MODELING PROTOCOL AND RISK ASSESSMENT WORK PLAN

Cleaner Air Oregon

Biomass One - White City

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1. EXECUTIVE SUMMARY

Biomass One L.P. (Biomass One) is an electrical power cogeneration facility (the Facility) using wood biomass located at 2350 Avenue G, White City, OR 97503, in Jackson County, Oregon. The Facility operates under Title V operating permit 15-0159-TV-01, SIC code 4911 and North American Industry Classification System (NAICS) code 221119 – Electric Power Co-generation wood fired, 25 MW or more under the jurisdiction of Oregon Department of Environmental Quality (Oregon DEQ).

This modeling protocol and risk assessment work plan for a Level 3 Risk Assessment under the Cleaner Air Oregon (CAO) program is being submitted in accordance with OAR 340-245-0210 for Oregon DEQ approval.

A summary of the contents in this document is provided as follows:

- Section 2 of this document describes the modeling methodology, including model selection, source characterization, source testing results, and selection of meteorological data, as well as the emissions inventory in relation to modeled sources.
- Section 3 includes the risk determination methodology for the CAO risk assessment work plan, as well as an uncertainty analysis conducted on the emissions inventory and modeling parameters.

2. MODELING METHODOLOGY

2.1 Model Overview

2.1.1 Dispersion Model Selection

The most recent American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee modeling system, AERMOD version 24142 with Plume Rise Model Enhancements (PRIME) advanced downwash algorithms, is used as the dispersion model in the air quality analysis.

2.1.2 Coordinate System

The location of the emission sources, structures, and receptors for this modeling analysis is represented in the Universal Transverse Mercator (UTM) coordinate system using the World Geodetic System (WGS) 1984 projection. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). The location of the Facility is approximately 4,698,152 meters Northing and 512,432 meters Easting in UTM Zone 10.

2.1.3 Terrain Elevations

Terrain elevations for receptors are determined using the National Elevation Dataset (NED) supplied by the United States Geological Survey (USGS), where facility grading does not apply.[1] The NED is a seamless dataset with the best available raster elevation data of the contiguous United States. NED data retrieved for this model have a grid spacing of 1/3 arc-second or 10 m. The AERMOD preprocessor, AERMAP version 18081, is used to compute model object elevations from the NED grid spacing.[2] AERMAP also calculates hill height data for all receptors. The base elevation for buildings and sources is determined by AERMAP.

2.2 Source Characterization

2.2.1 Facility Description

The facility is a biomass fired steam electric power plant. It acquires "hog fuel" (ground wood waste) from multiple sources including wood products facilities, orchard replacement, forest residuals from logging and thinning operations, as well as biomass material from consumers such as yard debris and remodeling waste. The biomass fuel is then stored in 2 fuel piles (EU-028) where it is spread out to make the pile as homogeneous as possible in order to facilitate stable boiler operations. While stored in the piles the biomass emits methanol due to decomposition of the woody biomass. The acquired biomass fuel is then conveyed to the two Deltak boilers, one delineated as North (EU-011) and one delineated as South (EU-012). The fuel is conveyed to the boilers where it is combusted to produce steam which is subsequently used in a pair of General Electric steam turbines to produce electricity (there is a third, backup turbine that is not normally operated). The electricity is then routed through the Facility's substation into the "power grid" and

[1] NED data retrieved from the National Map website at https://viewer.nationalmap.gov/basic/.

[2] Per the Model Change Bulletin (MCB) #5 issued by the Support Center for Regulatory Atmospheric Modeling (SCRAM) which discusses updates made between AERMAP version 18081 and 24142, the resulting elevations from AERMAP version 18081 are expected to be the same as the elevations that would result from AERMAP 24142 for this model.

sold to Pacific Corp. The boilers are started up and shut down using only natural gas. During these operations the North Boiler will be categorized as (EU-11_Startup) and the South Boiler as (EU-12_Startup).

To support the operation of the Facility there is a Maintenance Shop where welding (TEU-054) and repairs occur. The vast majority of the welding occurs in the Maintenance Shop or Plant Operations area (boilers). In the Maintenance Shop there is also specialized welding (TEU-055) referred to as "hardfacing". For both welding categories, different types of welding are performed with different welding rods. The Maintenance Shop also has a "used oil" fired space heater (EU-013) that operates in the cold months to provide heat to warm the work area of the Shop. Lastly there are chemicals used in the Maintenance Shop & Turbine building (TEU-061), Truck Shop (TEU-062), and the Truck Barn (TEU-063). There is also a greenwood waste grinder onsite in the landscaping area (TEU-064) which processes greenwood waste delivered onsite.

2.2.2 Operating Scenarios

The Biomass One facility will have separate emissions from the boiler stacks during startup and shutdown of the boilers. When starting up and shutting down natural gas will be fired rather than biomass fuel. These startup and shutdown emissions are incorporated into the risk assessment. Each source will be treated as concurrently emitting from the same boiler stacks. The boilers are controlled by a multiclone separator and an electrostatic precipitator (ESP). The ESP is operating during all biomass combustion.

Welding emissions are determined based on the welding rod used during maintenance. Specific welding rod use is dependent on several factors and varies daily and annually based on the equipment that requires servicing. Use of welding rods is considered part of maintenance activities and is unrelated to the throughputs associated with energy production. Biomass One has included conservative daily throughput values for each welding rod type to account for the maximum potential emissions associated with multiple potential maintenance activities. The maximum usage provided in the AQ520 form represents the maximum of any type of rod in a day or year.

2.2.3 Emission Source Location Maps

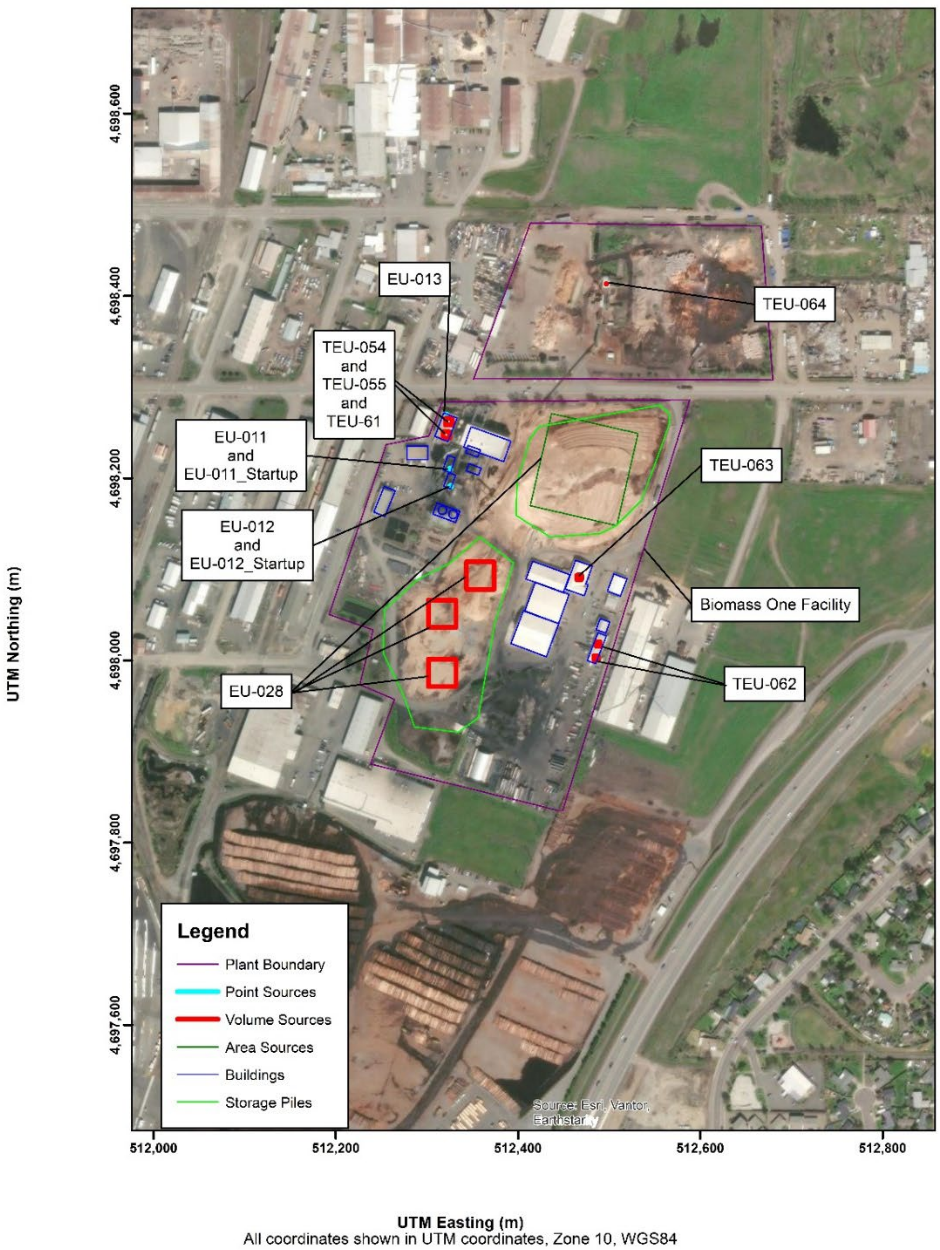
The Facility operates the following significant toxic emission units (TEUs), which as defined in OAR 340-245-0020(52) are units that are not exempt TEUs and are not aggregated TEUs. The significant TEU's are included within this evaluation and listed below in Table 2-1.

