



# The Dalles Area-wide Air Sampling

Revision date: 8/2/2016

## Background

On February 1, 2015, the DEQ's Nuisance Strategy was triggered due to the number and description of odor complaints DEQ received concerning AmeriTies West, LLC. As a result, DEQ staff conducted odor surveys in The Dalles, OR area and documented that creosote-type odors are often present in the community. DEQ is collecting air samples to determine the levels of polycyclic aromatic hydrocarbons (PAHs) east of city center in response to odor and air quality concerns related to tie treatment plant operations associated with AmeriTies West, LLC. The sampling objective is to determine if emissions associated with tie treatment plant facilities are present above human health risk-based concentrations or, in the case where risk-based concentrations are below naturally occurring background concentrations, where those emissions exceed background levels.

## Air Sampling

Starting in June 2016, DEQ staff have been using polyurethane foam samplers (PUFs) to collect air samples in the vicinity of AmeriTies West, LLC. Samples are being analyzed for PAHs that are likely associated with tie treatment plant facilities. DEQ is also collecting wind speed and wind direction data in the area to help potentially determine the source of any pollutants. Data from this project may also be used to estimate the area of distribution from air emissions from the facility(s). Oregon Health Authority may also utilize some of the data generated from this project as part of an OHA Health Consultation.

The study boundaries for this sampling were determined by using the wind speed and direction from the Columbia Gorge Airport, the known emission points for PAHs from AmeriTies West, LLC, and the complaint location information. DEQ's Air Quality Eastern Region office, the air toxics coordinator, and the ambient monitoring coordinator all participated in the selection process. The Lab air quality monitoring manager and the air quality modeling specialist were also consulted.

## Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are a class of over 100 different chemicals that occur naturally in coal, crude oil, and gasoline, however they can also be produced during the incomplete combustion of coal, oil, gas, wood, garbage, and other organic substances like tobacco and charbroiled meat. Among other chemical compounds, PAHs are found in creosote which has long been used as a wood preservative to protect railroad ties, utility poles, and other products from environmental and biological degradation. Generally, PAHs do not pose health risks in the short term, but many of them can increase lifetime cancer risk with prolonged exposure. Exposure to PAHs can occur by breathing contaminated air from sources such as vehicle exhaust, cigarette smoke, wood smoke, wildfires, or fumes from asphalt roads.

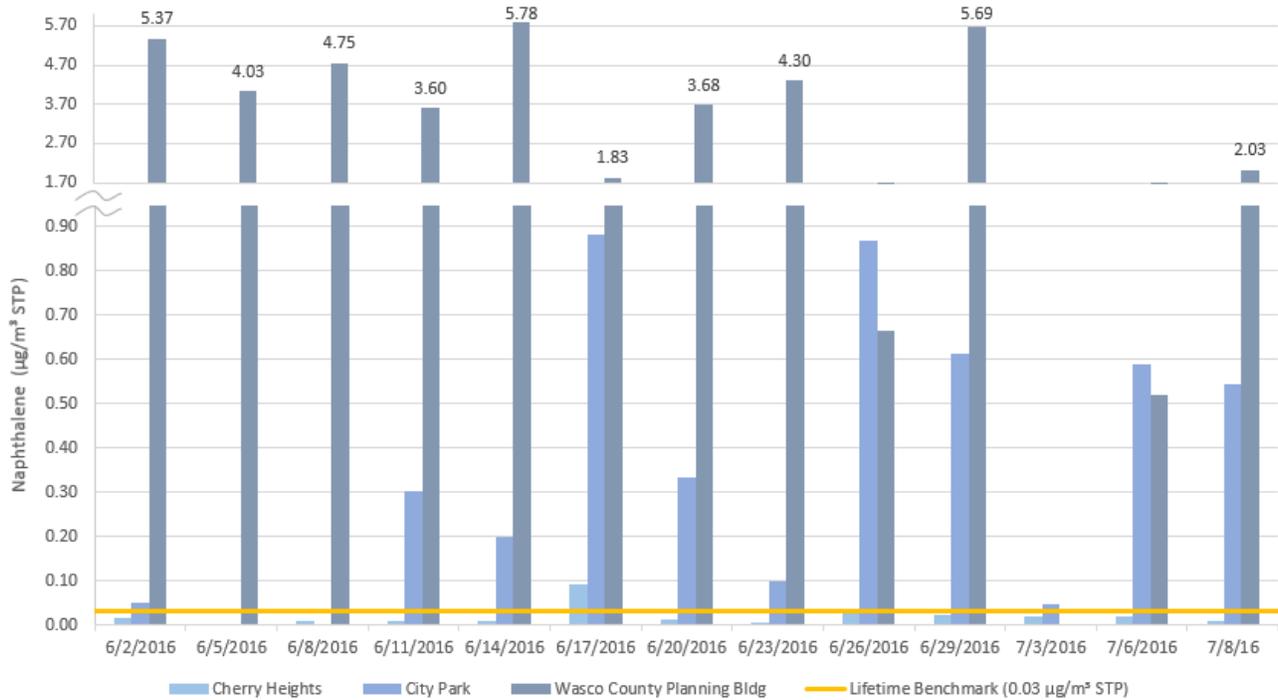
Oregon air toxics benchmarks are based on concentration levels that would result in a cancer risk of one-in-a-million additional cancers based on a lifetime of exposure. For non-carcinogens, the benchmarks are levels a person could breathe for a lifetime without any non-cancer health effects. The ambient benchmark concentrations for 52 air toxics of concern in Oregon are based on consensus recommendations from the Air Toxics Scientific Advisory Committee, a panel of experts that provides advice on the state air toxics program that is scientifically and technically sound, independent and balanced. The benchmarks are based on concentration levels that protect the health of our most sensitive individuals. These benchmarks provide consistent health-based goals, as DEQ develops strategies to reduce air toxics.

# Analysis

Three monitoring stations were setup to measure air quality and meteorological data: Cherry Heights (located near St. Mary's Middle School), City Park (located near E 9<sup>th</sup> St and Quinton St.), and Wasco County Planning (located at the Wasco County Planning building). All three stations collected one 24 hour air quality sample every three days.

## PAH Concentration and TEF

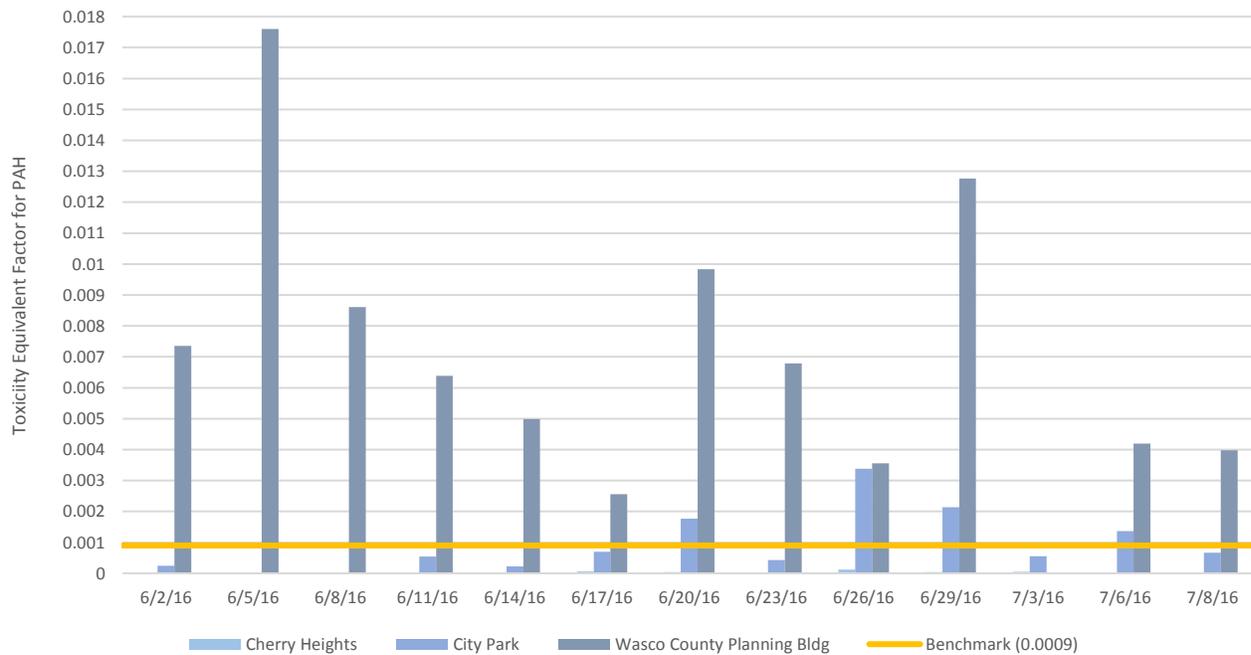
Figure 1 shows the concentration of Naphthalene recorded at each station during the sampling period compared to the State of Oregon benchmark of 0.03  $\mu\text{g}/\text{m}^3$  STP. Table 1 contains the minimum, maximum and average Naphthalene concentrations detected through July 8<sup>th</sup>, 2016 as well as times the lifetime Naphthalene benchmark, a measure of lifetime exposure. Another way to quantitatively assess the risk of PAHs is to use Toxic Equivalent Factors (TEF) that compare the PAH to some reference compound. Figure 2 shows the total TEF per day for PAH compounds that were detected and for which a TEF conversion existed, compared to benzo(a)pyrene. Table 2 contains the minimum, maximum and average concentrations detected for this group of PAHs through the current sampling period as well as times the lifetime benchmark. Conversely, Figure 3 shows PAH concentration at each site for PAHs where no TEF conversion was used. A full list of detections per sampling day at each monitoring location is provided in Appendix A.



