4.2	4.2
Forecast	2025	-	0.2	0.2	-	4.5	4.5
Forecast	2026	-	0.2	0.2	-	4.5	4.5
Forecast	2027	-	0.2	0.2	-	4.9	4.9
Forecast	2028	-	0.2	0.2	-	4.9	4.9
Forecast	2029	-	0.2	0.2	-	5.0	5.0
Forecast	2030	-	0.2	0.2	-	5.0	5.0

Table 1-4. Actual and High Forecast Height-Constrained Gross Revenues by Impacted Fabricators

		Number of Transits			Gross Revenue (million$)		
	Year	Oil Rigs	Other	Total	Oil Rigs	Other	Total
Actual	2002	-	-	-	-	-	-
Actual	2003	-	-	-	-	-	-
Actual	2004	-	-	-	-	-	-
Actual	2005	-	1.0	1.0	-	8.1	8.1
Actual	2006	-	-	-	2.8	-	2.8
Actual	2007	-	-	-	3.5	-	3.5
Actual	2008	-	-	-	26.6	-	26.6
Actual	2009	1.0	-	1.0	62.3	-	62.3
Actual	2010	-	-	-	52.2	-	52.2
Actual	2011	2.0	-	2.0	5.5	-	5.5
Actual	2012	-	-	-	-	-	-
Estimated	2013	-	-	-	1.0	8.5	9.5
Forecast	2014	-	-	-	-	-	-
Forecast	2015	1.0	0.5	1.5	27.0	9.0	36.1
Forecast	2016	-	0.5	0.5	27.0	9.0	36.1
Forecast	2017	1.0	0.5	1.5	29.2	9.7	39.0
Forecast	2018	-	0.5	0.5	29.2	9.7	39.0
Forecast	2019	1.0	0.5	1.5	31.6	10.5	42.2
Forecast	2020	-	0.5	0.5	31.6	10.5	42.2
Forecast	2021	1.0	0.4	1.4	23.3	7.8	31.1
Forecast	2022	-	0.4	0.4	23.3	7.8	31.1
Forecast	2023	1.0	0.4	1.4	25.2	8.4	33.6
Forecast	2024	-	0.4	0.4	25.2	8.4	33.6
Forecast	2025	1.0	0.4	1.4	27.3	9.1	36.4
Forecast	2026	-	0.4	0.4	27.3	9.1	36.4
Forecast	2027	1.0	0.4	1.4	29.5	9.8	39.4
Forecast	2028	-	0.4	0.4	29.5	9.8	39.4
Forecast	2029	-	0.4	0.4	-	10.0	10.0
Forecast	2030	-	0.4	0.4	-	10.0	10.0

1.4 EMPLOYEE COMPENSATION

Table 1-5 describes the fabricators' employee compensation, both company-wide and the estimated employee compensation associated with height-constrained projects at the CBC.

Employee compensation includes direct wages and fringe benefits but does not include employer-paid taxes. Company-wide (including all locations), the combined employee

compensation of the three firms also increased dramatically between 2002 and 2012, growing from $31.2 million in 2002 to $84.7 million in 2012 (estimated) or at an average annual growth rate of 10.5 percent per year. As with gross revenues, most of the increase was due to the dramatic growth by Greenberry in 2012.

During the eleven-year period (2002 to 2012 est.), employee compensation attributable to height-constrained projects at the CBC amounted to $63 million, which represents 10.0 percent of company-wide employee compensation.

Table 1-5. Employee Compensation by Impacted Fabricators (million$)

	Company-wide				Height-Constrained at CBC			
Year	Greenberry	OIW	TMF	Total	Greenberry	OIW	TMF	Total
2002				$31.2				$0.0
2003				$34.8				$0.0
2004				$37.6				$0.0
2005				$40.4				$2.9
2006				$51.1				$0.9
2007				$65.4				$1.3
2008				$71.4				$8.3
2009				$74.2				$22.1
2010				$79.1				$25.7
2011				$62.6				$1.8
2012est				$84.7				$0.0
Total				**$632.5**				**$63.0**
%Total				**100%**				**100%**

Source: Individual firms, BST Associates

Table 1-6 presents a forecast of employee compensation for the impacted fabricators both company-wide and for height-constrained projects. The forecast is based on the historical trends of employee compensation as a percentage of gross revenues and trends in average compensation per employee. Employee compensation company-wide is expected to grow at 5.0 percent per year under the low forecast and 6.8 percent per year under the high forecast between 2013 and 2030.

In nominal dollars, the average annual company-wide employee compensation was $57.5 million (from 2002 to 2012) and is estimated to average $117.4 million per year (low forecast) and $155.1 million per year (high forecast) for the period 2013 through 2030.

As with gross revenues, a more precise method of comparing annualized revenues adjusts for inflationary impacts on the value of the dollar. In inflation-adjusted dollars, company-wide employee compensation averaged $64.2 million per year from 2002 to 2012 and is estimated to average $93.2 million (low forecast) and $122.8 million (high forecast) for the period 2013 through 2030, accounting for an increase of 45 percent (low forecast) and 91 percent (high forecast).

In nominal dollars, the average annual employee compensation associated with height-constrained projects at the CBC was $5.7 million (from 2002 to 2012) and is estimated to average $1.4 million per year (low forecast) and $9.8 million per year (high forecast) for the period 2013 through 2030.

In inflation adjusted dollars, the forecast of employee compensation associated with height-constrained projects at the CBC was $6.2 million per year from 2002 to 2012 and is estimated to average between $1.1 million (low forecast) and $8.1 million (high forecast) for the period 2013 through 2030, accounting for a decrease of -82 percent (low forecast) and an increase of 30 percent (high forecast).

Table 1-6. Forecast of Employee Compensation by Impacted Fabricators (million$)

		Employee Compensation				Percent Height-Constrained at CBC of Total Emp Comp	
		Company-wide		Height-Constrained at CBC			
	Year	Low	High	Low	High	Low	High
Actual	2002	$31.2	$31.2	$0.0	$0.0	0%	0%
Actual	2003	$34.8	$34.8	$0.0	$0.0	0%	0%
Actual	2004	$37.6	$37.6	$0.0	$0.0	0%	0%
Actual	2005	$40.4	$40.4	$2.9	$2.9	7%	7%
Actual	2006	$51.1	$51.1	$0.9	$0.9	2%	2%
Actual	2007	$65.4	$65.4	$1.3	$1.3	2%	2%
Actual	2008	$71.4	$71.4	$8.3	$8.3	12%	12%
Actual	2009	$74.2	$74.2	$22.1	$22.1	30%	30%
Actual	2010	$79.1	$79.1	$25.7	$25.7	32%	32%
Actual	2011	$62.6	$62.6	$1.8	$1.8	3%	3%
Actual	2012	$84.7	$84.7	$0.0	$0.0	0%	0%
Estimated	2013	$79.1	$79.1	$3.1	$3.1	4%	4%
Forecast	2014	$61.0	$81.4	$0.0	$0.0	0%	0%
Forecast	2015	$68.4	$91.2	$1.3	$11.7	2%	13%
Forecast	2016	$73.4	$97.9	$1.3	$11.7	2%	12%
Forecast	2017	$80.6	$107.4	$1.4	$12.7	2%	12%
Forecast	2018	$87.4	$116.5	$1.4	$12.7	2%	11%
Forecast	2019	$95.4	$127.2	$1.5	$13.7	2%	11%
Forecast	2020	$103.8	$138.3	$1.5	$13.7	1%	10%
Forecast	2021	$113.0	$150.7	$1.1	$10.1	1%	7%
Forecast	2022	$123.1	$164.1	$1.1	$10.1	1%	6%
Forecast	2023	$129.1	$172.2	$1.2	$10.9	1%	6%
Forecast	2024	$135.4	$180.6	$1.2	$10.9	1%	6%
Forecast	2025	$142.1	$189.4	$1.3	$11.8	1%	6%
Forecast	2026	$149.0	$198.7	$1.3	$11.8	1%	6%
Forecast	2027	$156.3	$208.5	$1.4	$12.8	1%	6%
Forecast	2028	$164.0	$218.7	$1.4	$12.8	1%	6%
Forecast	2029	$172.0	$229.4	$1.5	$3.3	1%	1%
Forecast	2030	$180.5	$240.6	$1.5	$3.3	1%	1%
		Compound Annual Growth Rate					
	2002-12	10.5%	10.5%	NM	NM		
	2013-30	5.0%	6.8%	-4.3%	0.3%		
		Annualized Growth in Real Dollars (2013$)					
	2002-12	$64.2	$64.2	$6.2	$6.2	9.7%	9.7%
	2013-30	$93.2	$122.8	$1.1	$8.1	1.2%	6.6%
	% Change	45%	91%	-82%	30%		

1.5 EMPLOYMENT

Table 1-7 provides an estimate of the full-time equivalent employees at the three fabricators. Company-wide (including all locations), employment at the three firms increased dramatically between 2002 and 2012, growing from 529 FTE in 2002 to 1,239 FTE in 2012 (estimated) or at an average annual growth rate of 8.9 percent per year. Most of the increase was due to the dramatic growth by Greenberry in 2012, due in large part to fabrication undertaken at the Port of Bellingham.

[redacted]

During the eleven year period (2002 to 2012 est.), employment attributable to height-constrained work at the CBC amounted to 854 (an average of 78 jobs per year), which represents 9.2 percent of company-wide employment. [redacted]

Table 1-7. Employment by Impacted Fabricators (full-time equivalent jobs, FTEs)

	Company-wide				Height-Constrained at CBC			
Year	Greenberry	OIW	TMF	Total	Greenberry	OIW	TMF	Total
2002	[redacted]			529	[redacted]			-
2003				579				-
2004				605				-
2005				635				42
2006				754				13
2007				1,000				17
2008				991				118
2009				999				302
2010				1,061				333
2011				906				29
2012 est				1,239				-
Total				9,297				854
% Total				100%				100%
Average Annual				**845**				**78**

Source: Individual firms, BST Associates

[redacted] The total employment (FTEs) at the CBC by the three fabricators is estimated at around 360 employees in 2012.

Table 1-8 presents a forecast of employment for the fabricators at the CBC (including company-wide and for height-constrained activities undertaken at the CBC). The fabricators experienced average annual growth of 8.9 percent in company-wide employment between 2002 and 2013, which surpassed the growth rates of fabricators in Washington State (0.4 percent from 2002 to 2011), Oregon State (0.0 percent per year) and fabricators across the U.S. (-1.5 percent per year). The Washington State Employment Security Department projects fabricator employment statewide will grow at 3.7 percent from 2010 to 2020, -0.8 percent from 2020 to 2030 and -0.6 percent from 2020 to 2030.

The projected growth of employment by the impacted fabricators is close to the growth rates projected by the Washington State Employment Security Department. Company-wide, employment by the impacted fabricators is projected to grow at 2.6 percent per year (low forecast) and 4.4 percent (high forecast) from 2013 to 2030.

The employment forecast of employee compensation for height-constrained projects is projected to average 16.1 FTEs under the low forecast and 114.7 FTEs under the high forecast for the period 2013 through 2030, which accounts for a decline of 79 percent (low forecast) to an increase of 52 percent (high forecast) as compared with the actual levels of employment from 2002 to 2012.

Table 1-8. Forecast of Employment by Impacted Fabricators

		Employees (FTEs)				Percent Height-Constrained at CBC of Total Emp Comp	
		Company-wide		Height-Constrained at CBC			
	Year	Low	High	Low	High	Low	High
Actual	2002	529	529	-	-	0%	0%
Actual	2003	579	579	-	-	0%	0%
Actual	2004	605	605	-	-	0%	0%
Actual	2005	635	635	42	42	7%	7%
Actual	2006	754	754	13	13	2%	2%
Actual	2007	1,000	1,000	17	17	2%	2%
Actual	2008	991	991	118	118	12%	12%
Actual	2009	999	999	302	302	30%	30%
Actual	2010	1,061	1,061	333	333	31%	31%
Actual	2011	906	906	29	29	3%	3%
Actual	2012	1,239	1,239	-	-	0%	0%
Estimated	2013	1,117	1,117	43	43	4%	4%
Forecast	2014	832	1,110	-	-	0%	0%
Forecast	2015	901	1,201	17	152	2%	13%
Forecast	2016	934	1,245	16	147	2%	12%
Forecast	2017	989	1,319	17	154	2%	12%
Forecast	2018	1,037	1,382	17	148	2%	11%
Forecast	2019	1,092	1,456	17	155	2%	11%
Forecast	2020	1,148	1,530	17	150	1%	10%
Forecast	2021	1,208	1,610	12	107	1%	7%
Forecast	2022	1,270	1,693	12	103	1%	6%
Forecast	2023	1,286	1,715	12	108	1%	6%
Forecast	2024	1,303	1,737	12	104	1%	6%
Forecast	2025	1,320	1,760	12	109	1%	6%
Forecast	2026	1,337	1,783	12	105	1%	6%
Forecast	2027	1,355	1,806	12	109	1%	6%
Forecast	2028	1,373	1,830	12	106	1%	6%
Forecast	2029	1,390	1,854	12	26	1%	1%
Forecast	2030	1,409	1,878	11	25	1%	1%
		Compound Annual Growth Rate					
	2002-12	8.9%	8.9%	NM	NM		
	2013-30	2.6%	4.4%	-6.5%	-1.9%		
		Annualized Employment					
	2002-12	845.2	845.2	77.6	77.6	9.2%	9.2%
	2013-30	1,342.0	1,768.4	16.1	114.7	1.2%	6.5%
	% Change	64%	116%	-79%	52%		

1.6 ESTIMATED LOST FUTURE PROFITS

Table 1-9 provides a preliminary estimate of the net present value of profits that would result from lost height-constrained business opportunities at the CBC. This assumes the industrial capacity of the facility is not diverted to other non height-constrained work.

[redacted]

The preliminary estimate of economic damages for all three firms ranges from $29.4 million (low) to $48.7 million (high).

Table 1-9. Preliminary Estimate of Economic Damages from Loss of Height-Constrained Business ($millions)

	Estimated NPV of Lost Business ($millions)	
Firm	**Low**	**High**
TMF	[redacted]	
OIW		
Greenberry		
Total	**$29.43**	**$48.74**

Source: Individual firms, HSNO, Morones Analytics, LLC, BST Associates

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2. LONG-TERM EFFECTS ON INDUSTRY

Section 1 of this report included forecasts through the year 2030 of the potential impacts to the fabricators upstream of the proposed I-5 Bridge resulting from the change in vertical clearance. This section describes qualitatively how the change in navigational access will affect industries served by the fabricators, and what changes can be reasonably anticipated to the Columbia Business Center (CBC).

2.1 POTENTIAL IMPACTS TO INDUSTRIES SERVED BY THE CBC FABRICATORS

As indicated in Section 1, the portion of the fabricators' combined gross revenues attributable to height-constrained projects has been relatively small, compared to overall gross revenues. As previously discussed, approximately 9 percent of gross revenues occurring between 2002 and 2013 would have been height-constrained with a 116 foot bridge. Future projections estimate that height-constrained revenues will remain comparatively low, at just 1 percent (low forecast) to 6 percent (high forecast) of gross revenues.

The projections indicate that the limited future height-constrained work will be primarily in support of oil production and exploration in Alaska, with lesser amounts of activity in support of other industries such as wind, wave and tidal energy systems as well as port/marine structures such as ship loading systems. To understand how those industries may be affected, the following sections include forecasts of activity for those industries, the types of products likely to be required to support those industries, and how the proposed change in navigation access to the fabricators upstream of the proposed I-5 Bridge will affect the production of those products.

2.1.1 Alaska Petroleum Production

A recent report by Samuel Van Vactor, PhD forecasts Alaska oil and gas development and the resulting demand for drilling rigs of the type manufactured by the three fabricators. It is attached as Appendix B and summarized in this section.

A review of the State of Alaska Department of Revenue's (DOR) annual revenue forecast suggests that North Slope and Cook Inlet production will continue to decline, albeit at a slower rate than in the last few years. The last two years have witnessed a substantial drop in Alaskan oil production, -7.3 percent in 2011 and -7.5 percent in 2012. These figures compare to the overall negative trend of the last ten years of -5.8 percent. DOR expects the general trend to continue through 2022 at a slightly lower rate of - 5.2 percent.

In addition to the ongoing decline in production from the Prudhoe Bay oil field (typical for any mature oil field) there are two main reasons for the decline in Alaska oil production. First, the State of Alaska increased taxes on the industry in 2007, which the industry considers onerous and many analysts believe put Alaska at a competitive disadvantage for development. Secondly, the timing could not have been worse. Higher taxes were introduced just at the point at which shale gas and oil became viable in the Lower 48. Resources have rushed into Texas and North Dakota, but not Alaska. Oil production in North Dakota now exceeds that of the Alaska North Slope, and crude oil from the Midwest is now moving to refineries in Puget Sound, which have traditionally relied on Alaska crude oil. For 2013, the major oil companies plan to spend $3.5 billion

on oil and gas development in Alaska, which is only 1.5% of the total exploration and production budget of the oil industry in the rest of the United States.

There is some hope for future development in Alaska. A number of companies have leased acreage in the Beaufort and Chukchi Seas off the North Slope. If they make a big strike that would open a new province and turn Alaska's fortunes around. Such a strike would not, however, have much impact on demand for the types of rigs previously built by the fabricators at the CBC in Vancouver. Rather than land-based extended range drills (ERDs) and Arctic Alaska Drilling Units (AADUs) units currently deployed on the North Slope, these emerging development opportunities would require large marine platforms like those used in the North Sea, Brazil, West Africa, and the Gulf Coast, which are typically produced in the Gulf of Mexico, Korea, China, Singapore, and Indonesia. Such platforms are of such size that they would be height-constrained even under the existing I-5 Bridge. Similarly, a number of independent companies are drilling into the North Slope source rocks in the hope of developing shale oil. Such development is, however, highly speculative. In any case, such development will probably require smaller, more conventional drilling rigs, fabrication of which is not anticipated to be height-constrained by a 116-foot I-5 Bridge.

The demand for new rigs of the type previously fabricated will be relatively small. Table 2.1 provides forecasts a range of demand for new oil rig production of 0 to 7 new units through the year 2032.

Table 2-1. Estimated Demand for Large Scale Drilling Rigs in Alaska

		Demand for ERD or AADU Types			
		Pessimistic Scenario		Optimistic Scenario	
Drilling Activity	Existing ERD[a] or AADU[b]	to 2022	2022 to 2032	to 2022	2022 to 2032
Prudhoe Bay	2	2	0	2	2
PBU Satellites	0	0	0	0	0
GPMA	0	0	0	0	1
Kuparuk	0	0	0	0	0
Kuparuk Satellites	0	0	0	0	0
Endicott	0	0	0	0	0
Alpine	0	0	0	1	2
Offshore	1	1	0	1	2
NPR-A	0	0	0	0	0
Point Thomson	0	0	0	3	3
Subtotal, ANS	3	3	0	7	10
Subtotal, Cook Inlet	0	0	0	0	0
Total Alaska	3	3	0	7	10
Number of New Rigs		**0**	**0**	**4**	**3**

Source: "A Report on Alaska Oil and Gas Development Relevant to Drilling Rig Fabrication", Samuel Van Vactor, PhD, April 2013 (see Appendix B).

a ERD – Extended Reach Drill

b AADU – Arctic Alaska Drilling Unit

2.1.1.1 Impacts from Changes in Navigational Clearances on the Columbia River

As noted above, forecasts for oil rig construction to support the Alaska oil and gas industry predict that future development may require a mix of large offshore platforms, conventionally-sized rigs such as those used in North Dakota for shale oil, and a small number of larger extended reach drills (ERDs) or Arctic Alaska Drilling Units (AADUs) of the type manufactured at the CBC during the period from 2002 to 2012. Of those three types of fabricated structures, the offshore platforms are produced at several sites internationally as noted above, the conventional drill rigs would not be height-constrained, and only the third (ERDs and AADUs) would be potentially affected by the proposed change in vertical clearance at the I-5 Bridge. These projects may be partially built at the CBC and assembled downriver of the proposed I-5 Bridge or entirely fabricated downriver at facilities in Washington, Oregon, California and/or Alaska.

A description of alternative West Coast fabrication and shipbuilding sites is provided in Appendix C. It describes several existing fabrication sites and shipbuilders that could potentially participate in fabricating oil industry structures. It also lists several West Coast sites that could be developed specifically to meet future demand for height-constrained fabrications.

In sum, a twenty-year forecast for new rigs to support Alaskan oil exploration and production indicates that there will be limited demand for the large (ERD and AADU) drilling units. The proposed I-5 Bridge will have limited impact on the ability of existing and potential west coast sites to meet the anticipated demand.

2.1.2 Other Markets

As indicated above, during the period from 2001 to 2012, approximately 10 percent of the height-constrained work undertaken by the fabricators at the CBC as unrelated to oil rigs. Looking forward, the other markets served by the CBC fabricators that have been or may be height-constrained include offshore wind, tidal, and wave energy, industrial uses (tanks, structures, loaders, etc.), and port and marine structures.

There is substantial uncertainty about the demand for alternative energy products because the market for alternative energy is in a preliminary stage of development (particularly for offshore wind, wave, and tidal energy projects). The following summarizes a report on the state of development of offshore wind, wave and tidal energy on the West Coast, and what opportunities might emerge from those markets for development of fabricated units at the CBC site. The report is attached as Appendix D. In short, the proposed I-5 Bridge will likely not affect the ability of the CBC site to compete for fabrication of prototypes or components of offshore energy devices. Final designs of these structures were not available and as a result, some of these structures that could be height constrained with the proposed 116-foot high I-5 Bridge. Height constraints for other markets are projected under both the low and high forecasts in this study.

If full-scale development of an offshore energy site occurs, it is anticipated that a 116-foot height constraint on the Columbia will be of little bearing on full build-out. Instead, it is likely that final assembly and commissioning of production facilities, regardless of the I-5 Bridge, will occur at deep-draft sites with open-water access much nearer the proposed deployment, such as at Coos Bay or Reedsport, Oregon. As the report shows, even without a 116-foot height constraint, full fabrication and final assembly of these structures at CBC is neither practical nor contemplated.

2.1.2.1 Offshore Wind Energy

To this day, there are no installed offshore wind turbines in the U.S., either in waters subject to state jurisdiction or in federal waters. That said, there are several offshore wind farms in the planning process in the East Coast, Gulf of Mexico and the Oregon Coast. The most efficient technology today to install offshore wind turbines is by founding them on monopiles that are driven into the seabed in shallow coastal waters at a depth of up to 100 feet. Such shallow waters are rare on the West Coast. Hence, if offshore wind turbines are deployed on the West Coast, they will probably be founded on floating foundations.

While there are several different designs in development, typically the floating foundation and turbine combinations would be of a scale such that full assembly would require deep drafts and essentially unlimited air drafts. This would limit potential final assembly sites in the Pacific Northwest to locations such as Coos Bay (near a proposed deployment site) or Puget Sound. Clearance requirements for the fully assembled units would prohibit final assembly at any site on the Columbia River upriver of the Astoria Bridge. [redacted] However, the proposed I-5 Bridge would not affect the competitive position of the CBC site relative to fabrication of sub-assemblies to be shipped to a final assembly location.

