Air Toxics Summaries for 2019-2021

State of Oregon
DEQ Department of Environmental Quality

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1. Introduction

The Oregon Department of Environmental Quality monitors several ambient air pollutants throughout the state as required by federal law (Clean Air Act). These air pollutants are classified into two categories referred to as criteria air pollutants and hazardous air pollutants (HAPs), also known as air toxics. HAPs have been known to cause negative health effects due to long-term (chronic) or short-term (acute) exposure. This report summarizes air toxics data that was collected in 2019, 2020 and 2021, at nine monitoring locations throughout the state to provide information to the public and inform strategies to protect public health.

1.1 What are Air Toxics?

The terms “air toxics”, “toxic air contaminants”, “TACs” and “HAPs” are used interchangeably and refer to a diverse group of chemicals present in our air which, in amounts that are high enough, are known or suspected to increase risk of cancer or other serious health effects, or adversely affect environmental quality. Most air toxics come from human-made sources, such as vehicles (cars, buses, ships, planes) and industrial facilities (factories, refineries, power plants), as well as small businesses and residences, including residential wood burning. Natural sources, such as forest fires and volcanic eruptions, also release air toxics and can affect air quality at local and regional scales. Some air toxics are carried into Oregon from sources outside other state. Common air toxics include benzene, naphthalene, formaldehyde and metals, such as nickel and lead (U.S. EPA).

1.2 Which Air Toxics are Measured?

Section 112 of the federal Clean Air Act defines a list of 188 HAPs for which EPA is required to regulate emissions to protect public health. Since measuring all 188 HAPs at every sampling location is not feasible, EPA developed a list of 60 HAPS that are measured as part of its National Air Toxics Trends Station (NATTS) Program. These pollutants were selected by EPA because they have the greatest impact on public health and the environment in urban areas, and because cost-efficient measurement methods exist. As part of DEQ’s air toxics monitoring program, a total of 107 air toxics are measured at each monitoring site, which include all 60 priority HAPs in the NATTS program. In addition to EPA requirements for air toxics monitoring, the Environmental Quality Commission adopted rules in late 2018 to create the Cleaner Air Oregon Program. This program sets health risk limits on toxic air contaminants that industrial facilities emit so that neighbors and vulnerable people are protected from potentially harmful exposures. A list of air toxics can be found at the EPA and Cleaner Air Oregon program websites.

2. Air Toxics Monitoring Program

The purpose of the Air Toxics Monitoring program is to measure air toxics in areas around the state where Oregonians live, work and play. This way, communities can make better informed decisions about how to best regulate air toxics and lessen exposure to the harmful effects. DEQ currently operates 12 air toxics monitoring stations in Oregon as part of three main networks, each with its own goals. These programs are the EPA-funded NATTS sites, Oregon trend sites and rotating annual sites.

2.1 EPA National Air Toxics Trends Stations Program

DEQ operates two stations primarily funded by EPA as part of its NATTS program. Data from Oregon's urban (Portland) and rural (La Grande) monitoring sites are combined by EPA with data from other NATTS sites across the country and used to assess national level trends and other analyses detailed in the EPA's National-scale Air Toxics Assessment. In addition, DEQ uses data from these two sites to track key performance measures in relation to air toxics. Both sites in this network adhere to consistent sampling methods, analytical methods, quality assurance methods and the sampling schedule described by the NATTS program. Additionally, DEQ has adopted the NATTS program guidelines and procedures to cover all DEQ air toxics monitoring stations and laboratory analysis of samples.

2.2 Oregon Air Toxics Trends Sites

In 2017, the Oregon Legislature approved funding for DEQ to install and operate six new air toxics trend sites. Stations designated as "trend sites" are long-term monitoring sites located in cities with larger populations or where DEQ identified risks of air toxics. The goal for the trend sites is to measure changes in air toxics over time in representative areas of the state. Since 2018, trend sites have been established in Eugene, Medford, Bend and three locations in the Portland-metro area: Hillsboro, Tualatin and the NE Portland Cully neighborhood. More information on location selection can be found on DEQ's website.

2.3 Rotating Annual Sites

Due to the significant resources that are required to install, operate and maintain an air toxics monitoring site, it is not feasible for DEQ to measure air toxics at every desired location simultaneously. In efforts to monitor and identify air quality issues throughout the state, DEQ utilizes available resources to conduct monitoring at sites for a period of one year and then re-locates sampling equipment to the next "annual site" on a prioritized list to conduct monitoring for another one-year period. The locations of rotating annual sites are prioritized based on six factors: 1) known or potential sources of pollution, 2) number of pollutants of concern, 3) relative toxicity, 4) lack of data, 5) community and demographic factors, such as proximity of residential neighborhoods to industrial sources and 6) to address local concerns. Only one annual rotating site is included in this report, the Eugene Amazon Park site. Due to limited resources, the site stayed at this location for the three years summarized in this report. More information about prioritization of air toxics monitoring stations can be found here “Statewide Prioritization of Air Toxics Monitoring.”

2.4 Key Performance Measures

Oregon sets targets to reduce air toxics in ambient air. The data and statistics from monitoring sites informs progress toward these targets. As one of DEQ’s key performance measures (KPM), DEQ selected five representative air toxics – benzene, acetaldehyde, formaldehyde, arsenic and cadmium – to track over time as an indicator of overall trends. DEQ’s goal was to reduce levels of each pollutant down to be equal to one or less than the ambient benchmark concentration (ABC) for each pollutant by 2020. The ABCs are health-protective air concentrations that would not be expected to harm health even in sensitive populations like children, the elderly or people with pre-existing health conditions. If DEQ can meet these KPM goals, the agency and Oregonians can feel confident that the air they breathe does not pose a risk to public health.

3. Field and Laboratory Methods

3.1 Air Toxics Parameters

The goal for each site is to measure 107 air toxics. Several of these air toxics are not on the 60-priority HAPs list in the NATTS program or listed in the risk assessments for the CAO program. These additional air toxics are still measured because the field and analytical methods used to analyze results can include these at no additional cost. DEQ classifies these pollutants into four groups based on similar sampling and analytical method: metals, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and carbonyls. In addition, DEQ samples for hexavalent chromium, a metal, using a specially designated instrument to improve sample detection. Wind speed and direction are also measured at each site to inform pollutant dispersion. Tables 1-4 list the air toxics analytes that are measured by the DEQ laboratory. Air toxics are listed according to the analyte category and include the Chemical Abstracts Service registry number (CASRN).

Table 1. PM10 Metal analytes.

Metals	
CASRN	***Analyte***
7440-36-0	Antimony, Total
7440-38-2	Arsenic, Total
7440-41-7	Beryllium, Total
7440-43-9	Cadmium, Total
7440-47-3	Chromium, Total
7440-48-4	Cobalt, Total
18540-29-9	Hexavalent Chromium [Cr(VI)]
7439-92-1	Lead, Total

7439-96-5	Manganese, Total
7440-02-0	Nickel, Total
7782-49-2	Selenium, Total

Table 2. Carbonyl analytes.

Carbonyls	
CASRN	***Analyte***
5779-94-2	2,5-Dimethylbenzaldehyde
78-93-3	2-Butanone (MEK)
75-07-0	Acetaldehyde
67-64-1	Acetone
100-52-7	Benzaldehyde
123-72-8	Butyraldehyde
123-73-9	Crotonaldehyde
50-00-0	Formaldehyde
66-25-1	Hexaldehyde
590-86-3	Isovaleraldehyde
620-23-5	m-Tolualdehyde
529-20-4	o-Tolualdehyde
123-38-6	Propionaldehyde
104-87-0	p-Tolualdehyde
110-62-3	Valeraldehyde

Table 3. Polycyclic aromatic hydrocarbon (PAH) analytes.

PAHs			
CASRN	***Analyte***	***CASRN***	***Analyte***
83-32-9	Acenaphthene	53-70-3	Dibenzo(a,h)anthracene
208-96-8	Acenaphthylene	132-64-9	Dibenzofuran
120-12-7	Anthracene	132-65-0	Dibenzothiophene
56-55-3	Benzo(a)anthracene	206-44-0	Fluoranthene
50-32-8	Benzo(a)pyrene	86-73-7	Fluorene
205-99-2	Benzo(b)fluoranthene	193-39-5	Indeno(1,2,3-cd)pyrene
192-97-2	Benzo(e)pyrene	198-55-0	Perylene
191-24-2	Benzo(g,h,i)perylene	85-01-8	Phenanthrene
207-08-9	Benzo(k)fluoranthene	129-00-0	Pyrene
218-01-9	Chrysene	91-20-3	Naphthalene
191-07-1	Coronene		

Table 4. Volatile organic compound (VOC) analytes.

VOCs			
CASRN	***Analyte***	***CASRN***	***Analyte***
71-55-6	1,1,1-Trichloroethane	74-83-9	Bromomethane
79-34-5	1,1,2,2-Tetrachloroethane	75-15-0	Carbon disulfide
79-00-5	1,1,2-Trichloroethane	56-23-5	Carbon tetrachloride
75-34-3	1,1-Dichloroethane	108-90-7	Chlorobenzene
75-35-4	1,1-Dichloroethylene	75-00-3	Chloroethane

120-82-1	1,2,4-Trichlorobenzene	67-66-3	Chloroform
95-63-6	1,2,4-Trimethylbenzene	74-87-3	Chloromethane
106-93-4	1,2-Dibromoethane (EDB)	156-59-2	cis-1,2-Dichloroethene
95-50-1	1,2-Dichlorobenzene	10061-01-5	cis-1,3-Dichloropropene
107-06-2	1,2-Dichloroethane (EDC)	110-82-7	Cyclohexane
78-87-5	1,2-Dichloropropane	124-48-1	Dibromochloromethane
95-47-6	1,2-Dimethylbenzene	75-71-8	Dichlorodifluoromethane (Freon 12)
108-67-8	1,3,5-Trimethylbenzene	76-14-2	Dichlorotetrafluoroethane (Freon 114)
106-99-0	1,3-Butadiene	100-41-4	Ethylbenzene
541-73-1	1,3-Dichlorobenzene	87-68-3	Hexachloro-1,3-butadiene
106-46-7	1,4-Dichlorobenzene	67-63-0	Isopropanol
108-38-3	1,4-Dimethylbenzene + 1,3-Dimethylbenzene	1634-04-4	Methyl tert-butyl ether (MTBE)
123-91-1	1,4-Dioxane	75-09-2	Methylene chloride
78-93-3	2-Butanone (MEK)	80-62-6	Methylmethacrylate
126-99-8	2-Chloro-1,3-butadiene	142-82-5	n-Heptane
591-78-6	2-Hexanone	110-54-3	n-Hexane
622-96-8	4-Ethyltoluene	100-42-5	Styrene
108-10-1	4-Methyl-2-pentanone (MIBK)	127-18-4	Tetrachloroethylene
67-64-1	Acetone	109-99-9	Tetrahydrofuran
75-05-8	Acetonitrile	108-88-3	Toluene
107-02-8	Acrolein	156-60-5	trans-1,2-Dichloroethene
107-13-1	Acrylonitrile	10061-02-6	trans-1,3-Dichloropropene
71-43-2	Benzene	79-01-6	Trichloroethylene
100-44-7	Benzyl chloride	75-69-4	Trichlorofluoromethane (Freon 11)
75-27-4	Bromodichloromethane	76-13-1	Trichlotrifluoroethane (freon 113)
75-25-2	Bromoform	75-01-4	Vinyl chloride

3.2 Field Sampling Schedule

DEQ uses five individual instruments to sample all air toxics. Carbonyls, PAHs, PM10[1] metals and hexavalent chromium are sampled by drawing air through a filter at a constant flow rate for a duration of 24 hours. VOCs are sampled by drawing air into a collection canister, also at a constant flow rate for 24 hours. Generally, samples are collected every six days according to the NATTS program sampling schedule. In some cases, sampling may deviate from this schedule by collecting samples more frequently, or by collecting make-up samples if there was a problem with a regularly scheduled sample.

3.3 Field Sampling and Laboratory Analytical Methods

DEQ staff perform sampling activities in accordance with DEQ's Air Toxics Monitoring Quality Assurance Project Plan and EPA's Technical Assistance Document for the National Air Toxics Trends Station Program (NATTS TAD). Laboratory analyses are performed at the DEQ

[1] *Inhalable particulate matter with diameters of 10 micrometers and smaller.*

Laboratory following methods outlined in the NATTS TAD. Table 5 lists the sampling media, equipment and reference method followed for each sample type.

Table 5. Description of the sampling media, equipment and laboratory analytical reference method used to collect samples and obtain results for each analyte group.

