

CLEANER AIR OREGON— MODELING PROTOCOL

STIMSON LUMBER COMPANY FOREST GROVE COMPLEX
GASTON, OREGON



Prepared for
OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
CLEANER AIR OREGON AIR TOXICS PROGRAM
January 11, 2024
Project No. M0066.03.07

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ACRONYMS AND ABBREVIATIONS

ADJ_U*	adjustment to the surface frictional velocity
AGL	above ground level
ASOS	automated surface observation station
DEQ	Department of Environmental Quality (Oregon)
DEQ-approved emissions inventory the facility	emissions inventory approved by the DEQ on March 28, 2023 sawmill and wet process hardboard plant
DEQ met data files	AERMOD-ready meteorological data files SFC and PFL that were provided by the DEQ in 2018
EPA	U.S. Environmental Protection Agency
ESP	dry electrostatic precipitator
g/s	grams per second
Hillsboro met station	Portland-Hillsboro Airport monitoring station
Kiln	Lumber Kiln
m	meter
MFA	Maul Foster & Alongi, Inc.
MMIF	Mesoscale Model Interface Program
MMIF data	MMIF-derived prognostic meteorological data
MSL	mean sea level
OAR	Oregon Administrative Rule
RBC	risk-based concentration
Stimson	Stimson Lumber Company
TAC	toxic air contaminant
TEU	toxic emissions units
Title V permit	Title V Permit No. 34-2066-TV-01
ug/m ³	microgram per cubic meter
WWTP	wastewater treatment plant
YSINIT	initial horizontal dimension
ZSINIT	initial vertical dimension

1 INTRODUCTION

Stimson Lumber Company (Stimson) owns and operates a sawmill and wet process hardboard plant (alternatively referred to as the Forest Grove Complex) located at 49800 SW Scoggins Valley Road in Gaston, Oregon (the facility). The facility currently operates under Title V Permit No. 34-2066-TV-01 (the Title V permit) originally issued by the Oregon Department of Environmental Quality (DEQ) on May 21, 2002. The DEQ is currently in the process of issuing an updated Title V permit for the facility.

Maul Foster & Alongi, Inc. (MFA), has been retained by Stimson to assist the facility with the Cleaner Air Oregon permitting process. Stimson submitted a toxic air contaminant (TAC) emissions inventory to the DEQ on September 30, 2020. A final emissions inventory was approved by the DEQ on March 28, 2023 (DEQ-approved emission inventory).

As stated in Oregon Administrative Rule (OAR) 340-245-0030(1)(b), a modeling protocol must be submitted no later than 30 days after receipt of DEQ approval of the emissions inventory. As the approval occurred on March 28, 2023, the modeling protocol is due April 28, 2023. Stimson intends to conduct a Level 3 risk assessment to determine the potential excess cancer risk and chronic and acute noncancer risk (expressed numerically as the chronic and acute hazard index) impacts from the facility for comparison to the applicable risk action levels shown in OAR 340-245-8010 Table 1. The remainder of this modeling protocol outlines the proposed modeling methodology and specific information required by OAR 340-245-0210(1).

2 FACILITY DESCRIPTION

2.1 Facility Location

The facility is located in Gaston, Oregon, west of Oregon Route 47 in Washington County. The City of Gaston is located in the Tualatin Valley between the foothills of the Chehalem Mountains and the Coast Range. The area immediately surrounding the facility is the Scoggins Valley, a northwest-southeast-trending valley, with nearby elevations of approximately 1,200 feet above mean sea-level (MSL). Henry Hagg Lake is located northwest of the western property boundary. Stimson owns approximately 716 acres in the Scoggins Valley, including the 63-acre plot on which the facility sits. The facility is surrounded by a mixture of residential, private forest, and agricultural land-use zones. An aerial image of the facility location and the proposed modeling boundary is shown in Figure 2-1. The topography of the area immediately surrounding the facility is presented in Figure 2-2.

2.2 Process Description

The facility operates a sawmill and a wet process hardboard plant. Douglas-fir, hemlock, and true fir logs are procured from private and company-owned timberlands, transported to the facility by truck, and unloaded for on-site storage in the log yard or log pond.

Logs are sorted in the log yard, then sent for processing in the sawmill. Once in the log processing line, logs are debarked by a debarker and sent to a horizontal saw for further processing. A lug loader is used to separate and route individually cut boards, via lug chains, for the trimming and sorting area. The lumber is then routed to the trimming and sorting area via a mechanical belt.

After trimming and sorting, lumber is sent to one of six steam-heated lumber kilns for drying to optimal moisture content. The temperature for each lumber-drying kiln depends on the species of wood; the maximum drying temperature set at 190 degrees Fahrenheit. Each lumber-drying kiln processes Douglas-fir, hemlock, and true fir species. Lumber products are dried to an acceptable moisture content (typically less than 14 percent) prior to further processing. After kiln drying is complete, dried lumber is sent to the planer for shaping to final product dimensions—typically in lengths of between 6 feet and 10 feet. End seal and other wood treatments are applied to portions of the kiln dried lumber. Final products are stacked and wrapped for storage and eventual shipment off site.

Wood residuals from the sawmill—including chips, sawdust, and planer shavings, called furnish—are pneumatically transferred to the hardboard plant to be used as raw material for a hardboard product. The residuals are sent through a screening process to sort the furnish into material of acceptable size. Wax is added to the furnish via two rotary valves, then the furnish is steamed and softened in two steam-heated digesters. The furnish is further processed in two steam-heated pressurized refiners to produce wood fiber.

The refined fiber slurry is piped to a stock and mix chest where resin is introduced to the fiber. Following the stock and mix chests, the fiber is sent to a secondary refiner, then to the forming machine, where fibers pack together to form a wet mat. Water drains below the mat, assisted by a vacuum pump.

After forming, the mat is trimmed to size and conveyed to a steam-heated press. Emissions from the hardboard press are routed to a scrubber. After leaving the press, the cured panels are stacked, then transported to the rough warehouse for finishing. At the rough warehouse, finishing operations include cutting boards to size, sanding, and punch pressing for a portion of the boards. Additionally, surface coatings, including topcoats and basecoats, are applied to a portions of the hardboards at the paint line.

Steam from three Dutch oven hogged fuel boilers (the three boilers) is used to provide heat for the lumber-drying kilns and the hardboard plant. Exhaust from the three boilers can be routed between a dry electrostatic precipitator or the fuel dryer, which ventilates into a wet scrubber. Wood residuals from the sawmill are used as fuel for the three boilers. During the wet months, the residuals are sent through a rotary dryer (fuel dryer) to dehydrate the fuel to an acceptable moisture content for efficient combustion. Heat for the fuel dryer is provided by exhaust from the three boilers.

The facility employs a wastewater treatment plant (WWTP) to repurpose wastewater from the hardboard plant operations. The WWTP uses an aeration basin and secondary clarifier to reduce the total suspended solids from the wastewater. Once treated, the wastewater is repurposed back to the facility for use in the hardboard plant.

A process flow diagram outlining the manufacturing process and points of emission to atmosphere was provided to the DEQ as part of the TAC emissions inventory submittal.

3 EMISSION ESTIMATES AND MODEL SOURCES

Daily and annual TAC emission estimates for the process equipment and emission-control devices, considered to be toxic emissions units (TEUs) as defined in OAR 340-245-0020(59), were prepared as shown in the DEQ-approved emissions inventory. The DEQ-approved annual and daily TAC emission estimates will be converted to units of grams per second (g/s) for the purpose of conducting the Level 3 risk assessment as shown in Tables 3-1 and 3-2. Only TACs that have a risk-based concentration (RBC) set forth in OAR 340-245-8010 Table 2 will be assessed. Additional detail regarding how the daily and annual TAC emission rates will be used to complete the Level 3 risk assessment will be provided in the risk assessment work plan submittal.

The TEUs identified in the DEQ-approved emissions inventory will be represented in the dispersion model developed to represent the facility. For annual (chronic cancer and noncancer) assessments, each TEU included in the dispersion model will be modeled using a unit emission rate equivalent to 1 g/s for all modeled sources. Additional details describing unit emission rate modeling are provided in Section 4.4. For the 24-hour (acute) assessment, a risk equivalent emission rate was developed for each TEU, as shown in Table 3-3. Additional detail describing the risk equivalent emission rate modeling is also provided in Section 4.4.

3.1 Boilers

The facility employs three hog fuel-fired boilers that combine exhaust streams and vent to the atmosphere through two stacks. A common exhaust manifold and damper system allows the exhaust from both boilers to travel through two ducts, one east and one west. The west duct routes exhaust through a multicyclone, fuel dryer cyclone, fan, and stack that is controlled by a wet scrubber. The east duct exhausts to a multicyclone, fan, and stack that is controlled by a dry electrostatic precipitator.

The exhaust stacks for the boilers will be represented in the air dispersion model as individual point sources with unique labels (**BLR_ESP**) and (**BLR_SCR**). The proposed model source parameters for the boilers are presented in Table 3-4.

3.2 Kilns

There are six lumber-drying kilns currently in operation at the facility. Lumber Kiln 1 (Kiln 1) is a single track kiln and Lumber Kilns 2 through 6 (Kilns 2 through 6) are double track kilns. All six kilns

are indirectly heated by steam from the three boilers. Emissions from the kilns are released to atmosphere through a series of passive roof vents during lumber drying. MFA proposes to parameterize kiln emissions as volume sources. Because the kilns are downwash structures, the dimensions of the volume sources are effectively set by the dimensions of the kilns. Kiln 1 will be represented as four volume sources with unique labels (**KILN1_1** through **KILN1_4**). Kilns 2 through 6 will be represented as 15 individual volume sources (three per kiln) with unique labels (**KILN2_1** through **KILN2_3**, **KILN3_1** through **KILN3_3**, **KILN4_1** through **KILN4_3**, **KILN5_1** through **KILN5_3**, and **KILN5_1** through **KILN5_3**). As Kiln 1 is a single track kiln, the width of the building is approximately half of the width of the buildings housing Kilns 2 through 6. As a result, four volume sources with shorter side lengths will be required to capture the kiln building footprint for modeling.

The proposed release parameters for the kilns are shown in Table 3-4. In order to account for thermal buoyancy effects from the elevated temperature and velocity of the fugitive emissions releases through each kiln roof vent, MFA proposes to incorporate the plume rise calculation methodology consistent with U.S. Environmental Protection Agency (EPA) guidance (EPA 2019b). The proposed plume rise calculations for each kiln source representation are presented in Table 3-5. As stated in Appendix 12 of the 2019 EPA document, “for the kilns with emissions characterized as volume sources, the plume rise was added to the midpoint of the volume release height.”

The estimated plume rise shown in Table 3-5 is added to the midpoint of the volume release height, resulting in a calculated overall vertical dimension (estimated plume rise plus half of the kiln height). The effective release height for the volume source was set at half the overall vertical dimension. The initial vertical and lateral dimensions were derived consistent with EPA guidance for elevated sources on or adjacent to a building (EPA 2022).

Total daily and annual emissions from the kilns will be divided based on the number of tracks per kiln and the number of volume sources per kiln as shown in Table 3-6.

3.3 Refiners

A mixture of wood fiber bundles, wax, and steam is pressurized and sent through rotary valves, refiners and ultimately, a mixing chest prior to continuing down the process line. As characterized in the DEQ-approved emissions inventory, there are two known release points of TAC emissions from the refiners (1) fugitive emissions emitted through one of two rotary valve exhaust stacks and (2) controlled emissions through a wet scrubber exhaust stack. At any given time, only one of the two rotary valves will be in operation and, as such, MFA proposes to model emissions from the rotary valve assuming one stack. The two rotary valve stacks are adjacent to each other. Because the exhaust stacks do not have a designated fan to provide constant airflow, MFA proposes to characterize emissions released from the rotary valve stack as a volume source. The rotary valve stack will be represented in the dispersion model as a volume source with unique label (**REF_RV**), and the wet scrubber will be represented in the dispersion model as a point source with unique label (**REF_S5**).

The proposed model source parameters for the refiner sources in the dispersion model are presented in Table 3-4.

3.4 Forming Line

The wood fiber and wax mix is conveyed to a forming line where a vacuum pump is used to facilitate slurry removal prior to entering the hardboard press. The vacuum pump results in a negative pressure underneath the conveying line that captures most fugitive emissions loss during conveyance. Air captured by the vacuum pump is pneumatically conveyed to a stack on the side of the building. TAC emissions from the forming line can potentially be emitted to atmosphere through this stack or as fugitive emissions through a small opening near the roof. Forming line emissions through the designated stack will be represented in the dispersion model as a point source with unique label (**FORM_STK**). Fugitive emissions from the forming line will be represented in the air dispersion model as a volume source with unique label (**FORM_FUG**).

The proposed model source parameters for the stack and fugitive forming line sources in the dispersion model are presented in Table 3-4.

3.5 Hardboard Press

The hardboard press is a wet-process 250 pounds per square inch steam-heated press. Emissions from the hardboard press are primarily captured by an enclosure and routed through ductwork to a Tri-Mer scrubber control system. During a capture efficiency verification test conducted in 2009, it was identified that the enclosure captures approximately 98.8 percent of emissions emitted from the press. The remaining 1.2 percent of press emissions are expected to enter the atmosphere via an opening in the building near the press enclosure. Exhaust from the press will be represented in the air dispersion model as a point source for the combined press vents with a unique label (**PV_STK**). Uncaptured emissions from the press will be represented in the air dispersion model as a volume source with unique label (**HPVUV_FUG**).

The proposed model source parameters for the press sources in the dispersion model are presented in Table 3-4.

3.6 Fuel Dryer

The three boilers are connected to a manifold system that allows the fuel dryer to draw off a fixed amount of the boiler exhaust to dry the incoming fuel. The comingled boiler and fuel dryer exhaust are routed to a wet scrubber prior to entering the atmosphere. TAC emissions from the fuel dryer will be summed with emissions from the boiler through the wet scrubber and represented in the air dispersion model using the point source labeled (**BLR_SCR**).

3.7 Finished Product Marking

Uncontrolled fugitive emissions from top and bottom paint application and surface treatment to the finished product will be represented in the air dispersion model as volume sources with unique labels (**PAINT**) and (**LSP**), respectively. The length of side for the coating volume sources is estimated based on the size of the building opening nearest each source.

The proposed model source parameters for the coating application sources in the dispersion model are presented in Table 3-4.