2.1.2.2 Wave and Tidal Energy Converters

Oregon is a strong supporter of wave energy development and has a wave energy development center in Corvallis and an offshore testing site near Reedsport that attracted several wave energy device companies. Some of the devices under consideration are discussed below.

Wave Buoy from Ocean Power Technology

One of the most advanced wave energy devices is the wave buoy from Ocean Power Technology. Several prototype buoys are currently deployed from Coos Bay to be installed at the Reedsport offshore testing site. Oregon Iron Works is involved in the fabrication of these devices. The buoys have a capacity of 150 kW and are 140 feet long and 40 feet in width. The buoys can be transported either on a barge or more likely directly self-floating. Wave buoys of this size will, therefore, not bear any clearance challenges at the proposed 116 foot high I-5 Bridge. Once such buoys grow in size and capacity, it is more likely that they will be fabricated at near shore sites closer to the proposed deployments.

OpenHydro Tidal Power Device

The OpenHydro tidal turbine is an open center turbine from Ireland. The world's first large scale grid connected tidal energy farm is currently under construction off the coast of Brittany, using four OpenHydro 2MW tidal turbines. The turbines have a diameter of 52 feet and when installed on the gravity base will have a height of 72 feet, operating in water of 115 feet depth. Two smaller OpenHydro prototype turbines of 340 kW capacity each are currently installed in Admiralty Inlet by Snohomish Public Utility. These turbines have an overall height of 43 feet.

The current sizes of the OpenHydro tidal power devices could be potentially fabricated at the CBC without causing any clearance challenges at the proposed 116 foot high I-5 Bridge. However, future designs that might be larger in size and capacity might be unsuitable to be built at CBC for several reasons including the distance to the deployment site, the limited ship channel depth, and the bridge clearance. Similar to the floating wind turbine fabrication, once devices for larger power farms are deployed, it is more likely that fabrication, assembly, commission, and deployment would occur at a near-shore site where purpose-built deployment vessels can directly pick up the devices.

2.1.2.3 Other Port and Industrial Fabricated Structures

Beyond fabrications for the oil industry, and potential future markets for wave and wind energy, the three fabricators have a history of competing successfully in other markets, providing industrial components (tanks and other structures), fully assembled bridge sections, dam and power plant equipment, nuclear and marine projects, and cargo-loading equipment such as shiploaders.

These markets have occurred in the past and are expected to continue to occur in the future. Some of these structures may be height-constrained with the proposed 116-foot high I-5 Bridge.

2.2 COLUMBIA BUSINESS CENTER

The three fabricators are located in the Columbia Business Center, approximately one mile upstream from the I-5 Bridge in Vancouver, Washington. This section describes the long term impact to the CBC site following completion of the new bridge.

2.2.1 Description of the CBC Site

The CBC consists of approximately 219 acres, of which approximately 91 acres are owned by Killian Pacific. The Hidden Family owns the remaining 128 acres. Killian Pacific leases the Hidden Family property, with a lease term extending through the end of 2030.

The three fabricators represent a relatively large portion of the occupied space at the CBC. [redacted]

Killian Pacific has also reported that the Columbia Business Center provides employment for more than 1,300 employees. As of 2013, the three fabricators had approximately 360 employees located at the CBC or approximately 28 percent of direct employment.

2.2.2 Potential Impacts to CBC from Fabricator's Loss of Height-Constrained Business

The CBC contains a mixture of uses (heavy industrial, light industrial and flex space) and the conditions and age of the facilities serving these uses varies widely. The main buildings (40 and 41) that are used by the fabricators are old and are considered functionally obsolete. As a result, regular maintenance has been deferred, and there are no plans to renovate the buildings, although they will be kept functional for the lessees through the term of leases.

A rating agency (DBRS) that studied the leases and facilities points out the following issues related to the buildings used by the fabricators: "Buildings containing 38.2% of the NRA, all of which are located on the leasehold parcel, date from the 1940s and suffer from some form of functional obsolescence. In addition, many of these older properties are in poor condition with significant deferred maintenance. The property manager indicated that, due to the ground lease expiry in less than 20 years, it is the sponsor's intent to keep these properties structurally sound and functional for tenants, but not to make significant investments into improvements. Although unusual, given the ground lease expiry DBRS considers this to be a prudent strategy and one that should not have an adverse impact to the loan." The DBRS report is attached at Appendix E.

The fabricators could stay until their leases expire or longer if the leases are renewed or extended. OIW and Greenberry have expressed their interest in remaining at the CBC for as long as possible.

The impact of the loss of height-constrained business associated with the proposed 116 foot high CRC Bridge on the CBC could have modest impacts on the fabricators, affecting their gross revenues.

From 2002 through 2012, the combined height-constrained projects undertaken by the fabricators at CBC accounted for approximately 9 percent of company-wide gross revenues. Under the forecasts prepared for this report, height-constrained revenues would account for approximately 1.2 percent (low forecast) to 5.7 percent (high forecast) of combined gross revenues company-wide. Loss of 1 percent to 9 percent of overall firm revenues is likely not sufficient to trigger the need for relocation. If one fabricator decides to leave, the space could be reabsorbed by the existing fabricators or by new fabricators or by other industrial users. Likewise, the employees of the impacted fabricator could be hired by one of the existing fabricators or by a new fabricator. It should be noted that TMF and Greenberry have found several sub-tenants to lease a portion of their existing space at the CBC. This underscores the potential industrial demand at CBC under existing conditions.

Alternatively, the firms could continue to seek height-constrained contracts, which would require securing a downriver satellite site to complete final assembly. There have been several examples of this in the past. OIW works with Vigor Marine to construct large projects (offshore tidal power projects) which are assembled or handled at Vigor Industrial at Swan Island. TMF and OIW were planning on leasing space from the Port of Vancouver in an effort to win a bid to construct the Bay Bridge. In addition, Greenberry constructed the Arctic Challenger at facilities leased by Greenberry from the Port of Bellingham.

The CBC could also be positively impacted by construction of the CRC, which is scheduled to commence in 2014 and continue through 2020. Due to its proximity to the job site, use of the CBC would be highly sought after by CRC contractors for

construction assembly and staging. TMF and OIW have a primary focus on bridge projects.

At some point, however, there will need to be substantial recapitalization of the buildings at the CBC. The developer(s) will likely evaluate the return on investment associated with rebuilding for the existing uses versus potential higher yielding uses (such as a more upscale business/industrial park or mixed-use development), taking into account the associated site development and environmental cleanup costs. Likewise, the existing fabricators will have to evaluate re-leasing with potentially higher rental rates.

The opportunities for industrial development appear positive. Industrial markets in the Portland-metro area have been growing steadily since the depths of the recession and there is a significant lack of larger parcels for development in the Portland metro area.

The owner(s) could choose to redevelop the CBC for upscale industrial, commercial and/or mixed uses. The CBC, which has very high amenities associated with access by all modes and the view corridor of the Columbia River, is surrounded by changing uses on the west, east and north. Redevelopment has been considered in the past (when Schnitzer purchased the property in 2006) and will likely be discussed in the future.

2.2.3 Conclusions

The construction of the I-5 Bridge will have a modest impact on the ability of the property owners of the CBC to continue to use the site for heavy industrial and marine-dependent uses. As noted in Section 1, forecasts of future gross revenues for the three fabricators at the CBC indicate that about 1.2 percent (low forecast) to 5.9 percent (high forecast) of the activity could be constrained by the proposed bridge. In itself, a loss of 1 percent to 6 percent of gross revenues is relatively modest and would be unlikely to affect use of the site. It is conceivable that similar industrial uses could be maintained for some time into the future, given the relative lack of large industrial properties in the Portland-Vancouver metropolitan area. However, other factors may suggest a future conversion to other uses. Such factors would include the age and condition of the buildings at the site, as well as long term market conditions that may create pressure to convert the site to mixed use commercial and residential purposes, as has been seen in many waterfront properties throughout the US. Examples of that conversion in use can be found with the properties surrounding the CBC.

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3. CAPACITY OF THE WATERWAY

Sections 1 and 2 of this report provide forecasts of the future activity of the three fabricators, the industries served by the fabricators, and the CBC. Those sections demonstrate that the proposed I-5 Bridge will result in up to a 6 percent reduction in gross revenues for the three fabricators, but that those impacts will not materially affect the industries served by the fabricators or the CBC's owners.

This section describes the overall capacity of the waterway, including the current and anticipated marine navigational needs, existing limitation on upstream navigation due to vertical and horizontal clearance limitations, and potential upstream waterfront development and how it might affect future navigation needs. It concludes that the types of commercial marine navigation uses upriver of the I-5 Bridge are unlikely to shift significantly in the future. As a result, the proposed bridge will have virtually no impact on current or future upriver economic activity other than the very limited impact on activities at the Columbia Business Center as noted previously,

3.1 CURRENT MARINE NAVIGATION CAPACITY

The Columbia/Snake River navigation system begins at the mouth of the Columbia River and extends to Lewiston, Idaho, at the confluence of the Snake and Clearwater Rivers, approximately 465 miles upriver from Astoria, Oregon. The deep-draft navigation system extends from the mouth of the Columbia to immediately downstream of the BNSF Bridge in Vancouver, Washington. The shallow-draft system extends from Vancouver to Lewiston. Activity on each section of the river is described below.

3.1.1 Shallow-draft Section

The number of commercial lockages at Bonneville Dam provides a useful estimate of the economic activity on the shallow-draft section of the Columbia/Snake navigation system. Nearly all of the traffic to or from upriver ports passes through the Bonneville Locks to or from terminals located downriver of the I-5 Bridge. In 2009, approximately 92 percent of the cargo tonnage that moved between Vancouver and The Dalles either were upriver shipments such as petroleum products and chemicals that originated downstream of the bridge, or were downriver shipments (principally grain, forest products, and aggregates) that terminated downriver of the I-5 Bridge.

According to the U.S. Army Corps of Engineers, Bonneville Lock has averaged 9.7 million metric tons of waterborne commerce between 2002 and 2012 in total (upbound and downbound). Wheat, barley and other farm products, moving downriver primarily from upriver barge elevators to export terminals located on the deep water navigation channel of the Lower Columbia River accounted for approximately 56 percent of the total (5.4 million metric tons). Petroleum products, bound from distribution facilities in Vancouver and Portland to upriver terminals, accounted for 21 percent of the total (2.1 million metric tons). Crude materials (mainly downbound sand and gravel) accounted for 16 percent of the total (1.6 million metric tons). The remaining cargo (6 percent of the total or 577,000 metric tons) consisted of forest products, chemicals and manufactured products.

The percentage of shallow-draft, upriver navigation related to work that would be height-constrained if assembled and shipped downriver under I-5 is very small. There were an average of 2,465 upriver and downriver commercial lockages per year at

Bonneville Lock between 2000 and 2012. The barge slip at the CBC generated 0.32 percent of this commercial traffic. CBC barge slip use that would be height-constrained or was related to height-constrained activity represented 0.02 percent and 0.05 percent, respectively, of Bonneville lock commercial traffic.

As shown in Table 3-1, barge slip use at the CBC represents a very small portion of the commercial traffic flowing from the shallow-draft river section to the deep-draft navigation section.

Table 3-1. CBC Barge Slip Use as a Percent of Commercial Lockages

	CBC Barge Slip Use			Percent of Bonneville Commercial Lockages			
Year	Height Constrained	Non-height Constrained but Linked to Height Constrained	CRC Barge Slip Use Total	Height-constrained	Non-height Constrained but Linked to Height Constrained	CRC Barge Slip Use Total	Bonneville Commercial Lockages at Bonneville
2003	-	-	9	0.00%	0.00%	0.34%	2,631
2004	-	-	12	0.00%	0.00%	0.46%	2,601
2005	1	-	4	0.04%	0.00%	0.15%	2,664
2006	-	-	11	0.00%	0.00%	0.42%	2,610
2007	-	-	6	0.00%	0.00%	0.21%	2,813
2008	-	-	12	0.00%	0.00%	0.50%	2,416
2009	1	2	9	0.05%	0.10%	0.44%	2,054
2010	-	6	8	0.00%	0.26%	0.35%	2,287
2011	2	4	4	0.09%	0.17%	0.17%	2,317
2012	-	-	4	0.00%	0.00%	0.18%	2,261
Total	**4**	**12**	**79**	**0.02%**	**0.05%**	**0.32%**	**24,654**
Ave per year	**0.4**	**1.2**	**7.9**				**2,465**

Source: FC Services Barge Slip Use Data, U.S. Army Corps of Engineers lock performance data.

3.1.2 Deep-draft Section

Height-constrained shipments originating at CBC also represent a small portion of commerce downriver to the deep-draft section of the Columbia, both in terms of frequency of shipments and their value as compared to the overall value of navigation-dependent commerce on the Columbia. There were an estimated 28,000 entrances[1] by vessels in the Columbia River between 2002 and 2012, with the number of annual entrances ranging from around 2,000 to nearly 4,000, including self propelled vessels (passenger and dry cargo vessels, tankers and tugs and non-self propelled vessels (dry cargo barges and tank barges). This included approximately 8,668 vessels on domestic

1 Vessels enter and exit the Columbia River system in approximately the same numbers. Entrances were used to estimate transits because they represent a round trip vessel call, which avoids double counting.

routes and 19,303 vessels on foreign routes. The U.S. Army Corps of Engineers prepares annual reports of the number of vessels that enter and clear (leave) the entrance of the Columbia River. The database is current through 2010. The cargo volumes for 2011 and 2012 are comparable to 2010, so the 2010 estimates are used as a surrogate value for operations during those years.

There were 4 height-constrained transits by fabricators at the CBC during this period (2002 to 2012 estimated. As shown in Table 3-2, the transits associated with the fabricators at the CBC accounted for approximately 0.1 percent of total transits in the mouth of the Columbia River.

The value of cargo operations occurring at the entrance of the Columbia River ranges annually from $14 billion to $26 billion, based upon data from the WISER[2] databases that identify the value of imports and exports. The value of trade is not provided for trade on domestic routes.

The value of the height-constrained transits, as reported above, sums to $161 million between 2002 and 2012. As shown in Table 3-2, the value of cargo on transits associated with the fabricators at the CBC also accounted for approximately 0.1 percent of the value of all cargo transiting the mouth of the Columbia River.

2 WISER, the World Institute for Strategic Economic Research (based at Holyoke Community College in Massachusetts) was designated in 1988 by the US Census Bureau to be a Business and Industry Data Center, with special focus on foreign trade statistics. WISER maintains several time series of trade data based on United States trade statistics.

Table 3-2. Columbia River Transits and Value of Cargo

				Transits at CBR Entrance		Value of Transits ($millions)		
Year	Domestic	Foreign	Total	Estimated Height-Constrained Transits from CBC	Percent CBR Entrance	Foreign Trade at the CBR Entrance	Estimated Height-Constrained Transits at CBC	Percent of CBR
2002	1,044	2,785	3,829	0	0.00%	$14,312	$0	0.00%
2003	981	1,756	2,737	0	0.00%	$15,048	$0	0.00%
2004	1,029	1,778	2,807	0	0.00%	$16,063	$0	0.00%
2005	1,073	1,640	2,713	1	0.04%	$15,566	$8	0.05%
2006	937	1,691	2,628	0	0.00%	$19,790	$3	0.01%
2007	873	1,845	2,718	0	0.00%	$22,810	$3	0.02%
2008	642	1,828	2,470	0	0.00%	$26,429	$27	0.10%
2009	565	1,372	1,937	1	0.05%	$17,241	$62	0.36%
2010	508	1,536	2,044	0	0.00%	$20,023	$52	0.26%
2011est	508	1,536	2,044	2	0.10%	$22,102	$6	0.03%
2012est	508	1,536	2,044	0	0.00%	$22,102	$0	0.00%
Total	**8,668**	**19,303**	**27,971**	**4**	**0.01%**	**$211,485**	**$161**	**0.08%**

Source: USACE, WISER, BST Associates

3.2 FUTURE CAPACITY OF THE WATERWAY

The types of economic activity dependent on marine navigation upriver of the bridge are unlikely to change dramatically in the future. The vast majority of commercial river traffic in the shallow-draft upriver section of the Columbia/Snake system will continue to be dominated by barged shipments of grain, petroleum products, wood products, and other bulk products for domestic consumption and export. It is highly unlikely that the nature or composition of upriver navigation will change during the useful life of the I-5 replacement bridge for two reasons. First, navigational constraints due to river depth and other existing, permanent height and width constraints limit the size and draft of vessels capable of upriver navigation. Second, the availability of suitable waterfront properties for industrial development is and is expected to remain extremely limited.

As a result, virtually none of the anticipated economic activity on the river would be affected by the proposed bridge, with the exception of the projected reduction of up to 6 percent of gross revenues noted for the fabricators due to limitation on shipments of height-constrained products. No other types of cargo currently on the river, or projected in the future, are anticipated to be affected.

3.2.1 Navigational Constraints

Existing horizontal and vertical obstructions limit the size of vessels on the Columbia upriver of the I-5 Bridge. The BNSF railroad bridge at Celilo Falls, located 95 miles above the proposed bridge, has a vertical clearance of 79 feet in the raised position. Upstream from Celilo, several bridges and other obstructions such as power cables further limit the vertical clearance on the river to less than 79 feet. In addition, the Bonneville Locks and all other locks on the Columbia/Snake system also constrain navigation uses due to a maximum width of 86 feet, which prohibits passage by ocean-going barges. These barges typically have a minimum beam of 90 feet. As a result, sites located upriver of the Bonneville Lock will continue to be served by river barges.

The horizontal and vertical constraints upriver of the I-5 Bridge limit the extent of any potential impact to river navigation resulting from a change in vertical clearance at the I-5 Bridge. Other than those shipments noted previously for the CBC, no historical shipments destined or originating upstream of the bridge have been height-constrained, and the limited potential redevelopment of shoreline properties in the area upriver as far as the BNSF Celilo bridge indicates that no major new marine navigation-dependent land uses are anticipated.

3.2.2 Future Land Uses Upriver of the I-5 Bridge

Construction of a 116-foot bridge will have an insignificant effect on the availability of upriver waterfront lands suitable for marine-dependent industry, which is also extremely limited. As explained above, this limited potential for such development is primarily dependent on a host of other factors unrelated to the height of an I-5 Bridge.

Attachment E to the General Bridge Permit application submitted on January 30, 2013 describes the potentially re-developable waterfront lands along the reach of the Columbia from the I-5 Bridge to the BNSF Bridge at Celilo Falls. Several factors were noted that limit potential redevelopment of riverfront properties, including but not limited to:

- The Columbia River Gorge National Scenic Area strictly limits industrial development to sites within existing city limits;

- Most port-owned industrially zoned sites are planned for light industrial and commercial uses;
- Parcel size, configuration, topography and access constraints limit potential development opportunities;
- Public access to waterfronts with marinas, trails, and other features conflict with potential industrial uses.

As a result, it is unlikely that any of the limited number of sites upstream of the bridge would be redeveloped to produce large, height-constrained shipments. Conversely, given the other types of constraints noted above, the proposed I-5 Bridge is unlikely to affect the development potential of upriver sites.

3.2.3 Conclusion

Upriver navigational clearance limitations combined with limited opportunities for industrial marine-related shoreline development reinforce the conclusion that the types of commercial marine navigation uses upriver of the I-5 Bridge are unlikely to shift significantly in the future. As a result, the proposed bridge will have only a very limited impact on activities at the Columbia Business Center, and will have virtually no impact on other current or future upriver economic activity.

APPENDIX A

Review of Data Provided by Fabricators
Memo dated February 1, 2013 from BST Associates

Review of Data Provided by Fabricators

From Paul Sorensen
To: Jay Lyman, CRC
Date: February 1, 2013
Re: Data provided by fabricators

This memo summarizes the data sources that were provided by the three fabricators as well as other data sources used by BST Associates in preparation of the direct impacts associated with the activities bu the fabricators.

Thompson Metal Fab (TMF)

TMF provided the following data:

- Annual audited financial statements for the period 2001/2 through 2010/11.
- Impact of Loss of Future Height Constrained Revenues, by Morones Analytics (Dec 14, 2012).

A comparison of gross revenues and general expense categories in the audited reports are similar to those provided in the Morones report. Estimated results for FY2012 are also provided in Morones report.

The Morones reports provides additional details on the allocation of revenues and expenses to height constrained and non-height constrained business, which is not available in the audited reports. However, the results of the analysis appear reasonable based upon discussions with TMF and Morones.

Details on employee compensation are provided in the audited reports. The Morones report provides a distribution of employee compensation for height constrained and non-height constrained business. The results are within reason, showing that height constrained projects account for 34% of gross revenue and 25% of employee compensation.

Estimates of the number of employees from TMF (and other fabricators) generally considered head counts (all of the people compensated in a recent year). BST estimated full-time equivalent jobs (FTEs) based upon a standard year of 2,080 hours. The FTE estimates used an average hourly rate of employee compensation including wages/salaries and benefits but excluding employer paid payroll taxes. TMF provided a breakdown of the average employee compensation for 2011/12. This was used to estimate the number of FTEs. Estimates for prior years were based upon estimated percentage of employee compensation to gross revenue.

All of TMF's business occurs at the CBC.

Oregon Iron Works (OIW)

OIW provided the following data:

- A summary excel file with gross revenues and estimated height constrained revenues for 2000 to 2012 estimate, and projections for 2013 through 2045.
- Pages from consolidated financial statement for full year 2008 through 2011 and 2012 (Jan-Sep), which shows gross revenues, contract costs, selling/general/admin costs, other sources of revenue and expense, gross profit and net income.
- HSNO reports (preliminary report dated 12-14-2012) and revised report (1-17-2013), which included historical trends of gross revenues, contract costs, gross profits for the period 1990 to Sep 2012 as well as expected gross revenues, contract costs, gross profits for the period 2013 through 2057.

The historical trends provided in the HSNO report are approximately 6% to 7% lower than those in the OIW financial reports. It is not clear why this result is achieved but the ratio of gross profit to gross revenues nearly identical. As a result, the relative values are acceptable.

There are few details on employee compensation provided in either the financial statement or HSNO report. BST discussed employee compensation and number of employees with Bob Wise (Chief Financial Officer) and Tom Hickman (VP Sales and Marketing). BST was provided with estimates of the ratio of employee compensation to gross revenue and average employee compensation for 2012. BST estimated FTEs based upon these factors.

OIW has operations in Clackamas and at the CBC. The report of total company-wide revenues, employee compensation and employment was based on all operations. The estimates of height constrained business were allocated to the CBC.

Greenberry Industrial (Greenberry)

Greenberry provided the following data:

- A three ring binder of company information, including summary financial results for 2010 through 2013 (est.), reported man hours for 2010 through 2012 and a share of revenues by industrial sector.
- Pages from consolidated financial statements for years 2002 through 2011 and an estimate for 2012. Full financial statement details for 2007-2011 and estimate for 2012 year to date.
- Excel file that provided 2012 employee compensation (wages, benefits, etc) for contract employees and Greenberry staff.
- A letter or review of BST estimates from Cogence Group Inc, who will prepare an estimate of lost profits by mid-February 2013.

The gross revenues provided in the consolidated reports were used in the economic studies by BST. Estimates of revenue from height constrained projects that occurred at CBC were provided by Jason Pond, CEO of Greenberry.