**Figure 1.** Naphthalene concentration ( $\mu\text{g}/\text{m}^3$  STP) by sampling date. Sampling locations are represented by the vertical bars. The yellow line indicates the DEQ benchmark for naphthalene ( $0.30 \mu\text{g}/\text{m}^3$  STP). A break in the y-axis was included to show the maximum values at the Wasco County Planning building site on the same chart as the other sites. The interval of units below the y-axis break is  $0.1 \mu\text{g}/\text{m}^3$  STP, while the interval above the break in the y-axis is  $1.0 \mu\text{g}/\text{m}^3$  STP. The provisional 24-hr screening level of  $200 \mu\text{g}/\text{m}^3$  STP is not shown due to differences in scale.

**Table 1.** Concentration of Naphthalene samples ( $\mu\text{g}/\text{m}^3$  STP) per monitoring location over the sampling period (June 2-July 8, 2016). One sample is comprised of concentration levels measured over a 24-hour period. Benchmark =  $0.03 \mu\text{g}/\text{m}^3$  STP.

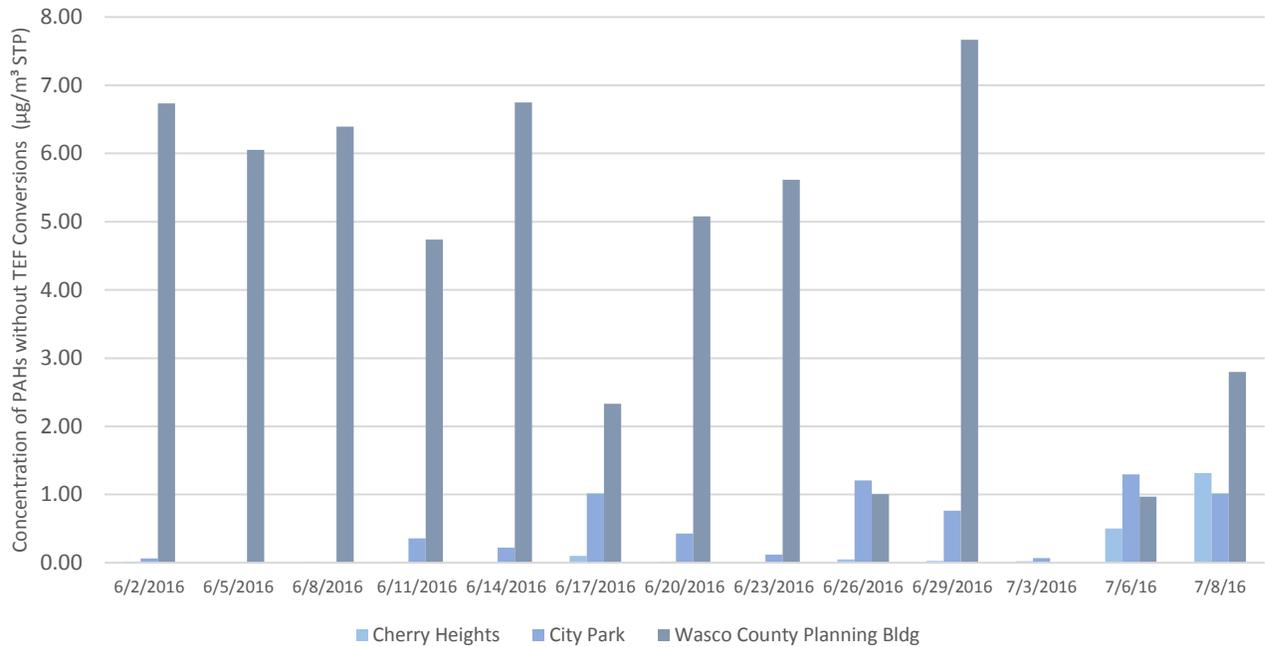
Monitor Location	Cherry Heights	City Park	Wasco County Bldg.
Min. Concentration	0.006	0.047	0.518
Max. Concentration	0.090	0.882	5.780
Avg. Concentration	0.022	0.410	3.520
Times the lifetime Naphthalene benchmark (avg. $\div$ benchmark)	0.7	13.7	117.3



**Figure 2.** Total PAHs (with toxicity equivalent factor conversions) concentration by sampling date. Sampling locations are represented by the vertical bars. The yellow line indicates the DEQ benchmark for total PAHs ( $0.0009 \mu\text{g}/\text{m}^3$  STP).

**Table 2.** Concentration of Total TEF PAH samples ( $\mu\text{g}/\text{m}^3$  STP) per monitoring location over the sampling period (June 2-July 8, 2016). One sample is comprised of concentration levels measured over a 24-hour period. Benchmark =  $0.0009 \mu\text{g}/\text{m}^3$  STP. TEF = Toxic Equivalent Factor.

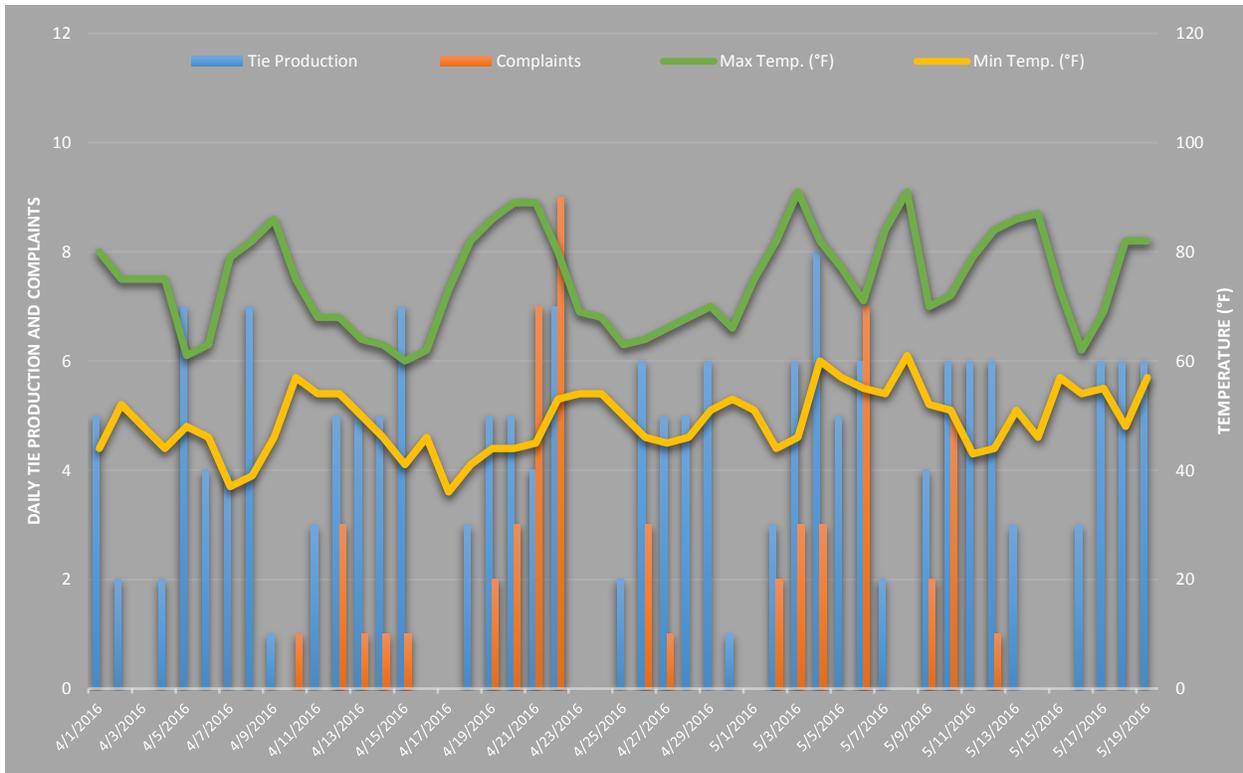
Monitor Location	Cherry Heights	City Park	Wasco County Bldg.
Min. Concentration	0.0000	0.0001	0.0005
Max. Concentration	0.0003	0.0034	0.0176
Avg. Concentration	0.0001	0.0008	0.0063
Times the lifetime Total TEF PAH benchmark (avg. $\div$ benchmark)	0.1	0.9	7.0



