Modeling Protocol and Risk Assessment Workplan

Cleaner Air Oregon

Columbia Forest Products, Inc.

4949 Highway 97 S, Klamath Falls, OR 97603

Prepared by:

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Making Sustainability Happen

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Acronyms and Abbreviations

ASOS	Automated Surface Observing System
B_0	Bowen ratio
BPIPPRM	Building Profile Input Program for PRIME
CAO	Cleaner Air Oregon
CFP	Columbia Forest Products
CSM	Conceptual Site Model
DEQ	Oregon Department of Environmental Quality
GEP	Good Engineering Practice
IGRA	Integrated Global Radiosonde Data Archive
K	Kelvin
KLMT	Klamath Falls Airport
KMFR	Medford Airport
m	Meters
m/s	Meters per second
$\mu g/m^3$	micrograms per cubic meter
NAD83	North American Datum of 1983
NED	National Elevation Dataset
NLCD	National Landcover Database
NWS	National Weather Service
OAR	Oregon Administrative Rule
r	Albedo
RAWP	Risk Assessment Work Plan
RAL	Risk Action Level
RBC	Risk-Based Concentration
REER	Risk-Equivalent Emission Rate
SLR	SLR International Corporation
TAC	toxic air contaminant
TEU	Toxic Emission Unit
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
z_0	Surface Roughness

1.0 Introduction

Columbia Forest Products, Inc. (CFP) operates a plywood manufacturing plant at 4949 Highway 97 S Klamath Falls, Oregon (Facility), operating under Oregon Title V Operation Permit No. 18-0014-TV-01. On August 29, 2024, CFP was informed by the Oregon Department of Environmental Quality (DEQ) that the Facility was being “called in” to the Cleaner Air Oregon (CAO) program administered by DEQ.

CFP is proposing to perform a Level 3 Risk Assessment as permitted under Oregon Administrative Rule (OAR) 340-245-0050(10) to comply with the CAO program. SLR International Corporation (SLR) has been retained by CFP to perform the air dispersion modeling and risk assessment.

As part of a Level 3 Risk Assessment, an air dispersion modeling demonstration and risk assessment are required. This document serves as the modeling protocol and risk assessment work plan for the demonstration to be conducted as part of the Level 3 Risk Assessment.

The modeling analysis will be conducted to determine the risk action levels (RALs) attributable to operations at the Facility and thereby determine additional requirements in relation to the action levels as outlined in OAR 340-245-8010 Table 1.

The purpose of this modeling protocol and work plan is to present to and obtain approval from DEQ for the proposed modeling and risk assessment inputs and methodologies. Inputs and methodologies will follow DEQ and United States Environmental Protection Agency (USEPA) modeling guidance as outlined in the following documents:

- DEQ Recommended Procedures for Air Quality Dispersion Modeling (DEQ 2022a) hereafter referred to as the DEQ Modeling Guidance
- DEQ Recommended Procedures for Toxic Air Contaminant Health Risk Assessments (DEQ 2022b) hereafter referred to as the CAO Guidance
- Revision to the Guideline on Air Quality Models [published as 40 CFR 51, Appendix W] (USEPA 2017) hereafter referred to as Appendix W

1.1 Facility Description

CFP produces hardwood faced plywood panels from pre-dried hardwood veneer sourced from other locations which is glued to core panels either processed onsite from raw logs or brought in from other sources. Raw logs are brought onsite, debarked, cut to length, conditioned in steam vats, and then peeled on lathes into veneer pieces. The veneer is sorted for use onsite, for sale offsite, and also chipped for fuel. Green veneer to be used onsite is dried in one of two dryers to a specific moisture content, glued together, and then pressed into panels. Finishing operations include trimming, patching, conditioning, sanding, and coating. Steam for the operations is provided by a single hog fuel boiler.

Figure 1-1 shows a topographic map of the area surrounding the Facility. Figure 1-2 presents a near-field aerial photograph of the Facility.

Figure 1-1 Area Map

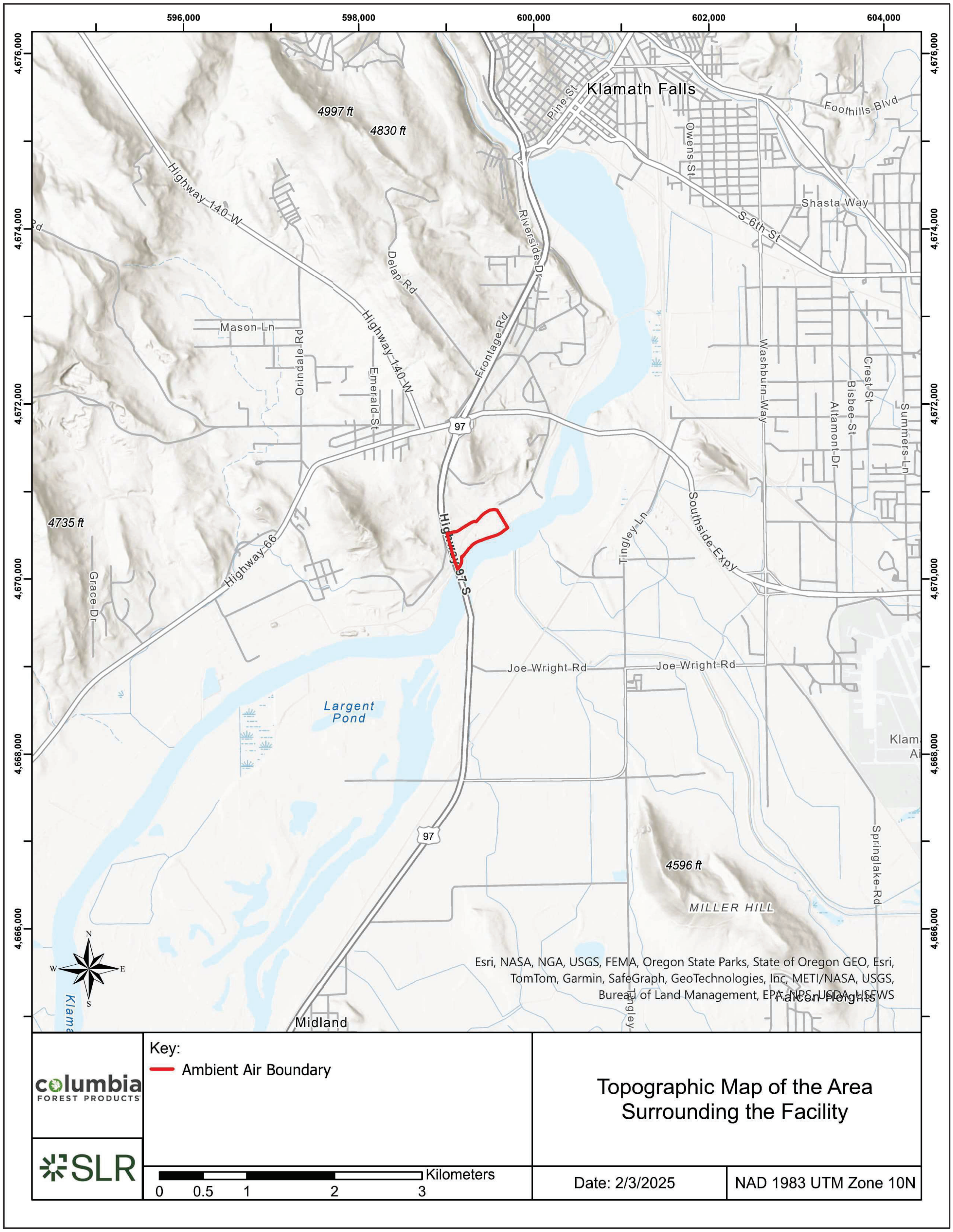


Figure 1-2 Site Map

columbia FOREST PRODUCTS	Key: Ambient Air Boundary	Aerial Photograph of the Facility
SLR	Meters 0 50 100 200	Date: 2/3/2025 / NAD 1983 UTM Zone 10N

2.0 Dispersion Modeling Methodology

2.1 Model Selection

To meet the dispersion modeling requirements for this analysis SLR will use the current version of the American Meteorological Society/EPA Regulatory Model (AERMOD) modeling system, the DEQ and USEPA-preferred regulatory modeling system. AERMOD is recommended for use in modeling multi-source emissions, and can account for plume downwash, stack tip downwash, and several source types including POINT, AREA, and VOLUME sources.

Current versions of the AERMOD model and pre-processors will be used. If a model version is updated prior to approval of this protocol, the newest version will be used. These include:

- AERMAP version 24142
- BPIPPRM version 04274
- AERMET version 24142
- AERMOD version 24142

2.2 Model Input Options

All DEQ and USEPA regulatory default dispersion options will be used.

