Existing Air Quality Conditions

Wind Frequency, Speed, and Direction

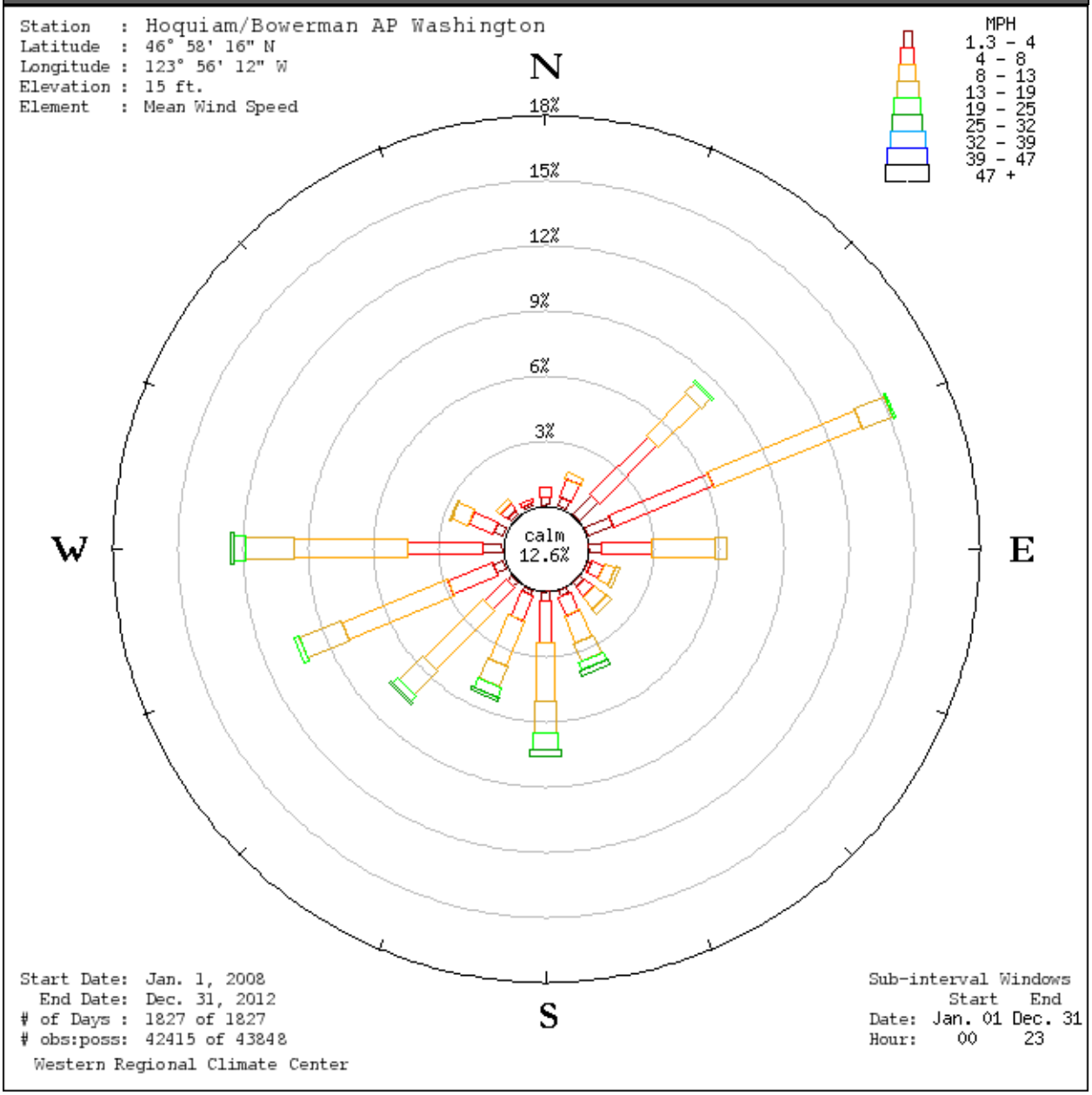
Figure 1 shows the wind rose for Bowerman Field (Hoquiam Airport) in Hoquiam, Washington, located 3.8 miles west of the project site. The wind rose consists of 16 "spokes" whose positions correspond to the major compass directions, and indicate the frequency of wind blowing from each direction. Longer arms indicate that the wind originates more frequently from the illustrated direction. Colored bands within each arm indicate the proportion of time that the wind blows with a given speed. Prevailing winds near the project site come from the west in April through September and from the east-northeast in October through March (Desert Research Institute Western Regional Climate Center 2013a).

