Attachment B

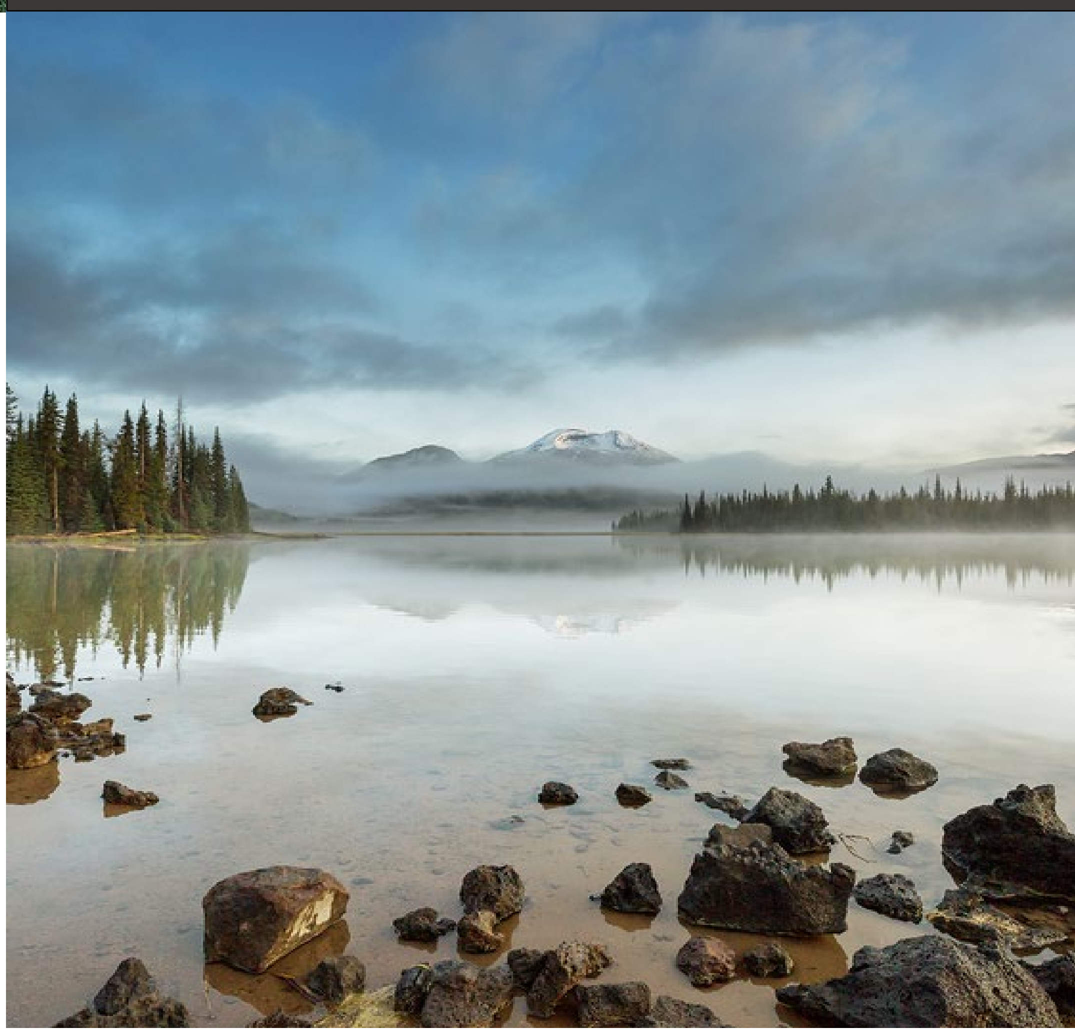
Includes:

- Klamath Falls Redesignation Request and Maintenance Plan for $PM_{2.5}$
- Appendices 1-6

Klamath Falls Redesignation Request and Maintenance Plan for $PM_{2.5}$

Submitted to: Environmental Protection Agency

Final Version
April 29, 2024



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Executive summary

The Oregon Department of Environmental Quality (DEQ) proposes a revision to the State of Oregon Clean Air Act Implementation Plan, referred to as the State implementation Plan (SIP). This proposed revision would:

- Redesignate the Klamath Falls airshed as attainment for the national air quality health standards for fine particles ($PM_{2.5}$); and
- Include a 10-year maintenance plan to keep PM2.5 concentrations in compliance with the 2024 24-hour national ambient air quality standards (40 CFR 50.7).

The U.S. Environmental Protection Agency (EPA) adopted more protective $PM_{2.5}$ health standard in 2006 as part of its periodic review of National Ambient Air Quality Standards (NAAQS) to ensure protection of public health. The Klamath Falls airshed was identified as an area not meeting the $PM_{2.5}$ health standard on worst winter days and was designated as a $PM_{2.5}$ nonattainment area in 2009.

In collaboration with the City of Klamath Falls, the County and other stakeholders, DEQ submitted a Klamath Falls 2012 PM2.5 Attainment Plan ("2012 Attainment Plan") for the Klamath Falls airshed in 2012 as a SIP revision. The 2012 Attainment Plan identified residential wood combustion (in certified and non-certified woodstoves, fireplaces and pellet stoves) as the major emission category causing violations of the $PM_{2.5}$ health standards on stagnant winter days and outlined commitments for a number of strategies to curtail residential wood combustion during stagnant conditions, replace non-certified woodstoves with cleaner burning units, and improve firewood seasoning and woodstove operation to reduce $PM_{2.5}$ emissions.

The 2012 Attainment Plan was successful in achieving the $PM_{2.5}$ health standard on schedule, based on 2012-2014 monitoring data. EPA made a finding of attainment for Klamath Falls and approved the Attainment Plan in June 2016.

Major wildfires in 2012, 2013, 2015, 2017, 2018, 2020 and 2021 caused summertime violations of the $PM_{2.5}$ health standard. These wildfires caused significant impacts on Klamath Falls residents, but those violations are being addressed separately by DEQ and EPA as part of the Exceptional Events review process. The Exceptional Events rule and guidance developed by EPA, in consultation with other agencies and the public, is intended to prevent penalizing communities for events outside their control.

This proposed redesignation request outlines the specific actions taken in the Klamath Falls area to successfully meet the federal Clean Air Act requirements and includes a maintenance plan to continue the critical air pollution control strategies. Ongoing and additional control strategies are:

- The Klamath County Clean Air Ordinance;
- Woodstove Change-Outs;
- Oregon and EPA Woodstove Certification Programs;
- Heat Smart: Statewide Stove Removal Upon Sale of Home;
- Public Education Efforts on Woodsmoke;
- ASTM Fireplace Standard for New Construction;
- Oregon Smoke Management Plan Restrictions on Prescribed Burning;
- Maximum Achievable Control Technology (MACT) Reductions;

- RACT for Industrial Sources of $PM_{2.5}$;
- Road Paving and Winter Sanding Best Practices;
- Federal Transportation and Fuel-Related Emissions Reductions.

Introduction

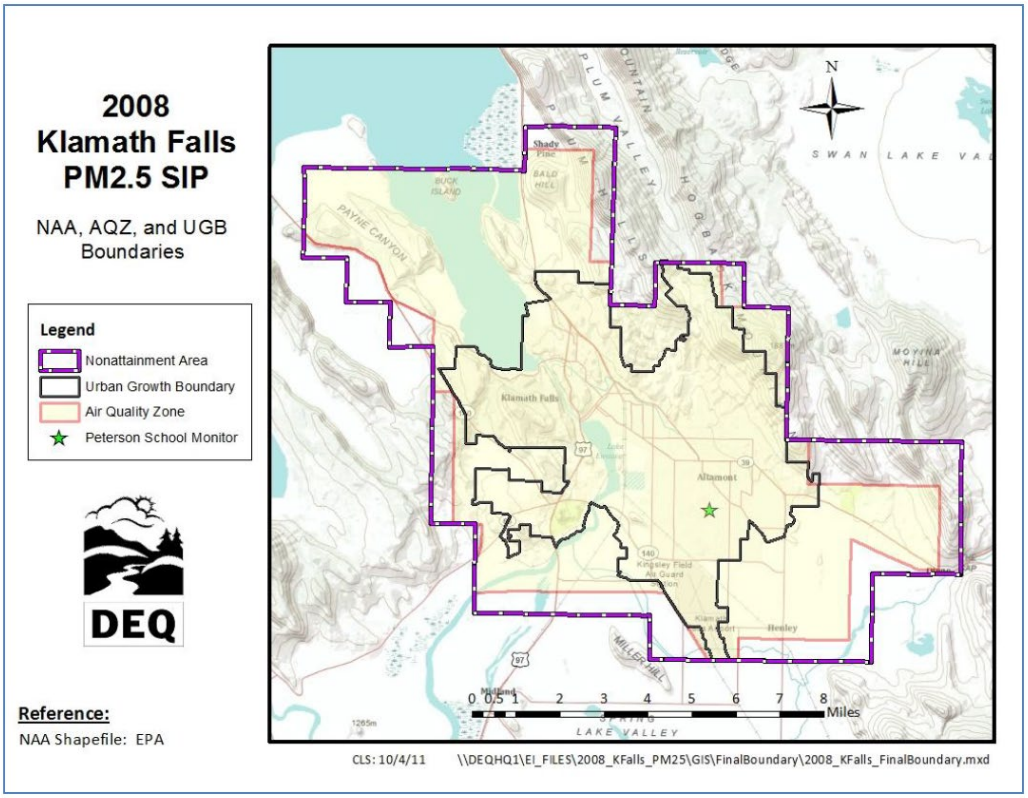
The federal Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) and to periodically review and update these standards to protect public health. EPA adopts new standards after consultation with the Clean Air Scientific Advisory Committee (CASAC), a group of non-EPA scientists and medical professionals established by Congress.

In 1997, EPA adopted a daily (24-hr) $PM_{2.5}$ standard of 65 micrograms per cubic meter ($\mu g/m^3$) and an annual $PM_{2.5}$ standard of 15 $\mu g/m^3$. However, subsequent national health studies supported more protective $PM_{2.5}$ health standards, and EPA adopted a 35 $\mu g/m^3$ 24-hour $PM_{2.5}$ standard in 2006 and a 12 $\mu g/m^3$ annual $PM_{2.5}$ standard in 2012. The annual PM2.5 standard was lowered again in March of 2024 to 9 $\mu g/m^3$.

In general, areas in violation of the $PM_{2.5}$ standards (based on the most recent three years of regulatory monitoring data) are initially designated as a Moderate Nonattainment Area (NAA) by the EPA. DEQ has monitored at the Peterson School site, in Klamath Falls, Since 1999 for $PM_{2.5}$. Klamath Falls was designated as nonattainment for the 2006 daily $PM_{2.5}$ standard in 2009 based on a comparison of Klamath Falls nonattainment area data from 2006-2008 with the 2006 daily standard of 35 $\mu g/m^3$. Figure 1 illustrates the nonattainment area boundary.

The $PM_{2.5}$ NAA boundary was expanded from the Klamath Falls Woodstove and Open Burning Ordinance Boundary, also known as the air quality zone (AQZ) and finalized by the EPA after collaboration with Oregon Department of Environmental Quality (DEQ) for the 2008 inventory. The 2008 non-attainment boundary was also used for the 2017 base year and 2037 future year emissions inventories. The NAA and AQZ boundaries, along with the Klamath Falls Urban Growth Boundary (UGB) are shown in Figure 1 below.

Figure 1: 2008 and 2017 Klamath Falls PM2.5 NAA, AQZ, and UGB Boundaries



The legal description of the Klamath Falls NAA defines the nonattainment area boundary and can be found in Oregon Administrative Rules (OAR) Chapter 340, Division 204, and Section 0010(6).

> *"Klamath Falls nonattainment area" means the area of the state beginning at the northwest corner of Section 31, T37S, R9E; thence east approximately two miles to the northeast corner of Section 32; thence south approximately four miles to the southeast corner of Section 17, T38S, R9E; thence east approximately one mile to the southwest corner of Section 15,; thence north approximately one mile to the northwest corner of Section 15; thence east approximately 2 miles to the northeast corner of Section 14; thence south approximately one mile to the northwest corner of section 24; thence east approximately one mile to the northeast corner of Section 24; thence south approximately three miles to the southeast corner of Section 36; thence east approximately four miles to the northeast corner of Section 3, T39S, R10E; thence south approximately three miles to the southeast corner of Section 15; thence west approximately two miles to the southwest corner of Section16; thence south approximately two miles to the southeast corner of Section 29; thence west approximately five miles to the southwest corner of Section 27, T39S, R9E; thence north approximately one mile to the northeast corner of Section 27; thence west approximately four miles to the southwest corner of Section 24, T39S R8E; thence north approximately two miles to the northeast corner of Section 13; thence west approximately one mile to*

the southwest corner of Section 11; thence north approximately four miles to the northwest corner of Section 26 T38S, R8E; thence west one mile to the southwest corner of Section 22; thence north approximately one mile to the northwest corner of Section 22; thence west approximately one mile to the southwest corner of Section 16; thence north approximately one mile to the northeast corner of Section 16; thence west approximately one mile to the southwest corner of Section 8; thence north approximately two miles to the northwest corner of Section 5; thence east to the northeast corner of Section 1; thence north approximately one mile to the point of beginning.

In addition to the NAA, there are other specified boundaries within the NAA including the Air Quality Zone (AQZ), the Urban Growth Boundary (UGB), the Open Burning Control Area, the Special Protection Zone (SPZ), and the Smoke Sensitive Receptor Area (SSRA).

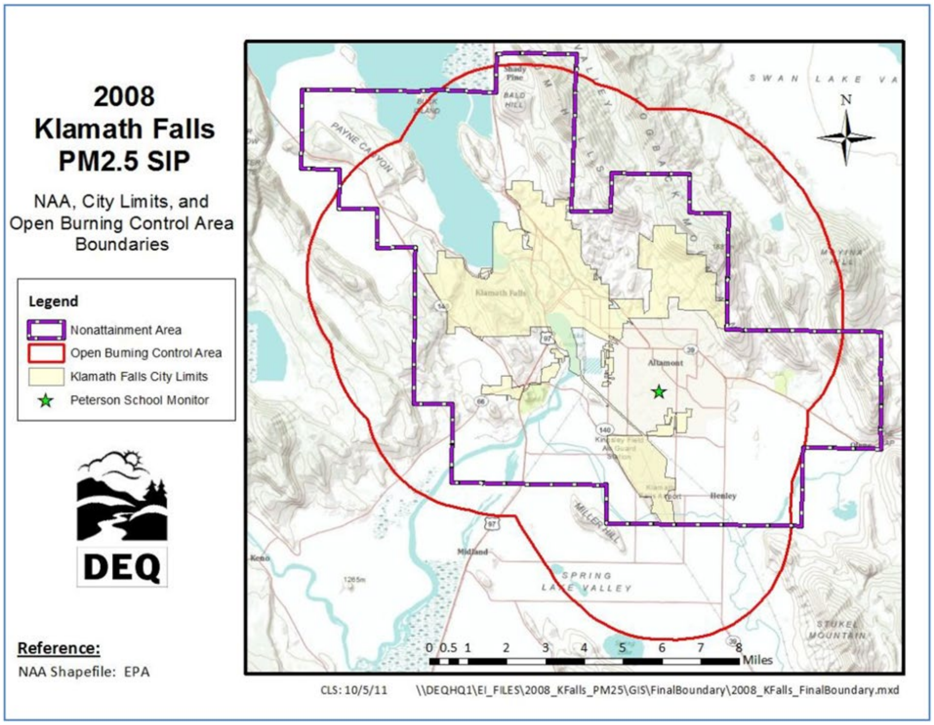
The AQZ is the area within Klamath County within which Air Quality Advisories and the burning restrictions of the Klamath Air Quality Ordinance apply in order to maintain attainment with the NAAQS.

The UGB is an area of the county surrounding the City of Klamath Falls designated by the Klamath County Board of Commissioners and the City of Klamath Falls as an area of potential growth to comply with Oregon land use law and control urban expansion onto farm and forest lands.

The purpose of the Open Burning Control Area is to restrict open burning in and around densely populated urban areas in order to reduce particulate matter in communities. These areas are regulated by DEQ and restrict commercial, construction and demolition open burning within three miles of the city limit. Slash burning on forest land within this area not controlled by the Department of Forestry is also prohibited in Open Burning Control Areas except as provided by OAR 340-264-0078(1). The Klamath Falls Open Burning Control Area is regulated by OAR 340-264-0175.

See Figure 2 for the 2008 Klamath Falls $PM_{2.5}$ NAA and Open Burning Control Area boundaries.

Figure 2: 2008 Klamath Falls $PM_{2.5}$ NAA, City Limits, and Open Burning Control Area Boundaries



In addition to the Open Burning Control Area, the Oregon Department of Forestry (ODF) has specified two additional zones. The SPZ is designated by ODF to provide additional protection from particulates. Any burning within the SPZ during the colder season when PM tends to be higher, from November 15-February 15, is restricted on red advisory days and requires approval of the meteorologist on green and yellow days. Additional restrictions that apply to the SPZ are set out in OAR 629-048-0135 and -0137. The SPZ boundaries are the same as the Klamath Falls NAA and apply until the area is designated in attainment with the $PM_{2.5}$ NAAQS.

As per OAR 629-048-0140, an SSRA is designated by the State Board of Forestry in consultation with DEQ to provide the highest level of protection under the Oregon Smoke Management Plan (SMP). Factors considered in the designation of SSRAs include past history of smoke incidents; density of population or other special legal status related to visibility. The SSRA in Klamath Falls has the same boundary as the City of Klamath Falls' Urban Growth Boundary.

Oregon Department of Environmental Quality, Klamath County, and other stakeholders developed the 2012 Attainment Plan to meet the daily $PM_{2.5}$ standard by the Clean Air Act deadline of December 31, 2014. The 2012 Attainment Plan was approved by the Environmental Quality Commission on November 16, 2012 and incorporated into the State of Oregon Clean Air Act Implementation Plan, referred to as the State Implementation Plan (SIP). On December 30, 2014 (79 FR 78372) EPA proposed and on August 25, 2015 (80 FR 51470) EPA finalized approval of the emissions inventory and control measures for the Klamath Falls nonattainment area.

On April 13, 2016 (81 FR 21814) EPA proposed and on June 6, 2016 (81 FR 36176) EPA finalized the finding of attainment and the 2012 Attainment Plan approval for the Klamath Falls $PM_{2.5}$ nonattainment area based on 2012-2014 air monitoring data. This approval was effective July 6, 2016.

The federal Clean Air Act [in CAA §107(d)(3)(E)] allows areas to request redesignation of a nonattainment area to attainment if certain criteria are met. This redesignation request and maintenance plan address the Clean Air Act requirements and outlines how the Klamath Falls airshed will continue to meet the $PM_{2.5}$ NAAQS. The redesignation request and maintenance plan are organized as follows:

- **Background:** describing the airshed, and the historical $PM_{2.5}$ air pollution problem.
- **Redesignation Requirements:** demonstrating how this document fulfills federal Clean Air Act requirements to redesignate the area to attainment.
- **Air Quality Monitoring:** summarizing the $PM_{2.5}$ monitoring data and trends.
- **Emission Inventories:** summarizing major sources of $PM_{2.5}$ emission from 2017 through 2037.
- **Air Pollution Control Strategies:** describing key control measures that continue to contribute to $PM_{2.5}$ emission reductions in future years.
- **Transportation Conformity:** summarizing the motor vehicle emissions budget to limit on-road motor vehicle emissions from cars and trucks.
- **Maintenance of 2006 $PM_{2.5}$ 24-hour NAAQS:** describing the commitment to continue monitoring, verify continued attainment, and the contingency plan.
- **Redesignation to Attainment:** describing the next steps in the process.

Background

Klamath Falls is a relatively small urban community located in a large rural county in south-central Oregon at an elevation of 4,105 feet. The Klamath Falls nonattainment area (see Figure 1) has a population of approximately 50,700 as of 2017. Based on Portland State University's Population Center's long-range forecast, the Klamath Falls nonattainment area population is expected to grow to approximately 52,125 by 2037 (0.14 percent per year linear non-compounding average annual growth).

The City of Klamath Falls serves as an important commercial center for south central Oregon. The Klamath Basin is a relatively flat area of an old high elevation lakebed that is drained by the Klamath River. Occasional hills and a system of elongated ridges confine the basin and the greater Klamath Falls area to the east and west. Most of the Klamath Falls residential area, especially the south suburban area, is located in the lower elevation portion of the basin. Because of these topographic features, Klamath Falls can experience very strong and shallow nighttime inversions that break up with daytime solar heating. In the wintertime, arctic air masses frequently move down Upper Klamath Lake and fill the Klamath Basin. Temperatures can remain well below freezing for several weeks at a time. Under these conditions, strong inversions occur over the Klamath Basin concentrating emissions in the south suburban area of Klamath Falls.

DEQ and the Klamath Falls community developed the 2012 Attainment Plan to bring air quality into compliance with the 24-hour PM2.5 NAAQS. DEQ and the Klamath Falls community have implemented and enforced all of the control strategies from the 2012 Attainment Plan that address various $PM_{2.5}$ emission sources, including residential wood smoke, open burning, industrial sources, and area sources. In implementing these efforts, Klamath Falls successfully achieved the 2006 24-hour $PM_{2.5}$ NAAQS on schedule in 2012-2014. EPA recognized compliance with the $PM_{2.5}$ NAAQS and made a finding attainment for the Klamath Falls area and approved the 2012 Attainment Plan in June 2016 (81 FR 36176).

Fine particulate matter ($PM_{2.5}$) is a mixture of extremely small particles and droplets in the air and is known to cause or contribute to respiratory disease, asthma attacks, heart problems, and premature death. Fine particles are most closely associated with such health effects as increased hospital admissions and emergency room visits for heart and lung disease, increased respiratory symptoms and disease, decreased lung function and premature death. Sensitive groups that are at greatest risk include the elderly, pregnant women, individuals with cardiopulmonary disease such as asthma, and children. Fine particles ($PM_{2.5}$) generally result from fuel combustion from residential fireplaces and woodstoves, pile and forest burning, industrial facilities, and motor vehicles.

EPA has established NAAQS for $PM_{2.5}$ at 35 µg/m^3 for a daily (24-hour) standard and 9 µg/m^3 as an annual standard. Any value monitored above these levels, as defined by federal rules and guidance, is considered an exceedance but not a violation of the NAAQS. A violation occurs when the design value is over the NAAQS. The design value for the daily standard is determined by taking the three-year average of the annual 98th percentile of the 24-hr average $PM_{2.5}$ levels. For more information on how the design value is calculated refer to 40 CFR Part 50, Appendix N.

EPA announced its boundary determination of Klamath Falls, OR as a nonattainment area for the 24-hour $PM_{2.5}$ standard in December 2008, and in December 2009 formally announced Klamath Falls as a nonattainment area (74 FR 58688). EPA subsequently made a finding of attainment and clean data determination (CDD), based on 2012-2014 air monitoring data, on June 6, 2016 (81 FR 36176), effective July 6, 2016. This Redesignation Request and Maintenance Plan includes a demonstration of continuing attainment with the 24-hr $PM_{2.5}$ standard in Klamath Falls.

Klamath Falls achieved attainment of the 2006 $PM_{2.5}$ NAAQS in 2014 and continues to attain that standard. Therefore, DEQ requests redesignation of the Klamath Falls Nonattainment Area (NAA) to attainment for the 24-hour $PM_{2.5}$ NAAQS (state classification will be "maintenance"). With the redesignation request, DEQ submits a maintenance plan to ensure the Klamath Falls area maintains compliance with the 24-hour $PM_{2.5}$ NAAQS. This redesignation request complies with the applicable 1990 federal Clean Air Act requirements and EPA rules, guidance, and policies. Redesignation requirements can be found in CAA §107(d)(3)(E), and maintenance plan requirements can be found in CAA §175(A).

The maintenance plan continues all permanent and enforceable strategies approved in the Klamath Falls attainment plan in order to continue to maintain the $PM_{2.5}$ standards for two decades following redesignation by EPA also includes contingency provisions should Klamath Falls not continue to meet air quality standards. For analyses in this report, the year 2017 was chosen as the emissions inventory baseline year because it is a year that the Klamath Falls NAA data suggest compliance with the standard and was the latest national emissions inventory year with data available for all sources when these analyses were conducted, including for nonpoint sources.

Oregon DEQ also developed and submitted actual annual emissions for larger permitted point sources for the 2017 NEI, which are critical for the analyses here. The end year of 2037 was chosen because DEQ had the necessary 2037 VMT data from ODOT's Travel Demand Model. Because Klamath Falls is an isolated rural area, it is not under the jurisdiction of a Metropolitan Planning Organization and thus reliant on ODOT to provide this data.

EPA must approve the Klamath Falls area maintenance plan under CAA Section 175(A) before the agency may redesignate the Klamath Falls area as attaining the $PM_{2.5}$ NAAQS. In order for EPA to redesignate the Klamath Falls area to attainment, the agency must also verify that the $PM_{2.5}$ design value meets the NAAQS, that the area has an attainment plan approved under CAA Section 110(k), that the state has met all applicable requirements for the area under CAA §110 Part D, and that air quality controls are permanent and enforceable.

Redesignation requirements

The federal Clean Air Act in Section 107 [CAA §107(d)(3)(E)] outlines the requirements the area must meet to redesignate the Klamath Falls $PM_{2.5}$ NAA to attainment:

a. The area has attained the 24-hour $PM_{2.5}$ NAAQS.
b. The improvement in air quality is due to permanent and enforceable reductions in emissions.
c. The plan has a fully approved implementation plan under CAA §110(k).
d. The area has met the requirements of CAA §110 and Part D.
e. The area has a fully approved maintenance plan that ensures attainment of the NAAQS for at least ten years beyond redesignation.

With EPA approval of this maintenance plan and redesignation request, the Klamath Falls NAA will meet all the requirements for EPA to redesignate the area to attainment, as outlined below.

Table 1: Federal Clean Air Act Requirements for Redesignation

Clean Air Act Requirement	How Requirement is Met
a. The area has attained the 2006 24-hour $PM_{2.5}$ NAAQS.	EPA certified and Quality-assured $PM_{2.5}$ data for the NAA for the 3-year period of 2021-2023 indicated that the NAA has attained the $PM_{2.5}$ NAAQS [(81 FR 36176]. Data from 2014-2023 confirm the NAA continues to attain the standards, except for wildfire impacts addressed by Exceptional Events guidance. See Section IV for more details.
b. The improvement in air quality is due to permanent and enforceable reductions in emissions.	Enforceable local and state strategies implemented in the attainment plan—primarily to reduce residential woodsmoke—have achieved the intended emissions reductions. Federal measures continue to reduce mobile source emissions.

c. The plan has a fully approved implementation plan under CAA §110(k).	DEQ, Klamath County and other stakeholders developed and implemented the Klamath Falls 2012 PM2.5 Attainment Plan to bring air quality in Klamath Falls into compliance with the standards by the Clean Air Act deadline of December 31,2015. Residential Wood Combustion (RWC) emissions from certified and noncertified woodstoves, fireplaces and pellet stoves were identified as the major source of $PM_{2.5}$ emissions on worst winter days contributing to violations of the 24-hour NAAQS for $PM_{2.5}$. The 2012 Attainment Plan was approved by the Environmental Quality Commission on November 16, 2012 and incorporated into the State of Oregon Clean Air SIP. The 2012 Attainment Plan was subsequently approved by EPA. In addition, the EPA made a finding of attainment and clean data determination (CDD), based on 2012-2014 air monitoring data, on June 6, 2016 (81 FR 36176), effective July 6, 2016.
d. The area has met the requirements of CAA §110 and Part D.	DEQ has met the requirements of CAA §110 and Part D. See https://www.epa.gov/sips-or. EPA has approved the 2012 Attainment Plan (April 13, 2016, 81 FR 21814), Oregon's Part D NA NSR and PSD Program (October 11, 2017, 82 FR 47122), the 24-hour $PM_{2.5}$ NAAQS Interstate Transport SIP (December 27, 2011, 76 FR 80747) and the Infrastructure SIP (August 1, 2014, 78 FR 46514).
e. The area has a fully approved maintenance plan that ensures attainment of the NAAQS for at least ten years beyond redesignation.	With the EPA approval of this maintenance plan and redesignation request, the Klamath Falls NAA will have a fully approved maintenance plan ensuring continued attainment of the 2006 24-hour $PM_{2.5}$ standard for at least ten years beyond redesignation. See Sections IV-IX for more details.

Air quality monitoring

The Klamath Falls area has one particulate ($PM_{2.5}$) monitoring site located at 4856 Clinton Street, also known as Peterson School. The site's ID in EPA's Air Quality System (AQS) database is 41-035-0004. DEQ has monitored at the Peterson School site since 1999 for $PM_{2.5}$. DEQ chose this site because of its low point in the basin and hence higher PM concentrations, fulfilling the requirement to site the monitor in the area of expected maximum $PM_{2.5}$ concentrations (40 CFR Part 58 Appendix D 4.7.1(b)(1)). DEQ quality assures and loads the data to AQS quarterly and runs certification reports to verify that all data is complete and accurate annually. DEQ then submits a certification letter by May 1 annually. After this date, both parties certify the data. EPA certified the data from the Peterson School monitor as the basis for the nonattainment determination and for determining compliance with the $PM_{2.5}$ NAAQS.

The purpose of a saturation survey is to verify that your monitoring station is in a representative area. A representative area measures the worst pollution concentrations of the local areas where people work, live and play. DEQ has conducted three saturation surveys to confirm Peterson School is still the appropriate location for the monitor. DEQ conducted saturation surveys in 1996-1997, 2000-2001, and most recently in 2010-2011. In the most recent survey, DEQ deployed six temporary $PM_{2.5}$ monitors across the community, with the majority of monitors situated to the northwest of the Peterson School site. DEQ suspected sources from northwest Klamath Falls because on days with elevated levels of $PM_{2.5}$, the wind was light but was from the northwest. The survey results showed that the neighborhood in the southeast of Klamath Falls (referred to as the Valley) had higher levels than the northwest part of the Klamath Falls. Within the Valley the highest $PM_{2.5}$ concentrations were at Peterson School, confirming that this site represents peak $PM_{2.5}$ concentrations in the Klamath Falls area. Details of the 2010-2011 Saturation Survey are available in **Appendix 5**.

The sampling method for $PM_{2.5}$ at Peterson School has historically been the filter-based Federal Reference Method (FRM) operating on an every-3rd-day schedule. In 2018, EPA requested ODEQ to increase the sampling frequency at Klamath Falls from every-3rd-day to daily in their response to ODEQ's 2017 Annual Network Plan. This was based on the 2015 Klamath DV, which was within 5% of the NAAQS. The letter stated that daily sampling was required, citing 40 CFR § 58.12(d)(1)(iii). In January 2019, a T640x Federal Equivalent Monitor (FEM) that runs every hour continuously was deployed to comply with EPA sampling frequency requirements. When the FEM was added, DEQ reduced the frequency of FRM sample collection to an every-6th-day schedule. DEQ found the FEM to be biased about 60% higher than the FRM and replaced the T640x with a BAM 1022 as the FEM in June 2021.The current parameters measured at the Peterson School station include:

- $PM_{2.5}$ with Federal Equivalent Method (continuous beta attenuation method),
- $PM_{2.5}$ with Federal Reference Method (FEM collocation requirement),
- Nephelometer (continuous optical backscatter),
- Wind Speed and Direction (continuous ultrasonic),
- Temperature (continuous platinum RTD at 2 meters and 10 meters height),
- Barometric Pressure (continuous electronic barometer), and
- Relative Humidity Sensor.

DEQ follows quality assurance procedures before submitting data quarterly to EPA within 90 days of the end of each calendar quarter. DEQ is committed to continue EPA-approved $PM_{2.5}$ monitoring throughout the maintenance period as outlined in the Oregon Annual Network Plan, biennial CAA §105 grant workplan and semi-annual progress reports. Any modification to operation of the monitoring network will be done in consultation with EPA R10.

Exceptional events reporting

In recent years, increasing wildfires have complicated DEQ's reporting of Klamath Falls PM concentrations and NAAQS compliance. The Exceptional Events (EE) rule and guidance developed by EPA, in consultation with other agencies and the public, is intended to prevent penalizing communities for events outside their control. State and local air agencies may flag days they believe have been influenced by exceptional events and submit a demonstration for EPA concurrence.

In 2012, wildfire smoke began to impact monitored $PM_{2.5}$ values in Klamath Falls and other Oregon communities. DEQ compiled and submitted documentation to EPA requesting that EPA concur that these wildfires were Exceptional Events. With EPA concurrence regarding Exceptional Events in 2012 and 2013, Klamath Falls air quality in 2012-2014 met the 24-hour NAAQS for $PM_{2.5}$, as projected in the 2012 Attainment Plan.

Large wildfires in Oregon and nearby states in 2015, 2017, 2018, 2020 and 2021 also resulted in monitored $PM_{2.5}$ values above the 24-hour $PM_{2.5}$ standard in Klamath Falls. DEQ submitted Exceptional Event documentation for wildfires in 2017 and EPA issued concurrence such that the Klamath Falls NAA maintained compliance with the 24-hour $PM_{2.5}$ standards.

While states may flag data they assert were influenced by wildfire, EPA can only approve wildfire smoke impacts (or other exceptional events) that have “regulatory significance.” This means that EPA may not be able to approve all the EE days that are flagged by local, or state agencies. EPA will concur that wildfires are Exceptional Events only if they have regulatory significance. Exceptional event concurrence happens only when the monitored values of $PM_{2.5}$ contribute to violations of the NAAQS. While the Klamath Falls area had increased $PM_{2.5}$ in 2018 due to wildfire events, the levels did not go above the NAAQS standard.

DEQ has also submitted Exceptional Events Documentation for wildfires in 2020 and 2021 but has yet to receive EPA concurrence. The Oregon DEQ Air Quality 2022 Annual Report also summarizes the 2000-2023 concentrations in Klamath with and without wildfire impacts and will be submitted to the EPA prior to the submission of this maintenance plan.

The following series of tables and graphs summarize the 2000-2023 data in the context of Exceptional Events demonstrations. The 3-year design values coded in red denote violation of the 24-hour $PM_{2.5}$ standard (35 $\mu g/m^3$) NAAQS; green indicates attainment with the 24-hr NAAQS. Table 2 displays Klamath Falls $PM_{2.5}$ data with all DEQ-flagged wildfire smoke impact days removed; Table 3 displays Klamath Falls $PM_{2.5}$ data with only Exceptional Events removed. For completeness, both data sets are included here for review. The data in Table 2 best describes the progress of the 2012 Attainment Plan. **Figure 3** shows the data in terms of AQI, EPA’s health index for reporting air quality. This figure shows a steady decrease in unhealthy winter days because of restrictions on wood burning, and an increase in unhealthy summer days due to wildfires. **Figure 3** illustrates that the problem in Klamath has largely shifted from a wintertime woodsmoke problem to a summertime wildfire problem. If EPA were to act on DEQ’s full set of wildfire-related exceptional events, the design value for Klamath Falls would not be within 5% of the NAAQS standard for requiring continuous monitoring.

Table 2: Klamath Falls data with all flagged wildfire smoke impact days removed.

PM2.5 Daily Design Values with Wildfire Data Removed

Year	98th %tile	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023
1999	44.1																							
2000	37.3	39																						
2001	35.1		41																					
2002	51.1	WF		39																				
2003	30.6				41																			
2004	42.0					41																		
2005	49.2						46																	
2006	47.5							45																
2007	39.6								46															
2008	52.2									45														
2009	44.0										44													
2010	34.6											39												
2011	37.1												32											
2012	25.1	WF												36										
2013	46.2	WF													33									
2014	27.8	WF														33								
2015	25.2	WF															25							
2016	23.0																	27						
2017	31.6	WF																	28					
2018	27.9	WF																		31				
2019	32.3	WF																			37			
2020	49.3	WF																				39		
2021	36.4	WF																					37	
2022	26.0	WF																						29
2023	25.6	WF																						

Gray - Meets old NAAQS
Green - Meets NAAQS
Red - Does not meet NAAQS

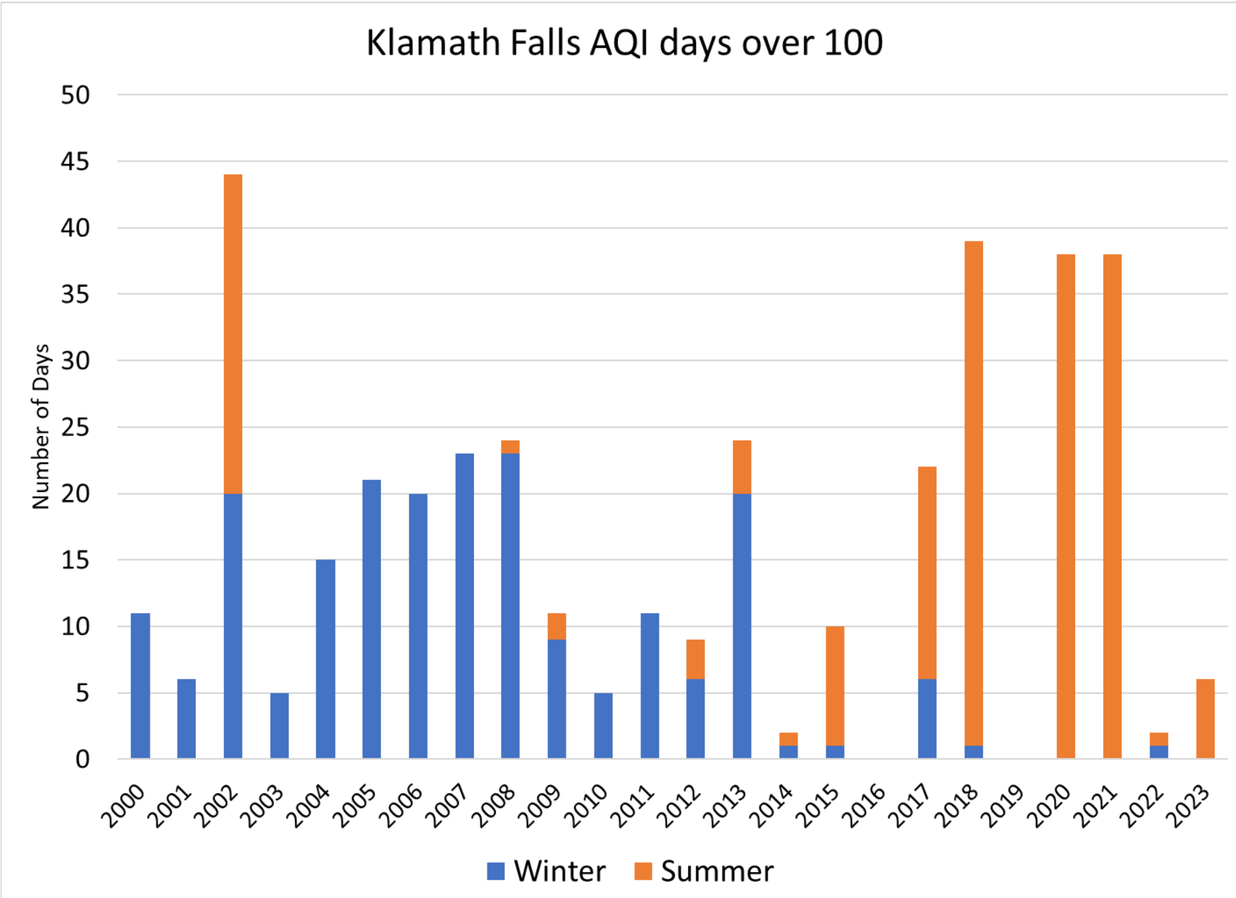
Table 3: Klamath Falls data with EE data of regulatory significance removed (current AQS).

PM2.5 Daily Design Values with Exceptional Events and Wildfire Data Removed

Year	98th %tile	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023
1999	44.1																							
2000	37.3	39																						
2001	35.1		41																					
2002	51.1	WF		39																				
2003	30.6				41																			
2004	42.0					41																		
2005	49.2						46																	
2006	47.5							45																
2007	39.6								46															
2008	52.2									45														
2009	44.0										44													
2010	34.6											39												
2011	37.1												33											
2012	25.9	EE												36										
2013	46.2	EE													34									
2014	29.6															35								
2015	29.5	EE															27							
2016	23.0																	32						
2017	44.7	EE																	28					
2018	27.9	WF																		35				
2019	32.3	WF																			37			
2020	49.3	WF																				39		
2021	36.4	EE																					37	
2022	26.0	WF																						29
2023	25.6	WF																						

Gray - Meets old NAAQS
Green - Meets NAAQS
Red - Does not meet NAAQS

Figure 3: Klamath Falls AQI days over the current Unhealthy for Sensitive Groups Level



Attainment inventory

In September 2019, DEQ and EPA established basic technical elements for developing the attainment and future year inventory. The discussion determined the following: 1) the use of 2017 and 2037 for the attainment and future year inventory, 2) which types of emissions, emission categories, and pollutants to inventory, 3) which EPA approved data models and resources to use, 4) which years of monitoring data to use, and 5) which years to use for the Motor Vehicle Emissions Budget (MVEB). These agreed upon elements were then included in a Technical Analysis Protocol (TAP) and submitted along with the Klamath Falls Inventory Preparation Plan to EPA in Spring 2020. The rest of this section summarizes the basic technical elements agreed upon by DEQ and EPA to develop the attainment and future year emissions inventory.

The emission inventory fulfills EPA requirements for preparing the 2017 Attainment and 2037 Future Year emissions inventory, as specified in the provisions of the 1990 CAAA, PM2.5 SIP Requirements Rule 40 CFR 51.1008, TAP, and other EPA guidance documents. The geographic boundary for the inventory continues to be the Klamath Falls NAA, as defined by the NAA boundary in the 2012 Attainment Plan and illustrated previously in **Figure 1**.

The purpose of the inventory was to establish attainment and projected emissions for the Klamath Falls NAA. DEQ chose 2017 as the attainment year because at the time of developing the inventory in 2020, it was the most current emissions data available from the National Emissions Inventory (NEI) for most emission categories. Both onroad and nonroad emissions were initially modeled using EPA's MOVES2014b because it was the latest model available when ran in 2020. However, due to delays in acquiring monitoring data, EPA and other transportation agencies requested Oregon DEQ update onroad and nonroad emission estimates using MOVES3.1 which was completed in the Spring of 2023. Although MOVES4 was released later that year in September of 2023 states are afforded a two-year grace period according to the new model's guidance before requiring its use beginning in 2025.

The reason for choosing 2037 as the future year was because the traffic activity data for running MOVES3.1 provided by Oregon Department of Transportation Traffic Demand Model (TDM) was already available without re-running the model due to resource constraints. Furthermore, the year 2037 as an end year for this maintenance plan also meets the requirement to demonstrate continued attainment for at least 10 years into the future. See **Appendix 3**, Motor Vehicles Emissions Inventory and Budget, for further explanation regarding the available traffic activity data to run the MOVES model.

The pollutants covered in the inventory are $PM_{2.5}$ and precursors of secondary formation of PM within the Klamath Falls NAA. $PM_{2.5}$ was further speciated to filterable and condensable forms for fuel combustion sources. The precursors included in this inventory are nitrogen oxides (NO_X), sulfur dioxide (SO_2), volatile organic compounds (VOC), and ammonia (NH_3).

To demonstrate maintenance of the 24-hour PM 2.5 NAAQS for at least ten years from redesignation, DEQ projected annual and winter PM season day (referred to hereafter as a typical season day) emissions for $PM_{2.5}$ and precursor pollutants for the 2027 interim maintenance year, and the 2037 maintenance demonstration year. The winter PM season when typical season days occur is represented by the months of January, February, November, and December in the same calendar year. Because the 24-hour $PM_{2.5}$ NAAQS is a daily standard, it is appropriate for the maintenance demonstration to be in the form of a daily emissions inventory comparison.

Emission categories inventoried include events and natural sources and mobile, nonpoint, and point sources of emissions. Both annual and typical season day emissions were estimated for this inventory. The emissions are reported in tons per year for annual and pounds per day for the typical season day. Temporal emissions are average daily emissions calculated over a four-month period identified as the PM winter season with typical season days. An exception to that are the mobile source emissions. DEQ selected the highest daily emissions estimated during that four-month period in MOVES3.1 for both 2017 attainment and 2037 future years.

DEQ used the ArcGIS Pro application for point source determination within the NAA and spatial allocation of nonpoint and event emissions, and mobile activity data to the NAA. DEQ developed all other actual emission estimates in-house for this project as specified in the EI report. Finally, DEQ developed and submitted actual annual emissions for larger permitted point sources for the 2017 NEI which are stored in the agency's permitting database Tracking, Reporting and Administration of Air Contaminant Sources (TRAACS). These 2017 permitted point source emissions were used to develop daily emissions for this inventory. Because smaller permitted point sources are not required reporting for 2017 NEI, DEQ developed actual annual and daily emission estimates in-house for this inventory as well.

The principal components for development and documentation of the $PM_{2.5}$ Maintenance Plan emission inventories are addressed in **Appendix 2**.

Estimating future year emissions

The attainment demonstration must show that total emissions in the future will not exceed 2017 PM2.5 baseline emissions and the National Ambient Air Quality Standard (NAAQS). Section 175A(a) of the Clean Air Act indicates the maintenance plan must ensure attainment for a minimum of 10 years. 2037 is the future year agreed upon by DEQ and EPA to project emissions out for this plan in accordance with the requirements of the Clean Air Act.

EPA provides guidance, *Emission Projections (EIIP Volume X, 1999),* for state and local agencies to develop emission projections for point, nonpoint, onroad, and nonroad emissions categories. However, some emissions categories or sectors may be difficult to project emissions. Such categories found within Klamath Falls NAA are point sources and some nonpoint sectors (some agriculture sources) and events (wildfires/prescribed and structural fires) and natural emission sources (biogenic) identified in EPA's *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations (EPA, 2017).* Such reasons for inability to project emissions include the following:

1. Events such as fires are highly variable from year to year,
2. Biogenic emissions that are dependent upon meteorology that is highly variable from year to year, and
3. State and federal permitted point sources with established emission limits that restrict emissions growth over the duration of the permit.

These categories and sectors considered difficult to project emissions were set at “no-growth”, essentially equal to 2017 attainment year emissions, for the 2037 future year inventory. See **Appendix 2, Section 3** of the EI report for further detail on developing the Future Year Emissions Inventory.

Growth within the Klamath Falls NAA

Emissions should reflect Klamath County and Klamath Falls NAA's growth in demographics and traffic patterns over the next 20-year period. Based on the 2018 through 2065 Coordinated Population Forecasts for Klamath County developed by Portland State University and Oregon Employment Department's data, county demographics are predicted to grow gradually from 2017 through 2037. The vehicle traffic growth patterns within the NAA were established by ODOT in their Traffic Demand Model (TDM) based on county demographics and roadwork network patterns used in the previous EI. See **Appendix 3** for further explanation on TDM traffic data development. DEQ used the ArcGIS Pro application to spatially allocate demographics and traffic data from county level to the Klamath Falls NAA.

The population for the Klamath Falls NAA is expected to increase from 48,496 to 49,840 people as well as housing from 24,493 to 25,172 units over the next 20 years. Likewise, employment will also steadily increase over the next 20 years from 19,124 to 24,024 employees as new people move into the area or young adults enter the workforce. Along with the increase in NAA population, household, and employment numbers, the TDM projected annual VMT will increase from 308,194,262 to approximately 369,833,114 vehicle miles traveled over the same period.

Growth factors

Since growth of $PM_{2.5}$ and precursor emissions vary based on the types of emission sources inventoried, growth factors were developed using demographics data to estimate 2037 emissions. DEQ developed 2017-2037 Annual Average Growth Rates (AAGR) for employment, population, household, or combination of the data. (See **Table 4** below.)

Table 4: Klamath Falls Non-Attainment (NAA) Growth Factors

Growth Type ID	Growth Type Description	2017-2037 AAGR	Growth Parameter	Data Resource
1	Klamath Falls NAA Population	0.14%	Linear, noncompounding	PSU Population Research Center
2	Klamath Falls NAA Household	0.14%	Linear, noncompounding	PSU Population Research Center
3	Klamath Falls NAA Employment (EMP) - use for commercial, construction, and industrial NAICS.	1.15%	Linear, noncompounding	Oregon Employment Department
9	Average of Population, Commericial, Industrial EMP	0.64%	Average of EMP and Population.	Oregon Employment Department, PSU Population Research Center, and U.S. Census
10	Animal Husbandry, Biogenics, Point, Structural Fires, and Prescribed Fires and Wildfires.	0.00%	No growth	2008 Klamath Falls SIP EI (ref. 815) page 196. Emissions held constant for these subsectors in FY estimates.

The growth factors were applied to various data categories to project future year emissions. For example, population, household, and employment or a combination of this data was applied to certain nonpoint emissions sources such as stationary fuel combustion, residential woodstoves, and commercial cooking.

It was not necessary for DEQ to develop growth factors to estimate 2037 onroad and re-entrained road dust emissions. ODOT provided 2037 traffic activity data from their TDM, which already incorporated growth for the NAA; therefore, 2037 emissions were calculated directly in MOVES3.1 and not grown. Further, DEQ used the same 2037 traffic activity data provided by ODOT to calculate re-entrained road dust emissions outside of MOVES using EPA AP-42 emission factors (See **Appendix 3** for further explanation).

Growth factors were not developed nor applied to permitted point sources, wildfires and prescribed and structural fires, and some nonpoint sources such as some agriculture emissions sources for this inventory. These categories are considered difficult to project emissions for and were established as “no-growth”, so 2037 emissions were set equal to 2017 attainment year emissions.

Further, once emission estimates were made for 2017 and 2037 for the appropriate emissions sources, emissions were linearly interpolated between those years based on 5-year intervals.

Emission summaries

$PM_{2.5}$ emissions inventories

The most significant categories for 2017 continue to be prescribed burning, permitted industries, and residential wood heating. **Figure 4** provides this visual representation of 2017 and 2037 Typical Season Day Emissions for the highest $PM_{2.5}$ emitting sectors within the Klamath Falls NAA. **Table 5** compares 2017 attainment year, 2027 interim year, and 2037 future year typical season day emissions for those highest $PM_{2.5}$ emitting sectors as well.

According to past and present data, some emission sources such as prescribed burning, wood stoves, open burning, and onroad mobile sources within the Klamath Falls NAA contribute to the violation of 24-hour NAAQS for $PM_{2.5}$ typical season days. **Table 6** includes the emissions categories that are most significant for maintaining attainment for these days. The progression of emissions changes from 2017, 2027, 2037 shows that over time some categories may increase due to changes in demographics such as population and housing, vehicle miles traveled, and employment. While other emission sources are decreasing over time out to 2037 such as onroad and nonroad mobile sources, due to cleaner fuels and change out of older equipment to more fuel-efficient equipment. However, some categories—such as prescribed fires and agricultural field burning or tilling—stay the same, not because this is a physical change in emissions, but due to the difficulty in projecting emissions out to 2037. These are episodic emissions and cannot be projected with any certainty out to a future year. Or in the case of permitted sources, emissions stay the same because these industries are constrained by allowable emission limits in permits that restrict growth in emissions. Also, EPA has determined that demographic growth does not directly impact emissions growth from permitted point sources.

Figure 4: Klamath Falls Non-Attainment Area (NAA) 2017 and 2037 $PM_{2.5}$ Typical Season Day (TSD) Emissions Comparison

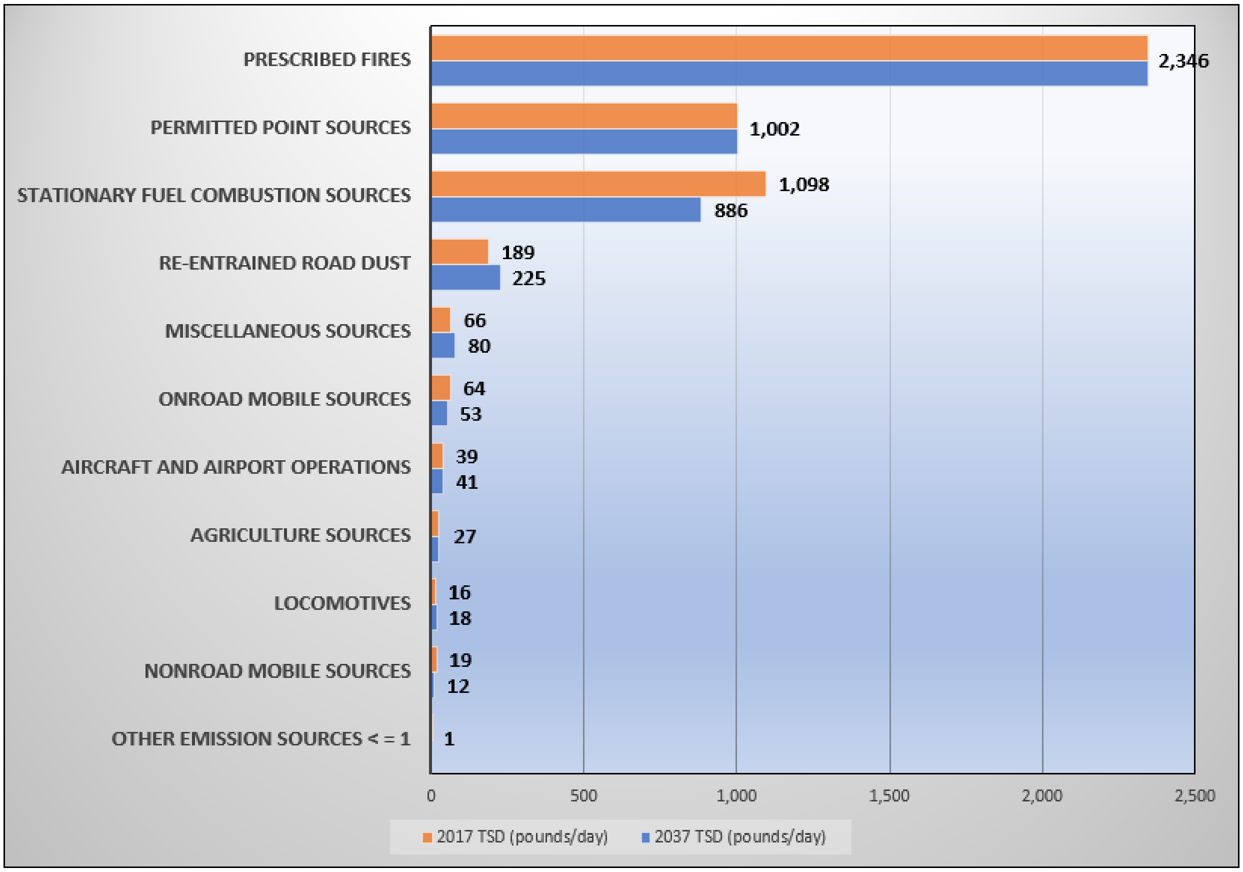


Table 5: Klamath Falls Non-Attainment Area (NAA) Comparison of Base Year and Future Years $PM_{2.5}$ Typical Season Day Emissions.

PM2.5 Emitting Sources	Typical Season Day Emissions PM2.5-Primary (pounds/day)		
	2017	2027	2037
Prescribed Fires	2346	2346	2346
Stationary Fuel Combustion Sources	1098	1034	886
Permitted Point Sources	1002	1002	1002
Re-Entrained Road Dust	189	200	225
Miscellaneous Sources	66	70	80
Onroad Mobile Sources	64	61	53
Aircraft and Airport Operations	39	40	41
Agriculture Sources	27	27	27
Nonroad Mobile Sources	19	17	12
Locomotives	16	17	18
Structure Fires	1	1	1
Fugitive Sources	0	0	0
Waste Disposal Sources	0	0	0
Wildfires	0	0	0
Grand Total	**4868**	**4815**	**4691**

Although prescribed burning is the highest source of $PM_{2.5}$ emissions on a typical season day, as summarized in **Table 5**, ground level impacts to the NAA from smoke are very rare. Within the EI, prescribed fire $PM_{2.5}$ amounts are estimated mass emissions that do not equate to pollutant amounts that will impact the ambient air within the NAA. Oregon's Smoke Management Plan (SMP) regulates prescribed fire and uses smoke forecasting to prevent smoke intrusions. In the last decade, the Klamath Falls NAA has experienced a total of only two smoke intrusions from prescribed fires. Emissions from 2017 through to 2037 stay the same due to the difficult nature in predicting fires out to a future year. However, this is a very conservative estimate as research shows repeat entry burns have lower fuel composition equating to less smoke emissions (Levine 2020). This was not accounted for in this Emissions Inventory.

Regarding residential wood heating—which is a subset of stationary fuel combustion sources—although some emissions projections increased due to population and housing growth in future years, these emissions decreased overall. This is the result of the replacement of non-certified woodstoves with cleaner equipment after 2017 and improvements in public outreach regarding cleaner burning techniques and code enforcement programs for curtailment during stagnant air episodes. **Table 6** reflects the projected changes mentioned above between 2017 and 2037.

Table 6: Klamath Falls Non-Attainment Area (NAA) 2017 and 2037 $PM_{2.5}$ Typical Season Day Emissions by Stationary Fuel Combustion Sources

Stationary Combustion Sources	Typical Season Day Emissions PM2.5 (pounds/day)	
	2017	2037
Residential Woodstove	617	395
Residential Hydronic Heater	254	254
Residential Fireplace	140	144
Residential Furnace	56	58
All Other Fuel Combustion Sources	31	36
Residential Outdoor Wood Devices	0	0
Grand Total	**1098**	**886**

The primary focus of the 2012 Attainment Plan and this Maintenance Plan is to continue to reduce residential wood combustion (RWC) emissions. As described in detail in the 2012 Attainment Plan, RWC emissions from certified and non-certified woodstoves, fireplaces and pellet stoves have been identified as the major source of $PM_{2.5}$ emissions during typical season days contributing to violation of the 24-hour $PM_{2.5}$ NAAQS. The Klamath Clean Air Ordinance, outlined in detail in **Appendix 4**, continues to implement RWC strategies that have been effective over the past few decades along with some new strategies, fully described in Section VI.

Most of the funding for the RWC emissions reductions in Klamath is provided by EPA Targeted Airshed Grants, with some additional state funding, and several further stove removals due to DEQ's Heat Smart Program requirements. **Table 7** is a breakdown of woodstoves to be replaced by 2028 and projected attendant $PM_{2.5}$ emissions reductions.

Table 7: Klamath Falls Projected Wood Stove Removals by 2028

Funding/Program	Number Stoves Removed	PM2.5 Emissions Reduced (tons per year)
2019 TAG	144	6.81
2019 State Funding	50	2.36
Heat Smart Program	7	0.33
2022 TAG	210	9.93
Totals	**411**	**19.43**

Because of this funding the most significant of the RWC reductions in the Klamath Falls NAA will be achieved from 2021-2028. These reductions are a product of woodstove changeouts to non-wood burning devices such as heat pumps or gas furnaces. A total of 411 stoves are projected to be replaced by 2028, of which 180 stoves have already been replaced. In addition to changeouts funded by TAG, a total of 50 stoves were replaced with DEQ funding in 2019 and an additional 7 uncertified stoves in Klamath Falls were removed to meet the requirements of the statewide Heat Smart program during the attainment planning period. Emissions reductions were estimated using a modified version of EPA's woodstove calculator (incorporating Oregon inputs). These changeouts are covered in more detail in **Section VI**. See **Appendix 2**, **Sections 2.4.4.5.3** for more information on developing RWC emissions and 3.1.2.1 for developing RWC emission reduction estimates.

Table 8 summarizes permitted point sources that contribute to $PM_{2.5}$ emissions by industry type using North American Industrial Classification System (NAICS) codes. The top industry types (NAICS) that contribute significantly to point source emissions are wood products manufacturing and electric power generation. DEQ attributes growth in industry emissions from the previous 2008 EI to the current EI (2017) to economic improvement after the 2009 recession. All permitted facilities are still emitting within permit limitations. Industrial emissions development is discussed in further detail in **Section 2.3.3 of Appendix 2**.

Table 8: Klamath Falls Non-Attainment Area (NAA) 2017 and 2037 $PM_{2.5}$ Typical Season Day Emissions by Broken Down by North American Industrial Classification System (NAICS)

NAICS and NAICS Description	Typical Season Day Emissions PM2.5 Emissions	
	2017	2037
	(pounds/day)	
321219 - Reconstituted Wood Product Manufacturing	487	487
321212 - Softwood Veneer and Plywood Manufacturing	358	358
221112 - Fossil Fuel Electric Power Generation	107	107
327992 - Ground or Treated Mineral and Earth Manufacturing	16	16
212321 - Construction Sand and Gravel Mining	15	15
423930 - Recyclable Material Merchant Wholesalers	7	7
812220 - Cemeteries and Crematories	7	7
327320 - Ready-Mix Concrete Manufacturing	3	3
928110 - National Security	0	0
335999 - All Other Miscellaneous Electrical Equipment and Component Manufacturing	0	0
812210 - Funeral Homes and Funeral Services	0	0
221330 - Steam and Air-Conditioning Supply	0	0
321918 - Other Millwork (including Flooring)	0	0
812910 - Pet Care (except Veterinary) Services	0	0
Grand Total	**1002**	**1002**

Onroad mobile source emissions were calculated by DEQ for the 2017 attainment year and 2037 future years emissions using the latest MOVES model. When the EI was developed in 2020, onroad mobile source emissions were run in the latest available model, MOVES2014(b). In January 2021, a year after the mobile source estimates were completed, a new version of MOVES was released. Since the onroad emission estimates were already completed using MOVES2014(b), EPA agreed that the mobile emissions did not need to be remodeled using MOVES3 at that time. However, due to delays in acquiring monitoring data, EPA and other transportation agencies requested Oregon DEQ to update onroad emission estimates using

MOVES3.1. A significant amount of work was accomplished to update mobile emissions in Spring 2023 using MOVES3.1. Although MOVES4 was released in September 2023, EPA grants a 2-year grace period before requiring states to move permanently to MOVES4 for transportation conformity and SIP mobile work; therefore, Oregon DEQ elected to utilize emissions already ran using MOVES3.1.

Although MOVES provides onroad default inputs such as vehicle populations, travel activity, fuel content and supply information at a county level, DEQ used regionally specific activity and vehicle population types and distribution data to run emissions in MOVES for Klamath Falls NAA. ODOT provided 2008 and 2037 vehicle activity in the form of Daily Vehicle Miles Traveled (DVMT) by Traffic Analysis Zone (TAZ) for Klamath County from previous traffic demand modeling for 2008 Klamath Falls SIP EI. DEQ linearly interpolated 2017 traffic activity using the 2008 and 2037 DVMT provided by ODOT. The DVMT was clipped by EI staff to the NAA via GIS analysis to use in MOVES. In addition, Oregon Department of Motor Vehicle data was used to identify vehicle populations and GIS analysis was used to distribute that data to the Klamath Falls NAA to use in the MOVES model. See **Appendix 3, Section 2.7** for inventory development details such as run specifications and activity data used to run MOVES.

DEQ used MOVES3.1 in emissions inventory mode to estimate 2017 and 2037 annual and typical season day onroad emissions for Klamath Falls NAA. The runs included all vehicle and road types and $PM_{2.5}$ and precursor pollutants. The model estimates onroad process emissions for exhaust, and brake and tire wear for all vehicle and road types. In addition, 2017 and 2037 re-entrained road dust emissions were estimated using the same vehicle activity (DVMT) data provided by ODOT's Travel Demand Model (TDM) which was initially used in MOVES3.1 to estimate onroad mobile source emissions. This activity was applied to emission factors developed by DEQ using EPA AP-42 emission factor formulas to estimate re-entrained road dust emissions outside of MOVES3.1. These emissions were folded in with exhaust and brake and tire wear process emissions for total onroad mobile sources. The $PM_{2.5}$ MOVES 3.1 emission modeling results and re-entrained road dust typical season day emissions for 2017 and 2037 are summarized in **Table 9** below. (See **Appendix 3**, Section 2.7 and 3.2.4 for further details on developing motor vehicle emissions for this plan.)

Table 9: Klamath Falls Non-Attainment Area (NAA) Onroad and Re-Entrained Road Dust 2017 and 2037 $PM_{2.5}$ Typical Season Day Emissions

PM2.5 by Process Type	Typical Season Day Emissions 2017 (pounds/day)	Typical Season Day Emissions 2037 (pounds/day)
Primary PM2.5 - Exhaust	55	37
Primary PM2.5 - Brakewear	7	12
Primary PM2.5 - Tirewear	2	4
Primary PM2.5 - RERD*	189	225
Grand Total	**254**	**278**

*Re-Entrained Road Dust

The differences between the 2017 attainment year and the 2037 future year emission inventory are the result of a combination of increases due to growth factors and decreases due to emission control strategies. For example, motor vehicle emissions continue to decrease overall due to progressively cleaner gasoline and diesel fuels and motor vehicles and the transition to more zero-emission vehicles.

Please see the EI report in **Appendix 2** for further discussion on other $PM_{2.5}$ emission sources within the Klamath Falls NAA that are not considered significant sources of emissions.

Precursor emission inventories (NOx, VOC, SO2 and NH3)

In addition to direct $PM_{2.5}$ emissions, particulate matter is formed in the atmosphere from precursors. Sulfur oxides (SO_X), nitrogen oxides (NO_X), volatile organic compounds (VOC), and ammonia (NH_3) all contribute to the secondary formation of particulate matter. Secondary particulate formation is a minor contributor to the Klamath Falls $PM_{2.5}$ air pollution concentrations on typical season days as summarized in the 2012 Attainment Plan. DEQ conducted an analysis of the $PM_{2.5}$ precursors in Klamath Falls to determine their contribution to the $PM_{2.5}$ nonattainment area and whether specific strategies needed to be developed to address precursor emissions. Although there is some contribution through secondary formation, analysis of filter samples and modeling shows on average that secondary formation is relatively small compared to the direct $PM_{2.5}$ emissions. For more detail on this analysis, see pages 17-18 of the 2012 Attainment Plan.

In the preparation of the maintenance plan, DEQ staff performed a more definitive analysis of the 2017 attainment and 2037 future years precursor emissions (NO_X, VOC, SO_2, and NH_3). Annual and typical season day precursor emissions were calculated for this plan and are discussed further in **Appendix 2.** DEQ focused its strategy development on those controls that directly impact $PM_{2.5}$ emission levels; however, many of these strategies simultaneously address precursor emissions. Annual $PM_{2.5}$ and precursor emissions of NH_3, NO_X, SO_2, and VOC are compared between the previous plan's 2008 EI and 2017 and 2037 emissions for the current plan in **Table 10**. This comparison showed overall precursor emissions for the Klamath Falls NAA were trending downward except for NH_3 and VOC. The general decrease for NO_X and SO_2 emissions are largely due to motor vehicle emissions within the NAA and should be even less significant contributor to $PM_{2.5}$ in the future. Motor vehicle emissions continue to decrease overall due to progressively cleaner gasoline and diesel fuels and motor vehicles and the transition to more zero-emission vehicles.

However, DEQ went a step further to compare county-level precursor trends using previous NEIs 2008, 2011, 2014, and 2017 triennial emissions to confirm a pattern of emission increases or decreases for certain pollutants. Overall county emissions over the different triennial years are decreasing as well for NO_X and SO_2, but NH_3 and VOCs are indeed increasing across the county. DEQ identified the causes for rising levels of NH_3 and VOC emissions within the county and NAA as increased prescribed fires, wildfires, and production activity by industrial sources. Increases in frequency and location of prescribed fires and wildfires have driven VOC emission levels up since the previous plan. In addition, economic improvement since the 2008 recession has provided an opportunity for industrial sources within the NAA to increase their annual production activity back to norm since the last plan but within current permit limits: thereby, may be the explanation for increasing NH_3 emission levels. While new control technologies installed by 2009 for some wood products manufacturing companies within the NAA might explain the emission reductions for the other pollutants not recognized until after the 2008 SIP EI was developed. (See **Section VI** below for more explanation). So overall, county and NAA emission trends corresponds with the emission estimates developed for the current plan.

Table 10: Klamath Falls Non-Attainment Area (NAA) Comparison of $PM_{2.5}$ and Precursors Annual Emissions from 2008-2037

Pollutants and Emissions Category	Base and Future Year Annual Emissions (AE)					
	2008		2017		2037	
	AE (tpy)	AE Percent Distribution	AE (tpy)	AE Percent Distribution	AE (tpy)	AE Percent Distribution
PM2.5-Primary						
Nonpoint Sources	296.0	45%	232.5	38%	223.7	37%
Events and Natural Sources	107.0	16%	163.5	27%	163.5	27%
Point Sources	143.4	22%	158.5	26%	158.5	26%
Mobile Sources	108.3	17%	56.5	9%	59.6	10%
PM2.5-Primary Total	**654.7**		**611.0**		**605.3**	
NH3						
Point Sources	70.4	29%	111.7	44%	111.7	43%
Nonpoint Sources	141.1	58%	97.6	38%	103.6	40%
Events and Natural Sources	20.8	9%	32.2	13%	32.2	12%
Mobile Sources	11.4	5%	13.0	5%	10.1	4%
NH3 Total	**243.7**		**254.4**		**257.6**	
NOX						
Mobile Sources	1792.5	80%	650.4	61%	451.0	56%
Point Sources	329.3	15%	257.6	24%	208.5	26%
Nonpoint Sources	100.6	4%	77.1	7%	79.8	10%
Events and Natural Sources	13.7	1%	72.8	7%	72.8	9%
NOX Total	**2236.1**		**1057.9**		**812.1**	
SO2						
Point Sources	40.7	37%	14.8	31%	14.8	31%
Mobile Sources	47.8	43%	13.9	29%	14.1	29%
Events and Natural Sources	13.0	12%	12.1	25%	12.1	25%
Nonpoint Sources	8.4	8%	6.7	14%	6.9	14%
SO2 Total	**109.9**		**47.6**		**47.9**	
VOC						
Events and Natural Sources	299.3	10%	5613.1	77%	5613.1	79%
Nonpoint Sources	673.6	23%	724.2	10%	756.5	11%
Mobile Sources	940.2	32%	406.6	6%	224.1	3%
Point Sources	997.2	34%	555.5	8%	555.5	8%
VOC Total	**2910.3**		**7299.4**		**7149.2**	

Table 11: Klamath Falls Non-Attainment Area (NAA) Comparison of Baseline and Future Years Typical Season Day Emissions

Attainmnet and Future Year Typical Season Day (TSD) Emissions				
Pollutant Emissions by Emission Category	2017		2037	
	TSD (lbs/day)	TSD Percent Distribution	TSD (lbs/day)	TSD Percent Distribution
PM2.5-Primary				
Events and Natural Sources	2347	48%	2347	50%
Mobile Sources	328	7%	348	7%
Nonpoint Sources	1191	24%	994	21%
Point Sources	1002	21%	1002	21%
PM2.5-Primary Total	**4868**		**4691**	
NH3				
Events and Natural Sources	462	33%	462	33%
Mobile Sources	69	5%	56	4%
Nonpoint Sources	337	24%	347	25%
Point Sources	537	38%	537	38%
NH3 Total	**1406**		**1403**	
NOX				
Events and Natural Sources	559	9%	559	11%
Mobile Sources	3490	56%	2469	50%
Nonpoint Sources	656	10%	670	13%
Point Sources	1551	25%	1281	26%
NOX Total	**6256**		**4980**	
SO2				
Events and Natural Sources	174	47%	174	47%
Mobile Sources	70	19%	71	19%
Nonpoint Sources	40	11%	38	10%
Point Sources	84	23%	84	23%
SO2 Total	**368**		**367**	
VOC				
Events and Natural Sources	47209	83%	47209	84%
Mobile Sources	2256	4%	1231	2%
Nonpoint Sources	4308	8%	4334	8%
Point Sources	3124	5%	3124	6%
VOC Total	**56897**		**55897**	

Table 11 summarizes 2017 and 2037 precursor typical season day emissions and distribution of those emissions across various emission categories within the Klamath Falls NAA for this plan. As indicated above, all the precursor emission categories generally decreased from 2017 to 2037. The general decrease is as expected since most of the precursor emissions are related to such sectors as Residential Wood Combustion or Onroad Motor Vehicles, and the precursor emissions are reduced by the same control strategies that reduce Residential Wood Combustion $PM_{2.5}$ emissions (e.g., progressively cleaner burning home heating units) and Onroad Motor Vehicle $PM_{2.5}$ emissions (e.g., progressively cleaner vehicles and fuels). See **Appendix 2** for more details on developing precursor emission estimates.

Air pollution control strategies

The SIP-approved Control Measures for $PM_{2.5}$ emissions in the Klamath Falls NAA from 2012 Attainment Plan that are currently in effect include the following:

- The Klamath County Clean Air Ordinance;
- Woodstove Change-Outs;
- Oregon and EPA Woodstove Certification Programs;
- Heat Smart: Statewide Stove Removal Upon Sale of Home;
- Maximum Achievable Control Technology (MACT) Reductions;
- RACT for Industrial Sources of $PM_{2.5}$;
- Road Paving and Winter Sanding Best Practices;
- Transportation and Fuel-Related Emissions Reductions.

DEQ is requesting that the following new control strategies since 2012 be considered for SIP approval:

- Revised Klamath County Clean Air Ordinance
- Public Education Efforts on Woodsmoke;
- ASTM Fireplace Standard for New Construction;
- Oregon Smoke Management Plan Limitations on Prescribed Burning;

Residential wood combustion

Residential wood combustion (RWC) emissions have been the major contributor to the historical $PM_{2.5}$ air pollution problems in the Klamath Falls NAA and are expected to continue to be one of the most significant sources of $PM_{2.5}$ emissions in the future, as illustrated in the emission inventories summarized in the previous section.

The key RWC control strategies in the Klamath Falls NAA have been:

- woodstove change-out programs replacing uncertified woodstoves with cleaner and more efficient home heating equipment;
- the Oregon and EPA woodstove certification programs requiring any new woodstoves installed since 1986 to be certified woodstoves;
- the Klamath Clean Air Ordinance and Oregon Heat Smart law requiring removal of uncertified woodstoves upon home sale; and
- enforcement of Klamath County's Clean Air Ordinance, which included:
  - Mandatory woodburning curtailment program during air stagnation episodes;
  - Prohibition of open burning except during 14-day windows twice a year in spring and fall, and complete prohibition of agricultural burning in the NAA;
  - Opacity standards to ensure clean burning woodstoves with reduced woodsmoke;
  - Restriction on wood stoves as the sole source of heat in rental units.

Since the submission of the 2012 Attainment Plan, the Clean Air Ordinance has been revised to include:

- Expanded code enforcement, public outreach and education to improve woodstove operation and minimize emissions, and educational diversion program for first-time smoke violations.
- ASTM Fireplace Standard for New Construction.

All RWC control strategies from the 2012 Attainment Plan will be continued, along with those added since the submission of the Attainment Plan. More specifics regarding the prohibition of residential open burning outside of open burning windows, mandatory woodstove curtailment during air stagnation episodes and opacity standards can be found in the Klamath Clean Air Ordinance, Chapter 406, 63.06 of the County Code. The Ordinance is also included in **Appendix 4.**

Woodstove changeouts

DEQ and Klamath County have been conducting woodstove changeouts by replacing old uncertified stoves with cleaner burning units over the past three decades and this work is ongoing. In 2019, DEQ funded the changeout of 50 stoves in the Klamath NAA with one-time funding. Credit was taken in the EI for these changeouts. Woodstoves will continue to be replaced with cleaner heating systems such as electric heat pumps or natural gas furnaces through the Klamath Falls Targeted Airshed Grant (TAG). The first round of TAG funding provided $1.8 million in EPA funding, which is projected to fund the changeout of 120 woodstoves and the weatherization of approximately 125 homes. This program will continue to be implemented from 2021-2025. DEQ also successfully applied for a second round of TAG funding and received a $4.67 million award to be spent from 2024-2028. Between both rounds of TAG funding and additional DEQ stove removal projects as described above, a total of 411 woodstoves will be replaced by 2028 with a total of 19.43 tons per year of reduced $PM_{2.5}$ emissions.

Additional woodstove changeouts may be funded by legislative funding. There has been an ongoing budget note in DEQ's biennial budget since 2009 that has been consistently renewed since that time, with funding ranging from $77,000 to $130,000 per year. Klamath typically has received approximately 26% of that funding annually. The funding isn't explicitly guaranteed to continue, so no emissions reductions credits were taken in the EI—but DEQ intends to continue to use those funds to reduce woodsmoke in the Klamath Falls NAA.

HeatSmart

In 2010, a statewide requirement mandating the removal of an uncertified stove at the time of home sale went into effect. This statewide rule closely mirrored the existing requirement in the Klamath County ordinance. Under the rule, all uncertified devices that are on the property being sold (including residences, shops, garages, and outbuildings) must be removed at the time of home sale. With the Heat Smart requirement and through the natural attrition of people wanting to upgrade or replace their old device on their own, there will continue to be old stoves replaced. Since 2017, Heat Smart records show that 7 additional uncertified stoves have been removed and destroyed in the Klamath Falls area. Emissions reductions credit was taken in the EI for this Control Measure.

Klamath Clean Air Ordinance

Much of the emissions reductions work in this sector is achieved through implementation of Klamath County's Clean Air Ordinance, found in Chapter 406, 63.06 of the County Code.

The ordinance includes provisions restricting open burning. Open burning in the Klamath Falls nonattainment area is now restricted to just 15 days in the fall and 15 days in the spring, outside of the typical season days during the PM season. The county also has the option to not open a fall window at all if conditions warrant it. In addition, the ordinance prohibits the use of burn barrels in the nonattainment area. In addition, the ordinance prohibits any agricultural burning on red and yellow days. Klamath County's health and environment staff monitor and enforce the open burning regulations as necessary. The open burning program also includes an effort for public outreach and education. Program staff makes field visits to homeowners to provide educational materials, warnings, and citations, as needed. Emissions reductions credit was taken for this Control Measure because it completely restricts residential open burning in the NAA during typical days of the PM winter season.

Additions to the Ordinance since the 2012 Attainment Plan include public outreach and education to improve woodstove operation and minimize emissions, expanded code enforcement and educational diversion program for first-time smoke violations. These control strategies were memorialized in the 2012 Plan as "public awareness." Starting in 2014, Klamath County used DEQ funding to enhance existing educational strategies regarding reducing woodsmoke and the proper use of woodstoves. Klamath County provides programs such as hands-on demonstration of wood stove use, wood smoke health effects information dissemination, videos on public access and government websites, and outreach to teach homeowners about appropriate wood selection. All residents with an exemption allowing them to burn wood for heat during curtailment periods are required to review BurnWise materials and use a moisture meter. Klamath County also oversees the School Flag program, in which the County provides educational materials for use in schools and assists students with efforts to raise awareness about red advisory days. Lastly, Klamath County participates in an average of 6 community events a year to conduct outreach regarding wood burning. While there were some limitations in 2020-2021 due to COVID-19, these efforts are ongoing and were reinitiated starting in September 2022.

In addition to educational programming, funding from DEQ increased enforcement of woodstove curtailment considerably. Starting during 2012-2013, Klamath County initiated patrols on every red day and on all days during the established open burning window. Accordingly, the number of patrol days increased from 71 to 108. Since 2013, this practice has been continued and the number of patrol days continues to average 100 or more days per year during all red days and open burning windows. No emissions reduction credit was taken for this educational programming or expanded code enforcement in the Emissions Inventory.

Lastly, an ASTM Fireplace Standard for New Construction was listed as a future Control Measure in the 2012 Attainment Plan. This Measure would require that fireplaces in newly constructed homes be built using the most stringent ASTM standard for fireplaces. This requires that all fireplaces in new construction emit no more than 5.1 g/kg of $PM_{2.5}$, as confirmed by ASTM test method E2558. When amendments to the Klamath Clean Air Ordinance went into effect on December 31 2012, this Standard became enforceable and is carried out by the Klamath County building codes department in issuing permits for fireplace construction in new homes. This measure continues to apply to all new construction in Klamath County. No emissions reduction credit was taken for this Control Measure.

Prescribed fire

The combination of increasing global temperatures and more prolonged and severe droughts over the past decades are creating favorable wildfire conditions. Larger and more intense wildfires are producing a lot of smoke. This is a big problem in Oregon, and across the country, given that pollution from wildfire smoke makes up an increasing share of total air pollution. Prescribed burning is an important management tool used to improve forest health and reduce the size and impact of wildfires. Although prescribed burning is the highest source of $PM_{2.5}$

emissions on a typical season day, as summarized in Figure 4, ground level impacts to the NAA from smoke are rare. In the last decade, the Klamath Falls NAA has experienced a total of two smoke intrusions from prescribed fires.

Prescribed burning is managed through the Oregon SMP (detailed in OAR 629-048-0001 through 629-048-0500), which was approved into Oregon's State Implementation Plan by EPA on June 24, 2021(86 FR 10220). DEQ collaborates with the Oregon Department of Forestry (ODF) to develop and implement the SMP. Klamath Falls is a Smoke Sensitive Receptor Area (SSRA), which receive the greatest level of protection under the SMP. Additionally, Klamath Falls is designated as a Special Protection Zone (SPZ), which further restricts prescribed burning to reduce the likelihood of smoke intrusions in the NAA during the winter.

Designation as an SPZ restricts prescribed burning in the Klamath Falls NAA from November 15-February 15. These restrictions include curtailed burning on red days, tailored forecasting practices and intermittent monitoring after ignition. These practices are known to substantially reduce the likelihood of smoke intrusions into nearby communities. More information about specific restrictions can be found in OAR 629-048-0135 and in the Operational Guidance for the Oregon Smoke Management Program.

Permitted industrial emissions

Permitted stationary source emissions are another significant source of emissions on typical season days. The installation of Maximum Available Control Technology (MACT) for particleboard and hardboard facilities significantly reduced $PM_{2.5}$ emissions. MACT compliance was required by 2007, although Collins Forest Products and Jeld-Wen applied for an extension and complied with the MACT by 2009. Although the control technology required under MACT was intended to address hazardous air pollutants, there were also reductions in $PM_{2.5}$ emissions. The MACT requirements provide the reasonably available reductions for $PM_{2.5}$ for these sources, so DEQ considers this to be RACT.

In addition to MACT compliance, DEQ has ensured that all permitted facilities emitting 10 or more tons per year of $PM_{2.5}$ have implemented RACT measures, specifically: opacity limits, fugitive emissions plans and operations and maintenance best practices. These measures can be found in OAR 340-240-0510 through -0530. All industrial facilities meeting this description implemented RACT measures by July 1, 2013, as described in the 2012 Attainment Plan. All of these measures continue to apply to industrial sources of $PM_{2.5}$.

Mobile sources

Mobile source emissions are much less significant sources of emissions in the Klamath NAA than area industrial sources. Klamath Falls is still an isolated, rural area and thus not under the jurisdiction of a Metropolitan Planning Organization. No Transportation Control Measures (TCMs) are currently utilized in the Klamath Falls Nonattainment Area.

Federal regulations requiring increased fuel economy for new cars, trucks and locomotives will continue to reduce mobile source emissions in future years, as summarized in Table 7 of the previous section and described in more detail in **Appendix 3**. Other control measures have included restrictions on winter sanding and street paving in the Klamath Falls NAA to reduce re-entrained road dust. While some street paving continued past the 2017 base year, no future street paving projects are planned and thus it is not a continuing Control Measure. Winter sanding continues to be a control measure; the winter sanding agreement remains in effect. DEQ has report data from 2012-2021 and will continue to receive reports. More information on winter sanding practices can be found in **Appendix 6**. No emissions reductions were taken for road paving and winter sanding.

Transportation conformity

Transportation Conformity ensures that air pollution from on-road mobile sources such as cars and trucks in the Klamath Falls NAA will not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS. Federal transportation conformity rules and regulations 40 CFR Parts 51 and 93 require the evaluation of potential changes to on-road emissions within Klamath Falls NAA that may be caused by proposed federally funded highway and transit projects for a 20-year period, following approval by EPA of the Maintenance Plan. Under conformity, emissions resulting from highway and transportation projects cannot exceed the allowable emissions level established for transportation in the air quality plan known as the motor vehicle emissions budget (MVEB). The MVEB ensures that on-road transportation activities within Klamath Falls NAA will not violate overall air quality standards. DEQ's transportation conformity rules and process can be found in Oregon Administrative Rule 340, Division 252. For this current plan, DEQ is only required to provide MVEB based on typical season day emissions from onroad mobile sources. DEQ did not include re-entrained road dust for this plan due to its insignificant contribution to overall PM2.5 emissions within the NAA. The previous SIP Plan (2012) used the highest emissions, worst-case day (2014), to establish the MVEB for onroad emissions sources including re-entrained road dust.

A motor vehicle emissions inventory was developed for the Klamath Falls NAA maintenance plan for the 2017 attainment year and 2037 future year. Onroad mobile source emissions were estimated by DEQ using EPA's MOVES3.1 model. Re-entrained road dust emission estimates were developed using daily VMT from the model runs, and emission factors developed by DEQ using EPA AP-42 formulas. The 2037 typical season day emission estimates from the motor vehicle EI (MVEI) were used to create the 2037 MVEB. See **Appendix 3** for further MVEI development details.

The MVEB for this plan was established using 2037 onroad $PM_{2.5}$ and NO_X emission estimates from the MVEI and safety margins developed by DEQ in consultation with EPA, FHWA and ODOT during the interagency consultation process, as required by OAR 340-252-0060. Based on interagency consultation in August 2022, the process for developing safety margins and application of a portion of woodstove emissions was agreed upon and applied to 2037 MVEI onroad mobile source emissions to set the budget. DEQ calculated these safety margins for onroad mobile sources only based on percent change from 2017-2037 for both PM2.5 and NOx typical season day emissions and then divided it in half. The percent change provides a moderate cushion for $PM_{2.5}$ and NO_x emissions within the NAA. The safety margin was applied to the 2037 MVEI onroad mobile emissions to calculate an increase that would cover any future transportation projects. DEQ did not include re-entrained road dust in the MVEB because overall mobile emissions are not a significant source of PM2.5 emissions within the NAA. See **Appendix 3, Section 2, Formulas 1 and 2** for details regarding the development of the safety margin and application to create MVEB estimates.