2.2.1 Urban Source Classification

An Auer land-use analysis, as described in 40 CFR 51 Appendix W was conducted to determine whether a facility area should be classified as urban. Less than 50 percent of the area within a 3-kilometer (km) radius of the Facility could be classified as urban land use types I1, I2, C1, R2, or R3 (heavy industrial, light/moderate industrial, commercial, compact residential [single family], or compact residential [multi-family], respectively). Therefore, the urban option in AERMOD (URBANOPT) will not be used and the default, rural dispersion coefficients will be used in the modeling analysis.

2.3 Meteorological Data

Hourly meteorological data used for air quality modeling must be spatially and climatologically representative of the area of interest. Appendix W recommends a minimum of one year of site-specific meteorological data or five consecutive years from the most recent, readily available data collected at the nearest National Weather Service (NWS) station. Required surface meteorological data inputs to the AERMOD meteorological processor (AERMET) include, at minimum, hourly observations of wind speed, wind direction, temperature, lateral turbulence, and cloud cover (or solar radiation and low-level vertical temperature difference data in lieu of cloud cover). The meteorological processor also requires morning upper air sounding data from a representative NWS station. Below is an overview of the data inputs that will be used to develop the meteorological data. All data and supporting information will be included in the model file archive submitted with the final modeling report.

2.3.1 Surface Data

The surface area to be used in the modeling analysis will be five years (2019 – 2023) of Automated Surface Observation System (ASOS) data collected at Klamath Falls International

Airport (KLMT, WBAN: 94236) located approximately 7 km to the southeast of the Facility. Given the proximity KLMT to the Facility, and the absence of significant intervening terrain, KLMT should be representative of meteorological condition at the Facility.

2.3.2 Upper Air Data

The temperature structure of the atmosphere prior to sunrise is required by AERMET to estimate the growth of the convective boundary layer for the day. AERMET uses the 1200 Greenwich Mean Time (GMT) upper air sounding from the nearest NWS upper air observing station for this purpose. The closest NWS upper air station located at Medford Airport in Medford, Oregon (KMFR), approximately 90 km northwest of the Facility will be used as the upper air input to AERMOD. The concurrent upper air data were obtained from the Integrated Global Radiosonde Data Archive (IGRA).

2.3.3 Surface Characteristics

Appropriate surface characteristics including surface roughness length (z_0), Bowen Ratio (B_0) and albedo (r) must be provided to AERMET. Surface characteristics were assigned following guidance provided in the current version of the *AERMOD Implementation Guide* (AIG; EPA, 2024c).

The AIG recommends that the surface characteristics be determined based on digitized land cover data using the latest version of the EPA land use processor, AERSURFACE (version 24142). The current version of AERSURFACE (version 24142) supports the use of land cover data from the United States Geological Survey (USGS) National Land Cover Database (NLCD). EPA recommends supplementing the NLCD with both the percent impervious data, and percent tree canopy data where available. The most recent year where the three data sets are available is 2021 and therefore 2021 NLCD data will be used to develop the surface characteristics to be used as input to AERMET.

AERSURFACE will be used to calculate surface characteristics for twelve 30-degree sectors beginning from the North (0 or 360 degrees) and rotating clockwise.

2.3.3.1 Seasonal Classification

In AERSURFACE, the various land cover categories are linked to a set of seasonal surface characteristics. As such, AERSURFACE requires specification of the seasonal category for each month of the year. The following five seasonal categories are offered by AERSURFACE:

- Late autumn after frost and harvest, or winter with no snow
- Winter with continuous snow on ground
- Transitional spring with partial green coverage or short annuals
- Midsummer with lush vegetation
- Autumn with un-harvested cropland.

To assign the seasonal classification for each month of each year, the default seasonal classifications found in the *User's Guide for AERSURFACE Tool* (USEPA 2024b) will be used and are presented in Table 2-1. Note that no months are classified as "winter with continuous snow on the ground".

2.3.3.2 Surface Moisture Determination

To determine the Bowen ratio, land use values are linked to three categories of surface moisture corresponding to average, wet, and dry conditions. The surface moisture conditions for the site may vary depending on the meteorological data period for which the surface characteristics are applied. One limitation of AERSURFACE is that the surface moisture condition is applied for the entire data period being processed. Therefore, if the surface moisture condition varies significantly across the data period, then AERSURFACE must be applied multiple times to account for those variations.

As recommended in USEPA 2024b, the surface moisture condition for each month should be determined by comparing precipitation for the period of data to be processed to the 30-year climatological record. “Wet” conditions are selected if precipitation was in the upper 30th percentile, “dry” conditions if precipitation was in the lower 30th percentile, and “average” conditions if precipitation was in the middle 40th percentile.

Surface moisture conditions can be determined by comparing local precipitation data with climatological average monthly precipitation totals. To determine surface moisture conditions, monthly precipitation totals at KLMT from 2019 through 2023 were compared to climatological average month totals at KLMT using data from April 1998 through December 2023, supplemented with monthly precipitation totals from a U.S. Cooperative Network station in Klamath Falls (Klamath Falls 2 SSW, USC00354506) for January 1994 through March 1998.

The results of the surface moisture determination are provided in Table 2-1 Seasonal Classifications

Season Description	Default Month Assignment
Midsummer with lush vegetation	Jun, Jul, Aug
Autumn with unharvested cropland	Sep, Oct, Nov
Late autumn after frost and harvest, or winter with no snow	Dec, Jan, Feb
Transitional spring with partial green coverage or short annuals	Mar, Apr, May

Table 2-2.

Table 2-1 Seasonal Classifications

Season Description	Default Month Assignment
Midsummer with lush vegetation	Jun, Jul, Aug
Autumn with unharvested cropland	Sep, Oct, Nov
Late autumn after frost and harvest, or winter with no snow	Dec, Jan, Feb
Transitional spring with partial green coverage or short annuals	Mar, Apr, May

Table 2-2 Monthly Surface Moisture

Month	2019	2020	2021	2022	2023
January	AVG	AVG	DRY	DRY	AVG
February	WET	DRY	AVG	DRY	DRY
March	AVG	AVG	DRY	DRY	AVG
April	WET	DRY	AVG	AVG	DRY
May	WET	AVG	DRY	DRY	WET
June	DRY	DRY	DRY	AVG	DRY
July	AVG	DRY	WET	AVG	DRY
August	WET	AVG	DRY	AVG	WET
September	WET	DRY	AVG	WET	WET
October	AVG	DRY	WET	DRY	DRY
November	DRY	WET	DRY	AVG	DRY
December	AVG	DRY	DRY	WET	AVG

2.4 Ambient Air Boundary and Receptor Network

2.4.1 Receptor Grids

Cartesian receptor grids were defined using Universal Transverse Mercator (UTM) Zone 10 NAD83 coordinates. The receptor grids were centered on the approximate centroid of all Facility emission units. The grids are designed to resolve the highest predicted pollutant impacts and conform to the recommendations in the DEQ Modeling Guidance. Access to the property is controlled by fencing, vegetation, and the Klamath River, and is sufficient to prevent unauthorized access. The grids consist of a set of nested receptors placed at:

- 25-m spacing along the fence line
- 25-m spacing extending to 400-m from the Facility centroid
- 50-m spacing extending from 400-m to 1,000-m from the Facility centroid
- 100-m spacing extending from 1,000-m to 2,000-m from the Facility centroid
- 200-m spacing extending from 2,000-m to 5,000-m from the Facility centroid
- 500-m spacing extending from 5,000-m to 10,000-m from the Facility centroid

Receptor elevation and hill height scale will be obtained using the AERMAP terrain processor. The digital terrain dataset provided as input to AERMAP was the National Elevation Dataset (NED) digital terrain data at 1/3 arc-second resolution, which is equivalent to approximately 10 m in the project area. All AERMAP input and output files will be included in the model file archive.

Figure 2-1 and Figure 2-2 present far-field and near-field views of the receptor grids and fence line, respectively.

A review of the area surrounding the Facility was conducted and revealed that no sensitive receptors (schools, daycare centers, etc.) are located within 1-km of the Facility.

If modeling results obtained with the grids outlined above reveal the presence of any "hot spots", defined regions with a risk of greater than 0.5 outside of the continuous region of risk greater than 0.5, then an additional grid of receptors spaced every 25 m will be placed on the hotspot.

2.4.2 Assignment of Receptors to Exposure Location Types

An additional requirement of CAO modeling analyses is the assignment of receptors to exposure location types. The assignment is necessary as the risks calculated under CAO are dependent on the type of use at a particular receptor. The four exposure types are residential, non-resident child, non-resident worker, and acute-only. The CAO rule defines chronic exposure locations as "an exposure location outside the boundary of a source being modeled for annual average concentrations of a toxic air contaminant" and an acute exposure location as "an exposure location outside the boundary of a source being modeled for daily average concentrations of a toxic air contaminant, and that is (a) a chronic exposure location, or (b) a location where people may spend several hours of one day."