In the summer months, average wind speed is 8.5 miles per hour (mph); the winter months have stronger winds with an average wind speed of 10.7 mph. December and January have the highest average wind speed at 11 mph (Desert Research Institute Western Regional Climate Center 2013b). Annual average wind speed is 9.3 mph. Calm conditions (less than 1.3 mph) occur about 12.6% of the time, predominately during the night and averaging a little over 17% of all nighttime hours.

Figure 2 shows the wind rose for Elma, Washington, which is located along the Puget Sound & Pacific Railroad (PS&P) rail line, approximately halfway between the project site and Centralia, Washington. Prevailing winds in Elma come from the west in April through September and from the east-southeast in October through March.

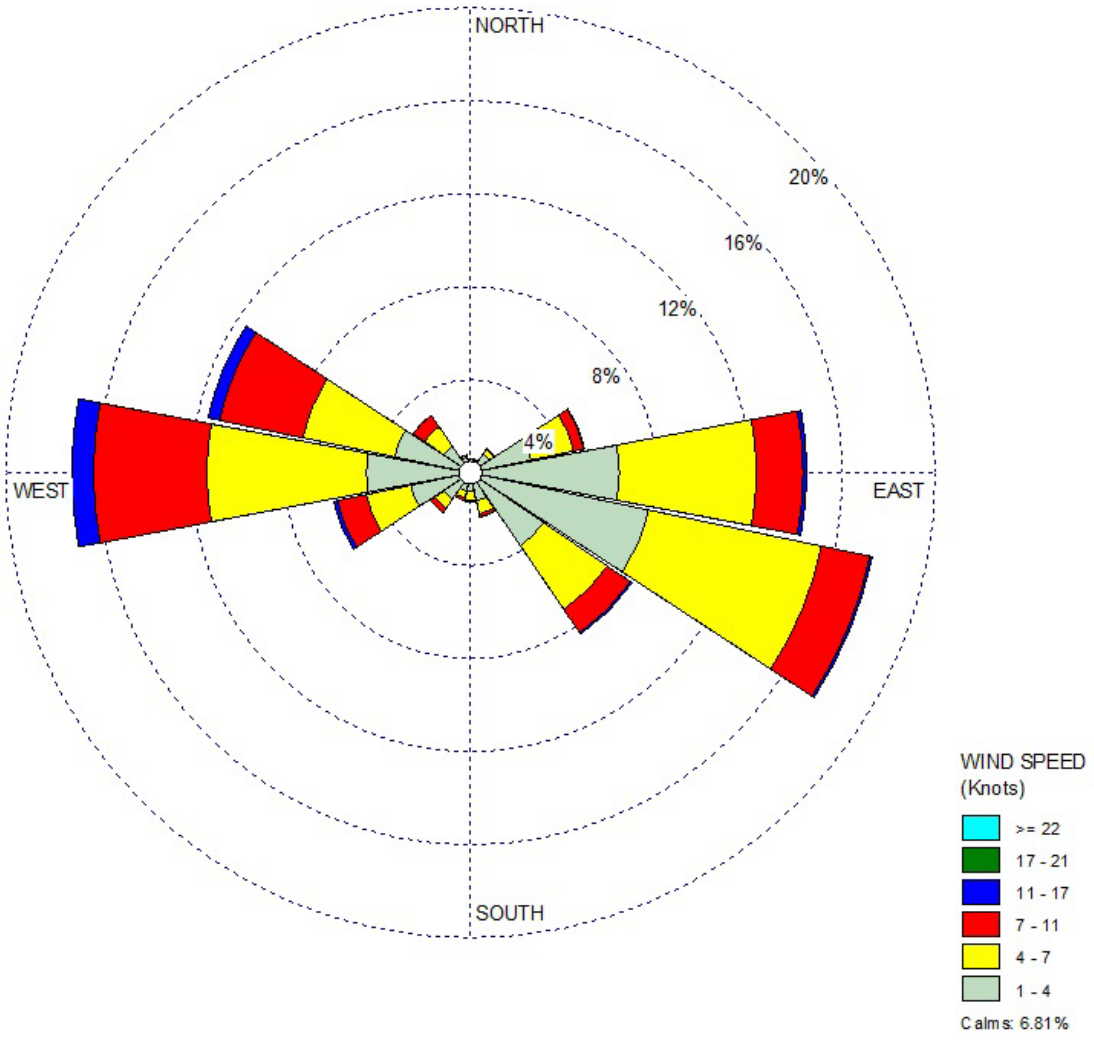
In the summer months, average wind speed is 6.4 mph; during the winter months, a lower average wind speed of 4.6 mph prevails at this inland location. Annual average wind speed is nearly half of that in Grays Harbor at 5.2 mph; however, calm conditions are less frequent, occurring about 6.8% of the time.