3.8 Hardboard Wastewater

There are three specific TEUs associated with the hardboard wastewater collection system. TAC emissions from the three open top tanks (whitewater chest, machine chest, and headbox) will be identified in the air dispersion model with unique labels (**WHITE**, **MACH**, and **HEADBOX**), respectively. Emissions from the machine chest and headbox are expected to enter the atmosphere via roof vents directly above each tank. The exhaust vent over the headbox vent has a designated fan that continuously draws air from the room. As a result, **HEADBOX** will be represented in the dispersion model as a point source. The exhaust vent above the machine chest does not have a designated fan, so **MACH** will be represented in the air dispersion model as a volume source. Lastly, the whitewater chest is located adjacent to a bay door that is occasionally opened for employee access to the building. As a result, MFA proposes to characterize **WHITE** as a volume source with sides estimated to the width of the bay door.

The proposed model source parameters for the hardboard wastewater sources in the dispersion model are presented in Table 3-4.

3.9 Wastewater Treatment

Emissions from each TEU in the WWTP system will be individually characterized in the dispersion model. In total, there are nine emission units associated with the WWTP throughout the facility, including two hydrosieves and seven separate ponds immediately east of the facility. All nine WWTP sources will be represented in the air dispersion model as area sources with the footprint of each TEU as the area source boundary. In the case of the two hydrosieves, the area source footprint will be representative of the exposed subterranean section of the hydrosieve.

TAC emissions from the hardboard wastewater and boiler scrubber hydrosieves will be represented in the air dispersion model with the unique labels **HYDRO** and **SCR_HYDRO**, respectively. TAC emissions from the secondary clarifier, sludge pit, aeration basin, sludge pond, reuse pond, surge pond, and east pond will be represented in the air dispersion model with unique labels (**CLAR**, **PIT**, **ABASE**, **S_POND**, **R_POND**, **SURGE**, **E_POND**).

The proposed model source parameters for the WWTP TEUs in the dispersion model are presented in Table 3-4.

3.10 Green-Wood Chipper

A green-wood chipper is used to reduce the size of wood residuals from the stud mill prior to going to the hardboard plant or fuel for the boiler. Exhaust from the chipper is routed through a cyclone to collect additional chip fragments prior to entering the atmosphere. Emissions from the green-wood chipper will be represented in the air dispersion model as a point source with a unique label (**S_CYC**).

The proposed model source parameters for the green-wood chipper in the dispersion model is presented in Table 3-4.

3.11 Bulk Storage Tanks

The facility uses three bulk storage tanks for vehicle fuel—one for gas, two for diesel, and three resin storage tanks for the hardboard plant. All six tanks are non-pressurized and are unheated. Per the *Cleaner Air Oregon Exempt TEU Reporting* guidance document (DEQ exempt TEU guidance; DEQ 2022) Section VII Storage Tanks, TAC emissions do not need to be estimated for diesel storage tanks that are kept at ambient temperature and are non-pressurized. In order to provide a comprehensive facility-wide emissions inventory, TAC emission from the two diesel storage tanks were included in the DEQ-approved emissions inventory. However, in following with DEQ exempt TEU guidance, MFA will not include the diesel tanks with the proposed Level 3 risk assessment.

TAC emissions from the bulk gas storage tank can be emitted to atmosphere via a small exhaust port near the top of the tank. TAC emissions will be characterized in the air dispersion model as a volume source with unique label (**GAS**). The three resin storage tanks are located inside a mostly enclosed room in the basement of the hardboard plant. Fugitive TAC emissions from standing and working losses can enter the atmosphere via open exhaust vents above each tank. As such, MFA proposes to represent each resin tank vent as a volume source in the air dispersion model using unique labels (**RESIN1**, **RESIN2**, and **RESIN3**).

The proposed model source parameters for the gas storage tank and the three resin tanks in the dispersion model are presented in Table 3-4.

3.12 Emergency Engines

A diesel-fueled emergency generator is used at the facility for energy supply during loss of power. A diesel-fueled fire pump is used at the facility to provide support for emergency firefighting activities. Stimson is proposing to install a second diesel-fueled emergency generator to provide power for boiler shutdown operations should there be a power outage at the facility. TAC emissions from the existing emergency generator and emergency fire pump, and proposed secondary emergency generator will be represented in the air dispersion model as point sources with unique labels **BGEN**, **FIRE**, and **EGEN01** respectively.

The proposed model source parameters for the existing emergency generator and fire pump, and proposed emergency generator in the dispersion model are presented in Table 3-4.

3.13 Welding

Welding activities occur in the facility maintenance shop located in the hardboard plant. A passive exhaust vent is located on the roof near where welding activities occur in the shop. As such, it is expected that any fugitive TAC emissions from the welding activities will enter the atmosphere via the roof vent. TAC emissions from welding activities will be represented in the air dispersion model as a volume source with unique label (**WELD**).

The proposed model source parameters for the welding activities roof vent in the dispersion model are presented in Table 3-4.

3.14 Babbitt Pot

Two babbitt pots are used at the facility to melt various metals for equipment maintenance activities. The babbitt pots are co-located in a maintenance shop west of the hardboard plant. A passive exhaust vent is located on the roof near where the two babbitt pots are located. TAC emissions from the combined babbitt pots are expected to enter the atmosphere via the roof vent. Babbitt pot emissions will be represented in the air dispersion model as a volume source with unique label (**BPOT**).

The proposed model source parameters for the babbitt pot roof vent in the dispersion model are presented in Table 3-4.

4 AIR DISPERSION MODELING METHODOLOGY

The following subsections detail the proposed conceptual site model for the facility. This proposed conceptual site model will be used in support of the Level 3 risk assessment.

4.1 Model Selection

MFA proposes to set up the dispersion model of the facility using the models shown in Table 4-1. Lakes Environmental, a third-party overlay software, will be used to execute the dispersion model.

Table 4-1. Proposed Model Selection

Model	Model Version
AERMOD	23132
AERMET	23132
AERMAP	18081
AERSURFACE	20060
AERMINUTE	15272
BPIP	04274
Note BPIP = Building Profile Input Program.	

4.2 Meteorological Data

In preparation for air dispersion modeling, MFA developed the meteorological and terrain data files shown in Table 4-2 below.

Table 4-2. Proposed Meteorological and Terrain Data

Data Set	Station ID
Surface	Station ID 94285 for Portland-Hillsboro Airport, Oregon (National Oceanic and Atmospheric Administration)
Upper Air	Station ID 24232 for Salem, Oregon (National Oceanic and Atmospheric Administration/ Earth System Research Laboratory Radiosonde Database)
Terrain	U.S. Geological Survey National Elevation Data Set (1/3-arc seconds with horizontal resolution of 10 meters)

4.2.1 Surface Meteorological Data

As shown in Figure 2-1, the facility is located at the northwest corner of the Scoggins Valley, a northwest-southeast oriented valley. Prominent terrain features are present on three sides of the facility. As a result, it is expected that meteorological conditions, and specifically wind, will be heavily influenced by the orientation of the valley. In preparation for air dispersion modeling, MFA reviewed an area of up to 30 kilometers around the facility in an effort to identify an ambient monitoring station suitable for use with dispersion modeling. The results of the analysis indicated that the only ambient monitoring location with model-appropriate meteorological data was the Portland-Hillsboro Airport monitoring station (Hillsboro met station) (station ID 94261) in Hillsboro, Oregon. The Hillsboro met station is located approximately 19 kilometers east of the facility.

In addition to the Hillsboro met station, MFA reviewed a set of AERMOD-ready meteorological data files (surface [SFC] and profile [PFL]) that were provided to MFA by the DEQ in 2018. The DEQ met data files were prepared using Mesoscale Model Interface Program (MMIF)-derived prognostic meteorological data (MMIF data) modeled by the EPA in 2016. The MMIF data were modeled using a 12-kilometer by 12-kilometer grid size with the centroid of the grid located approximately 8 kilometers southwest of the facility.

MFA compared the two data sets to identify which would better represent expected meteorological conditions at the facility. MFA determined the Hillsboro met station data were more representative than the DEQ met data files for the following reasons:

- A comparison of wind roses generated for each data set demonstrated that the predominant winds from the Hillsboro met station aligned more with the orientation of the Scoggins Valley than the MMIF data. As shown in Figure 4-1, the Hillsboro met station wind rose shows a quasi-bimodal distribution, with most winds blowing from the northwest. The northwesterly component mimics the orientation of the Scoggins Valley. Winds from the MMIF data, as shown in Figure 4-2, are more evenly distributed from southwest to the north and do not include an obvious distribution expected given the location of the facility in the Scoggins Valley. This is likely an impact from the relatively large spatial area represented by the 12-kilometer grid size and higher base elevation of the MMIF data as compared to the Hillsboro met station, the latter of which is discussed further below.

- The centroid coordinates of the MMIF data have a base elevation of 840 feet above MSL, while the facility is located at approximately 213 feet above MSL. Conversely, the Hillsboro met station is located at an elevation of 207 feet above MSL, much nearer to that of the facility. Elevation is a key component for several meteorological phenomena including wind, barometric pressure, dewpoint, relative humidity, and temperature.
- The height above ground level (AGL) modeled in the MMIF data for the reference wind speed and direction is 33.1 feet (10 meters [m]) or 873 feet above MSL. As discussed above, this is well above the elevation of the facility (213 feet above MSL). As shown in Table 3-4, the tallest exhaust stack at the facility is 60 feet AGL or 262 feet above MSL. Section 8.4.2(b) in Appendix W to Part 51 states: “*for a variables such as wind direction, the data should ideally be collected near plume height to be adequately representative, especially for sources located in complex terrain.*” As the height of the reference wind speed and direction in the MMIF data is more than 611 feet above the height of the plume height, the representativeness of the conditions near the plume is questionable. Further, the height of the anemometer at the Hillsboro met station is 33.1 feet (10 m) AGL or 240 feet above MSL, and only a 22-foot difference between the tower and the tallest exhaust stack at the facility.

As a result of this analysis, MFA proposes to use surface meteorological data collected from the Hillsboro met station. Hourly data for wind speed, wind direction, cloud cover, and temperature for the years 2018 through 2022 were downloaded by file transfer protocol from the National Oceanic and Atmospheric Administration, National Centers for Environmental Information website.

4.2.2 Upper-Air Data

Upper-air meteorological data for Salem, Oregon (station ID 24232), were obtained in the Forecast Systems Laboratory format, from the National Oceanic and Atmospheric Administration Earth System Research Laboratory Radiosonde Database. Upper-air meteorological data were extracted for the modeling period (2018 through 2022).

4.2.3 Data Processing—AERMET

The meteorological data were processed using the EPA AERMET program to produce five years of model-ready meteorological data for use in the AERMOD model. The adjustment to the surface frictional velocity option (i.e., ADJ_U*) was selected as part of the AERMET processing. The land-use surface characteristics were processed using AERSURFACE.

When automated surface observation station (ASOS) 1-minute data are used, AERMET enables a default wind speed adjustment option. This option adds 0.26 meters per second to all wind speeds to account for wind speed truncation (in units of whole knots) applied by the ASOS quality assurance system. Per the EPA technical memorandum *Use of ASOS Meteorological Data in AERMOD Dispersion Modeling*, dated March 8, 2013 (EPA 2013), a minimum wind speed detection threshold of 0.5 meters per second was used to account for the adjustment. Wind direction randomization was not selected when running AERMET because ASOS 1-minute data increases the precision of wind direction measurements and, unlike non-ASOS data, are rounded to the nearest ten whole degrees.

An analysis of the missing hours for the 2018 to 2022 meteorological data set produced by AERMET was performed by running AERMOD for each calendar quarter. Each calendar quarter was reviewed for the number of missing hours shown in the output file. To be considered complete and valid, each calendar quarter must have less than ten percent missing hours. As shown in Table 4-3, all quarters between 2018 and 2022 meet this criterion.

4.3 Land Use Data

AERSURFACE was used to generate seasonal values for albedo, Bowen ratio, and surface roughness heights required as part of the AERMET processing. State of Oregon National Land Cover Data Set 2016 land cover class definitions, along with concurrent percent impervious surface and percent tree canopy data, were downloaded from the U.S. Geological Survey and processed using AERSURFACE in order to generate the surface characteristics necessary to run AERMET. The State of Oregon National Land Cover Data Set 2016 data were processed in AERSURFACE using the settings described in Table 4-4.

Soil moisture conditions were determined following the methodology set forth in Section 3.2.8 of the EPA *User's Guide for the AERSURFACE Tool*, dated February 2020 (AERSURFACE User's Guide; EPA 2020), as follows:

[surface moisture] should be entered as either WET, DRY or AVERAGE, where, in general, WET is defined as precipitation amounts equal to or greater than the 70th percentile of the 30-year climatological records; DRY is equal to or less than the 30th percentile; and AVERAGE is between the 30th and 70th percentiles.

Annual precipitation data for each year of the five-year meteorological data set were reviewed and compared against the 30-year climatological record to determine the representative soil moisture condition for each modeling year. As shown in Table 4-5, the average annual precipitation varied between the lower 30th percentile up to the middle 40th percentile of the 30-year climatological record. To account for this variability, AERSURFACE was executed for each year using the corresponding surface moisture condition associated with that year's annual rainfall.

MFA proposes to execute the air dispersion model using rural dispersion coefficients. To make this determination, MFA followed the land-use procedure, as recommended in Section 7.2.1.1(b) of Appendix W to Part 51 *Guideline on Air Quality Models*, to conclude that less than 50 percent of the land use in the modeling domain is represented by the urban land-use type.

4.4 Unit Emission Rate

MFA proposes to execute the dispersion model using unit emission rates for all TEUs for annual (chronic cancer and noncancer) assessments. The maximum modeled unit concentration in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) at each modeled receptor for the annual averaging period will be considered a modeled dispersion factor in units of $\mu\text{g}/\text{m}^3$ per g/s. When this dispersion factor is multiplied by the g/s TAC emission rate for the modeled TEU, the result is the modeled concentration of the TAC. Therefore, a single unit emission rate model result can be used to calculate the modeled concentration for each TAC. The dispersion factors, in combination with TAC emission rates for each

TEU in g/s and the RBCs in ug/m³ set forth under OAR 340-245-8010 Table 2, will be used to conduct the chronic cancer and noncancer Level 3 risk assessments.

For the 24-hour (acute) assessment, MFA developed risk equivalent emission rates for each TEU. The proposed risk equivalent emission rates were calculated by dividing the individual TAC emission rate for each TEU by their respective acute RBC. The resulting value for each TAC was then summed to create a total risk equivalent emission rate for the TEU. This process was repeated for each TEU at the facility. The risk equivalent emission rates will be modeled for the 24-hour averaging period to assess the cumulative acute risk from the facility. The proposed risk equivalent emission rates are provided in Table 3-3.