Zoning information was obtained from the Oregon GeoHub website[1]. The zoning information is contained in a feature class that was imported into GIS software. The state level zoning feature includes recent zoning data (as of June 2023) from 229 local jurisdictions, including the city of Klamath Falls and Klamath County. The zoning data divides the area into zoning districts based on state zoning classes. Using the DEQ *Cleaner Air Oregon State Zoning to Exposure Location Crosswalk* (DEQ 2020), each zoning district was assigned an exposure location type of residential, worker, child or acute-only. Several zoning districts can potentially be assigned multiple exposure location types; for example, the Exclusive Farm Use zoning classes can be classified as residential for an area with a house, worker for areas with barnyards or other commercial activity or acute-only for fields. For these ambiguous zoning areas, inspection of publicly available aerial images was conducted, and the following methodology was used to assign the proper exposure location type:

1. If the zoning area contains a residence, the area was assigned a Residential exposure location
2. If the zoning area does not contain a residence, but does contain work-related facilities, the area was assigned a Worker exposure location
3. If the zoning area consists of open field or crop land, the area was assigned an Acute-Only exposure location
4. If a zoning area contains a school or daycare center, the area was assigned a Child exposure location

Figure 2-3 and Figure 2-4 provide a far-field and near-field view of the exposure locations. The residential, non-resident child, non-resident worker exposure locations are color coded. The acute exposure scenario will be assessed at all receptors in the modeling domain.