Figure 1. Bowerman Airport Wind Rose—January 1, 2008–December 31, 2012



Source: Washington State Department of Ecology 2014a

Figure 2. Elma Wind Rose—January 1, 2010–December 31, 2012



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 1/1/2010 - 00:00 End Date: 12/30/2012 - 23:00	MODELER:	
	CALM WINDS:	TOTAL COUNT:	
	6.81%	25336 hrs.	
	AVG. WIND SPEED:	DATE:	PROJECT NO.:
	4.51 Knots	10/20/2014	

Source: Washington State Department of Ecology 2014b

PM2.5 Monitoring in the Study Area

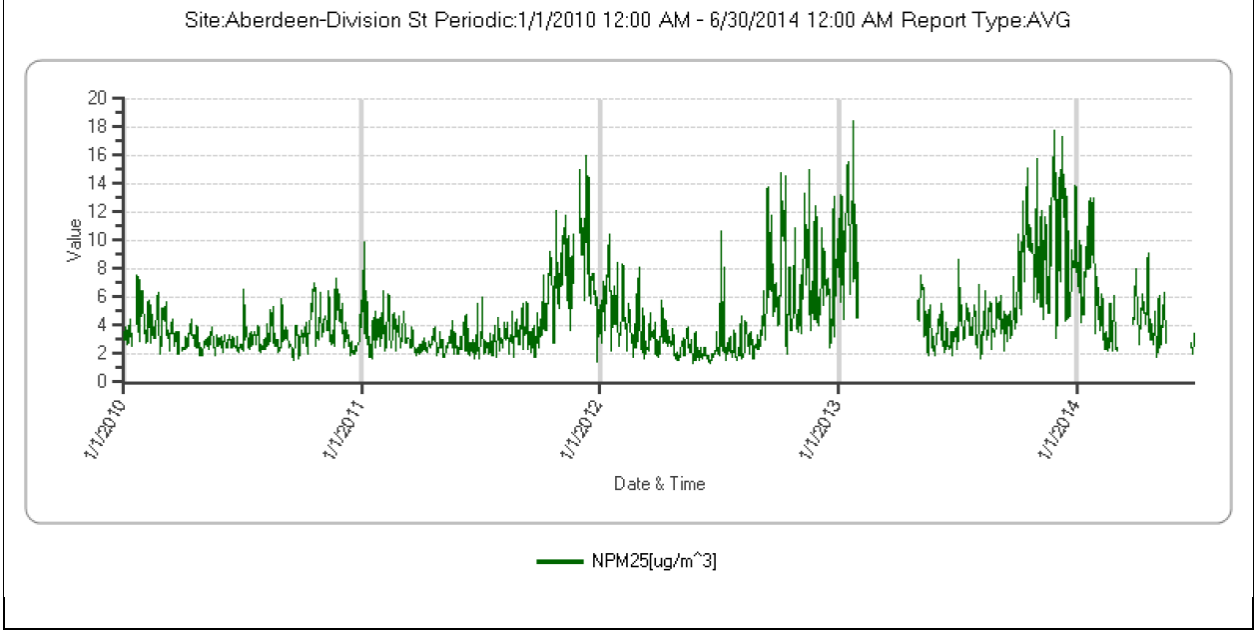
Three monitoring sites provide data on particulates less than 2.5 micrometers in diameter (PM2.5) in the study area: the Washington State Department of Ecology (Ecology) Harbor High School monitoring site and one site each in Chehalis and Oakville.