Table 2-1. Significant TEUs

TEU Description	TEU ID
North Biomass Boiler	EU-012
South Biomass Boiler	EU-011
North biomass Boiler run on natural gas	EU-012_Startup
South Biomass Boiler run on natural gas	EU-011_Startup
Space Heater	EU-013
Two Storage Piles	EU-028
Maintenance Shop Welding	TEU-054
Maintenance Shop Hardfacing Welding	TEU-055
Maintenance Shop Chemicals	TEU-061
Truck Shop Chemicals	TEU-062
Truck Barn Chemicals	TEU-063
Horizontal Grinder	TEU-064

A facility layout is provided in Appendix A that indicates locations for significant TEUs. The two boilers are located in the northwest part of the Facility, connected to the turbine building. The space heater is located in the northern corner of the maintenance shop, to the west of the turbine building. The two biomass storage piles or fuel piles are located in the south and the southwest part of the site. The horizontal grinder is used in the north part of the site by the landscaping area. Welding will occur in the maintenance shop. Different types of chemicals and aerosols are used in the Maintenance Shop, the Truck Barn, and in the Truck Shop. The Truck Barn is identified as Building 1 in Appendix A and is located on the south side of the facility near the Truck Shop. A map showing the location of the emission sources is included in Figure 2-1.

Figure 2-1. Modeled Objects



2.2.4 Point Sources

The stack parameters used to model emissions from the boilers while burning biomass are obtained from source testing by Advanced Industrial Resources Inc. (AIR) on August 13^{th}-16^{th}, 2024. Natural gas combustion does not have stack test specific information. However, exhaust parameters are expected to be hotter due to higher heating value associated with natural gas combustion in comparison to biomass combustion. Therefore, the stack test exhaust temperature as representative for the natural gas combustion during startup. Natural gas exhaust velocity is estimated at 50,000 cubic feet per minute (cfm).

The service manual for the space heater noted exhaust temperature of 500 to 750 degrees Fahrenheit, the average of this range is used in this exercise. The space heater service manual is included in Appendix A. The exhaust velocity is estimated using the F Factor per method 40 CFR 60 Appendix A, Method 19.[3] Calculations are as follows:

Space Heater - EU13_HTR			
Heat Rate:	3	MMBtu/hr	
Exhaust temp (Tstk):	625	°F	
Site Elevation:	1320	ft MSL	
Ambient pressure (Pstk):	28.51	in. Hg	Calculated based on elevation
F factor:	10320	wscf/MMBtu	40 CFR 60 Appx A Method 19
Exhaust flow	516.0	scfm	Calculated from F factor and heat rate
Exhaust flow:	1129.9	acfm	scfm * (Pstd/Pstk)*(Tstk/Tstd), Pstd = 29.92 "Hg, Tstd = 520 °R
Stack diameter:	0.67	ft	
Stack height:	30.00	ft	
Exhaust velocity:	53.95	ft/sec	Exhaust flow ÷ stack area

Stack orientation, diameter, and height are provided in Table 2-2 as obtained from the Facility. These sources are modeled as a "POINT" or "POINTCAP" source.

Table 2-2. Summary of Point Source Parameters

TEU ID	Description	Model ID	Model Source Type	Stack Height (m)	Stack Temperature (K)	Exhaust Velocity (m/s)	Stack Diameter (m)
EU-011	Normal operation (biomass fuel)	EU11	POINT	29.34	450	18.30	1.93
EU-011_Startup	SUSD operation (NG)	EU11B_NG	POINT	29.34	450	8.06	1.93
EU-012	Normal operation (biomass fuel)	EU12	POINT	29.34	453	18.20	1.93
EU-012_Startup	SUSD operation (NG)	EU12B_NG	POINT	29.34	453	8.06	1.93
EU-013	Space Heater	EU13_HTR	POINTCAP	9.14	603	16.44	0.20

[3] https://www.law.cornell.edu/cfr/text/40/appendix-A-7_to_part_60

2.2.5 Area Sources

An area source is a source whose emissions are distributed over two-dimensional space. The South Fuel Pile onsite is classified in the model as an area source. This fuel pile is an area source because the length and width of the pile is several times the height of the pile. Therefore, the emissions will more closely resemble a large plane than a taller storage pile. The length and width of the pile are determined based on aerial imagery of the pit. A summary of modeled parameters is provided in Table 2-3.

Table 2-3. Summary of Area Source Parameters

Source Description	Source ID	Release Height (m)	X Length (m)	Y Length (m)	Angle (degrees from North)
Material handling from fuel Piles[1]	EU28_MH1	13.44	103.80	97.45	103

1 Release height taken at top of storage pile.

2.2.6 Volume Sources

A volume source is a source whose emissions are distributed over three-dimensional space. Initial lateral and initial vertical dimensions are determined based on the User's Guide for the AMS/EPA Regulatory Model (AERMOD) Table 3-3.[4] The initial lateral dimension is the shorter of the length or width of the source divided by 2.15 for multiple adjacent sources and divided by 4.3 for a single source. The initial vertical dimension is the height of the building or pile divided by 2.15. The release height is the center of the source or associated structure.

The fugitive toxic emissions associated with the Southwest Fuel Pile are modeled as multiple adjacent volume sources along the length of the pile. The fugitive emissions from welding will also be modeled as adjacent volume sources along the length of the maintenance building. Similarly, fugitive emissions from various chemical uses in buildings will be modeled as adjacent volume sources along the associated buildings. A summary of modeled parameters is provided in Table 2-4 below with detailed model parameters included in Appendix D.

[4] User’s Guide for the AMS/EPA Regulatory model (AERMOD) Table 3.3 *Summary of Suggested Procedures for Estimating Initial Lateral Dimensions σyo and Initial Vertical Dimensions σzo for Volume and Line Sources*.

Table 2-4. Summary of Volume Source Parameters

Source Description	Source ID	Release Height (m)	Initial Lateral Dimension (m)	Initial Vertical Dimension (m)
Welding	EU54_WL1	3.66	7.26	3.40
Welding	EU54_WL2	3.66	7.26	3.40
Hardfacing welding	EU55_WL1	3.66	7.26	3.40
Hardfacing welding	EU55_WL2	3.66	7.26	3.40
Material Handling from Southwest Fuel Pile	EU28_MH2	9.68	30.15	9.00
Material Handling from Southwest Fuel Pile	EU28_MH3	9.68	30.15	9.00
Material Handling from Southwest Fuel Pile	EU28_MH4	9.68	30.15	9.00
Fugitive Chemical sources from Turbine Building	EU61-CH1	3.66	7.26	3.40
Fugitive Chemical sources from Turbine building	EU61-CH2	3.66	7.26	3.40
Fugitive Chemical sources from Truck Shop	EU62-CH1	2.89	4.56	2.69
Fugitive Chemical sources from Truck Shop	EU62-CH2	2.89	4.56	2.69
Fugitive Chemical sources from Truck Barn	EU-63	15.0	4.56	2.69
Horizontal Grinder	EU-64	0.76	0.28	0.18

2.2.7 Emission Source Toxic Emission Rates

Emission rates determination for long term (chronic) and 24-hour (acute) impacts are defined with the Facility submission for the emission inventory in AQ520.