[1] https://geohub.oregon.gov/

Figure 2-1 Far-Field View of the Receptor Grid

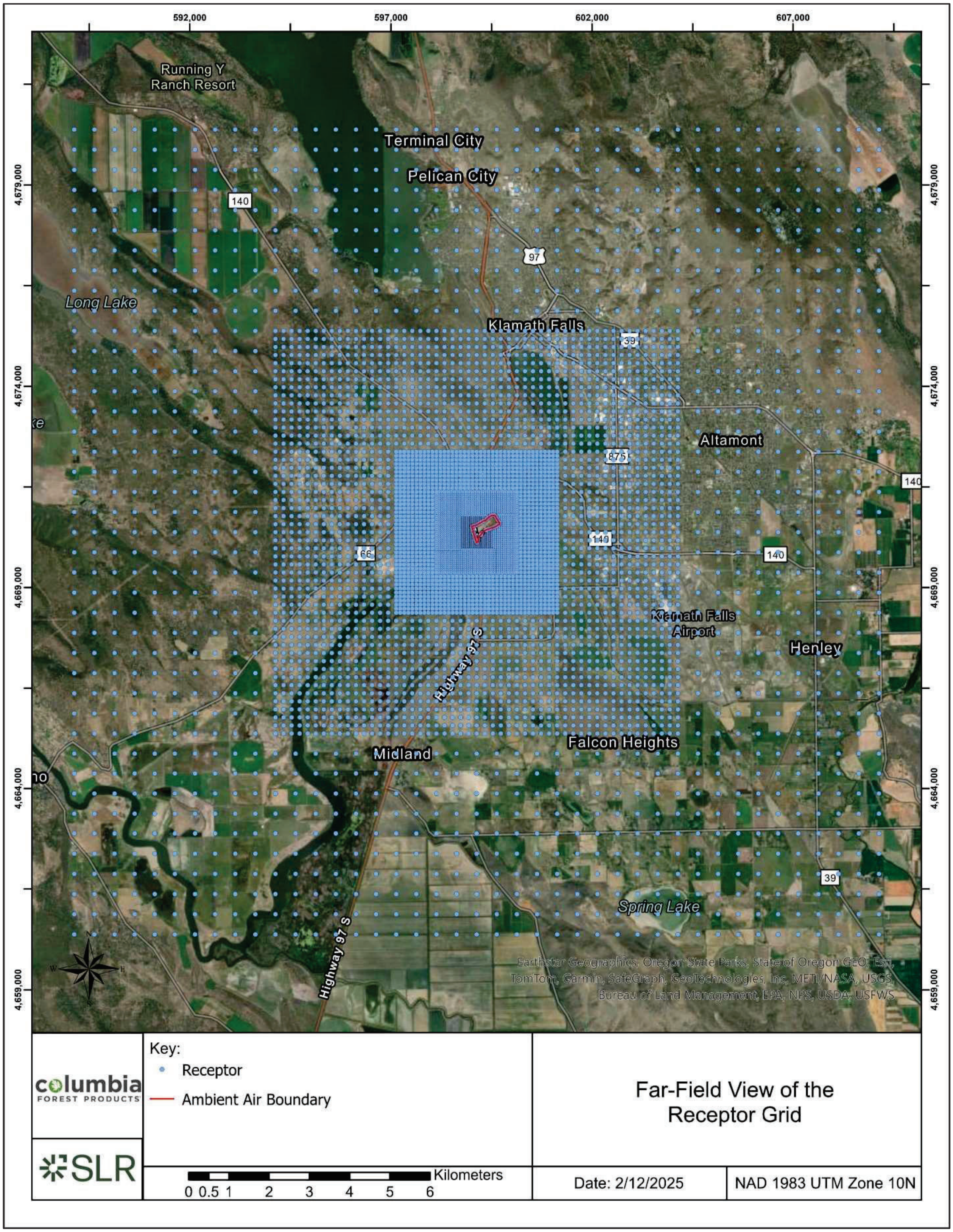


Figure 2-2 Near-Field View of the Receptor Grid

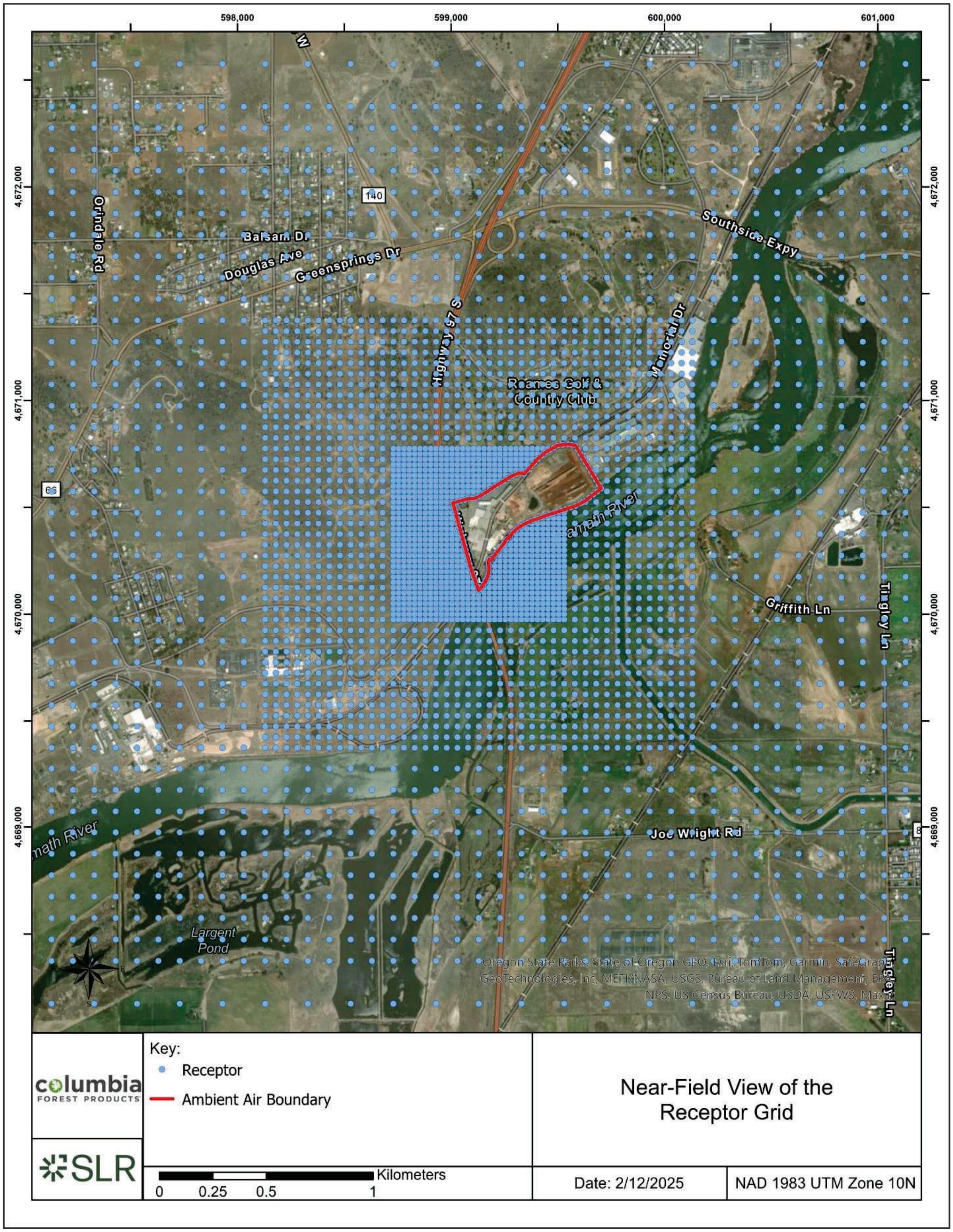


Figure 2-3 Far-Field View of the Exposure Locations

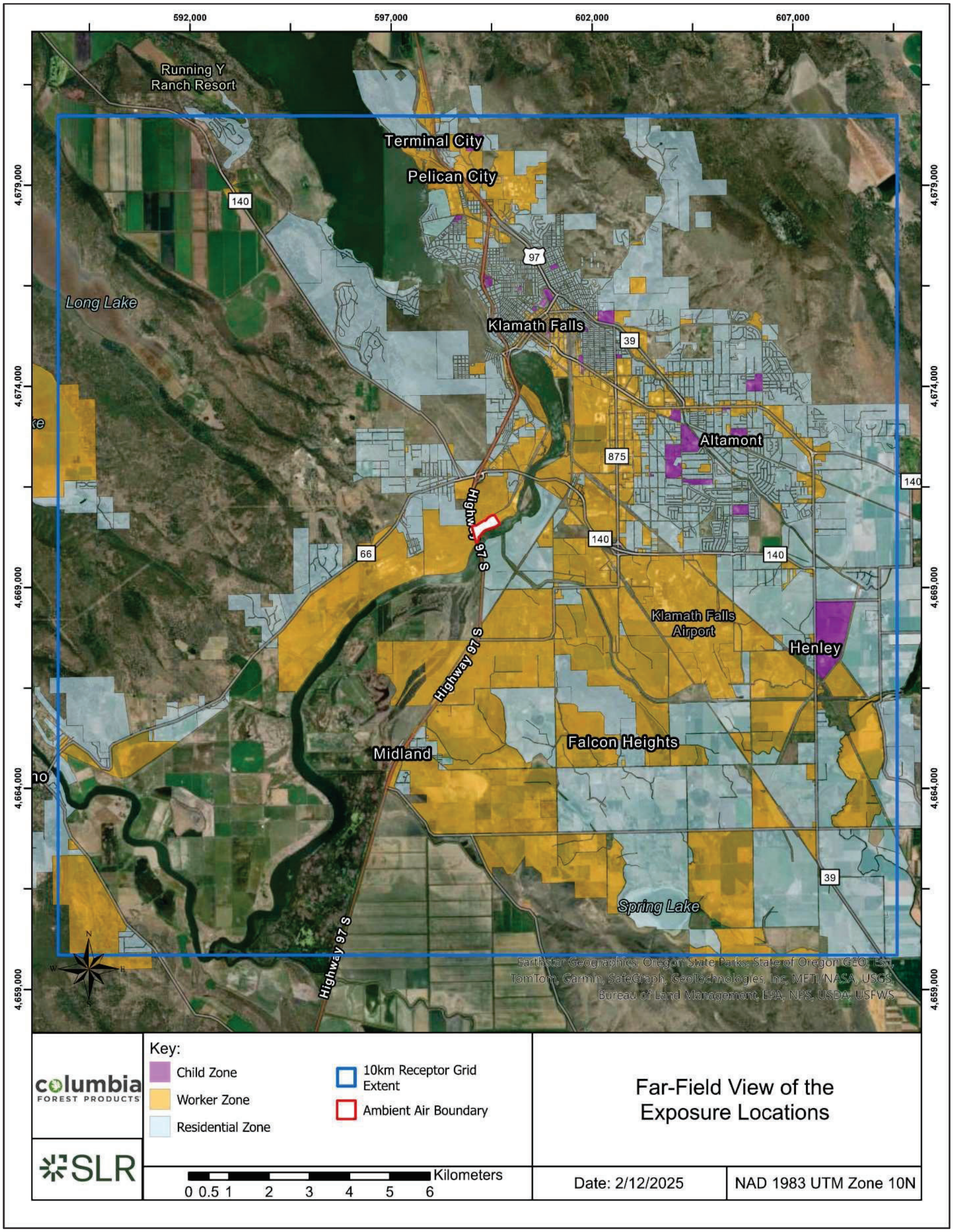
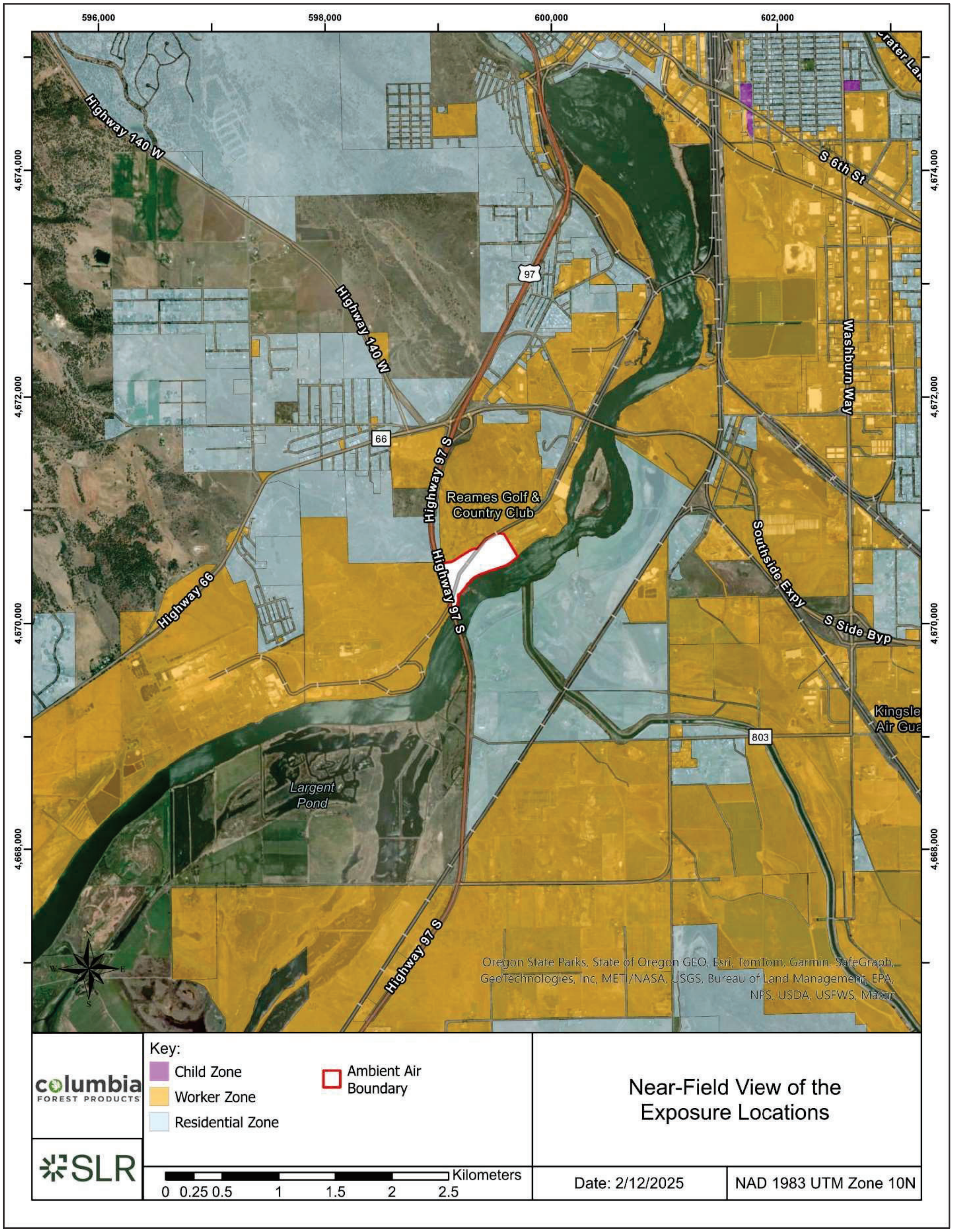


Figure 2-4 Near-Field View of the Exposure Locations



2.5 Emissions Source Inventory

Toxic emission units (TEUs) at CFP consist of a boiler, veneer dryers, log vats, press vent, and space heaters that operate on natural gas. All TEUs operate during the facility's normal operations.

