Work Session

WS

Milwaukie City Council

CITY OF MILWAUKIE

COUNCIL WORK SESSION

Zoom Video Conference
(www.milwaukieoregon.gov)

AGENDA

FEBRUARY 15, 2022

Council will hold this meeting through video conference. The public may attend the meeting by joining the Zoom webinar or watch live on the city's YouTube channel or Comcast Cable channel 30 in city limits. **For Zoom webinar login information** visit https://www.milwaukieoregon.gov/citycouncil/city-council-work-session-294.

To participate in this meeting by phone dial **1-253-215-8782** and enter Webinar ID **847 1299 8920** and Passcode: **331507**. To raise your hand by phone dial *9. **Written comments** may be submitted by email to ocr@milwaukieoregon.gov. Council may take limited verbal comments.

Note: agenda item times are estimates and are subject to change. **Page #**

1. **Oregon Department of Environmental Quality (DEQ) Air Quality – Report**
   (4:00 p.m.)
   Presenters: Tom Roick and Scott Peerman, DEQ

2. **Regional Inflow and Infiltration (I&I) Reduction Agreement – Discussion** 1
   (4:30 p.m.)
   Staff: Peter Passarelli, Public Works Director

3. **Adjourn** (5:30 p.m.)

Executive Session

After the work session Council will meet in executive session pursuant to Oregon Revised Statute (ORS) 192.660 (2)(h) to consult with counsel concerning the legal rights and duties of a public body with regard to current litigation or litigation likely to be filed.

Meeting Accessibility Services and Americans with Disabilities Act (ADA) Notice

The city is committed to providing equal access to public meetings. To request listening and mobility assistance services contact the Office of the City Recorder at least 48 hours before the meeting by email at ocr@milwaukieoregon.gov or phone at 503-786-7502. To request Spanish language translation services email espanol@milwaukieoregon.gov at least 48 hours before the meeting. Staff will do their best to respond in a timely manner and to accommodate requests. Most Council meetings are broadcast live on the city's YouTube channel and Comcast Channel 30 in city limits.

Servicios de Accesibilidad para Reuniones y Aviso de la Ley de Estadounidenses con Discapacidades (ADA)

La ciudad se compromete a proporcionar igualdad de acceso para reuniones públicas. Para solicitar servicios de asistencia auditiva y de movilidad, favor de comunicarse a la Oficina del Registro de la Ciudad con un mínimo de 48 horas antes de la reunión por correo electrónico a ocr@milwaukieoregon.gov o llame al 503-786-7502. Para solicitar servicios de traducción al español, envíe un correo electrónico a espanol@milwaukieoregon.gov al menos 48 horas antes de la reunión. El personal hará todo lo posible para responder de manera oportuna y atender las solicitudes. La mayoría de las reuniones del Consejo de la Ciudad se transmiten en vivo en el canal de YouTube de la ciudad y el Canal 30 de Comcast dentro de los límites de la ciudad.

Executive Sessions

The City Council may meet in executive session pursuant to Oregon Revised Statute (ORS) 192.660(2); all discussions are confidential; news media representatives may attend but may not disclose any information discussed. Final decisions and actions may not be taken in executive sessions.

CITY OF MILWAUKIE

COUNCIL WORK SESSION

Zoom Video Conference (www.milwaukieoregon.gov)

MINUTES

FEBRUARY 15, 2022

Council Present: Councilors Lisa Batey, Angel Falconer, Desi Nicodemus, Council President Kathy Hyzy, and Mayor Mark Gamba

Staff Present:
Justin Gericke, City Attorney
Adam Moore, Parks Development Coordinator
Ann Ober, City Manager
Peter Passarelli, Public Works Director
Natalie Rogers, Climate and Natural Resources Manager
Scott Stauffer, City Recorder

Mayor Gamba called the meeting to order at 4:01 p.m. and announced that after the work session Council would meet in executive session pursuant to Oregon Revised Statute (ORS) 192.660 (2)(h) to consult with counsel concerning the legal rights and duties of a public body with regard to current litigation or litigation likely to be filed.

1. Oregon Department of Environmental Quality (DEQ) Air Quality – Report

Tom Roick, DEQ Air Quality Monitoring Manager, discussed DEQ's air monitoring program which included tracking air toxins around the Precision Castparts Corporation (PCC) facility on the Milwaukie-Portland border. **Mayor Gamba** and **Roick** noted that DEQ tests the air at monitoring sites on different days of the week every six days.

It was noted that Councilor Batey joined the meeting at 4:04 p.m.

Roick continued to explain how DEQ monitors air quality at sites throughout the state. **Councilor Batey** and **Roick** commented on how DEQ monitored the air around PCC.

Scott Peerman, DEQ Data Assessment Specialist, presented metal pollution data collected from air monitoring sites around PCC. **Mayor Gamba** and **Peerman** commented on possible sources of chromium along the Springwater Trail corridor.

Peerman continued to present data on the metals detected in the air around PCC. **Councilor Batey** and **Peerman** remarked on the impact of wind on air pollution.

Peerman and **Roick** discussed pollution data collected at monitoring sites around the state and reported that the levels of pollution found around PCC were not greater than pollution detected at other sites in Oregon or other urban areas across the country.

Council President Hyzy asked if DEQ was reporting that air pollution levels around PCC were higher than the state's benchmarks but were not worse than other locations. **Peerman** and **Roick** explained how pollution goals were developed and confirmed that the levels at the PCC site were like other urban areas. **Councilor Batey** and **Peerman** remarked on which pollutants detected around PCC exceeded the benchmarks and why The Dalles, Oregon, site had higher pollution levels for certain chemicals.

Mayor Gamba suggested the data showed that PCC's pollution control systems had either not influenced the pollution or the chemical came from a different source. **Peerman** and **Roick** remarked on how DEQ determines other sources of pollution.

Mayor Gamba and **Councilor Batey** expressed interest in discussing the air pollution data further at a future meeting.

2. Region Inflow and Infiltration (I&I) Reduction Agreement – Discussion

Passarelli introduced Chris Storey, Clackamas County Water Environment Services (WES) Assistant Director and explained that the goal of the program was to expand and help fund local city led I&I reduction projects.

Storey provided an overview of the I&I program, noting studies that had led WES to find ways to work with cities to address I&I issues. **Councilor Batey**, **Storey**, and **Passarelli** commented on areas in WES' system that had excessive I&I issues.

Storey noted the proposed terms for the program's intergovernmental agreement (IGA).

Councilor Falconer asked if the aging sections of the city's water system would cause the program qualifications to be too high for the city to receive funding. **Passarelli** reported on staff discussions about system data collection and suggested the necessary older parts of the water system would not keep the city from receiving funding through the program. **Storey** commented that the program could fund studies to determine I&I project needs and added that projects would be vetted by a technical advisory committee of public works directors. **Storey** commented on WES' interest in funding local I&I projects.

Council President Hyzy asked about the program's duration and **Storey** believed that after the initial five-year period WES would re-evaluate the funding mechanisms for the project with a goal of extending the program for a total of 20-years.

Storey explained the process for providing project funding to cities once an IGA was approved and how WES would consider and prioritize projects.

Councilor Batey asked how much clay pipe was left in water systems across the region and **Storey** noted WES and other cities shared interest in addressing I&I issues to reduce the need to fund emergency repair projects.

3. Adjourn

Mayor Gamba reiterated that after the work session Council would meet in executive session and adjourned the meeting at 4:58 p.m.

Respectfully submitted,

Scott Stauffer, City Recorder

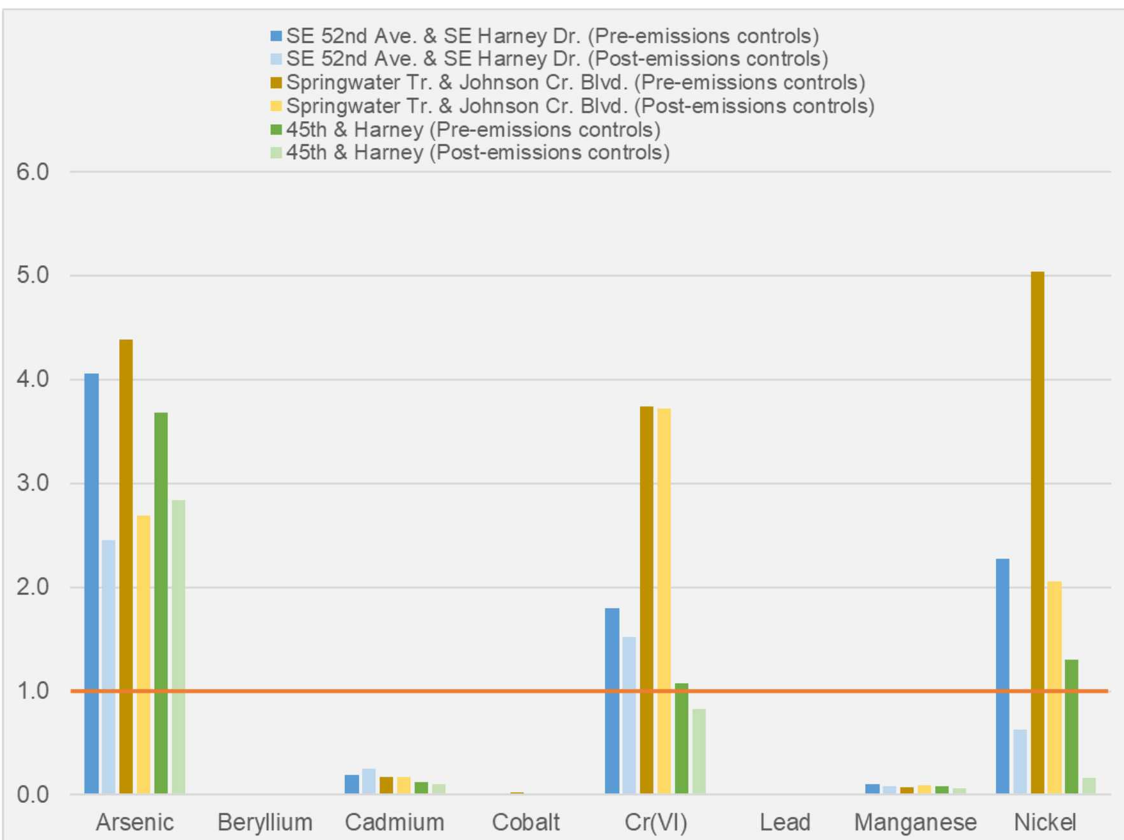
State of Oregon Department of Environmental Quality

Precision Castparts Emission Control Comparison

Updated: September 27, 2018

Analyte	SE 52nd & SE Harney (Pre-emissions controls)	SE 52nd & SE Harney (Post-emissions controls)	Springwater Tr. & Johnson Cr. Blvd. (Pre-emissions controls)	Springwater Tr. & Johnson Cr. Blvd. (Post-emissions controls)	SE 45th & Harney Dr. (Pre-emissions controls)	SE 45th & Harney Dr. (Post-emissions controls)
Arsenic	4.1	2.5	4.4	2.7	3.7	2.8
Beryllium	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	0.2	0.3	0.2	0.2	0.1	0.1
Cobalt	0.0	0.0	0.0	0.0	0.0	0.0
Cr(VI)	1.8	1.5	3.7	3.7	1.1	0.8
Lead	0.0	0.0	0.0	0.0	0.0	0.0
Manganese	0.1	0.1	0.1	0.1	0.1	0.1
Nickel	2.3	0.6	5.0	2.1	1.3	0.2

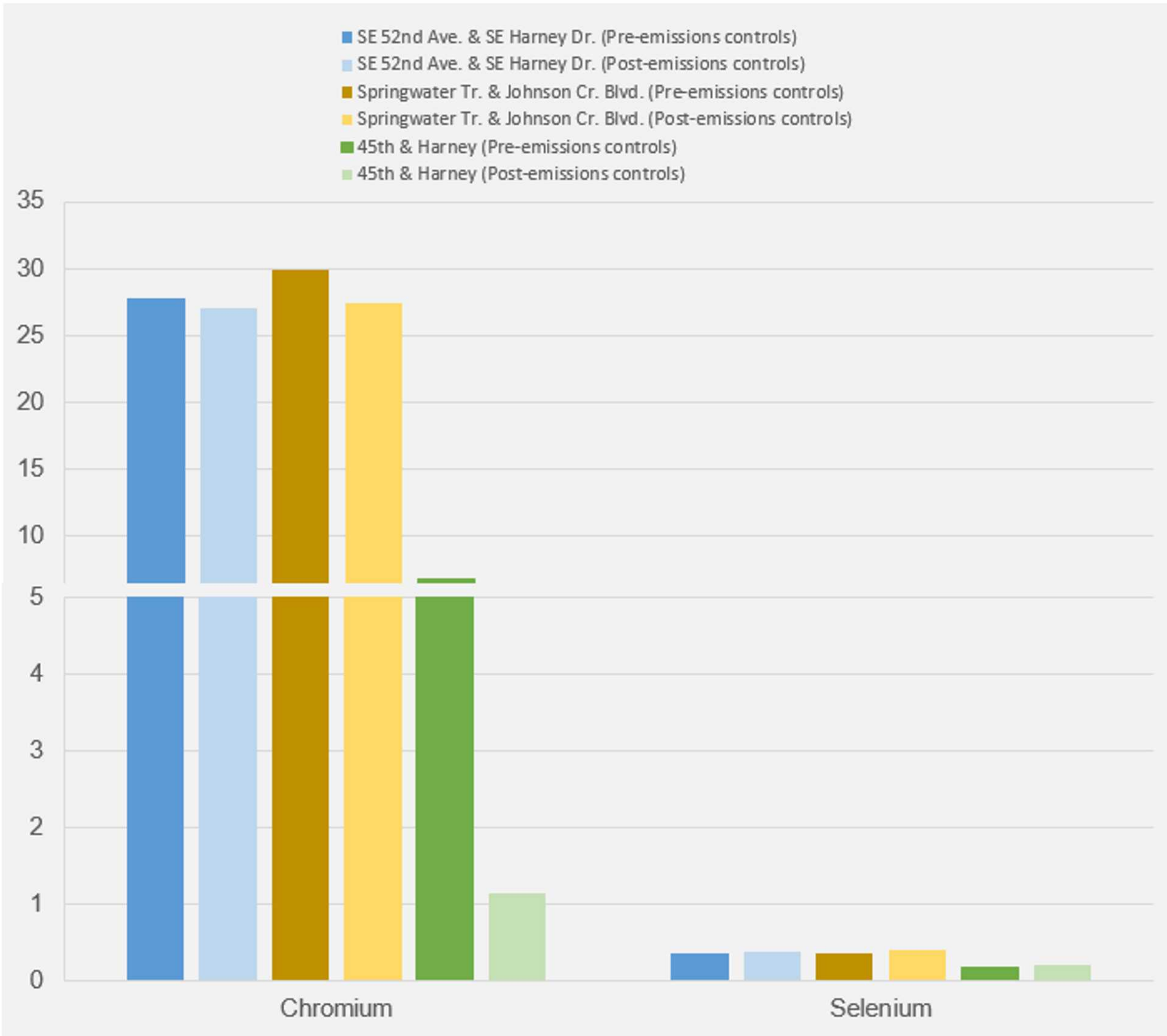
This table shows results from air monitoring locations for periods before and after emissions controls put in place by Precision Castparts on May 16th, 2016. The values show the times over the DEQ ambient benchmark concentration (ABC) before and after the emissions controls were put in place. Times over the ABC is calculated by dividing the average result by the ABC. Values greater than one indicate a level over the benchmark. The Pre-emissions control time period was March 30th – May 16th, 2016. The Post-emissions control period was May 17th – October 31st, 2016.



This figure shows results from air monitoring locations for periods before and after emissions controls put in place by Precision Castparts on May 16th, 2016. The vertical bars show the times above the DEQ ABC. Bars extending over the red line represent results over DEQ benchmark.

Analyte	SE 52nd & SE Harney (Pre-emissions controls)	SE 52nd & SE Harney (Post-emissions controls)	Springwater Tr. & Johnson Cr. Blvd. (Pre-emissions controls)	Springwater Tr. & Johnson Cr. Blvd. (Post-emissions controls)	SE 45th & Harney Dr. (Pre-emissions controls)	SE 45th & Harney Dr. (Post-emissions controls)
Chromium	27.73	27.03	29.93	27.47	6.767	1.145
Selenium	0.36	0.368	0.365	0.392	0.174	0.203

This table shows the effect of emissions controls put in place by Precision Castparts on May 16th, 2016. The values show the average concentration before and after the emissions controls were put in place.



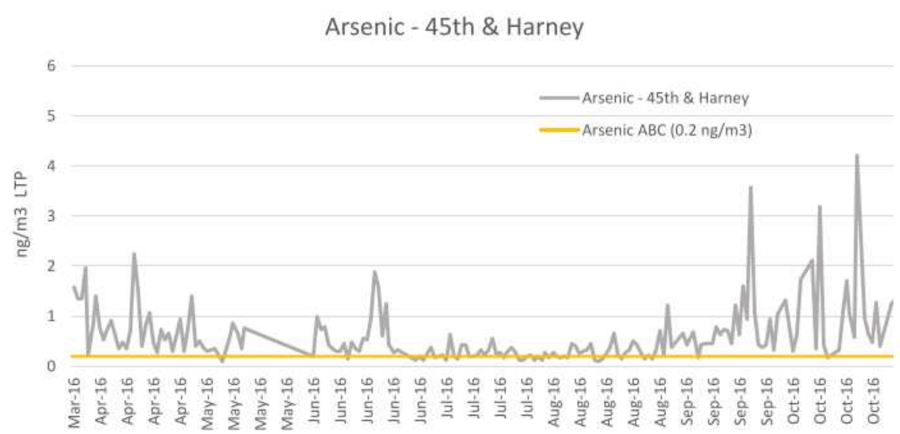
This figure shows the effect of emissions controls put in place by Precision Castparts on May 16th, 2016 for chromium and selenium which do not have established DEQ ambient benchmark concentrations.