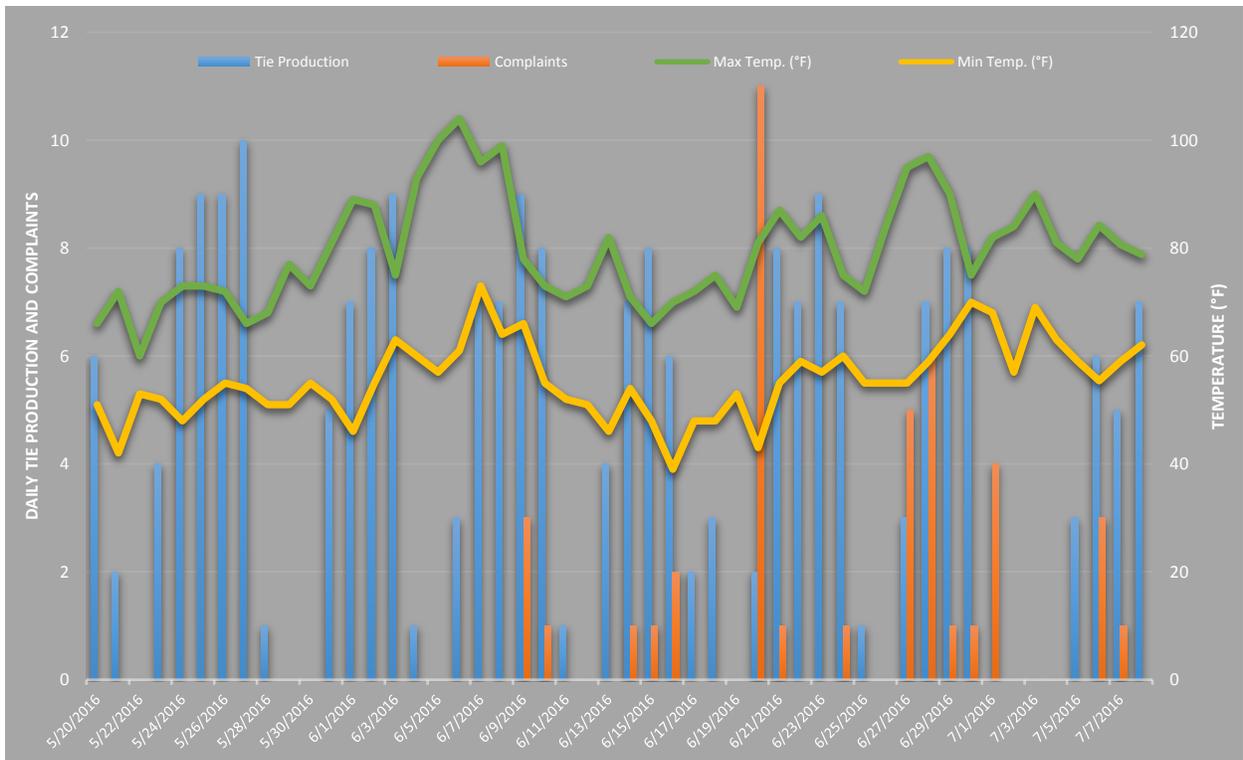
**Figure 3.** Concentration of PAHs by sampling date for PAH compounds where Toxicity Equivalent Factor conversion does not exist. Sampling locations are represented by the vertical bars.

### AmeriTies Production

In effort to correlate odor complaints with AmeriTies operations, Figures 4 and 5 compare the days of operation, the number of complaints received by DEQ, along with the daily minimum and maximum temperature recorded at the Columbia Gorge Airport. Daily production records prior to the sampling period and during the sampling period were assessed to determine if production volume and timing were being influenced by the presence of air quality samplers (Tables 3-4). Data show that weekly processing rates were representative throughout the testing period.



**Figure 4.** Comparison of tie production (blue bars) and number of odor complaints (orange bars) by day from April 1 through May 19, 2016. Daily maximum and minimum temperature (°F) are indicated by the green and yellow lines.



**Figure 5.** Comparison of tie production (blue bars) and number of odor complaints (orange bars) by day from May 20 through July 8, 2016. Daily maximum and minimum temperature (°F) are indicated by the green and yellow lines.

**Table 3.** Production records for AmeriTies prior to the start of air quality sampling. Production values are measured in non-standard units called "Charges". One Charge is equal to a full load of railroad ties that is treated and processed. No production occurred on Sundays therefore calculations were made using data from Monday through Saturday.

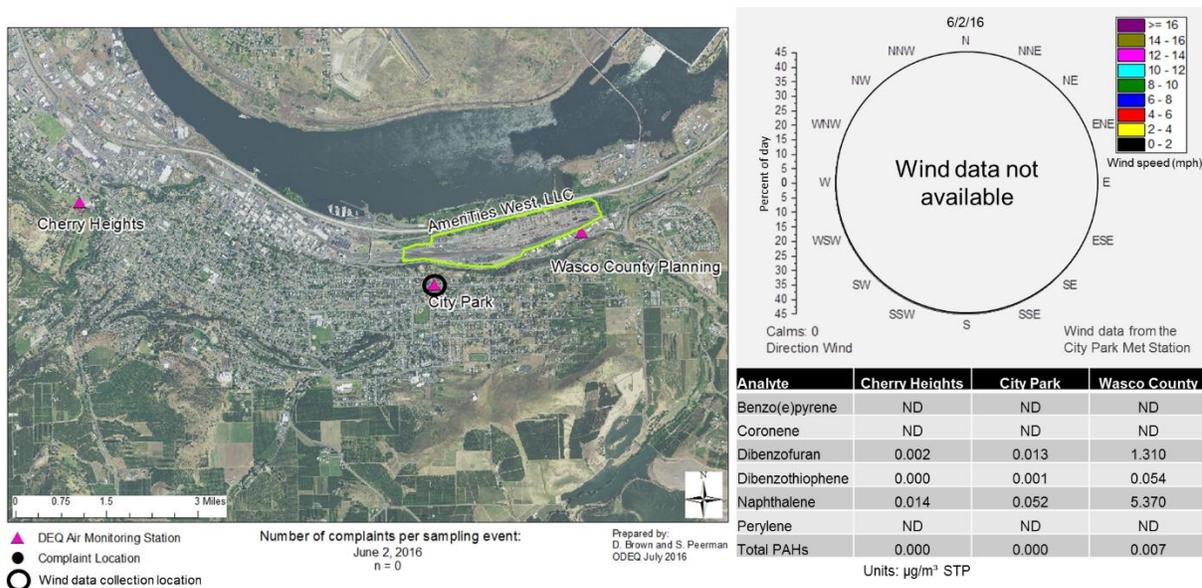
PRIOR to Sampling Period (4/1/16 - 6/1/16)							
	All Days, n = 53	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Min Production	0	0	5	4	4	3	0
Max Production	10	4	8	9	9	10	2
Avg Production	4.6	2.7	6.0	6.1	5.5	6.3	1.0

**Table 4.** Production records for AmeriTies during the air quality sampling period. Production values are measured in non-standard units called "Charges". One Charge is equal to a full load of railroad ties that is treated and processed. No production occurred on Sundays therefore calculations were made using data from Monday through Saturday.