The risk assessment procedures in OAR 340-245-0050(5) require that the risk from toxic air contaminants emitted from natural gas combustion be calculated and reported in the risk assessment. However, the risk from natural gas combustion is reported separately from the risk from all other toxic air contaminant emissions. Additionally, the risk from toxic air contaminants emitted solely from the combustion of natural gas may be excluded from the total risk for the purposes of determining compliance with the RALs and may be omitted from any requirements determined under a risk reduction plan if good air pollution control practices are followed. In accordance with these sections of the CAO regulations, the parameters and emission rates associated with the natural gas sources are included in this modeling protocol and work plan, and the TEUs combusting natural gas will be modeled. However, the risk resulting from natural gas combustion will not be included in the total risk compared to the RALs nor included in any requirements under a risk reduction plan, should that be necessary.

2.5.1 Emissions

Emission rates for each TEU and toxic air contaminant (TAC) are provided in an Excel workbook in **Error! Reference source not found.**.

Emission rates shown in Appendix A for the acute represent maximum emissions from each TEU over a daily (i.e., 24-hour) period. Emission rates shown in Appendix A for chronic cancer and chronic non-cancer represent the maximum emissions from each TEU over an annual period. Conversions to the Risk-Equivalent Emission Rate (REER) are also shown for each TEU and TAC in Appendix A: Emissions Rates and REER Calculations.

The air toxics emission inventory submitted by CFP includes detailed information and calculations on how the emission rates were developed. Emission factor references are noted within the inventory forms. Throughputs are provided for 2023 actual operations, requested potential to emit (PTE), and capacity, which is based on the facility plant site emission limits (PSELs). Columbia Steel has presented a requested PTE that equivalent to the capacity for most TEUs. Emission rates are presented for both annual emissions (pounds per year) and daily emissions (pounds per 24-hours). Daily emissions were conservatively calculated by assuming the facility operates 260 days per year (i.e., 5 days per week) for most TEUs and activities.

2.5.2 POINT Sources

TEUs with dedicated stacks will be represented in the modeling as POINT sources. TEUs to be represented by POINT sources are the boiler and the veneer dryers. Note that the veneer dryers exhaust through multiple stacks. Source data will be derived from facility records and stack test data. All POINT sources are unobstructed, vertical releases. Table 2-3 presents a summary of the POINT source data. Figure 2-5 shows the locations of the POINT sources.

2.5.3 VOLUME Sources

Several TEUs that are fugitive in nature and do not emit through a dedicated stack or vent will be represented in the analysis using VOLUME sources. TEUs to be represented by VOLUME sources are the log vats, press vents, and the natural-gas-fired space heaters.

The release height of each VOLUME source, except for the press vent, is calculated as the height of the bottom of the VOLUME plus one half the distance between the top and bottom of the VOLUME. For the press vent, the release height is set to the top of the VOLUME under the assumption that, due to the heated air exiting the press vent, emission will exit at the top of the vent.

Initial lateral and vertical dimensions will be developed based on the physical dimensions of the TEU and guidance from Table 3-3 of the *User's Guide for the AMS/EPA Regulatory Model (AERMOD)* (USEPA 2024c). Table 2-4 provides a summary of the VOLUME source data. Figure 2-6 shows the locations of the VOLUME sources.

2.5.4 AREA and AREA POLY Sources

Several TEUs that are fugitive in nature will be represented in the analysis using AREA and AREAPOLY sources. TEUs to be represented by an AREA source are welding activities and UV Line-related material usage. Finishing-related material usage emissions will be characterized using an AREAPOLY source.

The release height of each AREA or AREAPOLY source is calculated as one-half of the AREA or AREAPOLY source height. The initial vertical dimension will be developed based on the AREA or AREAPOLY source height and guidance from Table 3-3 of the *User's Guide for the AMS/EPA Regulatory Model (AERMOD)* (USEPA 2024c). Table 2-5 provides a summary of the AREA and AREAPOLY source data. Figure 2-6 shows the locations of the AREA and AREAPOLY sources.

Table 2-3 POINT Source Data

TEU	Model ID	Source Description	UTM X Coordinate (m)	UTM Y Coordinate (m)	Elevation (m)	Stack Height (m)	Exhaust Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
BLR-S	BLRS	Wood/Bark-Fired Boiler	599250.72	4670410.60	1249.68	10.67	481.48	9.96	1.23
V-N	VN1A	Veneer Dryer 1 Vent A	599105.17	4670368.99	1249.68	8.23	434.82	20.06	0.39
V-N	VN1B	Veneer Dryer 1 Vent B	599106.47	4670372.18	1249.68	8.23	455.93	20.67	0.39
V-N	VN1C	Veneer Dryer 1 Vent C	599106.11	4670373.24	1249.68	8.23	453.15	18.17	0.39
V-N	VN1D	Veneer Dryer 1 Vent D	599107.76	4670377.54	1249.68	8.23	467.59	14.78	0.39
V-N	VN1E	Veneer Dryer 1 Vent E	599108.96	4670382.04	1249.68	8.23	457.59	16.03	0.39
V-N	VN1F	Veneer Dryer 1 Vent F	599109.96	4670385.81	1249.68	8.23	424.82	11.09	0.39
V-N	VN1G	Veneer Dryer 1 Vent G	599111.22	4670390.43	1249.68	8.23	422.04	13.29	0.39
V-N	VN2A	Veneer Dryer 2 Vent A	599095.52	4670368.75	1249.68	7.92	433.15	13.29	0.39
V-N	VN2B	Veneer Dryer 2 Vent B	599096.66	4670371.94	1249.68	7.92	453.71	16.86	0.39
V-N	VN2C	Veneer Dryer 2 Vent C	599097.17	4670375.24	1249.68	7.92	445.37	11.28	0.39
V-N	VN2D	Veneer Dryer 2 Vent D	599101.23	4670384.98	1249.68	7.92	425.93	10.36	0.39

Table 2-4 VOLUME Source Data

TEU	Model ID	Source Description	UTM X Coordinate (m)	UTM Y Coordinate (m)	Elevation (m)	Release Height (m)	Initial Horizontal Dimension (m)	Initial Vertical Dispersion (m)
NG1	NG1	Space Heaters	599137.76	4670405.53	1249.68	3.05	26.28	2.84
PV	PV	Press Vents	599140.11	4670377.73	1249.68	10.06	3.25	2.98
Steam Vat	SV1	Steam Vats	599275.76	4670411.87	1249.68	1.52	4.88	1.42

Table 2-5 AREA and AREAPOLY Source Data

TEU	Model ID	Source Description	UTM X Coordinate (m)	UTM Y Coordinate (m)	Elevation (m)	Release Height (m)	X Length (m)	Y Length (m)	Angle (deg)	Initial Vertical Dispersion (m)
WELD	WELD	Welding Activities	599207.19	4670385.76	1249.68	4.57	30.8	17.8	127.3	4.25
UV Line	UVLINE	UV Line-Related Material Usage	599217.44	4670540.78	1249.68	3.81	19.6	92.6	42.0	3.54
Finishing	FINISH	Finishing-Related Material Usage	599170.04	4670392.16	1249.68	3.05	--	--	--	1.42

TEU	Model ID	Source Description	UTM X Coordinate (m)	UTM Y Coordinate (m)	Elevation (m)	Release Height (m)	X Length (m)	Y Length (m)	Angle (deg)	Initial Vertical Dispersion (m)