4.5 Emissions Source Locations

The location of each TEU to be included in the dispersion model is shown in Figure 4-3. For volume sources that are located on or adjacent to buildings, initial horizontal dimension (YSINIT) and initial vertical dimension (ZSINIT) will be calculated using the EPA method specified in the *User's Guide for the Industrial Source Complex Dispersion Models—Volume II—Description of Model Algorithms* (1995). Release heights will be set to half the building height. Release heights for the kilns will be adjusted to account for thermal buoyancy using the proposed methods discussed in Section 3.2 of this protocol.

4.6 Building Downwash

The current version of the Building Profile Input Program, shown in Table 4-1, will be used.

The proposed locations for structures that are projected to influence downwash are presented in Figure 4-4. Table 4-6 presents a summary of the proposed building heights to be included in the air dispersion model.

4.7 Receptor Locations and Terrain

Dispersion factors and cumulative acute risk will be determined for each modeling receptor identified outside the facility property boundary. MFA proposes to place modeling receptors at potential exposure locations in the surrounding area up to 10 kilometers away from the center of the facility. Figure 4-5 presents the proposed receptor spacing and locations for the modeling domain. Figure 4-6 presents the proposed receptor locations in the area immediately surrounding the facility.

Receptors will be defined in the dispersion model, as shown in Table 4-7 below.

Table 4-7. Proposed Receptor Locations

Receptor Spacing	Receptor Distance
25 m	Along fence line and out to at least: North: 435 m East and West: 200 m South: 425 m
50 m	North: 1,245 m East and West: 1,025 m South: 1,225 m
100 m	1,000 to 2,000 m
200 m	2,000 to 5,000 m
500 m	5,000 to 10,000 m
Note m = meter	

MFA reviewed an area within 1.5 kilometers of the facility property boundary to identify whether there were any locations considered to be sensitive areas (e.g., schools, hospitals). Results of the review indicated that there are no sensitive locations within 1.5 kilometers of the facility.

The terrain elevations for model receptors, source base elevations, and base elevations of downwash structures will be taken from the U.S. Geological Survey National Elevation Data Set data at a resolution of 1/3 arc-seconds (a horizontal resolution of roughly 10 m) and processed using the current version of AERMAP, shown in Table 4-1.

4.8 Land-Use Zoning Classification Data for Determining Exposure Types

In anticipation of dispersion modeling, the Oregon Department of Land Conservation and Development's statewide zoning data were reviewed to determine land-use classifications for areas in the modeling domain. The Oregon statewide zoning classifications provide the basis for the initial categorization of exposure classifications (i.e., residential, nonresidential worker, nonresidential child, or acute).

The zoning data were further evaluated against local data such as the Washington County zoning and school-location information. MFA also reviewed aerial imagery, using Esri ArcGIS and Google Earth software to determine whether the existing zoning information reflects actual land use and the corresponding exposure type categorization.

The zoning data and internal MFA review processes indicate that multiple proposed receptor locations fall within roadway and/or rail right-of-way interstitial spaces, which are identified in gray in Figures 4-5 and 4-6. These locations are proposed for dispersion modeling to maintain a uniform receptor grid. MFA does not propose to conduct risk evaluations for any receptor locations in roadways or rail rights-of-way. In the crosswalk of receptors—which will be provided to the DEQ in spreadsheet format because of the number of receptor locations—these locations are labeled as Risk

Not Assessed, even though they will be modeled. Receptors that fall within roadway and/or rail right-of-way interstitial spaces that are beyond the 50-meter grid, as identified in Table 4-7, will be assigned to the nearest zoning designation.

Figure 4-7 presents the existing land use zoning identified for the modeling domain, and Figure 4-8 is provided for the area immediately surrounding the proposed facility. Figures 4-9 and 4-10 present the corresponding exposure location categorization for the modeling domain and the immediate area surrounding the proposed facility, respectively. For additional clarification, Table 4-8, provided in electronic version only, shows all proposed receptor locations and their exposure classification.

5 CLOSING

MFA looks forward to working with the DEQ throughout the Cleaner Air Oregon permit application process. If there are any questions or comments regarding this modeling protocol, please contact Andrew Rogers at 503.407.6406 or arogers@maulfoster.com.

LIMITATIONS

The services undertaken in completing this document were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This document is solely for the use and information of our client unless otherwise noted. Any reliance on this document by a third party is at such party's sole risk.

Opinions and recommendations contained in this document apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this document.

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TABLES



Table 3-2
Proposed Daily Emission Rates
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon

Toxic Air Contaminant	CAS or DQID	EBC (Yes/No)	Daily Emission Estimates																							
			Hogged Fuel-Fired Boiler (EPA Control)		Hogged Fuel-Fired Boiler (Unabated Control)		Fuel Dryer		Total Scrubber		Kiln Total		Press (Stock)		Press (Fugitive)		Refiner (Rotary Valve)		Refiner (Scrubber 5)		Forming Line (Stock)					
			(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)	(lb/day)	(g/s) ^(a)				
Model ID			MBLE ESP		MBLE SCR		KILN 1-14		KILN 2-4,3		PVUV SK		HPVUV FUG		R#12 RV		R#12 SK		FORM SK							
Ammonia and compounds	7440-36-0	Yes	9.8E-04	5.1E-06	2.1E-05	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Antimony and compounds	7440-36-0	Yes	4.1E-03	3.3E-05	1.0E-04	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...					
Total TAC Emissions Estimate			41.6	0.22	14.3	0.075	9.34	0.050	23.8	0.12	338	1.78	7.69	0.040	2.05	0.11	93.1	0.49	2.08	0.011	1.43	7.0E-03	7.42	0.040	5.78	0.030

NOTE:
 g/s = grams per second.
 lb/day = pounds per day.
 EBC = risk-based concentration.
 (a) Emission rate (g/s) = (daily emissions estimate (lb/day)) x (453.592 g/lb) / (24 hrs/day) / (3,600 s/hr)
 (b) Total particulate emissions (lb/day) = hogged fuel-fired boiler (lb/day) + fuel dryer annual emissions (lb/day)
 (c) Model emission rate (lb/d) [Bv1] = (total kiln emission rate (Bv1)) x (model rate distribution for kiln 1 volume sources) + (total kiln emission rate (Bv1)) x (model rate distribution for kiln 1 volume sources) = 0.023 (b)
 (d) Model emission rate (lb/d) [Bv2-4] = (total kiln emission rate (Bv2)) x (model rate distribution for kiln 2-4 volume sources) + (total kiln emission rate (Bv2)) x (model rate distribution for kiln 2-4 volume sources) = 0.041 (b)
 (e) Total particulate emissions (lb/day) = basecoat emissions (lb/day) + (basecoat emissions (lb/day))

REFERENCES:
 (1) Emission rates representative of individual model volume sources and not entire facility.
 (2) Emission estimates based on ISO approved TAC emissions inventory.
 (3) See Table 3-6, Proposed Kiln Emissions Allocation.

**Table 3-2
Proposed Daily Emission Rates (Cont.)
Silvum Lumber Company Forest Grove Complex—Gaston, Oregon**

Toxic Air Contaminant	CAS or DQID	RBC (Yes/No)	Daily Emission Estimates																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
			Topcoat		Paintline Total		Lumber Surface Protection		Welding		Robott Pot		Chipper		Fire Pump		Backup Generator		Proposed Emergency Generator		Gas Storage Tank		Resin Storage Tank 1		Resin Storage Tank 2		Resin Storage Tank 3		Facility Total																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
			(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾	(B/day) ⁽¹⁾	(g/h) ⁽¹⁾																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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**Table 3-4
Proposed Model Source Parameters
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon**

Point Sources										
Model ID	Model Source Description	UTM Coordinates ⁽¹⁾		Stack Orientation ⁽¹⁾	Base Elevation ⁽²⁾ (m)	Release Height ⁽¹⁾ (m)	Stack Diameter ⁽¹⁾ (m)	Exit Velocity ⁽¹⁾ (m/s)	Exit Flowrate ⁽⁶⁾ (m ³ /s)	Exit Temperature ⁽¹⁾ (K)
		Eastings	Northing							
HBLR_SCR	Comingled boiler and fuel dryer exhaust scrubber stack	485,074.8	5,034,806.4	Vertical	67.1	12.80	1.52	11.03	20.11	322.0
HBLR_ESP	Comingled boiler exhaust ESP stack	485,098.6	5,034,785.7	Vertical	66.2	18.29	2.29	12.24	50.25	506.9
RF12_STK	Scrubber 5 controlling refiners	485,236.5	5,034,705.5	Vertical	65.2	13.72	0.76	4.11	1.87	323.7
PVUV_STK	Press vent exhaust stack	485,257.1	5,034,693.1	Vertical	66.2	13.72	2.74	6.42	37.95	313.7
FORM_STK	Forming line vacuum pump exhaust vent	485,218.9	5,034,778.2	Horizontal	65.8	15.42	0.20	14.84	0.49	337.0
HEADBOX	HBWW-Headbox Vent	485,211.5	5,034,780.6	Vertical	65.6	14.94	0.69	8.36	3.11	Ambient
S_CYC	Green chipper cyclone exhaust	485,100.7	5,034,851.7	Vertical	64.7	6.71	0.30	15.24	1.11	Ambient
FIRE	Emergency fire pump exhaust vent	485,140.6	5,034,754.1	Vertical	64.9	1.83	0.08	47.71	0.22	449.8
BGEN	Backup generator exhaust vent	485,144.8	5,034,745.0	Vertical	64.6	2.13	0.08	47.71	0.22	449.8
EGEN01	Proposed Diesel Generator	485,145.0	5,034,796.6	Vertical	64.6	1.92	0.13	50.38	0.64	806.2

Discrete Volume Sources									
Model ID	Model Source Description	UTM Coordinates ⁽¹⁾		On or Adjacent to a Building?	Base Elevation ⁽²⁾ (m)	Release Height (m)	Length of Side (m)	Initial Lateral Dimension ⁽⁶⁾ (m)	Initial Vertical Dimension (m)
		Eastings	Northing						
KILN1_1	Kiln 1 (1 of 4)	485,272.4	5,034,975.8	Yes	67.5	10.71 ⁽⁴⁾	3.66	0.85	9.97 ⁽⁴⁾
KILN1_2	Kiln 1 (3 of 4)	485,276.7	5,034,972.2	Yes	67.5	10.71 ⁽⁴⁾	3.66	0.85	9.97 ⁽⁴⁾
KILN1_3	Kiln 1 (2 of 4)	485,280.9	5,034,968.4	Yes	67.5	10.71 ⁽⁴⁾	3.66	0.85	9.97 ⁽⁴⁾
KILN1_4	Kiln 1 (4 of 4)	485,285.2	5,034,964.7	Yes	67.5	10.71 ⁽⁴⁾	3.66	0.85	9.97 ⁽⁴⁾
KILN2_1	Kiln 2 (1 of 3)	485,268.0	5,034,969.0	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN2_2	Kiln 2 (2 of 3)	485,273.5	5,034,963.7	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN2_3	Kiln 2 (3 of 3)	485,279.0	5,034,958.5	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN3_1	Kiln 3 (1 of 3)	485,261.5	5,034,961.3	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN3_2	Kiln 3 (2 of 3)	485,267.0	5,034,956.0	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN3_3	Kiln 3 (3 of 3)	485,272.5	5,034,950.7	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN4_1	Kiln 4 (1 of 3)	485,255.0	5,034,954.0	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN4_2	Kiln 4 (2 of 3)	485,260.4	5,034,948.8	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN4_3	Kiln 4 (3 of 3)	485,265.9	5,034,943.5	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN5_1	Kiln 5 (1 of 3)	485,248.4	5,034,946.4	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN5_2	Kiln 5 (2 of 3)	485,253.9	5,034,941.1	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN5_3	Kiln 5 (3 of 3)	485,259.4	5,034,935.8	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN6_1	Kiln 6 (1 of 3)	485,242.0	5,034,939.0	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN6_2	Kiln 6 (2 of 3)	485,247.5	5,034,933.7	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
KILN6_3	Kiln 6 (3 of 3)	485,253.0	5,034,928.4	Yes	67.5	12.94 ⁽⁴⁾	5.49	1.28	12.04 ⁽⁴⁾
WHITE	Bay door adjacent to white chest	485,197.3	5,034,778.9	Yes	65.5	7.47 ⁽⁶⁾	3.66	0.85	6.95 ⁽⁶⁾
MACH	Machine chest vent	485,203.3	5,034,759.3	Yes	65.6	4.42 ⁽⁶⁾	0.30	0.07	4.11 ⁽⁶⁾
RF12_RV	Rotary valve stack	485,198.3	5,034,750.7	Yes	65.5	7.47 ⁽⁶⁾	0.30	0.07	6.95 ⁽⁶⁾
HPVUV_FUG	Press fugitive emissions building opening	485,239.5	5,034,750.1	Yes	65.8	9.45 ⁽⁶⁾	4.70	1.09	8.79 ⁽⁶⁾
FORM_FUG	Forming line fugitive emissions release	485,211.5	5,034,772.3	Yes	65.7	4.42 ⁽⁶⁾	0.46	0.11	4.11 ⁽⁶⁾
GAS	Gas storage tank vent	485,414.0	5,034,724.5	No	65.4	2.44 ⁽⁷⁾	0.30	0.07	0.57 ⁽⁸⁾
RESIN1	Resin Tank 1	485,179.0	5,034,749.5	Yes	65.2	7.47 ⁽⁶⁾	2.07	0.48	6.95 ⁽⁶⁾
RESIN2	Resin Tank 2	485,182.3	5,034,746.9	Yes	65.4	7.47 ⁽⁶⁾	2.47	0.57	6.95 ⁽⁶⁾
RESIN3	Resin Tank 3	485,185.8	5,034,744.3	Yes	65.8	7.47 ⁽⁶⁾	2.47	0.57	6.95 ⁽⁶⁾
PAINT	Building opening near paintline	485,330.2	5,034,742.4	Yes	65.7	4.66 ⁽⁶⁾	7.05	1.64	4.22 ⁽⁶⁾
WELD	Welding Emissions	485,289.9	5,034,686.7	Yes	65.7	4.04 ⁽⁶⁾	0.61	0.14	3.76 ⁽⁶⁾
BPOT	Roof opening above babbitt pots	485,107.9	5,034,870.9	Yes	64.9	7.16 ⁽⁶⁾	0.61	0.14	6.66 ⁽⁶⁾

Area Sources										
Model ID	Model Source Description	UTM Coordinates ⁽¹⁾		Area Source Geometry	Base Elevation ⁽²⁾ (m)	Source Area ⁽⁹⁾ (m ²)	Source Diameter (m)	On or Adjacent to a Building?	Release Height AGL ⁽⁷⁾ (m)	Number of Vertices
		Eastings	Northing							
SCR_HYDRO	Exposed area above boiler scrubber hydro sieve	485,132.2	5,034,760.8	Area	65.0	2.20 ⁽⁸⁾		No	0	4 ⁽⁷⁾
HYDRO	Exposed area above hydro sieves	485,202.9	5,034,704.2	Area	65.3	2.20 ⁽⁸⁾		No	0	4 ⁽⁷⁾
CLAR	WWTP-Secondary clarifier	485,616.0	5,034,432.2	Circular	61.7	89.4	5.33	No	0	⁽⁸⁾
PIT	WWTP-Sludge pit opening	485,620.2	5,034,442.6	Circular	61.3	3.60	1.07	No	0	⁽⁸⁾
S_POND	WWTP-Sludge pond	485,599.9	5,034,475.4	Polygon	63.2	317 ⁽⁸⁾		No	0	9 ⁽⁷⁾
R_POND	WWTP-Reuse pond	485,588.9	5,034,590.6	Polygon	62.7	3,340 ⁽⁸⁾		No	0	15 ⁽⁷⁾
SURGE	WWTP-Surge pond	485,630.3	5,034,606.2	Polygon	62.8	3,496 ⁽⁸⁾		No	0	16 ⁽⁷⁾
ABASE	WWTP-Aeration basin	485,571.8	5,034,425.4	Polygon	63.1	3,099 ⁽⁸⁾		No	0	14 ⁽⁷⁾
E_POND	WWTP-East pond	485,893.9	5,034,151.6	Polygon	62.1	10,784 ⁽⁸⁾		No	0	18 ⁽⁷⁾

NOTES:

- K = kelvin.
- m = meter.
- m/s = meters per second.
- m³/s = cubic meters per second.
- UTM = Universal Transverse Mercator.
- AGL = above ground level.

