July 21
2021

CAP Report
Appendix B //

Conceptual Design Assumptions Summary

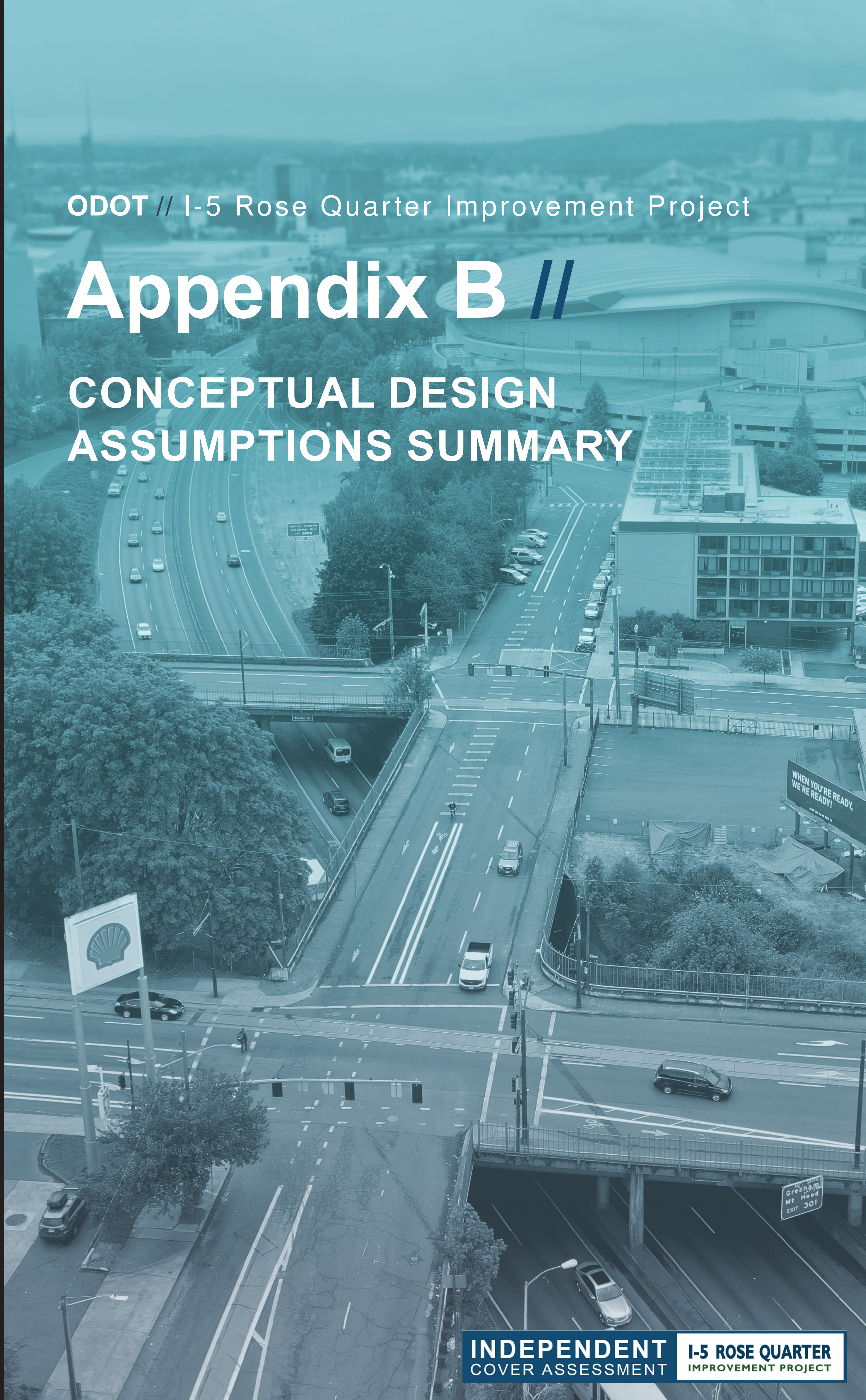
Task 2.2.3

ODOT EA:
PE002591000J71

ODOT // I-5 Rose Quarter Improvement Project

Appendix B //

CONCEPTUAL DESIGN ASSUMPTIONS SUMMARY



INDEPENDENT COVER ASSESSMENT | I-5 ROSE QUARTER IMPROVEMENT PROJECT

Conceptual Design Assumptions Summary

Task: 2.2.3

ODOT EA: PE002591000J71

July 21, 2021

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Task 2.2.3: Conceptual Design Assumptions Summary

The Independent Cover Assessment (ICA) team used assumptions and value judgements to guide its work in developing the design? scenarios in Task 2.2.1. This section articulates those assumptions.

Finance & Governance

The goal of the ICA is to analyze changes and alternatives to ODOT's 20% Design that increase the level of benefit the project will provide to the Black Historic Albina community. The community has expressed concerns that improvements on and around the highway cover may further gentrify the neighborhood, with the unintended consequence of further displacing the community and creating additional harm rather than benefit. During its design work, the ICA team assumed that developable area created by the highway cover project (both on the covers and on land adjacent to the covers and in the project area) could be transferred to the ownership or leasehold of a community-led organization (such as a community development corporation or other organization) upon project completion. The ICA team also assessed the appropriate governance structure and policies to support the delivery of benefits to the Black community, including but not limited to opportunities for land ownership, creating a development plan that reflects the community's goals, and development models that prioritize building community health, wealth, and cohesion.

Programming

During scenario development, the ICA team considered the following list of priorities generated by feedback gathered during Work Session 1, including them in the Development Assessment Framework and keeping them in mind as we looked for opportunities to support them with development.

<u>Community Wealth</u>

1) Creating a Black-led community development corporation, along with a Black-controlled community land trust that could hold all developable land in trust and cooperate with other partners to leverage community benefits from its development while maintaining permanent affordability
2) Creating affordable and ownership business spaces of all types and sizes for Black businesses with support services and access to capital
3) Developing a Black food sovereignty center or market that provides fresh produce for local businesses and residents, job training, and business enterprise support for supplying large local operators (hospital, convention center, hotel venues)
4) Creating permanently affordable rental and ownership housing that is mixed-use, multi-generational, built to high sustainability standards, including different types of living spaces such as live/work for artists and makers
5) Establishing a job training and development center for vocational, technical, STEM and clean energy jobs with services for youth and adults

<u>Community Health</u>

1) Developing a quality, culturally appropriate, affordable childcare and child development center for working parents
2) Developing a cultural health & wellness center with programming that addresses mental, physical and spiritual health and provides indoor recreation spaces, health classes, access to healthy food, wellness services and clinics
3) Providing a large, accessible outdoor community gathering space for multi-generational celebrations, festivals, events and includes spaces for active recreation use

<u>Community Cohesion</u>

1) Developing a Black cultural center that documents the history of Black Portland and creates experiences and education around Black food, Black art and Black music
2) Creating public realm aesthetics and art installations in the area that reflect Black culture, art and lived experience

Land

The ICA team made the following assumptions about how on-cover and off-cover land can be developed in the future:

Highway Cover Development Capacity

- Areas of the highway cover that have spans fewer than 80 feet can support buildings up to five stories.
- Areas of the highway cover than have spans greater than 80' can support buildings of two to three stories.
- Diagrams that show how cover spans relate to potential building height are provided in Appendix I: Cost and Constructability.
- For the area of the cover that can support buildings of five stories, the ICA team assumed that small, fragment parcels that would not be able to be developed alone could be combined with adjacent parcels on solid ground to achieve a five-story building. The parcel at the furthest south end of the cover is structurally able to support a five-story building but is too small to support typical five-story building design, so this parcel is assumed to support two to three-story construction only in development calculations.