1. The Finishing source is an AREAPOLY source is a polygon and does not a defined x-length, y-length or angle.

Figure 2-5 POINT Source Locations

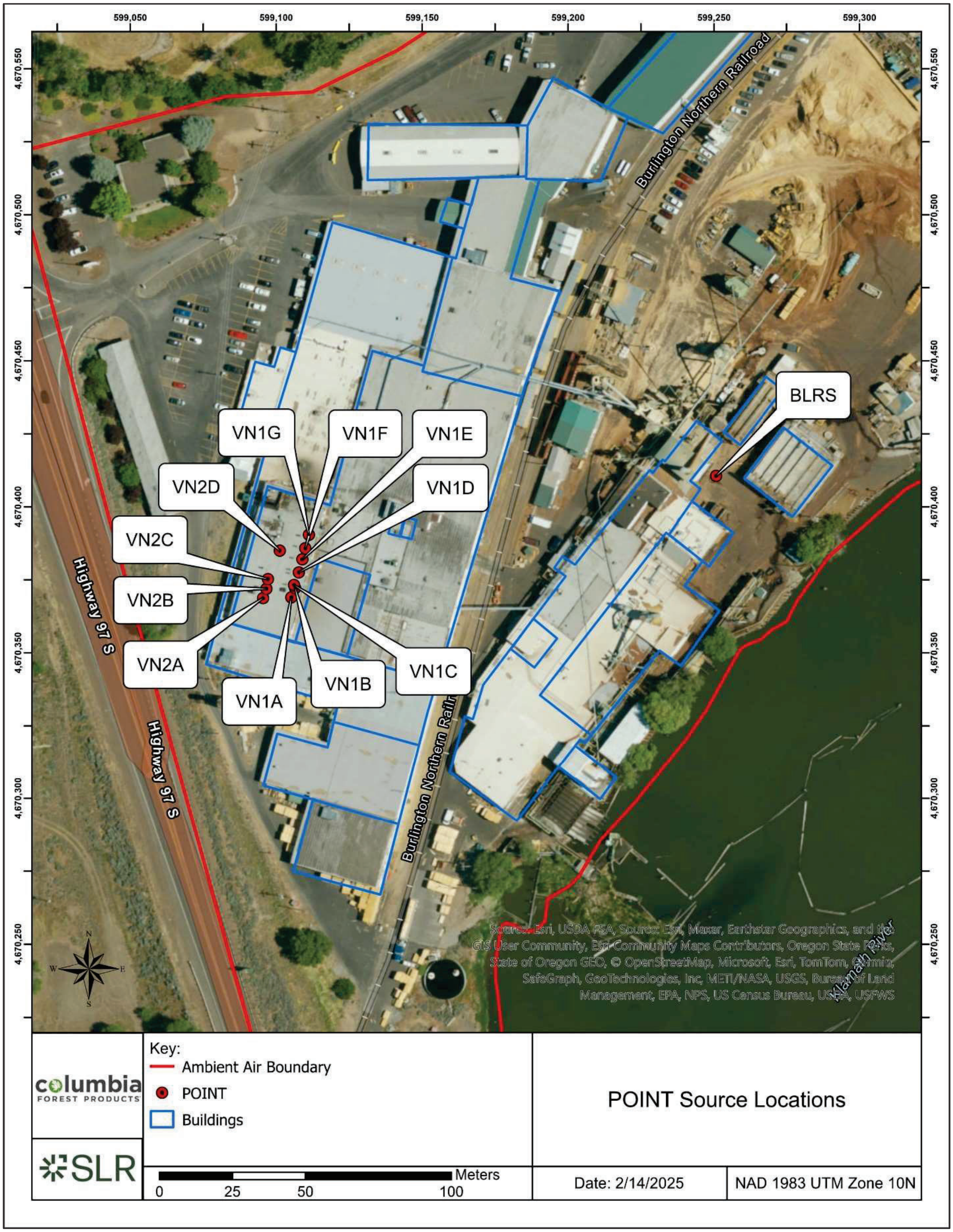
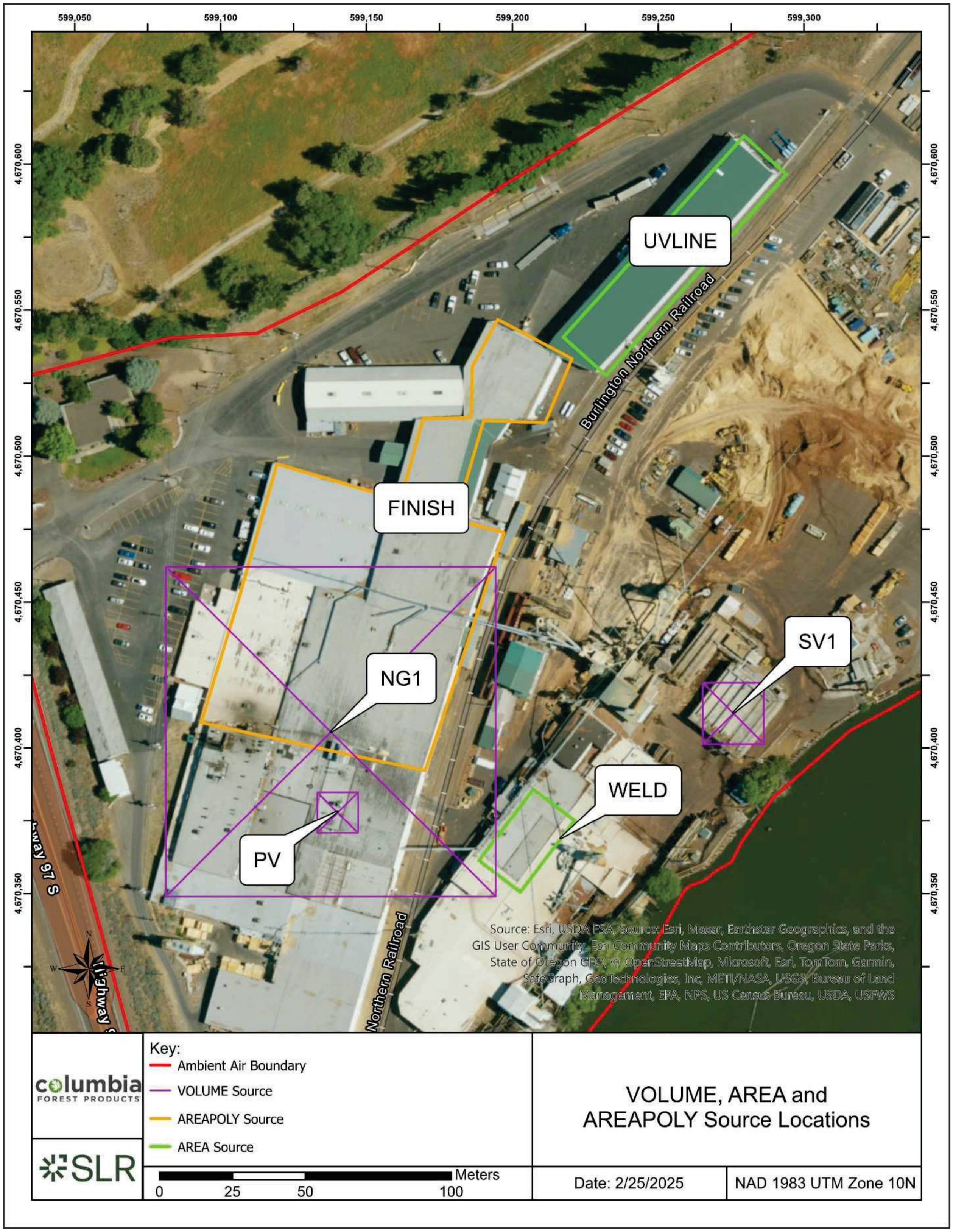


Figure 2-6 VOLUME, AREA and AREAPOLY Source Locations



2.6 Plume Downwash

The effects of plume downwash will be considered for all POINT sources, based on building locations and heights relative to facility emission sources. Direction-specific downwash parameters were calculated using the current version of the USEPA-approved Building Profile Input Program (BPIPPRM Version 04274). Figure 2-7 shows the location of all POINT sources and structures included in the plume downwash analysis.

In addition to calculating direction-specific building dimensions, the BPIPPRM program also calculates the Good Engineering Practice (GEP) stack height. The GEP stack height for each POINT source will be calculated pursuant to the USEPA's methodology to determine "the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies or wakes which may be created by the source itself, nearby structures or nearby terrain obstacles."

Per to 40 CFR 51.1(ii), the GEP stack height is defined as the greater of:

- 65 meters, measured from the ground-level elevation at the base of the stack; or
- Hg = H = 1.5L, where:
  - Hg = good engineering practice stack height, measured from the ground-level elevation at the base of the stack,
  - H = height of nearby structure(s) measured from the ground-level elevation at the base for the stack,
  - L = lesser dimension of the height or projected width of nearby structures.

All facility stack heights will be checked to verify that they are within the GEP stack height limit.

Figure 2-7 POINT Sources and Buildings included in the Downwash Analysis

3.0 Risk Assessment Work Plan

3.1 Introduction

A Level 3 Risk Assessment will be performed to estimate excess cancer risks and non cancer health effects due to facility TAC emissions. This Risk Assessment Work Plan (RAWP) provides the information listed in Section 3.2 of the CAO Guidance.

3.2 Conceptual Site Model

3.2.1 Toxic Air Contaminant Emissions

A listing of Facility TEUs is provided in Section 2.5. Note that Space Heaters combust only natural gas. The list of TACs emitted from the facility are provided in Table 3-1. Individual TAC emission rates from each TEU are provided in **Error! Reference source not found.** for TEUs that operate on natural gas, as well as for TEUs that do not operate on natural gas.