DEQ decided to go a step further by providing additional cushion using a portion of woodstove emission reductions projected between 2017 and 2037 for the MVEB. DEQ applied the onroad mobile source safety margins, 9% for $PM_{2.5}$ and 23% for NO_X, to get a portion of woodstove emission reductions to allocate towards the MVEB. This re-assignment of a portion of $PM_{2.5}$ and NO_X emissions to the MVEB is possible due to the removal of stoves from 2017 through 2037. These removals include 354 stoves via two rounds of EPA TAG funding and 57 stoves based on 2019 state funding and DEQ's Heat Smart program. DEQ applied the safety margins against the difference in PM2.5 and NOX emissions between 2017 and 2037 for residential woodstoves and added that portion back to the MVEB. These additional emissions will help cover any uncertainty or other potential changes in modeled transportation network, regional policy, and economic conditions that might impact $PM_{2.5}$ and NO_x emissions within the NAA. 2017 emissions and air monitoring indicate that Klamath Falls NAA is already in attainment; therefore, if we set MVEB at these levels then the NAAQS and 2017 attainment year emissions should not be violated if emissions from planned transportation projects or more extensive economic growth does not exceed this budgeted amount. See **Appendix 3, Section 2, Formula 3** for further details on how the portion of woodstove reductions were calculated.

Table 12 below reflects 2017 attainment year and 2037 future year emissions, and 2037 MVEB allocated emissions for onroad and woodstove sectors within the NAA. The 2037 MVEB column includes the adjusted 2037 onroad mobile source emissions based on safety margins and the portion of woodstove emissions reductions from 2017 to 2037.

Table 12: Klamath Falls Non-Attainment Area (NAA) 2037 $PM_{2.5}$ and NO_X Motor Vehicle Budget (pounds/day)

Onroad Category and Woodstove Emissions Reductions	2017 and 2037 Typical Season Day Emissions (lbs/day)							
	2017		2037		2037 MVEB		Safety Margins (%)	
	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx
Onroad	64	2149	53	1181	58	1447	9%	23%
Woodstove Emissions Reductions	617	64	395	57	20	2	9%	23%
Total Emissions (lbs/day)	**681**	**2214**	**448**	**1238**	**77**	**1448**		

Table 13 below provides a comparison of all emission categories for 2017 attainment and 2037 future years and the established 2037 MVEB for $PM_{2.5}$ and NO_X typical season day emissions. The 2037 MVEB column includes the adjusted 2037 onroad mobile source emissions and portion of woodstove emissions reductions allocated to the budget and all other emission categories set equal to 2037 emission amounts within the NAA. This table demonstrates that substitution of budgeted emissions in place of 2037 Future Year EI onroad mobile source emissions combined with other emission sources also emitting $PM_{2.5}$ and NO_X within the NAA will not exceed the 2017 attainment year emissions.

Table 13: Klamath Falls Non-Attainment Area (NAA) 2017 and 2037 $PM_{2.5}$ and NOx Emissions by Category including Motor Vehicle Emissions Budget (MVEB)

Typical Season Day (TSD) Emissions			
Pollutants and Emissions Category	Attainment and Future Year EI		2037 MVEB
	2017	2037	
	(lbs/day)		
PM2.5-Primary			
Nonpoint Sources	1191	994	994
Events and Natural Sources	2347	2347	2347
Point Sources	1002	1002	1002
Mobile Sources			
Woodstove Emissions Reductions	---	---	20
Onroad Mobile Sources	64	53	58
Subtotal	**64**	**53**	**77**
Re-Entrained Road Dust	189	225	225
Aircraft and Airport Operations	39	41	41
Nonroad Mobile Sources	19	12	12
Locomotives	16	18	18
Mobile Sources Subtotal	**328**	**348**	**373**
PM2.5-Primary Total	**4868**	**4691**	**4716**
NO_X			
Mobile Sources			
Woodstove Emissions Reductions	---	---	2
Onroad	2149	1181	1447
Subtotal	**2149**	**1181**	**1448**
Re-Entrained Road Dust	---	---	---
Aircraft and Airport Operations	558	574	574
Locomotives	550	619	619
Nonroad Mobile Sources	232	95	244
Mobile Sources Subtotal	**3490**	**2469**	**2885**
Point Sources	1551	1281	1281
Nonpoint Sources	656	670	681
Events and Natural Sources	559	559	559
NO_X Total	**6256**	**4980**	**5407**

Maintenance demonstration

Section 175A(a) of the CAA requires that the maintenance plan "provide for the maintenance of the national primary ambient air quality standard for such air pollutant in the area concerned for at least 10 years after the redesignation." According to EPA guidance in the Calcagni memo, a state may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory, or by conducting modeling that shows that the future mix of sources and emissions rates will not cause a violation of the NAAQS.

To demonstrate maintenance of the 24-hour PM 2.5 NAAQS for ten years from redesignation, DEQ projected annual and typical season day emissions inventories for $PM_{2.5}$, NO_x, SO_x, VOC, and NH_3 for 2027, the interim maintenance year, and 2037, the ten-year maintenance demonstration year. The attainment inventory shows a reduction in emissions between 2017-2037, which demonstrates that the area will continue to maintain compliance with the 24-hour $PM_{2.5}$ NAAQS. Because the 24-hour $PM_{2.5}$ NAAQS is a daily standard, it is appropriate for the maintenance demonstration to be in the form of a daily emissions inventory comparison. For a more detailed description of the attainment inventory, see Section V.

There are three additional key commitments to ensure continued maintenance of air quality health standards through at least 2037:

- Continued operation of the $PM_{2.5}$ monitoring network;
- Verification of continued maintenance of the 2006 24-hour $PM_{2.5}$ air quality health standards; and
- Contingency plan to implement if necessary to ensure maintenance of $PM_{2.5}$ standards.

Commitment to continue air monitoring network

DEQ will continue operation of the $PM_{2.5}$ monitoring network as outlined in the Annual DEQ Ambient Air Monitoring Network Plan and summarized in Section IV of this document. Any modifications to the monitoring network will be done in consultation with EPA Region 10.

Verification of continued maintenance of standards

DEQ will continue to provide quality-assured air quality data from the previous calendar quarter and upload it to the EPA Air Quality System (AQS) within 90 days of the end of each quarter to verify continued compliance with the NAAQS. DEQ will provide informational flags (IT) for any days it considers to be influenced by Exceptional Events such as wildfire smoke impacts.

DEQ will review the air monitoring results and design value each year to verify continued attainment. DEQ will determine annually if Exceptional Events influenced the continued attainment of the 2006 24-hour $PM_{2.5}$ NAAQS and need to be documented. If needed, Exceptional Events documentation will be submitted to EPA Region 10 for review.

Contingency plan

CAA section 175A(d) requires that a maintenance plan also include contingency provisions, as necessary, to promptly correct any violation of the NAAQS that occurs after redesignation of the area to attainment. For the purposes of CAA section 175A, a state is not required to have fully adopted contingency provisions that will take effect without further action by the state in order for the maintenance plan to be approved. However, the contingency plan is an enforceable part of the SIP and should ensure that contingency provisions are adopted promptly once they are triggered. The state should also identify the specific indicators, or triggers, which will be used to determine when the contingency plan will be implemented.

If real time monitored $PM_{2.5}$ levels exceed 35 µg/m^3 (24-hr average), DEQ will assess the probable emissions and meteorological events contributing to elevated $PM_{2.5}$ levels, including information on wildfires or winter power outages. The agency will work to determine the cause of the exceedance within 6 months after annual data certification.

DEQ and Klamath County will confer to discuss the exceedances and determine if:

(a) elevated $PM_{2.5}$ levels were caused by an event that is unlikely to occur again within the maintenance planning timeframe, or (b) high $PM_{2.5}$ levels were caused by an uncontrollable event such as a wildfire.

At this point, if prescribed burning were determined to be a contributor to the single exceedance of the 35 µg/m^3 24-hour $PM_{2.5}$ standard, existing rules related to prescribed burning would be implemented by DEQ and ODF as contingency provisions. The prescribed burning restrictions for the SPZ described in Section VI would be extended for a longer season from November 1 – March 1, and would expand the SPZ boundaries to include additional areas where burning is determined to be a contributor to violations of the standard. ODF would also require landowners to meet more extensive burning reporting requirements, and ODF and DEQ would undertake adaptive management steps as described in OAR 629-048-0110. This process is fully described in OAR 629-048-0137.

DEQ commits to work with Klamath County to implement necessary contingency provisions no later than one year after data from a single year exceeds the 24-hour NAAQS standard based on confirmed quality assured data. Any contingency provisions adopted and implemented will become part of the next revised maintenance plan submitted to the EPA for approval.

DEQ has identified the following additional potential contingency provisions for the Klamath Falls maintenance plan:

- Development of Red Day Plans for industrial sources of $PM_{2.5}$ with Title V permits to be implemented on non-wildfire related predicted red days when and if the Klamath Falls Contingency Plan goes into effect;
- Development of updated RACT measures for industrial sources with the capacity to emit more than 50 pounds per day of $PM_{2.5}$;
- Continuing to fund wood stove changeouts within the Klamath Falls nonattainment area;
- Use of application process for debris burning or agricultural burning to spread out incidents of burning and limit exceedances;
- Development of a street sweeping plan with local highway districts and the Oregon Department of Transportation to prioritize the reduction of fugitive road dust, and
- Additional street paving projects.

Redesignation to attainment

As outlined in Section III of this document, the EPA approval of this maintenance plan and redesignation request will satisfy the requirements of the federal Clean Air Act in Section 107 [CAA §107(d)(3)(E)] and the Klamath Falls NAA will then have a fully approved maintenance plan ensuring continued attainment of the 2006 24-hour $PM_{2.5}$ standard for at least ten years beyond redesignation. This would begin a 20-year planning cycle designed to ensure that the Klamath Falls airshed remains in continued attainment with the national 2006 24-hour $PM_{2.5}$ air quality health standard. This maintenance plan covers the first ten years of that planning cycle. The Clean Air Act requires a second 10-year maintenance plan in the future to complete the 20-year planning cycle.

Appendix 1

State of Oregon
DEQ Department of Environmental Quality

Appendix I: Ambient Air Quality Data Review

Klamath Falls $PM_{2.5}$ Maintenance Area

February 2024

Oregon Department of Environmental Quality

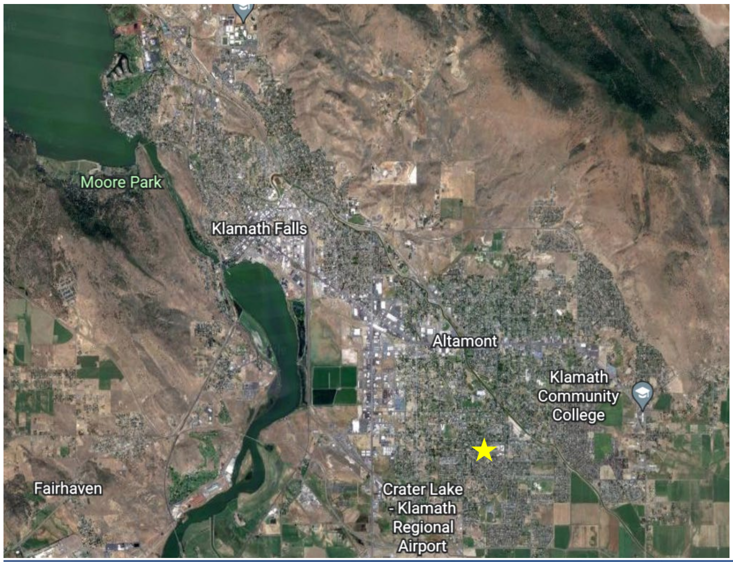
Monitoring of Particulate Matter in the Klamath Falls Area

The Klamath Falls air monitoring station (Site Code KFP, AQS #410350004) has been located at Peterson School in the Altmount portion of the city of Klamath Falls since 1985. Saturation monitoring studies have demonstrated the monitor is located in the area of maximum emissions and particulate matter, or PM, concentrations. The station is part of the State and Local Air Monitoring Stations, or SLAMS, network and meets all siting requirements and criteria for the monitoring objective of maximum population exposure at the neighborhood spatial scale.

The station sampling method for PM sized 2.5 microns and smaller, or $PM_{2.5}$, has historically been the filter-based Federal Reference Method operating on an every-third-day schedule. The current parameters measured at the station include:

- $PM_{2.5}$ with Federal Equivalent Method, continuous beta attenuation method.
- $PM_{2.5}$ with Federal Reference Method, collocation requirement.
- Nephelometer, continuous optical backscatter.
- Wind speed and direction, continuous wind vane and cups.
- Temperature, continuous thermometers at two and 10 meters high.
- Barometric pressure, continuous electronic barometer.
- Relative humidity, continuous.

Photos of the site are shown below.



Klamath Falls KFP Air Monitoring Station.

Quality-assured data is submitted quarterly to EPA within 90 days of the end of each calendar quarter.

The reporting of Klamath Falls PM concentrations was straightforward through 2011. Klamath Falls air quality in 2014-2016 met the National Ambient Air Quality Standard for $PM_{2.5}$ as projected in the 2012 Attainment Plan. The 2012 Attainment Plan was approved by the Environmental Quality Commission in November 2012 and incorporated into the State of Oregon Clean Air Act Implementation Plan, referred to as the State Implementation Plan or SIP. The U.S. Environmental Protection Agency approved the 2012 Attainment Plan. In addition, EPA made a finding of attainment and clean data determination based on 2012-2014 air monitoring data, on June 6, 2016, effective July 6, 2016.

Exceptional Events

Large wildfires in Oregon and nearby states in 2012, 2013, 2015, 2017, 2018, 2020 and 2021, resulted in many major wildfire smoke impacts in Klamath Falls which required documentation and submittal to EPA for review and approval as Exceptional Events. The DEQ annual reports since 2012 were expanded to include the $PM_{2.5}$ data with and without the days flagged as having had major wildfire smoke impacts. In Appendix B of the 2020 Air Quality Monitoring Annual Report summarizes the data with and without wildfire impacts.

The exceptional events rule and guidance EPA developed, in consultation with other agencies and the public, is intended to prevent penalizing communities for events outside their control. State and local air agencies may identify days they believe have been influenced by exceptional events, such as wildfire smoke, and submit a demonstration for EPA concurrence. However, EPA can only allow exclusion of exceptional events that have “regulatory significance.” This means that EPA may not be able to approve all the flagged exceptional event days submitted by local, or state agencies, and can result in a third set of data residing in EPA’s Air Quality System, or AQS. The AQS data will be less than or equal to the data with wildfire impacts, and greater than or equal to the data with all wildfire impacts removed as exceptional events.

State and local air agencies now have considerably more extensive experience with exceptional events during wildfires. DEQ recommends EPA, and state and local air agencies, reevaluate the exceptional event rule and guidance. In the meantime, DEQ will refer to the following two sets of air quality data for Klamath Falls for recent years:

1. Complete data including flagged wildfire impact days and exceptional event concurred data. This data compilation is important to report because it reflects the air pollution impacts experienced by the community. But it could penalize the community with nonattainment restrictions for events outside their control, which the EE guidance is intended to avoid.
2. Data with all flagged wildfire impact days removed and exceptional event concurred data. This data compilation best illustrates the air quality improvement trends from successful implementation of the air pollution control strategies in the attainment plan.

In the tables below, the three-year design values coded in gray denote the data prior to the EPA adoption of the 35 micrograms per cubic meter ($\mu g/m^3$) standard in 2006. Prior to 2006, the NAAQS was 65 $\mu g/m^3$. Red denotes violation of the 35 $\mu g/m^3$ NAAQS; green indicates attainment of the 35 $\mu g/m^3$ NAAQS; orange indicates violation of the 35 $\mu g/m^3$ NAAQS from flagged exceptional events due to wildfire smoke impacts.

State of Oregon
Department of Environmental Quality

Table A. Complete Klamath Falls data including flagged wildfire smoke impact days and exceptional event concurred years.

PM2.5 Daily Design Values with Exceptional Events Concurred data but Wildfire Data Included

98th %tile	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023
44.1																							
37.3	39																						
35.1		55																					
92.6			53																				
30.6				55																			
42.0					41																		
49.2						46																	
47.5							45																
39.6								46															
52.2									45														
44.0										44													
34.6											39												
37.1												33											
25.9	EE												36										
46.2	EE													34									
29.6															35								
29.5	EE															27							
23.0																	32						
44.7	EE																	71					
146.0																			75				
33.5																				89			
88.3																					68		
83.0																						67	
30.9																							49
34.2																							

Gray - Meets old NAAQS
Green - Meets NAAQS
Red - Does not meet NAAQS

Table B. Klamath Falls data with all flagged wildfire smoke impact days removed.

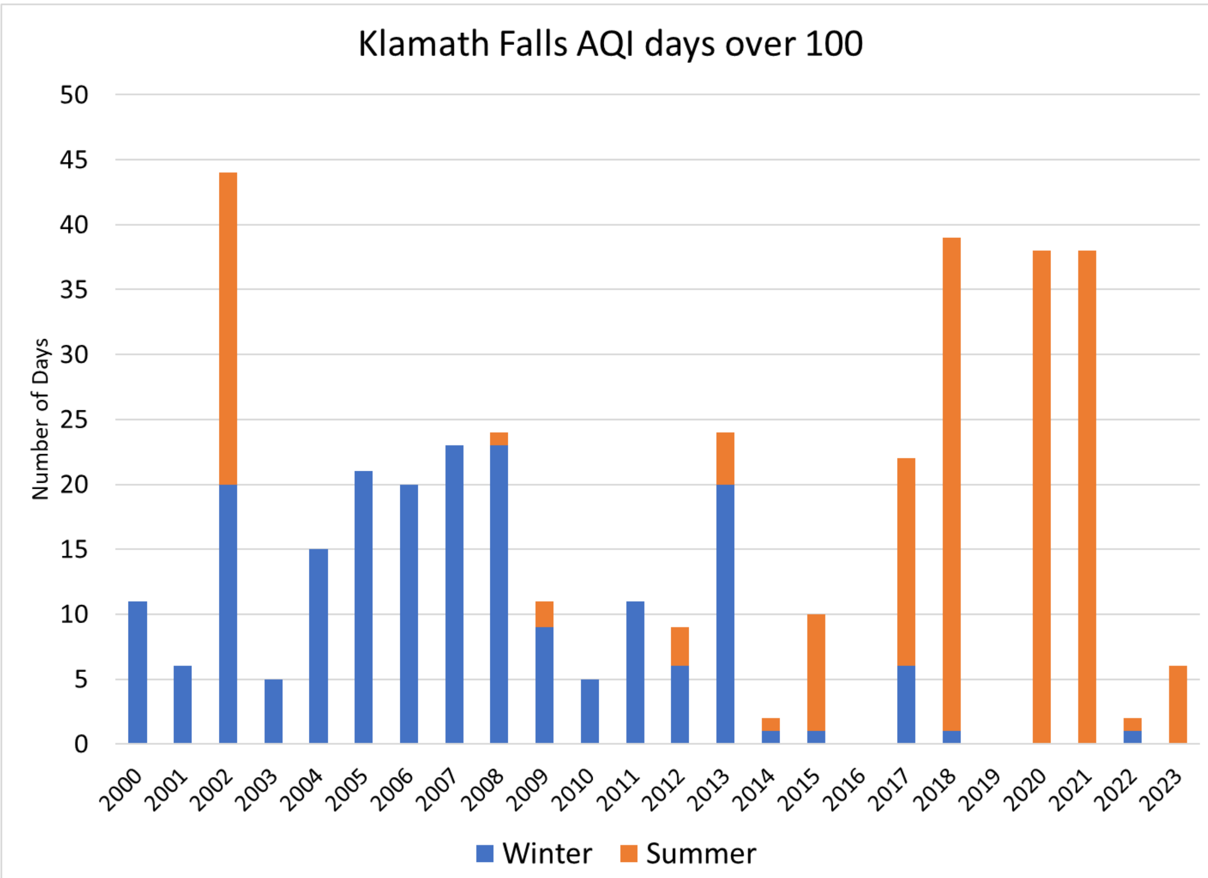
PM2.5 Daily Design Values with Exceptional Events and Wildfire Data Removed

Year	98th %tile	1999-2001	2000-2002	2001-2003	2002-2004	2003-2005	2004-2006	2005-2007	2006-2008	2007-2009	2008-2010	2009-2011	2010-2012	2011-2013	2012-2014	2013-2015	2014-2016	2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023
1999	44.1																							
2000	37.3	39																						
2001	35.1		41																					
2002	51.1	WF		39																				
2003	30.6				41																			
2004	42.0					41																		
2005	49.2						46																	
2006	47.5							45																
2007	39.6								46															
2008	52.2									45														
2009	44.0										44													
2010	34.6											39												
2011	37.1												33											
2012	25.9	EE												36										
2013	46.2	EE													34									
2014	29.6															35								
2015	29.5	EE															27							
2016	23.0																	32						
2017	44.7	EE																	28					
2018	27.9	WF																		35				
2019	32.3	WF																			37			
2020	49.3	WF																				39		
2021	36.4	EE																					37	
2022	26.0	WF																						29
2023	25.6	WF																						

Gray - Meets old NAAQS
Green - Meets NAAQS
Red - Does not meet NAAQS

$PM_{2.5}$ exceedances were primarily in the winter in the early 2000s and have changed over time. In the second decade of the 2000s, $PM_{2.5}$ exceedances occur primarily in the summer from wildfires. The chart below shows the number of days the Air Quality Index was over 100, Unhealthy for Sensitive Groups, using current breakpoints for all years. The chart demonstrates how the source of $PM_{2.5}$ has shifted over time.

Figure 1. Klamath Falls AQI days over the current Unhealthy For Sensitive Groups



Conclusions

DEQ has determined Table B best indicates the air quality improvement trend reflecting the progress of the Klamath Falls Attainment Plan. Table A best describes the air pollution impacts on residents of the Klamath Falls airshed, including the major wildfire smoke impacts in 2012, 2013, 2015, 2017, 2018, 2021 and 2021.

For completeness, both data sets are included here for review.

Appendix 2

2017 Attainment Year and 2037 Future Year State Implementation Plan Emissions Inventory

For Particulate Matter 2.5 microns and Precursor Pollutants, Klamath Falls Non-Attainment Area

Submitted to: U.S. Environmental Protection Agency

April 2024

State of Oregon
DEQ Department of Environmental Quality

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DEQ Department of Environmental Quality

1.1.1.1 Translation or other formats

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Executive Summary

Title I of the Clean Air Act Amendments of 1990 (CAAA) contains provisions on the required development of emission inventories for designated areas that failed or have failed in the past to meet the National Ambient Air Quality Standards (NAAQS). The Klamath Falls Nonattainment Area (NAA) is a designated NAAQS $PM_{2.5}$ attainment area with a maintenance plan. In compliance with published U.S. Environmental Protection Agency (EPA) requirements this emission inventory is provided as a part of the State's revisions to its State Implementation Plan (SIP) to formulate a strategy to maintain the NAAQS. The principal components for development and documentation of these inventories have been addressed in this report which includes point sources, nonpoint sources, mobile sources, and events and natural sources for quality assurance implementation, and emissions summaries. Inventory years include a 2017 attainment year and 2037 maintenance year. The geographic boundary for each inventory is the Klamath Falls NAA, as defined by the NAA boundary.

In conformance to 40 CFR §51.1002(c), this inventory includes emissions estimates for the following pollutants: $PM_{2.5}$, NH_3, NO_x, SO_2, and VOC.

In this document the terms annual and typical season day emissions (seasonal daily emissions) are used to categorize the estimated emissions for a particular time period. The annual emissions are a total amount of emissions for the source category that occurred throughout the year, represented in tons per year (tons per year). The typical seasonal day emissions (pounds per day) represent an average daily emission value occurring from November 1st through the end of February. This four-month time period is known as the PM winter season and typically when the PM standard is violated.

Executive Summary Figures and Tables

The following figures and tables summarize significant contributors to 2017 and 2037 annual and seasonal daily emissions within the Klamath Falls NAA. Higher contributing $PM_{2.5}$ emission categories are broken down further in this report to identify emission sources of concern.

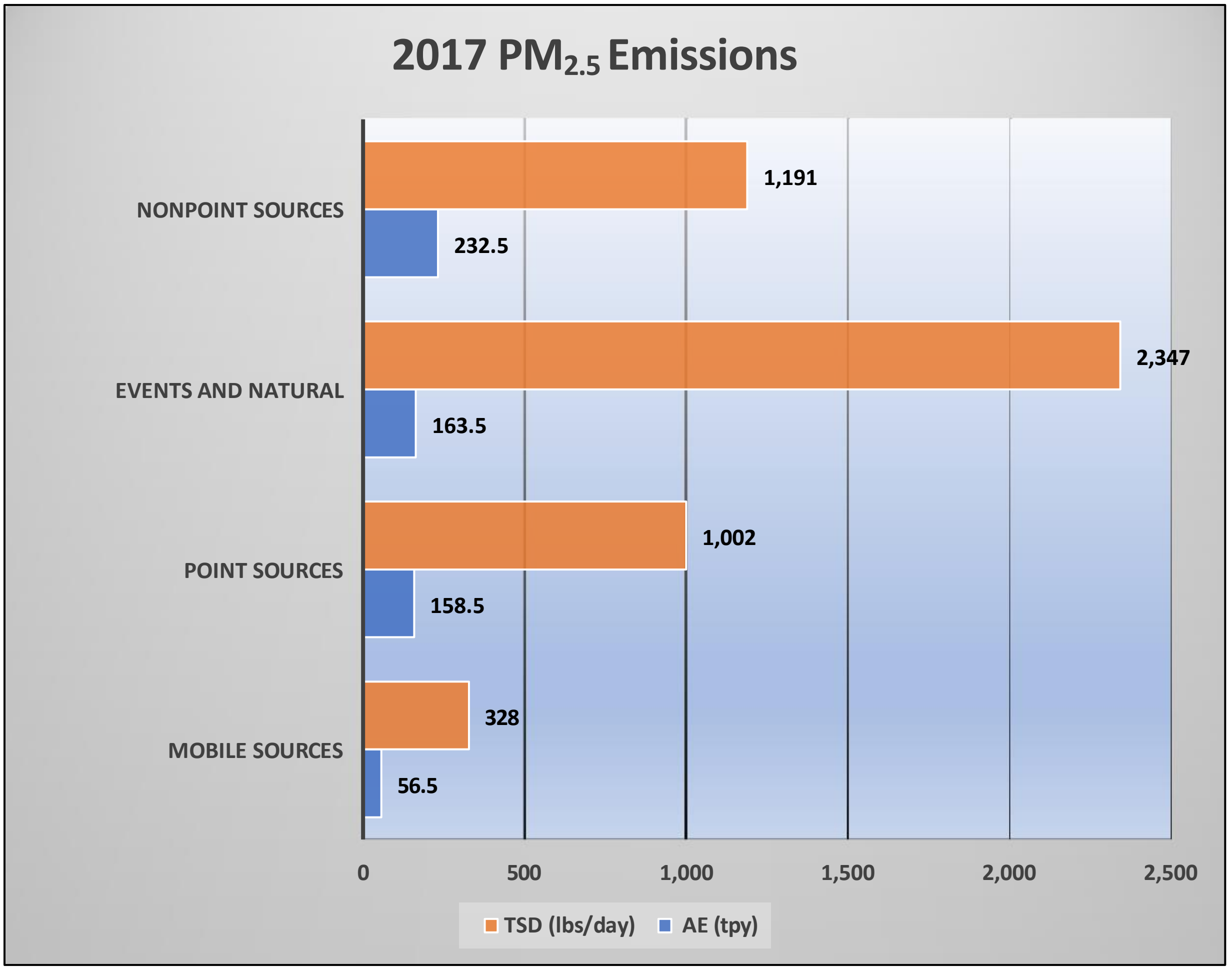

Figure 1. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions

Table 1. 2017 and 2037 Annual and Seasonal Daily Emissions by Pollutant

Pollutant	2017 AE	2017 TSD	2037 AE	2037 TSD
$PM_{2.5}$-Primary	611.0	4,868	605.3	4,691
NH_3	254.4	1,406	257.6	1,403
NO_x	1,057.9	6,256	812.1	4,980
SO_2	47.6	368	47.9	367
VOC	7,299.4	56,897	7,149.2	55,897

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 2. 2017 and 2037 $PM_{2.5}$ and Precursor Pollutants Annual and Seasonal Daily Emissions by Category

Emissions Categories by Pollutant	2017 AE	2017 AE % Distribution	2017 TSD	2017 TSD % Distribution	2037 AE	2037 AE % Distribution	2037 TSD	2037 TSD % Distribution
$PM_{2.5}$-Primary								
Nonpoint Sources	232.5	38%	1,191	24%	223.7	37%	994	21%
Events and Natural Sources	163.5	27%	2,347	48%	163.5	27%	2,347	50%
Point Sources	158.5	26%	1,002	21%	158.5	26%	1,002	21%
Mobile Sources	56.5	9%	328	7%	59.6	10%	348	7%
$PM_{2.5}$-Primary Total	611.0	100%	4,868	100%	605.3	100%	4,691	100%
NH_3								
Point Sources	111.7	44%	537	38%	111.7	43%	537	38%
Nonpoint Sources	97.6	38%	337	24%	103.6	40%	347	25%
Events and Natural Sources	32.2	13%	462	33%	32.2	12%	462	33%
Mobile Sources	13.0	5%	69	5%	10.1	4%	56	4%
NH_3 Total	254.4	100%	1,406	100%	257.6	100%	1,403	100%
NO_x								
Mobile Sources	650.4	61%	3,490	56%	451.0	56%	2,469	50%
Point Sources	257.6	24%	1,551	25%	208.5	26%	1,281	26%
Nonpoint Sources	77.1	7%	656	10%	79.8	10%	670	13%
Events and Natural Sources	72.8	7%	559	9%	72.8	9%	559	11%
NOx Total	1,057.9	100%	6,256	100%	812.1	100%	4,980	100%
SO_2								
Point Sources	14.8	31%	84	23%	14.8	31%	84	23%
Mobile Sources	13.9	29%	70	19%	14.1	29%	71	19%
Events and Natural Sources	12.1	25%	174	47%	12.1	25%	174	47%
Nonpoint Sources	6.7	14%	40	11%	6.9	14%	38	10%
SO_2 Total	47.6	100%	368	100%	47.9	100%	367	100%

Emissions Categories by Pollutant	2017 AE	2017 AE % Distribution	2017 TSD	2017 TSD % Distribution	2037 AE	2037 AE % Distribution	2037 TSD	2037 TSD % Distribution
VOC								
Events and Natural Sources	5,613.1	77%	47,209	83%	5,613.1	79%	47,209	84%
Nonpoint Sources	724.2	10%	4,308	8%	756.5	11%	4,334	8%
Point Sources	555.5	8%	3,124	5%	555.5	8%	3,124	6%
Mobile Sources	406.6	6%	2,256	4%	224.1	3%	1,231	2%
VOC Total	7,299.4	100%	56,897	100%	7,149.2	100%	55,897	100%

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 3. 2017 and 2037 Annual and Seasonal Daily Emissions from $PM_{2.5}$ Emitting Sources

$PM_{2.5}$ Emitting Sources	$PM_{2.5}$ Emissions							
	2017 AE	2017 AE % Distribution	2017 TSD	2017 TSD % Distribution	2037 AE	2037 AE % Distribution	2037 TSD	2037 TSD % Distribution
Prescribed Fires	163.0	27%	2,346	48%	163.0	27%	2,346	50%
Permitted Point Sources	158.5	26%	1,002	21%	158.5	26%	1,002	21%
Stationary Fuel Combustion Sources	120.6	20%	1,098	23%	98.1	16%	886	19%
Waste Disposal Sources	44.6	7%	0	0%	49.1	8%	0	0%
Miscellaneous Sources	34.9	6%	66	1%	42.5	7%	80	2%
Re-Entrained Road Dust	32.1	5%	189	4%	38.2	6%	225	5%
Agriculture Sources	25.6	4%	27	1%	25.6	4%	27	1%
Onroad Mobile Sources	9.3	2%	64	1%	7.4	1%	53	1%
Aircraft and Airport Operations	8.0	1%	39	1%	8.2	1%	41	1%
Fugitive Sources	6.8	1%	0	0%	8.3	1%	0	0%
Nonroad Mobile Sources	4.2	1%	19	0%	2.5	0%	12	0%
Locomotives	2.9	0%	16	0%	3.3	1%	18	0%
Structure Fires	0.3	0%	1	0%	0.3	0%	1	0%
Wildfires	0.2	0%	0	0%	0.2	0%	0	0%
Grand Total	611.0	100%	4,868	100%	605.3	100%	4,691	100%

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 4. 2017 and 2037 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Industrial Classification for Point Sources

NAICS and NAICS Description	$PM_{2.5}$-Emissions			
	2017		2037	
	AE	TSD	AE	TSD
321219 - Reconstituted Wood Product Manufacturing	88.7	487	88.7	487
321212 - Softwood Veneer and Plywood Manufacturing	41.2	358	41.2	358
221112 - Fossil Fuel Electric Power Generation	19.6	107	19.6	107
327992 - Ground or Treated Mineral and Earth Manufacturing	2.9	16	2.9	16
212321 - Construction Sand and Gravel Mining	2.7	15	2.7	15
423930 - Recyclable Material Merchant Wholesalers	1.4	7	1.4	7
812220 - Cemeteries and Crematories	1.3	7	1.3	7
327320 - Ready-Mix Concrete Manufacturing	0.5	3	0.5	3
928110 - National Security	0.1	0	0.1	0
335999 - All Other Miscellaneous Electrical Equip and Component Manufacturing	0.0	0	0.0	0
812210 - Funeral Homes and Funeral Services	0.0	0	0.0	0
221330 - Steam and Air-Conditioning Supply	0.0	0	0.0	0
321918 - Other Millwork (including Flooring)	0.0	0	0.0	0
812910 - Pet Care (except Veterinary) Services	0.0	0	0.0	0
Grand Total	158.5	1002	158.5	1002

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)
NAICS = North American Industrial Classification System

Table 5. 2017 and 2037 Comparison of $PM_{2.5}$ Annual and Seasonal Daily Emissions from Nonpoint Sources

Emissions Category and Sub-categories	$PM_{2.5}$ Emissions			
	2017 AE	2017 TSD	2037 AE	2037 TSD
Nonpoint Sources				
Stationary Fuel Combustion Sources	120.6	1,098	98.1	886
Waste Disposal Sources	44.6	0	49.1	0
Miscellaneous Sources	34.9	66	42.5	80
Agriculture Sources	25.6	27	25.6	27
Fugitive Sources	6.8	0	8.3	0
Grand Total	232.5	1,191	223.7	994

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 6. 2017 and 2037 $PM_{2.5}$ Annual and Seasonal Daily Emissions from Stationary Fuel Combustion Sources

Significant $PM_{2.5}$ Combustion Sources	$PM_{2.5}$ Emissions			
	2017 AE	2017 TSD	2037 AE	2037 TSD
Residential Woodstove	66.2	617	42.4	395
Residential Hydronic Heater	24.4	254	24.4	254
Residential Fireplace	11.1	140	11.4	144
Residential Outdoor Wood Devices	8.1	0	8.3	0
Residential Furnace	7.3	56	7.5	58
All Other Fuel Combustion Sources	3.5	31	4.1	36
Grand Total	120.6	1,098	98.1	886

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 7. 2008-2037 Annual Emissions Comparison by Category and Pollutants

Pollutants and Emissions Category	Base and Future Year Annual Emissions (AE)					
	2008		2017		2037	
	AE	AE % Distribution	AE	AE % Distribution	AE	AE % Distribution
$PM_{2.5}$-Primary:						
Nonpoint Sources	296.0	45%	232.5	38%	223.7	37%
Events and Natural Sources	107.0	16%	163.5	27%	163.5	27%
Point Sources	143.4	22%	158.5	26%	158.5	26%
Mobile Sources	108.3	17%	56.5	9%	59.6	10%
$PM_{2.5}$-Primary Total	654.7		611.0		605.3	
NH_3:						

Pollutants and Emissions Category	Base and Future Year Annual Emissions (AE)					
	2008		2017		2037	
	AE	AE % Distribution	AE	AE % Distribution	AE	AE % Distribution
Point Sources	70.4	29%	111.7	44%	111.7	43%
Nonpoint Sources	141.1	58%	97.6	38%	103.6	40%
Events and Natural Sources	20.8	9%	32.2	13%	32.2	12%
Mobile Sources	11.4	5%	13.0	5%	10.1	4%
NH_3 Total	243.7		254.4		257.6	
NO_x:						
Mobile Sources	1792.5	80%	650.4	61%	451.0	56%
Point Sources	329.3	15%	257.6	24%	208.5	26%
Nonpoint Sources	100.6	4%	77.1	7%	79.8	10%
Events and Natural Sources	13.7	1%	72.8	7%	72.8	9%
NO_x Total	2236.1		1057.9		812.1	
SO_2:						
Point Sources	40.7	37%	14.8	31%	14.8	31%
Mobile Sources	47.8	43%	13.9	29%	14.1	29%
Events and Natural Sources	13.0	12%	12.1	25%	12.1	25%
Nonpoint Sources	8.4	8%	6.7	14%	6.9	14%
SO_2 Total	109.9		47.6		47.9	
VOC:						
Events and Natural Sources	299.3	10%	5613.1	77%	5613.1	79%
Nonpoint Sources	673.6	23%	724.2	10%	756.5	11%
Mobile Sources	940.2	32%	406.6	6%	224.1	3%
Point Sources	997.2	34%	555.5	8%	555.5	8%
VOC Total	2910.3		7299.4		7149.2	

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1 Introduction

1.1 Inventory Purpose

The 2017 $PM_{2.5}$ NAA State Implementation Plan (SIP) emissions inventory has been developed in response to requirements specified in the Clean Air Act Amendments of 1990 for Klamath Falls. In conformance to 40 CFR §51.1002(c), this inventory will include pollutants of $PM_{2.5}$ and precursors of secondary formation of particulate matter for the Klamath Falls Air Quality Zone (AQZ) and the Non- Attainment Area (NAA), a partial county determination for Klamath County.

The $PM_{2.5}$ NAA boundary was expanded from the Klamath Falls Woodstove and Open Burning Ordinance Boundary, also known as the AQZ, and finalized by the EPA after collaboration with Oregon Department of Environmental Quality (DEQ) for the 2008 inventory. The 2008 Non-Attainment boundary was also used for the 2017 attainment year and 2037 future year emissions inventories. The NAA and AQZ boundaries, along with the Klamath Falls Urban

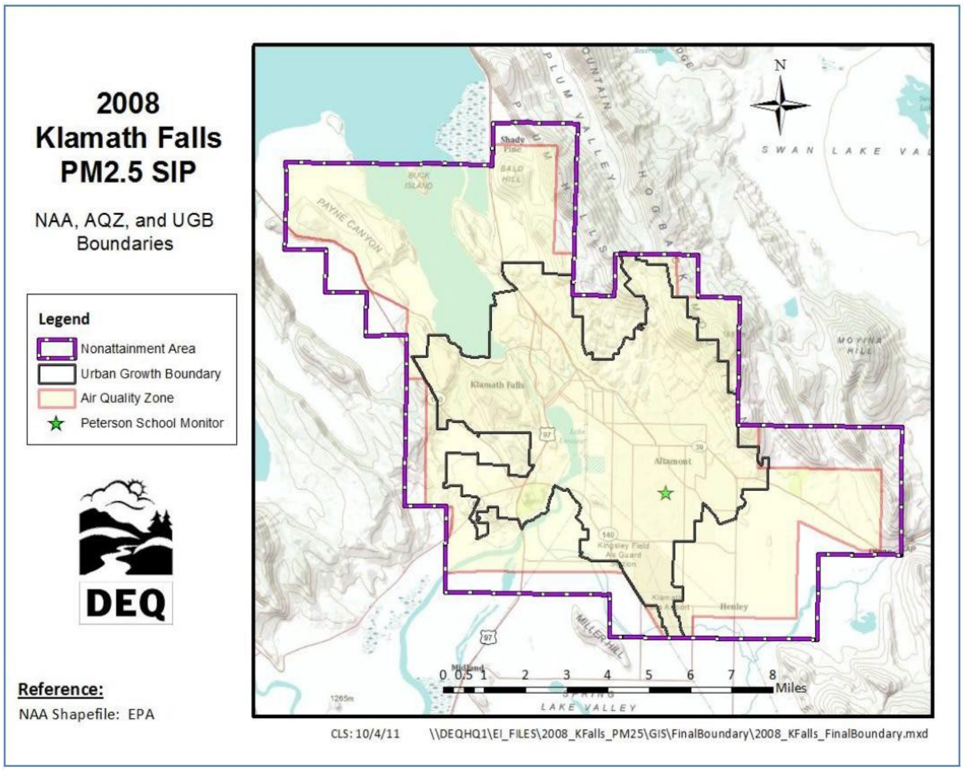

Figure 2. 2008 Klamath Falls NAA, AQZ, UG Boundaries

Growth Boundary (UGB) are shown in Figure 2 above.

The legal description of the Klamath Falls NAA defines the nonattainment area boundary and can be found in Oregon Administrative Rules (OAR) Chapter 340, Division 204, and Section 0030(3).

The Klamath Falls Nonattainment Area for $PM_{2.5}$ *is as follows: Townships and ranges defined by T37S R9E Sections 31-32. T38S R8E Sections 1-5, 8-16, 22-26, and 35-36. T38S R9E Sections 5-8, 14-15, 17-36. T39S R8E Sections 1-2, 11-13, 24. T39S R9E Sections 1-27. T39S R10E Sections 3-10, 15-20, 29-30.*

In addition to the NAA, DEQ has specific rules that address open burning for commercial, demolition, construction, and industrial open burning. These rules are identified for densely populated locations in the state as cities with a population over 4,000 and within three miles of the corporate city limits of these cities and are termed Open Burning Control Areas. These rules are located under OAR 340-264-0100 and are summarized below.

Generally, areas around the more densely populated locations in the state and valleys or basins which restrict atmospheric ventilation are designated open burning control areas. The practice of open burning may be more restrictive in open burning control areas than in other areas of the state. The specific open burning restrictions associated with these Open Burning Control Areas are listed in OAR 340-264-0080 through 340-264-0200 by county.

The Open Burning Control Areas of the eastern part of the state are defined as follows:

All areas in or within three miles of the incorporated city limit of all cities with a population of 4,000 or more.

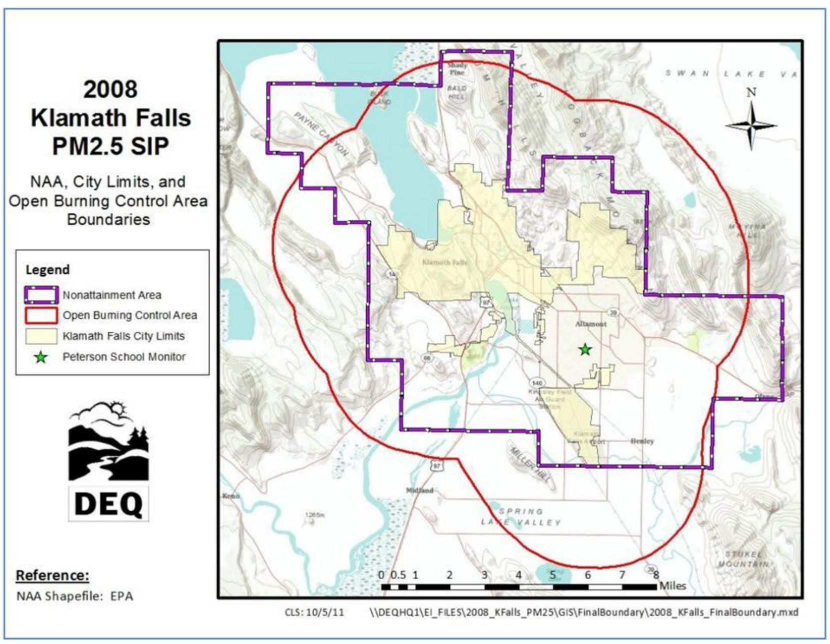

Figure 3. 2008 Klamath Falls NAA, City Limits, and Open Burning Control Area

The Clean Air Act Amendments (CAAA) of 1990 authorized the EPA to designate NAAs with respect to the National Ambient Air Quality Standards (NAAQS). Under the 1990 CAAA, pre-enactment $PM_{2.5}$ NAAs have been classified. The Klamath Falls NAA was designated as a moderate NAA for $PM_{2.5}$ for the 24-hour standard on October 8th, 2009. The table below shows the Klamath Falls NAA $PM_{2.5}$ NAAQS.

Table 8. Klamath Falls NAA $PM_{2.5}$ NAAQS

NAAQS	24-Hour (µg/m^3)	Annual (µg/m^3)
$PM_{2.5}$	35	15

In September 2019, DEQ and EPA engaged in a meeting to establish basic technical elements for developing this SIP emission inventory. The discussion over the basic technical elements included the following: 1) what years to use for the attainment and future year inventory, 2) types of emissions, emission categories, and pollutants to inventory, 3) EPA approved data models and resources to use, 4) monitoring, and 5) transportation conformity. These agreed upon elements were then included in a Technical Analysis Protocol (TAP) and submitted along with Klamath Falls Inventory Preparation Plan to EPA in Spring 2020.

These documents and the final emissions inventory fulfill EPA requirements for preparing the 2017 Attainment and 2037 Future Year emissions inventory, as specified in the provisions of the 1990 CAAA, $PM_{2.5}$ SIP Requirements Rule 40 CFR 51.1008, TAP, and other EPA guidance documents. The purpose of this report is to establish baseline and projected emissions for the Klamath Falls NAA. DEQ chose 2017 as the attainment year because at the time of developing the inventory it was the most current emissions data available from the National Emissions Inventory (NEI) for most emission categories. However, DEQ chose to run 2017 and 2037 regionally specific mobile source emissions in MOVES2014b instead of spatially allocating mobile emissions from 2017 NEI. MOVES2014b was the latest version of the model available when mobile emissions were ran in early 2020. Finally, 2037 was chosen as the future year to project emissions out from 2017. The reason for choosing 2037 as the future year was because the activity data available for running MOVES2014b provided by Oregon Department of Transportation (ODOT) Traffic Demand Model (TDM).

These emissions are then used to determine whether the area will remain in maintenance hereafter. This determination is documented in the 2022 Klamath Falls Maintenance Plan and Redesignation Request of which this report is an appendix.

The 2017 and 2037 $PM_{2.5}$ NAA SIP emissions inventory for Klamath Falls NAA is considered a Level II inventory, based on guidance provided by the Emission Inventory Improvement Program (EIIP)[17]. It is a Level II inventory because it will provide supportive data for strategic decision making.

1.2 Report Content

This report is divided into the following parts and sections:

Part 1: Introduction to the Report
Part 2: 2017 Attainment Year Emission Inventory
Part 3: 2037 Attainment Year Emission Forecast
Part 4: Emission Inventory for Transportation Conformity Analysis (2037)
Part 5: Quality Assurance and Quality Control
Part 6: References

Part 1 introduces this report and its purpose. The contents of this report briefly describe:

- **Section 1.1** contains discussion about inventory boundaries, pollutants, and federal and state rules that impact the boundary.

- **Section 1.2** discusses Report Contents.
    - **Subsection 1.2.1** provides information concerning emission inventory information systems, including descriptions of agency databases used.
    - **Subsection 1.2.2** is a summary of emission sources excluded from the inventory with rationale for the exclusions.
    - **Subsection 1.2.3** provides EPA procedure and guidance documents used in preparing the inventory.
    - **Subsection 1.2.4** discusses personnel responsible for the preparation of this inventory.

Part 2 describes in detail the methodologies and approaches taken to estimate emissions in the Klamath Falls NAA for the 2017 attainment year inventory. Part 2 is divided into sections describing the inventory process and the types of emission sources that are addressed in the inventory, as follows:

- **Section 2.2** contains summary tables of emissions from point, nonpoint, events, and nonroad and onroad mobile sources in the Klamath Falls NAA.

- **Section 2.3** contains a discussion of the point source emission category methodology and emissions estimation approach. Tables summarizing point source emissions estimates follow the discussion.

- **Section 2.4** addresses nonpoint sources and contains a discussion of the approaches used in estimating emissions for each subcategory and sector. Each area source category inventoried is described in detail, including the methodology used in making the calculations. Tables summarizing the emissions estimates from nonpoint sources follow the discussion.

- **Section 2.5** provides a discussion of the approach and methodology used in evaluating emissions from events and natural sources. Tables summarizing the emissions estimate from events and natural sources follows the discussion.

- **Section 2.6** provides a description of the approach and methodology used in evaluating emissions from nonroad mobile sources. Tables summarizing the emissions estimate from nonroad mobile sources follows the discussion.

- **Section 2.7** provides a description of the approach and methodology used in evaluating emissions from onroad mobile sources. Tables summarizing the emissions estimate from onroad mobile sources follow the discussion.

Part 3 provides future year growth rates and associated emission projections for point, nonpoint, and mobile sources from the 2017 attainment year through to the forecast year 2037.

Part 4 provides a brief outline of the methodology used to estimate onroad emissions for the 2037 transportation conformity year, along with details of the 2037 onroad inventory as compared to the 2017 attainment year for nonpoint, nonroad, and point sources.

Part 5 describes the Quality Assurance Quality Control procedures utilized in preparing the 2017 attainment and 2037 attainment year inventories.

Part 6 contains the list of references cited in this document.

Part 7 contains appendices of tables

1.2.1 Description of Emissions Inventory Systems

DEQ staff from the Technical Services Section, Air Quality Division assembled the inventory. Most nonpoint emission estimates came from the 2017 National Emissions Inventory (NEI) developed by EPA. In addition, DEQ used MOVES3.1 to develop nonroad and onroad annual and typical season day emission estimates for this inventory. Staff also used the ArcGIS Pro application for point source determination and spatial allocation of nonpoint and mobile source emissions to the NAA.

DEQ developed all other emission estimates in-house for this project where specified. Staff developed permitted point source annual emission estimates for the 2017 NEI via the agency permitting database Tracking, Reporting and Administration of Air Contaminant Sources (TRAACS). TRAACS serves several functions: permit management & performance tracking, compliance reporting, inspections scheduling and results management, emission inventory, and invoicing. DEQ calculated typical season day and future year estimates in MS Access databases for all nonpoint and point sources. The MS Access database allows multiple sources of data to be assembled and stored in one place to perform these types of calculations.

1.2.2 Emission Sources Not Inventoried

DEQ considered all sources for inclusion within the Klamath Falls NAA for the emission inventory. The following criteria was used to omit emission sources; 1) events and natural sources and mobile, nonpoint, and point sources that did not emit significant amounts of $PM_{2.5}$ annually or during the PM winter season months within Klamath Falls NAA and, 2) the activity did not occur within the Klamath Falls NAA. A discussion of omitted emission sources occurs in each emission category from Sections 2.3 through 2.7.

1.2.3 Guidance Documents

DEQ staff referred to current and applicable state agency and EPA inventory development guidance documents. The following resources were used to develop various sectors of this inventory including:

1) EPA's Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations.

2) Emission Inventory Improvement Program (EIIP) technical reports series

3) EPA Nonpoint Emissions Methodology and Operator (NEMO) Instructions

4) EPA Compilation of Air Pollutant Emission Factors referred to as AP-42.

5) State of Oregon 2008 Base Year & 2014 Attainment Year SIP Emission Inventory for Particulate Matter 2.5 Microns and Smaller ($PM_{2.5}$) Klamath Falls Nonattainment Area. (March 2012)

6) DEQ State and Federal Air Operating Permits

DEQ has cited these and other information sources throughout the text of this report, as appropriate.

1.2.4 Inventory Staff Contacts

DEQ is the lead agency tasked with updating the emissions inventory and SIP development with contributions from the Oregon State Department of Transportation (ODOT), Highway Division. ODOT provided data from the transportation demand model ran for the 2008 SIP EI3. The data was used to extrapolate 2017 and 2037 County and NAA VMT to develop onroad mobile source emissions from transportation sources (highway motor vehicles). The table below is the abbreviated organizational staff listing for carrying out these duties:

Table 9. Oregon Department of Environmental Quality Agency Personnel

Agency/Division	Staff Member	Position	Phone Number
Air Quality Division	Ali Mirzakhalili	Division Administrator	503-229-5397
Air Quality Planning	Michael Orman	AQ Planning Manager	503-229-6595
Air Quality Planning	Tori Heroux	AQ SIP Planner	971- 808-7046
Air Quality Technical Services (TS)	Jeffrey Stocum	AQ TS Manager	503-229-5506
Air Quality Technical Services (TS)	Brandy Albertson	AQ Senior Emissions Analyst	503-229-6459
Air Quality Technical Services (TS)	James Powell	AQ MOVES Model Emissions Analyst	TBD

Table 10. Oregon Department of Transportation Agency Personnel

Agency/Division	Staff Member	Position	Phone Number
Transportation Planning Analysis Unit	Brian Dunn	Manager	503-986-4106
Transportation Planning Analysis Unit	Sam Ayah	Transportation Analyst	503-986-4101

2 2017 Attainment Year Emissions Inventory

2.1 Inventory Description

The 2017 attainment year emissions inventory and 2037 future year emissions forecast covers $PM_{2.5}$ emissions and precursors of secondary formation of PM within the Klamath Falls NAA. The precursors included in this inventory are nitrogen oxides (NO_x), sulfur dioxide (SO_2), volatile organic compounds (VOC), and ammonia (NH_3).

Emission categories inventoried include events and natural sources, mobile sources, nonpoint sources, and point sources. The table below is a breakdown of emission categories and subcategories by section in the report.

Table 11. Emission Categories and Subcategories by Section

Emission Categories	Subcategories	Section
Events and Natural Sources	Biogenic Sources	2.5.3
	Prescribed Fires	2.5.1
	Structure Fires	2.5.2
	Wildfires	2.5.1
Mobile Sources	Aircraft and Airport Operations	2.6.3
	Locomotives	2.6.4
	Nonroad Mobile Sources	2.6
	Onroad Mobile Sources	2.7
	Re-Entrained Road Dust	2.7.4
Nonpoint Sources	Agriculture Sources	2.4.4.1
	Evaporative/Off-gassing Sources	2.4.4.2
	Fugitive Sources	2.4.4.3
	Miscellaneous Sources	2.4.4.4
	Stationary Fuel Combustion Sources	2.4.4.5
	Waste Disposal Sources	2.4.4.6
Point Sources	Permitted Sources	2.3

For this inventory, DEQ re-organized some emission categories and subcategories to align more with EPA reported categories in the NEI. The reorganization also grouped emission sources based on their similar activity type within the NAA. An example is moving fire emission sources such as wildfires, prescribed fires, and structure fires to events and natural sources category due to the intermittent nature of these emission sources. Also, biogenic emissions were added to events and natural sources and classified as a non-anthropogenic emission source. Wildfires and biogenic emission sources are included in the inventory but may be treated differently while proposing emission reduction strategies because they are not human caused (biogenic sources) or cannot be forecasted for future reduction strategies due to their intermittent nature (wildfires) from year to year.

Also, for this inventory gasoline stations and bulk terminals and plants were assigned to the nonpoint category under the evaporative/off-gassing subcategory as currently arranged in EPA's

2017 NEI. All gas stations and gasoline bulk terminals and plants in Oregon are captured under the state permitting system, Air Contaminant Discharge Permits (ACDP). DEQ spatially allocated emissions through GIS analysis in ArcGIS Pro using the 2017 NEI county level data and ACDP facilities latitude/longitude coordinates within the county and NAA. Due to data availability constraints, DEQ used the 2017 NEI data instead of performing individual gasoline source emission estimates like in the 2008 inventory. Therefore, gasoline emission sources were moved from point sources to nonpoint sources for this inventory.

Both annual and temporal emissions were estimated for this inventory. The emissions are reported in tons per year (tpy) for annual and pounds per day (lbs/day) for typical season day. Temporal emissions are average daily emissions calculated over a four-month period identified as the PM winter season. The winter season is represented by the months of January, February, November, and December in the same calendar year.

Emissions from events and natural sources, mobile and nonpoint sources were spatially allocated to the NAA by GIS analysis using ArcGIS Pro. County to NAA ratios were developed using U.S. Census Bureau Tiger/Line shape files consisting of Oregon demographic, economic, and zoning data. In addition, onroad mobile source emissions were allocated using a county to NAA ratio developed from ODOT provided data on Vehicle Miles Traveled (VMT) by Traffic Analysis Zone (TAZ).

2.2 Summary of Emissions Data

The major emission source categories covered in the following sections include point sources, nonpoint sources, mobile sources, and events and natural sources. The sections below discuss data sources, emission estimation methodologies, spatial and temporal allocation of emissions, and any applicable state regulations. Figures and tables are provided for each data category summarizing significant emission sources of $PM_{2.5}$ and precursor pollutants.

2.3 Point Sources

2.3.1 Introduction and Scope

The 2017 attainment year inventory consists of emissions from point sources within the Klamath Falls NAA only. While DEQ did evaluate point sources outside the NAA, nothing had significant impact on $PM_{2.5}$ emissions in the NAA.

DEQ manages both federal and state operating permit programs, Title V and Air Contaminant Discharge Permits (ACDP) respectively in TRAACS. The difference in air permit classification is: (1) state operating permits are minor sources that emit 99 tons or less per year of any criteria pollutant, and (2) federal operating permits are major sources emitting 100 tons or more of any criteria pollutants annually.

DEQ staff identified point sources in the NAA utilizing the previous list of existing facilities from the 2008 non-attainment inventory and identified closed or new facilities using TRAACS and ArcGIS Pro application to locate them within the NAA. Twenty-two facilities were included in the 2008 non- attainment inventory. Eight facilities have closed, and three new facilities have established business operations since the 2008 inventory. DEQ inventoried 17 permitted facilities within the NAA; four facilities are Title V permits and thirteen hold Air Contaminant

Discharge Permits (ACDP). Two ACDP facilities are considered portable, meaning they may move their equipment to various locations around the county throughout the year.

Air-permitted facilities represent various industries such as crematories, wood products manufacturing, redi- mix concrete plants, rock crushers, and electricity generation and natural gas transmission. The major portion of $PM_{2.5}$ emissions in the NAA comes from wood products industries such as sawmills and plywood/hardboard mills. They include equipment such as wood-fired boilers, particle or veneer dryers, hardboard presses, and lumber kilns. DEQ assumes that all facilities operate as specified in their permit.

Please refer to Table 12 and Figure 4 below, for a list of 17 facilities and a map of point sources located within the NAA inventoried within the NAA.

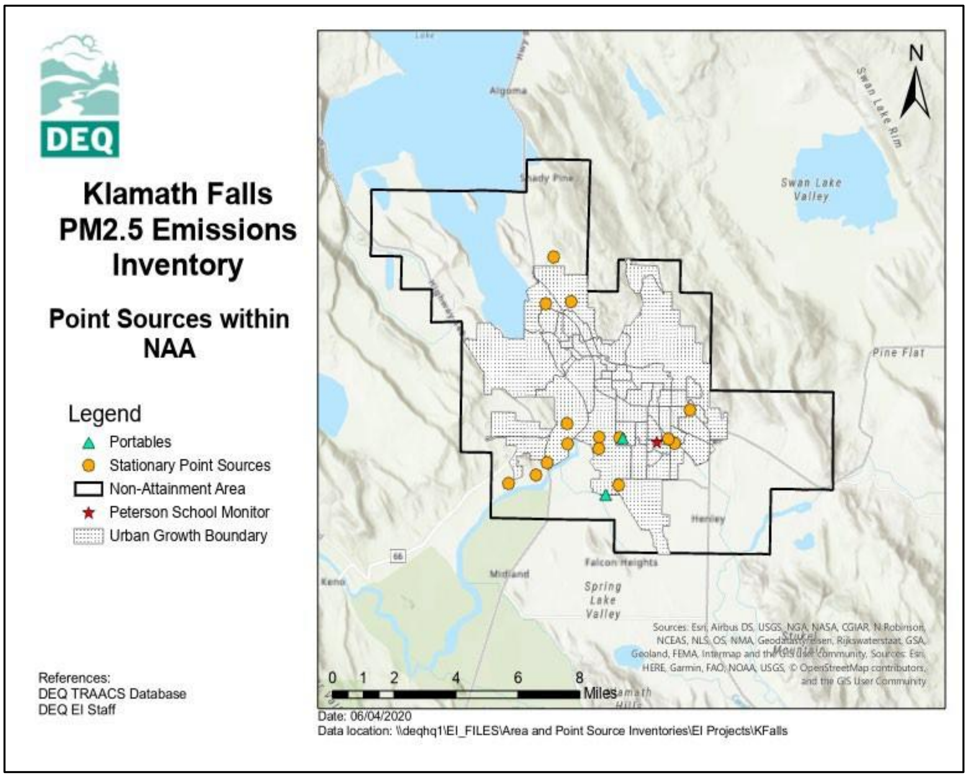

Figure 4. Point Sources within NAA

Table 12. List of Point Sources within NAA

DEQ Source Number	Source Name	Address	City	Zip Code	Latitude	Longitude	Permit Type
18-0003	Klamath Energy LLC	4940 HIGHWAY 97 S	KLAMATH FALLS	97603-9593	42.1748	-121.8072	TV
18-0006	JELD-WEN, Inc.	3303 LAKEPORT BLVD	KLAMATH FALLS	97601	42.2515	-121.8027	TV
18-0013	Collins Products LLC	6410 HIGHWAY 66	KLAMATH FALLS	97601	42.1708	-121.8244	TV
18-0014	Columbia Forest Products, Inc.	SOUTH HIGHWAY 97	KLAMATH FALLS	97601	42.1804	-121.8003	TV
18-0018	Pyramid Cremations	3539 AVALON STREET	KLAMATH FALLS	97603	42.1900	-121.7200	General
18-0020	Oil Re-Refining Company	1291 LAVERNE AVE	KLAMATH FALLS	97603-4563	42.1922	-121.7677	Simple
18-0022	Electro Scientific Industries, Inc.	4700 ESI WAY	KLAMATH FALLS	97601	42.2725	-121.7981	Simple
18-0053	Klamath Veterinary Services, Inc.	6360 S 6TH ST	KLAMATH FALLS	97603-7110	42.2050	-121.7107	Basic
18-0056	Sky Lakes Medical Center, Inc.	2865 DAGGETT AVE	KLAMATH FALLS	97601-1106	42.2526	-121.7867	General
18-0070	Knife River Corporation - Northwest	4815 TINGLEY LN	KLAMATH FALLS	97603	42.1871	-121.7679	General
18-0078	American Garden Perlite OR, LLC	5855 WASHBURN WAY	KLAMATH FALLS	97603-9634	42.1709	-121.7550	Simple
18-0086	Panel Processing of Oregon, Inc.	3033 MEMORIAL DRIVE	KLAMATH FALLS	97603	42.1890	-121.7876	General
18-0088	O'Hair & Riggs Funeral Services, Inc.	2680 MEMORIAL DR	KLAMATH FALLS	97601	42.1980	-121.7881	Basic
18-0097	Oregon Air National Guard	VANDENBURG DRIVE	KLAMATH FALLS	97603	42.1919	-121.7241	Simple
18-9503	Tracks to Heaven Pet Cremation	2818 LAVERNE AVE	KLAMATH FALLS	97603-7241	42.1921	-121.7548	General
37-0625	Knife River Corporation - Northwest	Portable	KLAMATH FALLS	97999	42.1668	-121.7631	General
37-0675	Rocky Mountain Construction, LLC	Portable	KLAMATH FALLS	97999	42.1922	-121.7529	General

Table 13. Point Sources NAICS and Permit Limits

DEQ Source Number	Source Name	NAICS Code	NAICS Description	$PM_{2.5}$ PSEL	NO_x PSEL	SO_2 PSEL	VOC PSEL
18-0003	Klamath Energy LLC	221112	Fossil Fuel Electric Power Generation	46	314	39	39
18-0006	JELD-WEN, Inc.	321219	Reconstituted Wood Product Manufacturing	11	67	39	295
18-0013	Collins Products LLC	321219	Reconstituted Wood Product Manufacturing	128	39	50	670
18-0014	Columbia Forest Products, Inc.	321212	Softwood Veneer and Plywood Manufacturing	66	65	39	143
18-0018	Pyramid Cremations	812220	Cemeteries and Crematories	9	39	39	39
18-0020	Oil Re-Refining Company	423930	Recyclable Material Merchant Wholesalers	9	39	39	39
18-0022	Electro Scientific Industries, Inc.	335999	Misc. Electrical Equip and Comp Manufacturing	9	39	39	39
18-0053	Klamath Veterinary Services, Inc.	812910	Pet Care (except Veterinary) Services	9	0	0	0
18-0056	Sky Lakes Medical Center, Inc.	221330	Steam and Air-Conditioning Supply	9	39	39	39
18-0070	Knife River Corporation - Northwest	327320	Ready-Mix Concrete Manufacturing	9	39	39	39
18-0078	American Garden Perlite OR, LLC	327992	Ground or Treated Mineral and Earth Manufacturing	9	39	39	39
18-0086	Panel Processing of Oregon, Inc.	321918	Other Millwork (including Flooring)	9	39	39	39
18-0088	O'Hair & Riggs Funeral Services, Inc.	812210	Funeral Homes and Funeral Services	9	0	0	0
18-0097	Oregon Air National Guard	928110	National Security	9	39	39	39
18-9503	Tracks to Heaven Pet Cremation	812220	Cemeteries and Crematories	9	39	39	39
37-0625	Knife River Corporation - Northwest	327320	Ready-Mix Concrete Manufacturing	9	39	39	39
37-0675	Rocky Mountain Construction, LLC	212321	Construction Sand and Gravel Mining	9	39	39	39

Notes:
NAICS = North American Industrial Classification System
PSEL = Plant Site Emission Limit for permit

DEQ does not report emissions for individual facilities with state operating permits (ACDP) to the NEI. The NEI typically captures these emissions under nonpoint categories such as stationary combustion, solvent usage, and other emission sources using statewide activity information. For this inventory, DEQ developed annual and seasonal emission estimates in-house for the individual ACDP and Title V facilities.

Please refer to Nonpoint Sources in **Section 2.4** for details on non-permitted stationary source emission estimates from fuel combustion and other processes.

2.3.2 Methodology and Approach

DEQ estimated point source annual emissions down to process level for each permitted facility. In addition, staff developed typical season day estimates using annual emissions; seasonal adjustment factors (SAFs) and operating schedules or EPA temporal data specific to a process. Data collection and estimation details are as follows:

2.3.2.1 Activity Data

DEQ collected activity data for both ACDP and Title V permitted facilities from 2017 annual reports. Facilities must fulfill certain permit conditions for annual reporting by submitting monthly and annual activity/throughput and emission estimates for criteria pollutants.

2.3.2.2 Emissions Calculation Methods

Emissions are typically estimated one of three ways using:

- Emission factors,
- Material balance, or
- Continuous Emissions Monitoring System (CEMS)

The most common methodology used by facilities to estimate emissions are emission factors. Facilities and their permit writers develop emissions factors to determine compliance with Plant Site Emission Limits (PSELs) and submit those estimates to DEQ annually. DEQ uses such resources as AP-42, industry standards, or source testing to develop emission factors for permits. Emission factors relate the quantity of a pollutant to its activity such as pounds of pollutant per gallon of fuel oil. Some emission factors use assumptions or conversions not likely defined in the permit or emission detail sheets including capture efficiencies, control efficiencies, conversion constants, and percent lower explosive limit (LEL), and transfer efficiency.

Estimations for material balance use assumptions and conversions including product retention factors, waste recovery, material density, VOC content, and conversions from volume to mass. Emission detail sheets and permit review reports, and annual reports may contain this information.

Continuous Emissions Monitoring is the most accurate representation of emissions at a facility because it relies on direct measurement of stack emissions. Facilities employ CEMS to continuously collect, record, and report CO, NO_x, or SO_2 emitted on the premises.

DEQ mostly used emission factors from permits or CEM data reported by the facility to develop 2017 emission estimates for $PM_{2.5}$ and precursors pollutants for this inventory.

2.3.2.3 Annual Emissions Calculations

DEQ estimated 2017 $PM_{2.5}$ and precursor pollutant emissions using emission basis derived from annual reports and permits. Emission basis consists of emission units and processes with associated pollutant emission factors or methodology found in permits and activity data taken from annual reports to estimate unit level emissions.

2.3.2.4 Seasonal Emissions Calculations

DEQ estimated typical season day emissions for point sources by applying a seasonal adjustment factor (SAF) to annual emission estimates. The peak $PM_{2.5}$ season (wintertime period) used for this inventory is January through February and November through December of the calendar year 2017.

DEQ estimates annual emissions for $PM_{2.5}$ and precursors as well as typical season day emissions for the wintertime period. When developing typical season day emissions, DEQ considers weekday versus weekend day variability in emissions. Since exceedances tend to occur during the week in Oregon, typical season day emissions will reflect activity occurring during the week whenever possible. DEQ calculated the SAF using temporal input file data of peak season activity by SCC from EPA's 2016 modeling platform. The temporal data is in the form of annual activity by month and SCC. The seasonal activity data is summed for winter season January, February, November, and December and used in following formula:

SAF = ((PM season activity) * (12 months) / (annual activity) * (# of season months))

Finally, DEQ estimated typical season day emissions by multiplying the actual annual emissions by a SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

DEQ used emissions information from TRAACS air permitting database and temporal input files from EPA's 2016 modeling platform to develop typical season day estimates.

2.3.2.5 Control Efficiency, Rule Effectiveness and Penetration

DEQ used emission factors from air permits to estimate annual emissions for each permitted facility. Control efficiencies for each controlled emission unit and process are already included in the emission factors for this inventory. As per EPA guidance for the 2008 inventory, DEQ chose to extend the option of not applying rule effectiveness to the 2017 $PM_{2.5}$ SIP emission inventory (EPA-454/R-05-001, p.18, paragraph 3, DEQ Ref. 627)[22]. Rule penetration at each point source is considered one.

2.3.3 Summary of Point Source Emissions

$PM_{2.5}$ emissions increased from 143.4 tons in 2008 to 158.5 tons in 2017 for this category. The industry driving $PM_{2.5}$ emissions within the NAA is Wood Products Manufacturing. Even though, 8 facilities closed, and 3 new facilities were added since 2008, one facility appears to have caused the increase in emissions. The facility is still operating within their permit's established PSELs but does show an increase in production levels from 2008 to 2017. All facilities operated within the limits of their permits in 2017.

The percent contribution of pollutants to the secondary formation of $PM_{2.5}$ is minimal; therefore, figures representing the distribution and percentages of pollutants contributing to secondary formation of $PM_{2.5}$ are not included in this EI. Although there is some contribution through secondary formation, analysis of filter samples and modeling shows on average that secondary formation is relatively small compared to the direct $PM_{2.5}$ emissions. For more detail on this analysis, see pages 17-18 of the 2012 Attainment Plan.

This document provides facility wide and unit level emission summaries for all facilities and pollutants inventoried. See **Appendix A: Section 2.3** for emissions details per facility down to equipment level. While industry and facility wide emissions can be seen in the following figures and tables below.

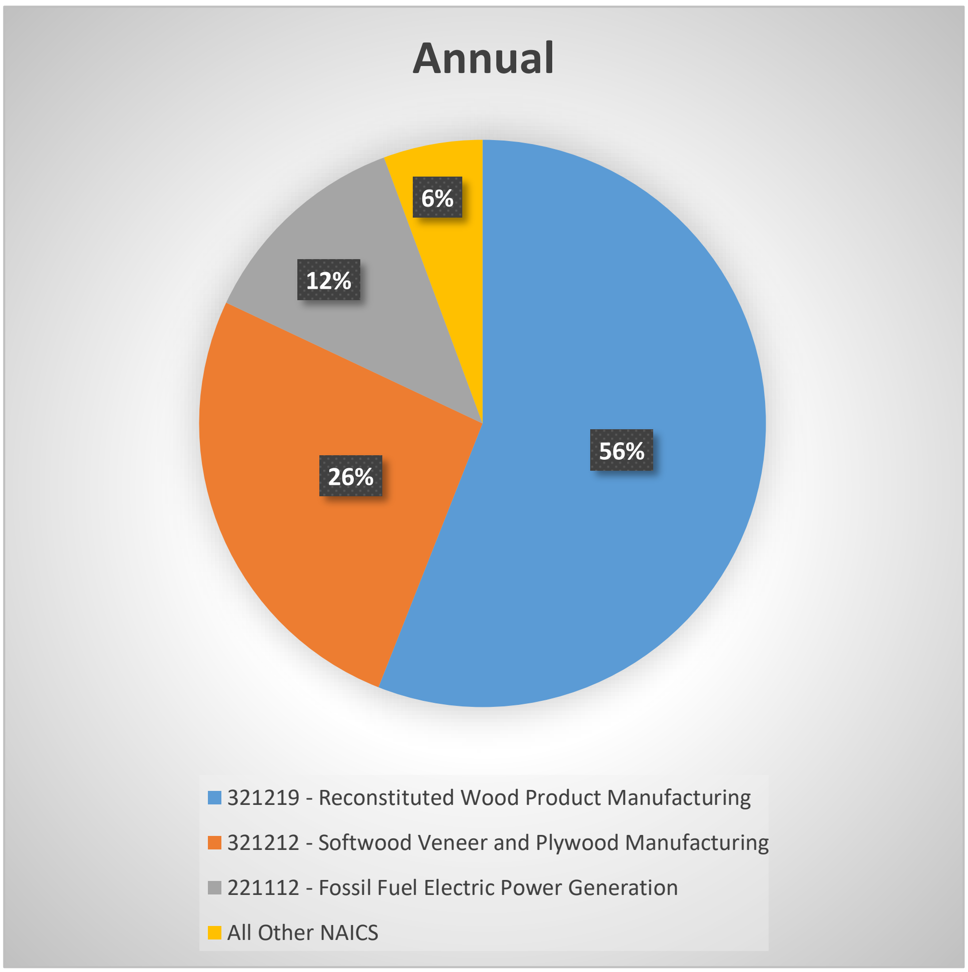

Figure 5. 2017 $PM_{2.5}$ Annual Emissions Distribution by Industry Type

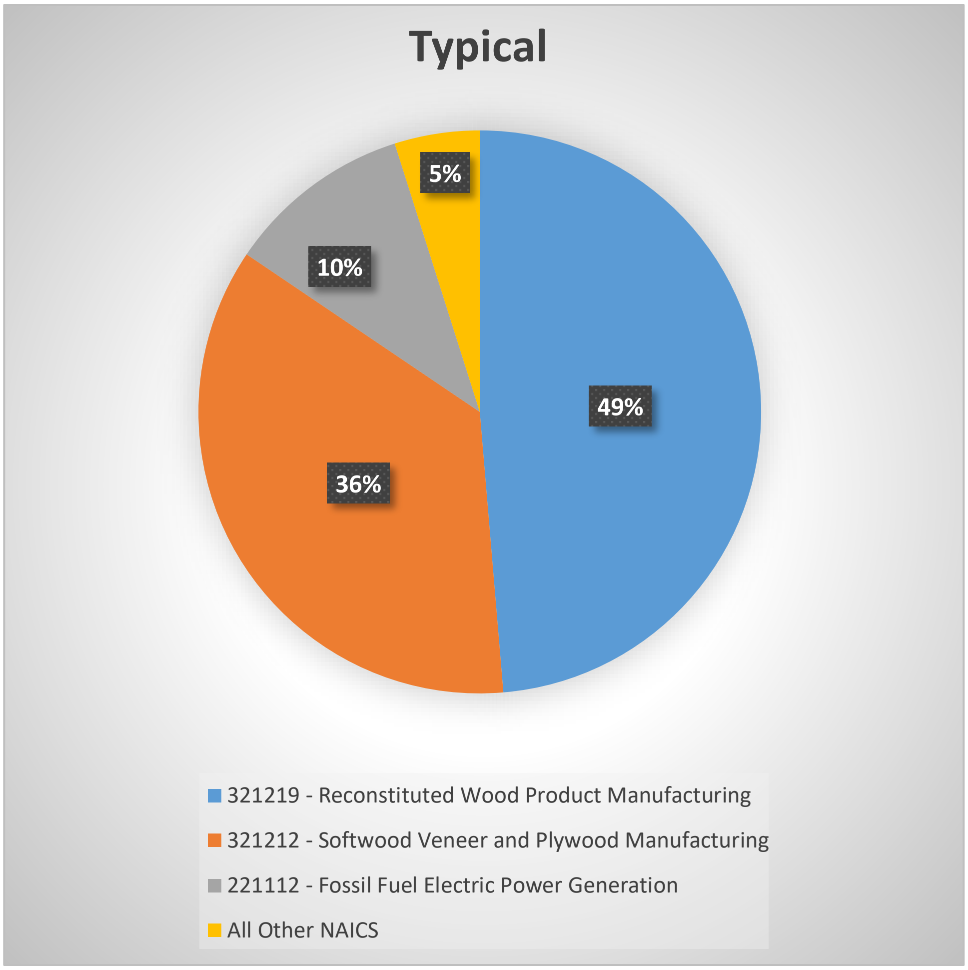

Figure 6. 2017 $PM_{2.5}$ Seasonal Daily Emissions Distribution by Industry Type

Table 14. 2017 Annual and Seasonal Daily Emissions by Industrial Type

NAICS Code	NAICS Description	PM 2.5-Primary		PM 2.5-Filterable		PM-Condensable		NH_3		NO_x		SO_2	
		AE	TSD	AE	TSD	AE	TSD	AE	TSD	AE	TSD	AE	TSD
212321	Construction Sand and Gravel Mining	2.7	15	0.0	0	0.0	0	0	0	34.6	190	2.3	12
221112	Fossil Fuel Electric Power Generation	19.6	107	0.2	1	0.5	2	111	534	143.0	780	6.4	35
221330	Steam and Air-Conditioning Supply	0.0	0	0.0	0	0.0	0	0	0	0.0	0	0.0	0
321212	Softwood Veneer and Plywood Manufacturing	41.2	358	0.0	0	0.0	0	0	1	43.2	376	0.7	6
321219	Reconstituted Wood Product Manufacturing	88.7	487	0.1	0	0.2	1	0	2	33.4	186	1.6	9
321918	Other Millwork (including Flooring)	0.0	0	0.0	0	0.0	0	0	0	0.0	0	0.0	0
327320	Ready-Mix Concrete Manufacturing	0.5	3	0.0	0	0.0	0	0	0	0.0	0	0.0	0
327992	Ground or Treated Mineral and Earth Manufacturing	2.9	16	0.0	0	0.0	0	0	0	0.9	5	0.0	0
335999	All Other Misc. Electrical Equip & Comp Manufacturing	0.0	0	0.0	0	0.0	0	0	0	0.9	6	0.0	0
423930	Recyclable Material Merchant Wholesalers	1.4	7	0.0	0	0.0	0	0	0	0.5	3	3.7	20
812210	Funeral Homes and Funeral Services	0.0	0	0.0	0	0.0	0	0	0	0.0	0	0.0	0
812220	Cemeteries and Crematories	1.3	7	0.0	0	0.0	0	0	0	0.2	1	0.0	0
812910	Pet Care (except Veterinary) Services	0.0	0	0.0	0	0.0	0	0	0	0.0	0	0.0	0
928110	National Security	0.1	0	0.0	0	0.0	0	0	0	0.9	5	0.0	0
Grand Total		158	1002	0	1	1	4	112	537	258	1551	15	84

Notes:
AE (tpy) = Annual Emissions (tons per year)
TSD (lbs/day) = Typical Season Day Emissions (pounds per day)
NAICS = North American Industrial Classification System

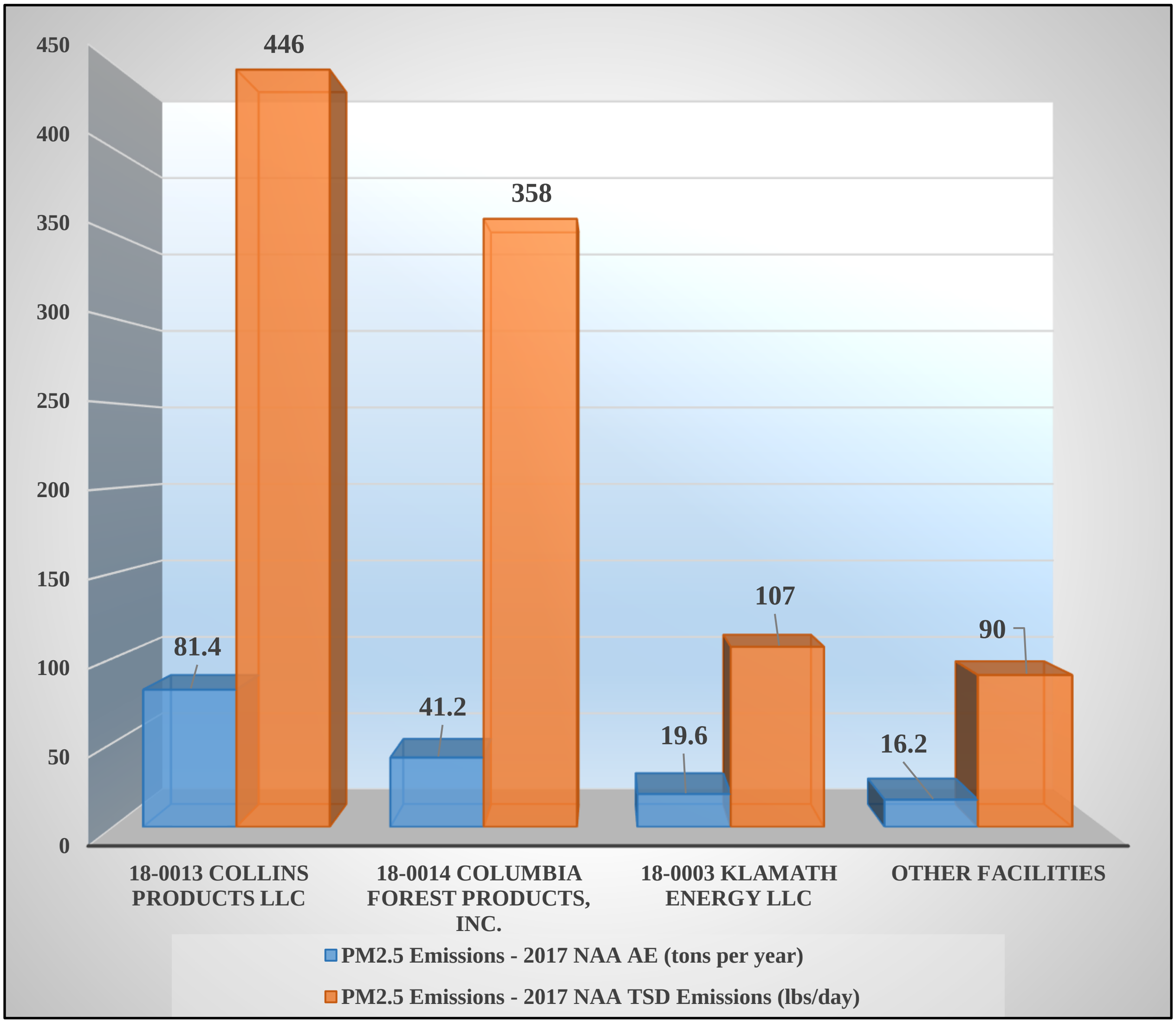

Figure 7. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Highest Contributing Facilities

Table 15. 2017 Annual and Seasonal Daily Emissions by Facility

DEQ Source Number	Source Name	2017											
		$PM_{2.5}$-Primary		$PM_{2.5}$-Filterable		PM-Condensable		NH_3		NO_x		SO_2	
		AE	TSD	AE	TSD	AE	TSD	AE	TSD	AE	TSD	AE	TSD
18-0003	Klamath Energy LLC	19.6	107	0.2	1	0.5	2	111.0	534	143.0	780	6.4	35
18-0006	JELD-WEN, Inc.	7.3	41	0.1	0	0.2	1	0.3	2	26.6	149	1.6	9
18-0013	Collins Products LLC	81.4	446	0.0	0	0.0	0	0.2	1	6.9	38	0.0	0
18-0014	Columbia Forest Products, Inc.	41.2	358	0.0	0	0.0	0	0.2	1	43.2	376	0.7	6
18-0018	Pyramid Cremations	1.3	7	0.0	0	0.0	0	0.0	0	0.1	0	0.0	0
18-0020	Oil Re-Refining Company	1.4	7	0.0	0	0.0	0	0.0	0	0.5	3	3.7	20
18-0022	Electro Scientific Industries, Inc.	0.0	0	0.0	0	0.0	0	0.0	0	0.9	6	0.0	0
18-0053	Klamath Veterinary Services, Inc.	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
18-0056	Sky Lakes Medical Center, Inc.	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
18-0070	Knife River Corporation - Northwest	0.4	2	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
18-0078	American Garden Perlite OR, LLC	2.9	16	0.0	0	0.0	0	0.0	0	0.9	5	0.0	0
18-0086	Panel Processing of Oregon, Inc.	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
18-0088	O'Hair & Riggs Funeral Services, Inc.	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
18-0097	Oregon Air National Guard	0.1	0	0.0	0	0.0	0	0.0	0	0.9	5	0.0	0
18-9503	Tracks to Heaven Pet Cremation	0.0	0	0.0	0	0.0	0	0.0	0	0.1	1	0.0	0
37-0625	Knife River Corporation - Northwest	0.2	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
37-0675	Rocky Mountain Construction, LLC	2.7	15	0.0	0	0.0	0	0.0	0	34.6	190	2.3	12
	Grand Total	158	1002	0	1	1	4	112	537	258	1551	15	84

Notes:
AE (tpy) = Annual Emissions (tons per year)

Notes: continued for Table 15.
TSD (lbs/day) = Typical Season Day Emissions (pounds per day)

2.4 Nonpoint Sources

2.4.1 Introduction and Scope

This section details the development of 2017 annual and typical season day estimates for nonpoint sources located within the Klamath Falls NAA. Nonpoint sources included in this inventory are mostly stationary and collectively represent relatively small and numerous individual emission sources. Included in the nonpoint source category are six broad groups of emission source contributors:

- •Agriculture sources (Section 2.4.4.1)
- •Evaporative/off-gassing emission sources (Section 2.4.4.2)
- •Fugitive sources (Section 2.4.4.3)
- •Miscellaneous area sources (Section 2.4.4.4)
- •Stationary fuel combustion including residential, commercial/institutional, and industrial sources (Section 2.4.4.5)
- •Waste disposal sources (Section 2.4.4.6)

Procedures and data resources used to develop the emission estimates for the various nonpoint subcategories in the Klamath Falls NAA is provided in the following sections.

2.4.2 Methodology and Approach

2.4.2.1 Data Resources and Seasonal Emissions Estimate Methodology

Discussion of guidance documents and broad methodologies used to calculate nonpoint source emissions can be found in **Section 1.3**. The list of nonpoint sources included in the inventory was based on the previous SIP EI and EPA's guidance Emission Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations[16].

Any errors in estimated emissions could occur in the multiplier values used, in the accuracy of calculations, or in mistakes in the construction of equations. Therefore, estimated emissions were checked for reasonableness by several approaches:

1) Using alternative multiplier value, when possible,
2) Comparing estimates with the results of earlier area source inventories, and
3) Performing independent checks on the accuracy of the multiplier values, the methodologies, documentation and references, and emission calculations.