BST used the 2012 file on employee compensation to estimate FTEs for 2012. Estimates of the employee compensation and number of FTEs for prior years were based upon the ratio of employee compensation to gross revenues and average wages.

Other Data Sources

BST also used the following public data sources:

- US Census data for 2007, that provided an estimate of employees, employee compensation and gross revenues.
- Washington State Employment Security data, which provided wages/salaries and number of employees for affected industries for Washington State (1990 through 2011) and Clark County (2002 through 2011).
- Washington State Department of Revenue, which provided gross business income for the fabricated metals sector for the period 1994 through 2011.
- Dun & Bradstreet data for metal fabricators in Oregon and Washington state, including estimated number of employees and revenues.
- City of Portland Bond issues, which provided employment estimates for the Portland Metro area for fabricated metals and other selected industries for the period 2007 through 2011.

APPENDIX B

Report on Alaska Oil and Gas Development Relevant to Drilling Rig Fabrication

Samuel A. Van Vactor, PhD
Economic Insight, Inc.

April 2, 2013

Report on Alaska Oil and Gas Development Relevant to Drilling Rig Fabrication

Samuel A. Van Vactor[1], PhD
Economic Insight, Inc.
April 8, 2013

[1] The author is an energy economist who has consulted to the State of Alaska and to the North Slope oil producers on royalty and tax matters. He is the author of the PennWell publication, *Introduction to the Global Oil & Gas Business.*

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[redacted]

7. Conclusion

1. Introduction and Executive Summary

In the last few years Thompson Metal Fab, Inc. ("TMF") fabricated three large drilling rigs for use on Alaska's North Slope. The rigs were loaded on barges and shipped under the I-5 drawbridge that spans the Columbia River between Portland and Vancouver. [redacted] Not all drilling rigs suitable for Alaska are [redacted] likely to be of the size and complexity of the 3 Parker drills. Moreover, it is unclear that it is necessary to ship large drills in a manner that requires heights in excess of that planned for the CRC project. The large extended reach drill built by Parker for Sakhalin Island (similar to the one built for Alaska's Liberty Project) was shipped in three parts from Louisiana.

This report investigates the level of expected oil and gas development in Alaska and concludes that while there could be some demand for new oil and gas drilling rigs, it will not be significant. [redacted]

The report begins with a general discussion of the nature of oil and gas development, with particular reference to Alaska. By segmenting development into a series of steps and different types of activities it is possible to pinpoint the type of drilling rig demand likely to emerge.

Review of the State of Alaska's annual revenue forecast by the Department of Revenue ("DOR") suggests that North Slope and Cook Inlet production will continue to decline, albeit at a slower rate than in the last few years. The last two years have witnessed a substantial drop in Alaska oil production, 7.3% in 2011 and 7.5% in 2012. These figures compare to the overall negative trend of the last ten years of 5.8%. DOR expects the general trend to continue through 2022 at a slightly lower rate of 5.2%. To a large extent Alaska experience contradicts expectations, because oil prices are much higher than in previous decades.

There are two main reasons for the decline in Alaska oil production. First, the State introduced a higher tax rate in 2007, which the industry considers onerous and many analysts believe rendered Alaska uncompetitive for development. Recent

legislation, Senate Bill 21 ("SB 21"), attempts to rectify the problem but it may be too little, too late. The timing of Alaska's tax increase could not have been worse. The higher rates were introduced just at the point at which shale gas and oil became viable in the lower forty-eight states. Resources have rushed into Texas and North Dakota, but not Alaska. For 2013 the companies plan to spend $3.5 billion on oil and gas development in Alaska. This is only 1.3% of the total exploration and production budget of the oil industry in the rest of the United States.

There is some hope for future development in Alaska. A number of companies have leased acreage in the Beaufort and Chukchi Seas off the North Slope. If they make a big strike, it would open a new province and turn Alaska's fortunes around. Such a strike would not, however, have much impact on drilling rig demand of the types of rigs previously built in Vancouver. Development would require large exploration platforms like those used in the North Sea, Brazil, West Africa, and the Gulf Coast. Similarly, a number of independent companies are drilling into the North Slope source rocks in the hope of developing shale oil. Such development is, however, very speculative because there are too many unknowns. In any case, such development will probably require smaller, more conventional drilling rigs. Conventional drilling rigs, like those used for oil and gas shale development in North Dakota and other states, are moved by truck from one location to another. As such they are designed to break into component parts so they can be shipped and would not have the height restrictions of the 3 Parker rigs.

Table 1.1
Estimated Demand for Large Scale Drilling Rigs in Alaska

		Pessimistic Scenario		Optimistic Scenario	
Drilling Activity	**Existing ERD or AADU**	**Demand for ERD or AADU types to 2022**	**Demand for ERD or AADU, 2022 to 2032**	**Demand for ERD or AADU types to 2022**	**Demand for ERD or AADU, 2022 to 2032**
Prudhoe Bay	2	2	0	2	2
PBU Statellites	0	0	0	0	0
GPMA	0	0	0	0	1
Kuparuk	0	0	0	0	0
Kuparuk Satellites	0	0	0	0	0
Endicott	0	0	0	0	0
Alpine	0	0	0	1	2
Offshore	1	1	0	1	2
NPR-A	0	0	0	0	0
Point Thomson	0	0	0	3	3
Total ANS	3	3	0	7	10

Cook Inlet	0	0	0	0	0
Total Alaska	3	3	0	7	10
Number of New Rigs		**0**	**0**	**4**	**3**

The demand for new rigs of the type previously fabricated in Vancouver will not be great. In a pessimistic scenario, such as the one presently held by the Alaska DOR, production on the North Slope could decline to the point that the pipeline would have to be shut down by 2022. If that were to occur there would no demand for new rigs at all. On the other hand, if lower tax rates stimulate development and there is exploration success, production could stabilize or even increase. Even so there is limited demand for large-scale rigs. An optimistic estimate of such demand suggests that 7 or fewer new drilling rigs will be required in Alaska over the next twenty years.

It is worth pointing out that the demand for all kinds of rigs in Alaska has never been high. According to the Baker-Hughes rig count, in 2011 there were only 7 active rigs. In the last twenty-five years there have never been more than 13 rigs active in Alaska. As of March 2013, *Petroleum News* lists 44 rigs at the North Slope and Cook Inlet; 19 were identified as stacked or "available," and the majorities of those leased or on site are inactive.

2. Background on relevant oil and gas resources in Alaska and the Pacific Rim

a. The oil cycle: discovery, development, maintenance and extension.

Before drilling into the details on oil and gas development in Alaska, it is useful to describe the industry's cycle of exploration, development, maintenance and extension. It is important to distinguish the various stages of activity in order to identify the types of drilling rigs that Alaska will require going forward.

Oil and gas deposits are usually found in sedimentary basins. They vary enormously in size and productivity. Usually the most profitable finds are large fields close to a market so the costs of development and transportation can be minimized. Historically exploration success made an oil company. J.P. Getty made his fortune on the Kern River oil field in California, where he had a freehold of 10 square miles. H.L. Hunt managed to consolidate holdings in the East Texas oil field. Both these fields were "super giants," that allowed low-cost exploitation.

The Prudhoe Bay oil field on Alaska's North Slope is the largest oil field in North America. Despite its remote location, it has been a hugely prolific field, enhancing the profitability of BP and Exxon and turning a small company, ARCO, into a major player on the West Coast. So far, Prudhoe Bay has produced over 12 billion barrels of oil and could continue to produce oil for several decades, albeit at a much lower rate.

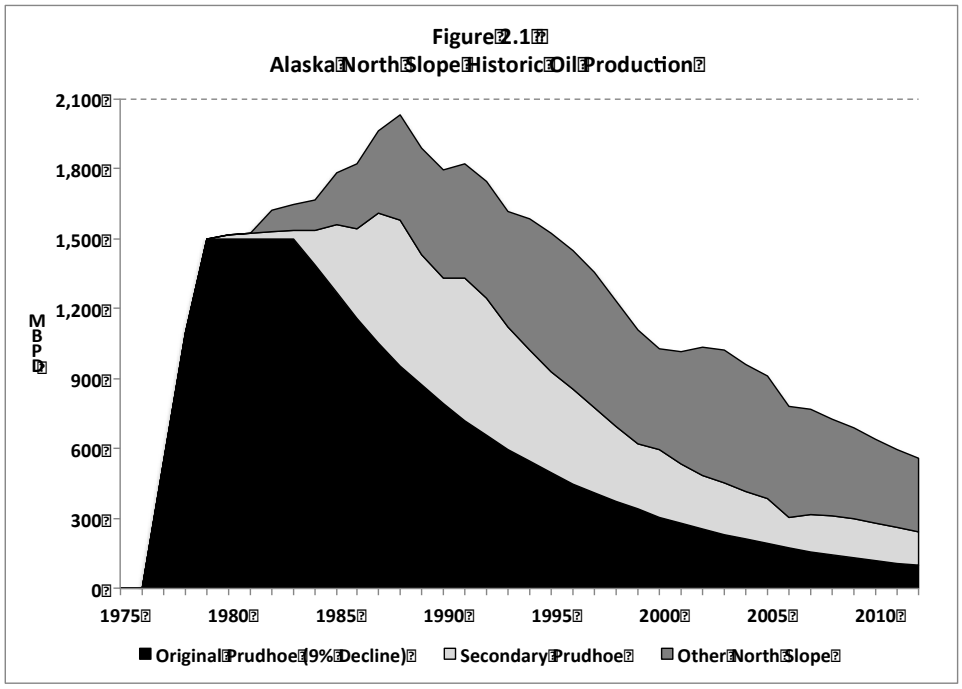
Historically, the exploration phase of the oil cycle was highly speculative. Many of the great finds were accidental. ARCO almost gave up on the North Slope until it discovered Prudhoe Bay with its last well. Exxon and BP, the other major leaseholders, had minimized exploration activity, considering the site too remote and costly to develop. For the North Slope to be developed it was necessary to discover a "super-giant" oil field and that is what Prudhoe Bay turned out to be.

The development of most oil provinces begins with the discovery of an "anchor" project. The field or fields have to be prolific enough to justify constructing support and transportation infrastructure. Once the threshold is reached, development can proceed. In the case of Prudhoe Bay a large support infrastructure for personnel and machinery had to be built on the North Slope and a costly pipeline, the Trans Alaskan Pipeline System (TAPS) had to be constructed to Valdez on the southern coast of Alaska.

A great deal of drilling activity takes place in the development phase. There are over 1,000 active wells in the Prudhoe Bay field. The wells are necessary both to produce the oil and to re-inject water and other unwanted fluids. The first wells went straight into the formation, spaced horizontally across the width and length of the field. Twenty to thirty wells were clustered together on gravel pads. The activity left a permanent "footprint" on the tundra. Since then, environmental regulations and cost-

cutting measures have resulted in greater direction drilling and a significantly reduced footprint.

Figure 2.1 illustrates how Alaska's North Slope developed over the decades. The lower part of the chart, in black, represents production from Prudhoe Bay based on a forecast made as production began. This forecast assumed that the field would be developed, but no further investments would be made and Prudhoe Bay would go into natural decline. Of course, that did not happen. Over the years the companies invested billions of dollars to extend production, known as enhanced oil recovery ("EOR"), as illustrated in the light grey band above the original forecast. As the chart makes clear, if these investments had not been made, production would now be down to a trickle.



Following the Prudhoe Bay discovery the North Slope experienced a "gold rush" as exploration companies spread out across the northern shoreline looking for other oil fields. More than a dozen deposits were found, including the Kuparuk field, which is also classified as a super-giant field, although it is only about one-quarter the size of Prudhoe Bay. In 2012, output from Kuparuk and other smaller fields represented about one-half of total production on the slope.

b. Oil and gas fields in Alaska

i. Cook Inlet

The North Slope is not the only petroleum province in Alaska nor was Prudhoe Bay the first discovery. There are a number of oil fields in the Cook Inlet near Anchorage

and small amounts of development occurred early in the twentieth century. The Swanson River field was discovered in 1957, followed by a number of discoveries over the following decade. Production peaked in 1970 at 227 thousand barrels per day ("mbpd"). Current production tallies around 11 mbpd.

Natural gas was discovered at North Cook Inlet in 1962, but there was little or no local market. As a consequence in 1968 the producer, Phillips Petroleum, constructed a gas liquefaction facility and exported liquefied natural gas ("LNG") to two Japanese utilities for over four decades. They also shipped gas to customers in the Anchorage area. Gas depletion recently caused ConocoPhillips to mothball the liquefaction facility and hold back remaining reserves for Alaskan consumers.

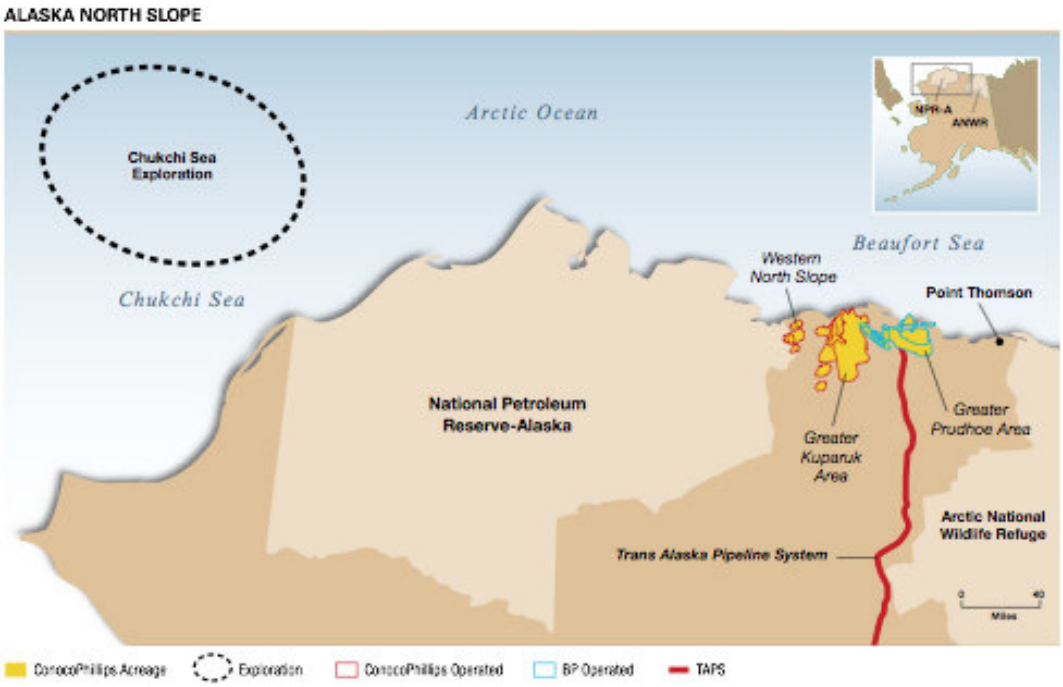
ii. North Slope

At one time, all the North Slope was federal land. When Congress granted Alaska statehood in 1959, it allowed the new state to select large tracks of land, giving it a resource base and potential revenue. A geologist working for Alaska believed that the North Slope area contained oil and selected the Prudhoe Bay area. It was not a popular choice with most Alaskans and was referred to as "Marshall's Icebox." In retrospect, however, the choice proved brilliant. Royalties and taxes from the North Slope oil not only fund state government, the Alaska Permanent Fund also provides an annual payment (negative tax) to residents.

Common parlance refers to oilfields, but the geological meaning of the term is vague. Crude oil fields can overlap one another by resting at different levels in the subsurface. Likewise, fault lines and other barriers often prevent oil from flowing from one part of a formation to another. Thus a whole set of "satellites" to the Kuparuk and Prudhoe Bay fields were developed separately. Likewise, many of the smaller fields in the region required separate development, although they may piggyback the Prudhoe or Kuparuk infrastructure.

The ConocoPhillips website contains a summary graphic of the North Slope that helps put the various regions in perspective.

Figure 2.2



North Slope oil and gas development boils down to seven categories of interest:

- To the center-east, near the right side of the chart is the "Greater Prudhoe Area." This area contains the Prudhoe Bay field and its satellites.
- Further east is the Point Thomson gas and condensate field. Although it is not yet producing the field may finally be developed this decade by ExxonMobil.
- East of Point Thomson is the Arctic National Wildlife Refuge ("ANWR"). Federal law prohibits ANWR development, but the companies have been keen to drill there for decades and environmentalists just as keen to prevent it.
- The "Greater Kuparuk Area" is west of Prudhoe Bay. The oil in this region is heavier and more costly to produce.
- There are a number of fields in the "Western North Slope," an area in and around the Coleville Delta.
- The large block of land, known as the National Petroleum Reserve of Alaska ("NPRA") is, as the name implies, federal land. The NPRA has been drilled multiple times over the last six decades and, to date, no sizeable oil field has been found.

- Finally there are the offshore areas. The Beaufort Sea is directly west of Prudhoe Bay and Chukchi Sea lies to the west of NPRA. Both Shell and ConocoPhillips plan to explore these areas, although Shell's problems last summer will constrain the effort.

Section 3, which follows, will address development in each of these areas in the context of the Alaska Department of Revenue ("DOR") 2012 forecast and the type of development likely to occur.

c. Development on Sakhalin Island

Before reviewing Alaska's oil and gas development in detail, a brief description of development on Sakhalin Island is useful. Sakhalin Island is Russian, but it lies only a few miles north of Hokkaido, Japan's northern-most island. Even though the island is further south than the North Slope the operating conditions are similar and American companies, particularly ExxonMobil, have been involved there in oil and gas development.

Sakhalin Island is relevant for two reasons. First, some of the drill rigs used on the island were fabricated in the U.S. Second, the experience in using those rigs is instructive to understanding how similar activity on the North Slope may unfold.

d. The purpose and use of extended reach drills ("ERDs") and Arctic Alaska Drilling Units ("AADUs")

The Parker Drilling Co. designed the three drill rigs fabricated in Vancouver and shipped to Alaska. The first of these rigs was an ERD intended to drill offshore oil and gas fields from shore, based on Parker's design for an ExxonMobil's similar rig on Sakhalin Island. The second set of rigs, AADUs, also allows for directional drilling, but "A BP spokesman said in August 2011 that the Parker-owned 272 and 273 rigs were part of the oil company's effort to modernize its North Slope drilling fleet." (*Petroleum News*, August 22, 2012).

The ExxonMobil ERD, named the Yastreb (Russian for Hawk,) is the most powerful land rig in the world, breaking records for distance and depth. The Parker Company states on its website: "Final assembly and commissioning occurred in June 2002 in New Iberia, Louisiana. The rig was then disassembled crated in cargo packages and shipped on three cargo vessels to the port of Korsakov on Sakhalin Island, arriving in early August. From Korsakov the containers were transported via barge, rail and truck to the well site…" This indicates that these types of rigs have been successfully shipped in non-height constrained combinations. The Yastreb has been in place since 2003; it has drilled around 20 wells in two different oilfields on the Island. By all accounts it is a highly successful technology.

Parker has been less successful with its North Slope rigs. The first of the three Vancouver rigs, the ERD, was installed for BP on the Endicott man-made island on the North Slope. The rig is part of the plan to develop the Liberty oil field, which is six miles offshore fifteen miles from Prudhoe Bay. In June 2012 BP decided to shelve the Liberty project due, in part, to problems with the rig. According to a BP spokesperson, "the rig needs 'substantial modifications,' including changes to the mud system, the hydraulics and walking system, and the pipe handling, heating and utility systems. The rig also needs a new drilling support module." (*Petroleum News*, July 1, 2012). The spokesperson said that a decision about what to do with the rig has not been made, noting several companies were involved: "'We expect that the issues with the rig will be worked out privately and confidentially between all the relevant parties.'"

The next two rigs, the AADUs designated 272 and 273, are installed at the Prudhoe Bay oil field also for BP. Although Parker missed initial installation deadlines, both rigs are now operational, but it is too early to determine if they will be successful. Overall these rigs will end up costing about $200 million each, which will likely curtail demand unless costs can be brought down.

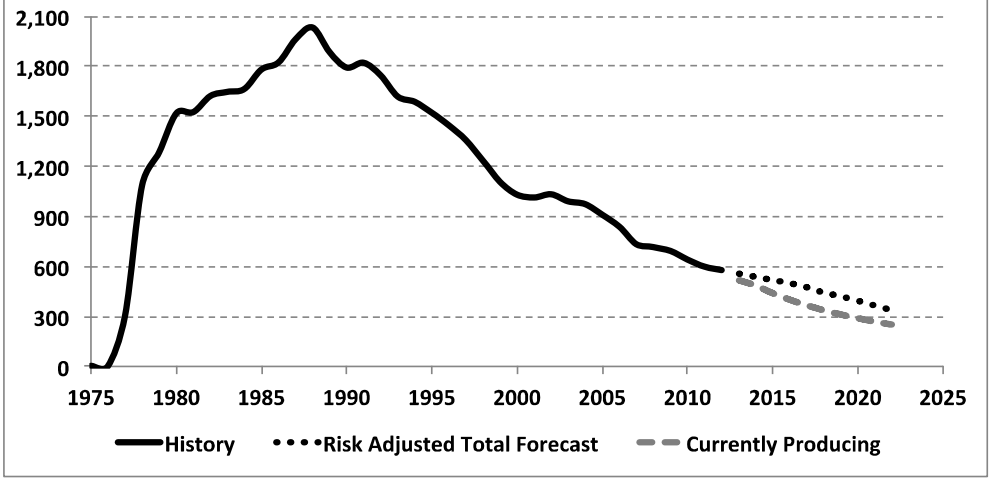
3. Alaska oil production forecast

    a. Background on oil and gas production forecasts

        i. Risk-based approach

Until recently Alaska's officials forecast future production based on known discoveries and the producers' development plans. This procedure had a bias, however, in that some of the plans fell short of expectations. The state now follows a "risk adjusted" methodology in which development plans are assigned a probability of being fulfilled. In the first few years this does not make much of a difference, but ten years hence it does. For 2022, DOR forecasts that "new oil" from planned development will be 87 mbpd. In contrast, the total in actual development plans is 193 mbpd. This means that total North Slope production in 2022 would be 445 mbpd, as compared to 339 mbpd projected by the risk adjusted total forecast. The difference in these figures is significant, because if North Slope oil production drops to too low a level, the Trans Alaska Pipeline System ("TAPS") would no longer be economic and all North Slope production would be shut in. (See section 5c).

Figure 3.1
Historic and Forecast North Slope Oil Production



It is worth pointing out that oil production and development are not the same. In other words, the huge drop off in production depicted in Figure 3.1 can be misleading. As oil fields mature, they require greater and greater investment to abate production decline. A young oil field is under high pressure and oil flows through existing wells at a rapid rate. As pressure declines more wells are required both for production and to re-inject fluids or gas to maintain field pressure. Put another way, the level of investment activity per unit of output increases as fields age.

ii. Cost structure

Development of the North Slope's prolific resources remains costly. So far the technological revolution that has swept the oil and gas industry in the lower forty-eight states has had limited impact on Alaska. Infrastructure support is the primary constraint; almost all labor and materials must be hauled in at two to three times the cost of development in Texas or North Dakota. Plus, the drilling season is limited to winter onshore and summer offshore. The winter climate is severe and environmental constraints are substantial. For example, Shell's offshore drilling had to be postponed so as not to endanger the migration of whales and other wildlife.

iii. Employment

Alaska's unemployment rate has tracked below the national average since 2008. The state's seasonally adjusted unemployment rate for February 2013 was 6.5%, as compared to the national average of 7.7%. The oil and gas industry employs managers and analysts in the Anchorage area and field workers at Cook Inlet and the North Slope. Many of the field workers live outside Alaska.