The Harbor High School monitoring site, approximately 1 mile from the project site, is representative of particulate matter levels near the project site and in Hoquiam and Aberdeen. Ecology has identified that the sources contributing to PM2.5 measured by this monitoring site are from home heating and mobile sources (cars and trucks). It is used by Ecology primarily to call for curtailment, if needed, during the home heating season. Figure 3 shows the daily average PM2.5 monitoring over the past 4.5 years at this monitoring site. The highest measured 24-hour concentration is just over 18 micrograms per cubic meter (µg/m^3), well below the PM2.5 air quality standard of 35 µg/m^3.

Two PM2.5 monitoring sites located in Chehalis and Oakville are representative of particulate matter levels along the PS&P rail line. Monitored data collected from January 1, 2010 through June 30, 2014, are shown in Figures 4 and 5.

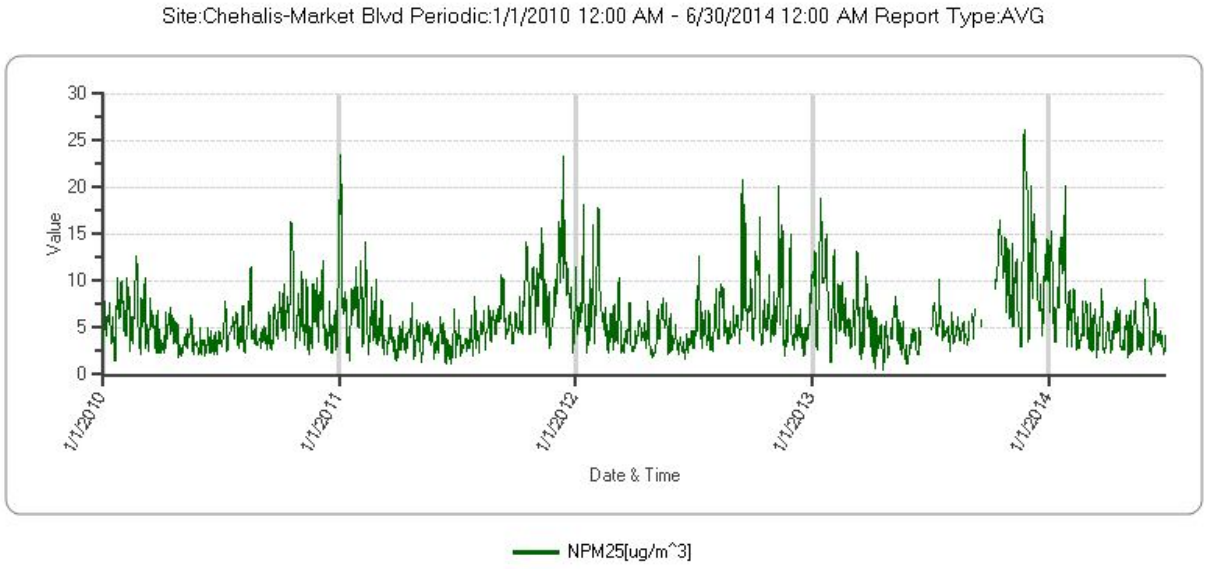
Figures 3 through 5 show how PM2.5 emissions peak in the fall and winter months and that the higher concentrations (above 20 µg/m^3) are relatively infrequent.

Figure 3. Harbor High School Daily Average PM2.5—January 01, 2010 to June 30, 2014