Development Capacity Overall

The ICA team assumed that a single Black-led governing entity would own or control all the land in a given scenario, both on and off the highway cover., This entity could transfer floor area ratio (FAR) from areas on the cover that can structurally support less building height to increase the zoning capacity of areas on solid ground that can structurally support greater building height. The ICA's estimate for the development capacity of each scenario is based on this ability to engage in FAR banking and transfer and is calculated in two ways in the graphs shown in the ICA's executive summary of the CAP report and in Appendix 2.2.4.:

1. Development Capacity is calculated as the highway cover + the parcels on solid ground ODOT currently plans to acquire as part of the project
2. Development Capacity is also calculated as the highway cover + the parcels on solid ground ODOT plans to acquire + the parcels on solid ground that ODOT does not currently plan to acquire, but which are cleared for acquisition in the Environmental Assessment (EA) (these parcels are shown with dashed pink outlines in plans and white dashed outlines in graphs)

Use Assumptions

- Land on the highway cover is more suitable for lower density development; covers can support buildings of two to three stories everywhere and five stories in some places. Base cost estimates for the highway covers do not include future development costs.
- Land on the highway cover is more suitable for commercial and office-type uses, public open space, and buildings in public ownership, such as cultural buildings.
- Land on the highway cover is less suitable for sale and ownership of residential development; the governance structure for creating opportunities for homeownership on the covers would likely be quite complex
- Land off the highway cover is more suitable for high-density development; up to what its zoning allows.

- Land off the highway cover is more suitable for sale and ownership of residential development.

Circulation

The ICA team made the following circulation assumptions for each development scenario:

- Maintaining a safe circulation system for all users is a baseline requirement.
- Maintaining car and truck connectivity to and from the I-5 ramps is a baseline requirement.
- To meet community goals, surface streets must be redesigned to prioritize the needs of an urban neighborhood. However, sufficient roadway capacity is also provided at signalized intersections comprising the interchange to meet the weekday peak hour demand anticipated in the year 2045. This capacity ensures that vehicle queues do not accumulate on the off-ramps during peak periods in a manner that impacts I-5 mainline safety and operations.
- The ICA scenarios include a high-performing circulation system :
    - Street network creates developable and accessible land parcels
    - Direct and efficient networks for all modes
    - Safe and comfortable routes that minimize conflicts
    - Make navigation logical with reduced complexity and confusion
    - Neighborhood-scale streets
    - Convenient, efficient transit
    - Conditions that make bicycling more attractive than driving for trips under three miles
- The minimum radius for new, proposed ramps (Scenarios 4 and 5) is based on a design speed of 25 mph where the minimum design speed of those ramps is 35 mph in the base case design. However, the minimum design speed for a loop is 25 mph per ODOT's HDM.
- The circulation system must reassign multimodal circulation through the area due to the expected closure of the Hancock Dixon Connection.
- The ICA team assumes the same design vehicles that are assumed in ODOT's 20% design package. A WB-67 design vehicle is assumed for freeway-bound movements and a WB-40 for local circulation. These vehicles are accommodated in different ways, whether in the lane or partially encroaching, and the practicalities of those turning movements are captured in Appendix J: Surface Street Network and Circulation.

Design exceptions: The base case design had identified about 14 design exceptions from ODOT's HDM. We anticipate Scenarios 4 and 5 will require a similar number of design exceptions as the base case design.

Environmental Review Implications

- The RQIP 20% Design documents do not contribute significant impacts beyond those impacts studied in the EA. Scenario 1 builds on the 20% Design documents as the basis of design that includes additional elements to enhance restorative justice outcomes without significant impacts beyond those studied in the EA.
- Per 23 Code of Federal Regulations (CFR) Section 771, the Federal Highway Administration will conduct an environmental evaluation to determine if a new environmental document is required.

Air Quality

Assumptions and Recommendations

The ICA team provides the following strategies relative to air quality and assumes these to be implemented as part of the Rose Quarter Improvement Plan (RQIP) in the preliminary concept scenarios. These strategies are derived from a report created by Arup for the ICA project, Local Air Quality Review and Recommendations, March 18, 2021; attached to the end of this document, beginning on page 7.

- Install a permanent air quality monitoring station near I-5 to collect data on pollution from the highway.
    - To be owned and maintained by Oregon Department of Environmental Quality or other authority.
    - Suggest monitoring the 6 criteria pollutants, in particular: NO_2, CO, Ozone, PM2.5 and PM10.
    - Collect particulate matter concentration data from outdoor Purple Air Sensors at Harriet Tubman Middle School, if available. Consider installing Purple Air (or similar) sensors to monitor particles of various sizes.

- Develop a detailed air quality dispersion model to assess pollution hot spots under current conditions and to assess the impact of the design on air quality in the surrounding community.
    - The model would account for background pollution, traffic emissions, physical obstructions, and meteorological data, including wind, to determine impacts on air quality.
    - Air quality at the portal locations and at the ramps is of particular interest as pollution concentrations are likely to be elevated in those areas.

- Develop Health Risk Assessment (HRA)
    - The HRA can be used to assess the health impact on the community based on air quality testing results from the air dispersion model and the time of exposure to that air quality. The HRA can be sensitive to the type of people who would use the facility and the types of users who would primarily be affected by pollutant exposure.