Sample Type	*Sample Media*	*Sample Equipment*	*Laboratory Analytical Reference Method*
PM10 Metals	PM10 Quartz Filter	Tisch PM10 High-Volume Air Sampler	EPA Compendium Method IO-3.5
Hexavalent Chromium	Ashless Cellulose Filter	BGI PQ200 / ARA N-FRM	Determination of Hexavalent Chromium in Ambient Air Analyzed By Ion Chromatography (IC) (CARB MLD-039)
VOCs	6L Silanized Canister	Restech Nutech 2701 Sampling Timer	EPA Compendium Method TO-15
PAHs	PUF/XAD Assembly	Tisch PUF Sampler	ASTM D6209-98(2012)
Carbonyls	DNPH-coated Silica Gel Cartridge	DEQ Laboratory Custom Sampler / ARA N-FRM	EPA Compendium Method TO-11A

3.4 Air Toxics Monitoring Sites

This report summarizes data from nine air toxics monitoring sites around the state (Figure 1). The four monitoring sites in the Portland-metro area are Cully Neighborhood at Helensview School (Cully), Tualatin near Interstate 5 (Tualatin), Hillsboro Hare Field (Hillsboro) and the Portland NATTS site. The sites outside the Portland-metro area include Bend, Eugene at Amazon Park (EAP), Eugene at Highway 99 (E99), Medford and the La Grande NATTS site (Site List).

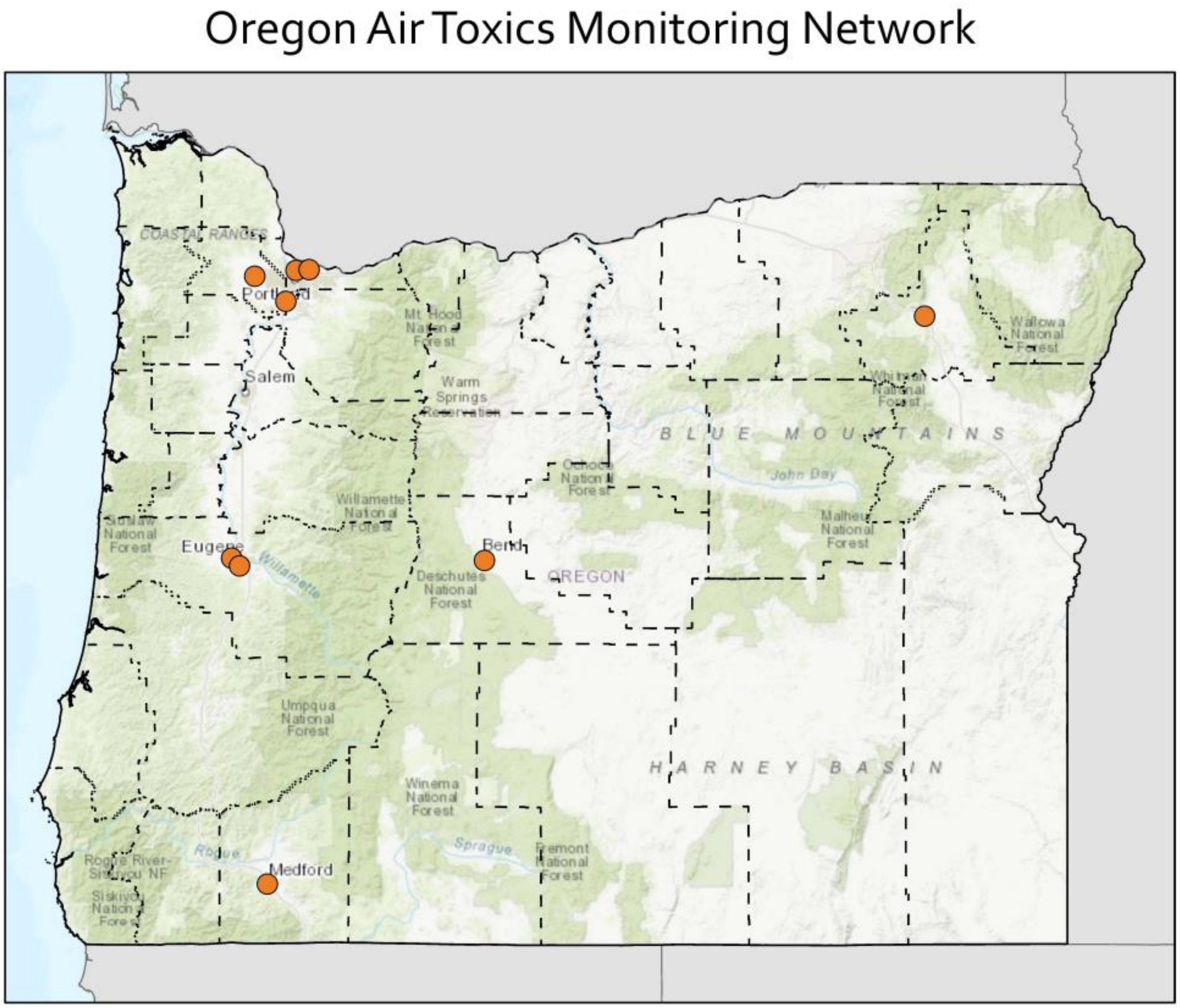

Figure 1. Air toxics monitoring site locations.

3.4.1 Site Selection Criteria

DEQ selects air toxics monitoring locations based on several criteria and depending on the objectives of the network type. Site specific siting criteria and guidance are provided in the NATTS TAD and DEQ applies this guidance towards all air toxics monitoring stations outside of the NATTS network. More information about how DEQ prioritizes sites for the placement of annual air toxics monitoring can be found in the standard operating procedure document "Statewide Prioritization of Air Toxics Monitoring."

3.4.2 Site List and Descriptions

This section lists the individual sites and provides a general description of each location. Table 6 provides a list of each site, the start of the data reporting period for this summary, site type and the current status of the site.

Table 6. List of sites included in this summary report.

Site Name	Location/ City	Site Type	Current Status
Portland Cully Helensview	Portland	Oregon Trend	Active
Portland NATTS	Portland	EPA NATTS	Active
La Grande NATTS	La Grande	EPA NATTS	Active
Medford Welch & Jackson	Medford	Oregon Trend	Active
Eugene Hwy 99	Eugene	Oregon Trend	Active
Eugene Amazon Park	Eugene	Annual Rotating	Moved Location
Bend 8th & Emerson	Bend	Oregon Trend	Active
Tualatin Bradbury Court	Tualatin	Oregon Trend	Active
Hillsboro Hare Field	Hillsboro	Oregon Trend	Active

Portland Cully Helensview

This site is located at the Helensview School in the northeast Portland Cully neighborhood (Figures 2-3). It was initially selected as a rotating annual site where one year of data would be collected. However, this station now remains as a long-term trend site. Air toxics sampling began in May 2018.

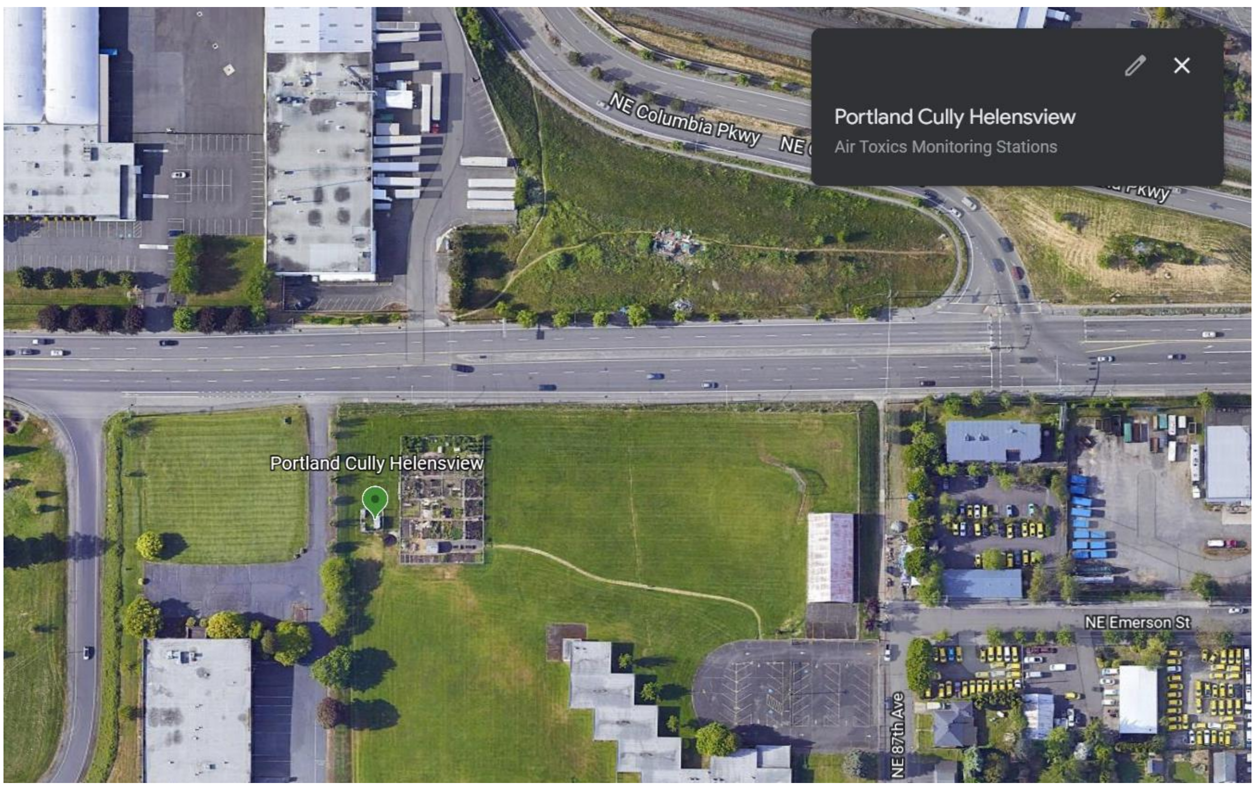

Figure 2. Location of Portland Cully Helensview air toxics monitoring site.

Figure 3. Photo of the Portland Cully Helensview air toxics monitoring site.

Portland NATTS

DEQ has operated an air toxics monitoring site in Portland as part of EPA's NATTS program since 2004 to help the program assess exposures to HAPs in urban areas (Figures 4-5). Prior to its current location, this site was located approximately 0.7 miles to the northeast, near the intersection of N. Roselawn Street and N. Vancouver Avenue. Due to the construction impacts of a multi-unit housing complex being built on an adjacent property, the site no longer met the siting criteria of the NATTS program and therefore was moved to its current location at the Humboldt School. Results from samples collected at the previous location from May 2015 to August 2016 were qualified to note the construction impacts. No samples were collected at this site from August 2016 until March 2017 when sampling began at the current location. The Portland NATTS site also contains duplicate samplers for each sample type which helps to provide quality assurance for all air toxics monitoring data.

Figure 4. Location of Portland NATTS air toxics monitoring site.

Figure 5. Photo of the Portland NATTS air toxics monitoring site.

La Grande NATTS

Along with the urban NATTS site located in Portland, DEQ has also operated a rural air toxics monitoring site in La Grande since 2004, as part of EPA's NATTS program in order to compare exposures to HAPs between urban and rural areas across the United States (Figures 6-7). This is the most rural air toxics monitoring location presented in this report.

Figure 6. Location of the La Grande NATTS air toxics monitoring site.

Figure 7. Photo of the La Grande NATTS air toxics monitoring site.

Medford Welch & Jackson

This site is located on Welch St. near its intersection with W. Jackson St. in northwest Medford (Figures 8-9). It is in an area next to small businesses and residential homes and is approximately half a mile west of Interstate 5. This site was selected partly due to the topography of the surrounding area. Medford has a unique airshed that can see smoke impacts from wildfires and thermal inversions. The air toxics data gathered during those events can be useful to understanding their impacts. The Medford site began air toxics sampling in October 2018.

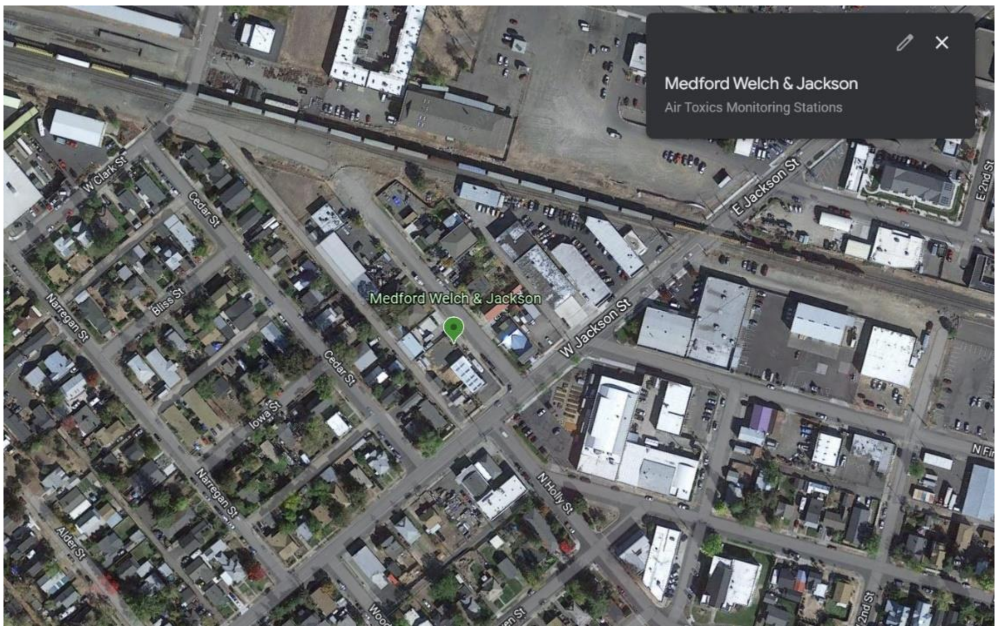

Figure 8. Location of the Medford Welch & Jackson air toxics monitoring site.