Chronic requested PTE emission rates are converted from pounds per year (lbs/yr) to grams per second (g/s) assuming continuous operation of the source. Therefore, annual emissions from each TEU are evenly distributed throughout the calendar year. Additionally, in cases where multiple sources are used to represent a single emission rate (e.g. storage piles), emissions are evenly divided across sources. For both welding and hardface welding, each type of welding and each welding rod has a different chemical composition and risk profile. Therefore, emission rates are calculated for each individual welding type.

Acute requested PTE emission rates are converted from lbs/day to g/s assuming continuous daily operation. The facility has not restricted operation for specific hours of the day.

All calculations and resulting emission factors can be seen in Appendix C.

2.2.8 Downwash

Emissions from each source are evaluated in terms of their proximity to nearby structures. The purpose of this evaluation is to determine if stack discharges might become caught in the turbulent wakes of these structures. Wind blowing around a building creates zones of turbulence that are greater than if the buildings were absent. The concepts and procedures expressed in the Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations)[5] and other related documents are applied to all structures at the proposed Biomass One facility. The Building Profile Input Program (BPIP) Version 04274 is used to calculate the downwash values for each point source.

[5] EPA-450/4-80-023R; Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations); June 1985; https://www.epa.gov/sites/default/files/2020-09/documents/gep.pdf

Buildings located within the facility property boundary are included in this evaluation. There are no nearby structures outside of the ambient air boundary that are expected to impact emissions. The building parameters are provided in Appendix D and are shown in Figure 2-1.

2.2.9 Urban/Rural Determination

The Multi-Resolution Land Characteristics Consortium National 2016 Land Cover Database (NLCD) was consulted to determine whether the site location should be classified as urban or rural.

In accordance with 40 CFR Part 51 Appendix W, Section 7.2.1.1(b)(i), the land use is classified based on a 3-kilometer radius circle around the facility center. Developed, high intensity and developed, medium intensity areas are considered urban, and all other areas are considered rural.

The NLCD2016 data map demonstrates that more than 50% of the land use within a 3-kilometer radius of the facility is rural. A land use map with this graphical interpretation is included in Appendix B. AERMOD's urban option will not be selected.

2.3 Meteorological Data

This section discusses the selection of representative meteorological data that will be used for this risk assessment. A copy of the AERMOD-ready data is provided in this submittal as Appendix F.

2.3.1 Meteorological Data Overview

Five years of surface meteorological data, from 2019 to 2023, are taken from the nearest airport, Rogue Valley International Medford Airport (Station ID: KMFR; WBAN ID: 24225). The upper air data was taken from the same meteorological station (KMFR) for the corresponding period. The meteorological data is processed using AERMET version 23132 using regulatory default options following US EPA's guidance on AERSURFACE and AERMET.[6] In keeping with that guidance, the ADJ_U* option is used to account for low wind speed and stable atmosphere conditions.

One-minute automated surface observing system (ASOS) data was processed using the latest version of AERMINUTE pre-processing tool (version 15272). The 1-minute wind speed threshold of 0.5 meter per second (m/s) is applied for the 1-minute ASOS data according to US EPA guidance. The wind rose for the modeled period (2019-2023) is provided in Figure 2-2.

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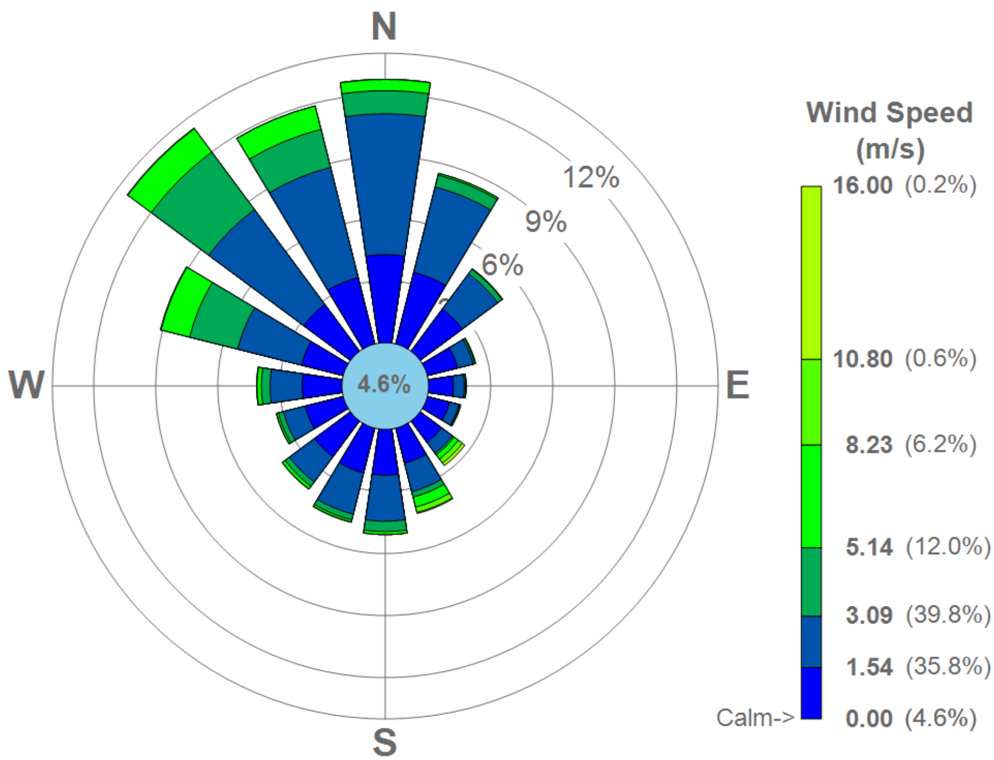
[6] Per the Model Change Bulletin (MCB) #14 issued by the Support Center for Regulatory Atmospheric Modeling (SCRAM) which discusses updates made between AERMET version 23132 and 24142, the resulting AERMAP output from version 23132 is expected to be the same or have negligible difference as result from AERMET 24142 for this model.

Figure 2-2. 2019-2023 Wind Rose at Rogue Valley International Medford Airport (KMFR)



The total percentage of calm wind data is 4.6% for the modeled period.
AERSURFACE was used to process land cover data to determine surface characteristics for use in AERMET.

Thirty years of precipitation data for the period of 1993-2023 was reviewed against the precipitation data for 2019-2023 to identify the moisture condition for each year. Moisture conditions were determined in accordance with US EPA's AERSURFACE User Guide. The moisture condition for 2019 was Wet; the moisture condition for 2021 was Average, and the moisture condition for 2020, 2022, and 2023 was Dry.

2.3.2 Meteorological Data Representativeness

Per 40 CFR Part 51 Appendix W, Section 8.4.1(b), the representativeness of meteorological data is dependent on factors including "(1) The proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected".

The Rogue Valley International Medford Airport meteorological station is located 7 kilometers to the north-northeast of the facility. The terrain of both the proposed facility and of the Rogue Valley International Medford Airport is flat with low-mountain topography located in all cardinal directions of each respective location as both sites reside in Oregon's Rogue Valley. The site's elevation is approximately 404m, while the Rogue Valley International Medford Airport's elevation is 397m. The land cover for the proposed site is generally agricultural with sporadic low to medium-population residential centers nearby within 10km, which is similar to the land cover around Rogue Valley International Medford Airport.

The meteorological dataset includes five years of data, from 2019 to 2023. The total percentage of missing data is 3.73% for the modeled period, and all quarters exceed the US EPA 90% quarterly completeness recommendation. The winds at the Rogue Valley International Medford Airport are primarily northwesterly or northerly. The dominant surface wind directions at the proposed facility are expected to be similar because of its proximity to the Rogue Valley International Medford Airport and the similar topography of the site and the airport. A wind rose for the dataset is provided in Figure 2-2.

Because of the site's proximity to the Rogue Valley International Medford Airport, the similar terrain between the two sites, and the recency of the meteorological dataset, the selected surface station dataset is considered representative for the proposed facility.

Rogue Valley International Medford Airport has a National Weather Service upper-air balloon station available on its facility grounds. The Medford, OR (MFR) station is located onsite near the meteorological station, approximately 7km from the project site with an elevation of approximately 397m. The MFR station is also located in similar terrain and in a location with moisture characteristics that are aligned with those found in the area of the proposed data center. Therefore, as requested by Oregon DEQ, meteorological data processed with the upper air data from the MFR station is used for this assessment.