- Use Design Strategies to Reduce Air Pollution
    - The ICA team assumed the RQIP would implement design strategies to improve air quality. Some of these strategies are listed below and a more detailed description can be found on the California Air Resources Board website[1] and the paper *Roadside Vegetation Design to Improve Local, Near-Road Air Quality*:[2]
        - Tall, solid, or vegetative barriers to protect areas close to I-5
        - Proper modeling to locate sensitive uses; see Recommendations above
        - Management of activities to reduce exposure; see Recommendations above
        - Reduction of emissions by preempting signals on surface streets
        - Lowering speeds of nearby vehicular facilities

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[1] "Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways." California Air Resources Board. 2017 April 27; Accessed 2021 April 14 at: Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways | California Air Resources Board

[2] Baldauf, Richard. "Roadside Vegetation Design to Improve Local, Near-Road Air Quality." *Transp Res D Transp Environ*. 2017 May 4; 52(11): 354–361. doi: 10.1016/j.trd.2017.03.013. Accessed 2021 April 14 at: Roadside Vegetation Design to Improve Local, Near-Road Air Quality (nih.gov)

Finally, the ICA team provides one additional consideration that was not a baseline assumption but came forward during our work: engage local students in an air quality study. The opportunity to install monitoring sensors provides an opportunity for students, community members, and the public agencies managing the highway to communicate, collaborate, and work on a foundation of shared knowledge and expertise.

Working Air Quality Assumptions

Without air quality dispersion modeling and a Health Risk Assessment to guide our creation of development scenarios, the ICA team made a rough, baseline assumption that higher pollutant concentrations would be present within 300 feet of any opening in the highway cover, and considered those areas as opportunities for less sensitive uses, like retail and office space. More sensitive uses, like residential development, were considered best located on sites 300 feet or more away from an opening to I-5. Outdoor recreation areas are assumed to be best placed 300-500 feet from an opening to I-5.[3]

See the attached report on the following pages for additional background on the ICA's air quality assumptions and recommendations.

Portland Rose Quarter Independent Cover Assessment

Local Air Quality Review and Recommendations

March 18, 2021

ARUP

Background on Air Quality

What is Air Quality?

- Air quality is a measure of pollution in ambient air, assessed by measuring a variety of pollutants ranging from solid particulates to harmful gases.
- Air pollution can have natural or human sources such as vehicle exhaust, all types of burning (including fireplaces and woodstoves), and industry, among others.
- Vehicle exhaust is a major source of pollution and is comprised of pollutants such as CO2, CO, SO2 Hydrocarbons (HC), NOx and particulates ranging in sizes.

Sources of Air Pollution

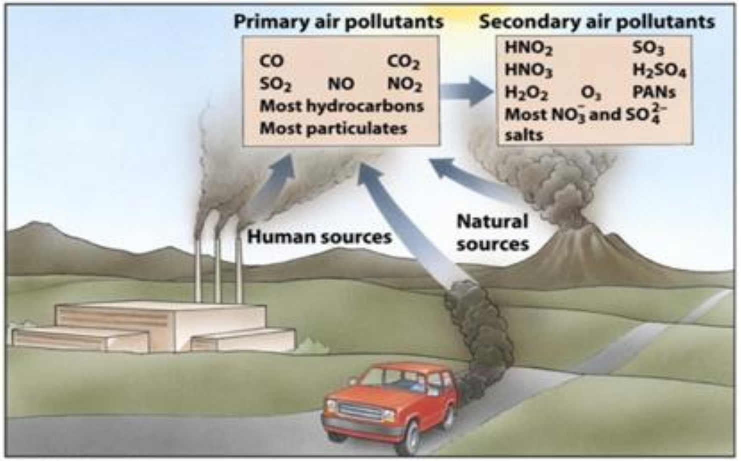


Figure 20-2 Environment, 5/e

Background on Air Quality

How is Air Quality measured and regulated?

- The US Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards (NAAQS) for six principal pollutants that can be harmful to public health and the environment.

- The EPA also uses the Air Quality Index (AQI) to report public health risks based on the concentrations of these six pollutants: ozone, carbon monoxide, nitrogen oxides, sulfur oxides, particulate matter, and lead. This is intended to be an easier way to communicate air quality levels to the general public. “Moderate” levels are set to not exceed the concentration limits in the NAAQS.

AQI

The U.S. EPA developed the Air Quality Index, or AQI scale, to make the public health impacts of air pollution concentrations easily understandable.

Air Quality Index

The Air Quality Index, or AQI, much like an air quality "thermometer", translates daily air pollution concentrations into a number on a scale between 0 and 500. The numbers in this scale are divided into six color-coded ranges, with numbers 0-300 as seen below.

(0-50)	Good No health impacts are expected when air quality is in this range.
(51-100)	Moderate Unusually sensitive people should consider limiting prolonged outdoor exertion.
(101-150)	Unhealthy for Sensitive Groups Active children and adults, and people with respiratory disease, such as asthma, should limit outdoor exertion.
(151-200)	Unhealthy Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.
(201-300)	Very Unhealthy Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.

National Ambient Air Quality Standards

Pollutant	Averaging Time	National Std
Ozone*	1 Hour	–
	8 Hour	0.070 ppm
Carbon Monoxide	1 Hour	35 ppm
	8 Hour	9 ppm
Nitrogen Dioxide	1 Hour	0.100 ppm
	Annual	0.053 ppm
Sulfur Dioxide	1 Hour	0.075 ppm
	24 Hour	–
Particulates ≤ 10 microns	24 Hour	150 µg/m^3
	Annual	–
Particulates ≤ 2.5 microns	24 Hour	35 µg/m^3
	Annual	12.0 µg/m^3

Background on Air Quality

Oregon State Air Toxics Program

- The Oregon Department of Environmental Quality (ODEQ) provides additional benchmark concentrations for specific air toxics like metals, volatile organic compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs), diesel particulate matter (DPM), and many more*. The air toxics are pollutants known or suspected to cause cancer or other serious health problems.

- The purpose of these Ambient Benchmark Concentrations (ABCs) are to set goals for the air toxics program. They are based on **human health risk and hazard levels** considering sensitive populations. Ambient benchmarks are **not regulatory standards**, but **reference values** by which air toxics problems can be identified, addressed and evaluated through various programs.

- The pollutants covered in the ABCs are not regulated by the EPA or included in the National Ambient Air Quality Standards (NAAQS).

- These air toxics are not captured in the federal AQI because they are present in very low concentrations and can generally only be reliably measured with complex laboratory analyses, which typically take several weeks to complete. Emerging technology may offer more real time monitoring solutions in the future.

*Oregon DEQ Ambient Benchmark Concentrations:
https://www.oregon.gov/deq/FilterDocs/airtox-abc.pdf

Air Quality Review

Standards on Air Quality

- Oregon DEQ owns and manages air quality stations in the State and in the Portland Metro area.