Unless otherwise noted, all county emissions came from the 2017 NEI for these nonpoint sources and were allocated spatially to the Klamath Falls NAA. The methodologies for preparing this SIP inventory came from Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations16 or the Emission Inventory Improvement Program17 EPA documents. Currently, there are no 2017 emissions available from the NEI for landfills, wind erosion, and truck transport of gasoline; therefore, DEQ used the previous SIP estimation methodologies and emissions factors to prepare 2017 emissions for these sectors.

Portland State University Population Research Center, United States (U.S.) Census Bureau, and Oregon Department of Employment data resources were used for 2017 population, household units, and employment population figures to develop county to NAA ratios to allocate emissions and develop growth factors for future year emissions.

Typical season day emissions for nonpoint sources were estimated applying a SAF to annual emissions. For many nonpoint categories, SAF data is available by Source Classification Code (SCC) in temporal

profiles provided by EPA's 2016 Modeling Platform. The temporal data is in the form of annual activity by month by SCC and weekly data. The season activity data is summed for January, February, November, and December and used in the following formula provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (4 season months))

For some subcategories and sectors, EPA temporal profile data indicates that activity is considered uniform throughout the week and year. As such, typical season day emissions were then estimated to be 1/365th of annual emissions. The SAF is then set equal to 1 for these particular estimates. Some sectors may not have EPA temporal profile data available; therefore, an alternative method was used to create a SAF. The SAF is calculated using the highest amount activity for a specific PM season day or annual and PM season activity or emissions in the formula above obtained directly from data source. These alternative methods will be specified under the various subsections.

Finally, DEQ estimated typical season day emissions by multiplying the actual annual emissions by a SAF and divide that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Each section below details sector descriptions, pollutants inventoried, and estimation approach or data sources used in calculating the annual and typical season day $PM_{2.5}$ and precursor emissions.

2.4.2.2 Prevention of Double Counting

Since most nonpoint source emissions came from the 2017 NEI, prevention of double counting is normally addressed during triennial inventory development for fuel combustion. States should provide fuel combustion, surface coating, and solvent usage activity data to EPA to back out overlapping emissions from nonpoint sources that otherwise were reported under the point source category. So, for this inventory the backing out of emissions from the nonpoint source subcategory fuel combustion for large, permitted facilities was already performed for the 2017 NEI. However, DEQ subtracted ACDP fuel combustion emissions from the stationary fuel combustion sector (nonpoint emissions category) because they are represented as point sources for this SIP EI and were not reported as point sources for 2017 NEI. State permitted sources of emissions are not required reporting for the 2017 NEI and are typically captured under the nonpoint emissions category. In addition, surface coating and solvent emissions for this SIP EI were also backed out because no solvent information was submitted to EPA for the 2017 NEI.

2.4.2.3 Emission Sources Not Included

Both industrial open burning and commercial/institutional on-site incineration were determined to be insignificant through DEQ permitting and complaints records. These two categories, mentioned in the previous Klamath Falls PM SIP EI, are also not included in this inventory. Residential Solid Waste Incineration

OAR Chapter 340, Division 230 defines refuse burning equipment as a device designed to reduce the volume of solid, liquid, or gaseous refuse by combustion. The cost of applications and fees is considered prohibitive for a residential application of this type of municipal waste disposal. Residential solid waste disposal in the Klamath Falls UGB occurs through commercial waste collection, on-site combustion in open burn barrels, and in some cases, within wood stoves and fireplaces. Emissions from this category of burning are captured in the open burning sections.

In addition, there are no known orchards within the Klamath Falls NAA; therefore, emissions for orchards are not included in this inventory. This is due to the high elevation and colder temperatures. The Oregon State University Extension Service, Oregon Agricultural Information Network (OAIN) shows no orchard acreage (tree fruits & nuts) for Klamath County in 2008 nor in 2017.

2.4.3 Summary of Nonpoint Sources Emissions

The most significant source of $PM_{2.5}$ emissions comes for nonpoint sources is residential woodstoves with open burning and commercial cooking leading relatively close behind. The contribution of pollutants contributing to the secondary formation of $PM_{2.5}$ is considered minimal[4], and as such figures representing the distribution and percentages of pollutants contributing to secondary formation of $PM_{2.5}$ are not included in this inventory. Emissions for all pollutants and sectors are represented in the following figures and tables for this data category.

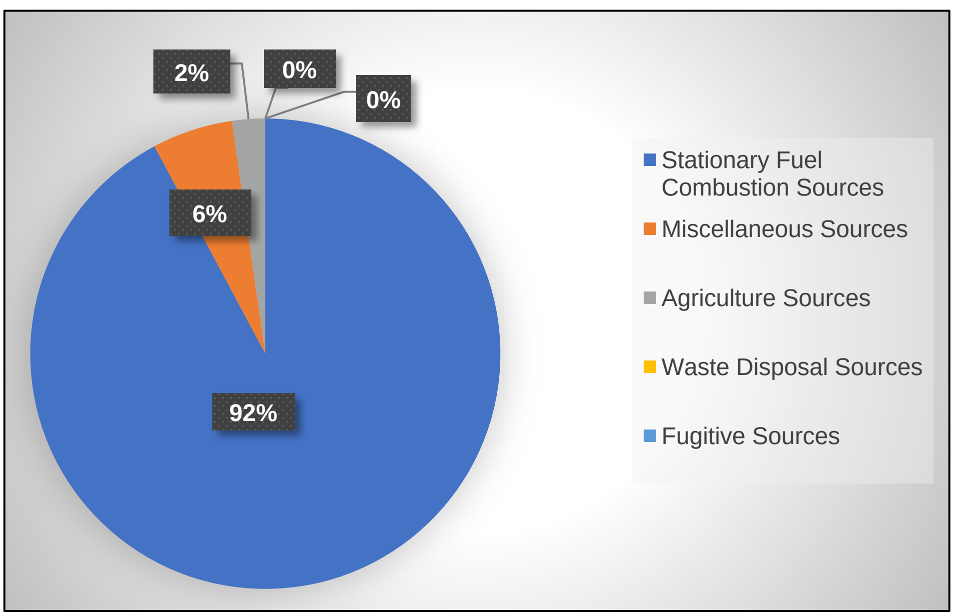

Figure 8. 2017 $PM_{2.5}$ Seasonal Daily Emissions Distribution for Nonpoint Sources

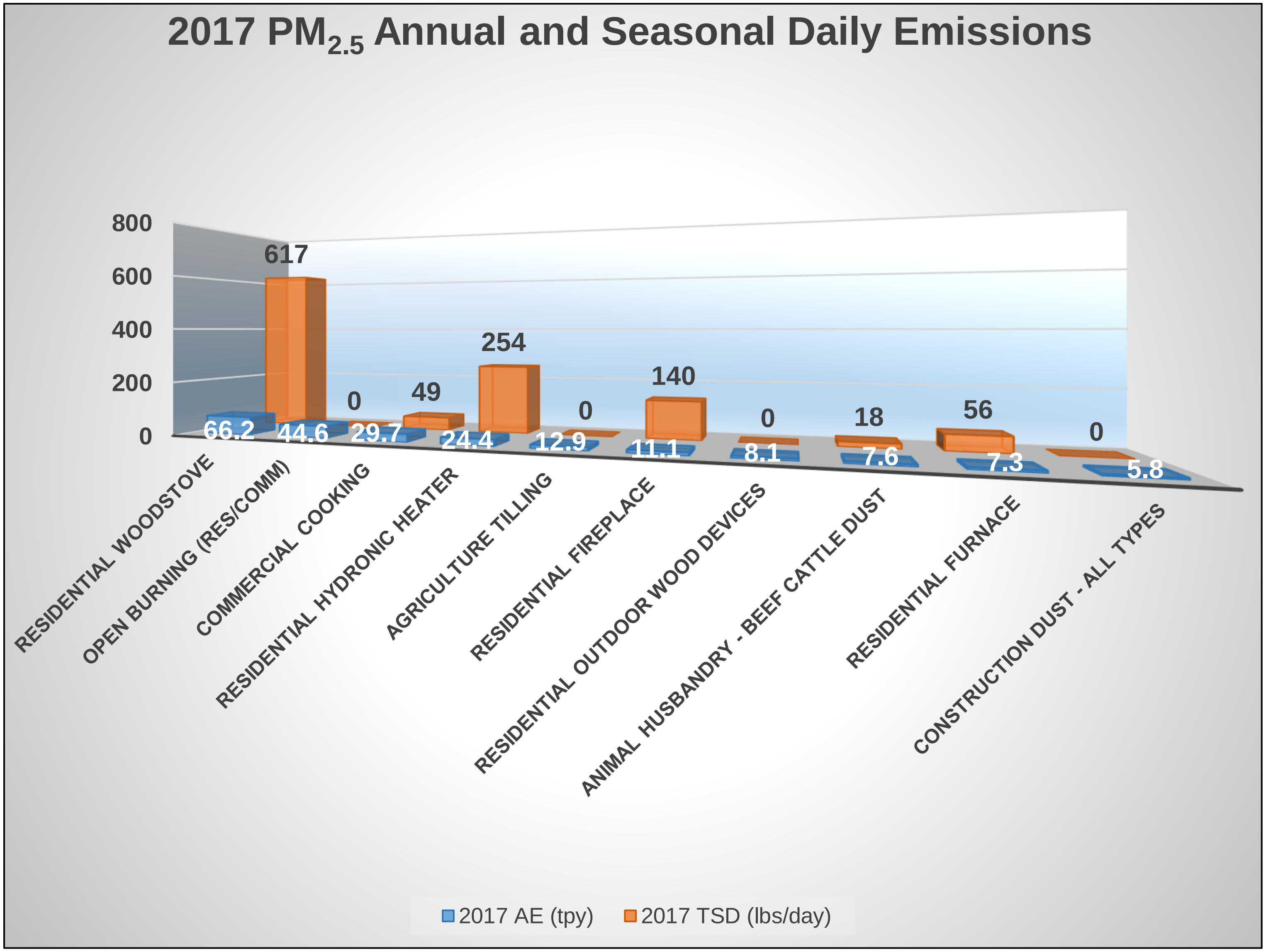

Figure 9. Top 10 Nonpoint $PM_{2.5}$ Emitting Sources

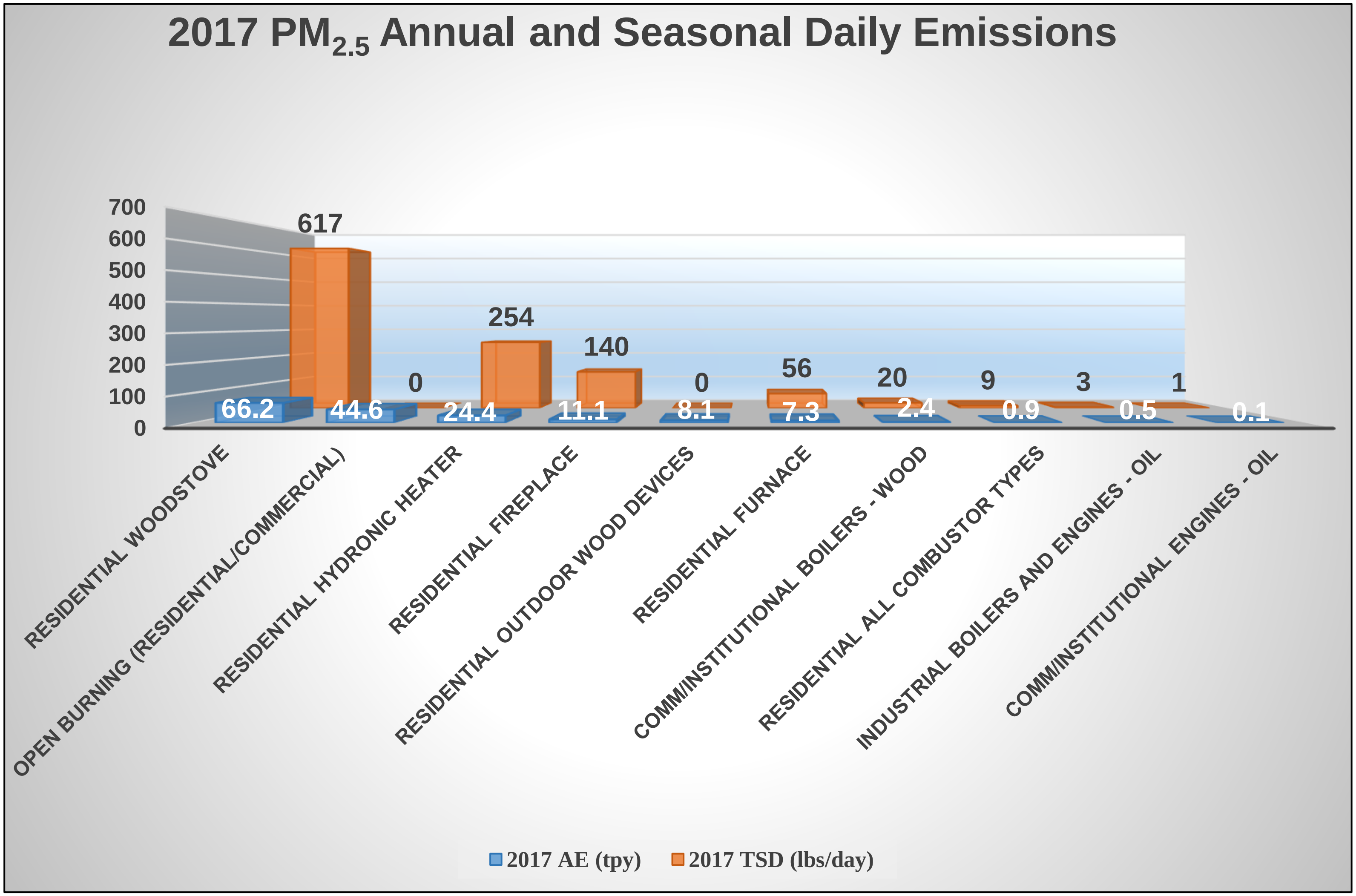

Figure 10. Top 10 Wood Burning Devices and Open Burning Sources

Table 16. 2017 $PM_{2.5}$, NH_3 and NO_X Annual and Seasonal Daily Emissions for Nonpoint Sources

Emissions Subcategory and Sector	$PM_{2.5}$		NH_3		NO_X	
	AE	TSD	AE	TSD	AE	TSD
Agriculture Sources						
Agricultural Field Burning	2.8	8	1.9	6	0.6	2
Agriculture Tilling	12.9	0	0.0	0	0.0	0
Animal Husbandry - Beef Cattle Dust	7.6	18	0.0	0	0.0	0
Animal Husbandry - Beef Cattle Waste	0.0	0	15.1	36	0.0	0
Animal Husbandry - Broilers Dust	0.0	0	0.0	0	0.0	0
Animal Husbandry - Dairy Cattle Dust	0.4	1	0.0	0	0.0	0
Animal Husbandry - Dairy Cattle Waste	0.0	0	8.2	24	0.0	0
Animal Husbandry - Goats Waste	0.0	0	0.1	0	0.0	0
Animal Husbandry - Horses Waste	0.0	0	0.9	3	0.0	0
Animal Husbandry - Layers Dust	0.0	0	0.0	0	0.0	0
Animal Husbandry - Poultry Waste	0.0	0	0.0	0	0.0	0
Animal Husbandry - Sheep Waste	0.0	0	0.4	1	0.0	0
Animal Husbandry - Swine Dust	0.0	0	0.0	0	0.0	0
Animal Husbandry - Swine Waste	0.0	0	0.0	0	0.0	0
Animal Husbandry - Turkeys Dust	0.0	0	0.0	0	0.0	0
Commercial Fertilizer and Pesticide App	0.0	0	44.8	60	0.0	0
Geogenic Wind Erosion	1.9	0	0.0	0	0.0	0
Agriculture Sources Total	25.6	27	71.5	131	0.6	2
Evaporative/Off-Gassing Sources						
Consumer & Commercial Solvent Use	0.0	0	0.0	0	0.0	0
Industrial Surface Coating & Solvent Use	0.0	0	0.0	0	0.0	0
Non-Industrial Surface Coating	0.0	0	0.0	0	0.0	0
Petroleum Product Storage and Transport	0.0	0	0.0	0	0.0	0
Evaporative/Off-Gassing Sources Total	0.0	0	0.0	0	0.0	0
Fugitive Sources						
Construction Dust - Indust/Comm/Inst	5.8	0	0.0	0	0.0	0
Construction Dust - Residential	0.6	0	0.0	0	0.0	0
Construction Dust - Road Construction	0.4	0	0.0	0	0.0	0
Fugitive Sources Total	6.8	0	0.0	0	0.0	0
Miscellaneous Sources						
Commercial Cooking	29.7	49	0.0	0	0.0	0
Mining and Quarrying	3.1	12	0.0	0	0.0	0
Residential Charcoal Grilling	2.1	5	0.0	0	0.3	1
Miscellaneous Sources Total	34.9	66	0.0	0	0.3	1

Emissions Subcategory and Sector	$PM_{2.5}$		NH_3		NO_X	
	AE	TSD	AE	TSD	AE	TSD
Stationary Fuel Combustion Sources						
Comm/Institutional All Combustor Types - Oil	0.0	0	0.0	0	0.0	0
Comm/Institutional All Combustors - LPG	0.0	0	0.0	0	0.8	7
Comm/Institutional Boilers - Coal	0.0	0	0.0	0	0.0	0
Comm/Institutional Boilers - Oil	0.0	0	0.0	0	0.1	1
Comm/Institutional Boilers - Wood	2.4	20	0.0	0	1.2	10
Comm/Institutional Boilers and Engines - NG	0.0	0	0.0	0	6.4	54
Comm/Institutional Engines - Oil	0.1	1	0.0	0	1.1	9
Industrial Boilers and Engines - Biomass	0.0	0	0.0	0	0.0	0
Industrial Boilers and Engines - Coal	0.0	0	0.0	0	0.0	0
Industrial Boilers and Engines - LPG	0.0	0	0.0	0	1.1	7
Industrial Boilers and Engines - NG	0.0	0	0.0	0	0.0	0
Industrial Boilers and Engines - Oil	0.0	0	0.0	0	0.0	0
Residential All Combustor Types	0.9	9	8.8	92	44.8	466
Residential Fireplace	11.1	140	0.8	11	1.2	15
Residential Furnace	7.3	56	0.5	4	1.3	10
Residential Heaters	0.0	0	0.0	0	0.3	1
Residential Hydronic Heater	24.4	254	0.7	7	0.8	8
Residential Outdoor Wood Devices	8.1	0	0.6	0	0.9	0
Residential Woodstove	66.2	617	3.4	31	6.9	64
Stationary Fuel Combustion Sources Total	120.6	1098	14.9	145	67.0	654
Waste Disposal Sources						
Composting	0.0	0	1.3	7	0.0	0
Landfills	0.0	0	9.9	54	0.0	0
Open Burning (Residential/Commercial)	44.6	0	0.0	0	9.3	0
Wastewater Treatment	0.0	0	0.1	1	0.0	0
Waste Disposal Sources Total	44.6	0	11.3	62	9.3	0
Grand Total	232.5	1191	97.6	337	77.1	656

Notes:
1) AE (tpy) = Annual Emissions (tons per year)
TSD (lbs/day) = Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determine via GIS analysis and divided to get the ratio. Ratio may consist of population, housing units, employment population, or zoning data.
Employment population (commercial/institutional/industrial)
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.

The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) EPA Data Source = 2017NEI_Apr2020

Table 17. 2017 SO_2 and VOC Annual and Seasonal Daily Emissions for Nonpoint Sources

Emissions Subcategory and Sector	SO_2		VOC	
	AE	TSD	AE	TSD
Agriculture Sources				
Agricultural Field Burning	0.1	0	2.4	7
Agriculture Tilling	0.0	0	0.0	0
Animal Husbandry - Beef Cattle Dust	0.0	0	0.0	0
Animal Husbandry - Beef Cattle Waste	0.0	0	1.2	3
Animal Husbandry - Broilers Dust	0.0	0	0.0	0
Animal Husbandry - Dairy Cattle Dust	0.0	0	0.0	0
Animal Husbandry - Dairy Cattle Waste	0.0	0	0.7	2
Animal Husbandry - Goats Waste	0.0	0	0.0	0
Animal Husbandry - Horses Waste	0.0	0	0.1	0
Animal Husbandry - Layers Dust	0.0	0	0.0	0
Animal Husbandry - Poultry Waste	0.0	0	0.0	0
Animal Husbandry - Sheep Waste	0.0	0	0.0	0
Animal Husbandry - Swine Dust	0.0	0	0.0	0
Animal Husbandry - Swine Waste	0.0	0	0.0	0
Animal Husbandry - Turkeys Dust	0.0	0	0.0	0
Commercial Fertilizer and Pesticide App	0.0	0	17.7	97
Geogenic Wind Erosion	0.0	0	0.0	0
Agriculture Sources Total	0.1	0	22.0	109
Evaporative/Off-Gassing Sources				
Consumer & Commercial Solvent Use	0.0	0	212.4	1164
Industrial Surface Coating & Solvent Use	0.0	0	174.3	941
Non-Industrial Surface Coating	0.0	0	55.8	304
Petroleum Product Storage and Transport	0.0	0	86.1	462
Evaporative/Off-Gassing Sources Total	0.0	0	528.6	2871
Fugitive Sources				
Construction Dust - Indust/Comm/Inst	0.0	0	0.0	0
Construction Dust - Residential	0.0	0	0.0	0
Construction Dust - Road Construction	0.0	0	0.0	0

Emissions Subcategory and Sector	SO_2		VOC	
	AE	TSD	AE	TSD
Fugitive Sources Total	0.0	0	0.0	0
Miscellaneous Sources				
Commercial Cooking	0.0	0	4.5	7
Mining and Quarrying	0.0	0	0.0	0
Residential Charcoal Grilling	0.0	0	0.8	2
Miscellaneous Sources Total	0.0	0	5.2	9
Stationary Fuel Combustion Sources				
Comm/Institutional All Combustor Types - Oil	0.0	0	0.0	0
Comm/Institutional All Combustors - LPG	0.0	0	0.0	0
Comm/Institutional Boilers - Coal	0.0	0	0.0	0
Comm/Institutional Boilers - Oil	0.2	1	0.0	0
Comm/Institutional Boilers - Wood	0.1	1	0.1	1
Comm/Institutional Boilers and Engines - NG	0.0	0	0.4	3
Comm/Institutional Engines - Oil	0.0	0	0.1	1
Industrial Boilers and Engines - Biomass	0.0	0	0.0	0
Industrial Boilers and Engines - Coal	0.0	0	0.0	0
Industrial Boilers and Engines - LPG	0.0	0	0.0	0
Industrial Boilers and Engines - NG	0.0	0	0.0	0
Industrial Boilers and Engines - Oil	0.0	0	0.0	0
Residential All Combustor Types	1.1	11	3.2	33
Residential Fireplace	0.2	2	8.9	112
Residential Furnace	0.6	4	3.3	25
Residential Heaters	0.0	0	0.0	0
Residential Hydronic Heater	0.8	8	25.7	267
Residential Outdoor Wood Devices	0.1	0	6.4	0
Residential Woodstove	1.1	10	81.5	759
Stationary Fuel Combustion Sources Total	4.2	40	129.6	1202
Waste Disposal Sources				
Composting	0.0	0	9.0	49
Landfills	0.0	0	11.8	64
Open Burning (Residential/Commercial)	2.4	0	17.4	0
Wastewater Treatment	0.0	0	0.7	4
Waste Disposal Sources Total	2.4	0	38.7	117
Grand Total	6.7	40	724.2	4308

See notes for **Table 16** above.

2.4.4 Discussion of Nonpoint Sources

2.4.4.1 Agriculture Sources

Agriculture emission sources encompass a variety of activities such as application of fertilizer and pesticides to crops, management of domesticated animals for food or labor, land preparation for planting, and wind erosion. These activities can release ammonia, particulate matter of various sizes, nitrogen and sulfur oxides, and volatile organic compounds into the air. The following sub-sectors provide information regarding data collection efforts, estimation methodologies, and additional information used in seasonal emission estimates. See **Appendix B: Section 2.4, Tables 41 and 42** for emissions details from agriculture sources.

Agricultural Field Burning

DEQ acquired agricultural field burning emissions from the 2017 NEI developed by EPA. DEQ allocated the county-level emissions from the NEI to the NAA using a county to NAA ratio of agriculture farmland (e.g. cropland plus mixed crop and grazing zones) determined via GIS analysis. The county-wide zoning data was mapped in GIS and clipped to the NAA. The NAA and county farm and cropland acreage were divided to create a ratio to allocate the emissions to the NAA.

DEQ calculated typical season day emissions for field burning using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Agriculture Tilling

Emissions from Agricultural tilling are comprised of airborne soil particulate emissions from fugitive dust from the preparation of land for planting. County-level emissions were taken from the 2017 NEI prepared by EPA. DEQ spatially allocated the county emissions from the NEI to the NAA using a county to NAA ratio of agriculture farmland (e.g. cropland plus mixed crop and grazing zones) determined via GIS analysis. The county-wide zoning data was plotted in GIS and clipped to NAA. The NAA and county farm and cropland acreage were divided to create a ratio to allocate the emissions to the NAA.

As in other soil-related fugitive dust categories, seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM winter season[4].

Animal Husbandry

Animal husbandry refers to the management of domesticated livestock intentionally reared for the production of food, fiber, or other goods or for the use of their labor. Livestock in this category includes beef and dairy cattle, goats, horses, poultry, sheep, and swine. All types of animal husbandry operations are incorporated, including Concentrated Animal Feeding Operations (CAFOs). Animal waste from livestock operations generates airborne pollutants such as VOC and ammonia. Particulate matter in the form of fugitive dust may come from animal movement in confined areas, the land application of solid manure, and the storage and treatment of manure.

2017 Klamath County animal husbandry emissions were taken from the 2017 National Emissions Inventory as calculated by EPA using the Wagon Wheel estimation tool. EPA obtained county level activity data from the National Agricultural Statistics Services (NASS) survey and census and other US Department of Agriculture (USDA) data sources. The activity data is comprised of livestock counts multiplied by EPA pollutant and animal specific emission factors to estimate annual dust and waste emissions for the category. DEQ spatially allocated the county emissions to the NAA using a county to NAA ratio of agriculture farmland (e.g., cropland plus mixed crop and grazing zones) determined via GIS.

DEQ calculated typical season day emissions for animal husbandry using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Commercial Fertilizer and Pesticide Application

Commercial Fertilizer Application:

For this inventory, the data resource used for county-level emissions from commercial fertilizer application was the 2017 NEI calculated by EPA. Fertilizer in this category refers to any nitrogen-based compound, or mixture containing such a compound, that is applied to land to improve plant fitness. The pollutant of concern for commercial fertilizer application is ammonia.

DEQ spatially allocated the county emissions from the NEI to the NAA using a county to NAA ratio of agriculture farmland (e.g., cropland plus mixed crop and grazing zones) determined via GIS analysis. The county-wide zoning data was plotted in GIS and clipped to NAA. The NAA and county farm and cropland acreage were divided to create a ratio to allocate the emissions to the NAA.

DEQ calculated typical season day emissions for fertilizer and pesticide application using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Pesticide Application:

VOCs are the emissions of concern for Agricultural Pesticide Application including the usage of insecticides, herbicides, fungicides, and other chemicals. These chemicals protect crops from insect pests, limit competition from other growing plants, and prevent reduction in quality from fungus growth.

Agricultural applications of pesticides can be from the ground or from the air, and can be applied as sprays, dusts, pellets, fogs, or through other dispersion techniques.

Formulations of pesticides are made through the combination of pest-killing material, referred to as the active ingredient, and various solvents acting as carriers for the pest-killing material, referred to as the inert ingredient. Both types of ingredients contain volatile organic compounds (VOCs) that can potentially be emitted to the air either during application or as a result of evaporation.

The USGS provides county level emission estimates for pesticide application to EPA. Activity data is compiled from proprietary surveys of farm operations located within U.S. Department of Agriculture Crop Reporting Districts (CRDs). Surveyed pesticide-use data are used in conjunction with county annual harvested-crop acres reported by the U.S. Department of Agriculture 2012 Censuses of Agriculture and the 2013 County Agricultural Production Survey to calculate use rates per harvested-crop acre, or an "estimated pesticide use" (EPest) rate, for each crop by year. County-use estimates are then calculated by USGS by multiplying EPest rates by harvested-crop acres for each pesticide crop combination.

DEQ spatially allocated the county-level pesticide emissions from the NEI to the NAA using a county to NAA ratio of agriculture farmland (e.g., cropland plus mixed crop and grazing zones) determined via GIS analysis. The county-wide zoning data was plotted in GIS and clipped to NAA. The NAA and county farm and cropland acreage were divided to create a ratio to allocate the NEI emissions to the NAA.

DEQ calculated typical season day emissions for fertilizer and pesticide application using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Geogenic Wind Erosion

Agricultural wind erosion emissions resulting from wind entrained dust were calculated based on GIS analysis of the cropland acreage within the NAA. Total cropland acreage within the NAA was used for a conservative-high estimate for geogenic dust because it was not known if or when any of the acreage lay fallow in 2017.

A composite emission factor for agricultural wind erosion was taken from Agricultural Activities Influencing Fine Particulate Matter Emissions[23]. The largest wind emission factors were chosen from this document in table 5-1[23] for corn and wheat to apply to the crops grown in the NAA. Texas crop factors were eliminated from the calculation based on climatic and topographical differences to local conditions. The decision of which emission factor to apply to each crop was made through the assumption of the type of bare field conditions leading to the wind erosion as either more similar to a corn field or a wheat field.

As in other soil-related fugitive dust categories, seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM winter season[4].

2.4.4.2 Evaporative/Off-Gassing Sources

Appendix B: Section 2.4, **Tables 43 through 44** provides emissions detail for Evaporative/Off-Gassing Sources and Truck Transport of Gasoline within the NAA.

Industrial Surface Coating & Solvent Use

This category encompasses VOC emissions estimates from solvent use by small, non-permitted point sources, namely small businesses. SCC with descriptions for the emissions sources within this category are:

SCC	SCC Description
2401005000	Surface Coating /Auto Refinishing /Total: All Solvent Types
2401015000	Surface Coating /Factory Finished Wood /Total: All Solvent Types
2401025000	Surface Coating /Metal Furniture /Total: All Solvent Types
2401025000	Surface Coating /Metal Furniture /Total: All Solvent Types
2401035000	Surface Coating /Plastic Parts /Total: All Solvent Types
2401055000	Surface Coating /Machinery & Equipment /Total: All Solvent Types
2401070000	Surface Coating /Motor Vehicles /Total: All Solvent Types
2401080000	Surface Coating /Marine /Total: All Solvent Types
2401090000	Surface Coating /Misc. Manufacturing /Total: All Solvent Types
2415000000	Degreasing /All Processes/All Industries /Total: All Solvent Types
2420000000	Dry Cleaning
2425000000	Graphic Arts /All Processes /Total: All Solvent Types

DEQ used county-level annual emissions data from the 2017 NEI for this inventory. EPA prepares emissions for this category through the Wagon Wheel estimation tool. DEQ provided activity data for Title V facilities that performed industrial surface coating and solvent use activities to the EPA to back out emissions for this nonpoint category from the 2017 NEI.

Further, DEQ allocated the county-level emissions from the NEI to the NAA using a county to NAA ratio of NAICS employment population determined via GIS analysis. The county-wide employment population data was plotted in GIS and clipped to NAA. The NAA and county employment population data were divided to create a ratio to allocate the NEI emissions to the NAA.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Consumer & Commercial Solvent Use

Emissions data for this category were taken from EPA's 2017 NEI county-wide estimates15. EPA prepares emissions for this category through the Wagon Wheel estimation tool. The following SCCs and descriptions for these VOC emission sources within this category are:

Table 18. Source Classification Codes for Consumer & Commercial Solvent Use

SCC	SCC Description
2460100000	All Personal Care Products
2460200000	All Household Products
2460400000	All Auto Aftermarket Products
2460500000	All Coatings & Related Products
2460600000	All Adhesives & Sealants
2460800000	All FIFRA Related Products
2460900000	Misc. Products -Total
2461021000	Cutback Asphalt
2461022000	Emulsified Asphalt

DEQ allocated the county-level emissions for consumer solvent usage from the NEI to the NAA using a county to NAA ratio of based on housing units (HU) via GIS analysis. The county-wide HU data was plotted in GIS and clipped to NAA. The NAA and county HU data were divided to create a ratio to allocate the NEI emissions to the NAA.

Information from EPA temporal allocation profiles[13] indicated that activity for consumer solvent categories is considered uniform throughout the year. As such, typical season day emissions were set equal to 1/365th of the annual emissions.

Asphalt Production

EPA defines Asphalt Production as follows:

> “Asphalt paving is the process of applying asphalt concrete to seal or repair the surface of roads, parking lots, driveways, walkways, or airport runways. Asphalt concrete is a composite material comprised of a binder and a mineral aggregate. The binder, referred to as asphalt cement, is a byproduct of petroleum refining and contains the semi-solid residual material left after the more volatile chemical fractions have been distilled off. Asphalt cements thinned with water and an emulsifying agent are known as emulsified asphalts. Asphalt cements thinned with petroleum distillates are known as cutback asphalts; cut-back asphalt is produced by thinning the binder in diluent containing 25 to 45 percent petroleum distillates by volume prior to mixing with the aggregate. Thinning reduces the viscosity of the asphalt making it easier to work with the mixture. The primary uses of asphalt cements include tack and seal operations, priming roadbeds, and paving operations for pavements up to several inches thick.” (EPA, [2017])[18]

VOC is the pollutant of concern for this inventory. DEQ used emissions for both roofing and paving asphalt activities from the 2017 NEI. EPA prepared emission estimates for these sectors using the Wagon Wheel estimation tool.

DEQ allocated the county-wide asphalt emissions to the NAA using two different methods. A county to NAA ratio based on roadway mileage and the other based on asphalt roofing employment population (NAICS 238160) obtained from Oregon Employment Department6 for 2017. Both county-wide roadway mileage and asphalt employment population data was plotted in GIS and clipped to NAA. The NAA and county data were divided to create a ratio to allocate the NEI emissions to the NAA for each sector.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Non-Industrial Surface Coating

Architectural surface coating includes paints, stains, varnishes, and other protective and decorative coatings used for the coating of buildings and curbs. The traffic markings category covers the application of roadway markings, paint or other, to facilitate the safe movement of vehicles, bicyclists, and pedestrians. County-wide VOC emissions data for both categories was taken from EPA 2017 NEI[15].

DEQ allocated the county-wide surface coating emissions to the NAA using two different methods. A county to NAA ratio based on roadway mileage and the other based on HU data for 2017. Both county- wide roadway miles and HU data was mapped in GIS and clipped to NAA. The NAA and county data were divided to create a ratio to allocate the NEI emissions to the NAA for each sector.

Information from EPA temporal allocation profiles[13] indicated that activity for both categories is considered uniform throughout the year. The SAF is set to 1.

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Petroleum Product Storage and Transport

Table 19 below, is a breakdown of SCCs describing activities for the petroleum product storage and transport sector.

Table 19. Source Classification Codes for Petroleum Product and Storage & Transport

SCC	SCC Description
2501011011	Residential Portable Gas Cans
2501011012	
2501011013	
2501011014	
2501011015	
2501012011	Commercial Portable Gas Cans
2501012012	
2501012013	
2501012014	
2501012015	
2501050120	Bulk Terminals: All Evaporative Losses
2501055120	Bulk Plants: All Evaporative Losses
2501060051	Gasoline Service Stations
2501060052	
2501060053	
2501060201	
2501080050	Airports : Aviation Gasoline
2501080100	
2505030120	Truck Gasoline Transport

Residential Portable Gas Cans:

Emissions data for portable fuel containers (PFCs) were taken from EPA county-wide emission estimates from the 2017 NEI15. EPA prepared emission estimates for this sector using the Wagon Wheel estimation tool. The category encompasses evaporative VOC emission estimates from residential and commercial PFCs. PFC related processes that produce emissions are permeation, evaporation, spillage during transport, vapor displacement at the pump, and spillage at the pump.

Klamath County emissions for residential PFCs were apportioned to the NAA through county to NAA population ratio. County commercial PFC emissions were apportioned to the NAA through GIS analysis of county to zoning ratio. Zones associated with commercial PFCs included an average of commercial, industrial, and recreational zones in the NAA and county[24].

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal profile data from the 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Gasoline Distribution:

EPA defines the gasoline distribution category as followings:

> "Stage I gasoline distribution includes the following gasoline emission points: 1) bulk terminals; 2) pipeline facilities; 3) bulk plants; 4) tank trucks; and 5) unloading at service stations. Emissions from Stage I gasoline distribution occur as gasoline vapors are released into the atmosphere. These Stage I processes are subject to EPA's maximum available control technology (MACT) standards for gasoline distribution." (EPA, [2017])[18]

Emissions from Stage I gasoline distribution occur as gasoline vapors are released into the atmosphere. These Stage I processes are subject to EPA's maximum available control technology (MACT) standards for gasoline distribution. Figure 11 provides the location of gas stations and bulk plants located within the NAA.

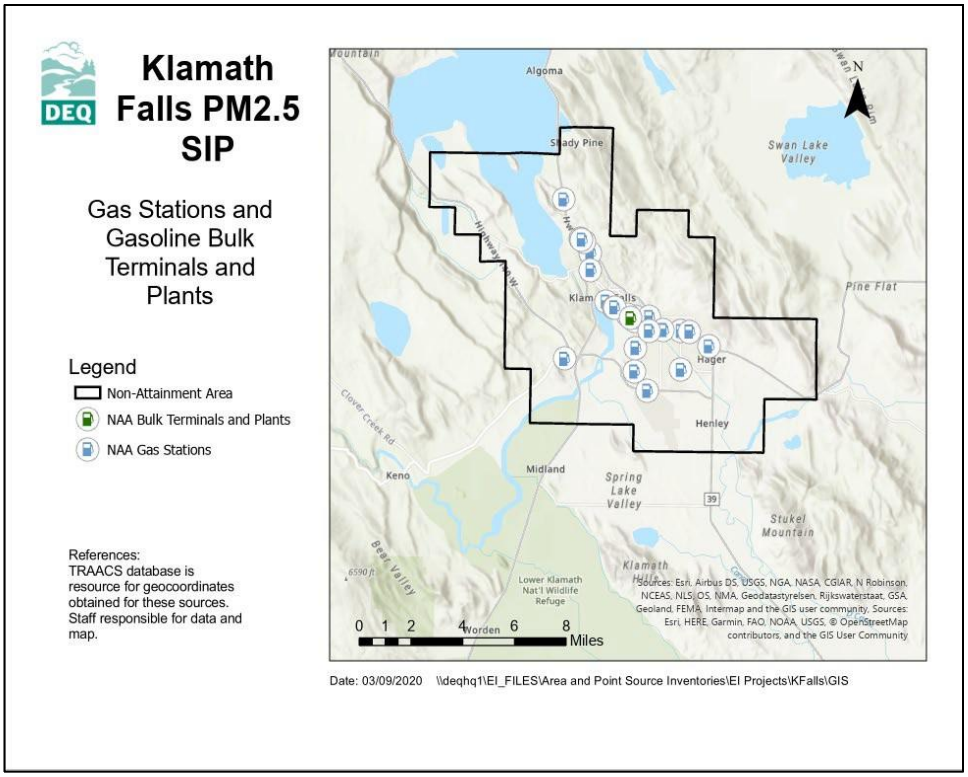

Figure 11. Gas Stations and Gasoline Bulk Terminals and Plants

Emissions from gasoline distribution at bulk terminals and bulk plants take place when gasoline is loaded into a storage tank or tank truck, from working losses (for fixed roof tanks), and from working losses and roof seals (for floating roof tanks). Working losses consist of both breathing and emptying losses.

Breathing losses are the expulsion of vapor from a tank vapor space that has expanded or contracted because of daily changes in temperature and barometric pressure; these emissions occur in the absence of any liquid level change in the tank. Emptying losses occur when the air that is drawn into the tank during liquid removal saturates with hydrocarbon vapor and expands, thus exceeding the fixed capacity of the vapor space and overflowing through the pressure vacuum valve.

Emissions from tank trucks in transit occur when gasoline vapor evaporates from (1) loaded tank trucks during transportation of gasoline from bulk terminals/plants to service stations, and (2) empty tank trucks returning from service stations to bulk terminals/plants. Pipeline emissions result from the valves and pumps found at pipeline pumping stations and from the valves, pumps, and storage tanks at pipeline breakout stations. Stage I gasoline distribution emissions also occur when gasoline vapors are displaced from storage tanks during unloading of gasoline from tank trucks at service stations (Gasoline Service Station Unloading) and from gasoline vapors evaporating from service station storage tanks and from the lines going to the pumps (Underground Storage Tank Breathing and Emptying). In 2014, Stage I Gasoline Distribution in the US, Puerto Rico, and US Virgin Islands resulted in more than 550,000 tons of VOC emissions."

The following SCCs and level descriptions are included in this source category for this inventory:

Table 20. Source Classification for Gasoline Distribution

SCC	SCC Level 1	SCC Level 2	SCC Level 3	SCC Level 4
2501050120	Storage and Transport	Petroleum and Petroleum Product Storage	Bulk Terminals: All Evaporative Losses	Gasoline
2501055120	Storage and Transport	Petroleum and Petroleum Product Storage	Bulk Plants: All Evaporative Losses	Gasoline
2501060051	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Submerged Filling
2501060052	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Splash Filling
2501060053	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Stage 1: Balanced Submerged Filling
2501060201	Storage and Transport	Petroleum and Petroleum Product Storage	Gasoline Service Stations	Underground Tank: Breathing and Emptying
2505030120	Storage and Transport	Petroleum and Petroleum Product Transport	Truck	Gasoline

DEQ used county emissions from the 2017 NEI developed by EPA for the triennial inventory. The county emissions were allocated to the NAA via a ratio based on the number of permitted gasoline bulk terminals/plants and gasoline service stations are located in the county and NAA. Latitude and longitude coordinates for these permitted facilities were obtained from DEQ's TRAACS database and mapped in GIS and clipped to the NAA.

EPA temporal profile data indicate that bulk terminals/plants and gasoline service station activity is considered uniform throughout the week and year. As such, typical season day emissions were estimated to be 1/365th of annual emissions. The SAF is set to 1.

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Emissions for the Truck Transport of Gasoline was calculated independently of EPA county-level emissions data. Please see the emission estimation process in the next section.

Truck Transport of Gasoline:

Stage I gasoline marketing includes the distribution of gasoline to bulk plants and retail outlets via tanker truck. The category includes evaporative loss (fugitive emissions) from gasoline tanker trucks during this segment of distribution. Activity, in the form of total gasoline dispensed at service stations within the NAA, was obtained from the DEQ TRAACS database.

To assure that all gasoline dispensed within the NAA was included in the throughput for this category, the location of each gas station and bulk gasoline plants in Klamath County was mapped using ArcGIS Pro and only the throughput for those stations within the NAA were included. Twenty-three gas stations and one bulk gasoline plant is located within the NAA and included for the emission estimates under this section.

DEQ used the VOC EF methodology from EIIP Vol II, Chapter 11, eqn. 11.4-232117 to develop a consolidated VOC emission factor for fuel transport that includes both the loading and unloading of fuel. The emission formula is as follows:

TTE (tpy) = ((TGD * LEF * GTA) + (TGD * UEF *GTA)) / 2000

This next formula combines loaded and unloaded gasoline tank truck emission factors:

TTE (tpy) = (TGD * VOC EF * GTA) / 2000

Where:

TGD = Total Gasoline Dispensed in the Inventory Region (1,000 gal) LEF = Loaded tank truck in-transit EF (lbs/1000 gal) = .005

UEF = Unloaded truck in-transit EF (lbs/1000 gal) = .055 VOCEF = .LEF + UEF = .005 + .055 = 06 (lbs/1000 gal)

GTA = Gasoline transportation adjustment factor = 1.25

Information from EPA temporal allocation profiles13 indicated that activity for gasoline dispensing is considered uniform throughout the year. As such, typical season day emissions were set equal to 1/365th of the annual emissions.

2.4.4.3 Fugitive Sources

This category includes particulate emissions from fugitive dust created by construction activities at industrial, commercial, institutional, and residential sites, and road construction. Emissions were based on the acreage of soil disturbed during construction activities. DEQ used Klamath county emissions prepared by EPA for the 2017 NEI. DEQ allocated the county-level fugitive dust emissions to the NAA using a ratio of construction employees from county to NAA.

Though a significant tonnage of annual emissions were estimated, seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM winter season4. See **Appendix B: Section 2.4, Table 45** for emissions details from fugitive sources.

2.4.4.4 Miscellaneous Sources

Commercial Cooking

EPA defines this sector as follows:

> “Commercial cooking refers to the cooking of meat, including steak, hamburger, poultry, pork, and seafood, and french fries on five different cooking devices: chain driven

(conveyorized) char- broilers, underfired char-broilers, deep-fat fryers, flat griddles, and clamshell griddles. Estimates of emissions of criteria air pollutants (CAPs) and hazardous air pollutants (HAPs) are based on the average amount of meat cooked on the different equipment types per week. Emissions from french fries are based on the amount of frozen potatoes sold in the US." (EPA, [2017])[18]

For this inventory, the data source for commercial cooking emissions was the 2017 NEI. EPA prepares these emissions using the Wagon Wheel estimation tool for triennial inventories. The county-wide emissions estimates were allocated to the NAA using a county to NAA ratio based on NAICS 722 and 7222 commercial employee population data. Employee population data was provided by the Oregon Employment Department[6].

According to a restaurant owners and managers survey performed for the previous SIP EI, results indicated that approximately 60% of annual business is accrued during the "summer season," the remaining 40% of annual income is realized during the "winter season."[4]. Based on this information, PM season activity is estimated to be 30% of the annual total.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year) * 30%

See **Appendix B: Section 2.4, Table 44** for emissions details from commercial cooking sources.

Residential Charcoal Grilling

EPA defines this sector as follows:

"Residential barbecue grilling emissions include emissions from the burning of charcoal (including the use of lighter fluid) and emissions from all types of meat cooked on charcoal, gas, and electric grills. Combustion emissions from gas barbecue grills are not included." (EPA, [2017])[18]

DEQ obtained county-wide emissions data from the 2017 NEI. EPA prepares these emissions via the Wagon Wheel estimation tool for triennial emission inventories. DEQ then allocated the county emissions to NAA using a ratio based on county and NAA housing units for 2017.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

See **Appendix B: Section 2.4, Table 46** for emissions details from commercial cooking sources.

Mining

EPA identifies this sector as follows:

> "Mining and quarrying activities produce particulate matter (PM) emissions due to the variety of processes used to extract the ore and associated overburden, including drilling and blasting, loading and unloading, and overburden replacement. Fugitive dust emissions for mining and quarrying operations are the sum of emissions from the mining of metallic and nonmetallic ores and coal. Each of these mining operations has specific emissions factors accounting for the different means by which the resources are extracted." (EPA, [2017])[18]

DEQ used county-wide mining emissions from the 2017 NEI. EPA prepares these emissions via the Wagon Wheel estimation tool for triennial emission inventories. DEQ then allocated the county emissions to NAA using a ratio based on county and NAA population for 2017.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

2.4.4.5 Stationary Fuel Combustion Sources

This category includes industrial, commercial/institutional, and residential stationary fuel combustion emission sources. This includes fuel burned in small boilers, space heaters, furnaces, emergency generators, and combustor type devices. Fuel types covered under this section includes coal, distillate and residual oil, kerosene, natural gas, liquid petroleum gas (LPG), and wood. DEQ inventoried $PM_{2.5}$ (e.g. including filterable and condensable forms) and precursors NH_3, NO_x, SO_2, and VOC. See **Appendix B: Section 2.4, Tables 46 through 52** for $PM_{2.5}$ and precursor emissions details from various stationary combustion sources.

Natural Gas (NG) and Liquefied Petroleum Gas (LPG)

This section covers emissions from both natural gas (NG) and liquefied petroleum gas (LPG) from commercial/institutional, industrial, and residential sources. LPG includes propane, propylene, butane, and butylene.

NG and LPG are used in the residential sector for space heating, water heating, and cooking. This category includes small boilers, furnaces, heaters, and other heating units not inventoried as point. NG and LPG combustion for the commercial/institutional sectors are comprised of housing units; wholesale and retail businesses; health institutions; social and educational institutions; and federal, state, and local government institutions (e.g., military installations, prisons, office buildings). NG is the major fuel used throughout the country mainly for power generation, for industrial process steam and heat production, and for domestic and commercial space heating. Domestic cooking and hot water heating also utilize natural gas.

DEQ used county-level emissions from the 2017 NEI. EPA prepares these emissions via the Wagon Wheel estimation tool for triennial emission inventories. DEQ then allocated the county emissions to NAA using a ratio based on county and NAA employment population (commercial/institutional/industrial) for 2017. For residential fuel use, DEQ used allocation ratio based on housing units for different fuel types from county to NAA from the US Census 2017 House Heating Fuel.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Fuel Oil

Fuel oil consumption covers the use of both distillate and residual oil. Distillate oil includes fuel oil grades 1, 2, and 4 and known as diesel fuel and kerosene as well. Residential and commercial/institutional sources are the largest consumers of distillate oil, nationwide. Residual oil includes fuel oil grades 5 and 6. In most areas, residential sources do not use residual oil; however, industrial and commercial/institutional users may consume significant amounts.

Fuel oil emissions from industrial/commercial/institutional sources are from fuel consumption in large or small boilers, furnaces, heaters, and other heating devices. Residential fuel oil emission sources are primarily from fuel consumption in furnaces, heaters, and other heating devices. For this inventory, industrial and commercial fuel oil consumption includes residual oil, distillate oil, and kerosene use; residential fuel oil consumption includes distillate and kerosene use only.

DEQ used county-level emissions from the 2017 NEI. EPA prepares these emissions via the Wagon Wheel estimation tool for triennial emission inventories. DEQ then allocated the county emissions to NAA using a ratio based on county and NAA commercial employment population for 2017. For residential fuel use, DEQ used a county to NAA allocation ratio based on housing units for different fuel types from the US Census 2017 House Heating Fuel data[12].

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Wood

This section consists of wood burning devices used for commercial, industrial, institutional, and residential heating or process emissions to power other industrial equipment. These wood burning devices include wood stoves, pellet stoves, furnaces, fireplaces, hydronic heaters, outdoor wood burning devices, and boilers.

County-level emissions were acquired from 2017 NEI for some fuel combustion sources. DEQ accepted emissions for residential sources such as furnaces, outdoor wood burning devices, and hydronic or residential heaters from the 2017 NEI. EPA prepares stationary combustion inventories using the Wagon Wheel estimation tool for fuels such as natural gas, fuel oils, propane, and wood. The exception to that is residential wood heating emissions for wood stoves and furnaces which were prepared and submitted to EPA's 2017 NEI by Oregon directly.

DEQ allocated most of the county emissions for commercial/institutional sources to NAA using ArcGIS Pro ratio based on county and NAA commercial employment population for 2017. For residential fuel use, DEQ allocated woodstoves, pellet stoves, furnaces, hydronic heaters, and outdoor wood burning devices, and firelog burning and fireplace emissions to the NAA using GIS analysis initially prepared by DEQ staff to develop 2017 NEI county-level wood combustion emissions. County emissions were linked to NAA using GEOID (block group) from both the NAA and County. In addition, DEQ used a county to NAA allocation method for emission sources for which 2017 NEI emissions were used instead of calculated by DEQ. This methodology used housing units by wood fuel usage from the *US Census 2017 House Heating Fuel* data[12] down to the NAA for furnaces, outdoor wood burning devices, and hydronic heaters. Emissions from these sources were estimated at the county-level by EPA for the 2017 NEI.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The exception to this is the SAF for residential wood heating were developed from the previous SIP EI. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p.5-22 of the EPA inventory guidance document[19]:

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

The exception to estimating typical season day emissions was for residential outdoor wood burning devices. As per Klamath County Code Chapter 406 Ordinance 63.06

("Klamath Clean Air Ordinance"), the use of residential outdoor wood devices is prohibited within the Air Quality Zone at all times by §150(2)(c). Thus, emissions for outdoor wood burning devices were set to zero for both the attainment and future years typical season day.

Other Fuels

This section covers emissions from both coal and kerosene use from commercial/institutional, industrial, and residential sources. There is no coal used in Klamath Falls and even the county; therefore, only limited kerosene use in the commercial/institutional categories is discussed further. Kerosene is primarily used for space heating both by commercial/institution and residential sources.

DEQ acquired county-level annual emissions for the 2017 NEI. EPA prepares emissions from Industrial, Commercial, and Institutional (ICI) sectors through the Wagon Wheel estimation tool. DEQ then allocated the county emissions to NAA using a ratio based on county and NAA commercial employment population for 2017.

DEQ calculated typical season day emissions for this sector using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed

for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

2.4.4.6 Waste Disposal Sources

This category consists of disposal of solid waste either through open burning, landfills and composting, and sewage waste treatment. The pollutants of concern are $PM_{2.5}$ from open burning and VOC and NH_3 from landfills, composting, and sewage waste treatment. See **Appendix B: Section 2.4, Table 53 and 55** for $PM_{2.5}$ and precursor emissions details from various waste disposal sources.

Open Burning

Commercial/Institutional/Residential Open Burning:

Open burning is the unconfined burning of waste as a method of waste disposal and results in $PM_{2.5}$ emissions. Open burning of residential yard waste consists of burning wood, leaves, and even grass in piles onsite, barrels, or in place.

Open burning also includes household waste. Household waste is often referred to as residential municipal solid waste (MSW), which is a term for nonhazardous refuse produced by households (e.g., paper, plastics, metals, wood, glass, rubber, leather, textiles, and food wastes).

Burning of solid waste from commercial/institutional, and residential sources results in $PM_{2.5}$ emissions and takes place as open outdoor fires or in devices such as pits or burn barrels which do not meet DEQ emission limits. These sources of emissions are not burned in a way where combustion air is effectively controlled, and combustion products do not vent through a stack or chimney.

DEQ used county-wide emissions from the 2017 NEI. EPA prepares these emissions via the Wagon Wheel estimation tool for triennial emission inventories. DEQ then allocated the county emissions to NAA using a ratio derived from county and NAA populations for 2017.

As per §150(2) of the Klamath Clean Air Ordinance, open burning of commercial/institutional and residential waste is prohibited in the Air Quality Zone outside of specified Open Burning Windows. These windows are set at Klamath County's discretion with the advice of the Environmental Health Division Manager, but they occur exclusively in spring and fall, outside of the winter PM season which begins in November and spans through the end of February. Accordingly, these emission sources have been set to zero for both the base and future years because no open burning is allowed during the period used to calculate Typical Season Days.

Land Clearing Debris Open Burning:

Burning of land clearing debris refers to the clearing of land for new construction and the burning of organic material (i.e., trees, shrubs, and other vegetation). The clearing of land for construction either for new buildings or highways often results in debris consisting of trees, shrubs, and brush. Often debris is collected in piles for burning or may be burned in place emits various sizes of particulate emissions. This is a practice used by both private individuals and corporations.

DEQ used county-wide open burning emissions from the 2017 NEI. EPA prepares these emissions via the Wagon Wheel estimation tool for triennial emission inventories. DEQ then allocated the county emissions to NAA using a ratio derived from county and NAA construction employment populations for 2017.

As per §150(2) of the Klamath Clean Air Ordinance, open burning of land clearing debris is prohibited in the Air Quality Zone outside of specified Open Burning Windows. These windows are set at Klamath County's discretion with the advice of the Environmental Health Division Manager, but they occur exclusively in spring and fall, outside of winter PM season which begins in November and spans through the end of February. Accordingly, these emissions sources have been set to zero for both the base and future years because no open burning is allowed during the period used to calculate Typical Season Days.

Wastewater Treatment

VOC and NH_3 emissions from domestic sewage and wastewater treatment comes from a variety of processes, including sewers, preliminary and primary treatment, dissolved air flotation, biological systems/activated sludge, fixed film processes, and biosolids/dewatering. DEQ used county-wide emissions from the 2017 NEI already prepared by EPA for triennial emission inventories. DEQ then allocated the county emissions to the NAA using a ratio derived from county and NAA populations for 2017.

DEQ calculated typical season day emissions for wastewater treatment using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Landfills and Composting

Landfills:

Klamath Falls Landfill is the only municipal landfill located within the Klamath Falls NAA. DEQ did not find any criteria emissions for this SCC in the 2017 NEI. Therefore, DEQ grew the landfill emissions from the 2008 SIP EI to 2017. The growth factor was based on NAA population growth from 2008 to 2017.The NAA population was 46,588 in 2008 and increased to 48,496 in 2017.

2008-2017 Annual Average Growth Rate (AAGR):

2008-2017 Annual Average Growth Rate = ((2017 NAA Population/2008 NAA Population) ^ (1/9)-1 2008-2017 Annual Average Growth Rate = ((48496/46588) ^ (1/9)-1 = .00446 or .45%

DEQ then used the 2008-2017 AAGR and 2008 SIP NH_3 and VOC emissions to grow emissions from 2008 to 2017. The following formula was used to estimate 2017 landfill annual emissions:

$$2017\ Emissions_{Pollutant} = (2008\ Emissions_{Pollutant}\ (tpy)) + [2008\text{-}2017\ AAGR * 9\ years * 2008\ Emissions_{Pollutant}\ (tpy)]$$

For this sector, EPA temporal profile data indicates that activity is considered uniform throughout the week and year. As such, typical season day emissions were then estimated to be 1/365th of annual emissions. The SAF is set equal to 1 for these types of estimates.

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Composting:

Green waste composting includes the diversion of yard waste, food waste, and other biogenic waste from landfills to composting facilities. Emissions of concern for this inventory is volatile organic compounds (VOC) and ammonia (NH_3) from green waste composting are based on the amount of food and yard waste composted.

EPA developed activity data for this source category using two reports: 1) Advancing Sustainable Materials Management, and 2) Food Waste Management in the United States. These two reports provide activity data based on the amount of food and yard waste composted.

DEQ used Klamath county emissions prepared by EPA for the 2017 NEI. DEQ spatially allocated the county-level composting emissions from the NEI to the NAA using a county to NAA ratio for population determined via GIS analysis. The county-wide population data was plotted in GIS and clipped to NAA. The NAA and county population data was divided to create a ratio to allocate the NEI emissions to the NAA.

DEQ calculated typical season day emissions for composting using a SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

2.5 Events and Natural Sources

2.5.1 Prescribed Fires and Wildfires

For this inventory, the reference source for all wildfire and prescribed burning activity and emissions was 2017 NEI. EPA calculated county-level emissions for the triennial inventory. Among the benefits of incorporating the EPA data for this inventory is that the information is in event format, meaning that emissions estimates are specific to date and location. This enabled DEQ staff to use ArcGIS Pro to map fire locations relative to the NAA. This also helped determine what fire events were specific to the PM winter season.

Fire events for 2017 were mapped to within a 15km radius of the Peterson School Monitor located in the NAA. The results indicate that 20 fires total, 10 prescribed fires and 10 wildfires, occurred within the 15km radius throughout 2017. Nine of those prescribed fires occurred during the PM season while no wildfires occurred during the season. The map below provides locations for each type of fire within the NAA and 15km radius buffer.

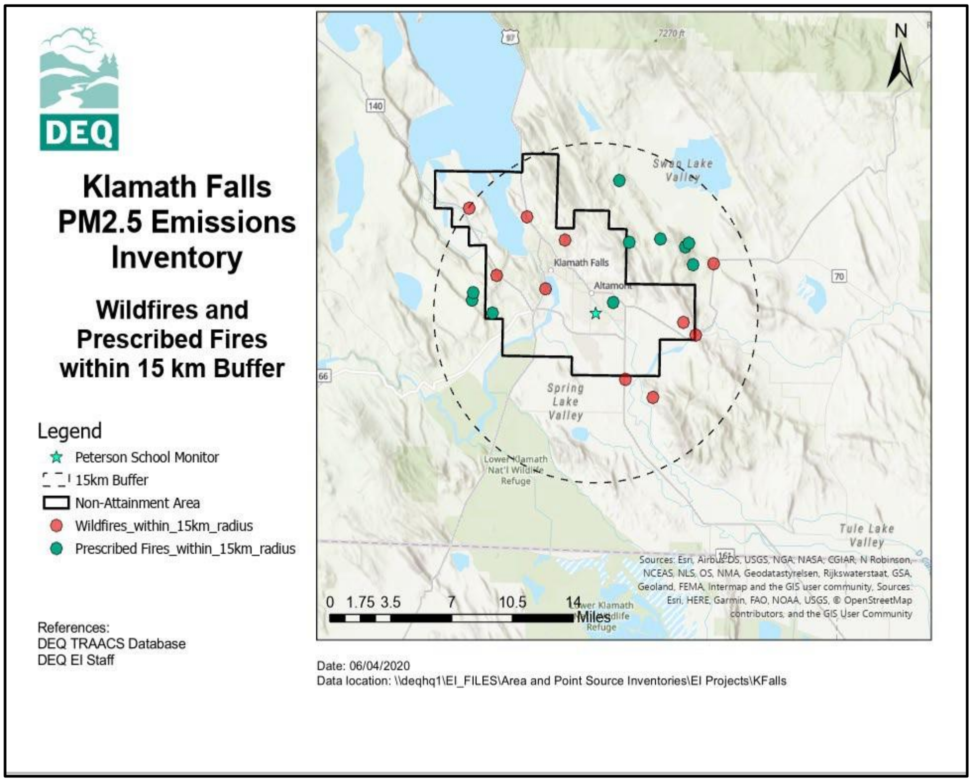

Figure 12. Wildfires and Prescribed Fires within 15 km Buffer

Prescribed fires and wildfires were also clipped in ArcGIS to identify fire events within the NAA during 2017. Two prescribed fires occurred within the NAA one in April and the other in November (PM season) of 2017. Six wildfires occurred within the NAA during the year, but none happened during the PM season. The other fires located outside the NAA but within the 15 km radius would be picked up at the Peterson School monitor and are counted towards NAA emission totals due to their proximity.

To estimate seasonal emissions for prescribed fires, a seasonal adjustment factor was calculated using number of annual fires and the number of fires that occurred during the PM season. The season fire data is summed for January, February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

2.5.2 Structure Fires

Information on the annual number of structural fires within the Klamath Falls NAA in 2017 was provided by the State of Oregon Fire Marshals' Office. Structural fire events and dates for the county were identified down to the Klamath Falls NAA. Approximately 50 fires happened within the Klamath Falls NAA in 2017. Fire data was specified as either residential or non-residential.

Weekly activity was assumed to be uniform, and seasonal adjustment factors for each category of structure were calculated using the date and number of fires in the county versus what is within the NAA.

Estimates of the amount of material burned were made using EPA EIIP Guidance17. EIIP recommends a fuel loading factor of 1.15 tons of combustible material per structure fire and provides total particulate emission factors for burning structures. Emissions estimates were assumed to be 100% $PM_{2.5}$ to provide a conservative-high estimate of emissions.

To estimate seasonal emissions, a seasonal adjustment factor was calculated using annual emissions and the emissions from fires occurring over the PM season. The season activity data is summed for January,

February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document19:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Winter Season Tons Burned * EF * SAF) / (# Activity days per year)

2.5.3 Biogenic Sources

Biogenic sources are mostly natural sources of emissions which occur from microbial activity such as decomposition of vegetation. In addition, soil microbial activity can also create emissions from agricultural and grasslands. Biogenic sources represent a significant portion of NO_x and VOC emitted into the atmosphere from agricultural and grazing lands, and natural sources.

EPA indicates that:

> “Vegetation is the predominant biogenic source of VOC and the only source used to estimate biogenic VOC emissions. Microbial activity is responsible for the emission of NO_x and greenhouse gases of CO2, CH4, and N2O. Soil microbial activity is responsible for NO_x and N2O emissions from agricultural lands and grasslands. Microbial action emits CH4 in waterlogged soils or in other anaerobic microenvironments and aerobic decay of biomass releases CO2 into the atmosphere (EPA, 1993; EPA, 1990a).” (EPA, [2017])[18]

For this inventory we are only focusing on NO_x and VOC emissions. DEQ obtained county-level emissions from the 2017 NEI. EPA prepares emission estimates for the triennial emissions inventories.

DEQ allocated the county-level biogenic emissions from the NEI to the NAA using a county to NAA ratio of agriculture farmland acreage (e.g., cropland plus mixed crop and grazing zones) determined via GIS analysis for SCC 2701220000. For SCC 2701200000, county to NAA ratio of forest land acreage was developed to allocate those emissions to the NAA. The county-wide zoning data was plotted in GIS and clipped to the NAA. The NAA and county farm and cropland acreage and forest lands were divided to create a ratio to allocate the NEI emissions to the NAA.

DEQ calculated typical season day emissions for biogenic sources using SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)13. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5- 22 of the EPA inventory guidance document19:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

2.5.4 Summary of Events and Natural Sources Emissions

Non-Anthropogenic emission sources such as biogenic sources and wildfires are only included here representing total emissions. Prescribed fires account for over 95% of the anthropogenic emissions in this category. The number of prescribed fires and wildfires has jumped dramatically from 2008 to 2017 which has resulted in a significant increase in VOC and $PM_{2.5}$ emissions. Though, the activity for majority of the fires was prescribed burning that occurred during the PM winter season where most of the wildfire activity occurred during the spring, summer, and early fall seasons. The anthropogenic emissions sources are the focus of this inventory. Events and natural sources emissions are summarized in the following figures and tables. The following figures and tables summarize emissions from fires and biogenic sources. See **Appendix C: Section 2.5, Tables 56 and 57** provide emissions details for structure fires and prescribed fires and wildfires that occurred throughout the year within 15 km buffer encompassing the NAA.

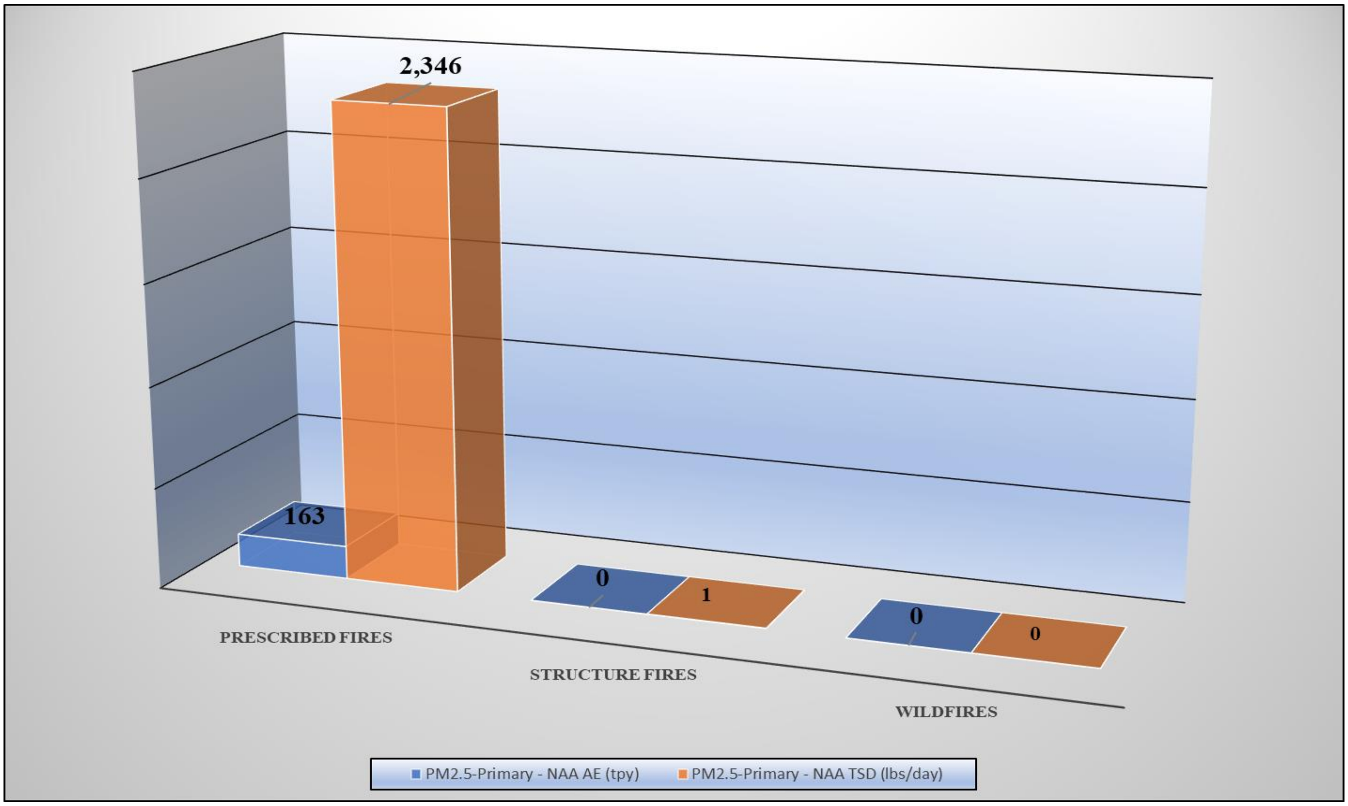

Figure 13. $PM_{2.5}$ Annual and Seasonal Daily Emissions

Table 21. 2017 Annual and Seasonal Daily Emissions for Fires and Natural Sources

Emission Category	$PM_{2.5}$		NH_3		NO_X		SO_2		VOC	
	AE	TSD	AE	TSD	AE	TSD	AE	TSD	AE	TSD
Prescribed Fires[5]	163.0	2346	32.1	462	18.1	260	12.1	174	1847.5	26588
Structure Fires[5]	0.3	1	0.0	0	0.0	0	0.0	0	0.3	1
Wildfires[6]	0.2	0	0.0	0	0.1	0	0.0	0	2.2	0
Biogenic Sources[6]	0.0	0	0.0	0	54.6	299	0.0	0	3763.1	20620
Grand Total	164	2347	32	462	73	559	12	174	5613	47209

Notes:
1) AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
(2) EPA 2017 NEI, EIS event annual emissions data 4/30/2020. DEQ Ref.
(3) Structural Fires estimated by DEQ
(4) No wildfires occurred during the PM season.
(5) Prescribed fires and structure fires are anthropogenic emission sources that are human caused.
(6) Wildfires and biogenic sources of emissions are considered non-anthropogenic which are natural caused emissions.

2.6 Nonroad Mobile Sources

2.6.1 Introduction and Scope

Within the Klamath Falls NAA, nonroad mobile emission source categories inventoried include gasoline and diesel-powered vehicles and equipment, aircraft, recreational marine vessels, and rail. Commercial marine vessels were not inventoried due to lack of suitable environment and little to no documented activity.

2.6.2 MOVES 3.1 Model

With the exception of aircraft and locomotive emissions, emissions for nonroad vehicles and equipment were initially modeled using EPA's MOVES2014b. The model was used to generate emissions from all 2-stroke, 4-stroke, diesel, CNG, and LPG nonroad vehicles and equipment, including recreational marine

vessels. Model inputs included parameters for temperature, fuel, time period, inventory area, and emission sources. The model generated emissions data for annual and typical season day depending upon input parameters entered.

Nonroad mobile source emissions were initially modeled using EPA's MOVES2014b model but re-ran in MOVES3.1 in Spring 2023. At the time the EI work was started for the Plan in early 2020, MOVES2014(b) was the latest model available to run nonroad emissions. Because substantial work was already completed on this project prior to EPA's adoption of MOVES3.1, DEQ initially used MOVES2014(b) to run nonroad emissions. However, due to delays in events data, EPA and other transportation agencies requested Oregon DEQ update nonroad emission estimates using MOVES3.1.

From this point on all work and estimates was completed in MOVES3.1.

2.6.2.1 MOVES Inputs, GIS Allocation, and Results

The following sections detail the inputs used for the MOVES3.1 runs, the vehicle and equipment types covered by the model, and how county-wide model output was allocated to the NAA.

Gasoline RVP, Sulfur Content, and Ethanol Content

Gasoline parameters were taken from the EPA National County Database (NCD)[20], and are specific to Klamath County, Oregon. The following bullets describing NCD gasoline parameter data are taken from EPA documentation[20]:

- Gasoline properties in the NCD were determined by the Eastern Research Group, Inc., (ERG) under contract to EPA using gasoline survey data from several surveys.

- Market share within the NCD for oxygenated gasolines was obtained from the EPA Oxygenate Type Analysis Tables and the Federal Highway Administration website.

- All gasoline properties are area-wide averages, except for oxygenates, which are allowed to have market shares. Three fuels (winter, summer, and spring/fall) are determined for each county and assigned to months by season. Months representing seasons vary by location. Spring/fall gasoline properties are derived from summer and winter fuels by interpolation.

Gasoline Ethanol Market Share

All retail, nonretail, or wholesale dealers within Klamath County may only sell or offer for sale gasoline that contains 10% EtOH by volume[25]. Exempt marina dealers are estimated to represent 2% of the total market. Previous to July 15, 2008, a market share of 30% has been estimated by DEQ[27].

Gasoline Oxygen Weight Percent

Gasoline oxygen wt% is based on a formula provided in EPA MOVES3.1 download documentation: Gasoline Oxygen wt% = (EtOH blend market %) * (EtOH volume %) * 0.35 * 0.01

Fuel Sulfur Content

Land diesel fuel parameters are from the EPA National County Database (NCD), and are specific to Klamath County, Oregon[20]. Marine diesel sulfur content was taken from EPA-420-B-09-018, Suggested Nationwide Fuel Properties[21]. CNG/LPG sulfur content is a conservative high estimate (maximum amount allowable) of 123 ppm for HD5 propane (LPG) rated for engine use[28].

Temperature

Average high, and low temperature values for Kingsley Field Airport were downloaded from the NOAA National Climatic Data Center website[8]. The data was imported into an MS Access database, and average maximum, and minimum temperatures were annually and seasonally calculated using the database.

Stage II Controls: Vapor Recovery System at the Pump

Stage II controls are not implemented in Klamath Falls; as such, model input was set to 0 for Stage II Controls.

Model Source Categories and Examples of Vehicles and Equipment

MOVES3.1 output is specific to vehicles and equipment. The major source categories covered by the model are shown below, along with some examples of vehicles and equipment within each category:

Recreational: All Terrain Vehicles (ATV's), Mini-bikes, Off-Road Motorcycles, Golf Carts, Snowmobiles, Specialty Vehicle Carts

Construction: Asphalt Pavers, Tampers/Rammers, Plate Compactors, Concrete Pavers, Rollers, Scrapers, Paving Equipment, Surfacing Equipment, Signal Boards, Trenchers, Bore/Drill Rigs, Excavators, Concrete/Industrial Saws, Cement and Mortar Mixers, Cranes, Graders, Off-Highway Trucks, Crushing/Proc. Equip., Rough Terrain Forklifts, Rubber Tired Loaders, Rubber Tired Dozers, Tractors/Loaders/Backhoes, Crawlers, Skid Steer Loaders, Off-Highway Tractors, Dumpers/Tenders, Other Construction Equipment

Industrial: Aerial Lifts, Forklifts, Sweepers/Scrubbers, Other General Industrial Equipment, Other Material Handling Equipment

Lawn & Garden: Trimmers/Edgers/Brush Cutters, Lawn Mowers, Leaf Blowers/Vacuums, Rear Engine Riding, Mowers, Front Mowers, Chainsaw < 4 HP, Shredder <5 HP, Tillers < 5 HP, Lawn & Garden Tractors, Wood Splitters, Snowblowers, Chippers/Stump Grinders, Commercial Turf Equipment, Other Lawn & Garden Equipment

Agricultural: 2-Wheel Tractors, Agricultural Tractors, Agricultural Mowers, Combines, Sprayers, Balers, Tillers >5 HP, Swathers, Hydropower Units, Irrigation Equipment

Light Commercial: Generator Sets, Pumps, Air Compressors, Gas Compressors, Welders, Pressure Washers

Logging: Chainsaws >4 HP, Shredders >5 HP, Skidders, Fellers/Bunchers

Recreational Marine: 2-stroke, 4-stroke, and diesel engines. Outboard, personal watercraft, and inboard/sterndrive vessels

Railway Maintenance: Diesel, 4-stroke, and LPG railway maintenance vehicles and equipment

Allocation of Model Output: County to NAA

For all categories except recreational marine and railway maintenance equipment, ArcGIS PRO was used to allocate MOVES3.1 county-wide emission estimates to the NAA. A Klamath County zoning shapefile was obtained from Klamath County MIS, and equipment and vehicle categories were matched to one or more of the following zones or zone mixes.

GIS ID 1. Agricultural: primarily farm and cropland
GIS ID 2. Agricultural: farm, cropland, and grazing
GIS ID 3. Commercial
GIS ID 4. Construction: commercial/residential/industrial zoning mix
GIS ID 5. Industrial
GIS ID 6. Forest
GIS ID 7. Golf Course
GIS ID 8. Recreational: farm zoning and low-density housing zoning mix
GIS ID 9. Commercial Lawn and Garden: residential and commercial zoning mix
GIS ID 10. Residential Lawn and Garden: residential zoning

Acreages for each of the zones and zone mixes for both the county and the NAA were calculated using ArcGIS PRO. Model output was then allocated to NAA using the following formula:

NAA Emissions = County Emissions * ((NAA Zone Acreage) / (County Zone Acreage))

The exception is county-wide railway maintenance equipment emissions were allocated to the NAA via GIS analysis of track length.

2.6.3 Aircraft and Airport Operations

EPA recently reclassified Airports as point sources for the NEI. Therefore, DEQ acquired Klamath County emissions through the 2017 NEI. EPA prepares aircraft emissions along with diesel and gasoline airport ground support equipment and operations via point source methodologies and MOVES, respectively. Through GIS analysis, DEQ mapped one airport, Klamath Falls International Airport (Kingsley Field), and a medical helicopter pad to the Klamath Falls NAA. Map below shows general location for airport and helicopter pad within the NAA.

This emission inventory includes aircraft and ground support equipment (GSE) emissions, aircraft auxiliary power units (APUs), and aircraft refueling (fugitive VOC emissions only).

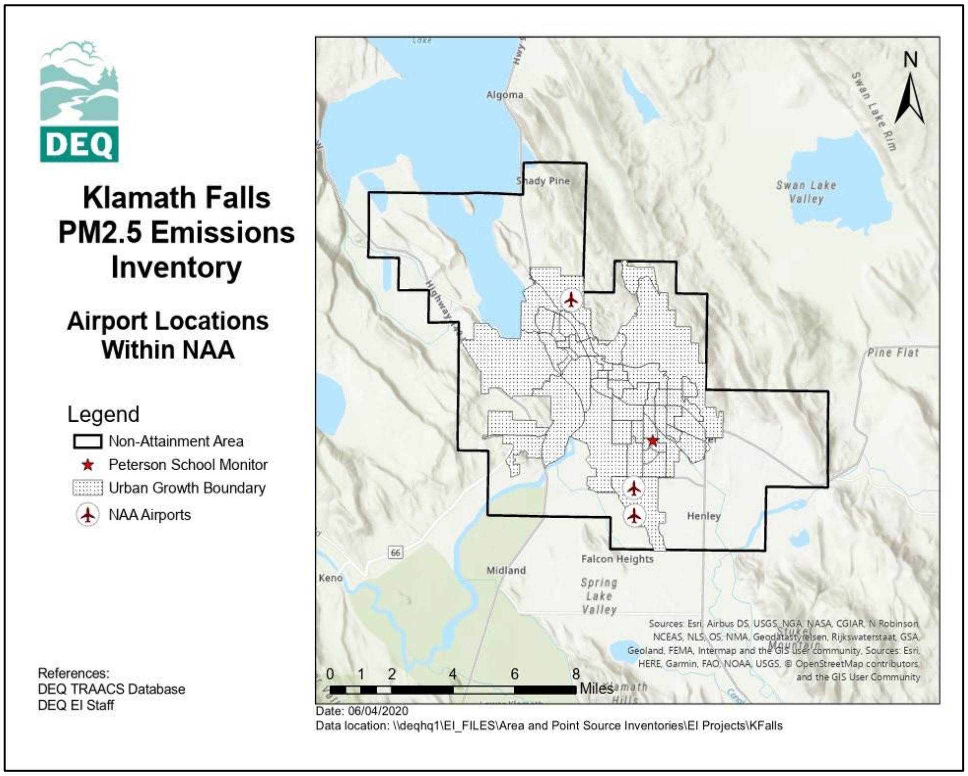

Figure 14. Airport Locations within NAA

The four aircraft fleet types present at Kingsley Field are commercial aviation, general aviation, air taxi, and military aircraft. Commercial aviation consists primarily of large jet aircraft carrying passengers or freight. General aviation is comprised of smaller aircraft that are used mostly for business purposes. Air taxis fly scheduled service carrying passengers and/or freight but are usually smaller aircraft that operate on a more limited basis than commercial aircraft. For Kingsley Field, military aircraft are comprised almost exclusively of F-15 fighter jets.

DEQ calculated typical season day emissions for aircraft and airport operations using SCC derived SAF from EPA temporal allocation data from their 2016 Modeling Platform (2019)[13]. The season activity data is summed for January, February, November, and December and used in the following formula as provided on p. 5-22 of the EPA inventory guidance document[19]:

SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))

DEQ completed typical season day estimates by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

2.6.4 Locomotives

Railroad locomotives used in the United States are primarily of two types: electric and diesel-electric:

- Electric locomotives- powered by electricity generated at stationary power plants. Emissions produced by the electrical generation plant are point sources and not included in this inventory.
- Diesel-electric locomotives- use a diesel engine and an alternator or generator to produce the electricity required to power its traction motors. Emissions produced by these diesel engines are of interest for this inventory. Other sources of emissions from railroad operations include the small gasoline and diesel engines used on refrigerated and heated rail cars. These engines are thermostatically controlled, working independently of train motive power, and fall in the category of nonroad equipment, addressed elsewhere in this document.

Locomotives can perform two different types of operations: Line Haul (SCC: 2285002005) and Yard (SCC: 2285002010). Line haul locomotives, which perform line haul operations, generally travel between distant locations, such as from one city to another. Yard locomotives, which perform yard operations, are primarily responsible for moving railcars within a particular railway yard. Yard locomotives considered point sources in the 2017 NEI and now captured under point SCC.

DEQ acquired county-level annual emissions from the 2017 NEI for line haul and yard locomotives and spatially allocated to the Klamath Falls NAA. Through GIS analysis, DEQ used US Census Tiger shapefiles11 for railroad track length to create a county to NAA ratio to allocate the emissions. The map below provides location of rail lines within the NAA.

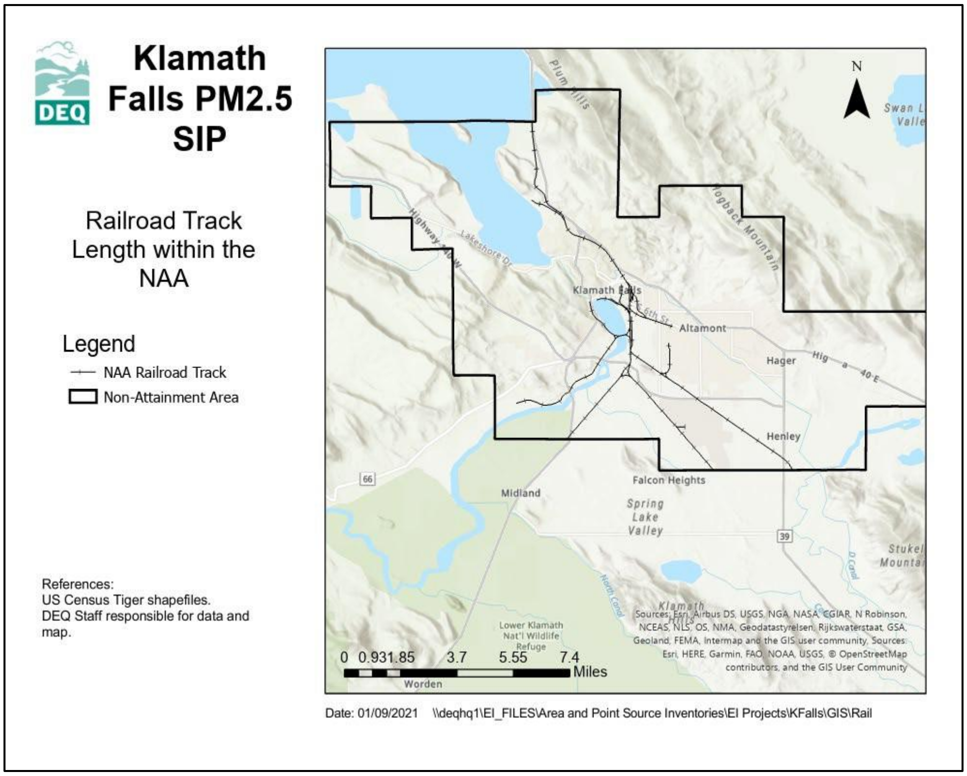

Figure 15. Railroad Track Length within NAA

Locomotive activity is considered uniform throughout the year, and as such typical season day emissions were set equal to 1/365th of the annual estimates. The SAF is set to 1and the typical season day estimates are calculated by multiplying the actual annual emissions by the SAF and divided that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Railway maintenance equipment emissions estimates were generated by EPA MOVES3.1; please see **Section 2.6.2** for further details.

2.6.5 Commercial Marine Vessels

There are two bodies of water in Klamath County that fall within the NAA boundary: Lake Ewana and Upper Klamath Lake. However, these waterbodies only support recreational activities such as fishing, and pleasure boating. As such, no emissions estimate for commercial marine vessels are included in this inventory.

2.6.6 Summary of Nonroad Emissions

Aircraft and airport operations and railroad and diesel equipment are considered significant contributors to $PM_{2.5}$ emission levels within the NAA. The contribution of pollutants contributing to the secondary formation of $PM_{2.5}$ is considered minimal[4], and as such figures representing the distribution and percentages of pollutants contributing to secondary formation of $PM_{2.5}$ are not included in this EI. Emissions from all pollutants are represented in tables in this document.

Please see the following figures for a breakdown of nonroad emissions. See **Appendix D: Section 2.6, Tables 58 through 60** for $PM_{2.5}$ and precursor emissions detail for nonroad sources. In addition, **Table 61 in Appendix E** provides $PM_{2.5}$ and precursor emissions from airports and locomotives.