2.4 Modeling Domain and Receptors

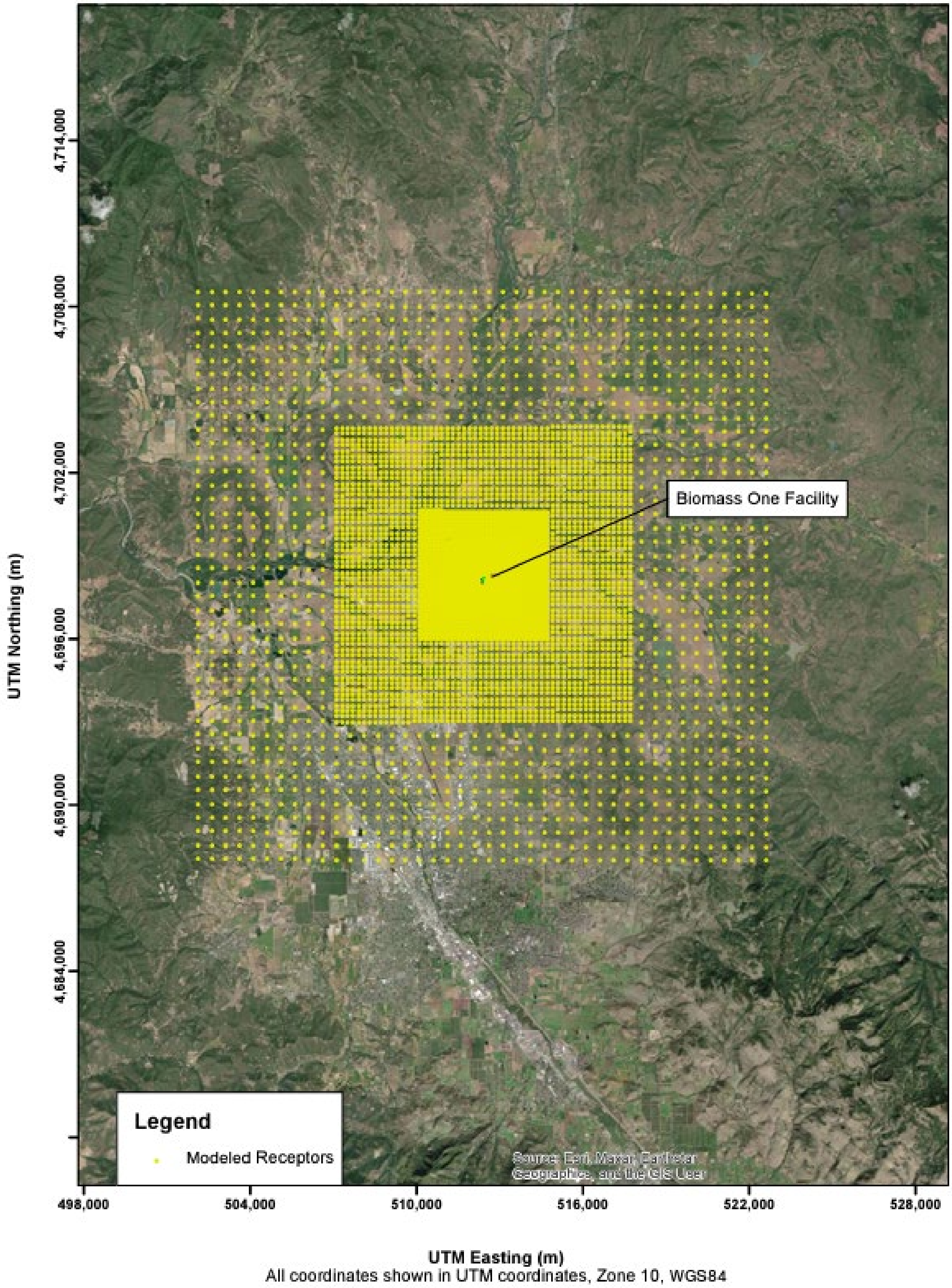
Four circular cartesian receptor grids are used in the analysis that are either as or more fine than the recommended receptor density in Section 2.4 of Oregon DEQ Recommended Modeling Procedures.[7]

- A grid containing 25-meter spaced receptors and extending 300 meters from the facility fenceline.
- A grid containing 50-meter spaced receptors extending from 300 meters to 1,000 meters from the facility fenceline.
- A grid containing 100-meter spaced receptors extending from 1,000 meters to 2,000 meters from the facility fenceline.
- A grid containing 200-meter spaced receptors extending from 2,000 meters to 5,000 meters from the facility fenceline.
- A grid containing 500-meter spaced receptors extending from 5,000 meters to 10,000 meters from the facility fenceline.

In addition, 25-meter spaced receptors are included along the facilities property boundary. The facility lies on both sides of Avenue G with the property boundary encompassing the roads on either side of it. All receptors are placed at ground level elevation, as calculated using the AERMOD preprocessor, AERMAP version 18081. All modeled receptors are shown in Figure 2-3.

[7] Oregon DEQ's Recommended Procedures for Air Quality Dispersion Modeling, March 2022.

Figure 2-3. Modeled Receptors



3. RISK ASSESSMENT WORK PLAN

3.1 Conceptual Site Model

3.1.1 Toxics Assessed

Risk will be evaluated using all toxic emission units at the proposed Biomass One site. The following list of TACs will be included in the Risk Assessment:[8]

- 1,1,1-Trichloroethane (methyl chloroform)
- 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)
- 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)
- 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)
- 1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)
- 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)
- 1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)
- 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)
- 1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)
- 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)
- 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)
- 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)
- 1,2,3-Trimethylbenzene
- 1,2-Dichlorobenzene
- 1,2-Dichloropropane (propylene dichloride)
- 1,4-Dioxane
- 1-Methylphenanthrene
- 2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)
- 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)
- 2,3,7,8-Tetrachlorodibenzofuran (TcDF)
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
- 2,4,6-Trichlorophenol
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2-Butanone (methyl ethyl ketone)
- 2-Butoxyethanol
- 2-Chlorophenol
- 2-Methyl naphthalene
- 3-Methylcholanthrene
- 4,6-Dinitro-o-cresol (and salts)
- 4-Nitrophenol
- 7,12-Dimethylbenz[a]anthracene
- Acenaphthene
- Acenaphthylene
- Acetaldehyde
- Acetone
- Acetophenone
- Acrolein
- Ammonia
- Anthracene
- Antimony and compounds
- Arsenic and compounds
- Barium and compounds
- Benz[a]anthracene
- Benzene
- Benzo[a]pyrene
- Benzo[b]fluoranthene
- Benzo[e]pyrene
- Benzo[g,h,i]perylene
- Benzo[j]fluoranthene
- Benzo[k]fluoranthene
- Beryllium and compounds
- bis(2-Ethylhexyl) phthalate (DEHP)
- Bromomethane (methyl bromide)
- Butyl benzyl phthalate
- Cadmium and compounds
- Carbon tetrachloride
- Chlorine
- Chlorobenzene
- Chloroform
- Chloromethane (methyl chloride)
- Chromium VI, chromate and dichromate particulate
- Chrysene
- Cobalt and compounds

[8] The TACs that do not have Risk-Based Concentrations (RBCs) identified in OAR 340-245-8010 Table 2 are not included in risk calculations, however their emissions are quantified.

- Copper and compounds
- Crotonaldehyde
- Cyanide, hydrogen
- Dibenz[a,h]anthracene
- Dibutyl phthalate
- Dichloromethane (methylene chloride)
- Diethanolamine
- Diethylene Glycol Monobutyl Ether
- Diethylphthalate
- Ethyl benzene
- Ethylene dichloride (EDC, 1,2-dichloroethane)
- Ethylene Glycol
- Ethylene Glycol Monopropyl Ether
- Ethylene Oxide
- Fluoranthene
- Fluorene
- Fluorides
- Formaldehyde
- Hexane
- Hydrochloric acid
- Hydrogen fluoride
- Indeno[1,2,3-cd]pyrene
- Isopropyl alcohol
- Isopropylbenzene (cumene)
- Lead and compounds
- Manganese and compounds
- Mercury and compounds
- Methanol
- Methyl isobutyl ketone (MIBK, hexone)
- Methylene Diphenyl Diisocyanate (MDI)
- Molybdenum trioxide
- Naphthalene
- Nickel and compounds
- Nickel compounds, insoluble
- Octachlorodibenzofuran (OCDF)
- Octachlorodibenzo-p-dioxin (OCDD)
- p-Dichlorobenzene (1,4-dichlorobenzene)
- Pentachlorophenol
- Perylene
- Phenanthrene
- Phenol
- Phosphorus and compounds[9]
- Phthalates
- Polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Propionaldehyde
- Propylene Glycol Monomethyl Ether
- Pyrene
- Selenium and compounds
- Silica, crystalline (respirable)
- Silver and compounds
- Styrene
- Tetrachloroethene (perchloroethylene)
- Thallium and compounds
- Toluene
- Trichloroethene (TCE, trichloroethylene)
- Trichlorofluoromethane (Freon 11)
- Vanadium (fume or dust)
- Vinyl chloride
- Xylene (mixture), including m-xylene, o-xylene, p-xylene
- Zinc and compounds

