Cleaner Air Oregon Level-3 Modeling Protocol and Risk Assessment Work Plan

EcoLube Recovery LLC
Portland, Oregon

Prepared for:

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BRIDGEWATER GROUP, INC.

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1.0 Introduction

EcoLube Recovery (ELR) is a Northwest owned and operated company engaged in the safe and sustainable practice of collecting and recycling used oil produced here in the region. The benefits of reusing and recycling used oil are well known and include the following:

- Recycling used oil keeps it from polluting soil and water.
- Motor oil does not wear out—it just gets dirty—so recycling it saves a valuable resource.
- Less energy is required to produce a gallon of re-refined base stock than a base stock from crude oil.
- One gallon of used motor oil provides the same 2.5 quarts of lubricating oil as 42 gallons of crude oil.

ELR's facility in Portland utilizes a specialized re-refining process where the used oil is converted into certified products such as marine fuel and Group 2 base oil. The facility is at 11535 N Force Ave. in Portland, Oregon at a latitude of N 45° 36′ 24′′ and a longitude of W122° 41′ 40′′ (UTM NAD 1983 zone 10 coordinates of 523,831 Easting and 5,050,396 Northing). The location of the facility is shown in Figure 1-1.

On September 17, 2020 Ecolube was "called in" to the Cleaner Air Oregon (CAO) program by the Oregon Department of Environmental Quality (DEQ). Under the Cleaner Air Oregon regulations (OAR-340-245), existing sources are required to conduct a health risk assessment of all non-exempt Toxic Emission Units (TEUs) at the facility and demonstrate the facility can operate at or below the applicable existing source Risk Action Levels (RALs). The first step in the CAO process is to submit a CAO Emissions Inventory that provides emission estimates of CAO regulated toxic air contaminants (TACs) from each non-exempt toxic emissions unit (TEU) at the facility. The initial Emissions Inventory (EI) was submitted on December 1, 2020. ELR responded to DEQ questions on this initial EI and conducted source testing. On October 24, 2022, Oregon Department of Environmental Quality (DEQ) approved the revised inventory that was submitted on July 14, 2022. The next step in the CAO process is to submit the Modeling Protocol by no later than November 28, 2022 and Level-3 Risk Assessment Work Plan by December 26, 2022. [OAR 340-245-0030(1)(b)&(c)]. This document is a combined modeling protocol (MP) and Level-3 Risk Assessment Work Plan (RAWP) which describes the methods, approaches, and assumption that will be used to calculate the Level-3 Risk Assessment of the ELR facility.

Figure 1-1: Site Location

2.0 Conceptual Site Model

2.1 Process Overview

ERL is a used oil refinery. Used oil is primarily received from trucks and unloaded into storage tanks. In general, there are three primary process operations at the facility:

- Refinery
- Sulfonation
- Oil Polishing System (OPS)

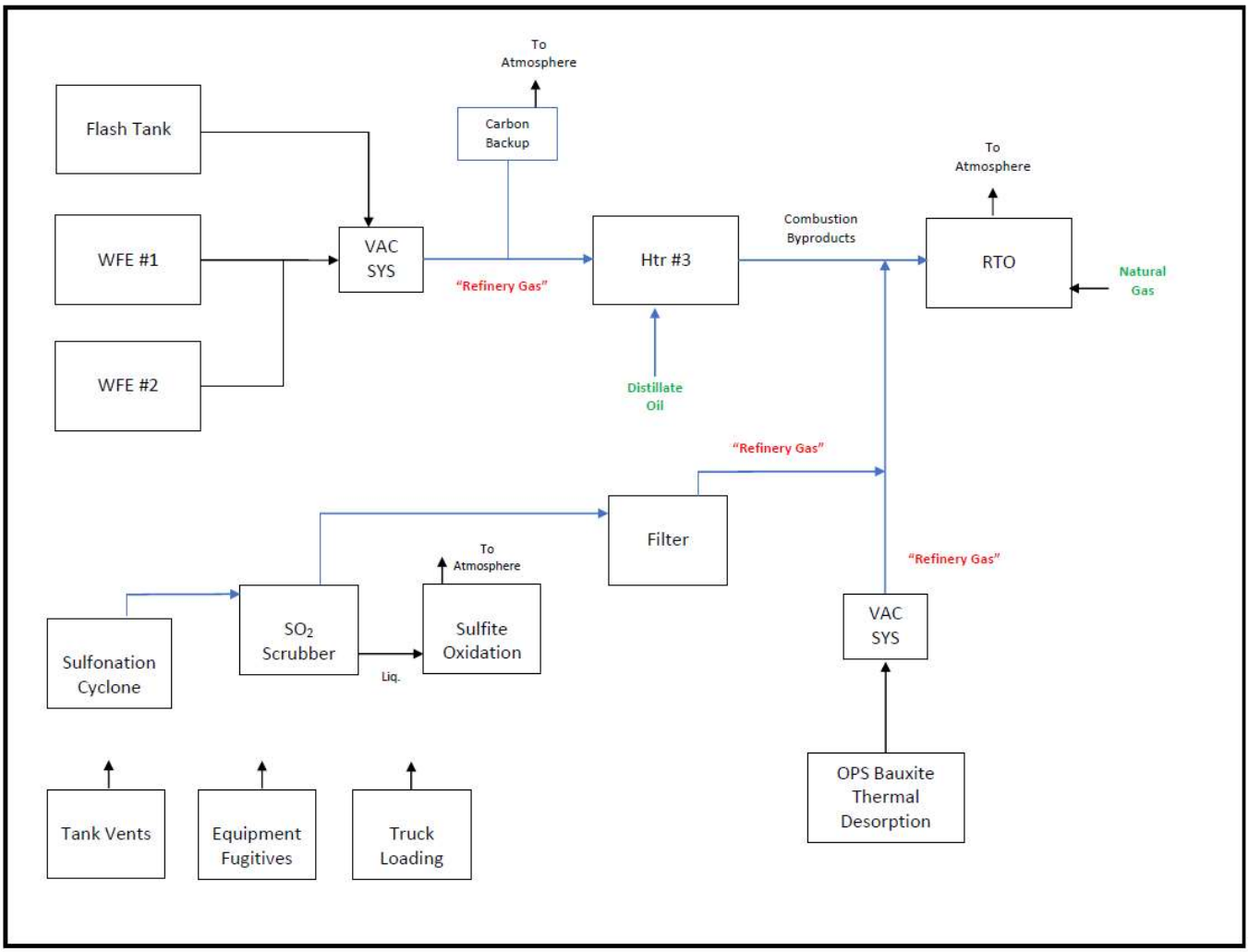
Used oil processed by the Refinery produces vacuum gas oil (VGO), flux, and #2 distillate oil. VGO can be further processed in Sulfonation and the OPS. The Sulfonation process reacts VGO with sulfur trioxide for the ultimate purpose of removing contaminants, color bearing agents and other compounds in the form of sulfonic acid. The sulfonic acid is removed in the OPS to produce base oil. Emissions from all three of these oil processing operations are ultimately controlled by Regenerative Thermal Oxidizer (RTO).

Non-exempt support equipment at the facility that are sources of TACs are the following:

- Storage tank vents, some of which are vented to carbon adsorption systems
- Fugitive equipment leaks
- Truck loading
- Carbon backup systems for the Refinery and OPS.

Figure 2-1 shows the facility process flow diagram.

Figure 2-1: ELR Process Flow Diagram



2.2 TEU Descriptions

Each of the toxic emission units (TEUs) is described below, with its TEU ID in parathesis. A more detail description is provided in the CAO emissions inventory submittal. Table 2-1 shows the cross-walk from the emission inventory TEU to the modeling ID, along with the UTM coordinates of each source. Source parameters are also provided below. The source locations are shown in Figure 2-2, along with buildings and Table 2-2 provides source parameters.

Table 2-1: TEUs, Emission Points, Model IDs and Locations

EI TEU	Description	Emission Point	Model ID	Type	X (m)	Y (m)
TO-01	Regenerative Thermal Oxidizer	RTO1	RTO1	POINT	523826.8	5050381
TANKS_CONTROLLED	Five Controlled tanks to carbon system	TCARBON	TCARBON	POINTHOR	523806.9	5050401
RCARBON	Refinery Carbon Back-Up Systems	RCARBON	RCARBON	POINTHOR	523819.9	5050394
TANKS	Uncontrolled Tanks	JAIL1	JAIL1	POINTHOR	523876	5050388
		JAIL2	JAIL2	POINTHOR	523871.3	5050390
		JAIL3	JAIL3	POINTHOR	523866.6	5050393
		JAIL4	JAIL4	POINTHOR	523862.1	5050395
		JAIL7	JAIL7	POINTHOR	523874.6	5050397
		JAIL8	JAIL8	POINTHOR	523869.9	5050399
		JAIL9	JAIL9	POINTHOR	523865.4	5050401
		CT1	CT1	POINTHOR	523904.4	5050375
		CT2	CT2	POINTHOR	523899.7	5050377
		CT3	CT3	POINTHOR	523907	5050380
		CT4	CT4	POINTHOR	523902.3	5050382
		TANK12	TANK12	POINTHOR	523855.9	5050403
		IT100-1	IT1001	POINTHOR	523811.4	5050412
		IT220-2	IT2202	POINTHOR	523816.3	5050416
		TK10401	SO1	POINTHOR	523832.7	5050411
		TK10402	SO2	POINTHOR	523837.4	5050409
		TK10403	SO3	POINTHOR	523830.4	5050407
		TK10404	SO4	POINTHOR	523835.2	5050404
		TK10405	GP1	POINTHOR	523834.9	5050416
		TK10406	GP2	POINTHOR	523839.7	5050413
		UO1	UO1	POINTHOR	523823.4	5050417
		UO2	UO2	POINTHOR	523827.5	5050415
		UO3	UO3	POINTHOR	523821.1	5050412
		UO4	UO4	POINTHOR	523825.3	5050410
		UO5	UO5	POINTHOR	523818.8	5050408
		UO6	UO6	POINTHOR	523823	5050406
		MDO1	MDO1	POINTHOR	523865.7	5050397
FUG-1	Fugitive Equipment Leaks	FRONT	FRONT	AREA	523883.2	5050395
		JAIL	JAIL	AREA	523852.2	5050411
		BO	BO	AREA	523833.3	5050418
		UO	UO	AREA	523821.6	5050419
		IT	IT	AREA	523805.4	5050423
		REF	REF	AREA	523826.7	5050391
	LDAR Derived Fugitive	LDARREF	REF	AREA	523826.7	5050391
		SULF	SULF	AREA	523809.3	5050378
	LDAR Derived Fugitive	LDARLPSSULF	SULF	AREA	523809.3	5050378
		LPS1	LPS1	AREA	523780.1	5050387
		LPS2	LPS2	AREA	523795.5	5050378
TLOAD1	Trunk loading	TLOAD1	TLOAD	VOLUME	523888	5050376

Regenerative Thermal Oxidizer (TO-01)

The Regenerative Thermal Oxidizer (RTO) is a natural gas fired VOC abatement system with an air flowrate capacity of approximately 6,400 acfm. As shown in Figure 2-1, the RTO controls emissions from the Re-refinery, Sulfonation and OPS processes. The RTO uses natural gas as a supplemental fuel to oxidize the three process vapor streams. The RTO was source tested in January 2020 for metals and in January 2022 for toxic gaseous compounds including PCBs, PAHs, furans and dioxins. The RTO will be modeled as a point source, with stack parameters based on recent source tests.

Carbon Back-Up Systems (RCARBON)

The ELR Refinery includes a carbon adsorption back-up system that is used periodically to provide short term control of emissions in lieu of the RTO. In order to determine potential emissions of TACs during use of the Refinery carbon back-up system, vapor stream analytical results from a similar refinery designed by the same manufacturer as the ELR refinery was used and it was conservatively assumed the back-up system was used one time per week for a one-hour duration. The carbon system is assumed to have a 90 percent control efficiency. The RCARBON source will be assumed to exhaust warm (140 F) through a 2-inch diameter vent at an exhaust rate of 57 acfm (13.5 m/s), which is the Refinery Vac System Flow Rate. This source will be modeled as a capped point source.

Uncontrolled Tanks (TANKS)

Tank TAC emissions are based on EPA's AP-42 Compilation of Air Emission Factors Chapter 7.1 Organic Liquid Storage Tanks and speciation factors determined from the compositional analysis. These tanks have a goose neck vent that exhaust above the top of the tank, thus the release height was set to 3 feet above the height of the tank. A tank parameterization from Santa Barbara Air District will be used in which the release temperature is set to ambient (0 K), the exit velocity to 0.001 m/s and the diameters to 0.001 m. This eliminates stack tip downwash while maintain the overall downwash effects. These sources will be modeled as a horizonal release as there is little to no momentum from the exhaust to propel the exhaust downward.

Controlled Tanks (TANKS_CONTROLLED)

Five tanks (AF1, IT100-2, PF2, TK30 and WLE1) have vents that are exhausted to a carbon adsorption abatement system venting at a single point. The carbon system is assumed to have a 90 percent control efficiency. Since this is a low volume source, the release temperature will be set to ambient (0 K), with a nominally small exit velocity of 0.001 m/s and a diameter of 0.001 m. This source will be modeled as a horizonal release at the heigh of the opening as there is little to no momentum from the exhaust.

Truck Loading (TLOAD1)

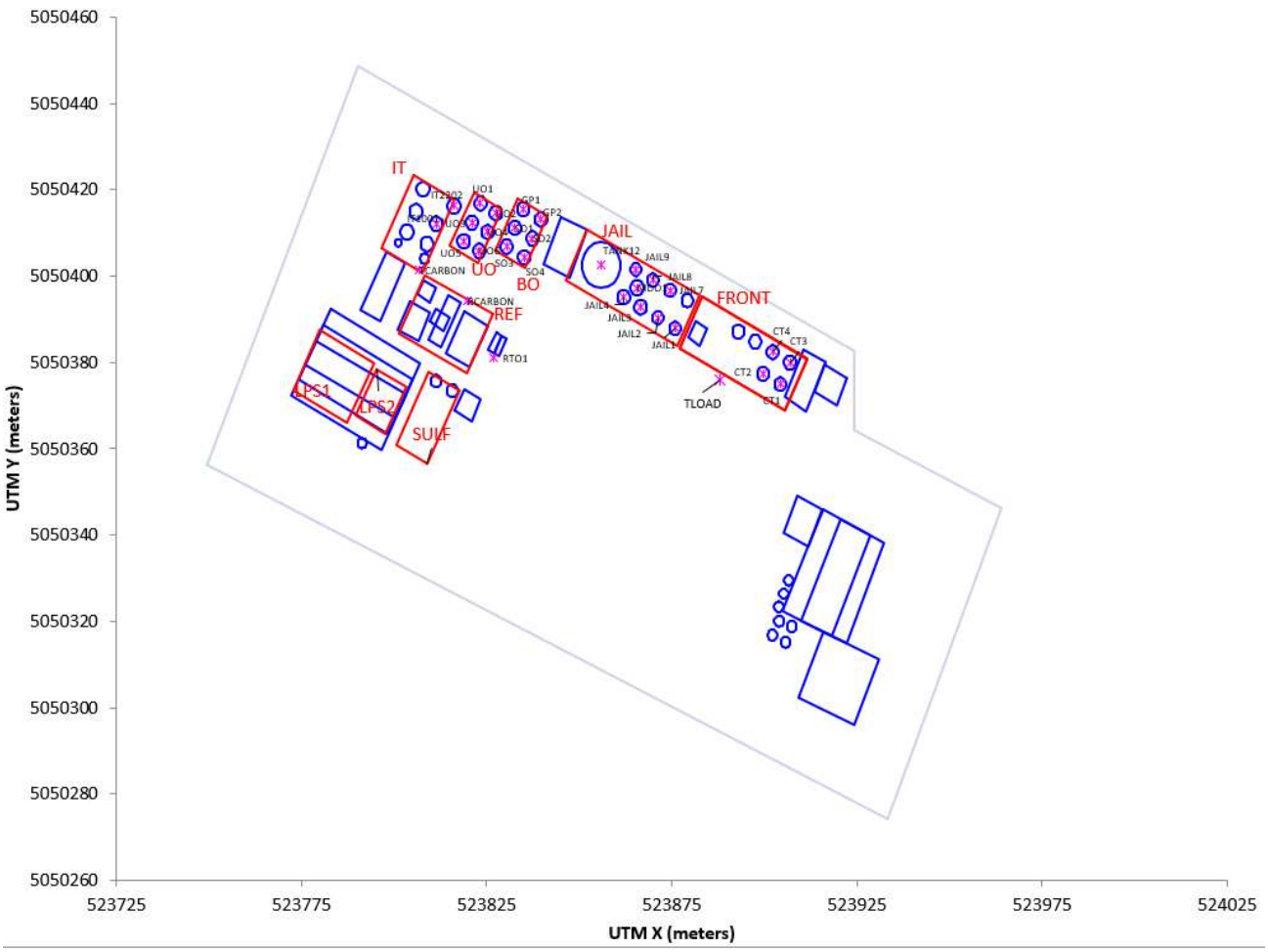
Various products at the ELR facility leave the site via trucks. During truck loading, vapors are displaced from the tank truck compartments resulting in air emissions. VOC emissions were first determined using EPA's AP-42 Compilation of Air Emission Factors Section 5.2, Equation 1 and then the speciation factors determined from the compositional analysis were used to calculate annual and daily emission rates of TACs. This source will be modeled as a volume source based on the dimensions of the truck and loading structure. The release height will be

set to ½ of the structure height (14 feet). The lateral dispersion parameter (Sy) will be set to average of the structure length and width (16.4 m) divided by 4.3 and the vertical dispersion parameter (Sz) will be set to the structure height divided by 4.3 as per AERMOD guidance.