DURING Sampling Period (6/2/16 - 7/8/16)								
	Sample Days, n = 8	Non-sample Days, n = 21	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Min Production	1	0	0	3	7	6	0	6
Max Production	9	9	4	8	8	9	9	3
Avg Production	5.5	4.9	2.4	6.4	7.5	8	5.2	1.2

## Wind Data

The City Park station was the only station to also measure wind speed and wind direction and was used in Figures 6-16 to compare meteorological data with PAH concentration and citizen complaint records. Some wind data was not available at the beginning of the sampling period due to the timing of equipment installation. Where wind data was available on sampling days, a wind rose was produced showing the wind speed, wind direction of origin, and percentage of time that wind was occurring throughout the 24 hour period that air quality samples were being collected.



**Figure 6.** Daily summary of complaint location, wind speed and direction and detection data for June 2, 2016.

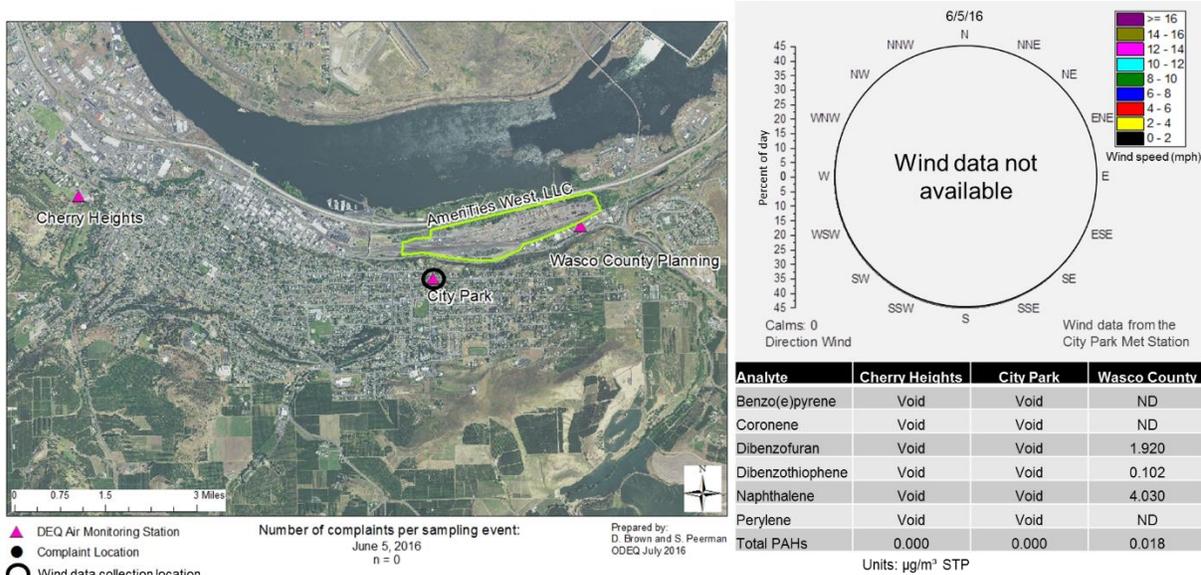


Figure 7. Daily summary of complaint location, wind speed and direction and detection data for June 5, 2016.

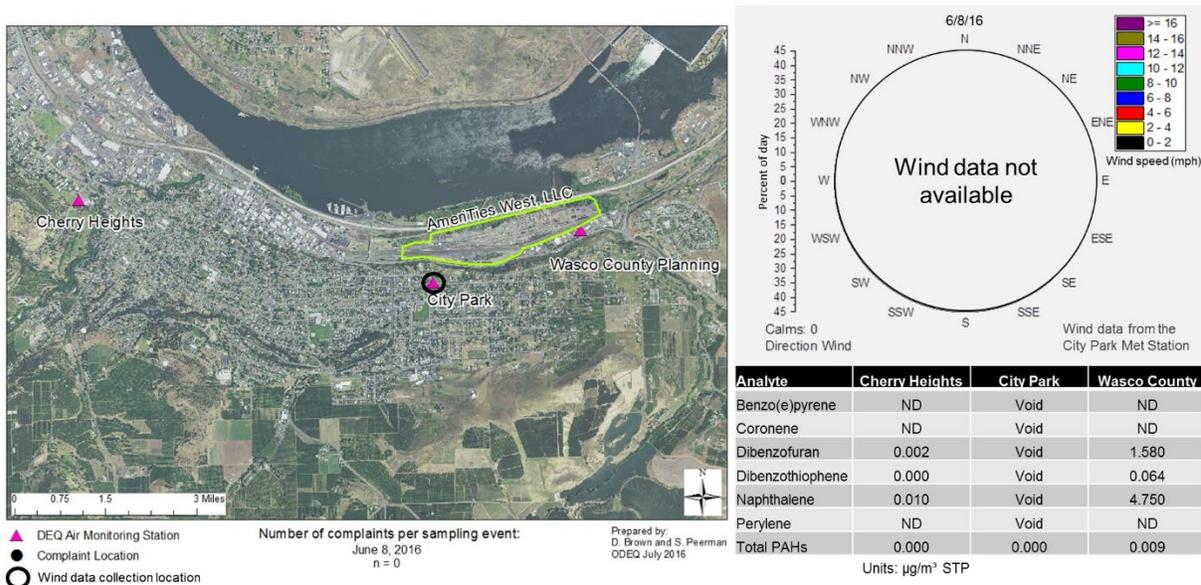


Figure 8. Daily summary of complaint location, wind speed and direction and detection data for June 8, 2016.

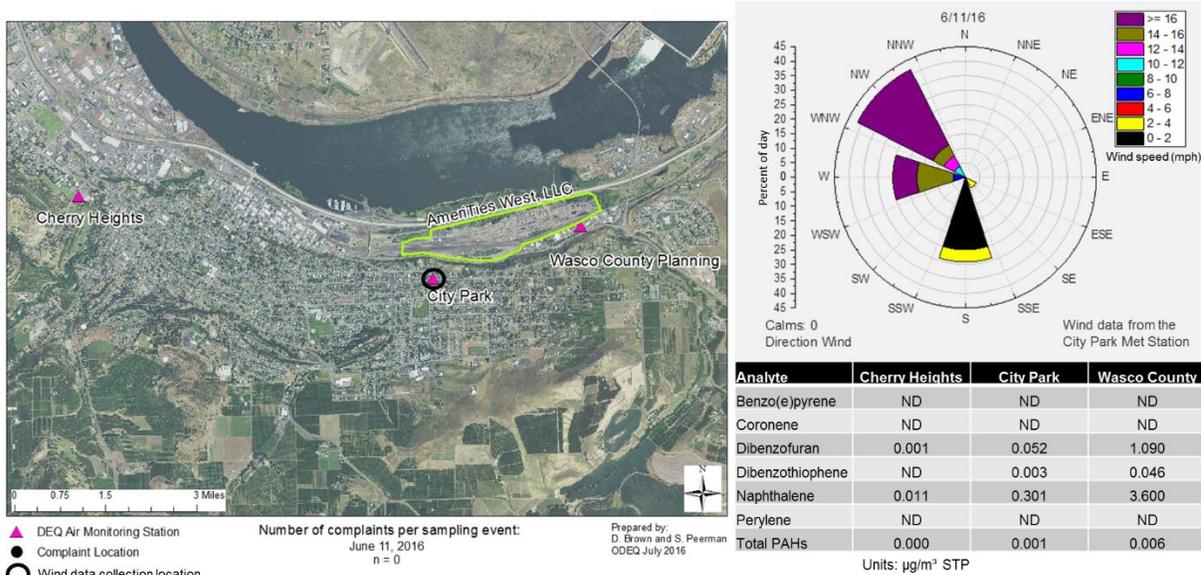


Figure 9. Daily summary of complaint location, wind speed and direction and detection data for June 11, 2016.