[9] Phosphoric acid is categorized as "Phosphorous and Compounds" (DEQ ID 504)

3.1.2 Exposure Locations

The receptor type for exposure was determined using digital shapefile for zoning information from Oregon Department of Land Conservation and Development.[10] The facility is located in an area with a mix of zoning and is immediately surrounded by areas that are zoned as Industrial-Heavy, and Commercial-General. There is also residential zoning with various densities. Mixed Farm-Forest (MFF) zoning in the vicinity of the Facility. A Worker exposure location is assigned for the commercial and heavy industrial areas, and Residential for any density residential zoning. For the MFF zoning, the receptor types will be residential for houses, worker for barnyards, and acute-only for fields or forest. Receptors located in MFF or Exclusive Farm-Use (EFU) zoning within 1.5 km of the facility will be categorized as acute-only receptors except for any residences or farm working areas (such as warehouses or barns) identified via satellite imagery. Outside the 1.5 km radius, each receptor will be conservatively treated as residential.[11] The following locations are identified for the purpose of this risk assessment:

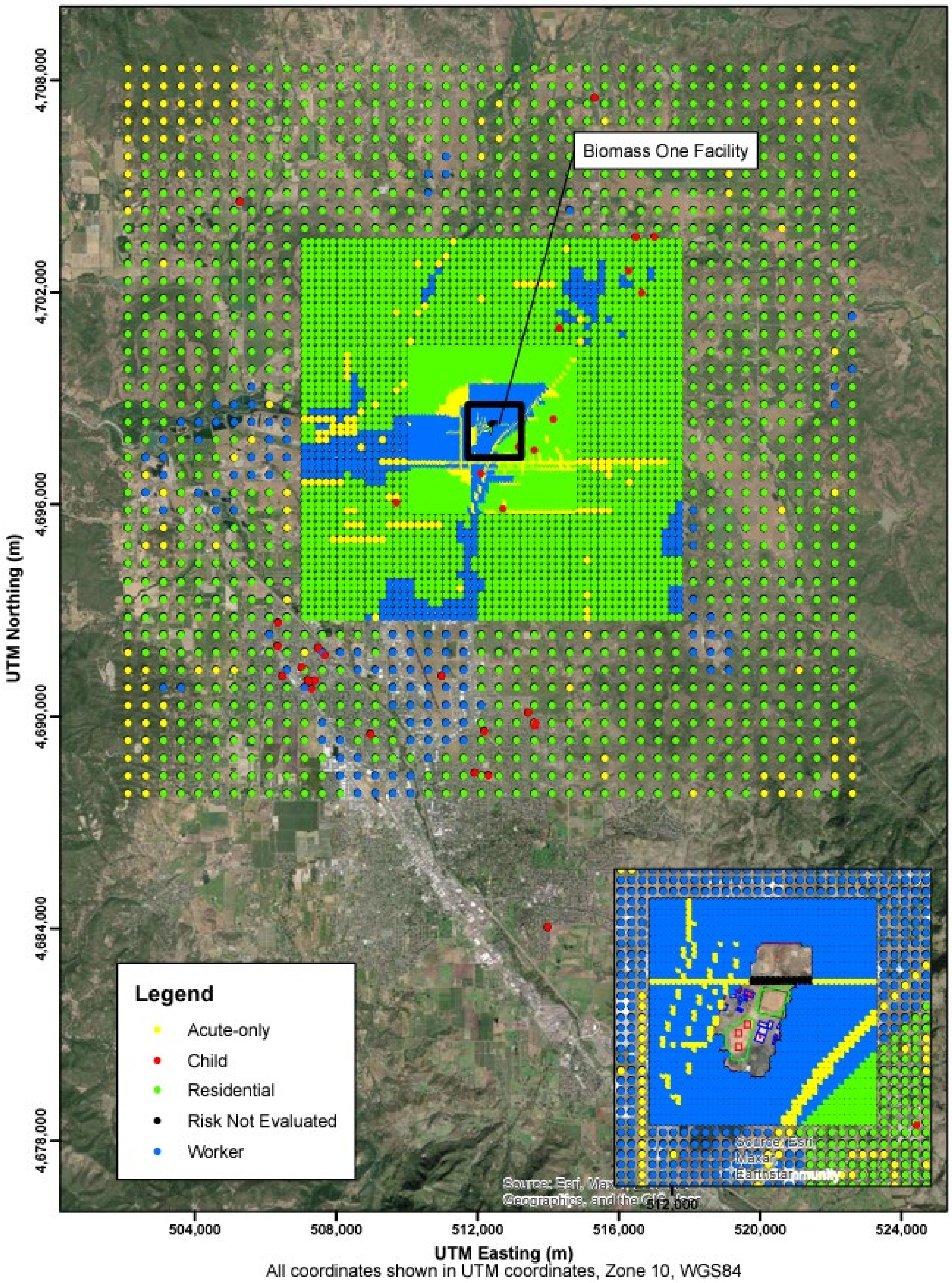
- The closest residential receptor to the facility is located 0.30 km from the facility and is zoned in a residential area.
- The Facility lies within industrial zoning and the area immediately surrounding the facility will be assessed for worker risk.
- The closest child receptor is located 0.75 km to the southeast from the Facility at Table Rock Elementary School at 512,306.08 m Easting and 4,698,176.97 m Northing.

Acute risks should be evaluated everywhere that people may spend several hours in a day per OAR 34245-0020(4). The receptors that lie on the facility fenceline between the facility properties and in the roadway on Avenue G between the facility properties will not be assigned an exposure location and will not have risk evaluated. All receptors assessed for chronic risks will be also assessed for acute risks. The exposure location crosswalk which labels every receptor's exposure type is included in Appendix G.

[10]Available at https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=planners.

[11] All receptors are designated in accordance with Oregon DEQ specified procedures, therefore AQ521 and AQ522 are not necessary.

Figure 3-1. Exposure Receptor by Type



3.1.3 Toxic Emission Unit Modeled Stack Parameters

All emission units will have the parameters as identified in Table 2-1, Table 2-2, Table 2-3, and Table 2-4. Details of the operating scenarios regarding startup and shutdown operations and welding maintenance activities are provided in Section 2-2. All emission units are modeled with the expected potential emission rate for the chronic and acute averaging period. Appendix D includes the modeled emission source parameters for individual units.

3.1.4 Calculation Methodology for REERs

There are up to seven risk-based concentrations (RBCs) that have been developed for each TAC to evaluate potential chronic cancer, chronic noncancer, and acute risks associated with the potential emissions at the facility, which are provided in OAR 340-245-8010 Table 2. The RBCs include assumptions and evaluations regarding exposure pathways for the specified exposure location. For both the chronic and acute analyses, Biomass One proposes to use Approach C: Risk-equivalent emission rate (REER) provided in *Recommended Procedures for Toxic Air Contaminant Health Risk Assessments*.[12] This method produces dispersion factors out of AERMOD that are used in conjunction with the REER to determine potential risk. The REER tables that are used to calculate the source REER are provided in Appendix E. The REER for each chemical is calculated by converting the annual and daily emission rates described in the CAO Form AQ520 to g/s and then dividing by the chemical's RBC. To account for the multiple types of welding performed, a REER is calculated for each type of welding and welding rod. The welding type with the greatest REER in each category is conservatively used as the representative REER for TEU_054 and TEU_055. REER values are used as the modeled emission rate. In the instance that emissions are included in the model as multiple sources, REERs are evenly divided across the sources. As an example, the REER for EU-028 Residential Chronic Noncancer is 0.00000139 g/s per $\mu g/m^3$. There are four modeled sources that comprise the EU-028 including EU28_MH1 (area source), EU28_MH2, EU28_MH3, and EU28_MH4. Therefore, each volume source is modeled using a REER of 0.000000348 g/s per $\mu g/m^3$. The resulting models will output the risk for specified exposure location and cancer or noncancer impacts.