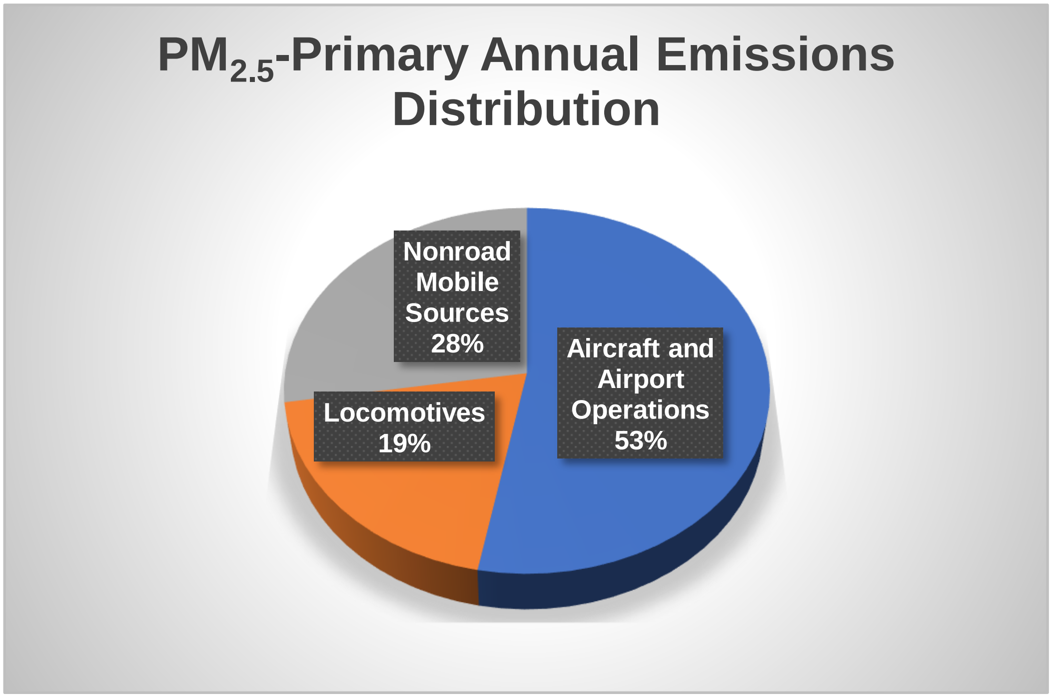

Figure 16. $PM_{2.5}$ Annual Emissions Distribution for Nonroad Sources within NAA

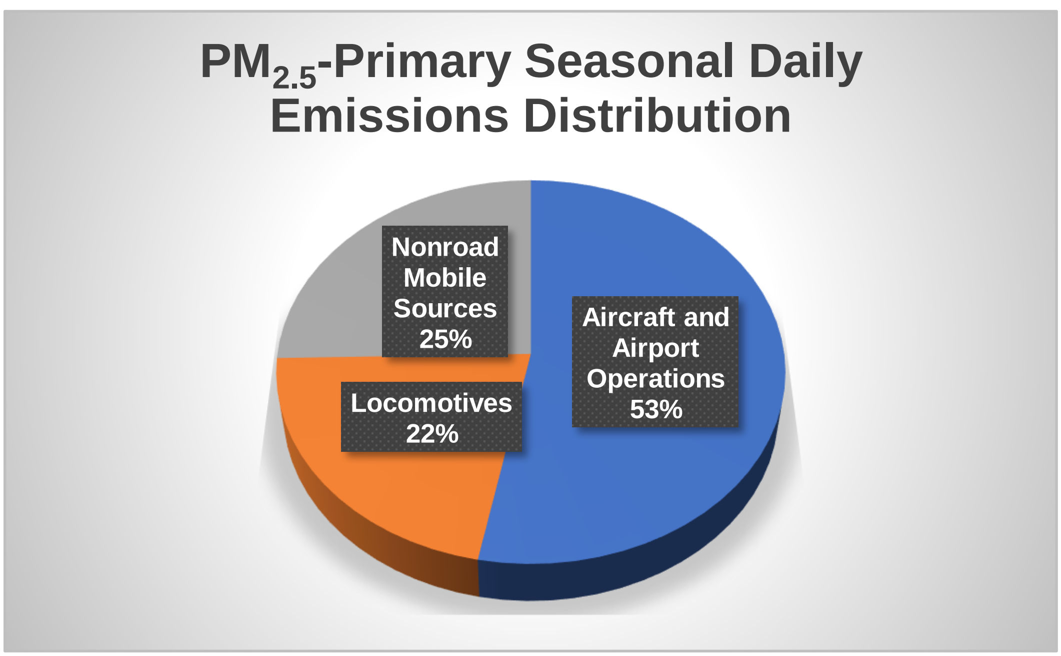

Figure 17. $PM_{2.5}$ Seasonal Daily Emissions Distribution for Nonroad Sources within NAA

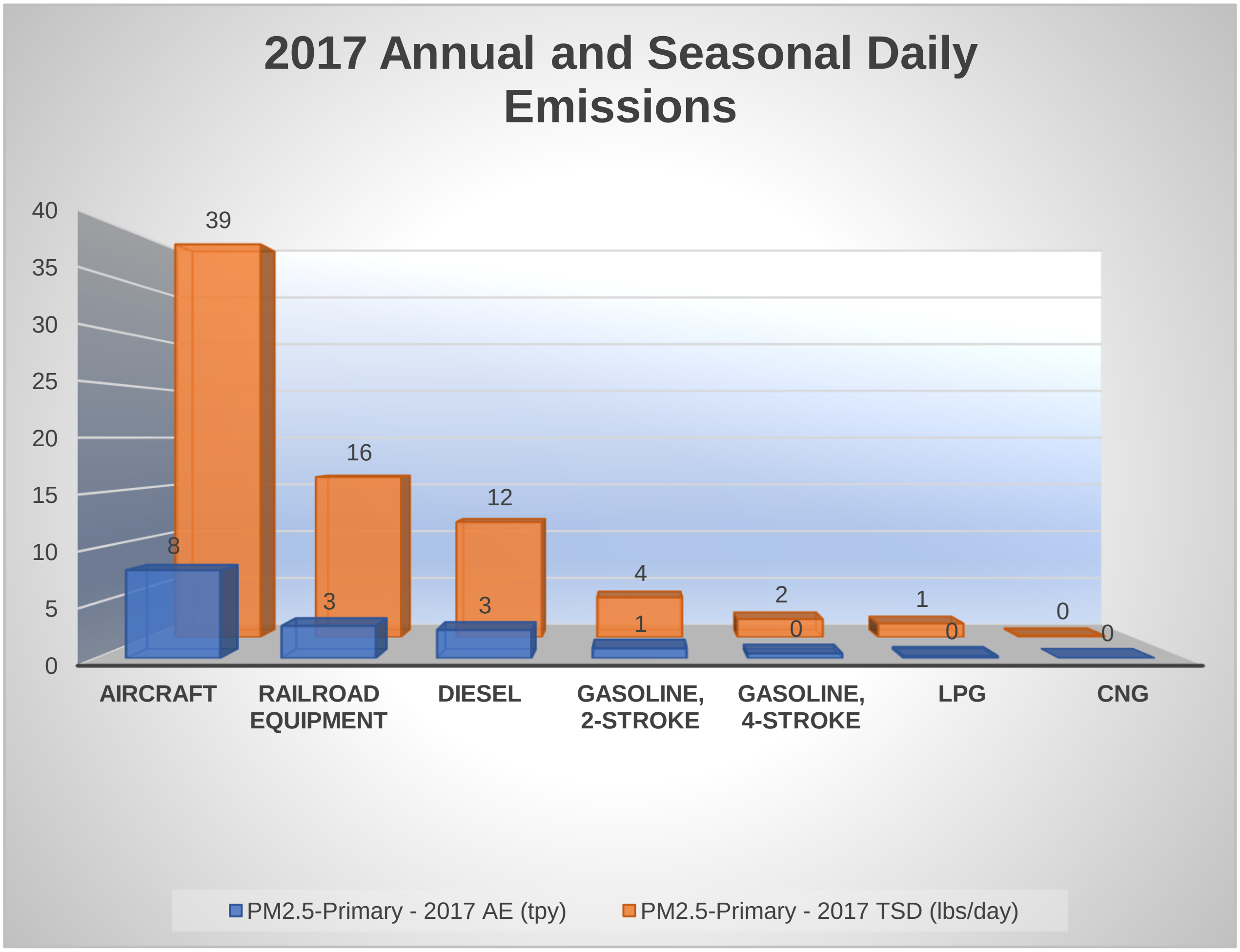

Figure 18. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Fuel or Equipment Type within NAA

2.7 Onroad Mobile Sources

2.7.1 Introduction and Scope

The 2017 Klamath Falls NAA $PM_{2.5}$ emission inventories from onroad mobile sources were completed in accordance with the current EPA emission inventory preparatory guidelines for state implementation plans and transportation conformity[26]. This component of the emission inventory was completed by DEQ but incorporated several key elements and contributions from Oregon Department of Transportation (ODOT) and other local participants.

Onroad mobile source emissions were initially modeled using EPA's MOVES2014b model but re-ran in MOVES3.1 in Spring 2023. At the time the EI work was started for the Plan in early 2020, MOVES2014(b) was the latest model available to run onroad emissions. Because substantial work was already completed on this project prior to EPA's adoption of MOVES3.1, DEQ initially used MOVES2014(b) to run onroad emissions. However, due to delays in events data, EPA and other transportation agencies requested Oregon DEQ update onroad emission estimates using MOVES3.1.

From this point on all work and estimates was completed in MOVES3.1.

2.7.2 MOVES 3.1 Emissions Model

Figure 19 below provides an overview of the methodology for the onroad mobile exhaust, brake, and tire emission estimates. As shown in the figure, the two main steps in developing the vehicle exhaust, brake and tire inventory were (1) the generation of link-based activity estimates using the transportation network travel demand model (TDM), and (2) the modeling of fleet $PM_{2.5}$ and other criteria pollutant emission factors using EPA's MOVES3.1 emissions model.

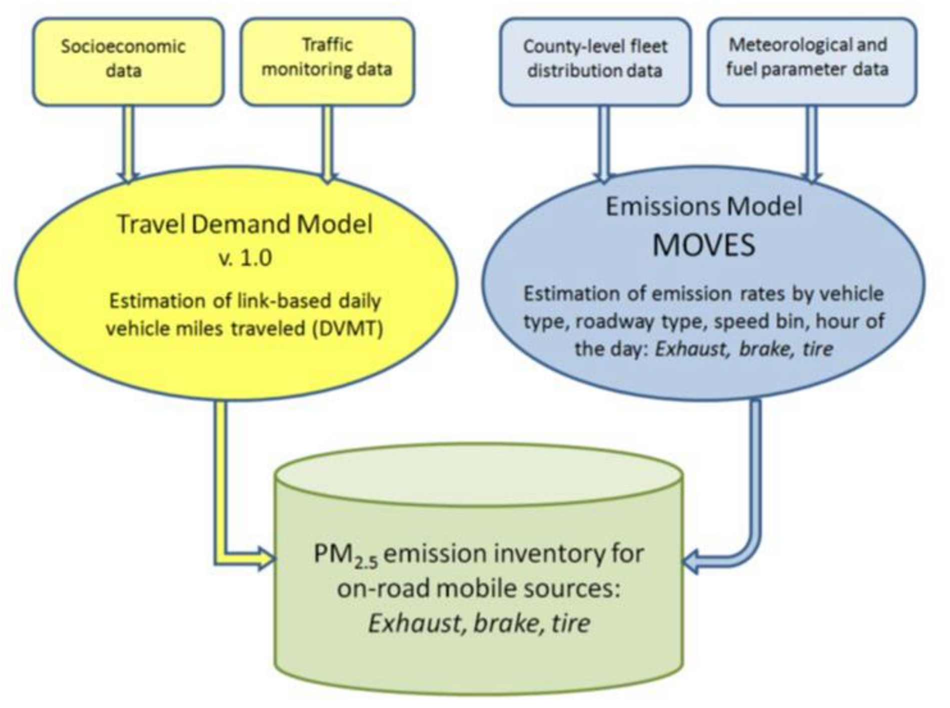

Figure 19. MOVES Model Process

2.7.2.1 Vehicle Activity Data

ODOT Methodology: Estimating Daily VMT by Link

Oregon Department of Transportation (ODOT) provided DEQ both 2008 and 2037 Daily Vehicle Miles Traveled (DVMT) activity data from their Travel Demand Model (TDM) to estimate transportation emissions in MOVES3.1. 2008 and 2037 DVMT was linearly interpolated by DEQ to get 2017 attainment year activity data. The activity data supplied was originally used to develop 2008, 2014 , and 2037 transportation emissions in MOVES2010 for the 2012 SIP Attainment Plan. The 2008 DVMT is based on actual vetted demographics data from Oregon State Office of Economic Analysis (OEA) and US Census 2000 for Klamath County. The TDM used the 2008 reference year extending out to the future year 2037 to satisfy the needs of the previous AQ analysis. All jurisdictions (ODOT, DEQ, and City of Klamath Falls) approved the demographics data and the roadwork network used in the TDM. (DEQ Ref. 806)

Upon evaluation by DEQ and consultation with ODOT and EPA, current demographics data from the PSU Coordinated Population Forecast for Klamath County 2015-2065 indicates population and economic growth is lower than the projections in 2011 used for the previous EI.

Table 22 compares the TDM Model NAA demographics (DEQ Ref.806) used in the previous EI against current data today. Growth overall is minimal within the NAA.

Table 22. Comparison of Demographic Data

Land Use Demographics	TDM Model NAA			Current US Census/PSU Data GIS to NAA	
	2008	2014	2037	2017	2037
Population	47276	49472	57293	48496	49840
Housing	18818	19665	22911	24493	25172
Employment	19951	20794	24024	19124	24024

The agencies agreed in late Fall 2019 that the TDM did not need to be updated with the current demographic data and re-ran for the attainment inventory because the rate of growth within the NAA has slowed since the last plan and is representative of current data today. Therefore, DEQ used the 2008 and 2037 DVMT to interpolate the 2017 attainment year activity and used the 2037 activity as-is to estimate transportation emissions in MOVES3.1.

ODOT DVMT Apportionment to NAA

ODOT supplied 2008 and 2037 DVMT to DEQ by links within Travel Analysis Zones (TAZ). The total area for DVMT supplied was slightly larger than the NAA; as such ArcGIS Pro was used to clip the ODOT data down to the NAA. Link distance was re-calculated, and VMT re-estimated for the clipped links.

ODOT DVMT Apportionment to Source Type

ODOT Daily VMT was apportioned to MOVES vehicle type using the partitioning into the FHWA 13 class system recorded by ODOT at ATRs at five stations in the area of the NAA. These were combined into a weighted average based on the total traffic recorded at each of the ATRs, so that more traffic meant more weight given to that station's partitioning of the fleet.

ODOT DVMT Temporal Allocation- Hour VMT

The ODOT DVMT was mapped via ArcGIS Pro, and a MOVES roadway type was assigned to each link based on ODOT speed bin and link location. The ODOT DVMT data was also assigned a MOVES speed bin ID; ODOT and MOVES speed bins aligned. ODOT daily VMT values were then adjusted to hourly VMT using MOVES default data, specifically the MOVES default hourly VMT Excel database input table "HourVMTFraction". The input table breaks down daily activity into hourly activity fractions by MOVES roadway and source types.

2.7.2.2 MOVES 3.1: Exhaust, Brake, and Tire Inputs and Scenarios

Onroad mobile source emissions were modeled using EPA's MOVES3.1 in inventory mode. Two model runs were conducted for the NAA, annual and typical season day. The run included all vehicle and road types and pollutants $PM_{2.5}$ including speciated pollutants, NH_3, NO_x, SO_2, and VOC. The model was run in inventory mode to output emissions for each road type, fuel type, day type, hour, speed bin, and process. The MOVES modeling run specifications are detailed in Tables 23 and 24 in the context of the Panel settings and County Data Manager datasets.

Table 23. MOVES Panel Settings for 2017 Attainment Year

Panel Item	Settings: Typical Season Day (TSD)	Settings: Annual
Description	Typical Season Day	Annual
Scale		
Scale	Klamath County (41035)	Klamath County (41035)
Calculation Type	Inventory	Inventory
Time Spans		
Aggregation	Day	Day
Year	2017	2017
Months	December	January, April, July, October
Days	Weekday	Weekend and Weekday
Hours	24	
Geographic Bounds	Klamath County	Klamath County
Vehicles/Equipment	All Fuels and all Vehicles/Equipment	All fuels and all Vehicles/Equipment
Road Type	All	All
Pollutants and Processes		
Pollutants	$PM_{2.5}$, NO_x, SO_2, VOC, NH_3, $PM_{2.5}$ Speciation	$PM_{2.5}$, NO_x, SO_2, VOC, NH_3, $PM_{2.5}$ Speciation
Processes	All	All
Manage Input Datasets	N/A	N/A
Strategies	None	None
Output		
General Output	Mass units = grams, Distance units = miles	Mass units = grams, Distance units = miles
Emissions Detail	Mass by pollutant, process, source type, roadtype	Mass by pollutant, process, source type, roadtype
Advanced Performance Features	N/A	N/A

Table 24. MOVES County Data Manager Inputs for 2017 Attainment Year

Dataset(s)	**Information Sources**
Source Type Population	Grown using population growth factor
Vehicle Type VMT	ODOT for Klamath Falls NAA with vehicle split.
Temporal Allocation	MOVES default
I/M Programs	N/A
Fuel	MOVES default with local regulations and ethanol amounts
Meteorology Data	Monitored data retrieved from Klamath Falls, Kingsley Field site.
Ramp Fraction	MOVES default
Road Type Distribution	ODOT with MOVES default vehicle split
Age Distribution	ODOT DMV vehicle Klamath County Registration data was used to distribute source types 21 and 31 vehicle population data by age. All other source types = default data, National County Database.
Average Speed Distribution	MOVES default

2.7.3 Re-Entrained Road Dust

Re-Entrained road dust emissions were estimated using vehicle activity data in the form of NAA vehicle miles traveled (VMT) via GIS analysis of data provided by ODOT, and emission factors developed using EPA AP-42 emission factor formulas. Of particular interest are the calculations for typical season day emissions; the typical season day is defined as the time period immediately following a snow or ice event when roadway has been sanded or cindered. Under these conditions, the silt-loading factor to the roadway surface increases dramatically from normal seasonal conditions, and as such the resulting emissions estimates for paved road re-entrained dust are elevated. However, Klamath County has purchased sweepers that comply with strict California standards, based upon FHWA's estimates for high efficiency machines at 99.6% removal efficiency and 90% of the area covered. DEQ has therefore applied a control efficiency (CE) of 90% to paved road re-entrained dust typical season day emission estimates, resulting in large reduction in the final estimates. In addition to paved road dust estimates, this category also includes emissions from unpaved roads, which are estimated to apply to 5% of the roadway in the NAA.

2.7.4 Summary of Onroad Emissions

Onroad mobile source emissions are summarized in the following figures and tables by vehicle and roadway type for annual and typical season day emissions. Emissions estimates indicate majority of onroad mobile source emissions originate from the following:

- urban, unrestricted access roadways,
- vehicle exhaust,
- passenger cars and trucks,
- long-haul and short-haul trucking

See **Appendix E: Section 2.7, Tables 62 through 65** that provides emissions details for onroad sources.

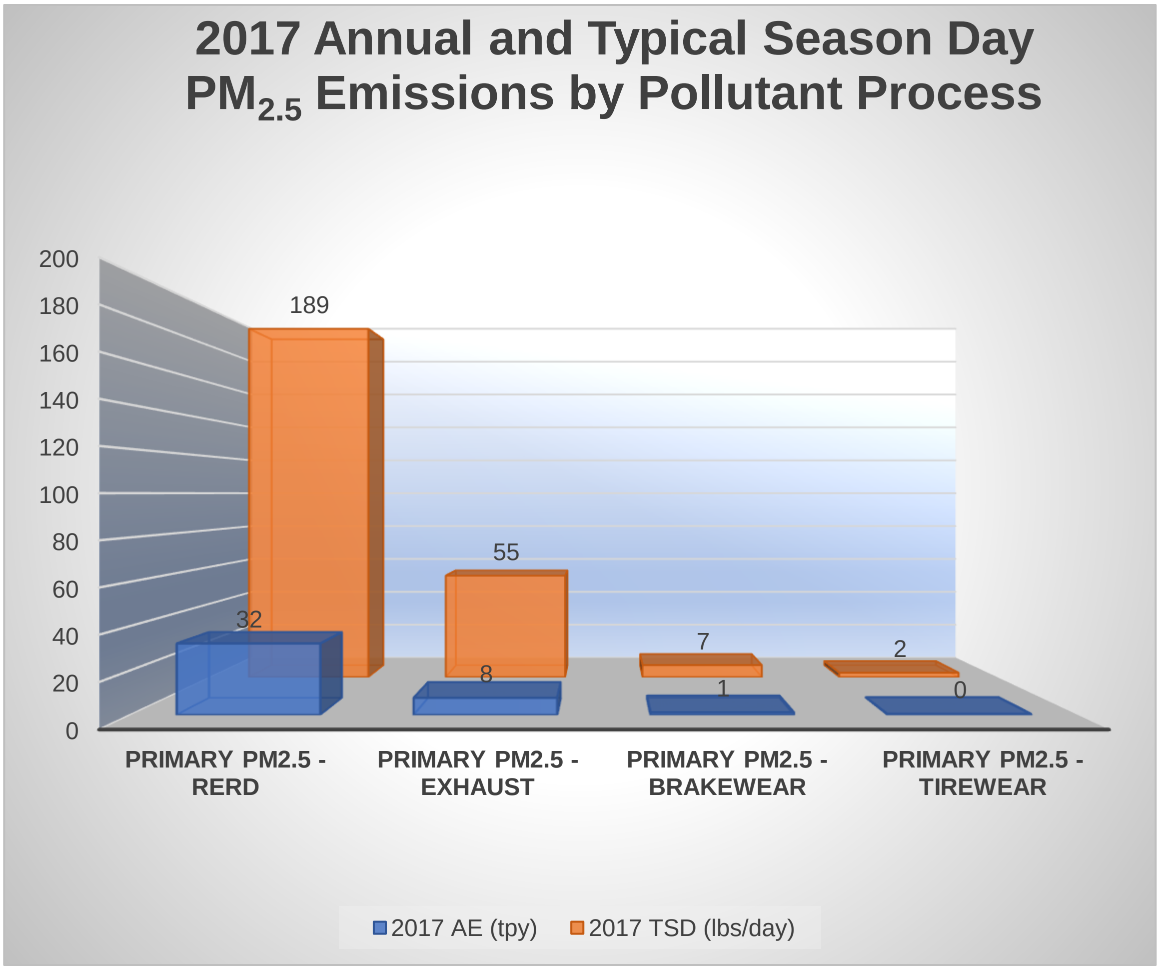

Figure 20. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Pollutant Process

RERD = Re-Entrained Road Dust (Paved and Unpaved)

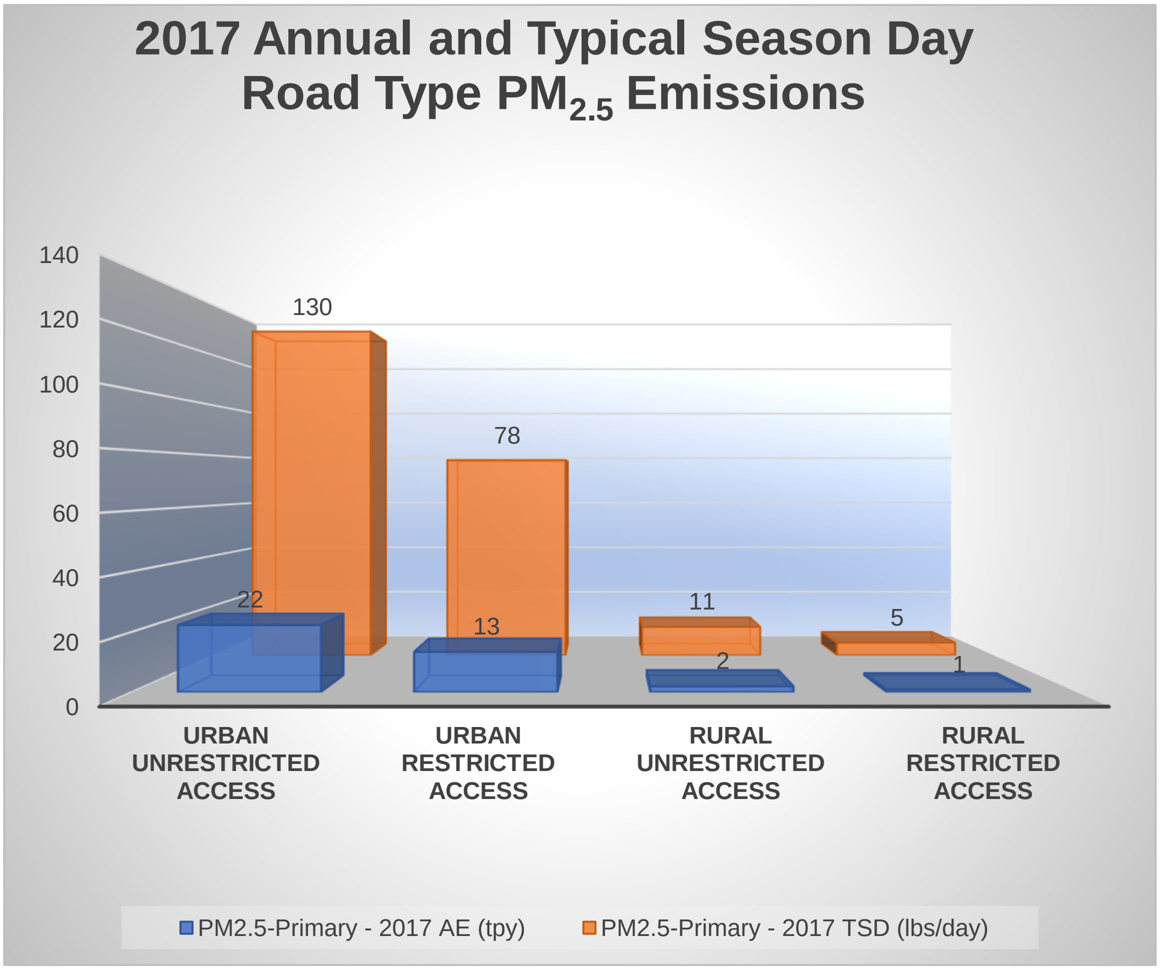

Figure 21. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Road Type

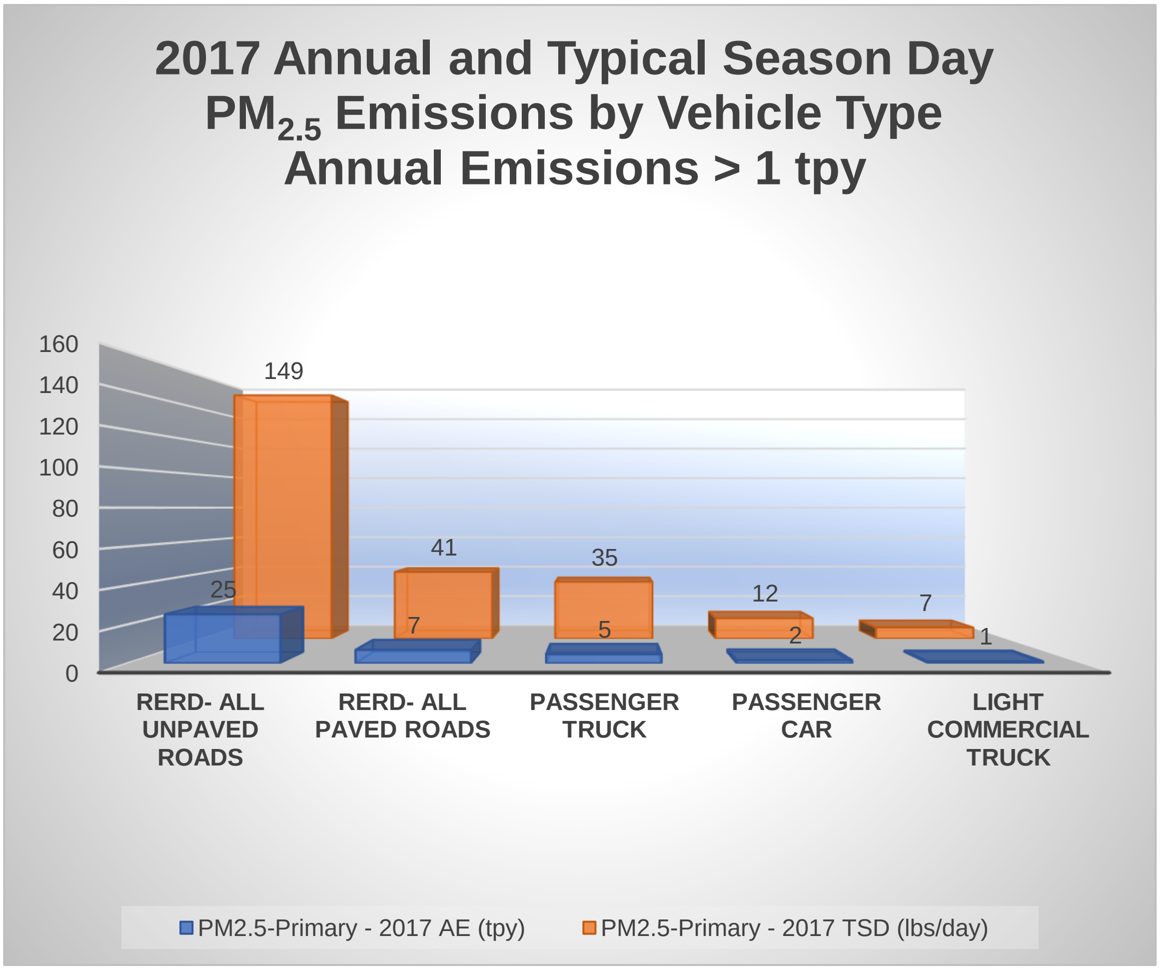

Figure 22. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Vehicle Types > 1 tpy

RERD = Re-Entrained Road Dust (Paved and Unpaved)

Table 25. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Vehicle Type

Vehicle Type	Annual VMT	VMT Distribution	$PM_{2.5}$ - Brakewear		$PM_{2.5}$ - Exhaust		$PM_{2.5}$ - RERD		$PM_{2.5}$ - Tirewear	
			AE	TSD	AE	TSD	AE	TSD	AE	TSD
Combination Long-haul Truck	21904913	7%	0.0	0	0.2	1	2.3	13	0.0	0
Combination Short-haul Truck	8589780	3%	0.0	0	0.1	1	0.9	5	0.0	0
Intercity Bus	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Light Commercial Truck	40620252	13%	0.2	1	0.8	5	4.2	25	0.1	0
Motor Home	6032451	2%	0.0	0	0.8	5	0.6	4	0.0	0
Motorcycle	1481137	0%	0.0	0	0.2	0	0.2	1	0.0	0
Other Buses	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Passenger Car	79095626	26%	0.3	2	1.2	10	8.2	49	0.1	1
Passenger Truck	134973083	44%	0.6	3	3.9	30	14.1	83	0.2	1
Refuse Truck	1285203	0%	0.0	0	0.1	1	0.1	1	0.0	0
School Bus	1676136	1%	0.0	0	0.1	0	0.2	1	0.0	0
Single Unit Long-haul Truck	6470531	2%	0.0	0	0.1	1	0.7	4	0.0	0
Single Unit Short-haul Truck	3723953	1%	0.0	0	0.1	1	0.4	2	0.0	0
Transit Bus	2341198	1%	0.0	0	0.1	0	0.2	1	0.0	0
		Grand Total	1	7	8	55	32	189	0	2

Notes:
AE (tpy) = Annual Emissions, tons per year
TSD (lbs/day) = Typical Season Day, pounds per day
$PM_{2.5}$ RERD = $PM_{2.5}$ Re-Entrained Road Dust
VMT = Vehicle Miles Traveled
1) Daily VMT provided by ODOT.
(a) Annual VMT = (Daily VMT) * (365 days/yr)
(b) % VMT by Vehicle Type = default roadway type distribution for Klamath Falls NAA from MOVES: default database output. Percentages used to allocate ODOT DVMT to DVMT by vehicle type.
2) $PM_{2.5}$ Annual Emissions = (MOVES output, emission inventory mode)
(a) Typical Season Day Emissions = (MOVES Output, emission inventory mode, average TSD for winter PM season)
3) Emission Factor, lbs/VMT = ((emissions, tpy)*2000 lbs/ton) / (VMT)

4) Re-Entrained Road Dust emissions estimates distributed across all vehicle types using VMT Vehicle Type Percent Distribution. Re-Entrained Road Dust emissions estimates and calculations are from Tables 2.7-5 and 2.7-6.

(a) $PM_{2.5}$ from Re-Entrained Road Dust = (NAA 2017 Road Dust $PM_{2.5}$ Emissions) * (% Total Vehicle Type VMT)

5) Off-network emissions distributed across all vehicle types using VMT Vehicle Type Percent Distribution and estimates derived from MOVES3.1.

(a) $PM_{2.5}$ from Off-network vehicles = (NAA 2017 Off-Network Emissions) * (% Total Vehicle Type VMT)

Table 26. 2017 $PM_{2.5}$ Precursor Annual and Seasonal Daily Emissions by Vehicle Type

Vehicle Type	Annual VMT	VMT Distribution	NH_3		NOx		SO_2		VOC	
			AE	TSD	AE	TSD	AE	TSD	AE	TSD
Combination Long-haul Truck	21904913	7%	0.0	0	9.4	53	0.0	0	0.5	3
Combination Short-haul Truck	8589780	3%	0.0	0	3.7	21	0.0	0	0.3	2
Intercity Bus	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Light Commercial Truck	40620252	13%	1.4	8	35.5	200	0.5	3	20.4	136
Motor Home	6032451	2%	0.2	1	23.2	132	0.1	0	8.9	44
Motorcycle	1481137	0%	0.7	1	8.6	14	0.1	0	16.5	27
Other Buses	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Passenger Car	79095626	26%	3.7	20	61.4	352	0.7	4	79.1	493
Passenger Truck	134973083	44%	6.7	37	230.8	1295	1.6	9	177.3	1063
Refuse Truck	1285203	0%	0.0	0	2.7	15	0.0	0	0.2	1
School Bus	1676136	1%	0.0	0	1.6	9	0.0	0	0.2	2
Single Unit Long-haul Truck	6470531	2%	0.1	0	4.0	22	0.0	0	0.4	2
Single Unit Short-haul Truck	3723953	1%	0.0	0	3.0	17	0.0	0	0.5	4
Transit Bus	2341198	1%	0.0	0	3.1	18	0.0	0	0.4	2
		Grand Total	13	68	387	2149	3	16	305	1779

Notes: See Table 25 above.

3 2037 Future Year Emissions Inventory

3.1 Future Year Emissions Inventory

3.1.1 Growth Within Klamath Falls NAA

Emissions should reflect Klamath County and Klamath Falls NAA's growth in demographics and traffic patterns for the next 20-year period. Based on the 2018 through 2065 Coordinated Population Forecasts for Klamath County developed by Portland State University and U.S. Census data, and Oregon Employment Department indicate county demographics and traffic growth are expected to grow gradually from 2017 through 2037. The vehicle traffic growth within the NAA was established by ODOT in their Traffic Demand Model based on demographics and roadwork network patterns used in the previous EI. (See section 3.1.4.1 below for further explanation) DEQ used ArcGIS Pro to spatially allocate the demographics and traffic data from county level to the Klamath Falls NAA.

The population for the Klamath Falls NAA is expected to increase from 48,496 to 49,840 people as well as housing from 24,493 to 25,172 units over the next 20 years. Likewise, employment will also steadily increase over the next 20 years from 19,124 to 24,024 employees as new people move into the area or young adults enter the workforce. Along with the increase in NAA population, household, and employment numbers, the TDM projected annual VMT will increase from 308,194,262 to approximately 369,833,114 vehicle miles traveled over the same period.

3.1.1.1 Growth Factors

Since growth of $PM_{2.5}$ and precursor emissions vary based on the types of emission sources inventoried, growth factors were developed using demographics data to grow 2017 emissions to 2037. DEQ developed 2017-2037 Annual Average Growth Rates (AAGR) for employment, population, household, or combination of the data. Table 27 is a breakdown of growth factors developed for this plan.

Table 27. Klamath Falls NAA Growth Factors

Growth Type ID	Growth Type Description	2017-2037 AAGR	Growth Parameter	Data Resource
1	Klamath Falls NAA Population	0.14%	Linear, noncompounding	PSU Population Research Center
2	Klamath Falls NAA Household	0.14%	Linear, noncompounding	PSU Population Research Center
3	Klamath Falls NAA Employment (EMP) - use for commercial, construction, and industrial NAICS.	1.15%	Linear, noncompounding	Oregon Employment Department
9	Average of Population, Commercial, Industrial EMP	0.64%	Average of EMP and Population.	Oregon Employment Department, PSU Population Research Center, and U.S. Census

Growth Type ID	Growth Type Description	2017-2037 AAGR	Growth Parameter	Data Resource
10	Animal Husbandry, Biogenics, Point, Structural Fires, and Prescribed Fires and Wildfires.	0.00%	No growth	2008 Klamath Falls SIP EI (ref. 815) page 196. Emissions held constant for these subsectors in FY estimates.

The growth factors were applied to various data categories to project future year emissions. For example, population, household, and employment or a combination of this data was applied to certain nonpoint emissions sources such as stationary fuel combustion, residential woodstoves, and commercial cooking.

3.1.1.2 No Growth Factors

Growth factors were not developed nor applied to permitted point sources, wildfires and prescribed and structural fires, and some nonpoint sources such as some agriculture emissions sources for this inventory. These categories are considered difficult to project emissions for and were established as “no-growth”, so 2037 emissions were set equal to 2017 attainment year emissions.

Also, it was not necessary for DEQ to develop growth factors to estimate 2037 onroad and re-entrained road dust emissions. ODOT provided 2037 traffic activity data from their TDM, which already incorporated growth for the NAA; therefore, 2037 emissions were calculated directly in MOVES3.1 and not grown. Further, DEQ used the same 2037 traffic activity data provided by ODOT to calculate re- entrained road dust emissions outside of MOVES using EPA AP-42 emission factors. See **Section 2.7 and 2.7.3** for further detail.

3.1.1.3 Estimating 2037 Emissions Using Growth Factors

Emissions were grown at a linear, non-compounding rate using the following formula:

2037 Emissions = 2017 Emissions + [(Growth Rate) * (Number of Years from 2017 to 2037) * (2017 Emissions)]

The following example demonstrates how the formula is used to calculate future year emissions. Using random 2017 emission number of 10 tpy and a growth rate of 1%, the data is plugged into the calculation as such:

2037 Emissions = 10 tpy in 2017 + [(.01 growth) * (20 years) * (10 tpy in 2017)] = 12 tpy in 2037

Once emission estimates were made for 2017 and 2037, emission sources were linearly extrapolated between those years based on 5-year intervals.

3.1.2 Point Sources

No growth was assumed for major permitted point sources located within the NAA between 2017 and 2037 because the sources have permit limits. However, DEQ is asking two facilities to install controls on two combustion turbines and two boilers for Regional Haze which will reduce overall emissions in the NAA between now and 2037. The facilities DEQ is seeking controls for are:

1) Klamath Energy, LLC (18-0003), CT-1/CT-2 combustion turbines
2) JELD-WEN, Inc. (18-0006), BLRG Boiler G

The controls proposed are Low NO_x burner on the combustion turbines and SNCR- Ammonia installed on BLRG boiler. The Low NO_x burner will result in reductions in emission by 33% for NO_x and the SNCR will get 30% reduction for NO_x for those facilities.

2037 AE (tpy) = 2017 AE (tpy) – [(2017 AE (tpy) * Control Efficiency %)]

No growth is applied but the controlled emissions (using 2017) are substituted for 2037 emissions for both annual and typical season day.

Another item to consider is all 17 facilities will be up for permit renewal before 2037. This is an opportunity to adjust their allowable permit limits down to apply emission reductions towards actual emissions for each facility. Because we do not have current information on how much those reductions will be, future year emissions are set equal to 2017 emissions both annual and typical season day.

3.1.3 Nonpoint Sources

2037 residential wood combustion estimates were completed using the following emission reductions over a five-year period. Emission reductions proposed by the 2019 EPA Targeted Airshed Grant (TAG) was used to project emissions to 2037 considering the replacement of 144 woodstoves with non-wood burning devices over 5-year period. Change outs are expected to reduce $PM_{2.5}$ emissions by 6.81 tons per year.

Upon closer examination, the proposed reductions were bolstered by additional changeouts based on state funding and DEQ’s Heat Smart program. State funding achieved 50 additional woodstove changeouts in 2019 and a review of Heat Smart data found another seven stoves were removed between 2017-2022 within the Klamath Falls NAA. EPA calculations of estimated PM 2.5 reductions for TAG changeouts were used to project additional emissions reductions from the changeouts for the additional 57 stoves and removed from the future year emissions inventory. This resulted in additional reductions of 2.69 tons of emissions per year.

Finally, 2022 TAG was awarded recently for Klamath Falls for another 5-year project period from 2023 to 2028. The proposed project would replace an additional 210 wood stoves with non-wood burning devices over the 5-year period in the nonattainment area. This projected an additional 9.93 tons per year of $PM_{2.5}$ removed from the nonattainment area in future years.

In conclusion, a total of 411 woodstoves are projected to be removed from 2017 through 2028 via TAG and State funding and DEQ’s Heat Smart Program removal requirements. To date 123 woodstoves have already been removed and not replaced with newer wood burning equipment. Emissions reductions were estimated using a modified version of EPA’s woodstove calculator (incorporating Oregon inputs). Total emission reductions of approximately 19.93 tons per year has been deducted from 2037 future year emissions. Table 28 is a breakdown of funding and program removal of woodstoves by 2028.

Table 28. Projected Woodstove Removals by 2028

Funding/Program	Number Stoves Removed	$PM_{2.5}$ Emissions Reduced (tons per year)
2019 TAG	144	6.81
2019 State Funding	50	2.36
Heat Smart Program	7	0.33
2022 TAG	210	9.93
Totals	411	19.43

For some nonpoint or events and natural sources, emissions growth may be restricted based on Klamath Clean Air Ordinances or held constant for future year forecasts due to the difficulty in predicting emissions out to 2037. Klamath Clean Air Ordinances within the Klamath Falls NAA restrict certain wood burning devices from burning during the winter PM season such as outdoor wood burning devices. As per Klamath County Code Chapter 406 Ordinance 63.06 ("Klamath Clean Air Ordinance"), the use of residential outdoor wood devices is prohibited within the Air Quality Zone at all times by §150(2)(c). Thus, typical season day emissions for outdoor wood burning devices were set to zero for future years as no growth is expected due to restrictions mentioned above.

Finally, no growth is estimated for residential hydronic heaters as well. As per OAR 340-262-0500(3), residential hydronic heaters must be certified by DEQ to be sold in Oregon. As none have been certified for the Klamath Falls NAA; therefore, there is no growth anticipated for residential hydronic heaters and emissions are held constant to the future year.

Growth estimates for all other sources, including wildfires, prescribed and agricultural burning, and windblown dust sources, were held constant for future year forecasts due to the difficult nature to predict out to 2037.

3.1.4 Nonroad Mobile Sources

DEQ re-ran nonroad emissions in MOVES3.1 at the request of EPA and other transportation agencies. The nonroad emissions were originally ran in MOVES2014b model to obtain 2037 emissions for nonroad vehicles and equipment. DEQ did not use either MOVES3.1 or MOVES2014b model for aircraft and airport operations and locomotive emissions but instead obtained them directly from the 2017 NEI.

DEQ used the following formula to grow aircraft and airport operations and locomotive emissions to 2037.

$$\text{2037 Emissions} = \text{2017 Emissions} + [(\text{Growth Rate}) * (\text{Number of Years from 2017 to 2037}) * (\text{2017 Emissions})]$$

DEQ grew all source emissions between 2017 and 2037 using linear extrapolation based on 5-year intervals.

3.1.5 Onroad Mobile Sources

3.1.5.1 ODOT Methodology: Estimating Daily VMT by Link

Oregon Department of Transportation (ODOT) provided DEQ both 2008 and 2037 Daily Vehicle Miles Traveled (DVMT) activity data from their Travel Demand Model (TDM) to estimate transportation emissions in MOVES 2014b. Oregon DEQ re-ran onroad emissions at the request of EPA and other transportation agencies in MOVES3.1 using the activity information provided by ODOT. The activity data supplied was originally used to develop 2008, 2014 , and 2037 transportation emissions in MOVES2010 for the 2012 SIP Attainment Plan. The 2008 DVMT is based on actual vetted demographics data from Oregon State Office of Economic Analysis (OEA) and US Census 2000 for Klamath County.

The TDM used the 2008 reference year extending out to the future year 2037 to satisfy the needs of the previous AQ analysis. All jurisdictions (ODOT, DEQ, and City of Klamath Falls) approved the demographics data and the roadwork network used in the TDM for the previous plan. Both DEQ and ODOT believes that limited changes in demographics and traffic activity patterns have not changed much since the previous plan and that it was not necessary to update 2017 and 2037 DVMT in the TDM for this current plan. Therefore, DEQ used the 2037 TDM DVMT from the previous EI to estimate transportation emissions in MOVES2014b. See Section 2.7.2.1 for more detail about the activity data provided by ODOT.

3.1.5.2 DVMT Adjustment: Clipping to NAA, Temporal Adjustment, Fleet Makeup

Methodology for formatting 2037 DVMT was the same as the methodology used for the 2017 DVMT. Please see **Section 2.7.2.1**, for how vehicle activity data was developed.

3.1.5.3 MOVES 3.1 Run Specification, County Data Manager Inputs, and Scenarios

Onroad mobile source emissions were initially modeled using EPA's MOVES2014b model and re-ran in MOVES3.1 in Spring 2023. At the time the EI work was started for the Plan in early 2020, MOVES2014(b) was the latest model available to run onroad emissions. Because substantial work was completed on this project prior to EPA’s adoption of MOVES3.0, the use of MOVES2014(b) was still appropriate at that time. However, due to delays in events data, EPA and other transportation agencies requested Oregon DEQ update emission estimates using MOVES3.1. From this point on all work and estimates was completed in MOVES3.1.

Two model runs were conducted for the NAA: annual and typical season day. Temperature profiles were specific to each model run. The runs included all vehicle and road types and the pollutants $PM_{2.5}$ including speciated pollutants and NH_3, NO_x, SO_2, and VOC. The model was run in emission inventory mode to output emissions for each road type, fuel type, day type, hour, speed bin, and process. Tables 29 and 30 below provide run specifications and county database manager datasets used to run MOVES3.1.

Table 29. MOVES Panel Settings for 2037 Future Year

Panel Item	Settings: Typical Season Day (TSD)	Settings: Annual
Description	Typical Season Day	Annual
Scale		
Scale	Klamath County (41035)	Klamath County (41035)
Calculation Type	Inventory	Inventory
Time Spans		

Panel Item	Settings: Typical Season Day (TSD)	Settings: Annual
Aggregation	Day	Day
Year	2037	2037
Months	December	January, April, July, October
Days	Weekday	Weekend and Weekday
Hours	24	
Geographic Bounds	Klamath County	Klamath County
Vehicles/Equipment	All Fuels and all Vehicles/Equipment	All fuels and all Vehicles/Equipment
Road Type	All	All
Pollutants and Processes		
Pollutants	$PM_{2.5}$, NO_x, SO_2, VOC, NH_3, $PM_{2.5}$ Speciation	$PM_{2.5}$, NO_x, SO_2, VOC, NH_3, $PM_{2.5}$ Speciation
Processes	All	All
Manage Input Datasets	N/A	N/A
Strategies	None	None
Output		
General Output	Mass units = grams, Distance units = miles	Mass units = grams, Distance units = miles
Emissions Detail	Mass by pollutant, process, source type, roadtype	Mass by pollutant, process, source type, roadtype
Advanced Performance Features	N/A	N/A

Table 30. MOVES County Data Manager Inputs for 2037 Future Year

Dataset(s)	Information Sources
Source Type Population	Grown using population growth factor
Vehicle Type VMT	ODOT for Klamath Falls NAA with vehicle split.
Temporal Allocation	MOVES default
I/M Programs	N/A
Fuel	MOVES default with local regulations and ethanol amounts
Meteorology Data	Monitored data retrieved from Klamath Falls, Kingsley Field site.
Ramp Fraction	MOVES default
Road Type Distribution	ODOT with MOVES default vehicle split
Age Distribution	ODOT DMV vehicle Klamath County Registration data was used to distribute source types 21 and 31 vehicle population data by age. All other source types = default data, National County Database.
Average Speed Distribution	MOVES default

The same procedures used for 2017 emissions estimates were used for 2037; please see **Section 2.7.2** of this document for the methodology used to develop 2037 emission estimates.

3.2 Summary of Future Year Emissions

The following figures and tables summarize future year emissions by data category and sectors. In addition, **Appendix F: Section 3.0, Table 66** provides a breakdown of $PM_{2.5}$ and precursor pollutant emissions by category and sector over five year periods.

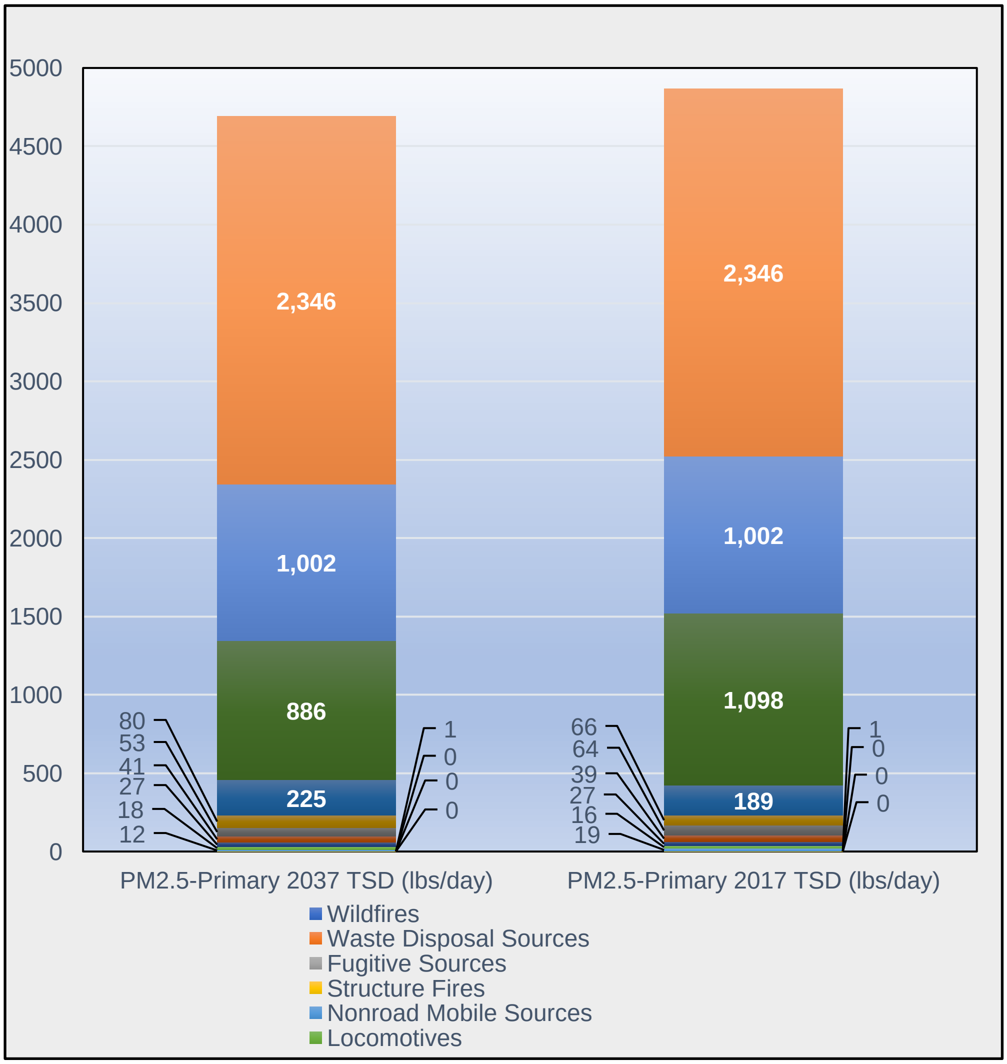

Figure 23. 2017 and 2037 $PM_{2.5}$ Comparison of Seasonal Daily Emissions

Table 31. 2017-2037 Annual and Seasonal Daily Emission Changes

Pollutant	2017 AE	2017 TSD	2022 AE	2022 TSD	2027 AE	2027 TSD	2032 AE	2032 TSD	2037 AE	2037 TSD
$PM_{2.5}$-Primary	611.0	4,868	609.9	4,832	609.3	4,815	608.9	4,803	605.3	4,691
$PM_{2.5}$-Filterable	192.2	1,079	189.5	1,015	188.1	983	187.2	962	178.5	760
PM-Condensable	36.5	109	37.6	108	38.2	107	38.6	107	42.2	103
NH_3	254.4	1,406	255.1	1,406	255.4	1,405	255.6	1,405	257.6	1,403
NO_X	1,057.9	6,256	1,003.4	5,972	979.5	5,848	963.6	5,765	812.1	4,980
SO_2	47.6	368	47.7	368	47.7	368	47.7	368	47.9	367
VOC	7,299.4	56,897	7,269.4	56,697	7,254.4	56,597	7,244.3	56,531	7,149.2	55,897

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 32. 2037 Annual and Seasonal Daily Pollutant Emissions by Category

Category by Pollutant	AE	AE % Distribution	TSD	TSD % Distribution
$PM_{2.5}$-Primary				
Events and Natural Sources	163.5	27%	2,347	50%
Mobile Sources	59.6	10%	348	7%
Nonpoint Sources	223.7	37%	994	21%
Point Sources	158.5	26%	1,002	21%
$PM_{2.5}$-Primary Total	605.3	100%	4,691	100%
NH_3				
Events and Natural Sources	32.2	12%	462	33%
Mobile Sources	10.1	4%	56	4%
Nonpoint Sources	103.6	40%	347	25%
Point Sources	111.7	43%	537	38%
NH_3 Total	257.6	100%	1,403	100%
NO_X				
Events and Natural Sources	72.8	9%	559	11%
Mobile Sources	451.0	56%	2,469	50%
Nonpoint Sources	79.8	10%	670	13%
Point Sources	208.5	26%	1,281	26%
NO_X Total	812.1	100%	4,980	100%
SO_2				
Events and Natural Sources	12.1	25%	174	47%
Mobile Sources	14.1	29%	71	19%
Nonpoint Sources	6.9	14%	38	10%
Point Sources	14.8	31%	84	23%
SO_2 Total	47.9	100%	367	100%
VOC				
Events and Natural Sources	5,613.1	79%	47,209	84%
Mobile Sources	224.1	3%	1,231	2%
Nonpoint Sources	756.5	11%	4,334	8%
Point Sources	555.5	8%	3,124	6%
VOC Total	7,149.2	100%	55,897	100%

Table 33. 2037 Annual and Seasonal Daily Emissions by $PM_{2.5}$ Emitting Sources

$PM_{2.5}$ Emitting Sources	$PM_{2.5}$ Emissions			
	AE	AE % Distribution	TSD	TSD % Distribution
Prescribed Fires	163.0	27%	2346	50%
Permitted Point Sources	158.5	26%	1002	21%
Stationary Fuel Combustion Sources	98.1	16%	886	19%
Waste Disposal Sources	49.1	8%	0	0%
Miscellaneous Sources	42.5	7%	80	2%
Re-Entrained Road Dust	38.2	6%	225	5%
Agriculture Sources	25.6	4%	27	1%
Fugitive Sources	8.3	1%	0	0%
Aircraft and Airport Operations	8.2	1%	41	1%
Onroad Mobile Sources	7.4	1%	53	1%
Locomotives	3.3	1%	18	0%
Nonroad Mobile Sources	2.5	0%	12	0%
Structure Fires	0.3	0%	1	0%
Wildfires	0.2	0%	0	0%
Grand Total	605	100%	4691	100%

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 34. 2037 $PM_{2.5}$ Annual and Seasonal Daily Emissions from Nonpoint Sources

Nonpoint $PM_{2.5}$ Emitting Sources	$PM_{2.5}$ Emissions	
	AE	TSD
Stationary Fuel Combustion Sources	98.1	886
Waste Disposal Sources	49.1	0
Miscellaneous Sources	42.5	80
Agriculture Sources	25.6	27
Fugitive Sources	8.3	0
Grand Total	224	994

AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)

Table 35. 2037 Annual and Seasonal Daily Emissions from Stationary Fuel Combustion Sources

Fuel Burning Equipment	$PM_{2.5}$ Emissions	
	AE	TSD
Residential Woodstove	42.4	395
Residential Hydronic Heater	24.4	254

Fuel Burning Equipment	$PM_{2.5}$ Emissions	
	AE	TSD
Residential Fireplace	11.4	144
Residential Outdoor Wood Devices	8.3	0
Residential Furnace	7.5	58
All Other Fuel Combustion Sources	4.1	36
Grand Total	98	886

Notes:
AE = Annual Emissions (tons per year)
TSD = Typical Season Day (pounds per day)
1) For Stationary Fuel Combustion, specifically residential woodstoves. A total of 411 woodstoves will be removed between 2017 and 2025 due to EPA's TAG (354), state approved funding (50), and HeatSmart (7), removing total of 19.3 tpy from this sector's emissions from the future year EI.

4 Transportation Conformity

4.1 Motor Vehicle Emissions Inventory

Transportation Conformity addresses air pollution from onroad mobile sources such as cars and trucks in the Klamath Falls NAA. Federal transportation conformity rules and regulations 40 CFR Parts 51 and 93 require the evaluation of potential changes to onroad emissions within Klamath Falls NAA that may be caused by proposed highway and transit projects over the next twenty-year period from 2017 to 2037.

Under conformity, emissions resulting from a transportation plan cannot exceed the allowable emissions level established for transportation in the air quality plan. This ensures that onroad transportation activities within Klamath Falls NAA will not violate overall air quality standards. DEQ's transportation conformity rules and process can be found in Oregon Administrative Rule 340, Division 252.

DEQ developed a 2017 and 2037 motor vehicle emissions inventory for the Klamath Falls NAA Maintenance Plan - to address Transportation Conformity and establish a Motor Vehicle Emissions Budget (MVEB). For this current plan, DEQ is only required to provide MVEB based on typical season day emissions. The previous SIP Plan (2012) used the highest emissions, worst-case day (2014), to establish the MVEB for onroad emissions sources including re-entrained road dust (RERD). However, this plan will only use typical season day emissions from the Motor Vehicle Emissions Inventory (MVEI) for onroad emissions sources only but not RERD to develop budget estimates. EPA instructed that RERD emissions do not need to be used in this MVEB because overall the $PM_{2.5}$ emission contribution is insignificant. The MVEB will be used to keep onroad emission levels within the limits of this SIP and prevent any further violations and ensure continued maintenance of the $PM_{2.5}$ NAAQS. The following sections discuss how a motor vehicle emissions inventory was developed and how those emissions were used to establish a MVEB.

4.1.1 Forecasting Future Year Motor Vehicle Emissions Inventories

4.1.1.1 Growth within Klamath Falls NAA

Emissions should reflect Klamath County and Klamath Falls NAA's growth in demographics and traffic patterns for the next 20-year period. Based on evaluations of 2018-2065 Coordinated Population Forecasts for Klamath County developed by Portland State University and Oregon Employment Department data indicate county demographics (e.g. population, housing, and employment) are expected to grow gradually from 2017 through 2037. County vehicle traffic growth is already incorporated into ODOT's Traffic Demand Model (TDM) based on projected changes in land use and roadway network patterns. DEQ used ArcGIS Pro to spatially allocate county demographics and traffic pattern data to the Klamath Falls NAA.

The population for the Klamath Falls NAA is expected to increase from 48,496 to 49,840 people as well as housing from 24,493 to 25,172 units over the next 20 years. Likewise, employment will also steadily increase over the next 20 years from 19,124 to 24,024 employees as new people move into the area or young adults enter the workforce. With the increase in NAA population, household, and employment numbers, the TDM projected annual VMT will increase from 308,194,262 to approximately 369,833,114 vehicle miles traveled.

4.1.1.2 Growth Factors

It was not necessary for DEQ to develop growth factors to estimate 2037 onroad and re-entrained road dust emissions. ODOT provided 2037 traffic activity data from their TDM, which already incorporated growth for the NAA; therefore, 2037 emissions were calculated directly in MOVES3.1 and not grown. Further, DEQ used the same 2037 traffic activity data provided by ODOT to calculate re-entrained road dust emissions outside of MOVES using EPA AP-42 emission factors. Once emission estimates were made for 2017 and 2037, onroad and re-entrained road dust emissions were linearly extrapolated between those years based on 5-year intervals.

4.1.2 Emissions Inventory Development and Tools Used

A motor vehicle emissions inventory (MVEI) was developed for the Klamath Falls NAA maintenance plan for 2017 attainment and 2037 future years. The procedure for developing 2017 and 2037 onroad and re-entrained road dust estimates is the same as those discussed in **Sections 2.7.2 and 2.7.3, and 3.1.4** of this report. DEQ used MOVES3.1 to estimate 2017 and 2037 emissions for Klamath Falls NAA and ran the model in emissions inventory mode using traffic activity data from ODOT's TDM to get regionally specific emissions. Re-entrained road dust emissions was not estimated in the MOVES3.1 model but instead uses daily VMT from the model runs, and emission factors developed using EPA AP-42 emission factor formulas.

4.1.2.1 MOVES Model

Onroad mobile source emissions were initially modeled using EPA's MOVES2014b model and re-ran in MOVES3.1 in Spring 2023 due to request by EPA and other transportation agencies . Two model runs per inventory years were conducted for the NAA: annual and typical season day emissions. Temperature profiles were specific to each model run. The runs included all vehicle and road types and the pollutants $PM_{2.5}$ including speciated pollutants and NH_3, NO_x, SO_2, and VOC. The model was run in emission inventory mode to output emissions for each road type, fuel type, day type, hour, speed bin, and process. See **Section 2.7.2.2 and Section 3.1.5.3** for 2017 and 2037 run specifications including panel settings and county data manager datasets used to run MOVES3.1.

4.1.2.2 Activity Data

Oregon Department of Transportation (ODOT) provided DEQ both 2008 and 2037 Daily Vehicle Miles Traveled (DVMT) activity data from their Travel Demand Model (TDM) to estimate transportation emissions in MOVES3.1. The activity data supplied was originally used to develop 2008, 2014 , and 2037 transportation emissions in MOVES2010 for the 2012 SIP Attainment Plan. The 2008 DVMT is based on actual vetted demographics data from Oregon State Office of Economic Analysis (OEA) and US Census 2000 for Klamath County. The TDM used the 2008 reference year extending out to the future year 2037 to satisfy the needs of the previous AQ analysis. All jurisdictions (ODOT, DEQ, and City of Klamath Falls) approved the demographics data and the roadwork network used in the TDM for the previous plan. Both DEQ and ODOT believes that limited changes in demographics and traffic activity patterns have not changed much since the previous plan and that it was not necessary to update 2017 and 2037 DVMT in the TDM for this current plan. Therefore, DEQ used the 2008 and 2037 DVMT to interpolate the 2017 attainment year activity and used the 2037 activity as-is to estimate transportation emissions in MOVES3.1. See **Section 2.7.2.1** for more detail on TDM activity data provided by ODOT.

4.1.2.3 Re-Entrained Road Dust

In addition to modeled onroad emissions, re-entrained road dust emissions for both paved and unpaved roads is included in the motor vehicle emissions inventory. Re-entrained road dust emissions are not estimated in the MOVES3.1 model but instead uses daily VMT from the model runs, and emission factors developed using EPA AP-42 emission factor formulas. Of particular interest for this inventory are the calculations for typical season day emissions. The typical season day is defined as the period immediately following a snow or ice event when roadway has been sanded or cindered. Under these conditions, the silt-loading factor to the roadway surface increases dramatically from normal seasonal conditions, and as such the resulting emissions estimates for paved road re-entrained dust are elevated. However, Klamath County has purchased sweepers that comply with strict California standards, based upon FHWA's estimates for high efficiency machines at 99.6% removal efficiency and 90% of the area covered. DEQ has therefore applied a control efficiency (CE) of 90% to paved road re-entrained dust typical season day emission estimates, resulting in large reduction in the final estimates. In addition to paved road dust estimates, this category also includes emissions from unpaved roads, which apply to approximately 5% of the roadway in the NAA. See **Section 2.7.3 and 3.1.5** for more details on developing emissions estimates for the attainment and future years.

4.1.3 Motor Vehicle Emissions Budget

The MVEB for this plan was established using 2037 onroad $PM_{2.5}$ and NO_x emission estimates from the MVEI and safety margins developed by DEQ. DEQ calculated safety margins of 9% for $PM_{2.5}$ and 23% for NO_x and applied to 2037 MVEI onroad mobile source emissions only to set the budget. DEQ calculated these safety margins for onroad mobile sources based on percent change from 2017-2037 for and NO_x typical season day emissions and then divided it in half. See the application of Formula 1 to estimate the safety margin. The safety margin was then applied to the 2037 MVEI onroad mobile emissions to calculate emissions allowance (Formula 2) that would cover any future transportation projects. The following formulas were applied to MVEI emissions.

Formula 1: Estimate Safety Margin:

$$\text{Safety Margin}_{pollutant} = (((\text{2017 attainment}_{pollutant} – \text{2037 future year}_{pollutant}) / \text{2017 attainment}_{pollutant})/2) * 100$$

The percent change divided in half provides a moderate cushion for $PM_{2.5}$ and NO_x emissions. The safety margin was applied to the 2037 emissions to calculate an increase in onroad mobile source emissions that would cover any future transportation projects.

Formula 2: Applying Safety Margin to 2037 Future Year (FY) Emissions:

$$MVEB_{pollutant} = \text{2037 FY}_{pollutant} + (\text{2037 FY}_{pollutant} * \text{Safety Margin}_{pollutant})$$

Both onroad mobile sources and re-entrained road dust emissions were included in the MVEB. However, DEQ is not applying any safety margins to re-entrained road dust and just using the 2037 emissions as-is to establish this sector in the MVEB to be consistent with its use in the previous plan.

DEQ decided to go a step further by providing additional cushion using a portion of woodstove emission reductions projected between 2017 and 2037 for the MVEB. DEQ applied the onroad mobile sources safety margins, 9% for $PM_{2.5}$ and 23% for NO_x, to get a portion of woodstove emission reductions allocated to the MVEB.

This re-assignment of both $PM_{2.5}$ and NO_x woodstove emission reductions is due to the approximate removal of 411 woodstoves over the next 20-year period. These removals include 354 woodstoves for the current EPA TAGs and 57 stoves based on 2019 state funding and DEQ's Heat Smart program. DEQ applied the safety margins against the difference in $PM_{2.5}$ and NO_x emissions between 2017 and 2037 for residential woodstoves and added that portion back to the MVEB. The portion of woodstove emission reductions for $PM_{2.5}$ and NO_x were calculated as follows:

Formula 3: Allocating a Portion of Woodstove Emissions Reductions to the MVEB:

$$MVEB_{pollutant} = (2017_{pollutant} - 2037_{pollutant}) * \text{Safety Margin}_{pollutant}$$

These additional emissions will help cover any uncertainty or other potential changes in modeled transportation network, regional policy, and economic conditions that might impact $PM_{2.5}$ and NO_x emissions within the NAA. 2017 emissions and air monitoring indicate that Klamath Falls NAA is already in attainment; therefore, if we set MVEB at these levels then the NAAQS and 2017 attainment year emissions should not be violated if emissions from planned transportation projects or more extensive economic growth does not exceed this budgeted amount.

4.2 Summary of Motor Vehicle Emissions Inventory and Budget

The following figures and tables summarize the final onroad transportation conformity budget. These tables and figures present a motor vehicles emissions inventory and motor vehicle emissions budget including all relevant emission sources for the NAA. **Appendix G: Section 4.0, Tables 67 through 69** provides emissions detail on vehicle miles traveled $PM_{2.5}$ emissions by vehicle process and seasonal daily emissions by process for the Motor Vehicle Emissions Inventory.

Motor Vehicle Emissions Inventory

Table 36. 2017-2037 Seasonal Daily Emissions for Onroad Mobile Source Emissions

pollutant code	2017	2022	2027	2032	2037
PM2.5-Primary	254	258	261	263	278
NH3	68	66	64	64	55
NOX	2,149	1,955	1,859	1,794	1,181
SO2	16	16	16	16	15
VOC	1,779	1,564	1,457	1,385	705

Table 37. 2017 and 2037 Seasonal Daily Emissions Comparison by $PM_{2.5}$ Process

Pollutants	2017 TSD (lbs/day)	2037 TSD (lbs/day)
Primary PM2.5 - Brakewear	7	12
Primary PM2.5 - Exhaust	55	37
Primary PM2.5 - RERD	189	225
Primary PM2.5 - Tirewear	2	4
Grand Total	**254**	**278**

*Re-Entrained Road Dust

Motor Vehicle Emissions Budget

Table 38. 2037 $PM_{2.5}$ and NO_X Onroad Emission Allowances and Potential Reductions to Use Towards Budget

Onroad Category and Woodstove Emissions Reductions	2017 and 2037 Typical Season Day Emissions (lbs/day)							
	2017		2037		2037 MVEB		Safety Margins (%)	
	$PM_{2.5}$	NOx	$PM_{2.5}$	NOx	$PM_{2.5}$	NOx	$PM_{2.5}$	NOx
Onroad	64	2149	53	1181	58	1447	9%	23%
Woodstove Emissions Reductions	617	64	395	57	20	2	9%	23%
Total Emissions (lbs/day)	681	2214	448	1238	77	1448		

Table 39. 2017 and 2037 $PM_{2.5}$ and NOX Seasonal Daily Emissions by Category for NAA

Typical Season Day (TSD) Emissions			
Pollutants and Emissions Category	Attainment and Future Year EI		MVEB
	2017	2037	2037
	(lbs/day)		
$PM_{2.5}$-Primary:			
Nonpoint Sources	1191	994	994
Events and Natural Sources	2347	2347	2347
Point Sources	1002	1002	1002
Woodstove Emissions Reductions	---	---	20

Typical Season Day (TSD) Emissions			
Pollutants and Emissions Category	Attainment and Future Year EI		MVEB
	2017	2037	2037
	(lbs/day)		
Onroad Mobile Sources	64	53	58
Subtotal	64	53	77
Re-Entrained Road Dust	189	225	225
Aircraft and Airport Operations	39	41	41
Nonroad Mobile Sources	19	12	12
Locomotives	16	18	18
Mobile Sources Subtotal	328	348	373
$PM_{2.5}$-Primary Total	4868	4691	4716
NO_X:			
Woodstove Emissions Reductions	---	---	2
Onroad Mobile Sources	2149	1181	1447
Subtotal	2149	1181	1448
Re-Entrained Road Dust	---	---	---
Aircraft and Airport Operations	558	574	574
Locomotives	550	619	619
Nonroad Mobile Sources	232	95	244
Mobile Sources Subtotal	3490	2469	2885
Point Sources	1551	1281	1281
Nonpoint Sources	656	670	681
Events and Natural Sources	559	559	559
NO_X Total	6256	4980	5407

5 Quality Assurance and Control

5.1 Introduction

The purpose of this section of the document is to describe the quality assurance (QA) and quality control (QC) procedures that were utilized in preparing the 2017 base and future year emission inventories for the Klamath Falls NAA. QA and QC are considered separate activities in this process where the QC is an internal system of routine technical activities implemented by inventory development personnel to measure and control the quality of the inventory as it is being developed, as well as checking the data generated.

5.2 Data Collection and Analysis

Inventoried sources are marked under the appropriate pollutant category. Only those sources that have been determined to operate in the inventoried areas were included. Source categories that were not included were summarized with an explanation for their omission in **Section 1.2.2**.

As discussed in Section 2.1, the source categories were divided into events and natural sources, point and nonpoint sources, and mobile sources. Stationary point source information is maintained by DEQ, so a questionnaire/survey was not necessary to identify point sources. Emissions from stationary point sources were calculated using 2017 production levels and the best available emission factors from permits.

Nonpoint source emissions were mostly obtained from 2017 NEI and appear in Section 2.4 detailing estimation approaches by emission category and sectors. In most cases estimated emissions were obtained from EPA. However, where DEQ estimated emissions activity and emission factor data sources were varied. However, in all cases, efforts were made to include the most up-to-date information available.

Nonroad vehicles and equipment (excluding aircraft and locomotives) and onroad mobile sources were based on emissions derived from MOVES3.1 and ODOT's transportation demand model. Locally available data at the county-wide level was used for VMT mix, and emissions by vehicle type.

Customized data included fuel parameters and temperatures.

5.3 Data Handling

Data handling included: 1) coding formats and data recording, 2) data tracking, and 3) QA/QC (which included data checking, data correcting, and handling corrected data). Specific additional procedures included checking data after conversion to the inventory format, checking for missing data, and reviewing the estimates.

5.3.1 Data Tracking

Information obtained from source files, other divisions of DEQ, other State and Local, and Federal agencies, and private companies used in compiling the emission inventories were recorded in references of this document, electronic files, and KFalls EI MS Access database. The excel files used for developing the final tables and figures are also stored electronically. All emission factors, throughputs, seasonal adjustment factors, and activities are documented in this document and stored in the database and kept at DEQ Headquarters.

5.3.2 Quality Assurance and Control Methods

Primary QA methods used for the Klamath Falls inventories included:

- Reality checks
- Calculation review and checks
- Reference data verification

QC methods for all emission categories included:

- Checking input data for inventory completeness, missing data, incorrect calculations, incorrect information, and reasonableness, and
- Correcting the database as well as calculation summary excel sheets.

5.3.3 Data Checking

5.3.3.1 Inventory Completeness

Completeness of the inventory was determined by checking against EPA's QA Plan guidance source listings and the 2008 SIP EI list of categories and sectors for Klamath County and the NAA.

Double counting was checked to ensure that industry type emissions included under point sources were removed from nonpoint or nonroad mobile emission categories. A tracking list of emission categories and sectors was developed in the KFalls EI MS Access database for this inventory. In addition, emissions used from the 2017 NEI were already reconciled for double counting of nonpoint stationary fuel combustion and surface coating emissions when DEQ prepared and submitted 2017 fuel throughput and coating emissions data from point sources for EPA to use in estimating emissions in the Wagon Wheel tool for nonpoint sources. DEQ reviewed this data to make sure the appropriate emissions were removed from the 2017 fuel combustion and surface coating emissions from nonpoint sources for Klamath County.

Extensive emission category list checks were conducted prior to and after completion of any emissions inventory work. Permitted point source emissions were checked against data prepared in DEQ's TRAACS permitting database and against EIS reports. The point source determination methodology can be reviewed in **Section 2.3** and the list of point sources was consistently referred to for completeness. The listing of nonpoint sources was derived from both EPA's 2017 NEI April 2020v1 release at county level and the list of nonpoint sectors from the 2008 SIP EI. It was assumed that the universe of sources in EPA's MOVES3.1 and the total VMT by link provided by ODOT encompassed all onroad source types.

5.3.3.2 Missing Data

Missing data for nonpoint and mobile sources can usually be identified by the inability to calculate emissions. If the appropriate data was missing, a reasonable effort was made to acquire it. If this was unsuccessful, estimates were made based on data of recent years or on information contained in EPA documents. Missing data was recorded in the database for point, nonpoint, and mobile sources.

5.3.3.3 Incorrect Calculations

In order to ensure that all the calculations were done correctly, the calculations were first reviewed to ensure that they were set up and used correctly; then the electronic equations were reviewed to make sure that they were entered correctly. QAQC queries were created in the KFalls EI MS Access database for each category and sector and used to test calculations of emissions. Any improperly used or incorrect calculations were removed from and updated in the database and the tables and figures of the excel spreadsheets.

5.3.3.4 Incorrect Information

In order to ensure that the information used for the calculations and in database tables and excel files are correct, all the explanations, titles, and reference were checked for accuracy and clarity. Any changes were documented and updated in database tables and in the excel files.

5.3.3.5 Reasonableness

A reasonableness check was performed on the estimated emissions, activity levels, and emission factors using the 2008 KFalls SIP EI submittal as a background comparison. Point source estimated emissions associated with the Air Contaminant Discharge and Title V Permit were reviewed in relation to similar sources as well as past NEI submittals for these facilities. In addition, stationary point source production levels, source tests, and permitted emission factors were rechecked against current and past source test reports, issued permits, and annual reports submitted by facilities. The references from which the emission factors and activity levels were taken were confirmed for the appropriateness of their use. Any reasonableness errors were documented in the database.

5.3.3.6 Reference Data Verification

All references used in the emissions inventory calculations for all source categories were verified and the source data checked for accuracy by both the EI developer and Senior Emissions Analyst. Reference verification is considered the most important steps of the QC process. All reference data cited in this document is kept at DEQ headquarters and available upon request. Section 6 contains a complete list of references cited.

5.3.4 Data Correction

Receipt of information that necessitated a correction to the data used in the preparation of the emission inventories was updated and documented with an explanation in the database.

5.3.5 Data Reporting

An electronic copy of this document will be provided to EPA Region 10.