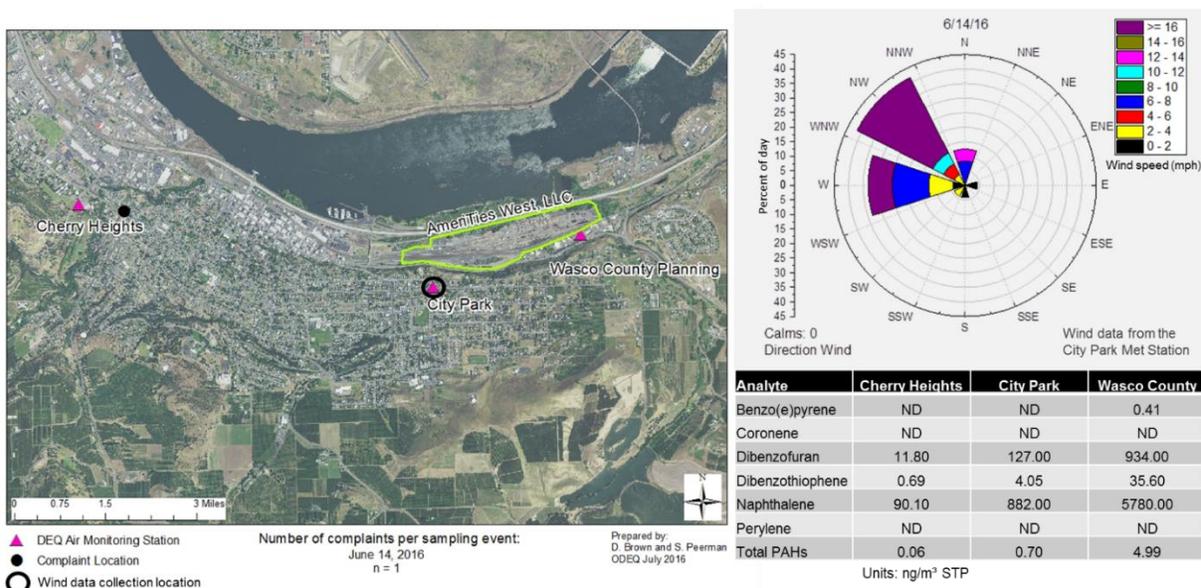


Figure 10. Daily summary of complaint location, wind speed and direction and detection data for June 14, 2016.

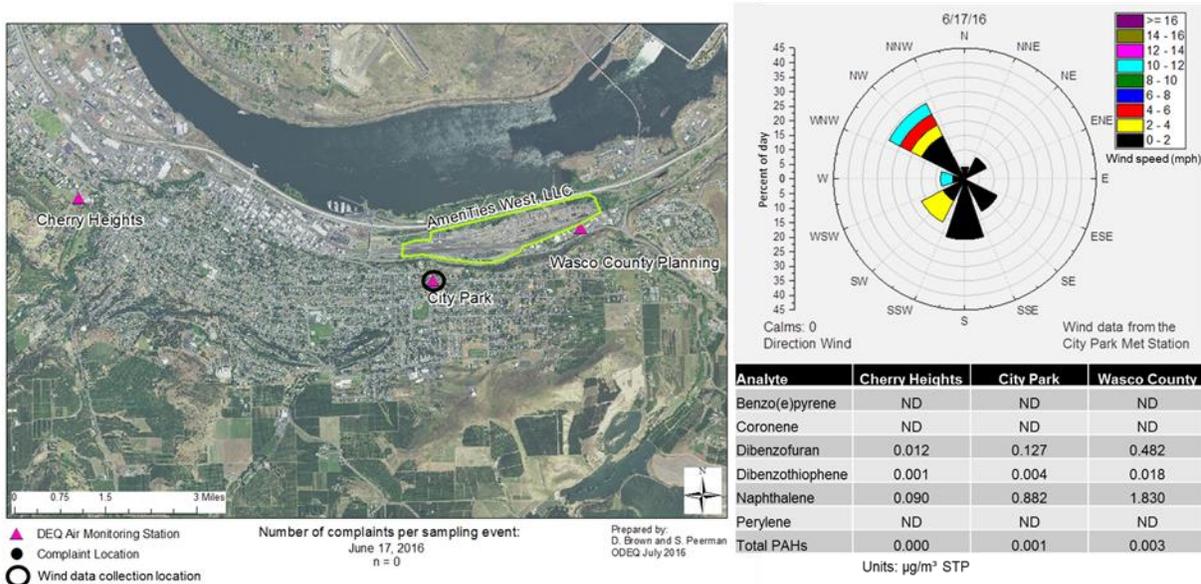


Figure 11. Daily summary of complaint location, wind speed and direction and detection data for June 17, 2016.

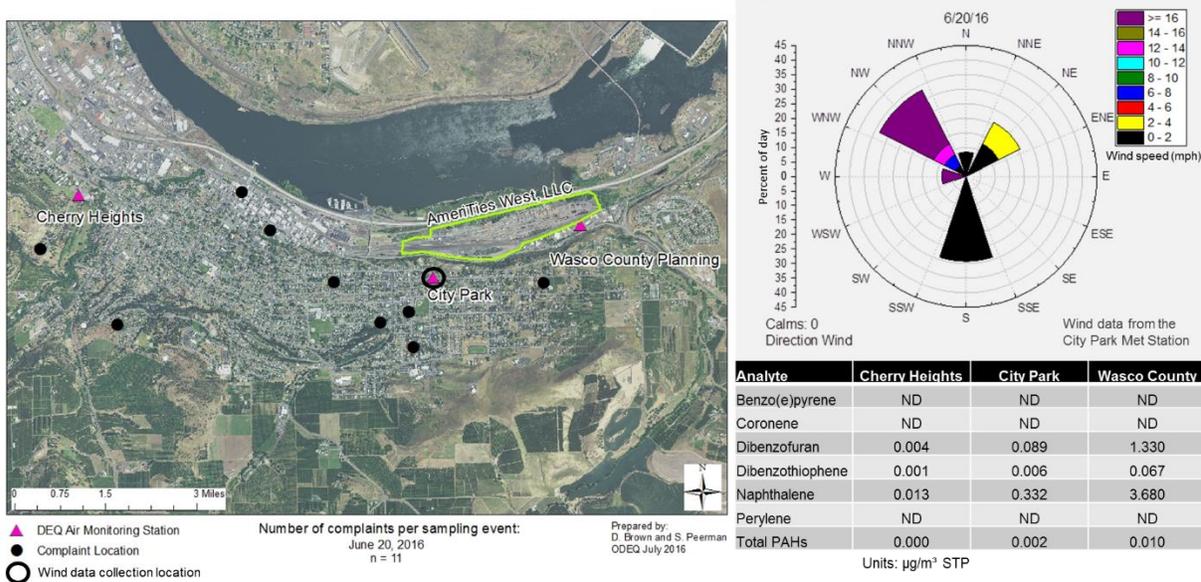


Figure 12. Daily summary of complaint location, wind speed and direction and detection data for June 20, 2016.

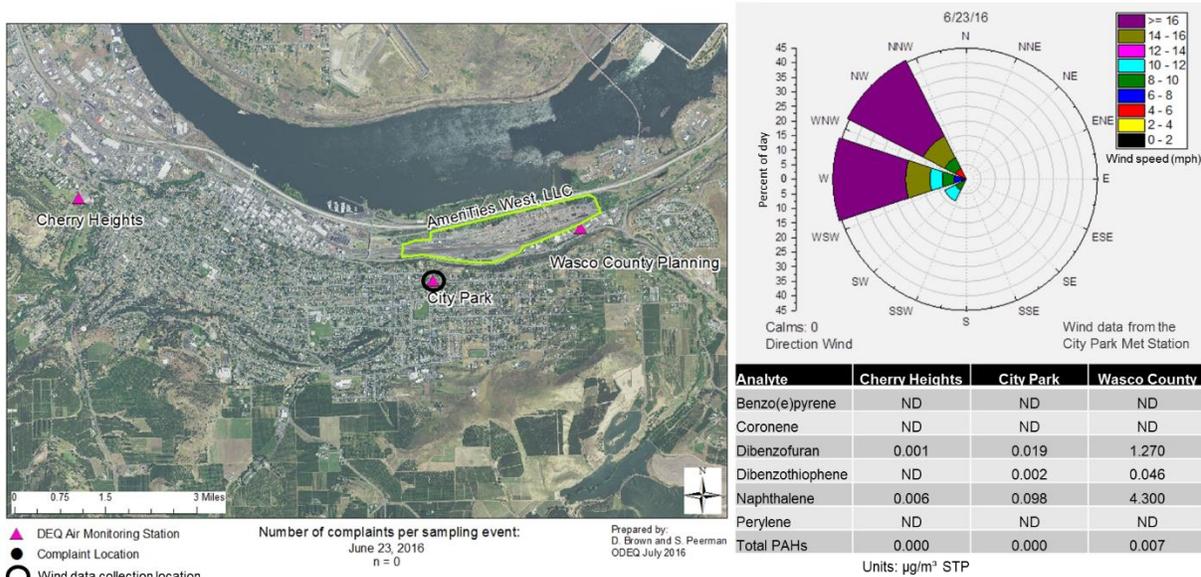


Figure 13. Daily summary of complaint location, wind speed and direction and detection data for June 23, 2016.