- ⁽⁶⁾ Exit flowrate (m³/s) = (π/4) x (stack diameter [m])² x (exit velocity [m/s])
- ⁽⁸⁾ Initial lateral dimension (m) = (length of side [m]) / (4.3) (3)
- ⁽³⁾ Initial vertical dimension (m) = (building height [m]) / (2.15) (3)
- ⁽⁴⁾ Initial vertical dimension (m) = (vertical dimension [m]) / (4.3) (3)

REFERENCES:

- ⁽¹⁾ Value based on information provided by Stimson Lumber Company.
- ⁽²⁾ Base elevation derived from the US Geological Survey National Elevation Dataset downloaded and processed in AERMET.
- ⁽³⁾ See "User's Guide for the AMS/EPA Regulatory Model (AERMOD)," dated June 2022.
- ⁽⁴⁾ Release height and initial vertical dimension were adjusted for thermal buoyancy using methods from Appendix 12, sub Appendix 1, Plume-Rise Methodology for Slag Pits Based Upon Work by John Irwin (EPA; 2003). See Table 3-5, Proposed Kin Thermal Buoyancy Effects Calculations.
- ⁽⁵⁾ Source is not a circular area source type. Therefore, there's no diameter.
- ⁽⁶⁾ See "Users Guide for the AMS/EPA Regulatory Model (AERMOD)," EPA-454/B-18-001 dated April 2018. Assumes release height for elevated volume source is half of the building height.
- ⁽⁷⁾ Area of source and number of vertices identified in AERMOD View software.
- ⁽⁸⁾ Circular area source type, therefore, there are no vertices.

**Table 3-5
Proposed Kiln Thermal Buoyancy Effects Calculations
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon**

Parameter	EPA Memo Acronym	(Units)	Source Representation						
			KILN1	KILN2	KILN3	KILN4	KILN5	KILN6	
PHYSICAL PARAMETERS									
Kiln Width	⁽¹⁾	--	(ft)	16.5	33.0	33.0	33.0	33.0	33.0
Kiln Length	⁽¹⁾	--	(ft)	73.0	73.0	73.0	73.0	73.0	73.0
Kiln Height	⁽¹⁾	--	(ft)	28.0	28.0	28.0	28.0	28.0	28.0
Kiln Flowrate	⁽²⁾	--	(acfm)	6,250	12,500	12,500	12,500	12,500	12,500
Kiln Temperature	⁽¹⁾	--	(°F)	190	190	190	190	190	190
Ambient Temperature	⁽³⁾	--	(°F)	52.9	52.9	52.9	52.9	52.9	52.9
Acceleration of Gravity Constant		g	(m/s ²)	9.81	9.81	9.81	9.81	9.81	9.81
EFFECTIVE RELEASE HEIGHT DERIVATION									
Kiln Width	^(a)	w	(m)	5.03	10.06	10.06	10.06	10.06	10.06
Kiln Length	^(a)	l	(m)	22.3	22.3	22.3	22.3	22.3	22.3
Kiln Height	^(a)	--	(m)	8.53	8.53	8.53	8.53	8.53	8.53
Kiln Flowrate	^(b)	Q	(m ³ /s)	2.95	5.90	5.90	5.90	5.90	5.90
Kiln Temperature	^(c)	T _p	(K)	361	361	361	361	361	361
Ambient Temperature	^(c)	T _a	(K)	285	285	285	285	285	285
Effective Radius	^(d)	r _p	(m)	5.97	8.44	8.44	8.44	8.44	8.44
Kiln Buoyancy Flux	^(e)	F _b	(m ⁴ /s ³)	1.94	3.89	3.89	3.89	3.89	3.89
Initial Vertical Velocity	^(f)	w _p	(m/s)	2.6E-02	2.6E-02	2.6E-02	2.6E-02	2.6E-02	2.6E-02
Froude Number	^(g)	F	--	5.3E-03	4.5E-03	4.5E-03	4.5E-03	4.5E-03	4.5E-03
Velocity Ratio	^(h)	K	--	98	98	98	98	98	98
Brunt Visalia Frequency	⁽ⁱ⁾	N	--	0.052	0.052	0.052	0.052	0.052	0.052
Stable Plume Rise	^(j)	Δh	(m)	17.16	21.62	21.62	21.62	21.62	21.62
Effective Release Height	^(k)	--	(m)	21.42	25.88	25.9	25.9	25.9	25.9
DISPERSION MODEL INPUT									
Vertical Dimension	⁽⁵⁾	--	(m)	21.42	25.88	25.88	25.88	25.88	25.88
Release Height	⁽⁵⁾	--	(m)	10.71	12.94	12.94	12.94	12.94	12.94
Initial Vertical Dimension	⁽⁷⁾	--	(m)	9.97	12.04	12.04	12.04	12.04	12.04

NOTES:

ft = feet.

acfm = actual cubic feet per minute.

°F = degrees Fahrenheit.

m/s² = meter per square second.

m = meter.

m³/s = cubic meters per second.

K = kelvin.

m⁴/s³ = quartic meter per cubic second.

m/s = meter per second.

^(a) Parameter (m) = (parameter [ft]) / (3.2808 ft/m)

^(b) Kiln flowrate (m³/s) = (kiln flowrate [acfm]) / (60 s/min) / (35.3147 ft³/m³)

^(c) Temperature (K) = ((Temperature [°F]) - 32) x (5/9) + (273.15)

^(d) Effective radius (m) = ((kiln width {m}) x (kiln length {m})) / (π)^{1/2}

^(e) Kiln buoyancy flux (m⁴/s³) = (acceleration of gravity [m/s²]) x (kiln flowrate [m³/s]) x ((kiln temperature [K]) - (ambient temperature [K])) / (π) / (kiln temperature [K]) (4)

^(f) Initial vertical velocity (m/s) = (kiln buoyancy flux [m⁴/s³]) x (kiln temperature [K]) / (acceleration of gravity [m/s²]) / ((kiln temperature [K]) - (ambient temperature [K])) / (effective radius [m])² (5)

^(g) Froude number = (initial vertical velocity [m/s]) / (((kiln temperature [K]) - (ambient temperature [K])) / (kiln temperature [K]) x (2) x (effective radius {m})) x (acceleration of gravity [m/s²])^{1/2} (5)

^(h) Velocity ratio = (wind speed [m/s]) / (initial vertical velocity [m/s])
Wind speed (m/s) = 2.59 (3)

⁽ⁱ⁾ Brunt visalia frequency = ((acceleration of gravity [m/s²]) / (ambient temperature [K]) x (temperature gradient [K/m]))^{1/2}
Temperature gradient (K/m) = 0.08 (5)

^(j) Stable plume rise (m) = (2.1) x ((effective radius [m]) x [wind speed {m/s}]² / [velocity ratio]³ / [Froude number]² / [Brunt visalia frequency]²)^{1/3}
Wind speed (m/s) = 2.59 (3)

^(k) Effective release height (m) = (stable plume rise [m]) + (kiln height [m]) / 2 (6)

REFERENCES:

⁽¹⁾ Information provided by Stimson Lumber Company

⁽²⁾ Per Appendix D2 of Appendix 1 in the EPA "Residual Risk Assessment for the Plywood and Composite Wood Products Source Category in Support of the 2019 Risk and Technology Review Proposed Rule" dated May, 2019. velocity measurement and total gas flow data indicate 12,500 acfm is representative of the total gas flow from batch kilns. Kiln 1 is one-track and is estimated to have half the airflow of the two-track batch kilns (kiln 2-6).

⁽³⁾ Representative of 5-year average daily temperature and average wind speed from January 1 2018 through December 31, 2022. Value calculated using Hillsboro met station data.

⁽⁴⁾ See Appendix 12, sub Appendix I, "Plume-Rise Methodology for Slag Pits Based Upon Work by John Irwin (EPA; 2003)," to the Residual Risk Assessment for the Plywood and Composite Wood Products Source Category in Support of the 2019 Risk and Technology Review Proposed Rule dated May, 2019. Formula for initial vertical velocity rearranged to solve for buoyancy flux.

⁽⁵⁾ See Appendix 12, sub Appendix I, "Plume-Rise Methodology for Slag Pits Based Upon Work by John Irwin (EPA; 2003)," to the Residual Risk Assessment for the Plywood and Composite Wood Products Source Category in Support of the 2019 Risk and Technology Review Proposed Rule dated May, 2019.

⁽⁶⁾ See section III of Appendix 12, "Development of Plume-Rise Adjustment Factors for Batch and Continuous Lumber Kilns," to the Residual Risk Assessment for the Plywood and Composite Wood Products Source Category in Support of the 2019 Risk and Technology Review Proposed Rule dated May, 2019.

⁽⁷⁾ See "User's Guide for the AMS/EPA Regulatory Model (AERMOD)" dated June 2022. See Table 3-2. The initial vertical dimension for elevated sources on or adjacent to a building is equal to the release height divided by 2.15.

Table 3-6
Proposed Kiln Emissions Allocation
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon

Model ID	Model Source Description	Kiln Track (Single/Double)	Emissions Distribution per Kiln	Emissions Distribution per modeled source
Kiln 1		Single	0.091 ^(a)	--
KILN1_1	Kiln 1 (1 of 4)	--	--	0.023 ^(b)
KILN1_2	Kiln 1 (3 of 4)	--	--	0.023 ^(b)
KILN1_3	Kiln 1 (2 of 4)	--	--	0.023 ^(b)
KILN1_4	Kiln 1 (4 of 4)	--	--	0.023 ^(b)
Kiln 2		Double	0.182 ^(c)	--
KILN2_1	Kiln 2 (1 of 3)	--	--	0.061 ^(d)
KILN2_2	Kiln 2 (2 of 3)	--	--	0.061 ^(d)
KILN2_3	Kiln 2 (3 of 3)	--	--	0.061 ^(d)
Kiln 3		Double	0.182 ^(c)	--
KILN3_1	Kiln 3 (1 of 3)	--	--	0.061 ^(d)
KILN3_2	Kiln 3 (2 of 3)	--	--	0.061 ^(d)
KILN3_3	Kiln 3 (3 of 3)	--	--	0.061 ^(d)
Kiln 4		Double	0.182 ^(c)	--
KILN4_1	Kiln 4 (1 of 3)	--	--	0.061 ^(d)
KILN4_2	Kiln 4 (2 of 3)	--	--	0.061 ^(d)
KILN4_3	Kiln 4 (3 of 3)	--	--	0.061 ^(d)
Kiln 5		Double	0.182 ^(c)	--
KILN5_1	Kiln 5 (1 of 3)	--	--	0.061 ^(d)
KILN5_2	Kiln 5 (2 of 3)	--	--	0.061 ^(d)
KILN5_3	Kiln 5 (3 of 3)	--	--	0.061 ^(d)
Kiln 6		Double	0.182 ^(c)	--
KILN6_1	Kiln 6 (1 of 3)	--	--	0.061 ^(d)
KILN6_2	Kiln 6 (2 of 3)	--	--	0.061 ^(d)
KILN6_3	Kiln 6 (3 of 3)	--	--	0.061 ^(d)
Total Fraction			1.00	1.00

NOTES:

^(a) Emissions Distribution per single track kiln = (tracks per kilns) / (total number of tracks)

Total number of tracks = 11 (1)

Tracks per kiln (single) = 1 (2)

^(b) Emissions Distribution per model source (kiln 1) = (emissions distribution per single track kiln) / (number of volume sources)

Number of volume sources = 4

^(c) Emissions Distribution per double track kiln = (tracks per kilns) / (total number of tracks)

Total number of tracks = 11 (1)

Tracks per kiln (double) = 2 (2)

^(d) Emissions distribution per model source (kilns 2-6) = (emissions distribution per single double track kiln) / (number of volume sources)

Number of volume sources = 3

REFERENCES:

⁽¹⁾ Representative of the total number of tracks for all six kilns at the facility.

⁽²⁾ Information provided by Stimson Lumber Company.

⁽³⁾ Number of volume sources set by the dimensions of each kiln.

Table 4-3
Assessment of Missing Meteorological Data
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon

Quarter ⁽¹⁾	Meteorological Data Assessment per Year														
	2018			2019			2020			2021			2022		
	Total Hours ⁽¹⁾	Missing Hours ⁽²⁾	Available ^(a) (%)	Total Hours ⁽¹⁾	Missing Hours ⁽²⁾	Available ^(a) (%)	Total Hours ⁽¹⁾	Missing Hours ⁽²⁾	Available ^(a) (%)	Total Hours ⁽¹⁾	Missing Hours ⁽²⁾	Available ^(a) (%)	Total Hours ⁽¹⁾	Missing Hours ⁽²⁾	Available ^(a) (%)
Q1	2,160	0	100.0%	2,160	18	99.2%	2,184	8	99.6%	2,160	94	95.6%	2,160	5	99.8%
Q2	2,184	1	100.0%	2,184	2	99.9%	2,184	6	99.7%	2,184	54	97.5%	2,184	14	99.4%
Q3	2,208	2	99.9%	2,208	21	99.0%	2,208	3	99.9%	2,208	27	98.8%	2,208	23	99.0%
Q4	2,208	18	99.2%	2,208	1	100.0%	2,208	47	97.9%	2,208	23	99.0%	2,208	21	99.0%

NOTES:

^(a) Available hours (%) = (1 - [{missing hours} / {total hours}]) x (100%)

REFERENCES:

⁽¹⁾ Meteorological data obtained from the National Oceanic and Atmospheric Administration National Climatic Data Center Integrated Surface Data for the Portland-Hillsboro Airport located in Hillsboro, Oregon (WBAN: 94261).