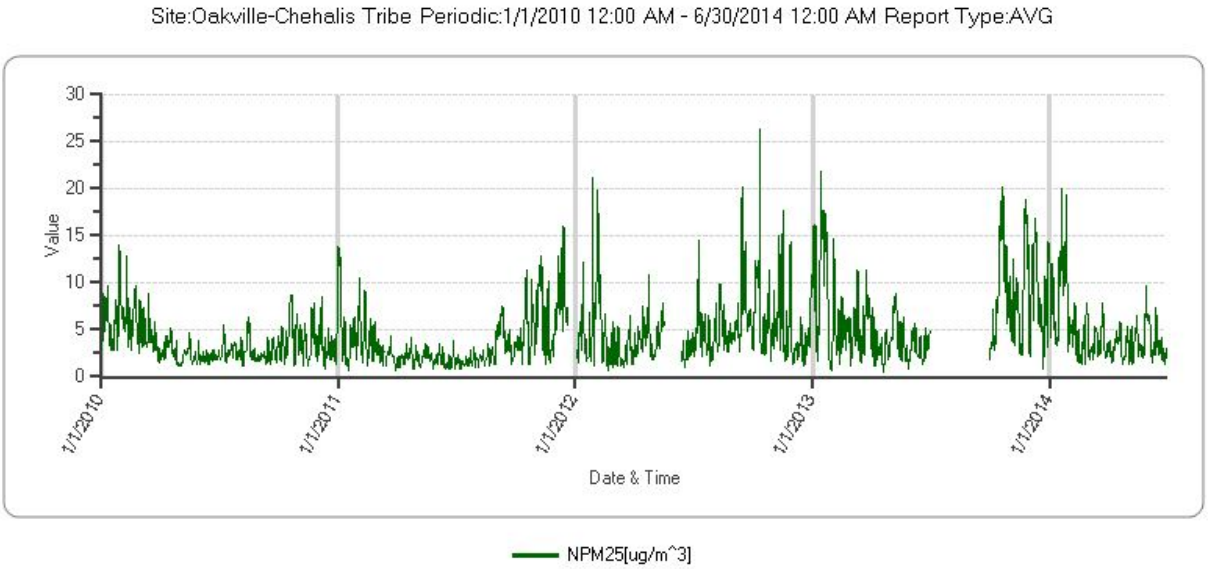
Source: Washington State Department of Ecology 2014a

Figure 4. Chehalis—Market Blvd Daily Average PM2.5—January 01, 2010 to June 30, 2014



Source: Washington State Department of Ecology 2014c

Figure 5. Oakville–Chehalis Tribe Daily Average PM2.5—January 01, 2010, to June 30, 2014



Source: Washington State Department of Ecology 2014b

Table 1 provides a statistical summary of Figures 3, 4, and 5 through 2013. The highest measured 24-hour concentration was at the Chehalis site at a little over 26 µg/m^3.

Table 1. PM2.5 Concentrations (µg/m^3) in and near the Study Area

	Monitoring Station		
Parameter	**Harbor High School**	**Chehalis**	**Oakville**
2010			
Minimum	1.6	1.5	0.9
Maximum	7.6	16.4	14
Average	3.4	5.2	3.6
Number	357	365	364
Data[%]	98%	100%	100%
2011			
Minimum	1.4	1.1	0.6
Maximum	16	23.5	16
Average	4.2	5.9	3.6
Number	355	363	352
Data[%]	97%	99%	96%
2012			
Minimum	1.3	1.6	0.7
Maximum	15	20.9	**26.4**
Average	4.5	5.8	5.0
Number	365	365	337
Data[%]	100%	100%	92%
2013			
Minimum	1.7	0.5	0.5
Maximum	**18.4**	**26.1**	21.8
Average	**6.6**	**7.1**	**6.3**
Number	276	314	272
Data[%]	76%	86%	75%

Source: Washington State Department of Ecology 2014b

Proposed Action

Criteria Air Pollutants and Toxic Air Pollutants

Construction

Tables 2 through 4 illustrate annual construction emissions for Phase 1 and 2.

Table 2. Annual Construction Emission (tons/year)—Phase 1

Sources	CO	NO_X	SO_X	VOC	PM10	PM2.5	CO_2e
Wind erosion					0.01	<0.01	
Pad construction activity					1.94	0.51	
Excavation	0.32	0.72	0.0019	0.08	0.05	0.04	273
Total earth moving activities	*0.32*	*0.72*	*0.0019*	*0.08*	*2.00*	*0.55*	*273*
Pile driving	0.02	0.03	0.0001	0.00	0.002	0.002	8
Mechanical	0.10	0.21	0.0002	0.03	0.015	0.014	36
General construction	1.12	1.63	0.0024	2.46	0.14	0.13	334
Off-site passenger vehicles	0.27	0.12	0.001	0.02	0.01	0.01	53
Total Emissions	**1.83**	**2.71**	**0.005**	**2.59**	**2.17**	**0.71**	**704**
General Conformity *de minimis* levels for ozone maintenance areas (CFR 93.153)	100	100	100	100	100	100	