6 References

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7 Appendices

Appendix A: Section 2.3

Table 40. 2017 Annual and Seasonal Daily Emissions at Emission Unit Level

DEQ Source Number	ES Description	SCC	Thruput Amount	UOM	Thruput Mat'l	SAF	Annual Activity Days	Pollutant	EF	2017	
										AE	TSD
18-0003	AIA	28888801	1	YR	Year	1.00	365	$PM_{2.5}$	2000	1.0	5
18-0003	AIA	28888801	1	YR	Year	1.00	365	NO_x	2000	1.0	5
18-0003	AIA	28888801	1	YR	Year	1.00	365	SO_2	2000	1.0	5
18-0003	Auxiliary Boiler	10100501	0	E3GAL	Distillate Oil	0.00	0	$PM_{2.5}$	0.0098	0.0	0
18-0003	Auxiliary Boiler	10100501	0	E3GAL	Distillate Oil	0.00	0	SO_2	(blank)	0.0	0
18-0003	Auxiliary Boiler	10100601	241056	E6BTU	Natural Gas	0.87	365	$PM_{2.5}$	0.0053	0.6	3
18-0003	Auxiliary Boiler	10100601	241056	E6BTU	Natural Gas	0.87	365	$PM_{2.5}$-Fil	0.0013	0.2	1
18-0003	Auxiliary Boiler	10100601	241056	E6BTU	Natural Gas	0.87	365	PM-Cond	0.0040	0.5	2
18-0003	Auxiliary Boiler	10100601	241056	E6BTU	Natural Gas	0.87	365	NH_3	0.003	0.4	2
18-0003	Auxiliary Boiler	10100601	241056	E6BTU	Natural Gas	0.87	365	NO_x	(blank)	5.0	24
18-0003	Auxiliary Boiler	10100601	241056	E6BTU	Natural Gas	0.87	365	SO_2	0.0006	0.1	0
18-0003	Turbines 1-2	20100209	17023821	E6BTU	Natural Gas	0.88	365	NH_3	0.0065	55.3	266
18-0003	Turbines 1-2	20100209	17023821	E6BTU	Natural Gas	1.00	365	$PM_{2.5}$	0.0018	15.3	84
18-0003	Turbines 1-2	20100209	17023821	E6BTU	Natural Gas	1.00	365	NO_x	(blank)	129.0	707
18-0003	Turbines 1-2	20100209	17023821	E6BTU	Natural Gas	1.00	365	SO_2	0.0006	5.1	28
18-0003	Turbines 3-6	20100109	0	E3GAL	Distillate Oil	0.00	0	$PM_{2.5}$	0.016	0.0	0
18-0003	Turbines 3-6	20100109	0	E3GAL	Distillate Oil	0.00	0	SO_2	(blank)	0.0	0
18-0003	Turbines 3-6	20100209	727075	E6BTU	Natural Gas	0.88	365	NH_3	0.0065	55.3	266
18-0003	Turbines 3-6	20100209	727075	E6BTU	Natural Gas	1.00	365	$PM_{2.5}$	0.0072	2.6	14
18-0003	Turbines 3-6	20100209	727075	E6BTU	Natural Gas	1.00	365	NO_x	(blank)	8.0	44
18-0003	Turbines 3-6	20100209	727075	E6BTU	Natural Gas	1.00	365	SO_2	0.0006	0.2	1
18-0006	AIA	30700799	1	YR	Year	1.00	365	$PM_{2.5}$	2000	1.0	5
18-0006	Boiler G	10200905	190740	E3LB	Steam	1.00	365	$PM_{2.5}$	0.017	1.6	9

DEQ Source Number	ES Description	SCC	Thruput Amount	UOM	Thruput Mat'l	SAF	Annual Activity Days	Pollutant	EF	2017	
										AE	TSD
18-0006	Boiler G	10200905	190740	E3LB	Steam	1.00	365	NH_3	0.0025	0.2	1
18-0006	Boiler G	10200905	190740	E3LB	Steam	1.00	365	NO_x	(blank)	22.0	121
18-0006	Boiler G	10200905	190740	E3LB	Steam	1.00	365	SO_2	0.014	1.3	7
18-0006	Dehumid. Kilns	30700799	24030	E3BDFT	Lumber	1.00	357	$PM_{2.5}$	0.006	0.1	0
18-0006	Millwork	30700799	24030	E3BDFT	Lumber	1.00	349	$PM_{2.5}$	0.17	2.0	12
18-0006	Millwork	30704003	24030	E3BDFT	Lumber	1.00	349	$PM_{2.5}$	0.13	1.6	9
18-0006	NG Combustion	10300602	183	E6FT3	Natural Gas	1.12	365	$PM_{2.5}$	2.5	0.2	1
18-0006	NG Combustion	10300602	183	E6FT3	Natural Gas	1.12	365	$PM_{2.5}$-Fil	0.625	0.1	0
18-0006	NG Combustion	10300602	183	E6FT3	Natural Gas	1.12	365	PM-Cond	1.875	0.2	1
18-0006	NG Combustion	10300602	183	E6FT3	Natural Gas	1.12	365	NH_3	0.49	0.0	0
18-0006	NG Combustion	10300602	183	E6FT3	Natural Gas	1.12	365	NO_x	50	4.6	28
18-0006	NG Combustion	10300602	183	E6FT3	Natural Gas	1.12	365	SO_2	2.6	0.2	1
18-0006	Wood Fiber Div.	30700799	156318	E3FT2	Hardboard	1.00	349	$PM_{2.5}$	0.006	0.5	3
18-0006	Wood Fiber Div.	30704003	156318	E3FT2	Hardboard	1.00	349	$PM_{2.5}$	0.0036	0.3	2
18-0013	4 Defib/Dryers	30700799	348086	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.165	28.7	157
18-0013	AIA	30700799	1	YR	Year	1.00	365	$PM_{2.5}$	2000	1.0	5
18-0013	Bake Oven (BO)	30700799	5	E6FT3	Natural Gas	1.00	365	SO_2	0.6	0.0	0
18-0013	Bake Oven (BO)	30700799	348086	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.009	1.6	9
18-0013	Bake Oven (BO)	30700799	348086	E3FT2	Hardboard	1.00	365	NO_x	0.013	2.3	12
18-0013	BO Roof Vents	30700799	348086	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.04	7.0	38
18-0013	Coating Ovens	40202131	41	E6FT3	Natural Gas	1.00	365	$PM_{2.5}$	7.5	0.2	1
18-0013	Coating Ovens	40202131	41	E6FT3	Natural Gas	1.00	365	NO_x	100	2.0	11
18-0013	Coating Ovens	40202131	41	E6FT3	Natural Gas	1.00	365	SO_2	0.6	0.0	0
18-0013	Core Dryers	30700799	0	E3GAL	Distillate Oil	0.00	0	$PM_{2.5}$	2.3	0.0	0
18-0013	Core Dryers	30700799	0	E3GAL	Distillate Oil	0.00	0	NO_x	20	0.0	0
18-0013	Core Dryers	30700799	0	E3GAL	Distillate Oil	0.00	0	SO_2	71	0.0	0
18-0013	Core Dryers	30700799	51	E6FT3	Natural Gas	1.00	365	NO_x	100	2.6	14

DEQ Source Number	ES Description	SCC	Thruput Amount	UOM	Thruput Mat'l	SAF	Annual Activity Days	Pollutant	EF	2017	
										AE	TSD
18-0013	Core Dryers	30700799	51	E6FT3	Natural Gas	1.00	365	SO_2	0.6	0.0	0
18-0013	Core Dryers	30700799	88415	TON	Wood/Bark	1.00	365	$PM_{2.5}$	0.465	20.6	113
18-0013	Cyclone (27)	30700808	348086	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.003	0.5	3
18-0013	Cyclone (7)	30700808	348086	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.032	5.6	31
18-0013	CYC (PB22)	30700799	5676	HR	Hours	1.00	365	$PM_{2.5}$	0.108	0.3	2
18-0013	CYC (PB24)	30700799	5676	HR	Hours	1.00	365	$PM_{2.5}$	0.54	1.5	8
18-0013	CYC-Pri. Filters	30700799	142825	TON	Wood/Bark	1.00	365	$PM_{2.5}$	0.001	0.1	0
18-0013	Cyclones (CYC)	30700808	6208	HR	Hours	1.00	365	$PM_{2.5}$	0.0005	0.0	0
18-0013	Cyclones (CYC)	30700808	6208	HR	Hours	1.00	365	$PM_{2.5}$	0.03	0.1	1
18-0013	Cyclones (CYC)	30700808	6208	HR	Hours	1.00	365	$PM_{2.5}$	0.038	0.1	1
18-0013	Cyclones (CYC)	30700808	348086	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.006	1.0	6
18-0013	CYC (15,25,26,30)	30700808	74976	TON	Wood/Bark	1.00	365	$PM_{2.5}$	0.001	0.0	0
18-0013	CYC (19,20,21)	30700808	6208	HR	Hours	1.00	365	$PM_{2.5}$	0.03	0.1	1
18-0013	CYC- Sec. Filters	30700799	5676	HR	Hours	1.00	365	$PM_{2.5}$	0.7	2.0	11
18-0013	CYC- Sec. Filters	30700799	48515	TON	Wood/Bark	1.00	365	$PM_{2.5}$	0.004	0.1	1
18-0013	NG Combustion	30700799	97	E6FT3	Natural Gas	1.00	365	NH_3	3.2	0.2	1
18-0013	Biofilter	30700799	87981	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.178	7.8	43
18-0013	Sec. Screens	30700799	45341	TON	Wood/Bark	1.00	365	$PM_{2.5}$	0.001	0.0	0
18-0013	Storage Piles	30704002	1	YR	Constant Time	1.00	365	$PM_{2.5}$	(blank)	0.3	2
18-0013	Surface Dryers	30700799	45341	TON	Wood/Bark	1.00	365	$PM_{2.5}$	0.058	1.3	7
18-0013	Trim Saw Vent	30700799	87981	E3FT2	Hardboard	1.00	365	$PM_{2.5}$	0.031	1.4	7
18-0013	Unpaved Roads	30700799	1	YR	Constant Time	1.00	365	$PM_{2.5}$	(blank)	0.1	1
18-0014	Mat'l Handling	30700808	114402	E3FT2	Plywood	1.00	230	$PM_{2.5}$	0.062	3.6	31
18-0014	NG Combustion	10300602	11	E6FT3	Natural Gas	1.12	230	$PM_{2.5}$	2.5	0.0	0
18-0014	NG Combustion	10300602	11	E6FT3	Natural Gas	1.12	230	$PM_{2.5}$-Fil	0.625	0.0	0
18-0014	NG Combustion	10300602	11	E6FT3	Natural Gas	1.12	230	PM-Cond	1.875	0.0	0

DEQ Source Number	ES Description	SCC	Thruput Amount	UOM	Thruput Mat'l	SAF	Annual Activity Days	Pollutant	EF	2017	
										AE	TSD
18-0014	NG Combustion	10300602	11	E6FT3	Natural Gas	1.12	230	NH_3	0.49	0.0	0
18-0014	NG Combustion	10300602	11	E6FT3	Natural Gas	1.12	230	NO_x	100	0.6	5
18-0014	NG Combustion	10300602	11	E6FT3	Natural Gas	1.12	230	SO_2	1.7	0.0	0
18-0014	North Boiler	10200905	0	E3LB	Steam	0.00	0	$PM_{2.5}$	0.22	0.0	0
18-0014	North Boiler	10200905	0	E3LB	Steam	0.00	0	NO_x	0.37	0.0	0
18-0014	North Boiler	10200905	0	E3LB	Steam	0.00	0	SO_2	0.01	0.0	0
18-0014	South Boiler	10200905	144588	E3LB	Steam	1.00	230	$PM_{2.5}$	0.3	21.7	189
18-0014	South Boiler	10200905	144588	E3LB	Steam	1.00	230	NO_x	0.52	37.6	327
18-0014	South Boiler	10200905	144588	E3LB	Steam	1.00	230	SO_2	0.01	0.7	6
18-0014	South Boiler	10200905	144588	E3LB	Steam	1.00	365	NH_3	0.0025	0.2	1
18-0014	Storage Piles	30700821	114402	E3FT2	Plywood	1.00	230	$PM_{2.5}$	0.015	0.9	7
18-0014	Veneer Dryers	30700752	83829	E3FT2	Veneer	1.00	230	$PM_{2.5}$	0.36	15.1	131
18-0014	Veneer Dryers	30700752	83829	E3FT2	Veneer	1.00	230	NO_x	0.12	5.0	44
18-0018	Crem. Incin.	31502101	1	E6FT3	Natural Gas	1.00	365	NO_x	100	0.1	0
18-0018	Crem. Incin.	31502101	1	E6FT3	Natural Gas	1.00	365	SO_2	1.7	0.0	0
18-0018	Crem. Incin.	31502101	815	TON	Material	1.00	365	$PM_{2.5}$	3.15	1.3	7
18-0020	Auxiliary Boiler	10200403	53	E3GAL	Residual Oil	1.00	365	$PM_{2.5}$	51	1.4	7
18-0020	Auxiliary Boiler	10200403	53	E3GAL	Residual Oil	1.00	365	$PM_{2.5}$-Fil	0	0.0	0
18-0020	Auxiliary Boiler	10200403	53	E3GAL	Residual Oil	1.00	365	PM-Cond	0	0.0	0
18-0020	Auxiliary Boiler	10200403	53	E3GAL	Residual Oil	1.00	365	NH_3	0.8	0.0	0
18-0020	Auxiliary Boiler	10200403	53	E3GAL	Residual Oil	1.00	365	NO_x	19	0.5	3
18-0020	Auxiliary Boiler	10200403	53	E3GAL	Residual Oil	1.00	365	SO_2	(blank)	3.6	20
18-0020	Auxiliary Boiler	10200503	2	E3GAL	Distillate Oil	1.00	365	$PM_{2.5}$	2.1	0.0	0
18-0020	Auxiliary Boiler	10200503	2	E3GAL	Distillate Oil	1.00	365	$PM_{2.5}$-Fil	0.3387	0.0	0
18-0020	Auxiliary Boiler	10200503	2	E3GAL	Distillate Oil	1.00	365	PM-Cond	1.7613	0.0	0
18-0020	Auxiliary Boiler	10200503	2	E3GAL	Distillate Oil	1.00	365	NH_3	0.8	0.0	0
18-0020	Auxiliary Boiler	10200503	2	E3GAL	Distillate Oil	1.00	365	NO_x	20	0.0	0

DEQ Source Number	ES Description	SCC	Thruput Amount	UOM	Thruput Mat'l	SAF	Annual Activity Days	Pollutant	EF	2017	
										AE	TSD
18-0020	Auxiliary Boiler	10200503	2	E3GAL	Distillate Oil	1.00	365	SO_2	71	0.1	0
18-0022	Boilers/Heaters	10200603	19	E6FT3	Natural Gas	1.07	365	$PM_{2.5}$	2.5	0.0	0
18-0022	Boilers/Heaters	10200603	19	E6FT3	Natural Gas	1.07	365	$PM_{2.5}$-Fil	0.625	0.0	0
18-0022	Boilers/Heaters	10200603	19	E6FT3	Natural Gas	1.07	365	PM-Cond	1.875	0.0	0
18-0022	Boilers/Heaters	10200603	19	E6FT3	Natural Gas	1.07	365	NH_3	3.2	0.0	0
18-0022	Boilers/Heaters	10200603	19	E6FT3	Natural Gas	1.07	365	NO_x	100	0.9	6
18-0022	Boilers/Heaters	10200603	19	E6FT3	Natural Gas	1.07	365	SO_2	2.6	0.0	0
18-0053	Crem. Incin.	31502101	3	TON	Material	1.00	365	$PM_{2.5}$	3.15	0.0	0
18-0056	Boilers	10200602	12	E6FT3	Natural Gas	1.01	365	$PM_{2.5}$	2.5	0.0	0
18-0056	Boilers	10200602	12	E6FT3	Natural Gas	1.01	365	$PM_{2.5}$-Fil	0.625	0.0	0
18-0056	Boilers	10200602	12	E6FT3	Natural Gas	1.01	365	PM-Cond	1.875	0.0	0
18-0056	Boilers	10200602	12	E6FT3	Natural Gas	1.01	365	NH_3	3.2	0.0	0
18-0070	Concrete Prod.	30501101	24400	YD3	Concrete	0.96	365	$PM_{2.5}$	0.03	0.4	2
18-0078	Baghouse	30501899	8112	TON	Wood Waste	1.00	365	$PM_{2.5}$	0.71	2.9	16
18-0078	Furnace	30501801	18	E6FT3	Natural Gas	1.00	365	$PM_{2.5}$	2.5	0.0	0
18-0078	Furnace	30501801	18	E6FT3	Natural Gas	1.00	365	NO_x	100	0.9	5
18-0078	Furnace	30501801	18	E6FT3	Natural Gas	1.00	365	SO_2	2.6	0.0	0
18-0086	CYC (High Effic)	30700808	251	TON	Wood Waste	1.00	365	$PM_{2.5}$	0.059	0.0	0
18-0088	Crem. Incin.	31502101	14	TON	Material	1.00	365	$PM_{2.5}$	3.15	0.0	0
18-0097	Engine Testing	20400110	1	HR	Hours	1.00	365	$PM_{2.5}$	1.13	0.0	0
18-0097	Engine Testing	20400110	1	HR	Hours	1.00	365	NO_x	9.07	0.0	0
18-0097	Engine Testing	20400110	1	HR	Hours	1.00	365	SO_2	1.15	0.0	0
18-0097	Engine Testing	20400110	4	HR	Hours	1.00	365	$PM_{2.5}$	11.6	0.0	0
18-0097	Engine Testing	20400110	4	HR	Hours	1.00	365	NO_x	284	0.5	3
18-0097	Engine Testing	20400110	4	HR	Hours	1.00	365	SO_2	10.3	0.0	0
18-0097	Engine Testing	20400110	5	HR	Hours	1.00	365	$PM_{2.5}$	10.7	0.0	0
18-0097	Engine Testing	20400110	5	HR	Hours	1.00	365	NO_x	128	0.3	2

DEQ Source Number	ES Description	SCC	Thruput Amount	UOM	Thruput Mat'l	SAF	Annual Activity Days	Pollutant	EF	2017	
										AE	TSD
18-0097	Engine Testing	20400110	5	HR	Hours	1.00	365	SO_2	6.12	0.0	0
18-0097	Engine Testing	20400110	17	HR	Hours	1.00	365	$PM_{2.5}$	2.01	0.0	0
18-0097	Engine Testing	20400110	17	HR	Hours	1.00	365	NO_x	5	0.0	0
18-0097	Engine Testing	20400110	17	HR	Hours	1.00	365	SO_2	1.15	0.0	0
18-9503	Crem. Incin.	31502101	2	E6FT3	Material	1.00	365	NO_x	100	0.1	1
18-9503	Crem. Incin.	31502101	2	E6FT3	Material	1.00	365	SO_2	1.7	0.0	0
18-9503	Crem. Incin.	31502101	21	TON	Material	1.00	365	$PM_{2.5}$	3.15	0.0	0
37-0625	Concrete Prod.	30501101	10809	YD3	Concrete	0.96	365	$PM_{2.5}$	0.03	0.2	1
37-0675	Diesel Engine	20100107	115	E3GAL	Diesel	1.00	365	$PM_{2.5}$	42.5	2.4	13
37-0675	Diesel Engine	20100107	115	E3GAL	Diesel	1.00	365	NO_x	604	34.6	190
37-0675	Diesel Engine	20100107	115	E3GAL	Diesel	1.00	365	SO_2	39.7	2.3	12
37-0675	Rock Crusher	30502001	458798	TON	Rock	1.00	365	$PM_{2.5}$	0.0012	0.3	2

Notes:
1) AIA = Aggregate Insignificant Activities
AE (tpy) = Annual Emissions (tons per year)
TSD (lbs/day) = Typical Season Day Emissions (pounds per day)
YR = Year
E3GAL = 1000 Gallons
E6BTU = Million British Thermal Units
E3LB = 1000 Pounds
E3BDFT = 1000 Board Feet
E6FT3 = Million Cubic Feet
E3FT2 = 1000 Square Feet
EF = pounds per throughput unit
HR = Hours
YD3 = Cubic Yards
$PM_{2.5}$-Fil = $PM_{2.5}$-Filterable
PM-Cond = PM Condensable
Concrete Prod. = Concrete Production
Crem. Incin. = Crematory Incinerator
2) Activity data taken from 2017 Annual Reports (per permit condition) and emission basis (e.g. emission units/processes, emission factors, etc.) taken from DEQ permits.

3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
Activity days per year acquired from facility operating schedules for 2017
5) Emission factor column, (blank) = no emission factor due to material balance or CEM

Appendix B: Section 2.4

Table 41. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions from Agriculture Sources

Agricultural Emitting Sources	SCC	SAF	Annual Activity Days	County to NAA Ratio	$PM_{2.5}$-Primary			$PM_{2.5}$-Filterable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Agricultural Field Burning	2801500000	0.50	365	4%	63.0	2.7	7	0.0	0.0	0
Agricultural Field Burning	2801500262	1.00	365	4%	2.4	0.1	1	0.0	0.0	0
Agriculture Tilling	2801000003	0.72	365	4%	299.1	12.9	0	299.1	12.9	0
Animal Husbandry - Beef Cattle Dust	2805001000	0.44	365	4%	175.7	7.6	18	175.7	7.6	18
Animal Husbandry - Beef Cattle Waste	2805002000	0.44	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Broilers Dust	2805001020	0.44	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Dairy Cattle Dust	2805001010	0.44	365	4%	9.6	0.4	1	9.6	0.4	1
Animal Husbandry - Dairy Cattle Waste	2805018000	0.53	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Goats Waste	2805045000	0.53	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Horses Waste	2805035000	0.53	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Layers Dust	2805001030	0.44	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Poultry Waste	2805007100	0.39	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Poultry Waste	2805009100	0.39	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Poultry Waste	2805010100	0.39	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Sheep Waste	2805040000	0.53	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Swine Dust	2805001040	0.44	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Swine Waste	2805025000	0.48	365	4%	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Turkeys Dust	2805001050	0.44	365	4%	0.0	0.0	0	0.0	0.0	0
Commercial Fertilizer and Pesticide Application	2461850000	1.00	365	4%	0.0	0.0	0	0.0	0.0	0
Commercial Fertilizer and Pesticide Application	2801700099	0.25	365	4%	0.0	0.0	0	0.0	0.0	0
Geogenic Wind Erosion	2730100000	0.00	365	4%	46.6	1.9	0	0.0	0.0	0

Agricultural Emitting Sources	SCC	SAF	Annual Activity Days	County to NAA Ratio	$PM_{2.5}$-Primary			$PM_{2.5}$-Filterable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Grand Total					596	26	27	484	21	19

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA farm and cropland acreage determine via GIS analysis and divided to get the ratio.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) For Geogenic Wind Erosion and Agriculture Tilling: seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM winter season (465).
6) EPA Data Source = 2017NEI_Apr2020

Table 42. 2017 $PM_{2.5}$ Precursor Pollutant Annual and Seasonal Daily Emissions from Agriculture Sources

Agricultural Emitting Sources	SCC	SAF	CTY to NAA Ratio	NH_3			NO_X			SO_2			VOC		
				CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Agricultural Field Burning	2801500000	0.50	4%	34.0	1.5	4	11.7	0.5	1	2.2	0.1	0	50.1	2.2	6
Agricultural Field Burning	2801500262	1.00	4%	9.8	0.4	2	1.4	0.1	0	0.3	0.0	0	5.4	0.2	1
Agriculture Tilling	2801000003	0.72	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Beef Cattle Dust	2805001000	0.44	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Beef Cattle Waste	2805002000	0.44	4%	348.7	15.1	36	0.0	0.0	0	0.0	0.0	0	27.9	1.2	3
Animal Husbandry - Broilers Dust	2805001020	0.44	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Dairy Cattle Dust	2805001010	0.44	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Dairy Cattle Waste	2805018000	0.53	4%	190.0	8.2	24	0.0	0.0	0	0.0	0.0	0	15.2	0.7	2
Animal Husbandry - Goats Waste	2805045000	0.53	4%	1.9	0.1	0	0.0	0.0	0	0.0	0.0	0	0.2	0.0	0
Animal Husbandry - Horses Waste	2805035000	0.53	4%	21.5	0.9	3	0.0	0.0	0	0.0	0.0	0	1.7	0.1	0
Animal Husbandry - Layers Dust	2805001030	0.44	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Poultry Waste	2805007100	0.39	4%	0.4	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Poultry Waste	2805009100	0.39	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Poultry Waste	2805010100	0.39	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Sheep Waste	2805040000	0.53	4%	10.3	0.4	1	0.0	0.0	0	0.0	0.0	0	0.8	0.0	0
Animal Husbandry - Swine Dust	2805001040	0.44	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Swine Waste	2805025000	0.48	4%	0.5	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Animal Husbandry - Turkeys Dust	2805001050	0.44	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0

Agricultural Emitting Sources	SCC	SAF	CTY to NAA Ratio	NH_3			NO_X			SO_2			VOC		
				CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Commercial Fertilizer and Pesticide Application	2461850000	1.00	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	409.1	17.7	97
Commercial Fertilizer and Pesticide Application	2801700099	0.25	4%	1037.5	44.8	60	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Geogenic Wind Erosion	2730100000	0.00	4%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Grand Total				1655	71	131	13	1	2	2	0	0	511	22	109

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA farm and cropland acreage determine via GIS analysis and divided to get the ratio.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) For Geogenic Wind Erosion and Agriculture Tilling: seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM winter season (465).
6) EPA Data Source = 2017NEI_Apr2020

Table 43. 2017 VOC Annual and Seasonal Daily Emissions from Evaporative/Off-Gassing Sources

VOC Emitting Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC		
					CTY AE (tpy)	NAA AE (tpy)	NAA TSD (lbs/day)
Consumer & Commercial Solvent Use:							
All Adhesives and Sealants	2460600000	1.00	365	72%	18.8	13.4	74
All Automotive After Market Products	2460400000	1.00	365	72%	44.8	32.1	176
All Coatings and Related Products	2460500000	1.00	365	72%	31.3	22.4	123
All FIFRA Related Products	2460800000	1.00	365	72%	58.6	42.0	230
All Household Products	2460200000	1.00	365	72%	72.4	51.9	284
All Personal Care Products	2460100000	1.00	365	72%	65.8	47.1	258
Cutback Asphalt	2461021000	1.00	365	5%	3.5	0.2	1
Emulsified Asphalt	2461022000	1.00	365	5%	33.7	1.7	10
Miscellaneous Products (Not Otherwise Covered)	2460900000	1.00	365	72%	2.3	1.7	9
Consumer & Commercial Solvent Use Sum					331.2	212.4	1164
Industrial Surface Coating & Solvent Use:							
Auto Refinishing: SIC 7532	2401005000	1.00	365	100%	11.8	11.8	65
Degreasing	2415000000	1.00	365	85%	22.4	15.1	70
Dry Cleaning	2420000000	0.99	365	100%	0.0	0.0	0
Factory Finished Wood: SIC 2426 thru 242	2401015000	0.98	365	73%	21.2	3.8	19
Graphic Arts	2425000000	1.00	365	100%	121.8	121.8	668
Industrial Maintenance Coatings	2401100000	1.00	365	78%	19.9	15.4	84
Machinery and Equipment: SIC 35	2401055000	1.00	365	60%	0.0	0.0	0
Metal Cans: SIC 341	2401040000	1.00	365	0%	47.3	0.0	0
Metal Furniture: SIC 25	2401025000	1.02	365	100%	6.1	6.1	34
Miscellaneous Manufacturing	2401090000	1.00	365	100%	0.0	0.0	0
Motor Vehicles: SIC 371	2401070000	0.98	365	0%	0.6	0.0	0

VOC Emitting Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC		
					CTY AE (tpy)	NAA AE (tpy)	NAA TSD (lbs/day)
Other Special Purpose Coatings	2401200000	1.00	365	78%	0.2	0.2	1
Paper: SIC 26	2401030000	1.00	365	0%	0.0	0.0	0
Wood Furniture: SIC 25	2401020000	1.02	365	100%	0.0	0.0	0
Industrial Surface Coating & Solvent Use Sum					251.3	174.3	941
Non-Industrial Surface Coating:							
Architectural Coatings	2401001000	0.99	365	72%	77.0	55.2	300
Traffic Markings	2401008000	1.00	365	5%	12.4	0.6	3
Non-Industrial Surface Coating Sum					89.4	55.8	304
Petroleum Product Storage and Transport:							
Airports : Aviation Gasoline	2501080050	1.00	365	62%	11.1	6.9	38
Airports : Aviation Gasoline	2501080100	1.00	365	62%	0.0	0.0	0
Bulk Plants: All Evaporative Losses	2501055120	1.00	365	33%	0.0	0.0	0
Bulk Terminals: All Evaporative Losses	2501050120	1.00	365	33%	2.8	0.9	5
Commercial Portable Gas Cans	2501012011	0.39	260	29%	0.1	0.0	0
Commercial Portable Gas Cans	2501012012	0.39	260	29%	0.1	0.0	0
Commercial Portable Gas Cans	2501012013	0.82	365	29%	3.7	1.1	5
Commercial Portable Gas Cans	2501012014	0.82	365	29%	1.2	0.3	2
Commercial Portable Gas Cans	2501012015	0.82	365	29%	0.1	0.0	0
Gasoline Service Stations	2501060051	1.00	365	62%	88.8	55.2	303
Gasoline Service Stations	2501060052	1.00	365	62%	0.0	0.0	0
Gasoline Service Stations	2501060053	1.00	365	62%	3.4	2.1	12
Gasoline Service Stations	2501060201	1.00	365	62%	22.0	13.7	75
Residential Portable Gas Cans	2501011011	0.39	260	72%	1.7	1.2	4
Residential Portable Gas Cans	2501011012	0.39	260	72%	1.9	1.3	4
Residential Portable Gas Cans	2501011013	0.82	365	72%	2.7	1.9	9

VOC Emitting Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC		
					CTY AE (tpy)	NAA AE (tpy)	NAA TSD (lbs/day)
Residential Portable Gas Cans	2501011014	0.82	365	72%	0.4	0.3	1
Residential Portable Gas Cans	2501011015	0.82	365	72%	0.1	0.1	0
Truck Gasoline Transport	2505030120	1.00	365	0%	1.0	0.8	5
Petroleum Product Storage and Transport Sum					141.1	86.1	462
Grand Total					813.0	528.6	2871

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA ratio determined via GIS analysis using the following data:
Employment population (Industrial),
Permitted gas stations and bulk plants (Petroleum Storage and Transport),
Roadway mileage (Non-industrial),
Housing units (Commercial and Consumer),
Zoning (Commercial)
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) Petroleum Product Storage and Transport: only residential and commercial portable gas cans and truck gasoline transport included in 2008 EI. Gas stations, bulk terminals and plants, and airport aviation gasoline storage was added to the evaporative/off-gassing subcategory in 2017 EI. If you remove the 2017 additions total emissions as compared to 2008 emissions are 7.2 tpy versus 23.5 in 2008.

Table 44. 2017 VOC Annual and Seasonal Daily Emissions from Truck Transport of Gasoline

Source Name	DEQ Source Number	SCC	SAF	Annual Activity Days	Station Thruput (E3GAL)	Truck Transport Thruput (E3GAL)	GTA factor	Truck Transport EF	VOC	
									Truck Transport AE	Truck Transport TSD
AMA Mini Mart Inc.	18-9509	4-06-003-99	1.00	365	1070	1338	1.25	0.06	0.0	0
AMA Mini Mart, Inc.	18-9510	4-06-003-99	1.00	365	212	265	1.25	0.06	0.0	0
AMA Mini Mart, Inc.	18-9511	4-06-003-99	1.00	365	744	930	1.25	0.06	0.0	0
Castel's Southside LLC	18-0027	4-06-003-99	1.00	365	541	676	1.25	0.06	0.0	0
Colvin Oil I, LLC	18-9530	4-06-003-99	1.00	365	593	741	1.25	0.06	0.0	0
Colvin Oil I, LLC	18-9531	4-06-003-99	1.00	365	283	354	1.25	0.06	0.0	0
Ed Staub and Sons Petroleum, Inc.	18-0037	4-06-003-99	1.00	365	105	131	1.25	0.06	0.0	0
Ed Staub and Sons Petroleum, Inc.	18-9519	4-06-003-99	1.00	365	962	1203	1.25	0.06	0.0	0
Ed Staub and Sons Petroleum, Inc.	18-9520	4-06-003-99	1.00	365	168	210	1.25	0.06	0.0	0
Ed Staub and Sons Petroleum, Inc.	18-9521	4-06-003-99	1.00	365	587	734	1.25	0.06	0.0	0
Ed Staub and Sons Petroleum, Inc.	18-9522	4-06-003-99	1.00	365	816	1020	1.25	0.06	0.0	0
Ed Staub and Sons Petroleum, Inc.	18-9523	4-06-003-99	1.00	365	293	366	1.25	0.06	0.0	0
Ed Staub and Sons Petroleum, Inc.	18-9543	4-06-003-99	1.00	365	23	29	1.25	0.06	0.0	0
Ezell Suty Fuel Incorporated	18-9506	4-06-003-99	1.00	365	925	1156	1.25	0.06	0.0	0
Fred Meyer Stores, Inc.	18-9527	4-06-003-99	1.00	365	5592	6990	1.25	0.06	0.2	1
ISA Enterprises Campus Inc	18-0044	4-06-003-99	1.00	365	566	708	1.25	0.06	0.0	0
Klamath Falls Kampground Inc	18-9528	4-06-003-99	1.00	365	110	138	1.25	0.06	0.0	0
Oregon Avenue Food Mart	18-9534	4-06-003-99	1.00	365	822	1028	1.25	0.06	0.0	0

Source Name	DEQ Source Number	SCC	SAF	Annual Activity Days	Station Thruput (E3GAL)	Truck Transport Thruput (E3GAL)	GTA factor	Truck Transport EF	VOC	
									Truck Transport AE	Truck Transport TSD
Pilot Travel Centers LLC	18-0039	4-06-003-99	1.00	365	2682	3353	1.25	0.06	0.1	1
Prems Gas and Mini Mart Inc	18-9512	4-06-003-99	1.00	365	768	960	1.25	0.06	0.0	0
Ray's Market #2	18-0038	4-06-003-99	1.00	365	376	470	1.25	0.06	0.0	0
TRMC Retail LLC	18-9513	4-06-003-99	1.00	365	1589	1986	1.25	0.06	0.1	0
Truax Corporation	18-9529	4-06-003-99	1.00	365	1728	2160	1.25	0.06	0.1	0
Washburn Auto Care, Inc.	18-0040	4-06-003-99	1.00	365	756	945	1.25	0.06	0.0	0
								Grand Total	1	5

Table 45. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions from Fugitive Sources

Construction Dust Activities	SCC	SAF	Annual Activity Days	Data Set	CTY to NAA Ratio	$PM_{2.5}$-Primary		
						CTY AE (tpy)	NAA AE (tpy)	NAA TSD (lbs/day)
Construction Dust - Industrial/Commercial/Institutional	2311020000	0.00	365	2017NEI_Apr2020	89%	6.5	5.8	0
Construction Dust - Residential	2311010000	0.00	365	2017NEI_Apr2020	89%	0.6	0.6	0
Construction Dust - Road Construction	2311030000	0.00	365	2017NEI_Apr2020	89%	0.5	0.4	0
					Grand Total	8	7	0

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA ratio determined via GIS analysis using the following data:
Construction Employment Population
3) Seasonal emissions were set to 0, as the soil moisture content in Klamath Falls is typically too high to generate dust during the PM winter season (465).
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Table 46. 2017 $PM_{2.5}$ and Precursor Pollutants Annual and Seasonal Daily Emissions from Miscellaneous Sources

Equipment/Process Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary			NO_X			VOC		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Clamshell Griddle Frying	2302003200	1.00	365	90%	0.4	0.3	1	0.0	0.0	0	0.0	0.0	0
Conveyorized Charbroiling	2302002100	1.00	365	90%	3.7	3.3	5	0.0	0.0	0	1.0	0.9	1
Deep Fat Frying	2302003000	1.00	365	90%	0.0	0.0	0	0.0	0.0	0	0.7	0.6	1
Flat Griddle Frying	2302003100	1.00	365	90%	5.0	4.5	7	0.0	0.0	0	0.4	0.4	1
Under-fired Charbroiling	2302002200	1.00	365	90%	24.1	21.6	35	0.0	0.0	0	3.0	2.7	4
Mining and Quarrying	2325000000	0.72	365	78%	4.0	3.1	12	0.0	0.0	0	0.0	0.0	0
Residential Charcoal Grilling	2810025000	0.45	365	72%	3.0	2.1	5	0.4	0.3	1	1.1	0.8	2
				Grand Total	40	35	66	0	0	1	6	5	9

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA ratio determined via GIS analysis using the following data:
NAICS 722 and 7222 commercial employee population data
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year) * 30%
5) EPA Data Source = 2017NEI_Apr2020

Table 47. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Fuel Combustion Equipment and Fuel Type

Stationary Fuel Combustion Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary			$PM_{2.5}$-Filterable			PM-Condensable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Comm/Institutional All Combustor Types - Oil	2103011000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Comm/Institutional All Combustors - LPG	2103007000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Coal	2103001000	1.30	365	91%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Coal	2103002000	1.30	365	91%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Oil	2103004001	1.30	312	91%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Oil	2103005000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Wood	2103008000	1.30	312	91%	2.7	2.4	20	2.6	2.3	19	0.1	0.1	1
Comm/Institutional Boilers and Engines - NG	2103006000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Engines - Oil	2103004002	1.30	312	91%	0.1	0.1	1	0.1	0.1	1	0.0	0.0	0
Industrial Boilers and Engines - Biomass	2102008000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Coal	2102001000	1.00	365	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Coal	2102002000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - LPG	2102007000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - NG	2102006000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102004001	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0

Stationary Fuel Combustion Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	PM2.5-Primary			PM2.5-Filterable			PM-Condensable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Industrial Boilers and Engines - Oil	2102004002	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102005000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102011000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104001000	1.90	365	100%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104002000	1.90	365	100%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104004000	1.90	365	41%	0.6	0.2	3	0.2	0.1	1	0.4	0.1	2
Residential All Combustor Types	2104006000	1.90	365	97%	0.2	0.2	2	0.0	0.0	0	0.1	0.1	1
Residential All Combustor Types	2104007000	1.90	365	61%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104009000	1.90	365	0%	0.6	0.5	5	0.6	0.5	5	0.0	0.0	0
Residential Fireplace	2104008100	2.30	365	0%	13.6	11.1	140	13.0	10.5	133	0.7	0.6	7
Residential Furnace	2104008510	1.40	365	40%	16.7	6.6	51	15.9	6.3	48	0.8	0.3	2
Residential Furnace	2104008530	1.40	365	40%	1.8	0.7	6	1.8	0.7	5	0.1	0.0	0
Residential Heaters	2104011000	1.00	365	41%	0.1	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential Hydronic Heater	2104008610	1.90	365	40%	37.6	14.9	155	35.8	14.2	148	1.8	0.7	7
Residential Hydronic Heater	2104008620	1.90	365	40%	24.0	9.5	99	22.9	9.1	94	1.1	0.4	5
Residential Hydronic Heater	2104008630	1.90	365	40%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential Outdoor Wood Devices	2104008700	1.90	365	40%	20.3	8.1	0	19.4	7.7	0	1.0	0.4	0
Residential Woodstove	2104008210	1.70	365	0%	9.6	8.6	80	9.1	8.1	76	0.5	0.4	4
Residential Woodstove	2104008220	1.70	365	0%	7.2	4.2	39	6.9	4.0	37	0.4	0.2	2

Stationary Fuel Combustion Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary			$PM_{2.5}$-Filterable			PM-Condensable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Residential Woodstove	2104008230	1.70	365	0%	13.0	8.0	74	12.4	7.6	71	0.7	0.4	4
Residential Woodstove	2104008310	1.70	365	0%	44.6	25.8	240	42.4	24.5	228	2.2	1.3	12
Residential Woodstove	2104008320	1.70	365	0%	7.7	5.5	51	7.3	5.2	48	0.4	0.3	3
Residential Woodstove	2104008330	1.70	365	0%	25.8	13.8	129	24.5	13.1	122	1.3	0.7	6
Residential Woodstove	2104008400	1.80	365	0%	0.7	0.4	4	0.7	0.4	4	0.0	0.0	0
Grand Total					227	227	121	1098	216	114	1041	12	6

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determine via GIS analysis and divided to get the ratio.
Employment population (commercial/institutional/industrial)
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) Total of 411 woodstoves to be removed and replaced with non-wood burning equipment by 2037
6) EPA Data Source = 2017NEI_Apr2020

Table 48. 2017 NH_3 and NO_X Annual and Seasonal Daily Emissions by Fuel Combustion Equipment and Fuel Type

Stationary Fuel Combustion Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NH_3			NO_X		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Comm/Institutional All Combustor Types - Oil	2103011000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional All Combustors - LPG	2103007000	1.30	312	91%	0.0	0.0	0	0.9	0.8	7
Comm/Institutional Boilers - Coal	2103001000	1.30	365	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Coal	2103002000	1.30	365	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Oil	2103004001	1.30	312	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Oil	2103005000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Wood	2103008000	1.30	312	91%	0.0	0.0	0	1.3	1.2	10
Comm/Institutional Boilers and Engines - NG	2103006000	1.30	312	91%	0.0	0.0	0	7.1	6.4	54
Comm/Institutional Engines - Oil	2103004002	1.30	312	91%	0.0	0.0	0	1.2	1.1	9
Industrial Boilers and Engines - Biomass	2102008000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Coal	2102001000	1.00	365	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Coal	2102002000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - LPG	2102007000	1.00	312	78%	0.0	0.0	0	1.5	1.1	7
Industrial Boilers and Engines - NG	2102006000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102004001	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102004002	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102005000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102011000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104001000	1.90	365	100%	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104002000	1.90	365	100%	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104004000	1.90	365	41%	0.3	0.1	1	5.0	2.1	21
Residential All Combustor Types	2104006000	1.90	365	97%	9.0	8.7	90	42.1	40.8	424
Residential All Combustor Types	2104007000	1.90	365	61%	0.0	0.0	0	3.1	1.9	19
Residential All Combustor Types	2104009000	1.90	365	0%	0.0	0.0	0	0.2	0.1	1

Stationary Fuel Combustion Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NH_3			NO_X		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Residential Fireplace	2104008100	2.30	365	0%	1.0	0.8	11	1.5	1.2	15
Residential Furnace	2104008510	1.40	365	40%	1.1	0.4	3	1.1	0.4	3
Residential Furnace	2104008530	1.40	365	40%	0.2	0.1	1	2.3	0.9	7
Residential Heaters	2104011000	1.00	365	41%	0.0	0.0	0	0.7	0.3	1
Residential Hydronic Heater	2104008610	1.90	365	40%	1.0	0.4	4	1.2	0.5	5
Residential Hydronic Heater	2104008620	1.90	365	40%	0.6	0.3	3	0.8	0.3	3
Residential Hydronic Heater	2104008630	1.90	365	40%	0.0	0.0	0	0.1	0.0	0
Residential Outdoor Wood Devices	2104008700	1.90	365	40%	1.5	0.6	0	2.2	0.9	0
Residential Woodstove	2104008210	1.70	365	0%	0.5	0.5	4	0.9	0.8	7
Residential Woodstove	2104008220	1.70	365	0%	0.3	0.2	2	0.8	0.5	5
Residential Woodstove	2104008230	1.70	365	0%	0.6	0.4	3	1.3	0.8	7
Residential Woodstove	2104008310	1.70	365	0%	2.5	1.4	13	4.1	2.4	22
Residential Woodstove	2104008320	1.70	365	0%	0.4	0.3	2	0.9	0.6	6
Residential Woodstove	2104008330	1.70	365	0%	1.1	0.6	6	2.5	1.4	13
Residential Woodstove	2104008400	1.80	365	0%	0.1	0.0	0	0.9	0.5	5
				Grand Total	56	20	15	145	84	67

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA ratio determined via GIS analysis using the following data:
NAICS 722 and 7222 commercial employee population data
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year) * 30%
5) EPA Data Source = 2017NEI_Apr2020

Table 49. 2017 SO_2 and VOC Annual and Seasonal Daily Emissions by Fuel Combustion Equipment and Fuel Type

Stationary Fuel Combustion Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	SO_2			VOC		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Comm/Institutional All Combustor Types - Oil	2103011000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional All Combustors - LPG	2103007000	1.30	312	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Coal	2103001000	1.30	365	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Coal	2103002000	1.30	365	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Oil	2103004001	1.30	312	91%	0.0	0.0	0	0.0	0.0	0
Comm/Institutional Boilers - Oil	2103005000	1.30	312	91%	0.2	0.2	1	0.0	0.0	0
Comm/Institutional Boilers - Wood	2103008000	1.30	312	91%	0.1	0.1	1	0.1	0.1	1
Comm/Institutional Boilers and Engines - NG	2103006000	1.30	312	91%	0.0	0.0	0	0.4	0.4	3
Comm/Institutional Engines - Oil	2103004002	1.30	312	91%	0.0	0.0	0	0.1	0.1	1
Industrial Boilers and Engines - Biomass	2102008000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Coal	2102001000	1.00	365	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Coal	2102002000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - LPG	2102007000	1.00	312	78%	0.0	0.0	0	0.1	0.0	0
Industrial Boilers and Engines - NG	2102006000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102004001	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102004002	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102005000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Industrial Boilers and Engines - Oil	2102011000	1.00	312	78%	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104001000	1.90	365	100%	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104002000	1.90	365	100%	0.0	0.0	0	0.0	0.0	0
Residential All Combustor Types	2104004000	1.90	365	41%	2.0	0.8	8	0.2	0.1	1
Residential All Combustor Types	2104006000	1.90	365	97%	0.3	0.3	3	2.5	2.4	25
Residential All Combustor Types	2104007000	1.90	365	61%	0.0	0.0	0	0.1	0.1	1
Residential All Combustor Types	2104009000	1.90	365	0%	0.0	0.0	0	0.8	0.6	7

Stationary Fuel Combustion Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	SO_2			VOC		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Residential Fireplace	2104008100	2.30	365	0%	0.2	0.2	2	10.9	8.9	112
Residential Furnace	2104008510	1.40	365	40%	1.2	0.5	4	7.1	2.8	21
Residential Furnace	2104008530	1.40	365	40%	0.2	0.1	1	1.3	0.5	4
Residential Heaters	2104011000	1.00	365	41%	0.0	0.0	0	0.0	0.0	0
Residential Hydronic Heater	2104008610	1.90	365	40%	1.2	0.5	5	39.6	15.7	163
Residential Hydronic Heater	2104008620	1.90	365	40%	0.8	0.3	3	25.3	10.0	104
Residential Hydronic Heater	2104008630	1.90	365	40%	0.0	0.0	0	0.0	0.0	0
Residential Outdoor Wood Devices	2104008700	1.90	365	40%	0.3	0.1	0	16.3	6.4	0
Residential Woodstove	2104008210	1.70	365	0%	0.1	0.1	1	16.7	14.9	138
Residential Woodstove	2104008220	1.70	365	0%	0.1	0.1	1	4.4	2.6	24
Residential Woodstove	2104008230	1.70	365	0%	0.3	0.2	1	9.6	5.9	55
Residential Woodstove	2104008310	1.70	365	0%	0.6	0.3	3	77.3	44.7	416
Residential Woodstove	2104008320	1.70	365	0%	0.2	0.1	1	4.7	3.3	31
Residential Woodstove	2104008330	1.70	365	0%	0.5	0.3	3	19.0	10.2	95
Residential Woodstove	2104008400	1.80	365	0%	0.1	0.0	0	0.0	0.0	0
				Grand Total	654	8	4	40	236	130

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determine via GIS analysis and divided to get the ratio.
Employment population (commercial/institutional/industrial)
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) Total of 411 woodstoves to be removed and replaced with non-wood burning equipment by 2037

Table 50. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions from Residential Fuel Combustion Sources

Residential Woodburning Equipment	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary			$PM_{2.5}$-Filterable			PM-Condensable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Residential Fireplace: general	2104008100	2.30	365	0%	13.6	11.1	140	13.0	10.5	133	0.7	0.6	7
Residential Furnace: Indoor, cordwood-fired, non-EPA certified	2104008510	1.40	365	40%	16.7	6.6	51	15.9	6.3	48	0.8	0.3	2
Residential Furnace: Indoor, pellet-fired, general	2104008530	1.40	365	40%	1.8	0.7	6	1.8	0.7	5	0.1	0.0	0
Residential Heaters: All Heater Types	2104011000	1.00	365	41%	0.1	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential Hydronic Heater: indoor	2104008620	1.90	365	40%	24.0	9.5	99	22.9	9.1	94	1.1	0.4	5
Residential Hydronic Heater: outdoor	2104008610	1.90	365	40%	37.6	14.9	155	35.8	14.2	148	1.8	0.7	7
Residential Hydronic Heater: pellet-fired	2104008630	1.90	365	40%	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Residential Outdoor wood burning device (fire-pits, chimineas, etc.)	2104008700	1.90	365	40%	20.3	8.1	0	19.4	7.7	0	1.0	0.4	0
Residential Woodstove: fireplace inserts; EPA certified; catalytic	2104008230	1.70	365	0%	13.0	8.0	74	12.4	7.6	71	0.7	0.4	4
Residential Woodstove: fireplace inserts; EPA certified; non-catalytic	2104008220	1.70	365	0%	7.2	4.2	39	6.9	4.0	37	0.4	0.2	2
Residential Woodstove: fireplace inserts; non-EPA certified	2104008210	1.70	365	0%	9.6	8.6	80	9.1	8.1	76	0.5	0.4	4

Residential Woodburning Equipment	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary			$PM_{2.5}$-Filterable			PM-Condensable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Residential Woodstove: freestanding, EPA certified, catalytic	2104008330	1.70	365	0%	25.8	13.8	129	24.5	13.1	122	1.3	0.7	6
Residential Woodstove: freestanding, EPA certified, non-catalytic	2104008320	1.70	365	0%	7.7	5.5	51	7.3	5.2	48	0.4	0.3	3
Residential Woodstove: freestanding, non-EPA certified	2104008310	1.70	365	0%	44.6	25.8	240	42.4	24.5	228	2.2	1.3	12
Residential Woodstove: pellet-fired, general (freestanding or FP insert)	2104008400	1.80	365	0%	0.7	0.4	4	0.7	0.4	4	0.0	0.0	0
Grand Total					223	117	1067	212	111	1014	11	6	52

Notes:

1) CTY AE (tpy) = County Annual Emissions (tons per year)

NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)

NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)

2) County to NAA allocation of emissions = County emissions * County to NAA ratio

Where: County and NAA determine via GIS analysis and divided to get the ratio.
For residential fuel use, DEQ used a county to NAA allocation ratio based on housing units for coal, fuel oil, liquefied petroleum gas, natural gas, and wood from the US Census 2017 House Heating Fuel data.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:

*SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

The exception to this is the SAF for residential fireplaces, furnaces, and woodstoves were taken from the previous SIP EI.
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
*Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)*
5) Total of 411 woodstoves to be removed and replaced with non-wood burning equipment by 2037
6) EPA Data Source = 2017NEI_Apr2020

Table 51. 2017 NH_3 and NO_X Annual and Seasonal Daily Emissions from Residential Fuel Combustion Sources

Residential Woodburning Equipment	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NH_3			NO_X		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Residential Fireplace: general	2104008100	2.30	365	0%	1.0	0.8	11	1.5	1.2	15
Residential Furnace: Indoor, cordwood-fired, non-EPA certified	2104008510	1.40	365	40%	1.1	0.4	3	1.1	0.4	3
Residential Furnace: Indoor, pellet-fired, general	2104008530	1.40	365	40%	0.2	0.1	1	2.3	0.9	7
Residential Heaters: All Heater Types	2104011000	1.00	365	41%	0.0	0.0	0	0.7	0.3	1
Residential Hydronic Heater: indoor	2104008620	1.90	365	40%	0.6	0.3	3	0.8	0.3	3
Residential Hydronic Heater: outdoor	2104008610	1.90	365	40%	1.0	0.4	4	1.2	0.5	5
Residential Hydronic Heater: pellet-fired	2104008630	1.90	365	40%	0.0	0.0	0	0.1	0.0	0
Residential Outdoor wood burning device (fire-pits, chimineas, etc.)	2104008700	1.90	365	40%	1.5	0.6	0	2.2	0.9	0
Residential Woodstove: fireplace inserts; EPA certified; catalytic	2104008230	1.70	365	0%	0.6	0.4	3	1.3	0.8	7
Residential Woodstove: fireplace inserts; EPA certified; non-catalytic	2104008220	1.70	365	0%	0.3	0.2	2	0.8	0.5	5
Residential Woodstove: fireplace inserts; non-EPA certified	2104008210	1.70	365	0%	0.5	0.5	4	0.9	0.8	7
Residential Woodstove: freestanding, EPA certified, catalytic	2104008330	1.70	365	0%	1.1	0.6	6	2.5	1.4	13
Residential Woodstove: freestanding, EPA certified, non-catalytic	2104008320	1.70	365	0%	0.4	0.3	2	0.9	0.6	6
Residential Woodstove: freestanding, non-EPA certified	2104008310	1.70	365	0%	2.5	1.4	13	4.1	2.4	22
Residential Woodstove: pellet-fired, general (freestanding or FP insert)	2104008400	1.80	365	0%	0.1	0.0	0	0.9	0.5	5
				Grand Total	11	6	53	21	11	100

Notes:

1) CTY AE (tpy) = County Annual Emissions (tons per year)

NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)

NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)

2) County to NAA allocation of emissions = County emissions * County to NAA ratio

Where: County and NAA determine via GIS analysis and divided to get the ratio.
For residential fuel use, DEQ used a county to NAA allocation ratio based on housing units for coal, fuel oil, liquefied petroleum gas, natural gas, and wood from the US Census 2017 House Heating Fuel data.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:

*SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))*

The exception to this is the SAF for residential fireplaces, furnaces, and woodstoves were taken from the previous SIP EI.
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
*Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)*
5) Total of 411 woodstoves to be removed and replaced with non-wood burning equipment by 2037
6) EPA Data Source = 2017NEI_Apr2020

Table 52. 2017 SO_2 and VOC Annual and Seasonal Daily Emissions from Residential Fuel Combustion Sources

Residential Woodburning Equipment	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	SO_2			VOC		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Residential Fireplace: general	2104008100	2.30	365	0%	0.2	0.2	2	10.9	8.9	112
Residential Furnace: Indoor, cordwood-fired, non-EPA certified	2104008510	1.40	365	40%	1.2	0.5	4	7.1	2.8	21
Residential Furnace: Indoor, pellet-fired, general	2104008530	1.40	365	40%	0.2	0.1	1	1.3	0.5	4
Residential Heaters: All Heater Types	2104011000	1.00	365	41%	0.0	0.0	0	0.0	0.0	0
Residential Hydronic Heater: indoor	2104008620	1.90	365	40%	0.8	0.3	3	25.3	10.0	104
Residential Hydronic Heater: outdoor	2104008610	1.90	365	40%	1.2	0.5	5	39.6	15.7	163
Residential Hydronic Heater: pellet-fired	2104008630	1.90	365	40%	0.0	0.0	0	0.0	0.0	0
Residential Outdoor wood burning device (fire-pits, chimineas, etc.)	2104008700	1.90	365	40%	0.3	0.1	0	16.3	6.4	0
Residential Woodstove: fireplace inserts; EPA certified; catalytic	2104008230	1.70	365	0%	0.3	0.2	1	9.6	5.9	55
Residential Woodstove: fireplace inserts; EPA certified; non-catalytic	2104008220	1.70	365	0%	0.1	0.1	1	4.4	2.6	24
Residential Woodstove: fireplace inserts; non-EPA certified	2104008210	1.70	365	0%	0.1	0.1	1	16.7	14.9	138
Residential Woodstove: freestanding, EPA certified, catalytic	2104008330	1.70	365	0%	0.5	0.3	3	19.0	10.2	95
Residential Woodstove: freestanding, EPA certified, non-catalytic	2104008320	1.70	365	0%	0.2	0.1	1	4.7	3.3	31
Residential Woodstove: freestanding, non-EPA certified	2104008310	1.70	365	0%	0.6	0.3	3	77.3	44.7	416
Residential Woodstove: pellet-fired, general (freestanding or FP insert)	2104008400	1.80	365	0%	0.1	0.0	0	0.0	0.0	0
Grand Total					6	3	25	232	126	1164

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determine via GIS analysis and divided to get the ratio.

For residential fuel use, DEQ used a county to NAA allocation ratio based on housing units for coal, fuel oil, liquefied petroleum gas, natural gas, and wood from the US Census 2017 House Heating Fuel data.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
The exception to this is the SAF for residential fireplaces, furnaces, and woodstoves were taken from the previous SIP EI.
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) Total of 411 woodstoves to be removed and replaced with non-wood burning equipment by 2037
6) EPA Data Source = 2017NEI_Apr2020

Table 53. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions from Waste Disposal Sources

Waste Disposal Emitting Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary			$PM_{2.5}$-Filterable		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Composting	2680003000	1.00	365	72%	0.0	0.0	0	0.0	0.0	0
Landfills	2620030000	1.00	365	0%	0.0	0.0	0	0.0	0.0	0
Household Waste	2610030000	1.00	365	72%	36.9	26.4	0	36.9	26.4	0
Land Clearing Debris	2610000500	1.00	365	89%	18.1	16.2	0	18.1	16.2	0
Yard Waste - Brush Species	2610000400	1.00	365	72%	1.4	1.0	0	1.4	1.0	0
Yard Waste - Leaf Species	2610000100	1.00	365	72%	1.4	1.0	0	1.4	1.0	0
Wastewater Treatment	2630020000	1.00	365	72%	0.0	0.0	0	0.0	0.0	0
				Grand Total	58	45	0	58	45	0

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determine via GIS analysis and divided to get the ratio.
Population and construction employment populations used for creating county to NAA ratio.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
For Landfills, EPA temporal profile data indicates that activity is considered uniform throughout the week and year. As such, typical season day emissions were then estimated to be 1/365th of annual emissions. The SAF is set equal to 1 for these types of estimates.
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) Landfill emissions grown from 2008 to 2017
2008-2017 Annual Average Growth Rate (AAGR):
2008-2017 Annual Average Growth Rate = ((2017 NAA Population/2008 NAA Population) ^ (1/9)-1 = ((48496/46588) ^ (1/9)-1 = .00446 or .45%
2017 Annual Emission Estimate:

DEQ used the 2008-2017 AAGR and 2008 SIP NH3 and VOC emissions to grow emissions from 2008 to 2017. The following formula was used to estimate 2017 landfill annual emissions:
2017 EmissionsPollutant = (2008 EmissionsPollutant (tpy)) + [2008-2017 AAGR * 9 years * 2008 EmissionsPollutant (tpy)]
6) EPA Data Source = 2017NEI_Apr2020

Table 54. 2017 NH_3 and NO_X Annual and Seasonal Daily Emissions from Waste Disposal Sources

Waste Disposal Emitting Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NH_3			NO_X		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD
Composting	2680003000	1.00	365	72%	1.8	1.3	7	0.0	0.0	0
Landfills	2620030000	1.00	365	0%	0.0	9.9	54	0.0	0.0	0
Household Waste	2610030000	1.00	365	72%	0.0	0.0	0	7.5	5.4	0
Land Clearing Debris	2610000500	1.00	365	89%	0.0	0.0	0	3.9	3.5	0
Yard Waste - Brush Species	2610000400	1.00	365	72%	0.0	0.0	0	0.3	0.2	0
Yard Waste - Leaf Species	2610000100	1.00	365	72%	0.0	0.0	0	0.3	0.2	0
Wastewater Treatment	2630020000	1.00	365	72%	0.2	0.1	1	0.0	0.0	0
				Grand Total	2	11	62	12	9	0

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determine via GIS analysis and divided to get the ratio.
Population and construction employment populations used for creating county to NAA ratio.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
For Landfills, EPA temporal profile data indicates that activity is considered uniform throughout the week and year. As such, typical season day emissions were then estimated to be 1/365th of annual emissions. The SAF is set equal to 1 for these types of estimates.

4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) Landfill emissions grown from 2008 to 2017
2008-2017 Annual Average Growth Rate (AAGR):
2008-2017 Annual Average Growth Rate = ((2017 NAA Population/2008 NAA Population) ^ (1/9)-1 = ((48496/46588) ^ (1/9)-1 = .00446 or .45%
2017 Annual Emission Estimate:
DEQ used the 2008-2017 AAGR and 2008 SIP NH3 and VOC emissions to grow emissions from 2008 to 2017. The following formula was used to estimate 2017 landfill annual emissions:
2017 EmissionsPollutant = (2008 EmissionsPollutant (tpy)) + [2008-2017 AAGR * 9 years * 2008 EmissionsPollutant (tpy)]
6) EPA Data Source = 2017NEI_Apr2020

Table 55. 2017 SO_2 and VOC Annual and Seasonal Daily Emissions from Waste Disposal Sources

Waste Disposal Emitting Sources	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	SO_2			VOC		
					CTY AE	NAA AE	NAA TSD	CTY AE	NAA AE	NAA TSD)
Composting	2680003000	1.00	365	72%	0.0	0.0	0	12.5	9.0	49
Landfills	2620030000	1.00	365	0%	0.0	0.0	0	0.0	11.8	64
Household Waste	2610030000	1.00	365	72%	1.3	0.9	0	7.9	5.6	0
Land Clearing Debris	2610000500	1.00	365	89%	1.6	1.4	0	11.0	9.8	0
Yard Waste - Brush Species	2610000400	1.00	365	72%	0.0	0.0	0	1.3	1.0	0
Yard Waste - Leaf Species	2610000100	1.00	365	72%	0.0	0.0	0	1.3	1.0	0
Wastewater Treatment	2630020000	1.00	365	72%	0.0	0.0	0	0.9	0.7	4
				Grand Total	3	2	0	35	39	117

Notes:
1) CTY AE (tpy) = County Annual Emissions (tons per year)
NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determine via GIS analysis and divided to get the ratio.
Population and construction employment populations used for creating county to NAA ratio.

3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
For Landfills, EPA temporal profile data indicates that activity is considered uniform throughout the week and year. As such, typical season day emissions were then estimated to be 1/365th of annual emissions. The SAF is set equal to 1 for these types of estimates.
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
5) Landfill emissions grown from 2008 to 2017
2008-2017 Annual Average Growth Rate (AAGR):
2008-2017 Annual Average Growth Rate = ((2017 NAA Population/2008 NAA Population) ^ (1/9)-1 = ((48496/46588) ^ (1/9)-1 = .00446 or .45%
2017 Annual Emission Estimate:
DEQ used the 2008-2017 AAGR and 2008 SIP NH3 and VOC emissions to grow emissions from 2008 to 2017. The following formula was used to estimate 2017 landfill annual emissions:
2017 EmissionsPollutant = (2008 EmissionsPollutant (tpy)) + [2008-2017 AAGR * 9 years * 2008 EmissionsPollutant (tpy)]
6) EPA Data Source = 2017NEI_Apr2020

Appendix C: Section 2.5

Table 56. 2017 Annual and Seasonal Daily Emissions from Structure Fires

Sectors	Description	Nbr Annual Fires	Nbr Season Fires	Annual Tons Burned	Season Tons Burned	SAF	EF (lb/ton)	$PM_{2.5}$		NO_x		VOC	
								10.8		1.4		11	
							Annual Activity Days	AE	TSD	AE	TSD	AE	TSD
Structure Fires	Non-Residential	14	6	16.1	6.9	1.29	365	0.1	0	0.0	0	0.1	0
	Residential	36	16	41.4	18.4	1.33		0.2	1	0.0	0	0.2	1
							Grand Total	0	1	0	0	0	1

Notes:
1) AE = Annual Emissions (tons per year)
TSD = Typical Season Day Emissions (pounds per day)
(2) Number of fires, by specific date & city, provided by the State Fire Marshal for 2017.
Note: The raw data is located here:\\deqhq1\EI_Files\Area and Point Source Inventories\EI Projects\SIPS\KFalls\Fire Data\Structure Fires\Klamath_StructureFires_DEQ_2017.xlsx
The number of fires is for those fires designated as building fires only.
(3) Since the information about the structure size and the extent of the material burned in each fire was not collected, the default fuel loading factor of 1.15 [tons/fire] from the EIIP, Ref. 321, Chapter 18, page18.4-2 was used.
(4) Annual tons burned = (number of annual structural fires) * (fuel loading factor [tons/fire])
Season tons burned = (number of season structural fires) * (fuel loading factor [tons/fire])
(5) Particulate emission factor is from EIIP, Ref. 321, Chapter 18, Table 18.4-1.
(6) DEQ staff were unable to find a size fraction breakdown of total particulate from structure fires. Assumed 100% $PM_{2.5}$ for a conservative est.
(7) Activity level (days/wk) is from the EPA Procedures Document, Table 5.8-1, p. 5-18. (Ref. 7)
(8) Seasonal adjustment factor = ([season activity] * [12 months]) / ([annual activity] * [season months])
Based on number of fires:
(9) Annual Emissions, tpy = (Annual Tons Burned) * (Particulate EF, lbs/ton)/ (2000 lbs/ton)
(10) Typical Day, lbs/day = (Seasonal Fires * 1.15 * PT EF * SAF) / (Annual Activity Days)

Table 57. 2017 Annual and Seasonal Daily Emissions from Prescribed Fires and Wildfires within 15 km Buffer

3							1, 2, 4									
							PM2.5-Primary		NH3		NOX		SO2		VOC	
Sectors	Facility ID	Date of Fire	Latitude	Longitude	SCC	SAF	NAA AE (tpy)	NAA TSD (lbs/day)	NAA AE (tpy)	NAA TSD (lbs/day)	NAA AE (tpy)	NAA TSD (lbs/day)	NAA AE (tpy)	NAA TSD (lbs/day)	NAA AE (tpy)	NAA TSD (lbs/day)
Prescribed Fires	SF11C378189	3-Apr	42.1990	-121.7120	2811015001	2.63	8.7	125	1.8	26	0.5	7	0.5	7	102.3	1472
Prescribed Fires	SF11C378189	3-Apr	42.1990	-121.7120	2811015002	2.63	11.1	159	2.1	30	2.1	30	1.1	15	118.5	1705
Prescribed Fires	SF11C443993	6-Nov	42.1990	-121.8700	2811015001	2.63	1.7	24	0.3	5	0.1	1	0.1	1	19.8	285
Prescribed Fires	SF11C443993	6-Nov	42.1990	-121.8700	2811015002	2.63	2.0	29	0.4	5	0.3	5	0.2	3	21.5	309
Prescribed Fires	SF11C445257	10-Nov	42.2300	-121.6230	2811015001	2.63	1.7	24	0.3	5	0.1	1	0.1	1	19.8	285
Prescribed Fires	SF11C445257	10-Nov	42.2300	-121.6230	2811015002	2.63	2.0	29	0.4	5	0.3	5	0.2	3	21.5	309
Prescribed Fires	SF11C445639	11-Nov	42.2050	-121.8690	2811015001	2.63	6.1	87	1.2	18	0.3	5	0.4	5	71.6	1031
Prescribed Fires	SF11C445639	11-Nov	42.2050	-121.8690	2811015002	2.63	7.8	112	1.4	21	1.5	21	0.7	11	82.9	1194
Prescribed Fires	SF11C445640	11-Nov	42.1890	-121.8470	2811015002	2.63	0.3	5	0.1	1	0.1	1	0.0	1	3.4	49
Prescribed Fires	SF11C445723	11-Nov	42.2440	-121.6320	2811015001	2.63	11.7	169	2.4	35	0.6	9	0.7	10	138.5	1993
Prescribed Fires	SF11C445723	11-Nov	42.2440	-121.6320	2811015002	2.63	11.1	160	2.1	31	1.7	25	1.0	14	122.2	1759
Prescribed Fires	SF11C445881	13-Nov	42.2960	-121.7070	2811015001	2.63	1.7	24	0.3	5	0.1	1	0.1	1	19.8	285
Prescribed Fires	SF11C445881	13-Nov	42.2960	-121.7070	2811015002	2.63	2.0	29	0.4	5	0.3	5	0.2	3	21.5	309
Prescribed Fires	SF11C448397	18-Nov	42.2500	-121.6600	2811015001	2.63	1.7	24	0.3	5	0.1	1	0.1	1	19.8	285
Prescribed Fires	SF11C448397	18-Nov	42.2500	-121.6600	2811015002	2.63	2.0	29	0.4	5	0.3	5	0.2	3	21.5	309
Prescribed Fires	SF11C448407	18-Nov	42.2470	-121.6950	2811015001	2.63	35.2	507	7.2	104	1.9	28	2.1	30	415.5	5979
Prescribed Fires	SF11C448407	18-Nov	42.2470	-121.6950	2811015002	2.63	33.4	481	6.4	92	5.2	74	2.9	41	366.7	5277
Prescribed Fires	SF11C452951	30-Nov	42.2470	-121.6280	2811015001	2.63	11.7	169	2.4	35	0.6	9	0.7	10	138.5	1993
Prescribed Fires	SF11C452951	30-Nov	42.2470	-121.6280	2811015002	2.63	11.1	160	2.1	31	1.7	25	1.0	14	122.2	1759
Wildfires	SF11C500083	4-May	42.2190	-121.8430	2810001001	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wildfires	SF11C500083	4-May	42.2190	-121.8430	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.1	0
Wildfires	SF11C511512	9-Jul	42.2720	-121.8750	2810001001	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wildfires	SF11C511512	9-Jul	42.2720	-121.8750	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.1	0
Wildfires	SF11C511977	11-Jul	42.2310	-121.6000	2810001001	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wildfires	SF11C511977	11-Jul	42.2310	-121.6000	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.1	0
Wildfires	SF11C514511	24-Jul	42.1240	-121.6660	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wildfires	SF11C514731	25-Jul	42.2480	-121.7670	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wildfires	SF11C517317	10-Aug	42.1840	-121.6330	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.3	0
Wildfires	SF11C647207	22-Jun	42.2090	-121.7880	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Wildfires	SF11C647517	26-Jun	42.1380	-121.6970	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.2	0
Wildfires	SF11C650579	19-Jul	42.2660	-121.8100	2810001002	2.63	0.1	0	0.0	0	0.0	0	0.0	0	1.5	0
Wildfires	SF11C656338	10-Sep	42.1740	-121.6190	2810001002	2.63	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
						Grand Total	163	2346	32	462	18	260	12	174	1850	26588

Notes:
(1) NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)

(2) EPA 2017 NEI, EIS event annual emissions data 4/30/2020. DEQ Ref.
(3) No wildfires occurred during the PM season.
(4) Seasonal Adjustment Factor (SAF) = (Seasonal Activity * 12 months) / (Annual Activity Days)
SAF, based on PM2.5 emissions = (143.3 tpy * 12 months) / (163 tpy * 4 months) = 2.63
(5) Typical Season Day Emissions = ((Annual Emissions, tpy) * (2000 lbs/ton) * SAF) / (365 days/yr)

Appendix D: Section 2.6

Table 58. 2017 $PM_{2.5}$ and NH_3 Annual and Seasonal Daily Emissions from Nonroad Sources

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
CNG:												
AC\Refrigeration	2268003060	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Air Compressors	2268006015	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Forklifts	2268003020	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Gas Compressors	2268006020	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Generator Sets	2268006005	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Irrigation Sets	2268005060	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Agricultural Equipment	2268005055	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Construction Equipment	2268002081	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Other General Industrial Equip	2268003040	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Other Oil Field Equipment	2268010010	1.00	312	0%	0.0	0	0.0	0	0.0	0	0.0	0
Pumps	2268006010	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2268003030	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2268003070	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
CNG Sum					0.1	0	0.0	0	0.0	0	0.0	0
Diesel:												
2-Wheel Tractors	2270005010	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
AC\Refrigeration	2270003060	1.00	312	60%	0.3	2	0.2	1	0.0	0	0.0	0
Aerial Lifts	2270003010	0.72	312	60%	0.1	0	0.0	0	0.0	0	0.0	0
Agricultural Mowers	2270005030	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Agricultural Tractors	2270005015	0.72	365	4%	8.6	34	0.4	1	0.1	1	0.0	0
Air Compressors	2270006015	0.72	365	70%	0.2	1	0.1	1	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Balers	2270005025	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Bore/Drill Rigs	2270002033	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Cement and Mortar Mixers	2270002042	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Chippers/Stump Grinders (Comm)					0.0	0	0.0	0	0.0	0	0.0	0
Combines	2270005020	0.72	365	4%	1.0	4	0.0	0	0.0	0	0.0	0
Concrete/Industrial Saws	2270002039	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Cranes	2270002045	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Crawler Tractor/Dozers	2270002069	0.72	312	24%	0.4	2	0.1	0	0.0	0	0.0	0
Crushing/Processing Equipment	2270002054	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Dumpers/Tenders	2270002078	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Excavators	2270002036	0.72	312	24%	0.3	1	0.1	0	0.0	0	0.0	0
Forest Eqp - Feller/Bunch/Skidder	2270007015	0.72	365	0%	1.5	6	0.0	0	0.1	0	0.0	0
Forklifts	2270003020	0.72	312	60%	0.2	1	0.1	0	0.0	0	0.0	0
Front Mowers (Commercial)	2270004046	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Generator Sets	2270006005	0.72	365	70%	0.4	2	0.3	1	0.0	0	0.0	0
Graders	2270002048	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Hydro-power Units	2270006035	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Irrigation Sets	2270005060	1.00	365	4%	0.1	1	0.0	0	0.0	0	0.0	0
Lawn and Garden Tractors (Comm)	2270004056	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2270004031	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Tractors	2270002075	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Trucks	2270002051	0.72	312	24%	0.2	1	0.1	0	0.0	0	0.0	0
Other Agricultural Equipment	2270005055	0.72	365	4%	0.2	1	0.0	0	0.0	0	0.0	0
Other Construction Equipment	2270002081	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Other General Industrial Equipment	2270003040	0.72	312	60%	0.1	0	0.1	0	0.0	0	0.0	0
Other Lawn and Garden Equip (Comm)	2270004076	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Other Material Handling Equipment	2270003050	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Other Oil Field Equipment	2270010010	1.00	312	0%	0.0	0	0.0	0	0.0	0	0.0	0
Pavers	2270002003	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Paving Equipment	2270002021	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Plate Compactors	2270002009	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pressure Washers	2270006030	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Pumps	2270006010	0.72	365	70%	0.1	0	0.1	0	0.0	0	0.0	0
Rollers	2270002015	0.72	312	24%	0.1	1	0.0	0	0.0	0	0.0	0
Rough Terrain Forklifts	2270002057	0.72	312	24%	0.2	1	0.0	0	0.0	0	0.0	0
Rubber Tire Loaders	2270002060	0.72	312	24%	0.5	2	0.1	1	0.0	0	0.0	0
Scrapers	2270002018	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Signal Boards/Light Plants	2270002027	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Skid Steer Loaders	2270002072	0.72	312	24%	0.8	4	0.2	1	0.0	0	0.0	0
Snowblowers (Commercial)	2270004036	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Specialty Vehicles/Carts	2270001060	0.72	365	4%	0.1	0	0.0	0	0.0	0	0.0	0
Sprayers	2270005035	0.72	365	4%	0.1	0	0.0	0	0.0	0	0.0	0
Surfacing Equipment	2270002024	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Swathers	2270005045	0.72	365	4%	0.1	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2270003030	0.72	312	60%	0.1	0	0.0	0	0.0	0	0.0	0
Tampers/Rammers	2270002006	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2270003070	1.00	312	60%	0.1	1	0.1	0	0.0	0	0.0	0
Tillers : 6 HP	2270005040	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Tractors/Loaders/Backhoes	2270002066	0.72	312	24%	1.0	5	0.2	1	0.0	0	0.0	0
Trenchers	2270002030	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Turf Equipment (Comm)	2270004071	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Welders	2270006025	0.72	365	70%	0.2	1	0.2	1	0.0	0	0.0	0
	Diesel Sum				17.6	73	2.6	12	0.4	2	0.1	0
Gasoline, 2-Stroke:												
Air Compressors	2260006015	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
All-Terrain Vehicles	2260001030	0.72	365	4%	0.3	1	0.0	0	0.0	0	0.0	0
Chain Saws : 6 HP	2260007005	0.72	365	0%	1.1	4	0.0	0	0.0	0	0.0	0
Chain Saws < 6 HP (Commercial)	2260004021	1.00	365	20%	0.4	2	0.1	0	0.0	0	0.0	0
Chain Saws < 6 HP (Residential)	2260004020	0.72	365	35%	0.2	1	0.1	0	0.0	0	0.0	0
Concrete/Industrial Saws	2260002039	0.72	312	24%	0.3	1	0.1	0	0.0	0	0.0	0
Crushing/Processing Equipment	2260002054	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Generator Sets	2260006005	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Hydro-power Units	2260006035	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2260004031	1.00	365	20%	0.2	1	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Residential)	2260004030	0.72	365	35%	0.2	1	0.1	0	0.0	0	0.0	0
Motorcycles: Off-road	2260001010	0.72	365	4%	1.5	6	0.1	0	0.0	0	0.0	0
Other General Industrial Equipment	2260003040	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Paving Equipment	2260002021	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Plate Compactors	2260002009	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pumps	2260006010	0.72	365	70%	0.3	1	0.2	1	0.0	0	0.0	0
Rotary Tillers < 6 HP (Commercial)	2260004016	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Rotary Tillers < 6 HP (Residential)	2260004015	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Signal Boards/Light Plants	2260002027	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Snowblowers (Commercial)	2260004036	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Snowblowers (Residential)	2260004035	1.18	365	35%	0.1	1	0.0	0	0.0	0	0.0	0
Snowmobiles	2260001020	0.72	365	4%	0.9	3	0.0	0	0.0	0	0.0	0
Specialty Vehicles/Carts	2260001060	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Sprayers	2260005035	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2260003030	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Tampers/Rammers	2260002006	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Comm)	2260004026	1.00	365	20%	0.2	1	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Res)	2260004025	0.72	365	35%	0.3	1	0.1	0	0.0	0	0.0	0
Turf Equipment (Comm)	2260004071	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Gasoline, 2-Stroke Sum					6.3	26	0.9	4	0.0	0	0.0	0
Gasoline, 4-Stroke:												
2-Wheel Tractors	2265005010	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
AC\Refrigeration	2265003060	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Aerial Lifts	2265003010	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Agricultural Mowers	2265005030	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Agricultural Tractors	2265005015	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Air Compressors	2265006015	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
All-Terrain Vehicles	2265001030	0.72	365	4%	0.3	1	0.0	0	0.0	0	0.0	0
Balers	2265005025	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Bore/Drill Rigs	2265002033	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Cement and Mortar Mixers	2265002042	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Chippers/Stump Grinders (Comm)					0.0	0	0.0	0	0.0	0	0.0	0
Combines	2265005020	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Concrete/Industrial Saws	2265002039	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Cranes	2265002045	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Crushing/Processing Equipment	2265002054	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Dumpers/Tenders	2265002078	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Forest Eqp - Feller/Bunch/Skidder	2265007015	0.72	365	0%	0.0	0	0.0	0	0.0	0	0.0	0
Forklifts	2265003020	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Front Mowers (Commercial)	2265004046	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Generator Sets	2265006005	0.72	365	70%	0.1	1	0.1	0	0.0	0	0.0	0
Golf Carts	2265001050	0.72	365	100%	0.0	0	0.0	0	0.0	0	0.0	0
Hydro-power Units	2265006035	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Irrigation Sets	2265005060	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Lawn and Garden Tractors (Comm)	2265004056	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Lawn and Garden Tractors (Residential)	2265004055	0.72	365	35%	0.1	0	0.0	0	0.0	0	0.0	0
Lawn Mowers (Commercial)	2265004011	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Lawn Mowers (Residential)	2265004010	0.72	365	35%	0.1	0	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2265004031	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Residential)	2265004030	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Motorcycles: Off-road	2265001010	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Agricultural Equipment	2265005055	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Construction Equipment	2265002081	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Other General Industrial Equipment	2265003040	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Other Lawn and Garden Equip (Comm)	2265004076	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Other Lawn and Garden Equip (Res)	2265004075	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Other Material Handling Equipment	2265003050	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Other Oil Field Equipment	2265010010	1.00	312	0%	0.0	0	0.0	0	0.0	0	0.0	0
Pavers	2265002003	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Paving Equipment	2265002021	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Plate Compactors	2265002009	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pressure Washers	2265006030	0.72	365	70%	0.1	0	0.1	0	0.0	0	0.0	0
Pumps	2265006010	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Rear Engine Riding Mowers (Comm)	2265004041	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Rear Engine Riding Mowers (Res)	2265004040	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Rollers	2265002015	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rotary Tillers < 6 HP (Commercial)	2265004016	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Rotary Tillers < 6 HP (Residential)	2265004015	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Rough Terrain Forklifts	2265002057	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rubber Tire Loaders	2265002060	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Shredders : 6 HP	2265007010	0.72	365	0%	0.0	0	0.0	0	0.0	0	0.0	0
Shredders < 6 HP (Commercial)	2265004051	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Signal Boards/Light Plants	2265002027	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Skid Steer Loaders	2265002072	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Snowblowers (Commercial)	2265004036	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Snowblowers (Residential)	2265004035	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Specialty Vehicles/Carts	2265001060	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Sprayers	2265005035	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Surfacing Equipment	2265002024	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Swathers	2265005045	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2265003030	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Tampers/Rammers	2265002006	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2265003070	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Tillers : 6 HP	2265005040	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Tractors/Loaders/Backhoes	2265002066	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Trenchers	2265002030	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Comm)	2265004026	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Res)	2265004025	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Turf Equipment (Comm)	2265004071	1.00	365	20%	0.1	0	0.0	0	0.0	0	0.0	0
Welders	2265006025	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Gasoline, 4-Stroke Sum					1.2	5	0.4	2	0.1	0	0.0	0
LPG:												
Aerial Lifts	2267003010	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Air Compressors	2267006015	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Bore/Drill Rigs	2267002033	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Chippers/Stump Grinders (Comm)					0.0	0	0.0	0	0.0	0	0.0	0
Concrete/Industrial Saws	2267002039	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Cranes	2267002045	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Crushing/Processing Equipment	2267002054	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Forklifts	2267003020	1.00	312	60%	0.3	2	0.2	1	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Generator Sets	2267006005	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Hydro-power Units	2267006035	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Irrigation Sets	2267005060	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Agricultural Equipment	2267005055	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Construction Equipment	2267002081	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Other General Industrial Equipment	2267003040	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Other Material Handling Equipment	2267003050	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Pavers	2267002003	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Paving Equipment	2267002021	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pressure Washers	2267006030	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Pumps	2267006010	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Rollers	2267002015	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rough Terrain Forklifts	2267002057	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rubber Tire Loaders	2267002060	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Skid Steer Loaders	2267002072	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Specialty Vehicles/Carts	2267001060	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Surfacing Equipment	2267002024	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2267003030	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2267003070	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Tractors/Loaders/Backhoes	2267002066	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Trenchers	2267002030	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Welders	2267006025	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
LPG Sum					0.4	2	0.2	1	0.0	0	0.0	0
Off-highway Vehicle CNG:												
CNG Commercial Equipment	2268006022	0.00	0	70%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	$PM_{2.5}$-Primary				NH_3			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Off-highway Vehicle CNG Sum					0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Vehicle Diesel:												
Diesel Logging Equipment	2270007022	0.00	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Other Underground Mining Equip	2270009010	0.00	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Vehicle Diesel Sum					0.0	0	0.0	0	0.0	0	0.0	0
Pleasure Craft:												
2-Stroke Pleasure Craft	2282005022	1.00	365	0%	6.9	38	0.0	0	0.2	1	0.0	0
Diesel Pleasure Craft	2282020022	1.00	365	0%	0.9	5	0.0	0	0.0	0	0.0	0
Inboard/Sterndrive	2282010005	1.00	365	0%	0.4	2	0.0	0	0.1	0	0.0	0
Pleasure Craft Sum					8.2	45	0.0	0	0.3	2	0.0	0
Grand Total					33.6	152	4.2	19	0.8	4	0.1	0

Notes:
1) NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) Does not include airports and locomotives within NAA.
mapped via GIS analysis from 2017EPA_Airport for Klamath County.
3) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determined via GIS analysis of Klamath County and NAA zoning and divided to get the ratio.
GIS ID dependent upon SCC match to Klamath County zoning.
4) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
5) NAA Emissions = (County Emissions) * (NAA % of County)
6) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
7) DEQ ran MOVES3.1 to estimate nonroad emissions for the NAA.

Table 59. 2017 NO_X and SO_2 Annual and Seasonal Daily Emissions from Nonroad Sources

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
CNG												
AC\Refrigeration	2268003060	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Air Compressors	2268006015	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Forklifts	2268003020	1.00	312	60%	0.5	3	0.3	2	0.0	0	0.0	0
Gas Compressors	2268006020	1.00	365	70%	0.2	1	0.1	1	0.0	0	0.0	0
Generator Sets	2268006005	1.00	365	70%	0.3	2	0.2	1	0.0	0	0.0	0
Irrigation Sets	2268005060	1.00	365	4%	0.1	1	0.0	0	0.0	0	0.0	0
Other Agricultural Equipment	2268005055	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Construction Equipment	2268002081	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Other General Industrial Equipment	2268003040	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Other Oil Field Equipment	2268010010	1.00	312	0%	0.0	0	0.0	0	0.0	0	0.0	0
Pumps	2268006010	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2268003030	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2268003070	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
CNG Sum					1.2	7	0.7	4	0.0	0	0.0	0
Diesel												
2-Wheel Tractors	2270005010	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
AC\Refrigeration	2270003060	1.00	312	60%	7.6	49	4.6	29	0.0	0	0.0	0
Aerial Lifts	2270003010	0.72	312	60%	0.4	2	0.2	1	0.0	0	0.0	0
Agricultural Mowers	2270005030	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Agricultural Tractors	2270005015	0.72	365	4%	105.9	418	4.6	18	0.2	1	0.0	0
Air Compressors	2270006015	0.72	365	70%	3.0	12	2.1	8	0.0	0	0.0	0
Balers	2270005025	0.72	365	4%	0.1	0	0.0	0	0.0	0	0.0	0
Bore/Drill Rigs	2270002033	0.72	312	24%	1.3	6	0.3	1	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Cement and Mortar Mixers	2270002042	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Chippers/Stump Grinders (Comm)					0.6	3	0.1	1	0.0	0	0.0	0
Combines	2270005020	0.72	365	4%	11.7	46	0.5	2	0.0	0	0.0	0
Concrete/Industrial Saws	2270002039	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Cranes	2270002045	0.72	312	24%	1.6	7	0.4	2	0.0	0	0.0	0
Crawler Tractor/Dozers	2270002069	0.72	312	24%	5.9	27	1.4	7	0.0	0	0.0	0
Crushing/Processing Equipment	2270002054	0.72	312	24%	0.4	2	0.1	0	0.0	0	0.0	0
Dumpers/Tenders	2270002078	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Excavators	2270002036	0.72	312	24%	4.6	21	1.1	5	0.0	0	0.0	0
Forest Eqp - Feller/Bunch/Skidder	2270007015	0.72	365	0%	20.7	82	0.1	0	0.1	0	0.0	0
Forklifts	2270003020	0.72	312	60%	2.5	12	1.5	7	0.0	0	0.0	0
Front Mowers (Commercial)	2270004046	1.00	365	20%	0.4	2	0.1	0	0.0	0	0.0	0
Generator Sets	2270006005	0.72	365	70%	5.7	22	4.0	16	0.0	0	0.0	0
Graders	2270002048	0.72	312	24%	1.1	5	0.3	1	0.0	0	0.0	0
Hydro-power Units	2270006035	0.72	365	70%	0.1	1	0.1	0	0.0	0	0.0	0
Irrigation Sets	2270005060	1.00	365	4%	1.3	7	0.1	0	0.0	0	0.0	0
Lawn and Garden Tractors (Comm)	2270004056	1.00	365	20%	0.1	0	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2270004031	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Tractors	2270002075	0.72	312	24%	0.9	4	0.2	1	0.0	0	0.0	0
Off-highway Trucks	2270002051	0.72	312	24%	5.7	26	1.4	6	0.0	0	0.0	0
Other Agricultural Equipment	2270005055	0.72	365	4%	2.3	9	0.1	0	0.0	0	0.0	0
Other Construction Equipment	2270002081	0.72	312	24%	1.0	5	0.2	1	0.0	0	0.0	0
Other General Industrial Equipment	2270003040	0.72	312	60%	1.7	8	1.0	5	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Other Lawn and Garden Equip (Comm)	2270004076	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Other Material Handling Equipment	2270003050	0.72	312	60%	0.1	0	0.1	0	0.0	0	0.0	0
Other Oil Field Equipment	2270010010	1.00	312	0%	0.2	2	0.0	0	0.0	0	0.0	0
Pavers	2270002003	0.72	312	24%	0.6	3	0.1	1	0.0	0	0.0	0
Paving Equipment	2270002021	0.72	312	24%	0.1	1	0.0	0	0.0	0	0.0	0
Plate Compactors	2270002009	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pressure Washers	2270006030	0.72	365	70%	0.2	1	0.1	1	0.0	0	0.0	0
Pumps	2270006010	0.72	365	70%	1.3	5	0.9	4	0.0	0	0.0	0
Rollers	2270002015	0.72	312	24%	1.6	8	0.4	2	0.0	0	0.0	0
Rough Terrain Forklifts	2270002057	0.72	312	24%	2.4	11	0.6	3	0.0	0	0.0	0
Rubber Tire Loaders	2270002060	0.72	312	24%	7.9	37	1.9	9	0.0	0	0.0	0
Scrapers	2270002018	0.72	312	24%	1.5	7	0.4	2	0.0	0	0.0	0
Signal Boards/Light Plants	2270002027	0.72	312	24%	0.3	1	0.1	0	0.0	0	0.0	0
Skid Steer Loaders	2270002072	0.72	312	24%	5.5	25	1.3	6	0.0	0	0.0	0
Snowblowers (Commercial)	2270004036	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Specialty Vehicles/Carts	2270001060	0.72	365	4%	0.5	2	0.0	0	0.0	0	0.0	0
Sprayers	2270005035	0.72	365	4%	0.9	4	0.0	0	0.0	0	0.0	0
Surfacing Equipment	2270002024	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Swathers	2270005045	0.72	365	4%	0.9	4	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2270003030	0.72	312	60%	1.3	6	0.8	4	0.0	0	0.0	0
Tampers/Rammers	2270002006	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2270003070	1.00	312	60%	1.2	7	0.7	4	0.0	0	0.0	0
Tillers : 6 HP	2270005040	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Tractors/Loaders/Backhoes	2270002066	0.72	312	24%	7.5	35	1.8	8	0.0	0	0.0	0
Trenchers	2270002030	0.72	312	24%	1.0	5	0.2	1	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Turf Equipment (Comm)	2270004071	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Welders	2270006025	0.72	365	70%	1.8	7	1.2	5	0.0	0	0.0	0
Diesel Sum					223.8	947	35.3	163	0.4	2	0.1	0
Gasoline, 2-Stroke												
Air Compressors	2260006015	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
All-Terrain Vehicles	2260001030	0.72	365	4%	0.2	1	0.0	0	0.0	0	0.0	0
Chain Saws : 6 HP	2260007005	0.72	365	0%	0.2	1	0.0	0	0.0	0	0.0	0
Chain Saws < 6 HP (Commercial)	2260004021	1.00	365	20%	0.1	0	0.0	0	0.0	0	0.0	0
Chain Saws < 6 HP (Residential)	2260004020	0.72	365	35%	0.1	0	0.0	0	0.0	0	0.0	0
Concrete/Industrial Saws	2260002039	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Crushing/Processing Equipment	2260002054	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Generator Sets	2260006005	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Hydro-power Units	2260006035	0.72	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2260004031	1.00	365	20%	0.1	0	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Residential)	2260004030	0.72	365	35%	0.1	0	0.0	0	0.0	0	0.0	0
Motorcycles: Off-road	2260001010	0.72	365	4%	0.5	2	0.0	0	0.0	0	0.0	0
Other General Industrial Equipment	2260003040	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Paving Equipment	2260002021	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Plate Compactors	2260002009	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pumps	2260006010	0.72	365	70%	0.1	0	0.1	0	0.0	0	0.0	0
Rotary Tillers < 6 HP (Commercial)	2260004016	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Rotary Tillers < 6 HP (Residential)	2260004015	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Signal Boards/Light Plants	2260002027	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Snowblowers (Commercial)	2260004036	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Snowblowers (Residential)	2260004035	1.18	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Snowmobiles	2260001020	0.72	365	4%	2.1	8	0.1	0	0.0	0	0.0	0
Specialty Vehicles/Carts	2260001060	0.72	365	4%	0.1	1	0.0	0	0.0	0	0.0	0
Sprayers	2260005035	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2260003030	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Tampers/Rammers	2260002006	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Comm)	2260004026	1.00	365	20%	0.1	0	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Res)	2260004025	0.72	365	35%	0.1	0	0.0	0	0.0	0	0.0	0
Turf Equipment (Comm)	2260004071	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Gasoline, 2-Stroke Sum					3.8	15	0.4	2	0.0	0	0.0	0
Gasoline, 4-Stroke												
2-Wheel Tractors	2265005010	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
AC\Refrigeration	2265003060	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Aerial Lifts	2265003010	0.72	312	60%	0.3	1	0.2	1	0.0	0	0.0	0
Agricultural Mowers	2265005030	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Agricultural Tractors	2265005015	0.72	365	4%	0.1	0	0.0	0	0.0	0	0.0	0
Air Compressors	2265006015	0.72	365	70%	0.4	1	0.3	1	0.0	0	0.0	0
All-Terrain Vehicles	2265001030	0.72	365	4%	2.5	10	0.1	0	0.0	0	0.0	0
Balers	2265005025	0.72	365	4%	0.1	1	0.0	0	0.0	0	0.0	0
Bore/Drill Rigs	2265002033	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Cement and Mortar Mixers	2265002042	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Chippers/Stump Grinders (Comm)					0.0	0	0.0	0	0.0	0	0.0	0
Combines	2265005020	0.72	365	4%	0.0	0	0.0	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Concrete/Industrial Saws	2265002039	0.72	312	24%	0.1	1	0.0	0	0.0	0	0.0	0
Cranes	2265002045	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Crushing/Processing Equipment	2265002054	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Dumpers/Tenders	2265002078	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Forest Eqp - Feller/Bunch/Skidder	2265007015	0.72	365	0%	0.0	0	0.0	0	0.0	0	0.0	0
Forklifts	2265003020	0.72	312	60%	0.5	2	0.3	1	0.0	0	0.0	0
Front Mowers (Commercial)	2265004046	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Generator Sets	2265006005	0.72	365	70%	3.0	12	2.1	8	0.0	0	0.0	0
Golf Carts	2265001050	0.72	365	100%	0.8	3	0.8	3	0.0	0	0.0	0
Hydro-power Units	2265006035	0.72	365	70%	0.1	0	0.0	0	0.0	0	0.0	0
Irrigation Sets	2265005060	1.00	365	4%	0.1	0	0.0	0	0.0	0	0.0	0
Lawn and Garden Tractors (Comm)	2265004056	1.00	365	20%	0.2	1	0.0	0	0.0	0	0.0	0
Lawn and Garden Tractors (Res)	2265004055	0.72	365	35%	2.7	11	0.9	4	0.0	0	0.0	0
Lawn Mowers (Commercial)	2265004011	1.00	365	20%	0.2	1	0.0	0	0.0	0	0.0	0
Lawn Mowers (Residential)	2265004010	0.72	365	35%	1.0	4	0.3	1	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2265004031	1.00	365	20%	0.2	1	0.0	0	0.0	0	0.0	0
Leafblowers/Vacuums (Residential)	2265004030	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Motorcycles: Off-road	2265001010	0.72	365	4%	0.3	1	0.0	0	0.0	0	0.0	0
Other Agricultural Equipment	2265005055	0.72	365	4%	0.3	1	0.0	0	0.0	0	0.0	0
Other Construction Equipment	2265002081	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Other General Industrial Equipment	2265003040	0.72	312	60%	0.2	1	0.1	1	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Other Lawn and Garden Equip (Comm)	2265004076	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Other Lawn and Garden Equip (Res)	2265004075	0.72	365	35%	0.1	0	0.0	0	0.0	0	0.0	0
Other Material Handling Equipment	2265003050	0.72	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Other Oil Field Equipment	2265010010	1.00	312	0%	0.1	0	0.0	0	0.0	0	0.0	0
Pavers	2265002003	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Paving Equipment	2265002021	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Plate Compactors	2265002009	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pressure Washers	2265006030	0.72	365	70%	1.2	5	0.8	3	0.0	0	0.0	0
Pumps	2265006010	0.72	365	70%	0.7	3	0.5	2	0.0	0	0.0	0
Rear Eng Riding Mowers (Comm)	2265004041	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Rear Eng Riding Mowers (Res)	2265004040	0.72	365	35%	0.2	1	0.1	0	0.0	0	0.0	0
Rollers	2265002015	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rotary Tillers < 6 HP (Commercial)	2265004016	1.00	365	20%	0.1	0	0.0	0	0.0	0	0.0	0
Rotary Tillers < 6 HP (Residential)	2265004015	0.72	365	35%	0.1	0	0.0	0	0.0	0	0.0	0
Rough Terrain Forklifts	2265002057	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rubber Tire Loaders	2265002060	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Shredders : 6 HP	2265007010	0.72	365	0%	0.7	3	0.0	0	0.0	0	0.0	0
Shredders < 6 HP (Commercial)	2265004051	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Signal Boards/Light Plants	2265002027	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Skid Steer Loaders	2265002072	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Snowblowers (Commercial)	2265004036	1.00	365	20%	0.1	1	0.0	0	0.0	0	0.0	0
Snowblowers (Residential)	2265004035	0.72	365	35%	0.2	1	0.1	0	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Specialty Vehicles/Carts	2265001060	0.72	365	4%	0.2	1	0.0	0	0.0	0	0.0	0
Sprayers	2265005035	0.72	365	4%	0.3	1	0.0	0	0.0	0	0.0	0
Surfacing Equipment	2265002024	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Swathers	2265005045	0.72	365	4%	0.2	1	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2265003030	0.72	312	60%	0.1	1	0.1	0	0.0	0	0.0	0
Tampers/Rammers	2265002006	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2265003070	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Tillers : 6 HP	2265005040	0.72	365	4%	0.5	2	0.0	0	0.0	0	0.0	0
Tractors/Loaders/Backhoes	2265002066	0.72	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Trenchers	2265002030	0.72	312	24%	0.1	0	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Comm)	2265004026	1.00	365	20%	0.0	0	0.0	0	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Res)	2265004025	0.72	365	35%	0.0	0	0.0	0	0.0	0	0.0	0
Turf Equipment (Comm)	2265004071	1.00	365	20%	0.8	4	0.2	1	0.0	0	0.0	0
Welders	2265006025	0.72	365	70%	0.8	3	0.5	2	0.0	0	0.0	0
Gasoline, 4-Stroke Sum					20.1	84	8.0	33	0.0	0	0.0	0
LPG												
Aerial Lifts	2267003010	1.00	312	60%	0.2	1	0.1	1	0.0	0	0.0	0
Air Compressors	2267006015	1.00	365	70%	0.1	0	0.1	0	0.0	0	0.0	0
Bore/Drill Rigs	2267002033	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Chippers/Stump Grinders (Comm)					0.0	0	0.0	0	0.0	0	0.0	0
Concrete/Industrial Saws	2267002039	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Cranes	2267002045	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Crushing/Processing Equipment	2267002054	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Forklifts	2267003020	1.00	312	60%	6.6	42	3.9	25	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Generator Sets	2267006005	1.00	365	70%	0.8	4	0.5	3	0.0	0	0.0	0
Hydro-power Units	2267006035	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Irrigation Sets	2267005060	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Agricultural Equipment	2267005055	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Other Construction Equipment	2267002081	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Other General Industrial Equipment	2267003040	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Other Material Handling Equipment	2267003050	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Pavers	2267002003	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Paving Equipment	2267002021	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Pressure Washers	2267006030	1.00	365	70%	0.0	0	0.0	0	0.0	0	0.0	0
Pumps	2267006010	1.00	365	70%	0.1	1	0.1	0	0.0	0	0.0	0
Rollers	2267002015	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rough Terrain Forklifts	2267002057	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Rubber Tire Loaders	2267002060	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Skid Steer Loaders	2267002072	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Specialty Vehicles/Carts	2267001060	1.00	365	4%	0.0	0	0.0	0	0.0	0	0.0	0
Surfacing Equipment	2267002024	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Sweepers/Scrubbers	2267003030	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Terminal Tractors	2267003070	1.00	312	60%	0.0	0	0.0	0	0.0	0	0.0	0
Tractors/Loaders/Backhoes	2267002066	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Trenchers	2267002030	1.00	312	24%	0.0	0	0.0	0	0.0	0	0.0	0
Welders	2267006025	1.00	365	70%	0.1	1	0.1	0	0.0	0	0.0	0
LPG Sum					8.1	51	4.9	31	0.0	0	0.0	0
Off-highway Vehicle CNG												

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	NO_X				SO_2			
					CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
CNG Commercial Equipment	2268006022	0.00	0	70%	0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Vehicle CNG Sum					0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Vehicle Diesel												
Diesel Logging Equipment	2270007022	0.00	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Other Underground Mining Equip	2270009010	0.00	0	0%	0.0	0	0.0	0	0.0	0	0.0	0
Off-highway Vehicle Diesel Sum					0.0	0	0.0	0	0.0	0	0.0	0
Pleasure Craft												
2-Stroke Pleasure Craft	2282005022	1.00	365	0%	96.9	531	0.0	0	0.1	1	0.0	0
Diesel Pleasure Craft	2282020022	1.00	365	0%	39.9	219	0.0	0	0.0	0	0.0	0
Inboard/Sterndrive	2282010005	1.00	365	0%	49.0	269	0.0	0	0.0	0	0.0	0
Pleasure Craft Sum					185.9	1,019	0.0	0	0.2	1	0.0	0
				Grand Total	443.0	2,123	49.2	232	0.6	3	0.1	0

Notes:
1) NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) Does not include airports and locomotives within NAA.
mapped via GIS analysis from 2017EPA_Airport for Klamath County.
3) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determined via GIS analysis of Klamath County and NAA zoning and divided to get the ratio.
GIS ID dependent upon SCC match to Klamath County zoning.
4) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
5) NAA Emissions = (County Emissions) * (NAA % of County)
6) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
7) DEQ ran MOVES3.1 to estimate nonroad emissions for the NAA.