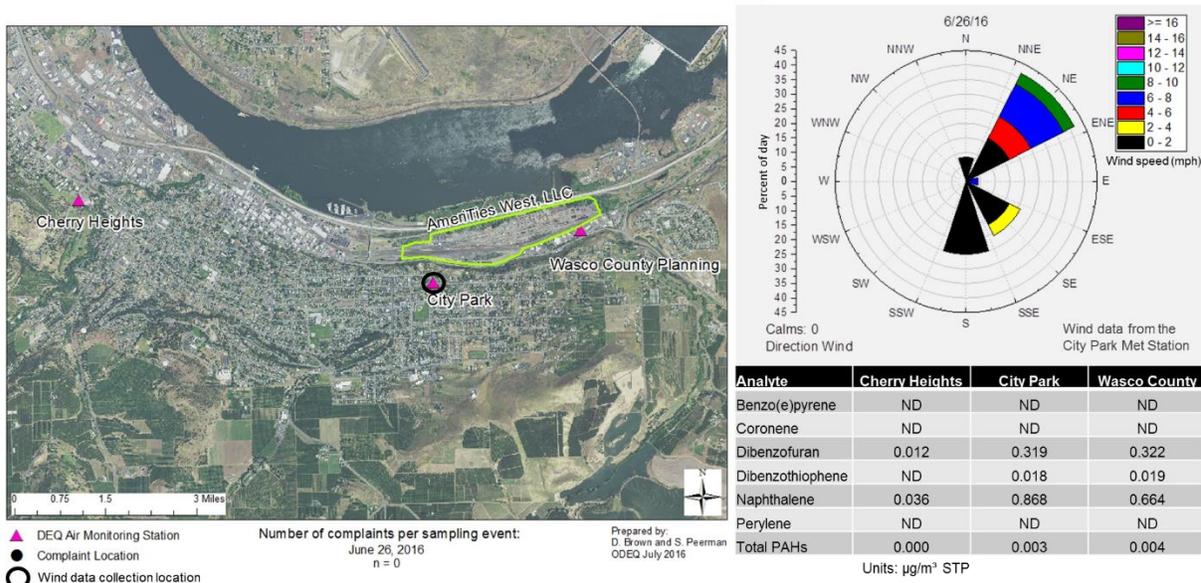


Figure 14. Daily summary of complaint location, wind speed and direction and detection data for June 26, 2016.

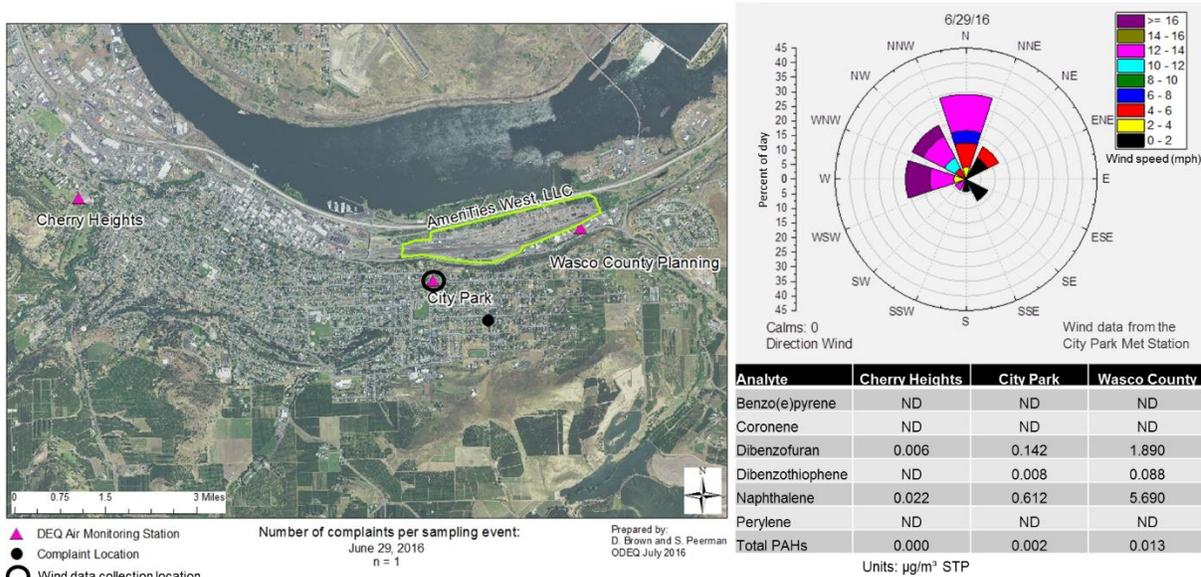


Figure 15. Daily summary of complaint location, wind speed and direction and detection data for June 29, 2016.

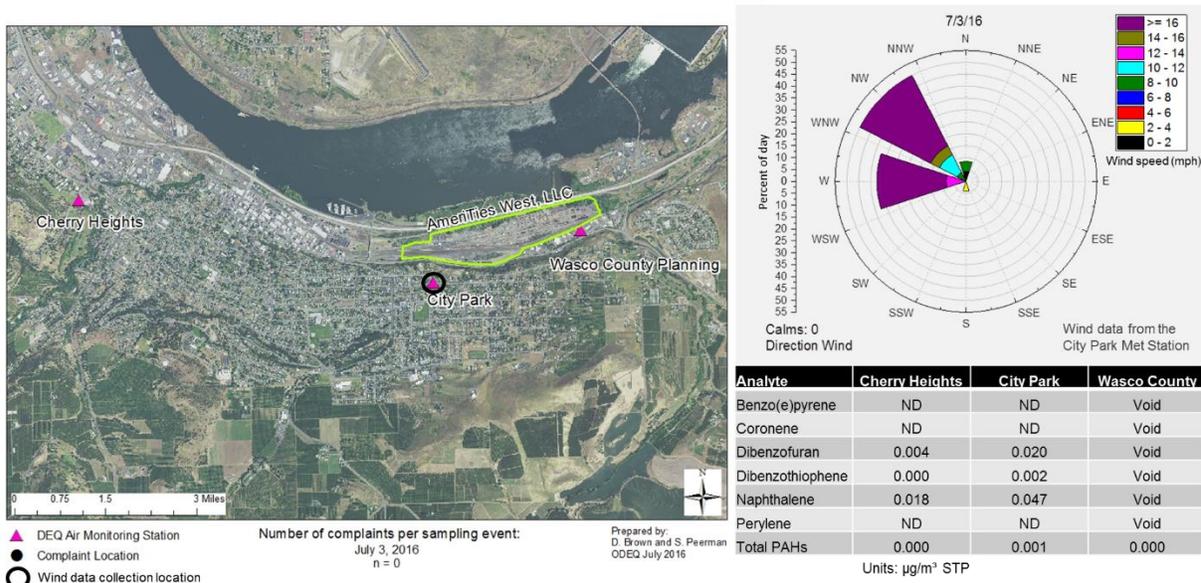


Figure 16. Daily summary of complaint location, wind speed and direction and detection data for July 3, 2016.