⁽²⁾ The number of missing hours was determined by generating a SFC QA excel file generated by AERMET version 22112.

Table 4-4
AERSURFACE Settings
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon

Parameter	Setting
Study radius for surface roughness	1.0 kilometer
Should continuous snow cover be assumed?	No
Is this an arid region?	No
Is this an airport site?	Yes
Number of sectors	12
Months assumed to constitute "winter"	December, January, and February
Months assumed to constitute "spring"	March, April, and May
Months assumed to constitute "summer"	June, July, and August
Months assumed to constitute "autumn"	September, October, and November
Period for land use calculations	Monthly

Table 4-5
Soil Moisture Condition Assessment
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon

Calendar Year	Total Precipitation ⁽¹⁾ (in)	Climatic Significance ⁽²⁾ (in)	Calendar Year Soil Moisture ⁽³⁾ (in)
2018	32.8	Lower 30th Percentile	Dry
2019	32.3	Lower 30th Percentile	Dry
2020	40.3	Middle 40th Percentile	AVG
2021	46.7	Middle 40th Percentile	AVG
2022	43.6	Middle 40th Percentile	AVG

30-Year Climate Precipitation Data ⁽⁴⁾		
Average Annual Precipitation	⁽⁵⁾	44.4
Lower 30th Percentile Annual Precipitation	⁽⁶⁾	37.5
Upper 70th Percentile Annual Precipitation	⁽⁷⁾	50.8

REFERENCES:

- ⁽¹⁾ Climatological data obtained from Western Regional Climate Center for the Dilly meteorological station in Gaston, OR (Station ID: 352325). The Dilly station was chosen as it represents the closest station to the Portland-Hillsboro Airport (Hillsboro met station) that has 30-consecutive years of precipitation data needed for the 30-year climatological calculations. Although the Hillsboro met station was determined to be the most representative station for dispersion modeling, the station does not have 30-consecutive years of precipitation data available for the soil moisture condition assessment.
- ⁽²⁾ Climatic significance represents annual precipitation compared to 30-year climatological period.
- ⁽³⁾ Surface moisture conditions correspond to "Dry", "Average" or "Wet" soil content determined by comparing annual precipitation to 30-year climatological period. This method is consistent with the methodology set forth in the current version of the USEPA AERSURFACE User's Guide dated February, 2020.
- ⁽⁴⁾ Represents 30-year period between January 1993 and December 2022.
- ⁽⁵⁾ Represents average annual precipitation during 30-year climatological period.
- ⁽⁶⁾ Represents lower limit of middle 40th percentile annual precipitation during 30-year climatological period.
- ⁽⁷⁾ Represents upper limit of middle 40th percentile annual precipitation during 30-year climatological period.

Table 4-6
Summary of Downwash Structure Heights
Stimson Lumber Company Forest Grove Complex—Gaston, Oregon

Downwash Structure Model ID	Base Elevation ⁽¹⁾		Number of Building Tiers	Tier Height ⁽²⁾		Diameter ⁽²⁾	
	(ft)	(m)		(ft)	(m)	(ft)	(m)
HBOARD	216.1	65.9	1	49.0	14.9	--	--
HBOARD	216.1	65.9	2	61.5	18.8	--	--
OFFICES	216.4	66.0	1	37.8	11.5	--	--
HB1	215.8	65.8	1	31.0	9.5	--	--
HB2	215.0	65.5	1	26.5	8.1	--	--
HB3	215.6	65.7	1	29.0	8.8	--	--
HB4	216.1	65.9	1	18.2	5.6	--	--
TANK1	214.6	65.4	1	60.0	18.3	32.3	9.8
TANK2	214.4	65.4	1	60.0	18.3	32.3	9.8
TANK3	215.1	65.6	1	32.3	9.8	32.6	9.9
BLD_1	214.8	65.5	1	27.9	8.5	--	--
BLD_2	212.1	64.6	1	35.8	10.9	--	--
BLD_3	213.7	65.1	1	16.1	4.9	--	--
BLD_4	211.3	64.4	1	13.7	4.2	--	--
BLD_10	224.6	68.5	1	28.7	8.8	--	--
BLD_11	211.9	64.6	1	53.1	16.2	--	--
BLD_12	213.8	65.2	1	18.0	5.5	--	--
BLD_13	213.7	65.1	1	25.0	7.6	--	--
BLD_17	213.0	64.9	1	29.5	9.0	--	--
BLD_18	215.3	65.6	1	10.8	3.3	--	--
BLD_23	211.6	64.5	1	47.0	14.3	--	--
BLD_24	212.9	64.9	1	31.9	9.7	--	--
BLD_25	213.4	65.0	1	24.7	7.5	--	--
BLD_26	212.5	64.8	1	27.1	8.3	--	--
BLD_22	214.9	65.5	1	49.0	14.9	--	--
BLD_27	217.2	66.2	1	32.0	9.8	--	--
BLD_28	213.5	65.1	1	30.3	9.2	--	--
BLD_21	221.1	67.4	1	29.0	8.8	--	--
BLD_29	221.3	67.5	1	28.0	8.5	--	--
BLD_30	219.5	66.9	1	20.0	6.1	--	--
BLD_30	219.5	66.9	1	20.0	6.1	--	--
BLD_30	219.5	66.9	1	20.0	6.1	--	--
BLD_30	219.5	66.9	1	20.0	6.1	--	--
BLD_31	218.7	66.7	1	20.0	6.1	--	--
BLD_31	218.7	66.7	2	25.0	7.6	--	--
BLD_31	218.7	66.7	3	30.0	9.1	--	--
BLD_31	218.7	66.7	4	35.0	10.7	--	--
BLD_32	219.7	67.0	1	24.8	7.6	--	--
BLD_33	221.6	67.5	1	24.5	7.5	--	--
BLD_34	215.8	65.8	1	20.0	6.1	--	--
BLD_34	215.8	65.8	2	25.0	7.6	--	--
BLD_34	215.8	65.8	3	30.0	9.1	--	--
BLD_34	215.8	65.8	4	35.0	10.7	--	--
BLD_35	217.7	66.4	1	20.0	6.1	--	--
BLD_35	217.7	66.4	2	25.0	7.6	--	--
BLD_35	217.7	66.4	3	30.0	9.1	--	--
BLD_35	217.7	66.4	4	35.0	10.7	--	--

REFERENCES:

⁽¹⁾ Base elevation derived from 1/3-arc second US Geological Survey National Elevation Dataset.

⁽²⁾ Information provided by Stimson Lumber Company.

FIGURES





Project: M0066.03.007 Produced By: jroberts Reviewed By: aragors Print Date: 4/10/2023 Path: X:\0066.03\Stimson Timber\HRA\Forest Grove Complex\GIS\M0066_03_007_AF_HRA.aprx\Fig2-1 Aerial Photography of Facility

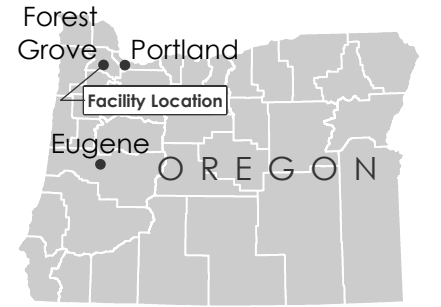
Figure 2-1 Aerial Photography of Facility

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

Legend

-  Exposure Assessment Boundary
-  UTM 500-Meter Grid Mark

Key Map



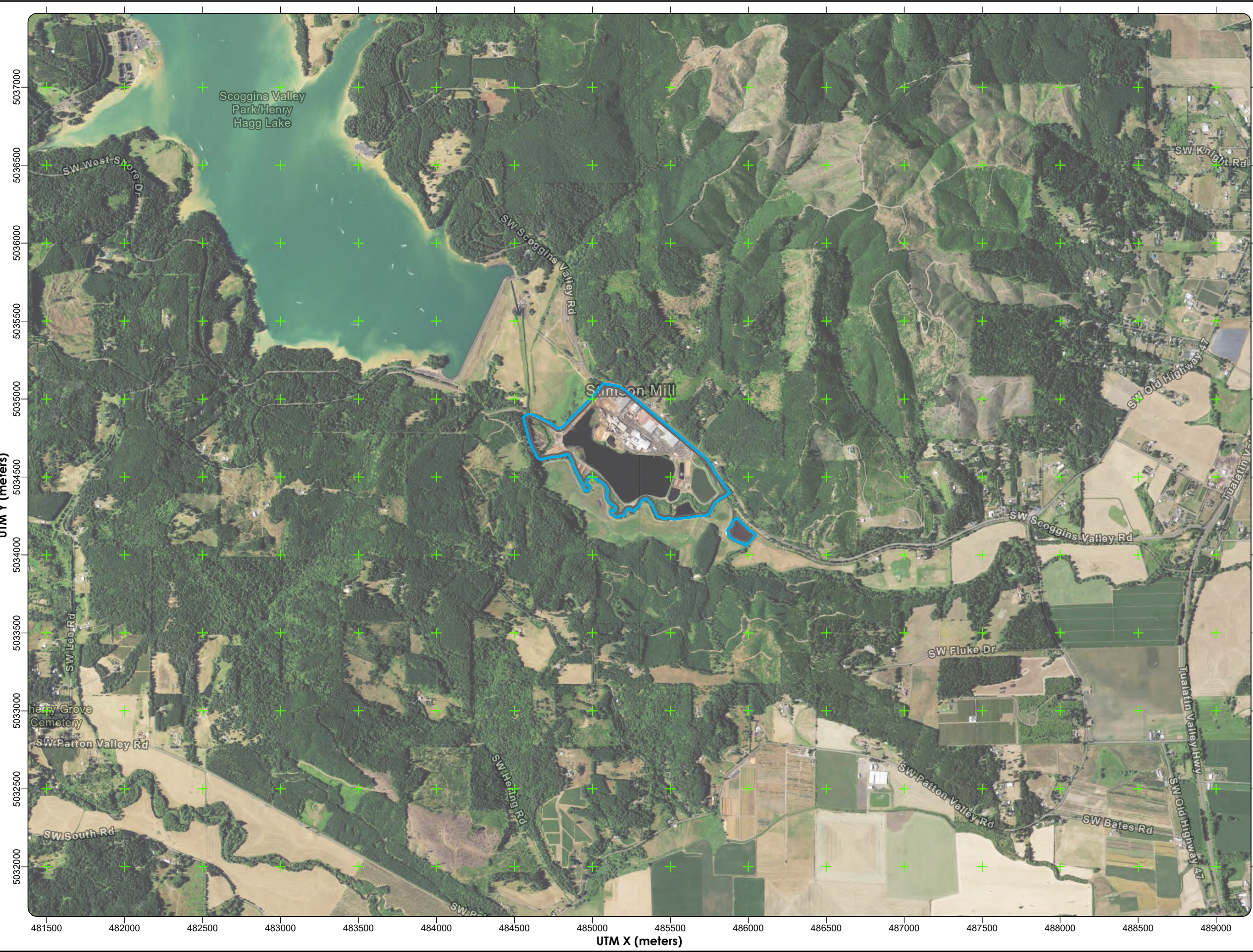
UTM = Universal Trans Mercator



Data Sources
Aerial photography from the U.S. Department of Agriculture; reference labels from Esri.

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Project: M0066.03.007
Produced By: JRoberts
Reviewed By: aragors
Print Date: 4/10/2023
Path: X:\0066.03.Stimson\Timber\HRA\Forest Grove Complex\GIS\W0066_03_007_Air_HRA.aprx\Fig2-2 Local Topography