CFR = Code of Federal Regulations

Table 3. Annual Construction Emission (tons/year)—Phase 2

Sources	CO	NO_X	SO_X	VOC	PM10	PM2.5	CO_2e
Wind erosion					<0.01	<0.01	
Pad construction activity					0.16	0.04	
Excavation	0.08	0.18	<0.001	0.02	0.01	0.01	68
Total earth moving activities	*0.08*	*0.18*	*<0.001*	*0.02*	*0.18*	*0.05*	*68*
Pile driving	0.02	0.05	<0.001	0.01	0.00	0.00	11
Mechanical	0.04	0.08	<0.001	0.01	0.01	0.01	13
General construction	0.28	0.41	0.001	2.27	0.03	0.03	84
Off-site passenger vehicles	0.03	0.01	<0.001	<0.01	<0.01	<0.01	7
Total Emissions	**0.45**	**0.73**	**0.001**	**2.31**	**0.22**	**0.09**	**183**
General Conformity *de minimis* levels for ozone maintenance areas (CFR 93.153)	100	100	100	100	100	100	

CFR = Code of Federal Regulations

Table 4. Maximum Daily Construction Emissions (pounds/day)—Phase 1

Sources	CO	NO_X	SO_X	VOC	PM10	PM2.5
Excavation	13.41	26.77	0.07	3.17	1.93	1.56
General construction	45.95	34.45	0.07	65.27	2.16	2.03
Off-site passenger vehicles	3.64	1.59	0.01	0.24	0.09	0.07
Total Emissions	**63.00**	**62.81**	**0.15**	**68.67**	**4.18**	**3.67**

Operations

Tables 5 through 7 illustrate estimated emissions of criteria air pollutants and toxic air pollutants under the proposed action.

Table 5. Estimated Emissions of Criteria Air Pollutants and Toxic Air Pollutants (pounds per year) Emitted On Site under the Proposed Action

	Stationary Sources[a]						Total[e]	
Pollutant	Fugitive Emissions[b]	Storage Tanks[c]	Tank Cleaning	Marine Vapor Control System[d]	Rail (Mobile Source)	Vessel (Mobile Source)	Stationary	Combined
Criteria Air Pollutants								
NO_X	–	–	–	4,934	2,324	10,256	4,934	17,514
PM10	–	–	–	499	59	184	499	742
PM2.5	–	–	–	499	57	170	499	726
VOC	652	25,705	15,847	29,463	94	384	71,677	72,145
CO	–	–	–	11,985	543	812	11,985	13,340
SO_2	–	–	–	33	2	295	33	330
Toxic Air Pollutants								
Benzene	3	50	23	43	2	8	119	129
Formaldehyde	–	–	–	4	14	58	4	76
Hydrogen sulfide	<0.1	25	19	35			79	79
Toluene	7	71	16	29	1	6	123	130
Sulfuric acid mist	–	–	–	1	–	–	1	1
n-hexane and isohexane	3	70	38	71	0.2	0.6	182	183
Cyclohexane	5	90	42	78	–	–	215	215

[a] Trinity Consultants 2015.
[b] Emissions are from losses during filling and draining.
[c] Leaks from valves and flanges.
[d] Vessel loading emissions are primarily from the marine vapor control system. The marine vapor control system has a John Zink performance guarantee destruction efficiency of 98% minimum reduction in the total hydrocarbon vapor emissions routed through the marine vapor control system.
[e] Totals may not sum due to rounding.