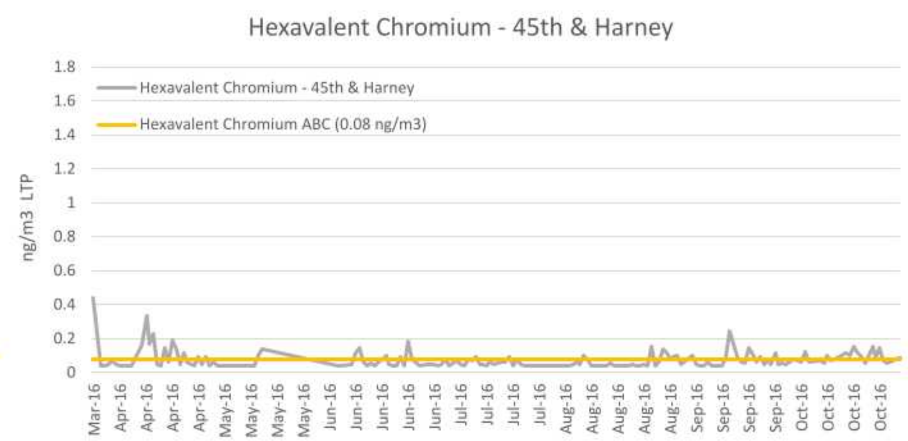
Heavy Metal Concentrations in Air in Southeast Portland near Precision Castparts Corp.

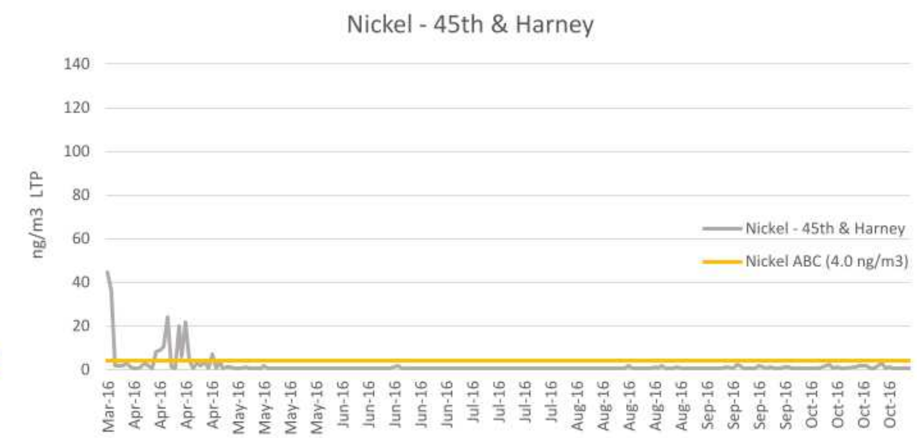
	As arsenic	Cr(VI) hexavalent chromium	Ni nickel

* Non-detect results are plotted at the non-detect concentration.

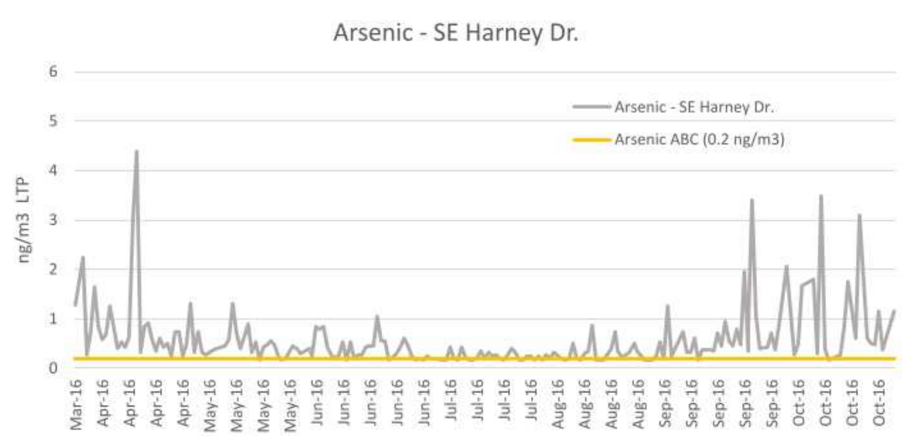
SE 45th & SE Harney Dr.

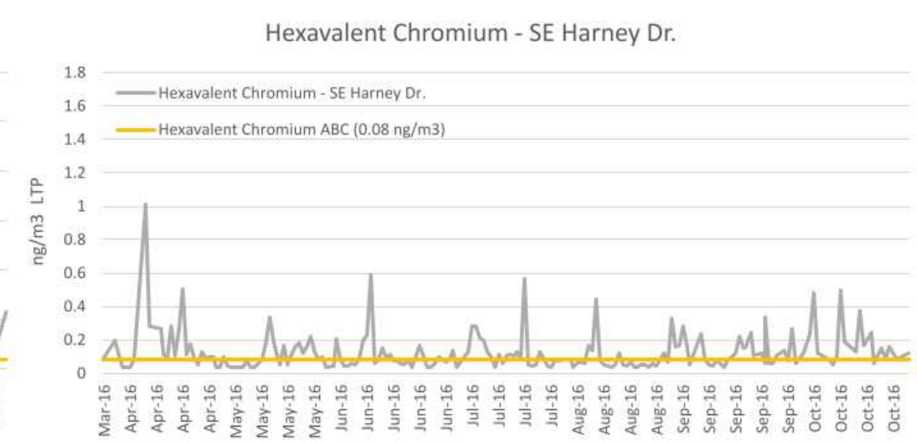


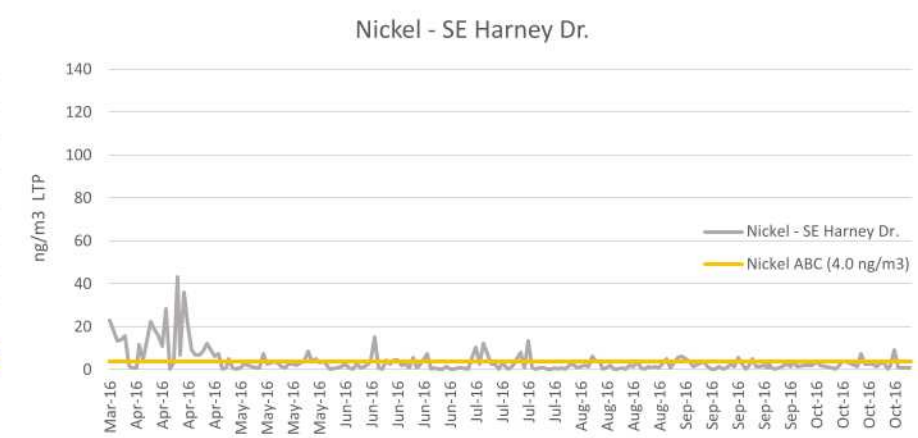




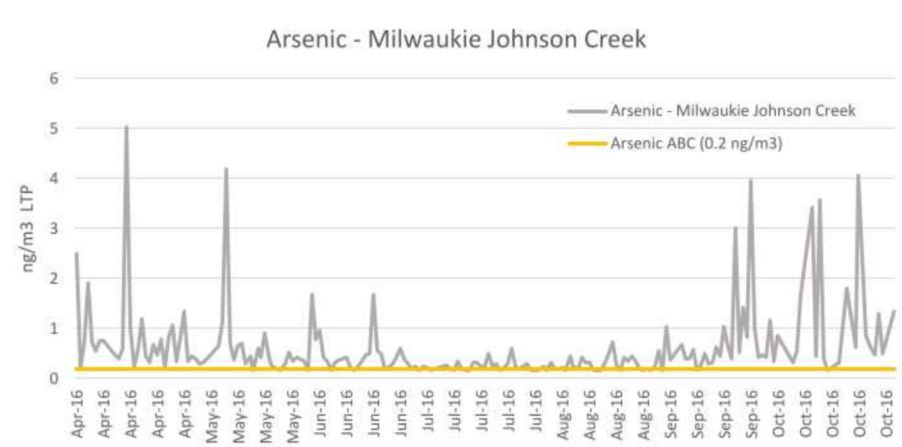
SE Harney Dr.

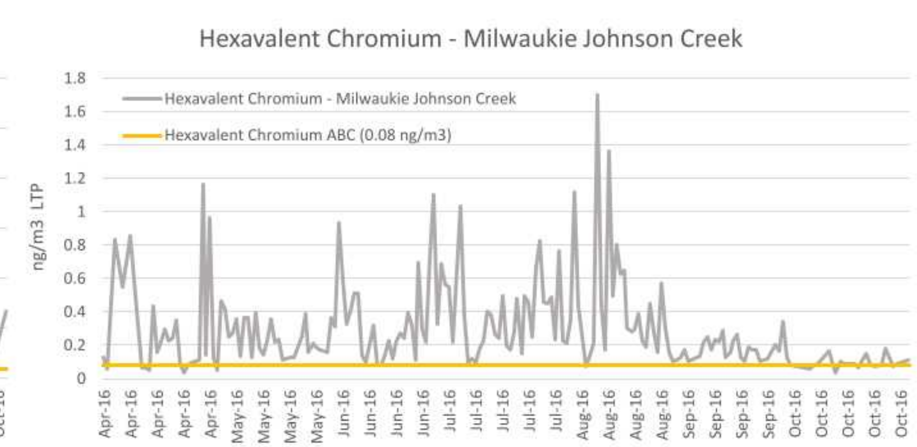


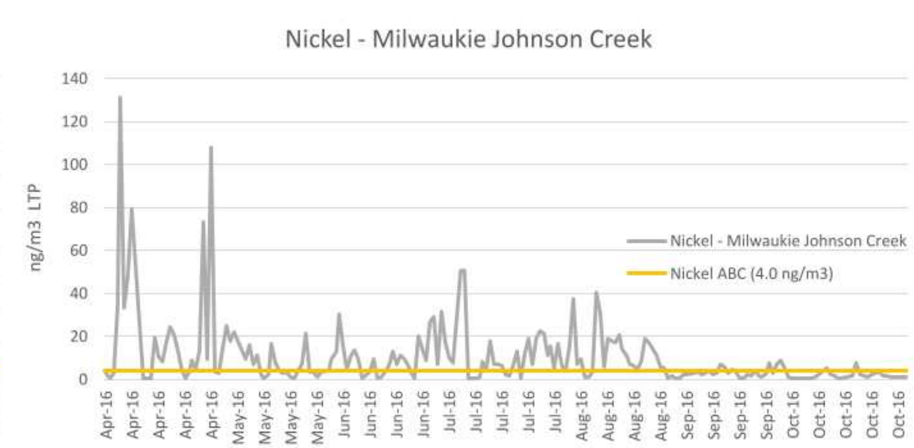




Milwaukie Johnson Creek







Author: S. Peerman, Oregon DEQ Date: 7/14/17

2018 Oregon Air Toxics Monitoring Summary

Report Date: February 2020

Laboratory and Environmental Assessment Division
7202 NE Evergreen Parkway, Suite 150
Hillsboro, OR 97124
Phone: 503-639-5700
800-452-4011
Fax: 503-639-4999
Contact: Scott Peerman
www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

State of Oregon
Department of Environmental Quality

This report prepared by:

Oregon Department of Environmental Quality
7202 NE Evergreen Parkway, Suite 150
Hillsboro, OR 97124
1-800-452-4011
www.oregon.gov/deq

Contact:
Scott Peerman
503-693-5782

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.state.or.us.

Table of contents

Executive summary

The Oregon Department of Environmental Quality (DEQ) implements several programs that regulate emissions of air toxics and monitors ambient levels present at various locations across Oregon. This report summarizes air toxics data collected at four air toxics monitoring sites located in the Portland-metro area, one site located in The Dalles, and one site located in La Grande.

Sampling schedules at each site generally consisted of one 24-hour sample being collected every six days for a minimum of one year. A total of 109 analytes, including PM10 metals (i.e. inhalable coarse particles smaller than 10 micrometers in diameter), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and carbonyl compounds. DEQ compared average annual pollutant concentrations to the Oregon Ambient Benchmark Concentrations (ABCs) and calculated urban background concentrations where available. Maximum 24-hour sample results were compared to Cleaner Air Oregon Acute (24-hour) Risk-Based Concentrations (RBC) where available.

Results showed that 36 of the air toxics tested for were below the detection limit in at least 90% of the samples collected across all sites. Six air toxics – arsenic, benzene, carbon tetrachloride, naphthalene, acetaldehyde, and formaldehyde – were found at levels above their ABCs at all monitoring locations, demonstrating that these pollutants are present at levels of concern in both urban and rural areas. Ethylbenzene was found at levels above its ABC at three of the monitoring sites located in the Portland-metro area. The average levels of arsenic were higher in the Portland-metro area sites compared to sites located in The Dalles and La Grande, which are more rural. The average levels of three air toxics – naphthalene, acetaldehyde, and formaldehyde – were higher at The Dalles monitoring site compared to all other sites.

For the 44 measured air toxics for which Acute RBCs are available, data showed that no individual 24-hour samples were above the Acute RBC. Wildfire smoke was shown to increase the average concentrations of benzene, carbon tetrachloride, acetaldehyde, and formaldehyde during the 2017 fire season.

DEQ will continue monitoring to track trends over time at long-term monitoring stations, which include two National Air Toxics Trends Sites in Portland and La Grande; as well as stations in Eugene, Medford, Bend, Hillsboro, Tualatin, and the Portland Cully neighborhood. Updated trends reports will be produced when a minimum of one year of data is available from those sites. DEQ will also operate monitoring sites on an annual basis in other communities. DEQ's Air Quality Program will use this information in the evaluation of air toxics in Oregon communities, in the implementation of the Cleaner Air Oregon program, and to develop future strategies for reducing air toxics.

1. Introduction

The Oregon Department of Environmental Quality monitors air quality throughout the state as required by the Clean Air Act. In addition, these data provide information to the public and inform strategies to protect public health. Air pollutants are generally classified into two main categories referred to as criteria air pollutants and hazardous air pollutants (HAPs), also known as air toxics. This report is focused on air toxics monitoring and provides a summary of air toxics that were measured in ambient air in recent years at six locations throughout the state.

1.1 What are air toxics?

The terms "air toxics", "toxic air contaminants" 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), 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 our 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 187 HAPs for which EPA is required to regulate emissions in order to protect public health. Since measuring all 187 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 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 109 air toxics are measured at each monitoring site, which include the 60 priority HAPs of the NATTS program.

2. Air toxics monitoring program

The purpose of the Air Toxics Monitoring program is to determine the concentration of air toxics in urban and rural areas of the state and to determine their spatial and temporal variability. DEQ currently operates air toxics monitoring stations in Oregon as part of three main networks or programs, each with its own goals.

2.1 EPA National Air Toxics Trends Stations Program

DEQ operates two stations primarily funded by EPA as part of its National Air Toxics Trends Stations (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. All sites in this network adhere to 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 air toxics trend sites is to measure changes in air toxics over time in representative areas of the state. In 2018 and 2019 DEQ established trend sites in Eugene, Medford, Bend, and three locations in the Portland Metro area: Hillsboro, Tualatin, and the NE Portland Cully neighborhood. Data from these trend sites will be presented in future air toxics reports when at least one year of data is available.

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. A single site typically takes months to setup and involves steps such as establishing a site agreement with the property owner, site preparation and construction (ex. working with local utility to install a power source, building elevated platforms for individual samplers), as well as calibration and installation of individual samplers and associated sampling equipment (computers, exhaust systems, air conditioners, etc.). DEQ utilizes available resources to conduct air toxics monitoring 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. Potential annual site monitoring locations are prioritized based on six main categories of information: 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. More than one rotating annual site may be operating at any given time. This report summarizes data from three annual sites where at least one year of data was available: SE Portland, Gresham, and The Dalles. DEQ initially set up the station in the Cully neighborhood of NE Portland as an annual site, but DEQ will retain it as a long-term trend site.

2.4 Key Performance Measures

As one of DEQ's Key Performance Measures (KPM), DEQ has selected five representative air toxics – benzene, acetaldehyde, formaldehyde, arsenic and cadmium – to track over time. DEQ's goal is to reduce levels of each pollutant down to be equal to or less than the ambient benchmark concentration (ABC) for each pollutant by 2020. The ABCs are very protective concentrations that would not be expected to harm health even in sensitive populations like children, elderly, or people with pre-existing health conditions. If DEQ can meet these KPM goals, DEQ and Oregonians can feel confident that risks to public health have been reduced because these five air toxics are often representative of other air toxics that are not being measured. KPM values are obtained by dividing the average annual monitored concentrations by the ABCs for each pollutant.

3. Field and laboratory methods

3.1 Air toxics parameters

A total of 109 individual analytes (i.e. pollutants or "air toxics") were measured at each site. These analytes are generally classified into four groups: PM10 metals (i.e. inhalable coarse particles smaller than 10 micrometers in diameter), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and carbonyls. Each group has a separate sampling and analytical method. Hexavalent chromium is a metal, but DEQ samples it separately using an instrument designated for that purpose. In addition to air toxics sampling, each site also measures wind speed and direction to provide more information about how these toxics are transported and dispersed at each sampling location. Appendix A presents a full list of analytes that were measured in each group.

3.2 Field sampling schedule

DEQ used five individual instruments to sample all analytes. Carbonyls, PAHs, PM10 metals, and hexavalent chromium were sampled by drawing air through a filter at a constant flow rate for a duration of 24 hours. VOCs were 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 performed 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 analysis was performed at the DEQ laboratory following methods outlined in the NATTS TAD; however, analysis of hexavalent chromium samples was initially performed by a subcontractor (Chester Labs) until the DEQ laboratory was able to perform the analytical method in-house. Table 1 lists the sampling media, equipment, and reference method followed for each sample type.

Table 1. 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 collected at six air toxics monitoring sites, four in the Portland-metro area and two outside the Portland Metro area. DEQ does not present results for a monitoring site until at least one year of data is available. Each of the six monitoring sites included in this report have at least one year of data. The four monitoring sites in the Portland-metro area presented here are Cully Helensview (Portland), SE 45th and SE Harney Dr. (Portland), Gresham Learning Centennial, and the Portland NATTS site. The two monitoring sites outside the Portland Metro area presented here are The Dalles Wasco Co. Library and the La Grande NATTS site (Figure 1).