Scott Goldsmith at the University of Alaska estimated the impact on jobs as a consequence of the oil industry. For 2010 he estimated the total direct and induced jobs at 44,800, out of a total state employment of 254,731. Most of the jobs arise from an income multiplier. The oil and gas industry employs only 3,997 men and women directly, with another 14,870 jobs from service firms that support the industry.

iv. Capital expenditures

The annual Construction Spending Forecast prepared by the University of Alaska, Institute of Social and Economic Research ("ISER") estimates that the Oil and Gas Industry will spend $3.6 billion in 2013, up 13% from 2012. Although this is a sizeable investment fund, it is small compared to overall U.S. exploration and production ("E&P") construction spending which, according to the *Oil and Gas Journal,* will total $288 billion in 2013. Put another way, the shale oil and gas boom in the lower forty-eight states is attracting the lion's share of investment capital. Alaska accounts for only **1.25%** of the industry's E&P investments despite the fact that there are substantial quantities of undeveloped resources on the North Slope.

v. Maintenance

The North Slope's infrastructure requires substantial maintenance. The harsh climate and mechanical wear and tear means that there are high costs just to maintain the flow of oil. In the past, the companies did not undertake adequate maintenance. This resulted in oil leaks and other problems.

vi. Impact of tax and fiscal regimens

The industry complains that Alaska's high taxes have rendered it uncompetitive when compared to other petroleum provinces around the globe. In 2007 the State adopted Alaska's Clear & Equitable Share ("ACES") oil tax system. It is now recognized by many Alaska politicians that taxes on the petroleum industry have been excessive. Alaska Governor, Sean Parnell, proposes to reduce the industry's taxes and he introduced SB 21. Alaska's Senate passed SB 21 on March 22. The bill now goes to the House where it will also likely pass. The new tax structure will improve incentives, but it may be too late to turn around Alaska's declining production, given the lead times required.

In retrospect, the adoption of the ACES tax structure could not have had worse timing. Just as the gas and oil shale boom started in the lower forty-eight, Alaska chose to raise taxes on the industry. As a consequence, development lagged, despite record high prices. The measure proposed by SB 21 will correct some of problems with the ACES tax structure, but it is unlikely to recharge development. Rightly or wrongly the oil and gas industry now focuses on its traditional resource base from the Rocky Mountains to Texas.

The ACES system is a progressive tax tied to oil prices. That is, the higher oil prices go, the greater the percentage the state collects. There are offsetting credits and other measures to soften the sting. However, a number of analysts testifying during the Senate hearings concluded that the effective rate was higher than other jurisdictions. In any case, tax rates in Texas and North Dakota where most E&P for oil is now focused are much lower.

b. Details on development forecast

Table 3.1 summarizes the October 2012 forecast by Alaska's DOR. The forecast divides the state's petroleum activity into eleven regions or categories, ten on the North Slope, plus Cook Inlet. The categories relate to those classified by ConocoPhillips in Figure 2.2, but they are not exactly the same. That is because ConocoPhillips focuses mainly on its own development and activity, excluding other companies such as BP. The DOR data are comprehensive for the whole state.

Each of the categories of petroleum production will be discussed in greater detail below. The DOR aggregates development across a number of projects or regions in order to protect the producer's confidential data. However, the various development projects underway in Alaska are well known, reported in the trade press and on websites. Thus, where such a project and its characteristics can be identified, it is discussed in the following pages.

Table 3.1
State of Alaska Department of Revenue 2012 Production Forecast

Alaska FY	Prudhoe Bay	PBU Satellites[1]	GPMA[2]	Kuparuk	Kuparuk Satellites[3]	Endicott[4]	Alpine[5]	Offshore[6]	NPR-A	Point Thomson	Total ANS	Cook Inlet	Total Alaska
2003	429.1	96.8	65.0	160.0	52.3	29.0	98.8	59.5			990.5	29.3	1,019.8
2004	414.4	103.3	60.2	154.0	48.9	28.1	99.0	66.1			974.0	25.1	999.1
2005	380.2	92.4	54.6	140.8	51.0	20.0	104.6	67.7			911.3	20.3	931.6
2006	335.4	82.1	47.5	132.0	43.3	20.5	123.4	55.4			839.6	18.3	857.9
2007	270.8	75.7	36.9	121.4	43.8	16.4	124.4	44.9			734.3	16.1	750.4
2008	291.1	67.5	44.3	112.5	37.7	14.1	114.9	34.4			716.5	13.9	730.4
2009	291.4	67.9	38.5	105.5	36.7	14.2	106.8	31.5			692.5	10.1	702.6
2010	276.7	63.0	34.0	99.2	35.0	12.7	93.5	28.2			642.3	8.9	651.2
2011	267.6	55.4	30.8	91.0	31.9	11.7	84.5	26.1			599.0	10.3	609.3
2012	265.2	50.7	29.6	91.6	27.5	11.2	78.7	24.6			579.1	10.8	589.9
2013	267.5	46.5	26.8	85.0	23.9	10.1	67.3	25.6			552.7	10.4	563.1
2014	256.1	44.4	25.5	84.8	23.4	10.0	64.3	29.9			538.4	9.6	548.0
2015	250.0	41.4	23.3	82.8	21.9	10.9	60.3	28.0			518.6	8.9	527.5
2016	240.3	38.9	21.1	79.0	21.8	10.5	60.5	26.3		1.3	499.7	8.3	508.0
2017	228.8	36.3	19.1	75.3	20.8	8.9	55.4	24.3		7.2	476.1	7.7	483.8
2018	218.1	33.3	17.7	71.7	18.6	7.6	47.3	21.8	0.1	6.7	442.9	7.2	450.1
2019	207.8	30.5	16.4	68.3	16.4	6.7	40.0	19.6	9.8	6.1	421.6	6.7	428.3
2020	197.0	27.7	15.2	65.0	14.7	6.1	34.4	17.9	11.2	5.6	394.8	6.3	401.1
2021	186.9	25.8	14.2	61.3	13.2	5.5	29.8	16.5	7.5	5.2	365.9	5.9	371.8
2022	177.3	23.8	13.4	56.2	11.9	4.9	26.0	15.1	5.1	4.8	338.5	5.6	344.1

[1]Aurora, Borealis, Midnight Sun, Orion, Polaris, Milne Point, Sag River, Schrader Bluff, Ugnu

[2]Greater Point McIntyre Area: Lisburne, Niakuk, Point McIntyre, Raven, West Beach, West Niakuk

[3]Meltwater, NEWS, Tabasco, Tarn, West Sak

[4]Endicott, Minke, Sag Delta, Eider, Badami

[5]Alpine, Fiuord, Nanuq, Qannik, Mustang (after 2016)

[6]Northstar, Oooguruk, Nakaitchuq, Liberty (delayed)

i. Cook Inlet

1. Oil fields

As noted, Cook Inlet oil fields are nearly depleted. While there is some exploration activity, no large strikes have been made and there is little or no demand for new oilrigs. Over the last decade Cook Inlet production has declined at an annual average of 9.7%. DOR project it will continue to decline until 2022, at an annual rate of 6.4%.

2. LNG exports

The gas fields around Cook Inlet suffer the same fate as oil production. They have been depleted to the point that LNG will no longer be exported.

ii. North Slope Developed Area

Figure 3.1

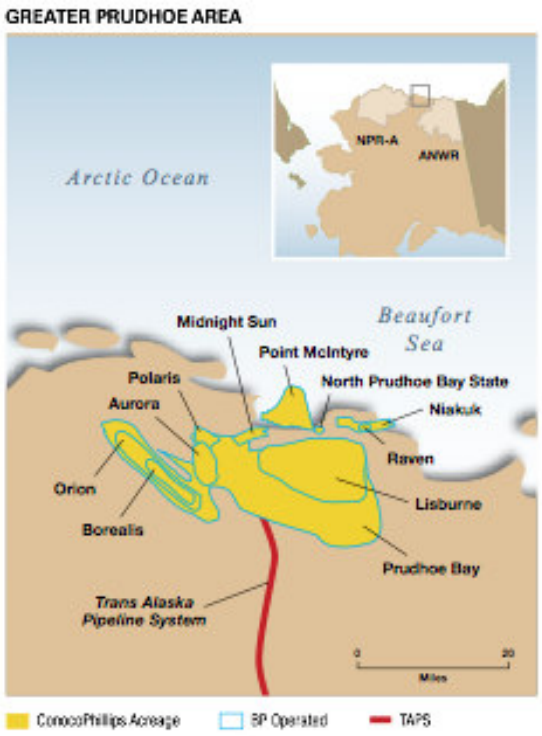


Figure 3.2

1. Prudhoe Bay and Satellites

BP expects to continue maintenance on the Prudhoe Bay field through additional drilling. The DOR expects production to decline at an annual rate of 3.9% over the next ten years. This is slightly slower than the annual decline rate of 4.9%, from 2002 through 2012. The two Parker rigs built in Vancouver are likely to be used in the Prudhoe Bay field and satellite area. The wells they drill will help stem the production decline.

The DOR categorizes Prudhoe Bay Satellites to include the following deposits developed over the years: Aurora, Borealis, Midnight Sun, Orion, Polaris, Milne Point, Sag River, Schrader Bluff, and Ugnu. Some of these deposits, for example Ugnu, are heavy oil that is too costly to produce and activity has been restricted to research and development. It is worth noting that BP canceled its cold heavy oil production with the sand ("CHOPS") project last year.

While the Prudhoe Bay itself and its Satellite deposits will be maintained, there are no major development plans since these areas have been thoroughly explored. Overall, Satellite production is expected to decline at an annual rate of 7.3% for the next decade. Based on the DOR forecast as well as public development plans of BP, ConocoPhillips, and ExxonMobil there will not be a need for extended reach drills through 2032, beyond those that are already available.

2. Greater Point McIntyre Area

The Greater Point McIntyre Area (GPMA) lies to the north of Prudhoe Bay along the shoreline. The fields are Niakuk, Point McIntyre, Raven, West Beach, and West Niakuk. The DOR forecast also includes the Lisburne oil field that lies over the top of Prudhoe Bay's primary reservoir. Production declined rapidly in this group of fields in the last decade and is expected to decline at similar rates, 7.6%, over the coming years. Conceivably, an ERD could be productive in this area of the slope sometime in the future, but that would depend on discovery of a nearby offshore deposit. I estimate that one ERD (or other type of large scale drill) might be ordered sometime between 2022 and 2032.

3. Kuparuk and Satellites

As noted, Kuparuk is the second largest field on the North Slope. DOR expects it to decline at a rate of 4.7%, slightly faster than Prudhoe Bay, but less than other regions. The satellite deposits around Kuparuk – Meltwater, NEWS, Tabasco, Tam, and West Sak – are, however, expected to decline rapidly at an average of 7.9% per year. These are mostly heavy oil deposits that are costly to exploit. Given the quality of Kuparuk oil and its onshore location, there is no reason to think an ERD would be cost effective.

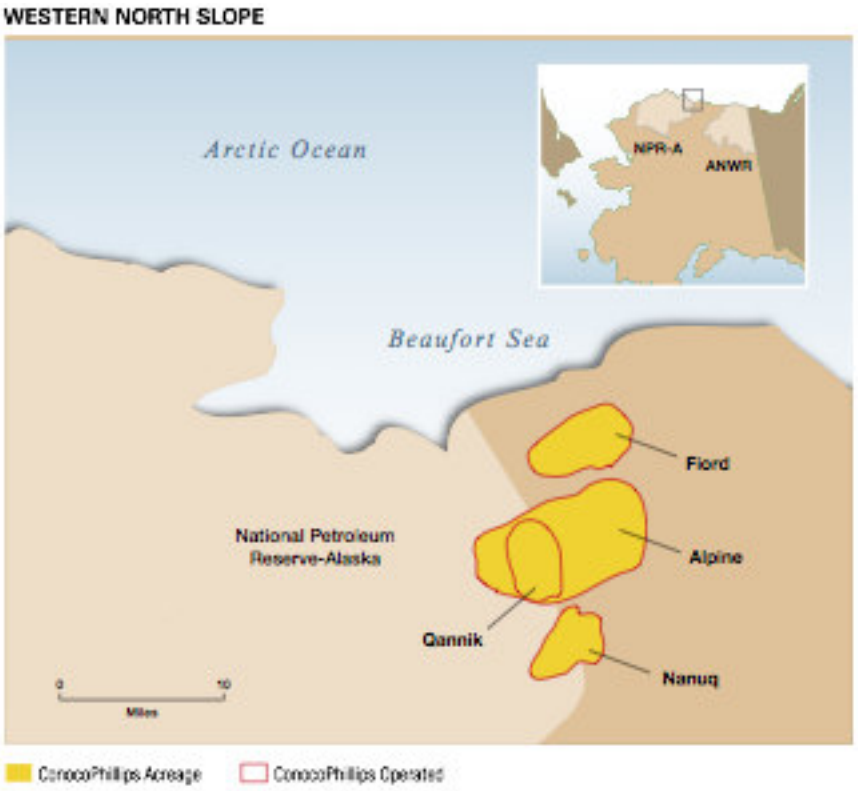
4. Endicott

The Endicott oil field began production in 1986 and peaked in 1992 at 111 mbpd. Production was down to 11 mbpd in 2012 and is expected to decline to less than 5 mbpd by 2022. The project raised a variety of environmental issues. In order to develop the field BP had to construct a causeway and artificial island. The construction interfered with wildlife movements and, of course, cost a lot. The Endicott experience is one of the reasons why, whenever possible, future development of offshore fields will occur onshore with the ERD technology. There are no further developments planned for Endicott itself. If, however, BP decides to reinstate the Liberty project, the Endicott Island will likely be the center of activity.

DOR's Endicott category also includes Minke, Sag Delta, Eider, and Bandami. The largest of these fields, Bandami, was developed by BP, but declined quickly. An independent has taken over as operator and is extending the field's life using EOR techniques. Most significantly, there is substantial pipeline capacity between Bandami and Prudhoe Bay. This provides incentive for Point Thomson development (see below). None of the fields in the Endicott category are expected to require ERD facilities.

5. Alpine

Figure 3.3



As Figure 3.3 illustrates, the Alpine category includes fields in the Coleville Delta Area and borders on the NPRA. The latest development announced by ConocoPhillips is the CD-5 satellite. When completed in 2014 it will join Fiord, Qannik, and Nanuq as active extensions of the Alpine field. The CD-5 deposit is located in the NPRA. ConocoPhillips states on their website: "Alpine is one of the largest onshore oil fields discovered in North America in the past 20 years. Directional drilling, zero-waste discharge, roadless development and other innovations minimize the Alpine development's environmental footprint in the arctic." This would suggest that at least one ERD will be used in CD-5 development, but that may not require a new rig.

In addition to CD-5, an independent Brooks Range Development announced the discovery of the Mustang field south of Alpine. It is not a large field and will not be developed until 2016 at the earliest. Brooks Range is likely to use existing drill rigs already on the North Slope for the development.

Although present development plans are conservative, demand for ERD and/or AADU drills could emerge in the future. The Alpine area is less well explored than the areas around Kuparuk and Prudhoe Bay. Consequently, it is possible that discoveries will be made that will require large-scale drills. I estimate that the range of demand for new drills will be between 0 and 2.

6. Offshore

DOR's category of offshore includes Alaska's land that extends to the outer continental shelf ("OCS") where federal ownership begins. Aside from the Liberty field, which BP just shelved, there are two active projects – Oooguruk and Nikaichuq. Northstar production peaked in 2004 and declined rapidly after that.

DOR projects the offshore category to decline at an annual average rate of 4.5% over the next decade, suggesting that some development will continue. The developers of Oooguruk are Pioneer and Eni. The drill site is a gravel island in shallow water and requires directional drilling. Interestingly, however, Pioneer had an existing drill rig already in Alaska converted to undertake the drilling.

The Nikaitchuq oil field is being developed by Eni and should be completed by 2014. The overall cost of the project is $1.45 billion and it has encountered some delay. All told, 71 directional wells will be drilled, with one-third of the wells drilled from on shore and the remainder from an artificial island.

The offshore projects identified by DOR are nearly complete and should not create further demand for drilling rigs. However, new projects are likely to come on the horizon, which might add some demand. These are exactly the types of projects that would require an ERD. I estimate that demand for ERDs will range from the existing Liberty drill to up to one new drill of similar capability.

i. Prudhoe Bay natural gas

In addition to the large volume of oil in the Prudhoe Bay field, there is also a "gas cap." The producers have tried to develop this gas since the 1970s. The first attempt known as the Alaska Natural Gas Transportation System (ANGTS) collapsed in the early 1980s as higher gas prices drove down demand in the lower forty-eight states. The most recent effort to develop a gas pipeline and commercialize the resource has been effectively killed by the shale gas revolution. System costs are far too high to make a pipeline profitable and there is unlikely to be any development until natural gas prices rise substantially.

ii. Point Thomson

Point Thomson is one of the more interesting fields on the North Slope. Fundamentally it is a gas field, heavily laden with condensate. The field holds approximately one-quarter of proven gas reserves on the North Slope. The evidence gathered so far suggests that the Arctic has a far greater volume of natural gas than oil. Most of the discoveries in the McKenzie Delta, the Arctic Islands, and Siberia have been gas rather than oil. And, with the exception of Russia the gas remains undeveloped because transport costs are too high. Point Thomson's gas will be re-injected and along with Prudhoe Bay gas it must await a gas pipeline to markets in Canada or the lower forty-eight.

Point Thomson's condensate fluids are thought to be highly beneficial for some of the oil fields to the east of Prudhoe Bay. This is because the oil, particularly from the West Sak field, is heavy and near the surface. Mixing the heavy oil with condensate would reduce the mixture's viscosity making it easier to move through a pipeline.

Development at Point Thomson had to wait thirty years, because the companies thought it was too costly to build a pipeline and because the Alaskan officials were not happy with the development plan. As a consequence Exxon nearly lost the lease. The latest plan was approved in 2012. Over one hundred permits are required before construction can begin, but the process is well underway. State officials are quite pleased with the construction plans, because it extends the pipeline system eastward and it will help oil flow through TAPS. The DOR projects Point Thomson to come on stream in 2016 and should produce from 5 to 7 mbpd, but could have greater potential if the development spurs nearby exploration. Given Point Thomson's resource potential, I find the DOR estimate of production for 2022 to be low, but it will depend on the pace of development. Like the Alpine area to the west of Prudhoe Bay, the area to the east near Point Thomson has not been fully explored due to the lack of infrastructure. Therefore it is reasonable to expect further discoveries.

According to *Petroleum News*, "ExxonMobil wanted to locate the three drill pads very close to the seashore to better tap the largely offshore Thomson Sand reservoir with long-reach directional drilling." (November 4, 2012). It appears that the Point Thomson development will require between zero and three ERD-type drills, depending on the speed at which the field is developed and projections for TAPS volume. (Further delays and rapidly declining North Slope production could mean that Point Thomson will never be developed.)

7. Estimated North Slope Demand for Large Rigs

Estimating future Alaska demand for ERD or AADU rigs is inherently speculative, particularly since it is understood that none are actually on order. Table 3.2 summarizes potential demand based on the summary of activity previously described. As many as 7 new rigs might be fabricated over the next two decades if the present plans all come to fruition.

Table 3.2
Estimated Demand for Large Scale Drilling Rigs in Alaska

		Pessimistic Scenario		Optimistic Scenario	
Drilling Activity	**Existing ERD or AADU**	**Demand for ERD or AADU types to 2022**	**Demand for ERD or AADU, 2022 to 2032**	**Demand for ERD or AADU types to 2022**	**Demand for ERD or AADU, 2022 to 2032**
Prudhoe Bay	2	2	0	2	2
PBU Statellites	0	0	0	0	0
GPMA	0	0	0	0	1
Kuparuk	0	0	0	0	0
Kuparuk Satellites	0	0	0	0	0
Endicott	0	0	0	0	0
Alpine	0	0	0	1	2
Offshore	1	1	0	1	2
NPR-A	0	0	0	0	0
Point Thomson	0	0	0	3	3
Total ANS	3	3	0	7	10
Cook Inlet	0	0	0	0	0
Total Alaska	3	3	0	7	10

4. Wildcat exploration

    a. NPRA

Over the last few years the federal government has offered leases in NPRA. The industry has shown some interest, but the response is, at best, tepid. There are a variety of reasons for the low level of interest. First, the Department of Interior and the Navy drilled a variety of wells in the years following World War II with little to show for the effort. Second, infrastructure support in the NPRA is limited; it will take a very large discovery to justify the extensive pipeline connections required.

    b. ANWR

Environmentalists view the Arctic Natural Wildlife Refuge as a key issue in their effort to preserve America's natural wilderness. The oil industry takes the opposing view, believing that ANWR holds the best promise of another major oil discovery on the North Slope. Estimates of the potential reserves vary. Ironically, there is a source of confidential knowledge. In the 1980s Chevron was granted permission from the natives living in ANWR to drill a well, but the results have never been made public.

It is unlikely that federal policy on ANWR will change. The possibility of drilling offshore to an onshore site has been raised, but that too is unlikely. For the foreseeable future it is best to assume that no further drilling will occur in or near ANWR.

    c. North Slope OCS

The North Slope OCS is a different matter from ANWR. The U.S. Mineral Management Service ("MMS") actively leased blocks in the Chukchi and Beaufort Seas (see Figure 2.1). Two major companies, Shell and ConocoPhillps, successfully bid and their exploration efforts have had uneven success.

So far the Shell exploration program has foundered. Shell chose to use drilling ships. One, the Kulluk, went aground in December spilling a small amount of oil. Last summer, Shell was forced to abandon an ambitious drilling program aimed at making a major discovery. Instead, the company drilled two "top-hole" wells useful for gathering data, but not adequate for confirming a find. Following the grounding of the Kulluk Shell decided to postpone its North Slope OCS exploration activities and relocated both of its drilling ships to Asia for maintenance and repair. (The Kulluk was constructed in Japan, the Nobel Discover in New Orleans). Shell stated that it remains committed to Alaska, but they have not announced when they may return to active exploration.

ConocoPhillips plans to begin exploring the North Sea OCS in the 2014 drilling season. Unlike Shell, they do not plan to use drilling ships, but will use a "Jackup Drilling Rig." These are types of rigs used in the North Sea and U.S. Gulf Coast. The name

describes how they are used. The rig has legs that can be jacked up to fix the platform solidly to the ocean bottom. ConocoPhillips believes this technology will allow the company to avoid the problems that Shell encountered.

Given the climate and remote location of the North Slope OCS, it will require a huge discovery of several billion barrels to make development economic. Even if such a strike is made, development will not parallel the onshore drilling example.