NO_X = nitrogen oxides; PM10 = particulate matter with a diameter of 10 micrometers or less; PM2.5 = particulate matter with a diameter of 2.5 micrometers or less; VOC = volatile organic compound; CO = carbon monoxide; SO_2 = sulfur dioxide

Table 6. Annual Operational Emissions of Criteria Air Pollutants Emitted within Gray Harbor County under the Proposed Action (tons per year) Compared to 2011 Gray Harbor County Emissions

Criteria Air Pollutant	Sources	Source Categories[a]					Total Emissions
		Facility Operations[b]	Rail[c,d]	Vessel[d]	On-Road Mobile	Other Sources	
NO_X	Proposed Action	2.5	14.9	44.0	0.1	-	**61.5**
	Grays Harbor County	643.7	41.4	297.9	2,224.3	484.2	**3,691.5**
PM10	Proposed Action	0.25	0.4	0.6	<0.01	-	**1.3**
	Grays Harbor County	410.2	1.0	9.9	82.5	1,681.4	**2,185.0**
PM2.5	Proposed Action	0.25	0.4	0.6	0.0	-	**1.3**
	Grays Harbor County	375.0	0.9	9.5	66.0	722.8	**1,174.2**
VOC	Proposed Action	35.8	0.6	1.8	0.0	-	**38.2**
	Grays Harbor County	140.7	1.6	7.8	1,138.6	19,451.3	**20,740.1**
CO	Proposed Action	6.0	3.5	2.7	0.2	-	**12.4**
	Grays Harbor County	730.8	4.1	55.8	13,786.3	12,562.9	**27,139.9**
SO_X	Proposed Action	0.02	0.0	0.9	<0.01	-	**0.9**
	Grays Harbor County	227.7	0.3	14.7	7.1	21.5	**271.3**

Sources: Grays Harbor County emissions: Washington State Department of Ecology 2014d; proposed action facility operations emissions: Trinity Consultants 2015.

[a] Source categories based on Washington State Department of Ecology 2014d.

[b] The proposed action onsite emissions include only those from stationary sources. The county emissions represent those from all industrial point sources.

[c] Based on estimate that 68% of the fuel consumption from rail transit along the PS&P occurs within Grays Harbor County.

[d] Rail and vessel emissions for the proposed action include emissions from on-site rail and vessel operations.

CO = carbon monoxide; NO_X = nitrogen oxides; SO_X = sulfur oxides; VOC = volatile organic compound; PM10 = particulate matter with a diameter of 10 micrometers or less; PM2.5 = particulate matter with a diameter of 2.5 micrometers or less

Table 7. Estimated Increased Emissions of Criteria Air Pollutants and Toxic Air Pollutants (pounds per year) from Off-Site Rail and Vessel Transport Related to the Proposed Action

	Rail		Vessel	
Pollutant	**2017**	**2037**	**2017**	**2037**
Criteria Air Pollutants				
NO_X	40,301	11,660	78,031	78,031
PM10	1,025	220	1,205	1,205
PM2.5	994	200	1,109	1,109
VOC	1,626	420	3,626	3,626
CO	9,412	9,420	5,302	5,302
SO_2	33	40	1,776	1,776
Toxic Air Pollutants				
Benzene	32.5	8	73	73
Formaldehyde	243.9	64	544	544
n-hexane and isohexane	2.6	1	6	6
Toluene	24.4	6	54	54

NO_X = nitrogen oxides; PM10 = particulate matter with a diameter of 10 micrometers or less; PM2.5 = particulate matter with a diameter of 2.5 micrometers or less; VOC = volatile organic compound; CO = carbon monoxide; SO2 = sulfur dioxide

Greenhouse Gas Emissions

Table 8 illustrates the annual average greenhouse gas (GHG) emissions from operation of the proposed action compared to statewide GHG emissions.

Table 8. Annual Average GHG Emissions (MT/yr CO_2e) from Operation of the Proposed Action Compared to Statewide 2011 GHG Emissions

Source Type	Washington State[a]	Proposed Action	Increase (%)
Rail transit	1,000,000	28,173[b]	2.82
Vessel transit	3,300,000	643[c]	0.02
Industrial sources only	3,700,000	4,052[d]	0.11
Total	**91,700,000**	**32,868**	**0.04**

[a] Washington State Department of Ecology 2014e.
[b] Rail transport throughout the state; includes on-site rail emissions.
[c] Includes emissions from vessels hoteling at the Terminal 1 dock (i.e., on-site vessel emissions).
[d] On-site stationary sources: Trinity Consultants 2015.

MT/yr CO_2e = metric tons per year of carbon dioxide equivalent

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