3.1.5 Risk Determination

Separate models will be completed for each exposure type. Using the modeled parameters with REERs representing the emission rates, potential risk will be determined at each exposure location. Modeled results for each source category will be rounded as specified in OAR 340-245-0200(4) to determine further actions in comparison to the risk action levels. Biomass One will include calculation of Risk Determination Ratio as specified in OAR 340-245-0200(5), if the resulting noncancer hazard index is greater than 1.

Startup and shutdown processes for the boilers use natural gas as the fuel source. These emissions will use the gas combustion exemption and be excluded from comparison to risk action levels.[13]

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[12] Section 3.1.3, Recommended Procedures for Toxic Air Contaminant Health Risk Assessments, Oregon DEQ (October 2022).

[13] OAR 340-245-0050(5).

3.2 Uncertainty Analysis

This section discusses the assumptions made for this risk assessment work plan and provides qualitative discussion on the uncertainty in the risks that will be reported in the risk assessment.

3.2.1 Selection of TACs for Evaluation

The list of TACs used for this risk assessment is presented in Section 3.1. Risk has not been assessed for the follows TACs without associated RBCs which may cause an underestimation of total risk.

- 1,2-Dichlorobenzene
- 1,4-Dioxane
- 2,4,6-Trichlorophenol
- 2,4-Dinitrophenol
- 2-Chlorophenol
- 4,6-Dinitro-o-cresol (and salts)
- 4-Nitrophenol
- Acetophenone
- Butyl benzyl phthalate
- Crotonaldehyde
- Dibutyl phthalate
- Dichloromethane (methylene chloride)
- Diethanolamine
- Diethylene Glycol Monobutyl Ether
- Diethylphthalate
- Ethylene Glycol Monopropyl Ether
- Ethylene Oxide
- Phthalates
- Trichloroethene (TCE, trichloroethylene)
- Trichlorofluoromethane (Freon 11)
- Vinyl chloride
- Barium and compounds
- Molybdenum trioxide
- Silver and compounds
- Thallium and compounds
- Zinc and compounds
- 1-Methylphenanthrene
- 3-Methylcholanthrene
- 7,12-Dimethylbenz[a]anthracene
- Nickel and compounds
- 2-Methyl naphthalene
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo[e]pyrene
- Fluorene
- Perylene
- Phenanthrene
- Phosphorus and compounds
- Propylene Glycol Monomethyl Ether
- Pyrene
- Fluorides

3.2.2 Emission Rate Calculations

Emission rates for the boilers are calculated using source testing data, Oregon DEQ approved emission factors, and emission factors from AP-42. There is a low degree of uncertainty in emission rates that are based on Oregon DEQ approved emission factors or source testing data during biomass combustion. Emission rates based on AP-42 emission factors are expected to be conservative. As discussed in section 2.2.4, boiler startup and shutdown emissions were estimated using Oregon DEQ's emission factors which are a conservative estimate of the actual emissions at the site. Similarly, emission factors for the space heater were calculated using AP-42, which conservatively estimates emissions.

The emissions estimates for the biomass storage pile's material handling methanol emissions are developed using PotlatchDeltic Land & Lumber PSD permit from EPA Region 10. These emissions lend some uncertainty as they are applied from another site and company; however, the processes are very similar and are expected to be representative.

The greenwood waste woodchipper emissions are estimated using an AP-42 factor for greenwood log debarking. This estimate is expected to be conservative.

The Facility estimated emissions from each welding type in the AQ520 form using Oregon DEQ's Welding Emission Calculation Tool. In this tool, the weight percentage of TAC's within the welding rods is reported as an estimated percentage for proprietary reasons. Weights were entered as an average of the percentage stated in the safety data sheets for each rod type. These agency tools lend a high degree of conservancy and can overestimate the estimated risk.

3.2.3 Exposure Pathways

An exposure pathway is the course a toxic air contaminant takes from a source to the exposed organism. The toxic chemicals incorporated into this risk assessment are airborne. Adjustments to incorporate any variance in exposure pathways are accommodated by using the RBC as defined by OAR 340-245-8010, Table 2. Oregon DEQ fully details adjustments for early-life and multipathway pollutants in Section 2.5 of the Recommended Procedures for Toxic Air Contaminant Health Risk Assessments (October 2022). The following chemicals have adjustments made to their RBC's.

Early-Life Adjustments

- Benzo[a]pyrene
- Chromium VI
- Dichloromethane
- Ethylene Oxide
- PAHs
- TCE
- Vinyl Chloride

Multipathway Cancer Adjustments

- Arsenic
- Benzo(a)pyrene
- Bis-(2-ethylhexyl)phthalate (DEHP)
- Cadmium
- Chromium VI
- Lead
- Naphthalene
- PCBs
- PAHs

Multipathway Noncancer Adjustments

- Arsenic
- Cadmium
- Chromium VI
- Fluorides
- Hydrogen Fluoride
- Mercury
- Naphthalene
- PCBs

It should be noted that Biomass One is proposing a Level 3 as part of this risk assessment process as it is assumed that risk from the Facility will not result in additional exposure pathways. Although Biomass One emits a variety of chemical constituents (i.e., dioxins/furans), emissions from these chemicals will not pose additional pathway impacts because the parcels with homes present where a prolonged period of deposition that impacts the same person(s) will be treated as residential exposure. Residential RBCs already include multipathway adjustment factors (MPFs) and therefore will not require an additional analysis to be completed, such as a Level 4.

3.2.4 Exposure Assessment Assumptions

The calculated risks will be based on AERMOD outputs, which are expected to overestimate the predicted concentrations at receptor locations, for the following reasons:

- AERMOD is an EPA-approved steady-state plume model and is periodically updated to refine the dispersion calculations and provide more accurate results with the intention to avoid underestimating the impacts.
- The acute risks are calculated based on maximum 24-hour model output. This method assumes that the worst-case emission rates occur on the worst-case meteorological day. Considering the conservatism built into the emission calculations and the variation of meteorological data, this creates an unrealistic, conservative scenario.