The sea ice that forms each winter off Alaska's North Slope means that offshore development would not proceed in the same way it has in the U.S. Gulf Coast or the North Sea. Sakhalin Island is similar to Alaska; the sea is frozen three months of the year. This is why ExxonMobil had to use an ERD to develop its offshore fields. Drill ships or Jackup Drilling Rigs can be used for exploration during the summer drilling season, but not for development year round. If a major find is made some sort of sub-sea completion will be required. ERDs would be useful if a find is made near land, but present drilling plans are for areas too far from a land base.

d. North Slope Shale Oil

There is one potential wildcard in North Slope development. Alaska's North Slope is rich in source rocks that normally generate the oil captured in fields such as Prudhoe Bay. The shale gas and oil revolution that has swept through the mid-continent is based on a new premise of exploration. It allows oil and gas to be extracted directly from the source rocks by horizontal drilling and fracturing the shale to release hydrocarbons.

Several companies have obtained leases south of Prudhoe Bay along the northern end of TAPS. They are drilling into the source rock, experimenting with methods to extract the oil. Predicting success or failure of this enterprise is nearly impossible. The methods developed to produce shale gas from the Barnett field took nearly two decades to mature. Obviously, the industry has learned a lot about shale oil production in the last few years. However, each deposit of source rock is different and it takes time to discover what type of extraction technique will work. If, however, these experiments prove to be economic, it would substantially increase the demand for drills on the North Slope. These drills would be comparable to land drills used in North Dakota, they are much smaller and compact so they can be easily transported.

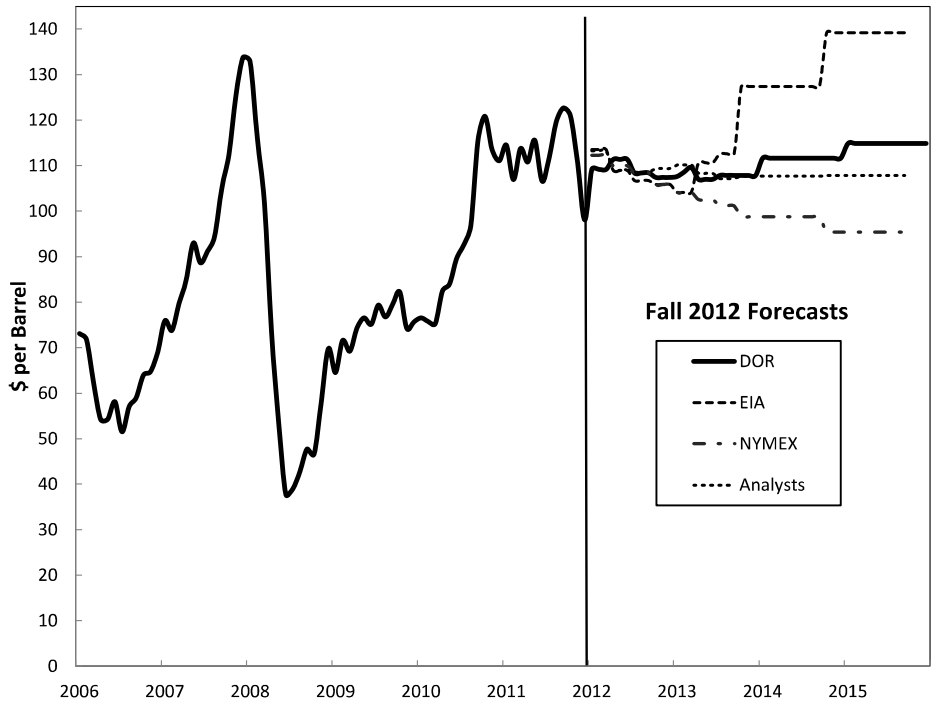
5. West Coast and Alaska Issues

a. Oil and gas pricing

i. EIA and Alaska DOR forecasts

Alaska's DOR prepares its annual revenue forecast in October. Obviously, important parts of that forecast are expectation regarding future crude oil prices. They impact the state's revenue immediately and in the longer term impact the level of development activity. Following in Figure 5.1 is a chart that provides a snapshot of expected oil prices as of October 2012. Since then there has been little change in the outlook. Predicting prices years ahead is a dangerous sport, as the historical record indicates. Nonetheless, the industry has lived with extreme price volatility since its inception. Lower prices may slow development somewhat, but they do not halt it. Likewise, higher prices do not guarantee accelerated development, in part, because development costs rise concurrently with the price.

Figure 5.1



(1) EIA, NYMEX and Analysts forecasts represent WTI forecasts with the department's differential applied.

ii. WTI price discount and West Coast oil prices

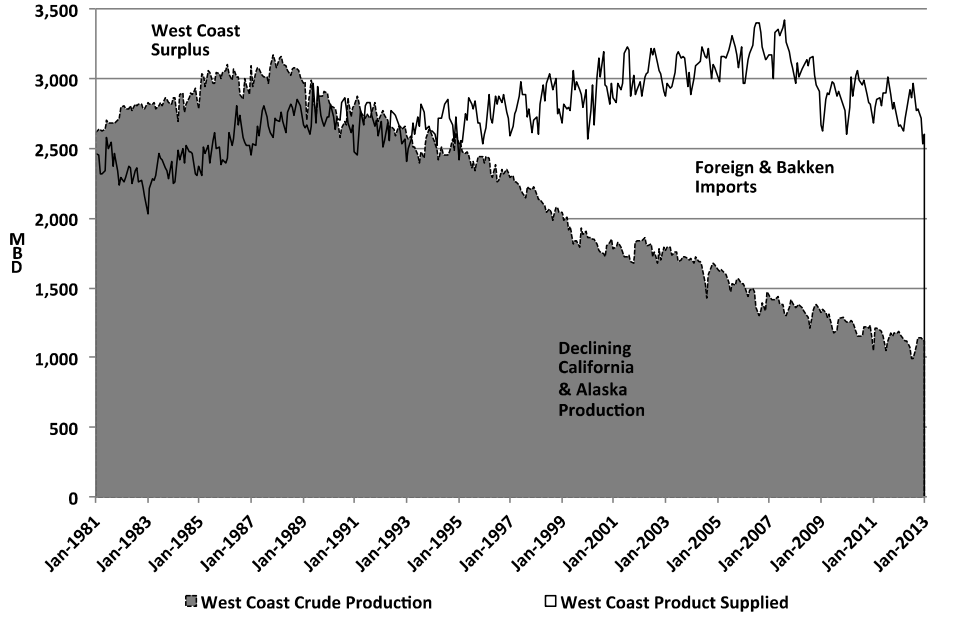
Mid-continent crude oil prices have been discounted from the world oil price level by about $20 per barrel for nearly two years. This is because Canadian oil sands

and oil shale development produce more oil than existing pipelines can handle. As a mid-continent crude oil, West Texas Intermediate ("WTI") reflects the discount. It is also the benchmark for futures trading in the North American market. As explained below, however, West Coast oil prices follow world levels and no longer track the WTI price.

b. Relevant markets for Alaska oil

Production from the Bakken oil play in North Dakota is now greater than that from the North Slope. Bakken oil production reached 673 mbpd in January 2013, as compared to the Alaska output of 549 mbpd. Oil production growth in the Bakken has been remarkable; output nearly doubled in two years. Oil development also differs significantly from that in Alaska. The activity is far more diversified and individual projects are of much smaller scale. There are 188 active drill rigs in the state and 5,161 wells. This is roughly ten times the level of activity on the North Slope.

Figure 5.2
PADD-V Historic Crude Oil Production and Petroleum Consumption



As described earlier the surplus of Bakken and Canadian oil sands output has driven down the mid-continent price of crude oil. Oil companies now rely on rail transport to move the crude oil to alternative refiners. Bakken oil now moves to Puget Sound, which has been the prime market for Alaska North Slope ("ANS") crude oil. Unlike the mid-continent, however, this is unlikely to have much impact on price. ANS can move to California or Hawaii at similar transport costs, where it competes with foreign crude oils. West Coast markets are tied to the international price levels and this is unlikely to change. Total petroleum product demand on the West Coast is around 2,700 mbpd, while crude oil production in Alaska and California totals only around 1,100

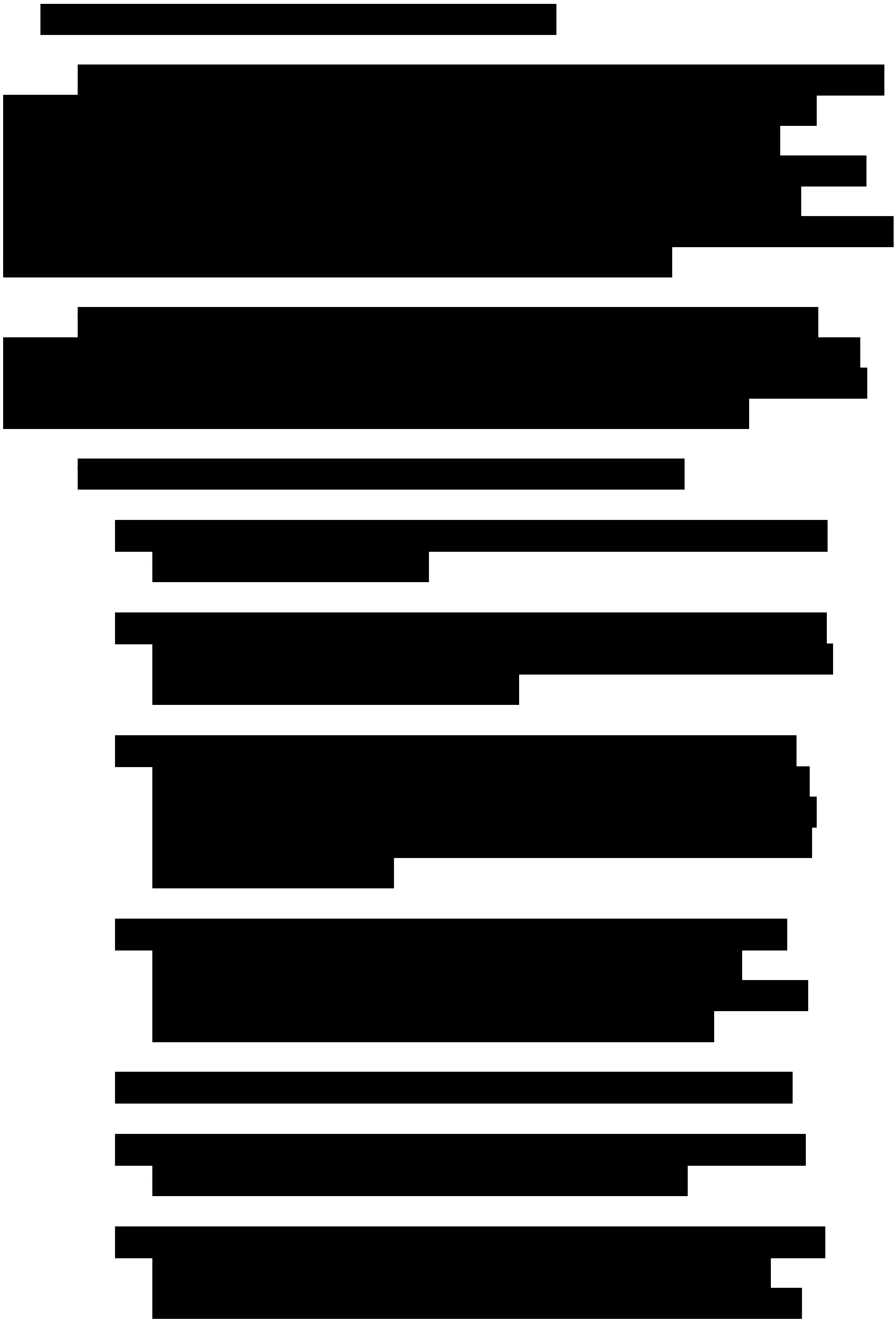
mbpd. Foreign oil imports fill the gap between demand and supply, with the exception of a small amount of Bakken oil that now moves to Puget Sound. The balance between West Coast oil demand and supply is illustrated in Figure 5.2.

c. The TAPS constraint

There is no market for ANS on the North Slope. The oil must be moved by pipeline to Valdez, an all-season port on the southern flank of Alaska. Concern has been raised that if production on the North Slope declines too much TAPS would have to cease operations.

Alyesaka Pipeline is the operator of TAPS. In June 2011 the company completed a study of the impact on the line of lower volumes anticipated in its design. Without going into the detail, Alyesaka concluded: "TAPS can continue to be operated safely and with reasonably high operational confidence down to throughputs of about 350,000 BPD…"

Table 3.1, which summarized the DOR production forecast, indicates that North Slope production could fall below the 350 mbpd mark by 2022. This casts considerable uncertainty over North Slope production beyond the next decade. There remain three big players on the North Slope – BP, ExxonMobil and ConocoPhillips. It will require the combined effort of all three to maintain exploration and development at a high enough level to keep TAPS open.



7. Conclusion

According to the records reviewed, the Vancouver facilities have constructed a number of large-scale rigs that would have been unable to pass under the planned I-5 Bridge across the Columbia River. Since the initial development of the Kuparuk and Prudhoe Bay fields the total projects amount to 5 rigs and associated support shipments – Parker rig 245 in 1990, the Nordic Calista rig in 1997, the Parker Liberty rig in 2009 and Parker rigs 272 and 273 in 2011. There are a number of factors that suggest the demand for these types of rigs is limited and that similar orders are unlikely to be forthcoming in the next decades.

First, as detailed in this report, Alaska's oil and gas development has slowed relative to other petroleum provinces in the U.S. and around the globe. Given the industry's focus on shale oil and gas, this is unlikely to change for some time. Alaska's attempt to lower taxes is too little, too late.

Second, the three Parker rigs constructed in Vancouver have been delivered late and in the case of the ERD delivered to BP for the Liberty project the drill was blamed, in part, for shelving the development. Thus, even if there is demand for large directional drills in Alaska, it is unclear that Vancouver's existing fabrication facilities would be selected for the work.

Third, the two types of activities with the most promise to stem the decline in Alaska oil production will not need the type of rigs fabricated in Vancouver. A major discovery on the North Slope OCS would likely result in the utilization of one or more production platforms for short-term exploration, not development. These types of platforms are constructed for the North Sea, Brazil, West Africa, and the U.S. Gulf Coast. Construction companies around the world compete for this business. For example, the jack-up rig that ConocoPhillips will use offshore off the North Slope comes from Singapore. Likewise, the development of shale oil on the North Slope would likely utilize smaller rigs already in surplus supply in Alaska. Or, they will be small enough to pass under the new CRC Bridge.

APPENDIX C

Analysis of Alternative West Coast Fabricators, Shipyards, and Potential Fabrication Sites

The three fabricators located at the Columbia Business Center in Vancouver, Washington represent an important industrial cluster. However, there are other fabricators and shipyards on the West Coast that have the potential to produce fabricated structures similar to those that have been produced in Vancouver. In addition, there are a number of potentially developable sites that could perform a similar role in the future.

This report summarizes analyses of alternative fabricators, shipyards, and potential future sites that could produce fabricated structures in competition with or in place of the fabricators located in Vancouver.

1. Review of Other Firms on the US West Coast

There are numerous other firms on the U.S. West Coast that can provide for the requirements of the industries that require height constrained structures. The following chapter summarizes the availability of other metal fabricators and shipyards to perform the required functions.

1.1 Fabricators

The metal fabricators based at the Columbia Business Center (CBC) are categorized in NAICS code 332312, Fabricated Structural Metal Manufacturing. According to data from Dun & Bradstreet data, in the U.S. West Coast states (Washington, Oregon, California, Alaska, and Hawaii) there are a total of 1,370 firms that fall into this category.

These firms located on the West Coast vary in size, based on annual sales. Including the three fabricators located at the CBC, 16 of the firms have sales of $20 million or more, and 40 have sales of $10 million or more.

1.1.1 Review of Firms with Waterfront Property

The firms also vary in their location, with some located on water and others located inland. Some of the firms located on water include:

- Jesse Engineering in Tacoma, Washington
- T Bailey Inc. in Anacortes, Washington, and
- American Bridge Manufacturing in Reedsport, Oregon.

Each of these firms works on large projects that are transported by water, similar to the fabricators located at the CBC.

In addition to those selected examples, many firms that work on large projects that are moved by water actually fabricate components at inland sites. These components are then transported to a waterfront site for final assembly. For example, one of the fabricators at the CBC, Oregon Iron Works, is fabricating components for a tidal power project that will be assembled at Vigor Shipyard in Portland with additional work completed by American Bridge in Reedsport.

Jesse Engineering, Tacoma, Washington

Jesse Engineering is a metal fabricator located on 14 acres of waterfront property in Tacoma, Washington. Jesse works on a wide range of light and heavy fabrication projects. The site on the Hylebos river offers deep water access to Puget Sound over a 640-foot pier and a 100-foot wide launch way. A rail spur runs along one edge of the property, and access to the Interstate highway system is minutes from the property.

Other features of the site include: a marine rail system with two sets of tracks for handling large vessels, bridge/hydraulic cranes and forklifts able to handle the weight of components or assemblies up to 120,000 pounds, and over 113,000 square feet of floor space for fabrication, machining, and assembly facilities. The site also offers 8.5 acres for outside fabrication, assembly and storage.

Jesse Engineering was part of a successful bid to construct the Explosive Handling Wharf for the U.S. Navy at Bangor, Washington. This project would be considered a height constrained project with the proposed 116 foot high I-5 Bridge, which underscores the capability of other firms to engage in these efforts.

FIGURE 1-1. JESSE ENGINEERING, TACOMA

Source: Google Earth

1.1.2 WSDOT Casting Basin, Aberdeen, Washington

WSDOT owns a site of 30+ acres in Aberdeen, Washington that is currently in use for constructing pontoons for a floating bridge. Pontoons are constructed in a casting basin that is separated from Grays Harbor by a removable gate. When pontoons are complete, the gate is removed, the basin floods, and the pontoons are towed out by tugboat. When construction of the SR520 Bridge is complete the site will be maintained in usable condition.

The casting basin encompasses a total of approximately 10.1 acres, with internal work area (slab floor of the basin) of 5.2 acres. An on-site concrete batch plant covers 2.3 acres, lay down and dry storage areas encompass 8.7 acres, and office space and parking use an additional 3.8 acres. Other infrastructure includes internal roads and a water treatment facility. In addition, rail access is available on-site.

FIGURE 1-2. ABERDEEN CASTING BASIN UNDER CONSTRUCTION

Source: WSDOT

1.1.3 American Bridge, Reedsport, Oregon

American Bridge operates a 40 acre waterfront site on the Umpqua River in Reedsport, Oregon. The property offers a deepwater barge pier and direct rail access. Buildings include a 48,000 square high bay fabrication building, 12,000 square foot paint building, and an engineering building. The fabrication building offers four overhead cranes, with capacity of up to 35 tons, and a wide range of tooling is available to meet an metal fabrication needs.

American Bridge is positioning itself to serve as a lead fabricator and repair/maintenance operator for wind and wave energy projects being planned along the Oregon coast. Some of these projects would also be considered height constrained under the proposed 116 foot high I-5 Bridge.

FIGURE 1-3. AMERICAN BRIDGE, REEDSPORT

Source: American Bridge

1.1.4 MJB Property, Anacortes, Washington

The MJB property in Anacortes was originally home to a number of forest products mills, but after those mills closed the site was used in the early 1980s as a staging area for oil field equipment, boat manufacturing and storage. The site is primarily vacant, although it is used on occasion for a variety of purposes.

A portion of the site is currently being used to service the oil industry. Haskell Corporation, in conjunction with Jesse Engineering, is constructing large oil tanks for oil companies in Alaska.

FIGURE 1-4. MJB PROPERTY, ANACORTES

Source: Google Earth

1.1.5 Greenberry Industrial at Port of Bellingham, Washington

Greenberry Industrial partnered with Superior Energy's Marine Division to build the oil-containment vessel Arctic Challenger for Shell Oil at the Bellingham Shipping Terminal owned by the Port of Bellingham. Superior has a long-term agreement with the Port to return the Arctic Challenger to the shipping terminal for maintenance, repair and upgrades. Greenberry indicated that they intended to pursue contracts for additional industrial projects at the shipping terminal.[1]

The Arctic Challenger would have been height constrained at the proposed 116-foot high I-5 Bridge.

[1] Source: Associated General Contractors of Washington Newspaper, One Year, Three New Facilities: Greenberry Industrial is Booming, http://www.agcwa.com/index.php/ListingItem/2306

FIGURE 1-5. BELLINGHAM SHIPPING TERMINAL, BELLINGHAM

2. Shipyards

Metal fabricators often work in collaboration with shipyards to assemble large floating structures. With their waterfront sites and specialized lifting equipment, shipyards make good locations for final assembly of structures that are fabricated off-site. Many of the shipyards on the West Coast have no vertical clearance issues. In the Pacific Northwest these include facilities in Bellingham, Anacortes, Everett, Seattle, Tacoma, and Portland among others. In California these include facilities in San Francisco, Alameda, and Long Beach, among others.

As is the case with fabricators, ship building and repair firms range in size. Two of the largest in the Pacific Northwest are Vigor Marine in Portland Oregon, and Vigor Marine in Seattle, Washington.

2.1 Vigor Industrial (Todd Shipyard), Seattle, Washington

This 27-acre shipyard is located on Harbor Island in Seattle. This is a full-service shipyard with deepwater access, and is capable of handling nearly any type of vessel. The shipyard includes three dry-docks of up to 18,000 long tons capacity, six piers totaling more than 3,000 feet, 12 Whirley Cranes up to 150 tons, and a 170,000 square foot covered shop/fabrication area.

The yard was recently used to overhaul the *Kulluk* arctic drilling rig for Shell Oil.

FIGURE 2-1. VIGOR INDUSTRIAL (TODD SHIPYARD), SEATTLE

FIGURE 2-2. SHELL DRILLING RIG *KULLUK* AT VIGOR SEATTLE

Source: Vigor Industrial

2.1.1 Vigor (Swan Island) Shipyard, Portland, Oregon

The Vigor Swan Island shipyard is a 60 acre site on the Willamette River in Portland capable of building and repairing all types of cargo ships, workboats, barges and large-scale industrial projects.

The Swan Island facility offers three dry-docks up to 661 feet long and up to 30,000 long ton capacity, 10,000 feet of dedicated pier space, 17 Whirley cranes and a 600-ton gantry crane. Indoor space includes 150,000 square feet of fabrication bays, each equipped with overhead cranes, plus another 200,000 square feet of covered, weather-protected workspace.

Vigor Portland and Oregon Iron Works have jointly engaged in several projects, including the construction of Spillway Weirs for the U.S. Army Corps of Engineers.

FIGURE 2-3. VIGOR SWAN ISLAND. PORTLAND.

Source: Vigor Industrial

3. Review of Alternative Sites

The construction of the proposed CRC could potentially impact navigation users located upriver of the proposed bridge. The purpose of this section is to document a search for alternative properties in Washington and Oregon that could potentially serve as relocation sites for impacted fabricators that are currently located at the Columbia Business Center.

The search entailed properties with the following characteristics:

- Approximately 25 acres (or more) of uplands
- Located on navigable waters that have 25 or more feet of water depth
- Reasonable access to rail and road systems
- Zoned for heavy industrial uses or could be rezoned to allow heavy industrial use
- Sale or lease
- Approximate sale or lease price (if available)

The property search was undertaken during July 2012. In addition, a review of other property searches for construction sites and marine terminals was undertaken in December 2012.