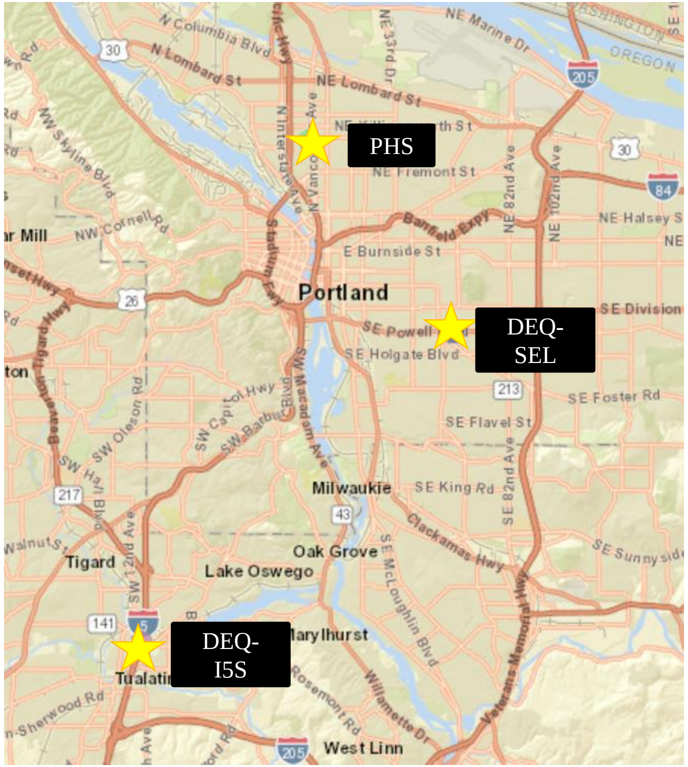
- The map on the right shows a selection of three ODEQ stations covered in this air quality review.

1. Portland Humboldt School (PHS)
   - Monitors PM2.5 and black carbon
   - Date range: 2017 to Present
   - Data gathered due to proximity to project site

2. Portland SE Lafayette (DEQ-SEL)
   - Monitors CO, NO2, Ozone, PM2.5, and SO2
   - Date range: 1980 to Present
   - Data gathered due to variety of pollutants monitored

3. Tualatin I-5 (DEQ I5S)
   - Monitors CO, NO2, Ozone, and PM2.5
   - Date range: 2014 to Present
   - Referenced in Harriet Tubman School Air Quality Study

Selection of Air Quality Stations in Portland

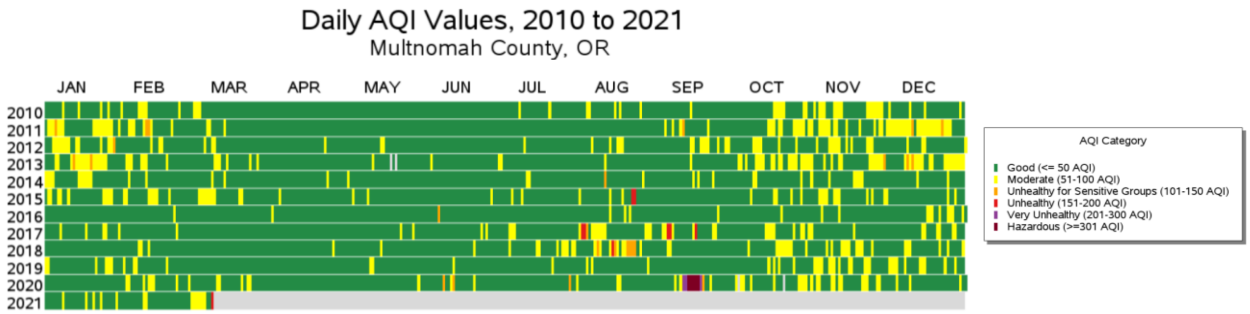


Air Quality Review

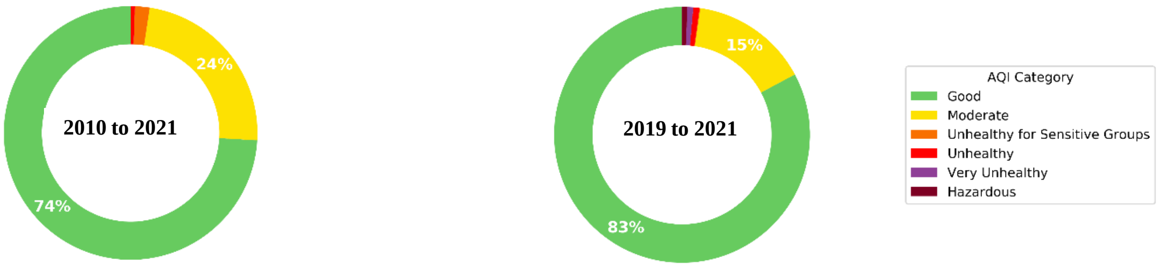
Background Portland Air Quality

Historical air quality in Multnomah County (DEQ-SEL) area shows a majority of "Good" levels of air quality (74-83%) and "Moderate" levels of air quality for the remainder of the time, with the exception of a few events of bad air quality likely due to wildfires.

This air quality data takes into account pollutants like ozone, particulate matter (PM2.5 and PM10), NO2, and CO. These levels can be considered the "background" pollution of the site.



Air Quality for DEQ-SEL (Portland Metro) **Air Quality for PHS (Portland Humboldt School)**



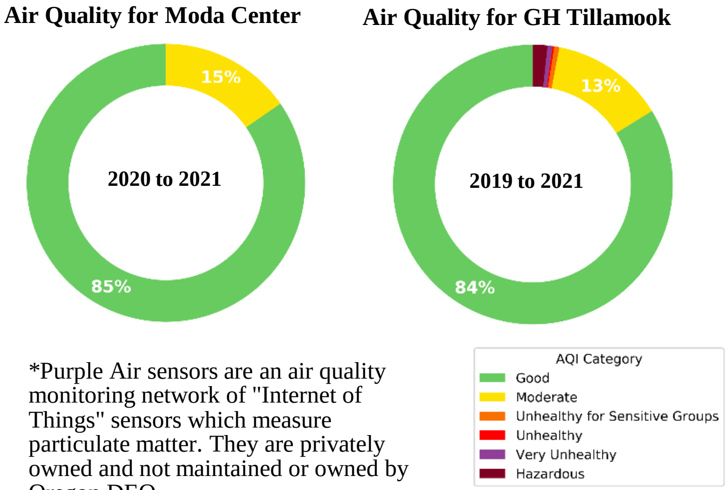
Air Quality Review

Local Air Quality

Although there are no permanent air quality stations near the site that are publicly accessible, there are two local Purple Air sensors that measure particulate concentrations. These indicate slightly better air quality levels compared to the background levels based on PM2.5 concentration data, but similar trends in AQI.