Table 60. 2017 VOC Annual and Seasonal Daily Emissions from Nonroad Sources

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
CNG								
AC\Refrigeration	2268003060	1.00	312	60%	0.0	0	0.0	0
Air Compressors	2268006015	1.00	365	70%	0.0	0	0.0	0
Forklifts	2268003020	1.00	312	60%	0.3	2	0.2	1
Gas Compressors	2268006020	1.00	365	70%	0.1	0	0.1	0
Generator Sets	2268006005	1.00	365	70%	0.2	1	0.1	1
Irrigation Sets	2268005060	1.00	365	4%	0.1	0	0.0	0
Other Agricultural Equipment	2268005055	1.00	365	4%	0.0	0	0.0	0
Other Construction Equipment	2268002081	1.00	312	24%	0.0	0	0.0	0
Other General Industrial Equipment	2268003040	1.00	312	60%	0.0	0	0.0	0
Other Oil Field Equipment	2268010010	1.00	312	0%	0.0	0	0.0	0
Pumps	2268006010	1.00	365	70%	0.0	0	0.0	0
Sweepers/Scrubbers	2268003030	1.00	312	60%	0.0	0	0.0	0
Terminal Tractors	2268003070	1.00	312	60%	0.0	0	0.0	0
CNG Sum					0.6	4	0.4	2
Diesel								
2-Wheel Tractors	2270005010	0.72	365	4%	0.0	0	0.0	0
AC\Refrigeration	2270003060	1.00	312	60%	0.4	3	0.3	2
Aerial Lifts	2270003010	0.72	312	60%	0.1	0	0.1	0
Agricultural Mowers	2270005030	0.72	365	4%	0.0	0	0.0	0
Agricultural Tractors	2270005015	0.72	365	4%	8.5	34	0.4	1
Air Compressors	2270006015	0.72	365	70%	0.2	1	0.2	1
Balers	2270005025	0.72	365	4%	0.0	0	0.0	0
Bore/Drill Rigs	2270002033	0.72	312	24%	0.1	0	0.0	0
Cement and Mortar Mixers	2270002042	0.72	312	24%	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
Chippers/Stump Grinders (Comm)					0.0	0	0.0	0
Combines	2270005020	0.72	365	4%	0.9	4	0.0	0
Concrete/Industrial Saws	2270002039	0.72	312	24%	0.0	0	0.0	0
Cranes	2270002045	0.72	312	24%	0.1	0	0.0	0
Crawler Tractor/Dozers	2270002069	0.72	312	24%	0.3	2	0.1	0
Crushing/Processing Equipment	2270002054	0.72	312	24%	0.0	0	0.0	0
Dumpers/Tenders	2270002078	0.72	312	24%	0.0	0	0.0	0
Excavators	2270002036	0.72	312	24%	0.3	1	0.1	0
Forest Eqp - Feller/Bunch/Skidder	2270007015	0.72	365	0%	1.2	5	0.0	0
Forklifts	2270003020	0.72	312	60%	0.1	0	0.1	0
Front Mowers (Commercial)	2270004046	1.00	365	20%	0.0	0	0.0	0
Generator Sets	2270006005	0.72	365	70%	0.6	2	0.4	2
Graders	2270002048	0.72	312	24%	0.1	0	0.0	0
Hydro-power Units	2270006035	0.72	365	70%	0.0	0	0.0	0
Irrigation Sets	2270005060	1.00	365	4%	0.1	1	0.0	0
Lawn and Garden Tractors (Comm)	2270004056	1.00	365	20%	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2270004031	1.00	365	20%	0.0	0	0.0	0
Off-highway Tractors	2270002075	0.72	312	24%	0.0	0	0.0	0
Off-highway Trucks	2270002051	0.72	312	24%	0.2	1	0.1	0
Other Agricultural Equipment	2270005055	0.72	365	4%	0.2	1	0.0	0
Other Construction Equipment	2270002081	0.72	312	24%	0.1	0	0.0	0
Other General Industrial Equipment	2270003040	0.72	312	60%	0.1	1	0.1	0
Other Lawn and Garden Equip (Comm)	2270004076	1.00	365	20%	0.0	0	0.0	0
Other Material Handling Equipment	2270003050	0.72	312	60%	0.0	0	0.0	0
Other Oil Field Equipment	2270010010	1.00	312	0%	0.0	0	0.0	0
Pavers	2270002003	0.72	312	24%	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
Paving Equipment	2270002021	0.72	312	24%	0.0	0	0.0	0
Plate Compactors	2270002009	0.72	312	24%	0.0	0	0.0	0
Pressure Washers	2270006030	0.72	365	70%	0.0	0	0.0	0
Pumps	2270006010	0.72	365	70%	0.1	1	0.1	0
Rollers	2270002015	0.72	312	24%	0.1	0	0.0	0
Rough Terrain Forklifts	2270002057	0.72	312	24%	0.2	1	0.0	0
Rubber Tire Loaders	2270002060	0.72	312	24%	0.5	2	0.1	1
Scrapers	2270002018	0.72	312	24%	0.1	0	0.0	0
Signal Boards/Light Plants	2270002027	0.72	312	24%	0.0	0	0.0	0
Skid Steer Loaders	2270002072	0.72	312	24%	1.2	5	0.3	1
Snowblowers (Commercial)	2270004036	1.00	365	20%	0.0	0	0.0	0
Specialty Vehicles/Carts	2270001060	0.72	365	4%	0.1	0	0.0	0
Sprayers	2270005035	0.72	365	4%	0.1	0	0.0	0
Surfacing Equipment	2270002024	0.72	312	24%	0.0	0	0.0	0
Swathers	2270005045	0.72	365	4%	0.1	0	0.0	0
Sweepers/Scrubbers	2270003030	0.72	312	60%	0.1	0	0.0	0
Tampers/Rammers	2270002006	0.72	312	24%	0.0	0	0.0	0
Terminal Tractors	2270003070	1.00	312	60%	0.1	0	0.0	0
Tillers : 6 HP	2270005040	0.72	365	4%	0.0	0	0.0	0
Tractors/Loaders/Backhoes	2270002066	0.72	312	24%	1.4	6	0.3	2
Trenchers	2270002030	0.72	312	24%	0.1	0	0.0	0
Turf Equipment (Comm)	2270004071	1.00	365	20%	0.0	0	0.0	0
Welders	2270006025	0.72	365	70%	0.3	1	0.2	1
Diesel Sum					18.3	77	3.1	14
Gasoline, 2-Stroke								
Air Compressors	2260006015	0.72	365	70%	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
All-Terrain Vehicles	2260001030	0.72	365	4%	11.2	44	0.5	2
Chain Saws : 6 HP	2260007005	0.72	365	0%	8.5	34	0.0	0
Chain Saws < 6 HP (Commercial)	2260004021	1.00	365	20%	3.1	17	0.6	3
Chain Saws < 6 HP (Residential)	2260004020	0.72	365	35%	2.5	10	0.9	3
Concrete/Industrial Saws	2260002039	0.72	312	24%	2.0	9	0.5	2
Crushing/Processing Equipment	2260002054	0.72	312	24%	0.0	0	0.0	0
Generator Sets	2260006005	0.72	365	70%	0.3	1	0.2	1
Hydro-power Units	2260006035	0.72	365	70%	0.0	0	0.0	0
Leafblowers/Vacuums (Comm)	2260004031	1.00	365	20%	1.5	8	0.3	2
Leafblowers/Vacuums (Residential)	2260004030	0.72	365	35%	1.7	7	0.6	2
Motorcycles: Off-road	2260001010	0.72	365	4%	43.4	171	1.9	8
Other General Industrial Equipment	2260003040	0.72	312	60%	0.0	0	0.0	0
Paving Equipment	2260002021	0.72	312	24%	0.0	0	0.0	0
Plate Compactors	2260002009	0.72	312	24%	0.0	0	0.0	0
Pumps	2260006010	0.72	365	70%	2.4	9	1.7	7
Rotary Tillers < 6 HP (Commercial)	2260004016	1.00	365	20%	0.1	1	0.0	0
Rotary Tillers < 6 HP (Residential)	2260004015	0.72	365	35%	0.1	1	0.0	0
Signal Boards/Light Plants	2260002027	0.72	312	24%	0.0	0	0.0	0
Snowblowers (Commercial)	2260004036	1.00	365	20%	1.6	9	0.3	2
Snowblowers (Residential)	2260004035	1.18	365	35%	3.1	20	1.1	7
Snowmobiles	2260001020	0.72	365	4%	33.6	132	1.5	6
Specialty Vehicles/Carts	2260001060	0.72	365	4%	0.6	2	0.0	0
Sprayers	2260005035	0.72	365	4%	0.1	1	0.0	0
Sweepers/Scrubbers	2260003030	0.72	312	60%	0.0	0	0.0	0
Tampers/Rammers	2260002006	0.72	312	24%	0.8	4	0.2	1
Trimmers/Edgers/Brush Cutters (Comm)	2260004026	1.00	365	20%	1.5	8	0.3	2

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
Trimmers/Edgers/Brush Cutters (Res)	2260004025	0.72	365	35%	2.8	11	1.0	4
Turf Equipment (Comm)	2260004071	1.00	365	20%	0.0	0	0.0	0
Gasoline, 2-Stroke Sum					121.0	499	11.6	51
Gasoline, 4-Stroke								
2-Wheel Tractors	2265005010	0.72	365	4%	0.0	0	0.0	0
AC\Refrigeration	2265003060	1.00	312	60%	0.0	0	0.0	0
Aerial Lifts	2265003010	0.72	312	60%	0.3	1	0.2	1
Agricultural Mowers	2265005030	0.72	365	4%	0.0	0	0.0	0
Agricultural Tractors	2265005015	0.72	365	4%	0.1	0	0.0	0
Air Compressors	2265006015	0.72	365	70%	0.8	3	0.6	2
All-Terrain Vehicles	2265001030	0.72	365	4%	20.1	79	0.9	3
Balers	2265005025	0.72	365	4%	0.1	0	0.0	0
Bore/Drill Rigs	2265002033	0.72	312	24%	0.1	0	0.0	0
Cement and Mortar Mixers	2265002042	0.72	312	24%	0.2	1	0.0	0
Chippers/Stump Grinders (Comm)					0.1	0	0.0	0
Combines	2265005020	0.72	365	4%	0.0	0	0.0	0
Concrete/Industrial Saws	2265002039	0.72	312	24%	0.3	1	0.1	0
Cranes	2265002045	0.72	312	24%	0.0	0	0.0	0
Crushing/Processing Equipment	2265002054	0.72	312	24%	0.0	0	0.0	0
Dumpers/Tenders	2265002078	0.72	312	24%	0.0	0	0.0	0
Forest Eqp - Feller/Bunch/Skidder	2265007015	0.72	365	0%	0.0	0	0.0	0
Forklifts	2265003020	0.72	312	60%	0.3	1	0.2	1
Front Mowers (Commercial)	2265004046	1.00	365	20%	0.1	0	0.0	0
Generator Sets	2265006005	0.72	365	70%	8.5	34	6.0	24
Golf Carts	2265001050	0.72	365	100%	2.2	9	2.2	9
Hydro-power Units	2265006035	0.72	365	70%	0.1	1	0.1	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
Irrigation Sets	2265005060	1.00	365	4%	0.1	0	0.0	0
Lawn and Garden Tractors (Comm)	2265004056	1.00	365	20%	0.7	4	0.1	1
Lawn and Garden Tractors (Res)	2265004055	0.72	365	35%	9.6	38	3.3	13
Lawn Mowers (Commercial)	2265004011	1.00	365	20%	0.8	4	0.2	1
Lawn Mowers (Residential)	2265004010	0.72	365	35%	6.7	27	2.3	9
Leafblowers/Vacuums (Comm)	2265004031	1.00	365	20%	0.5	3	0.1	1
Leafblowers/Vacuums (Residential)	2265004030	0.72	365	35%	0.1	0	0.0	0
Motorcycles: Off-road	2265001010	0.72	365	4%	2.0	8	0.1	0
Other Agricultural Equipment	2265005055	0.72	365	4%	0.2	1	0.0	0
Other Construction Equipment	2265002081	0.72	312	24%	0.0	0	0.0	0
Other General Industrial Equipment	2265003040	0.72	312	60%	0.6	3	0.4	2
Other Lawn and Garden Equip (Comm)	2265004076	1.00	365	20%	0.1	1	0.0	0
Other Lawn and Garden Equip (Res)	2265004075	0.72	365	35%	0.5	2	0.2	1
Other Material Handling Equipment	2265003050	0.72	312	60%	0.0	0	0.0	0
Other Oil Field Equipment	2265010010	1.00	312	0%	0.1	1	0.0	0
Pavers	2265002003	0.72	312	24%	0.0	0	0.0	0
Paving Equipment	2265002021	0.72	312	24%	0.2	1	0.0	0
Plate Compactors	2265002009	0.72	312	24%	0.1	0	0.0	0
Pressure Washers	2265006030	0.72	365	70%	3.6	14	2.5	10
Pumps	2265006010	0.72	365	70%	1.9	7	1.3	5
Rear Eng Riding Mowers (Comm)	2265004041	1.00	365	20%	0.1	0	0.0	0
Rear Eng Riding Mowers (Res)	2265004040	0.72	365	35%	0.9	4	0.3	1
Rollers	2265002015	0.72	312	24%	0.1	0	0.0	0
Rotary Tillers < 6 HP (Commercial)	2265004016	1.00	365	20%	0.5	3	0.1	1
Rotary Tillers < 6 HP (Residential)	2265004015	0.72	365	35%	0.6	2	0.2	1
Rough Terrain Forklifts	2265002057	0.72	312	24%	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
Rubber Tire Loaders	2265002060	0.72	312	24%	0.0	0	0.0	0
Shredders : 6 HP	2265007010	0.72	365	0%	2.1	8	0.0	0
Shredders < 6 HP (Commercial)	2265004051	1.00	365	20%	0.1	0	0.0	0
Signal Boards/Light Plants	2265002027	0.72	312	24%	0.0	0	0.0	0
Skid Steer Loaders	2265002072	0.72	312	24%	0.1	0	0.0	0
Snowblowers (Commercial)	2265004036	1.00	365	20%	0.4	2	0.1	0
Snowblowers (Residential)	2265004035	0.72	365	35%	1.0	4	0.4	1
Specialty Vehicles/Carts	2265001060	0.72	365	4%	0.6	2	0.0	0
Sprayers	2265005035	0.72	365	4%	0.4	2	0.0	0
Surfacing Equipment	2265002024	0.72	312	24%	0.1	0	0.0	0
Swathers	2265005045	0.72	365	4%	0.2	1	0.0	0
Sweepers/Scrubbers	2265003030	0.72	312	60%	0.2	1	0.1	0
Tampers/Rammers	2265002006	0.72	312	24%	0.0	0	0.0	0
Terminal Tractors	2265003070	1.00	312	60%	0.0	0	0.0	0
Tillers : 6 HP	2265005040	0.72	365	4%	1.4	6	0.1	0
Tractors/Loaders/Backhoes	2265002066	0.72	312	24%	0.1	0	0.0	0
Trenchers	2265002030	0.72	312	24%	0.1	1	0.0	0
Trimmers/Edgers/Brush Cutters (Comm)	2265004026	1.00	365	20%	0.0	0	0.0	0
Trimmers/Edgers/Brush Cutters (Res)	2265004025	0.72	365	35%	0.0	0	0.0	0
Turf Equipment (Comm)	2265004071	1.00	365	20%	2.0	11	0.4	2
Welders	2265006025	0.72	365	70%	1.8	7	1.3	5
Gasoline, 4-Stroke Sum					73.8	302	24.0	97
LPG								
Aerial Lifts	2267003010	1.00	312	60%	0.0	0	0.0	0
Air Compressors	2267006015	1.00	365	70%	0.0	0	0.0	0
Bore/Drill Rigs	2267002033	1.00	312	24%	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
Chippers/Stump Grinders (Comm)					0.0	0	0.0	0
Concrete/Industrial Saws	2267002039	1.00	312	24%	0.0	0	0.0	0
Cranes	2267002045	1.00	312	24%	0.0	0	0.0	0
Crushing/Processing Equipment	2267002054	1.00	312	24%	0.0	0	0.0	0
Forklifts	2267003020	1.00	312	60%	1.0	6	0.6	4
Generator Sets	2267006005	1.00	365	70%	0.1	1	0.1	0
Hydro-power Units	2267006035	1.00	365	70%	0.0	0	0.0	0
Irrigation Sets	2267005060	1.00	365	4%	0.0	0	0.0	0
Other Agricultural Equipment	2267005055	1.00	365	4%	0.0	0	0.0	0
Other Construction Equipment	2267002081	1.00	312	24%	0.0	0	0.0	0
Other General Industrial Equip	2267003040	1.00	312	60%	0.0	0	0.0	0
Other Material Handling Equip	2267003050	1.00	312	60%	0.0	0	0.0	0
Pavers	2267002003	1.00	312	24%	0.0	0	0.0	0
Paving Equipment	2267002021	1.00	312	24%	0.0	0	0.0	0
Pressure Washers	2267006030	1.00	365	70%	0.0	0	0.0	0
Pumps	2267006010	1.00	365	70%	0.0	0	0.0	0
Rollers	2267002015	1.00	312	24%	0.0	0	0.0	0
Rough Terrain Forklifts	2267002057	1.00	312	24%	0.0	0	0.0	0
Rubber Tire Loaders	2267002060	1.00	312	24%	0.0	0	0.0	0
Skid Steer Loaders	2267002072	1.00	312	24%	0.0	0	0.0	0
Specialty Vehicles/Carts	2267001060	1.00	365	4%	0.0	0	0.0	0
Surfacing Equipment	2267002024	1.00	312	24%	0.0	0	0.0	0
Sweepers/Scrubbers	2267003030	1.00	312	60%	0.0	0	0.0	0
Terminal Tractors	2267003070	1.00	312	60%	0.0	0	0.0	0
Tractors/Loaders/Backhoes	2267002066	1.00	312	24%	0.0	0	0.0	0
Trenchers	2267002030	1.00	312	24%	0.0	0	0.0	0

Equipment and Fuel Type	SCC	SAF	Annual Activity Days	CTY to NAA Ratio	VOC			
					CTY AE	CTY TSD	NAA AE	NAA TSD
Welders	2267006025	1.00	365	70%	0.0	0	0.0	0
LPG Sum					1.2	8	0.7	5
Off-highway Vehicle CNG								
CNG Commercial Equipment	2268006022	0.00	0	70%	0.0	0	0.0	0
Off-highway Vehicle CNG Sum					0.0	0	0.0	0
Off-highway Vehicle Diesel								
Diesel Logging Equipment	2270007022	0.00	0	0%	0.0	0	0.0	0
Other Underground Mining Equip	2270009010	0.00	0	0%	0.0	0	0.0	0
Off-highway Vehicle Diesel Sum					0.0	0	0.0	0
Pleasure Craft								
2-Stroke Pleasure Craft	2282005022	1.00	365	0%	524.9	2,876	0.0	0
Diesel Pleasure Craft	2282020022	1.00	365	0%	2.1	12	0.0	0
Inboard/Sterndrive	2282010005	1.00	365	0%	41.1	225	0.0	0
Pleasure Craft Sum					568.1	3,113	0.0	0
				Grand Total	783.0	4,002	39.8	169

Notes:
1) NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) Does not include airports and locomotives within NAA.
mapped via GIS analysis from 2017EPA_Airport for Klamath County.
3) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA determined via GIS analysis of Klamath County and NAA zoning and divided to get the ratio.
GIS ID dependent upon SCC match to Klamath County zoning.
4) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
5) NAA Emissions = (County Emissions) * (NAA % of County)
6) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:

Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
7) DEQ ran MOVES3.1 to estimate nonroad emissions for the NAA.

Table 61. 2017 Annual and Seasonal Daily Emissions for Airports and Locomotives

Equipment by SCC	SAF	Annual Activity Days	County to NAA Ratio	PM2.5-Primary				NH3				NOX				SO2				VOC			
				CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD	CTY AE	CTY TSD	NAA AE	NAA TSD
Aircraft and Airport Operations																							
Aircraft																							
2275001000	0.90	365	0%	6.8	34	6.8	34	0.0	0	0.0	0	111.8	551	111.8	551	10.6	52	10.6	52	54.4	268	54.4	268
2275050011	0.90	365	0%	0.8	4	0.7	3	0.0	0	0.0	0	0.3	2	0.3	1	0.1	0	0.0	0	0.8	4	0.6	3
2275050012	0.90	365	0%	0.4	2	0.4	2	0.0	0	0.0	0	0.8	4	0.7	3	0.2	1	0.2	1	1.6	8	1.4	7
2275060011	0.90	365	0%	0.1	0	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
2275060012	0.90	365	0%	0.1	0	0.0	0	0.0	0	0.0	0	0.2	1	0.2	1	0.1	0	0.1	0	0.8	4	0.7	3
Aircraft Auxiliary Power Units																							
2275070000	0.90	365	0%	0.0	0	0.0	0	0.0	0	0.0	0	0.2	1	0.2	1	0.0	0	0.0	0	0.0	0	0.0	0
Airport Ground Support Equipment - Diesel																							
2270008005	0.90	365	0%	0.0	0	0.0	0	0.0	0	0.0	0	0.1	0	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0
Airport Ground Support Equipment - Gasoline																							
2265008005	0.90	365	0%	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Aircraft and Airport Operations Sum				*8.3*	*41*	*8.0*	*39*	*0.0*	*0*	*0.0*	*0*	*113.5*	*560*	*113.2*	*558*	*10.9*	*54*	*10.9*	*54*	*57.7*	*284*	*57.2*	*282*
Locomotives																							
Line Haul Locomotives: Class I Operations																							
2285002006	1.00	365	13%	20.3	111	2.6	14	0.4	2	0.1	0	716.1	3904	90.7	495	0.5	3	0.1	0	33.0	180	4.2	23
Line Haul Locomotives: Class II / III Operations																							
2285002007	1.00	365	13%	0.2	1	0.0	0	0.0	0	0.0	0	8.7	48	1.1	6	0.0	0	0.0	0	0.4	2	0.1	0
Line Haul Locomotives: Passenger Trains (Amtrak)																							
2285002008	1.00	365	13%	2.3	13	0.3	2	0.0	0	0.0	0	68.5	376	8.7	48	0.0	0	0.0	0	3.8	21	0.5	3
Railway Maintenance - Diesel																							
2285002015	1.00	365	13%	0.3	2	0.0	0	0.0	0	0.0	0	2.6	14	0.3	2	0.0	0	0.0	0	0.4	2	0.1	0
Railway Maintenance - Gasoline																							
2285004015	1.00	365	13%	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.1	1	0.0	0
Railway Maintenance - Other																							
2285006015	1.00	365	13%	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Locomotives Sum				*23.2*	*127*	*2.9*	*16*	*0.5*	*3*	*0.1*	*0*	*796.1*	*4342*	*100.9*	*550*	*0.5*	*3*	*0.1*	*0*	*37.8*	*206*	*4.8*	*26*
Grand Total				32	168	11	55	0	3	0	0	910	4902	214	1109	11	57	11	54	95	490	62	308

Notes:

Aircraft and Airport Operations

1) NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
   NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)

2) To determine location of airports within NAA mapped via GIS analysis from 2017EPA_Airport for Klamath County.

3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)
<u>Locomotives</u>
1) NAA AE (tpy) = Non-Attainment Area Annual Emissions (tons per year)
   NAA TSD (lbs/day) = Non-Attainment Area Typical Season Day Emissions (pounds per day)
2) County to NAA allocation of emissions = County emissions * County to NAA ratio
Where: County and NAA active rail line length determined via GIS analysis and divided to get the ratio.
3) Seasonal Adjustment Factor (SAF) was calculated using Temporal Allocation Profile Data by Source Classification Code (SCC) from EPA's 2016 Modeling Platform.
The season activity data is summed for January, February, November, and December and used in the following formula:
SAF = ((PM season activity) * (12 months)) / ((annual activity) * (# of season months))
4) Typical season day emissions estimated by multiplying the actual annual emissions by the SAF and divide that by the annual activity days for 2017. The formula is as follows:
Typical Season Day Emissions (lbs/day) = (Annual emissions (tpy) * SAF * 2000 lbs/ton) / (# Activity days per year)

Appendix E: Section 2.7

Table 62. 2017 $PM_{2.5}$ and Precursor Pollutant Annual and Seasonal Daily Emissions by Road Type

Pollutants	Rural Restricted Access		Rural Unrestricted Access		Urban Restricted Access		Urban Unrestricted Access		Total AE	Total TSD
	7,480,708		15,958,572		112,446,175		172,308,807			
	2.43%		5.18%		36.49%		55.91%			
	AE	TSD	AE	TSD	AE	TSD	AE	TSD		
NH_3	0.2	1	0.6	3	4.4	23	7.2	39	12.5	66
NOx	6.6	34	16.6	86	109.7	599	184.8	1015	317.7	1734
SO_2	0.0	0	0.1	1	0.8	4	1.7	9	2.7	14
VOC	1.5	7	5.1	24	30.8	152	83.2	421	120.7	604
$PM_{2.5}$ - Brakewear	0.0	0	0.0	0	0.1	1	1.0	6	1.2	7
$PM_{2.5}$ - Exhaust	0.1	0	0.3	1	1.4	8	3.0	16	4.8	26
$PM_{2.5}$ - RERD	0.8	5	1.7	10	11.7	69	18.0	106	32.1	189
$PM_{2.5}$ - Tirewear	0.0	0	0.0	0	0.1	1	0.3	2	0.4	2
$PM_{2.5}$ Total	0.9	5	2.0	11	13.4	78	22.3	130	38.5	224

Notes:
AE (tpy) = Annual Emissions, tons per year
TSD (lbs/day) = Typical Season Day, pounds per day
VMT = Vehicle Miles Traveled
1) Daily VMT provided by ODOT.
(a) Annual VMT = (Daily VMT) * (365 days/yr)
2) Annual Emissions = (MOVES output, emission inventory mode)
(a) Typical Season Day Emissions = (MOVES Output, emission inventory mode, average TSD for winter PM season)
3) Re-Entrained Road Dust emissions estimates distributed across all road types using VMT Road Type Percent Distribution. Re-Entrained Road Dust emissions estimates and calculations are from Tables 2.7-5 and 2.7-6.
(a) PM2.5 from Re-Entrained Road Dust = (NAA 2017 Road Dust PM2.5 Emissions) * (% Total Road Type VMT)

Table 63. 2017 Annual and Seasonal Daily Emissions by Vehicle Type and Pollutant Process

Vehicle Type and Pollutant Process	Annual VMT	Daily VMT	VMT Distribution	AE EF	TSD EF	AE	TSD
Combination Long-haul Truck							
Primary $PM_{2.5}$ - Brakewear	21904913	60013	7%	2.11E-06	2.20E-06	0.0	0
Primary $PM_{2.5}$ - Exhaust	21904913	60013	7%	2.15E-05	2.19E-05	0.2	1
Primary $PM_{2.5}$ - RERD	21904913	60013	7%	2.08E-04	2.24E-04	2.3	13
Primary $PM_{2.5}$ - Tirewear	21904913	60013	7%	5.95E-07	6.03E-07	0.0	0
Combination Long-haul Truck Sum						2.5	15
Combination Short-haul Truck							
Primary $PM_{2.5}$ - Brakewear	8589780	23534	3%	1.90E-06	1.98E-06	0.0	0
Primary $PM_{2.5}$ - Exhaust	8589780	23534	3%	2.18E-05	2.22E-05	0.1	1
Primary $PM_{2.5}$ - RERD	8589780	23534	3%	2.08E-04	2.24E-04	0.9	5
Primary $PM_{2.5}$ - Tirewear	8589780	23534	3%	5.22E-07	5.30E-07	0.0	0
Combination Short-haul Truck Sum						1.0	6
Intercity Bus							
Primary $PM_{2.5}$ - Brakewear	0.0	0.0	0%	0.00E+00	0.00E+00	0.0	0
Primary $PM_{2.5}$ - Exhaust	0.0	0.0	0%	0.00E+00	0.00E+00	0.0	0
Primary $PM_{2.5}$ - RERD	0.0	0.0	0%	0.00E+00	0.00E+00	0.0	0
Primary $PM_{2.5}$ - Tirewear	0.0	0.0	0%	0.00E+00	0.00E+00	0.0	0
Intercity Bus Sum						0.0	0
Light Commercial Truck							
Primary $PM_{2.5}$ - Brakewear	40620252	111288	13%	8.54E-06	8.84E-06	0.2	1
Primary $PM_{2.5}$ - Exhaust	40620252	111288	13%	3.76E-05	4.90E-05	0.8	5
Primary $PM_{2.5}$ - RERD	40620252	111288	13%	2.08E-04	2.24E-04	4.2	25
Primary $PM_{2.5}$ - Tirewear	40620252	111288	13%	3.42E-06	3.49E-06	0.1	0
Light Commercial Truck Sum						5.2	32
Motor Home							
Primary $PM_{2.5}$ - Brakewear	6032451	16527	2%	1.48E-05	1.53E-05	0.0	0
Primary $PM_{2.5}$ - Exhaust	6032451	16527	2%	2.75E-04	2.86E-04	0.8	5

Vehicle Type and Pollutant Process	Annual VMT	Daily VMT	VMT Distribution	AE EF	TSD EF	AE	TSD
Primary $PM_{2.5}$ - RERD	6032451	16527	2%	2.08E-04	2.24E-04	0.6	4
Primary $PM_{2.5}$ - Tirewear	6032451	16527	2%	2.70E-06	2.75E-06	0.0	0
Motor Home Sum						1.5	9
Motorcycle							
Primary $PM_{2.5}$ - Brakewear	1481137	4058	0%	2.81E-05	8.22E-06	0.0	0
Primary $PM_{2.5}$ - Exhaust	1481137	4058	0%	3.30E-04	9.41E-05	0.2	0
Primary $PM_{2.5}$ - RERD	1481137	4058	0%	2.08E-04	2.24E-04	0.2	1
Primary $PM_{2.5}$ - Tirewear	1481137	4058	0%	1.10E-05	3.15E-06	0.0	0
Motorcycle Sum						0.4	1
Other Buses							
Primary $PM_{2.5}$ - Brakewear	0	0	0%	0.00E+00	0.00E+00	0.0	0
Primary $PM_{2.5}$ - Exhaust	0	0	0%	0.00E+00	0.00E+00	0.0	0
Primary $PM_{2.5}$ - Tirewear	0	0	0%	0.00E+00	0.00E+00	0.0	0
Other Buses Sum						0.0	0
Passenger Car							
Primary $PM_{2.5}$ - Brakewear	79095626	216700	26%	7.46E-06	7.73E-06	0.3	2
Primary $PM_{2.5}$ - Exhaust	79095626	216700	26%	3.03E-05	4.65E-05	1.2	10
Primary $PM_{2.5}$ - RERD	79095626	216700	26%	2.08E-04	2.24E-04	8.2	49
Primary $PM_{2.5}$ - Tirewear	79095626	216700	26%	3.18E-06	3.24E-06	0.1	1
Passenger Car Sum						9.9	61
Passenger Truck							
Primary $PM_{2.5}$ - Brakewear	1.35E+08	369789	44%	8.34E-06	8.64E-06	0.6	3
Primary $PM_{2.5}$ - Exhaust	1.35E+08	369789	44%	5.80E-05	8.18E-05	3.9	30
Primary $PM_{2.5}$ - RERD	1.35E+08	369789	44%	2.08E-04	2.24E-04	14.1	83
Primary $PM_{2.5}$ - Tirewear	1.35E+08	369789	44%	3.25E-06	3.31E-06	0.2	1
Passenger Truck Sum						18.8	118
Refuse Truck							
Primary $PM_{2.5}$ - Brakewear	1285203	3521	0%	8.36E-06	8.67E-06	0.0	0

Vehicle Type and Pollutant Process	Annual VMT	Daily VMT	VMT Distribution	AE EF	TSD EF	AE	TSD
Primary $PM_{2.5}$ - Exhaust	1285203	3521	0%	1.63E-04	1.65E-04	0.1	1
Primary $PM_{2.5}$ - RERD	1285203	3521	0%	2.08E-04	2.24E-04	0.1	1
Primary $PM_{2.5}$ - Tirewear	1285203	3521	0%	2.01E-06	2.05E-06	0.0	0
Refuse Truck Sum						0.2	1
School Bus							
Primary $PM_{2.5}$ - Brakewear	1676136	4592	1%	4.19E-06	4.34E-06	0.0	0
Primary $PM_{2.5}$ - Exhaust	1676136	4592	1%	8.00E-05	8.21E-05	0.1	0
Primary $PM_{2.5}$ - RERD	1676136	4592	1%	2.08E-04	2.24E-04	0.2	1
Primary $PM_{2.5}$ - Tirewear	1676136	4592	1%	8.60E-07	8.73E-07	0.0	0
School Bus Sum						0.2	1
Single Unit Long-haul Truck							
Primary $PM_{2.5}$ - Brakewear	6470531	17727	2%	6.11E-06	6.33E-06	0.0	0
Primary $PM_{2.5}$ - Exhaust	6470531	17727	2%	2.82E-05	2.82E-05	0.1	1
Primary $PM_{2.5}$ - RERD	6470531	17727	2%	2.08E-04	2.24E-04	0.7	4
Primary $PM_{2.5}$ - Tirewear	6470531	17727	2%	1.35E-06	1.37E-06	0.0	0
Single Unit Long-haul Truck Sum						0.8	5
Single Unit Short-haul Truck							
Primary $PM_{2.5}$ - Brakewear	3723953	10203	1%	5.38E-06	5.58E-06	0.0	0
Primary $PM_{2.5}$ - Exhaust	3723953	10203	1%	5.67E-05	5.91E-05	0.1	1
Primary $PM_{2.5}$ - RERD	3723953	10203	1%	2.08E-04	2.24E-04	0.4	2
Primary $PM_{2.5}$ - Tirewear	3723953	10203	1%	1.21E-06	1.23E-06	0.0	0
Single Unit Short-haul Truck Sum						0.5	3
Transit Bus							
Primary $PM_{2.5}$ - Brakewear	2341198	6414	1%	3.46E-06	3.60E-06	0.0	0
Primary $PM_{2.5}$ - Exhaust	2341198	6414	1%	5.58E-05	5.78E-05	0.1	0
Primary $PM_{2.5}$ - RERD	2341198	6414	1%	2.08E-04	2.24E-04	0.2	1
Primary $PM_{2.5}$ - Tirewear	2341198	6414	1%	7.57E-07	7.68E-07	0.0	0
Transit Bus Sum						0.3	2

Vehicle Type and Pollutant Process	Annual VMT	Daily VMT	VMT Distribution	AE EF	TSD EF	AE	TSD
					Grand Total	41.4	254

Notes:
VMT = Vehicle Miles Traveled
$PM_{2.5}$-PRI RERD = $PM_{2.5}$ Primary Re-Entrained Road Dust
1) Daily VMT provided by ODOT.
(a) Annual VMT = (Daily VMT) * (365 days/yr)
(b) % VMT by Vehicle Type = default roadway type distribution for Klamath Falls NAA from MOVES: default database output. Percentages used to allocate ODOT DVMT to DVMT by vehicle type.
2) $PM_{2.5}$ Annual Emissions = (MOVES output, emission inventory mode)
(a) Typical Season Day Emissions = (MOVES Output, emission inventory mode, average TSD for winter PM season)
3) Emission Factor, lbs/VMT = ((emissions, tpy)*2000 lbs/ton) / (VMT)
4) Re-Entrained Road Dust emissions estimates distributed across all vehicle types using VMT Vehicle Type Percent Distribution. Re-Entrained Road Dust emissions estimates and calculations are from Tables 2.7-5 and 2.7-6.
(a) $PM_{2.5}$ from Re-Entrained Road Dust = (NAA 2017 Road Dust PM2.5 Emissions) * (% Total Vehicle Type VMT)
5) Off-network emissions distributed across all vehicle types using VMT Vehicle Type Percent Distribution and estimates derived from MOVE3.1.
(a) $PM_{2.5}$ from Off-network vehicles = (NAA 2017 Off-Network Emissions) * (% Total Vehicle Type VMT)

Table 64. 2017 $PM_{2.5}$ Weekday and Weekend Onroad Daily Emissions by Season

		Spring		Summer		Fall		Winter	
		Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
Year	Pollutant*	(lbs/day)							
2017	PM2.5 Exhaust, Brakewear, Tirewear	56	44	49	38	57	44	56	44
2037	PM2.5 Exhaust, Brakewear, Tirewear	45	34	38	29	45	34	47	36

*Does not include re-entrained road dust

Table 65. 2017 $PM_{2.5}$ Annual and Seasonal Daily Emissions from Re-Entrained Road Dust

Road Type	SCC	SAF	Total 2017 Daily VMT	Percent Paved/Unpaved Road Type	Daily VMT Distributed	Pollutant	EF (lb/VMT)	Control Effic.	AE	TSD
Paved Road Dust	2294000000	0.74	844,368	95%	801,535	PM2.5	6.80E-05	0.9	6.9	41
Unpaved Road Dust	2296000000	0.74	844,368	3%	21,416	PM2.5	3.17E-03	0	8.5	50
							6.17E-03	0	16.7	98
								Grand Total	32.1	189

Notes:
AE = Annual Emissions (tons per year)
TSD = Typical Season Day Emissions (pounds per day)
Control Effic. = Control Efficiency
VMT = Vehicle Miles Traveled

Paved Roads

1) Klamath Falls 2008-2017 VMT by TAZ and Link linear extrapolation of original 2008 VMT data from ODOT. September 2017. (DEQ Ref. 747).

2) 2017 Daily VMT = 844368

% NAA Paved Roadway = 95%

3) Paved road daily VMT = (NAA daily VMT) * (% Paved Roads within the NAA)

4) k = Particle Size Multiplier = 0.25 g/VMT. AP-42, Table 13.2.1-1. (DEQ Ref. 8).

5) sL = Paved Road Silt Loading — Typical Season Day (TSD) = 0.37 g/m^2

Worst Case Day (WCD) = 3.1 g/m^2

Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)

6) W = Average Vehicle Weight, tons = 3. This is a DEQ staff best estimate.

7) Typical Season Day (TSD) PM2.5 EF, E, g/VMT = k * (sL^0.91) * (W^1.02). AP-42, Chapter 13, Equation 1, p. 13.2.1-4. (DEQ Ref. 8)

8) $PM_{2.5}$ EF, E, lb/VMT = (Particulate EF, g/VMT) * (0.0022046 lb/g)

9) Seasonal Adjustment Factor (SAF)= (peak season activity * 12 months)/(annual activity * 4 months)

10) 2017 NAA Annual Emissions, tpy = (Paved Road Daily VMT) * (252 days per year w/out precipitation) * (Particulate EF, lb/VMT, TSD) / (2000 lbs/ton)

11) 2017 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT, TSD) * (SAF)

Unpaved Roads

1) Klamath Falls 2008-2017 VMT by TAZ and Link linear extrapolation of original 2008 VMT data from ODOT. September 2017. (DEQ Ref. 747).

2) 2017 Daily VMT = 844368

% NAA Paved Roadway = 5%

Industrial Sites =	2.5%	(50% of all unpaved NAA roadway, DEQ staff best estimate)
Publicly Accessible Roadways =	2.5%	(50% of all unpaved NAA roadway, DEQ staff best estimate)

3) Unpaved road daily VMT = (NAA daily VMT) * (% Paved Roads within the NAA)

4) Constants. AP-42, Table 13.2.2-2, p. 13.2.2-5. (DEQ Ref. 8)

5) s = Surface Material Silt Content. Values taken from:

Oregon Fugitive Dust Emission Inventory, Final Report, Midwest Research Institute (MRI) study for U.S. EPA Region 10, Work Assignment No. 24, EPA Contract No. 86-DO-0123, MRI Project No. 9710-24, January 21, 1992. (DEQ Ref. 160)

6) W = Average Vehicle Weight in tons, S = Average Vehicle Speed. Values taken from:

Industrial W: Reference as in note (5), specifically, p. 41, Modoc Lumber Co. used as a surrogate.

Publicly Accessible Roads S: Speed estimated from ODOT data (see note 1). Speed is a VMT weight average, estimated as follows:

∑ (speed by link * daily VMT by link) =	30,081,747	VMT*mph
∑ daily VMT by link =	728,582	VMT

Avg Vehicle Speed =	41.3	mph

7) M = Surface Material Moisture Content. Reference as in note (%). Table 2, p.12. Values are specific to Klamath Falls.

8) C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear. From AP-42, Table 13.2.2-4, p. 13.2.2-6. (DEQ Ref. 8).

9) Industrial $PM_{2.5}$ EF, E = k * (s/12)^a * (W/3)^b. AP-42, Chapter 13.2.2, Equation 1a, p. 13.2.2-4. (DEQ Ref. 8)

Publicly Accessible Roads PM2.5 EF, E = ([k * (s/12)^a * (S/30)^d] \ [(M/0.5)^c]) - C. AP-42, Chapter 13.2.2, Equation 1b, p. 13.2.2-4. (DEQ Ref. 8)

10) 2017 NAA Annual Emissions, tpy = (Unpaved Road Daily VMT) * (252 annual days without precipitation) * ($PM_{2.5}$ EF, lb/VMT) / (2000 lbs/ton)

11) 2017 NAA Typical Season Day Emissions, lbs/day = (Paved Road Daily VMT) * (Particulate EF, lb/VMT) * (SAF)

Appendix F: Section 3.0

Table 66. 2017-2037 $PM_{2.5}$ Annual and Seasonal Daily Emissions by Emissions Subcategory

Pollutant Emissions by Sector	Growth Type ID	2017 AE	2017 TSD	2022 AE	2022 TSD	2027 AE	2027 TSD	2032 AE	2032 TSD	2037 AE	2037 TSD
Events and Natural Sources											
Biogenic Sources											
NO_X	10	54.6	299	54.6	299	54.6	299	54.6	299	54.6	299
VOC	10	3763.1	20620	3763.1	20620	3763.1	20620	3763.1	20620	3763.1	20620
Prescribed Fires											
$PM_{2.5}$-Primary	10	163.0	2346	163.0	2346	163.0	2346	163.0	2346	163.0	2346
NH_3	10	32.1	462	32.1	462	32.1	462	32.1	462	32.1	462
NO_X	10	18.1	260	18.1	260	18.1	260	18.1	260	18.1	260
SO_2	10	12.1	174	12.1	174	12.1	174	12.1	174	12.1	174
VOC	10	1847.5	26588	1847.5	26588	1847.5	26588	1847.5	26588	1847.5	26588
Structure Fires											
$PM_{2.5}$-Primary	10	0.3	1	0.3	1	0.3	1	0.3	1	0.3	1
NO_X	10	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
VOC	10	0.3	1	0.3	1	0.3	1	0.3	1	0.3	1
Wildfires											
$PM_{2.5}$-Primary	10	0.2	0	0.2	0	0.2	0	0.2	0	0.2	0
NH_3	10	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
NO_X	10	0.1	0	0.1	0	0.1	0	0.1	0	0.1	0
SO_2	10	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
VOC	10	2.2	0	2.2	0	2.2	0	2.2	0	2.2	0
Mobile Sources											
Aircraft and Airport Operations											
$PM_{2.5}$-Primary	1	8.0	39	8.0	40	8.1	40	8.1	40	8.2	41
NO_X	1	113.2	558	113.9	562	114.2	563	114.4	564	116.4	574

Pollutant Emissions by Sector	Growth Type ID	2017 AE	2017 TSD	2022 AE	2022 TSD	2027 AE	2027 TSD	2032 AE	2032 TSD	2037 AE	2037 TSD
SO_2	1	10.9	54	10.9	54	11.0	54	11.0	54	11.2	55
VOC	1	57.2	282	57.5	284	57.7	284	57.8	285	58.8	290
Locomotives											
$PM_{2.5}$-Primary	9	2.9	16	3.0	16	3.0	17	3.1	17	3.3	18
NH_3	9	0.1	0	0.1	0	0.1	0	0.1	0	0.1	0
NO_X	9	100.9	550	103.4	564	104.7	571	105.5	575	113.5	619
SO_2	9	0.1	0	0.1	0	0.1	0	0.1	0	0.1	0
VOC	9	4.8	26	4.9	27	5.0	27	5.0	27	5.3	29
Nonroad Mobile Sources											
$PM_{2.5}$-Primary	8	4.2	19	3.8	17	3.7	17	3.5	16	2.5	12
NH_3	8	0.1	0	0.1	0	0.1	0	0.1	0	0.1	0
NO_X	8	49.2	232	43.0	205	39.8	191	37.8	182	18.1	95
SO_2	8	0.1	0	0.1	0	0.1	0	0.1	0	0.1	1
VOC	8	39.8	169	41.6	176	42.5	180	43.1	183	48.9	206
Onroad Mobile Sources											
$PM_{2.5}$-Primary	8	9.3	64	8.9	62	8.8	61	8.6	60	7.4	53
NH_3	8	12.8	68	12.2	66	11.9	64	11.8	64	10.0	55
NO_X	8	387.0	2149	350.3	1955	331.9	1859	319.6	1794	203.1	1181
SO_2	8	2.9	16	2.9	16	2.8	16	2.8	16	2.7	15
VOC	8	304.8	1779	266.0	1564	246.7	1457	233.7	1385	111.0	705
Re-Entrained Road Dust											
$PM_{2.5}$-Primary	4	32.1	189	33.3	197	33.9	200	34.3	203	38.2	225
Nonpoint Sources											
Agriculture Sources											
$PM_{2.5}$-Primary	10	25.6	27	25.6	27	25.6	27	25.6	27	25.6	27
NH_3	9	44.8	60	46.0	62	46.5	63	46.9	63	50.6	68
	10	26.7	70	26.7	70	26.7	70	26.7	70	26.7	70

Pollutant Emissions by Sector	Growth Type ID	2017 AE	2017 TSD	2022 AE	2022 TSD	2027 AE	2027 TSD	2032 AE	2032 TSD	2037 AE	2037 TSD
NO_X	10	0.6	2	0.6	2	0.6	2	0.6	2	0.6	2
SO_2	10	0.1	0	0.1	0	0.1	0	0.1	0	0.1	0
VOC	9	17.7	97	18.1	99	18.4	101	18.5	101	19.9	109
	10	4.4	12	4.4	12	4.4	12	4.4	12	4.4	12
Evaporative/Off-Gassing Sources											
VOC	1	78.9	432	79.4	435	79.6	436	79.7	437	81.1	445
	9	449.7	2438	461.2	2501	467.0	2532	470.8	2553	507.4	2751
Fugitive Sources											
$PM_{2.5}$-Primary	3	6.8	0	7.1	0	7.2	0	7.4	0	8.3	0
Miscellaneous Sources											
$PM_{2.5}$-Primary	1	2.1	5	2.1	5	2.1	5	2.1	5	2.2	5
	3	32.8	61	34.3	64	35.1	65	35.6	66	40.4	75
NO_X	1	0.3	1	0.3	1	0.3	1	0.3	1	0.3	1
VOC	1	0.8	2	0.8	2	0.8	2	0.8	2	0.8	2
	3	4.5	7	4.7	8	4.8	8	4.9	8	5.5	9
Stationary Fuel Combustion Sources											
$PM_{2.5}$-Primary	1	0.5	5	0.5	5	0.5	5	0.5	5	0.5	5
	2	117.6	1072	113.0	1029	110.7	1007	109.1	993	94.5	856
	3	2.5	21	2.6	22	2.7	23	2.7	23	3.1	26
NH_3	1	8.8	92	8.9	92	8.9	92	8.9	93	9.1	94
	2	6.0	53	6.0	52	5.9	52	5.9	52	5.9	52
	3	0.1	1	0.1	1	0.1	1	0.1	1	0.1	1
NO_X	1	45.0	467	45.2	469	45.4	470	45.4	471	46.2	480
	2	11.2	100	10.8	96	10.6	94	10.5	93	9.2	81
	3	10.8	88	11.3	92	11.5	94	11.7	95	13.2	108
SO_2	1	1.1	11	1.1	11	1.1	11	1.1	11	1.1	12
	2	2.8	25	2.7	25	2.7	24	2.7	24	2.5	22
	3	0.4	3	0.4	3	0.4	3	0.4	3	0.5	4

Pollutant Emissions by Sector	Growth Type ID	2017 AE	2017 TSD	2022 AE	2022 TSD	2027 AE	2027 TSD	2032 AE	2032 TSD	2037 AE	2037 TSD
VOC	1	2.6	26	2.6	27	2.6	27	2.6	27	2.6	27
	2	126.5	1171	119.7	1107	116.3	1076	114.1	1054	92.6	854
	3	0.6	5	0.6	5	0.6	5	0.6	5	0.7	6
Waste Disposal Sources											
$PM_{2.5}$-Primary	1	28.4	0	28.6	0	28.7	0	28.7	0	29.2	0
	3	16.2	0	16.9	0	17.3	0	17.5	0	19.9	0
NH_3	1	1.4	8	1.4	8	1.4	8	1.4	8	1.4	8
	10	9.9	54	9.9	54	9.9	54	9.9	54	9.9	54
NO_X	1	5.8	0	5.9	0	5.9	0	5.9	0	6.0	0
	3	3.5	0	3.6	0	3.7	0	3.8	0	4.3	0
SO_2	1	1.0	0	1.0	0	1.0	0	1.0	0	1.0	0
	3	1.4	0	1.5	0	1.5	0	1.6	0	1.8	0
VOC	1	17.2	53	17.3	53	17.3	53	17.3	53	17.6	54
	3	9.8	0	10.3	0	10.5	0	10.6	0	12.1	0
	10	11.8	64	11.8	64	11.8	64	11.8	64	11.8	64
Point Sources											
Permitted Point Sources											
$PM_{2.5}$-Primary	10	158.5	1002	158.5	1002	158.5	1002	158.5	1002	158.5	1002
NH_3	10	111.7	537	111.7	537	111.7	537	111.7	537	111.7	537
NO_X	10	257.6	1551	242.5	1468	238.3	1445	235.4	1429	208.5	1281
SO_2	10	14.8	84	14.8	84	14.8	84	14.8	84	14.8	84
VOC	10	555.5	3124	555.5	3124	555.5	3124	555.5	3124	555.5	3124

Notes for **Table 3.0-3** above:

1) AE = Annual Emissions (tons per year) and TSD = Typical Season Day (lbs/day)

2) 2037 Emissions = 2017 Emissions + [(2017-2037 AAGR) * Years of Growth * 2017 Emissions)]

Growth Type ID	Growth Type Description	2017-2037 AAGR	Growth Parameter	Data Resource
1	Klamath Falls NAA Population	0.14%	Linear, noncompounding	PSU Population Research Center and U.S. Census
2	Klamath Falls NAA Household	0.14%	Linear, noncompounding	PSU Population Research Center and U.S. Census
3	Klamath Falls NAA Employment (EMP) - use for commercial, construction, and industrial NAICS.	1.15%	Linear, noncompounding	Oregon Employment Department
9	Average of Population, Commercial, Industrial EMP	0.64%	Average of EMP and Population.	Oregon Employment Department, PSU Population Research Center, and U.S. Census

10	Animal Husbandry, Biogenics, Point, Structural Fires, and Prescribed Fires and Wildfires.	0.00%	No growth	2008 Klamath Falls SIP EI (ref. 815) page 196. Emissions held constant for these subsectors in FY estimates.

3) Used linear extrapolation to grow emissions over 5-yr intervals between 2017 and 2037.

4) For point sources, one facility proposed Regional Haze controls and emission reductions were applied for $PM_{2.5}$-Primary and NOx.

5) Revised 12/22/2023 for Stationary Fuel Combustion, specifically residential woodstoves. A total of 411 woodstoves will be removed between 2017 and 2037 due to EPA's TAG (354), state approved funding (50), and HeatSmart (7), removing total of 19.3 tpy from this sector's emissions from the future year EI.

6) Revised 12/22/2023 due to re-processing Onroad Emissions run results after running in MOVES3.1 earlier this year.

Appendix G: Section 4.0

Motor Vehicle Emissions Inventory

Table 67. 2017 and 2037 Vehicle Miles Traveled (VMT) by Vehicle Type

	Vehicle Miles Traveled (VMT)			
	2017		2037	
Vehicle Type	Annual	Daily	Annual	Daily
Combination Long-haul Truck	21,904,913	60013	26,285,895	72,016
Combination Short-haul Truck	8,589,780	23534	10,307,736	28,240
Intercity Bus	0	0	0	0
Light Commercial Truck	40,620,252	111288	48,744,302	133,546
Motor Home	6,032,451	16527	7,238,941	19,833
Motorcycle	1,481,137	4058	1,777,364	4,869
Passenger Car	79,095,626	216700	94,914,752	260,040
Passenger Truck	134,973,083	369789	161,967,699	443,747
Refuse Truck	1,285,203	3521	1,542,243	4,225
School Bus	1,676,136	4592	2,011,363	5,511
Single Unit Long-haul Truck	6,470,531	17727	7,764,638	21,273
Single Unit Short-haul Truck	3,723,953	10203	4,468,744	12,243
Transit Bus	2,341,198	6414	2,809,437	7,697
Total Vehicle Miles Traveled	308,194,262	844,368	369,833,114	1,013,241

Table 68. 2017 and 2037 Seasonal Daily Emissions by Vehicle Type and Pollutant Process

$PM_{2.5}$ Emissions by Vehicle Type	2017 Daily VMT	2037 Daily VMT	2017 TSD (lbs/day)	2037 TSD (lbs/day)
Combination Long-haul Truck:				
Primary $PM_{2.5}$ - Brakewear	60,013	72,016	0	3
Primary $PM_{2.5}$ - Exhaust	60,013	72,016	1	4
Primary $PM_{2.5}$ - RERD	60,013	72,016	13	16
Primary $PM_{2.5}$ - Tirewear	60,013	72,016	0	1
Combination Long-haul Truck Sum			*15*	*24*
Combination Short-haul Truck:				
Primary $PM_{2.5}$ - Brakewear	23,534	28,240	0	1
Primary $PM_{2.5}$ - Exhaust	23,534	28,240	1	2
Primary $PM_{2.5}$ - RERD	23,534	28,240	5	6
Primary $PM_{2.5}$ - Tirewear	23,534	28,240	0	0
Combination Short-haul Truck Sum			*6*	*9*
Intercity Bus:				
Primary $PM_{2.5}$ - Brakewear	0	0	0	0
Primary $PM_{2.5}$ - Exhaust	0	0	0	0
Primary $PM_{2.5}$ - RERD	0	0	0	0
Primary $PM_{2.5}$ - Tirewear	0	0	0	0
Intercity Bus Sum			*0*	*0*
Light Commercial Truck:				
Primary $PM_{2.5}$ - Brakewear	111,288	133,546	1	1
Primary $PM_{2.5}$ - Exhaust	111,288	133,546	5	4
Primary $PM_{2.5}$ - RERD	111,288	133,546	25	30
Primary $PM_{2.5}$ - Tirewear	111,288	133,546	0	0
Light Commercial Truck Sum			*32*	*35*
Motor Home:				
Primary $PM_{2.5}$ - Brakewear	16,527	19,833	0	1
Primary $PM_{2.5}$ - Exhaust	16,527	19,833	5	1
Primary $PM_{2.5}$ - RERD	16,527	19,833	4	4
Primary $PM_{2.5}$ - Tirewear	16,527	19,833	0	0
Motor Home Sum			*9*	*7*
Motorcycle:				
Primary $PM_{2.5}$ - Brakewear	4,058	4,869	0	0
Primary $PM_{2.5}$ - Exhaust	4,058	4,869	0	0
Primary $PM_{2.5}$ - RERD	4,058	4,869	1	1
Primary $PM_{2.5}$ - Tirewear	4,058	4,869	0	0
Motorcycle Sum			*1*	*1*
Other Buses:				
Primary $PM_{2.5}$ - Brakewear	0	0	0	0
Primary $PM_{2.5}$ - Exhaust	0	0	0	0

$PM_{2.5}$ Emissions by Vehicle Type	2017 Daily VMT	2037 Daily VMT	2017 TSD (lbs/day)	2037 TSD (lbs/day)
Primary $PM_{2.5}$ - Tirewear	0	0	0	0
Other Buses Sum			*0*	*0*
Passenger Car:				
Primary $PM_{2.5}$ - Brakewear	216,700	260,040	2	2
Primary $PM_{2.5}$ - Exhaust	216,700	260,040	10	8
Primary $PM_{2.5}$ - RERD	216,700	260,040	49	58
Primary $PM_{2.5}$ - Tirewear	216,700	260,040	1	1
Passenger Car Sum			*61*	*69*
Passenger Truck:				
Primary $PM_{2.5}$ - Brakewear	369,789	443,747	3	3
Primary $PM_{2.5}$ - Exhaust	369,789	443,747	30	17
Primary $PM_{2.5}$ - RERD	369,789	443,747	83	99
Primary $PM_{2.5}$ - Tirewear	369,789	443,747	1	1
Passenger Truck Sum			*118*	*121*
Refuse Truck:				
Primary $PM_{2.5}$ - Brakewear	3,521	4,225	0	0
Primary $PM_{2.5}$ - Exhaust	3,521	4,225	1	0
Primary $PM_{2.5}$ - RERD	3,521	4,225	1	1
Primary $PM_{2.5}$ - Tirewear	3,521	4,225	0	0
Refuse Truck Sum			*1*	*1*
School Bus:				
Primary $PM_{2.5}$ - Brakewear	4,592	5,511	0	0
Primary $PM_{2.5}$ - Exhaust	4,592	5,511	0	0
Primary $PM_{2.5}$ - RERD	4,592	5,511	1	1
Primary $PM_{2.5}$ - Tirewear	4,592	5,511	0	0
School Bus Sum			*1*	*2*
Single Unit Long-haul Truck:				
Primary $PM_{2.5}$ - Brakewear	17,727	21,273	0	0
Primary $PM_{2.5}$ - Exhaust	17,727	21,273	1	0
Primary $PM_{2.5}$ - RERD	17,727	21,273	4	5
Primary $PM_{2.5}$ - Tirewear	17,727	21,273	0	0
Single Unit Long-haul Truck Sum			*5*	*5*
Single Unit Short-haul Truck:				
Primary $PM_{2.5}$ - Brakewear	10,203	12,243	0	0
Primary $PM_{2.5}$ - Exhaust	10,203	12,243	1	0
Primary $PM_{2.5}$ - RERD	10,203	12,243	2	3
Primary $PM_{2.5}$ - Tirewear	10,203	12,243	0	0
Single Unit Short-haul Truck Sum			*3*	*3*
Transit Bus:				
Primary $PM_{2.5}$ - Brakewear	6,414	7,697	0	0

$PM_{2.5}$ Emissions by Vehicle Type	2017 Daily VMT	2037 Daily VMT	2017 TSD (lbs/day)	2037 TSD (lbs/day)
Primary $PM_{2.5}$ - Exhaust	6,414	7,697	0	0
Primary $PM_{2.5}$ - RERD	6,414	7,697	1	2
Primary $PM_{2.5}$ - Tirewear	6,414	7,697	0	0
Transit Bus Sum			*2*	*2*
Grand Total			254	278

Table 69. Weekday and Weekend Onroad Seasonal Daily Emissions by Season

		Spring		Summer		Fall		Winter	
		Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
Year	Pollutant*	(lbs/day)							
2017	PM2.5 Exhaust, Brakewear, Tirewear	56	44	49	38	57	44	56	44
2037	PM2.5 Exhaust, Brakewear, Tirewear	45	34	38	29	45	34	47	36

*Does not include re-entrained road dust

Appendix 3

State of Oregon
DEQ Department of Environmental Quality

Appendix 3: Motor Vehicle Emissions Budget For Klamath Falls Non-Attainment Area

Transportation Conformity ensures that air pollution from onroad mobile sources such as cars and trucks and road dust in the Klamath Falls Nonattainment Area, or NAA, will not cause new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards, or NAAQS. Federal transportation conformity rules and regulations 40 CFR Parts 51 and 93 require the evaluation of potential changes to onroad emissions within Klamath Falls NAA that may be caused by proposed federally funded highway and transit projects over the next twenty-year period from 2017 to 2037. Under conformity, emissions resulting from highway and transportation projects cannot exceed the allowable emissions level established for transportation in the air quality plan. This ensures that onroad transportation activities within Klamath Falls NAA will not violate overall air quality standards. DEQ's transportation conformity rules and process can be found in Oregon Administrative Rule 340, Division 252.

The Oregon Department of Environmental Quality developed a 2017 and 2037 motor vehicle emissions inventory for the Klamath Falls NAA Maintenance Plan - to address Transportation Conformity and establish a Motor Vehicle Emissions Budget, or MVEB. For this current plan, DEQ is only required to provide MVEB based on typical season day emissions. The previous SIP Plan (2012) used the highest emissions, worst-case day (2014), to establish the MVEB for onroad emissions sources including re-entrained road dust (RERD). However, this plan will only use typical season day emissions from the Motor Vehicle Emissions Inventory (MVEI) for onroad emissions sources only but not RERD to develop budget estimates. EPA instructed that RERD emissions do not need to be used in this MVEB because overall the PM2.5 emission contribution is insignificant. The MVEB will be used to keep onroad emission levels within the limits of this SIP and prevent any further violations and ensure continued maintenance of the $PM_{2.5}$ NAAQS. The following sections discuss how a motor vehicle emissions inventory was developed and how those emissions were used to establish a MVEB.

1. Motor Vehicle Emissions Inventory Development Overview and Results

A motor vehicle emissions inventory was developed for the Klamath Falls NAA maintenance plan for 2017 attainment year and future year 2037. Oregon DEQ used EPA's MOVES3.1 model to estimate onroad mobile source emissions, but road dust was not. Re-entrained road dust emissions are not estimated in the MOVES model but instead uses daily VMT from the model runs, and emission factors developed using EPA AP-42 emission factor formulas.

1.1. Forecasting Future Year Motor Vehicle Emissions Inventories

Growth Within Klamath Falls NAA

Emissions should reflect Klamath County and Klamath Falls NAA's growth in demographics and traffic patterns for the next 20-year period. Based on evaluations of 2018-2065 Coordinated Population Forecasts for Klamath County developed by Portland State University and Oregon Employment Department data indicate county demographics (e.g. population, housing, and employment) are expected to grow gradually from 2017 through 2037. County vehicle traffic growth is already incorporated into ODOT's Traffic Demand Model (TDM) based on projected changes in land use and roadway network patterns. DEQ used ArcGIS Pro to spatially allocate county demographics and traffic pattern data to the Klamath Falls NAA.

The population for the Klamath Falls NAA is expected to increase from 48,496 to 49,840 people as well as housing from 24,493 to 25,172 units over the next 20 years. Likewise, employment will also steadily increase over the next 20 years from 19,124 to 24,024 employees as new people move into the area or young adults enter the workforce. With the increase in NAA population, household, and employment numbers, the TDM projected annual VMT will increase from 308,194,262 to approximately 369,833,114 vehicle miles traveled.

Growth Factors

It was not necessary for DEQ to develop growth factors to estimate 2037 onroad and re-entrained road dust emissions. ODOT provided 2037 traffic activity data from their TDM, which already incorporated growth for the NAA; therefore, 2037 emissions were calculated directly in MOVES3.1 and not grown. Further, DEQ used the same 2037 traffic activity data provided by ODOT to calculate re-entrained road dust emissions outside of MOVES using EPA AP-42 emission factors. Once emission estimates were made for 2017 and 2037, onroad and re-entrained road dust emissions were linearly extrapolated between those years based on 5-year intervals.

1.2. MOVES Model

DEQ used EPA's MOVES model to develop onroad emission estimates for the Klamath Fall's NAA. Onroad mobile source emissions were initially modeled using EPA's MOVES2014b model and re-ran in MOVES3.1 in Spring 2023. At the time the EI work was started for the Plan in early 2020, MOVES2014(b) was the latest model available to run onroad emissions. Because substantial work was already completed on this project prior to EPA's adoption of MOVES3.0, the use of MOVES2014(b) was still appropriate at that time. However, due to delays in events data and a request by EPA and other transportation agencies DEQ updated emission estimates using MOVES3.1 in inventory mode. From this point on all work and estimates was completed in MOVES3.1.

According to EPA MOVES model guidance, the model is described as follows:

MOVES (MOtor Vehicle Emissions Simulator) is a state-of-the-science model designed by the U.S. Environmental Protection Agency (EPA) to estimate air pollution emissions from mobile sources in the United States. MOVES can be used to estimate exhaust and evaporative emissions as well as brake and tire wear emissions from all types of onroad vehicles. MOVES can also be used to estimate emissions from many kinds of nonroad equipment.[1] The onroad and nonroad modeling capabilities exist as separate modules in MOVES.

The model is used by state and local agencies to estimate emissions for criteria, air toxic, and greenhouse gas pollutants at national, county, or project level. Federal requirements for cleaner vehicles and fuels are already reflected in the MOVES model at county level; therefore, these federal emissions reduction benefits will be reflected in MOVES model runs.

MOVES provides default vehicle populations, travel activity, fuel content and supply information, at county level. However, states can provide local inputs via the County Database Manager for the defaults mentioned above. The model can be run in either emissions inventory mode or emissions rate mode for any project. If the model is used in emissions rates mode than the state or local agency must provide vehicle activity and the emissions rates from MOVES to calculate emissions.

Run Specifications

Two model runs per inventory years were conducted for the NAA: annual and typical season day. Temperature profiles were specific to each model run. The runs included all vehicle and road types and the pollutants $PM_{2.5}$ including speciated pollutants and NH_3, NO_X, SO_2, and VOC. The model was run in emission inventory mode to output emissions for each road type, fuel type, day type, hour, speed bin, and process. The MOVES modeling Run Spec(s) for 2017 and 2037 are detailed in **Tables 1 and 2** in the context of the Panel settings.

Table 1: MOVES Panel Settings for Base Year 2017

Panel Item	**Settings:** Typical Season Day (TSD)	**Settings:** Annual
Description	Typical Season Day	Annual
Scale		
Scale	Klamath County (41035)	Klamath County (41035)
Calculation Type	Inventory	Inventory
Time Spans		
Aggregation	Day	Day
Year	2017	2017
Months	December	January, April, July, October
Days	Weekday	Weekend and Weekday
Hours	24	
Geographic Bounds	Klamath County	Klamath County
Vehicles/Equipment	All Fuels and all Vehicles/Equipment	All fuels and all Vehicles/Equipment
Road Type	All	All
Pollutants and Processes		
Pollutants	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation
Processes	All	All
Manage Input Datasets	N/A	N/A
Strategies	None	None
Output		
General Output	Mass units = grams, Distance units = miles	Mass units = grams, Distance units = miles
Emissions Detail	Mass by pollutant, process, source type, roadtype	Mass by pollutant, process, source type, roadtype
Advanced Performance Features	N/A	N/A

Table 2: MOVES Panel Settings for Base Year 2037

Panel Item	**Settings:** Typical Season Day (TSD)	**Settings:** Annual
Description	Typical Season Day	Annual
Scale		
Scale	Klamath County (41035)	Klamath County (41035)
Calculation Type	Inventory	Inventory
Time Spans		
Aggregation	Day	Day
Year	2037	2037
Months	December	January, April, July, October
Days	Weekday	Weekend and Weekday
Hours	24	
Geographic Bounds	Klamath County	Klamath County
Vehicles/Equipment	All Fuels and all Vehicles/Equipment	All fuels and all Vehicles/Equipment
Road Type	All	All
Pollutants and Processes		

Panel Item	Settings: Typical Season Day (TSD)	Settings: Annual
Pollutants	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation	PM2.5, NOx, SO2, VOC, NH3, PM2.5 Speciation
Processes	All	All
Manage Input Datasets	N/A	N/A
Strategies	None	None
Output		
General Output	Mass units = grams, Distance units = miles	Mass units = grams, Distance units = miles
Emissions Detail	Mass by pollutant, process, source type, roadtype	Mass by pollutant, process, source type, roadtype
Advanced Performance Features	N/A	N/A

Vehicle Activity Data

Oregon Department of Transportation (ODOT) provided DEQ both 2008 and 2037 Daily Vehicle Miles Traveled (DVMT) activity data by links within Travel Analysis Zone (TAZ) from their Travel Demand Model (TDM) to estimate transportation emissions in MOVES3.1. The DVMT was clipped by EI staff from county-level to the Klamath Falls NAA via GIS analysis and used in MOVES to estimate regionally specific emissions within the NAA. 2008 and 2037 DVMT was linearly interpolated by DEQ to get 2017 attainment year vehicle activity data.

The activity data supplied was originally used to develop 2008, 2014, and 2037 transportation emissions in MOVES2010 for the 2012 SIP Attainment Plan. The 2008 DVMT is based on actual vetted demographics data from Oregon State Office of Economic Analysis (OEA) and US Census 2000 for Klamath County. The TDM used the 2008 reference year extending out to the future year 2037 to satisfy the needs of the previous AQ analysis. All jurisdictions (ODOT, DEQ, and City of Klamath Falls) approved the demographics data and the roadwork network used in the TDM. (DEQ Ref. 806) For more detailed information

Upon evaluation by DEQ and consultation with ODOT and EPA, current demographics data from the PSU Coordinated Population Forecast for Klamath County 2015-2065 indicates population and economic growth is lower than the projections in 2011 used for the previous EI. **Table 4** compares the TDM Model NAA demographics (DEQ Ref.806) used in the previous EI against current data today. Growth overall is minimal within the NAA.

Table 4 Comparison of TDM and Current US Census and PSU Population Research Center Land Use

Land Use Demographics	TDM NAA			Current US Census/PSU Data GIS to NAA		Difference in 2037 TDM and Current Dems
	2008	**2014**	**2037**	**2017**	**2037**	
Population	47276	49472	57293	48496	49840	-15%
Housing	18818	19665	22911	24493	25172	9%
Employment	19951	20794	24024	19124	24024	0%

The agencies agreed in late Fall 2019 that the TDM did not need to be updated with the current demographic data and re-ran for the attainment inventory because the rate of growth within the NAA has slowed since the last plan and is representative of current data today. Therefore, DEQ used the 2008 and

2037 DVMT interpolated to get 2017 attainment year activity and used the 2037 activity as-is to estimate transportation emissions in MOVES3.1.

Developing Other MOVES Local Inputs for Klamath Fall's NAA

DEQ also developed other local inputs for the Klamath Fall's NAA to supplement MOVES default data. The County Data Manager is the platform for developing and importing these local inputs into MOVES. **Table 3** provides information on default or NAA specific inputs used in the MOVES runs to estimate regional emissions. Local input data was collected from both ODOT (VMT) and Oregon Department of Motor Vehicles (DMV) (Klamath County Registration data) for the various inputs listed in the table below. Also, meteorology data was collected from the Klamath Falls, Kingsley Field site for the MOVES runs.

Table 3:1 MOVES County Data Manager Inputs, 2017 Attainment Year and 2037 Future Year

Dataset(s)	**Information Sources**
Source Type Population	Grown using population growth factor
Vehicle Type VMT	ODOT for Klamath Falls NAA with vehicle split.
Temporal Allocation	MOVES default
I/M Programs	N/A
Fuel	MOVES default with local regulations and ethanol amounts
Meteorology Data	Monitored data retrieved from Klamath Falls, Kingsley Field site.
Ramp Fraction	MOVES default
Road Type Distribution	ODOT with MOVES default vehicle split
Age Distribution	ODOT DMV vehicle Klamath County Registration data was used to distribute source types 21 and 31 vehicle population data by age. All other source types = default data, National County Database.
Average Speed Distribution	MOVES default
AVFT	MOVES default

ODOT Daily VMT was apportioned to MOVES vehicle source type using the partitioning into the FHWA 13 class system recorded by ODOT at ATRs at five stations in the area of the NAA. These were combined into a weighted average based on the total traffic recorded at each of the ATRs, so that more traffic meant more weight given to that station's partitioning of the fleet.

The ODOT DVMT was mapped via ArcGIS Pro, and a MOVES roadway type was assigned to each link based on ODOT speed bin and link location. The ODOT DVMT data was also assigned a MOVES speed bin ID: ODOT and MOVES speed bins aligned. ODOT daily VMT values were then adjusted to hourly VMT using MOVES default data, specifically the MOVES default hourly VMT Excel database input table "HourVMTFraction". The input table breaks down daily activity into hourly activity fractions by MOVES roadway and source types.

Processing Inventory Mode Emissions Output from MOVES

Since DEQ ran MOVES in inventory mode not much post-processing was required since emissions estimates were calculated in MOVES directly. The 2017 and 2037 data sets include SCC, emission process, fuel type, road type, source use type, and pollutant emissions for NH3, NOX, PM2.5, SO2, and VOC. In addition, PM2.5 emissions are also broken down by process: brakewear, tirewear, and exhaust. These output data sets were processed via MS Access database and downloaded into excel file to create tables and graphs.

1.3. Re-Entrained Road Dust

In addition to modeled onroad emissions, re-entrained road dust emissions for both paved and unpaved roads is included in the motor vehicle emissions inventory. Re-entrained road dust emissions are not estimated in MOVES3.1 but instead DEQ calculated re-entrained road dust emissions with daily VMT from the model runs, and emission factors developed using EPA AP-42 emission factor formulas. Of particular interest for this inventory are the calculations for typical season day emissions. The typical season day is defined as the period immediately following a snow or ice event when roadway has been sanded or cindered. Under these conditions, the silt-loading factor to the roadway surface increases dramatically from normal seasonal conditions, and as such the resulting emissions estimates for paved road re-entrained dust are elevated. However, Klamath County has purchased sweepers that comply with strict California standards, based upon FHWA's estimates for high efficiency machines at 99.6% removal efficiency and 90% of the area covered. DEQ has therefore applied a control efficiency (CE) of 90% to paved road re-entrained dust typical season day emission estimates, resulting in large reduction in the final estimates. In addition to paved road dust estimates, this category also includes emissions from unpaved roads, which apply to approximately 5% of the roadway in the NAA.

1.4. Motor Vehicle Emissions Inventory Results

The MVEI results for 2017-2037 are included in the following tables which also include re-entrained road dust emissions except for the last table. The next set of tables break data down first by showing the 2017 and 2037 VMT distributed by vehicle type and used in MOVES3.1. Then total PM2.5 and precursor emissions are summarized over 5-year periods in the following table. Additional tables after that detail pollutant process/activity, types of vehicles, and finally seasonal activity that result in particulate emissions only.

Table 5: Klamath Falls NAA Vehicle Miles Traveled (VMT) Growth by Vehicle Type from 2017 to 2037

	Vehicle Miles Traveled (VMT)			
	2017		2037	
Vehicle Type	**Annual**	**Daily**	**Annual**	**Daily**
Combination Long-haul Truck	21,904,913	60013	26,285,895	72,016
Combination Short-haul Truck	8,589,780	23534	10,307,736	28,240
Intercity Bus	0	0	0	0
Light Commercial Truck	40,620,252	111288	48,744,302	133,546
Motor Home	6,032,451	16527	7,238,941	19,833
Motorcycle	1,481,137	4058	1,777,364	4,869
Passenger Car	79,095,626	216700	94,914,752	260,040
Passenger Truck	134,973,083	369789	161,967,699	443,747
Refuse Truck	1,285,203	3521	1,542,243	4,225
School Bus	1,676,136	4592	2,011,363	5,511
Single Unit Long-haul Truck	6,470,531	17727	7,764,638	21,273
Single Unit Short-haul Truck	3,723,953	10203	4,468,744	12,243
Transit Bus	2,341,198	6414	2,809,437	7,697
Total Vehicle Miles Traveled	**308,194,262**	**844,368**	**369,833,114**	**1,013,241**

Table 6 below is summary of PM2.5 and precursor emissions from onroad mobile sources over 5-year periods between 2017 and 2037. The emissions between 2017 and 2037 were interpolated outside of MOVES3.1 to get emissions specific for years 5, 10, and 15.

Table 6: Klamath Falls NAA $PM_{2.5}$ and Precursor Onroad Mobile Source Emissions (lbs/day) from 2017-2037

pollutant code	2017	2022	2027	2032	2037
PM2.5-Primary	254	258	261	263	278
NH3	68	66	64	64	55
NOX	2,149	1,955	1,859	1,794	1,181
SO2	16	16	16	16	15
VOC	1,779	1,564	1,457	1,385	705

The next tables break the total $PM_{2.5}$ primary emissions down to see what pollutant process or activity is creating the particulate emissions and further by the types of vehicles. Particulate emissions do not just come from the tailpipe (exhaust) but are created by vehicles brakes and tires wearing down over time, and road dust kicked up while driving on paved and unpaved roads.

Table 7: Klamath Falls NAA PM2.5 Motor Vehicle Emissions Inventory for 2017 and 2037

Pollutants	2017 TSD (lbs/day)	2037 TSD (lbs/day)
Primary PM2.5 - Brakewear	7	12
Primary PM2.5 - Exhaust	55	37
Primary PM2.5 - RERD	189	225
Primary PM2.5 - Tirewear	2	4
Grand Total	**254**	**278**

*Re-Entrained Road Dust

This next table distributes particulate emissions by vehicle type, pollutant process/activity, and VMT producing onroad mobile source and re-entrained road dust emissions.

Table 8: Klamath Falls NAA PM2.5 2017 and 2037 Typical Season Day Emissions by Vehicle Type

Row Labels	2017 Daily VMT	2037 Daily VMT	2017 TSD (lbs/day)	2037 TSD (lbs/day)
Combination Long-haul Truck				
Primary PM2.5 - Brakewear	60,013	72,016	0	3
Primary PM2.5 - Exhaust	60,013	72,016	1	4
Primary PM2.5 - RERD	60,013	72,016	13	16
Primary PM2.5 - Tirewear	60,013	72,016	0	1
Combination Long-haul Truck Sum			***15***	***24***

Combination Short-haul Truck				
Primary PM2.5 - Brakewear	23,534	28,240	0	1
Primary PM2.5 - Exhaust	23,534	28,240	1	2
Primary PM2.5 - RERD	23,534	28,240	5	6
Primary PM2.5 - Tirewear	23,534	28,240	0	0
Combination Short-haul Truck Sum			***6***	***9***
Intercity Bus				
Primary PM2.5 - Brakewear	0	0	0	0
Primary PM2.5 - Exhaust	0	0	0	0
Primary PM2.5 - RERD	0	0	0	0
Primary PM2.5 - Tirewear	0	0	0	0
Intercity Bus Sum			***0***	***0***
Light Commercial Truck				
Primary PM2.5 - Brakewear	111,288	133,546	1	1
Primary PM2.5 - Exhaust	111,288	133,546	5	4
Primary PM2.5 - RERD	111,288	133,546	25	30
Primary PM2.5 - Tirewear	111,288	133,546	0	0
Light Commercial Truck Sum			***32***	***35***
Motor Home				
Primary PM2.5 - Brakewear	16,527	19,833	0	1
Primary PM2.5 - Exhaust	16,527	19,833	5	1
Primary PM2.5 - RERD	16,527	19,833	4	4
Primary PM2.5 - Tirewear	16,527	19,833	0	0
Motor Home Sum			***9***	***7***
Motorcycle				
Primary PM2.5 - Brakewear	4,058	4,869	0	0
Primary PM2.5 - Exhaust	4,058	4,869	0	0
Primary PM2.5 - RERD	4,058	4,869	1	1
Primary PM2.5 - Tirewear	4,058	4,869	0	0
Motorcycle Sum			***1***	***1***
Other Buses				
Primary PM2.5 - Brakewear	0	0	0	0
Primary PM2.5 - Exhaust	0	0	0	0
Primary PM2.5 - Tirewear	0	0	0	0
Other Buses Sum			***0***	***0***
Passenger Car				
Primary PM2.5 - Brakewear	216,700	260,040	2	2
Primary PM2.5 - Exhaust	216,700	260,040	10	8
Primary PM2.5 - RERD	216,700	260,040	49	58
Primary PM2.5 - Tirewear	216,700	260,040	1	1
Passenger Car Sum			***61***	***69***
Passenger Truck				

Primary PM2.5 - Brakewear	369,789	443,747	3	3
Primary PM2.5 - Exhaust	369,789	443,747	30	17
Primary PM2.5 - RERD	369,789	443,747	83	99
Primary PM2.5 - Tirewear	369,789	443,747	1	1
Passenger Truck Sum			***118***	***121***
Refuse Truck				
Primary PM2.5 - Brakewear	3,521	4,225	0	0
Primary PM2.5 - Exhaust	3,521	4,225	1	0
Primary PM2.5 - RERD	3,521	4,225	1	1
Primary PM2.5 - Tirewear	3,521	4,225	0	0
Refuse Truck Sum			***1***	***1***
School Bus				
Primary PM2.5 - Brakewear	4,592	5,511	0	0
Primary PM2.5 - Exhaust	4,592	5,511	0	0
Primary PM2.5 - RERD	4,592	5,511	1	1
Primary PM2.5 - Tirewear	4,592	5,511	0	0
School Bus Sum			***1***	***2***
Single Unit Long-haul Truck				
Primary PM2.5 - Brakewear	17,727	21,273	0	0
Primary PM2.5 - Exhaust	17,727	21,273	1	0
Primary PM2.5 - RERD	17,727	21,273	4	5
Primary PM2.5 - Tirewear	17,727	21,273	0	0
Single Unit Long-haul Truck Sum			***5***	***5***
Single Unit Short-haul Truck				
Primary PM2.5 - Brakewear	10,203	12,243	0	0
Primary PM2.5 - Exhaust	10,203	12,243	1	0
Primary PM2.5 - RERD	10,203	12,243	2	3
Primary PM2.5 - Tirewear	10,203	12,243	0	0
Single Unit Short-haul Truck Sum			***3***	***3***
Transit Bus				
Primary PM2.5 - Brakewear	6,414	7,697	0	0
Primary PM2.5 - Exhaust	6,414	7,697	0	0
Primary PM2.5 - RERD	6,414	7,697	1	2
Primary PM2.5 - Tirewear	6,414	7,697	0	0
Transit Bus Sum			***2***	***2***
Grand Total			**254**	**278**

Finally, **Table 9** below combines exhaust, brake, and tire particulate emissions (not RERD) for onroad mobile sources for 2017 and 2037. The particulate emissions are divided out by season and distinguishes between weekday and weekend emissions.