Fugitive Equipment Leaks (FUG-1)

Equipment leak fugitive emissions from the ELR facility have the potential to include emissions from piping components such as valves, connectors, flanges or pumps. ELR has prepared an equipment inventory to generate a conservative estimate of the total number of components that have the potential to be fugitive equipment leak sources. The inventory includes liquid service components and vapor service components. The vapor service components are part of ELR's leak detection and repair (LDAR) program. As described in the EI, groupings of equipment components were established to ultimately model the emissions as an area source.

Figure 2-2: Site Layout Drawing



Buildings/tanks are blue, fugitive areas are red, points & volume source with magenta marker.

Table 2-2: Source Parameters

ID	TYPE	Height (m)	Temp (K)	Vel (m/s)	Diameter (m)
RTO1	POINT	7.9	585.9	16.4	0.5
TCARBON	POINTHOR	6.7	0	0.001	0.001
RCARBON	POINTCAP	7.6	333.2	13.3	0.1
JAIL1	POINTHOR	11.6	0	0.001	0.001
JAIL2	POINTHOR	11.6	0	0.001	0.001
JAIL3	POINTHOR	11.6	0	0.001	0.001
JAIL4	POINTHOR	11.6	0	0.001	0.001
JAIL7	POINTHOR	11.6	0	0.001	0.001
JAIL8	POINTHOR	11.6	0	0.001	0.001
JAIL9	POINTHOR	11.6	0	0.001	0.001
CT1	POINTHOR	10.1	0	0.001	0.001
CT2	POINTHOR	10.1	0	0.001	0.001
CT3	POINTHOR	9.8	0	0.001	0.001
CT4	POINTHOR	10.7	0	0.001	0.001
TANK12	POINTHOR	9.8	0	0.001	0.001
IT1001	POINTHOR	10.7	0	0.001	0.001
IT2202	POINTHOR	10.7	0	0.001	0.001
SO1	POINTHOR	11.6	0	0.001	0.001
SO2	POINTHOR	11.6	0	0.001	0.001
SO3	POINTHOR	11.6	0	0.001	0.001
SO4	POINTHOR	11.6	0	0.001	0.001
GP1	POINTHOR	11.6	0	0.001	0.001
GP2	POINTHOR	11.6	0	0.001	0.001
UO1	POINTHOR	9.9	0	0.001	0.001
UO2	POINTHOR	9.9	0	0.001	0.001
UO3	POINTHOR	9.9	0	0.001	0.001
UO4	POINTHOR	9.9	0	0.001	0.001
UO5	POINTHOR	9.9	0	0.001	0.001
UO6	POINTHOR	9.9	0	0.001	0.001
MDO1	POINTHOR	11.6	0	0.001	0.001
Volume		**Hgt (m)**	**Sy(m)**	**Sz(m)**	
TLOAD	VOLUME	2.1	3.80	0.992	
AREA		**Hgt(m)**	**Area (sq m)**	**Sz(m)**	
FRONT	AREAPOLY	3.0	427.8	1.42	
JAIL	AREAPOLY	3.0	439.4	1.42	
BO	AREAPOLY	3.0	124.2	1.42	
UO	AREAPOLY	3.0	118.5	1.42	
IT	AREAPOLY	3.0	236.0	1.42	
REF	AREAPOLY	3.0	314.2	1.42	
SULF	AREAPOLY	3.0	178.1	1.42	
LPS1	AREAPOLY	3.0	256.0	1.42	
LPS2	AREAPOLY	3.0	106.3	1.42	

2.3 Compounds Emitted

Table 2-3 shows the toxics air pollutant emitted from the facility, along with the form of the pollutant (particulate or volatile gas), whether the pollutant has an early-life (EL) or multipath way (MP) adjustment made to its RBCs. The table also indicates whether the acute TBACT TAL is 3 or 5.

Table 2-3: Compounds Emitted

CAS	Compound	Type	EL,MP Adj.	TBACT RAL
Compounds with RBCs				
106-99-0	1,3-Butadiene	Volatile	--	HI3
78-93-3	2-Butanone (methyl ethyl ketone)	Volatile	--	HI3
75-07-0	Acetaldehyde	Volatile	--	HI3
67-64-1	Acetone	Volatile	--	HI3
107-02-8	Acrolein	Volatile	--	HI5
7664-41-7	Ammonia	Volatile	--	HI3
7440-36-0	Antimony and compounds	Particulate	--	HI3
7440-38-2	Arsenic and compounds	Particulate	Yes	HI3
56-55-3	Benz[a]anthracene	Volatile	--	--
71-43-2	Benzene	Volatile	--	HI3
50-32-8	Benzo[a]pyrene	Volatile	Yes	HI3
205-99-2	Benzo[b]fluoranthene	Volatile	--	--
191-24-2	Benzo[g,h,i]perylene	Volatile	--	--
207-08-9	Benzo[k]fluoranthene	Volatile	--	--
7440-41-7	Beryllium and compounds	Particulate	--	HI3
7440-43-9	Cadmium and compounds	Particulate	Yes	HI3
75-15-0	Carbon disulfide	Volatile	--	HI3
463-58-1	Carbonyl sulfide	Volatile	--	HI3
75-00-3	Chloroethane (ethyl chloride)	Volatile	--	HI3
67-66-3	Chloroform	Volatile	--	HI3
18540-29-9	Chromium VI, chromate and dichromate particulate	Volatile	Yes	HI3
218-01-9	Chrysene	Volatile	--	--
7440-48-4	Cobalt and compounds	Particulate	--	HI3
7440-50-8	Copper and compounds	Particulate	--	HI3
1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p-cresol	Volatile	--	HI3
100-41-4	Ethyl benzene	Volatile	--	HI3
206-44-0	Fluoranthene	Volatile	--	--
50-00-0	Formaldehyde	Volatile	--	HI3
110-54-3	Hexane	Volatile	--	HI3
7647-01-0	Hydrochloric acid	Volatile	--	HI3
7783-06-4	Hydrogen sulfide	Volatile	--	HI3
98-82-8	Isopropylbenzene (cumene)	Volatile	--	HI3
7439-92-1	Lead and compounds	Particulate	Yes	HI3

CAS	Compound	Type	EL,MP Adj.	TBACT RAL
7439-96-5	Manganese and compounds	Particulate	--	HI3
7439-97-6	Mercury and compounds	Particulate	Yes	HI3
91-20-3	Naphthalene	Volatile	--	HI3
C365	Nickel compounds, insoluble	Particulate	--	HI3
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	Volatile	--	HI3
3268-87-9	Octachlorodibenzo-p-dioxin (OCDD)	Volatile	--	HI3
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran (TcDF)	Volatile	--	HI3
1336-36-3	Polychlorinated biphenyls (PCBs)	Volatile	Yes	--
32598-14-4	PCB 105 [2,3,3',4,4'-pentachlorobiphenyl]	Volatile	--	HI3
31508-00-6	PCB 118 [2,3',4,4',5-pentachlorobiphenyl]	Volatile	--	HI3
65510-44-3	PCB 123 [2,3',4,4',5'-pentachlorobiphenyl]	Volatile	--	HI3
38380-08-4	PCB 156 [2,3,3',4,4',5-hexachlorobiphenyl]	Volatile	--	HI3
52663-72-6	PCB 167 [2,3',4,4',5,5'-hexachlorobiphenyl]	Volatile	--	HI3
32774-16-6	PCB 169 [3,3',4,4',5,5'-hexachlorobiphenyl]	Volatile	--	HI3
32598-13-3	PCB 77 [3,3',4,4'-tetrachlorobiphenyl]	Volatile	--	HI3
70362-50-4	PCB 81 [3,4,4',5-tetrachlorobiphenyl]	Volatile	--	HI3
108-95-2	Phenol	Volatile	--	HI3
115-07-1	Propylene	Volatile	--	HI5
7782-49-2	Selenium and compounds	Particulate	--	HI3
108-88-3	Toluene	Volatile	--	HI3
1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p-xylene	Volatile	--	HI3
Compounds without RBCs				
91-58-7	2-Chloronaphthalene	Volatile	--	--
91-57-6	2-Methyl naphthalene	Volatile	--	--
83-32-9	Acenaphthene	Volatile	--	--
208-96-8	Acenaphthylene	Volatile	--	--
120-12-7	Anthracene	Volatile	--	--
7440-39-3	Barium and compounds	Particulate	--	--
192-97-2	Benzo[e]pyrene	Volatile	--	--
86-73-7	Fluorene	Volatile	--	--
37680-65-2	PCB 18 [2,2',5-trichlorobiphenyl]	Volatile	--	--
37680-73-2	PCB-101 [2,2',4,5,5'-pentachlorobiphenyl]	Volatile	--	--
38380-07-3	PCB-128 [2,2',3,3',4,4'-hexachlorobiphenyl]	Volatile	--	--
35065-28-2	PCB-138 [2,2',3,4,4',5'-hexachlorobiphenyl]	Volatile	--	--
35065-27-1	PCB-153 [2,2',4,4',5,5'-hexachlorobiphenyl]	Volatile	--	--
35065-30-6	PCB-170 [2,2',3,3',4,4',5-heptachlorobiphenyl]	Volatile	--	--
35065-29-3	PCB-180 [2,2',3,4,4',5,5'-heptachlorobiphenyl]	Volatile	--	--
52663-68-0	PCB-187 [2,2',3,4',5,5',6-heptachlorobiphenyl]	Volatile	--	--
7012-37-5	PCB-28 [2,4,4'-trichlorobiphenyl]	Volatile	--	--
41464-39-5	PCB-44 [2,2',3,5'-tetrachlorobiphenyl]	Volatile	--	--
35693-99-3	PCB-52 [2,2',5,5'-tetrachlorobiphenyl]	Volatile	--	--
32598-10-0	PCB-66 [2,3',4,4'-tetrachlorobiphenyl]	Volatile	--	--
34883-43-7	PCB-8 [2,4'-dichlorobiphenyl]	Volatile	--	--

CAS	Compound	Type	EL,MP Adj.	TBACT RAL
85-01-8	Phenanthrene	Volatile	--	--
7723-14-0	Phosphorus and compounds	Particulate	--	--
129-00-0	Pyrene	Volatile	--	--
7440-22-4	Silver and compounds	Particulate	--	--
7446-11-9	Sulfur trioxide	Volatile/Particulate	--	--
7440-28-0	Thallium and compounds	Particulate	--	--
7440-66-6	Zinc and compounds	Particulate	--	--

2.4 Land Use Characteristics

For initially defining exposure locations, a shapefile of the 2017 Oregon Zoning data from the Oregon Department of Land Conservation and Development was used. This data layer is an element of the Oregon GIS Framework and is available through the Oregon Spatial Data Library[1]. This feature class contains zoning data from 198 local jurisdictions, including the City of Portland and Multnomah County. The data set has 55 zoning classifications, which are binned into three categories: residential, worker (industrial/commercial), and open space. In addition, a City of Portland zoning land use layer from Metro Portland Metro RLIS Discovery will be used to supplement the statewide layer in Oregon. Washington Department of Ecology State Land Use zoning data will be used for Washington State. A crosswalk between the categories and the bins is shown in Table 2-4. The residential bin includes any category designating a residence. For example, mixed use commercial and residential areas and tribal reservation lands are defined as residential. The open space category includes parks, forests, beaches, public lands, and agricultural areas. Open space receptors will be evaluated for acute risk only. Roadway receptors will be excluded. Several areas along the slough have house boats on them. These areas were manually identified as residential.

Figure 2-3 shows the zoning around the facility. The facility is in an area zoned for industrial/commercial use and has commercial use on three sides of its property. Based on the land use, the closest residences are 360 meters north of the facility.