3.1 Findings – Property Search for CRC

The search indicated that there are several properties that meet these characteristics.

3.1.1 Port of Vancouver

Contact: Curtis Schuck, Director of Economic Development & Facilities, phone 360.992.1119
Date 7-16-2012

There is a site that could meet these requirements:

- Property adjacent to Terminal 5
  - located on the Columbia River (water depth 30+ feet)
  - 30+ acres
  - Access to water, road, rail
  - Estimated value ~$5 per foot
  - Lease rate range $0.05 per square feet per month
  - Zoned to permit heavy industry

3.1.2 City of Portland

Contact: Steve Kountz, City of Portland Bureau of Planning & Sustainability Senior Economic Planner, phone 503-823-7700
Date 7-16-2012

There are three sites that could meet these requirements:

- Atofina Chemicals
  - located on the Willamette River (water depth 30+ feet)
  - ~61 acres
  - Access to water, road, rail
  - Estimated value unknown
  - Lease rate range unknown
  - Zoned to permit heavy industry
- Time Oil
  - located on the Willamette River (water depth 30+ feet)
  - ~45 acres
  - Access to water, road, rail
  - Estimated value unknown
  - Lease rate range unknown
  - Zoned to permit heavy industry
- McCormick & Baxter Creosoting
  - located on the Willamette River (water depth 30+ feet)
  - ~44 acres
  - Access to water, road, rail
  - Estimated value unknown
  - Lease rate range unknown
  - Zoned to permit heavy industry

3.1.3 Port of Kalama

Contact: Mark Wilson, Deputy Director | Development Director, phone 360 673-2325
Date 7-10-2012

Port of Kalama North Port property could be a potential site:

- North Port
  - located on the Columbia River (water depth 30+ feet)
  - 30+ acres
  - Access to water, road, rail

- Estimated value ~ $200,000/acre but would need to make a strong case for sale of property
- Lease rate range ~ $12,000/acre per year
- Zoned to permit heavy industry

3.1.4 Port of Woodland

Contact: Nelson Holmberg, Executive Director, phone 360 225-6555
Date 7-10-2012

The Port has nothing available at this time.

3.1.5 Port of Longview

Contact: Ken O'Hollaren, Executive Director, phone 360 425-3305
Date 7-6-2012

The Port has nothing available at the time but a longer term opportunity could be available at Barlow Point.

3.1.6 Longview (Millennium Bulk)

Contact: Peter Bennett, Vice President of Business Development, phone 360 425-2800
Date 7-16-2012

Millennium Bulk has property that could meet these requirements at the terminal site in Longview. Details on price would require additional discussion but Millennium Bulk is a potential site:

- Millennium Bulk Terminal Area
  - located on the Columbia River (water depth 30+ feet)
  - 30+ acres
  - Access to water, road, rail
  - Estimated value ~ to be determined
  - Lease rate range - to be determined
  - Zoned to permit heavy industry

3.1.7 Port of Astoria

Contact: Herb Florer, Deputy Director/Interim Executive Director, phone 503-741-3300
Date 7-10-2012

Tongue point could meet the requirements:

- Tongue Point
  - located on the Columbia River (water depth 30+ feet)
  - 25+ acres

- Access to water, road, rail
- Estimated value ~ to be determined; unlikely to sell
- Lease rate range - to be determined
- Zoned to permit heavy industry

3.1.8 Port of St Helens

Contact: Paula Miranda, Deputy Executive Director, phone 503-397-2888
Date 7-10-2012

Several properties could meet the requirements, perhaps best opportunity is at:

- Columbia City Industrial Park
  - located on the Columbia River (water depth 30+ feet)
  - 30 to 40 acres
  - Access to water, road, rail
  - Estimated value ~ to be determined; unlikely to sell
  - Lease rate range - to be determined
  - Zoned to permit heavy industry

3.1.9 Port of Grays Harbor

Contact: website search
Date 7-10-2012

Several properties could meet the requirements, perhaps best opportunity is at:

- IDD-1 Riverfront
  - located on the Grays Harbor at the confluence of the Hoquiam and Chehalis rivers
  - 30+ acres
  - Access to water, road, rail
  - Estimated value ~ to be determined
  - Lease rate range - to be determined
  - Zoned to permit heavy industry

3.1.10 WSDOT Construction Site

Contact: website search
Date 12-23-2012

- SR520 Construction Site in Aberdeen
  - located on the Grays Harbor at the confluence of the Hoquiam and Chehalis rivers
  - 55 acres (including 4 acre casting basin for float construction)
  - Access to water, road, rail

- Estimated value ~ to be determined
- Lease rate range - to be determined
- Zoned to permit heavy industry (currently

3.1.11 Port of Tacoma

Contact: Jay Stewart, Real Estate, phone: 253-383-5841
Date 7-13-2012

Several properties could meet the requirements:

- Arkema Property
  - located on the Hylebos Waterway(water depth 30+ feet)
  - 40+ acres
  - Access to water, road, rail
  - Estimated value ~ $15 to$20/foot
  - Lease rate range - $0.10 to $0.15 per square feet per month
  - Zoned to permit heavy industry
- Kaiser Property
  - located on the Hylebos Waterway(water depth 30+ feet)
  - 80 acres
  - Access to water, road, rail
  - Estimated value ~ $15 to$20/foot
  - Lease rate range - $0.10 to $0.15 per square feet per month.
  - Zoned to permit heavy industry

3.1.12 Everett

Contact: web search
Date 1-9-2013

- Kimberly Clark Property
  - located on Port Gardner Bay (water depth 30+ feet)
  - 55+ acres
  - Access to water, road, rail
  - Estimated value - unknown
  - Lease rate range - unknown
  - Zoned to permit heavy industry

3.1.13 Anacortes

Contact: website search
Date 1-5-2013

- MJB Property
  - located in Anacortes on Fidalgo Bay (water depth 30+ feet)
  - 36 acres
  - Access to water, road, but not rail
  - Estimated value unknown
  - Lease rate range - unknown
  - Zoned to permit heavy industry – currently being used by another fabricator for construction of large tanks for Alaska oil (Exxon-Mobil), term of lease unknown

3.1.14 Bellingham

Contact: Dan Stahl, Maritime Director
Date 1-5-2013

- Bellingham Shipping Terminal
  - located on Bellingham Bay (water depth 30+ feet)
  - ~40 acres (BST has 12 acres of open storage at the terminal but this can be expanded to approximately 40 acres including GP property).
  - Access to water, road, rail
  - Estimated value unknown
  - Lease rate range - unknown
  - Zoned to permit heavy industry – recently used by Greenberry Industrial to reconstruct the Arctic Challenger, an oil spill response barge for use in Alaska by Shell, term of lease unknown

3.2 Literature Review

In addition to the above property search, a literature review was conducted of potential sites that could meet the specified requirement.

3.2.1 Hood Canal Bridge Site Selection Report

The Washington State Department of Transportation (WSDOT) conducted a detailed search for sites for a graving dock to support construction of pontoons and anchors for the Hood Canal Bridge. At the end of December 2004, WSDOT received 18 proposals from public and private owners. This section briefly reviews the proposed sites and the criteria for selection. The sites were according to the criteria identified in Table 1.

Table 3-1. Criteria Used for Site Selection for Hood Canal Bridge Construction Site

Criteria	Poor	Fair	Good
Towing Distance	> 100 miles	35 - 100 miles	< 35 miles
Site Size	< 16 acres	16 - 30 acres	> 30 ares
Waterfront Length	< 900 feet	900 - 1,000 feet	> 1,000 feet
Land & Water Access	Poor	Fair	Good
Existing Marine Facitities	Limited	Needs improvements	Ready for use
Proximity of Other Marine Facilities	> 30 miles	15 - 30 miles	< 15 miles
Tides & Currents	Severe	Moderate	Typical
Wind & Wave Exposure	Severe	Moderate	Minimal
Proximity of Rail	No direct acces	Within haul distance	Adjacent to site
Access to Aggregate	> 15 miles	7 - 15 miles	< 7 miles
Proximity to Concrete Plants	> 30 miles	15 - 30 miles	< 15 miles
Site Utilities	None	Needs improvements	Ready for use
Environmental Risks	High	Moderate	Low
Environmental Process	> 12 months	6 - 12 months	< 6 months
Site Data	Limited	Some exploration	Due diligence completed
Proximity to Trades People	> 60 miles	30 - 60 miles	< 30 miles
Local Support	None	Some	High
Availability for SR 520 Project	No	Maybe	Yes

Source: Hood Canal Bridge Site Selection, WSDOT, March 2005, page 2

The most important of these criteria for the relocation of fabricators are: site size, land & water access, existing marine facilities, proximity of other marine facilities, tides & currents, wind & wave exposure, proximity of rail and site utilities. BST Associates ranked the sites according to these criteria and only included sites with 25 or more acres.

The resulting ranked list of potential sites includes the following sites (the number before the site name identifies the location of the site on the map of sites (Figure 1) :

- 15 Port of Everett South Terminal
- 5 Rayonier Properties LLC
- 17 Everett Property – Snohomish Delta Partners
- 7 Port of Port Townsend
- 10 Floating Dry Dock
- 16 Everett Property on Snohomish River – KLB Construction
- 9 Port Gamble
- 18 Anacortes
- 8 Port Ludlow Quarry
- 6 Discovery Bay
- 2 Makah Reservation
- 1 Port of Grays Harbor

- 3 Twin River Clay Quarry
- 12 Sanderson Field Industrial Park
- 11 Skokomish River

FIGURE 3-1. SITE SELECTION MAP FOR CONSTRUCTION OF HOOD CANAL BRIDGE PONTOONS

Source: Hood Canal Bridge Site Selection, WSDOT, March 2005

Table 3-2. Criteria for Selecting Hood Canal Pontoon Construction Site

Sites	Towing Distance	Site Size	Waterfront Length	Land & Water Access	Existing Marine Facitities	Proximity of Other Marine Facilities	Tides & Currents	Wind & Wave Exposure	Proximity of Rail	Access to Aggregate	Proximity to Concrete Plants	Site Utilities	Environmental Risks	Environmental Process	Site Data	Proximity to Trades People	Local Support	Availability for SR 520 Project	Ranking for Site Relocation by Fabricators	Location	Acres		Rank for 25+ acre sites
15 Port of Everett South Terminal	3	2	3	3	3	3	3	2	3	3	3	3	2	2	1	3	2	3	22	Everett	26	1	22
5 Rayonier Properties LLC	2	2	3	3	2	3	3	3	1	3	3	3	1	2	3	3	2	3	20	Port Angeles	25	1	20
17 Everett Property – Snohomish Delta Partners	3	3	3	2	2	3	1	3	3	3	3	3	1	2	2	3	3	3	20	Everett	150	1	20
7 Port of Port Townsend	3	3	3	3	2	3	3	2	1	3	3	3	1	2	1	2	2	2	20	Port Townsend	44	1	20
10 Floating Dry Dock	2			3	3	3	2	3	3	2	3	3				3		1	20	Bremerton	?	1	20
16 Everett Property on Snohomish River – KLB Construction	3	2	2	2	2	3	1	3	3	3	3	3	2	2	1	3	3	3	19	Everett	26	1	19
9 Port Gamble	3	2	3	3	2	3	2	2	1	3	3	3	2	1	3	3	3	3	18	Port Gamble	26	1	18
18 Anacortes	2	3	3	2	1	3	2	2	3	2	2	2	2	2	3	3	2		18	Anacortes	36	1	18
8 Port Ludlow Quarry	3	3	3	2	2	1	3	3	1	3	1	2	3	2	3	3	2	3	17	Port Ludlow	60	1	17
6 Discovery Bay	3	3	3	2	2	1	3	3	1	3	3	2	1	1	2	3		3	17	Discovery Bay	100	1	17
2 Makah Reservation	1	3	3	2	1	1	3	2	1	3	2	3	2	2	1	1	3	3	16	Neah Bay	50	1	16
1 Port of Grays Harbor	1	3	3	2	1	1	1	2	1	3	2	3	2	2	1	1	3	3	14	Aberdeen	45	1	14
3 Twin River Clay Quarry	2	3	3	2	2	2	1	1	1	3	2	2	3	2	1	3		3	14	Clallam County	210	1	14
12 Sanderson Field Industrial Park		3	1	1	1	1			1	2	2	3	2	2	1	2			10	Shelton	100	1	10
11 Skokomish River	2			1	1	1		2	1	2	2		1	1	1	2			6	Mason County	?	1	6
14 FCB Facilities Team	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3		3	23	Seattle	20	-	-
4 Port of Port Angeles Terminal 7	2	1	3	3	2	3	3	3	1	3	3	3	1	2	1	3	3	2	19	Port Angeles	15	-	-
13 Thea Foss Waterway	2	1	1	2	3	3		3	2	3	3	3	1	2	1	2		2	17	Tacoma	6	-	-
Important Criteria for CRC Site Assessment		1		1	1	1	1	1	1			1											

Source: Hood Canal Bridge Site Selection, WSDOT, March 2005

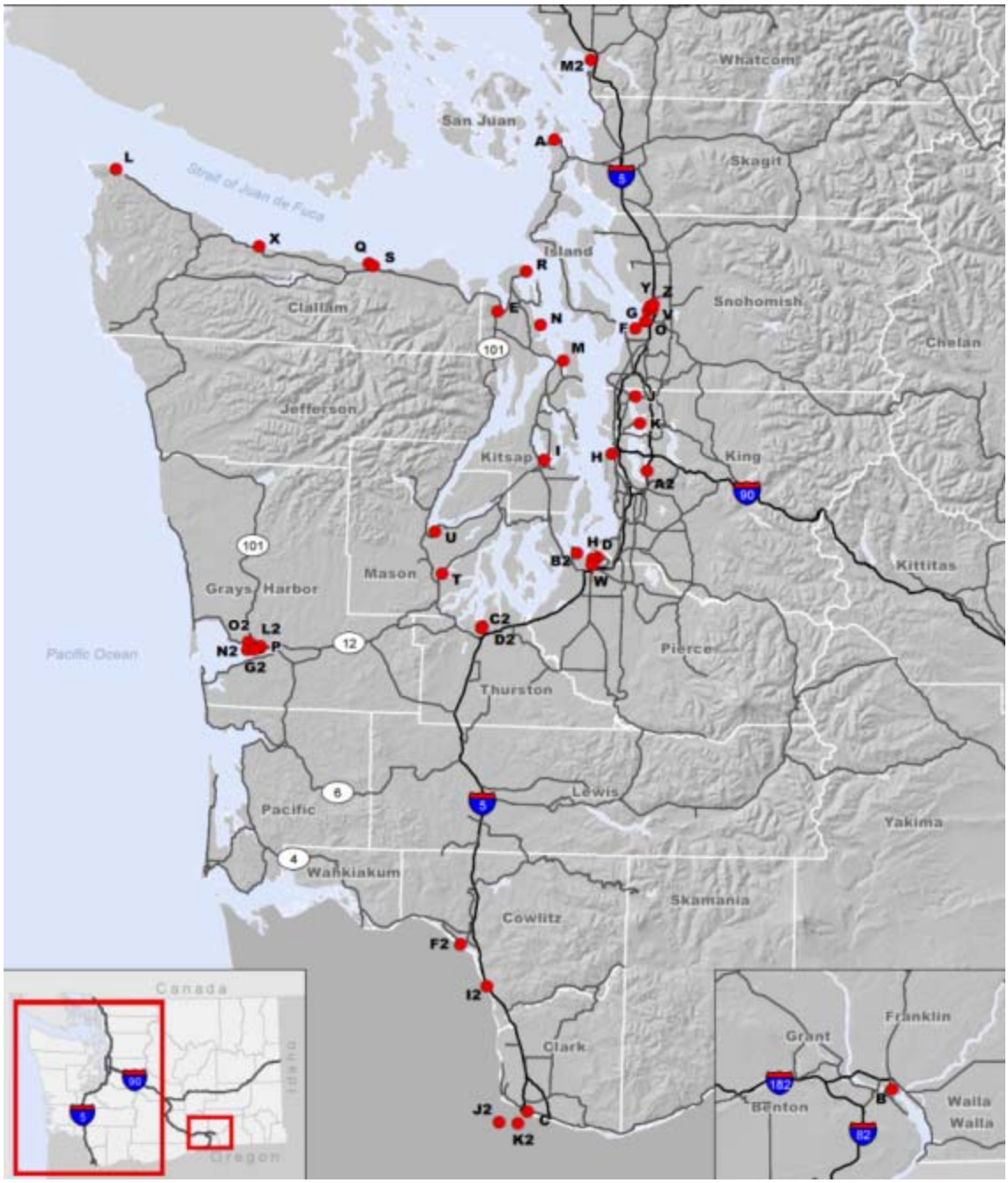
3.2.2 SR 520 Bridge Replacement and HOV Program EIS, Appendix B Description of Alternatives and Construction

In 2010, WSDOT refined the search for candidates sites for construction of the pontoons related to the SR520 Bridge. Approximately 40 sites were considered (see map for location):

- A MJB Properties, Anacortes, WA
- B Big Pasco Industrial Center, Pasco, WA
- C Columbia Industrial Park, Vancouver, WA
- D Concrete Technology Corporation, Hylebos Waterway, Tacoma, WA
- E Discovery Bay, Jefferson County, WA
- F KLB Construction property, Everett, WA
- G Snohomish Delta Partners, Everett, WA
- H FCB Facilities Team (various sites), Seattle and Tacoma, WA
- I Puget Sound Naval Shipyard Drydock or other floating Drydocks
- J Glacier Northwest Kenmore Premix Plant, Kenmore, WA
- K Lake Washington (in-lake), Seattle, WA
- L Makah Reservation, Neah Bay, WA
- M Port Gamble Mill Site, Port Gamble, WA
- N Port Ludlow Quarry, Jefferson County, WA
- regulations
- O Port of Everett South Terminal, Everett, WA
- P Port of Grays Harbor IDD #1, Hoquiam, WA
- Q Port of Port Angeles Terminal 7, Port Angeles, WA
- R Port of Port Townsend, Port Townsend, WA
- S Rayonier Properties, Port Angeles, WA
- T Sanderson Field Industrial Park, Shelton, WA
- U Skokomish River, Mason County, WA
- V Snohomish Delta Partners (Miller Shingle Mill), Everett, WA
- W Thea Foss Waterway, Tacoma, WA
- X Twin River Clay Quarry, Clallam County, WA
- Y Port of Everett Riverside Business Park, Everett, WA
- Z Cedar Grove Composting, Snohomish County, WA

- A2 Lake Washington, Renton, WA
- B2 Port of Tacoma, Tacoma, WA
- C2 Washington Department of Natural Resources
- D2 Port of Olympia, Olympia, WA
- E2 Port Gamble, Port Gamble, WA
- F2 Port of Longview, Longview, WA
- G2 Weyerhaeuser (Cosmopolis), Aberdeen, WA
- H2 Port of Anacortes, Anacortes, WA
- I2 Port of Kalama, Kalama, WA
- J2 Northwest Industrial Center, Multnomah County, OR
- K2 Hayden Island, Multnomah County, OR
- M2 Whatcom Waterway, Bellingham, WA
- O2 Port of Grays Harbor Terminal 3, Hoquiam, WA

FIGURE 3-2. SITE SELECTION MAP FOR CONSTRUCTION OF SR520 PONTOONS AND ANCHORS



Source: FINAL ENVIRONMENTAL IMPACT STATEMENT, SR 520 BRIDGE REPLACEMENT AND HOV PROGRAM, DECEMBER 2010, SR 520 Pontoon Construction Project, Appendix B, Description of Alternatives and Construction Techniques Discipline Report

Based upon this search, WSDOT narrowed the selection to three sites and ultimately chose the site referred to as the Aberdeen Log Yard.

This site is scheduled for use through 2014 After which time, a decision will be made regarding its future use. It offers 55 acres of industrial land, with a 4 acre casting basin for float construction, access for ocean barges, and direct access to the site by rail and road, and utilities for major construction. It could potentially be used to support metal fabrication or construction projects.

FIGURE 3-3. SR 520 PONTOON CONSTRUCTION SITE (ABERDEEN)

3.2.3 West Hayden Island Marine Cargo Forecasts & Capacity Assessment Final Report[2]

BST Associates conducted a study of alternative port development sites for the Port of Portland in 2010. The report found that there were more than 2,000 acres of land available for near-term and long-term development in the Lower Columbia River from Longview/St Helens to Portland/Vancouver:

> "Including known public and private sites, there are an estimated 2,058 gross acres[3] of potential land for marine terminal development. This is slightly more than the existing

[2] Source: West Hayden Island Marine Cargo Forecasts & Capacity Assessment Final Report prepared by BST Associates for the Port of Portland, April 2010, pages 44-45

supply of marine terminals. It is likely that a substantial portion of this acreage will not be developed due to environmental constraints, market conditions, and financial viability, particularly with respect to required infrastructure and terminal development."

Table 3-4. Lower Columbia River Port Expansion Capability for Large Marine Terminals (gross acres)

Location/Type	Expansion Capability	Expansion Capability
Public Ports		
Portland	450	22%
Vancouver	718	35%
Longview	-	0%
Kalama	90	4%
St Helens	200	10%
subtotal	1,458	71%
Private Sites		
Chinook Ventures	300	15%
Barlow Point	300	15%
subtotal	600	29%
Total	2,058	100%

Source: BST Associates

"Portland - The Port of Portland has limited space available at its existing marine terminals, with approximately 71.5 acres available at three separate locations. If the Port of Portland is to engage in large scale marine terminal development, it needs to have a large site for development. The only site that could be used for this purpose is West Hayden Island, which includes approximately 450 acres. It is unknown how much of this area could be devoted to marine terminals.

Vancouver - The Port of Vancouver has approximately 718 acres for marine terminal development. This includes current development of Terminal 5 and future development of Columbia Gateway.

Longview - In Longview, there are an estimated 600 acres of expansion at private sites (Barlow Point and Chinook Properties). The Port of Longview will essentially be out space after development of the new grain terminal.

Kalama - The Port of Kalama has approximately 90 acres of expansion at the North Port. However, the Port of Kalama has an expressed interest in cargo generating companies (like the steel mill), and may not compete for marine terminal development opportunities.

St Helens - The Port of St Helens has approximately 200 acres available for development that could serve marine terminals. Much of the waterfront frontage at the Port Westward site has been utilized for development of an ethanol plant and a power plant."

[3] A gross acre refers to total developable area, which may include marine terminal, rail and road access and other components of pot development.

Several of these sites could serve as relocation sites for metal fabricators.

3.2.4 Portland Harbor: Industrial Land Supply Analysis[4]

The purpose of this study was to assess the availability of sites in Portland that could be utilized as port development sites. Two sites were identified:

> "The Atofina site is a collection of parcels under several ownerships, which total approximately 114 acres (59 acres in the four main Atofina parcels, and an additional 55 acres in adjacent parcels across Front Ave.). The parcels are zoned heavy industrial (IH), and are bordered by industrial uses. The site is adjacent to SR 30 and fronts the Willamette River within the Portland Harbor.
>
> The Time Oil site includes several separately owned parcels totaling approximately 84.2 acres. The subject parcels are adjacent to the Willamette River within the Portland Harbor and are zoned heavy industrial (IH) with a 'River' overlay designation. The site is bordered by industrial uses and also an area governed by a soon-to-expire natural resource management plan."[5]

These sites would meet the requirements for potential relocation of the metal fabricators.