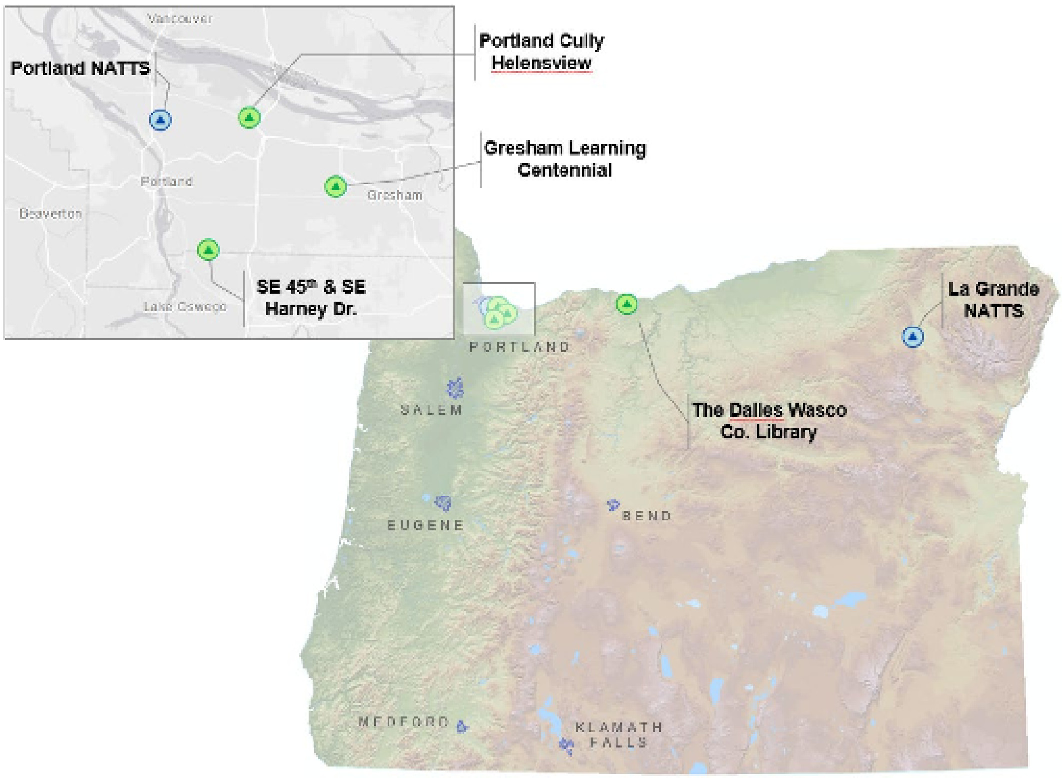


Figure 1. Air toxics monitoring stations.

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 (see Section 2.3). 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 sites can be found in the standard operating procedure document "Statewide Prioritization of Air Toxics Monitoring."

3.4.2 Portland Cully Helensview

This site is located at the Helensview alternative school in the northeast Portland Cully neighborhood (Figures 2-3). The site 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. Data presented in this report is from May 14, 2018 through July 26, 2019. The site was selected to assess air toxics in the area which is surrounded by many point, area, mobile, and non-mobile sources. The site at the Helensview school has good open exposure and is downwind of several sources. The wind comes from the northwest in the summer and from the southwest in the winter. There are occasional east winds throughout the year.

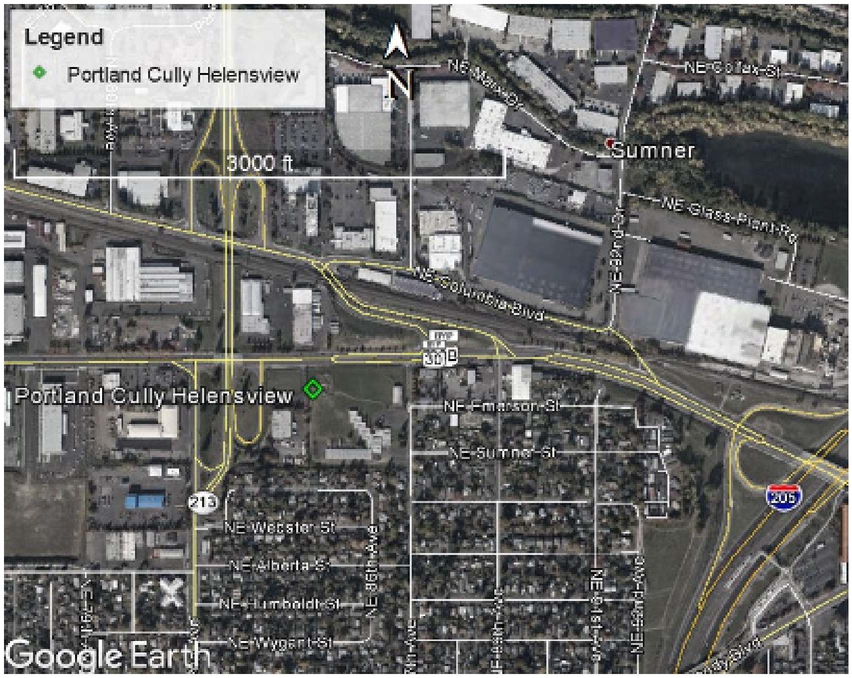


Figure 2. Location of Portland Cully Helensview air toxics monitoring site.

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

3.4.3 Portland SE 45th and SE Harney Dr.

This site operated from March 30, 2016 through Dec. 9, 2017. This site initially sampled for PM10 metals and hexavalent chromium. Other parameters (VOCs, PAHs, and carbonyls) began being sampled on June

4, 2016. This monitoring site was located in southeast Portland in Multnomah County (Figures 4-5). This site is adjacent to industrial facilities located across the street and to the southeast, while neighborhood housing makes up the rest of the surrounding area.

Figure 4. Location of the Portland SE 45th & SE Harney air toxics monitoring site.

Figure 5. Photo of the SE 45th & SE Harney Dr. air toxics monitoring site.

3.4.4 Gresham Learning Centennial

This site was located at Centennial Park School and operated from December 2, 2016 through March 27, 2018. This site is located in Gresham which is east of Portland and within Multnomah County (Figures 6-7). The site is mainly surrounded by residential areas with some industrial activity located to the east.

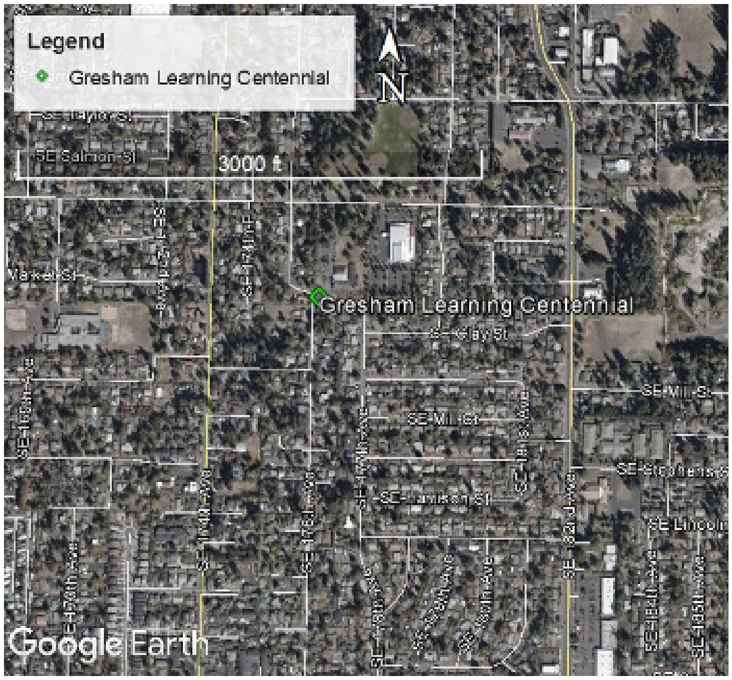


Figure 6. Location of Gresham Learning Centennial air toxics monitoring site.


Figure 7. Photo of the Gresham Learning Centennial air toxics monitoring site.

3.4.5 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 8-9). 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 air toxics group which helps to provide quality assurance for all air toxics monitoring data.

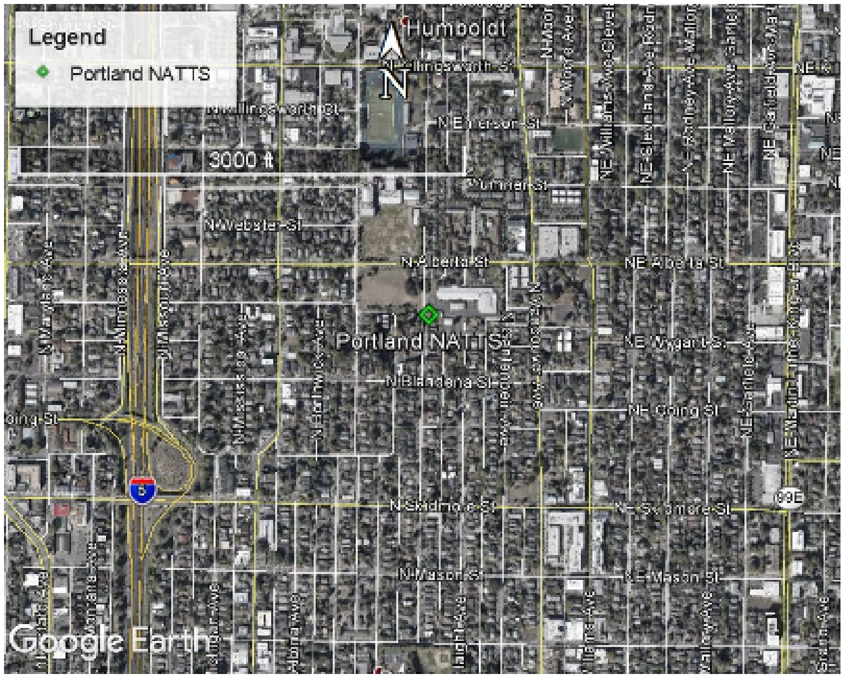


Figure 8. Location of Portland NATTS air toxics monitoring site.

Figure 9. Photo of the Portland NATTS air toxics monitoring site.

3.4.6 The Dalles Wasco Co. Library

This monitoring station was located at The Dalles Public Library and operated from July 30, 2017 through September 29, 2018 (Figures 10-11). This site is located in the Columbia River Gorge, where strong seasonal winds exist. Along with the La Grande NATTS site, this is the only other air toxics monitoring location presented in this report that is outside of the Portland-metro area. Results from PAH monitoring in The Dalles in 2016 and 2017 informed the decision to place a full air toxics monitoring station in order to measure levels of other pollutants.

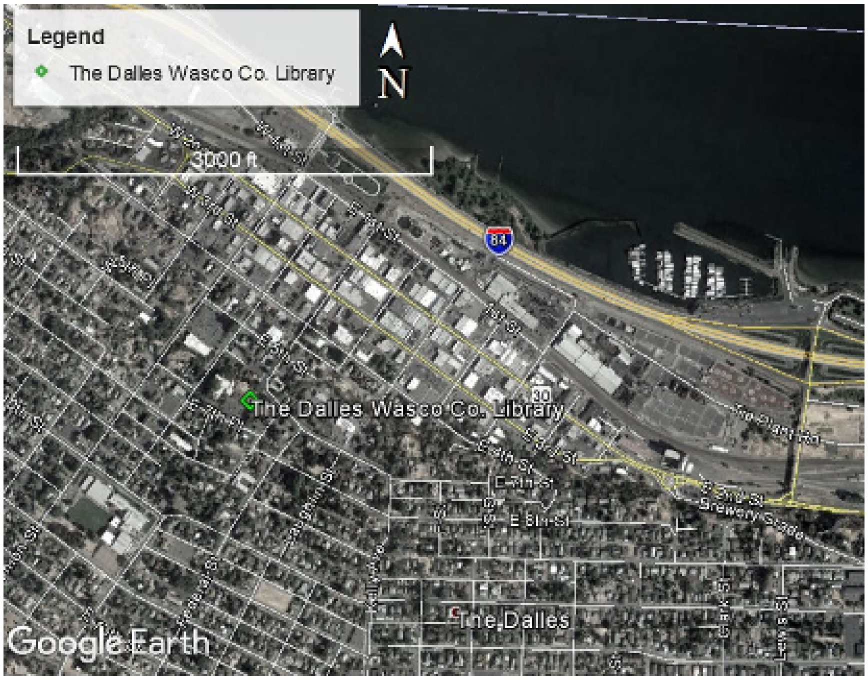


Figure 10. Location of The Dalles Wasco Co. Library air toxics monitoring site.

Figure 11. Photo of The Dalles Wasco Co. Library air toxics monitoring site.

3.4.7 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 12-13). This is the most rural air toxics monitoring location presented in this report.

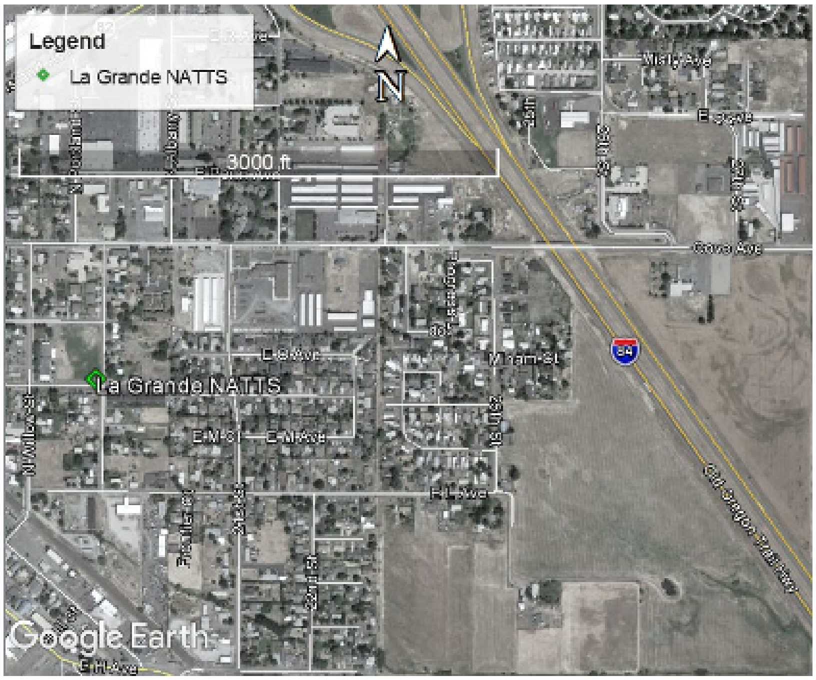


Figure 12. Location of La Grande NATTS air toxics monitoring site.

Figure 13. Photo of the La Grande NATTS air toxics monitoring site.

4. Results and discussion

4.1 Summary statistics

Appendix B presents summary statistics for all analytes at each monitoring location and includes information such as data completeness, and maximum and mean concentrations. Out of the 109 individual analytes measured there were 36 (33%) that were below the detection limit in at least 90% of the samples collected across all sites. DEQ compared analytes that were detected in at least 30% of the samples collected against their ABCs or Acute Risk-Based Concentrations (RBCs) where available.

4.2 Air Toxics Compared to ABCs

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. DEQ developed ABCs based on consensus recommendations from Oregon's Air Toxics Scientific Advisory Committee, a panel of outside experts that provided advice on the state air toxics program that was scientifically and technically sound, independent and balanced. The ABCs are designed to protect the health of the most sensitive individuals in our communities and serve as clean air goals or targets, not regulatory standards. The ABCs are intended to be compared against concentrations of pollutants averaged over the course of a year (i.e. the average annual concentration). Out of the 109 pollutants reported by the DEQ laboratory there are 28 ABCs available against which to compare results.

4.2.2 Acute Risk-Based Concentrations (RBCs)

Through the Cleaner Air Oregon rulemaking process, Risk-Based Concentrations (RBCs) were developed for many air toxics and are used as part of the permitting process to help assess the risk associated with emissions from new and existing point source facilities. RBCs were developed based on various exposure scenarios including a short-term, or "acute", exposure scenario of 24 hours. When concentrations of air toxics averaged over a 24-hour period are at or below their acute RBCs, no health effects are expected in the community breathing that air, including sensitive individuals like children, the elderly, and people with pre-existing health problems.

In contrast to the ABCs that are used to assess the long-term average levels of air toxics, the Acute RBCs serve as a useful reference for assessing levels of air toxics over the course of 24 hours. There are 44 analytes that have Acute RBCs available for comparison.

4.2.3 Analyte summary

Out of the 28 ABCs that exist for the analytes that are measured, results showed the average concentrations of 21 analytes were below their respective ABCs while seven analytes were above their respective ABCs at one or more monitoring locations (Table 2). In order to compare levels of these air toxics in Oregon with other urban monitoring locations across the U.S., a national average was calculated by taking the average of the annual means from 2016, 2017, and 2018 at all 18 urban NATTS sites (including the Portland site) for each analyte. The ratio of the urban NATTS average versus the Oregon ABC is provided at the end of Table 2.

Table 2. "Impact Factors" for air toxics with mean concentrations above the Oregon Ambient Benchmark Concentration (ABC). The "impact factor", or the number of times over the ABC, is the mean concentration divided by the ABC. The impact factor for all urban NATTS sites is shown in order to compare levels of air toxics to other urban areas in the U.S.

	DEQ Monitoring Sites						
Analyte Name	Portland SE 45th and SE Harney	Gresham Learning Centennial	The Dalles Wasco Co. Library	Portland Cully Helensview	Portland NATTS	La Grande NATTS	*All Urban NATTS Sites
Metals							
Arsenic	3.4	5.9	1.7	5.4	3.6	1.2	3.7
VOCs							
Benzene	3.8	4.8	3.7	2.9	3.5	2.6	5.2
Carbon tetrachloride	2.5	2.3	1.8	1.8	1.7	1.7	2.9
Ethylbenzene	1.8	1.1	Below ABC	2.7	Below ABC	Below ABC	6.2
PAHs							
Naphthalene	1.6	1.4	5.0	1.1	1.3	1.1	1.9
Carbonyls							
Acetaldehyde	3.4	2.9	5.1	2.3	2.9	3.7	3.7
Formaldehyde	9.9	9.1	18.6	7.9	9.1	11.6	15.6

*This impact factor was calculated by taking the average of the annual means from 2016, 2017, and 2018 at all 18 urban NATTS sites (including the Portland site). This national average from the urban NATTS sites was then divided by the Oregon ABC.