Figure 9. Photo of the Medford Welch & Jackson Air Toxics Monitoring Site.

Eugene Highway 99

This site is located near state Highway 99 in Eugene (Figures 10-11). A residential neighborhood lies to the west and Highway 99 to the east. Sampling at the Eugene site began in April 2018 and continues to supplement urban air toxic data.

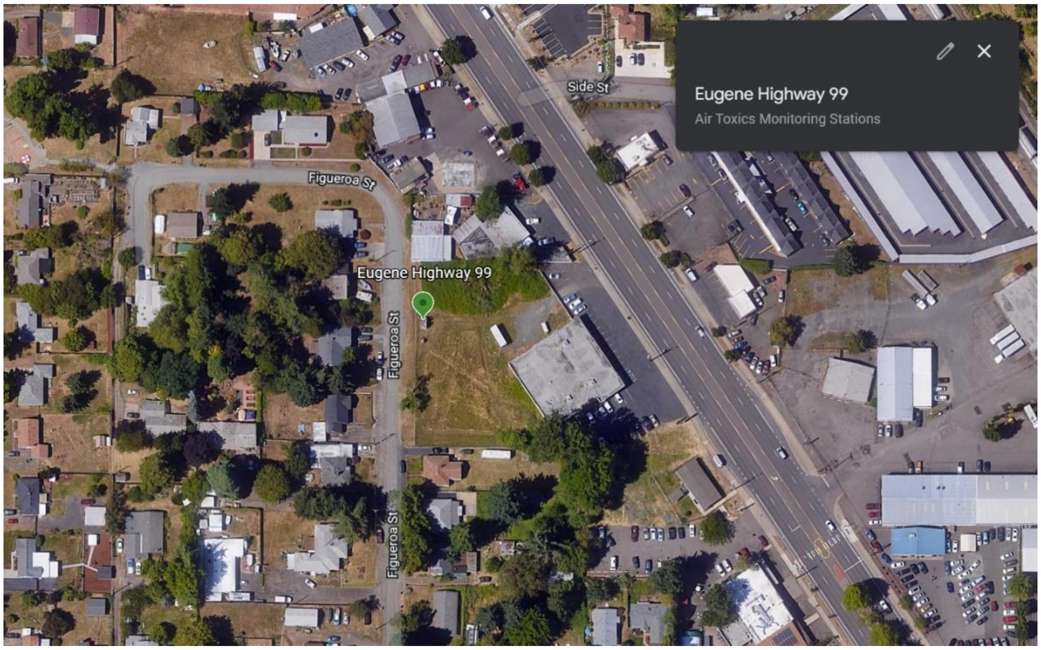

Figure 10. Location of the Eugene Highway 99 Air Toxics Monitoring Site.

Figure 11. Photo of the Eugene 99 Highway Air Toxics Monitoring Site.

Eugene Amazon Park

This site is located inside Amazon Park near E. 29th Ave in Eugene (Figures 12-13). It was established as an annual rotating site in 2019. Due to limited resources, the site was not relocated and continued to operate until June 2022. Amazon Park is in south Eugene with numerous recreation opportunities, community centers and natural areas. Air toxics sampling began in April 2018.

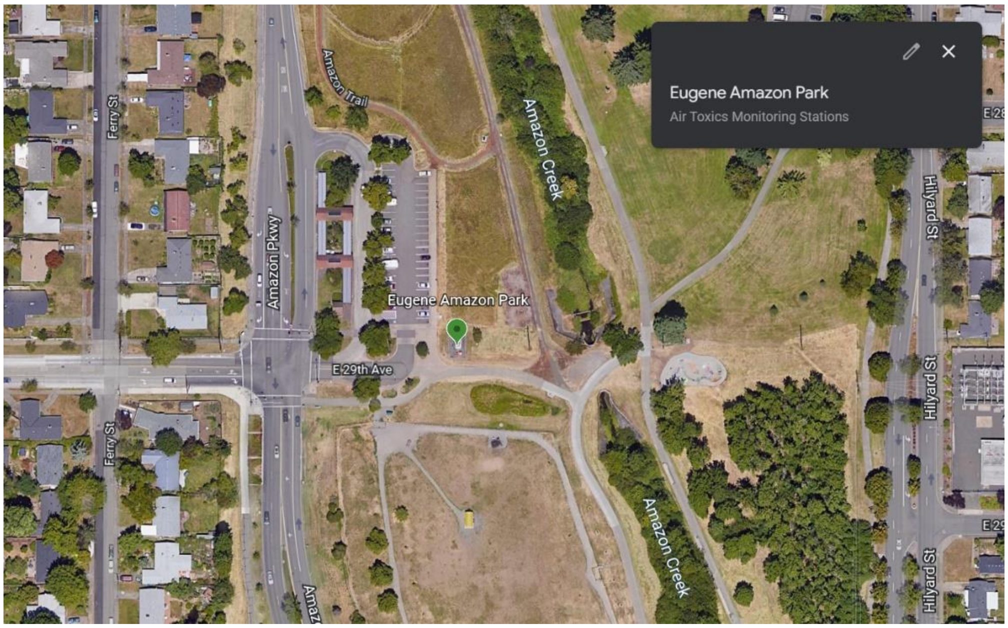

Figure 12. Location of the Eugene Amazon Park Air Toxics Monitoring Site.

Figure 13. Photo of the Eugene Amazon Park Air Toxics Monitoring Site.

Bend 8th & Emerson

The Bend site is located at Bend Senior High School, east of State Route 97 and south of State Route 20 (Figure 15-16). This site has the highest elevation of any air toxics monitoring site in this report, at 1114 meters. Air toxics sampling began in August 2020.

Figure 14. Location of the Bend 8th & Emerson Air Toxics Monitoring Site.

Figure 15. Photo of the Bend 8th & Emerson Air Toxics Monitoring Site.

Tualatin Bradbury Court

Also referred to as the Near Road site, Tualatin Bradbury Court is located a few meters from the Interstate 5 corridor in Tualatin (Figures 16-17). This site was selected for its proximity to one of the most heavily trafficked roadways in all of Oregon. Data from this site is useful to understanding the air quality impacts of on-road vehicles. Air toxics sampling began in March 2019.

Figure 16. Location of the Tualatin Bradbury Court Air Toxics Monitoring Site.

Figure 17. Photo of Tualatin Bradbury Court Air Toxics Monitoring Site.

Hillsboro Hare Field

This site is located at Hare Field in Hillsboro (Figures 18-19). Owned by the Hillsboro School District, Hare Field includes a baseball stadium, a football stadium, practice fields and track and field equipment. The venue hosts high school sports, open track meets and youth sports. Air toxics sampling began in January 2019.

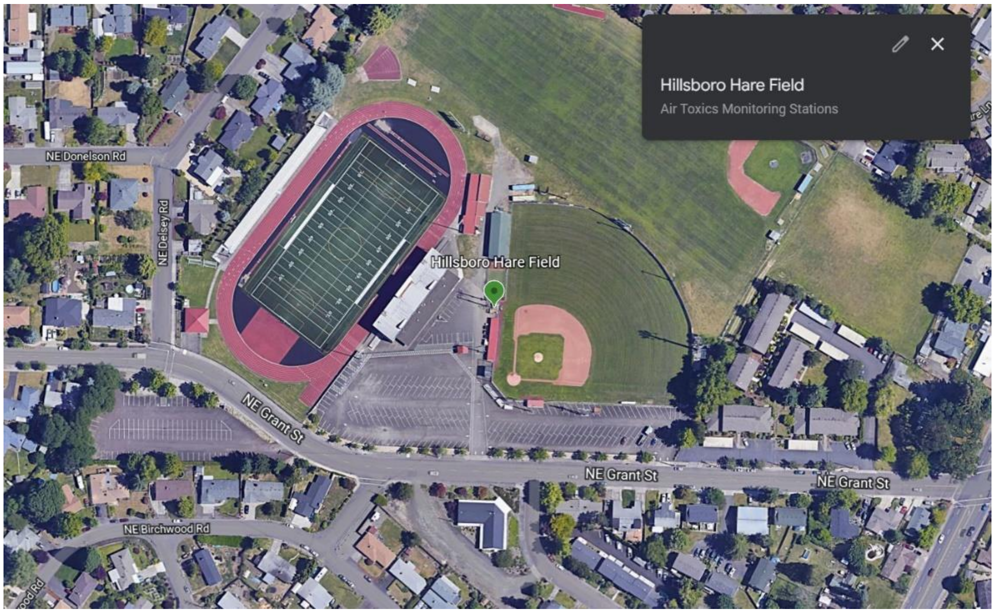

Figure 18. Location of Hillsboro Hare Field Air Toxics Monitoring Site.

Figure 19. Photo of Hillsboro Hare Field Air Toxics Monitoring Site.

4. Data Summary

4.1 Data Completeness

Completeness is measured as the number of valid samples divided by the number of expected samples for a given time. The minimum quality objective for the Air Toxics Monitoring program is to achieve a data completeness of greater than or equal to 85% for a given quarter. Completeness was calculated for each sample type by using the number of valid samples from a single analyte to represent the number of valid samples for the entire analyte group (Table 7. Annual data completeness for each sample type at each site relative to the initial start date. Some percentages may exceed 100% due to the collection of additional make-up samples throughout the year.Table 7). The representative analytes were chosen because they are rarely voided during sample analysis. Complete datasets of evenly distributed air samples throughout the year are needed to remove bias and calculate annual average concentrations for ambient air.

Due to robust quality assurance plans and standard operating procedures that exist for field and laboratory methods, samples may be voided at various stages of the sample collection and analysis process. Common reasons for a sample to be voided include, but are not limited to, power failures at the monitoring site, sampling instrument malfunction, issues with sample extraction in the laboratory, or due to laboratory instrument performance criteria not being met during analysis. When a sample is voided during the sample collection process, it is standard operating procedure to collect a make-up sample as soon as possible, however make-up samples may occur several days or weeks after the original sample failed. For this reason, completeness is reported for the year to evaluate the sampling effort over the course of the year. In addition to individual samples being voided, there are times when instruments malfunction and samples can't be collected until the sampler is repaired. This may lead to several missed sample dates in the sampling calendar. In particular, over this reporting period challenges with sampling and analytical instrument performance limited DEQ's ability to collect valid VOC data.

Table 7. Annual data completeness for each sample type at each site relative to the initial start date. Some percentages may exceed 100% due to the collection of additional make-up samples throughout the year.