[1] https://spatialdata.oregonexplorer.info/geoportal/

Figure 2-3: Land Use Around ELR

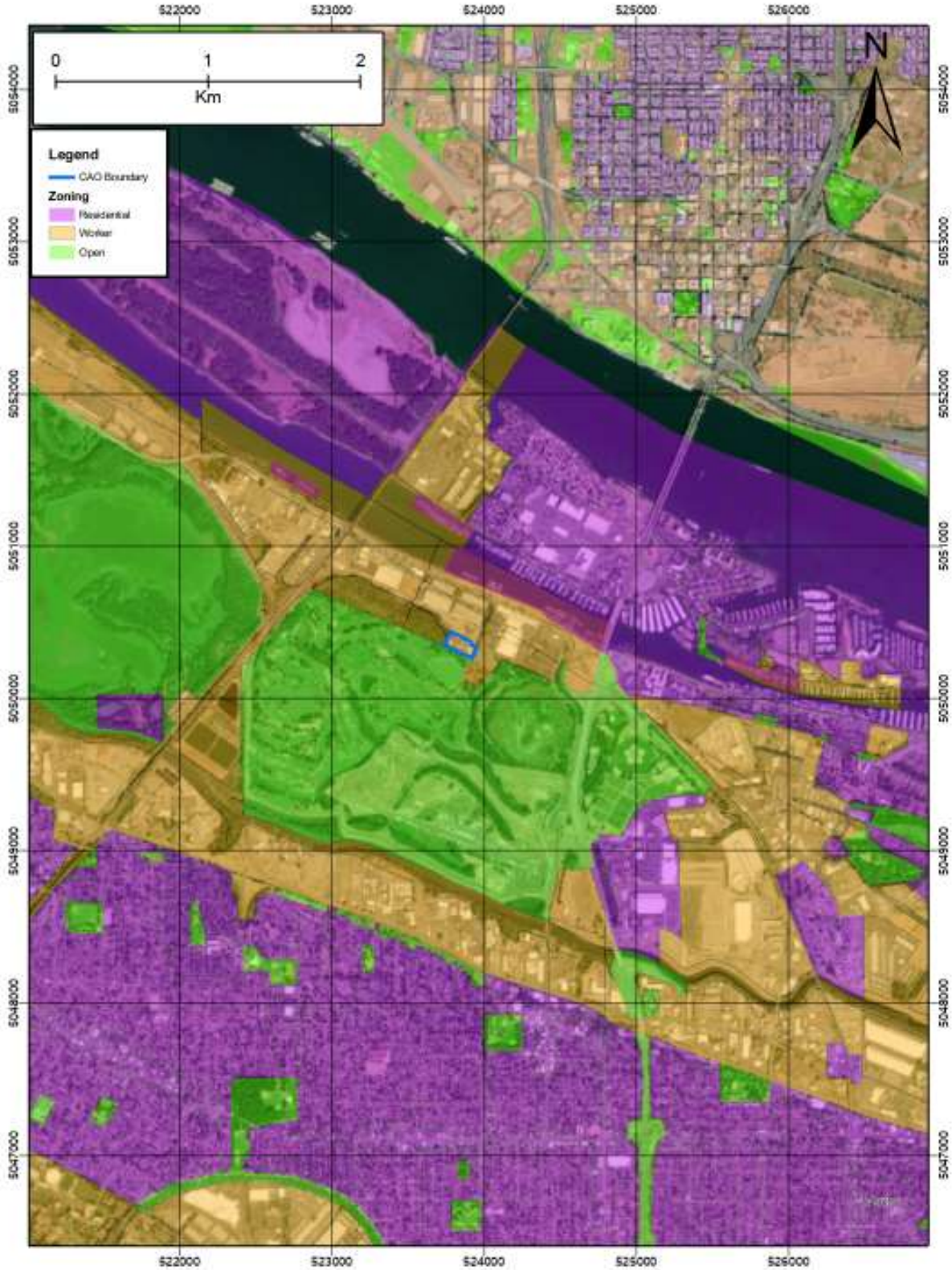


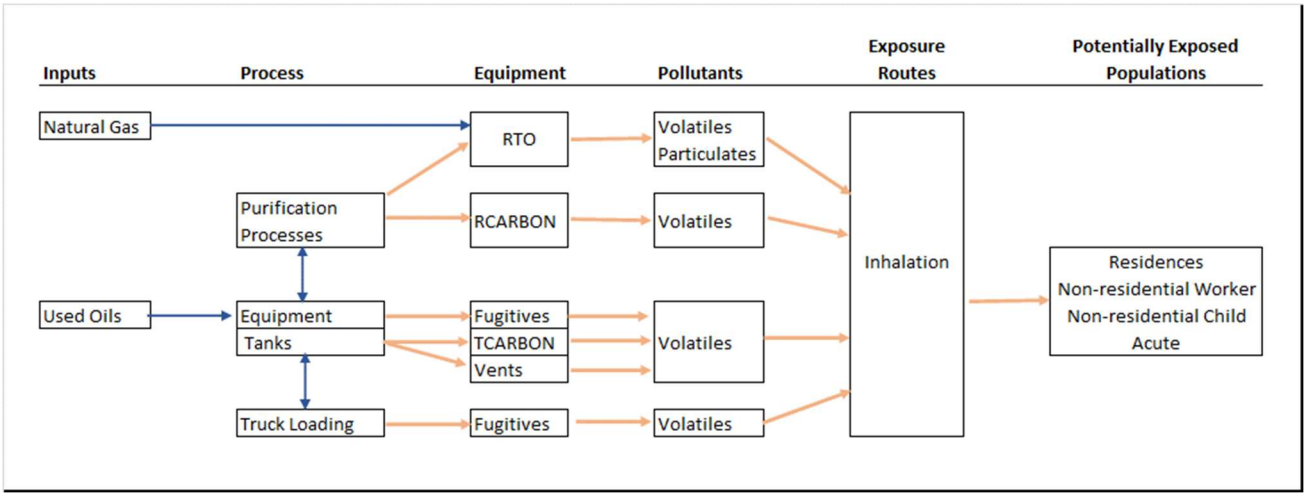
Table 2-4: Land Use Crosswalk

LU Code	Description	CAO code	LU Code	Description	CAO code
BD	Beaches and Dunes	Open	MFL10	Marginal Farm Land 10+	Open
CC	Commercial - Central	Worker	MHDR	Medium High-density Res.	RES
CE	Coastal Estuarine	Open	MLDR	Medium Low-density Res.	RES
CEE	Combo equal emphasis	Worker	MUREH	Mixed-Use Com. & Res. Extremely High	RES
CG	Commercial - General	Worker	MURH	Mixed-Use Com. & Res. High	RES
CN	Commercial - Neighborhood	Worker	MURL	Mixed-Use Com. & Res. Low	RES
CO	Commercial - Office	Worker	MURM	Mixed-Use Com. & Res. Medium	RES
CPE	Combo with priority emphasis	Worker	MURMH	Mixed-Use Com. & Res. Med-high	RES
CS	Coastal Shorelands	Open	MURVH	Mixed-Use Com. & Res. V.High	RES
EFU160	Exclusive Farm Use 160+	Open	ND	No Data	Open
EFU20	Exclusive Farm Use 20+	Open	O	Other	Open
EFU40	Exclusive Farm Use 40+	Open	OSC	Open Space/Conservation	Open
EFU80	Exclusive Farm Use 80	Open	PF	Public & semi-public Uses	Worker
FF160	Mixed Farm-Forest 160+	Open	PF80	Prime Forest 80	Open
FF20	Mixed Farm-Forest 20	Open	POS	Parks & Open Space	Open
FF40	Mixed Farm-Forest 40	Open	RC	Rural Commercial	Worker
FF80	Mixed Farm-Forest 80	Open	RI	Rural Industrial	Worker
FOR	Federal Forest	Open	RNG	Federal Range	Open
FUD	Future Urban Development	Open	RR1	Rural Residential 1 acre	RES
HDR	High-density Res.	RES	RR10	Rural Residential 10 acres	RES
IC	Industrial Campus	Worker	RR2	Rural Residential 2-4 acres	RES
IH	Industrial - Heavy	Worker	RR5	Rural Residential 5 acres	RES
IL	Industrial - Light	Worker	SF80	Secondary Forest 80	Open
IO	Industrial Office	Worker	UCRC	UC Rural Commercial	Worker
IRM	Indian reservation/tribal trust	RES	UCRI	UC Rural Industrial	Worker
LDR	Low-density Res.	RES	VHDR	Very High-density Res.	RES
MA	Mineral and Aggregate	Worker	VLDR	Very Low-density Res.	RES
MDR	Medium-density Res.	RES			

2.5 Conceptual Site Model Diagram

Figure 2-4 shows the conceptual site model for the CAO process. Only the inhalation pathway is considered in this evaluation.

Figure 2-4: CAO Conceptual Site Model



3.0 Level-3 Modeling Protocol

This section presents the Level-3 modeling protocol and is intended to outline the assumptions and methodologies that will be used in the air quality analysis to calculate 24-hour and annual risk values for each emission point for use in the Risk Assessment Work Plan (Section 4).

All coordinates are in Universal Transverse Mercator (UTM) NAD 83 Zone 10.

3.1 Model Selection

For this evaluation, AERMOD (AMS [American Meteorological Society]/EPA [Environmental Protection Agency] Regulatory Model) will be used, which follows the procedure requirements as specified in 40 CFR Part 51, Appendix W, "Guidelines on Air Quality Models (Revised)". AERMOD incorporates air dispersion for both surface and elevated sources, and accounts for differing terrain (i.e., simple and/or complex). AERMOD includes three components: a meteorological data preprocessor, AERMET; a terrain data preprocessor, AERMAP; and the air dispersion model, AERMOD. The dispersion model will be performed using the following versions:

- AERMOD: 22112
- AERMET: 22112
- AERMINUTE: 15272
- AERMAP: 18081
- AERSURFACE: 20060
- BPIP: 04274

AERMOD modeling will be performed using regulatory default options, which include stack tip downwash, buoyancy-induced dispersion, upper-bound downwash concentrations, default wind speed profile exponents and vertical potential temperature gradients, and a routine for processing concentration averages during calm winds and when there are missing meteorological data. The effects from local terrain will also be incorporated.

3.2 Land Use Determination

AERMOD allows for the choice of rural or urban dispersion conditions around the source location, which depends upon the land use characteristics within 3 kilometers of the facility (as per Appendix W to 40 CFR Part 51, section 7.2.1.1). Following Auer (1977), if the land use is industrial, commercial, or developed residential, then these areas are designated as urban. All other types of land use are considered rural. The most objective approach is to use the 2016 NLCD land cover classification data (the same data set as used in AERSURFACE) and designate the "Developed Intensity" areas (IDs 22, 23 & 24) as urban based on Auer's classification. These classes are:

- Developed, Low Intensity (NLDC Code 22) - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 to 49 percent of total cover. These areas most commonly include single-family housing units.
- Developed, Medium Intensity (NLCD Code 23) – This classification includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 to 79 percent of the total cover.
- Developed, High Intensity (NLCD Code 24) – This classification includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.

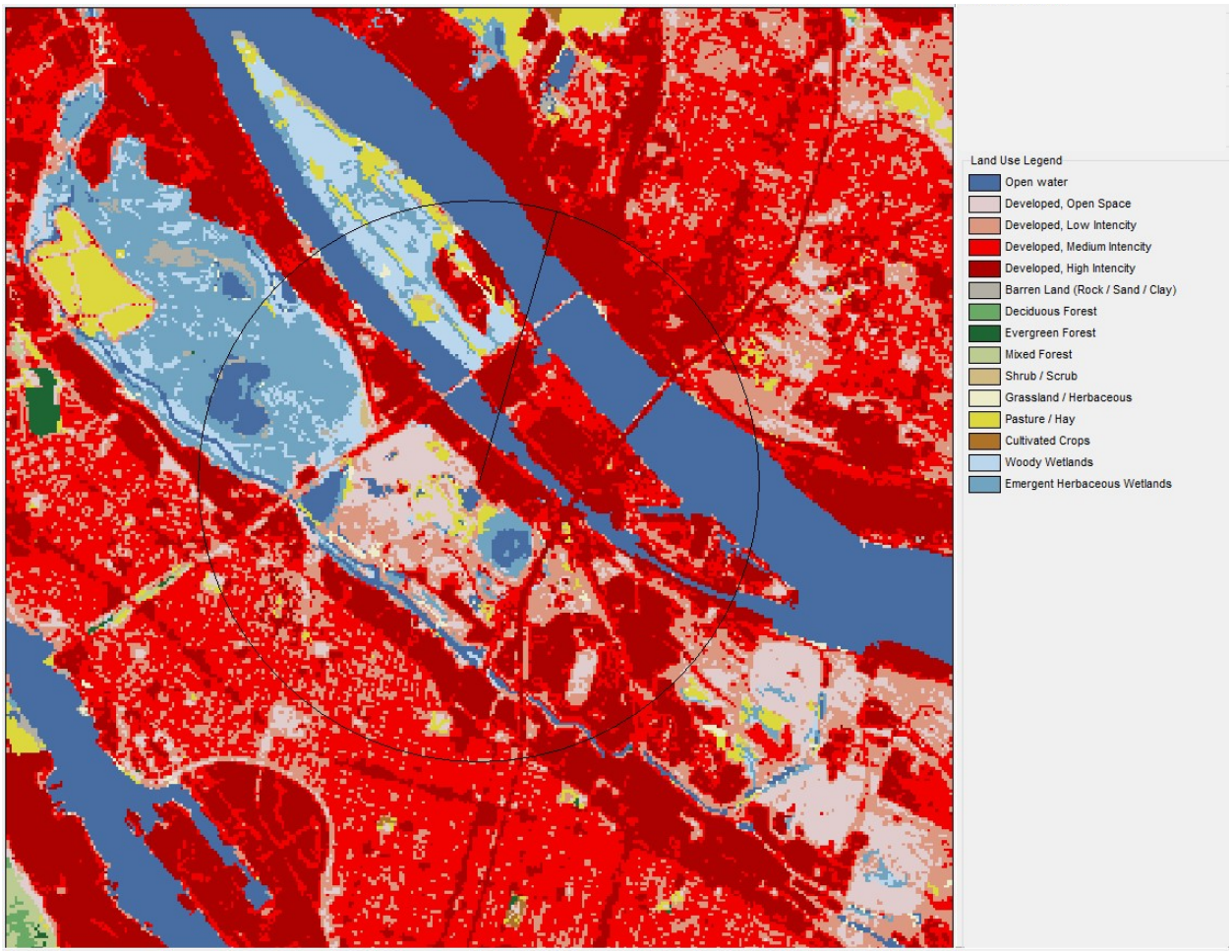
Table 3-1 shows the land use determination around the Ecolube sites. Because the area within 3 km is more than 50 percent classified as urban land use, the URBAN option will be used for AERMOD modeling of the Facility. Typically, the population value should be equal to the population of the counties contained within the modeling domain. The modeling domain includes receptors in Washington, Clark, and Multnomah counties. Using the latest U.S. Census Bureau estimates of population (2021), the total population for these three counties is 1.9 million; this population will be input to AERMOD for use in the urban modeling of the Facility.

Table 3-1: Land User Determination

Cat	Description	Type	Count	Percent
11	Open Water:	Rural	6197	20%
21	Developed, Open Space:	Rural	1764	6%
22	**Developed, Low Intensity:**	**Urban**	**4050**	**13%**
23	**Developed, Medium Intensity:**	**Urban**	**6150**	**20%**
24	**Developed, High Intensity:**	**Urban**	**8498**	**27%**
31	Barren Land (Rock/Sand/Clay):	Rural	91	0%
42	Evergreen Forest:	Rural	2	0%
52	Shrub/Scrub:	Rural	73	0%
71	Grasslands/Herbaceous:	Rural	158	1%
81	Pasture/Hay:	Rural	542	2%
82	Cultivated Crops:	Rural	2	0%
90	Woody Wetlands:	Rural	1519	5%
95	Emergent Herbaceous Wetland:	Rural	2369	8%
	Total:		31415	
	Rural			40%
	Urban			60%

Figure 3-1: Land use around the ELR Facility

The 3-kilometer evaluation circle is shown in black.



3.3 Meteorological Data

For this analysis, five-years (2017-2021) of hourly surface meteorological data from the National Weather Service (NWS) station at the Portland airport will be used. The station is located about 6.5 kilometers east of the project site. The station includes the one-minute data so it can be processed through AERMINUTE as per EPA suggestion. Upper air data from Salem Airport will be used. A five-year wind rose is shown in Figure 3-2.

The surface parameters (surface roughness, Bowen ratio, and noon-time albedo) will be determined using the most recent version of AERSURFACE. AERSURFACE will be run for average, wet, and dry conditions on a monthly basis, using 12 evenly spaced sectors. A 30-year moisture analysis for the Portland area will be conducted to determine the wetness condition for each year. If the yearly precipitation exceeded the 70th percentile, then the year will be defined as wet. If the yearly precipitation was less than the 30th percentile, then the year will be defined as dry. If the precipitation was between the 30th and 70th percentiles, it will be defined as average. The soil moisture conditions for the five years of meteorological data are shown in Table 3-2. Since albedo and Bowen ratio are area averages, all sectors will have the same values. Also, albedo and surface roughness are the same for all wetness conditions. For each modeled year, the appropriate monthly surface parameters will be then entered into the AERMET Stage 2 processing.