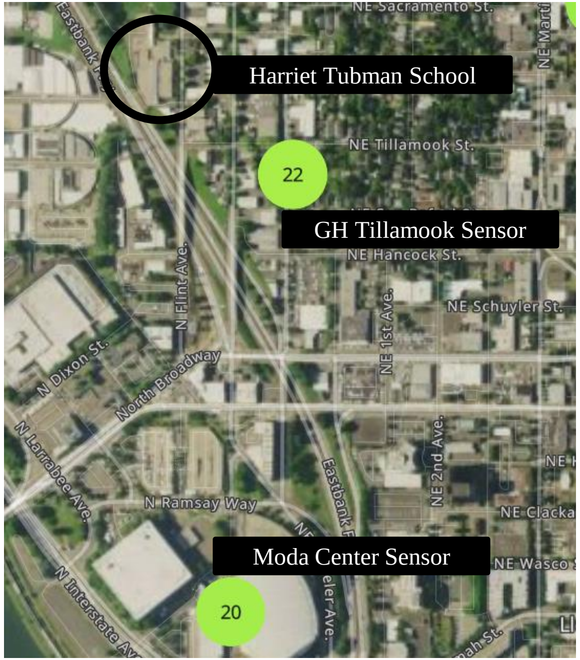
This data is indicative of air quality trends and validates the air quality background levels measured at DEQ-SEL and PHS.

PM2.5 Data from Purple Air Sensors



*Purple Air sensors are an air quality monitoring network of "Internet of Things" sensors which measure particulate matter. They are privately owned and not maintained or owned by Oregon DEQ.

Locations of Purple Air Sensors



Air Quality Review

Local Air Quality – Harriet Tubman Middle School

Researchers from Portland State University conducted an air quality study by monitoring outdoor and indoor air pollutants at Harriet Tubman Middle School during March 2018.

Their findings show that:

1. There is a gradient of traffic related pollutants that decreases as a function of distance away from I-5 N, reaching background levels about 200-300 feet from the freeway.

2. Many air pollutants measured at Tubman are elevated compared to Portland background site (DEQ SE Lafayette).

3. Criteria pollutants were below the National Ambient Air Quality Standard for the monitoring period.

4. Toxic metals were below Oregon Ambient Benchmark Concentrations (except for arsenic).

5. Some toxic volatile organic compounds (benzene, acrolein, and naphthalene) were above Oregon Ambient Benchmark Concentrations.

6. Black carbon (part of diesel exhaust) was also elevated above Ambient Benchmark Concentrations measured at the school and the background site.

NO2 levels around HTMS

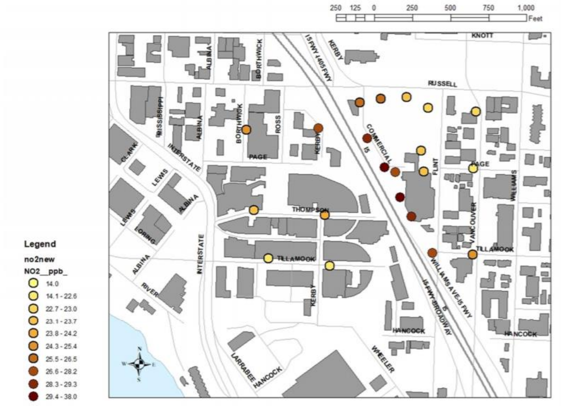


Figure 9. Summary of passive NO_2 monitoring deployment conducted from February 27th-March 12th, 2018)

NOx and CO concentrations from Air Quality Study at Harriet Tubman School

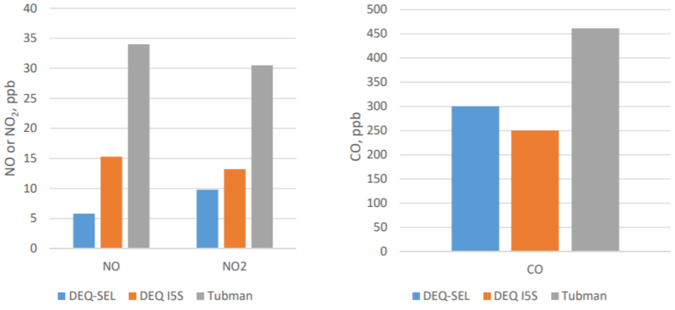


Figure 12. Comparison of NO, NO2, and CO at Harriet Tubman Middle School to urban background

Air Quality Review

Local Air Quality – Harriet Tubman Middle School

Further Takeaways from the PSU Air Quality Study:

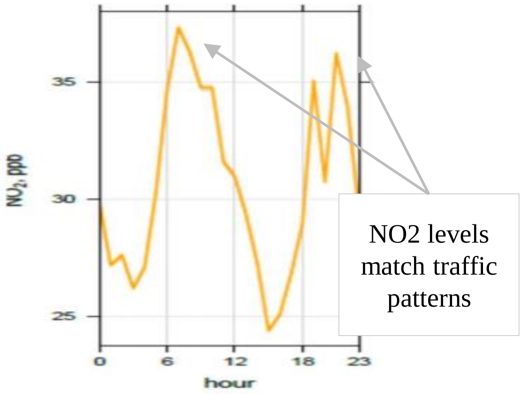
- For the sampling period, the average concentrations of toxic metals were significantly below the Oregon Ambient Benchmark Concentrations (ABCs), except for arsenic. However, arsenic has been found to have been at elevated levels in urban background air in the Portland area.
- Black carbon levels measured near I-5 also exceeded background levels in Portland during some afternoon hours. Black carbon concentrations are higher than the Oregon ABCs at both the site and in the background concentrations.
- Due to these air toxics that exceed the Oregon Ambient Benchmark Concentrations, the study recommended that “Student outdoor activities be limited at HTMS, especially during high traffic periods.” The rationale is that air quality at the site is impacted by I-5 traffic, as evidenced by the recorded pollutant concentrations and the exceedance of air toxics (benzene, acrolein, naphthalene, and black carbon).

Why is pollution elevated near I-5?

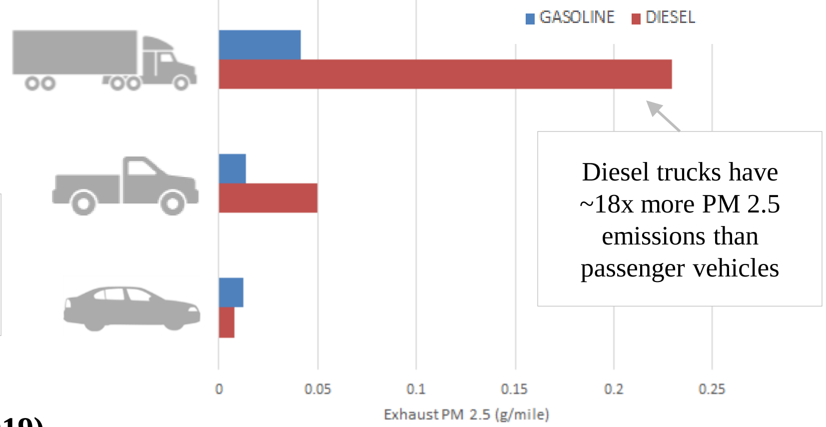
Reasons for elevated pollution

- Report by PSU shows that diurnal pollution patterns for gases like NO, NO2, and CO are consistent with traffic patterns.
- Data on daily traffic shows that trucks make up about 10-13% of vehicles. Diesel trucks can have up to 18 times more particulate emissions than light-duty vehicles.