Table 9: Klamath Falls NAA PM2.5 Weekday and Weekend Onroad Emissions by Season

		Spring		Summer		Fall		Winter	
		Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
Year	Pollutant*	(lbs/day)							
2017	PM2.5 Exhaust, Brakewear, Tirewear	56	44	49	38	57	44	56	44
2037	PM2.5 Exhaust, Brakewear, Tirewear	45	34	38	29	45	34	47	36

*Does not include re-entrained road dust

2. Motor Vehicle Emissions Budget (MVEB)

A Motor Vehicle Emissions Inventory (MVEI) for 2017 and 2037 was used to address Transportation Conformity and establish limits for a Motor Vehicle Emissions Budget (MVEB) based on onroad mobile sources such as cars and trucks, and road dust. The transportation emissions budget consists of attainment and projected onroad mobile emissions only. The emission estimates were developed using activity data provided by ODOT's travel demand model. This model already incorporates future demographic and traffic network patterns that results in the Daily VMT used to estimate 2037 emissions in MOVES3.1. The 2037 typical season day emission estimates from the MVEI were used to create the 2037 MVEB.

The MVEB for this plan was established using 2037 onroad $PM_{2.5}$ and NO_X emission estimates from the MVEI and safety margins developed by DEQ in consultation with EPA, FHWA and ODOT during the interagency consultation process, as required by OAR 340-252-0060. Based on interagency consultation in August 2022, the process for developing safety margins and application of a portion of woodstove emissions was agreed upon and applied to 2037 MVEI onroad mobile source emissions to set the budget. DEQ calculated these safety margins for onroad mobile sources only based on percent change from 2017-2037 for both PM2.5 and NOx typical season day emissions and then divided it in half. The percent change provides a moderate cushion for $PM_{2.5}$ and NO_x emissions within the NAA. The safety margin was applied to the 2037 MVEI onroad mobile emissions to calculate an increase that would cover any future transportation projects. DEQ did not include re-entrained road dust in the MVEB at EPA's instruction because overall mobile emissions are not a significant source of PM2.5 emissions within the NAA. neither the EPA Regional Administrator nor the Oregon DEQ Director have made a finding that re-entrained road dust is a significant contributor to the Klamath Falls PM2.5 non-attainment area.

DEQ calculated these safety margins based on percent change from 2017-2037 in PM2.5 and NOx typical season day emissions divided in half for onroad mobile source emissions only. The percent change provides a moderate cushion for $PM_{2.5}$ and NO_x.

Formula 1: Estimate Safety Margin:

$$\text{Safety Margin}_{\text{pollutant}} = (((2017\ \text{attainment}_{\text{pollutant}} - 2037\ \text{future year}_{\text{pollutant}}) / 2017\ \text{attainment}_{\text{pollutant}})/2) * 100$$

The safety margin was applied to the 2037 emissions to calculate an increase in onroad mobile source emissions that would cover any future transportation projects.

Formula 2: Applying Safety Margin to 2037 Future Year (FY) Emissions:

$$\text{MVEB}_{\text{pollutant}} = 2037\ \text{FY}_{\text{pollutant}} + (2037\ \text{FY}_{\text{pollutant}} * \text{Safety Margin}_{\text{pollutant}})$$

DEQ decided to go a step further by providing additional cushion using a portion of woodstove emission reductions projected between 2017 and 2037 for the MVEB. DEQ applied the onroad mobile sources safety margins, 9% for $PM_{2.5}$ and 23% for NO_X, to get a portion of woodstove emission reductions allocated to the MVEB.

This re-assignment of both $PM_{2.5}$ and NO_X woodstove emission reductions is due to the approximate removal of 411 stoves over the next 20-year period. These removals include 354 stoves for two EPA TAGs funding and 57 stoves based on 2019 state funding and DEQ's Heat Smart program. DEQ applied the safety margins against the difference in $PM_{2.5}$ and NO_X emissions between 2017 and 2037 for residential woodstoves and added that portion back to the MVEB. The portion of woodstove emission reductions for $PM_{2.5}$ and NO_X were calculated as follows:

Formula 3: Allocating a Portion of Woodstove Emissions Reductions to the MVEB:

$$MVEB_{pollutant} = (2017_{pollutant} - 2037_{pollutant}) * \text{Safety Margin}_{pollutant}$$

These additional emissions will help cover any uncertainty or other potential changes in modeled transportation network, regional policy, and economic conditions that might impact $PM_{2.5}$ and NO_x emissions within the NAA. 2017 emissions and air monitoring indicate that Klamath Falls NAA is already in attainment; therefore, if we set MVEB at these levels then the NAAQS and 2017 attainment year emissions should not be violated if emissions from planned transportation projects or more extensive economic growth does not exceed this budgeted amount.

Table 10 below reflects the total onroad $PM_{2.5}$ typical season day emissions for the 2017 attainment year and 2037 future year. The 2037 MVEB column includes the adjusted 2037 onroad mobile source emissions and a portion of woodstove emissions reductions from 2017 to 2037.

Table 10: Klamath Falls Non-Attainment Area (NAA) 2037 $PM_{2.5}$ and NO_X Motor Vehicle Budget (pounds/day)

Onroad Category and Woodstove Emissions Reductions	2017 and 2037 Typical Season Day Emissions (lbs/day)							
	2017		2037		2037 MVEB		Safety Margins (%)	
	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx	PM2.5	NOx
Onroad	64	2149	53	1181	58	1447	9%	23%
Woodstove Emissions Reductions	617	64	395	57	20	2	9%	23%
Total Emissions (lbs/day)	**681**	**2214**	**448**	**1238**	**78**	**1449**		

Table 11 below provides a comparison of all emission categories for 2017 attainment and 2037 future years and the established 2037 MVEB for $PM_{2.5}$ and NO_X typical season day emissions. The 2037 MVEB column includes the adjusted 2037 onroad mobile source emissions and portion of woodstove emissions reductions allocated to the budget. This table demonstrates that substitution of budgeted emissions in place of 2037 Future Year EI onroad mobile source emissions combined with other emission sources also emitting $PM_{2.5}$ and NO_X within the NAA will not exceed total attainment emissions (2017).

Table 11: Klamath Falls Non-Attainment Area (NAA) 2017 and 2037 PM2.5 and NOx Emissions by Category including Motor Vehicle Emissions Budget (MVEB).

Typical Season Day (TSD) Emissions			
Pollutants and Emissions Category	Attainment and Future Year EI		2037 MVEB
	2017	2037	
	(lbs/day)		
PM2.5-Primary			
Nonpoint Sources	1191	994	994
Events and Natural Sources	2347	2347	2347
Point Sources	1002	1002	1002
Mobile Sources			
Woodstove Emissions Reductions	---	---	20
Onroad Mobile Sources	64	53	58
Subtotal	**64**	**53**	**78**
Re-Entrained Road Dust	189	225	225
Aircraft and Airport Operations	39	41	41
Nonroad Mobile Sources	19	12	12
Locomotives	16	18	18
Mobile Sources Subtotal	**328**	**348**	**373**
PM2.5-Primary Total	**4868**	**4691**	**4716**
NOX			
Mobile Sources			
Woodstove Emissions Reductions	---	---	2
Onroad	2149	1181	1447
Subtotal	**2149**	**1181**	**1449**
Re-Entrained Road Dust	---	---	---
Aircraft and Airport Operations	558	574	574
Locomotives	550	619	619
Nonroad Mobile Sources	232	95	244
Mobile Sources Subtotal	**3490**	**2469**	**2885**
Point Sources	1551	1281	1281
Nonpoint Sources	656	670	681
Events and Natural Sources	559	559	559
NOX Total	**6256**	**4980**	**5407**

3. Inventory Staff Contacts

DEQ is the lead agency tasked with updating the emissions inventory and SIP development with contributions from the Oregon State Department of Transportation (ODOT), Highway Division. ODOT provided data from the transportation demand model ran for the 2008 SIP EI[3]. The data was used to extrapolate 2017 and 2037 County and NAA VMT to develop Onroad mobile source emissions from transportation sources (highway motor vehicles).

The table below is the abbreviated organizational staff listing for carrying out these duties:

State of Oregon
DEQ Department of Environmental Quality

Table 12: Agency Staff List

Agency/Division	Staff Member	Position	Phone Number
Oregon DEQ			
Air Quality Division	Ali Mirzakhalili	Division Administrator	(503) 229-5397
Air Quality Planning	Michael Orman	AQ Planning Manager	(503) 229-6595
Air Quality Planning	Tori Heroux	AQ SIP Planner	(971) 808-7046
Air Quality Technical Services (TS)	Jeffrey Stocum	AQ TS Manager	(503) 229-5506
Air Quality Technical Services (TS)	Brandy Albertson	AQ Senior Emissions Analyst	(503) 229-6459
Air Quality Technical Services (TS)	James Powell	AQ MOVES Model Emissions Analyst	TBD
Oregon Department of Transportation			
Transportation Planning Analysis Unit	Brian Dunn	Manager	(503) 986-4106
Transportation Planning Analysis Unit	Sam Ayah	Transportation Analyst	(503) 986-4101

Appendix 4a

Chapter 406
Klamath County Clean Air Ordinance

Contents

Exhibits

Ordinance No. 63.00- 07/31/1991

Ordinance No. 63.01- 06/25/1997

Ordinance No. 63.02- 12/23/1997

Ordinance No. 63.03- 08/23/2021

Ordinance No. 63.04- 10/05/2004

Ordinance No. 63.05- 08/07/2007

Ordinance No. 63.06- 12/31/2012

Chapter 406
Klamath County Clean Air Ordinance
406.001 Policy and purpose.
To assess and control air quality issues and identify the Air Quality Zone, so that Klamath County will have cleaner air for the benefits of its citizens' health and welfare; to be in compliance with the requirement of the Federal Clean Air Act of 1990 and applicable revisions or updates, and not exceed the National Ambient Air Quality Standard for particulate matter; and to improve economic development opportunities.

406.005 Definitions.
Except where the context otherwise requires, the definitions given in this section govern the construction of this chapter.

1. **Air quality outlook.** Air quality outlooks are solely informational and non-regulatory to inform area residents of the estimated average air quality during the 24-hour period of that day. KCPH shall utilize the Oregon Department of Environmental Quality Air Quality Index (AQI) as defined in 406.005(3) for providing air Quality outlook information. Air quality outlooks are typically utilized when the 24-hour average for the AQI is estimated to be Unhealthy for Sensitive Groups (USG) (AQI of 101) or higher for particulate matter (PM) concentrations. The air quality outlooks shall be:

    A. **Hazardous (H) air quality outlook.** A period of time when an air quality forecast, as defined in 406.005(2), projects that particulate matter concentrations have the potential to exceed an estimate of 250 $\mu g/m^3$ (or an AQI greater than 300) of PM 2.5 for a 24-hour daily average. Hazardous air quality is a health warning of emergency conditions. The entire population is likely to be affected.

    B. **Very Unhealthy (VU) air quality outlook.** A period of time when an air quality forecast projects that particulate matter concentrations are estimated between 150 $\mu g/m^3$ and 250 $\mu g/m^3$ (AQI of 201-300) of PM 2.5 for a 24-hour daily average. Everyone may experience health effects.

    C. **Unhealthy (U) air quality outlook.** A period of time when an air quality forecast projects that particulate matter concentrations are estimated between 55 $\mu g/m^3$ and 150 $\mu g/m^3$ (AQI of 151-200) of PM 2.5 for a 24-hour daily average. Members of sensitive groups may experience serious health effects.

    D. **Unhealthy for Sensitive Groups (USG) air quality outlook.** A period of time when an air quality forecast projects that particulate matter concentrations are estimated between 35 $\mu g/m^3$ and 55 $\mu g/m^3$ (AQI of 101-150) of PM 2.5 for a 24-hour daily average. Members of sensitive groups may experience health effects, but the general public is not likely to be affected.

    E. **Moderate (M) air quality outlook.** A period of time when an air quality forecast projects that particulate matter concentrations are estimated between 12 $\mu g/m^3$ and 35 $\mu g/m^3$

(AQI of 51-100) of PM 2.5 for a 24-hour daily average. Moderate air quality is acceptable but may pose some health concerns to certain individuals who are unusually sensitive to air pollution.

F. **Good (G) air quality outlook.** A period of time when an air quality forecast projects that particulate matter concentrations are estimated to be less than 12 $\mu g/m^3$ (AQI less than 50) of PM 2.5 for a 24-hour average. Good air quality is considered satisfactory and air pollution poses little or no risk.

2. **Air quality forecast**. A method of using available data including, but no limited to, local weather conditions, current and anticipated particulate levels, and weather forecasts to determine the PM 2.5 particulate matter concentrations.

3. **Air Quality Index (AQI).** An index provided by the Oregon Department of Environmental Quality (DEQ) which reports air quality using numerical values coinciding with particulate matter (PM) concentrations.

4. **Air quality specialist**. Air quality specialists may be staff of Klamath County Public Health or other designated Klamath County employees. The primary role of an air quality specialist is to develop air quality forecasts, observe, respond, and document violations of Chapter 406 and to educate the public with respect to this Chapter and the documented violation.

5. **Air Quality Zone (AQZ).** An area within the County as depicted on the map in Exhibit A.

6. **American Society for Testing and Materials (ASTM) Standards.** All fireplaces that meet the ASTM international standard test method E2558, and meet current federal EPA New Source Performance Standards for structurally integrated fireplaces, whichever is less.

7. **Building.** All residential or commercial structures.

8. **Burn-down time.** A period of time allowed for fires in wood burning device and open/outdoor burning, to completely extinguish burning fuels prior to the beginning of enforcement activities. Such burn-down time applies any time there is a change to the burn notification. The burn down time is three (3) hours unless directed otherwise by air quality specialists or fire officials due to extreme or hazardous conditions.

9. **Burn notification.** Daily notification provided by Klamath County Public Health, Environmental Health division based on an air quality forecast, for the purpose of maintaining National Ambient Air Quality Standards (NAAQS). The notification shall be:

   A. **No burning allowed.** When an air quality forecast projects that particulate matter concentrations have the potential to exceed or are exceeding an estimate of 35 $\mu g/m^3$ of PM 2.5 for a 24-hour average and/or would be difficult to reduce due to atmospheric conditions. Such pollution concentrations have a higher probability of being unhealthy.

   B. **Exempt wood burning devices only.** When an air quality forecast projects that particulate matter concentrations are less than what would be considered for the no burning allowed notification, but have the potential to exceed estimates of 16 $\mu g/m^3$ of PM 2.5 for a 24-hour average. Such pollution concentrations have a high probability of impacting public health.

C. **Burning allowed.** When an air quality forecast projects daily particulate matter concentrations for a 24-hour average will not exceed 16 $\mu g/m^3$ of PM 2.5 for a 24-hour average. Such pollution concentrations have a low probability of impacting public health.

10. **Certificate of Exemption.** A written approval issued by Klamath County Public Health, Environmental Health division to use a wood burning device in a manner normally in violation of the requirements of this Chapter.

11. **Certificate of Variance.** A written approval issued by Klamath County Public Health, Environmental Health division to open/outdoor burn in a manner normally in violation of the requirements of this Chapter.

12. **Certified wood burning device.** A wood burning heating appliance that has been certified by the Oregon Department of Environmental Quality (DEQ) or has an Environmental Protection Agency (EPA) certification label indicating that the model is built in accordance with current EPA emission standards for certification.

13. **Cook stove.** A wood burning stove which is installed for cooking and primarily designed for stovetops and an oven.

14. **Exempt wood burning device.** A wood burning device that has been issued an exemption from Klamath County Public Health, Environmental Health division.

15. **Fire department.** The unit of municipal government or county approved local fire district having the authority and responsibility to extinguish unintended fires and to promote fire safety.

16. **Fireplace.** A framed opening made in a chimney to hold an open fire. Also known as an open fireplace or structurally integrated fireplace which could be made of metal or masonry construction.

17. **Klamath County Air Quality Advisory Committee.** A volunteer committee selected by Klamath County Public Health. The purpose of the Air Quality Advisory Committee is to evaluate relevant air quality data, recommend emission reduction strategies, and provide community input regarding program implementation and other projects as needed.

18. **Low income.** An individual whose annual income is at or below 250% of the federal poverty level.

19. **Non-certified wood burning device.** A wood burning heating appliance that has not been certified by either the Oregon Department of Environmental Quality or the Environmental Protection Agency (EPA) as complying with smoke emission standards.

20. **Notice of noncompliance.** A letter notifying an individual or entity in violation of this Chapter of the specific violation and the corrective action necessary.

21. **Nonattainment area.** The federally designed area within the County that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the primary or secondary NAAQS. as depicted on the map in Exhibit A.

22. **Opacity**. The degree to which emissions reduce the transmission of light and obscure the view of an object in the background. See Exhibit B.

23. **Open/outdoor burning.** All open or outdoor fires intended for the combustion of yard debris and materials included in the definition of "open burning" in Oregon Administrative Rule Chapter 340 Division 264.

24. **Particulate matter two and one-half microns or less (PM 2.5).** Airborne particulate matter with an aerodynamic diameter of two-point-five (2.5) microns (µg) in size or less. PM 2.5 is normally measured by weight per unit volume of air in micrograms per cubic meter ($\mu g/m^3$).

25. **Prohibited materials:** Any combustible material as defined by Oregon State's prohibited materials open burning rule (Chapter 340 Division 264) which include wet garbage, plastic, wire insulation, automobile parts, asphalt, petroleum product, petroleum treated material, rubber products, or animal or vegetable matter resulting from the handling, preparation, cooking or service of food that normally results in dense or noxious smoke when burned. Also included are coal and any open burned materials that cause a public or private nuisance or a hazard to public safety.

26. **Responsible party.** An individual eighteen (18) years of age or older, authorized by the property owner to attend an open/outdoor burning event and who is capable of and has the necessary equipment to extinguish the fire.

27. **Sale of real property.** Any transaction whereby the ownership of a building, as defined by the Klamath County Development Code, or the real property upon which a building is located, is transferred by an agreement for the sale and purchase of the building or the real property.

28. **Sole source of heat.** One or more residential wood burning devices that constitute the only source of heat in a private residence. No residential wood burning device(s) shall be considered to be the sole source of heat if the private residence is equipped with a permanently installed working system such as: oil, natural gas, electric, geothermal, solar or propane heating system, whether connected or disconnected from its source.

29. **Wood burning device.** A device designed for a solid fuel combustion, including cordwood stoves (woodstoves, fireplace stove inserts and pellet stoves), fireplaces, solid-fuel fired cook stoves and combination fuel furnaces or boilers, which burn solid fuels.

30. **Yard Debris.** Wood, needle or leaf material from trees, shrubs, or plants.

406.100 County wide air quality pollution control requirements.

1. **Burn notifications.** The Klamath County Public Health, Environmental Health division shall determine and issue burn notifications to the public at least daily during the winter heating season and at other times of the year as needed according to the definitions provided in section 406.005(9). Notifications will be effective at 8:30 a.m. each day during the winter heating season starting October 15 through March 15 and during open/outdoor burn periods. Each notification will contain information about restrictions on the use of wood burning devices and open/outdoor burns for a 24-hour period.

2. **Air quality outlooks will be provided at other times of the year as needed according to the definition provided in section 406.005(1).**

3. **Wood burning device**

   A. Appliance resale and installation:

      a. The resale or installation of a non-certified wood burning device or any appliance not meeting the requirements of Section 406.005(12) is prohibited.

      b. The resale, or installation of an exempt wood burning device, is allowed in accordance with state and local requirements.

      c. A Klamath County Building Division Permit is required for the for the installation of a wood burning device.

   B. **Disclosure of wood burning device upon the sale of real property:** The presence of all wood burning devices including wood stoves, fireplace inserts, fireplaces, and pellet stoves in the building shall be disclosed by the seller to the buyers as part of sale and purchase of any building. The disclosure shall state whether any wood burning devices are certified or non-certified.

   C. **Removal of non-certified wood burning devices upon the sale of real property:** Non-certified devices must be removed upon sale. The removal shall be accomplished prior to the closing of any real estate transaction involving the building containing the non-certified device(s).

   D. **Sole heating source:** It shall be a violation of this ordinance for a wood burning device to be the sole source of heat in any non-owner (tenant) occupied dwelling unit within Klamath County.

   E. **Wood burning device fuel:** Only dry, seasoned cordwood, pressed sawdust logs, organic charcoal or pellets specifically manufactured for the appliance may be burned in a wood burning device.

   F. **Any newly constructed or retrofitted fireplaces must comply with ASTM standards.**

   G. **Prohibited materials:** Prohibited materials as defined in Section 406.005(25) and Oregon Administrative Rule 340-264-0060(3), shall not be burned within the Klamath County Air Quality Zone (AQZ). An exception is burning of re-refined used oil in an approved oil-burning device.

4. **Open/outdoor burning requirements –** This section pertains to burning as defined in Section 406.005(23).

   A. **All open/outdoor burning is prohibited within the Klamath County AQZ** unless during a designated open burn period or a Certificate of Variance has been issued by the Klamath County Public Health, Environmental Health division in accordance with Section 406.250.

   B. Open/outdoor burning hours:

      a. Open/outdoor fires are not to be started until 8 a.m. and must be completely extinguished by 5 p.m. unless otherwise directed by the local fire department.

b. Burning conducted by federal, state, and local agencies are exempt from this rule. Examples of agency managed open/outdoor burning include, but are not limited to, forest fuel reduction, ecosystem management, and fire training.

C. **Local fire authorization required**: Individuals burning shall adhere to all municipal and local fire department, State Fire Marshal, Oregon Department of Forestry or DEQ rules, ordinances, or restrictions.

D. Responsible party:

a. A responsible individual, as defined in section 406.005(26), must constantly attend burning.

b. This person must also completely extinguish the fire before leaving it.

E. **Outdoor fires used for cooking, personal warmth, lighting, ceremonial, or aesthetic purposes, and are not associated with waste disposal are permitted.** Outdoor fires used for these purposes must be contained within a fireproof container designed for outdoor burning and be capable of containing the fire and coals above the ground surface. Outdoor fires used for these purposes may not exceed two feet in diameter and two feet in height.

406.150 Air quality pollution requirements applying within the Air Quality Zone

In additions to the requirements in Section 406.100 the following requirements apply:

1. **Wood burning device**. This section applies to the use of wood burning devices for residential and commercial heating within the AQZ.

A. Burn notifications

a. **During a no burning period, no individual shall operate any wood burning device.**

b. **During an exempt wood burning device period**, only devices with an approved certificate of exemption may burn.

c. **During a burning allowed period,** there are no restrictions on using wood burning devices.

B. **No person operating a wood burning device within the AQZ shall allow smoke of an opacity of greater than 20%,** as shown in Exhibit B. Emissions created during a ten (10) minute start-up period are exempt.

C. **Burn-down time.** A burn-down time, not to exceed three (3) hours, will be given any time there is a change in burn notification. No enforcement action described in Section 406.300 will take place for visible air contaminant emissions emitted during the burn-down time.

D. **Emergency conditions.** An exemption to Section 406.150 may be issued by the Klamath County Public Health, Environmental Health division to allow the use of normally prohibited wood burning devices within the AQZ, during periods when:

a. Utility suppliers declare energy shortages;

b. Electric power or outages occur;

c. Interruptions occur of natural gas supplies; or

d. Temporary failure occurs of a resident's heating system when there is an immediate need to operate a solid fuel space-heating device to protect health and welfare.

e. Other emergencies as determined by Klamath County Public Health.

2. **Open/outdoor burning:** Except as specified in this section or allowed by Section 406.250, open burning is prohibited within the AQZ.

A. **Open/outdoor burning window:** The Klamath County Public Health Director, in consultation with the Board of County Commissioners, and Fire Districts with jurisdiction inside the AQZ may declare two specific fifteen (15) day periods a year during which times the open/outdoor burning of residential yard debris, as defined in Section 406.005(30), will be allowed within the AQZ.

a. During the open burning window, the Klamath County Public Health, Environmental Health division will issue a daily burn notification to inform residents whether open/outdoor burning is permitted.

B. **All open/outdoor burning is prohibited, outside of declared open burn windows, in the AQZ** unless issued a Certificate of Variance **as defined in Section 406.250(1).** Certificates must be obtained from Klamath County Public Health, Environmental Health division.

C. The use of burn barrels and other outdoor burning devices or any structure which would impede direct view of material which are to be burned is prohibited.

406.200 Certificate of Exemption.

1. **Issuance:** The Klamath County Public Health, Environmental Health Division Administrator or designee may issue a Certificate of Exemption to allow the use of wood burning devices within the AQZ for residential heating purposes to individuals who qualify as low income or whose sole source of heat is a wood burning device.

A. All applications for certificates of exemption shall be on forms provided by the Klamath County Public Health, Environmental Health division.

B. **Within five (5) working days of receiving a completed application, the Klamath County Public Health, Environmental Health division shall review** and: 1) approve the application; 2) approve the application with conditions; or 3) deny the application.

C. **Klamath County Public Health, Environmental Health division shall not charge a fee** for processing an application or issuing a Certificate of Exemption.

D. All Certificates of Exemption expire on March 15 of each year.

E. **Applying for Certificates of Exemptions is the responsibility of the applicant.**

406.250 Certificate of Variance.

Certificates of Variance issued by Klamath County Public Health, Environmental Health division are required for all open/outdoor burning not conforming to the requirements of Section 406.100(4) and Section 406.150(2).

1. **Certificate of Variance**
   A. **All applications for Certificates of Variance shall be on forms provided by the Klamath County Public Health, Environmental Health division** and submitted at least six (6) working days prior to the proposed or desired starting date of the variance.
   B. **Within five (5) working days of receiving a completed application, the Klamath County Public Health, Environmental Health division shall review** and: 1) approve the application; 2) approve the application with conditions; or 3) deny the application.

406.300 Enforcement.

1. **Klamath County Public Health, Air Quality specialists will monitor and enforce compliance with this Chapter.** Minor violations of this Chapter will be documented and a notice of noncompliance will be submitted to the Klamath County Public Health Environmental Health Administrator for approval.

2. **When a Klamath County Air Quality specialist has observed a significant or repeated violation of this Chapter, they will submit documentation, to the Klamath County Public Health, Environmental Health division Administrator.** The Administrator will review the documentation and:

   A. **If the documentation is complete, the Environmental Health Administrator will forward to the Klamath County Public Health Director to approve** and issue a Notice of Noncompliance and/or a citation and summons to the violator to appear in court.

3. **Notice of noncompliance:** A Notice of Noncompliance as defined in Section 406.005(20) may be issued to the violator as the sole enforcement action, or in addition to a citation.

   A. The notice shall contain the date, time, location and violation observed.

   B. The notice shall specify the corrective action that must be taken and the time in which it must be accomplished.

   C. **The notice may require that within ten (10) days of correcting the violation,** the violator shall in writing notify Klamath County Public Health, Environmental Health division that the corrective action has been taken.

4. **Air quality citations:** An appropriate law enforcement officer or the Klamath County Public Health Director may issue a citation and summons to appear in court for a violation of this Chapter.

406.400 Penalties.

Failure to comply with the provisions of this Chapter shall be subject to fines of up to $720 for a one-time occurrence, and fines of not more than $1,000 for a continuing, or repeated offense. This provision will be enforced in accordance with Klamath County Code Chapter 800, Uniform Civil Violation Procedure.

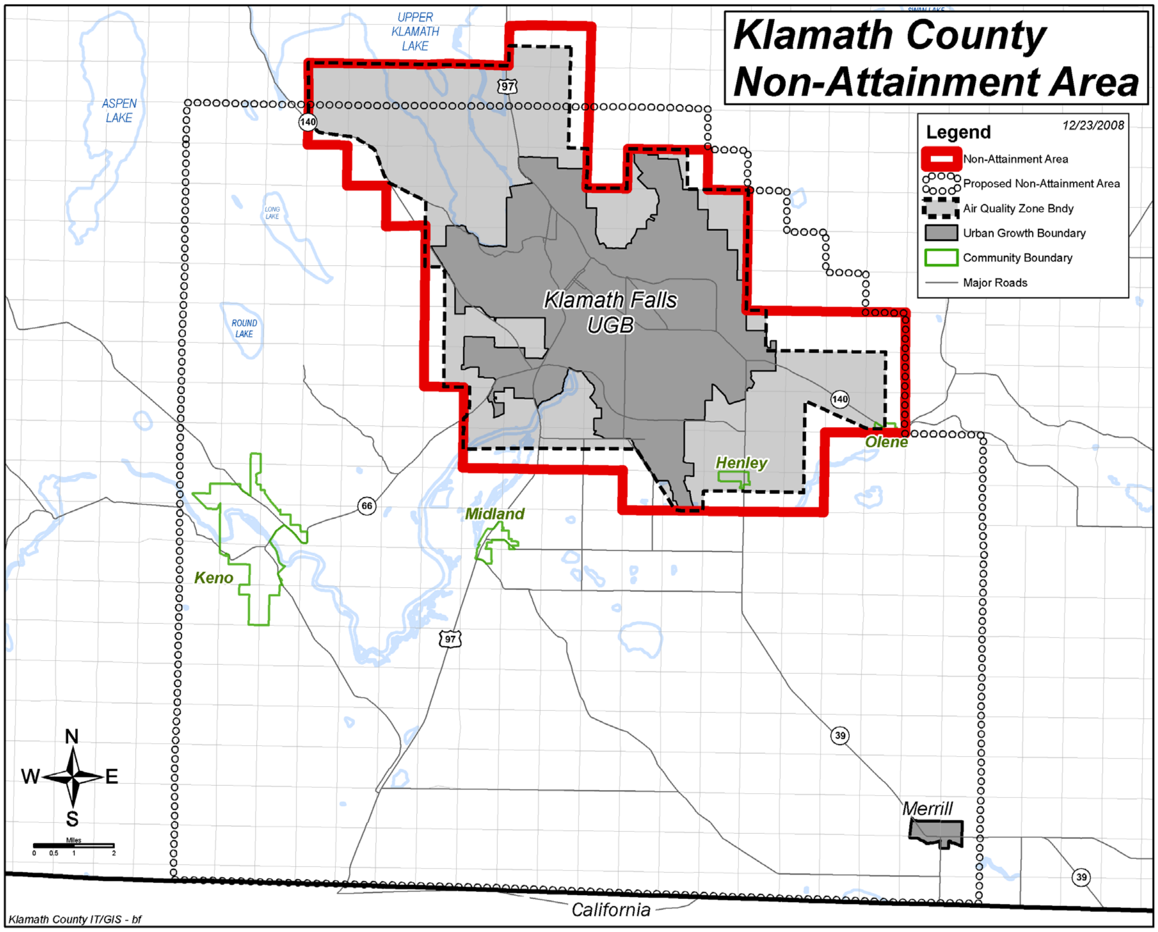
406.450 Severability.

If any section, subsection, sentence clause, phrase or portion of this Chapter is for any reason held invalid or unconstitutional in a court of competent jurisdictions, such portion shall be deemed a separate, distinct and independent provision, and shall not affect the validity of the remaining portion thereof.

406.500 Air Quality Advisory Committee.

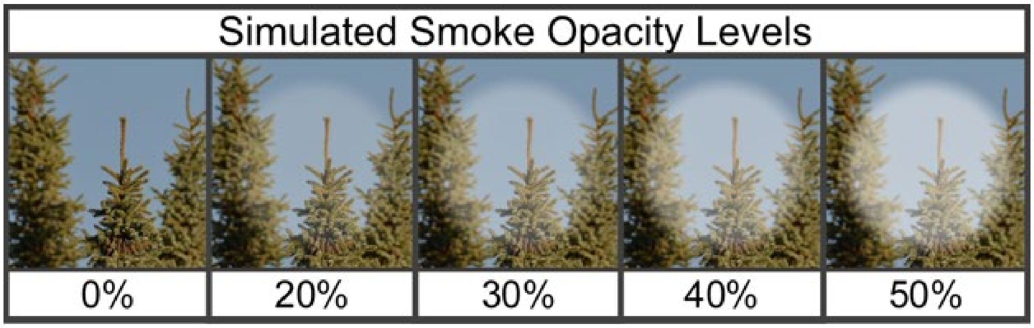
1. **Committee:** A volunteer committee as defined in 406.005(17). The committee may meet as needed. The Committee will be composed of community members and agency representatives.

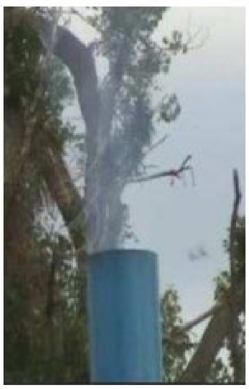
Exhibit A



Klamath County
Non-Attainment Area
Legend
12/23/2008
Non-Attainment Area
Proposed Non-Attainment Area
Air Quality Zone Bndy
Urban Growth Boundary
Community Boundary
Major Roads
UPPER KLAMATH LAKE
ASPEN LAKE
ROUND LAKE
Klamath Falls UGB
Keno
Midland
Henley
Olene
Merrill
California
N
W
E
S
Klamath County IT/GIS - bf

Exhibit B

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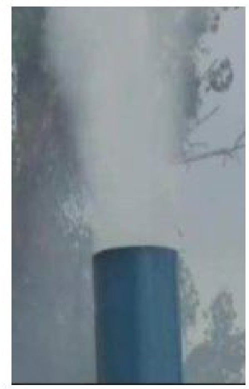
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Appendix 4b

Chapter 406
Klamath County Clean Air Ordinance

Contents

Exhibits

Ordinance No. 63.00- 07/31/1991

Ordinance No. 63.01- 06/25/1997

Ordinance No. 63.02- 12/23/1997

Ordinance No. 63.03- 08/23/2021

Ordinance No. 63.04- 10/05/2004

Ordinance No. 63.05- 08/07/2007

Ordinance No. 63.06- 12/31/2012

Chapter 406

Klamath County Clean Air Ordinance

406.001 Policy and purpose.

To ~~control and address~~assess and control air quality ~~problems~~ issues and identify the Air Quality Zone, so that Klamath County will have cleaner air for the benefits of its citizens' health and welfare; to be in compliance with the requirement of the Federal Clean Air Act of 1990 and applicable revisions or updates, and not exceed the National Ambient Air Quality Standard for particulate matter; and to improve economic development opportunities.

406.005 Definitions.

Except where the context otherwise requires, the definitions given in this section govern the construction of this chapter.

Air quality outlook. Air quality outlooks are solely informational and non-regulatory to inform area residents of the estimated average air quality during the 24-hour period of that day. KCPH shall utilize the Oregon Department of Environmental Quality Air Quality Index (AQI) as defined in 406.005(3) for providing Air Quality Outlook information. Air Quality Outlooks are typically utilized when the 24-hour average for the AQI is estimated to be Unhealthy for Sensitive Groups (USG) (AQI of 101) or higher for particulate matter (PM) concentrations. The Air Quality Outlooks shall be:

1.

A. **Hazardous (H) air quality outlook.** A period of time when an Air Quality Forecast, as defined in 406.005(2), projects that particulate matter concentrations have the potential to exceed an estimate of 250 µg/m^3 (or an AQI greater than 300) of PM 2.5 for a 24-hour daily average. Hazardous air quality is a health warning of emergency conditions. The entire population is more likely to be affected.

B. **Very Unhealthy (VU) air quality outlook.** A period of time when an Air Quality Forecast projects that particulate matter concentrations are estimated between 150 µg/m^3 and 250 µg/m^3 (AQI of 201-300) of PM 2.5 for a 24-hour daily average. Very unhealthy is a health alert. Everyone may experience more serious health effects.

C. **Unhealthy (U) air quality outlook.** A period of time when an Air Quality Forecast projects that particulate matter concentrations are estimated between 55 µg/m^3 and 150 µg/m^3 (AQI of 151-200) of PM 2.5 for a 24-hour daily average. Everyone may begin to experience health effects; members of sensitive groups may experience more serious effects when in unhealthy range.

D. **Unhealthy for Sensitive Groups (USG) air quality outlook.** A period of time when an Air Quality Forecast projects that particulate matter concentrations are estimated between 35 µg/m^3 and 55 µg/m^3 (AQI of 101-150) of PM 2.5 for a 24-hour daily average. Members of sensitive groups may experience health effects within the USG range, but the general public is not likely to be affected.

E. **Moderate (M) air quality outlook.** A period of time when an Air Quality Forecast projects that particulate matter concentrations are estimated between 12 µg/m^3 and 35 µg/m^3 (AQI of 51-100) of PM 2.5 for a 24-hour daily average. Moderate air quality is acceptable but may be some health concern to certain persons who are unusually sensitive to air pollution.

Good (G) air quality outlook. A period of time when an Air Quality Forecast projects that particulate matter concentrations are estimated to be less than 12 µg/m^3 ~~-~~(AQI less than 50) of PM 2.5 for a 24-hour average. Good air quality is considered satisfactory and air pollution poses little or no risk.

F.

~~1. **Air quality advisory**. A means, declared and provided by the Klamath County Environmental Health Division based on the air quality forecast, to inform area residents of what the air quality is or potentially will be. The advisories shall be:~~

~~A. Red advisory period. A period of time when an air quality forecast predicts that particulate matter concentrations have the potential to exceed or are exceeding an estimate of 150 µg/m3 of PM 10 or 30 µg/m3 for PM 2.5 for a 24-hour average. Such pollution concentrations have a high probability of being unhealthy.~~

~~B. Yellow advisory period. A Period of time when the air quality forecast predicts that particulate matter concentrations less than what would be considered for the Red Advisory Period, but would likely exceed estimated 80 µg/m3 of PM 10 or 16 µg/m3 of PM 2.5 for a 24-hour average. Such pollution concentrations have a high probability of impacting public health.~~

~~C. Green advisory period. A period of time when an air quality forecast predicts daily particulate matter concentrations for a 24-hour average will not exceed 80 ug/m3 of PM 10, or 16 ug/m3 of PM 2.5.~~

2. **Air quality forecast**. A method of using available data including, but no limited to, local weather conditions, current and anticipated particulate levels, and weather forecasts to determine the PM 10 and PM 2.5 particulate matter concentrations.

~~2.~~3. **Air Quality Index (AQI).** An index provided by the Oregon Department of Environmental Quality (DEQ) which reports air quality using numerical values coinciding with particulate matter (PM) concentrations.

~~3.~~4. **Air quality ~~inspector~~specialist**. Air quality specialists ~~inspectors~~ may be staff of ~~the~~ Klamath County Public Health ~~Environmental Health Division,~~ or other designated Klamath County employees. ~~the Klamath County Code Compliance office, the code Enforcement Office of the City of Klamath Falls, or the County Fire District who will act within their scope of authority.~~ The primary role of an air quality ~~Inspector~~ specialist is to develop air quality forecasts, observe, respond, and document violations of Chapter 406 and to educate the public with respect to this Chapter and the documented violation.

5. **Air Quality Zone.** An area within the County as depicted on the map ~~and legal description~~ in Exhibit A.

~~4.~~6. **American Society for Testing and Materials (ASTM) Standards.** All fireplaces that meet the ASTM international standard test method E2558, and meet ~~5.1 grams per kilogram specifications, or~~ current federal EPA New Source Performance ~~S s~~Standards for structurally integrated fireplaces, whichever is less.

~~5. **Agricultural operation.** An activity including an irrigation operation on land currently used, or intended to be used primarily for the purpose of obtaining a profit by raising, harvesting and selling crops or by raising and selling livestock and or/ poultry, or the product thereof. Agricultural operation also means activities conducted by not-for-profit agricultural research organizations, which activities are necessary to serve the purpose. It does not include the construction and use of dwellings customarily provided in conjunction with the agricultural operation.~~

~~6.~~7. **Building.** All residential or commercial structures including manufactured homes.

~~7.~~8. **Burn-down time.** A period of time allowed for fires in ~~solid-fuel fired appliance~~wood burning device~~s~~ and open/outdoor burning, to ~~die down~~ completely extinguish burning fuels prior to the beginning of enforcement activities. Such burn-~~-~~down time applies any time there is a change to the burn notification ~~to Red and Yellow advisory period~~. The burn down time is three (3) hours unless directed otherwise by air quality specialists or fire officials due to extreme or hazardous conditions.

Burn notification. Daily notification provided by Klamath County Public Health, ~~-~~ Environmental Health ~~D~~division based on an air quality forecast, for the purpose of maintaining National Ambient Air Quality Standards (NAAQS). The notification shall be:

9.

A. **No burning allowed.** When an air quality forecast projects that particulate matter concentrations have the potential to exceed or are exceeding an estimate of 35 µg/m³ of PM 2.5 for a 24-hour average and/or would be difficult to reduce due to atmospheric conditions. Such pollution concentrations have a higher probability of being unhealthy.

Exempt wood burning devices only. When an air quality forecast projects that particulate matter concentrations are less than what would be considered for the no burning allowed notification, but have the potential to exceed estimates of 16 µg/m³ of PM 2.5 for a 24-hour average. Such pollution concentrations have a high probability of impacting public health.

B.

Burning allowed. When an air quality forecast projects daily particulate matter concentrations for a 24-hour average will not exceed ~~80 ug/m3 of PM 10, or~~ 16 µg/m^3 of PM 2.5 for a 24-hour average. Such pollution concentrations have a low probability of impacting public health.

C.

~~8.~~10. **Certificate of Exemption.** A written approval issued by ~~the~~ Klamath County Public Health, Environmental Health division to use a ~~solid-fuel fired appliance~~wood burning device ~~or open outdoor burning~~ in a manner normally in violation of the requirements of this Chapter.

~~9.~~11. **Certificate of Variance.** A written approval issued ~~to a person~~ by ~~the~~ Klamath County Public Health, Environmental Health division to open/outdoor burn in a manner normally in violation of the requirements of this Chapter.

~~10.~~12. **Certified ~~woodstove of fireplace insert~~wood burning device.** A ~~solid-fuel fired~~wood burning ~~space~~ heating appliance that has been certified by the Oregon Department of Environmental Quality (DEQ) or ~~bears~~ has an Environmental Protection Agency (EPA) certification label indicating that the model is built in accordance with current EPA emission ~~certification~~standards for certification.

~~11.~~13. **Cook stove.** A wood burning stove ~~kitchen,~~ which is installed for cooking and primarily designed for stovetops and an oven. It may also be equipped with gas burners or electric heat elements.

~~12.~~14. **Exempt ~~solid-fuel fire appliance~~wood burning device.** A ~~solid-fuel fired appliance~~wood burning device that has been issued an exemption from Klamath County Public Health, Environmental Health division. ~~is exempt from the Oregon Department of Environmental Quality (DEQ) or the United States Environmental Protection Agency (EPA) requirements for certification for its installation. Exempt stoves are pellet stoves, antique stoves (built before 1940 with ornate construction and substantially higher current market value), open masonry fireplaces, cook stoves, or other stoves that have a valid letter of exemption from DEQ, or do not meet the definition of a "woodstove" or "wood heater" as defined DEQ's Oregon Administrative Rules for Residential Wood Heating.~~

~~13.~~15. **Fire department.** The unit of municipal government or county approved ~~Local~~ local fFire dDistrict having the authority and responsibility to extinguish unintended fires and to promote fire safety.

~~14.~~16. **Fireplace.** A framed opening made in a chimney to hold an open fire. Also known as an open fireplace or structurally integrated fireplace which could be made of metal or masonry construction.

~~15. **Fireplace ASTM Standards.** All fireplaces that meet the ASTM international standard test method E2558, and meet 5.1 grams per kilogram specifications, or current federal EPA NSPS standards for structurally integrated fireplaces, whichever is less.~~

~~16.~~17. **Klamath County Air Quality Advisory Committee.** A volunteer committee ~~appointed by the Klamath County Board of Commissioners~~selected by Klamath County Public Health. The purpose of the Air Quality Advisory Committee is to evaluate relevant air quality data, ~~identify significant contributing emission sources,~~ recommend ~~appropriate~~ emission reduction strategies~~, and~~ provide community input regarding program implementation and other projects as needed. ~~recommend action to the Board of County Commissioners.~~

~~17.~~18. **Low income ~~person~~.** An individual whose annual income is at or below 250% of the federal poverty level. ~~person of family who demonstrates economic need by certifying through proof that their total household income is less than the very low-income guidelines established by the United States Department of Housing and Urban Development.~~

~~18.~~19. **Non-certified wood ~~stove or fireplace insert~~burning device.** A ~~solid fuel fired residential space~~wood burning heating ~~device~~ appliance that has not been certified by either the Oregon Department of Environmental Quality or the Environmental Protection Agency (EPA) as complying with smoke emission standards. ~~"Non- certified wood stove or fireplace insert" does not include fireplaces, nor devices exempt from certification requirements as defined in Section 406.005(13).~~

~~19.~~20. **Notice of noncompliance.** A letter notifying an individual or entity in violation ~~violator~~ of this Chapter of the specific violation and the corrective action necessary.

21. **Nonattainment area.** The federally designed area within the County that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the primary or secondary National Ambient Air Quality Standards (NAAQS).~~that~~ ~~is~~ as depicted on the map ~~and legal description~~ in Exhibit A. ~~Normally thought of as synonymous with the Air Quality Zone unless contingency measures are implemented.~~

~~20.~~22. **Opacity**. The degree to which emissions reduce the transmission of light and obscure the view of an object in the background. See Exhibit B.

~~21.~~23. **Open/outdoor burning.** ~~This section refers to~~ All open or outdoor fires intended for ~~heating or~~ the combustion of ~~waste,~~yard debris and ~~those~~ materials included in the definition of "open burning" in Oregon Administrative Rule Chapter 340 Division 264. ~~Outdoor cooking fires are not included.~~

~~22. **Particulate matter ten microns and less (PM 10)**. Airborne particulate matter was an aerodynamic diameter of ten (10) microns in size or less. PM 10 is meter(ug/m3). The National Ambient Air Quality Standard is 150 ug/m3 for a 24-hour period beginning at 12:01 a.m.~~

~~23.~~ **Particulate matter two and one-half microns or ~~L~~less (PM 2.5).** Airborne particulate matter with an aerodynamic diameter of two-point-five (2.5) microns (µg) in size or less. PM 2.5 is normally measured by weight per unit volume of air in micrograms per cubic meter (~~ug~~µg/m^3). ~~The National Ambient Air Quality Standards are 35 ug/m3 for a 24-hour period beginning at 12:01 a.m., with a 15 ug/m3 annual average.~~

24. ~~**Pellet stove.** A wood burning heating appliance which uses wood pellets as its primary sources of fuel.~~

~~25. **Person.** any individual, partnership, company or other association or corporation.~~

~~26.~~25. **Prohibited materials:** Any combustible material as defined by ~~the~~ Oregon State's prohibited materials open burning rule (Chapter 340 Division 264) which include wet garbage, plastic, wire insulation, automobile parts, asphalt, petroleum product, petroleum treated material, rubber products, or animal or vegetable matter resulting from the handling, preparation, cooking or service of food that normally results in dense or noxious smoke when burned. Also included are coal and any open burned materials that cause a public or private nuisance or a hazard to public safety.

~~27.~~26. **Responsible ~~person~~party.** An ~~person~~individual eighteen (18) years of age or older, authorized by the property owner to attend an open burning event and who is capable of and has the necessary equipment to extinguish the fire.

~~28.~~27. **Sale of real property.** Any transaction whereby the ownership of a building~~s~~, as defined by the Klamath County Development Code, or the real property upon which a building is located, is transferred by an agreement for the sale and purchase of the building or the real property.

~~29.~~28. **Sole source of heat.** One or more residential ~~solid-fuel fired appliance~~wood burning devices that constitute the only source of ~~space~~ heat in a private residence. No residential ~~solid-fuel fired appliance~~wood burning ~~or~~ device~~/~~(s) shall be considered to be the sole source of heat if the private residence is equipped with permanently installed working system such as: oil, natural gas, electric, geothermal, solar or propane heating system, whether connected or disconnected from its source.

~~30.~~29. **~~Solid-fuel fired appliance~~Wood burning device.** A device designed for a solid fuel combustion, including cordwood stoves (woodstoves ~~and~~, fireplace stove inserts and pellet stoves), fireplaces, solid-fuel fired cook stoves and combination fuel furnaces or boilers, which burn solid fuels.

~~**Urban Growth Boundary (UGB).** An area of the county surrounding and including the City of Klamath Falls which has been designed by the Klamath County Board of Commissioners and the City of Klamath Falls as an area of potential growth which may impact both governmental bodies.~~

~~**Waste:**~~

~~**Agriculture waste.** Any waste materials generated or used by an agriculture operation.~~

~~**Commercial waste.** Waste materials from offices, warehouses, restaurants, mobile home parks, dwellings (apartments) containing more than four (4) family units, hotels, motels, schools, or wholesale or retail yards.~~

~~**Construction waste.** Any waste material produced by a building or construction project. Example of construction waste are wood, lumber, paper, wood pallets, crating and packing materials used during construction, materials left after completion of construction and materials collected during cleanup of a construction site.~~

~~**Demolition waste.** Any material produced by the complete or partial destruction, or tearing down, of any man-made structure, the clearing of any site for land improvement; or cleanup such as the removal of trees, brush or stumps, excluding agricultural waste, Section 406.005 (31) (a), or domestic waste, Section 406.005(31) (e).~~

~~**Domestic Waste.** Household materials including paper, cardboard, clothing, yard debris, Section 406.005 (31) (h), or other material generated in or around a dwelling of four (4) or less family units, or on the real property adjacent to the dwelling. Once domestic waste is removed from the property of origin it becomes commercial waste.~~

~~**Forest Slash.** Forest debris or woody vegetation related to the management of forestlands, used for the growing and harvesting of timber.~~

31. ~~**Industrial Waste.** Any materials (including process wastes) produced as a direct result of any manufacturing or industrial process.~~

~~32.~~30. **Yard Debris.** Wood, needle or leaf material from trees, shrubs, or plants.~~ on real property adjacent to a dwelling of not more than four (4) family dwelling units. Once yard debris is removed from the property of origin, it becomes commercial waste, Section 406.005(31)(b).~~

~~**Woodstove/wood heater.** An enclosed, wood burning appliance capable of and intended for space heating or domestic water heating that meets all of the following:~~

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~~a. An air-to-fuel averaging ratio in combustion chamber 35-1 as determined by less than procedure prescribed the test in federal regulations, 40 CFR Part 60, Subpart AAA, accredited Section 60.534 performed at a laboratory;~~
~~b. A usable firebox volume of less than 20 cubic feet;~~
~~c. A minimum burn rate less than 5 kg/hr as determined by the test procedure prescribed in federal regulation, 40 CFR, part 60, Subpart AAA, Section 60.534 performed at an accredited laboratory: and~~
~~d. A maximum weight of 800 kg (1760 lb). In determining the weight of an appliance for these purposes, fixtures and devices that are normally sold separately, such as flue pipe, chimney, heat distribution ducting, and masonry components that are not an integral part of the appliance or heat distribution ducting, shall not be included.~~

406.100 County wide air quality pollution control ~~R~~requirements.

1. ~~**Air quality advisories**~~**Burn notifications.**~~-~~ The Klamath County Public Health, Environmental Health ~~D~~division shall determine and issue ~~air quality advisories~~burn notifications to the public at least daily during the winter heating season and at other times of the year as needed according to the definitions provided in section 406.005(9~~1~~). Notifications will be effective at 8:30 a.m. each day during the winter heating season starting October 15 through March 15 and during open/outdoor burn periods. Each notification will contain information about restrictions on the use of wood burning devices and/or open burns for a 24-hour period. ~~Restrictions and Advisories will be provided to the public.~~

~~1.~~2. **Air quality outlooks will be provided at other times of the year as needed according to the definition provided in section 406.005~~-~~(1).**

~~2. **Public responsibilities**. Each person that burns outdoors or in a solid-fuel fired appliance in Klamath County is required to comply with the requirements of this Chapter.~~

3. **~~Solid-fuel fired appliance~~Wood burning device~~s~~**

   A. Appliance resale and installation:

   a. The resale or installation of a non-certified ~~solid-fuel fired appliance~~wood burning device or any appliance not meeting the requirements of Section 406.005~~-~~(~~31~~12) is prohibited.

   b. The resale, or installation of an exempt ~~solid-fuel fired appliance~~wood burning device, is allowed in accordance with state and local requirements.

   c. A Klamath County Building Division Permit is required for the for the ~~fired~~ installation of a ~~solid fuel-fire appliance~~wood burning device.

   B. **Disclosure of ~~solid-fuel fired appliance~~wood burning device~~s~~ upon the sale of real property:** The presence of all ~~solid-fuel fired appliance~~wood burning devices~~s~~ including wood stoves, fireplace inserts, fireplaces, and pellet stoves in the building shall be disclosed by the seller to the buyers as part of sale and purchase of any building. The disclosure shall state whether any ~~solid-fuel fired appliance~~wood burning devices~~s~~ are certified or ~~,~~non-certified.~~, exempt or pellet.~~

   C. **Removal of non-certified ~~woodstoves and fireplace inserts~~wood burning devices upon the sale of real property:** Non-certified ~~wood stoves and fireplace inserts~~devices must be removed ~~from building~~ upon sale. ~~of any building containing them.~~ The removal shall be accomplished prior to the closing of any real estate transaction involving the building containing the non-certified ~~wood stove(s) or fireplace insert(s).~~device(s).

   D. **Sole heating source:** It shall be ~~unlawful~~ a violation of this ordinance for a ~~solid-fuel fired appliance~~wood burning device to be the sole source of heat in any non-owner (tenant) occupied dwelling unit within Klamath County.

   E. **~~Solid-fuel fired appliance~~Wood burning device fuel:** Only dry, seasoned cordwood, pressed sawdust logs, organic charcoal or pellets specifically manufactured for the appliance may be burned in a ~~solid-fuel fired appliance~~wood burning device.

   F. **Any newly constructed fireplaces must comply with ~~fireplaces~~ ASTM standards.** Any retrofitted fireplaces must meet ~~fireplace~~ ASTM standards.

   ~~G.~~ **Prohibited ~~Materials~~materials:** Prohibited materials as defined in Section~~s~~ 406.005~~-~~(25) and Oregon Administrative Rule 340-264-0060~~-~~(3), shall not be burned in ~~fireplaces, solid-fuel fired appliance~~wood burning devices~~s, pellet stoves or cook stoves~~ within the Klamath County Air Quality Zone (AQZ). An exception is burning of re-refined used oil in an approved oil-burning device.

   ~~H.~~G.

4. **Open/outdoor burning requirements –** This section pertains to burning as defined in Section~~s~~ 406.005~~ ~~(2~~0~~3).

    A. **All open/outdoor burning is prohibited ~~during Red or Yellow Advisory~~ within the Klamath County ~~a~~Air ~~q~~Quality ~~z~~Zone** unless during a designated open burn period or a Certificate of Variance has been issued by the Klamath County Public Health, Environmental Health d~~D~~ivision in accordance with Section 406.250.

    B. Open/outdoor burning hours:

    a. Open burning fires are not to be started until ~~one hour after sunrise~~8 a.m. and must be completely ~~out~~ extinguished by 5 p.m. ~~one hour before sunset,~~ unless otherwise directed by the local fire department.

    b. Burning conducted ~~for forest slash fires, or ecosystem management, for example are not required to be out by sunset~~by federal, state, and local ~~agnecies~~agencies are exempt from this rule. Examples of agency managed open burning include, but are not limited to, forest fuel reduction, ecosystem management, and fire training.

    C. **Local fire ~~permit~~ authorization required**: ~~–~~ ~~Persons~~ Individuals burning~~,~~ shall adhere to all municipal and local fire department, State ~~fire~~ Fire Marshal~~ or~~, Oregon Department of Forestry or DEQ rules, ordinances, or restrictions.

    D. Responsible ~~person~~party:

    a. A responsible ~~person~~individual, as defined in section 406.005~~ ~~(26), must constantly attend burning.

    b. This person must also completely extinguish the fire before leaving it.

    ~~**E. Prohibited materials. Burning of prohibited materials as defined in Section 406.005 (25) and Oregon Administrative Rule 340-264-0060(3), in outdoor or open fires in prohibited.**~~

    E. **Open fires used for cooking, personal warmth, lighting, ceremonial, or aesthetic purposes, and are not associated with waste disposal are permitted.** Open fires used for these purposes must be contained within a fireproof container designed for outdoor burning and be capable of containing the fire and coals above the ground surface. Open fires used for these purposes may not exceed two feet in diameter and two feet in height.

406.150 Air ~~Quality~~ quality ~~Pollution~~ pollution ~~Requirements~~ requirements ~~Applying~~ applying ~~Within~~ within the Air Quality Zone

In additions to the requirements in Section 406.100 the following requirements apply:

1. **~~Solid-fuel fired appliance~~Wood burning device**.~~s–~~ This section applies to the use of ~~solid-fuel fired appliance~~wood burning devices~~s~~ for residential and commercial heating within the Air Quality Zone.

A. **During a ~~Red Advisory Period~~no burning period, no ~~person~~ individual shall operate any ~~solid-fuel fired appliance~~wood burning device ~~except a pellet stove~~.**

B. **During an exempt wood burning device period~~.~~**, ~~O~~only devices with an approved certification of exemption may burn. ~~Yellow Advisory Period, no person shall operate a non-certified wood stove, non-certified wood stove inserts, or fireplace. Only certified solid-fuel fired appliances and pellet stoves may be operated.~~

C. **During a ~~Green Advisory Period~~burning allowed period,** there are no restrictions on using wood burning devices. ~~, non-certified wood stoves, non-certified wood stove inserts, fireplaces, certified wood stoves, certified wood stove inserts and pellet stoves may be used for indoor heating.~~

D. **~~Visible Air Contaminant Emissions.~~ No person operating a ~~solid-fuel fired appliance~~wood burning device within the Air Quality Zone shall allow smoke of an opacity of greater than 20%,** ~~or comparable to that described in the Ringelmann Smoke Chart (~~as shown in Exhibit B~~)~~.~~, to be vented to the atmosphere for more than three (3) minutes in any one (1) hour period.~~ Emissions created during a ten (10) minute start-up period are exempt.

E. **Burn-down time.** A ~~Burn~~burn-down time, not to exceed three (3) hours, will be given any time there is a change in burn notification. ~~on Red or Yellow Advisory Periods.~~ No enforcement action described in Section 406.300 will take place for visible air contaminant emissions emitted during the burn-down time.

F. **Emergency conditions.** An exemption to Section~~s~~ 406.150 may be issued by the Klamath County Public Health, Environmental Health ~~D~~division to allow the use of normally prohibited ~~solid fuel-burning appliances~~wood burning devices within the Air Quality Zone, during periods when:

   a. Utility suppliers declare energy shortages;

   b. Electric power or outages occur;

   c. Interruptions occur of natural gas supplies; or

   d. Temporary failure occurs of a resident's heating system when there is an immediate need to operate a solid fuel space-heating device to protect family/individual health and welfare.

   ~~d.~~e. Other emergencies as determined by Klamath County Public Health.

2. **Open/outdoor burning:** Except as specified in this section or allowed by ~~section~~ Section 406.250, open burning is prohibited within the Air Quality Zone.

   A. **Open/outdoor burning window:** The Klamath County Public Health Director ~~Klamath County Environmental Health Division Manager~~, in consultation with the Board of County Commissioners, ~~the City of Klamath Falls Code Compliance Officer~~ and Fire Districts ~~No. 1 and No. 4~~ with jurisdiction inside the ~~a~~Air ~~q~~Quality ~~z~~Zone, may declare two specific fifteen (15) day periods a year during which times the open burning of residential yard debris, as defined in Section 406.005 (3~~0~~2) ~~(h~~a~~)~~, will be allowed within the Air Quality Zone. ~~Open/outdoor burning windows within the Air Quality Zone will occur in spring and fall. Each window will include three (3) weekends.~~

a. During the open burning window, the Klamath County Public Health, Environmental Health dDivision will issue a daily burn notification to inform residents whether open/outdoor burning is permitted. ~~may temporarily prohibit open burning should poor ventilation episodes occur, or be forecast.~~

~~b. **The Klamath County Environmental Health Division Manager, in consultation with the Board of County Commissioners, the City of Klamath Falls Code Compliance Officer, and Fire Districts No. 1 and No. 4 may extend the Open Burning Window one day for every day in which open burning has been prohibited during the Open Burning window due to poor ventilation or weather conditions.**~~

B. **All ~~agricultural~~ open/outdoor burning is prohibited, outside of declared open burn windows, ~~at all times~~ in the Air Quality Zones** unless issued a Certificate of ~~v~~Variance ~~in accordance with section 406.250.~~**as defined in Section 406.250(1).** Certificates must be obtained from Klamath County Public Health, Environmental Health division.

C. The use of burn barrels and other outdoor burning devices or any structure which would impede direct view of material which are to be burned is prohibited.

~~D. **A Certificate of Variance, as defined in Section 406.250 (1), to allow open burning outside the Spring spring or Fall fall open burning Windowswindows, may be issued** by Klamath County Public Health, Environmental Health division on a case- by -case basis within the Air Quality Zone. when an emergency, or substantial need is documented.~~

406.200 Certificates of Exemption.

1. **Issuance:** The Klamath County Public Health, Environmental Health Division ~~Manager~~ Administrator or designee may issue a Certificate of Exemption to allow the use of ~~solid-fuel fired appliance~~wood burning devices within the Air Quality Zone for residential ~~space~~ heating purposes to individuals who qualify as low income or whose sole source of heat is a wood burning device. ~~during Red, Yellow or green advisory periods.~~

A. All applications for certificates of exemption shall be on forms provided by the Klamath County Public Health, Environmental Health dDivision.

B. **Within five (5) working days of receiving a completed application, the Klamath County Public Health, Environmental Health dDivision shall review** and: 1) approve the application; 2) approve the application with conditions; or 3) deny the application.

C. **Klamath County Public Health, Environmental Health Ddivision shall not charge a fee** for processing an application or issuing a Certificate of Exemption.

D. All Certificates of Exemption expire on ~~May~~ March 15 of each year.

E. Applying for ~~the renewal of all~~ Certificates of Exemptions is the responsibility of the applicant~~registrant~~.

~~2. Low income exemption: A low-income person, either tenant or owner, after submitting adequate documentation, may be granted a Certificate of Exemption to use a solid-fuel fired appliance, for residential heating, during Red and Yellow Advisory Restriction Periods.~~

406.250 Certificate~~s~~ of Variance.

Certificates of Variance issued by Klamath County Public Health, Environmental Health ~~D~~division are required for all open/outdoor burning not conforming to the requirements of Section 406.100~~-~~(4) and Section 406.150~~-~~(2).

1. **Certificate of Variance**
   A. **All applications for Certificates of Variance shall be on forms provided by the Klamath County Public Health, Environmental Health d~~D~~ivision** and submitted at least five (5) working days prior to the proposed or desired starting date of the variance.
   B. **Within five (5) working days of receiving a completed application, the Klamath County Public Health, Environmental Health d~~D~~ivision shall review** and: 1) approve the application; 2) approve the application with conditions; or 3) deny the application.
   ~~C. **Klamath County Public Health, Environmental Health Ddivision shall not charge a fee** for processing an application or issuing a Certificate of Variance.~~
   ~~D. Inside the Air Quality Zone, Klamath County Fire Districts No. 1 and No. 4, the City of Klamath Falls, and the Klamath County Environmental Health Division may develop an interagency agreement to expedite the processing of applications.~~
   ~~E. The Klamath County Environmental Health Division Manager, or designee, may issue a Certificate of Variance for an area of the county when the meteorological conditions are expected to be different from those forecast for other parts of the county.~~

406.300 Enforcement.

1. **Klamath County Public Health, ~~Environmental Health Ddivision Staff~~ Air Quality ~~S~~specialists will monitor and enforce compliance with this Chapter~~. countywide~~.** Minor violations of this Chapter will be documented and ~~an issuance of~~ a notice of noncompliance will be submitted to the Klamath County Public Health ~~Enviornmental~~Environmental Health Administrator for approval. ~~result in a Notice of noncompliance being sent to the violator to appear in court.~~

2. **When a Klamath County Air Quality ~~inspector~~ specialist has observed a significant or repeated violation of this Chapter, ~~he or she shall transmit this information, along with the~~ they will submit documentation, to the Klamath County Public Health, Environmental Health d~~D~~ivision ~~Manager~~Administrator.** The ~~Environmental Health Manager~~Administrator will review the ~~submitted~~ documentation and:

   A. **If the documentation is complete, the Environmental Health ~~Manager~~ Administrator will forward to the Klamath County Public Health Director to approve** and issue a Notice of Noncompliance and/or~~,~~ a c~~C~~itation and s~~S~~ummons to the violator to appear in court~~, or other legal action depending on the severity and frequency of the violation~~.

B. ~~If the documentation is not complete, the Environmental Health Manager~~ Administrator ~~will issue a Notice of Noncompliance to the alleged violator, and send a copy of the documents to the Air Quality inspector who observed the violation.~~

3. **Notice of noncompliance:** A Notice of Noncompliance as defined in Section 406.005-(20) may be issued to the violator as the sole enforcement action, or in addition to a citation.

   A. The notice shall contain the date, time, location~~street name and number~~ and violation observed.

   B. The notice shall specify the corrective action that must be taken and the time in which it must be accomplished.

   C. **The notice may require that within t~~h~~en (10) days of correcting the violation,** the violator shall in writing notify Klamath County Public Health, ~~Eviornmental~~Environmental Health division ~~the Klamath County Air Quality Inspector~~specialist that the corrective action has been taken.

~~4.~~ **Air quality citations:** An appropriate law enforcement officer or ~~a~~the Klamath County Public Health Director, ~~Environmental Health Division Manager~~ ~~Administrator~~ may issue a c~~C~~itation and s~~S~~ummons to appear in court for a violation of this Chapter.

~~5.~~4.

406.400 Penalties.

Failure to comply with the provisions of this Chapter shall be subject to fines of up to $720~~.00~~ for a one-time occurrence, and fines of not more than $1,000~~.00~~ for a continuing, or repeated offense. This provision will be enforced in accordance with Klamath County Code Chapter 800, Uniform Civil Violation Procedure ~~of the Klamath County Code~~.

406.450 Severability.

If any section, subsection, sentence clause, phrase or portion of this Chapter is for any reason held invalid or unconstitutional in a court of competent jurisdictions, such portion shall be deemed a separate, distinct and independent provision, and shall not affect the validity of the remaining portion thereof.

406.500 Air Quality Advisory Committee ~~and contingency strategies~~.

1. **Committee:** ~~Klamath County Board of Commissioners hereby establishes the Klamath County Air Quality Advisory Committee. The purpose of the Committee is to evaluate relevant air quality data; identify significant contributing emission sources; develop appropriate emission reduction strategies such as the expansion of the Air Quality Zone and will recommend action to the Board of County Commissioners.~~A volunteer committee as defined in 406.005-(17). The committee may ~~will~~ meet as needed. ~~semi-annually, once in the spring and again in the fall, and at other times as deemed necessary~~as needed. The Committee will be composed of community members and agency

representatives. ~~interested persons representing industry, the general public and governmental agencies.~~

~~2. **Contingency measures:** If the Klamath Falls Nonattainment Area does not meet the federal deadline (December 2014) for compliance with PM 2.5 (2006) standard by the Department of Environmental Quality, Klamath County automatically requires the following Best Available Control Measures to become additions to Sections 406.100 and 406.150:~~

   ~~A. Beginning March 1,2015, within the air quality zone, the use of fireplaces, without certified inserts of not meeting fireplace ASTM standards, shall be prohibited between November 1 and February 28 of each winter heating season. On a case by case basis, the Environmental Health Program may grant a limited short term exemption for holidays or special occasions on green advisory days only in accordance with Section 406.200.~~

~~The Exhibits can be obtained from the County Counsel Office, 305 Main Street, 2nd Floor, Klamath Falls, OR 97601; the Klamath County Library; or the Klamath County Law Library. They can also be accessed at the following links:~~

~~Exhibit A – Air Quality Zone: http//www.co.klamath.or.us/EH/indez.html~~

~~Exhibit B – Ringlemann Smoke Chart: http://www.cdc.gov/niosh/rning/pubs.pdfs.ic8333.pdf~~

Appendix 5

Report

Klamath Falls 2010-2011 $PM_{2.5}$ Survey

Submitted to: File
By: Anthony Barnack
January 2012

State of Oregon
Department of Environmental Quality

Air Quality Monitoring Manager ____________________________

Air Quality Planning Manager ____________________________

Regional Manager ____________________________

Last Updated: 01/12/12
By: Anthony Barnack
DEQ 03-??-###

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Department of Environmental Quality

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey

State of Oregon
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Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey

State of Oregon
Department of Environmental Quality

1. Executive Summary

In the winter of 2010/2011, Oregon DEQ and the Klamath County Health Department conducted a seven site survey around Klamath Falls to determine whether the current monitoring site at Petersen School was representative of the area and whether intrusions were coming from other parts of Klamath Falls during elevated days.

The survey results showed that the neighborhood in the Valley to the Southeast of Klamath Falls had higher levels than the NW part of Klamath Falls. Within the Valley the highest levels were at Petersen School, but Brixner and Stearns Schools were similar to Petersen. The one site located west of town at the Fire Department #4 was the lowest site.

ODEQ has concluded that Petersen School is representative of the Valley area and higher than the NW downtown area. The Petersen School Air Quality Index will be protective of health in all areas of town and monitoring will remain at Petersen School.

2. Introduction

In 1997 EPA released a NAAQS of 65ug/m3. In 1998 ODEQ installed a sampler for comparison to the NAAQS. In 2000 and 2001, ODEQ performed a five site, one year, monitoring survey in the area surrounding Peterson School. Based on that survey, ODEQ concluded that the Peterson School site was representative and continued to monitor for at that location.

After nearly 10 years since the previous survey, EPA requested that ODEQ resurvey the area to see if there had been any changes in representation of the site. In addition, ODEQ wanted to survey areas to the northwest of the Peterson School site to see if was being transported into SE Klamath Falls (referred to in this report as the Valley) from sources in that area or upwind of NW Klamath Falls. Sources from NW Klamath Falls were suspected because on days with elevated, the wind was light but was from the northwest. Finally ODEQ wanted to survey a site Southwest of Klamath Falls in a more rural neighborhood to get a baseline of levels before a new industrial source is to be built nearby. This source could potentially contribute to the air shed.

3. Method

The survey was done using well established siting, sampling, and analysis methods. When possible, ODEQ followed the Federal Reference Method (FRM) guidance.

3.1 Siting

The survey sites were selected with input from ODEQ regional staff and Klamath County Health and were installed following EPA siting criteria as much as

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possible. Primary and duplicate survey samplers were installed at the Petersen School site for comparison to each other and to the FRM $PM_{2.5}$ sampler. Three survey locations were selected within one mile of Peterson School (Brixner School, Stearns School, and Fergusen School). These sites were chosen to surround the Petersen site to determine if Petersen was representative of the very local area in the SE Klamath Falls Valley area. Two sites were selected to the northwest of the Valley. One site, Mills School, was located in a residential neighborhood closer to the city center. The second site, Pelican School, is on the far northwest part of Klamath Falls in a neighborhood adjacent to the Jeldwen Industrial complex. The purpose of this site was to determine what impact Jeldwen has on the residential area near Pelican School. The last site was to the west of Klamath Falls at the intersection of Highways 66, 142, and 97. This site was in a small rural neighborhood isolated from any other sources aside from vehicle traffic. The purpose of this site was to get a background $PM_{2.5}$ level relative to the rest of Klamath Falls prior to the installation of an industrial source to the south. Maps of the sites are shown in Figures 1 and 2.

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey

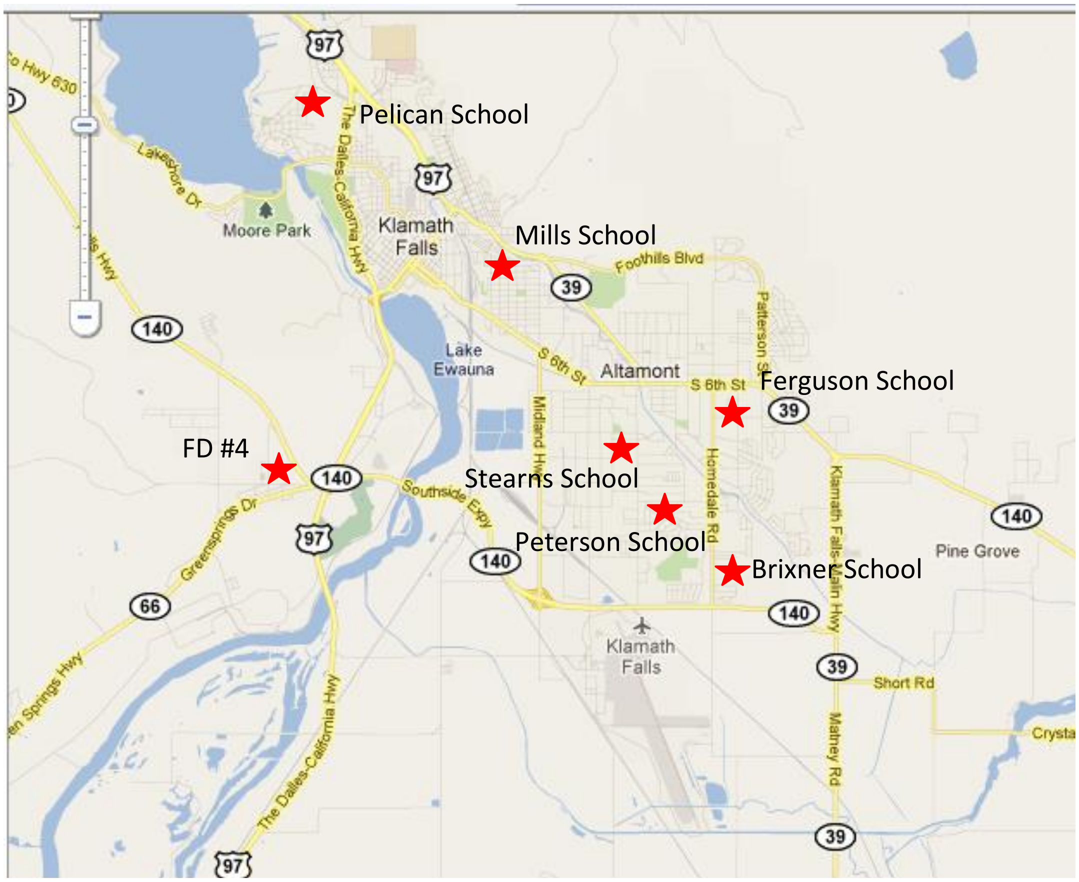

Figure 1. Map of Klamath Falls Survey Sites.

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Quality

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey

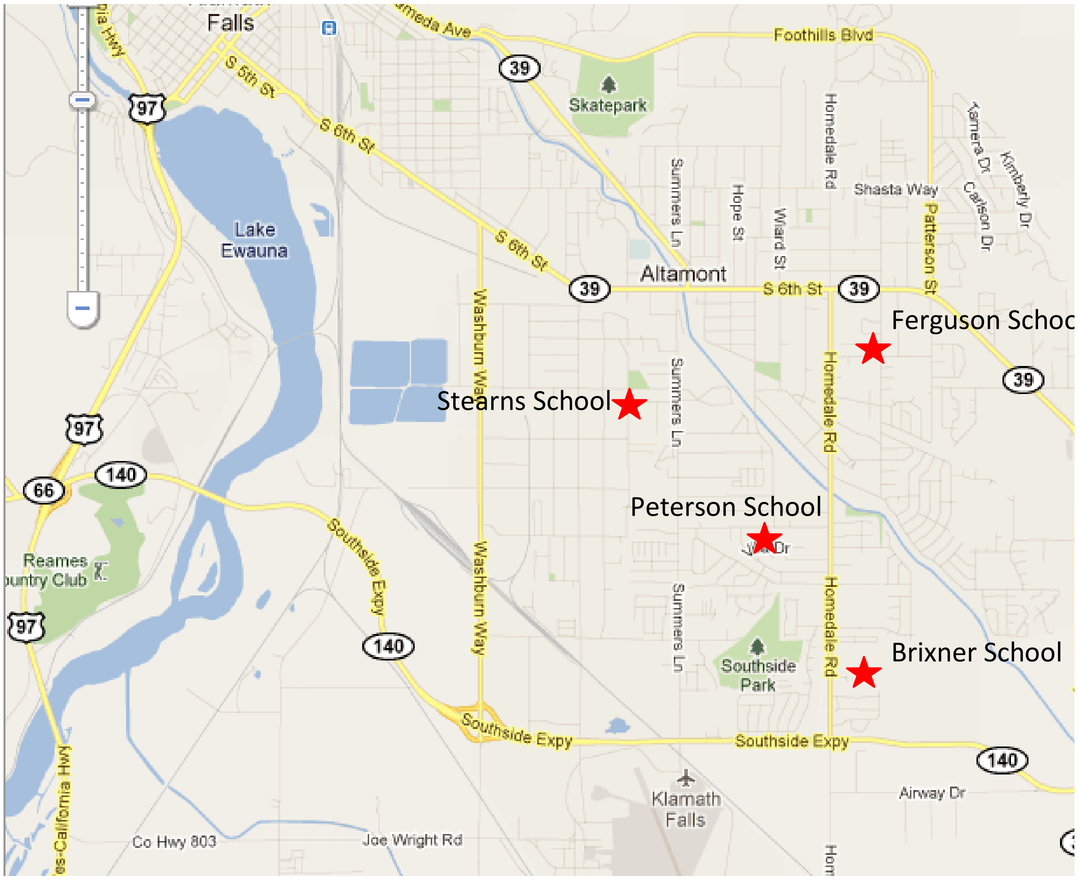

Figure 2. Map of Valley survey sites.

3.2 Site installation:

All sites used the same survey sampler mounted with the AirMetrics™ $PM_{2.5}$ sample inlets. All inlet heights were 2 to 3 meters above the ground and away from any obstructions.

3.3 Sampler

The data was collected by pulling ambient air through a filter for 24 hours (midnight to midnight). The filter was pre-weighed at the ODEQ Laboratory and Environmental Assessment Department (Lab) facilities in Hillsboro, Oregon. Following sampling, the filter was reweighed to determine the loading. Filter weighing followed standard Federal Reference Method (FRM) procedures required for $PM_{2.5}$ monitoring.

The survey samplers were made by ODEQ and consist of a linear vacuum pump, a flow adjustment valve, a start and stop time clock, a flow time totalizer, a probe line, and an Airmetrics™ PM_{10}/$PM_{2.5}$ inlet. The pump draws air through the inlet, through the filter, into the probe line, past the flow adjuster valve. The valve is adjusted at the time of the filter installation to be 16.7 liters per minute. The survey sampler is shown in Figure 3.

Figure 3. Survey Sampler (without inlet).

<u>Inlet design</u>

The inlet was designed following the $PM_{2.5}$ FRM inlet design. The inlet separated particulate into PM_{10}, then $PM_{2.5}$ fractions at 16.7 liters per minute +/- 5%. The PM_{10} portion of the inlet consisted of a funnel with a jet at the bottom. $PM_{2.5}$ particulates impacted out of the funnel onto a greased plate while the smaller, lighter particles stayed in the air flow and continued down one of the three jets. A manometer was connected to a quick connect fitting below the jets to measures the vacuum created by restricted flow through the jets. Each of the inlets used at the survey sites was calibrated. The sample filter was placed in a holder in the bottom of the inlet. Figure 4 shows the inlet design.

<u>Calibrating the Inlets</u>

Each inlet is calibrated using the ODEQ lab Rootsmeter and Marion Smart manometer. As the flow rate increases, the vacuum below the inlets orifice gets higher. The vacuum is recorded, and the ambient temperature and pressure are used to convert the vacuum/flow table to Standard Temperature and Pressure (1 atm, 25^{o}C). In the field the vacuum is taken and used to look up the standard flow. The ambient temperature and pressure are used to convert the flow from standard to local temperature and pressure.

Figure 4. $PM_{2.5}$ Inlet with smart manometer connection.

The jets created enough restriction that flow could be measured by vacuum below the jets.

<u>Inlet loading</u>

The filter is installed in the inlet below the $PM_{2.5}$ separator at the time of set up. With the filter in place, the vacuum is measured with a manometer from the inlet tap below the $PM_{2.5}$ separator. The vacuum is converted to flow and the sampler is adjusted to 16.7 liters per minute (LTP). Within seven days after the sample is run, the end flow is measured in the same way. The start and end flows are averaged to get the run flow.

The run is started when a time clock turns on the line voltage and starts the pump. After 24 hours the clock turns off the line voltage and the pump stops. The time totalizer measures the minutes that the voltage is on.

The volume is calculated by multiplying the average of the start and stop flow rates by the operating time taken from the time totalizer.

The concentration is calculated by dividing the filter mass by the volume.

3.4 Operators

The survey samplers and filters were provided by ODEQ to Klamath County Health. ODEQ trained Klamath County Health on site operation and provided technical support. Klamath County Health operated the survey samplers.

The FRM sampler at Petersen School was operated by the local ODEQ contractor following standard FRM procedures.

3.5 Filter Handling

The filters were shipped, stored, and handled following $PM_{2.5}$ FRM protocol. The unsampled survey filters were shipped to Klamath County and FRM filters were shipped to the ODEQ contract operator. Once sampled, the survey filters were stored with the FRM filters in the same temperature monitored refrigerator at the Petersen School site, and shipped back with the FRM filters, by the ODEQ contract operator, in a temperature monitored cooler. At the lab they were stored and weighed using the same protocol as the FRM filters.

3.6 Lab Analysis

The survey samplers used the same 47mm Teflon™ filters that the FRM samplers use. The filter prep, storage, weighing, shipping, and handling were identical to the FRM filters. All procedures followed the $PM_{2.5}$ Field and lab Standard Operating Procedures.

4. Quality Control

<u>Precision</u>

Two survey samplers were collocated at Petersen School for precision. The samplers shared a time clock but where otherwise separate. The inlets were located about one meter apart. The filters were loaded and removed at the same time, by the same operator, and were handled, shipped, and weighed following the same protocol.

Accuracy

The primary and duplicate survey samplers were collocated at Petersen School near a Rupprecht and Pataschnick 2025 Partisol $PM_{2.5}$ (FRM) sampler. The FRM sampler was audited monthly following the monitoring QAPP protocol. The FRM sampler is far more sophisticated with a mass flow controller, temperature and pressure sensors, and a data logger. The FRM data is deemed to be correct for this study and the survey samplers are deemed to be biased.

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5. Results and Discussion

5.1 Quality Assurance

The primary and duplicate survey samplers at Petersen School had 13 samples days. Of these seven had values where either sampler was above 15µg/m^3 (an indication of elevated particulate).

Precision

For these days, the average percent difference between the primary and duplicate values was 4% ±7%. For comparison, the FRM primary and duplicate in Medford had a 2005 to 2010 average percent difference of 0% ± 2% on days greater than 15µg/m^3. The maximum percent difference was 14% for the survey samplers and 5% for the Medford primary and duplicate FRMs. This comparison indicates that on days greater than 15µg/m^3 there is a 4% variation between sites because of variations in the survey samplers design. This is not unexpected because the survey samplers have critical flow orifices whereas the FRMs have flow controllers.

Accuracy

The survey sampler accuracy as compared to the FRM at Peterson School was -14% ±7% with a maximum difference of -29% when using data over 15µg/m^3. This indicates that the survey samplers were under collecting $PM_{2.5}$. The precision and accuracy data summaries are shown in Figure 5 and Table 1 showing the bias of the sampling.