Comparing pollutants to their ABCs illustrates the following key points:

- The same analytes were above their ABCs at all monitoring locations (with the exception of ethylbenzene) indicating that even though the levels vary between sites, the presence of these pollutants is widespread and not unique to individual communities.
- The Dalles had the highest levels for three out of the seven analytes that were above their ABCs: naphthalene, acetaldehyde, and formaldehyde.
- Arsenic levels at Portland-metro area sites were higher than levels seen at The Dalles and La Grande, which are more rural and less densely populated. Arsenic concentrations were also higher during winter months at all sites except for La Grande.
- Four out of the five analytes that DEQ has designated as key performance measure (arsenic, benzene, acetaldehyde, and formaldehyde) were above their ABCs. The fifth key performance measure analyte, cadmium, was below its ABC at each site.

Three pollutants (1,3-butadiene, 1,4-dichlorobenzene, and acrylonitrile) had calculated means that were above their respective ABCs, however the ABCs are below the method detection limits (MDL) of the analytical method used to obtain the results and the datasets contain relatively high (65% - 100%) percentages of non-detects. For these analytes, the percentage of non-detect results in the dataset and the MDL should be considered carefully when comparing the calculated mean to the ABC.

For the 44 air toxics for which Acute RBCs are available, data showed that no individual 24-hour samples were above the Acute RBC.

4.3 Site summaries

4.3.1 Portland Cully Helensview

This monitoring site experienced the second highest levels of arsenic which were also above the national urban average. The highest levels of ethylbenzene were also found at this site which were below the national urban average. Levels of other air toxics found at this location were similar to the other Portland-metro area locations.

4.3.2 Portland SE 45th and SE Harney

Levels of air toxics at this site were similar to the other sites located in the Portland-metro area. All seven analytes shown above in Table 2 were above their ABC with the mean concentration of carbon tetrachloride being the highest out of all monitoring locations. Though levels of all seven air toxics were above their Oregon ABCs, they were all below the national average from all urban NATTS monitoring sites.

4.3.3 Gresham Learning Centennial

This location experienced the highest levels of arsenic among all sites. The most common and likely source of arsenic is vehicle engine exhaust, and the highest levels are seen during the winter months when lower mixing heights create less room for the pollutant to disperse in the atmosphere. Levels of arsenic at this location were above the national urban average. Levels of benzene, which also comes mostly from vehicle engine exhaust, were highest at this location though the mean was below the national urban average.

4.3.4 Portland NATTS

The levels of air toxics found at this location were similar to levels found at the other Portland-metro area sites. All seven analytes that were above their ABCs were also below the national average from all urban NATTS sites. Ethylbenzene was found to be below its ABC at this location.

4.3.5 The Dalles Wasco Co. Library

The Dalles monitoring site experienced the highest levels for three out of the seven analytes that were above their ABCs: naphthalene, acetaldehyde, and formaldehyde. Each of these pollutants were also above their respective national averages for urban areas. This location was one of the three locations where ethylbenzene was found to be below its ABC.

4.3.6 La Grande NATTS

With the exception of acetaldehyde and formaldehyde, the La Grande site experienced some of the lowest levels of air toxics among all six of the monitoring locations. Levels of acetaldehyde and formaldehyde found in La Grande were higher than all of the Portland-metro area sites, as well as the national urban average, but lower than levels found at The Dalles site.

4.4 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, respectively. Annual averages for the last five years were calculated for the five KPM analytes at both NATTS sites (Figures 14-15). Although samples collected at the Portland NATTS site from May 2015 to August 2016 may have been impacted by construction activities at the adjacent property, the data were used to calculate annual averages for 2015 and 2016 for informational purposes. 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. These data suggest that cadmium concentrations at the Portland site showed a statistically significant decline in concentrations over the last five years. Reduced levels of cadmium found at the site in 2017 and 2018 coincide with the regulation of emissions from art glass manufacturers in the area.

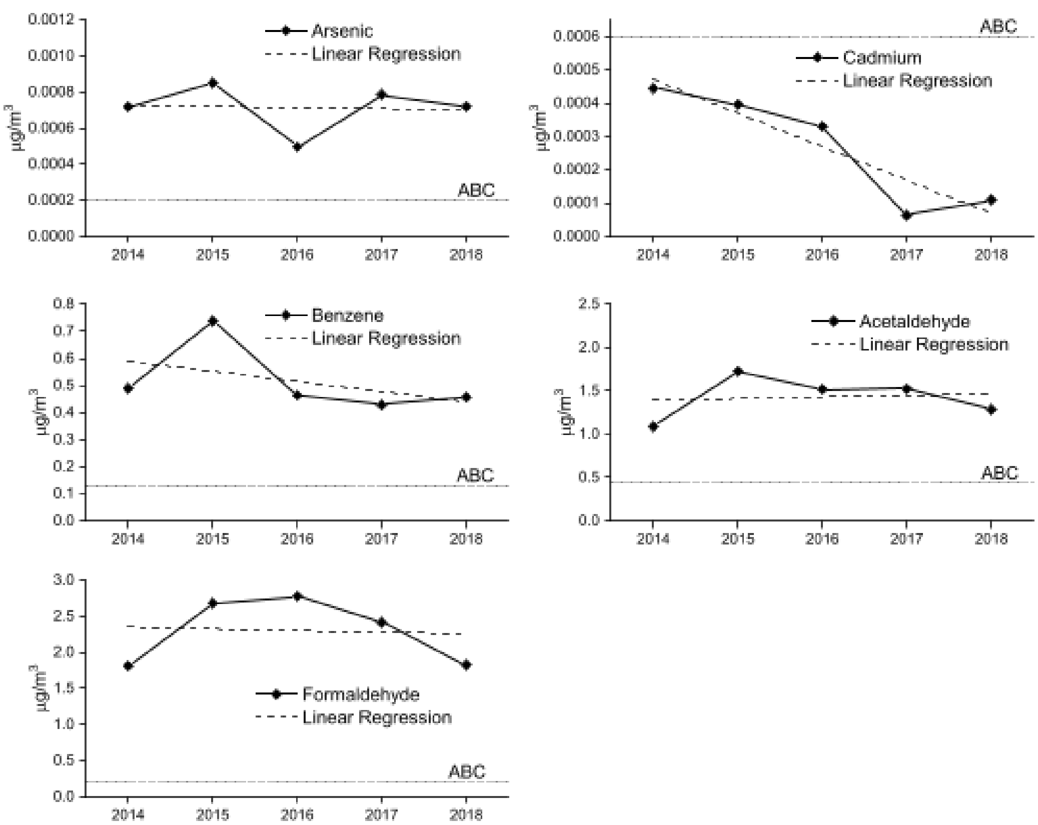


Figure 14. Five year trends for KPM analytes at the Portland NATTS site. The ambient benchmark concentration (ABC) is shown for reference. Only cadmium showed a statistically significant change (decrease) in concentrations over the last five years.

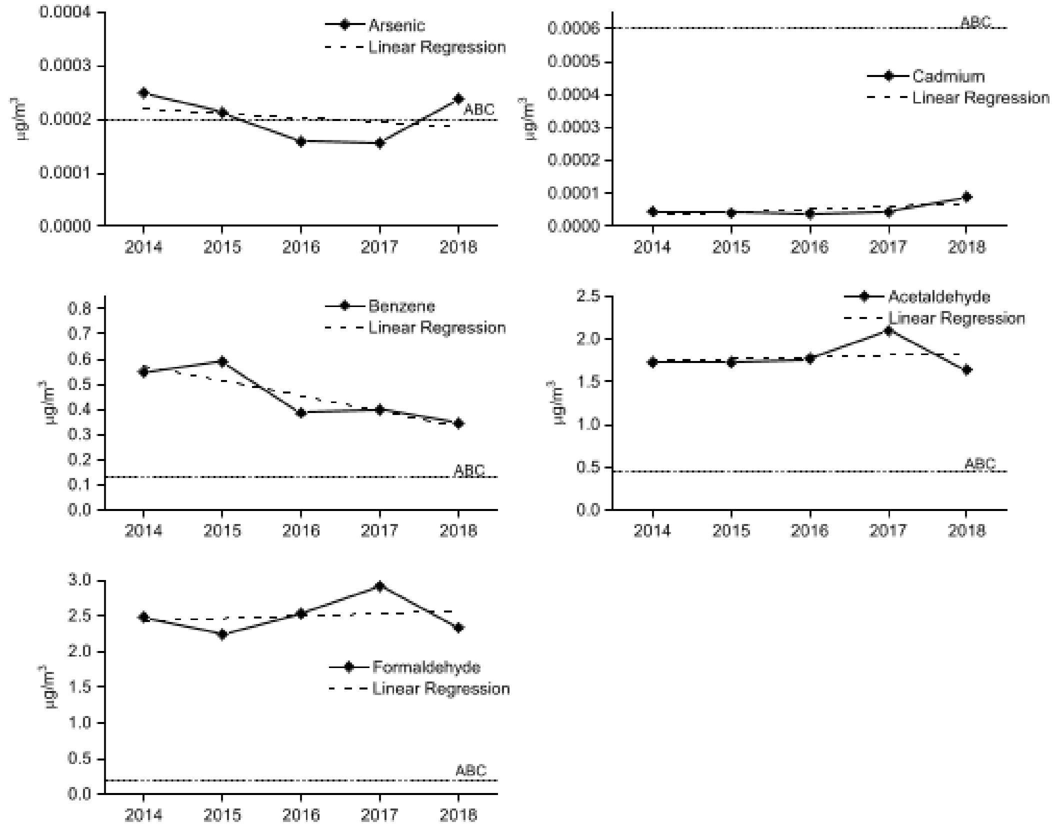


Figure 15. Five year trends for KPM analytes at the La Grande NATTS site. The ambient benchmark concentration (ABC) is shown for reference. No analytes showed a statistically significant change in concentrations over the last 5 years.

4.5 Wildfire smoke impacts

Forest fire smoke is known to contain several air toxics such as naphthalene and other PAHs, VOCs such as 1,3-butadiene, as well as metals and carbonyls. DEQ is able to identify days and times when forest fire smoke is present in an area by measuring the PM2.5 concentrations. When PM2.5 concentrations reach 25µg/m^3 and above, the site is identified as being impacted by forest fire smoke.

From August 2017 to October 2017 at The Dalles Wasco Co. Library site, there were seven days where air toxics samples were collected that coincided with impacts from forest fire smoke (i.e. PM2.5 levels were 25µg/m^3 or higher). The Dalles site had the most sample days that coincided with smoke impacts. Removing those sample days from the dataset shows the effects that forest fire smoke can have on levels of certain pollutants. Table 3 shows the maximum and average concentrations for the six pollutants that were above their ABCs compared to the maximum and average concentrations of those pollutants after removing the days that were affected by forest fire smoke from their datasets. The average concentrations for benzene, carbon tetrachloride, acetaldehyde, and formaldehyde all decreased after removing the forest fire smoke days from the datasets and with the exception of carbon tetrachloride, the maximum concentrations of those pollutants measured at the site also decreased. No change in levels of arsenic or naphthalene was seen after removing the forest fire days.

Table 3. Change in maximum and average concentrations of pollutants after removing samples from the dataset that were collected on days with impacts from forest fire smoke.

			Wildfire Smoke Days Removed from Dataset			
Analyte	*(µg/m³)* *Maximum*	*(µg/m³)* *Mean*	*(µg/m³)* *Maximum*	*(µg/m³)* *Mean*	*% Change of Means*	*(µg/m³)* ABC
Metals						
Arsenic	0.00164	0.000337	0.00164	0.000337	No change	**0.0002**
VOCs						
Benzene	3.480	0.485	1.16	0.419	-14%	**0.131**
Carbon tetrachloride	0.648	0.363	0.648	0.357	-2%	**0.201**
PAHs						
Naphthalene	0.596	0.1498	0.596	0.1498	No change	**0.03**
Carbonyls						
Acetaldehyde	11.5	2.305	8.87	1.983	-14%	**0.45**
Formaldehyde	17.7	3.726	14	3.216	-14%	**0.2**

5. Summary

5.1 Data summary

Most of the air toxics that are measured at each site were either below the detection limit for 90% of samples collected, or were detected but do not have ABCs to reference. Average levels of three analytes – 1,3-butadiene, 1,4-dichlorobenzene, and acrylonitrile – may be above their ABCs, but since the detection limits for these analytes are above the ABCs, it is difficult to assess the average levels of these pollutants.

Results show that the same seven air toxics tend to be above their ABCs at all monitoring locations demonstrating that these air toxics are present across Oregon in both urban and rural areas, though levels of some of these air toxics were higher in specific areas. Levels of arsenic appear to be higher at the Portland-metro area monitoring sites compared to monitoring sites in The Dalles and La Grande, which have smaller populations and are less urban. Levels of three air toxics – naphthalene, acetaldehyde, and formaldehyde – are higher at The Dalles Wasco Co. Library site compared to all other monitoring sites. Over the last five years, only cadmium at the Portland NATTS site showed a statistically significant change (decrease) in concentrations out of the five KPM analytes (arsenic, cadmium, benzene, acetaldehyde, formaldehyde) assessed at the Portland and La Grande NATTS sites. While most sources of air toxics are human-caused, smoke from wildfires can increase the levels of some air toxics and contribute to the overall average concentrations throughout the year. The maximum concentrations of benzene, acetaldehyde and formaldehyde in The Dalles were seen on days where forest fire smoke was present. Overall, data from these sites demonstrate that some air toxics are present in communities across Oregon.

5.2 Future air toxics monitoring

Results from long-term trend sites located in Medford, two locations in Eugene, and Hillsboro, Tualatin, Portland Cully neighborhood, and Bend will be available in the future and allow for further comparison of the levels of air toxics throughout the state. Data from Portland and La Grande NATTS sites will continue to be available annually. DEQ's Air Quality Program will use this information in the evaluation of air toxics in Oregon communities, in the implementation of the Cleaner Air Oregon program, and to develop future strategies for reducing air toxics. Rotating annual monitoring sites will also be set up at various locations around the state based on the prioritization schedule for annual sites.

6. References

E. L. Kaplan & Paul Meier (1958) *Nonparametric Estimation from Incomplete Observations*, Journal of the American Statistical Association, 53:282, 457-481.

Helsel DR. (2012). *Statistics for censored environmental data using Minitab® and R*. 2nd ed. New York: John Wiley & Sons, Inc.

ODEQ. *Quality Assurance Project Plan: Air Toxics Monitoring*. April 2019. DEQ01-LAB-0004-QAPP. Available upon request.

ODEQ. *Standard Operating Procedure Statewide Prioritization of Air Toxics Monitoring*. April 2017. https://www.oregon.gov/deq/FilterDocs/priorATmonitorSOP.pdf.

ODEQ. *Statewide Prioritization of Air Toxics Monitoring.* March 2019. Available at https://www.oregon.gov/deq/FilterDocs/priorATmonitorLoc.pdf.

ODEQ. *Oregon Ambient Benchmark Concentrations*. May 2018. Available at https://www.oregon.gov/deq/FilterDocs/airtox-abc.pdf.

US EPA. "Hazardous Air Pollutants". Accessed August 1, 2019. https://www.epa.gov/haps.

US EPA. 2007. *ProUCL Version 4.0 Technical Guide*. EPA/600/R-07/041. Available at http://www.epa.gov/osp/hstl/tsc/ProUCL_v4.0_tech.pdf. Accessed June 1, 2014.

US EPA. *Technical Assistance Document for the National Air Toxics Trends Stations Program*. Revision 3. October 2016. Available at https://www3.epa.gov/ttnamti1/files/ambient/airtox/NATTS%20TAD%20Revision%203_FINAL%20October%202016.pdf.

Appendix A – Analyte lists

Tables 1-4 list the air toxics analytes that are measured by the DEQ laboratory. All analytes are measured at all air toxics monitoring stations. Analytes are listed according to the analyte category and include the Chemical Abstracts Service registry number (CASRN).

Table 1. 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

Appendix B – Summary statistics for 2018 NATTS and select rotating annual sites

1. Data completeness

One of the measurement quality objectives for the Air Toxics Monitoring Program is to achieve a data completeness of greater than or equal to 85% for a given quarter to ensure that enough data is available for calculating summary statistics and assessing air quality. Completeness is defined as the number of valid samples divided by the number of expected samples for a given time period. Completeness was calculated for each analyte group by using the number of valid samples from a single analyte to represent the number of valid samples for the entire analyte group (Tables 1-6). The representative analytes were chosen because they are rarely voided during sample analysis.

Despite 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. A sample may be voided for reasons including, but 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.

Table 1. Completeness records for Cully Helensview (Portland).

		Cully Helensview (Portland)			
Analyte Group	Representative Analyte	*Date range*	*# Valid Samples*	*# Expected Samples*	*Completeness*
Metals	(Arsenic)	5/14/18 - 6/26/19	68	69	99%
Hexavalent Chromium	(Hexavalent Chromium)	5/14/18 - 6/26/19	65	69	94%
VOCs	(1,1,1-Trichloroethane)	6/19/18 - 6/26/19	60	63	95%
PAHs	(Perylene)	5/14/18 - 6/26/19	66	69	96%
Carbonyls	(Formaldehyde)	5/14/18 - 6/26/19	65	69	94%

Table 2. Completeness records for SE 45th and SE Harney (Portland).

		SE 45th and SE Harney (Portland)			
Analyte Group	Representative Analyte	*Date range*	*# Valid Samples*	*# Expected Samples*	*Completeness*
PM10 Metals	(Arsenic)	3/30/16 - 12/9/17	282	104	100%
Hexavalent Chromium	(Hexavalent Chromium)	3/30/16 - 12/9/17	296	104	100%

VOCs	(1,1,1-Trichloroethane)	6/4/16 - 12/9/17	94	93	100%
PAHs	(Perylene)	6/4/16 - 12/9/17	86	93	92%
Carbonyls	(Formaldehyde)	6/4/16 - 12/9/17	98	93	100%

Table 3. Completeness records for Gresham Learning Centennial.