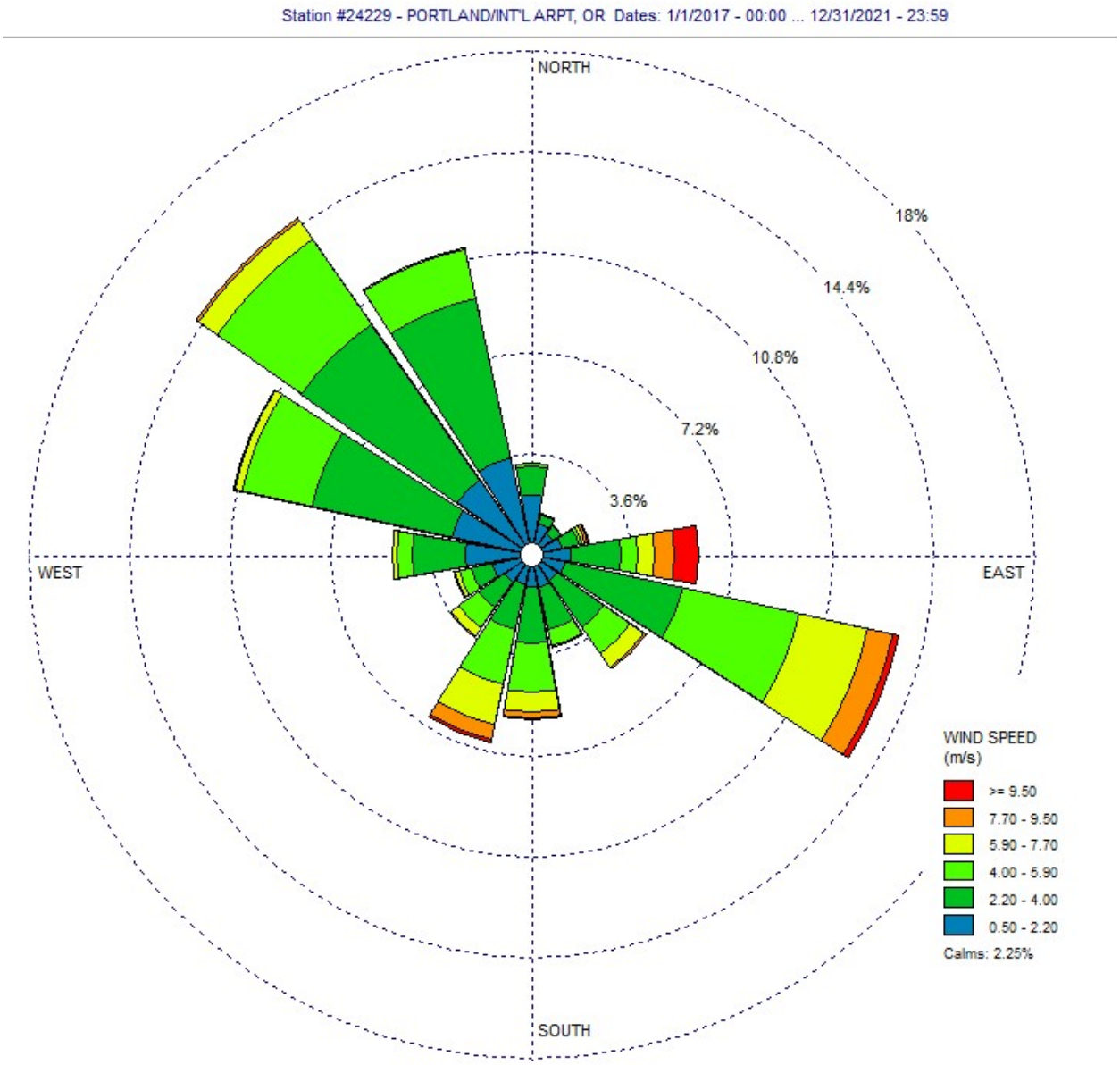
The months of December to February will be assumed as "winter", March to May will be assumed as "spring", June to August will be assumed as "summer", and September to November will be assumed as "autumn". The data will be processed using the AERMET program with the adjust U-star option selected.

Table 3-2: Surface Soil Moisture Condition Assessment

Percentile	Precipitation (in)	
30th	30.48	
70th	41.18	
Year	**Precipitation (in)**	**Soil Moisture Condition**
2017	45.80	wet
2018	27.30	dry
2019	26.67	dry
2020	32.44	average
2021	35.59	average

Historical 30-year record based on period from 1992 to 2021. (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?or6751)

Figure 3-2: Portland Airport Wind Rose



3.4 Receptor Grid and Exposure Locations

Under the Cleaner Air Oregon Rules, section 340-245-0020 (43) indicates that residential exposure locations are to be located "outside the boundary where people may reasonably be present for most hours of the day over a period of many year." Likewise, 340-245-0020 (36) indicates "nonresidential exposure location" means an exposure location outside the boundary of a source where people may reasonably be present for a few hours several days per week, possibly over a period of several years".

Where the property borders other commercial property, receptors on the property boundary will be evaluated. On the east side of the property, there is roadway and in such areas the public will not normally congregate. Thus, the receptor boundary for the CAO assessment will be expanded to exclude such areas.

Receptor elevations for AERMOD were determined using the AERMAP pre-processor. AERMAP uses United States Geological Survey (USGS) 1-degree and 7.5-minute Digital Elevation Model (DEM) files and a newer National Elevation Dataset (NED). AERMAP was run to generate the receptor elevations using the NED data. The dataset was downloaded using the Lakes Environmental AERMOD View program (version 10.0.0).

The following receptor grid spacing was used in the modeling analyses:

- 25-meter spacing along the CAO boundary,
- 25-meter spacing out to 200 m from the CAO boundary,
- 50-meter spacing out to 1.0 kilometers,
- 100-meter spacing out to 2.0 kilometers,
- 200-meter spacing out to 5.0 kilometers,
- 500-meter spacing out to 10.0 kilometers.

The land use classifications are applied to each receptor around the facility to define their exposure class. The receptors, identified by class, are shown in Figure 3-3 and 3-4. As describe above, receptors exposure classes are defined as residential, non-residential child (schools/daycares), non-residential worker (industrial/comm.), open space, and excluded. The excluded class applies to receptors where the risk is not calculated, for example, along roads or highways or along the facility property line or train tracks where people will likely not congregate. Chronic exposure is only applicable to residential, non-residential child, and non-residential worker classes. The acute exposure is applied to all classes except the excluded class.

The zoning dataset does not identify schools or daycares. Three sources were used to identify schools and daycares:

- Manual entries from Google search
- Oregon Child Care Centers ArcGIS Online database
- HIFLD Daycare ArcGIS Online database for OR & WA.

Each school or daycare was explicitly identified with a receptor assigned a daycare/school exposure class. There are 201 schools and daycares within 10 km of the facility with the closest

school/daycare 2.3 km south of the facility. The list of schools and daycares is provided in Appendix B.

Figure 3-3: Near Field Receptors

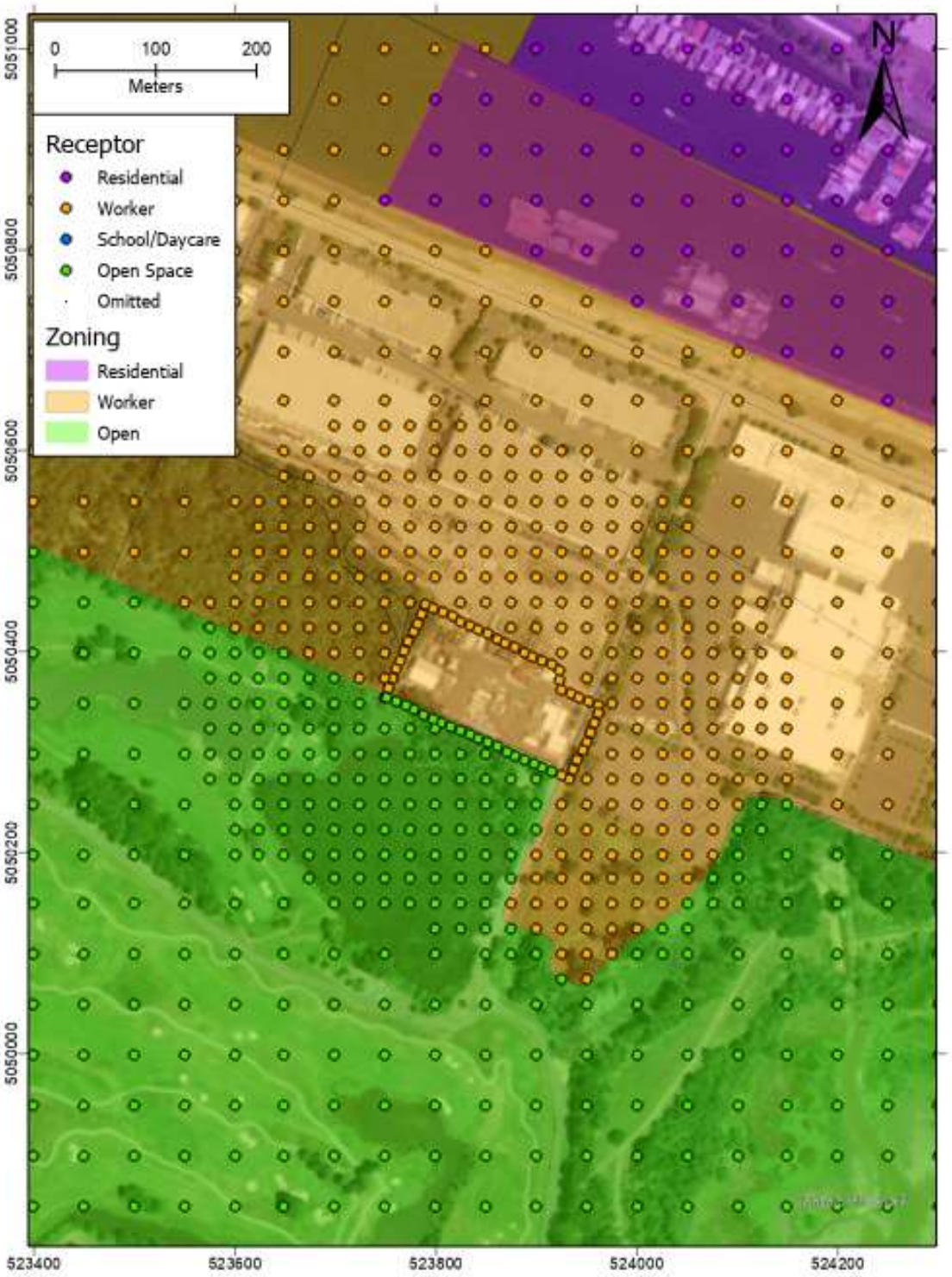
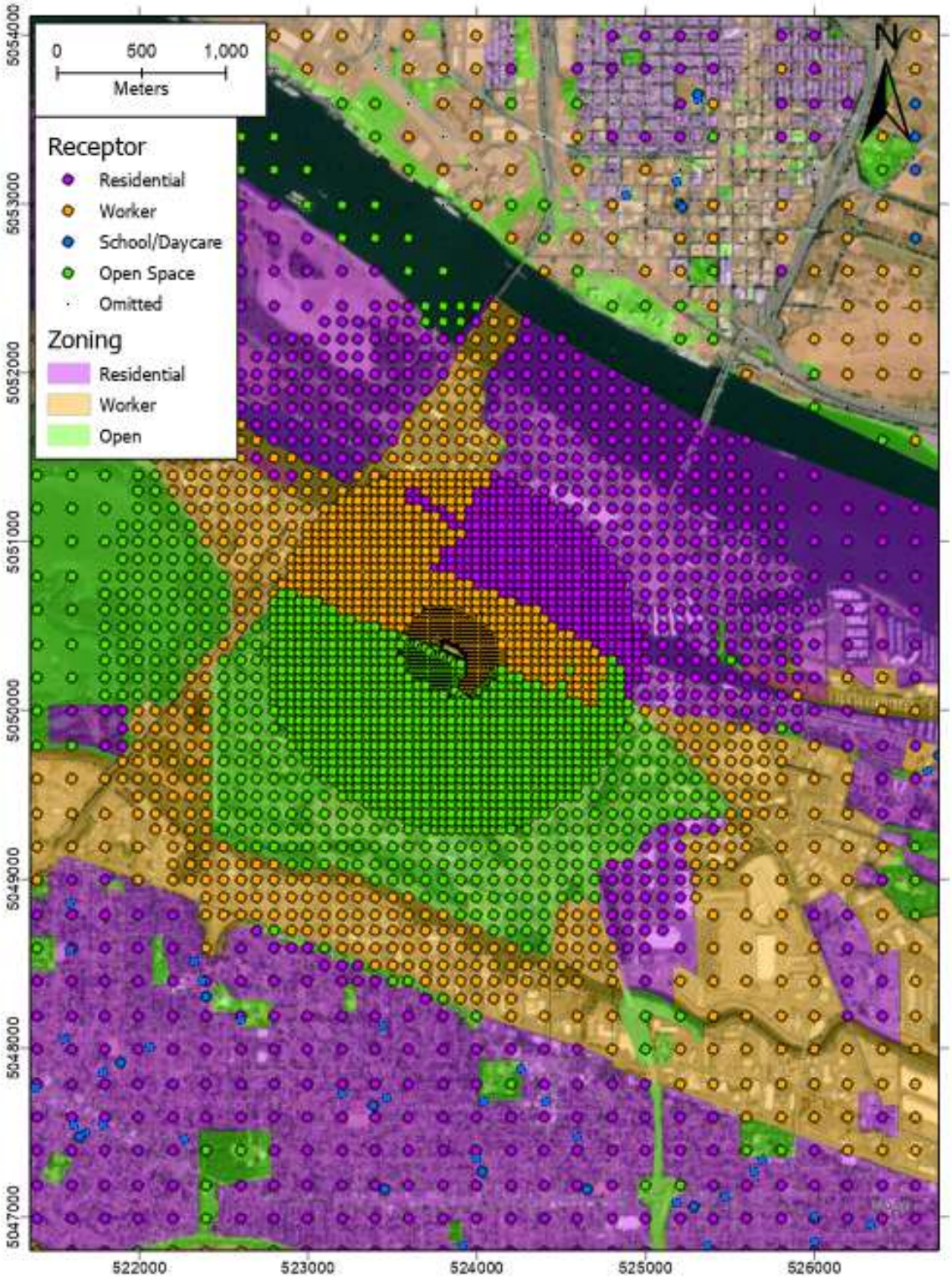


Figure 3-4: Far-Field Receptors



3.5 Model Execution

AERMOD will be run to model each emission point using a 1 g/s unit emission. Area source will be run with the unit emission rate divided by the source area (sq. meters). The outputs will be plot files of the maximum 24-hour concentrations and the 5-year average annual concentrations at each receptor for each emission point. These plot files then be used in the risk assessment as described in Section 4.0.