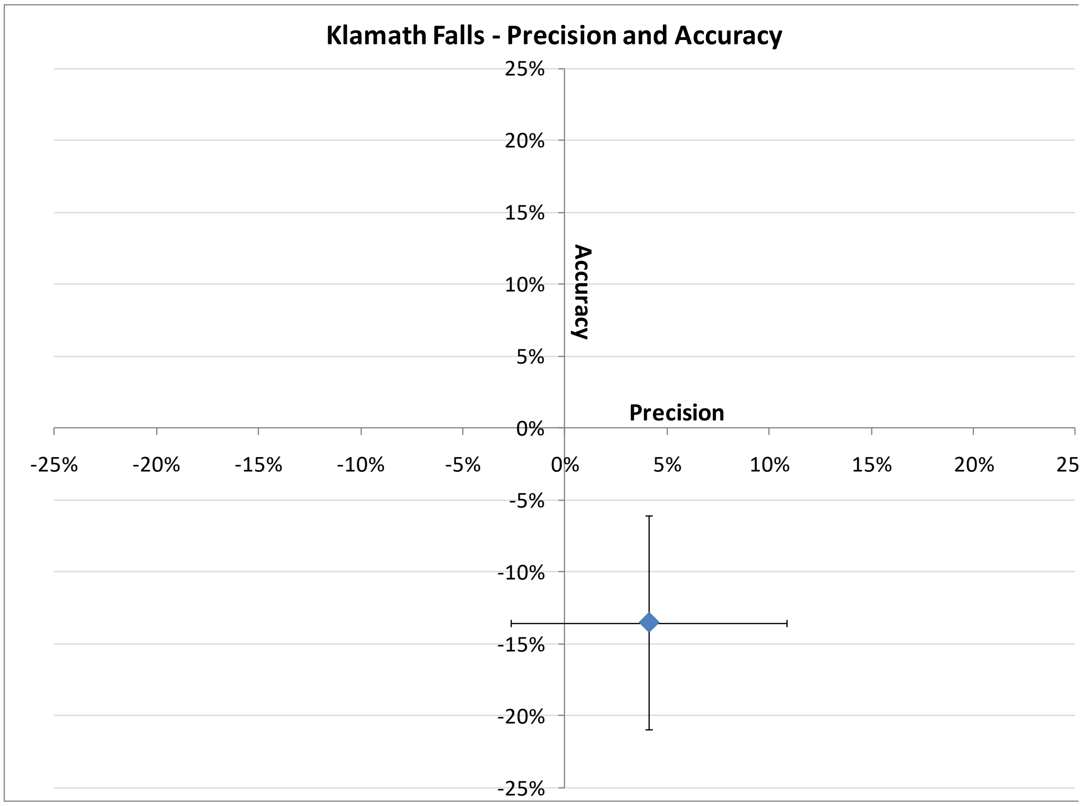
Klamath Falls - Precision and Accuracy
Accuracy
Precision
25%
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
-25%
-25%
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%
25

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Figure 5. Survey sampler vs. Federal Reference Sampler Precision and Accuracy.
Chart description:

1. The y-axis shows the percent accuracy of the survey samplers compared to the FRM. The survey samplers were -14% lower, on average, than FRM samplers for days greater than 15µg/m^3. The vertical error bars show the accuracy uncertainty and are ±7%.
2. The x-axis shows the percent relative precision of the co-located KFP survey samplers. The samplers had an average relative difference of 4%. The horizontal error bars show the precision uncertainty and are ±7%.

Table 1. Survey sampler vs. Federal Reference Sampler Precision and Accuracy.

	Peterson School Survey		Medford
	Accuracy	Precision	Precision
aver	-14%	4%	0%
stdev	7%	7%	2%
max	-4%	14%	5%
min	-29%	-7%	-4%
median	-13%	5%	0%
count	8	8	40

5.2 Survey results

<u>All Data</u>

The results for all the sites are included in Table 2. Several sites missed a lot of samples due to instrument malfunctions or power fails. Many of the Ferguson samples were downgraded to estimates because the sample run time was 25 hours instead of 24 hours. This was accounted for in the volume but the highest particulate levels occur in the evening so the filters may have been exposed for an extra hour during a high $PM_{2.5}$ concentration.
All the survey results are listed in Table 2.

Table 2. All results for all sites.

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey

	Peterson	Brixner	Fergusen	FD #4	Mills	Pelican	Sterns
12/4/10	8.4	9.2	9.7	Cancelled	5	2.6	9.3
12/10/10	9.8	1.7	8	2.7	5.8	2.1	Void
12/16/10	25.1	25.7	20.3	12.2	11.3	7.8	25.6
12/22/10	19	18	Void	7.4	12.8	4.6	15.4
12/25/10	2.1	1.5	Void	2.8est	3	0.8	<0.7
12/28/10	Void	5.7	Void	2.6	5	1.9	7.8
1/3/11	Void	Void	Void	Void	Void	Void	Void
1/6/11	Void	Void	Void	Void	Void	Void	Void
1/9/11	29.6	19.9	17.1est	10.1	7.5	1.5	26
1/15/11	22.6	14.6	14.6est	10.3	8.5	8.7	21
1/21/11	21	18.6	16.9est	11.6	25.9	9.8	Void
1/27/11	20.9	16	Void	14.7	19.6	10.2	27.7
2/2/11	28	24.1	21.1est	19.3	14.2	10.8	9.7
2/8/11	7.4	3.5	Void	2.5est	4.8	1	4.8
2/14/11	Void	3.6	Void	4.2	13.2	4.3	Void
2/20/11	5.9	3.7	Void	3.4	3.8	<0.7	3.2
2/26/11	14.7	2.4	Void	8.2	14	6.3	14.4

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The survey had two main purposes: 1) a survey to see how the Valley compares to the northwest and west part of Klamath Falls and 2) a survey within the Valley to see if the Peterson School site is representative of that area. Additional information was also gained showing the baseline levels in Western Klamath Falls prior to the installation of a new industrial facility.

Figure 6 displays Peterson School and the other sites to the northwest and west of the Valley area. Peterson School is higher than the other areas on most elevated days. One day Mills School was the highest. Mills School is to the northwest of the Valley but still in a residential area. The site to the west (FD#4) was higher than Pelican School most of the time but lower than Mills School during the highest days.

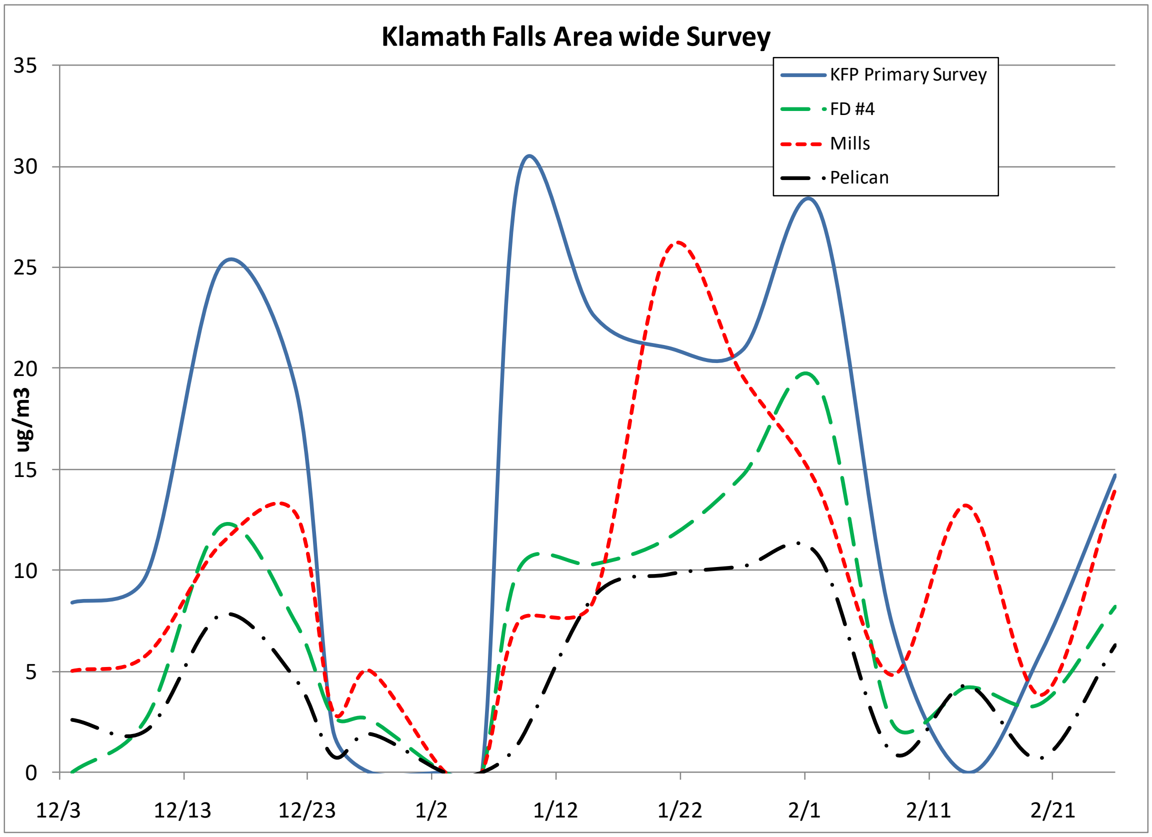

Klamath Falls Area wide Survey
ug/m3
35
30
25
20
15
10
5
0
12/3
12/13
12/23
1/2
1/12
1/22
2/1
2/11
2/21
KFP Primary Survey
FD #4
Mills
Pelican

Figure 6. Greater Klamath Falls survey comparison.
Peterson School vs. survey sites outside of the Valley.

The other goal of the survey was to determine if Peterson School represented the Valley area. Figure 7 shows the data for the four Valley area sites. Stearns, Peterson, and Brixner have relatively close values on elevated $PM_{2.5}$ days but Peterson is usually the highest. The Fergusen site missed many samples but was the lowest site on the days with data.

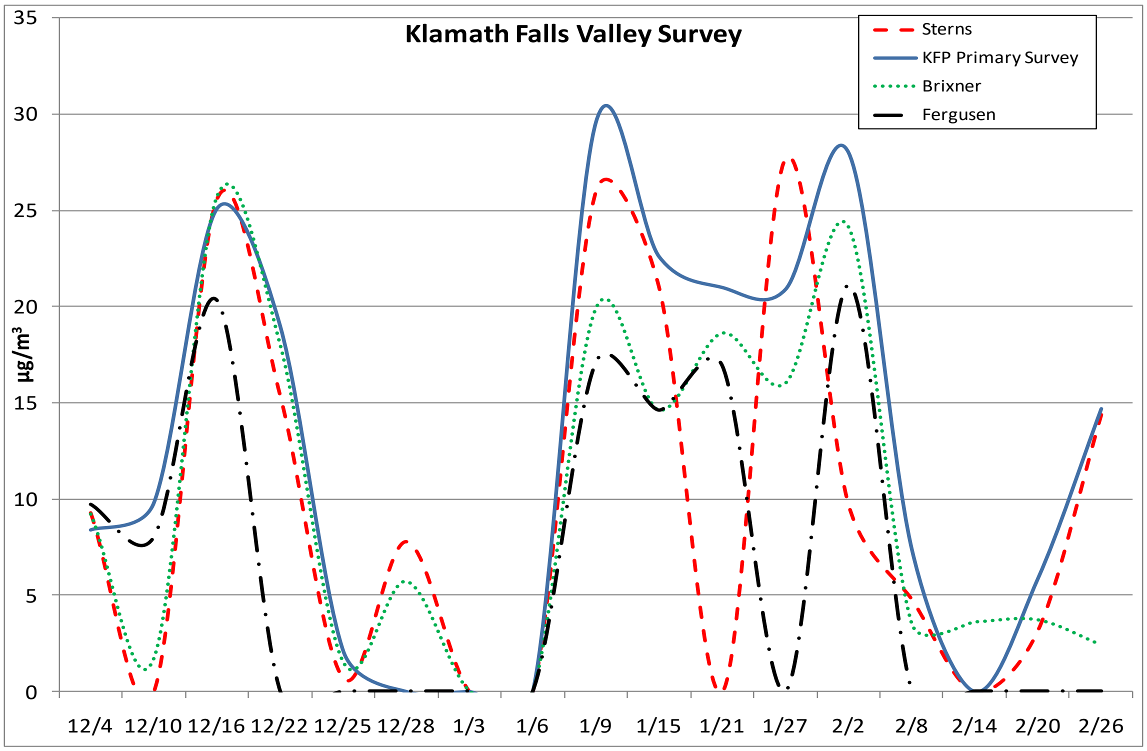
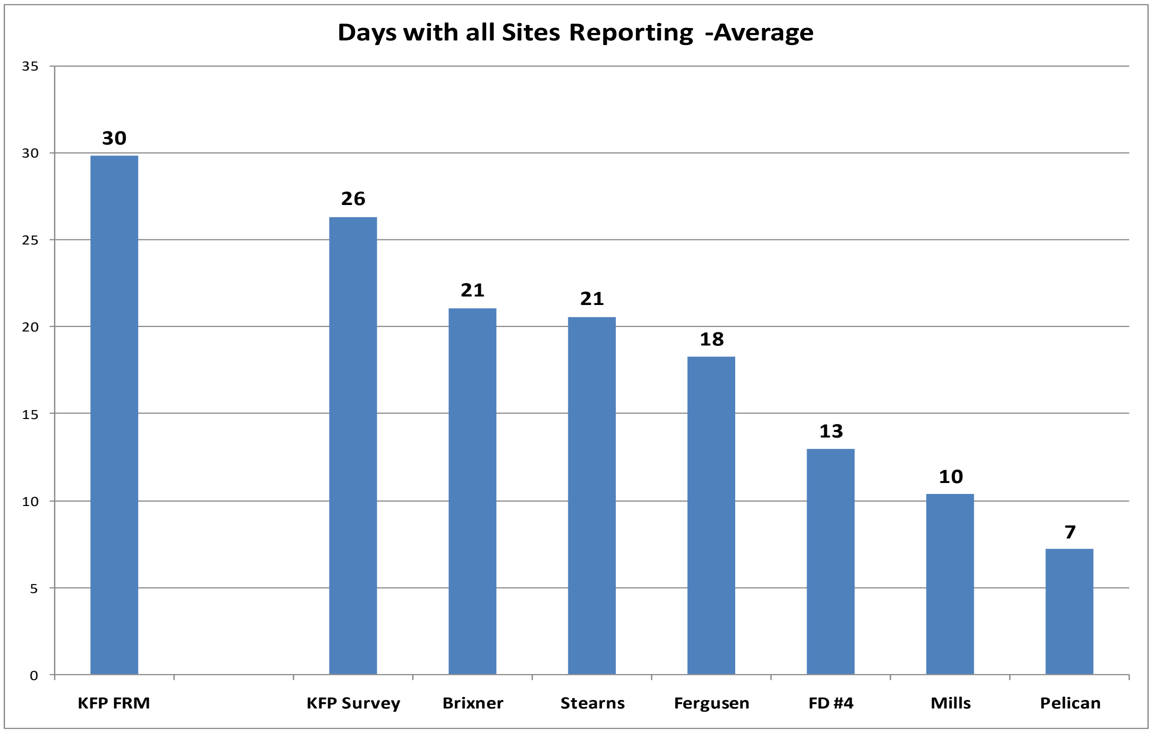


Figure 7. Klamath Falls Valley survey comparison.
Peterson School vs. survey sites inside the Valley.

Highest days with all sites

Days with at least one site in the survey were selected for site comparison. Of these, only days above 15µg/m^3 where selected for further analysis because that is the lower break point for moderate days and only moderate and unhealthy days are of concern. There were four days that met both these criteria: Dec 12th, Jan 9th, Jan 15th, and Feb 2nd. When only these days are averaged for each site and compared, the Valley sites are the highest and of these, Petersen School is the highest (Figure 8).

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey



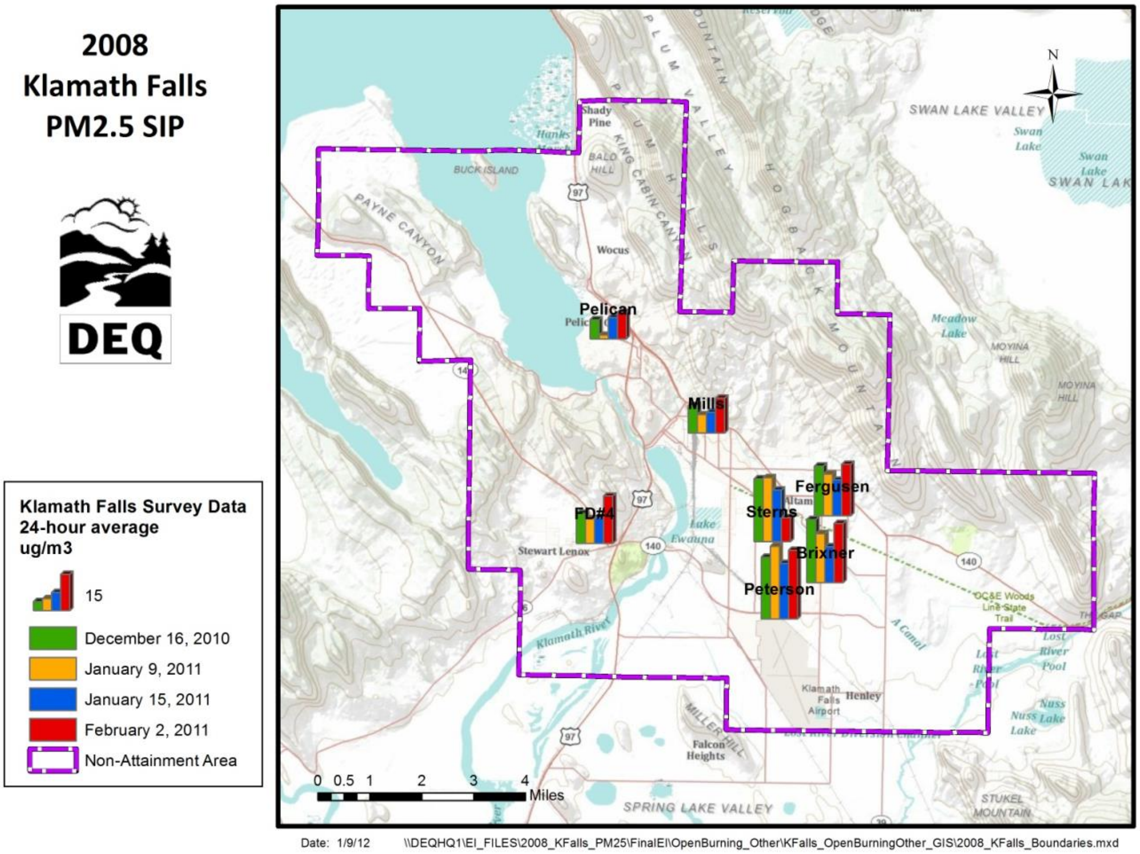
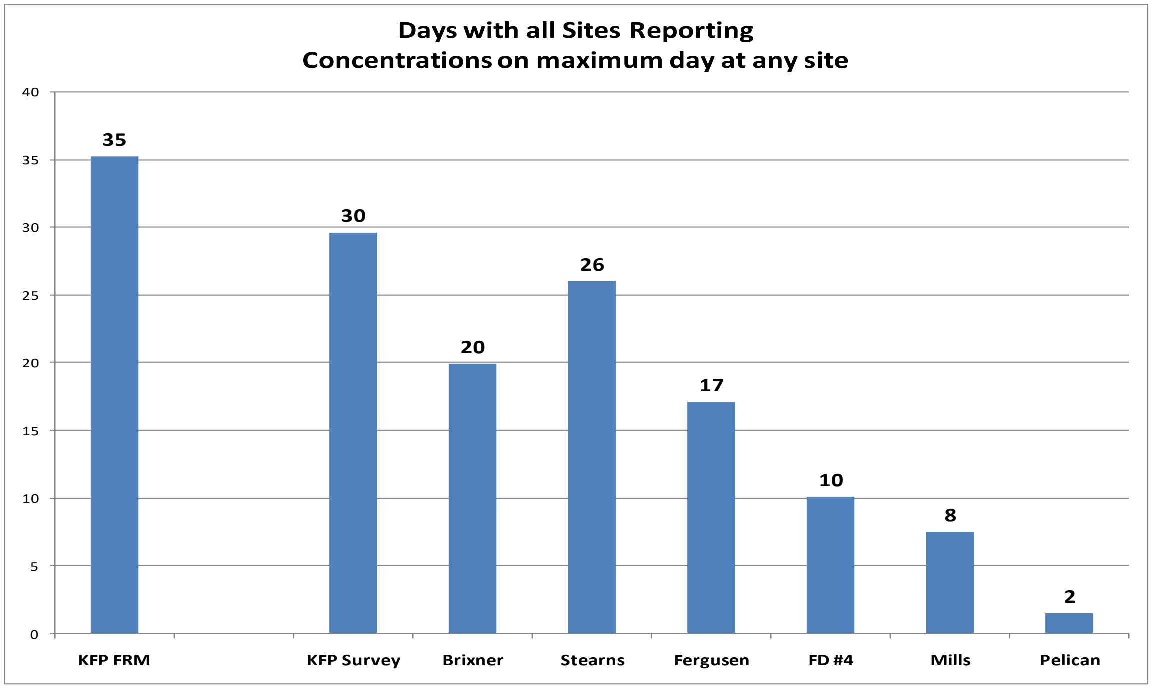


Figure 8. Average $PM_{2.5}$ concentration on days when all sites reported data (4 days). The days are: 12/16,10, 1/9/11, 1/15/11, 2/2/11.

On the highest day of the survey, Jan 9th, the Valley sites are more polluted than the sites to the west. Of the Valley sites, Petersen is the maximum but Stearns is second highest not Brixner (Figure 9) which is higher on other elevated days.

Klamath Falls Winter 2010/2011 $PM_{2.5}$ Survey



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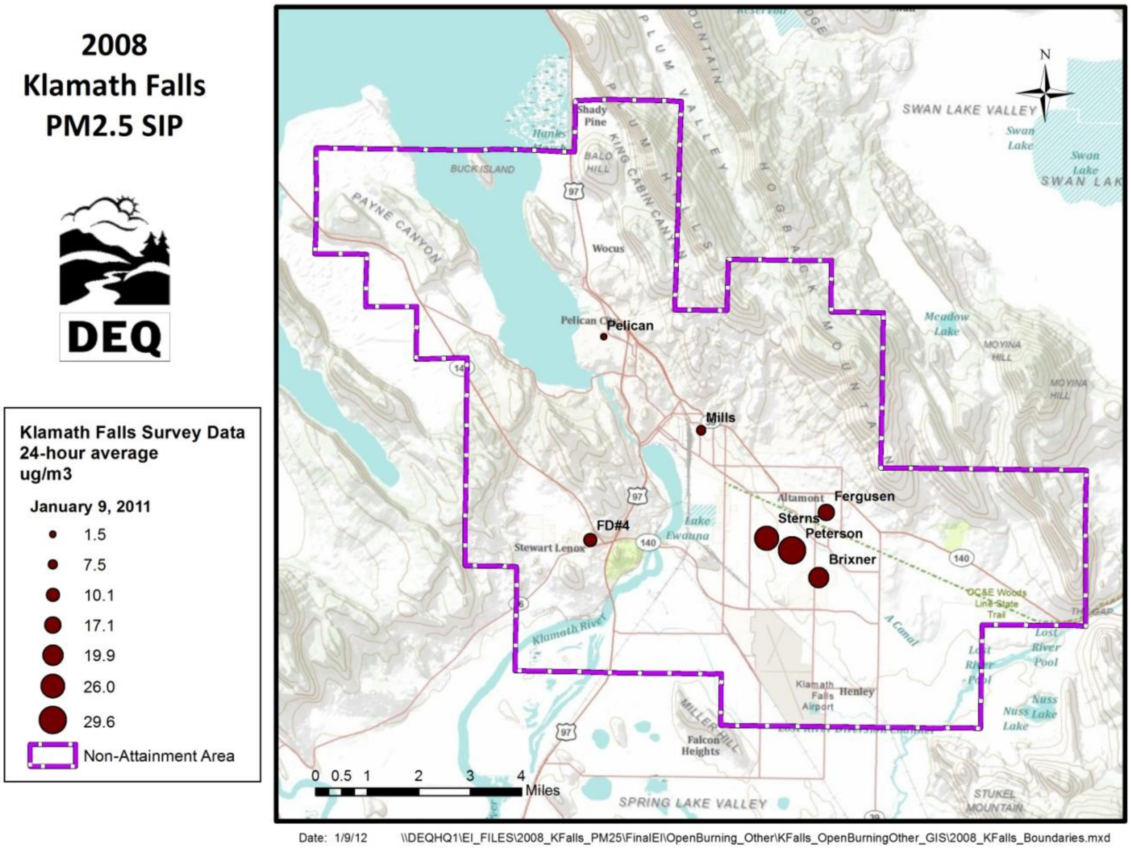


Figure 9. Average $PM_{2.5}$ concentration on the maximum concentration day (Jan 9th). On the other three days over 15µg/m^3 with all sites reporting, the Valley remains the most polluted part of Klamath Falls (Figure 10 -12). On all four days, Petersen School has the highest concentration three times and Brixner once. Stearns is second highest three out of four days, and Fergusen is the lowest twice.

State of Oregon Department of Environmental Quality

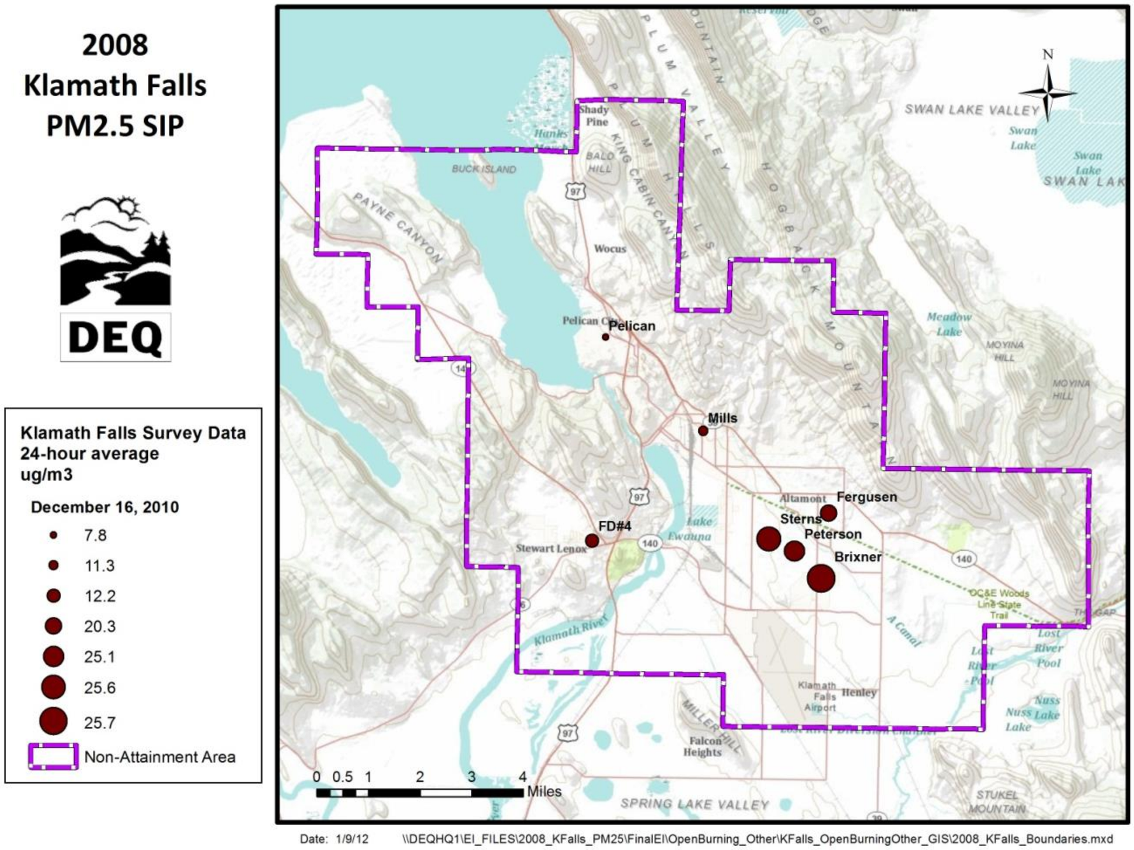


Figure 10. Concentration map for December 16, 2010.

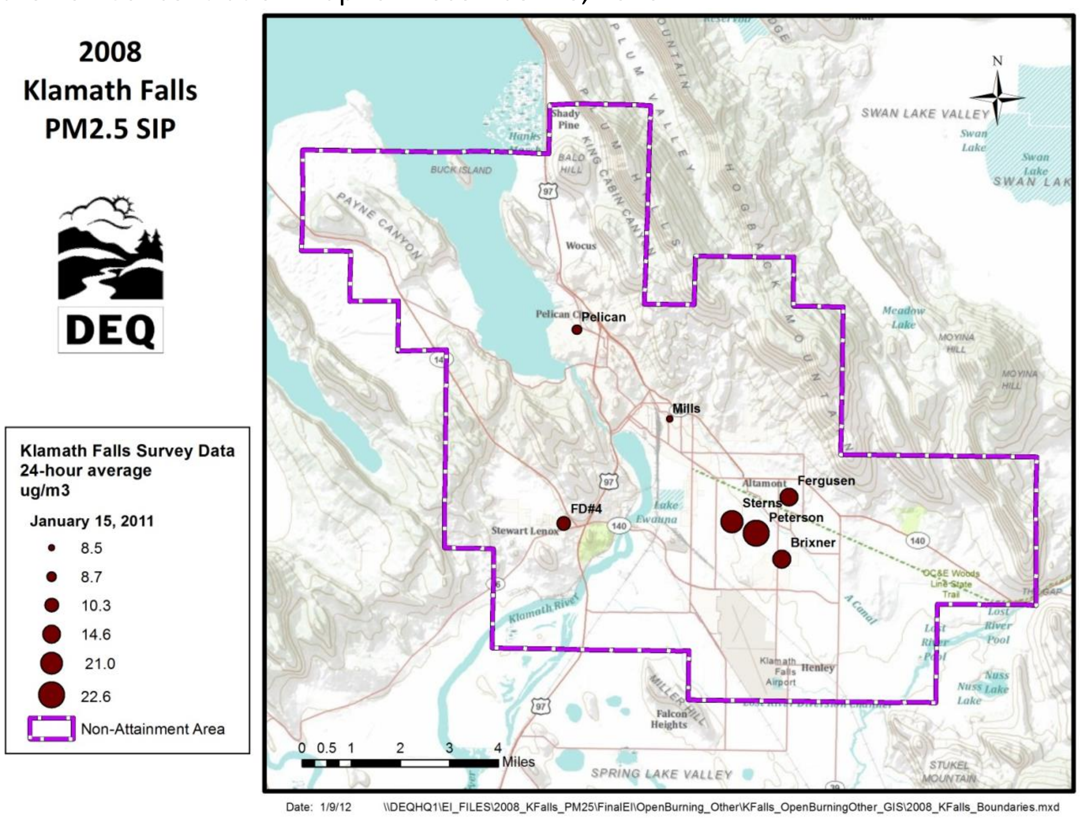


Figure 11. Concentration map for January 15, 2011.

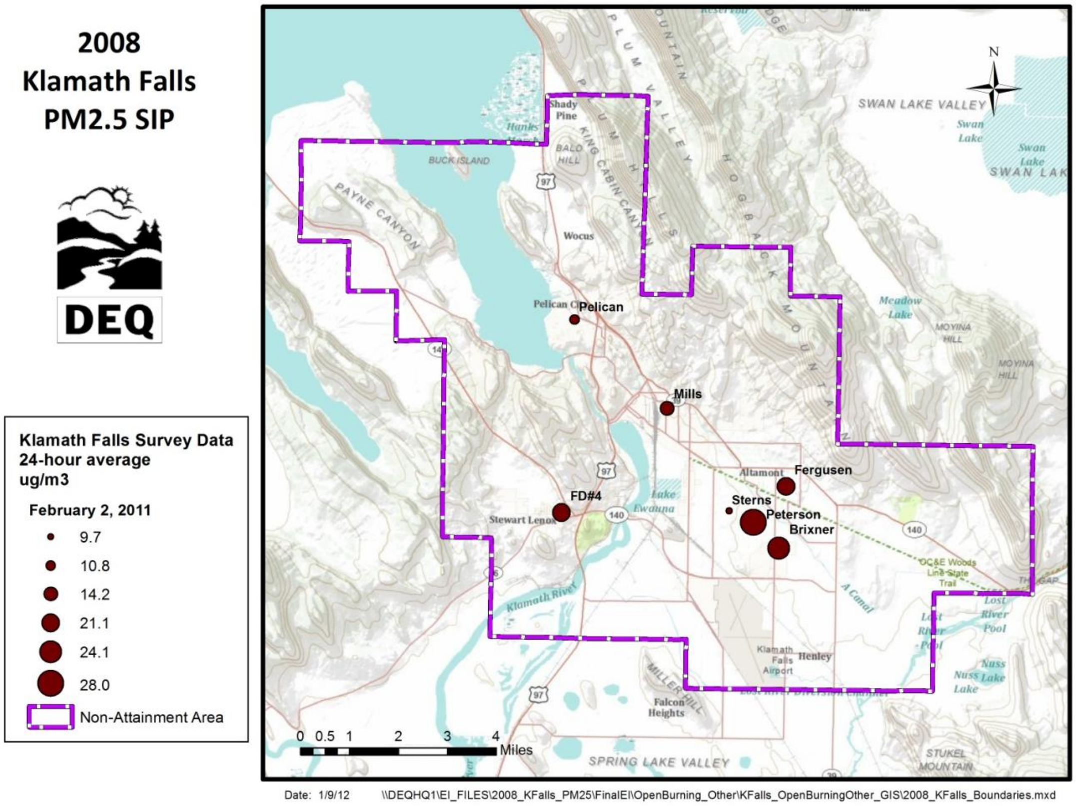


Figure 12. Concentration map for February 2, 2011.

The wind direction during the highest four days was below 4 mph and from the northwest and southeast (Figure 13). This shows that if the $PM_{2.5}$ were coming from the northwest it would have been transported during these days and the Mills and Pelican School sites should be elevated. Since the Mills and Pelican School sites were much lower than the Valley sites, transport from the northwest seems unlikely.

State of Oregon Department of Environmental Quality

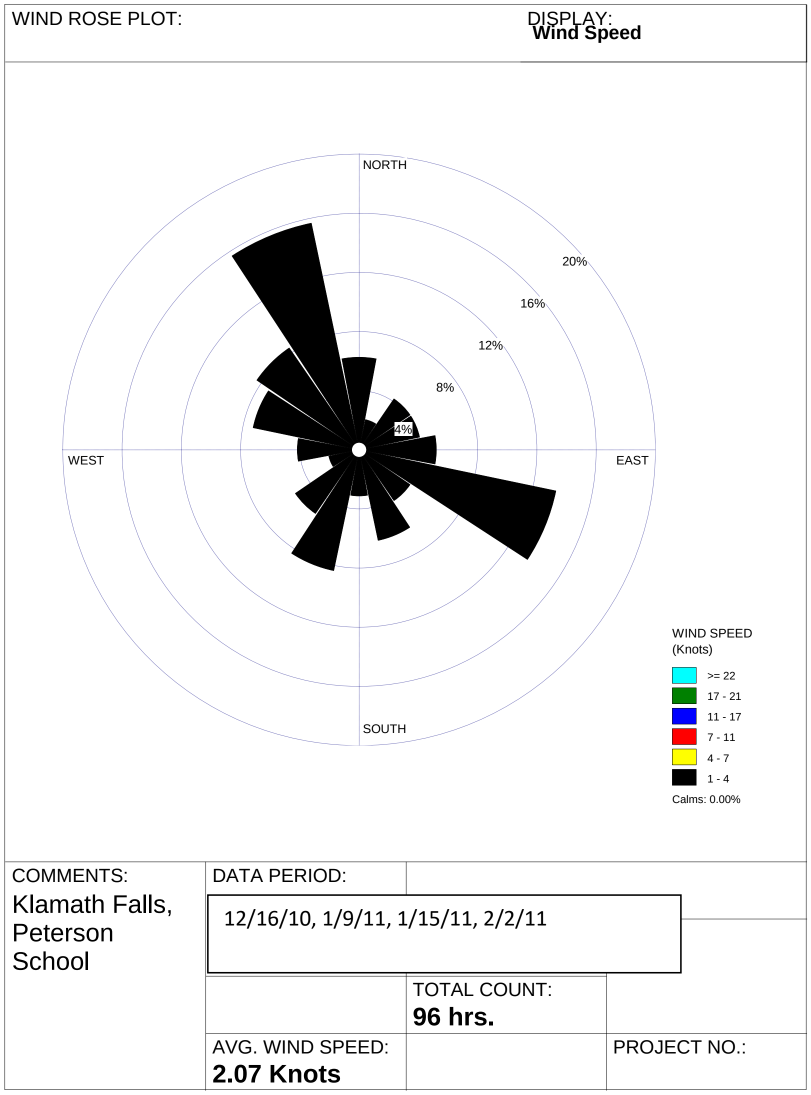
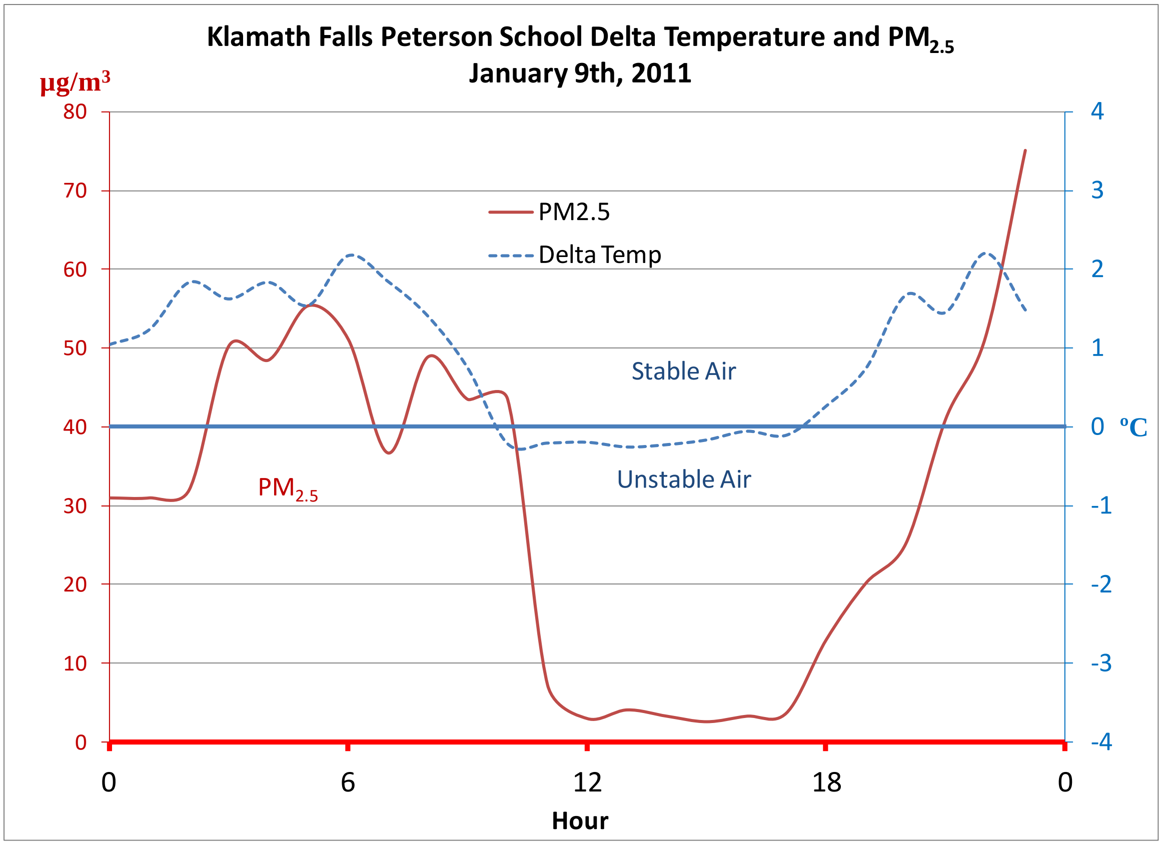


Figure 13. Wind rose on four highest days with all sites reporting.

The principal contributing meteorological factor for elevated $PM_{2.5}$ is an inversion. The National Weather Service has stated that inversions can persist when wind speeds are below 5 mph.   During the four survey days considered here, the wind speed never exceeded 4 mph (Figure 13).   If the Petersen School delta temperature (inversion) and hourly $PM_{2.5}$ (estimated from the nephelometer) are compared during the maximum survey day, the inversion and the $PM_{2.5}$ track each other well (Figure 14). Since air movement is very slight during an inversion, and the maximum site was at Petersen School, the likelihood is that the $PM_{2.5}$ was generated by very, localized sources.


Klamath Falls Peterson School Delta Temperature and PM2.5
January 9th, 2011
µg/m3
80
70
60
50
40
30
20
10
0
4
3
2
1
0 °C
-1
-2
-3
-4
PM2.5
Delta Temp
Stable Air
Unstable Air
PM2.5
0
6
12
18
0
Hour

State of Oregon
Department of Environmental Quality

Figure 14. $PM_{2.5}$ and delta temperature hourly values.
The highest $PM_{2.5}$ occurred in the morning and evening when the inversion occurred (air is stable). $PM_{2.5}$ levels start to drop at 6 a.m. then go back up even though the inversion is breaking up. This indicates a new infusion of $PM_{2.5}$ at 6 a.m.

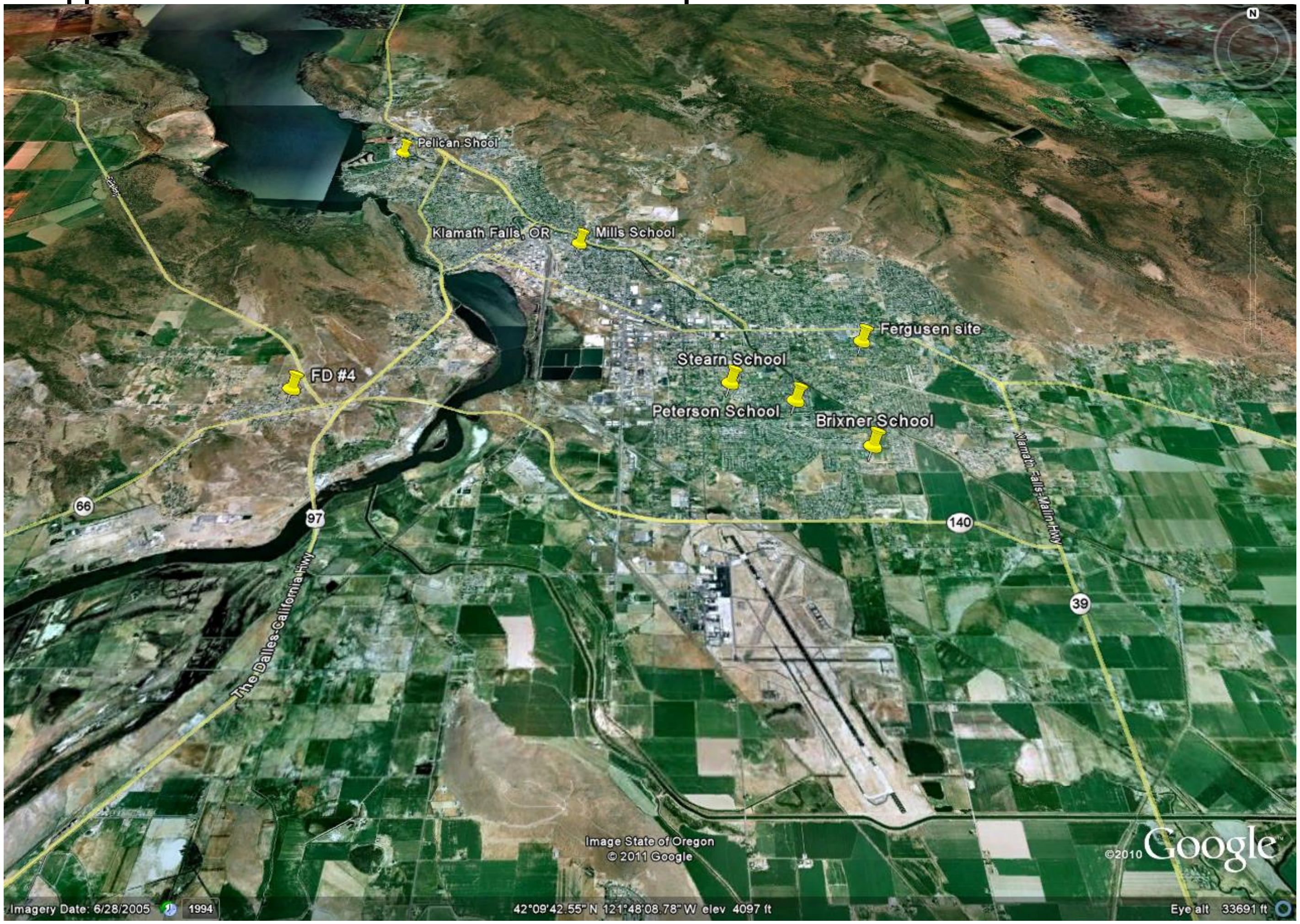
6. Conclusion

This survey shows SE Klamath Falls (A.K.A the Valley) to have higher $PM_{2.5}$ than the Pelican and Mills School locations. This indicates that the source of the $PM_{2.5}$ is generated in the Valley and not transported from the northwest. This also shows that to be more protective, the monitor needs to be located in the Valley. A monitor around Mills School may not show unhealthy readings while they actually existed in the Valley. Within the Valley, the survey shows that Peterson School is the best location for the monitor. It had the highest values on most days but was not that different from Stearns and Brixner Schools. It is centrally located so it will monitor the particulate levels no matter which way the wind is blowing, while the other school are on the edges of the Valley and may miss a high $PM_{2.5}$ event if the wind is from the wrong direction. Granted there is very low wind during high $PM_{2.5}$ events.
Finally, the FD#4 site outside of Klamath Falls was the lowest. This was expected and no further monitoring is needed at this time. When this area of town develops, future monitoring can be compared to this survey for trending information.

7. References

1. Hansen, M., Smith J., Klamath Falls, Oregon $PM_{2.5}$ Particulate Site Validation Study, Oregon Department of Environmental Quality, August, 2001.
2. Smith J., Quality Assurance Project Plan Document: Ambient Air Quality Monitoring for Criteria Air Pollutants (Clean Air Act), DEQ09-LAB-0004-QAPP, May, 2010.
3. Standard Operating Procedure: Gravimetric Analysis of Particulate Collected with R&P Partisol Samplers and Met One SASS Samplers, DEQ03-LAB-0027-SOP, June, 2003.

Appendix A: Site aerial views and directional photos.



1. Brixner School Site:

Brixner Shool – Directions:

North

Northeast

East

Southeast

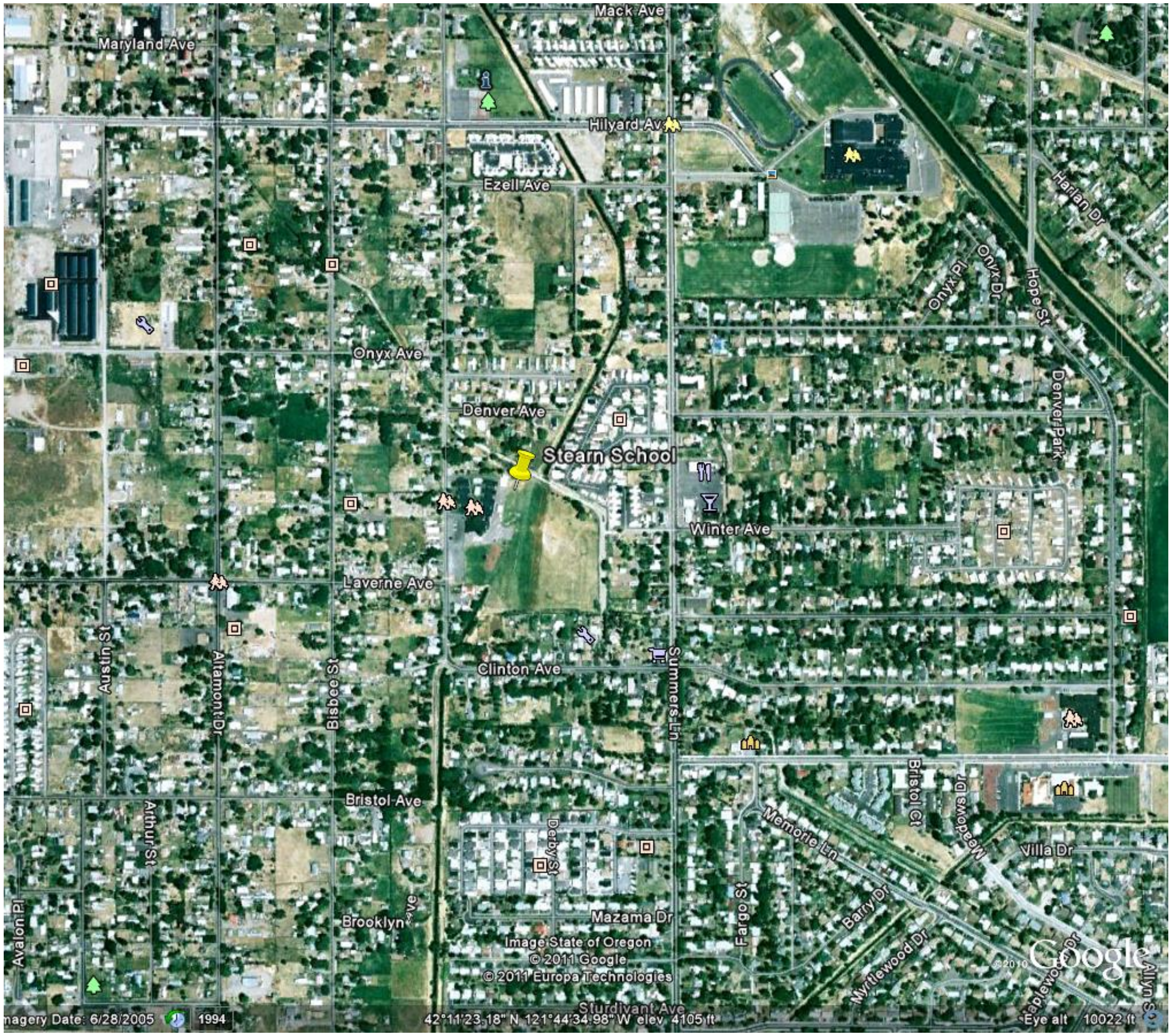
South

Southwest

West

Northwest

2. Stearns School Site:



Stearns School

North

Northeast

East

Southeast

South

Southwest

Northwest

West

3. Pelican School

Pelican School Directions

North

Northeast

East

Southeast

South

Southwest

Northwest

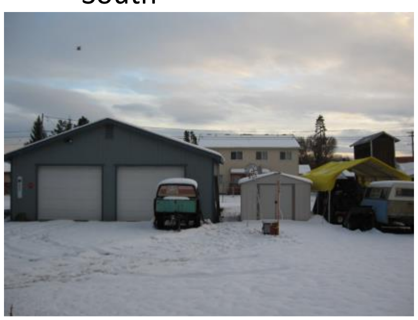
West

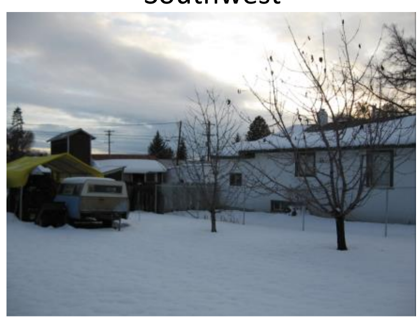
3. Mills School

Mills School Directions:

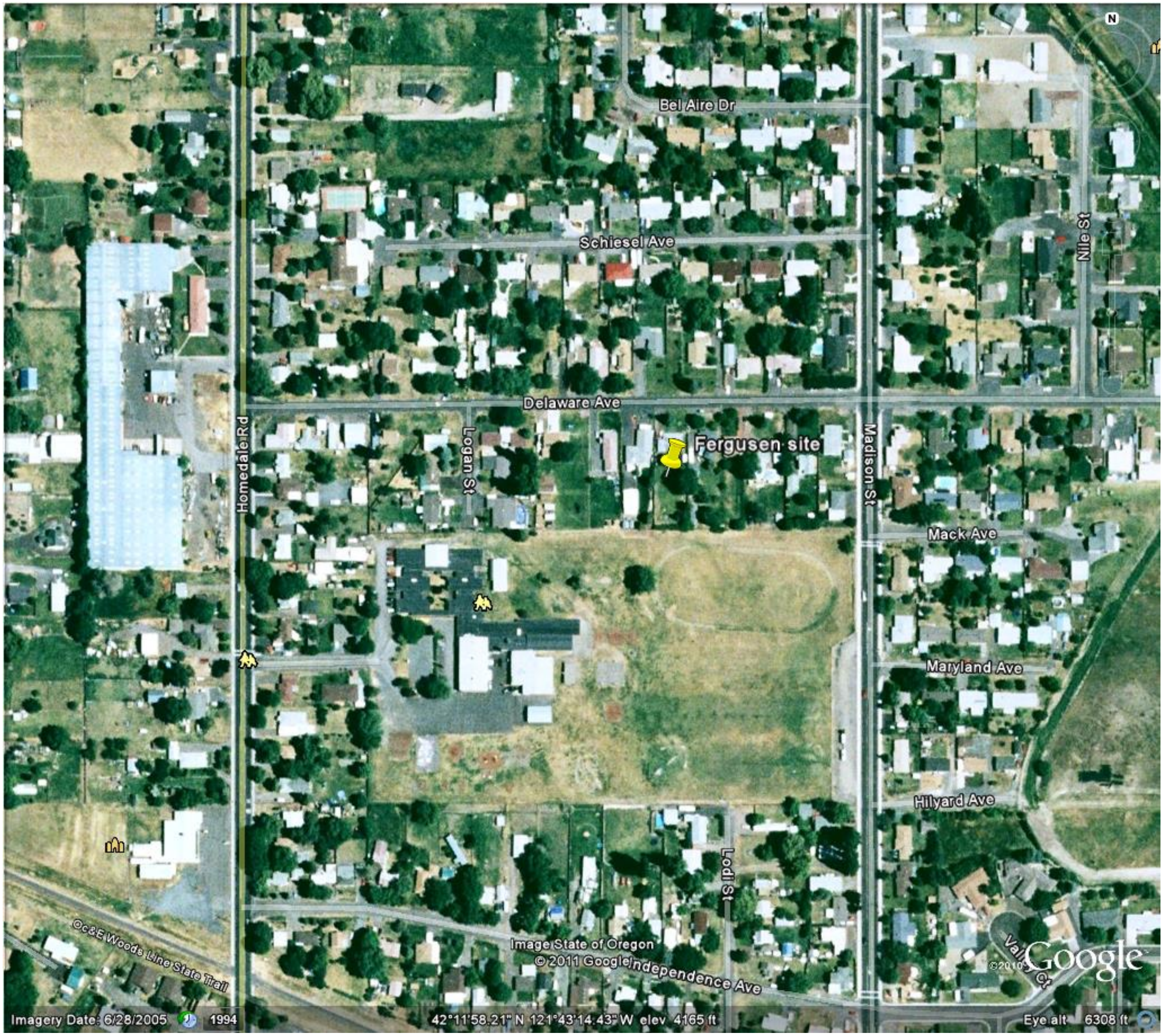
North Northeast East Southeast

South Southwest Northwest West





4. Ferguson School



Ferguson School Directions:

North

Northeast

Photo Not Available

East

Photo Not Available

Southeast

Photo Not Available

South

Photo Not Available

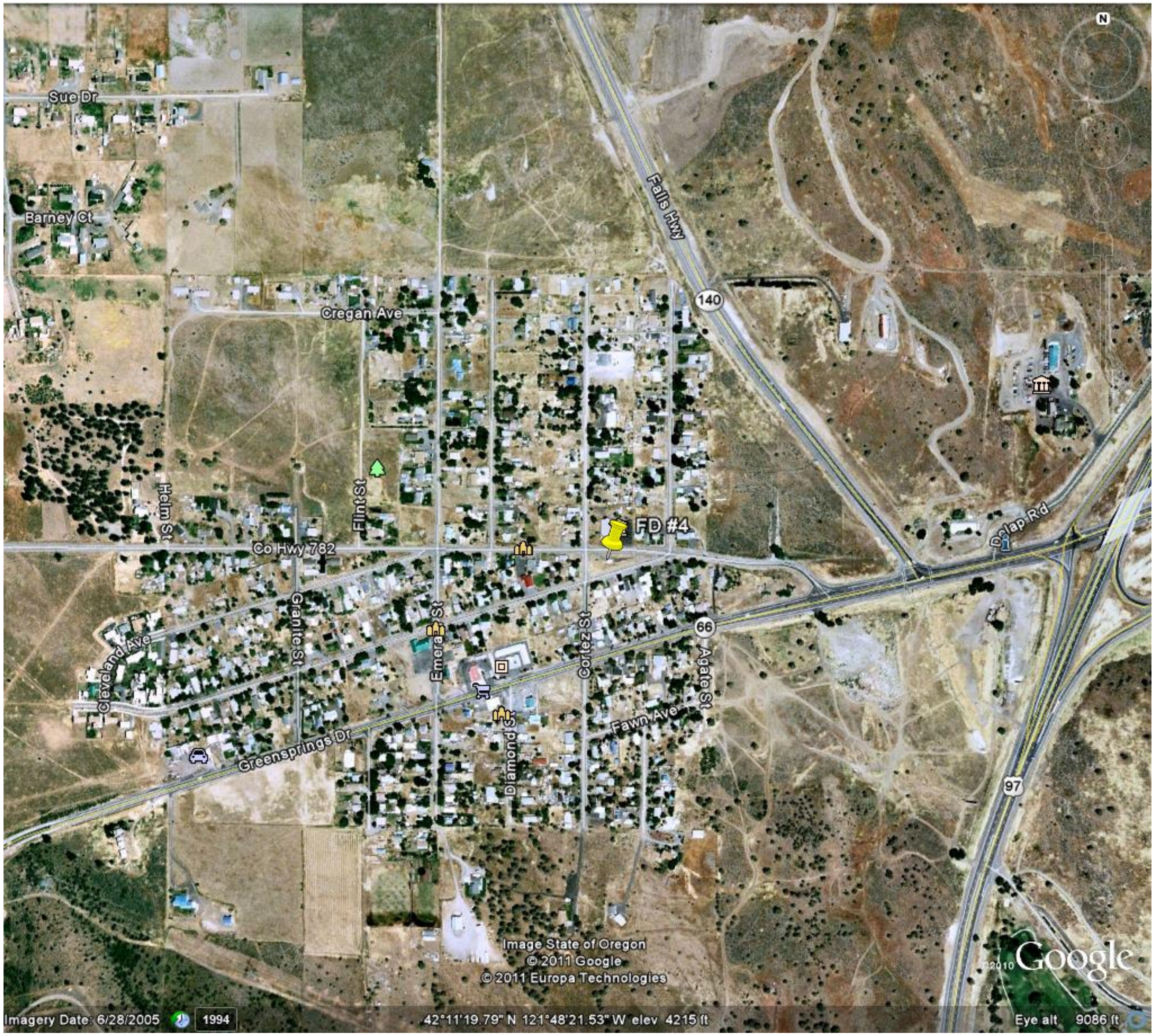
Southwest

West

Photo Not Available

Northwest

5. Fire Department #4



Fire Department #4 Directions:

North

Northeast

East

Southeast

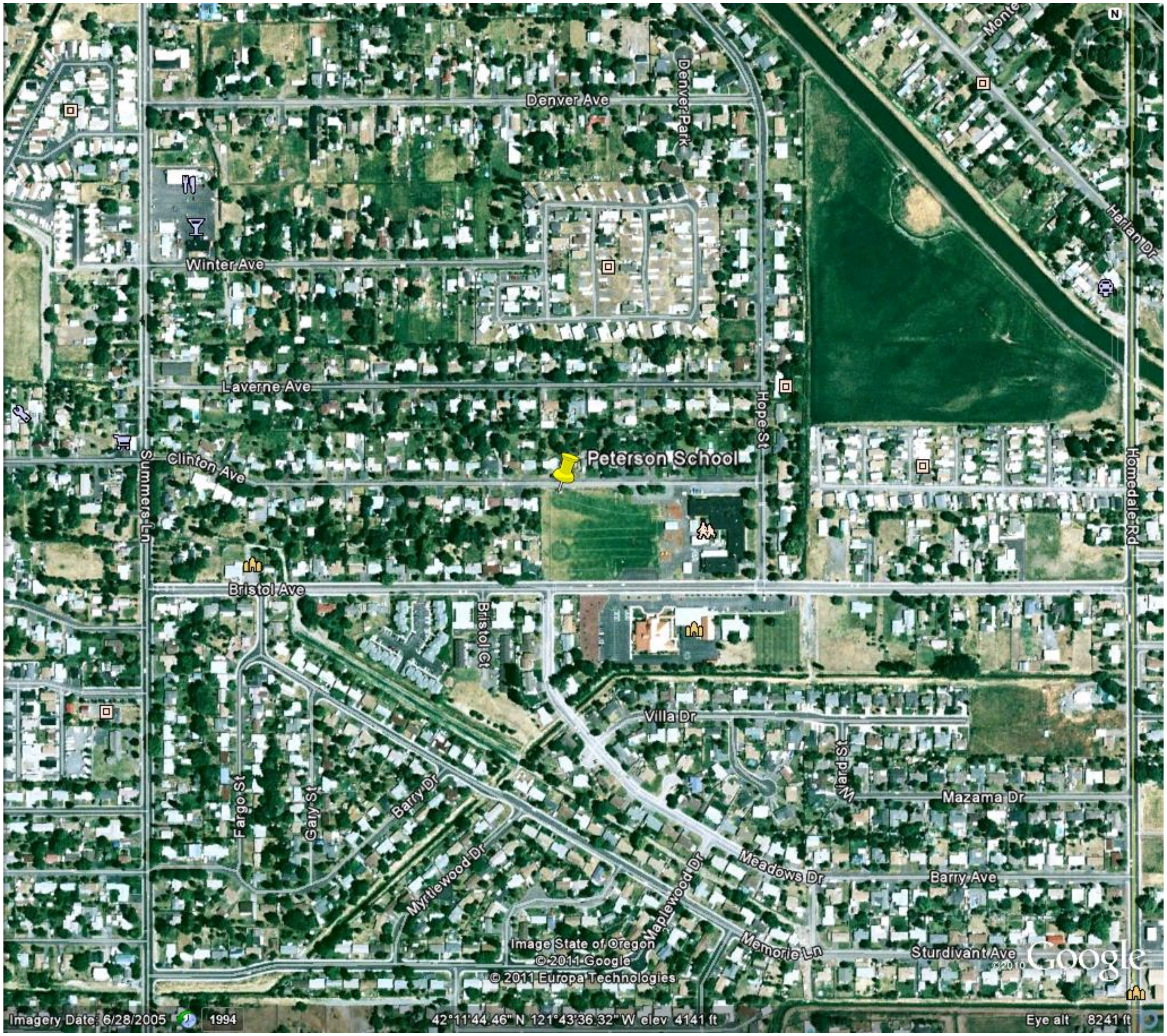
South

Southwest

Northwest

West

6. Peterson School



Peterson School Directions:

North Northeast East Southeast

South Southwest Northwest West

Appendix 6

Klamath Falls $PM_{2.5}$ Attainment Plan Appendix 20

Klamath Falls Interagency Agreement to Reduce Emissions from Winter Sanding

State of Oregon
Department of Environmental Quality

Submitted to: EPA

December 2013

Air Quality Division
811 SW 6th Avenue
Portland, OR 97204
Phone: (503) 229-5696
(800) 452-4011
Fax: (503) 229-6762
Contact: Rachel Sakata
Larry Calkins
www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon’s air, land and water.

Last Updated: 12/31/13

Klamath Falls Particulate Matter ($PM_{2.5}$) Attainment Plan

Interagency Agreement to Reduce Particulate Emissions from Winter Road Sanding

May, 2012

This agreement, effective the date shown on the signature page, is between Oregon Department of Environmental Quality (ODEQ), Oregon Department of Transportation (ODOT), Klamath County, and City of Klamath Falls, for the purpose of minimizing adverse air quality impacts related to particulate matter from winter road sanding activity.

Objective

This agreement recognizes that the Klamath Falls Nonattainment Area has violated the 24-hour National Ambient Air Quality Standard (NAAQS) for fine particulate matter (PM2.5). The objective of this agreement is to minimize air quality impacts from winter road sanding in the Klamath Falls PM2.5 Non-Attainment Area (map provided in Appendix A). Road dust generated from winter traction materials applied during the snow and ice season is entrained and suspended in air in a form of fine fraction particulates contributing to reduced air quality.

Procedure

In response to this issue, Klamath County, City of Klamath Falls, and ODOT agree to apply measures to mitigate the generation of road dust associated with winter traction materials including the material selection, application, and collection. The measures will be applied only when their effects do not compromise safety.

Klamath County, City of Klamath Falls, and ODOT agree to:

- Select durable material that is less likely to breakdown through road wear whenever available and cost effective.
- When deemed appropriate and as funding permits, apply de-icing agents in conjunction with abrasive material to spread it more easily and to help anchor the abrasives into the ice or snow on the road's surface.
- Limit the amount of material used and only sand intersections, hills, curves, and known trouble areas on roads that are critical for safety.
- Apply materials with appropriate equipment to limit spillage and redundant application of materials. Calibrate equipment at least one time per year for optimum application rates and avoid applying more material than necessary for safety.
- Schedule the removal of abrasive materials as early as possible to shorten the period of dust generation. It is expected to be done at least once a year at the end of season, or more often if possible.

- Ensure that only South Coast Air Management District certified sweepers or equivalent technologies are purchased in future for use in the Klamath Falls PM2.5 Non-Attainment Area. The current list of certified sweepers approved is in Appendix B. Equivalent sweepers are listed in Appendix C.

Reporting

- At the end of the winter vehicle traction season, or by June 30, of each year, submit to DEQ for the nonattainment area the following information:
  - Approximate amount of sanding material applied during the previous winter season.
  - Approximate amount of sanding material picked up during the previous winter season.
  - Types of equipment used to pick up sanding material.
  - Alternatives to sanding used, if any
    - Include anti-icing agents used
    - Geothermal roadways heated where sanding was not used
    - Other alternatives
  - Other methods used to reduce re-entrained road dust from roadways within the nonattainment area.
  - Road paving.

This agreement is entered into on the final date all signatures are signed:

For the Department of Environmental Quality ______ 6/26/12
JOAN STEVENS-SCHWENGER FOR ANDY GINSBURG
Andrew Ginsburg Date

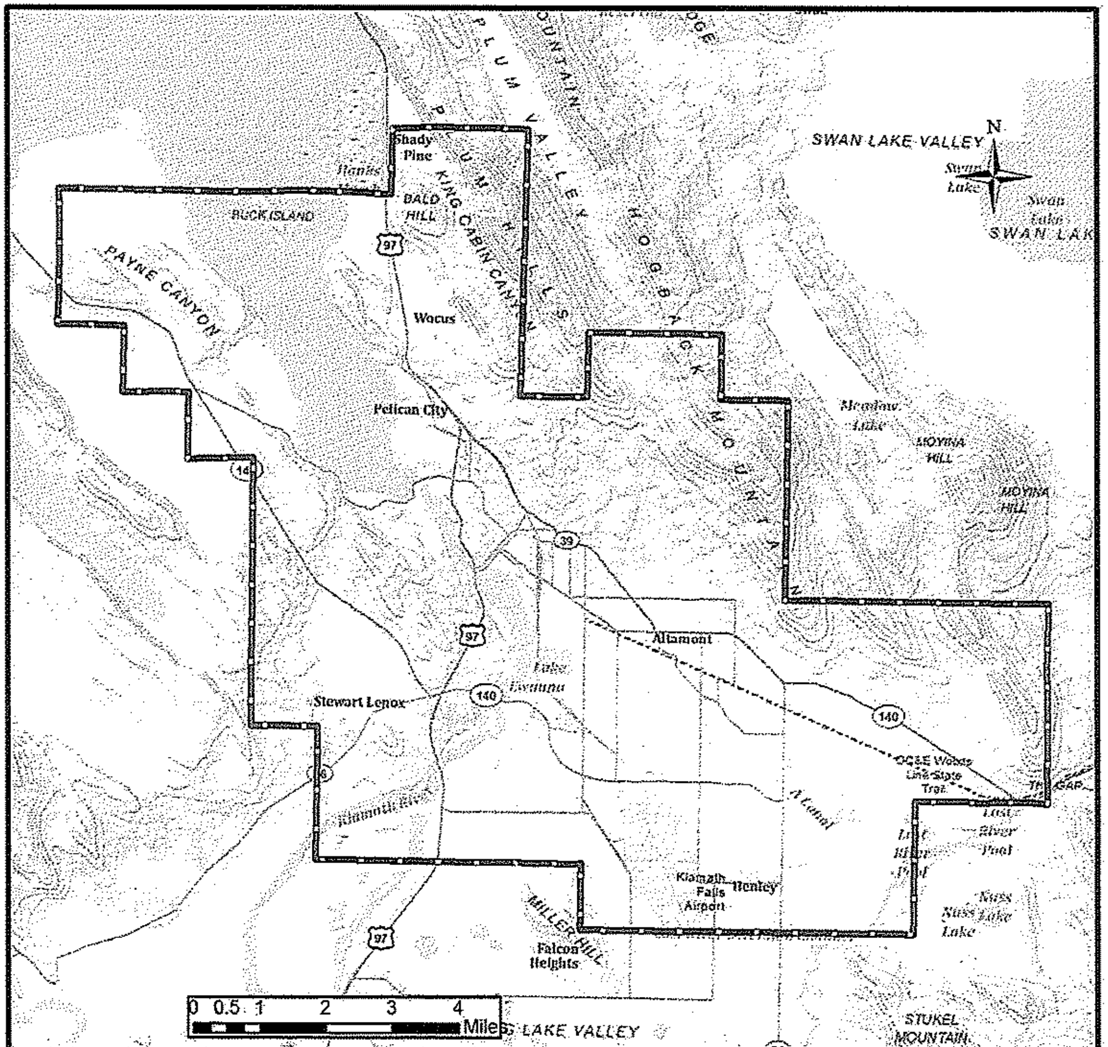
For the City of Klamath Falls ______ 5/30/12
Mark Willrett Date

For Klamath County ______ MAY 07 2012
Stan Strickland Date

For the Oregon Department of Transportation ______ 5-18-12
Michael Stinson Date

Klamath Falls

DEQ



Legend
Non-Attainment Area

Date: 8/9/11 \\DEQHQ1\EI_FILES\2008_KFalls_PM25\FinalEI\OpenBurning_Other\KFalls_OpenBurningOther_GIS\2008_KFalls_OpenBurningOther.mxd

APPENDIX B

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE 1186 CERTIFIED* STREET SWEEPERS AS OF MARCH 11, 2010 THE FOLLOWING IS A LIST OF STREET SWEEPING EQUIPMENT THAT HAS CURRENTLY BEEN CERTIFIED FOR SCAQMD RULE 1186. ALL CERTIFIED EQUIPMENT MUST BE OPERATED AND MAINTAINED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. FUTURE TESTING MAY QUALIFY ADDITIONAL EQUIPMENT. CALL 1 (800) CUT-SMOG FOR THE CURRENT LIST. * In order to ensure compliance with Rule 1186 requirements, all certified equipment must be operated and maintained in accordance with the manufacturer's specifications. End users are responsible for ensuring that the dust control systems are in place for each certified sweeper. Note: The make and model of the sweeper must have the dust control system(s) specified above to be in compliance. (Standard or older models may not have all the systems). Please contact the manufacturer if you would like to ensure that your sweeper(s) are Rule 1186 compliant. 1

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
CHALLENGER MANUFACTURING	CHALLENGER	☐ THREE (3) 0.03 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ FOUR (4) 0.03 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BETWEEN THE MAIN BROOM AND THE CONVEYOR ☐ WATER PUMP TO PROVIDE 25 POUNDS PER SQUARE INCH WATER PRESSURE DURING OPERATION; MAXIMUM OF 45 POUNDS PER SQUARE INCH
ELGIN	AIR CUB (LX/DX) CROSSWIND FURY	☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ LOUVERED CENTIFUGAL DUST SEPARATOR ☐ ONE (1) 0.06 INCH DIAMETER ORIFICE NOZZLE CENTRALLY LOCATED ABOVE FAN INLET IN THE HOPPER ☐ TWO (2) 0.047 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SUCTION TUBE ☐ FOUR (4) 0.051 INCH DIAMETER ORIFICE

		NOZZLES LOCATED AT EACH SIDE BROOM ☐ PUMP TO PROVIDE 40 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	CROSSWIND J	☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ S-TRAP CENTRIFUGAL SEPARATOR ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE HOPPER ☐ THREE (3) 0.059 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE SUCTION TUBE ☐ THREE (3) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
	MODEL*	**DUST CONTROL SYSTEMS***
ELGIN	PELICAN P & S PELICAN SE (WET SUPPRESSION)	☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BETWEEN THE MAIN BROOM AND THE CONVEYOR ☐ TWO (2) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	PELICAN P (WATERLESS SUPPRESSION)	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ TWO CENTRIFUGAL DUST EVACUATION FANS ☐ SYNTHETIC MULTI-POCKET FILTER WITH HYDRAULIC SHAKER FOR DUST REMOVAL

ELGIN	PELICAN P (COMBINATION)	☐ ALL OF THE FEATURES OF THE WET AND WATERLESS SUPPRESSION PELICAN P STREET SWEEPER WITH THE EQUIPMENT OPERATED IN EITHER THE WET OR WATERLESS MODE
ELGIN	EAGLE E EAGLE F EAGLE (CNG) BROOM BEAR ROAD WIZARD	☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BETWEEN THE MAIN BROOM AND THE CONVEYOR ☐ THREE (3) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	EAGLE F (WATERLESS)	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ CENTRIFUGAL DUST EVACUATION FAN ☐ SYNTHETIC MULTI-POCKET FILTER WITH HYDRAULIC SHAKER FOR DUST CONTROL
ELGIN	EAGLE F (COMBINATION)	☐ ALL OF THE FEATURES OF THE WET AND WATERLESS EAGLE F STREET SWEEPER WITH THE EQUIPMENT OPERATED IN EITHER THE WET OR WATERLESS MODE

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
ELGIN	GEOVAC	

		☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED IN THE HOPPER ☐ TWO (2) 0.059 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SUCTION TUBE ☐ TWO (2) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES LOCATED AT THE EXTENSION BROOM ☐ WATER PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE
ELGIN	WHIRLWIND MV	☐ DIAMOND GRID DUST SEPARATION SCREEN ☐ FOUR (4) 0.06 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED IN THE HOPPER ☐ TWO (2) 0.059 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SUCTION TUBE ☐ TWO (2) 0.057 INCH DIAMETER ORIFICE NOZZLES LOCATED AT EACH SIDE BROOM ☐ FOUR (4) 0.60 INCH DIAMETER ORIFICE NOZZLES LOCATED AT THE EXTENSION BROOM

☐ PUMP TO PROVIDE 80 POUNDS PER SQUARE INCH WATER PRESSURE

MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
JOHNSTON	310	☐ FOUR (4) 0.072 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT SPRAY BAR ☐ TWO (2) 0.072 INCH DIAMETER ORIFICE NOZZLES PER EACH GUTTER BROOM ☐ ONE (1) 0.026 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE FAN SUCTION HOOD ☐ WATER PUMP TO PROVIDE 50 POUNDS PER SQUARE INCH WATER PRESSURE
JOHNSTON	3000 MX450 4000 4000 SDS MST 350	☐ ENCLOSED ELEVATOR SYSTEM ☐ STEEL OR MIXED POLYESTER MAIN PICK UP BROOM ☐ ONE (1) 0.072 INCH DIAMETER ORIFICE NOZZLE PER EACH GUTTER BROOM ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES PER EACH SIDE OF THE MAIN PICK UP BROOM ☐ THREE (3) 0.057 INCH DIAMETER ORIFICE NOZZLES IN SPRAY BAR LOCATED BEHIND THE MAIN PICK UP BROOM ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN SPRAY BAR LOCATED UNDERNEATH THE CAB ☐ WATER PUMP TO PROVIDE 40 POUNDS PER SQUARE INCH WATER PRESSURE

MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***

JOHNSTON	VT605 VT610 VT605 VT650	☐ TWO (2) 0.039 INCH DIAMETER ORIFICE NOZZLES PER GUTTER BROOM ☐ THREE (3) 0.042 INCH DIAMETER ORIFICE NOZZLES PER SUCTION BROOM ☐ THREE (3) 0.039 INCH DIAMETER ORIFICE NOZZLES PER SUCTION NOZZLE ☐ MULTI-POSITION SUCTION NOZZLE TWO ARM FACILITY ☐ ONE (1) 0.042 INCH DIAMETER ORIFICE NOZZLE FOR THE IMPELLER FAN ☐ WATER PUMP TO PROVIDE 50 POUNDS PER SQUARE INCH WATER PRESSURE
JOHNSTON	770 CYCLONE	☐ THREE (3) 0.067 INCH DIAMETER ORIFICE NOZZLES FOR GUTTER BROOMS ☐ TWO (2) 0.07 INCH DIAMETER ORIFICE NOZZLES FOR CENTER CURTAIN ☐ FOUR (4) 0.055 INCH DIAMETER ORIFICE NOZZLES FOR FRONT BUMPER ☐ TWO (2) 0.067 INCH DIAMETER ORIFICE NOZZLES FOR FRONT CURB SPRAY ☐ TWO (2) 0.07 INCH DIAMETER ORIFICE NOZZLES ON LEFT AND RIGHT SIDE OF PICK UP HEAD ☐ THREE (3) 0.082 INCH DIAMETER ORIFICE NOZZLES FOR PICK UP HEAD FRONT SIDE ☐ SEVEN (7) 0.079 INCH DIAMETER ORIFICE NOZZLES FOR PICK UP HEAD REAR SIDE ☐ THREE (3) 0.079 INCH DIAMETER ORIFICE NOZZLES FOR WINDROW PATH ☐ TWO (2) 0.045 INCH DIAMETER ORIFICE NOZZLES FOR PICK UP HEAD SUCTION ☐ ONE (1) 0.079 INCH DIAMETER ORIFICE NOZZLE FOR BLOWER FAN OUTLET

☐ PUMP TO PROVIDE 50 POUNDS PER SQUARE INCH WATER PRESSURE

MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
SCHWARZE	EV-1	☐ TWELVE (12) POLYESTER DRY FILTER CARTRIDGES (MAINTAINED TO ENSURE PROPER INTEGRITY) ☐ FILTRATION CLEANED THREE TIMES PER MINUTE ☐ FILTRATION SYSTEM ACTIVE AT ALL TIMES
SCHWARZE	EV-2	☐ EIGHT (8) POLYESTER DRY FILTER CARTRIDGES (MAINTAINED TO ENSURE PROPER INTEGRITY) ☐ FILTRATION SYSTEM OPERATED AT ALL TIMES ☐ EACH FILTER CLEANED THREE TIMES PER MINUTE
SCHWARZE	DXR	☐ POLYESTER DRY FILTER CARTRIDGES (MAINTAINED TO ENSURE PROPER INTEGRITY) ☐ FILTRATION SYSTEM ACTIVE AT ALL TIMES ☐ FILTRATION CLEANED FOUR TIMES PER MINUTE AND A HALF
SCHWARZE	A4000	☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON THE SWEEPING

		HEAD ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES INSIDE HOPPER ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES INSIDE HOPPER ON SPRAY BAR ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE
SCHWARZE	M5000/M6000	☐ FIVE (5) 0.036 INCH DIAMETER ORIFICE NOZZLES ON MAIN BROOM ☐ THREE (3) 0.036 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE
MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
SCHWARZE	A 7000/ A 8000/ A 9000	☐ SAWTOOTH DUST SEPARATION SCREEN, SELF DUMPING DUST SEPARATOR, FAN CENTRIFUGE ☐ FIVE (5) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON THE SWEEPING HEAD ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON HEAD INTAKE TUBE ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN RIGHT HAND GUTTER BROOM ☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES LOCATED ON HOPPER SPRAY BAR ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN LEFT HAND GUTTER BROOM (REQUIRED IF BOTH GUTTER BROOMS ARE

		USED)
SCHWARZE	S348-I/ S348-LE	☐ FOUR (4) 0.036 INCH DIAMETER ORIFICE NOZZLES ON HOPPER SPRAY BAR ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES IN HOPPER ☐ TWO (2) 0.036 INCH DIAMETER ORIFICE NOZZLES ON RIGHT HAND GUTTER BROOM ☐ WATER PUMP TO PROVIDE 70 POUNDS PER SQUARE INCH WATER PRESSURE
STEWART-AMOS	STARFIRE S-4, S-5, AND S-6	☐ FOUR (4) 0.05 INCH DIAMETER ORIFICE NOZZLES CENTRALLY LOCATED BEWEEN THE MAIN BROOM AND THE ELEVATOR ☐ FOUR (4) 0.05 INCH DIAMETER ORIFICE NOZZLES LOCATED BENEATH THE FRONT BUMPER OF THE CHASSIS ☐ TWO (2) 0.05 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT OF EACH GUTTER BROOM ☐ WATER PUMP TO PROVIDE 40 POUNDS PER SQUARE INCH WATER PRESSURE

MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
PYTHON	S2000	☐ FOUR (4) 0.008 INCH DIAMETER ORIFICE NOZZLES MOUNTED ABOVE AND AHEAD OF A 36 INCH FILL DIAMETER REAR BROOM ☐ WATER LINE WITH 0.02 INCH DIAMETER ORIFICE AND THREE (3) 0.06 DIAMETER OUTLETS ABOVE EACH 42 INCH DIAMETER GUTTER BROOM ☐ PUMP TO PROVIDE 24 POUNDS PER

		SQUARE INCH WATER PRESSURE DURING OPERATION *PLEASE NOTE THAT THE GUTTER AND REAR BROOM SIZES ARE DIFFERENT THAN THE STANDARD MODEL*
PYTHON	S3000	☐ FOUR (4) 0.008 INCH DIAMETER ORIFICE NOZZLES MOUNTED ABOVE AND AHEAD OF REAR BROOM ☐ WATER LINE WITH 0.02 INCH DIAMETER ORIFICE AND THREE (3) 0.06 DIAMETER OUTLETS ABOVE EACH GUTTER BROOM ☐ PUMP TO PROVIDE 24 POUNDS PER SQUARE INCH WATER PRESSURE DURING OPERATION
TENNANT	CENTURION	☐ SEVEN (7) 0.0925 INCH DIAMETER ORIFICE NOZZLES ON SPRAY BAR UNDERNEATH THE CAB ☐ TWO (2) 0.0925 INCH DIAMETER ORIFICE NOZZLES PER GUTTER BROOM ☐ (GUTTER BROOMS CAN BE OPERATED WITHOUT WATER SPRAYS IF FULLY ENCLOSED SHROUD SYSTEM IS UTILIZED AND MAINTAINED PER THE MANUFACTURERS SPECIFICATIONS) ☐ THREE (3) 0.0925 INCH DIAMETER ORIFICE NOZZLES ON SPRAY BAR ABOVE CONVEYOR ☐ 300 GALLON WATER TANK ☐ WATER PUMP TO PROVIDE MINIMUM OF SEVEN GALLONS PER MINUTE ☐ SINGLE FAN VACUUM SYSTEM ☐ GLAZED, POLYESTER FILTER SYSTEM (MAINTAINED TO ENSURE PROPOER INTEGRITY)

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
TENNANT	SENTINEL	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ DUAL FAN VACUUM SYSTEM (OPERATED AT ALL TIMES) ☐ SYNTHETIC-SINGED POLYESTER FILTER (MAINTAINED TO ENSURE PROPER INTEGRITY)
TENNANT	830 I / 830 II	☐ GUTTER/MAIN BROOM FULLY ENCLOSED SHROUD SYSTEM ☐ DUAL FAN VACUUM SYSTEM (OPERATED AT ALL TIMES) ☐ SYNTHETIC-SINGED POLYESTER FILTER (MAINTAINED TO ENSURE PROPER INTEGRITY)
TYMCO	210 300 350 435	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ CENTER DEBRIS DEFLECTOR ASSEMBLY PERPENDICULAR TO THE PICK UP HEAD ☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLE FOR EACH GUTTER BROOM ☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER ☐ ONE (1) 0.063 INCH DIAMETER ORIFICE

		NOZZLE LOCATED IN BLOWER HOUSING ☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH.
MAKE*	**MODEL***	**DUST CONTROL SYSTEMS***
TYMCO	600 600 BAH FHD 500X	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ CENTER DEBRIS DEFLECTOR ASSEMBLY PERPENDICULAR TO THE PICK UP HEAD ☐ FRONT DEBRIS DEFLECTOR CURTAIN ASSEMBLY PARALLEL TO THE PICK UP HEAD ☐ LOW EMISSION DUST GUARDS (ONLY APPLICABLE TO CABOVER TRUCKS) ☐ THREE (3) 0.063 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ ONE (1) 0.093 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER ☐ ONE (1) 0.093 INCH DIAMETER ORIFICE NOZZLE LOCATED IN BLOWER HOUSING ☐ TWO (2) [MINIMUM] HOPPER BAFFLE CURTAINS ☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH.
TYMCO	DST - 4	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ SELF CONTAINED MULTIPLE FILTRATION SYSTEM UTILIZING PTFE MEMBRANE FILTERS

☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH 32 INCH DIAMETER GUTTER BROOM
☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLES FOR EACH 32 INCH DIAMETER GUTTER BROOM
☐ ONE (1) 0.063 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER
☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH.

MAKE*	MODEL*	DUST CONTROL SYSTEMS*
TYMCO	DST - 6	☐ CYCLONIC, MULTIPASS, CENTRIFUGAL SEPARATION ☐ SELF CONTAINED MULTIPLE FILTRATION SYSTEM UTILIZING PTFE MEMBRANE FILTERS ☐ THREE (3) 0.063 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ TWO (2) 0.043 INCH DIAMETER ORIFICE NOZZLES FOR EACH GUTTER BROOM ☐ ONE (1) 0.094 INCH DIAMETER ORIFICE NOZZLE LOCATED IN THE HOPPER ☐ TWO (2) [MINIMUM] HOPPER BAFFLE CURTAINS ☐ WATER PUMP WITH A MINIMUM SYSTEM RELIEF VALVE SET AT 25 POUNDS PER SQUARE INCH

VACALL	VS10/10D, VF10 VS13/13D, VF13 VS14/14D, VF14 VS16/16D, VF16 VS20/20D, VF20	☐ FOUR (4) 0.062 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT OF EACH 36 INCH GUTTER BROOM ☐ FOUR (4) 0.062 INCH DIAMETER ORIFICE NOZZLES LOCATED IN FRONT OF THE TRANSFER BROOM ☐ TEN (10) 0.125 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE PICK UP HEAD ☐ SIX (6) 0.181 INCH DIAMETER ORIFICE NOZZLES LOCATED INSIDE THE SCRUBBER COLLAR OF THE PICK UP HEAD ☐ 48 INCH POWER VACUUM NOZZLE ☐ MINIMUM 300 GALLON GRAVITY FEED WATER SUPPLY SYSTEM WITH WATER CONTINOUSLY SUPPLIED TO ALL NOZZLES ☐ LOW VELOCITY DUST COLLECTION AIR CHAMBER ☐ MINIMUM OF SIX (6) EXPANDED METAL SCREENS