		Gresham Learning Centennial			
Analyte Group	Representative Analyte	*Date range*	*# Valid Samples*	*# Expected Samples*	*Completeness*
Metals	(Arsenic)	12/2/16 - 3/27/18	77	81	95%
Hexavalent Chromium	(Hexavalent Chromium)	12/2/16 - 3/27/18	40	81	49%
VOCs	(1,1,1-Trichloroethane)	12/2/16 - 3/27/18	80	81	99%
PAHs	(Perylene)	12/2/16 - 3/27/18	73	81	90%
Carbonyls	(Formaldehyde)	12/2/16 - 3/27/18	77	81	95%

Table 4. Completeness records for The Dalles Wasco Co. Library.

		The Dalles Wasco Co. Library			
Analyte Group	Representative Analyte	*Date range*	*# Valid Samples*	*# Expected Samples*	*Completeness*
Metals	(Arsenic)	7/30/17 - 9/29/18	59	72	82%
Hexavalent Chromium	(Hexavalent Chromium)	7/30/17 - 9/29/18	72	72	100%
VOCs	(1,1,1-Trichloroethane)	7/30/17 - 9/29/18	66	72	92%
PAHs	(Perylene)	7/30/17 - 9/29/18	71	72	99%
Carbonyls	(Formaldehyde)	7/30/17 - 9/29/18	55	72	76%

Table 5. Completeness records for Portland NATTS.

		Portland NATTS			
Analyte Group	Representative Analyte	*Date range*	*# Valid Samples*	*# Expected Samples*	*Completeness*
Metals	(Arsenic)	2018	61	61	100%
Hexavalent Chromium	(Hexavalent Chromium)	2018	60	61	98%
VOCs	(1,1,1-Trichloroethane)	2018	53	61	87%
PAHs	(Perylene)	2018	58	61	95%
Carbonyls	(Formaldehyde)	2018	56	61	92%

Table 6. Completeness records for La Grande NATTS.

		La Grande NATTS			
Analyte Group	Representative Analyte	*Date range*	*# Valid Samples*	*# Expected Samples*	*Completeness*
Metals	(Arsenic)	2018	61	61	100%
VOCs	(1,1,1-Trichloroethane)	2018	60	61	98%
PAHs	(Perylene)	2018	53	61	87%
Carbonyls	(Formaldehyde)	2018	59	61	97%

2. Summary statistics

Summary statistics such as the number of observations (i.e. valid results, "# Obs"), percentage of results that were "non-detect" (i.e. below the detection limit of the analytical method, "%NDs"), the maximum concentration, and the mean concentration are shown for each analyte at each monitoring location. For reference, the Oregon Ambient Benchmark Concentration (ABC) is included for each analyte where available.

For many analytes, sample results may be below the method detection limit (MDL) which is the lowest concentration that can reliably be detected by laboratory analysis. Such results are reported as "non-detect", or "ND", and can affect the calculation of summary statistics as well as the interpretation of levels present in ambient air. When the percentage of non-detect results reaches 75%-80% for an analyte, a mean concentration cannot be reliably calculated and therefore should not be used for further analysis or comparison to the ABC. For documentation purposes, a mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean. Analytes with a mean concentration above its ABC is shaded grey for identification purposes.

Mean concentrations were calculated using the Kaplan-Meier method ("KM Mean") which accounts for datasets with non-detect values and generated using ProUCL version 5.1 statistical software.

Table 7. Summary statistics for metals analytes at select rotating annual sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

Metals	ROTATING ANNUAL SITES																Ambient Benchmark Concentration (ABC)
	Portland SE 45th & SE Harney (Mar. 2016 - Dec. 2017)				Gresham Learning Centennial (Dec. 2016 - Mar. 2018)				The Dalles Wasco Co. Library (Jul. 2017 - Sep. 2018)				Portland Cully Helensview (May 2018 - Jul. 2019)				
Analyte	*# Obs*	*% NDs*	*(µg/m³ LTP) Maximum*	*(µg/m³ LTP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ LTP) Maximum*	*(µg/m³ LTP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ LTP) Maximum*	*(µg/m³ LTP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ LTP) Maximum*	*(µg/m³ LTP) KM Mean*	***ABC Units (µg/m³ LTP)***
Antimony, Total	11	0%	0.00157	0.001063	30	50%	0.0023	0.00077	58	91%	0.000628	0.000448	68	10%	0.00369	0.000939	--
Arsenic, Total	282	0%	0.00548	**0.000671**	77	0%	0.0051	**0.001174**	59	0%	0.00164	**0.000337**	68	0%	0.00956	**0.001086**	**0.0002**
Beryllium, Total	282	65%	0.000018	0.00000496	77	71%	0.000024	0.00000552	59	86%	0.000018	0.00000508	68	99%	0.000014	0.00000907	**0.0004**
Cadmium, Total	282	39%	0.0013	0.0000812	77	47%	0.000759	0.0000813	59	88%	0.000585	0.0000561	68	72%	0.000352	0.00011	**0.0006**
Chromium, Total	281	91%	0.0316	0.001396	77	97%	0.00122	0.001064	59	100%	N/A	N/A	68	96%	0.00842	0.004544	--
Cobalt, Total	282	4%	0.0254	0.000332	77	39%	0.000449	0.0000947	59	39%	0.000407	0.000144	68	43%	0.000663	0.000146	**0.1**
Hexavalent Chromium [Cr(VI)]	274	26%	0.00044	0.0000641	40	55%	0.000077	0.0000284	72	92%	0.000034	0.0000197	65	66%	0.000076	0.0000264	**0.00008**
Lead, Total	282	1%	0.00865	0.00188	77	4%	0.0152	0.002161	59	0%	0.0094	0.001745	68	0%	0.0413	0.003753	**0.15**
Manganese, Total	282	0%	0.0452	0.006293	77	14%	0.16	0.007332	59	2%	0.0185	0.005915	68	1%	0.0431	0.00599	**0.09**
Nickel, Total	282	38%	0.0445	0.001374	77	83%	0.000991	0.00044	59	100%	N/A	N/A	68	94%	0.00211	0.000927	**0.004**
Selenium, Total	282	9%	0.00194	0.000175	77	35%	0.000434	0.000127	59	63%	0.000253	0.000107	68	24%	0.00355	0.000317	--

Table 8. Summary statistics for metals analytes at Oregon NATTS sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

Metals	NATIONAL AIR TOXICS TRENDS SITES								Ambient Benchmark Concentration (ABC)
	Portland NATTS 2018				La Grande NATTS 2018				
Analyte	*# Obs*	*% NDs*	*(µg/m³ LTP) Maximum*	*(µg/m³ LTP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ LTP) Maximum*	*(µg/m³ LTP) KM Mean*	***ABC Units (µ/m³ LTP)***
Antimony, Total	61	48%	0.00321	0.000725	61	97%	0.00072	0.00045	--
Arsenic, Total	61	0%	0.00297	**0.000719**	61	5%	0.00159	**0.000238**	**0.0002**
Beryllium, Total	61	92%	0.000013	0.0000091	61	74%	0.000031	0.0000104	**0.0004**
Cadmium, Total	61	75%	0.000374	0.000109	61	97%	0.000126	0.0000897	**0.0006**
Chromium, Total	61	98%	0.00538	0.004446	61	100%	N/A	N/A	--
Cobalt, Total	61	48%	0.000454	0.000147	61	39%	0.000566	0.000147	**0.1**
Hexavalent Chromium [Cr(VI)]	60	72%	0.000082	0.0000253	#N/A	#N/A	#N/A	#N/A	**0.00008**
Lead, Total	61	2%	0.00835	0.002378	61	16%	0.00476	0.001068	**0.15**
Manganese, Total	61	3%	0.092	0.01692	61	0%	0.0301	0.006766	**0.09**
Nickel, Total	61	62%	0.00419	0.001138	61	98%	0.00107	0.000888	**0.004**
Selenium, Total	61	21%	0.00223	0.000288	61	79%	0.000133	0.0000923	--

Table 9. Summary statistics for VOC analytes at select rotating annual sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

VOCs	ROTATING ANNUAL SITES																Ambient Benchmark Concentration (ABC)
	Portland SE 45th & SE Harney (Mar. 2016 - Dec. 2017)				Gresham Learning Centennial (Dec. 2016 - Mar. 2018)				The Dalles Wasco Co. Library (Jul. 2017 - Sep. 2018)				Portland Cully Helensview (May 2018 - Jul. 2019)				
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*ABC Units (µg/m³ STP)*
1,1,1-Trichloroethane	94	100%	N/A	N/A	80	99%	0.294	0.273	66	100%	N/A	N/A	60	100%	N/A	N/A	**5000**
1,1,2,2-Tetrachloroethane	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
1,1,2-Trichloroethane	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	57	100%	N/A	N/A	–
1,1-Dichloroethane	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
1,1-Dichloroethylene	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
1,2,4-Trichlorobenzene	69	90%	1.313	0.779	62	97%	1.194	0.764	54	100%	N/A	N/A	40	100%	N/A	N/A	–
1,2,4-Trimethylbenzene	93	2%	19.407	1.273	76	9%	2.938	0.801	66	26%	1.838	0.511	60	53%	2.000	0.435	–
1,2-Dibromoethane (EDB)	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
1,2-Dichlorobenzene	94	96%	0.428	0.304	80	95%	0.613	0.306	66	100%	N/A	N/A	60	100%	N/A	N/A	–
1,2-Dichloroethane (EDC)	94	98%	0.213	0.203	80	96%	0.238	0.203	66	97%	0.207	0.202	60	100%	N/A	N/A	–
1,2-Dichloropropane	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	57	100%	N/A	N/A	–
1,2-Dimethylbenzene	94	1%	11.283	0.759	80	6%	1.879	0.538	66	18%	1.137	0.326	60	2%	2.070	0.582	–
1,3,5-Trimethylbenzene	94	21%	4.962	0.402	80	43%	0.722	0.309	66	76%	0.555	0.256	60	87%	0.455	0.253	–
1,3-Butadiene	94	72%	0.345	**0.107**	80	65%	0.394	**0.112**	66	86%	0.314	**0.096**	60	92%	0.178	**0.091**	**0.03**
1,3-Dichlorobenzene	94	99%	1.076	0.309	80	100%	N/A	N/A	66	100%	N/A	N/A	58	100%	N/A	N/A	–
1,4-Dichlorobenzene	94	89%	0.817	**0.308**	80	95%	0.561	**0.307**	66	97%	0.349	**0.301**	60	100%	N/A	N/A	**0.09**
1,4-Dimethylbenzene + 1,3-Dimethylbenzene	94	3%	26.646	1.831	80	11%	4.774	1.319	66	21%	2.756	0.742	60	0%	5.728	1.766	–
1,4-Dioxane	65	100%	N/A	N/A	44	100%	N/A	N/A	31	100%	N/A	N/A	33	100%	N/A	N/A	–
2-Butanone (MEK)	89	7%	3.331	0.666	75	5%	2.591	0.572	58	10%	2.948	0.531	53	0%	1.945	0.551	–
2-Chloro-1,3-butadiene	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	59	100%	N/A	N/A	–
2-Hexanone	94	99%	0.475	0.409	75	97%	0.532	0.414	52	100%	N/A	N/A	60	100%	N/A	N/A	–
4-Ethyltoluene	94	64%	3.759	0.419	78	60%	1.322	0.360	65	52%	0.948	0.299	58	79%	0.580	0.260	–
4-Methyl-2-pentanone (MIBK)	88	90%	0.774	0.220	74	80%	0.317	0.219	60	58%	0.282	0.216	59	78%	0.357	0.216	–
Acetone	93	0%	24.927	6.460	69	0%	32.999	5.615	55	4%	23.977	4.387	48	0%	18.826	6.626	–
Acetonitrile	94	0%	6.527	0.797	80	0%	1.795	0.351	66	0%	3.272	0.435	57	12%	7.400	0.492	–
Acrolein	93	0%	1.302	0.250	80	3%	1.625	0.275	66	3%	2.498	0.280	60	13%	0.403	0.156	**0.35**
Acrylonitrile	87	94%	0.228	**0.112**	70	89%	0.208	**0.114**	54	96%	0.247	**0.113**	57	100%	N/A	N/A	**0.01**
Benzene	94	1%	2.021	**0.498**	79	0%	2.519	**0.632**	66	9%	3.480	**0.485**	60	5%	1.287	**0.377**	**0.13**
Benzyl chloride	92	98%	0.306	0.259	79	96%	0.411	0.262	64	97%	0.268	0.259	37	100%	N/A	N/A	–
Bromodichloromethane	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
Bromoform	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
Bromomethane	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
Carbon disulfide	94	89%	0.738	0.176	80	88%	0.598	0.181	66	85%	0.566	0.196	60	65%	0.691	0.212	–
Carbon tetrachloride	94	0%	0.660	**0.509**	79	0%	0.622	**0.466**	66	0%	0.648	**0.363**	60	0%	0.660	**0.371**	**0.2**
Chlorobenzene	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
Chloroethane	94	99%	0.174	0.132	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	–
Chloroform	94	95%	0.476	0.247	80	95%	0.302	0.246	66	98%	0.250	0.244	60	100%	N/A	N/A	**300**
Chloromethane	94	0%	1.603	1.085	79	0%	1.506	0.989	66	0%	1.467	0.731	60	0%	1.267	0.704	–

Table 10. (Continued) Summary statistics for VOC analytes at select rotating annual sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

VOCs (continued)	ROTATING ANNUAL SITES																Ambient Benchmark Concentration (ABC)
	Portland SE 45th & SE Harney (Mar. 2016 - Dec. 2017)				Gresham Learning Centennial (Dec. 2016 - Mar. 2018)				The Dalles Wasco Co. Library (Jul. 2017 - Sep. 2018)				Portland Cully Helensview (May 2018 - Jul. 2019)				
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	***ABC Units (µg/m³ STP)***
cis-1,2-Dichloroethene	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	--
cis-1,3-Dichloropropene	94	98%	0.287	0.228	80	98%	0.311	0.228	66	92%	0.381	0.233	60	100%	N/A	N/A	--
Cyclohexane	94	24%	0.908	0.266	80	25%	0.960	0.289	66	61%	0.495	0.200	60	72%	0.392	0.190	--
Dibromochloromethane	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	--
Dichlorodifluoromethane (Freon 12)	94	0%	3.158	2.412	79	0%	2.951	2.224	66	0%	2.857	1.680	60	0%	2.817	1.695	--
Dichlorotetrafluoroethane (Freon 114)	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	--
Ethylbenzene	94	4%	12.976	**0.694**	80	11%	1.471	**0.438**	66	30%	1.115	0.306	60	0%	2.786	**1.055**	**0.4**
Hexachloro-1,3-butadiene	77	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	58	100%	N/A	N/A	--
Isopropanol	89	10%	5.380	1.415	62	2%	6.264	2.520	59	63%	2.776	0.666	48	58%	1.462	0.599	--
Methyl tert-butyl ether (MTBE)	94	100%	N/A	N/A	80	100%	N/A	N/A	66	94%	1.218	0.225	60	100%	N/A	N/A	--
Methylene chloride	94	0%	4.062	0.677	79	0%	1.899	0.531	66	6%	1.646	0.345	60	2%	1.989	0.375	**100**
Methylmethacrylate	94	89%	1.535	0.241	80	86%	1.760	0.241	66	85%	1.981	0.262	60	100%	N/A	N/A	--
n-Heptane	94	15%	0.967	0.341	80	16%	1.221	0.354	66	47%	0.709	0.250	60	43%	0.688	0.256	--
n-Hexane	94	5%	6.904	0.578	80	10%	1.790	0.454	66	21%	1.134	0.293	60	32%	0.747	0.270	**700**
Styrene	94	24%	18.306	1.315	80	40%	0.745	0.292	60	63%	0.788	0.269	60	87%	0.856	0.236	**1000**
Tetrachloroethylene	94	57%	2.996	0.235	80	68%	1.139	0.207	66	79%	0.678	0.211	60	82%	0.332	0.182	**4**
Tetrahydrofuran	94	98%	2.278	0.318	80	99%	0.357	0.295	66	100%	N/A	N/A	60	100%	N/A	N/A	--
Toluene	94	0%	10.734	2.267	76	4%	7.721	1.902	66	14%	5.047	0.926	60	0%	5.009	1.235	**5000**
trans-1,2-Dichloroethene	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	59	100%	N/A	N/A	--
trans-1,3-Dichloropropene	94	99%	0.261	0.227	80	98%	0.269	0.228	66	91%	0.319	0.230	60	100%	N/A	N/A	--
Trichloroethylene	94	94%	0.261	0.192	80	95%	0.220	0.190	66	97%	0.203	0.189	60	100%	N/A	N/A	**0.2**
Trichlorofluoromethane (Freon 11)	94	0%	1.724	1.297	79	0%	1.617	1.185	66	0%	1.583	0.915	60	2%	1.819	0.977	--
Trichlotrifluoroethane (freon 113)	94	12%	0.630	0.540	80	29%	0.628	0.495	66	62%	0.643	0.407	60	63%	0.766	0.407	--
vinyl chloride	94	100%	N/A	N/A	80	100%	N/A	N/A	66	100%	N/A	N/A	60	100%	N/A	N/A	**0.1**

Table 11. Summary statistics for VOC analytes at Oregon NATTS sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