The air quality analysis submittal will consist of a report and electronic modeling files, which will include:

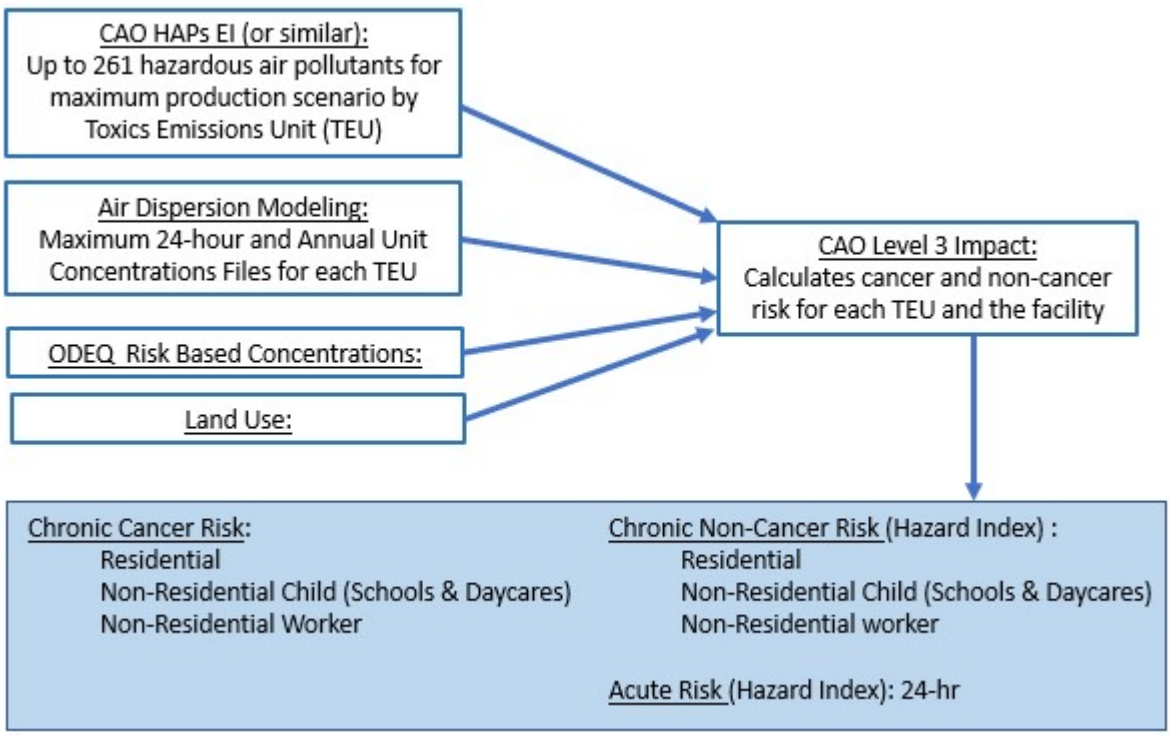
- AERMAP, BPIP, and AERMOD input and output files;
- AERSURFACE files;
- Downwash files including building heights and locations; and
- Meteorological data.

4.0 Risk Assessment Work Plan

4.1 Methodology

Figure 4-1 shows the Level-3 Risk Assessment process. Using the CAO air toxics emissions inventory, the 24-hr and annual average concentration files from the AERMOD runs, the Risk Based Concentrations, and the land use designations at each receptor, the chronic cancer, chronic non-cancer and acute hazard index risk will be found at every receptor.

Figure 4-1: Level-3 Refined Risk Assessment



Using the 24-hr and annual emission rates from CAO toxic air contaminant emissions inventory (Provided in Appendix A), the 24-hr and annual average concentration files from AERMOD runs, the RBCs, and the land use designations at each receptor, the chronic cancer, chronic non-cancer and acute hazard index risk will be found at every receptor. The risk at each receptor from source ($R_{r,s}$) is given by:

$$R_{r,s} = \chi_{r,s}\, C \sum_{p} \frac{E_s TO_{p,o}}{RBC_{p,L(r)}}$$

where $\chi_{r,g}$ is the unit concentration for source s at receptor r, C is a constant to convert g/s to either lbs/day or lbs/year, Q_p is the pollutant emission rate from the CAO emission inventory

(Appendix A), $TO_{p,o}$ is the target organ factor (0 or 1) for pollutant p and organ o, and $RBC_{p,L(r)}$ is the RBC for pollutant *p* and land use *L* at the receptor *r*. For non-cancer risk, different pollutants impact different parts of the body so the non-cancer risk is not additive. When applied, the target organ factor is set to 1 for pollutants that impacts a particular organ and zero otherwise. For cancer risk, TO is always 1. The target organ analysis will only be done if the non-cancer risk exceeds the Source Permit Level.

Each receptor will have three risk numbers for each source: chronic cancer risk, chronic non-cancer risk, and acute risk. For informational purposes, the chronic risk values will be grouped by exposure type (residential, non-residential child, and worker) from which the maximum risk will be determined. This results in seven risk levels being determined. The risk levels will be compared to the Risk Action Levels for existing sources (Table 4-2).

If the facility non-cancer risk exceeds the non-cancer Source Permit Level, then the Risk Determination Ratio (RDR) will be explicitly calculated. The RDR is the combined risk for HI3 chemicals/3 plus the combined risk for HI5 chemicals/5.

The risk calculations will be made in an Excel spreadsheet. The spreadsheet will have tabs for the RBCs, the target organ assignments, annual and 24-hr emissions, annual and 24-hr unit concentrations, receptors, seven risk evaluations, and a final summary. The spreadsheet will be provided as part of the submittal.

Table 4-1: Compound RBCs

		Chronic Cancer			Chronic Non-Cancer			Acute
		Res.	Child	Worker	Res.	Child	Worker	
CAS	Compound	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
75-07-0	Acetaldehyde	0.45	12	5.5	620	140	620	470
67-64-1	Acetone	--	--	--	140000	31000	140000	62000
107-02-8	Acrolein	--	--	--	1.5	0.35	1.5	6.9
7664-41-7	Ammonia	--	--	--	2200	500	2200	1200
7440-36-0	Antimony and compounds	--	--	--	1.3	0.3	1.3	1
7440-38-2	Arsenic and compounds	0.000024	0.0013	0.00062	0.0024	0.00017	0.0024	0.2
71-43-2	Benzene	0.13	3.3	1.5	13	3	13	29
7440-41-7	Beryllium and compounds	0.00042	0.011	0.005	0.031	0.007	0.031	0.02
106-99-0	1,3-Butadiene	0.033	0.86	0.4	8.8	2	8.8	660
78-93-3	2-Butanone (Methyl ethyl ketone)	--	--	--	22000	5000	22000	5000
7440-43-9	Cadmium and compounds	0.00056	0.014	0.0067	0.037	0.005	0.037	0.03
75-15-0	Carbon Disulfide	--	--	--	3500	800	3500	6200
463-58-1	Carbonyl Sulfide	--	--	--	44	10	44	660
75-00-3	Chloroethane (Ethyl chloride)	--	--	--	130000	30000	130000	40000
67-66-3	Chloroform	--	--	--	1300	300	1300	490
18540-29-9	Chromium VI, chromate, and dichromate particulate	0.000031	0.00052	0.001	0.88	0.083	0.88	0.3
7440-48-4	Cobalt and compounds	--	--	--	0.44	0.1	0.44	--
7440-50-8	Copper and compounds	--	--	--	--	--	--	100
1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p-cresol	--	--	--	2600	600	2600	--
100-41-4	Ethylbenzene	0.4	10	4.8	1100	260	1100	22000
100-41-4	Ethyl benzene	0.4	10	4.8	1100	260	1100	22000
50-00-0	Formaldehyde	0.17	4.3	2	40	9	40	49

		Chronic Cancer			Chronic Non-Cancer			Acute
		Res.	Child	Worker	Res.	Child	Worker	
CAS	Compound	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
110-54-3	Hexane	--	--	--	3100	700	3100	--
7647-01-0	Hydrochloric acid	--	--	--	88	20	88	2100
7783-06-4	Hydrogen Sulfide	--	--	--	8.8	2	8.8	98
98-82-8	Isopropylbenzene (Cumene)	--	--	--	1800	400	1800	--
7439-92-1	Lead and compounds	--	--	--	0.66	0.15	0.66	0.15
7439-96-5	Manganese and compounds	--	--	--	0.4	0.09	0.4	0.3
7439-97-6	Mercury and compounds	--	--	--	0.63	0.077	0.63	0.6
91-20-3	Naphthalene	0.029	0.76	0.35	16	3.7	16	200
C365	Nickel compounds, insoluble	0.0038	0.1	0.046	0.062	0.014	0.062	0.2
108-95-2	Phenol	--	--	--	880	200	880	5800
1336-36-3	Polychlorinated biphenyls (PCBs)	5.3E-04	2.0E-02	9.2E-03	--	--	--	--
32598-13-3	PCB 77 [3,3',4,4'-tetrachlorobiphenyl]	1.0E-05	9.0E-04	4.2E-04	0.26	0.0013	0.26	--
70362-50-4	PCB 81 [3,4,4',5-tetrachlorobiphenyl]	3.4E-06	3.0E-04	1.4E-04	0.085	0.00042	0.085	--
32598-14-4	PCB 105 [2,3,3',4,4'-pentachlorobiphenyl]	3.4E-05	3.0E-03	1.4E-03	0.85	0.0042	0.85	--
31508-00-6	PCB 118 [2,3',4,4',5-pentachlorobiphenyl]	3.4E-05	3.0E-03	1.4E-03	0.85	0.0042	0.85	--
65510-44-3	PCB 123 [2,3',4,4',5'-pentachlorobiphenyl]	3.4E-05	3.0E-03	1.4E-03	0.85	0.0042	0.85	--
38380-08-4	PCB 156 [2,3,3',4,4',5-hexachlorobiphenyl]	3.4E-05	3.0E-03	1.4E-03	0.85	0.0042	0.85	--
52663-72-6	PCB 167 [2,3',4,4',5,5'-hexachlorobiphenyl]	3.4E-05	3.0E-03	1.4E-03	0.85	0.0042	0.85	--
32774-16-6	PCB 169 [3,3',4,4',5,5'-hexachlorobiphenyl]	3.4E-08	3.0E-06	1.4E-06	8.5E-04	4.2E-06	8.5E-04	--
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.0E-07	9.0E-06	4.2E-06	2.6E-03	1.3E-05	2.6E-03	--
3268-87-9	Octachlorodibenzo-p-dioxin (OCDD)	3.4E-06	3.0E-04	1.4E-04	0.085	0.00042	0.085	--
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran (TcDF)	1.0E-08	9.0E-07	4.2E-07	0.00026	1.3E-06	0.00026	--
56-55-3	Benz[a]anthracene	2.1E-04	7.8E-03	1.5E-02	--	--	--	--
50-32-8	Benzo[a]pyrene	4.3E-05	1.6E-03	3.0E-03	0.0088	0.002	0.0088	0.002
205-99-2	Benzo[b]fluoranthene	5.3E-05	2.0E-03	3.8E-03	--	--	--	--
191-24-2	Benzo[g,h,i]perylene	0.0047	0.17	0.34	--	--	--	--
207-08-9	Benzo[k]fluoranthene	0.0014	0.052	0.1	--	--	--	--
218-01-9	Chrysene	0.00043	0.016	0.03	--	--	--	--
206-44-0	Fluoranthene	0.00053	0.02	0.038	--	--	--	--
115-07-1	Propylene	--	--	--	13000	3000	13000	--
7782-49-2	Selenium and compounds	--	--	--	--	--	--	2
108-88-3	Toluene	--	--	--	22000	5000	22000	7500
1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p-xylene	--	--	--	970	220	970	8700

Table 4-2: Existing Facility Risk Action Levels

	Existing Source	
	Cancer	Non-Cancer
Source Permit Level	5	0.5
Community Engagement Level	25	1
TBACT Level	50	3*/5** or RDR of 1
Risk Reduction Level	200	6*/10** or RDR of 2
Immediate Curtailment Level	500	12*/20** or RDR of 4

* For pollutant identified as HI3 in OAR 340-245-8010, Table 2.
** For pollutant identified as HI5 in OAR 340-245-8010, Table 2.
RDR: Risk Determination Ratio = (Combined Risk for HI3 chemicals / 3) + (Combined Risk for HI5 chemicals / 5)

4.2 Uncertainty Analysis

CAO rules require that a quantitative or qualitative uncertainty evaluation be included in a Level 3 risk assessment. The uncertainty in the various elements of the analysis will be described in the Risk Assessment report.

Appendix A: CAO EI Data

EMISSION LIST			lbs/day	lbs/yr
SRC	**CAS**	**POL**	**ST_ER**	**LT_ER**
RTO1	7440-36-0	Antimony and compounds	9.12E-05	3.33E-02
RTO1	7440-38-2	Arsenic and compounds	7.20E-04	2.63E-01
RTO1	7440-39-3	Barium and compounds	3.12E-04	1.14E-01
RTO1	7440-41-7	Beryllium and compounds	3.60E-06	1.31E-03
RTO1	7440-43-9	Cadmium and compounds	7.20E-06	2.63E-03
RTO1	18540-29-9	Chromium VI, chromate, and dichromate particu	3.84E-04	1.40E-01
RTO1	7440-48-4	Cobalt and compounds	1.49E-05	5.43E-03
RTO1	7440-50-8	Copper and compounds	1.99E-04	7.27E-02
RTO1	7439-92-1	Lead and compounds	5.04E-04	1.84E-01
RTO1	7439-96-5	Manganese and compounds	7.20E-04	2.63E-01
RTO1	7439-97-6	Mercury and compounds	4.08E-05	1.49E-02
RTO1	C365	Nickel compounds, insoluble	2.64E-04	9.64E-02
RTO1	7723-14-0	Phosphorus and compounds	1.71E+00	6.22E+02
RTO1	7782-49-2	Selenium and compounds	3.36E-04	1.23E-01
RTO1	7440-22-4	Silver and compounds	7.68E-05	2.80E-02
RTO1	7440-28-0	Thallium and compounds	1.80E-04	6.57E-02
RTO1	7440-66-6	Zinc and compounds	4.04E-03	1.48E+00
RTO1	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpC	3.70E-09	1.35E-06
RTO1	3268-87-9	Octachlorodibenzo-p-dioxin (OCDD)	8.78E-09	3.21E-06
RTO1	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran (TcDF)	1.75E-09	6.37E-07
RTO1	83-32-9	Acenaphthene	5.16E-05	1.88E-02
RTO1	208-96-8	Acenaphthylene	1.27E-04	4.65E-02
RTO1	120-12-7	Anthracene	7.01E-05	2.56E-02
RTO1	56-55-3	Benz[a]anthracene	3.65E-05	1.33E-02
RTO1	50-32-8	Benzo[a]pyrene	5.91E-07	2.16E-04
RTO1	205-99-2	Benzo[b]fluoranthene	1.81E-05	6.61E-03
RTO1	192-97-2	Benzo[e]pyrene	4.44E-06	1.62E-03
RTO1	191-24-2	Benzo[g,h,i]perylene	2.45E-06	8.94E-04
RTO1	207-08-9	Benzo[k]fluoranthene	3.53E-06	1.29E-03
RTO1	218-01-9	Chrysene	5.42E-05	1.98E-02
RTO1	206-44-0	Fluoranthene	1.59E-04	5.82E-02
RTO1	86-73-7	Fluorene	2.16E-04	7.88E-02
RTO1	91-57-6	2-Methyl naphthalene	5.14E-03	1.87E+00
RTO1	91-20-3	Naphthalene	6.72E-02	2.45E+01
RTO1	85-01-8	Phenanthrene	6.24E-04	2.28E-01
RTO1	129-00-0	Pyrene	1.06E-04	3.88E-02
RTO1	34883-43-7	PCB-8 [2,4'-dichlorobiphenyl]	2.88E-07	1.05E-04
RTO1	37680-65-2	PCB 18 [2,2',5-trichlorobiphenyl]	1.91E-07	6.96E-05
RTO1	7012-37-5	PCB-28 [2,4,4'-trichlorobiphenyl]	1.61E-07	5.88E-05
RTO1	41464-39-5	PCB-44 [2,2',3,5'-tetrachlorobiphenyl]	6.46E-08	2.36E-05
RTO1	35693-99-3	PCB-52 [2,2',5,5'-tetrachlorobiphenyl]	6.77E-08	2.47E-05
RTO1	32598-10-0	PCB-66 [2,3',4,4'-tetrachlorobiphenyl]	3.24E-08	1.18E-05
RTO1	32598-13-3	PCB 77 [3,3',4,4'-tetrachlorobiphenyl]	3.96E-09	1.45E-06
RTO1	70362-50-4	PCB 81 [3,4,4',5-tetrachlorobiphenyl]	3.40E-10	1.24E-07
RTO1	37680-73-2	PCB-101 [2,2',4,5,5'-pentachlorobiphenyl]	3.29E-08	1.20E-05
RTO1	32598-14-4	PCB 105 [2,3,3',4,4'-pentachlorobiphenyl]	7.82E-09	2.86E-06
RTO1	31508-00-6	PCB 118 [2,3',4,4',5-pentachlorobiphenyl]	1.99E-08	7.25E-06
RTO1	65510-44-3	PCB 123 [2,3',4,4',5'-pentachlorobiphenyl]	5.08E-10	1.85E-07
RTO1	38380-07-3	PCB-128 [2,2',3,3',4,4'-hexachlorobiphenyl]	1.64E-09	5.98E-07
RTO1	35065-28-2	PCB-138 [2,2',3,4,4',5'-hexachlorobiphenyl]	1.33E-08	4.84E-06
RTO1	35065-27-1	PCB-153 [2,2',4,4',5,5'-hexachlorobiphenyl]	1.20E-08	4.36E-06
RTO1	38380-08-4	PCB 156 [2,3,3',4,4',5-hexachlorobiphenyl]	1.10E-09	4.01E-07
RTO1	52663-72-6	PCB 167 [2,3',4,4',5,5'-hexachlorobiphenyl]	3.69E-10	1.35E-07
RTO1	32774-16-6	PCB 169 [3,3',4,4',5,5'-hexachlorobiphenyl]	8.54E-10	3.12E-07
RTO1	35065-30-6	PCB-170 [2,2',3,3',4,4',5-heptachlorobiphenyl]	1.33E-09	4.85E-07
RTO1	35065-29-3	PCB-180 [2,2',3,4,4',5,5'-heptachlorobiphenyl]	5.02E-09	1.83E-06
RTO1	52663-68-0	PCB-187 [2,2',3,4',5,5',6-heptachlorobiphenyl]	2.10E-09	7.68E-07
RTO1	1336-36-3	Polychlorinated biphenyls (PCBs)	2.95E-06	1.08E-03
RTO1	75-07-0	Acetaldehyde	3.38E-02	1.23E+01
RTO1	107-02-8	Acrolein	1.32E-03	4.82E-01