Year	*Project*	*Sample Type*	*Start Date*	*End Date*	*# of Samples*	*Expected Samples*	*Annual % Completeness*
2019	Medford Welch and Jackson	Carbonyls	2/20/2019	12/29/2019	42	53	79%
2019	Medford Welch and Jackson	Metals	1/3/2019	12/29/2019	59	61	97%
2019	Medford Welch and Jackson	Cr6+	1/3/2019	12/29/2019	50	61	82%
2019	Medford Welch and Jackson	PAHs	1/3/2019	12/29/2019	46	61	75%
2019	Medford Welch and Jackson	VOCs	3/10/2019	12/29/2019	35	50	70%
2019	Eugene Hwy 99	Carbonyls	1/3/2019	12/29/2019	56	61	92%

Year	Project	Sample Type	Start Date	End Date	# of Samples	Expected Samples	Annual % Completeness
2019	Eugene Hwy 99	Metals	1/3/2019	12/29/2019	59	61	97%
2019	Eugene Hwy 99	Cr6+	1/3/2019	12/29/2019	52	61	85%
2019	Eugene Hwy 99	PAHs	1/3/2019	12/29/2019	58	61	95%
2019	Eugene Hwy 99	VOCs	--	--	0	61	0%
2019	Eugene Amazon Park	Carbonyls	1/3/2019	12/29/2019	53	61	87%
2019	Eugene Amazon Park	Metals	1/3/2019	12/29/2019	59	61	97%
2019	Eugene Amazon Park	Cr6+	1/3/2019	12/29/2019	53	61	87%
2019	Eugene Amazon Park	PAHs	1/3/2019	12/29/2019	58	61	95%
2019	Eugene Amazon Park	VOCs	--	--	0	61	0%
2019	Portland Humboldt School	Carbonyls	1/3/2019	12/29/2019	59	61	97%
2019	Portland Humboldt School	Metals	1/3/2019	12/29/2019	61	61	100%
2019	Portland Humboldt School	Cr6+	1/3/2019	12/29/2019	58	61	95%
2019	Portland Humboldt School	PAHs	1/3/2019	12/29/2019	60	61	98%
2019	Portland Humboldt School	VOCs	1/3/2019	12/29/2019	59	61	97%
2019	Portland Cully Helensview	Carbonyls	1/3/2019	12/29/2019	54	61	89%
2019	Portland Cully Helensview	Metals	1/3/2019	12/29/2019	60	61	98%
2019	Portland Cully Helensview	Cr6+	1/3/2019	12/29/2019	56	61	92%
2019	Portland Cully Helensview	PAHs	1/3/2019	12/29/2019	58	61	95%
2019	Portland Cully Helensview	VOCs	1/3/2019	12/29/2019	56	61	92%
2019	La Grande Hall and N	Carbonyls	1/3/2019	12/29/2019	47	61	77%
2019	La Grande Hall and N	Metals	1/3/2019	12/29/2019	61	61	100%
2019	La Grande Hall and N	PAHs	1/3/2019	12/29/2019	49	61	80%
2019	La Grande Hall and N	VOCs	1/3/2019	12/29/2019	41	61	67%
2019	Hillsboro Hare Field	Carbonyls	2/20/2019	12/29/2019	29	53	55%
2019	Hillsboro Hare Field	Metals	1/27/2019	12/29/2019	57	57	100%
2019	Hillsboro Hare Field	Cr6+	1/27/2019	12/29/2019	51	57	89%
2019	Hillsboro Hare Field	PAHs	1/27/2019	12/29/2019	57	57	100%
2019	Hillsboro Hare Field	VOCs	--	--	0	61	0%
2019	Tualatin Bradbury Court	Carbonyls	6/2/2019	12/29/2019	31	36	86%
2019	Tualatin Bradbury Court	Metals	3/16/2019	12/29/2019	50	49	102%
2019	Tualatin Bradbury Court	Cr6+	3/16/2019	12/29/2019	46	49	94%
2019	Tualatin Bradbury Court	PAHs	3/16/2019	12/29/2019	47	49	96%
2019	Tualatin Bradbury Court	VOCs	--	--	0	61	0%
2020	Bend 8th & Emerson	Carbonyls	8/7/2020	12/29/2020	23	24	96%
2020	Bend 8th & Emerson	Metals	8/7/2020	12/29/2020	24	24	100%
2020	Bend 8th & Emerson	Cr6+	8/7/2020	12/29/2020	17	24	71%
2020	Bend 8th & Emerson	PAHs	8/13/2020	12/29/2020	24	23	104%
2020	Bend 8th & Emerson	VOCs	--	--	0	61	0%
2020	Medford Welch and Jackson	Carbonyls	1/4/2020	12/29/2020	57	61	93%
2020	Medford Welch and Jackson	Metals	1/4/2020	12/29/2020	60	61	98%
2020	Medford Welch and Jackson	Cr6+	1/4/2020	12/29/2020	58	61	95%

Year	Project	Sample Type	Start Date	End Date	# of Samples	Expected Samples	Annual % Completeness
2020	Medford Welch and Jackson	PAHs	1/4/2020	12/29/2020	57	61	93%
2020	Medford Welch and Jackson	VOCs	1/4/2020	12/29/2020	50	61	82%
2020	Eugene Hwy 99	Carbonyls	1/4/2020	12/29/2020	59	61	97%
2020	Eugene Hwy 99	Metals	1/4/2020	12/29/2020	61	61	100%
2020	Eugene Hwy 99	Cr6+	1/4/2020	12/17/2020	57	61	93%
2020	Eugene Hwy 99	PAHs	1/4/2020	12/29/2020	60	61	98%
2020	Eugene Hwy 99	VOCs	1/16/2020	12/29/2020	54	59	92%
2020	Eugene Amazon Park	Carbonyls	1/4/2020	12/29/2020	58	61	95%
2020	Eugene Amazon Park	Metals	1/4/2020	12/29/2020	60	61	98%
2020	Eugene Amazon Park	Cr6+	1/4/2020	12/29/2020	61	61	100%
2020	Eugene Amazon Park	PAHs	1/4/2020	12/29/2020	59	61	97%
2020	Eugene Amazon Park	VOCs	--	--	0	61	0%
2020	Portland Humboldt School	Carbonyls	1/4/2020	12/29/2020	58	61	95%
2020	Portland Humboldt School	Metals	1/4/2020	12/29/2020	60	61	98%
2020	Portland Humboldt School	Cr6+	1/4/2020	12/29/2020	60	61	98%
2020	Portland Humboldt School	PAHs	1/4/2020	12/29/2020	61	61	100%
2020	Portland Humboldt School	VOCs	1/4/2020	12/29/2020	56	61	92%
2020	Portland Cully Helensview	Carbonyls	1/4/2020	12/29/2020	61	61	100%
2020	Portland Cully Helensview	Metals	1/4/2020	12/29/2020	61	61	100%
2020	Portland Cully Helensview	Cr6+	1/4/2020	12/29/2020	60	61	98%
2020	Portland Cully Helensview	PAHs	1/4/2020	12/29/2020	59	61	97%
2020	Portland Cully Helensview	VOCs	1/4/2020	12/29/2020	59	61	97%
2020	La Grande Hall and N	Carbonyls	1/4/2020	12/29/2020	60	61	98%
2020	La Grande Hall and N	Metals	1/4/2020	12/29/2020	61	61	100%
2020	La Grande Hall and N	PAHs	1/4/2020	12/29/2020	61	61	100%
2020	La Grande Hall and N	VOCs	1/4/2020	12/29/2020	58	61	95%
2020	Hillsboro Hare Field	Carbonyls	1/4/2020	12/29/2020	50	61	82%
2020	Hillsboro Hare Field	Metals	1/4/2020	12/29/2020	60	61	98%
2020	Hillsboro Hare Field	Cr6+	1/4/2020	12/29/2020	60	61	98%
2020	Hillsboro Hare Field	PAHs	1/4/2020	12/29/2020	59	61	97%
2020	Hillsboro Hare Field	VOCs	--	--	0	61	0%
2020	Tualatin Bradbury Court	Carbonyls	1/4/2020	12/30/2020	57	61	93%
2020	Tualatin Bradbury Court	Metals	1/4/2020	12/30/2020	60	61	98%
2020	Tualatin Bradbury Court	Cr6+	1/1/2020	12/30/2020	56	61	92%
2020	Tualatin Bradbury Court	PAHs	1/4/2020	12/30/2020	60	61	98%
2020	Tualatin Bradbury Court	VOCs	--	--	0	61	0%
2021	Bend 8th & Emerson	Carbonyls	1/4/2021	12/30/2021	55	61	90%
2021	Bend 8th & Emerson	Metals	1/4/2021	12/30/2021	59	61	97%
2021	Bend 8th & Emerson	Cr6+	1/4/2021	12/30/2021	60	61	98%
2021	Bend 8th & Emerson	PAHs	1/4/2021	12/30/2021	59	61	97%
2021	Bend 8th & Emerson	VOCs	--	--	0	61	0%

Year	Project	Sample Type	Start Date	End Date	# of Samples	Expected Samples	Annual % Completeness
2021	Medford Welch and Jackson	Carbonyls	1/4/2021	12/30/2021	53	61	87%
2021	Medford Welch and Jackson	Metals	1/4/2021	12/30/2021	57	61	93%
2021	Medford Welch and Jackson	Cr6+	1/4/2021	12/30/2021	51	61	84%
2021	Medford Welch and Jackson	PAHs	1/4/2021	12/30/2021	57	61	93%
2021	Medford Welch and Jackson	VOCs	1/4/2021	12/30/2021	26	61	43%
2021	Eugene Hwy 99	Carbonyls	1/4/2021	12/30/2021	56	61	92%
2021	Eugene Hwy 99	Metals	1/4/2021	12/30/2021	59	61	97%
2021	Eugene Hwy 99	Cr6+	1/4/2021	12/30/2021	60	61	98%
2021	Eugene Hwy 99	PAHs	1/4/2021	12/30/2021	57	61	93%
2021	Eugene Hwy 99	VOCs	1/4/2021	12/30/2021	51	61	84%
2021	Eugene Amazon Park	Carbonyls	1/4/2021	12/30/2021	54	61	89%
2021	Eugene Amazon Park	Metals	1/4/2021	12/30/2021	59	61	97%
2021	Eugene Amazon Park	Cr6+	1/4/2021	12/30/2021	59	61	97%
2021	Eugene Amazon Park	PAHs	1/4/2021	12/30/2021	59	61	97%
2021	Eugene Amazon Park	VOCs	--	--	0	61	0%
2021	Portland Humboldt School	Carbonyls	1/4/2021	12/30/2021	62	61	102%
2021	Portland Humboldt School	Metals	1/4/2021	12/30/2021	61	61	100%
2021	Portland Humboldt School	Cr6+	1/4/2021	12/30/2021	60	61	98%
2021	Portland Humboldt School	PAHs	1/4/2021	12/30/2021	63	61	103%
2021	Portland Humboldt School	VOCs	1/4/2021	12/30/2021	61	61	100%
2021	Portland Cully Helensview	Carbonyls	1/4/2021	12/30/2021	54	61	89%
2021	Portland Cully Helensview	Metals	1/4/2021	12/30/2021	59	61	97%
2021	Portland Cully Helensview	Cr6+	1/4/2021	12/30/2021	57	61	93%
2021	Portland Cully Helensview	PAHs	1/4/2021	12/30/2021	57	61	93%
2021	Portland Cully Helensview	VOCs	1/4/2021	12/30/2021	36	61	59%
2021	La Grande Hall and N	Carbonyls	1/4/2021	12/30/2021	57	61	93%
2021	La Grande Hall and N	Metals	1/4/2021	12/30/2021	58	61	95%
2021	La Grande Hall and N	PAHs	1/4/2021	12/30/2021	59	61	97%
2021	La Grande Hall and N	VOCs	1/4/2021	12/30/2021	54	61	89%
2021	Hillsboro Hare Field	Carbonyls	1/4/2021	12/30/2021	59	61	97%
2021	Hillsboro Hare Field	Metals	1/4/2021	12/30/2021	60	61	98%
2021	Hillsboro Hare Field	Cr6+	1/4/2021	12/30/2021	60	61	98%
2021	Hillsboro Hare Field	PAHs	1/4/2021	12/30/2021	60	61	98%
2021	Hillsboro Hare Field	VOCs	--	--	0	61	0%
2021	Tualatin Bradbury Court	Carbonyls	1/4/2021	12/30/2021	57	61	93%
2021	Tualatin Bradbury Court	Metals	1/4/2021	12/30/2021	60	61	98%
2021	Tualatin Bradbury Court	Cr6+	1/4/2021	12/30/2021	60	61	98%
2021	Tualatin Bradbury Court	PAHs	1/4/2021	12/30/2021	60	61	98%
2021	Tualatin Bradbury Court	VOCs	--	--	0	61	0%

4.2 Air Toxics Concentrations and Comparisons

4.2.1 Ambient Benchmark Concentrations (ABCs)

Oregon's air toxics ABCs help DEQ identify, evaluate and address air toxics concerns. For air toxics with the potential to increase cancer risk, DEQ sets ABCs at levels that would not pose more than one-in-a-million excess lifetime cancer risk if a person breathed air with that level every day for an entire lifetime. For air toxics that have the potential to cause health effects other than cancer, DEQ sets ABCs at concentrations that would not be expected to harm anyone's health even if they breathed that air every day for a lifetime. ABCs are based on federal and state authoritative sources, including the U.S. Environmental Protection Agency (EPA), U.S. Agency for Toxic Substances and Disease Registry (ATSDR) and California EPA. DEQ uses values from these agencies because they conduct comprehensive reviews of all available toxicology data on a chemical. Every three years, DEQ reviews all the authoritative sources to see if updates to ABCs are needed based on the current science.

The ABCs are designed to protect the health of the most sensitive individuals in our communities and serve as clean air targets, not regulatory standards. There are different ABCs for the type of health effect (noncancer or cancer) and whether exposure is for a long or short period of time (chronic or acute). Chronic ABCs for cancer and noncancer health effects are intended to be compared against concentrations of pollutants averaged over the course of a year (i.e., the average annual concentration). Table 8 lists the air toxics measured in this report that have ABC values. Not all air toxics have ABCs developed for their individual risks to human health.

Table 8. Air toxics listed with associated ABC values for chronic cancer risk, chronic noncancer risk and acute noncancer risk.