VOCs	NATIONAL AIR TOXICS TRENDS SITES: Portland NATTS 2018				La Grande NATTS 2018				Ambient Benchmark Concentration (ABC)
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*ABC Units (µg/m³ STP)*
1,1,1-Trichloroethane	53	100%	N/A	N/A	60	100%	N/A	N/A	**5000**
1,1,2,2-Tetrachloroethane	53	100%	N/A	N/A	60	100%	N/A	N/A	--
1,1,2-Trichloroethane	50	100%	N/A	N/A	56	100%	N/A	N/A	--
1,1-Dichloroethane	53	100%	N/A	N/A	60	100%	N/A	N/A	--
1,1-Dichloroethylene	53	100%	N/A	N/A	60	100%	N/A	N/A	--
1,2,4-Trichlorobenzene	36	100%	N/A	N/A	42	100%	N/A	N/A	--
1,2,4-Trimethylbenzene	53	21%	1.798	0.545	60	35%	1.174	0.385	--
1,2-Dibromoethane (EDB)	53	100%	N/A	N/A	60	100%	N/A	N/A	--
1,2-Dichlorobenzene	53	100%	N/A	N/A	60	100%	N/A	N/A	--
1,2-Dichloroethane (EDC)	53	100%	N/A	N/A	60	100%	N/A	N/A	--
1,2-Dichloropropane	50	100%	N/A	N/A	56	100%	N/A	N/A	--
1,2-Dimethylbenzene	53	13%	1.688	0.398	60	38%	0.516	0.261	--
1,3,5-Trimethylbenzene	53	64%	0.521	0.270	60	93%	0.325	0.248	--
1,3-Butadiene	53	85%	0.181	**0.095**	60	95%	0.105	**0.089**	**0.03**
1,3-Dichlorobenzene	53	100%	N/A	N/A	60	100%	N/A	N/A	--
1,4-Dichlorobenzene	53	100%	N/A	N/A	60	100%	N/A	N/A	**0.09**
1,4-Dimethylbenzene + 1,3-Dimethylbenzene	53	13%	5.164	0.929	60	45%	2.174	0.573	--
1,4-Dioxane	16	100%	N/A	N/A	17	100%	N/A	N/A	--
2-Butanone (MEK)	50	0%	4.746	0.784	54	13%	2.152	0.489	--
2-Chloro-1,3-butadiene	51	100%	N/A	N/A	59	100%	N/A	N/A	--
2-Hexanone	43	100%	N/A	N/A	46	100%	N/A	N/A	--
4-Ethyltoluene	52	54%	0.614	0.285	58	83%	0.382	0.251	--
4-Methyl-2-pentanone (MIBK)	52	77%	0.352	0.218	59	90%	0.368	0.208	--
Acetone	42	0%	16.760	4.905	49	2%	15.716	4.655	--
Acetonitrile	50	0%	13.558	0.816	56	0%	2.668	0.552	--
Acrolein	53	0%	0.752	0.238	60	13%	1.017	0.222	**0.35**
Acrylonitrile	46	98%	0.139	**0.109**	52	94%	0.214	**0.111**	**0.01**
Benzene	53	4%	2.018	**0.457**	60	8%	1.127	**0.345**	**0.13**
Benzyl chloride	42	95%	0.269	0.259	48	98%	0.260	0.259	--
Bromodichloromethane	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Bromoform	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Bromomethane	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Carbon disulfide	53	91%	0.507	0.176	60	87%	0.772	0.203	--
Carbon tetrachloride	53	0%	0.399	**0.336**	60	0%	0.435	**0.344**	**0.2**
Chlorobenzene	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Chloroethane	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Chloroform	53	100%	N/A	N/A	60	100%	N/A	N/A	**300**
Chloromethane	53	0%	1.312	0.728	60	0%	1.211	0.724	--

Table 12. (Continued) Summary statistics for VOC analytes at Oregon NATTS sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

VOCs (continued)	NATIONAL AIR TOXICS TRENDS SITES: Portland NATTS 2018				La Grande NATTS 2018				Ambient Benchmark Concentration (ABC)
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	***ABC Units (µg/m³ STP)***
cis-1,2-Dichloroethene	53	100%	N/A	N/A	60	100%	N/A	N/A	--
cis-1,3-Dichloropropene	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Cyclohexane	53	49%	0.802	0.232	60	78%	0.406	0.184	--
Dibromochloromethane	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Dichlorodifluoromethane (Freon 12)	53	0%	1.977	1.611	60	0%	1.947	1.621	--
Dichlorotetrafluoroethane (Freon 114)	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Ethylbenzene	53	26%	1.502	0.357	60	53%	0.521	0.245	**0.4**
Hexachloro-1,3-butadiene	50	100%	N/A	N/A	56	100%	N/A	N/A	--
Isopropanol	38	53%	2.403	0.725	44	5%	9.114	1.646	--
Methyl tert-butyl ether (MTBE)	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Methylene chloride	53	0%	1.340	0.385	60	3%	48.950	1.416	**100**
Methylmethacrylate	53	96%	0.259	0.206	60	98%	0.227	0.205	--
n-Heptane	53	30%	1.061	0.292	60	47%	0.496	0.227	--
n-Hexane	53	6%	1.377	0.377	60	18%	15.570	0.690	**700**
Styrene	51	61%	0.536	0.253	57	82%	0.434	0.220	**1000**
Tetrachloroethylene	53	91%	0.436	0.179	60	98%	0.206	0.170	**4**
Tetrahydrofuran	53	100%	N/A	N/A	60	98%	0.392	0.298	--
Toluene	53	0%	5.649	1.152	60	17%	15.969	0.960	**5000**
trans-1,2-Dichloroethene	51	100%	N/A	N/A	59	100%	N/A	N/A	--
trans-1,3-Dichloropropene	53	100%	N/A	N/A	60	100%	N/A	N/A	--
Trichloroethylene	53	98%	0.193	0.188	60	100%	N/A	N/A	**0.2**
Trichlorofluoromethane (Freon 11)	53	0%	1.814	0.915	60	0%	1.707	0.887	--
Trichlotrifluoroethane (freon 113)	53	75%	0.470	0.391	60	78%	0.446	0.389	--
vinyl chloride	53	100%	N/A	N/A	60	100%	N/A	N/A	**0.1**

Table 13. Summary statistics for PAH analytes at select rotating annual sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

PAHs	*ROTATING ANNUAL SITES*																**Ambient Benchmark Concentration (ABC)**
	Portland SE 45th & SE Harney (Mar. 2016 - Dec. 2017)				**Gresham Learning Centennial (Dec. 2016 - Mar. 2018)**				**The Dalles Wasco Co. Library (Jul. 2017 - Sep. 2018)**				**Portland Cully Helensview (May 2018 - Jul. 2019)**				
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	***ABC Units (µg/m³ STP)***
Acenaphthene	85	6%	0.0183	0.002001	73	14%	0.00635	0.00165	71	1%	0.108	0.02597	65	0%	0.0116	0.002737	**0.002***
Acenaphthylene	86	49%	0.0131	0.001252	73	41%	0.0114	0.001892	71	38%	0.00845	0.001437	65	66%	0.00464	0.00088	
Anthracene	86	81%	0.00703	0.00048	73	63%	0.00215	0.000586	71	54%	0.00464	0.000839	65	82%	0.001	0.000439	
Benzo(a)anthracene	86	98%	0.00075	0.000367	73	81%	0.00165	0.000454	71	89%	0.00208	0.000516	66	97%	0.00045	0.000401	
Benzo(a)pyrene	86	93%	0.00086	0.000379	73	82%	0.00156	0.000463	71	93%	0.00135	0.000481	66	94%	0.00062	0.000407	
Benzo(b)fluoranthene	86	91%	0.00103	0.000388	73	71%	0.00165	0.000494	71	86%	0.00154	0.000527	66	88%	0.00082	0.000417	
Benzo(e)pyrene	86	95%	0.00071	0.000373	73	82%	0.00112	0.000426	71	87%	0.001	0.000486	66	98%	0.00053	0.000402	
Benzo(g,h,i)perylene	86	91%	0.00098	0.00039	73	81%	0.00131	0.000439	71	92%	0.00083	0.000479	66	91%	0.00071	0.000412	
Benzo(k)fluoranthene	86	92%	0.00095	0.000384	73	75%	0.00167	0.00049	71	87%	0.00152	0.000511	66	97%	0.00067	0.000406	
Chrysene	86	94%	0.00103	0.000379	73	74%	0.00199	0.000506	71	75%	0.00299	0.000601	66	97%	0.00066	0.000405	
Coronene	83	99%	0.00044	0.000361	66	97%	0.00061	0.000385	68	100%	N/A	N/A	66	100%	N/A	N/A	
Dibenzo(a,h)anthracene	86	100%	N/A	N/A	73	100%	N/A	N/A	71	100%	N/A	N/A	66	100%	N/A	N/A	
Dibenzofuran	85	0%	0.0341	0.003557	73	0%	0.0204	0.003841	71	0%	0.0844	0.02191	65	0%	0.00824	0.003294	
Dibenzothiophene	86	87%	0.00085	0.000389	73	82%	0.00063	0.000408	71	44%	0.00291	0.000927	65	82%	0.00093	0.000441	
Fluoranthene	86	8%	0.0139	0.000957	73	10%	0.00467	0.001225	71	13%	0.00829	0.002074	65	3%	0.00233	0.001017	
Fluorene	85	0%	0.0313	0.00275	73	0%	0.0081	0.00249	71	0%	0.0694	0.01382	65	0%	0.00749	0.002703	
Indeno(1,2,3-cd)pyrene	86	84%	0.00478	0.000447	73	73%	0.0016	0.000464	71	87%	0.00101	0.000496	66	85%	0.00088	0.000433	
Perylene	86	100%	N/A	N/A	73	100%	N/A	N/A	71	100%	N/A	N/A	66	100%	N/A	N/A	
Phenanthrene	85	0%	0.056	0.004299	73	0%	0.0132	0.004785	71	0%	0.0422	0.01171	65	0%	0.0101	0.004407	
Pyrene	86	31%	0.0148	0.000805	73	23%	0.00379	0.000922	71	27%	0.00694	0.001266	66	29%	0.00183	0.000677	
Total PAHs				0.0009				0.0011				0.0013				0.0010	**0.002**
Naphthalene	86	2%	0.632	**0.04842**	73	0%	0.146	**0.04161**	68	0%	0.596	**0.1498**	62	0%	0.116	**0.03291**	**0.03**

***The ABC for Total PAHs is based on the toxicity equivalency factor weighted sum of concentrations for 26 individual PAHs relative to benzo(a)pyrene. The list of individual PAHs can be found at:**

https://www.oregon.gov/deq/FilterDocs/airtox-abc.pdf

Table 14. Summary statistics for PAH analytes at Oregon NATTS sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

PAHs	NATIONAL AIR TOXICS TRENDS SITES Portland NATTS 2018				La Grande NATTS 2018				Ambient Benchmark Concentration (ABC)
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	***ABC Units (µg/m³ STP)***
Acenaphthene	58	5%	0.0143	0.002242	53	8%	0.0879	0.007604	**0.002*** ***The ABC for Total PAHs is based on the toxicity equivalency factor weighted sum of concentrations for 26 individual PAHs relative to benzo(a)pyrene. The list of individual PAHs can be found at:** **https://www.oregon.gov/deq/FilterDocs/airtox-abc.pdf**
Acenaphthylene	58	53%	0.00775	0.001076	53	58%	0.00605	0.00088	
Anthracene	58	81%	0.00096	0.000451	53	68%	0.00141	0.00055	
Benzo(a)anthracene	58	95%	0.00055	0.000404	53	85%	0.00129	0.000456	
Benzo(a)pyrene	58	93%	0.00065	0.00041	53	87%	0.00106	0.000424	
Benzo(b)fluoranthene	58	88%	0.0007	0.00042	53	81%	0.00105	0.000457	
Benzo(e)pyrene	58	95%	0.00052	0.000403	53	94%	0.00069	0.000404	
Benzo(g,h,i)perylene	58	88%	0.0007	0.000419	53	89%	0.00082	0.000436	
Benzo(k)fluoranthene	58	90%	0.00064	0.000412	53	85%	0.00111	0.000458	
Chrysene	58	90%	0.00064	0.000412	53	81%	0.00137	0.000486	
Coronene	56	100%	N/A	N/A	52	100%	N/A	N/A	
Dibenzo(a,h)anthracene	58	100%	N/A	N/A	53	100%	N/A	N/A	
Dibenzofuran	58	2%	0.0119	0.003293	53	0%	0.0637	0.007435	
Dibenzothiophene	58	86%	0.00095	0.000437	53	60%	0.00237	0.000537	
Fluoranthene	58	14%	0.00205	0.000909	53	8%	0.00367	0.001353	
Fluorene	58	2%	0.00985	0.002498	53	2%	0.0482	0.005612	
Indeno(1,2,3-cd)pyrene	58	86%	0.00087	0.00043	53	81%	0.00125	0.000468	
Perylene	58	100%	N/A	N/A	53	100%	N/A	N/A	
Phenanthrene	58	0%	0.0102	0.003874	53	0%	0.0283	0.006837	
Pyrene	58	40%	0.00178	0.000665	53	32%	0.00342	0.000865	
Total PAHs				0.0010				0.0011	**0.002**
Naphthalene	55	2%	0.148	**0.03906**	50	4%	0.174	**0.03202**	**0.03**

Table 15. Summary statistics for carbonyl analytes at select rotating annual sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

Carbonyls	ROTATING ANNUAL SITES: Portland SE 45th & SE Harney (Mar. 2016 - Dec. 2017)				Gresham Learning Centennial (Dec. 2016 - Mar. 2018)				The Dalles Wasco Co. Library (Jul. 2017 - Sep. 2018)				Portland Cully Helensview (May 2018 - Jul. 2019)				Ambient Benchmark Concentration (ABC)
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	***ABC Units (µg/m³ STP)***
2,5-Dimethylbenzaldehyde	98	94%	0.0457	0.017	77	73%	0.0547	0.0194	55	75%	0.0417	0.0202	65	63%	0.0462	0.0202	--
2-Butanone (MEK)	98	4%	1.97	0.23	77	1%	0.567	0.225	55	0%	0.885	0.253	65	3%	0.749	0.224	--
Acetaldehyde	98	0%	10.3	**1.536**	77	0%	8.26	**1.323**	55	0%	11.5	**2.305**	65	2%	4.21	**1.032**	**0.45**
Acetone	98	0%	32.9	2.688	77	0%	8.19	2.148	55	0%	27.3	4.995	65	2%	11.6	3.046	--
Benzaldehyde	98	1%	1.85	0.19	77	3%	0.741	0.135	55	0%	0.925	0.209	65	3%	0.299	0.104	--
Butyraldehyde	98	3%	1.15	0.203	77	3%	1.1	0.195	55	0%	2.68	0.614	65	2%	0.438	0.138	--
Crotonaldehyde	98	92%	0.0809	0.0287	77	97%	0.133	0.0361	55	89%	0.157	0.0394	65	97%	0.0903	0.0348	--
Formaldehyde	98	0%	16.3	**1.973**	77	0%	9.71	**1.822**	55	0%	17.7	**3.726**	65	2%	5.89	**1.584**	**0.2**
Hexaldehyde	98	0%	2.45	0.214	77	0%	1.26	0.198	55	0%	8.5	0.733	65	3%	0.274	0.0996	--
Isovaleraldehyde	97	3%	1.05	0.171	75	0%	0.796	0.179	55	2%	0.757	0.21	65	6%	0.406	0.146	--
m-Tolualdehyde	98	42%	0.341	0.0274	77	40%	0.0584	0.0236	55	60%	0.0395	0.0208	65	48%	0.102	0.0236	--
o-Tolualdehyde	98	86%	0.0311	0.0172	77	83%	0.0324	0.0186	55	85%	0.0422	0.0181	65	78%	0.041	0.0185	--
Propionaldehyde	98	0%	1.77	0.257	77	0%	1.37	0.241	55	0%	1.63	0.381	65	0%	0.799	0.209	--
p-Tolualdehyde	98	90%	0.069	0.0159	77	97%	0.0494	0.0179	55	96%	0.0359	0.0172	65	83%	0.0588	0.0208	--
Valeraldehyde	98	1%	0.863	0.106	77	0%	0.599	0.101	55	2%	2.2	0.273	65	0%	0.173	0.0737	--

Table 16. Summary statistics for carbonyl analytes at Oregon NATTS sites. The number of observations ("# Obs"), percentatge of non-detect results in the dataset ("%NDs"), maximum concentration, and Kaplan-Meier mean ("KM Mean") are shown for each analyte. Analytes where the calculated KM Mean is greater than the Ambient Benchmark Concentration are shaded grey. A mean concentration is listed for each analyte with at least one result above the detection limit; however, the percentage of non-detect results should be used to inform the reliability of the mean.

Carbonyls	NATIONAL AIR TOXICS TRENDS SITES – Portland NATTS 2018				La Grande NATTS 2018				Ambient Benchmark Concentration (ABC)
Analyte	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	*# Obs*	*% NDs*	*(µg/m³ STP) Maximum*	*(µg/m³ STP) KM Mean*	***ABC Units (µg/m³ STP)***
2,5-Dimethylbenzaldehyde	56	38%	0.0469	0.0238	59	85%	0.0554	0.0208	–
2-Butanone (MEK)	56	0%	6.06	0.364	59	0%	0.674	0.278	–
Acetaldehyde	56	0%	2.82	**1.283**	59	0%	5.9	**1.644**	**0.45**
Acetone	56	0%	7.04	2.21	59	0%	8.78	3.641	–
Benzaldehyde	56	0%	0.344	0.113	59	3%	0.395	0.11	–
Butyraldehyde	56	0%	0.273	0.15	59	0%	0.37	0.143	–
Crotonaldehyde	56	100%	N/A	N/A	59	92%	0.0621	0.0403	–
Formaldehyde	56	0%	4.95	**1.828**	59	0%	7.84	**2.329**	**0.2**
Hexaldehyde	56	0%	0.355	0.175	59	0%	0.357	0.14	–
Isovaleraldehyde	55	0%	0.407	0.158	59	0%	0.323	0.174	–
m-Tolualdehyde	56	55%	0.0582	0.0235	59	73%	0.0499	0.0229	–
o-Tolualdehyde	56	64%	0.0364	0.0202	59	83%	0.0391	0.021	–
Propionaldehyde	56	0%	0.59	0.223	59	0%	0.687	0.246	–
p-Tolualdehyde	56	91%	0.0298	0.0175	59	95%	0.1	0.0221	–
Valeraldehyde	56	0%	0.19	0.101	59	0%	0.3	0.0975	–

Table 3. Polycyclic aromatic hydrocarbon (PAH) analytes.

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

Table 4. Volitile 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

CITY OF MILWAUKIE

WS 2.
2/15/22
OCR USE ONLY

COUNCIL STAFF REPORT

To: Mayor and City Council
Ann Ober, City Manager

Date Written: Feb. 1, 2022

Reviewed: Jennifer Lee (as to form), Administrative Specialist

From: Peter Passarelli, Public Works Director

Subject: **REGIONAL INFLOW AND INFILTRATION REDUCTION AGREEMENT**

ACTION REQUESTED

Council is asked to discuss and provide feedback on a proposed regional infiltration and inflow (I&I) reduction agreement.