RTO1	71-43-2	Benzene	1.59E-01	5.79E+01
RTO1	106-99-0	1,3-Butadiene	4.10E-02	1.49E+01
RTO1	67-66-3	Chloroform	1.81E-02	6.61E+00
RTO1	91-58-7	2-Chloronaphthalene	2.46E-05	8.97E-03
RTO1	50-00-0	Formaldehyde	2.60E-01	9.50E+01
RTO1	115-07-1	Propylene	3.53E-02	1.29E+01
RTO1	108-88-3	Toluene	2.50E-01	9.14E+01
RTO1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.03E-01	3.77E+01
RTO1	7647-01-0	Hydrochloric acid	3.91E-01	1.43E+02
RTO1	100-41-4	Ethylbenzene	5.10E-02	1.86E+01
RTO1	7783-06-4	Hydrogen Sulfide	6.76E-01	2.47E+02
RTO1	108-95-2	Phenol	1.16E-02	4.24E+00
RTO1	7664-41-7	Ammonia	7.53E-02	2.75E+01
RTO1	110-54-3	Hexane	1.48E-04	5.41E-02
RTO1	7446-11-9	Sulfur Trioxide	1.29E+01	4.71E+03
TCARBON	91-57-6	2-Methyl naphthalene	0.000629	2.29E-01
TCARBON	91-20-3	Naphthalene	0.000365	1.33E-01
TCARBON	108-95-2	Phenol	7.67E-06	2.80E-03
TCARBON	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.86E-06	1.04E-03
TCARBON	71-43-2	Benzene	5.1E-05	1.86E-02
TCARBON	100-41-4	Ethyl benzene	0.000129	4.73E-02
TCARBON	98-82-8	Isopropylbenzene (Cumene)	2.68E-05	9.79E-03
TCARBON	108-88-3	Toluene	0.000459	1.68E-01
TCARBON	110-54-3	Hexane	7.58E-05	2.77E-02
TCARBON	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	0.000765	2.79E-01
TCARBON	7783-06-4	Hydrogen sulfide	3.74E-05	1.36E-02
RCARBON	75-15-0	Carbon Disulfide	2.21E-02	2.55E-01
RCARBON	463-58-1	Carbonyl Sulfide	1.92E-01	2.20E+00
RCARBON	7783-06-4	Hydrogen Sulfide	1.60E+00	1.84E+01
RCARBON	67-64-1	Acetone	1.42E-01	1.63E+00
RCARBON	71-43-2	Benzene	4.25E-02	4.89E-01
RCARBON	78-93-3	2-Butanone (Methyl ethyl ketone)	1.67E-02	1.92E-01
RCARBON	75-00-3	Chloroethane (Ethyl chloride)	5.24E-03	6.03E-02
RCARBON	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.39E-02	1.60E-01
JAIL1	91-57-6	2-Methyl naphthalene	4.89E-04	0.178571
JAIL1	91-20-3	Naphthalene	2.84E-04	0.103646
JAIL1	108-95-2	Phenol	5.97E-06	0.002179
JAIL1	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.22E-06	0.000812
JAIL1	71-43-2	Benzene	3.97E-05	0.014485
JAIL1	100-41-4	Ethyl benzene	1.01E-04	0.036776
JAIL1	98-82-8	Isopropylbenzene (Cumene)	2.09E-05	0.007617
JAIL1	108-88-3	Toluene	3.58E-04	0.130494
JAIL1	110-54-3	Hexane	5.90E-05	0.021541
JAIL1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	5.95E-04	0.217282
JAIL1	7783-06-4	Hydrogen sulfide	2.91E-05	0.010614
JAIL2	91-57-6	2-Methyl naphthalene	4.89E-04	0.178571
JAIL2	91-20-3	Naphthalene	2.84E-04	0.103646
JAIL2	108-95-2	Phenol	5.97E-06	0.002179
JAIL2	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.22E-06	0.000812
JAIL2	71-43-2	Benzene	3.97E-05	0.014485
JAIL2	100-41-4	Ethyl benzene	1.01E-04	0.036776
JAIL2	98-82-8	Isopropylbenzene (Cumene)	2.09E-05	0.007617
JAIL2	108-88-3	Toluene	3.58E-04	0.130494
JAIL2	110-54-3	Hexane	5.90E-05	0.021541
JAIL2	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	5.95E-04	0.217282
JAIL2	7783-06-4	Hydrogen sulfide	2.91E-05	0.010614
JAIL3	91-57-6	2-Methyl naphthalene	5.95E-04	0.217236
JAIL3	91-20-3	Naphthalene	3.45E-04	0.126088
JAIL3	108-95-2	Phenol	7.26E-06	0.002651
JAIL3	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.71E-06	0.000987
JAIL3	71-43-2	Benzene	4.83E-05	0.017622
JAIL3	100-41-4	Ethyl benzene	1.23E-04	0.044739

JAIL3	98-82-8	Isopropylbenzene (Cumene)	2.54E-05	0.009267
JAIL3	108-88-3	Toluene	4.35E-04	0.15875
JAIL3	110-54-3	Hexane	7.18E-05	0.026205
JAIL3	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	7.24E-04	0.26433
JAIL3	7783-06-4	Hydrogen sulfide	3.54E-05	0.012913
JAIL4	91-57-6	2-Methyl naphthalene	5.95E-04	0.217236
JAIL4	91-20-3	Naphthalene	3.45E-04	0.126088
JAIL4	108-95-2	Phenol	7.26E-06	0.002651
JAIL4	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.71E-06	0.000987
JAIL4	71-43-2	Benzene	4.83E-05	0.017622
JAIL4	100-41-4	Ethyl benzene	1.23E-04	0.044739
JAIL4	98-82-8	Isopropylbenzene (Cumene)	2.54E-05	0.009267
JAIL4	108-88-3	Toluene	4.35E-04	0.15875
JAIL4	110-54-3	Hexane	7.18E-05	0.026205
JAIL4	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	7.24E-04	0.26433
JAIL4	7783-06-4	Hydrogen sulfide	3.54E-05	0.012913
JAIL7	91-57-6	2-Methyl naphthalene	4.89E-04	0.178571
JAIL7	91-20-3	Naphthalene	2.84E-04	0.103646
JAIL7	108-95-2	Phenol	5.97E-06	0.002179
JAIL7	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.22E-06	0.000812
JAIL7	71-43-2	Benzene	3.97E-05	0.014485
JAIL7	100-41-4	Ethyl benzene	1.01E-04	0.036776
JAIL7	98-82-8	Isopropylbenzene (Cumene)	2.09E-05	0.007617
JAIL7	108-88-3	Toluene	3.58E-04	0.130494
JAIL7	110-54-3	Hexane	5.90E-05	0.021541
JAIL7	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	5.95E-04	0.217282
JAIL7	7783-06-4	Hydrogen sulfide	2.91E-05	0.010614
JAIL8	91-57-6	2-Methyl naphthalene	4.89E-04	0.178571
JAIL8	91-20-3	Naphthalene	2.84E-04	0.103646
JAIL8	108-95-2	Phenol	5.97E-06	0.002179
JAIL8	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.22E-06	0.000812
JAIL8	71-43-2	Benzene	3.97E-05	0.014485
JAIL8	100-41-4	Ethyl benzene	1.01E-04	0.036776
JAIL8	98-82-8	Isopropylbenzene (Cumene)	2.09E-05	0.007617
JAIL8	108-88-3	Toluene	3.58E-04	0.130494
JAIL8	110-54-3	Hexane	5.90E-05	0.021541
JAIL8	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	5.95E-04	0.217282
JAIL8	7783-06-4	Hydrogen sulfide	2.91E-05	0.010614
JAIL9	91-57-6	2-Methyl naphthalene	4.89E-04	0.178571
JAIL9	91-20-3	Naphthalene	2.84E-04	0.103646
JAIL9	108-95-2	Phenol	5.97E-06	0.002179
JAIL9	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.22E-06	0.000812
JAIL9	71-43-2	Benzene	3.97E-05	0.014485
JAIL9	100-41-4	Ethyl benzene	1.01E-04	0.036776
JAIL9	98-82-8	Isopropylbenzene (Cumene)	2.09E-05	0.007617
JAIL9	108-88-3	Toluene	3.58E-04	0.130494
JAIL9	110-54-3	Hexane	5.90E-05	0.021541
JAIL9	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	5.95E-04	0.217282
JAIL9	7783-06-4	Hydrogen sulfide	2.91E-05	0.010614
CT1	91-57-6	2-Methyl naphthalene	5.93E-04	0.216369
CT1	91-20-3	Naphthalene	3.44E-04	0.125585
CT1	108-95-2	Phenol	7.23E-06	0.00264
CT1	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.69E-06	0.000983
CT1	71-43-2	Benzene	4.81E-05	0.017552
CT1	100-41-4	Ethyl benzene	1.22E-04	0.04456
CT1	98-82-8	Isopropylbenzene (Cumene)	2.53E-05	0.00923
CT1	108-88-3	Toluene	4.33E-04	0.158116
CT1	110-54-3	Hexane	7.15E-05	0.0261
CT1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	7.21E-04	0.263274
CT1	7783-06-4	Hydrogen sulfide	3.52E-05	0.012861
CT2	91-57-6	2-Methyl naphthalene	5.93E-04	0.216369
CT2	91-20-3	Naphthalene	3.44E-04	0.125585

CT2	108-95-2	Phenol	7.23E-06	0.00264
CT2	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.69E-06	0.000983
CT2	71-43-2	Benzene	4.81E-05	0.017552
CT2	100-41-4	Ethyl benzene	1.22E-04	0.04456
CT2	98-82-8	Isopropylbenzene (Cumene)	2.53E-05	0.00923
CT2	108-88-3	Toluene	4.33E-04	0.158116
CT2	110-54-3	Hexane	7.15E-05	0.0261
CT2	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	7.21E-04	0.263274
CT2	7783-06-4	Hydrogen sulfide	3.52E-05	0.012861
CT3	91-57-6	2-Methyl naphthalene	6.38E-04	0.232759
CT3	91-20-3	Naphthalene	3.70E-04	0.135098
CT3	108-95-2	Phenol	7.78E-06	0.00284
CT3	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.90E-06	0.001058
CT3	71-43-2	Benzene	5.17E-05	0.018881
CT3	100-41-4	Ethyl benzene	1.31E-04	0.047935
CT3	98-82-8	Isopropylbenzene (Cumene)	2.72E-05	0.009929
CT3	108-88-3	Toluene	4.66E-04	0.170093
CT3	110-54-3	Hexane	7.69E-05	0.028078
CT3	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	7.76E-04	0.283217
CT3	7783-06-4	Hydrogen sulfide	3.79E-05	0.013835
CT4	91-57-6	2-Methyl naphthalene	6.19E-04	0.225835
CT4	91-20-3	Naphthalene	3.59E-04	0.131079
CT4	108-95-2	Phenol	7.55E-06	0.002756
CT4	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.81E-06	0.001027
CT4	71-43-2	Benzene	5.02E-05	0.018319
CT4	100-41-4	Ethyl benzene	1.27E-04	0.046509
CT4	98-82-8	Isopropylbenzene (Cumene)	2.64E-05	0.009634
CT4	108-88-3	Toluene	4.52E-04	0.165033
CT4	110-54-3	Hexane	7.46E-05	0.027242
CT4	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	7.53E-04	0.274792
CT4	7783-06-4	Hydrogen sulfide	3.68E-05	0.013424
TANK12	91-57-6	2-Methyl naphthalene	5.64E-02	20.58575
TANK12	91-20-3	Naphthalene	3.27E-02	11.94838
TANK12	108-95-2	Phenol	6.88E-04	0.251204
TANK12	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.56E-04	0.093572
TANK12	71-43-2	Benzene	4.58E-03	1.669893
TANK12	100-41-4	Ethyl benzene	1.16E-02	4.239514
TANK12	98-82-8	Isopropylbenzene (Cumene)	2.41E-03	0.878134
TANK12	108-88-3	Toluene	4.12E-02	15.04344
TANK12	110-54-3	Hexane	6.80E-03	2.483247
TANK12	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	6.86E-02	25.0484
TANK12	7783-06-4	Hydrogen sulfide	3.35E-03	1.223629
IT100-1	91-57-6	2-Methyl naphthalene	1.07E-03	0.391311
IT100-1	91-20-3	Naphthalene	6.22E-04	0.227125
IT100-1	108-95-2	Phenol	1.31E-05	0.004775
IT100-1	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.87E-06	0.001779
IT100-1	71-43-2	Benzene	8.70E-05	0.031743
IT100-1	100-41-4	Ethyl benzene	2.21E-04	0.080588
IT100-1	98-82-8	Isopropylbenzene (Cumene)	4.57E-05	0.016692
IT100-1	108-88-3	Toluene	7.83E-04	0.285958
IT100-1	110-54-3	Hexane	1.29E-04	0.047204
IT100-1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.30E-03	0.476141
IT100-1	7783-06-4	Hydrogen sulfide	6.37E-05	0.02326
IT220-2	91-57-6	2-Methyl naphthalene	8.46E-04	0.308688
IT220-2	91-20-3	Naphthalene	4.91E-04	0.179168
IT220-2	108-95-2	Phenol	1.03E-05	0.003767
IT220-2	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.84E-06	0.001403
IT220-2	71-43-2	Benzene	6.86E-05	0.02504
IT220-2	100-41-4	Ethyl benzene	1.74E-04	0.063572
IT220-2	98-82-8	Isopropylbenzene (Cumene)	3.61E-05	0.013168
IT220-2	108-88-3	Toluene	6.18E-04	0.22558
IT220-2	110-54-3	Hexane	1.02E-04	0.037237