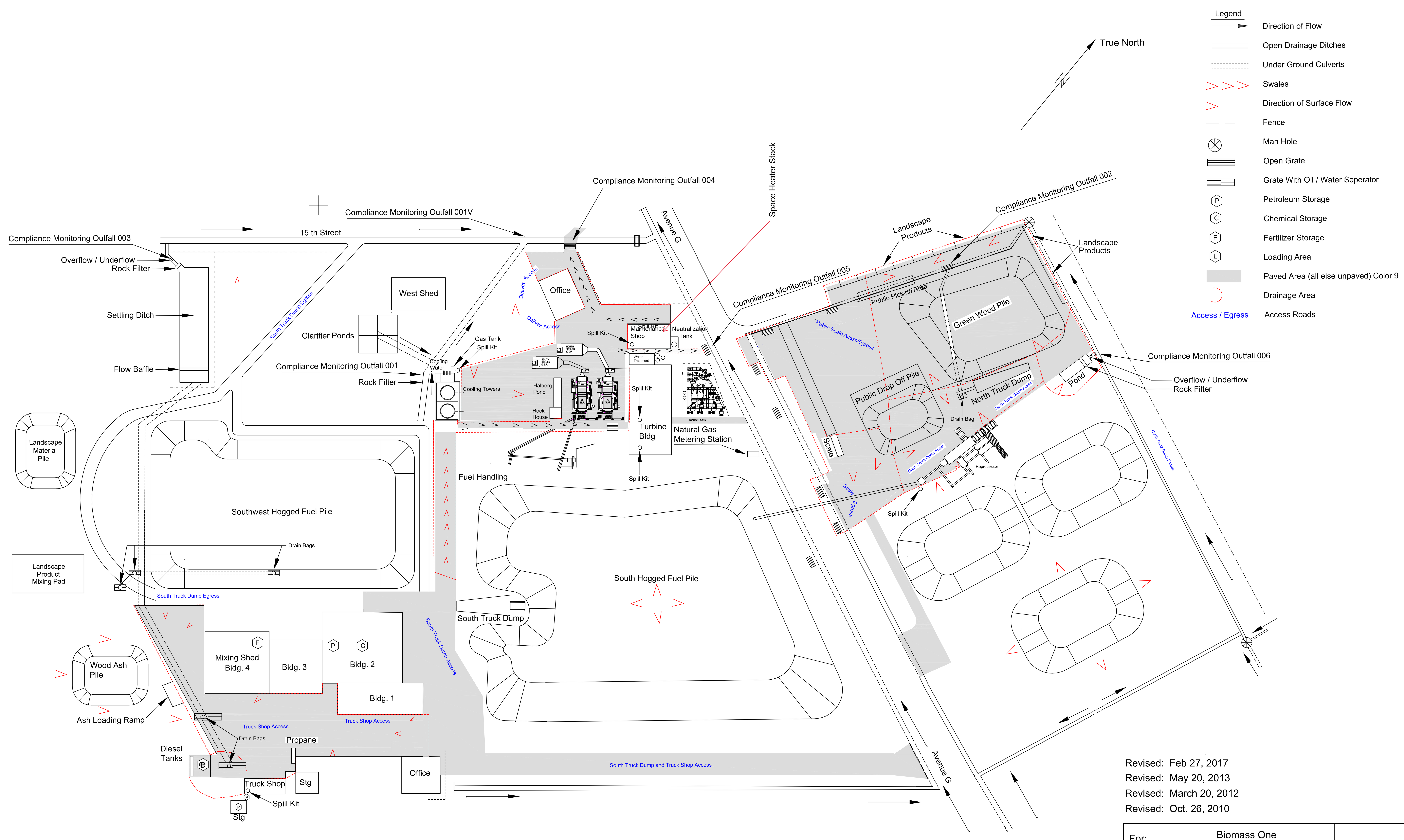
3.2.5 Derivation of Toxicity Values

The calculated risks are determined based on the model results and the RBCs for each TAC evaluated in this risk assessment. The RBCs in OAR Chapter 340-245 are determined from the Toxicity Reference Values (TRVs) and then are adjusted with expected exposure duration and target organs for each TAC.
Firstly, the TRVs are obtained from various sources, including but not limited to EPA's Integrated Risk Information System (IRIS) database, Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles, and California's Office of Environmental Health Hazard Assessment (OEHHA). The TRVs are selected from the reference concentrations (RfCs) for noncancer effects and unit risk factors (URFs) for cancer effects. When EPA and other agencies developed the RfCs or URFs, uncertainty factors (UFs) are applied to derive the doses or concentrations from various studies. The UFs usually include interspecies extrapolation, possible human variability in sensitivity etc. which are intended to result in protective doses or concentrations.

Secondly, the exposure duration is also based on conservative assumptions, e.g., a worker stays in the area with highest ambient concentration for 8 hours per day, 250 days per year, over a period of 25 years. These assumptions significantly overestimate the reported risks.

Lastly, not all TACs have the same target organ for the same exposure type. For example, ethyl benzene compounds target kidneys while ammonia targets the respiratory system. However, when calculating the risks reported in this risk assessment, it is assumed that all compounds target the same organ by summing the calculated risks directly. Therefore, the reported risks are likely overestimated in this risk assessment.

APPENDIX A. FACILITY LAYOUT AND EQUIPMENT SPECIFICATION



Limits: 2000'x3000'
Text: 12'

Drawing Name: Biomass Revised Site Plan

Revised: Feb 27, 2017
Revised: May 20, 2013
Revised: March 20, 2012
Revised: Oct. 26, 2010

For: Biomass One Location: White City		Scale 1" = 90'
Title: Revised Facility Site Plan		
DRN: RLE	CKD: JKY	Date: Oct. 26, 2010

Firelake

Owner's Manual

Multi-Oil Fired Furnaces

MODELS

155, 200, 245, 315, 350, & 500

(Single pass and 3-Pass Units)

All Installations Must Be In Accordance With State and Local Codes and it is the responsibility of the installer to assure all codes are met

For service, call your dealer or installer at

Date Installed:

WARRANTY NOTICE

Use of equipment on any equipment not manufactured or designed for use VOIDS the warranty - property or personal damage could occur.

Created: May 2007 **Revised: 8/20/09**

Table of Contents

SPECIFICATIONS

Model 'A' Oil Pump		Model 'J' Oil Pump
1/4 " FNPT	Inlet Port	1/4 " FNPT
1/8 FNPT	Outlet Port	1/8 " FNPT
40-60 PSI	Pressure Range	20-40 PSI
6 GPH	Max. Flow	18 GPH
3450 RPM	Max Allowable Speed	3450 RPM
1/4	HP	1/4
CW Shaft End	Rotation	CW Shaft End
20" Hg	Max Operating Vacuum	20" Hg
10' Vertical	Maximum Suggested Lift	10' Vertical
<30', use 3/4" pipe	Horizontal Suction Piping	<30', use 3/4" pipe
30-90', use 1" pipe	Horizontal Suction Piping	30-90', use 1" pipe

Maximum Fuel Consumption

Model	U.S. Gal./Hr.	liters/hr	Model	U.S. Gal./Hr.	liters/hr
155	1.1	4.2	200	1.43	5.41
245	1.75	6.62	315	2.25	8.52
350	2.5	9.46	500	3.6	13.6

Air Pump ***(Burner mounted, fits all but Mdl 350, 500)*** 3450 rpm, filtered inlet, 20 psi discharge.

Minimum Heater Clearances

Above: 6"(15cm)	Inlet Blower: 18"(46cm)	Rear: 18"(46cm)	Chimney Connector: 18"(46cm)
Below: 18"(46cm)	Outlet Louver: 84"(2.1m)	Front: 24"(61cm)	

Cabinet Dimensions (includes stack collars but not blower or burner)

Model	Length	Width	Height	Weight	Hot Air Outlet
155	66"(1.67m)	22"(56cm)	18"(46cm)	150#(68kg)	15" sq. (38cm)
200	79"(2m)	22"(56cm)	22"(56cm)	167#(76kg)	15" sq. (38cm)
245	82"(2.1m)	26"(66cm)	22"(56cm)	200#(91kg)	18" sq. (46cm)
315	96"(2.5m)	26"(66cm)	22"(56cm)	256#(116kg)	18" sq. (46cm)
350	55"(1.4m)	52"(1.32m)	33"(84cm)	800#(364kg)	23x41"(58x104cm)
500	55"(1.4m)	52"(1.32m)	33"(84cm)	800#(364kg)	23x41"(58x104cm)

Overall Dimensions of Heater with Burner and Blower

Model	Length	Width	Height	Weight
155	79.5"(2.0m)	22"(56cm)	34.5"(88cm)	234#(106kg)
200	92.5"(2.3m)	22"(56cm)	34.5"(88cm)	251#(114kg)
245	95.5"(2.3m)	26"(66cm)	41"(1m)	348#(158kg)
315	109.5"(2.8m)	26"(66cm)	41"(1m)	348#(158kg)
350	59"(1.5m)	62"(157cm)	33"(84cm)	927#(421kg)
500	59"(1.5m)	62"(157cm)	33"(84cm)	927#(421kg)

Construction and Specifications:

Heat Exchanger : Stainless and/or aluminized steel. Exhaust collars 8" (20cm), 10" (25.4cm) model 500. Stack allows connection to either side (except 350,500). Cap provided must be installed on unused collar.

Cabinet : Mill coated appliance grade painted steel. The louvered opening may be rotated and/or placed on either side and filler panel is provided and installed on the side opposite the outlet (Except model 350, 500). Burner is attached to a hinged door that allows for easy clean out as well as inspection of nozzle area.

Blower HP (Min.) : Model 15, 20, 35: 3/4 HP. Model 24, 31, 50: 1HP

HEATER INSTALLATION PROCEDURE

1) Select a location for your heater observing minimum clearance to combustibles. Consider that maintenance and cleaning will be required. Allow adequate work space around burner and stack. Mount heater as low as code allows, easing service and keeping your heat at floor level. Select a noncombustible area or observe minimum clearances to combustibles.

2) For best operation minimize distance of horizontal chimney runs. Do not exceed 8' in length. Horizontal runs must have a minimum 1/4" rise per foot. Clean horizontal runs every 500 hours of use or as needed. Ash will accumulate here and block draft. Poor draft causes poor flame, backpressure, oily buildup, unreliable ignition. Use a draft inducer if draft is marginal or inconsistent. Negative pressure is a must in the flame area.

3) If suspending the heater use (4) 3/8, 1/2, or 5/8 diameter all-thread and tie into the provided brackets at each end of the cabinet. The mount brackets are designed to attach at the top or bottom of the heater ends to meet various field mounting needs. Lock nuts and washers should be used for safety. <u>Never let the weight of the heater rest on the weaker center portion of cabinet bottom, cabinet will flex</u>. The larger models are more prone to this.