HISTORY OF PRIOR ACTIONS AND DISCUSSIONS

July 2012: The city and Clackamas County Service District #1 (CCSD#1) signed an intergovernmental agreement (IGA) for the provision of wastewater treatment services and the establishment of a good neighbor committee.

ANALYSIS

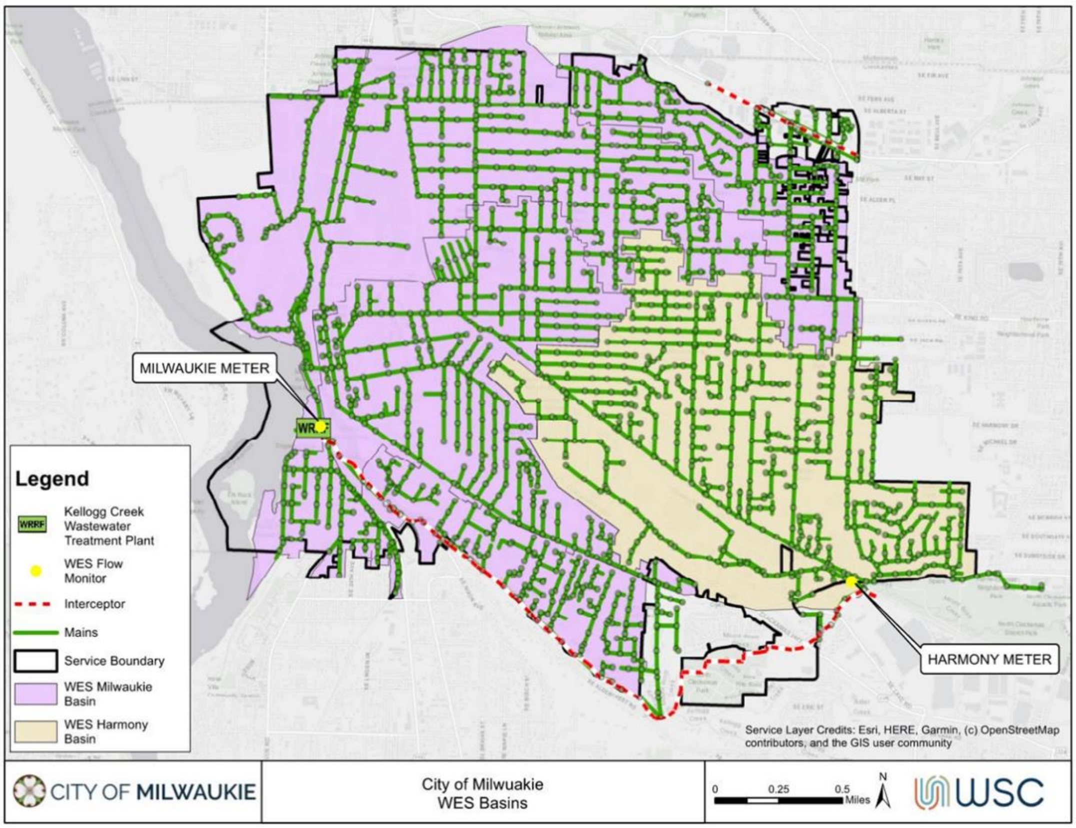
Water Environment Services (WES), an intergovernmental partnership (an Oregon Revised Statute (ORS) 190 entity) formed by the consolidation of CCSD#1 and Tri-City Service District (TCSD), provides wholesale wastewater treatment services to the City of Milwaukie.

WES has identified the reduction of I&I as a priority within the collection systems that convey wastewater to the Kellogg and Tri-Cities wastewater treatment facilities. I&I is water from rain or naturally occurring groundwater that can seep into cracked or broken sewer pipes, adding to the flow of water into our wastewater treatment facilities. In many cases, excessive I&I can be a significant cause of sanitary sewer overflows and basement backups.

Figure 1: Typical sources of I/I in sanitary sewer systems.
(Adapted from WE&RF, 2003)

WES has launched a I&I reduction program stemming from the findings presented in their 2019 Sanitary Sewer System Master Plan. WES performed a cost-benefit analysis to determine the optimal balance of I&I reduction versus treatment and conveyance infrastructure expansion to handle future flows. The study concluded that a 65% reduction in I&I would result in the lowest life cycle cost for its ratepayers and member agencies. As a result, WES is working with partner jurisdictions to cooperate in reducing I&I.

The city's wastewater collection system consists of two WES basins – the Milwaukie Basin and the Harmony Basin (see figure below). Target levels of I&I have been established for both basins, with the Milwaukie Basin identified as one of 19 high-priority basins across the WES system. To achieve the most cost-effective plan, high priority basins must achieve target reductions of I&I by 2040.



WES has developed a proposed grant program to assist its partner agencies in achieving the target I&I reductions. As proposed, the agreement would cover 33% of costs on all I&I projects undertaken by the partner agencies within the priority basins. WES would agree to reimburse thirty-three percent (33%) of the actual costs incurred by the city in the completion of work arising out of an approved qualified proposal from revenues received through the collective wholesale sewer rate. This is an expansion in funding from our current IGA with WES, in which WES agreed to contribute ten percent (10%) of the city's costs for all wastewater collection system projects designed to reduce I&I within the city.

This funding could cover expenses relating to flow monitoring studies, consultant services to analyze flow monitoring results, I&I source identification, rehabilitation design and construction, and post flow monitoring services.

WES's goal is to have one single agreement that is executed by WES and all its city partners to provide transparent and guaranteed support for undertaking I&I reduction efforts.

The city intends to submit the Waverly Clay Pipe Replacement project scheduled for fiscal year (FY) 2024 for consideration. This project's total cost is currently estimated at $2.8 million, and this agreement could reimburse 33% of the I&I related elements

BUDGET IMPACT

Funding through this agreement would allow the city to further expand its I&I reduction efforts.

WORKLOAD IMPACT

This agreement will not impact staff workload.

CLIMATE IMPACT

This agreement supports city climate efforts by providing another mechanism for the city to construct projects that minimizes both the city's and WES's carbon and energy footprints within the city's wastewater collection system and at WES's treatment facilities.

COORDINATION, CONCURRENCE, OR DISSENT

Milwaukie is joined by the cities of Gladstone, Happy Valley, Johnson City, Oregon City, and West Linn in support of this agreement.

STAFF RECOMMENDATION

Not applicable.

ALTERNATIVES

Not applicable.

ATTACHMENTS

1. IGA

INTERGOVERNMENTAL AGREEMENT BETWEEN WATER ENVIRONMENT SERVICES AND PARTNER CITIES FOR REGIONAL INFLOW AND INFILTRATION REDUCTION

THIS REGIONAL INFLOW AND INFILTRATION REDUCTION AGREEMENT (this "**Agreement**") is entered into between Water Environment Services ("**District**"), an intergovernmental entity formed pursuant to ORS Chapter 190, and those Cities (defined below) that execute this Agreement (collectively, the "**Partners**" or individually "**Partner**"). The District and the Partners are collectively referred to as the "**Parties**" and each a "**Party**."

RECITALS

Oregon Revised Statutes Chapter 190.010 confers authority upon local governments to enter into agreements for the performance of any and all functions and activities that a party to the agreement, its officers or agencies have authority to perform.

The District provides sanitary sewer treatment to over 190,000 people in Clackamas County. This service area includes the City of Gladstone, the City of Happy Valley, the City of Johnson City, the City of Milwaukie, the City of Oregon City, and the City of West Linn, all Oregon municipal corporations (collectively the "Cities" and each a "City"). There are thousands of miles of underground pipes that convey sewage from homes and businesses in Partner jurisdictions to the District's regional wastewater treatment facilities. Some of those pipes allow clean groundwater to enter the system during the winter, through a process called "infiltration." In other cases, there are accidental or illicit connections such as downspouts or street drains that allow rain water to enter the sanitary sewer system, through a process called "inflow." Together, this additional water is called infiltration and inflow, or by its' industry shorthand "**I/I**."

Analysis shows that the amount of I/I entering into District's system is higher than industry norms. This surge of water during wet weather events is approaching the maximum peak flow capacities of the District's Tri-City and Kellogg Creek water resource reclamation facilities and that of portions of the regional collection system. Excessive I/I can result in higher-than-needed costs to the District's and Partner's ratepayers, given that under the Clean Water Act, a treatment provider must convey and treat every drop of water that arrives at a treatment facility as wastewater. This additional treatment capacity and effort for cleaning what is essentially rainwater or groundwater is inefficient and expensive. It can also require upsizing of buried infrastructure at significant cost.

To most effectively reduce excessive I/I, a regional I/I program is needed to manage peak flows in the wastewater collection and treatment systems in the most cost-effective manner. The program is the implementation of the recommended capital improvement program outlined in the Sanitary Sewer Master Plan for Water Environment Services ("**SSMP**") (Jacobs, 2019). The SSMP identified reduction targets throughout the regional system, not just that portion of the collection system directly managed by the District. All Partner systems were included in the review, except for the City of Johnson City's collection system; however, leadership for the city has been engaged on this topic.

The SSMP identified 19 sub-basins as priority investment areas ("**Target Areas**"), further described in Exhibit A ("**Technical Memos**"), due to the high rate of I/I present, the cost of conveying the peak flow downstream, and ultimately the cost of treating it. These Target Areas are located throughout the regional wastewater network, in both District-owned and Partner-owned collection systems.

The SSMP found the most cost-effective alternative for all parties was a sixty-five percent (65%) I/I reduction in the Target Areas by 2040. Removal of 65% in Target Areas over the time period study of 2020-2040 is considered ambitious within the industry and will take a significant amount of investment to reach. However, this yields to lowest cost for ratepayers, resulting in a net savings for the regional system of approximately $120 million in avoided capital and operational expenditures during the next 20 years, with the cost savings growing larger in the outer years. In order to achieve the lowest cost solution for District ratepayers, a collective effort from all Partners is required to implement this regional I/I reduction.

In 2019, this recommendation was presented to the Technical Advisory Team ("**TAT**"), made up of District engineers, Partner public works directors, and Partner engineers, which broadly agreed that a focus on 65% level of I/I removal in Target Areas, balanced with other necessary improvements in the collection and plant treatment systems, is the most cost-effective regional solution to managing peak flows. The Water Environment Services Advisory Committee ("**District Advisory Committee**") agreed that these targets should be the baseline for the regional discussion in 2019.

In an effort to implement the program recommended in the SSMP and by the advisory committee, the District and the Partners desire to establish a pilot program to determine the long-term feasibility of the District providing funding to Partners in support of projects that will help achieve the collective goal of reducing I/I by 65% in the Target Areas ("**Regional I/I Reimbursement Program**" or the "**Program**"). Beyond just this Program, it is the District's desire that this be the first step towards establishing a more collaborative relationship with the Partners moving forward to address I/I and other regional issues using common studies, common approaches and common solutions.

In consideration of the mutual promises set forth below and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby agree as follows:

TERMS

1. **Term.** The Agreement shall be effective between the District and any individual Partner upon execution by the District and Partner ("**Effective Date**"). After District execution, a City may sign on to the Agreement at a later date by executing the signature page below. A lack of execution by one City shall not impact the validity of the Agreement as to any other Partner. The Agreement shall expire on June 30, 2026. It is the intent of the Parties to evaluate the effectiveness of the Program and, if significant progress is being made towards the goal of 65% I/I reduction in Target Areas, continue this approach. The term of this Agreement may be extended by the Parties in five (5) year increments upon a writing signed by all Parties.

2. **Cost Sharing.** The District agrees to reimburse thirty-three percent (33%) of the actual costs incurred by a Partner in the completion of work arising out of a Qualified Proposal that has received an Approval Letter (both defined below) ("**Reimbursement Contribution**") from revenues received through the collective wholesale sewer rate. The amount the District is contributing reflects the mutual savings to ratepayers with

respect to wholesale sewer expenditures through regional collective action. Note that these contributions are intended to supplement, not replace, collection system service charges already being charged by District or Partners.

3. **Program Proposal Process.**

   A. Qualified Proposals. Partners will identify qualified proposal projects to submit for review. A "**Qualified Proposal**" means a project proposal that meets the base threshold of being designed for I/I reduction purposes and occurring within the Target Areas. A Qualified Proposal should include a project description, project area/boundary, flow-metering data if available (I/I rates), rehabilitation method (if applicable), project statistics (i.e. number of manholes, linear feet of pipe or number of laterals to be rehabilitated), construction schedule, and anticipated I/I flow reduction. Potential eligible projects may include, but are not limited to, flow-metering studies, consulting services to analyze flow-metering results, I/I source identification, rehabilitation design or construction, post-construction flow monitoring, etc.

   B. Approval of Qualified Proposals. Each Partner will bring forward their proposed projects for approval by the TAT. The TAT will review the proposal and determine if it satisfies the elements of a Qualified Proposal identified in Section A above. If the TAT members approve, by majority vote of those present, a proposal as being an eligible Qualified Proposal, the Partner will be provided with a letter of approval in a form substantially similar to Exhibit B ("**Approval Letter**").

   C. Annual Notification of Proposals. Each Partner agrees to submit an annual list summarizing the potential Qualified Proposals planned for the following year, including their estimated cost, to the District no later than February 1st of each year, in order to provide the District with sufficient time to budget appropriately for the upcoming fiscal year. Failure to provide the notice will not automatically prevent funding of a Qualified Proposal, but such funding may be delayed by a fiscal year. Notwithstanding the above, upon execution of the Agreement by a Partner, the Partner may immediately submit Qualified Proposals for the current fiscal year.

   D. Annual Reports. Each Partner receiving funding pursuant to this Agreement will provide an annual report out to the District Advisory Committee, indicating the projects completed with the funding provided and their anticipated or actual reduction of I/I in the impacted Target Area. The Partners may elect to provide the report at the end of each fiscal year or calendar year.

   E. TAT Membership. The Parties acknowledge that thus far the TAT has been an informal advisory group of technical experts meeting to share knowledge and collaborate on infrastructure strategy, and that a more formalized procedure will be needed to allow the TAT to effectuate the purposes of this Agreement. Therefore, bylaws will be drafted creating, amongst other provisions, a voting procedure with each of the District and Partners having a single vote for the purposes of approving a Qualified Proposal.

4. **Reimbursement.** In order to receive the Reimbursement Contribution, the Partners agree to submit a single invoice after the completion of the work performed related to their Qualified Proposal, with a copy of their Approval Letter from the TAT included.

Invoices shall describe the work performed with particularity, by whom it was performed, and shall itemize and explain the expenses for which reimbursement is claimed, noting the elements of the project correlated with I/I reduction. Reimbursement Contribution payments shall be made by the District to the Partner within forty-five (45) days of receipt of an invoice that complies with the requirements of this section. The District is not obligated to pay any amount in excess of the Reimbursement Contribution amount identified above.

5. **Representations and Warranties**.
   A. Party Representations and Warranties. Each Party represents and warrants to the other Parties that it has the power and authority to enter into and perform this Agreement, and this Agreement, when executed and delivered, shall be a valid and binding obligation of the Party enforceable in accordance with its terms.

6. **Withdrawal; Termination**.
   A. Any Partner may withdraw from this Agreement at any point and for any reason upon thirty (30) days' written notice to the District. If one Party withdraws from this Agreement, such withdrawal shall not affect the Agreement with the remaining Partners.
   B. The District may terminate the Agreement with any individual Partner at any point and for any reason upon thirty (30) days' written notice. Any termination of the Agreement with an individual Partner shall not affect the Agreement as to the remaining Partners.
   C. Either the District or the Partners may terminate this Agreement in the event of a material breach of the Agreement by the other. Prior to such termination however, the Party seeking the termination shall give the other Party written notice of the breach and of the Party's intent to terminate. If the breaching Party has not entirely cured the breach within fifteen (15) days of deemed or actual receipt of the notice, then the Party giving notice may terminate the Agreement at any time thereafter by giving written notice of termination stating the effective date of the termination. If the default is of such a nature that it cannot be completely remedied within such fifteen (15) day period, this provision shall be complied with if the breaching Party begins correction of the default within the fifteen (15) day period and thereafter proceeds with reasonable diligence and in good faith to effect the remedy as soon as practicable. The Party giving notice shall not be required to give more than one (1) notice for a similar default in any twelve (12) month period.
   D. The District or the Partners shall not be deemed to have waived any breach of this Agreement by any other Party except by an express waiver in writing. An express written waiver as to one breach shall not be deemed a waiver of any other breach not expressly identified, even though the other breach is of the same nature as that waived.
   E. The District may terminate this entire Agreement with all Parties upon fifteen (15) days' written notice in the event the District fails to receive expenditure authority sufficient to allow the District, in the exercise of its reasonable administrative discretion, to continue to perform under this Agreement, or if federal or state laws, regulations or guidelines are modified or interpreted in such a way that either the

work under this Agreement is prohibited or the District is prohibited from paying for such work from the planned funding source. The District agrees to provide a Reimbursement Contribution for all Qualified Proposals that receive an Approval Letter prior to the date of termination identified in the notice provided pursuant to this subsection.

F. Any termination of this Agreement shall not prejudice any rights or obligations accrued to the Parties prior to termination.

7. **Indemnification**.

A. Subject to the limits of the Oregon Constitution and the Oregon Tort Claims Act or successor statute, the District agrees to indemnify, save harmless and defend the Partners, and their officers, elected officials, agents and employees from and against all costs, losses, damages, claims or actions and all expenses incidental to the investigation and defense thereof arising out of or based upon damages or injuries to persons or property caused by the negligent or willful acts or omissions of the District or its officers, elected officials, owners, employees, agents, or its subcontractors or anyone over which the District has a right to control.

Subject to the limits of the Oregon Constitution and the Oregon Tort Claims Act or successor statute, each Partner agrees to indemnify, save harmless and defend the District, Clackamas County and any other Partner, as well as each of their officers, elected officials, agents and employees from and against all costs, losses, damages, claims or actions and all expenses incidental to the investigation and defense thereof arising out of or based upon damages or injuries to persons or property caused by the negligent or willful acts or omissions of the Partner or its officers, elected officials, owners, employees, agents, or its subcontractors or anyone over which the Partner has a right to control.