IT220-2	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.03E-03	0.375606
IT220-2	7783-06-4	Hydrogen sulfide	5.03E-05	0.018349
TK10401	91-57-6	2-Methyl naphthalene	8.95E-04	0.326657
TK10401	91-20-3	Naphthalene	5.19E-04	0.189598
TK10401	108-95-2	Phenol	1.09E-05	0.003986
TK10401	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.07E-06	0.001485
TK10401	71-43-2	Benzene	7.26E-05	0.026498
TK10401	100-41-4	Ethyl benzene	1.84E-04	0.067273
TK10401	98-82-8	Isopropylbenzene (Cumene)	3.82E-05	0.013934
TK10401	108-88-3	Toluene	6.54E-04	0.238711
TK10401	110-54-3	Hexane	1.08E-04	0.039404
TK10401	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.09E-03	0.397471
TK10401	7783-06-4	Hydrogen sulfide	5.32E-05	0.019417
TK10402	91-57-6	2-Methyl naphthalene	8.95E-04	0.326657
TK10402	91-20-3	Naphthalene	5.19E-04	0.189598
TK10402	108-95-2	Phenol	1.09E-05	0.003986
TK10402	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.07E-06	0.001485
TK10402	71-43-2	Benzene	7.26E-05	0.026498
TK10402	100-41-4	Ethyl benzene	1.84E-04	0.067273
TK10402	98-82-8	Isopropylbenzene (Cumene)	3.82E-05	0.013934
TK10402	108-88-3	Toluene	6.54E-04	0.238711
TK10402	110-54-3	Hexane	1.08E-04	0.039404
TK10402	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.09E-03	0.397471
TK10402	7783-06-4	Hydrogen sulfide	5.32E-05	0.019417
TK10403	91-57-6	2-Methyl naphthalene	8.95E-04	0.326657
TK10403	91-20-3	Naphthalene	5.19E-04	0.189598
TK10403	108-95-2	Phenol	1.09E-05	0.003986
TK10403	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.07E-06	0.001485
TK10403	71-43-2	Benzene	7.26E-05	0.026498
TK10403	100-41-4	Ethyl benzene	1.84E-04	0.067273
TK10403	98-82-8	Isopropylbenzene (Cumene)	3.82E-05	0.013934
TK10403	108-88-3	Toluene	6.54E-04	0.238711
TK10403	110-54-3	Hexane	1.08E-04	0.039404
TK10403	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.09E-03	0.397471
TK10403	7783-06-4	Hydrogen sulfide	5.32E-05	0.019417
TK10404	91-57-6	2-Methyl naphthalene	8.95E-04	0.326657
TK10404	91-20-3	Naphthalene	5.19E-04	0.189598
TK10404	108-95-2	Phenol	1.09E-05	0.003986
TK10404	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.07E-06	0.001485
TK10404	71-43-2	Benzene	7.26E-05	0.026498
TK10404	100-41-4	Ethyl benzene	1.84E-04	0.067273
TK10404	98-82-8	Isopropylbenzene (Cumene)	3.82E-05	0.013934
TK10404	108-88-3	Toluene	6.54E-04	0.238711
TK10404	110-54-3	Hexane	1.08E-04	0.039404
TK10404	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.09E-03	0.397471
TK10404	7783-06-4	Hydrogen sulfide	5.32E-05	0.019417
TK10405	91-57-6	2-Methyl naphthalene	9.05E-04	0.330185
TK10405	91-20-3	Naphthalene	5.25E-04	0.191646
TK10405	108-95-2	Phenol	1.10E-05	0.004029
TK10405	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.11E-06	0.001501
TK10405	71-43-2	Benzene	7.34E-05	0.026784
TK10405	100-41-4	Ethyl benzene	1.86E-04	0.068
TK10405	98-82-8	Isopropylbenzene (Cumene)	3.86E-05	0.014085
TK10405	108-88-3	Toluene	6.61E-04	0.241289
TK10405	110-54-3	Hexane	1.09E-04	0.03983
TK10405	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.10E-03	0.401763
TK10405	7783-06-4	Hydrogen sulfide	5.38E-05	0.019626
TK10406	91-57-6	2-Methyl naphthalene	9.05E-04	0.330185
TK10406	91-20-3	Naphthalene	5.25E-04	0.191646
TK10406	108-95-2	Phenol	1.10E-05	0.004029
TK10406	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.11E-06	0.001501
TK10406	71-43-2	Benzene	7.34E-05	0.026784

TK10406	100-41-4	Ethyl benzene	1.86E-04	0.068
TK10406	98-82-8	Isopropylbenzene (Cumene)	3.86E-05	0.014085
TK10406	108-88-3	Toluene	6.61E-04	0.241289
TK10406	110-54-3	Hexane	1.09E-04	0.03983
TK10406	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.10E-03	0.401763
TK10406	7783-06-4	Hydrogen sulfide	5.38E-05	0.019626
UO1	91-57-6	2-Methyl naphthalene	7.67E-04	0.280021
UO1	91-20-3	Naphthalene	4.45E-04	0.16253
UO1	108-95-2	Phenol	9.36E-06	0.003417
UO1	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.49E-06	0.001273
UO1	71-43-2	Benzene	6.22E-05	0.022715
UO1	100-41-4	Ethyl benzene	1.58E-04	0.057669
UO1	98-82-8	Isopropylbenzene (Cumene)	3.27E-05	0.011945
UO1	108-88-3	Toluene	5.61E-04	0.204631
UO1	110-54-3	Hexane	9.25E-05	0.033779
UO1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	9.33E-04	0.340725
UO1	7783-06-4	Hydrogen sulfide	4.56E-05	0.016645
UO2	91-57-6	2-Methyl naphthalene	7.67E-04	0.280021
UO2	91-20-3	Naphthalene	4.45E-04	0.16253
UO2	108-95-2	Phenol	9.36E-06	0.003417
UO2	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.49E-06	0.001273
UO2	71-43-2	Benzene	6.22E-05	0.022715
UO2	100-41-4	Ethyl benzene	1.58E-04	0.057669
UO2	98-82-8	Isopropylbenzene (Cumene)	3.27E-05	0.011945
UO2	108-88-3	Toluene	5.61E-04	0.204631
UO2	110-54-3	Hexane	9.25E-05	0.033779
UO2	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	9.33E-04	0.340725
UO2	7783-06-4	Hydrogen sulfide	4.56E-05	0.016645
UO3	91-57-6	2-Methyl naphthalene	7.67E-04	0.280021
UO3	91-20-3	Naphthalene	4.45E-04	0.16253
UO3	108-95-2	Phenol	9.36E-06	0.003417
UO3	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.49E-06	0.001273
UO3	71-43-2	Benzene	6.22E-05	0.022715
UO3	100-41-4	Ethyl benzene	1.58E-04	0.057669
UO3	98-82-8	Isopropylbenzene (Cumene)	3.27E-05	0.011945
UO3	108-88-3	Toluene	5.61E-04	0.204631
UO3	110-54-3	Hexane	9.25E-05	0.033779
UO3	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	9.33E-04	0.340725
UO3	7783-06-4	Hydrogen sulfide	4.56E-05	0.016645
UO4	91-57-6	2-Methyl naphthalene	7.67E-04	0.280021
UO4	91-20-3	Naphthalene	4.45E-04	0.16253
UO4	108-95-2	Phenol	9.36E-06	0.003417
UO4	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.49E-06	0.001273
UO4	71-43-2	Benzene	6.22E-05	0.022715
UO4	100-41-4	Ethyl benzene	1.58E-04	0.057669
UO4	98-82-8	Isopropylbenzene (Cumene)	3.27E-05	0.011945
UO4	108-88-3	Toluene	5.61E-04	0.204631
UO4	110-54-3	Hexane	9.25E-05	0.033779
UO4	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	9.33E-04	0.340725
UO4	7783-06-4	Hydrogen sulfide	4.56E-05	0.016645
UO5	91-57-6	2-Methyl naphthalene	7.67E-04	0.280021
UO5	91-20-3	Naphthalene	4.45E-04	0.16253
UO5	108-95-2	Phenol	9.36E-06	0.003417
UO5	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.49E-06	0.001273
UO5	71-43-2	Benzene	6.22E-05	0.022715
UO5	100-41-4	Ethyl benzene	1.58E-04	0.057669
UO5	98-82-8	Isopropylbenzene (Cumene)	3.27E-05	0.011945
UO5	108-88-3	Toluene	5.61E-04	0.204631
UO5	110-54-3	Hexane	9.25E-05	0.033779
UO5	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	9.33E-04	0.340725
UO5	7783-06-4	Hydrogen sulfide	4.56E-05	0.016645
UO6	91-57-6	2-Methyl naphthalene	7.67E-04	0.280021

UO6	91-20-3	Naphthalene	4.45E-04	0.16253
UO6	108-95-2	Phenol	9.36E-06	0.003417
UO6	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.49E-06	0.001273
UO6	71-43-2	Benzene	6.22E-05	0.022715
UO6	100-41-4	Ethyl benzene	1.58E-04	0.057669
UO6	98-82-8	Isopropylbenzene (Cumene)	3.27E-05	0.011945
UO6	108-88-3	Toluene	5.61E-04	0.204631
UO6	110-54-3	Hexane	9.25E-05	0.033779
UO6	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	9.33E-04	0.340725
UO6	7783-06-4	Hydrogen sulfide	4.56E-05	0.016645
MDO1	91-57-6	2-Methyl naphthalene	1.41E-03	0.515498
MDO1	91-20-3	Naphthalene	8.20E-04	0.299205
MDO1	108-95-2	Phenol	1.72E-05	0.006291
MDO1	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	6.42E-06	0.002343
MDO1	71-43-2	Benzene	1.15E-04	0.041817
MDO1	100-41-4	Ethyl benzene	2.91E-04	0.106164
MDO1	98-82-8	Isopropylbenzene (Cumene)	6.02E-05	0.02199
MDO1	108-88-3	Toluene	1.03E-03	0.37671
MDO1	110-54-3	Hexane	1.70E-04	0.062184
MDO1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.72E-03	0.627249
MDO1	7783-06-4	Hydrogen sulfide	8.39E-05	0.030641
Front	91-57-6	2-Methyl naphthalene	6.23E-03	2.270783
Front	91-20-3	Naphthalene	3.62E-03	1.318007
Front	108-95-2	Phenol	7.60E-05	0.02771
Front	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	2.83E-05	0.010322
Front	71-43-2	Benzene	5.05E-04	0.184203
Front	100-41-4	Ethyl benzene	1.28E-03	0.467654
Front	98-82-8	Isopropylbenzene (Cumene)	2.66E-04	0.096866
Front	108-88-3	Toluene	4.55E-03	1.659418
Front	110-54-3	Hexane	7.52E-04	0.273923
Front	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	7.58E-03	2.763051
Front	7783-06-4	Hydrogen sulfide	3.70E-04	0.134977
Jail	91-57-6	2-Methyl naphthalene	1.08E-02	3.94007
Jail	91-20-3	Naphthalene	6.28E-03	2.286894
Jail	108-95-2	Phenol	1.32E-04	0.04808
Jail	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	4.91E-05	0.017909
Jail	71-43-2	Benzene	8.77E-04	0.319614
Jail	100-41-4	Ethyl benzene	2.23E-03	0.811434
Jail	98-82-8	Isopropylbenzene (Cumene)	4.61E-04	0.168073
Jail	108-88-3	Toluene	7.90E-03	2.879282
Jail	110-54-3	Hexane	1.30E-03	0.475288
Jail	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.32E-02	4.794212
Jail	7783-06-4	Hydrogen sulfide	6.43E-04	0.2342
BO	91-57-6	2-Methyl naphthalene	7.06E-03	2.571531
BO	91-20-3	Naphthalene	4.10E-03	1.492567
BO	108-95-2	Phenol	8.61E-05	0.03138
BO	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	3.21E-05	0.011689
BO	71-43-2	Benzene	5.72E-04	0.2086
BO	100-41-4	Ethyl benzene	1.45E-03	0.529591
BO	98-82-8	Isopropylbenzene (Cumene)	3.01E-04	0.109695
BO	108-88-3	Toluene	5.16E-03	1.879195
BO	110-54-3	Hexane	8.51E-04	0.310202
BO	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	8.59E-03	3.128995
BO	7783-06-4	Hydrogen sulfide	4.19E-04	0.152853
UO	91-57-6	2-Methyl naphthalene	2.59E-03	0.94363
UO	91-20-3	Naphthalene	1.50E-03	0.547702
UO	108-95-2	Phenol	3.16E-05	0.011515
UO	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	1.18E-05	0.004289
UO	71-43-2	Benzene	2.10E-04	0.076546
UO	100-41-4	Ethyl benzene	5.33E-04	0.194335
UO	98-82-8	Isopropylbenzene (Cumene)	1.10E-04	0.040253
UO	108-88-3	Toluene	1.89E-03	0.689576

UO	110-54-3	Hexane	3.12E-04	0.11383
UO	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	3.15E-03	1.148194
UO	7783-06-4	Hydrogen sulfide	1.54E-04	0.05609
IT	91-57-6	2-Methyl naphthalene	1.22E-02	4.458791
IT	91-20-3	Naphthalene	7.10E-03	2.58797
IT	108-95-2	Phenol	1.49E-04	0.05441
IT	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	5.56E-05	0.020267
IT	71-43-2	Benzene	9.92E-04	0.361692
IT	100-41-4	Ethyl benzene	2.52E-03	0.918262
IT	98-82-8	Isopropylbenzene (Cumene)	5.22E-04	0.1902
IT	108-88-3	Toluene	8.94E-03	3.258347
IT	110-54-3	Hexane	1.48E-03	0.537861
IT	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.49E-02	5.425382
IT	7783-06-4	Hydrogen sulfide	7.27E-04	0.265033
REF	91-57-6	2-Methyl naphthalene	1.73E-02	6.31846
REF	91-20-3	Naphthalene	1.01E-02	3.667358
REF	108-95-2	Phenol	2.12E-04	0.077103
REF	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	7.88E-05	0.02872
REF	71-43-2	Benzene	1.41E-03	0.512546
REF	100-41-4	Ethyl benzene	3.57E-03	1.301249
REF	98-82-8	Isopropylbenzene (Cumene)	7.40E-04	0.269529
REF	108-88-3	Toluene	1.27E-02	4.617336
REF	110-54-3	Hexane	2.09E-03	0.762192
REF	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	2.11E-02	7.688196
REF	7783-06-4	Hydrogen sulfide	1.03E-03	0.375573
SULF	91-57-6	2-Methyl naphthalene	1.39E-02	5.060287
SULF	91-20-3	Naphthalene	8.06E-03	2.937089
SULF	108-95-2	Phenol	1.69E-04	0.06175
SULF	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	6.31E-05	0.023001
SULF	71-43-2	Benzene	1.13E-03	0.410485
SULF	100-41-4	Ethyl benzene	2.86E-03	1.042136
SULF	98-82-8	Isopropylbenzene (Cumene)	5.92E-04	0.215858
SULF	108-88-3	Toluene	1.01E-02	3.697902
SULF	110-54-3	Hexane	1.67E-03	0.610419
SULF	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	1.69E-02	6.157272
SULF	7783-06-4	Hydrogen sulfide	8.25E-04	0.300786
LPS1	91-57-6	2-Methyl naphthalene	3.06E-01	55.70178
LPS1	91-20-3	Naphthalene	1.77E-01	32.3304
LPS1	108-95-2	Phenol	3.73E-03	0.679718
LPS1	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	1.39E-03	0.25319
LPS1	71-43-2	Benzene	2.48E-02	4.518466
LPS1	100-41-4	Ethyl benzene	6.30E-02	11.47145
LPS1	98-82-8	Isopropylbenzene (Cumene)	1.30E-02	2.37609
LPS1	108-88-3	Toluene	2.23E-01	40.70515
LPS1	110-54-3	Hexane	3.69E-02	6.719271
LPS1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	3.72E-01	67.77699
LPS1	7783-06-4	Hydrogen sulfide	1.82E-02	3.310945
LPS2	91-57-6	2-Methyl naphthalene	2.63E-02	7.310376
LPS2	91-20-3	Naphthalene	1.53E-02	4.243085
LPS2	108-95-2	Phenol	3.21E-04	0.089207
LPS2	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	1.20E-04	0.033229
LPS2	71-43-2	Benzene	2.13E-03	0.59301
LPS2	100-41-4	Ethyl benzene	5.42E-03	1.505528
LPS2	98-82-8	Isopropylbenzene (Cumene)	1.12E-03	0.311841
LPS2	108-88-3	Toluene	1.92E-02	5.342198
LPS2	110-54-3	Hexane	3.17E-03	0.881846
LPS2	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	3.20E-02	8.895143
LPS2	7783-06-4	Hydrogen sulfide	1.56E-03	0.434533
LDARREF	91-57-6	2-Methyl naphthalene	2.05E-05	0.007464
LDARREF	91-20-3	Naphthalene	1.19E-05	0.004332
LDARREF	108-95-2	Phenol	2.50E-07	9.11E-05
LDARREF	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	9.31E-08	3.39E-05