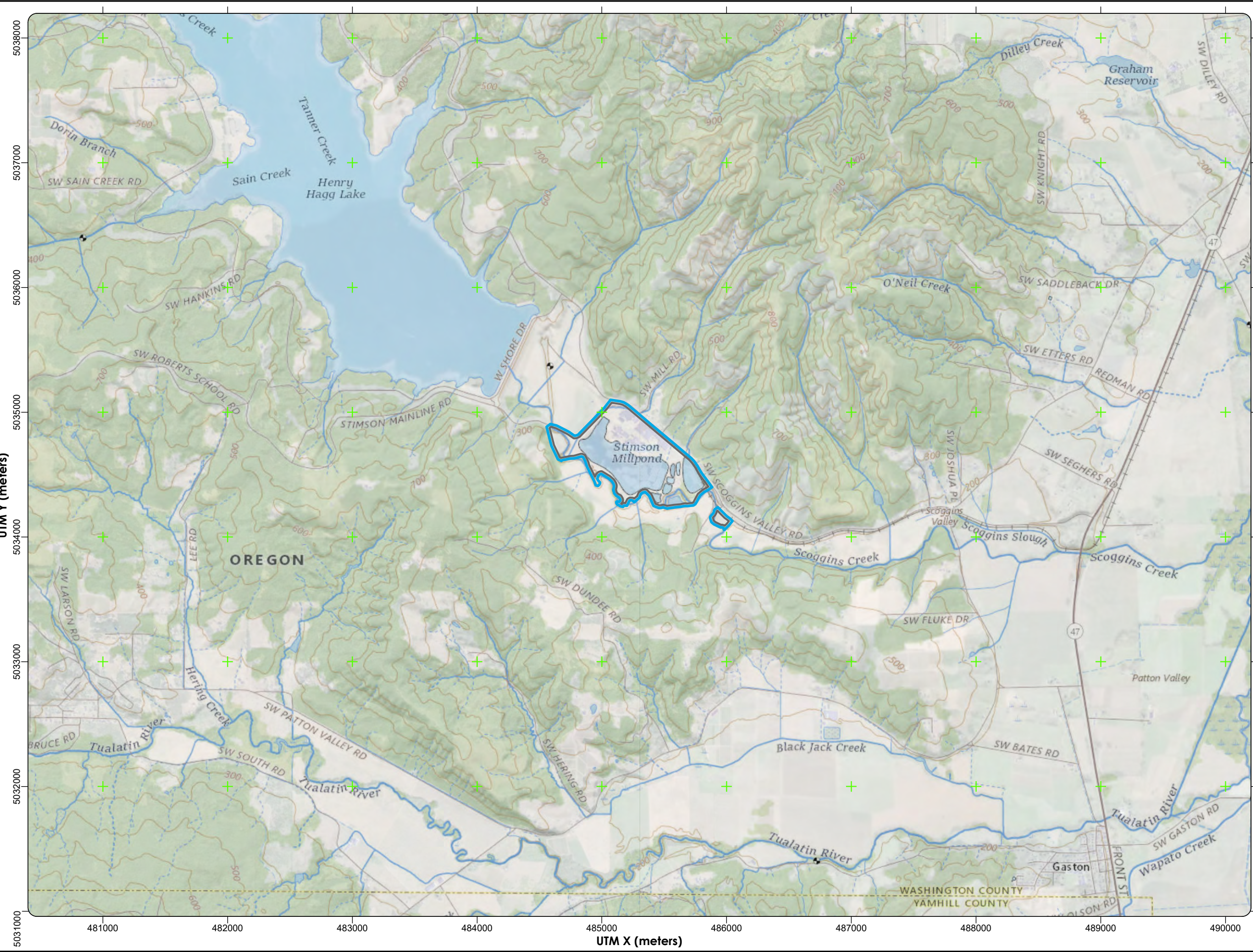




Figure 2-2 Local Topography

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

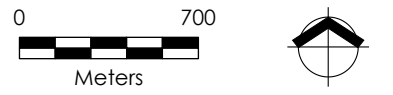
Legend

-  Exposure Assessment Boundary
-  UTM 1-Kilometer Grid Mark

Key Map



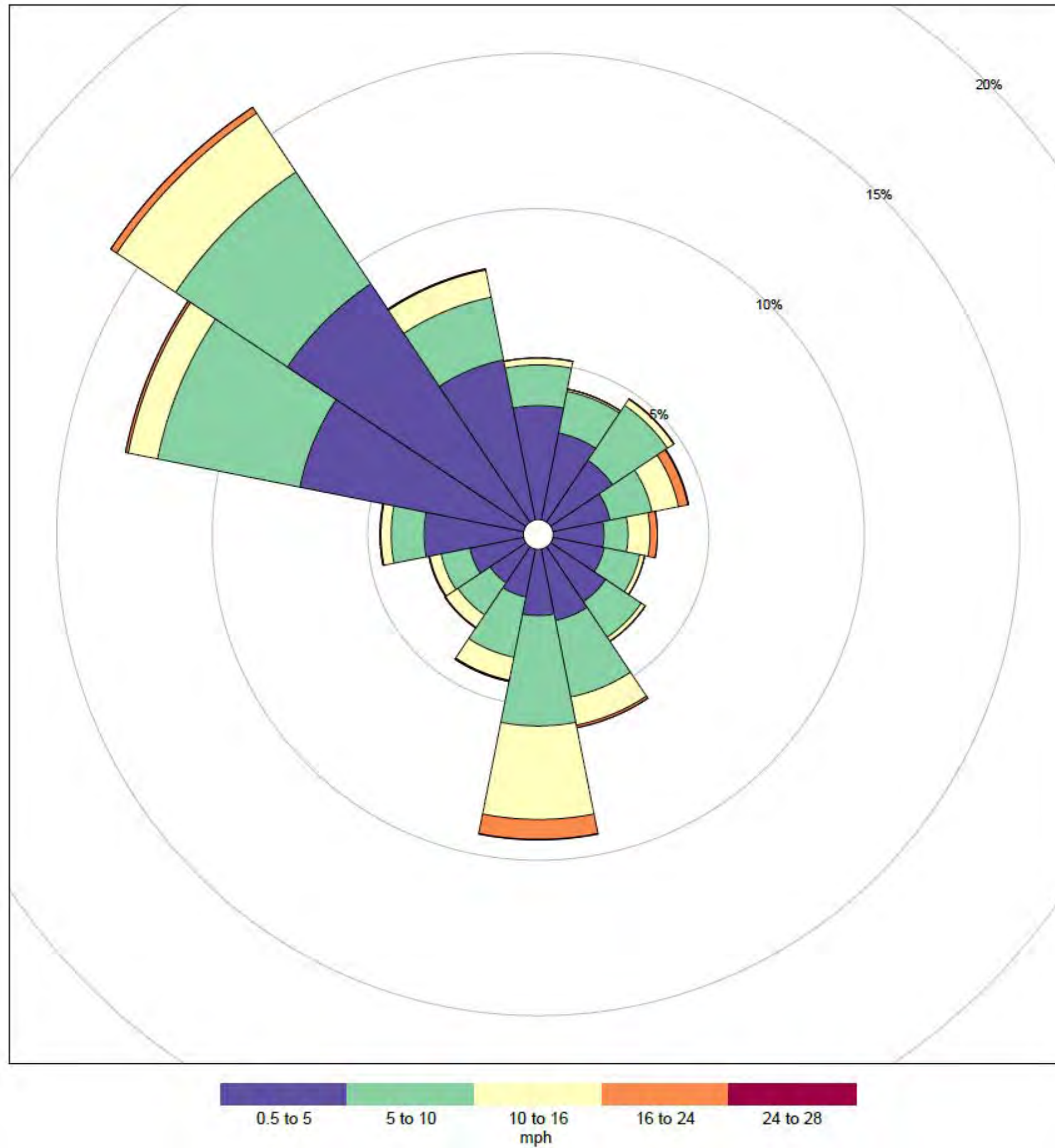
UTM = Universal Trans Mercator



Data Source
Topographic basemap from Esri.



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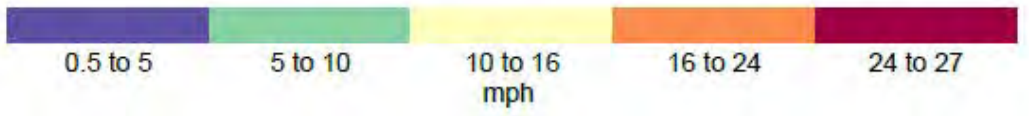
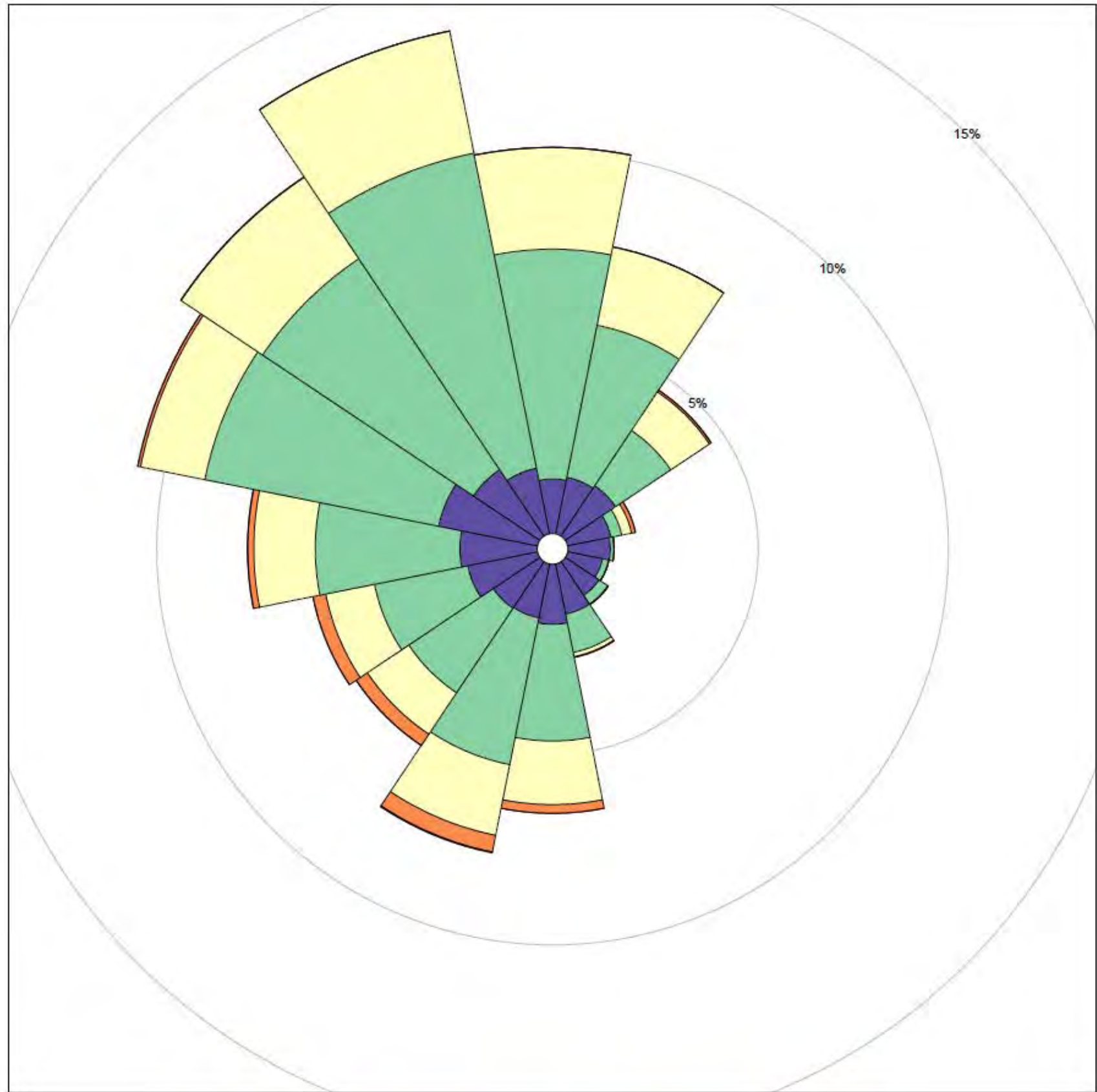
**Figure 4-1
Wind Rose**

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

Key Map



mph = miles per hour



**Figure 4-2
Wind Rose
(MMIF Data)**

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

Key Map



mph = miles per hour




Project: M0066.03.007
Produced By: jroberts
Reviewed By: anogers
Print Date: 4/11/2023
Path: X:\0066.03.Stimson Timber\HRA\Forest Grove Complex\GIS\M0066.03.007_Air_HRA.aprx\Fig4-3 Proposed Downwash Structure Locations



Figure 4-4 Proposed Downwash Structure Locations

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

Legend

-  Proposed Downwash Structures
-  Exposure Assessment Boundary
-  UTM 50-Meter Grid Mark

Key Map



UTM = Universal Trans Mercator



Data Sources
Aerial photography from the U.S. Department of Agriculture; reference labels from Esri.



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Project: MD066.03.007
 Produced By: aragors
 Reviewed By: aragors
 Print Date: 1/15/2024
 Path: X:\0066.03.Stimson Timber\HRA\Forest Grove Complex\GIS\MD066.03_007_Air_HRA\appx\Fig4-2_Proposed Emission Source Locations

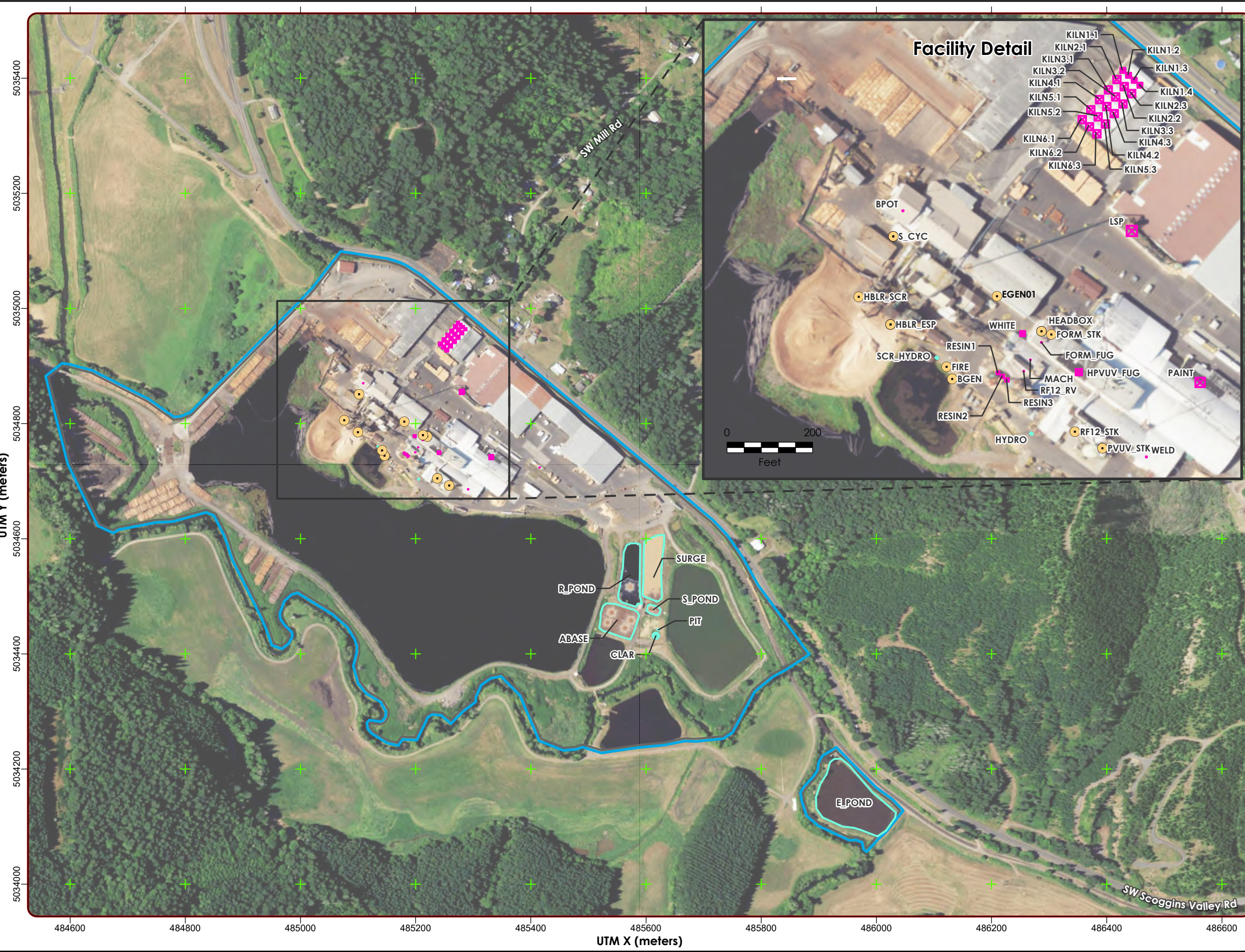


Figure 4-2
Proposed Emission Source Locations
 Stimson Lumber Company
 Forest Grove Complex
 Gaston, OR

Legend

- Proposed Point Source
- Proposed Area Source
- Proposed Volume Source
- ▭ Exposure Assessment Boundary
- + UTM 500 Meter Grid Mark