8. **Dispute Resolution**. In the event of a dispute arising out of this Agreement, the Parties involved in the dispute agree to meet with one another in a good faith attempt to resolve the dispute prior to taking any other action against another Party. In these discussions, city managers will represent the affected Partners and the District will be represented by its Director. If a dispute cannot be resolved through these discussions, then the Parties may seek relief from any available method.

9. **Insurance.** The Parties agree to maintain levels of insurance, or self-insurance, sufficient to satisfy their obligations under this Agreement and all requirements under applicable law.

10. **Notices; Contacts.** Legal notice provided under this Agreement shall be delivered personally, by email or by certified mail to the business address for the party thereof as published. Any communication or notice so addressed and mailed shall be deemed to be given upon receipt. Any communication or notice sent by electronic mail to an address indicated herein is deemed to be received 2 hours after the time sent (as recorded on the device from which the sender sent the email), unless the sender receives an automated message or other indication that the email has not been delivered. Any communication or notice by personal delivery shall be deemed to be

given when actually delivered. Each Party shall provide a separate written designation for notices relating to this Agreement, and any Party may change such Party's contact information, or the invoice or payment addresses by giving prior written notice thereof to the other Party at its then current notice address.

11. **General Provisions.**

A. **Oregon Law and Forum.** This Agreement, and all rights, obligations, and disputes arising out of it will be governed by and construed in accordance with the laws of the State of Oregon without giving effect to the conflict of law provisions thereof. Any claim between District and Partners that arises from or relates to this Agreement shall be brought and conducted solely and exclusively within the Circuit Court of Clackamas County for the State of Oregon; provided, however, if a claim must be brought in a federal forum, then it shall be brought and conducted solely and exclusively within the United States District Court for the District of Oregon. In no event shall this section be construed as a waiver by any Party of any form of defense or immunity, whether sovereign immunity, governmental immunity, immunity based on the Eleventh Amendment to the Constitution of the United States or otherwise, from any claim or from the jurisdiction of any court. Each Party, by execution of this Agreement, hereby consents to the in personam jurisdiction of the courts referenced in this section.

B. **Compliance with Applicable Law**. All Parties shall comply with all applicable local, state and federal ordinances, statutes, laws and regulations. All provisions of law required to be a part of this Agreement, whether listed or otherwise, are hereby integrated and adopted herein. Failure to comply with such obligations is a material breach of this Agreement.

C. **Non-Exclusive Rights and Remedies**. Except as otherwise expressly provided herein, the rights and remedies expressly afforded under the provisions of this Agreement shall not be deemed exclusive, and shall be in addition to and cumulative with any and all rights and remedies otherwise available at law or in equity. The exercise by any Party of any one or more of such remedies shall not preclude the exercise by it, at the same or different times, of any other remedies for the same default or breach, or for any other default or breach, by any other Party.

D. **Access to Records**. Each Party shall retain, maintain, and keep accessible all records relevant to this Agreement ("**Records**") for a minimum of six (6) years, following Agreement termination or any longer period as may be required by applicable law, or until the conclusion of an audit, controversy or litigation arising out of or related to this Agreement, whichever is later. Each Party shall maintain all financial records in accordance with generally accepted accounting principles. All other Records shall be maintained to the extent necessary to clearly reflect actions taken. During this record retention period, the Party's shall permit the District's or another Party's authorized representatives' access to the Records at reasonable times and places for purposes of examining and copying.

E. **Work Product**. Reserved.

F. **Hazard Communication**. Reserved.

G. **Debt Limitation.** This Agreement is expressly subject to the limitations of the Oregon Constitution and Oregon Tort Claims Act, and is contingent upon appropriation of funds. Any provisions herein that conflict with the above referenced laws are deemed inoperative to that extent.

H. **Severability.** If any provision of this Agreement is found to be unconstitutional, illegal or unenforceable, this Agreement nevertheless shall remain in full force and effect and the offending provision shall be stricken. The Court or other authorized body finding such provision unconstitutional, illegal or unenforceable shall construe this Agreement without such provision to give effect to the maximum extent possible the intentions of the Parties.

I. **Integration, Amendment and Waiver.** Except as otherwise set forth herein, this Agreement constitutes the entire agreement between the Parties on the matter of the Project. There are no understandings, agreements, or representations, oral or written, not specified herein regarding this Agreement. No waiver, consent, modification or change of terms of this Agreement shall bind any Party unless in writing and signed by all Parties and all necessary approvals have been obtained. Such waiver, consent, modification or change, if made, shall be effective only in the specific instance and for the specific purpose given. The failure of any Party to enforce any provision of this Agreement shall not constitute a waiver by such Party of that or any other provision.

J. **Interpretation**. The titles of the sections of this Agreement are inserted for convenience of reference only and shall be disregarded in construing or interpreting any of its provisions.

K. **Independent Contractor**. Each of the Parties hereto shall be deemed an independent contractor for purposes of this Agreement. No representative, agent, employee or contractor of one Party shall be deemed to be a representative, agent, employee or contractor of the other Party for any purpose, except to the extent specifically provided herein. Nothing herein is intended, nor shall it be construed, to create between the Parties any relationship of principal and agent, partnership, joint venture or any similar relationship, and each Party hereby specifically disclaims any such relationship.

L. **No Third-Party Beneficiary.** The Partners and the District are the only parties to this Agreement and are the only parties entitled to enforce its terms. Nothing in this Agreement gives, is intended to give, or shall be construed to give or provide any benefit or right, whether directly, indirectly or otherwise, to third persons unless such third persons are individually identified by name herein and expressly described as intended beneficiaries of the terms of this Agreement. No contractors or agents of the Partners performing work on Qualifying Projects are considered intended beneficiaries for the purposes of this Agreement.

M. **Assignment**. No Partner shall assign or transfer any of its interest in this Agreement by bankruptcy, operation of law or otherwise, without obtaining prior written approval from the District, which shall be granted or denied in the District's sole discretion.

N. **Counterparts**. This Agreement may be executed in several counterparts (electronic or otherwise), each of which shall be an original, all of which shall constitute the same instrument.

O. **Survival.** All provisions in Sections 5, 7, 8 and 10 (A), (C), (D), (G), (H), (I), (J), (L), (Q), and (T) shall survive the termination of this Agreement, together with all other rights and obligations herein which by their context are intended to survive.

P. **Necessary Acts.** Each Party shall execute and deliver to the others all such further instruments and documents as may be reasonably necessary to carry out this Agreement.

Q. **Time is of the Essence**. With the ambitious goal of reducing I/I by 65% in Target Areas, the Parties are encouraged to act expeditiously in submitting and completing Qualified Proposal work.

R. **Successors in Interest.** The provisions of this Agreement shall be binding upon and shall inure to the benefit of the parties hereto, and their respective authorized successors and assigns.

S. **Force Majeure.** Neither the Partners nor District shall be held responsible for delay or default caused by events outside of the Partners' or District's reasonable control including, but not limited to, fire, terrorism, epidemic, riot, acts of God, or war.

T. **No Attorney Fees.** In the event any arbitration, action or proceeding, including any bankruptcy proceeding, is instituted to enforce any term of this Agreement, each party shall be responsible for its own attorneys' fees and expenses.

Signature Page Follows

IN WITNESS HEREOF, the Parties have executed this Agreement by the date set forth opposite their names below.

Water Environment Services

____
Chair

____
Date

City of Gladstone

____
Authorized Signatory

____
Title

____
Date

City of Happy Valley

____
Authorized Signatory

____
Title

____
Date

City of Johnson City

____
Authorized Signatory

____
Title

____
Date

City of Milwaukie

____
Authorized Signatory

____
Title

____
Date

City of Oregon City

____
Authorized Signatory

____
Title

____
Date

City of West Linn

____
Authorized Signatory

____
Title

____
Date

Exhibit A

Technical Memos

Exhibit B

Form Letter

[Insert Date]

[Insert Name]
[Insert Address]

RE: Regional I/I Reimbursement Program – [Insert Qualified Proposal Title or Description]

Dear __________,

Thank you for the submittal and presentation of your Qualified Proposal to the Technical Advisory Team ("TAT").

This letter serves as notification that the TAT has approved your project for reimbursement as a part of the Regional I/I Reimbursement Program, in accordance with the terms of the IGA for Regional Inflow and Infiltration Coordination ("IGA"). The total amount of fund reimbursed will be determined in accordance with Section 2 of the IGA.

Please retain a copy of this letter in your records, as you will be required to provide it along with documentation of your expenses when you seek reimbursement from Water Environment Services once your project is complete.

On behalf of WES and all the cities participating in this I/I reduction effort, we appreciate your commitment to addressing this regional issue. Thank you!

Sincerely,

Chair,
Technical Advisory Team

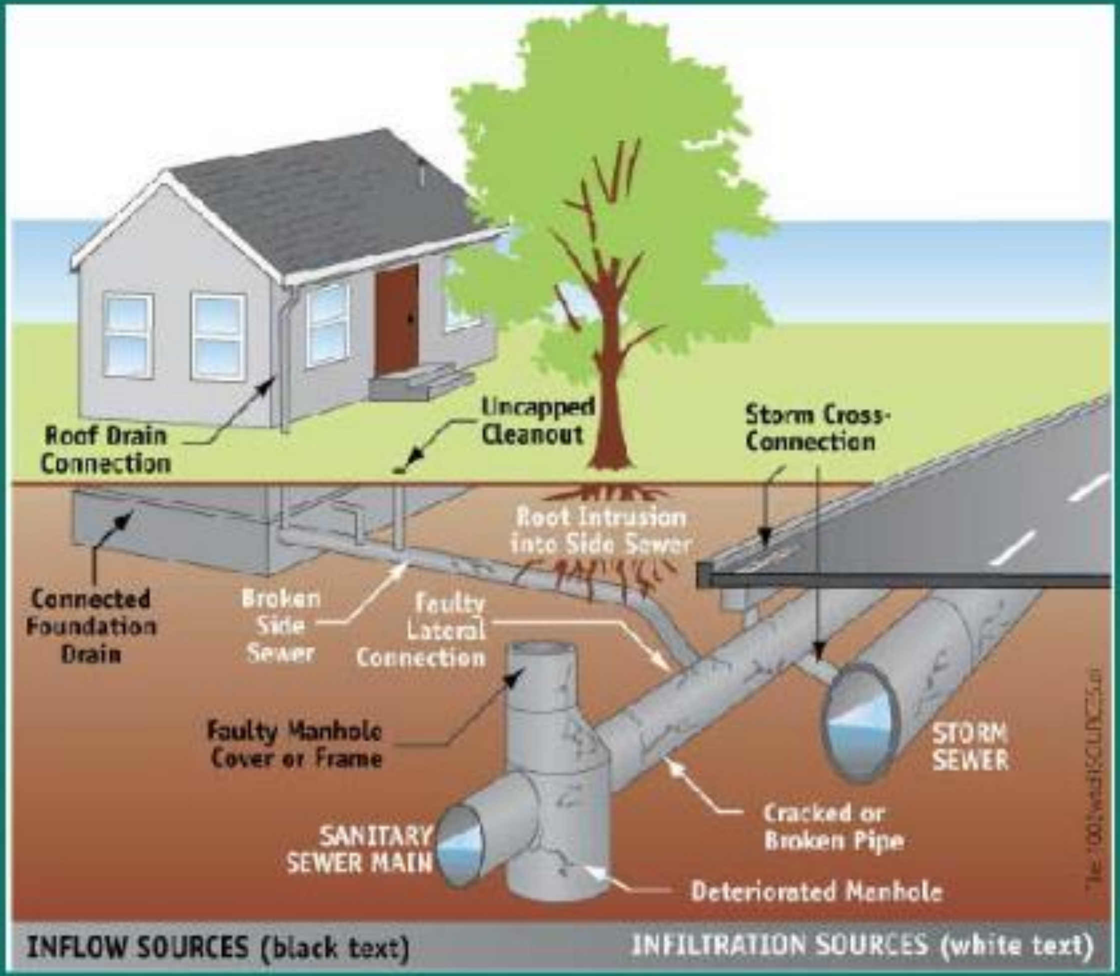
Regional I/I Agreement

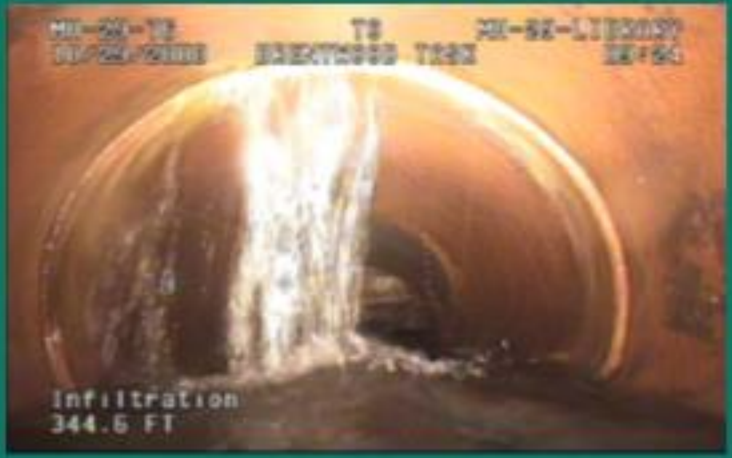
CLACKAMAS
WATER
ENVIRONMENT
SERVICES

Milwaukie
February 15, 2022

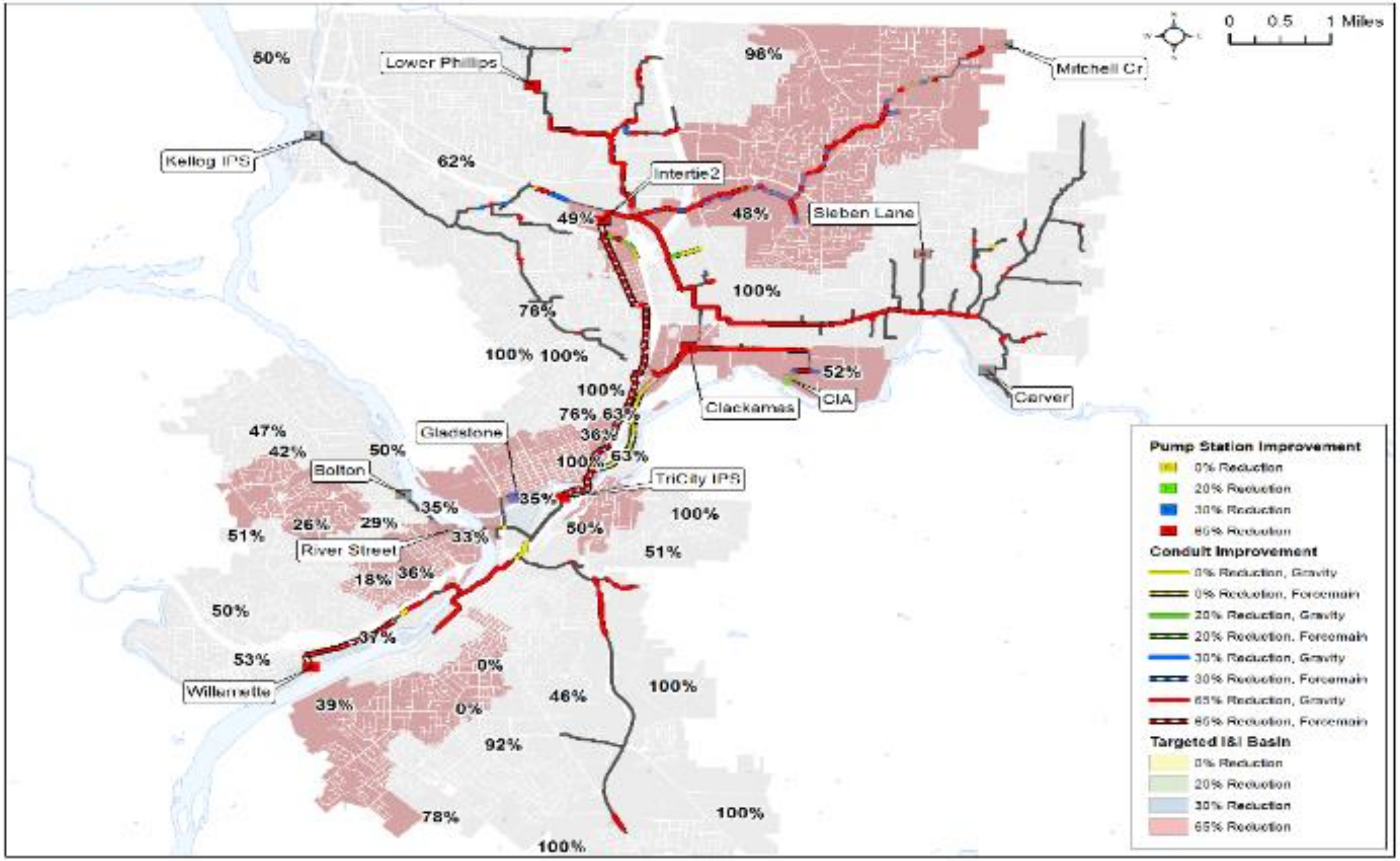
Chris Storey

Inflow and Infiltration





Inflow and Infiltration Reduction A Top Priority



Agreement Terms

- IGA is the same for all Partner cities. So far Gladstone, Happy Valley, and Johnson City have signed the agreement
- WES will use funds from the wholesale wastewater treatment rate to support I/I reduction efforts in the key identified basins, reflecting a sharing of the $120 million in regional savings
- Support will be for reimbursement of 33% of the qualified project to achieve the targeted I/I reduction level
- The Technical Advisory Team, composed of WES engineers, city engineers and city public works directors, will be the group that determines eligible projects.

CLACKAMAS WATER ENVIRONMENT SERVICES

Agreement Terms, con’t

- WES has sufficient resources to fully fund projects for 5 year pilot term of the Agreement; will be revisited by WES Advisory Comm for effectiveness and sustainability
- Want to support and incentivize early action for I/I reduction – earlier results in higher savings
- Up to Milwaukie to prioritize projects and areas in your collection system – City is the lead, WES supporting

CLACKAMAS
WATER ENVIRONMENT SERVICES

QUESTIONS?

CLACKAMAS
WATER
ENVIRONMENT
SERVICES