3.2.2 Exposure Locations

Under the CAO program, chronic exposure will be evaluated at residential, non-residential adult (worker), and non-residential child (schools and daycare facilities) locations. Acute exposure will be evaluated at locations outside the facility boundary including areas where people may spend several hours in one day as well as all chronic exposure locations. Sensitive population exposure will also be assessed.

Details regarding the various exposure locations identified from available land use zoning data are provided in Section 3.2.2.

3.3 Toxicity Assessment

The emission inventory described in **Error! Reference source not found.** indicates that 98 TACs are emitted from the facility. The potential human health risks associated with these TACs will be evaluated in the risk assessment.

The toxicity potential risk associated with hypothetical exposures to each TAC are assessed in a screening-level risk assessment using the Risk-Based Concentrations (RBC) provided in OAR 340-245-8010 Table 2. The RBCs account for both the inhalation and non inhalation pathways, as applicable to each TAC, as well as early-life exposure adjustment factors. Table 3-1 lists the RBCs for each emitted TAC.

3.4 Risk Characterization

SLR proposes to use the REER approach for risk characterization, as allowed by DEQ guidance ("Recommended Procedures for Toxic Air Contaminant Health Risk Assessments") Section 3.1.3, Approach C. Under the REER approach, each TAC emission rate described in Section 2.2 is normalized to risk by dividing the emission rate by the appropriate RBC for each exposure type. The calculated REERs are then summed for each TEU for input to the AERMOD dispersion model as the "emission rate" in the SRCPARAM cards for each TEU. The AERMOD output is thus equivalent to units of risk thereby significantly reducing or even eliminating post-processing calculations that other approaches require to calculate risks from standard AERMOD output. The DEQ considers the REER method mathematically equivalent to performing separate risk calculations after modeling as described in DEQ 2022b, Section 3.1.3, Approaches A and B.

For each TAC, there are up to seven RBCs, accounting for the different exposure scenarios under Cleaner Air Oregon (acute, chronic non-cancer residential, chronic cancer residential, chronic non-cancer non-resident child, chronic cancer non-resident child, chronic non-cancer non-resident worker, chronic cancer non-resident worker). Conversions of TAC emissions to REERs for each of the seven exposure scenarios are provided in Appendix A. For each of the seven exposure scenarios, AERMOD will be run using the appropriate REERs and the receptors assigned to each exposure scenario.

For the non cancer risks, certain TACs fall into two classes of Hazard Index, with some TACs falling into the Hazard Index 3 (HI3) category and other TACs falling into the Hazard Index 5 (HI5) category as described in OAR 340 245-8010 Table 1. Review of the TACs emitted by the facility in Tables A-1 through A-7 indicates that, of the 98 TACs emitted by the facility's non-natural gas TEUs that have RBCs, only two (acrolein and propionaldehyde) are HI5 TACs. Review of the emission rates of these TACs and their RBCs versus other TACs in the inventory indicate that these three TACs are not expected to be major contributors to the facility's risk. Therefore, for conservatism and simplicity, all TACs will be treated as though they are HI3 TACs and calculated acute and chronic non cancer risks will be compared to the RALs defined for facilities emitting HI3 TACs.

As discussed in Section 2, the facility includes several sources which combust only natural gas. REER calculations for these sources are also included in Appendix A. These sources will be modeled separately, and the risk attributable to these sources will be included in the modeling report. However, the risk attributable to these sources will not be included in the reported risk for comparison to the RALs. In addition, should a Risk Reduction Plan be necessary, the risk contributions from the sources emitting only natural gas will not be included in the Risk Reduction Plan analysis.

3.5 Uncertainty Evaluation

CAO rules require that an uncertainty analysis be included in a Level 3 Risk Assessment. Although the risk assessment will be conducted using the most recent available emission information and the most recent modeling data, there are various levels of uncertainly associated with a risk assessment. Potential uncertainly in the assessment may occur from the following:

- The acute noncancer risk assessment will be based on the assumption that a person will be exposed for the full 24-hour duration. While it's unlikely that a person will be in the same location for 24 consecutive hours, this methodology should result in the worst-case exposure and may overestimate of the acute noncancer risk.
- The acute noncancer risk assessment will be performed assuming that each TEU is operating at capacity, simultaneously. It's not likely that this operating scenario will occur for a consecutive 24-hour period and should result in an overestimate of the acute noncancer risk.
- The maximum 24-hour model concentration is used for the acute noncancer risk assessment. The maximum 24-hour model concentration is typically the result of worst-case dispersion characteristics that occur on only a few days over the 5-year meteorological data period. It's unlikely that the worst-case meteorology will coincide with the worst-case operating conditions mentioned above as it does in the modeling and should result in an overestimate of the acute noncancer risk.
- The RBCs developed by DEQ for excess cancer and chronic noncancer risk assumes 70 years of exposure, 24 hours a day. It's unlikely that a person will reside in the same area

that is affected by the Facility for 70 years and 24 hours a day. This assumption may result in an overestimation of cancer and chronic noncancer risk.

- The excess cancer and chronic noncancer risk assume that each TEU will operate at capacity over a calendar year. It's unlikely that all TEUs will operate at capacity over a calendar year without downtime for maintenance. Therefore, the assumption that all TEUs will operate at capacity for the calendar year may result in an overestimate of excess cancer and chronic noncancer risk.
- Several TACs emitted at the facility do not have RBCs and therefore cannot be evaluated quantitatively. Though most chemicals known to affect cancer and noncancer risk will have an RBC, an underestimation of the risk may occur since not all TACs are evaluated.
- Exposure locations presented in Section 2.4.2 were developed from Oregon zoning data. Though the data was reviewed using GIS software, there is the potential that the zoning data contains errors. This could result in either an overestimation or underestimation of the results, depending on the situation. Also, zones designated as Exclusive Farm use were designated as residential or worker exposure areas even though most of the zone is cropland or an open field. This is a conservative estimation of the exposure location and may result in an overestimation of excess cancer and chronic noncancer risk.

Table 3-1 RBCs for Each Emitted TAC

CAS	Chemical	Non Cancer Class	Residential Chronic		Non-Residential Chronic				Acute
			Cancer RBC (µg/m³)	Non- cancer RBC (µg/m³)	Child Cancer RBC (µg/m³)	Child Non-cancer RBC (µg/m³)	Worker Cancer RBC (µg/m³)	Worker Non-cancer RBC (µg/m³)	Non-cancer RBC (µg/m³)
75-07-0	Acetaldehyde	HI3	0.45	140	12	620	5.5	620	470
98-86-2	Acetophenone	--	--	--	--	--	--	--	--
107-02-8	Acrolein	HI5	--	0.35	--	1.5	--	1.5	6.9
7440-36-0	Antimony and compounds	HI3	--	0.3	--	1.3	--	1.3	1
7440-38-2	Arsenic and compounds	HI3	0.000024	0.00017	0.0013	0.0024	0.00062	0.0024	0.2
71-43-2	Benzene	HI3	0.13	3	3.3	13	1.5	13	29
7440-41-7	Beryllium and compounds	HI3	0.00042	0.007	0.011	0.031	0.005	0.031	0.02
75-27-4	Bromodichloromethane	--	--	--	--	--	--	--	--
7440-43-9	Cadmium and compounds	HI3	0.00056	0.005	0.014	0.037	0.0067	0.037	0.03
56-23-5	Carbon tetrachloride	HI3	0.17	100	4.3	440	2	440	1900
108-90-7	Chlorobenzene	HI3	--	50	--	220	--	220	--
120-82-1	1,2,4-Trichlorobenzene	--	--	--	--	--	--	--	--
67-66-3	Chloroform	HI3	--	300	--	1300	--	1300	490
95-57-8	2-Chlorophenol	--	--	--	--	--	--	--	--
87-86-5	Pentachlorophenol	--	0.2	--	5.1	--	2.4	--	--
88-06-2	2,4,6-Trichlorophenol	--	0.05	--	1.3	--	0.6	--	--