3.2.5 Survey and Characterization of Potential Offshore Wave Energy Sites in Oregon[6]

The purpose of the study was to assess the viability of coastal sites in Oregon to support off-shore energy production. Seven candidate sites were evaluated, including:

- Clatsop County — Astoria
- Tillamook County — Garibaldi
- Lincoln County — Newport
- Lane County — Cushman
- Douglas County — Reedsport
- Coos County — Coos Bay
- Curry County — Brookings

In recent news, OPAC has reduced the number of candidate sites.

> "That leaves on the list REFSSAs offshore of Camp Rilea, in Clatsop County, Gold Beach, in Curry County, two near Reedsport, in Douglas County, and one near Newport, in Lincoln County. All are near deepwater ports – Astoria, Newport, and Coos Bay – considered important for maintaining the offshore facilities. One of the sites near

[4] Source: Portland Harbor: Industrial Land Supply Analysis, prepared for the City of Portland Bureau of Planning and Sustainability by ECONorthwest, May 2012.

[5] Source: Portland Harbor: Industrial Land Supply Analysis, pages 20-23.

[6] Source: E2I EPRI Survey and Characterization of Potential Offshore Wave Energy Sites in Oregon, prepared by George Hagerman, May 2004.

Reedsport already has a permit from the Federal Energy Regulatory Commission (FERC), issued before the state of Oregon began Territorial Sea Plan revisions four years ago."[7]

The ports of Astoria, Newport and Coos Bay have sites that could be used for relocation of the metal fabricators. Astoria's Tongue Point has 25+ acres of potential land for development with rail access, suitable water depth for ocean barge transit and no height constraints. Newport's recently constructed Newport International Terminal has approximately 17 acres, which is under the required site size. Coos Bay has sites available on the North Spit that could meet fabricator requirements, including access by road, rail and ocean barge.

3.3 Summary

3.3.1 Site Development

Some of the sites evaluated above could be used with minimal reconstruction required. Other sites may require permitting and construction of in-water improvements. Under these cases, the development process could take 1.5 years (1 year for permits and 6 months for construction) up to 3.2 years (2.5 years for permits with a relatively long EIS process and 9 months to construct). The length of time to construct an alternative site (for sites that would require major in-water construction) depends upon local site conditions. If potential relocation were commenced in early 2013, sites that require in-water construction could be available by mid-2014 to early 2016. The bridge decks that would constrain navigation to 116 feet at the proposed I-5 Bridge are planned to be constructed by mid-2017 at the earliest.

Details of permits and construction are as follows:

- Permits for a barge slip would take about 12 months to 18 months, if an EIS is not required. If an EIS is required, development could take 2 years to 2.5 years, depending on local site conditions.
- The starting date for construction is dependent upon completion of permits and the in-water window applicable to the site. The schedule for construction of a barge slip would likely be around 6 months to 9 months after permits are received.

3.3.2 Findings

The preliminary search revealed that there are several properties that could meet the requirements. There is also substantial interest from local communities in assisting economic development that creates and/or retains well paying family wage jobs, such as the jobs in the metal fabrication industry.

This search was a brief assessment of the availability of potential sites. It is likely that a more exhaustive search could reveal additional sites that could meet the proposed site requirements.

[7] Source: OPAC rejects Pacific City, Netarts wave-energy sites, The News Guard, January 8th, 2013 by Joe Wrabek.

APPENDIX D

Height Constraint Projects for the Offshore Renewable Energy Industry

BergerABAM

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206/431-2300 • 206/431-2250 Fax • www.abam.com

8 April 2013

Mr. Jay Lyman
Executive Vice President
David Evans and Associates, Inc.
2100 SW River Parkway
Portland, OR 97201

Ref: Columbia River Crossing Project
Economic Impact Study
Height Constraint Projects for the Offshore Renewable Energy Industry

Dear Jay:

You asked us to look at the sizes of components for offshore renewable energy projects that could potentially be fabricated at the Columbia Business Center and either shipped to a deployment site at the coast or directly deployed to an installation site offshore. In the following pages, we assembled some examples of possible projects here on the West Coast and examined how fabricators at the Columbia Business Center could potentially be involved in them.

MAXIMUM SIZE OF LOAD TO CLEAR NEW BRIDGE

The clearance of the new I-5 bridge is 116 feet from the Columbia River Datum (CRD) to the soffit of the bridge at the shipping channel. The actual size of a load that can be transported on a barge is smaller. The navigator can expect that the water level is 16 feet above the CRD, which is the Ordinary High Water level of the river. Furthermore, an ocean-going barge can be temporarily ballasted to float at a minimum freeboard of 1.5 feet to pass underneath the bridge. And if the load is placed on the barge with means of a Self-Propelled Modular Transporter (SPMT) instead of a crane, then about 3 feet of bunking underneath the load will have to be provided for the SPMT to move. Finally, there is an air gap required between load and bridge soffit that can be between 1 and 20 feet. Assuming a 10-foot air gap, the maximum height of the load on an ocean-going barge underneath the new I-5 bridge reduces to about 85 feet. The existing I-5 bridge allows a maximum height of the load of 147 feet under the same assumptions at fully raised lift span. Figure 1 shows a sketch of the maximum load height under the existing and new bridge.

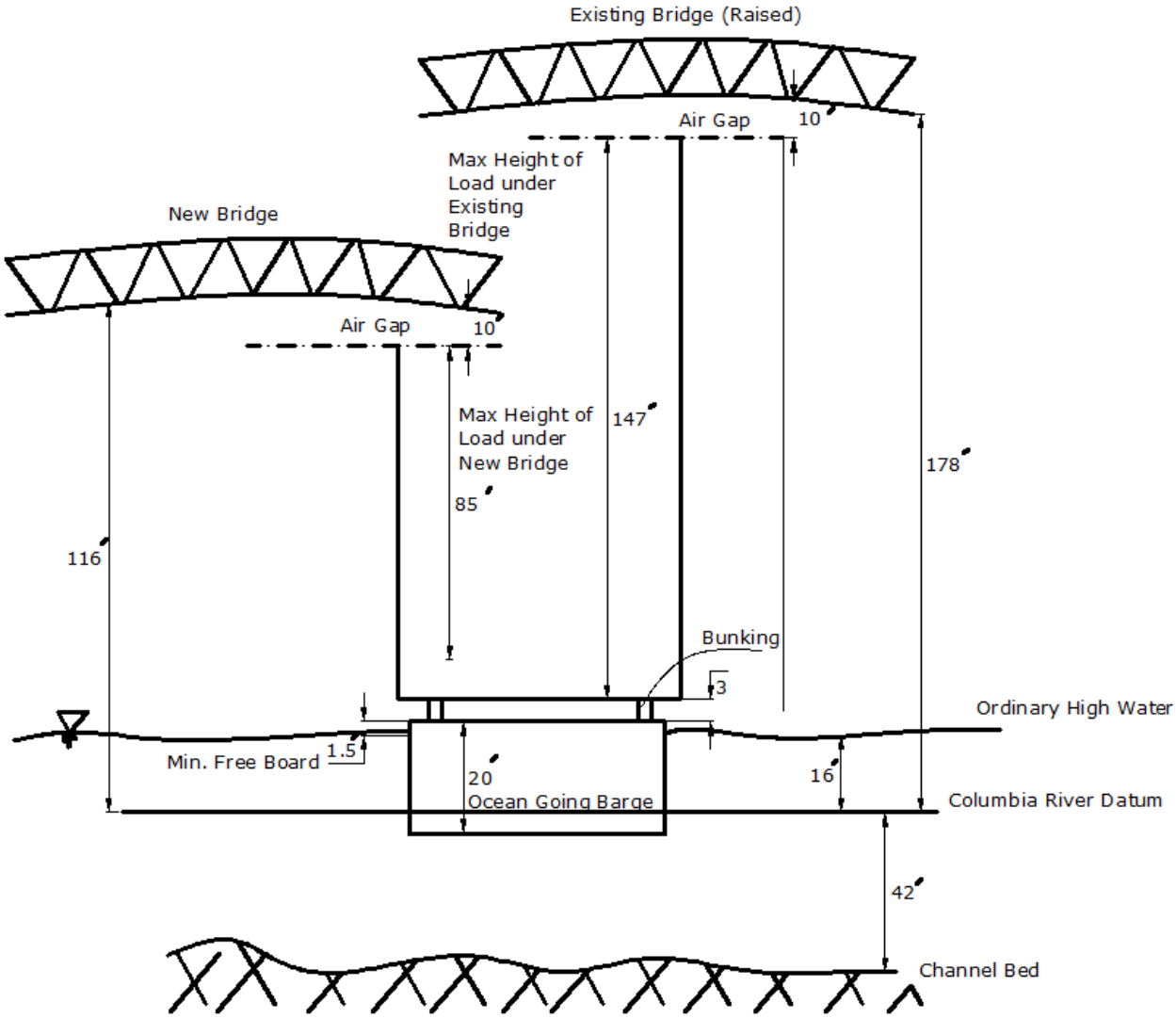

Figure 1. Maximum height of load on an ocean-going barge underneath the existing and new Columbia River Bridge

OFFSHORE WIND

To this day, there is no installed offshore wind turbine in the US. However, there are several offshore wind farms in planning mostly on the East Coast, as well as in the Gulf of Mexico and the Oregon Coast. The most efficient technology today to install offshore wind turbines is by founding them on monopiles that are driven into the seabed in shallow coastal waters at a depth of up to 100 feet. Such shallow waters are rare on the US West Coast. Hence, if offshore wind turbines are deployed on the US West Coast, they will probably be founded on floating foundations.

There are three types of floating platforms for wind turbines that are currently under development.

1. Semi-Submersible Platforms

2. Spar Platforms

3. Tension Legged Platforms

The most commercially advanced floating wind turbine tower systems are discussed below.

WINDFLOAT FLOATING WIND TURBINE (SEMI-SUBMERSIBLE PLATFORM)

Principle Power from Seattle developed an offshore wind turbine under the name WindFloat that is installed on a three-legged semi-submersible platform. WindFloat is one of the most advanced floating offshore wind turbine systems. A 2.0 MW prototype turbine has been deployed off the Portuguese Coast and is currently being tested (Figure 2). Last year, the U.S. Department of Energy (DOE) awarded Principle Power $4 million to design a prototype wind farm consistent of five full-size 6.0 MW turbines to be deployed off the Oregon Coast near Coos Bay. The award was one of seven projects funded by the DOE to accelerate offshore wind technology. Principal Power is the only awardee from the West Coast. Up to three of these projects will be awarded additional funding towards the actual construction of the prototype wind farm in the order of $47 million to achieve commercial operation by 2017, as shown on the following DOE website:

Figure 2. 2.0 MW Prototype Offshore Wind Turbine on Semi-Submersible

http://www1.eere.energy.gov/wind/offshore_wind.html

Principle Power's floating platform can be built in a dry dock or on land and shipped to an outfitting facility before deployment to the installation site. Hence, the five platforms for the prototype wind farm could potentially be built at the Columbia Business Center. The dimensions of the 2.0 MW prototype platform can be seen in Figure 3.The semi-submersible platform has a height of about 76 feet and could, therefore, be still loaded on a barge and clear the new bridge. The structural weight for the platform of the 2.0 MW prototype turbine is about 1200 tons. A full-scale platform can have a weight of up to

1800 tons (Figure 4) and might be too tall to be loaded onto a barge. In this case, the platform could be towed without a barge, with additional buoyancy as needed to avoid grounding in the shipping channel. The full-size platform floats at a draft of about 49 feet without additional buoyancy, which is too deep for the shipping channel. Hence, in order to fabricate a full-size WindFloat platform at the Columbia Business Center, it is probably necessary that features have to be added to pass underneath the new Columbia River Bridge, which would raise the fabrication cost.

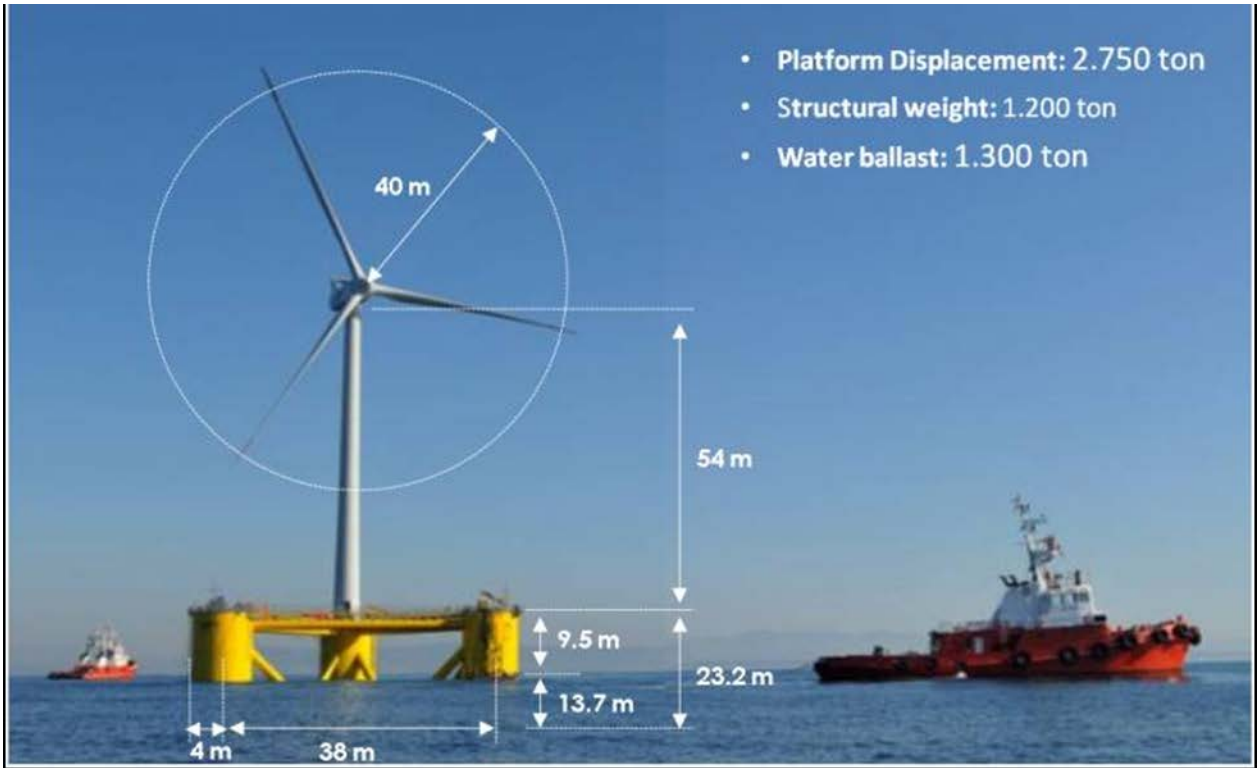

Figure 3. Approximate Dimensions of 2.0 MW Prototype Offshore Wind Turbine (Principle Power)

Note that it will not be possible to install the wind turbine on the platform until the platform is downriver of the Astoria Bridge. The fully installed full-size floating wind turbine has an air draft of at least 400 feet, which is twice as tall as the clearance of the Columbia River Bridge in Astoria. It is important to consider that the production of such wind turbines beyond a prototype wind farm will require installing the turbines before launching of the platforms, so that the wind turbines can be pre-commissioned before launch. Hence, for a full scale wind farm of 30 or more wind turbines, the Columbia Business Center will unlikely be a suitable site to fabricate the platforms. In this case, it is more likely that a near shore site such as Coos Bay or Reedsport will be chosen as a combined fabrication, commissioning, and deployment site for the turbines. A rendering of what such a site could look like is shown in Figure 5

A FEW WINDFLOAT SPECS	
Turbine sizes	3.6 to 10 MW
Rotor diameters	120 to 150m
Hub heights	80 to 90m
Nacelle weights	250 to 400 tons
Tower weights	200 to 350 tons
Hull weights	1,200 to 1,800 tons
Total displacement (with ballast)	< 6000 ton
Hull draft	< 20m
Operational water depth	≥ 50m
Conventional mooring components	(4 to 6 lines)

Figure 4. Typical sizes of the full-size WindFloat (Principle Power)

Figure 5. Rendering of Offshore Wind Turbine Fabrication and Deployment Facility (Principle Power)

Siemens Hywind Floating Wind Turbine (Spar Platform)

Spar platforms are, in essence, a continuation of the tower under water with ballast at the bottom of the structure (Figure 6). In order to provide stability and sufficient buoyancy, these structures have a deep draft once they are in their installed position. Spar platforms are manufactured in a horizontal position and then flipped into vertical position at a deepwater site, where tower, turbine, and blades are installed and commissioned. The completed turbines are then towed to their final installation site and moored.

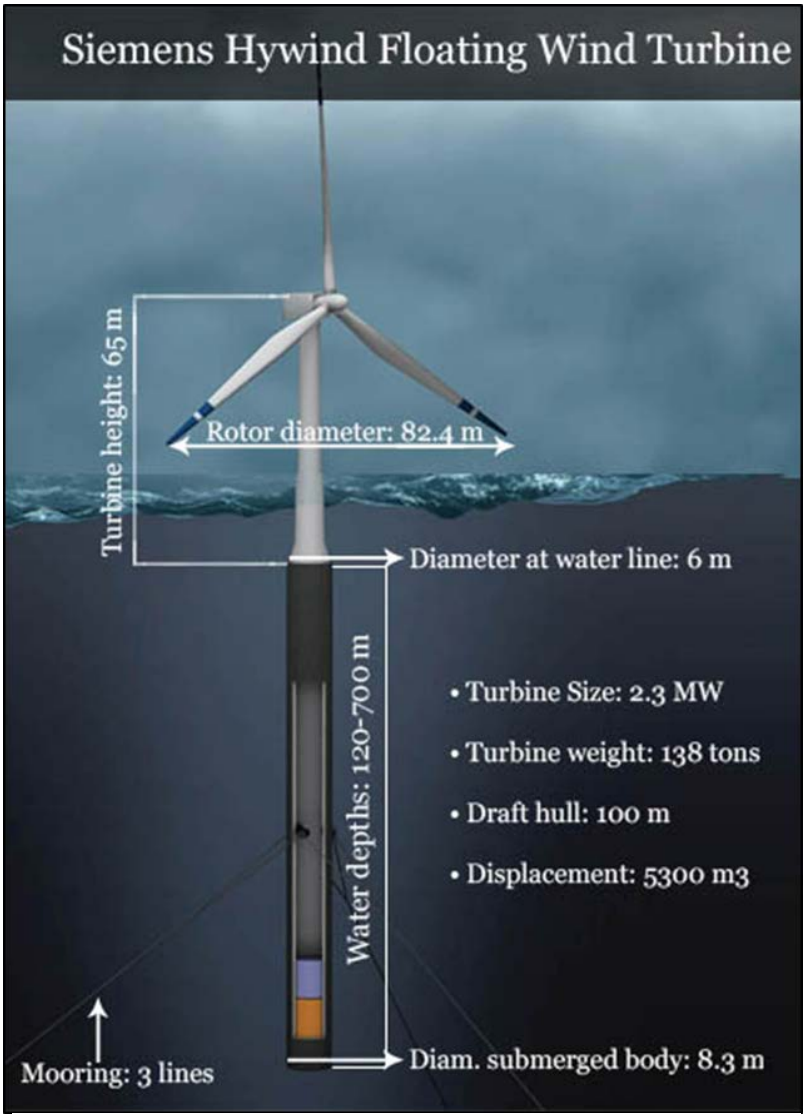

Figure 6. Offshore Wind Turbine on Spar Structure (Hywind)

Protected deepwater sites that would be suitable for the erection of spar platforms can be found in Puget Sound. The Oregon Coast does not provide a suitable site. However, the spars could be fabricated at the Columbia Business Center and be towed in horizontal position to the deepwater site. The tow of the spar, with or without barge, would not cause any clearance problem at the Columbia River Bridge (Figure 7).

Figure 7. Tow of a spar platform for a floating wind turbine (Hywind)

Pelastar Floating Wind Turbine (Tension Legged Platform)

Glosten Associates in Seattle developed an offshore wind turbine that is supported by a tension-legged platform (Figure 8). A potential 6.0 MW prototype of such a turbine might be installed off the Scottish coast as early as 2015. No project with such turbines has been announced for the West Coast. However, similar challenges can be expected as for the spar platform. The structure has a relatively deep draft and cannot be towed in the final position, as it would be unstable. Hence, a likely fabrication scenario would be to fabricate, assemble, and commission the wind turbines at a nearshore deployment site and brought to the offshore installation site with purpose-built installation vessels. Suitable deployment sites in Oregon would be Coos Bay and Reedsport. It might be possible that components of the platform—such as the submerged star structure or the lower shaft—are fabricated at the Columbia Business Center in Vancouver

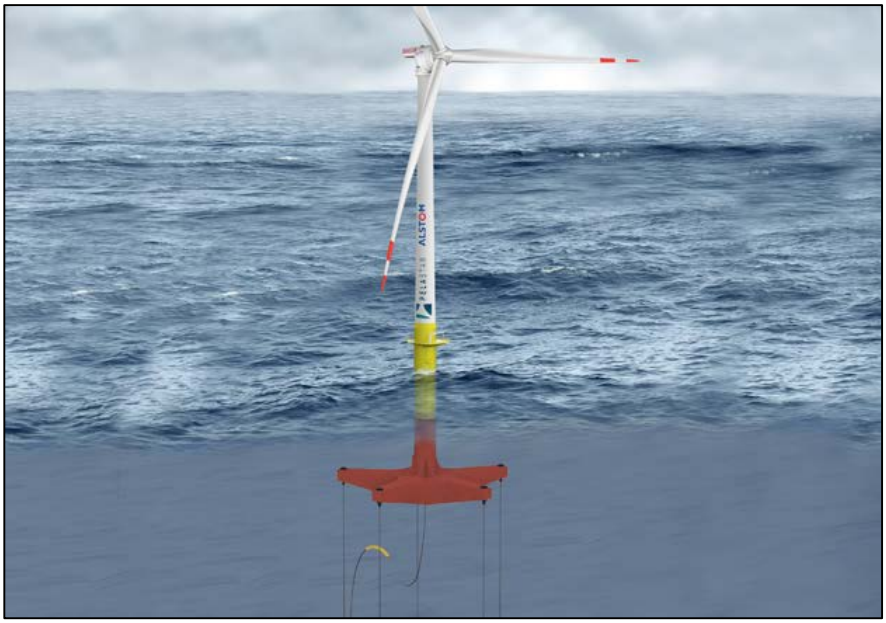

Figure 8. 6.0 MW Pelastar floating offshore wind turbine of a tension legged platform (Glosten)

and then shipped to the deployment site via barge. Transportation of single components, if shaft and star structure are not in one piece, would not cause any clearance issues at the Columbia River Bridge. The final assembly of the turbines will occur at the deployment site anyway.

WAVE AND TIDAL ENERGY CONVERTERS

Oregon is strongly supportive of wave energy development and has a wave energy development center in Corvallis and an offshore testing site near Reedsport that attracted several wave energy device companies. Some of the devices are discussed below.