Key Map

0 200
 Meters

Data Source
 Aerial photography from the U.S. Department of Agriculture

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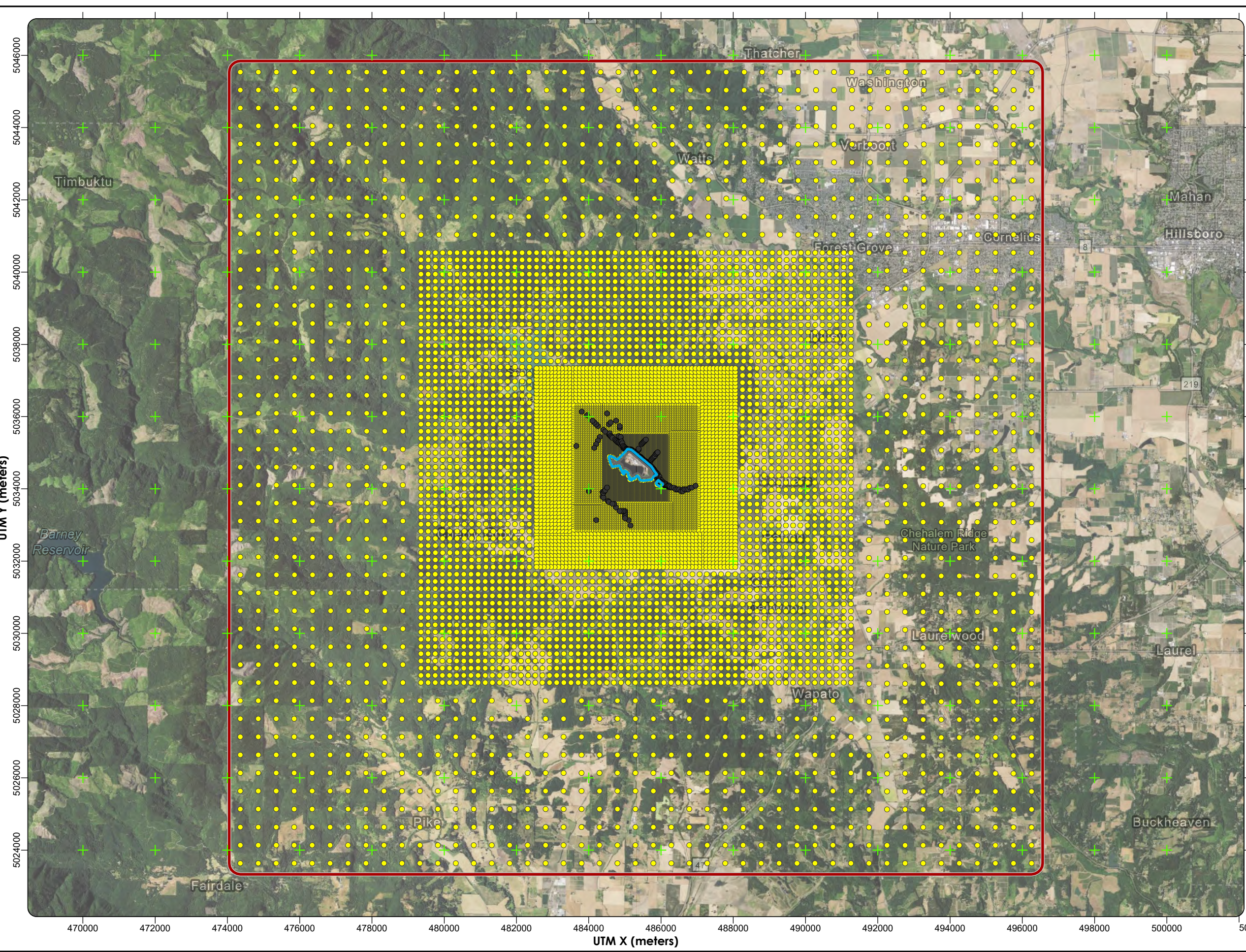


Figure 4-5 Proposed Receptor Locations

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

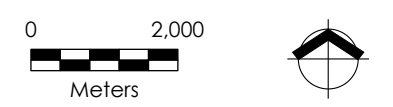
Legend

- Proposed Receptor
- Proposed Receptor in Right of Way
- Proposed Modeling Domain Extent
- Exposure Assessment Boundary
- + UTM 2-Kilometer Grid Mark

Key Map



UTM = Universal Trans Mercator



Data Sources
Aerial photography from the U.S. Department of Agriculture; reference labels from Esri.



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Project: MD066.03.007 Produced By: jroberts Reviewed By: aragors Print Date: 4/12/2023 Path: X:\0066.03\Stimson Timber\HRA\Forest Grove Complex\GIS\MD066.03_007_Ar_HRA_aprx\Fig4-6_Proposed Receptor Locations in Immediate Area

Figure 4-6 Proposed Receptor Locations in Immediate Area

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

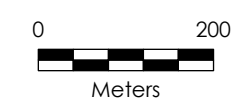
Legend

- Proposed Receptor
- Proposed Receptor in Right of Way
- Exposure Assessment Boundary
- + UTM 200-Meter Grid Mark

Key Map



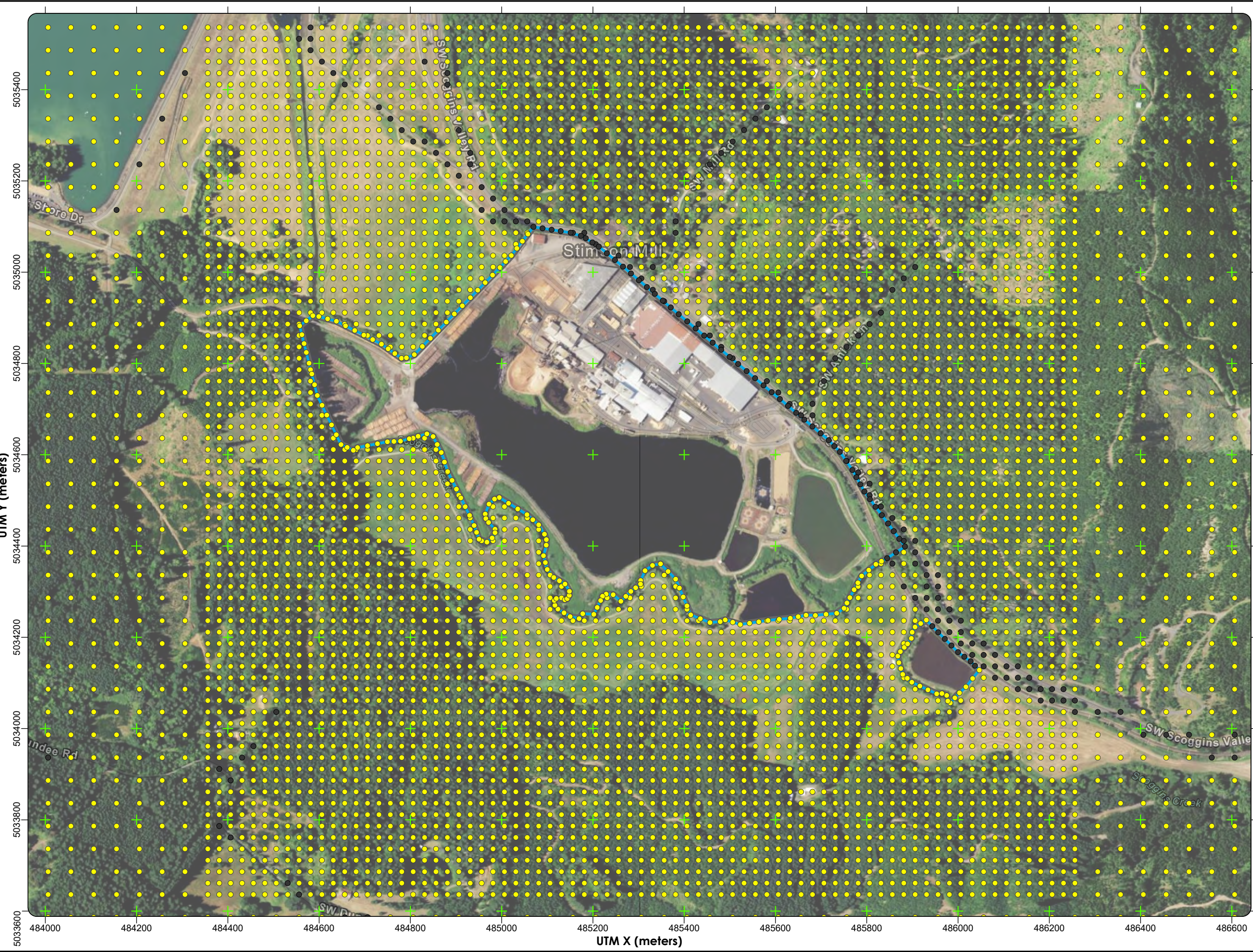
UTM = Universal Trans Mercator



Data Sources
Aerial photography from the U.S. Department of Agriculture; reference labels from Esri.



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Path: X:\006663\Stinson\Timber\HRA\Forest_Grove_Corridor\GIS\Map066_03_007_Air_HRA.aprx; Find: 6 Existing Land Use Classification
Print Date: 4/12/2023
Reviewed By: anbers
Produced By: anbers
Project: MD066_03_007

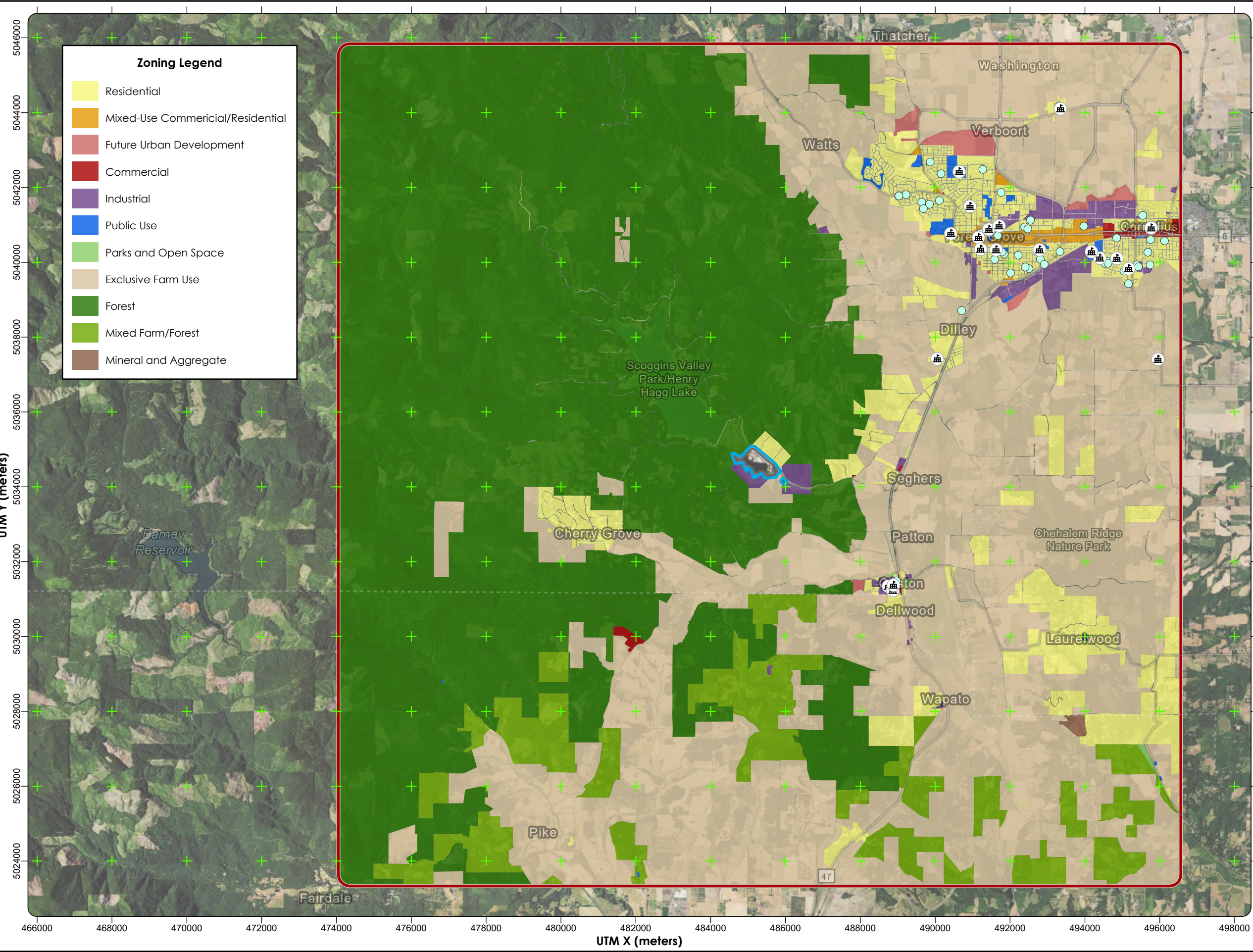


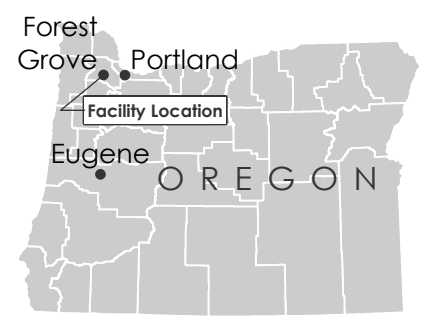
Figure 4-7
Existing Land Use
Zoning Classifications

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

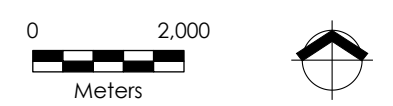
Legend

- School Location (2015-16)
- Early Learning Providers (2020)
- Exposure Assessment Boundary
- Proposed Modeling Domain Extent
- UTM 2-Kilometer Grid Mark

Key Map



UTM = Universal Trans Mercator



Data Sources
Zoning from the Oregon Department of Land Conservation and Development (2017); school locations from Oregon Health Authority; early learning providers from Oregon Department of Education; aerial photography from the U.S. Department of Agriculture; reference labels from Esri.