CASRN	Chemical Name	Chronic Cancer ABC (µg/m3)	Chronic Noncancer ABC (µg/m3)	Acute Noncancer ABC (µg/m3)
75-07-0	Acetaldehyde	0.45	140	470
67-64-1	Acetone		31,000	62,000
75-05-8	Acetonitrile		60	
107-02-8	Acrolein		0.35	6.9
7440-36-0	Antimony		0.3	1.0
107-13-1	Acrylonitrile	0.015	5	220
7440-38-2	Arsenic	0.00023	0.015	0.20
71-43-2	Benzene	0.13	3.0	29
100-44-7	Benzyl chloride	0.020	1.0	240
7440-41-7	Beryllium	0.00042	0.0070	0.020
75-25-2	Bromoform	0.91		
74-83-9	Bromomethane		5.0	3,900
106-99-0	1,3-Butadiene	0.033	2.0	660
78-93-3	2-Butanone		5,000	5,000

CASRN	Chemical Name	Chronic Cancer ABC (µg/m3)	Chronic Noncancer ABC (µg/m3)	Acute Noncancer ABC (µg/m3)
7440-43-9	**Cadmium**	**0.00056**	**0.010**	**0.030**
56-23-5	**Carbon tetrachloride**	**0.17**	**100**	**1.900**
108-90-7	**Chlorobenzene**		**50**	
75-00-3	**Chloroethane**		**30,000**	**40,000**
74-87-3	**Chloromethane**		**90**	**1,000**
126-99-8	**2-Chloro-1,3-butadiene**	**0.0033**	**20**	
18540-29-9	**Hexavalent Chromium [Cr(VI)]**	**8.3E-05**	**0.20**	**0.30**
67-66-3	**Chloroform**		**300**	**490**
7440-48-4	**Cobalt**		**0.10**	
110-82-7	**Cyclohexane**		**6,000**	
106-46-7	**1,4-Dichlorobenzene**	**0.091**	**60**	**12,000**
75-34-3	**1,1-Dichloroethane**	**0.63**		
156-60-5	**trans-1,2-Dichloroethene**			**790**
75-09-2	**Methylene chloride**	**100**	**600**	**2,100**
78-87-5	**1,2-Dichloropropane**		**4.0**	**230**
123-91-1	**1,4-Dioxane**	**0.20**	**30**	**7,200**
100-41-4	**Ethylbenzene**	**0.40**	**260**	**22,000**
106-93-4	**1,2-Dibromoethane (EDB)**	**0.0017**	**9.0**	
107-06-2	**1,2-Dichloroethane (EDC)**	**0.038**	**7.0**	
50-00-0	**Formaldehyde**	**0.17**	**9.0**	**49**
87-68-3	**Hexachloro-1,3-butadiene**	**0.045**		
110-54-3	**n-Hexane**		**700**	
67-63-0	**Isopropanol**		**200**	**3,200**
7439-92-1	**Lead, Total**		**0.15**	**0.15**
7439-96-5	**Manganese, Total**		**0.090**	**0.30**
108-10-1	**4-Methyl-2-pentanone (MIBK)**		**3,000**	
80-62-6	**Methylmethacrylate**		**700**	
1634-04-4	**Methyl tert-butyl ether (MTBE)**	**3.8**	**8,000**	**8,000**
91-20-3	**Naphthalene**	**0.029**	**3.7**	**200**
7440-02-0	**Nickel**	**0.0038**	**0.014**	**0.2**
56-55-3	**Benzo(a)anthracene**	**0.0083**		
50-32-8	**Benzo(a)pyrene**	**0.0017**	**0.0020**	**0.0020**
205-99-2	**Benzo(b)fluoranthene**	**0.0021**		
191-24-2	**Benzo(g,h,i)perylene**	**0.19**		
207-08-9	**Benzo(k)fluoranthene**	**0.056**		
218-01-9	**Chrysene**	**0.017**		
53-70-3	**Dibenzo(a,h)anthracene**	**0.00017**		
206-44-0	**Fluoranthene**	**0.021**		
193-39-5	**Indeno(1,2,3-cd)pyrene**	**0.024**		
123-38-6	**Propionaldehyde**		**8.0**	
7782-49-2	**Selenium, Total**			**2.0**
100-42-5	**Styrene**		**1,000**	**21,000**

CASRN	Chemical Name	Chronic Cancer ABC (µg/m3)	Chronic Noncancer ABC (µg/m3)	Acute Noncancer ABC (µg/m3)
79-34-5	1,1,2,2-Tetrachloroethane	0.017		
127-18-4	Tetrachloroethylene	3.8	41	41
108-88-3	Toluene		5,000	7,500
71-55-6	1,1,1-Trichloroethane		5,000	11,000
79-00-5	1,1,2-Trichloroethane	0.063		
79-01-6	Trichloroethylene	0.24	2.1	2.1
95-63-6	1,2,4-Trimethylbenzene		60	
108-67-8	1,3,5-Trimethylbenzene		60	
75-01-4	Vinyl chloride	0.11	100	1,300
75-35-4	1,1-Dichloroethylene		200	200

4.2.2 Annual Averages Compared to Chronic Cancer ABCs

The following table compares the annual average at each site, for each pollutant, that is above its chronic cancer risk ABC. Acrolein is unique in this list as it is the only pollutant that is above its chronic noncancer ABC. Comparisons to ABC values allows DEQ to “level the playing field” for health risk assessment. Air toxics have different toxicity values and measuring them against their ABC value allows DEQ to compare their risks against each other. This allows DEQ to flag specific pollutants at locations for prioritization and further consideration. The following tables (Tables 9 – 11) round risk numbers to one significant digit to avoid implying a degree of precision that doesn’t exist.

Table 9. Pollutants with annual average concentrations above their chronic cancer risk ABC. The “excess cancer risk”, or the number of times over the ABC, is the probability of additional cancer cases in a population of a million. Values marked with an * indicate that either a partial year of sampling occurred, or the 85% completeness objective was not met and therefore the annual average used to calculate the impact factor may be biased. -- denotes values less than 1.0 for that year.

	2019	2020	2021
Bend 8th & Emerson			
Acetaldehyde	*	*5	4
Formaldehyde	*	*28	16
Naphthalene	*	*3	--
Eugene Amazon Park			
Acetaldehyde	2	3	2
Arsenic, Total	3	2	1
Formaldehyde	9	9	8
Naphthalene	2	2	--
Eugene Hwy 99			
1,3-Butadiene	--	4	*2

Acetaldehyde	3	4	3
Arsenic, Total	4	3	2
Benzene	--	11	5
Carbon tetrachloride	--	4	*4
1,2-Dichloroethane (EDC)	--	2	2
Ethylbenzene	--	2	--
Formaldehyde	9	10	9
Naphthalene	9	4	4
Hillsboro Hare Field			
Acetaldehyde	*2	*2	2
Arsenic, Total	4	4	3
Formaldehyde	*11	*9	9
Naphthalene	1	1	--
La Grande Hall and N			
1,3-Butadiene	*2	2	2
1,2-Dichloroethane (EDC)	2	2	2
Acetaldehyde	*3	4	3
Acrolein	--	1	--
Arsenic, Total	1	--	--
Benzene	*4	7	4
Carbon tetrachloride	*3	4	4
Formaldehyde	*14	14	15
Medford Welch and Jackson			
1,3-Butadiene	*3	*3	*3
1,2-Dichloroethane (EDC)	3	3	2
Acetaldehyde	*5	5	5
Arsenic, Total	2	2	2
Benzene	*6	*8	*8
Carbon tetrachloride	*3	*4	*4
Ethylbenzene	*1	*2	*1
Formaldehyde	*18	19	19
Naphthalene	*2	2	3
Portland Cully Helensview			
1,3-Butadiene	2	3	*2
1,2-Dichloroethane (EDC)	2	2	2
1,1,2-Trichloroethane	1	--	--
Acetaldehyde	2	3	2
Acrolein	--	1	--
Arsenic, Total	5	4	3
Benzene	4	9	*5

Carbon tetrachloride	3	4	*4
Ethylbenzene	2	1	--
Formaldehyde	9	10	10
Naphthalene	1	2	1
Portland Humboldt School			
1,3-Butadiene	2	3	2
1,2-Dichloroethane (EDC)	2	2	2
1,1,2-Trichloroethane	1	--	--
Acetaldehyde	2	3	2
Arsenic, Total	3	3	2
Benzene	4	9	5
Carbon tetrachloride	3	4	4
Formaldehyde	10	10	9
Naphthalene	1	1	1
Tualatin Bradbury Court			
Acetaldehyde	*2	3	3
Arsenic, Total	*4	3	2
Formaldehyde	*11	10	11
Naphthalene	*1	2	2[2]

Table 9 shows that several of the same pollutants were above their ABCs at most monitoring locations indicating that even though the levels vary between sites, the presence of these pollutants is widespread and not unique to individual communities. Examples are acetaldehyde, arsenic, benzene, formaldehyde and naphthalene. More information about the health effects of these pollutants can be found at EPA's Health Effects Notebook for Hazardous Air Pollutants.

There are several statistical methods that can be used to determine averages on environmental data with a certain percentage of non-detects or biases based on seasonality. To control for this and to develop mean concentrations that are more representative over a year, we decided to take quarterly averages and then average those four quarters for each year. For non-detect data we looked at what the minimum detection limit was for that pollutant and substituted half its value.

Several pollutants had mean concentrations that were above their ABC, however they are not reported where the datasets contain high percentages of non-detects (greater than 75%). For these pollutants, the analytical methods used do not have the precision to reliably detect these pollutants at such small concentrations. Because these pollutants are usually not detected during a sampling event, we can say they are not often found at levels that would pose a chronic health risk.

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[2] *Cancer risk values are rounded to 1 significant digit.*

4.2.3 National Averages

As Table 9 shows, several of the same pollutants are present at most sites around the state. To provide context about the levels of these pollutants, we compared them to pollutants at other air toxics monitoring sites around the US. The following table uses the annual averages of air toxics monitoring sites around the US in 2019 and 2020 and compares them to the chronic cancer risk ABC for that pollutant. This dataset uses approximately 91 sites in 66 cities of various sizes across the continental US. Data about monitoring sites outside of Oregon are provided by the EPA.

Table 10. "Excess Cancer Risk" for U.S. averages. This list provides context to the pollutants we commonly see above their chronic cancer risk ABC at sites in Oregon.

National Average	2019	2020
1,3-Butadiene	2	5
1,1,2-Trichloroethane	1	1
Acetaldehyde	4	4
Acrolein	2	2
Arsenic, Total	3	4
Benzene	6	7
Carbon tetrachloride	4	4
Ethylbenzene	1	1
Formaldehyde	16	16
Naphthalene	2	2

[3]

4.2.4 Cumulative Excess Cancer and Noncancer Health Risks

Most Oregonians would like to know what the risk to their health is from the air they breathe. State agencies evaluate cancer and noncancer health risks in different ways. A noncancer health effect is any kind of health effect other than cancer. Examples of noncancer health effects include (but are not limited to) breathing problems, heart problems, or damage to the immune or nervous systems. For both cancer and noncancer health effects, DEQ divided the annual average measured air concentration of each pollutant by the chronic cancer and chronic noncancer ambient benchmark concentration (ABC) for that chemical. DEQ then added those

[3] *Cancer risk values are rounded to 1 significant digit.*

ratios within a category meaning that they added up cancer ratios separately from the noncancer ratios. Those ratios represent different things for cancer risk and noncancer risk.

Cancer risk is expressed as a **probability** and can be thought of as additional cancer cases in a population. Table 12 expresses cancer risk as an estimated number of cancer cases per million people beyond the average cancer rate in society. Cancer risk from environmental exposure is considered in addition to the "background" risk of developing cancer over a lifetime. The American Cancer Society estimates that one in three women and one in two men will develop some type of cancer in their life. These background cancers are from a combination of all reasons, which includes genetics, lifestyle factors like tobacco use, and environmental exposures. So, on average about 400,000 people per million will get cancer at some point in their lifetime. This is called the background rate of cancer. The cancer risk numbers in Table 11 represent excess cancer risk in a million from continuously breathing the air that DEQ evaluated at these different monitoring locations in addition to the background cancer rate of 400,000 in a million. Excess lifetime cancer risk less than 100 in a million is generally considered low compared to the background rate of 400,000 in a million.

Noncancer risk is expressed as a hazard index. A hazard index of 1 or less means that scientists do not expect that anyone would have any noncancer health effects related to breathing that air, even if they breath it 24 hours a day, 7 days a week, for an entire lifetime. A hazard index above one does not necessarily mean that noncancer health effects are expected, but it does warrant a closer look. For more information about noncancer risk and hazard indices see this factsheet: https://www.oregon.gov/deq/FilterDocs/caononcancerfs.pdf. All of the locations monitored in Table 11, except Bend 8th & Emerson, Eugene Amazon Park, Hillsboro Hare Field and Tualatin Bradbury Court, had a hazard index of 2 or 3 during at least one monitoring year. These levels represent a hazard index greater than 1. However, they are typical of levels measured in urban environments around the country.