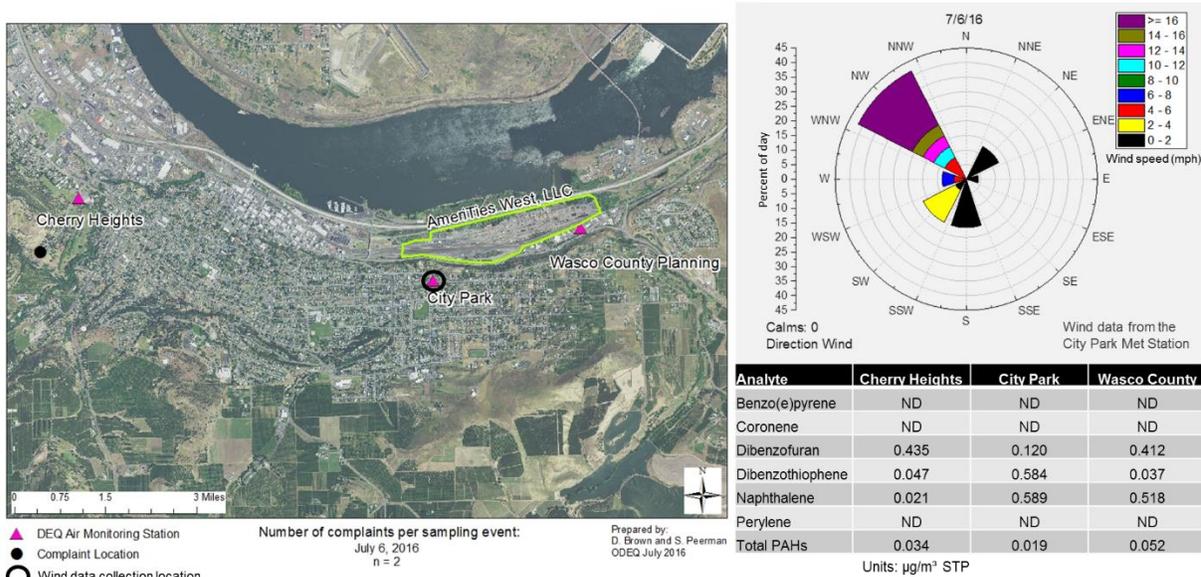


Figure 17. Daily summary of complaint location, wind speed and direction and detection data for July 6, 2016.

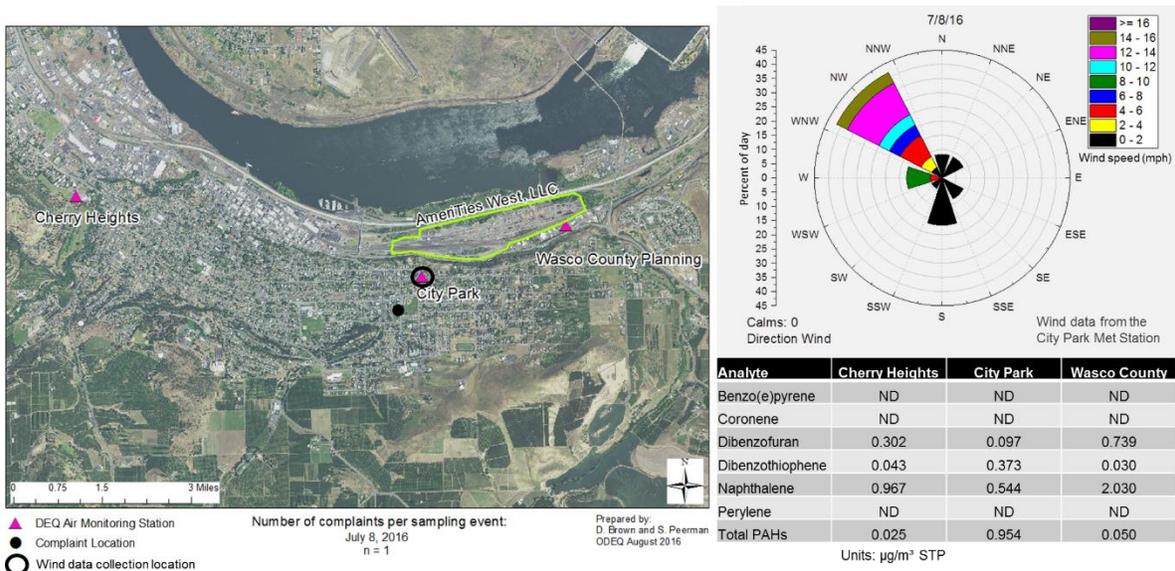


Figure 18. Daily summary of complaint location, wind speed and direction and detection data for July 8, 2016.

## Appendix A. Daily Data

**Table 1.** Raw data from June 2, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/2/2016			Units	Cherry Heights	City Park	Wasco Cty
	ABC	TEF					
Acenaphthene	-	0.001		µg/m <sup>3</sup> STP	0.00307	0.0149	2.54
Acenaphthylene	-	0.001		µg/m <sup>3</sup> STP	0.00055	ND	0.00951
Anthracene	-	0.0005		µg/m <sup>3</sup> STP	ND	0.00063	0.04
Benzo(a)anthracene	-	0.005		µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0		µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1		µg/m <sup>3</sup> STP	ND	ND	0.00059
Benzo(e)pyrene	-	-		µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02		µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05		µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03		µg/m <sup>3</sup> STP	ND	ND	0.00104
Coronene	-	-		µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1		µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-		µg/m <sup>3</sup> STP	0.00245	0.0127	1.31
Dibenzothiophene	-	-		µg/m <sup>3</sup> STP	0.00044	0.00117	0.054
Fluoranthene	-	0.05		µg/m <sup>3</sup> STP	ND	0.0042	0.0669
Fluorene	-	0.001		µg/m <sup>3</sup> STP	0.00193	0.00946	0.922
Indeno(1,2,3-cd)pyrene	-	0.1		µg/m <sup>3</sup> STP	ND	ND	0.00041
Naphthalene	30	-		µg/m <sup>3</sup> STP	0.0142	0.0517	5.37
Perylene	-	-		µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005		µg/m <sup>3</sup> STP	0.00293	0.0177	0.703
Pyrene	-	0.001		µg/m <sup>3</sup> STP	ND	0.00168	0.0329
Total PAHs	0.9	-		µg/m <sup>3</sup> STP	0.00000702	0.000245	0.00735
*ABC = Ambient Benchmark Concentration							
*TEF = Toxicity Equivalent Factor							
*STP = Standard Temperature and Pressure							
*ND = Non-detect							
*Void = Sample not used due to collection or analytical error							

**Table 2.** Raw data from June 5, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/5/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	Void	Void	3.63
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	Void	Void	0.00598
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	Void	Void	0.085
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	Void	Void	0.00116
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	Void	Void	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	Void	Void	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	Void	Void	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	Void	Void	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	Void	Void	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	Void	Void	0.00302
Coronene	-	-	µg/m <sup>3</sup> STP	Void	Void	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	Void	Void	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	Void	Void	1.92
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	Void	Void	0.102
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	Void	Void	0.228
Fluorene	-	0.001	µg/m <sup>3</sup> STP	Void	Void	1.55
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	Void	Void	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	Void	Void	4.03
Perylene	-	-	µg/m <sup>3</sup> STP	Void	Void	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	Void	Void	1.54
Pyrene	-	0.001	µg/m <sup>3</sup> STP	Void	Void	0.108
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0	0	0.01760
*ABC = Ambient Benchmark Concentration						
*TEF = Toxicity Equivalent Factor						
*STP = Standard Temperature and Pressure						
*ND = Non-detect						
*Void = Sample not used due to collection or analytical error						

**Table 3.** Raw data from June 8, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/8/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00261	Void	2.99
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	0.00043	Void	0.0117
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	Void	0.0436
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	Void	0.00045
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	Void	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	Void	0.00056
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	Void	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	Void	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	Void	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	Void	0.00122
Coronene	-	-	µg/m <sup>3</sup> STP	ND	Void	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	Void	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00229	Void	1.58
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	0.00047	Void	0.0642
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	Void	0.0765
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00184	Void	1.17
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	Void	0.00044
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.0101	Void	4.75
Perylene	-	-	µg/m <sup>3</sup> STP	ND	Void	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00249	Void	0.828
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	Void	0.0382
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.00000613	0	0.00861
*ABC = Ambient Benchmark Concentration						
*TEF = Toxicity Equivalent Factor						
*STP = Standard Temperature and Pressure						
*ND = Non-detect						
*Void = Sample not used due to collection or analytical error						

**Table 4.** Raw data from June 11, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/11/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00159	0.0998	1.98
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00108	0.00678
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00143	0.0308
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	ND	0.00062
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00141	0.0523	1.09
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	ND	0.00272	0.0456
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	0.00765	0.0642
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00112	0.0353	0.82
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.0105	0.301	0.036
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00165	0.0368	0.617
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00311	0.0311
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.00000354	0.000541	0.00639