Wave Buoy from Ocean Power Technology

One of the most advanced wave energy devices is the wave buoy from Ocean Power Technology. Several prototype buoys are currently in the process of being deployed from Coos Bay to be installed at the Reedsport offshore testing site. Oregon Iron Works is involved in the fabrication of these devices. The buoys have a capacity of 150 kW and are 140 feet long and 40 feet in width. The buoys can be transported either on a barge, or more likely, directly self-floating as seen in Figure 9. Wave buoys of this size will, therefore, not bear any clearance challenges at the Columbia River Bridge. Once such buoys grow in size and capacity, it is more likely that they will be fabricated closer to shore in a similar fabrication and deployment setting as for floating wind turbines.

Figure 9. 150 kW Wave Energy Buoy by OPT, 140 feet long, 40 feet wide deployed

OpenHydro Tidal Power Device

The OpenHydro tidal turbine is an open center turbine from Ireland (see http://www.36energy.org). A 250kW model was tested off Orkney, at the European Marine Energy Centre (EMEC) in 2008 and became the first tidal turbine to generate power to the UK

electricity grid. The world's first large scale grid connected tidal energy farm is currently under construction off the coast of Brittany at Paimpol-Brehat. This €40 million ($52 million) project for the French power company EdF consists of four OpenHydro 2MW tidal turbines. The turbines have a diameter of 52 feet, and when installed on the gravity base, will have a height of 72 feet when operating in water of 115 feet in depth (Figure 10). The first of the turbines was tested on site for three months during 2011. The project is likely to be completed during 2013.

Figure 10. Deployment of an OpenHydro 2MW turbine off the coast of Brittany

Two smaller OpenHydro prototype turbines of 340 kW capacity each are currently installed in Admiralty Inlet by Snohomish Public Utility. The turbines have an overall height of 43 feet (Figure 11).

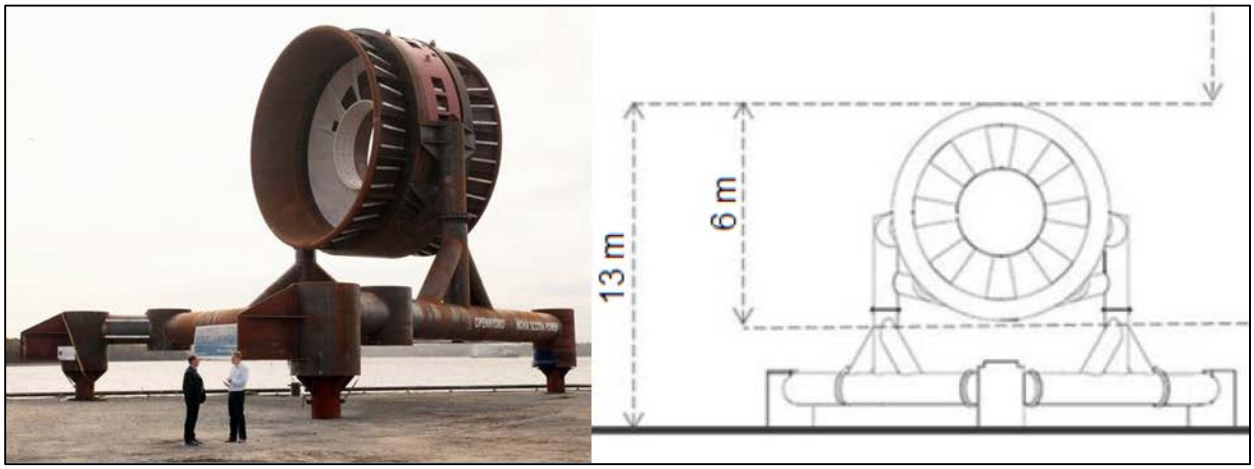

Figure 11. 340 kW Open Hydro Prototype Tidal Power Convertor Installed in Admiralty Inlet

The current sizes of the OpenHydro tidal power devices could be potentially fabricated at the Columbia Business Center without causing any clearance challenges at the Columbia River Bridge. However, future designs that might be larger in size and capacity might be unsuitable to be built in Vancouver for several reasons, which include the distance to the deployment site, the limited ship channel depth, and the bridge clearance. Similar to the floating wind turbine fabrication, once devices for larger power farms are deployed, it is more likely that fabrication, assembly, commission, and deployment happens at a nearshore site where purpose-built deployment vessels as seen in Figure 10 can directly pick up the devices.

These examples show that in general, the fabrication of prototypes or components of offshore energy devices can be manufactured at the Columbia Business Center in Vancouver and shipped to a deployment site closer to shore, despite the lower clearance of the new Columbia River Bridge. However, it can be expected that for larger power plants, fabrication at the Columbia Business Center will be limited to sub-components of such devices as most of the fabrication and assembly work will be more likely happen at a deployment site near shore such as at Coos Bay or in Reedsport.

Please give me a call (206/357-5642) if you have any further questions.

Sincerely,

Markus Wernli, PhD, PE, LEED AP
Senior Project Manager

MW:keh
Attachments

APPENDIX E

DBRS Report Regarding Columbia Business Center Re-financing

Insight beyond the rating.

GS Mortgage Securities Trust, Series 2012-GCJ7

Report Date
May 15, 2012

Press Release
May 15, 2012

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Surveillance
Monthly analytics will be available at www.dbrs.com following the first remittance date.

Structure Summary

Commercial Mortgage Pass-Through Certificates Series 2012-GCJ7

Class Description	Rating Action	Class Amount	Subordination Percent	Provisional Rating
A-1	New Rating - Provisional	$88,050,000	30.000%	AAA (sf)
A-2	New Rating - Provisional	$243,624,000	30.000%	AAA (sf)
A-3	New Rating - Provisional	$48,140,000	30.000%	AAA (sf)
A-4	New Rating - Provisional	$673,926,000	30.000%	AAA (sf)
A-AB	New Rating - Provisional	$82,519,000	30.000%	AAA (sf)
A-S	New Rating - Provisional	$172,468,000	19.375%	AAA (sf)
B	New Rating - Provisional	$93,336,000	13.625%	AA (sf)
C	New Rating - Provisional	$54,784,000	10.250%	A (low) (sf)
D	New Rating - Provisional	$64,929,000	6.250%	BBB (low) (sf)
E	New Rating - Provisional	$26,377,000	4.625%	BB (sf)
F	New Rating - Provisional	$26,378,000	3.000%	B (sf)
G	New Rating - Provisional	$48,697,182	0.000%	NR
S	NR	N/A	-	NR
R	NR	N/A	-	NR
X-A	New Rating - Provisional	$1,308,727,000	-	AAA (sf)
X-B	New Rating - Provisional	$314,501,182	-	AAA (sf)

Notes:
1)Classes X-B, D, E, F, G, S and R are privately placed pursuant to Rule 144a.
2)NR = Not Rated.
3)The X-A and X-B balances are notional. DBRS ratings on interest-only certificates address the likelihood of receiving interest based on the notional amount outstanding. DBRS considers the interest-only certificate's position within the transaction payment waterfall when determining the appropriate rating.

Portfolio Characteristics

Trust Amount	$1,623,228,182	**Wtd. Avg. Remaining Term**	104
Number of Loans	79	**Wtd. Avg. Remaining Amort.**	332
Number of Properties	175	**Wtd. Avg. DBRS Term DSCR Whole Loan**	1.20x
Wtd. Avg. DBRS Term DSCR Trust	1.21x	**Wtd. Avg. DBRS Refi DSCR Whole Loan**	1.40x
Wtd. Avg. DBRS Refi DSCR Trust	1.41x	**Wtd. Avg. DBRS Debt Yield Whole Loan**	10.0%
Wtd. Avg. DBRS Debt Yield Trust	10.1%	**Wtd. Avg. DBRS Exit Debt Yield Whole Loan**	11.8%
Wtd. Avg. DBRS Exit Debt Yield Trust	11.8%		
Largest 10 Loans Concentration	45.5%		
Interest Rate	5.798%	**Avg. DBRS NCF Variance**	-6.3%

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CMBS Rating Methodology – Highlights 87

LOAN SNAPSHOT

Trust Balance ($ million)
$99.9

Loan psf/Unit
$43

Percentage of the Pool (%)
6.2%

Loan Maturity/ARD
December 2020

Amortization
20.5 Years

DBRS Term DSCR
1.20x

DBRS Refi DSCR 1.45x

DBRS Debt Yield 10.8%

DBRS Exit Debt Yield
14.4%

COMPETITIVE SET

Industrial, Large, Tertiary

Median Debt Yield
10.7%

Median Loan PSF/Unit
$30

DEBT STACK

Trust Amount
$99.9

B-Note
$0.0

Mezz
$0.0

Total Debt
$99.9

GSMS 2012-GCJ7
May 15, 2012

Columbia Business Center

The loan consists of two separate notes: one secured by the fee parcel with an original principal balance of $57 million, and one secured by the leasehold parcel with an original principal balance of $44 million. The notes are pari-passu and cross-defaulted, and both mature in December 2020. The leasehold portion of the property is subject to a ground lease that expires on December 31, 2030. As a result of this near-term expiry without any extension options, the leasehold note amortizes on a 15-year schedule, which would result in a complete payoff in 2026. DBRS considers a leasehold interest Þnanceable if the loan amortizes ten years prior to ground lease expiry (December 2020 in this instance) and as such, has sized for this shorter amortization period, as the fee note amortizes on a 30-year schedule after two years of IO payments. The loan allows for release of the leasehold parcel, subject to a release price equal to 115% of the allocated loan amount plus $500,000. In addition, the LTV after release must be no greater than 72% (currently 68.1% based on appraised value) and debt yield no less than the greater of the debt yield for the fee parcel and 8.8%.

The subject loan has reÞnanced $106 million of existing debt. Inclusive of closing costs and funding of reserves, the sponsor invested $6.8 million of new cash equity to close the transaction. The sponsor purchased the property in 2006 for $129.1 million, leaving more than $30 million of cash equity behind the subject loan.

Tenant Summary

Ownership Interest	SF	% of SF	Occupancy	WA Age by Buildout	% Office	WA Clear Height	WA Year Built
Fee	1,215,125		86.9%	26	6.9%	26’	1986
Leasehold	1,115,246		93.2%	61	11.3%	38’	1951
Combined	**2,330,371**		**91.8%**	**43**	**9.0%**	**31’**	**1969**

The subject property consists of 2.3 million sf of industrial space and over one million sf of outdoor storage space. In addition, income is generated from two barge slips and from rail access provided to tenants. Collateral securing both the fee and leasehold parcels includes 26 separate buildings, including the original buildings dating from 1942. The original structures were used to build ships during World War II and due to the extremely high clearance throughout this space, they are still used for assembly of very large projects.

The newer, more modern, industrial properties are concentrated on the fee parcel. This is because the remaining term on the ground lease is insufÞcient to justify building new properties on the leasehold parcel. As of the March 19, 2012, rent roll, the property was 91.8% occupied. The leasehold component is 97.3% occupied, while the fee component is 86.9% occupied. More than half of the vacancy in the fee component is due to one large building being completely vacant, as its sole tenant (AHP, a diaper manufacturer) recently left the property. Occupancy at the property held up very well during the recession, but in 2010 several tenants vacated the property, and the current occupancy rate is the lowest since 2009. Although the property has been historically used for heavy manufacturing purposes, that is not the case today, and the Phase I environmental reports for each parcel did not identify any material issues.

The largest tenant at the property, Thompson Metal Fab (“Thompson”), has increased its presence at the property from approximately 200,000 sf in 2006, when the sponsor purchased the property, to its current 717,762 sf, 30.8 % of the NRA. The most recent expansion, in 2011, consisted of master leasing two large older buildings. These properties were occupied in part by Thompson and in part by other tenants, and this continues to be the case. Thompson planned to master lease the space in order to secure access to the entire buildings in the event its business expanded in the future.

The company completes large-scale fabrication projects at the subject, including assembly of an oil rig and platforms for large rockets. This space is considered mission critical for the tenant, as the large open buildings are ideal for its use, with exterior storage space for housing partially completed projects. In addition, Thompson is the heaviest user of the barge slip outside one of its buildings, which ßoats its large projects up the Columbia River to the PaciÞc Ocean. Only one other tenant, West Linn Paper, occupies more than 10% of the NRA. The subject serves as a warehousing facility for paper products and also receives raw pulp via rail to be shipped to its mill approximately 25 miles away.

Tenant Summary

Tenant	Component SF		% of NRA	Base Rent PSF	% of UW Base Rent	Expiry Year
Thompson Metal Fab	Leasehold	717,762	30.8%	$3.64	24.5%	2021
West Linn Paper	Fee	242,649	10.4%	$4.74	10.8%	2017
Vanport Warehouse, Inc.	Fee	82,145	3.5%	$5.17	4.0%	2015
Canfield Transfer, LLC	Fee	62,798	2.7%	$6.59	3.9%	2012
Laclede Chain Manuf. Co	Fee	84,180	3.6%	$4.76	3.7%	2017
Sharp Electronics	Fee	66,099	2.8%	$5.46	3.4%	2015
Oregon Iron Works	Leasehold	75,601	3.2%	$4.72	3.3%	2017
Portco	Fee	58,301	2.5%	$5.30	2.9%	2015
RM Beverage	Fee	58,178	2.5%	$4.68	2.5%	2021
United Warehouse Company	Fee	46,057	2.0%	$5.04	2.2%	2012
Total/Wtd. Avg.	**-**	**1,493,770**	**64.0%**	**$4.37**	**61.2%**	**-**

The subject is located in Vancouver, Washington, just across the Columbia River from Portland. The Portland MSA has a population of approximately 2.3 million and according to the Bureau of Labor Statistics its February 2012 unemployment rate was 8.8%, a significant improvement from the 11.5% rate of February 2010. The subject has easy access to I-5, which is important for the many trucks parked in the outdoor storage area and those used by tenants for shipping and receiving large amounts of goods. According to the property manager, the other large business parks in the area have inferior access to major roadways.

According to CBRE, the Clark County industrial submarket had a Q4 2011 vacancy rate of 5.4%, which compared favorably to the 7.8% rate for that of the larger Portland market. Average asking rents in the submarket at $5.40 psf were also outperforming the overall market rate of $4.44 psf. The weighted-average NNN rental rate at the subject property is approximately 8% lower than the submarket at $4.98 psf. Given the subject property's unique location with significant frontage on the Columbia River, it is unlikely that new competition catering to the unique needs of the subject's tenants will be built in the near future.

There are four SPE tenant-in-common borrowers, each of which is indirectly owned by the principals of Killian Pacific LLC ("Killian Pacific"). Killian Pacific is headquartered in Vancouver, Washington, and currently owns a portfolio with 3.1 million sf, inclusive of the subject property. All of its properties are located in the Portland MSA and it has developed 85 retail, office, industrial and residential projects. The property is managed by FC Services LLC, an affiliate of the borrowers, at a contractual fee of 4% of gross revenue.

DBRS ANALYSIS

Site Inspection Summary

Based on the DBRS site inspection and management meeting held on April 25, 2011, DBRS found the property quality to be Below Average.

The subject property is located less than a mile east of I-5, with easy access to the highway. Directly adjacent to the west is a mixed-use development consisting of residential condominiums, a hotel and an office building. The parcel is a relatively long and narrow 291-acre strip of land which DBRS

accessed in its entirety, with the western portion being the leasehold parcel and the eastern portion being the fee parcel. The leasehold parcel features a small number of more modern industrial and flex buildings built as late as 1989, but it is dominated by older buildings, as well as outdoor storage areas. The older buildings include the three original buildings constructed in 1942, as well as several other old structures that, along with those on the fee parcel, are considered "fit for purpose" by the sponsor. This means that the properties are in some ways obsolete, but can still be relatively functional. Some of these properties have 50-foot clear heights, making them useful for assembling very large products and structures that would be difficult to assemble in a modern warehouse space.

In addition, some of these buildings are not fully enclosed, having large open bays along one side. These structures are generally in relatively poor condition, though not structurally deficient, and have very limited curb appeal. The outdoor storage space on this parcel is used to store trucks, as well as products and projects in use by the tenants occupying the buildings. As a result, a significant portion of the property is unpaved. There is one barge slip on this parcel in relatively poor condition and does not get much use. By comparison, the fee parcel is more heavily developed, with modern warehouse buildings and limited outdoor storage. However, there are some older "fit for purpose" structures on this parcel as well.

In addition, the fee parcel contains the other barge slip at the property. This slip has been improved by one of the tenants, Thompson Metal Fabricators, at a cost of over $1 million, and is heavily used. The property is also served by rail, with the sponsor providing tenants access to a Burlington Northern rail line. DBRS observed many tenants with freight cars at their loading doors, as well as two of the subject's locomotives. The overall property quality of Below Average essentially integrates an assessment of Average for the modern warehouse, flex and office buildings with one of Poor for the "fit for purpose" vintage buildings.

NCF Summary

NCF Analysis

	2009	2010	T-12 as of 11/30/2011	Issuer NCF	DBRS NCF	NCF Variance
GPR	$10,899,402	$10,450,901	$9,378,943	$11,645,786	$11,606,150	-0.3%
Recoveries	$3,681,316	$3,502,588	$3,124,803	$3,864,072	$3,864,072	0.0%
Other Income	$2,266,464	$2,447,701	$2,372,339	$2,372,339	$2,372,339	0.0%
Vacancy	$111,471	$0	$0	$960,268	$1,507,228	57.0%
EGI	$16,735,711	$16,401,190	$14,876,085	$16,921,929	$16,335,333	-3.5%
Other Income	$0	$0	$0	$0	$0	0.0%
Total Revenue	$16,735,711	$16,401,190	$14,876,085	$16,921,929	$16,335,333	-3.5%
Expenses	$4,780,358	$4,524,269	$4,779,140	$4,690,174	$4,630,599	-1.3%
NOI	$11,955,353	$11,876,921	$10,096,946	$12,231,755	$11,704,735	-4.3%
Capex	$0	$0	$0	$349,556	$349,556	0.0%
TIs	$0	$0	$0	$228,255	$280,903	23.1%
LCs	$0	$0	$0	$228,255	$316,817	38.8%
NCF	$11,955,353	$11,876,921	$10,096,946	$11,425,689	$10,757,460	-5.8%

DBRS underwrote the gross potential revenue based on leases in place as of the March 19, 2012, rent roll with vacancy grossed up at market. DBRS accepted contractual rental increases through October

31, 2012, according to in-place leases. Expense recoveries were underwritten based on the contractual obligations of the in-place tenants. Underwritten recoveries represent a substantial increase compared to the T-12 ending November 30, 2011, level, primarily due to the new Thompson Metal Fabricators lease. DBRS included other income, including income from outdoor storage, barge rental, and rail access, at the T-12 ending November 30, 2011, level. Other income has been relatively stable since 2008.

Vacancy is underwritten based on actual vacancy plus expired leases. DBRS underwritten vacancy is 9.7% on all income, excluding storage, barge and rail income. DBRS UW EGI is 9.8% higher than the T-12 ending November 30, 2011, level, reflecting the significant leasing activity the sponsor has generated in the past year. However, it is essentially in line with the YE2010 level, reflecting how the property suffered tenant losses as of relatively lately, due to the recession.

The expenses were generally underwritten based on the T-12 ending November 30, 2011, level, with the exception of real estate taxes, which were based on the 2011 figure and ground rent. Ground rent was included based on the formula stated in the lease, which features a base rent component and a variable component that depends on the amount of square footage occupied at the property. DBRS UW ground rent is 1.8% higher than the T-12 ending November 30, 2011, figure. A management fee equal to 3% of the EGI was applied, which is lower than the actual fee of 4%. The manager has subordinated 1% of its fee to the mortgage. This is a relatively low percentage, due to the very large size of the property.

Below-the-line deductions included $0.15 psf for capital expenditures, which is higher than the engineer's inflated recommendation of $0.14 psf. TI allowances of $1 psf for new leases and $0.50 psf for renewal leases were assumed based on the appraiser's estimates. Recent leasing activity indicates only a minority of tenants receives any TI allowance, typically between $2 and $5 psf. LCs are 5% for new tenants and 2% for renewal tenants. The resulting total below-the-line item deductions equated to $0.41 psf. The resulting DBRS NCF was $10,757,460, a variance of -5.8% to the issuer's NCF.

DBRS Viewpoint

The property is very unique and benefits from its access to multiple forms of transportation, including car/truck, rail and barge. The latter two are especially important for many of the tenants assembling large pieces of equipment and machinery, as the only way to transport them is via barge. Most industrial properties with rail access rely on the rail lines to drop off and pick up tenants' freight cars, and the schedule is often erratic. By contrast, the subject has three locomotives on site and provides rail service two times daily, increasing operating efficiencies for the tenants. The Port of Vancouver has some qualities similar to the subject, but as a publicly-owned industrial park, it attempts to attract tenants that will employ significant numbers of unionized workers, which is a different target tenant than the subject's. Buildings containing 38.2% of the NRA, all of which are located on the leasehold parcel, date from the 1940s and suffer from some form of functional obsolescence. In addition, many of these older properties are in poor condition with significant deferred maintenance. The property manager indicated that, due to the ground lease expiry in less than 20 years, it is the sponsor's intent to keep these properties structurally sound and functional for tenants, but not to make significant investments into improvements. Although unusual, given the ground lease expiry DBRS considers this to be a prudent strategy and one that should not have an adverse impact to the loan.

 Thompson's lease expires in 2021, one year before loan maturity, and it leases

30.8% of the NRA. Although this represents a significant rollover concentration, Thompson subleases some of the space, making it likely that even if it vacated at expiry, the full impact to occupancy would be less than

the amount it directly leases. In addition, the sponsor has shown an ability to keep the property well-leased during difficult economic conditions. The loan has appropriately low leverage given the unique nature of the property and the short-term ground lease. DBRS Term DSCR is depressed at 1.20x because DBRS is modeling the loan with a nine-year amortization schedule on the leasehold note. To better understand the refinance risk of the fee note, as DBRS is modeling the leasehold note to amortize shortly after loan maturity, DBRS estimated NCF on the fee parcel and applied it to the balloon balance on the fee note. The result is a modest 10.7% DBRS Exit Debt Yield on the fee note.

Downside Risks

- There will only be four years remaining on the ground lease of the leasehold parcel at the end of the 15-year amortization term.
- Thirteen of the buildings are located in Flood Zone A, which is defined as having a 26% chance of flooding over the term of a 30-year mortgage.
- The border dividing the fee and leasehold parcels runs through one of the original buildings, Building 40, a 502,634 sf structure leased to Thompson.

Stabilizing Factors and Upside Potential

- DBRS modeled the loan assuming a shorter nine-year amortization schedule that will result in full amortization ten years prior to ground lease expiry, which is in line with DBRS criteria. This resulted in a lower DBRS Term DSCR, and as a result a higher POD for the loan.
- The loan agreement requires flood insurance coverage in the amount of the full replacement cost of the structures in Flood Zone A. The current policy has $50 million of coverage, which is far higher than the $7 million insurable value for the properties requiring coverage.
- All of the income generated by this building is allocated to the leasehold property, which means that if the property cannot be divided upon ground lease expiry and needs to be destroyed, there is no value or income loss to the fee parcel. In addition, if control of the parcels is split after ground lease expiry, the sponsor indicates there would be minimal cost to ensure full ingress/egress to the remaining fee parcel.