Not all sites are sampling for the full list of air toxics during certain periods. For example, Eugene Amazon Park was not sampling for VOCs in 2020 and therefore the health effects of these VOCs would not be included in the list for that site, during that year.

Table 12. The excess cancer risk and hazard index for air toxics found at monitoring sites around the state.

	2019	2020	2021
Bend 8th & Emerson			
Cancer Risk (chances in a million)	*	40	22
Hazard Index	*	1	1
Eugene Amazon Park			
Cancer Risk (chances in a million)	18	18	14
Hazard Index	1	1	1
Eugene Hwy 99			
Cancer Risk (chances in a million)	27	24	19
Hazard Index	1	1	2

Hillsboro Hare Field			
Cancer Risk (chances in a million)	20	18	15
Hazard Index	1	1	1
La Grande Hall and N			
Cancer Risk (chances in a million)	37	42	37
Hazard Index	2	3	2
Medford Welch and Jackson			
Cancer Risk (chances in a million)	50	55	51
Hazard Index	3	3	3
Portland Cully Helensview			
Cancer Risk (chances in a million)	39	43	36
Hazard Index	2	3	2
Portland Humboldt School			
Cancer Risk (chances in a million)	37	41	33
Hazard Index	2	3	2
Tualatin Bradbury Court			
Cancer Risk (chances in a million)	21	20	19
Hazard Index	1	1	1[4]

[4] *Cancer and health risk values are rounded to 1 significant digit.*

4.2.5 24-hour Samples Above Acute ABCs

For the air toxics in which Acute ABCs are available, there were 5 samples that had pollutant concentrations above their Acute ABC (Table 12).

Table 12. Pollutants with 24-hour concentrations that were above the Acute Ambient Benchmark Concentration (non-cancer).

Site	Sample Date	Analyte	Result (µg/m^3)	Acute ABC (µg/m^3)	AQI Value	AQI Category	Air Advisory
Medford Welch and Jackson	1/3/2019	Benzo(a)pyrene	0.00282	0.002	93	Moderate	Stagnation
Medford Welch and Jackson	1/27/2019	Benzo(a)pyrene	0.00227	0.002	79	Moderate	Stagnation
Eugene Amazon Park	9/12/2020	Benzo(a)pyrene	0.00261	0.002	438	Hazardous	Smoke
Eugene Hwy 99	9/12/2020	Benzo(a)pyrene	0.00226	0.002	420	Hazardous	Smoke
Eugene Hwy 99	9/12/2020	Benzene	40	29	420	Hazardous	Smoke

Each of the three samples collected on September 12, 2020, were collected during a roughly week-long period of intense wildfire smoke that blanketed a large portion of the state. Levels of wildfire smoke during this week reached Hazardous levels on the Air Quality Index and is responsible for the elevated levels of those pollutants. The AQI category was Moderate for the two samples collected at the Medford site however an Air Stagnation advisory was in effect during both of those days. Air Stagnation advisories are issued by the National Weather Service when poor mixing and light winds trap pollutants near the ground level which results in reduced air quality.

4.3 KPM Trends at National Air Toxics Trends Sites

The Portland and La Grande National Air Toxics Trends Sites (NATTS) sites serve as long-term urban and rural air quality monitoring sites. Annual averages for the last five years were calculated for the five KPM analytes at both NATTS sites (Figures 20-24, 26-30). For further context, long-term trends beginning in 2004 for key performance measure pollutants are displayed in a combined chart (Figures 25, 31).

Figures 20-24. Five-year trends for KPM analytes at the Portland NATTS site. The chronic cancer risk ambient benchmark concentration (ABC) is shown for reference. No data was available at the Portland NATTS site from August 2016 to March 2017 while the sampling equipment was relocated to the current site, however annual averages were calculated for informational purposes.

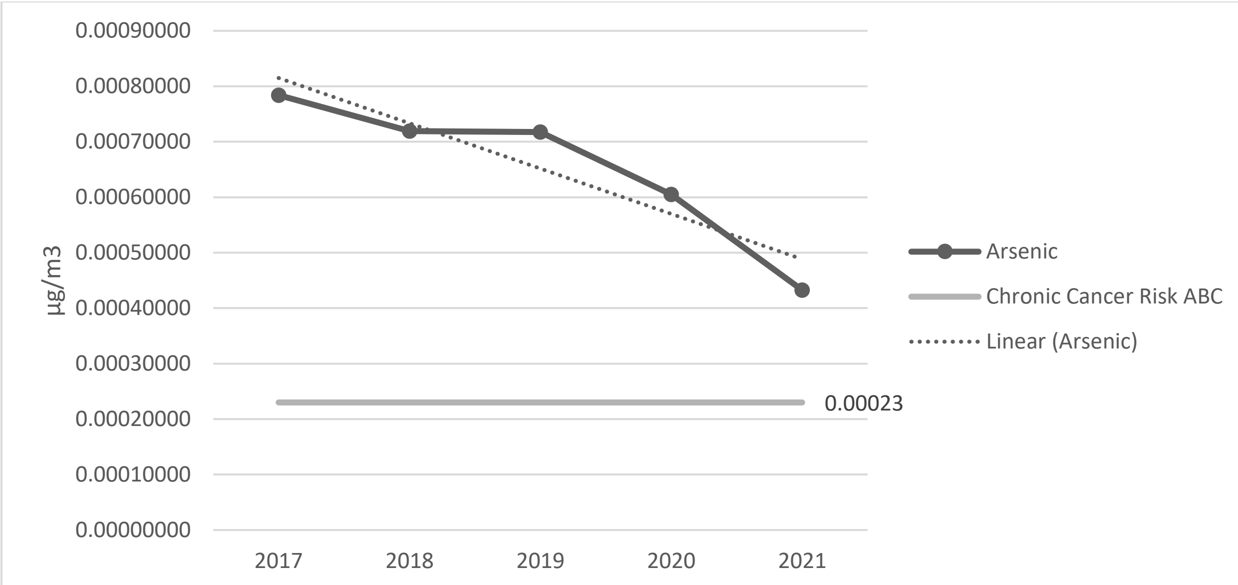

Figure 20. Arsenic trend at Portland NATTS site. Despite a downward trend, annual averages remain above the ABC for chronic cancer risk.

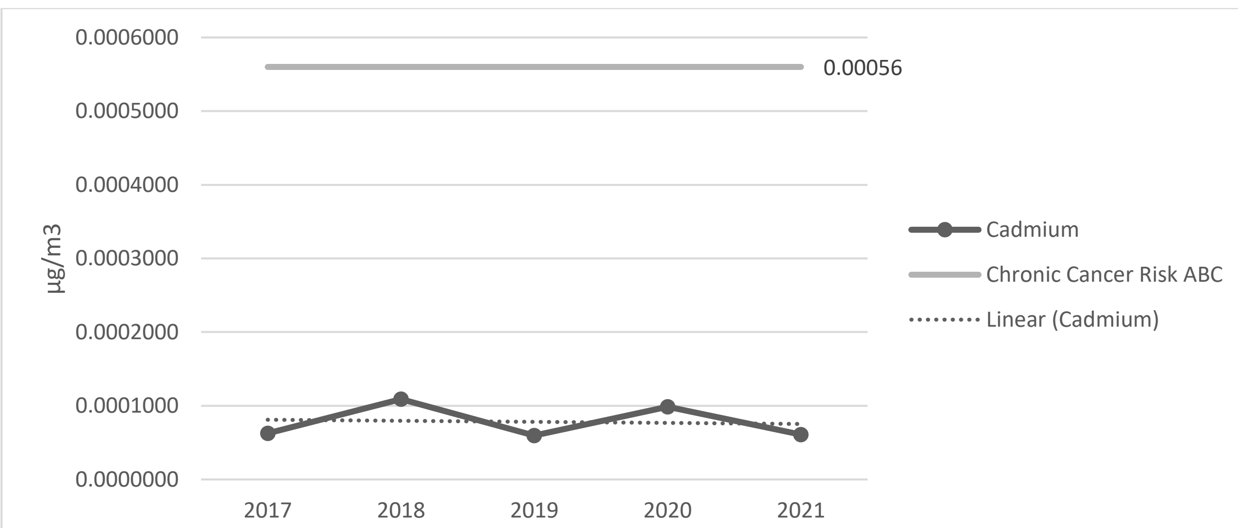

Figure 21. Cadmium trend at Portland NATTS site. Cadmium levels remain relatively unchanged and are below chronic cancer risk levels.

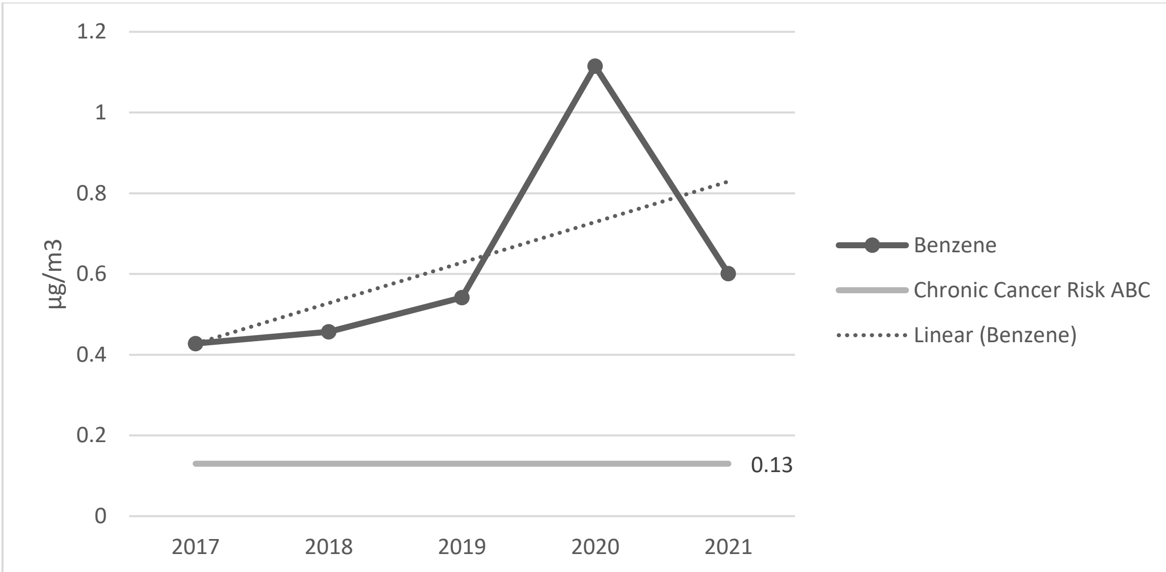

Figure 22. Benzene trend at Portland NATTS site. A spike in benzene levels in 2020 is biased by wildfire smoke.

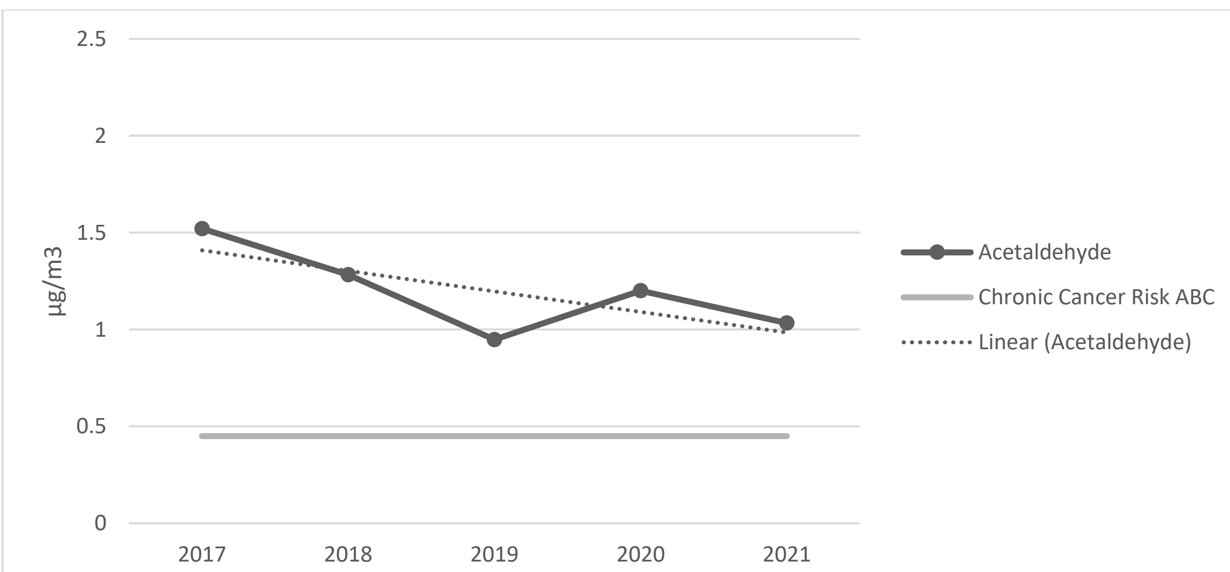

Figure 23. Acetaldehyde trend at Portland NATTS site. Despite a downward trend, levels remain above chronic cancer risk ABC.