LDARREF	71-43-2	Benzene	1.66E-06	0.000605
LDARREF	100-41-4	Ethyl benzene	4.22E-06	0.001537
LDARREF	98-82-8	Isopropylbenzene (Cumene)	8.74E-07	0.000318
LDARREF	108-88-3	Toluene	1.50E-05	0.005454
LDARREF	110-54-3	Hexane	2.47E-06	0.0009
LDARREF	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	2.49E-05	0.009081
LDARREF	7783-06-4	Hydrogen sulfide	1.22E-06	0.000444
LDARLPSSULF	91-57-6	2-Methyl naphthalene	2.86E-05	0.010405
LDARLPSSULF	91-20-3	Naphthalene	1.66E-05	0.006039
LDARLPSSULF	108-95-2	Phenol	3.48E-07	0.000127
LDARLPSSULF	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	1.30E-07	4.73E-05
LDARLPSSULF	71-43-2	Benzene	2.32E-06	0.000844
LDARLPSSULF	100-41-4	Ethyl benzene	5.88E-06	0.002143
LDARLPSSULF	98-82-8	Isopropylbenzene (Cumene)	1.22E-06	0.000444
LDARLPSSULF	108-88-3	Toluene	2.09E-05	0.007604
LDARLPSSULF	110-54-3	Hexane	3.44E-06	0.001255
LDARLPSSULF	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	3.47E-05	0.012661
LDARLPSSULF	7783-06-4	Hydrogen sulfide	1.70E-06	0.000618
TLOAD1	91-57-6	2-Methyl naphthalene	3.11E-02	1.13E+01
TLOAD1	91-20-3	Naphthalene	1.80E-02	6.59E+00
TLOAD1	108-95-2	Phenol	3.79E-04	1.38E-01
TLOAD1	1319-77-3	Cresols (mixture), including m-cresol, o-cresol, p	1.41E-04	5.16E-02
TLOAD1	71-43-2	Benzene	2.52E-03	9.21E-01
TLOAD1	100-41-4	Ethyl benzene	6.40E-03	2.34E+00
TLOAD1	98-82-8	Isopropylbenzene (Cumene)	1.33E-03	4.84E-01
TLOAD1	108-88-3	Toluene	2.27E-02	8.29E+00
TLOAD1	110-54-3	Hexane	3.75E-03	1.37E+00
TLOAD1	1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p	3.78E-02	1.38E+01
TLOAD1	7783-06-4	Hydrogen sulfide	1.85E-03	6.75E-01

Appendix B: Schools and Daycares

Institution	X (m)	Y (m)	Dist (km)	Institution	X (m)	Y (m)	Dist (km)
Nanny Mo's Child Care	523449	5048144	2.28	Washington State School for the Deaf	528062	5052483	4.72
PRIV Portsmouth Portland	522333	5048521	2.40	GROWING SEEDS	526399	5046393	4.76
Cece Babysitting	522369	5048407	2.47	YMCA WOODLAWN	527050	5046882	4.77
Rosa Parks Elementary School	522397	5048310	2.53	SUN Community School - Woodlawn	527025	5046858	4.77
Albina Early Head Start - Charles Jordan	522602	5048180	2.53	Woodlawn Elementary School	527060	5046874	4.78
Discovery Gardens - Kenton	524263	5047890	2.54	GROWING SEEDS NORTH	526391	5046351	4.79
B's Preschool LLC	523464	5047717	2.70	The Montessori House	519404	5048571	4.79
Clarendon Early Learner's Academy Head Start	521593	5048870	2.71	Today's Little Scholars Childcare	525207	5045779	4.82
Air/Plane Cottage School	524041	5047693	2.71	Portland Parks & Rec - St. Johns Community Center	519307	5048728	4.82
Helping Hands Family Daycare & Preschool Inc	523198	5047743	2.73	James John Elementary School	519349	5048573	4.84
Little Angels Academy	524409	5047689	2.77	SUN Community School - James John Elementary	519364	5048495	4.85
Peninsula Elementary School	523384	5047663	2.77	CLARK COLLEGE CHILD & FAMILY STUDIES	527348	5053758	4.87
LITTLE WORLD CHILD CARE CTR	524884	5053057	2.86	Lifeworks Northwest/Children's Relief Nursery	519234	5048501	4.97
Albina Early Head Start - Clarendon	521595	5048588	2.88	Sunshine Center Montessori Preschool	524721	5045503	4.97
Clark County Juvenile Detention School	525215	5052987	2.94	SUN Community School - Sitton Elementary	518900	5049649	4.99
Siletz Tribal Head Start - Portland Center	526672	5049651	2.94	Sitton Elementary School	518847	5049638	5.04
Cynthia's Busy Bee's Childcare	522062	5048013	2.97	Trillium	524848	5045451	5.05
Bridges Middle School	526740	5049742	2.98	Harney Elementary School	528425	5052614	5.10
Mrs Teapot's Tiny Tots	524593	5047484	3.01	Portland Community College	525486	5045572	5.10
Vermont Hills - Portland Village	524001	5047357	3.04	Rosemary Anderson High School	525424	5045438	5.21
ST PAUL CHRISTIAN DCC	525185	5053138	3.06	Washington Elementary	527079	5054540	5.26
Portland Village School	524034	5047281	3.12	Lincoln Elementary School	525251	5055538	5.33
Cesar Chavez K-8 School	521888	5047924	3.15	Gate Program	528123	5053666	5.39
Open Meadow School North	523459	5047174	3.24	Jefferson High School	525597	5045263	5.43
Rock, Paper, Scissors Childcare	521787	5047869	3.25	Beach Elementary School	524544	5044993	5.45
Honor's Day Care	521563	5048056	3.26	Discovery Middle School	526193	5055434	5.56
Child's Reach	522268	5047470	3.32	Our Lady of Lourdes School	525143	5055928	5.69
De La Salle North Catholic High School	524654	5047168	3.33	Benjamin Franklin Elementary	525057	5056283	6.01
Veronica's Daycare	520661	5049363	3.33	King Elementary School	526613	5045000	6.07
George Middle School	520551	5049209	3.49	Faubion Elementary School	528473	5046459	6.09
Bronwyn's Place, Inc.	521787	5047557	3.50	St. Andrew Nativity School	526783	5045051	6.11
SWCCC HOUGH DCC	525312	5053619	3.55	Concordia University	528319	5046234	6.12
SUN Community School - George Middle	520484	5049204	3.55	Vernon Elementary School	527801	5045494	6.31
Olive Branch School	523919	5046838	3.56	Martin Luther King Elementary	529599	5053034	6.34
Discovery Gardens Childcare	525179	5047099	3.56	Self Enhancement Inc/SEI Academy	525623	5044270	6.38
Hough Elementary School	525310	5053649	3.57	Fir Grove Childrens Center	528863	5054385	6.42
Applegate Head Start	525692	5047342	3.58	Open Doors Vancouver	528963	5054364	6.49
Uno Dos Tres Academy St Johns	521388	5047773	3.58	Albina Youth Opportunity School	525352	5044088	6.49
In Kim's Care	525643	5047281	3.60	Roosevelt Elementary School	529033	5054592	6.68
Vermont Hills - Holy Cross Elementary	521681	5047502	3.60	Hosanna Christian School	528298	5055409	6.71
Holy Cross Catholic School Pre Kindergarten	521618	5047548	3.61	Kairos PDX	525971	5044024	6.72
VERMONT HILLS-HOLY CROSS ELEMENTARY	521662	5047490	3.63	Boise-Eliot Elementary School	525548	5043871	6.75
Trinity Academy	525284	5047067	3.63	Mcloughlin Middle School	530307	5052355	6.76
Holy Cross Catholic School	521653	5047489	3.63	The Gladys McCoy Academy	526444	5044129	6.79
Rubies Child Care	525466	5047129	3.65	Lewis and Clark High School	529565	5054407	7.00
Chief Joseph Elementary School	524082	5046644	3.76	Sabin Elementary School	527496	5044356	7.07
North Portland Montessori School	525369	5046839	3.87	St. Joseph School	530798	5051660	7.08
Little Imprints LLC	524714	5046619	3.88	George C Marshall Elementary	530712	5052195	7.11
Albina Early Head Start - Carl Talton Center	523652	5046502	3.90	Fort Vancouver High School	530182	5053749	7.18
HEAD START PRIESTLEY CENTER (ALBINA)	524772	5046611	3.90	The Ivy School	526067	5043485	7.26
Blooming Rose Preschool, LLC	523675	5046495	3.90	Minnehaha Elementary School	527838	5056583	7.37
Sheila Ward	524287	5046507	3.92	Harry S Truman Elementary School	529029	5055753	7.46
Albina Head Start - Benjamin M Priestley Center	524793	5046598	3.92	Hazel Dell Elementary School	525954	5057555	7.47
Petit a Petit	524481	5046527	3.92	White Shield Center	521626	5043132	7.59
HEAD START ROOSEVELT (ALBINA)	520449	5048385	3.94	Portland Community College	529742	5045611	7.60
Roosevelt High School	520414	5048425	3.95	Pioneer High School	525843	5042918	7.74
Cathedral Park Preschool	521336	5047338	3.95	Alliance High School	529485	5045084	7.76
Flouriche LLC	523603	5046448	3.95	ESA 112 Special Ed Co-Op	530723	5054023	7.79
IMAGINATION STATION DAYCARE CENTER	521309	5047331	3.97	Depaul Youth Center	529834	5045425	7.79
Crayola Kids Child Care	526001	5047017	4.02	CLASS Academy	522823	5042598	7.86
SUN Community School - Roosevelt High	520334	5048375	4.04	The Madeleine School	527956	5043677	7.88
Little Oats Daycare	520038	5048977	4.05	Alameda Elementary School	528315	5043860	7.93

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Nature's Way Child Care	525375	5046624	4.08
HEAD START MCCORMACK/MATHEWS (ALBINA)	525545	5046682	4.09
PRIV Piedmont Portland	525638	5046694	4.12
PRIV Piedmont Portland	525477	5046610	4.13
VERMONT HILLS - ASTOR ELEMENTARY	521106	5047285	4.14
Adams Child Care	525995	5046865	4.14
Astor Elementary School	521089	5047273	4.16
St John's Day Care	520360	5048087	4.17
Wild Portland Nature Care	524476	5046258	4.19
Georgy's Playcare	525798	5046694	4.19
Hudson's Bay High School	527043	5053105	4.20
Vermont Hills - Astor	521068	5047232	4.20
Fresh Start Preschool Enrichment Program	526328	5046971	4.24
SWCCC HUDSON'S BAY	527146	5053151	4.31
New Farm Montessori	524473	5046130	4.31
Luhndyn Daycare	520227	5048000	4.33
Ladybugs Childcare	525998	5046622	4.35
Casita Montessori School	520843	5047192	4.38
Vermont Hills Family Life Center at University of Portland	520977	5047071	4.38
PRIV St. Johns Portland	520044	5048147	4.40
Wow & Flutterville Playopolis	525766	5046428	4.41
The Montessori House of St Johns	520011	5048151	4.43
EOCF FRUIT VALLEY EARLY LEARNING CENTER	523921	5054891	4.50
Rowanberry School	526271	5046608	4.51
SWCCC FRUIT VALLEY DCC	523922	5054904	4.51
Fruit Valley Elementary School	523911	5054906	4.51
SWCCC CENTRAL PARK	527367	5053215	4.52
Washington State School for the Blind	527474	5053078	4.52
Holy Redeemer Catholic School	525874	5046360	4.52
SUN Community School - Ockley Green	524957	5046011	4.53
Chief Joseph/Ockley Green School	524919	5046000	4.53
Rivendell Preschool	525574	5046214	4.53
HOLY REDEEMER BEYOND THE CLASSROOM	525900	5046353	4.54
Holy Redeemer Pre Kindergarten and Beyond the Classroom	525917	5046325	4.57
University of Portland	521238	5046615	4.59
Vancouver School of Arts and Academics	525810	5054544	4.59
OVERLOOK COLLABORATIVE PRESCHOOL	524577	5045763	4.69
Peace Tree School	526485	5046524	4.69
Toni's Daycare	525836	5046137	4.71
Childpeace Montessori School	524433	5042475	7.94
Childpeace Montessori	524510	5042416	8.01
Irvington Elementary School	527174	5043022	8.10
Portland SD 1J	525657	5042490	8.11
The Ivy School	529664	5044699	8.15
Chapman Elementary School	522989	5042229	8.21
Trinity Lutheran School	530707	5045418	8.49
Jason Lee Middle School	524844	5058878	8.54
Beaumont Middle School	529596	5043994	8.62
Shining Star Waldorf School	527777	5042685	8.66
Early Childhood Education Center	532375	5051849	8.67
Pacific Northwest College of Art	524689	5041759	8.68
Rigler Elementary School	530617	5044790	8.80
Metropolitan Learning Center	523954	5041503	8.89
Beverly Cleary School	529116	5043137	8.98
Skinner Elementary Montessori School	530812	5056137	9.04
Peter S Ogden Elementary	531918	5054465	9.05
Lake Shore Elementary	523790	5059494	9.10
King's Way Christian School	528203	5058423	9.14
Community Transitional School	531634	5045585	9.17
Grant High School	529123	5042911	9.17
Beverly Cleary School	528774	5042668	9.17
Dwight D Eisenhower Elementary	525160	5059494	9.19
Cathedral School	524369	5041188	9.22
Henrietta Lacks Health and Bioscience High School	532795	5052724	9.26
Emerson School	525036	5041205	9.27
Benson Polytechnic High School	527157	5041578	9.42
New Avenues School	525006	5041013	9.46
Forest Park Elementary School	517361	5043246	9.64
Scott Elementary School	531673	5044692	9.70
Everest College	525266	5040792	9.71
Columbia River High	524991	5060110	9.78
Lincoln High School	524293	5040624	9.78
Archbishop Howard School	530584	5043280	9.81
Le Monde French Immersion Public Charter School	524514	5040592	9.83
Northwest Academy	524575	5040500	9.92
Montessori School of Beaverton	516376	5043786	9.96
Walnut Grove Elementary	531269	5057076	10.00