Hourly Emissions of NO2 at Harriet Tubman School



Estimated U.S. Average Total PM2.5 (g/mile) Emissions Rates in 2018 per Vehicle Type



Annual Average Daily Traffic (2019)

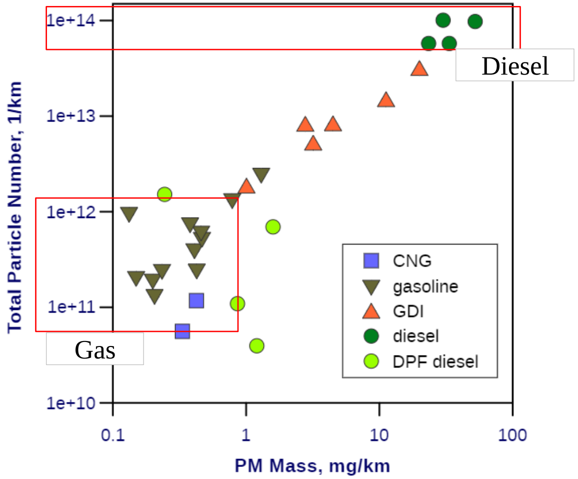
Segment	Annual Average Daily Traffic	Truck Annual Average Daily Traffic
I-5, between I-405 and Broadway / Weidler	120,100	15,300 (12.7%)
I-5, between Broadway / Weidler & I-84	118,900	11,700 (9.8%)

Impact of Diesel Exhaust

Diesel Exhaust

- Diesel engines emit a complex mixture of air pollutants, including both gaseous and solid material. The gaseous pollutants include volatile organic compounds (VOCs) and oxides of nitrogen (NOx). The solid material in diesel exhaust is known as diesel particulate matter (DPM) and is typically composed of carbon particles (“soot”, also called black carbon) and numerous organic compounds, including over 40 known cancer-causing organic substances. Examples of these chemicals include polycyclic aromatic hydrocarbons(PAHs), benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene.
- Compared to gasoline engines, diesel engines can emit up to 3 orders of magnitude more particulates through the exhaust.
- More than 90% of DPM is less than 1 µm in diameter. These ultrafine particles (UFP) are able to travel to the deep and more vulnerable parts of the lung, along with any toxic chemicals that have adsorbed to the surface of the particles.
- After reviewing scientific research, the International Association for Research on Cancer reclassified diesel exhaust to be a known human carcinogen while keeping the classification of gasoline exhaust as a possible human carcinogen.
- UFPs have been shown to be toxic and have health impacts but are not specifically regulated.

Comparison of the emission rate of particulates from different light-duty engine technologies

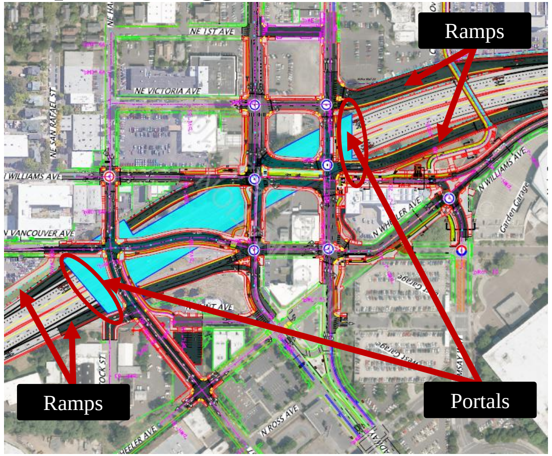


Impact of Design on Air Quality

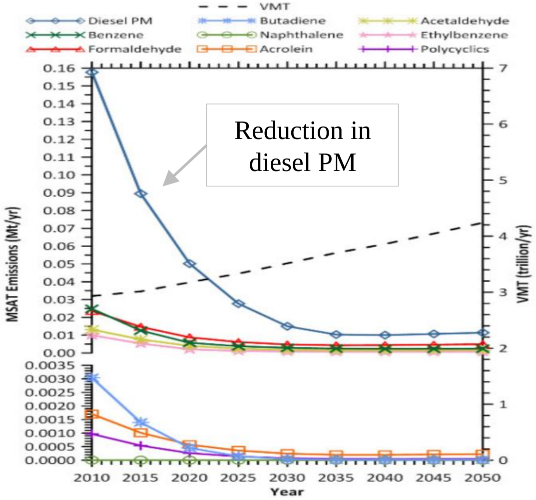
Project Environmental Assessment Findings

- Rose Quarter Improvement Project's Environmental Assessment published in Feb 2019: "Long-term emissions of mobile source air toxics (MSAT) and National Ambient Air Quality Standards (NAAQS) criteria pollutants from vehicles operating on the highway and local surface streets would be **equal to or lower** than emissions for the No-Build Alternative and would be **substantially lower in 2045 compared to existing conditions** (2017)."
- Pollution levels for the criteria pollutants do not exceed NAAQs.
- National roadway emissions projected to decrease in the future as more restrictive tailpipe emission standards are implemented.
- During construction, minor short-term air quality impacts would occur within the existing I-5 corridor and surface streets in the immediate vicinity of construction activity (including haul routes).

Proposed Design



Projected National MSAT Emission Trends 2010-2050



Additional research / recommendations

Best Practices for Reducing Near-Road Pollution Exposure at Schools

- The EPA developed a document to address best practices for reducing pollution at schools located near roadways.
- The California Air Resources Board, South Coast Air Quality Management District, and the Los Angeles Unified School District all recommend that schools are not built within 500 feet of a major roadway. There are about 120,000 vehicles/day currently on I-5 near the site, which would make this road section fall under the recommendations of these agencies.
- The Harriet Tubman Middle School is <500 feet from I-5.

Table 2. School siting documents developed by various agencies.

Agency	Guidance	Key Outcomes
U.S. EPA	School Siting Guidelines (2011)	Recommends considering many factors in evaluating locations for new schools, including proximity to the community (including community amenities and infrastructure), distance from major transportation facilities, exposure to air pollutants during student commutes, feasible mitigation on site, and accessibility by walking or biking.
California Air Resources Board	Air Quality and Land Use Handbook (2005)	Recommends that new schools are not located within 500 feet of major roadways (>50,000 vehicles/day).
California Department of Education	School Site Selection and Approval Guide (2000)	Recommends distancing schools 2,500 feet from major roadways where explosives are carried and at least 1,500 feet from roads where gasoline, diesel, propane, chlorine, oxygen, pesticides, or other combustible or poisonous gases are transported.
South Coast Air Quality Management District	Air Quality Issues in School Site Selection: Guidance Document (2005, updated 2007)	Recommends a buffer zone of no less than 500 feet, and as much as 1,000 feet, between schools and major roadways.
Los Angeles Unified School District	Distance Criteria for School Siting (2008)	Recommends that new schools are not built within 500 feet of a freeway or major transportation corridor (>100,000 vehicles/day).