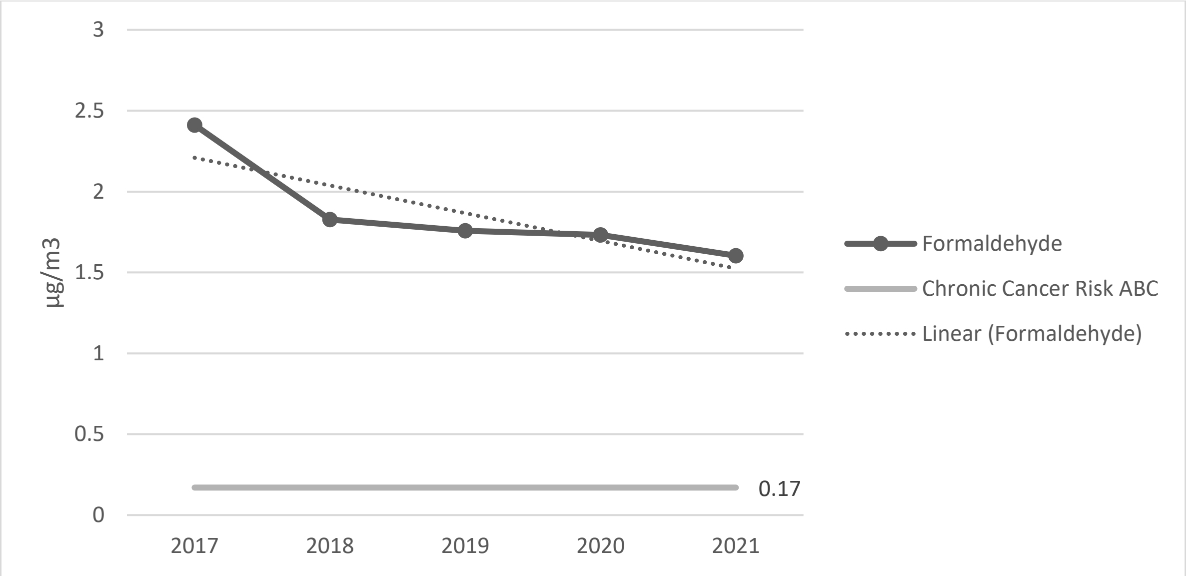

Figure 24. Formaldehyde trend at Portland NATTS site. Pollutant levels trend downward but remain above chronic cancer risk ABC.

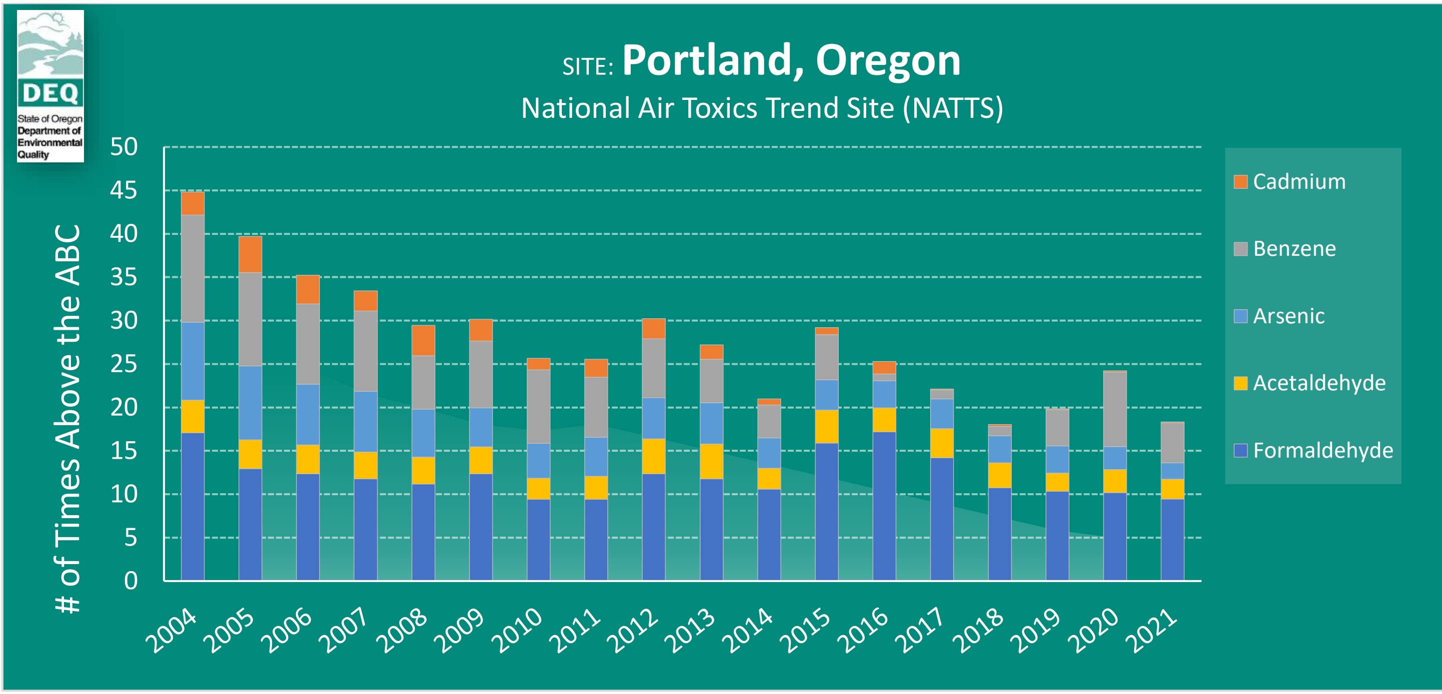

Figure 25. Long term trends for KPMs at Portland NATTS site. Although the KPM target was not reached in 2020, levels have fallen significantly since 2004.

Figures 26-30. Five-year trends for KPM analytes at the La Grande NATTS site. The chronic cancer risk ambient benchmark concentration (ABC) is shown for reference.

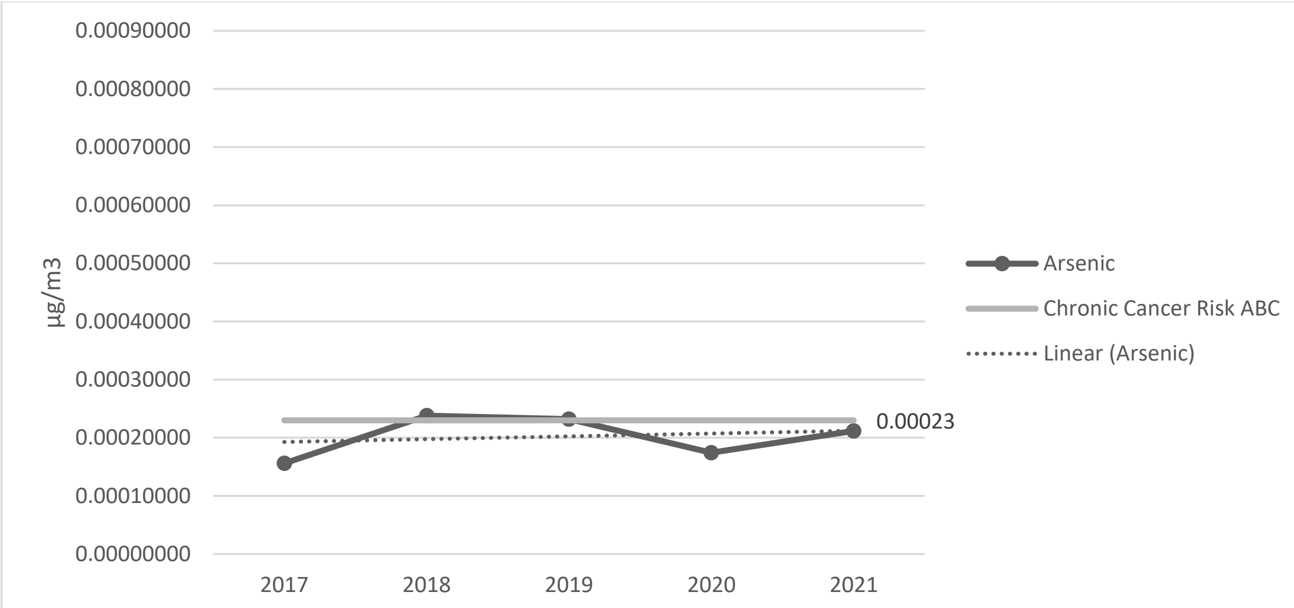

Figure 26. Arsenic trend at La Grande NATTS site. Levels have remained relatively unchanged.

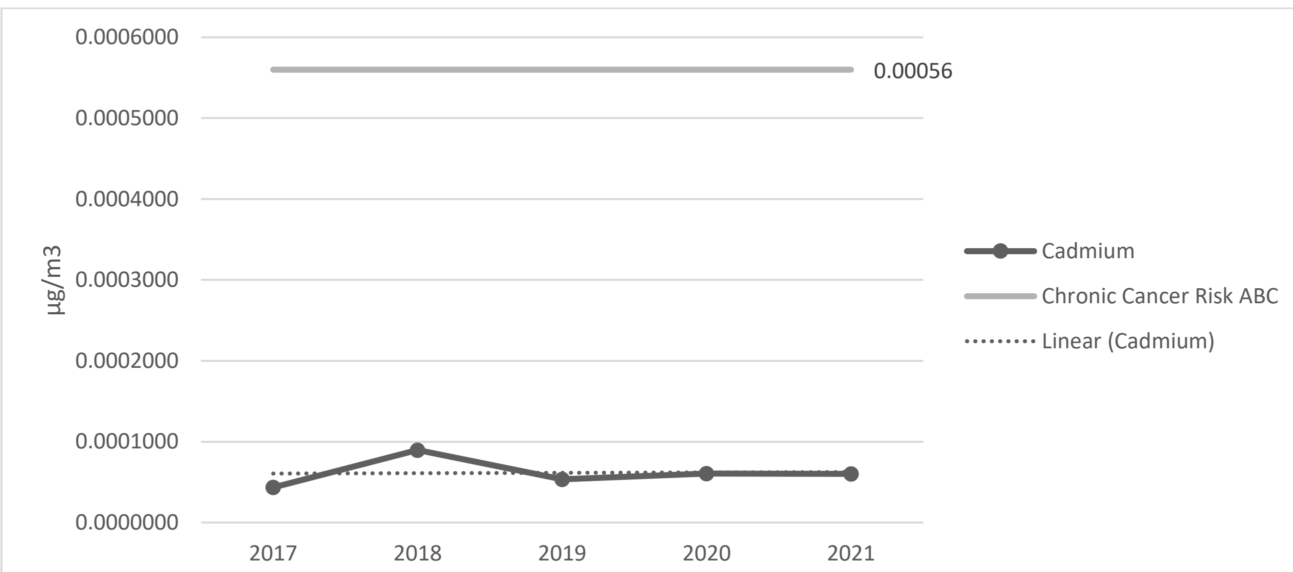

Figure 27. Cadmium trend at La Grande NATTS site. Similar to the Portland NATTS site, levels remain below their chronic cancer risk ABC.

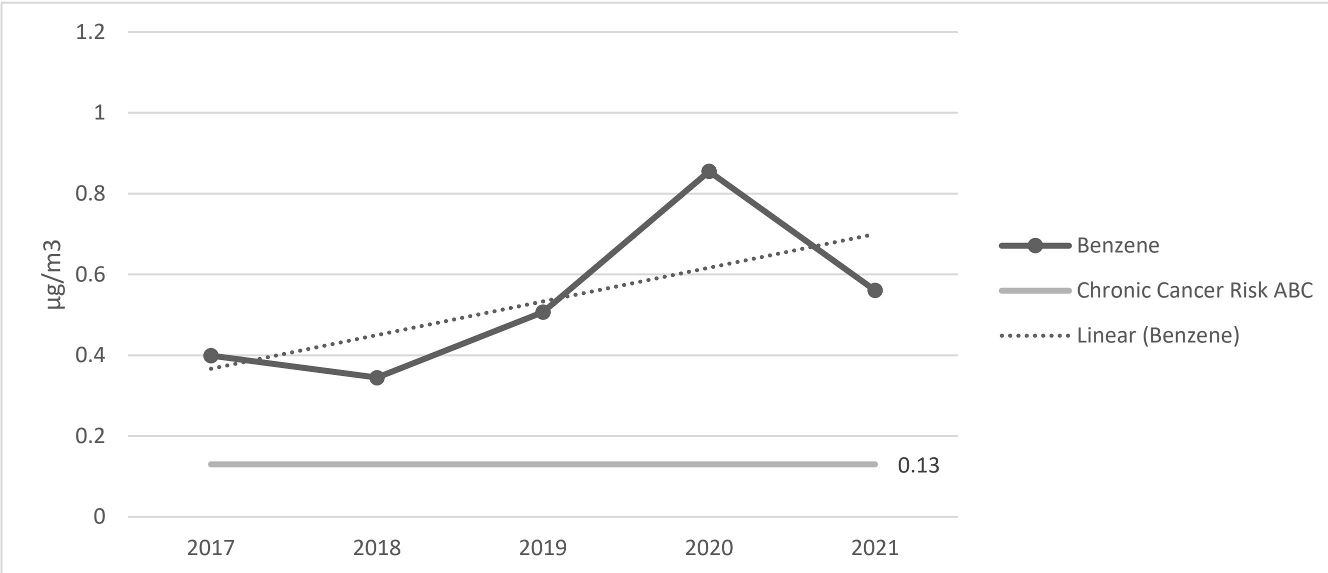

Figure 28. Benzene trend at La Grande NATTS site. Chronic cancer risk ABC shown for reference.