\*ABC = Ambient Benchmark Concentration  
 \*TEF = Toxicity Equivalent Factor  
 \*STP = Standard Temperature and Pressure  
 \*ND = Non-detect  
 \*Void = Sample not used due to collection or analytical error

**Table 5.** Raw data from June 14, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/14/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	ND	0.0459	1.94
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00058	0.00786
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00093	0.0288
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	0.00044
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	0.00071
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	0.00041
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	ND	0.00117
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00087	0.0226	0.934
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	ND	0.00115	0.0356
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	0.00305	0.0405
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00084	0.0145	0.638
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	0.00045
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.00891	0.197	5.78
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00123	0.0156	0.386
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00122	0.0198
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.00000146	0.000223	0.00499

\*ABC = Ambient Benchmark Concentration  
 \*TEF = Toxicity Equivalent Factor  
 \*STP = Standard Temperature and Pressure  
 \*ND = Non-detect  
 \*Void = Sample not used due to collection or analytical error

**Table 6.** Raw data from June 17, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/17/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.0164	0.242	0.794
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00166	0.00415
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00198	0.0115
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	ND	ND
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.0118	0.127	0.482
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	0.00069	0.00405	0.0176
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	0.00061	0.00683	0.0258
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00791	0.0795	0.329
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.0901	0.882	1.83
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00657	0.0549	0.246
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00248	0.0106
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.0000581	0.000696	0.00256
*ABC = Ambient Benchmark Concentration						
*TEF = Toxicity Equivalent Factor						
*STP = Standard Temperature and Pressure						
*ND = Non-detect						
*Void = Sample not used due to collection or analytical error						

**Table 7.** Raw data from June 20, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/20/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00337	0.15	2.68
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00169	0.00797
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00602	0.0458
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	0.00046	0.00124
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.0043	0.0892	1.33
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	0.00061	0.00634	0.0665
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	0.00062	0.0294	0.111
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00311	0.0674	1.03
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.013	0.332	3.68
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00403	0.102	0.899
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.0126	0.0524
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.0000395	0.00177	0.00983
*ABC = Ambient Benchmark Concentration						
*TEF = Toxicity Equivalent Factor						
*STP = Standard Temperature and Pressure						
*ND = Non-detect						
*Void = Sample not used due to collection or analytical error						

**Table 8.** Raw data from June 23, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/23/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00101	0.034	2.51
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00045	0.0102
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00188	0.0495
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	ND	0.00088
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00108	0.0185	1.27
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	ND	0.00186	0.0456
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	0.00729	0.0585
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00104	0.0135	0.966
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.00626	0.0975	0.043
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00155	0.0265	0.593
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00264	0.0277
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.00000283	0.000429	0.00679
*ABC = Ambient Benchmark Concentration						
*TEF = Toxicity Equivalent Factor						
*STP = Standard Temperature and Pressure						
*ND = Non-detect						
*Void = Sample not used due to collection or analytical error						

**Table 9.** Raw data from June 26, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/26/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.0157	0.531	0.493
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00423	0.00339
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	0.0006	0.0162	0.0121
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	0.00072	0.00083
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.0118	0.319	0.322
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	ND	0.0177	0.0192
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	0.0017	0.0484	0.0522
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.0104	0.242	0.252
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.0356	0.868	0.664
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.0124	0.256	0.276
Pyrene	-	0.001	µg/m <sup>3</sup> STP	0.0008	0.0228	0.0262
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.0001184	0.003378	0.00355

\*ABC = Ambient Benchmark Concentration  
 \*TEF = Toxicity Equivalent Factor  
 \*STP = Standard Temperature and Pressure  
 \*ND = Non-detect  
 \*Void = Sample not used due to collection or analytical error

**Table 10.** Raw data from June 29, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	6/29/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00638	0.265	4.11
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00274	0.0273
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00874	0.107
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	0.0007
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	0.00061	0.00166
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00599	0.142	1.89
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	ND	0.00814	0.0875
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	0.00041	0.0333	0.129
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00516	0.101	1.44
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.0222	0.612	5.69
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00401	0.123	1.13
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.016	0.0681
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.00003405	0.002134	0.01277
*ABC = Ambient Benchmark Concentration *TEF = Toxicity Equivalent Factor *STP = Standard Temperature and Pressure *ND = Non-detect *Void = Sample not used due to collection or analytical error						

**Table 11.** Raw data from July 3, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	7/3/2016					
	ABC	TEF	Units	Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00236	0.027	Void
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	0.00077	0.00094	Void
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	0.00048	0.00219	Void
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	Void
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	Void
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	Void
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	Void
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	Void
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	Void
Chrysene	-	0.03	µg/m <sup>3</sup> STP	0.00042	ND	Void
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	Void
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	Void
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00419	0.0198	Void
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	0.00044	0.00214	Void
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	0.0005	0.0098	Void
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00356	0.0181	Void
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	Void
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.0175	0.0474	Void
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	Void
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00395	0.033	Void
Pyrene	-	0.001	µg/m <sup>3</sup> STP	0.00041	0.00414	Void
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.00004692	0.000558	0

\*ABC = Ambient Benchmark Concentration  
 \*TEF = Toxicity Equivalent Factor  
 \*STP = Standard Temperature and Pressure  
 \*ND = Non-detect  
 \*Void = Sample not used due to collection or analytical error

**Table 12.** Raw data from July 6, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	ABC	TEF	Units	7/6/2016		
				Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00456	0.239	0.686
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00254	0.00646
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00575	0.038
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	ND	0.001
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00435	0.12	0.412
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	0.00047	0.00584	0.0369
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	0.0196	0.0571
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00373	0.0838	0.353
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.0206	0.589	0.518
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00356	0.0884	0.41
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00996	0.0433
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.000335667	0.000195	0.0005247

\*ABC = Ambient Benchmark Concentration  
 \*TEF = Toxicity Equivalent Factor  
 \*STP = Standard Temperature and Pressure  
 \*ND = Non-detect  
 \*Void = Sample not used due to collection or analytical error

**Table 13.** Raw data from July 8, 2016 collected at three sampling stations in The Dalles, OR.

Analyte	ABC	TEF	Units	7/8/2016		
				Cherry Heights	City Park	Wasco Cty
Acenaphthene	-	0.001	µg/m <sup>3</sup> STP	0.00346	0.183	1.34
Acenaphthylene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00133	0.00591
Anthracene	-	0.0005	µg/m <sup>3</sup> STP	ND	0.00299	0.0235
Benzo(a)anthracene	-	0.005	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(a)pyrene	-	1.0	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(b)fluoranthene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(e)pyrene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(g,h,i)perylene	-	0.02	µg/m <sup>3</sup> STP	ND	ND	ND
Benzo(k)fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	ND	ND
Chrysene	-	0.03	µg/m <sup>3</sup> STP	ND	ND	0.00041
Coronene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzo(a,h)anthracene	-	1.1	µg/m <sup>3</sup> STP	ND	ND	ND
Dibenzofuran	-	-	µg/m <sup>3</sup> STP	0.00302	0.0971	0.739
Dibenzothiophene	-	-	µg/m <sup>3</sup> STP	0.00043	0.00373	0.0303
Fluoranthene	-	0.05	µg/m <sup>3</sup> STP	ND	0.00777	0.0371
Fluorene	-	0.001	µg/m <sup>3</sup> STP	0.00258	0.0638	0.536
Indeno(1,2,3-cd)pyrene	-	0.1	µg/m <sup>3</sup> STP	ND	ND	ND
Naphthalene	30	-	µg/m <sup>3</sup> STP	0.00967	0.544	2.03
Perylene	-	-	µg/m <sup>3</sup> STP	ND	ND	ND
Phenanthrene	-	0.0005	µg/m <sup>3</sup> STP	0.00296	0.0528	0.395
Pyrene	-	0.001	µg/m <sup>3</sup> STP	ND	0.00303	0.019
Total PAHs	0.9	-	µg/m <sup>3</sup> STP	0.000250667	9.54E-05	0.0004972

\*ABC = Ambient Benchmark Concentration  
 \*TEF = Toxicity Equivalent Factor  
 \*STP = Standard Temperature and Pressure  
 \*ND = Non-detect  
 \*Void = Sample not used due to collection or analytical error