Additional research / recommendations

The Community Assessment of Freeway Exposure and Health Study (CAFEH) in the Boston Area

- The Community Assessment of Freeway Exposure and Health Study (CAFEH) began studying pollution in Boston communities near major highways in 2008 with the aim to assess the association between exposure to air pollutants, including ultrafine particulates (UFP), emanating from highway traffic and cardiac health in communities near highways. They are measuring changes in air pollution levels and health impacts as a function of distance from highways in six communities in greater Boston.

- The findings for the Somerville near highway study area show there is site-specific evidence, developed through a rigorous environmental epidemiology approach, that near highway exposure to ultrafine particles **raises risk for cardiovascular illness**.

- When examining the levels of UFP monitored near the highway, the study found that the UFP levels were higher closer to the highway and inside highway tunnels. The concentration of these particles decreased with distance from the highway. Unlike the concentration of ultrafine particles, the levels of larger particles did not vary with distance from the highway. More importantly, the study also found that **UFP can and do get into people’s homes**.

Additional research / recommendations

Identifying Areas with Cumulative Impacts from Air Pollution in the San Francisco Bay Area

- The San Francisco Bay Area Air Quality Management District undertook an assessment of the health implications due to poor air quality throughout communities in the Bay Area.

- The report cites multiple studies that have shown that low-income communities, communities with higher populations of racial or ethnic minorities, communities with combined stressors such as noise, crime, and under-employment have less access to health care, elevated stress levels, and **reduced resiliency to the added health burden of air pollution**.

- The assessment found that the distribution pattern of **cancer risk-weighted emissions closely follows that of diesel PM emissions along major roadways** and in the urban center.

Summary

Air Quality Review

1. Current air quality meets NAAQS (National Ambient Air Quality Standards).

2. Air quality measured in 2018 at Harriet Tubman Middle School **does not meet** Oregon Ambient Benchmark Concentrations for arsenic, black carbon, and some VOCs (benzene, acrolein, and naphthalene).

3. Pollution levels are elevated near I-5 and decrease down to background levels 200-300 ft away from highway.

4. Research shows that diesel exhaust, including ultrafine particulates and gases, can increase the risk of cancer and cardiovascular disease. Several agencies also recommend schools not to be built within 500 feet of major roadways due to these air quality concerns.

5. The RQIP Environmental Assessment conducted claims that future long-term emissions of mobile source air toxics (MSAT) and National Ambient Air Quality Standards (NAAQS) criteria pollutants from vehicles operating on the highway and local surface streets would be equal to or lower than emissions for the No-Build Alternative and would be substantially lower in 2045 compared to existing conditions (2017). Therefore, the Project meets all applicable requirements of the Clean Air Act.

Takeaway: The effects of the project on air quality are minimal because the expected emissions are the same or lower as the current condition.

However, the RQIP Environmental Assessment does not account for how the emissions travel from the highway and roads to create pollution near the highway. These pollutant concentrations can be higher than benchmarks for known carcinogens, as measured in the Air Quality Study for the Harriet Tubman School.

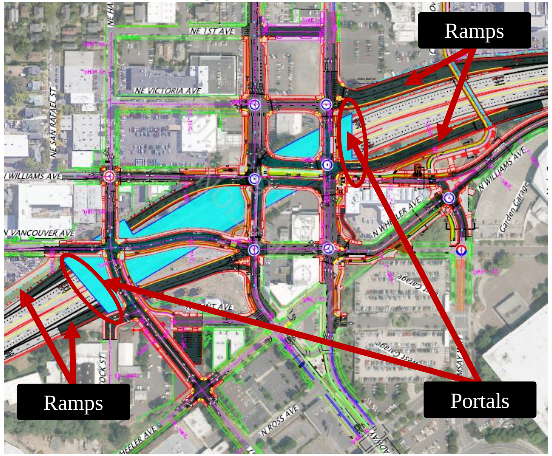
Summary

Recommendations

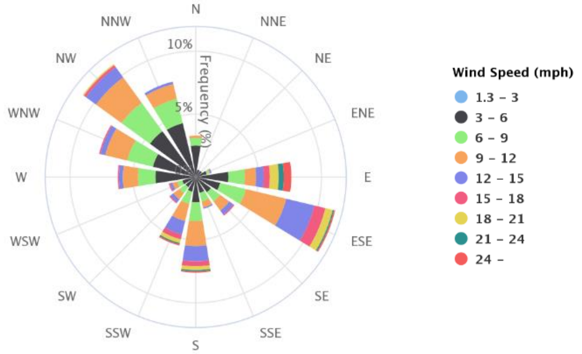
- **Install permanent air quality monitoring station near I-5 to collect data on pollution from highway.**
  - To be owned and maintained by Oregon Department of Environmental Quality.
  - Collect particulate matter concentration data from outdoor Purple Air Sensors at Harriet Tubman Middle School, if available.
  - Monitor Black Carbon, if possible.

- **Develop detailed air quality dispersion model to assess pollution "hot-spots" under current conditions and to assess the impact of the design on air quality in the surrounding community.**
  - The model would account for background pollution, traffic emissions, physical obstructions, and meteorological data, including wind, to determine impacts on air quality.
  - Air quality at the portal locations and at the ramps is of particular interest as pollution concentrations are likely to be elevated in those areas.

Proposed Design



Portland Wind Rose



Example of wind inputs to proposed air quality dispersion model

Appendix

Daniel Stindt

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More on Oregon Air Toxics Program

Oregon State Air Toxics Program

- DEQ routinely measures: arsenic, beryllium, cadmium, chromium, cobalt, lead, manganese, nickel, selenium and hexavalent chromium, also volatile organic compounds, aldehydes and ketones.
- While DEQ can conduct special monitoring studies to determine hourly or shorter concentrations, the shortest time period for which air toxics concentrations can be determined from routine air toxics monitoring is 24 hours.
- For air toxics with the highest levels in Oregon, the most significant health problems come from long-term exposure. Long-term exposure to low concentrations of air toxics can cause cancer and other health problems.
- DEQ will evaluate the need to formally adopt short–term benchmarks for Oregon. At present the focus of DEQ's air toxics program is to reduce significant risks of cancer and other chronic diseases caused by long-term exposure to air toxics. The emission reduction measures adopted to reduce long-term exposures in many cases also reduce the potential for short-term emission spikes that could lead to acute health problems.
- In 1999, 2000, and 2005, DEQ monitored air toxics including airborne metals at six residential locations in the Portland region: North Portland, Southeast Portland, Southwest Portland, Northwest Portland, Beaverton, and Vancouver. DEQ did additional monitoring in Northwest Portland between 2000 and 2005.
  - Annual average concentrations of arsenic varied across the six sites from a low of 0.93 to a high of 1.74 nanograms per cubic meter of air. The benchmark for arsenic is 0.2 nanograms per cubic meter of air. **This indicates the entire region is above the health benchmark.**