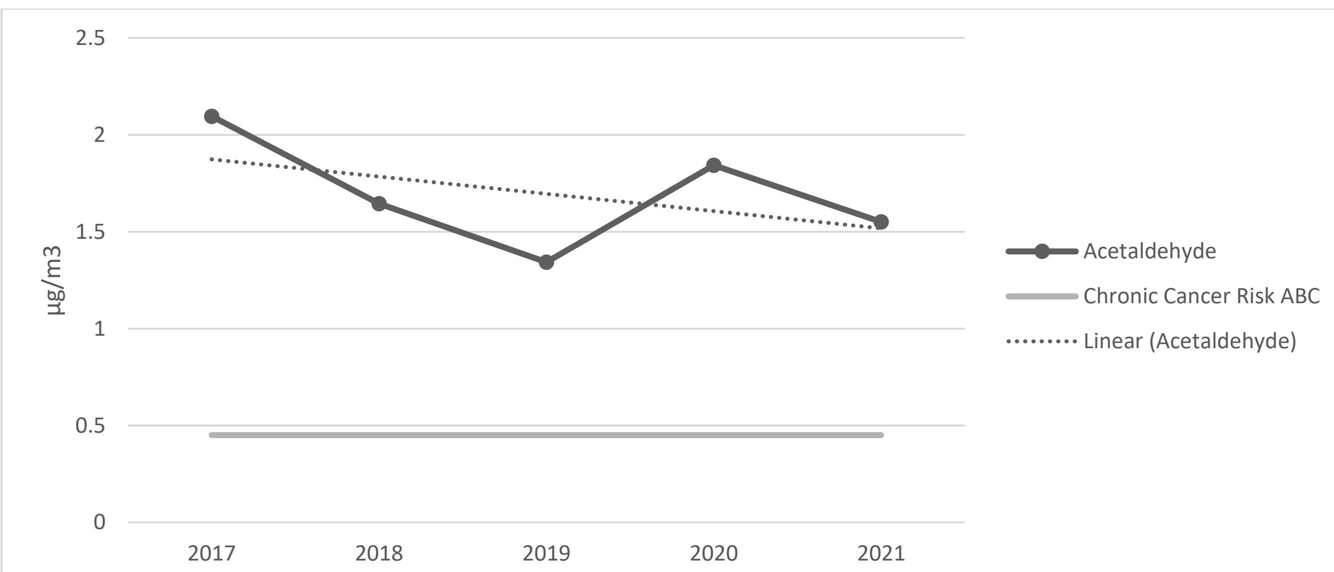

Figure 29. Acetaldehyde trend at La Grande NATTS site. Levels have trended downward for the last five years but remain above their chronic cancer risk ABC.

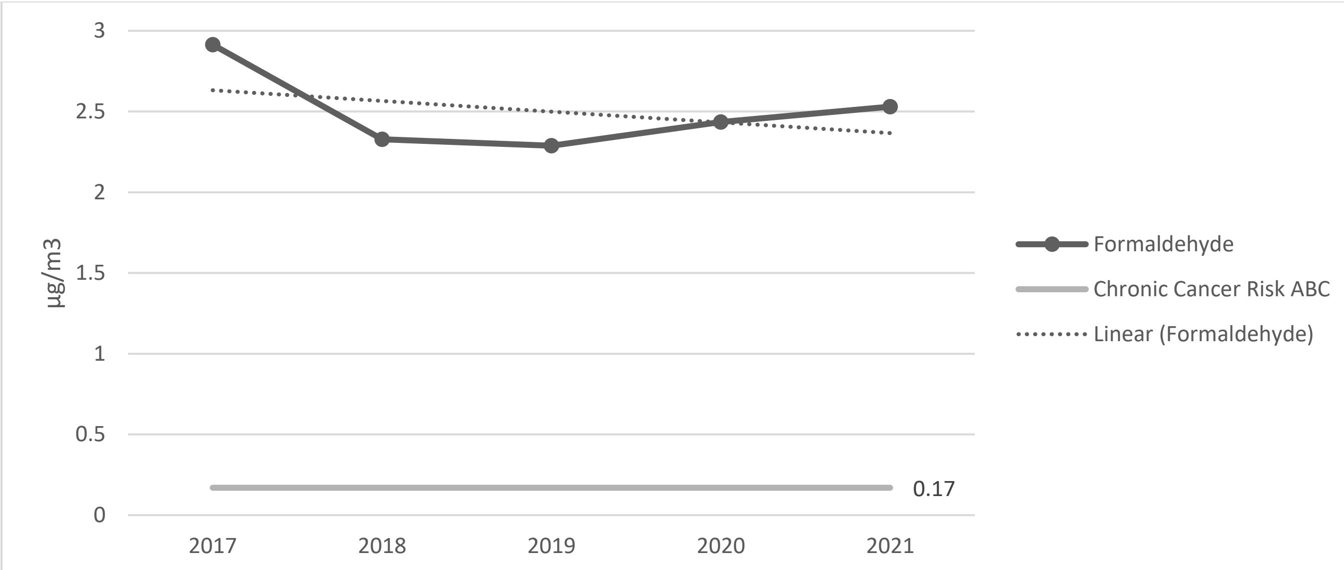

Figure 30. Formaldehyde trend at La Grande NATTS site. Formaldehyde levels have remained relatively unchanged.

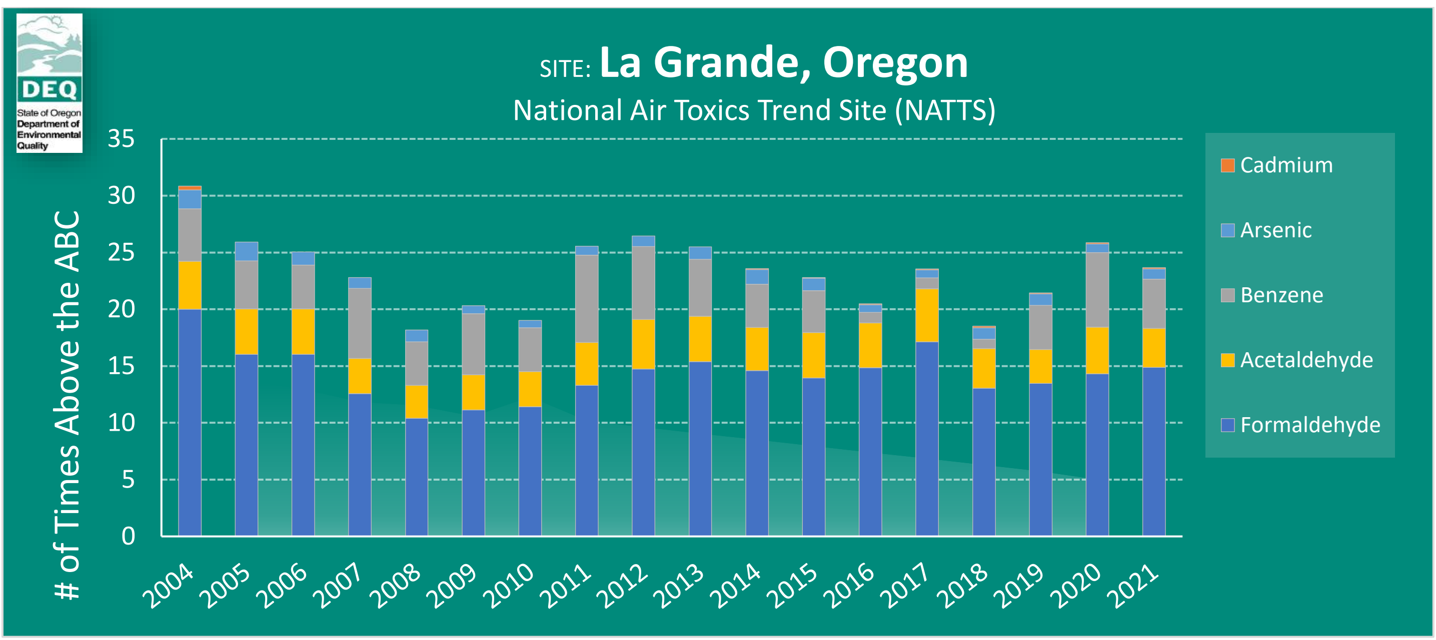

Figure 31. Long term KPM trends at La Grande NATTS site.

4.4 Wildfire Smoke Impacts

Forest fire smoke contains VOCc and PAHs, which are measured in this report, and other pollutants including PM2.5. To sample air that is being polluted by wildfire smoke, the smoke would have to be present on a day that the samples are pre-programmed to run. When this happens the high levels of some pollutants in those samples may skew the annual average that is calculated at the end of the year and compared to the ABC. Samples were labeled as being impacted by wildfire smoke if the daily average PM2.5 concentration at the site nearest the air toxics monitoring location was 25 µg/m^3 or higher on the day of the air toxics sample. These samples were then removed from the datasets and the annual averages were recalculated to show how the wildfire smoke samples impacted the annual averages.

In three cases where the annual average concentration of a pollutant was close to but still above its chronic cancer ABC, removing the wildfire impacted samples reduced the annual average to below the chronic cancer ABC (Table 13).

Table 13. Comparison of the cancer risk calculated from data with smoke affected samples to cancer risk calculated from data where smoke affected samples were removed. * Denotes acrolein uses its noncancer health risk ABC.

Year	Site	Sample Type	Analyte	Cancer/Health Risk	Cancer Risk with Smoke Samples Removed
2020	Portland Cully Helensview	VOCs	*Acrolein	1.0	0.9
2020	Portland Cully Helensview	VOCs	Ethylbenzene	1.0	0.9
2020	La Grande Hall and N	VOCs	*Acrolein	1.1	0.9

In other cases, the impact factors were reduced by 25% or more however the annual averages were still above their chronic cancer ABCs (Table 14).

Table 14. Percent change of impact factor for selected pollutants when smoke affected samples were removed from the dataset.

Year	Site	Sample Type	Analyte	Cancer Risk	Cancer/Health Risk with Smoke Samples Removed	Percent Change
2020	Eugene Hwy 99	VOCs	1,3-Butadiene	4.2	2.9	-31%
2020	Eugene Hwy 99	VOCs	Benzene	11.3	6.5	-42%
2020	Portland Humboldt School	VOCs	1,3-Butadiene	2.6	1.8	-31%
2020	Portland Humboldt School	VOCs	Benzene	8.6	5.0	-42%
2020	Portland Cully Helensview	VOCs	1,3-Butadiene	3.0	2.5	-16.7%
2020	Portland Cully Helensview	VOCs	Benzene	8.6	5.5	-37%
2020	La Grande Hall and N	Carbonyls	Acetaldehyde	4.1	2.9	-28%
2020	La Grande Hall and N	VOCs	Benzene	6.6	4.5	-32%

Overall, the types and concentrations of pollutants in wildfire smoke varies as does the concentration of the smoke emissions itself. In cases where smoke is highly concentrated during a sample collection day, the resulting data may bias the annual averages high when calculating summary statistics for the year. As trends in the increase in frequency of wildfires is expected to continue the resulting smoke is also likely to affect more air toxics samples in the future.

4.5 Future Monitoring

At the time of release for this report, DEQ operates eleven air toxics monitoring sites. This network may expand or decrease depending on where and when high-quality data is needed. NATTS sites will continue to produce data for long-term monitoring and evaluation with rotating annual sites being prioritized and moved accordingly. Monitoring equipment will continue to be updated, evaluated, tested and deployed in the field when and where available. DEQ's air toxics monitoring program and laboratory analytical methods will continue to evolve and be updated based on guidance form EPA and best available scientific methods. In addition to gathering high quality data, DEQ is striving to make monitoring data more easily accessible online and in other formats. As the air toxics monitoring network continues to evolve, DEQ will continue to provide high-quality data to inform Oregonians about the levels of air toxics in their communities.