4) WASTE OIL FURNACES ARE DEPENDENT ON PROPER DRAFT FOR EFFICIENT BURNING. ASSURE THAT ADEQUATE MAKE-UP AIR IS AVAILABLE. NEGATIVE DRAFT REQUIREMENT: -.04 TO -.06 INCHES OF WATER COLUMN AT FURNACE OUTLET. BUILDING EXHAUST FANS OR COLD BUILDINGS AT NIGHT CAN REVERSE YOUR DRAFT AND CAUSE FUMES, POOR COMBUSTION, OR NUISANCE BURNER LOCKOUTS. TAKE MEASURES TO ASSURE FURNACE WILL HAVE PROPER DRAFT DIRECTION WHEN OPERATING.

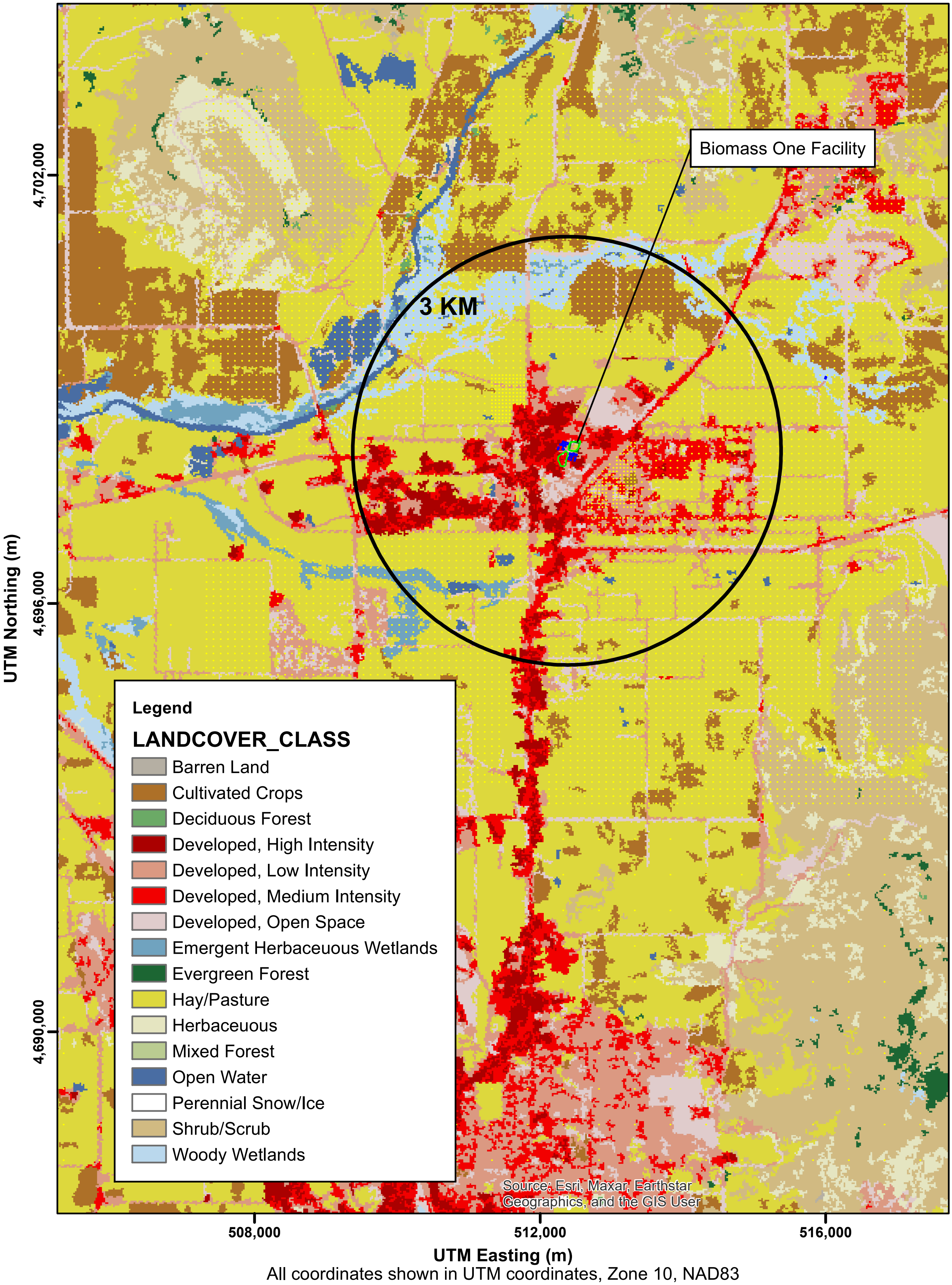
5) If permanent masonry chimney is not available, use appropriate diameter multi-wall manufactured chimney and collars listed for use with oil fired furnaces per UL 103 or All Fuel Class A. Locate for easy connection to the furnace and install per manufacturers' instructions and local building and fire codes. Normal operation will produce a gross chimney temperature between 500F and 750F.

6) The chimney must extend a minimum 3' above the highest roof line within 10'. In general you will need a minimum of 2 feet of vertical for each foot of horizontal for best draft.

7) Use a stack that is equal diameter to the furnace outlet. Use minimum 24 gauge single wall connector pipe between furnace outlet and damper. Do not allow rain to come down the chimney and have a path into fire chamber. This will create a rusting environment. Install a chimney tee near the furnace to act as a cleanout / water trap.

8) Locate barometric damper near the furnace and face away from blower. Its opening must be visible from the floor and out of strong air flows that could falsely affect its ability to regulate. Read instruction sheet included with damper.

APPENDIX B. LANDUSE MAP



All coordinates shown in UTM coordinates, Zone 10, NAD83

APPENDIX C. EMISSION CALCULATIONS

Oregon DEQ Form AQ520 for the emission inventory is submitted in a separate electronic copy using a Microsoft Excel file. This electronic submittal shows the total of each pollutant per toxic emission unit for the specified averaging period.

APPENDIX D. MODELED BUILDING AND SOURCE PARAMETERS

Appendix Table D-1. Building Parameters

Building ID	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Height (m)
B_2	512318.5	4698271.8	402.15	7.32
B_4	512278	4698235	401.83	4.11
B_5	512323	4698225	402.14	29.26
B_6	512324	4698206	402.12	29.26
B_3	512348.5	4698256.5	402.26	16.15
B_8	512253	4698191	401.64	7.01
B_9	512311	4698173	402.08	7.92
B_7A	512345.2	4698235.9	402.25	18.9
B_7B	512346	4698216	402.25	18.9
BLDG_3	512419	4698086	402.81	7.92
BLDG_4	512406	4698055	402.82	13.41
BLDG_2	512416	4698109	402.72	9.14
BLDG_7	512476	4698000	403.35	5.79
BLDG_6	512490	4698046	403.21	5.79
BLDG_5	512498	4698076	403.11	3.96
FAN_1	512316.9	4698165	402.15	10.97
FAN_2	512328.6	4698160.4	402.23	10.97
BLDG_1	512463	4698110	402.88	9.14

Appendix Table D-2 Source Parameters

Source ID	X Coordinate (m)	Y Coordinate (m)	Elevation (m)	Height (m)
EU11	512325	4698210.0	402.14	29.34
EU12	512326	4698191.0	402.15	29.34
EU11B_NG	512325	4698210.0	402.14	29.34
EU12B_NG	512326	4698191.0	402.15	29.34
EU13_HTR	512321.9	4698270.3	402.15	29.34
EU28_MH1	512436.7	4698271.0	402.6	13.44
EU28_MH2	512316.7	4697986.3	402.26	9.68
EU28_MH3	512316.7	4698051.2	402.14	9.68
EU28_MH4	512358.4	4698093.2	402.39	9.68
EU54_WL1	512323.9	4698261.9	402.15	3.66
EU54_WL2	512321.1	4698247.4	402.15	3.66
EU55_WL1	512323.9	4698261.9	402.15	3.66
EU55_WL2	512321.1	4698247.4	402.15	3.66
EU63	512467.1	4698091.2	402.88	4.57
EU64	512496.9	4698413.4	402.1	0.76
EU61_CH1	512323.9	4698261.9	402.15	3.66
EU61_CH2	512321.1	4698247.4	402.15	3.66
EU62_CH2	512487.8	4698018	403.35	2.89
EU62_CH1	512485.6	4698002.9	403.35	2.89

APPENDIX E. REER CALCULATIONS

Files submitted electronically only.

APPENDIX F. METEOROLOGICAL DATA

Files submitted electronically only.

APPENDIX G. CAO CROSSWALK

Files submitted electronically only.