Air Quality Study at Harriet Tubman School

Local Air Quality – Harriet Tubman Middle School

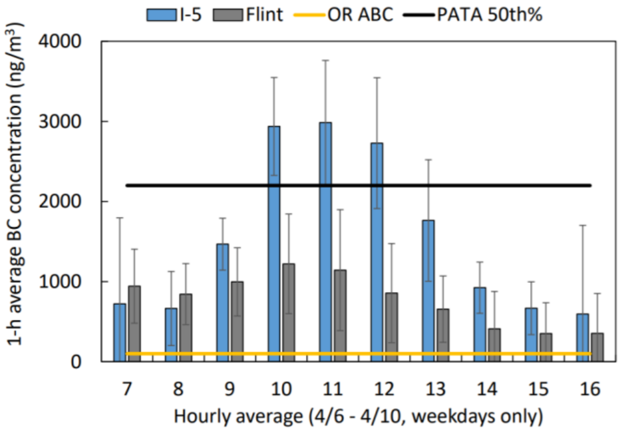
Supporting data from Air Quality Study at Harriet Tubman Middle School conducted by Portland State University researchers during Spring 2018.

Metals Analysis at Harriet Tubman Middle School

Toxic Metal	*Oregon ABC (1 in million risk) ug/m3*	PM_{10} µg/m3 (uncertainty) n=10	$PM_{2.5}$ µg/m3 (uncertainty) n=7	Method
Arsenic	*0.0002*	0.0009 (0.0003)	0.0012 (0.0003)	XRF
Cadmium	*0.0006*	<DL	NA	ICP-OES, DL=0.0007
Cobalt	*0.1*	0.0001 (0.0013)	<DL (0.0013)	XRF
Lead	*0.15*	0.002 (0.0005)	0.008 (0.0005)	XRF
Manganese	*0.09*	0.0230 (0.0018)	0.0143 (0.0013)	XRF
Mercury	*0.3*	0.0001 (0.0005)	<DL (0.0005)	XRF
Nickel	*0.004*	0.0019 (0.0003)	0.0014 (0.0003)	XRF

XRF = X-ray fluorescence
ICP-OES = Inductively coupled plasma – optical emission spectroscopy

Black Carbon Analysis at Harriet Tubman Middle School



- Metals analysis shows elevated levels of arsenic at Harriet Tubman School.
- Black carbon measurements show that levels recorded at HTMS during normal school periods are bracketed by the Oregon Ambient Benchmark Concentration (ABC) for black carbon (0.1 µg/m3) and the average background concentration in Portland (2,200 ng/m3).
- Portland background levels are elevated compared to the Oregon ABC, but measured levels near I-5 can reach even higher concentrations than the background black carbon levels.

Air Quality Study at Harriet Tubman School

Local Air Quality – Harriet Tubman Middle School

Supporting data from Air Quality Study at Harriet Tubman Middle School conducted by Portland State University researchers during Spring 2018.

- VOCs analysis shows elevated levels above the Oregon Ambient Benchmark Concentrations for acrolein, benzene, and naphthalene. Benzene is elevated in vehicle exhaust and is a known carcinogen. Naphthalene is present in diesel and a known carcinogen as well.

Table 3. Summary of VOCs concentrations at Harriet Tubman Middle School – Comparison with Oregon Ambient Benchmark Concentrations (ABC) and Portland Urban Background from ODEQ Humboldt (ODEQ data is provisional). Values in red are those elevated above Oregon ABCs.

Chemical name	Sources *	PDX BG** ($\mu g/m^3$)	ABC[#] ($\mu g/m^3$)	Tubman average concentrations all days ($\mu g/m^3$)	Tubman average concentrations weekdays 7AM-4PM ($\mu g/m^3$)	Analytical Method
acrolein	burning of fuels (gasoline/oil), burning of organic matter (as tobacco), …	0.25	0.02	0.34***	0.40***	PTR-TOF-MS
benzene	burning of coal and oil, gasoline service stations, and motor vehicle exhaust	0.59	0.13	1.22 / 0.87	0.91 / 1.02	TD-GC-MS / PTR-TOF-MS
naphthalene	burning of coal gas, diesel and oil, use of mothballs, some manufactory	traces	0.03	0.13 / 0.26***	0.12 / 0.31***	TD-GC-MS / PTR-TOF-MS

***VOCs that are exceeded at Harriet Tubman Middle School**

Environmental Assessment – Further Notes

Environmental Assessment – Oct 2020

- ODOT conducted an air quality analysis for the Project Area, including I-5 and surface streets, using the EPA-approved Mobile Vehicle Emission Simulator (MOVES) model. **The analysis concluded that the Project would comply with all NAAQS over the life of the Project.**
- A mobile source air toxics (MSAT) analysis was also performed using the MOVES model. The model estimated MSAT emissions from highway operations for the Build Alternative in 2045 would be equal to or lower than the MSAT emissions for the No-Build Alternative. The estimated reduction in future MSAT emissions compared to the No-Build Alternative is **likely due to the higher speeds and reduced congestion** that the Build Alternative would allow
- Regarding air quality, the FHWA and ODOT maintain that the United States Environmental Protection Agency (EPA) Mobile Vehicle Emission Simulator (MOVES) model that was used to analyze long-term air quality impacts, following FHWA and EPA guidance, represents the most contemporary emissions model available to estimate mobile sources at the project level for criteria air pollutants and air toxics.
- In Spring 2020, following publication of the Environmental Assessment and at the direction of the Oregon Transportation Commission (OTC), ODOT hired an independent panel of six technical experts from across the country to conduct a peer review to evaluate the methodologies, analyses, conclusions, and mitigation measures for the air quality, noise, and greenhouse gas (GHG) emissions analyses conducted for the Environmental Assessment. This effort was intended to address the observed controversy by establishing an objective position on the defensibility of the analyses presented in the Environmental Assessment. Regarding the air quality analysis, the peer review concluded:
  - **ODOT properly followed FHWA and EPA guidance to conduct the air quality analysis for the Project,**
  - **ODOT exhibited best practices as it followed FHWA guidance on quantitative analysis of MSATs, and**
  - **ODOT's conclusion was technically correct in that there would be no adverse long-term air quality impacts**.