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Project: M0066.03.007 Produced By: jroberts Reviewed By: drogers Print Date: 4/12/2023 Path: X:\0066.03.Stimson_Timber\HRA\Forest Grove Complex\GIS\M0066.03_007_Air_HRA.aprx\Fig4.7_Existing Land Use Classification Immediate Area

Figure 4-8 Existing Land Use Zoning Classifications in the Immediate Area

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

Legend

-  Exposure Assessment Boundary
-  Tax Lot
-  UTM 200-Meter Grid Mark

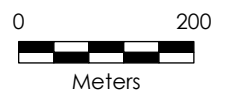
Zoning

-  Residential
-  Industrial
-  Exclusive Farm Use
-  Forest

Key Map



UTM = Universal Trans Mercator

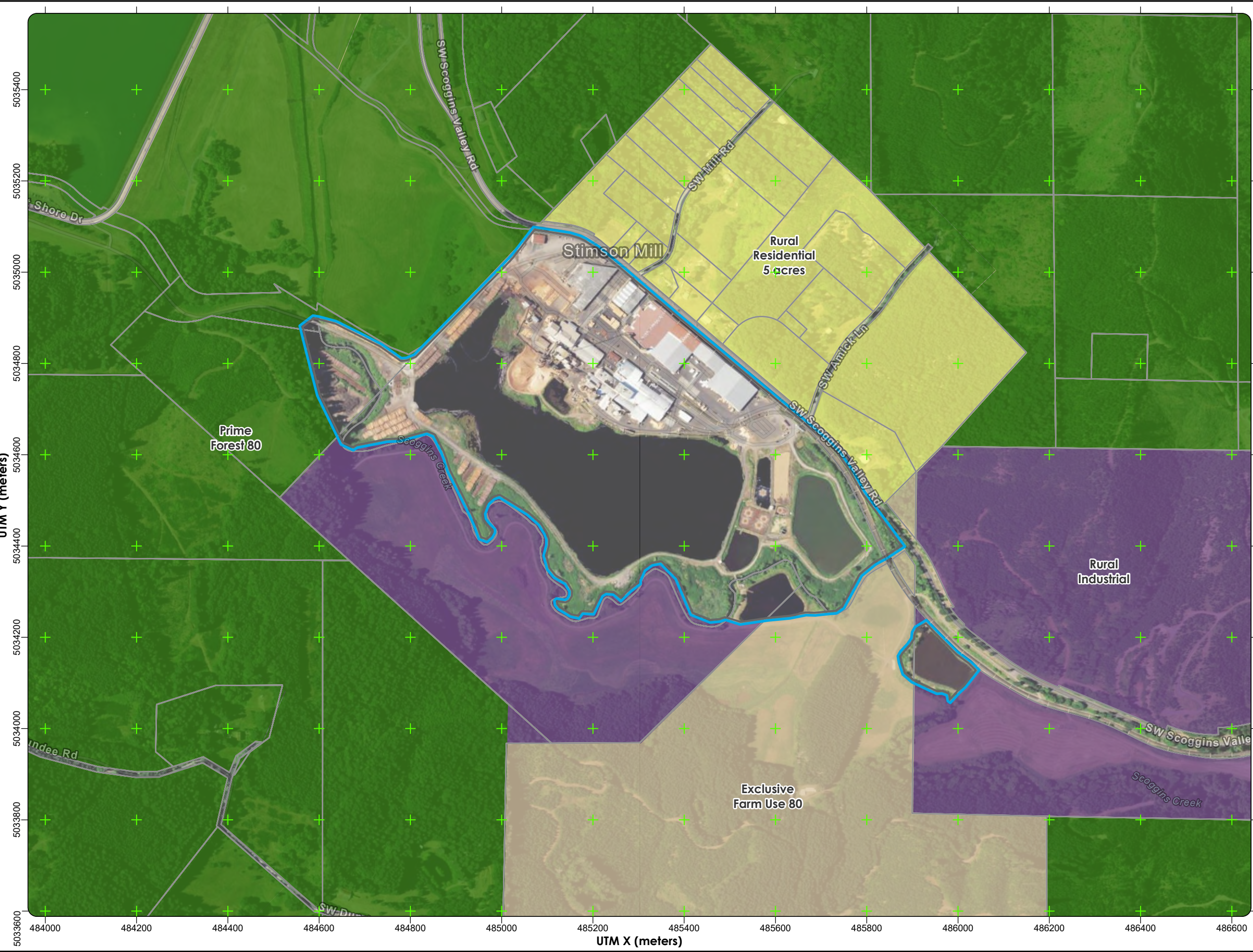


Data Sources

Zoning from the Oregon Department of Land Conservation and Development (2017); aerial photography from the U.S. Department of Agriculture; tax lots from Oregon Metro and Yamhill County.



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Path: C:\Users\arogers\Desktop\Work\Stimson\Figures\M0066_03_007_Air_HEA_AR.aprx\Fig4-8 Proposed Exposure Categorization
Print Date: 10/18/2023
Reviewed By: arogers
Produced By: arogers
Project: M0066_03_007

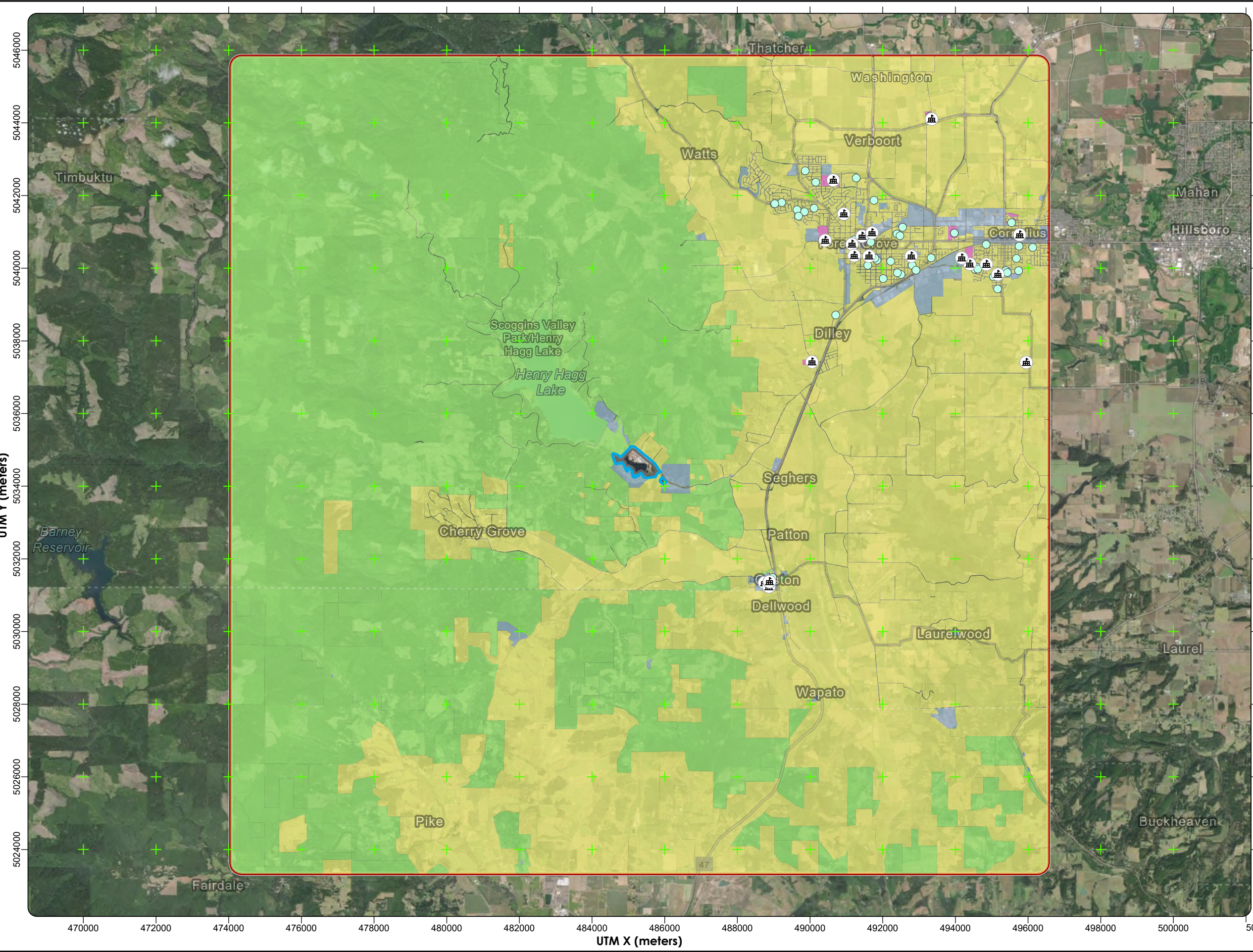


Figure 4-8 Proposed Exposure Categorization

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

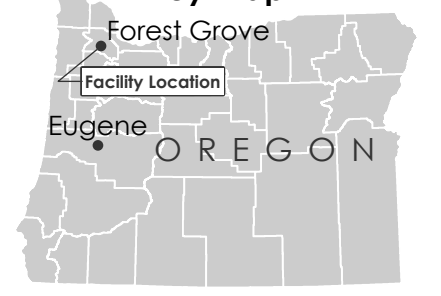
Legend

- School Location (2015-16)
- Early Learning Providers (2020)
- Exposure Assessment Boundary
- Proposed Modeling Domain Extent
- UTM 2-Kilometer Grid Mark

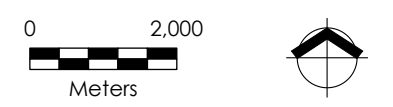
Proposed Exposure Classification

- Acute
- Child
- Residential
- Worker

Key Map



Notes
Zoning data from the Oregon Department of Land Conservation and Development (2017).
Existing land use classifications revised to reflect the risk-based concentration categories presented in Oregon Administrative Rule 340-245-8040 Table 4. Tax lot land use is used for classifications where zoning data is unavailable and where tax lot land use is more conservative.



Data Sources
Aerial photography from the U.S. Department of Agriculture; schools from Oregon Health Authority; early learning facilities from the Oregon Department of Education.



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Path: C:\Users\arogers\Desktop\Work\Stimson\Figures\M0066_03_007_Air_HRA_AR.aprx\Fig4-9 Proposed Exposure Categorization in Immediate Area
Print Date: 10/18/2023
Reviewed By: arogers
Produced By: arogers
Project: M0066.03.007

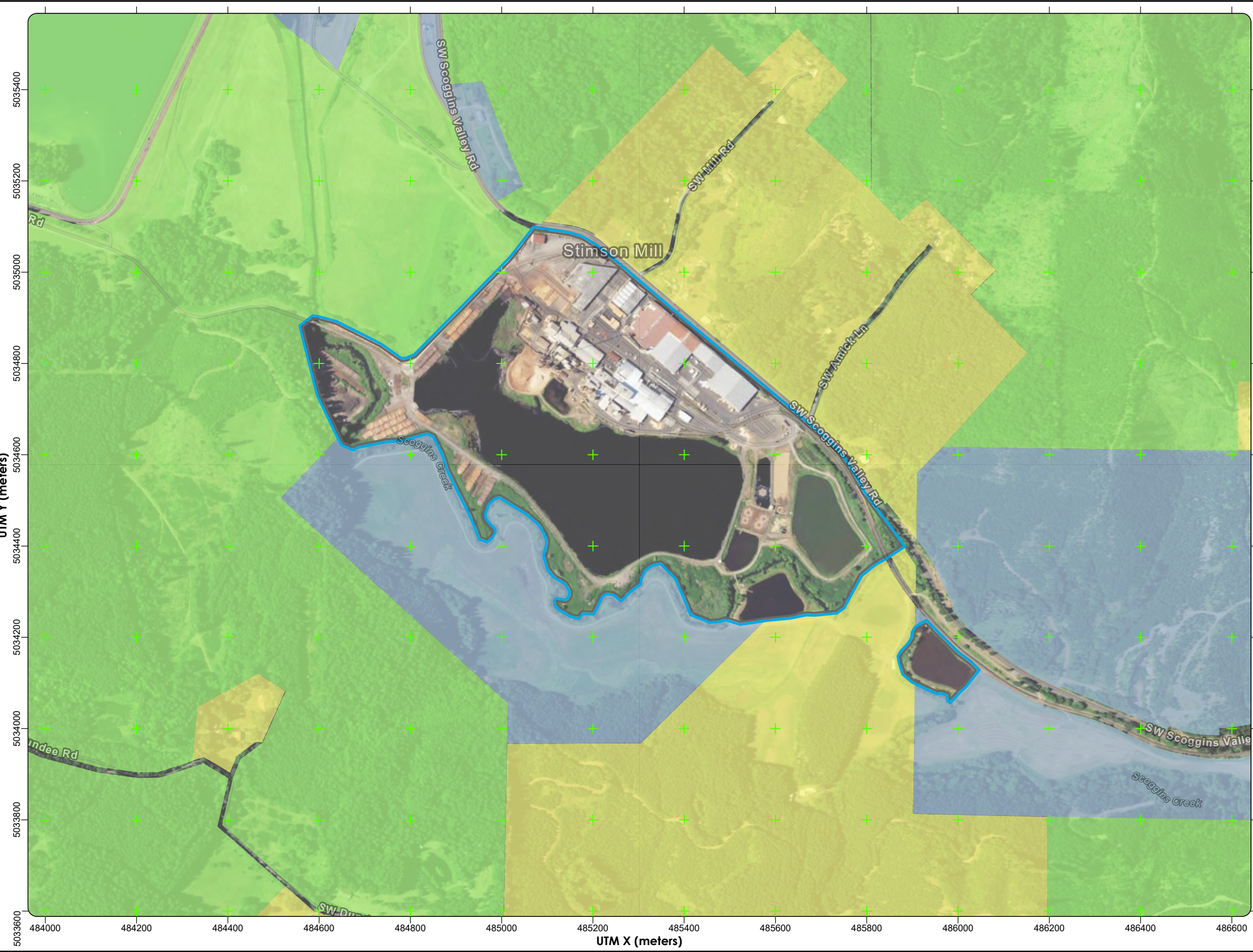


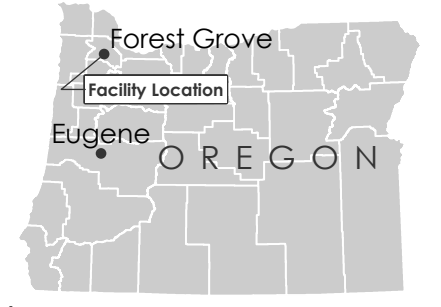
Figure 4-9 Proposed Exposure Categorization in the Immediate Area

Stimson Lumber Company
Forest Grove Complex
Gaston, OR

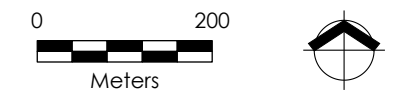
Legend

- Exposure Assessment Boundary
- UTM 200-Meter Grid Mark
- Proposed Exposure Classification**
- Acute
- Residential
- Worker

Key Map



Notes
Zoning data from the Oregon Department of Land Conservation and Development (2017). Existing land use classifications revised to reflect the risk-based concentration categories presented in Oregon Administrative Rule 340-245-8040 Table 4. Tax lot land use is used for classifications where zoning data is unavailable and where tax lot land use is more conservative.



Data Sources
Aerial photography from the U.S. Department of Agriculture.



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