CAS	Chemical	Non Cancer Class	Residential Chronic		Non-Residential Chronic				Acute
			Cancer RBC (µg/m³)	Non- cancer RBC (µg/m³)	Child Cancer RBC (µg/m³)	Child Non-cancer RBC (µg/m³)	Worker Cancer RBC (µg/m³)	Worker Non-cancer RBC (µg/m³)	Non-cancer RBC (µg/m³)
18540-29-9	Chromium VI, chromate and dichromate particulate	HI3	0.000031	0.083	0.00052	0.88	0.001	0.88	0.3
7440-48-4	Cobalt and compounds	HI3	--	0.1	--	0.44	--	0.44	--
7440-50-8	Copper and compounds	HI3	--	--	--	--	--	--	100
4170-30-3	Crotonaldehyde	--	--	--	--	--	--	--	--
98-82-8	Isopropylbenzene (Cumene)	HI3	--	400	--	1800	--	1800	--
74-90-8	Cyanide, Hydrogen	HI3	--	0.8	--	3.5	--	3.5	340
132-64-9	Dibenzofuran	--	--	--	--	--	--	--	--
51-28-5	2,4-Dinitrophenol	--	--	--	--	--	--	--	--
100-41-4	Ethyl benzene	HI3	0.4	260	10	1100	4.8	1100	22000
7664-39-3	Hydrogen fluoride	HI3	--	2.1	--	19	--	19	16
50-00-0	Formaldehyde	HI3	0.17	9	4.3	40	2	40	49
118-74-1	Hexachlorobenzene	--	0.002	--	0.051	--	0.024	--	--
110-54-3	Hexane	HI3	--	700	--	3100	--	3100	--
7647-01-0	Hydrochloric acid	HI3	--	20	--	88	--	88	2100
7439-96-5	Manganese and compounds	HI3	--	0.09	--	0.4	--	0.4	0.3
7439-97-6	Mercury and compounds	HI3	--	0.077	--	0.63	--	0.63	0.6
7439-92-1	Lead and compounds	HI3	--	0.15	--	0.66	--	0.66	0.15
67-56-1	Methanol	HI3	--	4000	--	18000	--	18000	28000

CAS	Chemical	Non Cancer Class	Residential Chronic		Non-Residential Chronic				Acute
			Cancer RBC (µg/m³)	Non- cancer RBC (µg/m³)	Child Cancer RBC (µg/m³)	Child Non-cancer RBC (µg/m³)	Worker Cancer RBC (µg/m³)	Worker Non-cancer RBC (µg/m³)	Non-cancer RBC (µg/m³)
75-09-2	Dichloromethane (Methylene chloride)	HI3	59	600	620	2600	1200	2600	2100
78-93-3	2-Butanone (Methyl ethyl ketone)	HI3	--	5000	--	22000	--	22000	5000
108-10-1	Methyl isobutyl ketone (MIBK, Hexone)	HI3	--	3000	--	13000	--	13000	--
7440-02-0	Nickel and compounds	--	0.0038	0.014	0.1	0.062	0.046	0.062	0.2
100-02-7	4-Nitrophenol	--	--	--	--	--	--	--	--
83-32-9	Acenaphthene	--	--	--	--	--	--	--	--
208-96-8	Acenaphthylene	--	--	--	--	--	--	--	--
120-12-7	Anthracene	--	--	--	--	--	--	--	--
56-55-3	Benz[a]anthracene	--	0.00021	--	0.0078	--	0.015	--	--
50-32-8	Benzo[a]pyrene	HI3	0.000043	0.002	0.0016	0.0088	0.003	0.0088	0.002
205-99-2	Benzo[b]fluoranthene	--	0.000053	--	0.002	--	0.0038	--	--
192-97-2	Benzo[e]pyrene	--	--	--	--	--	--	--	--
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	--	--
53-70-3	Dibenz[a,h]anthracene	--	0.0000043	--	0.00016	--	0.0003	--	--
206-44-0	Fluoranthene	--	0.00053	--	0.02	--	0.038	--	--

CAS	Chemical	Non Cancer Class	Residential Chronic		Non-Residential Chronic				Acute
			Cancer RBC (µg/m^3)	Non- cancer RBC (µg/m^3)	Child Cancer RBC (µg/m^3)	Child Non-cancer RBC (µg/m^3)	Worker Cancer RBC (µg/m^3)	Worker Non-cancer RBC (µg/m^3)	Non-cancer RBC (µg/m^3)
86-73-7	Fluorene	--	--	--	--	--	--	--	--
193-39-5	Indeno[1,2,3-cd]pyrene	--	0.00061	--	0.022	--	0.043	--	--
91-57-6	2-Methyl naphthalene	--	--	--	--	--	--	--	--
91-20-3	Naphthalene	HI3	0.029	3.7	0.76	16	0.35	16	200
198-55-0	Perylene	--	--	--	--	--	--	--	--
85-01-8	Phenanthrene	--	--	--	--	--	--	--	--
129-00-0	Pyrene	--	--	--	--	--	--	--	--
1336-36-3	Polychlorinated biphenyls (PCBs)	--	0.00053	--	0.02	--	0.0092	--	--
127-18-4	Tetrachloroethene (Perchloroethylene)	HI3	3.8	41	100	180	46	180	41
108-95-2	Phenol	HI3	--	200	--	880	--	880	5800
504	Phosphorus and compounds	--	--	--	--	--	--	--	--
85-68-7	Butyl benzyl phthalate	--	--	--	--	--	--	--	--
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	HI3	0.000000001	0.00000013	0.00000009	0.000026	0.000000042	0.000026	--
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	HI3	0.000000001	0.00000013	0.00000009	0.000026	0.000000042	0.000026	--
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--

CAS	Chemical	Non Cancer Class	Residential Chronic		Non-Residential Chronic				Acute
			Cancer RBC (µg/m³)	Non- cancer RBC (µg/m³)	Child Cancer RBC (µg/m³)	Child Non-cancer RBC (µg/m³)	Worker Cancer RBC (µg/m³)	Worker Non-cancer RBC (µg/m³)	Non-cancer RBC (µg/m³)
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	HI3	0.0000001	0.000013	0.000009	0.0026	0.0000042	0.0026	--
3268-87-9	Octachlorodibenzo-p-dioxin (OCDD)	HI3	0.0000034	0.00042	0.0003	0.085	0.00014	0.085	--
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran (TcDF)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	HI3	0.000000034	0.0000042	0.000003	0.00085	0.0000014	0.00085	--
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	HI3	3.4E-09	0.00000042	0.0000003	0.000085	0.00000014	0.000085	--
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	HI3	0.00000001	0.0000013	0.0000009	0.00026	0.00000042	0.00026	--
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	HI3	0.0000001	0.000013	0.000009	0.0026	0.0000042	0.0026	--
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	HI3	0.0000001	0.000013	0.000009	0.0026	0.0000042	0.0026	--
39001-02-0	Octachlorodibenzofuran (OCDF)	HI3	0.0000034	0.00042	0.0003	0.085	0.00014	0.085	--
7782-49-2	Selenium and compounds	HI3	--	--	--	--	--	--	2
123-38-6	Propionaldehyde	HI5	--	8	--	35	--	35	--

CAS	Chemical	Non Cancer Class	Residential Chronic		Non-Residential Chronic				Acute
			Cancer RBC (µg/m³)	Non- cancer RBC (µg/m³)	Child Cancer RBC (µg/m³)	Child Non-cancer RBC (µg/m³)	Worker Cancer RBC (µg/m³)	Worker Non-cancer RBC (µg/m³)	Non-cancer RBC (µg/m³)
100-42-5	Styrene	HI3	--	1000	--	4400	--	4400	21000
108-88-3	Toluene	HI3	--	5000	--	22000	--	22000	7500
79-00-5	1,1,2-Trichloroethane (Vinyl trichloride)	--	0.063	--	1.6	--	0.75	--	--
79-01-6	Trichloroethene (TCE, Trichloroethylene)	HI3	0.2	2.1	3.5	9.2	2.9	9.2	2.1
75-01-4	Vinyl chloride	HI3	0.11	100	0.22	440	2.7	440	1300
1330-20-7	Xylene (mixture), including m-xylene, o-xylene, p-xylene	HI3	--	220	--	970	--	970	8700
7440-66-6	Zinc and compounds	--	--	--	--	--	--	--	--
401	Polycyclic aromatic hydrocarbons (PAHs)	--	0.000043	--	0.0016	--	0.003	--	--
7664-41-7	Ammonia	HI3	--	500	--	2200	--	2200	1200
7440-39-3	Barium and compounds	--	--	--	--	--	--	--	--
1313-27-5	Molybdenum trioxide	--	--	--	--	--	--	--	--
365	Nickel compounds, insoluble	HI3	0.0038	0.014	0.1	0.062	0.046	0.062	0.2
7440-62-2	Vanadium (fume or dust)	HI3	--	0.1	--	0.44	--	0.44	0.8
107-98-2	Propylene glycol monomethyl ether	HI3	--	7000	--	31000	--	31000	--
101-68-8	Methylene diphenyl diisocyanate (MDI)	HI3	--	0.08	--	0.35	--	0.35	12
111-76-2	Ethylene glycol monobutyl ether	HI3	--	82	--	360	--	360	29000

4.0 References

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Appendix A Emissions Rates and REERs Summary Tables

Modeling Protocol and Risk Assessment Workplan

Cleaner Air Oregon

Columbia Forest Products, Inc.

SLR Project No.: 108.V00218.00040

February 25, 2025

Making Sustainability Happen